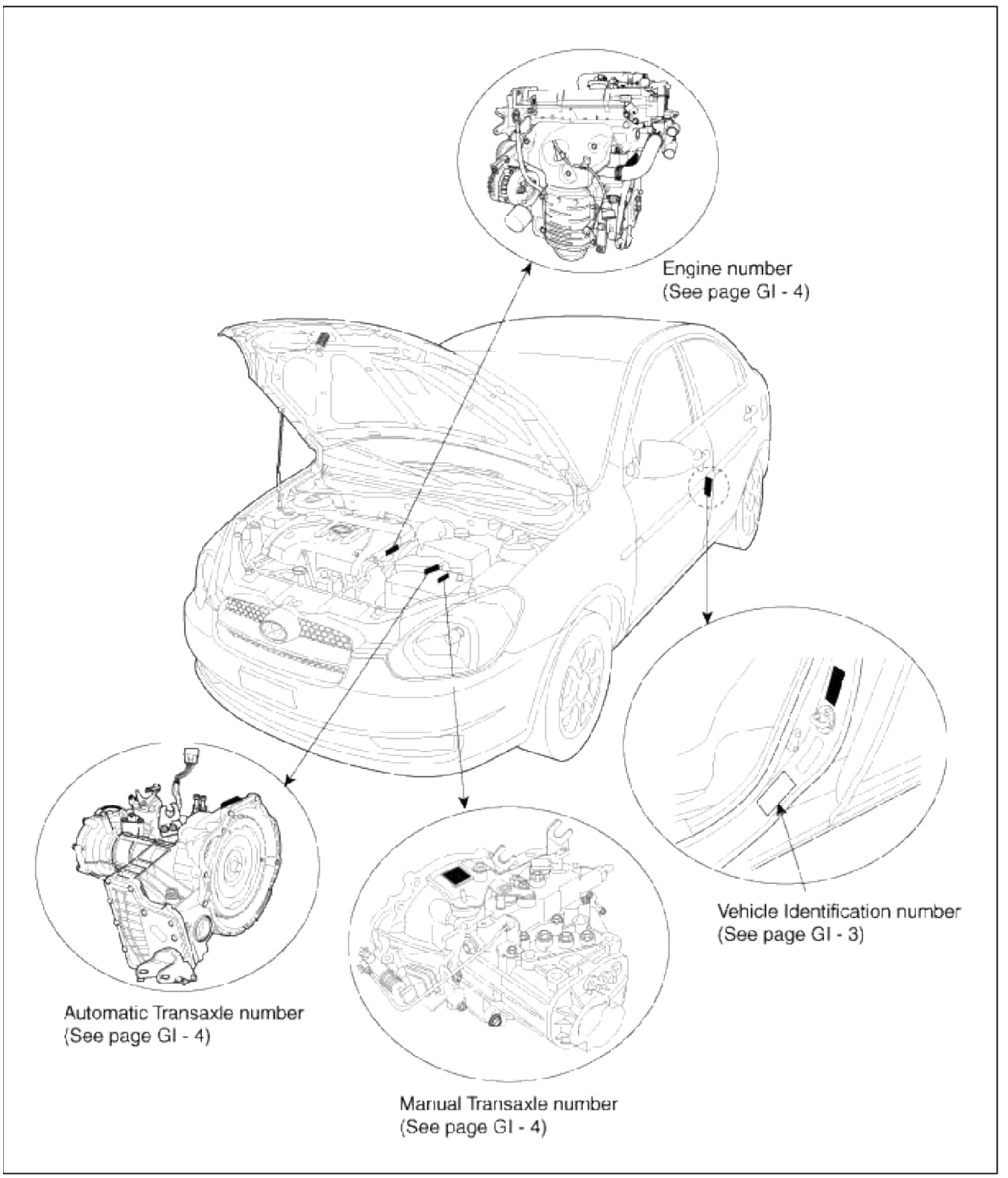
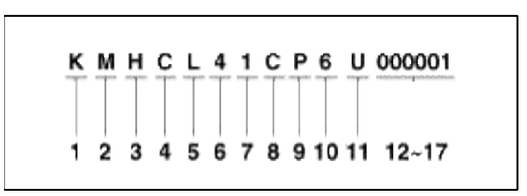
ACCENT(MC) > 2008 > G 1.6 DOHC > General Information

General Information > General Information > General Information

IDENTIFICATION NUMBER LOCATIONS



IDENTIFICATION NUMBER DESCRIPTION
VEHICLE IDENTIFICATION NUMBER



1 : Geographic zone

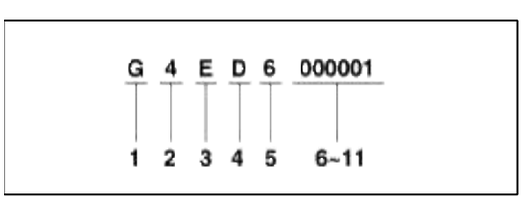
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- K = Korea
2 : Manafacturer
- M = Hyundai motor company
3 : Vehicle type
- H = Passenger
4 : Vehicle Line
- C = ACCENT
5 : Model & Series
- L = STANDARD (L)
- M = DELUXE (GL)
- N = SUPER DELUXE (GLS)
6 : Body type
- 3 = Sedan 3 door
- 4 = Sedan 4 door
7 : Safety device
- 0 = None
- 1 = Active belt (Driver + Passenger)
- 2 = Passive belt (Driver + Passenger)
8 : Engine type
- C = 1.6 GASOLINE
9 : Driving type
- P = LHD, R = RHD
10 : Model year
- 5 = 2005, 6 = 2006
11 : Plant location
- U = Ulsan plant
12 : Sequential number
- 000001 ~ 999999

PAINT CODE

CODE	COLOR
NW	NOBLE WHITE
EB	EBONY BLACK
HL	HIPHOP RED
5S	SPACE SILVER
2B	SKY BLUE
9G	GOLD BEIGE
3E	BLUE ONYX
3W	SHEER YELLOW
2M	MIDNIGHT GRAY
8N	LEAF GREEN
5R	RUBY RED

ENGINE IDENTIFICATION NUMBER

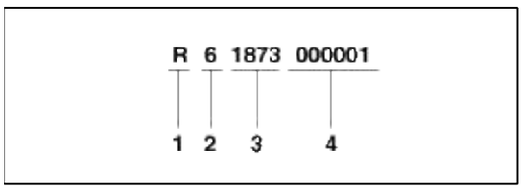


1. Engine fuel
   - G = Gasoline

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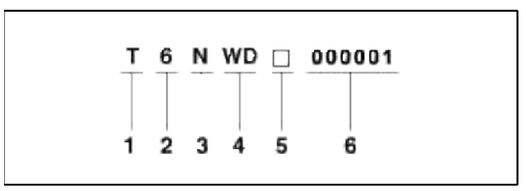
2. Engine range
   - 4 = 4 cycle 4 cylinder
3. Engine development order
   - E = ALPHA Engine
4. Engine capacity
   - D = 1,599cc
5. Production year
   - 5 : 2005, 6 : 2006
6. Engine production sequence number
   - 000001 ~ 999999

TRANSMISSION IDENTIFICATION NUMBER MANUAL
MANUAL



1. Model
   - R = M5CF1
   - P = M5CF2
2. Production year
   - 5 : 2005, 6 : 2006
3. Gear ratio(Tooth number)
   <Differential drive gear tooth number / Output shaft gear tooth number>
   - 1873 = 73/18 = 4.056
4. Transaxle production sequence number
   - 000001 ~ 999999

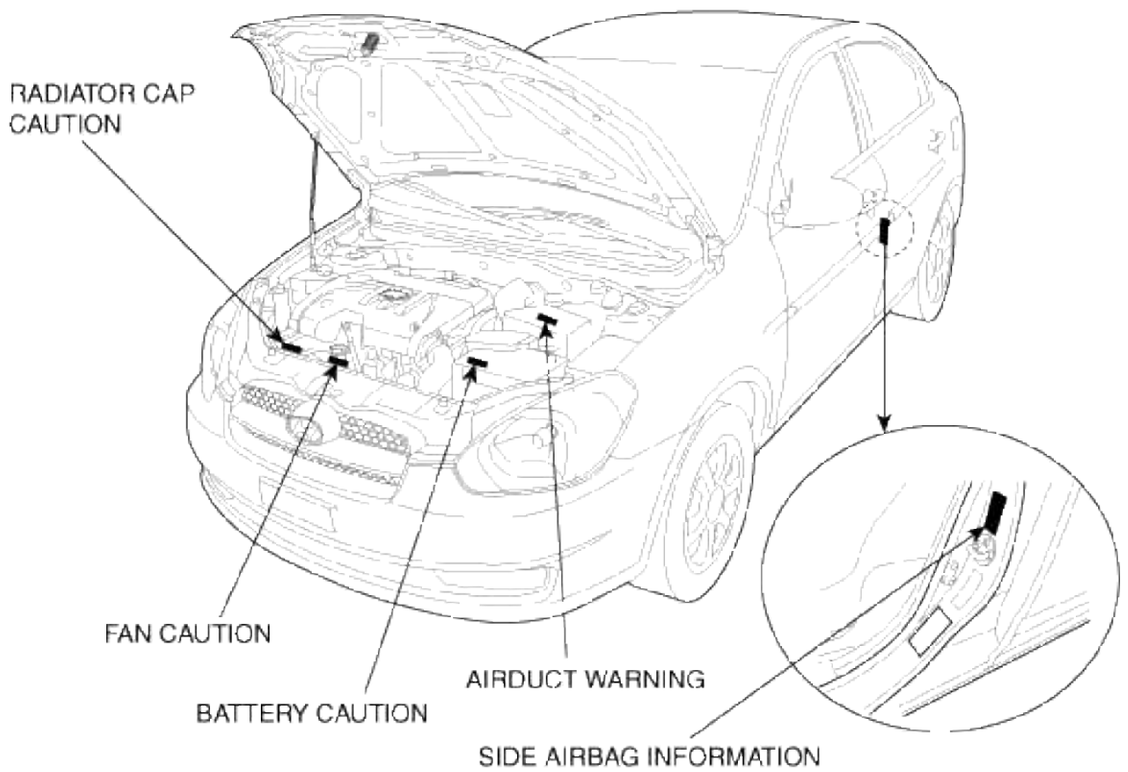
AUTOMATIC



1. Modle
   - T = A4AF3
2. Production year
   - 5 : 2005, 6 : 2006
3. Gear ratio
   - N = 4.041
4. Detailed chassification
   - WD = 1.6 CVVT
5. Spare
6. Transaxle production sequence number
   - 000001 ~ 999999

WARNING / CAUTION LABEL LOCATIONS

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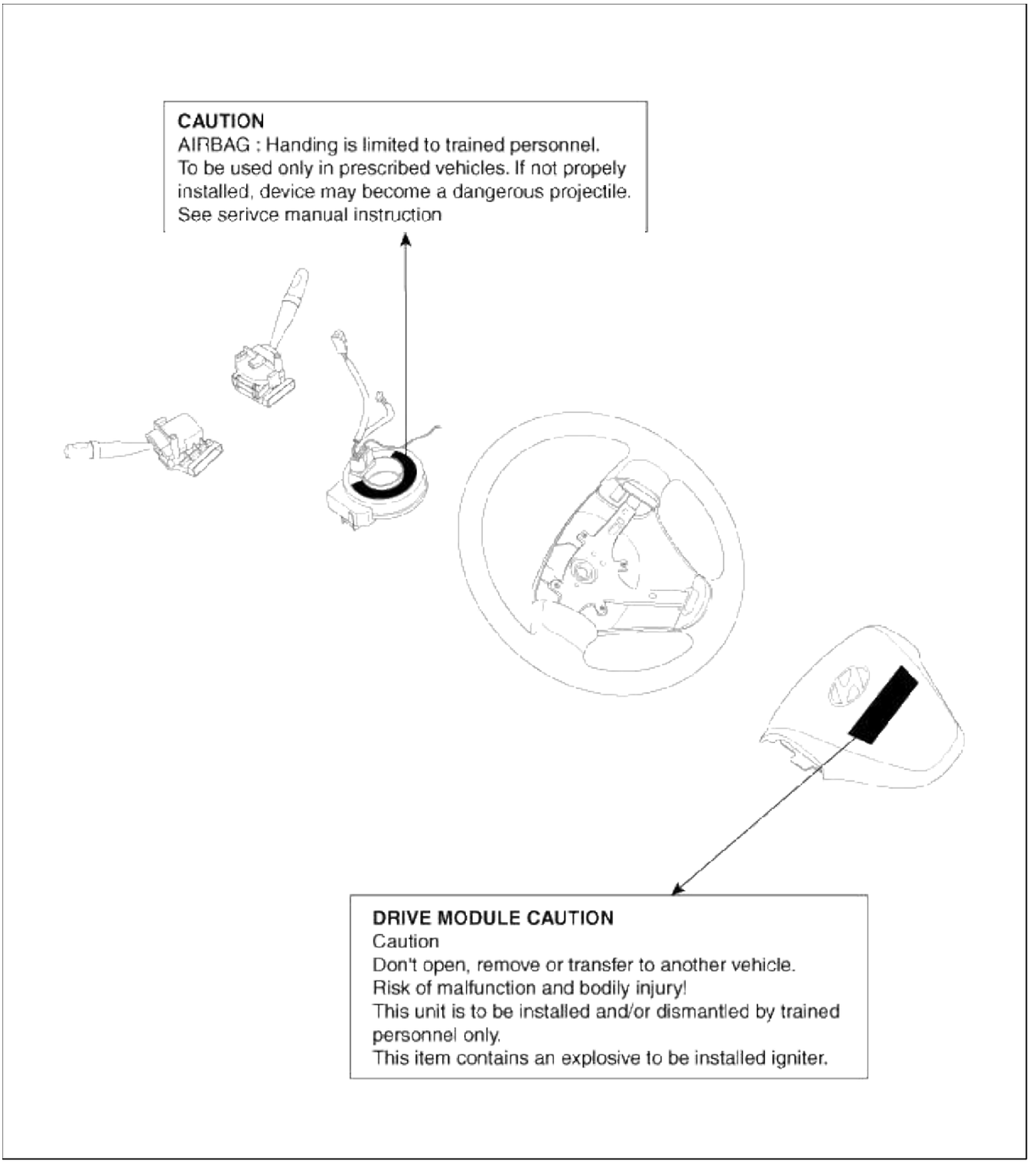


ATTENTION
SRS VEHICLE
THIS CAR IS EQUIPPED WITH A SUPPLEMENTAL RESTRAINT SYSTEM. TO PROVIDE CONTINED RELIABLITY, CERTAIN ELEMENTS OF THE SUPPLEMENTAL RESTRAINT SYSTEM SHALL BE SERVICED OR REPLACED BY AUTHORIZED DEALER TEN YEARS AFTER VEHICLE LABEL. FOR FURTHER INFORMATION.
SEE OWNER'S MANUAL.

SIDE AIR BAG
THIS CAR IS EQUIPPED WITH A SIDE AIRBAG SYSTEM.
TO PROVIDE CONTINUED RELIABILITY, CERTAIN ELEMENTS OF THE SIDE AIRBAG SYSTEM SHALL BE SERVICED OR VEHICLE MANUFACTURE DATE SHOWN ON CERTIFICATION LABEL.
FOR FURTHER INFORMATION
SEE OWNER'S MANUAL.

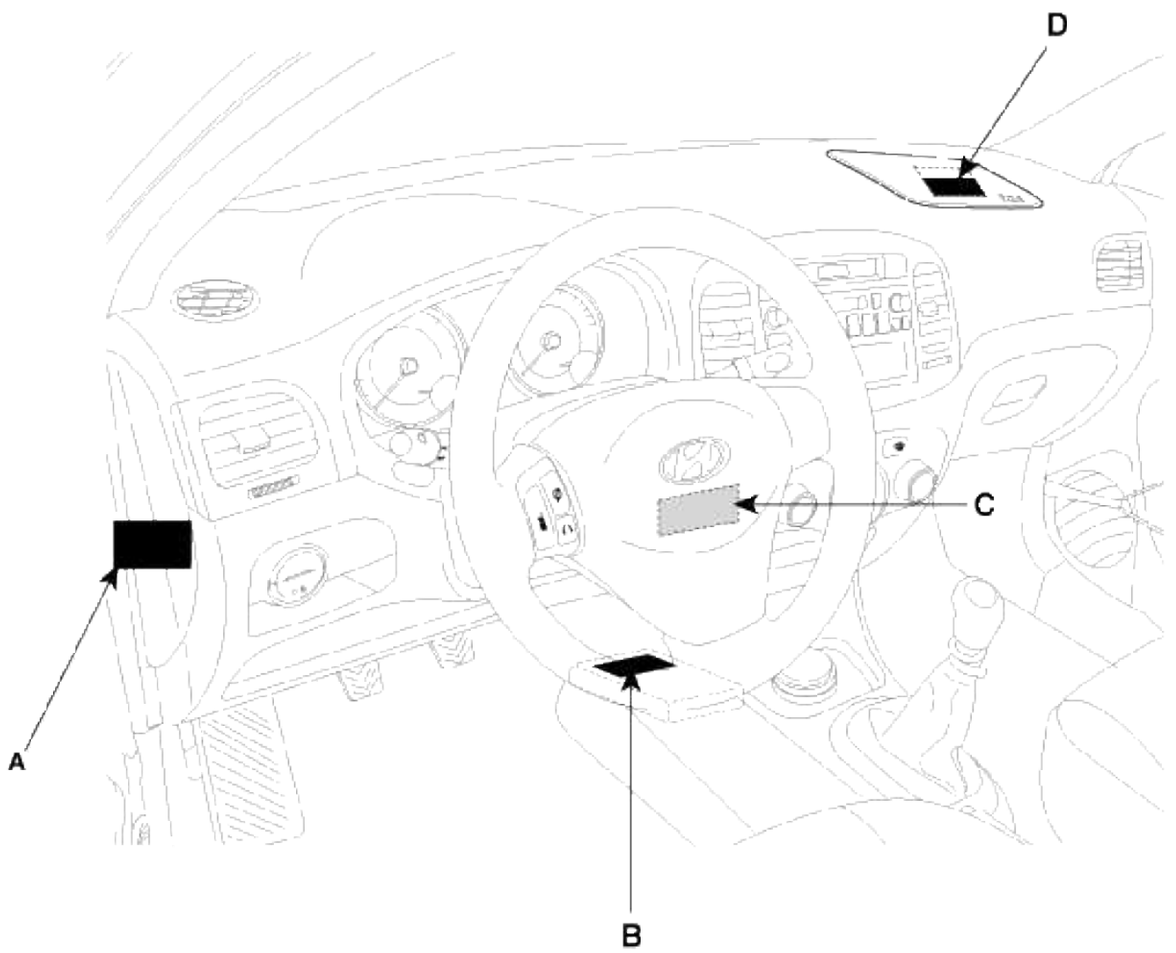
AIR BAG WARNING / CAUTION LABEL

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AIR BAG WARNING / CAUTION LABEL (CONT'D)

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AIR BAG WARNING / CAUTION LABEL (CONT'D)

A : WARNING
SEE OWNER'S MANUAL.
This car is equipped a side airbag for each front seat.

- Do not use any accessory seat covers.
- Use of other seat covers could reduce the effect of the system.
- Do not install any accessories on the side or near the side airbag.
- Do not use excessive force on the side of the seal.
- For further information, see the owner's manual.

B : CAUTION
AIRBAG ESPE UNIT

Detach connector before unmounting. Assemble strictly according to manual instructions.

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C : PASSENGER MODULE CAUTION

CAUTION
Don't open, remove or transfer to another vehicle. Risk of malfunction and bodily injury!
This unit is to be installed and/or dismantled by trained personnel only. This item contains an explosive to be installed igniter.

D : SUPPLEMENTAL RESTRAINT SYSTEM (AIRBAG) INFORMATION

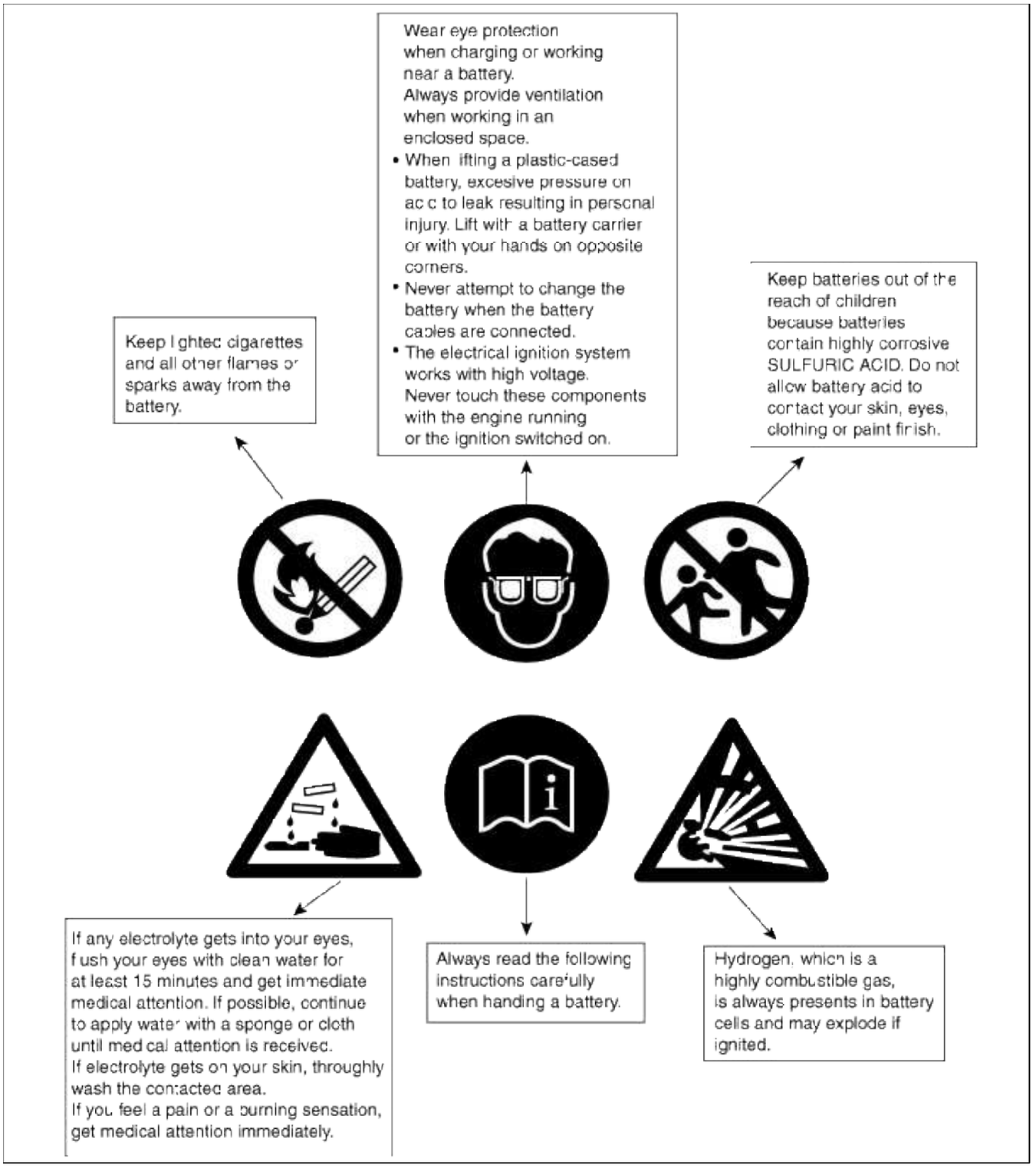
- The airbag is a Supplement Restraint System (SRS).
  You must always wear the seat belts.
- The airbag system condition is normal when the "SRS" lamp in the cluster flashes approximately 6 times after the ignition key is turned on and then goes off.
- If any of the following condition occur, the system must be serviced.
  - "SRS" lamp does not light up when the key is turned on.
  - "SRS" lamp stays lit or flashes continuously.
  - The airbag has inflated.
- The airbag system must be inspected by an authorized dealer ten years after the vehicle manufacture date shown on the certification label, located on left front door opening area.

WARNING
Failure to the above instructions may result in injury to you or other occupants in the vehicle

- See the "SRS" section in Owner's Manual for more information about airbags.

BATTERY CAUTION LABEL DESCRIBTION

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LIFT AND SUPPORT POINTS

WARNING

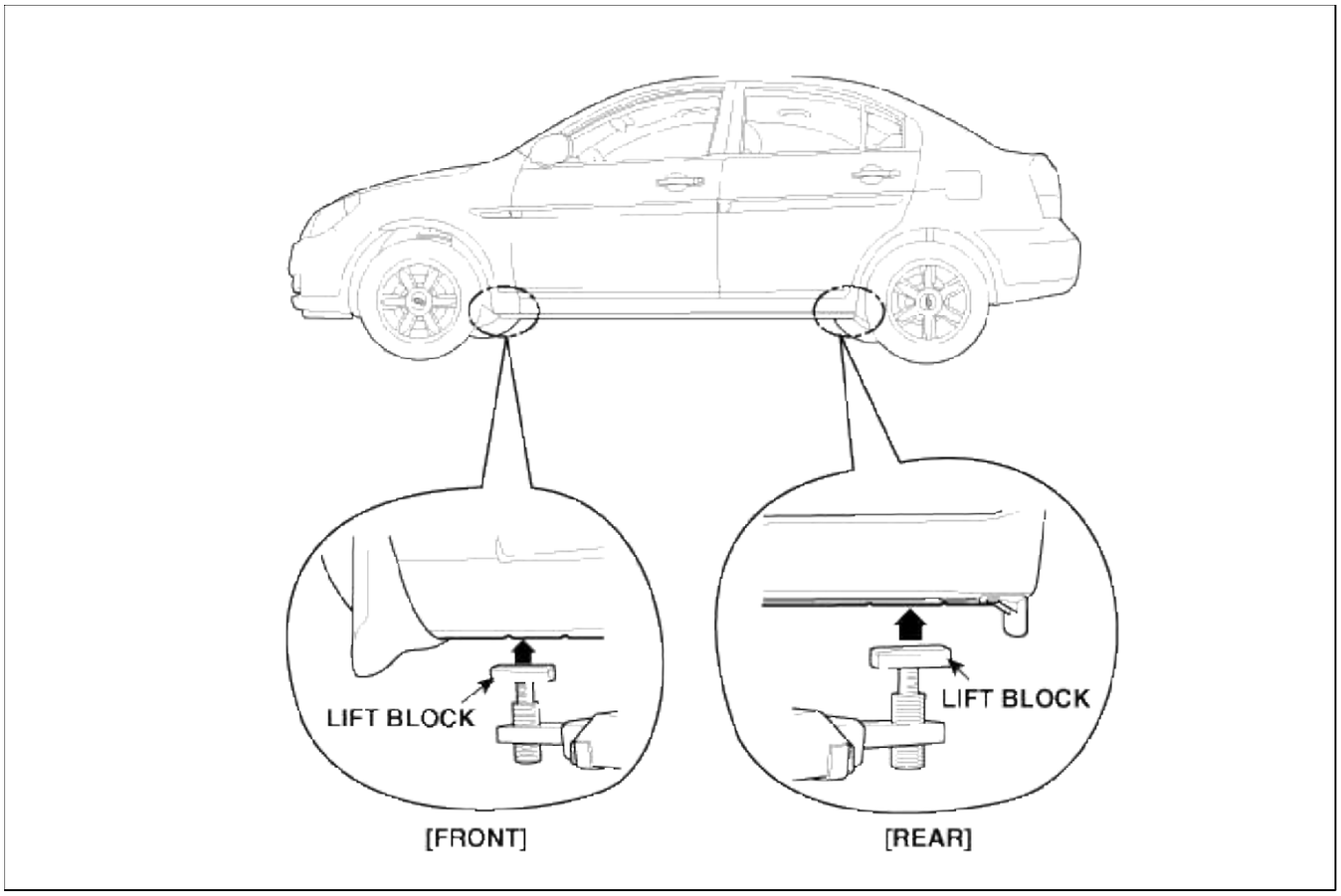
When heavy rear components such as suspension, fuel tank, spare tire, tailgate and trunk lid are to be removed, place additional weight in the luggage area before hoisting. When substantial weight is removed from the rear of the vehicle, the center of gravity may change and cam cause the vehicle to tip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

NOTE

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

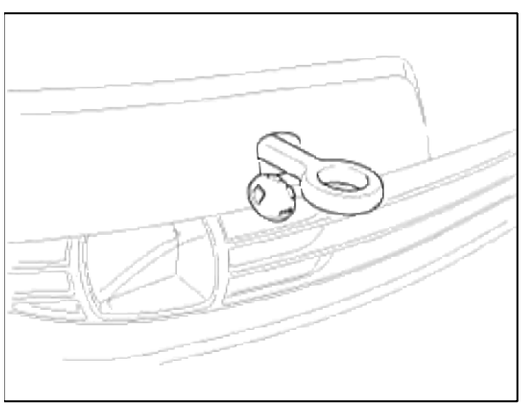
1. Place the lift blocks under the support points as shown in the illustration.
2. Raise the hoist a few inches (centimeters) and rock the vehicle to be sure it is firmly supported.
3. Raise the hoist to full height to inspect the lift points for secure support.

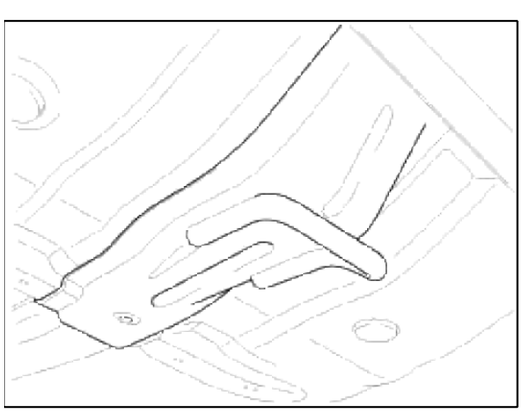
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TOWING

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 propular methods of towing a vehicle :

If the vehicle cannot be transported by flat-bed, if should be towed with the front wheels off the ground. If due to damage, the vehicle must be toward with the front wheels on the ground, do not following :

Manual Transmission

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

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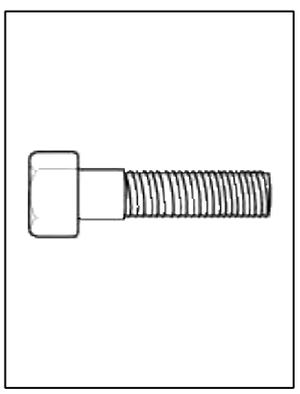
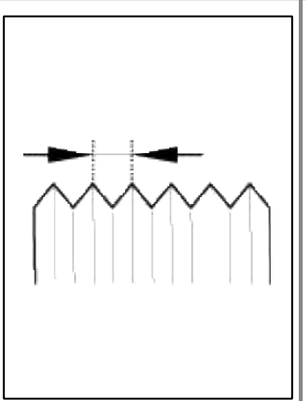
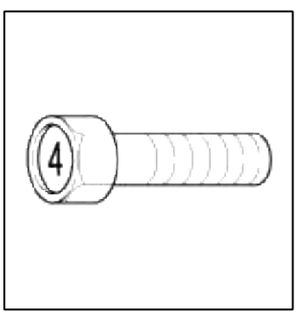
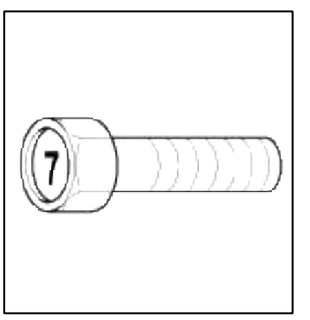
Automatic Transmission

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

CAUTION

- Improper towing preparation will damage the transmission. Follow the above procedure exactly. If you cannot shift the transmission or start the engine (automatic transmission), your vehicle must be transported on a flatbed.
- It is the best to tow vehicle no farther than 19miles (30km), and keep the speed below 30mph (50km/h).
- 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.

TIGHTENING TORQUE TABLE OF STANDARD PARTS

Bolt nominal diameter (mm)	Pitch (mm)	Torque Nm (kg.cm, lb.ft)	
		Head Mark 4	Head Mark 7
			
M5	0.8	3 ~ 4 (30 ~ 40, 2.2 ~ 2.9)	5 ~ 6 (50 ~ 60, 3.6 ~ 4.3)
M6	1.0	5 ~ 6 (50 ~ 60, 3.6 ~ 4.3)	9 ~ 11 (90 ~ 110, 6.5 ~ 8.0)
M8	1.25	12 ~ 15 (120 ~ 150, 9 ~ 11)	20 ~ 25 (200 ~ 250, 14.5 ~ 18.0)
M10	1.25	25 ~ 30 (250 ~ 300, 18 ~ 22)	30 ~ 50 (300 ~ 500, 22 ~ 36)
M12	1.25	35 ~ 45 (350 ~ 450, 25 ~ 33)	60 ~ 80 (600 ~ 800, 43 ~ 58)
M14	1.5	75 ~ 85 (750 ~ 850, 54 ~ 61)	120 ~ 140 (1,200 ~ 1,400, 85 ~ 100)
M16	1.5	110 ~ 130 (1,100 ~ 1,300, 80 ~ 94)	180 ~ 210 (1,800 ~ 2,100, 130 ~ 150)
M18	1.5	160 ~ 180 (1,600 ~ 1,800, 116 ~ 130)	260 ~ 300 (2,600 ~ 3,000, 190 ~ 215)
M20	1.5	220 ~ 250 (2,200 ~ 2,500, 160 ~ 180)	360 ~ 420 (3,600 ~ 4,200, 260 ~ 300)
M22	1.5	290 ~ 330 (2,900 ~ 3,300, 210 ~ 240)	480 ~ 550 (4,800 ~ 5,500, 350 ~ 400)
M24	1.5	360 ~ 420 (3,600 ~ 4,200, 260 ~ 300)	610 ~ 700 (6,100 ~ 7,000, 440 ~ 505)

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NOTE

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

LUBRICANTS

RECOMMENDED LUBRICANTS

Parts	**OIL & GREASE STANDARD**
Engine Oil	API SL(SJ) or ABOVE,
	ILSAC GF-3 and ABOVE
Manual transaxle	GENUINE PART MTF 75W/85 (API GL - 4)
Automatic transaxle	DIAMOND ATF SP-III, SK ATF SP-III
Brake	DOT 3, DOT 4 or equivalent
Coolant	Ethlyene glycol base for aluminium radiator
Coolant	Ethlyene glycol base for aluminium radiator
Transaxle linkage, parking breake cable mechanism, hood, door latch, seat adjuster, tailgate latch, door hinges, tailgate hinge	Multipurpose grease NIGL grade #2
Power Steering	PSF - III

WARNING

Always use Genuine Kia parts and recommended fluid.
Using any other type of parts and fluid can cause serious damaged if the vehicle.

LUBRICANTS CAPACITIES

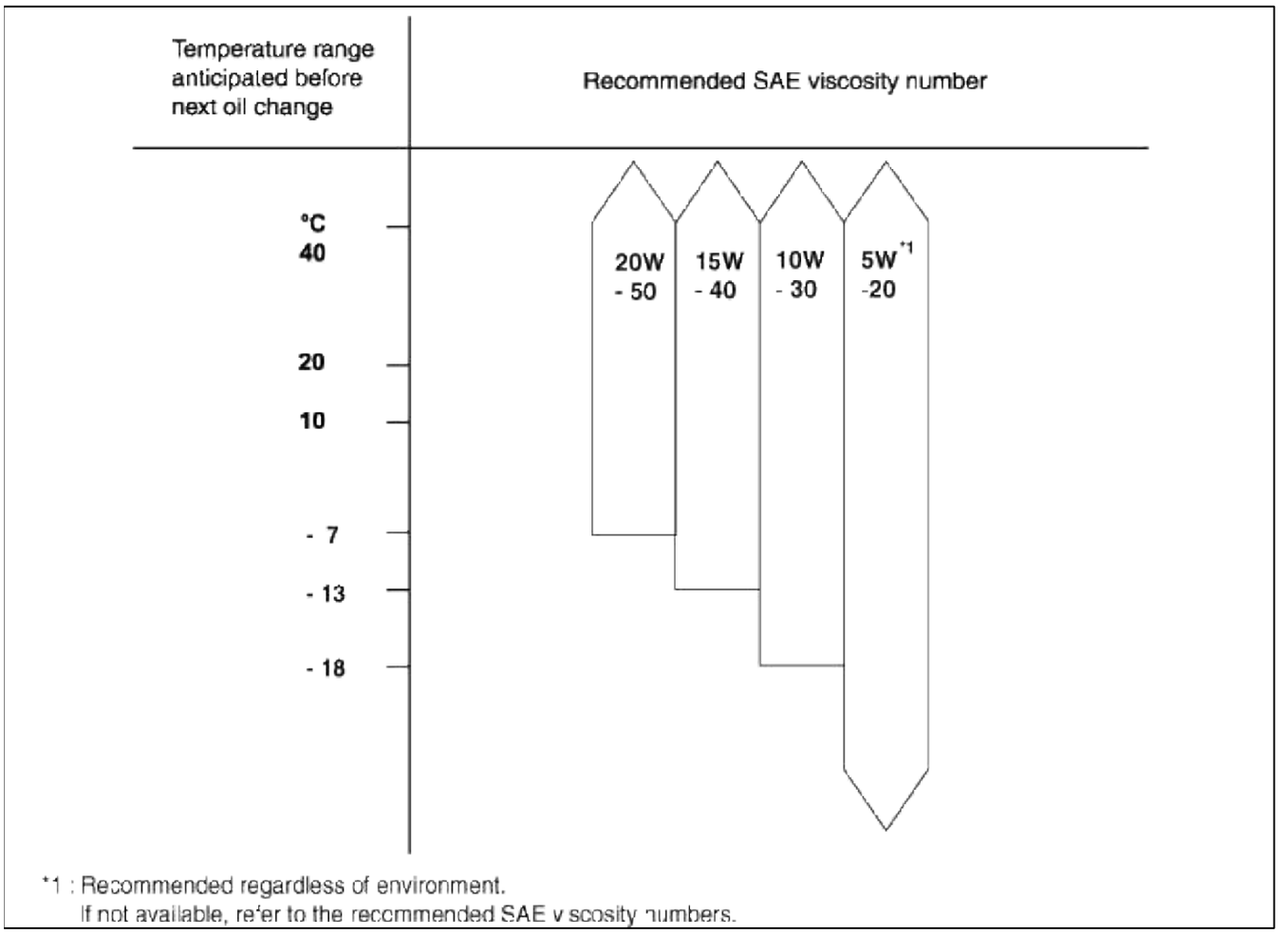
Description		**Capacities**
Engine oil	Oil pan	3.0 (3.17, 2.64)
	Oil filter	0.3 (0.32, 0.26)
	Total	3.3 (3.49, 2.90)
Cooling system		5.5~5.8 (5.81~6.13, 4.84~5.10)
Manual transaxle		2.0 (2.11, 1.76)
Automatic transaxle		6.1 (6.45, 5.37)
Power steering		0.75~0.8 (0.79~0.85, 0.66~0.70)

Capacities: [liter (U.S.qts, lmp.qts)]

SELECTION OF ENGINE OIL

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RECOMMENDED ILSAC classification : GF-3 OR ABOVE
RECOMMENDED API classification : SL(SJ) OR ABOVE
RECOMMENDED SAE VISCOSITY GRADES :



NOTE

For best performance and maximum protection of all types of operation, select only those lubricants which :
1. Satisfy the requirements of the API classification.
2. Have the proper SAE grade number for expected ambient temperature range.

Lubricants that do not have both an SAE grade number and API service classification on the container should not be used.

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.

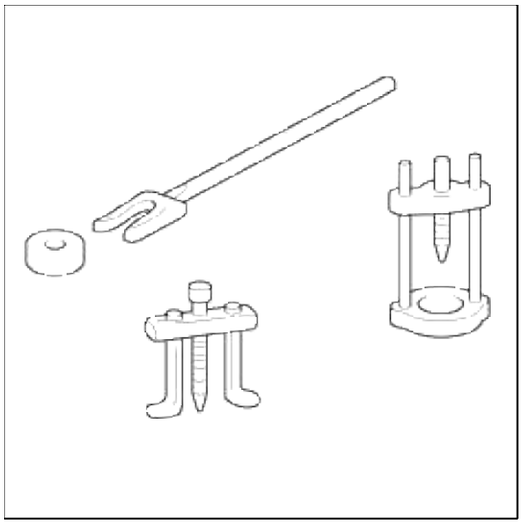
PREPARATION OF TOOLS AND MESURING EQUIPMENT

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

SPECIAL TOOLS

Use special tools when they are required.

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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.

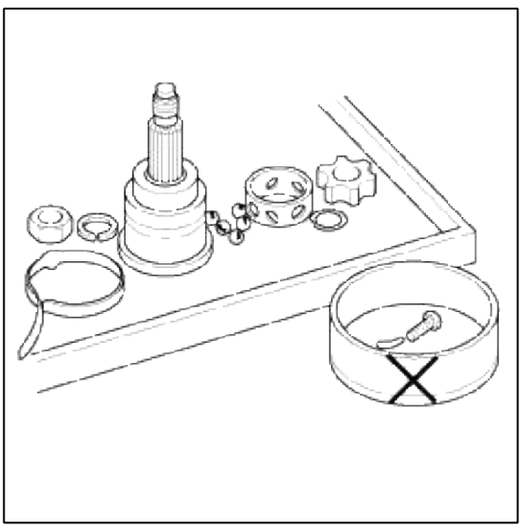
1. **Inspection of parts**

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

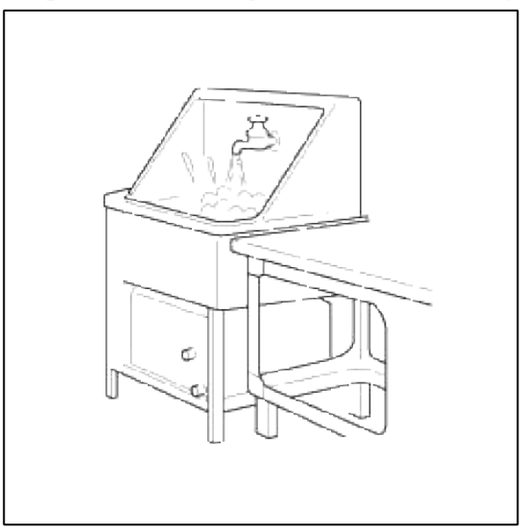


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2. **Arrangement of parts**
   All disassembled parts should be carefully arranged for effective reassembly.
   Be sure to separate and correctly identify the parts to be replaced from those that will be used again.



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 MOTORS genuine parts.

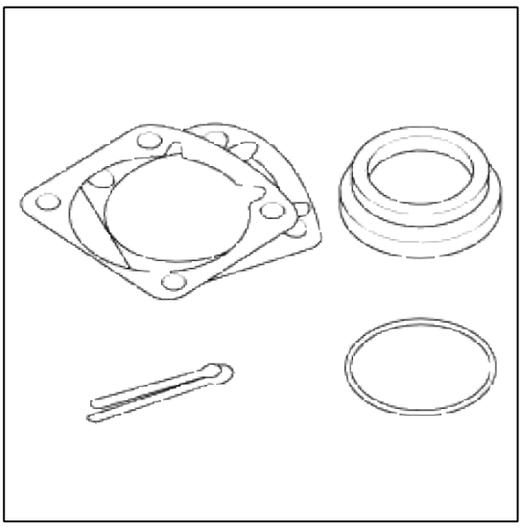


REPLACEMENT
Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
If removed, the following parts should always be replaced with new ones.

1. Oil seals
2. Gaskets

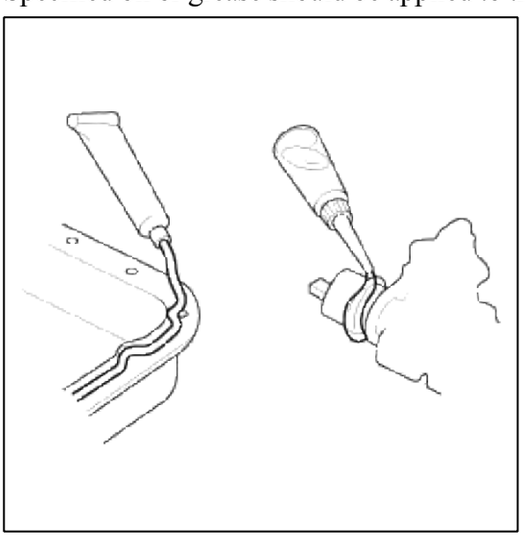
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3. O-rings
4. Lock washers
5. Cotter pins (split pins)
6. Plastic nuts



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.

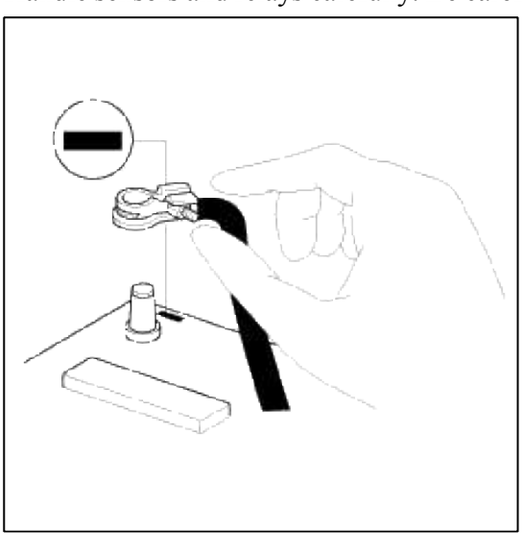


ADJUSTMENT

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

ELECTRICAL SYSTEM

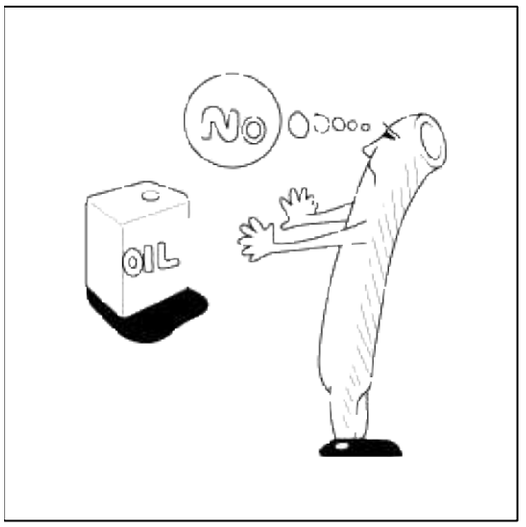
1. Be sure to disconnect the battery cable from the negative (-) terminal of the battery.
2. Never pull on the wires when disconnecting connectors.
3. Locking connectors will click when the connector is secure.
4. Handle sensors and relays carefully. Be careful not to drop them against other parts.



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RUBBER PARTS AND TUBES

Always prevent gasoline or from touching rubber parts or tubing.

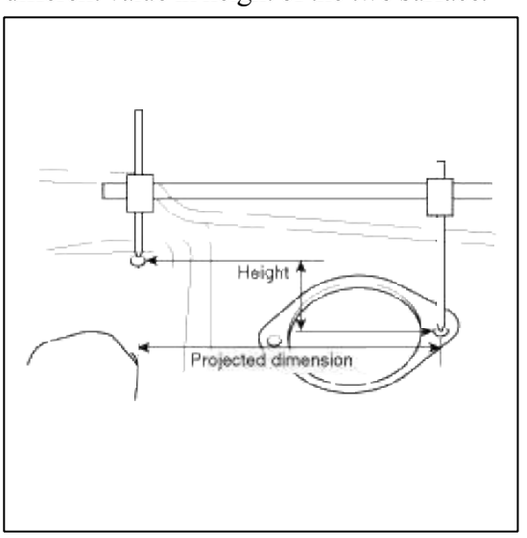


MEASURING BODY DIMENSIONS

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 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.



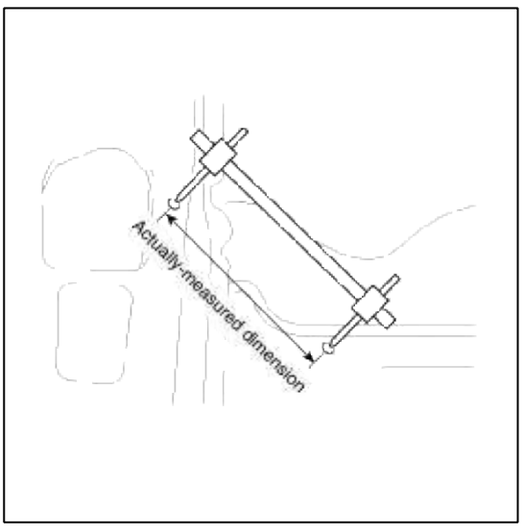
MEASURING ACTUAL DIMENSIONS

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.

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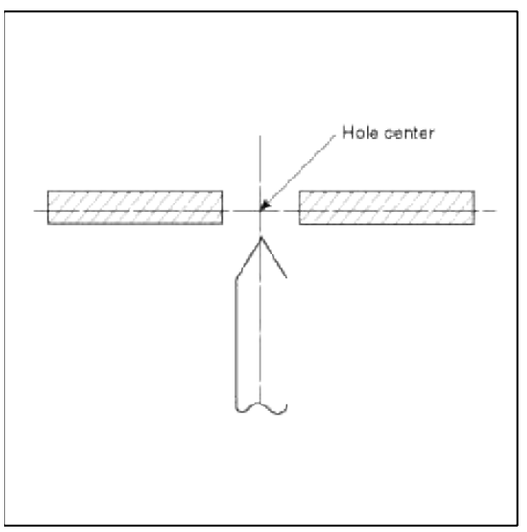
2. First adjust both probes to the same length (A=A') before measurement.

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



MEASUREMENT POINT

Measurements should be taken at the center fo the hole.

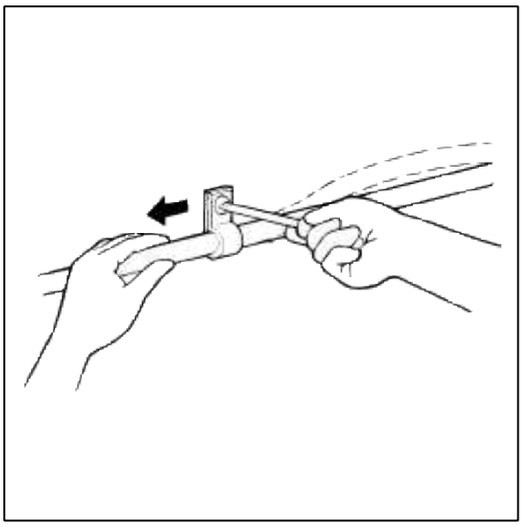


CHECKING CABLES AND WIRES

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.

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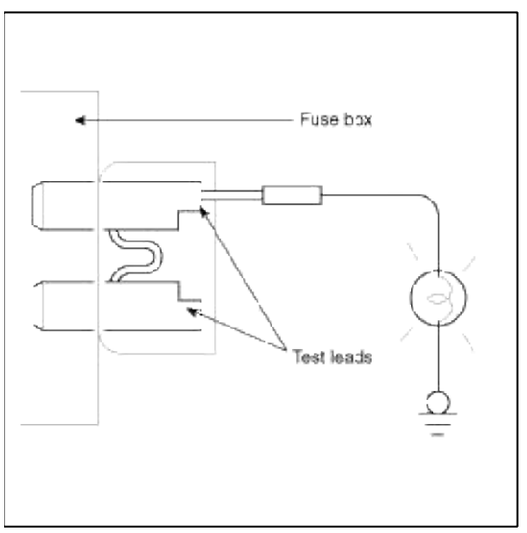
10. Check that the wiring has a little space so that it can vibrate between fixed and moving parts such as the vehicle body and the engine.



CHECK FUSES

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

(Turn the ignition switch so that the fuse circuit becomes operative)

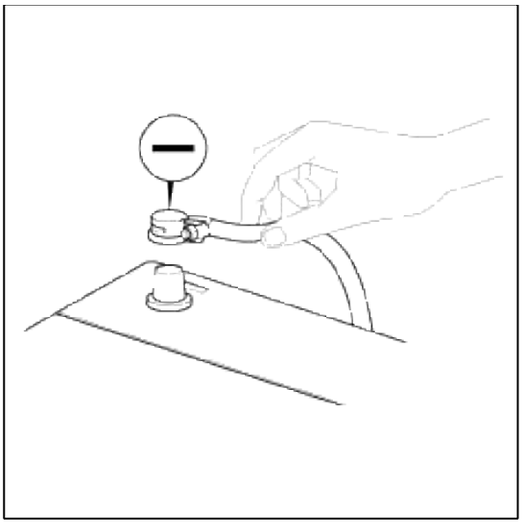


SERIVICING THE ELECTRICAL SYSTEM

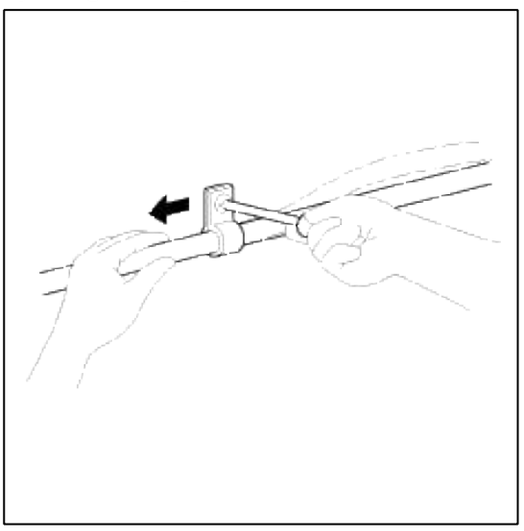
1. Prior to servicing the electrical system, be sure to turn off the ignition switch and disconnect the battery ground cable.

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

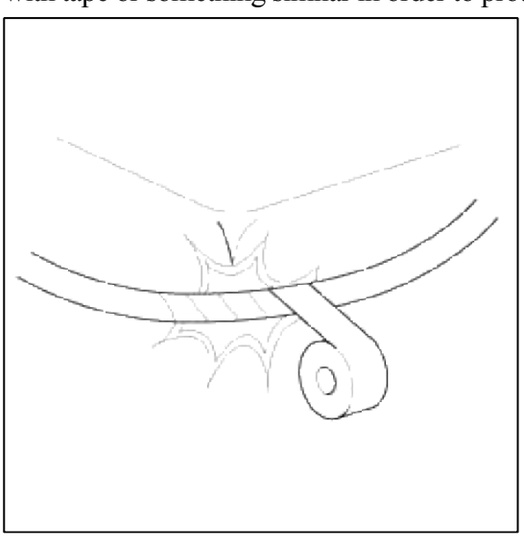
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2. Attach the wiring harnesses with clamps so that there is no slack. However, for any harness which passes the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness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

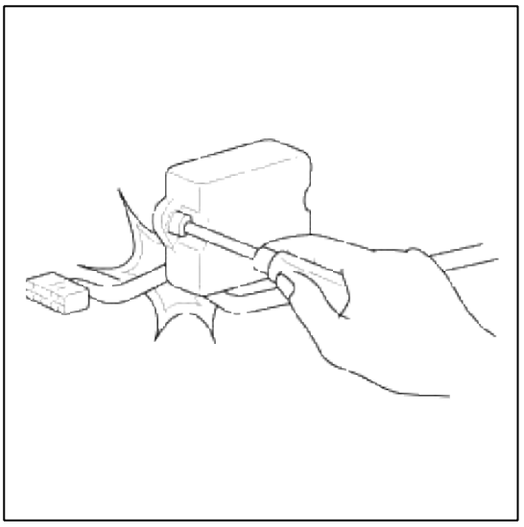


3. If any section of a wiring harness interferes with the edge of a parts, or a corner, wrap the section of the harness with tape or something similar in order to protect if from damage.

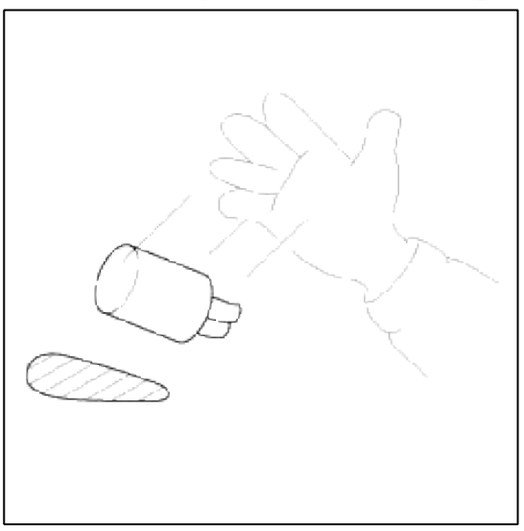


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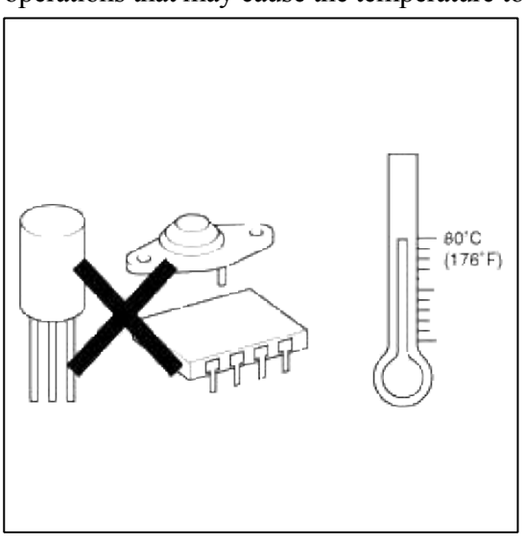
4. When installing any parts, be careful not to pinch or damage any of the wiring harness.



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

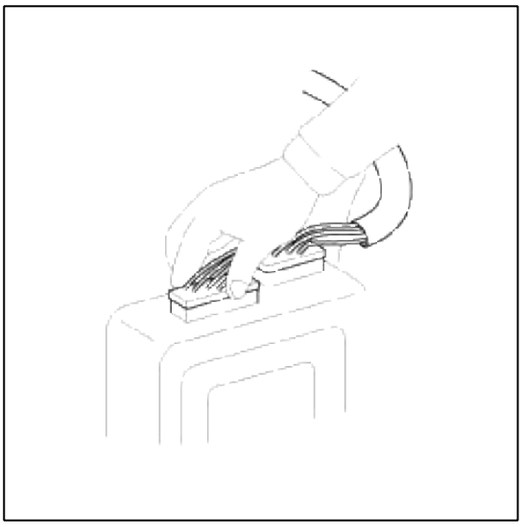


6. The electronic parts used in the computer, relays, etc. are readily damaged by heat. If there is a need for service operations that may cause the temperature to exceed 80°C (176°F), remove the electronic parts before hand.

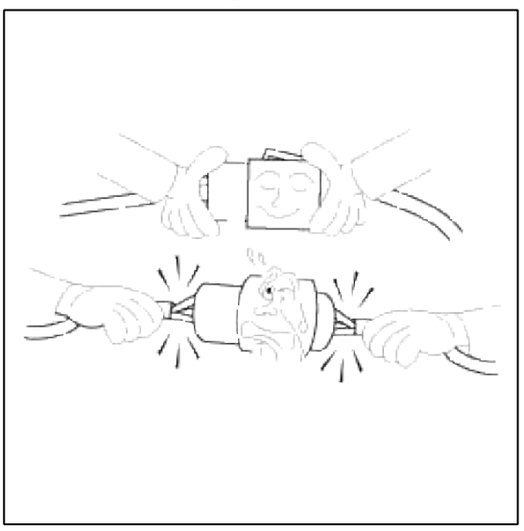


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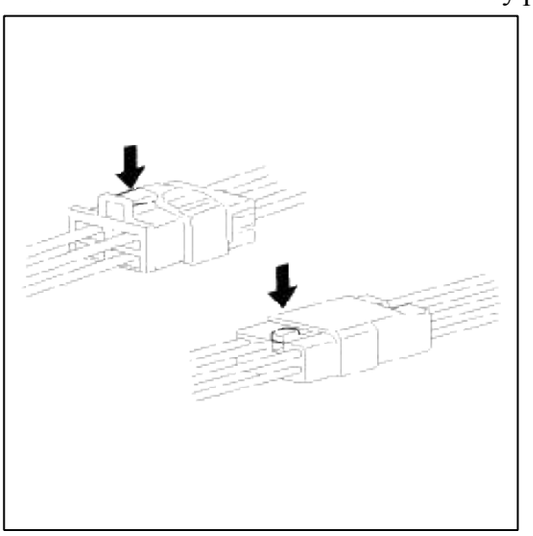
7. Loose connectors cause problems. Make sure that the connectors are always securely fastened.



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

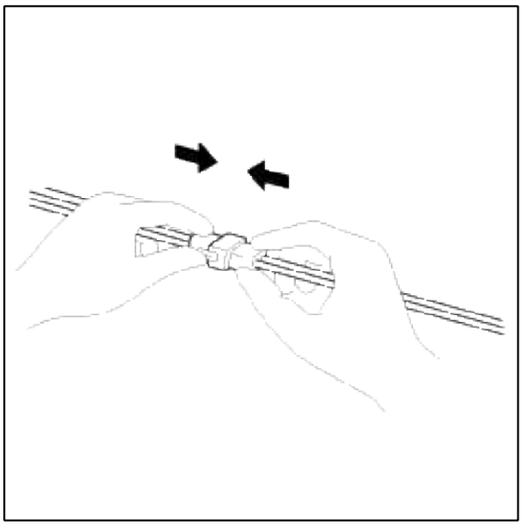


9. Disconnect connector which have catches by pressing in the direction of the arrows shown the illustration.

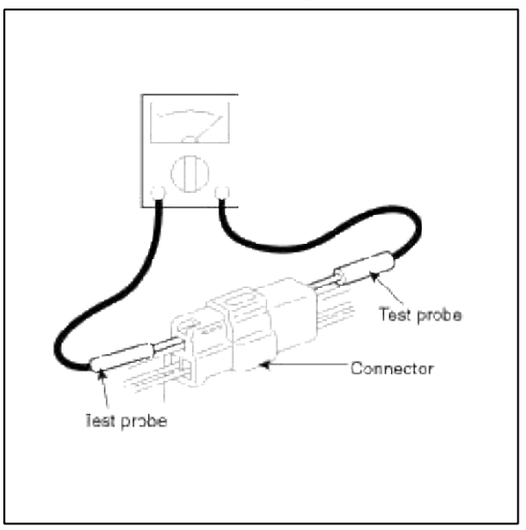


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10. Connect connectors which have catches by inserting the connectors until they make a clicking sound.



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 flow into the converter, it may overheat and create a fire hazard. To prevent this observe the following precautions and explain them to your customer.

1. Use only unleaded gasoline.
2. Do not run the engine while the car is at rest for a long time. Avoid running the engine at fast idle for more than 10minutes and idle speed for more than 20 minutes.
3. Avoid start-jump tests. Do start-jumps only when absolutely necessary. Perform this test as rapidly as possible and, while testing, never race the engine.

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4. Do not measure engine compression for and extended time. Engine compression tests must be made as rapidly as possible.
5. Avoid coasting with the ignition turned and during prolonged braking.
6. Do not dispose of used catalytic converter together with parts contaminated with gasoline or oil.

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ACCENT(MC) > 2008 > G 1.6 DOHC > Automatic Transaxle System

Automatic Transaxle System > General Information > Specifications (A4AF3)

Specifications

Item		Contents
Engine displacement		G4ED(1.6)
Torque converter	Type	3 elements, 2 phases, 1 stage
	Engine stall speed(rpm)	2400~2800
	Stall torque ratio	1.9
Transaxle	Type	Electronically controlled automatic transaxle with four-speed
Gear ratio	1st	2.846
	2nd	1.581
	3rd	1.000
	4th	0.685
	Reverse	2.176
Final gear ratio		4.041(G4ED)
Speedometer gear ratio		Driven 32
Friction elements		3C2B1F (3Clutches 2Brakes 1OWC): 1-band, 4-multiple disc type 3 Clutches: Front clutch, Rear clutch, End clutch 2 Brakes: Low&reverse brake, Kick-down brake (Band type)
Planetary gear		1 Ravigneaux type planetary gear set with long and short pinion
Solenoid valve		6 Solenoid valves (3-PWM, 3-ON/OFF) 2-Pressure control solenoid valves (PWM) 1-Damper clutch control solenoid valve (PWM) 3-Shift control solenoid valve (ON/OFF)

Tightening Torques

Items	Nm	kgf.cm	lb-ft
Oil pan bolt	10-12	100-120	7-8
Select lever assembly mounting bolt	9-14	90-140	6.5-10
Starter motor mounting bolt	27-34	270-340	19-24
Oil cooler hose connector	15-22	150-220	11-16
Hose bracket	3-5	30-50	2-4
Bell housing cover to engine	8-10	80-100	6-7
Transaxle mounting lower bolt(dia.10mm)	43-55	430-550	32-41
Transaxle mounting upper bolt(dia.12mm)	60-80	600-800	43-58

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Torque converter mounting bolt		46-53	460-530	33-38
Control cable to body		8-11	80-110	6-7.5
Lever assembly to bracket assembly		14-22	140-220	10-16
Oil drain plug		35-45	350-450	25-32
Pressure check plug		8-10	80-100	6-7
Pulse generator		10-12	100-120	7-8
Bearing retainer		17-22	170-220	13-16
Transfer drive gear		16-21	160-210	12-15
One-way clutch inner race		35-45	350-450	25-32
Differential drive gear		130-140	1300-1400	94-101
Manual control lever		17-21	170-210	13-15
Manual control shaft lock screw		8-10	80-100	6-7
Inhibitor switch		10-12	100-120	7-8
Sprag rod support bolt		20-27	200-270	14-19
Pump housing to reaction shaft support bolt		10-12	100-120	7-8
Oil pump assembly mounting bolt		19-23	190-230	14-17
Valve body cover		10-12	100-120	7-8
Valve body assembly mounting bolt		10-12	100-120	7-8
Oil filter		5-7	50-70	4-5
Speedometer driven gear sleeve		3-5	30-50	2-4
Kickdown adjusting screw		15-22	150-220	11-15
End cover bolt		19-23	190-230	14-17
Differential cover	M8	20-27	200-270	14-19
	M10	43-55	430-550	32-41
Differential bearing cap		60-80	600-800	43-58
Differential bearing retainer		43-55	430-550	32-41
Locking nut(M38)-Input		180-210	1800-2100	130-152
Locking nut-Output		200-230	2000-2300	146-166
Shift cable bracket bolt		19-23	190-230	14-17
Rear roll supt bracket	M12	60-80	600-800	43-58

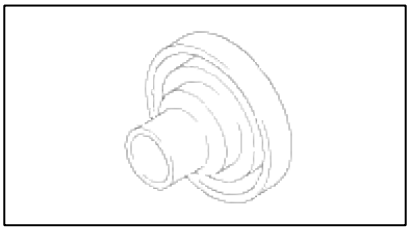
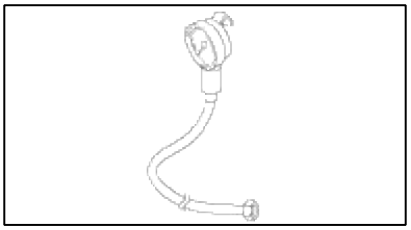
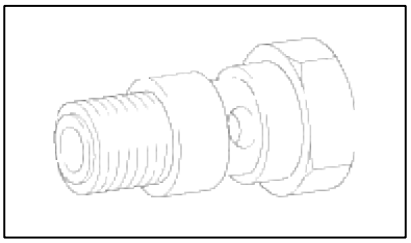
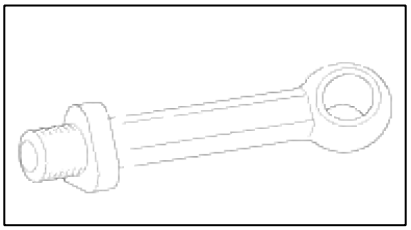
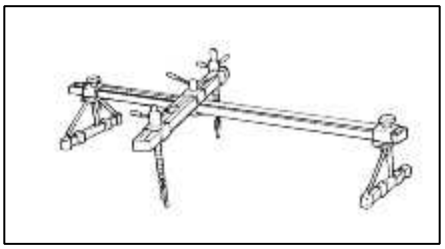
Lubricants

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Items	Specified lubricant	Quantity
Transaxle fluid liter (U.S. lmp.qts.)	GENUINE DIAMOND ATF SP-III or SK ATF SP-III	6.1ℓ (6.4 US qt, 5.4 lmp.qt)
Drive shaft and oil seal lip bushing sliding parts	GENUINE DIAMOND ATF SP-III CHASSIS GREASE SAE J310, NLGINO.0	As required
Select lever sliding parts	SAE J310, NLGINo.2	

Automatic Transaxle System > General Information > Special Service Tools (A4AF3)

Special Service Tools

Tool (Number and name)	Illustration	Use
09431-22100 Oil seal installer		Installation of the differential oil seal. (Use with 09231-H1100)
09452-21500 Oil pressure gauge		Measurement of the oil pressure. (Use with 09452-21001 and 09452-21002)
09452-21002 Oil pressure gauge adapter		Measurement of the oil pressure. (Use with 09452-21500 and 09452-21001)
09452-21001 Oil pressure gauge adapter		Measurement of the oil pressure. (Use with 09452-21500 and 09452-21002)
09200-38001 Engine support fixture		Removal and installation of the transaxle.

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Automatic Transaxle System > Automatic Transaxle System > Description and Operation (A4AF3)

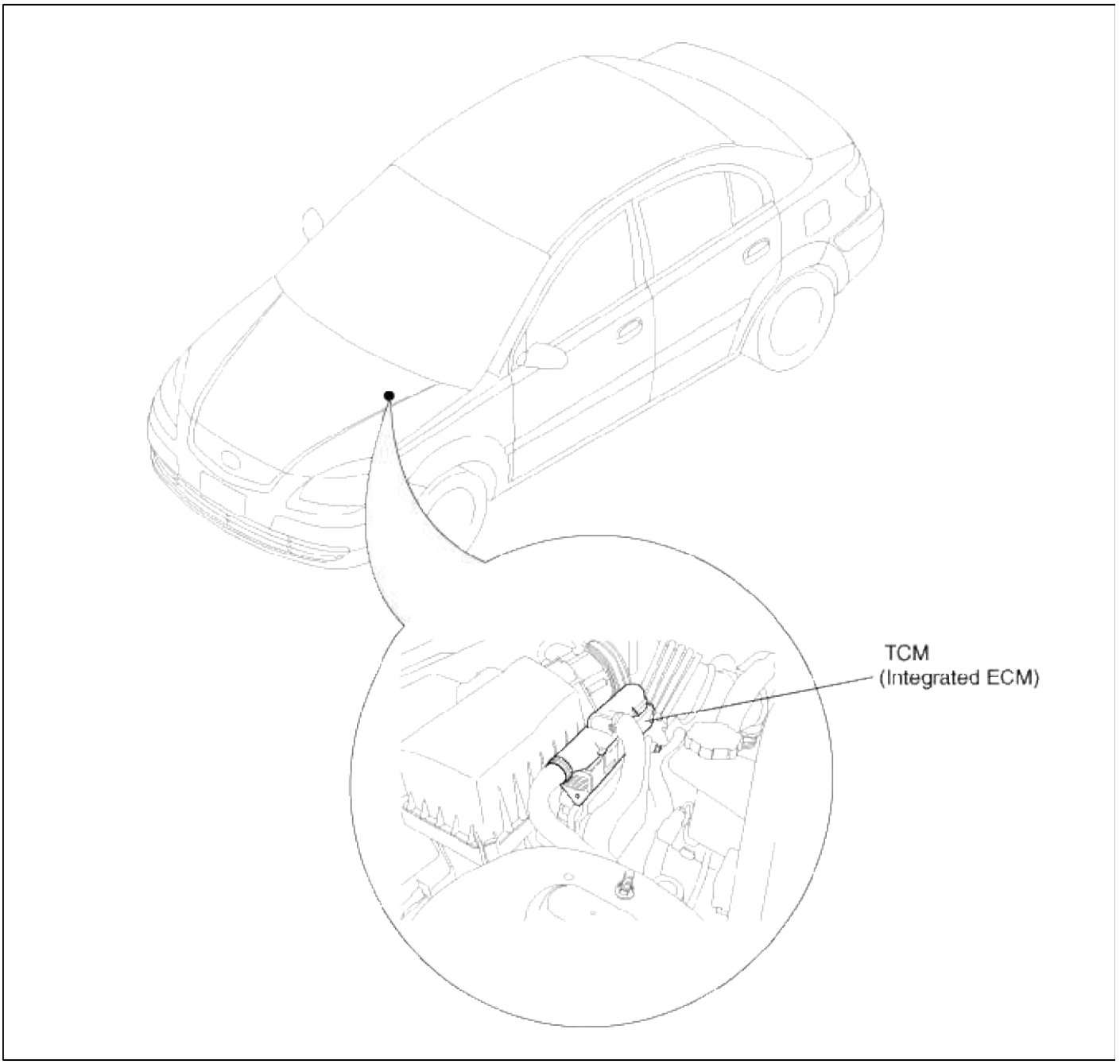
Description

The advanced alpha automatic transaxle is for a 1.4/ 1.6 DOHC engine. The advanced alpha AT is popularly used among small sized vehicles.

Nowadays PCM(power-train control module), which integrates the ECU and TCU inside, is the new trend of the power-train system.

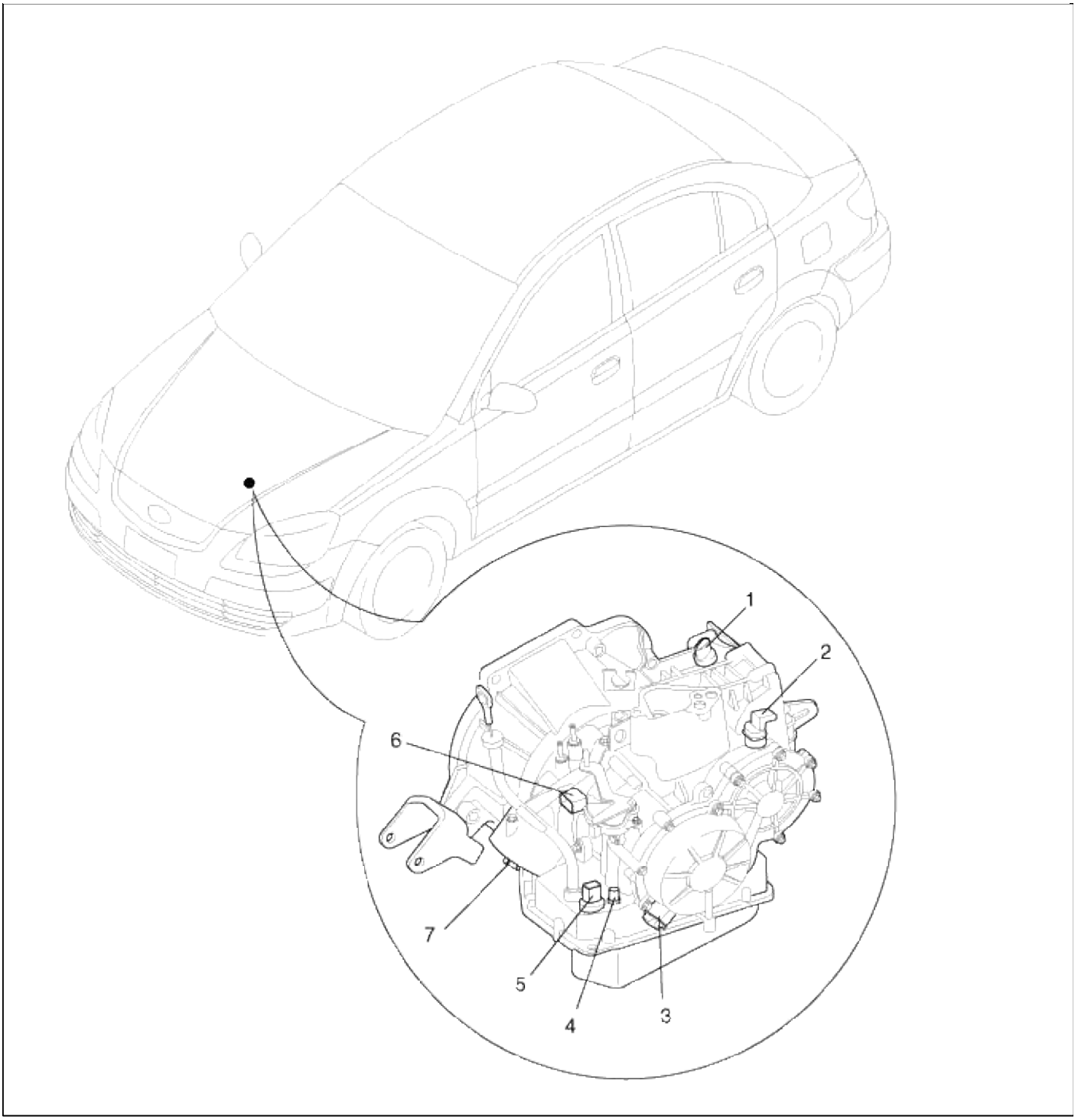
The merge of two system guarantees stable quality of the AT as well as better shift feeling and faster response to ECU information.

Components(1)



Components(2)

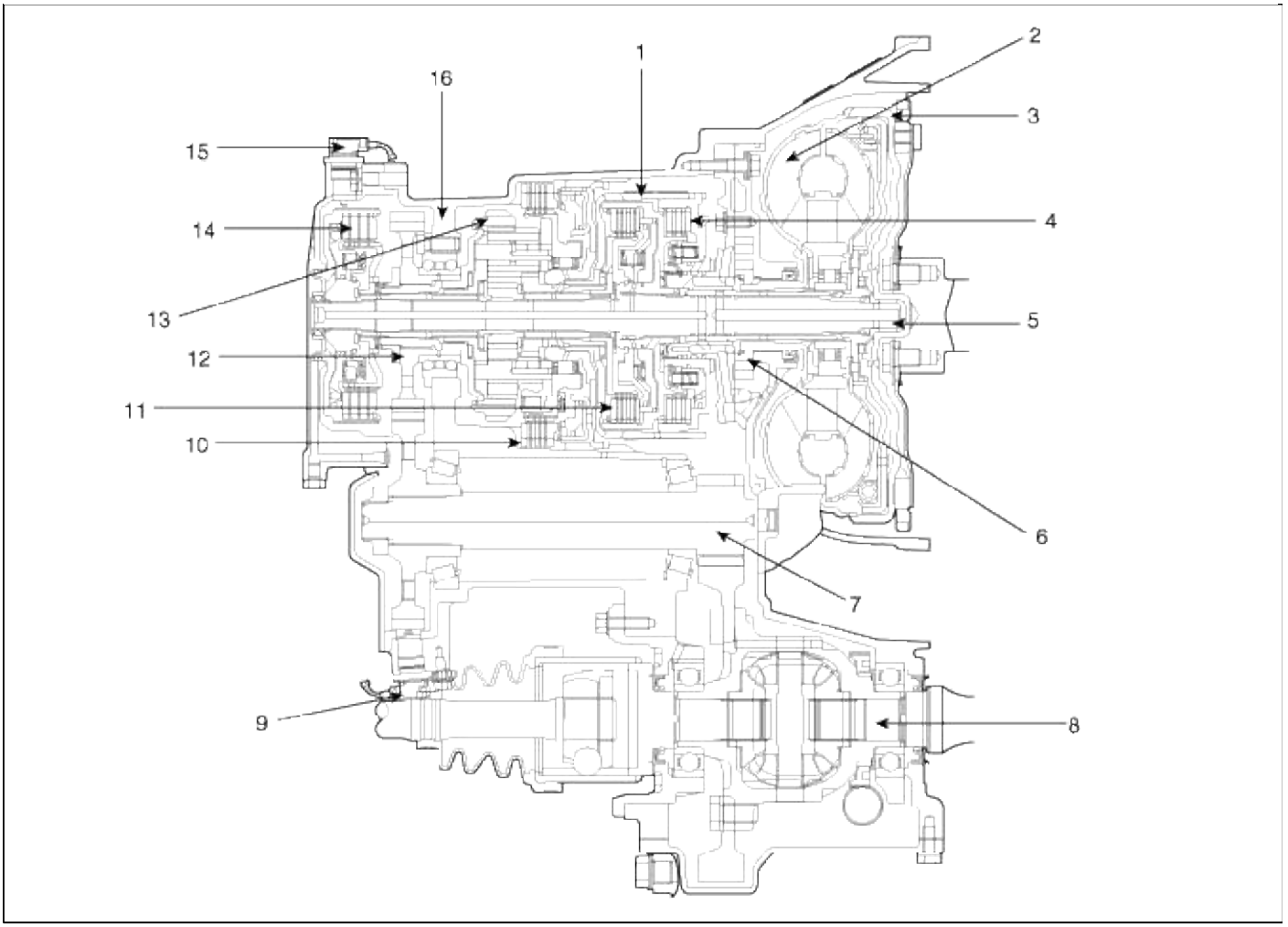
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1. Vehicle speed sensor 2. Output shaft speed sensor 3. Input shaft speed sensor 4. Fluid temperature sensor	5. Solenoid valve 6. Inhibitor switch 7. Kickdown servo switch

Mechanical System
Components

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1. Kickdown band 2. Torque converter 3. Damper clutch 4. Front clutch 5. Input shaft 6. Oil pump 7. Transfer drive gear 8. Transfer driven gear	9. Pulse generator B 10. Low&Reverse brake 11. Rear clutch 12. Output shaft 13. Planetary gear set 14. End clutch 15. Pulse generator A 16. Transaxle case

Function

Component	Symbol	Function
Front clutch	F/C	Connect input shaft and reverse sun gear
Rear clutch	R/C	Connect input shaft and forward sun gear
End clutch	E/C	Connect input shaft and planetary carrier
Kick down brake	K/D	Hold reverse sun gear
Low&Reverse clutch	L/R	Hold planetary carrier
One way clutch	OWC	Restrict planetary carrier turning direction

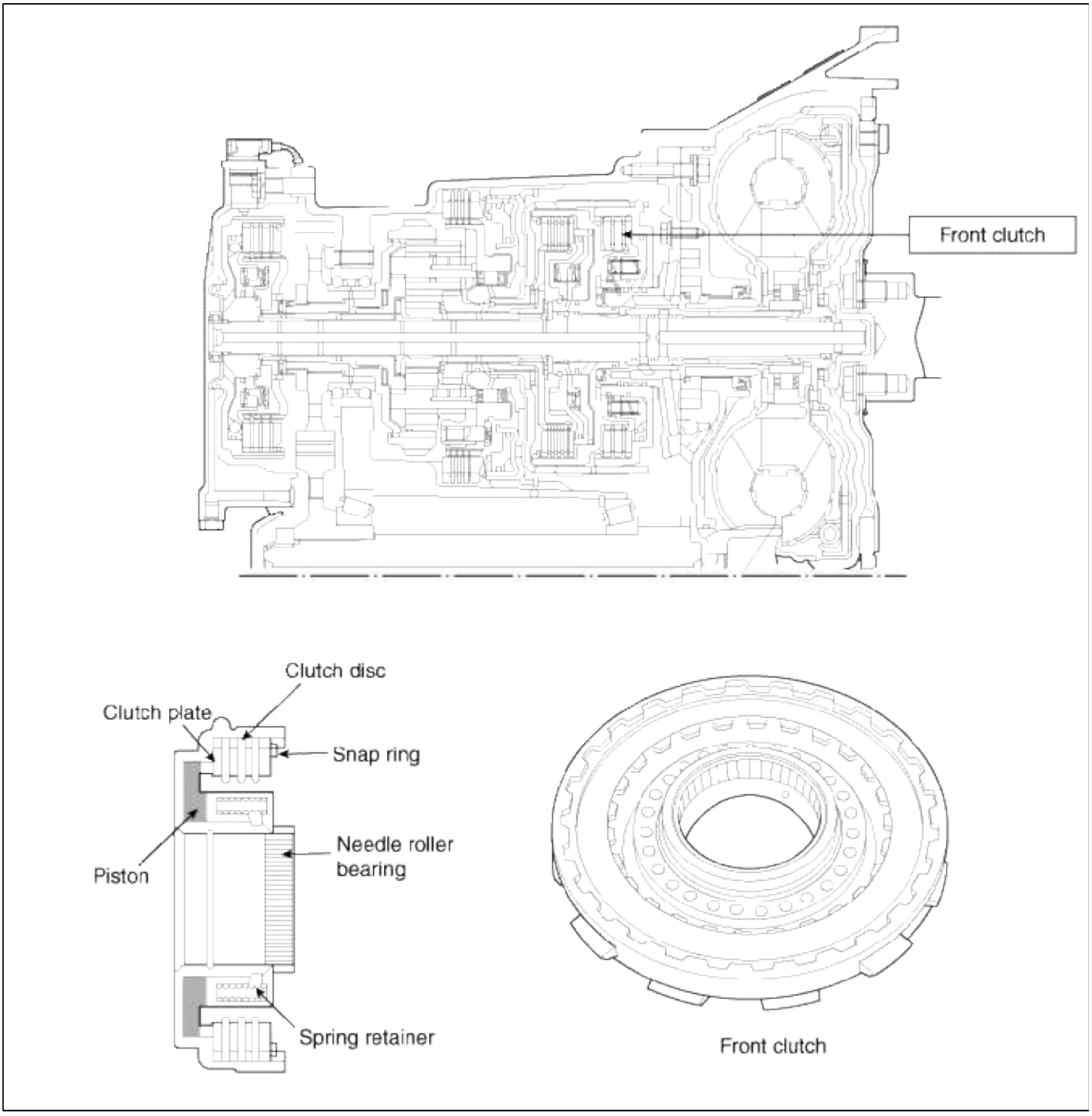
Front Clutch

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Front clutch is engaged at 3rd gear of D range and R range. When it is engaged, reverse sun gear of the planetary gear rotates.

Power Flow:

Input shaft→ Rear clutch retainer→ Front clutch→ Kick-down drum→ Reverse sun gear→ Long pinion→ Ring gear→ Transfer driven gear



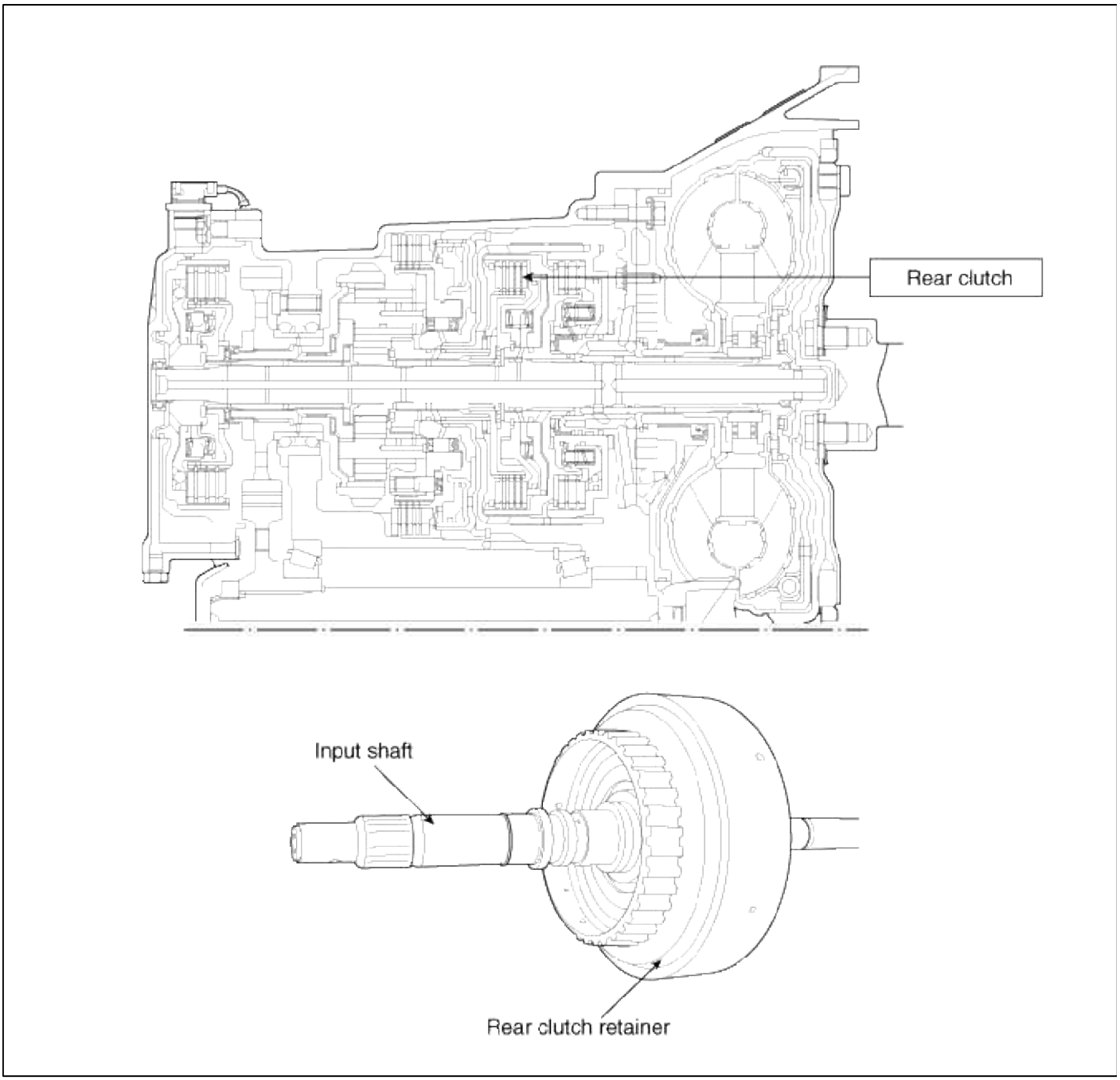
Rear Clutch

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Rear clutch is engaged at 1st~3rd gear of D/2/L range. When it is engaged, forward sun gear of the planetary gear rotates.

Power Flow:

Input shaft→ Rear clutch retainer→ Rear clutch→ Rear clutch hub→ Forward sun gear→ Short pinion



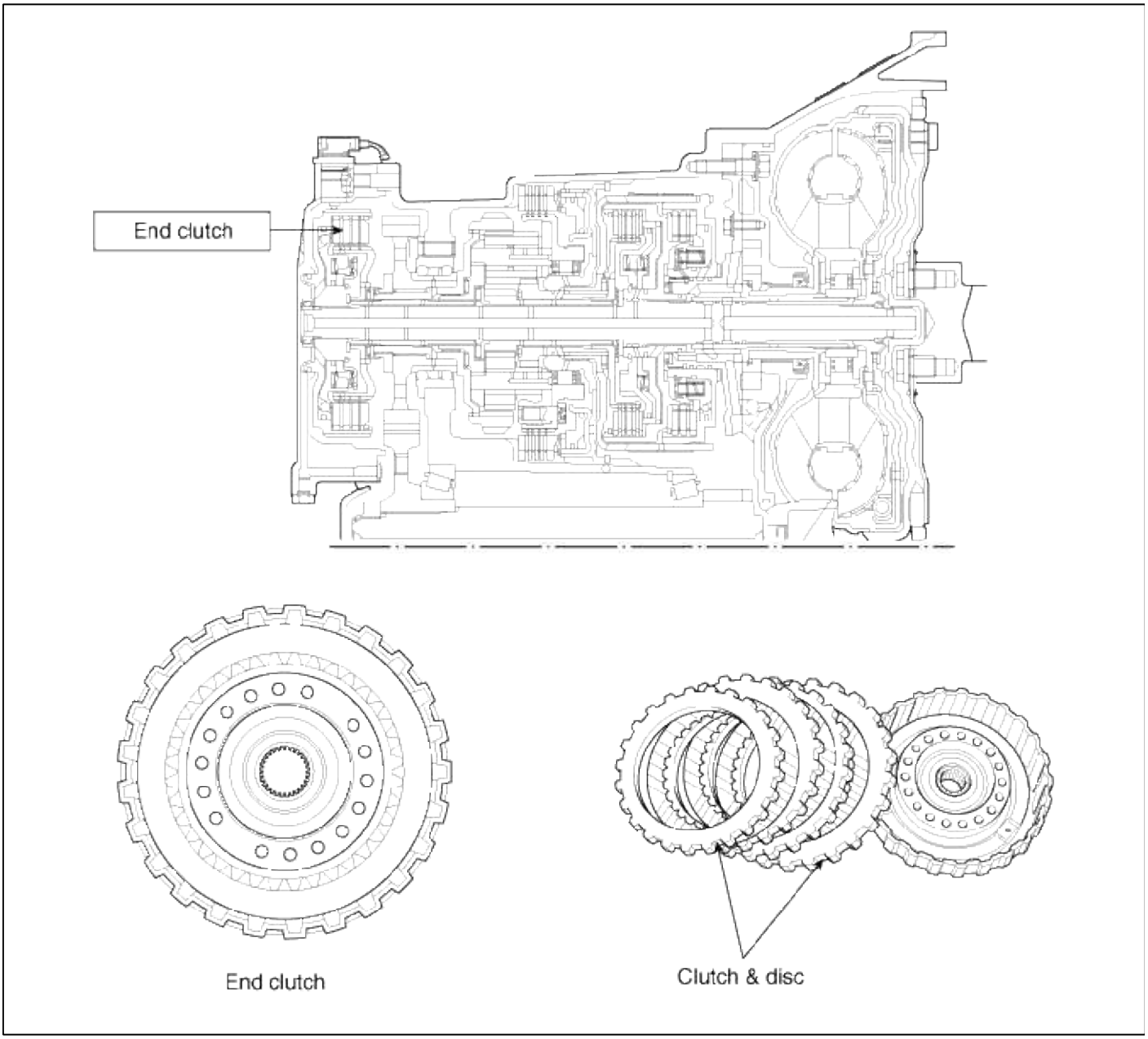
End Clutch

End clutch is engaged at 4th gear (Actually, end clutch is being engaged from 3rd gear. This is only for smooth shifting to 4th gear). When it operates, planetary carrier rotates.

Power Flow:

Input shaft→ End clutch retainer→ End clutch→ End clutch hub→ End clutch shaft→ Planetary carrier→ Ring gear→ Transfer driven gear

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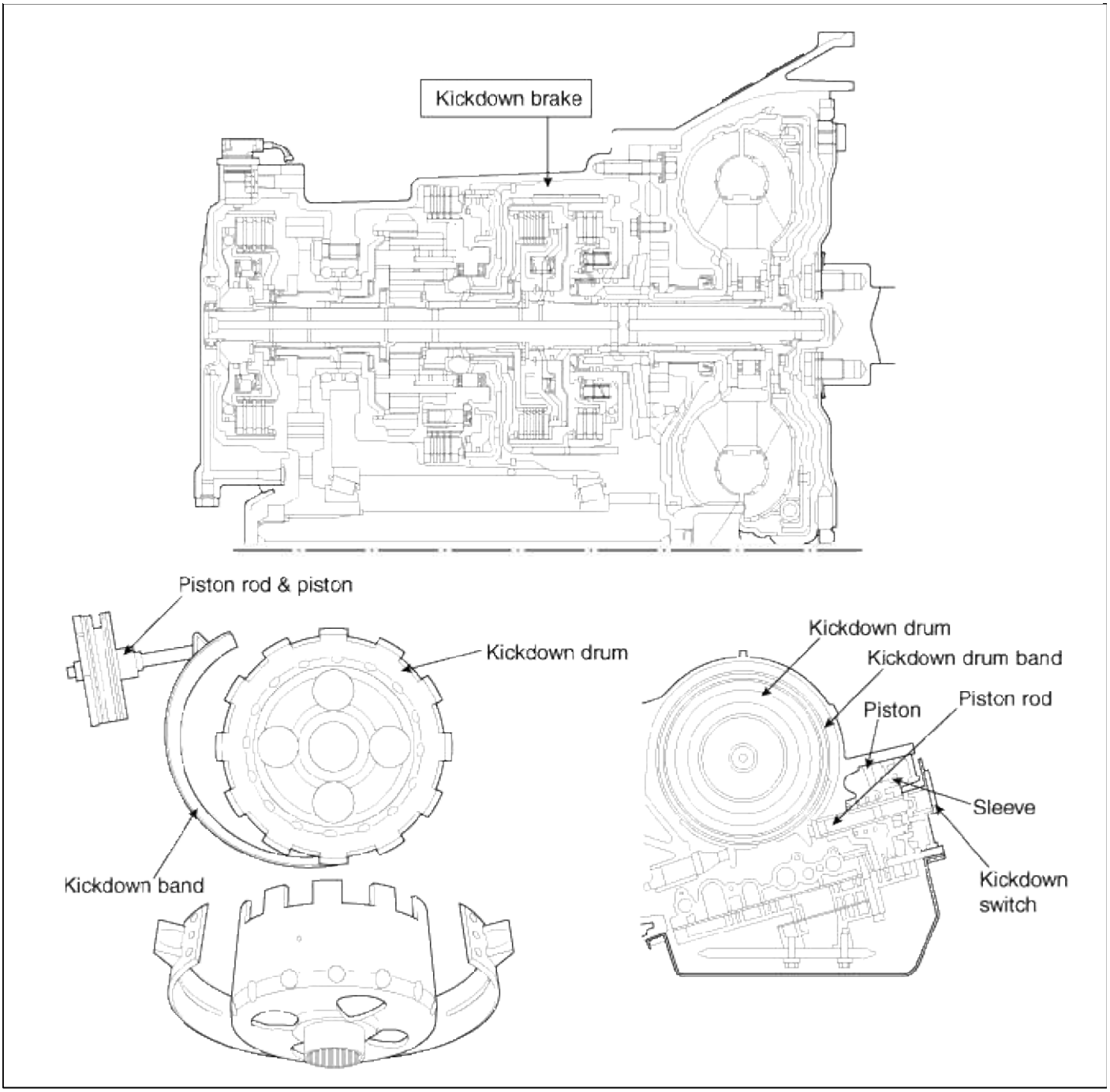
Kick Down Brake

End clutch is composed of a kick down brake band, drum, servo piston and servo switch. It is engaged at 2nd&4th gear. When it operates, reverse sun gear of the planetary gear is held.

Power Flow:

Kick down brake→ Kick down drum hold→ Reverse sun gear hold

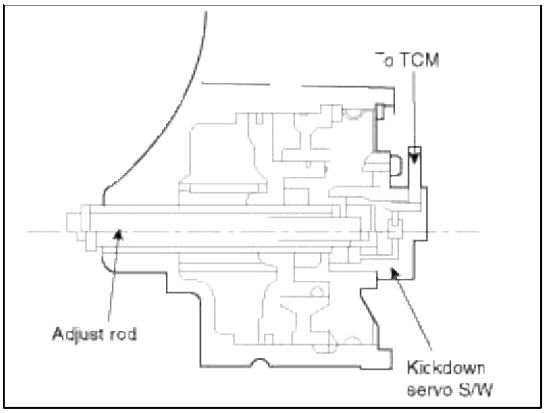
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The kickdown brake is a band type brake; it is composed of a kickdown band, drum, kickdown servo, switch and anchor. When the 2nd pressure is admitted to the apply side chamber of kickdown servo cylinder, the kickdown piston and rod moves toward the left, tightening the brake band to hold the kickdown drum. As a result, the reverse sun gear (interlocked with the kickdown drum) is held. This brake functions during 2nd gear and during overdrive.

The kickdown servo switch detects the position of the kickdown piston just before the brake is applied, and sends the signal to the transaxle control module. Using this signal, the transaxle control module controls the 2nd pressure both before, and during application of the brake. In the initial control stage or until just before the kickdown brake is applied, a higher 2nd pressure is supplied to the kickdown servo so that the kickdown piston con move quickly for faster response to the kickdown condition that has been initiated. In the second control stage or while the brake is being applied, the 2nd pressure is regulated at an optimum level so that the band is tightened on the drum the proper amount for good kickdown "feeling".

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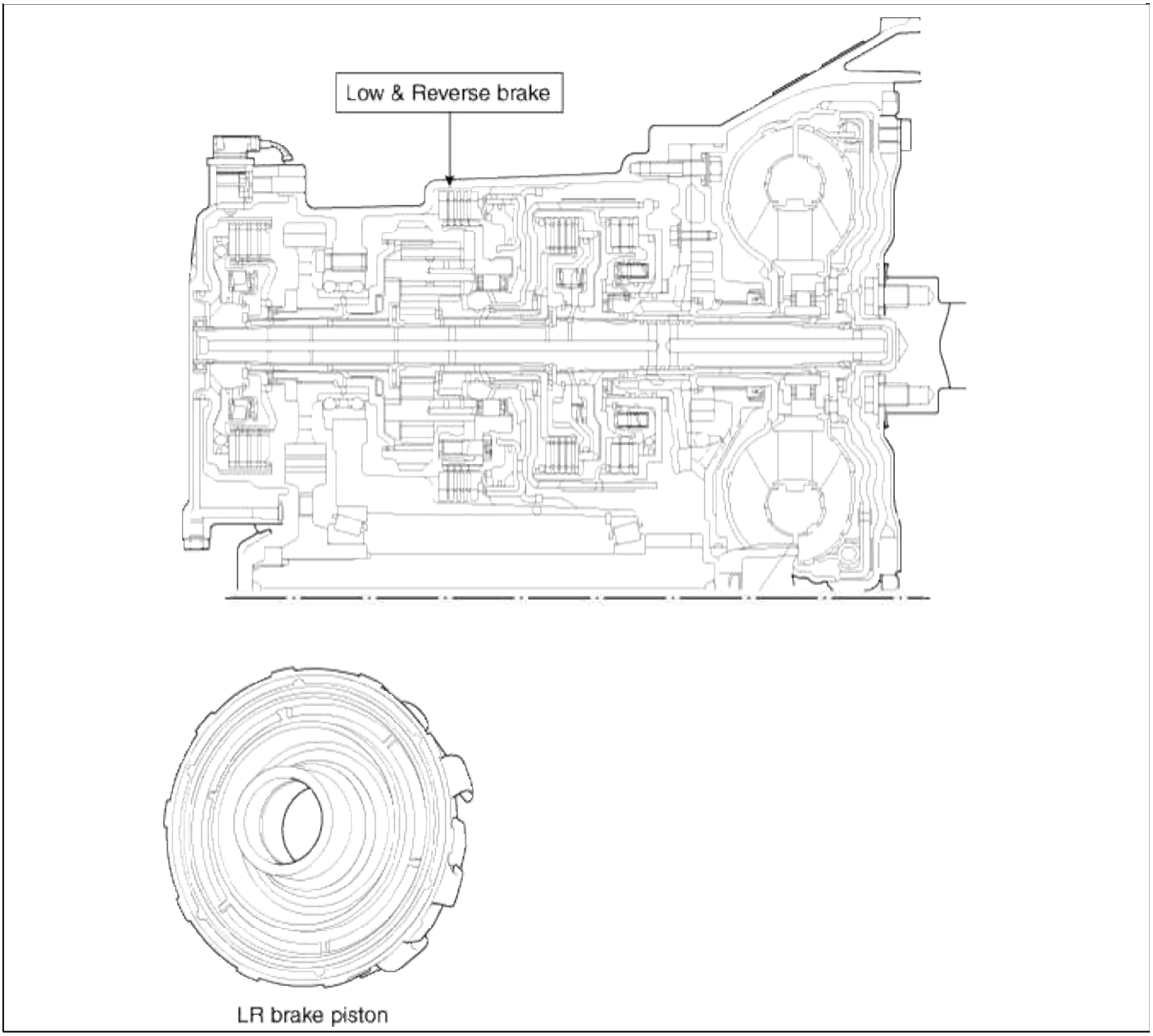
Low&reverse Brake

Low&Reverse brake is engaged at 1st gear of L range and R range. When it operates, the planetary carrier is held.

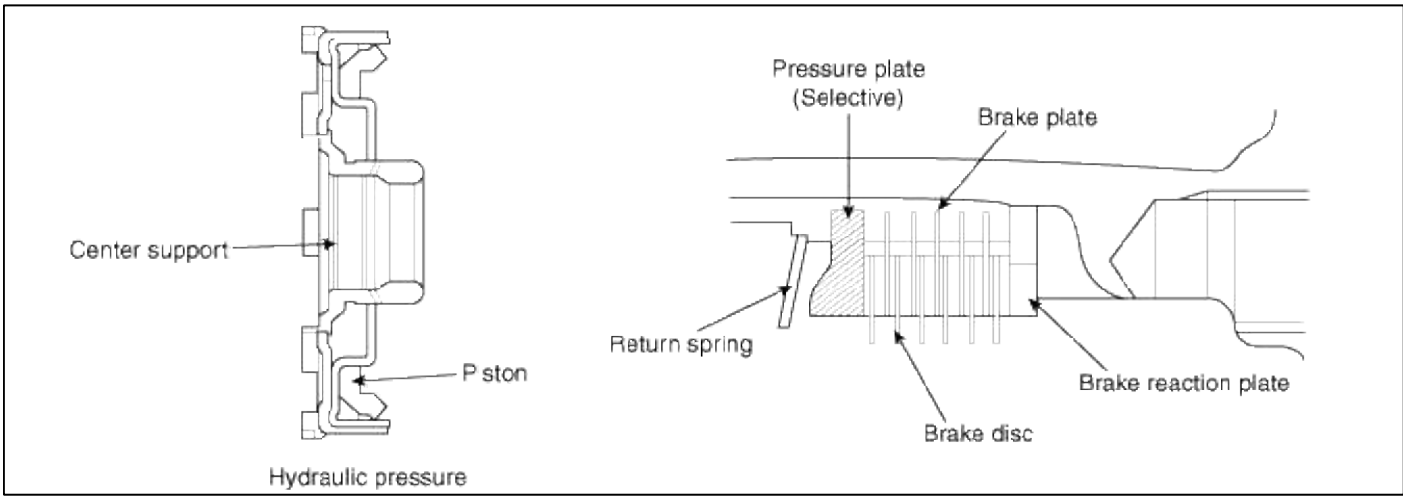
Power Flow:

Low & Reverse brake→ Planetary carrier hold

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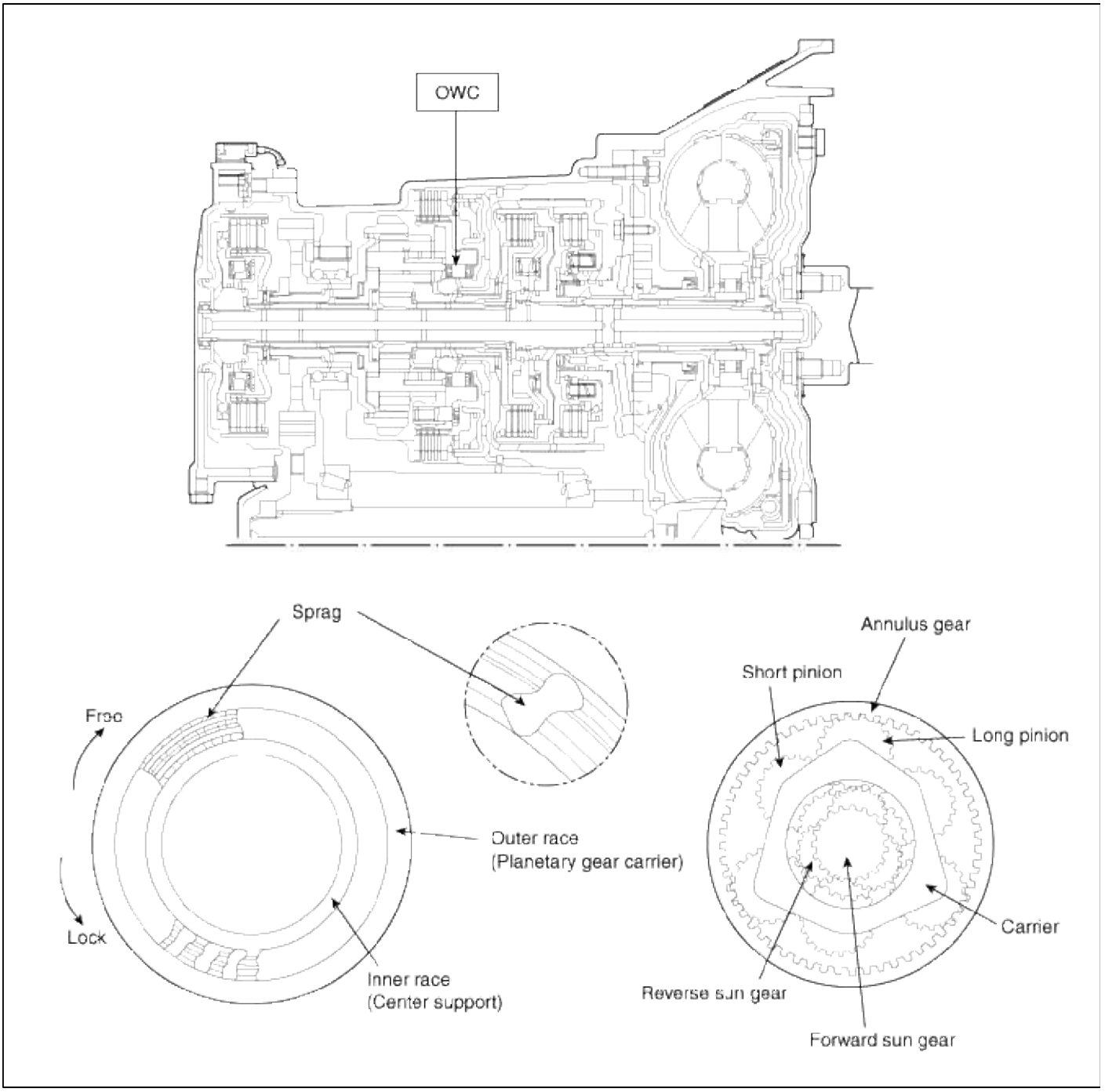


Low&reverse brake is of the multiple disc type and is composed of a center support, disc plates and a piston. The brake operates when the shift is in 1st gear in the "L" range or back gear. It fastens the carrier in the planetary gearing set. That is, the shafts of the long and short pinions are fastened.



One Way Clutch (O.W.C)

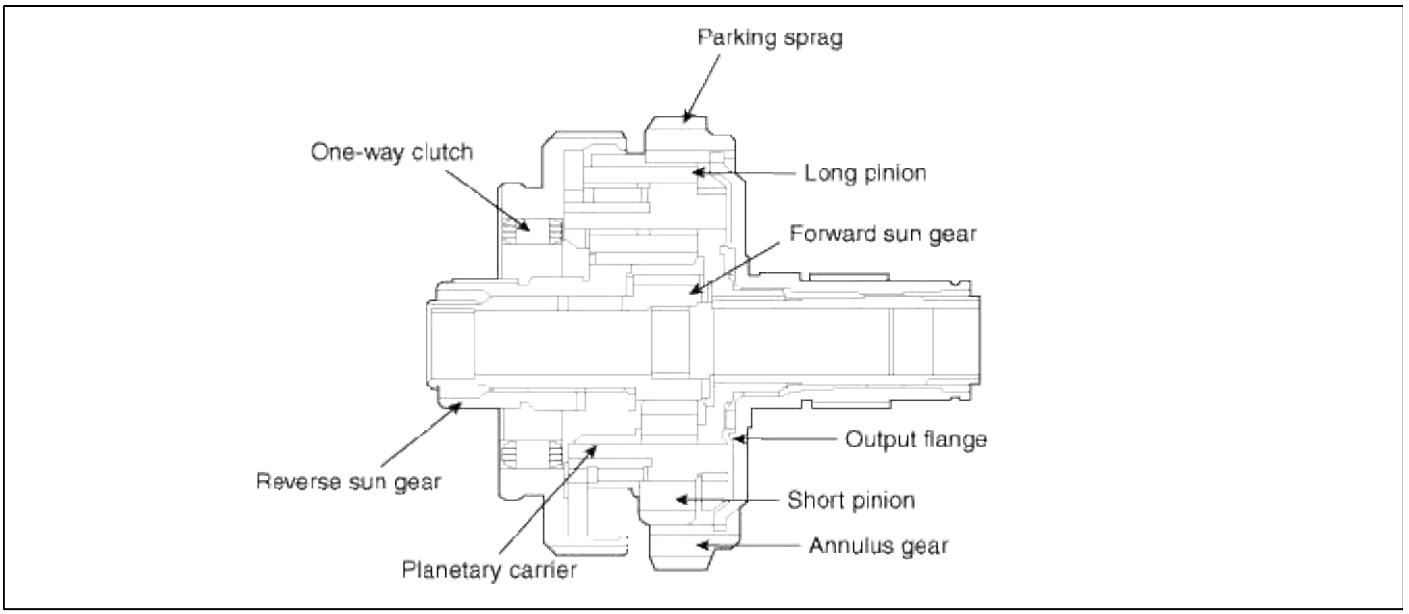
One-way clutch is of the sprag type and is incorporated between the pinion carrier and the center support.
In 1st gear (D or 2 range), the long pinion rotates clockwise. This reduces a force which has the tendency to cause the carrier is blocked from rotating in that direction by the one-way clutch. As a result, the long pinion transmits its force to the annulus gear. The carrier, which is coupled with the one-way clutch outer race, is free to turn in clockwise direction.
In an engine braking condition under which the annulus gear is turned first, the carrier turns clockwise freely and, therefore, the engine braking effect is not obtained.



Planetary Gear
The planetary gear set incorporated in this transaxle consists of a forward sun gear, a reverse sun gear, a short pinion, a carrier to support both pinions, and an annulus gear.
The reverse sun gear is connected to the front clutch retainer via the kickdown drum, while the forward sun gear is connected to the rear clutch hub.
The carrier is built in one unit with the low reverse brake's hub and the outer race of the one-way clutch. The carrier

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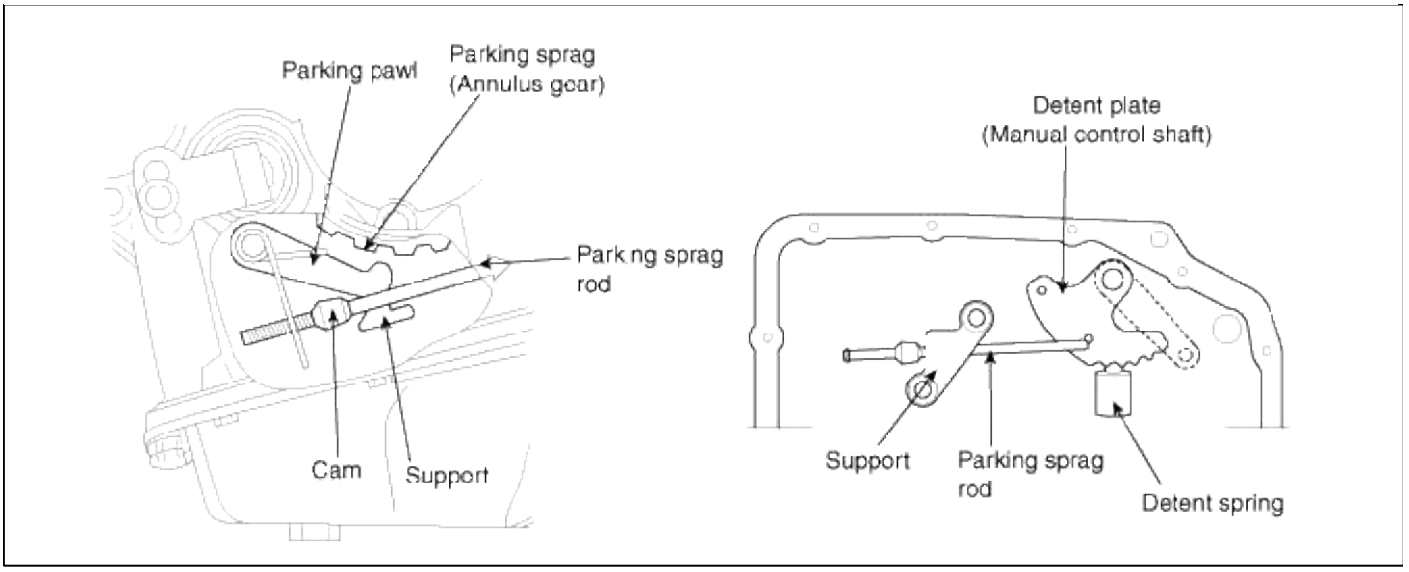
is connected to the end clutch via the end clutch shaft.
The annulus gear, to which the output flange is connected, conveys driving force to the transfer drive gear installed on the output flange. And the parking sprag is provided on the outer circumference of the annulus gear.
The Ravigneaux type planetary gear set consists of two sun gears, each meshing with one of two sets of planetary pinion gears in a single carrier, and a single annulus gear that meshes with one of the sets of pinions. The two sun gears are called the forward and the reverse sun gears, for the gear conditions they operate in. Power input is to either of these two sun gears. Power output is through the annulus gear, which has the parking sprag on the outer circumstance. Various holding elements are built into gear set components.- Ravigneaux type planetary gear ratio.



Parking Mechanism
When the shaft is in the "P" range, the parking pawl engages with the parking sprag provided on outer circumference of the annulus gear to fasten the output shaft, to prevent the wheels from rotating. In other words, when the select lever is set to the "P" range, the detent plate and the parking sprag rod move in the direction of arrow, causing the cam on the parking sprag rod to push up the parking pawl to engage with the sprag.
In case the parking pawl collides against a crest of the sprag, only the rod moves because the parking pawl cannot be moved upward, and the cam, while pressing the spring, collides with the parking pawl and the support, and is with held in this condition. If the car is moved even slightly in this condition, the turning of wheels causes the annulus gear to turn as well. Since the cam is pressed in the direction of arrow, the parking pawl is pushed up as a bottom of the sprag aligns with the parking sprag to engage with the sprag.
In this way, the parking mechanism eliminates any chances of the vehicle from being.

No.	Cause	Symptom	Analysis	Remedy	Remarks
1	Locking due to cam broken	Forward and/ or reverse drive impossible intermmittently	Parking sprag locks the annulus gear due to drifted cam	Replace parking sprag rod	
2	Detent spring roller separated	Looseness of manual lever	Detent plate not fixed properly	Install detent spring assembly	

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Power Flow

Selector lever position			Gear position	Clutches			Brakes			Remarks
				F/C	R/C	E/C	K/D	L&R	OWC	
P			Parking							□
R			Reverse	○				○		
N			Neutral							
D	O/D S/W ON	O/D S/W OFF	1st		○				○	
			2nd		○		○			
			3rd	○	○	Δ				
			4th			○	○			
2			1st		○				○	
			2nd		○		○			
L			1st		○			○		

- Engine start possible

□ - Parking mechanism

○ - Element engaged in each gear position

Δ - Pre-engaged element

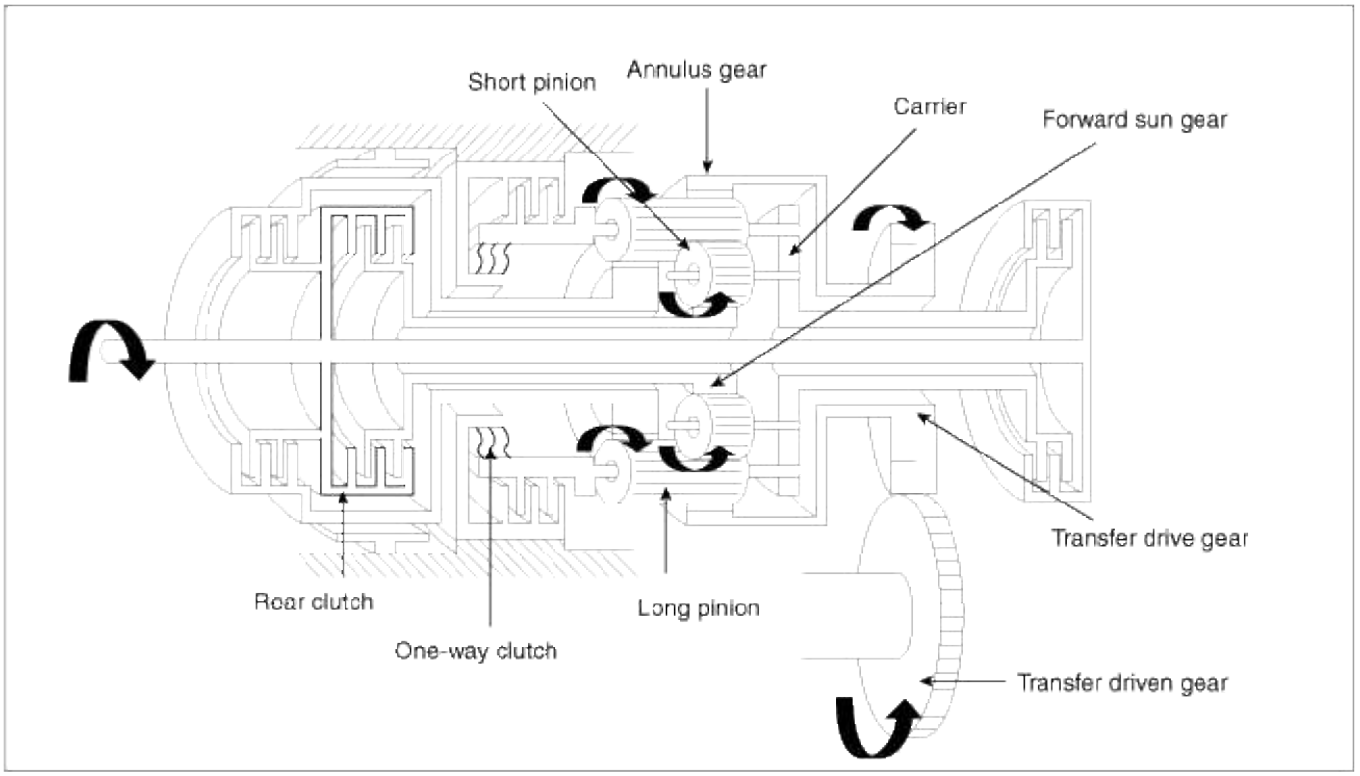
- F/C : Front Clutch
- R/C : Rear Clutch
- E/C : End Clutch
- OWC : One Way Clutch
- K/D : Kickdown brake
- L&R : Low&Reverse brake

For each shift condition, certain holding units in the transaxle are used. Knowing which holding element is used and how they are connected in the transaxle, we can trace the power flow through the transaxle for each shift condition.
One set of pinions, the short pinions, meshes with the reverse sun gear.
The other set, the long pinions, meshes with both the forward sun gear and with the annulus gear. The two sets of pinions also mesh with each other in pairs. The pinion carrier is built as a unit with the low reverse brake hub and the outer race of the one-way clutch. Power input is to either of the two sun gears.
The reverse sun gear is connected to the front clutch retainer through the kick-down drum. The forward sun gear is

connected to the rear clutch hub. So by engaging either the front or the rear clutch, power is directed to either the reverse or the forward sun gear. When both front and rear clutches are engaged, the gear set is locked, and power passes directly through the transaxle. Power output is through the annulus gear, which has the parking sprag on the outer circumference and is connected to the output flange.

1st Gear ("D" and "2" range)

Operating elements: Rear Clutch, One-Way Clutch



The rear clutch and one-way clutch are engaged.

Operation of rear clutch rotates the forward sun gear clockwise.

Rotation of forward sun gear moves the ring gear (annulus gear) via pinion gears.

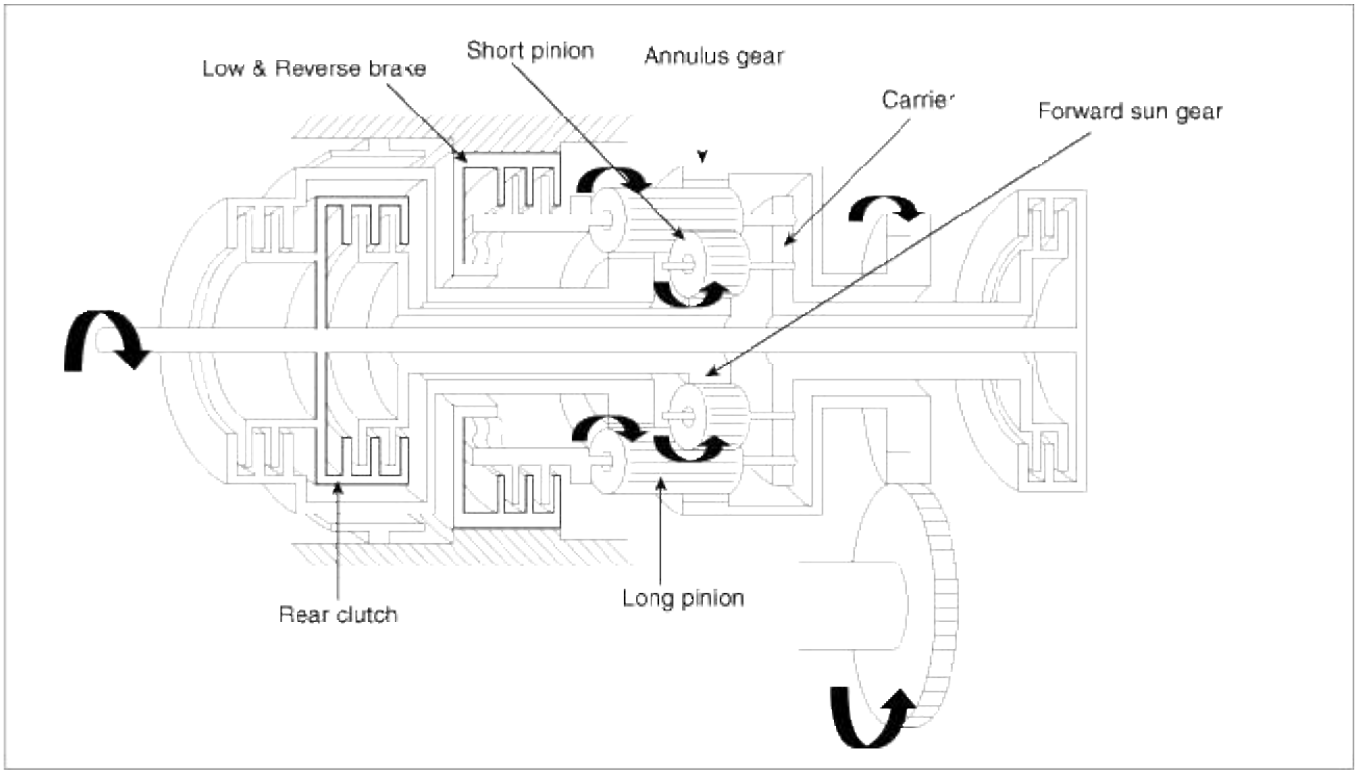
At that time, the planetary carrier tries to move counterclockwise because of long pinion.
However the one-way clutch holds the carrier rotation to count-clockwise, all power is delivered to the ring gear (annulus gear).

On the contrary, power from the ring gear (annulus gear) is delivered back to the planetary carrier.
At that time the carrier rotates clockwise transmitting the power. Engine brake does not work.

1st Gear ("L" range)

Operating elements: Rear Clutch, Low & Reverse Brake

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At "L" range 1st gear, the rear clutch and low & reverse brake are engaged.

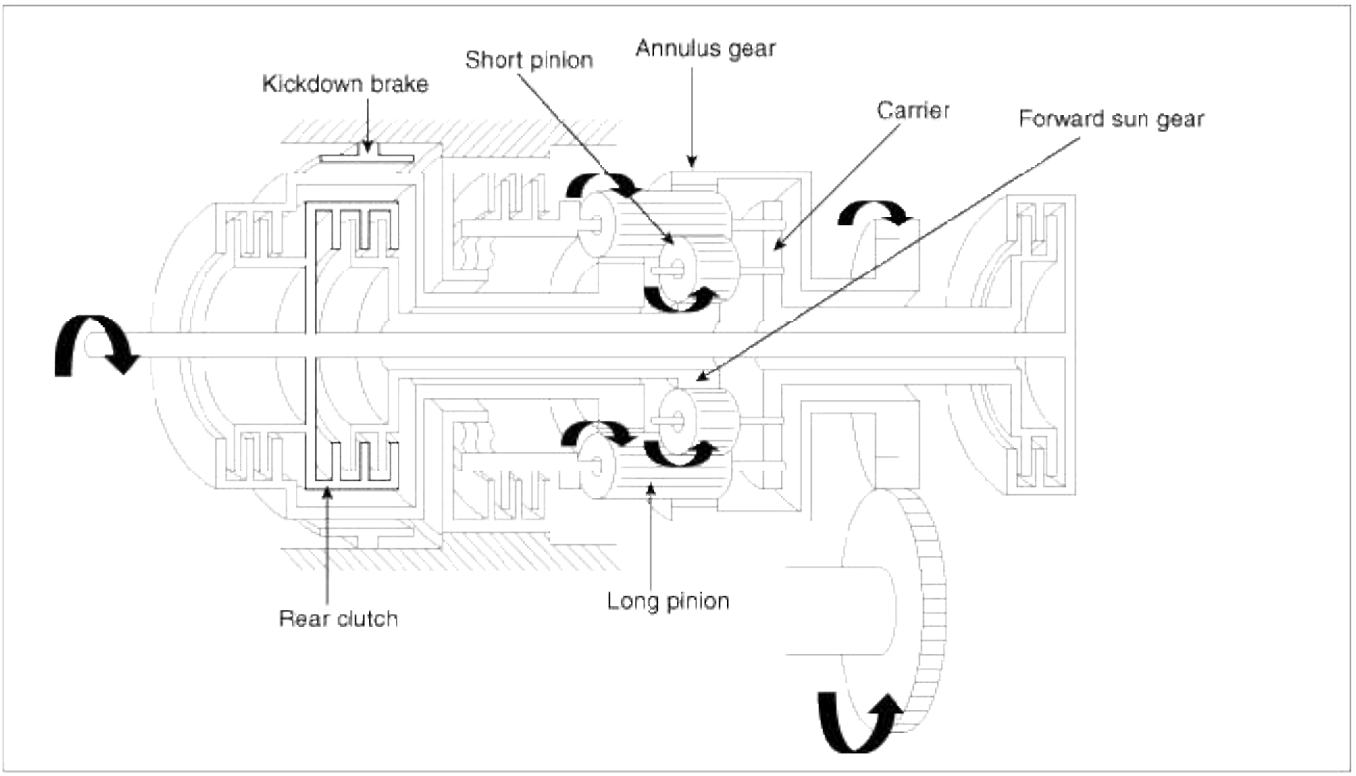
Planetary carrier is fixed.

All power is delivered to the ring gear (annulus gear) via pinion gears.

In the case that power is delivered from the ring gear back to the planetary carrier.
The carrier cannot be rotated in any direction, and the engine brake does work.

2nd Gear ("D" and "2" range)
Operating elements: Rear Clutch, Kick Down Brake

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At 2nd gear the rear clutch and kick down brake are engaged.

Operation of rear clutch rotates the forward sun gear clockwise.

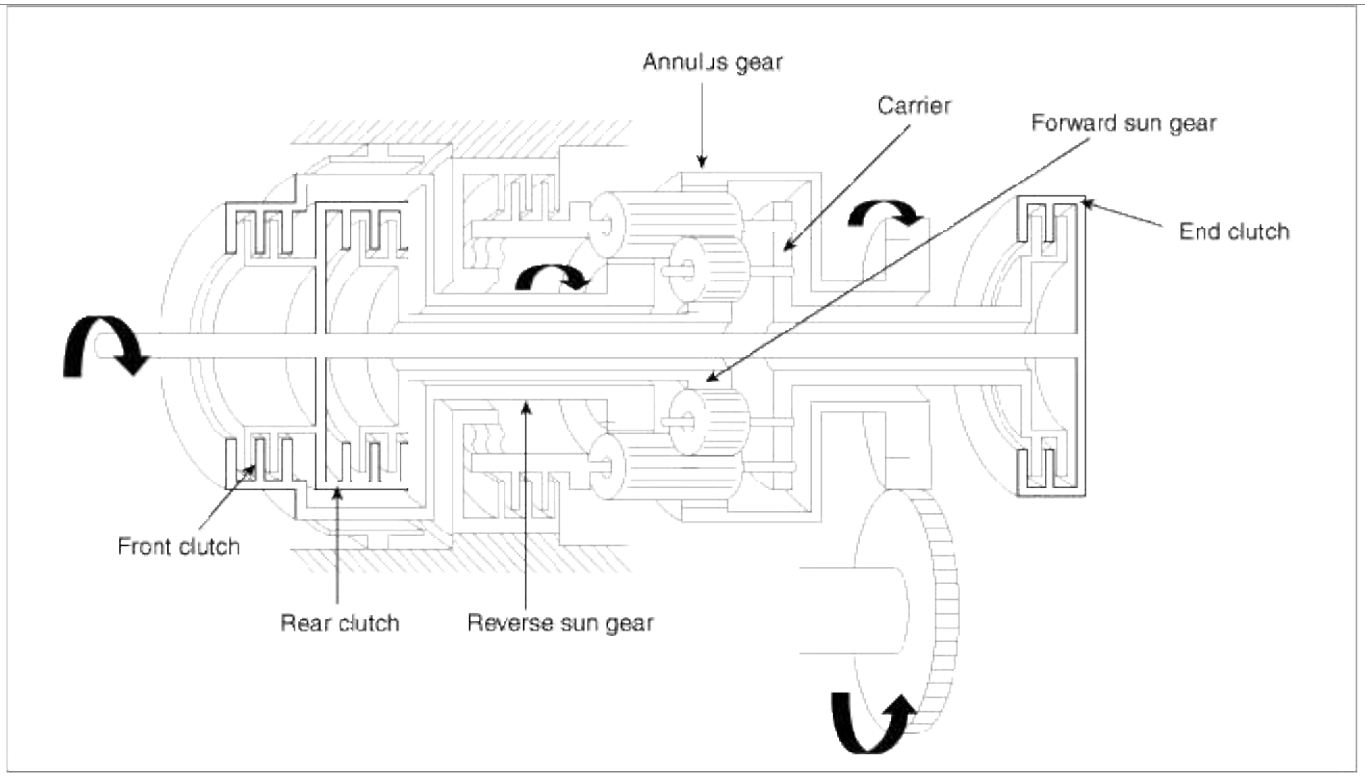
Rotation of forward sun gear moves the ring gear via pinion gears.

At that time, the reverse sun gear is fixed by the kick down brake.

Long pinion gears are rotating around the sun gear. The speed of the ring gear (annulus gear) is faster than 1st gear.

3rd Gear ("D" range)
Operating elements: Front Clutch, Rear Clutch, End Clutch

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At 3rd gear the front clutch and the rear clutch are engaged.
End clutch is engaged only to prepare the 4th gear for the purpose of reducing the 3-4 shifting shock.
However end clutch does not deliver the power at 3rd gear.

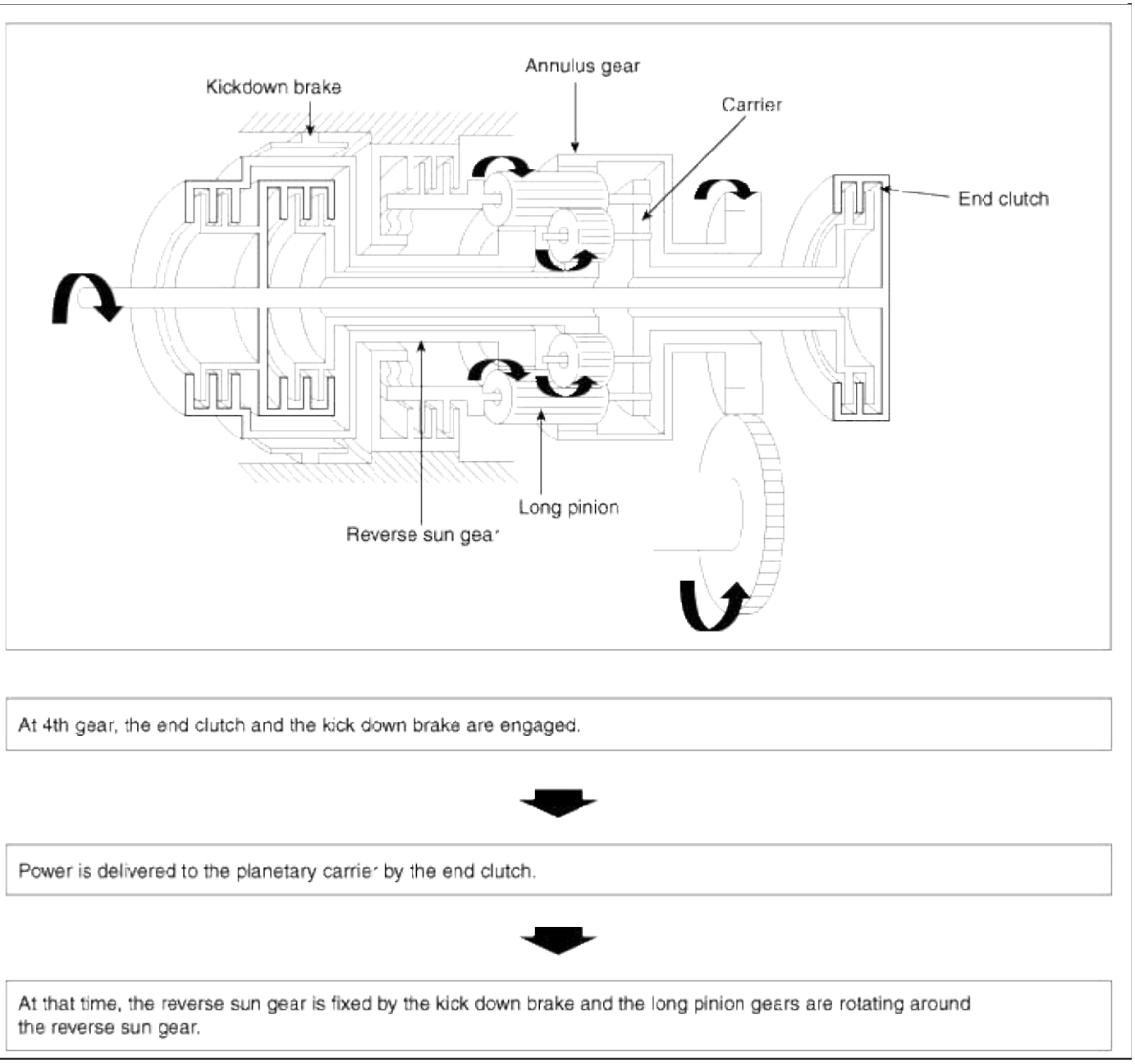
Power is delivered to the forward sun gear and the reverse sun gear.

The forward sun gear and the reverse sun gear rotate same direction.
At that time the short pinion gears and the long pinion gears are fixed, the planetary gear set rotates as one unit.

Input speed is directly delivered to the ring gear (annulus gear).

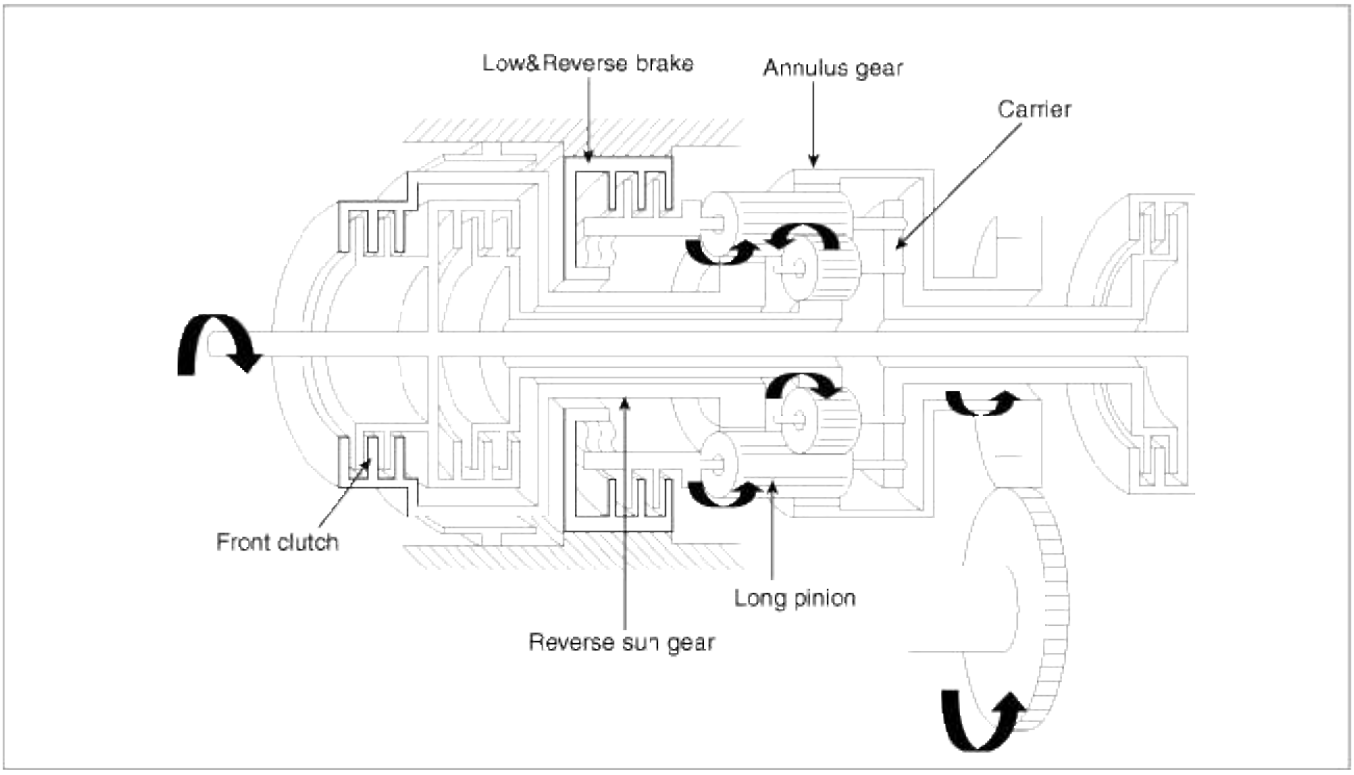
4th Gear ("D" range)
Operating elements: Front Clutch, Rear Clutch, End Clutch

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"R" range
Operating elements: Front Clutch, Low & Reverse Brake

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The front clutch and the low & reverse brake are engaged.

Power is delivered to the reverse sun gear and it rotates clockwise.

The planetary carrier is fixed by the low & reverse brake.
The rotation of the reverse sun gear turns the long pinion gears counterclockwise.
And the ring gear (annulus gear) which is contacting the long pinion gears rotates counterclockwise.

In the case that power is delivered from the ring gear back to the planetary carrier.
The carrier cannot rotate any direction, engine brake does work.

Hydraulic Control System

1. The hydraulic pressure during gear shifting engages the clutches and applies the brakes. It is regulated by the pressure control valve. The hydraulic pressure that works on the pressure control valve is further regulated by the pressure control solenoid valve which functions under the control of the transaxle control module. The transaxle control module controls the solenoid valve using a duty cycle signol, thus providing appropriate regulation of the hydraulic pressure.
2. The transaxle control module decides the timing of the gear-shifting period (during which it performs hydraulic pressure control for gear shifting) according to the change in the kickdown drum rotating speed that it detects. The module identifies the time just before the kickdown brake is applied and uses that as the timing for initiating control of the hydraulic pressure that is to be applied to the kickdown brake.

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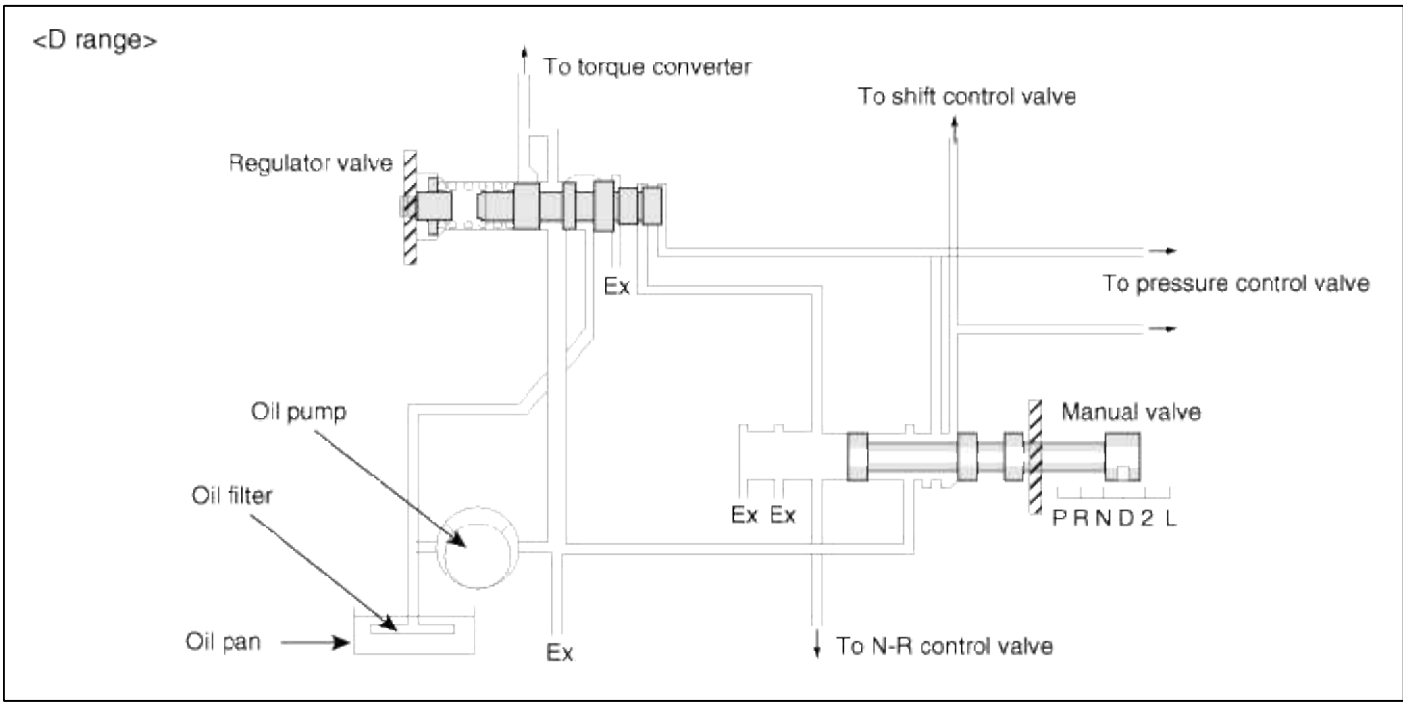
3. TCM detects torque change ratio (turbine speed change ratio in torque converter). If input torque is larger than the pre-set torque in TCM, TCM controls the duty of PCSV and changes oil pressure. Shift shock will be alleviated due to torque control. Torque change ratio is applied differently according to each pattern.
4. When the transaxle is cold, the fluid viscosity is high, causing slower oil pressure response. In such conditions, the transaxle control module provides a correction for the oil pressure by changing the control duty of the pressure control solenoid valve. This control is performed when the fluid temperature as indicated by the oil temperature sensor is lower than 60°C(140°F).
5. After the engine has been started and the vehicle is in motion, the transaxle control module continues to refine its performance for smoothest possible gear shifting.
   The hydraulic control system consists of an oil pump that generates hydraulic pressure for A/T. It also has valves and solenoid valves that control the hydraulic pressure or switch the oil passage. The valves and solenoid valves are all built into the valve body.
   For better and smoother shift quality, the rear clutch pressure is controlled independently, 4th→2nd gear skip shift is available and the line pressure at 3rd/4th gear is reduced.
   There are 6 solenoid valves are incorporated on the valve body. 2 of those are duty-controlled type and the rest are ON/OFF type.
   A. Duty control type: Pressure control solenoid valve A/B, Damper clutch control solenoid valve
   B. ON/OFF type: Shift control solenoid valve A/B/C
   If the mechanical malfunction such as valve sticking occurred, the fail-safe valve has been adopted to prevent interlock. The line pressure is regulated at the 4th speed to improve the efficiency of power transmission. This function is performed by High-low pressure valve and regulator valve.

Oil Pump

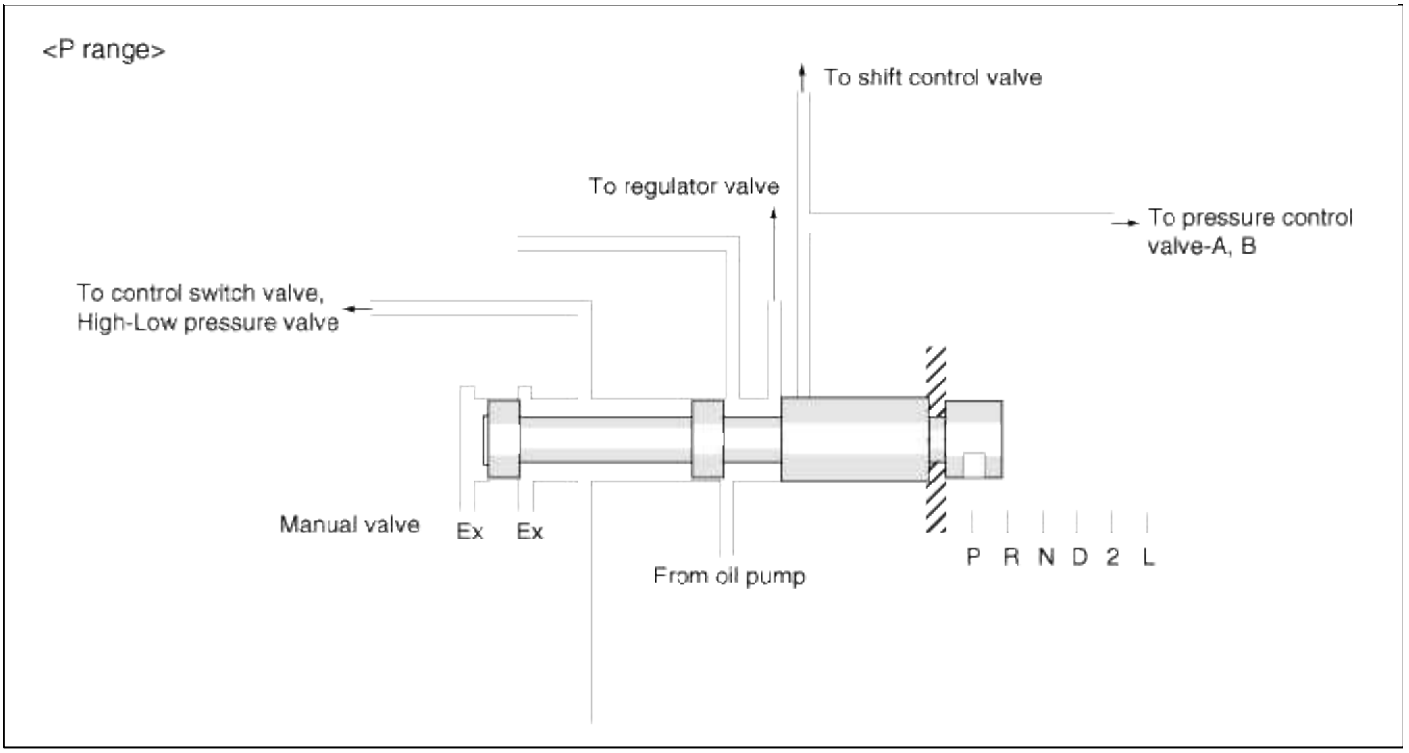
Oil pump generates pressure for supplying oil to the torque converter, for lubricating frictional parts of the planetary gearing set and the overrunning clutch, etc.., and for activating the hydraulic control system.

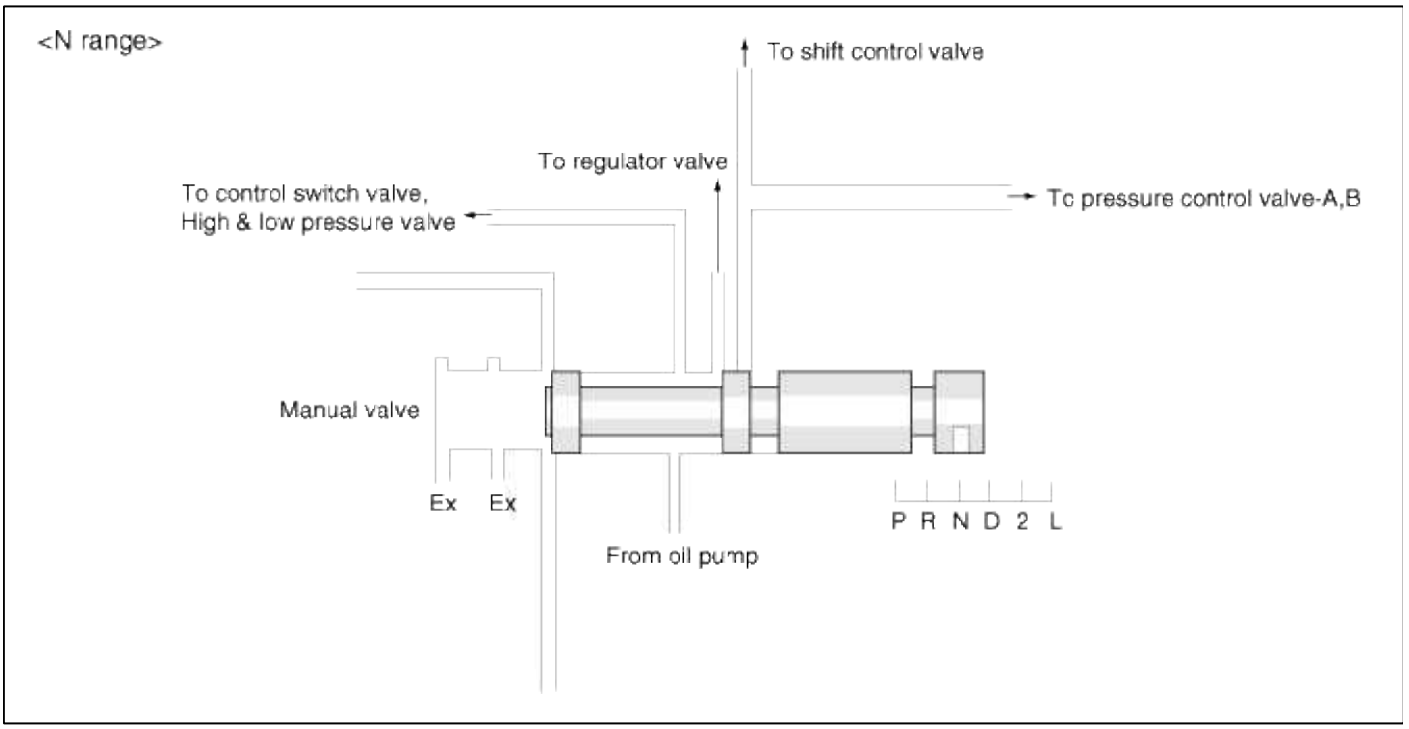
The pump is one of the inner-teeth engaging trochoid type. It always generates the oil pressure when the engine is running since the drive gear is driven by 2 pawls of the pump drive hub welded at the center of the torque converter shell.

Manual Valve



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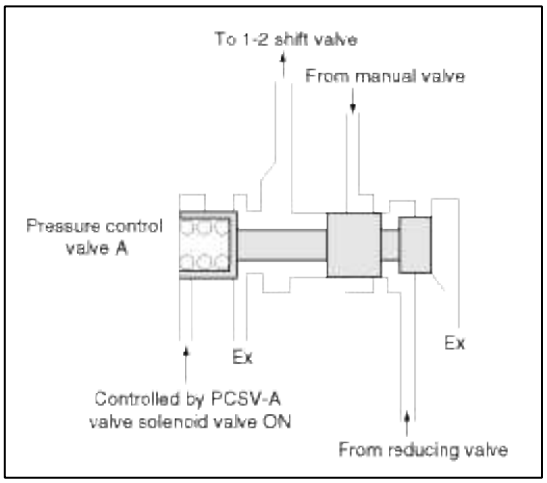


Pressure Control Valve-A, B

Pressure control valve A, B regulate the pressure supplied to each clutch under the control of the pressure control solenoid valve A, B to eliminate shock at the time of shifting.

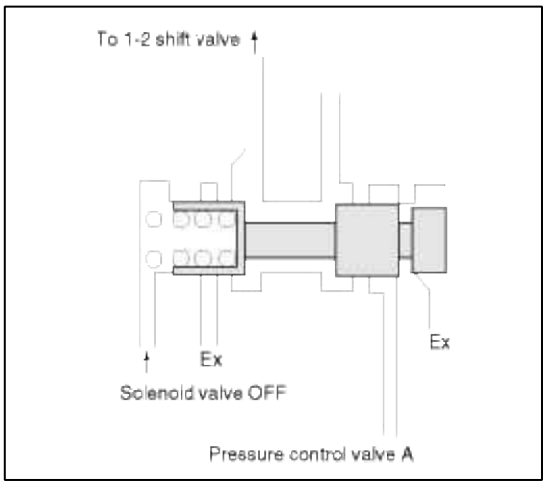
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1. Pressure control valve A - Not operated



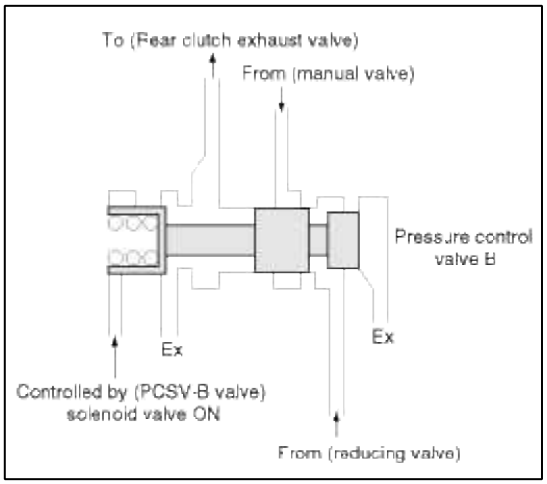
Pressure Control Valve-A, B

1. Pressure control valve A - Operation



Pressure Control Valve-A, B

1. Pressure control valve B - Not Operated

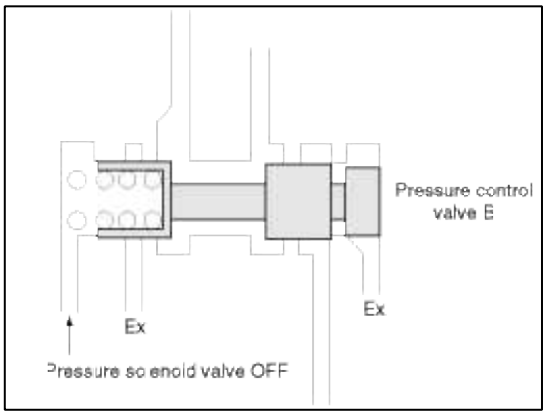


Pressure Control Valve-A, B

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1. Pressure control valve B - Operation

The main function of this valve controls the rear clutch independently.



Shift Control Valve(scv) And Solenoid Valve-A, B, C (SCSV-A,B,C)

The line pressure acting upon the shift control valve is controlled by the two shift control solenoid valves(which are switch ON and OFF according to the shifting gear by the transaxle control module command), and the shift control valve is activated according to the shifting gear, thus switching the oil passages.

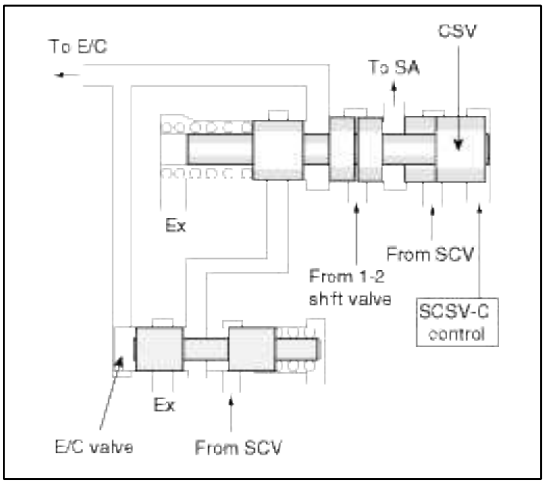
The relationship of the shifting gear and the ON-OFF switch of shift control solenoid valve "A", "B" and "C" is shown in the table below.

Position	Shift control solenoid valve		
	A	B	C
1st gear	ON	ON	OFF
2nd gear	OFF	ON	OFF
3rd gear	OFF	OFF	ON
4th gear	ON	OFF	ON

Control Switch Valve(CSV) & End Clutch(E/C) Valve

- Function

Switching the pressure of E/C and SA



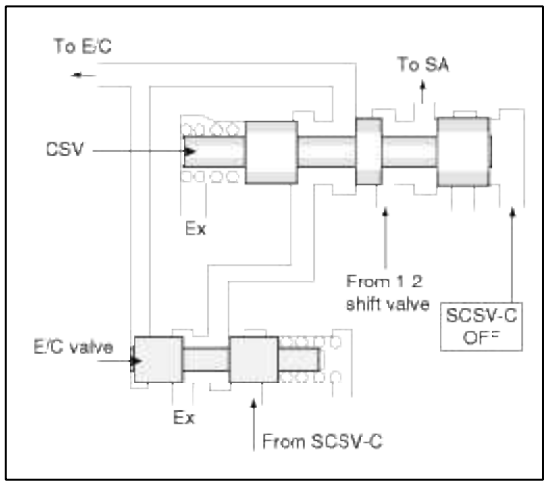
Control Switch Valve(CSV) & E/C Valve

- 2nd Gear

• 2nd pressure is supplied from SA through the CSV.

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• SCSV-C maintains OFF as well as 2nd gear.



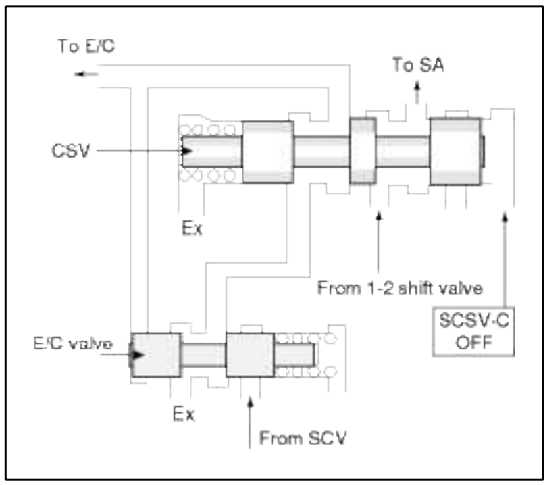
Control Switch Valve(CSV) & E/C Valve

- 2nd → 3rd gear

• SCSV-C maintains OFF as well as 2nd gear.

• The E/C pressure from shift control valve is intercepted at the E/C valve during up-shifting from 2nd to 3rd gear.

• SA pressure is supplied from 1-2 shift valve, but the front clutch and SR pressure is also supplied from the 2-3/4-3 shift valve, so the both SR and SA pressure will be set off..



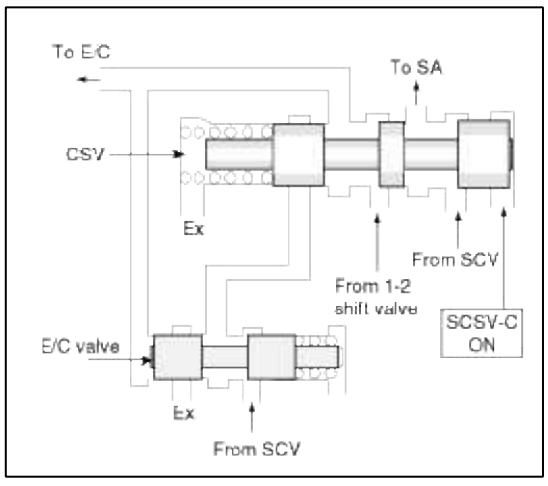
Control Switch Valve(CSV) & E/C Valve

- 3rd gear

• SCSV-C is changed from OFF to ON.

• The E/C pressure is supplied from 1-2 shift valve at the CSV after finishing the up-shifting from 2nd to 3rd gear.

• SA pressure is supplied from shift control valve, but the front clutch and SR pressure is also supplied from the 2-3/4-3shift valve, so the both SR and SA pressure will be set off.



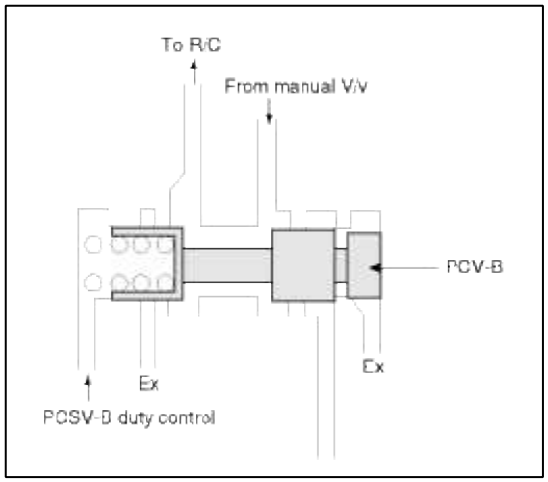
4 → 2 Skip Shift

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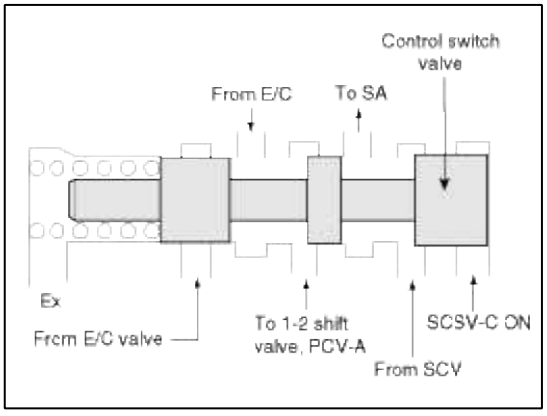
1. Operating elements

Speed	R/C	E/C	K/D
4th	-	O	O
2nd	O	-	O

2. Controls
   A. R/C engaging duty control
   B. E/C releasing duty control
   C. Continuous switching to SA
3. Description
   A. R/C engaging duty control



   B. E/C releasing duty control
      4 → 2 Skip shift only (SCSV-C ON)
      When releasing the E/C clutch pressure, it is controlled by duty of PCSV-A only in case of 4 → 2 skip shift.



   C. Continuous switching to SA
      From (SCV) to SA through (CSV)

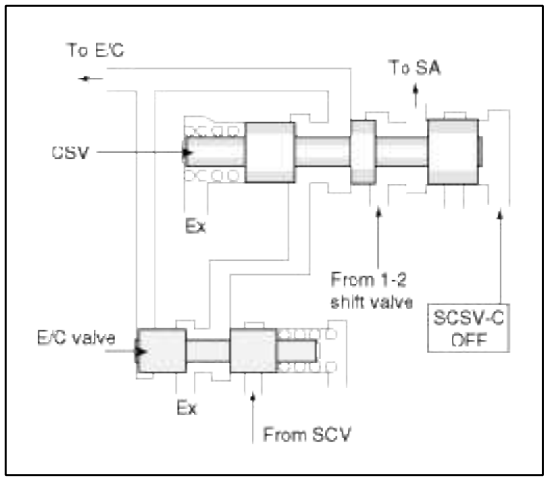
Fail Safe Function

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1. TCM malfunction in 1st or 2nd gear
   CUTTING OFF THE E/C PRESSURE BY E/C VALVE

Speed	F/C	R/C	E/C	K/D
1st		O		
2nd		O		O
Fail	O	O		

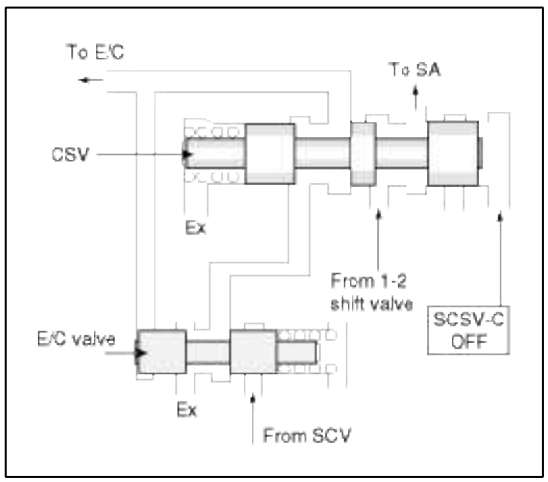
A. F/C, SR : from 2-3/4-3 shift valve
B. R/C : from PCV-B
C. SA : from 1-2 shift valve



2. TCM malfunction in 1st or 2nd gear
   If the hydraulic pressure is supplied to E/C and the F/C, SR pressure is delayed

Speed	F/C	R/C	E/C	K/D
1st		O		
2nd		O		O
Fail		O		O

A. R/C, E/C, S/A : interlock

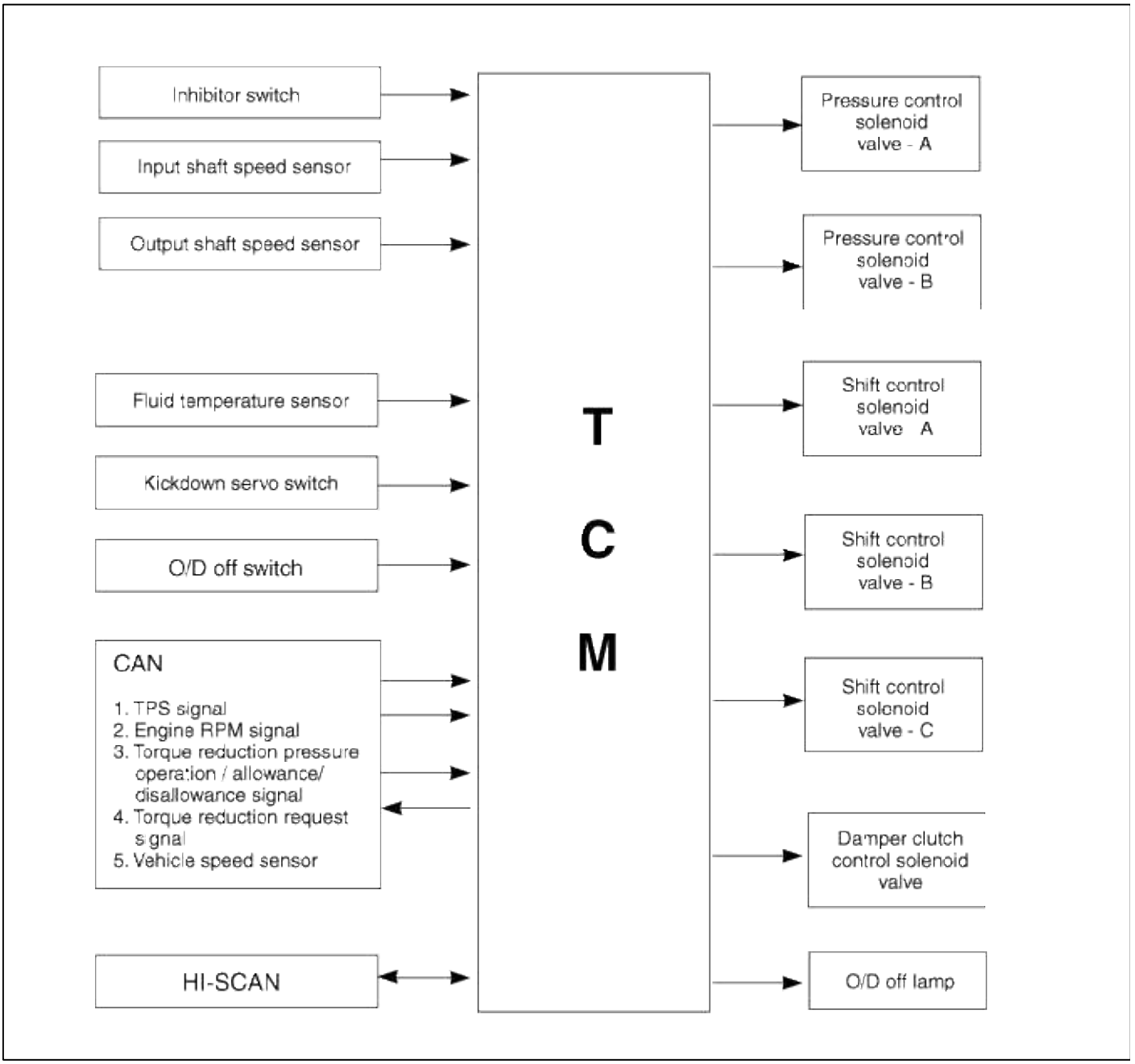


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NOTE

- SA : Servo Apply pressure
- F/C : Front Clutch pressure
- R/C : Rear Clutch pressure
- K/D : Kick Down
- SCV : Shift Control Valve
- CSV : Control Switch Valve
- PCSV : Pressure Control Solenoid Valve
- SCSV : Shift Control Solenoid Valve
- PCV : Pressure Control Valve
- RCEV : Rear Clutch Exhaust Valve

Electronic Control System

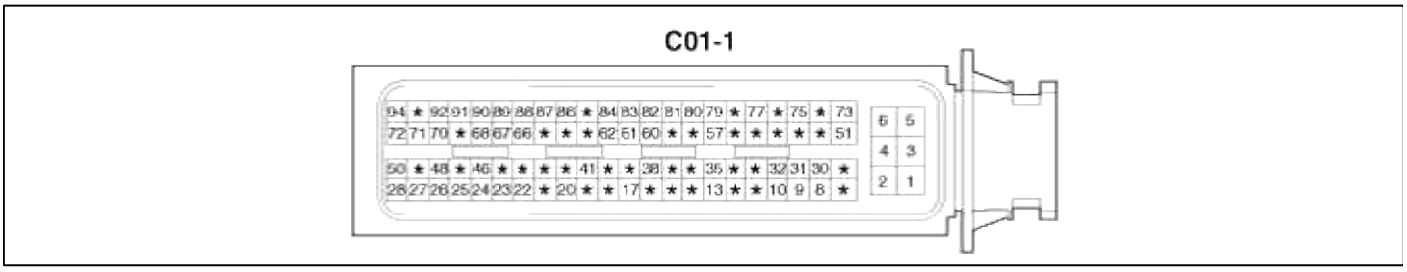


Sensor And Actuator Function

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Item	Functions
Input shaft speed sensor	Detect the turbine RPM at the E/C retainer
Output shaft speed sensor	Detect the T/F drive gear RPM at the transfer drive gear
Engine RPM signal	Receive the engine RPM via communication with ECU
Vehicle speed sensor	Detect the vehicle speed at the speedometer gear
Kickdown servo switch	Detect the operation starting of kickdown brake
Inhibitor switch	Detect the position of select lever through the contact switch
Overdrive switch	Detect the position of overdrive(4th gear)
TPS	Detect the throttle open angle through the potentiometer
Fluid temperature sensor	Detect the temperature of ATF through the thermistor
Torque reduction request signal	Transmit the torque reduction request signal to the engine ECU
Torque reduction operation/allowance/disallowance signal	Receive the signal of engine reduction pressure operation / allowance/disallowance from the ECU
Pressure control solenoid valve-A	Control the hydraulic pressure to the pressure control valve for shift control
Pressure control solenoid valve-B	Control the hydraulic pressure to the pressure control valve for shift control
Shifting control solenoid valve-A	Make the hydraulic passage for shift control
Shifting control solenoid valve-B	Make the hydraulic passage for shift control
Shifting control solenoid valve-C	Make the hydraulic passage for shift control
Damper clutch control solenoid valve	Control the hydraulic pressure for the damper clutch control

* E/C : End Clutch
T/F : Transfer
Integrated TCM Side Connector



Integrated Tcm Input/output Terminal Voltage

PIN No.	Signal	Condition	Input/output value		Test result	Remark
			Type	Level		
4 5	Battery voltage (Main relay)	IG ON	DC Voltage	VBR	VBR	
26	Shift control solenoid valve-B	Shifting	DC Voltage	V_BAT Max. 1.0V Vpeak : Max. -2V	14.01 V 9.2 mV -0.69 V	

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27	Shift control solenoid valve-A	Shifting	DC Voltage	V_BAT Max. 1.0V Vpeak : Max. -2V	14.01 V 9.6 mV -0.69 V	
48	Drive position PWM signal to trip computer	Idle '2' Position 'L' Position	Pulse Duty ↑	HI : V_BAT or Vcc LO : Max. 1.0V Freq. : 50Hz±2% (Reference) 72.5±2 12.5±2	12.8 V 12 mV 50.0 Hz 72.5 % 12.5 %	
50	Shift control solenoid valve-C	Shifting	DC Voltage	V_BAT Max. 1.0V Vpeak : Max. -2V	13.97 V 7.9 mV -0.78 V	
57	Fluid temperature sensor	Idling	Analog	0.5~4.5V	2.16V	@72°C (161.6°F)
60	Pulse Generator B	60kph	Sine Wave	Vp_p : Above 1.0V Freq.: 1.5~2.0kHz (Reference)	1.42 V 1.98 kHz	
61	Pulse Generator A	3,000rpm	Sine Wave	Vp_p : Above 1.0V Freq.: 1.1~1.3kHz (Reference)	3.86 V 1.25 kHz	
63	Brake SW	Release Push	DC Voltage	Max. 0.5V V_BAT	0.0 mV 12.24 V	
66	Inhibitor SW "D"	"D" range Otherwise		V_BAT Max. 1.0V	14.15 V 3.4 mV	
67	Inhibitor SW "P"	"P" range Otherwise		V_BAT Max. 1.0V	14.21 V 4.2 mV	
68	Inhibitor SW "L"	"L" range Otherwise		V_BAT Max. 1.0V	14.15 V 3.7 mV	
70	PWR4 GND	Idling		Max. 50mV	-4.2mV	(50.0Hz / 4.3kHz Chopping)
71	Pressure control solenoid valve-A	Shifting	Pulse	HI : V_BAT LO : Max. -3.0V Vpeak : Max. -60V	13.8 V -0.85 V -13.5 V	
72	Pressure control solenoid valve-B	Shifting	Pulse	HI : V_BAT LO : Max. -3.0V Vpeak : Max. -60V	13.8 V -0.86 V -13.5 V	(50.0Hz/ 4.3kHz Chopping)
80	Fluid temperature sensor GND	Idling	Analog	0.2V ~ 4.9V	2.5V (58°C (136°F))	
82	Pulse Generator B	60kph	Sine Wave	Vp_p : Above 1.0V Freq.: 1.5~2.0kHz (Reference)	1.42 V 1.98 kHz	
83	Pulse Generator A	3,000rpm	Sine Wave	Vp_p : Above 1.0V Freq.: 1.1~1.3kHz (Reference)	3.86 V 1.25 kHz	
87	Kickdown(K/D) servo	1, 3 speed		Max. 1.0V	0.0 mV	

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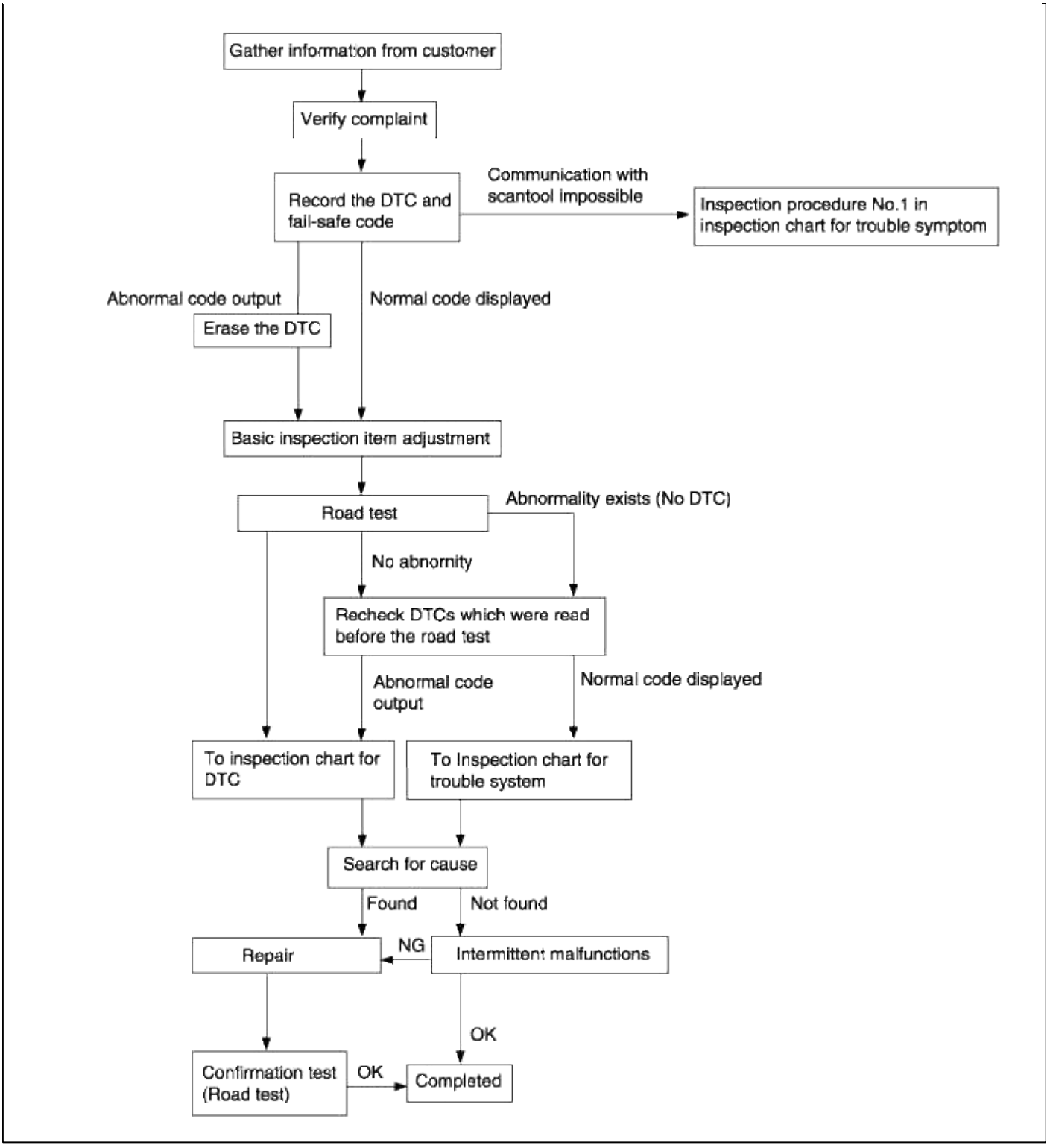
87	Kickdown(K/D) servo	2, 4 speed	DC Voltage	V_BAT	13.41 V	
88	Inhibitor SW "R"	"R" range Otherwise		V_BAT Max. 1.0V	13.79 V 3.4 mV	
89	Inhibitor SW "2"	"2" range Otherwise		V_BAT Max. 1.0V	14.19 V 4.1 mV	
90	O/D OFF SW	OD OFF OD ON		V_BAT Max. 1.0V	14.21 V 0.0 mV	
91	Inhibitor SW "N"	"N" range Otherwise		V_BAT Max. 1.0V	14.22 V 3.6 mV	
94	Damper clutch solenoid valve	Lock Up ON	Pulse	HI : V_BAT LO : Max. -3.0V Vpeak : Max. -60V	13.9 V -0.87 V -13.5 V	(35.0Hz/ 4.3kHz Chopping)

- V_BAT : Battery Voltage
- VBR : Converted battery voltage via main relay

Automatic Transaxle System > Automatic Transaxle System > Troubleshooting (A4AF3)

Troubleshooting

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Diagnositc Toruble Codes (Inspection Procedure)

Check The Diagnostic Trouble Codes

1. Turn the ignition switch to OFF.
2. Connect the Hi-scan tool to the DLC connector for diagnosis.
3. Turn the ignition switch to ON.
4. Check the diagnostic trouble codes using the Hi-scan tool.

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5. Read the output diagnostic trouble codes. Then follow the remedy procedures according to the "DIAGNOSTIC TROUBLE CODE DESCRIPTION" on the following pages.

NOTE

- A maximum of 10 diagnostic trouble codes (in the sequence of occurrence) can be stored in the Random Access Memory (RAM) incorporated within the control module.
- The same diagnostic trouble code can be stored one time only.
- If the number of stored diagnostic trouble codes or diagnostic trouble patterns exceeds 10, already stored diagnostic trouble codes will be erased in sequence, beginning with the oldest.
- Do not disconnect the battery until all diagnostic trouble codes or diagnostic trouble patterns have been read out, because all stored diagnostic trouble codes or diagnostic trouble patterns will be cancelled when the battery is disconnected.
- All diagnostic trouble codes are deleted from memory the 200th time the ATF temperature reaches 50°C(122°F) after memorization of the most recent diagnostic code.

6. Delete the diagnostic trouble code.
7. Disconnect the Hi-scan tool.

NOTE

DTC cleaning should only be done with the scan tool.

Diagnostic Trouble Code Table

No.	Code	Item	MIL	Remark
1	P0707	Transmission Range Sensor Circuit Low Input	●	
2	P0708	Transmission Range Sensor Circuit High Input	●	
3	P0711	Transmission Fluid Temperature Sensor "A" Circuit Range/Performance	●	
4	P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	●	
5	P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	●	
6	P0716	Input/Turbine Speed Sensor "A" Circuit Range/Performance		
7	P0717	Input/Turbine Speed Sensor "A" Circuit No Signal	●	
8	P0722	Output Speed Sensor Circuit No Signal	●	
9	P0731	Gear 1 Incorrect Ratio	●	
10	P0732	Gear 2 Incorrect Ratio	●	
11	P0733	Gear 3 Incorrect Ratio	●	
12	P0734	Gear 4 Incorrect Ratio	●	
13	P0741	Torque Converter Clutch Circuit Performance or Stuck Off	●	
14	P0742	Torque Converter Clutch Circuit Performance or Stuck On	●	
15	P0743	Torque Converter Clutch Circuit Electrical	●	
16	P0745	Pressure Control Solenoid Valve "A"		
17	P0750	Shift Control Solenoid Valve "A"	●	
18	P0755	Shift Control Solenoid Valve "B"	●	
19	P0760	Shift Control Solenoid Valve "C"(2nd Brake Solenoid)	●	

20	P0775	Pressure Control Solenoid Valve "B"	●	
21	P1709	Kick Down Servo Switch-Open or Short to Ground	●	
22	U0001	High Speed CAN Communication Bus off	●	
23	U0100	Lost Communication With ECM/PCM "A"	●	

NOTE

- D/C : Damper clutch
- PG-A : Input shaft rotation speed sensor
- PG-B : Output shaft rotation speed sensor
- PCSV : Pressure control solenoid valve
- SCSV : Shift solenoid valve

Check The Control System (Using The Hi-scan Tool)

Diagnosis items	Checking procedures		Probable cause
	Check conditions	Normal value	
Fluid temperature sensor	Engine doesn't operate before starting	Equivalent to outside air temperature	- Malfunction of the fluid temperature sensor or the circuit harness
	While warming up engine	Gradual increase	
	After warming up engine	80~110°C (176~230°F)	
Kickdown servo switch	"L"range : Idling	ON	- Malfunction of the kickdown servo adjustment - Malfunction of the kickdown servo switch or the circuit harness - Malfunction of the kickdown servo system
	"D"range :1st or 3rd gear	ON	
	"D"range :2nd or 4th gear	OFF	
Ignition signal • Engine rpm	"N"range: Idling	650-900rpm	- Malfunction of the ignition system - Malfunction of the ignition signal pick-up circuit
	"N"range, 2500rpm (Tachometer)	2400-2600rpm	
Idling switch	Accelerator pedal fully released	ON	- Malfunction of the TPS adjustment - Malfunction of the TPS or the circuit harness
	Press accelerator pedal slightly	OFF	
Air conditioning relay signal	"D"range: Air conditioning ON	ON	- Malfunction of the air conditioning power relay circuit harness
	"D"range: Air conditioning OFF	OFF	
Transaxle range switch	"D"range: Idling	C(creep)	- Malfunction of the TCM - Malfunction of the idling switch system - Malfunction of the inhibitor
	"L"range: Idling	1st gear	
	"2"range: 2nd gear	2nd gear	

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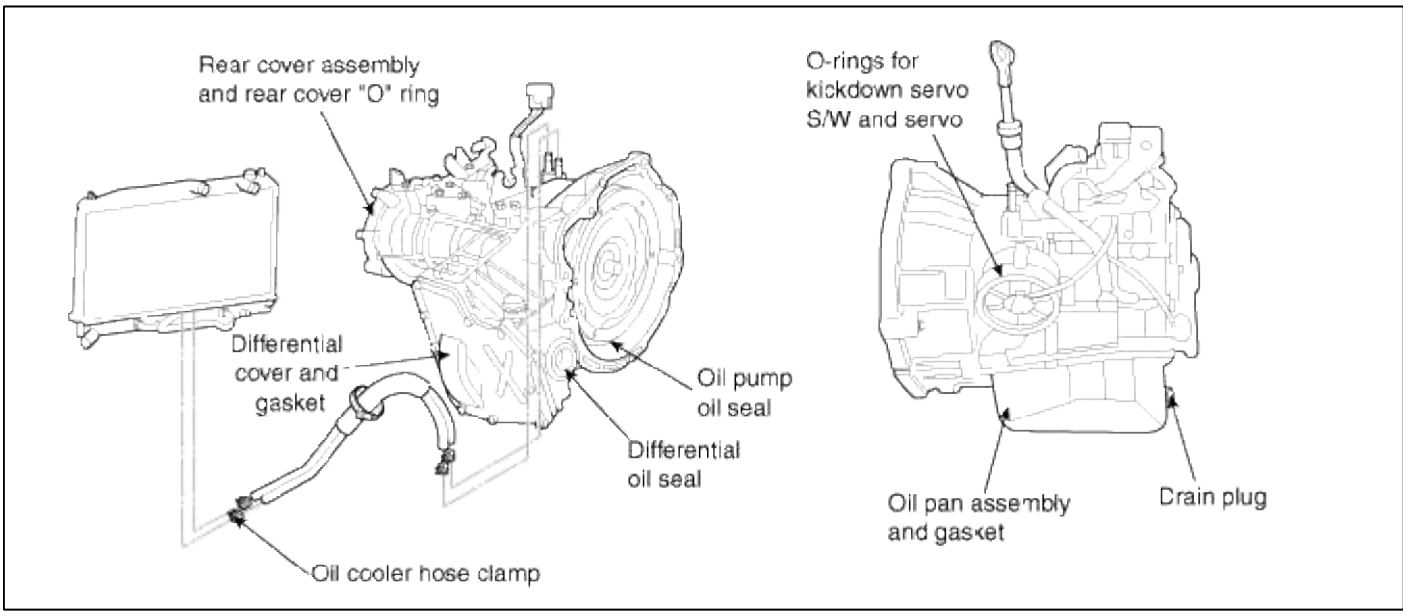
	"D"range: Overdrive switch is turned OFF, 3rd gear	3rd gear	switch system - Malfunction of the TPS system
	"D"range: Overdrive switch is turned ON, 4th gear	4th gear	
Pulse generator-A • Turbine rpm	"D"range: Engine stopped	0rpm	- Malfunction of the pulse generator-A or the circuit harness - Incoming noise from outside
	"D"range:Driving at 50km/h(31mph) in 3rd gear	1600~2000rpm	
	"D"range:Driving at 50km/h(31mph) in 4th gear	1100~1400rpm	
Pulse generator-B • Output shaft RPM sensor	"D"range: Engine stopped	0rpm	- Malfunction of the pulse generator-B or the circuit harness - Incoming noise from outside
	"D"range:Driving at 50km/h(31mph) in 3rd gear	1600~2000rpm	
	"D"range:Driving at 50km/h(31mph) in 4th gear	1600~2000rpm	
Overdrive switch	Overdrive switch is turned ON	OD:ON	- Malfunction of the overdrive switch or the circuit harness
	Overdrive switch is turned OFF	OD:OFF	
Inhibitor switch	Shift select lever to "P"range	P	- Malfunction of the inhibitor switch adjustment - Malfunction of the inhibitor switch or the circuit harness - Malfunction of the manual control cable
	Shift select lever to "R"range	R	
	Shift select lever to "N"range	N	
	Shift select lever to "D"range	D	
	Shift select lever to "2"range	2	
	Shift select lever to "L"range	L	
Vehicle speed sensor	Keep vehicle stopped	0km/h	- Malfunction of the vehicle speed sensor if high speed signal is delivered while vehicle is stopping - In other cases, malfunction of the vehicle speed sensor or circuit harness
	Driving at 30km/h(19mph)	30km/h(19mph)	
	Driving at 50km/h(31mph)	50km/h(31mph)	
Pressure control solenoid valve duty(PCSV duty)	"D"range : Idling	60~80%	- When accelerator pedal is slightly pressed while idling in "D"range, duty should become100% - Malfunction of the TCM - Malfunction of the TPS system - Malfunction of the idling switch system
	"D"range: 1st gear	100%	
	"D"range: During shift	Varies with condition	
Damper clutch slip rpm • Turbine rpm	"D"range: 3rd gear, 1500rpm (Tachometer)	200~300rpm	- Malfunction of the damper clutch

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			- Malfunction of the ignition signal wire or pulse generator-B system - Abnormality transaxle fluid pressure - Malfunction of the damper clutch solenoid valve
	"D"range: 3rd gear, 3500rpm (Tachometer)	0rpm	
DCCSV duty	"D"range: 3rd gear, 1500rpm (Tachometer)	0%	- Malfunction of the TCM - Malfunction of the TPS system - Malfunction of the pulse generator-B system
	"D"range: 3rd gear, 2500rpm (Tachometer)	Varies with load	

Fluid Leaks Inspection

Check for leaks from the transmission. If there are leaks, it is necessary to repair or replace O-ring, seal packings, oil seals, plugs or other parts.



Transaxle Fluid Level Inspection

1. Park the vehicle at even straight surface.
2. Before removing the oil level gauge, wipe all contaminants from around the oil level gauge.
3. Set the select lever to the "P"position and engage the parking brake and then start the engine.
4. Drive the vehicle until the fluid reaches normal.(80~90°C(176~194°F))
5. Move the select lever through all positions. This will fill the torque converter with transaxle fluid. Set the select lever to the "N"(Neutral) position.

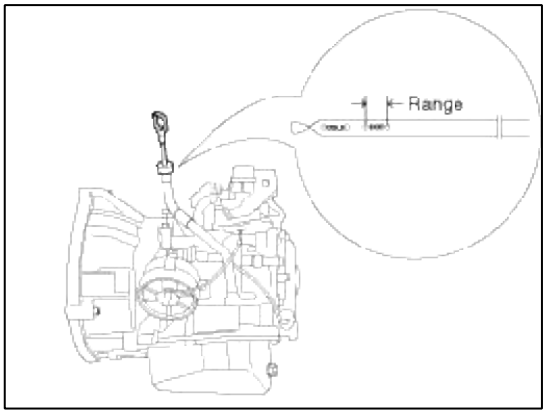
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6. Check that the fluid level is the "HOT" mark on the oil level gauge. If fluid level is low, add automatic transaxle fluiduntil the level reaches the "HOT" mark.

Automatic transaxle fluid :
GENUINE DIAMOND ATF SP-III or SK ATF SP-III
Quantity: 6.1ℓ (6.4 US qt, 5.4 lmp.qt)

NOTE

Low fluid level can cause a variety of abnormal conditions because it allows thepump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles, which are compressible.
Therefore, pressures will be erratic, causing delayed shifting, slipping clutches and brakes, etc. Improper filling can also raise fluid level too high. When the transaxle has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid.
In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and brake operation.
Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.
Also check the condition of the transaxle fluid. If the fluid smells as if it is burning, it means that the fluid has been ontaminated by fine particles from the bushes and friction material, a transaxle overhaul may be necessary.
Inspect the condition of fluid on the oil level gauge. For the detail check, drain some of the oil fluid out of the pump and then inspect the condition of the oil fluid.
After checking, insert the oil level gauge into the oil filler tube securely.



When new, automatic transaxle fluid should be red, The red dve is added so the assembly plant can identify it as transaxle fluid and distinguish it from engine oil or antifreeze. The red dve, which is not an indicator of fluid quality, is not permanent. As the vehicle is driven the transaxle fluid will begin to look darker. The color may eventually appear light brown.
But, the transaxle should be overhauled under the following conditions.

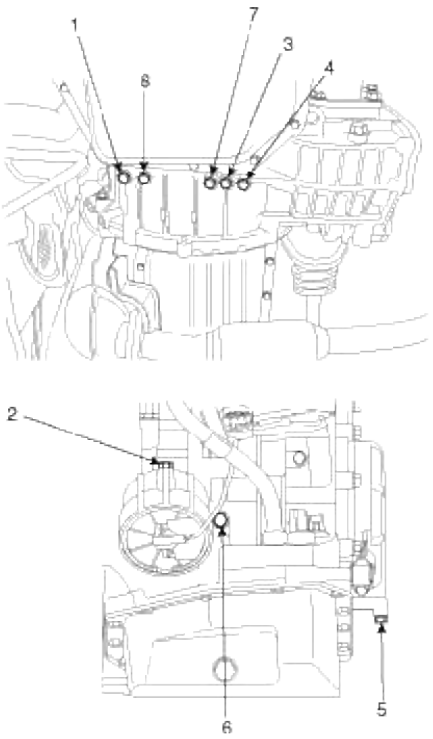
- If there is a "burning"door.
- If the fluid the color has become noticeably blacker.
- If there is a noticeably excessive amount of metal particle in the fluid.

Hydraulic Pressure Test

1. Warm up the engine until the automatic transaxle fluid temperature is 80~100°C(176~212°F).
2. Jack up the vehicle so that the wheels are free to turn.
3. Connect the engine tachometer.

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4. Connect the oil pressure gauge(09452-21500) and the oil pressure gauge adapter(09452-21002, 09452-21001) to each pressure discharge port. But use the gauge(30kg/cm²) when measuring the reverse pressure, front clutch pressure and low&reverse brake pressure.



1. Reduction pressure
2. Kickdown servo pressure
3. Rear clutch pressure
4. Front clutch pressure
5. End clutch pressure
6. Low & reverse brake pressure
7. Damper clutch apply pressure
8. Damper clutch prelease pressure

5. If a value is outside the standard range, correct the problem while referring to the hydraulic pressure test diagnosis table.

Standard Hydraulic Pressure Test

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No.	Measurement Condition			Standard hydraulic pressure kpa(kg/cm², psi)							
				1	2	3	4	5	6	7	8
	Select lever position	Engine speed (rpm)	Shift position	Reduction pressure	Servo apply pressure	Rear clutch pressure	Front clutch pressure	End clutch pressure	Low & reverse brake pressure	Torque converter pressure	Damper clutch pressure
1	N	Idling	Neutral	402~422 (4.1~4.3, 58~61)					-	-	-
2	D (switch ON)	2,500	4th gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	-	-	834~873 (8.5~8.9, 121~127)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
3	D	2,500	3rd gear	402~422 (4.1~4.3, 58~61)	844~883 (8.6~9.0, 122~128)	844~883 (8.6~9.0, 122~128)	824~863 (8.4~8.8, 119~125)	844~883 (8.6~9.1, 122~128)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
4	D	2,500	2nd gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	844~883 (8.6~9.0, 122~128)	-	-	-	-	628~687 (6.4~7.0, 91~96) D/C ON
5	L	1,000	1st gear	402~422 (4.1~4.3, 58~61)	-	844~883 (8.6~9.0, 122~128)	-	-	343~520 (3.5~5.3, 50~75)	422~480 (4.3~4.9, 61~70)	235~275 (2.4~2.8, 34~40) D/C OFF
6	R	2,500	Reverse	441~461 (4.5~4.7, 64~67)	-	-	1815~1913 (18.5~19.5, 263~277)	-	1815~1913 (18.5~19.5, 263~277)	432~490 (4.4~5.0, 63~71)	265~343 (2.7~3.5, 38~50) D/C OFF

NOTE

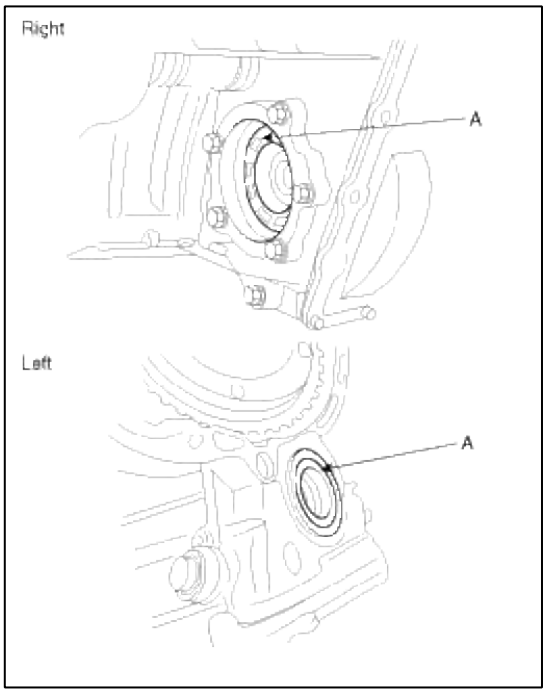
- "-" is 0.2(0.3)kg/cm² or less and "( )" is the reverse.
- SW-ON : Turn the overdrive control switch ON.
- SW-OFF : Turn the overdrive control switch OFF.
- The hydraulic pressure may be more than standard value at the ambient temperature.

Drive Shaft Oil Seals Replacement

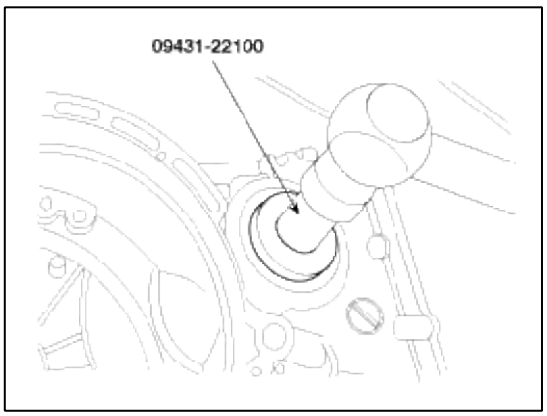
1. Disconnect the drive shaft from the transaxle.

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2. Using a flat-tip (-) screwdriver, remove the oil seal(A).



3. Apply a coating of the transaxle fluid to the lip of the oil seal.
4. Using the special tool (09431-22100), tap the drive shaft oil seal into the transaxle.



Torque Converter Stall Test

This test measures the maximum engine speed when the select lever is at the "D" or "R" position and the throttle is fully opened to test the operation of the torque converter overrunning clutch and the holding ability of clutch and brake inthe transaxle.

NOTE

Do not let anybody stand in front of or behind the vehicle while this test is being carried out.

1. Check the automatic transaxle fluid level and temperature and the engine coolant temperature.
   A. Fluid level : At the HOT mark on the oil level gauge
   B. Fluid temperature : 80~90°C (176~194°F)
   C. Engine coolant temperature : 80~90°C (176~194°F)
2. Apply chocks to both rear wheels.
3. Connect the engine tachometer.
4. Pull the parking brake lever on, with the brake pedal fully depressed.
5. Start the engine.

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6. Move the select lever to the "D" position, fully depress the accelerator pedal and take a reading of the maximum engine speed at this time.

CAUTION

- The throttle should not be left fully open for any more than 5 seconds.
- If carrying out the stall test two or more times, move the select lever to the "N" position and run the engine at 1,000 r/min to let the automatic transaxle fluid cool down before carrying out subsequent tests.
- Move the select lever to the "R" position and carry out the same test again.

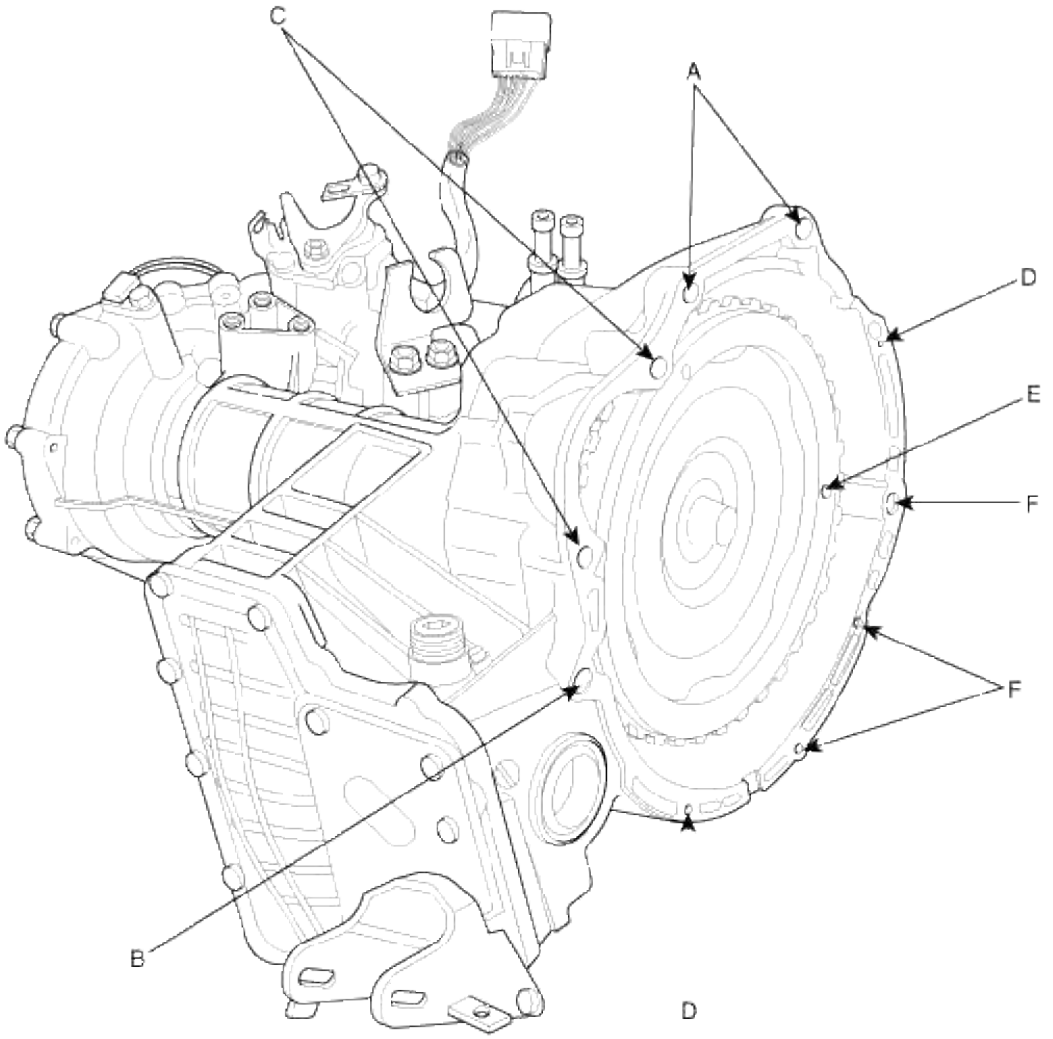
Stall rpm : 2,400~2,800 RPM

7. Moe the select lever to the "R" position carry out the same test again.
   (1) "Stall speed above specification in "D"
   If stall speed is higher than specification, the rear clutch or overrunning clutch of the transaxle is slipping. In thiscase, perform a hydraulic test to locate the cause of slippage.
   (2) Stall speed above specification in "R"
   If the stall speed is higher than specification, the front clutch of the transaxle or low&reverse brake is slipping. In this case, perform a hydraulic test to locate the cause of slippage.
   (3) Stall speed above specification in "D" and "R"
   If the stall speed is lower than specification, insufficient engine output or a faulty torque converter is suspected.

Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > Components and Components Location (A4AF3)

Component(1)

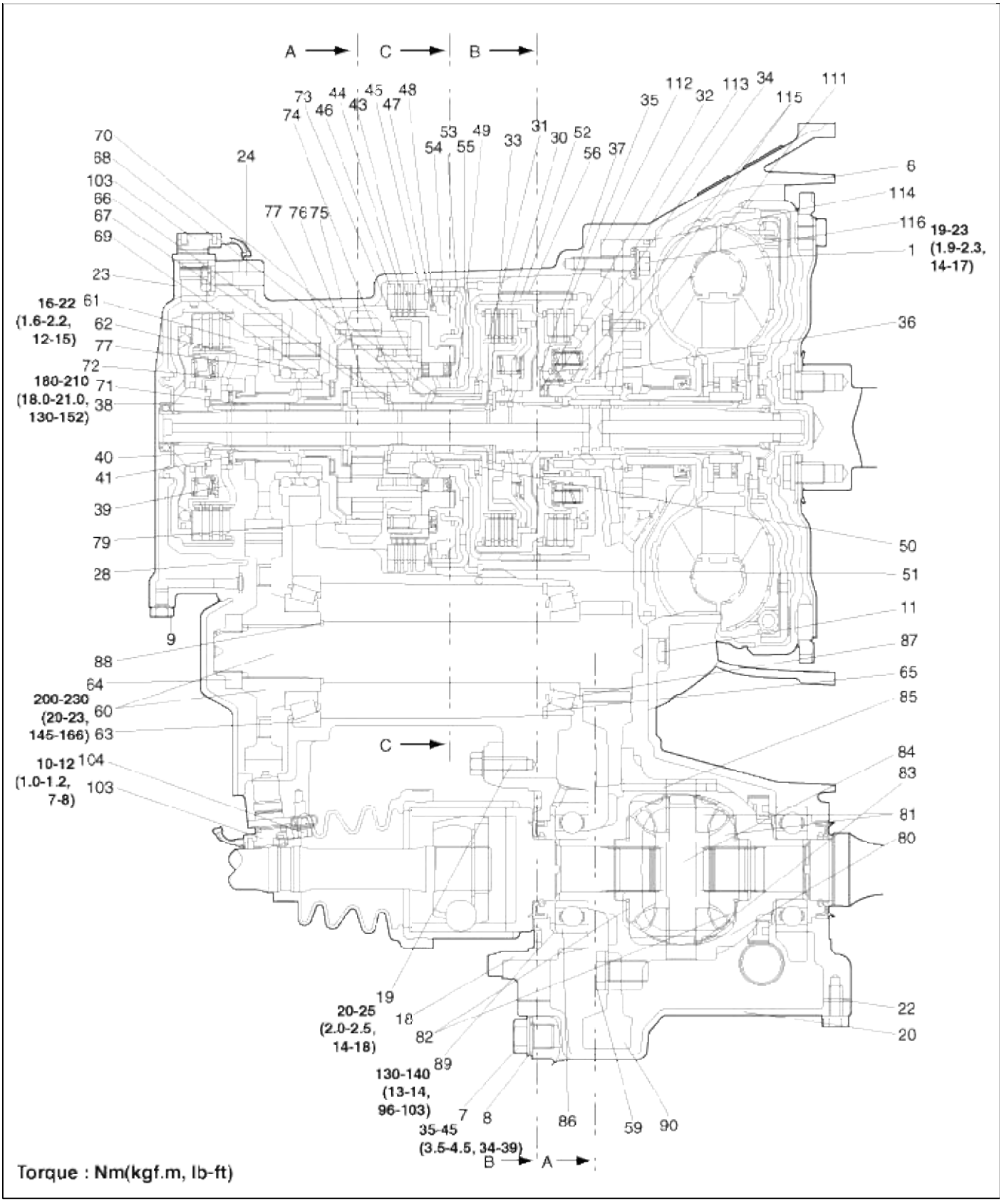
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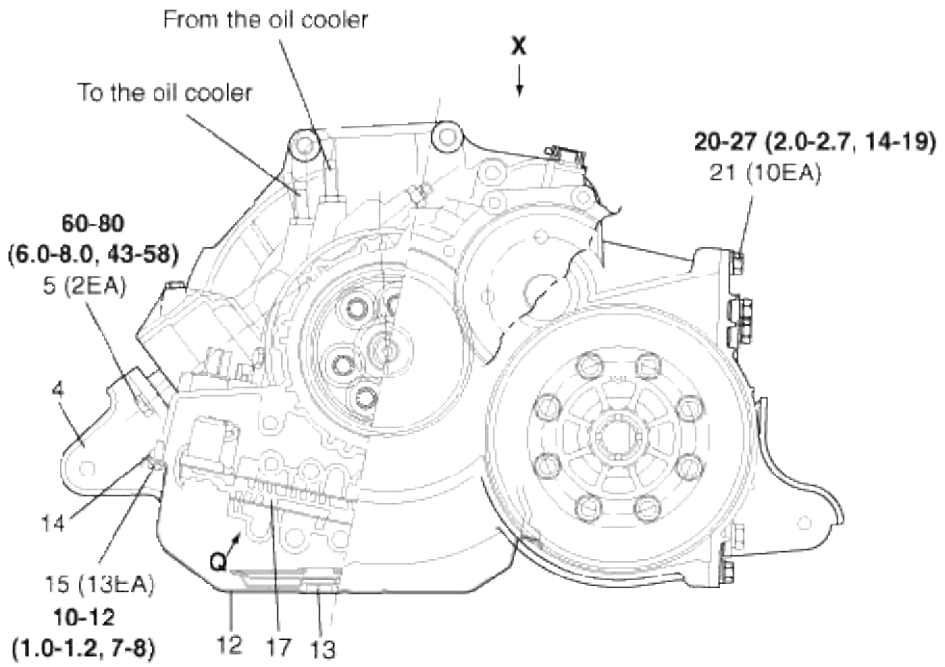
	Tightening torque (Nm(kgf.cm, lb-ft))	O.D × Length [mm(in.)]	Identification Mark
A	60~80(600~800, 43~58)	7 12×40(0.47×1.57)	7 A×B
B	43~55(430~550, 32~41)	7 10×60(0.39×2.36)	
C	27~34(270~340, 19~24)	7 10×55(0.39×2.17)	
D	3~5(30~50, 2~4)	7 6×14(0.24×0.55)	
E	46~53(460~530, 34~39)	7 10×11(0.39×0.43)	
F	30~42(300~420, 22~30)	7 10×20(0.39×0.79)	

Component(2)

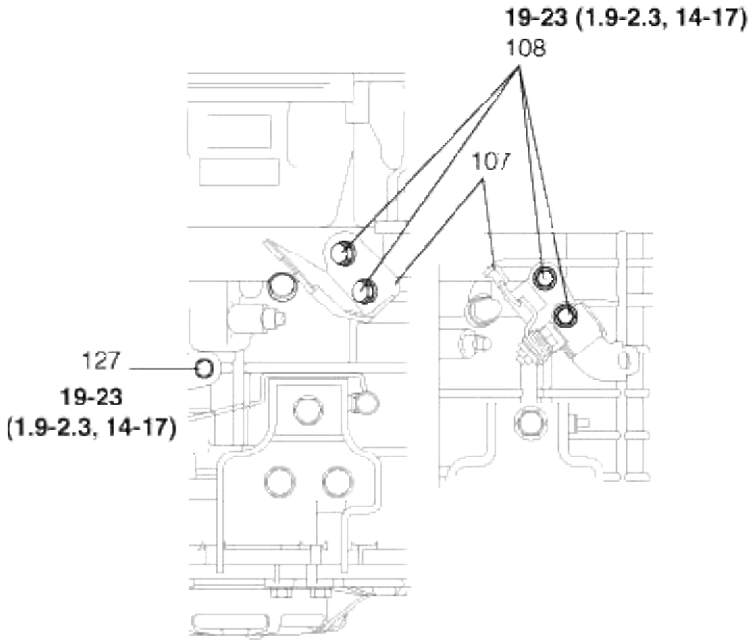
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A
C
B
73 44 45 48
74 46 43 47
53 49 31
54 55 33 30 52
56 37
35 112 32 113 34 111
115
70
68
103
66
67
69
24
77 76 75
6
114
116
19-23
(1.9-2.3,
14-17)
1
23
16-22
(1.6-2.2,
12-15)
61
62
77
72
180-210
(18.0-21.0,
130-152)
71
38
36
40
41
39
79
28
50
51
11
9
87
88
65
64
200-230
(20-23,
145-166)
60
63
85
C
10-12
(1.0-1.2,
7-8)
104
103
84
83
81
80
19
20-25
(2.0-2.5,
14-18)
18
82
22
20
89
130-140
(13-14,
96-103)
7
8
86
59
90
35-45
(3.5-4.5, 34-39)
B
A
Torque : Nm(kgf.m, lb-ft)

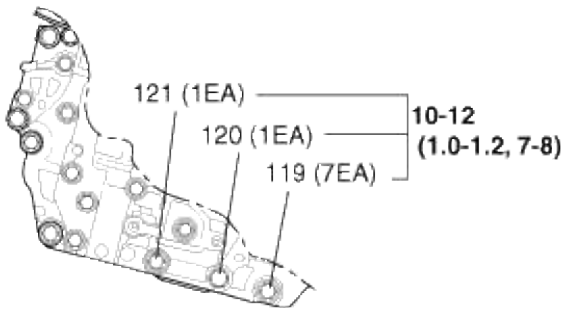
Component(3)



<A-A side view>



<Side view ("X" axis)>

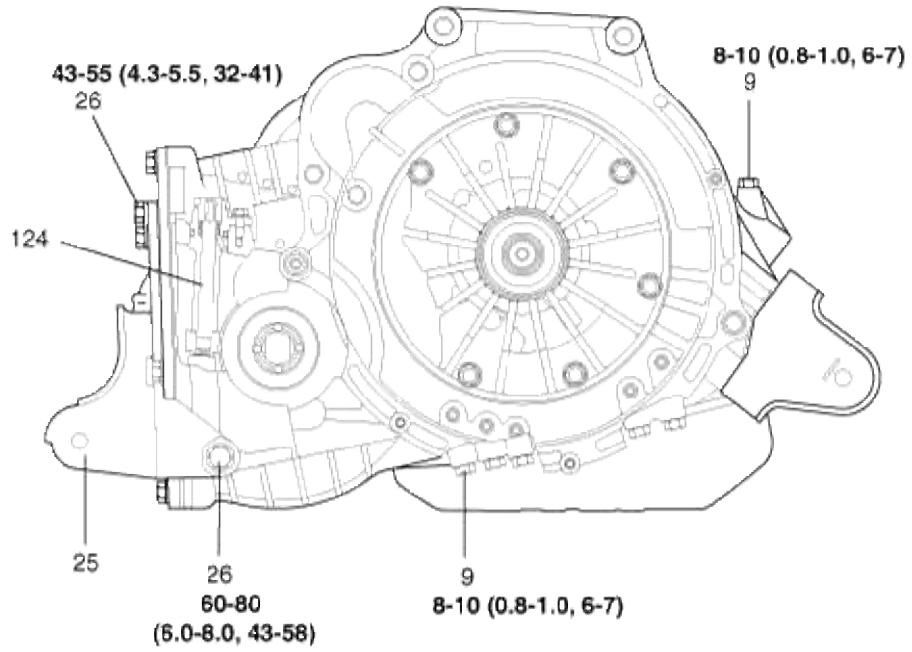


<Side view ("Q" axis)>

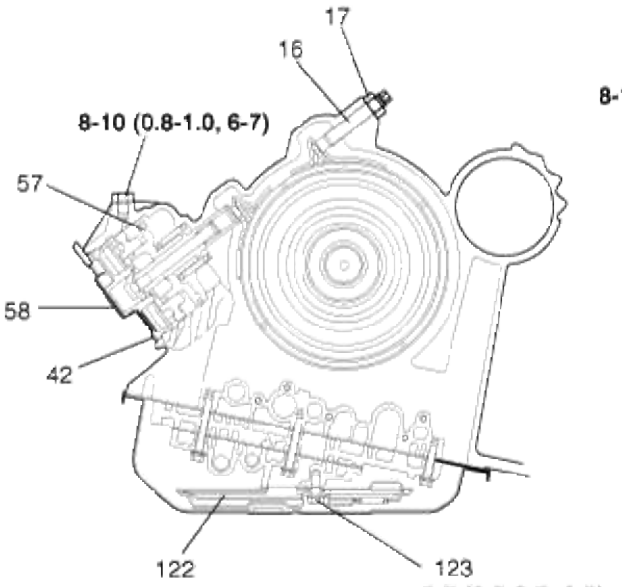
Torque : Nm(kgf. m, lb-ft)

Component(4)

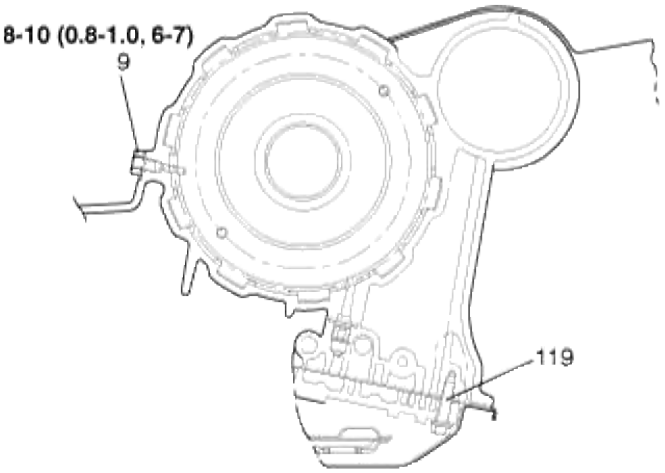
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<Transaxle side view>



<Section B-B>

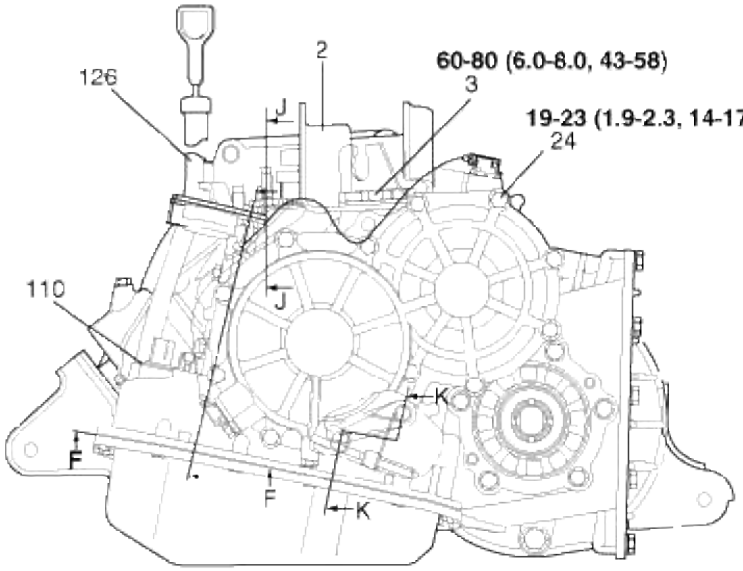


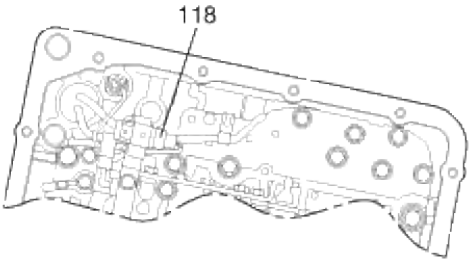
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Torque : Nm(kgf.m, lb-ft)

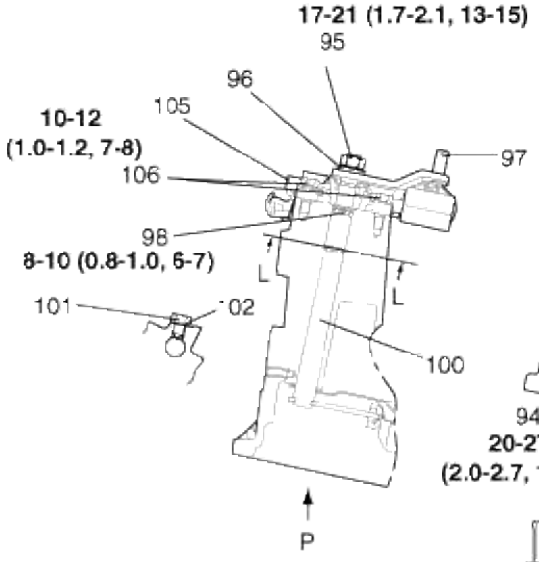
Component(5)

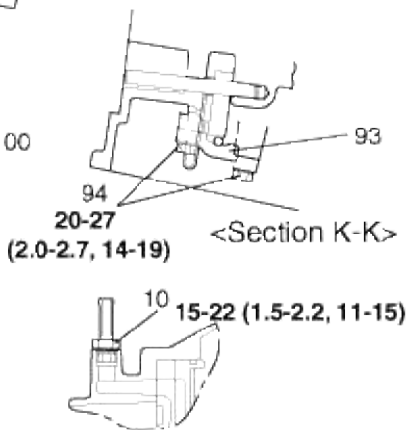
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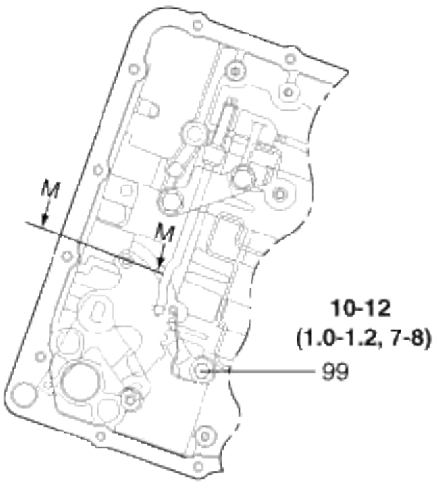
<Section K-K>





<Section K-K>

<Section J-J >



P

Torque : Nm(kgf.m, lb-ft)

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1. Torque converter	44. Brake plate	87. Side bearing
2. Transaxle support bracket	45. Brake pressure plate	88. Spacer
3. Bolt washer	46. Brake reaction plate	89. Spacer
4. Front roll support bracket	47. Return spring	90. Differential drive gear
5. Bolt washer	48. Wave spring	91. Speedometer driven gear
6. Transaxle case	49. Thrust bearing	92. Stopper plate
7. Drain plug	50. Thrust race	93. Sprag rod support
8. Gasket	51. Snap ring	94. Flange bolt(8×25)
9. Pressure check plug	52. Kickdown drum	95. Nut
10. Oil cooler connector	53. Packing	96. Spring washer
11. Seal ring cap	54. Low & reverse brake piston	97. Manual control lever
12. Oil pan	55. Center support	98. O-ring
13. Magnet	56. Kickdown band	99. Bolt
14. Oil pan gasket	57. Kickdown servo and spring piston	100. Manual control
15. Bolt	58. Kickdown servo switch	101. Screw
16. Adjusting screw	59. Fly wheel bolt	102. Seal ring washer
17. Nut	60. Transfer driven gear set	103. Pulse generator
18. Differential bearing retainer	61. Bolt	104. Flange bolt(6×14)
19. Flange bolt(8×25)	62. Double angular ball bearing	105. Inhibitor switch
20. Differential cover	63. Taper roller bearing	106. Flange bolt
21. Bolt washer	64. Locking nut	107. Shift cable bracket
22. Differential cover gasket	65. Snap ring	108. Flange bolt
23. End cover	66. Thrust bearing	109. Clamp
24. Flange bolt	67. Thrust race	110. Snap ring
25. Rear roll support bracket	68. Seal ring	111. Oil pump
26. Seal bolt	69. Thrust bearing	112. Oil pump gasket
27. Bolt(10×20)	70. Snap ring	113. Seal washer
28. O-ring	71. End clutch shaft	114. O-ring
29. Air breather cap	72. Locking nut(M38)	115. Seal ring
30. Rear clutch	73. Planetary carrier	116. Seal bolt
31. Rear clutch hub	74. Reverse sun gear	117. Valve body
32. Thrust bearing	75. Forward sun gear	118. Oil temperature sensor
33. Thrust bearing	76. Annulus gear	119. Bolt(6×26)
34. Thrust race	77. Transfer drive gear	120. Bolt(6×36)
35. Front clutch	78. Output flange	121. Bolt(6×41)
36. Thrust washer	79. Snap ring	122. Oil filter
37. Thrust washer	80. Differential case	123. Flange bolt(6×12)
38. End clutch	81. Differential gear	124. Speedometer driven gear sleeve
39. End clutch hub	82. Differential gear spacer	125. Flange bolt(6×14)
40. Thrust washer	83. Washer	126. Oil level gauge and filler tube
41. Thrust bearing	84. Pinion shaft	127. Flange bolt(8×16)
42. Snap ring	85. Lock pin	128. Oil level gauge
43. Brake disc	86. Ball bearing	

Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > Repair procedures (A4AF3)

Removal

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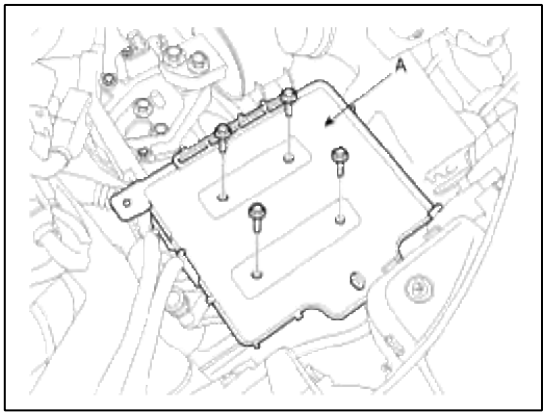
CAUTION

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

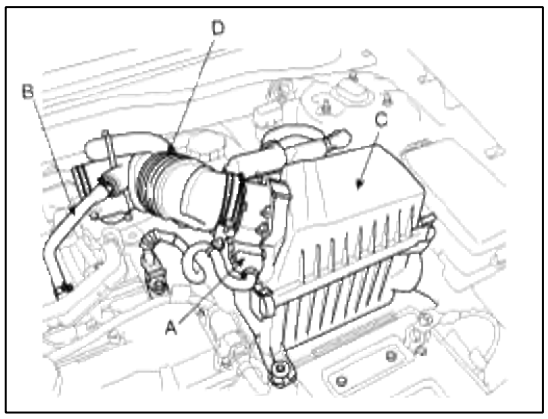
NOTE

- Mark all wiring and hoses to avoid misconnection.

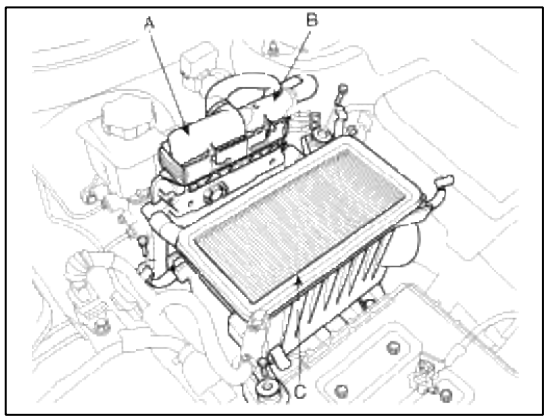
1. Disconnect the battery terminals and then remove battery.
2. Remove the battery and battery tray(A).



3. Remove the intake air hose and air cleaner assembly.
   (1) Disconnect the AFS(Air Flow Sensor) connector(A).
   (2) Disconnect the breather hose(B) from intake air hose(D).
   (3) Remove the intake air hose(D) and air cleaner upper cover(C).

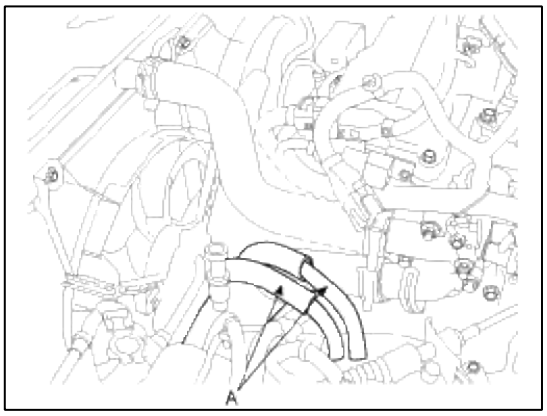


   (4) Disconnect the ECM connector(A, B).
   (5) Remove the air cleaner element and lower cover(C).

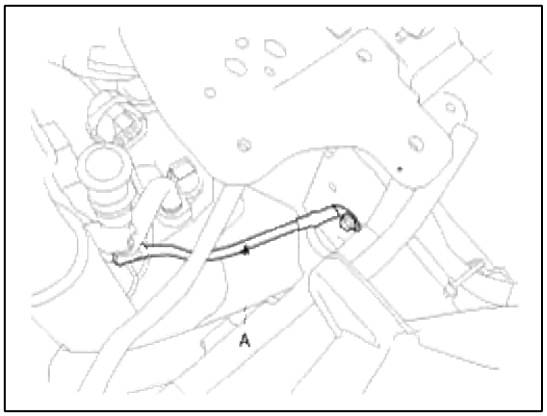


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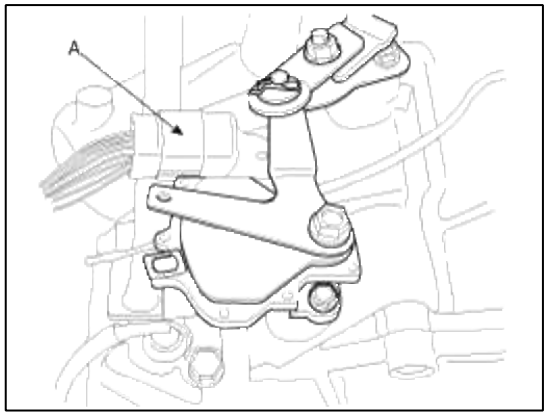
4. Remove the ATF(Automatic transaxle fluid) cooler hose(A).



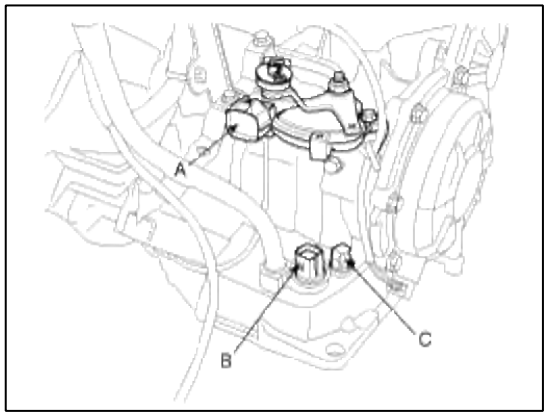
5. Remove the transaxle ground cable(A).



6. Remove the transaxle wire harness connectors and control cable from transaxle.
   (1) Disconnect the transaxle range switch connector(A).



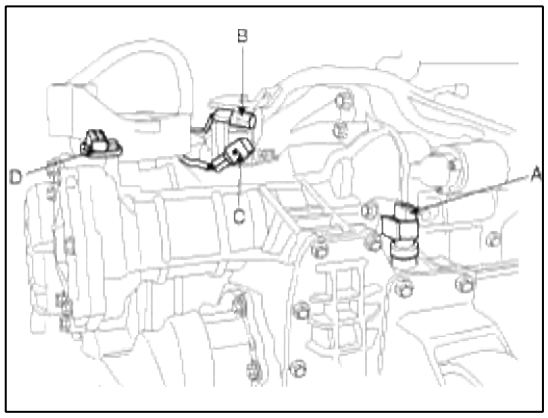
   (2) Disconnect the solenoid valve connector(B).



   (3) Disconnect the fluid temperature sensor connector(C).

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(4) Disconnect the vehicle speed sensor connector(A).

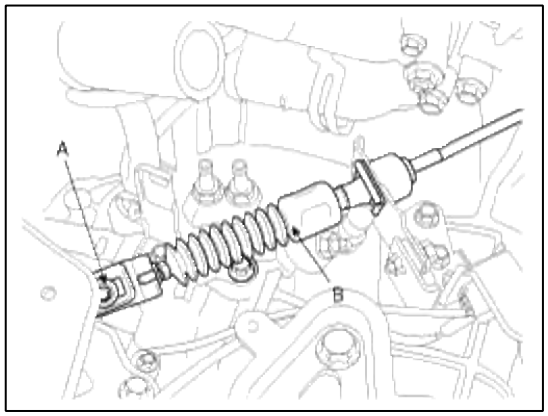


(5) Disconnect the band servo switch connector(B).

(6) Disconnect the pulse generator A connector(C).

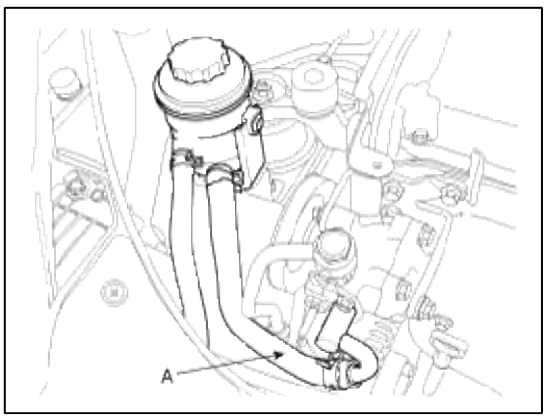
(7) Disconnect the pulse generator B connector(D).

(8) Remove the control cable nut(A) from transaxle range switch.



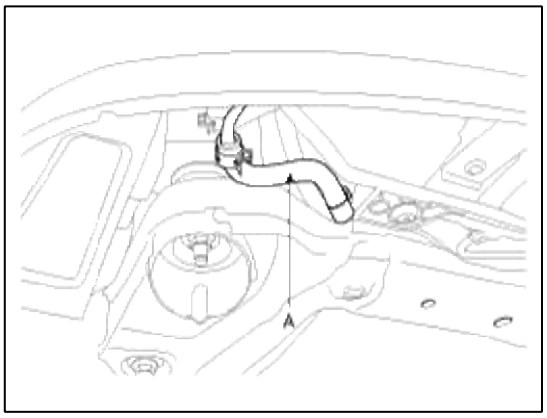
(9) Remove the control cable(B).

7. Remove the power steering oil hose(A) and drain the power steering oil.

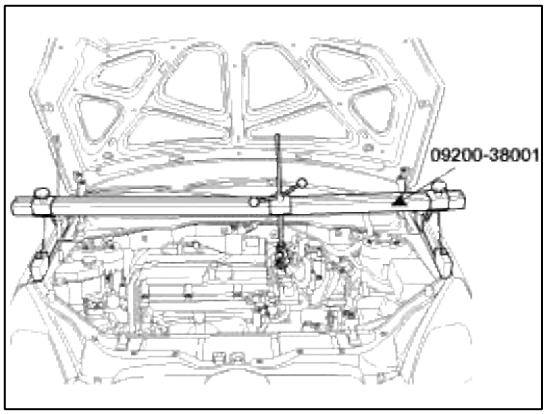


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8. Remove the power steering return hose(A).

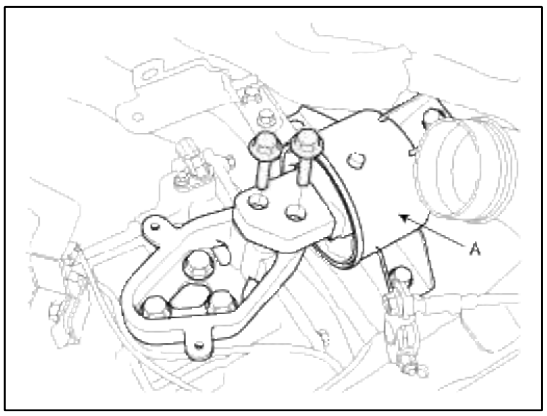


9. Install the special tools(09200-38001), the engine support fixture and the adapter, on the engine assembly.



10. Remove the transaxle mounting support bracket(A).

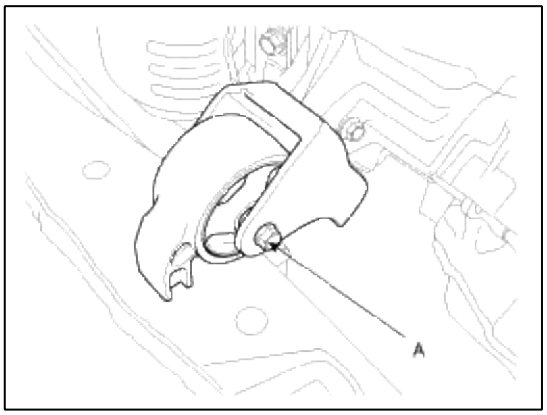
Tightening torque :
70~95Nm (700~950kgf.cm, 50~69lb-ft)



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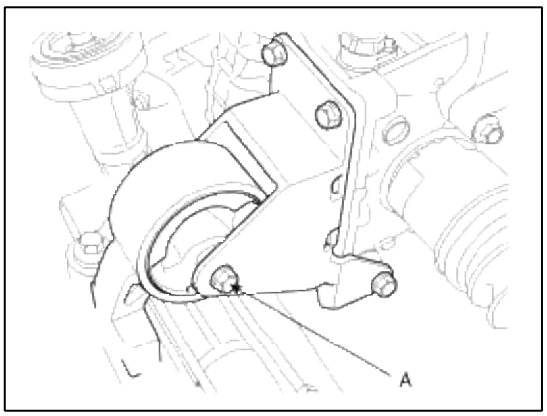
11. Remove the front roll stopper mounting bolt(A).

Tightening torque :
50~65Nm (500~650kgf.cm, 36~47lb-ft)

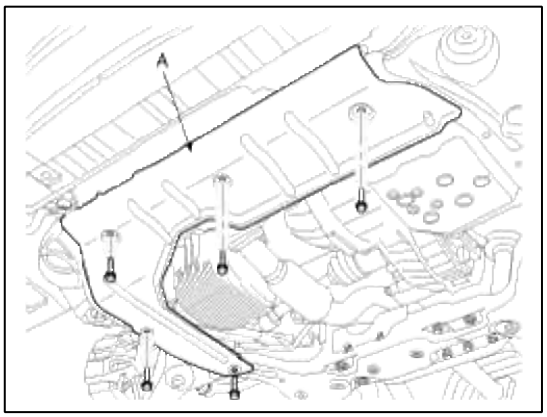


12. Remove the rear roll stopper mounting bolt(A).

Tightening torque :
50~65Nm (500~650kgf.cm, 36~47lb-ft)



13. Remove the under cover(A).

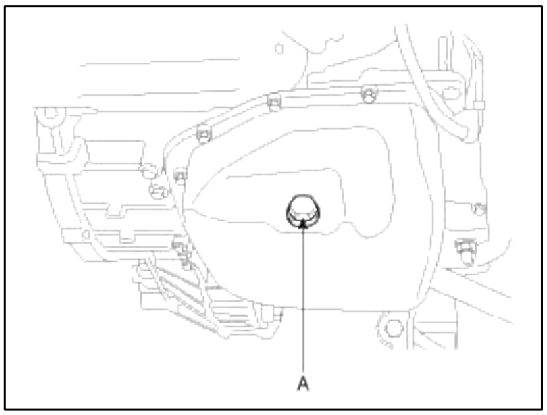


14. Remove the side cover.
15. Remove the front wheel.

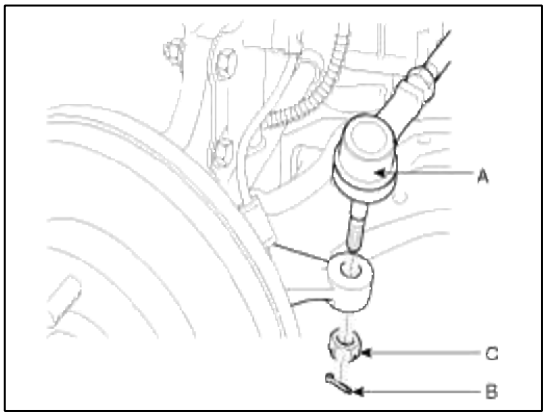
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16. Remove the drain plug(A) and drain the automatic transaxle fluid.

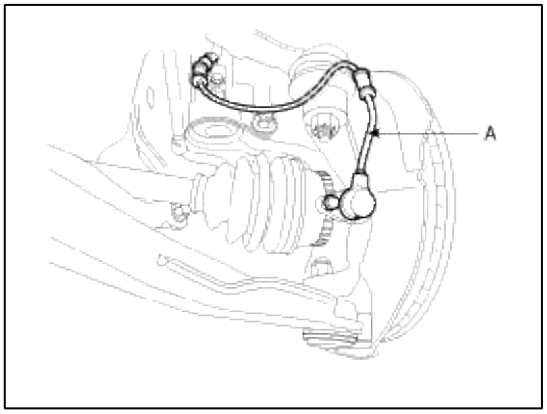
Tightening torque :
35~45Nm (350~450kgf.cm, 25~32lb-ft)



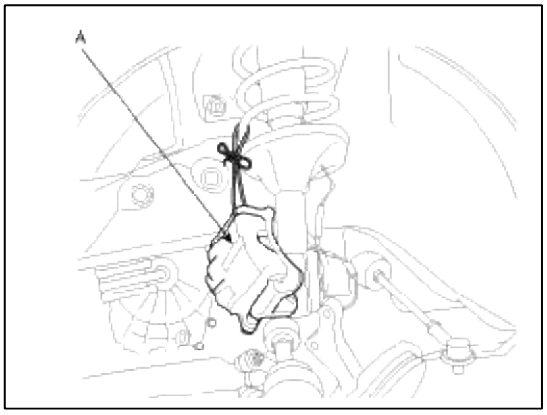
17. Separate the tie rod end(A) from the pin(B) and nut(C).



18. Remove the ABS wheel speed sensor(A).

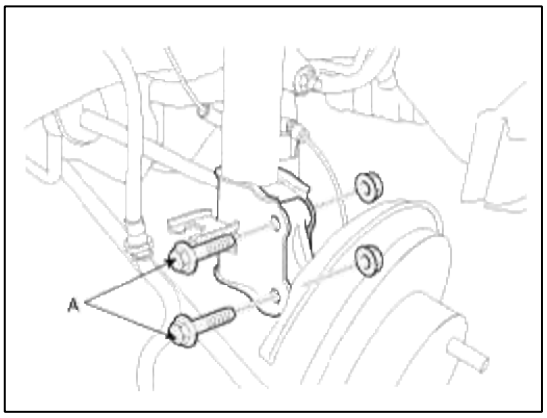


19. Remove the front caliper(A) and use a wire to secure the caliper to the vehicle so that it is out of the way.

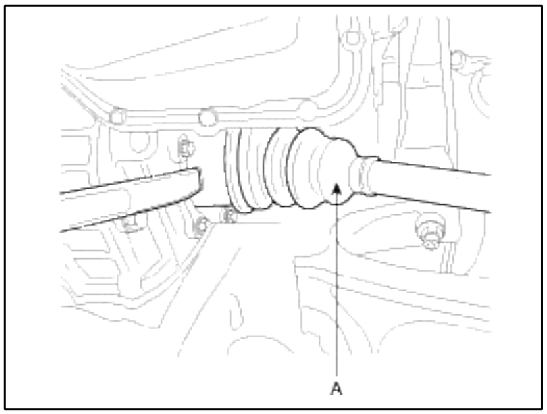


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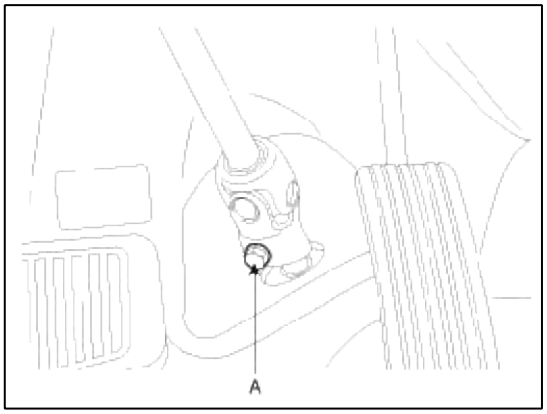
20. Remove the knuckle mounting bolts(A).



21. Remove the drive shaft(A) from the transaxle.



22. Remove the steering U-joint mounting bolt(A).



23. Install the jack for supporting transaxle.

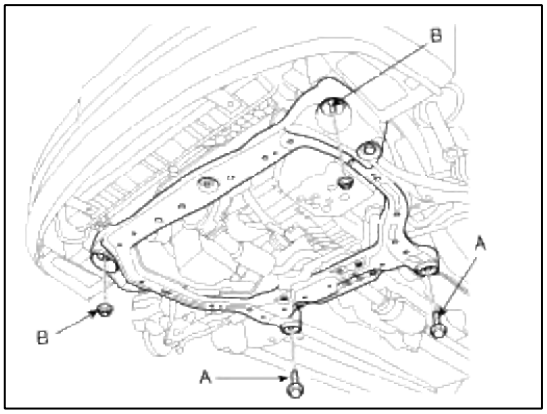
NOTE

When supporting the transaxle assembly, make sure that the weight is applied to a wide area of the jack surface.

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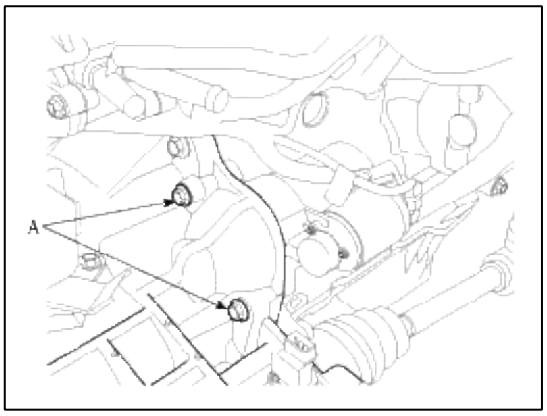
24. Remove the sub-frame bolt(A) and nut(B).

Tightening torque :
Bolts(A): 40~50Nm(400~550Kgf.cm, 29~40lb-ft)
Nuts(B): 160~180Nm(1600~1800Kgf.cm, 110~126lb-ft)



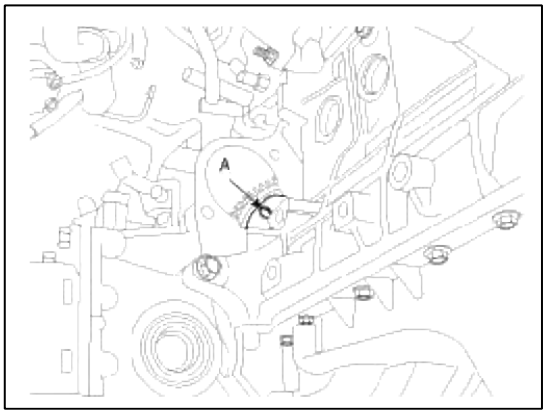
25. Remove the start motor mounting bolt(A).

Tightening torque :
27~34Nm (270~340kgf.cm, 19~24lb-ft)



26. Remove the engine to the torque converter mounting bolts(A). (4EA).

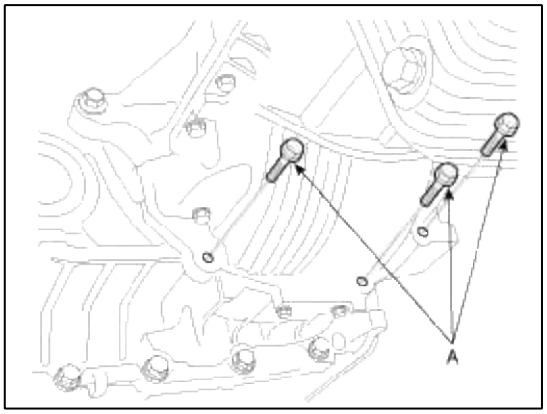
Tightening torque :
46~53Nm (460~530kgf.cm, 33~38lb-ft)



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27. Remove the engine to automatic transaxle mounting bolts(A).

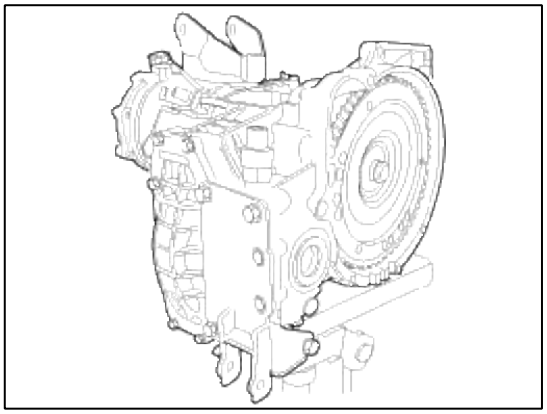
Tightening torque :
Bolts(12mm): 60~80Nm(600~800Kgf.cm, 43~58lb-ft)
Bolts(10mm): 43~55Nm(430~550Kgf.cm, 32~41lb-ft)



28. Remove the transaxle assembly.

CAUTION

Be careful not damage the other parts during removal.



Installation

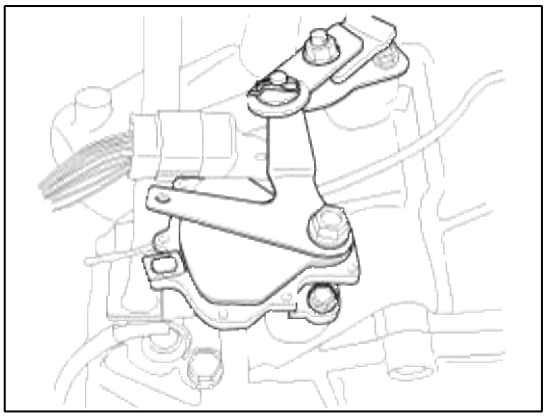
1. Attach the torque converter on the transaxle side and mount the transaxle assembly onto the engine.

CAUTION

If the torque converter is mounted first on the engine, the oil seal on the transaxle may be damaged.
Therefore, be sure to first assemble the torque converter to the transaxle.

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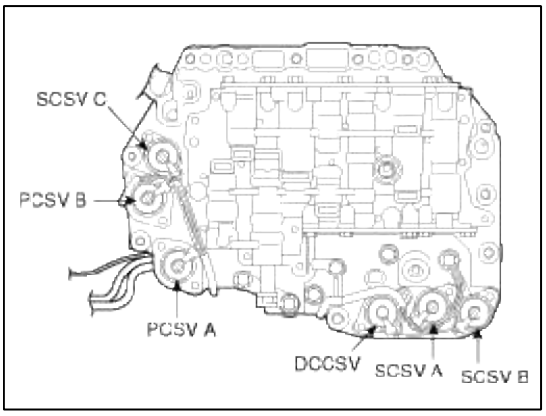
2. Install the transaxle control cable and adjust as follows.
   (1) Move the shift lever and the transaxle range switch to the "N" position, and install the control cable.
   (2) When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable.
   (3) Remove any free-play in the control cable by adjusting nut and then check to see that the selector lever moves smoothly.
   (4) Check to see that the control cable has been adjusted correctly.



3. Installation is the reverse of removal.

Automatic Transaxle System > Valve Body System > Pressure Control Solenoid Valve (PCSV) > Description and Operation (A4AF3)

Description



NOTE

- SCSV-A/B/C (ON/OFF)
- PCSV-A/B (Duty)
- DCCSV (ON/OFF)

Function

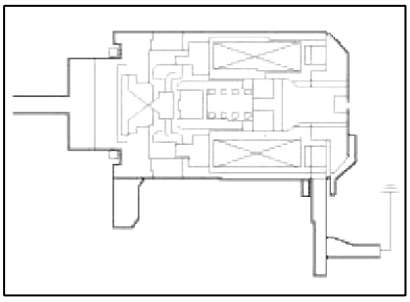
- Damper Clutch Control Solenoid Valve(DCCSV)
  : Controlled by the PCM. A damper clutch operates by the DCCSV.
- Shift Control Solenoid Valve-A (SCSV-A)
  : Controlled by the PCM. It operates at 1st / 4th gear.
- Shift Control Solenoid Valve-B (SCSV-B)
  : Controlled by the PCM. It operates at 1st / 2nd gear.

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- Shift Control Solenoid Valve-C (SCSV-C)
  : Controlled by the PCM. It operates at 3rd / 4th gear and reduces line pressure.
  It controls the end clutch.
- Pressure Control Solenoid Valve-A (PCSV-A)
  : Controlled by the PCM. It controls the engaged pressure of the front clutch, end clutch, kick down brake and low & reverse brake.
- Pressure Control Solenoid Valve-B (PCSV-B)
  : Controlled by the PCM. It controls the engaged pressure of the rear clutch.

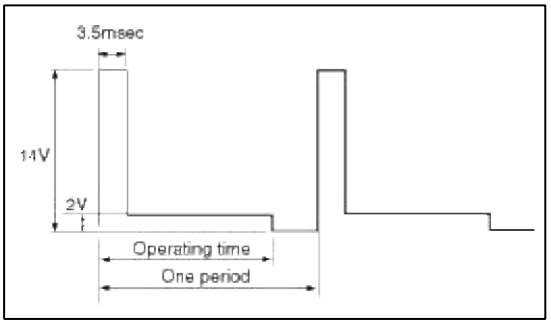
Item	Function
DC control solenoid valve	Makes the oil passage for damper clutch
Pressure control solenoid valve A	Makes the oil passage for K/D, E/C
Pressure control solenoid valve B	Makes the oil passage for R/C
Shift control solenoid valve A	Makes the oil passage at each gear
Shift control solenoid valve B	Makes the oil passage at each gear
Shift control solenoid valve C	Makes the oil passage for E/C
Torque reduction request sig.	Send torque reduction request signal to ECM

Features

<table>
<tr><td>Duty ratio
(Frequency)</td><td>- PCVSV-A : 35Hz
- PCVSV-B : 50Hz</td></tr>
<tr><td>Surge voltage</td><td>
<table>
<tr><td>Solenoid</td><td>Valve resistance : Above 2.6Ω</td></tr>
<tr><td>Surge voltage</td><td>56V</td></tr>
</table>
</td></tr>
<tr><td>Structure</td><td>  </td></tr>
<tr><td>Pressure by duty ratio</td><td>
<table>
<tr><td rowspan="2">PCSV-B</td><td colspan="5">Duty(%)</td></tr>
<tr><td>0</td><td>25</td><td>50</td><td>75</td><td>100</td></tr>
<tr><td>Rear clutch pressure(kg/cm²)</td><td>8.7±0.3</td><td>6.3±0.5</td><td>2.8±0.4</td><td>0.9±0.3</td><td>Max. 0.2</td></tr>
<tr><td>Reducing pressure(kg/cm²)</td><td>4.3±0.2</td><td>←</td><td>←</td><td>←</td><td>←</td></tr>
</table>
※ The pressure is under normal temperature. [85˚C(185˚F)]
</td></tr>
</table>

Characteristics

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Pin voltage		Output waveform
Solenoid valve resistance	Above 2.6Ω	
Surge voltage	56V	
IG "ON"	12~14V (TCM Pin)	

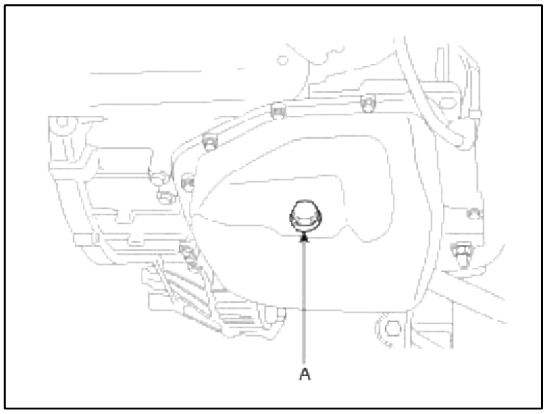
Solenoid Operation

Shift	SCSV-A	SCSV-B	SCSV-C	PCSV-A	PCSV-B	Remarks
1	ON	ON	OFF	ON	OFF	
1→2A	OFF	ON	OFF	DUTY	OFF	
2A	OFF	ON	OFF	OFF	OFF	
2→3	OFF	OFF	OFF	DUTY	OFF	
3	OFF	OFF	ON	OFF	OFF	
3→4	ON	OFF	OFF	DUTY	OFF	
4	ON	OFF	ON	OFF	OFF	
4→3	OFF	OFF	OFF	DUTY	DUTY	
4→2B	OFF	ON	ON	DUTY	DUTY	
2B	OFF	ON	ON	ON	OFF	
3→2A	OFF	ON	OFF	DUTY	OFF	
2→1	ON	ON	OFF	ON	OFF	
N→D2	OFF	ON	OFF	DUTY	DUTY	
Fail safe	OFF	OFF	OFF	OFF	OFF	

Automatic Transaxle System > Valve Body System > Pressure Control Solenoid Valve (PCSV) > Repair procedures (A4AF3)

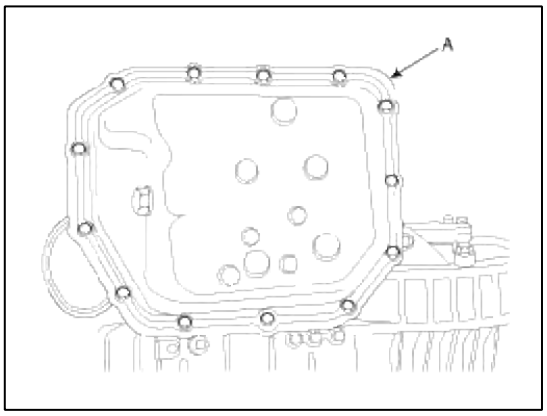
Adjustment

1. Remove the drain plug(A) and drain the automatic transaxle fluid.

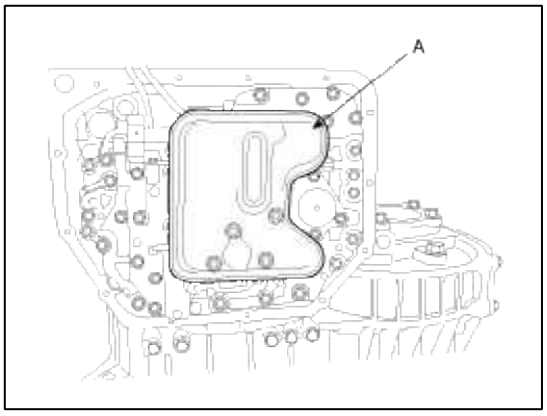


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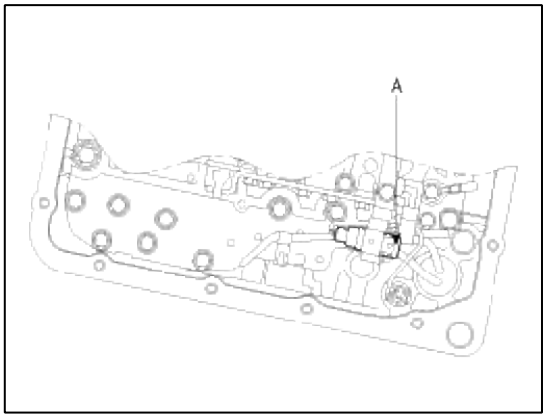
2. Remove the oil pan(A).



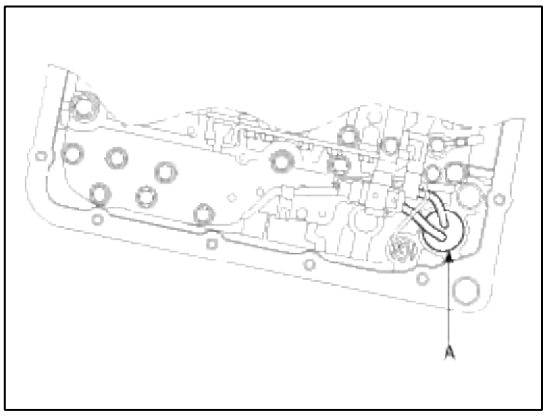
3. Remove the oil filter(A).



4. Remove the fluid temperature sensor(A).

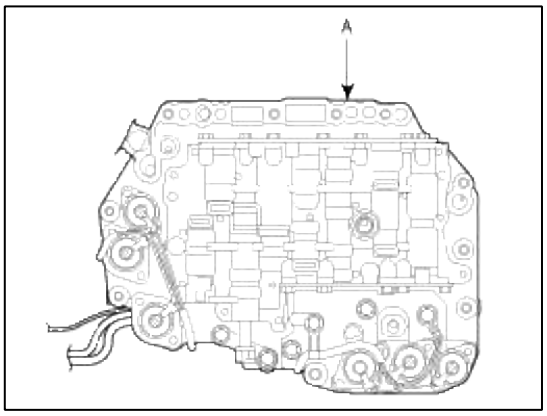


5. Press the tab of the solenoid valve harness grommet tab(A) and push in.



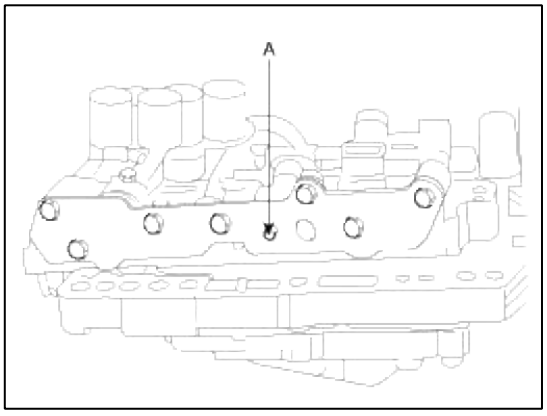
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6. Remove the valve body assembly(A). The manual valve can come out, so be careful not to drop it.

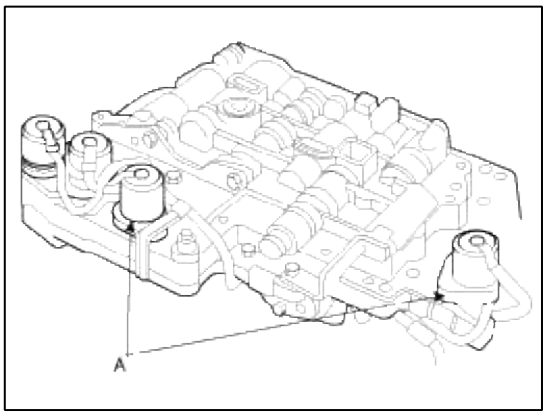


7. Turn the adjustment screw(A) of the regulator valve and adjust so that the line pressure (kickdown brake pressure) reaches the standard value. When the adjustment screw is turned clockwise, the line pressure becomes lower; when it is turnedcounter-clockwise, it becomes higher.

Standard value:
860~900 kPa (122~129 psi, 8.77~9.18 kg/cm²)
Oil pressure change for each turn of adjustment screw :
38 kPa (5.4 psi, 0.39 kg/cm²)

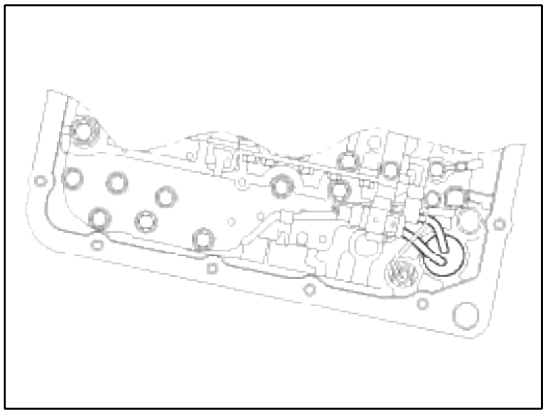


8. Check to be sure that the O-ring is installed on the upper surface of the valve body at the place.
9. Replace the O-ring(A) of the solenoid valve connector with a new one.



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10. Install the valve body assembly to the case and then insert the solenoid valve connector into the case.
    Be sure, at this time, that the notched part of the connector faces. Also be careful that the lead wiring isn't caught.

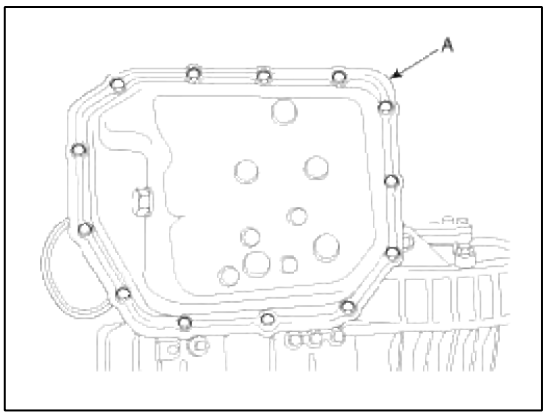


11. Tighten the valve body assembly mounting bolts to 10-12 Nm (100-120 kgf.cm, 7-8 lb-ft).

Bolts	Length [in(mm)]
A	0.98 (25)
B	1.38 (35)
C	1.57 (40)

12. Install a new oil pan gasket with the oil pan(A).

Tightening torque :
10-12 Nm (100-120 kgf.cm, 7-8 lb-ft)



13. Pour in the specified amount of automatic transaxle fluid.
14. Perform the oil pressure test. Readjust if necessary.

Reducing Pressure Adjustment

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1. If the Hi-scan tool is not available
   (1) Remove parts up to the oil filter in the same way as for adjustment of the line pressure. The valve body need not be removed.
   (2) Turn the adjusting screw of the lower valve body and adjust so that the reduction pressure is the standard value.
   When the adjusting screw is turned clockwise, the reduction pressure becomes lower; when it is turned counter clockwise, it becomes higher.

> NOTE
>
> When adjusting the reducing pressure, aim for the center value (425 kPa, 60 psi) of the standard value allowance.

Standard value:
420 kPa (60 psi, 4.2 ± 0.2 kg·cm²)
Oil pressure change for each turn of the adjustment screw:
420 kPa (60 psi, 4.2 ± 0.2 kg·cm²)

   (3) Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
   (4) Perform the oil pressure test. Readjust if necessary.

2. If the Hi-scan tool is used
   (1) Adjust the pressure control solenoid so that the kickdown brake pressure is the standard value when activated to 50% duty by the Scan Tool.

Standard value:
320±30 kPa (39 ± 1 psi, 3.2 ± 0.3 kg·cm²)
Oil pressure change for each turn of the adjustment screw:
30 kPa (3 psi, 0.3 kg·cm²)

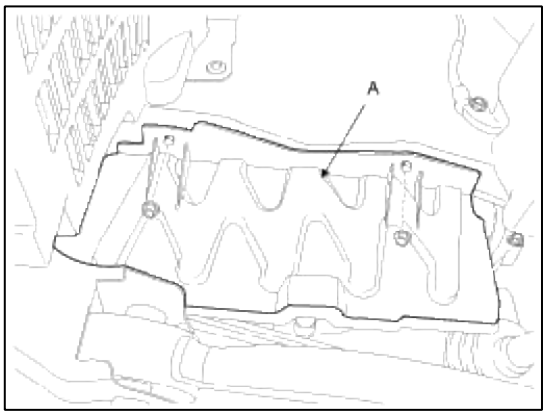
> CAUTION
>
> This adjustment should be made with an oil temperature of 80~90°C (176~194°F). If the adjustment is made at a temperature that is too high, the line pressure will drop during idling, with the result that it might not be possible to make thecorrect adjustment.

Inspection

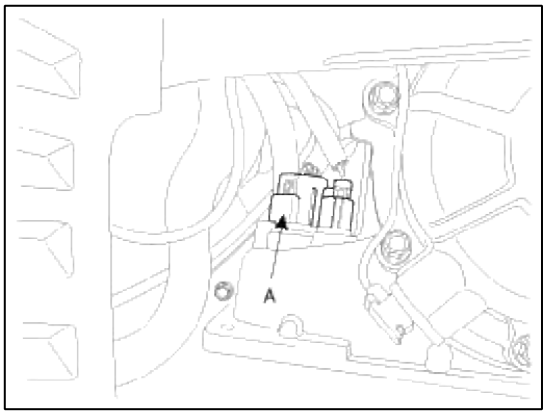
1. Remove the battery terminal.
2. Lift the vehicle.

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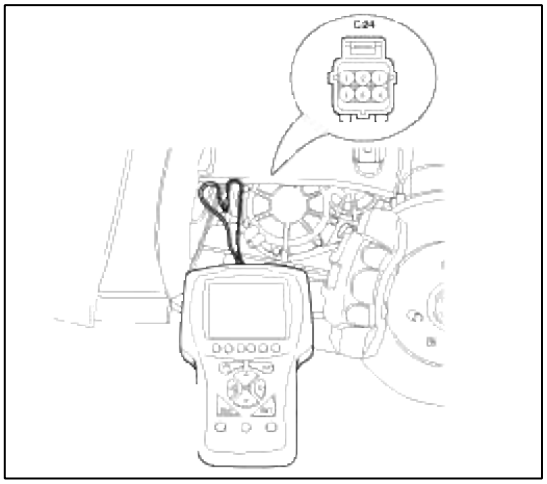
3. Remove the side cover(A). (Bolt:2EA)



4. Disconnect the solenoid valve connector(A).



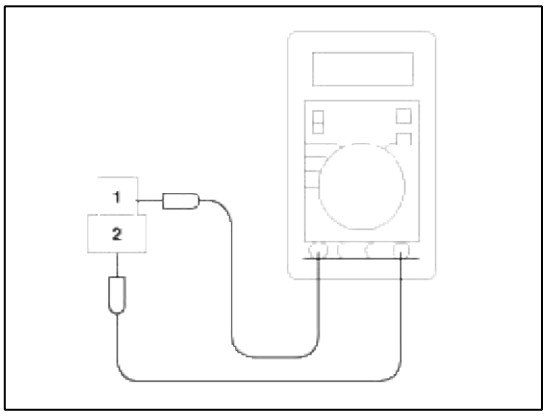
5. Measure the resistance between terminals of the solenoid valve connector on the transaxle case.



Pin no.	Name	Resistance
1	Damper clutch solenoid valve	2.7 ~ 3.4Ω (20°C(68°F))
2	Shift control solenoid valve A	22.3 ± 1.5Ω (20°C(68°F))
3	Shift control solenoid valve B	
4	Pressure control solenoid valve B	2.7 ~ 3.4Ω (20°C(68°F))
5	Pressure control solenoid valve A	
6	Shift control solenoid valve C	22.3 ± 1.5Ω (20°C(68°F))

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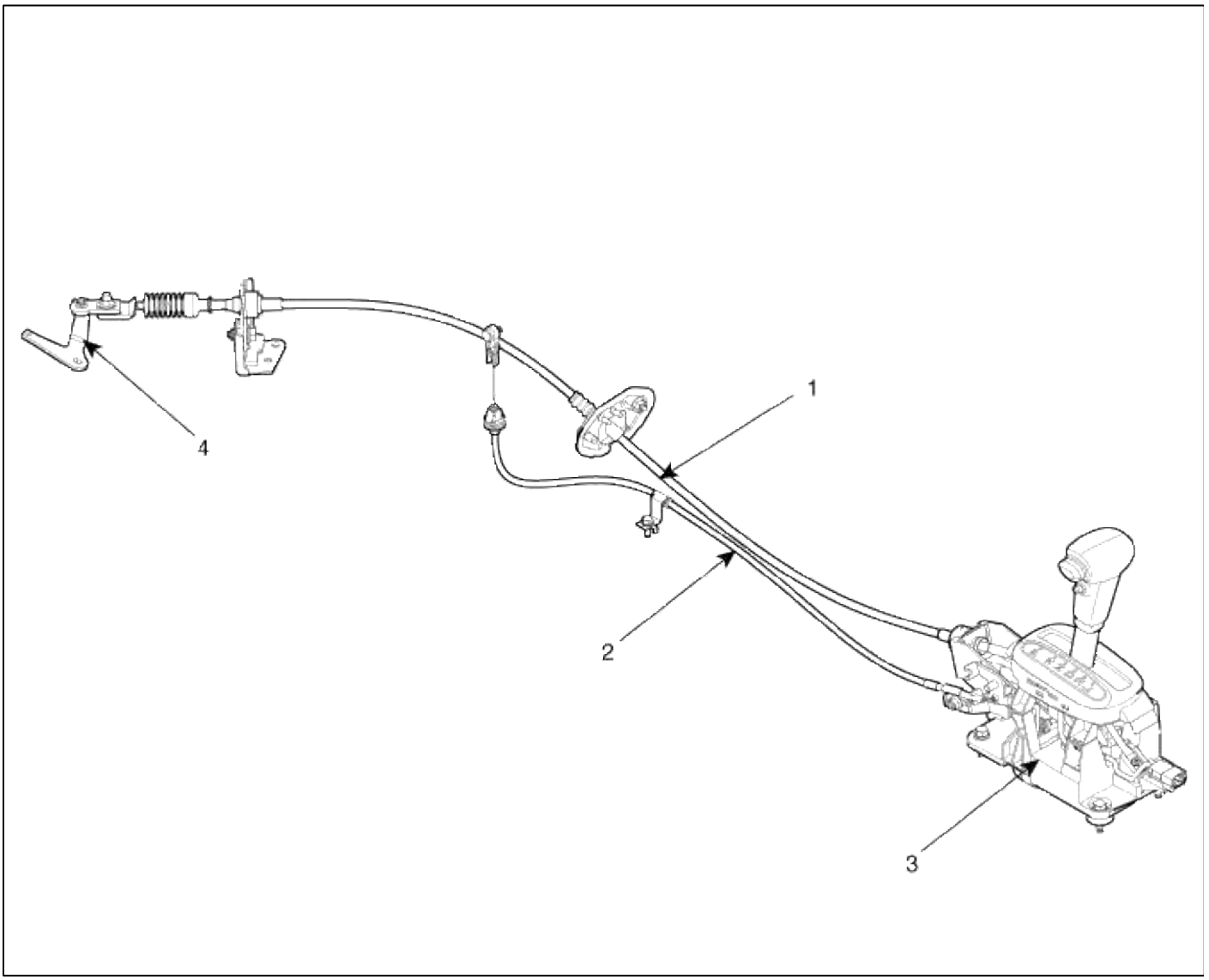
6. If the result isn't within the standard value, remove the valve body cover.
7. Measure the resistance after removing the solenoid valve connector.



8. If the result isn't within the standard value, replace the solenoid valve.

Automatic Transaxle System > Automatic Transaxle Control System > Shift Lever > Components and Components Location (A4AF3)

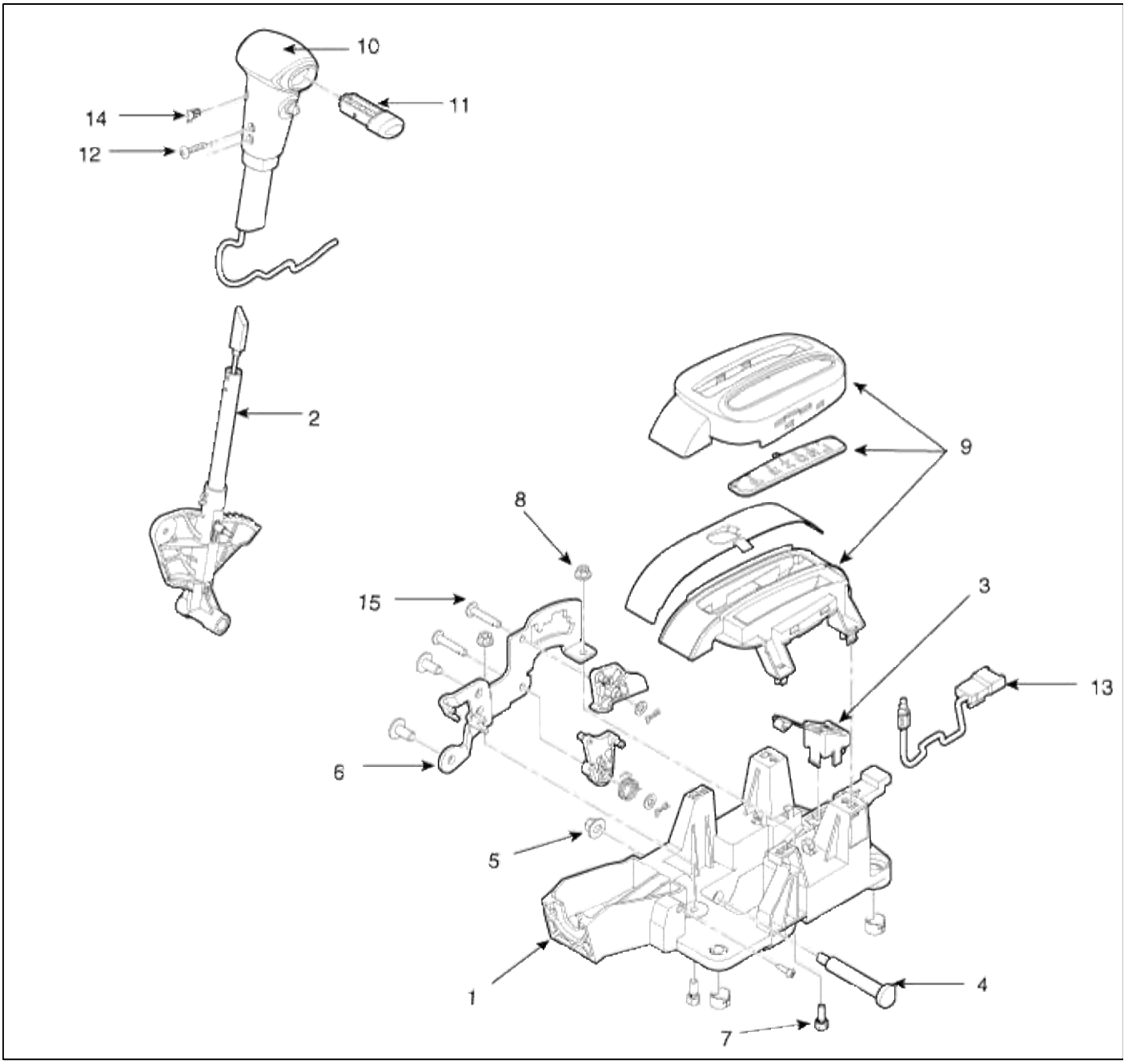
Components (1)



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1. A/T control cable 2. Shift lock cable	3. Shift lever assembly 4. Shift lever(TM side)

Components (2)



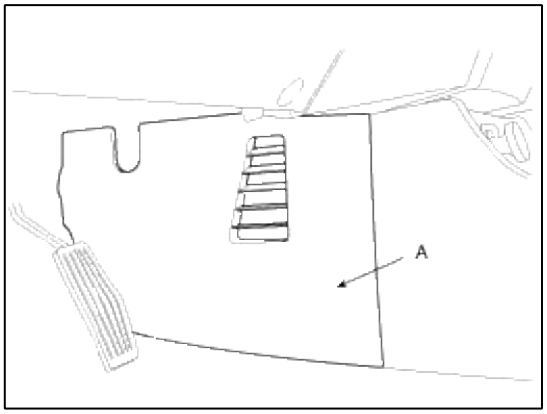
1. Shift lever bracket assembly	9. Indicator assembly
2. Lever sub assembly	10. Knob sub assembly
3. Detent spring	11. Push button
4. Hinge shaft	12. Knob screw
5. Plain washer	13. Illumination wiring assembly
6. Cable bracket sub assembly	14. Knob cap
7. Tapping screw	15. Pin stopper
8. Flange nut	

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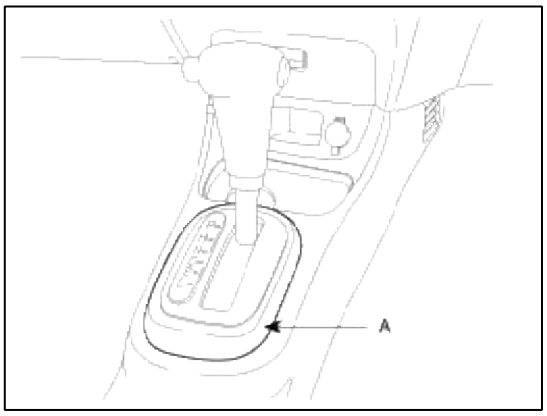
Automatic Transaxle System > Automatic Transaxle Control System > Shift Lever > Repair procedures (A4AF3)

Removal

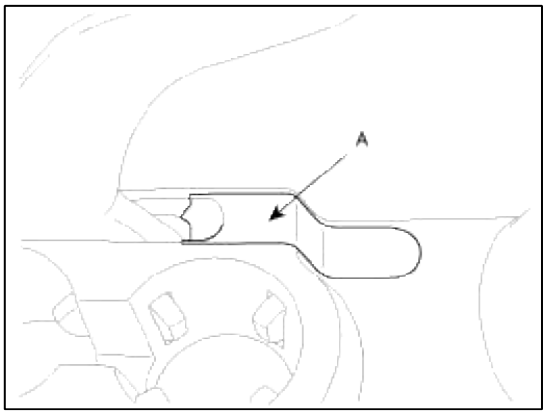
1. Remove both sides of center sonsole cover(A).



2. Remove the center console cover(A).

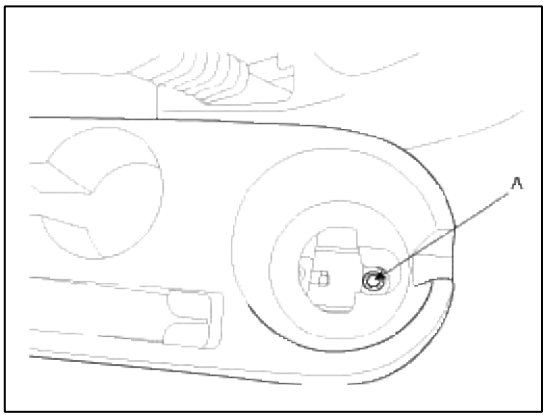


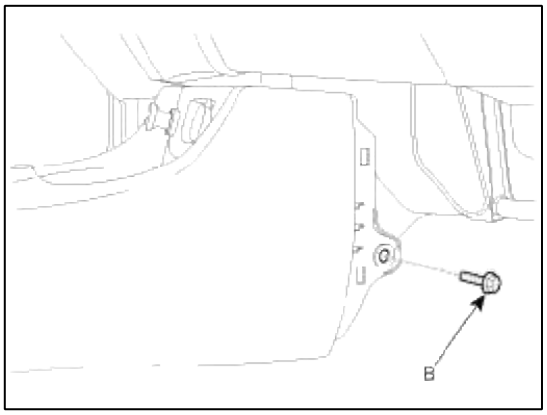
3. Remove the parking brake lever cover(A).



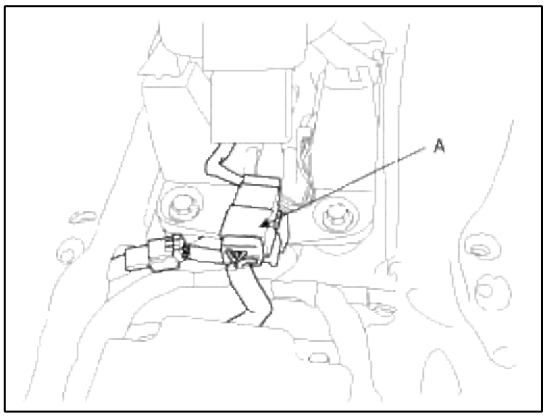
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4. Remove the center console mounting bolts(A, B) and remove the center console.(Refer to BD Group)

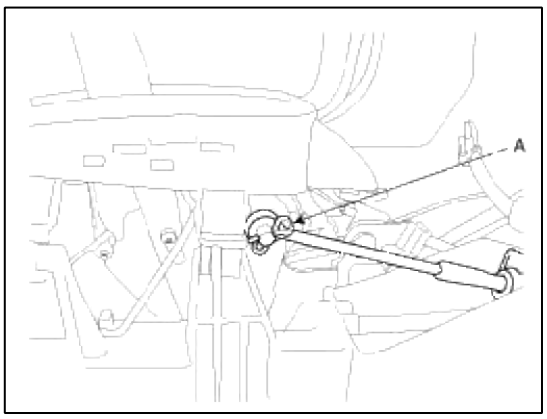




5. Disconnect lever assembly electrical connector(A).



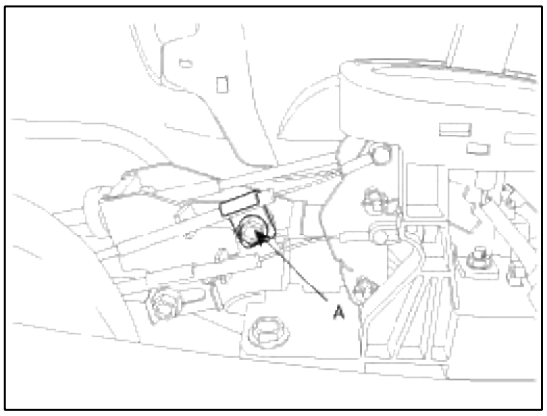
6. Remove the control cable cotter pin(A).



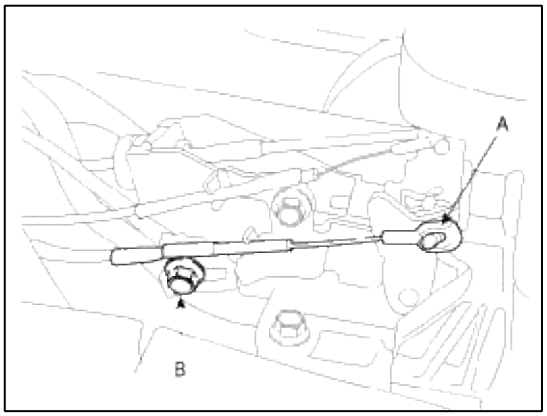
7. Remove control cable hold (lever side).

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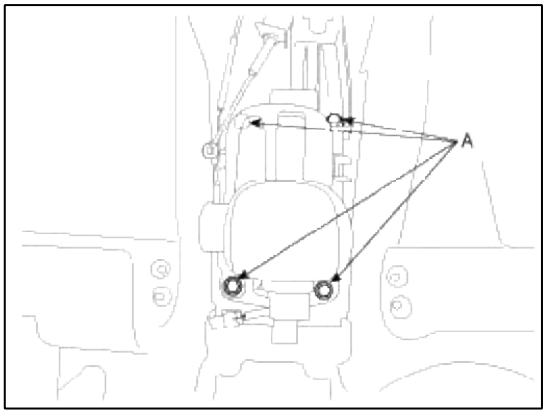
8. Remove the key interlock cable mounting nut(A) and disconnect the cable.



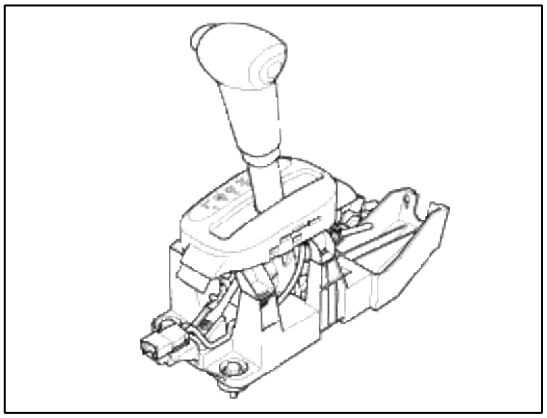
9. Remove the shift lock cable P-LOCK cam(A).
10. Remove the shift lock cable mounting nut(B). (Nut: 1EA)



11. Remove the shift lever bolt(A). (Bolt: 4EA)



12. Remove the shift lever assembly.

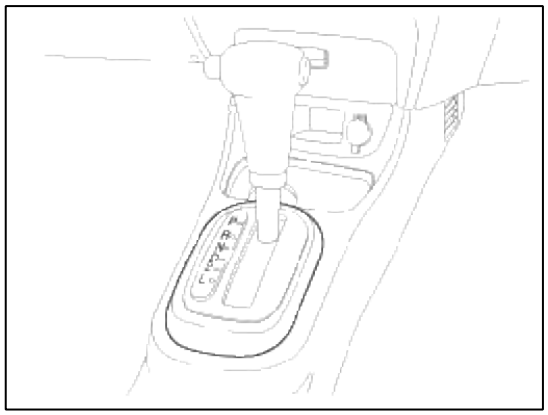


Installation

1. Installation is the reverse of removal.

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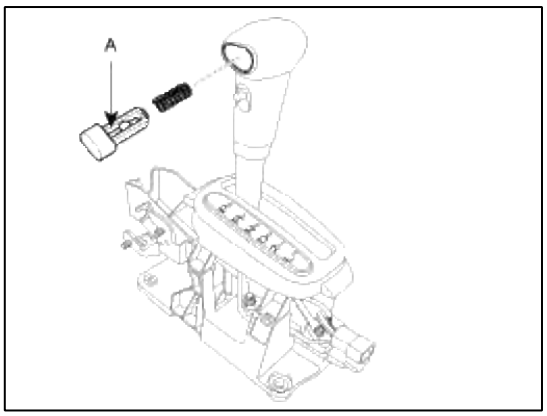
2. After assembling, check the followings.
   (1) When shifting with each position, lever must be operated securely without friction and free from looseness, noise and so on.
   (2) When lever shifting, it shall not be stopped easily between each positions.
   (3) When lever should be stopped between "P" and "R" position intentionally. It should not be shifted to "R" position by vibration added for lever assembly.



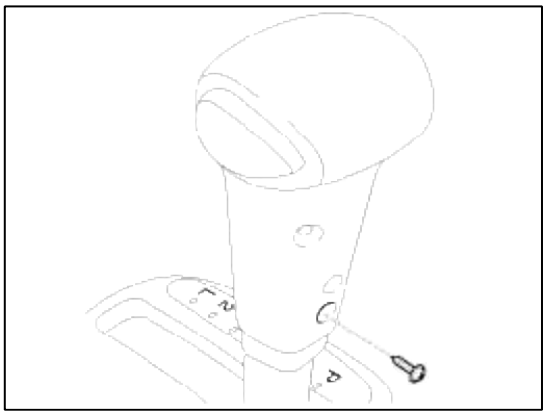
   (4) Free from noise when being shifted from "R" to "N", push button being released.
   (5) Slider must be operated smoothly between each position.
   (6) Slider must be operated smoothly without looseness, sticking and noise.
   (7) Shift lock must be operated well.

Disassembly

1. Remove the push button(A) from the knob sub assembly.

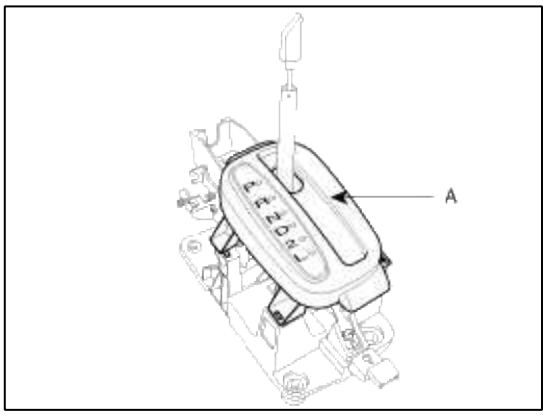


2. Remove the knob sub assembly from the lever sub assembly. (Screw:1EA)

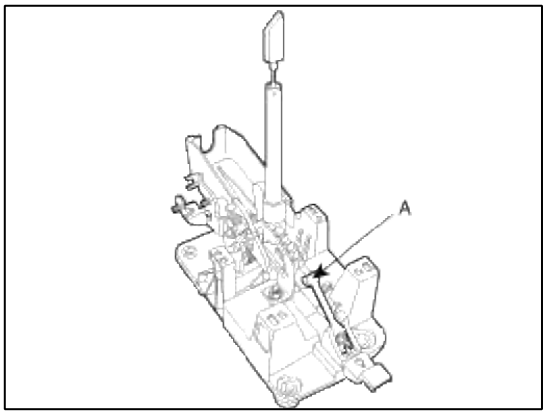


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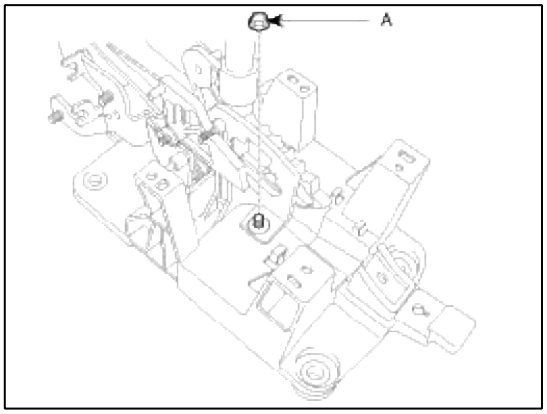
3. Remove the indicator assembly(A).



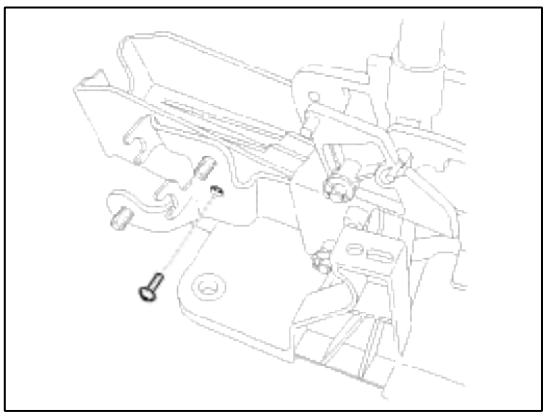
4. Remove the detent spring(A). (Bolt:1EA)



5. Loosen the bracket sub assembly nut(A).

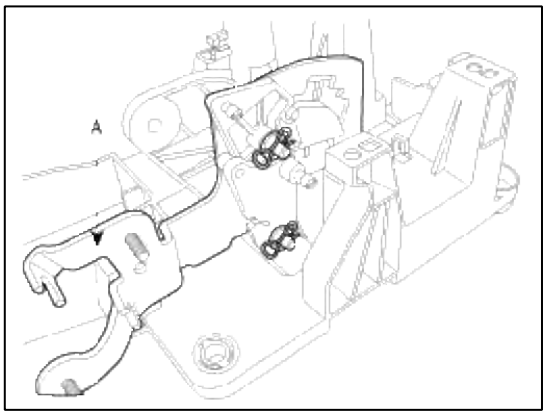


6. Remove the screw.

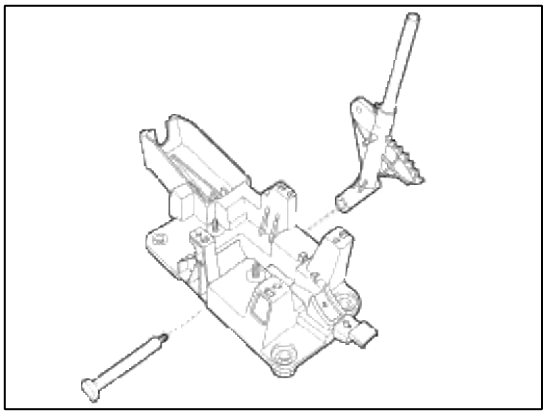


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7. Disassemble the bracket sub assembly(A) after removing the cotter pin (2EA).



8. Disassemble the hinge shaft from the lever sub assembly.



Reassembly

1. Reassemble the hinge shaft to lever sub assembly.
2. Reassemble the bracket sub assembly.
3. Install the detent spring.
4. Install the indicator assembly.
5. Reassemble the knob sub assembly to the lever sub assembly.
6. Install the push button to the knob sub assembly.

Automatic Transaxle System > Automatic Transaxle Control System > Pulse Generator A > Description and Operation (A4AF3)

Description

The pulse generator "A" detects the speed of the end clutch retainer. The speed signal is used for damper clutch control, hydraulic pressure control and incorrect gear detection by PCM.
The pulse generator "B" detects the speed of the transfer driven gear. The speed signal is used for shift timing, hydraulic pressure control and incorrect gear detection by PCM.

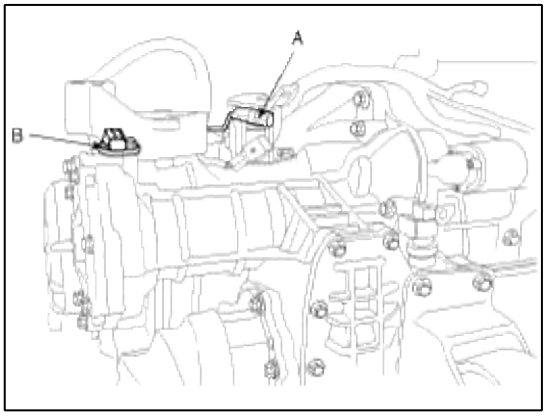
Pulse generator A,B	Inspection item	Standard value
Sensor resistance	A: 1 terminal ~ 2 terminal	215 ~ 275 Ω
	B: 1 terminal ~ 2 terminal	215 ~ 275 Ω
Output voltage (A,B)	1 terminal ~ ground	2.5 V ± 1.2V
	2 terminal ~ ground	2.5 V

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Automatic Transaxle System > Automatic Transaxle Control System > Pulse Generator A > Repair procedures (A4AF3)

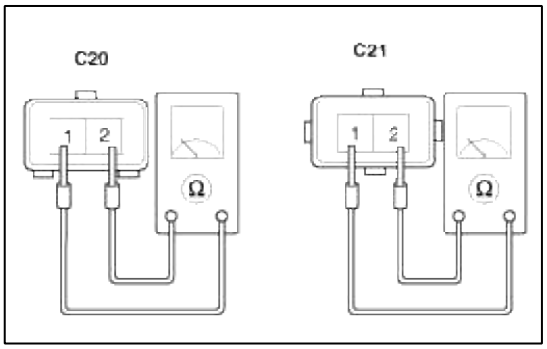
Replacement

1. Remove the battery terminal.
2. Remove the intake air hose and air clean assembly.
   (Refer to the automatic transaxle - Removal/ installation procedure)
3. Disconnect the sensor wire from the control cable mounting bracket.
4. Remove the pulse generator A, B.
   (1) Disconnect the connector from the sensor.



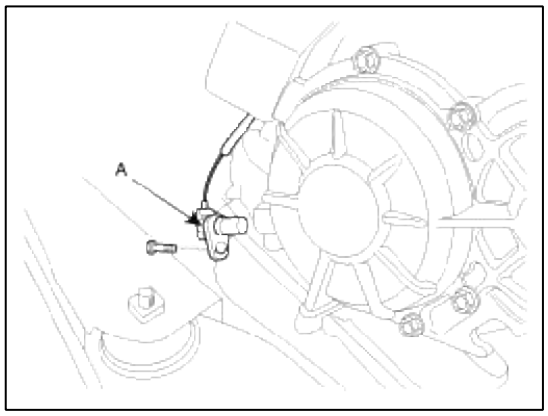
   (2) Measure the pulse generator A, B resistance.

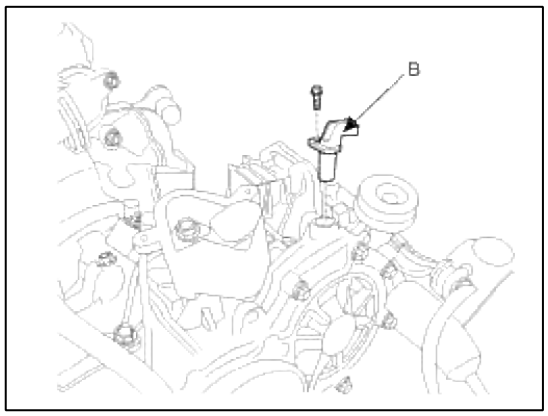
Standard value:
Pulse generator A: 245±30Ω/ 20°C(68°F)
Pulse generator B: 245±30Ω/ 20°C(68°F)



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(3) If the result isn't within the standard value, remove the pulse generator A, B.





5. Measure the pulse generator A, B resistance.

Standard value
Pulse generator A : 245±30Ω/20°C(68°F)
Pulse generator B : 245±30Ω/20°C(68°F)

6. If the result isn't within the standard value, replace the pulse generator A, B.
7. Apply the ATF oil around the oil seal before installing the oil seal.
8. Install the pulse generator A, B.

Tightening torque :
10~12Nm (100~120Kgf.cm, 7~8lb-ft)

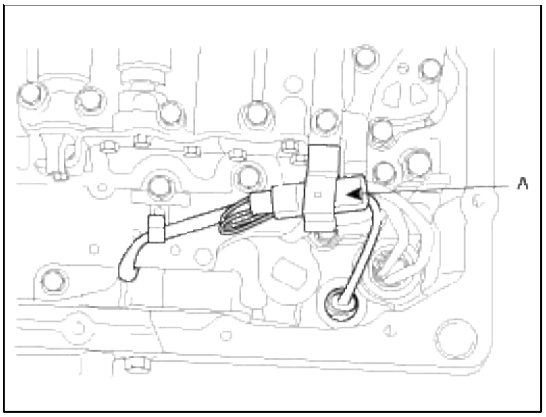
9. Connect the sensor wire to the control cable mounting bracket.
10. Connect the pulse generator connector.
11. Installation is the reverse of removal.

Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Oil Temperature Sensor > Description and Operation (A4AF3)

Description

The oil temperature sensor(A) detects the automatic transaxle fluid temperature. The oil temperature sensor is a negative thermal coefficient type. The resistance of the sensor increases when the oil temperature goes down and the resistance goes up when the oil temperature decreases.
Using the signal from this sensor, PCM corrects the solenoid drive duty when the fluid is cold (lower than 60°C) and hot (higher than 125°C). PCM restricts the shift pattern to the economy mode when the fluid is cold.- Service point

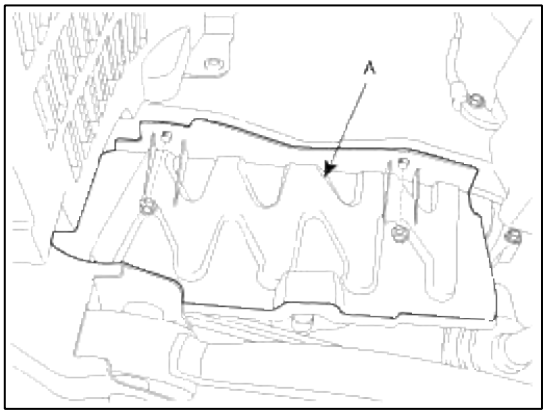
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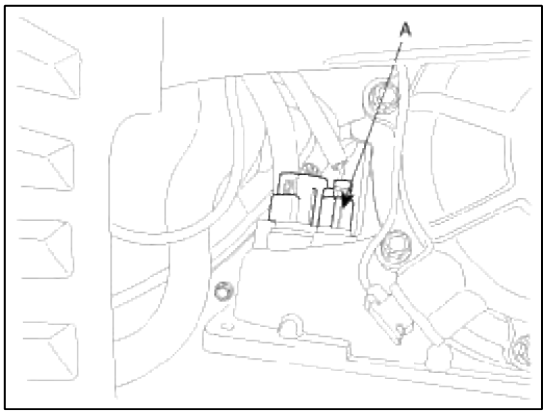
Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Oil Temperature Sensor > Repair procedures (A4AF3)

Inspection

1. Remove the battery terminal.
2. Lift the vehicle.
3. Remove the side cover(A). (Bolt: 2EA)

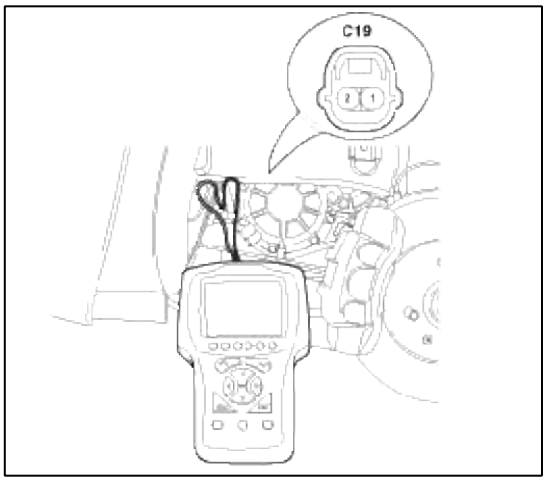


4. Disconnect the fluid temperature sensor connector(A).



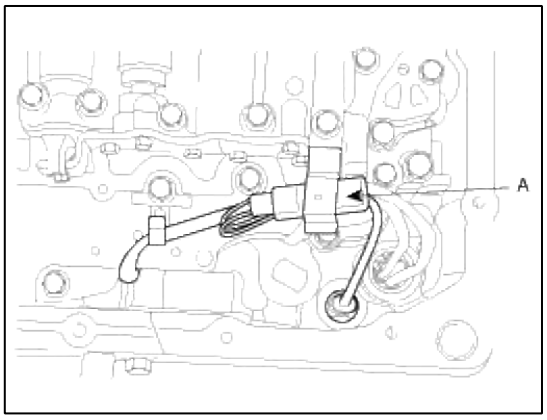
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5. Measure the resistance between terminals "1" and "2" of the fluid temperature sensor connector on the transaxle case.



Temp.[°C(°F)]	Resistance(kΩ)	Temp.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		

6. If the result isn't within the standard value, remove the valve body cover.
7. Replace the fluid temperature sensor(A).



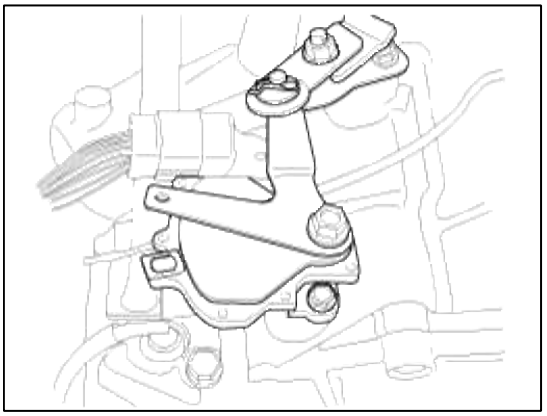
Automatic Transaxle System > Automatic Transaxle Control System > Inhibiter Switch > Description and Operation (A4AF3)

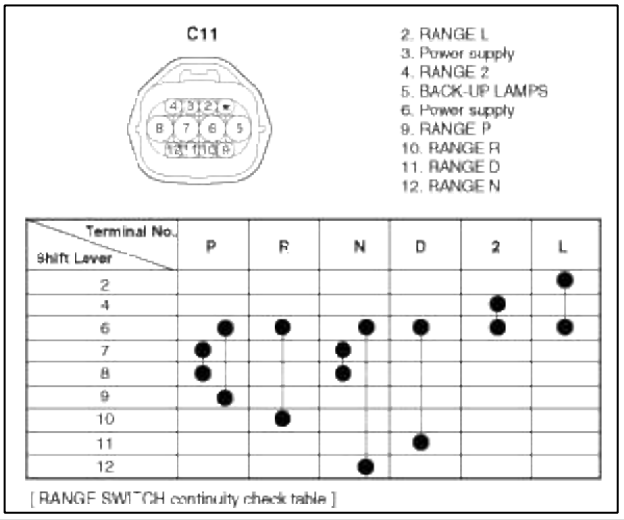
Description

When the selector lever is in the position other than "P" or "N", the electrical circuit for starting the engine is kept in the OFF state by the inhibitor switch. Therefore, the engine does not start even if the ignition switch is turned to the "START" position. Inhibitor switch is installed on the transaxle case located at the upper end of the manual control shaft and is interlocked with the manual control lever.

By shifting the selector to the "P" or "N" range, the electrical circuit inside the inhibitor switch is connected to form the ignition circuit with which the engine can be started. When the shift is in the "R" range, the backup lamp lights up as backup lamp circuit is energized.

The inhibitor switch, in addition to the start safety device, also includes a circuit for detection of the selector lever position, for sending signals to the transaxle control module.

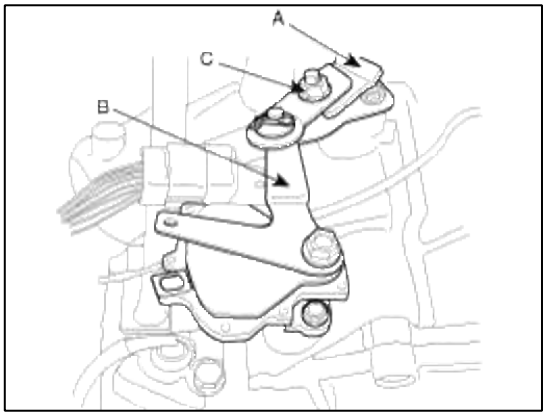


Type	- Type : rotary type - Use available temperature : -40°C~141°C(-40°F~286°F) - Tightening torque : 1.0~1.2 kg/m
Function	- Detect shift lever position - It makes starting possible in "P" & "N".
Terminal	

Automatic Transaxle System > Automatic Transaxle Control System > Inhibiter Switch > Repair procedures (A4AF3)

Adjustment

1. Set the select lever to the "N" position.
2. Loosen the control cable(A) to manual control lever flange nut(C) to free the cable and lever(B).



3. Set the manual control lever to the "N" position.

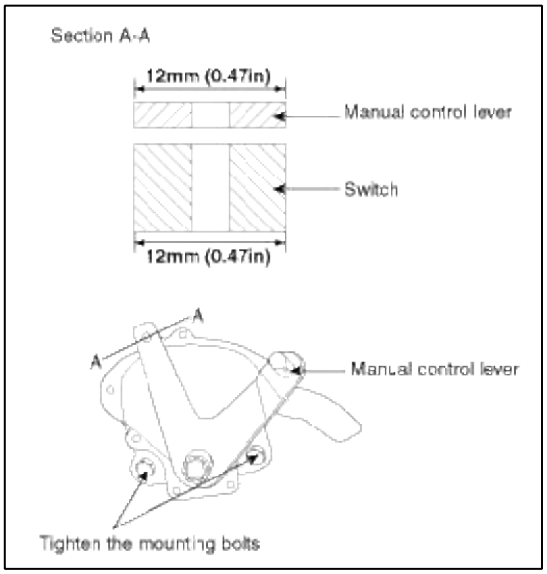
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4. Loosen the transaxle range switch body mounting bolts and then turn the transaxle range switch body so the hole in the end of the manual control lever and the hole (cross section A-A in the figure) in the flange of the transaxle range switch body flange are aligned.
5. Insert the special tool to fix the manual control lever and switch body.
6. Tighten the transaxle range switch body mounting bolts to the specified torque.

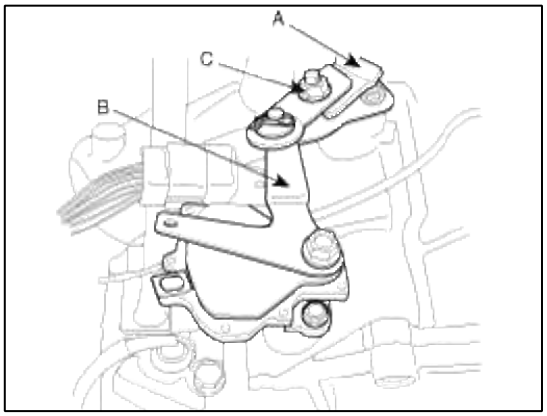
Tightening torque :
10~12Nm (100~120kgf.cm, 7~8lb-ft)

NOTE

- When setting up the switch body, be careful that the O-ring does not drop from the switch.
- Tighten the mounting bolts carefully so that the position of the switch body does not move.



7. Check that the select lever is in the "N" position.
8. Adjust the adjusting nut(C) so that there is no slack in the control cable(A) and make sure that the select lever(B) operates smoothly.



9. Run the vehicle and confirm that the transaxle is set in each range when the select lever is shifted to each position.

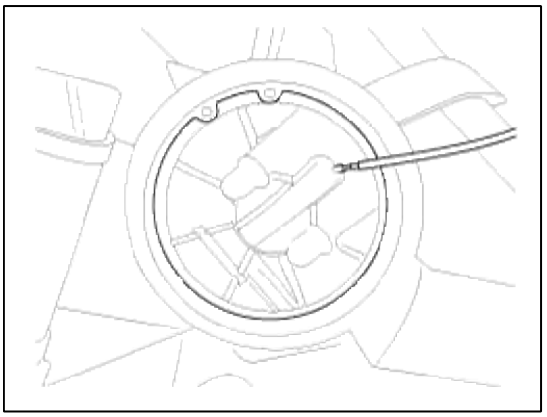
Automatic Transaxle System > Automatic Transaxle Control System > Kick Down Switch > Description and Operation (A4AF3)

Description

The adjust sleeve and the retainer constitute the contacts of the kick-down servo switch. The switch detects the position of the kickdown piston just before the kick-down brake is applied, and sends the signal to the transaxle

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control module.
When the kickdown servo is not in operation, the switch contacts are kept closed. When the hydraulic pressure is applied to the kick-down servo, the piston operates, and the adjust sleeve separates from the retainer, thus turning off the switch.
* Switch ON/OFF condition
→ ON: 1st gear, 3rd gear
→ OFF : 2nd gear, 4th gear



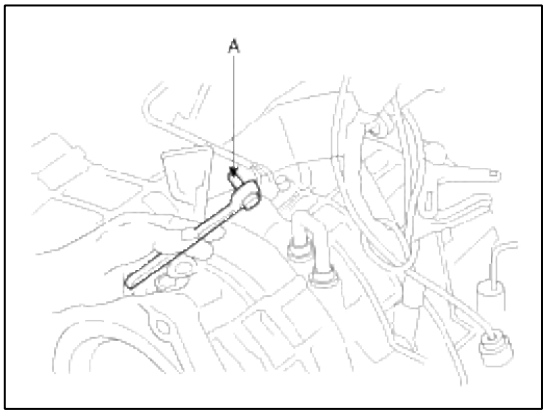
Automatic Transaxle System > Automatic Transaxle Control System > Kick Down Switch > Repair procedures (A4AF3)

Adjustment
1. Completely remove all dirt and other contaminating materials adhered around the kickdown adjust screw.
2. Loosen the lock nut.
3. Loosen and tighten the adjust screw(A) two times by torque of 5 Nm (50 kg·cm, 4 lb·ft).
4. Tighten adjust screw by torque of 5 Nm and then, loosen the adjust screw 3 to 3-1/3 turns.
5. Tighten the lock nut to the specified torque.

Lock nut :
15~22 Nm (150~220 kgf.cm, 11~15 lb-ft)

NOTE

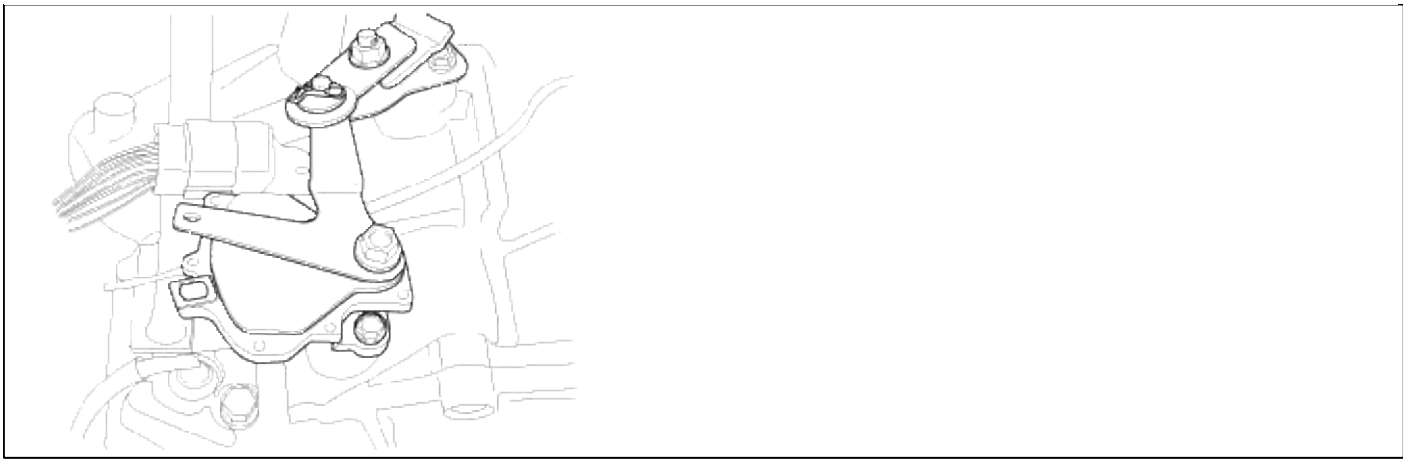
Before assembling, apply sealant (DC780) to the center portion of the adjust screw.



Automatic Transaxle System > Troubleshooting > P0707

COMPONENT LOCATION

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GENERAL DESCRIPTION

The Transaxle range switch sends the shift lever position information to the PCM using a 12V (battery voltage) signal. When the shift lever is in the D (Drive) position the output signal of transaxle range switch is 12V and in all other positions the voltage is 0V. The PCM judges the shift lever position by reading all signals, for the transaxle range switch, simultaneously.

DTC DESCRIPTION

The PCM sets this code when the transaxle range switch has no output signal for an extended period of time.

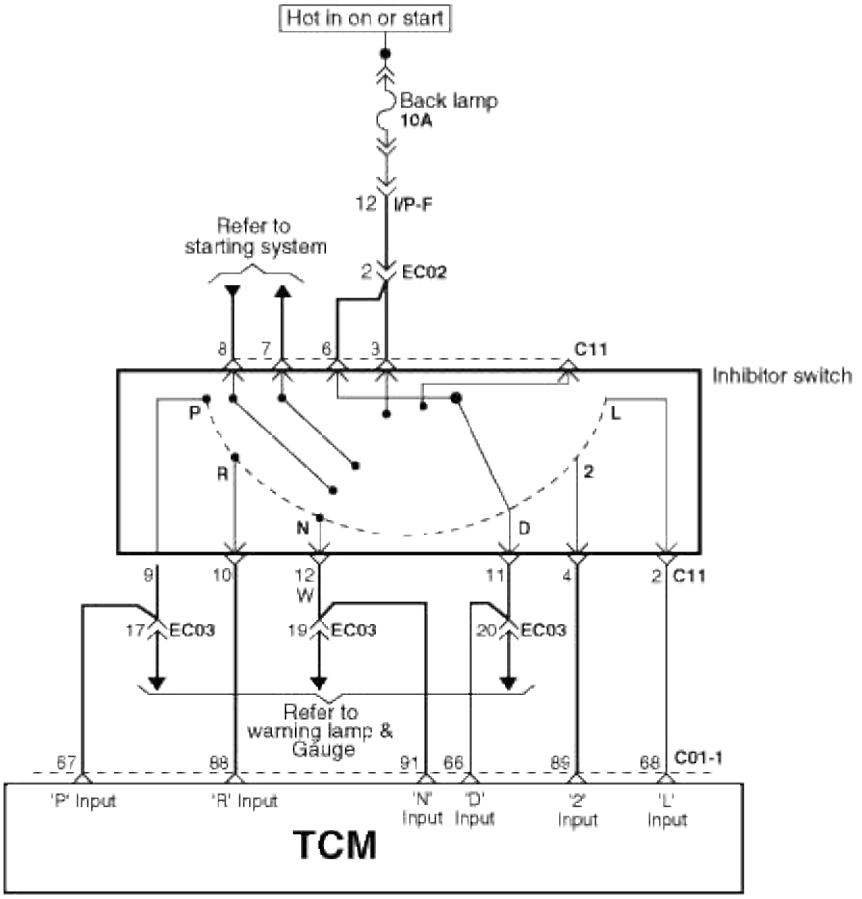
DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check for No signal	• Open or short in circuit • Faulty TRANSAXLE RANGE SWITCH • Faulty PCM
Enable Conditions	• Engine speed ≥ 500rpm • OUTPUT SPEED(PG-B) ≥0rpm	
Threshold value	• No signal detected	
Diagnostic Time	• More than 30sec	
Fail Safe	• Recognition as previous signal - When P-D or R-D or D-R SHIFT is detected, it is regarded as N-D or N-R though "N" signal is not detected. - When sports mode S/W is ON without P,R,N, D-RANGE signals, it is regarded sports mode.(DTC is not set)	

SCHEMATIC DIAGRAM

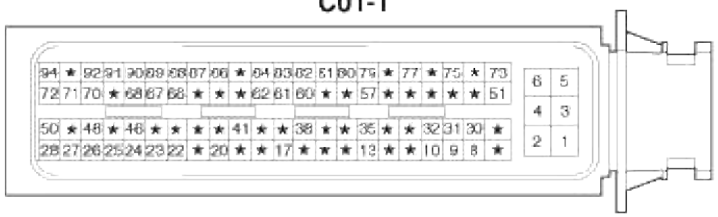
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[Circuit Diagram]



[Harness Connector]

C01-1



C11



[Connection Information]

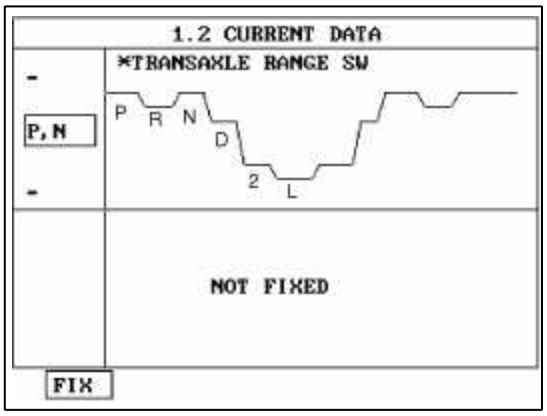
Terminal No. / Shift Lever	P	R	N	D	2	L	Connection
2						●	TCM(C01-1 No.68)
4					●		TCM(C01-1 No.89)
3	●	●	●	●	●	●	Ignition SW (IG1)
7	●		●				Start ng motor
8	●		●				Ignition SW (Start)
9	●						TCM(C01-1 No.67)
10		●					TCM(C01-1 No.88)
11				●			TCM(C01-1 No.66)
12			●				TCM(C01-1 No.91)

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "TRANSAXLE RANGE SWITCH" parameter on the scan tool.

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4. Move selector lever from "P" range to "L" range.



5. Does "TRANSAXLE RANGE SWITCH" follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Power supply circuit inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION

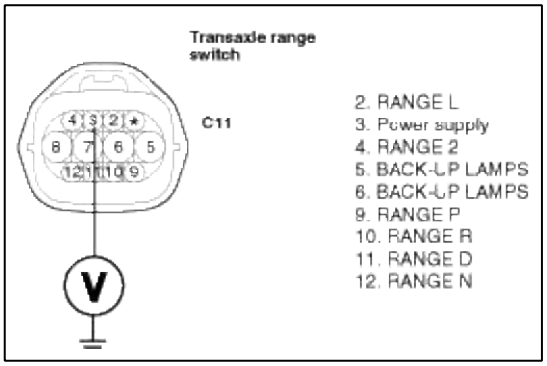
1. CHECK POWER TO RANGE SWITCH

(1) Disconnect "TRANSAXLE RANGE SWITCH" connector.

(2) Ignition "ON" & Engine "OFF".

(3) Measure voltage between terminal "3" of the sensor harness connector and chassis ground.

Specification : approx. B+



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(4) Is voltage within specifications?

YES

Go to "Signal circuit inspection" procedure.

NO

Check that Fuse 5-10A is installed or not blown.

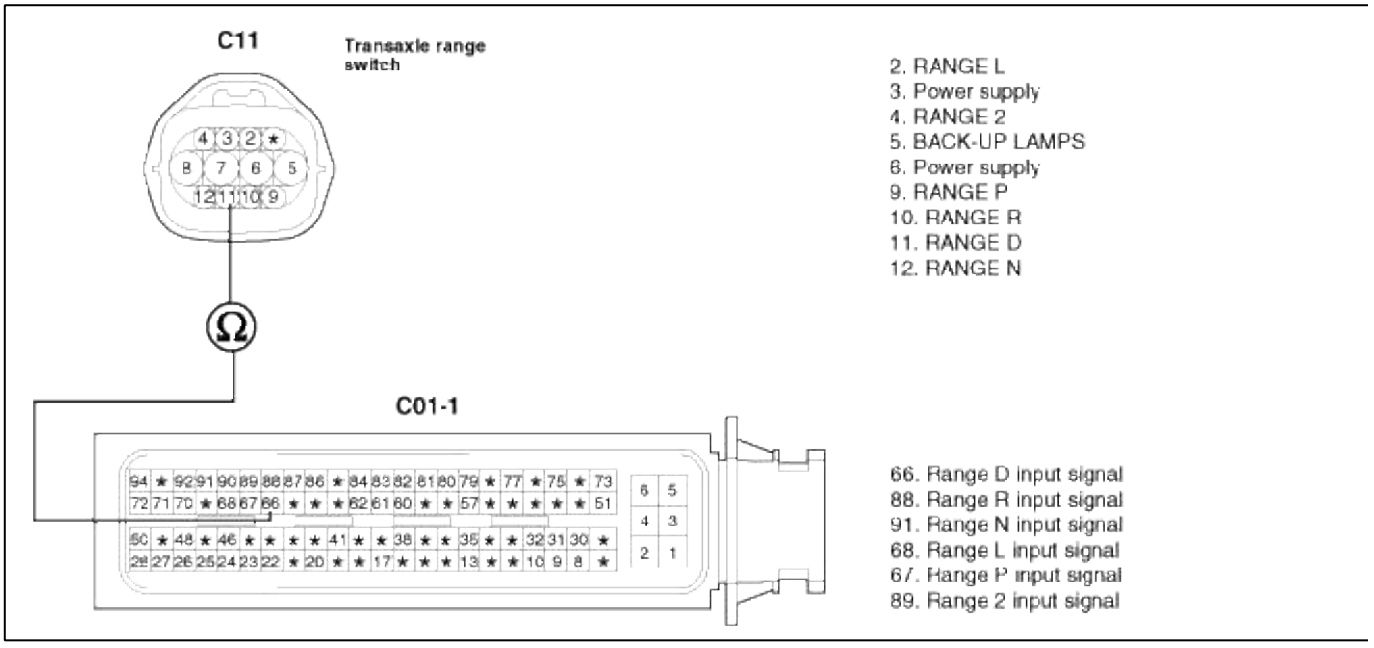
Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect "TRANSAXLE RANGE SWITCH" and "PCM" connector.
3. Measure resistance between each terminal of the sensor harness connector and PCM harness connector as below

Specification : Shown below

RANGE	L	2	P	R	D	N
Pin No of "TRANSAXLE RANGE SWITCH"	C11 No.2	C11 No.4	C11 No.9	C11 No.10	C11 No.11	C11 No.1
Pin No of "PCM" harness	C01-1 No.68	C01-1 No.89	C01-1 No.67	C01-1 No.88	C01-1 No.66	C01-1 No.91
Specification	0Ω	0Ω	0Ω	0Ω	0Ω	0Ω



4. Is resistance within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

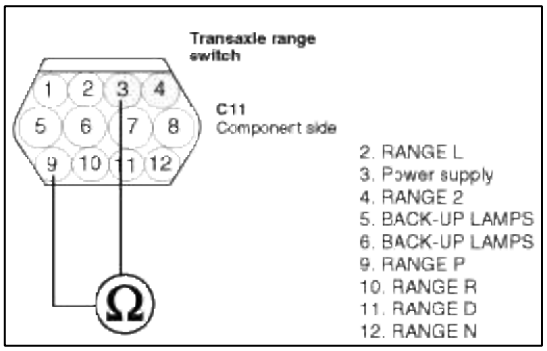
COMPONENT INSPECTION

1. Ignition "OFF".
2. Remove "TRANSAXLE RANGE SWITCH".

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3. Measure the resistance between each terminal of the transaxle range switch.

Specification : approx. 0 Ω



Terminal No. / Shift Lever	P	R	N	D	2	L
2						●
4					●	
3	●	●	●	●	●	●
7	●		●			
8	●		●			
9	●					
10		●				
11				●		
12			●			

[RANGE SWITCH continuity check table]

4. Is resistance within specifications?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM as necessary and then go to "Verification of vehicle repair" procedure.

NO

Replace "TRANSAXLE RANGE SWITCH" as necessary and go to "Verification of vehicle repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present?

YES

Go to the applicable troubleshooting procedure.

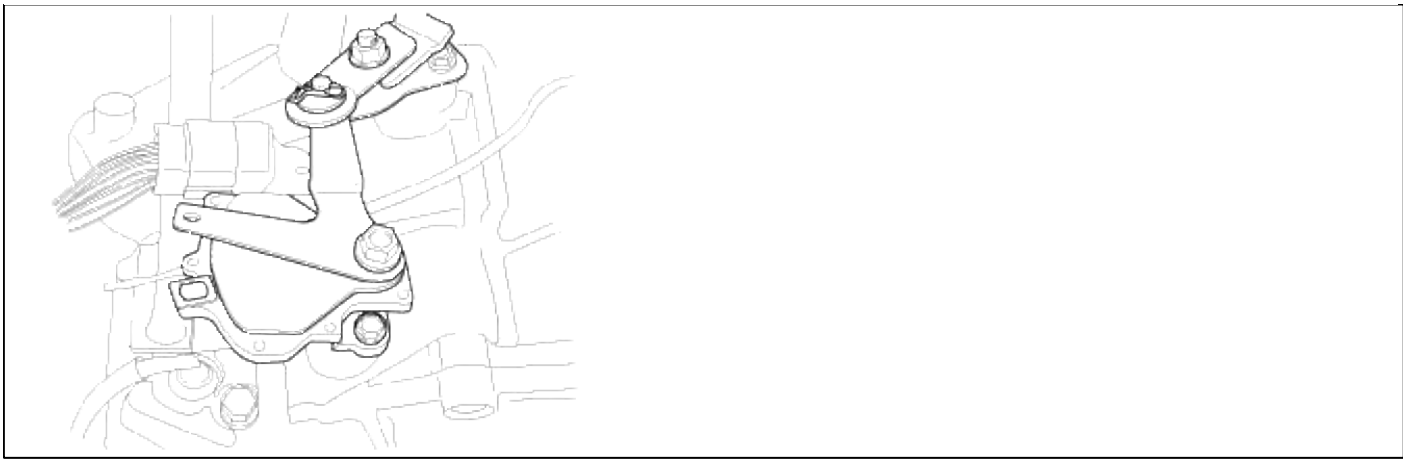
NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0708

COMPONENT LOCATION

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GENERAL DESCRIPTION

The Transaxle range switch sends the shift lever position information to the PCM using a 12V (battery voltage) signal. When the shift lever is in the D (Drive) position the output signal of transaxle range switch is 12V and in all other positions the voltage is 0V. The PCM judges the shift lever position by reading all signals, for the transaxle range switch, simultaneously.

DTC DESCRIPTION

The PCM sets this code when the transaxle range switch outputs multiple signals for an extended period of time.

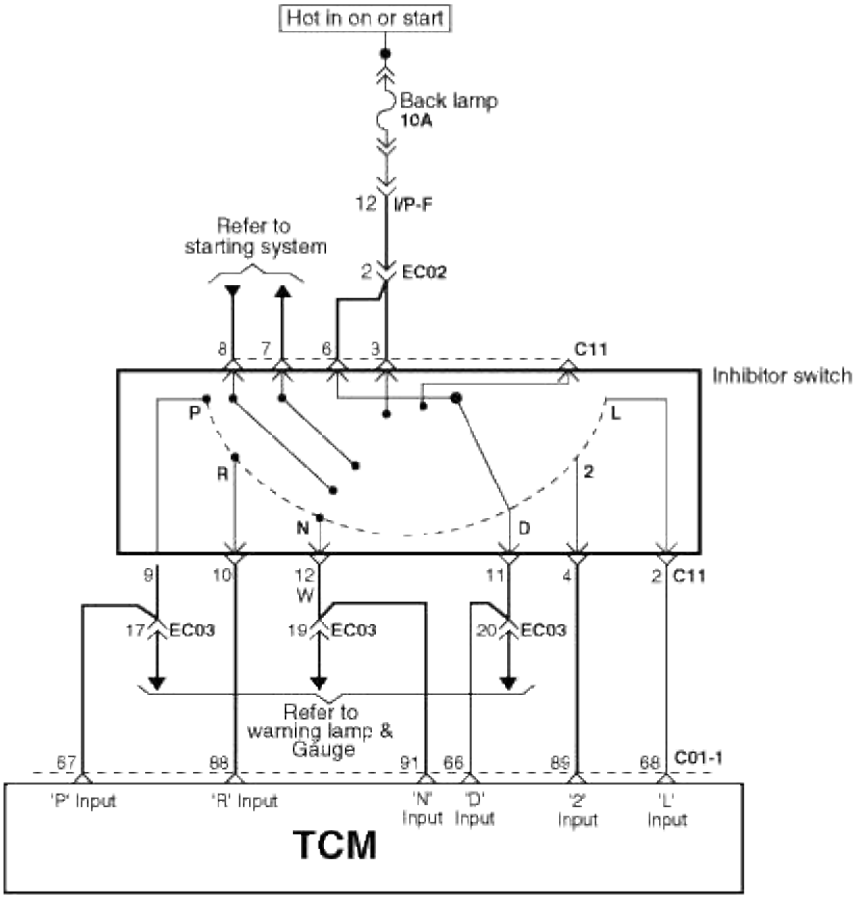
DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check for multiple signals	• Open or short in TRANSAXLE RANGE SWITCH • Faulty TRANSAXLE RANGE SWITCH • Faulty PCM
Enable Conditions	• Engine speed ≥ 500rpm • OUTPUT SPEED(PG-B) ≥0rpm	
Threshold value	• Multiple signal	
Diagnostic Time	• More than 30sec	
Fail Safe	• Recognition as previous signal - When signal is input "D" and "N" at the same time, PCM regards it as "N" RANGE. - After PCM reset, if the if the PCM detects multiple signal or no signal, then it holds the 3rd gear position.	

SCHEMATIC DIAGRAM

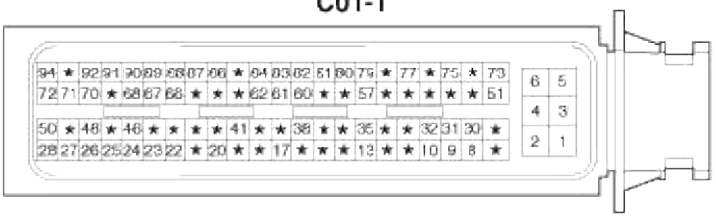
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[Circuit Diagram]



[Harness Connector]

C01-1



C11



[Connection Information]

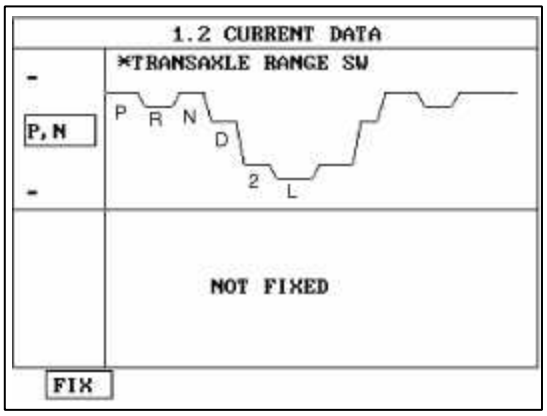
Terminal No. / Shift Lever	P	R	N	D	2	L	Connection
2						●	TCM(C01-1 No.68)
4					●		TCM(C01-1 No.89)
3	●	●	●	●	●	●	Ignition SW (IG1)
7	●		●				Start ng motor
8	●		●				Ignition SW (Start)
9	●						TCM(C01-1 No.67)
10		●					TCM(C01-1 No.88)
11				●			TCM(C01-1 No.66)
12			●				TCM(C01-1 No.91)

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Ignition "ON" & Engine "OFF".
3. Monitor the "TRANSAXLE RANGE SWITCH" parameter on the scantool.

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4. Move selector lever from "P" range to "L" range.



5. Does "TRANSAXLE RANGE SWITCH" follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Power supply circuit inspection" procedure.

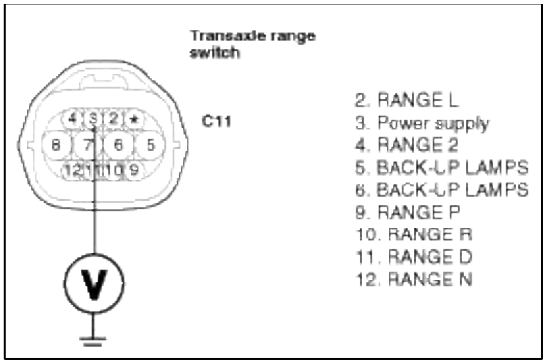
POWER SUPPLY CIRCUIT INSPECTION

1. Disconnect "TRANSAXLE RANGE SWITCH" connector.
2. Ignition "ON" & Engine "OFF".
3. Measure voltage between each terminal of the sensor harness connector and chassis ground.

Specification : Shown below

TERMINAL (C11)	2	3	4	5	6	7	8	9	10	11	12
SPECIFICATION	0V	12V	0V	0V	12V	0V	0V	0V	0V	0V	0V

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4. Is voltage within specifications?

YES

Go to "Signal circuit inspection" procedure.

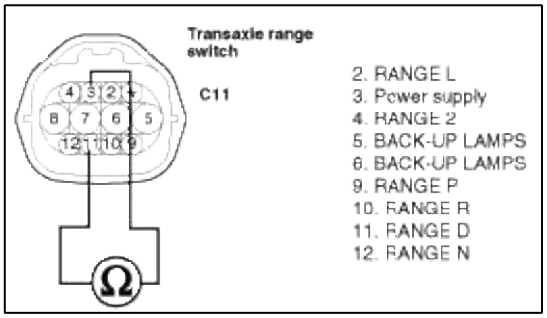
NO

Check for short in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect "TRANSAXLE RANGE SWITCH" and "PCM" connector.
3. Measure resistance between each terminals of the sensor harness to check for Short.

Specification : Infinite



4. Is resistance within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

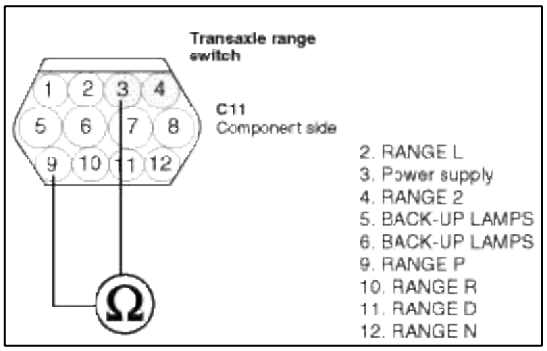
COMPONENT INSPECTION

1. Ignition "OFF".
2. Remove "TRANSAXLE RANGE SWITCH".

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3. Measure continuity(resistance) between each terminals of the sensor.

Specification : approx. 0 Ω



Terminal No. / Shift Lever	P	R	N	D	2	L
2						●
4					●	
3	●	●	●	●	●	●
7	●		●			
8	●		●			
9	●					
10		●				
11				●		
12			●			

[RANGE SWITCH continuity check table]

4. Is resistance within specifications?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM as necessary and then go to "Verification of vehicle repair" procedure.

NO

Replace "TRANSAXLE RANGE SWITCH" as necessary and go to "Verification of vehicle repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present?

YES

Go to the applicable troubleshooting procedure.

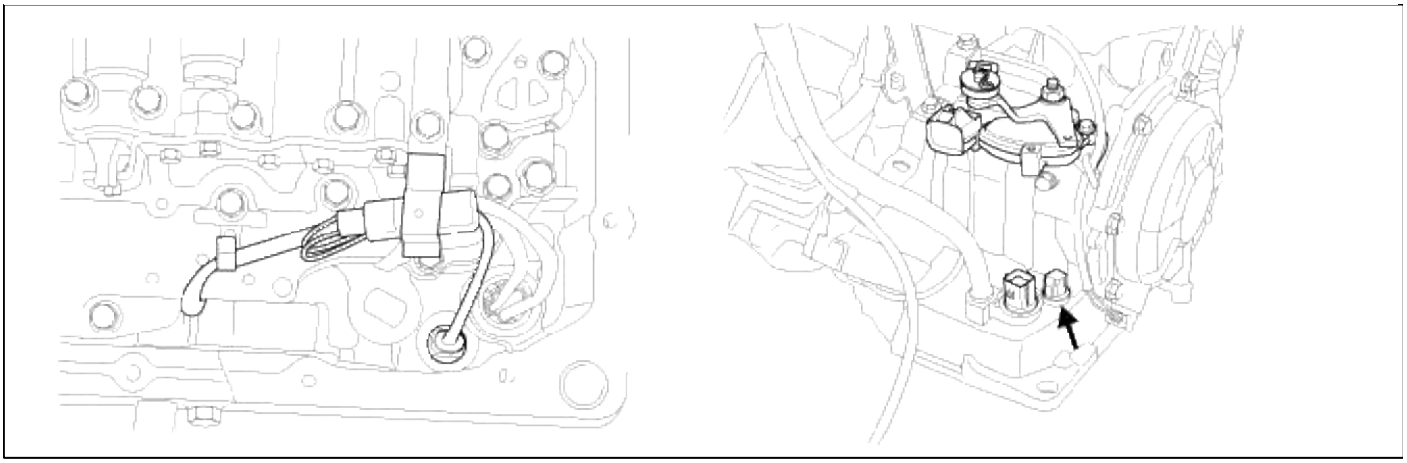
NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0711

COMPONENT LOCATION

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GENERAL DESCRIPTION

The automatic transmission fluid(ATF) temperature sensor is installed in the valve body. This sensor uses a thermistor whose resistance changes according to the temperature changes. The PCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies. The automatic transmission fluid(ATF) temperature provides very important data for the PCM's control of the torque converter clutch, and is also used for many other purposes.

DTC DESCRIPTION

This DTC code is set when the ATF temperature output voltage is lower than the value generated by thermistor resistance, in a normal operating range, for approximately 1 second or longer. The PCM regards the ATF temperature as fixed at a value of 80°C(176°F), if this DTC is detected.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• check for ground short	• Sensor signal circuit is short to ground • Faulty sensor • Faulty PCM
Enable Conditions	• ATF Temp. at IG ON>45°C(113°F) • (ATF Temp. at IG OFF - Coolant Temp. at IG ON)>30°C(86°F) • The variation of coolant temp.>5°C(41°F) • Coolant temp. at IG ON>-20°C(-4°F)	
Threshold value	• (ATF Temp. at IG ON - Coolant Temp. at IG ON)>10°C(50°F)	
Diagnostic Time	• More than 1 sec.	
Fail Safe	• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C(176°F)	

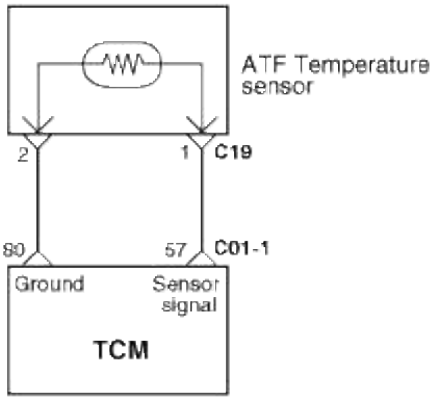
SPECIFICATION

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Temp.[°C(°F)]	Resistance(kΩ)	Temp.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		

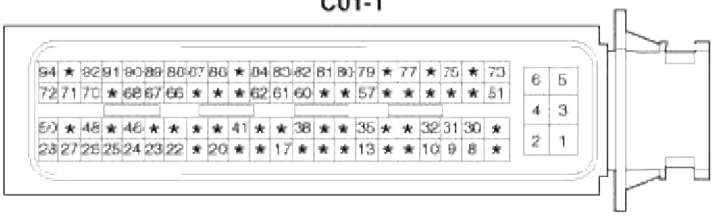
SCHEMATIC DIAGRAM

[Circuit Diagram]



[Harness Connector]

C01-1



C19



[Connection Information]

Terminal	Connection	Function
1	TCM(C01-1 No.57)	Sensor signal
2	TCM(C01-1 No.80)	Sensor ground

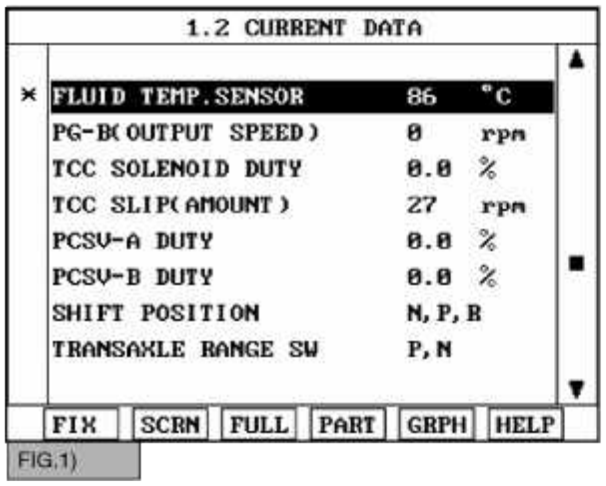
MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".

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3. Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR" parameter on the scantool.

Specification : Increasing gradually with increase in temperature



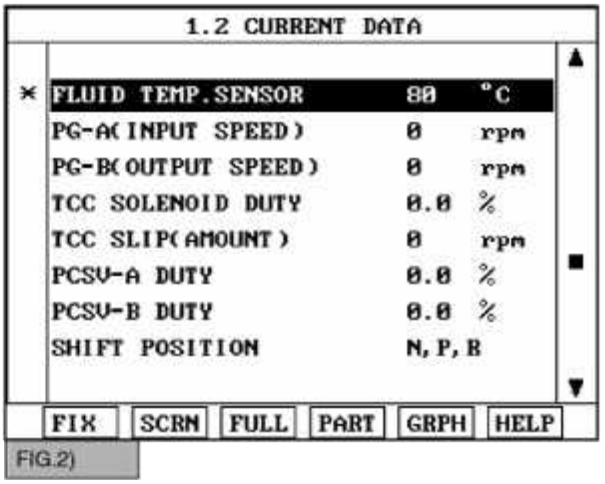


FIG.1) Normal.
FIG.2) Signal harness short.

4. Does "TRANSAXLE FLUID TEMPERATURE SENSOR " follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

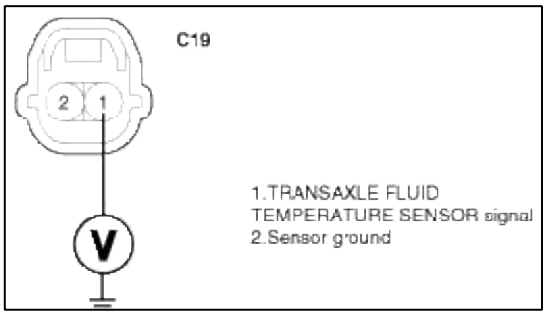
SIGNAL CIRCUIT INSPECTION

1. Ignition "ON"&Engine "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.

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3. Measure the voltage between terminal "1" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

Specification : Approx. 5 V



4. Is voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

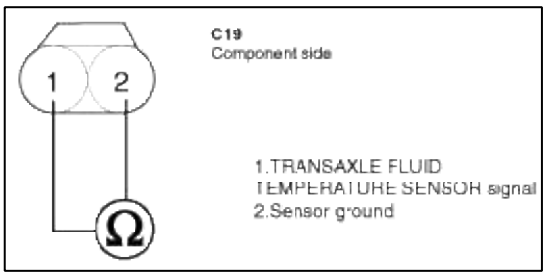
COMPONENT INSPECTION

1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"
   (1) Ignition "OFF".
   (2) Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
   (3) Measure the resistance between terminals "1" and "2" of the "TRANSMISSION FLUID TEMPERATURE SENSOR".

Specification : Refer to "Reference data"

[REFERENCE DATA]

Temp.[°C(°F)]	Resistance(kΩ)	Temp.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		



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(4) Is resistance within specifications?

YES

Go to "CHECK PCM" as below.

NO

Replace "TRANSAXLE FLUID TEMPERATURE SENSOR" as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM

(1) Ignition "ON" & Engine "OFF".

(2) Connect "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.

(3) Install scantool and select SIMU-SCAN mode.

(4) Simulate voltage (0→5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR" signal circuit.

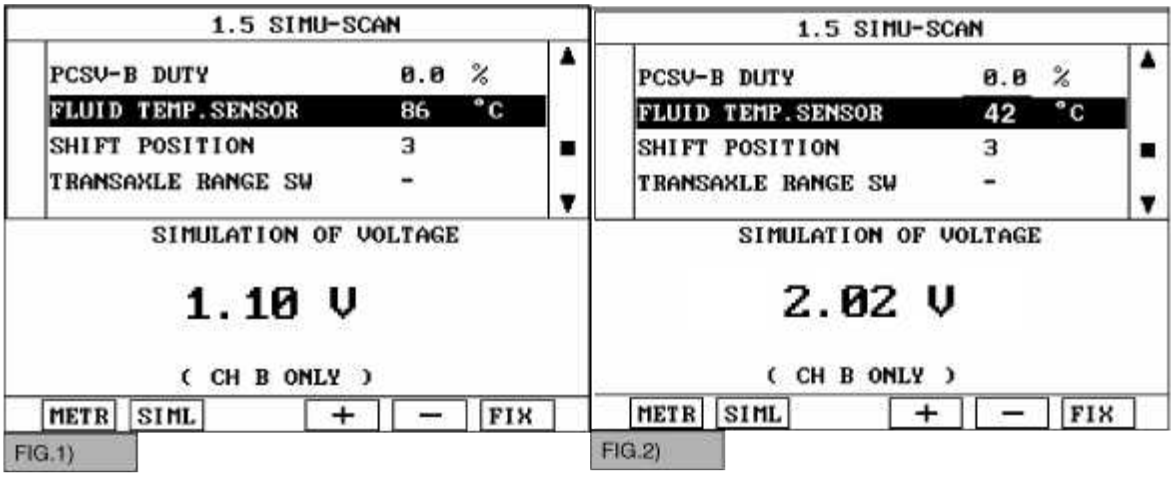


FIG.1) INPUT 1.02V → 86°C(187°F)
FIG.2) INPUT 2.02V → 42°C(108°F)

※ The values are subject to change according to vehicle model or conditions.

(5) Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of vehicle repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

Go to the applicable troubleshooting procedure.

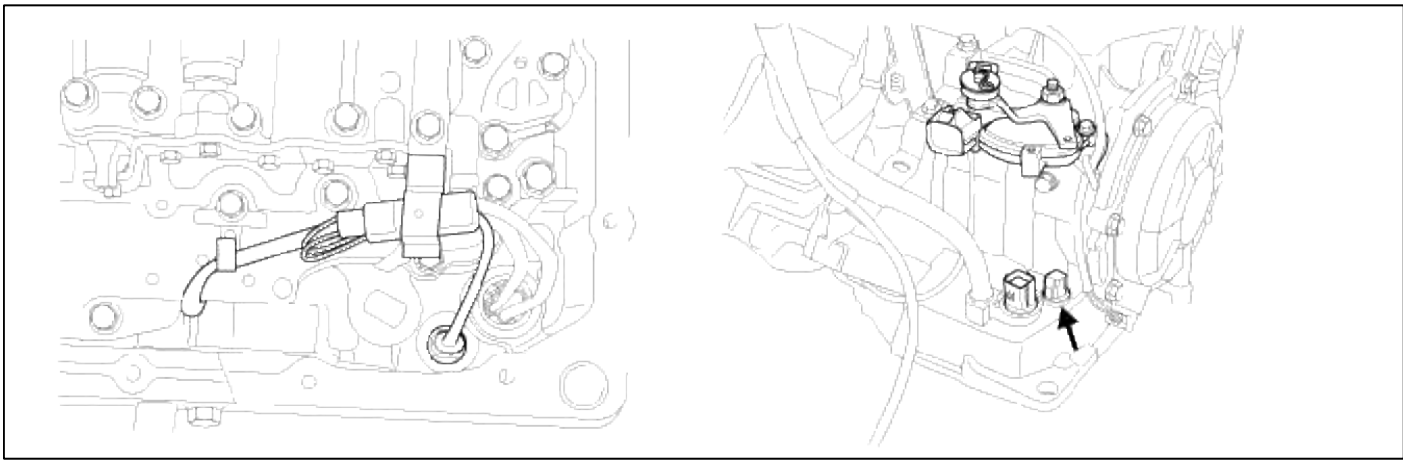
NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0712

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COMPONENT LOCATION



GENERAL DESCRIPTION

The automatic transmission fluid(ATF) temperature sensor is installed in the valve body. This sensor uses a thermistor whose resistance changes according to the temperature changes. The PCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies. The automatic transmission fluid(ATF) temperature provides very important data for the PCM's control of the torque converter clutch, and is also used for many other purposes.

DTC DESCRIPTION

This DTC code is set when the ATF temperature output voltage is lower than the value generated by thermistor resistance, in a normal operating range, for approximately 1 second or longer. The PCM regards the ATF temperature as fixed at a value of 80°C(176°F), if this DTC is detected.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check for ground short	• Sensor signal circuit is short to ground • Faulty sensor • Faulty PCM
Enable Conditions	• Battery voltage>9V	
Threshold value	• Voltage < 0.1V	
Diagnostic Time	• More than 1sec	
Fail Safe	• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C(176°F)	

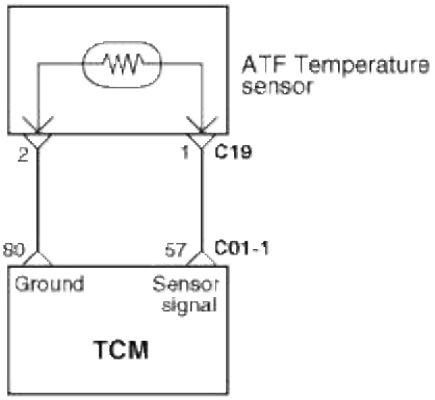
SPECIFICATION

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Temp.[°C(°F)]	Resistance(kΩ)	Temp.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		

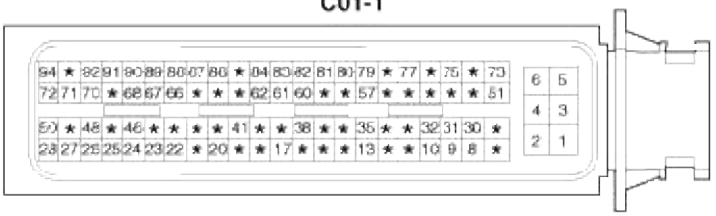
SCHEMATIC DIAGRAM

[Circuit Diagram]



[Harness Connector]

C01-1



C19



[Connection Information]

Terminal	Connection	Function
1	TCM(C01-1 No.57)	Sensor signal
2	TCM(C01-1 No.80)	Sensor ground

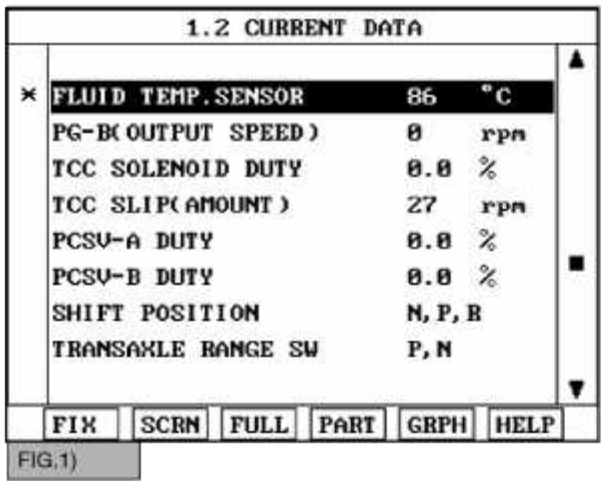
MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".

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3. Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR" parameter on the scantool.

Specification : Increasing gradually with increase in temperature



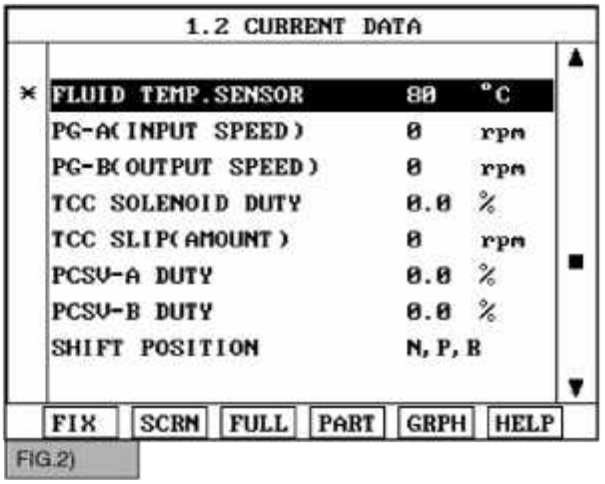


FIG.1) Normal.
FIG.2) Signal harness short.

4. Does "TRANSAXLE FLUID TEMPERATURE SENSOR " follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

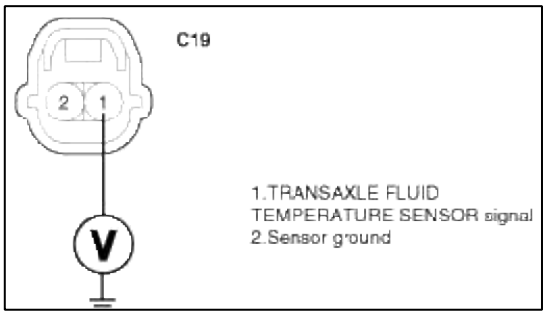
SIGNAL CIRCUIT INSPECTION

1. Ignition "ON"&Engine "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.

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3. Measure the voltage between terminal "1" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

Specification : Approx. 5 V



4. Is voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

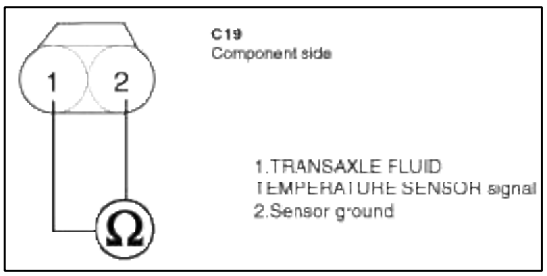
COMPONENT INSPECTION

1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"
   (1) Ignition "OFF".
   (2) Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
   (3) Measure the resistance between terminals "1" and "2" of the "TRANSMISSION FLUID TEMPERATURE SENSOR".

Specification : Refer to "Reference data"

[REFERENCE DATA]

Temp.[°C(°F)]	Resistance(kΩ)	Temp.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		



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(4) Is resistance within specifications?

YES

Go to "CHECK PCM" as below.

NO

Replace "TRANSAXLE FLUID TEMPERATURE SENSOR" as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM

(1) Ignition "ON" & Engine "OFF".

(2) Connect "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.

(3) Install scantool and select SIMU-SCAN mode.

(4) Simulate voltage (0→5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR" signal circuit.

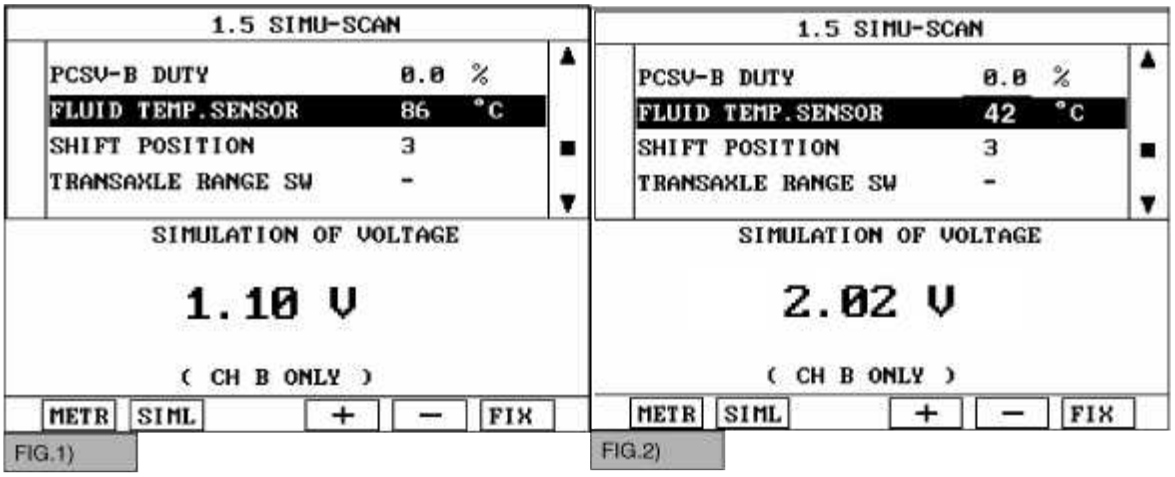


FIG.1) INPUT 1.02V → 86°C(187°F)
FIG.2) INPUT 2.02V → 42°C(108°F)

※ The values are subject to change according to vehicle model or conditions.

(5) Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of vehicle repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

Go to the applicable troubleshooting procedure.

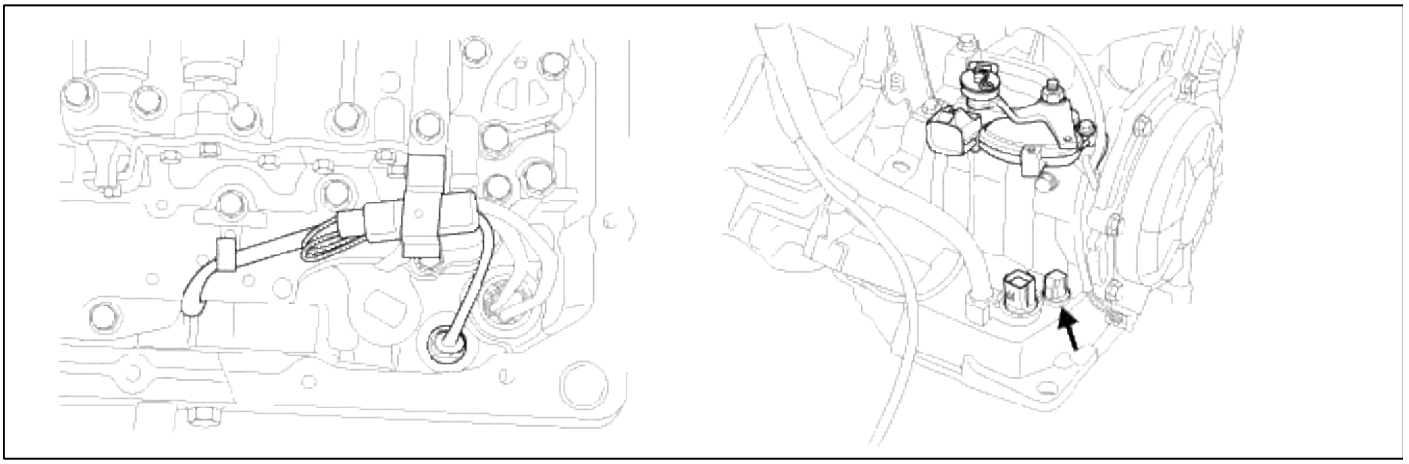
NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0713

tomsn048@gmail.com

COMPONENT LOCATION



GENERAL DESCRIPTION

The automatic transmission fluid(ATF) temperature sensor is installed in the valve body. This sensor uses a thermistor whose resistance changes according to the temperature changes. The PCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies. The automatic transmission fluid(ATF) temperature provides very important data for the PCM's control of the torque converter clutch, and is also used for many other purposes.

DTC DESCRIPTION

This DTC code is set when the ATF temperature output voltage is lower than the value generated by thermistor resistance, in a normal operating range, for approximately 1 second or longer. The PCM regards the ATF temperature as fixed at a value of 80°C(176°F), if this DTC is detected.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check voltage range	• Open in circuit • Faulty sensor • Faulty PCM
Enable Conditions	• Engine speed >1000rpm • Output speed > 500rpm • ATF temperture<-38°C(-36°F) • Engine coolant temp.≥70°C(158°F)	
Threshold vaue	• Voltage>4.8V or 4.8>Voltge≥4.45V	
Diagnostic Time	• 1 sec.	
Fail Safe	• Learning control and Intelligent shift are inhibited • Fluid temperature is regarded as 80°C(176°F)	

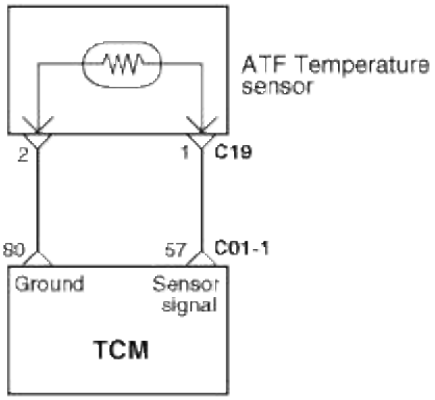
SPECIFICATION

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Temp.[°C(°F)]	Resistance(kΩ)	Temp.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		

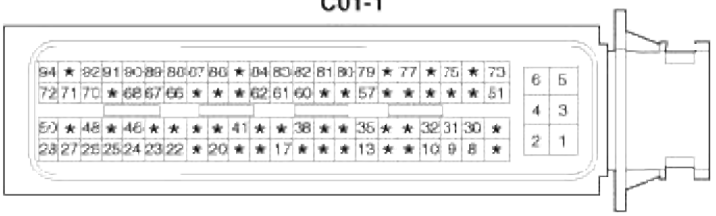
SCHEMATIC DIAGRAM

[Circuit Diagram]



[Harness Connector]

C01-1



C19



[Connection Information]

Terminal	Connection	Function
1	TCM(C01-1 No.57)	Sensor signal
2	TCM(C01-1 No.80)	Sensor ground

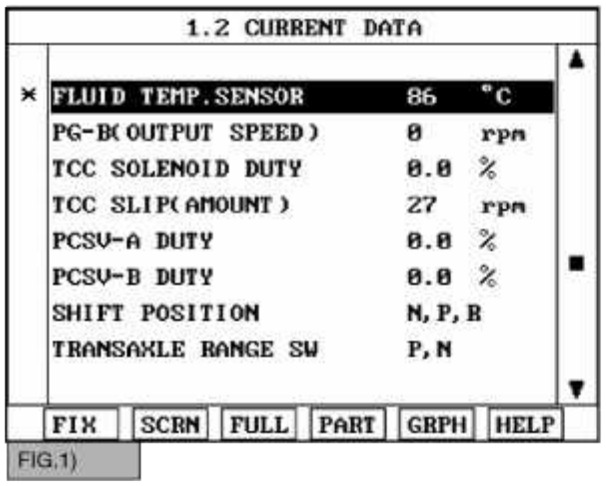
MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".

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3. Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR" parameter on the scan tool.

Specification : Increasing gradually with increase in temperature



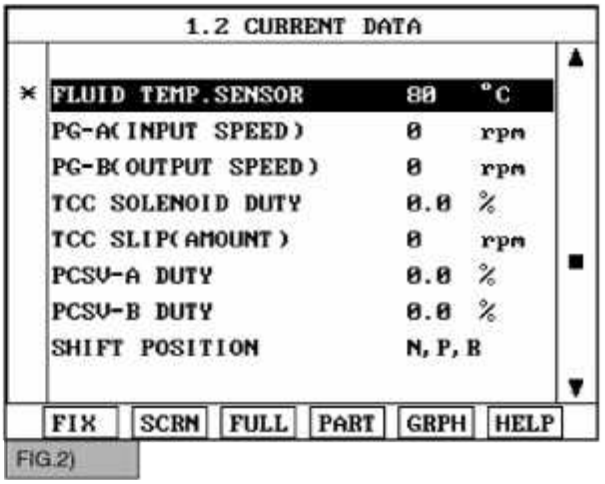


FIG.1) Normal.
FIG.2) Signal harness short.

4. Does "TRANSAXLE FLUID TEMPERATURE SENSOR " follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

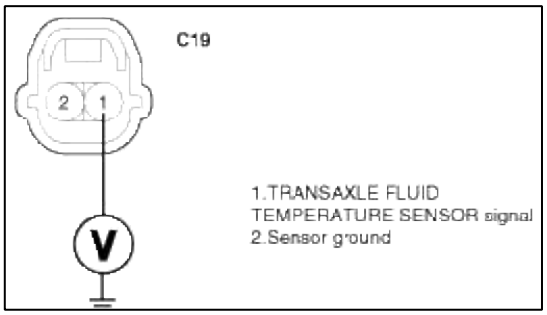
SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.

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3. Measure the voltage between terminal "1" of the "TRANSAXLE FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

Specification : Approx. 5 V



4. Is voltage within specifications?

YES

Go to "Component inspection" procedure.

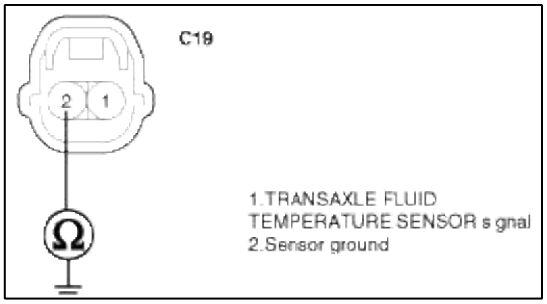
NO

Check for short to ground in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF".
2. Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3. Measure the resistance between terminal "2" of the "TRANSMISSION FLUID TEMPERATURE SENSOR" harness connector and chassis ground.

Specification : Approx. 0 Ω



4. Is resistance within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION

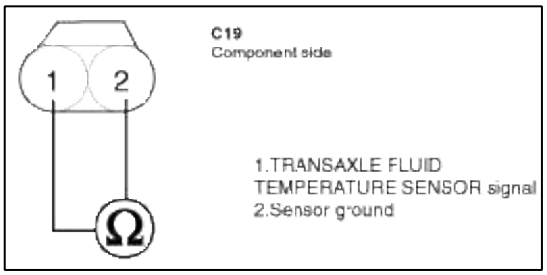
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1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"
   (1) Ignition "OFF".
   (2) Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
   (3) Measure the resistance between terminals "1" and "2" of the "TRANSMISSION FLUID TEMPERATURE SENSOR".

   Specification : Refer to "Reference data"

   [REFERENCE DATA]

Temp.[°C(°F)]	Resistance(kΩ)	Temp.[°C(°F)]	Resistance(kΩ)
-40(-40)	139.5	80(176)	1.08
-20(-4)	47.7	100(212)	0.63
0(32)	18.6	120(248)	0.38
20(68)	8.1	140(284)	0.25
40(104)	3.8	160(320)	0.16
60(140)	1.98		



   (4) Is resistance within specifications?

   YES

   Go to "CHECK PCM" as below.

   NO

   Replace "TRANSAXLE FLUID TEMPERATURE SENSOR" as necessary and go to "Verification vehicle repair" procedure.

2. CHECK PCM
   (1) Ignition "ON" & Engine "OFF".
   (2) Connect "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
   (3) Install scantool and select SIMU-SCAN mode.

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(4) Simulate voltage (0→5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR" signal circuit.

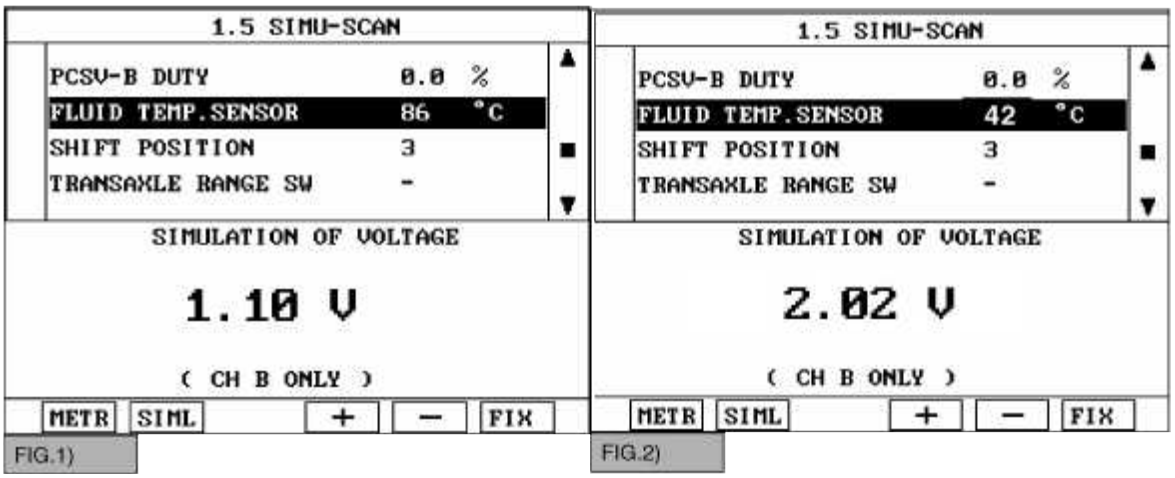


FIG.1) INPUT 1.02V → 86°C(187°F)
FIG.2) INPUT 2.02V → 42°C(108°F)

※ The values are subject to change according to vehicle model or conditions.

(5) Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of vehicle repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace F as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

Go to the applicable troubleshooting procedure.

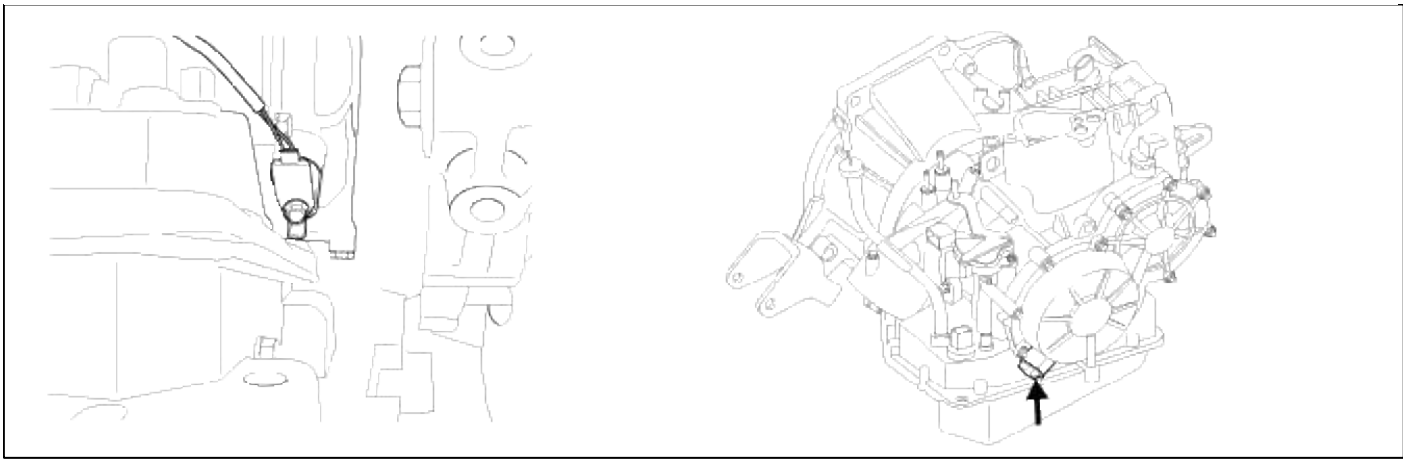
NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0716

COMPONENT LOCATION

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GENERAL DESCRIPTION

The input(turbine) speed sensor outputs waveform signals according to the revolutions of the input shaft, installed in front of end clutch retainer, of the transmission. The PCM determines the input shaft speed by calculating the frequency of the pulses. This value is mainly used to control the optimum fluid pressure during shifting.

DTC DESCRIPTION

The PCM sets this code if an output pulse-signal is not detected, from the INPUT SPEED SENSOR(PG-A), when the vehicle is running faster than 30 km/h(19 mile/h). The Fail-Safe function will be set by the PCM if this code is detected.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Speed rationality check	• Faulty INPUT SPEED SENSOR • Faulty PCM
Enable Conditions	• Battery voltage>9V	
Threshold value	• Input speed≥8000rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd or 2nd gear • Manual shifting is possible (2 nd → 3 rd, 3 rd → 2 nd)	

SIGNAL WAVEFORM

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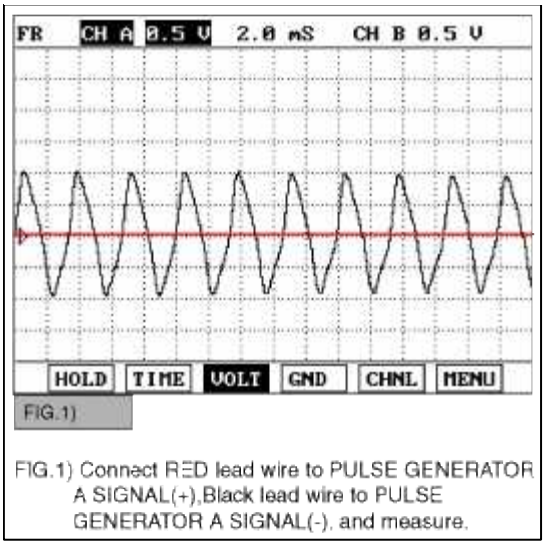


FIG.1) Connect RED lead wire to PULSE GENERATOR A SIGNAL(+),Black lead wire to PULSE GENERATOR A SIGNAL(-), and measure.

SPECIFICATION

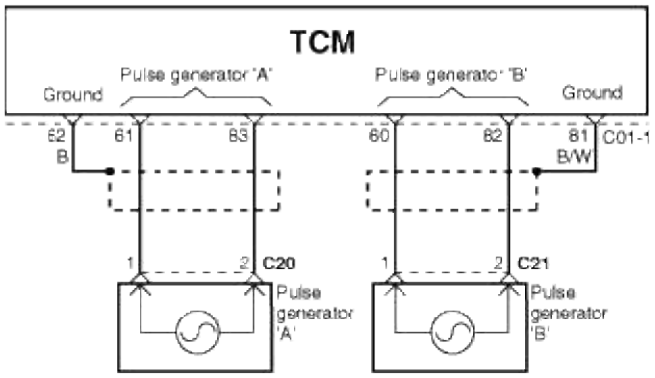
Input shaft & Output shaft speed sensor

- Type : Magnetic Inductive Type
- Sensor body and sensor connector have been unified as one.

SCHEMATIC DIAGRAM

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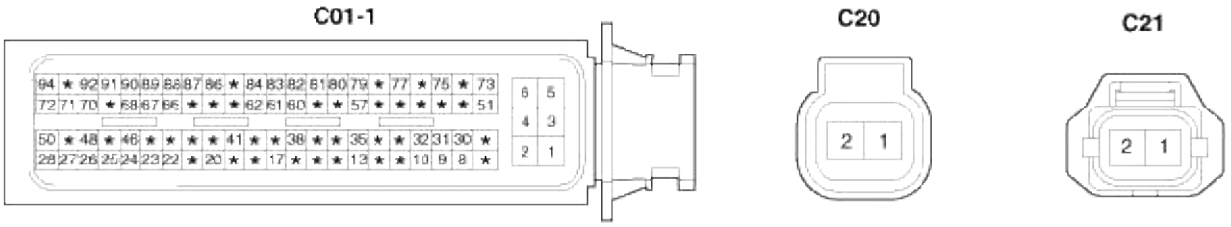
[Circuit Diagram]



[Connection Information]

Terminal	Connection	Function
C20-1	TCM (C01-1 No.61)	Pulse generator A +
C20-2	TCM (C01-1 No.83)	Pulse generator A -
C21-1	TCM (C01-1 No.60)	Pulse generator B +
C21-2	TCM (C01-1 No.82)	Pulse generator B -

[Harness Connector]



MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON" .
3. Monitor the "INPUT SPEED SENSOR" parameter on the scantool

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4. Driving at speed of over 30 Km/h(19 mph).

Specification : Increasing gradually with increase in temperature

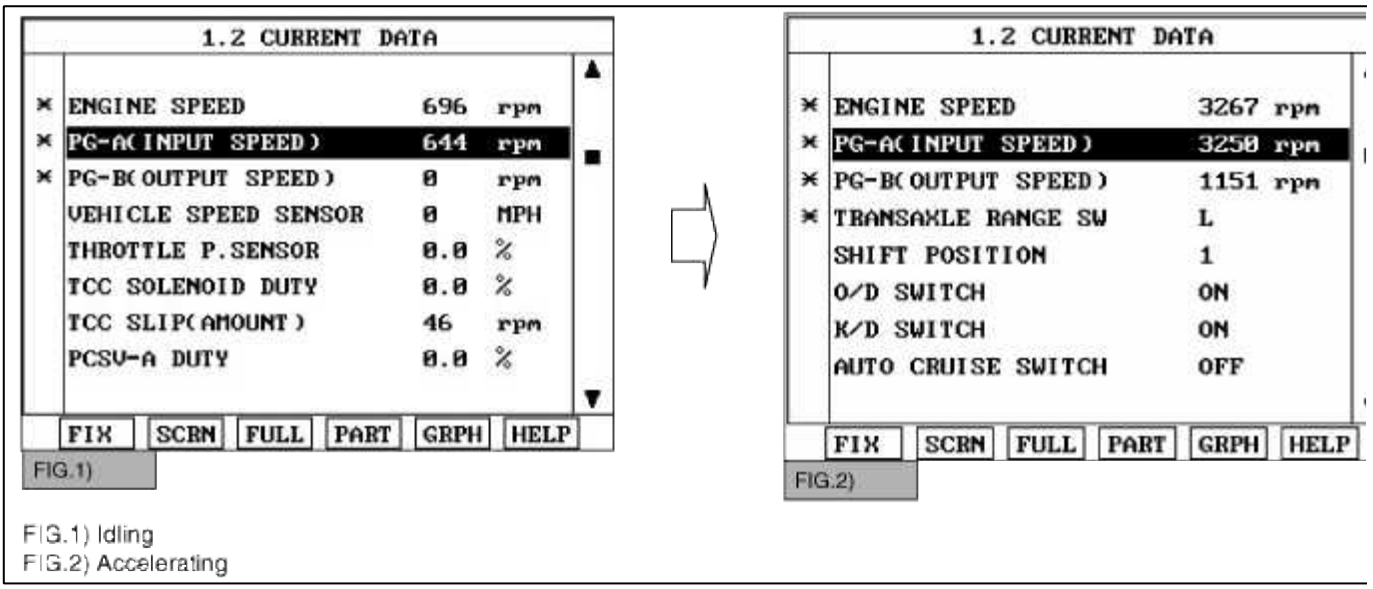


FIG.1) Idling
FIG.2) Accelerating

5. Does "INPUT SPEED SENSOR(PG-A) " follow the referance data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system may be caused from poor harness and terminals. These faults can be caused by interference from other electrical systems and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

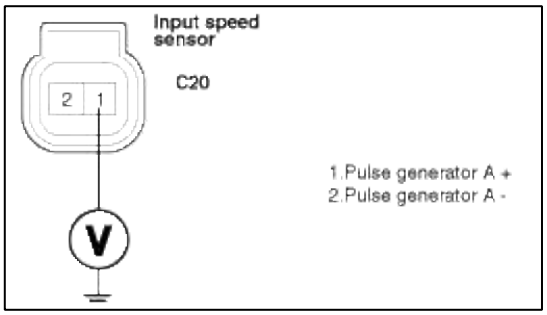
SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "INPUT SPEED SENSOR" connector.

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3. Measure voltage between terminal "1" of the INPUT SPEED SENSOR harness connector and chassis ground.

Specification : approx. 1.45V



4. Is voltage within specifications?

YES

Go to "Ground circuit inspection" procedure .

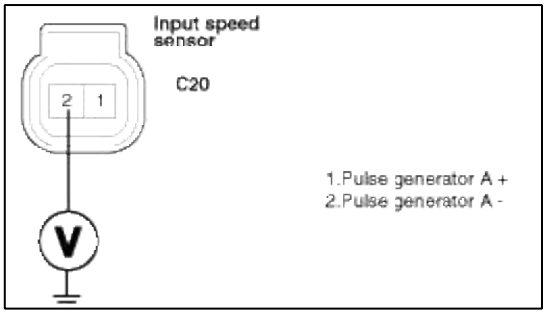
NO

Check for open or short in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.
If signal circuit in harness is OK, Go to "Check PCM" of the "Component inspection" procedure.

Ground circuit inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "INPUT SPEED SENSOR" connector.
3. Measure voltage between terminal "2" of the INPUT SPEED SENSOR harness connector and chassis ground.

Specification : approx. 1.7V



4. Is voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

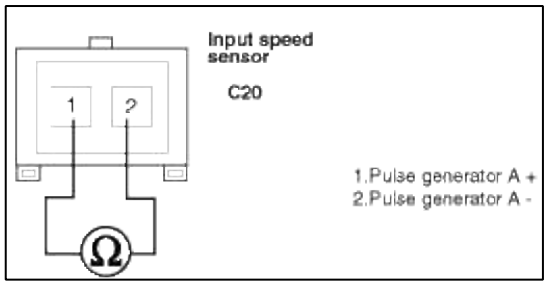
Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.
If ground circuit in harness is OK, go to "Check PCM" of the "Component inspection" procedure.

COMPONENT INSPECTION

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1. Check "INPUT SPEED SENSOR(PG-A)"
   (1) Ignition "OFF".
   (2) Disconnect the "INPUT SPEED SENSOR" connector.
   (3) Measure resistance between terminal "1" and "2" of the "INPUT SPEED SENSOR" connector.

   Specification : 245 ± 30 Ω/20°C(68°F)



   (4) Is resistance within specifications?

   YES

   Go to "CHECK PCM" as below.

   NO

   Replace "INPUT SPEED SENSOR" as necessary and Go to "Verification of vehicle repair" procedure.

2. CHECK PCM
   (1) Ignition "ON" & Engine "OFF".
   (2) Connect "INPUT SPEED SENSOR" connector.
   (3) Install scantool and select SIMU-SCAN mode.
   (4) Simulate frequency to INPUT SPEED SENSOR signal circuit.

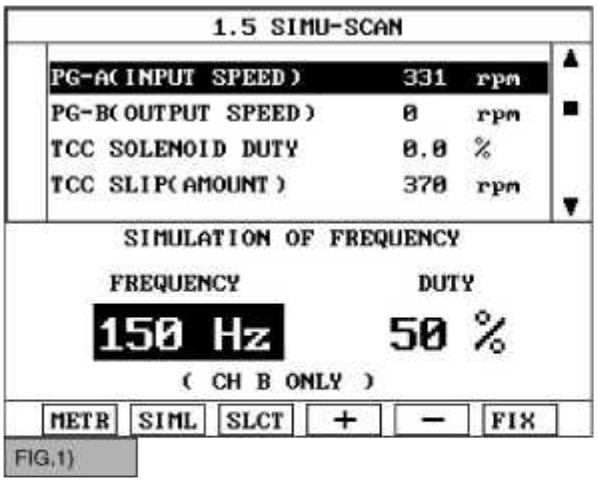


FIG.1)

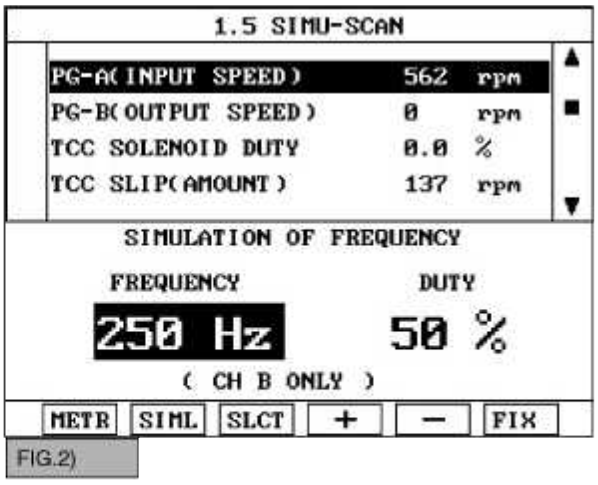


FIG.2)

FIG.1) INPUT 150Hz → 331rpm
FIG.2) INPUT 250Hz → 562rpm

※ The values are subject to change according to vehicle model or conditions.

   (5) Is "INPUT SPEED SENSOR(PG-A)" signal value changed according to simulation frequency?

   YES

   Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of vehicle repair" procedure.

   NO

   Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I as necessary and then go to "Verification of vehicle repair" procedure.

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VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present?

YES

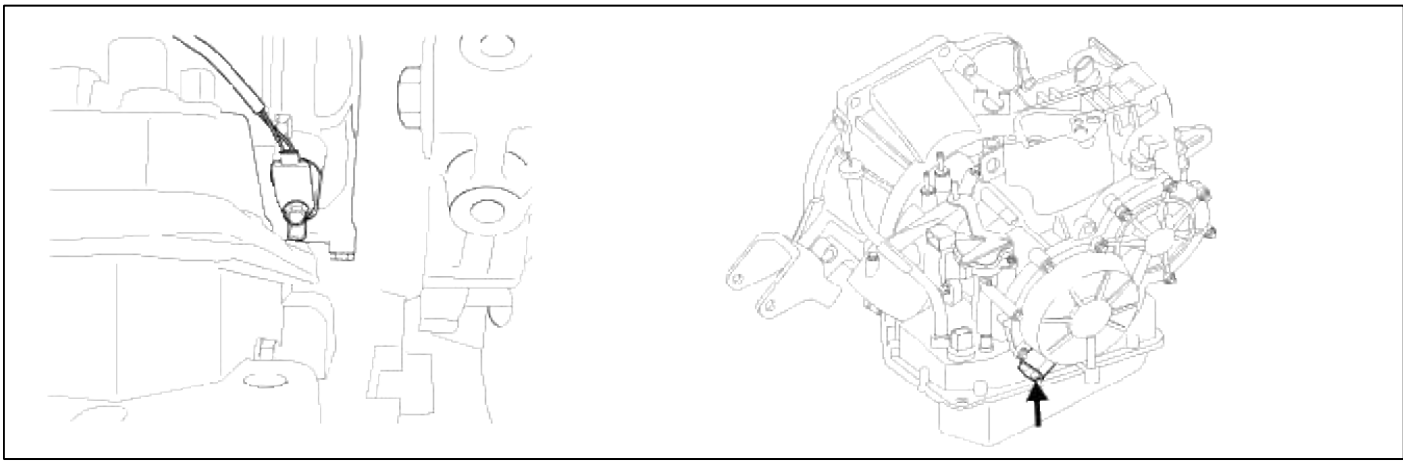
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0717

COMPONENT LOCATION



GENERAL DESCRIPTION

The input(turbine) speed sensor outputs waveform signals according to the revolutions of the input shaft, installed in front of end clutch retainer, of the transmission. The PCM determines the input shaft speed by calculating the frequency of the pulses. This value is mainly used to control the optimum fluid pressure during shifting.

DTC DESCRIPTION

The PCM sets this code if an output pulse-signal is not detected, from the INPUT SPEED SENSOR(PG-A), when the vehicle is running faster than 30 km/h(19 Mile/h). The Fail-Safe function will be set by the PCM if this code is detected.

DTC DETECTING CONDITION

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Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Speed rationality check	• Faulty INPUT SPEED SENSOR • Faulty PCM
Enable Conditions	• Battery voltage>9V • Inhibitor switch : "D,2,L" • Output speed sensor>1000rpm • Engine speed(Only 1st gear)>3000rpm	
Threshold value	• No signal	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd or 2nd gear • Manual shifting is possible (2 nd → 3 rd, 3 rd → 2 nd)	

SIGNAL WAVEFORM

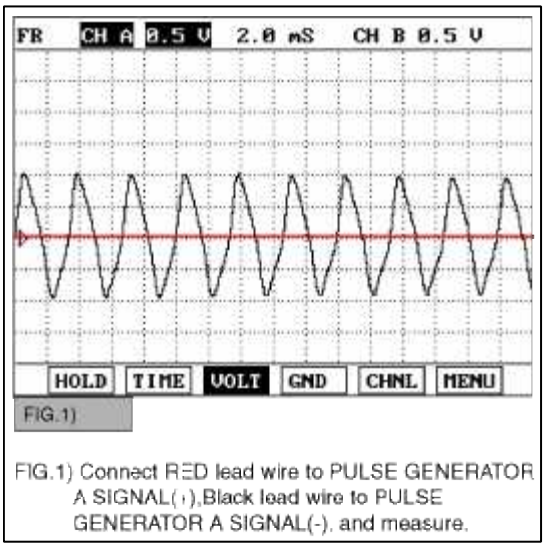


FIG.1) Connect RED lead wire to PULSE GENERATOR A SIGNAL(+),Black lead wire to PULSE GENERATOR A SIGNAL(-), and measure.

SPECIFICATION

Input shaft & Output shaft speed sensor

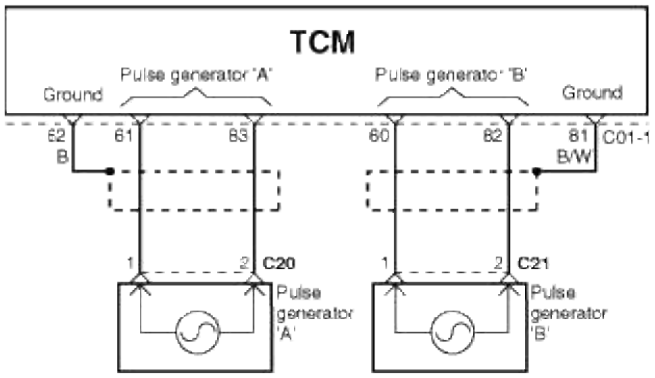
● Type : Magnetic Inductive Type

● Sensor body and sensor connector have been unified as one.

SCHEMATIC DIAGRAM

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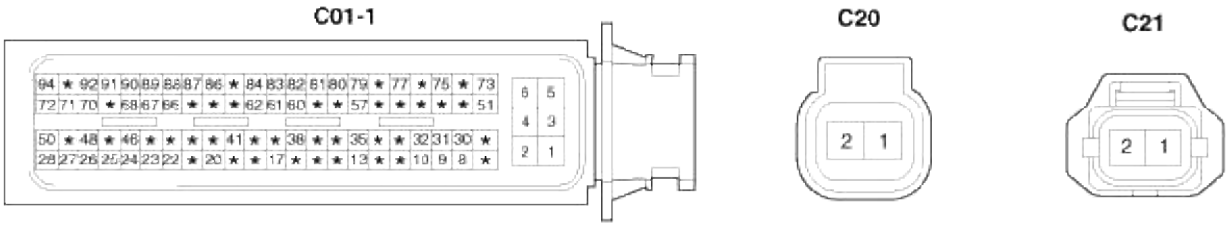
[Circuit Diagram]



[Connection Information]

Terminal	Connection	Function
C20-1	TCM (C01-1 No.61)	Pulse generator A +
C20-2	TCM (C01-1 No.83)	Pulse generator A -
C21-1	TCM (C01-1 No.60)	Pulse generator B +
C21-2	TCM (C01-1 No.82)	Pulse generator B -

[Harness Connector]



MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON" .
3. Monitor the "INPUT SPEED SENSOR" parameter on the scantool

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4. Driving at speed of over 30 Km/h(19 mph).

Specification : Increasing gradually with increase in temperature

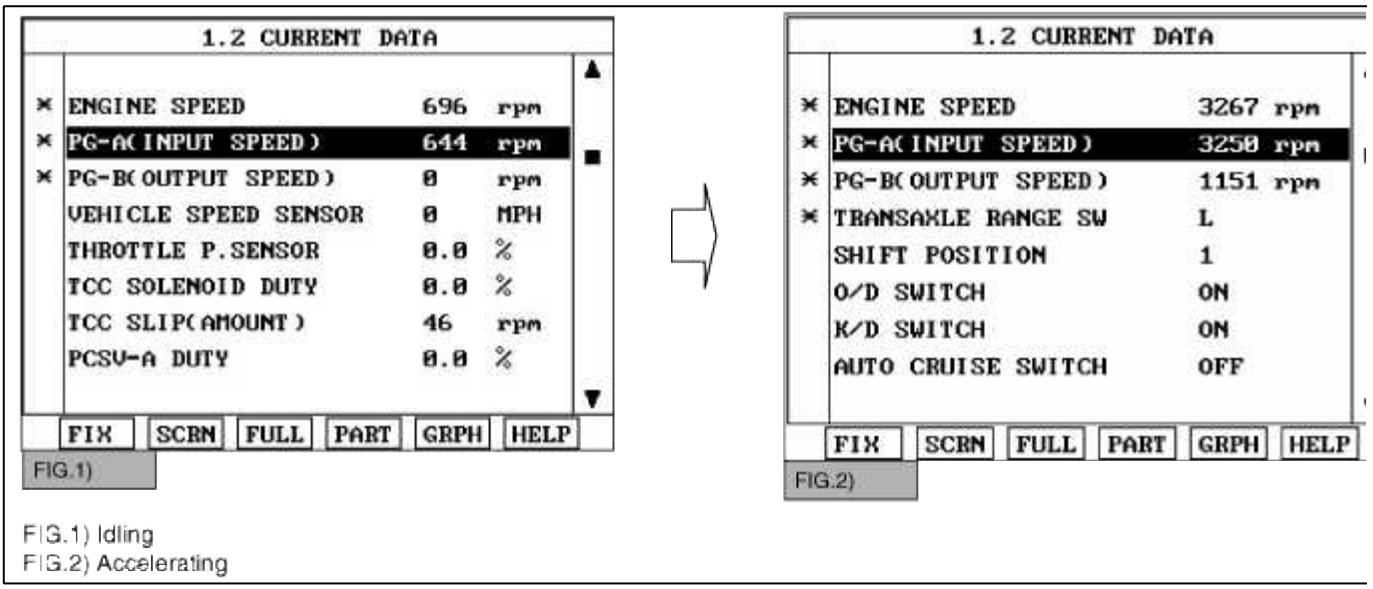


FIG.1) Idling
FIG.2) Accelerating

5. Does "INPUT SPEED SENSOR(PG-A) " follow the referance data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system may be caused from poor harness and terminals. These faults can be caused by interference from other electrical systems and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

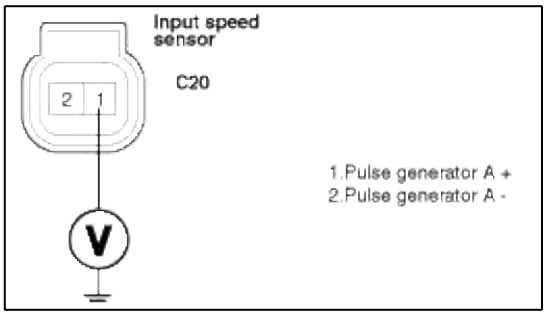
SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "INPUT SPEED SENSOR" connector.

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3. Measure voltage between terminal "1" of the INPUT SPEED SENSOR harness connector and chassis ground.

Specification : approx. 1.45V



4. Is voltage within specifications?

YES

Go to "Ground circuit inspection" procedure .

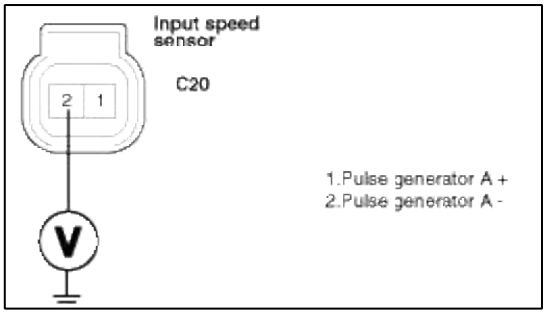
NO

Check for open or short in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.
If signal circuit in harness is OK, Go to "Check PCM" of the "Component inspection" procedure.

Ground circuit inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "INPUT SPEED SENSOR" connector.
3. Measure voltage between terminal "2" of the INPUT SPEED SENSOR harness connector and chassis ground.

Specification : approx. 1.7V



4. Is voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

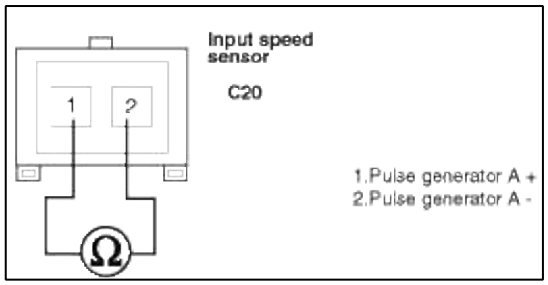
Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.
If ground circuit in harness is OK, go to "Check PCM" of the "Component inspection" procedure.

COMPONENT INSPECTION

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1. Check "INPUT SPEED SENSOR(PG-A)"
   (1) Ignition "OFF".
   (2) Disconnect the "INPUT SPEED SENSOR" connector.
   (3) Measure resistance between terminal "1" and "2" of the "INPUT SPEED SENSOR" connector.

   Specification : 245 ± 30 Ω/20°C(68°F)



   (4) Is resistance within specifications?

   YES

   Go to "CHECK PCM" as below.

   NO

   Replace "INPUT SPEED SENSOR" as necessary and Go to "Verification of vehicle repair" procedure.

2. CHECK PCM
   (1) Ignition "ON" & Engine "OFF".
   (2) Connect "INPUT SPEED SENSOR" connector.
   (3) Install scantool and select SIMU-SCAN mode.
   (4) Simulate frequency to INPUT SPEED SENSOR signal circuit.

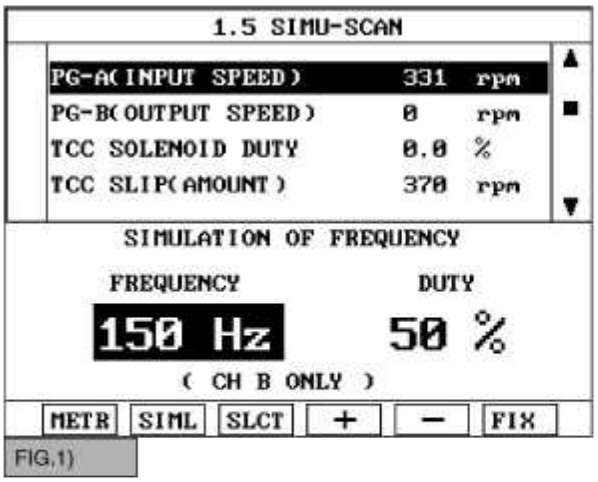


FIG.1)

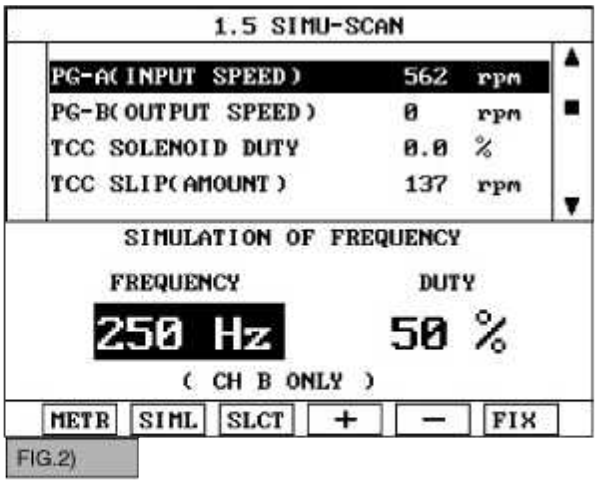


FIG.2)

FIG.1) INPUT 150Hz → 331rpm
FIG.2) INPUT 250Hz → 562rpm

※ The values are subject to change according to vehicle model or conditions.

   (5) Is "INPUT SPEED SENSOR(PG-A)" signal value changed according to simulation frequency?

   YES

   Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of vehicle repair" procedure.

   NO

   Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I as necessary and then go to "Verification of vehicle repair" procedure.

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VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present?

YES

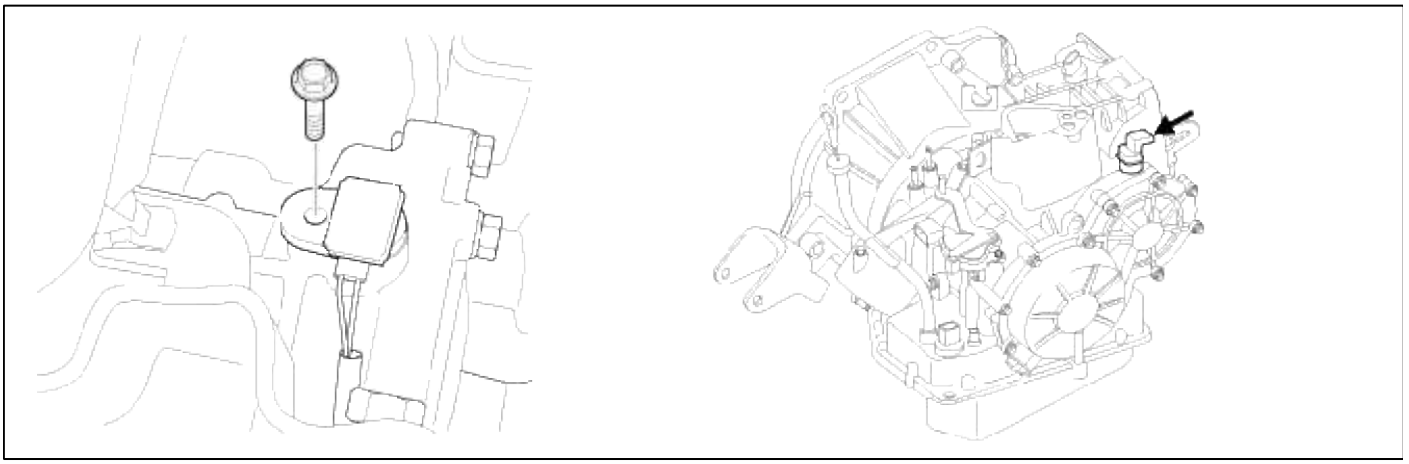
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0722

COMPONENT LOCATION



GENERAL DESCRIPTION

The OUTPUT SPEED SENSOR(PG-B) outputs waveform signals according to the revolutions of the output shaft of the transmission. The OUTPUT SPEED SENSOR(PG-B) is installed in front of the Transfer Drive Gear and determine the Transfer Drive Gear rpms by calculating the frequency of the pulses. This value, together with the throttle position data, is mainly used to decide the optimum gear position.

DTC DESCRIPTION

The PCM sets this code if the calculated value of the pulse-signal is noticeably different from the value calculated, using the Vehicle Speed Sensor output, when the vehicle is running faster than 19 mph(30 km/h). The PCM will initiate the fail safe function if this code is detected.

DTC DETECTING CONDITION

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Item		Detecting Condition & Fail Safe	Possible cause
DTC Strategy		• Speed rationality check	• Signal circuit is open or short • Sensor power circuit is open • Sensor ground circuit is open • Faulty OUTPUT SPEED SENSOR • Faulty PCM
Enable Conditions	**Case 1**	• Vehicle speed is over 19 Mile/h(30 Km/h) in D, 2, L(A/T range swhitch) • Throttle opening>14.9% • Engine speed >3500 rpm	
	Case 2	• Vehicle speed is over 19 Mile/h(30 Km/h) in D, 2(A/T range swhitch) • Input speed>1500 rpm • Engine speed>3500 rpm	
Threshold value		• Output speed = 0 rpm	
Diagnostic Time		• More than 5 secs	
Fail Safe		• Locked into 3rd or 2nd gear • Manual shifting is possible (2 nd → 3 rd, 3 rd → 2 nd)	

SIGNAL WAVEFORM

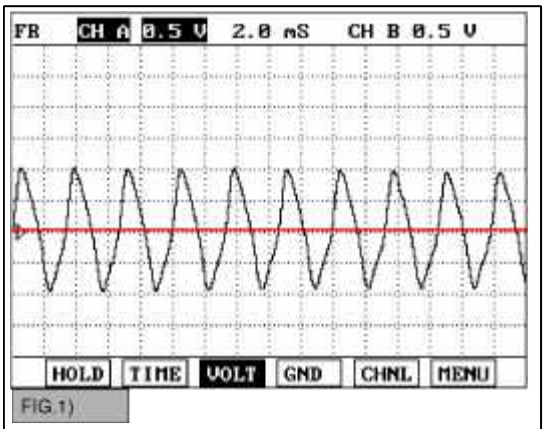


FIG.1) Connect RED lead wire to PULSE GENERATOR B SIGNAL(+),Black lead wire to PULSE GENERATOR B SIGNAL(-), and measure.

SPECIFICATION

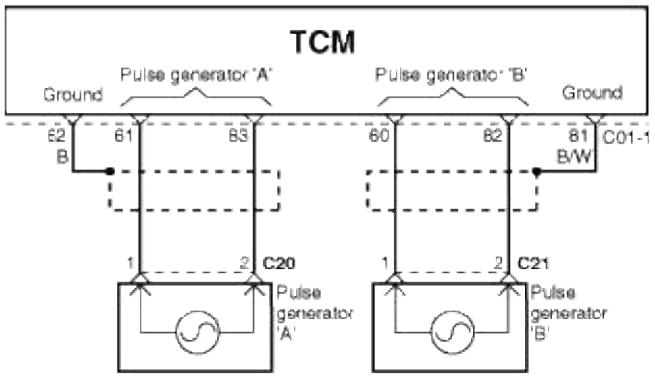
Input shaft & Output shaft speed sensor

- Type : Magnetic Inductive Type
- Sensor body and sensor connector have been unified as one.

SCHEMATIC DIAGRAM

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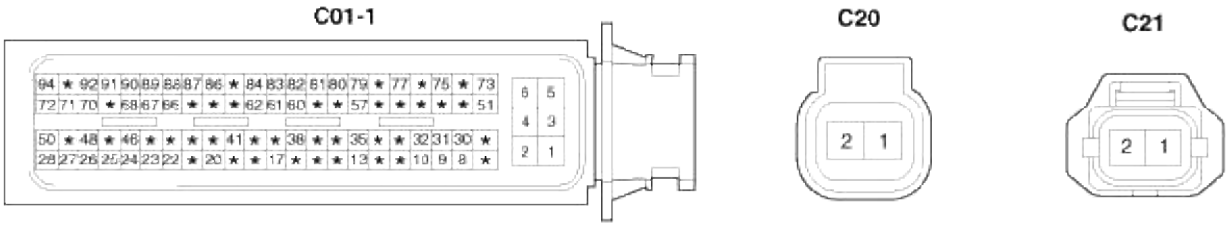
[Circuit Diagram]



[Connection Information]

Terminal	Connection	Function
C20-1	TCM (C01-1 No.61)	Pulse generator A +
C20-2	TCM (C01-1 No.83)	Pulse generator A -
C21-1	TCM (C01-1 No.60)	Pulse generator B +
C21-2	TCM (C01-1 No.82)	Pulse generator B -

[Harness Connector]



MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "OUTPUT SPEED SENSOR(PG-B)" parameter on the scan tool.

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4. Driving at speed of over 30 Km/h(19 mile/h).

Specification : Increasing gradually with increase in temperature

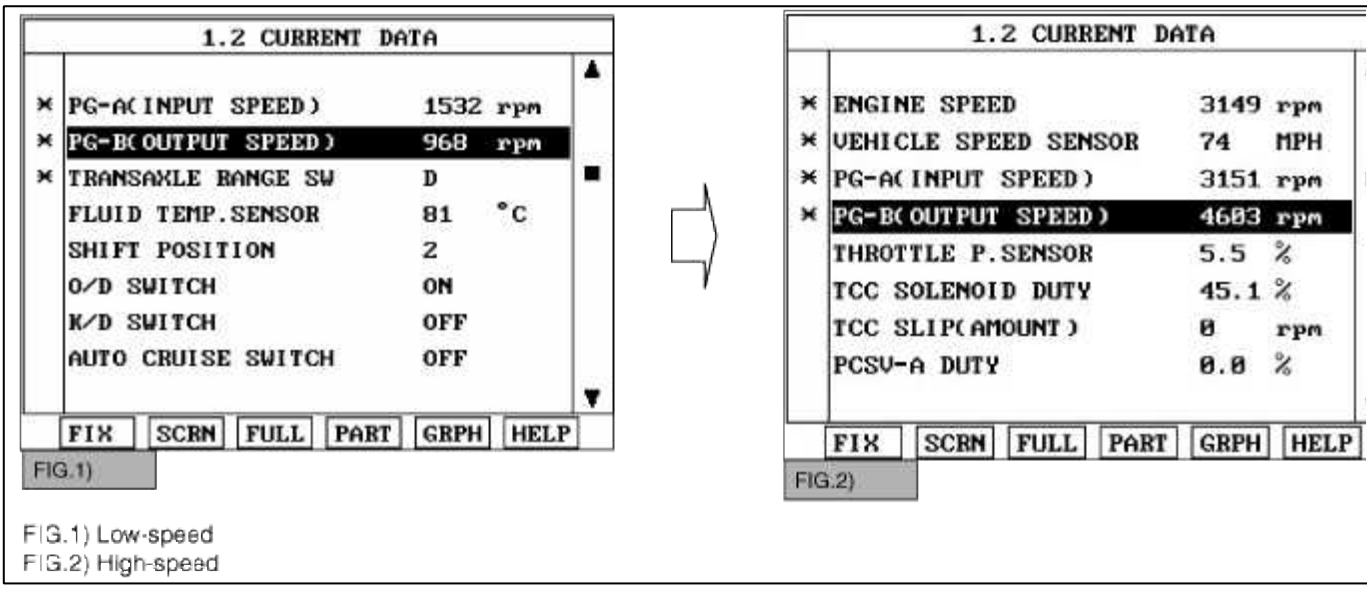


FIG.1) Low-speed
FIG.2) High-speed

5. Does "OUTPUT SPEED SENSOR(PG-B)" follow the referance data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system may be caused from poor harness and terminals. These faults can be caused by interference from other electrical systems and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

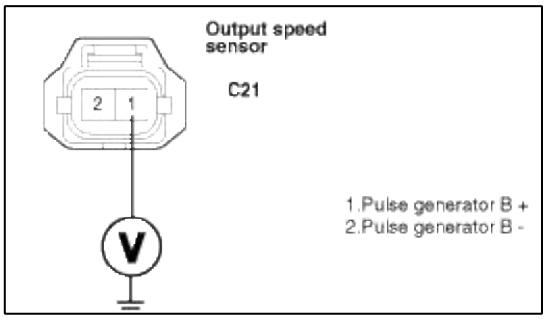
SIGNAL CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "OUTPUT SPEED SENSOR(PG-B)" connector.

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3. Measure voltage between terminal "1" of the OUTPUT SPEED SENSOR(PG-B) harness connector and chassis ground.

Specification : approx. 1.45V



4. Is voltage within specification?

YES

Go to "Ground circuit inspection" procedure.

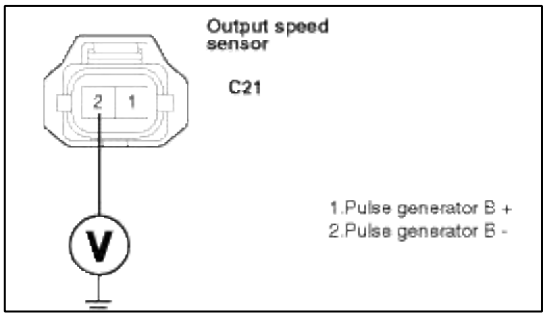
NO

Check for open or short in harness. Repair as necessary and go to "Verification of vehicle repair" procedure
If signal circuit in harness is OK, go to "Check PCM" of the "Component inspection" procedure.

GROUND CIRCUIT INSPECTION

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "OUTPUT SPEED SENSOR(PG-B)" connector.
3. Measure voltage between terminal "2" of the OUTPUT SPEED SENSOR(PG-B) harness connector and chassis ground.

Specification : approx. 1.17V



4. Is voltage within specification?

YES

Go to "Component inspection" procedure.

NO

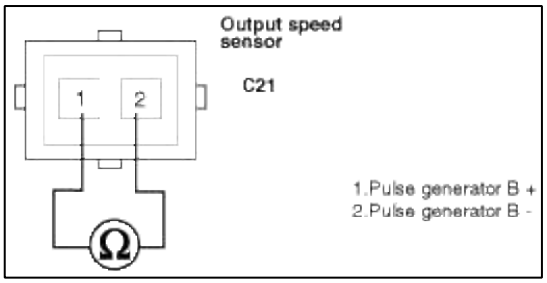
Check for open in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.
If ground circuit in harness is OK, go to "Check PCM of the "Component inspection" procedure.

COMPONENT INSPECTION

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1. Check "OUTPUT SPEED SENSOR(PG-B)"
   (1) Ignition "OFF".
   (2) Disconnect the "OUTPUT SPEED SENSOR" connector.
   (3) Measure resistance between terminal "1" and "2" of the "OUTPUT SPEED SENSOR(PG-B)" connector.

   Specification : 245±30 Ω/20°C(68°F)



   (4) Is resistance within specifications?

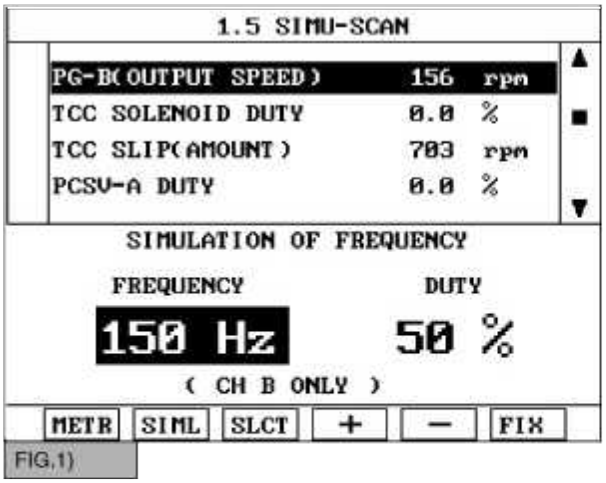
   YES

   Go to "CHECK PCM" as below.

   NO

   Replace "OUTPUT SPEED SENSOR(PG-B)" as necessary and go to "Verification of vehicle repair" procedure.

2. CHECK PCM
   (1) Ignition "ON" & Engine "OFF".
   (2) Connect "OUTPUT SPEED SENSOR" connector.
   (3) Install scantool and select SIMU-SCAN mode.
   (4) Simulate frequency to "OUTPUT SPEED SENSOR(PG-B)" signal circuit.



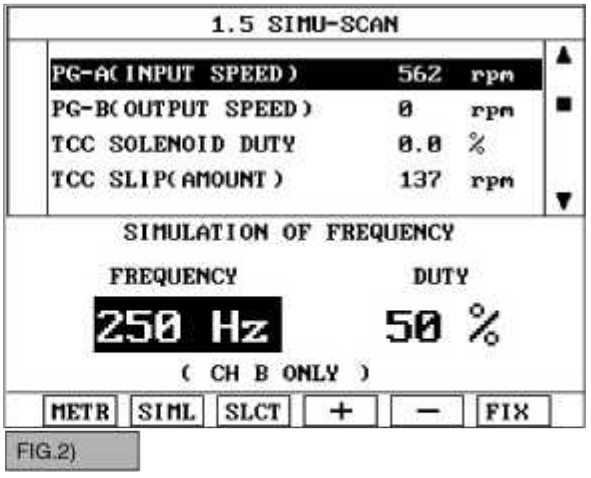


FIG.1) OUTPUT 150Hz → 156rpm
FIG.2) OUTPUT 250Hz → 562rpm

※ The values are subject to change according to vehicle model or conditions.

   (5) Is "OUTPUT SPEED SENSOR(PG-B)" signal value changed according to simulation frequency?

   YES

   Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of vehicle repair" procedure.

   NO

   Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I as necessary and then go to "Verification of vehicle repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present?

YES

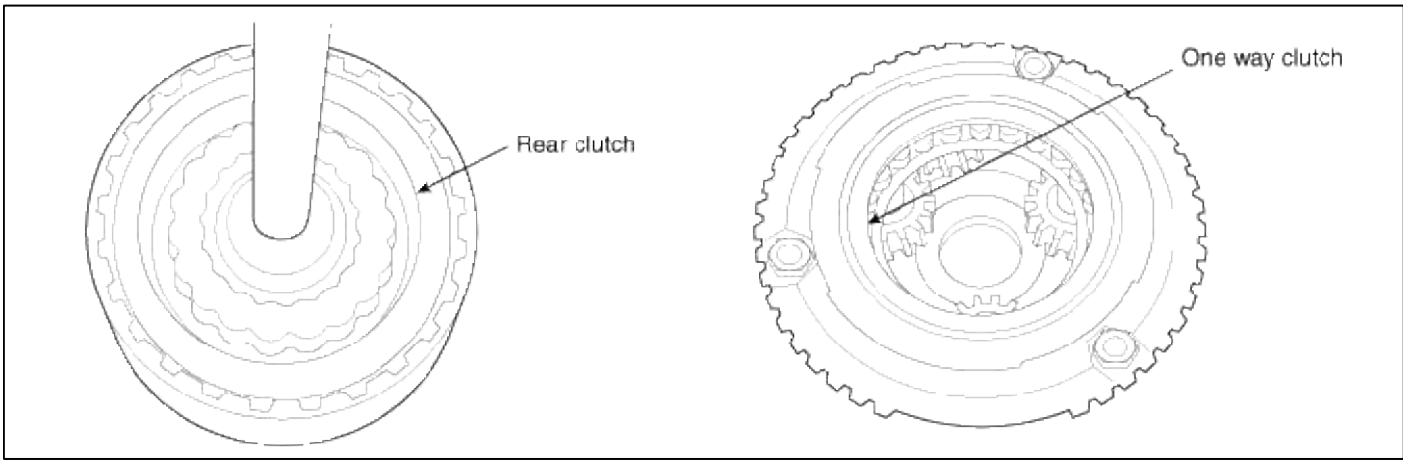
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0731

COMPONENT LOCATION



GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 1st gear ratio, while the transaxle is engaged in the 1st gear. For example, if the input speed is 1000 rpm and the 1st gear ratio is 2.846, then the output speed is about 2846 rpm.

DTC DESCRIPTION

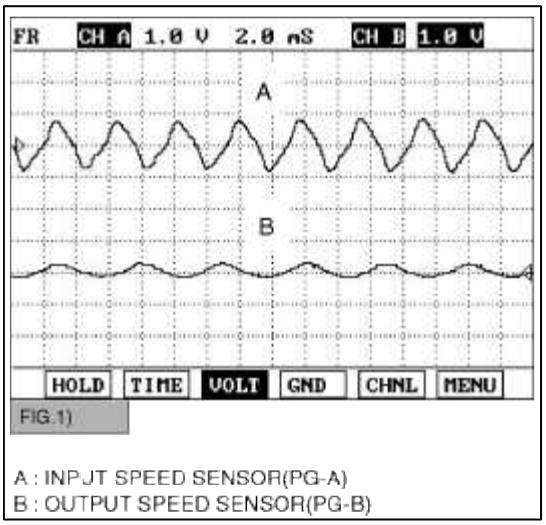
This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 1st gear ratio, while the transaxle is engaged in 1st gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION

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Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• 1st gear incorrect ratio	• Faulty input speed sensor • Faulty output speed sensor • Faulty R/C or OWC F/C-Front Clutch R/C - Rear Clutch E/C - End Clutch OWC - One Way Clutch K/B - Kicdown brake L/R - Low&Reverse brake
Enable Conditions	• Engine speed >400rpm • Output speed(PG-B) >300rpm • Shift stage 1st gear • Input speed(PG-A) >300rpm • A/T fluid temp. >-10°C(14°F) • Inhibitor switch : "D,2,L" • Solenoid is normal	
Threshold value	• Input speed/1st gear ratio - output speed ≥200rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0731 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM

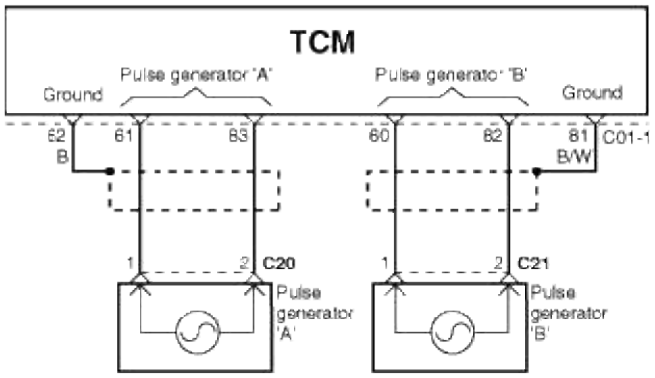


A : INPJT SPEED SENSOR(PG-A)
B : OUTPUT SPEED SENSOR(PG-B)

SCHEMATIC DIAGRAM

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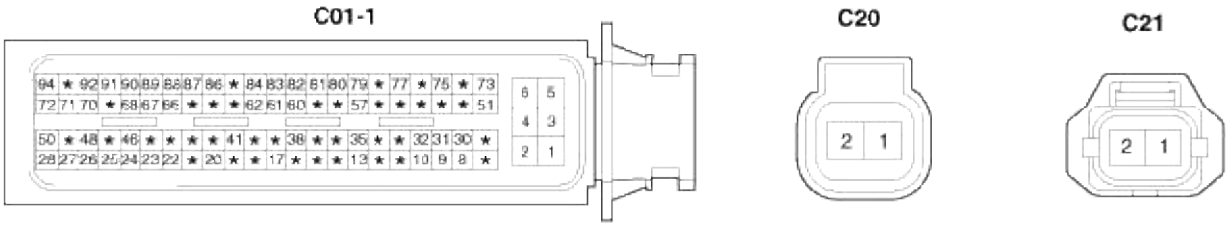
[Circuit Diagram]



[Connection Information]

Terminal	Connection	Function
C20-1	TCM (C01-1 No.61)	Pulse generator A +
C20-2	TCM (C01-1 No.83)	Pulse generator A -
C21-1	TCM (C01-1 No.60)	Pulse generator B +
C21-2	TCM (C01-1 No.82)	Pulse generator B -

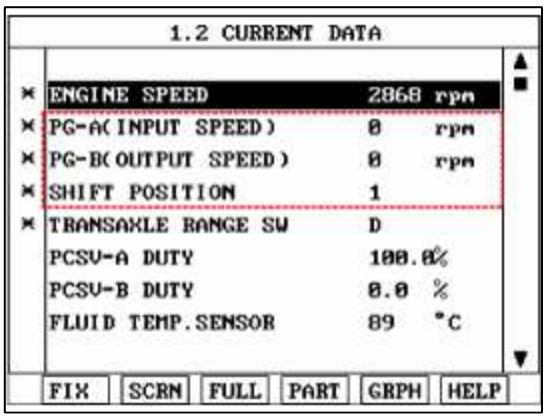
[Harness Connector]



MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR(PG-A), OUTPUT SPEED SENSOR(PG-B), GEAR POSITION" parameter on the scantool.
4. Perform the "STALL TEST" at gear position "1"

Specification : 2400~2800 engine rpm



OPERATING ELEMENT OF EACH SHIFTING RANGE

Selector lever position	Overdrive control switch	Shifting gear	Engine start	Parking Mechanism	Clutch				Brake	
					C1	C2	C3	OWC	B1	B2
P	-	Neutral	Possible	O						
R	-	Reverse			O					
N	-	Neutral	Possible							O
D	ON	1st				O		O		
		2nd				O			O	
		3rd			O	O	O			
		4th					O		O	
D	OFF	1st				O		O		
		2nd				O			O	
		3rd			O	O	O			
2	-	1st				O		O		
		2nd				O			O	
L	-	1st				O				O

C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low&reverse brake

Stall test procedure in D1 and reason

Procedure

A. Warm up the engine

B. Fully depress the brake pedal, than place the transaxle gear lever in to "D" range.
Press and hold the accelerator pedal to the floor for no more than eight seconds while observing the engine, input speed, and output speed, and output speed RPM value.
* The slippage of 1st gear operating parts can be detected by stall test in D1.

Reason for stall test

A. If there is no mechanical defaults in A/T, all slippage occurs in torque converter.

B. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.

C. If 1st gear operating part has faults, input speed revolution will be out of specification.

D. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

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5. Is "STALL TEST " within specification?

YES

Go to "W/Harness inspection" procedure.

NO

Go to "Component inspection" procedure.

CAUTION

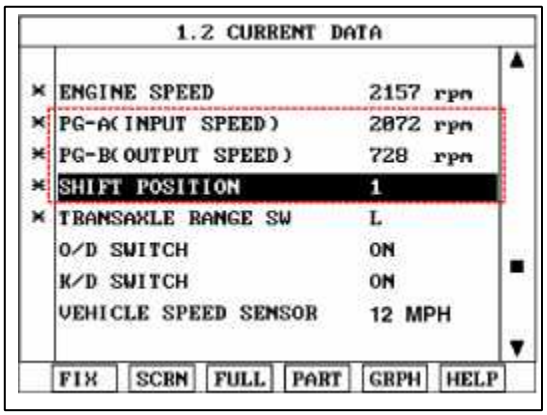
- Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
- Check the A/T fluid level and temperature and the engine coolant temperature.
  - Fluid level : At the hot mark on the oil level gauge.
  - Fluid temperature : 176 °F~ 212 °F (80~100 °C).
  - Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).
- Chock both rear wheel(left and right).
- Pull the parking brake lever on with the brake pedal fully depressed.
- The throttle should not be left fully open for more than eight seconds.
- If carrying out the stall test two or more times, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent tests.

Perform stall test on "L" range If the result of stall test on "D" range is out of specifications. "One Way Clutch" is fauly If the result of stall test on "L" range is within specifications.

SIGNAL CIRCUIT INSPECTION

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR, OUTPUT SPEED SENSOR, GEAR POSITION" parameter on the scantool.
4. Perform the "STALL TEST" at gear position "1".

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



5. Are "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES

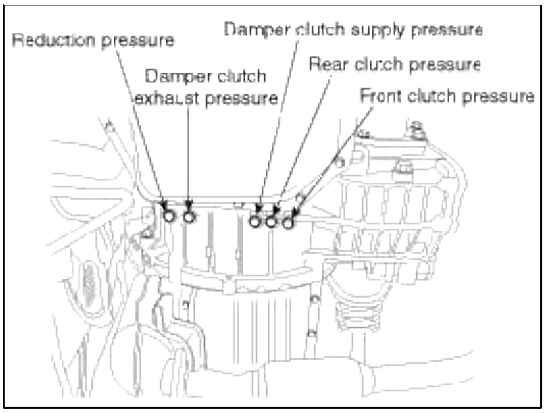
Go to "Component inspection" procedure.

NO

Check for electrical noise of circuit in INPUT&OUTPUT SPEED SENSOR or Replace INPUT&OUTPUT SPEED SENSOR. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION

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1. Connect oil pressure gauge to "R/C(rear clutch)" port.
2. Engine "ON".
3. Drive a car at gear position 1 in "D RANGE".
4. Compare actual value to specifications.

Specification : Shown below

No.	Measurement Condition			Standard hydraulic pressure kpa(kg/cm², psi)							
				1	2	3	4	5	6	7	8
	Select lever position	Engine speed (rpm)	Shift position	Reduction pressure	Servo apply pressure	Rear clutch pressure	Front clutch pressure	End clutch pressure	Low & reverse brake pressure	Torque converter pressure	Damper clutch pressure
1	N	Idling	Neutral	402~422 (4.1~4.3, 58~61)	-	-	-	-	-	-	-
2	D (switch ON)	2,500	4th gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	-	-	834~873 (8.5~8.9 121~127)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
3	D	2,500	3rd gear	402~422 (4.1~4.3, 58~61)	844~883 (8.6~9.0, 122~128)	844~883 (8.6~9.0, 122~128)	824~863 (8.4~8.8, 119~125)	844~883 (8.6~9.1, 122~128)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
4	D	2,500	2nd gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	844~883 (8.6~9.0, 122~128)	-	-	-	-	628~687 (6.4~7.0, 91~96) D/C ON
5	L	1,000	1st gear	402~422 (4.1~4.3, 58~61)	-	844~883 (8.6~9.0, 122~128)	-	-	343~520 (3.5~5.3, 50~75)	422~480 (4.3~4.9, 61~70)	235~275 (2.4~2.8, 34~40) D/C OFF
6	R	2,500	Reverse	441~461 (4.5~4.7, 64~67)	-	-	1815~1913 (18.5~19.5, 263~277)	-	1815~1913 (18.5~19.5, 263~277)	432~490 (4.4~5.0, 63~71)	265~343 (2.7~3.5, 38~50) D/C OFF

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NOTE

- "-" is 0.2(0.3)kg/cm² or less and "( )" is the reverse.
- SW-ON : Turn the overdrive control switch ON.
- SW-OFF : Turn the overdrive control switch OFF.
- The hydraulic pressure may be more than standard value at the ambient temperature.

The values are subject to change according to vehicle model or condition

5. Is oil pressure value within specification?

YES

Repair AUTO TRANSAXLE(Clutch or brake) as necessary and go to "Verification of vehicle repair" procedure.

NO

Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and go to "Verification of vehicle repair " procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present ?

YES

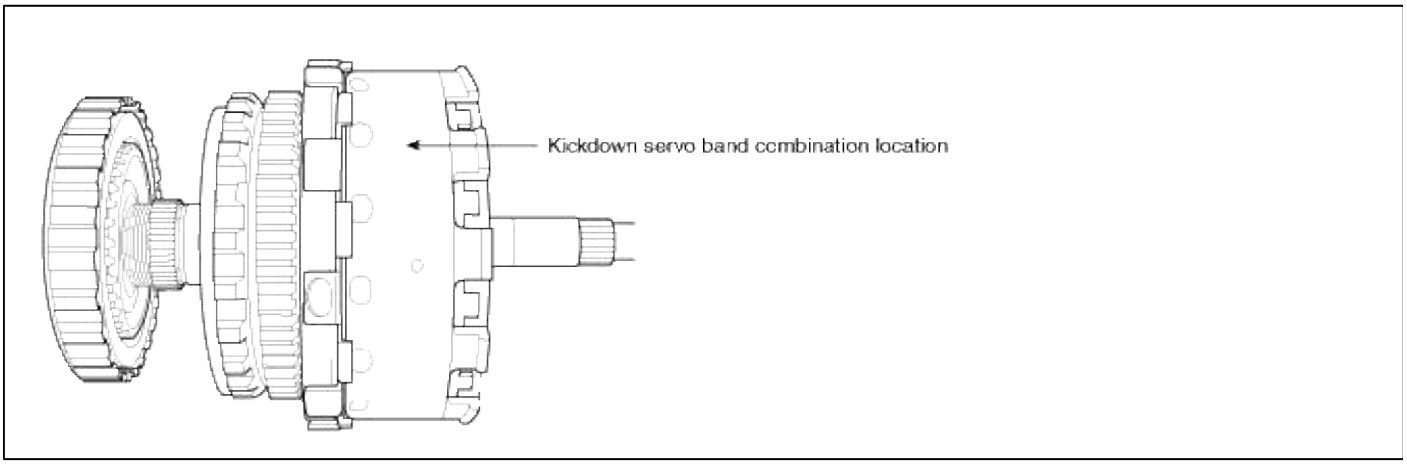
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0732

COMPONENT LOCATION



GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 2nd gear ratio, while the transaxle is engaged in the 2nd gear. For example, if the input speed is 1000 rpm and the 2nd gear ratio is 1.581, then the output speed is 1581 rpm.

DTC DESCRIPTION

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This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 2nd gear ratio, while the transaxle is engaged in 2nd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• 2nd gear incorrect ratio	• Faulty input speed sensor • Faulty output speed sensor • Faulty R/C or K/D F/C-Front Clutch R/C - Rear Clutch E/C - End Clutch OWC - One Way Clutch K/B - Kicdown brake L/R - Low&Reverse brake
Enable Conditions	• Engine speed >400rpm • Output speed(PG-B) >600rpm • Shift stage 2nd gear • Input speed(PG-A) >300rpm • A/T fluid temp. >-10°C(14°F) • Inhibitor switch : "D,2" • Solenoid is normal	
Threshold value	• Input speed/2nd gear ratio - output speed ≥200rpm	
Diagnostic Time	• More than 1 sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0732 is output four times, the transaxle is locked into 3rd gear)	

SIGNAL WAVEFORM

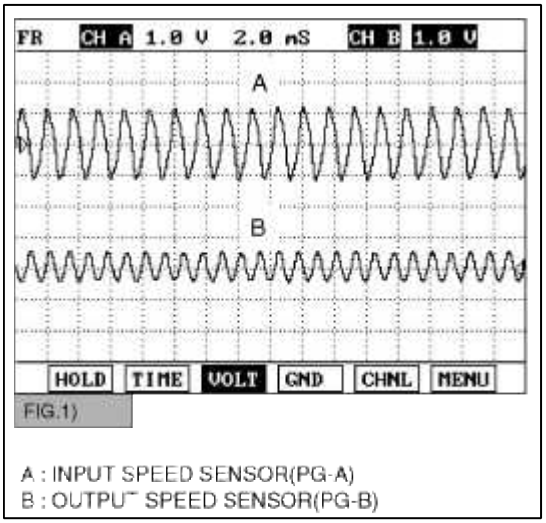


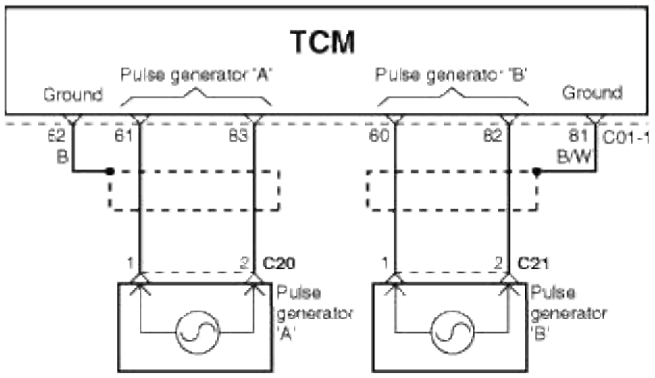
FIG.1)

A : INPUT SPEED SENSOR(PG-A)
B : OUTPU" SPEED SENSOR(PG-B)

SCHEMATIC DIAGRAM

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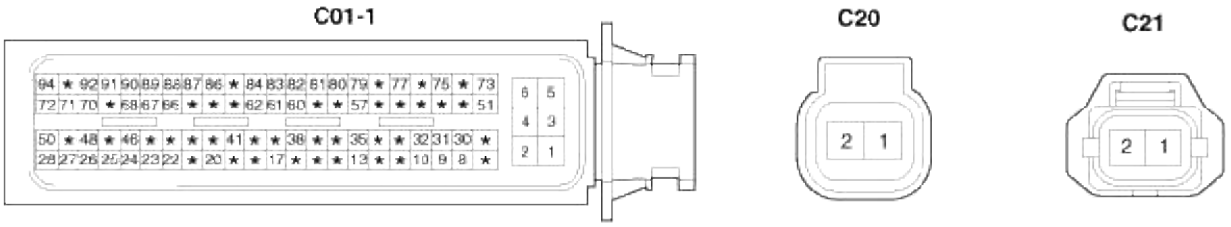
[Circuit Diagram]



[Connection Information]

Terminal	Connection	Function
C20-1	TCM (C01-1 No.61)	Pulse generator A +
C20-2	TCM (C01-1 No.83)	Pulse generator A -
C21-1	TCM (C01-1 No.60)	Pulse generator B +
C21-2	TCM (C01-1 No.82)	Pulse generator B -

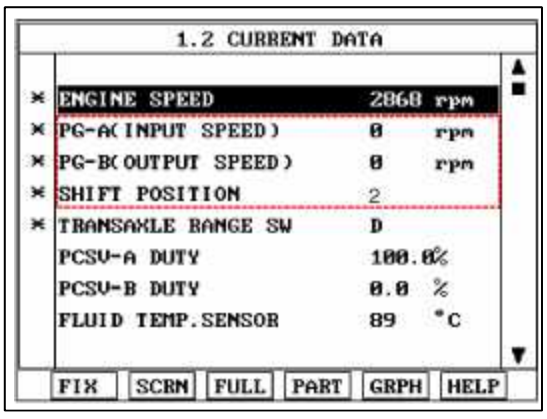
[Harness Connector]



MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR(PG-A), OUTPUT SPEED SENSOR(PG-B), GEAR POSITION" parameter on the scantool.
4. Perform the "STALL TEST" at gear position "2"

Specification : 2400~2800 engine rpm



* This test is possible only for "HOLD S/W" or "SPORTS MODE" applied vehicles.

OPERATING ELEMENT OF EACH SHIFTING RANGE

Selector lever position	Overdrive control switch	Shifting gear	Engine start	Parking Mechanism	Clutch				Brake	
					C1	C2	C3	OWC	B1	B2
P	-	Neutral	Possible	O						
R	-	Reverse			O					
N	-	Neutral	Possible							O
D	ON	1st				O		O		
		2nd				O			O	
		3rd			O	O	O			
		4th					O		O	
D	OFF	1st				O		O		
		2nd				O			O	
		3rd			O	O	O			
2	-	1st				O		O		
		2nd				O			O	
L	-	1st				O				O

C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low&reverse brake

Stall test procedure in D2 and reason

Procedure

A. Warm up the engine
B. After positioning the select lever in "D" and "ON" of the HOLD SW.
C. Depress the foot brake pedal fully after that, depress the accelerator pedal to the maximum.
   * The slippage of 2nd gear operating parts can be detected by stall test in D2.

Reason for stall test

A. If there is no mechanical defaults in A/T, all slippage occurs in torque converter.
B. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.
C. If 2nd gear operating part has faults, input speed revolution will be out of specification.
D. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

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5. Is "STALL TEST " within specification?

YES

Go to "W/Harness inspection" procedure.

NO

Go to "Component inspection" procedure.

CAUTION

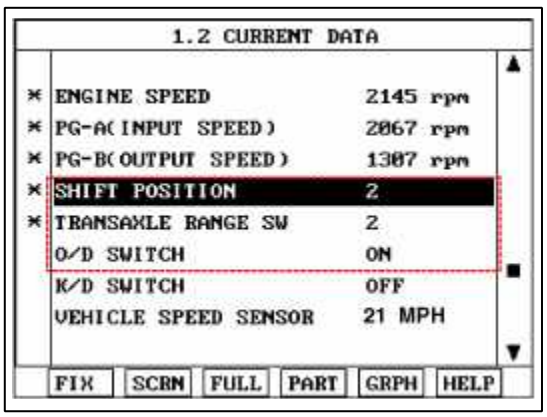
- Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
- Check the A/T fluid level and temperature and the engine coolant temperature.
  - Fluid level : At the hot mark on the oil level gauge.
  - Fluid temperature : 176 °F~ 212 °F (80~100 °C).
  - Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).
- Chock both rear wheel(left and right).
- Pull the parking brake lever on with the brake pedal fully depressed.
- The throttle should not be left fully open for more than eight seconds.
- If carrying out the stall test two or more times, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent test.

Perform stall test on "L" range If the result of stall test on "D" range is out of specifications. "One Way Clutch" is fauly If the result of stall test on "L" range is within specifications.

SIGNAL CIRCUIT INSPECTION

1. Connect Scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.
4. Accelerate the engine speed until about 2000 rpm in the 2nd gear while driving the vehicle on a level road.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



5. Are "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES

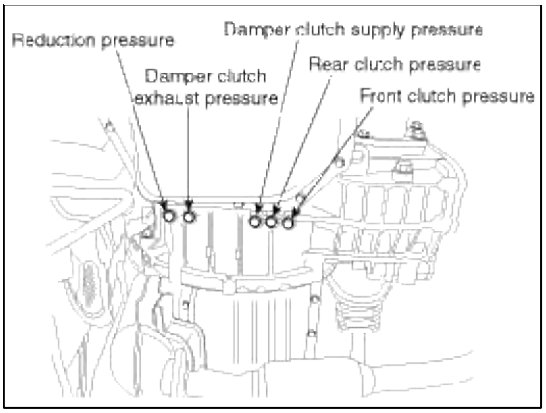
Go to "Component inspection" procedure.

NO

Check for electrical noise of circuit in INPUT&OUTPUT SPEED SENSOR or Replace INPUT&OUTPUT SPEED SENSOR. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION

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1. Connect oil pressure gauge to "R/C" and "K/D" port.
2. Engine "ON".
3. Drive a car at gear position 2 in "D RANGE".
4. Compare actual value to specifications.

Specification : Shown below

No.	Measurement Condition			Standard hydraulic pressure kpa(kg/cm², psi)							
				1	2	3	4	5	6	7	8
	Select lever position	Engine speed (rpm)	Shift position	Reduction pressure	Servo apply pressure	Rear clutch pressure	Front clutch pressure	End clutch pressure	Low & reverse brake pressure	Torque converter pressure	Damper clutch pressure
1	N	Idling	Neutral	402~422 (4.1~4.3, 58~61)	-	-	-	-	-	-	-
2	D (switch ON)	2,500	4th gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	-	-	834~873 (8.5~8.9 121~127)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
3	D	2,500	3rd gear	402~422 (4.1~4.3, 58~61)	844~883 (8.6~9.0, 122~128)	844~883 (8.6~9.0, 122~128)	824~863 (8.4~8.8, 119~125)	844~883 (8.6~9.1, 122~128)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
4	D	2,500	2nd gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	844~883 (8.6~9.0, 122~128)	-	-	-	-	628~687 (6.4~7.0, 91~96) D/C ON
5	L	1,000	1st gear	402~422 (4.1~4.3, 58~61)	-	844~883 (8.6~9.0, 122~128)	-	-	343~520 (3.5~5.3, 50~75)	422~480 (4.3~4.9, 61~70)	235~275 (2.4~2.8, 34~40) D/C OFF
6	R	2,500	Reverse	441~461 (4.5~4.7, 64~67)	-	-	1815~1913 (18.5~19.5, 263~277)	-	1815~1913 (18.5~19.5, 263~277)	432~490 (4.4~5.0, 63~71)	265~343 (2.7~3.5, 38~50) D/C OFF

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NOTE

- "-" is 0.2(0.3)kg/cm² or less and "( )" is the reverse.
- SW-ON : Turn the overdrive control switch ON.
- SW-OFF : Turn the overdrive control switch OFF.
- The hydraulic pressure may be more than standard value at the ambient temperature.

The values are subject to change according to vehicle model or condition

5. Is oil pressure value within specification?

YES

Repair AUTO TRANSAXLE(Clutch or brake) as necessary and go to "Verification of vehicle repair" procedure.

NO

Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and go to "Verification of vehicle repair " procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present ?

YES

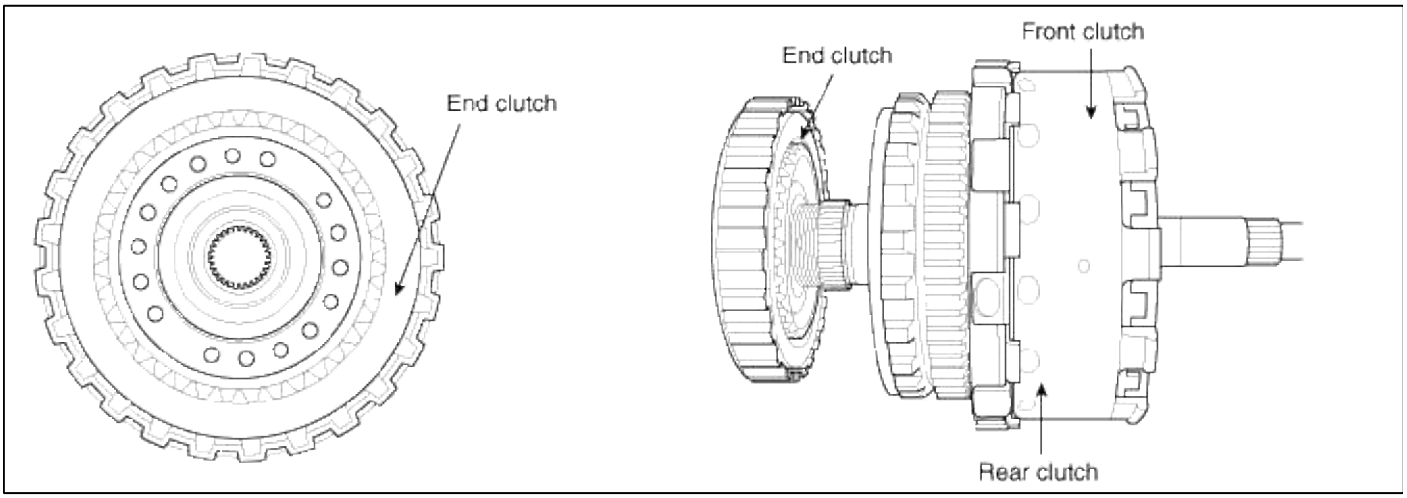
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0733

COMPONENT LOCATION



GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 3rd gear ratio, while the transaxle is engaged in the 3rd gear. For example, if the input speed is 1000 rpm and the 3rd gear ratio is 1.000, then the output speed is approx. 1000 rpm.

DTC DESCRIPTION

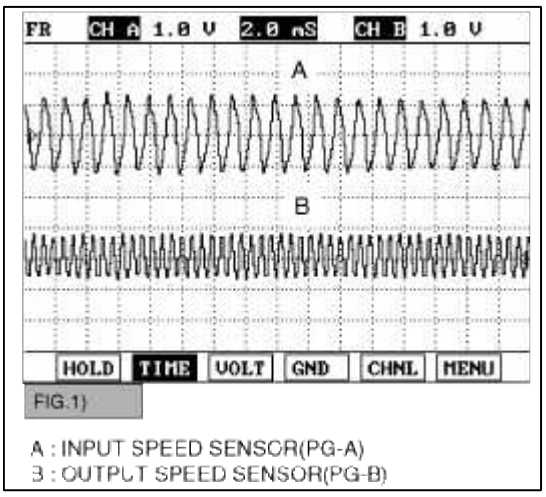
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This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 3rd gear ratio, while the transaxle is engaged in 3rd gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• 3rd gear incorrect ratio	• Faulty input speed sensor • Faulty output speed sensor • Faulty R/D or F/C or E/C F/C-Front Clutch R/C - Rear Clutch E/C - End Clutch OWC - One Way Clutch K/B - Kicdown brake L/R - Low&Reverse brake
Enable Conditions	• Engine speed >400rpm • Output speed(PG-B) >600rpm • Shift stage 3rd gear • Input speed(PG-A) >300rpm • A/T fluid temp. >-10°C(14°F) • Inhibitor switch : "D" • Solenoid is normal	
Threshold value	• Input speed/3rd gear ratio - output speed ≥200rpm	
Diagnostic Time	• More than 1 sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0733 is output four times, the transaxle is locked into 3rd gear)	

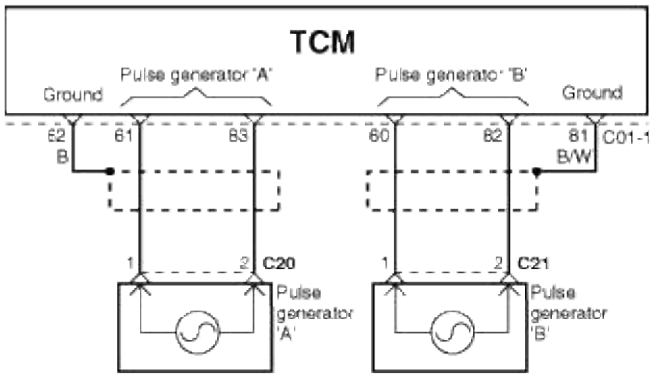
SIGNAL WAVEFORM



SCHEMATIC DIAGRAM

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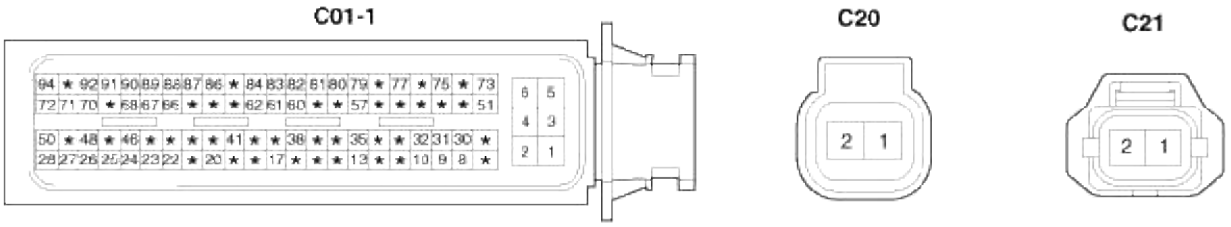
[Circuit Diagram]



[Connection Information]

Terminal	Connection	Function
C20-1	TCM (C01-1 No.61)	Pulse generator A +
C20-2	TCM (C01-1 No.83)	Pulse generator A -
C21-1	TCM (C01-1 No.60)	Pulse generator B +
C21-2	TCM (C01-1 No.82)	Pulse generator B -

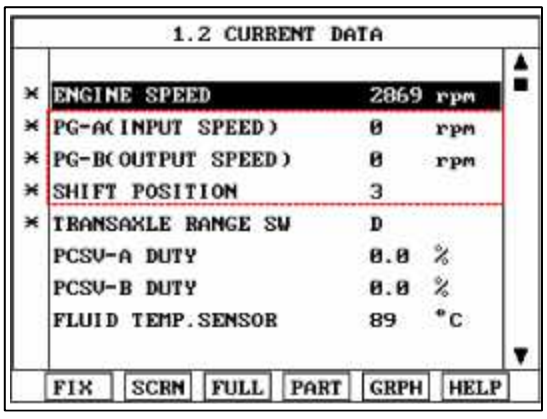
[Harness Connector]



MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "ENGINE SPEED, INPUT SPEED SENSOR(PG-A), OUTPUT SPEED SENSOR(PG-B), GEAR POSITION" parameter on the scantool.
4. Disconnect the solenoid valve connector and perform the "STALL TEST".

Specification : 2400~2800 engine rpm



OPERATING ELEMENT OF EACH SHIFTING RANGE

Selector lever position	Overdrive control switch	Shifting gear	Engine start	Parking Mechanism	Clutch				Brake	
					C1	C2	C3	OWC	B1	B2
P	-	Neutral	Possible	O						
R	-	Reverse			O					
N	-	Neutral	Possible							O
D	ON	1st				O		O		
		2nd				O			O	
		3rd			O	O	O			
		4th					O		O	
D	OFF	1st				O		O		
		2nd				O			O	
		3rd			O	O	O			
2	-	1st				O		O		
		2nd				O			O	
L	-	1st				O				O

C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low&reverse brake

Stall test procedure in D3 and reason

Procedure

A. Warm up the engine

B. Set 3rd gear hold by disconnecting the solenoid valve connector. Fylly depress the brake pedal, then place the transaxle gear lever into "D" range. Press and hold the accelerator pedal to the floor for no more than eight seconds while observing the engine, input speed, and output speed RPM values.
   * The slippage of 3rd gear operating parts can be detected by stall test in D3.

Reason for stall test

A. If there is no mechanical defaults in A/T, all slippage occurs in torque converter.

B. Therefore, engine revolution is output, but input and output speed revolution must be "zero" due to wheel's lock.

C. If 3rd gear operating part has faults, input speed revolution will be out of specification.

D. If output speed revolution is output. It means that the foot brake force is not applied fully. Remeasuring is required.

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5. Is "STALL TEST " within specification?

YES

Go to "W/Harness inspection" procedure.

NO

Go to "Component inspection" procedure.

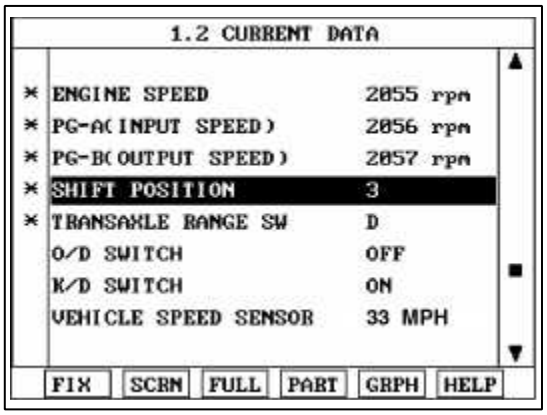
CAUTION

- Do not let anybody stand in front of or behind the vehicle while this test is being carried out.
- Check the A/T fluid level and temperature and the engine coolant temperature.
  - Fluid level : At the hot mark on the oil level gauge.
  - Fluid temperature : 176 °F~ 212 °F (80~100 °C).
  - Engine coolant temperature : 176 °F~ 212 °F (80~100 °C).
- Chock both rear wheel(left and right).
- Pull the parking brake lever on with the brake pedal fully depressed.
- The throttle should not be left fully open for more than eight seconds.
- If carrying out the stall test two or more times, move the select lever to the "N" position and run the engine at 1,000 rpm to let the A/T fluid cool down before carrying out subsequent test.

SIGNAL CIRCUIT INSPECTION

1. Connect scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.
4. Accelerate the Engine speed until about 2000 rpm in the 3rd gear while driving the vehicle on a level road.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



5. Are "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES

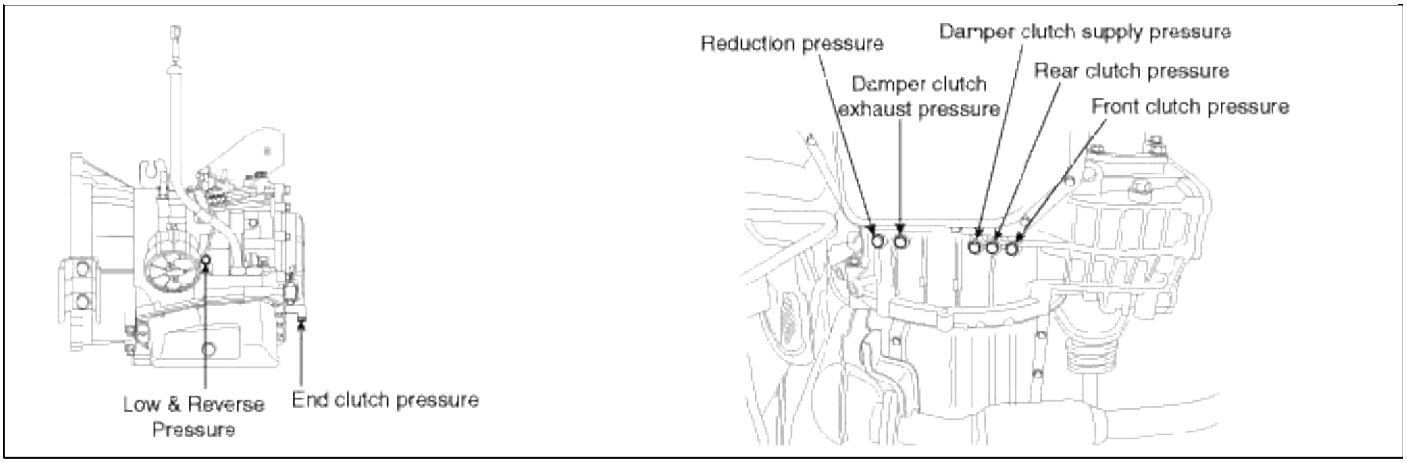
Go to "Component inspection" procedure.

NO

Check for electrical noise of circuit in INPUT&OUTPUT SPEED SENSOR or Replace INPUT&OUTPUT SPEED SENSOR. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION

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1. Connect oil pressure gauge to "E/C" and "R/C" and "F/C"port.
2. Engine "ON".
3. Disconnect the solenoid valve connector.
4. Drive a car at gear position 3 in "D RANGE".
5. Compare actual value to specifications.

Specification : Shown below

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No.	Measurement Condition			Standard hydraulic pressure kpa(kg/cm², psi)							
				1	2	3	4	5	6	7	8
	Select lever position	Engine speed (rpm)	Shift position	Reduction pressure	Servo apply pressure	Rear clutch pressure	Front clutch pressure	End clutch pressure	Low & reverse brake pressure	Torque converter pressure	Damper clutch pressure
1	N	Idling	Neutral	402~422 (4.1~4.3, 58~61)					-	-	-
2	D (switch CN)	2,500	4th gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	-	-	834~873 (8.5~8.9 12'~127)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
3	D	2,500	3rd gear	402~422 (4.1~4.3, 58~61)	844~883 (8.6~9.0, 122~128)	844~883 (8.6~9.0, 122~128)	824~863 (8.4~8.8, 119~125)	844~883 (8.6~9.1, 122~128)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
4	D	2,500	2nd gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	844~883 (8.6~9.0, 122~128)	-	-	-	-	628~687 (6.4~7.0, 91~96) D/C ON
5	L	1,000	1st gear	402~422 (4.1~4.3, 58~61)	-	844~883 (8.6~9.0, 122~128)	-	-	343~520 (3.5~5.3, 50~75)	422~480 (4.3~4.9, 61~70)	235~275 (2.4~2.8, 34~40) D/C OFF
6	R	2,500	Reverse	441~461 (4.5~4.7, 64~67)	-	-	1815~1913 (18.5~19.5, 263~277)	-	1815~1913 (18.5~19.5, 263~277)	432~490 (4.4~5.0, 63~71)	265~343 (2.7~3.5, 38~50) D/C OFF

NOTE

- "-" is 0.2(0.3)kg/cm² or less and "( )" is the reverse.
- SW-ON : Turn the overdrive control switch ON.
- SW-OFF : Turn the overdrive control switch OFF.
- The hydraulic pressure may be more than standard value at the ambient temperature.

The values are subject to change according to vehicle model or condition

6. Is oil pressure value within specifications?

YES

Repair AUTO TRANSAXLE(Clutch or brake) as necessary and go to "Verification of vehicle repair" procedure.

NO

Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and go to "Verification of vehicle repair " procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.

2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present ?

YES

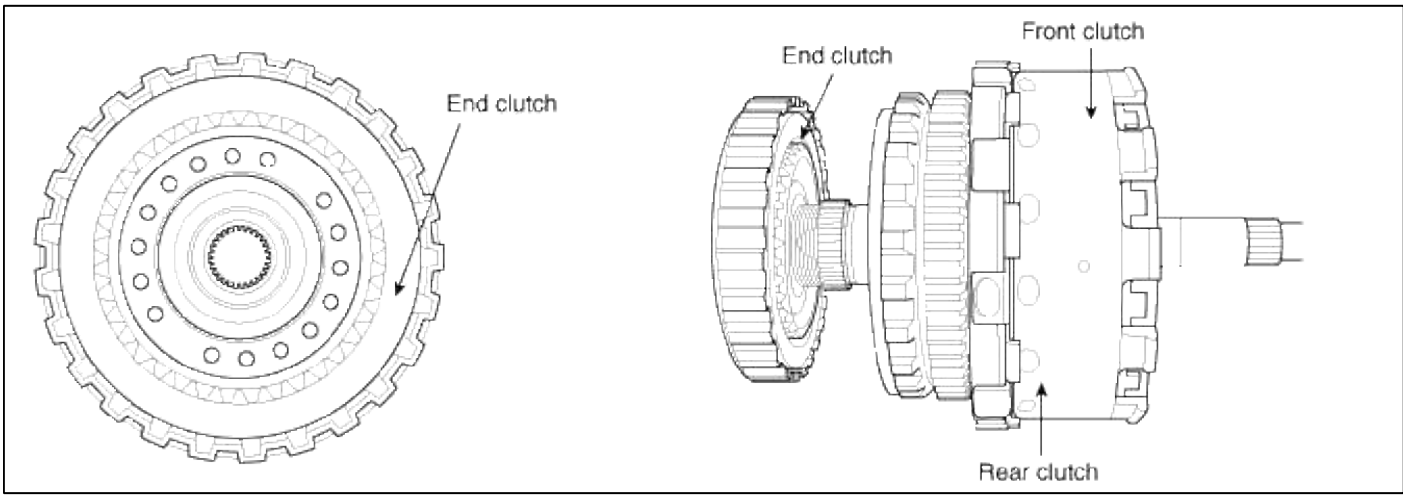
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0734

COMPONENT LOCATION



GENERAL DESCRIPTION

The value of the input shaft speed should be equal to the value of the output shaft speed, when multiplied by the 4th gear ratio, while the transaxle is engaged in the 4th gear. For example, if the input speed is 1000 rpm and the 4th gear ratio is 0.685, then the output speed is 685 rpm.

DTC DESCRIPTION

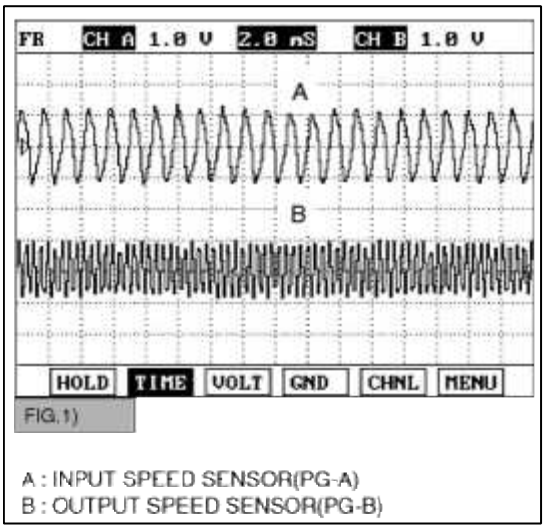
This code is set if the value of input shaft speed is not equal to the value of the output shaft, when multiplied by the 4th gear ratio, while the transaxle is engaged in 4th gear. This malfunction is mainly caused by mechanical troubles such as control valve sticking or solenoid valve malfunctioning rather than an electrical issue.

DTC DETECTING CONDITION

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Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• 4th gear incorrect ratio	• Faulty input speed sensor • Faulty output speed sensor • Faulty E/C or K/D F/C-Front Clutch R/C - Rear Clutch E/C - End Clutch OWC - One Way Clutch K/B - Kicdown brake L/R - Low&Reverse brake
Enable Conditions	• Engine speed >400rpm • Output speed(PG-B) >600rpm • Shift stage 4th gear • Input speed(PG-A) >300rpm • A/T fluid temp. >-10°C(14°F) • Inhibitor switch : "D" • Solenoid is normal	
Threshold value	• Input speed/4th gear ratio - output speed ≥200rpm	
Diagnostic Time	• More than 1sec	
Fail Safe	• Locked into 3rd gear. (If diagnosis code P0734 is output four times, the transaxle is locked into 3rd gear)	

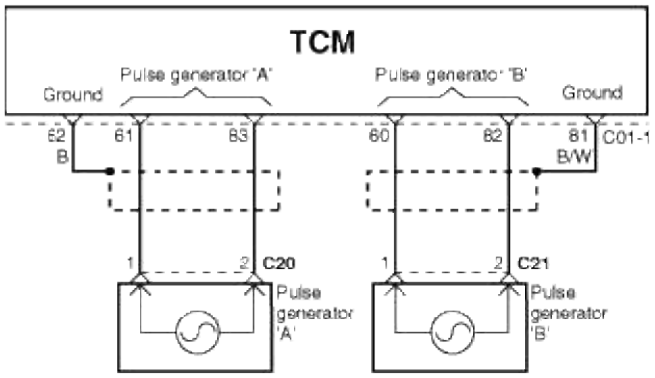
SIGNAL WAVEFORM



SCHEMATIC DIAGRAM

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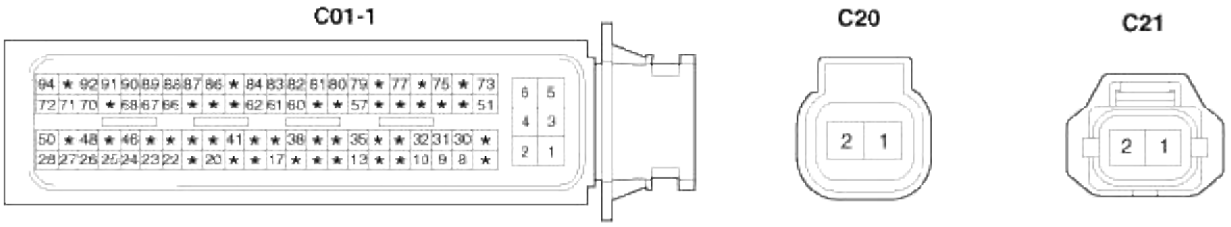
[Circuit Diagram]



[Connection Information]

Terminal	Connection	Function
C20-1	TCM (C01-1 No.61)	Pulse generator A +
C20-2	TCM (C01-1 No.83)	Pulse generator A -
C21-1	TCM (C01-1 No.60)	Pulse generator B +
C21-2	TCM (C01-1 No.82)	Pulse generator B -

[Harness Connector]



MONITOR SCANTOOL DATA

It is difficult to "STALL TEST" in reverse gear, therefore Go to "W/Harness inspection" procedure.

OPERATING ELEMENT OF EACH SHIFTING RANGE

Selector lever position	Overdrive control switch	Shifting gear	Engine start	Parking Mechanism	Clutch				Brake	
					C1	C2	C3	OWC	B1	B2
P	-	Neutral	Possible	O						
R	-	Reverse			O					
N	-	Neutral	Possible							O
D	ON	1st				O		O		
		2nd				O			O	
		3rd			O	O	O			
		4th					O		O	

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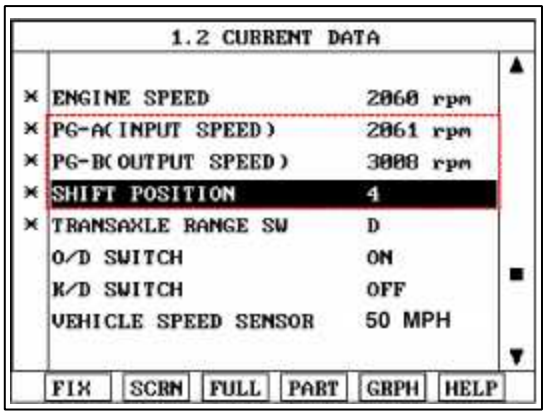
D	OFF	1st				O		O		
		2nd				O			O	
		3rd			O	O	O			
2	-	1st				O		O		
		2nd				O			O	
L	-	1st				O				O

C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low&reverse brake

SIGNAL CIRCUIT INSPECTION

1. Connect scantool.
2. Engine "ON".
3. Monitor the "INPUT & OUTPUT SPEED SENSOR" parameter on the scantool.
4. Accelerate the engine speed until about 2000 rpm in the 4th gear while driving the vehicle on a level road.

Specification : INPUT SPEED - (OUTPUT SPEED × GEAR RATIO) ≤ 200 RPM



5. Are "INPUT & OUTPUT SPEED SENSOR" within specifications?

YES

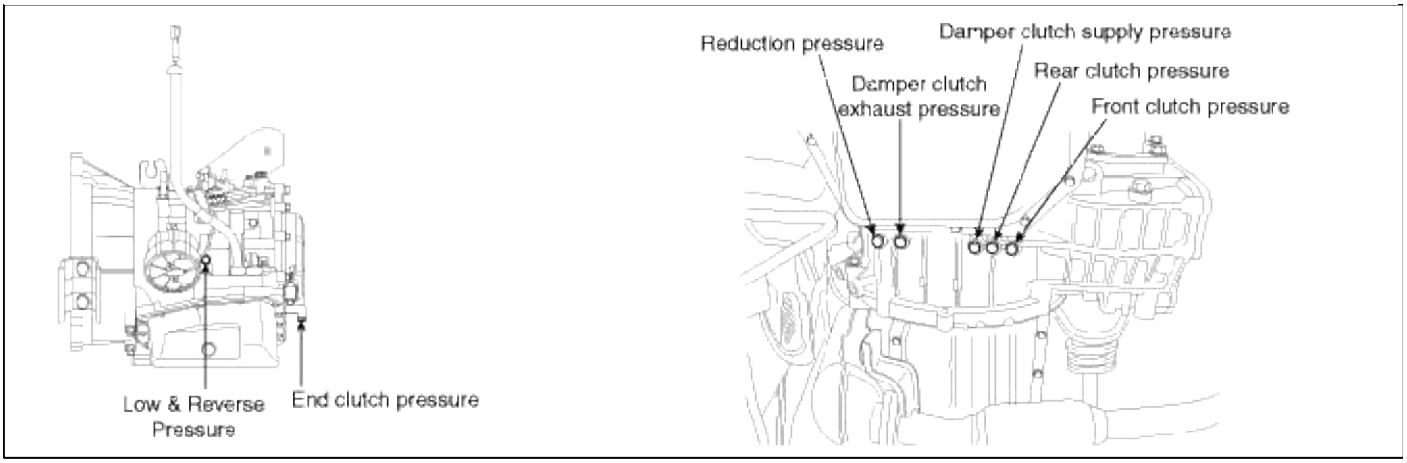
Go to "Component inspection" procedure.

NO

Check for electrical noise of circuit in INPUT&OUTPUT SPEED SENSOR or Replace INPUT&OUTPUT SPEED SENSOR. Repair as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION

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1. Connect oil pressure gauge to "E/C" and "K/D" port.
2. Engine "ON".
3. Drive a car at gear position "4" in "D RANGE".
4. Compare actual value to specifications.

Specification : Shown below

No.	Measurement Condition			Standard hydraulic pressure kpa(kg/cm², psi)							
				1	2	3	4	5	6	7	8
	Select lever position	Engine speed (rpm)	Shift position	Reduction pressure	Servo apply pressure	Rear clutch pressure	Front clutch pressure	End clutch pressure	Low & reverse brake pressure	Torque converter pressure	Damper clutch pressure
1	N	Idling	Neutral	402~422 (4.1~4.3, 58~61)	-	-	-	-	-	-	-
2	D (switch ON)	2,500	4th gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	-	-	834~873 (8.5~8.9 121~127)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
3	D	2,500	3rd gear	402~422 (4.1~4.3, 58~61)	844~883 (8.6~9.0, 122~128)	844~883 (8.6~9.0, 122~128)	824~863 (8.4~8.8, 119~125)	844~883 (8.6~9.1, 122~128)	-	-	628~687 (6.4~7.0, 91~96) D/C ON
4	D	2,500	2nd gear	402~422 (4.1~4.3, 58~61)	853~893 (8.7~9.1, 124~129)	844~883 (8.6~9.0, 122~128)	-	-	-	-	628~687 (6.4~7.0, 91~96) D/C ON
5	L	1,000	1st gear	402~422 (4.1~4.3, 58~61)	-	844~883 (8.6~9.0, 122~128)	-	-	343~520 (3.5~5.3, 50~75)	422~480 (4.3~4.9, 61~70)	235~275 (2.4~2.8, 34~40) D/C OFF
6	R	2,500	Reverse	441~461 (4.5~4.7, 64~67)	-	-	1815~1913 (18.5~19.5, 263~277)	-	1815~1913 (18.5~19.5, 263~277)	432~490 (4.4~5.0, 63~71)	265~343 (2.7~3.5, 38~50) D/C OFF

NOTE

- "-" is 0.2(0.3)kg/cm² or less and "( )" is the reverse.
- SW-ON : Turn the overdrive control switch ON.
- SW-OFF : Turn the overdrive control switch OFF.
- The hydraulic pressure may be more than standard value at the ambient temperature.

The values are subject to change according to vehicle model or condition

5. Is oil pressure value within specifications?

YES

Repair AUTO TRANSAXLE(Clutch or brake) as necessary and go to "Verification of vehicle repair" procedure.

NO

Replace AUTO TRANSAXLE (BODY CONTROL VALVE faulty) as necessary and go to "Verification of vehicle repair " procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present ?

YES

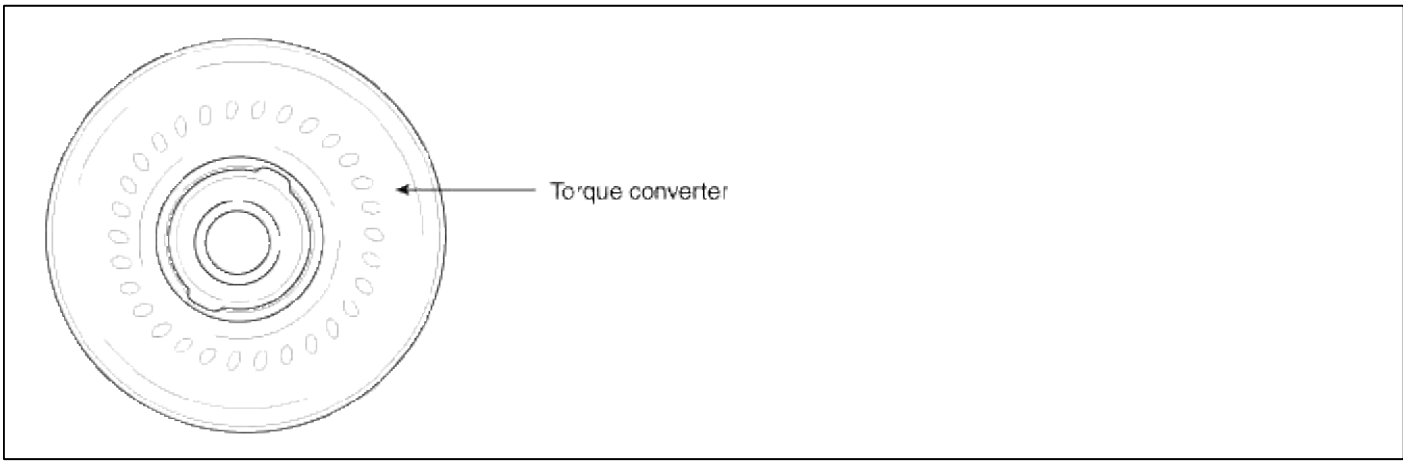
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0741

COMPONENT LOCATION



GENERAL DESCRIPTION

The PCM controls the locking and unlocking of the Torque Converter Clutch (or Damper Clutch), to the input shaft of the transmission, by appling hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The PCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve(DCCSV) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked. The normal operating range of the Damper Clutch Control duty ratio value is from 30%(unlocked) to 85%(locked).

DTC DESCRIPTION

The PCM increases the duty ratio to engage the Damper Clutch by monitoring slip rpms (difference vlaue beteween engine speed and turbine speed). To decrease the slip of the Damper Clutch, the PCM increases the duty ratio by appling more hyraulic pressure. When slip rpm does not drop under specification with 100% duty ratio, the PCM determines that the Torque Converter Clutch is stuck OFF and sets this code.

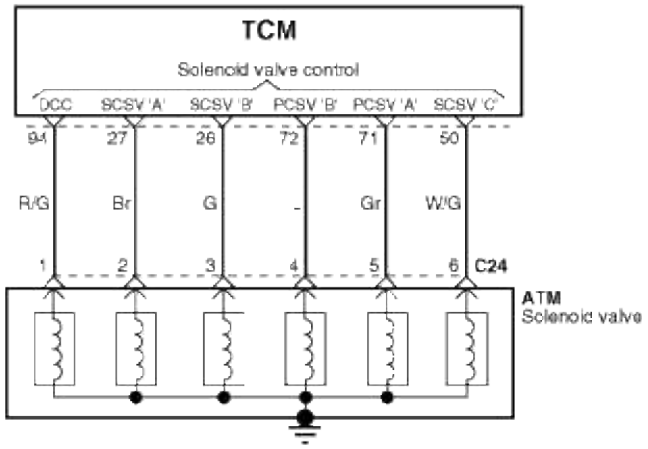
DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Stuck "OFF"	TORQUE CONVERTER(DAMPER) CLUTCH : TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty PCM
Enable Conditions	• A/T range switch D,2,L • Solenoid valve status is 100% duty	
Threshold value	• Calculated slip (engine speed-input speed) >100rpm(need to verify threshold value)	
Diagnostic Time	• More than 10secs	
Fail Safe	• Damper clutch abnormal system (If diagnosis code P0741 is output four times, TORQUE CONVERTER(DAMPER) CLUTCH is not controlled by PCM)	

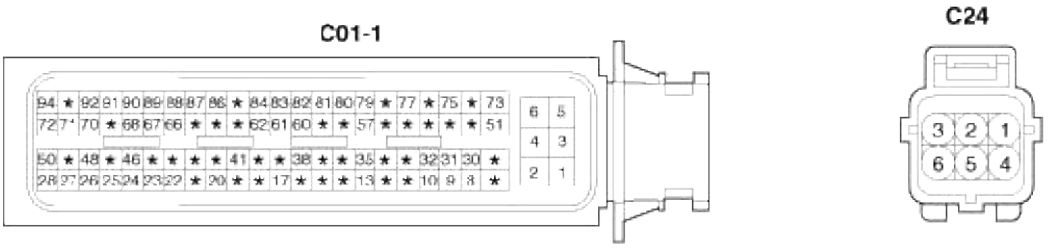
SCHEMATIC DIAGRAM

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[Circuit Diagram]



[Harness Connector]



[Connection Information]

Terminal	Connection	Function
1	TCM (C01-1 No 94)	Damper clutch(TCC) control solenoid valve
2	TCM (C01-1 No 27)	Shift control solenoid valve A
3	TCM (C01-1 No 26)	Shift control solenoid valve B
4	TCM (C01-1 No 72)	Pressure control solenoid valve B
5	TCM (C01-1 No 71)	Pressure control solenoid valve A
6	TCM (C01-1 No 50)	Shift control solenoid valve C

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Select "D RANGE" and drive vehicle.

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4. Monitor the "TORQUE CONVERTER(DAMPER) CLUTCH" parameter on the scantool.

Specification : TCC SLIP<100RPM(In condition that TCC SOL. DUTY = 100%)

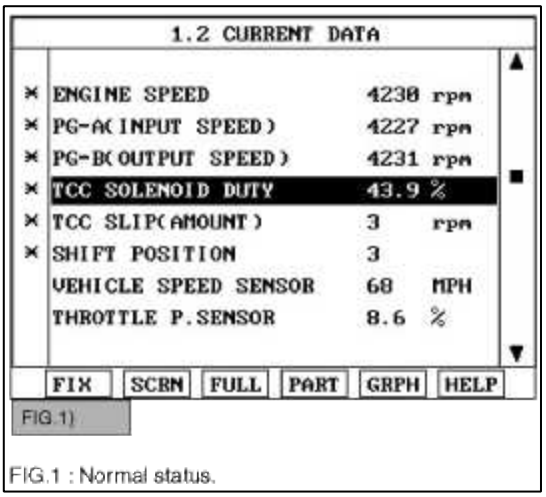


FIG.1 : Normal status.

5. Is "TCC SLIP" within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Component inspection" procedure.

COMPONENT INSPECTION

1. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE

(1) Connect scantool to data link connector(DLC).

(2) Ignition "ON" & Engine "OFF".

(3) Select A/T solenoid valve actuator test and operate actuator test.

(4) Can you hear operating tone for using TCC SOLENOID VALVE actuator testing function?

YES

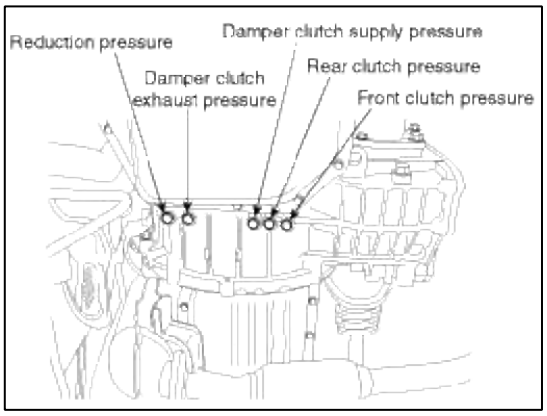
Go to "CHECK OIL PRESSURE" as below.

NO

Repair or replace as necessary and then go to "TCC SOLENOID VALVE" and go to "Verification of vehicle repair" procedure.

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2. CHECK OIL PRESSURE



(1) Connect oil pressure gauge to "DA" port.

(2) Engine "ON".

(3) After connecting scantool and monitor the "TCC SOLENIOD VALVE DUTY" parameter on the scantool data list.

(4) Operate vehicle with 3rd or 4th gear and operate the "TCC SOLENIOD VALVE DUTY" more than 40%.

(5) Measure oil pressure.

Specification : approx. 637~686Kpa(6.4~7.0kg/cm²) - (In condition that TCC SOL. DUTY > 40%)

(6) Is oil pressure value within specification?

YES

Repair TORQUE CONVERTER CLUTCH(REPLACE Torque Converter) as necessary and go to "Verification of vehicle repair " procedure.

NO

Replace A/T ass'y (possible to BODY CONTROL VALVE faulty) as necessary and go to "Verification of vehicle repair " procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

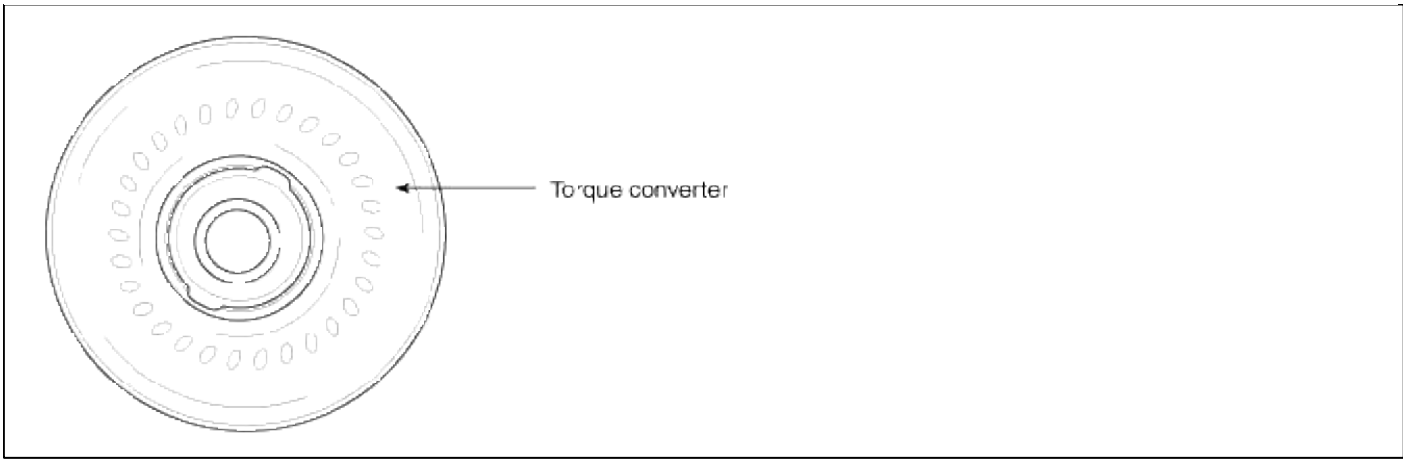
NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0742

COMPONENT LOCATION

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GENERAL DESCRIPTION

The PCM controls the locking and unlocking of the Torque Converter Clutch (or Damper Clutch), to the input shaft of the transmission, by appling hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The PCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve(DCCSV) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked. The normal operating range of the Damper Clutch Control duty ratio value is from 30%(unlocked) to 85%(locked).

DTC DESCRIPTION

The PCM increases duty ratio, to engage the Damper Clutch, by monitoring slip rpms. (difference in value between engine speed and turbine speed). However, If a very small amount of slip rpm is maintained, the PCM applies 0% duty ratio value, then the PCM judges that the Torque Converter Clutch is stuck ON and sets this code.

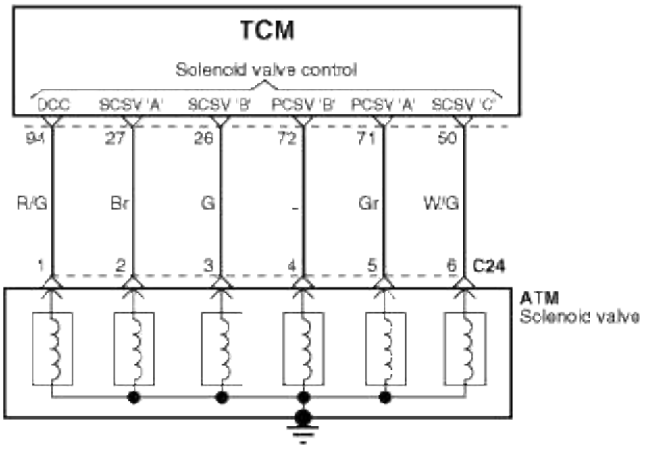
DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Stuck "ON"	TORQUE CONVERTER(DAMPER) CLUTCH : TCC • Faulty TCC or oil pressure system • Faulty TCC solenoid valve • Faulty body control valve • Faulty PCM
Enable Conditions	• Solenoid valve status is 0% duty • Throttle position ≥20% • Engine speed>0 rpm • Output speed(PG-B)>1000rpm • A/T range switch D,2,L • -10°C(14°F)< A/T fluid temperature >130°C(266°F)	
Threshold value	• Calculated slip: | engine speed-input speed | <5rpm	
Diagnostic Time	• More than 3 secs	
Fail Safe	• Damper clutch abnormal system (If diagnosis code P0742 is output four times, TORQUE CONVERTER(DAMPER) CLUTCH is not controlled by PCM)	

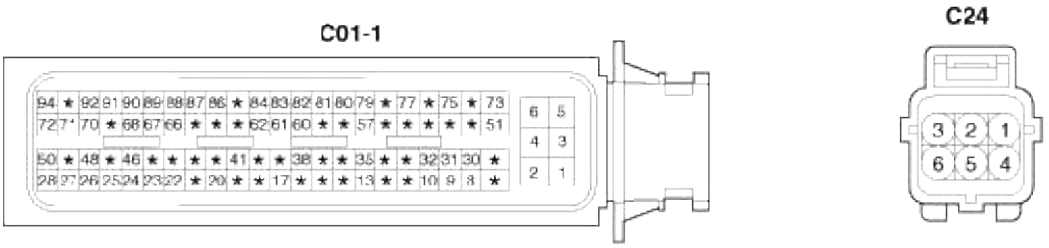
SCHEMATIC DIAGRAM

tomsn048@gmail.com

[Circuit Diagram]



[Harness Connector]



[Connection Information]

Terminal	Connection	Function
1	TCM (C01-1 No 94)	Damper clutch(TCC) control solenoid valve
2	TCM (C01-1 No 27)	Shift control solenoid valve A
3	TCM (C01-1 No 26)	Shift control solenoid valve B
4	TCM (C01-1 No 72)	Pressure control solenoid valve B
5	TCM (C01-1 No 71)	Pressure control solenoid valve A
6	TCM (C01-1 No 50)	Shift control solenoid valve C

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Select "D RANGE" and drive vehicle.

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4. Monitor the "TORQUE CONVERTER(DAMPER) CLUTCH" parameter on the scantool.

Specification : TCC SLIP>5RPM ≥ (In condition that TCC SOL. DUTY = 0%)

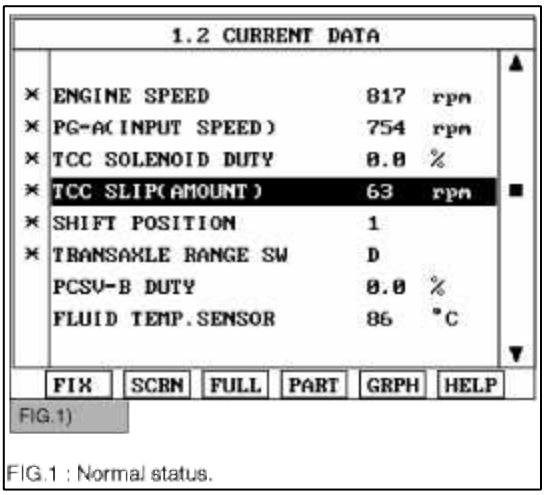


FIG.1 : Normal status.

5. Is "TCC SLIP" within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Component inspection" procedure.

COMPONENT INSPECTION

1. CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE

(1) Connect scantool to data link connector(DLC).

(2) Ignition "ON" & Engine "OFF".

(3) Select A/T solenoid valve actuator test and operate actuator test.

(4) Can you hear operating tone for using TCC SOLENOID VALVE actuator testing function?

YES

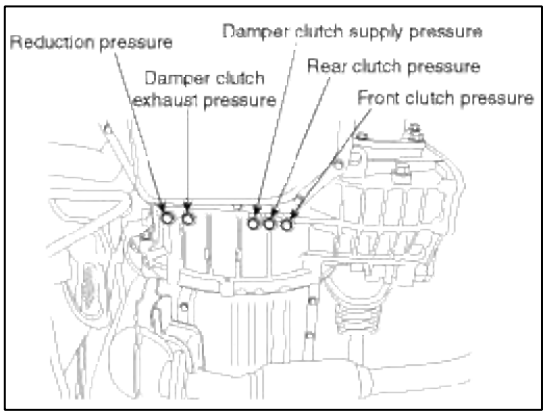
Go to "CHECK OIL PRESSURE" as below.

NO

Repair or replace as necessary and then go to "Verification of vehicle repair" procedure.

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2. CHECK OIL PRESSURE



(1) Connect oil pressure gauge to "DR" port.

(2) Ignition "ON" & Engine "OFF".

(3) After connecting scantool and monitor the "TCC SOLENIOD VALVE DUTY" parameter on the scantool data list.

(4) Select 1st gear and accelerate engine speed to 2500 rpm.

(5) Measure oil pressure.

Specification : approx. 235~274Kpa(2.4~2.8kg/cm²) ≥ (In condition that TCC SOL. DUTY = 0%)

3. Is oil pressure value within specification?

YES

Repair TORQUE CONVERTER CLUTCH(REPLACE Torque Converter) as necessary and go to "Verification of vehicle repair " procedure.

NO

Replace A/T ass'y (possible to BODY CONTROL VALVE faulty) as necessary and go to "Verification of vehicle repair " procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC enable conditions in general information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

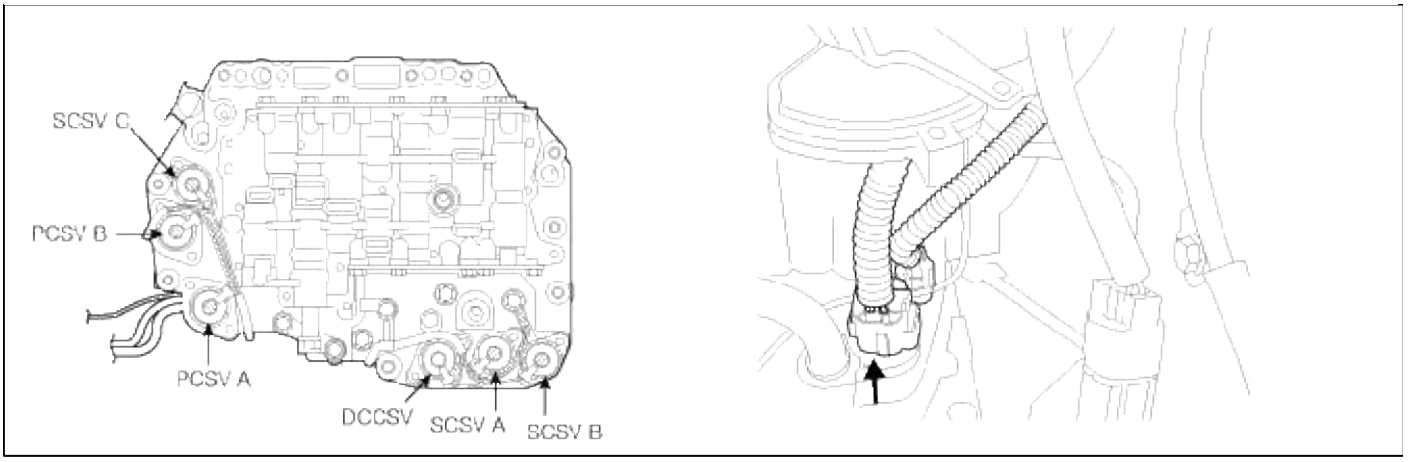
NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0743

COMPONENT LOCATION

tomsn048@gmail.com



GENERAL DESCRIPTION

The PCM controls the locking and unlocking of the Torque Converter Clutch (or Damper Clutch), to the input shaft of the transmission, by appling hydraulic pressure. The main purpose of T/C clutch control is to save fuel by decreasing the hydraulic load inside the T/C. The PCM outputs duty pulses to control the Damper Clutch Control Solenoid Valve(DCCSV) and hydraulic pressure is applied to the DC according to the DCC duty ratio value. When the duty ratio is high, high pressure is applied and the Damper Clutch is locked. The normal operating range of the Damper Clutch Control duty ratio value is from 30%(unlocked) to 85%(locked).

DTC DESCRIPTION

The PCM checks the Damper Clutch Control Signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored (for example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the PCM judges that DCCSV circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check voltage range	TORQUE CONVERTER(DAMPER) CLUTCH : TCC PWM : Pulse Width Modulation • Open or short in circuit • Faulty TCC SOLENOID VALVE • Faulty PCM
Enable Conditions	• 25%<Solenoid duty<100% • 8V<Battery voltage<16V	
Threshold value	• The circuit is short in condition of the Max. of the feedback voltage>3.999V • The circuit is open in condition of the Max. of the feedback voltage<0.0977V	
Diagnostic Time	• More than 0.3 sec.	
Fail Safe	• Lock-up control is prohibited	

SIGNAL WAVEFORM

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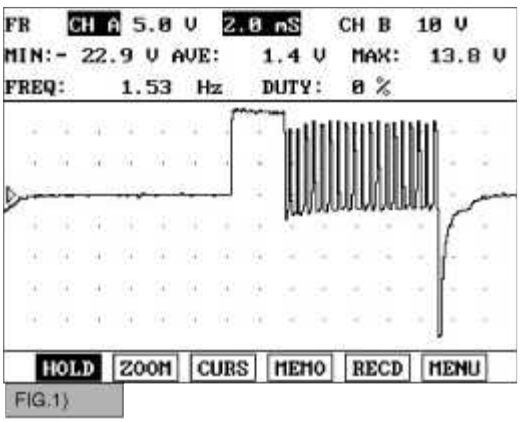
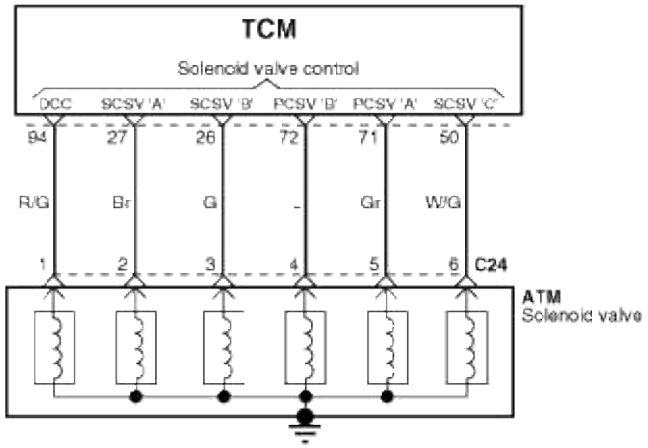


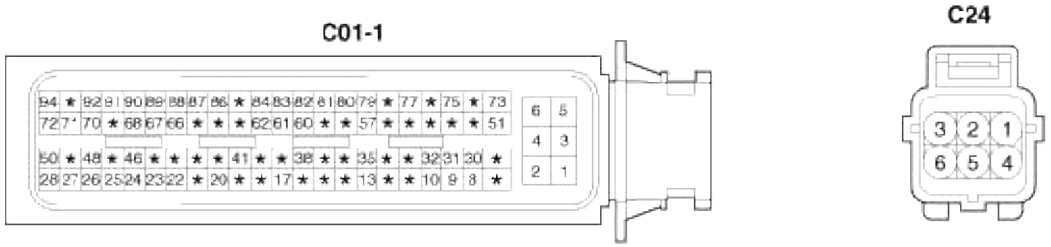
FIG.1) Operating for the TCCSV

SCHEMATIC DIAGRAM

[Circuit Diagram]



[Harness Connector]



[Connection Information]

Terminal	Connection	Function
1	TCM (C01-1 No 94)	Damper clutch(TCC) control solenoid valve
2	TCM (C01-1 No 27)	Shift control solenoid valve A
3	TCM (C01-1 No 26)	Shift control solenoid valve B
4	TCM (C01-1 No 72)	Pressure control solenoid valve B
5	TCM (C01-1 No 71)	Pressure control solenoid valve A
6	TCM (C01-1 No 50)	Shift control solenoid valve C

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".

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3. Monitor the "TCC SOL. VALVE" parameter on the scantool.
4. Select "D RANGE" and operate the vehicle.
5. Check "TCC SOL. VALVE" parameter value changes while driving.

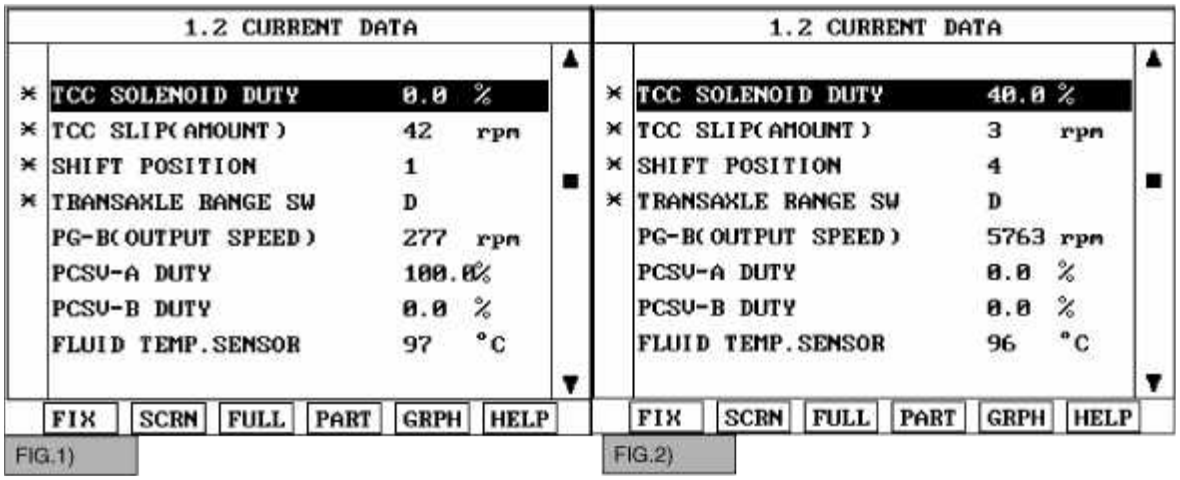


FIG.1) Not engagement status of TCC
FIG.2) Engagement status of TCC

6. Does "TCC SOLENOID DUTY " follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

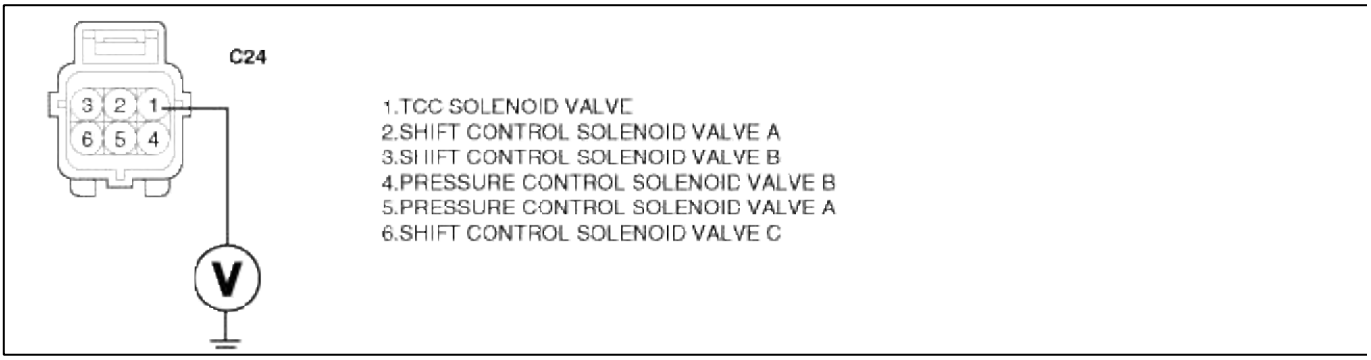
SIGNAL CIRCUIT INSPECTION

1. Disconnect "A/T SOLENOID VALVE" connector.
2. IGNITION "ON", ENGINE "OFF".

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3. Measure voltage between terminal "1" of the sensor harness connector and chassis ground.

Specification: approx. 6V



4. Is resistance within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open or short in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.
If signal circuit in harness is OK, Go to "Check PCM" of the "Component inspection" procedure

COMPONENT INSPECTION

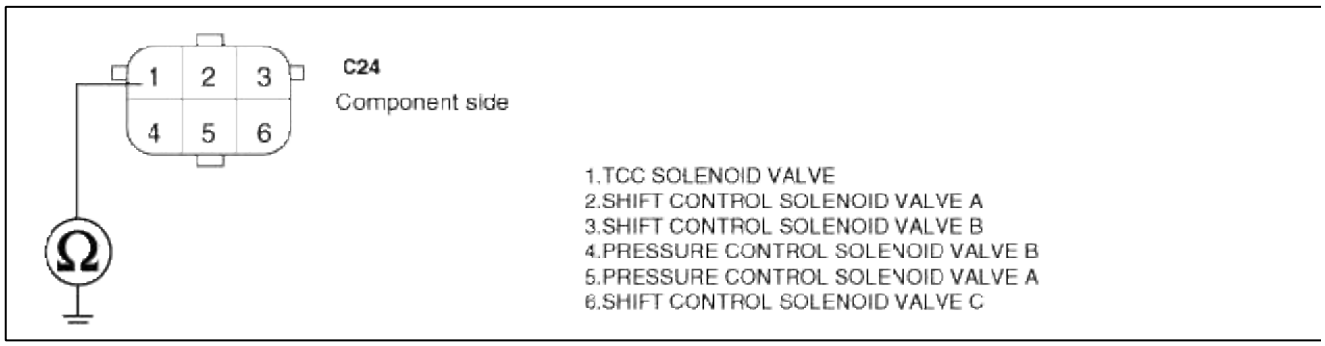
1. CHECK SOLENOID VALVE

(1) Ignition "OFF".

(2) Disconnect "A/T SOLENOID VALVE" connector.

(3) Measure resistance between terminal "1" and chassis ground.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



(4) Is resistance within specification?

YES

Go to "CHECK PCM" as below.

NO

Replace TCC SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

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2. CHECK PCM

(1) Connect scantool to data link connector(DLC).

(2) Ignition "ON" & Engine "OFF".

(3) Select A/T solenoid valve actuator test and operate actuator test.

(4) Can you hear operating sound for TCC SOLENOID VALVE actuator testing function?

YES

Go to "Verification of vehicle repair" procedure.

NO

Replace TCM(PCM) as necessary and Go to "Verification of vehicle repair" procedure

ACTUATOR TEST CONDITION

A. IG SWITCH ON

B. TRANSAXLE RANGE SWITCH is normal

C. P RANGE

D. Vehicle speed 0 mph (0 km/h)

E. Throttle position sensor< 1V

F. IDLE SWITCH ON

G. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

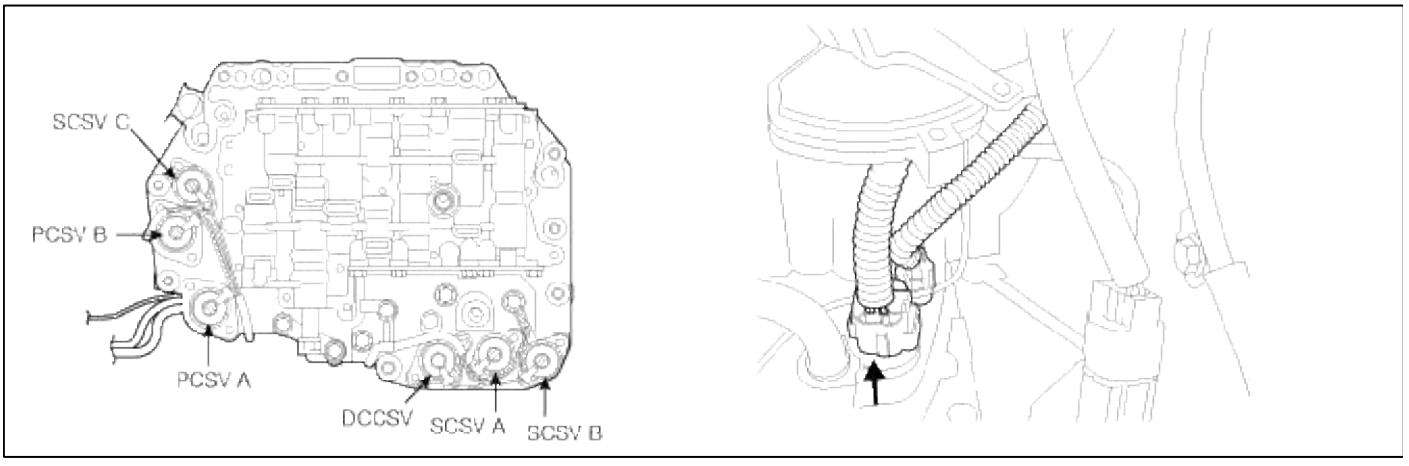
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0745

COMPONENT LOCATION



GENERAL DESCRIPTION

The Pressure Control Solenoid Valve A (PCSV A) converts the electric signals, which are controlled by the PCM, into hyraulic pressure. The PCSV A controls the hydraulic pressure, which is applied to the Clutches and Brakes, to

reduce the shift shock during shifting.

DTC DESCRIPTION

The PCM checks the Pressure Control Solenoid Valve signals by monitoring the feedback signals from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the PCM judges that the PCSV A drive circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check voltage range	PWM : Pulse Width Modulation • Open or short in circuit • Faulty PCSV-A • Faulty PCM
Enable Conditions	• 25%<Solenoid duty<100% • Timer of PWM monitoring > 0.5sec • 8V<Battery voltage<16V	
Threshold value	• The circuit is open in condition of the Max. of feedback voltage>3.999V • The circuit is short in condition of the Max. of feedback voltage<0.097V	
Diagnostic Time	• More than 0.3 sec.	
Fail Safe	• Locked in 3rd gear	

SIGNAL WAVEFORM

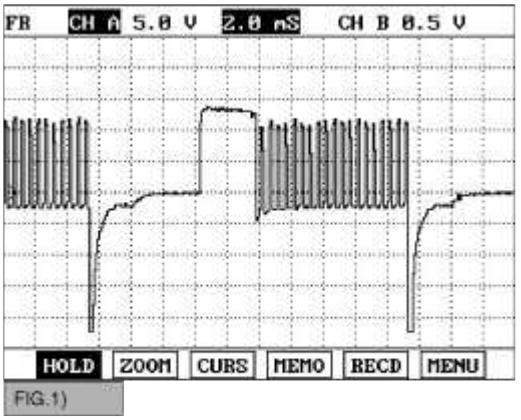
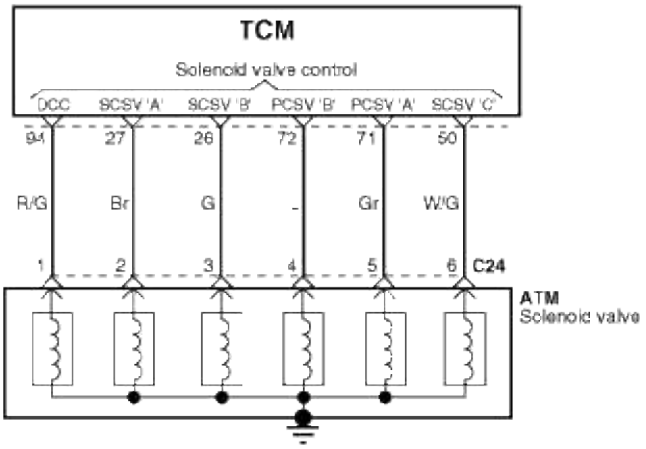


FIG.1) Operating for the PCSV-A

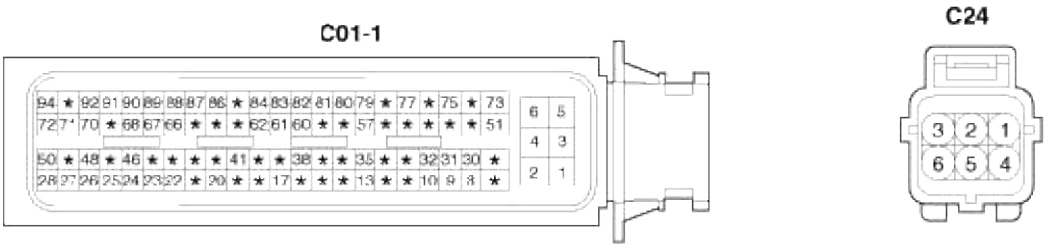
SCHEMATIC DIAGRAM

tomsn048@gmail.com

[Circuit Diagram]



[Harness Connector]



[Connection Information]

Terminal	Connection	Function
1	TCM (C01-1 No 94)	Damper clutch(TCC) control solenoid valve
2	TCM (C01-1 No 27)	Shift control solenoid valve A
3	TCM (C01-1 No 26)	Shift control solenoid valve B
4	TCM (C01-1 No 72)	Pressure control solenoid valve B
5	TCM (C01-1 No 71)	Pressure control solenoid valve A
6	TCM (C01-1 No 50)	Shift control solenoid valve C

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "PCSV-A" parameter on the scantool.
4. Select "N → D RANGE".

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5. Check "PCSV-A " parameter value changes while driving.

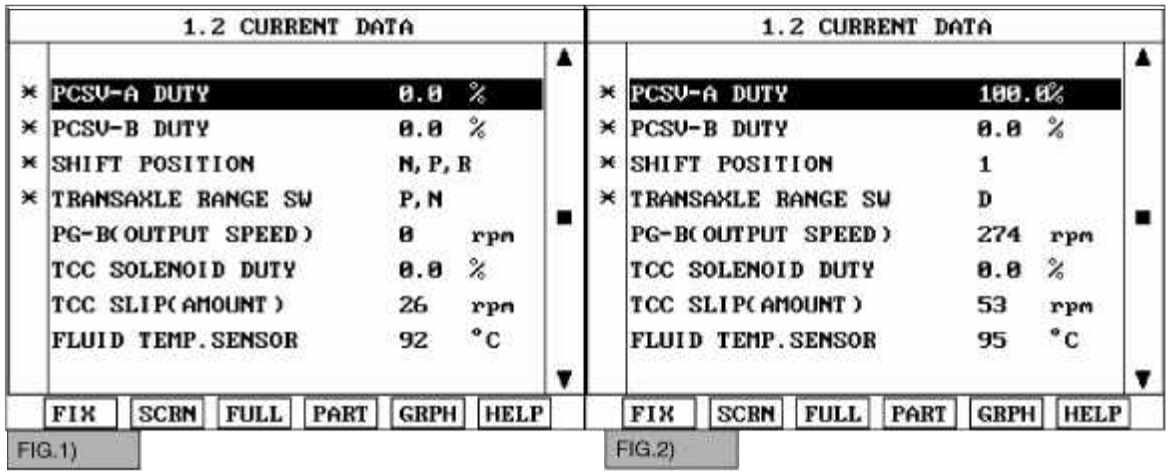


FIG.1) 'N' Range
FIG.2) 'D' Range

※ PCSV-A is gradually changed from 0% to 100% while you are selecting D RANGE from N RANGE and then return to 0%.

6. Does "PCSV-A DUTY " follow the referance data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

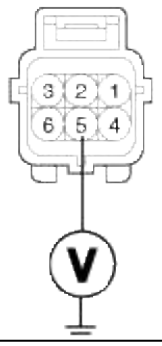
SIGNAL CIRCUIT INSPECTION

1. Disconnect "A/T SOLENOID VALVE" connector.
2. IGNITION "ON", ENGINE "OFF".

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3. Measure voltage between terminal "5" of the sensor harness connector and chassis ground.

Specification: approx. 6V



C24

1.TCC SOLENOID VALVE
2.SHIFT CONTROL SOLENOID VALVE A
3.SHIFT CONTROL SOLENOID VALVE B
4.PRESSURE CONTROL SOLENOID VALVE B
5.PRESSURE CONTROL SOLENOID VALVE A
6.SHIFT CONTROL SOLENOID VALVE C

4. Is voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open or short in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.
If signal circuit in harness is OK, Go to "Check PCM" of the "Component inspection" procedure

COMPONENT INSPECTION

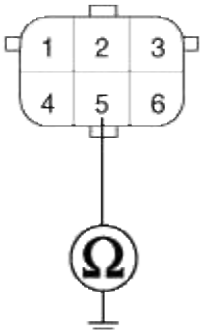
1. CHECK SOLENOID VALVE

(1) Ignition "OFF".

(2) Disconnect "A/T SOLENOID VALVE" connector.

(3) Measure resistance between terminal "5" and chassis ground.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



C24
Component side

1.TCC SOLENOID VALVE
2.SHIFT CONTROL SOLENOID VALVE A
3.SHIFT CONTROL SOLENOID VALVE B
4.PRESSURE CONTROL SOLENOID VALVE B
5.PRESSURE CONTROL SOLENOID VALVE A
6.SHIFT CONTROL SOLENOID VALVE C

(4) Is resistance within specification?

YES

Go to "CHECK PCM" as below.

NO

Replace TCC SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

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2. CHECK PCM

(1) Connect scantool to data link connector(DLC).

(2) Ignition "ON" & Engine "OFF".

(3) Select A/T solenoid valve actuator test and operate actuator test.

(4) Can you hear operating sound for "TCC SOLENOID VALVE" actuator testing function?

YES

Go to "Verification of vehicle repair" procedure.

NO

Replace PCM as necessary and Go to "Verification of vehicle repair" procedure

ACTUATOR TEST CONDITION

A. IG SWITCH ON

B. TRANSAXLE RANGE SWITCH is normal

C. P RANGE

D. Vehicle speed 0 mph(0 km/h)

E. Throttle position sensor< 1V

F. IDLE SWITCH ON

G. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

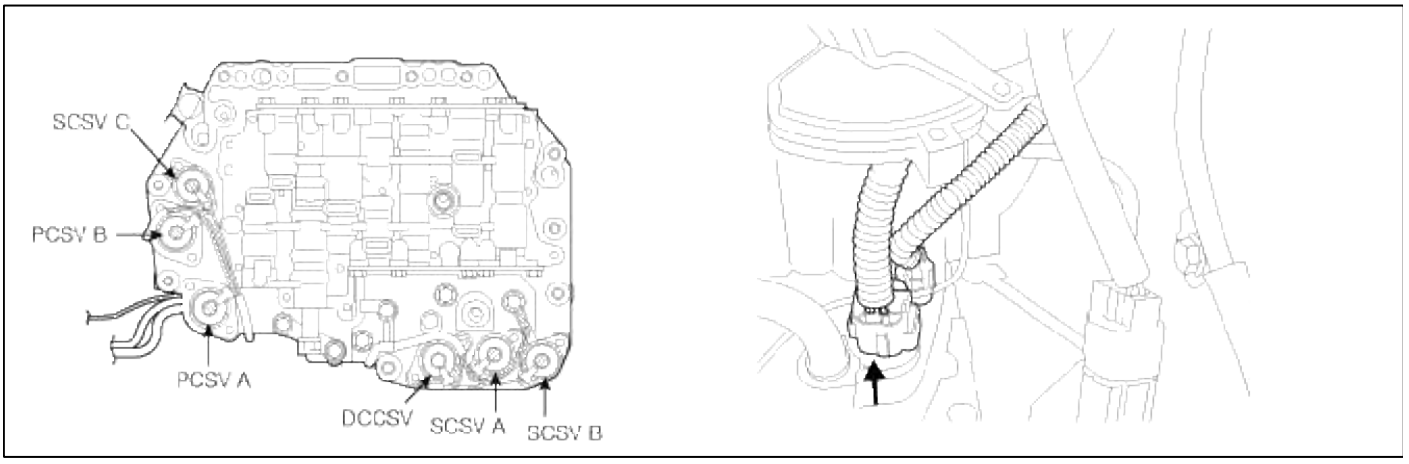
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0750

COMPONENT LOCATION



GENERAL DESCRIPTION

The Automatic Transmission changes the gear position of the transmission utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. The New Alpha Automatic Transmission consists of a: LR (Low

and Reverse Brake), KD (Kick Down Brake), FC (Front Clutch), RC (Rear Clutch), and EC (End Clutch). The gear position is determined by the combination of 3 kinds of Shift Control Solenoid Valves. (SCSV A , SCSV B, SCSV C).

DTC DESCRIPTION

The PCM checks the Shift Control Solenoid Valve A control signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the PCM judges that SCSV A control solenoid circuit is malfunctioning and sets this code.

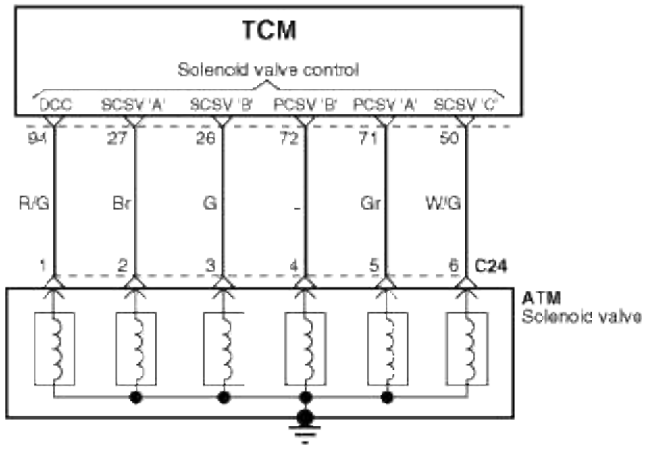
DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty SCSV-A • Faulty PCM
Enable Conditions	• 25% < Solenoid duty < 100% • Timer of PWM monitoring > 0.5sec • 8V < Voltage of Battery <16V	
Threshold value	• The circuit is open in condition of the feedback voltage>1.01V • The circuit is short in condition of the feedback voltage<1.001V	
Diagnostic Time	• More than 0.3 sec.	
Fail Safe	• Locked in 3rd gear	

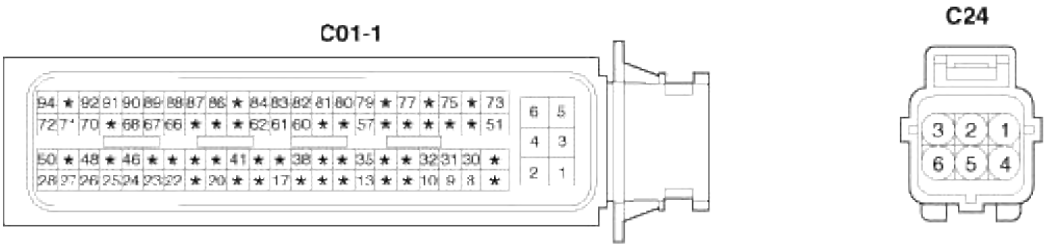
SCHEMATIC DIAGRAM

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[Circuit Diagram]



[Harness Connector]



[Connection Information]

Terminal	Connection	Function
1	TCM (C01-1 No 94)	Damper clutch(TCC) control solenoid valve
2	TCM (C01-1 No 27)	Shift control solenoid valve A
3	TCM (C01-1 No 26)	Shift control solenoid valve B
4	TCM (C01-1 No 72)	Pressure control solenoid valve B
5	TCM (C01-1 No 71)	Pressure control solenoid valve A
6	TCM (C01-1 No 50)	Shift control solenoid valve C

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Measure valtage between terminal "2" of the sensor harness connector and chassis ground.

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4. Select "N → D RANGE".

Specification: "N" Range - 0V, "D 1" Range - 12V.

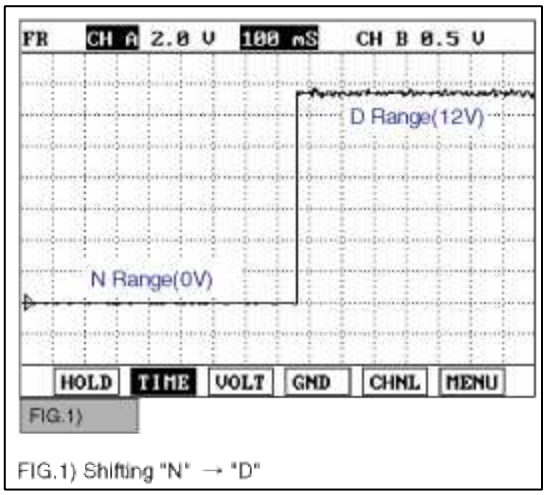


FIG.1) Shifting "N" → "D"

5. Is "SCSV-A" within the specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

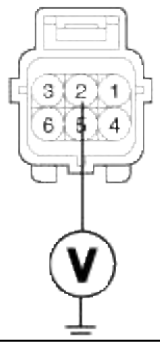
SIGNAL CIRCUIT INSPECTION

1. Disconnect "A/T SOLENOID VALVE" connector.
2. IGNITION "ON", ENGINE "OFF".

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3. Measure voltage between terminal "2" of the sensor harness connector and chassis ground.

Specification: approx. 12V



1.TCC SOLENOID VALVE
2.SHIFT CONTROL SOLENOID VALVE A
3.SHIFT CONTROL SOLENOID VALVE B
4.PRESSURE CONTROL SOLENOID VALVE B
5.PRESSURE CONTROL SOLENOID VALVE A
6.SHIFT CONTROL SOLENOID VALVE C

4. Is voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open or short in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.
If signal circuit in harness is OK, Go to "Check PCM" of the "Component inspection" procedure

COMPONENT INSPECTION

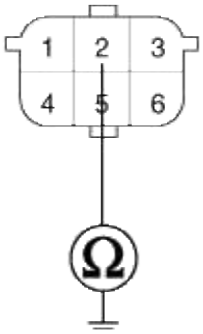
1. CHECK SOLENOID VALVE

(1) Ignition "OFF".

(2) Disconnect "A/T SOLENOID VALVE" connector.

(3) Measure resistance between terminal "2" and chassis ground.

Specification: Approximately 22.3±1.5 Ω [20°C(68°F)]



C24
Component side

1.TCC SOLENOID VALVE
2.SHIFT CONTROL SOLENOID VALVE A
3.SHIFT CONTROL SOLENOID VALVE B
4.PRESSURE CONTROL SOLENOID VALVE B
5.PRESSURE CONTROL SOLENOID VALVE A
6.SHIFT CONTROL SOLENOID VALVE C

(4) Is resistance within specification?

YES

Go to "CHECK PCM" as below.

NO

Replace SHIFT CONTROL SOLENOID VALVE-A as necessary and go to "Verification of vehicle repai procedure.

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2. CHECK PCM
(1) Connect scantool to data link connector(DLC).
(2) Ignition "ON" & Engine "OFF".
(3) Select A/T solenoid valve actuator test and operate actuator test.
(4) Can you hear operating sound for "TCC SOLENOID VALVE" actuator testing function?

YES

Go to "Verification of vehicle repair" procedure.

NO

Replace PCM as necessary and Go to "Verification of vehicle repair" procedure

ACTUATOR TEST CONDITION

A. IG SWITCH ON
B. TRANSAXLE RANGE SWITCH is normal
C. P RANGE
D. Vehicle speed 0 mph(0 km/h)
E. Throttle position sensor< 1V
F. IDLE SWITCH ON
G. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

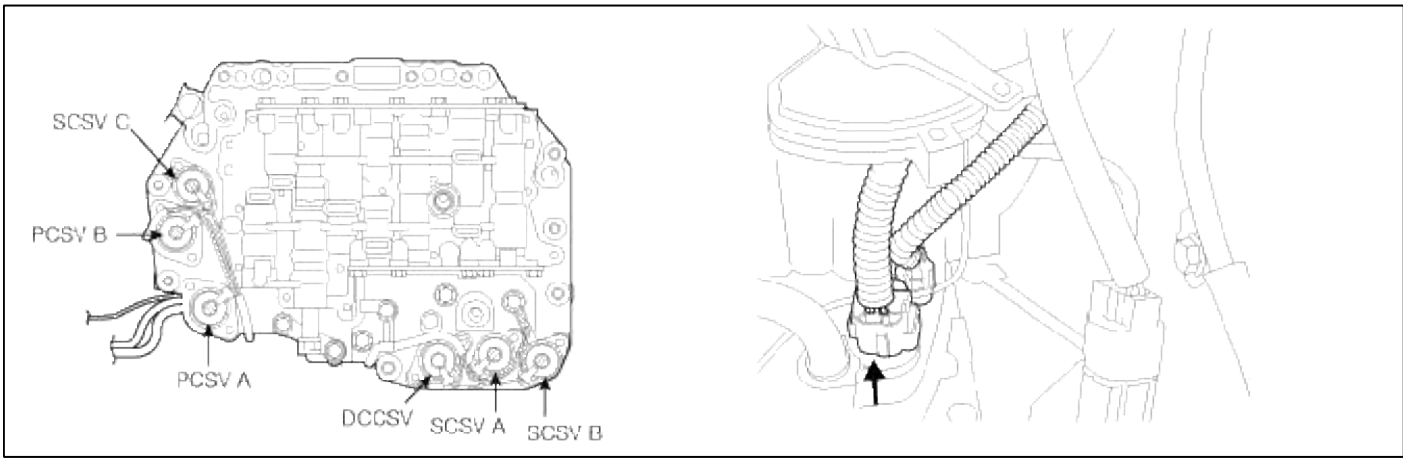
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0755

COMPONENT LOCATION



GENERAL DESCRIPTION

The Automatic Transmission changes the gear position of the transmission utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. The New Alpha Automatic Transmission consists of a: LR (Low

and Reverse Brake), KD (Kick Down Brake), FC (Front Clutch), RC (Rear Clutch), and EC (End Clutch). The gear position is determined by the combination of 3 kinds of Shift Control Solenoid Valves. (SCSV A , SCSV B, SCSV C).

DTC DESCRIPTION

The PCM checks the Shift Control Solenoid Valve B control signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the PCM judges that SCSV B control solenoid circuit is malfunctioning and sets this code.

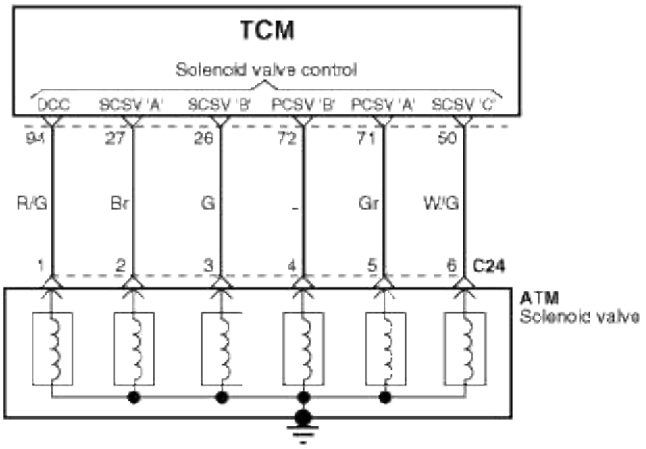
DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty SCSV-B • Faulty PCM
Enable Conditions	• 25% < Solenoid duty < 100% • Timer of PWM monitoring > 0.5sec • 8V < Voltage of Battery <16V	
Threshold value	• The circuit is open in condition of the feedback voltage>1.01V • The circuit is short in condition of the feedback voltage<1.001V	
Diagnostic Time	• More than 0.3 sec.	
Fail Safe	• Locked in 3rd gear	

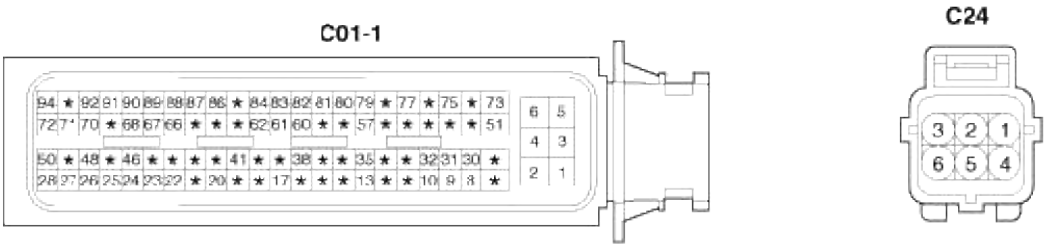
SCHEMATIC DIAGRAM

tomsn048@gmail.com

[Circuit Diagram]



[Harness Connector]



[Connection Information]

Terminal	Connection	Function
1	TCM (C01-1 No 94)	Damper clutch(TCC) control solenoid valve
2	TCM (C01-1 No 27)	Shift control solenoid valve A
3	TCM (C01-1 No 26)	Shift control solenoid valve B
4	TCM (C01-1 No 72)	Pressure control solenoid valve B
5	TCM (C01-1 No 71)	Pressure control solenoid valve A
6	TCM (C01-1 No 50)	Shift control solenoid valve C

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Measure valtage between terminal "3" of the sensor harness connector and chassis ground.

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4. Shift 2nd → 3rd.

Specification: "2nd" gear - 12V, "3rd" gear - 0V.

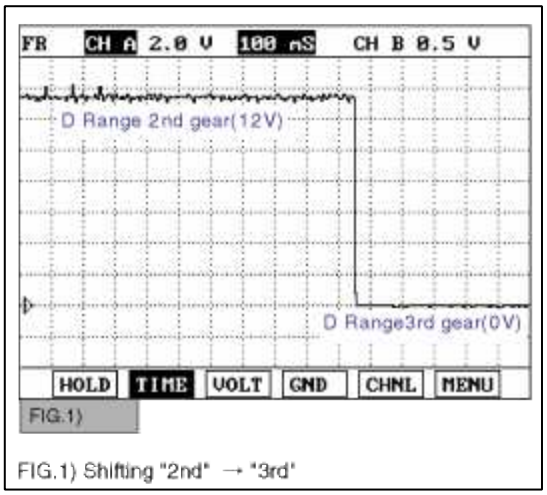


FIG.1) Shifting "2nd" → "3rd"

5. Is "SCSV-B" within the specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

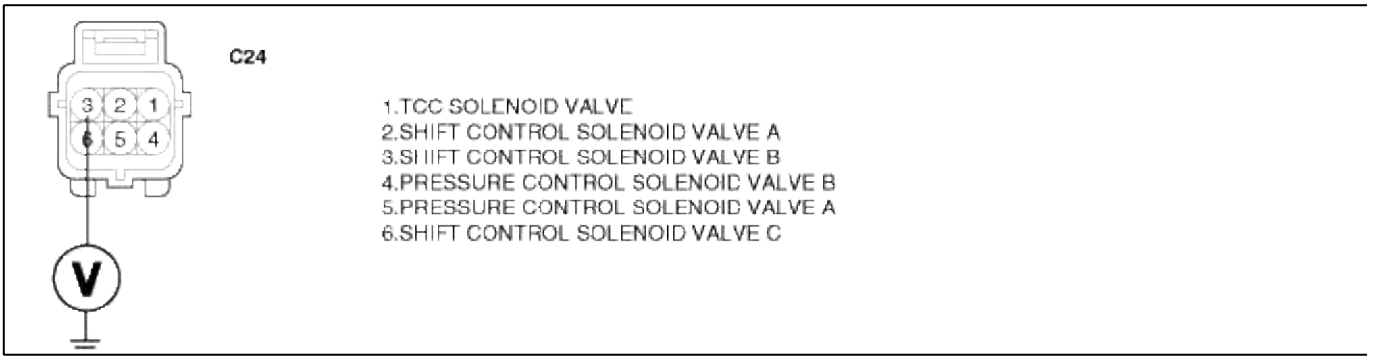
SIGNAL CIRCUIT INSPECTION

1. Disconnect "A/T SOLENOID VALVE" connector.
2. IGNITION "ON", ENGINE "OFF".

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3. Measure voltage between terminal "3" of the sensor harness connector and chassis ground.

Specification: approx. 12V



4. Is voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open or short in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.
If signal circuit in harness is OK, Go to "Check PCM" of the "Component inspection" procedure

COMPONENT INSPECTION

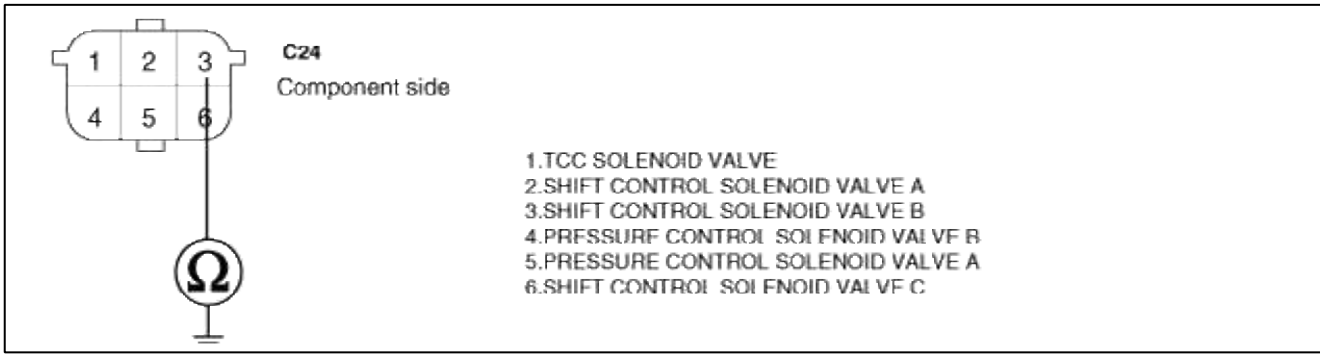
1. CHECK SOLENOID VALVE

(1) Ignition "OFF".

(2) Disconnect "A/T SOLENOID VALVE" connector.

(3) Measure resistance between terminal "3" and chassis ground.

Specification: Approximately 22.3±1.5 Ω [20°C(68°F)]



(4) Is resistance within specification?

YES

Go to "CHECK PCM" as below.

NO

Replace SHIFT CONTROL SOLENOID VALVE-B as necessary and go to "Verification of vehicle repai procedure.

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2. CHECK PCM

(1) Connect scantool to data link connector(DLC).

(2) Ignition "ON" & Engine "OFF".

(3) Select A/T solenoid valve actuator test and operate actuator test.

(4) Can you hear operating sound for "TCC SOLENOID VALVE" actuator testing function?

YES

Go to "Verification of vehicle repair" procedure.

NO

Replace PCM as necessary and Go to "Verification of vehicle repair" procedure

ACTUATOR TEST CONDITION

A. IG SWITCH ON

B. TRANSAXLE RANGE SWITCH is normal

C. P RANGE

D. Vehicle speed 0 mph(0 km/h)

E. Throttle position sensor< 1V

F. IDLE SWITCH ON

G. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

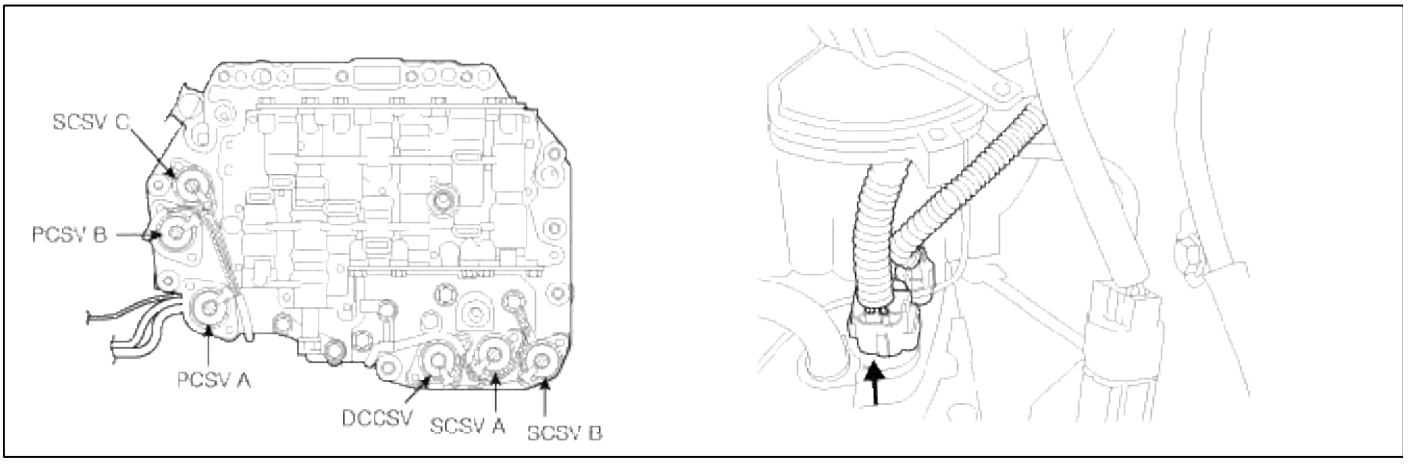
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0760

COMPONENT LOCATION



GENERAL DESCRIPTION

The Automatic Transmission changes the gear position of the transmission utilizing a combination of Clutches and Brakes, which are controlled by solenoid valves. The New Alpha Automatic Transmission consists of a: LR (Low

and Reverse Brake), KD (Kick Down Brake), FC (Front Clutch), RC (Rear Clutch), and EC (End Clutch). The gear position is determined by the combination of 3 kinds of Shift Control Solenoid Valves. (SCSV A , SCSV B, SCSV C).

DTC DESCRIPTION

The PCM checks the Shift Control Solenoid Valve C control signal by monitoring the feedback signal from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected, or low voltage is detected when high voltage is expected) the PCM judges that SCSV C control solenoid circuit is malfunctioning and sets this code.

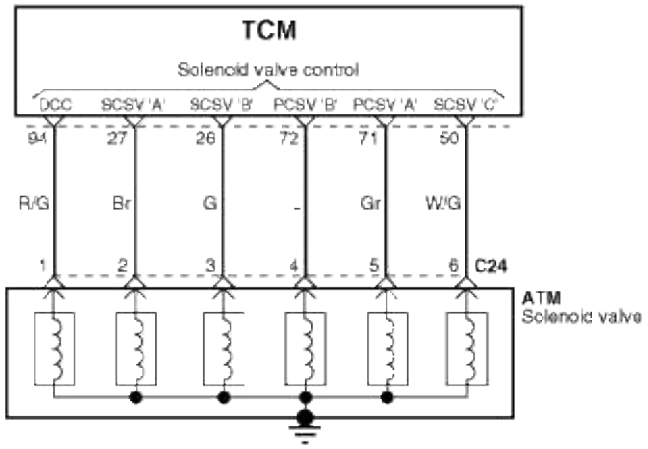
DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check voltage range	• Open or short in circuit • Faulty SCSV-C • Faulty PCM
Enable Conditions	• 25% < Solenoid duty < 100% • Timer of PWM monitoring > 0.5sec • 8V < Voltage of Battery <16V	
Threshold value	• The circuit is open in condition of the feedback voltage>1.01V • The circuit is short in condition of the feedback voltage<1.001V	
Diagnostic Time	• More than 0.3 sec.	
Fail Safe	• Locked in 3rd gear	

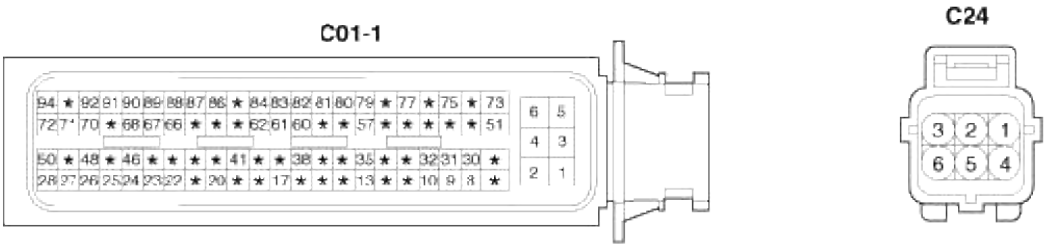
SCHEMATIC DIAGRAM

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[Circuit Diagram]



[Harness Connector]



[Connection Information]

Terminal	Connection	Function
1	TCM (C01-1 No 94)	Damper clutch(TCC) control solenoid valve
2	TCM (C01-1 No 27)	Shift control solenoid valve A
3	TCM (C01-1 No 26)	Shift control solenoid valve B
4	TCM (C01-1 No 72)	Pressure control solenoid valve B
5	TCM (C01-1 No 71)	Pressure control solenoid valve A
6	TCM (C01-1 No 50)	Shift control solenoid valve C

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Measure valtage between terminal "6" of the sensor harness connector and chassis ground.

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4. Select "N → D".

Specification: "D" Range 2nd gear- 0V, "D " Range 3rd gear- 12V.

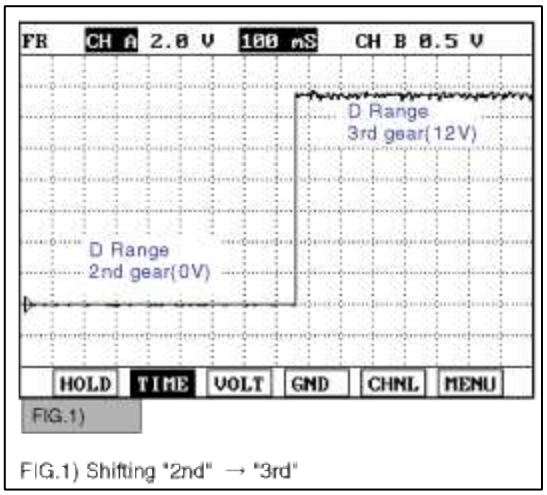


FIG.1) Shifting "2nd" → "3rd"

5. Is "SCSV-C" within the specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

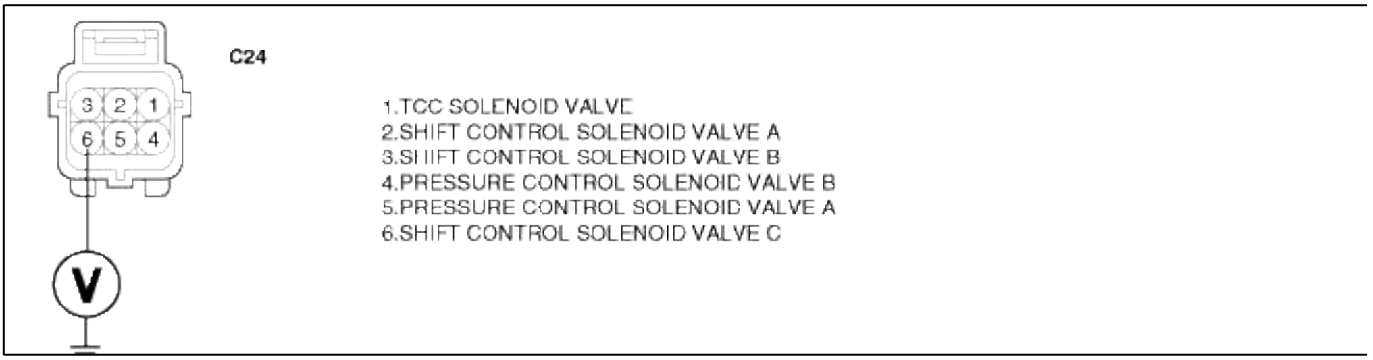
SIGNAL CIRCUIT INSPECTION

1. Disconnect "A/T SOLENOID VALVE" connector.
2. IGNITION "ON", ENGINE "OFF".

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3. Measure voltage between terminal "6" of the sensor harness connector and chassis ground.

Specification: approx. 12V



4. Is voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open or short in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.
If signal circuit in harness is OK, Go to "Check PCM" of the "Component inspection" procedure

COMPONENT INSPECTION

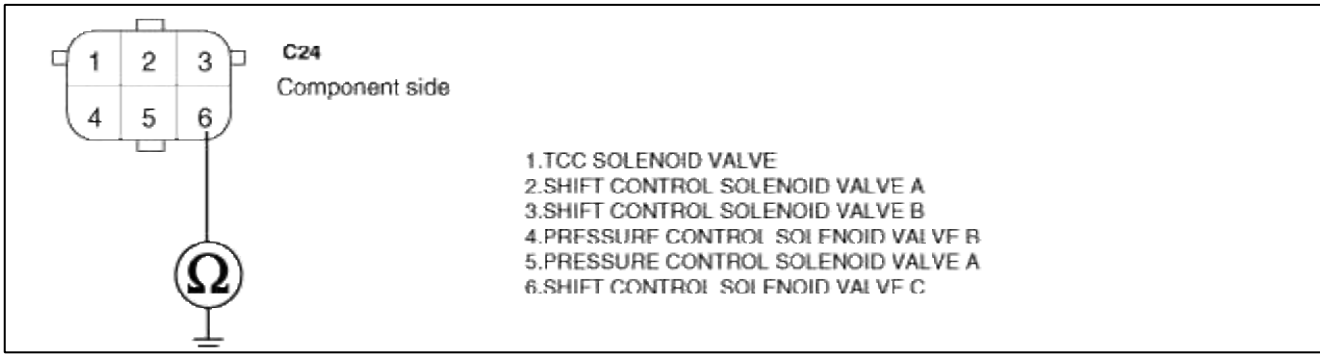
1. CHECK SOLENOID VALVE

(1) Ignition "OFF".

(2) Disconnect "A/T SOLENOID VALVE" connector.

(3) Measure resistance between terminal "6" and chassis ground.

Specification: Approximately 22.3±1.5 Ω [20°C(68°F)]



(4) Is resistance within specification?

YES

Go to "CHECK PCM" as below.

NO

Replace SHIFT CONTROL SOLENOID VALVE-C as necessary and go to "Verification of vehicle repai procedure.

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2. CHECK PCM

(1) Connect scantool to data link connector(DLC).

(2) Ignition "ON" & Engine "OFF".

(3) Select A/T solenoid valve actuator test and operate actuator test.

(4) Can you hear operating sound for "TCC SOLENOID VALVE" actuator testing function?

YES

Go to "Verification of vehicle repair" procedure.

NO

Replace PCM as necessary and Go to "Verification of vehicle repair" procedure

ACTUATOR TEST CONDITION

A. IG SWITCH ON

B. TRANSAXLE RANGE SWITCH is normal

C. P RANGE

D. Vehicle speed 0 mph(0 km/h)

E. Throttle position sensor< 1V

F. IDLE SWITCH ON

G. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

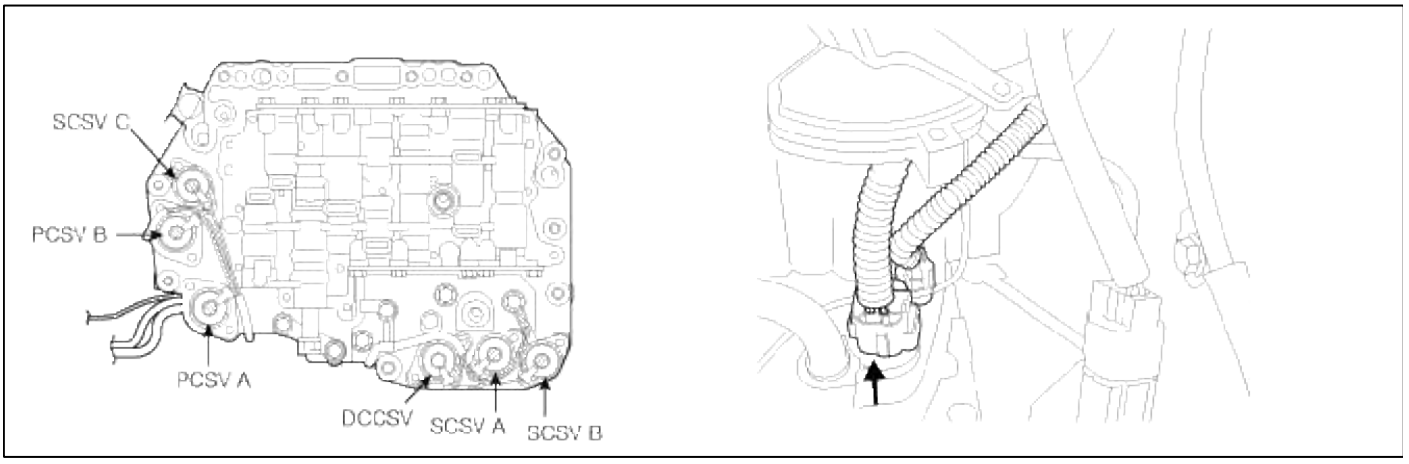
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P0775

COMPONENT LOCATION



GENERAL DESCRIPTION

The Pressure Control Solenoid Valve B (PCSV B) converts the electric signals, which are controlled by the PCM, into hyraulic pressure. The PCSV B is designed to control the Rear Clutch and related skip shift from 4th to 2nd or

from 2nd to 4th.

DTC DESCRIPTION

The PCM checks the Pressure Control Solenoid Valve signals by monitoring the feedback signals from the solenoid valve drive circuit. If an unexpected signal is monitored, (For example, high voltage is detected when low voltage is expected or low voltage is detected when high voltage is expected) the PCM judges that the PCSV B drive circuit is malfunctioning and sets this code.

DTC DETECTING CONDITION

Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check voltage range	PWM : Pulse Width Modulation • Open or short in circuit • Faulty PCSV-B • Faulty PCM
Enable Conditions	• 25% < Solenoid duty < 100% • Timer of PWM monitoring > 0.5sec • 8V < Voltage of Battery <16V	
Threshold value	• The circuit is open in condition of the Max. of the feedback voltage>3.999V • The circuit is short in condition of the Max. of the feedback voltage<0.097V	
Diagnostic Time	• More than 0.3 sec.	
Fail Safe	• Locked in 3rd gear	

SIGNAL WAVEFORM

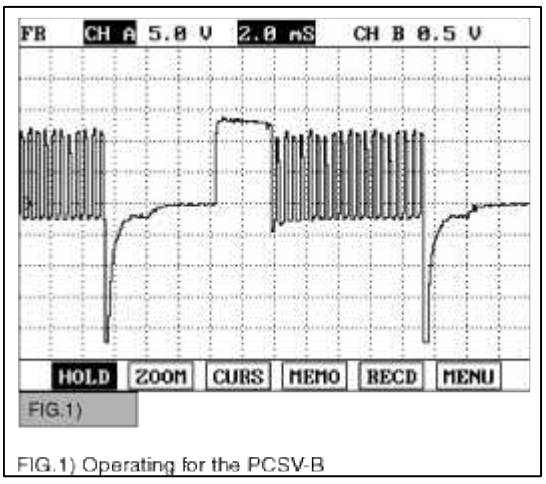
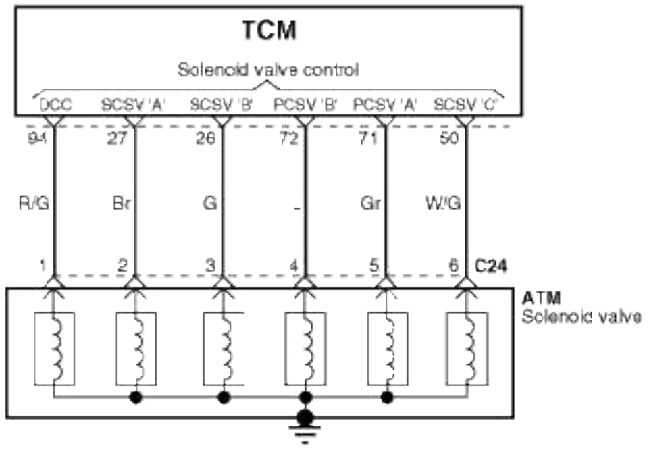


FIG.1) Operating for the PCSV-B

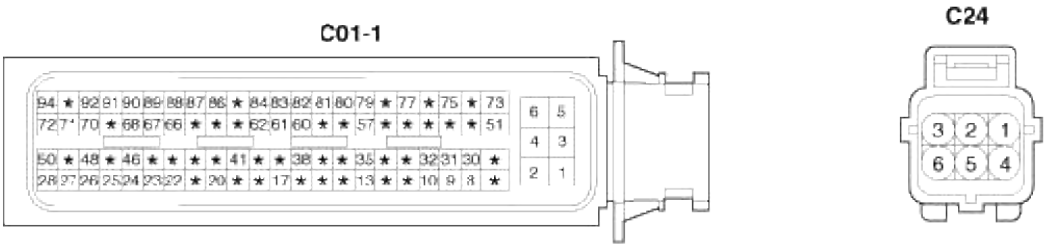
SCHEMATIC DIAGRAM

tomsn048@gmail.com

[Circuit Diagram]



[Harness Connector]



[Connection Information]

Terminal	Connection	Function
1	TCM (C01-1 No 94)	Damper clutch(TCC) control solenoid valve
2	TCM (C01-1 No 27)	Shift control solenoid valve A
3	TCM (C01-1 No 26)	Shift control solenoid valve B
4	TCM (C01-1 No 72)	Pressure control solenoid valve B
5	TCM (C01-1 No 71)	Pressure control solenoid valve A
6	TCM (C01-1 No 50)	Shift control solenoid valve C

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "PCSV-B" parameter on the scantool.
4. Select "D → N RANGE".

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5. Check "PCSV-B" parameter value changes while driving.

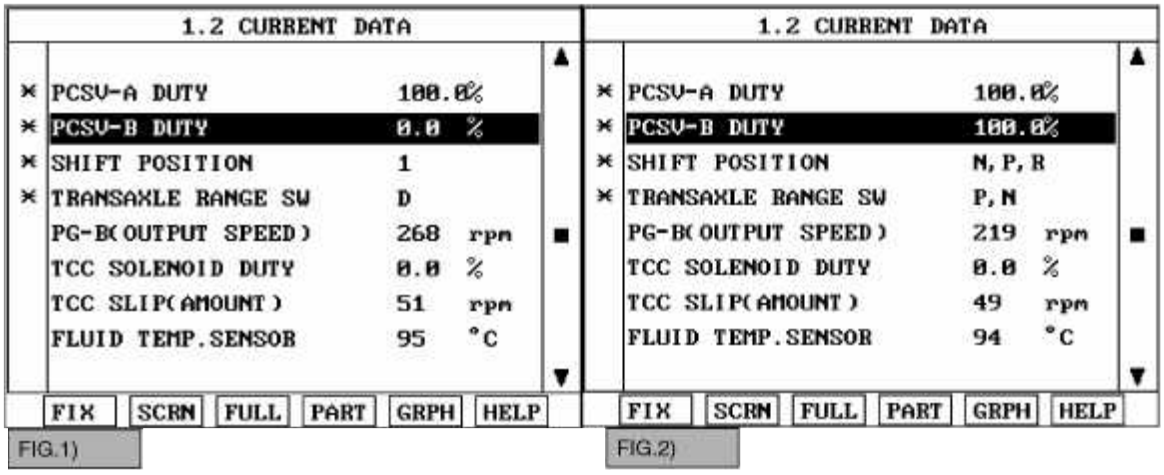


FIG.1) 'N' Range
FIG.2) 'D' Range

※ PCSV-B is gradually changed from 0% to 100% while you are selecting N RANGE from D RANGE and then return to 0%.

6. Does "PCSV-B DUTY" follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

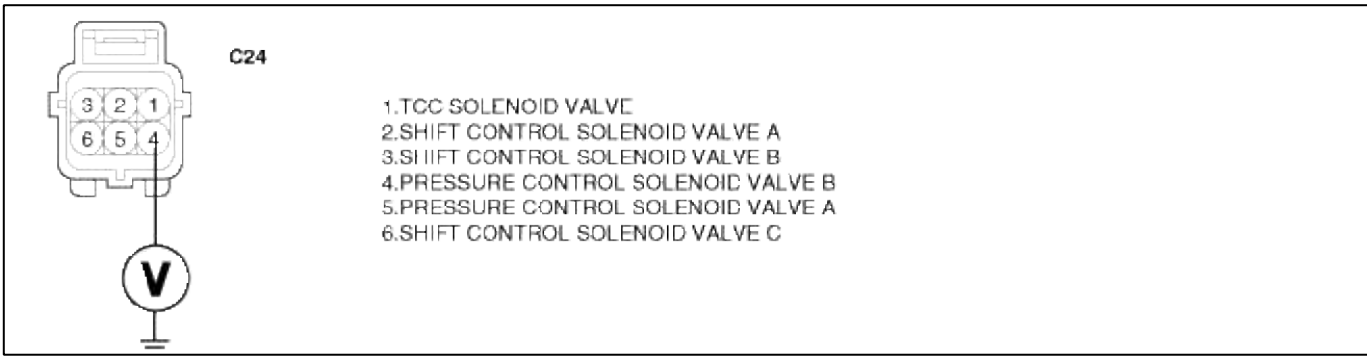
SIGNAL CIRCUIT INSPECTION

1. Disconnect "A/T SOLENOID VALVE" connector.
2. IGNITION "ON", ENGINE "OFF".

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3. Measure voltage between terminal "4" of the sensor harness connector and chassis ground.

Specification: approx. 6V



4. Is resistance within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open or short in harness. Repair as necessary and Go to "Verification of vehicle repair" procedure.
If signal circuit in harness is OK, Go to "Check PCM" of the "Component inspection" procedure

COMPONENT INSPECTION

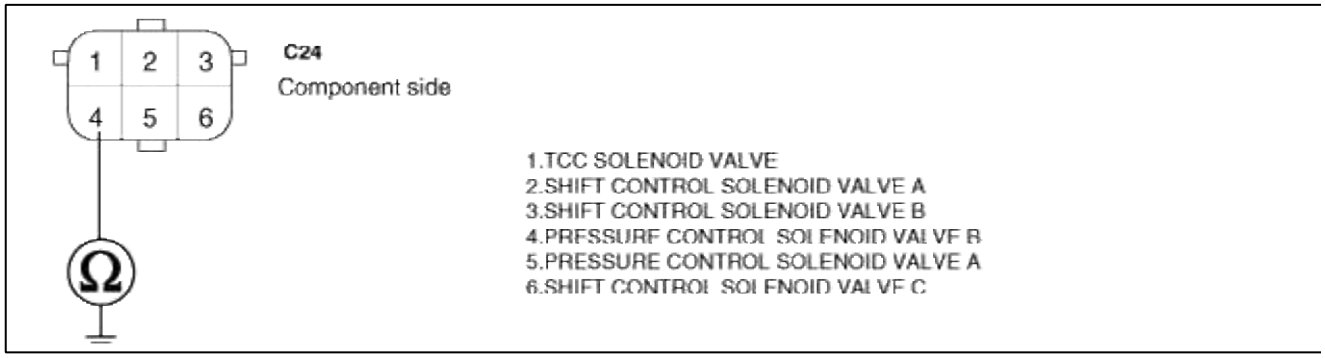
1. CHECK SOLENOID VALVE

(1) Ignition "OFF".

(2) Disconnect "A/T SOLENOID VALVE" connector.

(3) Measure resistance between terminal "4" and chassis ground.

Specification: Approximately 2.7~3.4 Ω [20°C(68°F)]



(4) Is resistance within specification?

YES

Go to "CHECK PCM" as below.

NO

Replace TCC SOLENOID VALVE as necessary and go to "Verification of vehicle repair" procedure.

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2. CHECK PCM
(1) Connect scantool to data link connector(DLC).
(2) Ignition "ON" & Engine "OFF".
(3) Select A/T solenoid valve actuator test and operate actuator test.
(4) Can you hear operating sound for TCC SOLENOID VALVE actuator testing function?

YES

Go to "Verification of vehicle repair" procedure.

NO

Replace PCM as necessary and Go to "Verification of vehicle repair" procedure

ACTUATOR TEST CONDITION

A. IG SWITCH ON
B. TRANSAXLE RANGE SWITCH is normal
C. P RANGE
D. Vehicle speed 0 mph(0km/h)
E. Throttle position sensor< 1V
F. IDLE SWITCH ON
G. ENGINE RPM 0

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

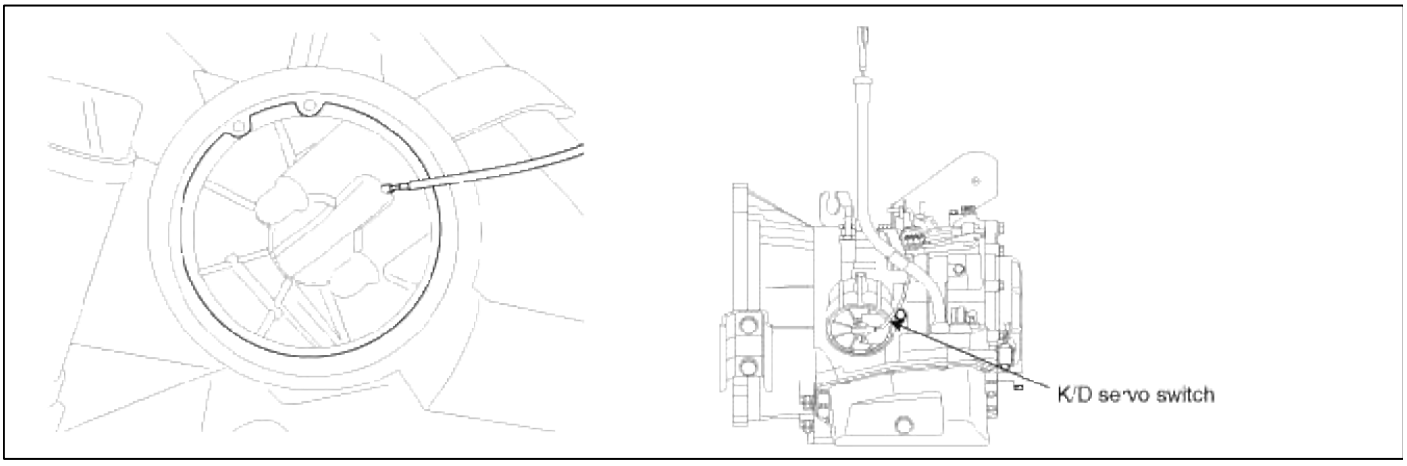
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > P1709

COMPONENT LOCATION



GENERAL DESCRIPTION

The KICK DOWN BRAKE is one of the New Alpha automatic transmission's members, which is engaged in the

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2nd or 4th gear position, and is released in the 1st or 3rd gear position. The Kick Down Servo switch is installed inside the Kick down brake to provide the optimum hydraulic pressure control by checking the position of the kickdown brake. The Kick Down Servo switch is OFF when the gear is in the 2nd or 4th position, and the switch is ON when the gear is 1st or 3rd position.

DTC DESCRIPTION

The TCM sets this code if the Kick Down Servo switch is ON when the gear is in the 2nd or 4th position, or the switch is OFF when the gear is in the 1st or 3rd position.

DTC DETECTING CONDITION

Item		Detecting Condition & Fail Safe	Possible cause
DTC Strategy		• Check voltage range	• Open or short in circuit • Faulty KICK DOWN SERVO SWITCH • Faulty PCM
Enable Conditaions		• PG-B >900 &oil temp. >60°C(140°F) • Inhibitor swich D,2,L • Engine speed >400rpm • Output speed>900rpm	
Threshold value	**Case 1**	• After holding gear position 1 or 3 and continuing 5 sec, SW OFF state	
	Case 2	• After holding gear position 2 or 4 and continuing 5 sec, SW ON state	
Diagnostic Time	**Case 1**	• 1 sec.	
	Case 2	• 2 sec.	
Fail Safe		• None	

SIGNAL WAVEFORM

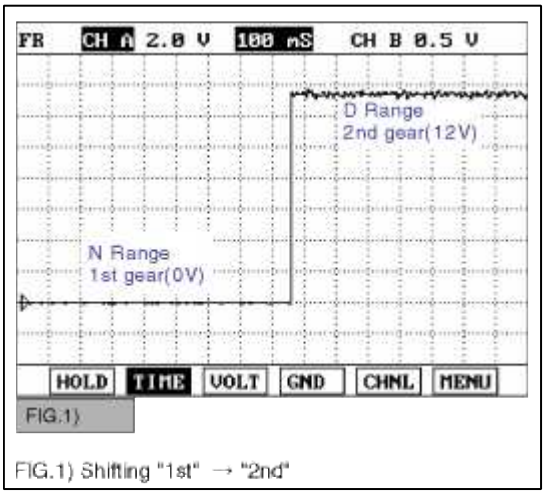
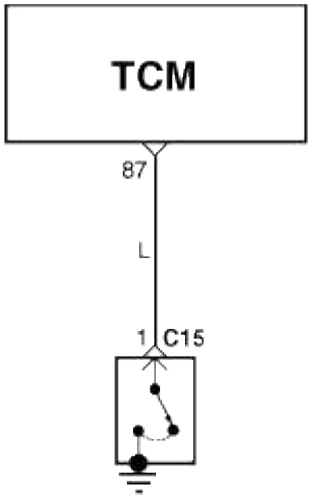


FIG.1) Shifting "1st" → "2nd"

SCHEMATIC DIAGRAM

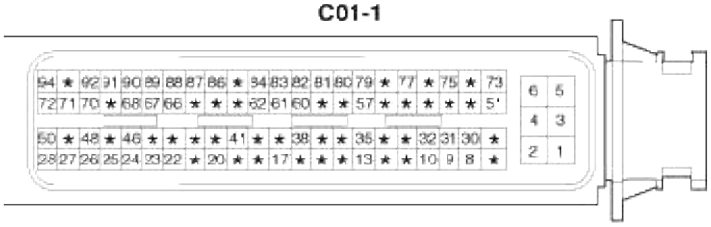
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[Circuit Diagram]



[Harness Connector]

C01-1



C15



[Connection Information]

Terminal	Connection	Function
C15-1	TCM(Co1-1 No.87)	Kick down servo switch

MONITOR SCANTOOL DATA

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "K/D SWITCH" parameter on the scantool.

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4. Operate the vehicle from "1st" gear to "4th" gear.

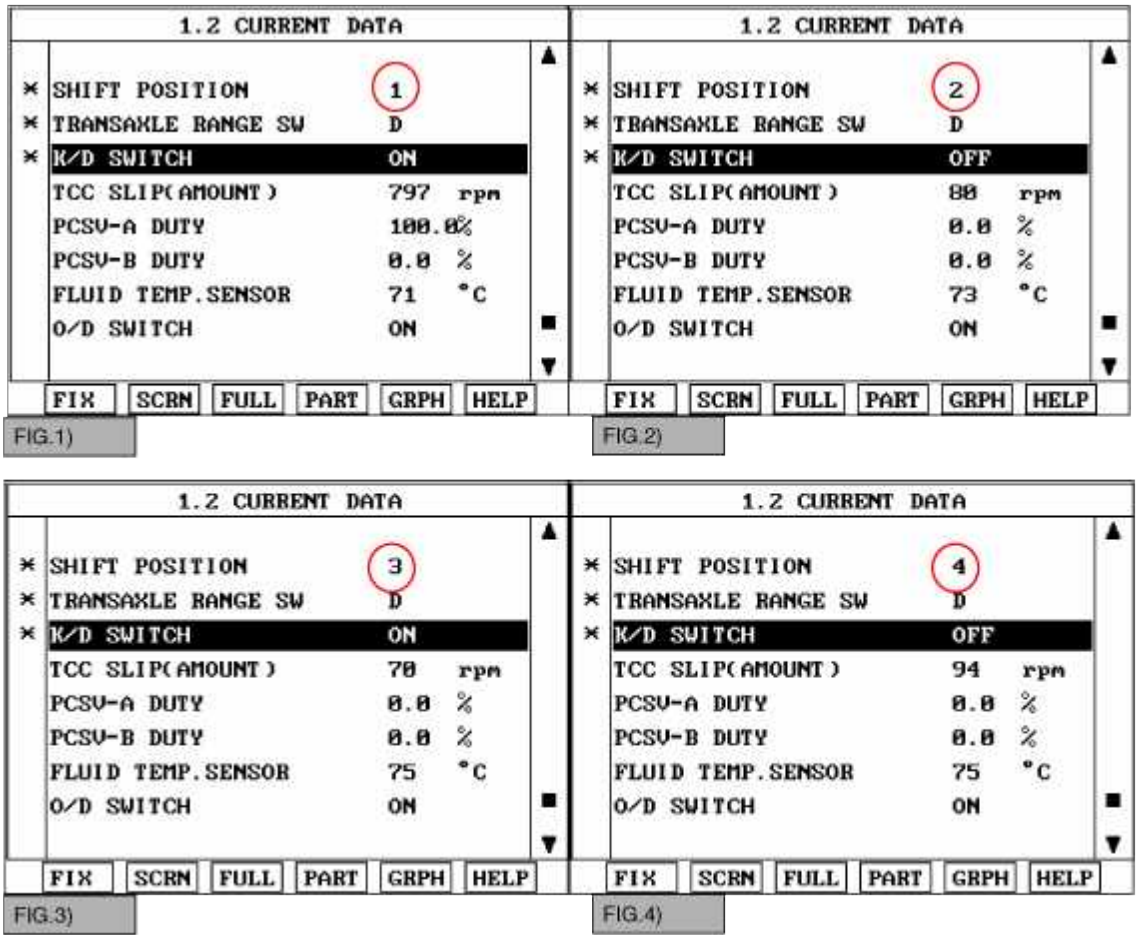


FIG.1) & FIG.3) : K/D SWITCH → "ON"
FIG.2) & FIG.4) : K/D SWITCH → "OFF"

5. Does "K/D SWITCH" follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal&connector inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

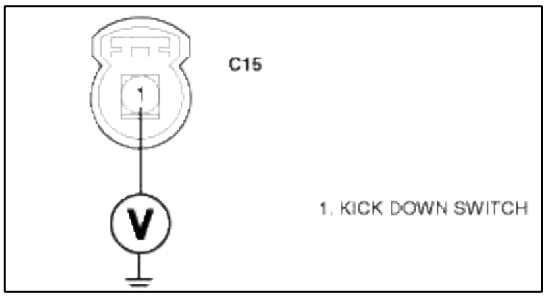
SIGNAL CIRCUIT INSPECTION

1. Disconnect "K/D SWITCH" connector.
2. IGNITION "ON", ENGINE "OFF"

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3. Measure voltage between terminal "1" of the sensor harness connector and chassis ground.

Specification : Approx. 12 V



4. Is voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

Check for open or short in harness. Repair as necessary and go to "Verification of vehicle repair" procedure.

If signal circuit in harness is OK, Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM as necessary and go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION

1. CHECK K/D SWITCH

Specification: Connecting the point of contact → 0Ω, Disconnecting the point of contact → ∞Ω

(1) Is resistance within specifications?

YES

Go to "2. KICK DOWN SERVO ADJUSTMENT" as below.

NO

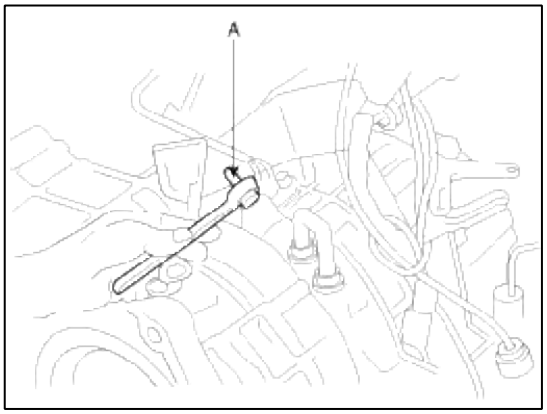
Replace "K/D SWITCH" as necessary and go to "Verification of vehicle repair" procedure.

2. KICK DOWN SERVO ADJUSTMENT

(1) Completely remove all dirt and other contaminating materials adhered around the kickdown adjust screw.

(2) Loosen the lock nut.

(3) Loosen and tighten the adjust screw(A) two times by torque of 5Nm(3.6lb·ft).



(4) Tighten adjust screw by torque of 5 Nm and then loosen the adjust screw 3 to 3.1/3 turns.

(5) Tighten the lock nut to the specified torque.

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(6) After adjusting, has problem been solved?

YES

Go to "Verification of vehicle repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM as necessary and go to "Verification of vehicle repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Enable conditions in general information.
4. Are any DTCs present?

YES

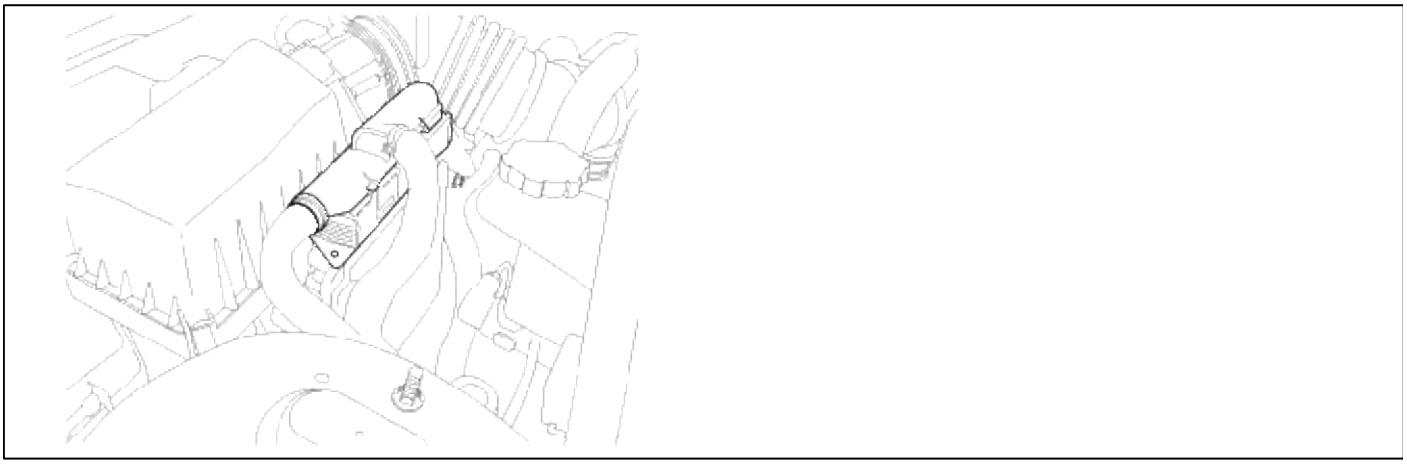
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Automatic Transaxle System > Troubleshooting > U0100

COMPONENT LOCATION



GENERAL DESCRIPTION

The TCM can either receive data from the Engine Control Module or ABS control module, or it can send data to the ECM and ABSCM by using CAN communication. The CAN communicaton is one of the vehicle communication methods, which is now widely used to transfer the vehicle data.

DTC Description

When the TCM cannot read the data from the ECM through the CAN-BUS line, the TCM sets this code. CAN-BUS circuit malfunctioning or ECM can be a posssible cause of this DTC.

DTC DETECTING CONDITION

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Item	Detecting Condition & Fail Safe	Possible cause
DTC Strategy	• Check communication	• Open or short in CAN communication harness • Faulty ECM • Faulty TCM
Enable Conditions	• Timer of ECM CAN Monitoring > 25msec • Input speed(PG-A) > 300rpm • Battery voltage>10V • Timer of ECM CAN monitoring>25msec	
Threshold value	• No message from ems.	
Diagnostic Time	• more than 1sec	
Fail Safe	• INTELLIGENT SHIFT is inhibited • Learning for oil pressure control is inhibited • Torque Retard requirement is inhibited • Direct connection control of TCC is inhibited	

Monitor Scantool Data

1. Connect scantool to data link connector(DLC).
2. Engine "ON".
3. Monitor the "CAN COMMUNICATION SERVICE DATA (ENGINE RPM, VEHICLE SPEED SENSOR, THROTTLE P. SENSOR)" parameters on the scantool.
4. Compare it with reference data as below.
5. Does "CAN BUS LINE DATA " follow the reference data?

YES

Fault is intermittent caused by poor contact in the sensor's and/or TCM's connector or was repaired and TCM memory was not cleared. Go to verification of vehicle repair procedure.

NO

Go to "Terminal & connector inspection" procedure.

Terminal & Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Fault is intermittent caused by poor contact in the sensor's and/or TCM's connector or was repaired and TCM memory was not cleared. And go to verification of vehicle repair procedure.

NO

Go to "Verification of vehicle repair" procedure.

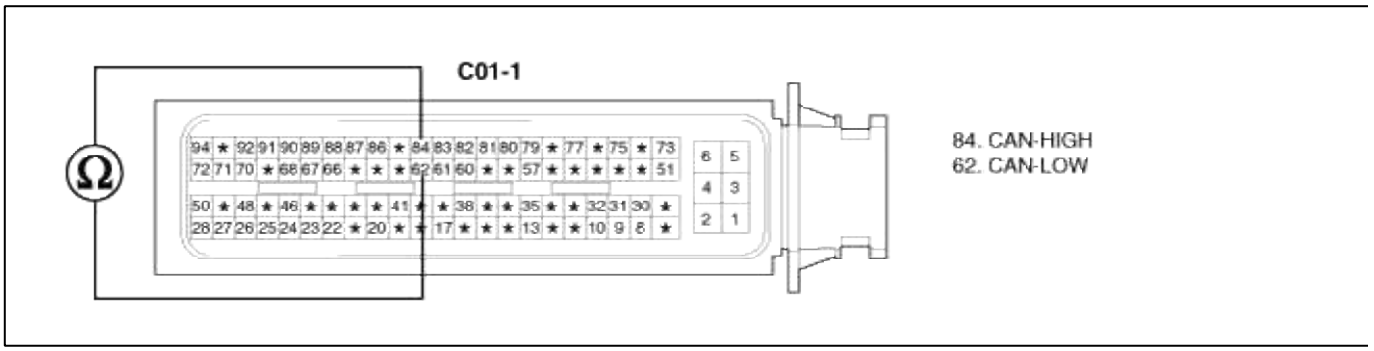
Signal Circuit inspection

1. Ignition "ON" & Engine "OFF".
2. Disconnect the "PCM/TCM" connector.

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3. Measure resistance between terminal "62" and "84" of the "PCM/TCM" harness connector.

Specification : approx. 120 Ω



4. Is measured resistance within specifications?

YES

Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage of ECM.and then Repair or replace Resistance for CAN communication as necessary and go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present?

YES

Go to the applicable troubleshooting procedure.

NO

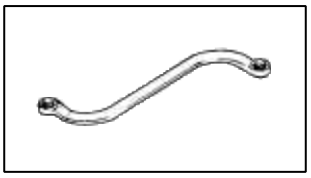
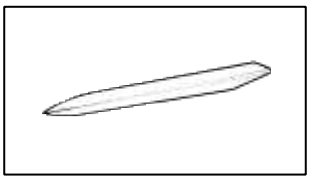
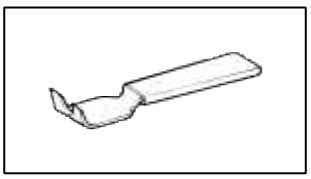
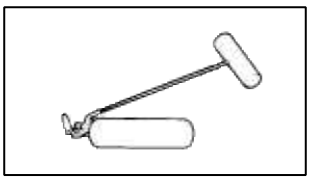
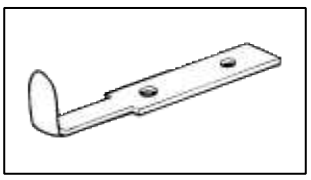
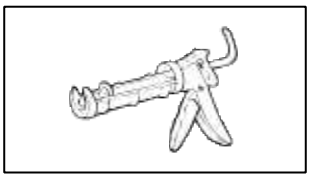
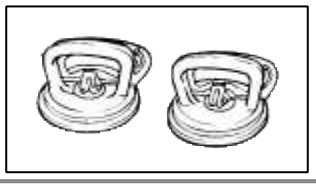
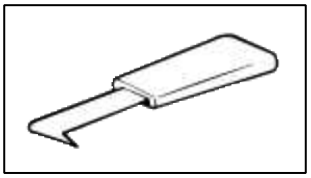
System performing to specification at this time.

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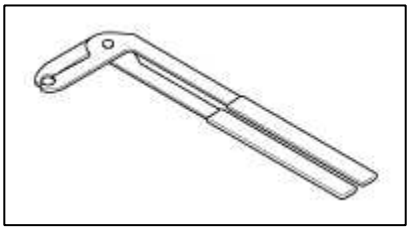
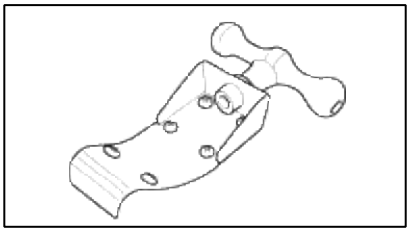
ACCENT(MC) > 2008 > G 1.6 DOHC > Body (Interior and Exterior)

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

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)
09861-31300 Sealant gun		Application of the sealant to the windshield
09861-31400 Glass holder		Removal and installation of the windshield
09861-31000 Windshield moulding remover		Removal of the windshield moulding

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09880-4F000 Hogring clip installer		Installation of the hogring clip
09840-1E100 Center Fascia remover		Removal of the Center Fascia

Body (Interior and Exterior) > General Information > Troubleshooting

TROUBLESHOOTING

Symptom	Suspect	Remedy
Wind noise around door	Weatherstrip not folding firmly	Adjust hit door
	Improperly installed weatherstrip	Repair or replace
	Improperly closed door	Adjust
	Improperly fit door	Adjust
	Improperly clearance between door glass And division channel	Adjust
	Deformed door	Repair or replace
Water leaks from sunroof	Dirt accumulated in drain tube	Clear dirt inside of drain
	Broken or dislocated drain tube, defective or cracked clip	Check tube installation and flange contact
	Clogged drain tube	Blow air into drain to remove dirt
	Deteriorated roof lid weatherstrip	Replace
	Excessive roof lid-to-body clearance and improperly fitted weatherstrip	Adjust

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Wind noise around sunroof	Loosen or deformed deflector, gaps in body work	Retighten adjust or replace
Door glass fails to operate up and down	Incorrect window glass installation	Adjust position
	Damaged or faulty regulator arm or regulator	Correct or replace
Door dose 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 and rear window	Defective seal	Fill with sealant
	Defective flange	Correct

Body (Interior and Exterior) > General Information > Specifications

SPECIFICATIONS

HOOD	Type	Rear hinged, prop rod type
FRONT DOOR	Construction Regulator system Locking system	Front hinged, full door construction Wire drum type Pin-fork system
REAR DOOR	Construction Regulator system Locking system	Front hinged, full door construction Wire drum type Pin-fork system
TRUNK LID	Type	Torsion bar type
GLASS THICKNESS	Windshield glass Front door glass Rear door glass Rear window glass	5mm 3.2mm 3.2mm 3.2mm
SEAT BELTS	Front Rear	3 point type with Emergency Locking Retractor (E.L.R) 3 point type with Emergency Locking Retractor (E.L.R)

TIGHTENING TORQUES

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Items		N·m	Kgf·m	lbf·ft
Front and rear doors	Door hinge to body Door hinge to door Checker mounting bolt to door Checker mounting bolt to body Striker mounting bolts	33.3~41.2 9.8~19.6 6.9~10.8 21.6~22.6 16.7~21.6	3.4~4.2 1.0~2.0 0.7~1.1 2.2~2.3 1.7~2.2	24.6~30.4 7.2~14.5 5.1~8.0 15.9~16.6 12.3~15.9
Trunk lid	Trunk lid latch	6.9~10.8	0.7~1.1	5.1~8.0
Hood	Hood hinge to body Hood hinge to hood Hood latch to body	21.6~26.5 21.6~26.5 6.9~10.8	2.2~2.7 2.2~2.7 0.7~1.1	15.9~19.5 15.9~19.5 12.3~18.8
Seat	Front seat mounting bolts Front seat mounting nut Rear seat mounting bolts	34.3~53.9 38.2~53.9 16.7~25.5	3.5~5.5 3.9~5.5 1.7~2.6	25.3~39.8 28.2~39.8 12.3~18.8
Seat belt	Front seat belt height adjuster Front seat belt lower anchor Front seat belt upper anchor Front seat belt retractor mounting bolt Rear seat belt anchor attaching bolt Rear seat belt retractor mounting bolt Buckle mounting bolt	39.2~53.9 44.1~53.9 44.1~53.9 44.1~53.9 44.1~53.9 44.1~53.9 44.1~53.9	4.0~5.5 4.0~5.5 4.0~5.5 4.0~5.5 4.0~5.5 4.0~5.5 4.0~5.5	28.9~39.8 35.2~39.8 35.2~39.8 35.2~39.8 35.2~39.8 35.2~39.8 35.2~39.8

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

REPLACEMENT

HOOD ASSEMBLY REPLACEMENT

NOTE

- 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.

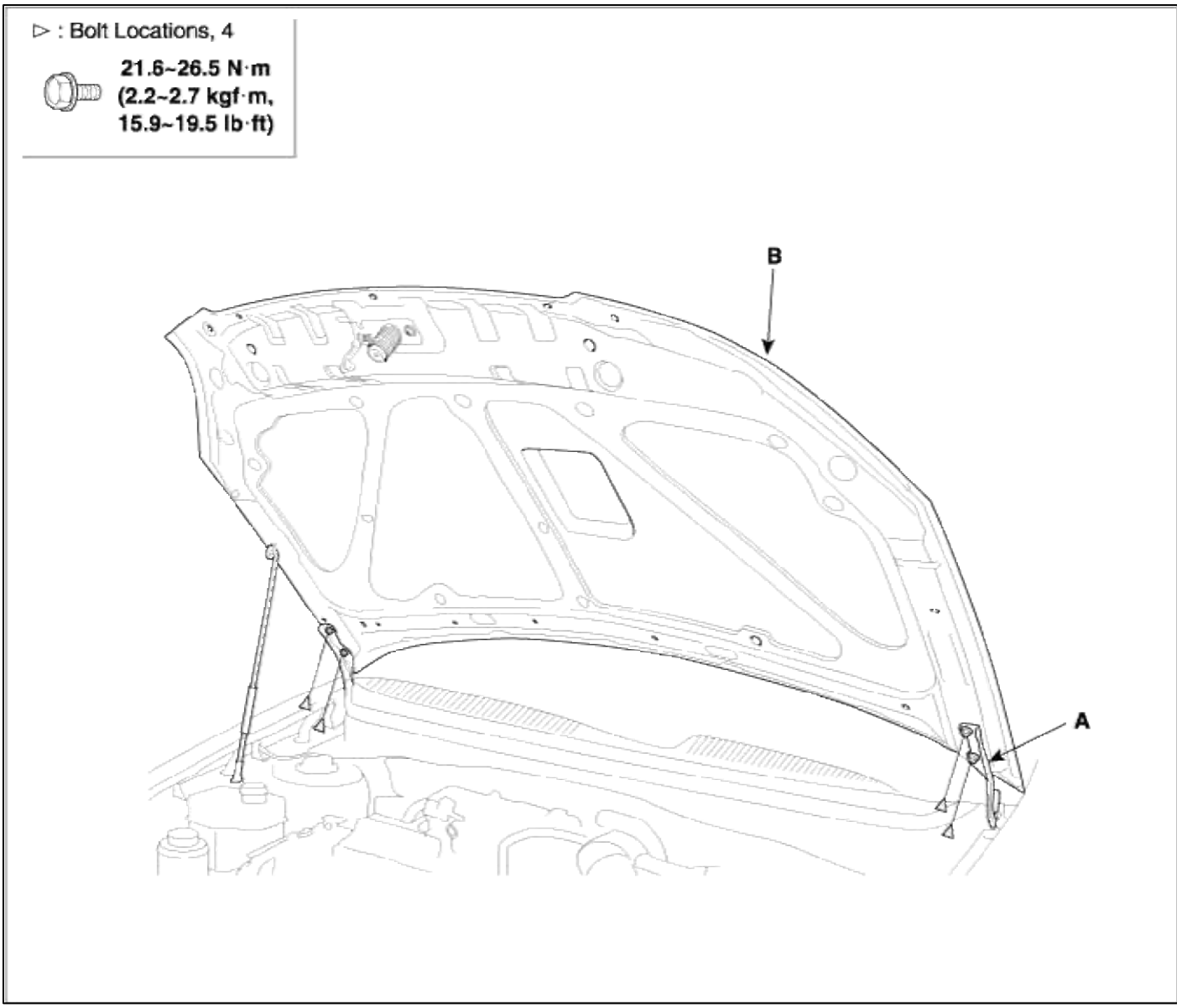
1. Disconnect the windshield washer nozzle connecting tube.
2. After loosening the hood hinge (A) mounting bolts, remove the hood (B).

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3. Installation is the reverse of removal.

NOTE

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



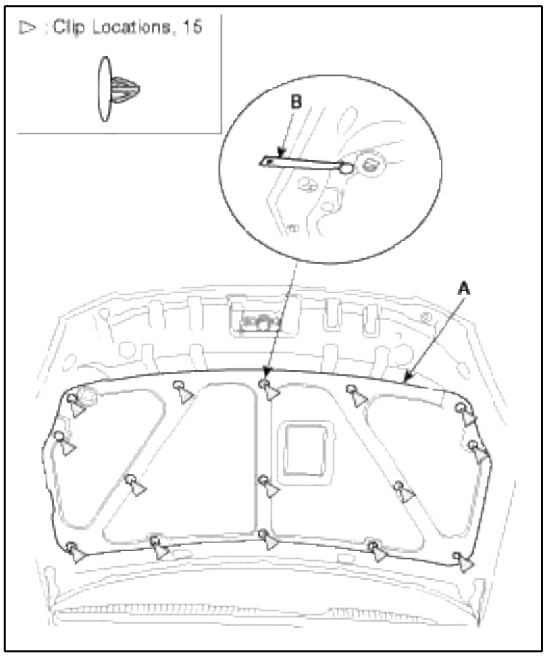
HOOD INSULATOR REPLACEMENT

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

NOTE

- Take care not to scratch the hood panel.



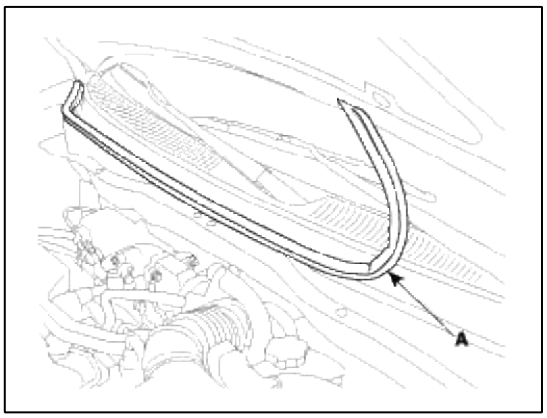
2. Installation is the reverse of removal.

NOTE

- Replace any damaged clips.

HOOD SEAL WEATHERSTRIP REPLACEMENT

1. Remove the hood weatherstrip(A).



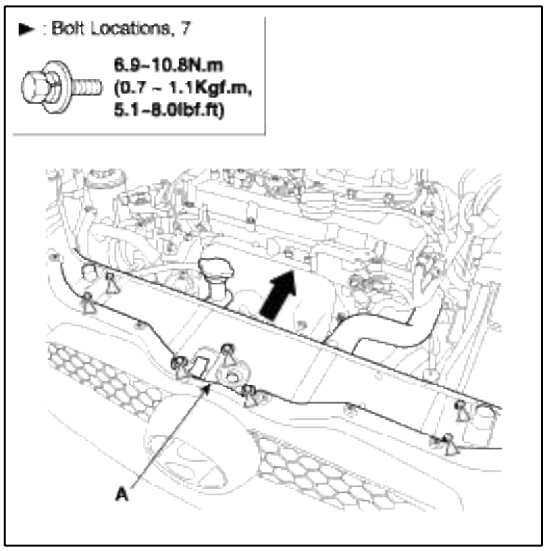
2. Installation is the reverse of removal.

HOOD LATCH REPLACEMENT

1. Remove the battery and battery tray.

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2. Pull tn the arrow direction after loosen the radiator mounting bolts then remove the hood latch (A).



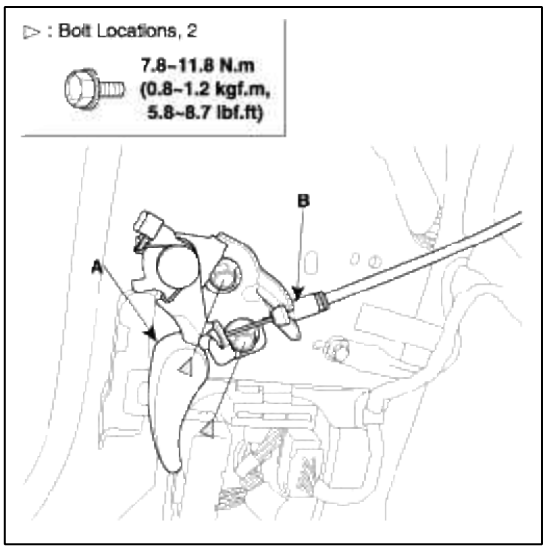
3. Installation is the reverse of removal.

NOTE

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

HOOD RELEASE HANDLE REPLACEMENT

1. Remove the cowl side trim.
2. Remove the mounting bolt, then remove the hood release handle (A).
3. Disconnect the hood latch cable (B) from the hood release handle.



4. Installation is the reverse of removal.

NOTE

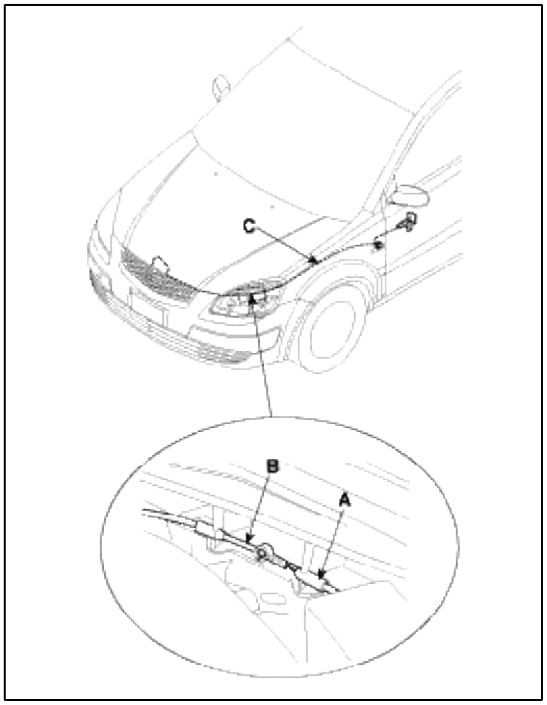
- Make sure the hood latch cable is connected properly.
- Make sure the hood locks securely.

HOOD LATCH RELEASE CABLE REPLACEMENT

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1. Remove the following items.
   A. Hood latch.
   B. Hood latch release handle.
   C. Weel guard.
2. Remove the clip, latch cable(A) and then remove the realese cable(B).

> NOTE
>
> - Make sure the hood latch cable is connected.

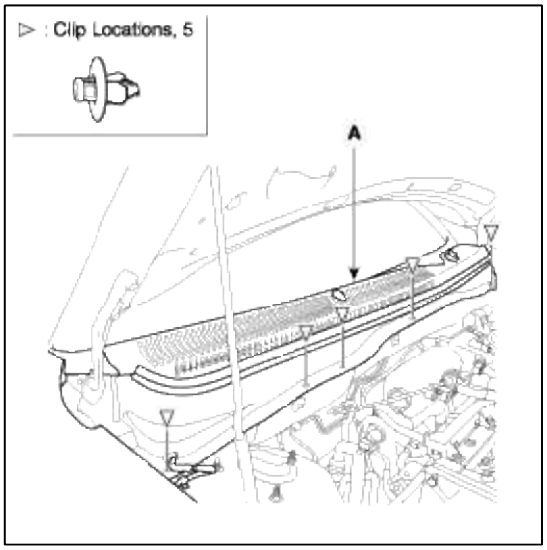


3. Installation is the reverse of removal.

> NOTE
>
> - Make sure the hood latch cable is connected proterly.
> - Replace any damaged clips.

COWL TOP COVER REPLACEMENT

1. Remove the wiperarm.
2. Disconnecting the hood weatherstrip(A), remove the cowl top cover(B).

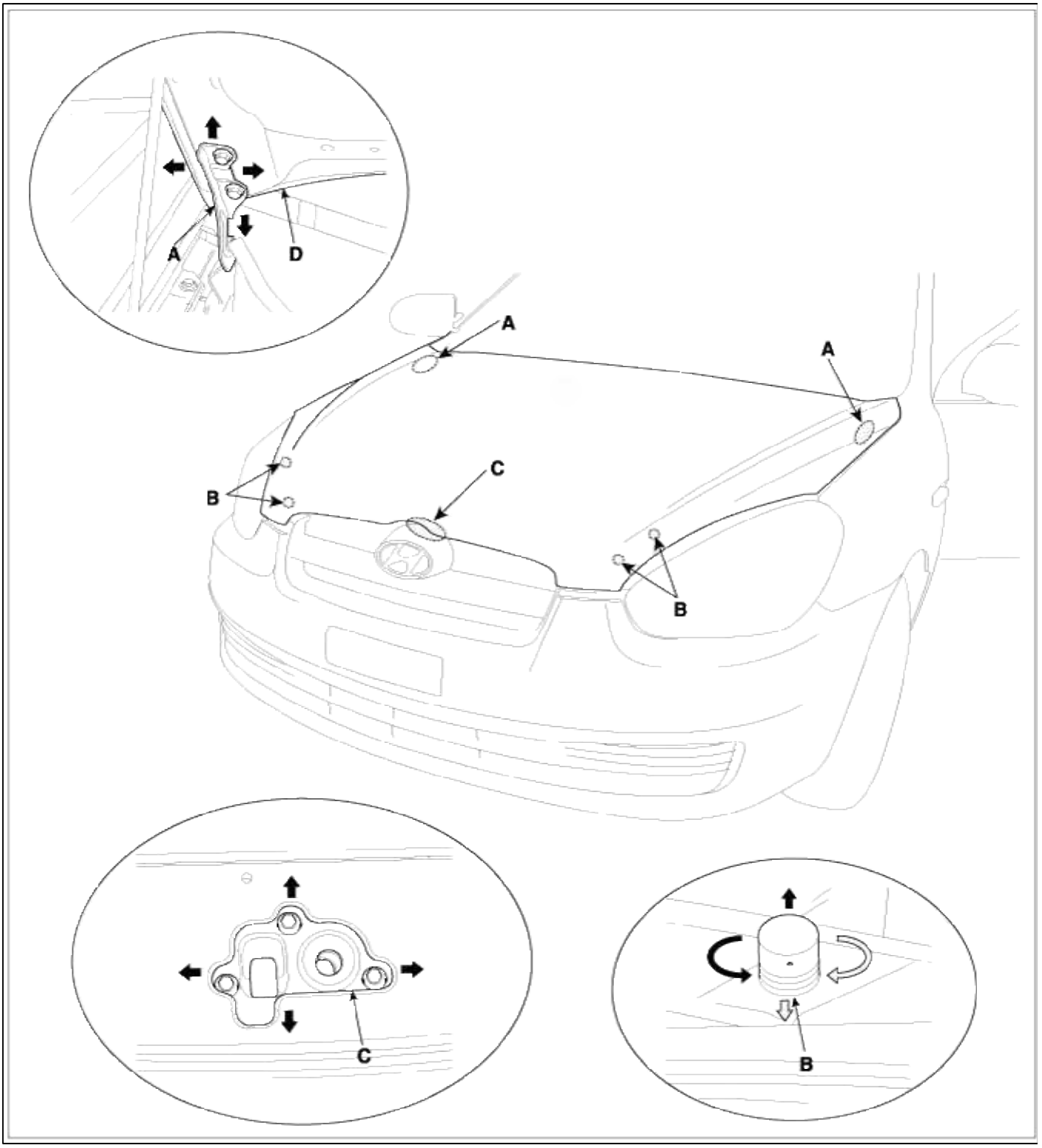


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3. Installation is the reverse of removal.

ADJUSTMENT

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.



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

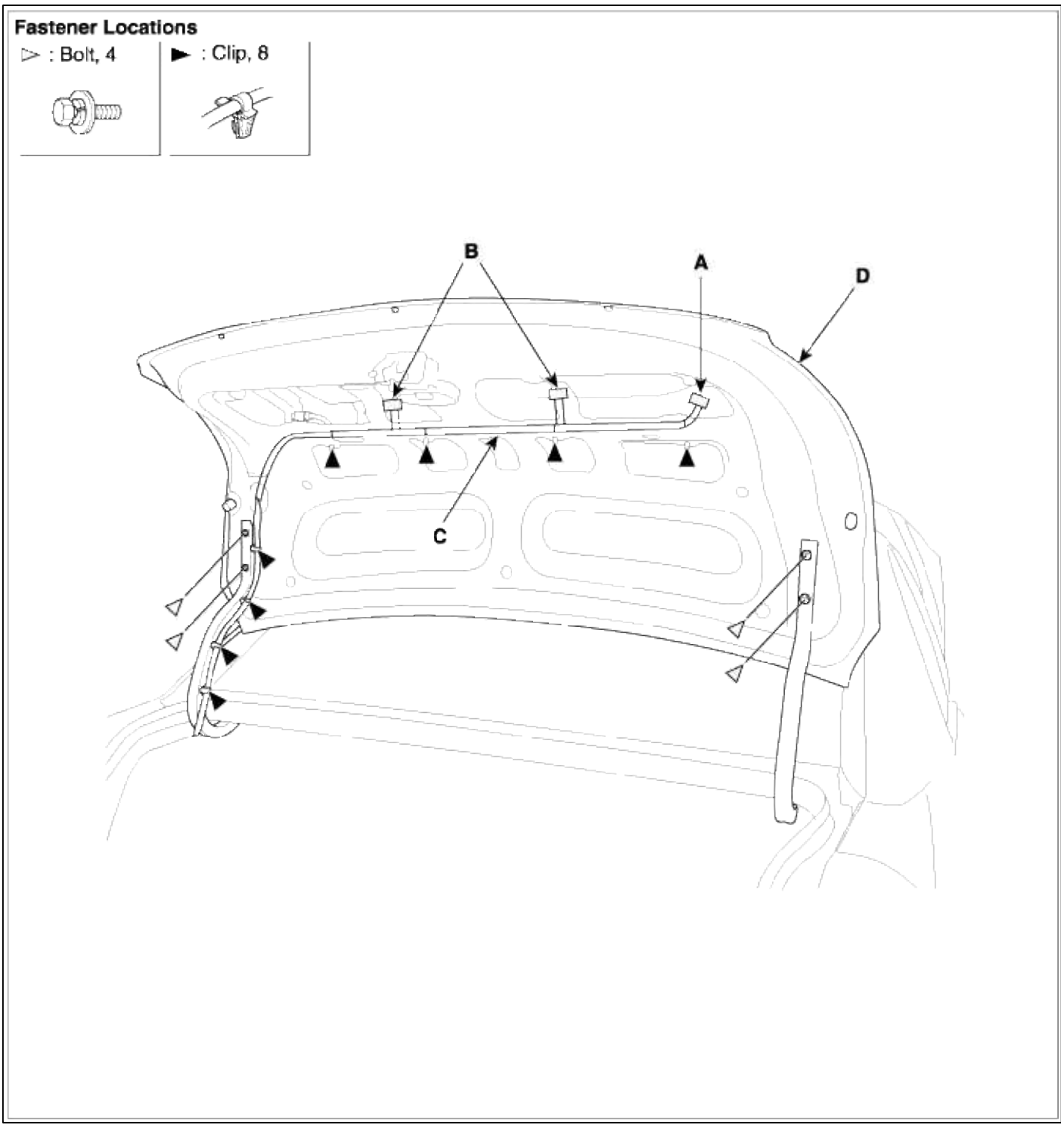
REPLACEMENT

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NOTE

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

1. Disconnect the key cylinder connector (A) license plate lamp connector(B) then remove tne wire ring harness from trunk lid.
2. Loosen the trunk lid mounting bolt, then remove the trunk lid(C).
3. Installation is the reverse of removal.

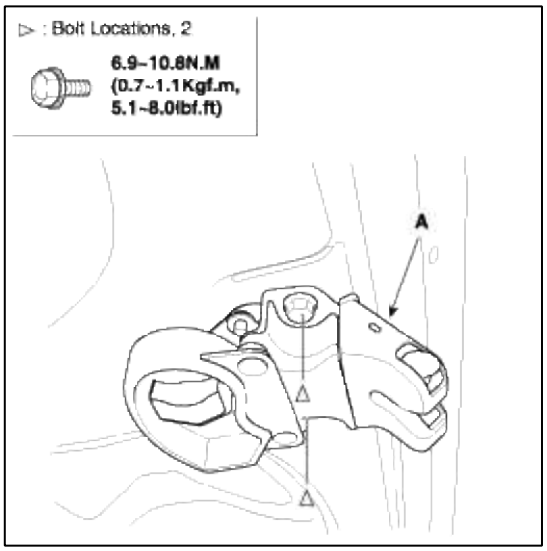


TRUNK LID LATCH REPLACEMENT

1. Loosening the tunk lid latch mounting bolts.
2. Disconnect the tunk lid latch rod.

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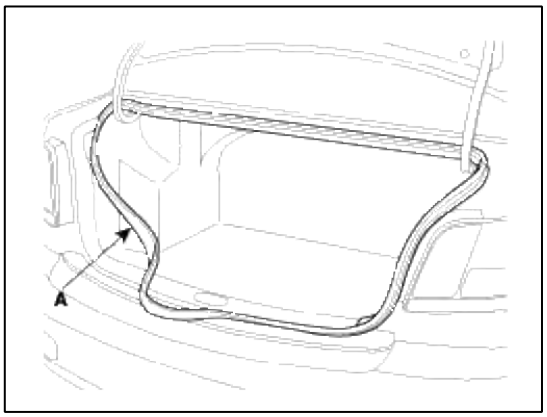
3. Remove the tunk lid latch (A).



4. Installation is the reverse of removal.

TRUNK LID WEATHERSTRIP REPLACEMENT

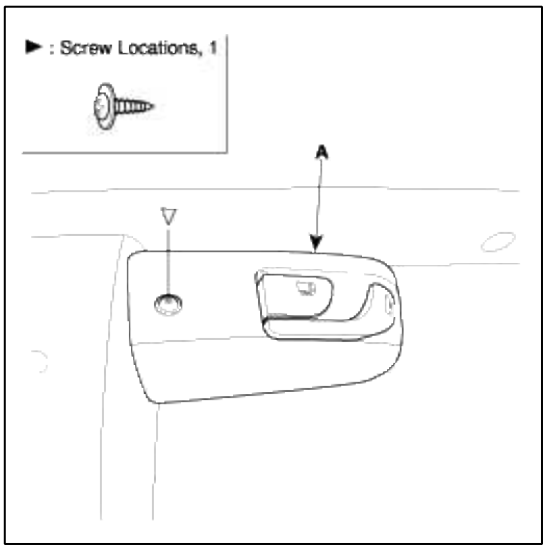
1. Remove the trunk lid weatherstrip (A).



2. Installation is the reverse of removal.

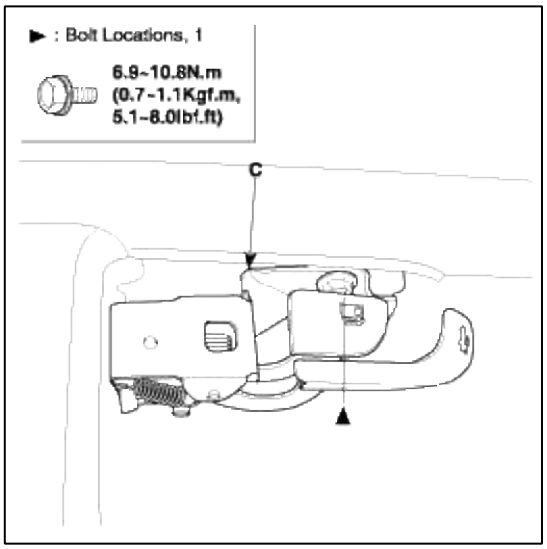
TRUNK LID RELEASE HANDLE REPLACEMENT

1. Remove the handle cover(A).

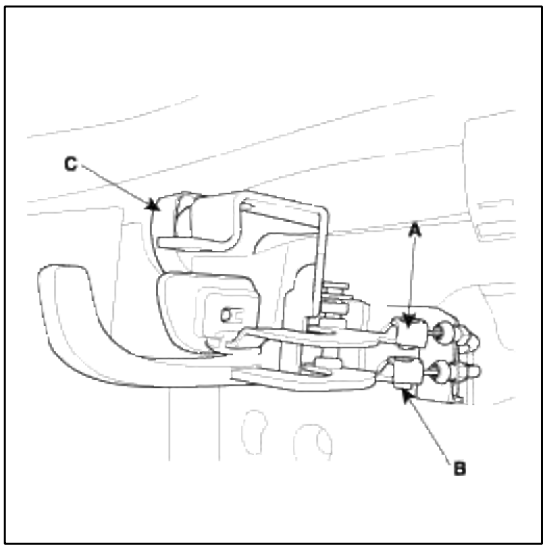


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2. After loosening the mounting bolts(C).



3. Disconnet the release handle cable (A) and fuel fill door release handle cable (B) then remove the release handle(C).



4. Installation is the reverse of removal.

NOTE

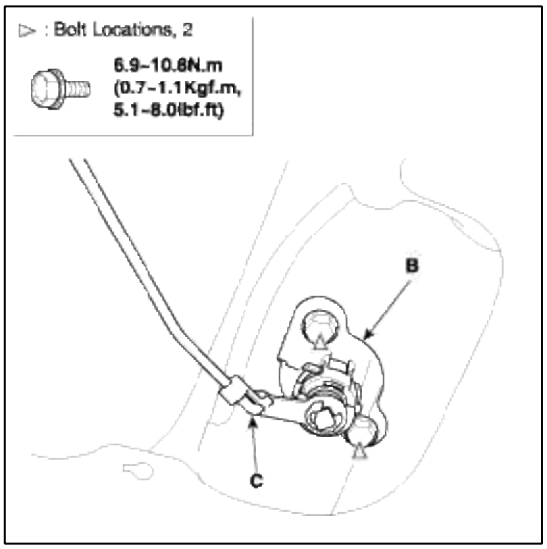
- Make sure the trunk lid latch cable is connected properly.
- Make sure the trunk lid opens properly and locks securely.

KEY CYLINDER REPLACEMENT

1. Loosening the mounting bolts, disconnect the rod(C).

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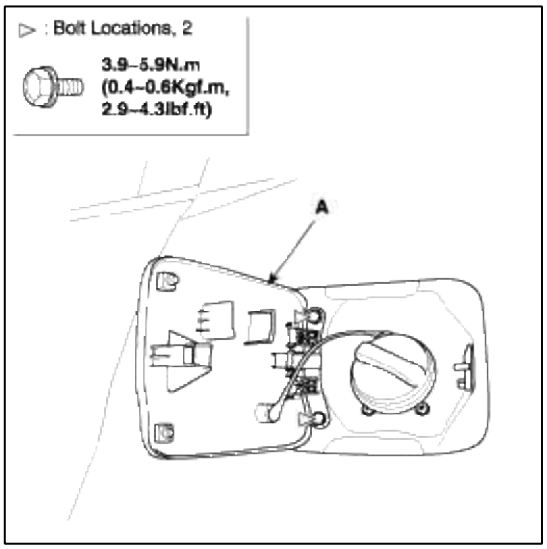
2. Remove the key holder(B).



3. Installation is the reverse of removal.

FUEL FILL DOOR REPLACEMENT

1. Loosen the bolts, then remove the fuel filler door (A).



2. Installation is the reverse of removal.

NOTE

- Make sure the fuel fill door opens properly and locks securely.

TRUNK LID, FEUL FILL DOOR RELEASE CABLE REPLACEMENT

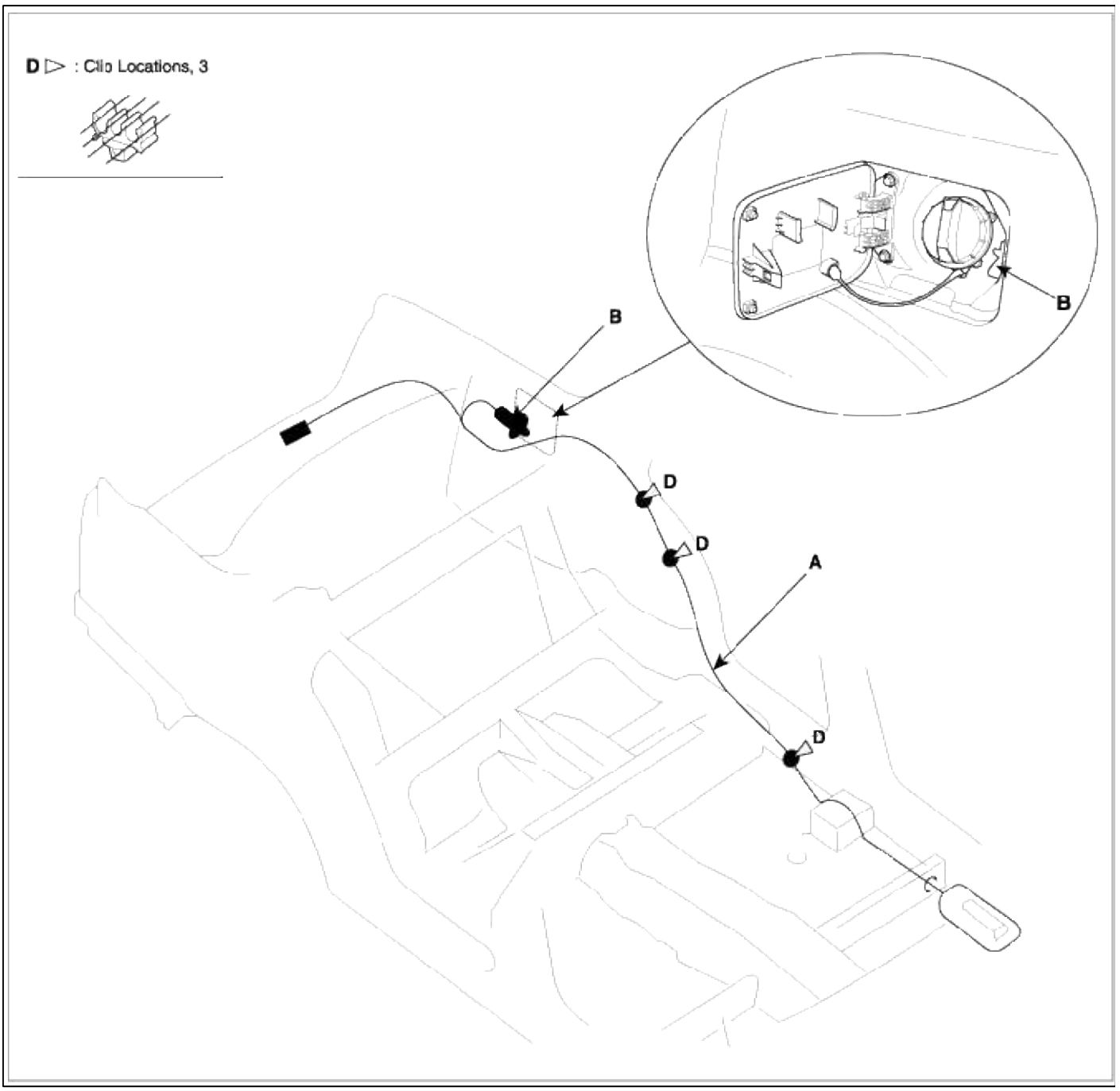
1. Remove the following items.
   A. Front seat.
   B. Rear seat.
   C. Front, rear door scuff trim.
   D. Center lower pillar trim.
   E. Luggage side trim.
   F. Fuel fill door releas handle.
2. Remove the cable mounting clip (A).
3. After disconnting catch (B), remove the cable.

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4. Installation is the reverse of removal.

NOTE

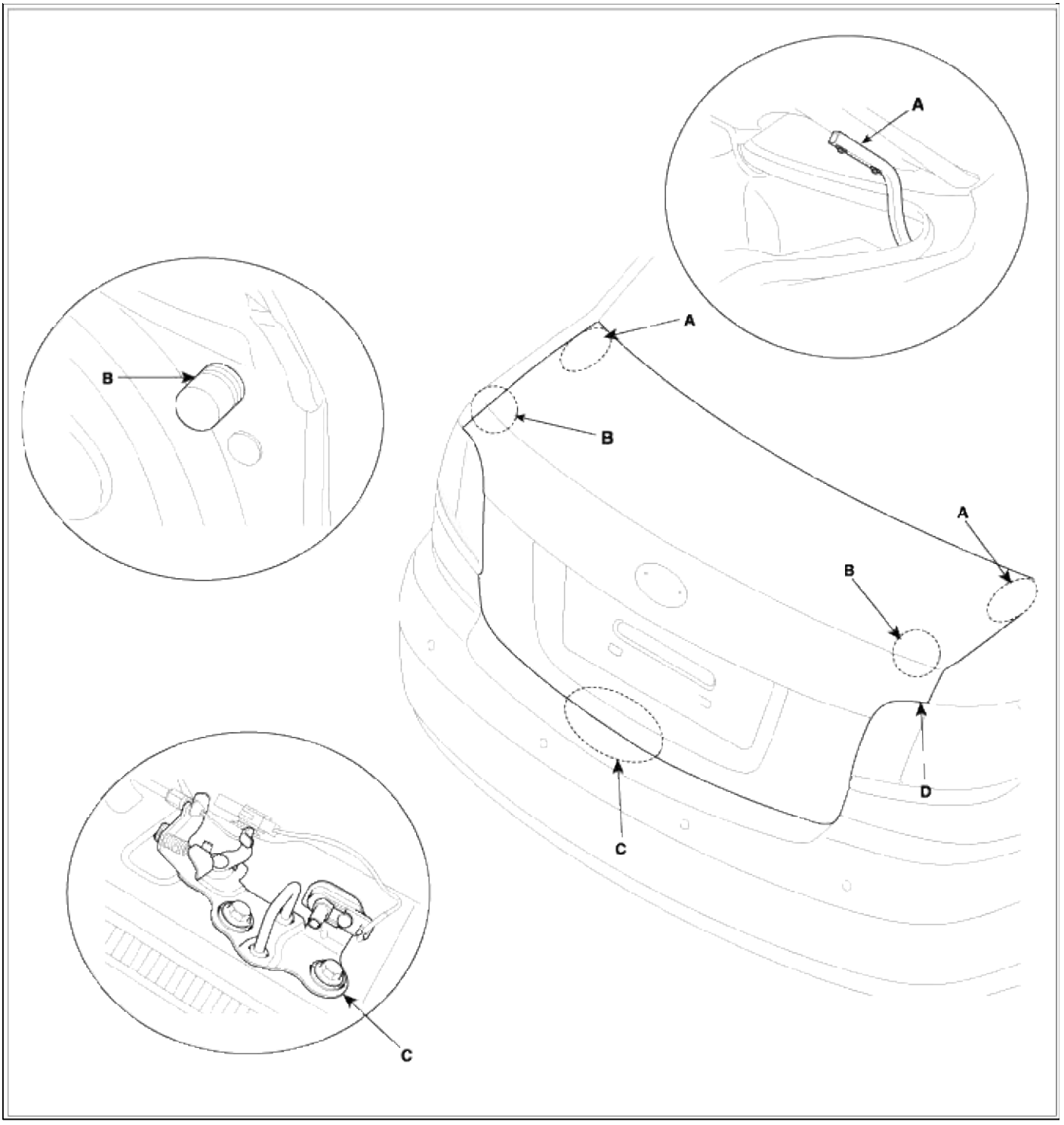
- Make sure the fuel fill door opens properly and locks securely.



ADJUSTMENT

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

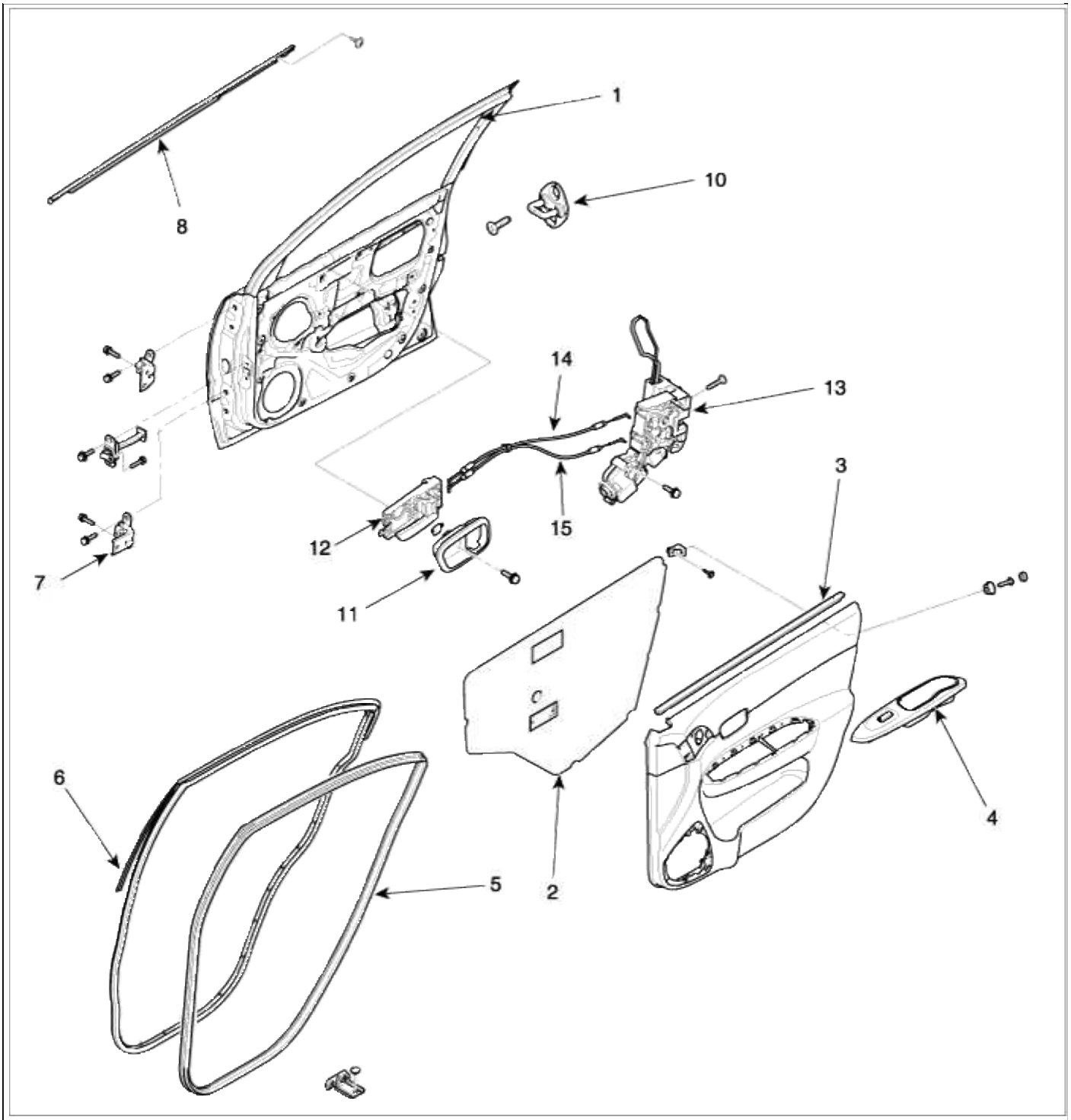
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Body (Interior and Exterior) > Exterior > Front Door > Components and Components Location

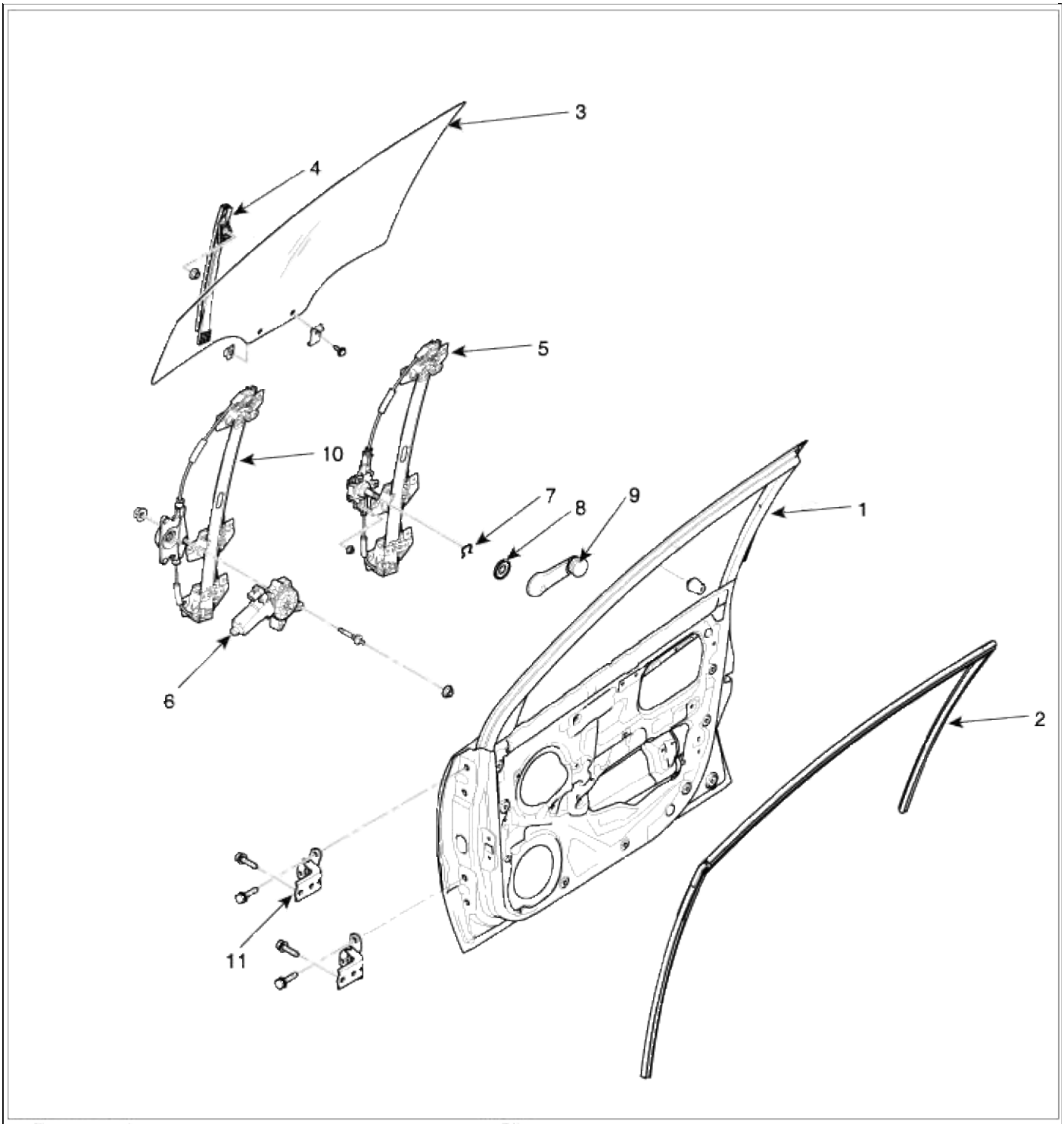
COMPONENTS

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1. Door panel
2. Door trim seal
3. Door trim
4. Power window switch
5. Body side weatherstrip
6. Door side weatherstrip
7. Door hinge
8. Door belt weatherstrip
9. Door cheaker
10. Door striker
11. Inside handle housing
12. Inside handle
13. Latch
14. Safety lock cable
15. Inside handle cable

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1. Door panel
2. Glass molding
3. Glass
4. Channel
5. Standard regulator
6. Power window motor
7. Clip
8. Bushing
9. Door window handle
10. Power window regulator
11. Door hinge

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

REPLACEMENT

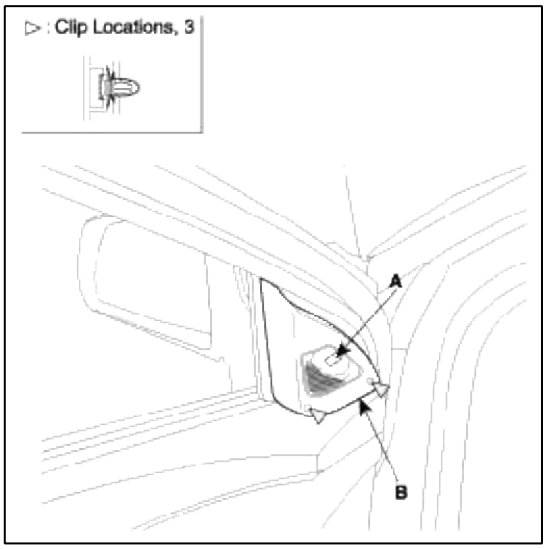
DOOR TRIM REPLACEMENT

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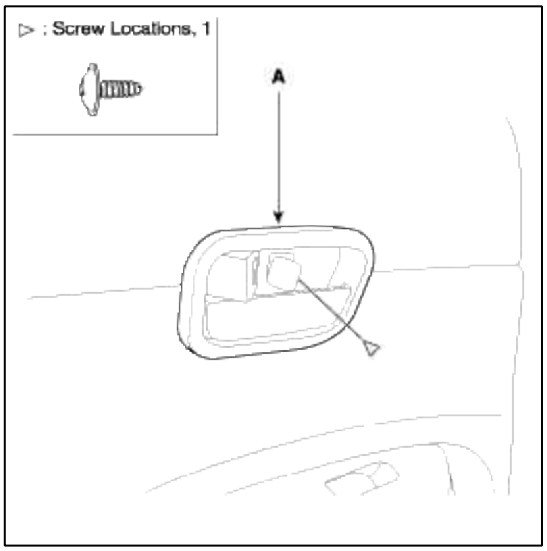
NOTE

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

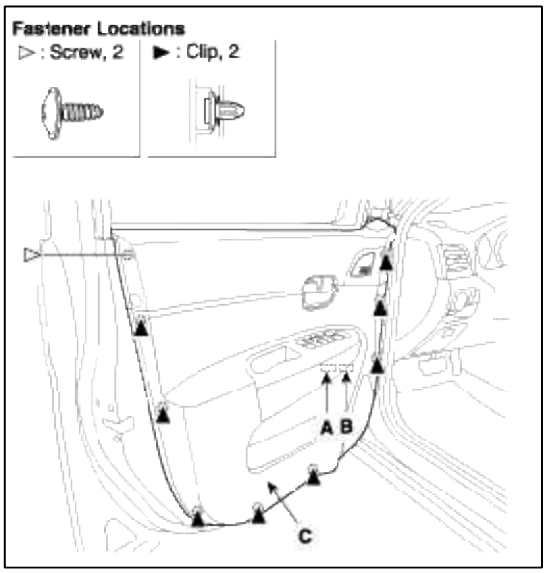
1. After disconncting the connector(A), remove the quadrant inner cover(B).



2. After loosen the inside handle cover mounting screw, remove the inside handle cover(A).



3. Loosen the door trim mounting screws. Disconnect the power window switch connector(A), power mirror connector(B). Remove the door trim(C).



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4. Installation is the reverse of removal.

NOTE

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

GLASS REPLACEMENT

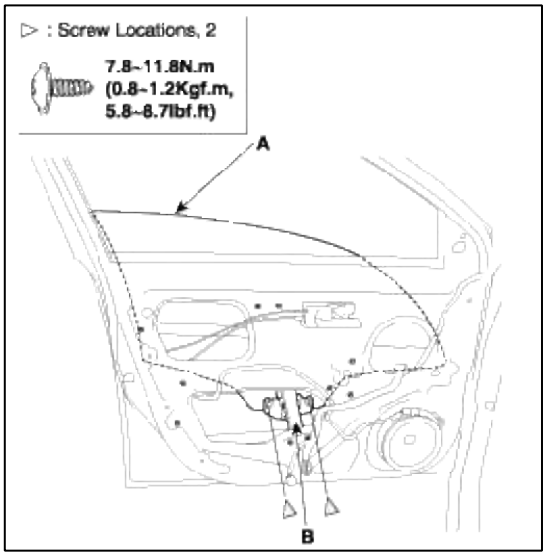
NOTE

- Put on gloves to protect your hands.

1. Remove the front door trim.
2. Door trim seal.
3. Carefully move the glass (A) until you can see the bolts, then loosen them. Separate the glass from the glass run and carefully pull the glass out through the window slot (B).

CAUTION

- Take care not to drop to glass and scratch the glass surface.



4. Installation is the reverse of removal.

NOTE

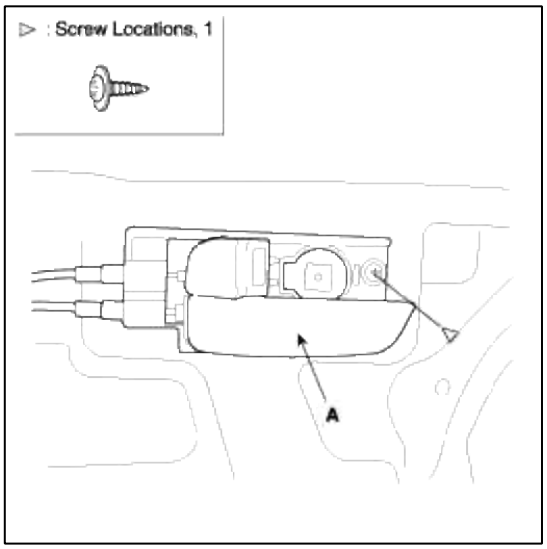
- Roll the glass up down to see if it move freely without binding.
- Adjust the position of the glass as necessary.
- If the door trim seal is damaged, it must be replaced.

INSIDE HANDLE REPLACEMENT

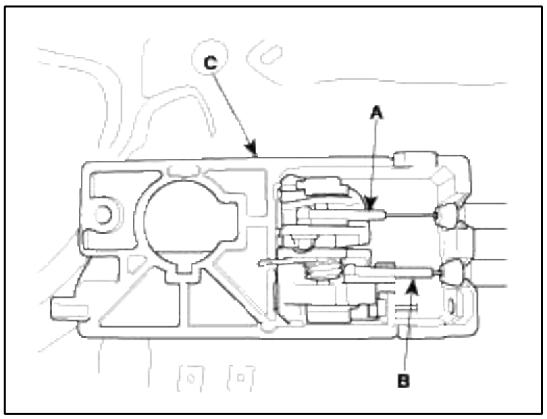
1. Remove the front door trim.

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2. Loosen the inside handle (A) mounting screw.
   Push the inside handle rearward to disconnect from the door module.



3. Disconnect the safety lock cable(A) and inside handle cable (B).
   Remove the inside handle(C).

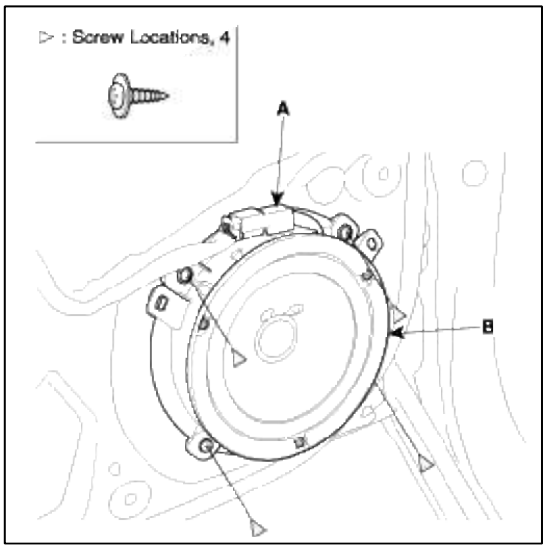


4. Installation is the reverse of removal.

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

SPEAKER REPLACEMENT

1. Remove the front door trim.
2. After disconnect the speaker mounting screw and connector(A), remove the speaker(B).

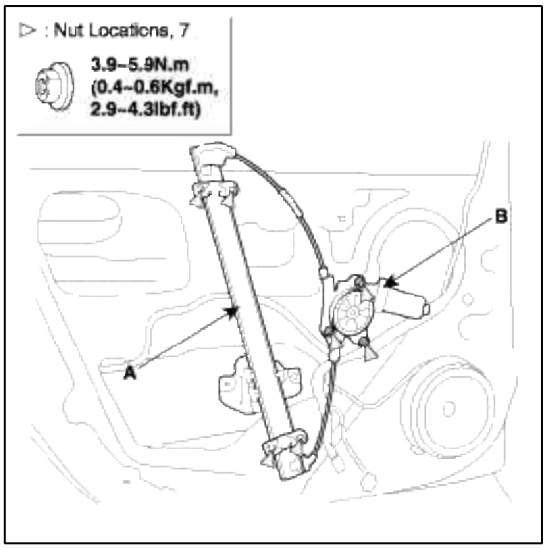


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3. Installation is the reverse of removal.

DOOR REGULATOR REPLACEMENT

1. Remove the door trim.
2. Remove the door trim seal.
3. Remove the window glass.
4. After disconnecting window motor connector(B), loosen the door regulator mounting nuts and window motor mounting nuts, remove the door regulator(A).



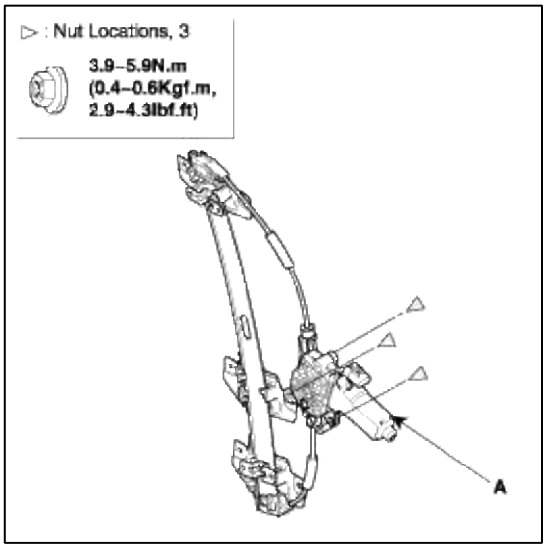
5. Installation is the reverse of removal.

NOTE

- If the door trim seal is damaged, it must be replaced.

POWER WINDOW MOTOR REPLACEMENT

1. Remove the front door trim.
2. Remove the door trim seal.
3. Remove the glass.
4. Remove the door regulator.
5. After loosening the power window mounting nuts, remove the power window motor(A).



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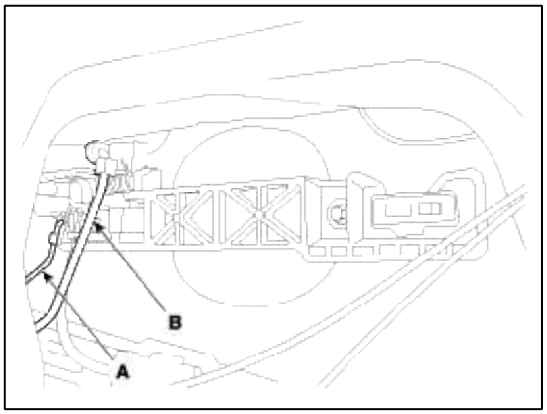
6. Installation is the reverse of removal.

NOTE

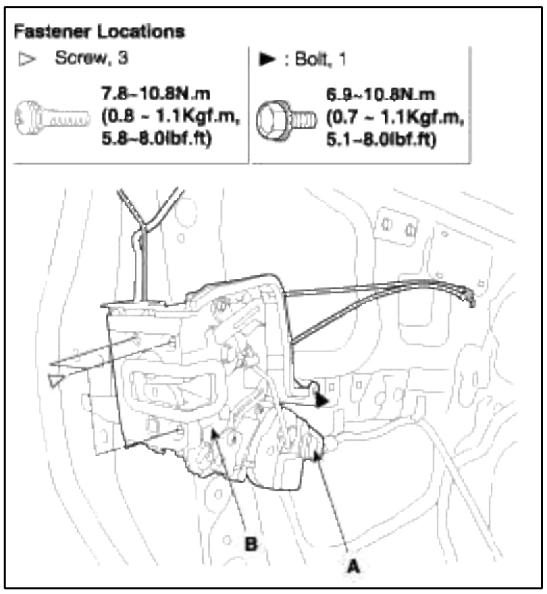
- Roll the glass up down to see if it move freely without binding.
- If the door trim seal is damaged, it must be replaced.

FRONT DOOR LATCH REPLACEMENT

1. Remove the door trim.
2. Remove the door trim seal.
3. Remove the inside handle.
4. Remove the channel.
5. Disconnect the lock rod(A), out side handle rod(B).



6. After disconnect the connector(A), loosen the mounting bolts. Remove the latch assembly(B).



7. Installation is the reverse of removal.

NOTE

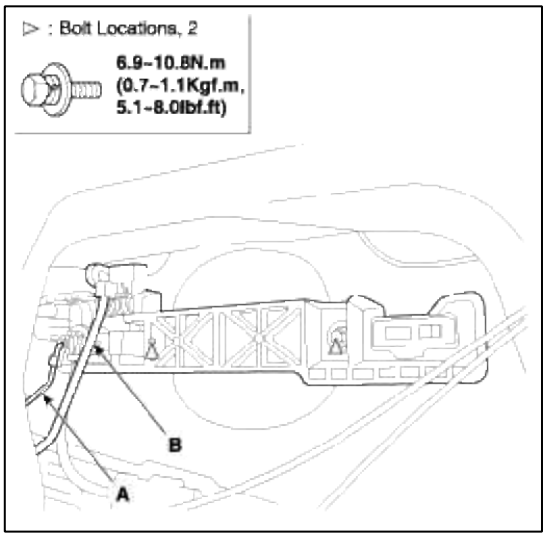
- Roll the glass up down to see if it move freely without binding.
- Make sure the door lock and opens properly.
- If the door trim seal is damaged, it must be replaced.

OUTSIDE HANDLE REPLACEMENT

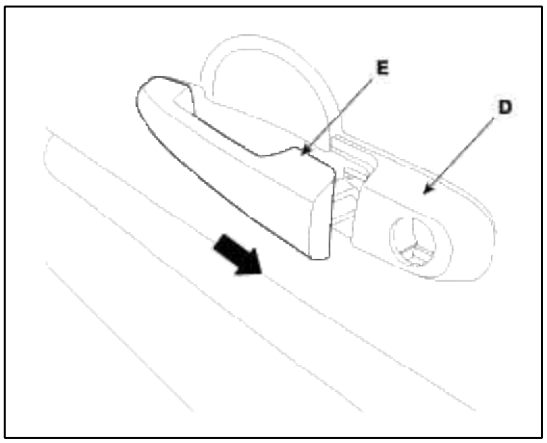
1. Remove front door trim.
2. Remove the door trim seal.
3. Remove the front door lower channel.

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4. Disconnect the lock rod(A), out side handle rod(B).
5. Loosen the outside handle mounting bolts.



6. Push the outside handle base forward(D) and remove the outside handle(E).

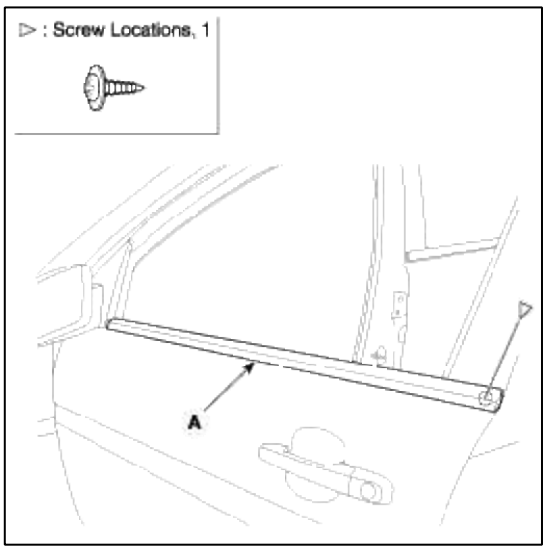


7. Installation is the reverse of removal.

> NOTE
>
> - Make sure the door lock and opens properly.

DOOR BELT WEATHERSRIP REPLACEMENT

1. Remove front door trim.
2. Remove the door belt weatherstrip(A).

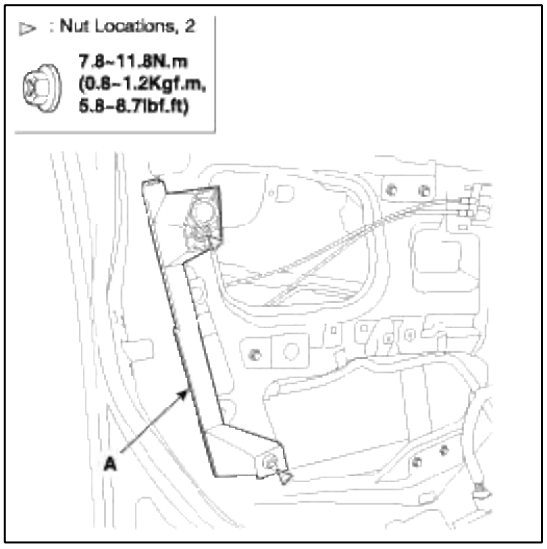


3. Installation is the reverse of removal.

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REAR CHANNEL REPLACEMENT

1. Remove front door trim.
2. Remove the door trim seal.
3. Remove the galss.
4. Remove the rear channel(A).



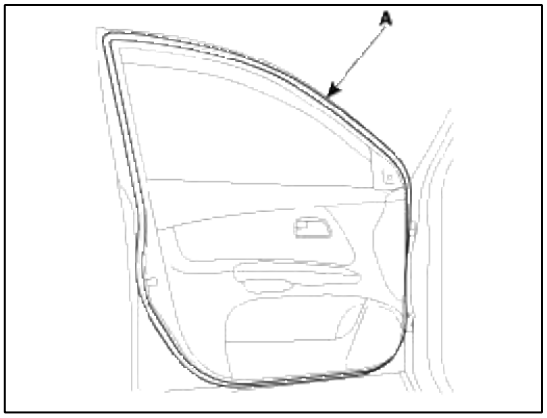
5. Installation is the reverse of removal.

NOTE

- If the door trim seal is damaged, it must be replaced.

DOOR WEATHERSTRIP REPLACEMENT

1. Remove the door weatherstrip(A).



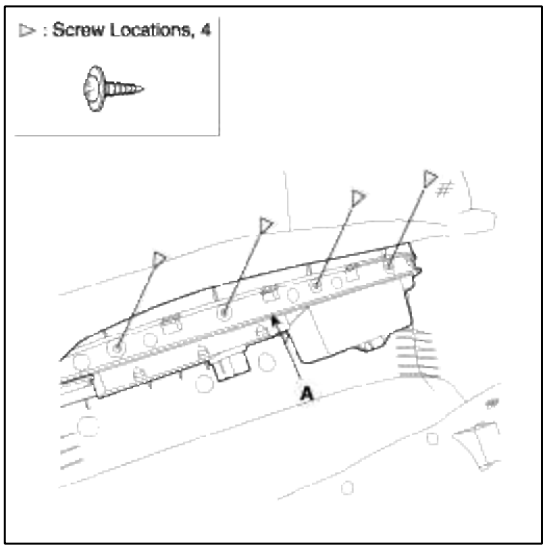
2. Installation is the reverse of removal.

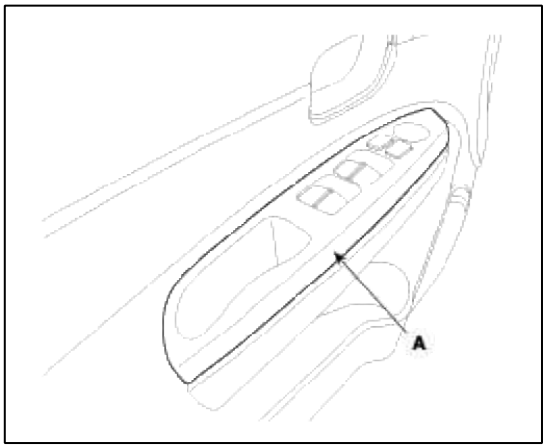
POWER WINDOW SWITCH REPLACEMENT

1. Remove the door trim.

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2. Remove the power window switch (A).





3. Installation is the reverse of removal.

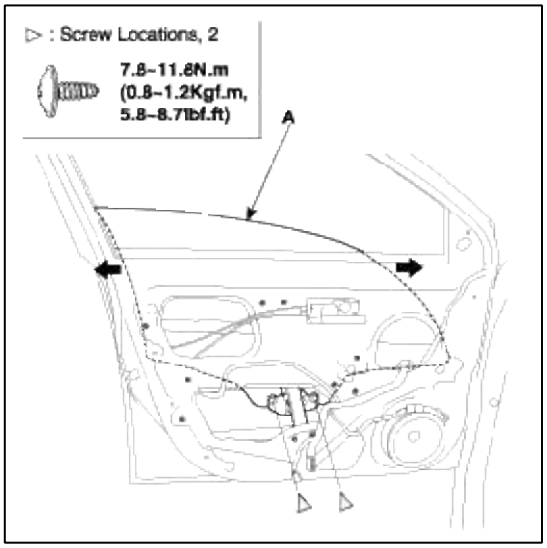
ADJUSTMENT

GLASS ADJUSTMENT

NOTE

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

1. Remove the front door trim.
2. Remove the door trim seal.
3. Carefully move the glass (A) until you can see the glass mounting bolts, then loosen them.



4. Check that the glass moves smoothly.

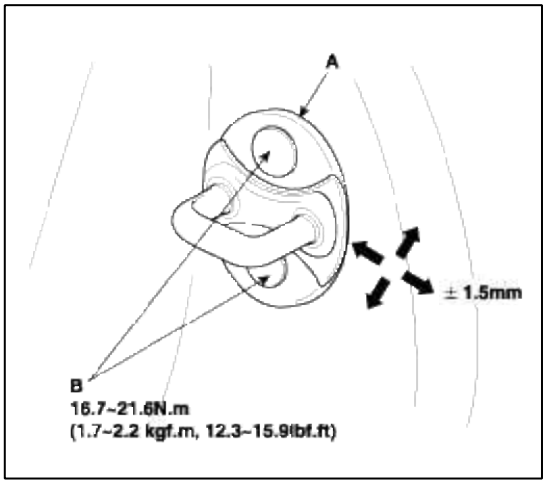
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DOOR STRIKER ADJUSTMENT

Make sure the door latches securely without slamming It.

If necessary, adjust the striker (A): The strike nuts Are fixed. The strike 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(A).



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.

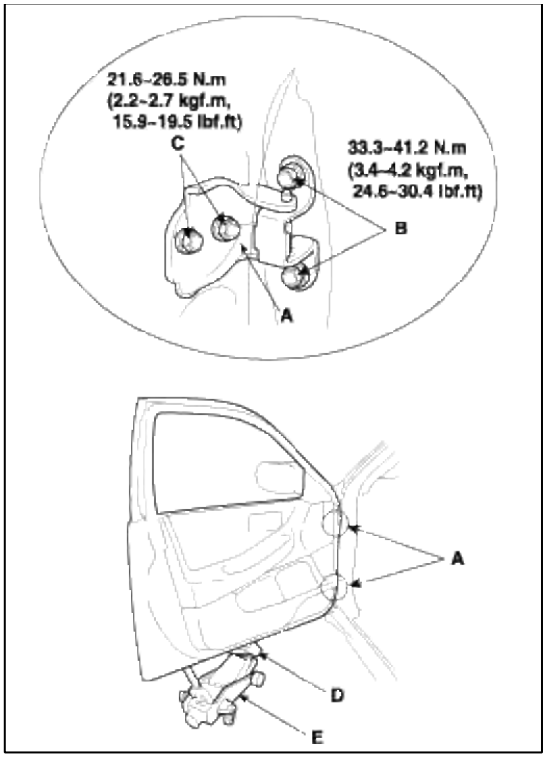
DOOR POSITION ADJUSTMENT

NOTE

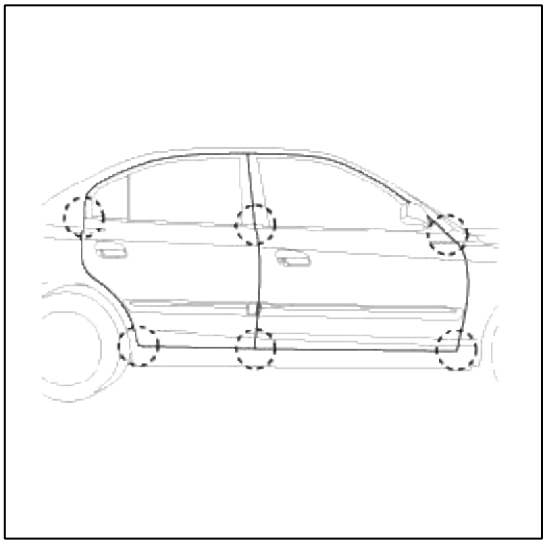
- After installing the door, check for a flush fit with the Body, then check for equal gaps between the front, Rear, and bottom, door edges and the body. Check That the door and body edges are parallel. Before Adjusting, replace the mounting bolts.

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

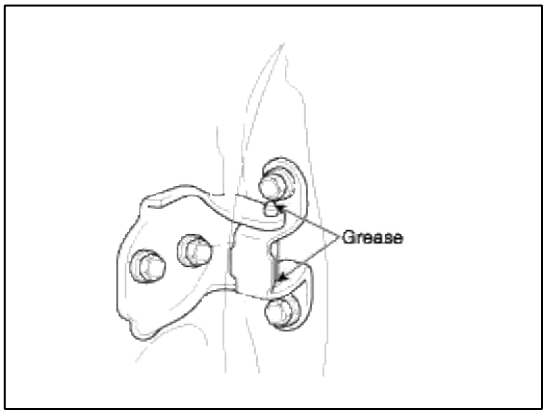
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3. Check that the door and body edges are parallel.



4. Grease the pivot portions of the hinges indicated by the arrows.

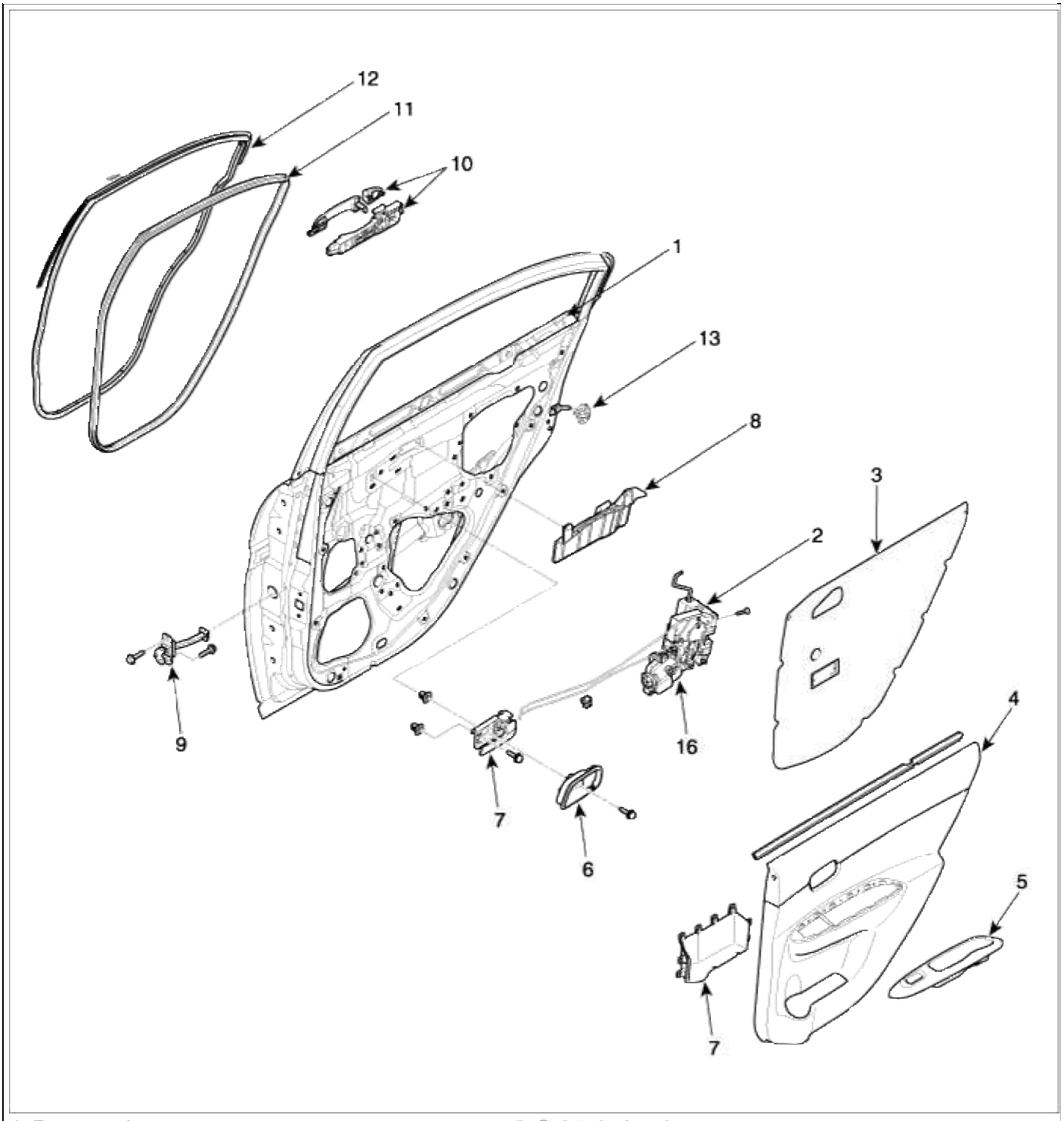


5. Check for water leaks.

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

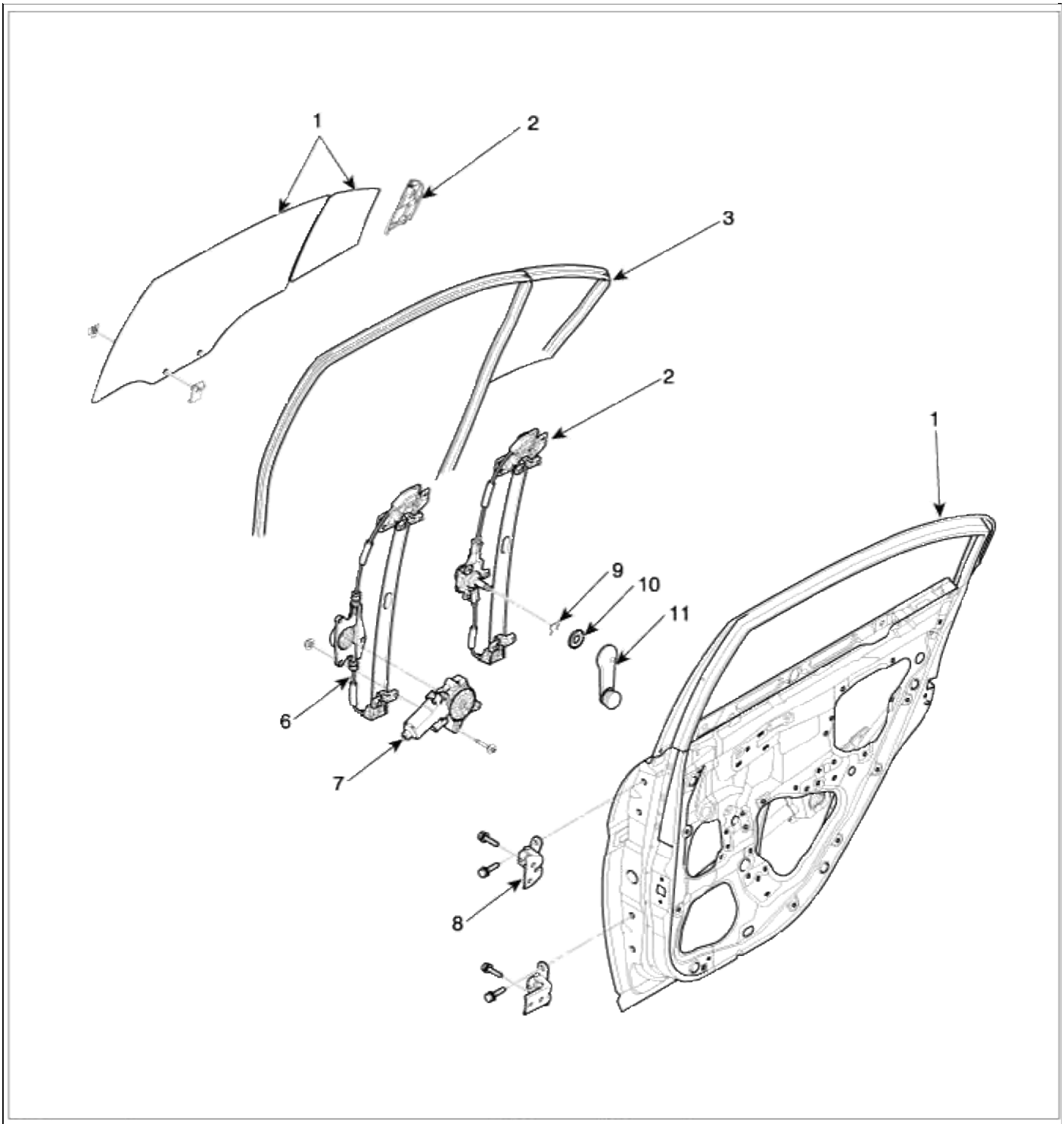
COMPONENTS

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1. Door panel
2. Latch
3. Door trim seal
4. Door trim
5. Armrest
6. Inside handle housing
7. Inside handle
8. Safety lock rod cover
9. Checker
10. Outside handle assembly
11. Body side weatherstrip
12. Door side weatherstrip
13. Striker

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1. Door panel
2. Standard regulator
3. Glass molding
4. Side cover
5. Glass
6. Power window regulator
7. Power window motor
8. Door hinge
9. Clip
10. Bushing
11. Door window handle

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

REPLACEMENT

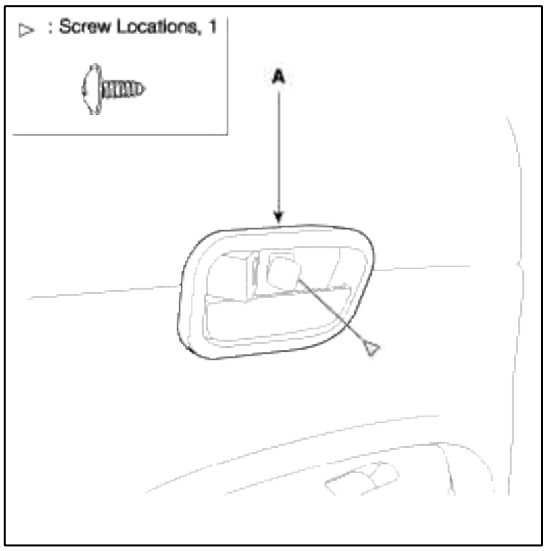
REAR DOOR TRIM REPLACEMENT

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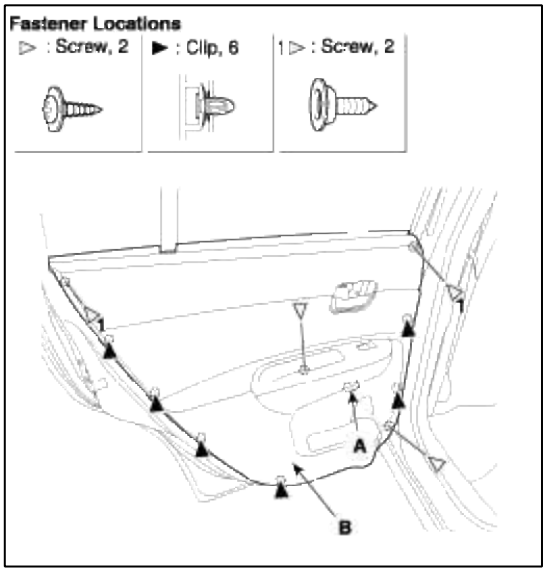
NOTE

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

1. After loosen the inside handle cover mounting screw, remove the inside handle cover(A).



2. Loosen the door trim mounting screws. disconnect the power window switch connector(A), power mirror connector. remove the door trim(B).



3. Installation is the reverse of removal.

NOTE

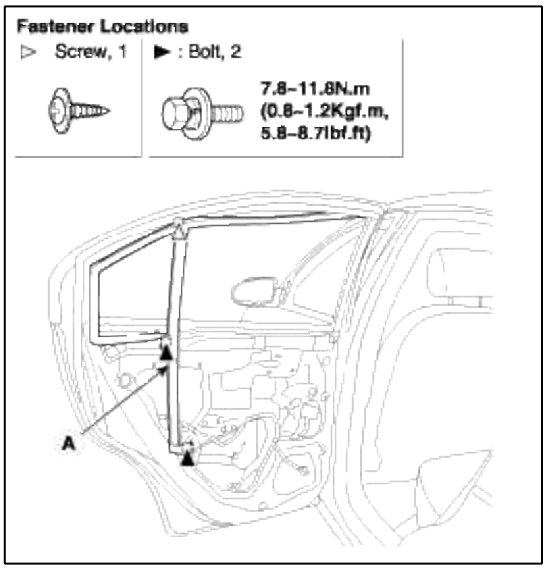
- Make sure of connectors is plugged in properly and each rod is connected securely.
- Make sure the door lock and opens properly.

GLASS REPLACEMENT

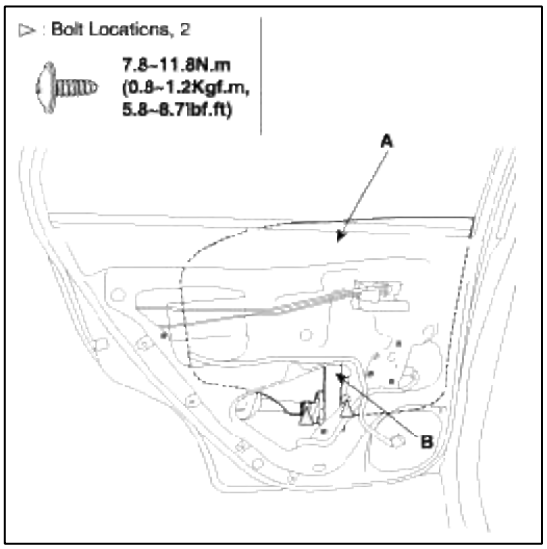
1. Remove the rear door trim.
2. Remove the door trim seal.

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3. After loosening the fixed glass mounting screw and bolts, remove the glass(A).



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



5. Installation is the reverse of removal.

CAUTION

- Take care not to drop to glass and scratch the glass Glass surface.

NOTE

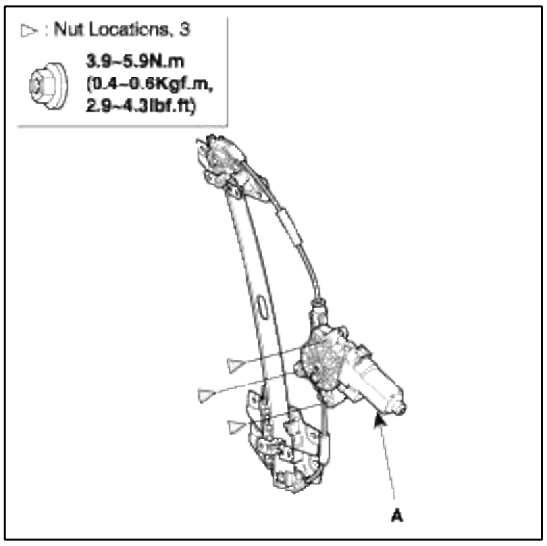
- If the door trim seal is damaged, it must be replaced.

POWER WINDOW MOTOR REPLACEMENT

1. Remove the following items.
   A. Door trim
   B. Door trim seal
   C. Glass
   D. Door regulator

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2. After loosening the power window motor mounting nuts, remove the power window motor (A).



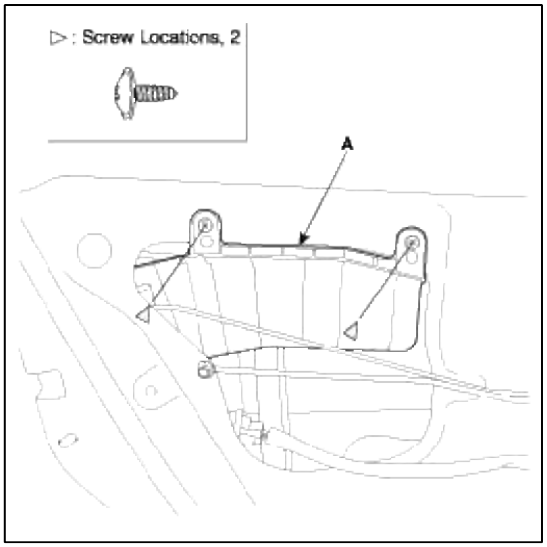
3. Installation is the reverse of removal.

NOTE

- Roll the glass up down to see if it move freely without binding.
- If the door trim seal is damaged, it must be replaced.

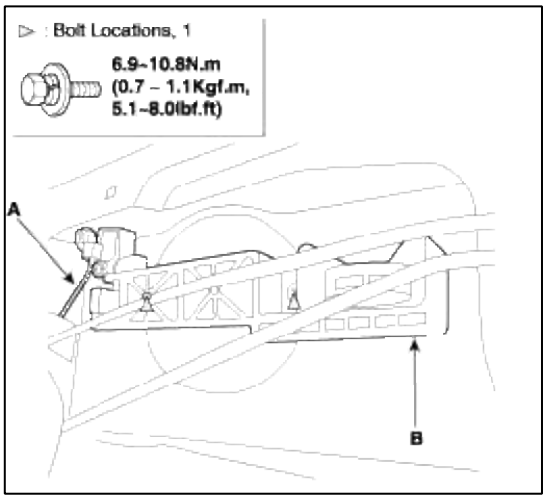
OUT SIDE HANDLE REPLACEMENT

1. Remove the rear door trim.
2. Remove the rear door trim seal.
3. Remove the road safety lock rod cover(A).

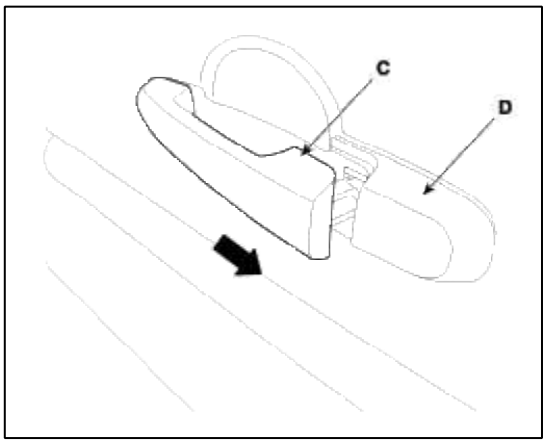


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4. After disconnect the out side handle rod(A), loosen the outside handle mounting bolts.



5. Push the outside handle base forward(D) and remove the outside handle(C)



6. Installation is the reverse of removal.

NOTE

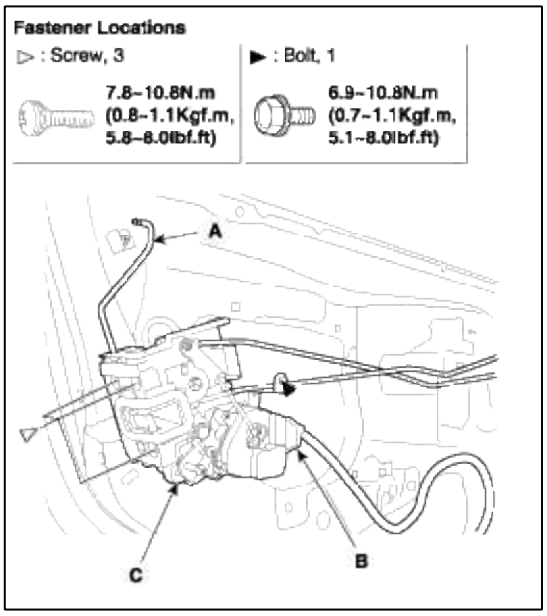
- Make sure of connectors is plugged in properly and each rod is connected securely.
- Make sure the door lock and opens properly.
- If the door trim seal is damaged, it must be replaced.

REAR DOOR LATCH REPLACEMENT

1. Remove the following items
   A. Door trim.
   B. Door trim seal.
   C. Inside handle.
   D. Inside lock rod cover.
   E. Chanuel.
2. Disconnect the out side handle lod (A), connector(B).

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3. After loosen the latch mounting bolts, remove the latch assmbly (C).



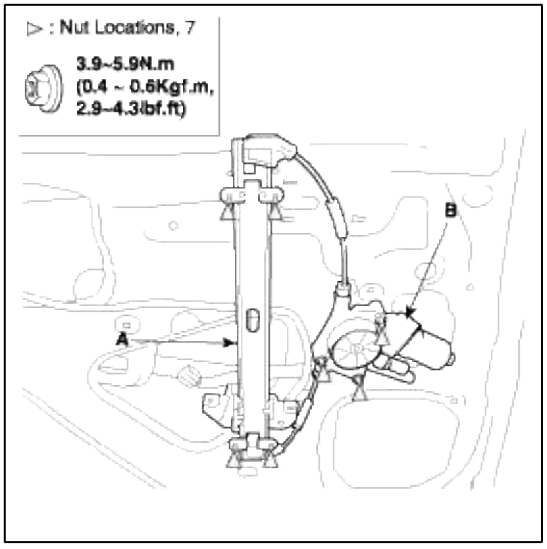
4. Installation is the reverse of removal.

NOTE

- Make sure the door lock and opens properly.
- If the door trim seal is damaged, it must be replaced.

DOOR REGULATOR REPLACEMENT

1. Remove the door trim.
2. Remove the door trim seal.
3. Remove the window glass.
4. After disconnecting window motor connector (B), loosen the door regulator mounting nuts and window motor mounting nuts.Remove the door regulator (A).



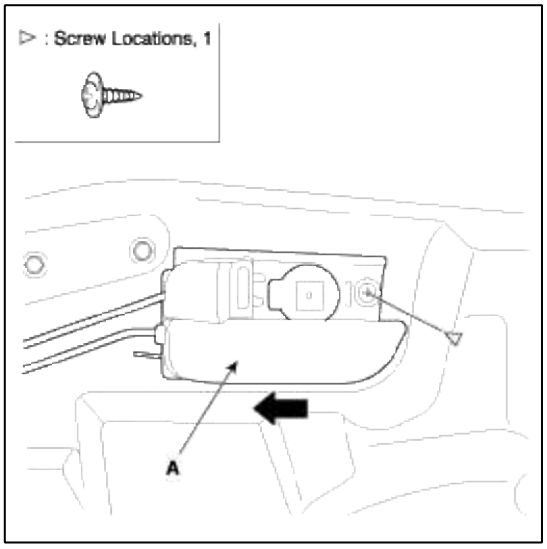
5. Installation is the reverse of removal.

NOTE

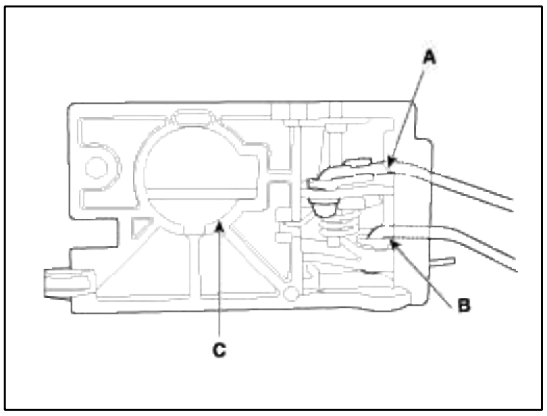
- Make sure the connector is plugged in properly and each rod is connected securely.
- Make sure the door lock and open properly.
- If the door trim seal is damaged, it must be replaced.

INSIDE HANDLE REPLACEMENT

1. Remove the rear door trim.
2. Loosen the inside handle (A) mounting screw.
   Push the inside handle rearward to disconnect from the door module.



3. Disconnect the safety lock rod and (A) inside handle rod(B), remove rhe inside handle(C).



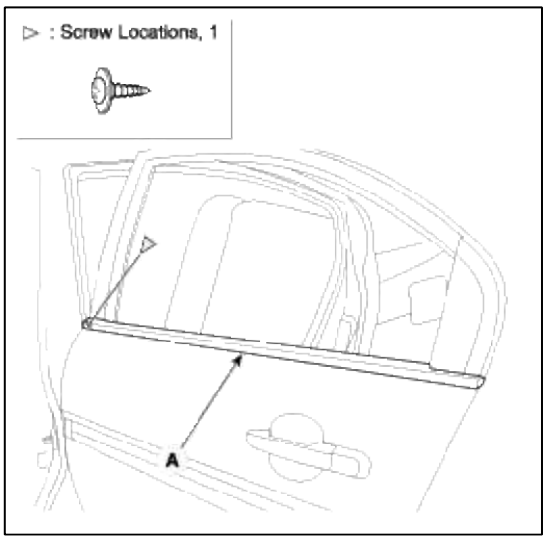
4. Installation is the reverse of removal.

NOTE

- Make sure the door lock and open properly.

DOOR BELT WEATHERSTRIP REPLACEMENT

1. Remove the door belt weatherstrip(A).

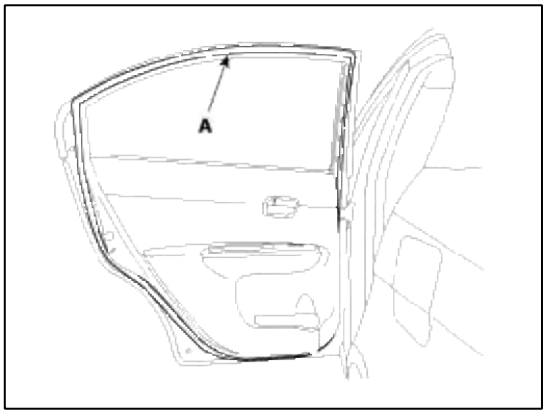


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2. Installation is the reverse of removal.

DOOR WEATHERSTRIP REPLACEMENT

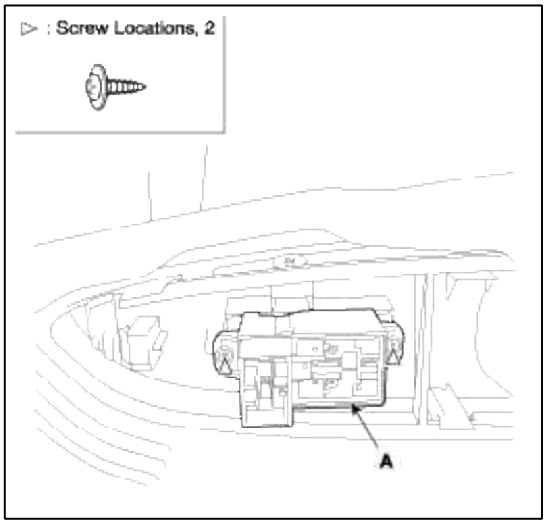
1. Remove the door weatherstrip(A).



2. Installation is the reverse of removal.

POWER WINDOW SWITCH REPLACEMENT

1. Remove the door trim.
2. Remove the power window switch (A).



3. Installation is the reverse of removal.

ADJUSTMENT

GLASS ADJUSTMENT

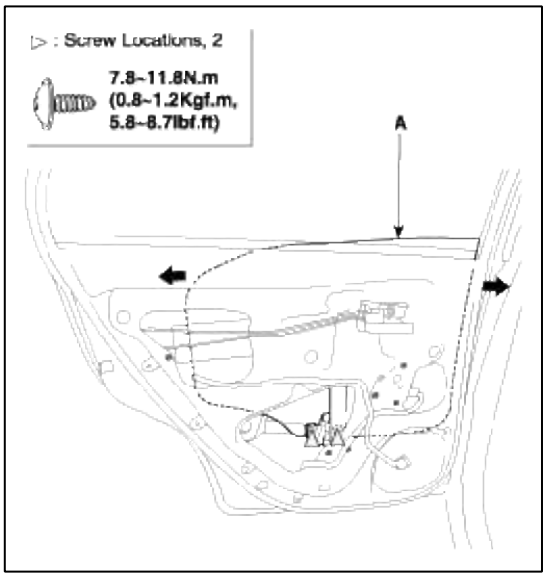
NOTE

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

1. Remove the following parts.
   A. Door trim.
   B. Door trim seal.

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2. Carefully move the glass (A) until you can see the glass mounting bolts, then loosen them.



3. Check that the glass moves smoothly.

NOTE

- The door trim seal must be replaced if it is damaged.

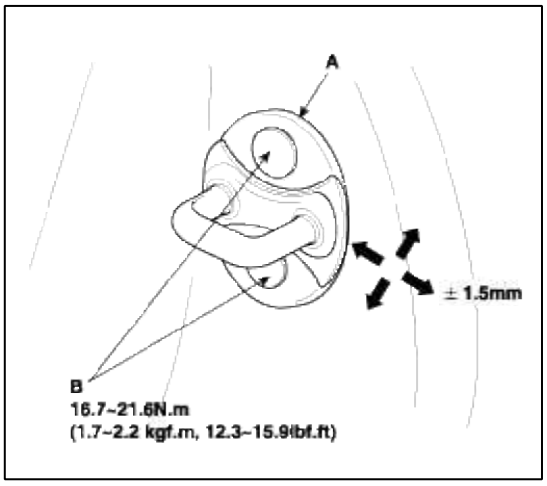
DOOR STRIKER ADJUSTMENT

Make sure the door latches securely without slamming it.

If necessary, adjust the striker (A) : The striker nuts Are fixed. The strike can be fine adjusted up or down, and in or out.

Striker ceater to be adjusted max ± 1.5mm

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



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.

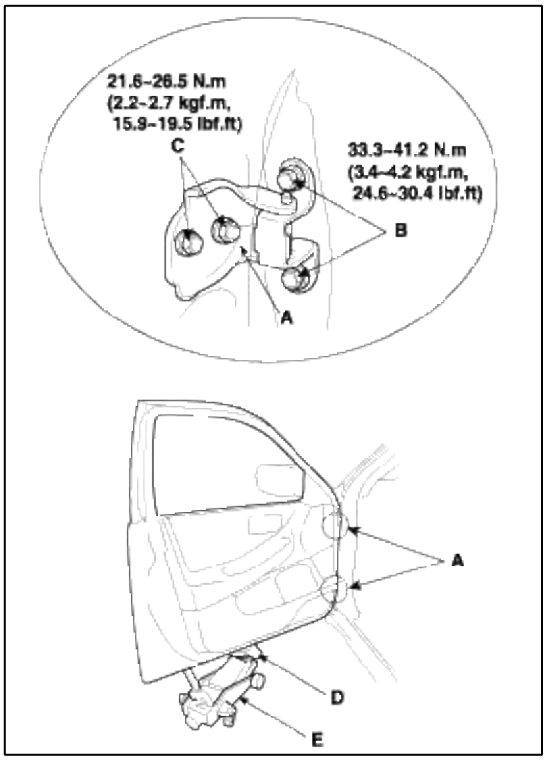
DOOR POSITION ADJUSTMENT

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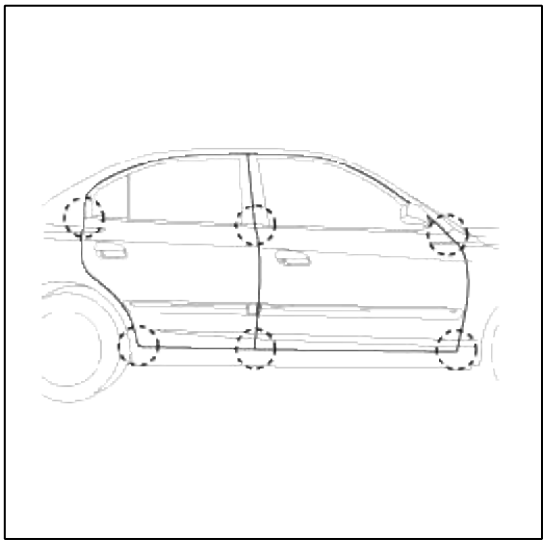
NOTE

- After installing the door, check for a flush fit with the Body, then check for equal gaps between the front, Rear, and bottom, door edges and the body. CheckThat 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):
   A. Loosen the door mounting bolts (B) slightly, and move the door IN or OUT until it aligns flush with the body.)
   B. Loosen the hinge mounting bolts (C) slightly, and move the door BACKWARD or FORWARD, UP or DOWN as necessary to equalize the gaps.
   C. Place a shop towel (D) on the jack (E) to prevent damage to the door when adjusting the door.

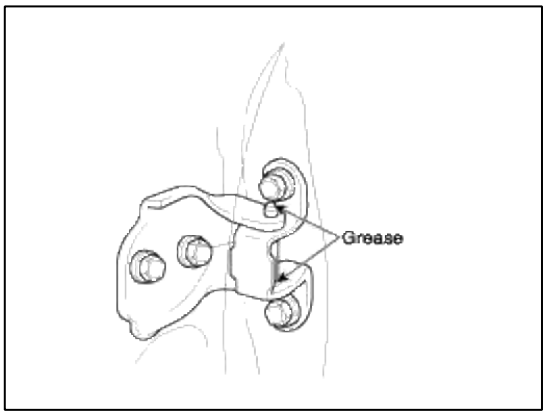


3. Check that the door and body edges are parallel.



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4. Grease the pivot portions of the hinges indicated by the arrows.



5. Check for water leaks.

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

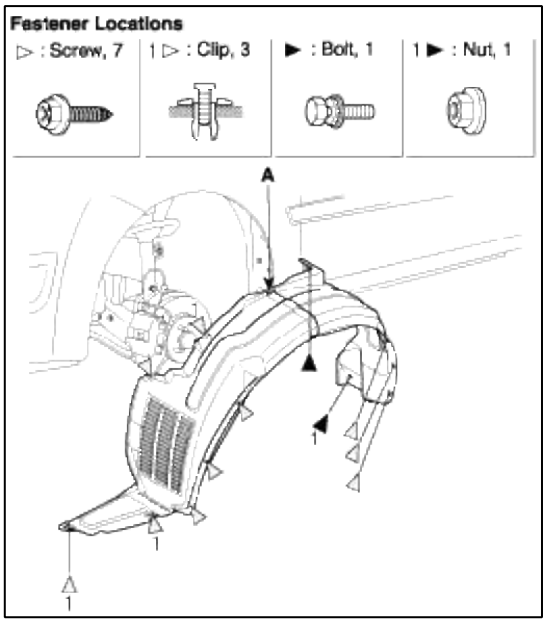
REPLACEMENT

FRONT MUD GUARD AND WHEEL GUARD

NOTE

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

1. Remove the wheel guard, mud guard(A).



2. Installation is the reverse of removal.

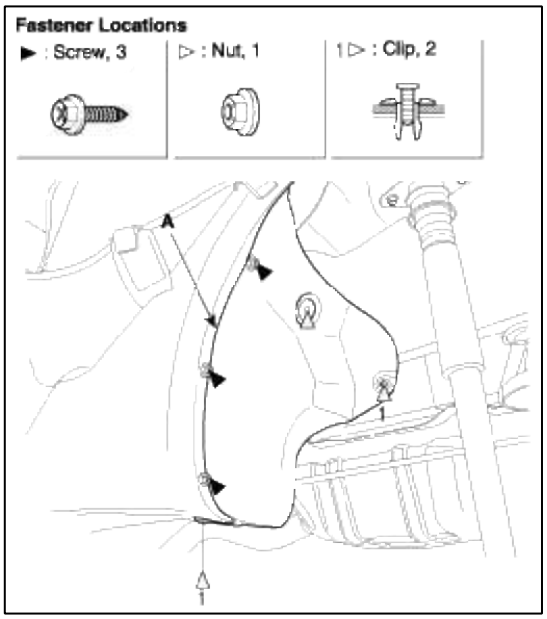
REAR MUD GUARD AND WHEEL GUARD

NOTE

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

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1. Remove the wheel guard(A).



2. Installation is the reverse of removal.

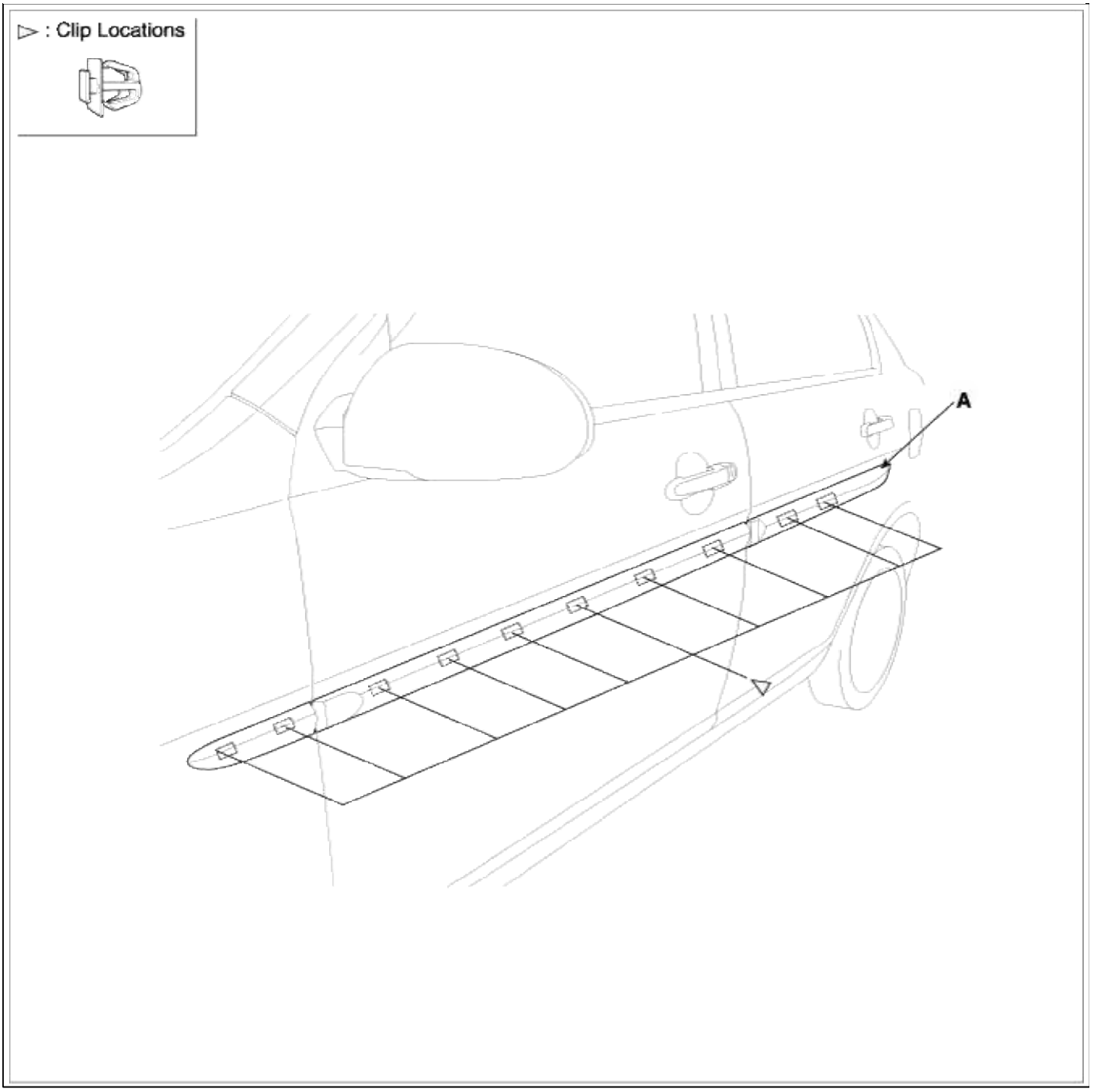
SIDE GARNISH AND SIDE SILL REPLACEMENT

NOTE

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

1. Remove the side garnish(A).
2. Installation is the reverse of removal.

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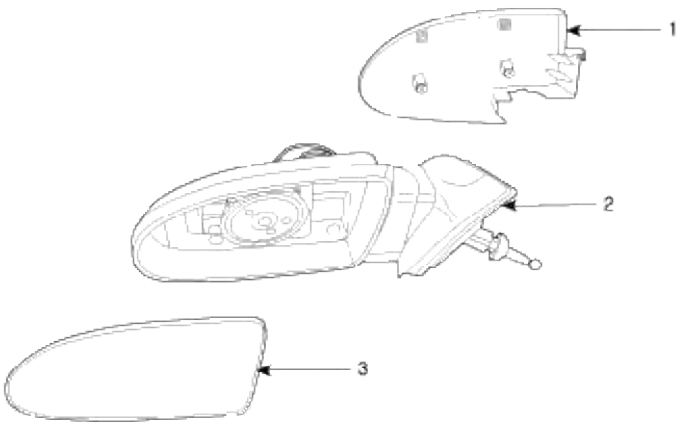


Body (Interior and Exterior) > Exterior > Mirror > Components and Components Location

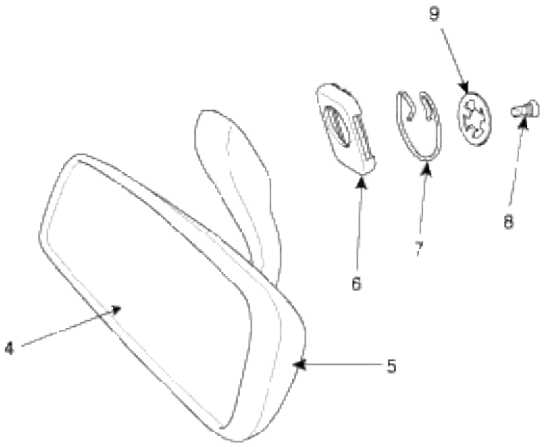
COMPONENTS

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[Outside rearview mirror]



[Inside rearview mirror]



1. Housing cover
2. Housing
3. Glass
4.Mirror
5. Housing
6. Base
7. Spring
8. Screw
9. Retainer

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

REPLACEMENT

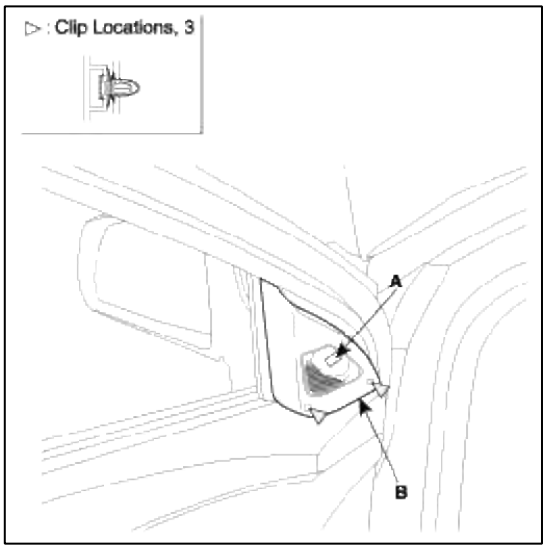
OUTSIDE REAR VIEW MIRROR RELPLACEMENT

NOTE

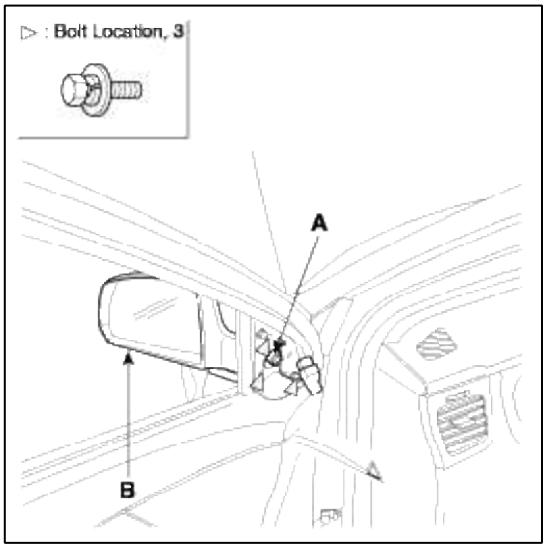
- When prying with a flat-up screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Put on gloves to protect your hands.

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1. Remove the quadrant inner cover (A), then disconnect the connector (B).



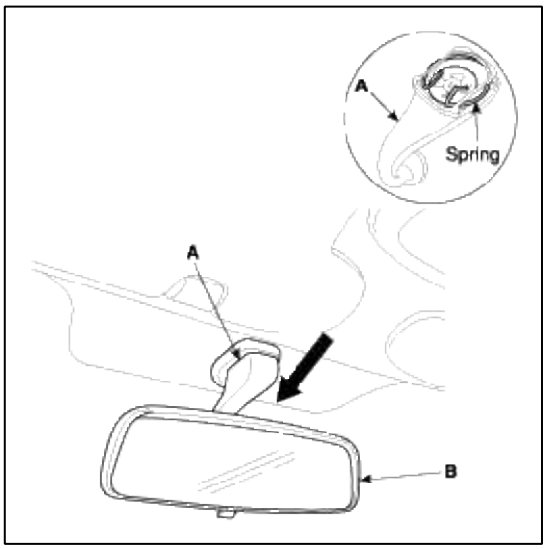
2. After disconnecting the connector (A), remove the outside rear view mirror (B).



3. Installation is the reverse of removal.

INSIDE REAR VIEW MIRROR REPLACEMENT

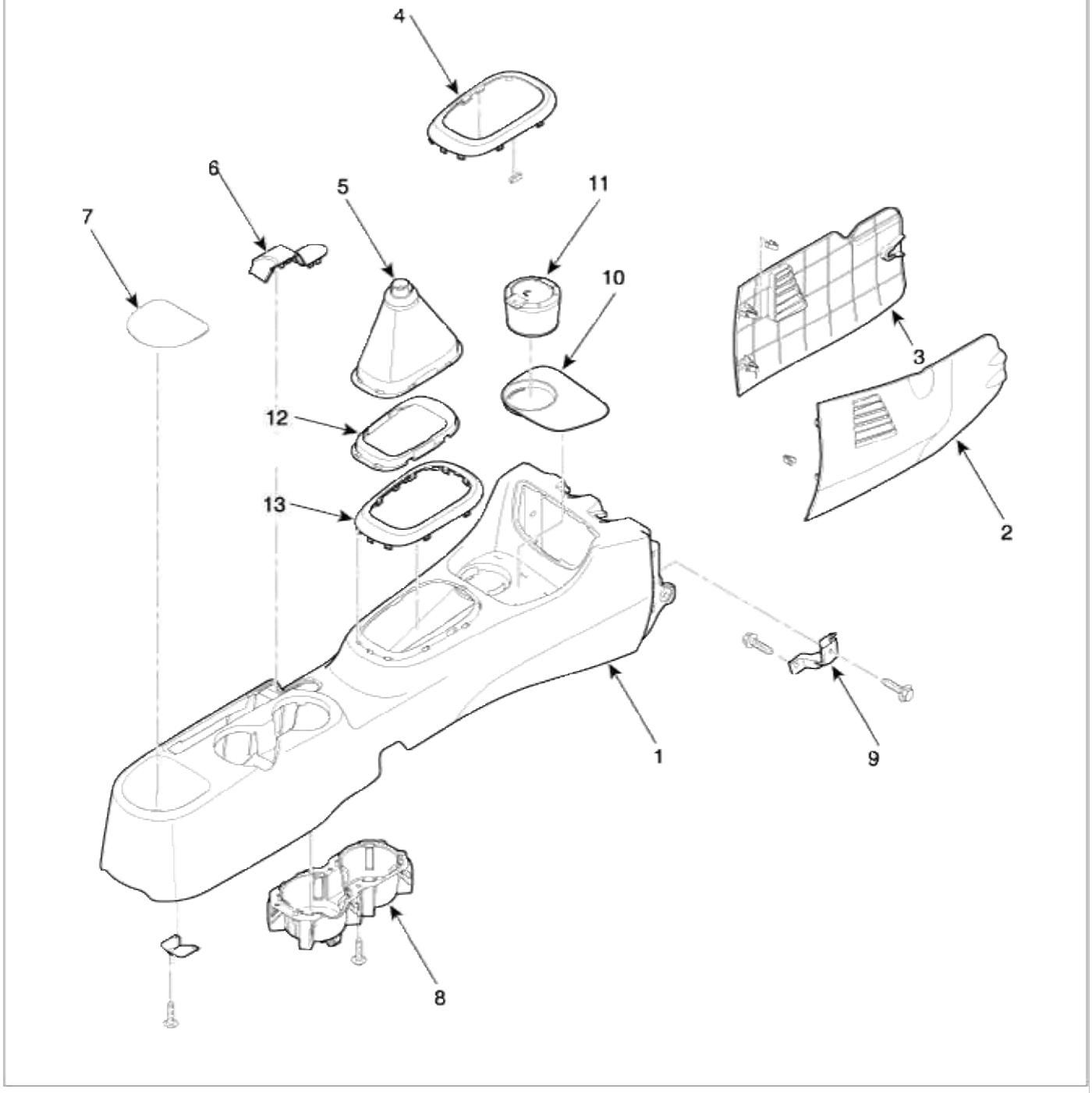
1. Push the inside rear view mirror base (A) down to remove to inside rear view mirror assembly(B).
2. Installation is the reverse of removal.



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

COMPONENTS

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1. Floor console
2. Console side cover
3. Console side cover
4. Console upper cover(ATM)
5. Boot(MTM)
6. Parking bracket cover
7. Cup holder mat
8. Cup holder
9. Console mounting braket
10. Console tray
11. ASH tray
12. Retainer(MTM)
13. Console upper cover(ATM)

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

REPLACEMENT

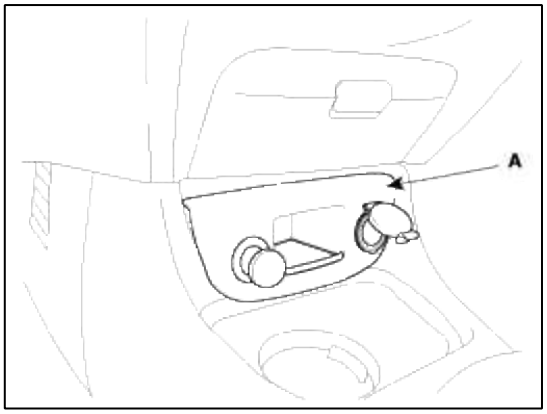
FLOOR CONSOLE REPLACEMENT

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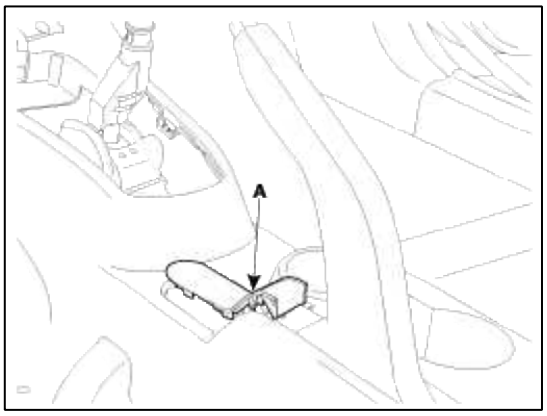
NOTE

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

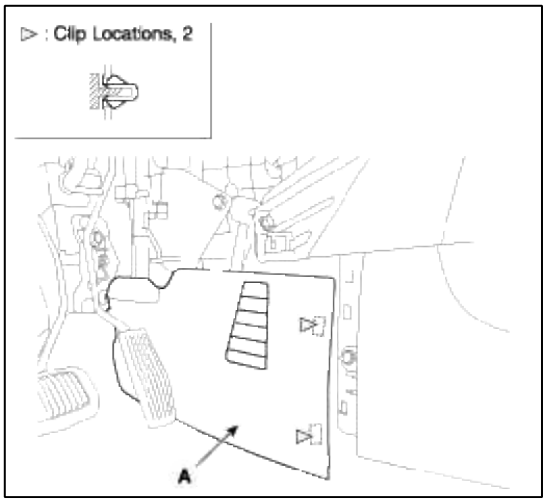
1. Remove the front seat.
2. After disconnecting the console switch (A), remove the connector.



3. Remove the parking brake cover (A).

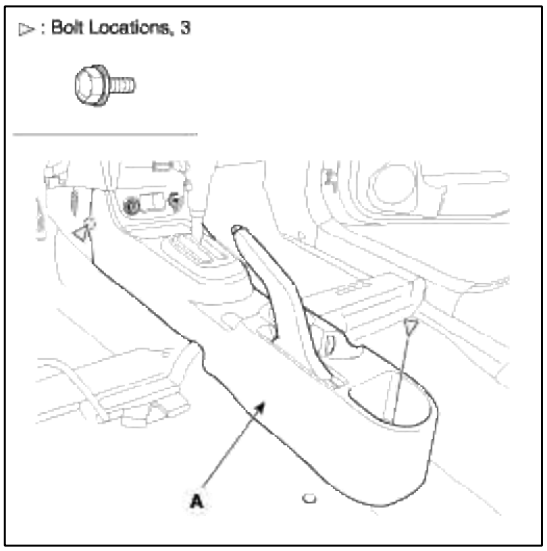


4. Remove the console side cover (A).



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5. Loosning the console mounting screw and clip, remove the console assembly (A).

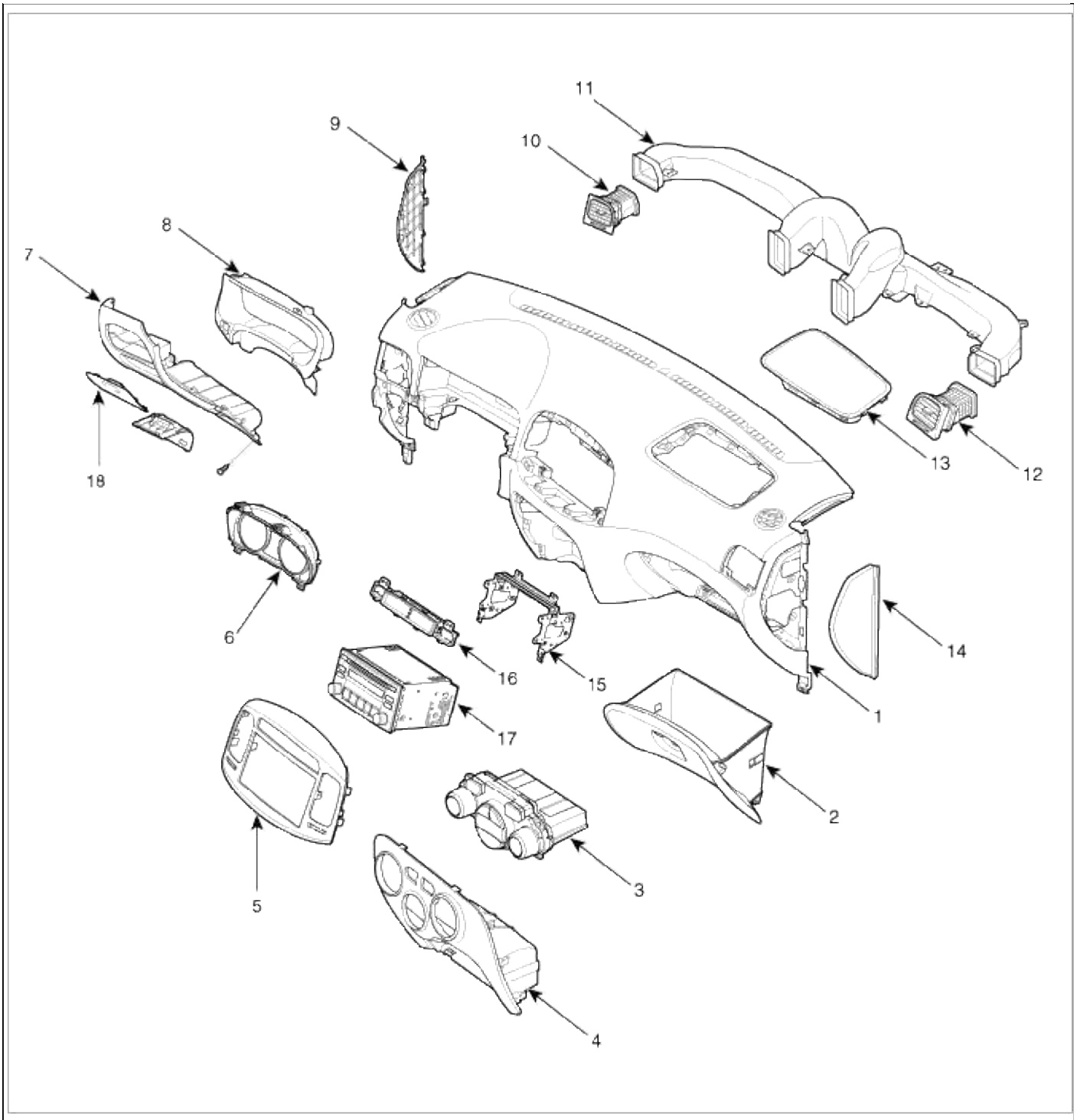


6. Installation is the reverse of removal.

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

COMPONENTS

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1. Main crash pad	7. Crash pad lower panel	13. Passauger air bag module
2. Glove box	8. Cluster fascia panel	14. Crash pad side cover
3. Heater control switch	9. Crash pad side cover	15. Audio bracket
4. Center facia lower panel	10. Air vent	16. Center facia switch clock
5. Center facia upper panel	11. Air duct	17. Audio
6. Cluster	12. Air vent	18. Fuse box cover

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

REPLACEMENT

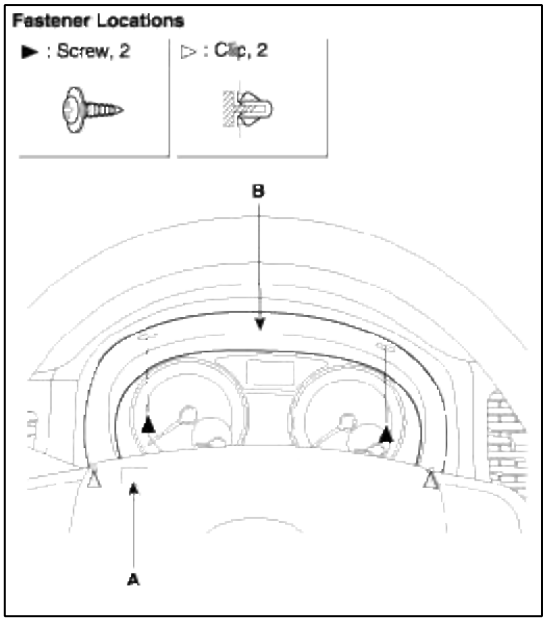
CLUSTER FASCIA PANEL REPLACEMENT

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NOTE

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

1. Tilt the steering column down.
2. After disconnecting the trip sensor connector (A), remove the cluster facia panel (B).



3. Installation is the reverse of removal.

NOTE

- Make sure the connector is plugged in properly.

CENTER FASCIA PANEL REPLACEMENT

NOTE

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

1. Put the SST (09840-1E100) (B) into the space between the center fascia and crash pad.

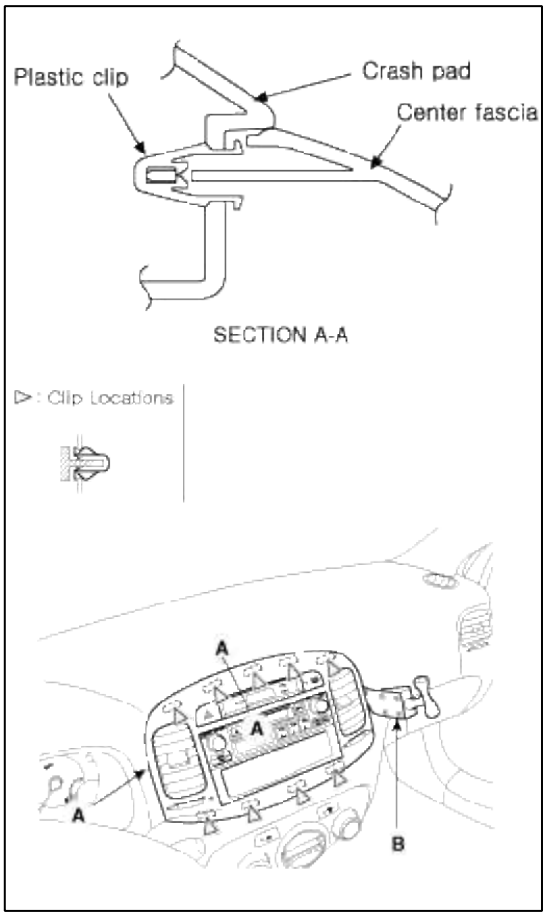
NOTE

Be care not to damage the center fascia and crash pad.

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

> **CAUTION**
>
> Pull the SST slowly not to damage the center fascia panel.

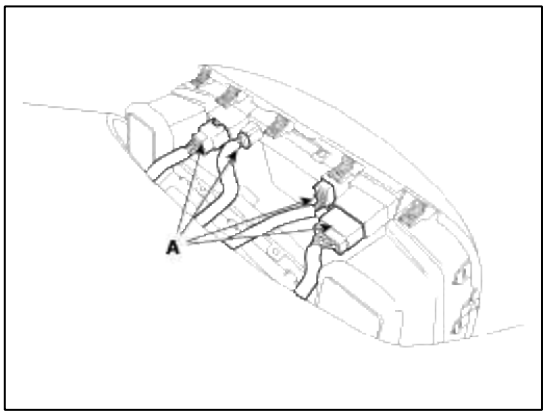


3. Pull the other side of center fascia panel (A) with the SST (09840-1E100) (B) in the way of "ste 2)".



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4. Disconnect the connector (A), then remove the center facia panel.

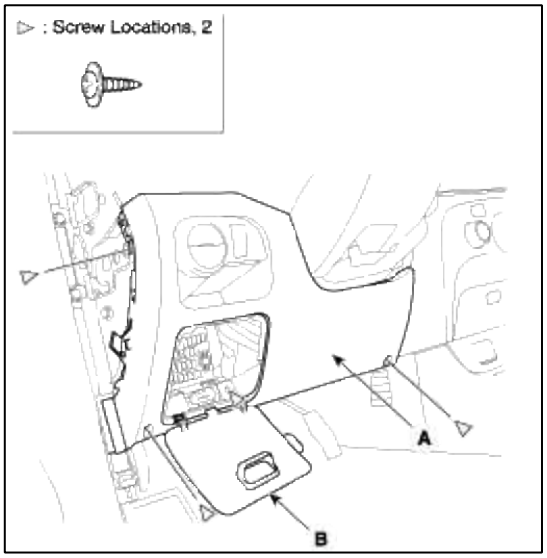


5. Installation is the reverse of removal.

> **NOTE**
>
> Make sure the connector is plugged in properly.

LOWER CRASH PAD PANEL REPLACEMENT

1. Remove the side cover.
2. Remove the fuse box cover (B).
3. Loosening the crash pad lower panel mounting screw. Remove the lower crash pad panel (A).



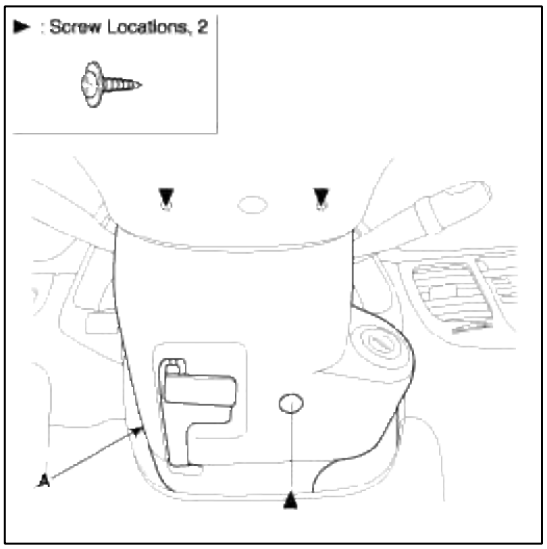
4. Installation is the reverse of removal.

SHROUD REPLACEMENT

1. Loosen the screws.

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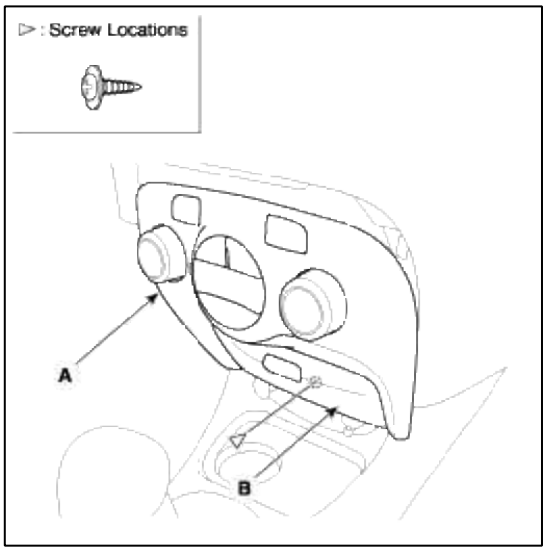
2. Remove the shroud (A).



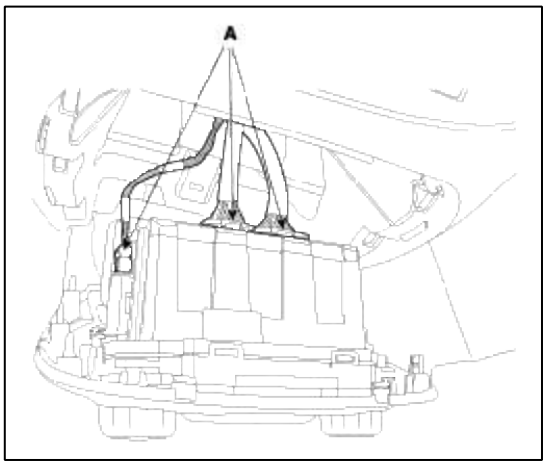
3. Installation is the reverse of removal.

HEATER CONTROL UNIT REPLACEMENT

1. Disconnect the center facia lower tray(B).
2. Remove the center facia lower panel (A).

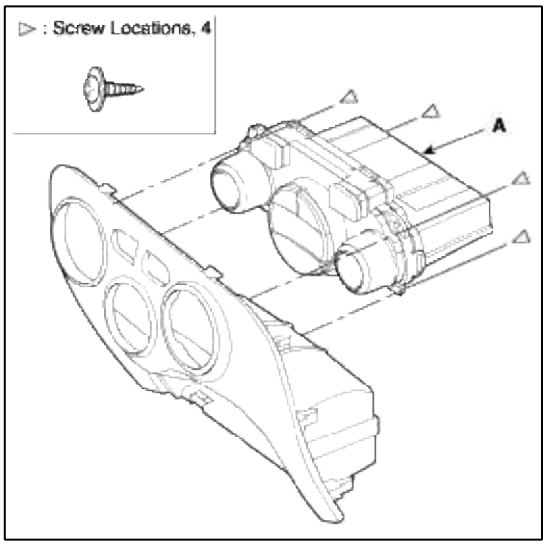


3. Disconnect the connector (A), then remove the center facia panel (B).



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4. Loosen the heater control unit mounting screw. remove the heater control unit (A).



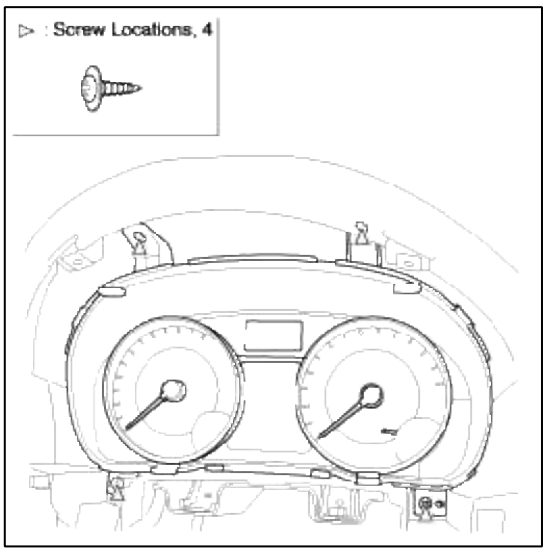
5. Installation is the reverse of removal.

NOTE

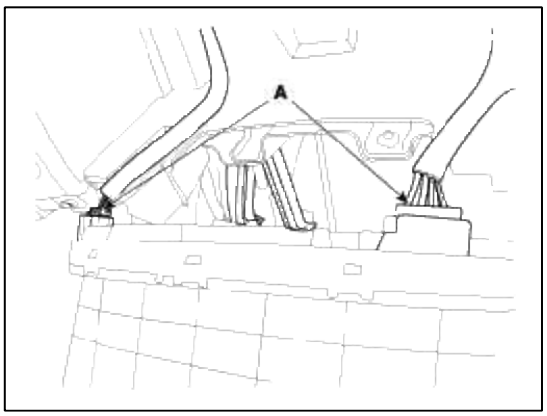
- Make sure the connector is plugged in properly.

CLUSTER REPLACEMENT

1. Remove the cluster fascia panel.
2. Loosen the mounthing screws.



3. Disconnect the cluster connectors (A), then remove the cluster.



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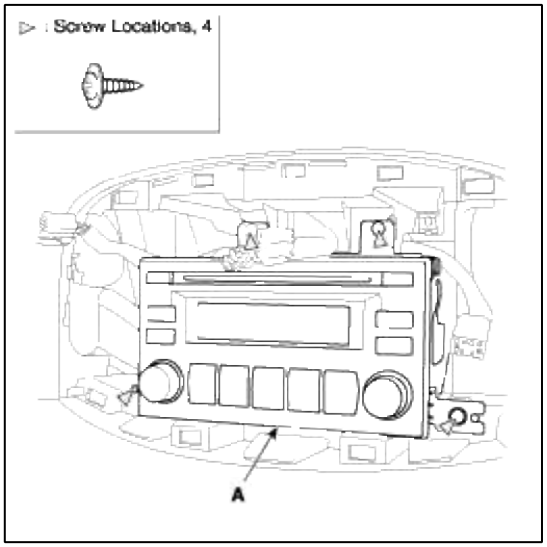
4. Installation is the reverse of removal.

NOTE

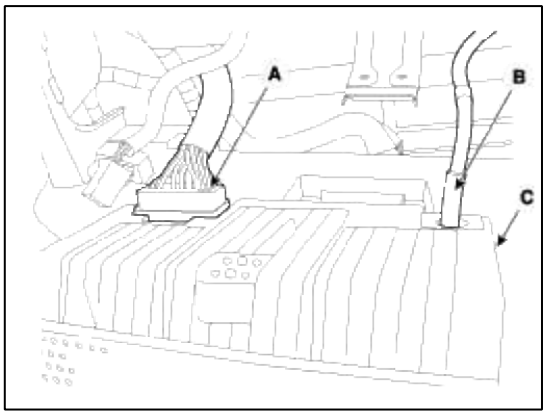
- Make sure the connector is plugged in properly.

AUDIO ASSEMBLE REPLACEMENT

1. Remove the center facia panel.
2. Loosen the screws.
3. Disconnect the audio connector and antenna cable, then remove the audio assembly (A).



4. Disconnect the audio connector (A) and antenna cable (B), then remove the audio assembly (C).



5. Installation is the reverse of removal.

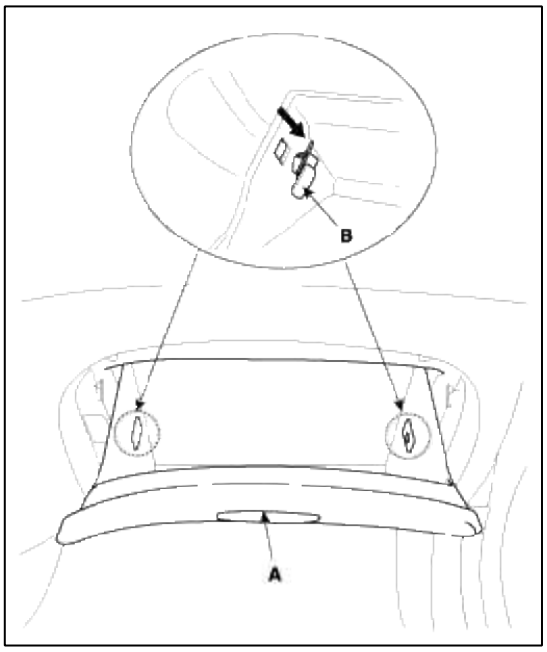
NOTE

- Make sure the connector is plugged in properly.

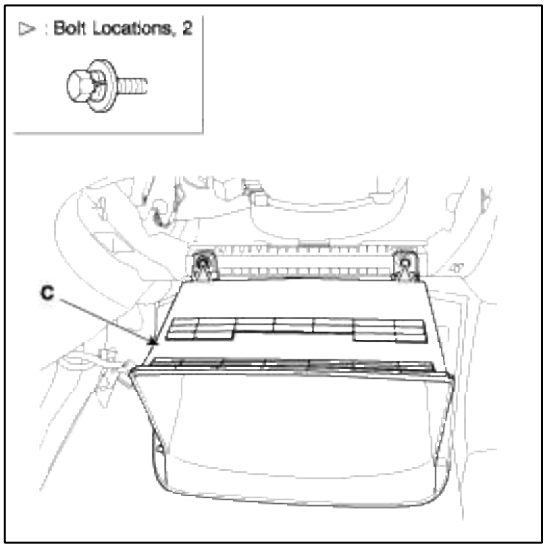
GLOVE BOX REPLACEMENT

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



2. Remove the glove box (C).



3. Installation is the reverse of removal.

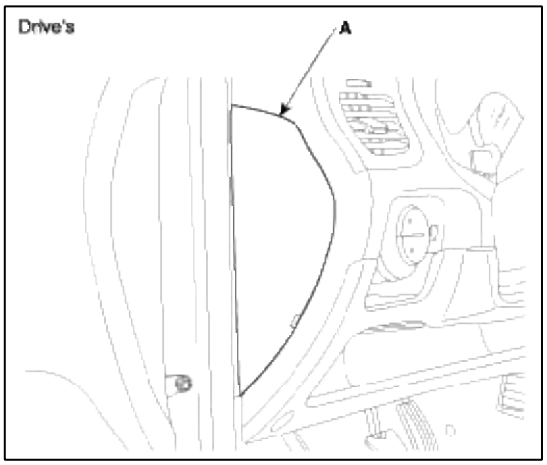
COVER REPLACEMENT

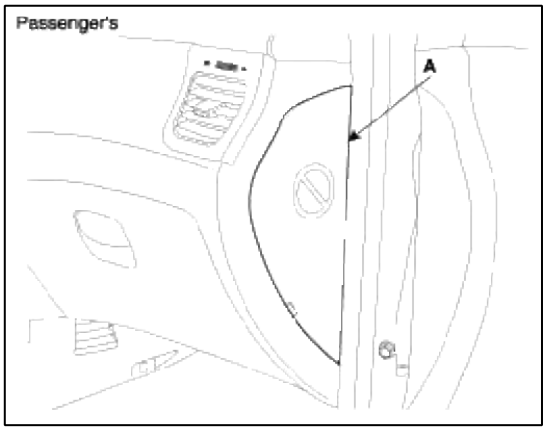
NOTE

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

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



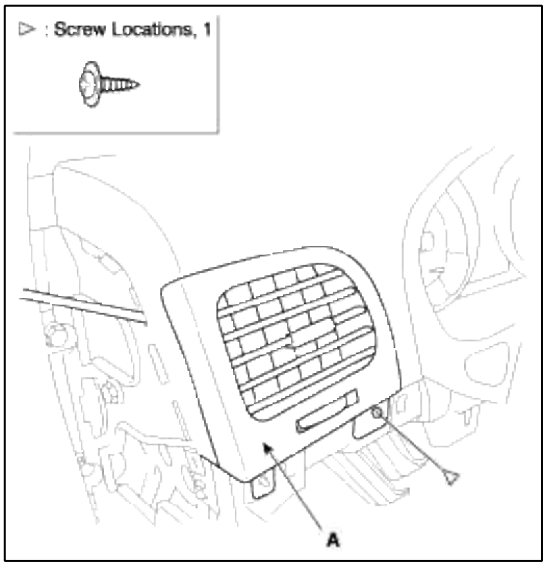


AIR VENT REPLACEMENT

NOTE

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

1. Remove the crashpad side cover.
2. Remove the air vent (A).



3. Installation is the reverse of removal.

CRASH PAD MAIN REPLACEMENT

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NOTE

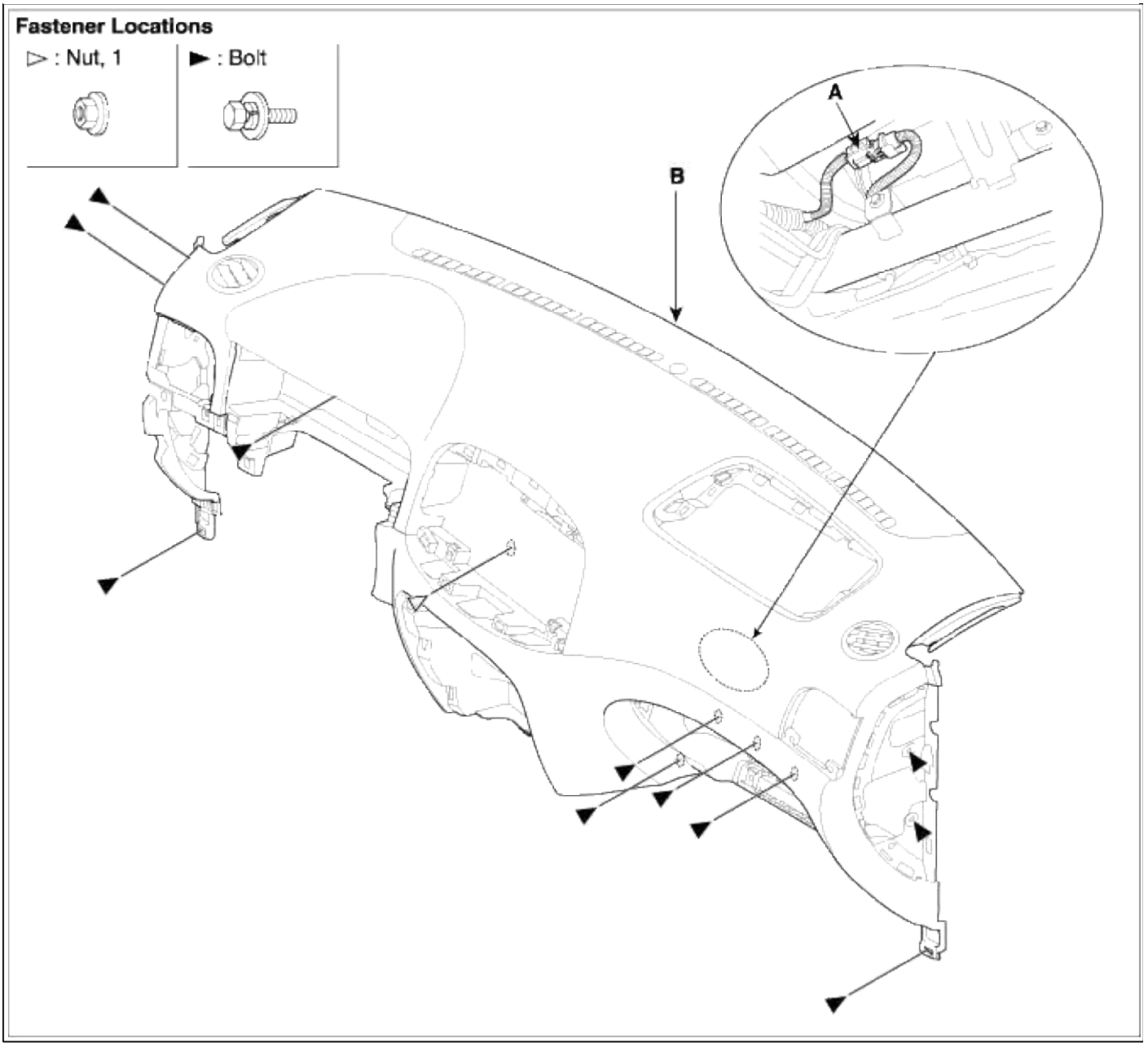
- When prying with a flat-up screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Put on gloves to protect your hands.

1. Remove the following items.
   A. Front seat assemble.
   B. Cluster facia panel, cluster.
   C. Lower crash pad panel.
   D. Glove box.
   E. Side cover.
   F. Front pillar trim.
   G. Center fascia upper, lower cover.
2. Disconnect the passenger's air bag connector(A).
3. Loosen the bolt`s and nuts then remove the main carash pad assembly(B).
4. Installation is the reverse of removal.

NOTE

- Make sure the crash pad fits on to the guide pins correctly.
- Before tihgtening 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.

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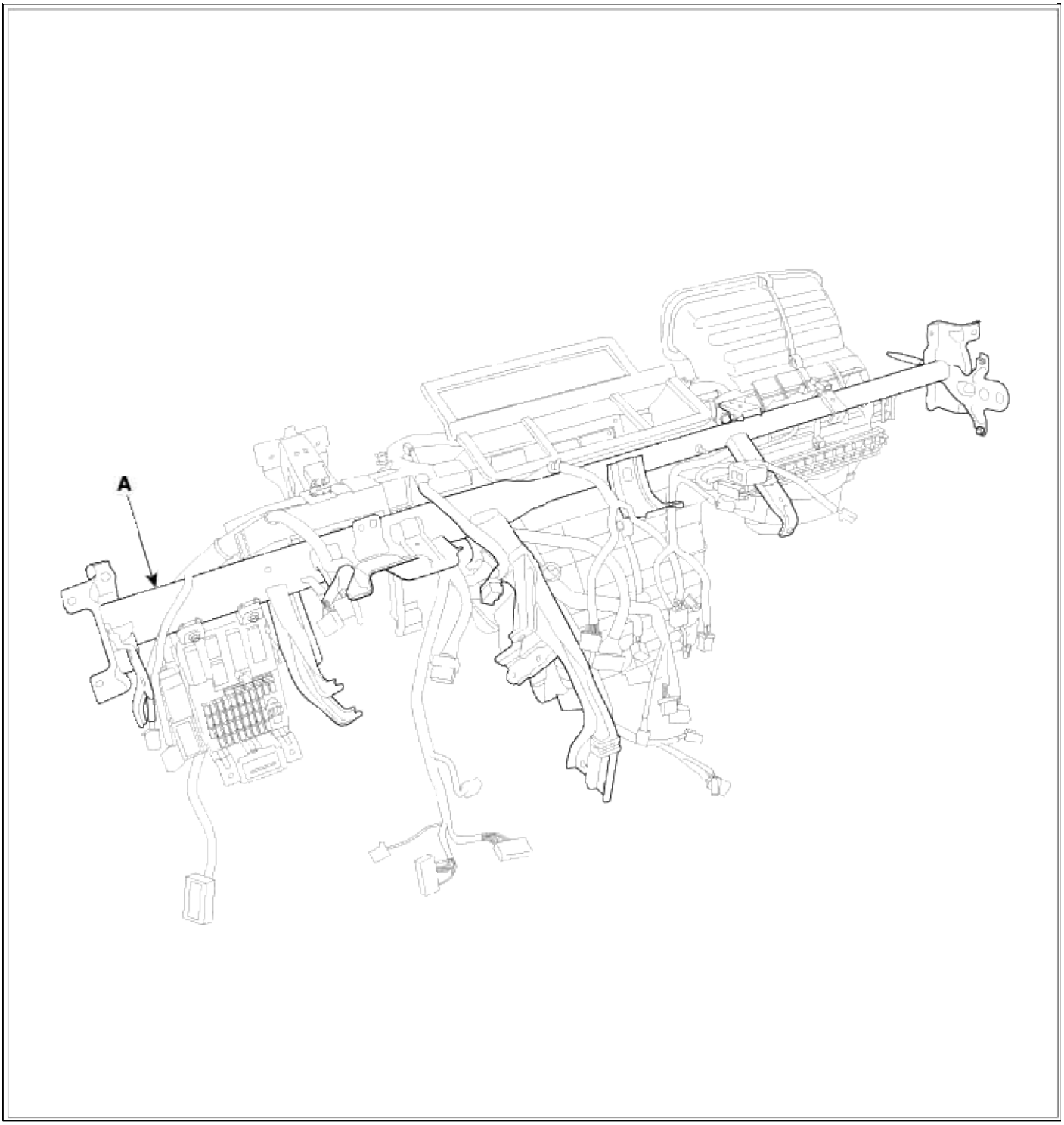
COWL CROSS BAR ASSEMBLE REPLACE MENT

NOTE

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

1. Remove the crash pad.
2. Disconnect the connectors, after loosening the mounthing bolts and nuts remove the cowl crossbar(A).
3. Installation is the reverse of removal.

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

REPLACEMENT

FLOOR AND SIDE TRIM

1. Remove the trim.

NOTE

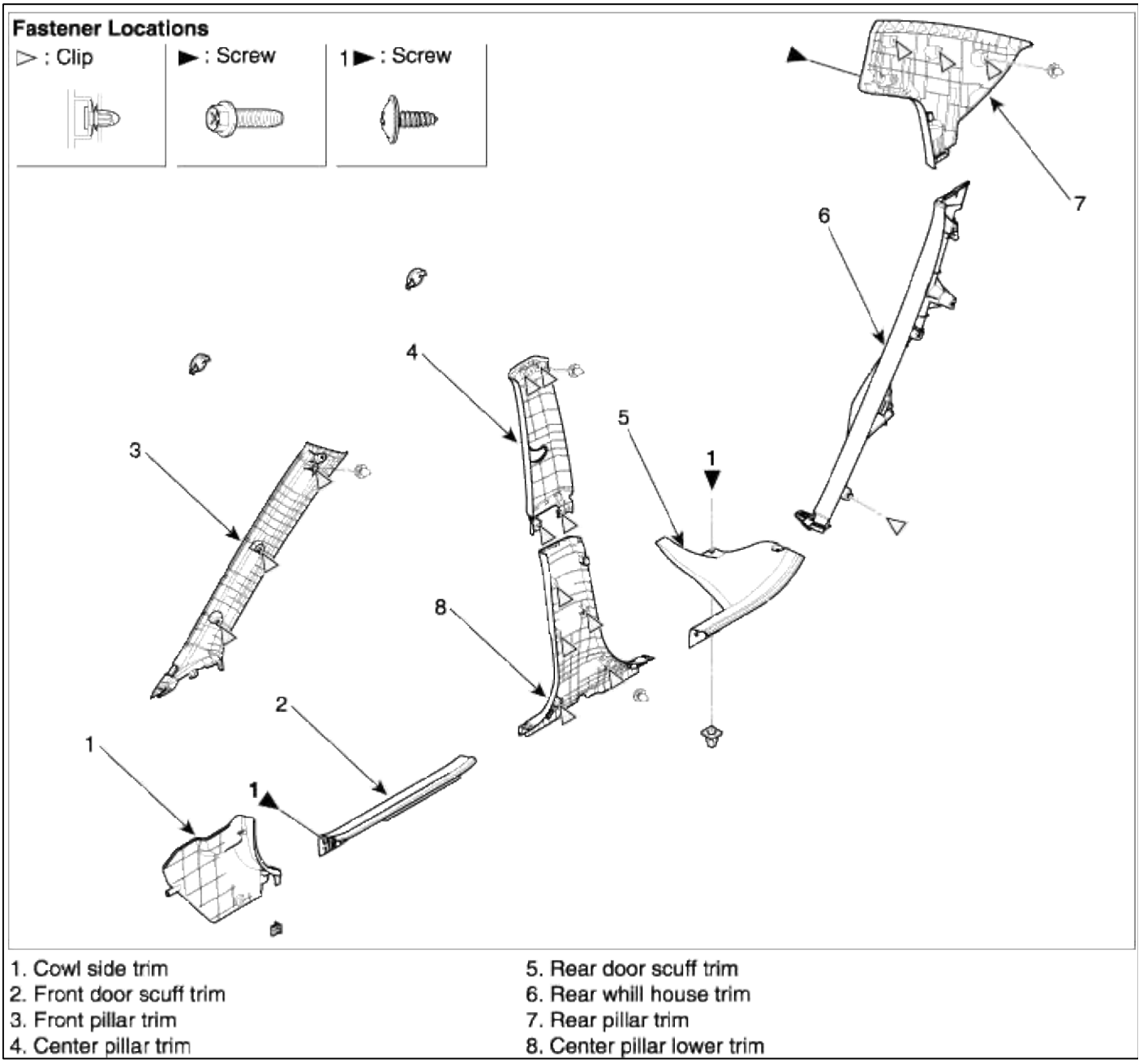
- Put on gloves to protect your hands.
- When prying with a flat-tip screwdriver, wrap it with protective tape to prevent damage.
- Take care not to bend or scratch the trim and panels.

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2. Installation is the reverse of removal.

NOTE

- Replace any damage clips.



1. Cowl side trim
2. Front door scuff trim
3. Front pillar trim
4. Center pillar trim
5. Rear door scuff trim
6. Rear whill house trim
7. Rear pillar trim
8. Center pillar lower trim

TRUNK TRIM

1. Remove the trunk trim.

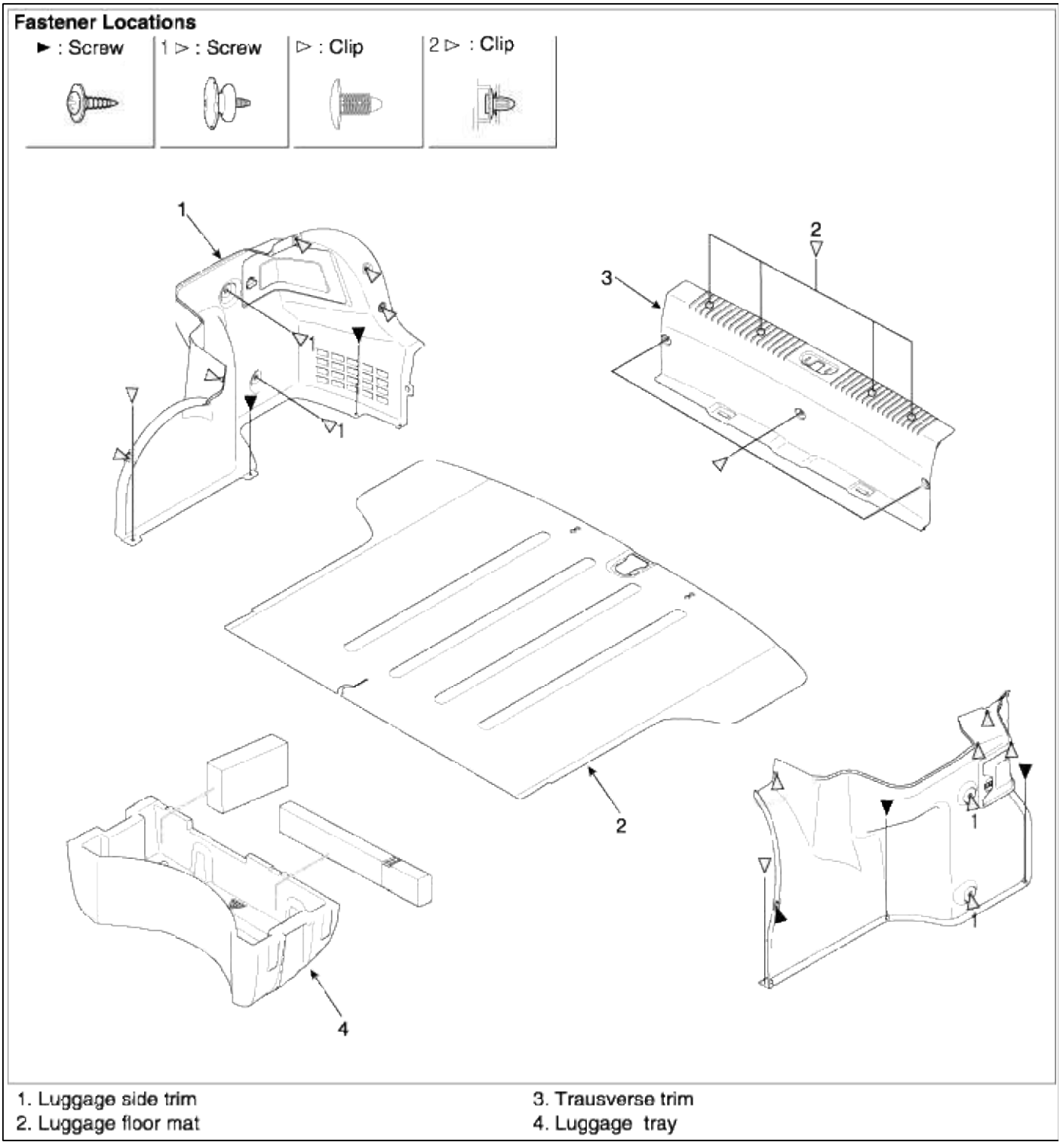
NOTE

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

2. Installation is the reverse of removal.

NOTE

- Replace any damage clips



1. Luggage side trim
2. Luggage floor mat
3. Trausverse trim
4. Luggage tray

ROOF TRIM

1. Remove the roof trim.

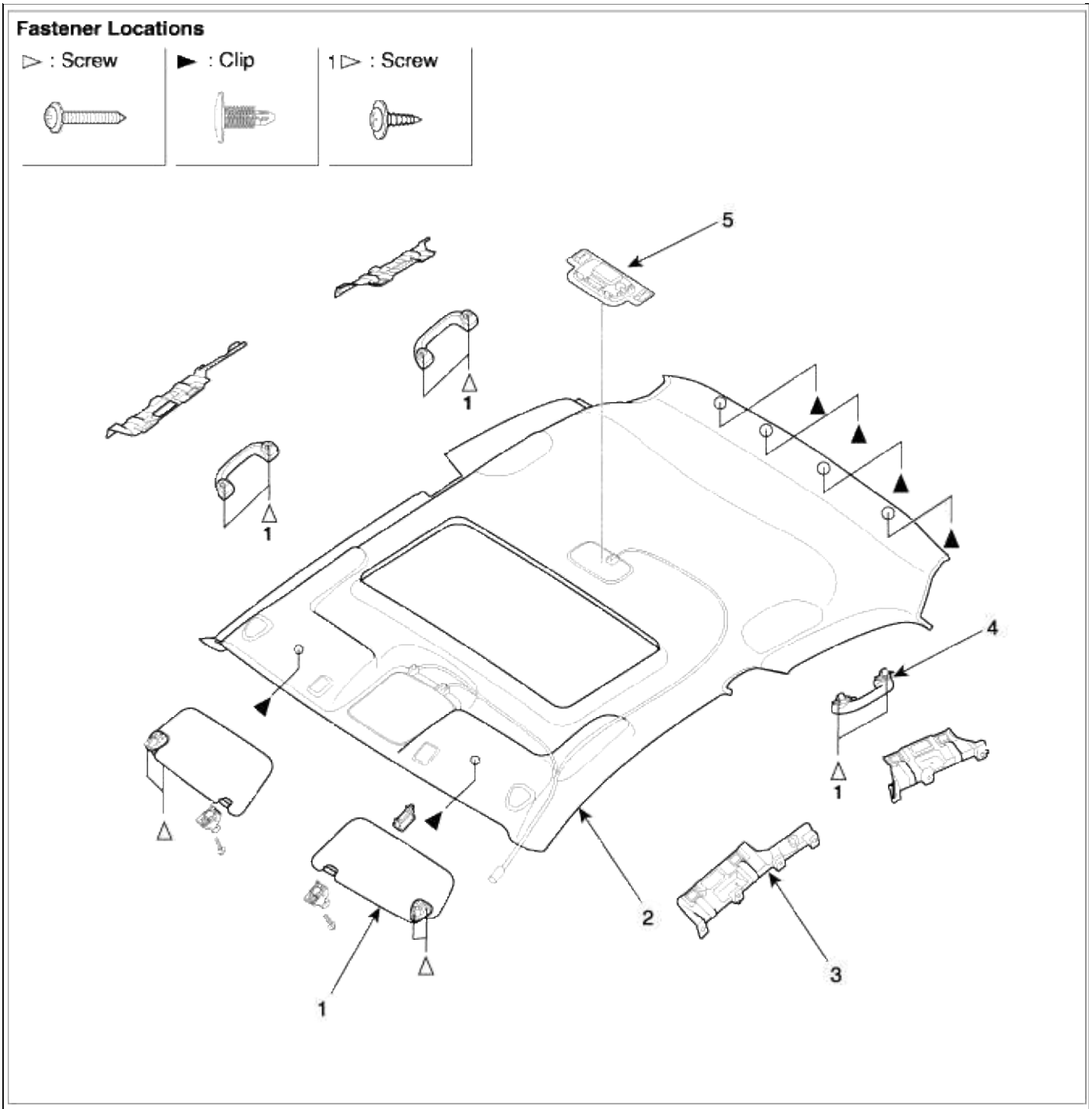
NOTE

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

2. Installation is the reverse of removal.

NOTE

- Replace any damage clips.



1. Sunvisor
2. Headlining
3. Assist handle bracket
4. Assist handle
5. Room ramp

PACKAGE TRAY

1. Remove the trim.

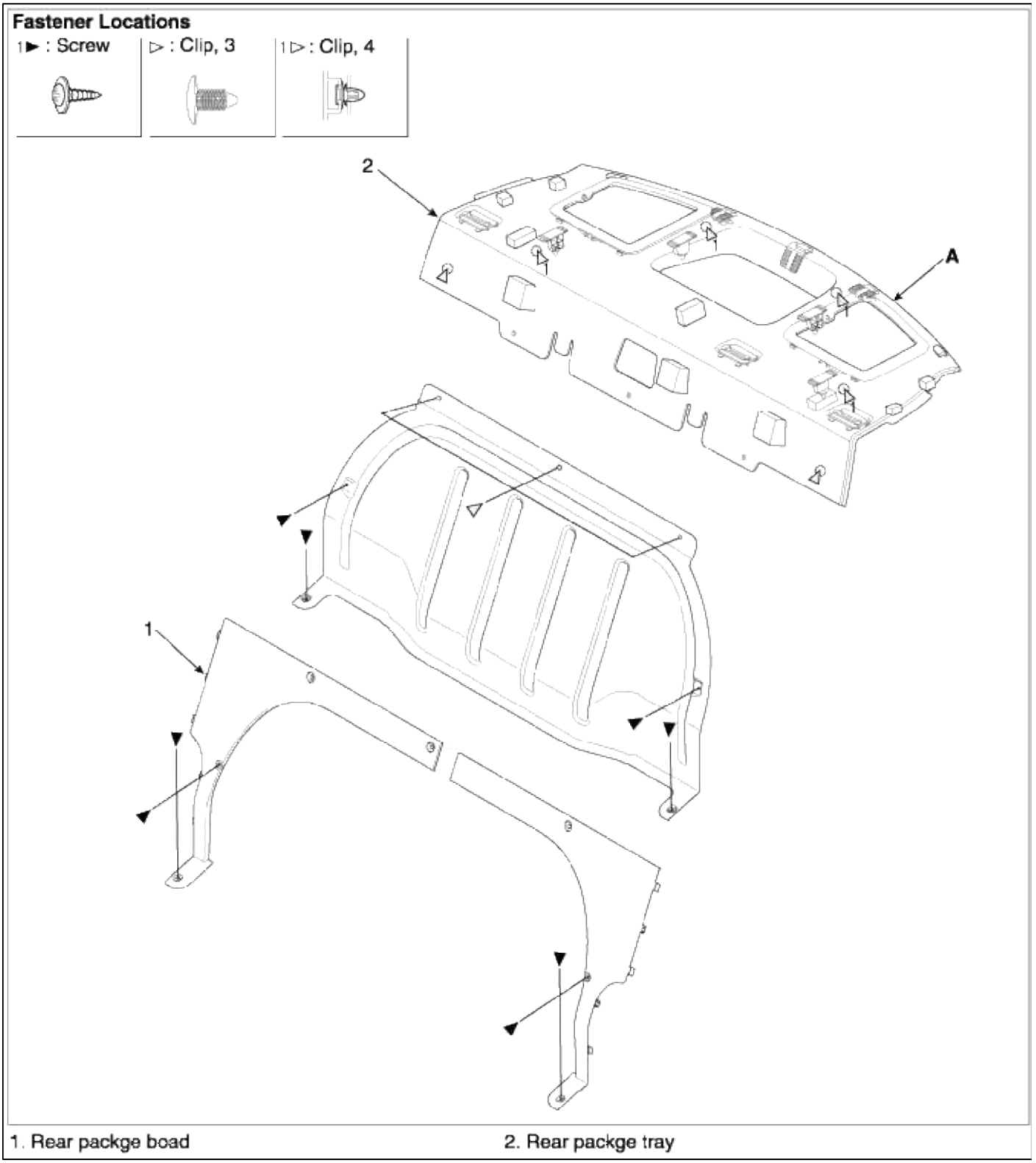
NOTE

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

2. Installation is the reverse of removal.

NOTE

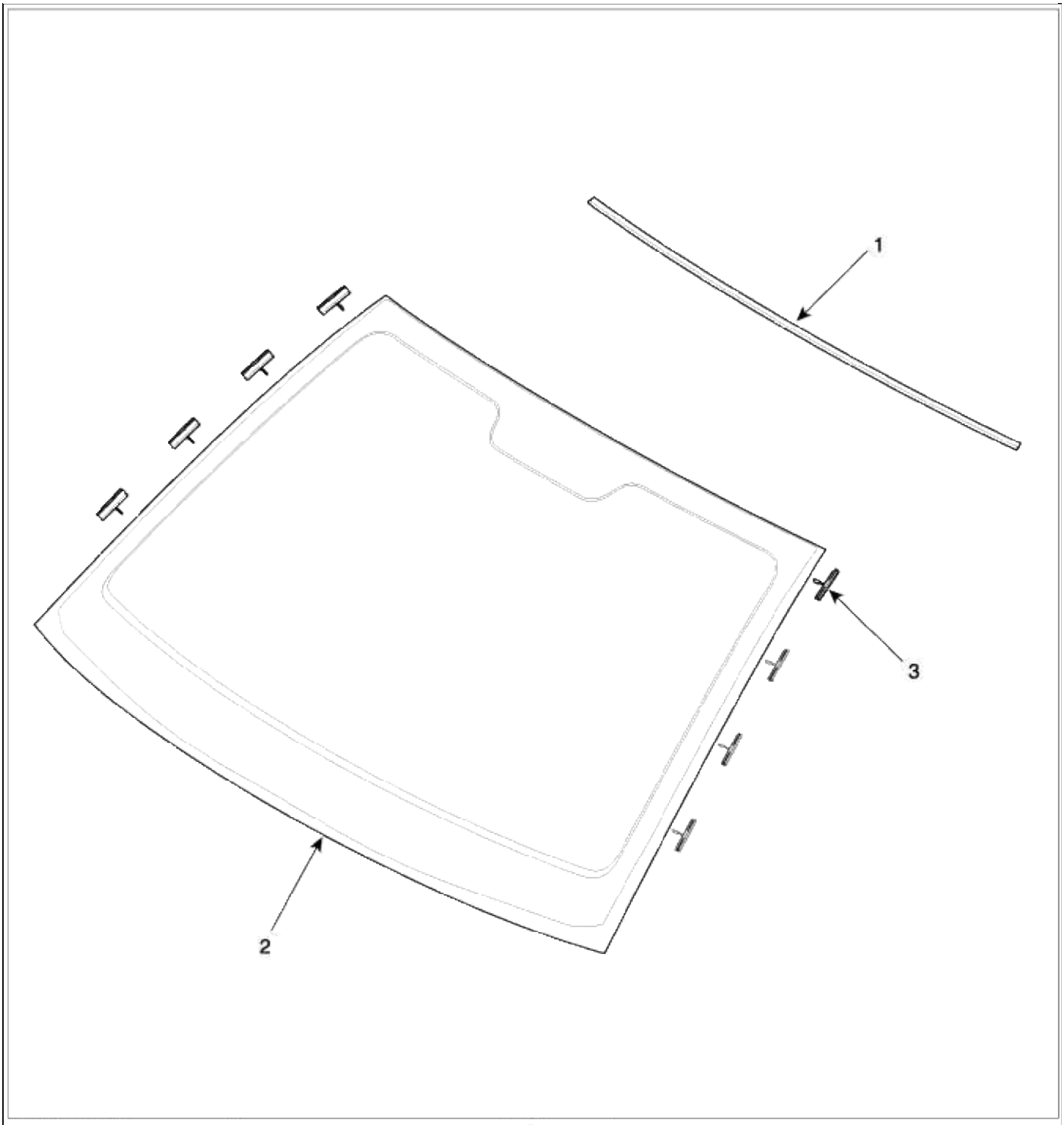
- Replace any damage clips.



1. Rear packge boad
2. Rear packge tray

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

COMPONENTS



1. Windshield upper molding
2. Windshield glass
3. Glass pad

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

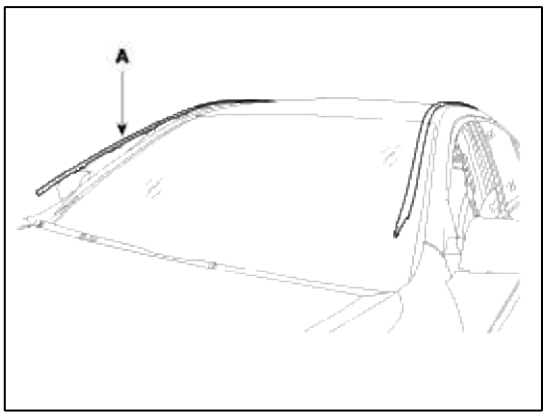
REPLACEMENT

REMOVAL

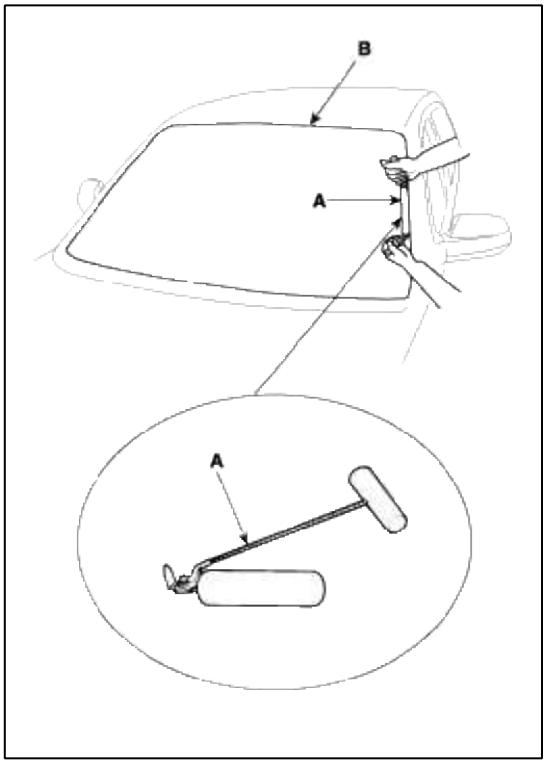
NOTE

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

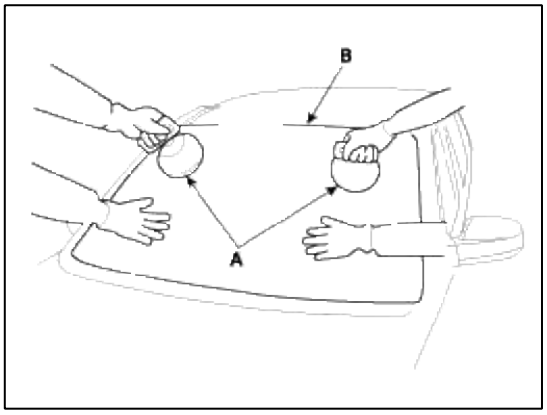
1. Remove the following items.
   A. Front piller trim.
   B. Inside rear view mirror.
   C. Windshield wiper arms.
   D. Cowl top cover.
2. Remove the molding (A) from the edge of the windshield. If necessary, cut the molding with a utility knife.



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)].

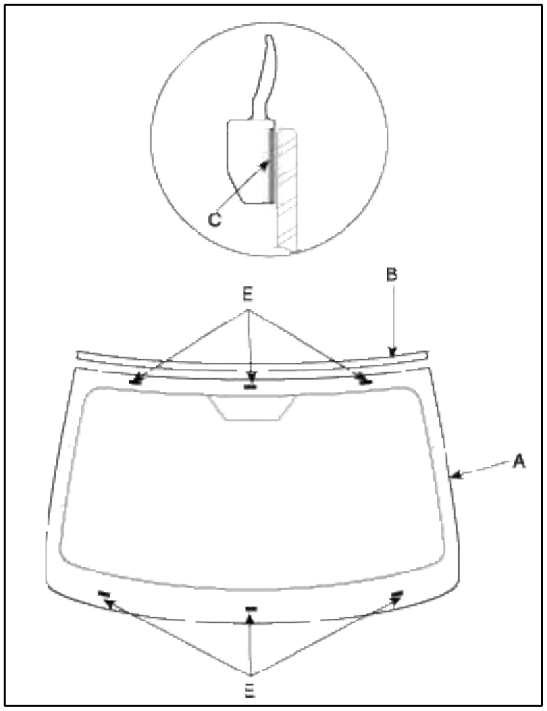


5. Remove the windshield (A) carefully using the glass holder (B)(09861-31100).

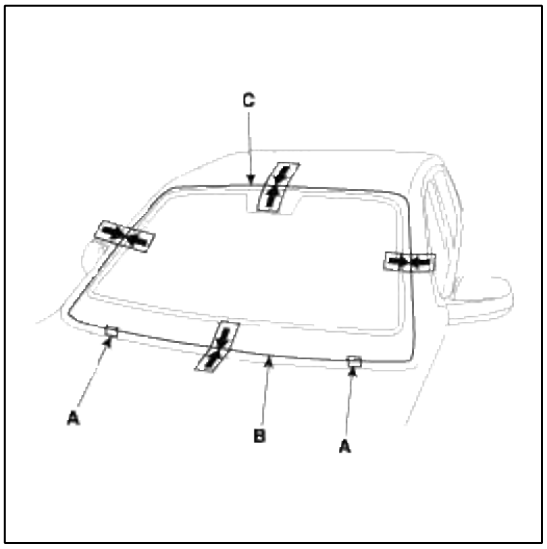


INSTALLTION

1. With a knife, scrape the old adhesive smooth to a thickness of about 2mm (0.08 in.) on the bonding surface around the entire windshield opening flange:
   A. Do not scrape down to the painted surface of the body; damaged paint will interfere with proper bonding.
   B. Remove the rubber dam and fasteners from the body.
   C. 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 bothsided 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.



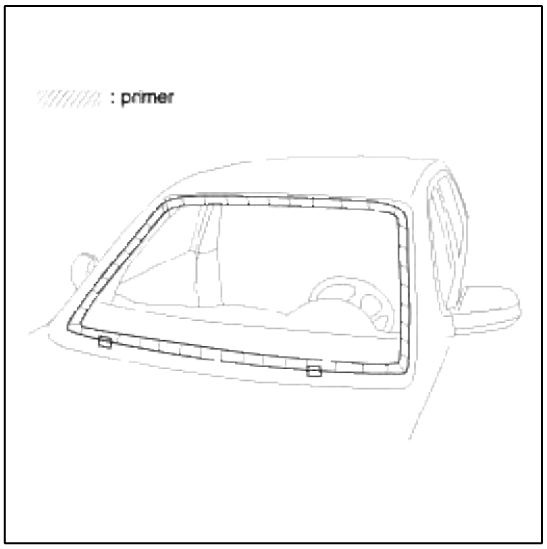
5. Install the spacer (A) install the windshield glass (B) temperarily with making sure to position them on the center, and then place the alignment mark (C).



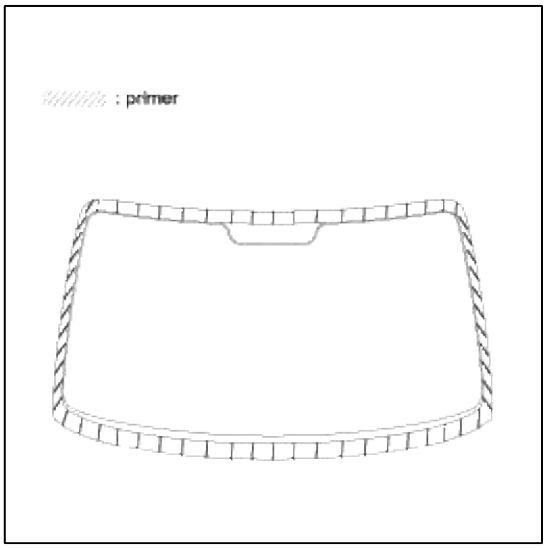
6. Apply a light coat of glass primer to the outside of the fasteners.

NOTE

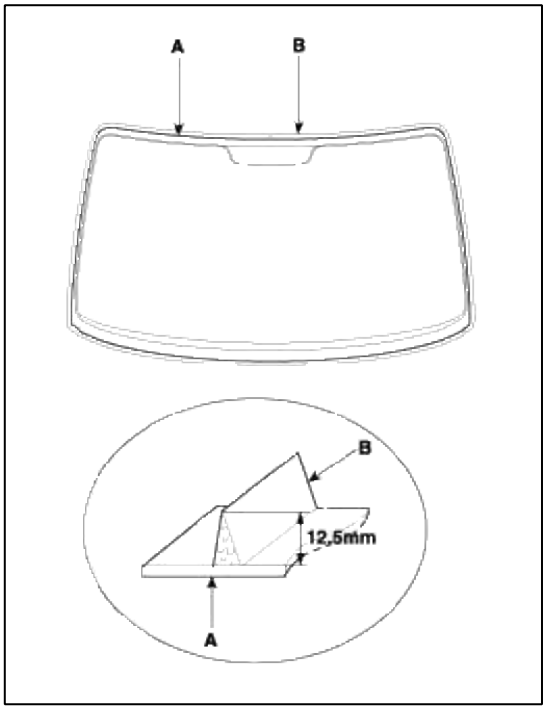
- Never touch the primed surface with your hand. If you do, the adhesive may not bond to the glass properly, causing a leak after the windshield glass is installed.
- Do not apply body primer to the glass.
- Keep water, dust, and abrasive materials away from the primer.



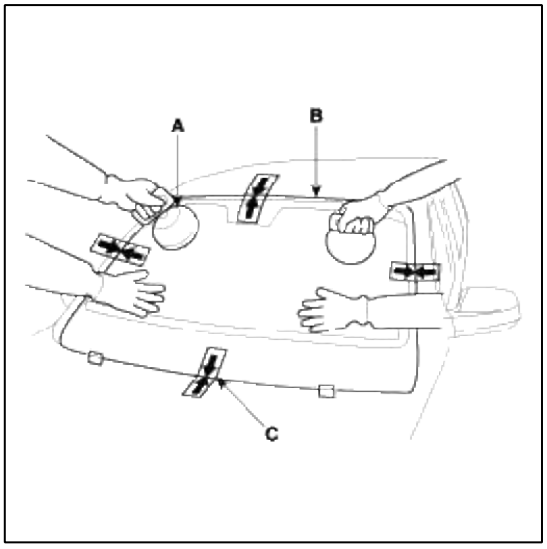
7. With a sponge, apply a light coat of body primer to the original adhesive remaining around the windshield opening flange. Let the body primer dry for at least 10 minutes:
   A. Do not apply glass primer to the body, and be careful not to mixup glass and body primer sponges.
   B. Never touch the primed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



8. 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.



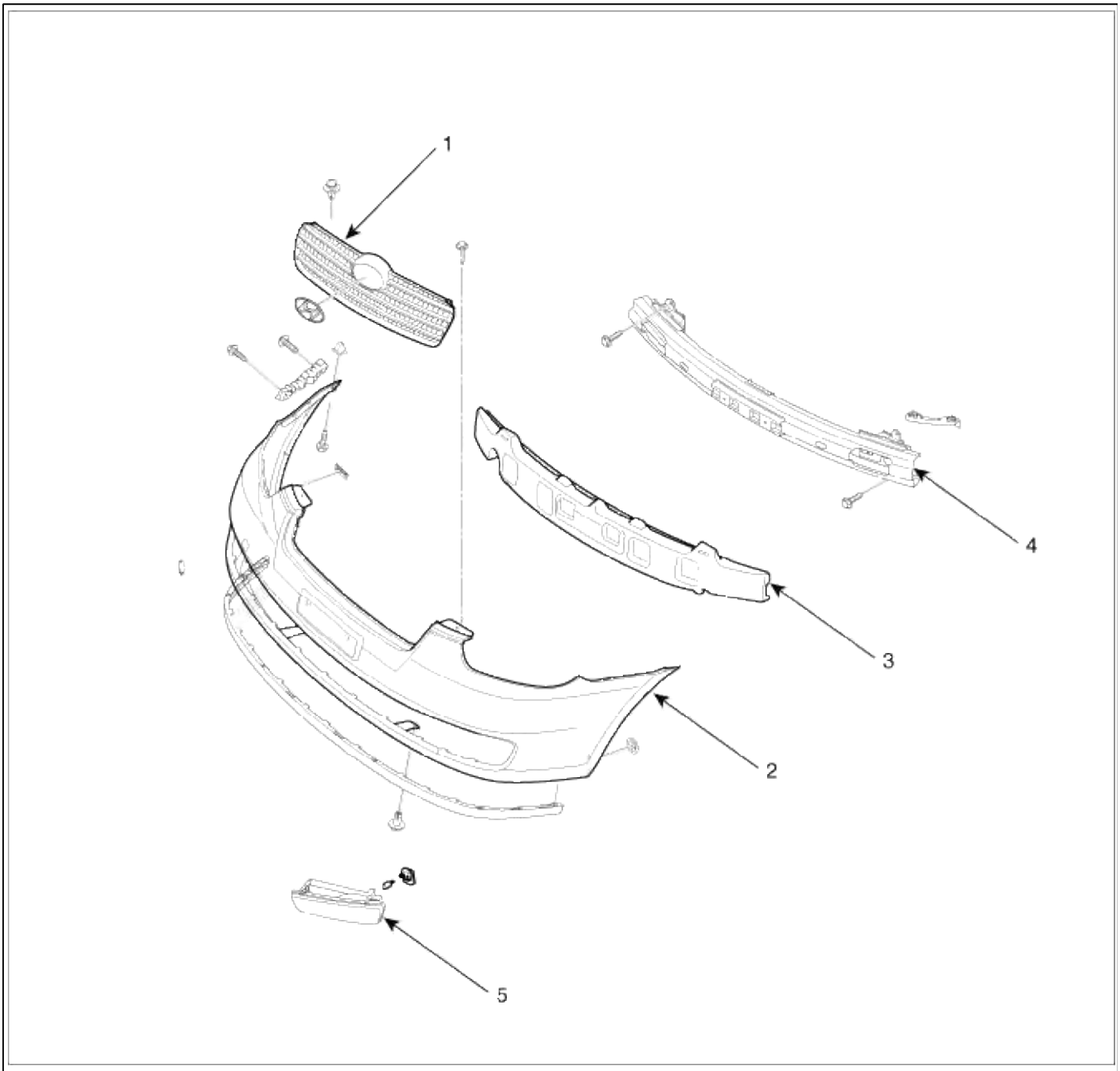
9. Use glass holder (A) to hold the windshield over the opening, align it with the alignment marks (B) made in step 15, and set it down on the adhesive. Lightly push on the windshield until its edges are fully seated on the adhesive all the way around. Do not open or close the doors until the adhesive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



10. 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.
11. 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:
    A. 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.
    B. Keep the windshield dry for the first hour after installation.
12. 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;
    A. Slam the door with all the windows rolled up.
    B. Twist the body excessively (such as when going in and out of driveways at an angle or driving over rough, uneven roads).

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

COMPONENTS



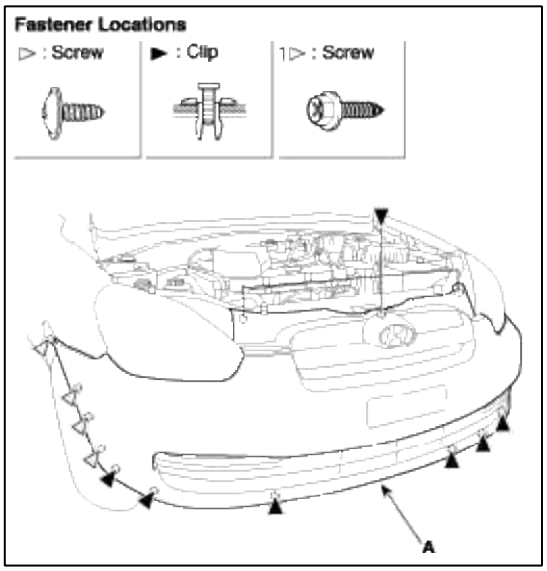
1. Grill
2. Front bumper cover
3. Energy absorber
4. Front bumper rail
5. Fog Lamp

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

REPLACEMENT

FRONT BUMPER COVER REPLACEMENT

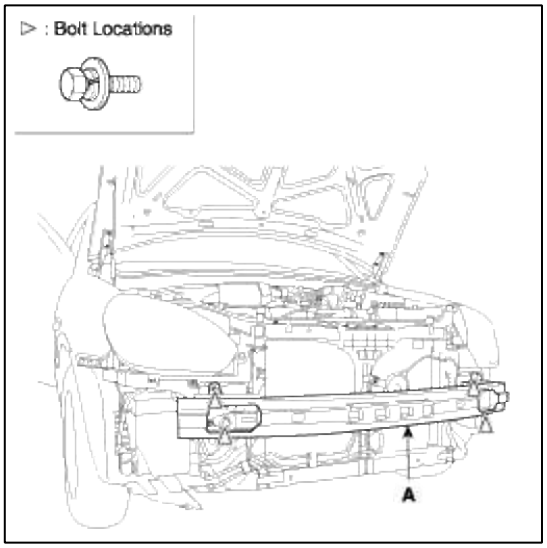
1. Remove the bumper cover (A).



2. Installation is the reverse of removal.

FRONT BUMPER RAIL REPLACEMENT

1. Remove the front bumper rail (A).



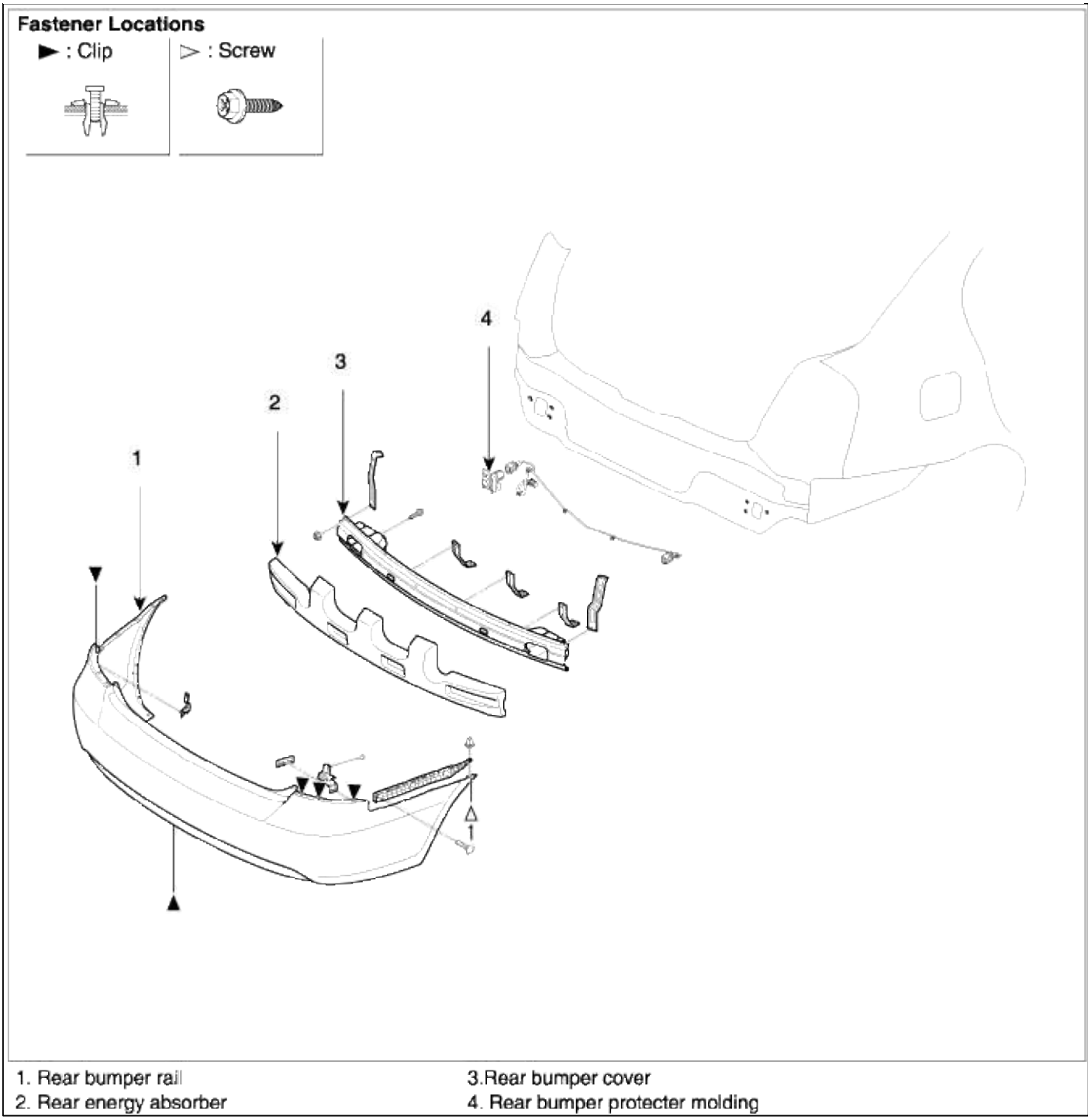
2. Installation is the reverse of removal.

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

REPLACEMENT

NOTE

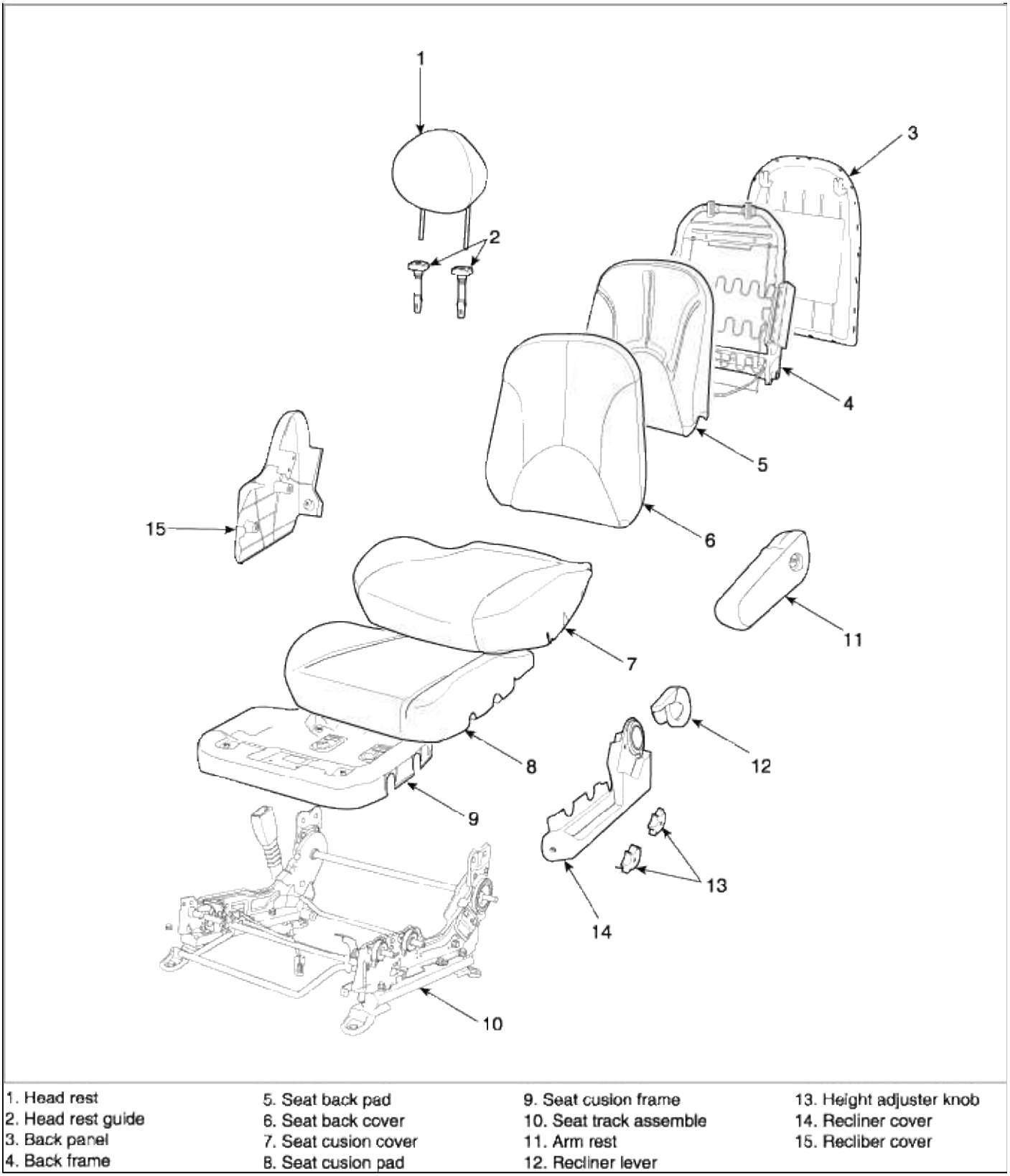
- After remove the rear combination lamp.
- When prying with a flat-tip screwdriver, wrap it with protective tape , and apply protective tape around the related parts your hands.
- Put on gloves to protect your hands.
- Take care not bend or scratch the cover and other parts.
- Replace any damage clips.



1. Rear bumper rail
2. Rear energy absorber
3.Rear bumper cover
4. Rear bumper protecter molding

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

COMPONENTS



1. Head rest	5. Seat back pad	9. Seat cusion frame	13. Height adjuster knob
2. Head rest guide	6. Seat back cover	10. Seat track assemble	14. Recliner cover
3. Back panel	7. Seat cusion cover	11. Arm rest	15. Recliber cover
4. Back frame	8. Seat cusion pad	12. Recliner lever	

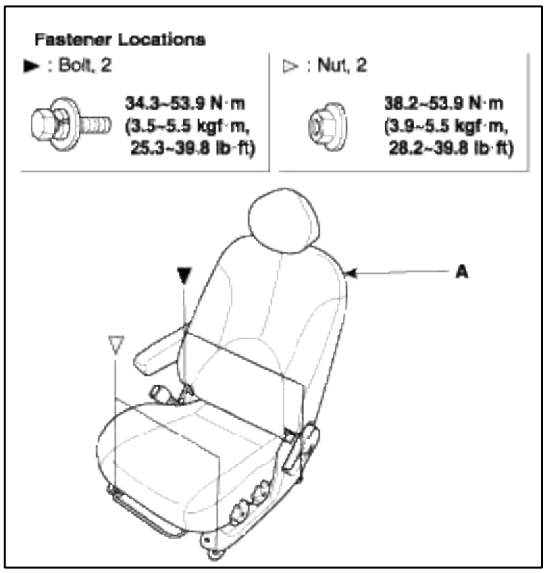
Body (Interior and Exterior) > Seat & Power Seat > Front Seat > Repair procedures

REPLACEMENT

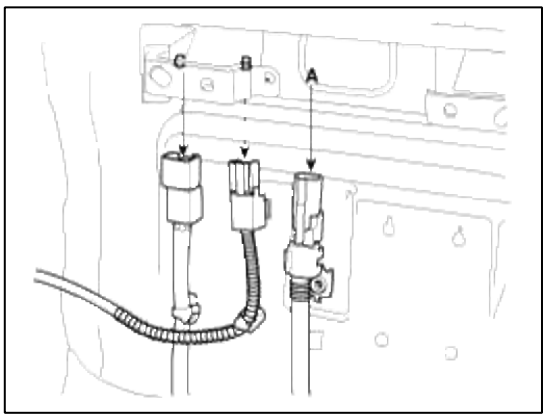
SEAT ASSEMBLY REPLACEMENT

1. Remove the seat assembly mounting cover.

2. After loosening the seat assembly mounting bolt and nut, remove the seat assembly (A).



3. Disconnect the connectors, and remove the seat assembly.
   DRIVER'S
   A. Disconnect the airbag connector (A), STP connector (B), Seat belt buckle connecotr (C) and then remove the seat assembly.



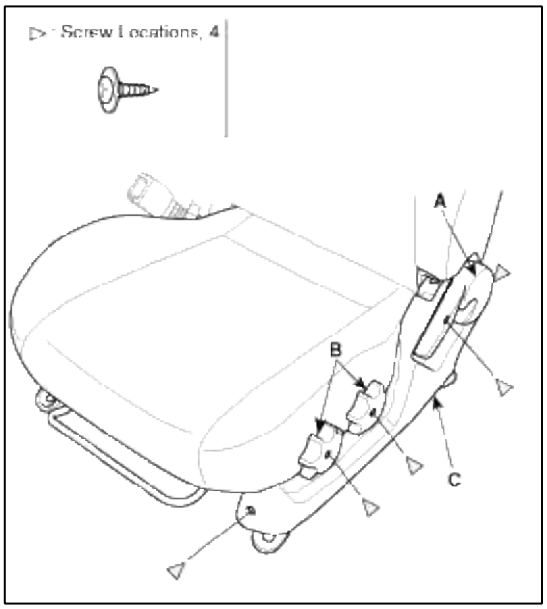
   PASSENGER'S
   A. Disconnect the airbag connector, OCS connector, Seat belt buckle connector.
4. Installation is the reverse of removal.

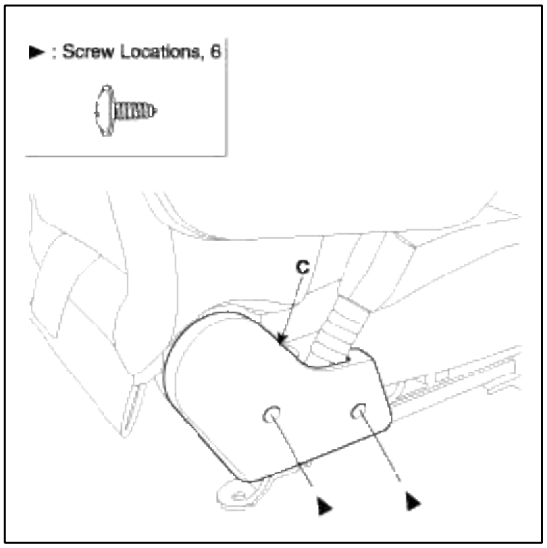
> CAUTION
>
> - Set the into the most rearward position. Check then each slide is locked, and then Tighten the front mounting bolt temporarily.
> - Set the seat into most forward position.Check that each slide is locked, and then Tighten the rear mounting bolt completely.
> - Set the seat into the most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

RECLINER COVER, KNOB AND HEIGHT KNOB REPLACEMENT

1. Remove the height adjuster knob (A) and recliner knob(B).

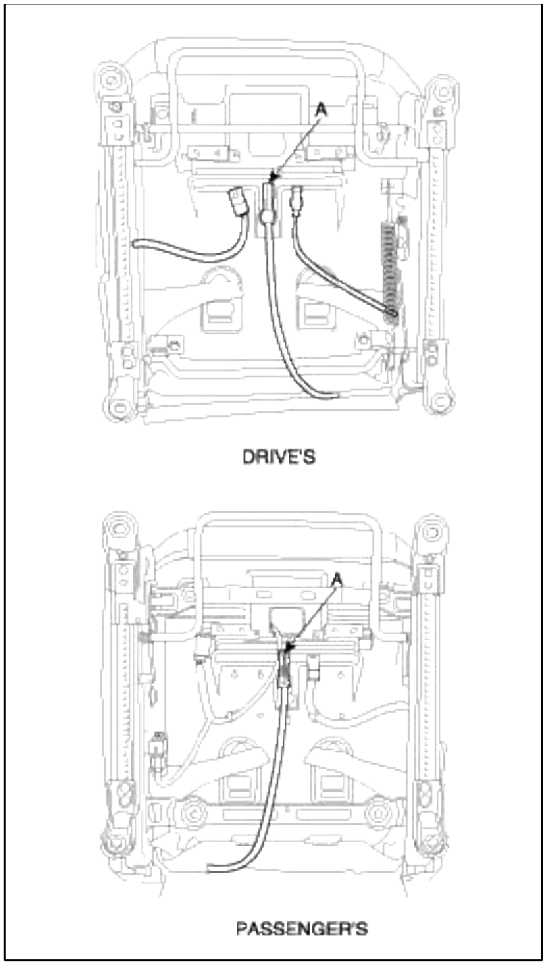
2. Loosen the recliner mounting screw and clip, then remove the recliner cover(C).



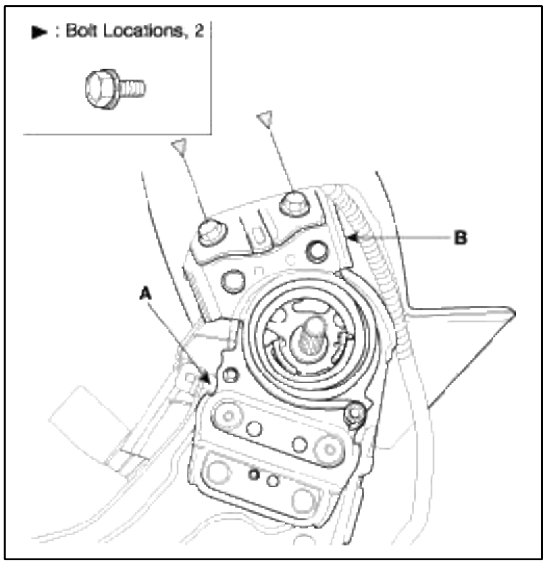


SEAT BACK COVER REPLACEMENT

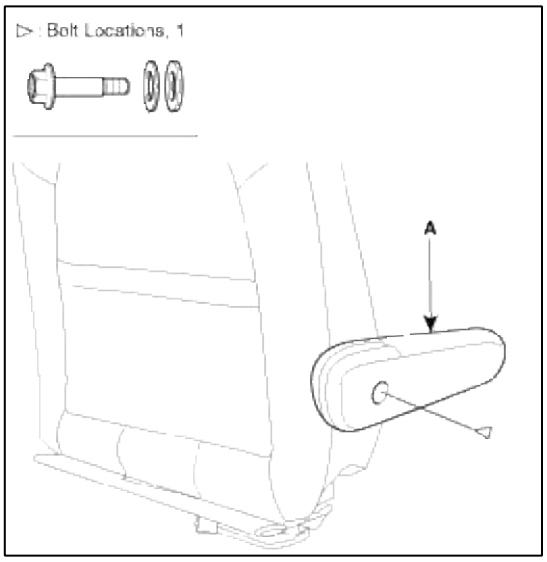
1. Remove the recliner cover, knob and height knob.
2. Disconnect the airbag connector(A).



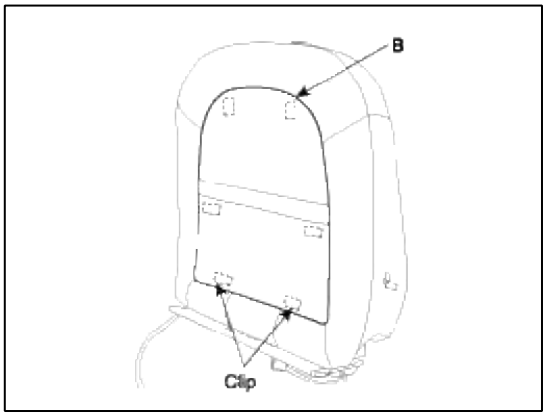
3. Disconnect the seat back frame(B), from seat track assemble(A).



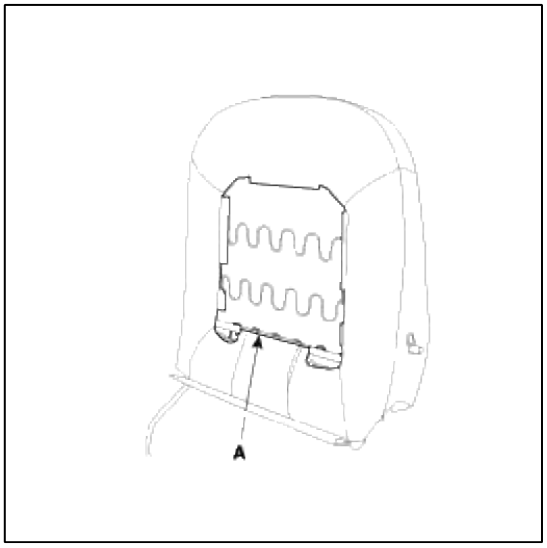
4. After loosening the mounthing screw, remove the front seat armrest(A).



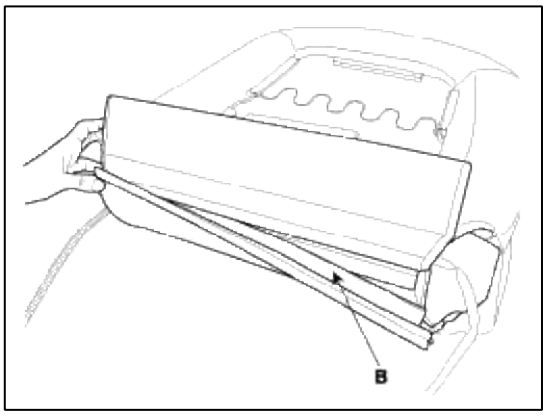
5. Using a screw driver, remove the seat back panel(B).



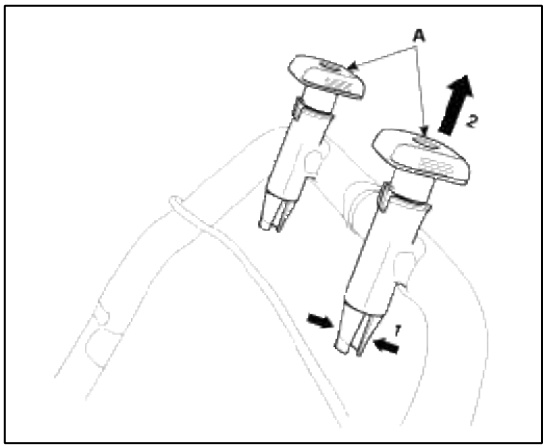
6. Disconnect the protector(A) from seat back frame.



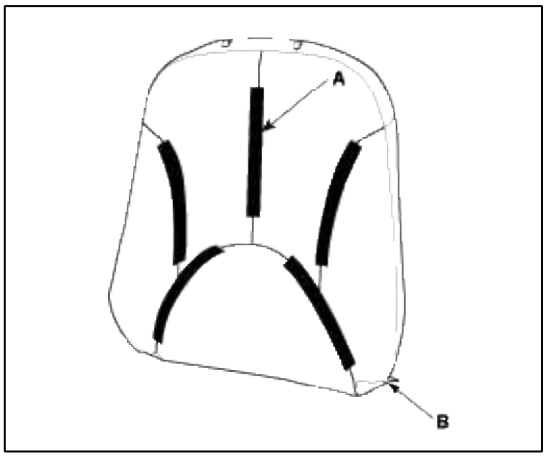
7. Disconnect the band(B).



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



9. Arter removing the apilx(A) on the front of seat cover and remove the seat cover(B).

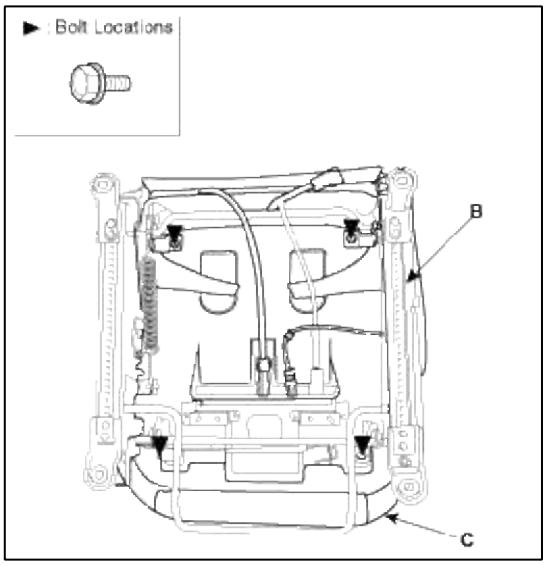


10. Installation is the reverse of removal.

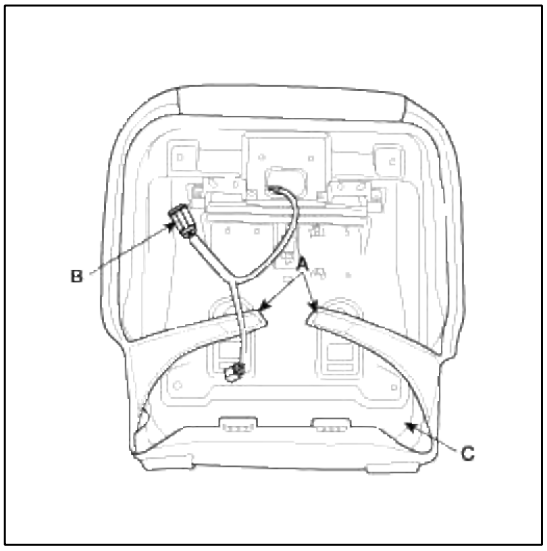
SEAT CUSION COVER REPLACEMENT

1. Remove the front seat assemble.

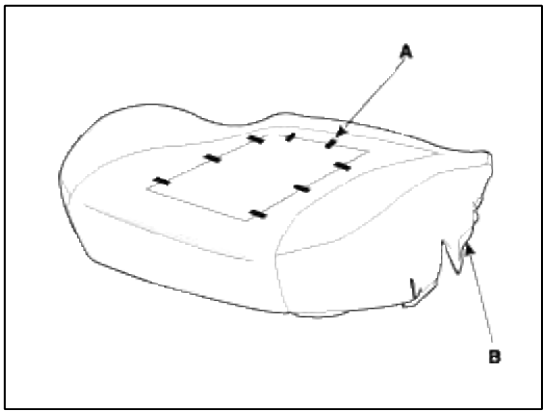
2. Disconnect the connectors (A), then remove the cushiou frame (C) from track assembly.



3. Remove (A) the connector(B) then disconnect the protector (A) from cusion frame(C).



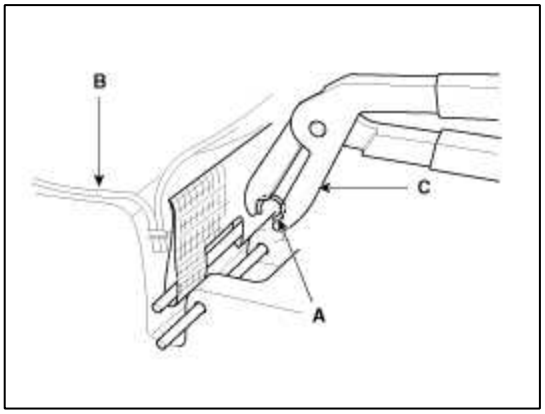
4. After removing the hogring clips(A) on the front of seat cusion and remove the seat cusion(B).



5. Installation is the reverse of removal.

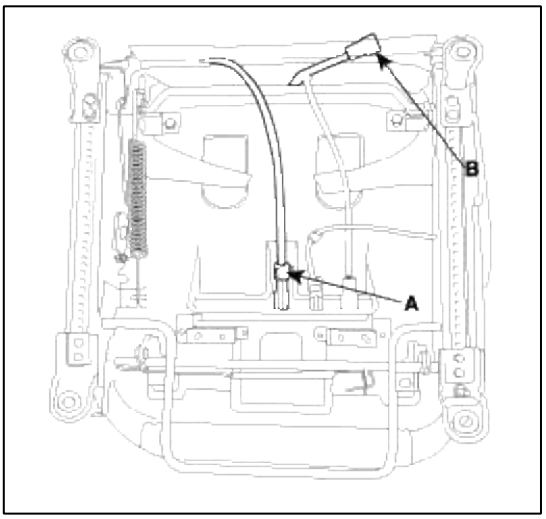
NOTE

- To prevent wrinkles, make sure the material is stretched evenly over the over (B) before securing the hogring clips (A).
- Replace the hogring clips with new ones using special tool (C).

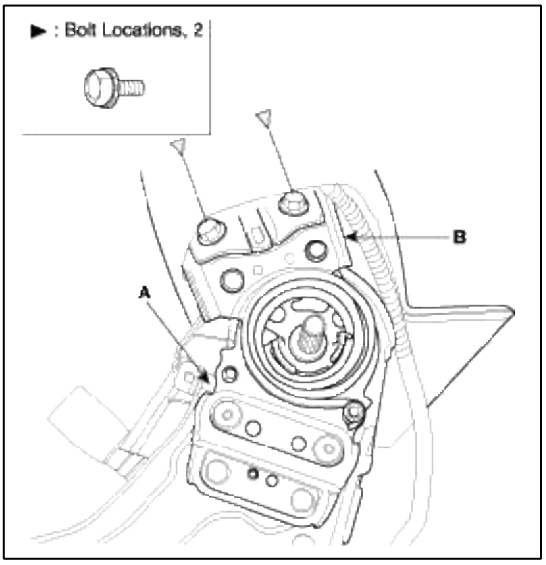


SEAT BACK FRAME REPLACEMENT

1. Remove the recliner cover, knob and height knob.
2. Disconnect the airbag connect(A) and heater connect(B).



3. Disconnect the seat back frame(B) from seat track assembly(A).

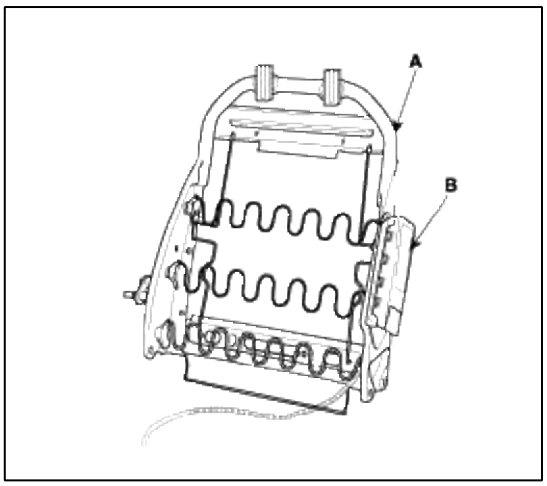


4. Remove the seat back cover.
5. Remove the head rest and head rest guide.

6. Remove the seat back cover and sponge, from frame.
7. After loosening seat back frame mouting bolts, remove the seat back frame(A).

NOTE

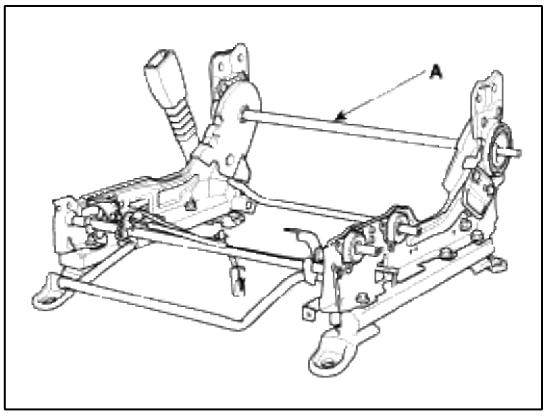
- Remove the side air bag for replacing side air bag installation seat.
- Be fore service, be fully aware of precaution and service procedure relevant to air bag.



8. Installation is the reverse of removal.

SEAT TRACK REPLACEMENT

1. Remove the seat back pannel.
2. Remove the recliner cover, knob and height knob.
3. Remove the seat back assembly.
4. Remove the seat cushion.
5. Remove the seat assembly (A).



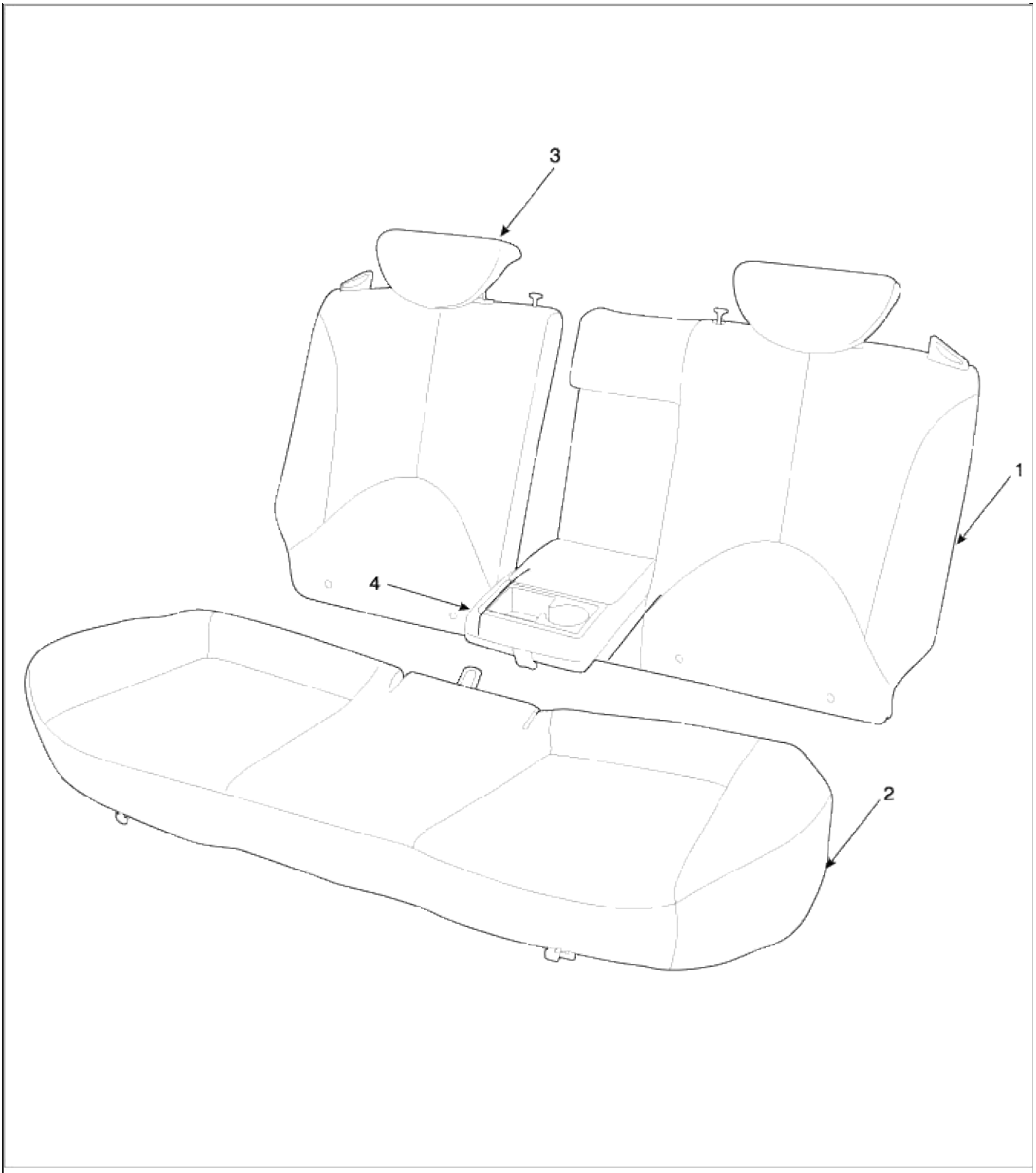
6. Installation is the reverse of removal.

NOTE

After installing the OCS, confirm proper system operation : Turn the ingintion switch ON, the SRS indicator should be turned on for about six seconds and then go off.
Telltale lamp will turn on for 4 seconds and be turned off afterward. (Refer to RT group)

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

COMPONENTS



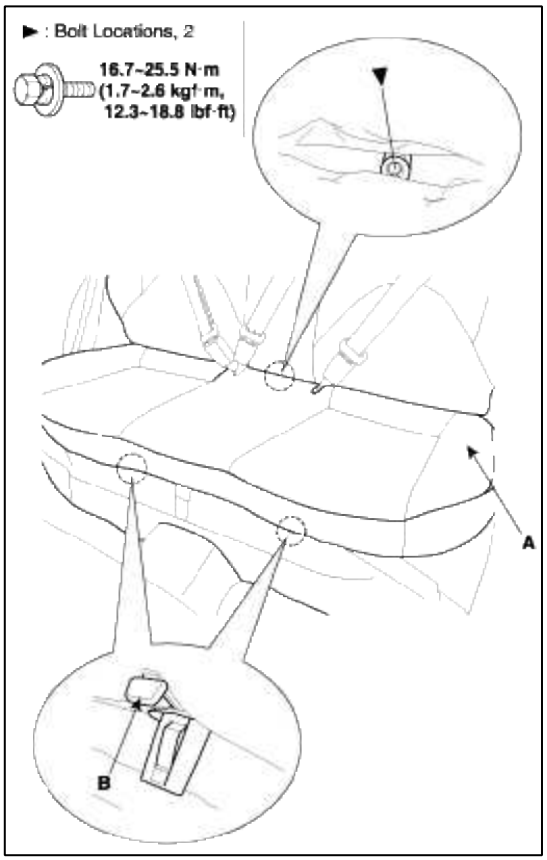
1. Seat back cusion
2. Seat cusion
3. Head rest
4. Arm rest

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

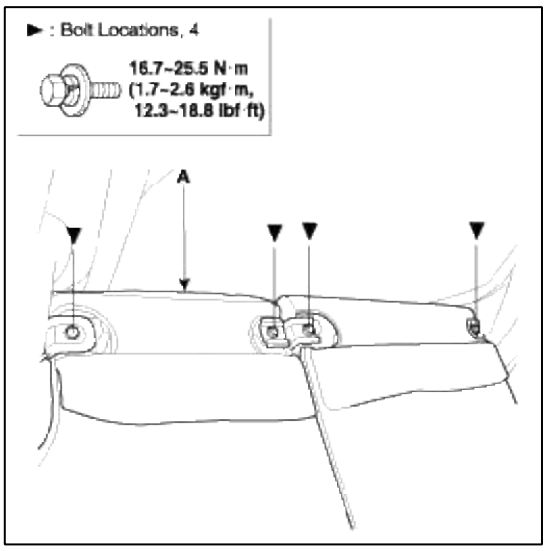
REPLACEMENT

SEAT ASSEMBLY REPLACEMENT

1. Loosen the rear seat cushion mounting bolts, then remove the rear seat cushion(A) after pull the stopper(B).



2. Loosenig the seat belt mounting bolt, remove the seat back(A).

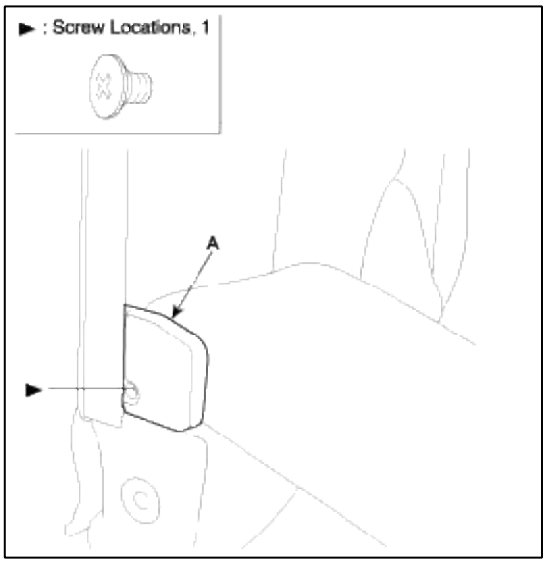


3. Installation is the reverse of removal.

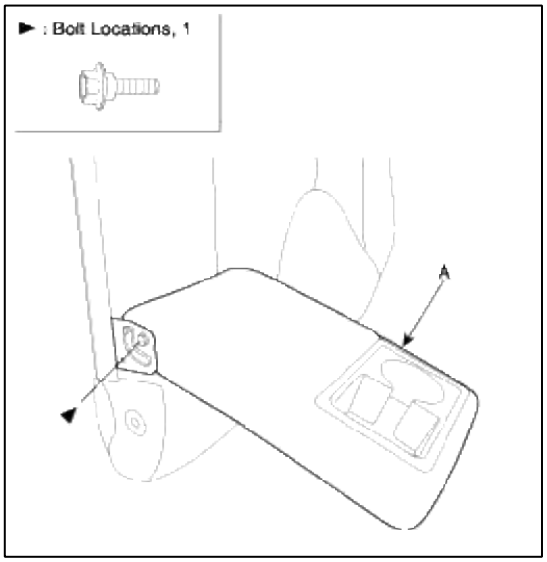
ARM REST REPLACEMENT

1. Remove the rear rear seat.

2. Remove the arm rest cover(A).



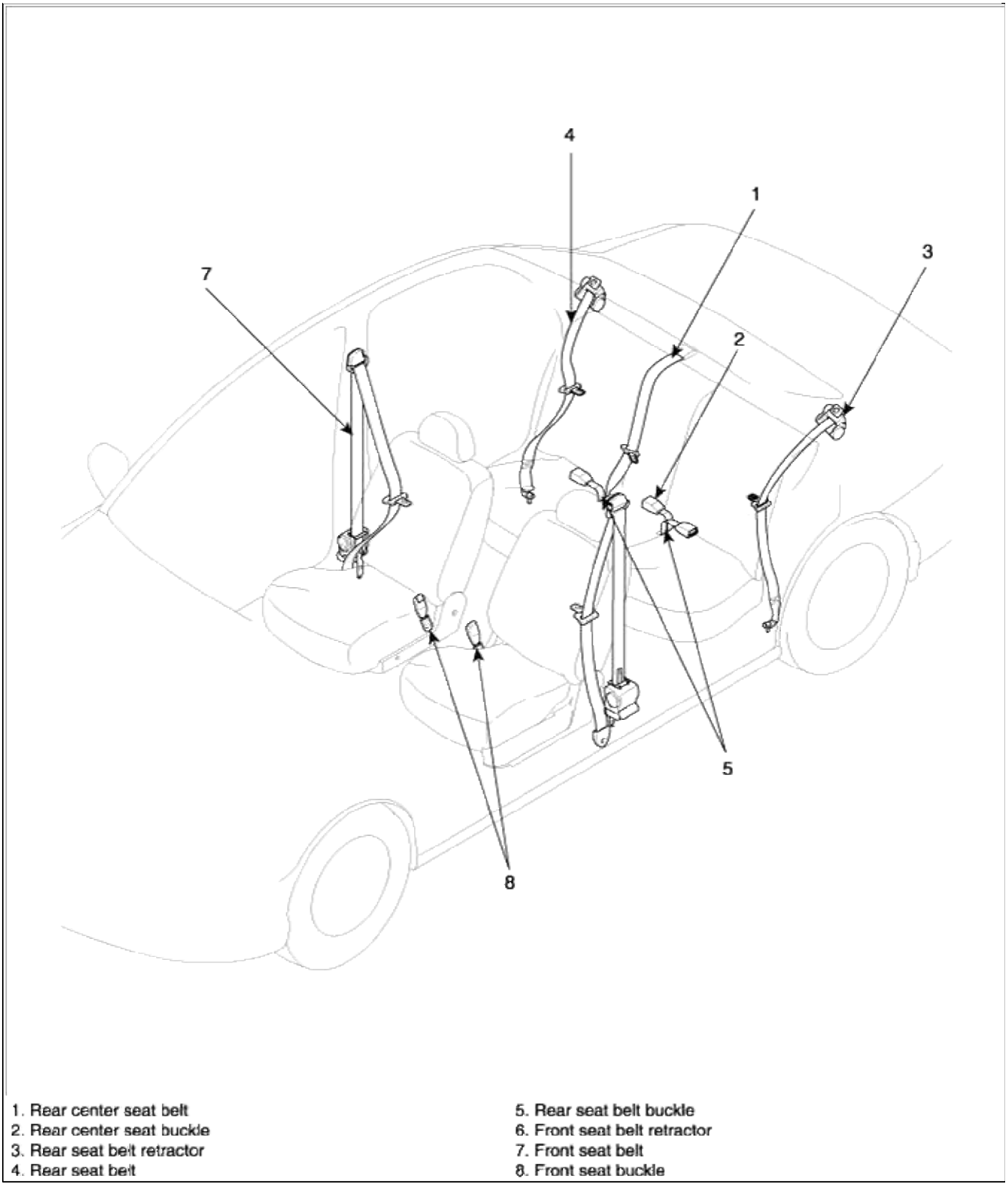
3. Loosening the arm rest mounting bolt, remove the arm rest(A).



4. Installation is the reverse of removal.

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

COMPONENTS



1. Rear center seat belt
2. Rear center seat buckle
3. Rear seat belt retractor
4. Rear seat belt
5. Rear seat belt buckle
6. Front seat belt retractor
7. Front seat belt
8. Front seat buckle

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

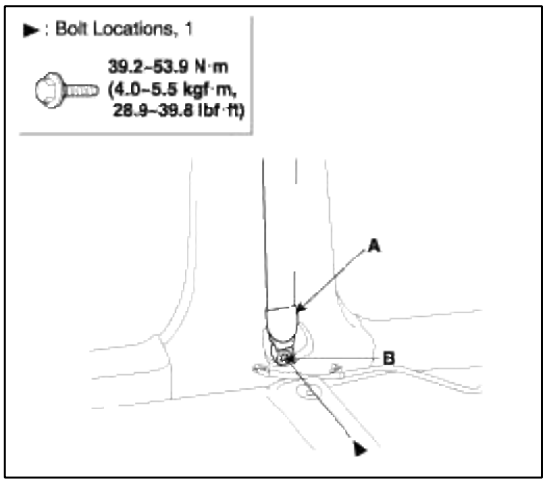
REPLACEMENT

FRONT SEAT BELT REPLACEMENT

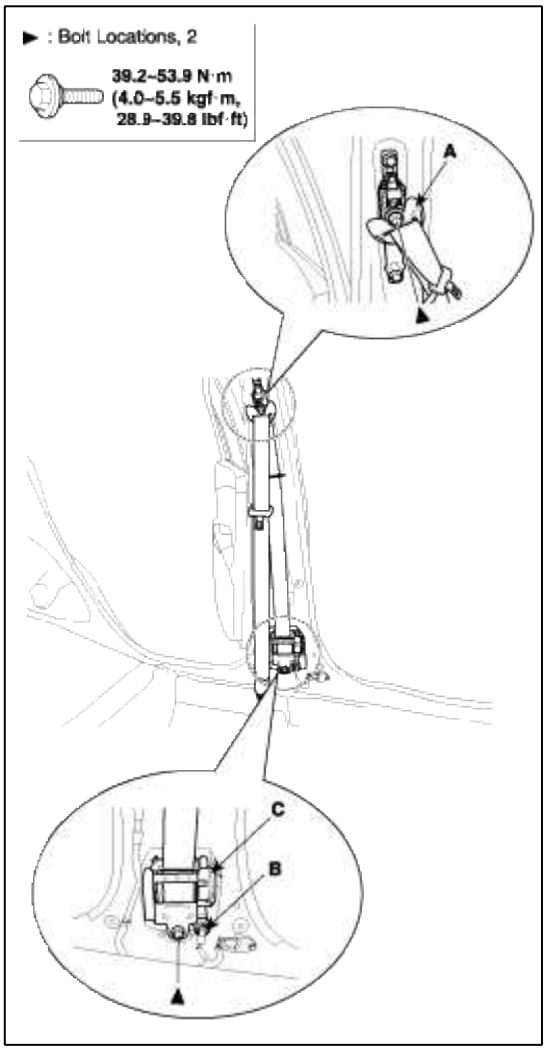
CAUTION

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

1. Remove the following items first.
   A. Front seat assembly.
   B. Front and rear door scuff trim.
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. Remove the upper anchor (A).
6. After disconnecting the pretensioner connector lock pin, remove the connector(B), Loosen the mounting bolt, then remove the pretensioner (C).

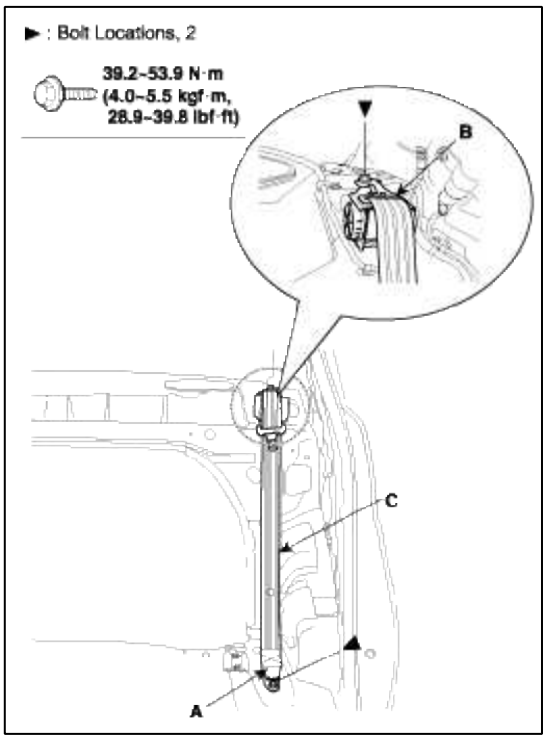


REAR SEAT BELT RELACEMENT

CAUTION

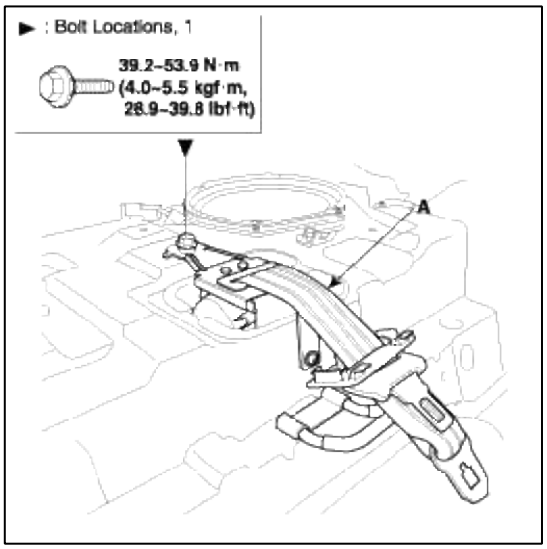
- When installing the belt, make sure not to damage the pretensioner.

1. Remove the following items first.
   A. Rear seat assembly.
   B. Front and rear door scuff trim.
   C. Rear piller trim.
2. Remove the lower anchor (A).
3. Remove the package tray trim.
4. After loosening the retractor (B) mounting bolt, remove the rear seat belt (C).



REAR CENTER SEAT BELT REPLACEMENT

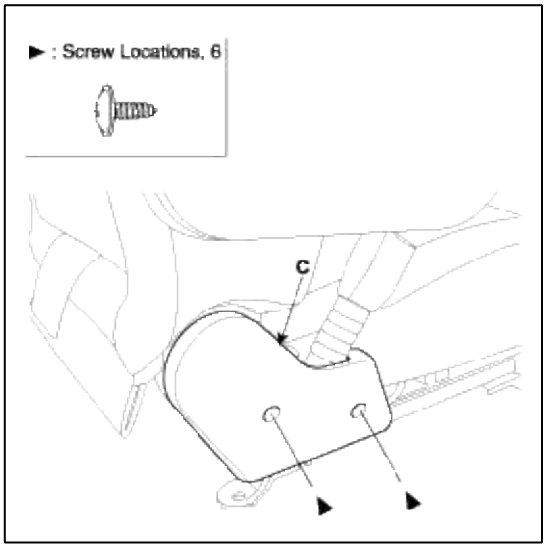
1. Remove the following items first.
   A. Rear seat assemble.
   B. Rear wheel guard and rear door scuff trim.
   C. Rear piller trim.
   D. Package tray.
2. Remove the rear center seat belt(A).



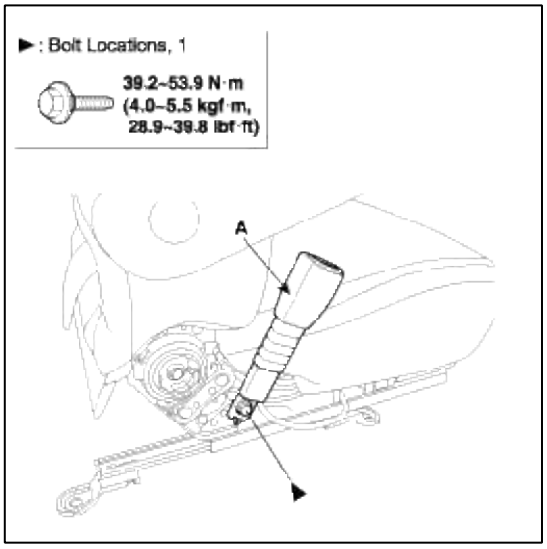
3. Installation is the reverse of removal.

FRONT SEAT BELT BUCKLE REPLACEMENT

1. Remove the following items first.
   A. Front seat assembly.
2. Remove the recliner cover(C).



3. Remove the seat belt buckle(A).

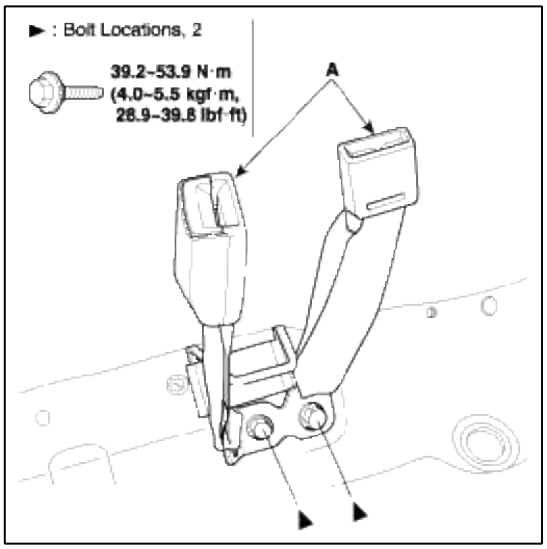


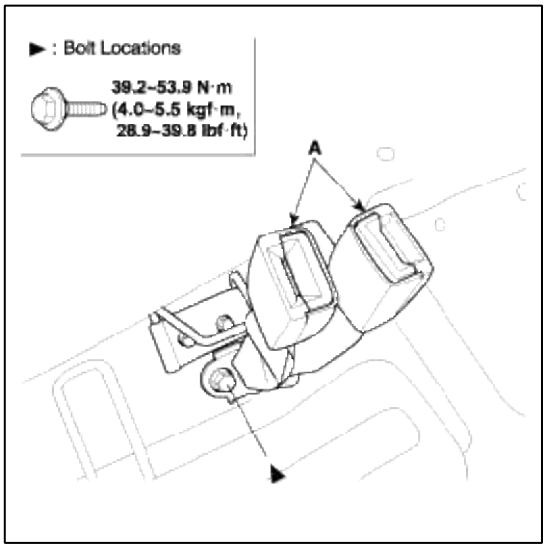
4. Installation is the reverse of removal.

REAR SEAT BELT BUCKLE REPLACEMENT

1. After cushion frame hinge mounting bolt, fold the cushion.
2. Remove the seat belt buckle (A).

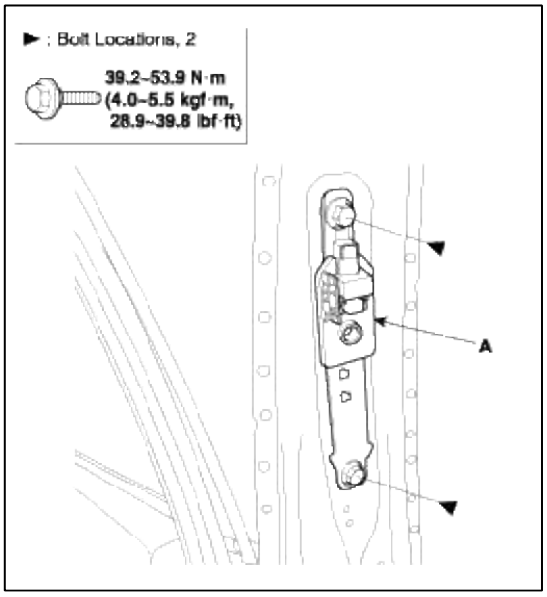
3. Installation is the reverse of removal.





HIGHT ADJUSTER REPLACEMENT

1. Remove the following items first.
   A. Front seat assembly.
   B. Front and rear door scuff trim.
   C. Front seat belt upper and lower anchor.
   D. Center pillar lower and upper trim.
2. Loosen the mounting bolt, then remove the height adjuster (A).



3. Installation is the reverse of removal.

ACCENT(MC) > 2008 > G 1.6 DOHC > Body Electrical System

Body Electrical System > General Information > General Information

GENERAL TROUBLESHOOTING INFORMATION

BEFORE TROUBLESHOOTING

1. Check applicable fuses in the appropriate fuse/relay box.
2. Check the battery for damage, state of charge, and clean and tight connections.

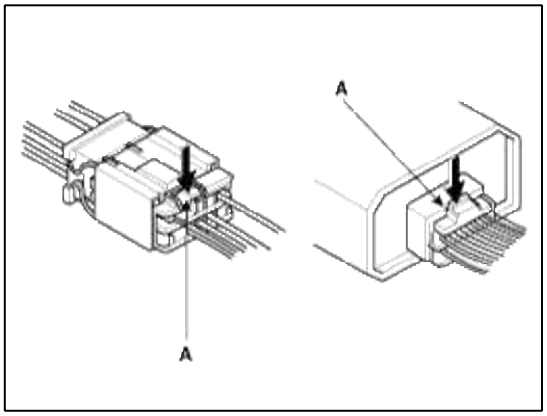
NOTE

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

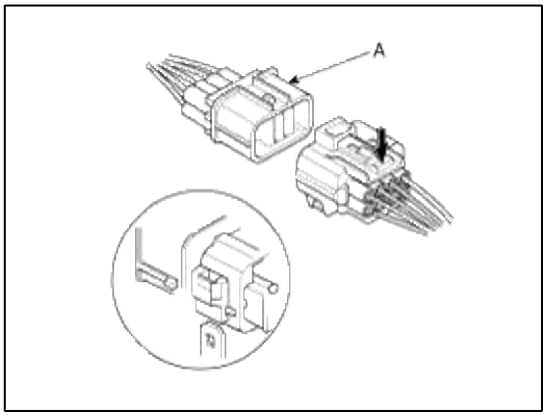
3. Check the alternator belt tension.

HANDLING CONNECTORS

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

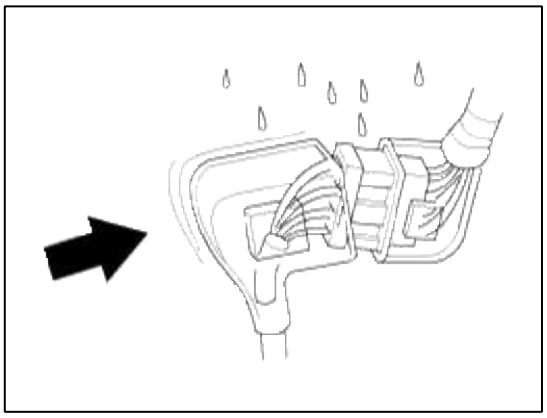


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).

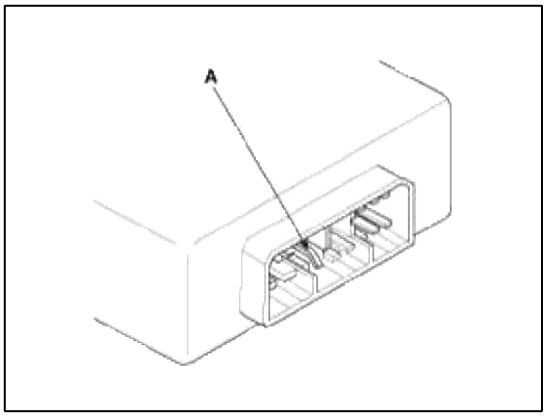


6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.

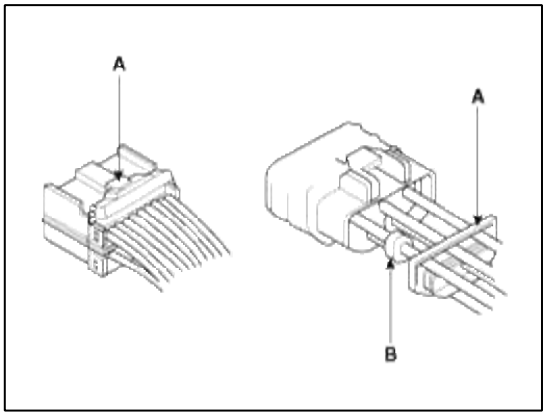
7. Always reinstall plastic covers.



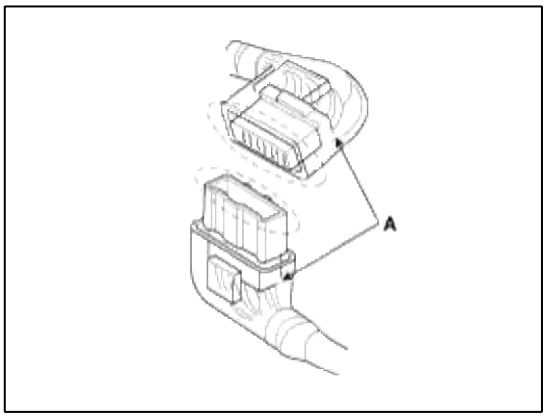
8. Before connecting connectors, make sure the terminals (A) are in place and not bent.



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

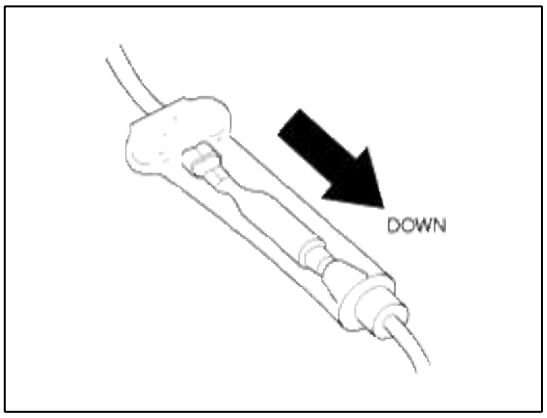


10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.



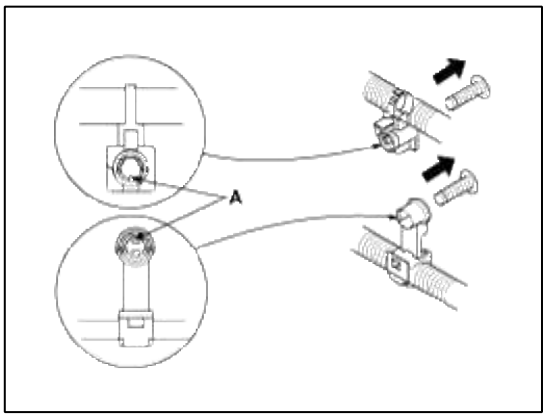
11. Insert the connector all the way and make sure it is securely locked.

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

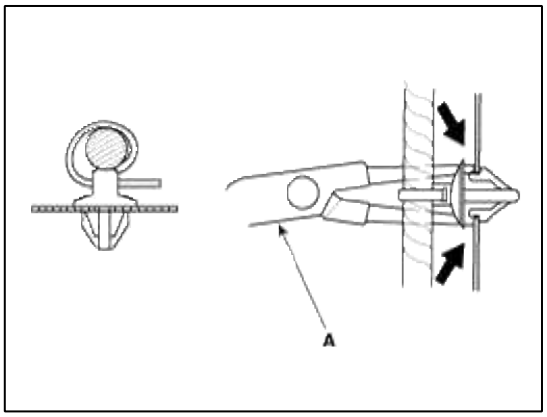


HANDLING WIRES AND HARNESSES

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

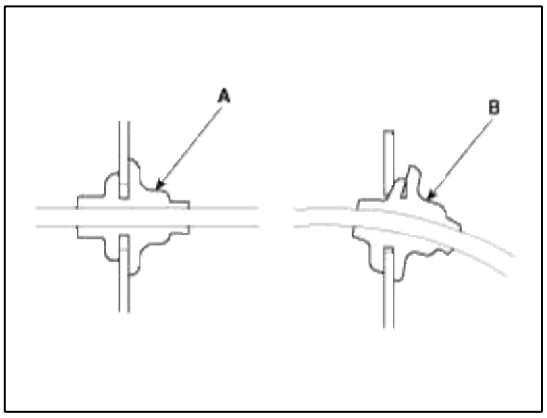


3. Slip pliers (A) under the clip base and through the hole at an angle, and then squeeze the expansion tabs to release the clip.



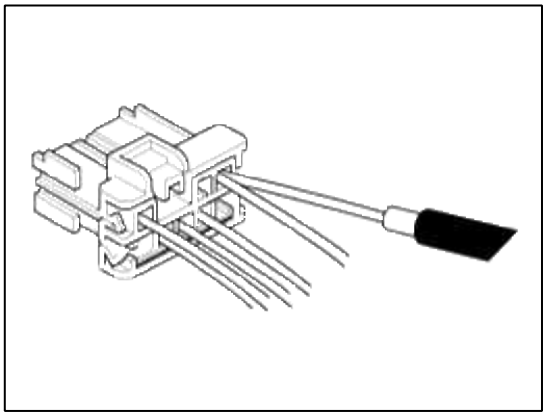
4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.

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

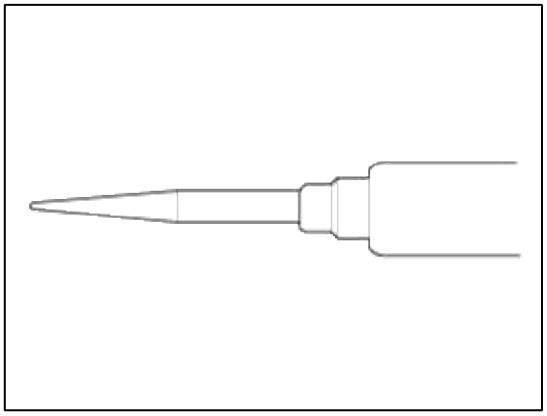


TESTING AND REPAIRS

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



5. Use a probe with a tapered tip.



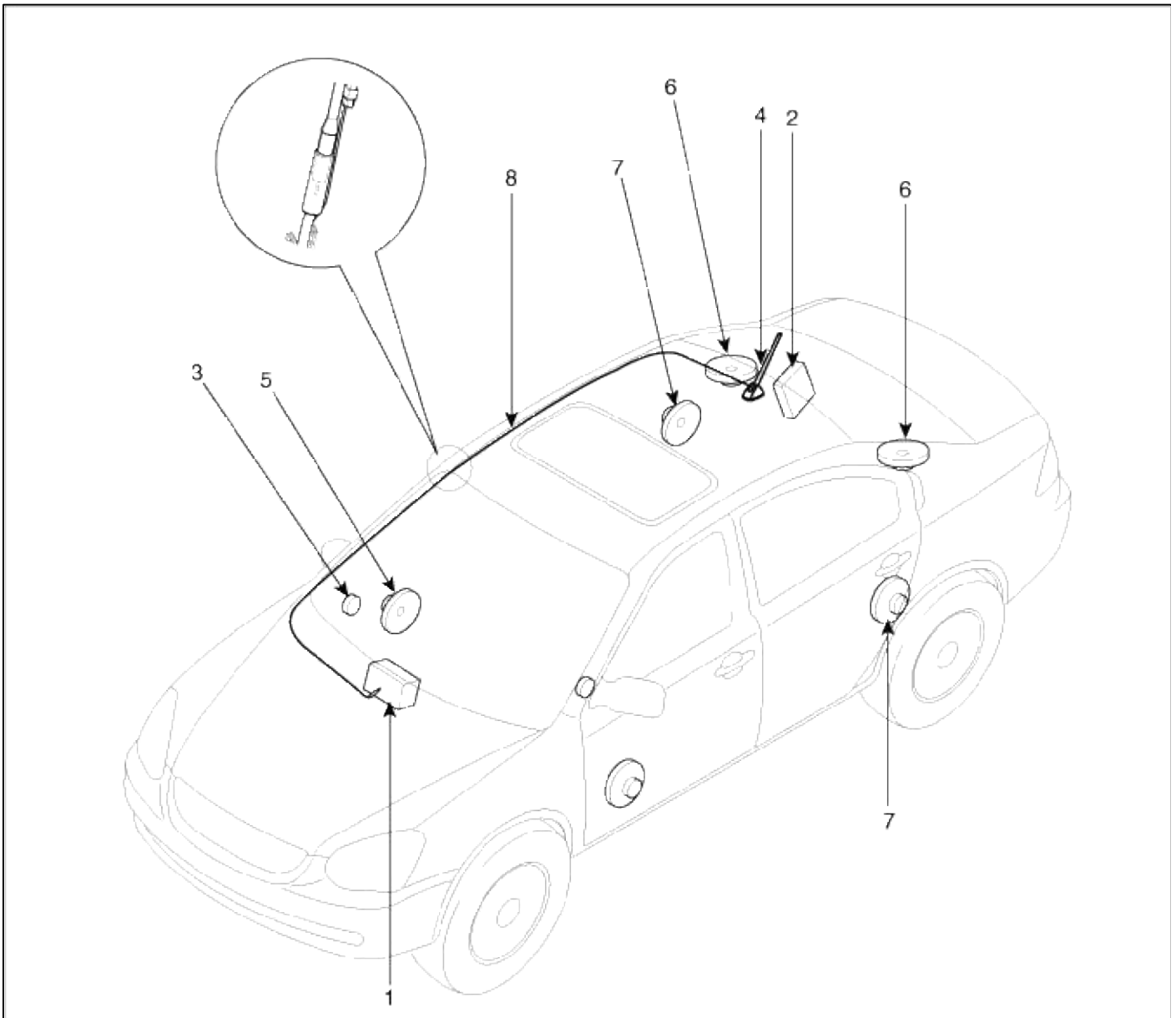
FIVE-STEP TROUBLESHOOTING

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.

Body Electrical System > Audio > Components and Components Location

COMPONENT LOCATION



1. Audio unit	5. Front door speaker
2. External amplifier	6. Rear package tray speaker (4 doors)
3. Tweeter speaker	7. Rear door speaker (3 doors)
4. Roof antenna	8. Antenna feeder cable

Body Electrical System > Audio > Troubleshooting

CUSTOMER COMPLAINT ANALYSIS CHECK SHEET

TROUBLE IN	☐ ALL ☐ AM ☐ FM ☐ TAPE ☐ CD ☐ MP3 ☐ CD changer ☐ AMP ☐ Athers
TROUBLE OCCURS	☐ Always ☐ Engine start ☐ Engine Running ☐ Cold ☐ Warm ☐ Sometimes ☐ Most of the time ☐ Engine off
TYPE OF TROUBLE	☐ Will not play ☐ Tape speed not proper ☐ Weak ☐ Noise squeal ☐ East tape ☐ Display/illumination poor ☐ CD skips & jumps ☐ Tape/CD will not eject or insert ☐ Others (Describe) :
OTHERS	▶ Customer complaint contents : ▶ Have you checked customer's defects :
★ Using the customer complaint analysis check sheet for reference, ask the customer as much detail as possible about the problem.	

TROUBLESHOOTING

There are six areas where a problem can occur: wiring harness, the radio, the cassette tape deck, the CD player, and speaker. Troubleshooting enables you to confine the problem to a particular area.

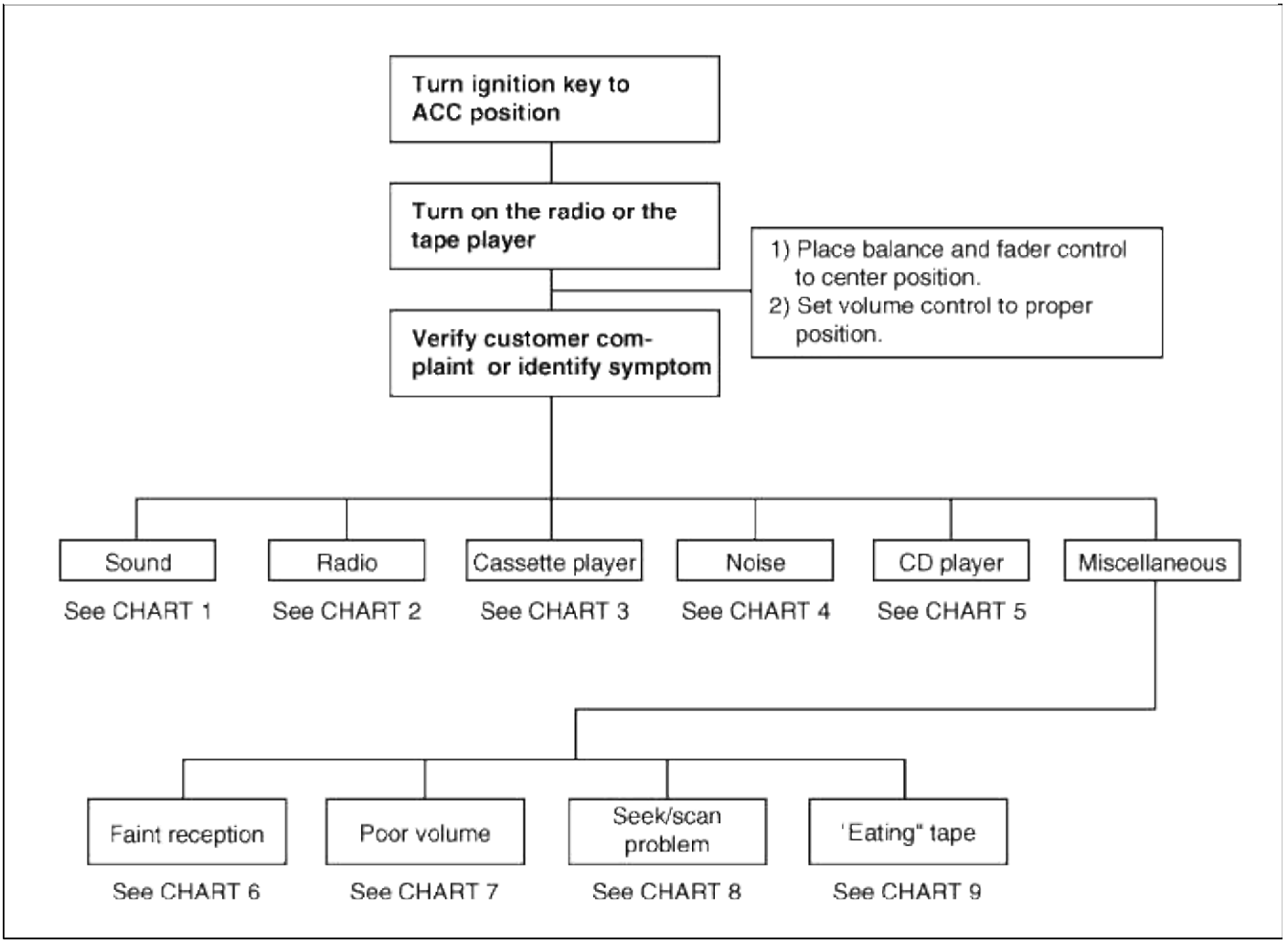
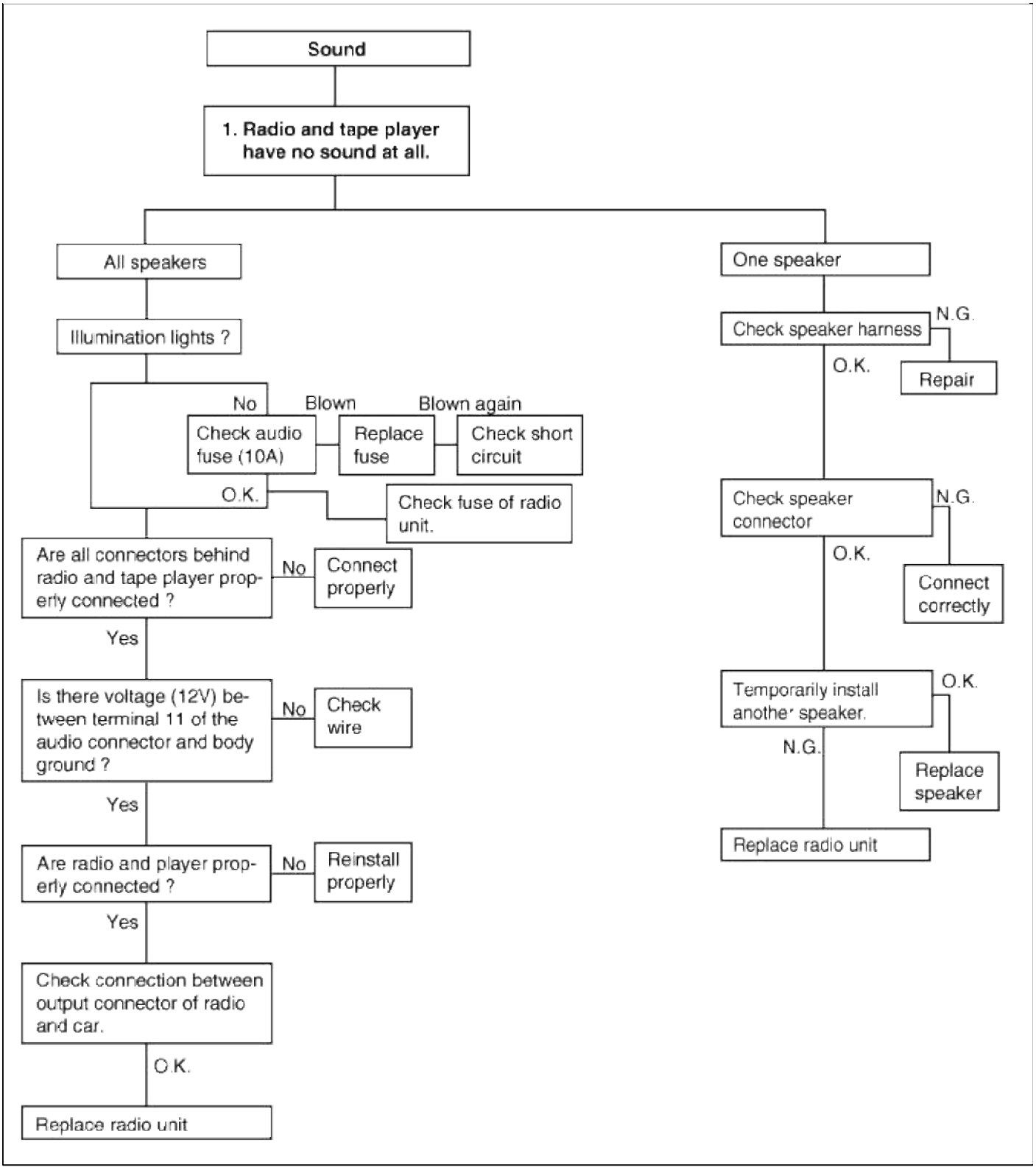

Turn ignition key to ACC position
Turn on the radio or the tape player
1) Place balance and fader control to center position.
2) Set volume control to proper position.
Verify customer complaint or identify symptom
Sound
See CHART 1
Radio
See CHART 2
Cassette player
See CHART 3
Noise
See CHART 4
CD player
See CHART 5
Miscellaneous
Faint reception
See CHART 6
Poor volume
See CHART 7
Seek/scan problem
See CHART 8
'Eating" tape
See CHART 9

Chart 1


Sound
1. Radio and tape player have no sound at all.
All speakers
Illumination lights ?
No
Blown
Blown again
Check audio fuse (10A)
Replace fuse
Check short circuit
O.K.
Check fuse of radio unit.
Are all connectors behind radio and tape player properly connected ?
No
Connect properly
Yes
Is there voltage (12V) between terminal 11 of the audio connector and body ground ?
No
Check wire
Yes
Are radio and player properly connected ?
No
Reinstall properly
Yes
Check connection between output connector of radio and car.
O.K.
Replace radio unit
One speaker
Check speaker harness
N.G.
O.K.
Repair
Check speaker connector
N.G.
O.K.
Connect correctly
Temporarily install another speaker.
O.K.
N.G.
Replace speaker
Replace radio unit

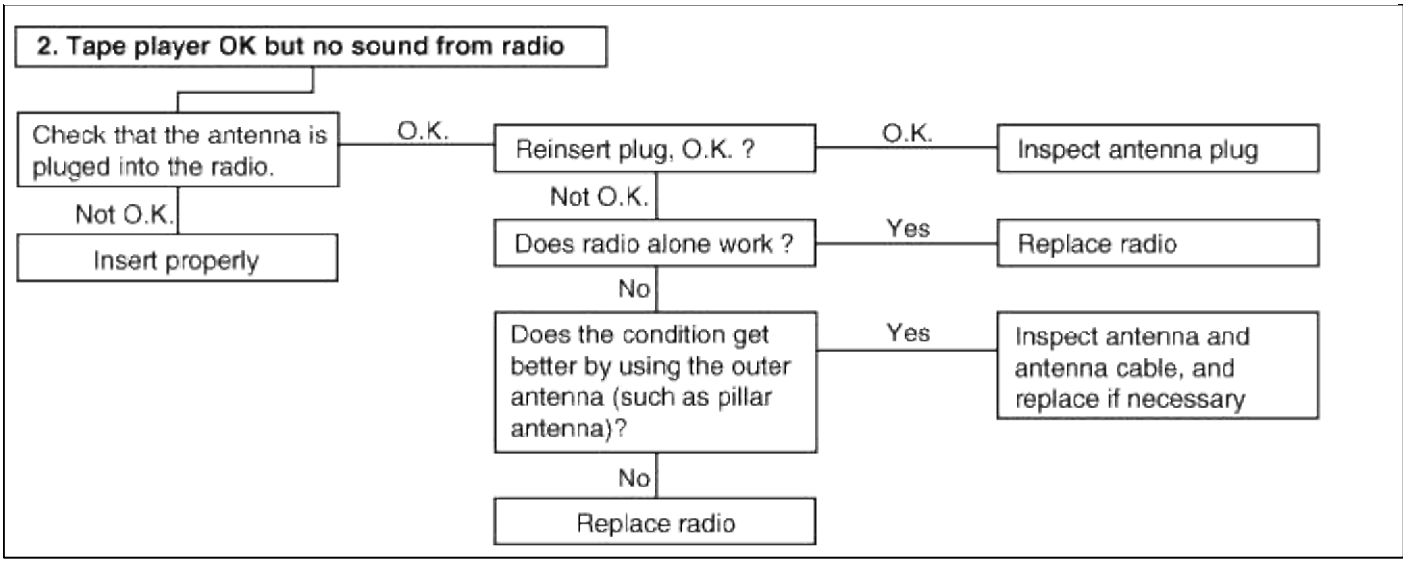


Chart 2

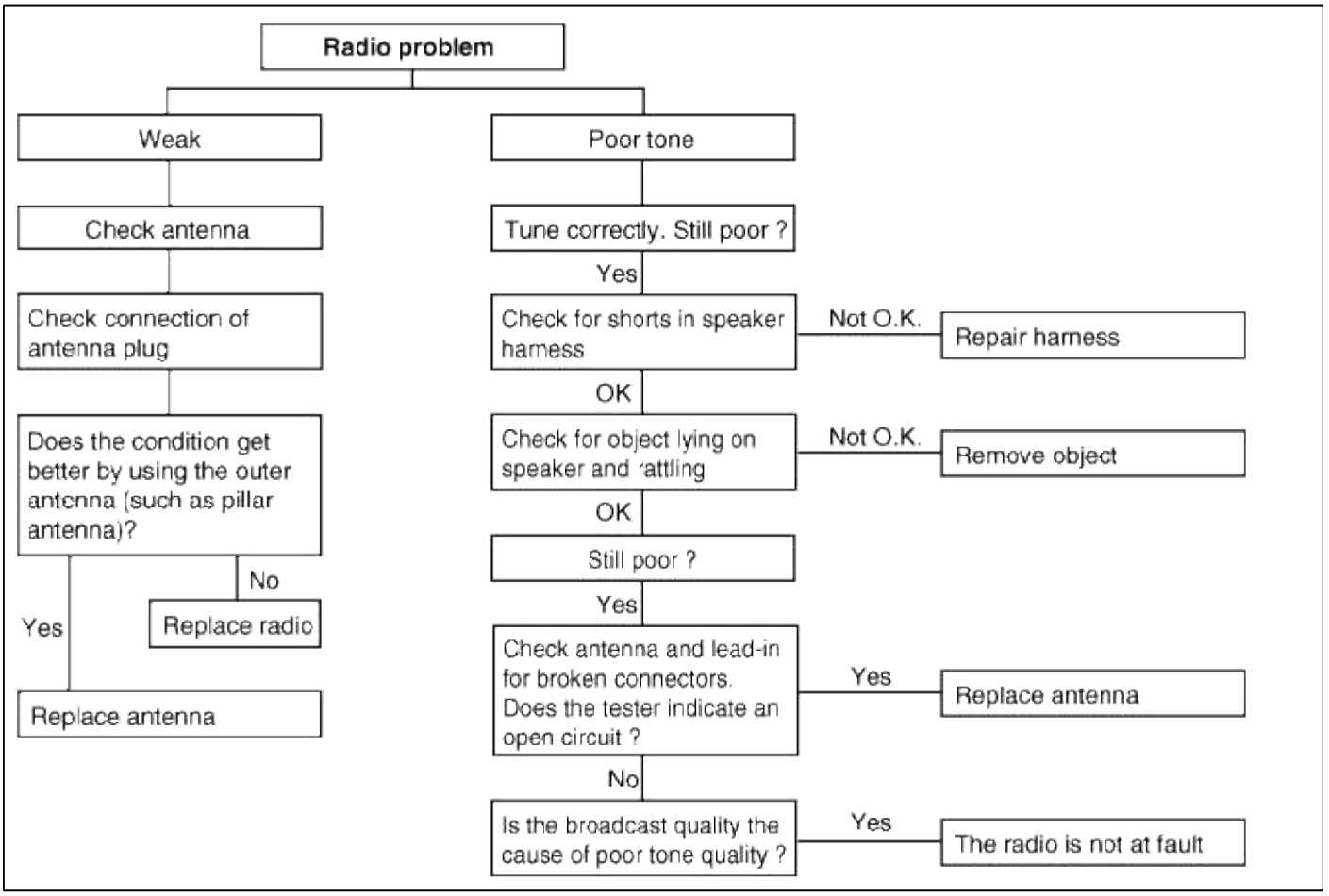


Chart 3

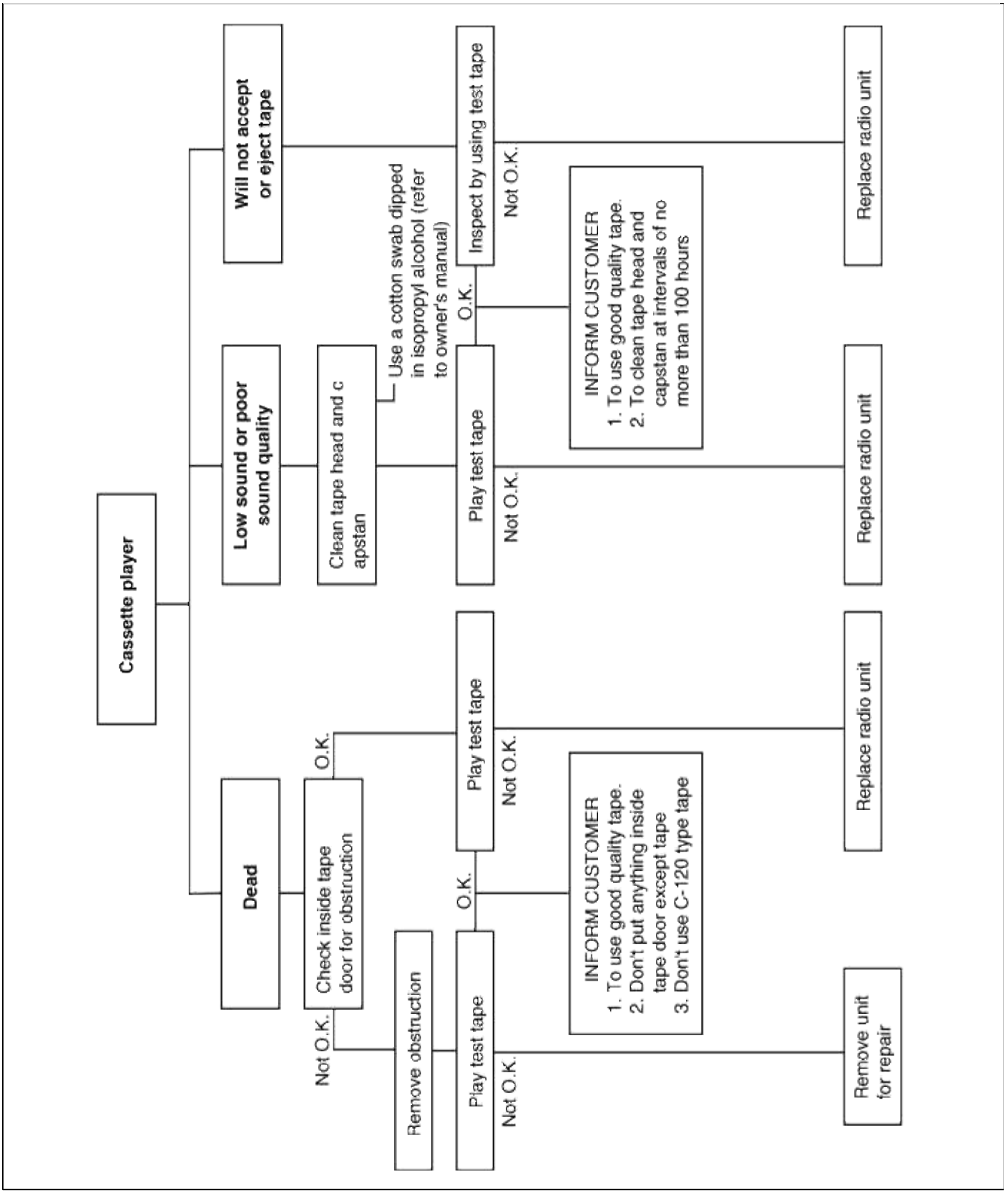
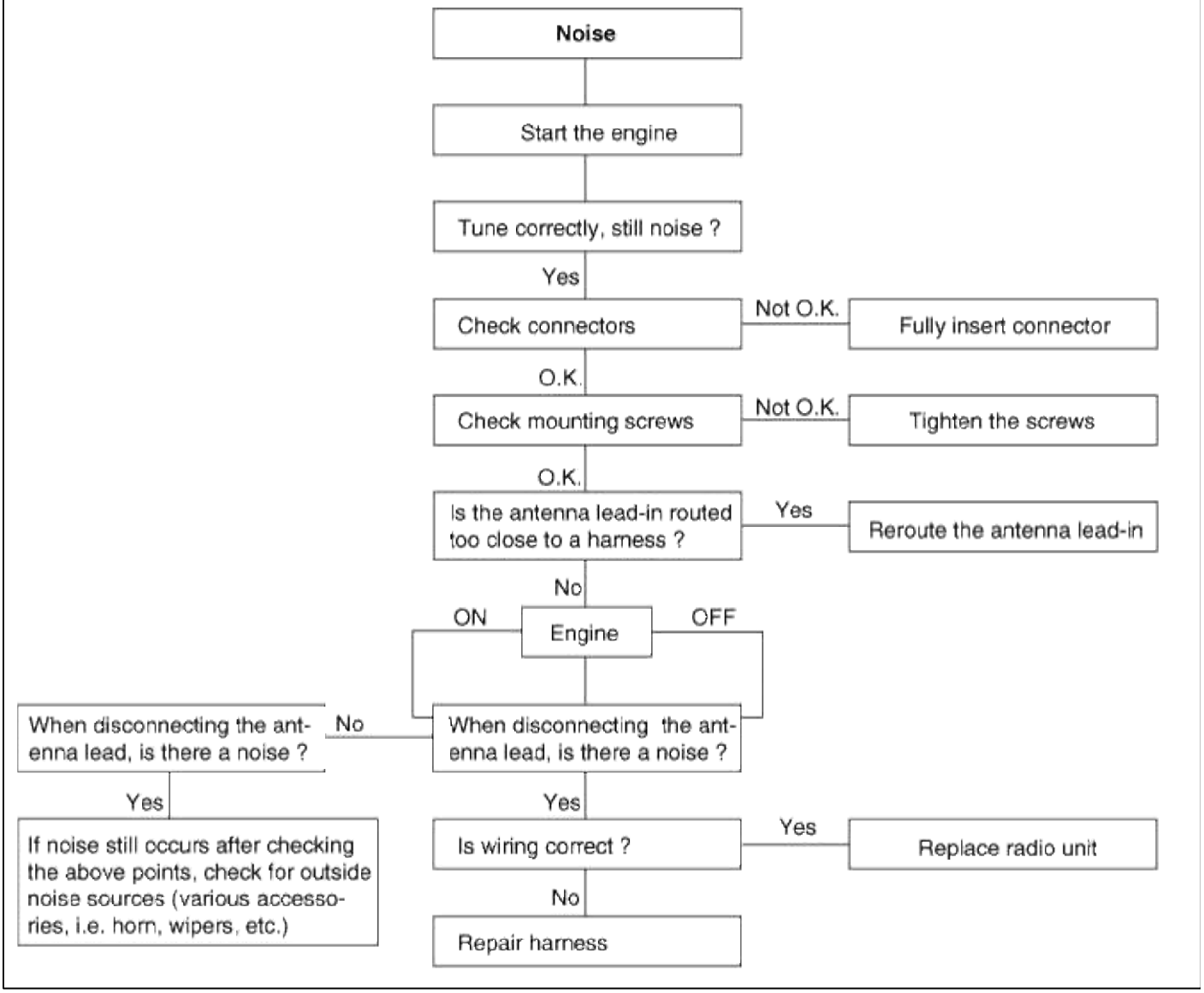

Cassette player
Will not accept or eject tape
Inspect by using test tape
Not O.K.
Replace radio unit
O.K.
INFORM CUSTOMER
1. To use good quality tape.
2. To clean tape head and capstan at intervals of no more than 100 hours
Low sound or poor sound quality
Clean tape head and c apstan
Use a cotton swab dipped in isopropyl alcohol (refer to owner's manual)
Play test tape
Not O.K.
Replace radio unit
Dead
Check inside tape door for obstruction
O.K.
Play test tape
Not O.K.
Replace radio unit
INFORM CUSTOMER
1. To use good quality tape.
2. Don't put anything inside tape door except tape
3. Don't use C-120 type tape
Not O.K.
Remove obstruction
O.K.
Play test tape
Not O.K.
Remove unit for repair

Chart 4

1. RADIO


Noise
Start the engine
Tune correctly, still noise ?
Yes
Check connectors
Not O.K.
Fully insert connector
O.K.
Check mounting screws
Not O.K.
Tighten the screws
O.K.
Is the antenna lead-in routed too close to a harness ?
Yes
Reroute the antenna lead-in
No
ON
Engine
OFF
When disconnecting the antenna lead, is there a noise ?
No
When disconnecting the antenna lead, is there a noise ?
Yes
If noise still occurs after checking the above points, check for outside noise sources (various accessories, i.e. horn, wipers, etc.)
Yes
Is wiring correct ?
Yes
Replace radio unit
No
Repair harness

2. TAPE

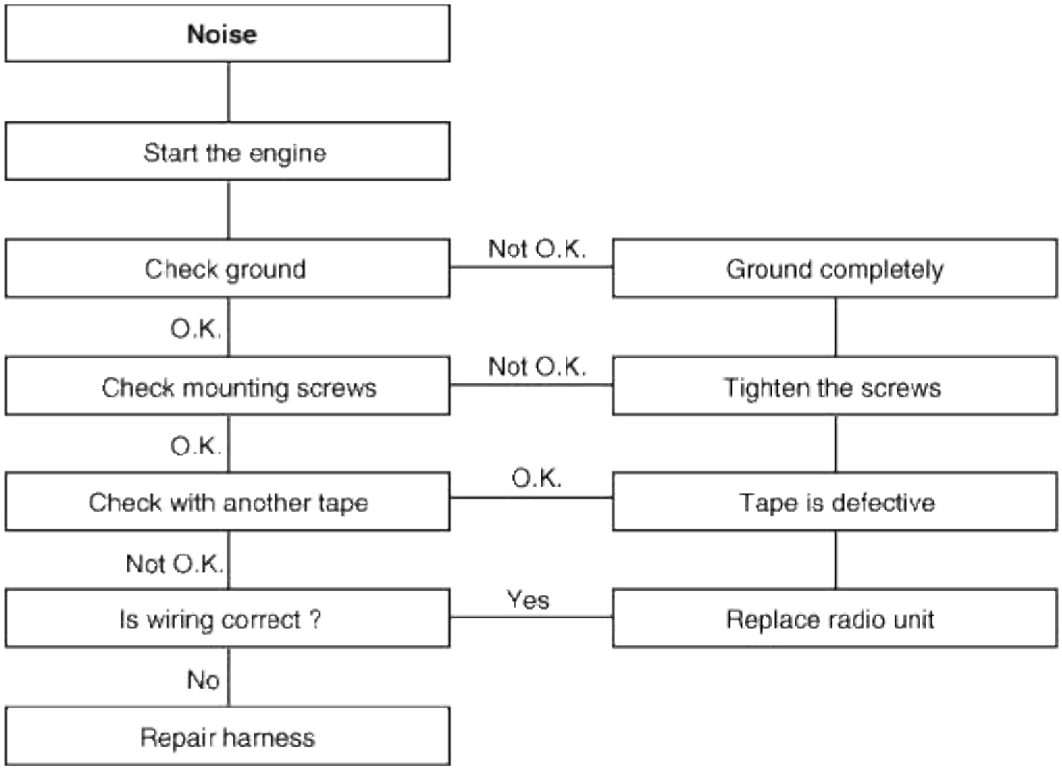
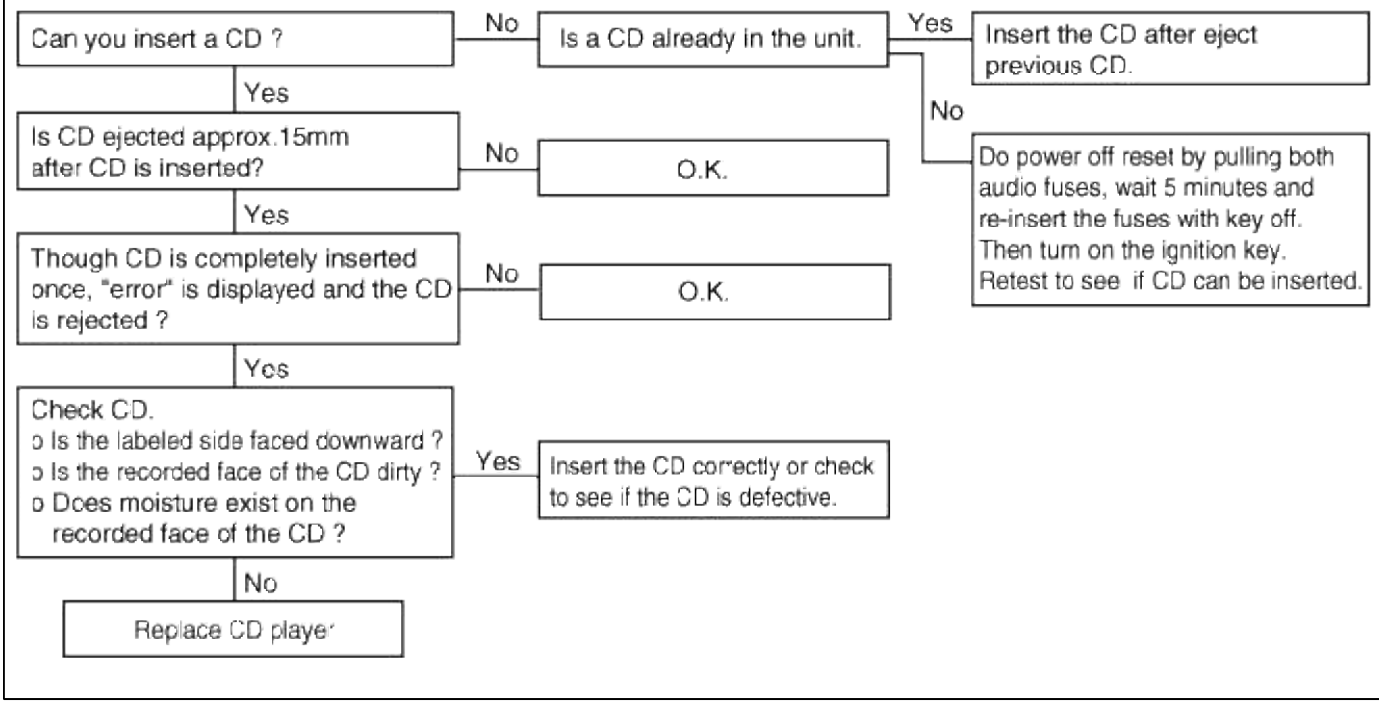
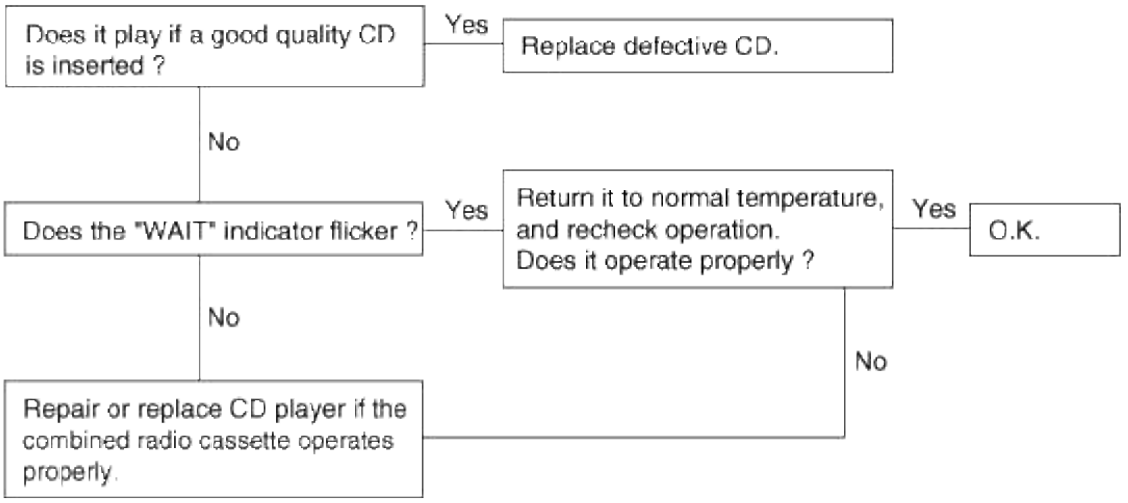


Chart 5

1. CD WILL NOT BE ACCEPTED

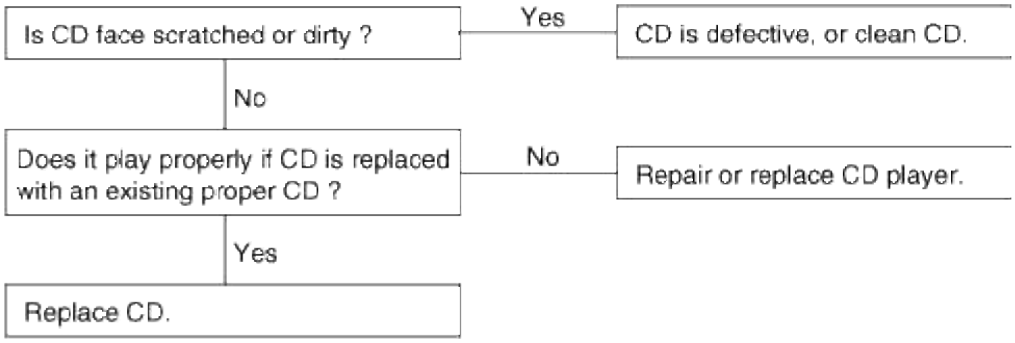


2. NO SOUND

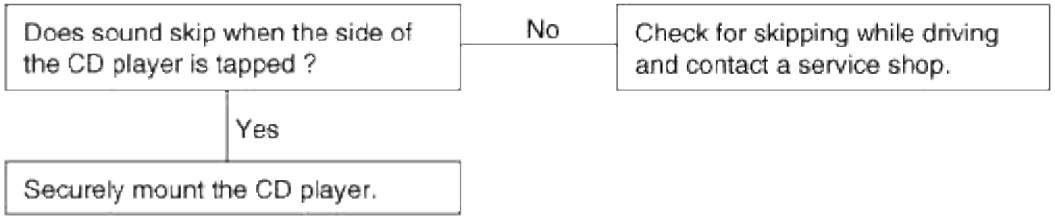


3. CD SOUND SKIPS

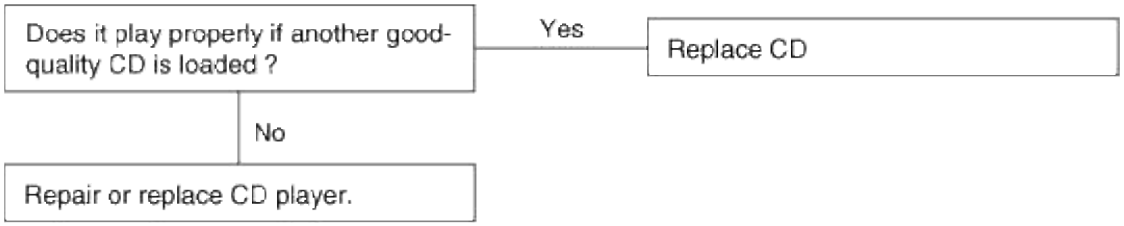
1) Sound sometimes skips when parking.



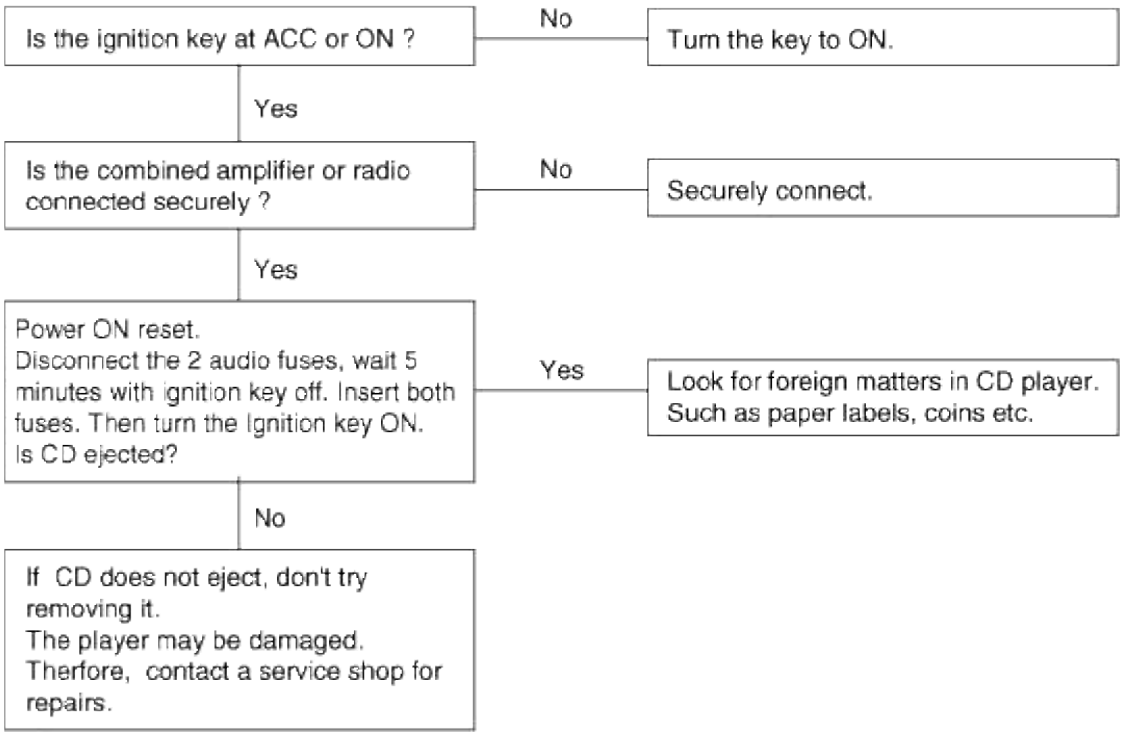
2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)



4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT



6. NO SOUND FROM ONE SPEAKER

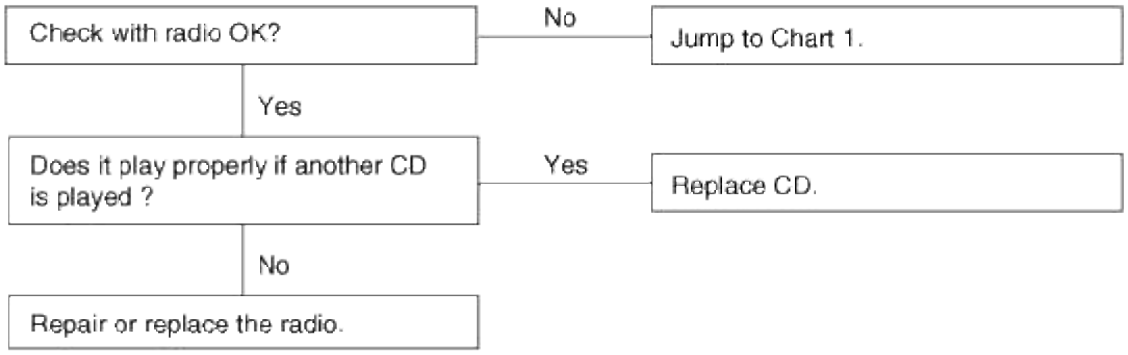


Chart 6

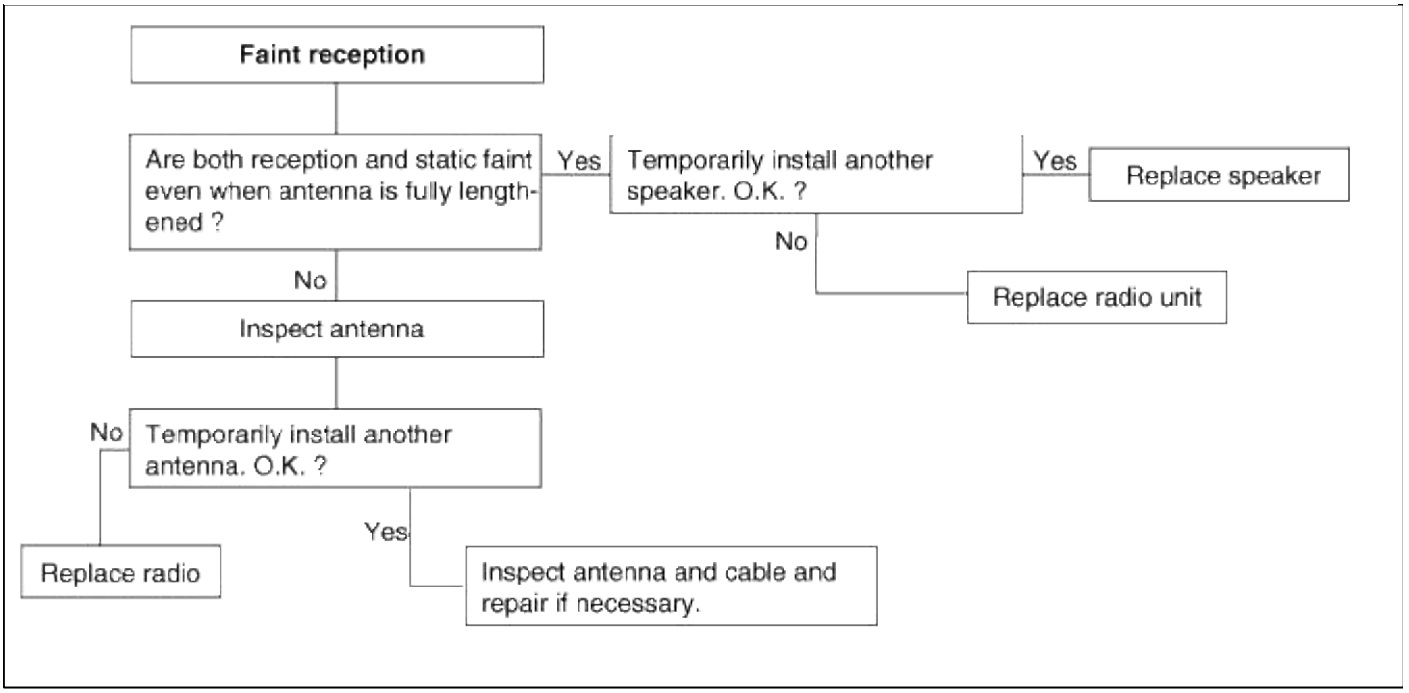


Chart 7

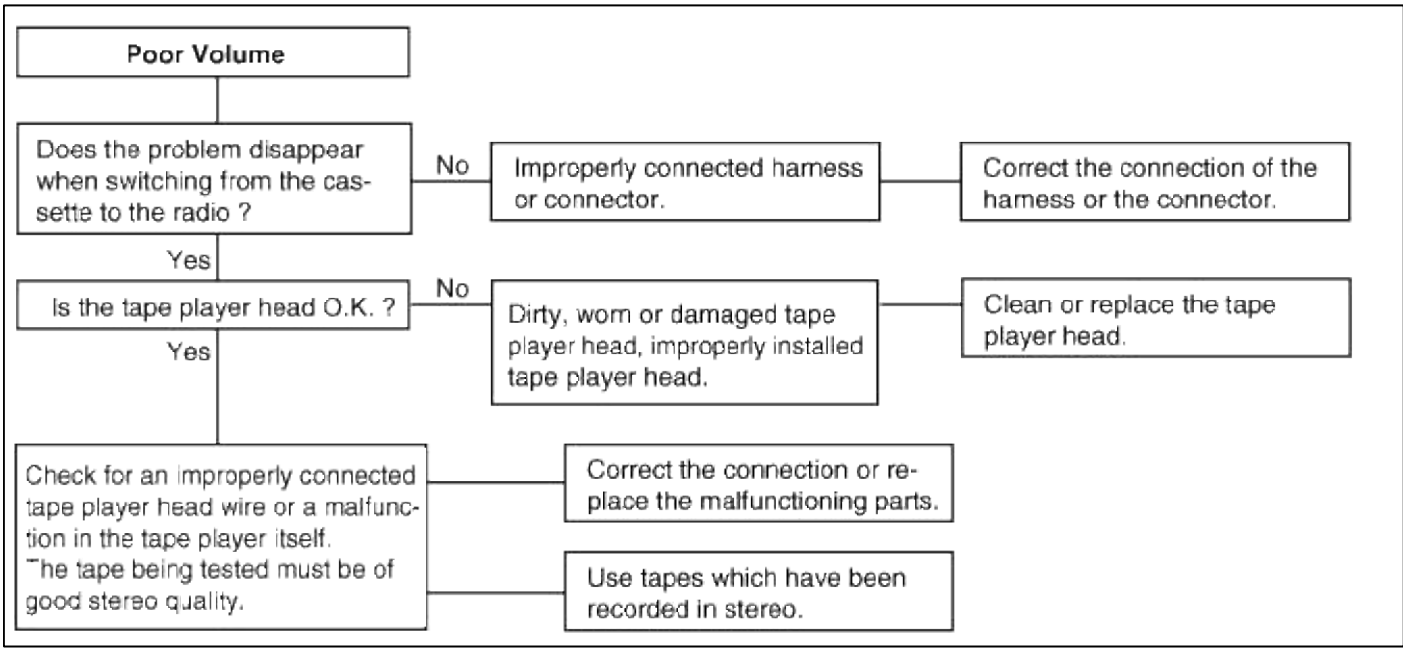


Chart 8

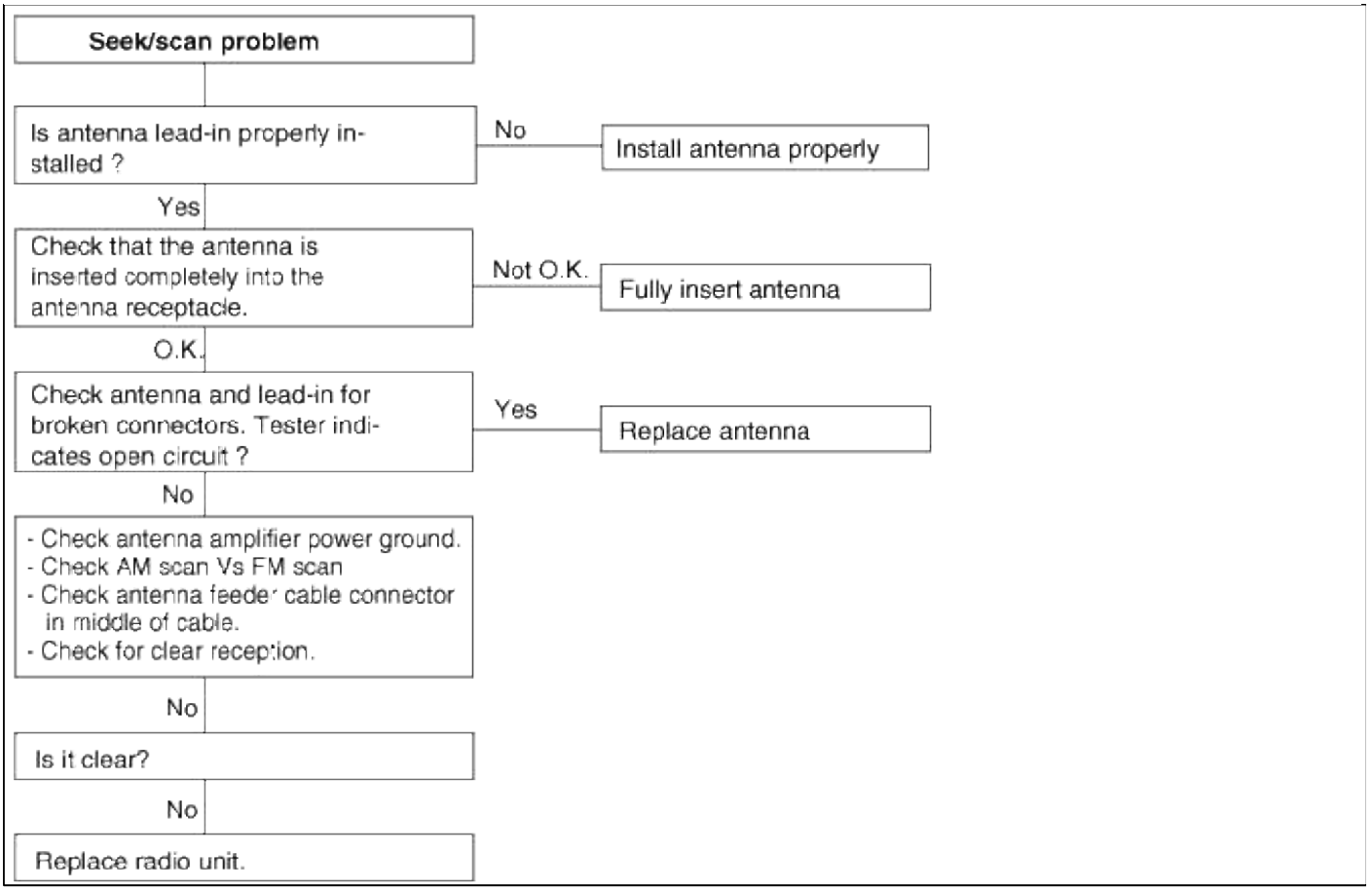
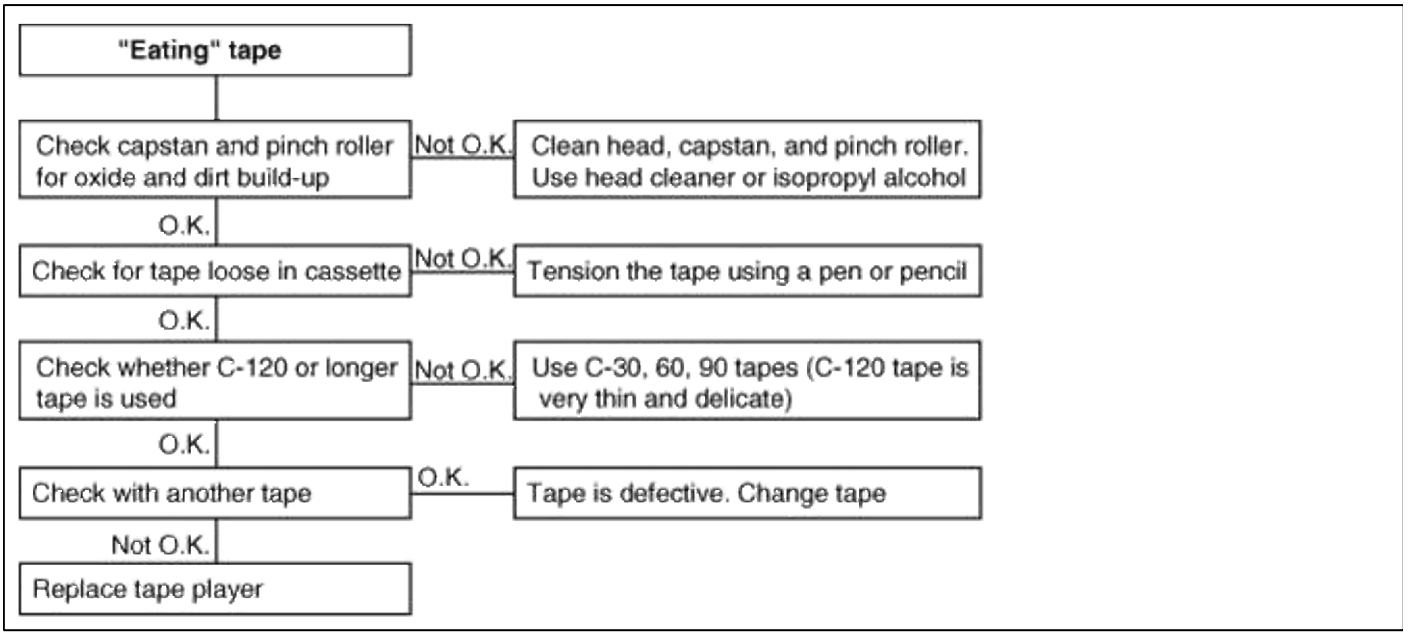


Chart 9



Body Electrical System > Audio > Specifications

SPECIFICATION

AUDIO

Item		Specification		
Model		AM/FM/CD (M445)	AM/FM/Cassette/MP3 (M445)	AM/FM/6CDC (M465)
Power supply		DC 14.4V		
Rated output		Max 43W x 4		Max 55W x 4
Speaker impedance		4Ω x 4		2Ω x 4
Antenna		80PF 75Ω		
Tuning type		PLL synthesized type		
Frequency range / Channel space	FM	87.5~108.0 MHz/ 200KHz		
	AM	530~1602 KHz/ 10KHz		

SPEAKER

Item	Specification				
Model	Front	Rear	Tweeter	Front (External amplifier)	Rear (External amplifier)
Input power	Max 40W	Max 40W	Max 40W	Max 40W	Max 40W
Impedance	4±0.6Ω	4±0.6Ω	4±0.6Ω	2±0.3Ω	2±0.3Ω

EXTERNAL AMPLIFIER

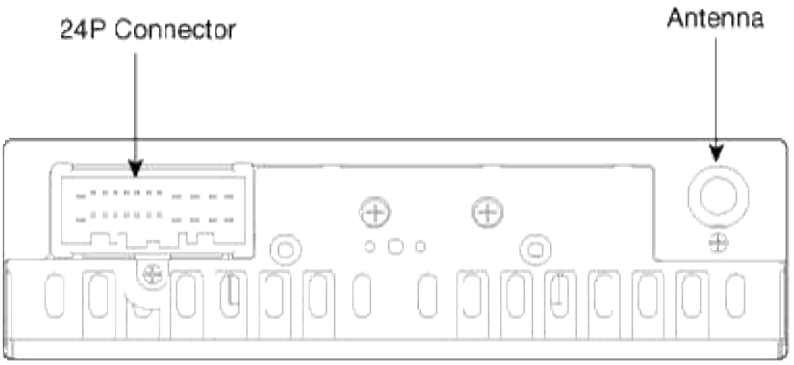
Item	Specification
Power supply	DC 14.4V
Output power	Max 220W (55W*4Channel)
Speaker impedance	2Ω x 4

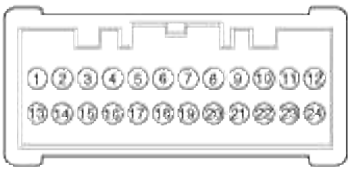
Body Electrical System > Audio > Audio Unit > Components and Components Location

COMPONENT

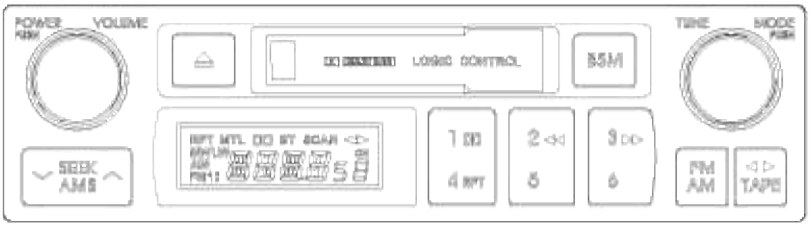
AM/FM/Cassette (M410)

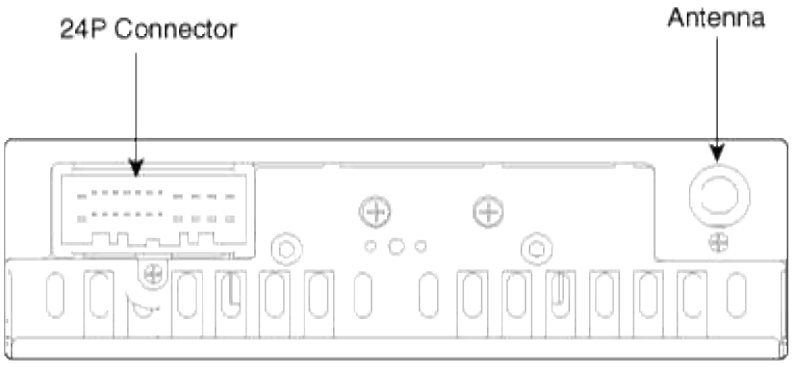


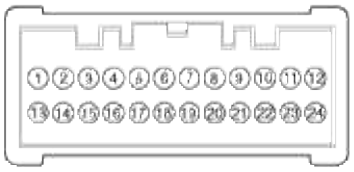


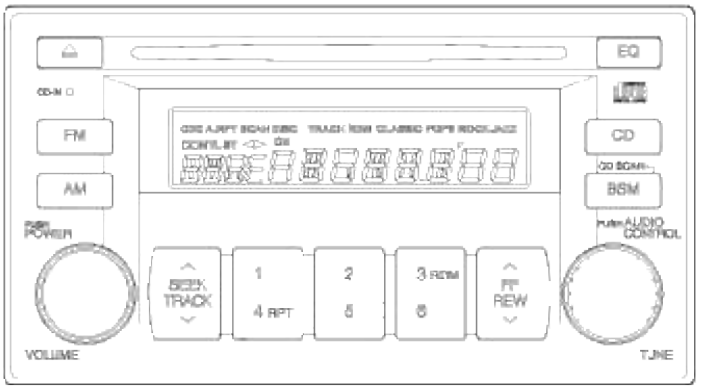
Audio connector	Terminal	Description	Terminal	Description
	1	Front left speaker (+)	13	Front left speaker (-)
	2	Front right speaker (+)	14	Front right speaker (-)
	3	Rear right speaker (+)	15	Rear right speaker (-)
	4	Rear left speaker (+)	16	Rear left speaker (-)
	5	Illumination (+)	17	Illumination (-)
	6	-	18	-
	7	-	19	TEL MUTE
	8	-	20	Ground
	9	-	21	-
	10	-	22	-
	11	ACC	23	Antenna B+
	12	Battery	24	Ground

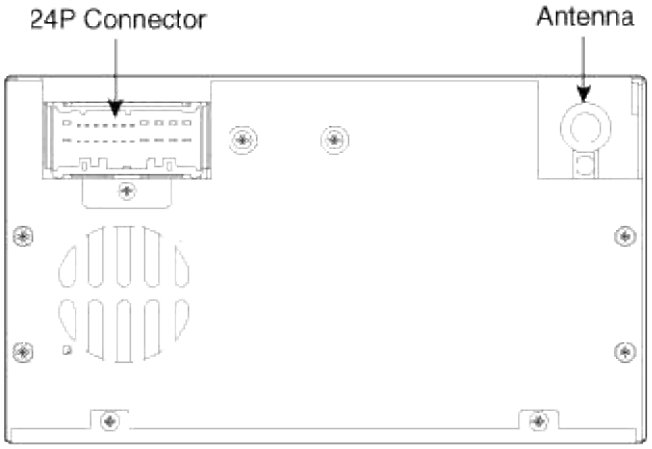
AM/FM/Cassette (M420)

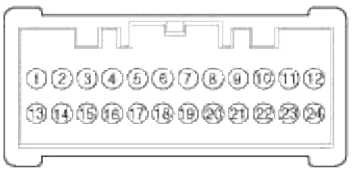


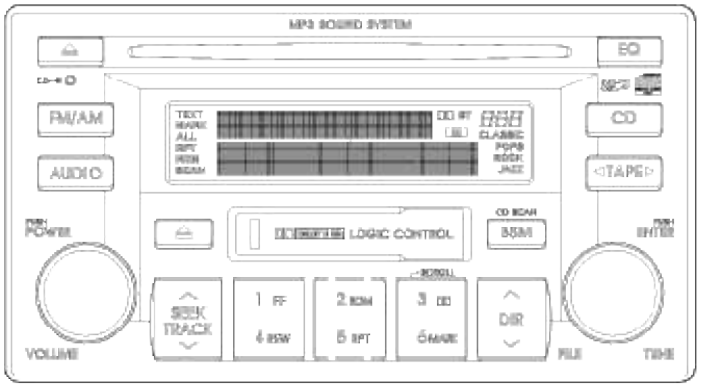


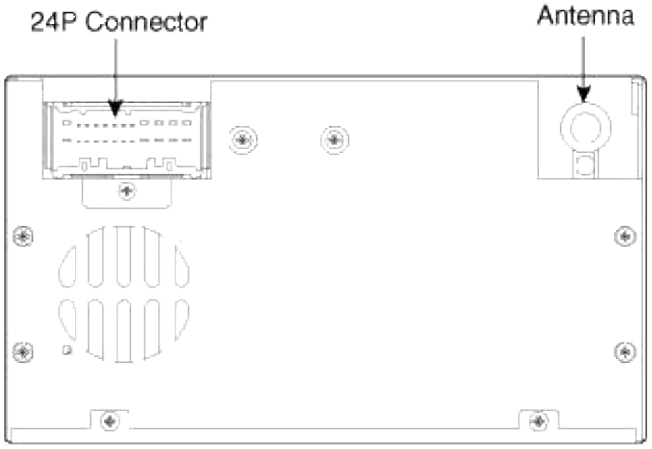
Audio connector	Terminal	Description	Terminal	Description
	1	Front left speaker (+)	13	Front left speaker (-)
	2	Front right speaker (+)	14	Front right speaker (-)
	3	Rear right speaker (+)	15	Rear right speaker (-)
	4	Rear left speaker (+)	16	Rear left speaker (-)
	5	Illumination (+)	17	Illumination (-)
	6	Steering remote control	18	Remocon - Ground
	7	-	19	¯EL MUTE
	8	-	20	Ground
	9	-	21	-
	10	-	22	-
	11	ACC	23	Antenna B+
	12	Battery	24	Ground

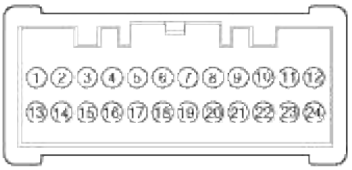




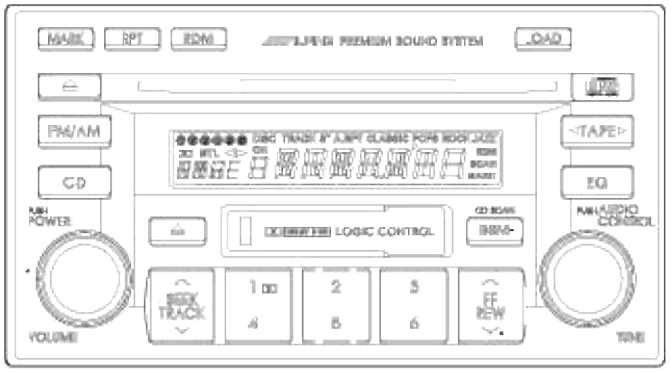
Audio connector	Terminal	Description	Terminal	Description
	1	Front left speaker (+)	13	Fron: left speaker (-)
	2	Front right speaker (+)	14	Fron: right speaker (-)
	3	Rear right speaker (+)	15	Rear right speaker (-)
	4	Rear left speaker (+)	16	Rear left speaker (-)
	5	Illumination (+)	17	Illumination (-)
	6	Steering remote control	18	Remocon - Ground
	7	-	19	TEL MUTE
	8	-	20	Ground
	9	-	21	-
	10	-	22	-
	11	ACC	23	Antenna B+
	12	Battery	24	Ground

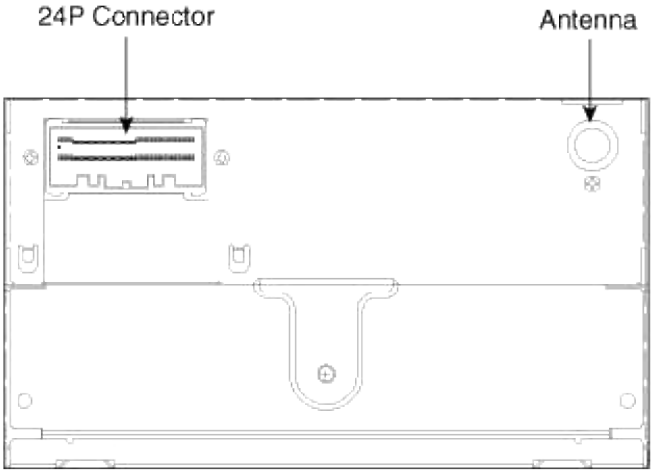


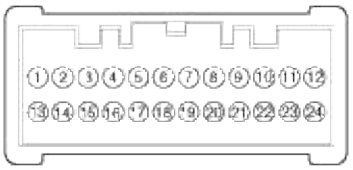


Audio connector	Terminal	Description	Terminal	Description
	1	Front left speaker (+)	13	Front left speaker (-)
	2	Front right speaker (+)	14	Front right speaker (-)
	3	Rear right speaker (+)	15	Rear right speaker (-)
	4	Rear left speaker (+)	16	Rear left speaker (-)
	5	Illumination (+)	17	Illumination (-)
	6	Steering remote control	18	Remocon - Ground
	7	-	19	TEL MUTE
	8	-	20	Ground
	9	-	21	-
	10	-	22	-
	11	ACC	23	Antenna B+
	12	Battery	24	Ground

AM/FM/6CDC (M465)





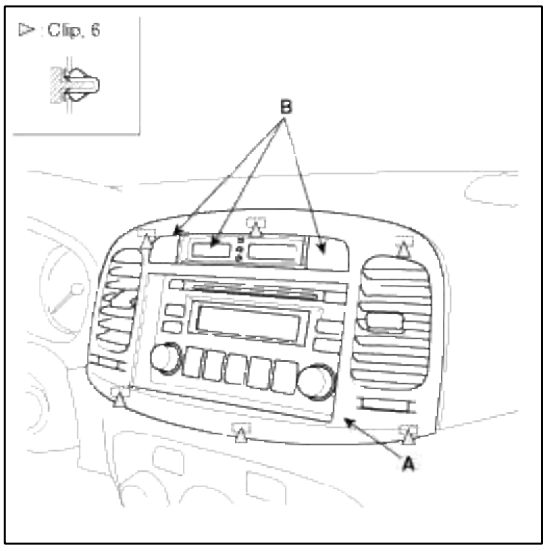
Audio connector	Terminal	Description	Terminal	Description
	1	Front left speaker (+)	13	Front left speaker (-)
	2	Front right speaker (+)	14	Front right speaker (-)
	3	Rear right speaker (+)	15	Rear right speaker (-)
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	5	Illumination (+)	17	Illumination (-)
	6	Steering remote control	18	Remocon - Ground
	7	-	19	TEL MUTE
	8	-	20	Ground
	9	-	21	-
	10	-	22	-
	11	ACC	23	Antenna B+
	12	Battery	24	Ground

Body Electrical System > Audio > Audio Unit > Repair procedures

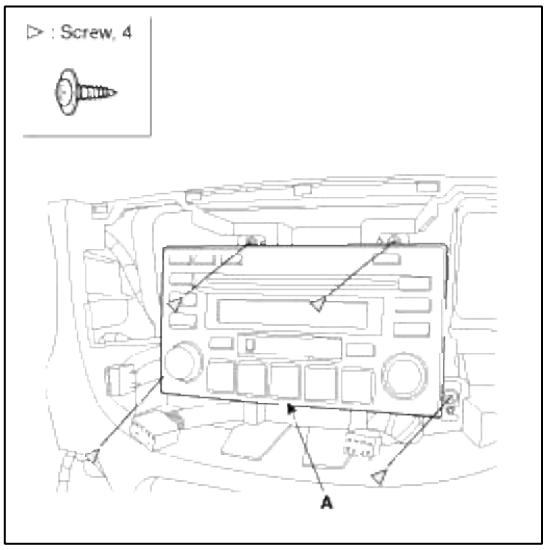
REPLACEMENT

1. Disconnect the negative (-) battery terminal.

2. Remove the center facia upper panel (A).



3. Remove the connectors of digital clock and hazard switch (B).
4. Remove the mounting screws then remove the audio unit (A).

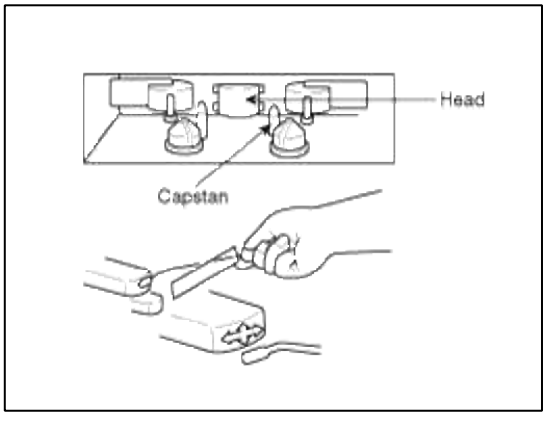


5. Installation is the reverse of removal.

INSPECTION

TAPE HEAD AND CAPSTAN CLEANING

1. To obtain optimum performance, clean the head, and capstan as often as necessary, depending on frequency of use and tape cleanness.
2. To clean the tape head and capstan, use a cotton swab dipped in ordinary rubbing an alcohol. Wipe the head and capstan.

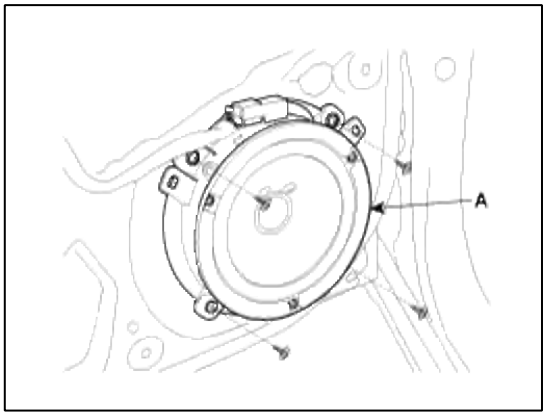


Body Electrical System > Audio > Speakers > Repair procedures

REPLACEMENT

FRONT SPEAKER

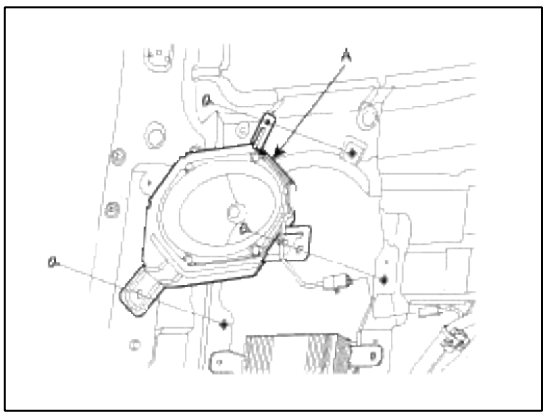
1. Remove the front door trim panel (Refer to the Body group - front door).
2. Remove the front speaker (A) after removing 4 screws.



3. Installation is the reverse of removal.

REAR SPEAKER (3 Doors)

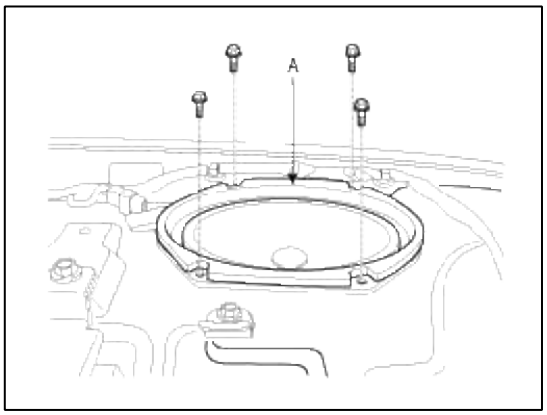
1. Remove the rear door trim panel (Refer to the Body group - rear door).
2. Remove the rear speaker (A) after removing 3 screws.



3. Installation is the reverse of removal.

REAR SPEAKER (4 Doors)

1. Remove the rear seat (Refer to the Body group - rear seat).
2. Remove the rear package tray (Refer to the Body group - rear seat).
3. Remove the rear speaker (A) after removing 4 bolts.

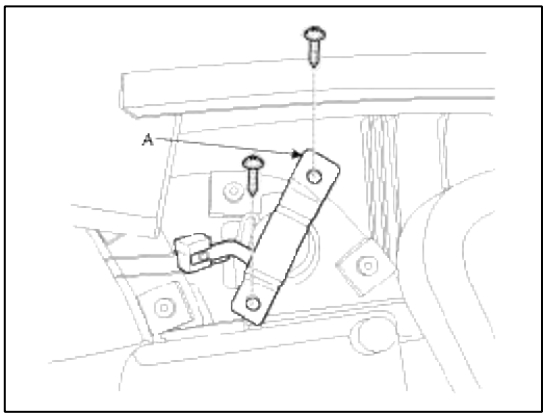


4. Installation is the reverse of removal.

TWEETER SPEAKER

1. Remove the front door trim panel (Refer to the Body group - front door).

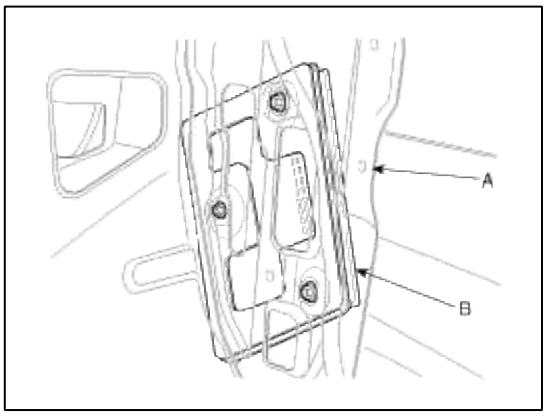
2. Remove the tweeter speaker after disconnecting the connector(A).



3. Installation is the reverse of removal.

EXTERNAL AMPLIFIER (4 Doors)

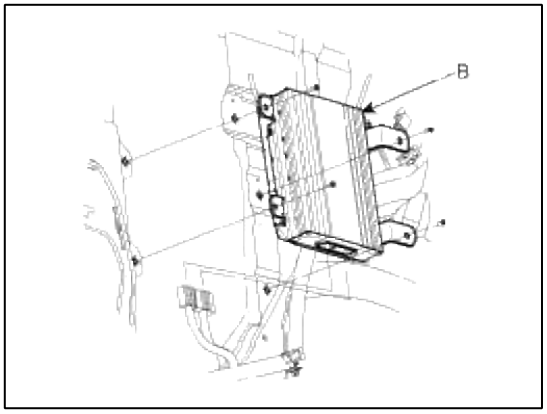
1. Remove the right luggage side trim.
2. Remove the external amplifier (B) from the quarter inner panel (A) after removing 3 nuts.



3. Installation is the reverse of removal.

EXTERNAL AMPLIFIER (3 Doors)

1. Remove the right luggage side trim.
2. Remove the external amplifier (B) from the quarter inner panel (A) after removing 4 bolts.



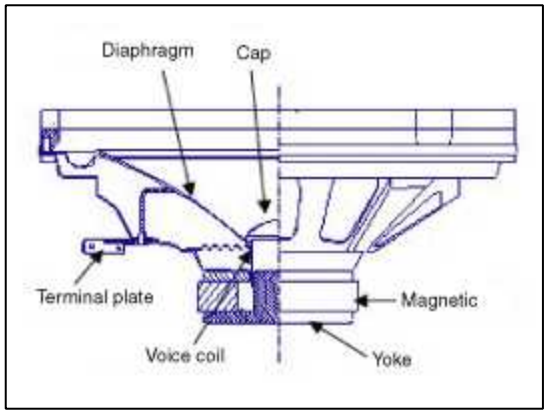
3. Installation is the reverse of removal.

INSPECTION

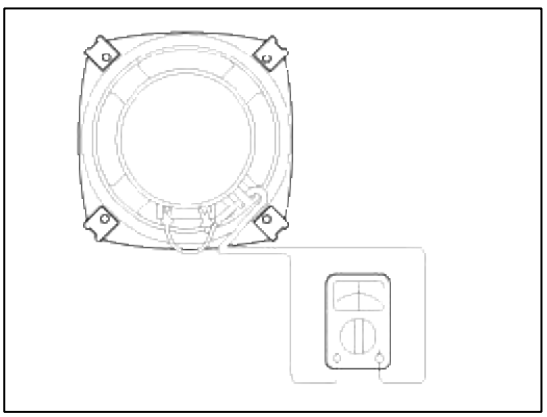
1. Troubleshooting for Speaker

(1) Basic inspection of speaker

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



(2) Case Troubleshooting

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

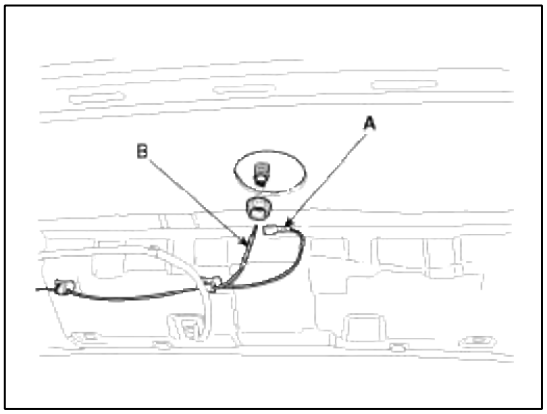
CAUTION

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

Body Electrical System > Audio > Antenna > Repair procedures

REPLACEMENT

1. Remove the rear roof trim (Refer to Body group-roof trim).
2. Disconnect the 1P connector (A) and antenna jack (B) from the roof antenna.
3. Remove the roof antenna after removing a nut.

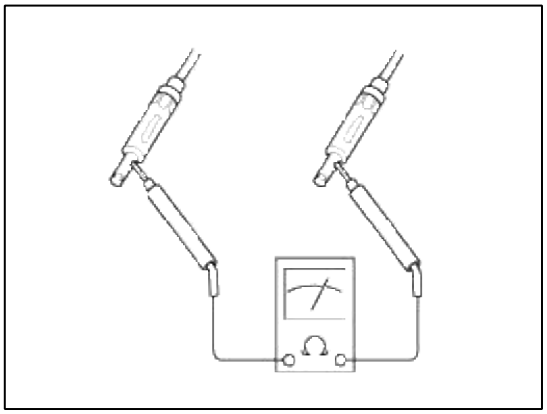


4. Installation is the reverse of removal.

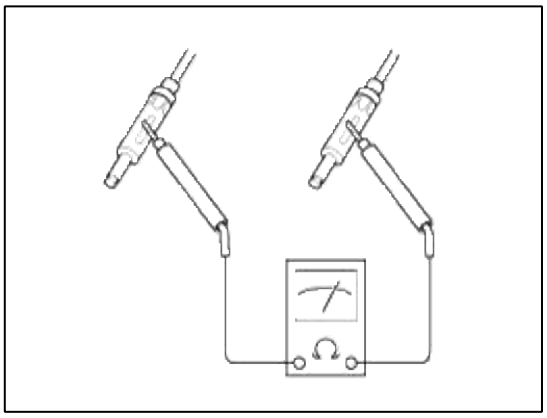
INSPECTION

ANTENNA CABLE

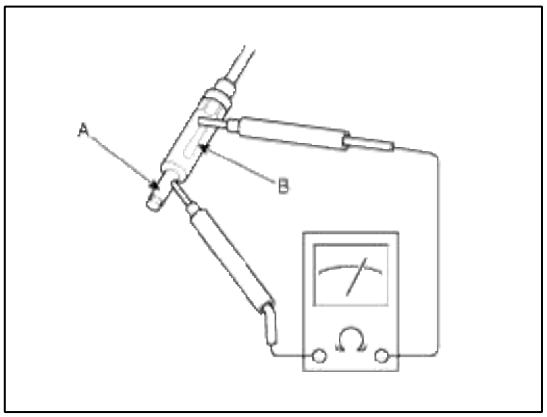
1. Remove the antenna jack from the audio unit and antenna.
2. Check for continuity between the center poles of antenna cable.



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

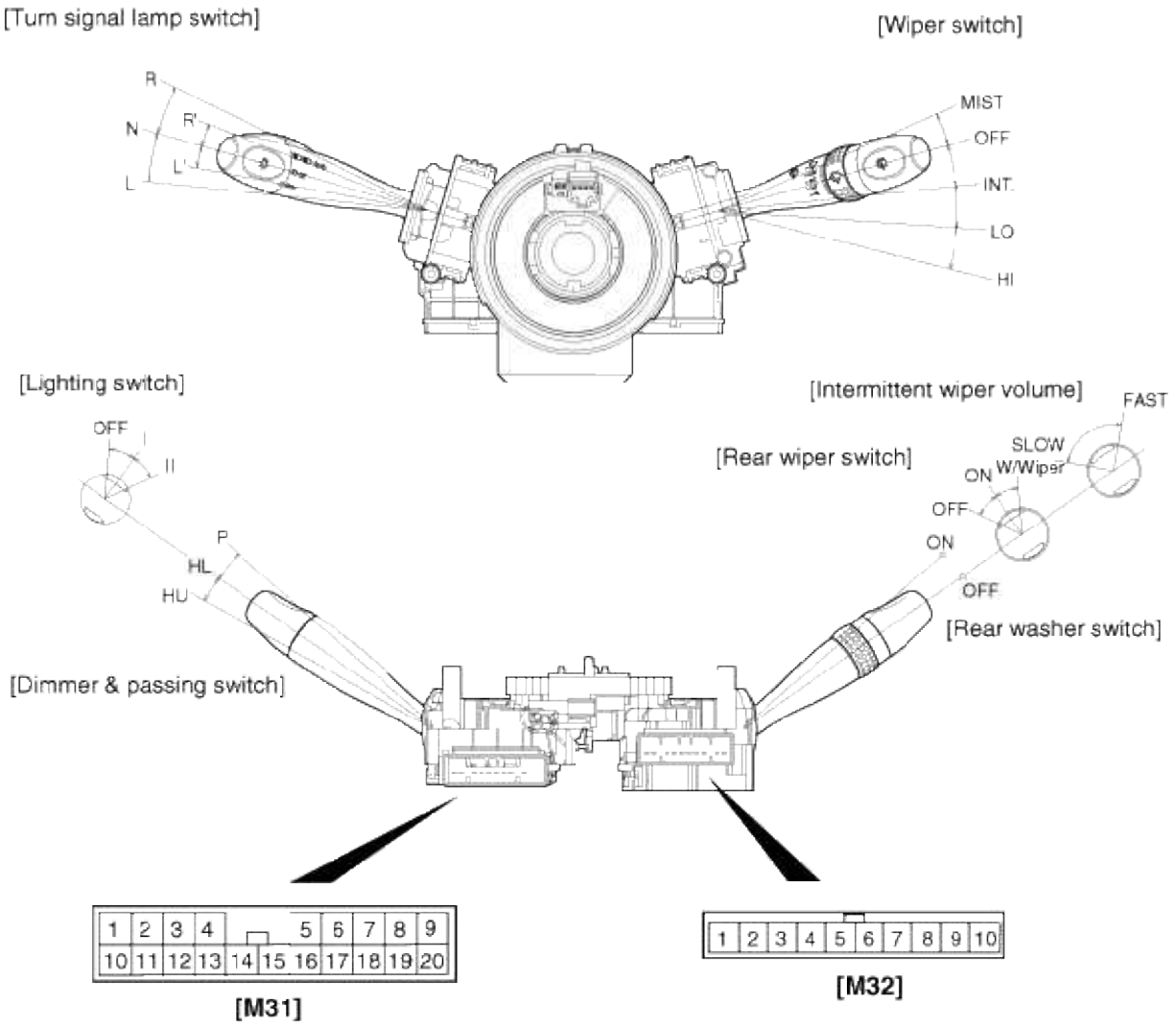


4. If there is no continuity, replace the antenna cable.
5. Check for continuity between the center pole (A) and outer pole (B) of antenna cable. There should be no continuity.
6. If there is continuity, replace the antenna cable.



Body Electrical System > Multifunction switch > Components and Components Location

COMPONENT



[M31]

[M32]

Circuit connection

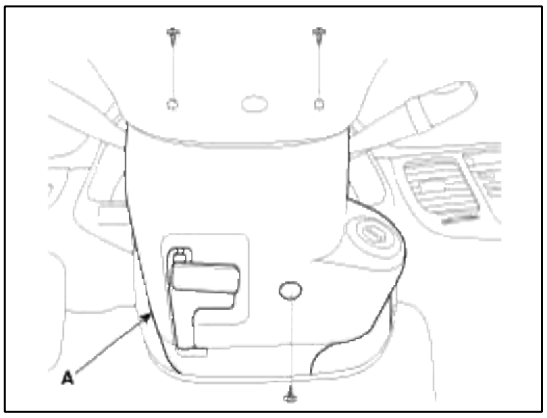
Connector No.	Terminal No.	Description	Connector No.	Terminal No.	Description
M31	10	Head lamp switch power	M32	1	Wiper ground
	11	Rear fog switch		2	Wiper high speed
	12	Head lamp switch ground		3	Wiper & washer power
	13	Tail lamp switch		4	Wiper low speed
	14	Head lamp high beam power		5	Wiper parking
	15	Head lamp low beam power		6	Rear wiper & washer power
	16	Turn signal lamp (RH)		7	Front washer switch
	17	Flasher unit power		8	Rear wiper parking
	18	Turn signal lamp (LH)		9	Rear washer
				10	Rear wiper

Body Electrical System > Multifunction switch > Repair procedures

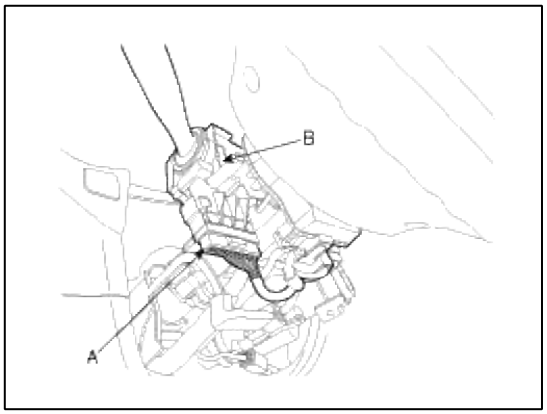
REPLACEMENT

1. Disconnect the negative (-) battery terminal.

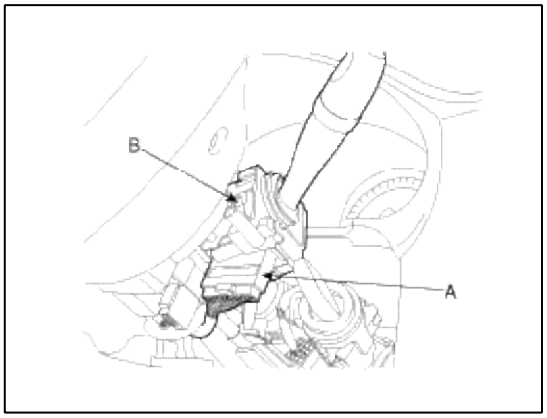
2. Remove the steering column upper and lower shrouds (A) after removing 3 screws.



3. Remove the light switch by pushing the lock pin (B) after disconnecting the connector (A).



4. Remove the wiper switch by pushing the lock pin (B) after disconnecting the connector (A).

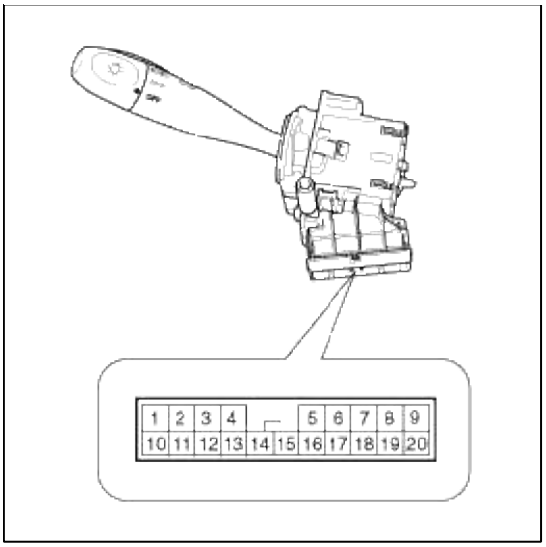


5. Installation is the reverse of removal.

INSPECTION

LIGHTING SWITCH INSPECTION

With the multi function switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multi-function switch.



Terminal / Position	10	13	11	12
OFF				
I	○—○			
II	○—○		○—○	

Terminal / Position	12	14	15
HU	○—○		
HL	○—		—○
P	○—○		

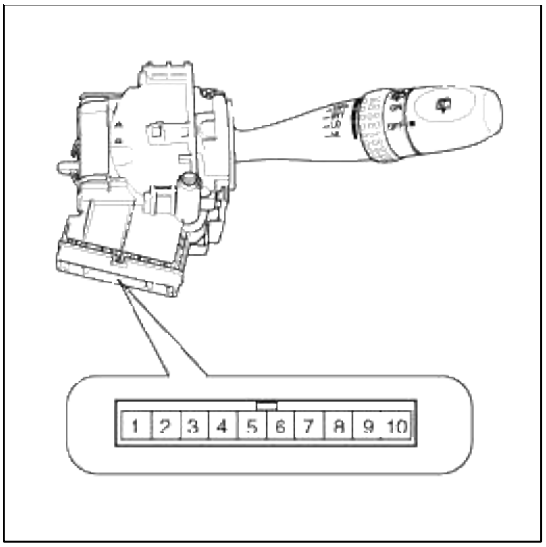
HU : Head lamp high beam
HL : Head lamp low beam
P : Head lamp passing switch

TURN SIGNAL SWITCH

Terminal / Hazard switch	Turn signal switch	16	17	18
OFF	L		○—○	
	N			
	R	○—○		

WIPER AND WASHER SWITCH INSPECTION

With the multi function switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multi-function switch.



Terminal / Position	2	3	4	5
MIST		○	○	
OFF			○	○
INT			○	○
LOW		○	○	
HI	○	○		

Terminal / Position	3	7
OFF		
ON	○	○

REAR WIPER & WASHER SWITCH (3 Doors)

Terminal / Position	6	8	9	10
OFF		○		○
ON	○			○
Rear washer	○		○	○

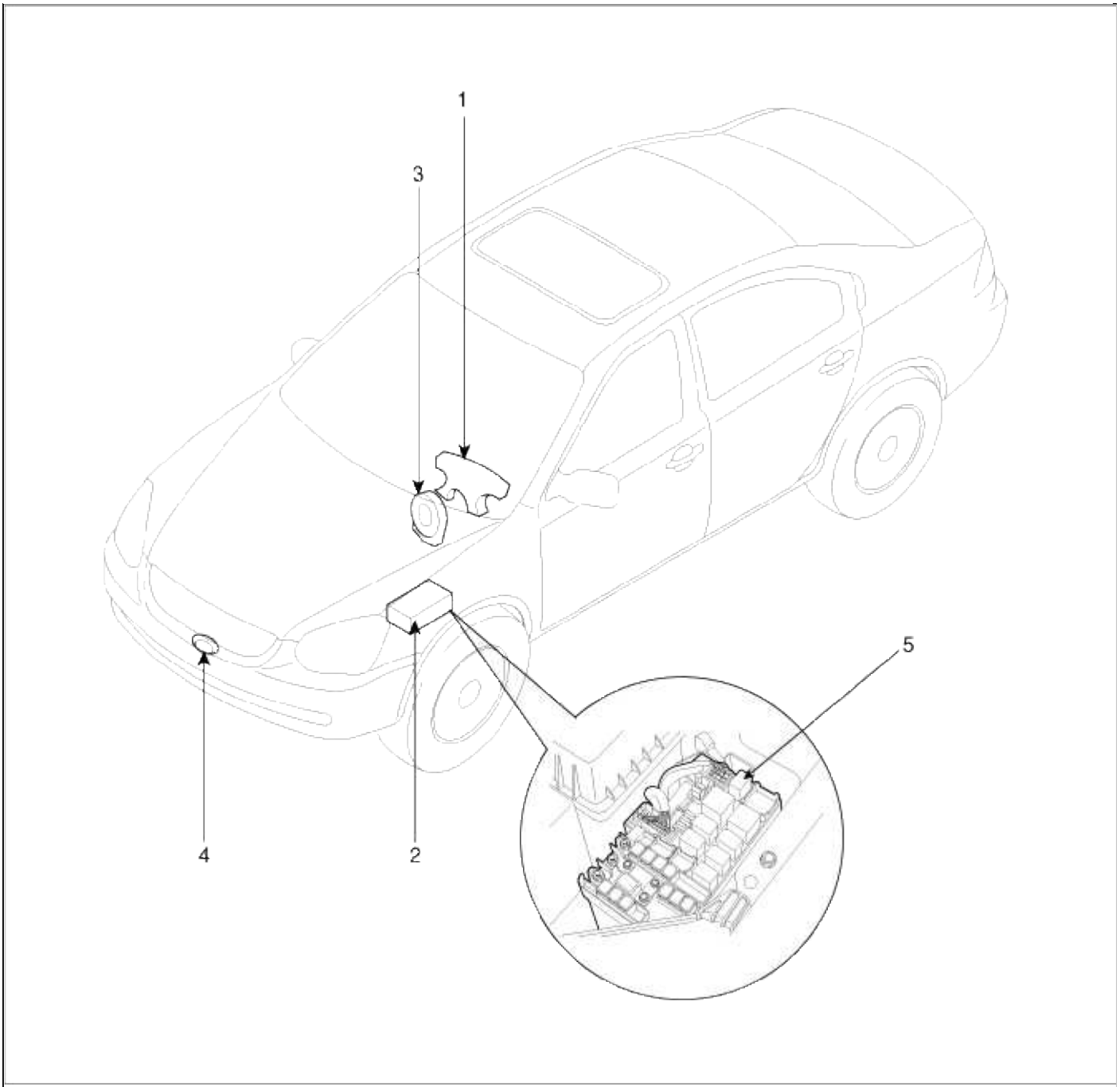
Body Electrical System > Multifunction switch > Specifications

SPECIFICATION

Items	Specifications
Rated voltage	DC 12 V
Operating temperature range	-30°C ~ +80°C (-22 ~ +176°F)
Rated load	
Dimmer & passing switch	High : 120W (Lamp load) Low : 110W (Lamp load) Passing : 120W (Lamp load)
Lighting switch	Lighting : 21W (Lamp load)
Turn signal & lane change switch	69W (Lamp load)
Wiper & mist switch	Low, High : 5.0A (Motor load) Intermittent : 0.07±0.05A (Relay load) Lock : Max. 25A (Motor load) Mist: 5A (Motor load)
Washer switch	5A (Motor load)
Rear wiper & washer switch (3 doors)	Rear wiper : 3.5A (Motor load) Rear washer : 5A (Motor load)

Body Electrical System > Horn > Components and Components Location

COMPONENT LOCATION



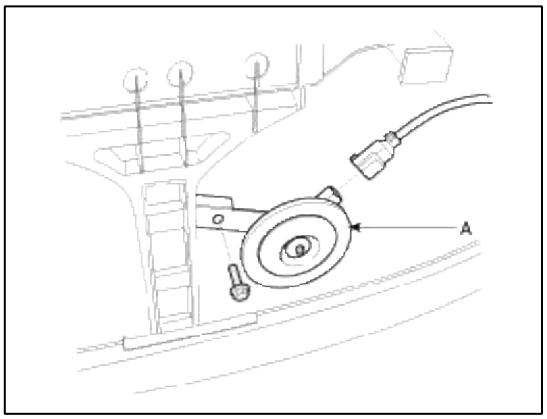
1. Horn switch
2. Relay box (Engine room compartment)
3. Clock spring
4. Horn (High pitch)
5. Horn relay

Body Electrical System > Horn > Repair procedures

REPLACEMENT

1. Remove the radiator grill.

2. Remove the bolt and disconnect the horn connector, then remove the high pitch horn (A).



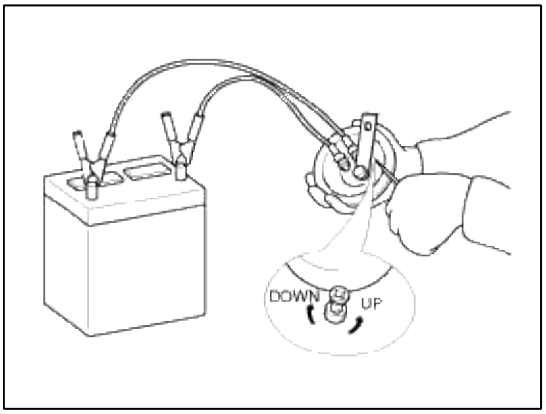
3. Installation is the reverse of removal.

ADJUSTMENT

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

NOTE

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



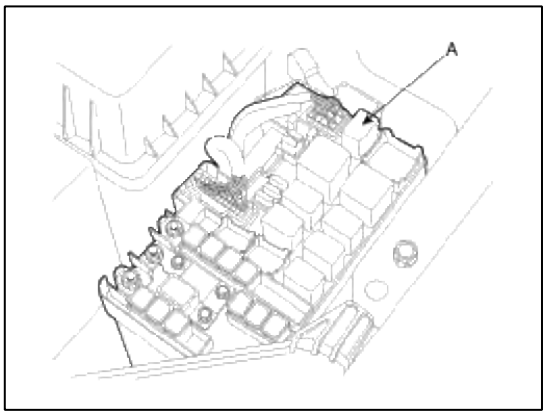
INSPECTION

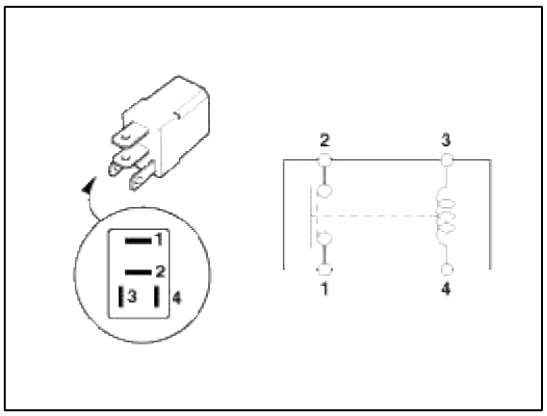
Test the horn by connecting battery voltage to the 1 terminal and ground the 2 terminal.
The horn should make a sound. If the horn fails to make a sound, replace it.

HORN RELAY INSPECTION

1. Remove the horn relay (A) from the engine room relay box.
2. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.4 terminals.

3. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.





Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○	○
Connected	○	○	⊖	⊕

Body Electrical System > Keyless Entry And Burglar Alarm > Description and Operation

DESCRIPTION

BURGLAR ALARM SYSTEM

The burglar alarm system is armed automatically after the doors, hood, and trunk lid (tailgate) are closed and locked by transmitter or the key.

The system is set off when any of these things occur :

- A door is forced open.
- A door is unlocked without using the transmitter.
- ARM is released when a dooris unlocked by key.
- The trunk lid (tailgate) is opened without using the key.
- The hood is opened.
- The engine starter circuit and battery circuit are bypassed by breaking the ignition switch.

When the system is set off, the alarm (horn) sounds and the hazard lamp flash for about two minutes or until the system is disarmed by unlocking the transmitter or the 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 trunk lid (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 trunk lid (tailgate) switch are all close and lock the doors with the remote transmitter or the key and then the system arms immediately.

If anything is opened or improperly unlocked after the system is armed, the body control module gets a ground signal from that switch, and the system is set off.

If one of the switches is misadjusted or there is a short in the system, the system will not arm. As long as the body

control module continues to get a ground signal, it thinks the vehicle is not closed and locked and will not arm.The receiver is integrated in the body control module.

KEYLESS ENTRY SYSTEM

The burglar alarm system is integrated with the keyless entry system. The keyless entry system allows you to lock and unlock the vehicle with the remote transmitter. When you push the LOCK button, all doors lock. When you push the UNLOCK button, all doors unlock.

The room lamp, if its switch is in the center position, will come on when you press the UNLOCK button on the transmitter. 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. If you open a door, the lamp will go on and go off in about 30 seconds.

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.

FUNCTIONS

1. ARM Function

(1) When doors will be lock by LOCK on the RKE (Remote Keyless Entry), the hazard lamp will blink once within 1 second and the Anti-Theft System will ARM, if the following conditions have been met.

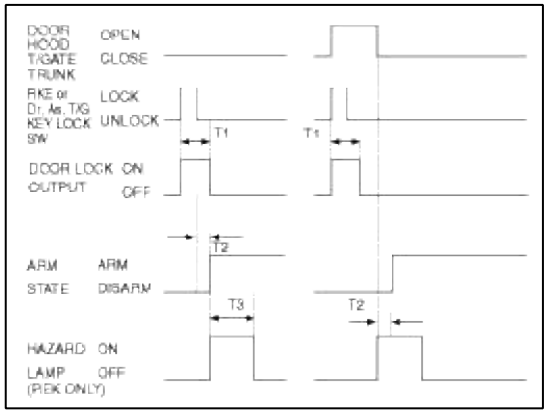
A. The ignition key is removed from the ignition switch.

B. All entry points are closed (doors, trunk, tail gate and hood)

(2) If either the door or trunk or hood is open when activating LOCK using the RKE or using driver, assistant, tail gate key LOCK switch, the doors will lock, however the hazard lamp will not flash and the Anti-Theft System will not arm.

(3) In Step 2) if the opened entry points are subsequently closed. the door will lock, the hazard lamp will blink once(RKE only) and the Anti-Theft System will ARM.

(4) The ARM mode of the Anti-Theft System can only be set using the LOCK feature of the RKE or using driver, assistant, tail gate key LOCK switch.



T1 : 0.5 ± 0.1 sec,

T2 : within 2.0 sec,

T3 : 1.0 ± 0.2 sec.

2. DISARM Function

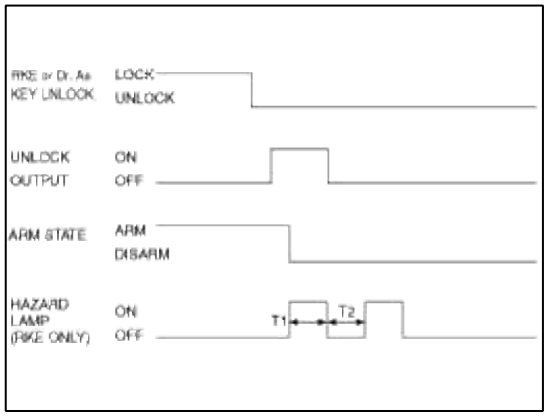
(1) When the UNLOCK button is pressed on the transmitter, the hazard lamps will blink 2 times (indicating a DISARM event) and the door will unlock.
(Whether entry points are open or Closed is irrelevant)

(2) Once the ignition key is IN (inserted into the ignition switch) and the ignition is turned to the ON position the Anti-Theft system will immediately DISARM.

(3) If the UNLOCK signal is sent by the RKE or using driver, assistant, tail gate key UNLOCK switch, and either the ignition key is not inserted or entry (door, trunk, tail gate, hood) to the vehicle is not made within 30 seconds, the LOCK mode will be automatically reset, the hazard lamps will blink(RKE only), and the Anti-Theft System will rearm. (Key IN = Key Insertion)
(Provided that there is no automatic lock function at a period of 30 seconds, when the UNLOCK is done by the RKE with an entry being open).

(4) In steps 3), when UNLOCK is activated within the initial 30 seconds, another period of 30 seconds occurs.

(5) The DISARM mode of the Anti-Theft System can only be set using the UNLOCK feature of the RKE or using driver, assistant, tail gate key UNLOCK switch. The door key will disarm the Anti-theft System.



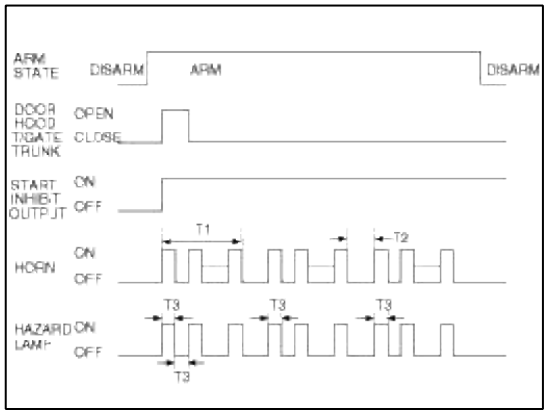
T1, T2 : 0.5 ± 0.1 sec.

3. ALARM Function

(1) When a point of entry is opened while the Anti-Theft System is in the ARM mode, the hazard lamp and horn alarm will activate (ON/OFF 3 times each) for a period of 27 seconds.

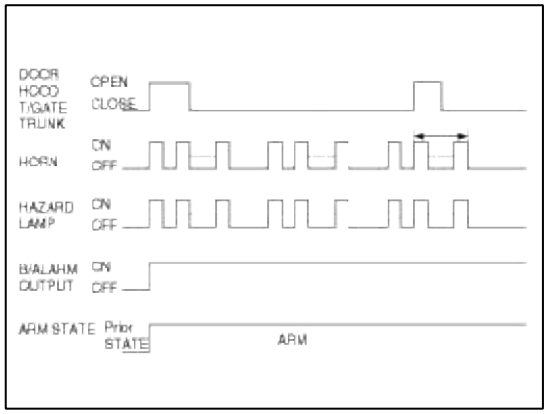
(2) Output intervals for the horn alarm and hazard lamps are identical.

(3) The alarm sequence, when activated will continue for the duration of the alarm period even when the entry point is closed. (The alarm will reactivate if entry port is reopened after the initial alarm sequence completes.)

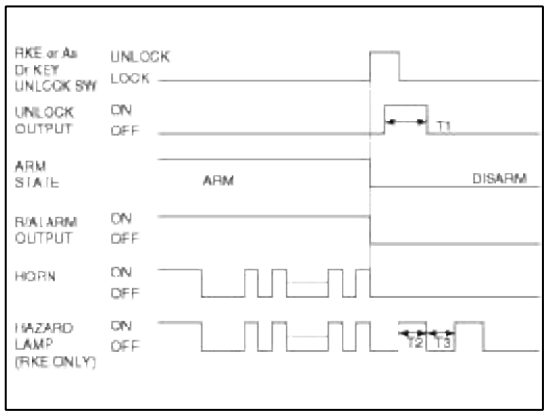


T1: 27 ± 2 sec,
T2: 10 ± 1 sec,
T3: 0.4 ~ 0.5 sec.

4. New alarm event trigger during existing alarm sequence
   (1) When a new alarm event trigger is received during an existing alarm sequence, the existing alarm sequence will remain active. Horn and hazard lamp output will only continue for the duration of the existing alarm sequence (event timer will not re-set).

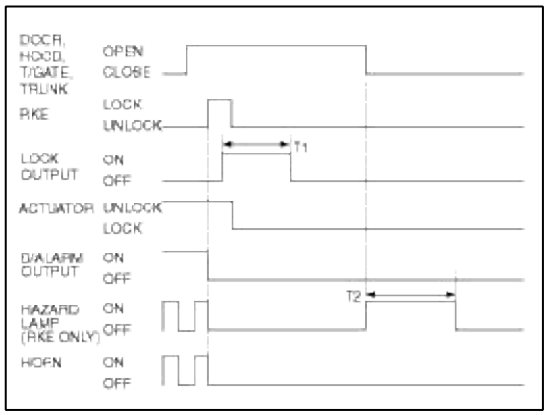


5. Transmitter or Dr/As door, tail gate key lock switch controlled unlock during the alarm sequence
   (1) ARM state is released (DISARM state) and the horn, the hazard output and the B/Alarm output shall be OFF, and the unlock output shall be ON by Tx or As Door KEY unlock SW, not Dr Door key or tail gate key, and hazard lamp output shall be ON twice with cycle of T2(RKE only).



T1, T2, T3 : 0.5 ± 0.1 sec.

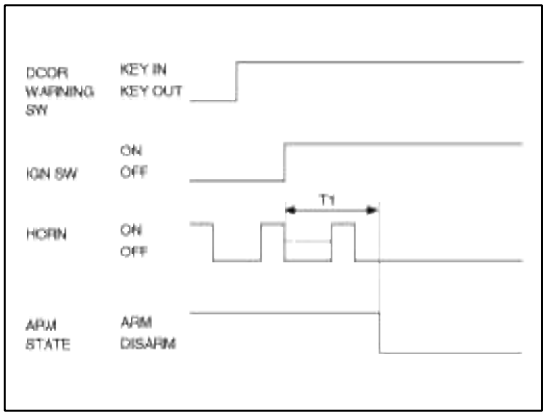
6. Transmitter or Dr/As door, tail gate key unlock switch controlled lock during the alarm sequence
   (1) During alarm sequence, if the opened door is open and the Lock signal is received from RKE or Dr/As door, tail gate key lock switch : The horn alarm output, the hazard lamp output and the B/Alarm output shall be OFF and, the Lock output shall be ON for T1 and then, if the opened door is closed actuator lock shall be checked, the hazard lamp output shall be ON once(RKE only) and, it shall be in the ARM state.



T1 : 0.5 ± 0.1 sec,
T2 : 1.0 ± 0.2 sec.

7. Alarm clearance

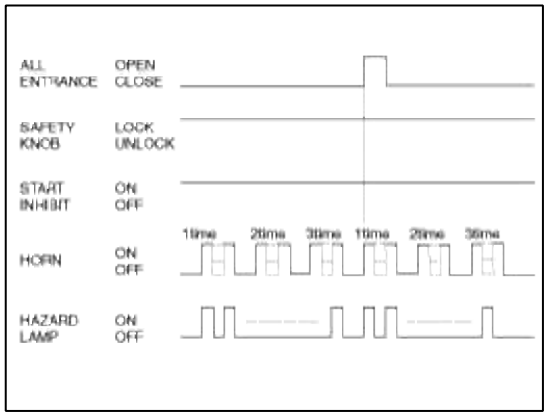
If the ignition key is turned to ON for 30 seconds during alarm activation the alarm will be cleared and the start inhibitor reset.



T1 : 30 ± 3 sec.

8. REALARM Function

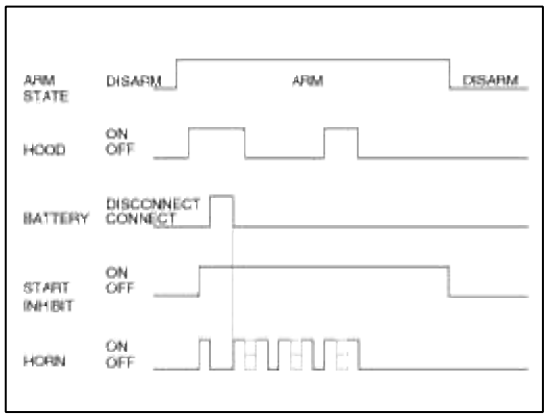
(1) Output again horn alarm 3 times when outlet OPEN again, again B/ALARM horn hold "ON", without safety knob lock at outlet close condition after completing 3 times alarm(120sec.)



9. Battery Separation

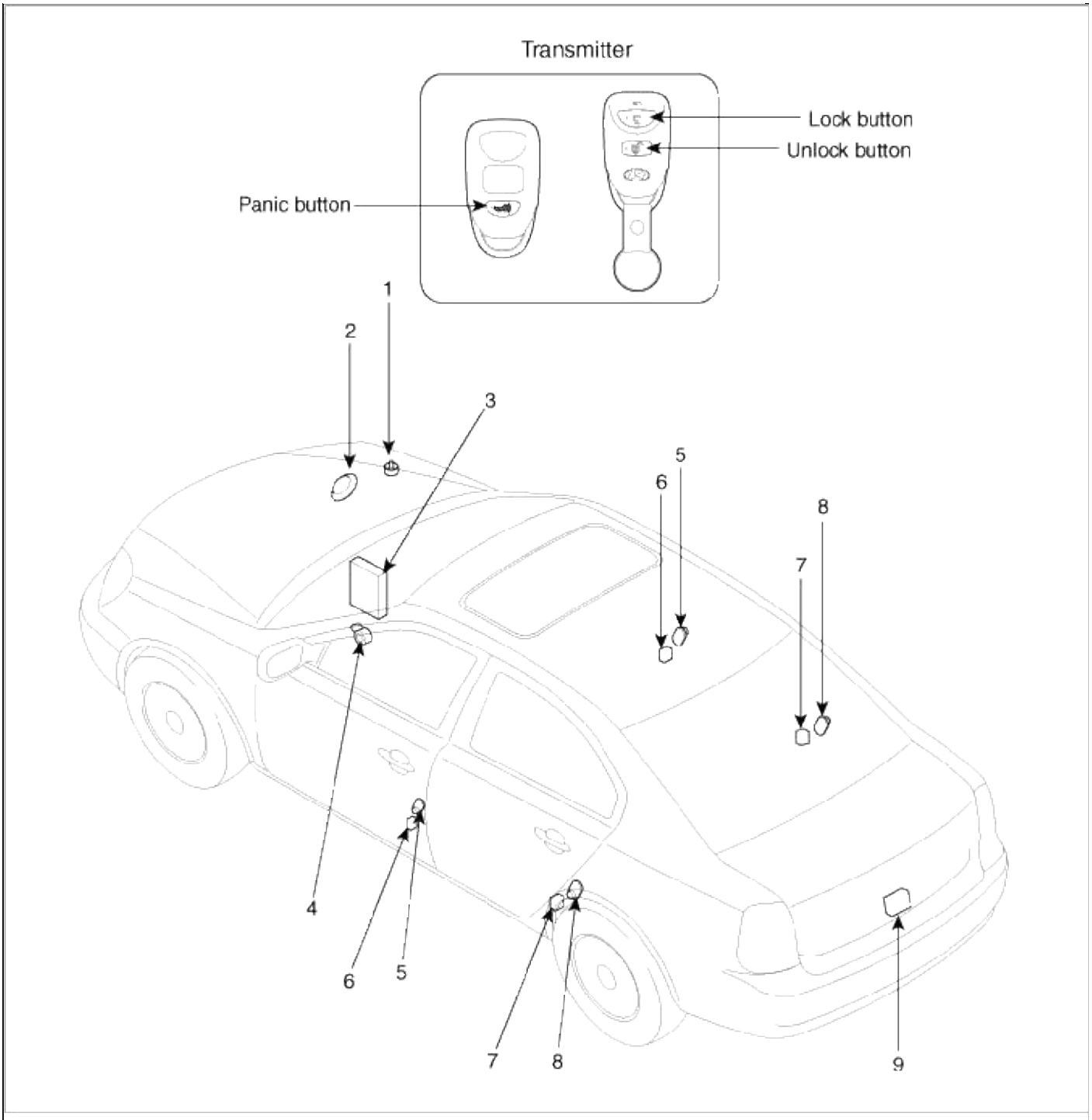
(1) The alarm and starter inbibit functions will remain active if the battery is disconnected, then re-connected during an alarm event sequence.

(2) The system will remain in an ARM state if the battery is disconnected and re-connected when the system is armed.



Body Electrical System > Keyless Entry And Burglar Alarm > Components and Components Location

COMPONENT LOCATION

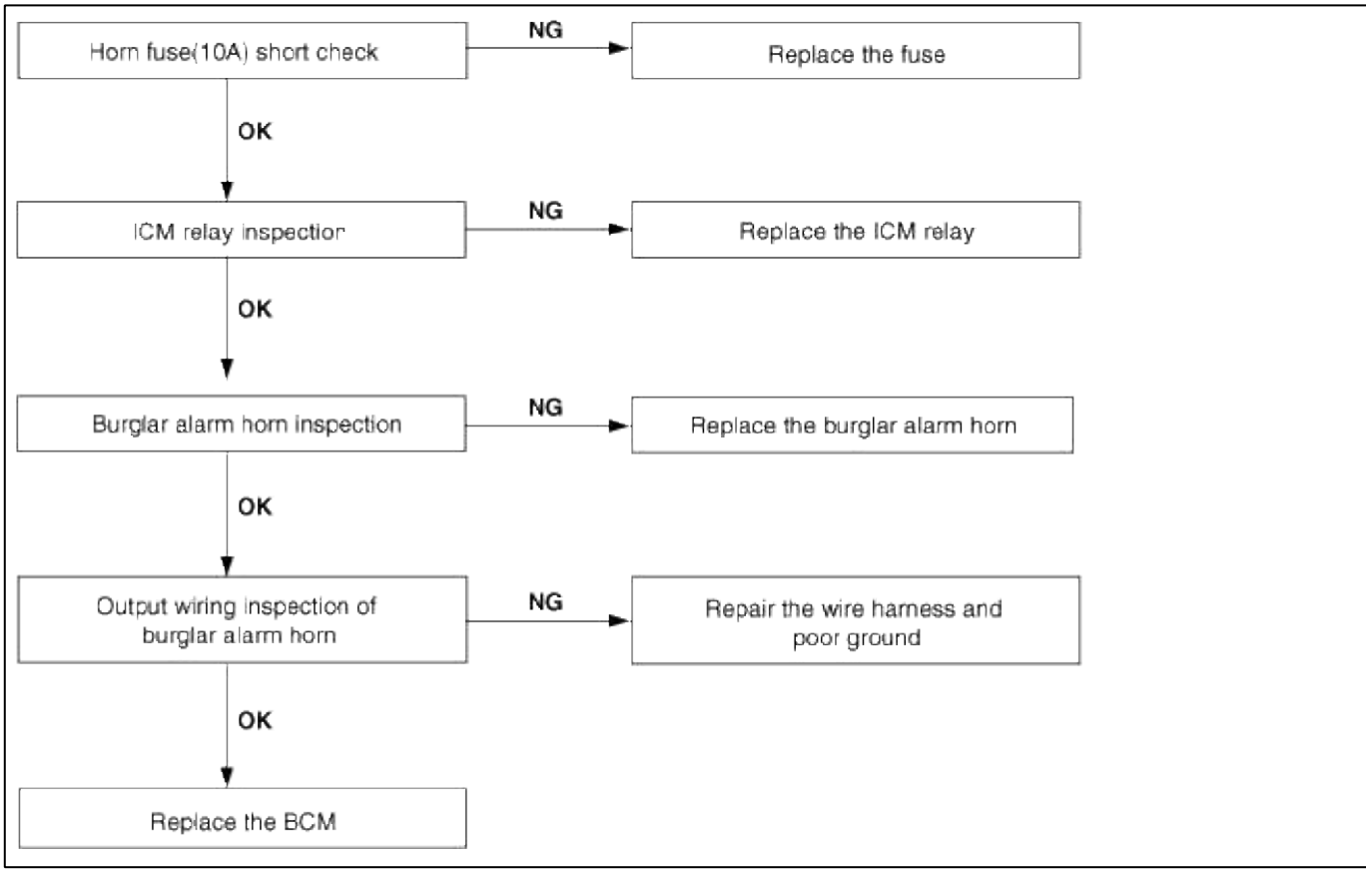


1. Hood switch
2. Burglar horn
3. Body control module
4. Door warning switch
5. Front door switch
6. Front door lock actuator & switch
7. Rear door lock actuator & switch
8. Rear door switch
9. Tailgate lock actuator (3 DOORS)

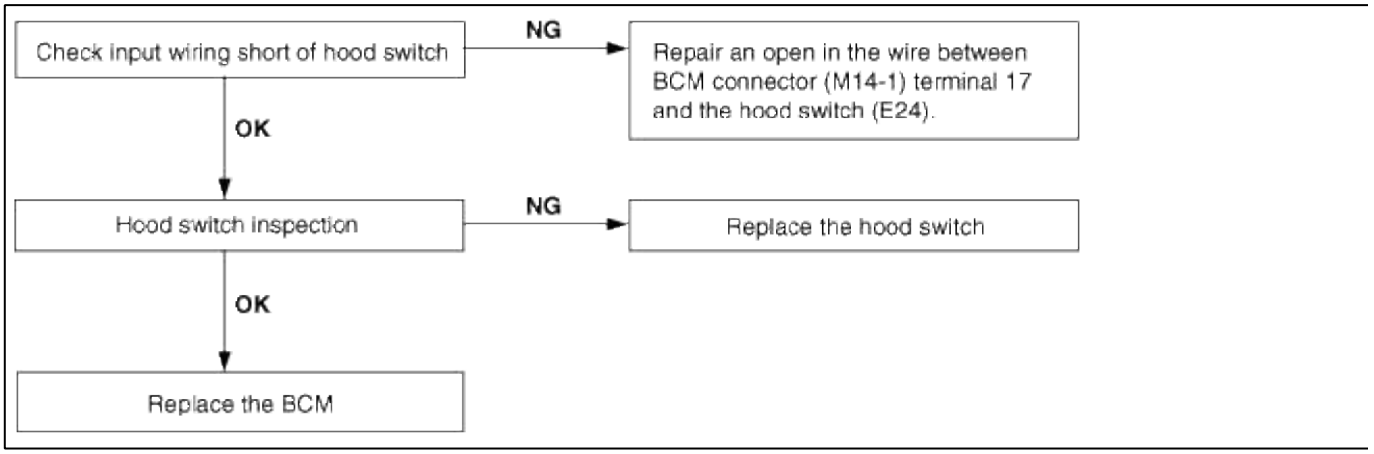
Body Electrical System > Keyless Entry And Burglar Alarm > Troubleshooting

TROUBLESHOOTING

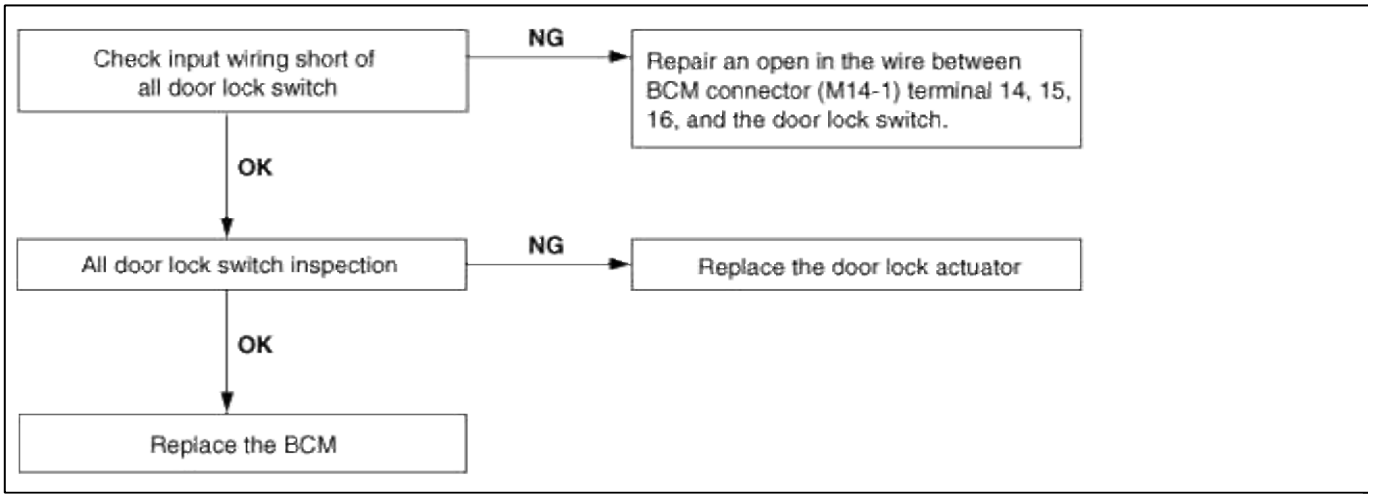
1. Alarm does not work. (Hazard lamps work)



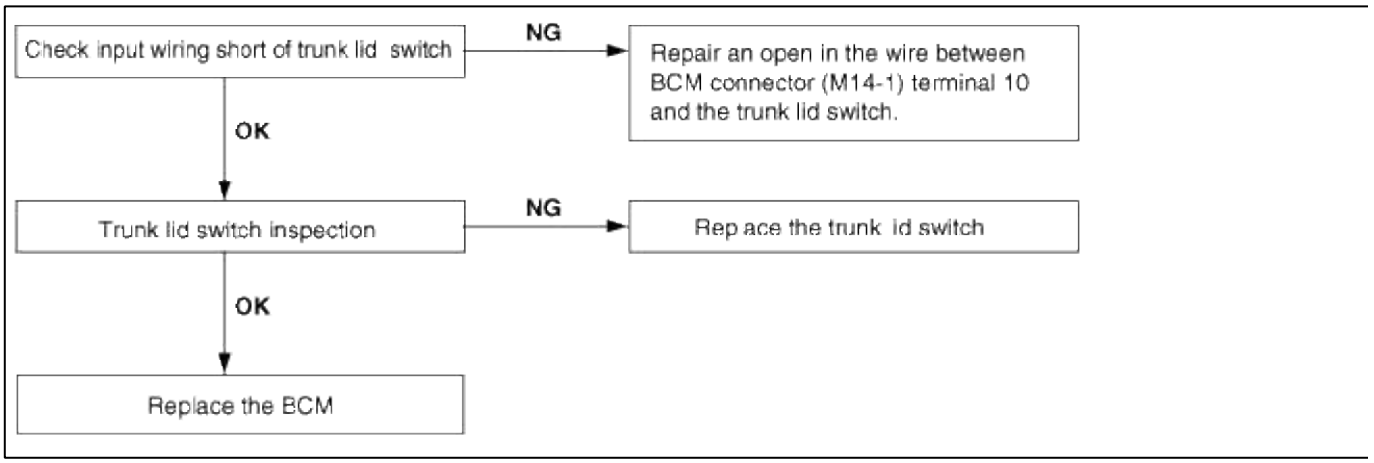
2. When hood is opened in ARM mode, burglar horn does not work.



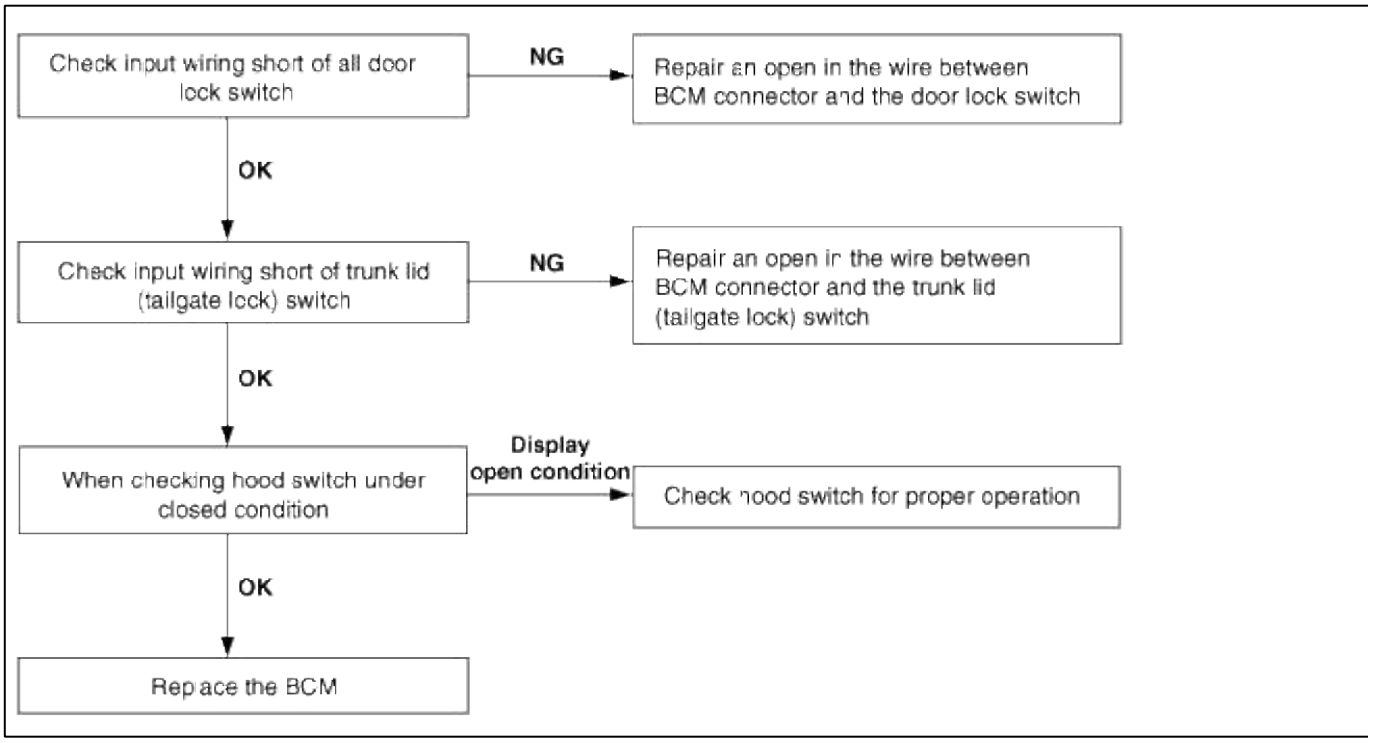
3. When door is opened in ARM mode, burglar horn does not work (If tailgate and hood is opened, alarm works)



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.



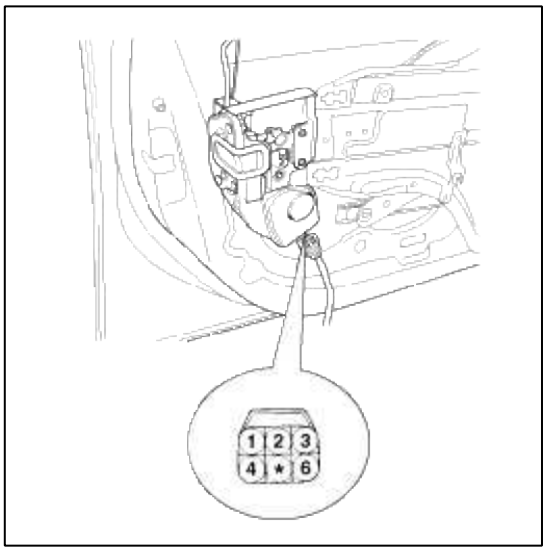
Body Electrical System > Keyless Entry And Burglar Alarm > Repair procedures

INSPECTION

FRONT DOOR LOCK ACTUATOR

1. Remove the front door trim panel. (Refer to the Body group - front door)

2. Disconnect the 6P connector from the actuator.

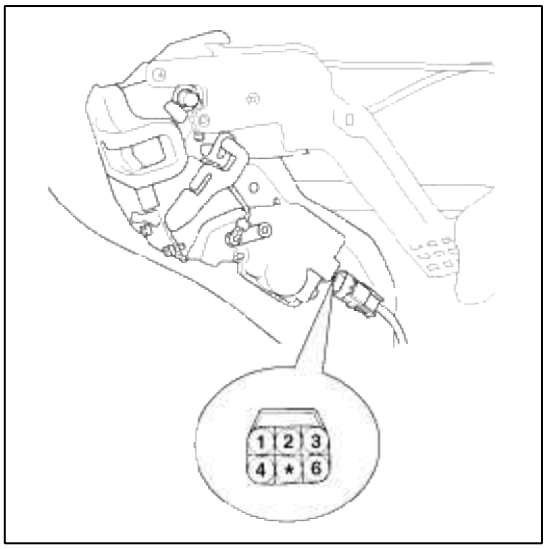


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		4	6
Right	Lock	⊖	⊕
	Unlock	⊕	⊖
Left	Lock	⊕	⊖
	Unlock	⊖	⊕

REAR DOOR LOCK ACTUATOR

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 6P connector from the actuator.



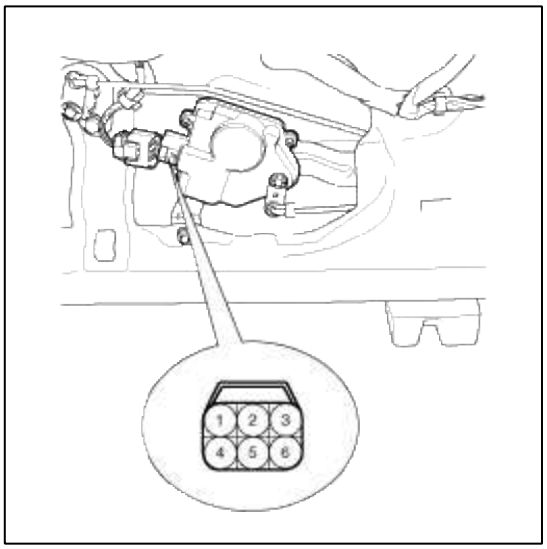
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		4	6
Right	Lock	⊖	⊕
	Unlock	⊕	⊖
Left	Lock	⊕	⊖
	Unlock	⊖	⊕

TAILGATE LOCK ACTUATOR (3 DOORS)

1. Remove the tailgate trim panel. (Refer to the Body group - tailgate)

2. Disconnect the 6P connector from the actuator.

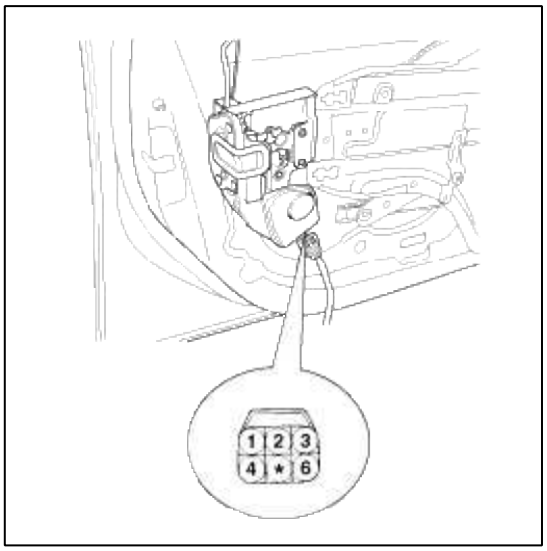


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal / Position	1	2
LOCK	⊕	⊖
UNLOCK	⊖	⊕

FRONT DOOR LOCK SWITCH

1. Remove the front door trim panel. (Refer to the Body group - front door)
2. Disconnect the 6P connector from the actuator.



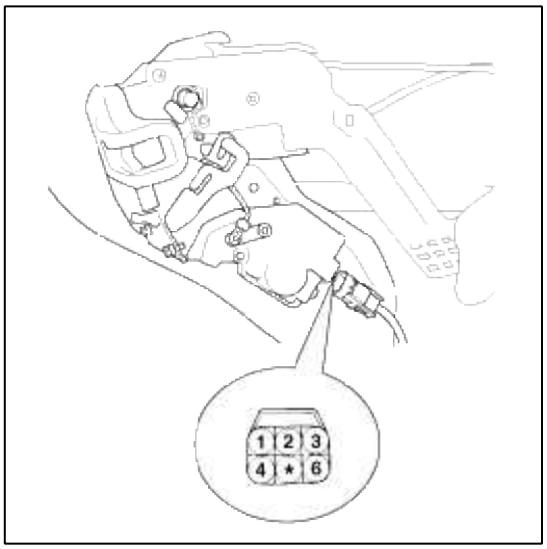
3. Check for continuity between the terminals in each switch position according to the table.

Position / Terminal		1	2	3
Right	Lock	○		○
	Unlock	○	○	
Left	Lock	○		○
	Unlock		○	○

REAR DOOR LOCK SWITCH

1. Remove the rear door trim panel. (Refer to the Body group - rear door)

2. Disconnect the 6P connector from the actuator.

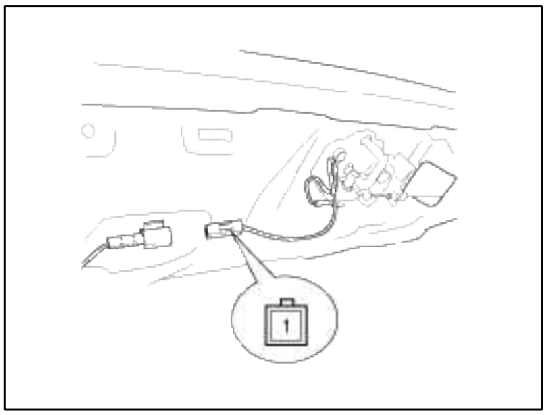


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	2	3
Right	Lock	○		○
	Unlock	○	○	
Left	Lock	○		○
	Unlock		○	○

TRUNK LID SWITCH (4 DOORS)

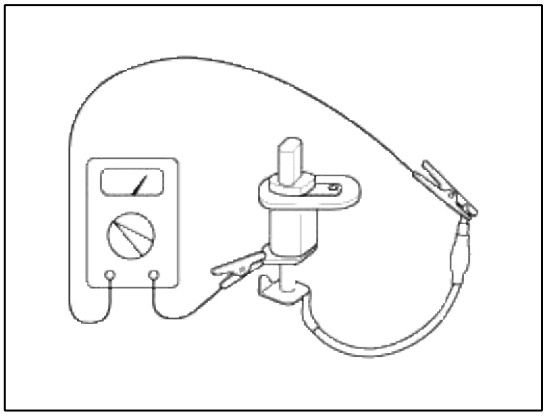
1. Disconnect the negative battery terminal.
2. Remove the rear trunk lid trim, and then remove the trunk lid switch from the trunk lid striker.



3. Disconnect the 1P connector from the rear harness.

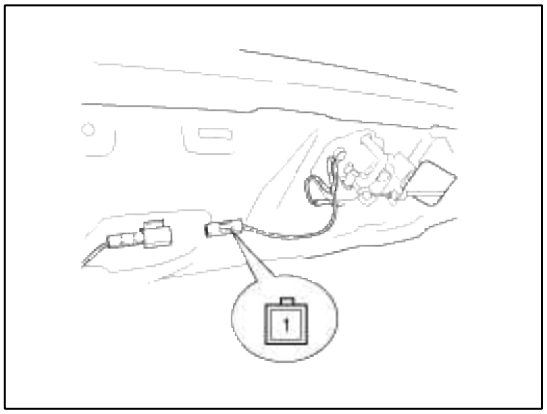
4. Check for continuity between the terminal and body while pushing the rod.

Switch rod condition	Continuity
Push (OFF)	Non-conductive (∞Ω)
Released (ON)	Conductive (0Ω)



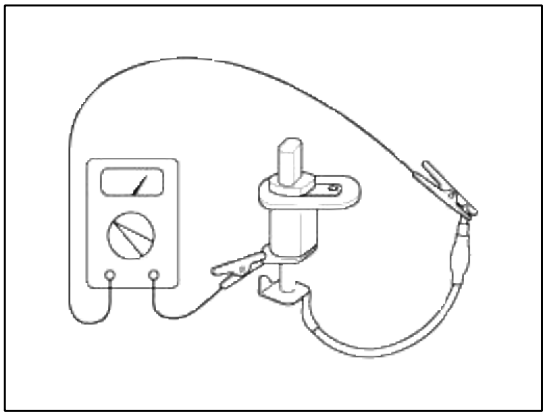
TAILGATE LOCK SWITCH (4 DOORS)

1. Remove the rear transbus trim. (Refer to the Body group - tailgate)
2. Disconnect the trunk lid switch connector from the actuator.



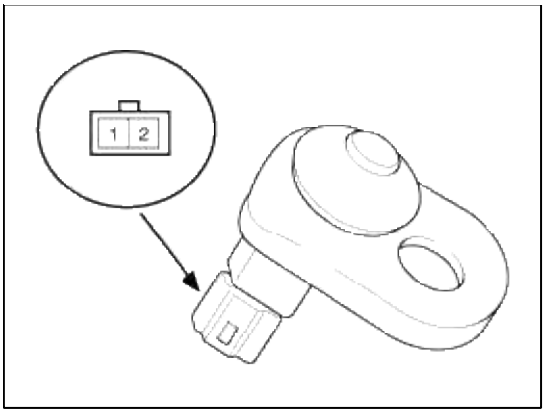
3. Check for continuity between the terminal and switch body when push the switch.

Switch	Continuity
Push	Non-conductive (∞Ω)
Free	Conductive (0Ω)



DOOR SWITCH

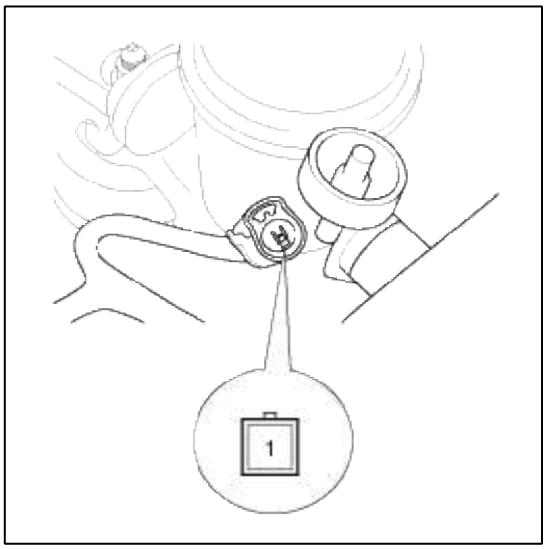
Remove the door switch and check for continuity between the terminals.



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

HOOD SWITCH

1. Disconnect the 1P connector from the hood switch.

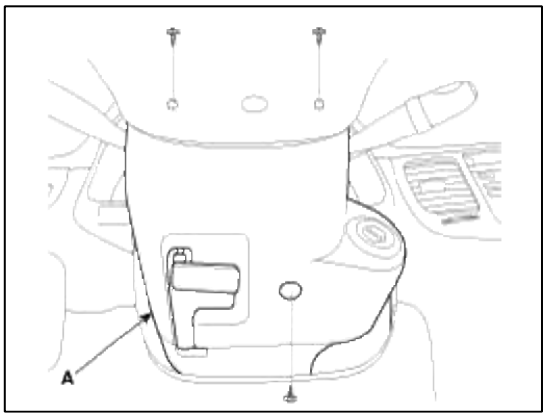


2. Check for continuity between the terminals and ground according to the table.

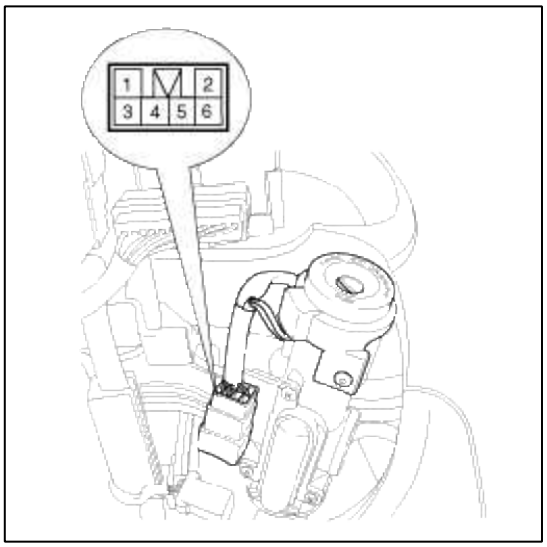
Terminal / Position	Ground (Body)	1
Hood open (Free)	○	○
Hood close (Push)		

DOOR WARNING SWITCH

1. Remove the steering column upper & lower shrouds (A) after loosening 3 screws.



2. Disconnect the 6P connector from the door warning switch.

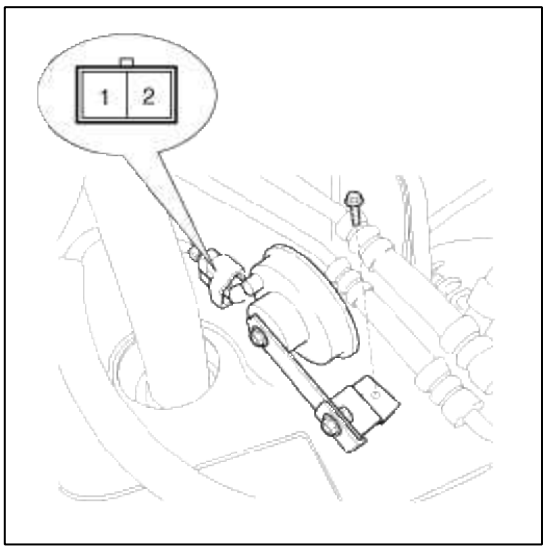


3. Check for continuity between the terminals in each position according to the table.

Terminal / Key position	5	6
Insert	○	○
Removal		

BURGLAR HORN

1. Remove the burglar horn after removing 1 bolts 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.

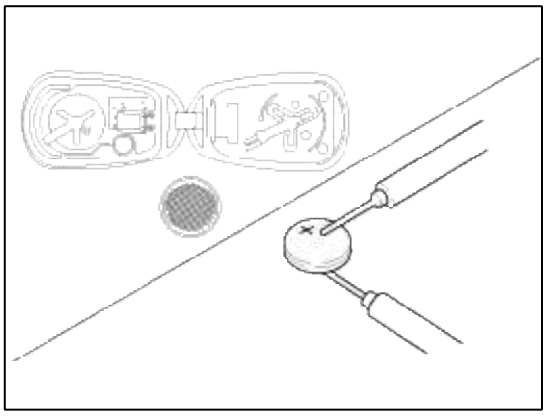
Body Electrical System > Keyless Entry And Burglar Alarm > Transmitter > Repair procedures

INSPECTION

1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.

2. Remove the battery(A) and check voltage if the red light doesn't flicker.

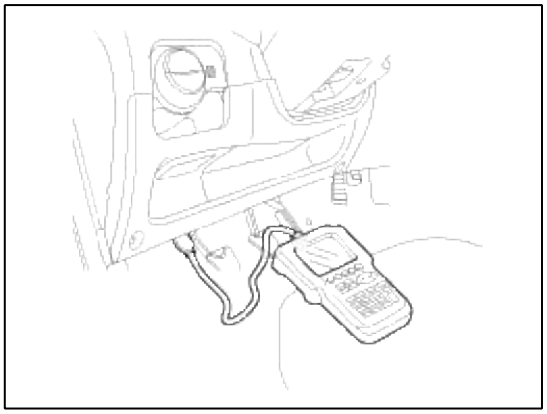
Standard voltage : 3V



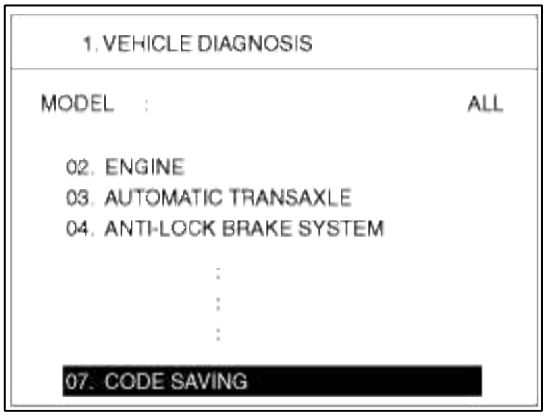
3. Replace the transmitter battery with a new one, if voltage is below 3V then try to lock and unlock the doors with the transmitter by pressing the lock or unlock button five or six times.
4. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, register the transmitter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

TRANSMITTER CODE REGISTRATION

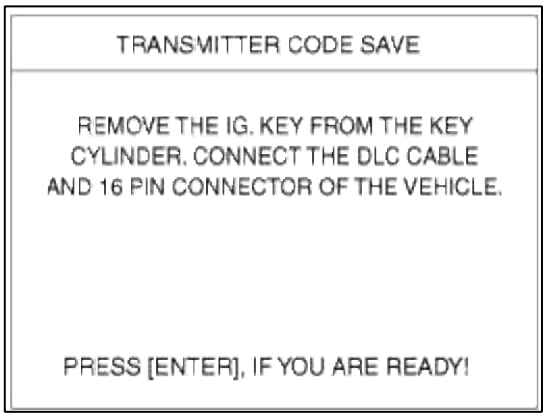
1. Connect the DLC cable of hi-scan to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on hi-scan.



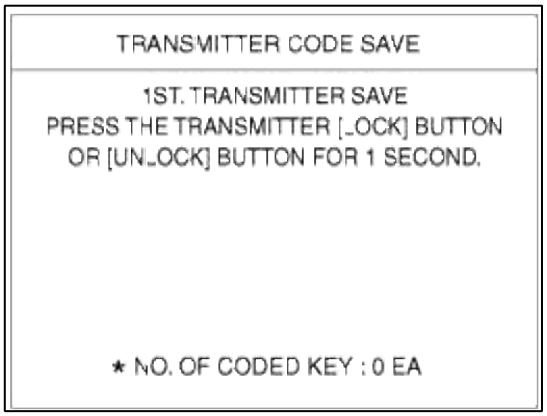
2. Select the vehicle model and then do "CODE SAVING".

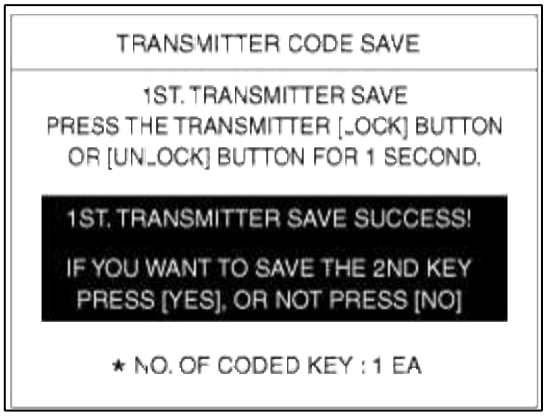


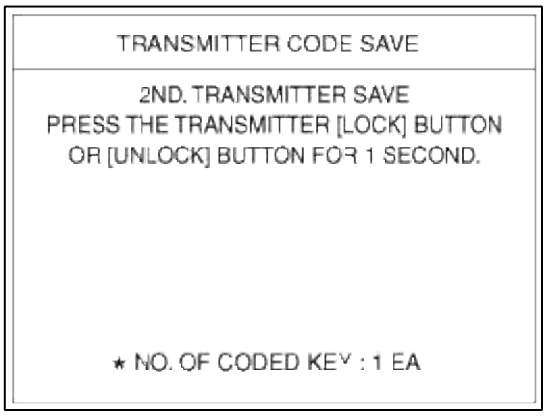
3. After selecting "CODE SAVING" menu, push "ENTER" key, then the screen will be shown as below.



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.









Body Electrical System > Keyless Entry And Burglar Alarm > Transmitter > Specifications

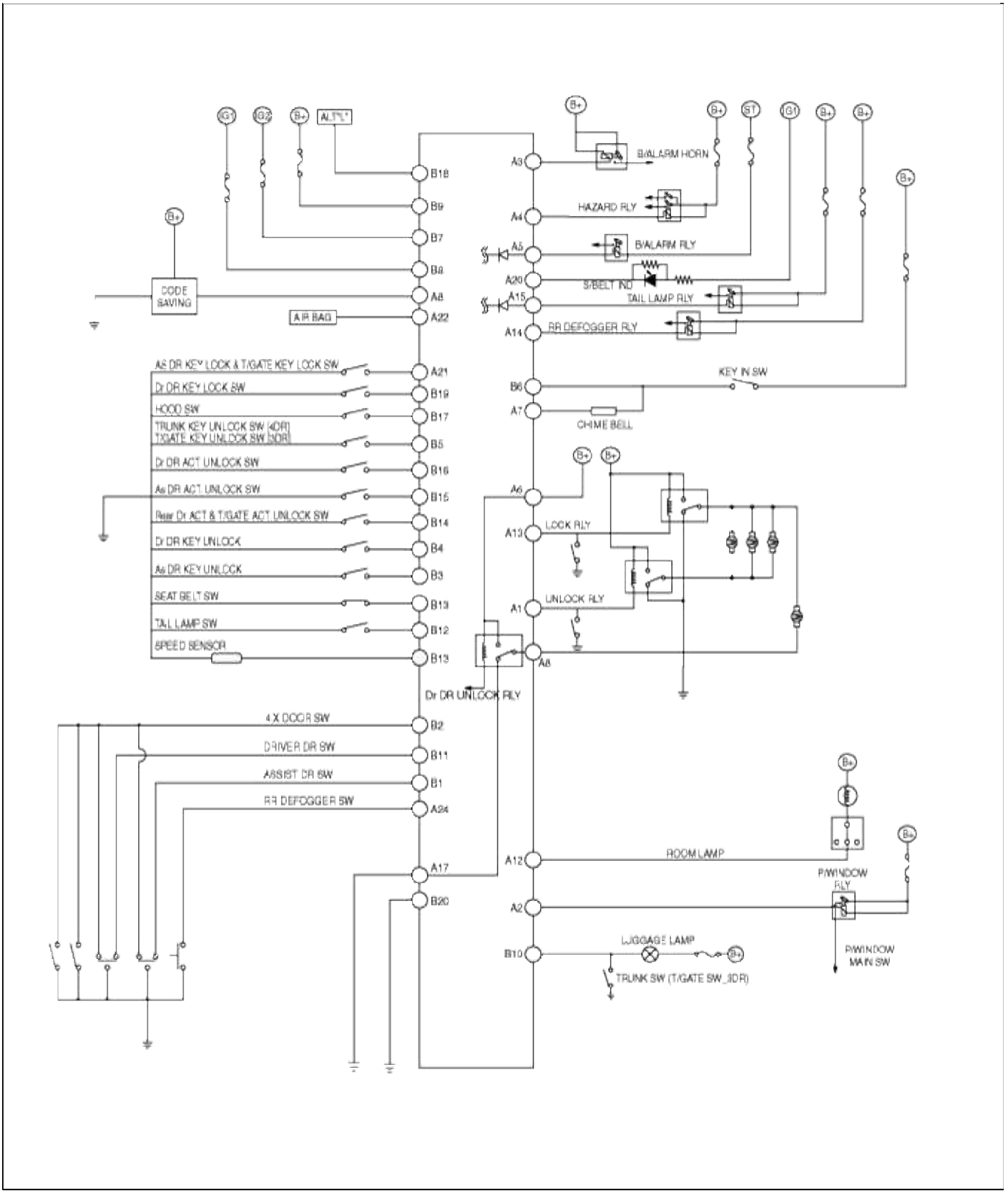
SPECIFICATION

Items	Specifications
Keyless entry transmitter Power source	Lithium 3V battery (1EA)
Transmissible distance	10m or more
Life of battery	2 years or more (at 20 times per day)
Button	Door lock Door unlock Trunk open (option) panic
Transmission frequency	315 MHz

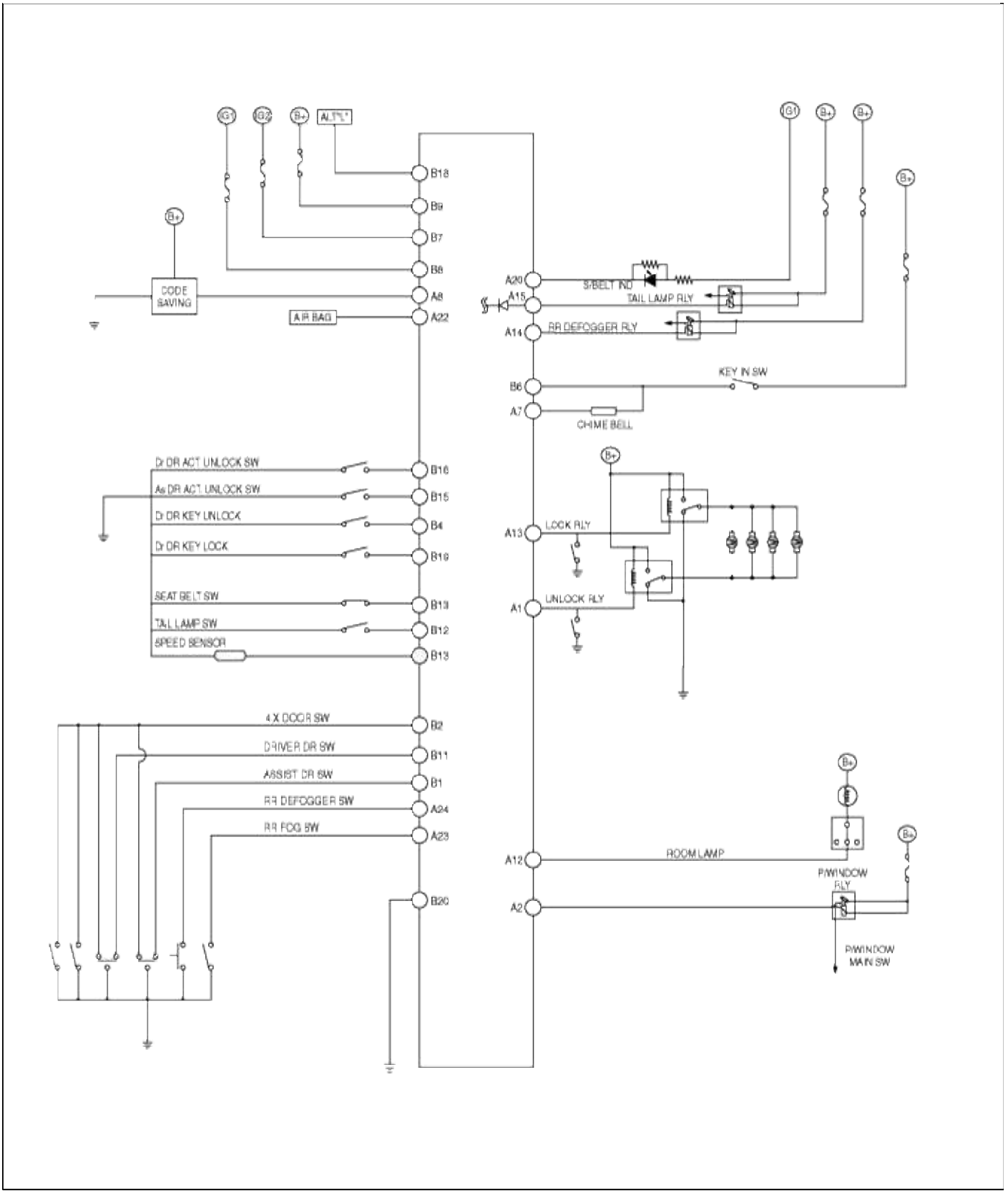
Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Schematic Diagrams

CIRCUIT DIAGRAM

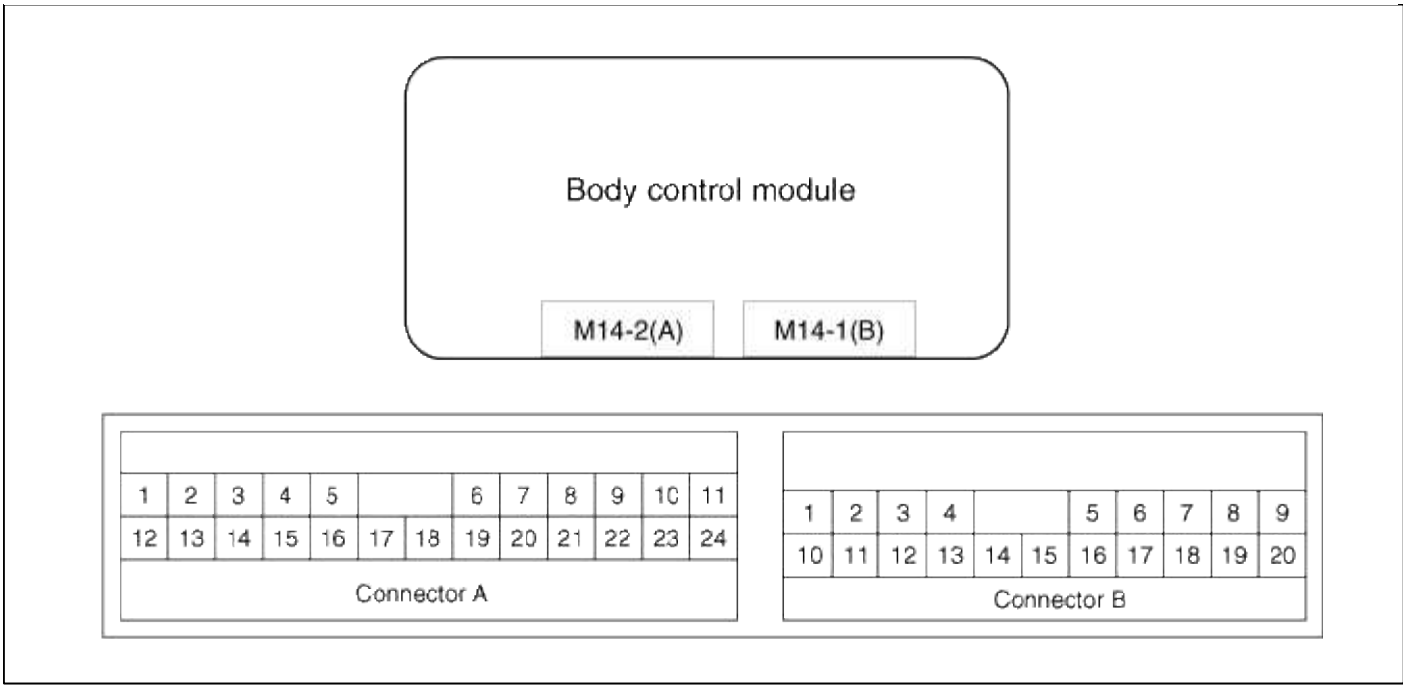
BCM & RECEIVER


IG1
IG2
B+
ALT"L"
B18
B9
B7
B8
A8
A22
CODE SAVING
AIR BAG
As DR KEY LOCK & T/GATE KEY LOCK SW
Dr DR KEY LOCK SW
HOOD SW
TRUNK KEY UNLOCK SW (4DR)
T/GATE KEY UNLOCK SW (3DR)
Dr DR ACT UNLOCK SW
As DR ACT UNLOCK SW
Rear Dr ACT & T/GATE ACT UNLOCK SW
Dr DR KEY UNLOCK
As DR KEY UNLOCK
SEAT BELT SW
TAIL LAMP SW
SPEED SENSOR
A21
B19
B17
B5
B16
B15
B14
B4
B3
B13
B12
B13
Dr DR UNLOCK RLY
4 X DOOR SW
DRIVER DR SW
ASSIST DR SW
RR DEFOGGER SW
B2
B11
B1
A24
A17
B20
A3
A4
A5
A20
A15
A14
B6
A7
A6
A13
A1
A8
B/ALARM HORN
HAZARD RLY
B/ALARM RLY
S/BELT IND
TAIL LAMP RLY
RR DEFOGGER RLY
KEY IN SW
CHIME BELL
LOCK RLY
UNLOCK RLY
ST
IG1
A12
A2
B10
ROOM LAMP
P/WINDOW RLY
LUGGAGE LAMP
TRUNK SW (T/GATE SW_3DR)
P/WINDOW MAIN SW

BCM



BCM CONNECTOR TERMINALS



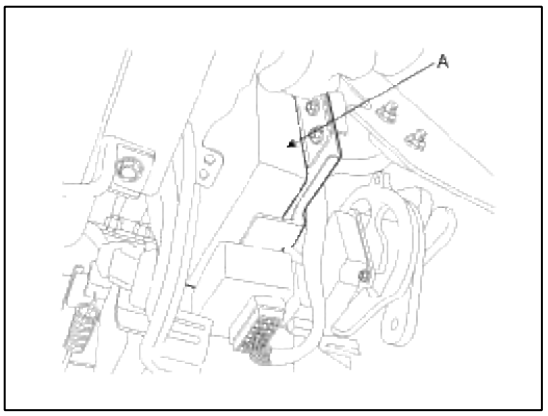
Terminal No.	Connector A	Connector B
1	Door unlock relay	Assist door switch
2	Power window relay	4 door switch
3	Burglar alarm horn relay	Assist door key unlock switch
4	Hazard lamp relay	Driver door key unlock switch
5	Burglar alarm relay	Trunk key unlock switch (4Doors), Tail gate key unlock switch (3Doors)
6	B+	Door warning switch
7	Chime bell	IG2
8	Code saving	IG1
9	-	B+
10	-	Trunk switch (4Doors), Tail gate switch (3Doors)
11	Seat belt switch	Driver door switch
12	Room lamp switch	Tail lamp switch
13	Door lock relay	SPEED SENSOR SIGNAL
14	Rear defogger relay	Rear door actuator unlock switch (4Doors), Rear door & tail gate actuator unlock switch (3Doors)
15	Tail lamp relay	Assist door actuator unlock switch
16	-	Driver door actuator unlock switch
17	Ground	Hood switch
18	Driver door unlock actuator	Alternator (L)
19	-	Driver door key lock switch

20	Seat belt indicator	Ground
21	Assist door key lock switch	-
22	Air bag signal(Crash signal)	-
23	Rear fog lamp switch (EC, Australia)	-
24	Rear defogger switch	-

Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Description and Operation

DESCRIPTION

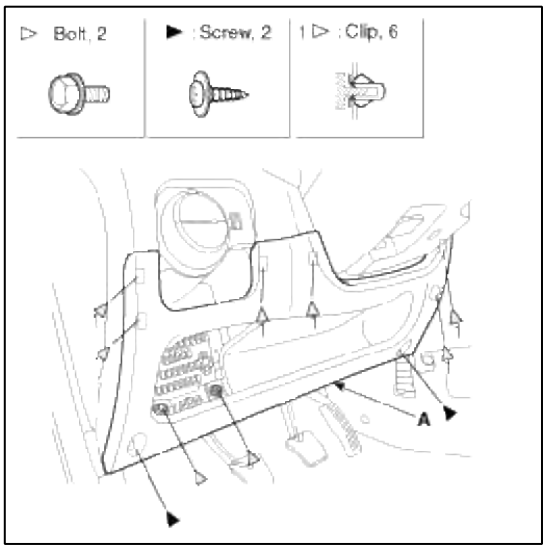
Body control module (A) receives various input switch signals controlling time and alarm functions for the rear defogger timer, seat belts warning, delayed out room lamp, central door lock, ignition key reminder, power window timer, door warning, tail lamp auto cut, crash door unlock, ignition key hole illumination and keyless entry & burglar alarm.



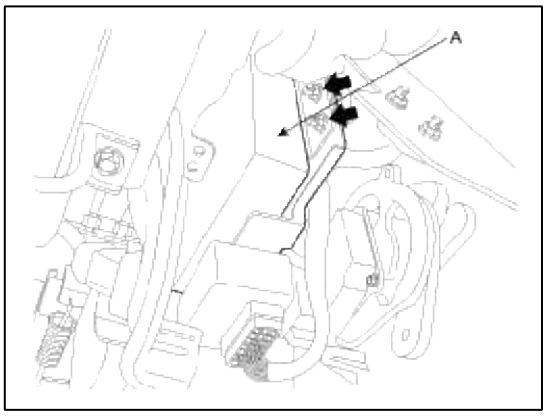
Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A) (Refer to the Body group - crash pad).



3. Remove the body control module (A) after loosening 2 nuts.

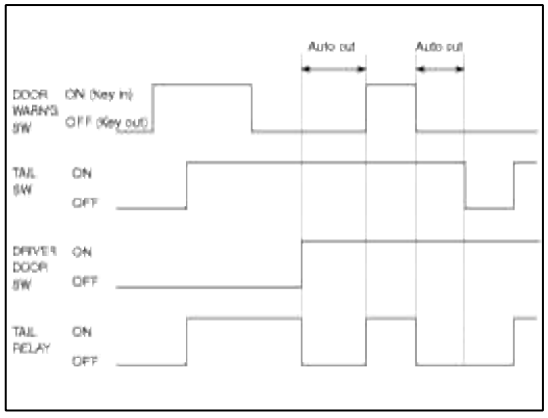


4. Installation is the reverse of removal.

INSPECTION

Verify each components operation using related timing charts.

1. TAIL LAMP AUTO CUT
   (1) With the tail lamp switched ON, the Door warning SW is turned off. and the Driver door opened, the tail lamp should be automatically turned OFF.
   (2) With the ignition switch ON, if the Driver door is opened and the ignition is switched to OFF, the tail lamp should be automatically turned OFF.
   (3) When the tail lamp is cut automatically and the tail lamp switch is turned OFF and ON, the tail lamp illuminates and auto cut function is cancelled.
   (4) When the tail lamp is cut automatically and the ignition key is inserted, the tail lamp illuminates and auto cut function is canceled.



2. DELAYED ROOM LAMP

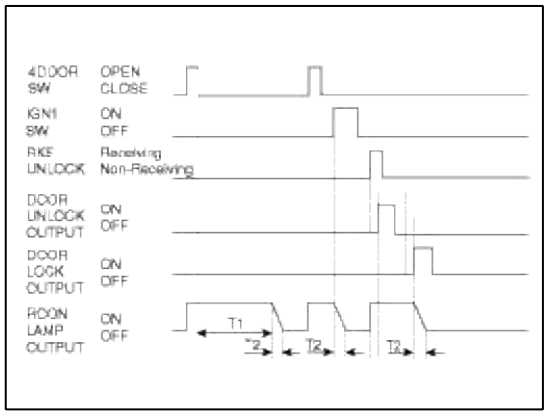
(1) When the first door (driver, or assist or 4doors) is opened, room lamp is turned on.

(2) When all doors are closed, the room lamp will remain illuminated for 30 seconds; the lamp will then fade out over a 2-second period.

(3) Regardless of ignition ON/OFF in door open state, room lamp output is ON.

(4) When remote control unlock is received, room lamp is turned on for 30 seconds.

(5) While room lamp is on due to Remote control unlock, if another remote control unlock is received, then room lamp is again on for 30 sec.



T1 : 30 ± 3 sec.,
T2 : 2 ± 0.2 sec.

3. CENTRAL DOOR LOCK/UNLOCK (Included 2-Turn unlock)

(1) If assist door unlock knob (below unlock knob) is turn to Unlock from Lock, then the Unlock output shall be ON to all doors for T1.

(2) If assist door unlock knob is turn to Lock from Unlock, then the Lock output shall be ON to all doors for T1.

(3) If driver/assist door KEY LOCK switch is turn to ON from OFF, then the Lock output shall be ON to all doors for T1.

(4) When the TX Lock signal is received, the door Lock output shall be ON for T1.

(5) If the driver door Key Unlock switch is turn to ON from OFF, then the driver door Lock switch shall be unlocked mechanically. (The BCM & RECEIVER shall not be output.)
(After being unlocked mechanically, if the same condition is satisfied within T2, then the Unlock output shall be ON for T1 to all doors.)
(After the TX Unlock signal is received, if the same condition is satisfied within T2, then the Unlock output shall be ON for T1 to all doors.)

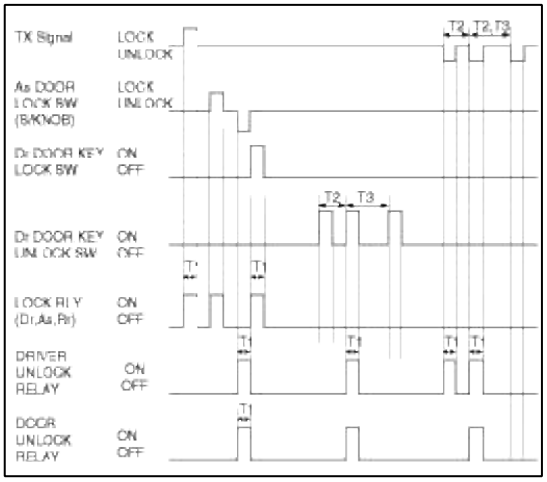
(6) When the TX Unlock signal is received, the driver door Unlock output shall be ON for T1.
If the TX Unlock signal is received within T2, the Unlock output shall be ON to all doors for T1. (After the driver door Key Unlock switch is turn to ON from OFF, if the same condition is satisfied within T2, then the Unlock output shall be ON to all doors.)

A. If, within T2, other registered TX signals are received, they shallbe treated as the same TX signal.

B. The Lock (Unlock) output by the changing of the driver door unlock knob shall not be performed.

C. In the state of being all unlock knob in Lock position, if Lock signals of Tx, driver, assist(Tail Gate) door Key switch are input, the second Lock output shall not be performed.

D. In the state of being all unlock knob in UnLock position, if UnLock signals of Tx, driver, assist(Tail Gate) door Key switch are input, the second UnLock output shall not be performed.



T1 : 0.5 ± 0.1sec,
T2 : within 4 ± 1sec,
T3 : over 4 ± 1sec.

4. KEYLESS ENTRY & CENTROL DOOR LOCK/UNLOCK(BCM & RECEIVER ONLY)

(1) When the TX Lock is ON, the Hazard Lamp shall be output at one time for T2 after Lock Relay is output for T1.

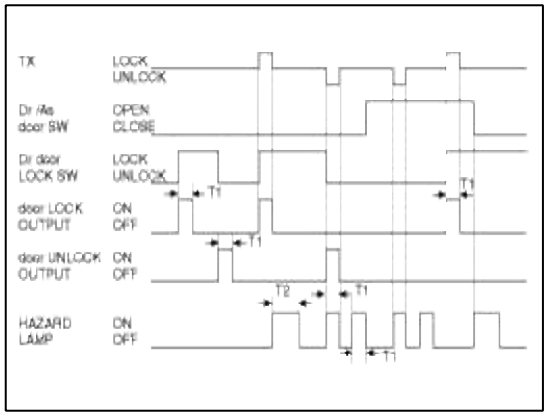
A. However, after the TX lock is ON, during waiting for the Hazard output, if the Key is inserted(KEY IN SW=ON), then the Hazard Lamp output shall not be performed.

B. After the TX lock is On, if Key is inserted within 0.5 sec(KEY IN SW=ON), keep the prior state without alarm being entered.

(2) When TX Unlock is ON, the Unlock Relay for T1, and the Hazard Lamp for T1 outputs are performed at two times.

(3) In the state that the Key is OUT(KEY IN SW=OFF), the Dr/As/RR door switch are close, if there is no change during 30 seconds after the TX Unlock is output, then the Hazard lamp output shall be ON for T2 at one time after the Lock is output for T1.

(4) When the battery is connected, there shall not be sign of any malfunction.
(Even if the Battery is connected when S/Knob is in Lock or Unlock position, the Lock signal shall not be output.)



T1 : 0.5 ± 0.1sec
T2 : 1 ± 0.2sec.

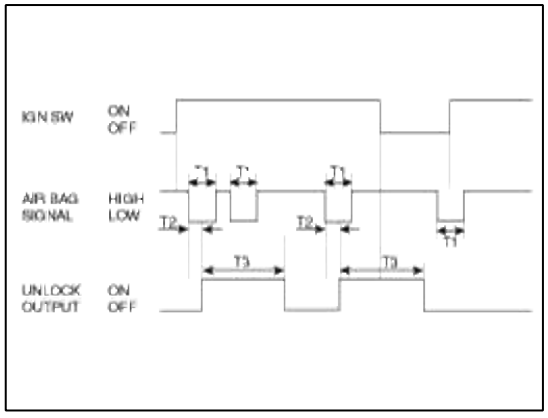
5. CRASH DOOR UNLOCK

(1) Whenever the air bag (below A/BAG) signal is inputted in the IG SW ON state, the unlock output shall be ON for T3.

(2) During unlock output, although IG SW is turned to OFF from ON, the unlock output shall maintain for the remained time period.

(3) If IG SW is turned to ON from OFF after A/BAG signal first is inputted, the Unlock output shall not be performed.

(4) If drive or assist door lock switch is turned to lock from unlock after unlock output, the unlock output shall be On for T3.



T1 : 0.2 sec,
T2 : 0.04 sec,
T3 : 5 ± 0.5 sec.

6. IGNITION KEY REMINDER

(1) In the state that the door warning switch is ON, the driver door is opened, and the driver Safety Knob(below unlock knob) is locked, only the driver door (RKE only) or all doors (Non RKE) unlock shall be output within T1 for T2.

If the door is locked, the unlock shall be output at one time for T2, at three times for T3 only when the switch has not been changed within actuator.

(2) During the 3-time UNLOCK output, if the actuator is unlocked, then the next output shall be stopped.

(3) During the 3-time UNLOCK output, if the door is closed or the key is out from the cylinder, then the next output shall be stopped.

(4) After the 3-time UNLOCK output, if the actuator is locked, then the current state shall be maintained.

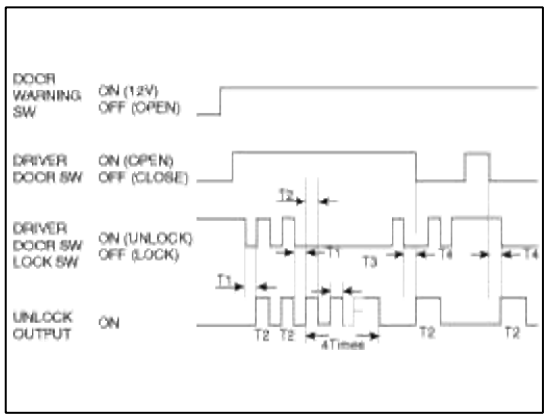
(5) If any of the door warning switch, the driver/assist door switch, and the driver/assist door actuator. UNLOCK switch is changed, then the reset operation shall be performed.

(6) If the door is closed within T4 after the actuator is locked, all the door unlock shall be output for T2.

(7) If the lock switch is ON within T4 sec. when the door is turn to the closed state, then all the door unlock signal shall be output for T2.

(8) If door warning switch is Off and IGN switch is On, then the IG key reminder function shall not be operated.

(9) If the speed sensor input is 3-5KPH, the IG key reminder function shall not be operated.



T1 : MAX 0.5 sec,
T2 : 1 ± 0.2sec,
T3 : 0.5 ± 0.1 sec,
T4 : MAX 0.5 sec.

7. SEAT BELT REMINDER FUNCTION

(1) Warning Lamp lights every 0.6sec and Warning Bell sounds every 0.9sec for 6sec when IGN1 switch is ON under unfastened S/Belt.
(Warning lamp continues to light for 6sec if S/Belt is fastened within 6sec)
30sec-TIME COUNT starts at ALT"L" ON under this state.
(30sec-TIME COUNT starts after 6sec. If ALT"L" is ON within initial 6sec)

(2) Warning Bell stops and the Warning Lamp is turned OFF when IGN1 switch is turned OFF within 6sec-output.

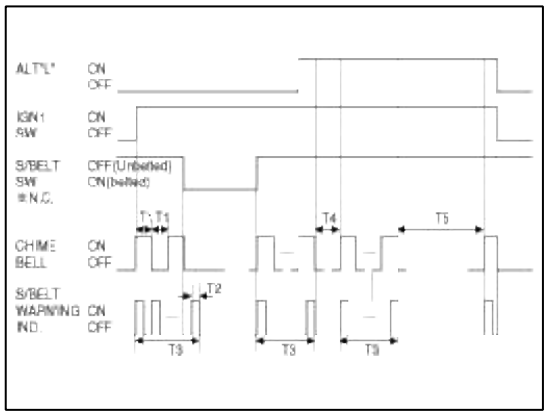
(3) Warning Bell stops and the Warning Lamp is turned OFF 30sec-TIME COUNT also stops when S/Belt is fastened after IGN1 switch ON.

(4) If unfastened S/Belt state continues after 60sec-TIME COUNT from ALT"L" ON, the Warning Lamp flashes and Warning Bell sounds 11 times in 30sec-cycle(6sec ON/ 24sec OFF) after 30sec from ALT"L" ON.

(5) Warning Lamp & Warning Bell are turned OFF when IGN1 switch is OFF or S/Belt is fastened during(4).

(6) Operation in (1) is performed when S/Belt is unfastened again under ALT"L" ON and fastened S/Belt.

(7) Operation in (4) is performed when ALT"L" is turned ON again after turning OFF under unfastened S/Belt.

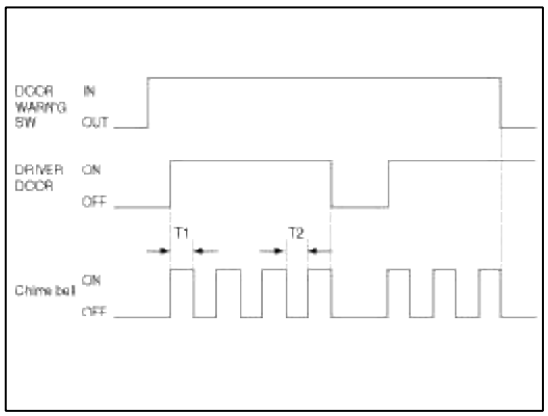


T1 : 0.45 ± 1.0 sec, T2 : 0.3 ± 0.1 sec,
T3 : 6 ± 1.0 sec, T4 : 30 ± 3.0 sec,
T5 : 24 ± 2.0 sec.

8. KEY OPERATED WARNING

(1) If the key is in the key cylinder and the Driver door is opened, the chime bell is sounded (period: 0.9 sec., duty rate: 50%).

(2) If the ignition key is removed, or the door is closed, the chime bell is switched OFF immediately.

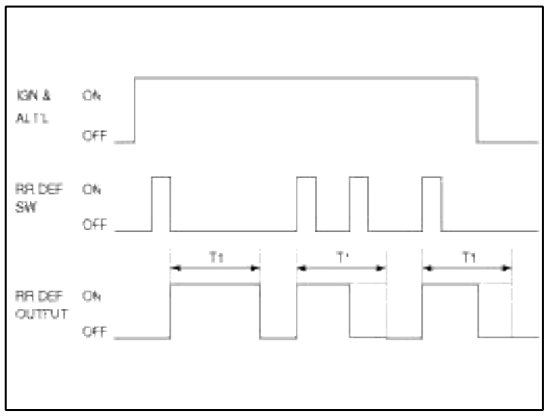


T1, T2 : 0.45 ± 0.1sec.

9. DEFOGGER TIMER (INCLUDING OUTSIDE MIRROR HEATER)

(1) Once ALT "L" is ON, if the defogger is switched ON, the defogger will stay ON for 20 minutes duration.

(2) If defogger switch is pressed again (see Step 1), or if ignition is switched OFF, the defogger will shut OFF.



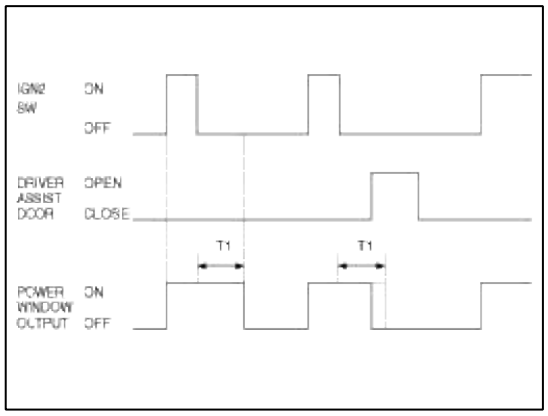
T1 : 20 ± 1 min.

10. POWER WINDOW TIMER

(1) When the ignition is switched OFF, power window output remains ON for 30 seconds and then turns OFF.

(2) Related to Step 1), if the driver door or assist door is opened, window power output is turned OFF immediately.

(3) When the driver door or assist door is opened, the power window relay output is turned OFF immediately.



T1: 30 ± 3 sec.

11. PANIC ALARM (KEYLESS TYPE)

(1) If TX Panic signal is received, Panic alarm shall be on for T1 by using horn, hazard.

(2) During panic alarm, if (TX LOCK/UNLOCK/PANIC,KEY IN,DOOR KEY LOCK,DOOR KEY UNLOCK,T/GATE KEY UNLOCK,TRUNK KEY UNLOCK) signals are received, Panic alarm shall be OFF.

(3) During Panic operating, if the ARM condition is satisfied, Panic alarm shall be OFF.

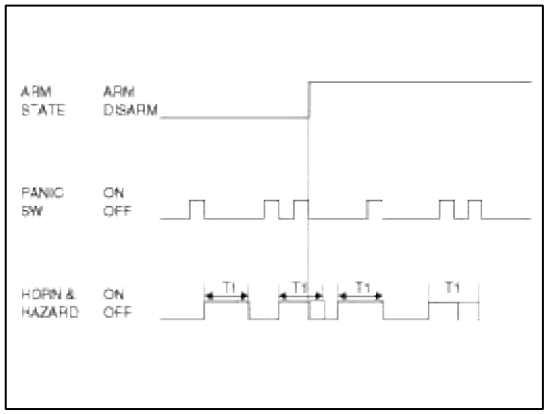
(4) The related matter to the Anti theft alarm function shall be as follows.

A. During the Anti theft alarm sequence, even if the TX Panic signal is received, the Anti theft alarm shall be maintained. (The Panic signal shall be ignored.)

B. If the Anti theft alarm condition is satisfied during the Panic alarm sequence, the Anti theft alarm shall be output. (The Panic output shall be OFF.)

C. If the Panic signal is received in the warning standby/warning/alarm completion/RELOCK standby modes, then the Anti theft function shall be operated and the Panic alarm shall be ON.

(5) During the Panic alarm sequence, although other registered TX signals are received, they shall be treated as the same TX signal.



T1 : 30 ± 3sec(0.9seconds with the cycle of 50% DUTY)

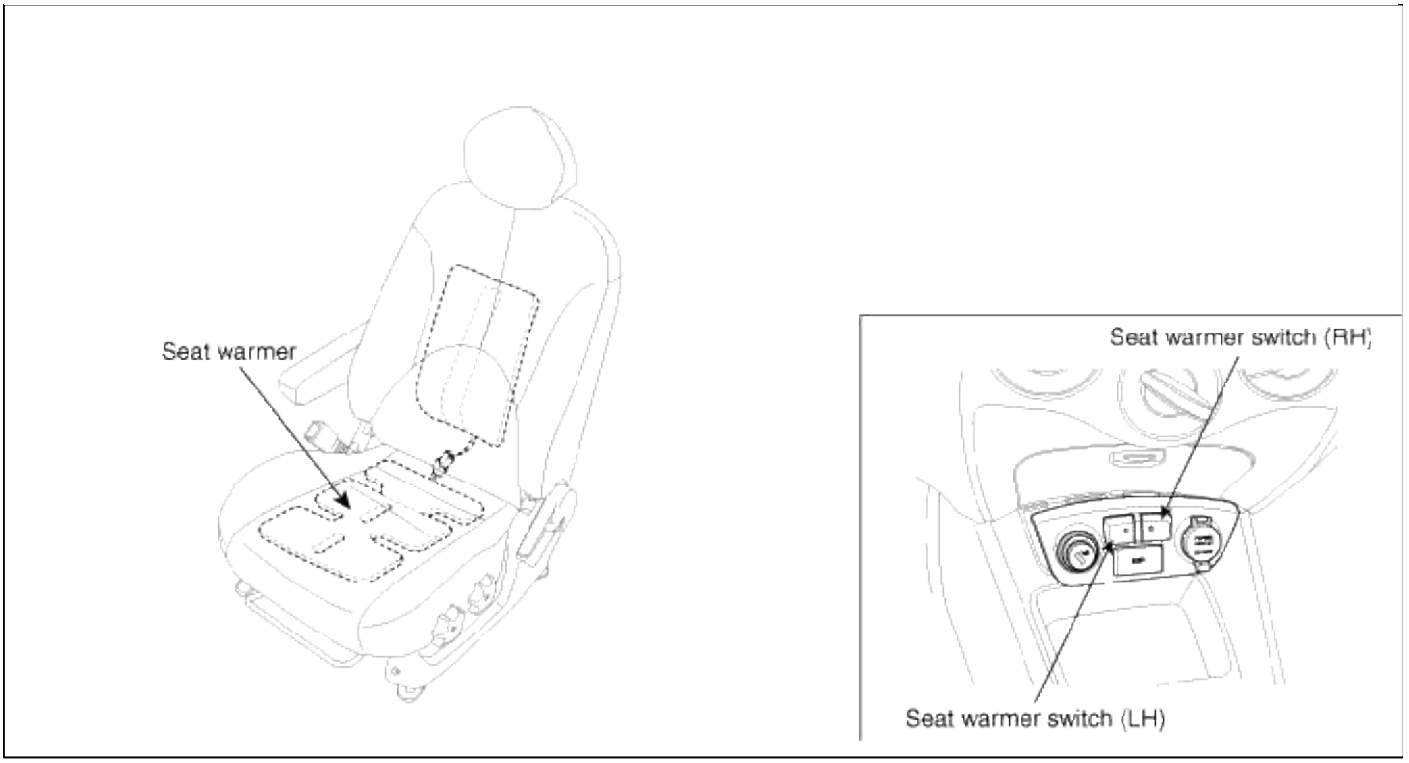
Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Specifications

SPECIFICATION

Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F~176°F(-30°C ~ 80°C)
Insulation resistance	100MΩ or more
Parasitic current draw	Less than 4mA (12.8 V) - BCM & Receiver Less than 3mA (12.8V) - BCM
Rated load	
Burglar horn Burglar relay Tail lamp relay Rear defogger relay Power window timer relay Seat belt warning indicator Room lamp Door lock relay Door unlock relay Hazard lamp relay Driver door actuator	DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 40~60mW (LED load) DC 12V, 30W (Lamp load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 10W (Motor load)

Body Electrical System > Seat Electrical > Components and Components Location

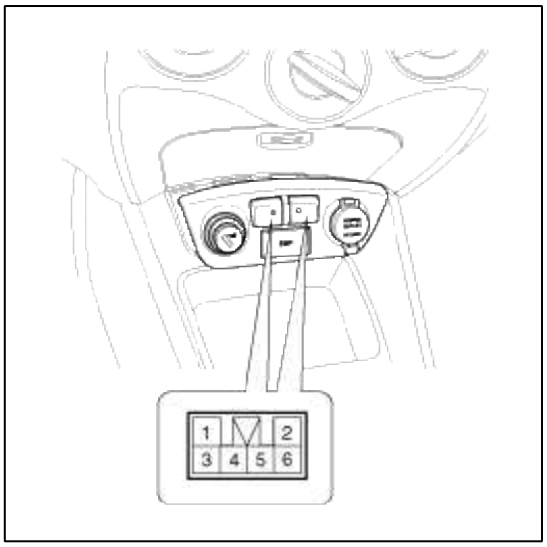
COMPONENT LOCATION



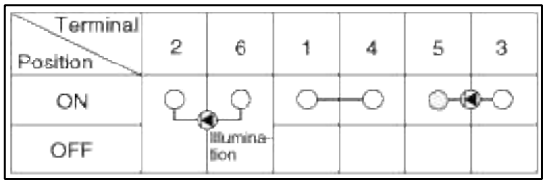
Body Electrical System > Seat Electrical > Seat Heater Switch > Repair procedures

INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the seat warmer switch from the floor console with scraper.



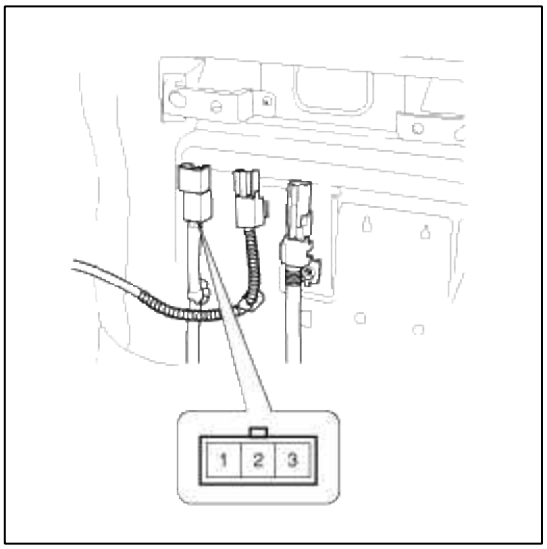
3. Check for continuity between the terminals in each switch position according to the table.



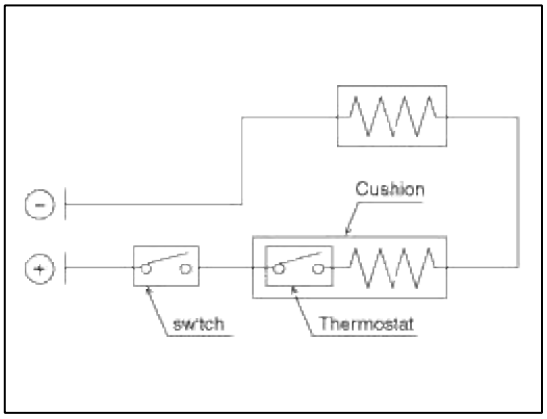
Body Electrical System > Seat Electrical > Seat Heater > Repair procedures

INSPECTION

1. Check for continuity and measure the resistance between No.1 and NO.3 terminals.



Standard value: 2.31Ω ± 10%
(Cushion: 1.15Ω ± 10%, Back: 1.16Ω ± 10%)



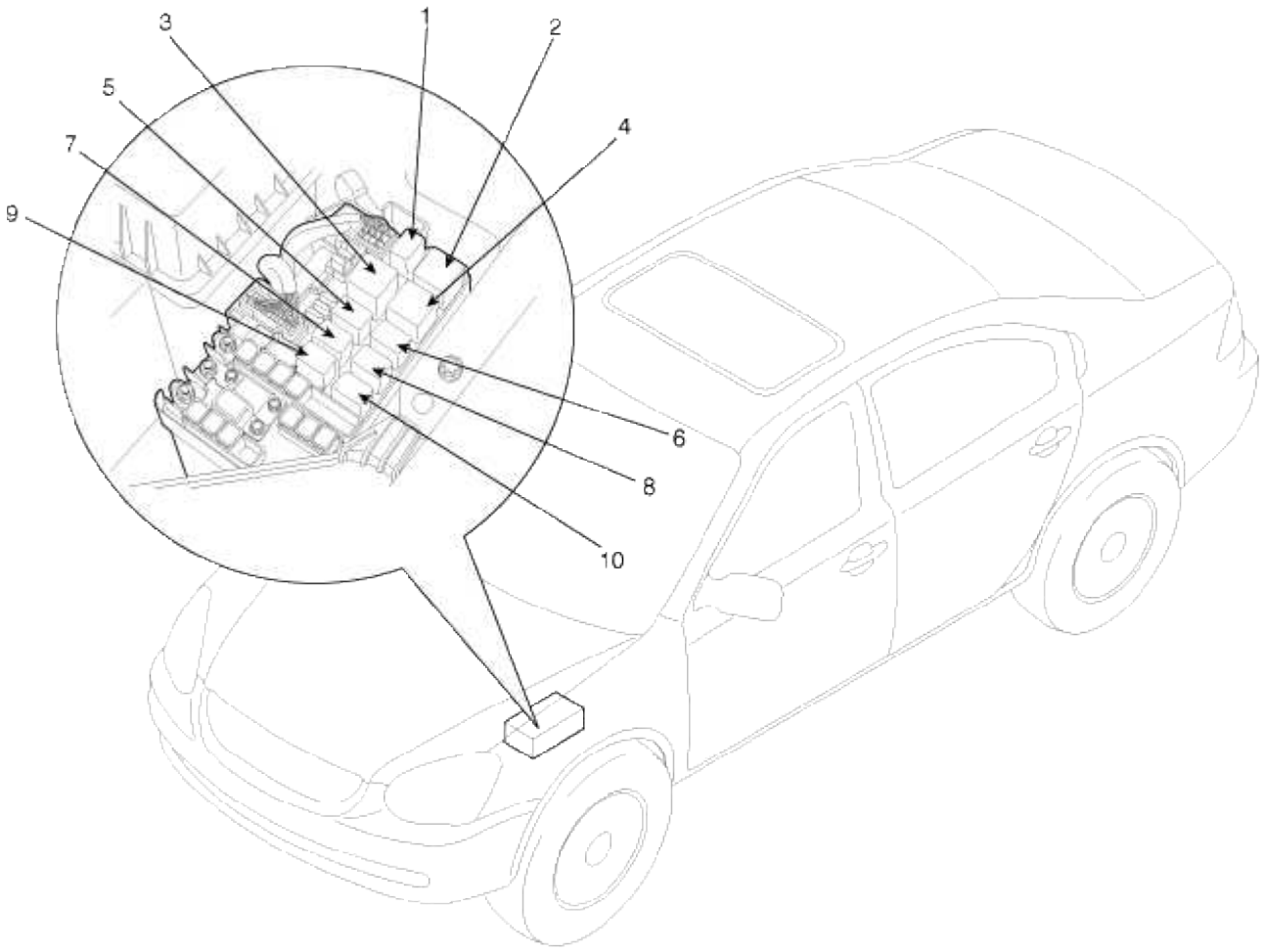
2. Operate the seat warmer after connecting the 3P connector, and then check the thermostat by measuring the temperature of seat surface.
3. Check for continuity between the terminals after disconnecting the 3P connector.

Standard value :
28 ±3.5°C(Continuity), 37 ±3.0°C(Short)

Body Electrical System > Fuses And Relays > Components and Components Location

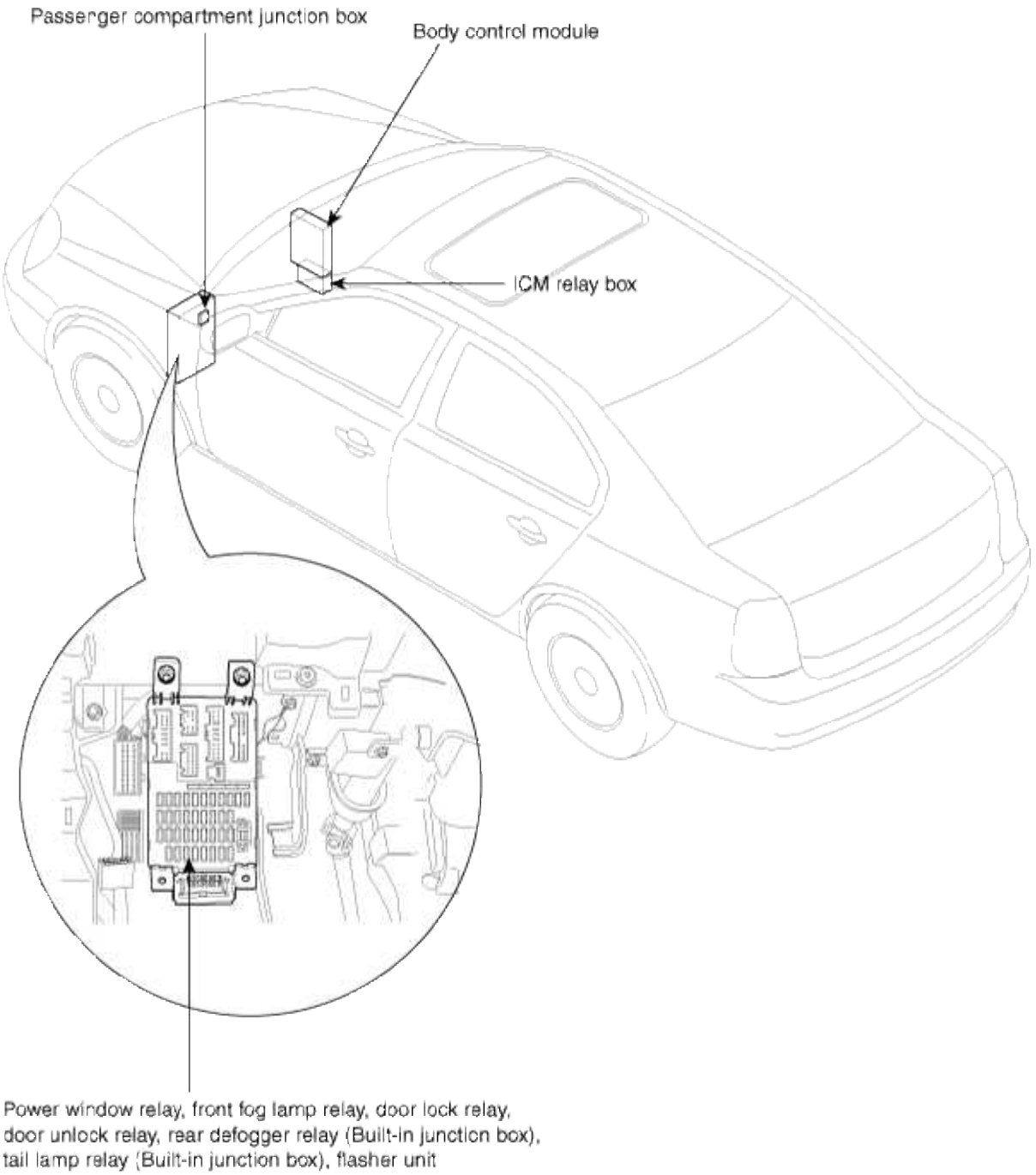
COMPONENT LOCATION

[Engine room relay box]



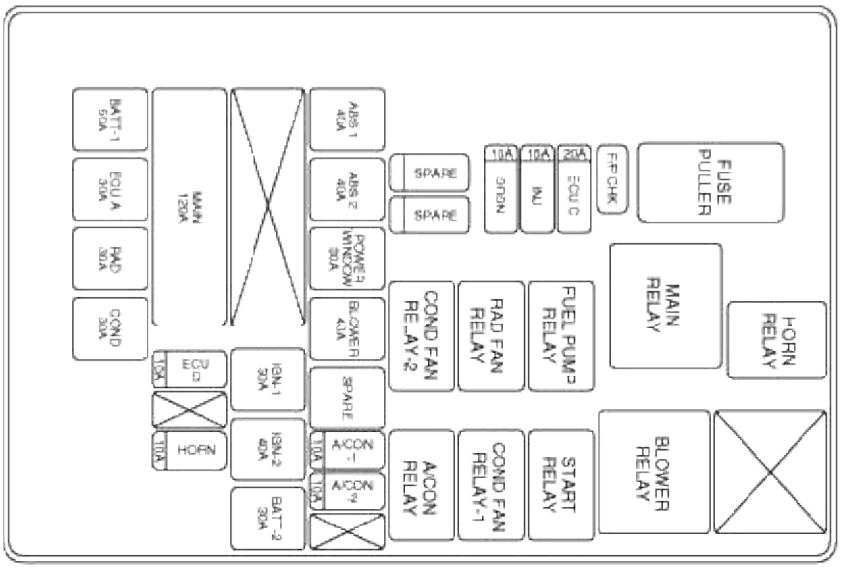
1. Horn relay
2. Fuel heater relay
3. Main relay
4. Blower relay
5. Fuel pump relay
6. Start relay
7. Radiator fan relay
8. Condenser fan relay 1
9. Condenser fan relay 2
10. Air conditioning relay

[Passenger compartment relay box]



Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Components and Components Location

COMPONENTS



CIRCUIT

FUSE	(A)	Circuit Protected
MAIN	120A	Alternator
BATT-1	50A	I/P Junction Box
BLOWER	40A	Blower Relay
ABS-1	40A	ABS Control Module, ESP Control Module
ABS-2	40A	ABS Control Module, ESP Control Module
IGN-2	40A	Start Relay, Ignition Switch
IGN-1	30A	Ignition Switch, Horn Relay, ICM Relay Box
BATT-2	30A	I/P Junction Box
P/WDW	30A	I/P Junction Box
RAD	30A	RAD Fan Relay
ECU A	30A	Main Relay
ECU C	20A	ECM
FUEL CUT	20A	Fuel Pump Relay
INJ	15A	Injector-1, -2, -3, -4, CVVT Oil Control Valve, Idle Speed Control Actuator, Canister Purge Control Valve, Immobilizer Control Module
A/CON-1	10A	A/Con Relay
A/CON-2	10A	A/Con Control Module, Blower Motor
ECU B	10A	ECM
HORN	10A	Horn Relay, Siren Relay
SNSR	10A	A/Con Relay, RAD Fan Relay, Cond Fan Relay-1, -2
COND	30A	RAD Fan Relay, Cond Fan Relay-1, -2

※ USE THE DESIGNATED FUSE ONLY

Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Repair procedures

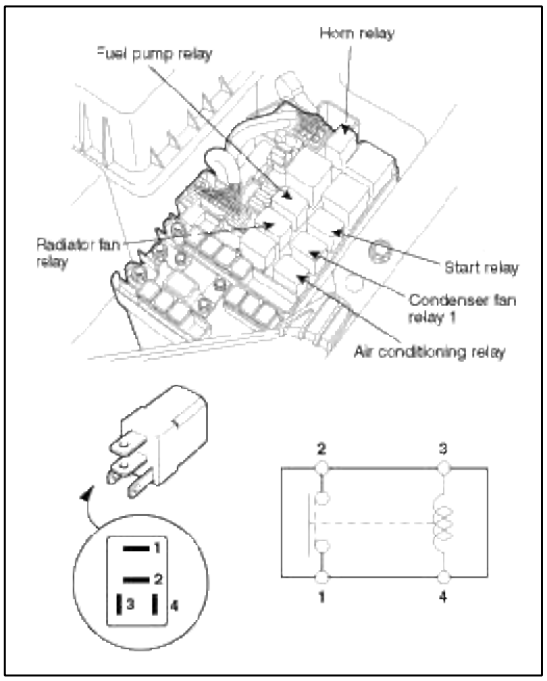
INSPECTION

POWER RELAY (TYPE A)

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.4 terminals.

2. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.

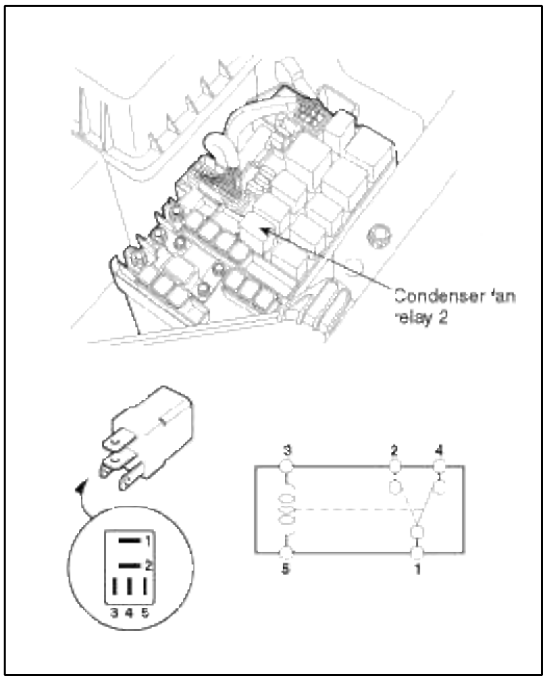


Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○	○
Connected	○	○	⊖	⊕

POWER RELAY (TYPE B)

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.5 terminals.
2. There should be continuity between the No.1 and No.4 terminals when power is disconnected.

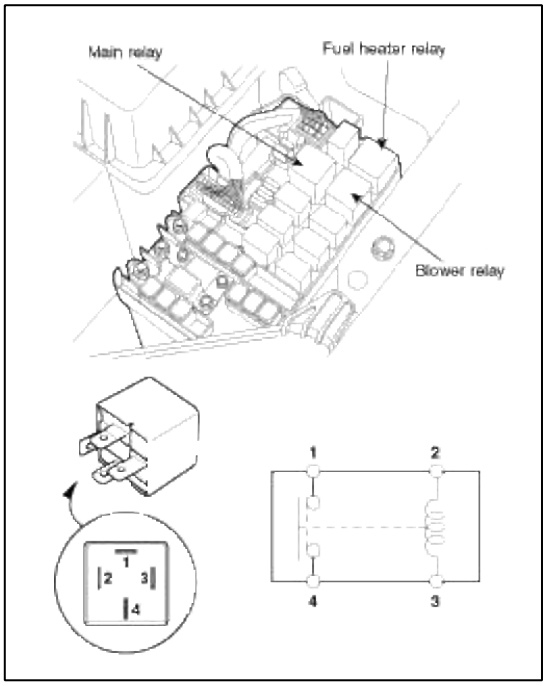


Terminal / Power (No.3-No.5)	3	5	1	2	4
Disconnected			○		○
Connected	⊖	⊕	○	○	

POWER RELAY (TYPE C)

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.4 terminals when power and ground are connected to the No.2 and No.3 terminals.
2. There should be no continuity between the No.1 and No.4 terminals when power is disconnected.



Terminal / Power (No.2-No.3)	2	3	1	4
Disconnected	○	○		
Connected	⊖	⊕	○	○

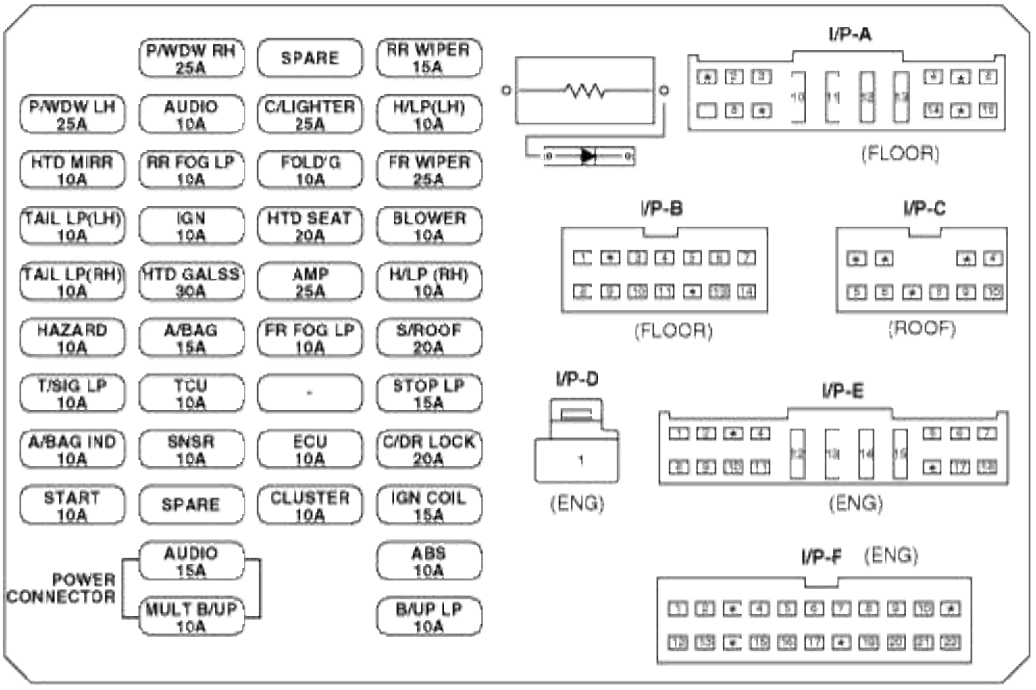
FUSE

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.

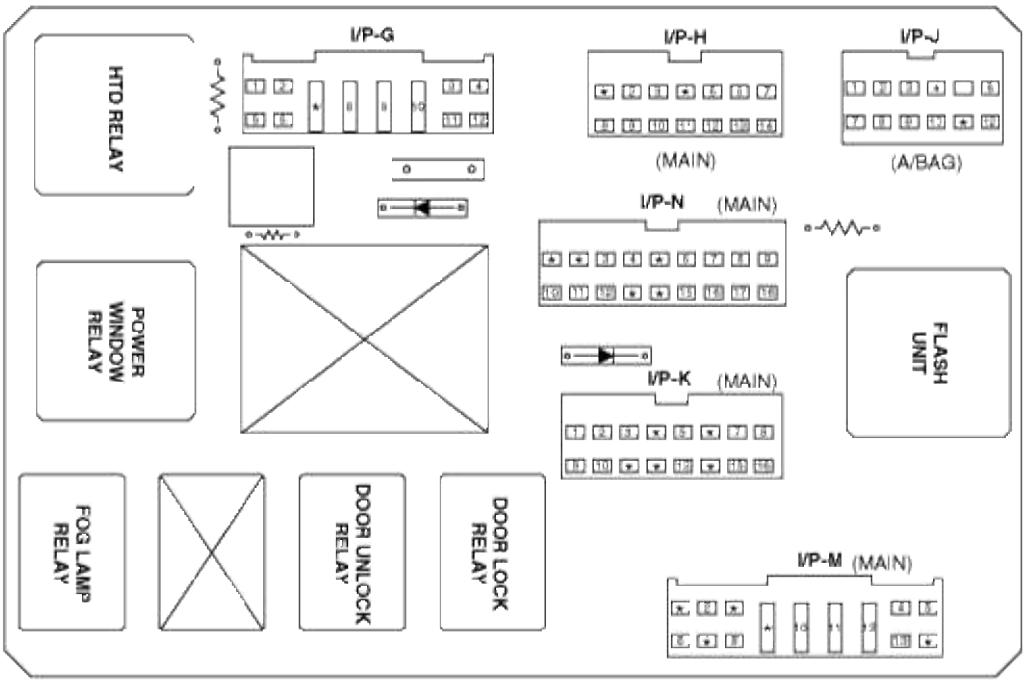
Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Components and Components Location

COMPONENTS

< FRONT>



<REAR>



※ USE THE DESIGNATED FUSE ONLY

CIRCUIT

FUSE	(A)	Circuit Protected
P/WDW RH	25A	Front Power Window Switch, Rear Power Window Switch RH,Front power window Switch RH Rear Power Window Switch LH,
P/WDW LH	25A	Front Power Window Switch LH
AUDIO	10A	Power Outside Mirror & Mirror Folding Switch, Audio, Digital Clock
C/LIGHTER		Cigarette Lighter, Power Outlet
H/LP (LH)	10A	Head Lamp LH
HTD MIRR	10A	ECM, Power Outside Mirror & Mirror Folding Motor LH, Power Outside Mirror & Mirror Folding Motor RH, Rear Defogger Switch
RR WIPER	15A	Rear Wiper Motor, Multifunction Switch
FR WIPER	25A	Multifunction Switch, Front Wiper Motor
TAIL LP (LH)	10A	Rear Combi Lamp LH, License Lamp LH, Head Lamp LH, Side Mark Lamp LH
IGN	10A	Defogger Timer
HTD SEAT	20A	Seat Warmer Switch LH, Seat Warmer Switch RH
BLOWER	10A	BCM, A/C Control Module, AQS Sensor, Sunroof Motor, E/R Fuse & Relay Box
TAIL LP (RH)	10A	Rear Combi Lamp RH, License Lamp RH, Head Lamp RH, Side Mark Lamp RH
HTD GLASS	30A	Defogger Timer, BCM, Rear Defogger Switch
AMP	25A	Audio
H/LP (RH)	10A	Head Lamp RH, Instrument Cluster, DRL Control Modu e
HAZARD	10A	ICM Relay Box, Hazard Switch, BCM, Multifunction Switch
A/BAG	15A	SRS control Module
FR FOG LP	10A	Front Fog Lamp LH, Front Fog Lamp RH, Front Fog Lamp Switch
S/ROOF	20A	Sunroof Motor, AMP
T/SIG LP	10A	Hazard Switch
TCU	10A	Vehicle Speed Sensor, Over Driver Switch
STOP LP	15A	Multipur Pose Check Connector, Stop Lamp Switch, Data Link Connector
A/BAG IND	10A	Instrument Cluster
ECU	10A	ECM
C/DR LOCK	20A	Front Door Lock Actuator LH, Front Door Lock Actuator RH, Rear Door Lock Actuator LH, Rear Door Lock Actuator RH, Front Door Lock Switch, BCM, Tailgate Lock Actuator
START	10A	Start Relay
CLUSTER	10A	BCM, Instrument Cluster, Defogger Timer, Alternator, Tire Pressure Monitoring Module
ING COIL	15A	Ignition Coil-1, -2, -3, -4, Condensor
AUDIO	15A	Audio
MULT B/UP	10A	Luggage Lamp, Center Room Lamp, Driver Sunvisor Lamp, Overhead Consol Lamp, Front Room Lamp, Digital Clock, BCM, A/C Control Module, Door Warning, Instrument Cluster, Piezo Buzzer, Power Outside Mirror & Mirror Folding Switch
ABS	10A	ABS Control Module
B/UP LP	10A	Back-up Lamp Switch, Transaxle Range Switch
RR FOG LP	10A	DRL Control
SNSR	10A	OCS Module, Telltale Lamp

※ USE THE DESIGNATED FUSE ONLY

Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Repair procedures

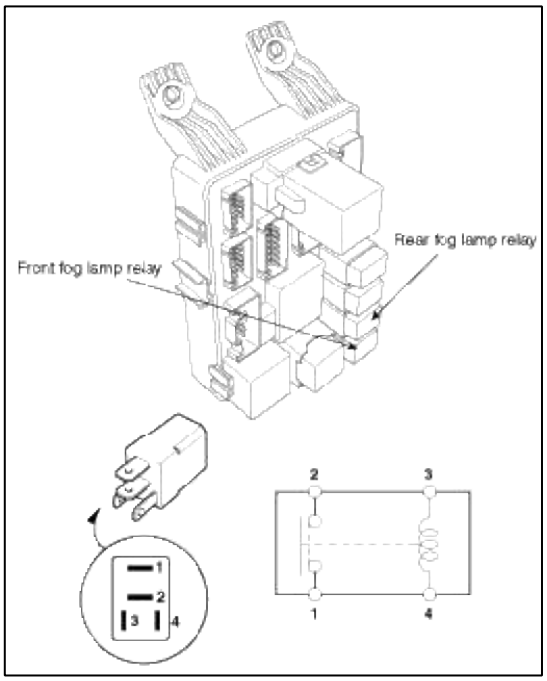
INSPECTION

POWER RELAY (TYPE A)

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.4 terminals.

2. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.

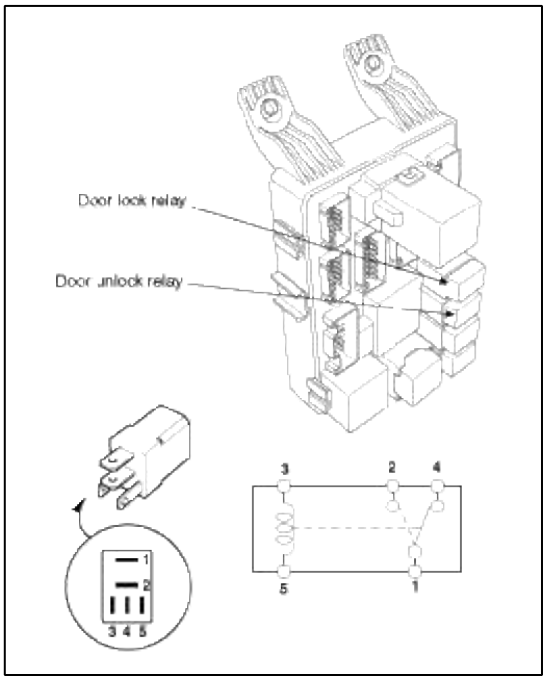


Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○ ——— ○	
Connected	○ ——— ○		⊖ ——— ⊕	

POWER RELAY (TYPE B)

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.5 terminals.
2. There should be continuity between the No.1 and No.4 terminals when power is disconnected.

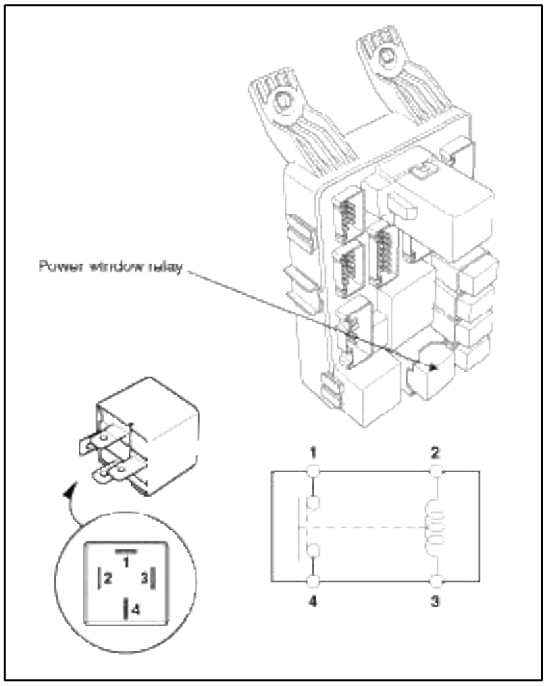


Terminal / Power (No.3-No.5)	3	5	1	2	4
Disconnected			○ ——— ○		
Connected	⊖ ——— ⊕		○ ——— ○		

POWER RELAY (TYPE C)

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.4 terminals when power and ground are connected to the No.2 and No.3 terminals.
2. There should be no continuity between the No.1 and No.4 terminals when power is disconnected.



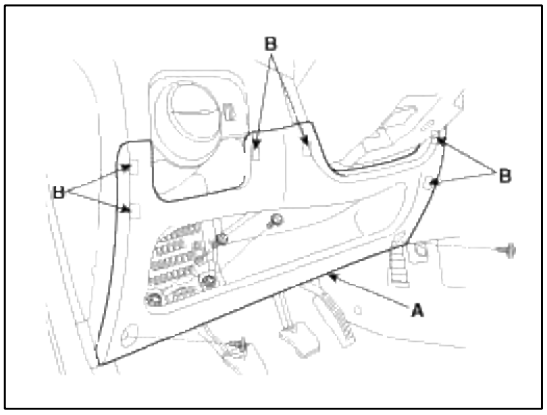
Terminal / Power (No.2-No.3)	2	3	1	4
Disconnected	○	○		
Connected	⊖	⊕	○	○

FUSE

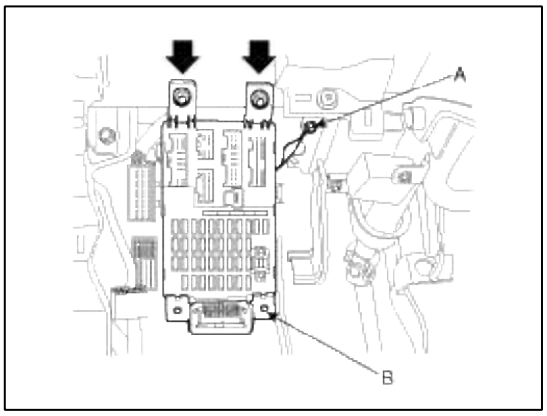
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?
   If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely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

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A)(Refer to the Body group - crash pad). Avoid damaging retaining clips (B).



3. Disconnect the connectors of junction box and loosen the ground cable (A).

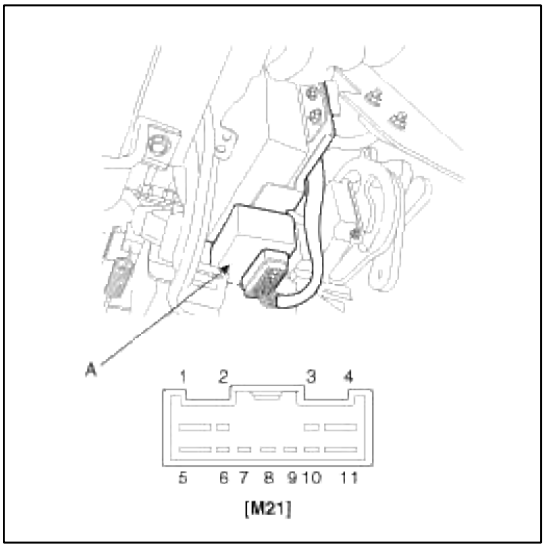


4. Remove the junction box (B) after loosening the mounting nuts (2EA).
5. Installation is the reverse of removal procedures.

Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Description and Operation

DESCRIPTION

The ICM is united with many kinds of relays and installed below the body control module.



Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Repair procedures

INSPECTION

HAZARD LAMP RELAY

Check for continuity between the terminals.

1. There should be continuity between the No.8 and No.6 terminals when power and ground are connected to the No.8 and No.9 terminals.
2. There should be no continuity between the No.8 and No.6 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.4 terminals when power and ground are connected to the No.11 and No.3 terminals.
2. There should be no continuity between the No.11 and No.4 terminals when power is disconnected.

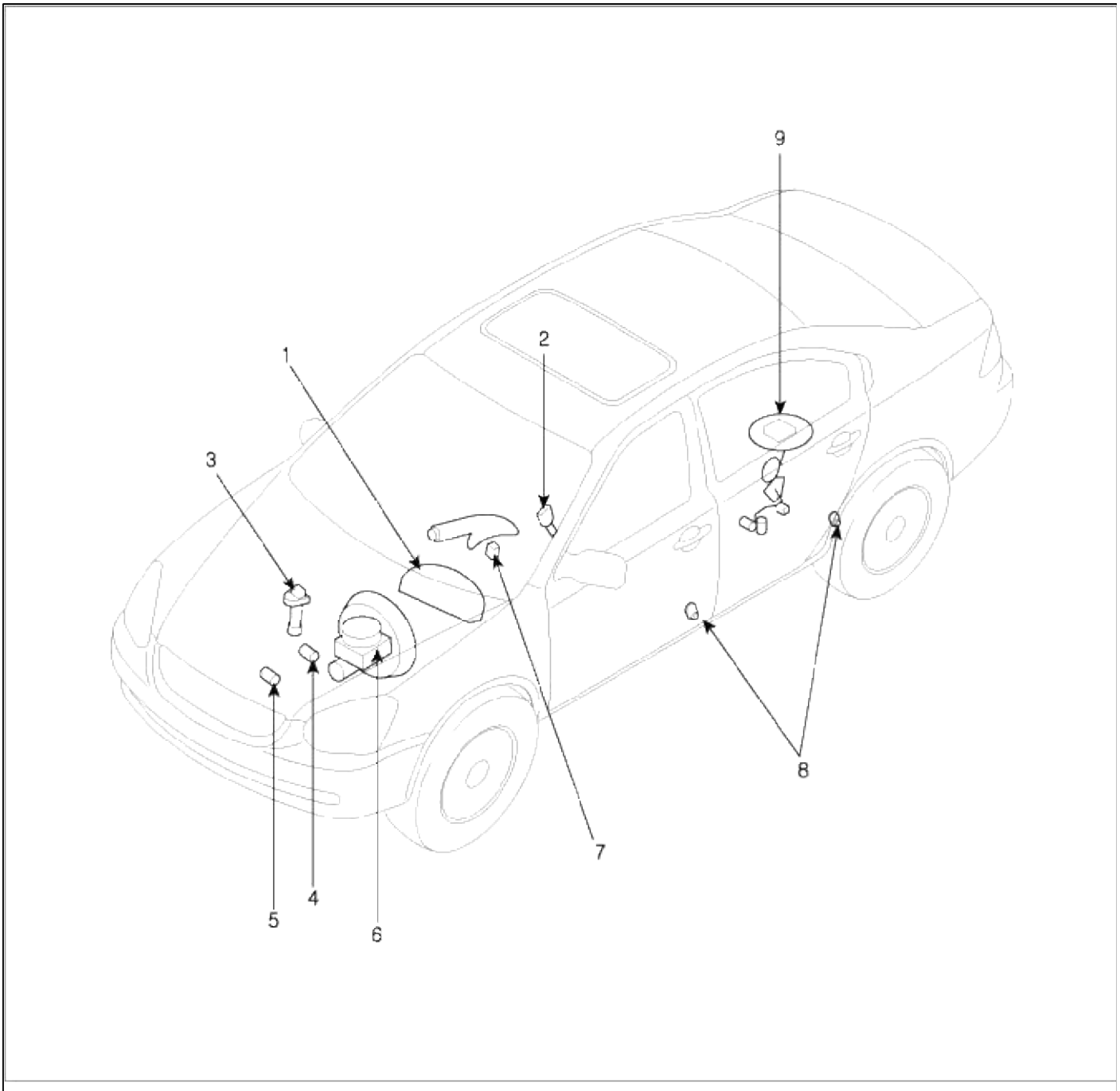
BURGLAR ALARM

Check for continuity between the terminals.

1. There should be no continuity between the No.1 and No.5 terminals when power and ground are connected to the No.1 and No.2 terminals.
2. There should be continuity between the No.1 and No.5 terminals when power is disconnected.

Body Electrical System > Indicators And Gauges > Components and Components Location

COMPONENT LOCATION



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

Body Electrical System > Indicators And Gauges > Troubleshooting

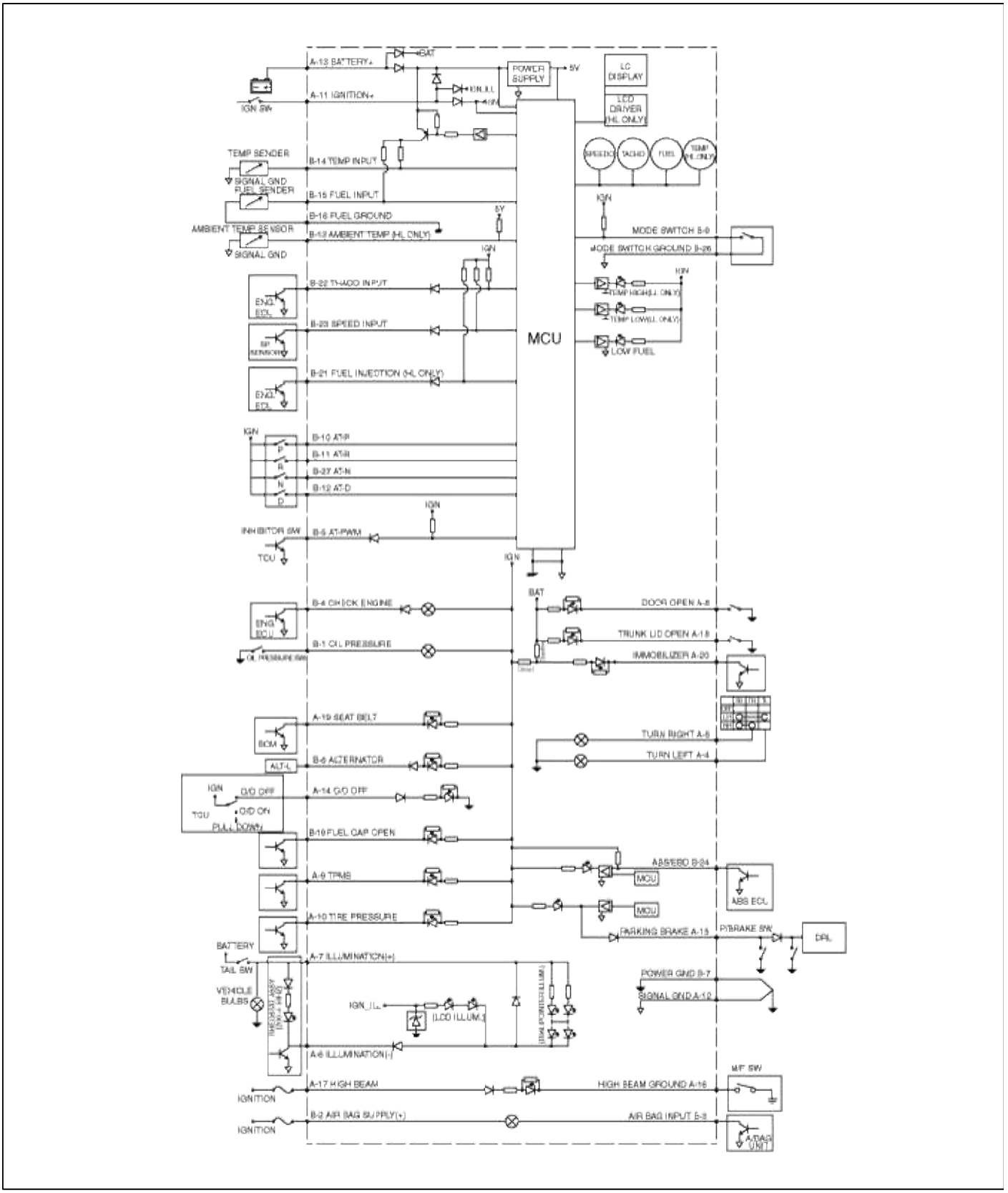
TROUBLESHOOTING

Symptom	Possible cause	Remedy
Speedometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Speedometer faulty	Check speedometer
	Vehicle speed sensor faulty	Check vehicle speed sensor
	Wiring or ground faulty	Repair if necessary
Tachometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Tachometer faulty	Check tachometer
	Wiring or ground faulty	Repair if necessary
Fuel gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Fuel gauge faulty	Check gauge
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Low fuel warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Water temperature gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Water temperature gauge faulty	Check gauge
	Water temperature sender faulty	Check sender
	Wiring or ground faulty	Repair if necessary
Oil pressure warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	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 trunk lid warning lamp do not light up	Multi backup 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

Body Electrical System > Indicators And Gauges > Instrument Cluster > Schematic Diagrams

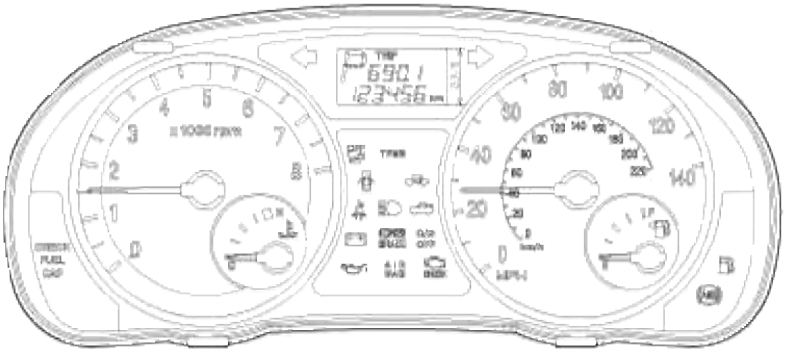
CIRCUIT DIAGRAM



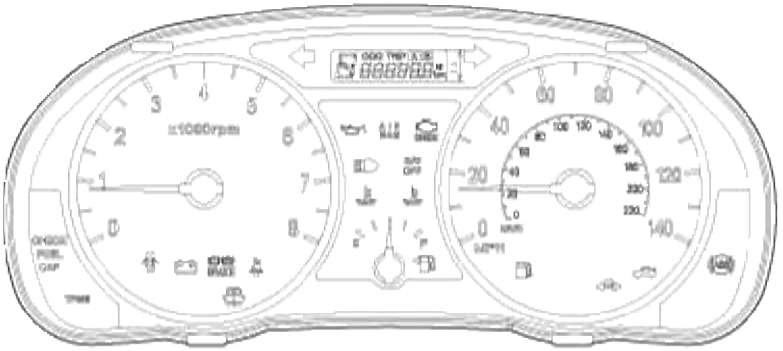
Body Electrical System > Indicators And Gauges > Instrument Cluster > Components and Components Location

COMPONENTS

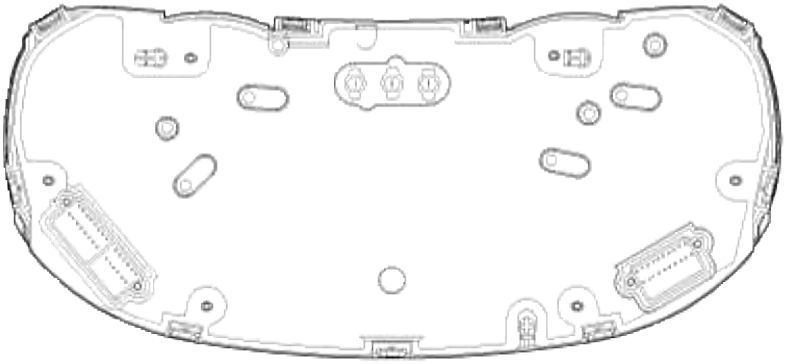
[USA]

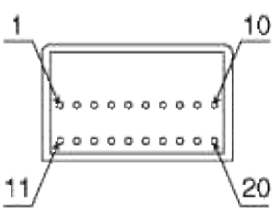


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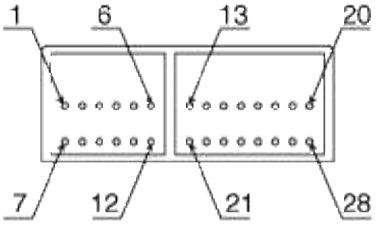


<Low-model>





M09-1(A)

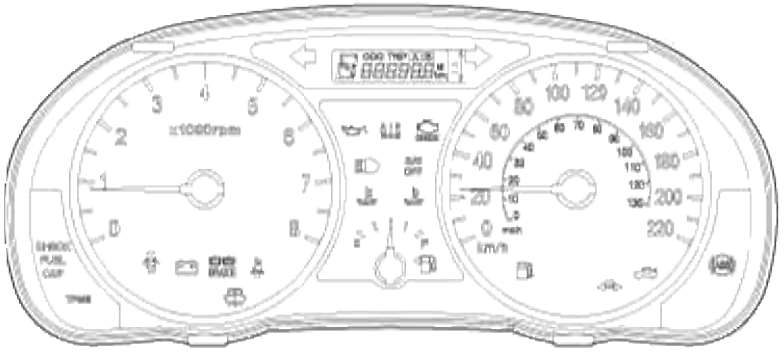


M09-2(B) M09-3(B)

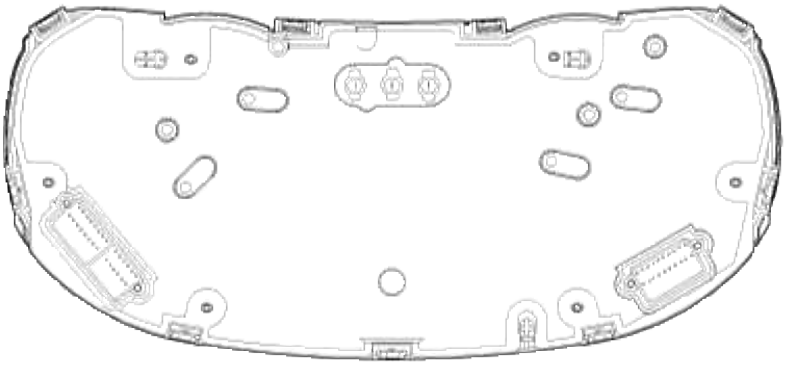
[CANADA]

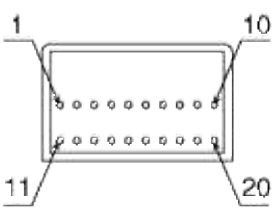


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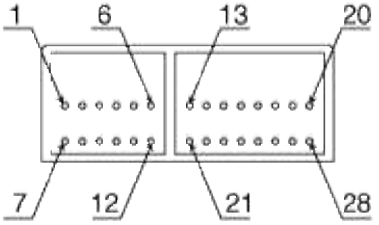


<Low-model>





M09-1(A)



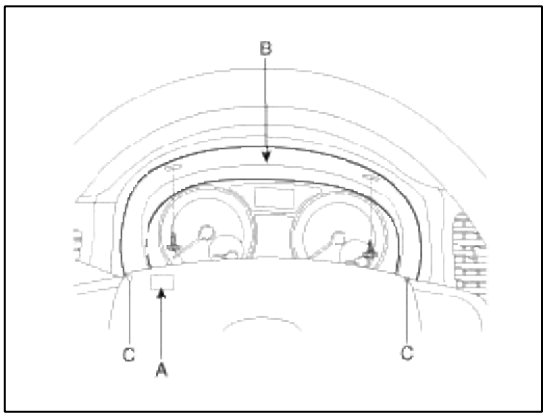
M09-2(B) M09-3(B)

Body Electrical System > Indicators And Gauges > Instrument Cluster > Repair procedures

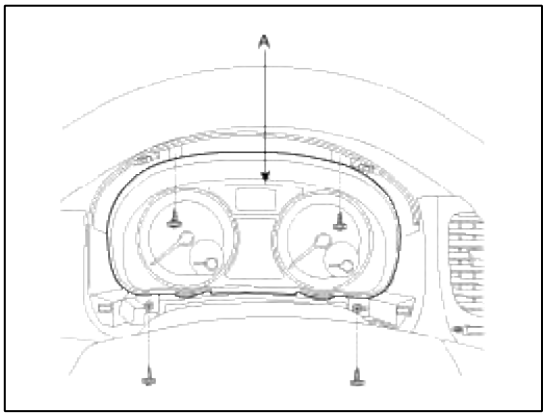
REPLACEMENT

1. Disconnect the negative (-) battery terminal.

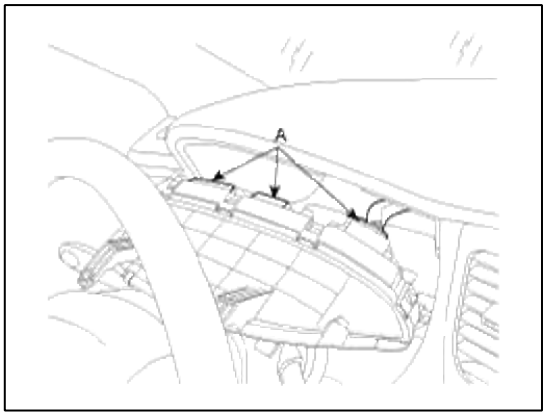
2. Remove the cluster facia panel (B) after disconnecting the connector of trip switch (A) and loosening the 2 screws take care of fixing clips(C).



3. Pull out the cluster (A) from the housing after removing 4 screws.



4. Disconnect the cluster connecter (A) and then remove the cluster.



5. Installation is the reverse of removal.

INSPECTION

SPEEDOMETER

1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks as appropriate.

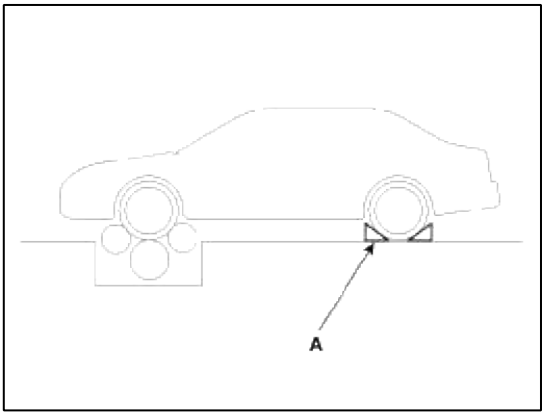
3. Check if the speedometer indicator range is within the standard values.

CAUTION

Do not operate the clutch suddenly or increase/ decrease speed rapidly while testing.

NOTE

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



[CANADA - km/h]

Velocity (km/h)	20	40	60	80	100
Tolerance (km/h)	+4.1 +0.7	+4.2 +1.3	+6.1 +1.9	+7.0 +2.6	+7.8 +3.2
Velocity (km/h)	120	140	160	180	200
Tolerance (km/h)	+8.5 +3.9	+9.3 +4.5	+10.2 +5.2	+10.8 +5.8	+11.4 +6.4

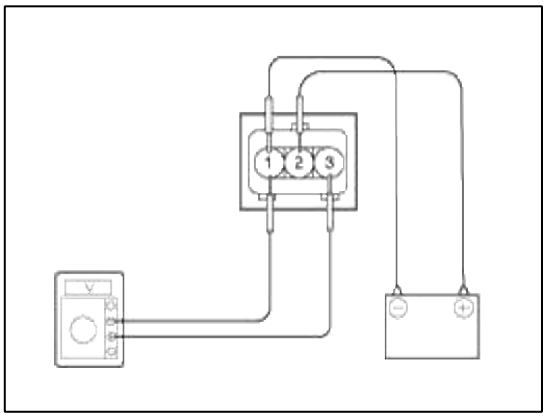
[MPH]

Velocity (MPH)	10	20	40	60
Tolerance (MPH)	+2.8 +0.4	+3.7 +0.7	+5.0 +1.4	+6.0 +2.0
Velocity (MPH)	80	100	120	-
Tolerance (MPH)	+6.6 +2.6	+7.2 +3.2	+7.9 +3.9	-

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.

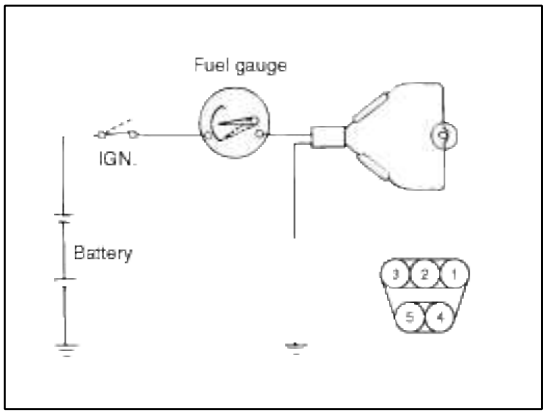
CAUTION

1) Reversing the connections of the tachometer will damage the transistor and diodes inside.
2) When removing or installing the tachometer, be careful not to drop it or subject it to severe shock.

Revolution(rpm)	1,000	2,000	3,000
Tolerance(rpm)	±100	±125	±150
Revolution(rpm)	4,000	5,000	6,000
Tolerance(rpm)	±170	±200	±240

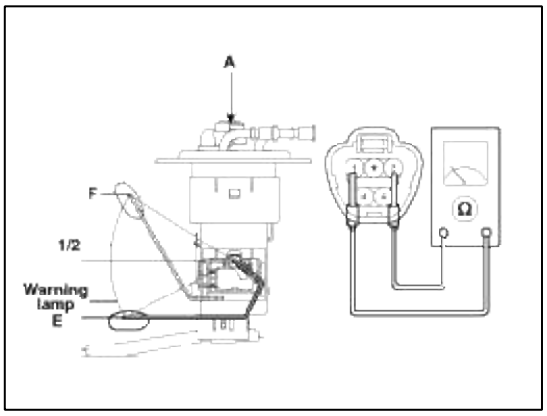
FUEL GAUGE

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

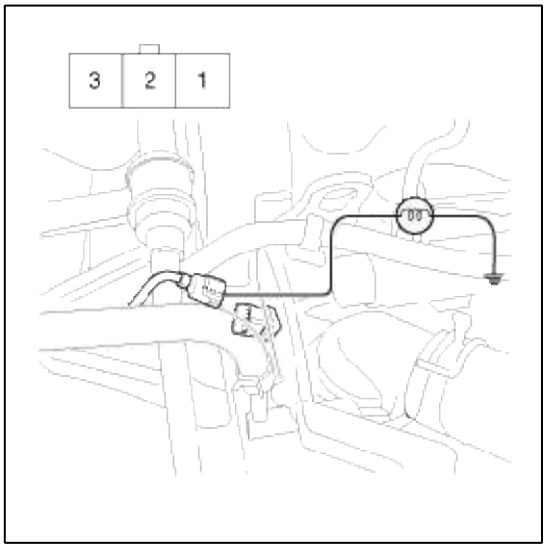
Position	Resistance(Ω)
Sender (E)	184 ± 2
Warning lamp	170 ± 2
1/2	66 ± 1
Sender (F)	15 ± 1

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 (Hi model)

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



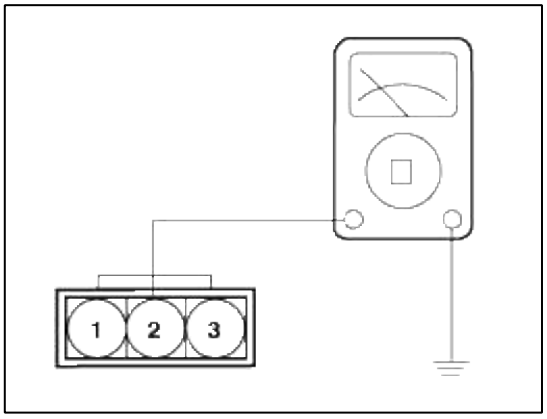
ENGINE COOLANT TEMPERATURE GAUGE (Low model)

1. Turn the ignition switch ON.

2. Check that the high temperature lamp (Red & Blue) is ON for 3 seconds and then the low temperature lamp (Blue) is ON.
3. If operation is not as specified, replace the cluster. 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.

Hi model

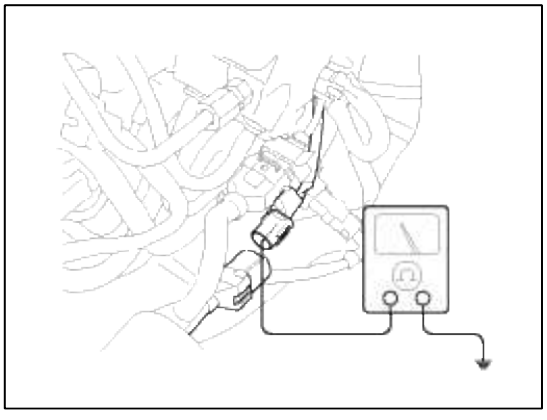
Temperature [°F(°C)]	140 (60)	185 (85)	230 (110)	257 (125)
Resistance (Ω)	142	62	21.5	16.5

Low model

Temperature [°F(°C)]	Resistance (Ω)	Tolerance	Lamp
131 (55)	160	± 3°C	Low temperature lamp (ON)
140 (60)	133	± 3°C	Low temperature lamp (OFF)
248 (120)	18.5	± 3°C	High temperature lamp (OFF)
253 (123)	16.5	± 3°C	High temperature lamp (ON)

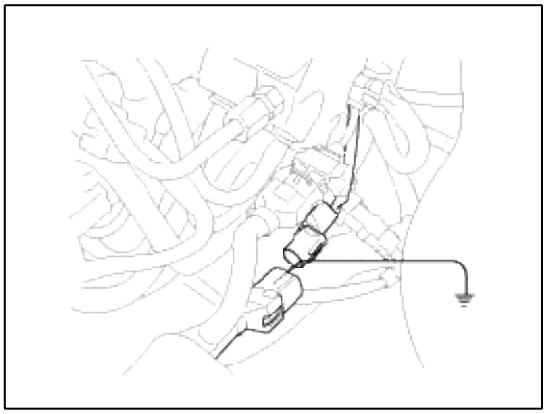
OIL PRESSURE SWITCH

1. Check that there is continuity between the oil press 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.



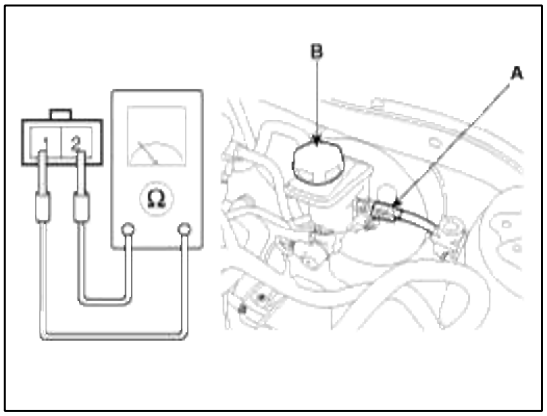
OIL PRESSURE WARNING LAMP

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 (B).
2. Verify that continuity exists between switch terminals 1 and 2 while pressing the switch (float) down with a rod.



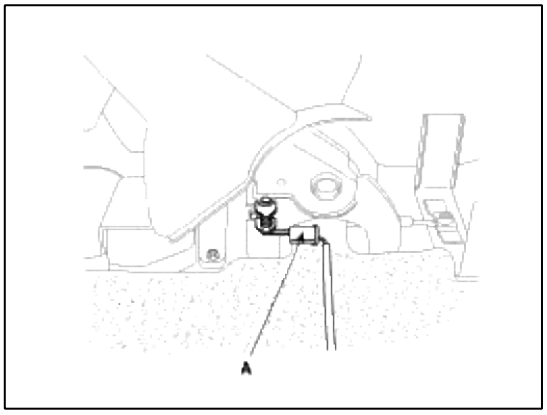
BRAKE FLUID LEVEL WARNING LAMP

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

PARKING BRAKE SWITCH

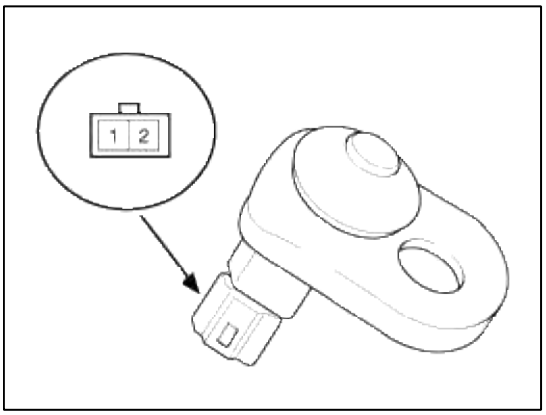
The parking brake switch (A) is a pulling type. It is located under the parking brake lever. To adjust, move the switch mount up and down with the parking brake lever released all the way.

1. Check that there is continuity between the terminal and switch body with the switch ON (Lever is pulled).
2. Check that there is no continuity between the terminal and switch body with the switch OFF (Lever is released). If continuity is not as specified, replace the switch or inspect its ground connection.



DOOR SWITCH

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

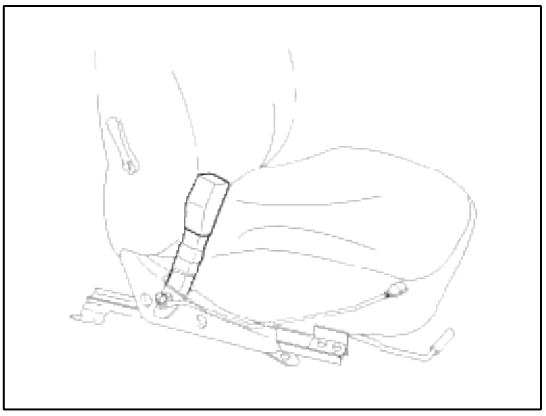


Terminal / Position	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

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

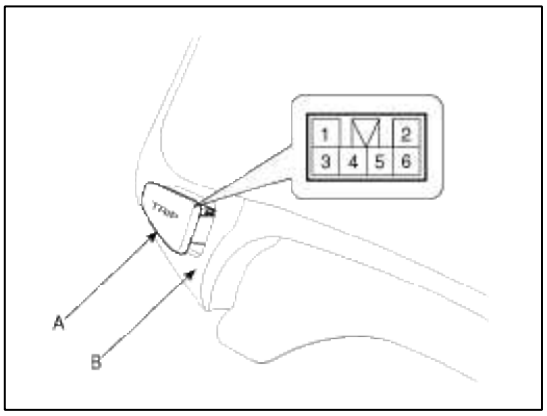
With the ignition switch turned ON, verify that the lamp glows.

Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

TRIP SWITCH

1. Disconnect the negative (-) battery terminal.

2. Remove the trip switch (A) from the cluster facia panel (B).

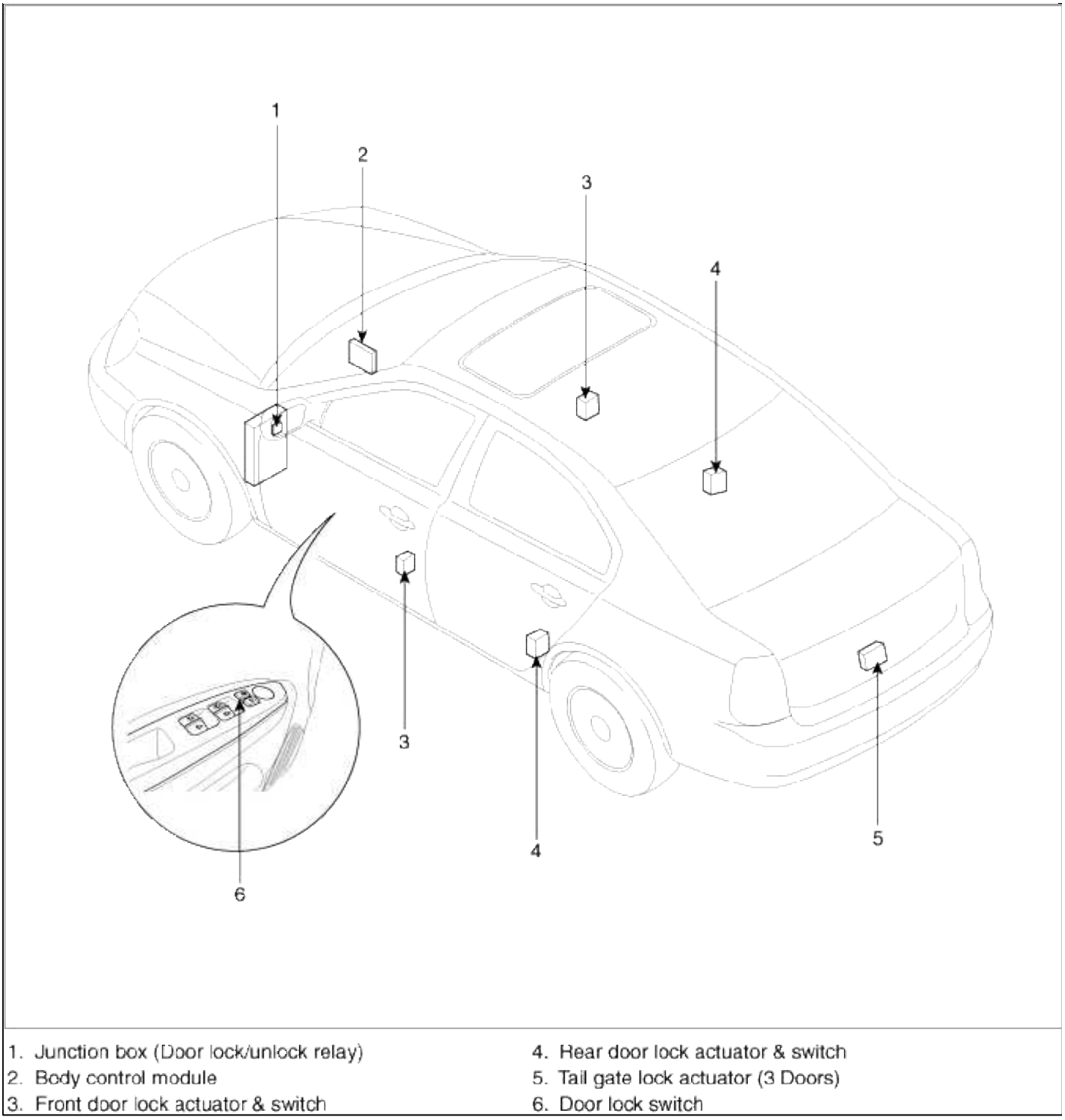


3. Check for continuity between the terminals in each switch position according to the table.

Termina / Position	3	6	4	5
ON		Illumination		
OFF				

Body Electrical System > Power Door Locks > Components and Components Location

COMPONENT LOCATION



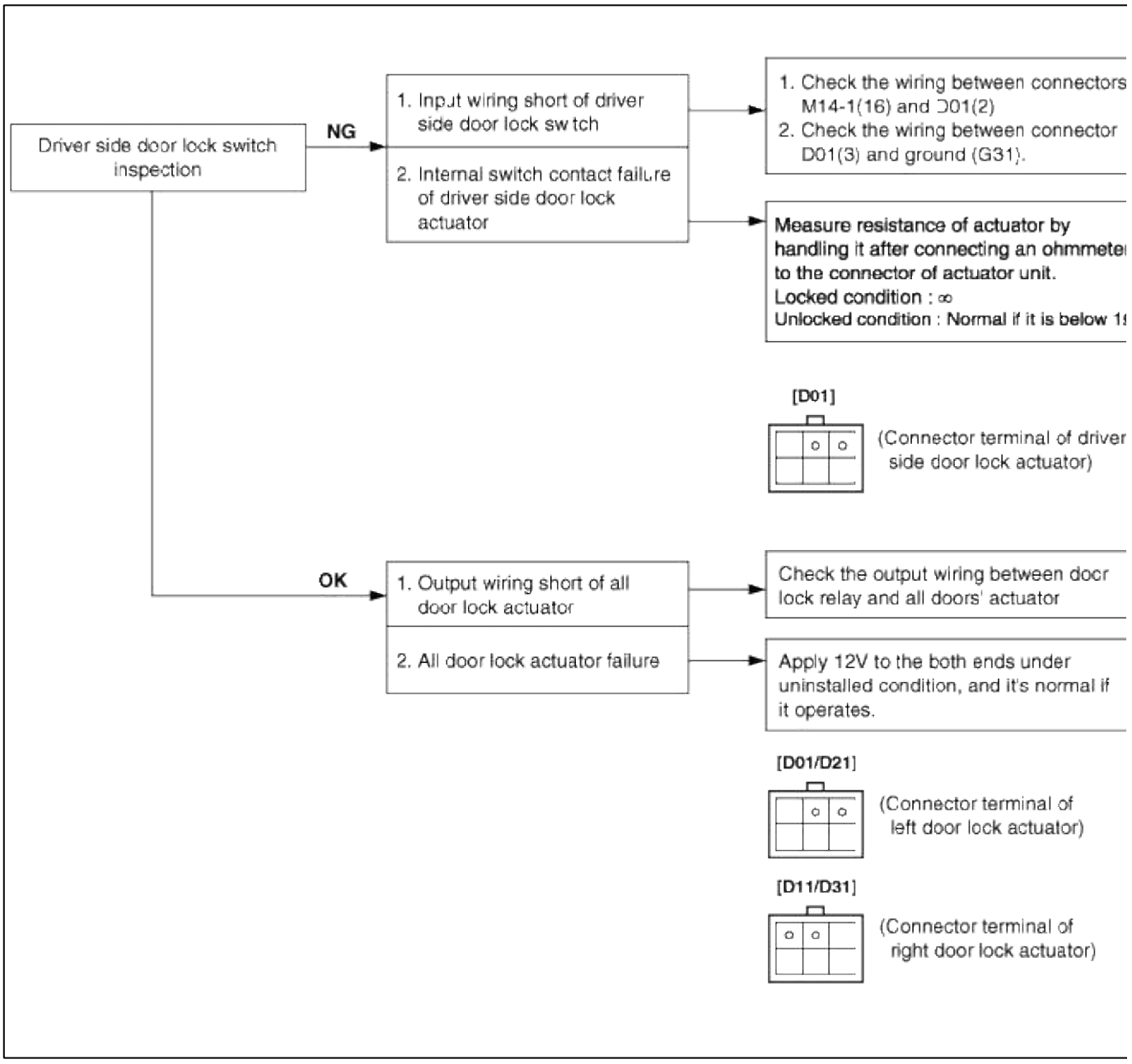
1. Junction box (Door lock/unlock relay)
2. Body control module
3. Front door lock actuator & switch
4. Rear door lock actuator & switch
5. Tail gate lock actuator (3 Doors)
6. Door lock switch

Body Electrical System > Power Door Locks > Troubleshooting

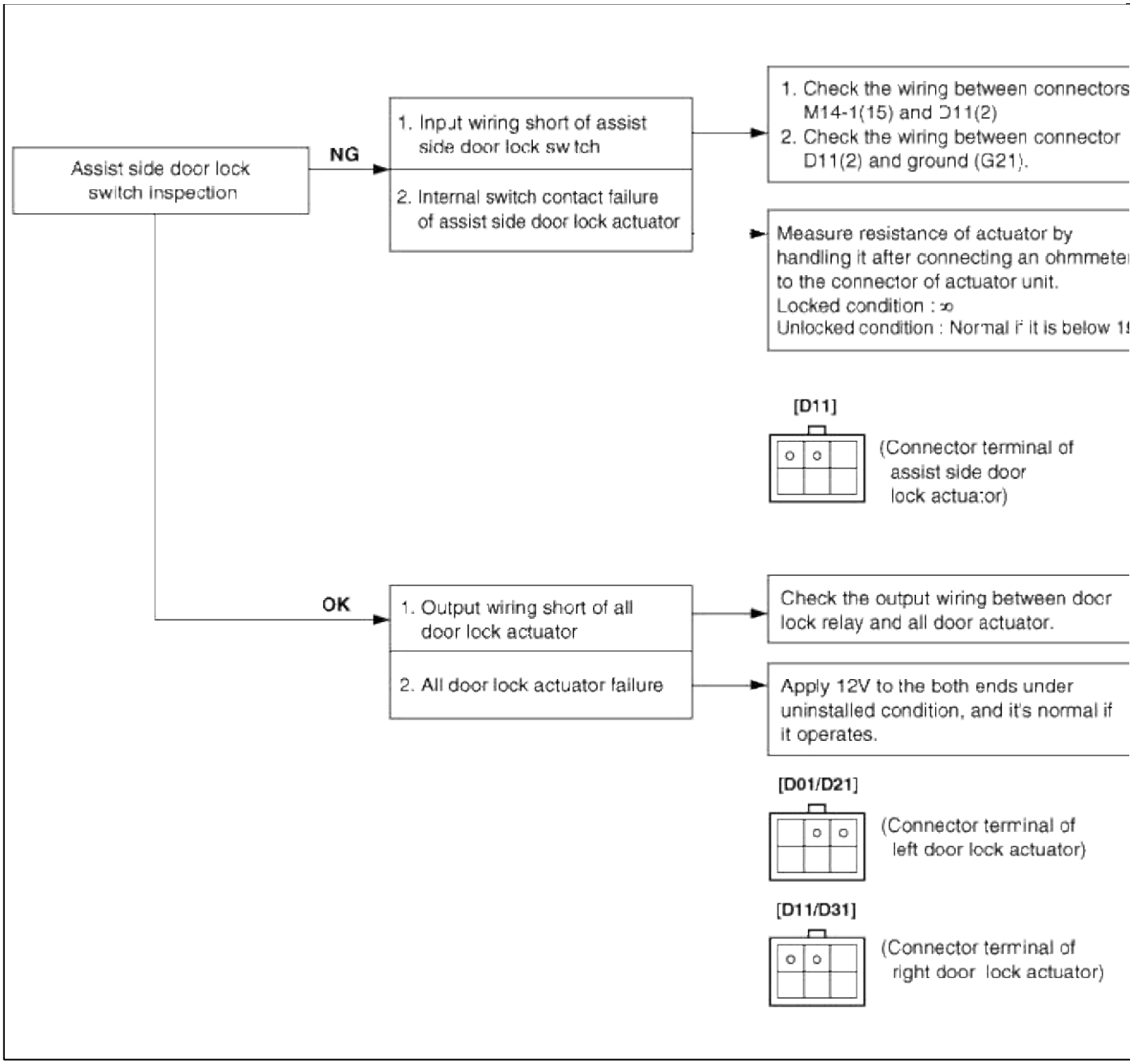
TROUBLESHOOTING

1. Lock function works but unlock function does not work. → Since door unlock relay is malfunction, replace the door unlock relay.
2. Unlock function works but lock function does not work. → Since door lock relay is malfunctioning, replace the door lock relay.

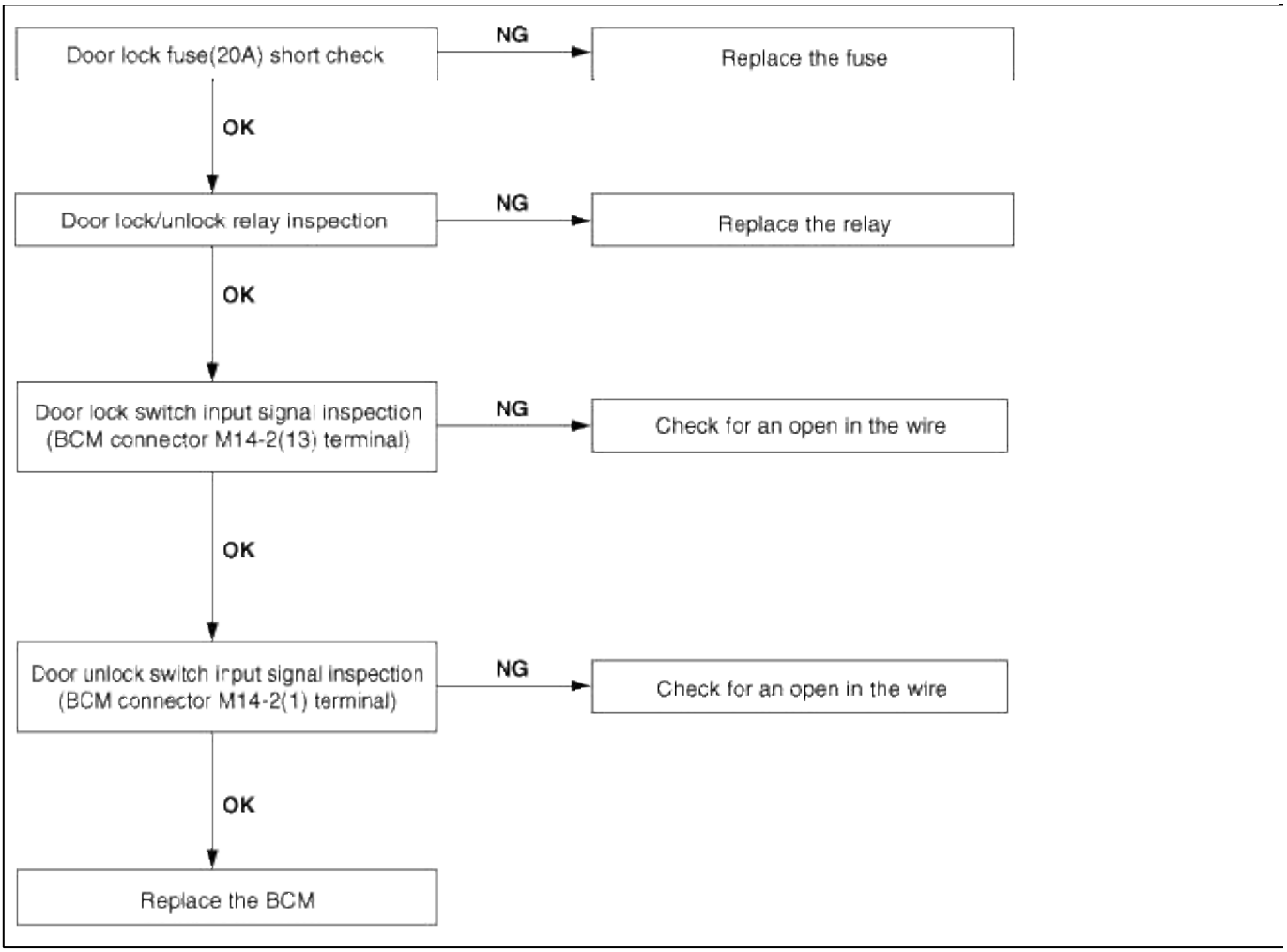
3. When Assist side knob is controlled, all doors locks, but when driver side knob is controlled, all doors do not locl



4. When driver side knob is controlled. All doors lock. But when the Assist side knob is controlled, all doors do not lock.



5. Both sides do not lock either.

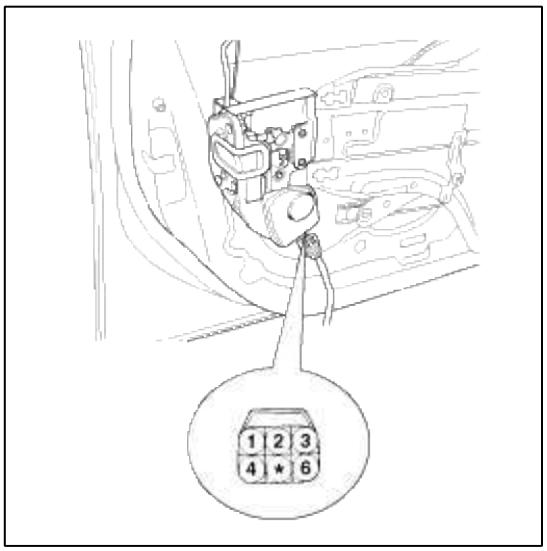


Body Electrical System > Power Door Locks > Power Door Lock Actuators > Repair procedures

INSPECTION

FRONT DOOR LOCK ACTUATOR

1. Remove the front door trim panel. (Refer to the Body group - front door)
2. Disconnect the 6P connector from the actuator.

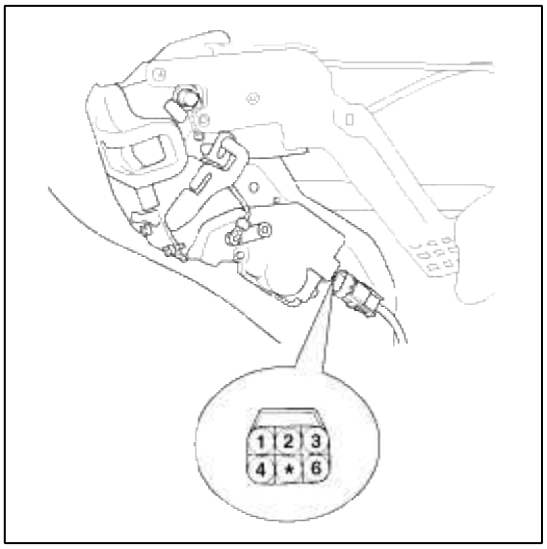


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		4	6
Right	Lock	⊖	⊕
	Unlock	⊕	⊖
Left	Lock	⊕	⊖
	Unlock	⊖	⊕

REAR DOOR LOCK ACTUATOR

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 6P connector from the actuator.

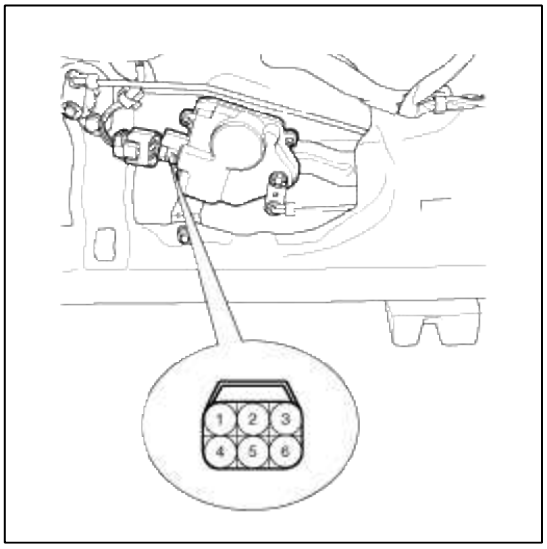


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		4	6
Right	Lock	⊖	⊕
	Unlock	⊕	⊖
Left	Lock	⊕	⊖
	Unlock	⊖	⊕

TAILGATE LOCK ACTUATOR (3 DOORS)

1. Remove the tailgate trim panel. (Refer to the Body group - tailgate)
2. Disconnect the 6P connector from the actuator.

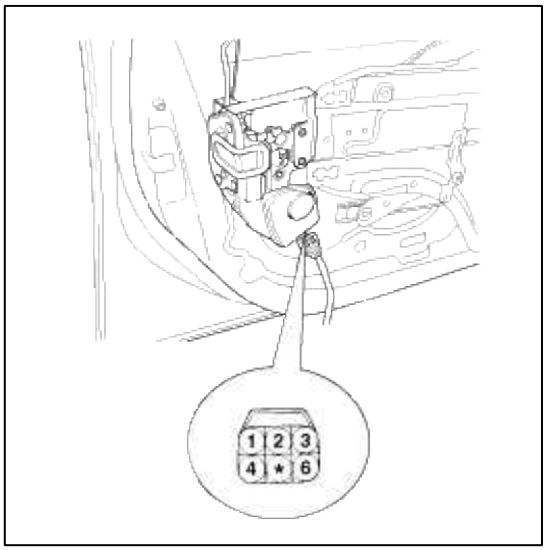


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal / Position	1	2
LOCK	⊕	⊖
UNLOCK	⊖	⊕

FRONT DOOR LOCK SWITCH

1. Remove the front door trim panel. (Refer to the Body group - front door)
2. Disconnect the 6P connector from the actuator.

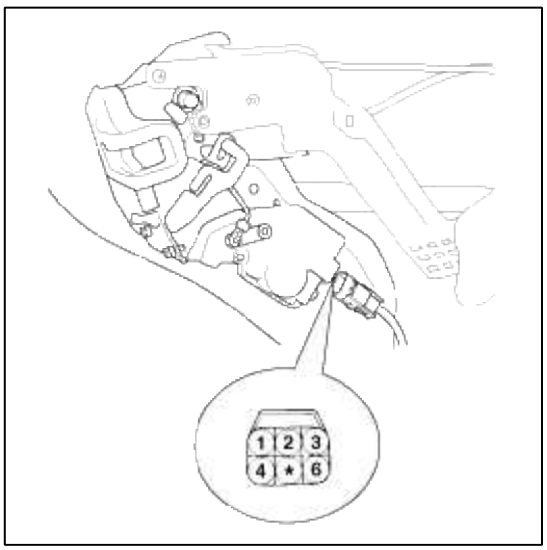


3. Check for continuity between the terminals in each switch position according to the table.

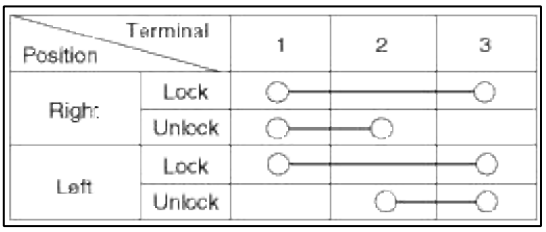
Position / Terminal		1	2	3
Right	Lock	○		○
	Unlock	○	○	
Left	Lock	○		○
	Unlock		○	○

REAR DOOR LOCK SWITCH

1. Remove the rear door trim panel. (Refer to the Body group - rear door)
2. Disconnect the 6P connector from the actuator.

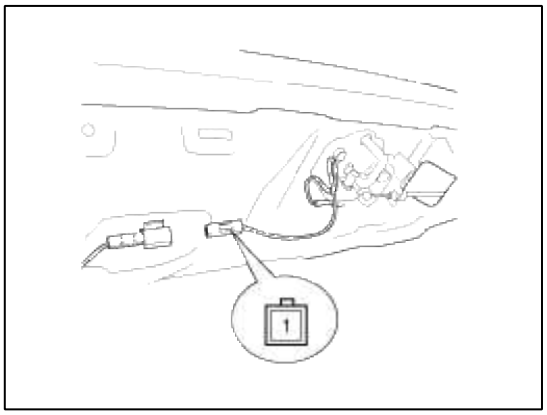


3. Check for continuity between the terminals in each switch position according to the table.



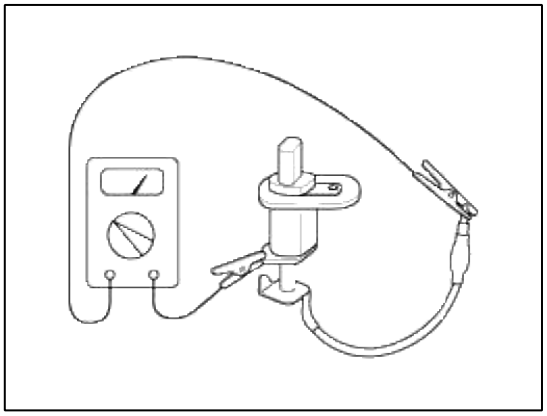
TRUNK LID SWITCH (4DOORS)

1. Disconnect the negative battery terminal.
2. Remove the rear trunk lid trim, and then remove the trunk lid switch from the trunk lid striker.



3. Disconnect the 1P connector from the rear harness.
4. Check for continuity between the terminal and body while pushing the rod.

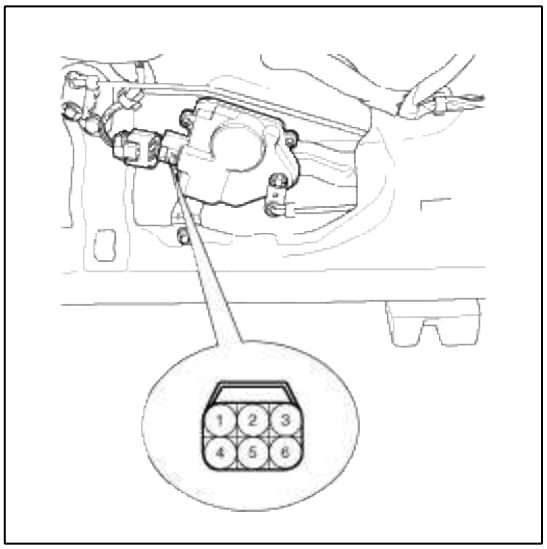
Switch rod condition	Continuity
Push (OFF)	Non-conductive (∞Ω)
Released (ON)	Conductive (0Ω)



TAILGATE LOCK SWITCH (3 DOORS)

1. Remove the tailgate trim panel. (Refer to the Body group - tailgate)

2. Disconnect the 6P connector from the actuator.



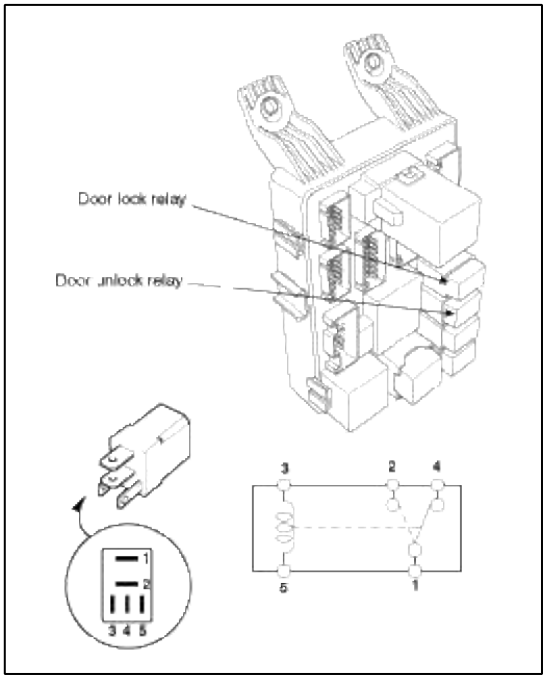
3. Check for continuity between the terminals in each switch position according to the table.

Terminal / Position	4	5	6
Unlock		○	○
Lock	○		○

Body Electrical System > Power Door Locks > Power Door Lock Relay > Repair procedures

INSPECTION

1. Remove the door lock/unlock relay from the junction box.
2. Check for continuity between the terminals.
3. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.5 terminals.
4. There should be continuity between the No.1 and No.4 terminals when power is disconnected.



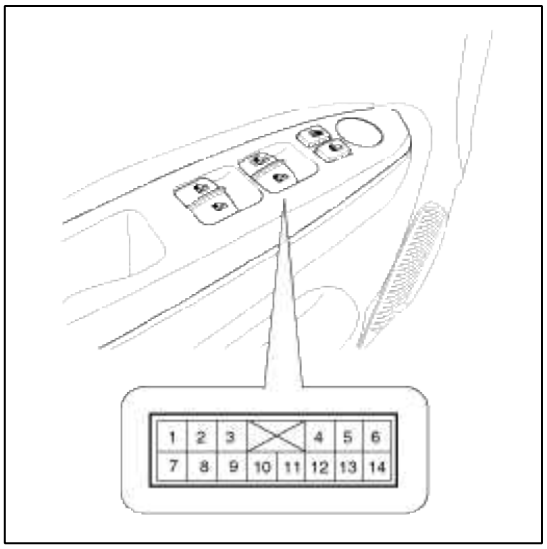
Terminal / Power (No.3-No.5)	3	5	1	2	4
Disconnected			○		○
Connected	⊖	⊕	○	○	

Body Electrical System > Power Door Locks > Power Door Lock Switch > Repair procedures

INSPECTION

DRIVER DOOR LOCK SWITCH

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group - front door)
3. Disconnect the 14P connector from the switch.

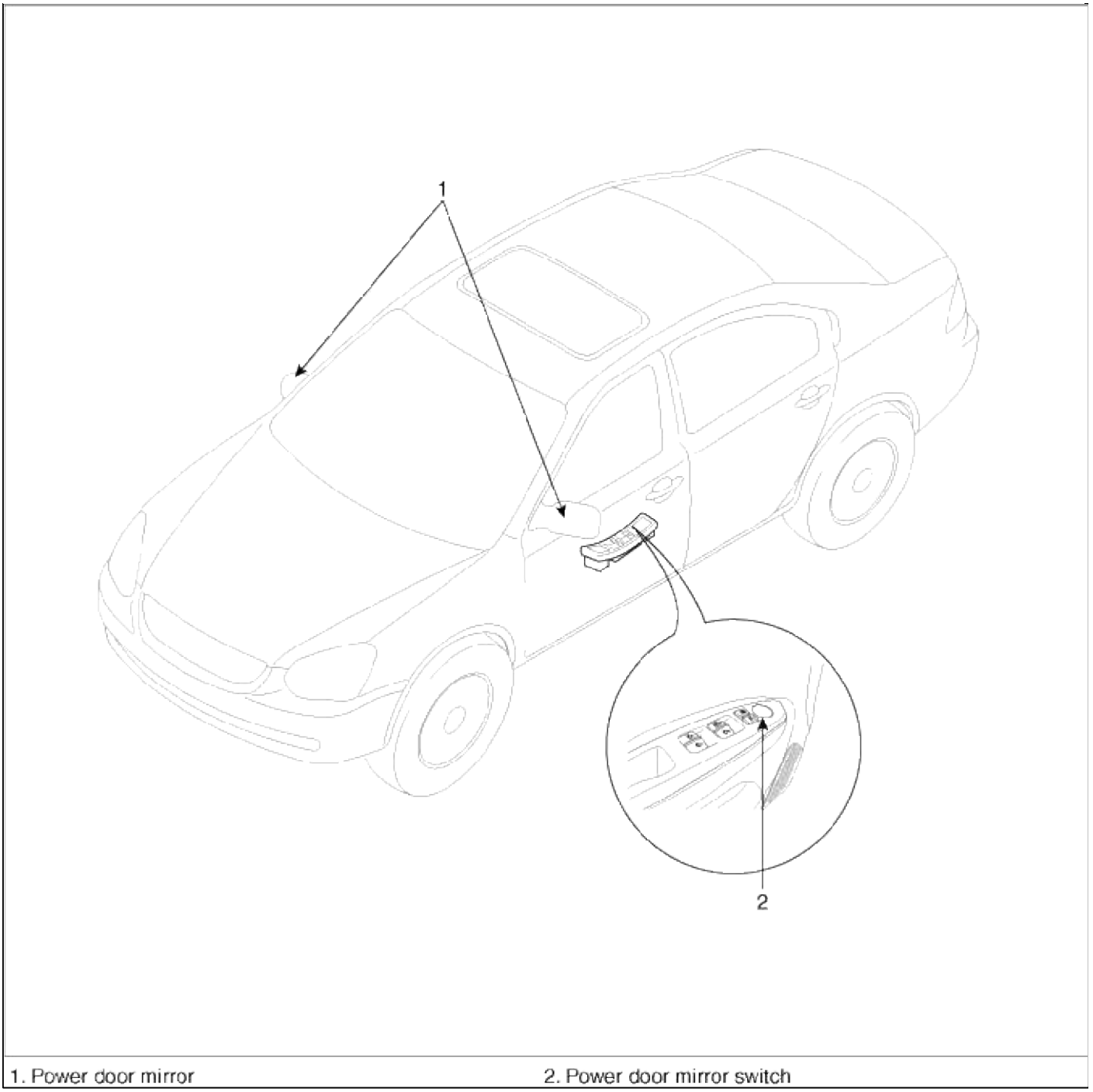


4. Check for continuity between the terminals in each switch position according to the table.

Terminal / Position	13	2	14
Lock		○——	——○
Unlock	○——	——○	

Body Electrical System > Power Door Mirrors > Components and Components Location

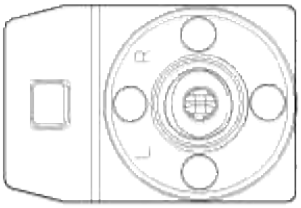
COMPONENT LOCATION

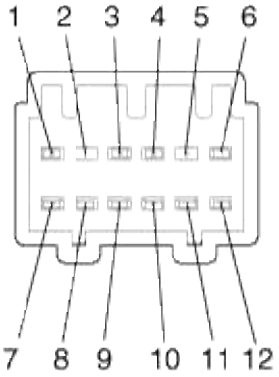


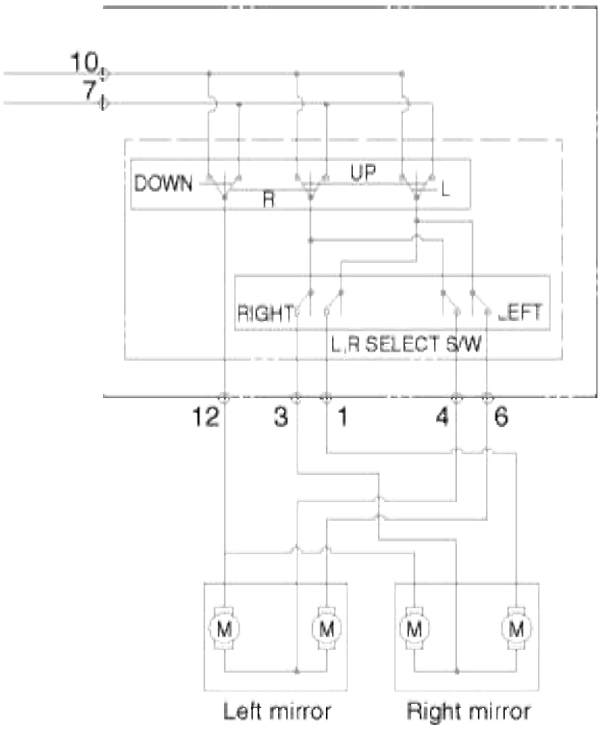
1. Power door mirror
2. Power door mirror switch

Body Electrical System > Power Door Mirrors > Power Out Side Mirror Switch > Schematic Diagrams

CIRCUIT DIAGRAM





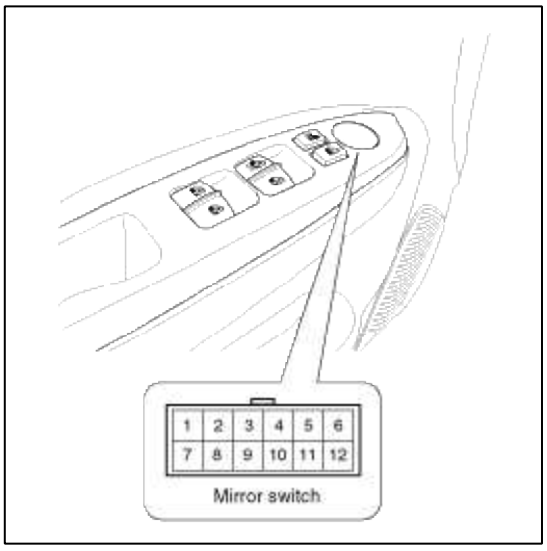


Body Electrical System > Power Door Mirrors > Power Out Side Mirror Switch > Repair procedures

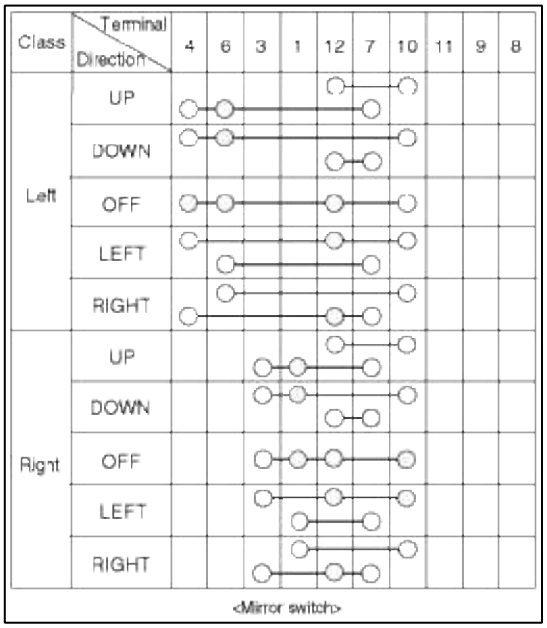
INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group-front door)

3. Disconnect the 12P connector from the switch.



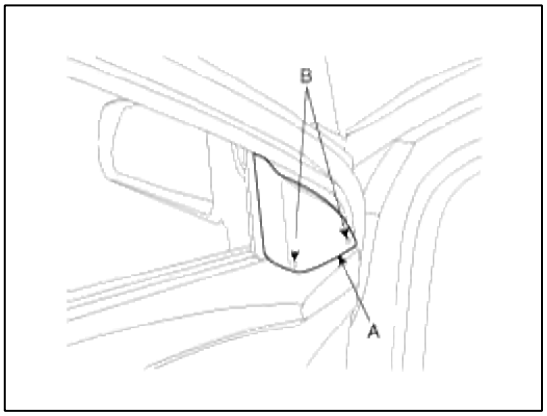
4. Check for continuity between the terminals in each switch position according to the table.



Body Electrical System > Power Door Mirrors > Power Door Mirror Actuator > Repair procedures

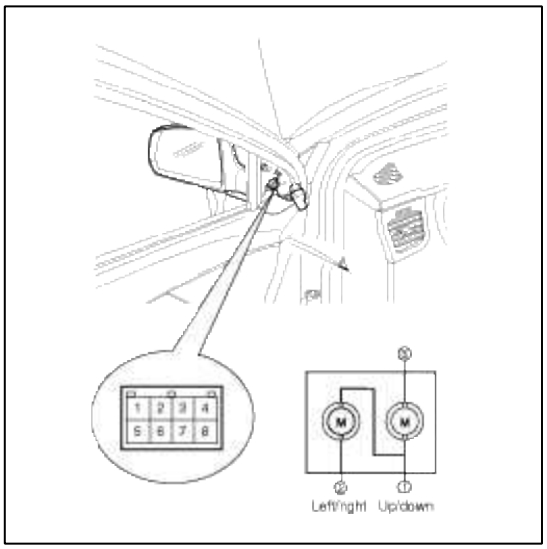
INSPECTION

1. Remove the front door quadrant inner cover (B) (Refer to the Body group - front door)
2. Remove the tweeter speaker after disconnecting the connector(A).



3. Disconnect the power door mirror connector from the harness.

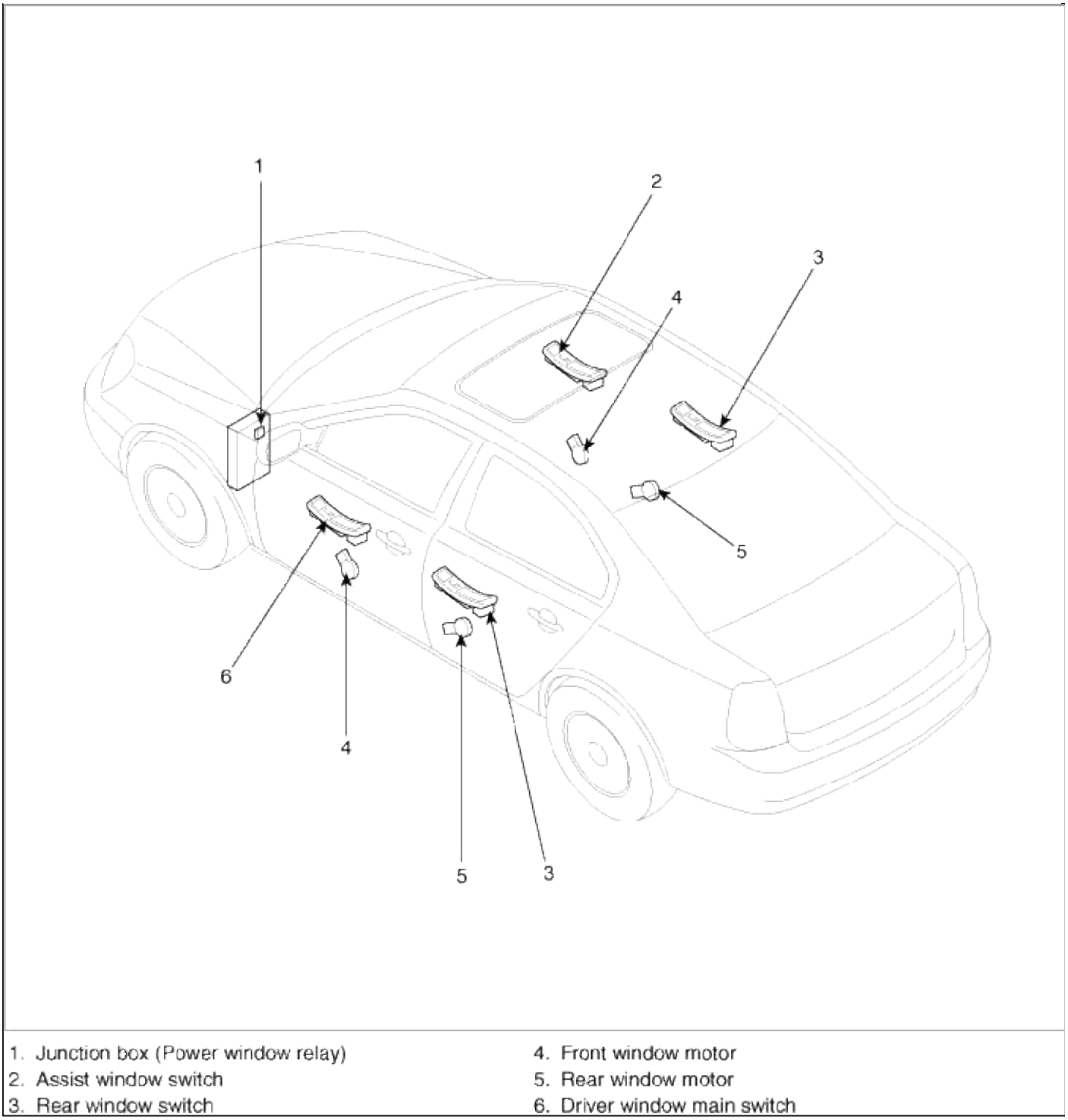
4. Apply battery voltage to each terminal as shown in the table and verify that the mirror operates properly.



Terminal / Position	1	2	3
UP	⊕	⊕	⊖
DOWN	⊖	⊖	⊕
OFF	⊕	⊕	⊖
LEFT	⊕	⊖	⊕
RIGHT	⊖	⊕	⊖

Body Electrical System > Power Windows > Components and Components Location

COMPONENT LOCATION

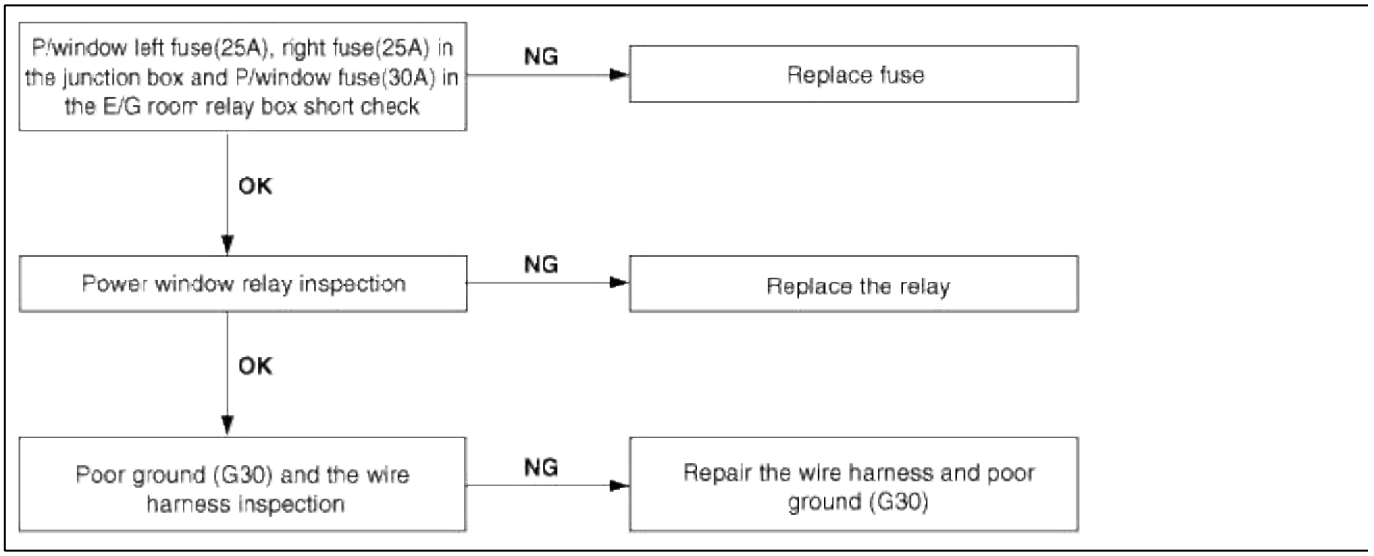


1. Junction box (Power window relay)
2. Assist window switch
3. Rear window switch
4. Front window motor
5. Rear window motor
6. Driver window main switch

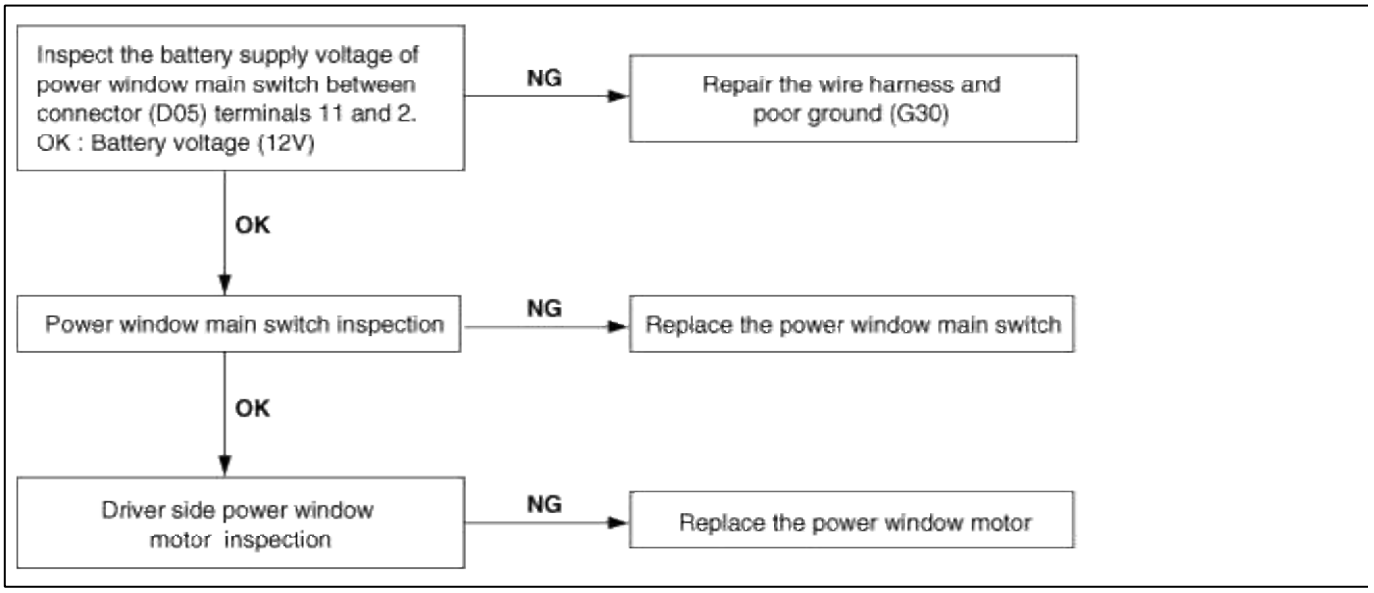
Body Electrical System > Power Windows > Troubleshooting

TROUBLESHOOTING

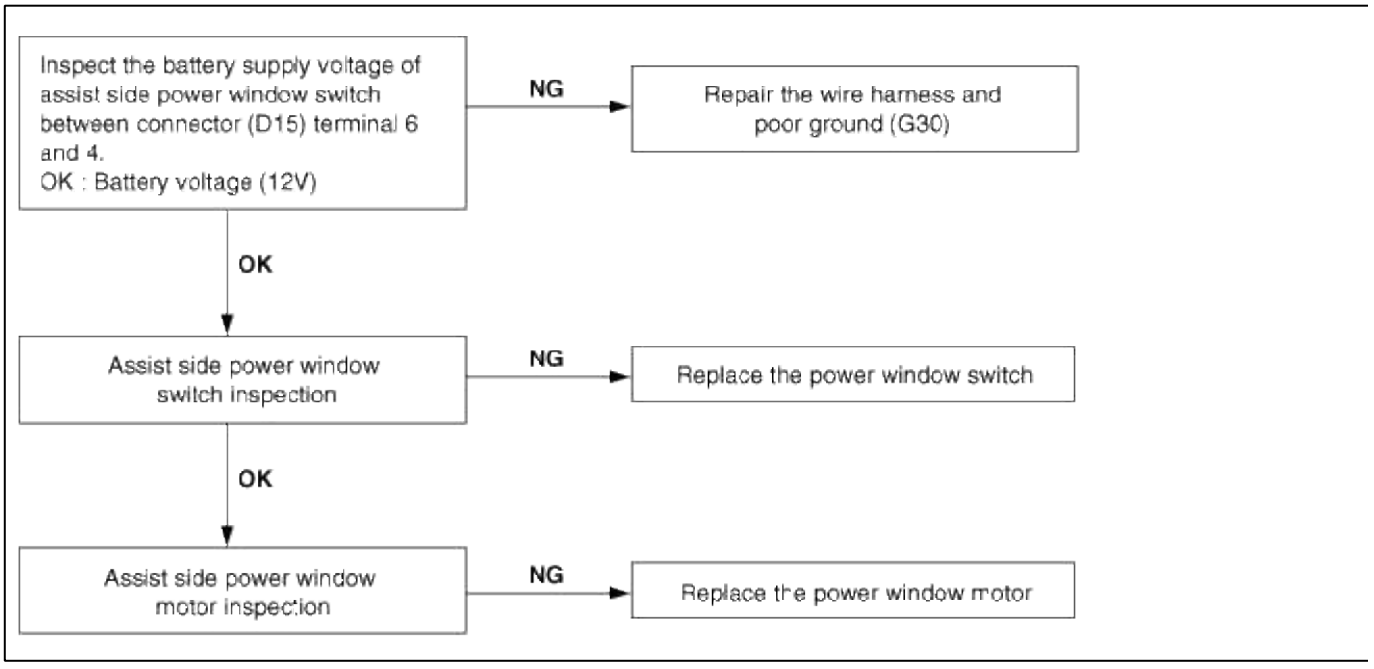
1. No windows operate from the main switch on the driver door.



2. Driver side window does not operate.



3. Assist side window does not operate.

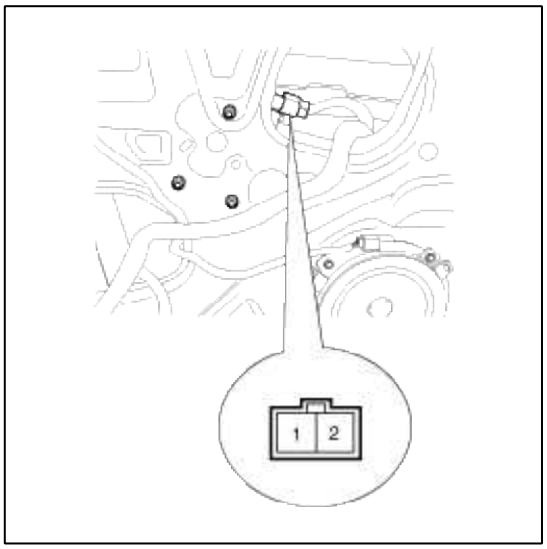


Body Electrical System > Power Windows > Power Window Motor > Repair procedures

INSPECTION

FRONT POWER WINDOW MOTOR

1. Remove the front door trim panel. (Refer to the Body group-front door)
2. Disconnect the connector from the motor.

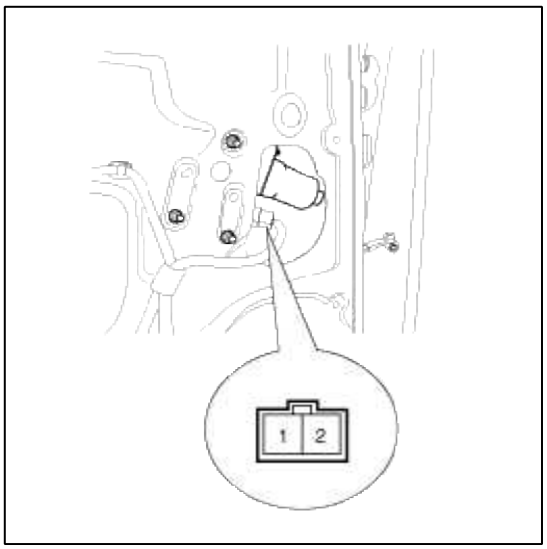


3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

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

REAR POWER WINDOW MOTOR

1. Remove the rear door trim panel. (Refer to the Body group-rear door)
2. Disconnect the 2P connector from the motor.

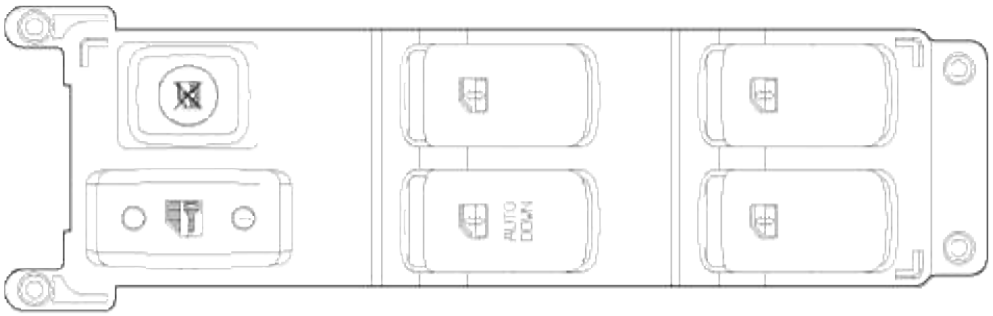


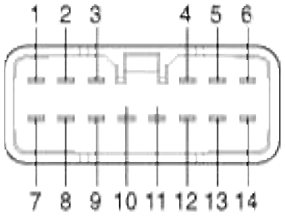
3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

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

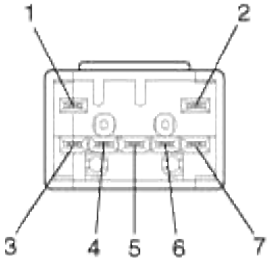
Body Electrical System > Power Windows > Power Window Switch > Schematic Diagrams

CIRCUIT DIAGRAM

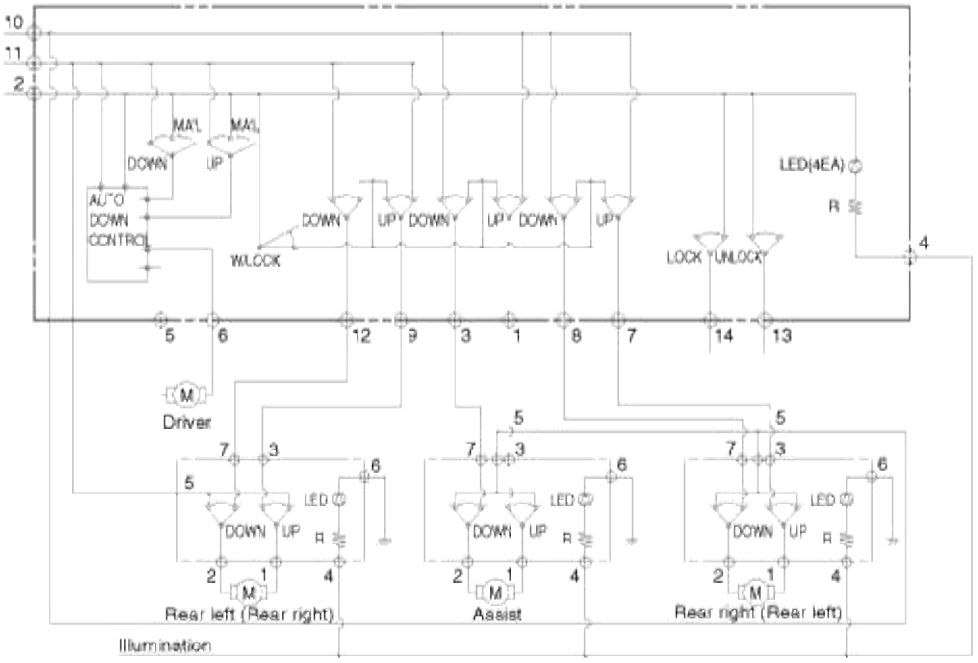




<Power window main switch>



<Assist/rear power window switch>



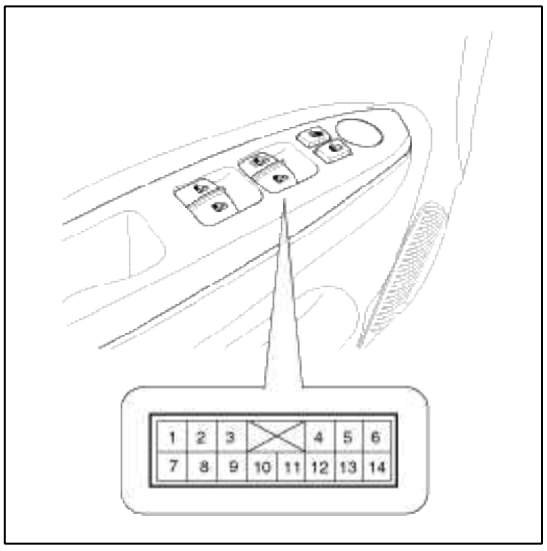
Body Electrical System > Power Windows > Power Window Switch > Repair procedures

INSPECTION

POWER WINDOW MAIN SWITCH

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel. (Refer to the Body group - front door)

3. Disconnect the 14P 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.

Terminal / Position	DRIVER				ASSIST			
	11	6	5	2	3	10	1	2
UP	○—○		○—○		○—○		○—○	
OFF		○—○—○			○—○—○			
DOWN	○—○		○—○		○—○		○—○	

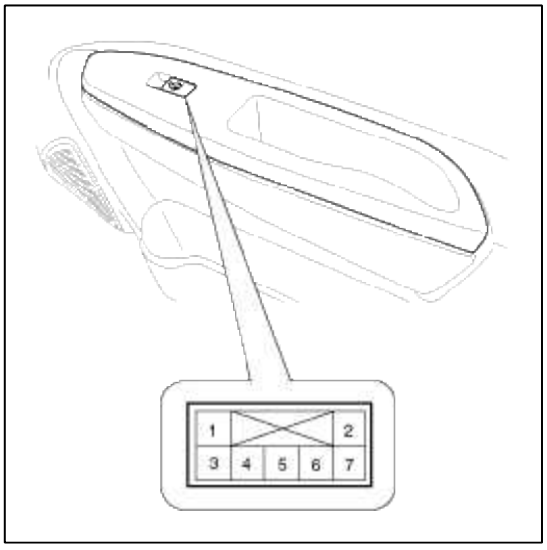
Terminal / Position	Rear left				Rear right			
	9	11	12	2	7	10	8	2
UP	○—○		○—○		○—○		○—○	
OFF	○—○—○				○—○—○			
DOWN	○—○		○—○		○—○		○—○	

POWER WINDOW LOCK SWITCH

Terminal / Position	2	9 or 12
NORMAL	○	○
LOCK		

ASSIST/REAR POWER WINDOW SWITCH

1. Disconnect the negative (-) battery terminal.
2. Remove the door trim panel. (Refer to the Body group - door)
3. Disconnect the 7P connector from the switch.



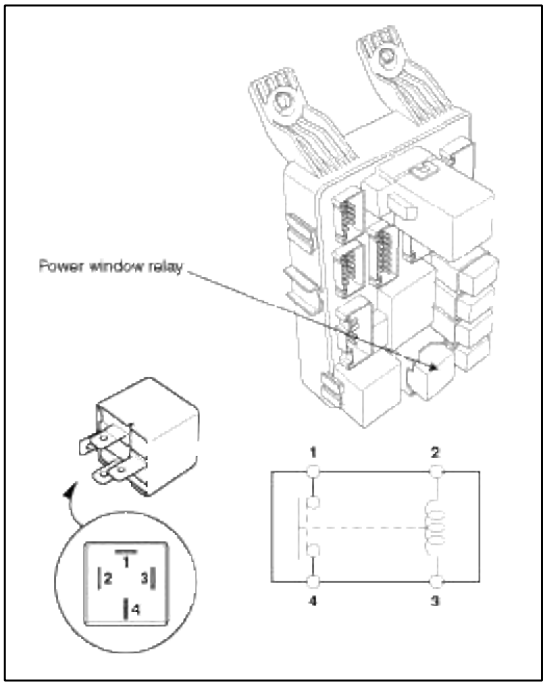
4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Position \ Terminal	1	2	3	5	7
UP	○			○	
		○			○
OFF		○			○
	○		○		
DOWN		○		○	
	○		○		

Body Electrical System > Power Windows > Power Window Relay > Repair procedures

INSPECTION

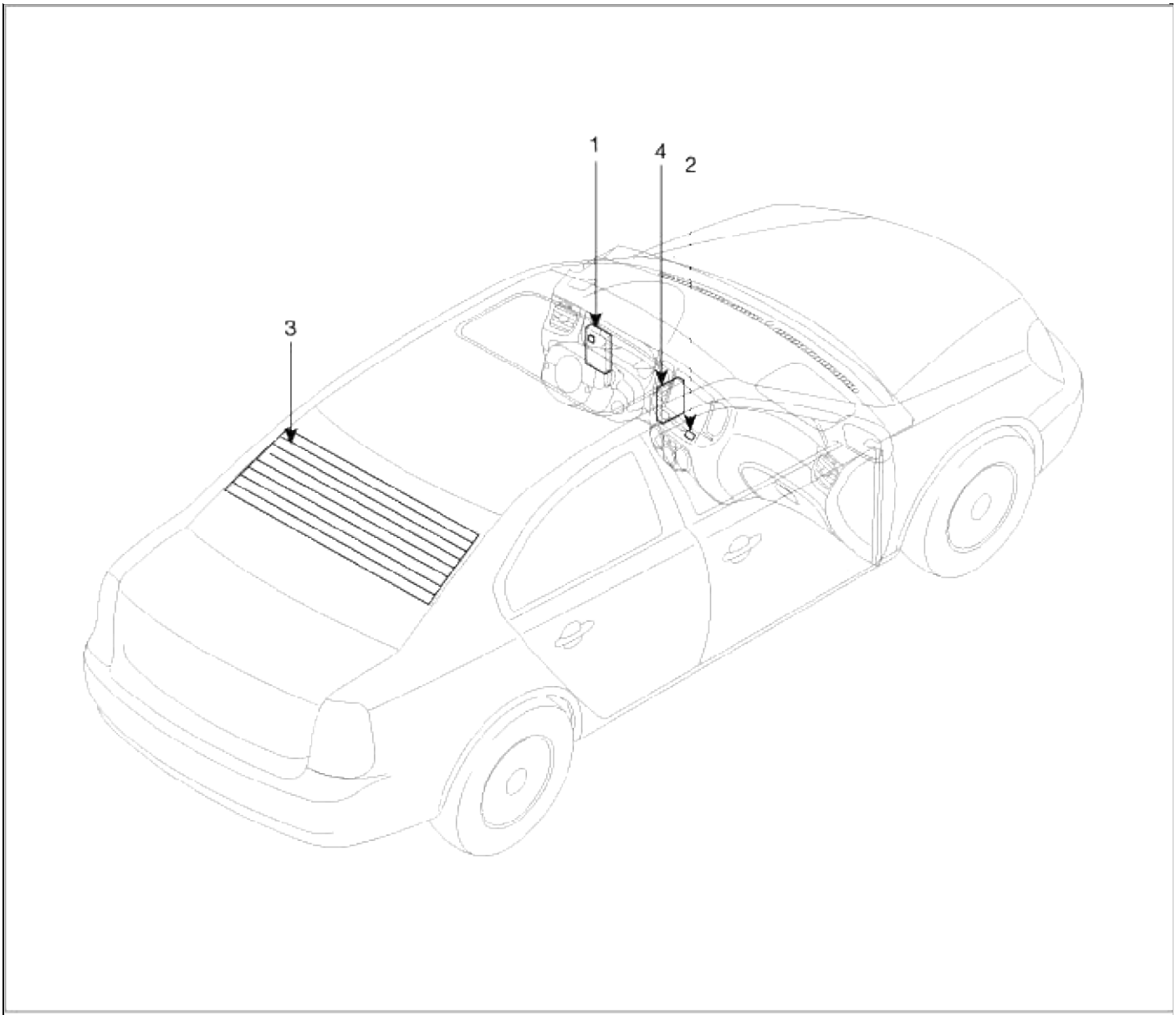
1. Disconnect the negative (-) battery terminal.
2. Remove the power window relay from the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.1 and No.4 terminals when power and ground are connected to the No.2 and No.3 terminals.
5. There should be no continuity between the No.1 and No.4 terminals when power is disconnected.



Power (No.2-No.3) \ Terminal	2	3	1	4
Disconnected	○	○		
Connected	⊖	⊕	○	○

Body Electrical System > Rear Glass Defogger > Components and Components Location

COMPONENT LOCATION



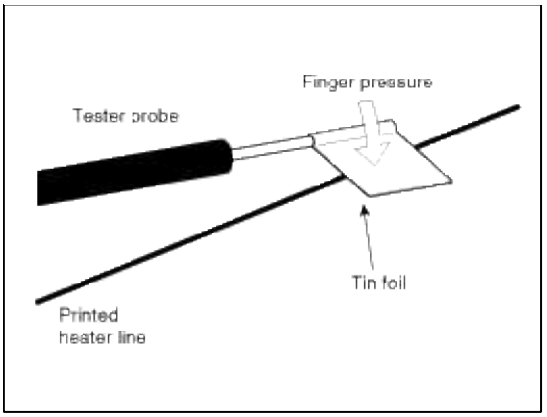
1. Junction box (Rear window defogger)
2. Rear window defogger switch
3. Rear window defogger
4. Body control module

Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Printed Heater > Repair procedures

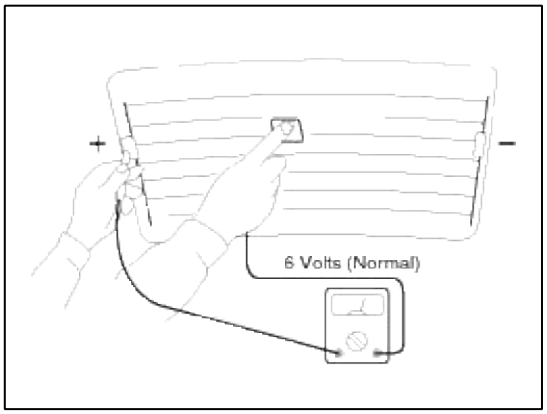
INSPECTION

CAUTION

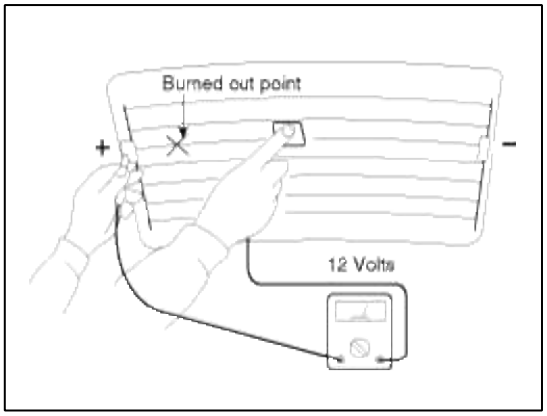
Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply finger pressure on the tin foil, moving the tin foil along the grid line to check for open circuits.



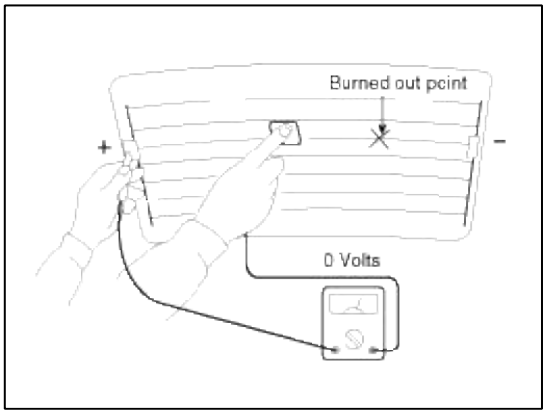
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



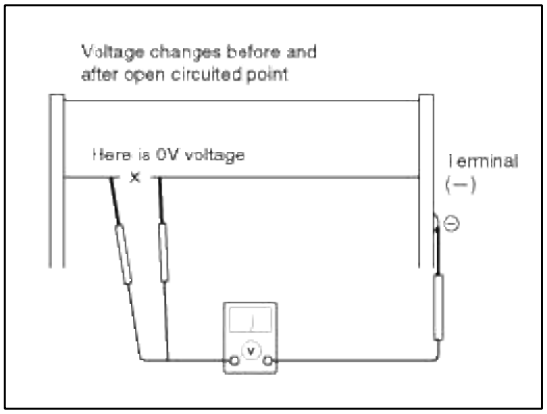
2. If a heater line is burned out between the center point and (+) terminal, the voltmeter will indicate 12V.



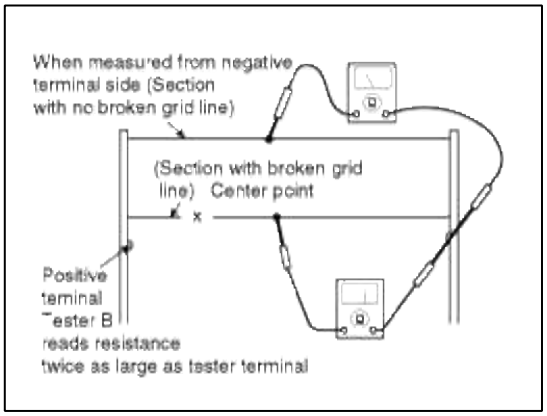
3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.



4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuit point.



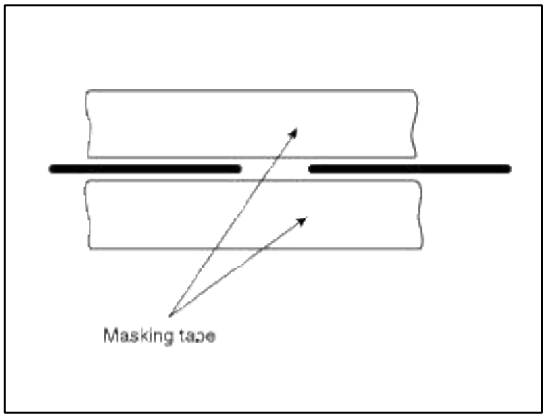
5. Use an ohmmeter to measure the resistance of each heater line between a terminal and the center of a grid line, and between the same terminal and the center of one adjacent heater line. The section with a broken heater line will have a resistance twice as that in other sections. In the affected section, move the test lead to a position where the resistance sharply changes.



REPAIR OF BROKEN HEATER LINE

Prepare the following items:

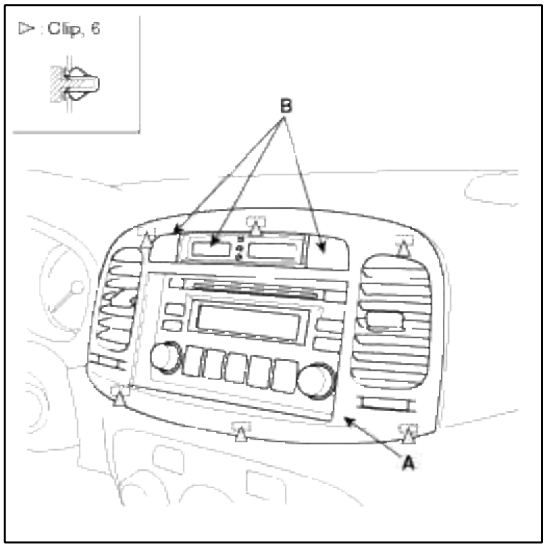
1. Conductive paint.
2. Paint thinner.
3. Masking tape.
4. Silicone remover.
5. Using a thin brush:
   Wipe the glass adjacent to the broken heater line, clean with silicone remover and attach the masking tape as shown. Shake the conductive paint container well, and apply three coats with a brush at intervals of about 15 minutes apart. Remove the tape and allow sufficient time for drying before applying power. For a better finish, scrape away excess deposits with a knife after the paint has completely dried. (Allow 24 hours).



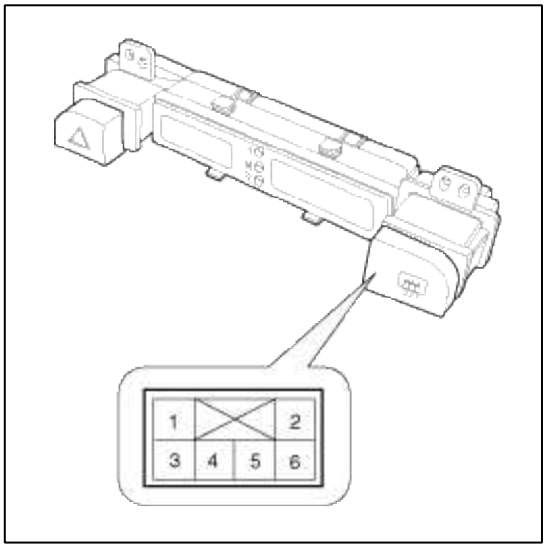
Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Switch > Repair procedures

INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the center facia upper panel (A).



3. Remove the connectors of rear window defogger switch and hazard switch (B).
4. Using an ohmmeter, inspection the continuity between the terminals after removing to the switch connector.



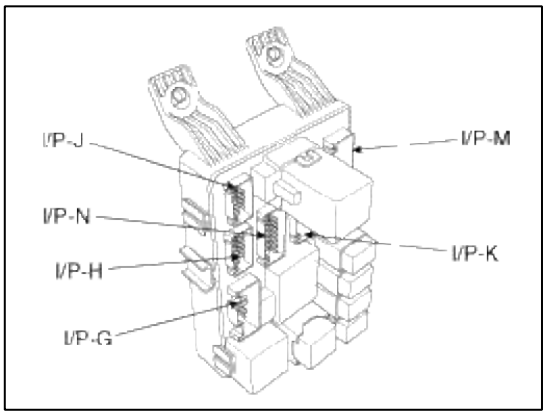
Terminal / Position	2	5	3	6	4	1
ON		Illumination				
OFF						

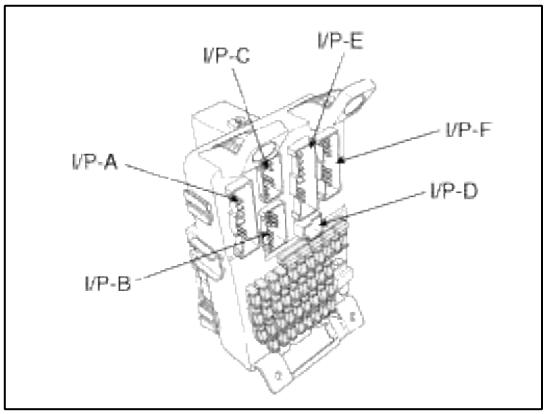
Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Relay > Repair procedures

INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.1 in the I/P-D and No.6 terminal in the I/P-M when power and ground are connected to the No.10 terminal in the I/P-M and No.6 terminal in the I/P-G.

5. There should be no continuity between the No.1 terminal in the I/P-D and No.6 terminal in the I/P-M when power is disconnected.





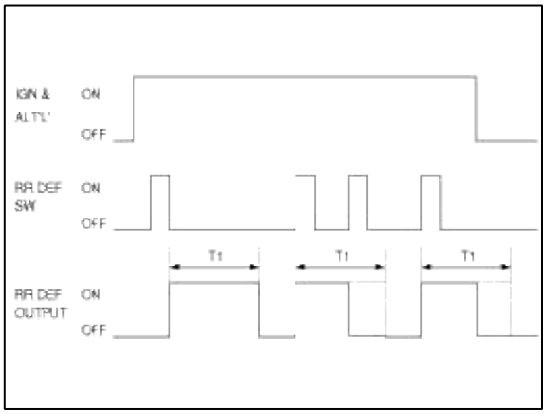
Terminal / Power	I/P-D (1)	I/P-M (6)	I/P-G (6)	I/P-M (10)
Disconnected			○	○
Connected	○	○	⊖	⊕

Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Timer > Repair procedures

INSPECTION

While operating the components, check whether the operations are normal as shown in the timing chart. (Including outside mirror heater)

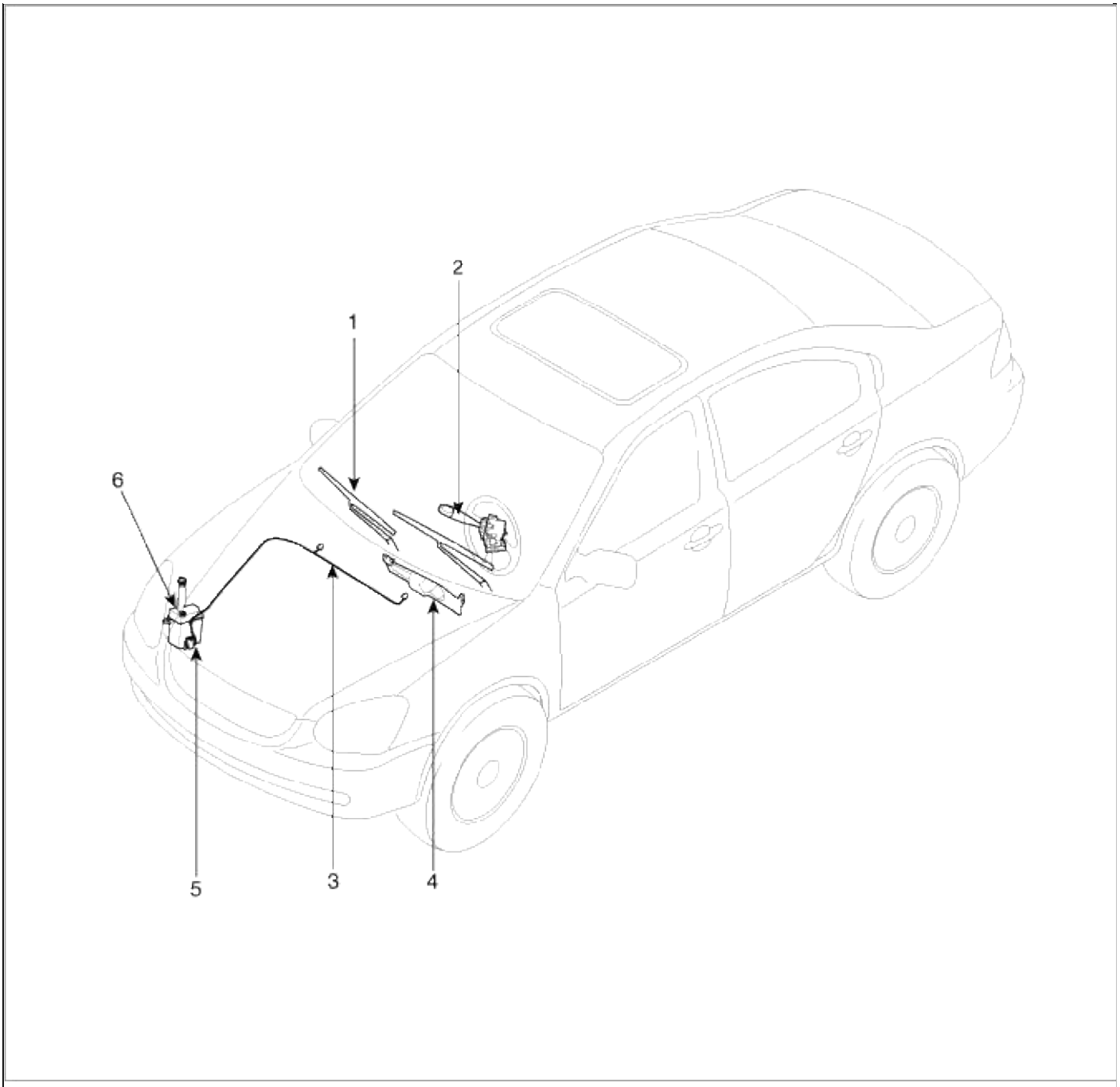
1. Once ALT "L" is ON, if the defogger is switched ON, the defogger will stay ON for 20 minutes duration.
2. If defogger switch is pressed again (see Step 1), or if ignition is switched OFF, the defogger will shut OFF.



T1 : 20 ± 1 min.

Body Electrical System > Windshield Wiper/Washer > Components and Components Location

COMPONENT LOCATION

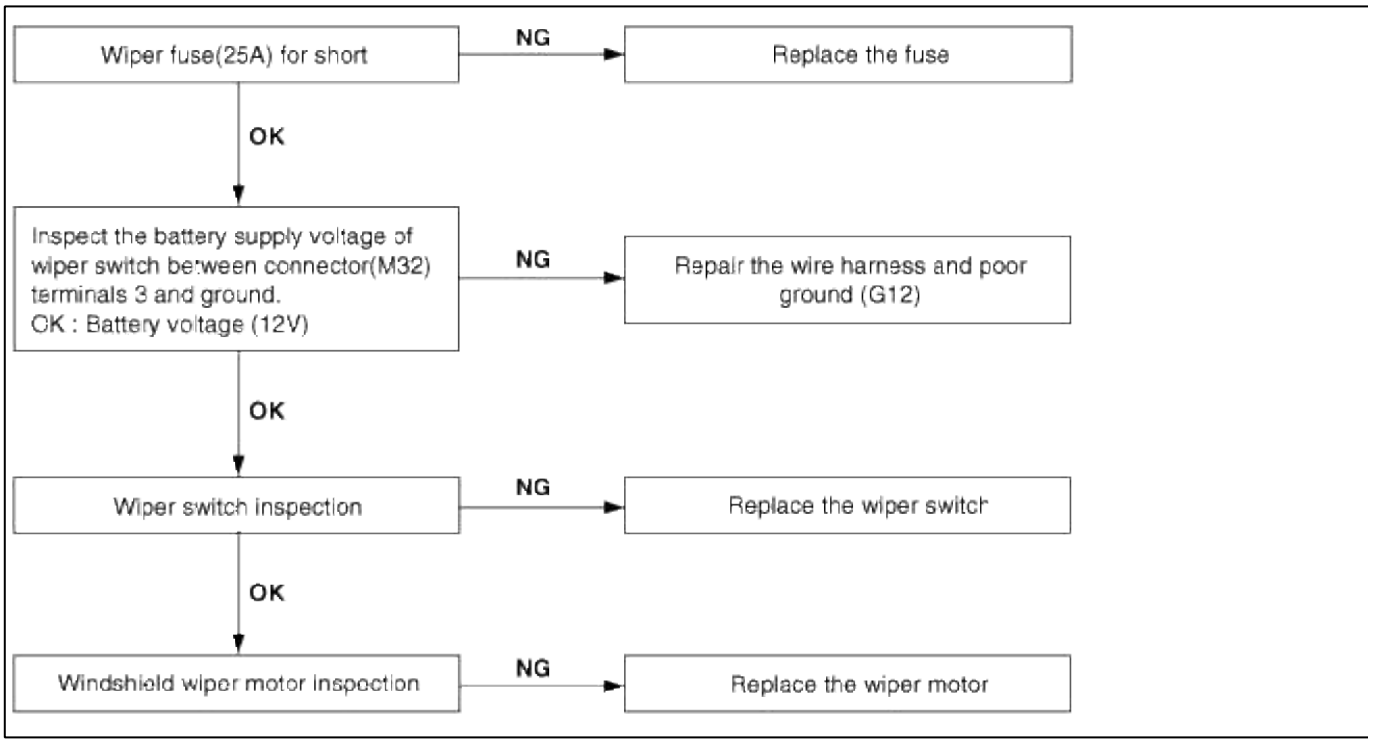


1. Windshield wiper arm & blade
2. Wiper & washer switch
3. Windshield washer hose
4. Windshield wiper motor & linkage
5. Washer motor
6. Washer reservoir

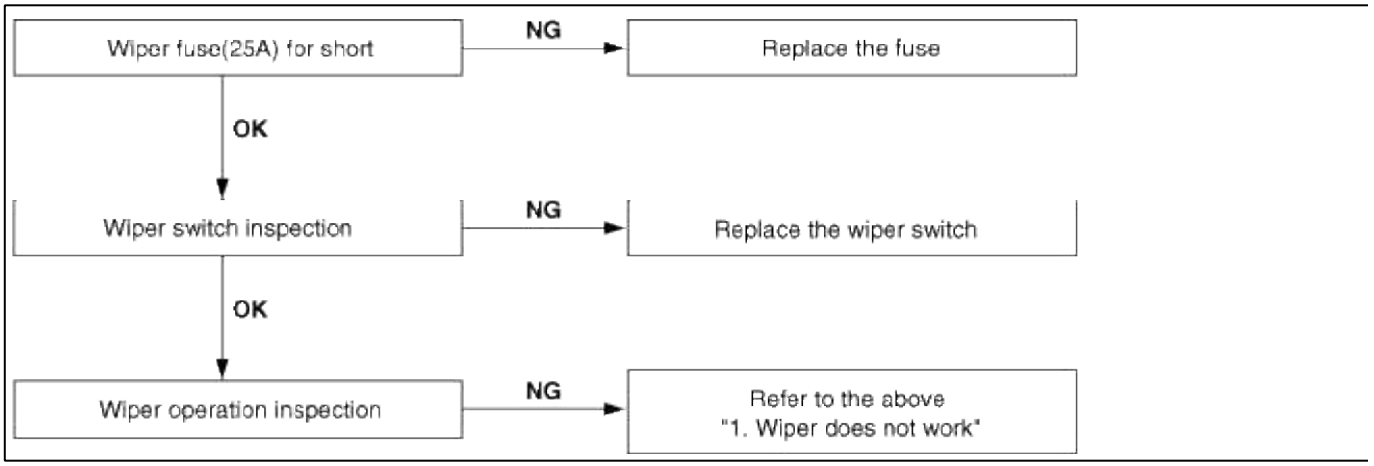
Body Electrical System > Windshield Wiper/Washer > Troubleshooting

TROUBLESHOOTING

1. Wiper low and wiper high do not work.



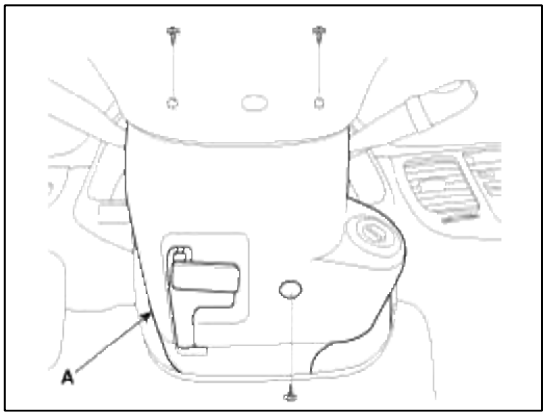
2. When washer switch is on, wiper does not work.



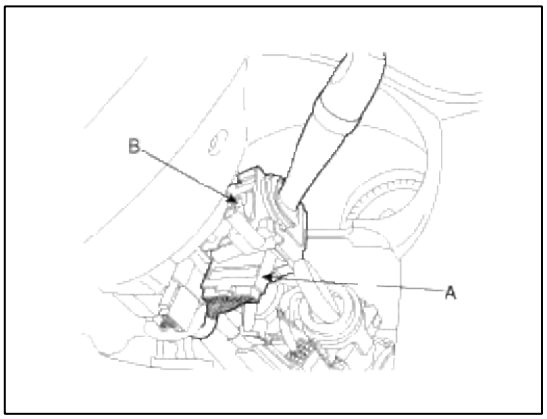
Body Electrical System > Windshield Wiper/Washer > Windshield Wiper-Washer Switch > Repair procedures

REPLACEMENT

1. Remove the steering column upper and lower shrouds (A) after removing 3 screws.



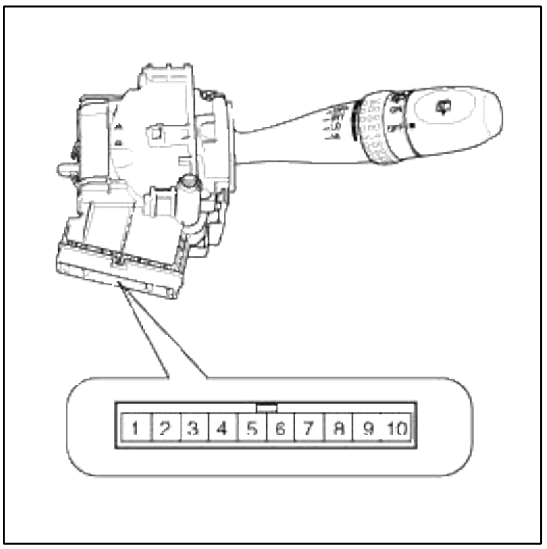
2. Remove the wiper switch (A) by pushing the lock pin (B) after disconnecting the connector.



3. Installation is the reverse of removal.

INSPECTION

Check for continuity between the terminals while operating the wiper and washer switch. If it is not normal condition, replace wiper and wiper switch.



WIPER SWITCH

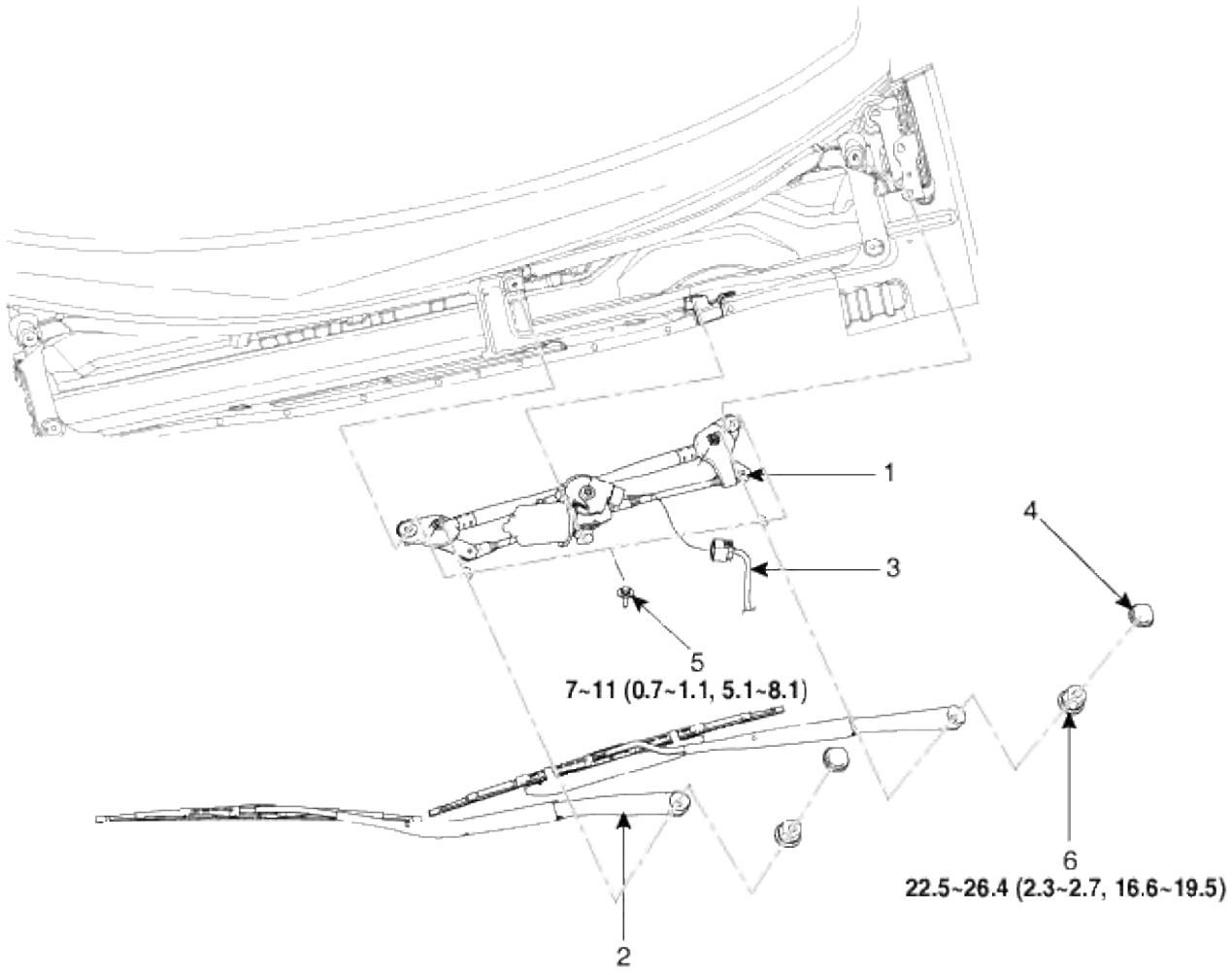
Terminal / Position	2	3	4	5
MIST		○	○	
OFF			○	○
INT			○	○
LOW		○	○	
HI	○	○		

WASHER SWITCH

Terminal / Position	3	7
OFF		
ON	○	○

Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Components and Components Location

COMPONENT LOCATION



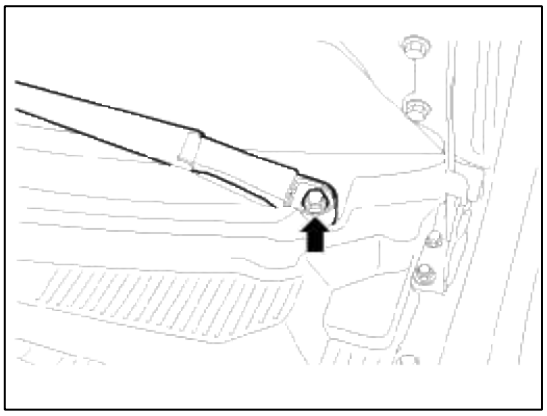
1. Wiper motor & linkage assembly
2. Wiper arm & blade
3. Wiper motor connector
4. Cap
5. Bolt
6. Nut

Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Repair procedures

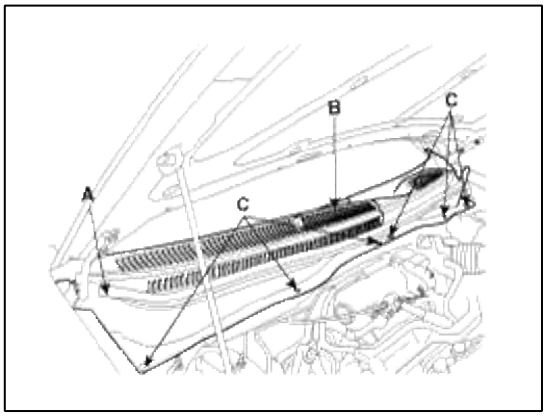
REMOVAL

1. Remove the windshield wiper arm and blade after removing a nut.

TORQUE : 28~32 Nm (2.8~3.2 kgf.m, 20~23.1 lbf.ft)

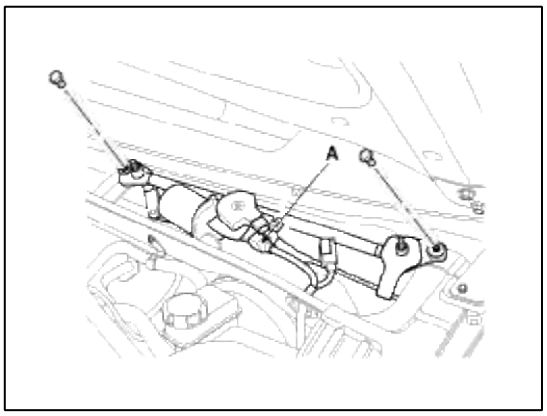


2. Remove the weather strip (A) then remove the cowl top cover (B) after removing 6 clips (C).



3. Remove the windshield wiper motor and linkage assembly after removing 2 bolts. Disconnect the wiper motor connector (A) from the wiper motor & linkage assembly.

TORQUE : 7-11Nm (0.7-1.1, kgf.m, 5.1-8.1 lbf.ft)

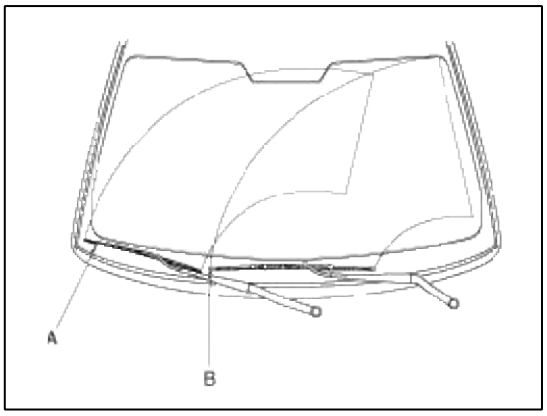


4. Installation is the reverse of removal.

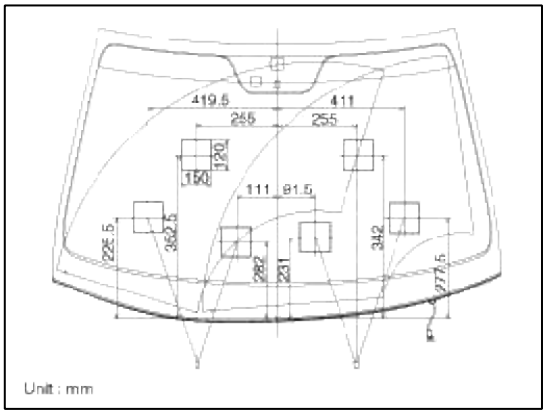
INSTALLATION

1. Install the wiper arm and blade to the specified position.

Specified position	A	B
Distance [in (mm)]	1.49+0.2/0 (38+5/0)	1.26+0.2/0 (32+5/0)



2. Set the washer nozzle on the specified spray position.

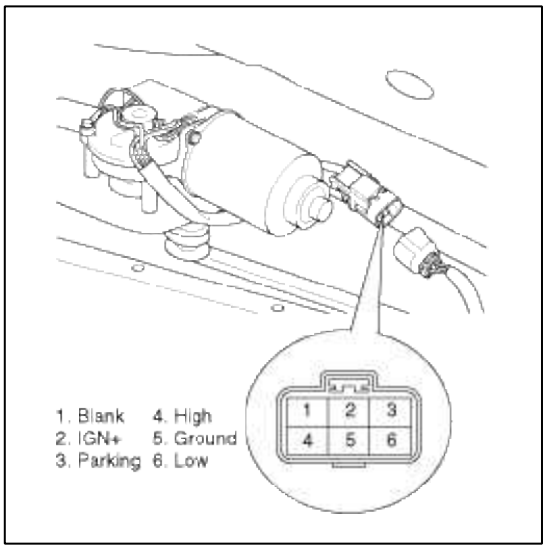


INSPECTION

SPEED OPERATION CHECK

1. Remove the connector from the wiper motor.
2. Attach the positive (+) lead from the battery to terminal 6 and the negative (-) lead to terminal 5.
3. Check that the motor operates at low speed.
4. Connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 5.

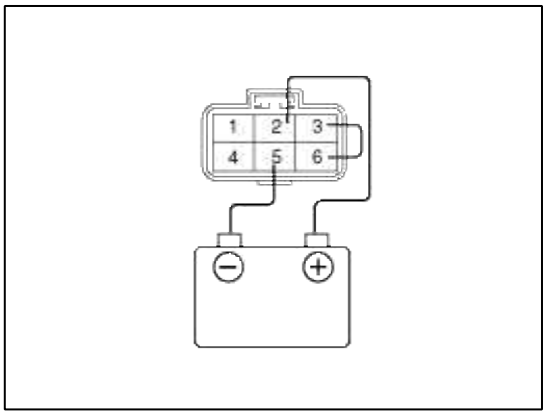
5. Check that the motor operates at high speed.



Position \ Terminal	3	2	4	6
OFF	○			○
LOW		○		○
HIGH		○	○	

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 6.
3. Connect terminals 3 and 6.
4. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 5.
5. Check that the motor stops running at the off position.

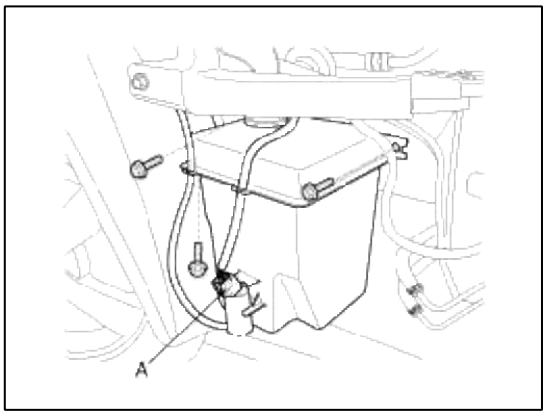


Body Electrical System > Windshield Wiper/Washer > Front Washer Motor > Repair procedures

REPLACEMENT

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).

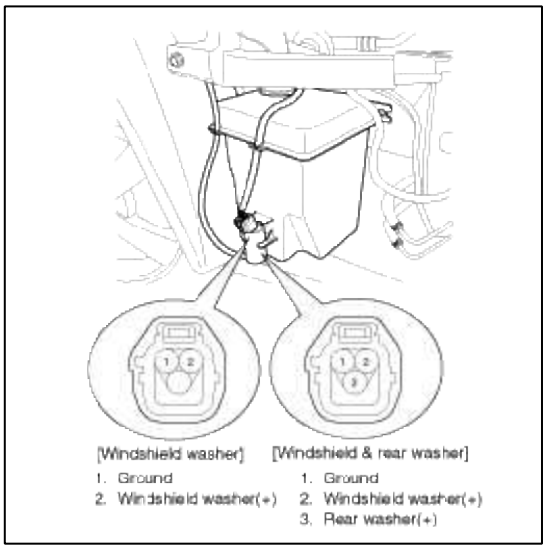
4. Remove the washer reservoir after removing 3 bolts.

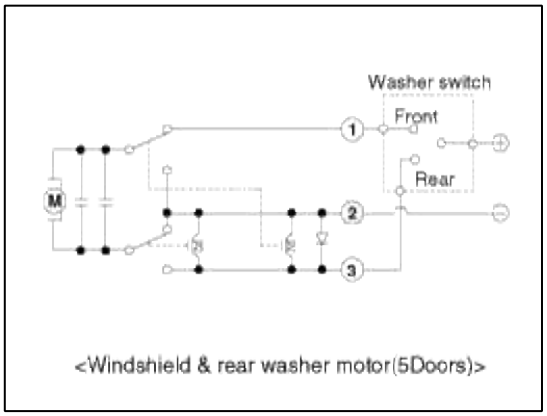


5. Installation is the reverse of removal.

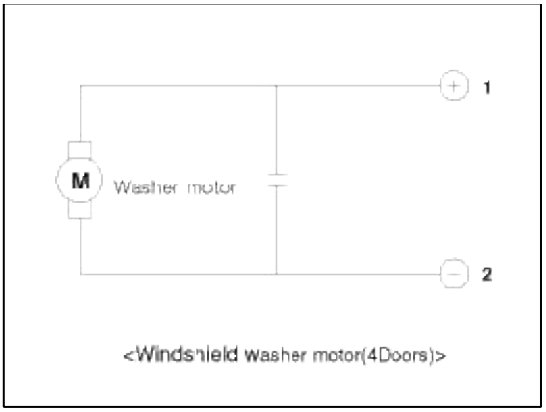
INSPECTION

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.





<Windshield & rear washer motor(5Doors)>



WASHER FLUID LEVEL SWITCH

1. Remove the washer fluid level switch from the washer reservoir.

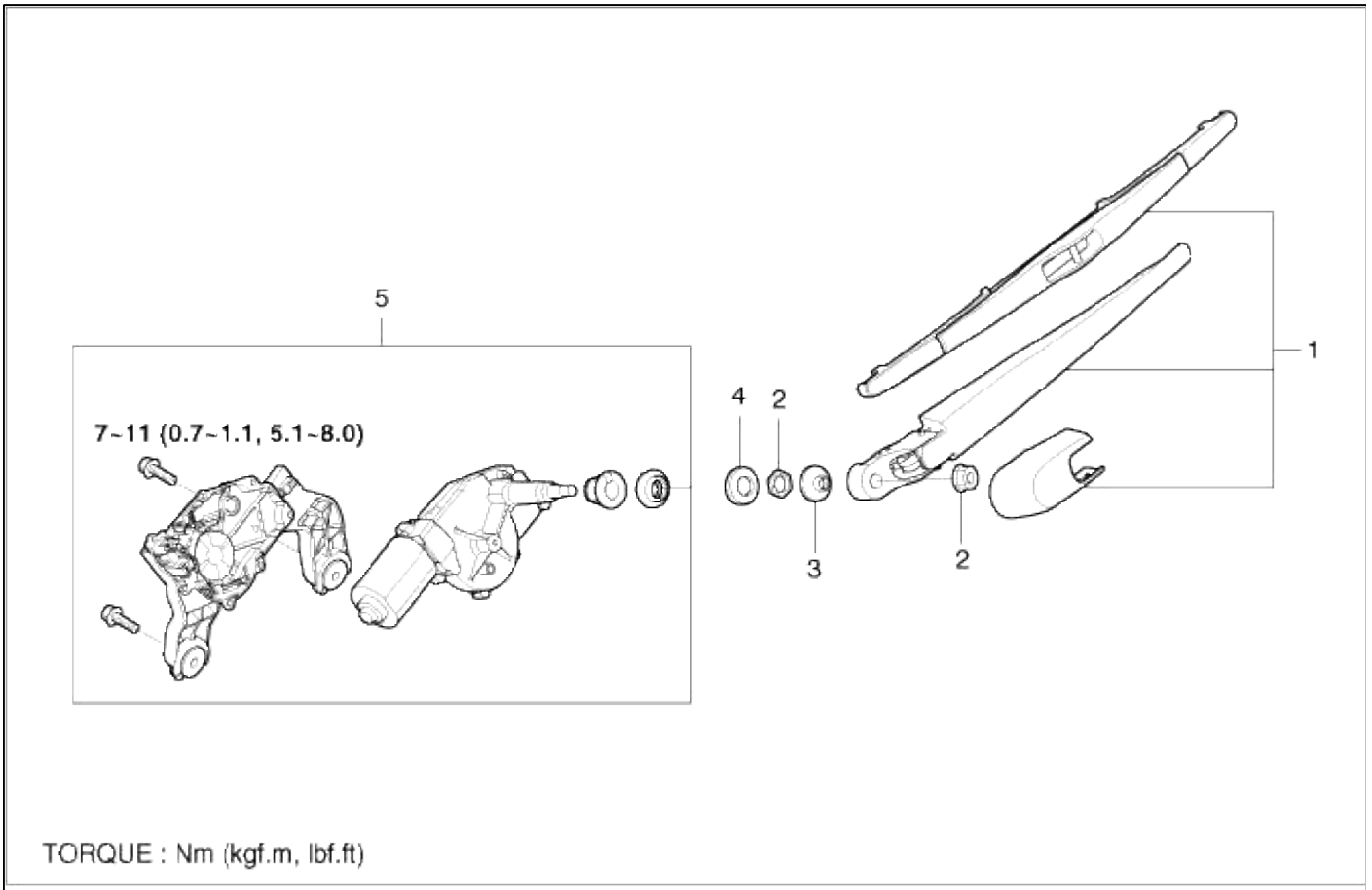
NOTE

Fluid may flow out of the opening

2. Check for continuity between the No. 1and No. 2 terminals in each float position.
   There should be continuity when the float is down.
   There should be no continuity when the float is up.
3. If the continuity is not as specified, replace the washer fluid level switch.

Body Electrical System > Rear Wiper/Washer > Components and Components Location

COMPONENT LOCATION



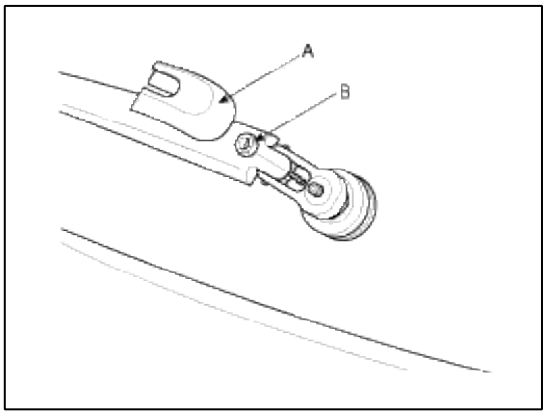
1. Rear wiper arm & blade
2. Nut
3. Rear wiper motor cover
4. Rear wiper cap & pad
5. Rear wiper motor

Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Repair procedures

REMOVAL

1. Remove the tail gate trim.
2. Detach the wiper cap (A), and then remove the rear wiper arm after removing a nut (B).

Tightening torque Nut(B) :
10~13 Nm (1.0~1.3 kgf·m, 7.2~9.4 lbf·ft)

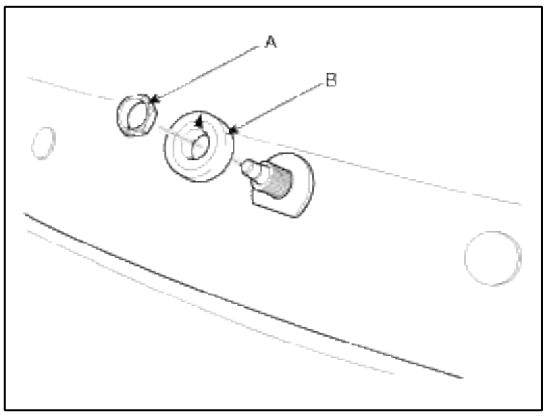


3. Detach the wiper motor cover, and then remove the rear wiper cap & pad (B) after removing a nut (A).

NOTE

When installing the rear wiper cap & pad, in order for the arrow mark toward an upper direction.

Tightening torque Nut(A) :
10~13 Nm (1.0~1.3 kgf·m, 7.2~9.4 lbf·ft)



4. Disconnect the rear wiper motor connector (B) then remove the rear wiper motor (A) after removing 2 bolts.

Tightening torque Nut :
7~11 Nm (0.7~1.1 kgf·m, 5.1~8.0 lbf·ft)

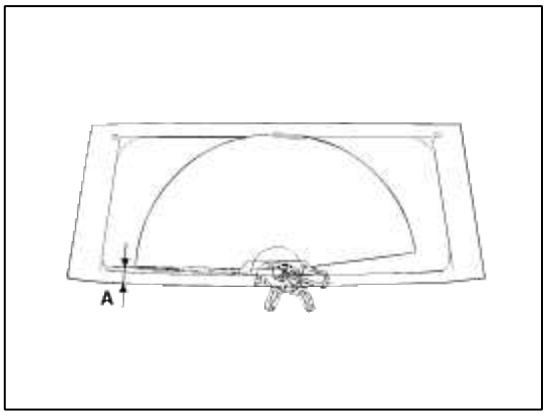
5. Installation is the reverse of removal.

INSTALLATION

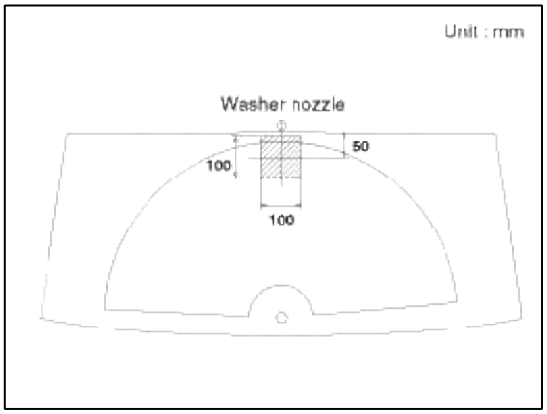
1. Install the rear wiper arm and blade to the specified position.

Specified position	A
Distance [in (mm)]	1.417 (36)

Specified position: The first defogger line from bottom of the rear window.

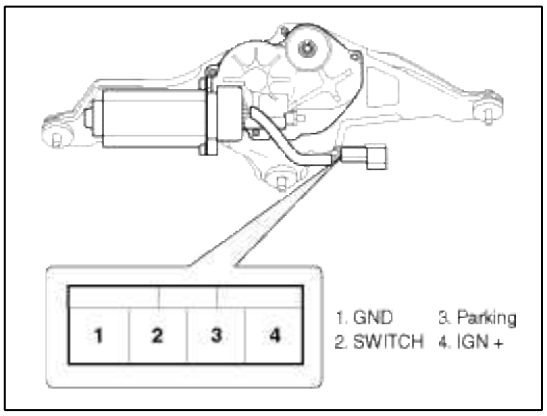


2. Set the rear washer nozzle on the specified spray position.



INSPECTION

1. Remove the 4P connector from the rear wiper motor.
2. Connect battery positive (+) and negative (-) cables to terminals 2 and 1 respectively.
3. Check that the motor operates normally. Replace the motor if it operates abnormally.

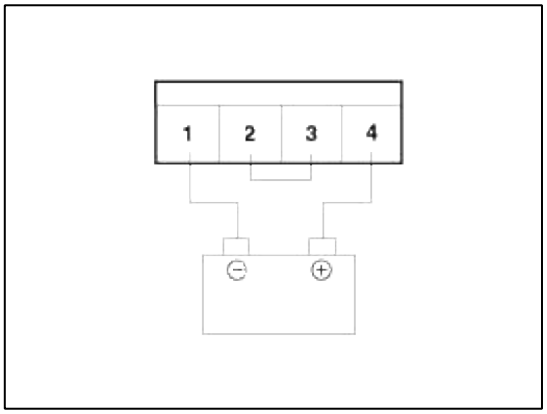


Terminal / Position	2	3	4
OFF	○	○	
ON	○		○

AUTOMATIC STOP OPERATION

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.

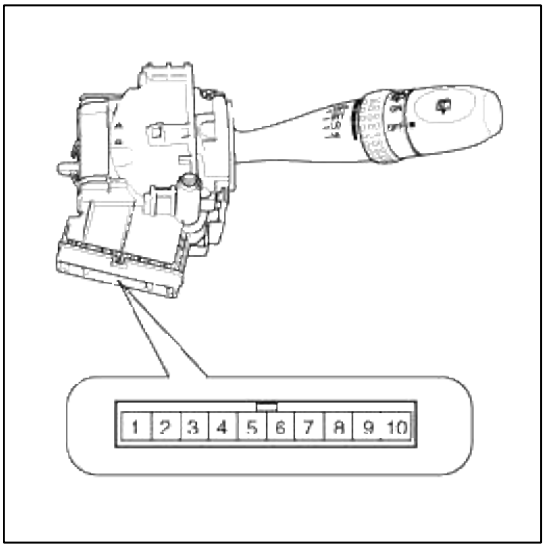
3. Connect terminals 2 and 3.
4. Connect the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 4.
5. Check that the motor stops running at the off position.



Body Electrical System > Rear Wiper/Washer > Rear Washer Switch > Repair procedures

INSPECTION

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

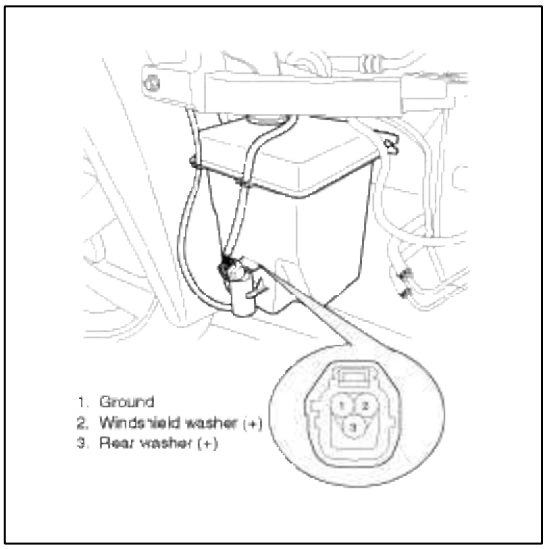
Terminal / Position	6	8	9	10
OFF		○		○
ON	○			○
Rear washer	○		○	○

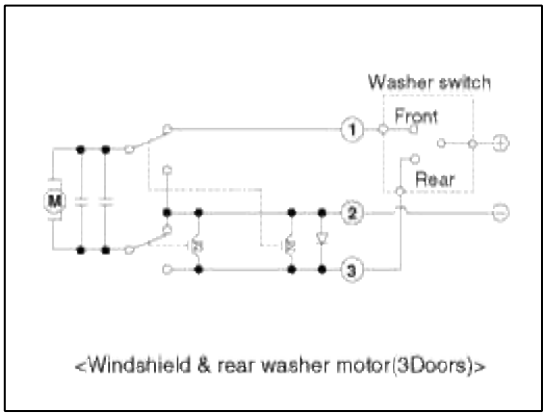
Body Electrical System > Rear Wiper/Washer > Rear Washer Motor > Repair procedures

INSPECTION

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Remove the front bumper. (Refer to the Body 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.

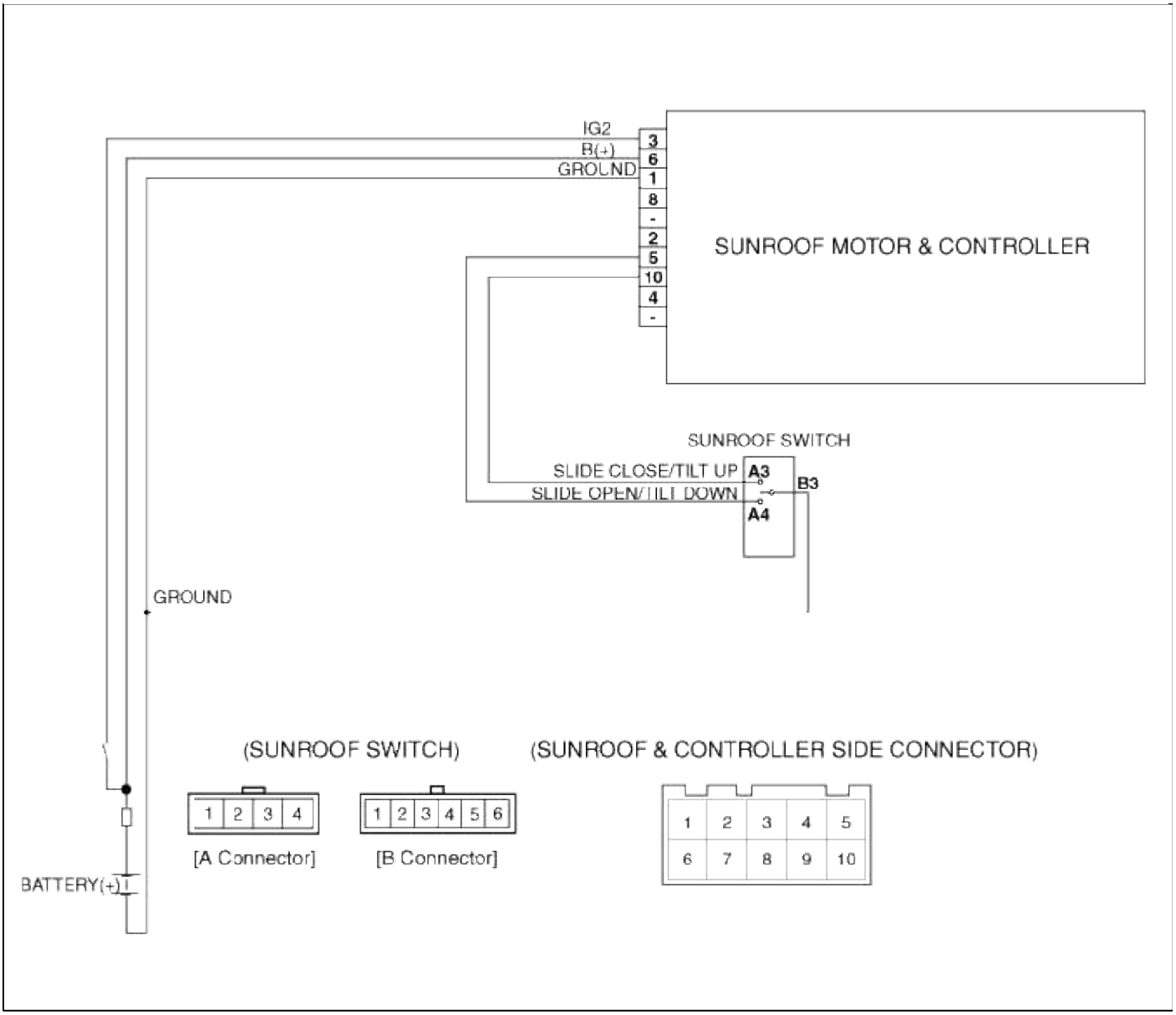




<Windshield & rear washer motor(3Doors)>

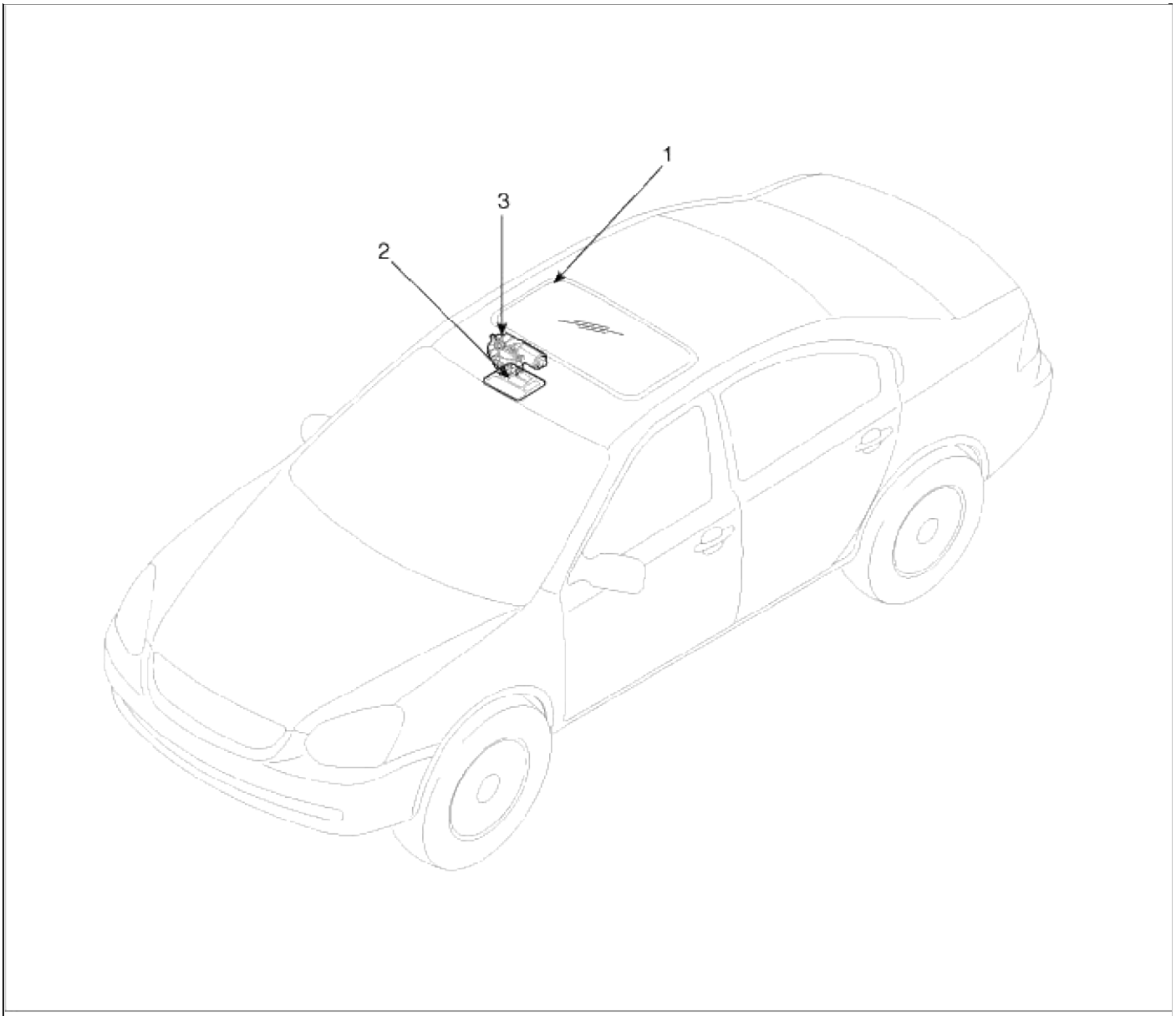
Body Electrical System > Sun Roof > Schematic Diagrams

CIRCUIT DIAGRAM



Body Electrical System > Sun Roof > Components and Components Location

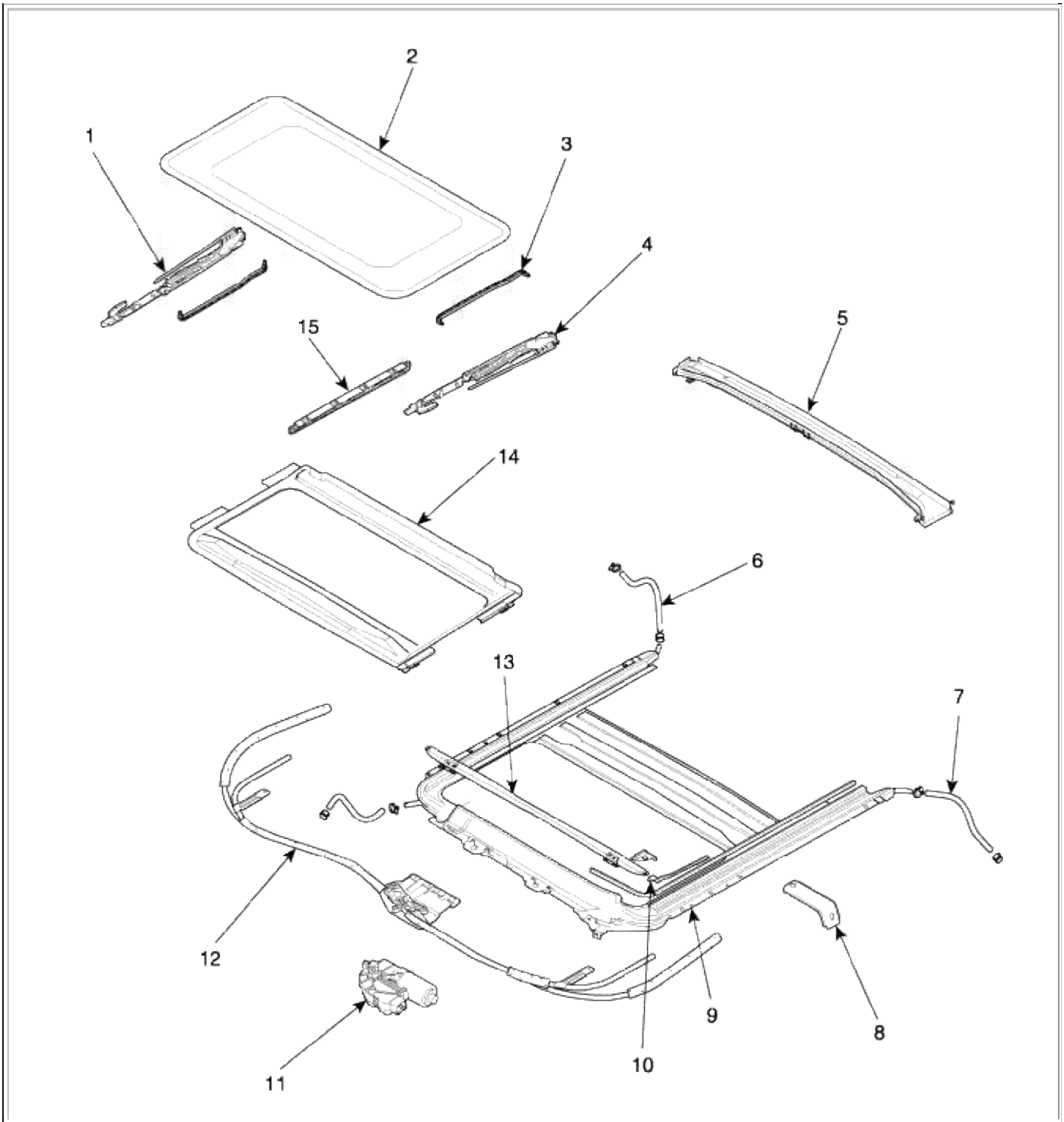
COMPONENT LOCATION



1. Sunroof
2. Sunroof motor & controller
3. Sunroof switch

Body Electrical System > Sun Roof > Sunroof Assembly > Components and Components Location

COMPONENTS



1. Guide assemble
2. Glass
3.Drip link
4. Guide assemble
5.Drip rail
6. Drain hose
7. Drain hose
8. Set bracket
9. Frame
10. Defector link
11. Motor
12. Drive unit
13. Defector
14. Sunshade
15. Decoration cover

Body Electrical System > Sun Roof > Sunroof Assembly > Repair procedures

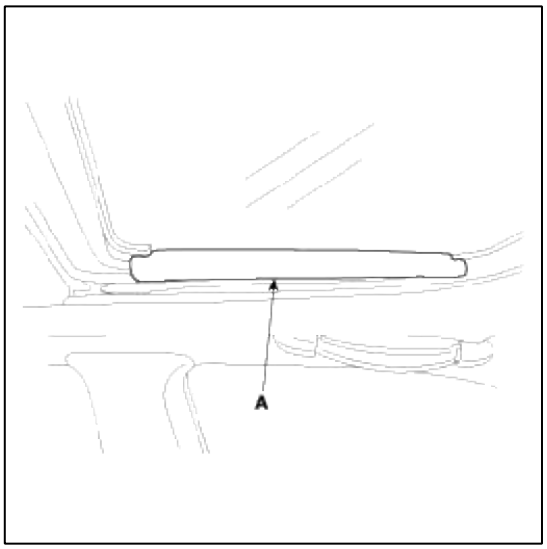
REPLACEMENT

GLASS REPLACEMENT

NOTE

- Put on glove to protect your hands.

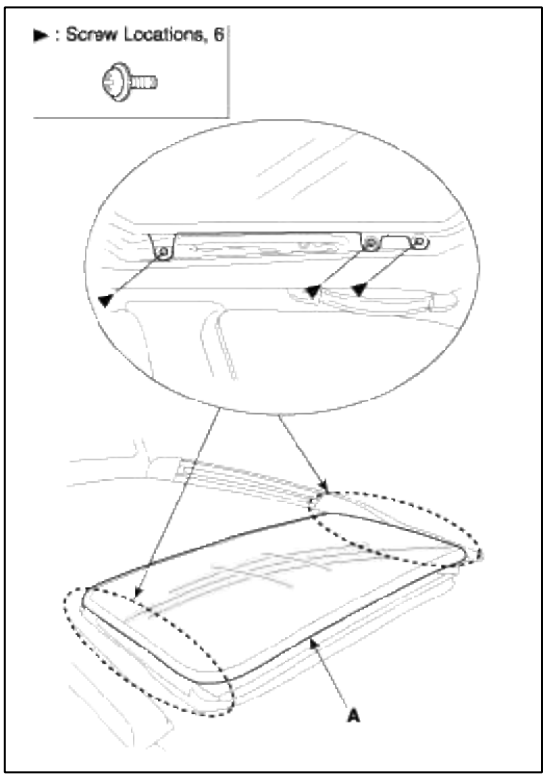
1. Remove both decoration cover (A).



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

NOTE

- Do not damage the roof panel.



3. Installation is the reverse of removal.

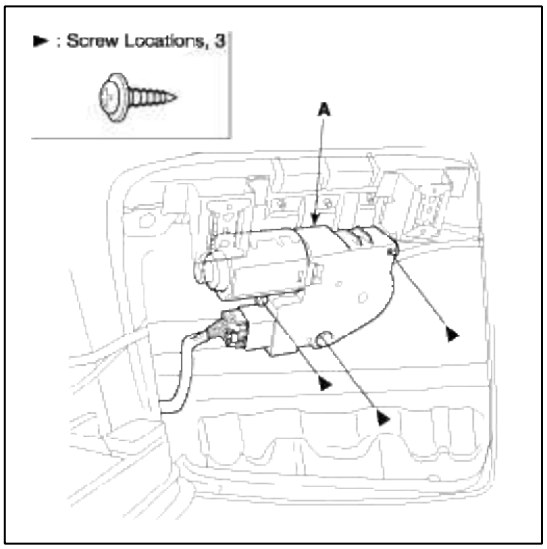
MOTOR REPLACEMENT

1. Remove the over head console.

NOTE

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

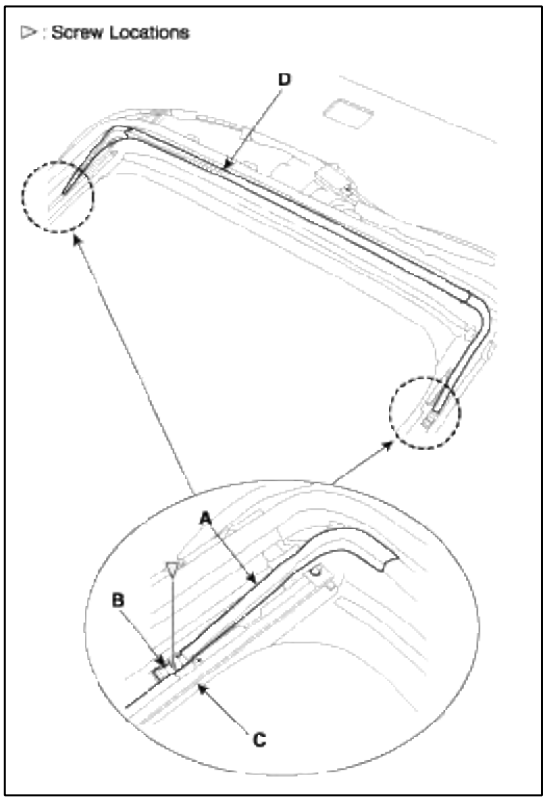
2. Disconnect the motor connector , remove the screws and then remove the motor (A).



3. Installation is the reverse of removal.

DEFLECTOR REPLACEMENT

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



3. Installation is the reverse of removal.

SUNROOF ASSEMBLY REPLACEMENT

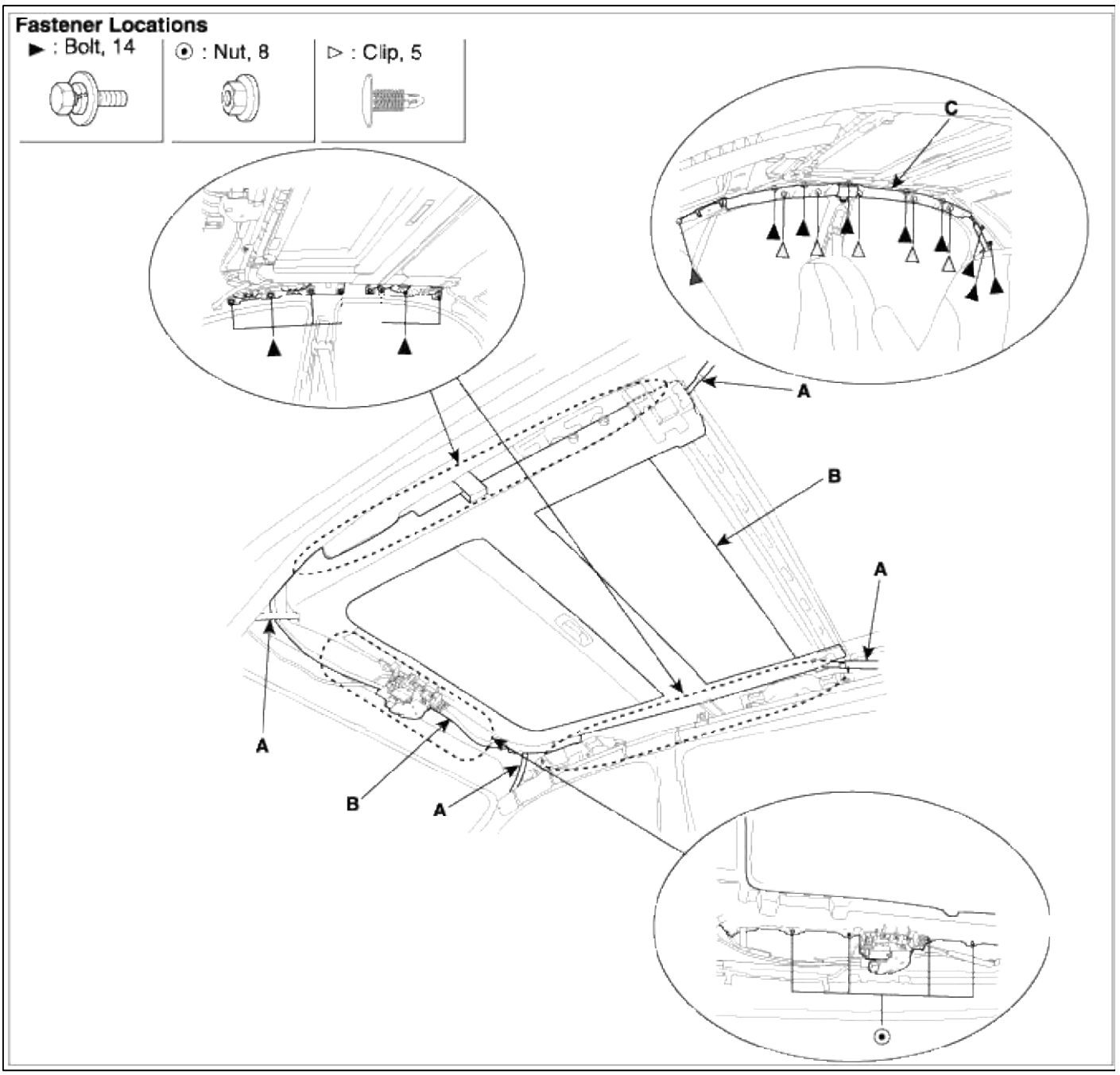
1. Remove the follows parts.
   A. Front and rear door scuff trim.
   B. Front, center and rear pillar trim.
   C. Hadlining.
   D. Sunroof glass.
2. Disconnect the drain tubes (A).

3. After loosening the mounting bolts and nuts, remove the sunroof assembly (B).

NOTE

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

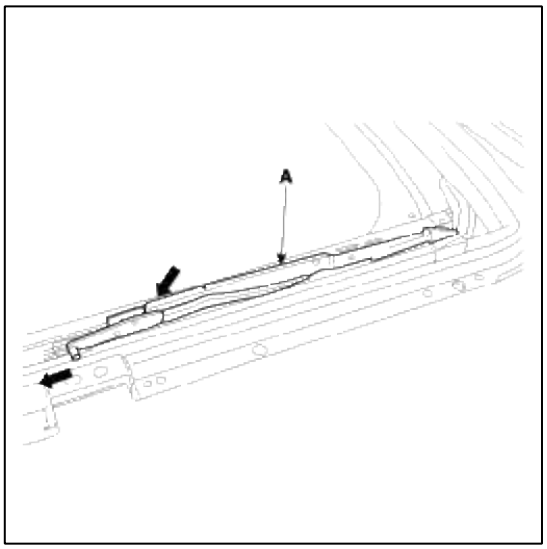
4. Installation is the reverse of removal.



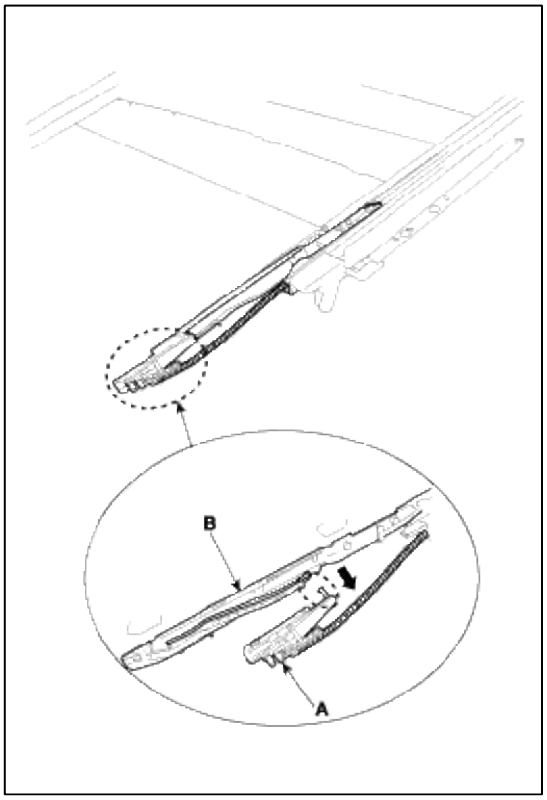
GUIDE ASSEMBLY REPLACEMENT

1. Remove the sunroof assembly

2. Remove a guide assembly (A) after lowering a guide thoroughly by pushing a slide to rear.



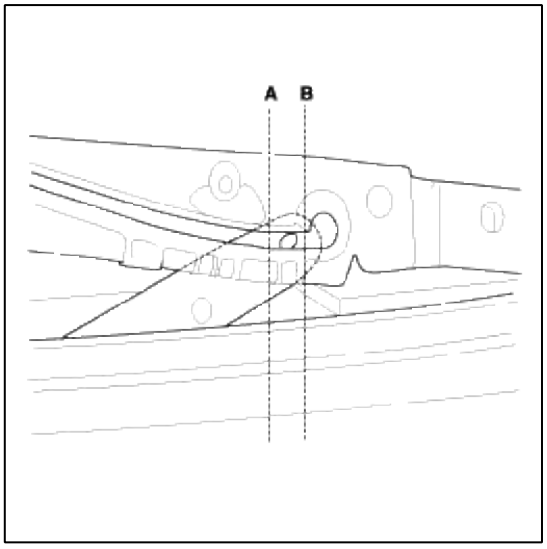
3. Remove the guide (A) and slide (B).



4. Installation is the reverse of removal.

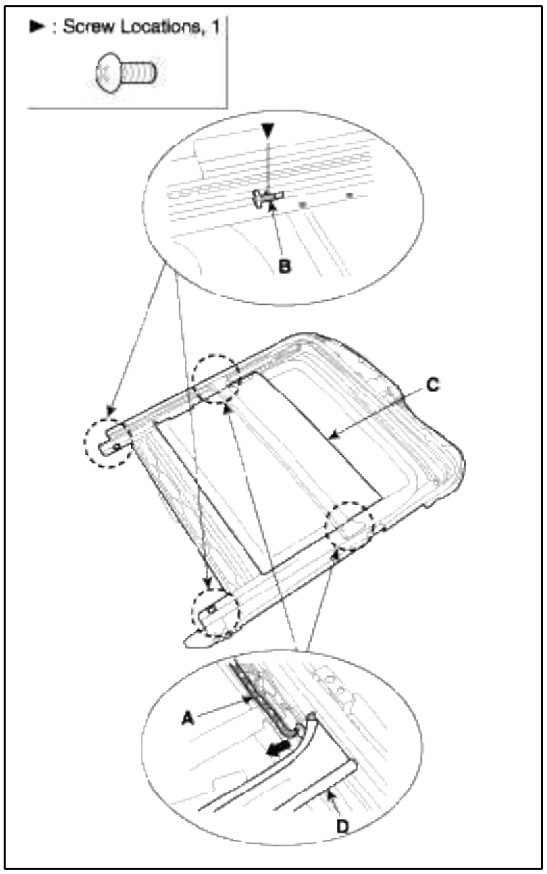
NOTE

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



SUNSHADE AND DRIP RAIL REPLACEMENT

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

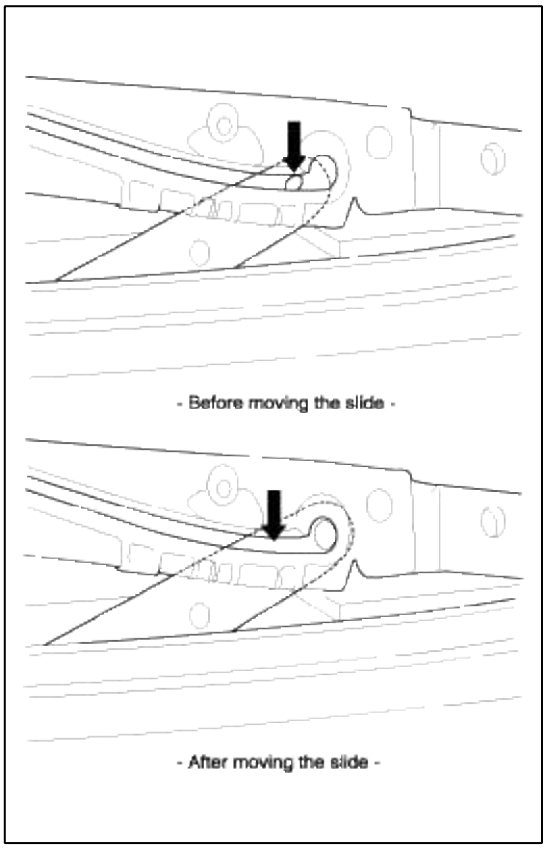


4. Installation is the reverse of removal.

ADJUSTMENT

HOW TO INITIALIZE

1. Check that the glass has been installed.
   A. Finished height adjustment.
2. Push the up switch. (Keep on pushing the switch)
   A. The slide moved 5mm forward after 15 seconds.



3. After moving the slide moves 5mm backward, release the switch and push the UP switch (Keep holding the switch)
   A. If the operation above is normal condition, the sunroof opens once and closes.
4. When the sunroof is closed completely, release the UP switch initialize the motor completely.

WHEN TO INITIALIZE THE MOTOR

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

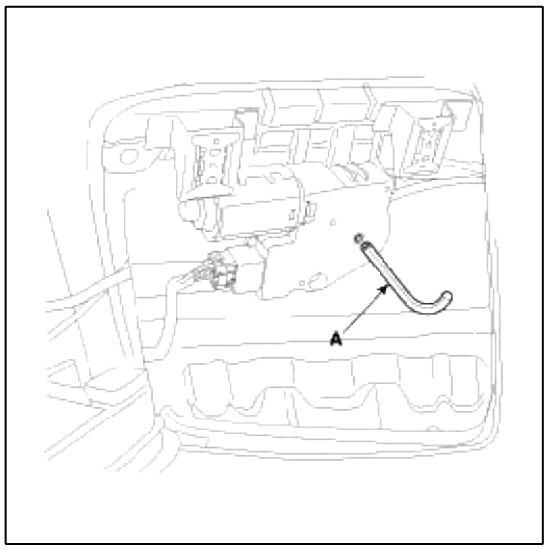
OPERATING THE SUNROOF EMERGENCY HANDLE

1. Use the sunroof emergency handle to close and open the sunroof manually for the following case only.
   A. To close the sunroof before driving a vehicle in a rainy day or on the highway if the sunroof cannot be closed due to failure of the sunroof motor or controller.

2. Operating method.
   A. Remove the overhead console.
   B. Push the emergency handle up into the hexagonal drive (A) of the sunroof motor. You must push hard enough to disengage the motor clutch; otherwise the emergency handle will slip due to incomplete fit in the motor.
   C. Carefully turn the emergency handle clockwise to close the sunroof.
   D. After closing the sunroof, wiggle the handle back and forth as you remove the tool from the motor, to ensure the motor clutch reengages.
   E. A 5mm hex socket may be used in place of the emergency handle, with a" Speeder" type handle.

CAUTION

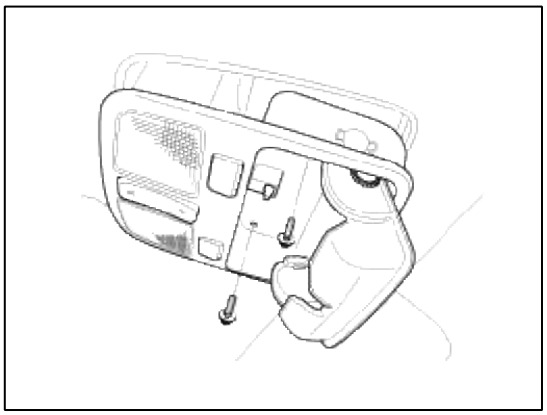
- Do not use power tools to operate the sunroof.
  Damage to the components may occur.



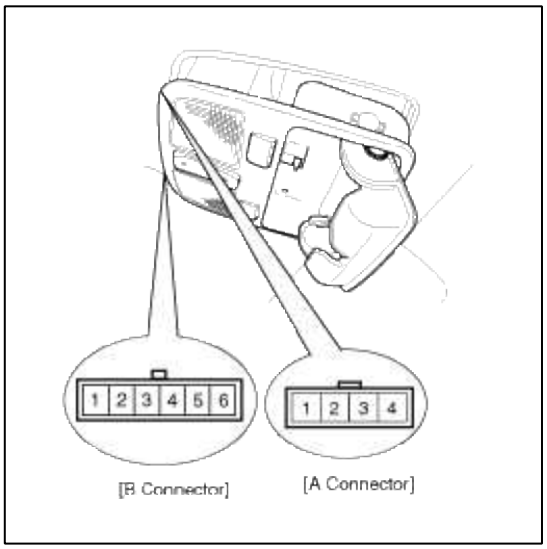
Body Electrical System > Sun Roof > Sunroof Switch > Repair procedures

INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Open the sunglass case cover from the overhead console then remove the 2 screws holding the overhead console.



3. Disconnect the connector then remove the overhead console lamp assembly from the headliner. Check for continuity between the terminals. If the continuity is not as specified, replace the sunroof switch.

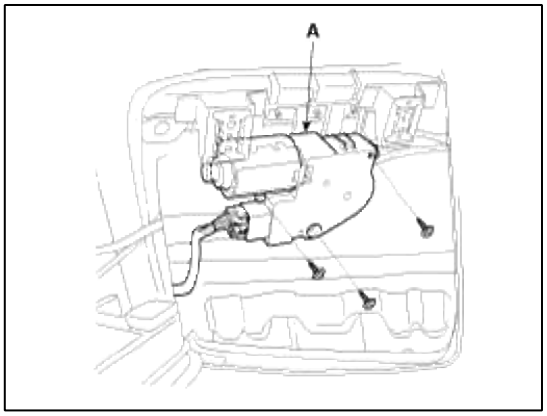


Terminal / position	B3	A3	A4
Slide open	○		○
Tilt down	○		○
Tilt up	○	○	

Body Electrical System > Sun Roof > Sunroof Motor > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the sunroof motor (A) after removing 3 screws and disconnect.

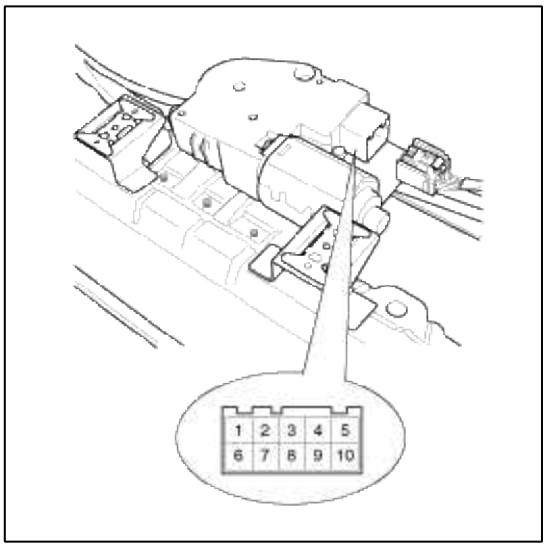


3. Installation is the reverse of removal.

INSPECTION

1. Disconnect the negative (-) battery terminal.

2. Apply the battery voltage to terminal 3, 6 and ground the terminal 1.



3. Ground the terminals as below table, and check that the sunroof unit operates as below table.

Position \ Terminal	3	4	5	10
Slide close/Tilt up	⊕			○
Slide open/Tilt down	⊕		⊖	

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:

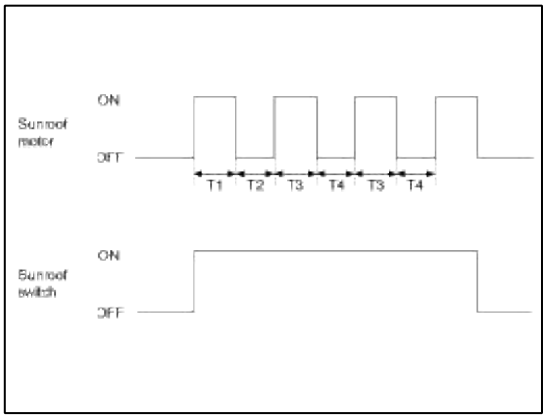
1. Turn the ignition key to the ON position.
2. According to the position of the sunroof, do as follows.
   (1) In case that the sunroof has closed completely or been tilted:
   Press the TILT UP button until the sunroof has tilted upward completely.
   (2) In case that the sunroof has slide-opened:
   Press and hold the CLOSE button for more than 5 seconds until the sunroof has closed completely.
   Press the TILT UP button until the sunroof has tilted upward completely.
3. Release the TILT UP button.
4. Press and hold the TILT UP button once again until the sunroof has returned to the original position of TILT UP after it is raised a little higher than the maximum TILT UP position.
   When this is complete, the sunroof system is reset.

PROTECTING THE OVERHEATED MOTOR

In order to protect the overheated sunroof motor by continuous motor operation, the sunroof ECU controls the

Run-time and Cool-time of motor as followings;

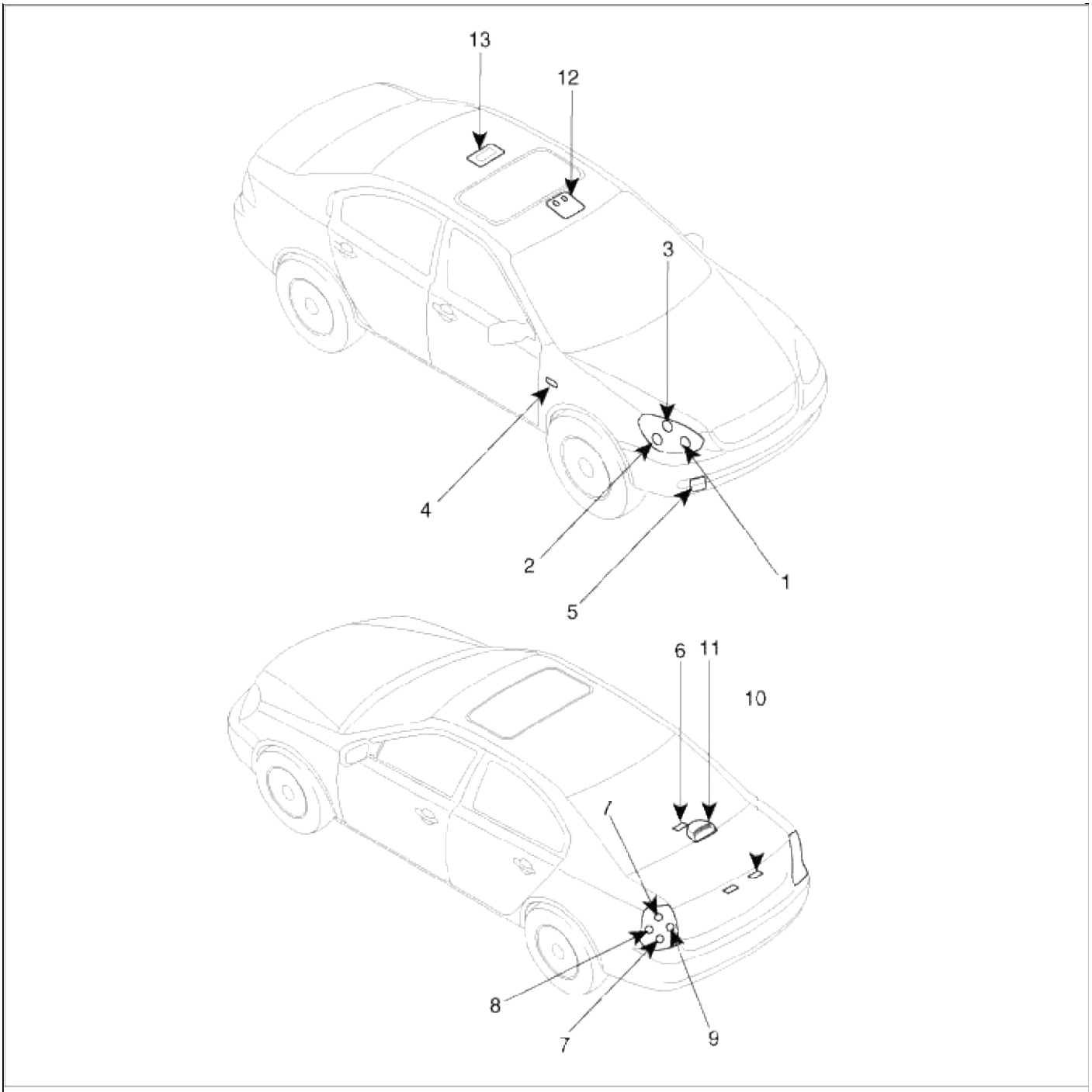
1. The Sunroof ECU detects the Run- time of motor
2. Motor can be operated continuously for the 1st Run-time(120 ± 10sec.).
3. The continuously operated motor stops operating after the 1st Run-time(120 ± 10sec.).
4. And then Motor is not operated for the 1st Cool-time(18 ± 2sec.).
5. Motor is operated for the 2nd Run-time(10 ± 2sec.) at the continued motor operation after 1st Cool-time(18 ± 2sec.)
6. The continuously operated motor stops operating after the 2st Run-time(120 ± 10sec.)
7. Motor is not operated for the 2st Cool-time(18 ± 2sec.).
8. Motor repeats the 2nd Run-time and 2nd Cool-time at the continued motor operation.
   A. In case that motor is not operated continuously, the Run-time which is limited for protecting the overheated motor is increased.
   B. The Run-Time of motor is initialized to "0" if the battery or fuse is reconnected after being disconnected, discharged or blown.



T1 : 120 ± 10 sec., T2 : 18 ± 2 sec.,
T3 : 10 ± 2 sec., T4 : 18 ± 2 sec.

Body Electrical System > Lighting System > Components and Components Location

COMPONENT LOCATION



1. Head lamp (High/Low)
2. Front turn signal lamp
3. Position lamp
4. Side marker
5. Front fog lamp
6. Luggage lamp
7. Tail/stop lamp
8. Rear turn signal lamp
9. Back up lamp
10. License plate lamp
11. High mounted stop lamp
12. Overhead console lamp (Map lamp)
13. Room lamp

Body Electrical System > Lighting System > Troubleshooting

TROUBLESHOOTING

Symptom	Possible cause	Remedy
One lamp does not light (all exterior)	Bulb burned out	Replace bulb
	Socket, wiring or ground faulty	Repair if necessary
Head lamps do not light	Bulb burned out	Replace bulb

	Head lamp fuse (10A) blown	Check for short and replace fuse
	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
	Position 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 (10A) 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
	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
	Multi back up fuse (10A) 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 (10A) 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 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
Map lamp does not light	Bulb burned out	Replace bulb
	Multi back up fuse (10A) blown	Check for short and replace fuse
	Map lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Trunk room lamp does not light	Bulb burned out	Replace bulb
	Multi back up fuse (10A) blown	Check for short and replace fuse
	Trunk lid switch (4 doors) faulty	Check switch
	Tailgate switch (5 doors) faulty	Check switch
	Wiring or ground faulty	Repair if necessary

Body Electrical System > Lighting System > Specifications

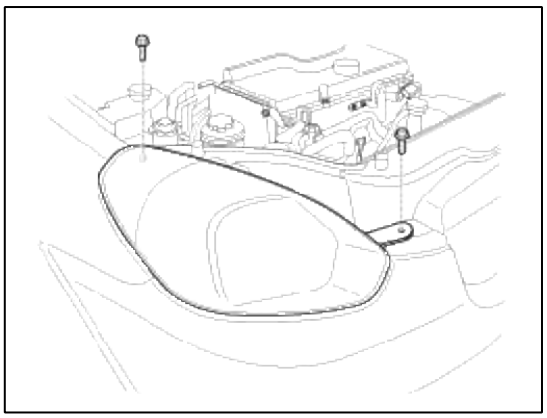
SPECIFICATION

Items	Bulb Wattage (W)
Head lamp (High/Low)	55/60
Front turn signal lamp	28
Front position lamp	8
Front fog lamp	27
Rear tail/stop lamp	27/8
Back up lamp	16
Rear turn signal lamp	27
License plate lamp	5
Side marker	27/8
Room lamp	10
Overhead console lamp	10 x 2
High mounted stop lamp	16
Luggage lamp	5

Body Electrical System > Lighting System > Head Lamps > Repair procedures

REPLACEMENT

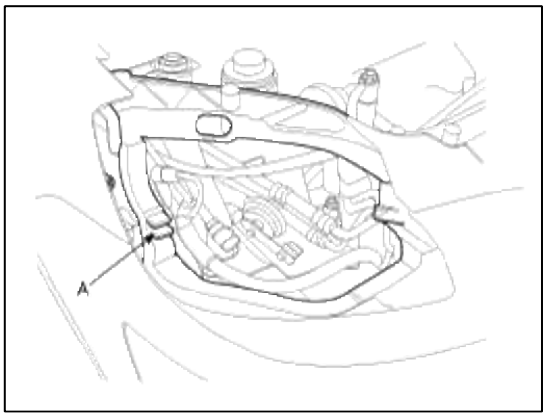
1. Disconnect the negative (-) battery terminal.
2. Remove the radiator grill after loosening bolt and clip.
3. Loose the mounting bolts (2EA) of head lamp.



4. Remove the head lamp assembly after disconnecting the lamp connectors.

NOTE

Take care that holding clip (A) is not to be damaged.



5. Installation is the reverse of removal.

HEAD LAMP AIMING INSTRUCTIONS

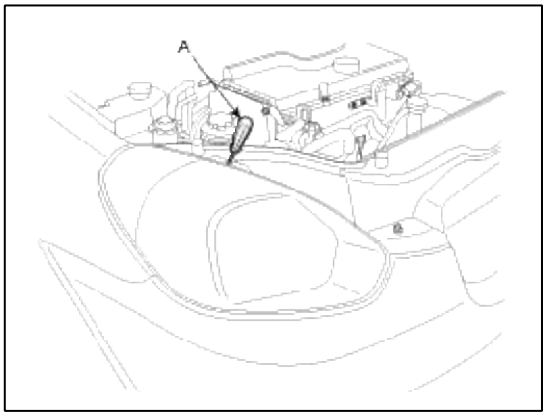
The head lamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

NOTE

If there are any regulations pertinent to the aiming of head lamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

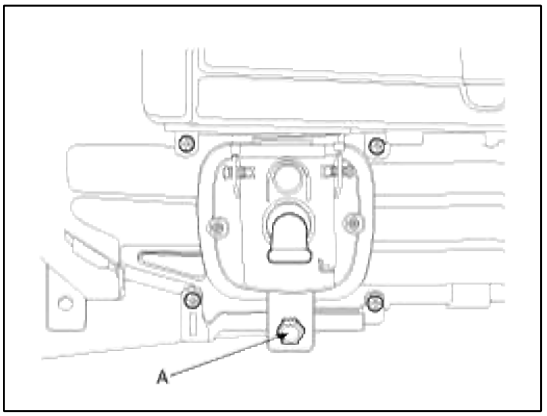
Alternately turn the adjusting gear to adjust the head lamp aiming. If beam-setting equipment is not available, proceed as follows :

1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) on the screen.
4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the vertical lines.
   Make vertical adjustments (A) to the lower beam using the adjusting wheel.

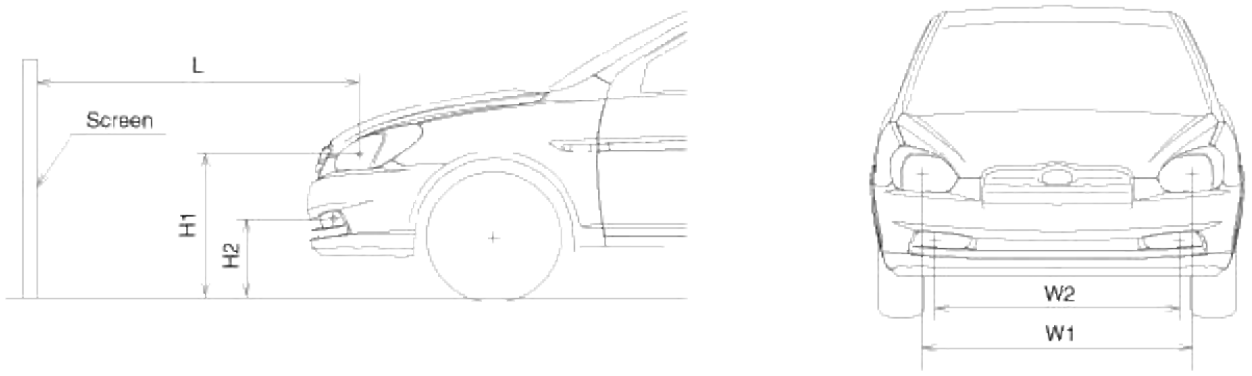


FRONT FOG LAMP AIMING

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.



HEAD LAMP AND FOG LAMP AIMING POINT

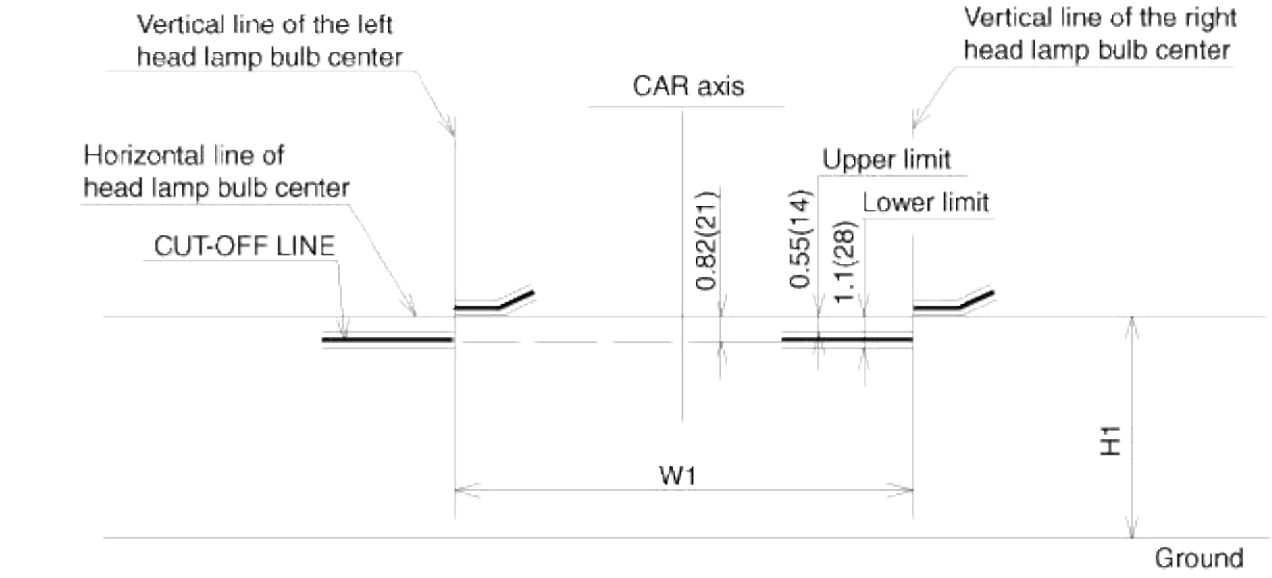


H1 : Height between the head lamp bulb center and ground (High/Low beam)
H2 : Height between the fog lamp bulb center and ground
W1 : Distance between the two head lamp bulb centers (High/Low beam)
W2 : Distance between the two fog lamp bulb centers
L : Distance between the head lamp bulb center and screen

Unit : in(mm)

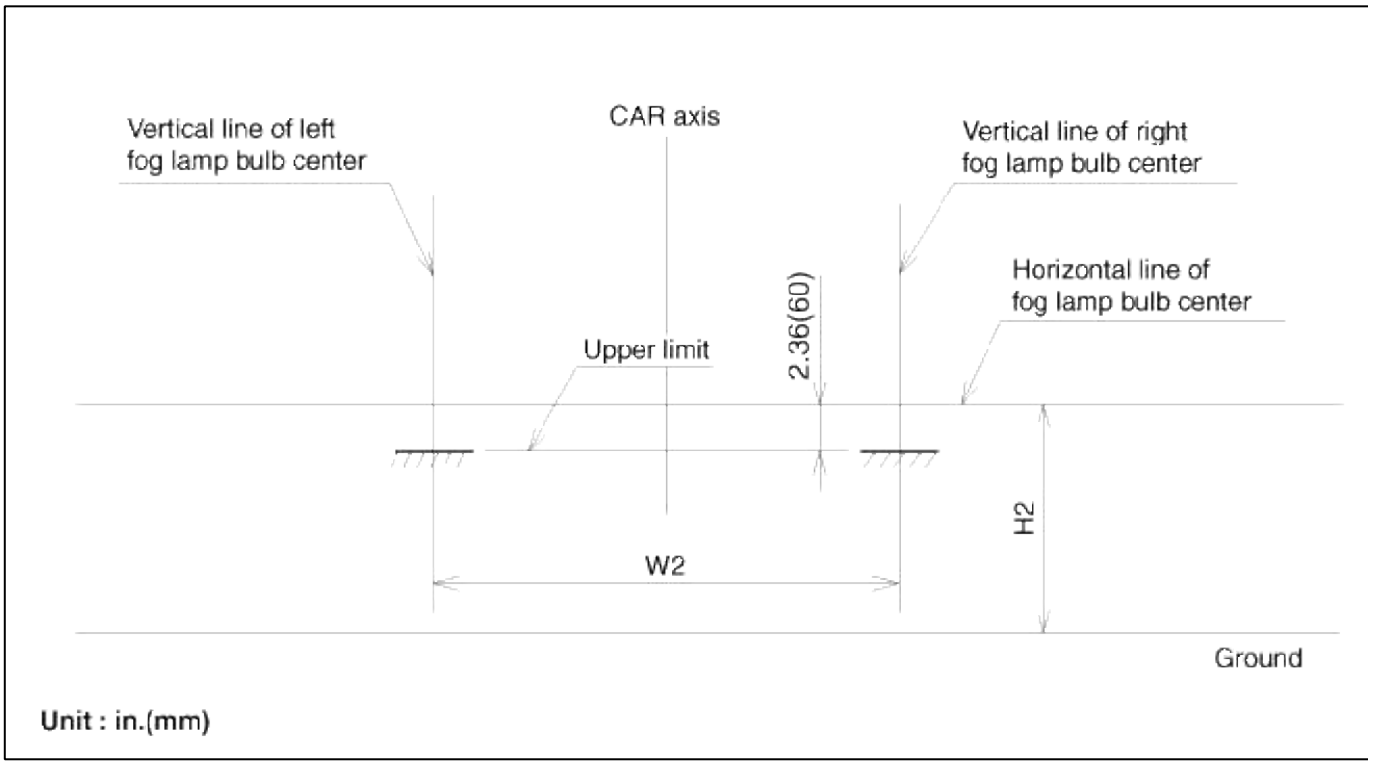
Vehicle condition	H1	H2	W1	W2	L
Without driver	26.4(671)	14.1(359)	46.0(1,170)	47.2(1,200)	118.1(3,000)
With driver	26.1(665)	13.9(353)			

1. Turn the low beam on with driver.
The cut-off line should be projected in the allowable range (shaded region).



Unit : in.(mm)

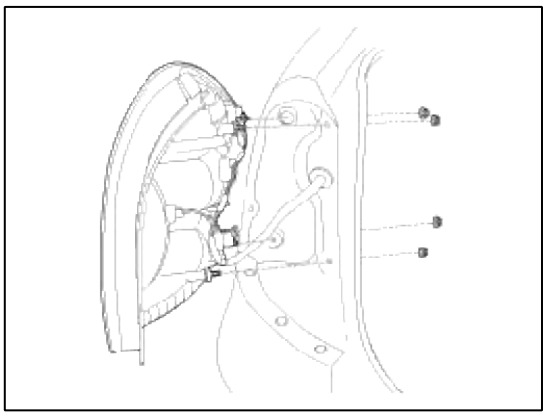
2. Turn the front fog lamp on with driver.
   The cut-off line should be projected in the allowable range (shaded region).



Body Electrical System > Lighting System > Turn Signal Lamp > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Loose the nuts holding the rear combination lamp then disconnect the 6P connector then remove the rear combination lamp.



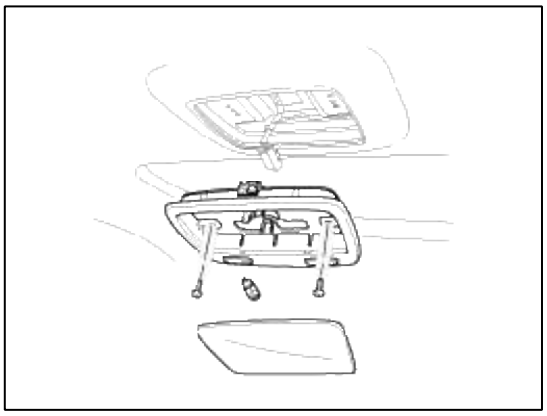
3. Installation is the reverse of removal.

Body Electrical System > Lighting System > Room Lamp > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.

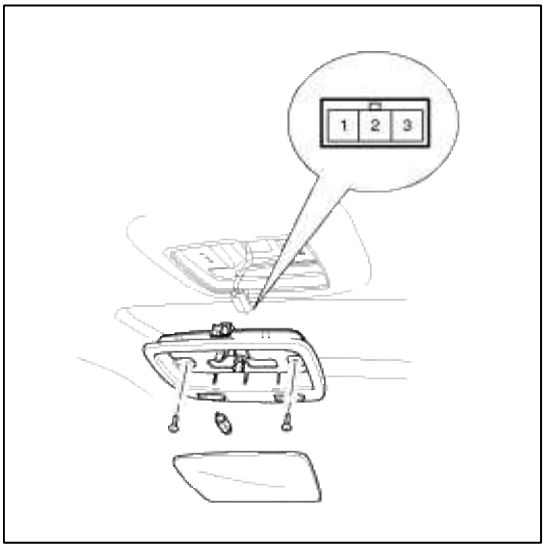
2. Detach the lamp lens from the room lamp with a flat-tip screwdriver then replace the bulb.



3. Remove the room lamp assembly after removing 2 screws and disconnecting the 3P connector.
4. Installation is the reverse of removal.

INSPECTION

Remove the room lamp assembly then check for continuity between terminals.



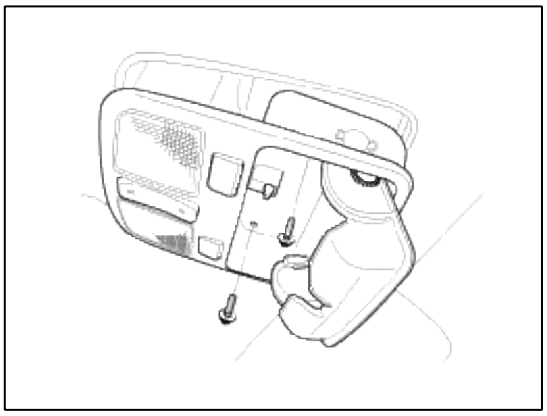
Terminal / Position	1	2	3
DOOR		○	○
ON	○	○	○
OFF			

Body Electrical System > Lighting System > Overhead Console Lamp > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Detach the lamp lens from the overhead console lamp with a flat-tip screw driver, then replace the bulb.

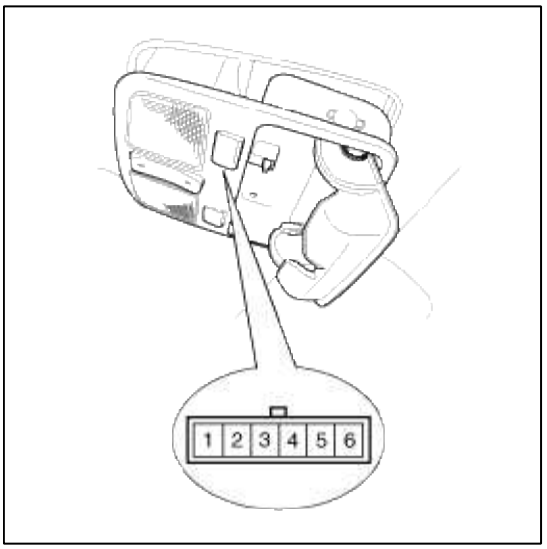
3. Open the sunglass case cover then remove the 2 screws holding the overhead console.



4. Disconnect the connector (4P) of sunroof switch and the connector (6P) of map lamp then remove the overhead console lamp assembly from the headliner.
5. Installation is the reverse of removal.

INSPECTION

Remove the overhead console lamp assembly then check for continuity between terminals. If the continuity is not as specified, replace the map lamp switch.



Terminal / Position	2	3	4
ROOM	○	○	○
DOOR	○	○	

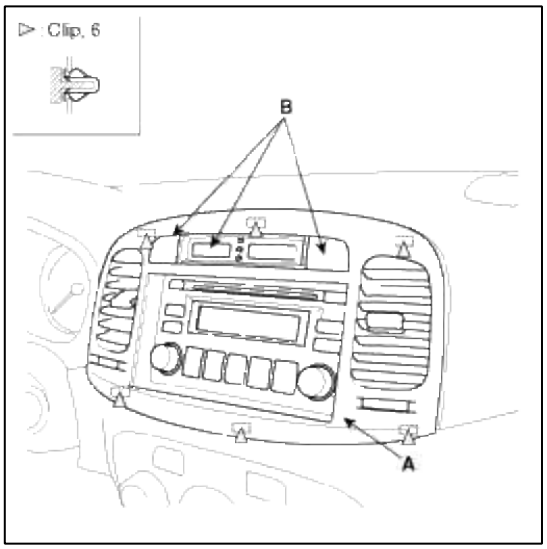
Body Electrical System > Lighting System > Hazard Lamp Switch > Repair procedures

INSPECTION

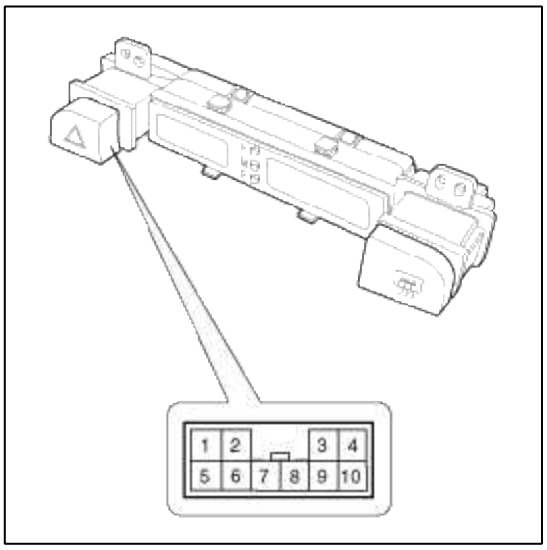
HAZARD LAMP SWITCH

1. Disconnect the negative (-) battery terminal.

2. Remove the center facia upper panel (A) after pulling it by using regular screw driver (-).



3. Disconnect the connectors of rear defogger switch and hazard switch (B).
4. Remove the center facia switch assembly(B) from the center facia upper panel.



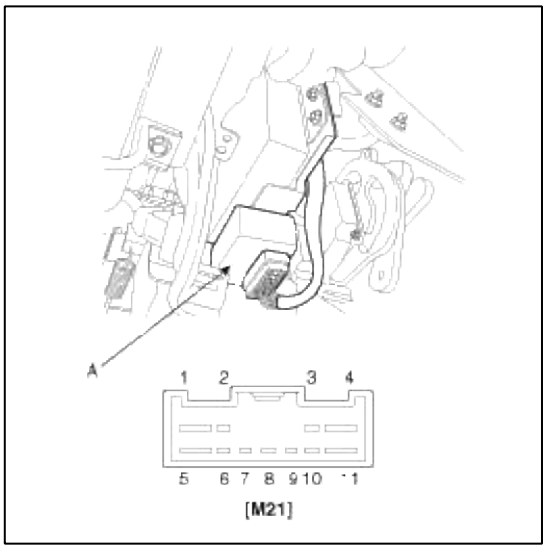
5. Operate the switch and check for continuity between terminals with an ohmmeter.

Terminal / Position	2	3	6	9	10	5	7	8
OFF	○	○				○	—	○
ON	Illumination		○	—	○		○	— ○

HAZARD LAMP RELAY

1. Remove 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.8 and No.6 terminals when power and ground are connected to the No.8 and No.9 terminals.

5. There should be no continuity between the No.8 and No.6 terminals when power is disconnected.

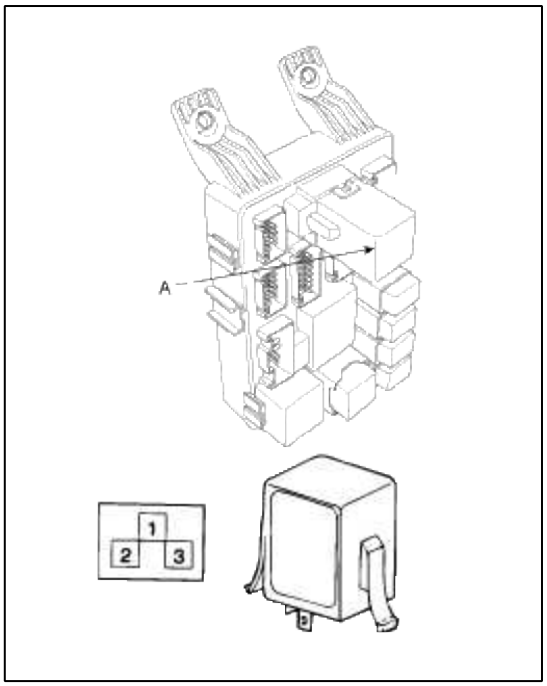


Terminal / Power	9	8	8	7	6
Disconnected					
Connected	⊖ ⊕		○ ○	○	○

Body Electrical System > Lighting System > Flasher Unit > Repair procedures

INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the junction box. (Refer to the Fuses and relays)
3. Remove the flasher unit (A) from the junction.



4. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 3.
5. Connect the two turn signal lamps in parallel to terminals 1 and 3. Check that the bulbs turn on and off.

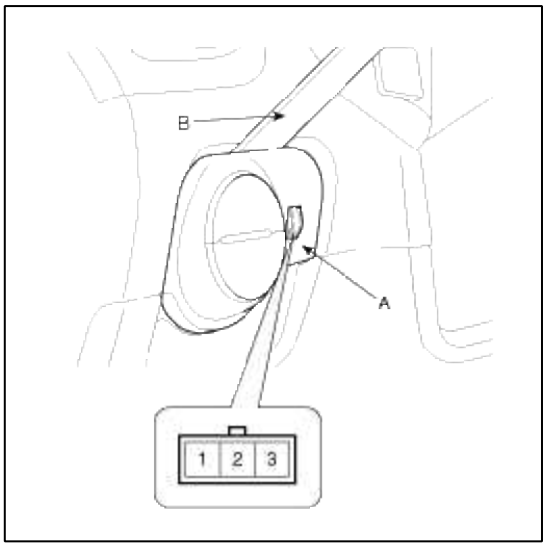
NOTE

The turn signal lamps should flash 60 to 120 times per minute. If one of the front or rear turn signal lamps has an open circuit, the number of flashes will be more than 120 per minute. If operation is not as specified, replace the flasher unit.

Body Electrical System > Lighting System > Rheostat > Repair procedures

INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side switch (A) by using the scraper (B) and then disconnect the connectors. Take care of fixing clips.

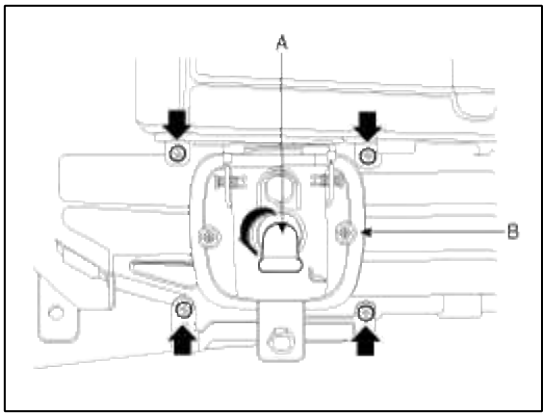


3. Check for intensity. If the light intensity of the lamps changes smoothly without any flickering when the rheostat is turned, it can be assumed that the rheostat is normal.

Body Electrical System > Lighting System > Front Fog Lamps > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Replace the bulb by rotating the bulb holder (A) to the clockwise direction after disconnecting the fog lamp connector.
3. Remove the front fog lamp (B) after loosening the screws and disconnecting the fog lamp connector.



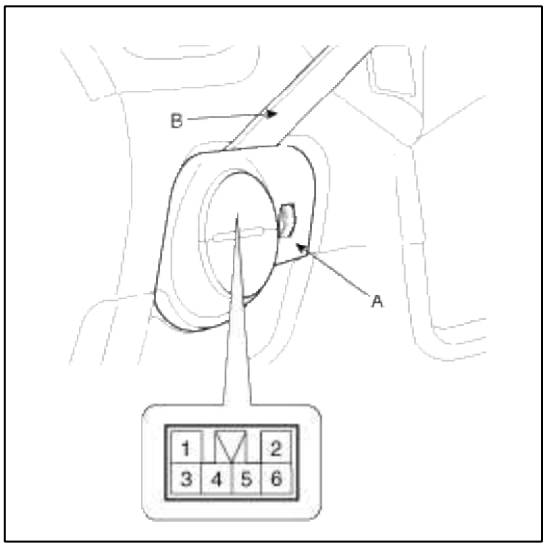
4. Installation is the reverse of removal.

INSPECTION

FRONT FOG LAMP SWITCH

1. Disconnect the negative (-) battery terminal.

2. Remove the crash pad side switch (A) by using the scraper (B) and then disconnect the connectors. Take care of fixing clips.

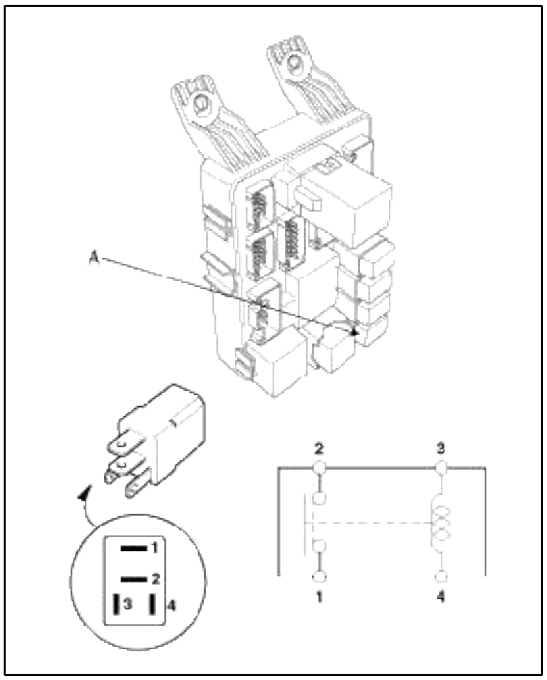


3. Remove the front fog lamp switch (C) from crash pad side switch.
4. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	2	6	1	4	5	3
ON						
OFF		Illumination				

FRONT FOG LAMP RELAY

1. Pull out the front fog lamp (A) relay from the junction box.
2. Check for continuity between terminals. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.4 terminals.
3. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.

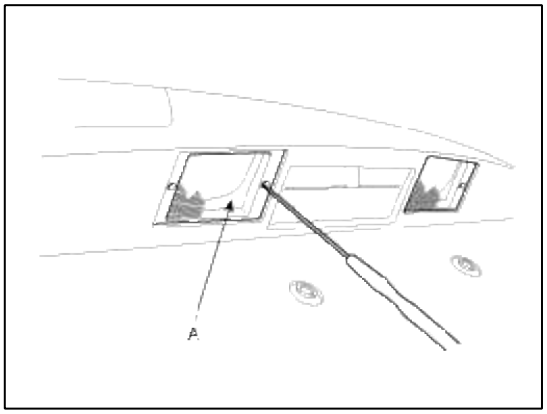


Power (No.3-No.4) \ Terminal	1	2	3	4
Disconnected				
Connected			⊖	⊕

Body Electrical System > Lighting System > License Lamps > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Detach the license lamp lens (A) from the trunk lid panel with a flat-tip screwdriver.

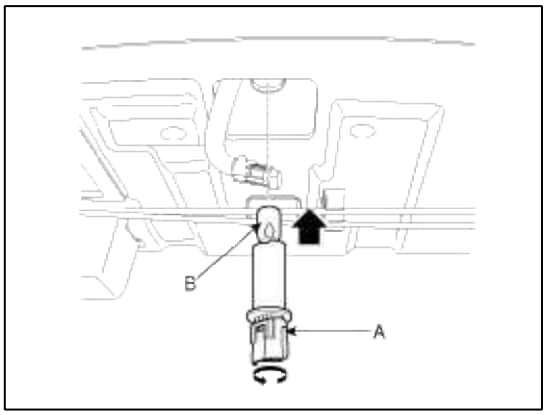


3. Replace the bulb.
4. Installation is the reverse of removal.

Body Electrical System > Lighting System > High Mounted stop lamp > Repair procedures

REPLACEMENT

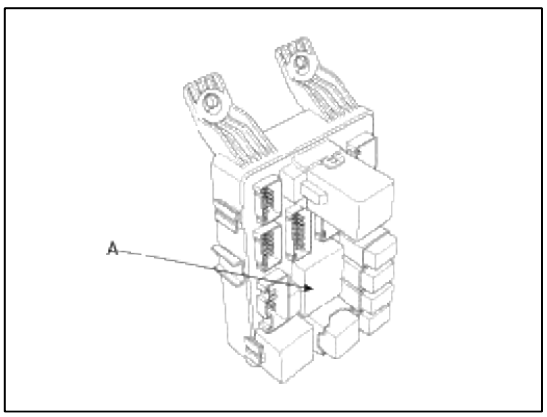
1. Disconnect the negative (-) battery terminal.
2. Open the trunk lid (Tail gate) and then disconnect the connector of high mounted stop lamp.
3. Replace the bulb (B) by rotating the bulb holder (A) to the clockwise direction.



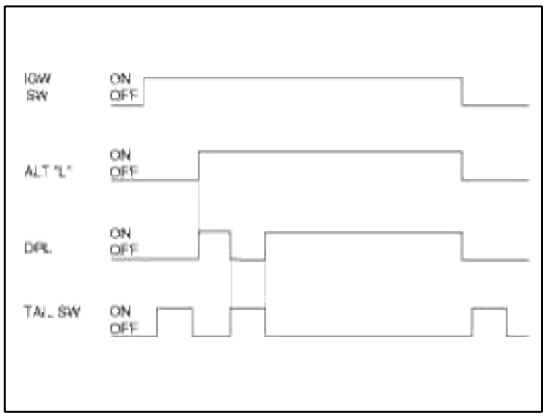
Body Electrical System > Daytime Running Lights > DRL Control Module > Repair procedures

INSPECTION

1. The daytime running unit (A) is integrated in the junction box.
2. Daytime running unit (A) is installed at the right side strut housing.



3. Check that the light operate according to the following timing chart.



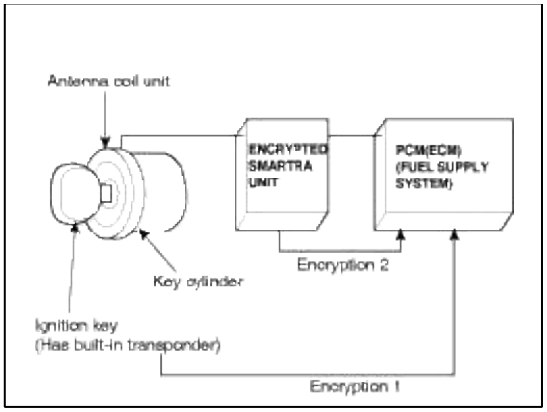
4. If the daytime running light is not operated well, inspect the connector and terminals to be sure they are all making good contact.
   If the terminals are bent, loose or corroded, repair them as necessary, and recheck the system.
   If the terminals look OK, go to step 5.
5. Make these input tests 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 junction box (control unit) must be faulty; replace it.

Body Electrical System > Immobilizer System > Description and Operation

DESCRIPTION

The immobilizer system will disable the vehicle unless the proper ignition key is used, in addition to the currently available anti-theft systems such as car alarms, the immobilizer system aims to drastically reduce the rate of auto theft.

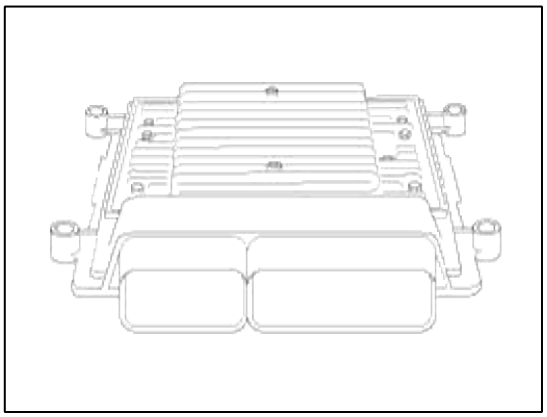
1. Encrypted SMARTRA type immobilizer
   A. The SMARTRA system consists of a passivie challenge - response (mutual authentication)transponder located in the ignition key, an antenna coil, a encoded SMARTRA unit, an indicator light and the PCM(ECM).
   B. The SMARTRA communicates to the PCM(ECM) (Engine Control Module) via a dedicated communications line. Since the vehicle engine management system is able to control engine mobilization, it is the most suitable unit to control the SMARTRA.
   C. When the key is inserted in the ignition and turned to the ON position, the antenna coil sends power to the transponder in the ignition key. The transponder then sends a coded signal back through the SMARTRA unit to the PCM(ECM).
   D. If the proper key has been used, the PCM(ECM) will energize the fuel supply system. The immobilizer indicator light in the cluster will simultaneously come on for more than five seconds, indicating that the SMARTRA unit has recognized the code sent by the transponder.
   E. If the wrong key has been used and the code was not received or recognized by the PCM(ECM) the indicator light will continue blinking for about five seconds until the ignition switch is turned OFF.
   F. If it is necessary to rewrite the PCM(ECM) to learn a new key, the dealer needs the customer's vehicle, all its keys and the Hi-scan (pro) equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
   G. The immobilizer system can store up to eight key codes.
   H. If the customer has lost his key, and cannot start the engine, contact Hyundai motor service station.



COMPONENTS OPERATIONS

PCM (Power Train Control Module)

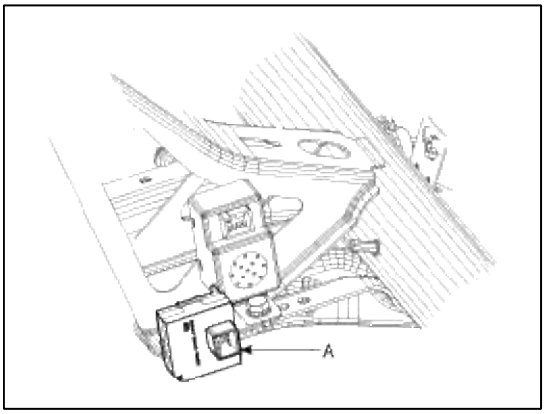
1. The PCM(ECM) carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the PCM(ECM) simultaneously. Only if the results are equal, the engine can be started. The data of all transponders, which are valid for the vehicle, are stored in the PCM(ECM).



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.

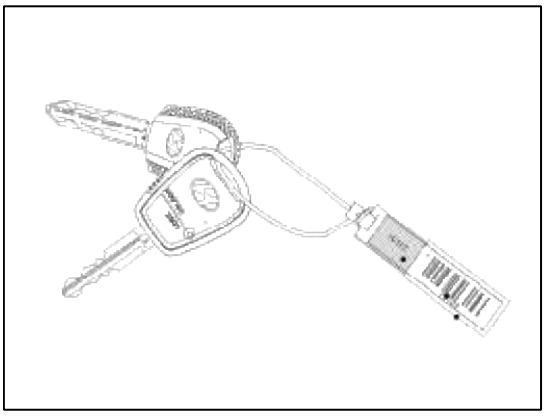
[USA only]



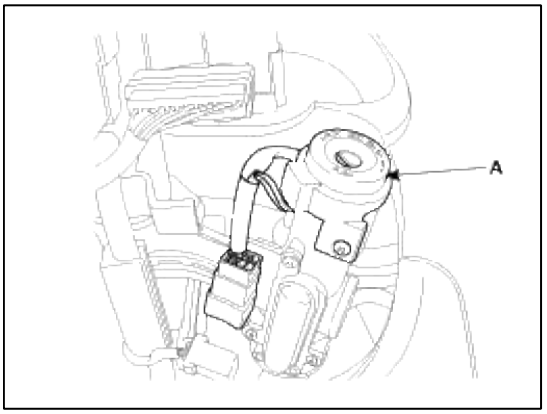
TRANSPONDER (Built-in keys)

The transponder 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 has the following functions.
- The antenna coil supplies energy to the transponder.
- The antenna coil receives signal from the transponder.
- The antenna coil sends transponder signal to the SMARTRA.
  It is located directly in front of the steering handle lock.



Body Electrical System > Immobilizer System > Troubleshooting

DIAGNOSIS OF IMMOBILIZER FAULTS
- Communication between the ECM and the SMARTRA.
- Function of the SMARTRA and the transponder.
- Data (stored in the ECM related to the immobilizer function.

The following table shows the assignment of immobilizer related faults to each type:

Immobilizer Related Faults	Fault types	Diagnostic codes
PCM(ECM) fault	1. Non-Immobilizer-EMS connected to an Immobilizer	P1610
Transponder key fault	1. Transponder not in password mode 2. Transponder transport data has been changed.	P1674 (Transponder status error)
Transponder key fault	1. Transponder programming error	P1675 (Transponder programming error)
SMARTRA fault	1. Invalid message from SMARTRA to PCM(ECM)	P1676 (SMARTRA message error)
SMARTRA fault	1. Virgin SMARTRA at learnt EMS 2. Neutral SMARTRA at learnt EMS 3. 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)
Invalid key fault	1. Virgin transponder at PCM(ECM) status "Learnt"Learnt (Invalid) Transponder at PCM(ECM) status "Learnt"(Authentication fail)	P1696 (Authentication fail)
Hi-Scan fault	1. Hi-Scan message error	P1697
Locked by timer	1. Exceeding the maximum limit of Twice IGN ON (32 times)	P1699 (Twice IG ON over trial)

IMMOBILIZER (SMARTRA) DTC LIST

No.	Fault code	Monitor strategy description	Gasoline (µ-engine)
1	P1610	Non-Immobilizer-EMS connected to an immobilizer	O
2	P1674	Transponder status error	O
3	P1675	Transponder programming error	O
4	P1676	SMARTRA message error	O
5	P169A	SMARTRA fault	O
6	P1690	SMARTRA no response	O
7	P1691	Antenna coil error	O
8	P1692	Immobilizer lamp error	O
9	P1693	Transponder no response error / Invalid response	O
10	P1694	EMS message error	O
11	P1695	EMS memory error	O
12	P1696	Authentication fail	O
13	P1697	HI-SCAN message error	O
14	P1699	Twice overtrial	O

Body Electrical System > Immobilizer System > Repair procedures

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.

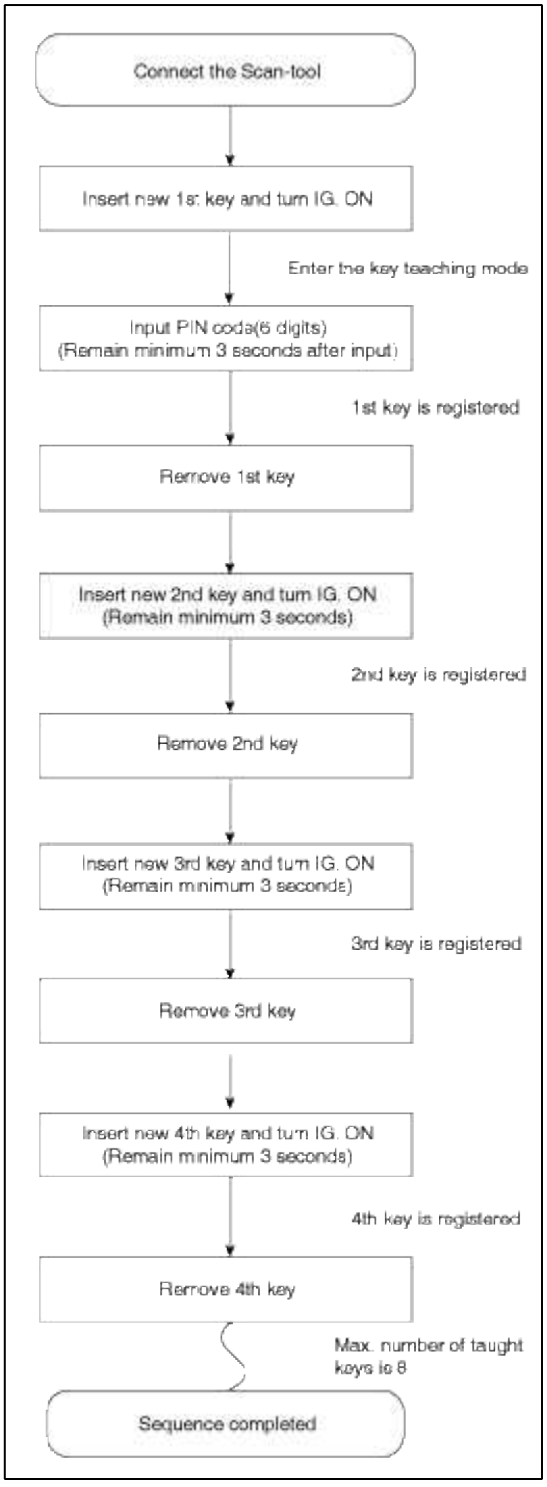
The PCM(ECM) rejects invalid keys, which are presented for teaching. A message is sent to the tester. The key can be invalid due to faults in the transponder or other reasons, which result from unsuccessful programming of data. If the PCM(ECM) detects different authenticators of a transponder and an PCM(ECM), the key is considered to be invalid.

The maximum number of taught keys is 8

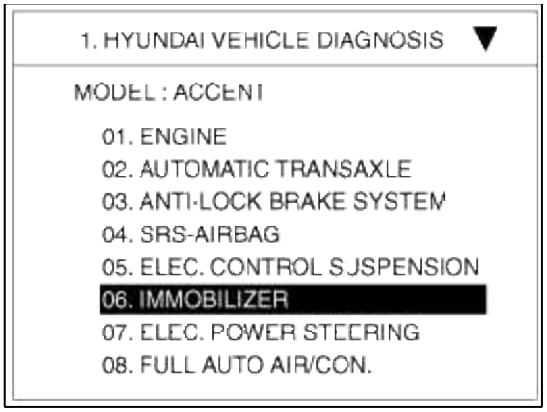
If an error occurs during the Immobilizer Service Menu, the PCM(ECM) status remains unchanged and a specific fault code is stored.
If the PCM(ECM) status and the key status do not match for teaching of keys, the tester procedure will be stopped and a specific fault code will be stored at PCM(ECM).

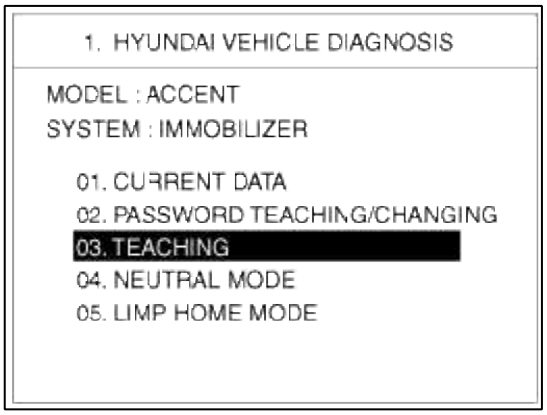
NOTE

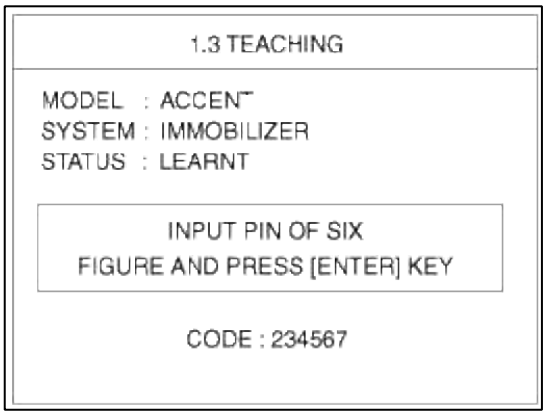
When teaching the 1st key, smartra regists at the same time.

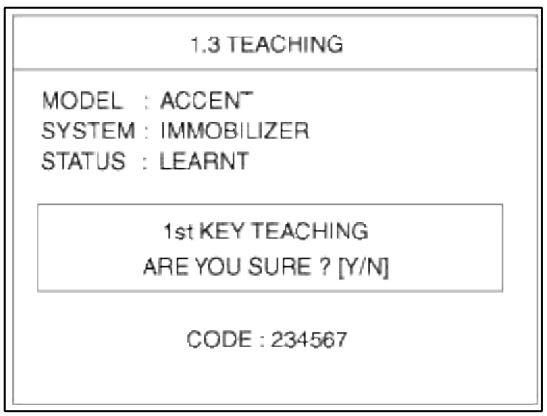


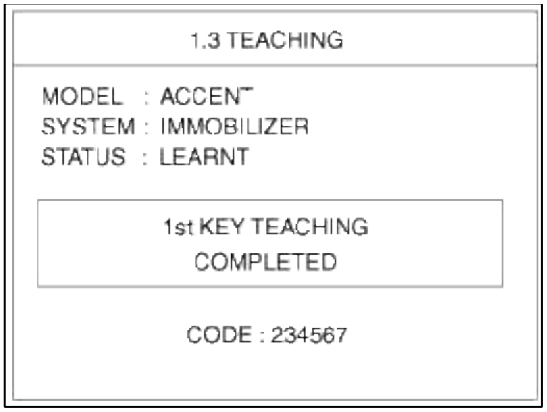
(1) PCM(ECM) learnt status.

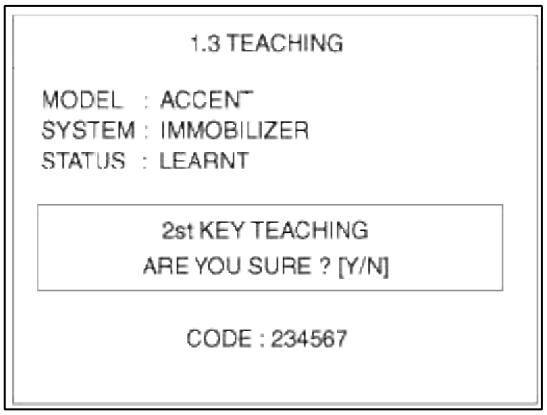

1. HYUNDAI VEHICLE DIAGNOSIS
MODEL : ACCENT
01. ENGINE
02. AUTOMATIC TRANSAXLE
03. ANTI-LOCK BRAKE SYSTEM
04. SRS-AIRBAG
05. ELEC. CONTROL SUSPENSION
06. IMMOBILIZER
07. ELEC. POWER STEERING
08. FULL AUTO AIR/CON.

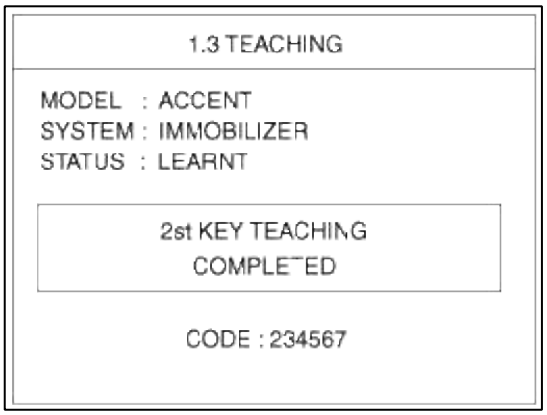

1. HYUNDAI VEHICLE DIAGNOSIS
MODEL : ACCENT
SYSTEM : IMMOBILIZER
01. CURRENT DATA
02. PASSWORD TEACHING/CHANGING
03. TEACHING
04. NEUTRAL MODE
05. LIMP HOME MODE


1.3 TEACHING
MODEL : ACCENT
SYSTEM : IMMOBILIZER
STATUS : LEARNT
INPUT PIN OF SIX
FIGURE AND PRESS [ENTER] KEY
CODE : 234567


1.3 TEACHING
MODEL : ACCENT
SYSTEM : IMMOBILIZER
STATUS : LEARNT
1st KEY TEACHING
ARE YOU SURE ? [Y/N]
CODE : 234567

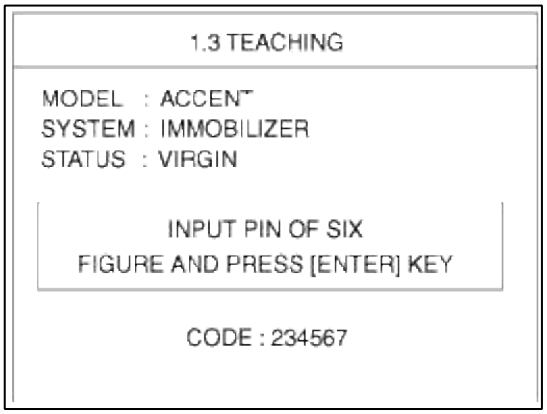


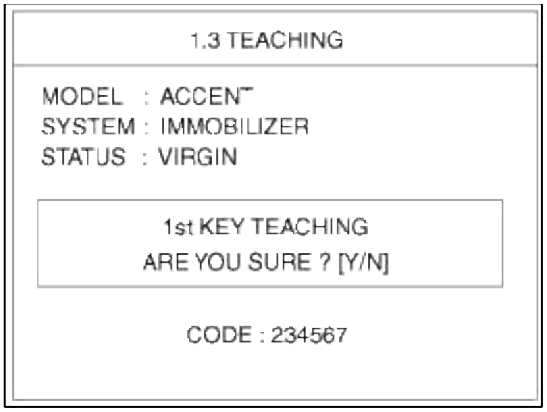


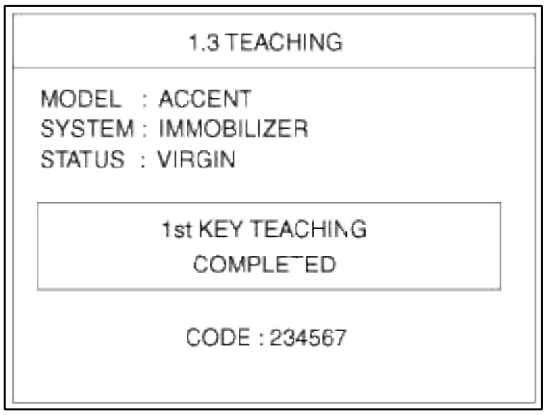


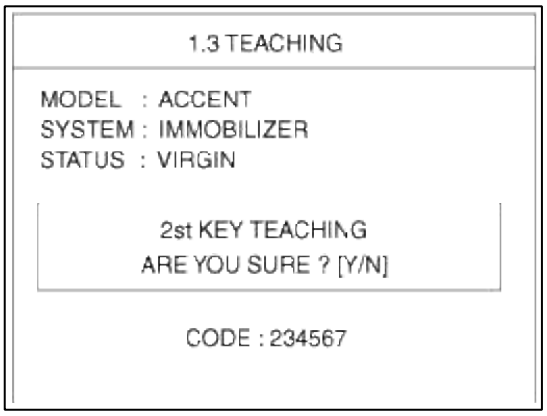
(2) PCM(ECM) virgin status.

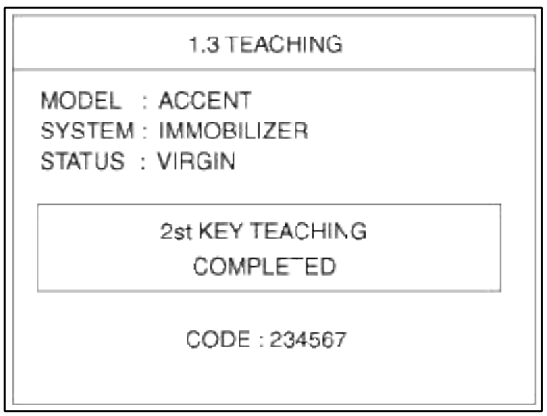
After replacing new "PCM(ECM)" scantool displays that PCM(ECM) is virgin status in Key Teaching mode. "VIRGIN" status means that PCM(ECM) has not matched any PIN code before.











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 (learnt key) and sending the user password by tester. After successful teaching, the status of the user password changes from "virgin" to "learnt"

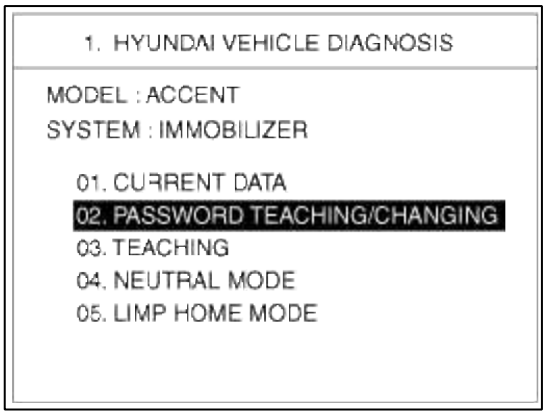
The learnt user password can also be changed. This can be done if the user password status is "learnt" and the tester sends authorization of access, either the old user password or the vehicle specific data. After correct

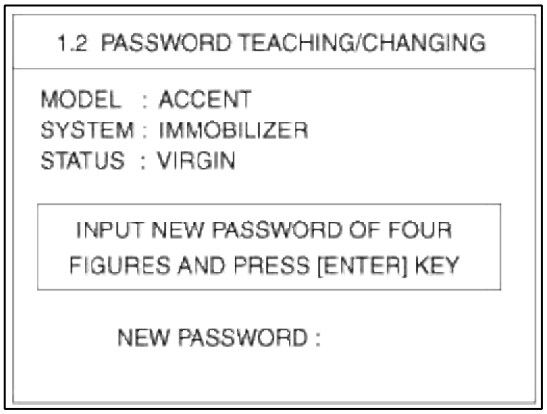
authorization, the PCM(ECM) requests the new user password. The status remains "learnt" and the new user password will be valid for the next limp home mode.

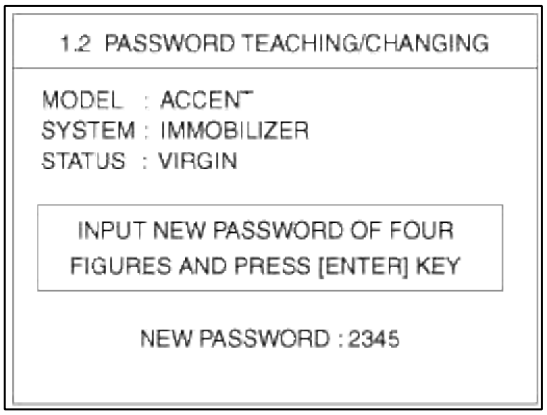
If incorrect user passwords or wrong vehicle specific data have been sent to the PCM(ECM) three times, the PCM(ECM) will reject the request to change the password for one hour. This time cannot be reduced by disconnecting the battery or any other actions. After reconnecting the battery, the timer starts again for one hour.

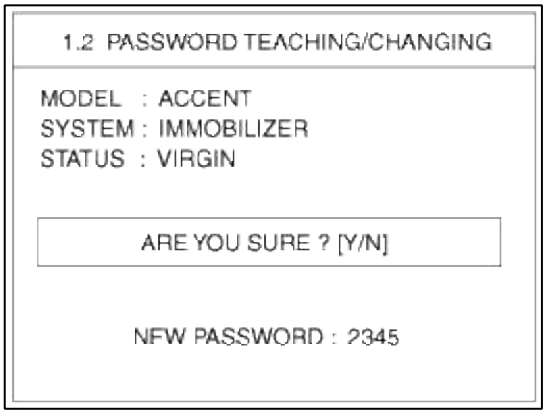
(1) User password teaching

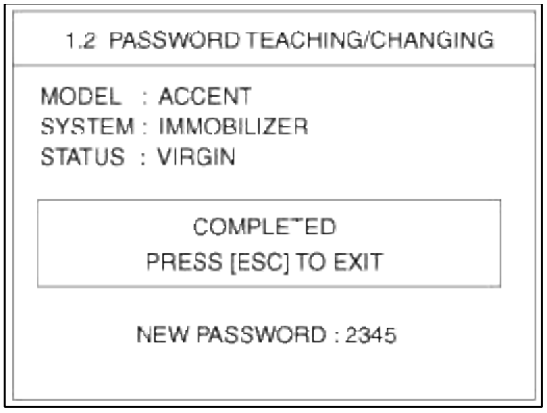
In case of putting wrong password, retry from first step after 10 seconds.





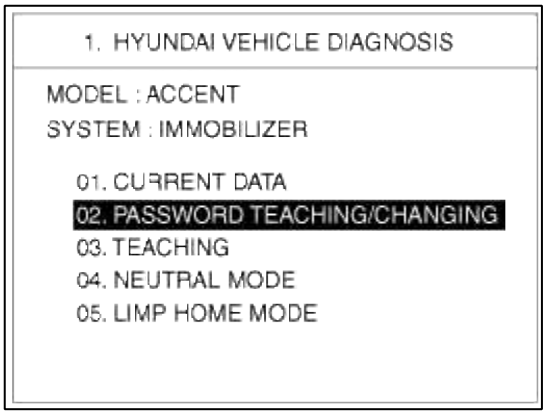


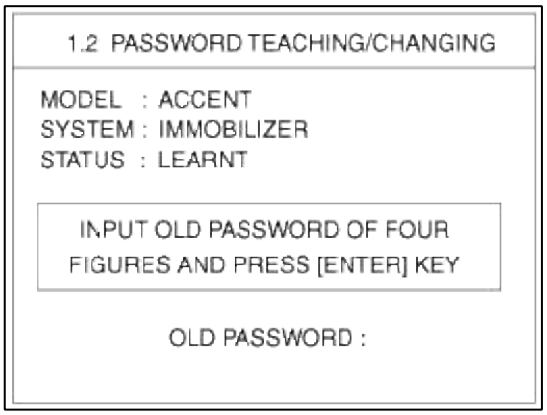


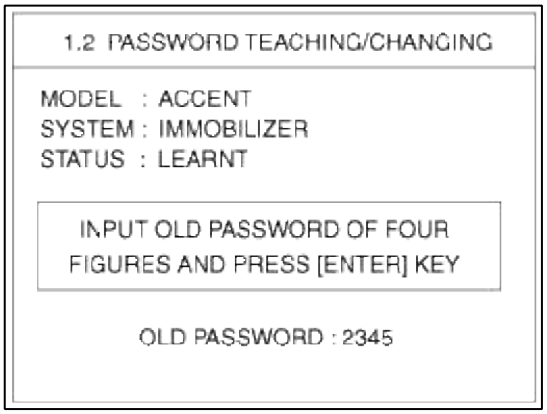


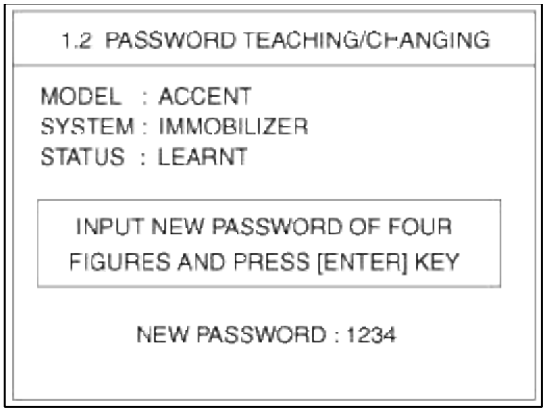
In case of putting wrong password, retry from first step after 10 seconds.

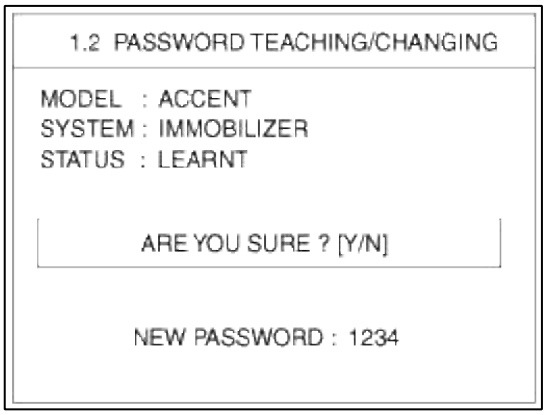
(2) User password changing

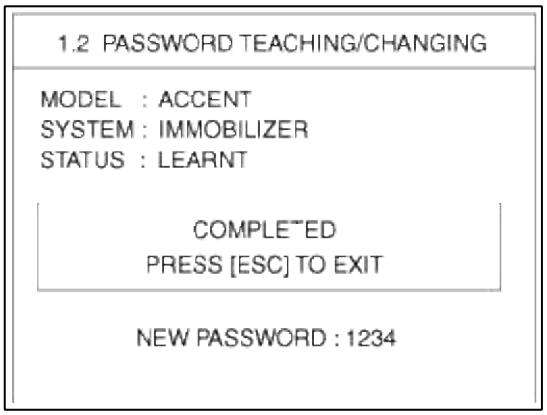












LIMP HOME FUNCTION

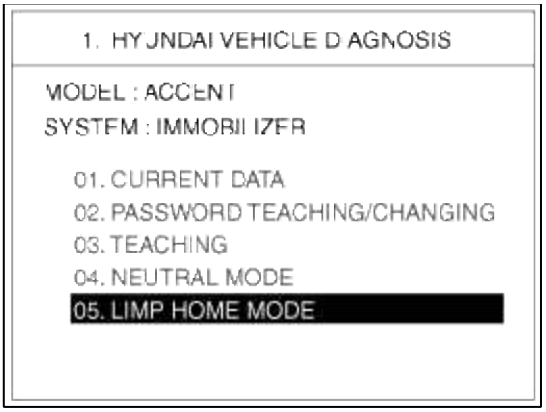
1. LIMP HOME BY TESTER

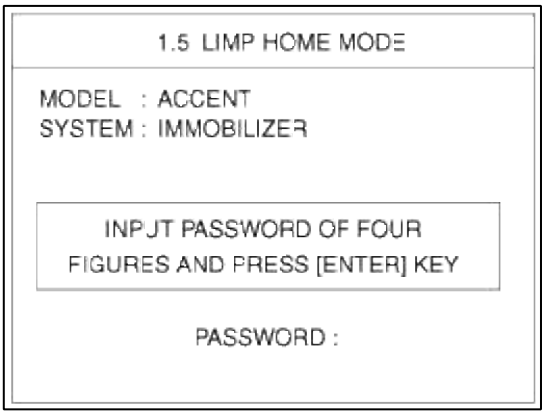
   If the PCM(ECM) detects the fault of the SMARTRA or transponder, the PCM(ECM) will allow limp home function of the immobilizer. Limp home is only possible if the user password (4 digits) has been given to the PCM(ECM) before. This password can be selected by the vehicle owner and is programmed at the service station.

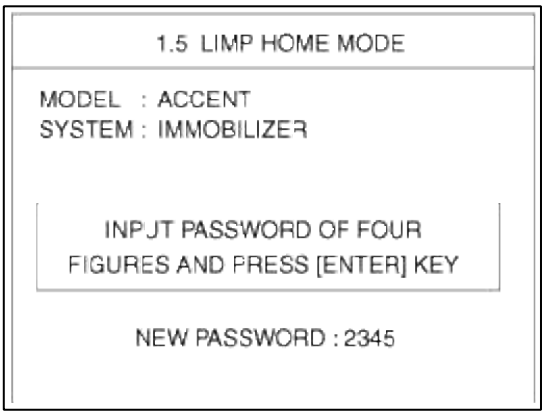
   The user password can be sent to the PCM(ECM) via the special tester menu.

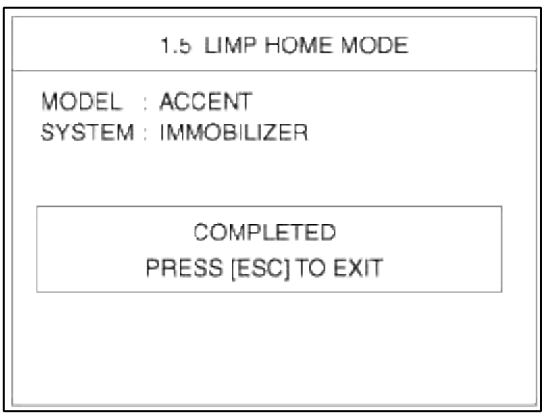
   Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is correct, the PCM(ECM) will be unlocked for a period of time (30 sec.). The engine can only be started during this time. After the time has elapsed, engine start is not possible.

   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.







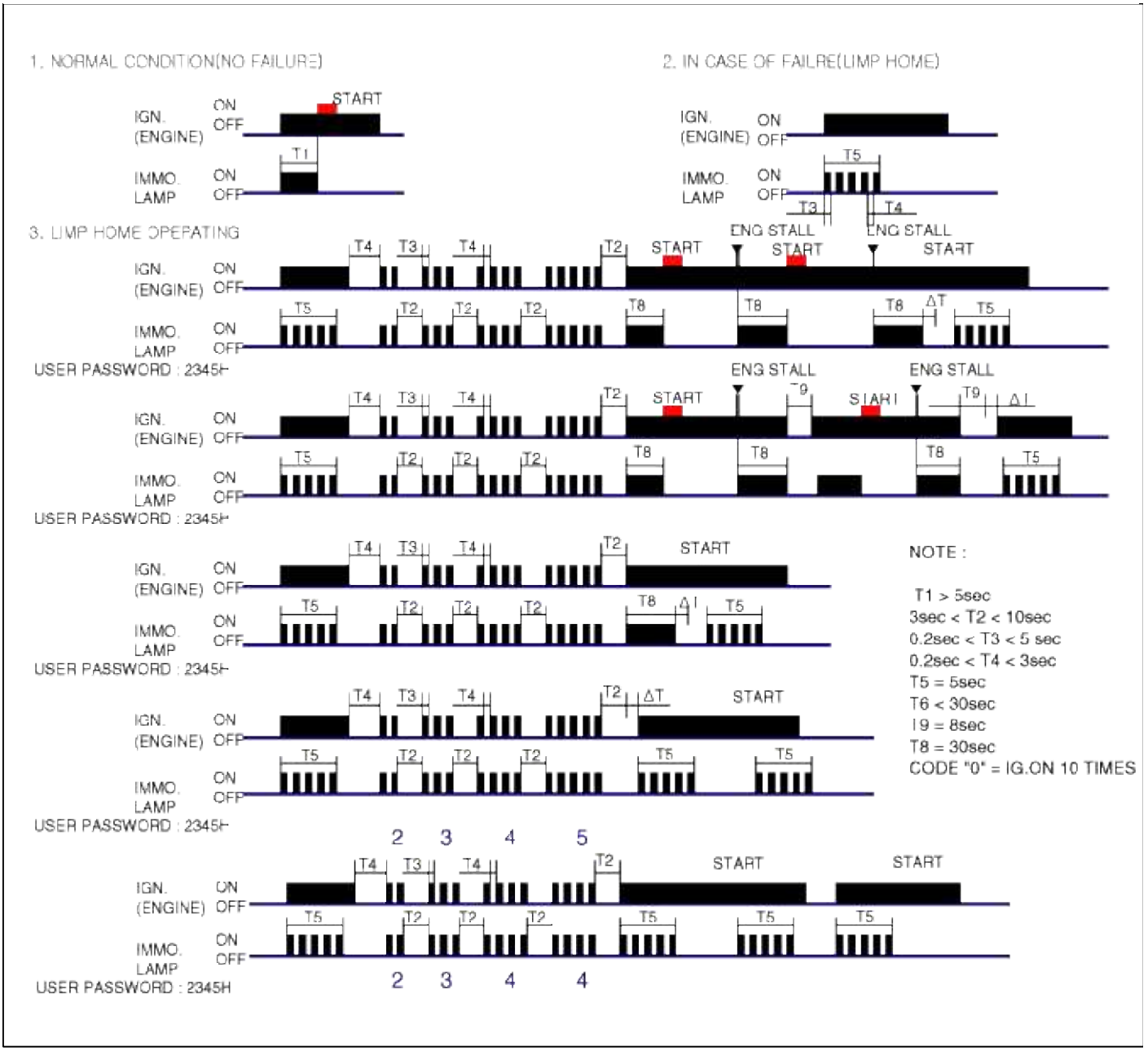


2. LIMP HOME BY IGNITION KEY

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:

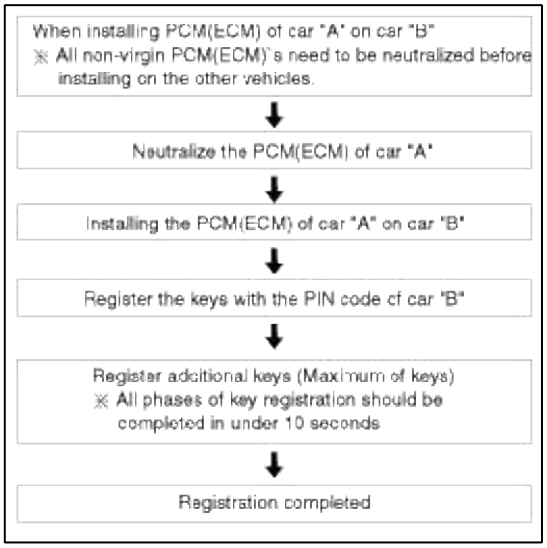
Problem	Part set	Scan tool required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA unit does not work	SMARTRA unit	NO

REPLACEMENT OF ECM AND SMARTRA

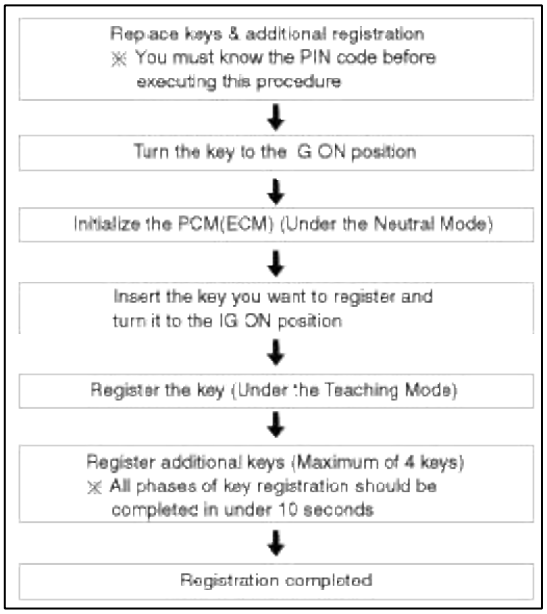
In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught

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, there is no special procedure required. A new SMARTRA device simply replaces the old one. 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)



NOTE

1. When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered.
2. When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2.
   (Note that key #2 must be used within 10 seconds of removing key #1)
3. When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position.
   The engine cannot be started even with the registered key #1.
4. When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3.
   Always remember the 10 seconds zone.
5. If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.
6. Be cautious not to overlap the transponder areas.
7. Problems can occur at key registration or vehicle starting if the transponders should overlap.

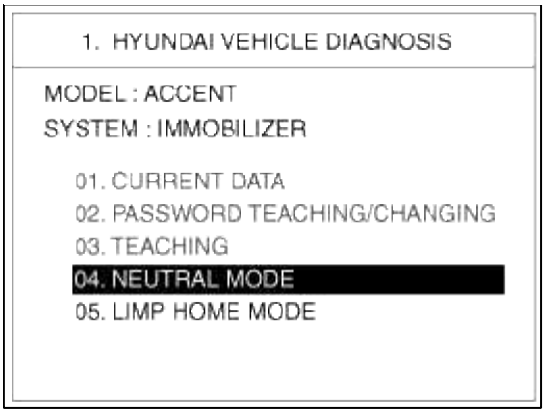
NEUTRALISING OF ECM

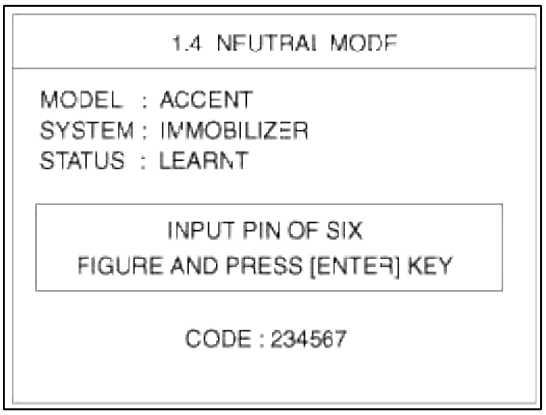
The PCM(ECM) can be set to the "neutral" status by a tester.
A valid ignition key is inserted and after ignition on is recorded, the PCM(ECM) requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the PCM(ECM) 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.

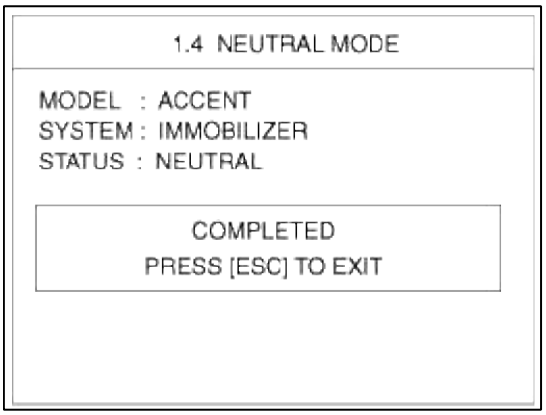
NOTE

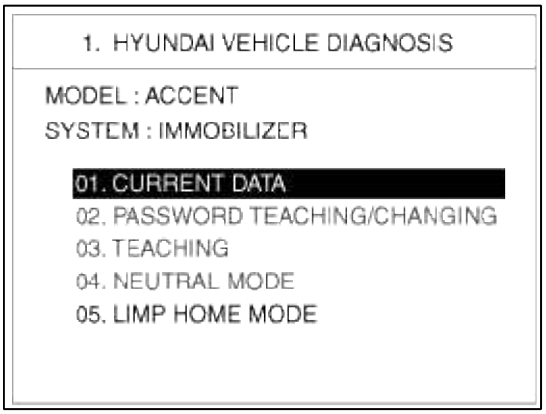
- Neutralizing setting condition
  - In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"
  - Input correct PIN code by scanner.
  - Neutralizing meaning .
    : PIN code (6) & user password (4) deletion.
    : Locking of ECM (except key teaching permission)
- Neutralizing meaning:
  - PIN Code(6) & User P/Word(4) deletion
  - Locking of EMS(except Key Learning permission)

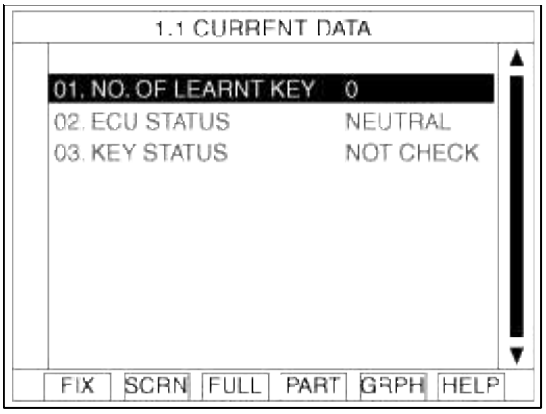
Function / EMS	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	No	No	Yes	No


1. HYUNDAI VEHICLE DIAGNOSIS
MODEL : ACCENT
SYSTEM : IMMOBILIZER
01. CURRENT DATA
02. PASSWORD TEACHING/CHANGING
03. TEACHING
04. NEUTRAL MODE
05. LIMP HOME MODE


1.4 NEUTRAL MODE
MODEL : ACCENT
SYSTEM : IMMOBILIZER
STATUS : LEARNT
INPUT PIN OF SIX
FIGURE AND PRESS [ENTER] KEY
CODE : 234567


1.4 NEUTRAL MODE
MODEL : ACCENT
SYSTEM : IMMOBILIZER
STATUS : NEUTRAL
COMPLETED
PRESS [ESC] TO EXIT


1. HYUNDAI VEHICLE DIAGNOSIS
MODEL : ACCENT
SYSTEM : IMMOBILIZER
01. CURRENT DATA
02. PASSWORD TEACHING/CHANGING
03. TEACHING
04. NEUTRAL MODE
05. LIMP HOME MODE



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".

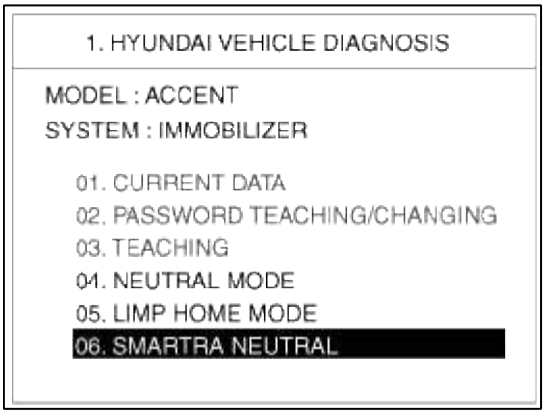
In case of chaging the vehicle password, new virgin transponder must be only used. And in case of virgin key, after Learning the key of vehicle password, it can be used.

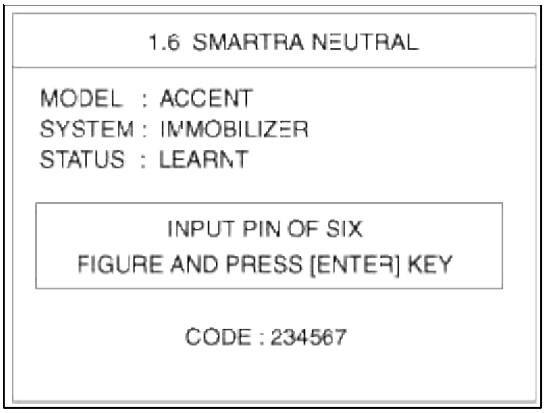
If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

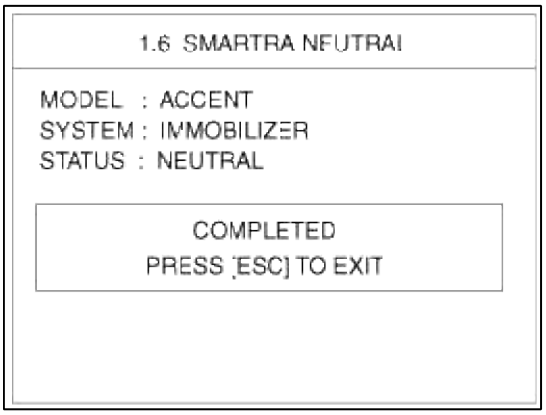
NOTE

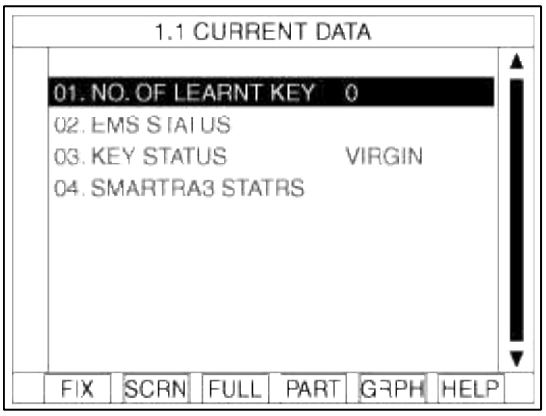
- Neutralizing Setting condition :
  - In case of "SMARTRA status", "Learnt"
  - Input correct Pin code by tester
- Neutralizing meaning :
  - Vehicle password(DPN Code) & SEK Code deletion.
  - Permission of New DPN Learning.

Function / SMARTRA	Engine Running			Learning	
	Learnt Key	Limp home	Twice ignition	Key	User Password
Neutral	No	Yes (EMS learnt)	No	Yes	No





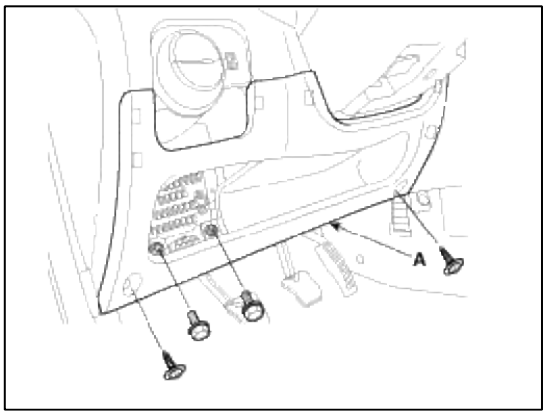




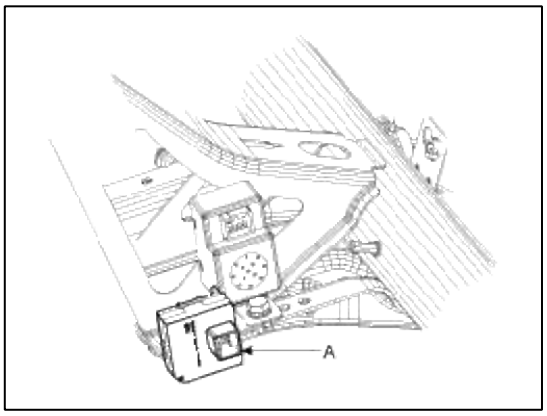
Body Electrical System > Immobilizer System > Immobilizer Control Unit > Repair procedures

REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel(A) after removing side cover. (Refer to the Body group - "Crash pad").



3. Disconnect the 5P connector of the SMARTRA unit and then remove the SMARTRA unit (A) mounted on the left side cowl cross bar. after loosening a shear bolt (B).



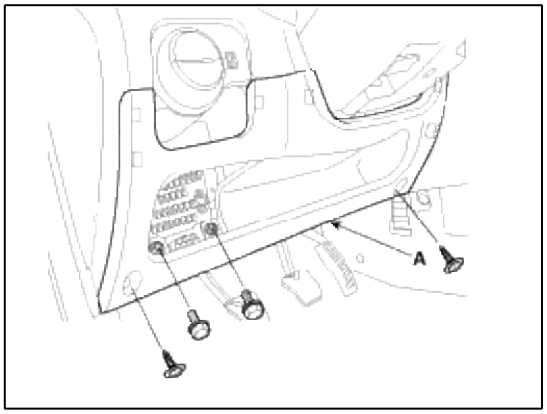
INSTALLATION

1. Reassemble the SMARTRA unit after connecting the connector.
2. Reassemble the driver crash pad lower panel.

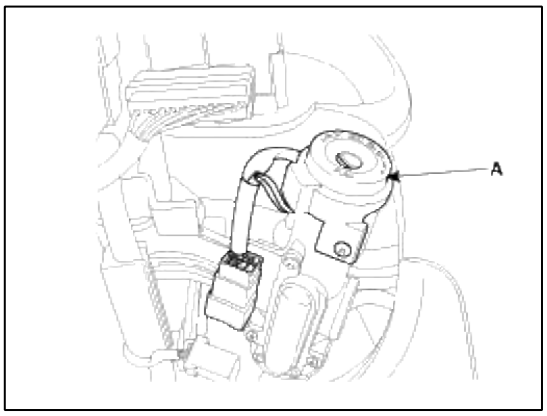
Body Electrical System > Immobilizer System > Antenna Coil > Repair procedures

REMOVAL

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



3. Disconnect the 6P connector of the coil antenna and then remove the coil antenna (A) after loosening the screw.

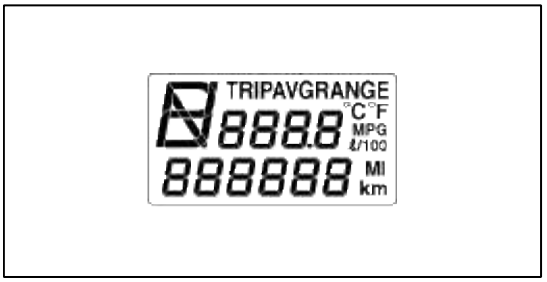


INSTALLATION

1. Reassemble the coil antenna after connecting the connector.
2. Reassemble the crash pad lower panel.

Body Electrical System > Trip Computer > Description and Operation

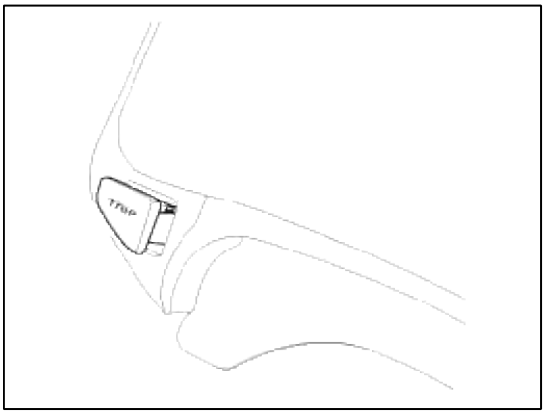
DESCRIPTION



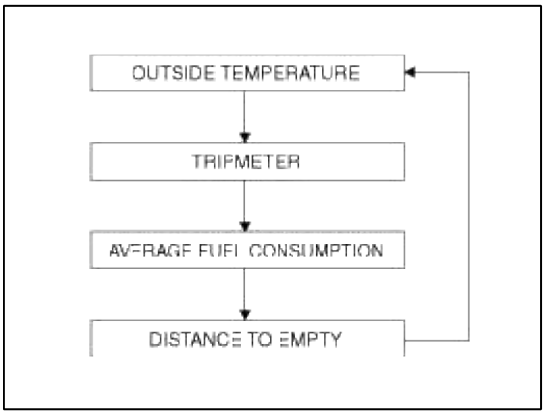
The trip computer is a microcomputer-controlled driver information gauge that displays information related to driving such as outside temperature, tripmeter, average fuel consumption and distance to empty on the LCD.

FUNCTION

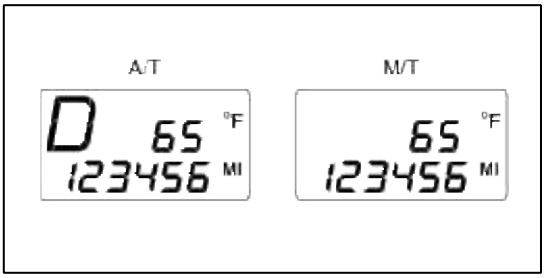
TRIP SWITCH



Pushing in the TRIP switch for less than 1 second when the ignition switch is in "ON" position changes the display as follows;

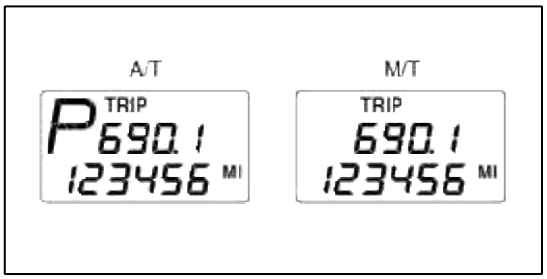


1. Outside Temperature (°F)



This mode indicates the outside temperature between -40°F (-40°C) and 176°F (80°C).

2. Tripmeter (miles)

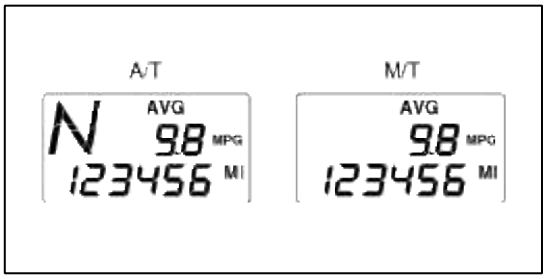


A. This mode indicates the total distance travelled since the last tripmeter reset. Total distance is also reset to zero if the battery is disconnected.

B. Pressing the TRIP switch for more than 1 second when the tripmeter is being displayed clears the tripmeter to zero.

C. The meter's working range is from 0 to 999.9 miles (999.9 kms).

3. Average Fuel Consumption (MPG)



A. This mode calculates the average fuel consumption from the total fuel used and the distance since the last average consumption reset.

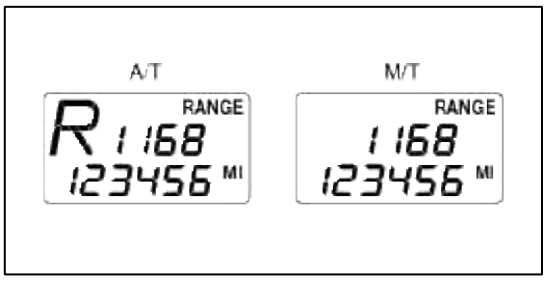
B. The total fuel used is calculated from the fuel consumption input.

C. Average fuel consumption is reset to zero (--) if the battery is disconnected.

D. To reset the average fuel consumption to zero (--), press the TRIP switch for more than 1 second.

E. When you drive 0.5 mile (0.5 km) and less after resetting, the average fuel consumption will be displayed to '--'.

4. Distance to Empty (miles)



A. This mode indicates the estimated distance to empty from the current fuel level in the fuel tank.

B. The trip computer may not register additional fuel if less than 1.36 gallons (6 liters) of fuel are added to the vehicle.



A. When the distance to empty is less than 30 miles (50 km), the distance to empty digits (----) will blink until more fuel is added.

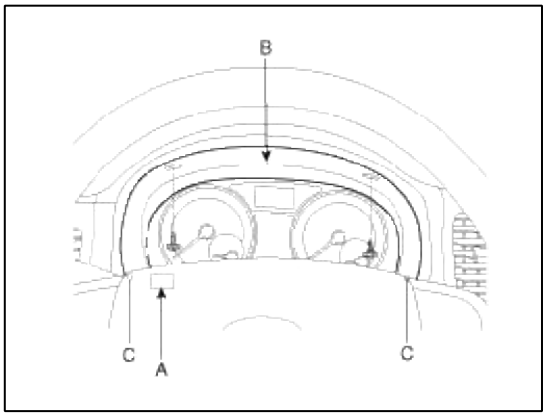
NOTE

- The distance to empty can differ from the actual tripmeter according to driving conditions.
- The distance to empty can vary according to the driving conditions, driving pattern or vehicle speed.

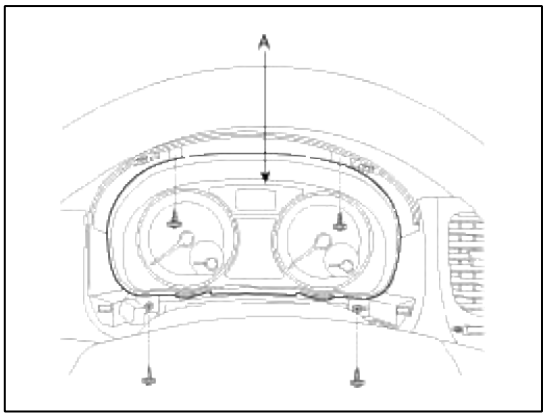
Body Electrical System > Trip Computer > Repair procedures

REPLACEMENT

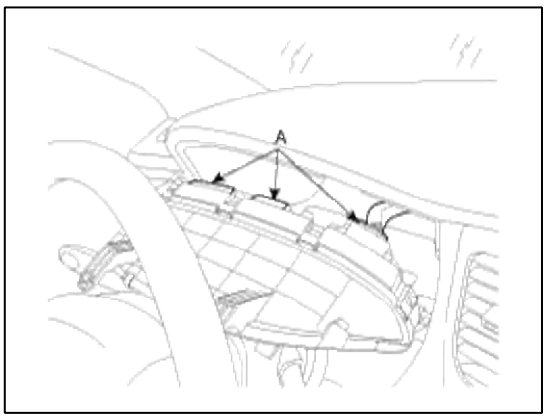
1. Disconnect the negative (-) battery terminal.
2. Remove the cluster facia panel (B) after disconnecting the connector of trip switch (A) and loosening the 2 screws take care of fixing clips(C).



3. Pull out the cluster (A) from the housing after removing 4 screws.



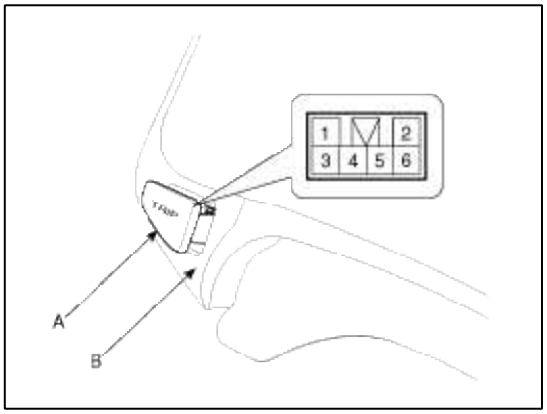
4. Disconnect the cluster connecter (A) and then remove the cluster.



5. Installation is the reverse of removal.

INSPECTION

1. Remove the cluster facia panel (B).
   (Refer to BE Group - Instrument cluster)
2. Operate the switch (A) and check for continuity between terminals with an ohmmeter.

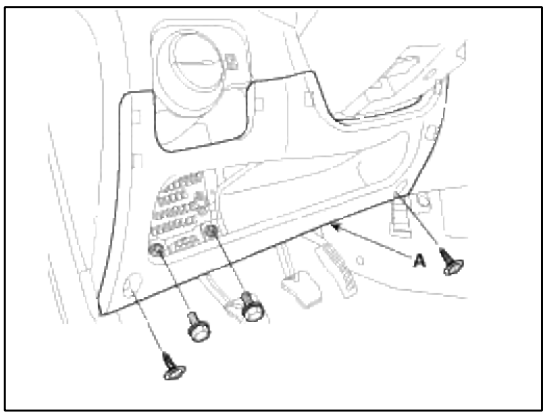


Termina / Position	3	6	4	5
ON		Illumination		
OFF				

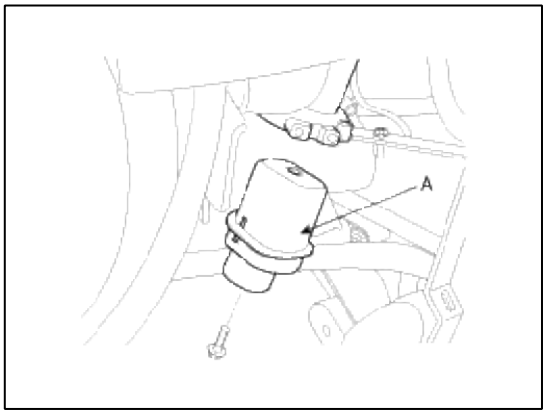
Body Electrical System > Ignition Switch Assembly > Ignition Switch > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel(A) (Refer to the Body group - crash pad).

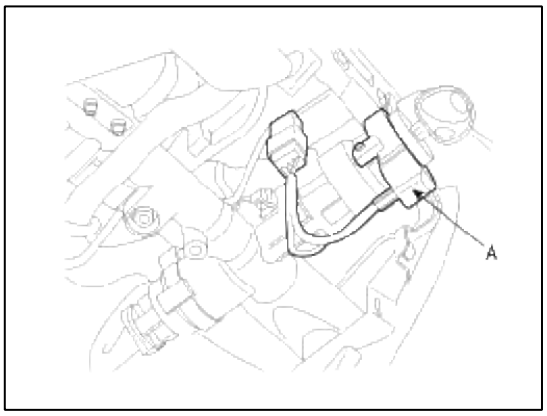


3. Remove the ignition switch (A) after loosening the screw with IG ON and disconnecting the 6P connector.

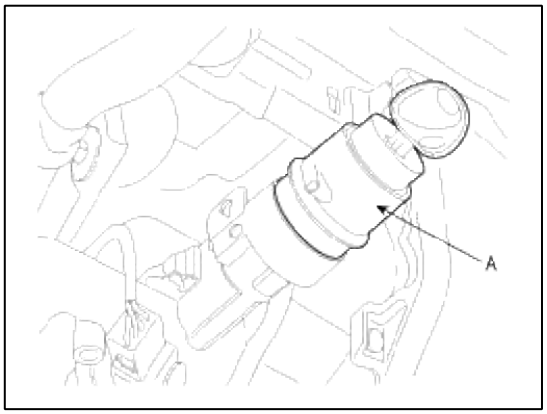


4. Remove the steering column shaft (Refer to the ST group).

5. Remove the door warning switch after loosening the screws and disconnecting the 6P connector.

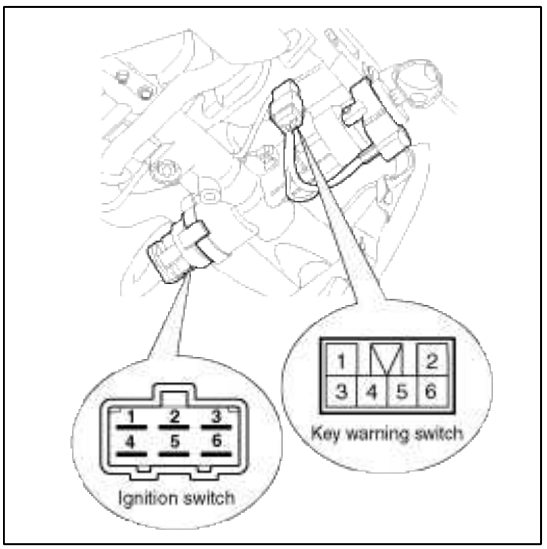


6. If it is necessary to remove the key lock cylinder (A), remove the key lock cylinder (A) after pushing lock pin with key ACC.



7. Installation is the reverse of removal procedure.

INSPECTION

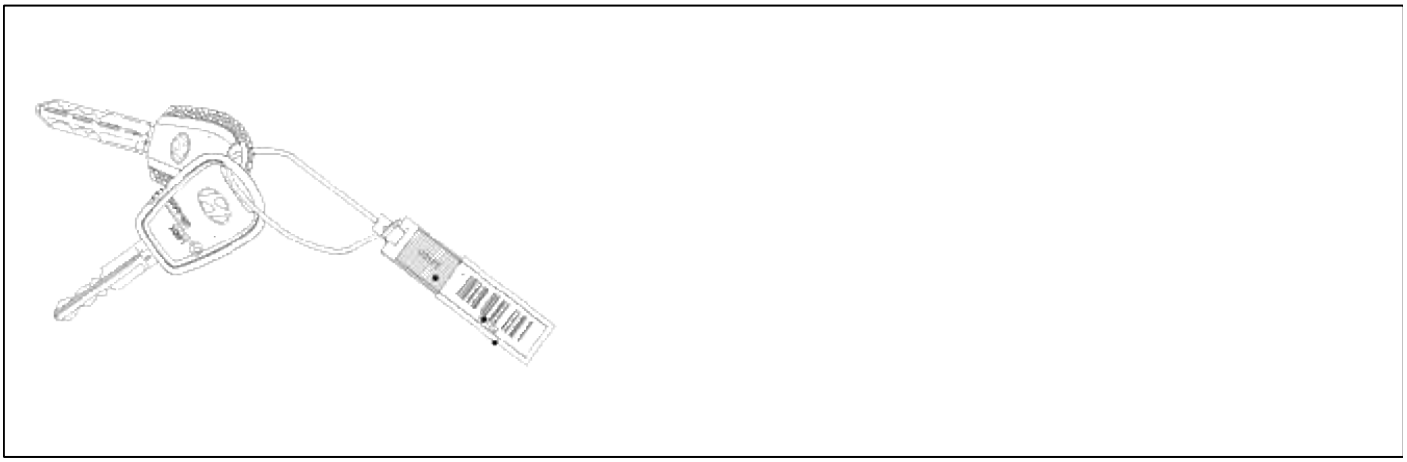


1. Disconnect the ignition switch connector and key warning switch connector from under the steering column.
2. Check for continuity between the terminals.
3. If continuity is not specified, replace the switch.

TERMINAL / POSITION	KEY	IGNITION SWITCH 2	4	6	5	3	1	STEERING TRAVAL	TRAVAL	KEY WARNING SWITCH 5	6
LOCK	REMOVAL							LOCK			
	INSERT							LOCK	UNLOCK		
ACC		○——	——○					UNLOCK		○——	——○
ON		○——	——○	——○	○——	——○					
START		○——	——○	——○	○——	——○	——○				

Body Electrical System > Troubleshooting > P1674

Component Location



General Description

The vehicle immobilizer system consists of the ECM, the SMARTRA3 and ignition keys with built-in transponder. The ECM carries out the check of ignition key by special encryption algorithm with SMARTRA3 and Transponder. The encryption algorithm (between ECM ans SMARTRA3) is used one offered from BOSCH.
The encryption algorithm (between ECM and Transponder) is Hitag2 type which is the high level. When IGN On, the ECM executes the key Authentication after SMARTRA3 authentication. The Engine can be started in case of the success in SMARTRA3 and key authentication.
The Key teaching procedure starts with ECM request of PIN from Scanner. The "virgin"ECM stores the PIN and the key Learning can be started. The "learnt"ECM compares the PIN from tester with the vehicle password in Transponder. If the data are correct, the key Learning can be started.
Scanner requests the Learning of the first key, the SMARTRA3 is registered at first and then the first key is registered by ECM. If the SMARTRA3 status is learnt and PIN number is different, the SMARTRA3 will return the incorrect PIN data to the ECM. In this case, The ECM can't excute the key learning process.

DTC Description

The ECM sets DTC P1674 if transponder key that can't be register(TP not in the password mode or whose transport data has been changed) is inserted for registration procedure.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Invalid transponder Key not in 'VIRGIN' Status or with invalid ID code
Enable Conditions	● IG ON (On Registering TP Procedure)	
Threshold value		
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Check status
   (1) IGN "ON" &Engine "OFF"
   (2) Monitor the "ECM KEY and Smartra Status" Parameter on the Scantool.

Specification : 'LEARNT'

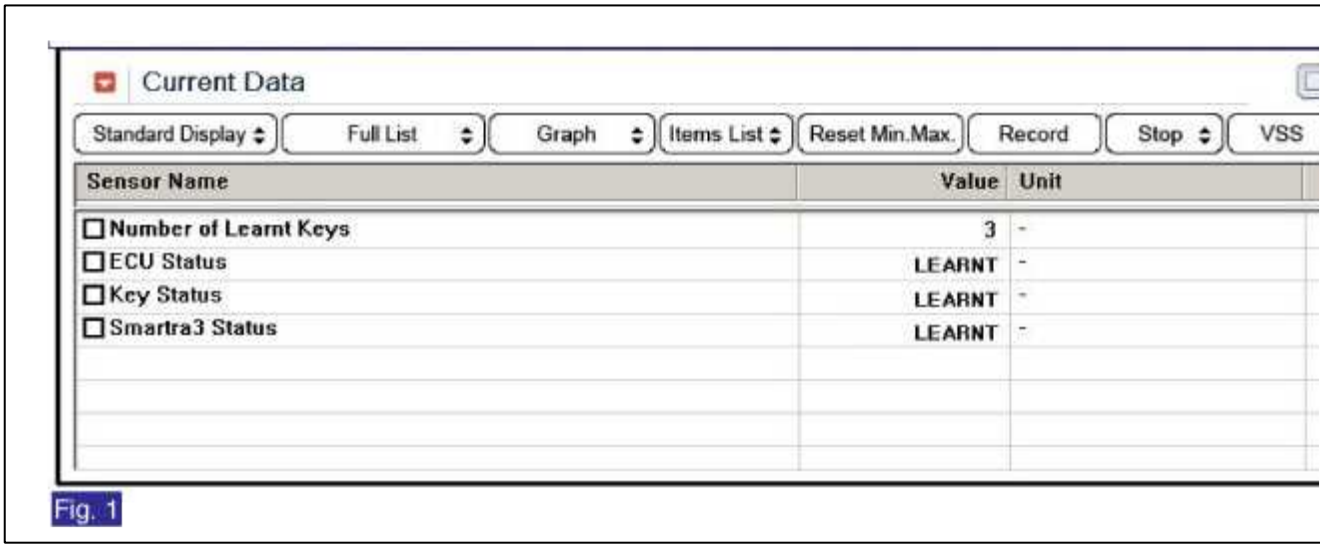


Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt SMARTRA3 has been learnt.

   (3) Has the key status been learnt?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damag the ECM or SMARTRA.
And this DTC has not been erased in previous repair. Repair or replace as necessary and then, go to "Verifica Vehicle Repair" procedure.

NO

Go to "Component Inspection" Procedure.

Component Inspection

1. Check transponder
   (1) IGN "ON" & Engine "OFF"
   (2) Neutralize ECM and Register transponder key by scantool.

> NOTE
>
> Pin code is requied to Neutralize ECM and to Register transponder key

   (3) Are Neutralizing and Registering completed normally ?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good transponder and perform key teaching procedure with scanner.
If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

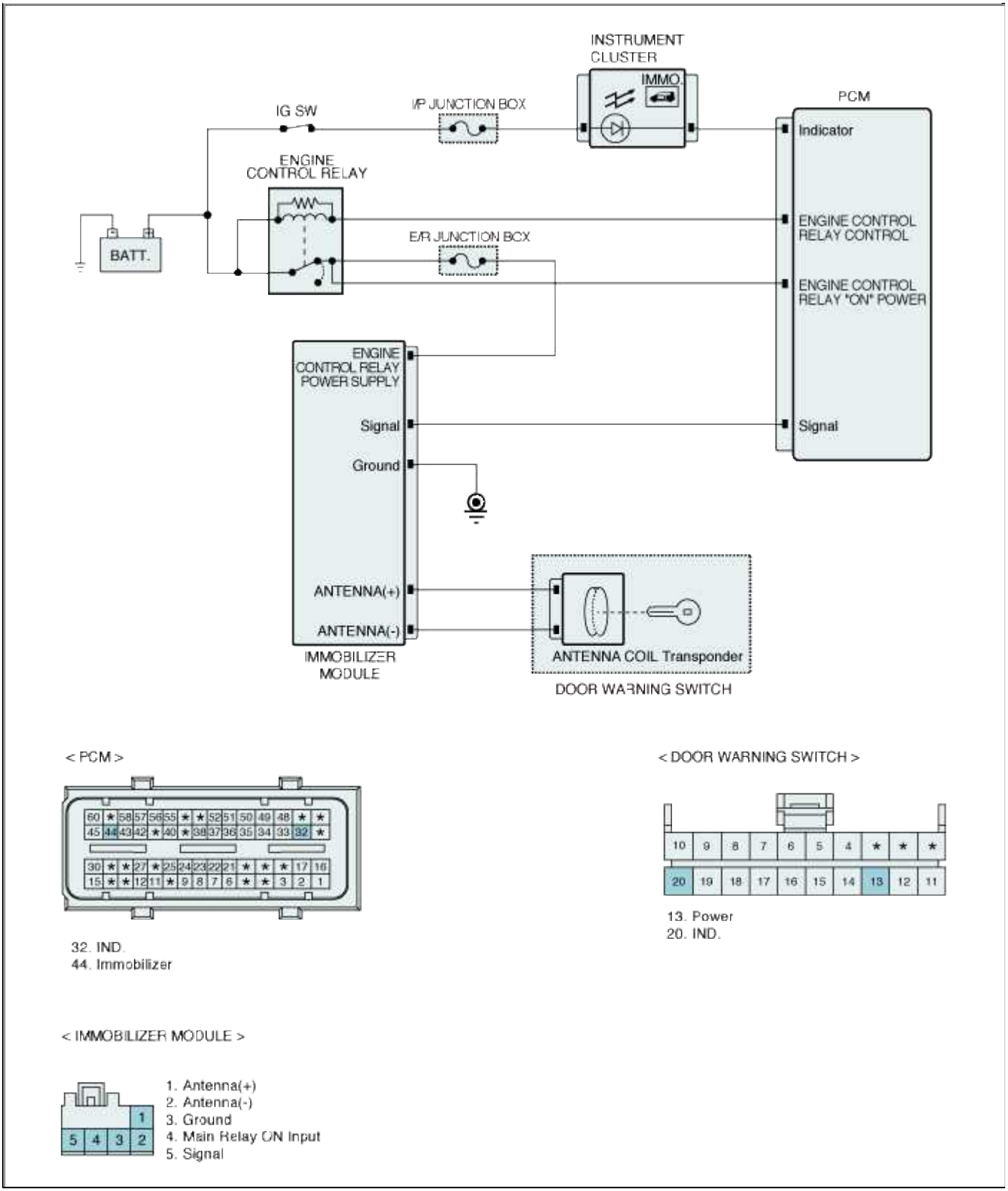
YES

Go to the applicable troubleshooting procedure.

NO

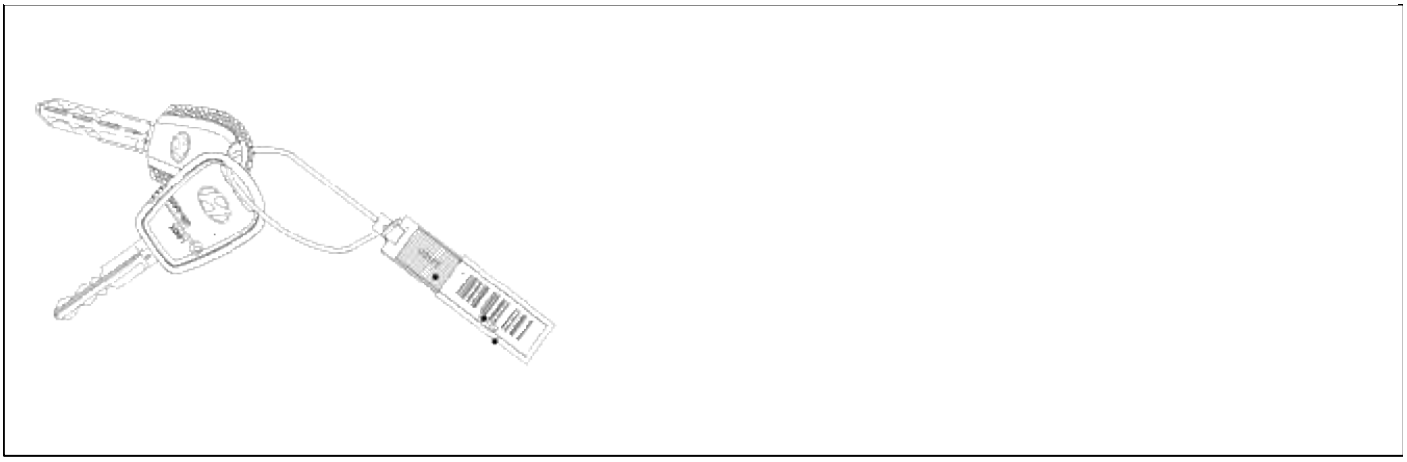
System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1675

Component Location



General Description

The vehicle immobilizer system consists of the ECM, the SMARTRA3 and ignition keys with built-in transponder.
The ECM carries out the check of ignition key by special encryption algorithm with SMARTRA3 and Transponder.
The encryption algorithm (between ECM ans SMARTRA3) is used one offered from BOSCH.
The encryption algorithm (between ECM and Transponder) is Hitag2 type which is the high level.
When IGN On, the ECM executes the key Authentication after SMARTRA3 authentication. The Engine can be started in case of the success in SMARTRA3 and key authentication.
The Key teaching procedure starts with ECM request of PIN from Scanner. The "virgin"ECM stores the PIN and the key Learning can be started. The "learnt"ECM compares the PIN from tester with the vehicle password in Transponder. If the data are correct, the key Learning can be started.
Scanner requests the Learning of the first key, the SMARTRA3 is registered at first and then the first key is registered by ECM. If the SMARTRA3 status is learnt and PIN number is different, the SMARTRA3 will return the incorrect PIN data to the ECM. In this case, The ECM can't excute the key learning process.

DTC Description

The ECM sets DTC P1675 if characteristic data of transponder doesn't coincide with that of ECM owing to transponder programming error.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Invalid transponder Invalid characteristic data No transponder or more than two transponder is detected by coil antenna
Enable Conditions	● IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Check status
   (1) IGN "ON" & Engine "OFF"
   (2) Monitor the "ECM, KEY and Smartra Status" Parameter on the Scantool.

Specification : 'LEARNT'

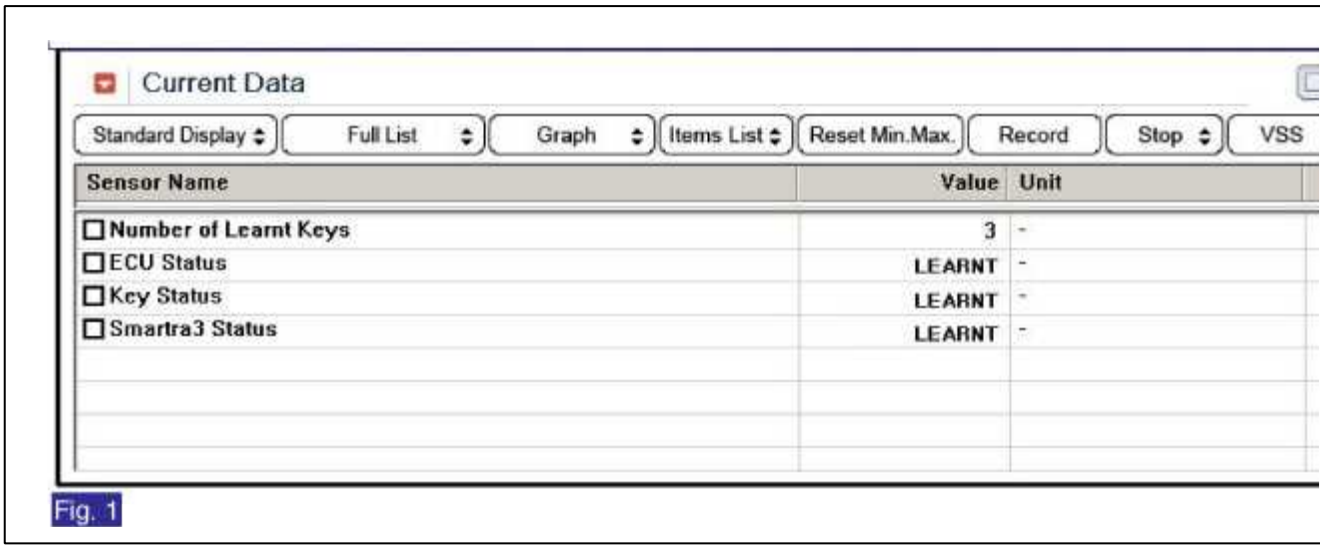


Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt SMARTRA3 has been learnt.

   (3) Has the KEY status been learnt?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damag the ECM or SMARTRA. And This DTC has not been erased in previous repair. Repair or replace as necessa then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Component Inspection" Procedure.

Component Inspection

1. Check transponder and ECU status
   (1) IGN "ON" & Engine "OFF" with key intended to register

(2) Monitor the "ECM,KEY and Smartra STATUS" Parameter on the Scantool.

Specification : 'LEARNT'

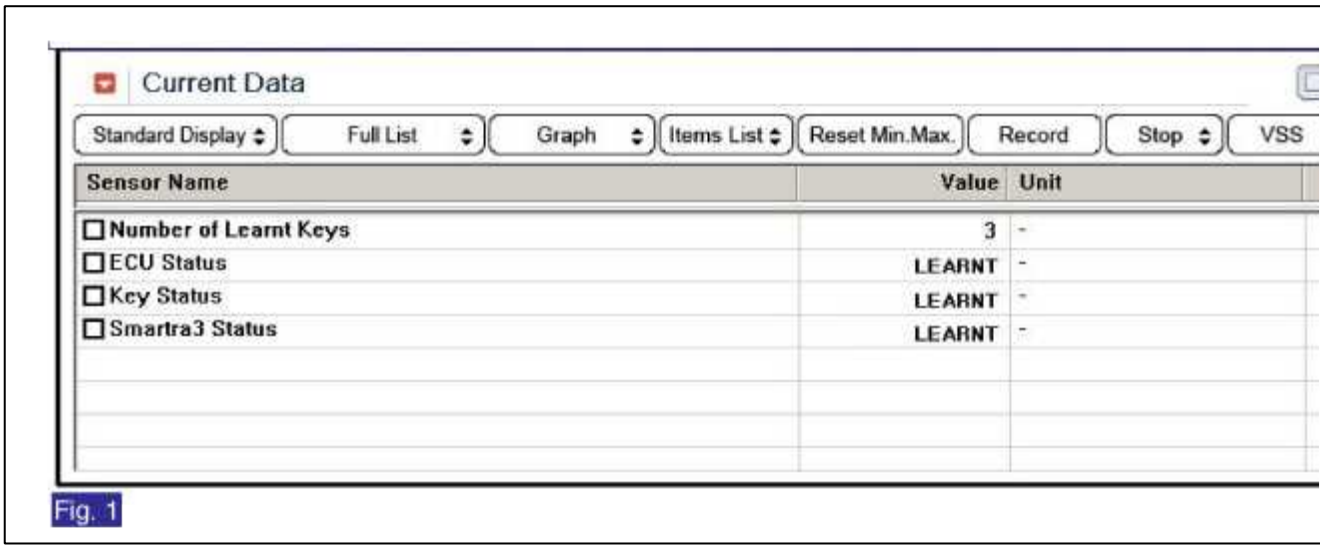


Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt SMARTRA3 has been learnt.

(3) Are "KEY STATUS", "SMARTRA STATUS" and "ECU STATUS" Parameter within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or dam Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check Transponder" procedure.

2. Check transponder

(1) IGN "ON" & Engine "OFF"

(2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize ECM and to Register transponder key

(3) Are Neutralizing and Registering completed normally ?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good transponder and perform key teaching procedure with scanner.
If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.

3. Are any DTCs present?

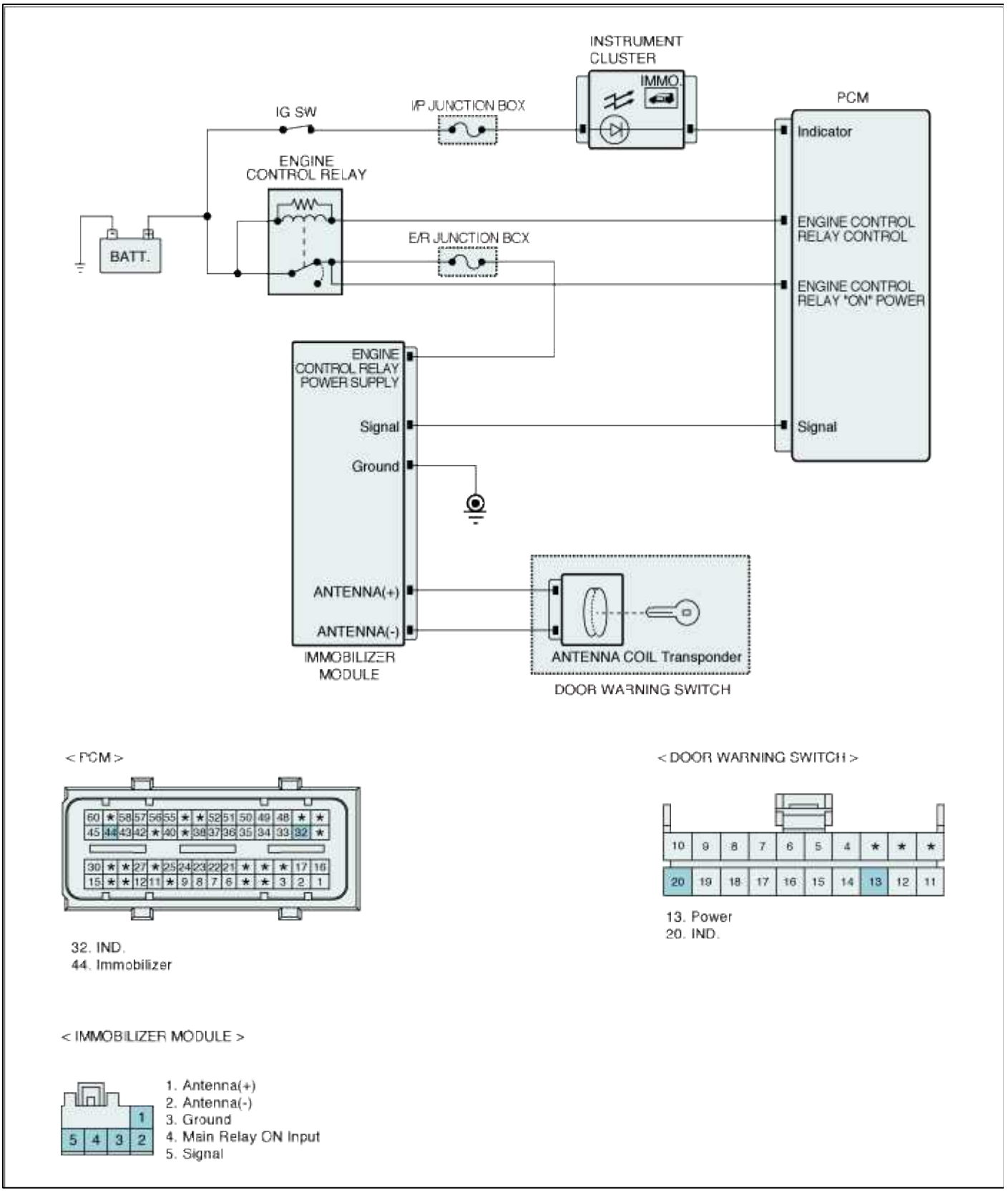
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1676

Component Location



General Description

1. The sequences of the PIN code storage are as follows.
   (1) Input the PIN code into the scanner when key teaching process.
   The scanner transmits the Encrypted Code to the ECM after converting the PIN code into Encrypted Code.
   (2) When the ECM gets the firtst key learning command, it transmits the SMARTRA3 learnt command and Encrypted Code to the SMARTRA3
   (3) If the SMARTRA3 statue is virgin/neutral, the SMARTRA3 stores Encrypted Code in EEPROM and transmits the success message of the Encrypted Code storage.
   (If the SMARTRA3 is learnt, the SMARTRA3 compares Encrypted Code transmitted by the ECM with Encrypted Code stored in EEPROM and transmits the (in)correct Encrypted Code message to ECM)
   (4) If the SMARTRA3 is learnted normally or the Encrypted Code of the registered SMARTRA3 is same as the ECM, the ECM begins operation the Transponder Learning.
   (5) If the learning of the first transponder, the ECM stores the Encrypted Code in its EEPROM and converts state into learnt state.
2. The SMARTRA3 learning :
   (1) starts with EMS request of PIN from scanner through the key teaching procedure.
   (2) is possible in case that the status of SMARTAR is "virgin" or "neutral ".
   (3) In case that the SMARTRA3 is "learnt", the SMARTRA3 will transmits the information if PIN inputted from scanner is same as the PIN in SMARTRA3.
   (4) is possible regardless of key status.
3. The sequence of the SMARTRA3 confirms are as follows.
   (1) After communication with the SMARTRA3, the ECM transmits the random number with requirement of the TP ID information.
   (2) The SMARTRA3 encryptes the random number and transmits the result(Encrypted Random Number) to the ECM with TP ID information.
   (3) The ECM compares the result transmitted from the SMARTRA3 with the result calculated by ECM.
   And If result are coincided with each other; the ECS concludes the valid confirmation of the SMARTRA3.

DTC Description

The ECM sets DTC P1676 if there's any fault in message from SMARTRA to ECU

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Faulty SMARTRA
Enable Conditions	● IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Check transponder and ECU status
   (1) IGN "ON" & Engine "OFF" with key intended to register
   (2) Monitor the "ECU, KEY, Smartra STATUS" Parameter on the Scantool.

Specification : 'LEARNT'

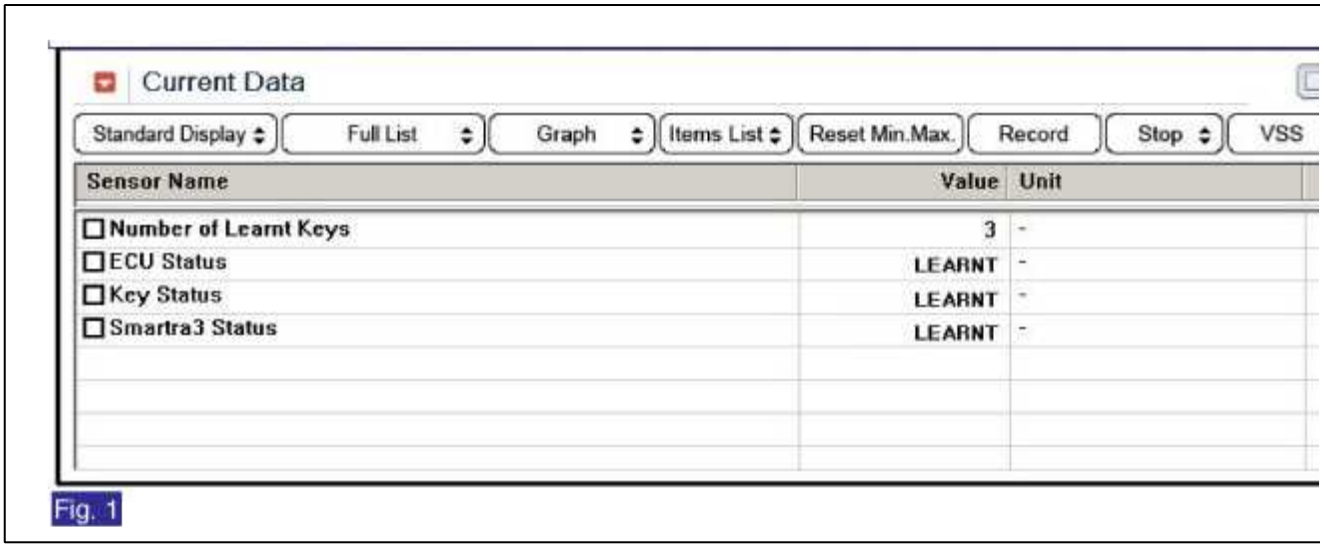


Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt SMARTRA3 has been learnt.

   (3) Has the "SMARTRA" status been learnt?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damag the ECM or SMARTRA.
And has not erased this DTC which is not erased previous repair. Repair or replace as necessary and then go "Verification of Vehicle Repair" procedure.

NO

Go to "Check SMARTRA" procedure.

2. Check SMARTRA
   (1) IGN "ON" & Engine "OFF"
   (2) Neutralize SMARTRA with scantool.
   (3) Neutralize ECM and Register transponder key by scantool.

> NOTE
>
> Pin code is required to Neutralize SMARTRA & ECM and to Register transponder key.

   (4) Are Neutralizing and Registering Key completed normally ?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. Or It has not been erased this DTC in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good SMARTRA and perform the Key teaching.
If the problem is corrected, replace SMARTRA and then go to "Verification of Vehicle Repair" procedure.

> NOTE
>
> If the SMARTRA3 is only replaced using an existing key and ECM, after replacing the "virgin" or "neutral" SMARTRA3, reteaching is possible by key Learning mode of scanner. In this case, all existing key must be retaught.
> If SMATRA3 is replaced to another one (used at other vehicle), it can only recycle its neutralized first before replacing.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

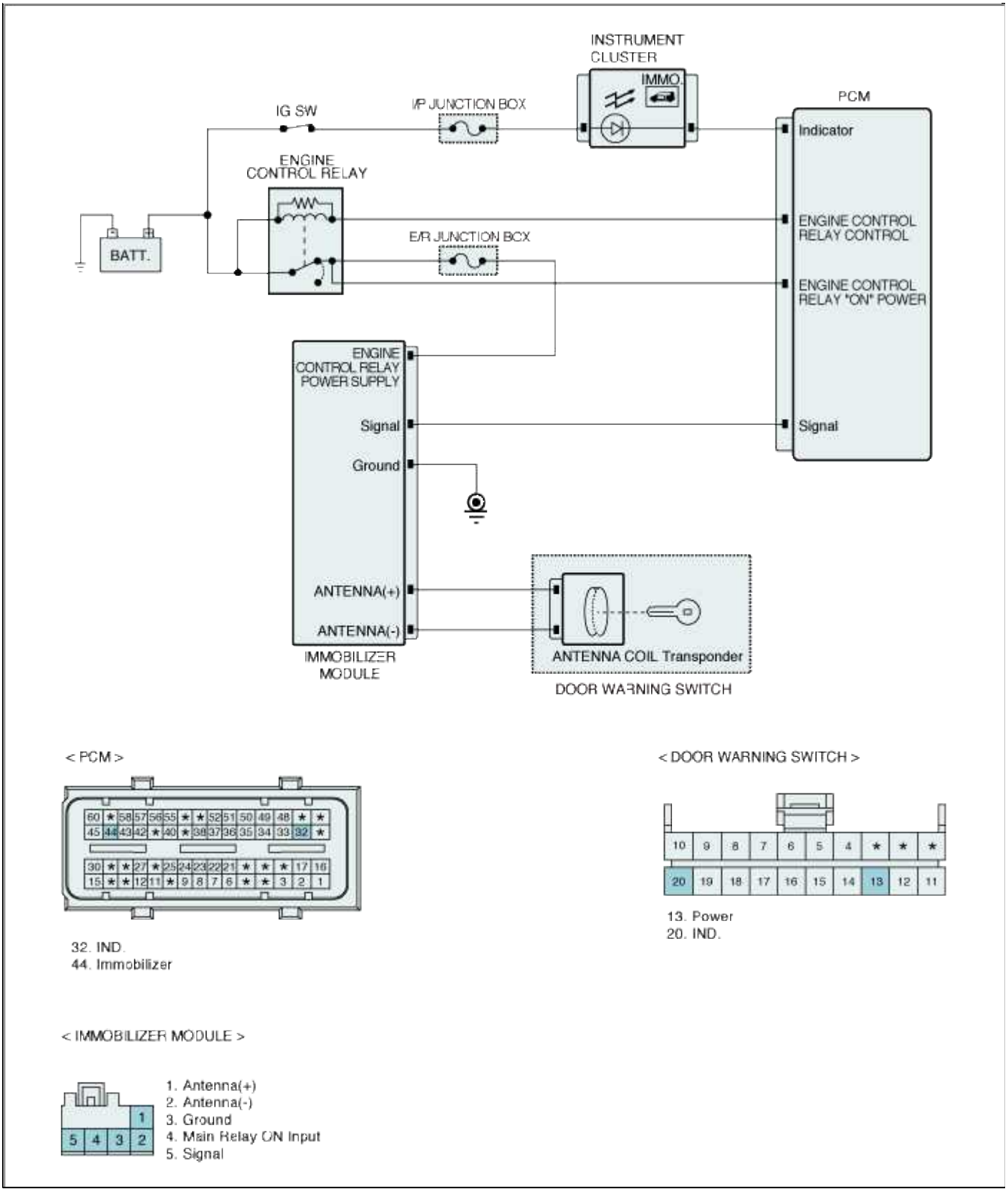
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1690

Component Location



General Description

The sequence of the pin code storage are as follaws.
1) Input the PIN code into the scanner when key teaching process.
The scanner transmits the Encrypted Code to the ECM after converting the PIN code into Encrypted Code.
2) When the ECM gets the firtst key learning command , it transmits the SMARTRA3 learnt command and Encrypted Code to the SMARTRA3.
3) If the SMARTRA3 statue is virgin/neutral, the SMARTRA3 stores Encrypted Code in EEPROM and transmits the success message of the Encrypted Code storage.(If the SMARTRA3 is learnt, the SMARTRA3 compares Encrypted Code transmitted by the ECM with Encrypted Code stored in EEPROM and transmits the (in)correct Encrypted Code message to ECM)
4) If the SMARTRA3 is learnted normally or the Encrypted Code of the registered SMARTRA3 is same as the ECM, the ECM begins operation the Transponder Learning.
5) If the learning of the first transponder, the ECM stores the Encrypted Code in its EEPROM and converts state into learnt state.
2. The SMARTRA3 learning :
1) starts with EMS request of PIN from scanner through the key teaching procedure.
2) is possible in case that the status of SMARTAR is "virgin" or "neutral".
3) In case that the SMARTRA3 is "learnt", the SMARTRA3 will transmits the information if PIN inputted from scanner is same as the PIN in SMARTRA3.
4) is possible regardless of key status.
3. The sequence of the SMARTRA3 confirms are as follows.
1) After communication with the SMARTRA3, the ECM transmits the random number with requirement of the TP ID information.
2) The SMARTRA3 encryptes the random number and transmits the result(Encrypted Random Number) to the ECM with TP ID information.
3) The ECM compares the result transmitted from the SMARTRA3 with the result calculated by ECM.
And If result are coincided with each other; the ECS concludes the valid confirmation of the SMARTRA3.

DTC Description

The PCM/ECM sets DTC P1690 if authentication between PCM/ECM and SMARTRA has been failed.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Open Circuit in signal harness ● Short Circuit in signal harness ● Faulty SMARTRA
Enable Conditions	● IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IGN "ON" &Engine "OFF"
3. Monitor the "ECU, KEY and Smartra STATUS" Parameter on the Scantool.

Specification : 'LEARNT'

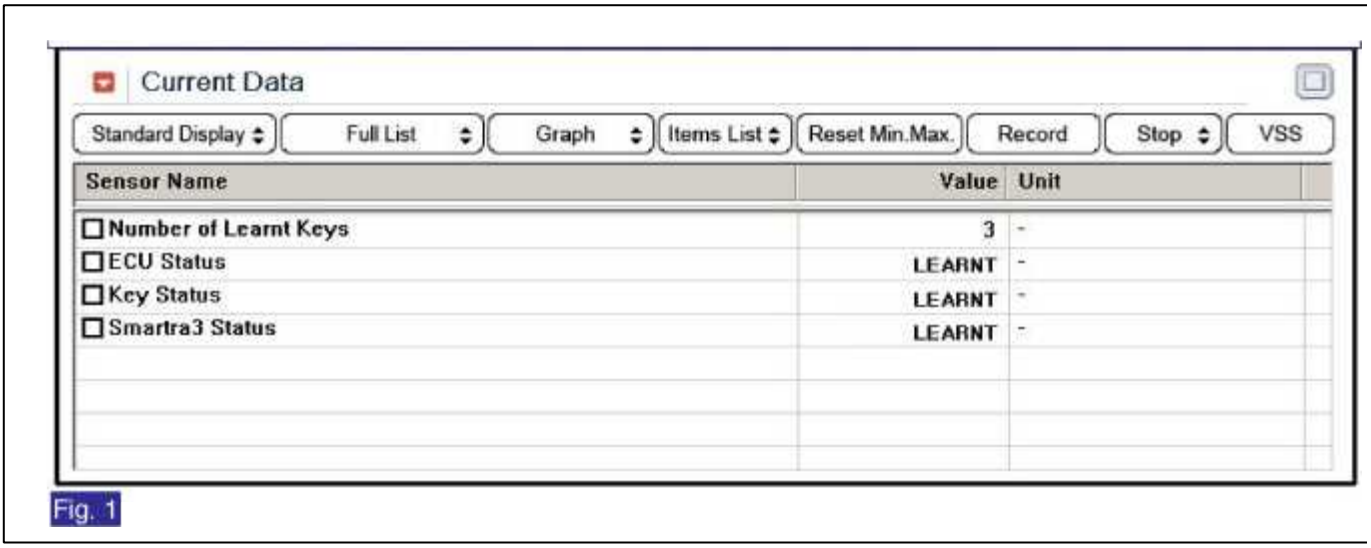


Fig. 1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt an SMARTRA3 has been learnt.

4. Has the "SMARTRA" status been learnt?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA.
And this DTC has not been erased in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical aor chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

Power Circuit Inspection

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect SMARTRA Connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between Engine Control Relay Power of SMARTRA harness connector and chassis ground.

   Specification : 9~16V

   (5) Is the measured voltage within specifications?

   YES

   Go to "Signal circuit Inspection" procedure.

   NO

   Check for open or short in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

Signal Circuit Inspection

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect SMARTRA connector.
   (3) Measure resistance between signal terminal of smartra harness connector and ECM/PCM harenss connector.

   Specification : 1 Ω or less

   (4) Is the measured resistance within specifications?

   YES

   Go to "Check for short in harness" procedure.

   NO

   Check for open in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

2. Check for short in harness
   (1) Ignition "OFF"
   (2) Disconnect SMARTRA connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between signal terminal of SMARTRA harness connector and chassis ground.

   Specification :Approx. 5.48V

   (5) Is the measured voltage within specifications?

   YES
   Go to "Signal circuit Inspection" procedure.

   NO
   Check for short in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

1. Check for open in ground harness
   (1) Ignition "OFF"
   (2) Disconnect SMARTRA Connector.
   (3) Measure resistance between ground terminal of SMARTRA harness and chassis ground.

   Specification : 1 Ω or less

   (4) Is the measured resistance within specifications?

   YES
   Go to "Component Inspection" procedure.

   NO
   Check for open in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. (1) IGN "ON" & Engine "OFF"
   (2) Neutralize Both "SMARTRA" and "ECM" and Register transponder key by scantool.

   NOTE
   Pin code is required to Neutralize SMARTRA and to Register transponder key

   (3) Are Neutralizing and Registering completed normally ?

   YES
   Perform all the key teaching procedure with scantool. (All the keys must be retaught) and then, go to "Verification of Vehicle Repair" Procedure.

   NO
   Substitute with a known-good SMARTRA and Perform Key teaching procedure.
   If the problem is corrected, replace SMARTRA and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.

3. Are any DTCs present?

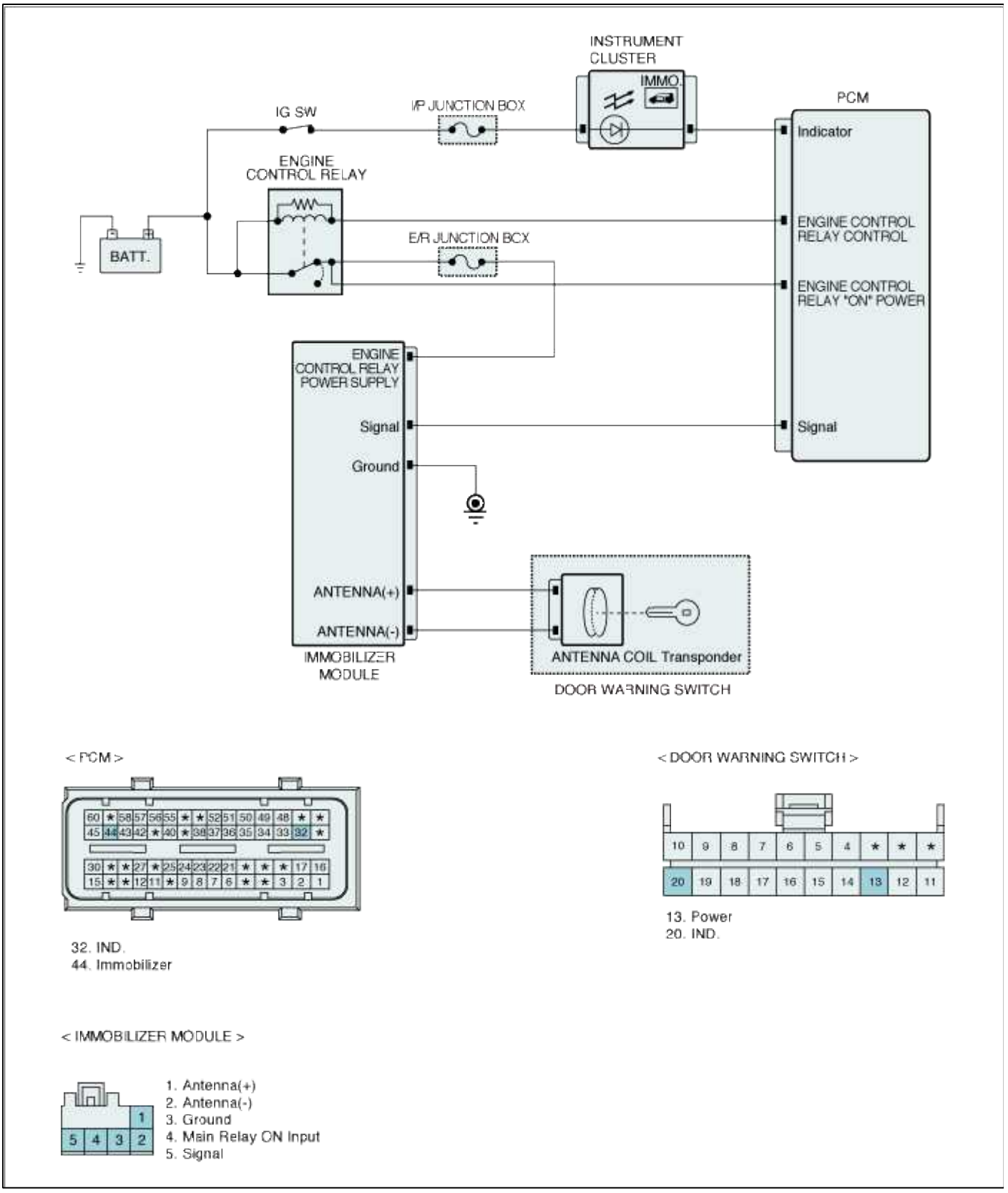
YES

Go to the applicable troubleshooting procedure.

NO

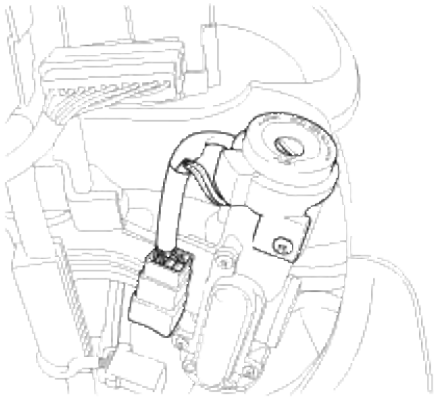
System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1691

Component Location



General Description

This wireless communication runs on RF (Radio frequency of 125 kHz). The antenna coil is mounted on the top of ignition lock for RF transmission and receiving. 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 ECM are converted into an RF signal, which is transmitted, to the transponder by the antenna.

DTC Description

The ECM sets DTC P1691 if there's any fault in immobilizer antenna coil.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Open Circuit in antenna coil ● Short Circuit in antenna coil ● Faulty antenna coil
Enable Conditions	● IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IGN "ON" & Engine "OFF"

3. Monitor the "ECU, KEY and Smartra STATUS" Parameter on the Scantool.

Specification : 'LEARNT'

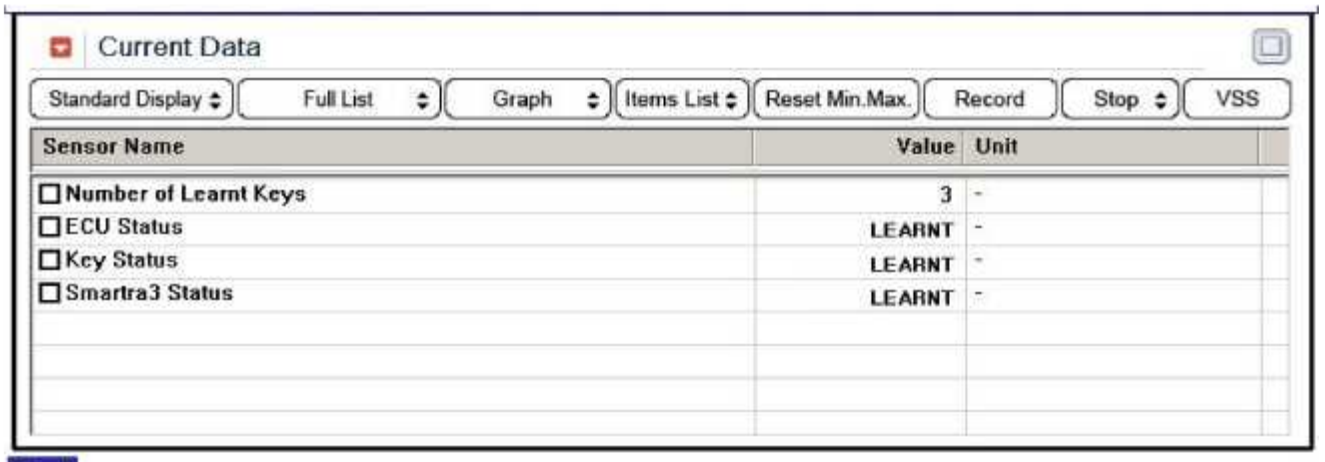


Fig. 1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt.

4. Have "ECM, KEY and SMARTR" status been learnt?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA.
And This DTC has not been erased in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Check coil antenna
   (1) Ignition "OFF"
   (2) Disconnect SMARTRA connector.
   (3) Measure resistance between antenna coil(+) and (-) terminal of SMARTRA harness connector.

   Specification : Approx 8.5 Ω

   (4) Is the measured resistance within specifications?

   YES

   Go to "Check SMARTRA" procedure.

   NO

   Check for open or short in antenna coil. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

2. Check SMARTRA
   (1) IGN "ON" & Engine "OFF"
   (2) Neutralize Both "SMARTRA" and "ECM" and Register transponder key with scantool.

> NOTE
>
> Pin code is required to Neutralize SMARTRA and to Register transponder key

   (3) Are Neutralizing and Registering completed normally?

YES

Perform all the key teaching procedure with scantool. (All the keys must be retaught) and then, go to "Verification of Vehicle Repair" Procedure.

NO

Substitute with a known-good transponder and perform the key teaching procedure.
If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

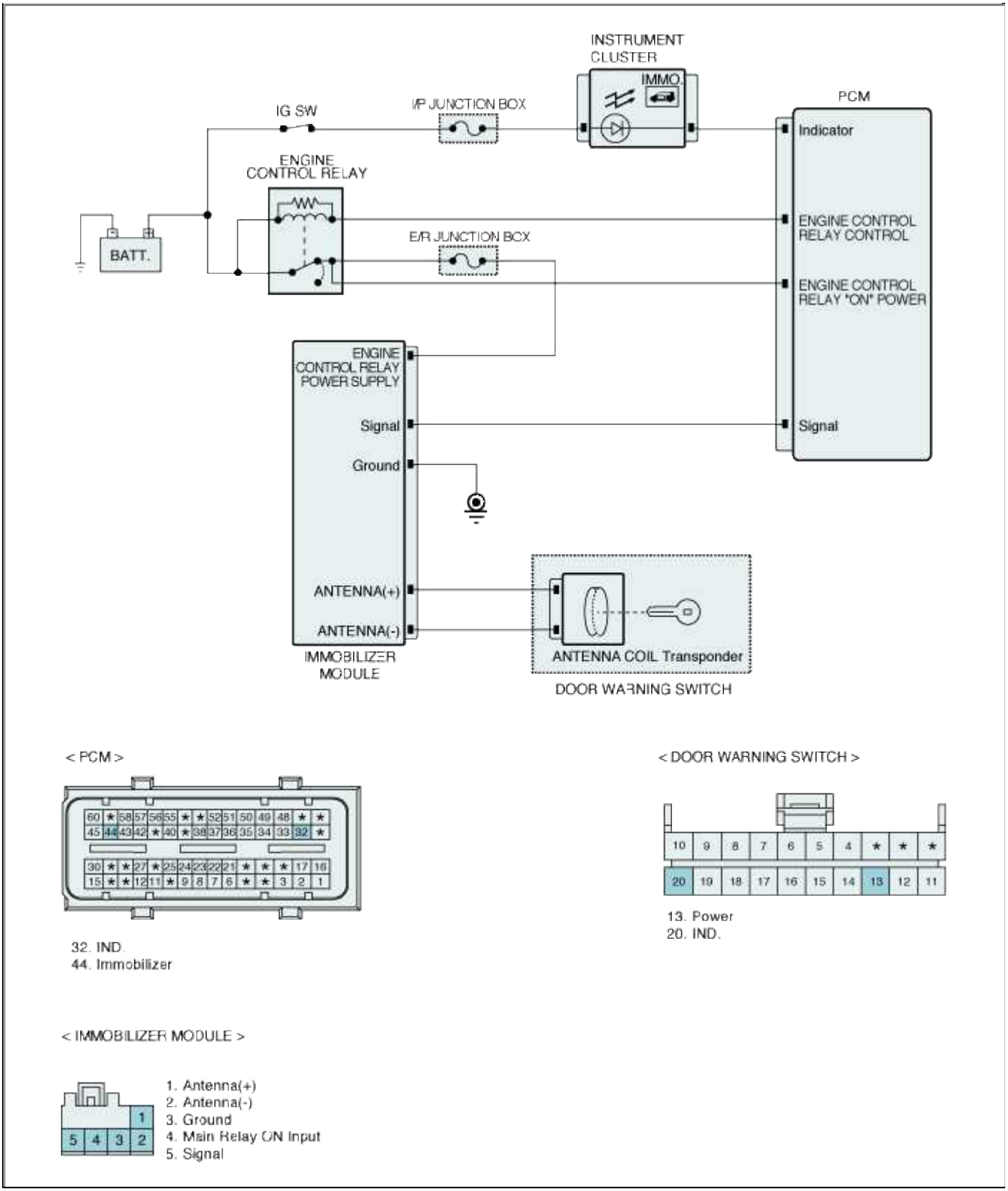
YES

Go to the applicable troubleshooting procedure.

NO

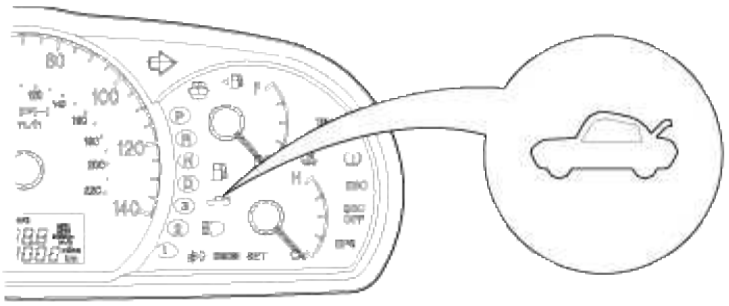
System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1692

Component Location



General Description

When driver inserts key and IGN "ON", Immobilizer informs status of system and result of Authentication by blinking of immobilizer lamp on instrument cluster. through Authentication procedure immobilizer lamp keep lighting up till engine starts. In normal status. Immobilizer lamp lights up for 30sec Right after ignition "ON". If there's any fault in immobilizer system or in Authentication, lamp blinks 5 times after ignition "ON".

DTC Description

The ECM sets DTC P1692 if there's short circuit in immobilizer lamp circuit.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Short Circuit in immobilizer lamp circuit ● Open/Short in control harness ● Faulty PCM/ECM
Enable Conditions	● IG ON	
Threshold value	● Short to GND, Wiring open	
Detecting time		
FAIL SAFE		

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical aor chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

Contol Circuit Inspection

Check for open in harness

1. IG KEY OFF
2. Connect SMARTRA connector and disconnect PCM connector
3. IG KEY ON & Engine "OFF"

4. Measure voltage between indicator terminal of PCM harness connector and chassis ground.

Specification : Batt.

5. Is the measured voltage within specifications

YES

Go to "Component Inspection" procedure

NO

Check for open or short in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

Visual / Physical Inspection

1. Check immobilizer lamp circuit
   (1) Ignition "ON" & Engine "OFF"
   (2) Check if immobilizer lamp operates properly.

NOTE

Right after ignition "ON", Immobilizer lamp lights up for 30sec.
If lamp blinks 5 times after ignition "ON", there's any fault in immobilizer system.

   (3) Is immobilizer lamp operates properly?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

Check immobilizer lamp

1. IG KEY OFF
2. Connect SMARTRA connector and disconnect PCM connector
3. Ground indicator terminal of PCM harness connector with wire.
4. IG KEY ON & Engine "OFF"

Specification : Immobilizer lamp "ON"

5. Is the Immobilizer lamp "ON"?

YES

Substitute with a known-good ECM and check for proper operation.
If the problem is corrected, replace ECM and then go to "Verification of Vehicle Repair" procedure.

NOTE

ECM substitued for old one must be in "Virgin" or "Neutral" status and Pin code is requied to Neutralize ECM and to Register transponder key

NO

Check that fuse has blown off and harness between ECM connector and Battery is in normal condition. And. check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

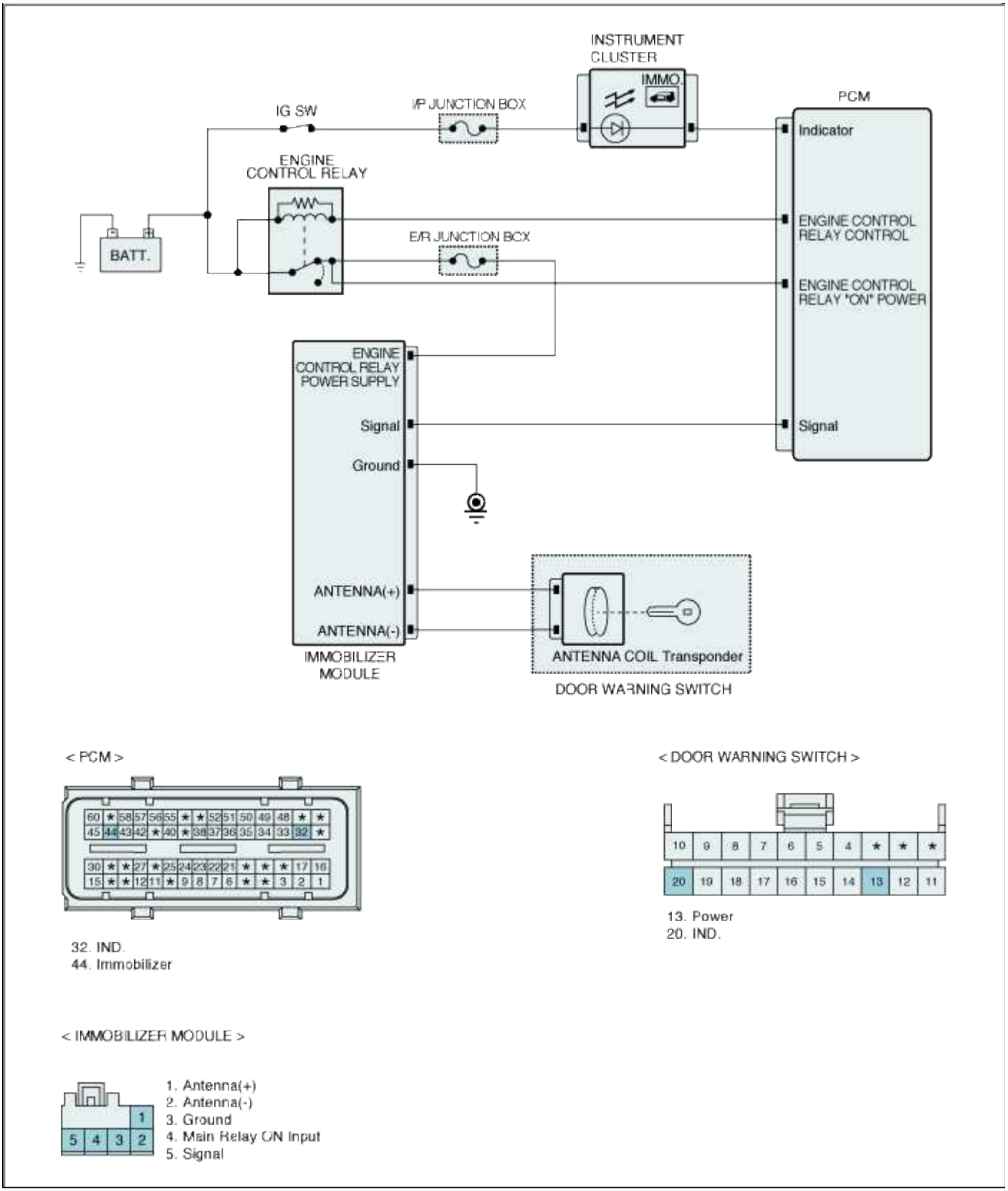
YES

Go to the applicable troubleshooting procedure.

NO

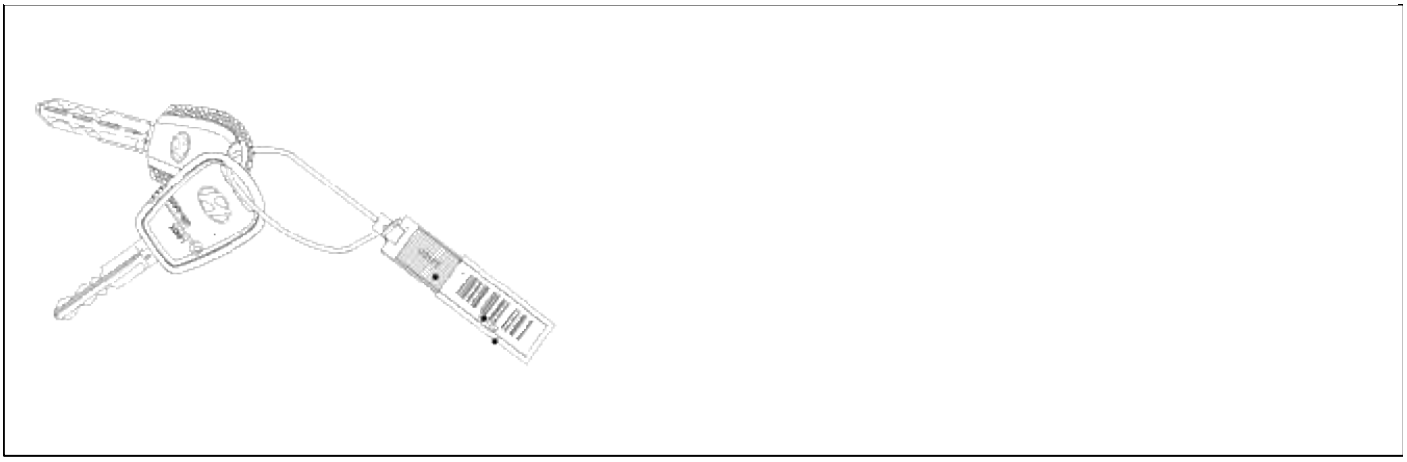
System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1693

Component Location



General Description

The vehicle immobilizer system consists of the ECM, the SMARTRA3 and ignition keys with built-in transponder. The ECM carries out the check of ignition key by special encryption algorithm with SMARTRA3 and Transponder. The encryption algorithm (between ECM ans SMARTRA3) is used one offered from BOSCH.
The encryption algorithm (between ECM and Transponder) is Hitag2 type which is the high level.
When IGN On, the ECM executes the key Authentication after SMARTRA3 authentication. The Engine can be started in case of the success in SMARTRA3 and key authentication.
The Key teaching procedure starts with ECM request of vehicle specific data from Scanner. The "virgin"ECM stores the vehicle specific data and the key Learning can be started. The "learnt"ECM compares the vehicle specific data from tester with the vehicle password in Transponder. If the data are correct, the key Learning can be started. Scanner requests the Learning of the first key, the SMARTRA3 is registered at first and then the first key is registered by ECM. If the SMARTRA3 status is learnt and PIN number is different, the SMARTRA3 will return the incorrect PIN data to the ECM. In this case, The ECM can't excute the key Learning process.

DTC Description

The ECM sets DTC P1693 if there’s abnormal response from transponder.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Corrupted data from Transponder ● More than one TP in the magnetic field ● No TP(Key without TP) in the magnetic field
Enable Conditions	● IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Check transponder and ECU status
   (1) IGN "ON" & Engine "OFF"
   (2) Monitor the "ECU, KEY and Smartra STATUS" Parameter on the Scantool.

   Specification : 'LEARNT'

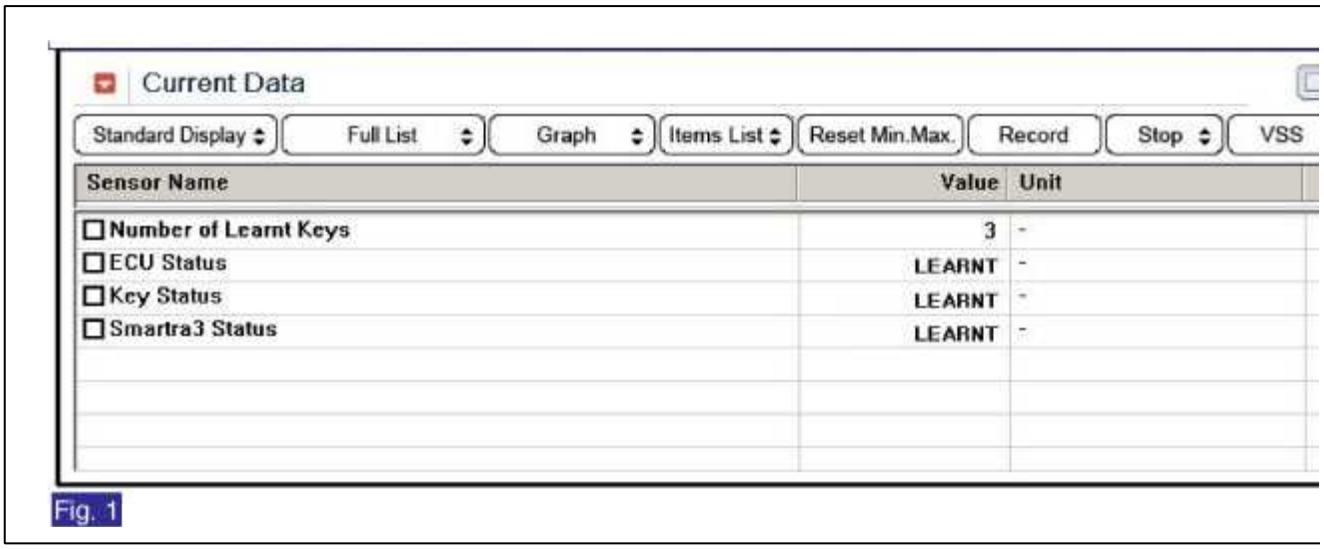


   Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt SMARTRA3 has been learnt.

   (3) Have both the "ECM" and "KEY" status been learnt?

   YES

   Check connectors for looseuess, poor connection, bending, corrosion, contamination dererioration, damage the ECM or SMARTRA.
   And this DTC has not been erased in prerious repair. Repair or replace as necessary and then go to "Verificati Vehicle Repair" procedure.

   NO

   Go to "Component Inspection" Procedure.

Component Inspection

1. Check transponder
   (1) IGN "ON" & Engine "OFF"
   (2) Neutralize ECM and Register transponder key by scantool.

   NOTE

   Pin code is required to Neutralize ECM and to Register transponder key

   (3) Are Neutralizing and Registering completed normally ?

   YES

   Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known-good transponder and perform the key teaching procedure.
   If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

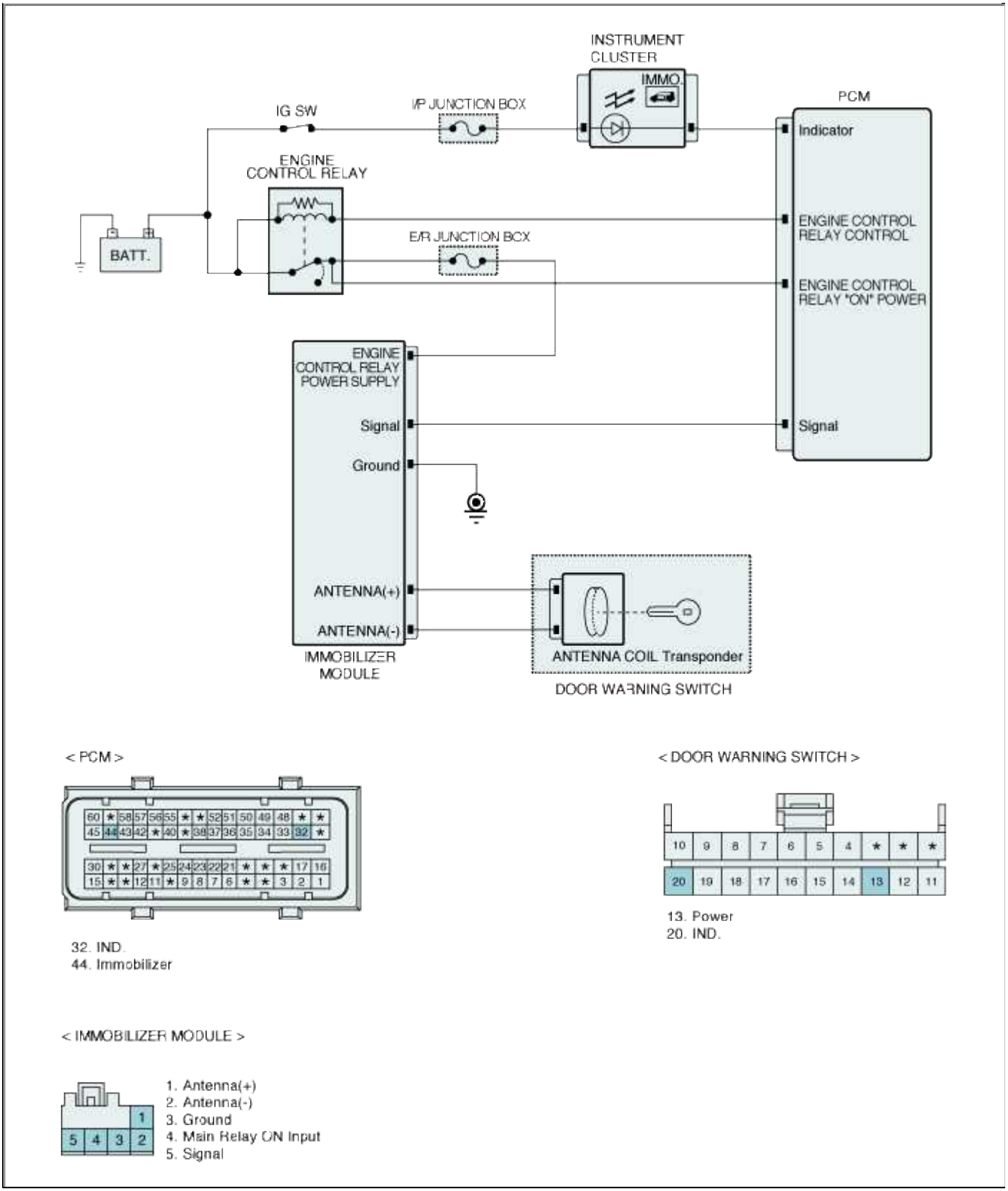
YES

Go to the applicable troubleshooting procedure.

NO

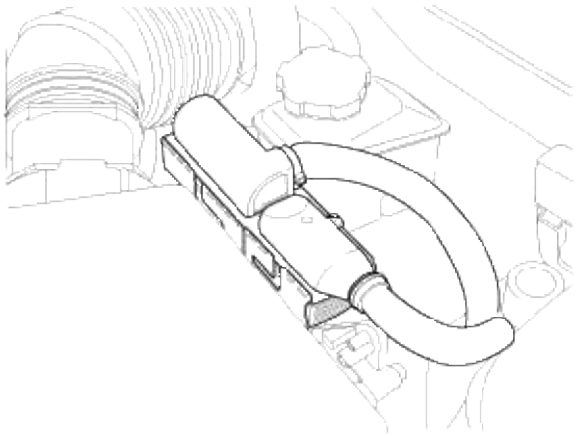
System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1695

Component Location



General Description

The relevant data for the immobilizer function are stored at permanent memory (EEPROM or Flash etc.)..
The immobilizer data are stored by three independent entries.
The data from EEPROM are evaluated by 2 of 3 decision". That means all three entries are read and the content is compared before authentication process.
If the contents of all entries are equal, the authentication will run without additional measures.
If only the contents of two entries are equal, the authentication will run and fault code "EEPROM defective" is stored at ECM.
If the contents of all three entries are different from each other, no authentication will be possible and the fault code "EEPROM defective" will be stored. The limp home function cannot be activated. The ECM shall be replaced if the EEPROM related fault occurs again after new teaching of all keys.

DTC Description

The ECM sets DTC P1694 if there's any fault in EMS internal permanent memory(EEPROM or Flash etc.).

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Faulty EMS
Enable Conditions	● IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Check status
   (1) IGN "ON" & Engine "OFF"
   (2) Monitor the "KEY STATUS", "SMARTRA STATUS" and "ECU STATUS" Parameter on the Scantool.

Specification : 'LEARNT'

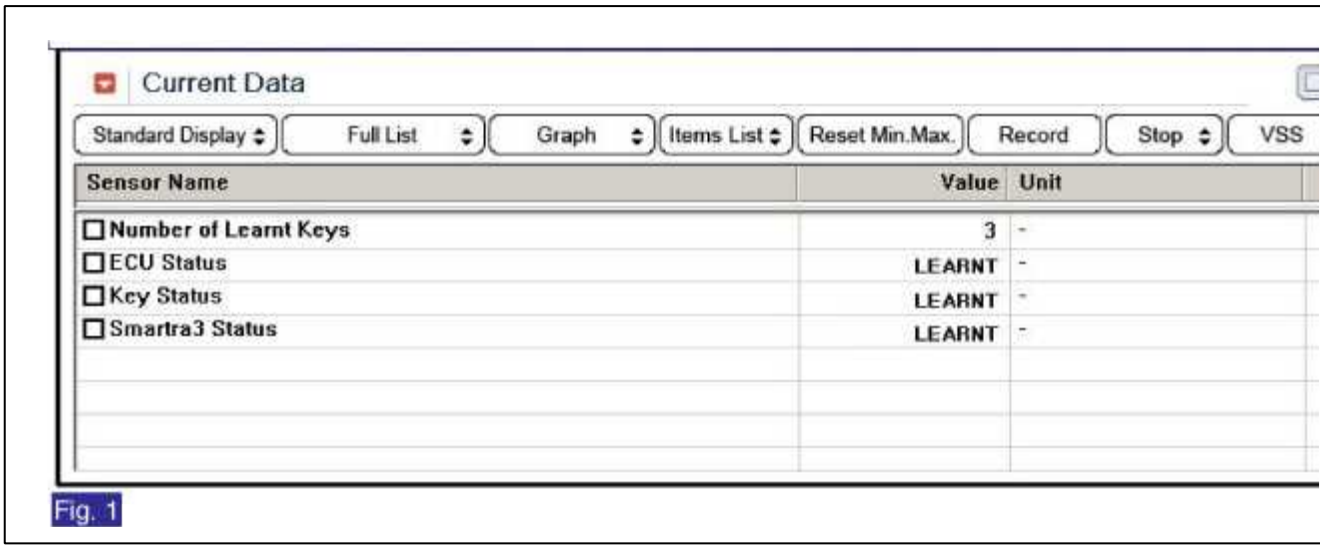


Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt SMARTRA3 has been learnt.

   (3) Are "KEY STATUS", "SMARTRA STATUS" and "ECU STATUS" Parameter within specifications?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damag the ECM or SMARTRA.
And this DTC has not been erased in previous repair. Repair or replace as necessary and then go to "Verificat Vehicle Repair" procedure.

NO

Go to "Component Inspection" Procedure.

Component Inspection

1. Check ECM
   (1) IGN "ON" & Engine "OFF"
   (2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is requried to Neutralize ECM and to Register transponder key

(3) Are Neutralizing and Registering completed normally ?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ECM and perform the key teaching procedure.
If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

> NOTE
>
> ECM substitued for old one must be in "Virgin" or "Neutral" status and Pin code is requied to Neutralize ECM and to Register transponder key

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

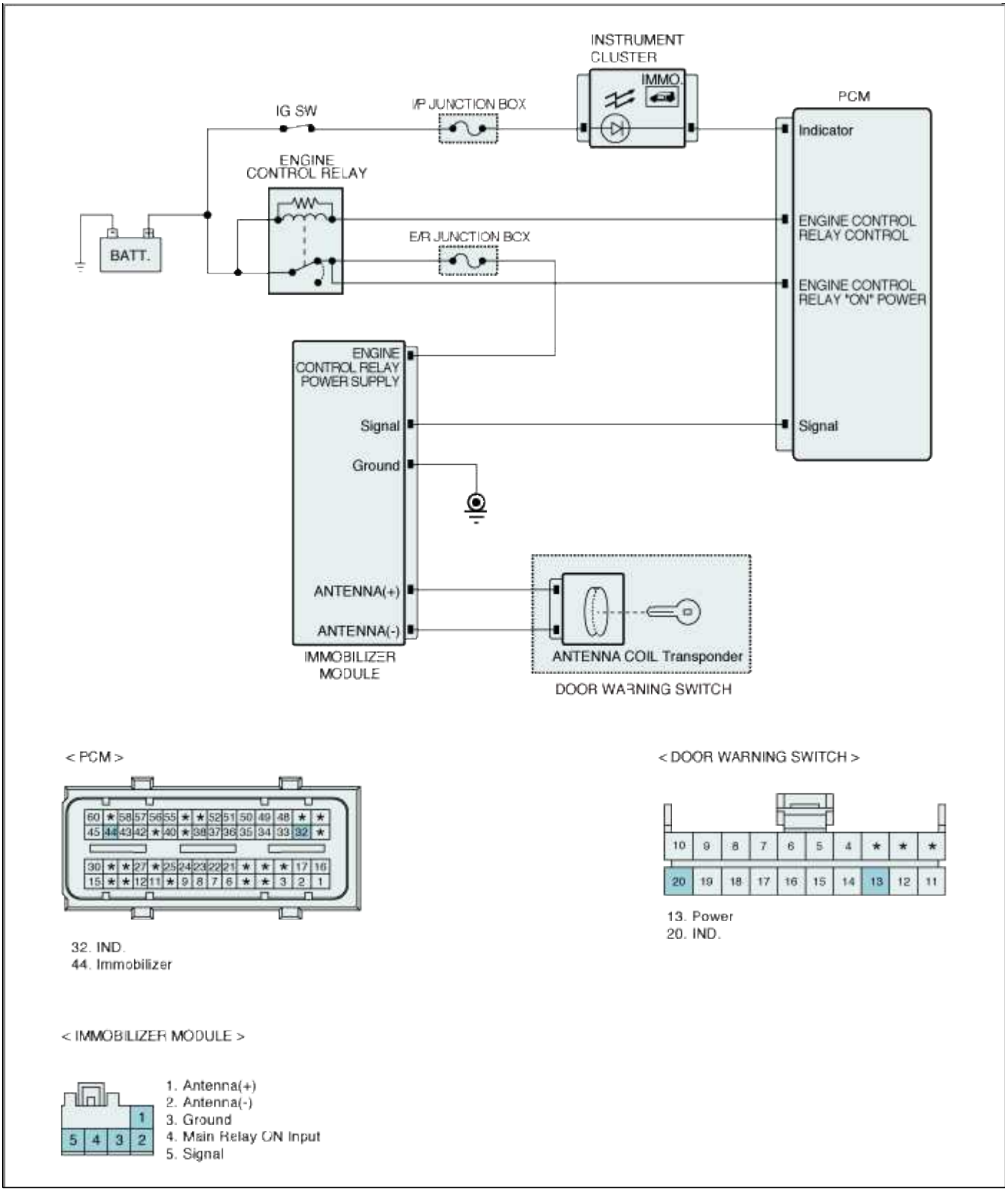
YES

Go to the applicable troubleshooting procedure.

NO

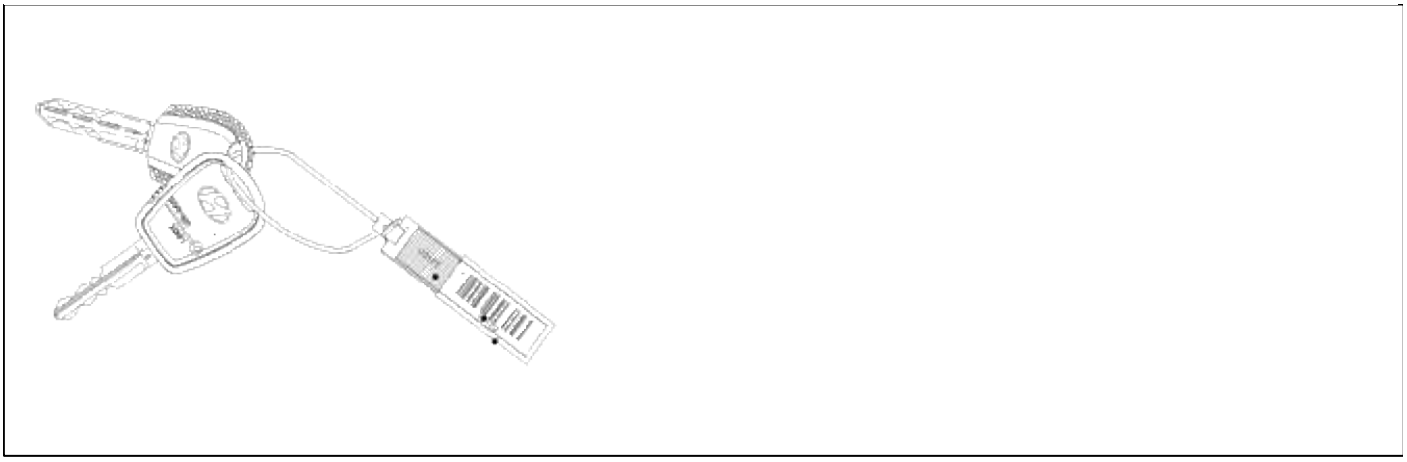
System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1696

Component Location



General Description

The vehicle immobilizer system consists of the ECM, the SMARTRA3 and ignition keys with built-in transponder.
The ECM carries out the check of ignition key by special encryption algorithm with SMARTRA3 and Transponder.
The encryption algorithm (between ECM ans SMARTRA3) is used one offered from BOSCH.
The encryption algorithm (between ECM and Transponder) is Hitag2 type which is the high level.
When IGN On, the ECM executes the key Authentication after SMARTRA3 authentication. The Engine can be started in case of the success in SMARTRA3 and key authentication.
The Key teaching procedure starts with ECM request of PIN from Scanner. The "virgin"ECM stores the PIN and the key Learning can be started. The "learnt"ECM compares the PIN from tester with the vehicle password in Transponder. If the data are correct, the key Learning can be started.
Scanner requests the Learning of the first key, the SMARTRA3 is registered at first and then the first key is registered by ECM. If the SMARTRA3 status is learnt and PIN number is different, the SMARTRA3 will return the incorrect PIN data to the ECM. In this case, The ECM can't excute the key learning process.

DTC Description

The ECM sets DTC P1696 if transponder key that can't be register(TP not in the password mode or whose transport data has been changed) is inserted for registration procedure.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Invalid transponder
Enable Conditions	● IG ON	
Threshold value	● Virgin TP at PCM/ECM status "Learnt" ● Learnt(Invalid) TP at PCM/ECM status "Learnt"	
Detecting time	● Immediately	
FAIL SAFE		

Monitor Scantool Data

1. Check status
   (1) IGN "ON" & Engine "OFF"
   (2) Monitor the "ECM, Key and Smartra Status" Parameter on the Scantool.

Specification : 'LEARNT'

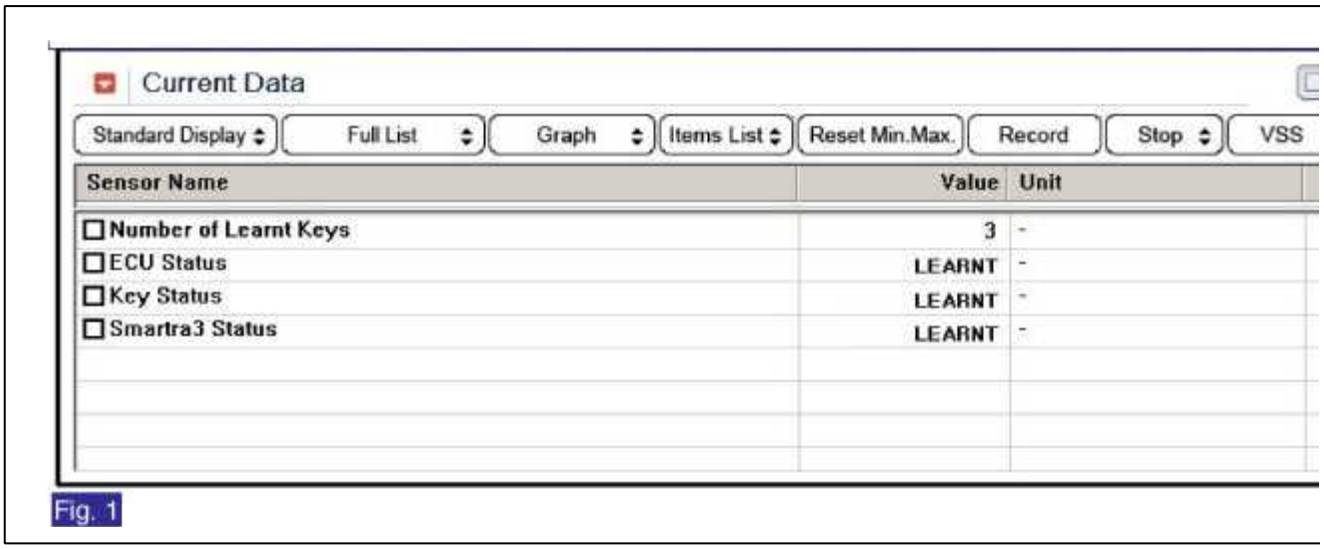


Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt SMARTRA3 has been learnt.

   (3) Are both the ECM and KEY status learnt?

YES

Check connectors for looseuess, poor connection, bending, corrosion, contamination dererioration, damage the ECM or SMARTRA.
And this DTC has not been erased in prerious repair. Repair or replace as necessary and then go to "Verificati Vehicle Repair" procedure.

NO

Go to "Component Inspection" Procedure.

Component Inspection

1. Check transponder
   (1) IGN "ON" & Engine "OFF"
   (2) Neutralize ECM and Register transponder key by scantool.

> **NOTE**
>
> Pin code is requied to Neutralize ECM and to Register transponder key

   (3) Are Neutralizing and Registering completed normally ?

YES

Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good transponder and perform the key teaching procedure.
If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

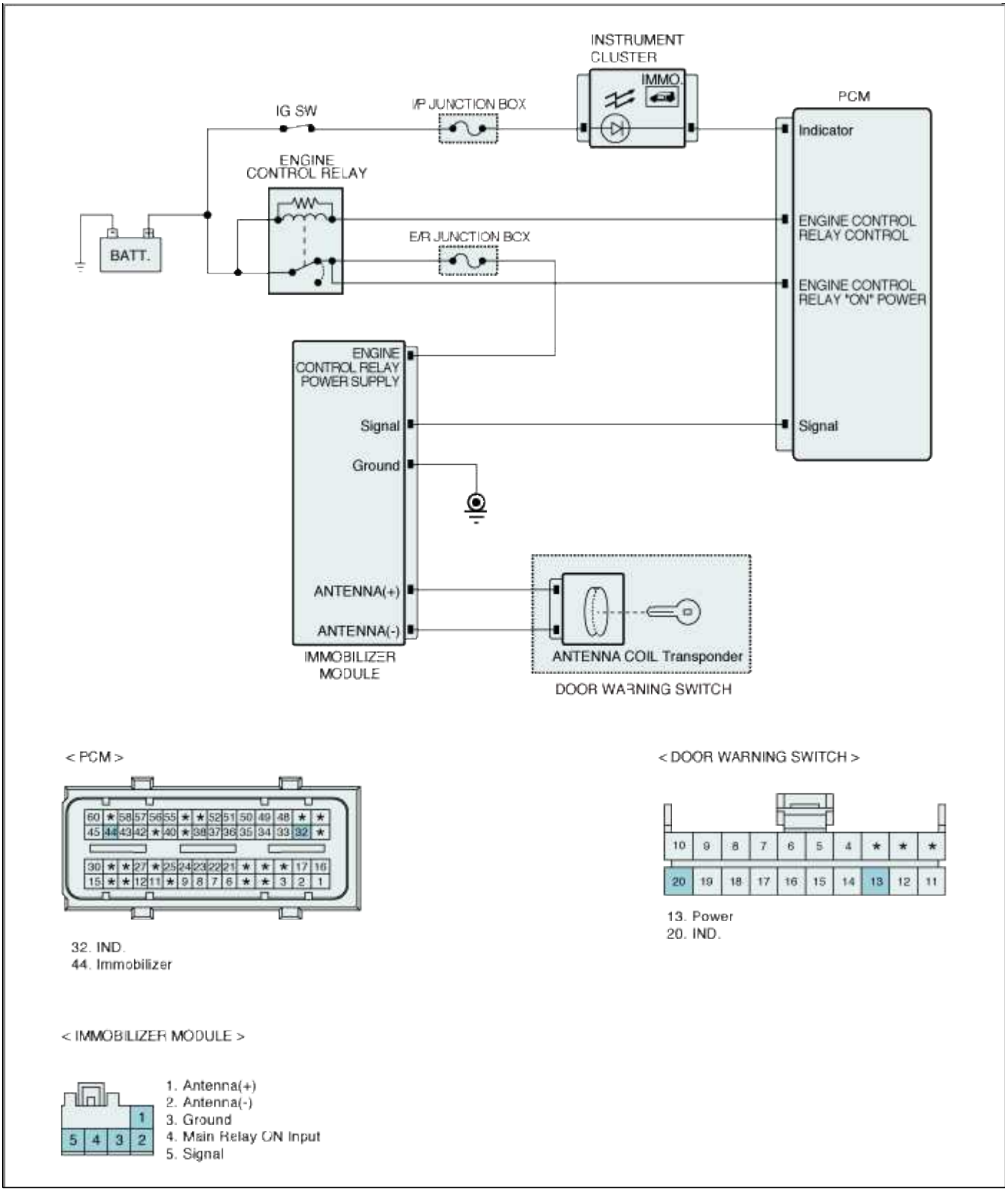
YES

Go to the applicable troubleshooting procedure.

NO

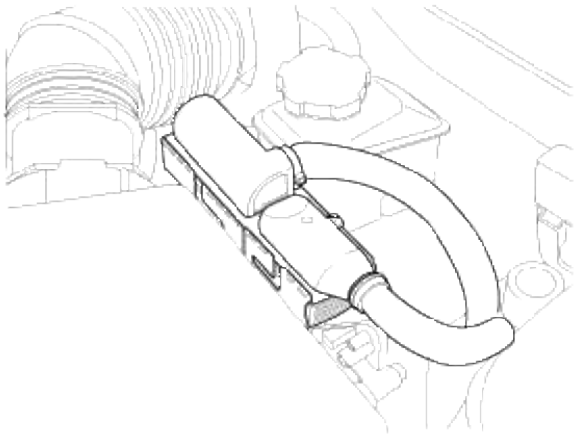
System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P1699

Component Location



General Description

This is a special function for engine start by vehicle manufacturer. The engine can be started for moving from the production line to an area where the key teaching is proceeded.

DTC Description

The ECM sets DTC P1699 if the maximum limit of Twice IGN is Exceeded.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Twice IGN ≥ 32 times
Enable Conditions	● IG ON	
Threshold value		
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Check status
   (1) IGN "ON" & Engine "OFF"
   (2) Monitor the "ECM, Key and Smartra Status" Parameter on the Scantool.

   Specification : 'LEARNT'

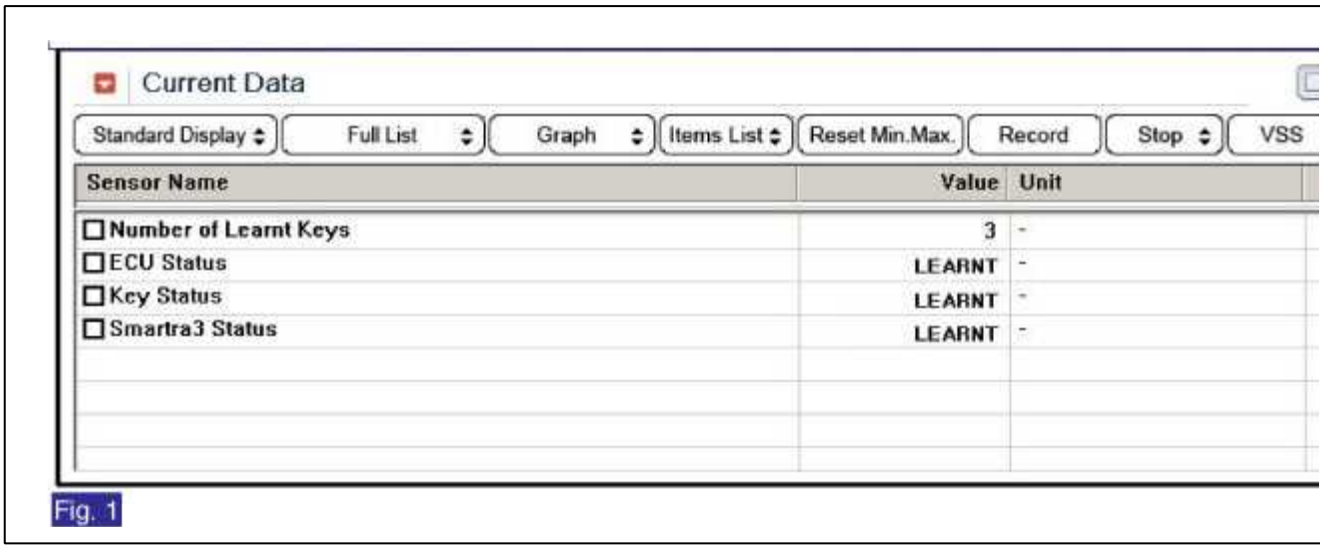


Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt SMARTRA3 has been learnt.

   (3) Is the "ECU STATUS" Parameter "Locked"?

   YES

   Keep "KEY ON" status for 1 hours to withdraw "Locked by Timer" status. Then register transponder and "Verification of Vehicle Repair" procedure.

   NO

   Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damag the ECM or SMARTRA.
   And this DTC has not erased in previous repair. Repair or replace as necessary and then go to "Verification o Vehicle Repair" procedure.

Component Inspection

1. Check transponder
   (1) IGN "ON" & Engine "OFF"
   (2) Neutralize ECM and Register transponder key by scantool.

   NOTE

   Pin code is required to Neutralize ECM and to Register transponder key

   (3) Are Neutralizing and Registering completed normally ?

   YES

   Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known-good transponder and perform key teaching procedure.
   If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

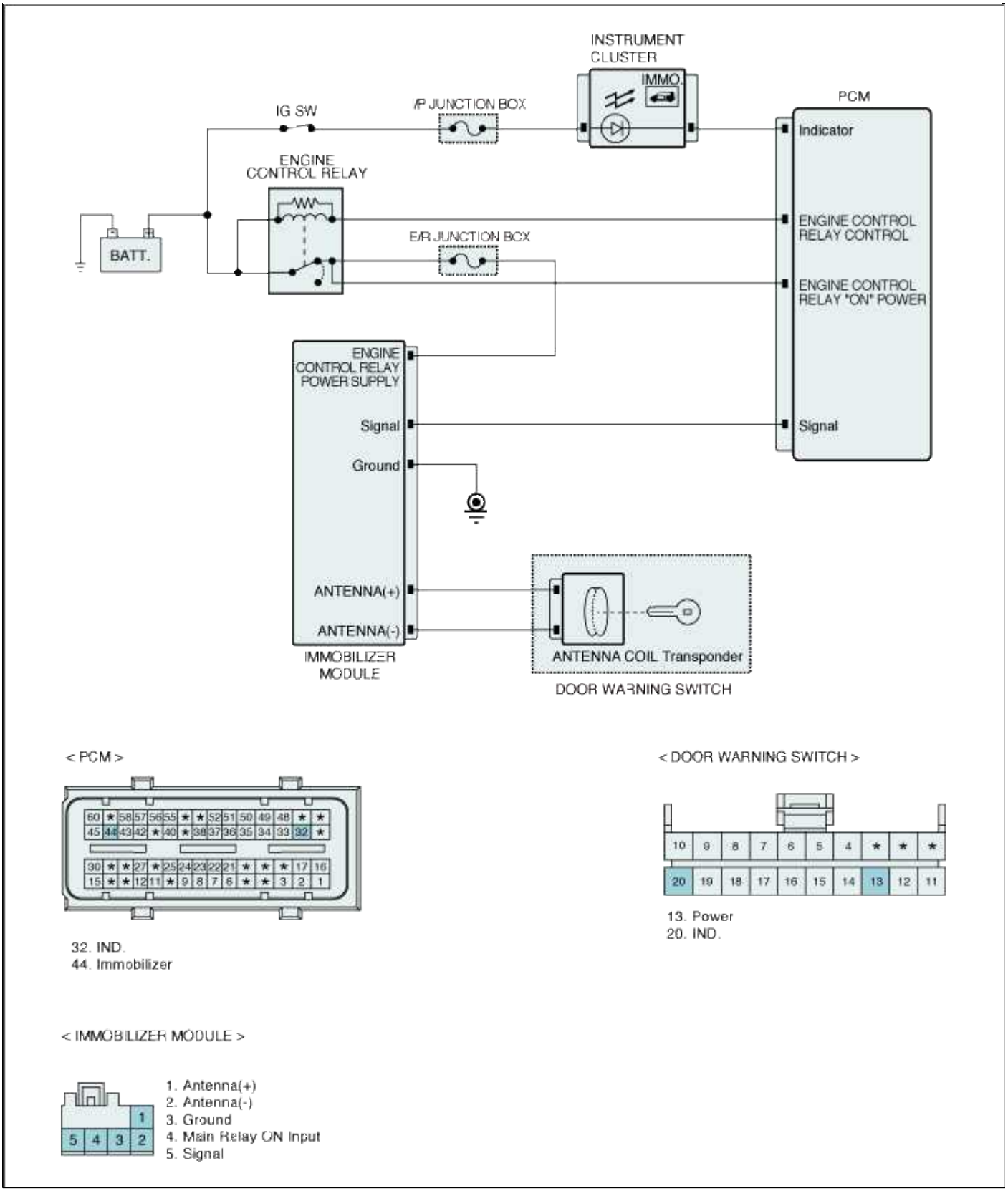
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Diagnostic Circuit Diagram



Body Electrical System > Troubleshooting > P169A

Component Location



General Description

The sequence of the pin code storage are as follow :
1) Input the PIN code into the scanner when key teaching process.
The scanner transmits the Encrypted Code to the ECM after converting the PIN code into Encrypted Code.
2) When the ECM gets the firtst key learning command , it transmits the SMARTRA3 learnt command and Encrypted Code to the SMARTRA3.
3) If the SMARTRA3 statue is virgin/neutral, the SMARTRA3 stores Encrypted Code in EEPROM and transmits the success message of the Encrypted Code storage.(If the SMARTRA3 is learnt, the SMARTRA3 compares Encrypted Code transmitted by the ECM with Encrypted Code stored in EEPROM and transmits the (in)correct Encrypted Code message to ECM)
4) If the SMARTRA3 is learnted normally or the Encrypted Code of the registered SMARTRA3 is same as the ECM, the ECM begins operation the Transponder Learning.
5) If the learning of the first transponder, the ECM stores the Encrypted Code in its EEPROM and converts state into learnt state.
2. The SMARTRA3 learning :
1) starts with EMS request of PIN from scanner through the key teaching procedure.
2) is possible in case that the status of SMARTAR is "virgin" or "neutral".
3) In case that the SMARTRA3 is "learnt", the SMARTRA3 will transmits the information if PIN inputted from scanner is same as the PIN in SMARTRA3.
4) is possible regardless of key status.
3. The sequence of the SMARTRA3 confirms are as follows.
1) After communication with the SMARTRA3, the ECM transmits the random number with requirement of the TP ID information.
2) The SMARTRA3 encryptes the random number and transmits the result(Encrypted Random Number) to the ECM with TP ID information.
3) The ECM compares the result transmitted from the SMARTRA3 with the result calculated by ECM.
And If result are coincided with each other; the ECS concludes the valid confirmation of the SMARTRA3.

DTC Description

The PCM/ECM sets DTC P169A if authentication between PCM/ECM and SMARTRA has been failed.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy		● Locking of SMARTRA
Enable Conditions	● IG ON	
Threshold value	● Virgin SMARTRA at Learnt EMS ● Neutral SMARTRA at Learnt EMS ● Incorect the Authetication of EMS and SMARTRA ● Locking of SMARTRA	
Detecting time		
FAIL SAFE		

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IGN "ON" & Engine "OFF"
3. Monitor the "KEY STATUS", "SMARTRA STATUS" and "ECU STATUS" Parameter on the Scantool.

Specification : 'LEARNT'

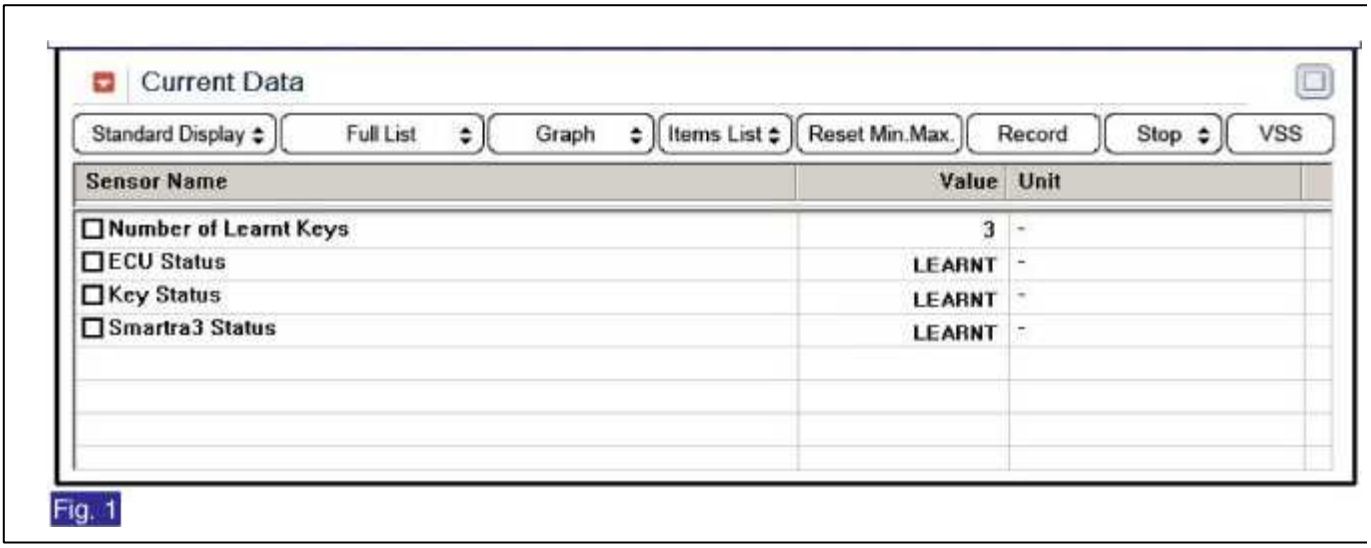


Fig. 1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt.

4. Has the "SMARTRA" status been learnt?

YES

Keep "KEY ON" status for 1 hours to withdraw "Locked by Timer" status. Then register transponder and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Check SMARTRA
   (1) IGN "ON" & Engine "OFF"
   (2) Neutralize Both "SMARTRA" and "ECM" and Register transponder key with scantool.

> NOTE
>
> Pin code is required to Neutralize SMARTRA and to Register transponder key

   (3) Are Neutralizing and Registering completed normally ?

YES

Perform the key teaching procedure with scantool. (All the keys must be retaught) and then, go to "Verification of Vehicle Repair" Procedure.

NO

Substitute with a known-good SMARTRA and Perform Key teaching procedure.
If the problem is corrected, replace SMARTRA and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

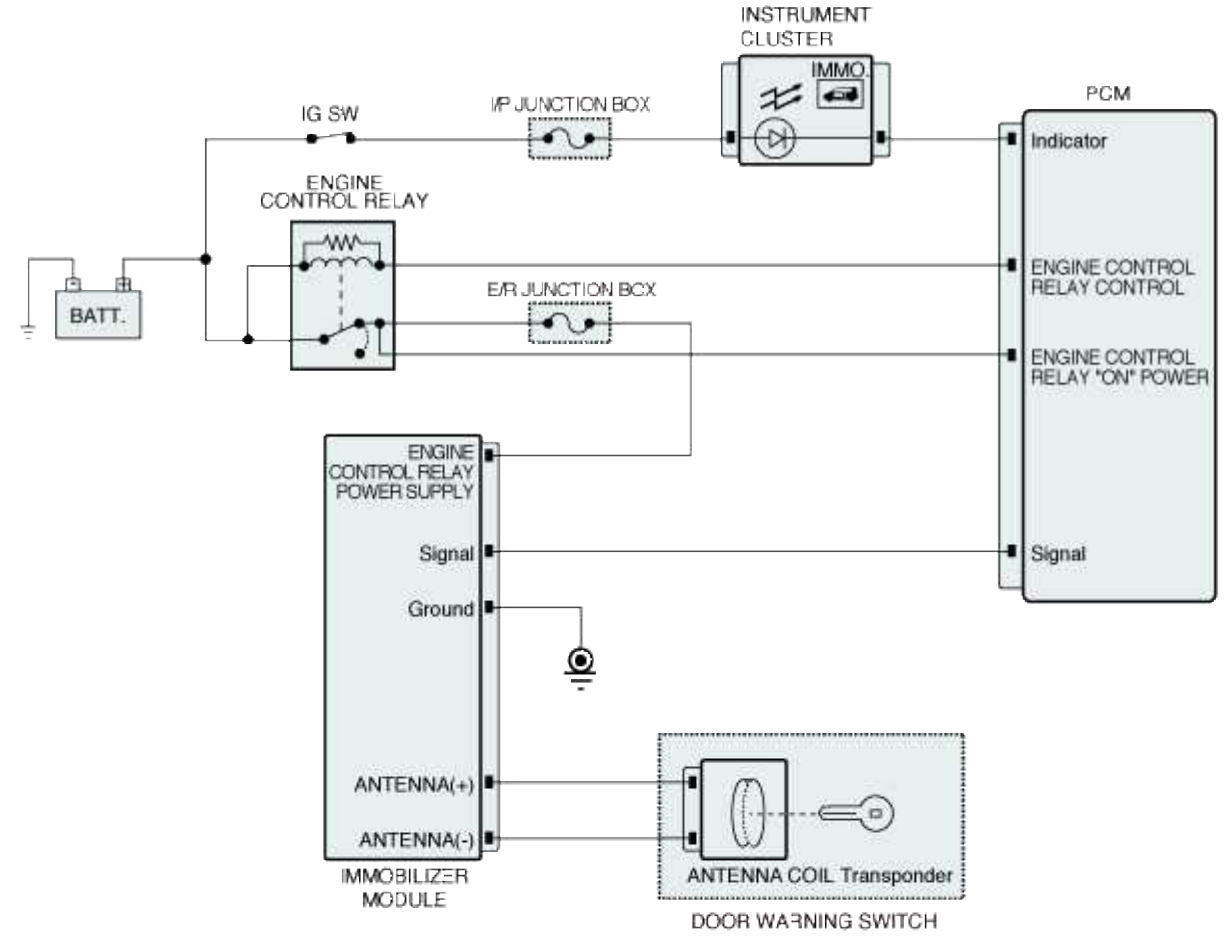
YES

Go to the applicable troubleshooting procedure.

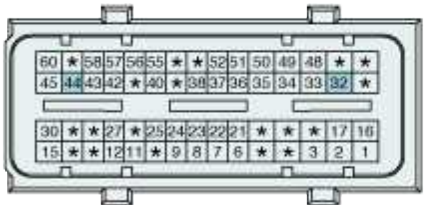
NO

System is performing to specification at this time.

Diagnostic Circuit Diagram

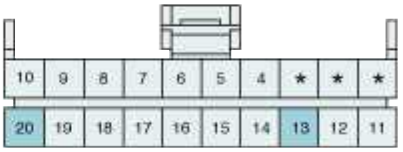


< PCM >



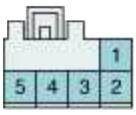
32. IND.
44. Immobilizer

< DOOR WARNING SWITCH >



13. Power
20. IND.

< IMMOBILIZER MODULE >

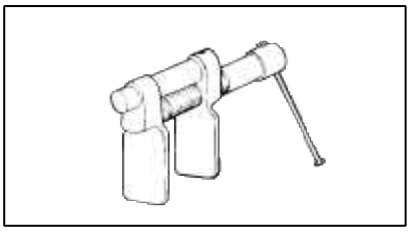


1. Antenna(+)
2. Antenna(-)
3. Ground
4. Main Relay ON Input
5. Signal

ACCENT(MC) > 2008 > G 1.6 DOHC > Brake System

Brake System > General Information > Special Service Tools

SPECIAL SERVICE TOOLS

Tool (Number and Name)	Illustration	Use
09581 - 11000 Piston expander		Pushing back of the front disc and rear disc brake piston

Brake System > General Information > Troubleshooting

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 Adjust
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 Repair Replace
Brake pull	1. Piston (sticking) 2. Pad or lining (Oily) 3. Piston (Frozen) 4. Disc (Scored) 5. Pad or lining (Cracked or distorted)	Replace Replace Replace Replace Replace
Hard pedal but brake inefficient	1. Brake system (Fluid leaks) 2. Brake system (Air in) 3. Pad or lining (Worn) 4. Pad or lining (Cracked or distorted) 5. Pad or lining (Oily) 6. Pad or lining (Oily) 7. Pad or lining (Glazed) 8. Disc (Scored) 9. Booster system (Vacuum leaks)	Repair Air bleeding Replace Replace Replace Adjust Replace Replace Repair

Noise from brake	1. Pad or lining (Cracked or distorted) 2. Installation bolt (Loosen) 3. Disc (Scored) 4. Pad retainers (Loosen) 5. Sliding pin (Worn) 6. Pad or lining (Dirty) 7. Pad or lining (Glazed) 8. Return spring (Faulty) 9. Brake pad shim (Damage) 10. Shoe hold-down spring (Damage)	Replace Retighten Replace Retighten Replace Clean Replace Replace Replace Replace
Brake fades	1. Master cylinder	Replace
Brake vibration, pulsation	1. Brake booster 2. Pedal free play 3. Master cylinder 4. Caliper 5. Master cylinder cap seal 6. Damaged brake lines	Replace Adjust Replace Replace Replace Replace
Brake chatter	Brake chatter is usually caused by loose or worn components, or glazed or burnt linings. Rotors with hard spots can also contribute to brake chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.	

Brake System > General Information > Specifications

SPECIFICATIONS

Item	Specification
Master cylinder Type I.D. Piston stroke Fluid level warning sensor	 Tandem type 22.22 mm (0.875 in) 29 ~ 31 mm Provided
Proportioning valve (CBS) Cut-in pressure (Split point) Decompression ratio	 35 kg/cm² (3.43 MPa, 497.8 psi) 0.27 : 1
Brake booster Type Effective diameter Boosting ratio	 Vacuum 254 mm (10 in) 7 : 1
Front brake (Disc) Type Disc O.D. Disc thickness Pad thickness Cylinder type Cylinder I.D.	 Floating type with ventilated disc 256 mm (10 in) 22 mm (0.87 in) 11 mm (0.43 in) Single piston Ø54 mm (2.12 in)

Rear brake (Drum) Type Drum I.D Brake lining thickness Clearance adjustment	 Leading trailing 203.2 mm (8 in) 4.3 mm (0.17 in) Automatic
Parking brake Actuation Type Drum I.D.	Mechanical brake acting on rear wheels Lever 168 mm (6.61 in)

NOTE

ABS : Anti-lock Brake System
CBS : Conventional Brake System

SERVICE STANDARD

Item	Standard value
Standard value Brake pedal height Brake pedal stroke Stop lamp switch outer case to pedal stopper clearance Brake pedal free play Booster push rod to master cylinder piston clearance Parking brake lever stroke when lever assembly is pulled with 196N (20Kg, 44lb force) Front disc brake pad thickness Front disc thickness Rear drum brake lining thickness Rear drum brake drum I.D.	 164.8 mm (6.49 in) [LHD] 125 mm (4.92 in) 1 ~ 2 mm (0.04 ~ 0.08 in) 3 ~ 8 mm (0.11 ~ 0.31 in) 0 (at 500 mmHg vacuum) 6 ~ 8 clicks 11 mm (0.43 in.) 22 mm (0.87 in) 4.3 mm (0.17 in) 203.2 mm (8 in)

TIGHTENING TORQUES

Item	Nm	kgf.m	lb-ft
Master cylinder to booster mounting nut	7.9 ~ 11.8	0.8 ~ 1.2	5.79 ~ 8.68
Brake booster mounting nut	12.74 ~ 15.68	1.3 ~ 1.6	9.4 ~ 11.57
Bleeder screw	5.88 ~ 9.8	0.6 ~ 1.0	4.34 ~ 7.23
Brake tube nut, brake hose	12.74 ~ 16.64	1.3 ~ 1.7	9.4 ~ 12.3
Caliper guide rod bolt	21.56 ~ 31.36	2.2 ~ 3.2	15.91 ~ 23.14
Caliper mounting bolt	83.36 ~ 93.16	8.5 ~ 9.5	61.48 ~ 68.71
Brake pedal member assembly bracket mounting bolt	7.9 ~ 11.8	0.8 ~ 1.2	5.79 ~ 8.68
Brake pedal mounting nut	24.51 ~ 34.32	2.5 ~ 3.5	18.08 ~ 25.31
Stop lamp switch mounting nut	7.9 ~ 9.8	0.8 ~ 1.0	5.79 ~ 7.23
Rear drum brake bleeder screw	5.88 ~ 8.82	0.6 ~ 0.9	4.34 ~ 6.51

Wheel speed sensor mounting bolt	8.04 ~ 9.51	0.82 ~ 0.97	5.93 ~ 7.02
HECU mounting bracket bolt	7.9 ~ 9.8	0.8 ~ 1.0	5.79 ~ 7.23
HECU union screw	11.76 ~ 15.68	1.2 ~ 1.6	8.68 ~ 11.57
Rear drum backing plate mounting bolt	9.8 ~ 12.74	1 ~ 1.3	7.23 ~ 9.4
Proportioning valve to master cylinder	34.3 ~ 44.1	3.5 ~ 4.5	25.31~32.55

SPECIFICATION(ABS)

Part	Item	Standard value	Remark
HECU	System	4 Channel 4 Sensor (Solenoid)	
	Type	ABS + EBD	
	Operating Voltage	10 ~ 16 V	
	Operating Temperature	-40 ~ 110 °C	
	Motor power	180 W	
Warning lamp	Min. Operating Voltage	1.2 V	
	Max. Current consumption	120 mA	
Active Wheel speed sensor (ABS)	Supply voltage	DC 4.5 ~ 20 V	
	Operating Temperature	-40 ~ 150 °C	
	Output current low	5.9 ~ 8.4 mA	Typ. 7 mA
	Output current high	11.8 ~ 16.8 mA	Typ. 14 mA
	Output range	1 ~ 2500 Hz	
	Tone wheel	48 teeth	
	Air gap	0.4 ~ 1.5 mm	
	Output duty	30 ~ 70 %	

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
Caliper guide rod bolt and boot	AI -11(P) grease	1.0 ~ 1.8 g
Parking brake shoe and backing plate contact surfaces	Bearing grease	As required

Brake System > Brake System > Description and Operation

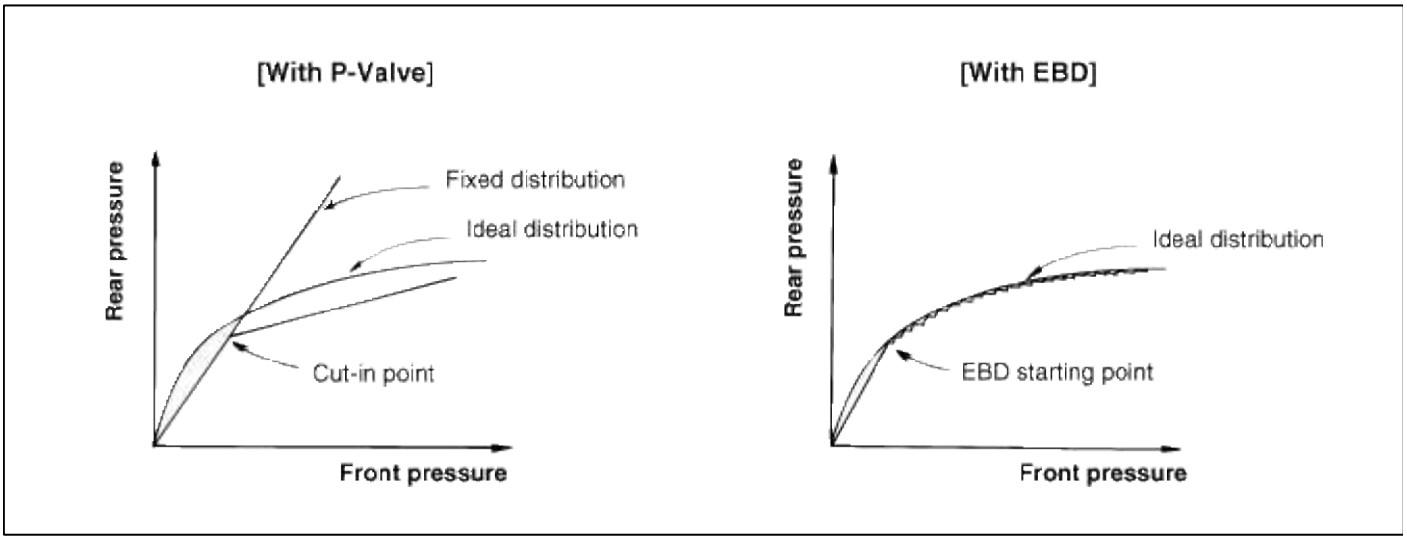
EBD (ELECTRONIC BRAKE-FORCE DISTRIBUTION) OPERATION

The EBD system (Electronic Brake force Distribution) as a sub-system of the ABS system is to control the effective

adhesion utilization by the rear wheels.
It further utilizes the efficiency of highly developed ABS equipment by controlling the slip of the rear wheels in the partial braking range.
The brake force is moved even closer to the optimum and controlled electronically, thus dispensing with the need for the proportioning valve.
The proportioning valve, because of a mechanical device, has limitations to achieve an ideal brake force distribution to the rear wheels as well as to carry out the flexible brake force distribution proportioning to the vehicle load or weight increasing. And in the event of malfunctioning, driver cannot notice whether it fails or not.
EBD controlled by the ABS Control Module, calculates the slip ratio of each wheel at all times and controls the brake pressure of the rear wheels not to exceed that of the front wheels.
If the EBD fails, the EBD warning lamp (Parking brake lamp) lights up.
ADVANTAGES

- Function improvement of the base-brake system.
- Compensation for the different friction coefficients.
- Elimination of the proportioning valve.
- Failure recognition by the warning lamp.

Comparison between Proportioning valve and EBD

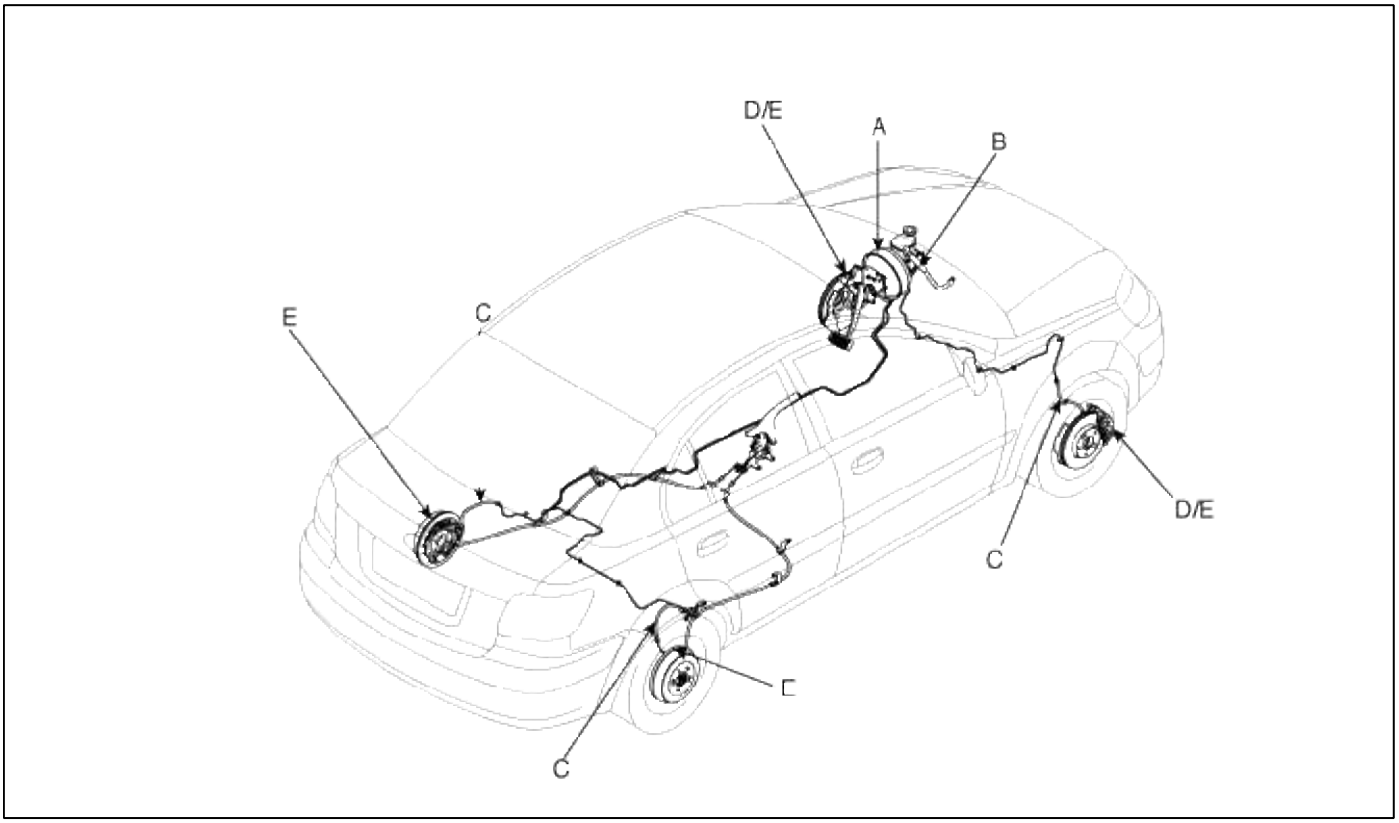


Brake System > Brake System > Repair procedures

Operation and Leakage Check

Check all of the following items:

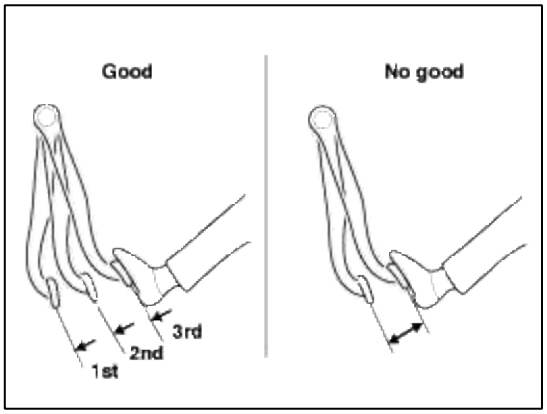
Component	Procedure
Brake Booster (A)	Check brake operation by applying the brakes during a test drive. If the brakes do not work properly, check the brake booster. Replace the brake booster as an assembly if it does not work properly or if there are signs of leakage.
Piston cup and pressure cup inspection (B)	Check brake operation by applying the brakes. Look for damage or signs of fluid leakage. Replace the master cylinder as an assembly if the pedal does not work properly or if there is damage or signs of fluid leakage.
	Check for a difference in brake pedal stroke between quick and slow brake applications. Replace the master cylinder if there is a difference in pedal stroke
Brake hoses (C)	Look for damage or signs of fluid leakage. Replace the brake hose with a new one if it is damaged or leaking.
Caliper piston seal and piston boots (D)	Check brake operation by applying the brakes. Look for damage or signs of fluid leakage. If the pedal does not work properly, the brakes drag, or there is damage or signs of fluid leakage, disassemble and inspect the brake caliper. Replace the boots and seals with new ones whenever the brake caliper is disassembled.
Wheel cylinder piston cup and dust cover (E)	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, replace the wheel cylinder.



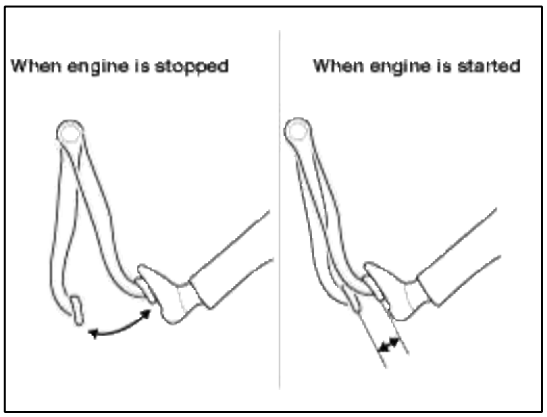
BRAKE BOOSTER OPERATING TEST

For simple checking of the brake booster operation, carry out the following tests :

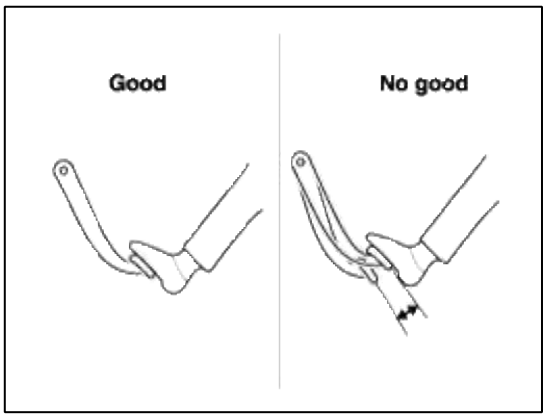
1. Run the engine for one or two minutes, and then stop it. If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is defective.



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.

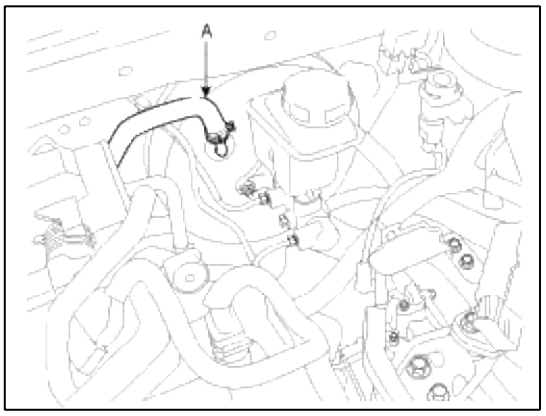


VACUUM HOSE (CHECK VALVE)

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.

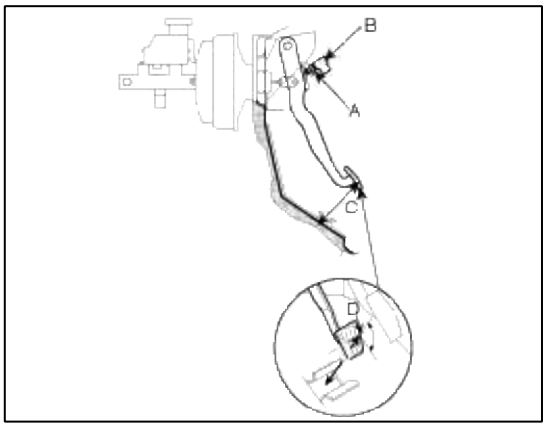


BRAKE PEDAL BRAKE SWITCH ADJUSTMENT

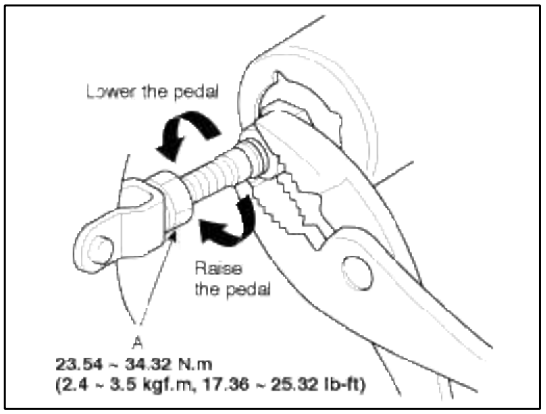
PEDAL HEIGHT

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. Lift up the carpet. At the insulator cutout, measure the pedal height (C) from the middle of the left-side center of the pedal pad (D).

Standard pedal height (with carpet removed) :
164.8 mm (6.49 in)

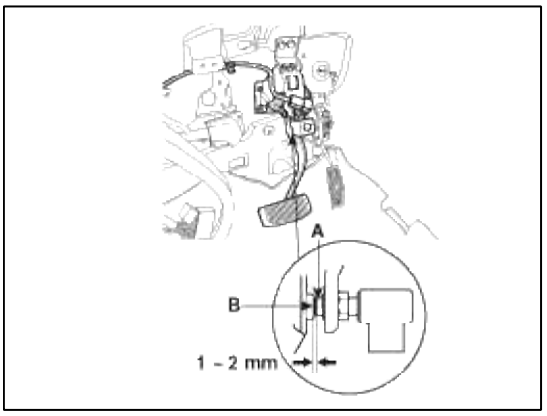


3. Loosen the pushrod locknut (A), and screw the pushrod in or out with pliers until the standard pedal height from the floor is reached. After adjustment, tighten the locknut firmly. Do not adjust the pedal height with the pushrod depressed.



BRAKE SWITCH CLEARANCE

Screw in the brake switch until its plunger 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 ~ 2 mm (0.04 ~ 0.08 in.) of clearance between the brake switch connector. Make sure that the brake lights go off when the pedal is released.

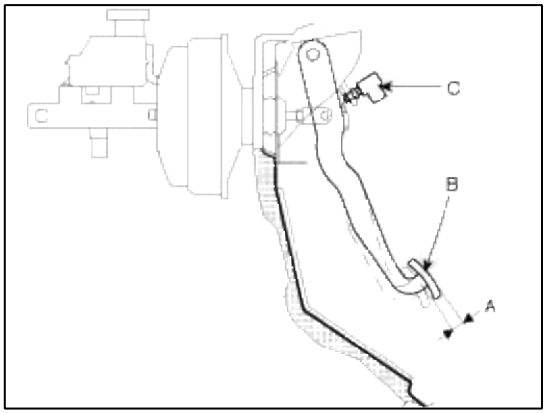


PEDAL FREE PLAY

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.)

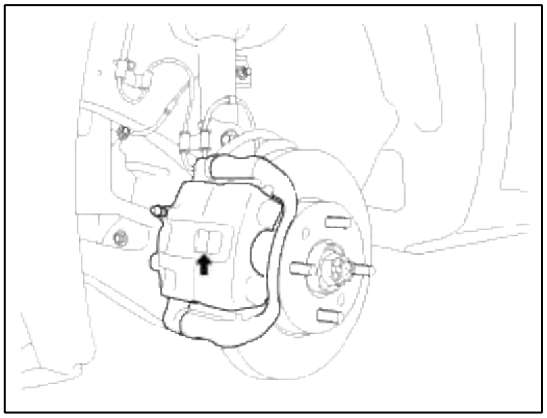
2. If free play does not reach the standard value, check that clearance between the outer case of stop light switch (C) and brake pedal is within the standard value. If free play exceeds the standard value, it is probably due to excessive clearance between the clevis pin and brake pedal arm. Check for excessive clearance and replace faulty parts as required.
3. Start the engine, depress the brake pedal with approximately 1176.8N (120kg, 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.)

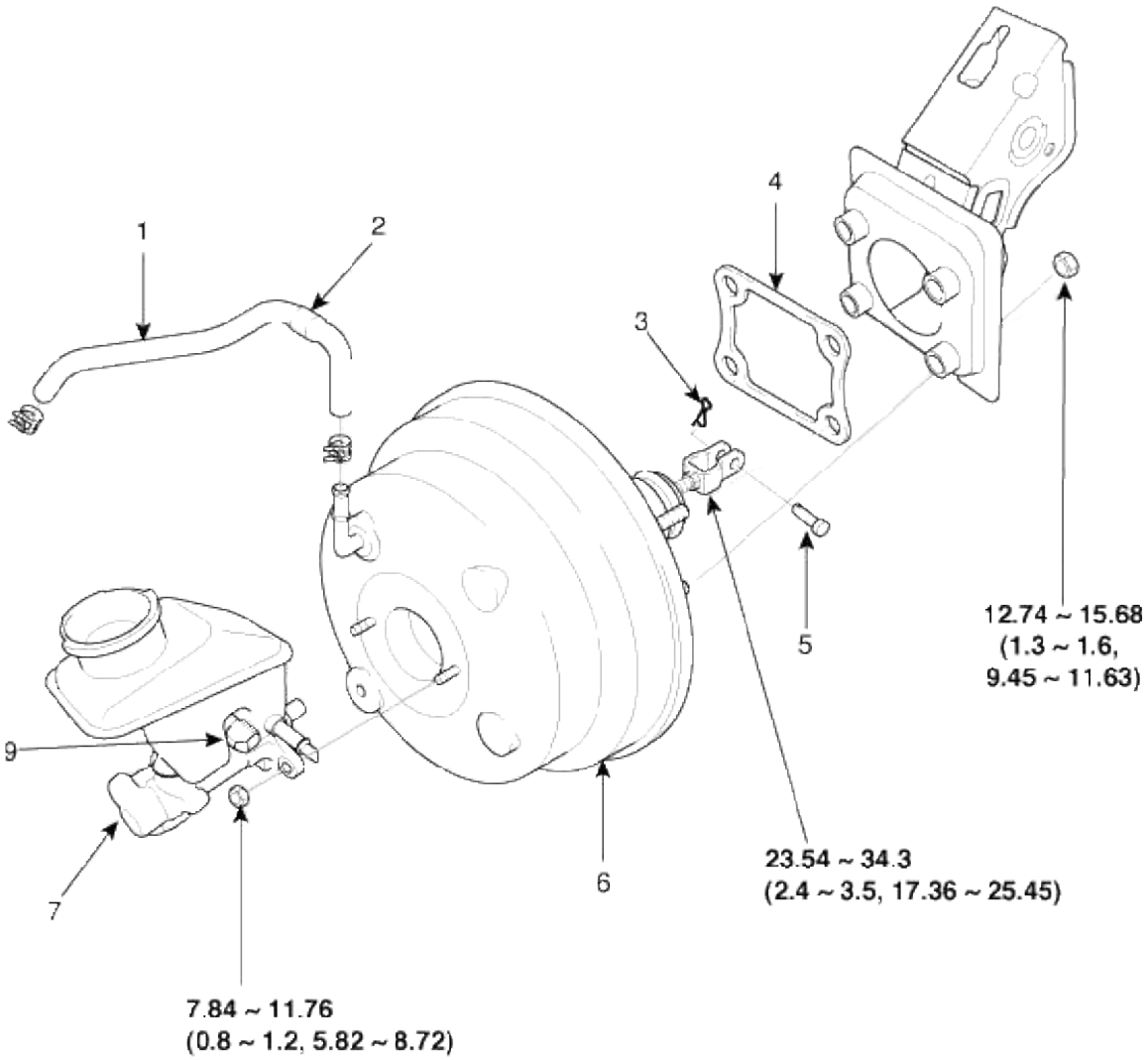


CAUTION

- 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.

Brake System > Brake System > Brake Booster > Components and Components Location

COMPONENTS(1)



TORQUE : Nm (kgf.m, lb-ft)

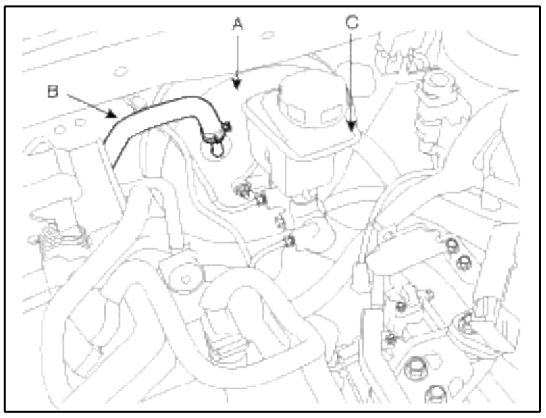
1. Vacuum hose
2. Check valve
3. Snap pin
4. Seal
5. Clevis pin
6. Brake booster
7. Mater cylinder
8. Washer
9. Brake fluid level sensor connector

Brake System > Brake System > Brake Booster > Repair procedures

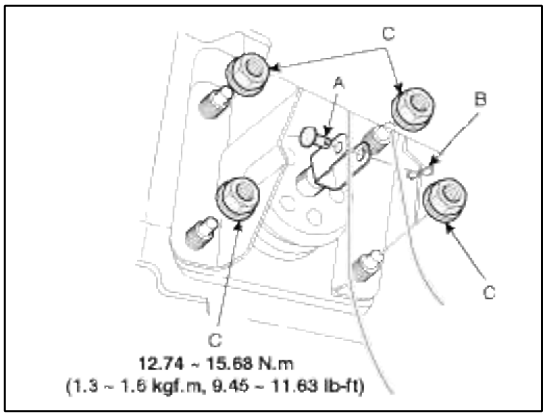
REMOVAL

1. Remove the master cylinder(C).

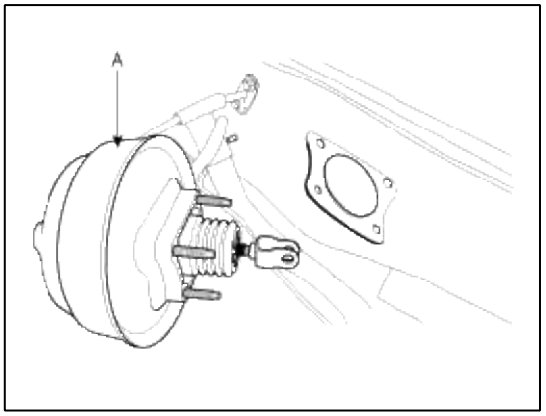
2. Disconnect the vacuum hose (B) from the brake booster (A).



3. Remove the clevis pin(A) and snap pin (B).



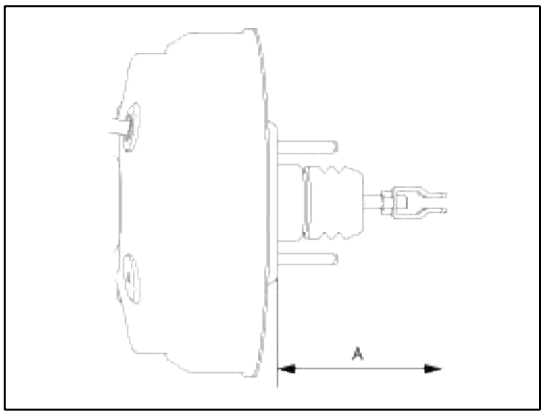
4. Remove the four booster mounting nuts (C).
5. Remove the brake booster (A) from the engine compartment.



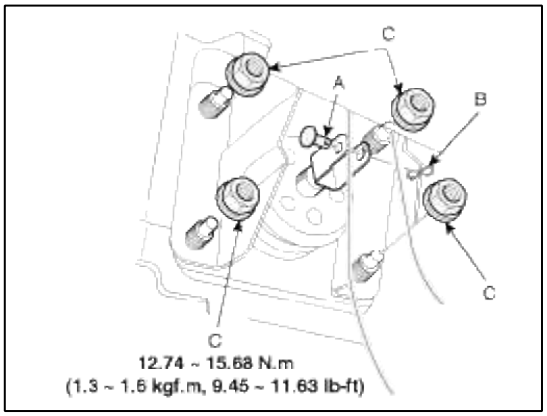
INSTALLATION

1. Adjust push rod length of the booster, and then install the seal on the booster assembly.

Standard length(A) : 116.3 ± 0.5 mm (4.58 ± 0.019 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).

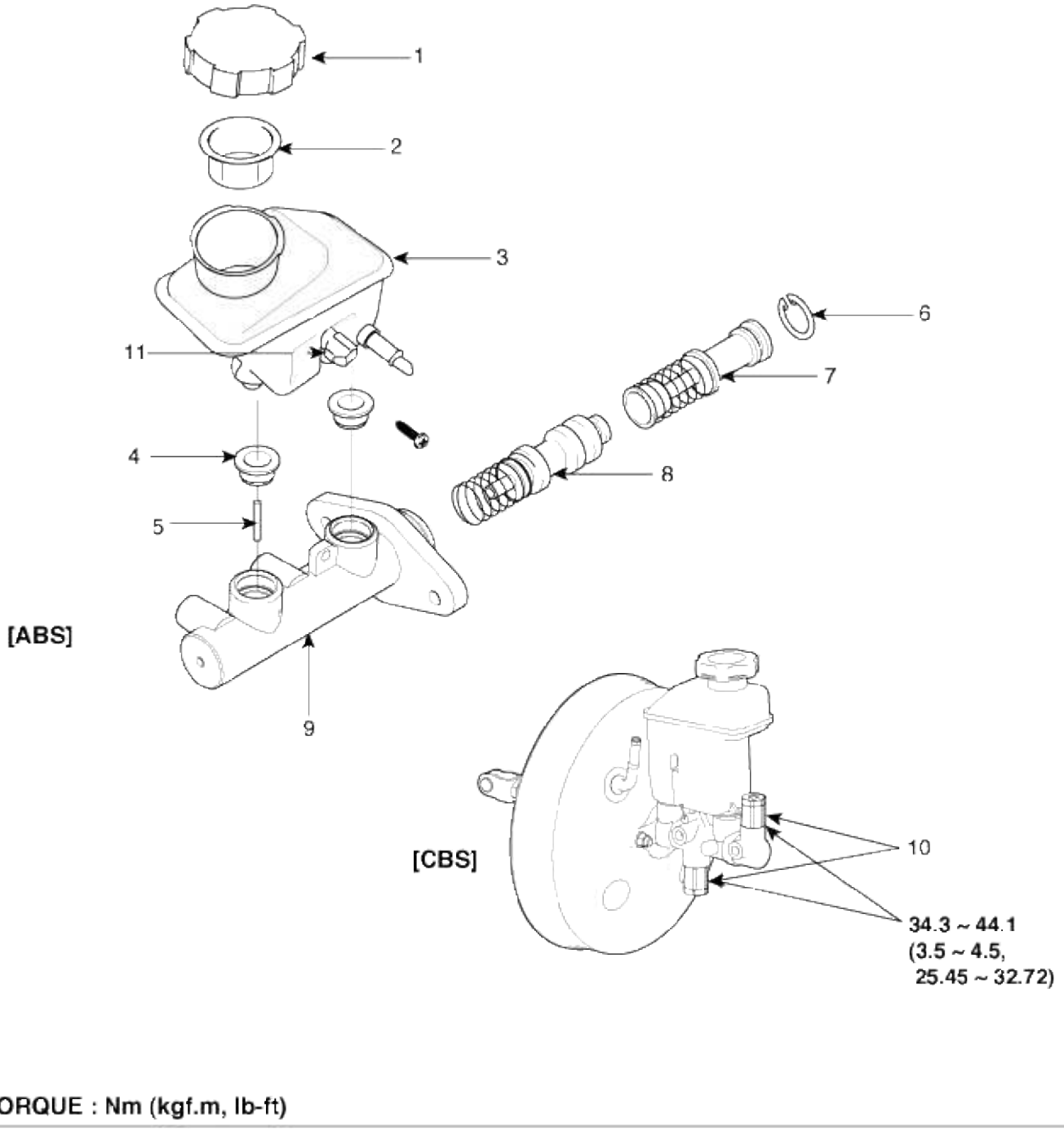
CAUTION

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. Connect the vacuum hose to the brake booster.
6. After filling the brake reservoir with brake fluid, bleed the system.
7. Check for fluid leakage.
8. Check and adjust the brake pedal for proper operation.

Brake System > Brake System > Master Cylinder > Components and Components Location

COMPONENTS



TORQUE : Nm (kgf.m, lb-ft)

1. Reservoir cap
2. Brake fluid filter
3. Reservoir
4. Grommet
5. Cylinder pin
6. Retainer
7. Primary piston assembly
8. Secondary piston assembly
9. Master cylinder body
10. Proportioning valve
11. Brake fluid level sensor connector

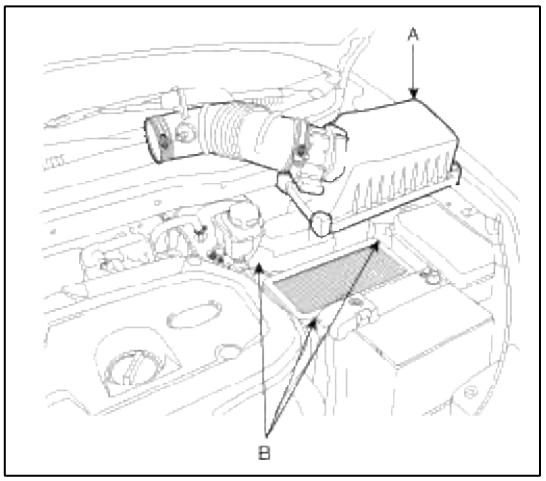
Brake System > Brake System > Master Cylinder > Repair procedures

REMOVAL

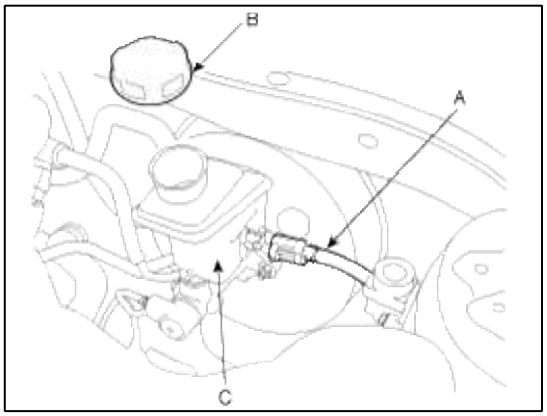
NOTE

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.

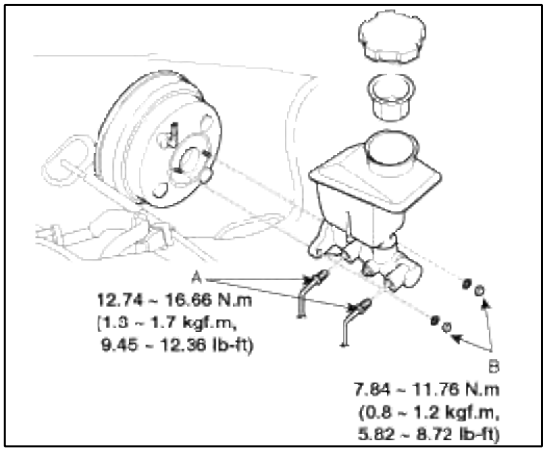
1. Remove air cleaner mounting bolts (B) from the air cleaner mounting bracket and air cleaner body (A).



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 (C) with a syringe.
4. Disconnect the brake lines (A) from the master cylinder. To prevent spills, cover the hose joints with rags or shop towels.

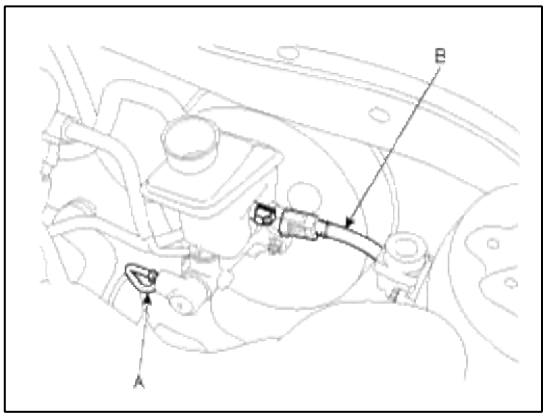


5. Remove the master cylinder mounting nuts (B) and washers.
6. Remove the master cylinder(C) from the brake booster . Be careful not to bend or damage the brake lines when removing the master cylinder.

INSTALLTION

1. Install the master cylinder to the brake booster.

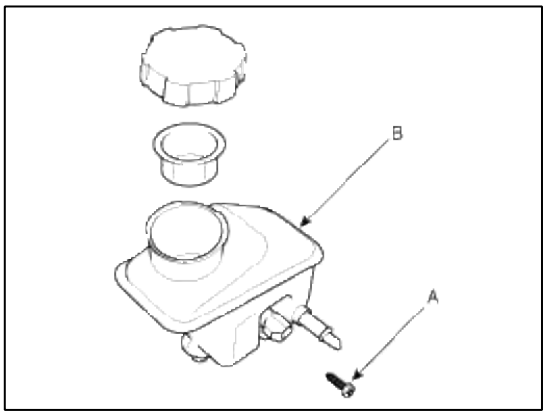
2. Connect the brake tubes(A) and brake level switch connector(B) to the master cylinder.



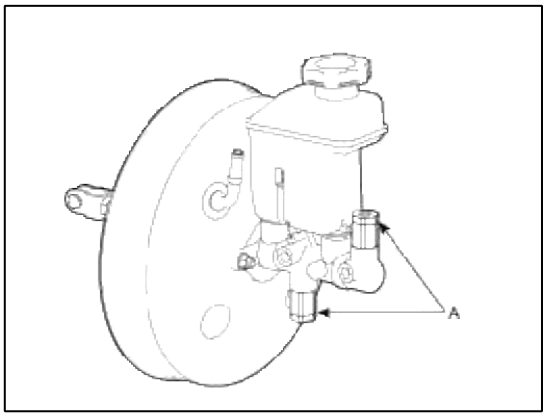
3. After refilling the master cylinder reservoir to the maximum line, bleed the brake system.

DISASSEMBLY

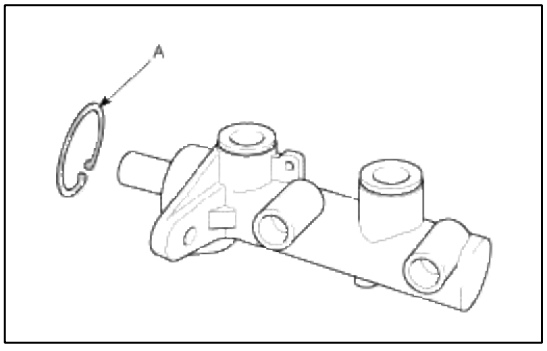
1. Remove the reservoir cap and drain the brake fluid into a suitable container.
2. Remove the fluid level sensor.
3. Remove the reservoir(B) from the master cylinder after remove the mounting screw (A).



4. Remove the proportioning valves(A).(Conventional brake system)

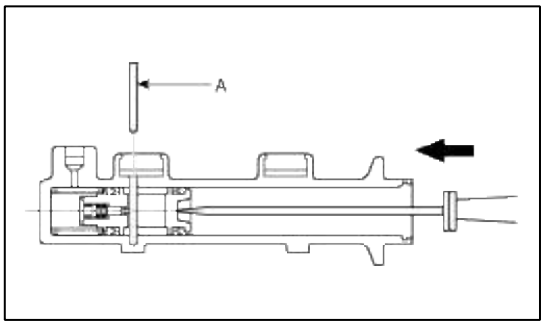


5. Remove the retainer ring(A) by using the snap ring pliers.



6. Remove the pin with the primary piston pushed completely using a screwdriver. Remove the primary piston assembly.

7. Remove the pin(A) with the secondary piston pushed completely using a screwdriver. Remove the secondary piston assembly.



NOTE

Do not disassemble the primary and secondary piston assembly.

INSPECTION

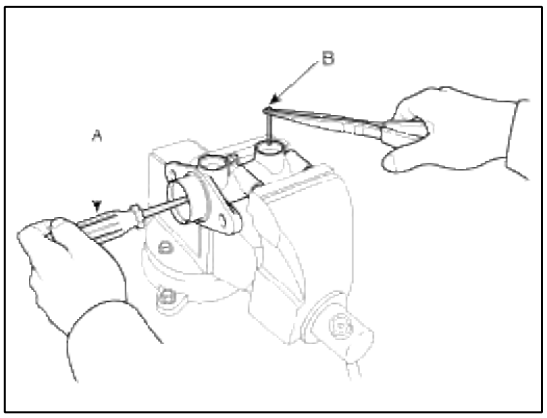
1. Check the master cylinder bore for rust or scratch.
2. Check the master cylinder for wear or damage. If necessary, clean or replace the cylinder.

CAUTION

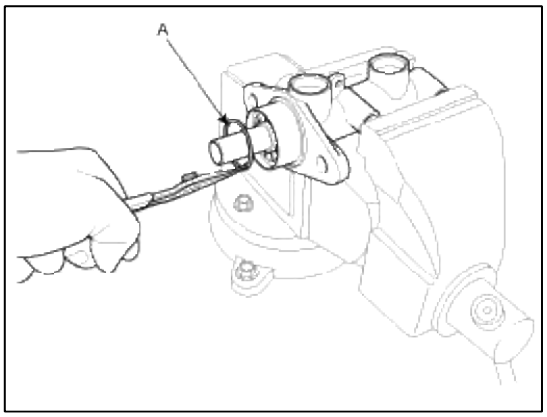
- f the cylinder bore is damaged, replace the master cylinder assembly.
- Wash the contaminated parts in alcohol.

REASSEMBLY

1. Apply genuine brake fluid to the rubber parts of the cylinder kit and grommets.
2. Carefully insert the springs and pistons in the proper direction.
3. Press the piston with a screwdriver(A) and install the cylinder pin(B).



4. Press the piston with a screwdriver and install the retainer ring(A).



5. Install the proportioning valves (In case of CBS).
6. Mount two grommets.
7. Install the reservoir on the cylinder.

Brake System > Brake System > Proportioning Valve > Description and Operation

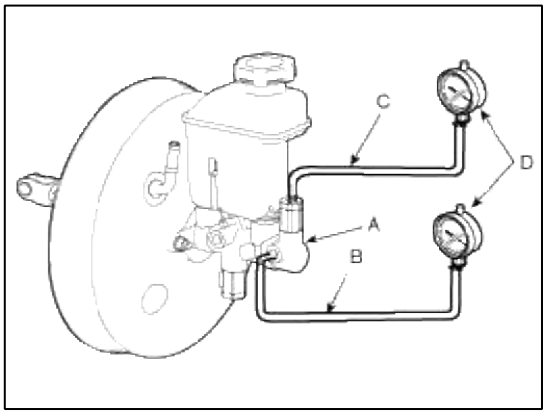
DESCRIPTION

Do not disassemble the proportioning valve. The proportioning valve makes the ideal distribution of fluid pressure to the front and rear brakes to prevent the brakes from skidding in the event of rear wheel lock up and to obtain higher brake efficiency within the range of service brake application.

Brake System > Brake System > Proportioning Valve > Repair procedures

INSPECTION

1. Remove the front brake tube (B) and rear brake tube (C) from the master cylinder (A).
2. Connect two pressure gauges (D); one to the output valve of the front (B) and rear (C) brake.



NOTE

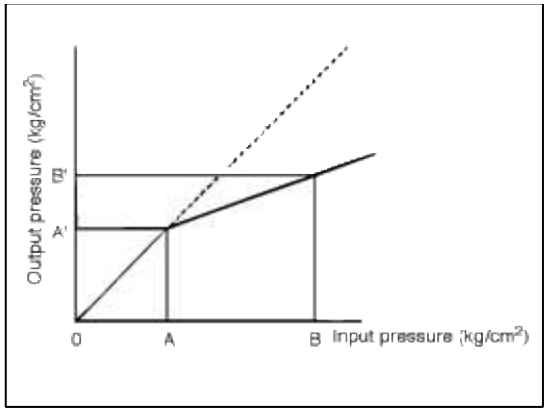
Be sure to bleed the system after connecting the pressure gauges.

3. With the brake applied, measure the front pressure and the rear pressure. If the measured pressures are within the specified range as illustrated, the proportioning valve is good.
4. Reconnect the brake lines in their original positions and bleed the brake system.

NOTE

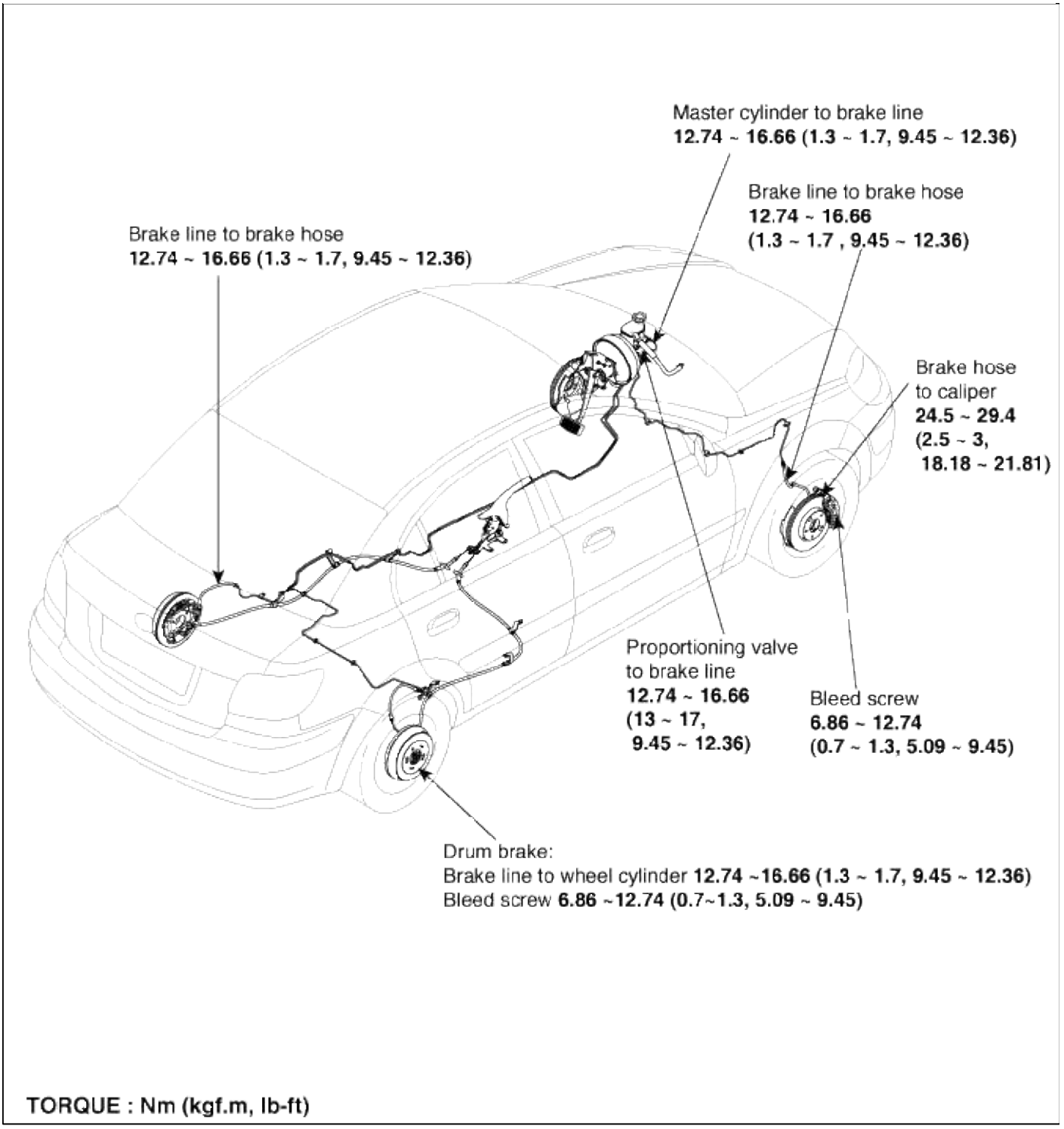
This table shows characteristics of the proportioning valve as the pressure increases.

Front (Output of master cylinder)	Rear (Output of proportioning valve)
A : 35 kg/cm² (3.43 MPa, 497 psi)	A' : 35 kg/cm² (2.94 MPa, 427 psi)
B : 70 kg/cm² (6.86 MPa, 995 psi)	B' : 44.5 ± 3.5 kg/cm² (4.36 ± 0.34 MPa, 632 ± 49 psi)



Brake System > Brake System > Brake Line > Components and Components Location

components

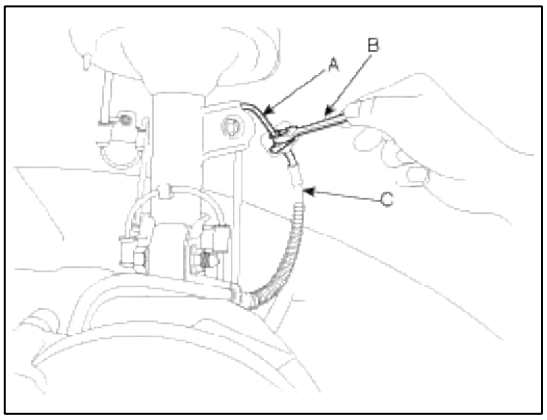


Brake System > Brake System > Brake Line > Repair procedures

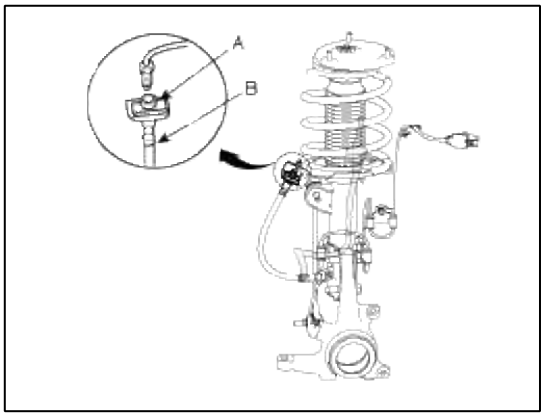
REMOVAL

FRONT

1. Disconnect the brake hose(C) from the brake line(A) using a flare-nut wrench(B).



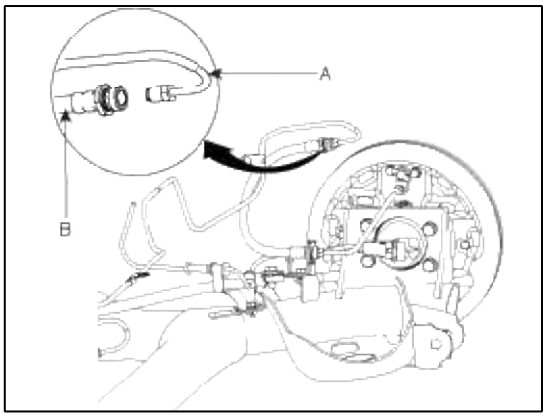
2. Remove the brake hose clip(A), and then remove the brake hose(B).



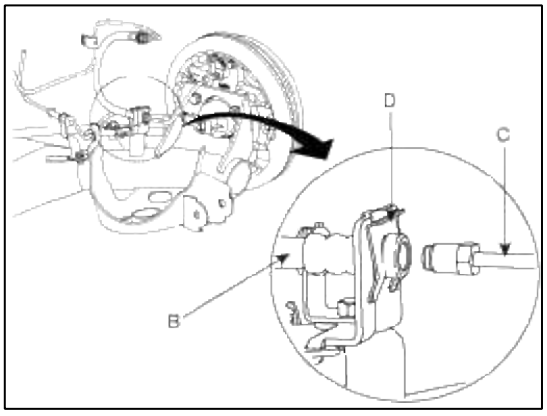
3. Remove the connector bolt from the caliper, and disconnect the brake hose from the caliper.

REAR

1. Disconnect the brake hose(B) from the brake line(A) using a flare-nut.

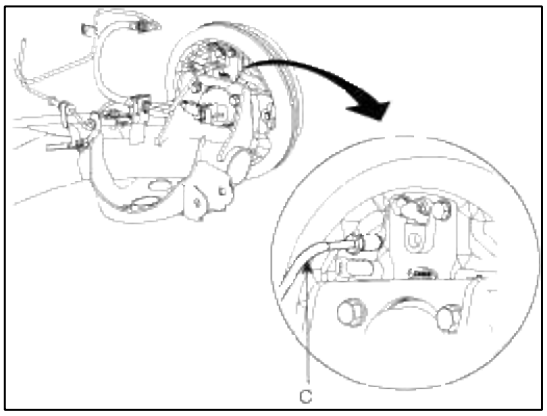


2. Remove the brake hose(B) from the brake line(C) using a flare-nut.



3. Remove the brake hose dlip(D), and the remove the brake hose.

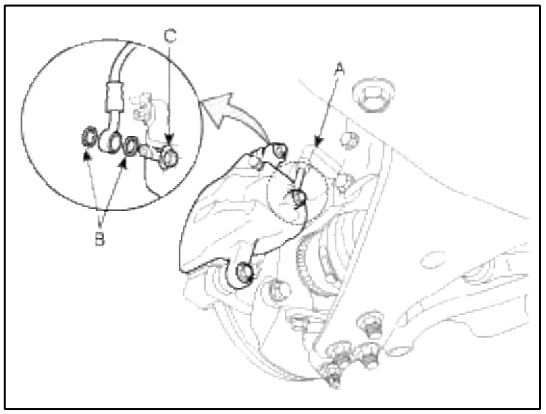
4. Disconnect the brake tube(C) from the drum brake using a flare-nut.



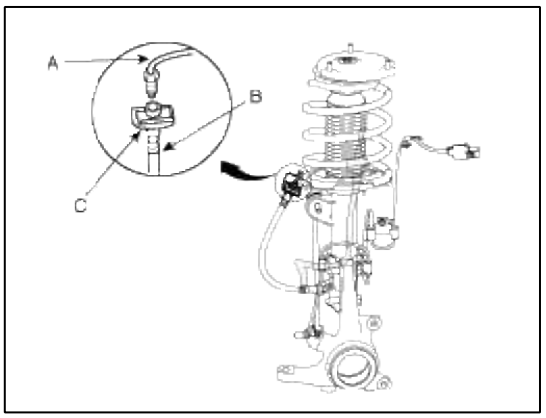
INSTALLATION

FRONT

1. Install a brake hose(A) on the caliper with tightening brake hose bolt(C) and washer(B).



2. Install the brake hose clip(C) to the brake hose bracket(B) , then install the brake hose(A).



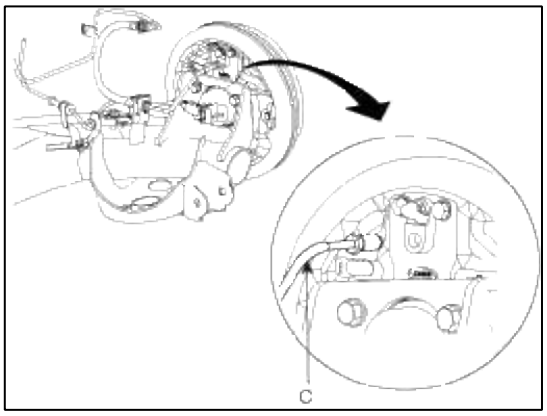
3. Connect the brake hose to the brake line.
4. After installing the brake hose, bleed the brake system.

CAUTION

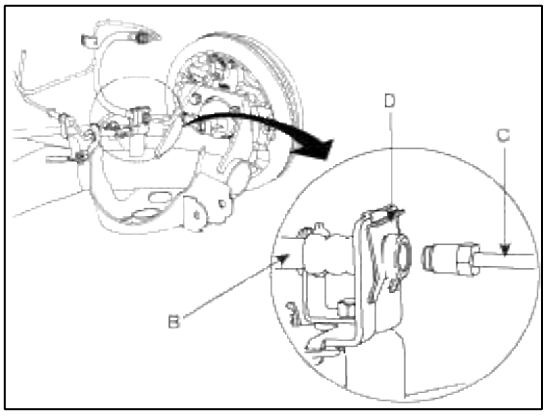
- Check the brake hoses for interference and twisting.
- Check the brake hose and line joint for leaks, and tighten if necessary.

REAR

1. Install a brake tube(C) on the drum brake using a flare-nut.



2. Install the brake hose clip(D) to brake hose bracket, the install the brake hose(B).



3. Connect the brake hose(B) to the brake line(A) using a flare-nut.
4. Connect the brake hose to the brake line(A).
5. 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.

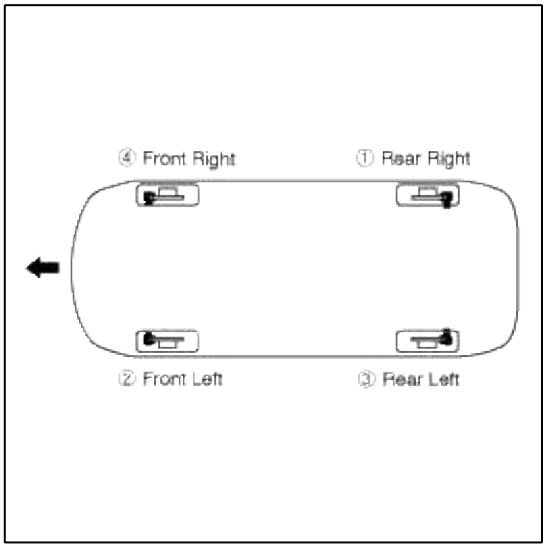
Brake System Bleeding

NOTE

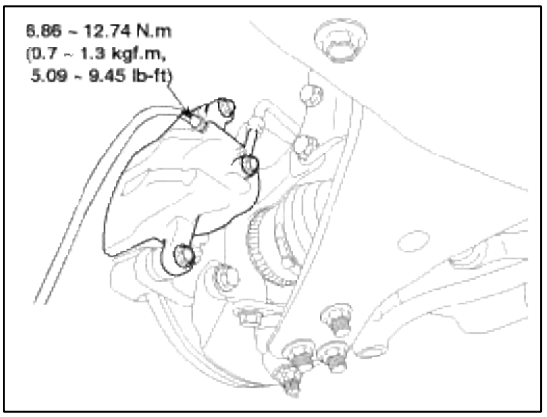
- Do not reuse the drained fluid.
- Always use Genuine DOT 3 or DOT 4 Brake Fluid. Using a non-Genuine DOT3 or DOT 4 brake fluid can cause corrosion and decrease the life of the system.
- Make sure no dirt of other foreign matter is allowed to contaminate the brake fluid.
- Do not spill brake fluid on 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.

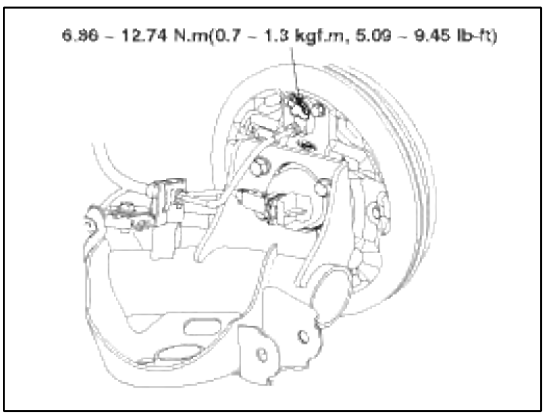
2. Have someone slowly pump the brake pedal several times, and then apply steady pressure.
3. Loosen the right-rear brake bleed screw to allow air to escape from the system. Then tighten the bleed screw securely.
4. Repeat the procedure for each wheel in the sequence shown below until air bubbles no longer appear in the fluid.
5. Refill the master cylinder reservoir to the MAX (upper) level line.



Front disc brake :

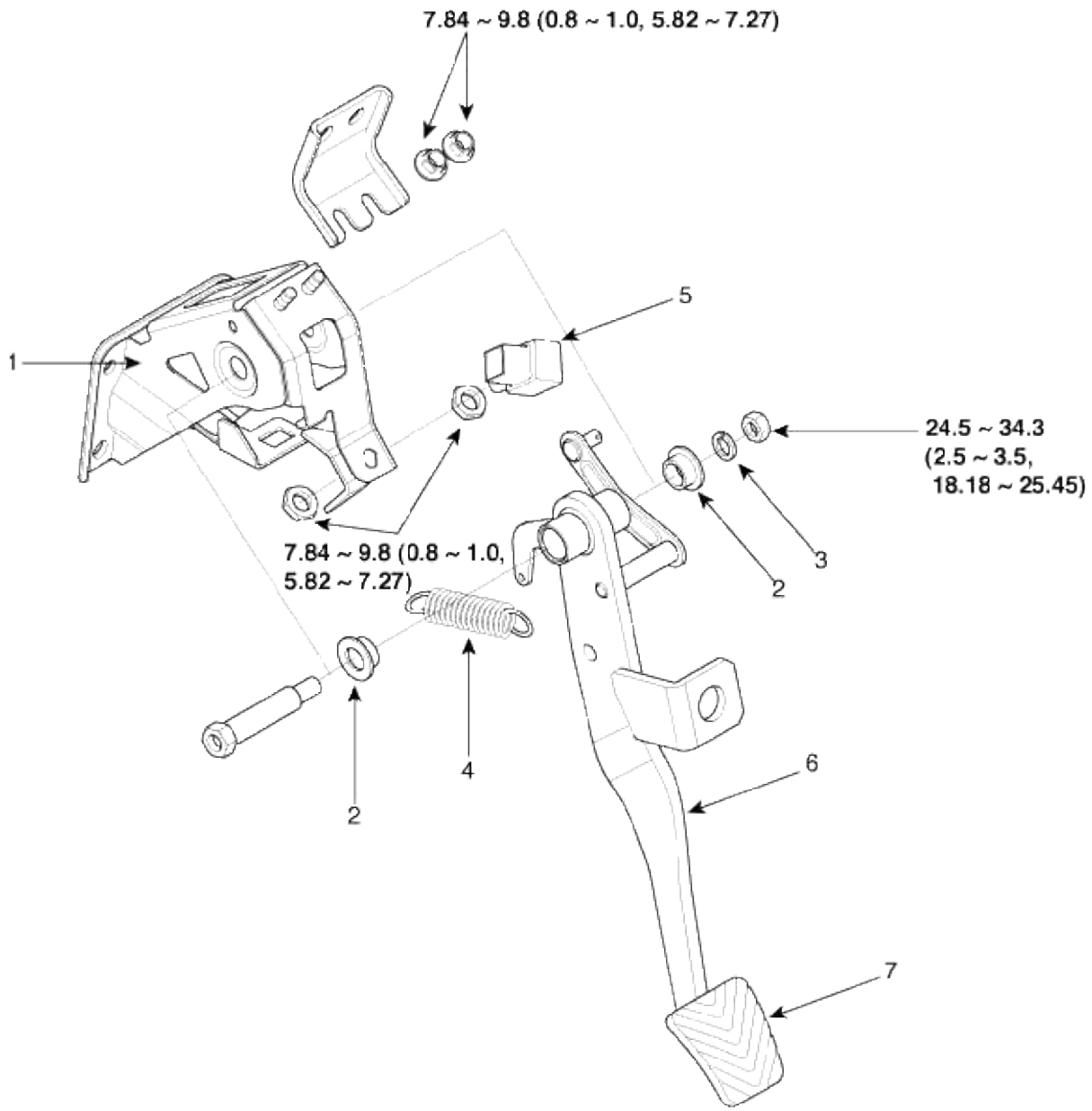


Rear drum brake :



Brake System > Brake System > Brake Pedal > Components and Components Location

COMPONENTS(1)



TORQUE : Nm (kgf.m, lb-ft)

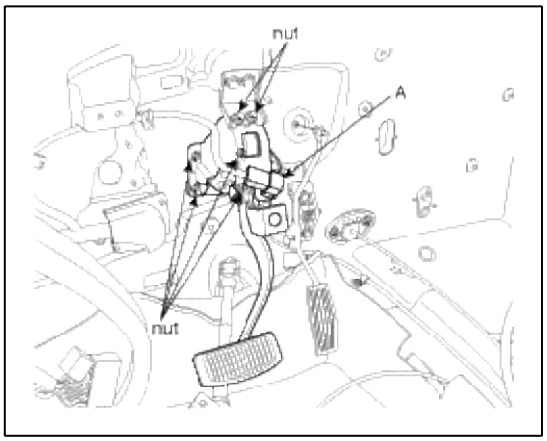
1. Member assembly bracket
2. Pedal bushing
3. Spring washer
4. Return spring
5. Stop lamp switch
6. Brake pedal
7. Pedal pad

Brake System > Brake System > Brake Pedal > Repair procedures

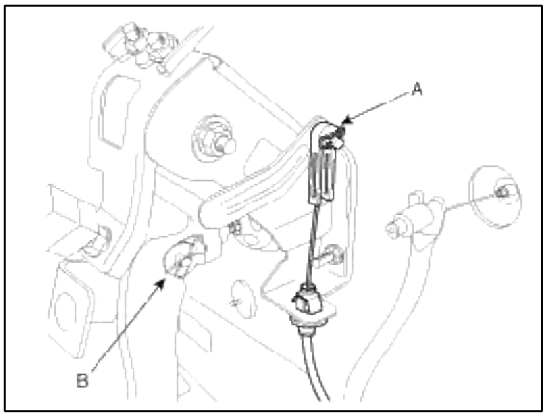
REMOVAL

1. Remove the lower crash pad. (Refer to BD-"crash pad".)
2. Loosen the brake member assembly bracket 2 upper nuts and 4 lower nuts.

3. Remove the stop lamp switch connector (A).



4. Remove the shift lock cable(A) (A/T).



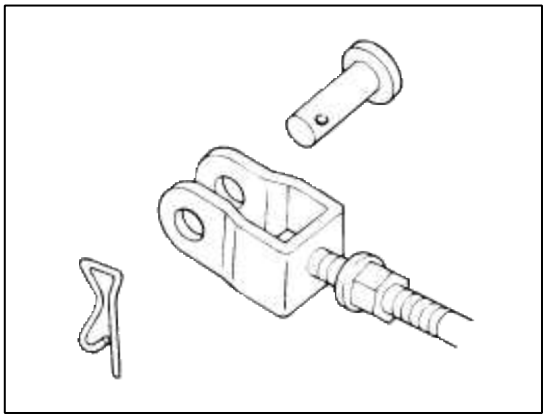
5. Remove the clevis pin and snap pin(B).
6. Remove the brake pedal member assembly mounting nuts and then remove the brake pedal assembly.

INSTALLATION

1. Installation is the reverse of removal.

> **CAUTION**
>
> Coat the inner surface of the bushings with the specified grease.

2. Before inserting the pin, apply the chassis grease to the joint pin.

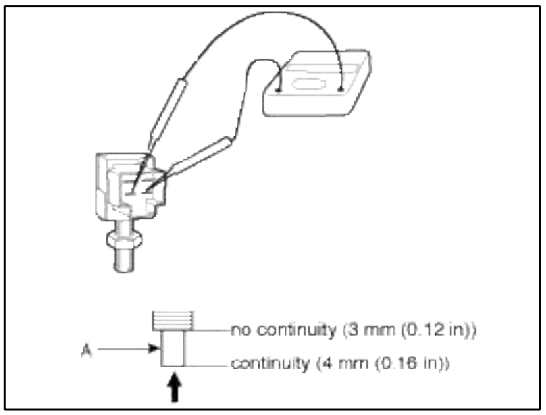


3. Adjust the brake pedal height and free play.
4. Install the stop lamp switch.

INSPECTION

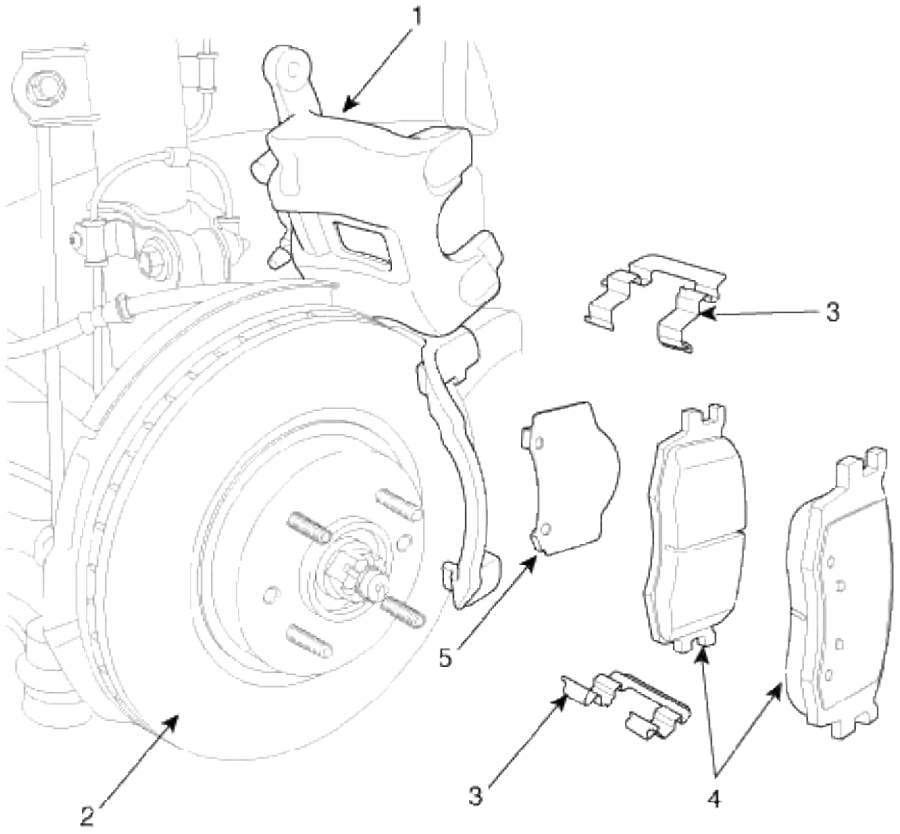
1. Check the bushing for wear.

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 plunger of the stop lamp switch is pushed in and when it is released.
   (2) The stop lamp switch is in good condition if there is no continuity when the plunger(A) is pushed.



Brake System > Brake System > Front Disc Brake > Components and Components Location

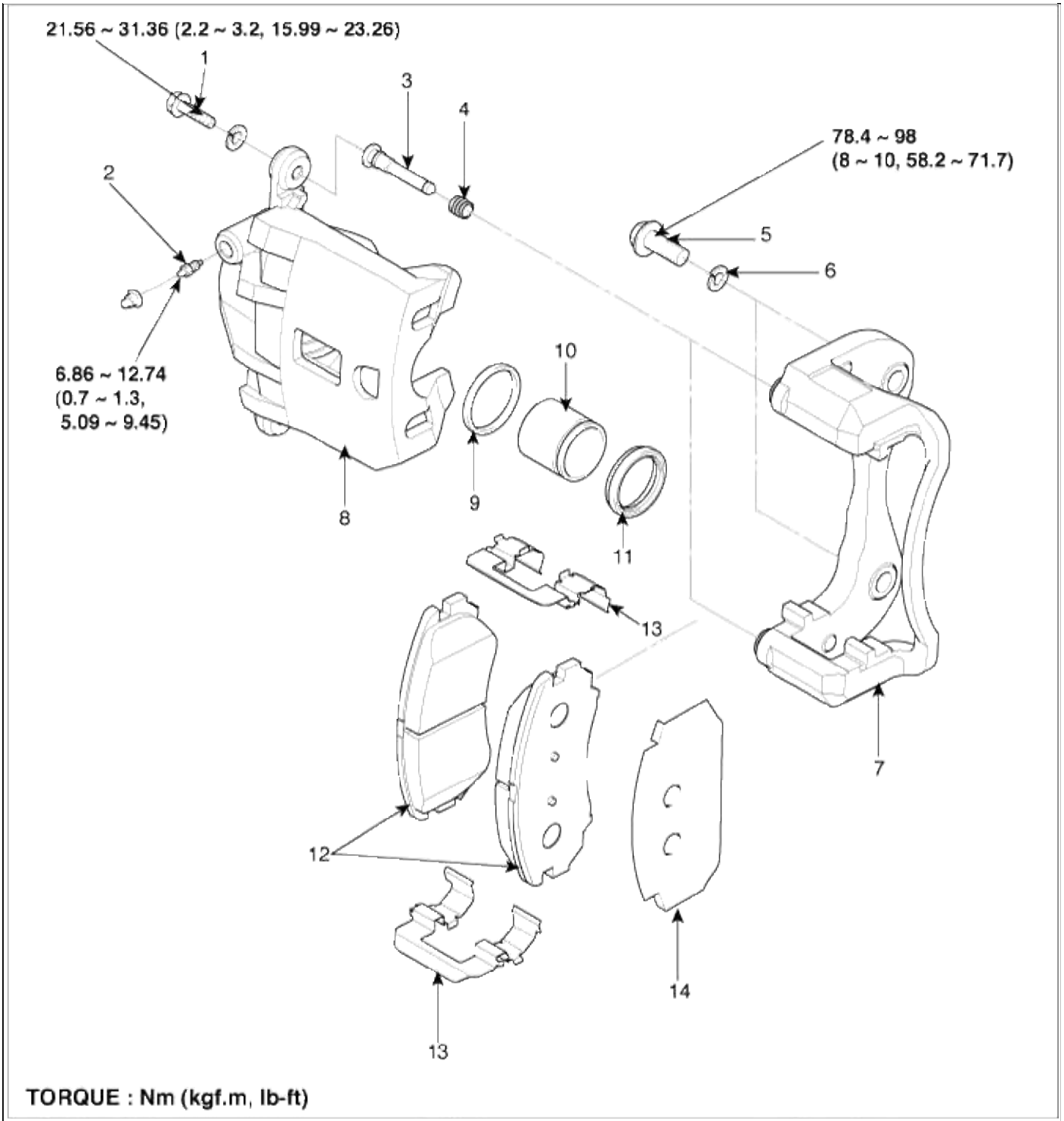
COMPONENTS(1)



TORQUE : kgf.m (Nm, lb-ft)

1. Brake caliper
2. Brake disc
3. Pad retainer
4. Brake pad
5. Brake pad shim

COMPONENTS(2)



1. Guide rod bolt
2. Bleeder screw
3. Guide rod
4. Boot
5. Caliper mounting bolt
6. Washer
7. Caliper bracket
8. Caliper body
9. Piston seal
10. Piston
11. Piston boot
12. Brake pad
13. Pad retainer
14. Shim

Brake System > Brake System > Front Disc Brake > Repair procedures

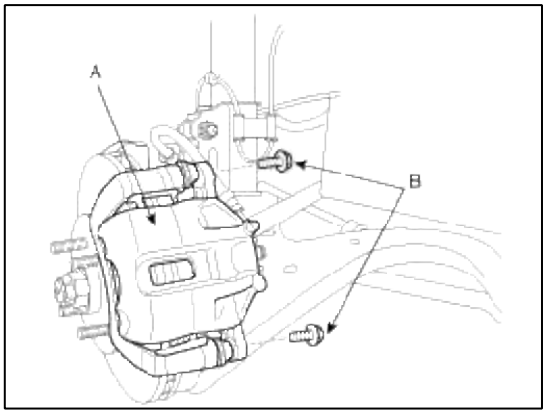
REMOVAL

CAUTION

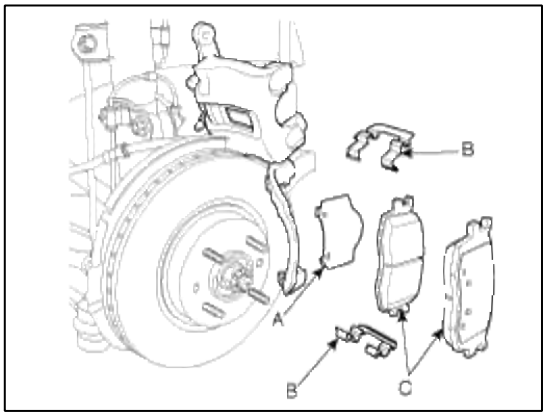
Frequent inhalation of brake pad dust, regardless of material composition, could be hazardous to your health.

- 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 (A).Check the hoses and pin boots for damage and deterioration.

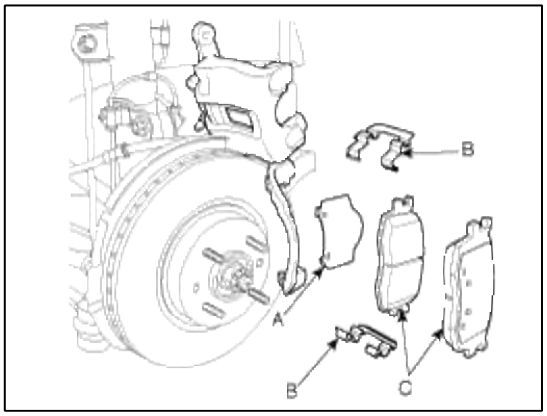


2. Remove the pad shims (A), pad retainers (B) and pads (C).

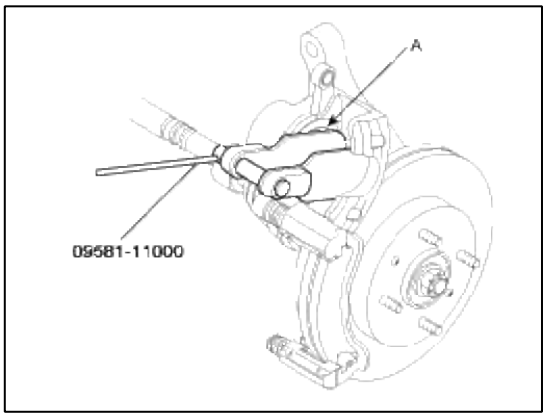


INSTALLATION

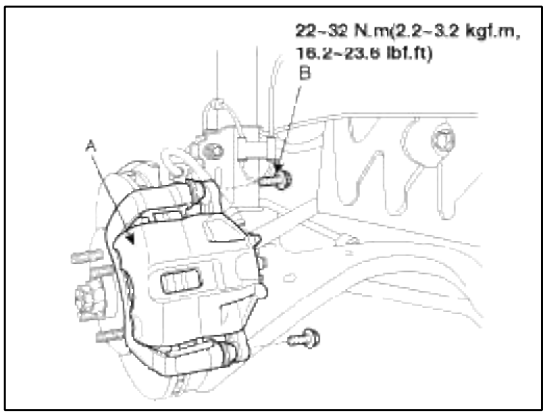
1. Install the pad retainers (B) to the caliper.
2. Check the foreign material at the pad shims (D) and the back of the pads (C).
   Contaminated brake discs or pads reduce stopping ability. Keep grease off the discs and pads.
3. Install the brake pads (C) and pad shims (A) on the pad retainer correctly. 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.



4. 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 pivoting the caliper down.



5. Pivot the caliper down into position. Being careful not to damage the pin boot, install the guide rod bolt (B) and tighten it to the specified torque.



6. If caliper assembly (A) was removed, install the brake hose to the caliper.
7. Refill the master cylinder reservoir to the MAX line.
8. Bleed the brake system.
9. Depress the brake pedal several times to make sure the brakes work, then test-drive.

> NOTE
>
> 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.

10. After installation, check for leaks at hose and line joints or connections, and retighten if necessary.

INSPECTION

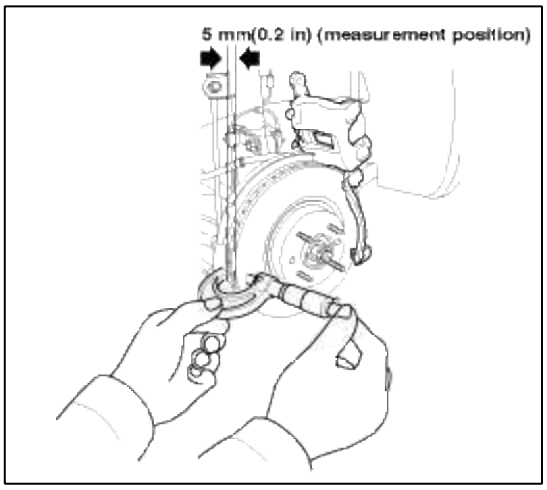
FRONT BRAKE DISC THICKNESS CHECK

1. Remove all rust and contamination from the disc surface, and then measure the disc thickness at 4 positions at least.

Front brake disc thickness
Standard value : 22.0 mm (0.87 in)
Limit : 20.0 mm (0.79 in)

2. Thickness variation should not exceed 0.005 mm(0.0002 in) (circumference) and 0.05 mm(0.0020 in) (radius) at any directions.

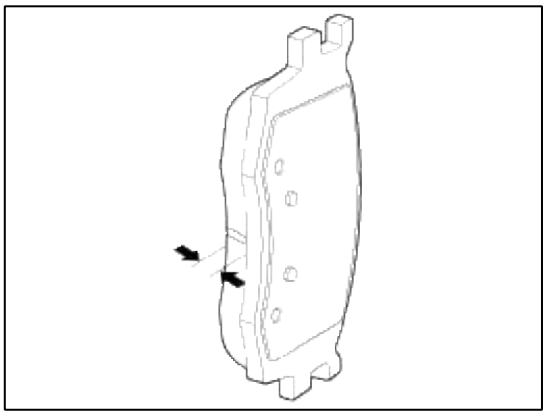
3. If wear exceeds the limit, replace the discs and pad assemblies for left and right of the vehicle.



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 if there is damage to the pad and backing metal.

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 : 0.03 mm (0.0012 in) or less

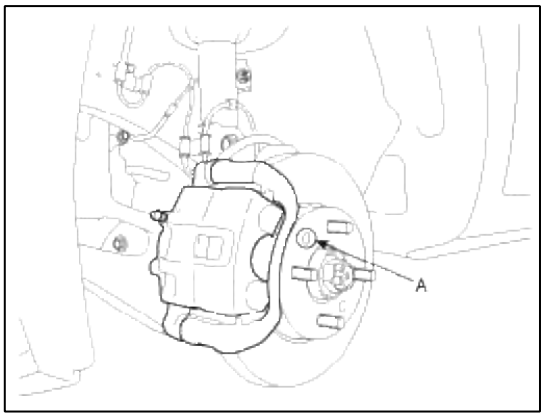
2. If the run out of the brake disc exceeds the limit specification, replace the disc, and then measure the run out again.
3. If the run out does not exceed the limit specification, install the brake disc after turning it 180° and then check the run out of the brake disc again.
4. If the run out cannot be corrected by changing the position of the brake disc, replace the brake disc.

SEIZE OF FRONT BRAKE DISC

1. Remove the brake disc from hub using M8 screw(A) if the brake disc has been seized with the hub due to corrosion or overheat.

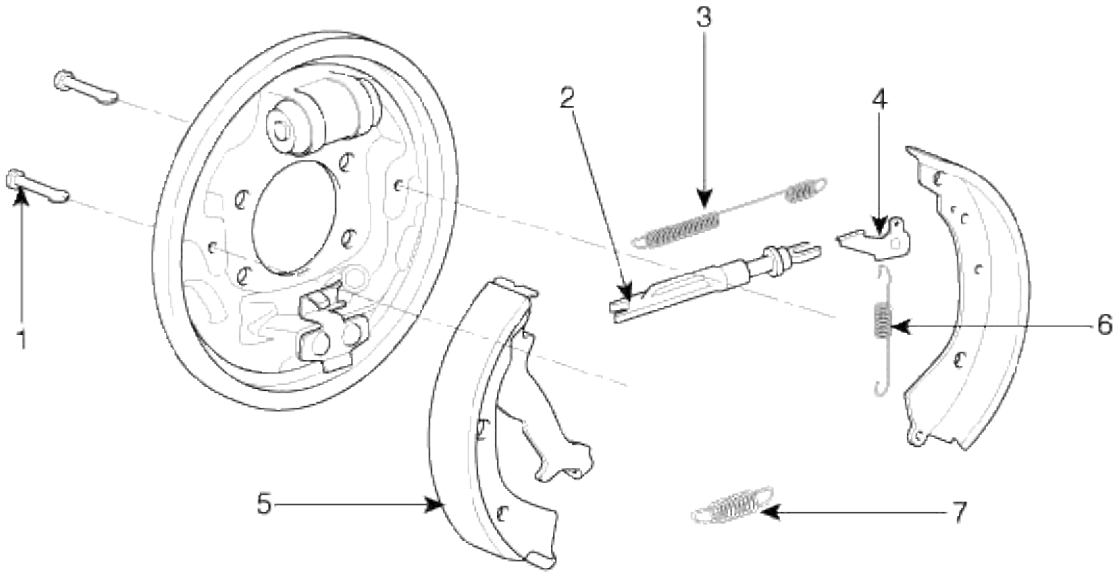
NOTE

Be careful not to use the hammer. The disc can be damaged if you remove the disc from the hub by hammer.



Brake System > Brake System > Rear Drum Brake > Components and Components Location

COMPONENTS



1. Shoe hold down pin
2. shoe adjuster
3. Upper return spring
4. Adjusting lever
5. Shoe
6. Adjusting spring
7. Lower return spring

Brake System > Brake System > Rear Drum Brake > Repair procedures

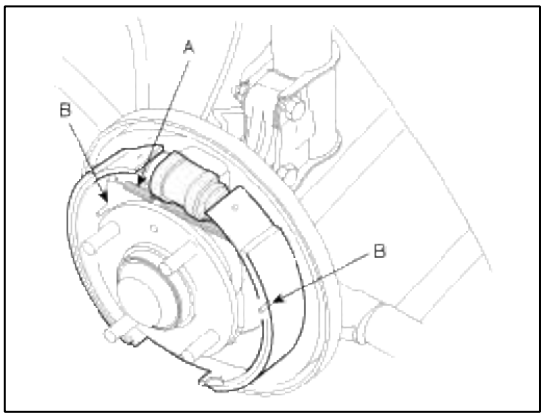
REMOVAL

CAUTION

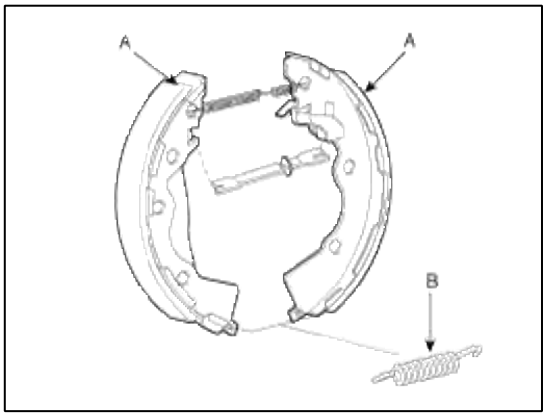
- Frequent inhalation of brake pad dust, regardless of material composition, could be hazardous to your health.
- Avoid breathing dust particles.
- Never use an air hose or brush to clean brake assemblies.

1. Remove the shoe hold spring and shoe hold pin (B).

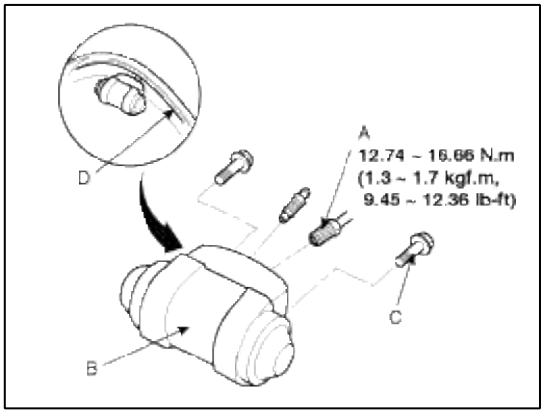
2. Remove the upper return spring (A).



3. Lower the brake shoe assembly (A), and remove the lower return spring (B). Make sure not to damage the dust cover on the wheel cylinder.



4. Disconnect the parking brake cable from the parking brake lever.
5. Remove the brake shoe assembly.
6. Disconnect brake tubes(A) from the wheel cylinder(B).
7. Remove the bolt (C) and the wheel cylinder(B) from the backing plate(D).

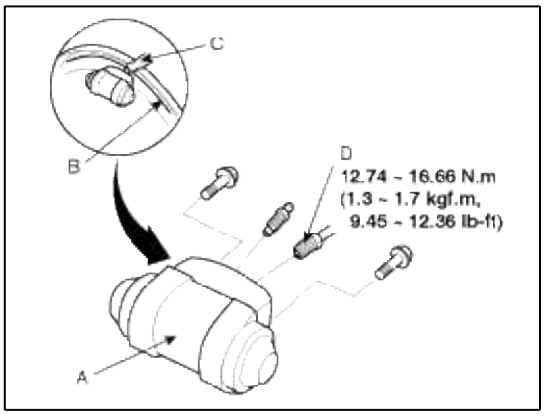


INSTALLATION

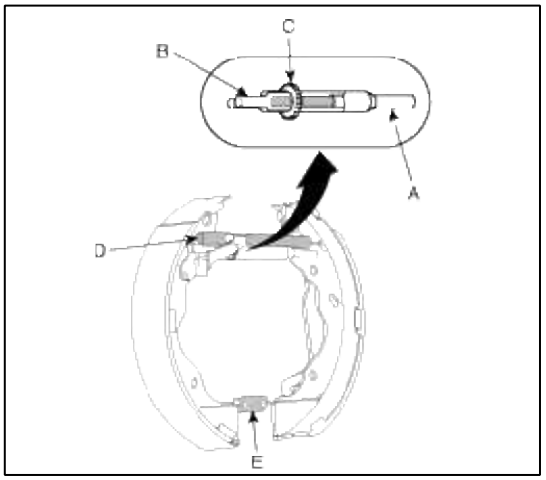
NOTE

- 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.
- To prevent spills, cover the hose joints with rags or shop towels.
- Use only a genuine wheel cylinder special bolt.

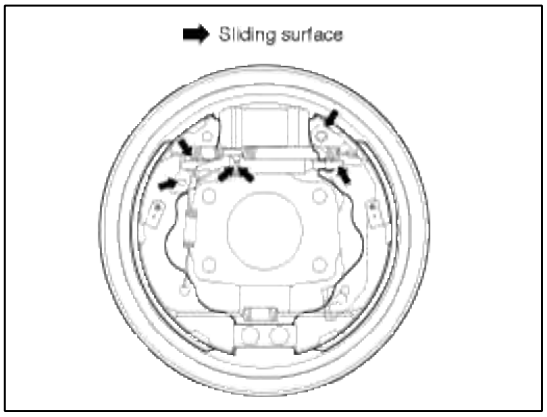
1. Apply sealant (C) between the wheel cylinder (A) and backing plate (B), and install the wheel cylinder.



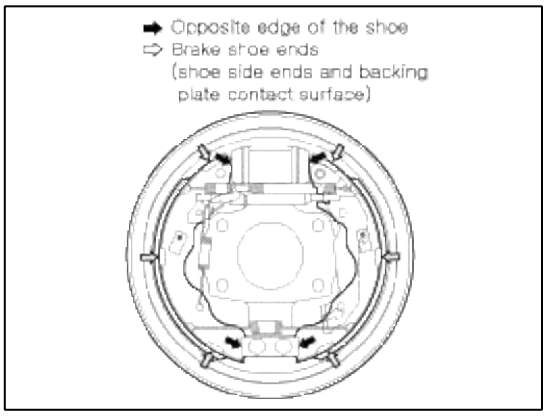
2. Connect the brake tubes (D) to the wheel cylinder.
3. Connect the parking brake cable to the parking brake lever.
4. Clean the threaded portions of adjuster sleeve (A) and push rod female (B). Coat the threads of the adjuster assembly with grease. To shorten the clevises, turn the adjuster bolt (C).



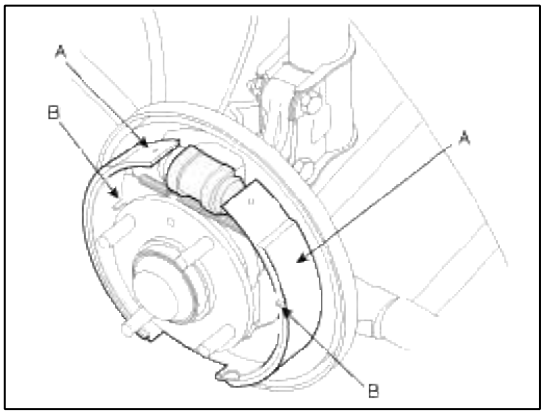
5. Hook the shoe adjuster lever, then install it to the brake shoe.
6. Install the adjuster assembly and upper return spring (D) as right direction. Be careful not to damage the wheel cylinder dust covers.
7. Install the lower return spring (E).
8. Apply brake cylinder grease or equivalent rubber grease to the sliding surfaces shown. Don't get grease on the brake linings.



9. Apply brake cylinder grease or equivalent rubber grease to the brake shoe ends and opposite edges of the shoes shown. Don't get grease on the brake linings.



10. Install the brake shoes (A) onto the backing plate. Be careful not to damage the wheel cylinder dust covers.
11. Install the shoe hole down pins (B) and the shoe hole down springs.



12. Install the brake drum.
13. If the wheel cylinder has been removed, bleed the brake system.
14. Depress the brake pedal several times to set the self-adjusting brake.
15. Adjust the parking brake.

INSPECTION

CAUTION

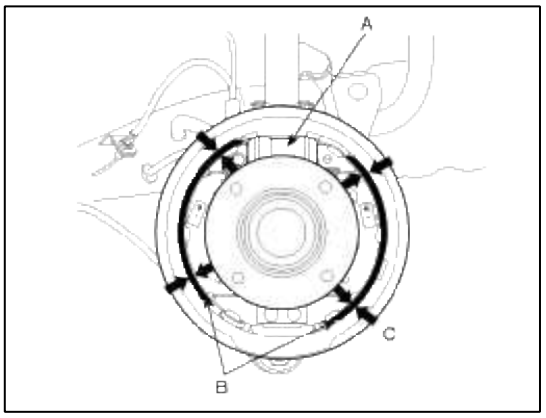
Frequent inhalation of brake pad dust, regardless of material composition, could be hazardous to your health.
- Avoid breathing dust particles.
- Never use an air hose or brush to clean brake assemblies.

NOTE

- Contaminated brake linings or drums reduce stopping ability.
- Block the front wheels before jacking up the rear of the vehicle.

1. Raise the rear of the vehicle, and make sure it is securely supported.
2. Release the parking brake, and remove the rear brake drum.

3. Check the wheel cylinder (A) for leakage.



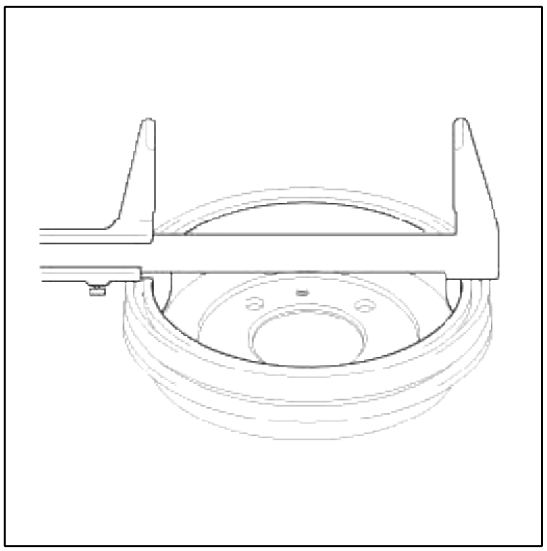
4. Check the brake linings (B) for cracking, glazing, wear, and contamination.
5. Measure the brake lining thickness (C).
   Measurement does not include brake shoe thickness.

Brake lining thickness
Standard : 3.9 ~ 4.5 mm (0.15 ~ 0.177 in.)
Service limit : 1.0 mm (0.039 in.)

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6. If the brake lining thickness is less than the service limit, replace the brake shoes as a set.
7. Check the bearings in the hub unit for smooth operation. If it requires servicing, replace it.
8. Measure the inside diameter of the brake drum with inside vernier calipers.

Drum inside diameter
Standard : 203.2 mm (8.0 in)
Drum roundness
Service limit : 0.06 mm(0.00236 in)

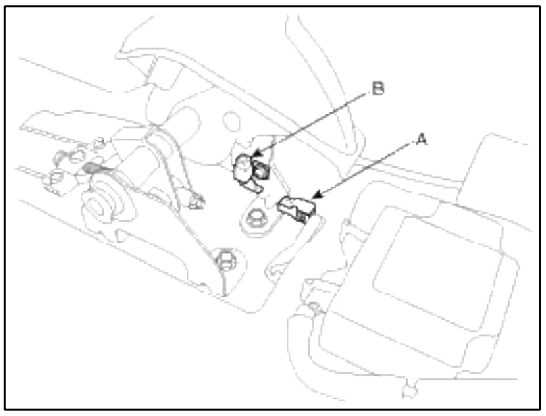


9. If the inside diameter of the brake drum is more than the service limit, replace the brake drum.
10. Check the brake drum for scoring, grooves, and cracks.
11. Inspect the brake lining and drum for proper contact.
12. Inspect the wheel cylinder outside for excessive wear and damage.
13. Inspect the backing plate for wear or damage.

Brake System > Brake Warning System > Parking Brake Switch > Repair procedures

INSPECTION

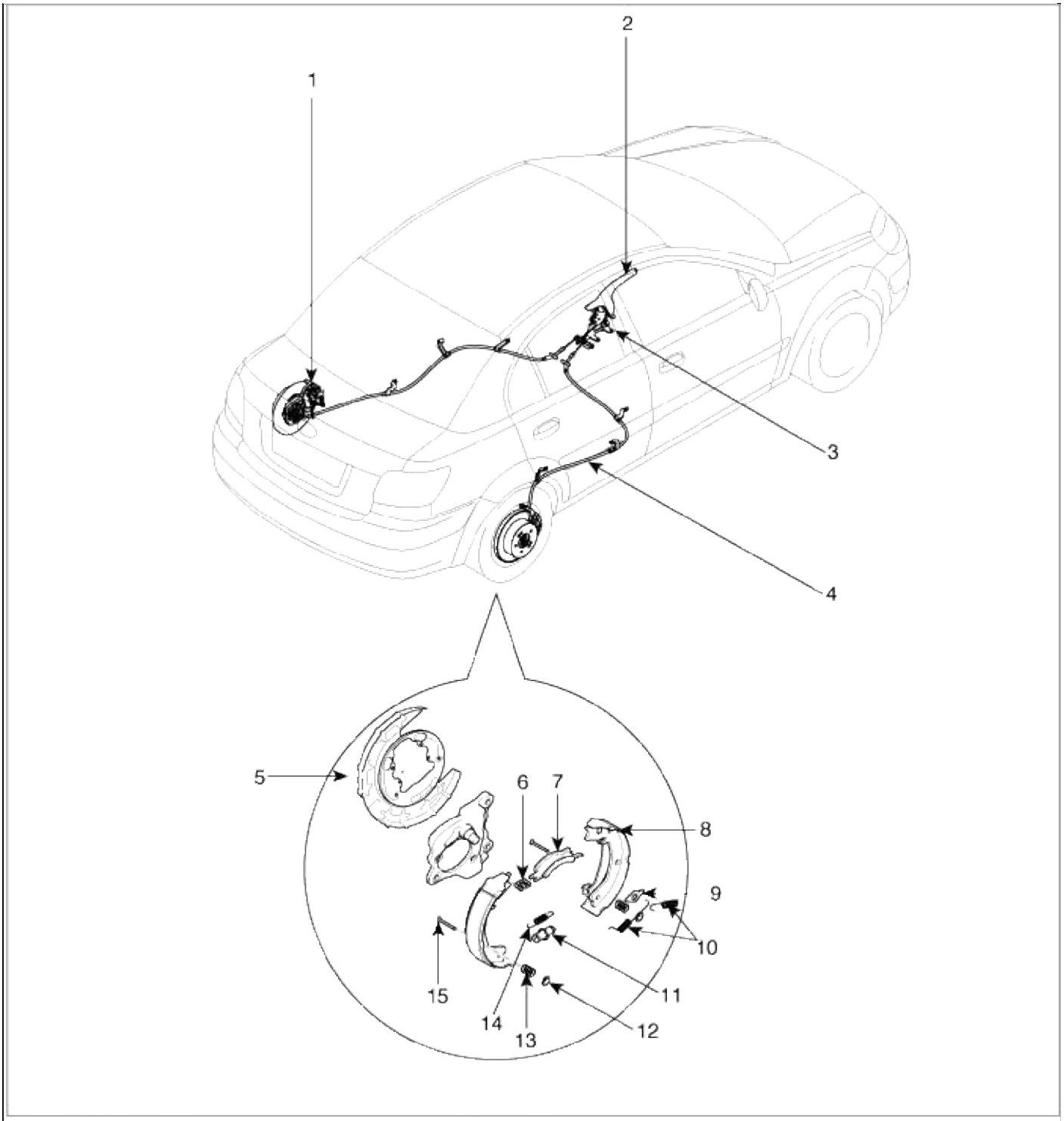
1. Remove the floor console .(refer to body group-console)
2. Remove the connector(B) from the switch(A).



3. Inspect the continuity between (-) terminal and the ground.
   A. When the brake lever is pulled, there should be the continuity between them.
   B. When the brake lever is released, there should be no continuity between them.

Brake System > Brake Warning System > Parking Brake Assembly > Components and Components Location

COMPONENTS



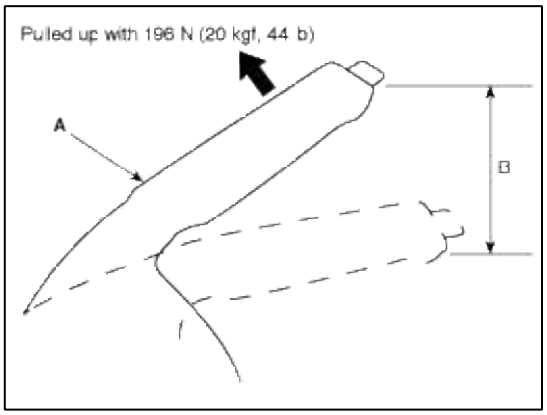
1. Rear brake caliper
2. Parking brake lever
3. Parking brake switch
4. Parking brake cable
5. Backing plate
6. Strut spring
7. Strut
8. Shoe & lining
9. Shoe guide
10. Return spring
11. Adjuster
12. Cup washer
13. Shoe hold down spring
14. Return spring
15. Shoe hold down pin

Brake System > Brake Warning System > Parking Brake Assembly > Repair procedures

Inspection

1. Pull the parking brake lever (A) with 196 N (20 kg, 44lbf) force to fully apply the parking brake. The parking brake lever should be locked within the specified number of clicks (B).

Lever locked clicks: 6~8 clicks



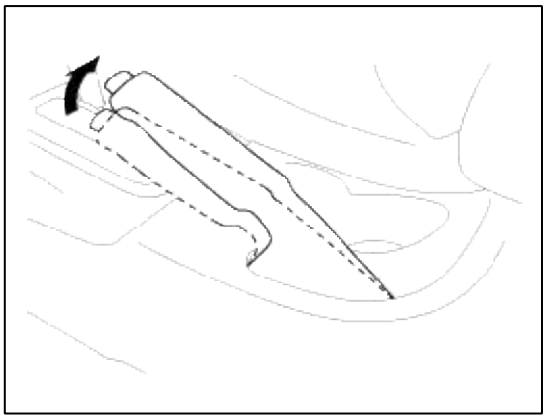
2. Adjust the parking brake if the lever clicks are out of specification.

ADJUSTMENT

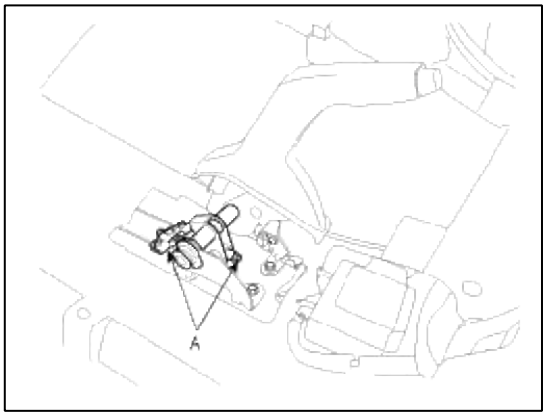
NOTE

After rear brake caliper servicing, loosen the parking brake adjusting nut, start the engine and depress the brake pedal several times to set the self-adjusting brake before adjusting the parking brake.

1. Block the front wheels, then raise the rear of the vehicle and make sure it is securely supported.
2. Pull the parking brake lever up one click.



3. Remove the console. (Refer to the body group-console.)
4. Tighten the adjusting nuts (A) until the parking brakes drag slightly when the rear wheels are turned.



5. Release the parking brake lever fully, and check that parking brakes do not drag when the rear wheels are turned. Readjust if necessary.
6. Make sure that the parking brakes are fully applied when the parking brake lever is pulled up fully.

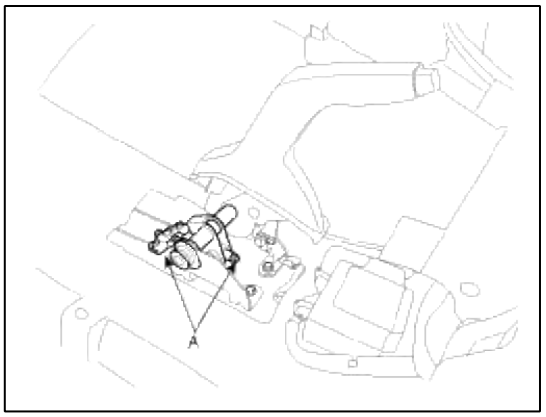
7. Reinstall the console.

REMOVAL

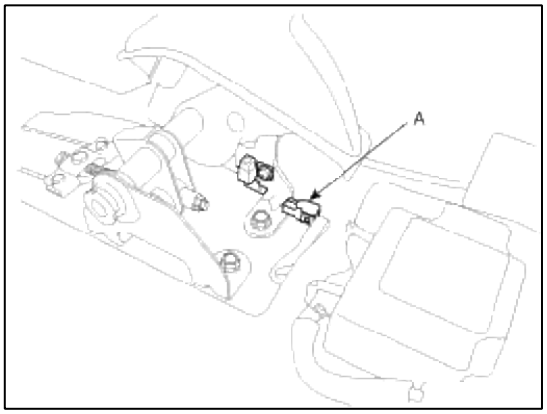
NOTE

The parking brake cables must not be bent or distorted. This will lead to stiff operation and premature failure.

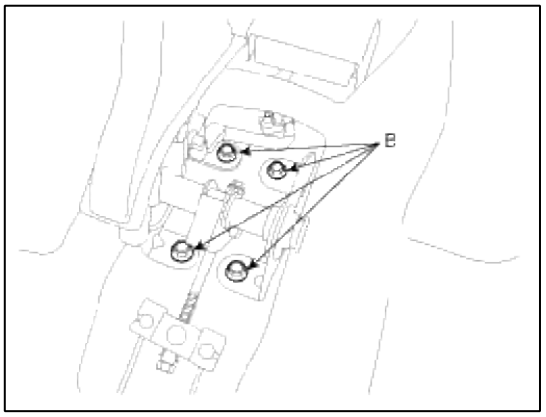
1. Remove the console.(Refer to body group-console.)
2. Loosen the adjusting nut (A) and the parking brake cables.



3. Disconnect the connector (A) of parking brake switch.

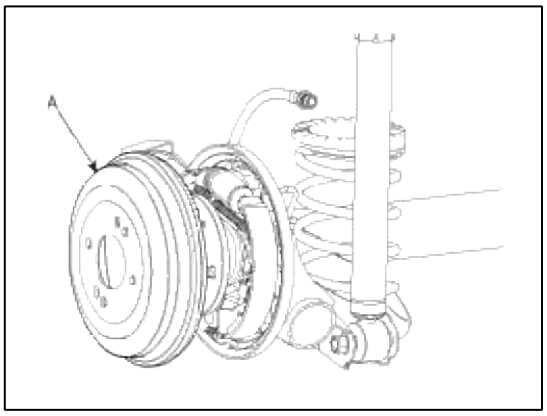


4. Remove the parking brake lever assembly (A) with loosening the bolts (B).

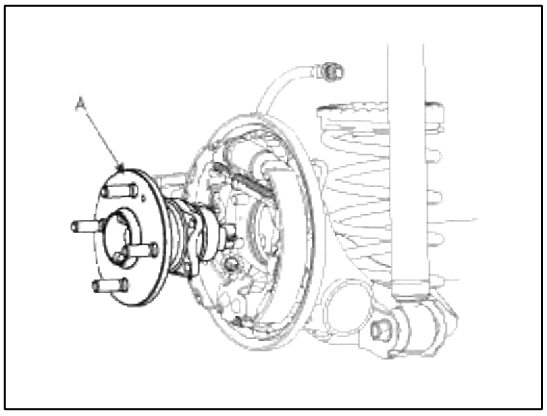


5. Remove the wheel and tire.

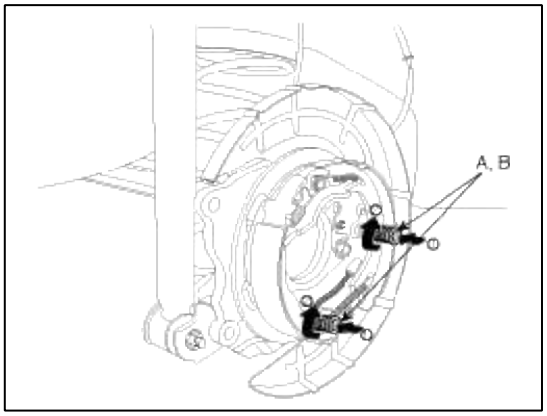
6. Remove the brake drum(A).



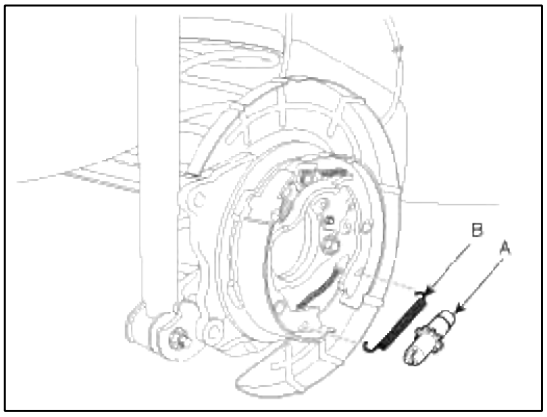
7. Remove the rear hub unit bearing(A).



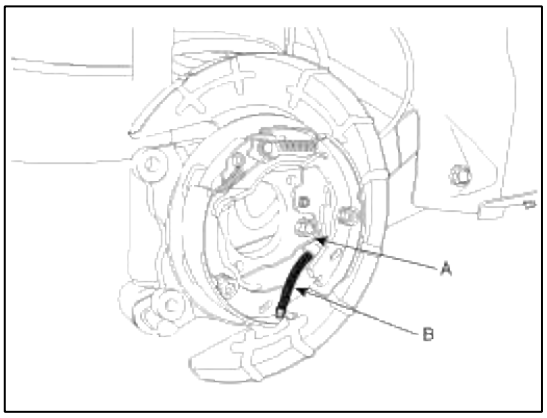
8. Remove the shoe hold down pin (A) and the spring (B) by pushing the retainer spring and turning the pin.



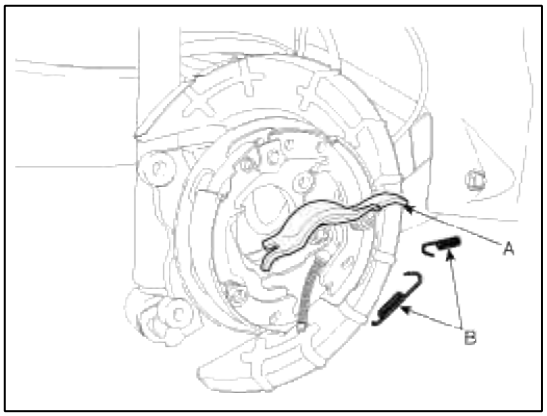
9. Remove the adjuster assembly (A) and the return spring (B).



10. Remove the parking brake cable (B) from the brake shoe (A).



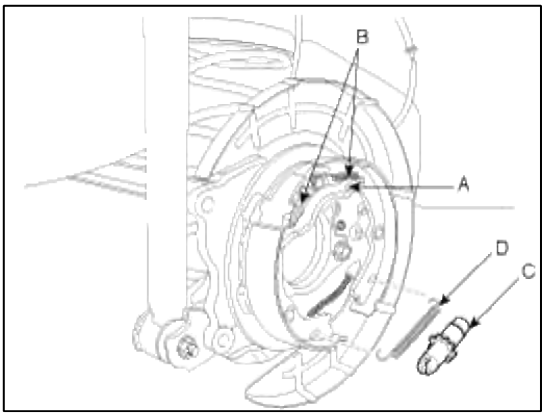
11. Remove the strut (A) and the strut spring (B).



12. Remove the brake shoe.

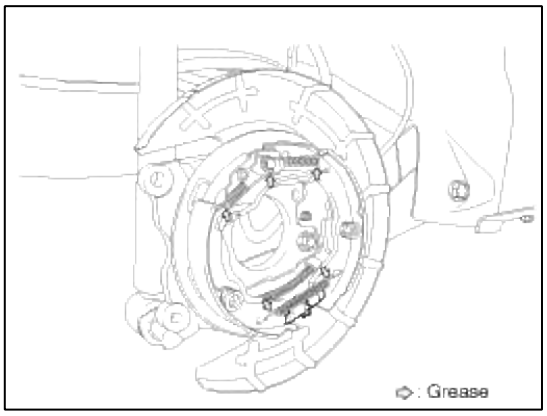
INSTALLATION

1. Install the brake shoe(A) to the backing plate(B).
2. Install the shoe hold down pin(C) and the spring(D) by pushing the retainer spring (D) and turning the pins.
3. After installing the strut(C) and upper return spring(D), install the adjuster assembly(B) and the lower return spring(C).



4. Apply a coating of the specified grease to each sliding parts of parking brake as shown.

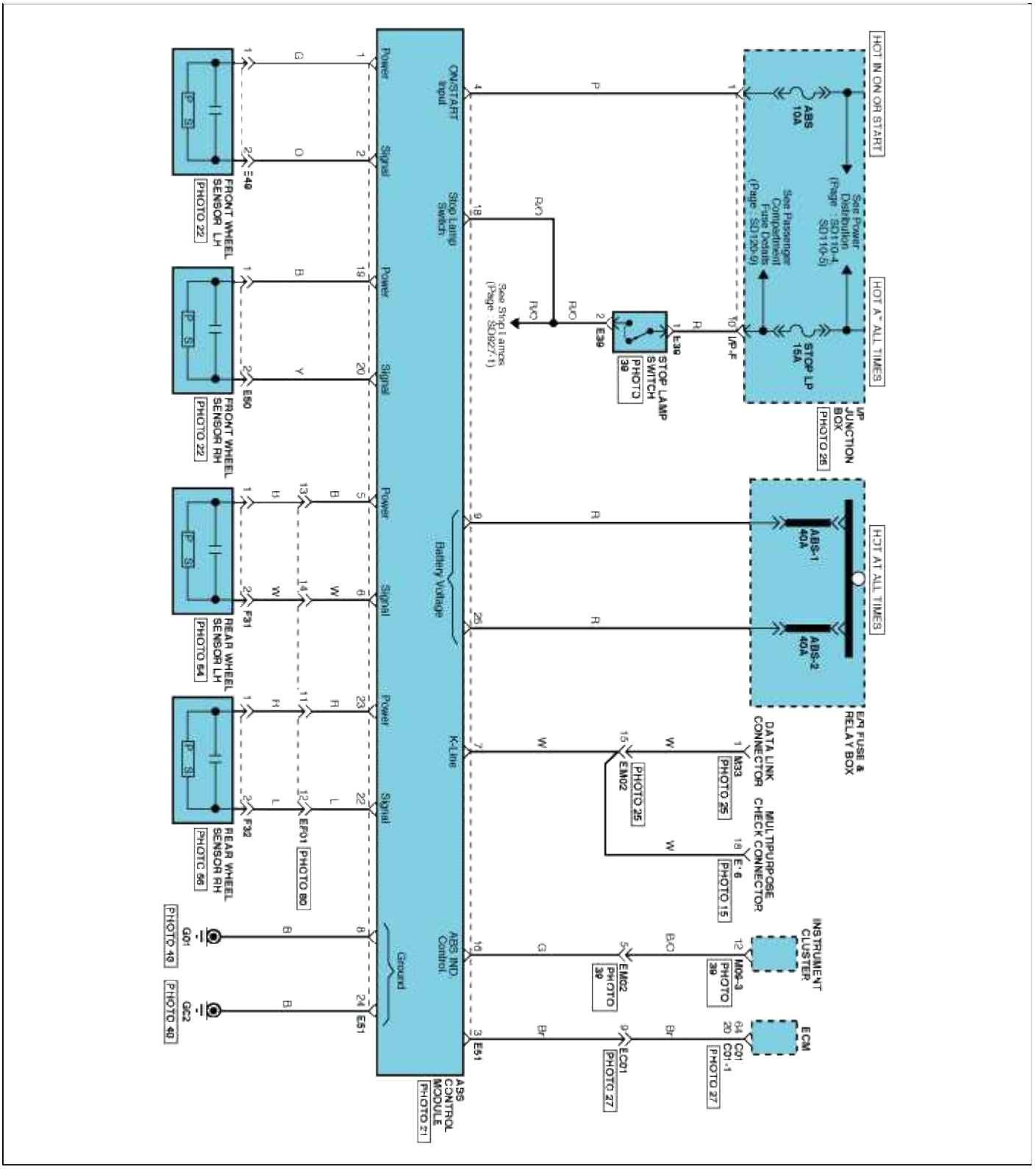
Specified grease :
Multi purpose grease SAE J310, NLGI No.2



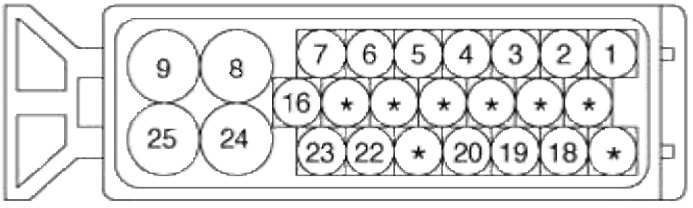
5. Install the rear brake disc/drum and rear brake caliper.
6. After installing the cable adjuster, adjust the parking brake lever stroke.

Brake System > ABS(Anti-Lock Brake System) > Schematic Diagrams

ABS CIRCUIT DIAGRAM



ABS CONNECTOR INPUT/OUTPUT



Connector Terminal		Specification	Remark
No	Description		
4	IGNITION1( )	Over voltage range: 16.5 ± 0.5 V Operating voltage range: 9.5 ± 0.5 V < V < 16.5 ± 0.5 V Low voltage range: 7.0 ± 0.5 V < V < 9.5 ± 0.5 V Max. current: I < 300 mA	
25	POS. BATTERY.(SOLENOID)	Max leakage current : I < 0.8 mA Operating voltage range: 9.5 ± 0.5 V < V < 16.5 ± 0.5 V Max current : I < 30 A	
9	POS, BATTERY.(MOTOR)	Operating voltage range: 9.5 ± 0.5 V < V < 16.5 ± 0.5 V Rush current : I < 100 A Max current : I < 30 A (lower 250 W motor) I < 40 A (lower 250 W motor) Max leakage current : I < 0.2 mA	
8	GROUND	Rated current : I < 300 mA Max. current: I < 30 A	
24	PUMP MOTOR GROUND	Rush current : I < 100 A Max current : I < 30 A	
18	BRAKE LIGHT SWITCH	Input voltage low: 0 V ≤ V ≤ 3.0 V Input voltage High: 7.0 V ≤ V ≤ 16.0 V	
16	ABS/EBD W/LAMP DRIVE	Max. current: I < 200 mA Max. output low voltage : V < 1.2 V	
1	SENSOR FRONT LEFT POWER	- Output voltage : IGN[V] ± 1 V - Output current : Max 30 mA	
19	SENSOR FRONT RIGHT POWER		
5	SENSOR REAR LEFT POWER		
23	SENSOR REAR RIGHT POWER		
2	SENSOR FRONT LEFT SIGNAL	- Input current LOW : 5.9 ~ 8.4 - Input current HIGH : 11.8 ~ 16.8 - Frequency range : 1 ~ 2000 Hz - Input duty : 50 ± 20 %	
20	SENSOR FRONT RIGHT SIGNAL		
6	SENSOR REAR LEFT SIGNAL		
22	SENSOR REAR RIGHT SIGNAL		
7	DIAGNOSIS INPUT/OUTPUT	Input voltage : VIL < 0.3 IGN[V] VIH > 0.7 IGN[V] Output voltage : VOL < 0.2 IGN[V] VOH > 0.8 IGN[V]	

3	SENSOR FRONT RIGHT OUTPUT	Mzximum Current : I < 2 mAExternal pull up resister : 10KΩ < ROutput duty : 50 ± 20 %	

Brake System > ABS(Anti-Lock Brake System) > Description and Operation

DESCRIPTION

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 17 ± 0.5 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 10V), 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

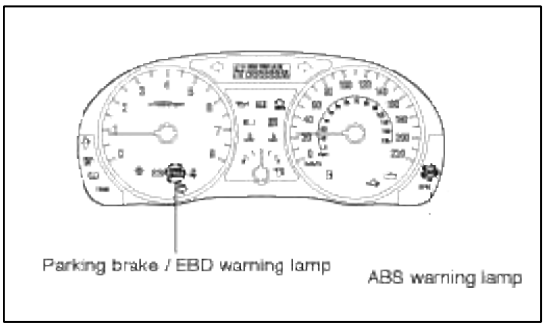
The ECU performs a pump motor test at a speed of 12 km/h(7 MPH) once after IGN is switched on.

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 in the test line of manufactories (Air-bleeding line or Roll and Brake Test line).

WARNING LAMP MODULE

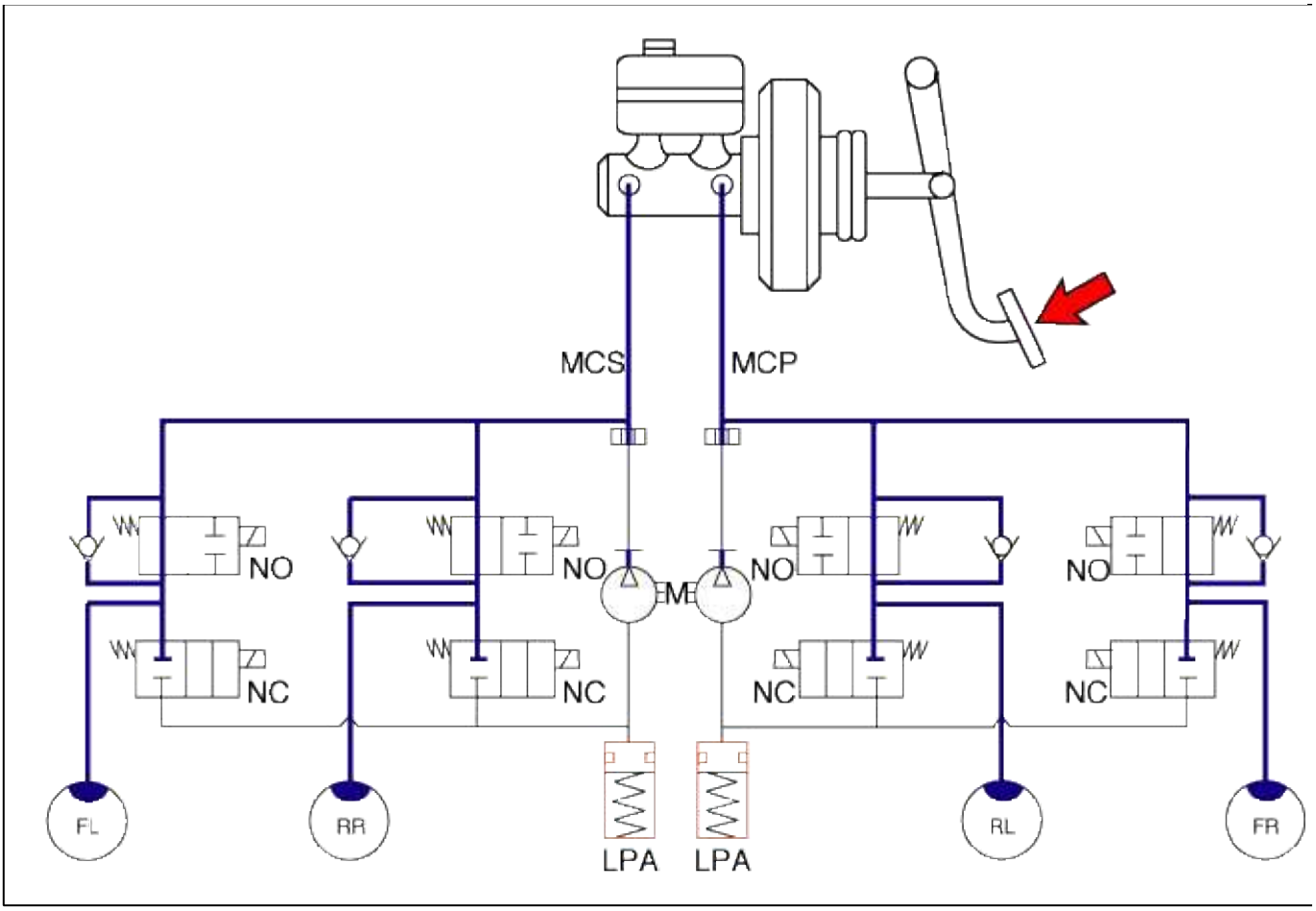


1. ABS Warning Lamp module
   The active ABS warning lamp module indicates the self-test and failure status of the ABS.
   The ABS warning lamp shall be on:
   A. During the initialization phase after IGN ON. (continuously 3 seconds).
   B. In the event of inhibition of ABS functions by failure.
   C. During diagnostic mode.
   D. When the ECU Connector is seperated from ECU.
2. PARKING/EBD warning lamp module
   The active EBD warning lamp module indicates the self-test and failure status of the EBD.
   However, in case the Parking Brake Switch is turned on, the EBD warning lamp is always turned on regardless of EBD functions.
   The EBD warning lamp shall be on:
   A. During the initialization phase after IGN ON. (continuously 3 seconds).
   B. When the Parking Brake Switch is ON or brake fluid level is low.
   C. When the EBD function is out of order.
   D. During diagnostic mode.
   E. When the ECU Connector is seperated from ECU.

ABS CONTROL

1. NORMAL BRAKING without ABS
   Under the normal braking, voltage is not supplied to solenoid valve, inlet valve is opened and outlet valve is closed.When the brake is depressed, brake fluid is supplied to the wheel cylinder via solenoid valve to activate the brake.When the brake is released, brake fluid is back to the master cylinder via inlet valve and check valve.

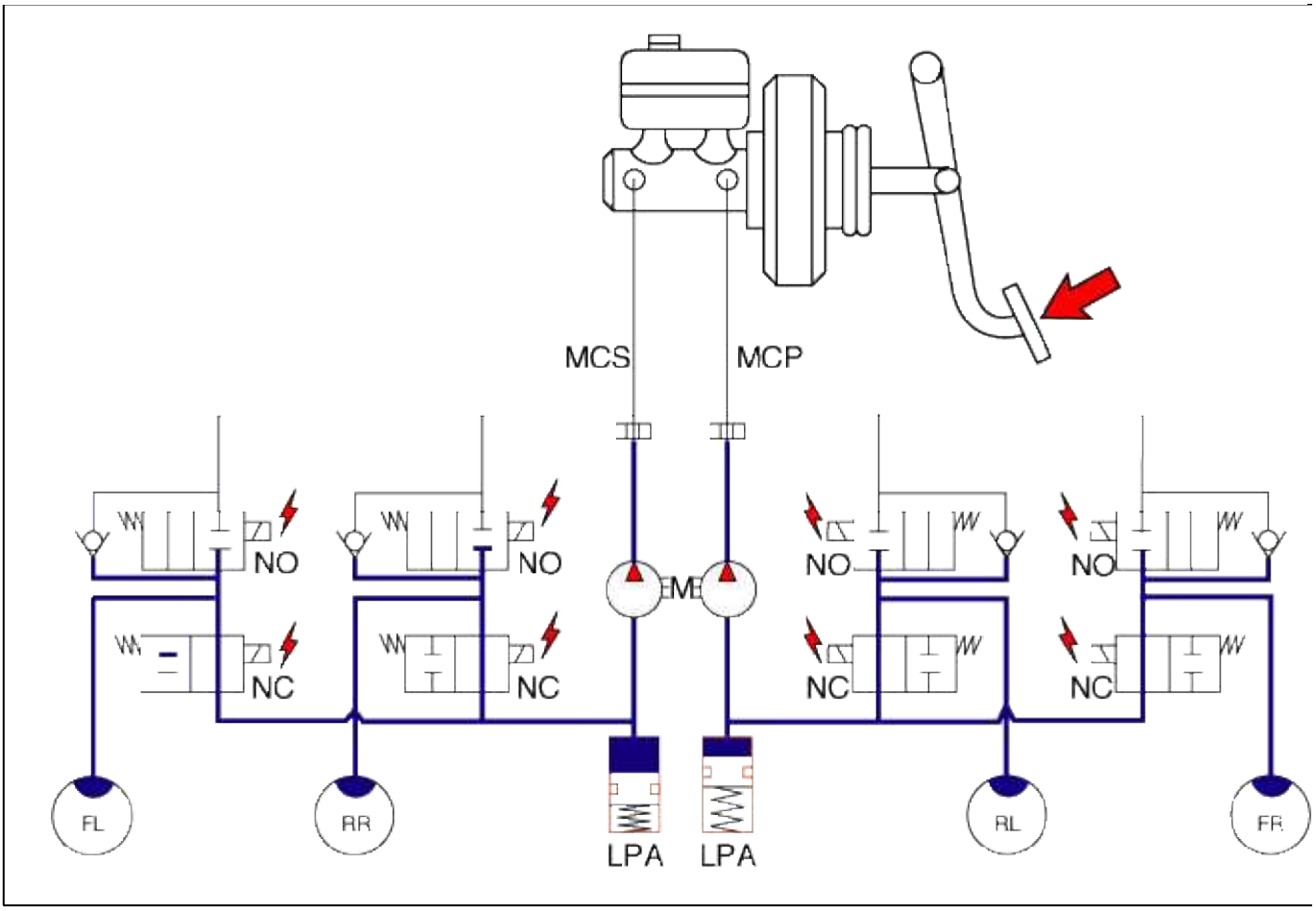
Solenoid valve	**State**	**Valve**	**Passage**	**Pump motor**
Inlet valve (NO)	OFF	Open	Master cylinder Wheel cylinder	OFF
Outlet valve (NC)	OFF	Close	Wheel cylinder Reservoir	



2. DUMP MODE

Under the emergency braking, if the wheels start to lock up, HECU sends a signal to the solenoid valve to decreas the brake fluid, then voltage is supplied to each solenoid. At this time inlet valve is closed and brake fluid is blocke from the master cylinder. Conversely outlet valve is opened and brake fluid passes through wheel cylinder to reservoir, resulting in pressure decrease.

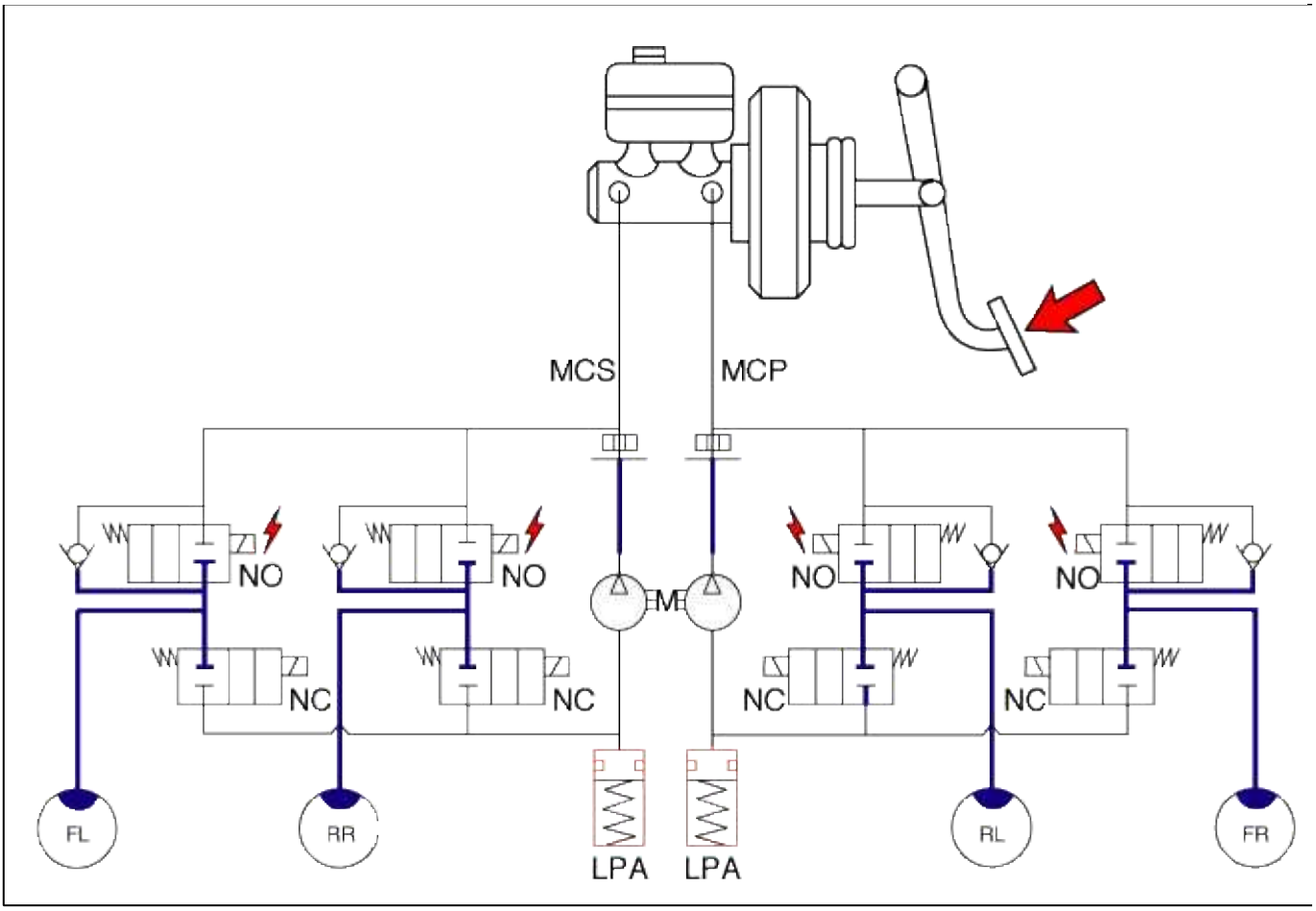
Solenoid	State	Valve	Passage	Pump motor
Inlet valve (NO)	ON	Close	Master cylinder Wheel cylinder	ON
Outlet valve (NC)	ON	Open	Wheel cylinder Reservoir	



3. HOLD MODE

When the brake fluid pressure is maximally decreased in wheel cylinder, HECU sends a signal to solenoid valve to keep the fluid pressure, voltage is supplied to inlet valve but it is not supplied to outlet valve. At this time inlet and outlet valves are closed and brake fluid is kept in wheel cylinder.

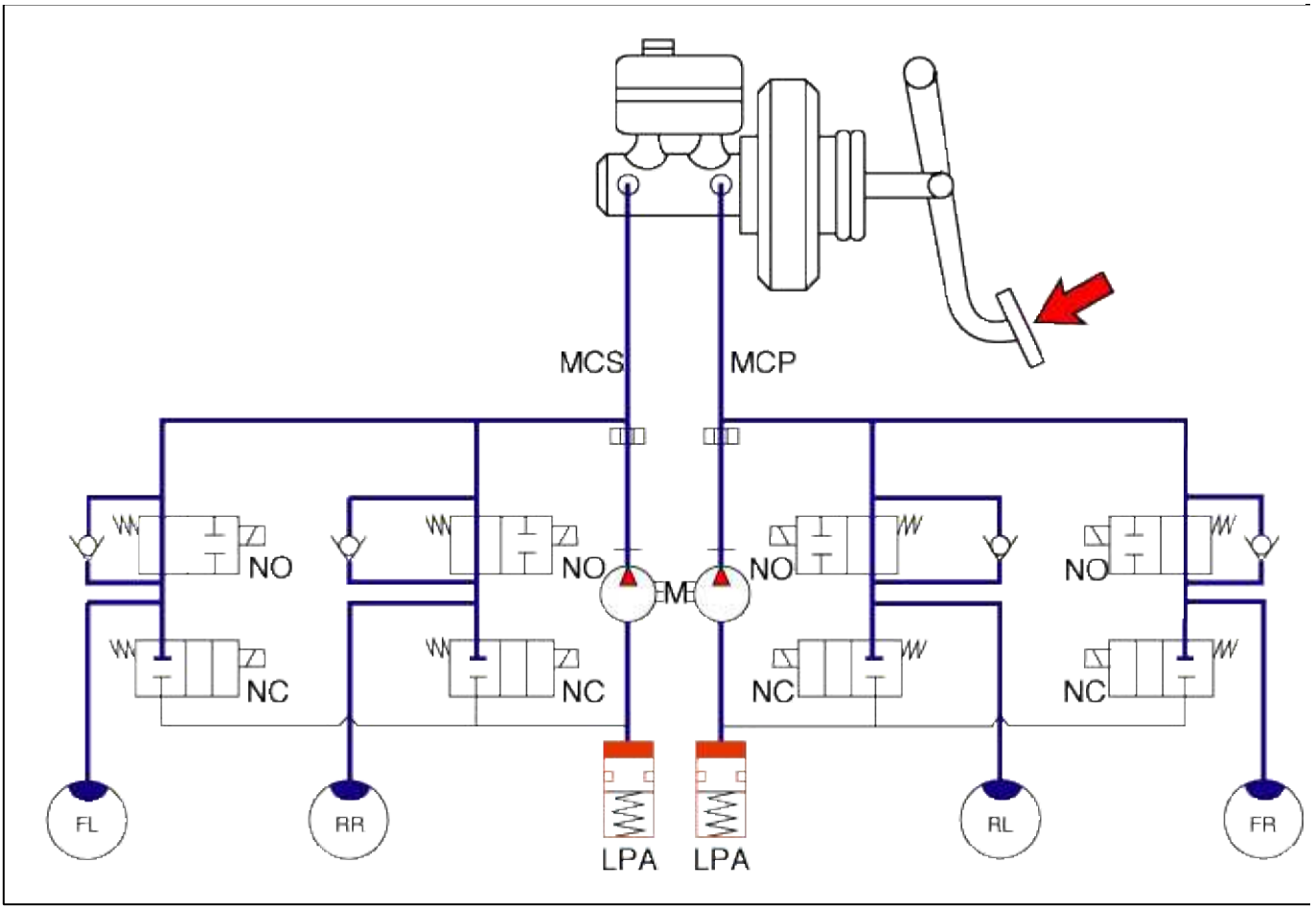
Solenoid	State	Valve	Passage	Pump motor
Inlet valve (NO)	ON	Close	Master cylinder Wheel cylinder	OFF
Outlet valve (NC)	OFF	Close	Wheel cylinder Reservoir	



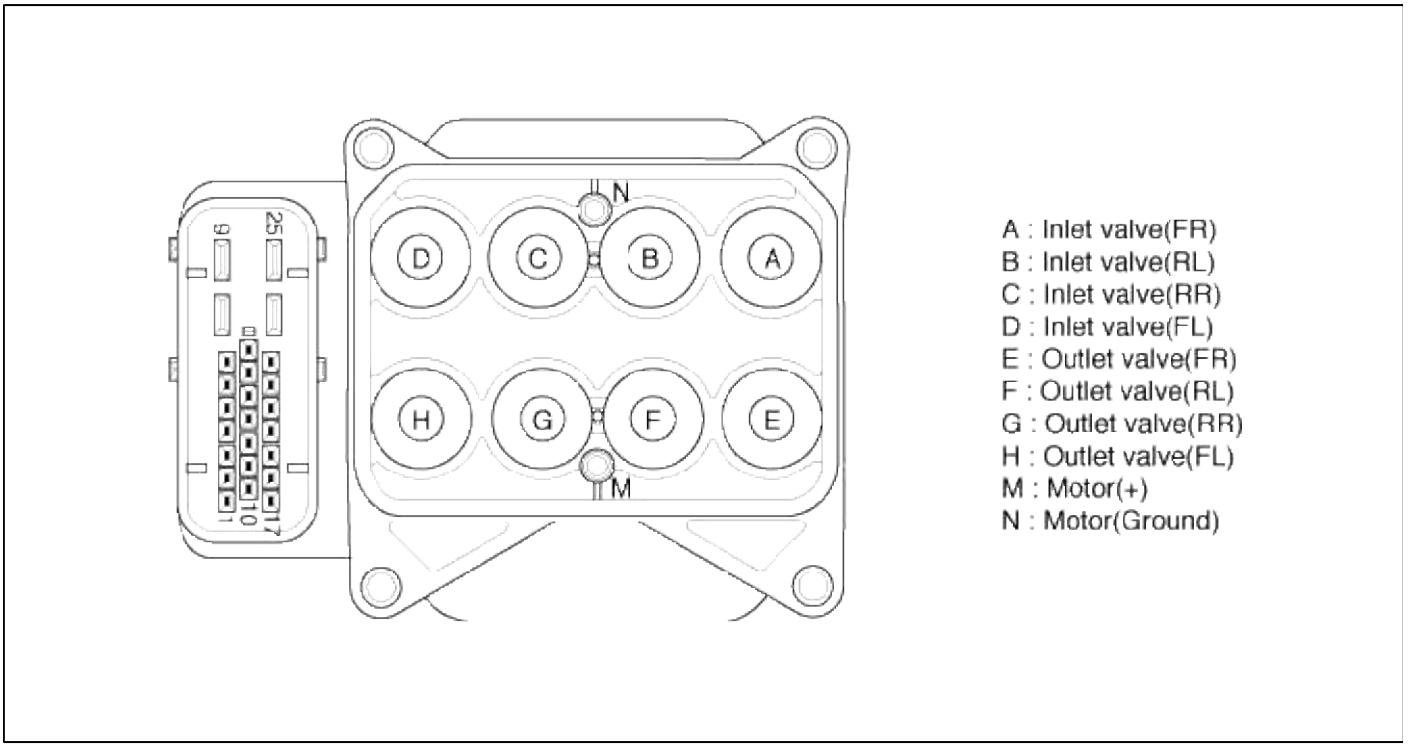
4. INCREASE MODE

If HECU determines there's no lock-up in the wheel, HECU cuts voltage to solenoid valve. So voltage is not supplied to each solenoid valve, brake fluid passes through the inlet valve to wheel cylinder, resulting in pressure increase.

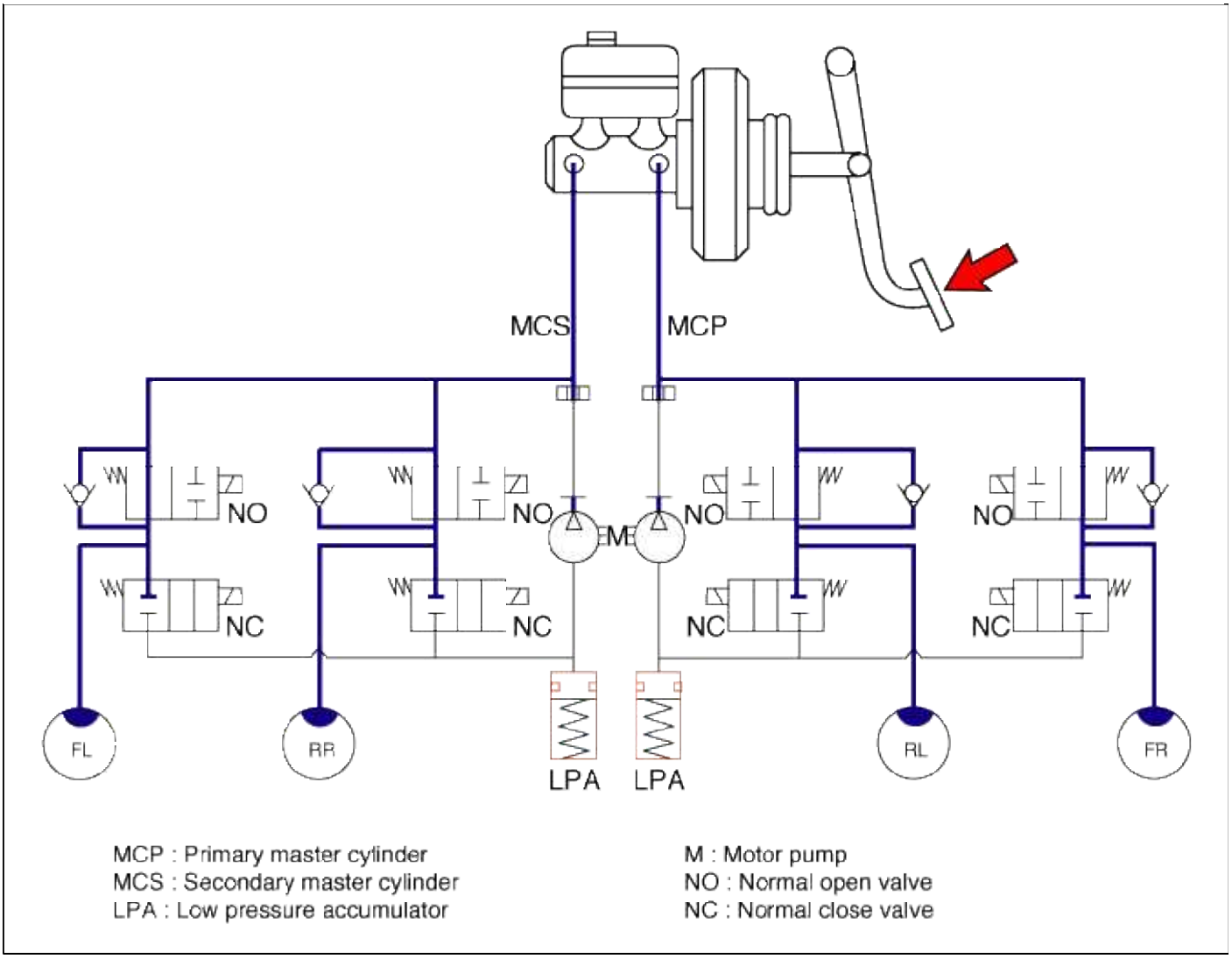
Solenoid	State	Valve	Passage	Pump motor
Inlet valve (NO)	OFF	Open	Master cylinder Wheel cylinder	ON
Outlet valve (NC)	OFF	Close	Wheel cylinder Reservoir	



ABS HECU EXTERNAL DIAGRAM

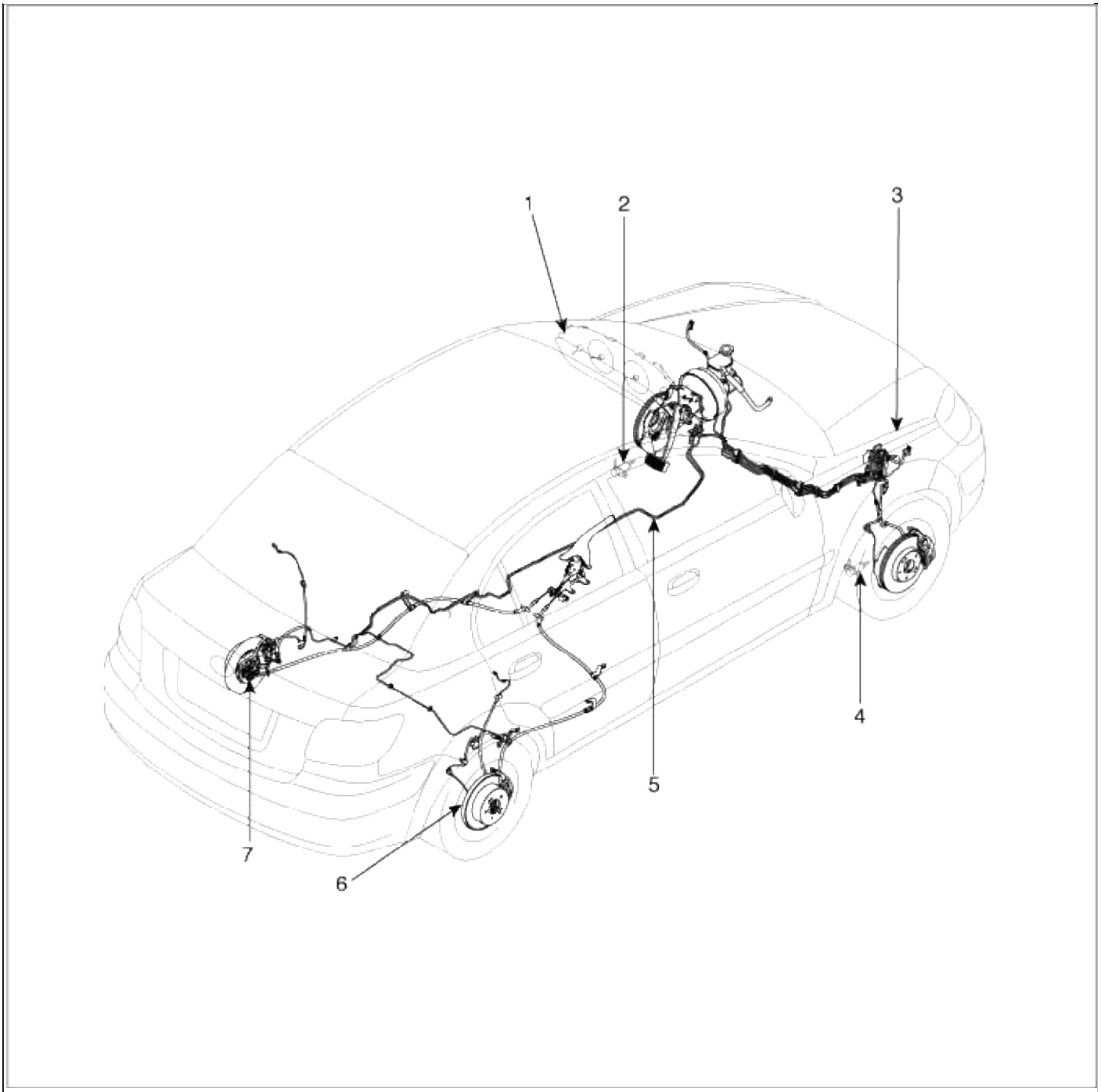


HYDRAULIC SYSTEM DIAGRAM



Brake System > ABS(Anti-Lock Brake System) > Components and Components Location

COMPONENTS



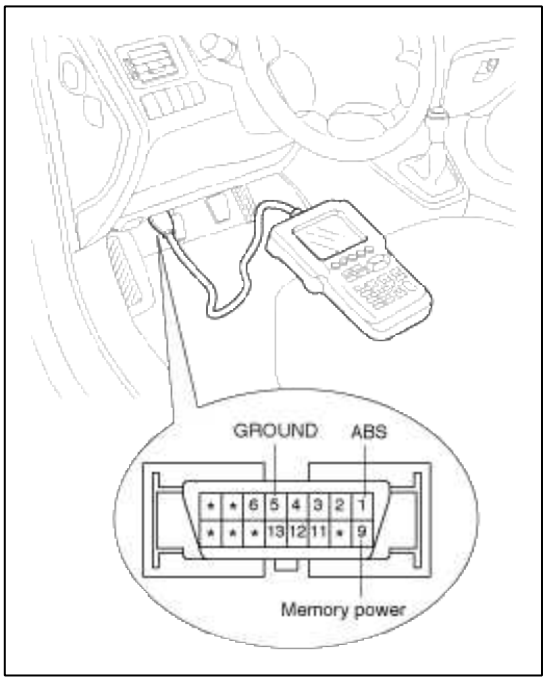
1. Cluster (ABS/EBD warning lamp)
2. Front left wheel speed sensor
3. ABS control module (HECU)
4. Front right wheel speed sensor
5. Hydrauric line
6. Rear right wheel speed sensor
7. Rear left wheel speed sensor

Brake System > ABS(Anti-Lock Brake System) > Troubleshooting

HI-SCAN (PRO) CHECK

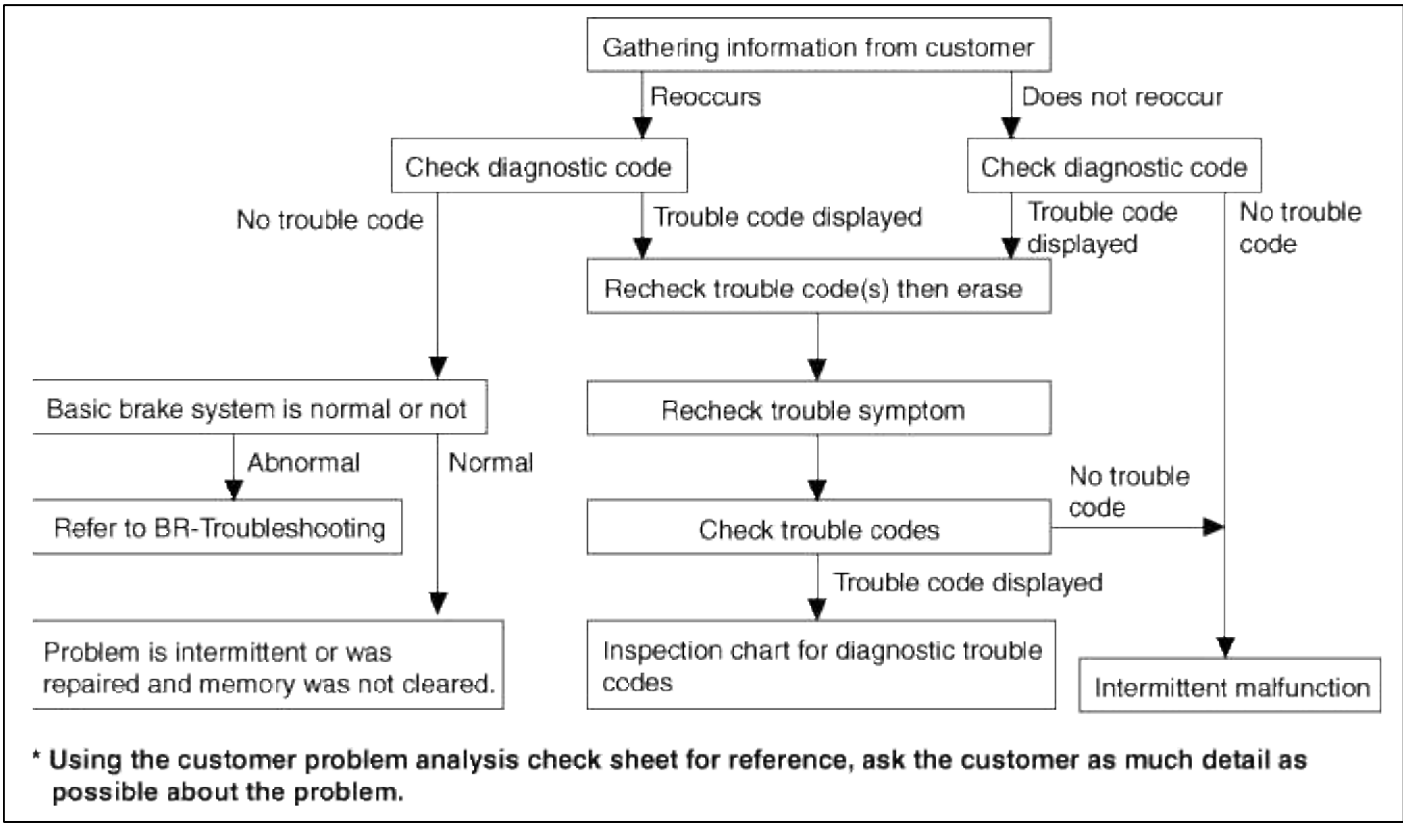
1. Turn the ignition switch OFF.

2. Connector the Hi-scan(pro) to the 16P data link connector located the driver'd side kick panel.



3. Turn the ignition switch ON.
4. Check for diagnostic trouble using the Hi-scan(pro)
5. After completion trouble of the repair or correction of the problem, erase the stored fault codes the clear key on the Hi-scan(pro).
6. Disconnect the Hi-scan(pro) from the 16P data link connector.

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



NOTES WITH REGARD TO DIAGNOSIS

The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment. This is because the system operation check is being performed.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operation (whine). 2. Sound is generated along with vibration of the brake pedal (scraping). 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release (Thump : suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed.
Diagnosis detection conditions can vary depending on the diagnosis code. When checking the trouble symptom after the diagnosis code has been erased, ensure that the requirements listed in "Comment" are met.	

ABS CHECK SHEET

ABS Check Sheet

Inspector's Name

Customer's Name		Registration No.	
		Registration Year	/ /
		VIN.	
Date Vehicle Brought In	/ /	Odometer	Km Miles

Date the Problem First Occurred	/ /
Frequency of Occurence of Problem	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	☐ Intermittent (times a day)
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not light up

Diagnostic Trouble Code Check	1st Time	☐ Normal Code	☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code	☐ Malfunction Code (Code)

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the circuits for each problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

Symptom	Suspect Area
ABS does not operate.	Only when 1. -4. are all normal and the problem is still occurring, replace the HECU. 1. Check the DTC reconfirming that the normal code is output. 2. Power source circuit. 3. Speed sensor circuit. 4. Check the hydraulic circuit for leakage.
ABS does not operate intermittently.	Only when 1. -4. are all normal and the problem is still occurring, replace the ABS actuator assembly. 1. Check the DTC reconfirming that the normal code is output. 2. Wheel speed sensor circuit. 3. Stop lamp switch circuit. 4. Check the hydraulic circuit for leakage.
Communication with Hi-scan (pro) is not possible. (Communication with any system is not possible)	1. Power source circuit 2. Diagnosis line
Communication with Hi-scan (pro) is not possible. (Communication with ABS only is not possible)	1. Power source circuit 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.	- Faulty power source circuit - Faulty wheel speed sensor circuit - Faulty hydraulic circuit for leakage - Faulty HECU

INSPECTION PROCEDURES

DTC INSPECTION

1. Connect the Hi-Scan (pro) with the data link connector and turn the ignition switch ON.

2. Verify that the normal code is output.
   Is the normal code output?

NO

Check the power source circuit.

YES

Erase the DTC and recheck using Hi-Scan (pro).

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 4 of the ABS control module harness side connector and body ground.

Specification : approximately B+

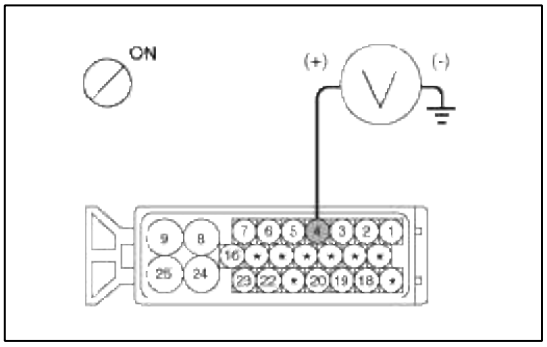
Is the voltage within specification?

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.

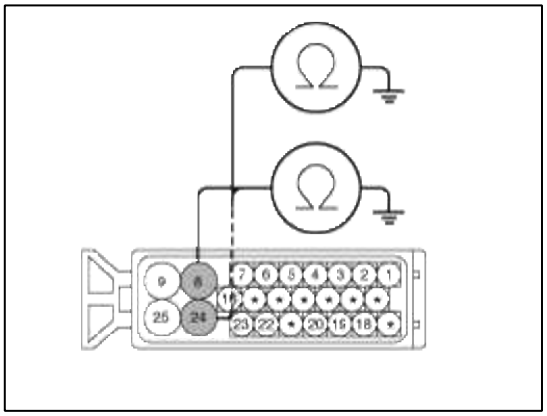
1. Disconnect the connector from the ABS control module.
2. Check for continuity between terminals 8, 24 of the ABS control module harness side connector and ground point.
   Is there continuity?

YES

Check the wheel speed sensor circuit.

NO

Repair an open in the wire and ground point.



CHECK THE WHEEL SPEED SENSOR CIRCUIT.

Refer to the DTC troubleshooting procedures.

Is it normal?

YES

Check the hydraulic circuit for leakage.

NO

Repair or replace the wheel speed sensor.

CHECK THE HYDRAULIC CIRCUIT FOR LEAKAGE.

Refer to the hydraulic lines.

Inspect leakage of the hydraulic lines.

Is it normal?

YES

The problem is still occurring, replace the ABS control module.

NO

Repair the hydraulic lines for leakage.

ABS Does Not Operate Intermittently.

DETECTING CONDITION

Trouble Symptoms	Possible Cause
Brake operation varies depending on driving conditions and road surface conditions, so diagnosis can be difficult. However if a normal DTC is displayed, check the following probable cause. When the problem is still occurring, replace the ABS control module.	- Faulty power source circuit - Faulty wheel speed sensor circuit - Faulty hydraulic circuit for leakage - Faulty HECU

INSPECTION PROCEDURES

DTC INSPECTION

1. Connect the Hi-Scan (pro) with the data link connector and turn the ignition switch ON.
2. Verify that the normal code is output.

Is the normal code output?

NO

Check the wheel speed sensor circuit.

YES

Erase the DTC and recheck using Hi-Scan (pro).

CHECK THE WHEEL SPEED SENSOR CIRCUIT.

Refer to the DTC troubleshooting procedures.

Is it normal?

YES

Check the stop lamp switch circuit.

NO

Repair or replace the wheel speed sensor.

CHECK THE STOP LAMP SWITCH CIRCUIT.

1. Check that stop lamp lights up when brake pedal is depressed and turns off when brake pedal is released.

2. Measure the voltage between terminal 18 of the ABS control module harness side connector and body ground when brake pedal is depressed.

Specification : approximately B+

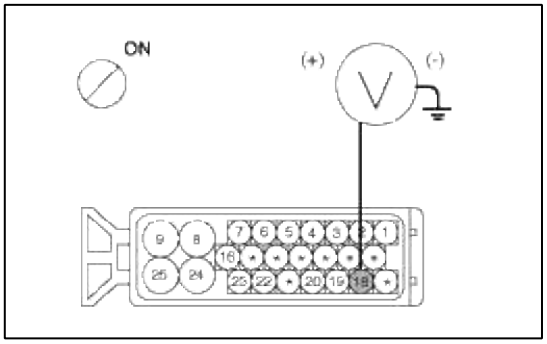
Is the voltage within specification?

YES

Check the hydraulic circuit for leakage.

NO

Repair the stop lamp switch. Repair an open in the wire between the ABS control module and the stop lamp switch.



CHECK THE HYDRAULIC CIRCUIT FOR LEAKAGE.
Refer to the hydraulic lines.
Inspect leakage of the hydraulic lines.
Is it normal?

YES

The problem is still occurring, replace the ABS control module.

NO

Repair the hydraulic lines for leakage.

Communication with Hi-scan (pro) is not possible.
(Communication with any system is not possible)

DETECTING CONDITION

Trouble Symptoms	Possible Cause
Possible defect in the power supply system (including ground) for the diagnosis line.	- An open in the wire - Poor ground - Faulty power source circuit

INSPECTION PROCEDURES

CHECK THE POWER SUPPLY CIRCUIT FOR THE DIAGNOSIS

Measure the voltage between terminal 9 of the data link connector and body ground.

Specification : approximately B+

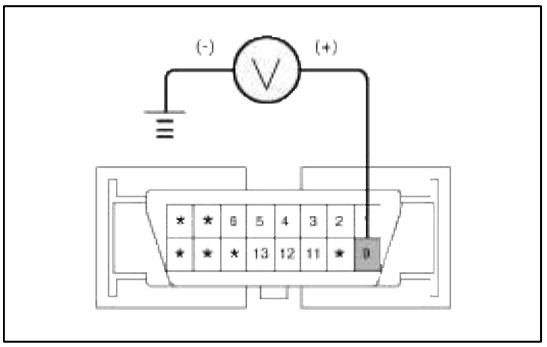
Is voltage within specification?

YES

Check the ground circuit for the diagnosis.

NO

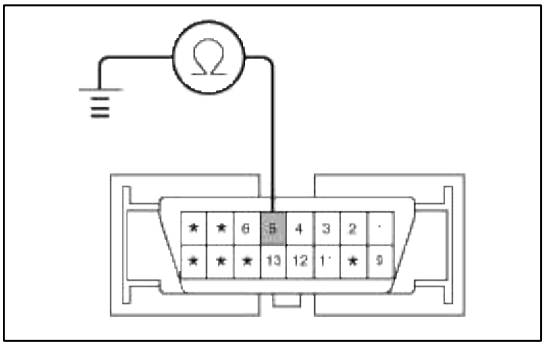
Repair an open in the wire. Check and replace fuse (15A) from the engine compartment junction block.



CHECK THE GROUND CIRCUIT FOR THE DIAGNOSIS
Check for continuity between terminal 5 of the data link connector and body ground.
Is there continuity?

NO

Repair an open in the wire between terminal 5 of the data link connector and ground point.



Communication with Hi-scan (pro) is not possible.
(Communication with ABS only is not possible)

DETECTING CONDITION

Trouble Symptoms	Possible Cause
When communication with Hi-Scan (pro) is not possible, the cause may be probably an open in the HECU power circuit or an open in the diagnosis output circuit.	- An open in the wire - Faulty HECU - Faulty power source circuit

INSPECTION PROCEDURES
CHECK FOR CONTINUITY IN THE DIAGNOSIS LINE

1. Disconnect the connector from the ABS control module.
2. Check for continuity between terminals 7 of the ABS control module connector and 1 of the data link connector.
   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 4 of the ABS control module harness side connector and body ground.

Specification : approximately B+

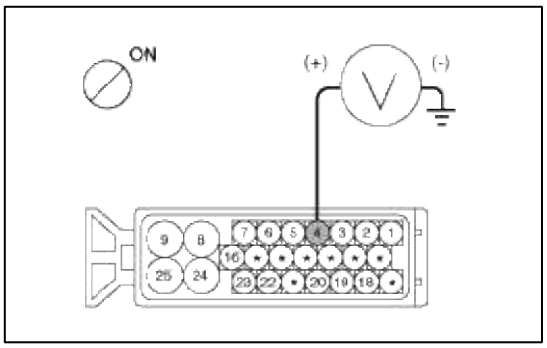
Is voltage within specification?

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

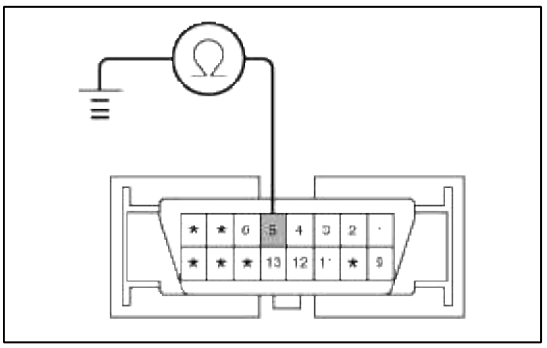
Check for continuity between terminal 5 of the data link connector and ground point.

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

Disconnect the connector from the ABS control module and turn the ignition switch ON.
Does the ABS warning lamp light up?

YES

It is normal. Recheck the ABS control module.

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 and turn the ignition switch ON.
2. Measure the voltage between terminal 12 of the cluster harness side connector and body ground.

Specification : approximately B+

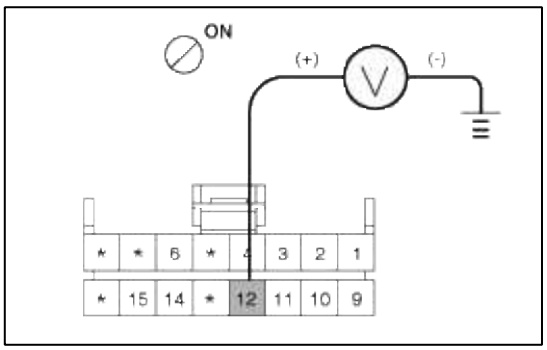
Is voltage within specification?

YES

Repair bulb or instrument cluster assembly.

NO

Check for blown fuse.



CHECK FOR BLOWN FUSE

Check continuity of fuse (10A) from the engine compartment junction block.
Is there continuity?

YES

Repair an open in the wire between ABS fuse and 12 of cluster connector.

NO

Replace the blown fuse.

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 Hi-Scan (pro) to the 16P data link connector located behind the driver's side kick panel.
2. Check the DTC output using Hi-Scan (pro).

Is DTC output?

NO

Repair circuit indicated by code output.

YES

Check instrument cluster.

CHECK INSTRUMENT CLUSTER

Disconnect the cluster connector and turn the ignition switch ON.

Does the ABS warning lamp remains ON?

YES

Replace the instrument cluster.

NO

Check for open the wire.

CHECK FOR OPEN IN THE WIRE

Check for continuity in the wire between cluster and ABS control module.

Is there continuity?

YES

Replace the ABS control module and recheck.

NO

Repair an open in the wire between cluster and ABS control module.

BLEEDING OF BRAKE SYSTEM

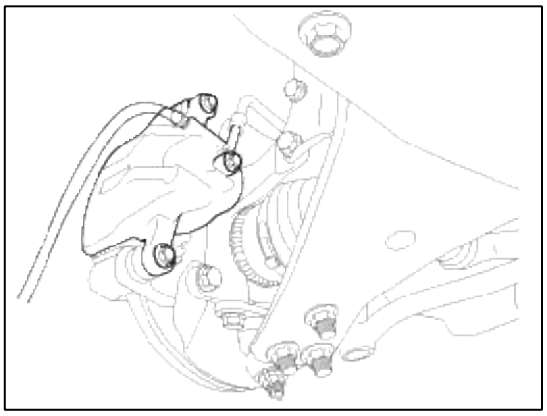
This procedure should be followed to ensure adequate bleeding of air and filling of the ABS unit, brake lines and master cylinder with brake fluid.

1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

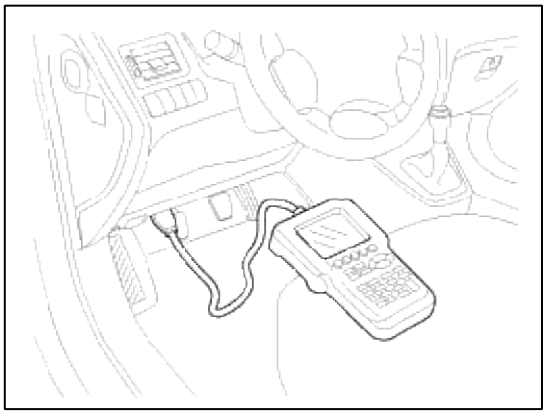
> CAUTION
>
> If there is any brake fluid on any painted surface, wash it off immediately.

> NOTE
>
> 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. Bleed the brake system(See page BR-17)
4. Connect the hi-scan (pro) to the data link connector located underneath the dash panel.



5. Select and operate according to the instructions on the hi-scan (Pro) screen.

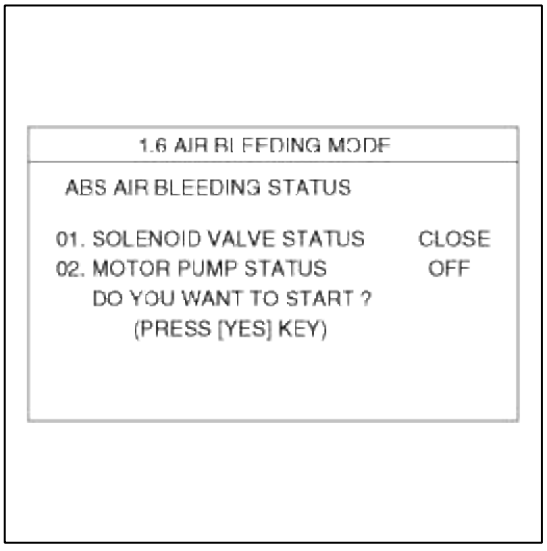
> **CAUTION**
>
> You must obey the maximum operating time of the ABS motor with the hi-scan (Pro) to prevent the motor pump from burning.

(1) Select vehicle name.

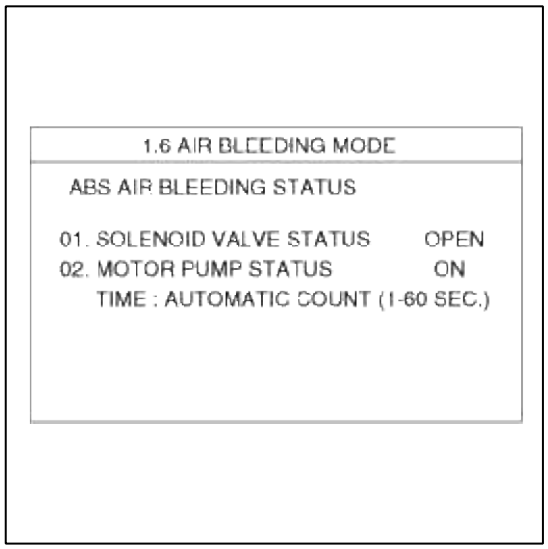
(2) Select Anti-Lock Brake system.

(3) Select air bleeding mode.

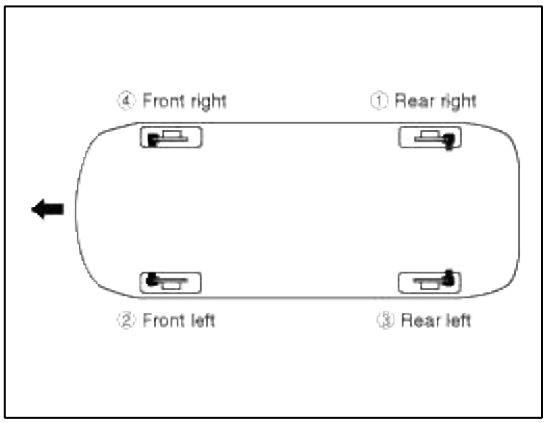
(4) Press "YES" to operate motor pump and solenoid valve.



(5) Wait 60 sec. before operating the air bleeding.
(If not, you may damage the motor.)



6. Pump the brake pedal several times, and then loosen the bleeder screw until fluid starts to run out without bubbles. Then close the bleeder screw.
7. Repeat step 5 until there are no more bubbles in the fluid for each wheel.



8. Tighten the bleeder screw.

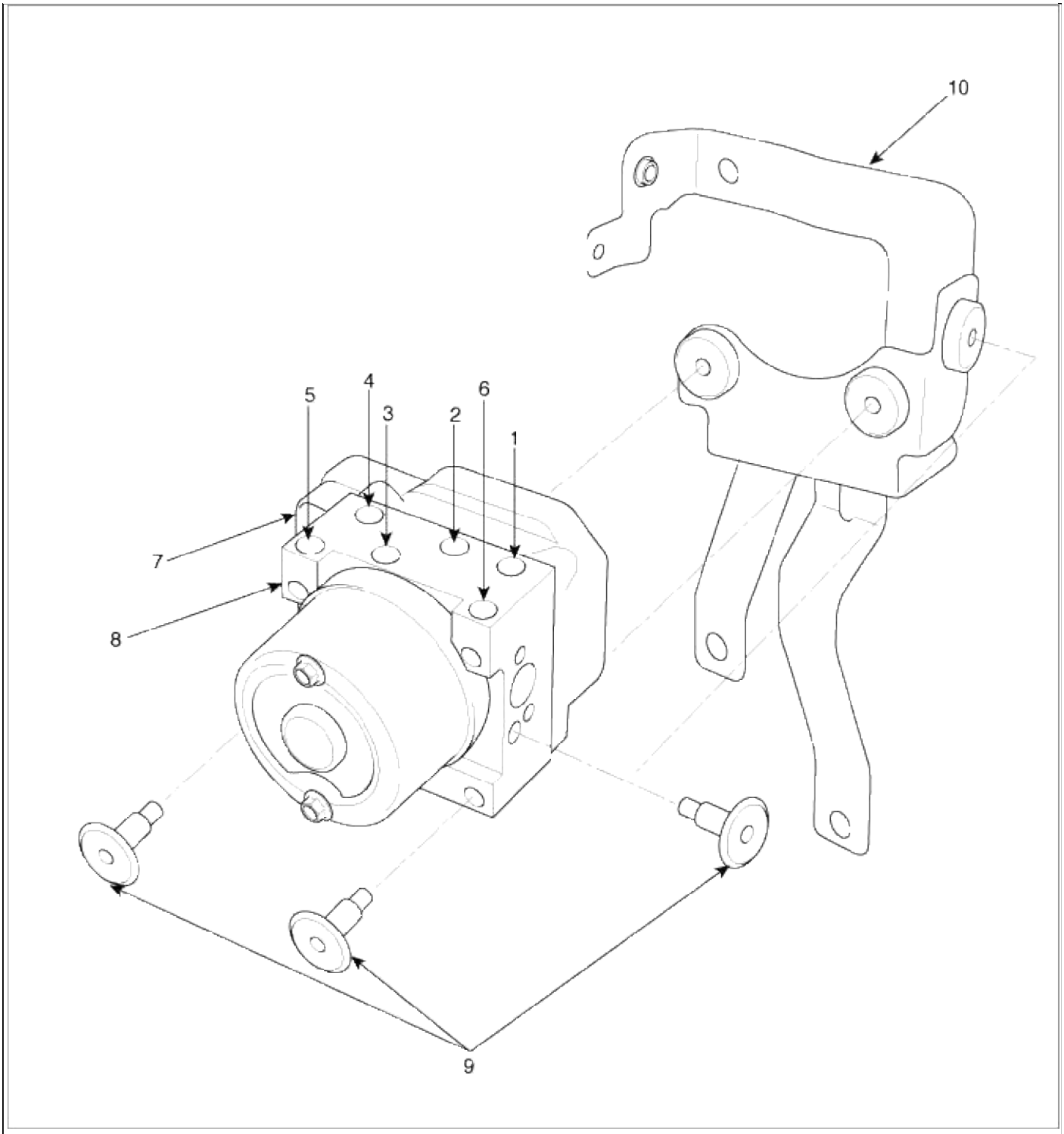
Bleed screw tightening torque:
0.7 ~1.3 kgf·m (6.86~12.74 Nm, 5.09 ~ 9.45 lb-ft)

DIGNOSTIC TROUBLE CODE CHART(DTC)

DTC	Trouble description	Warning lamp	
		EBD	ABS
C1101	Battery voltage high	○	○
C1102	Battery voltage low	X/○	○
C1112	Sensor power voltage	X	X
C1200	Wheel speed sensor front-LH open/short	X/○	○
C1201	Wheel speed sensor front-LH range / performance / intermittent	X/○	○
C1202	Wheel speed sensor front-LH invalid/no signal	X/○	○
C1203	Wheel speed sensor front-RH open/short	X/○	○
C1204	Wheel speed sensor front-RH range / performance / intermittent	X/○	○
C1205	Wheel speed sensor front-RH invalid/no signal	X/○	○
C1206	Wheel speed sensor rear-LH open/short	X/○	○
C1207	Wheel speed sensor rear-LH range / performance / intermittent	X/○	○
C1208	Wheel speed sensor rear-LH invalid/no signal	X/○	○
C1209	Wheel speed sensor rear-RH open/short	X/○	○
C1210	Wheel speed sensor rear-RH range / performance / intermittent	X/○	○
C1211	Wheel speed sensor rear-RH invalid/no signal	X/○	○
C1604	ECU hardware error	○	○
C2112	Valve relay error	○	○
C2380	ABS valve error	○	○
C2402	Motor electrical	X	○

Brake System > ABS(Anti-Lock Brake System) > ABS Control Unit > Components and Components Location

COMPONENTS



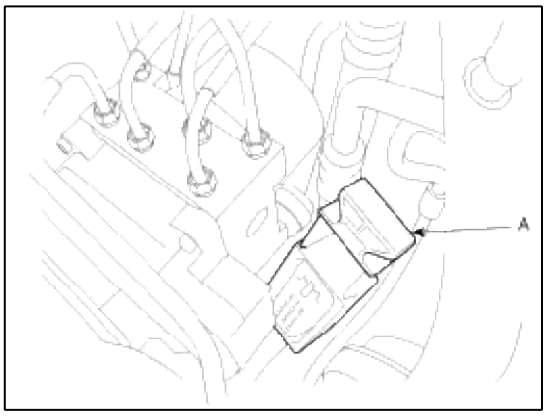
1. Front-right tube
2. Rear-left tube
3. Rear-right tube
4. Front-left tube
5. MC2
6. MC1
7. ABS control module connector (25P)
8. ABS control module(HECU)
9. Damper screw
10. Bracket

Brake System > ABS(Anti-Lock Brake System) > ABS Control Unit > Repair procedures

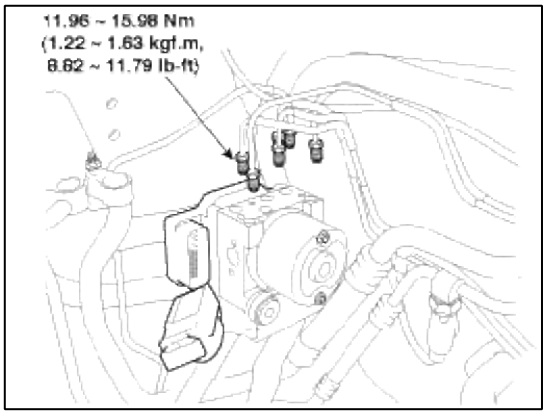
REMOVAL

1. Turn the ignition switch OFF.

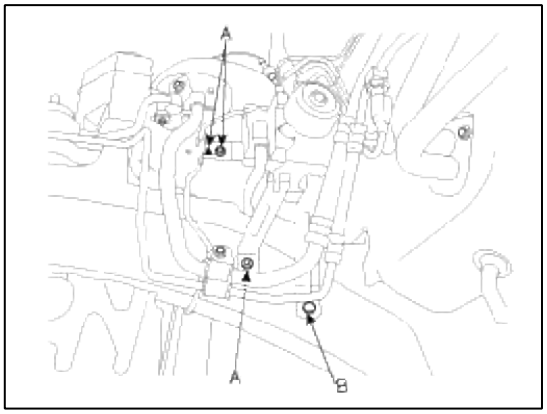
2. Pull up the lock(A) of the ABS control unit 25P connector , then disconnect the connector.



3. Disconnect the brake tubes from the HECU by unlocking the nuts counterclockwise with a spanner.



4. Loosen the 3 ABS HECU bracket bolts (A) and 1 nut(B) , then remove HECU and bracket.



CAUTION

1. Never attempt to disassemble the HECU.
2. The HECU must be transported and stored in.
3. Never shock to the HECU.

5. Remove the 3 damper screws and washer , then remove the bracket.

INSTALLATION

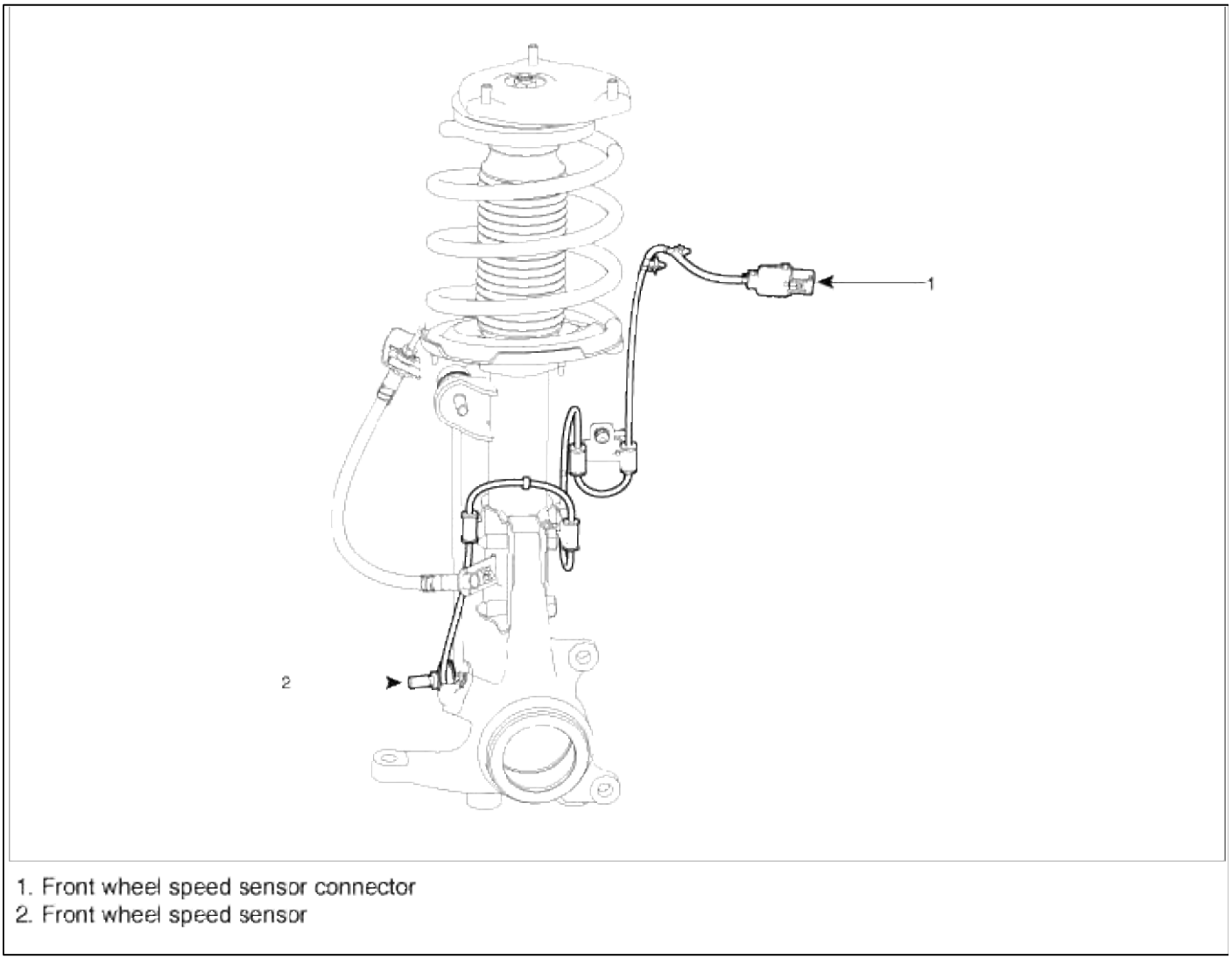
1. Installation is the reverse of removal.

2. Tighten the HECU mounting bolts and brake tube nuts to the specified torque.

Tightening torque
HECU damper screw :
12.36 ~ 14.02 Nm (1.26 ~ 1.43 kgf.m, 9.1 ~ 10.34 Ib-ft)
HECU bracket mounting bolt, nut :
7.85 ~ 9.8 Nm (0.8 ~ 1.0 kgf.m, 5.79 ~ 7.23 Ib-ft)

Brake System > ABS(Anti-Lock Brake System) > Front Wheel Speed Sensor > Components and Components Location

COMPONENTS

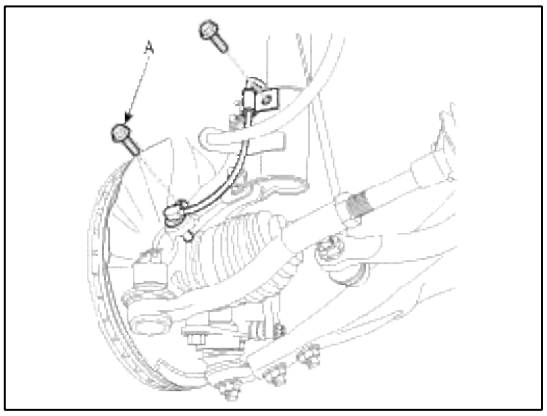


1. Front wheel speed sensor connector
2. Front wheel speed sensor

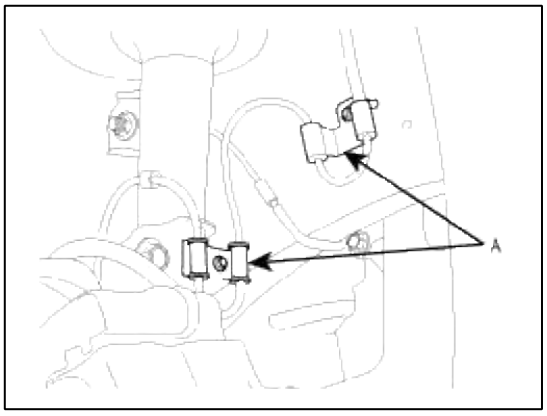
Brake System > ABS(Anti-Lock Brake System) > Front Wheel Speed Sensor > Repair procedures

REMOVAL

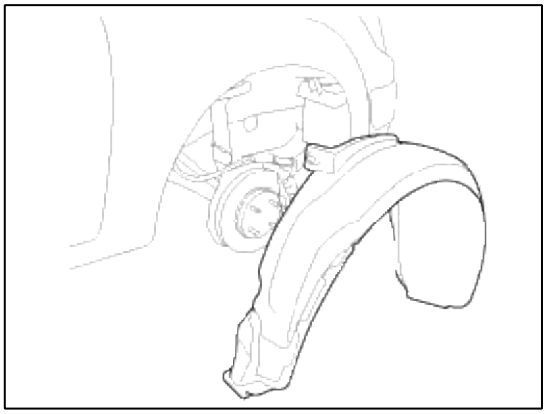
1. Remove the front wheel speed sensor mounting bolt(A).



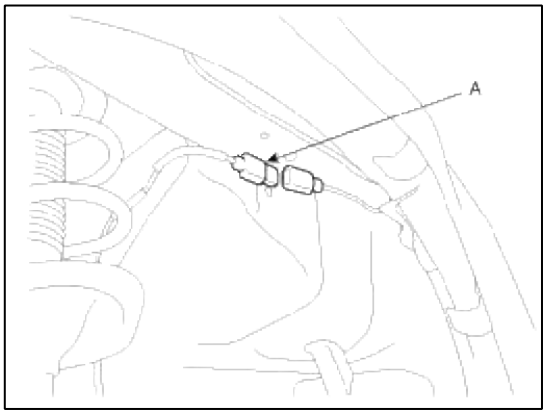
2. Remove the front wheel speed sensor bracket(A).



3. Remove the front wheel guard .



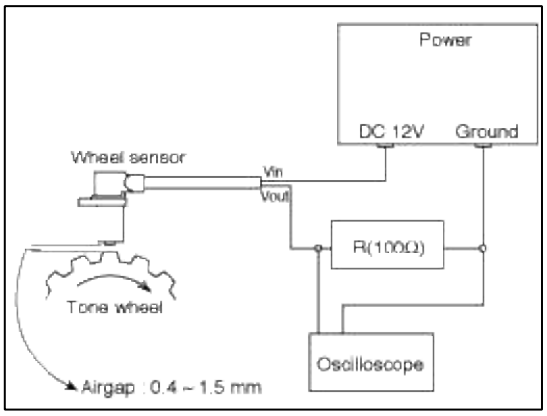
4. Disconnect the front wheel speed sensor connector (A) , then remove the front wheel speed sensor.



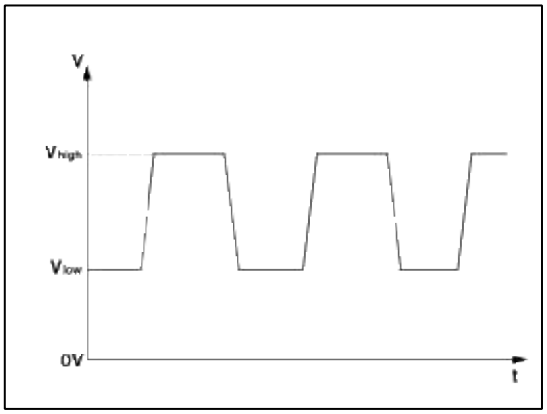
INSPECTION

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 100 Ω resister must be used as shown.



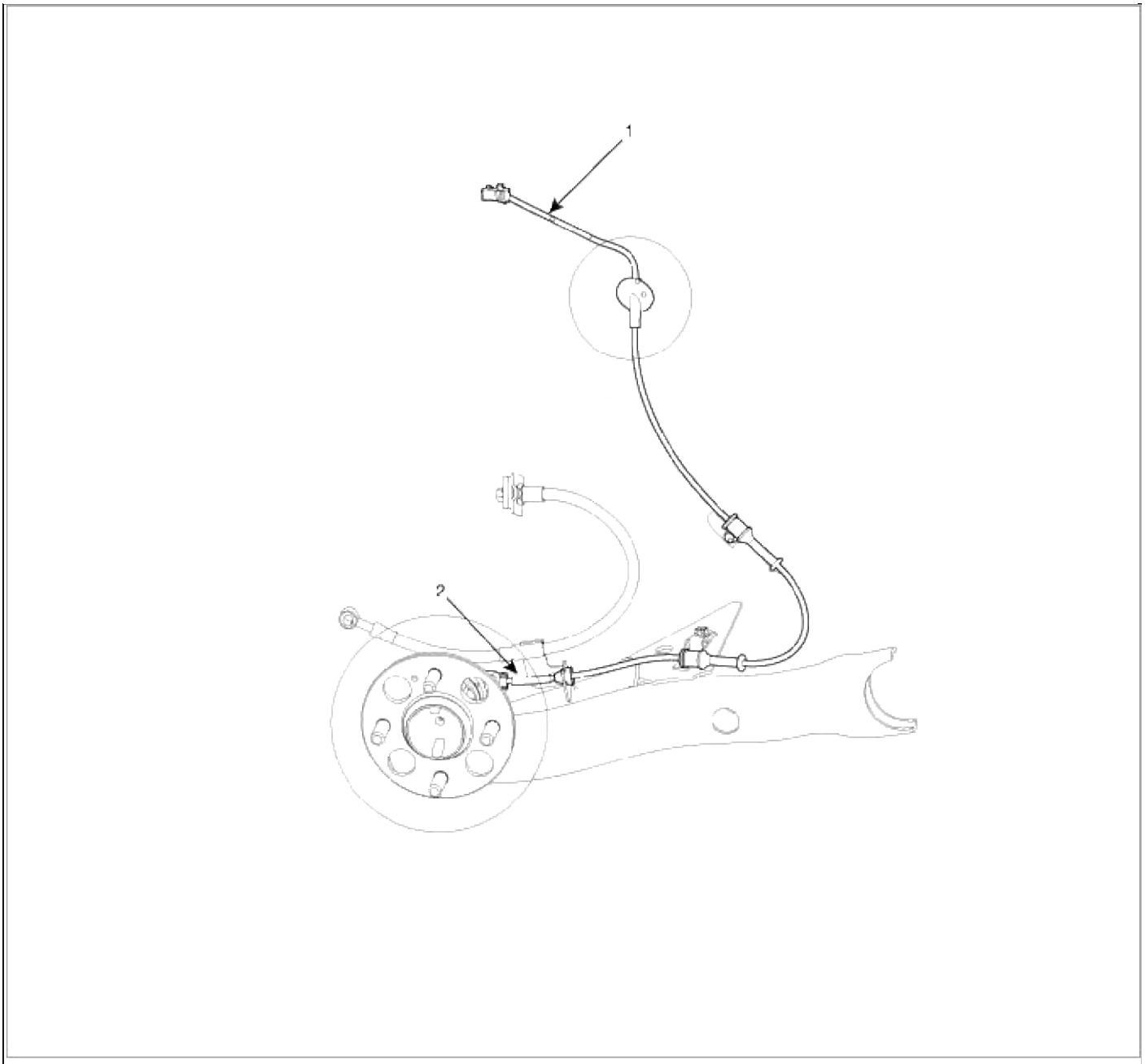
2. Compare the change of the output voltage of the wheel speed sensor to the normal change of the output voltage as shown below.



V_low : 0.59 V ~ 0.84 V
V_high : 1.18 V ~ 1.68 V
Frequency range : 1 ~ 2,500 Hz

Brake System > ABS(Anti-Lock Brake System) > Rear Wheel Speed Sensor > Components and Components Location

COMPONENTS

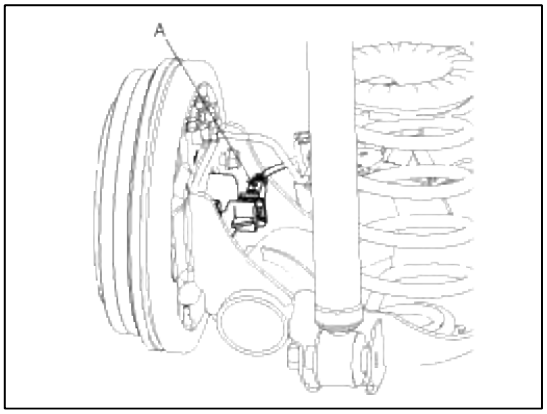


1. Rear wheel speed sensor connector
2. Rear wheel speed sensor

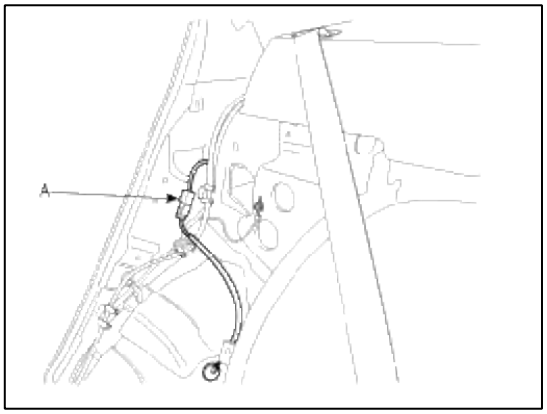
Brake System > ABS(Anti-Lock Brake System) > Rear Wheel Speed Sensor > Repair procedures

REMOVAL

1. Remove the rear wheel speed sensor connector (A).

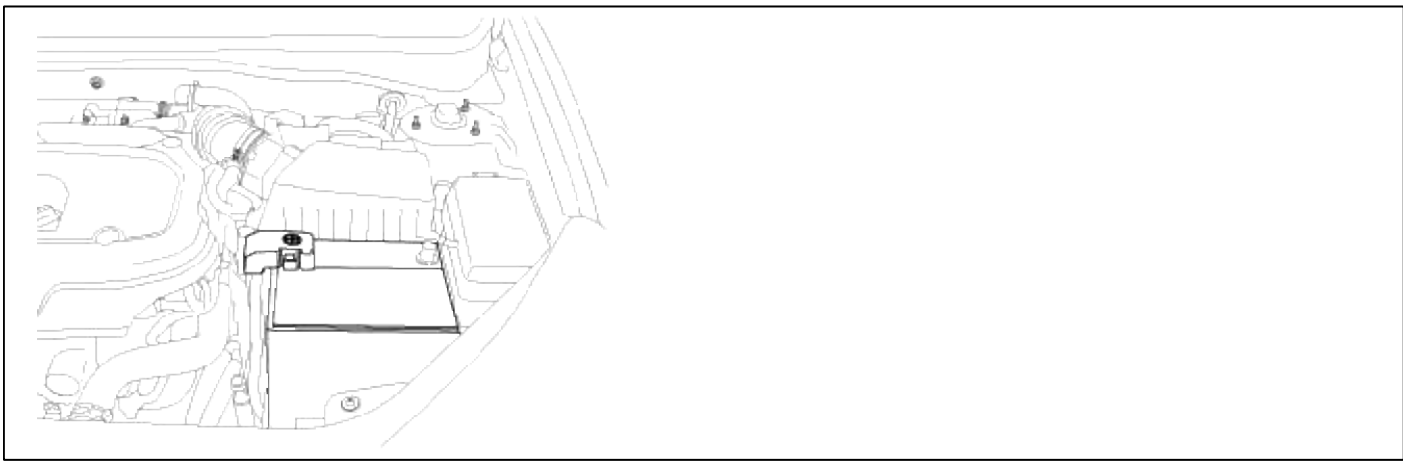


2. Remove the rear seat assembly.(Refer to BD-"rear seat")
3. Remove the rear wheel speed house trim and rear pillar trim.Disconnect the rear wheel speed sensor connector(A).



Brake System > Troubleshooting > C1101

Component Location



General Description

The ABS ECU (Electronic Control Unit) checks the battery voltage to determine, as a safety issue, whether the ABS system can operate normally or not. The normal battery voltage range is essential for controlling the ABS system as intended.

DTC Description

The ABS ECU monitors battery voltage by reading the value of voltage. When the voltage is higher than the expected normal value, this code is set, and the ABS/EBD functions are prohibited. If the voltage recovers, to within normal operating ranges, then the controller returns to normal operation as well.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Battery Voltage Monitoring	• Poor connection in power supply circuit (IGN+) • Faulty Alternator • Faulty HECU
Detect Mode	• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	• When V_IGN > 17 ± 0.5 V is continued for 500msec. • If V_IGN is recovered to normal operating voltage, the controller is reset.	
Fail Safe	• System down. The ABS/EBD functions are inhibited. - The valve relay and all solenoids are prevented from being switched on. • The ABS/EBD warning lamps are activated.	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification Of Vehicle Repair" procedure.

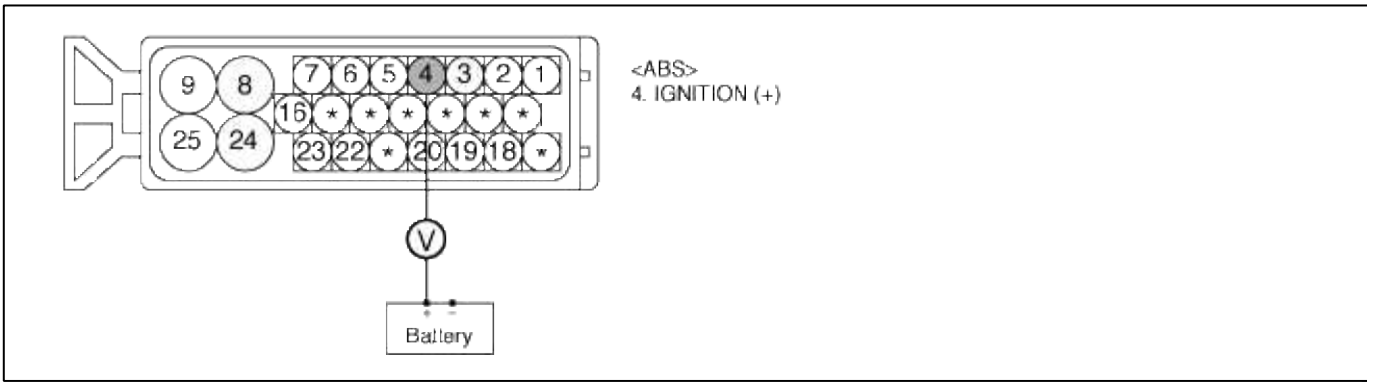
NO

Go to next step.

Power Circuit Inspection

1. Engine "ON".
2. Measure voltage between the battery terminal(+) and terminal "4" of the HECU harness connector.

Specification : Approx. below 0.2 V



3. Is the measured voltage within specifications?

YES

Go to "Ground Circuit Inspection" procedure.

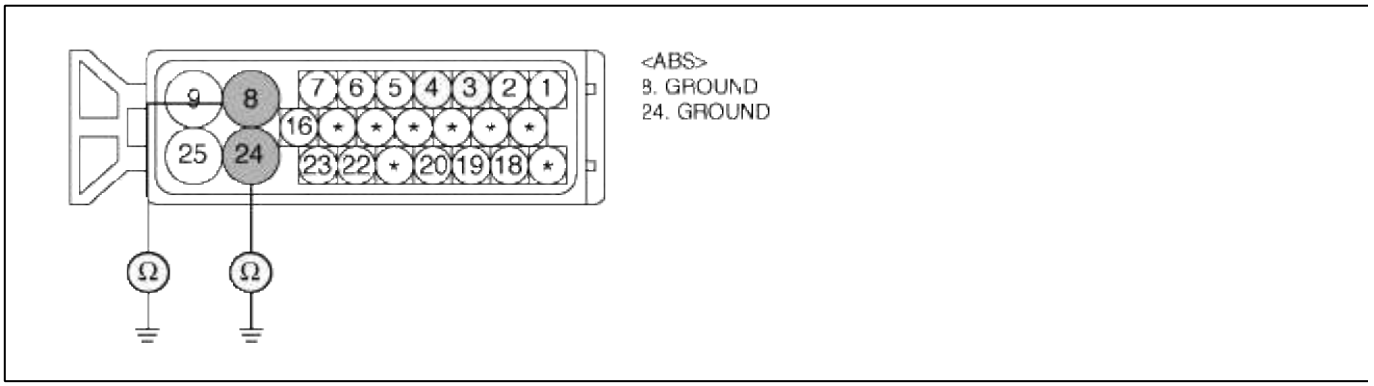
NO

Check for damaged harness and poor connection between the battery terminal(+) and terminal "4" of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

Ground Circuit Inspection

1. Ignition "OFF".
2. Disconnect HECU connector.
3. Measure resistance between terminal "8, 24" of the HECU harness connector and chassis ground.

Specification : Approx. below 1Ω



4. Is the measured resistance within specifications?

YES

Go to "Component Inspection" procedure.

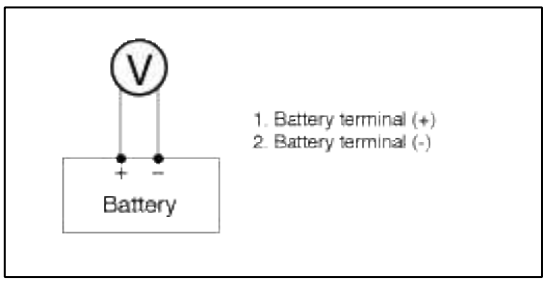
NO

Check for damaged harness and poor connection between terminal " 8, 24" of the HECU harness connector and chassis ground. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

Alternator Output Voltage Inspection

1. Engine "ON".
2. Measure voltage between the battery terminal(+) and the battery terminal(-).

Specification : 10 < V < 16 V



3. Is the measured voltage within specifications?

YES

Go to "Power Circuit Inspection" procedure.

NO

Check for damaged harness and poor connection between alternator and battery. If OK repair or replace alternator and then go to "Verification of vehicle Repair" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by poor connection in power harness (IGN+), faulty Alternator and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes (DTCs)" mode.
2. Using a scantool, clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Are any DTCs present ?

YES

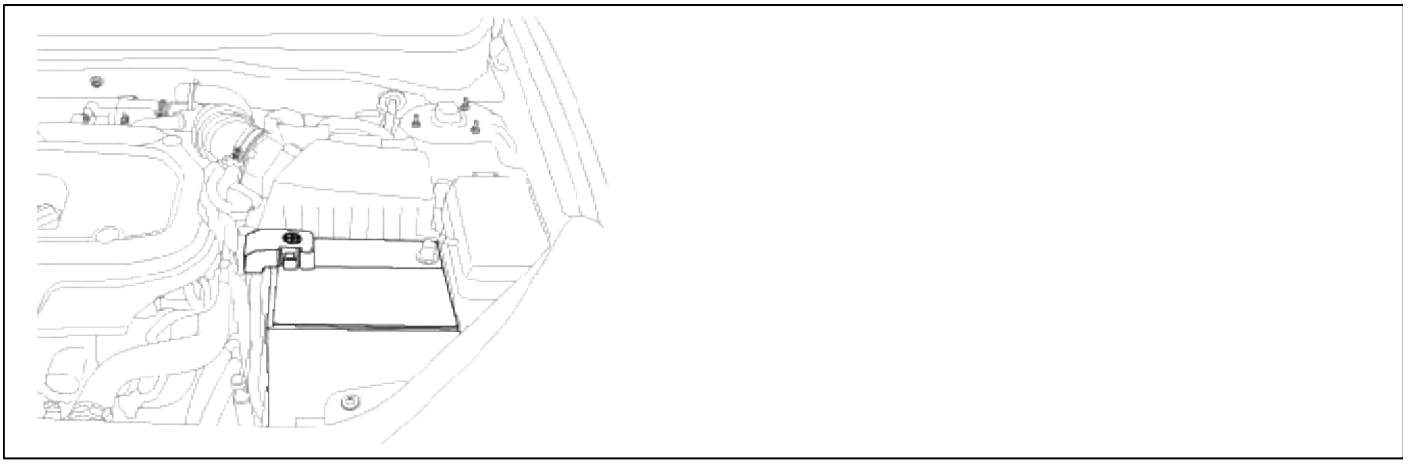
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1102

Component Location



General Description

The ABS ECU(Electronic Control Unit) checks the battery voltage to determine, as a safety issue, whether the ABS system can operate normally or not. The normal battery voltage range is essential for controlling the ABS system as intended.

DTC Description

The ABS ECU monitors the battery voltage by reading the value of voltage. When the voltage is lower than the expected normal value, this code is set. The ABS functions are prohibited and the EBD function is allowed on LOW VOLTAGE CONDITION, the ABS/EBD functions are prohibited on UNDER VOLTAGE CONDITION. If the voltage recovers, to within normal operating ranges, then the controller returns to normal operations as well.

DTC Detecting Condition

Item		Detecting Condition	Possible cause
DTC Strategy		• Battery Voltage Monitoring	• Poor connection in power supply circuit (IGN+) • Faulty HECU
Detect Mode		• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Case1 (Low voltage)	Enable Conditions	• When Vign < 9.5 V ± 0.5 V is continued for 500 msec during Vref >= 4.35 mph. • When Vign < 8.5 V ± 0.5 V is continued for 500msec during Vref < 4.35 mph or ABS control. - If IGN voltage is recovered to normal operating voltage, the system recovers to normal state.	
	Fail Safe	• Outside the ABS control cycle : inhibit the ABS control of front wheels and allow the ABS control of rear wheels, deactivating the motor and the ABS warning lamps are directly switched on. When the voltage recovers the normal operating range, enable ABS functions and warning lamps are switched off and erase the error code. • Inside the ABS control cycle : inhibit the ABS control of front wheels and allow the ABS control of rear wheels, deactivating the motor. The ABS warning lamps are switched on directly and kept on in a continuous state. The error code is always stored.	
Case2 (Under voltage)	Enable Conditions	• When Vign < 7.2 V ± 0.5 V is continued for 56 msec. - If IGN voltage is recovered to normal operating voltage, the system recovers to normal state.	
	Fail Safe	• System down. The ABS/EBD functions are inhibited. - The valve relay and all solenoids are prevented from being switched on. • The ABS/EBD warning lamps are activated.	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

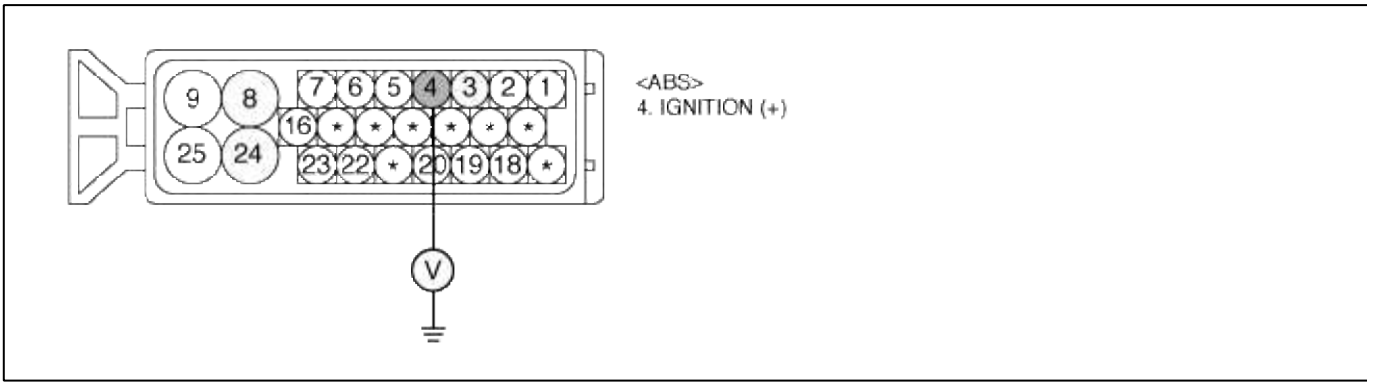
Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

1. Ignition "OFF"

2. Disconnect HECU connector.
3. Ignition "ON" & Engine "OFF".
4. Measure voltage between terminal "4" of the HECU harness connector and chassis ground.

Specification : Approx. B+



5. Is the measured voltage within specifications?

YES

Go to "Ground Circuit Inspection" procedure.

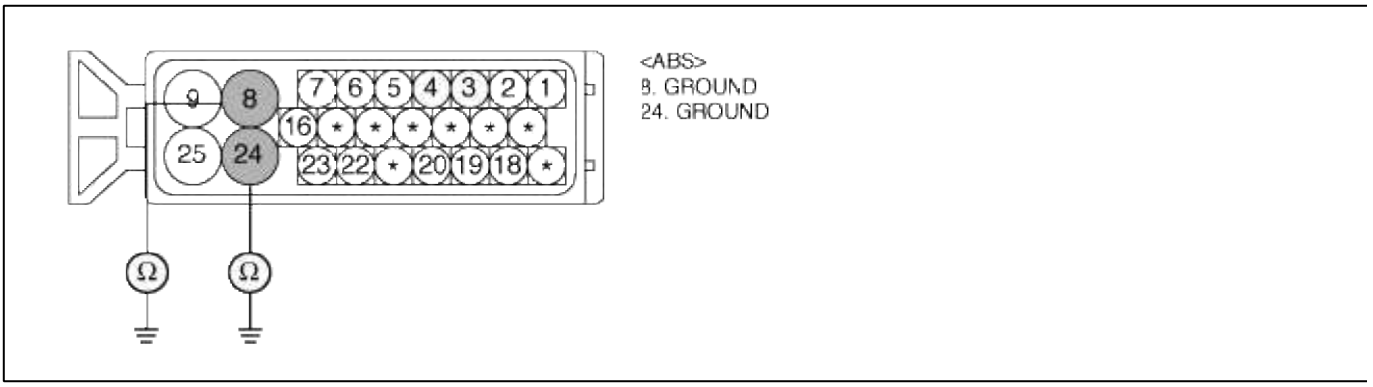
NO

Check for damaged harness and poor connection between the battery terminal(+) and terminal "4" of the HECU harness connector. Check for open or blown 10A ABS fuse. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

Ground Circuit Inspection

1. Ignition "OFF".
2. Disconnect HECU connector.
3. Measure resistance between terminal "8, 24(ESP :16, 47)" of the HECU harness connector and chassis ground.

Specification : Approx. below 1Ω



4. Is the measured resistance within specifications?

YES

Go to "Component Inspection" procedure.

NO

Check for damaged harness and poor connection between terminal "8, 24(ESP : 16, 47)" of the HECU harness connector and chassis ground. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

Component Inspection

1. Ignition "OFF".

2. Engine "ON".
3. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by poor connection in power harness(IGN+) and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Are any DTCs present ?

YES

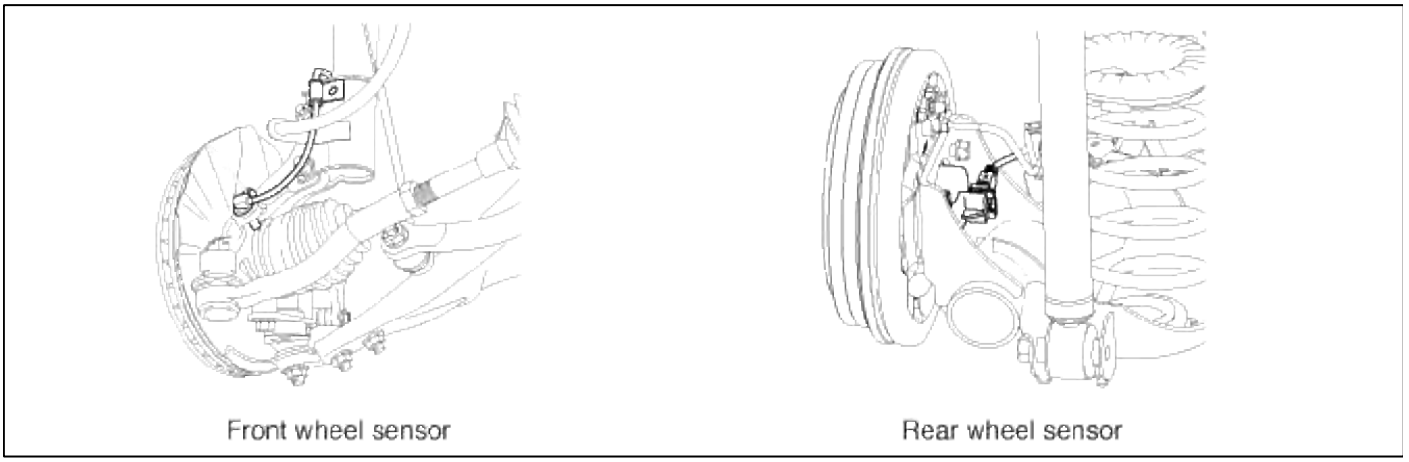
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1200

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise tolerance. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor circuit continuously. If the sensor signal current is continuously out of the specified range for 140 msec, then the HECU determines that the circuit is open/short, and sets this code. Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Current Monitoring	• Open or short of Wheel speed sensor circuit • Faulty Wheel speed sensor • Faulty HECU
Detect Mode	• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	• When the sensor signal current is continuously out of the specified range of 4 mA ± 10% ~ 22 mA ± 10% for 140msec.	
Fail Safe	• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle 1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

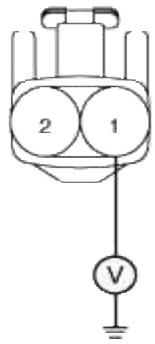
NO

Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Measure voltage between terminal "1" of the wheel speed sensor harness connector and chassis ground.

Specification : Approx. B+



1. Wheel speed sensor(power)
2. Wheel speed sensor(signal)

3. Is the measured voltage within specifications?

YES

Go to "Signal Circuit Inspection" procedure.

NO

Check for open or short to GND in wheel speed sensor harness between terminal 1 of the wheel speed sensor harness connector and terminal of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

If OK, go to "Component Inspection" procedure.

DTC	HECU connector harness terminal
DTC C1200	1 - FL
DTC C1203	19 - FR
DTC C1206	5 - RL
DTC C1209	23 - RR

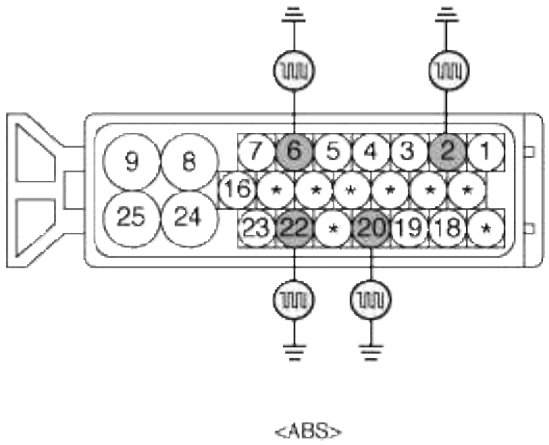
Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Turn the wheel slowly with hand.

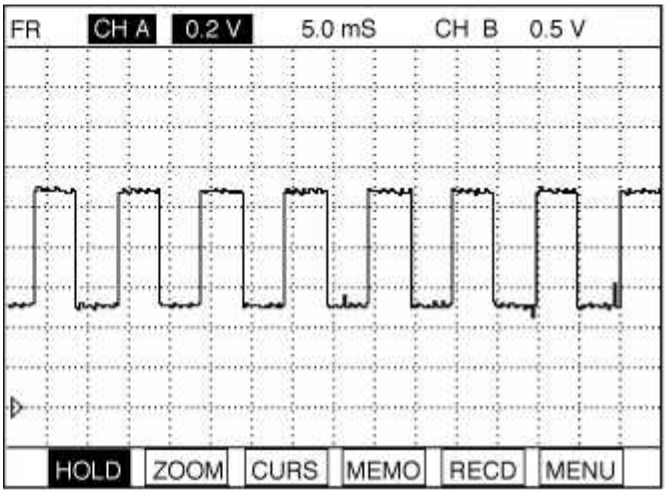
3. Measure voltage between terminal "2, 20, 6, 22" of the HECU harness connector and chassis ground.

Specification : Approx. High : 1.18 ~ 1.68 V , Low : 0.59 ~ 0.84 V

DTC	HECU connector harness terminal
DTC C1200	2 - FL
DTC C1203	20 - FR
DTC C1206	6 - RL
DTC C1209	22 - RR



<ABS>



4. Is the measured voltage within specifications?

YES

Go to "Component Inspection" procedure.

NO

Check for open or short to GND in wheel speed sensor harness between terminal "2" of the wheel speed sensor harness connector and terminal "2, 20, 6, 22" of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

If OK, substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by open or short of wheel speed sensor harness, faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect Scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a Scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more)
4. Are any DTCs present ?

YES

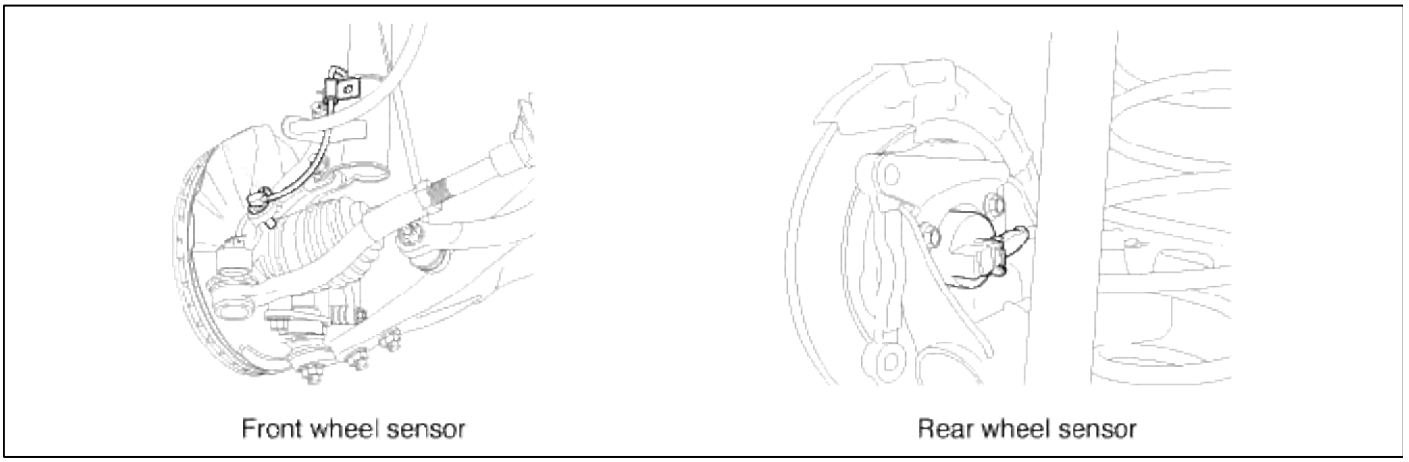
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1201

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise charieristic. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor signal continuously. This code is set if an abnormal speed change ratio is detected while the vehicle speed is more than 1.24 mph . Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Signal monitoring	

Detect Mode		• Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	Case1(Wrong Exciter)	• Max. wheel velocity exceeds 12.4 mph and the wheel velocity is 40 % of max. wheel velocity. if this condition is lasted for 2 minutes. • Max. wheel velocity exceeds 24.8 mph and the wheel velocity is 60 % of max. wheel velocity. if this condition is lasted for 2 minutes.	• Improper installation of wheel speed sensor • Abnormal Rotor and wheel bearing • Faulty Wheel speed sensor • Faulty HECU
	Case2 (Speed Jump)	• Controller counts the number of the wheel acceleration of 100 g[(15.5 mph) for 7 ms]. When the numbers at one wheel exceed 56 times, or When the numbers at more two wheels exceed 5 times, controller recognize the failure. • Controller counts the number of the wheel acceleration of 40 g[(10.87 mph) for 7 ms]. When the numbers at one wheel exceed 126 times, or When the numbers at more two wheels exceed 20 times, controller recognize the failure. • Controller counts the number of the wheel deceleration of -100 g[(-15.5 mph) for 7 ms]. When the numbers at each wheel exceed 56 times, controller recognize the failure. • The wheel deceleration of -100 g[(-15.5 mph) for 7 ms] causes the controller to start monitoring this failure and to compare the wheel velocity with the vehicle velocity from next cycle. When its difference of -100 g is continued for more than 140 msec, controller recognize the failure. • n case that any sensor failure at other wheel was already detected, When the numbers of 100 g at each wheel exceed 5 times, or When the numbers of 40 g at each wheel exceed 20 times, controller recognize the failure. - The counter of speed jump is cleared every 30 min.	
		• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle	

Fail Safe	1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC)
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more
4. Monitor the "Wheel speed sensor" parameter on the Scantool.

Specification : Approx. 24.8 mph or more(24 mph or more)

5. Is parameter displayed within specifications?

YES

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Repair or replace as necessary and then go to "Component Inspection" procedure.

NO

Check for improper installation of wheel speed sensor. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Check for damage of rotor teeth or wheel bearing. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

If OK, Go to "Component Inspection" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more(24 mph or more))
4. Are any DTCs present ?

YES

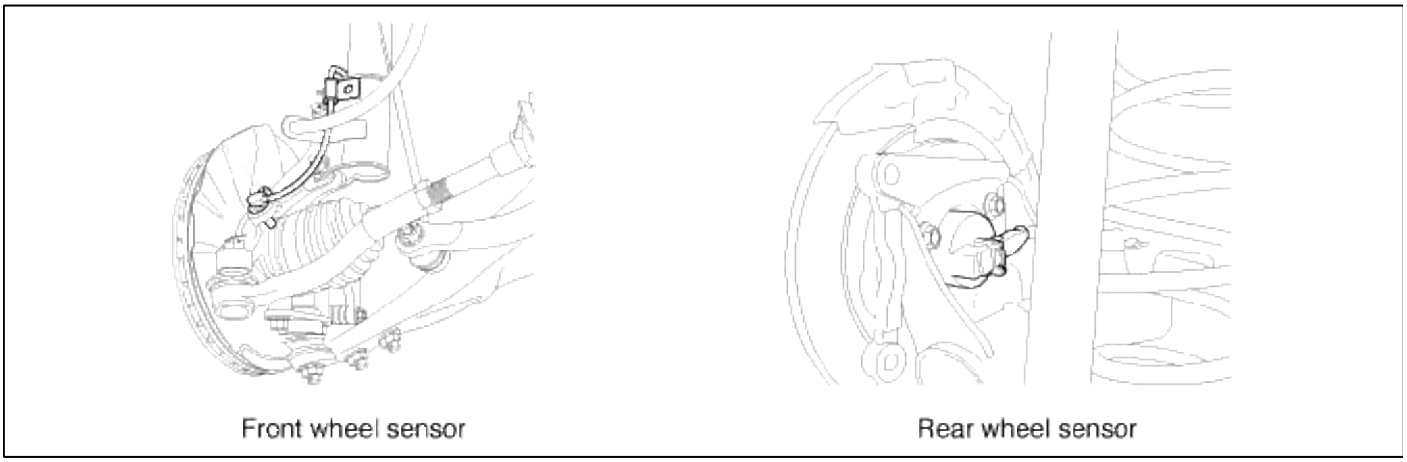
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1202

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise charireristic. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor signal continuously. This code is set when the sensor air gap is out of specified range or when the ABS control cycle is continued abnormally. The HECU checks for air gap malfunctioning by monitoring the sensor signal at speeds between 1.24 mph to 6.21 mph. Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Signal monitoring	

Case1 (Large Air-Gap)	Detect Mode	• Outside the ABS control cycle • Diagnosis mode • Failure mode	• Improper installation of wheel speed sensor • Abnormal Rotor and wheel bearing • Faulty Wheel speed sensor • Faulty HECU
	Enable Conditions	• When the minimum wheel velocity is 1.24 mph and the velocity of other wheels exceed 6.21 mph with the acceleration of < 0.4g , the controller start comparing the velocity of other wheels except the min. wheel. if their difference below 2.49 mph is continued for 140 msec, Otherwise, if their difference beyond 2.49 mph or > 0.4 g is continued for 2 minutes. • In < 0.4 g, when the velocity of more two wheels is 1.24 mph and the max. wheel velocity exceeds 6.21 mph, the condition is continued for 20 sec. Otherwise, In >0.4 g, the condition is 2 minutes. • After velocity of 4 wheel exceeds 6.21 mph, when velocity of 1 wheel or 2 wheel is 1.24 mph and difference of other 2 wheel velocity is less than 2.49 mph under that those velocity is more than 6.21 mph, if that conditions are continued for 12 seconds. - This monitoring is performed for the period that the minimum velocity rises from 1.24 mph to 6.21 mph.	
Case2(long term ABS mode)	Detect Mode	• Inside the ABS control cycle	
	Enable Conditions	• During the ABS control cycle, if the wheel velocity of 1.24 mph is lasted for more than 12 sec. • If the ABS control cycle is continued for more than 36 sec.	
		• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle	

Fail Safe	1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC)
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more
4. Monitor the "Wheel speed sensor" parameter on the Scantool.

Specification : Approx. 6.21 mph or more

5. Is parameter displayed within specifications?

YES

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Repair or replace as necessary and then go to "Component Inspection" procedure.

NO

Check for improper installation of wheel speed sensor. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Check for damage of rotor teeth or wheel bearing. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

If OK, Go to "Component Inspection" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more).
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more))
4. Are any DTCs present ?

YES

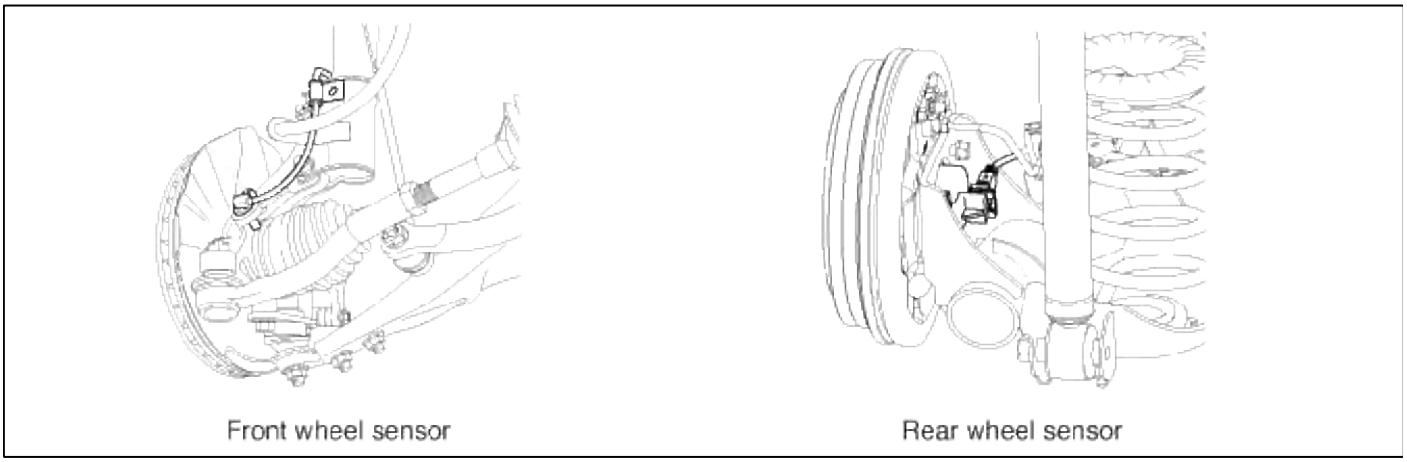
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1203

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise tolerance. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor circuit continuously. If the sensor signal current is continuously out of the specified range for 140 msec, then the HECU determines that the circuit is open/short, and sets this code. Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Current Monitoring	• Open or short of Wheel speed sensor circuit • Faulty Wheel speed sensor • Faulty HECU
Detect Mode	• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	• When the sensor signal current is continuously out of the specified range of 4 mA ± 10% ~ 22 mA ± 10% for 140msec.	
Fail Safe	• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle 1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

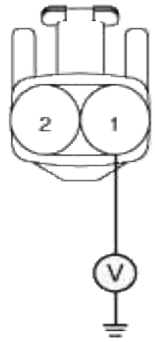
Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

1. Ignition "ON" & Engine "OFF".

2. Measure voltage between terminal "1" of the wheel speed sensor harness connector and chassis ground.

Specification : Approx. B+



1. Wheel speed sensor(power)
2. Wheel speed sensor(signal)

3. Is the measured voltage within specifications?

YES

Go to "Signal Circuit Inspection" procedure.

NO

Check for open or short to GND in wheel speed sensor harness between terminal 1 of the wheel speed sensor harness connector and terminal of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

If OK, go to "Component Inspection" procedure.

DTC	HECU connector harness terminal
DTC C1200	1 - FL
DTC C1203	19 - FR
DTC C1206	5 - RL
DTC C1209	23 - RR

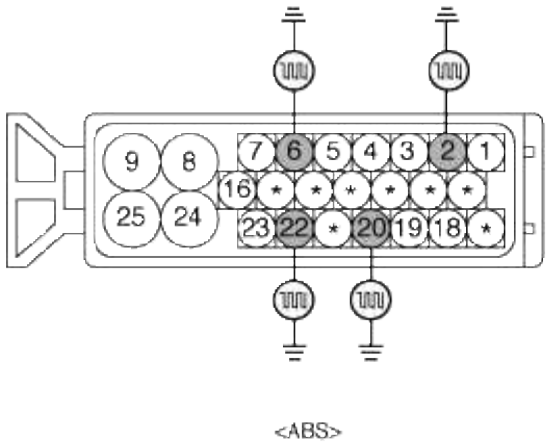
Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Turn the wheel slowly with hand.

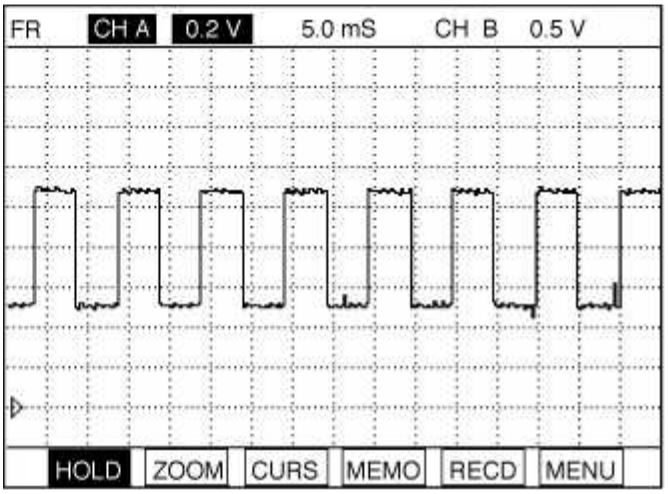
3. Measure voltage between terminal "2, 20, 6, 22" of the HECU harness connector and chassis ground.

Specification : Approx. High : 1.18 ~ 1.68 V , Low : 0.59 ~ 0.84 V

DTC	HECU connector harness terminal
DTC C1200	2 - FL
DTC C1203	20 - FR
DTC C1206	6 - RL
DTC C1209	22 - RR



<ABS>



4. Is the measured voltage within specifications?

YES

Go to "Component Inspection" procedure.

NO

Check for open or short to GND in wheel speed sensor harness between terminal "2" of the wheel speed sensor harness connector and terminal "2, 20, 6, 22" of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

If OK, substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by open or short of wheel speed sensor harness, faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect Scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a Scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more)
4. Are any DTCs present ?

YES

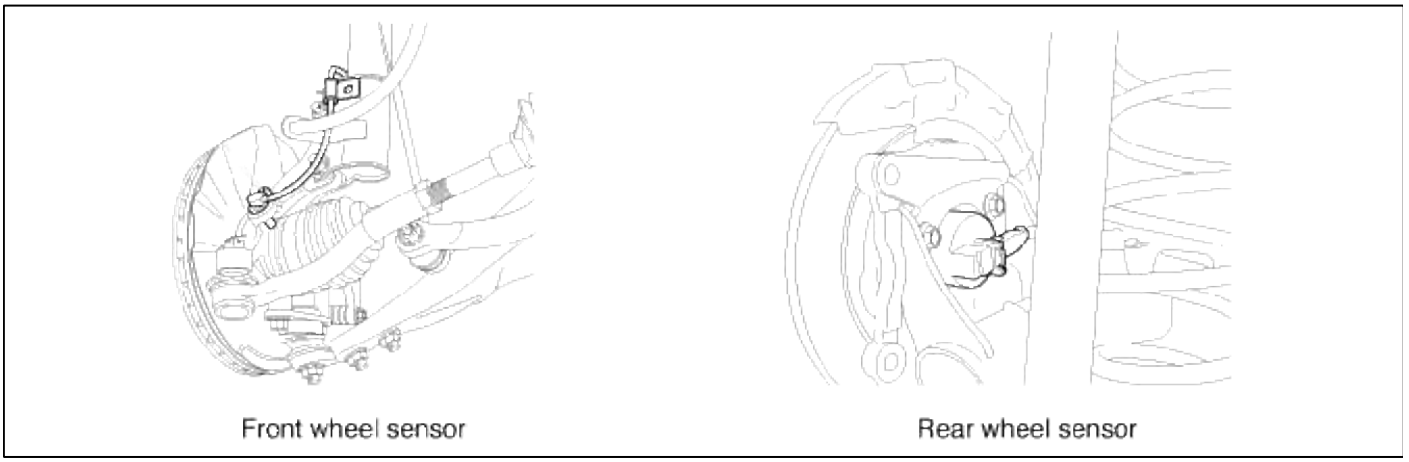
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1204

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise charieristic. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor signal continuously. This code is set if an abnormal speed change ratio is detected while the vehicle speed is more than 1.24 mph . Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Signal monitoring	

<table>
<tr><td colspan="2">Detect Mode</td><td>• Outside the ABS control cycle
• Inside the ABS control cycle
• Diagnosis mode
• Failure mode</td><td rowspan="3">• Improper installation of wheel speed sensor
• Abnormal Rotor and wheel bearing
• Faulty Wheel speed sensor
• Faulty HECU</td></tr>
<tr><td rowspan="2">Enable Conditions</td><td>Case1(Wrong Exciter)</td><td>• Max. wheel velocity exceeds 12.4 mph and the wheel velocity is 40 % of max. wheel velocity. if this condition is lasted for 2 minutes.
• Max. wheel velocity exceeds 24.8 mph and the wheel velocity is 60 % of max. wheel velocity. if this condition is lasted for 2 minutes.</td></tr>
<tr><td>Case2 (Speed Jump)</td><td>• Controller counts the number of the wheel acceleration of 100 g[(15.5 mph) for 7 ms]. When the numbers at one wheel exceed 56 times, or When the numbers at more two wheels exceed 5 times, controller recognize the failure.
• Controller counts the number of the wheel acceleration of 40 g[(10.87 mph) for 7 ms]. When the numbers at one wheel exceed 126 times, or When the numbers at more two wheels exceed 20 times, controller recognize the failure.
• Controller counts the number of the wheel deceleration of -100 g[(-15.5 mph) for 7 ms]. When the numbers at each wheel exceed 56 times, controller recognize the failure.
• The wheel deceleration of -100 g[(-15.5 mph) for 7 ms] causes the controller to start monitoring this failure and to compare the wheel velocity with the vehicle velocity from next cycle. When its difference of -100 g is continued for more than 140 msec, controller recognize the failure.
• n case that any sensor failure at other wheel was already detected, When the numbers of 100 g at each wheel exceed 5 times, or When the numbers of 40 g at each wheel exceed 20 times, controller recognize the failure.
- The counter of speed jump is cleared every 30 min.</td></tr>
<tr><td colspan="2"></td><td>• Sensor failure outside of the ABS control cycle
1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated
2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.
• Sensor failure inside the ABS control cycle</td></tr>
</table>

Fail Safe	1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC)
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more
4. Monitor the "Wheel speed sensor" parameter on the Scantool.

Specification : Approx. 24.8 mph or more(24 mph or more)

5. Is parameter displayed within specifications?

YES

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Repair or replace as necessary and then go to "Component Inspection" procedure.

NO

Check for improper installation of wheel speed sensor. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Check for damage of rotor teeth or wheel bearing. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

If OK, Go to "Component Inspection" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more(24 mph or more))
4. Are any DTCs present ?

YES

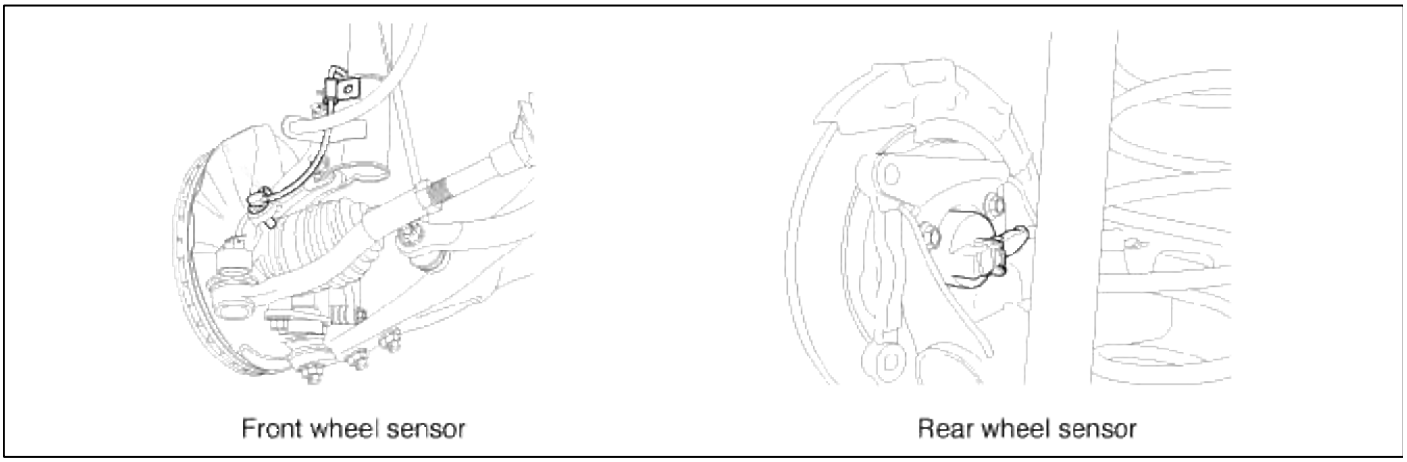
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1205

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise charireristic. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor signal continuously. This code is set when the sensor air gap is out of specified range or when the ABS control cycle is continued abnormally. The HECU checks for air gap malfunctioning by monitoring the sensor signal at speeds between 1.24 mph to 6.21 mph. Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Signal monitoring	

Case1 (Large Air-Gap)	Detect Mode	• Outside the ABS control cycle • Diagnosis mode • Failure mode	• Improper installation of wheel speed sensor • Abnormal Rotor and wheel bearing • Faulty Wheel speed sensor • Faulty HECU
	Enable Conditions	• When the minimum wheel velocity is 1.24 mph and the velocity of other wheels exceed 6.21 mph with the acceleration of < 0.4g , the controller start comparing the velocity of other wheels except the min. wheel. if their difference below 2.49 mph is continued for 140 msec, Otherwise, if their difference beyond 2.49 mph or > 0.4 g is continued for 2 minutes. • In < 0.4 g, when the velocity of more two wheels is 1.24 mph and the max. wheel velocity exceeds 6.21 mph, the condition is continued for 20 sec. Otherwise, In >0.4 g, the condition is 2 minutes. • After velocity of 4 wheel exceeds 6.21 mph, when velocity of 1 wheel or 2 wheel is 1.24 mph and difference of other 2 wheel velocity is less than 2.49 mph under that those velocity is more than 6.21 mph, if that conditions are continued for 12 seconds. - This monitoring is performed for the period that the minimum velocity rises from 1.24 mph to 6.21 mph.	
Case2(long term ABS mode)	Detect Mode	• Inside the ABS control cycle	
	Enable Conditions	• During the ABS control cycle, if the wheel velocity of 1.24 mph is lasted for more than 12 sec. • If the ABS control cycle is continued for more than 36 sec.	
		• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle	

Fail Safe	1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC)
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more
4. Monitor the "Wheel speed sensor" parameter on the Scantool.

Specification : Approx. 6.21 mph or more

5. Is parameter displayed within specifications?

YES

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Repair or replace as necessary and then go to "Component Inspection" procedure.

NO

Check for improper installation of wheel speed sensor. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Check for damage of rotor teeth or wheel bearing. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

If OK, Go to "Component Inspection" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more).
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more))
4. Are any DTCs present ?

YES

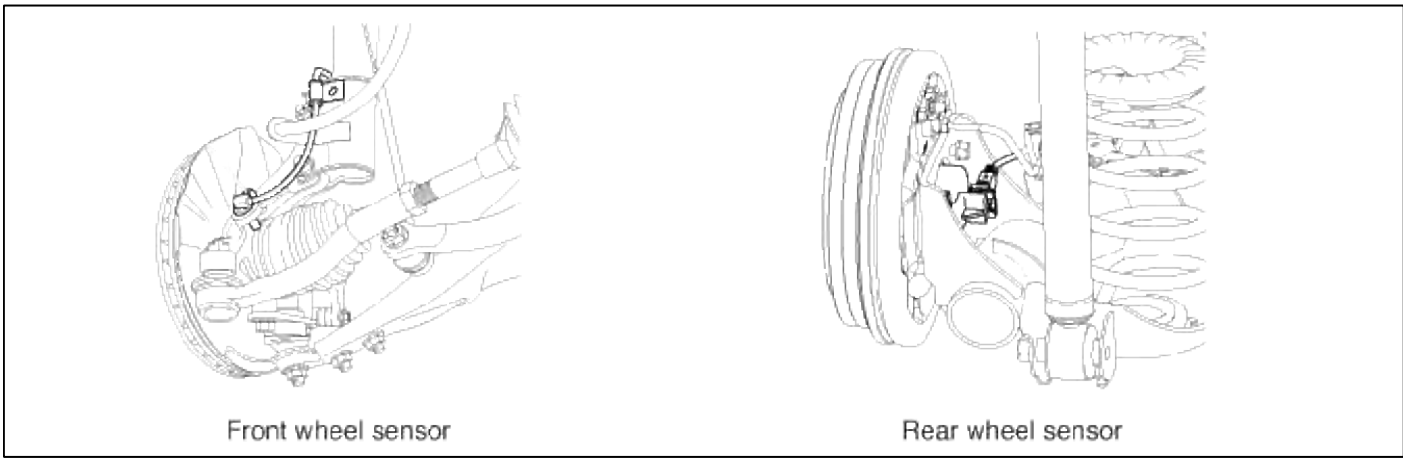
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1206

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise tolerance. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor circuit continuously. If the sensor signal current is continuously out of the specified range for 140 msec, then the HECU determines that the circuit is open/short, and sets this code. Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Current Monitoring	• Open or short of Wheel speed sensor circuit • Faulty Wheel speed sensor • Faulty HECU
Detect Mode	• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	• When the sensor signal current is continuously out of the specified range of 4 mA ± 10% ~ 22 mA ± 10% for 140msec.	
Fail Safe	• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle 1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

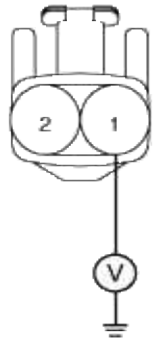
Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

1. Ignition "ON" & Engine "OFF".

2. Measure voltage between terminal "1" of the wheel speed sensor harness connector and chassis ground.

Specification : Approx. B+



1. Wheel speed sensor(power)
2. Wheel speed sensor(signal)

3. Is the measured voltage within specifications?

YES

Go to "Signal Circuit Inspection" procedure.

NO

Check for open or short to GND in wheel speed sensor harness between terminal 1 of the wheel speed sensor harness connector and terminal of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

If OK, go to "Component Inspection" procedure.

DTC	HECU connector harness terminal
DTC C1200	1 - FL
DTC C1203	19 - FR
DTC C1206	5 - RL
DTC C1209	23 - RR

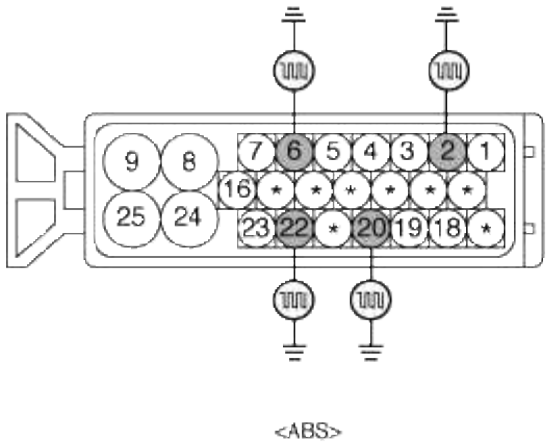
Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Turn the wheel slowly with hand.

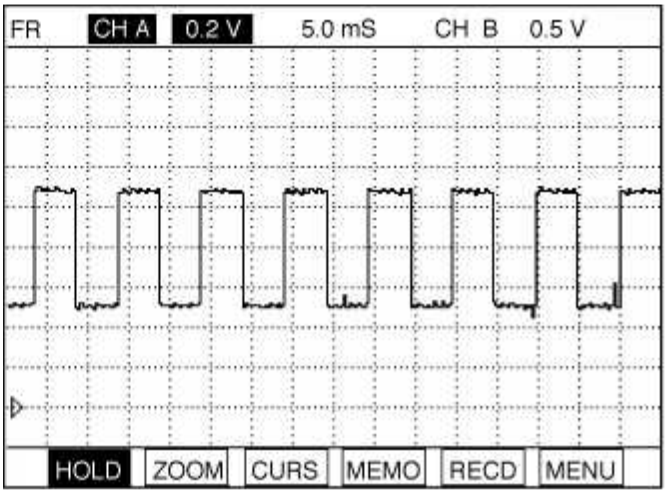
3. Measure voltage between terminal "2, 20, 6, 22" of the HECU harness connector and chassis ground.

Specification : Approx. High : 1.18 ~ 1.68 V , Low : 0.59 ~ 0.84 V

DTC	HECU connector harness terminal
DTC C1200	2 - FL
DTC C1203	20 - FR
DTC C1206	6 - RL
DTC C1209	22 - RR



<ABS>



4. Is the measured voltage within specifications?

YES

Go to "Component Inspection" procedure.

NO

Check for open or short to GND in wheel speed sensor harness between terminal "2" of the wheel speed sensor harness connector and terminal "2, 20, 6, 22" of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

If OK, substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by open or short of wheel speed sensor harness, faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect Scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a Scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more)
4. Are any DTCs present ?

YES

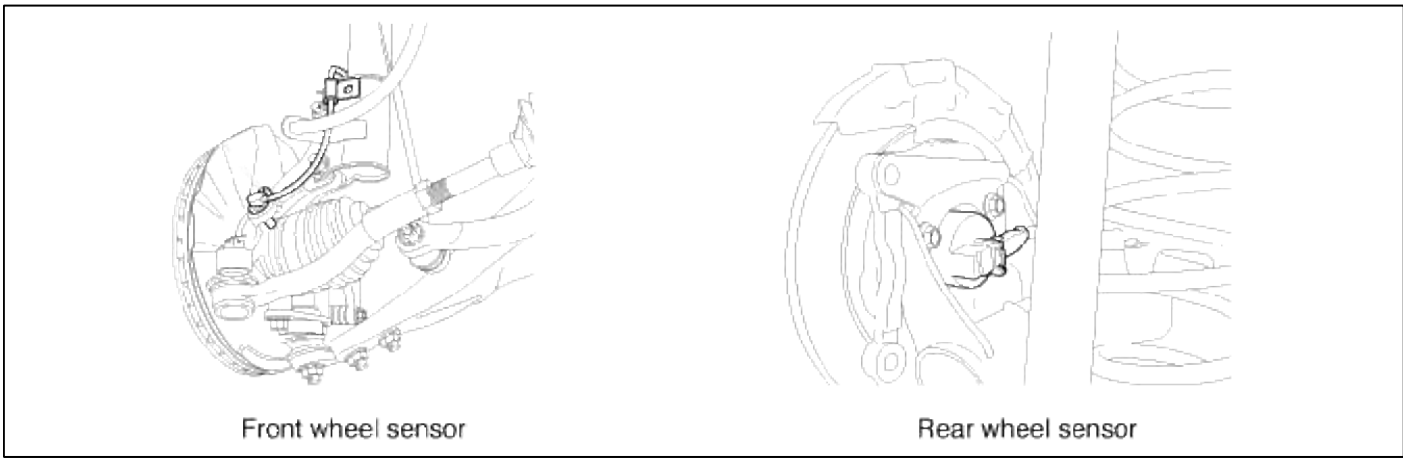
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1207

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise charireristic. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor signal continuously. This code is set if an abnormal speed change ratio is detected while the vehicle speed is more than 1.24 mph . Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Signal monitoring	

Detect Mode		• Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	Case1(Wrong Exciter)	• Max. wheel velocity exceeds 12.4 mph and the wheel velocity is 40 % of max. wheel velocity. if this condition is lasted for 2 minutes. • Max. wheel velocity exceeds 24.8 mph and the wheel velocity is 60 % of max. wheel velocity. if this condition is lasted for 2 minutes.	• Improper installation of wheel speed sensor • Abnormal Rotor and wheel bearing • Faulty Wheel speed sensor • Faulty HECU
	Case2 (Speed Jump)	• Controller counts the number of the wheel acceleration of 100 g[(15.5 mph) for 7 ms]. When the numbers at one wheel exceed 56 times, or When the numbers at more two wheels exceed 5 times, controller recognize the failure. • Controller counts the number of the wheel acceleration of 40 g[(10.87 mph) for 7 ms]. When the numbers at one wheel exceed 126 times, or When the numbers at more two wheels exceed 20 times, controller recognize the failure. • Controller counts the number of the wheel deceleration of -100 g[(-15.5 mph) for 7 ms]. When the numbers at each wheel exceed 56 times, controller recognize the failure. • The wheel deceleration of -100 g[(-15.5 mph) for 7 ms] causes the controller to start monitoring this failure and to compare the wheel velocity with the vehicle velocity from next cycle. When its difference of -100 g is continued for more than 140 msec, controller recognize the failure. • n case that any sensor failure at other wheel was already detected, When the numbers of 100 g at each wheel exceed 5 times, or When the numbers of 40 g at each wheel exceed 20 times, controller recognize the failure. - The counter of speed jump is cleared every 30 min.	
		• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle	

Fail Safe	1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC)
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more
4. Monitor the "Wheel speed sensor" parameter on the Scantool.

Specification : Approx. 24.8 mph or more(24 mph or more)

5. Is parameter displayed within specifications?

YES

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Repair or replace as necessary and then go to "Component Inspection" procedure.

NO

Check for improper installation of wheel speed sensor. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Check for damage of rotor teeth or wheel bearing. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

If OK, Go to "Component Inspection" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more(24 mph or more))
4. Are any DTCs present ?

YES

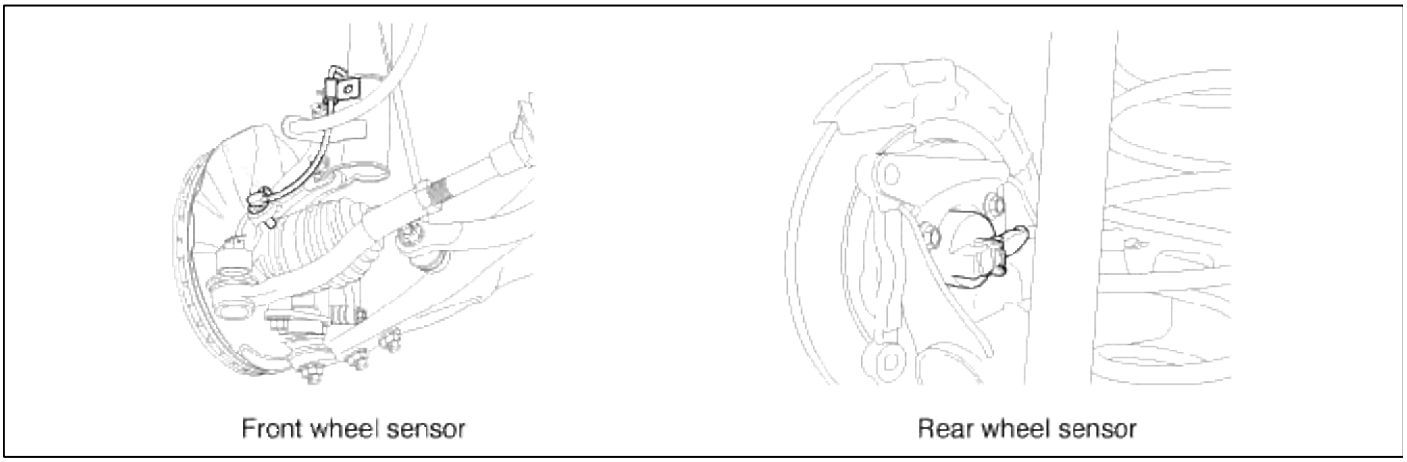
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1208

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise charireristic. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor signal continuously. This code is set when the sensor air gap is out of specified range or when the ABS control cycle is continued abnormally. The HECU checks for air gap malfunctioning by monitoring the sensor signal at speeds between 1.24 mph to 6.21 mph. Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Signal monitoring	

Case1 (Large Air-Gap)	Detect Mode	• Outside the ABS control cycle • Diagnosis mode • Failure mode	• Improper installation of wheel speed sensor • Abnormal Rotor and wheel bearing • Faulty Wheel speed sensor • Faulty HECU
	Enable Conditions	• When the minimum wheel velocity is 1.24 mph and the velocity of other wheels exceed 6.21 mph with the acceleration of < 0.4g , the controller start comparing the velocity of other wheels except the min. wheel. if their difference below 2.49 mph is continued for 140 msec, Otherwise, if their difference beyond 2.49 mph or > 0.4 g is continued for 2 minutes. • In < 0.4 g, when the velocity of more two wheels is 1.24 mph and the max. wheel velocity exceeds 6.21 mph, the condition is continued for 20 sec. Otherwise, In >0.4 g, the condition is 2 minutes. • After velocity of 4 wheel exceeds 6.21 mph, when velocity of 1 wheel or 2 wheel is 1.24 mph and difference of other 2 wheel velocity is less than 2.49 mph under that those velocity is more than 6.21 mph, if that conditions are continued for 12 seconds. - This monitoring is performed for the period that the minimum velocity rises from 1.24 mph to 6.21 mph.	
Case2(long term ABS mode)	Detect Mode	• Inside the ABS control cycle	
	Enable Conditions	• During the ABS control cycle, if the wheel velocity of 1.24 mph is lasted for more than 12 sec. • If the ABS control cycle is continued for more than 36 sec.	
		• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle	

Fail Safe	1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC)
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more
4. Monitor the "Wheel speed sensor" parameter on the Scantool.

Specification : Approx. 6.21 mph or more

5. Is parameter displayed within specifications?

YES

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Repair or replace as necessary and then go to "Component Inspection" procedure.

NO

Check for improper installation of wheel speed sensor. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Check for damage of rotor teeth or wheel bearing. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

If OK, Go to "Component Inspection" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more).
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more))
4. Are any DTCs present ?

YES

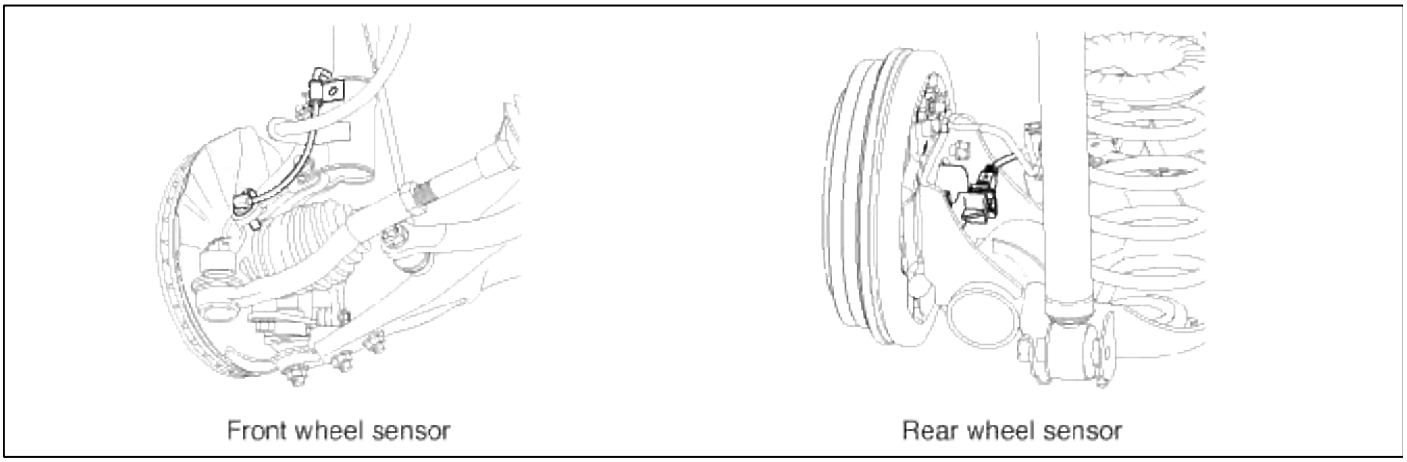
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1209

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise tolerance. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor circuit continuously. If the sensor signal current is continuously out of the specified range for 140 msec, then the HECU determines that the circuit is open/short, and sets this code. Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Current Monitoring	• Open or short of Wheel speed sensor circuit • Faulty Wheel speed sensor • Faulty HECU
Detect Mode	• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	• When the sensor signal current is continuously out of the specified range of 4 mA ± 10% ~ 22 mA ± 10% for 140msec.	
Fail Safe	• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle 1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

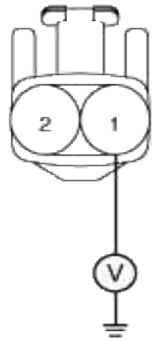
Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

1. Ignition "ON" & Engine "OFF".

2. Measure voltage between terminal "1" of the wheel speed sensor harness connector and chassis ground.

Specification : Approx. B+



1. Wheel speed sensor(power)
2. Wheel speed sensor(signal)

3. Is the measured voltage within specifications?

YES

Go to "Signal Circuit Inspection" procedure.

NO

Check for open or short to GND in wheel speed sensor harness between terminal 1 of the wheel speed sensor harness connector and terminal of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

If OK, go to "Component Inspection" procedure.

DTC	HECU connector harness terminal
DTC C1200	1 - FL
DTC C1203	19 - FR
DTC C1206	5 - RL
DTC C1209	23 - RR

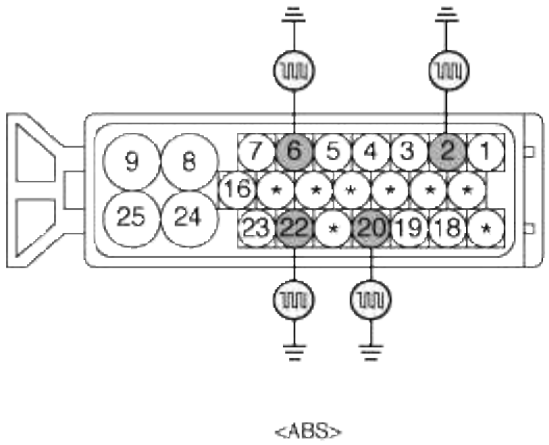
Signal Circuit Inspection

1. Ignition "ON" & Engine "OFF".
2. Turn the wheel slowly with hand.

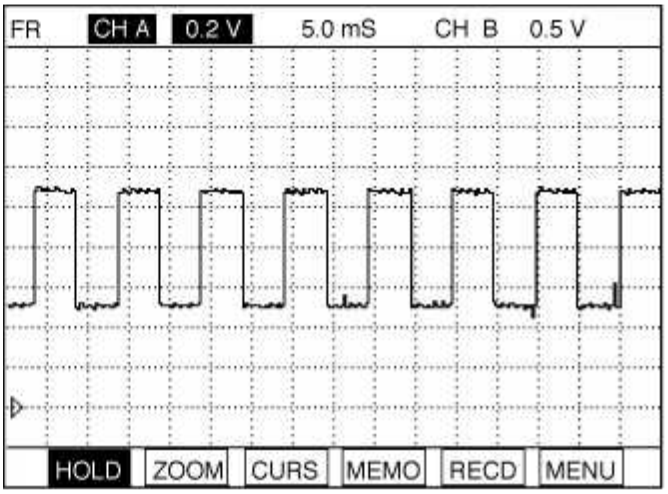
3. Measure voltage between terminal "2, 20, 6, 22" of the HECU harness connector and chassis ground.

Specification : Approx. High : 1.18 ~ 1.68 V , Low : 0.59 ~ 0.84 V

DTC	HECU connector harness terminal
DTC C1200	2 - FL
DTC C1203	20 - FR
DTC C1206	6 - RL
DTC C1209	22 - RR



<ABS>



4. Is the measured voltage within specifications?

YES

Go to "Component Inspection" procedure.

NO

Check for open or short to GND in wheel speed sensor harness between terminal "2" of the wheel speed sensor harness connector and terminal "2, 20, 6, 22" of the HECU harness connector. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

If OK, substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by open or short of wheel speed sensor harness, faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect Scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a Scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more)
4. Are any DTCs present ?

YES

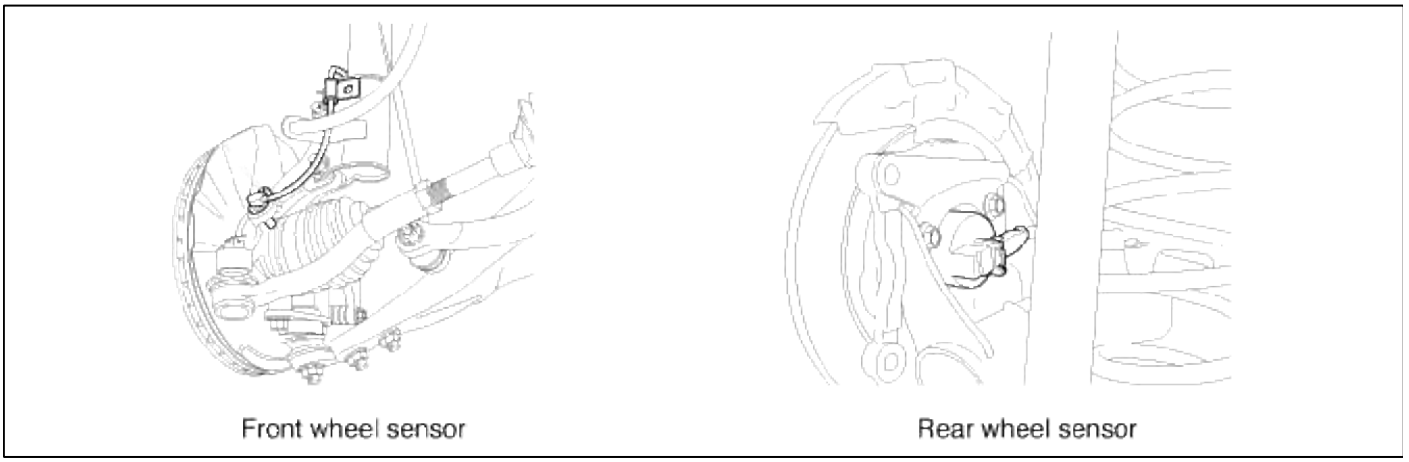
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1210

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise charieristic. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor signal continuously. This code is set if an abnormal speed change ratio is detected while the vehicle speed is more than 1.24 mph . Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Signal monitoring	

Detect Mode		• Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	Case1(Wrong Exciter)	• Max. wheel velocity exceeds 12.4 mph and the wheel velocity is 40 % of max. wheel velocity. if this condition is lasted for 2 minutes. • Max. wheel velocity exceeds 24.8 mph and the wheel velocity is 60 % of max. wheel velocity. if this condition is lasted for 2 minutes.	• Improper installation of wheel speed sensor • Abnormal Rotor and wheel bearing • Faulty Wheel speed sensor • Faulty HECU
	Case2 (Speed Jump)	• Controller counts the number of the wheel acceleration of 100 g[(15.5 mph) for 7 ms]. When the numbers at one wheel exceed 56 times, or When the numbers at more two wheels exceed 5 times, controller recognize the failure. • Controller counts the number of the wheel acceleration of 40 g[(10.87 mph) for 7 ms]. When the numbers at one wheel exceed 126 times, or When the numbers at more two wheels exceed 20 times, controller recognize the failure. • Controller counts the number of the wheel deceleration of -100 g[(-15.5 mph) for 7 ms]. When the numbers at each wheel exceed 56 times, controller recognize the failure. • The wheel deceleration of -100 g[(-15.5 mph) for 7 ms] causes the controller to start monitoring this failure and to compare the wheel velocity with the vehicle velocity from next cycle. When its difference of -100 g is continued for more than 140 msec, controller recognize the failure. • n case that any sensor failure at other wheel was already detected, When the numbers of 100 g at each wheel exceed 5 times, or When the numbers of 40 g at each wheel exceed 20 times, controller recognize the failure. - The counter of speed jump is cleared every 30 min.	
		• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle	

Fail Safe	1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC)
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more
4. Monitor the "Wheel speed sensor" parameter on the Scantool.

Specification : Approx. 24.8 mph or more(24 mph or more)

5. Is parameter displayed within specifications?

YES

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Repair or replace as necessary and then go to "Component Inspection" procedure.

NO

Check for improper installation of wheel speed sensor. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Check for damage of rotor teeth or wheel bearing. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

If OK, Go to "Component Inspection" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 24.8 mph or more(24 mph or more))
4. Are any DTCs present ?

YES

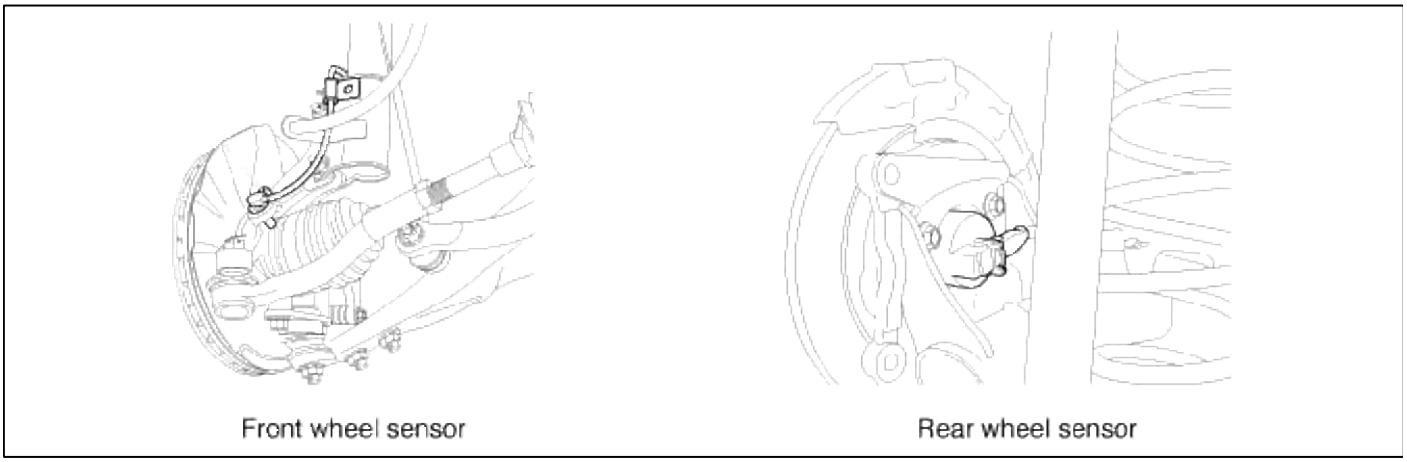
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1211

Component Location



General Description

The wheel speed sensor is the essential component the ABS ECU uses to calculate vehicle speed and to determine whether wheel lock occurs. For example, rear wheel speed signal is used as a referecnce value, for vehicle speed, in front wheel drive vehicles, and if a difference between front and rear wheel speed occurs, then ABS control is performed. Wheel speed sensor is active hall-sensor type and good at temperature and noise charireristic. Digital wave is produced as tone wheel rotate according as hall sensor principle. Frequency of duty wave is changed in proportion to rotation of tone wheel and HECU calculate vehicle speed by this frequency.

DTC Description

The ABS ECU monitors the wheel speed sensor signal continuously. This code is set when the sensor air gap is out of specified range or when the ABS control cycle is continued abnormally. The HECU checks for air gap malfunctioning by monitoring the sensor signal at speeds between 1.24 mph to 6.21 mph. Warning lamp is turned OFF if the detected fault is not more than when the IG KEY is turned to ON again, and wheel speeds are more than 6.21 mph.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Signal monitoring	

Case1 (Large Air-Gap)	Detect Mode	• Outside the ABS control cycle • Diagnosis mode • Failure mode	• Improper installation of wheel speed sensor • Abnormal Rotor and wheel bearing • Faulty Wheel speed sensor • Faulty HECU
	Enable Conditions	• When the minimum wheel velocity is 1.24 mph and the velocity of other wheels exceed 6.21 mph with the acceleration of < 0.4g , the controller start comparing the velocity of other wheels except the min. wheel. if their difference below 2.49 mph is continued for 140 msec, Otherwise, if their difference beyond 2.49 mph or > 0.4 g is continued for 2 minutes. • In < 0.4 g, when the velocity of more two wheels is 1.24 mph and the max. wheel velocity exceeds 6.21 mph, the condition is continued for 20 sec. Otherwise, In >0.4 g, the condition is 2 minutes. • After velocity of 4 wheel exceeds 6.21 mph, when velocity of 1 wheel or 2 wheel is 1.24 mph and difference of other 2 wheel velocity is less than 2.49 mph under that those velocity is more than 6.21 mph, if that conditions are continued for 12 seconds. - This monitoring is performed for the period that the minimum velocity rises from 1.24 mph to 6.21 mph.	
Case2(long term ABS mode)	Detect Mode	• Inside the ABS control cycle	
	Enable Conditions	• During the ABS control cycle, if the wheel velocity of 1.24 mph is lasted for more than 12 sec. • If the ABS control cycle is continued for more than 36 sec.	
		• Sensor failure outside of the ABS control cycle 1. Only one wheel failure : Only the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated 2. More than two wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated. • Sensor failure inside the ABS control cycle	

Fail Safe	1. One front wheel failure : Inhibit the ABS control of the failed-wheel and maintain the ABS control of normal wheel. After the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 2. Failure at one rear wheel : ABS control of both front wheels are inhibited and the pressure of both rear wheels are decreased. After the controller completes the ABS control, the ABS functions are inhibited. The ABS warning lamps are activated and the EBD warning lamp is not activated. 3. More than 2 wheels failure : System down. The ABS/EBD functions are inhibited. The valve relay and all solenoids are prevented from being switched on. The ABS/EBD warning lamps are activated.	

Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC)
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 6.21 mph or more
4. Monitor the "Wheel speed sensor" parameter on the Scantool.

Specification : Approx. 6.21 mph or more

5. Is parameter displayed within specifications?

YES

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Repair or replace as necessary and then go to "Component Inspection" procedure.

NO

Check for improper installation of wheel speed sensor. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Check for damage of rotor teeth or wheel bearing. If NG, repair as necessary and then go to "Verification of vehicle Repair" procedure.

Substitute with a known-good Wheel speed sensor and check for proper operation. If problem is corrected, replace Wheel speed sensor and then go to "Verification of Vehicle Repair" procedure.

If OK, Go to "Component Inspection" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more).
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty wheel speed sensor and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more))
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1212

General Description

The TPMS has an automatic sensor learn function.
This function is to registe sensor IDs automatically during driving. (Typical time at driving continuously over 12.4mph (20kph) to learn a new sensor is up to 20minutes.
Therefore a speed input signal is used for this function.

DTC Description

This DTC indicates that the speed input1 is open or short circuited.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Two speed input check	• Speed input 1 failure • Shorted/open speed input
Enable conditions	• Speed input1 problem	
Threshold value	• 5 consecutive seconds of speed sensor input2 speed >= 20kph while speed sensor input1 speed < 10kph.	
Diagnosis time	• < 10s	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition.Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
3. Has a problem been found?

YES

Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

NO

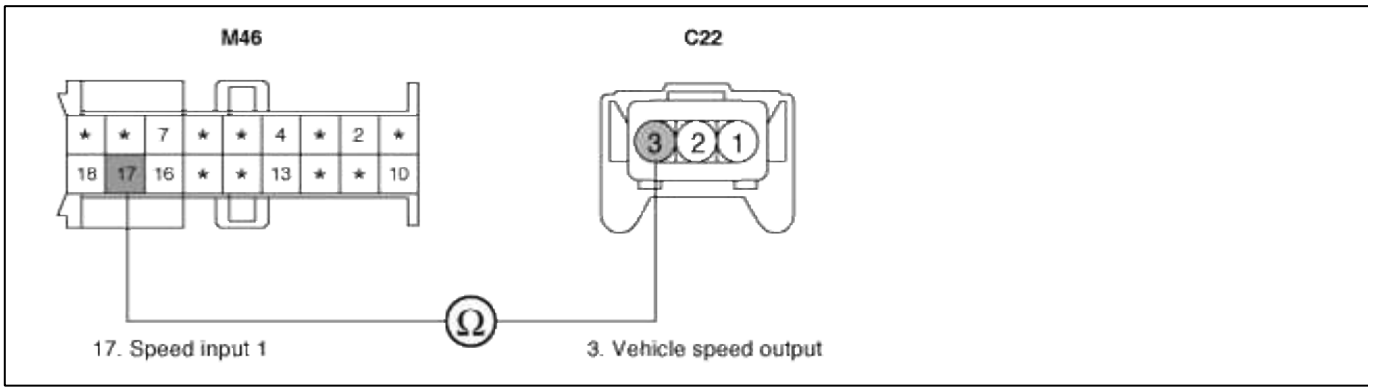
Go to "Signal Circuit Inspection" procedure.

Signal Circuit Inspection

1. Ignition "OFF" & Engine "OFF".
2. Disconnect TPMS connector and vehicle speed sensor connector.

3. Measure resistance between "17" terminal of the TPMS harness connector and "3" terminal of the vehicle speed sensor harness connector.

Specification : 0 Ω



4. Is the measured resistance within specifications?

YES

Check for short circuit between TPMS harness connector and vehicle speed sensor harness connector.
If harness condition is OK, replace vehicle speed sensor and then go to "Verification of Vehicle Repair" procedure.

NO

Check for open circuit between TPMS harness connector and vehicle speed sensor harness connector.
Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1240

General Description

The TPMS has a automatic sensor learn function.
This function is to register sensor ID automatically during driving. (Typical time at driving continuously over 12.4mph (20kph) to learn a new sensor is up to 20minutes.)
Therefore a speed input signal is used for this function.

DTC Description

This DTC indicates that the speed input 2 is open or short circuited.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Check speed signal	• Speed input 2 failure • Shorted/open speed input
Enable conditions	• Vehicle is driving under more than 20 km/h.	
Threshold value	• Speed Sensor input 1 speed > 20 km/h while Speed Sensor input 2 speed < 10 km/h. • Invalid Speed Sensor input 2 is measured.	
Diagnosis time	• 20 seconds	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition.Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
3. Has a problem been found?

YES

Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

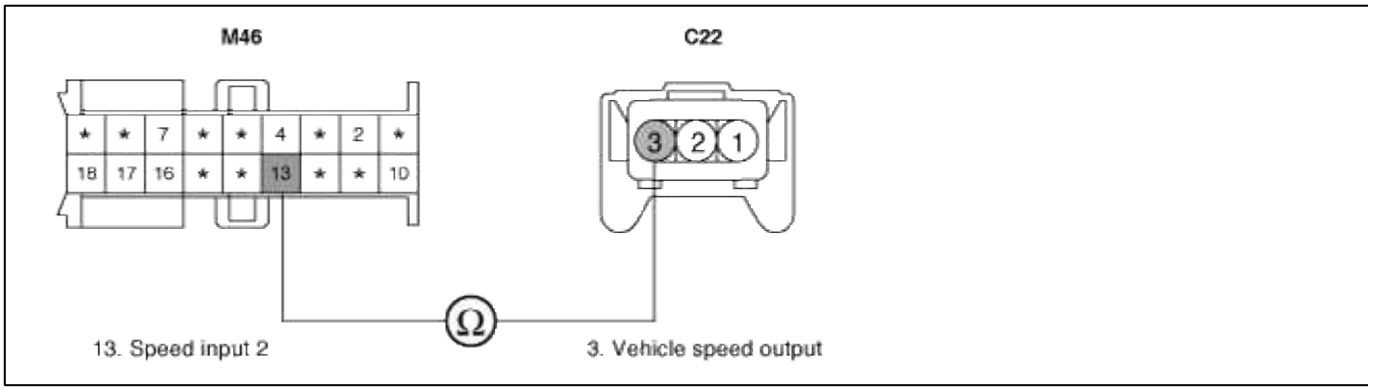
NO

Go to "Signal Circuit Inspection" procedure.

Signal Circuit Inspection

1. Ignition "OFF" & Engine "OFF".
2. Disconnect TPMS connector and vehicle speed sensor connector.
3. Measure resistance between "13" terminal of the TPMS harness connector and "3" terminal of the vehicle speed sensor harness connector.

Specification : 0 Ω



4. Is the measured resistance within specifications?

YES

Check for short circuit between TPMS harness connector and vehicle speed sensor harness connector.
If harness condition is OK, replace vehicle speed sensor and then go to "Verification of Vehicle Repair" procedure.

NO

Check for open circuit between TPMS harness connector and vehicle speed sensor harness connector.
Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C1604

Component Location



General Description

The HECU is composed of an ECU (Electronic Control Unit) and a HCU(Hydraulic Control Unit) , so the HECU hardware includes all solenoid valves inside the unit as well as the ECU.

DTC Description

The HECU monitors the operation of the IC components such as memory, register, A/D converter and so on. The HECU sets this code when the EEPROM data read by the master processor is different from prior data written, or when the master/slave processor detects abnormal operation in RAM, Status Register, Interrupt, Timer, A/D converter or cycle time.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Internal monitoring	• Faulty HECU
Detect Mode	• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode • Failure mode	
Enable Conditions	• When the MCU can't erase or write a data of the EEPROM. • When the master/slave processor detects abnormal operation in RAM, ROM, INTERRUPT, TIMER, A/D CONVERTER, CYCLE TIME.	
Fail Safe	• System down. The ABS/EBD functions are inhibited. - The valve relay and all solenoids are prevented from being switched on. • The ABS/EBD warning lamps are activated.	

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C2112

Component Location



General Description

The ABS ECU supplies battery power to all solonid valves by the way of a valve relay which is controlled by the Electronic Control Unit(ECU). The valve relay and all solenoid valves are installed inside the HECU (Hydraulic and Electronic Control Unit).

DTC Description

ABS ECU monitors voltage of the valve relay to check if ABS ECU can perform ABS control normally. When the valve relay is switched to ON, the HECU will set this code if the solenoid drive voltage is below permissible voltage ranges for a period of time. When the valve relay is switched to OFF, the HECU sets this code if the solenoid drive voltage is over the permissible voltage range for a period of time.

DTC Detecting Condition

Item		Detecting Condition	Possible cause
DTC Strategy		• Battery Voltage Monitoring	• Open or short of power supply circuit (ABS1) • Faulty HECU
Case1 (Open)	Detect Mode	• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode	
	Enable Conditions	• If the valve relay is switched on and the reference voltage of valve relay < 5 ± 0.5 V continuously for 56 ms, the failure is detected.	
Case2(Short or Leakage)	Detect Mode	• Initial Check • Failure mode	
	Enable Conditions	• If the valve relay is switched off and Vvr > 6 ± 0.5 V or Vvr < 2.5 ± 0.5 V continuously for 56 ms, the failure is detected.	
Fail Safe		• System down. The ABS/EBD functions are inhibited. - The valve relay and all solenoids are prevented from being switched on. • The ABS/EBD warning lamps are activated.	

Monitor Actuation Test

1. Connect scantool to Data Link Connector(DLC)
2. Ignition "ON" & Engine "OFF".
3. Select the "Actuation Test" mode on the scantool.
4. Inspect opearating status of all valves with Actuation Test.

Specification : It's normal if operating sound is heard.

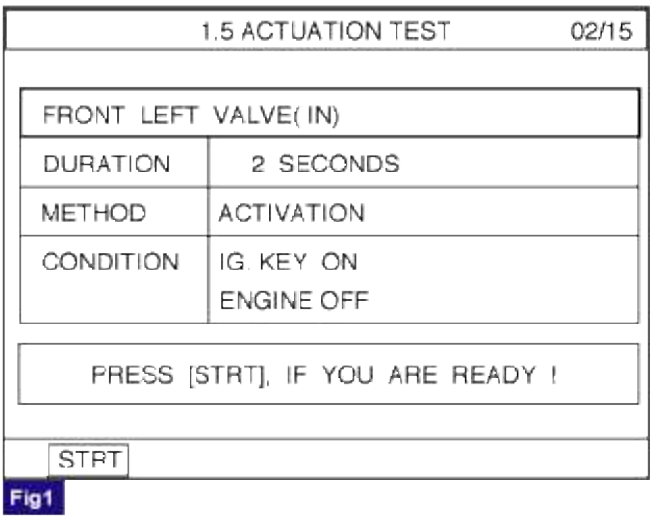


Fig 1.Test Condition : Ignition "ON" & Engine "OFF".
Ex. Actuation Test on Front left valve (in) .

5. Do all valves operate normally?

YES

Fault is intermittent caused by poor connection in power harness (ABS1) and/or HECU's connector or was repaired and HECU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to next step.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

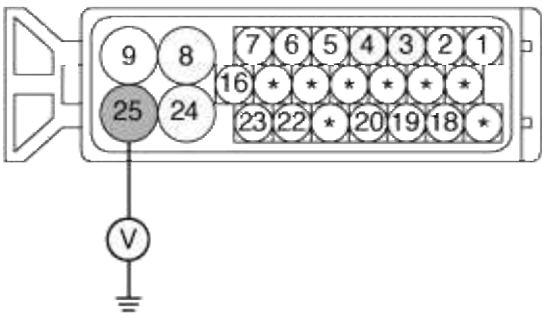
Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

1. Ignition "OFF"
2. Disconnect HECU connector.
3. Ignition "ON" & Engine "OFF".

4. Measure voltage between terminal "25" of the HECU harness connector and chassis ground.

Specification : Approx. B+



<ABS>
25. Battery (ABS1)

5. Is the measured voltage within specifications?

YES

Go to "Ground Circuit Inspection" procedure.

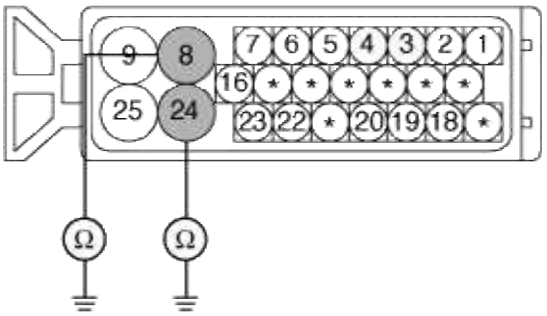
NO

Check for open or short in power harness between battery terminal(+) and terminal "25 " of the HECU harness connector. Check for open or blown 40 A ABS1 fuse referring to "Circuit Diagram". Repair as necessary and then go to "Verification of vehicle Repair" procedure.

Ground Circuit Inspection

1. Ignition "OFF".
2. Disconnect HECU connector.
3. Measure resistance between terminal "8, 24" of the HECU harness connector and chassis ground.

Specification : Approx. below 1Ω



<ABS>
8. Ground
24. Ground

4. Is the measured resistance within specifications?

YES

Go to "Component Inspection" procedure.

NO

Check for damaged harness and poor connection between terminal "8, 24(ESP : 16, 47)" of the HECU harness connector and chassis ground. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".

3. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by open or short of power harness and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information.
4. Are any DTCs present ?

YES

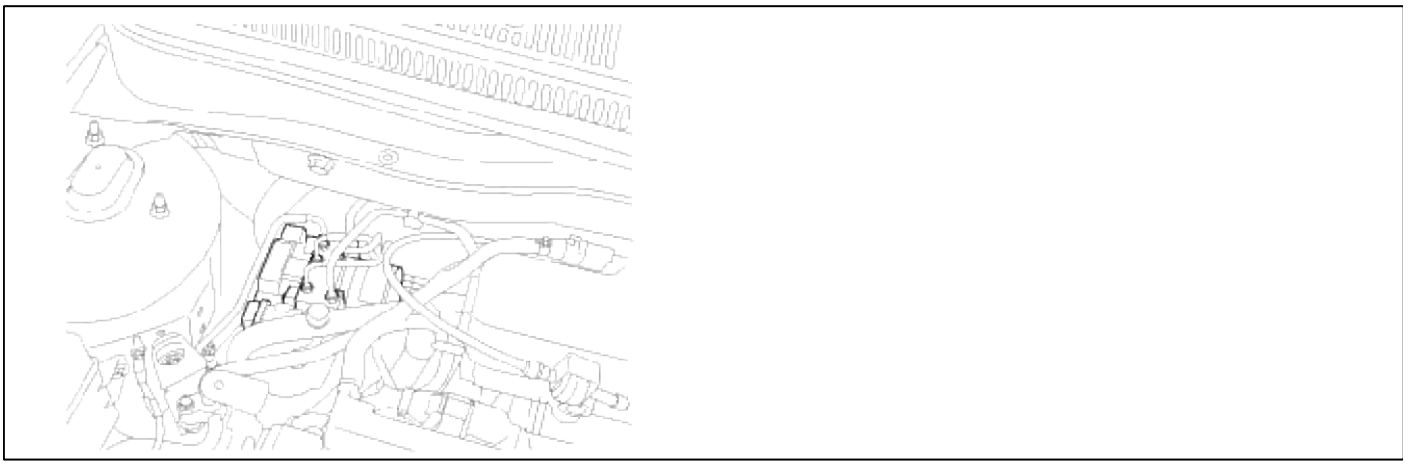
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C2380

Component Location



General Description

The ABS HECU is composed of an ECU (Electronic Control Unit) and a HCU(Hydraulic Control Unit), so the HECU hardware includes all solenoid valves inside the unit as well as the ECU. Solenoid valves are switched to ON, OFF by HECU when the ABS is activated. Solenoid valves function is to increase, decrease or maintain the hydrualic pressure supplied to a wheel cylinder.

DTC Description

The HECU monitors the operation of the valves by checking the drive circuit of the solenoid valves, and then sets this code when the unexpcted drive voltage is detected. For example, the HECU sets the DTC if an unexpected high drive voltage is detected when the valve relay is switched to OFF. (Or unexpected low voltage is detected when the solenoid valve drive TR is switched to ON).

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Internal monitoring	• Faulty HECU
Detect Mode	• Initial Check • Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode	
Enable Conditions	• If the valve relay is switched ON and corresponding solenoid driver OFF and the voltage of solenoid < 3.5 ± 0.5 V continuously for 56 ms, the failure is detected. • If the valve relay is switched ON and corresponding solenoid driver ON and the voltage of solenoid > 1.5 ± 0.5 V continuously for 56 ms, the failure is detected.	
Fail Safe	• System down. The ABS/EBD/TCS/ESP functions are inhibited. - The valve relay and all solenoids are prevented from being switched on. • The ABS/EBD/ESP warning lamps are activated.	

Component Inspection

1. Ignition "OFF".
2. Ignition "ON"
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 7.46 mph or more(7 mph or more)
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 7.46 mph or more)
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Brake System > Troubleshooting > C2402

Component Location



General Description

The ABS ECU supplies battery power to the electric motor by way of a motor relay which is controlled by the Electronic Control Unit(ECU). The electric motor pump supplies hydraulic pressure to all wheel brake calipers by operating the piston inside the pump.

DTC Description

The ABS ECU monitors the pump motor relay or fuse open, open or short in motor or motor lock and then sets this code if a malfunction is detected.

DTC Detecting Condition

Item		Detecting Condition	Possible cause
DTC Strategy		• Battery Voltage Monitoring	• Open or short of power supply circuit (ABS2) • Faulty HECU
Case1 (Motor Relay Open or Motor Short to GND)	Detect Mode	• Outside the ABS control cycle • Inside the ABS control cycle • Diagnosis mode	
	Enable Conditions	• If the motor relay is switched ON and motor voltage < (IGN voltage - 4 ± 0.5 V) continued for 56 msec, the failure is detected.	
Case2(Motor Open, Motor Short to BATT)	Detect Mode	• Initial Check • Outside the ABS control cycle • Diagnosis mode • Failure mode	
	Enable Conditions	• After 1.8 sec from the time that motor relay is switched OFF, the motor voltage > 4 ± 0.5 V continued for 1.8 sec, the failure is detected.	
Case3 (Motor Lock)	Detect Mode	• Outside the ABS control cycle	
	Enable Conditions	• After motor relay is switched OFF, motor voltage is measured. If the time which motor voltage > 1 ± 0.1 V is less than evaluation time, recheck is performed again for a maximum of three times. When the motor voltage is not normal even on the third recheck, the controller recognizes it as failure.	

Case4 (Motor Fuse Open)	Detect Mode	• Initial Check • Outside the ABS control cycle • Diagnosis mode • Failure mode
	Enable Conditions	• If the motor relay is switched OFF and motor power supply voltage < 4 ± 0.5 V continued for 1 sec, the failure is detected.
Fail Safe		• The ABS functions are inhibited. • The ABS warning lamps are activated and the EBD warning lamp is not activated. • Motor failure during the ABS control cycle (Case 1, 4) :Inhibit the ABS control of front wheels, allow the ABS control of rear wheels, and ABS warning lamps are switched on at the end of ABS control.

Monitor Actuation Test

1. Connect scantool to Data Link Connector(DLC)
2. Ignition "ON" & Engine "OFF".
3. Select the "Actuation Test" mode on the scantool.
4. Inspect opearating status of all valves with Actuation Test.

Specification : It's normal if operating sound is heard.

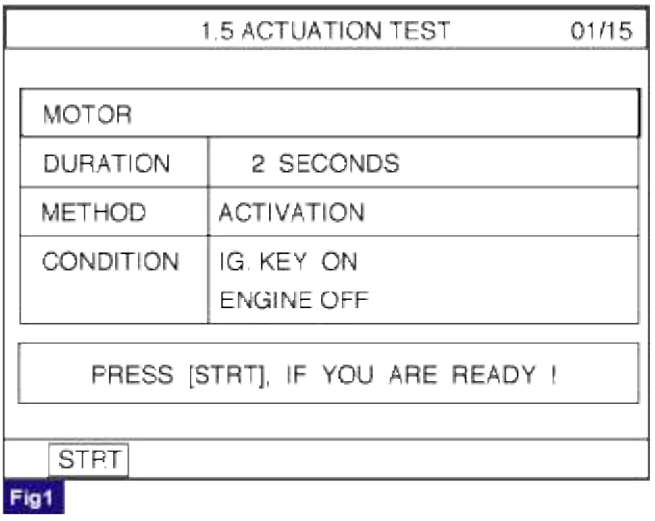


Fig 1) Test Condition : Ignition "ON" & Engine "OFF".
Ex) Actuation Test on Motor

5. Does the motor operate normally?

YES

Fault is intermittent caused by poor connection in power harness (ABS1) and/or HECU's connector or was repaired and HECU memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness(es) and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

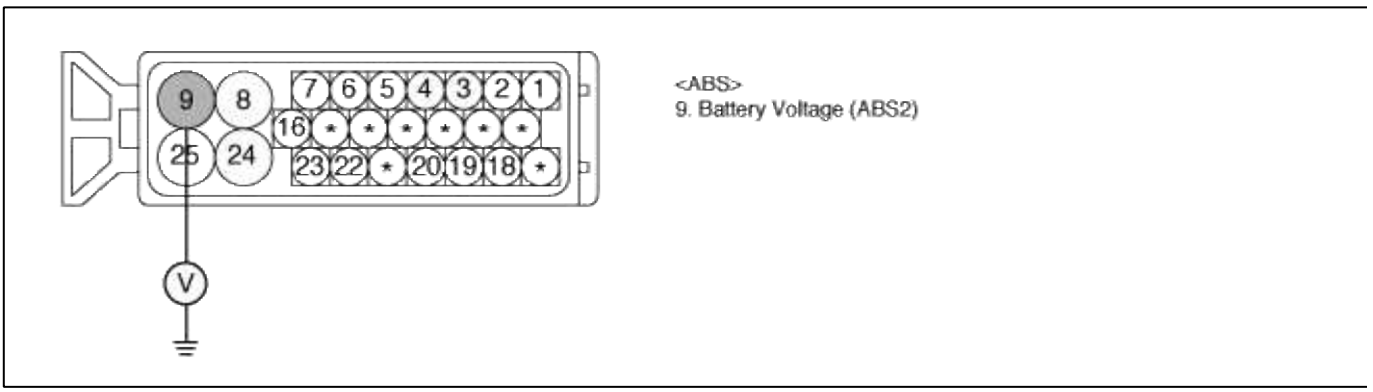
NO

Go to "Power Circuit Inspection" procedure.

Power Circuit Inspection

1. Ignition "OFF"
2. Disconnect HECU connector.
3. Ignition "ON" & Engine "OFF".
4. Measure voltage between terminal "9" of the HECU harness connector and chassis ground.

Specification : Approx. B+



5. Is the measured voltage within specifications?

YES

Go to "Ground Circuit Inspection" procedure.

NO

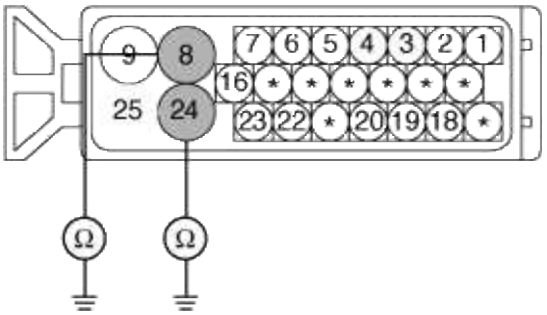
Check for open or short in power harness between battery terminal(+) and terminal "9" of the HECU harness connector. Check for open or blown 40 A ABS2 fuse referring to "Circuit Diagram". Repair as necessary and then go to "Verification of vehicle Repair" procedure

Ground Circuit Inspection

1. Ignition "OFF".

2. Check for open or short in power harness between battery terminal(+) and terminal "9" of the HECU harness connector. Check for open or blown 40A ABS2 fuse referring to "Circuit Diagram". Repair as necessary and then go to "Verification of vehicle Repair" procedure.

Specification : Approx. below 1Ω



<ABS>
8. Ground
24. Ground

3. Is the measured resistance within specifications?

YES

Go to "Component Inspection" procedure.

NO

Check for damaged harness and poor connection between terminal "8, 24" of the HECU harness connector and chassis ground. Repair as necessary and then go to "Verification of vehicle Repair" procedure.

Component Inspection

1. Ignition "OFF".
2. Engine "ON".
3. Start and drive vehicle in gear and maintain vehicle speed is approx. 7.46 or more
4. Does warning lamp remain On?

YES

Substitute with a known-good HECU and check for proper operation. If problem is corrected, replace HECU and then go to "Verification of Vehicle Repair" procedure.

NO

Fault is intermittent caused by open or short of power harness (ABS2) and/or faulty HECU or was repaired and HECU memory was not cleared. Go to the applicable troubleshooting procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Using a scantool, Clear DTC.
3. Operate the vehicle within DTC Detecting Condition in General Information. (Start and drive vehicle in gear and maintain vehicle speed is approx. 10 km/h or more(6 mph or more))
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

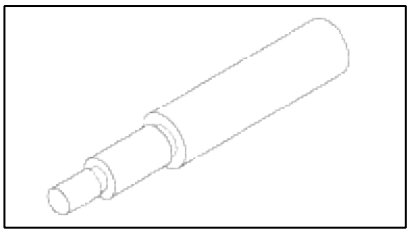
NO

System performing to specification at this time.

ACCENT(MC) > 2008 > G 1.6 DOHC > Clutch System

Clutch System > General Information > Special Service Tools

SPECIAL SERVICE TOOLS

Tool (Number and name)	Illustration	Use
09411-25000 Clutch disc guide		Installation of the clutch disc.

Clutch System > General Information > Troubleshooting

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	Damaged pilot bushing	Replace

	when the car suddenly rolled up with the clutch partially engaged		
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
		Insufficient lubrication of the front bearing retainer	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

Clutch System > General Information > Specifications

SPECIFICATIONS

Engine type	G4ED(1.6)
Clutch operation method	Hydraulic type
Clutch disc Type Facing diameter (outside x inside)mm (in)	 Single dry with diaphragm 215 x 145 (8.5 x 5.7)
Clutch cover assembly Type	 Diaphragm spring strap
Clutch release cylinder * I.D. mm (in)	 20.64 (0.81)
Clutch master cylinder * I.D. mm(in)	 15.87 (0.62)

* I.D: Inside diameter

SERVICE STANDARD

Standard value Clutch disc thickness [When free] Clutch pedal height [Without carpet] Clutch pedal free play Clutch pedal stroke	 8.5 ~ 0.3 mm (0.335 ±0.012 in) 163.9 mm (6.45 in) 6 ~ 13 mm (0.24 ~ 0.51 in) 145 mm (5.7 in)
Limit Clutch disc rivet sink Diaphragm spring end height difference Clutch replease cylinder clearance to piston Clutch master cylinder clearance to piston	 1.1 mm (0.047 in) 0.5 mm (0.02 in) 0.15 mm (0.006 in) 0.15 mm (0.006 in)

TIGHTENING TORQUES

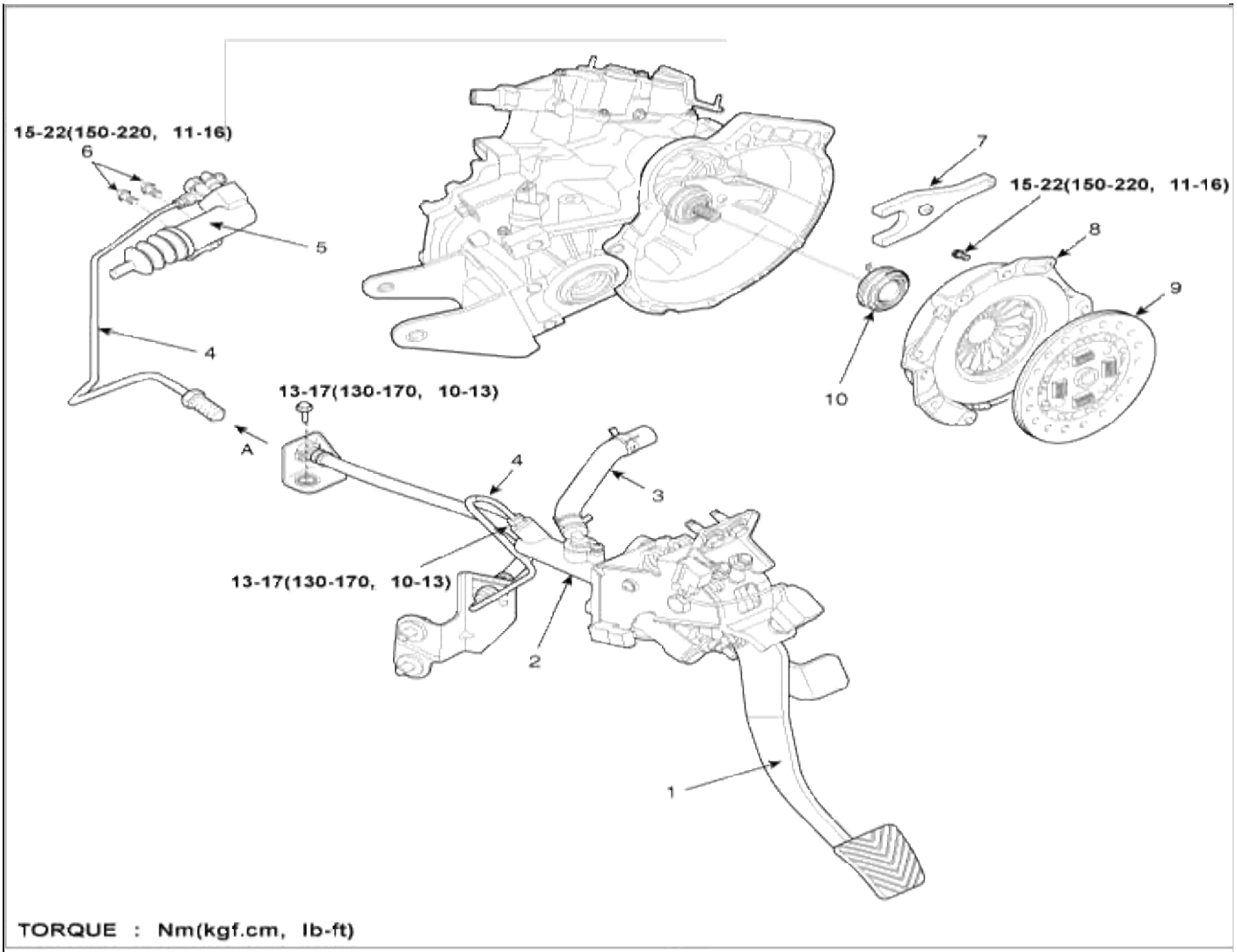
Item	Nm	kgf.cm	lb-ft
Clutch pedal to pedal support member (Clutch pedal bracket)	25 ~ 35	250 ~ 350	18.1~ 25.4
Clutch pedal support member to master cylinder	10 ~ 17	100 ~ 170	7.3 ~ 12.4
Clutch tube flare nut	13 ~ 17	130 ~ 170	9.4 ~ 12.4
Clutch tube bracket	9 ~ 14	90 ~ 140	6.5 ~ 10.2
Clutch release cylinder	15 ~ 22	150 ~ 220	10.9 ~ 16.0
Clutch release cylinder union bolt	25 ~ 40	250 ~ 400	18.1 ~ 29.1
Clutch cover assembly	15 ~ 22	150 ~ 220	10.9 ~ 16.0
Ignition lock switch nut	8 ~ 10	80 ~ 100	5.8 ~ .7.3
Master cylinder cap screw	2 ~ 3	20 ~ 30	1.4 ~ 2.2
Master cylinder push rod nut	9 ~ 14	90 ~ 140	6.5 ~ 10.2
Master cylinder nut	9 ~ 14	90 ~ 140	6.5 ~ 10.2

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

Clutch System > Clutch System > Components and Components Location

COMPONENTS



1. Clutch pedal
2. Master cylinder
3. Reserve hose
4. Clutch tube
5. Clutch release cylinder
6. Bolt
7. Clutch release fork
8. Clutch cover
9. Clutch disc
10. Clutch release bearing

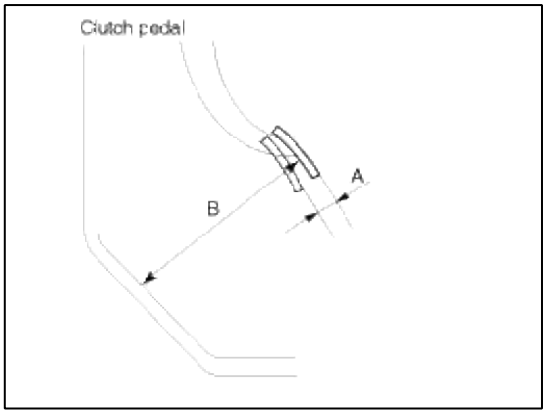
Clutch System > Clutch System > Repair procedures

SERVICE ADJUSTMENT PROCEDURE

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

1. Measure the clutch pedal height (from the face of the pedal pad to the floorboard) and the clutch pedal clevis pin play (measured at the face of the pedal pad.)

Standard value
(A) : 6 ~ 13 mm (0.24~0.51 in)
(B)163.9 mm (6.45 in)

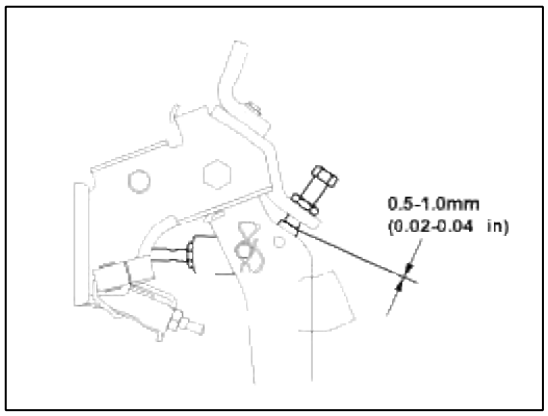


2. If the clutch pedal freeplay and height is not within the standard value range, adjust as follows:
   (1) Turn and adjust the bolt within the standard value, then secure by tightening the lock nut.

> **NOTE**
>
> 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.



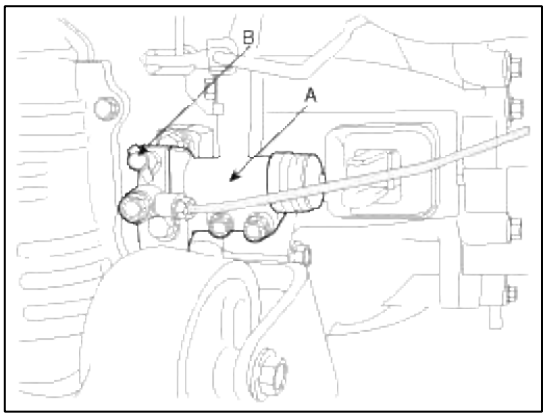
3. If the clutch pedal free play and the distance between the clutch pedal and the floor board when the clutch is disengaged, do not meet with the standard values, it may be the result of either air in the hydraulic system or a faulty clutch master cylinder. Bleed the air or disassemble and inspect the master cylinder or clutch.

BLEEDING

> **CAUTION**
>
> Use the specified fluid. Avoid mixing different brands of fluid.

Specified fluid: SAE J1703 (DOT 3 or DOT 4)

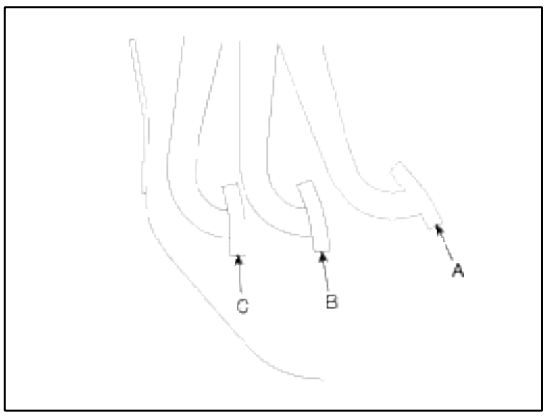
1. Loosen the bleeder screw(B) at the clutch release cylinder(A).



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.

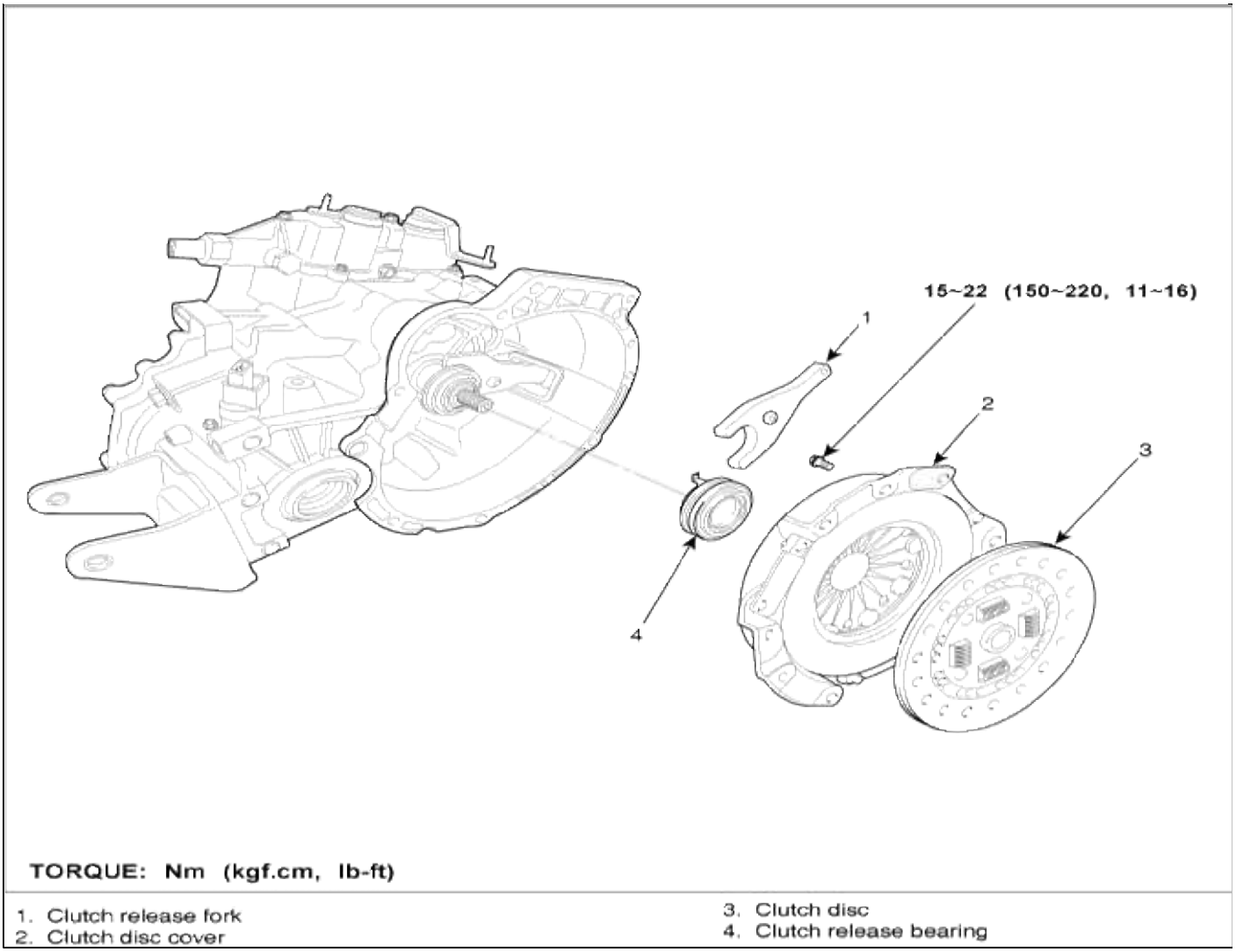
CAUTION

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.



Clutch System > Clutch System > Clutch Cover And Disc > Components and Components Location

COMPONENTS

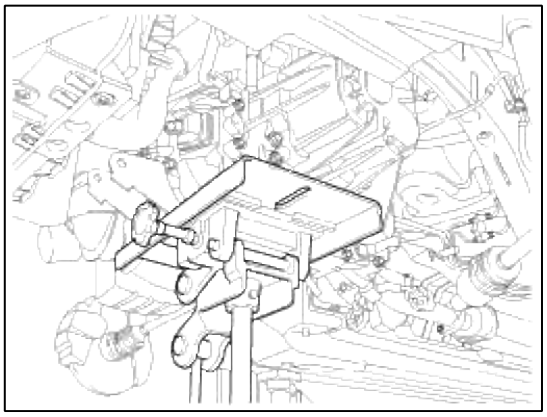


1. Clutch release fork
2. Clutch disc cover
3. Clutch disc
4. Clutch release bearing

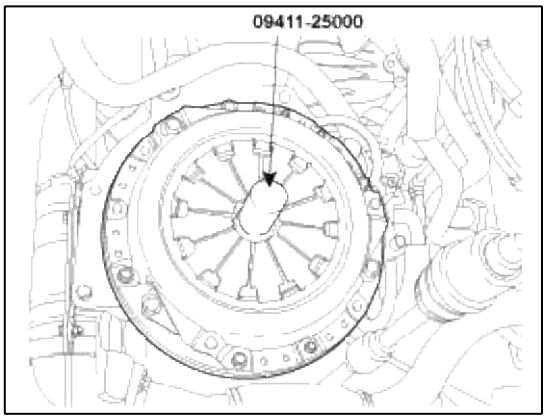
Clutch System > Clutch System > Clutch Cover And Disc > Repair procedures

REMOVAL

1. Remove the transaxle assembly. (Refer to the removal of the manual transaxle-MT Gr.).



2. Insert the special tool (09411-25000) in the clutch disc to prevent the disc from shifting.



3. 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.

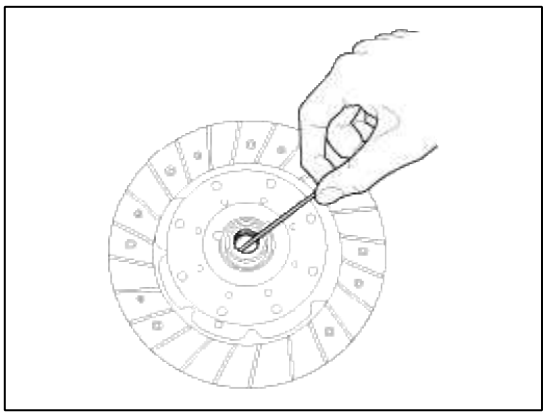
> NOTE
>
> Do not clean the clutch disc or the release bearing with cleaning solvent.

Installation

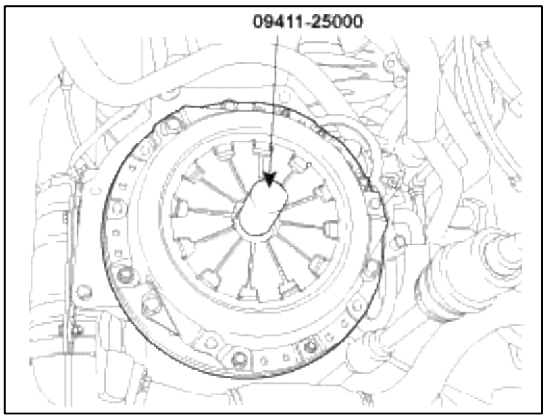
1. Apply multipurpose grease to the spline of the disc.

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).

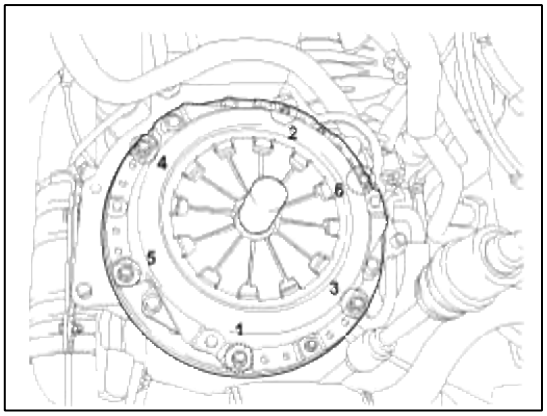


2. Install the clutch disc assembly to the flywheel using the special tool (09411-25000).

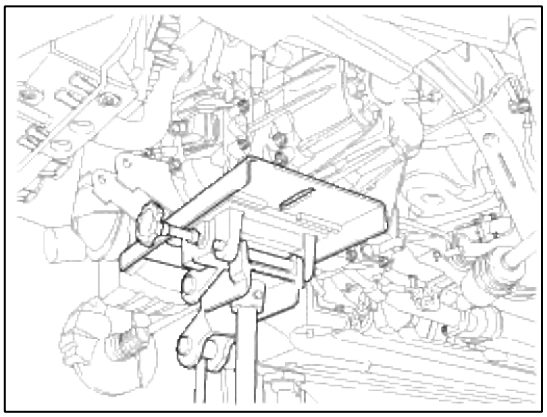


3. Install the clutch cover assembly to the flywheel and temporarily tighten the bolts one or two steps at a time in a star pattern.

TORQUE
Clutch cover bolt :
15 ~ 22 Nm (150 ~ 220 kgf.cm, 11 ~ 16 lb-ft)



4. Install the transaxle assembly to the engine. (Refer to the Removal and Installation of the manual transaxle-MT Gr.)



INSPECTION

Clutch cover assembly

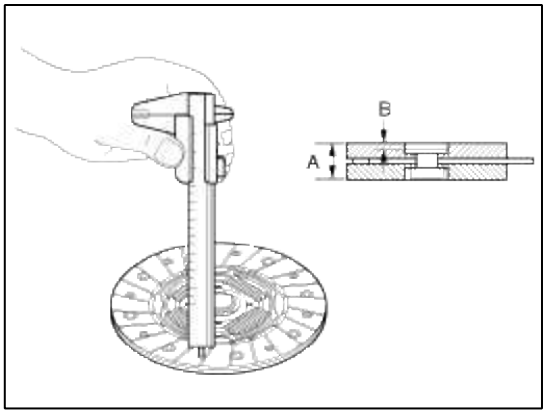
1. Check the diaphragm spring end for wear and uneven height.
2. Check the pressure plate surface for wear, cracks and color change.
3. Check the rivets for looseness and replace the clutch cover assembly if necessary.

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] :
8.5 ± 0.3mm[0.33 ±0.012in]
Limit :
Clutch disc rivet depth(B) : 0.3mm[0.012 in]



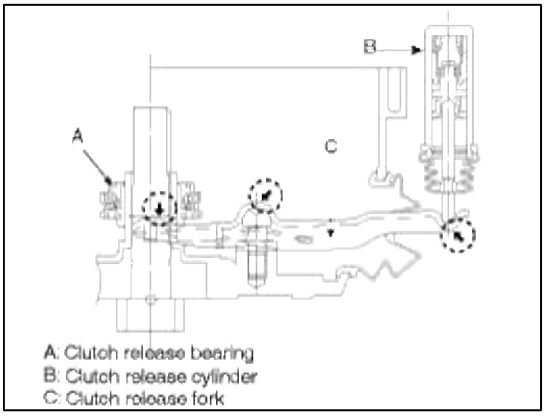
3. Check for the torsion spring play and damage and if defective, replace the clutch disc.
4. Clean the splines on the input shaft and install the clutch disc.
   If the disc does not slide smoothly or if play is excessive, replace the clutch disc and/or the input shaft.

Clutch release bearing

CAUTION

The release bearing is packed with grease. Do not use cleaning solvent or oil.

Standard grease : CASMOLY L9508



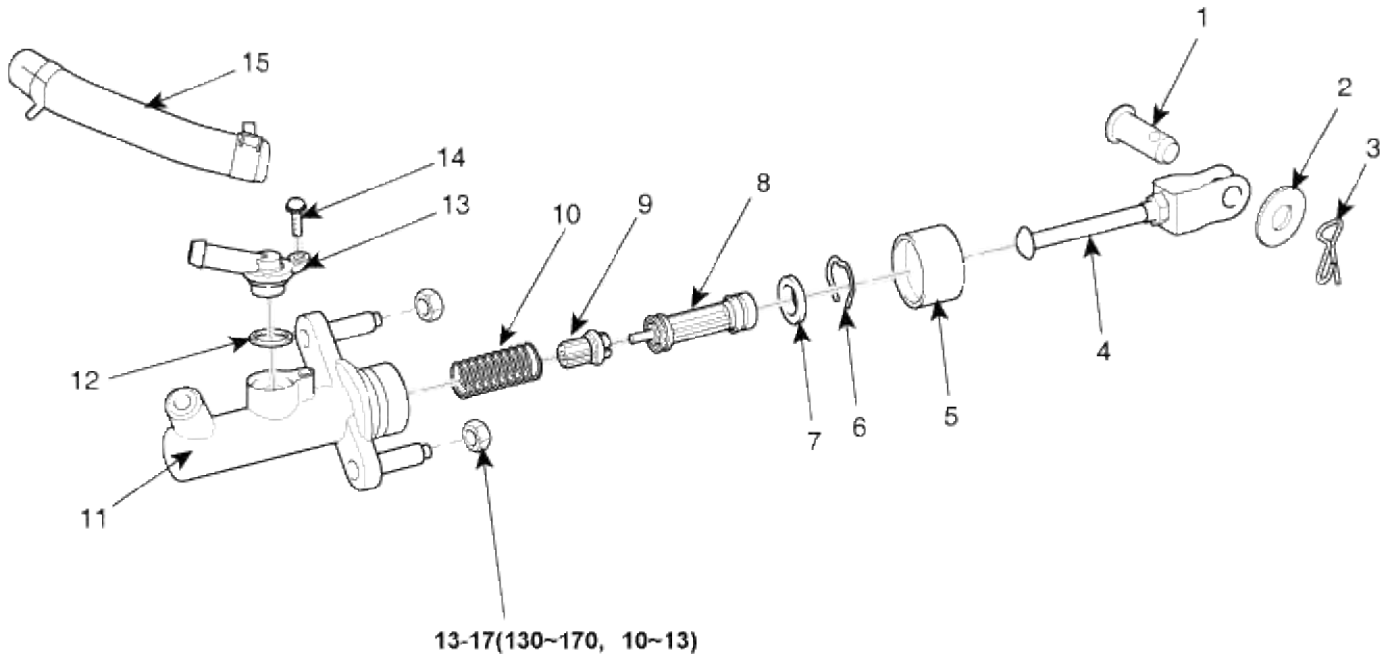
1. Check the bearing for seizure, damage or abnormal noise. Also check the diaphragm spring contacting points for wear.
2. Replace the bearing if the release fork contacting points are worn abnormally.

Clutch release fork

If there is abnormal wear at the point of contact with the bearing, replace the release fork assembly.

Clutch System > Clutch System > Clutch Master Cylinder > Components and Components Location

COMPONENTS



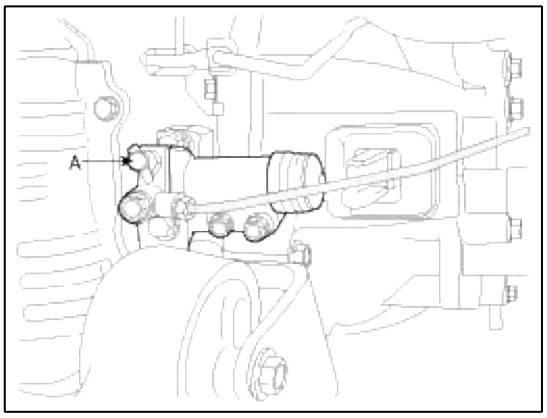
TORQUE: Nm (kgf.cm, lb-ft)

1. Clevis pin
2. Washer
3. Snap pin
4. Rod assembly
5. Boot
6. Key
7. Plate
8. Piston assembly
9. Spring seat
10. Spring
11. Body assembly
12. O-ring
13. Nipple
14. Bolt
15. Flexible hose

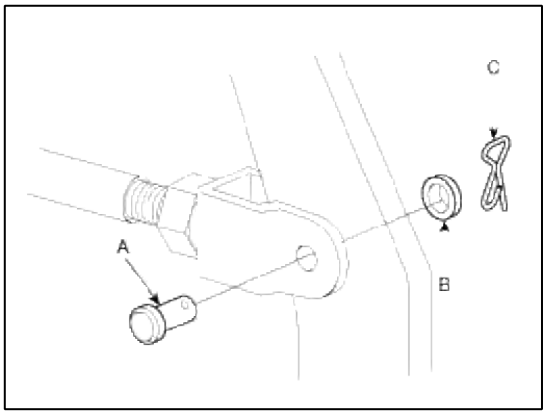
Clutch System > Clutch System > Clutch Master Cylinder > Repair procedures

REMOVAL

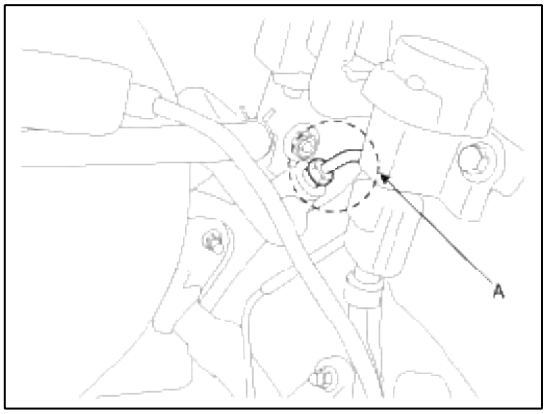
1. Drain the clutch fluid through the bleed plug (A).



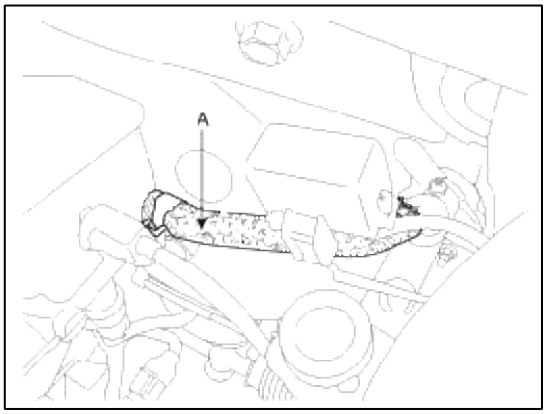
2. Remove clevis pin (A), snap pin (C) and washer (B).



3. Disconnect the clutch tube (A) (master cylinder side).



4. Remove the flexible hose(A) connected to brake reserve tank.



5. Remove the master cylinder mounting nut under the instrument panel.

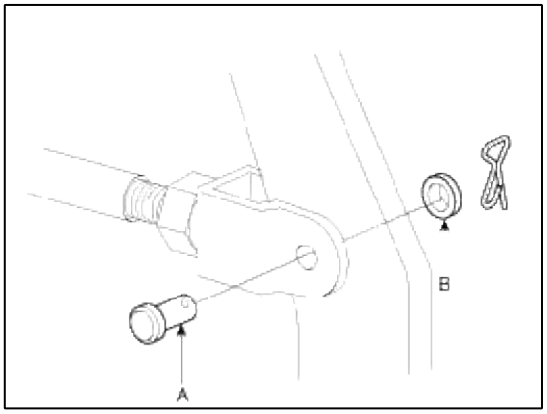
Installation

1. Install the master cylinder under the instrument panel.

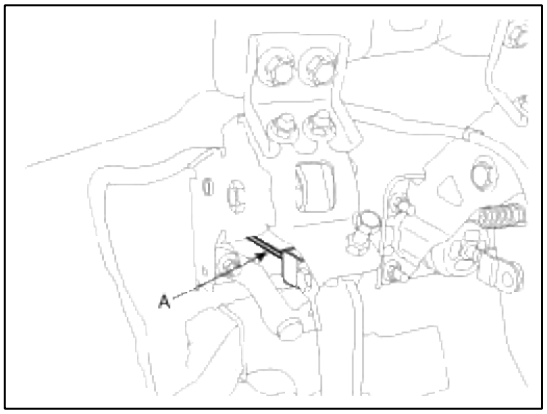
TORQUE :
9~14Nm(90~140 kgf.cm, 6.5~10.2 lb-ft)

2. Apply specified grease to the clevis pin(A) and washer(B).

Grease : SAE J310 NLGI NO.2



3. Connect the push rod(A) to the clutch pedal.



4. Connect the flexible hose of the brake reserve tank to the master cylinder.
5. Pour the brake fluid.
6. Connect the clutch tube to the master cylinder.

TORQUE :
13~17Nm(130~170 kgf.cm, 10~13 lb-ft)

7. Bleed the clutch system.

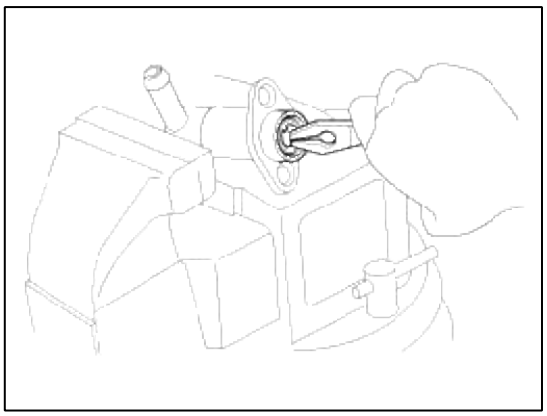
DISASSEMBLY

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.

NOTE

1. Use care not to damage the master cylinder body and piston assembly.
2. Do not disassemble the piston assembly.

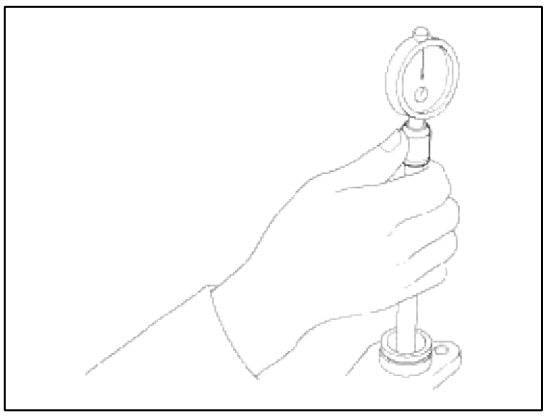


INSPECTION

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.

NOTE

Measure the inside diameter of the master cylinder at three places (bottom, middle, and top) in a perpendicular direction.



6. If the master cylinder-to-piston clearance exceeds the limit, replace the master cylinder and/or piston assembly.

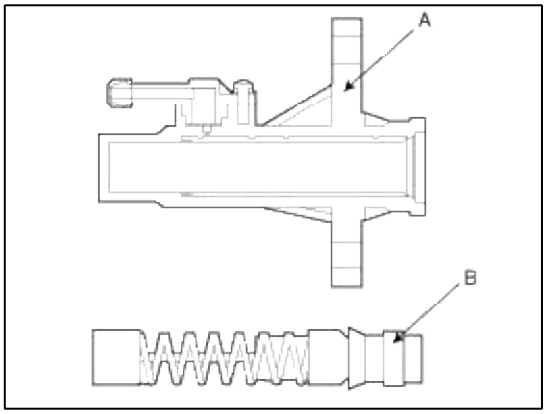
Limit : 0.15 mm (0.006 in.)

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).

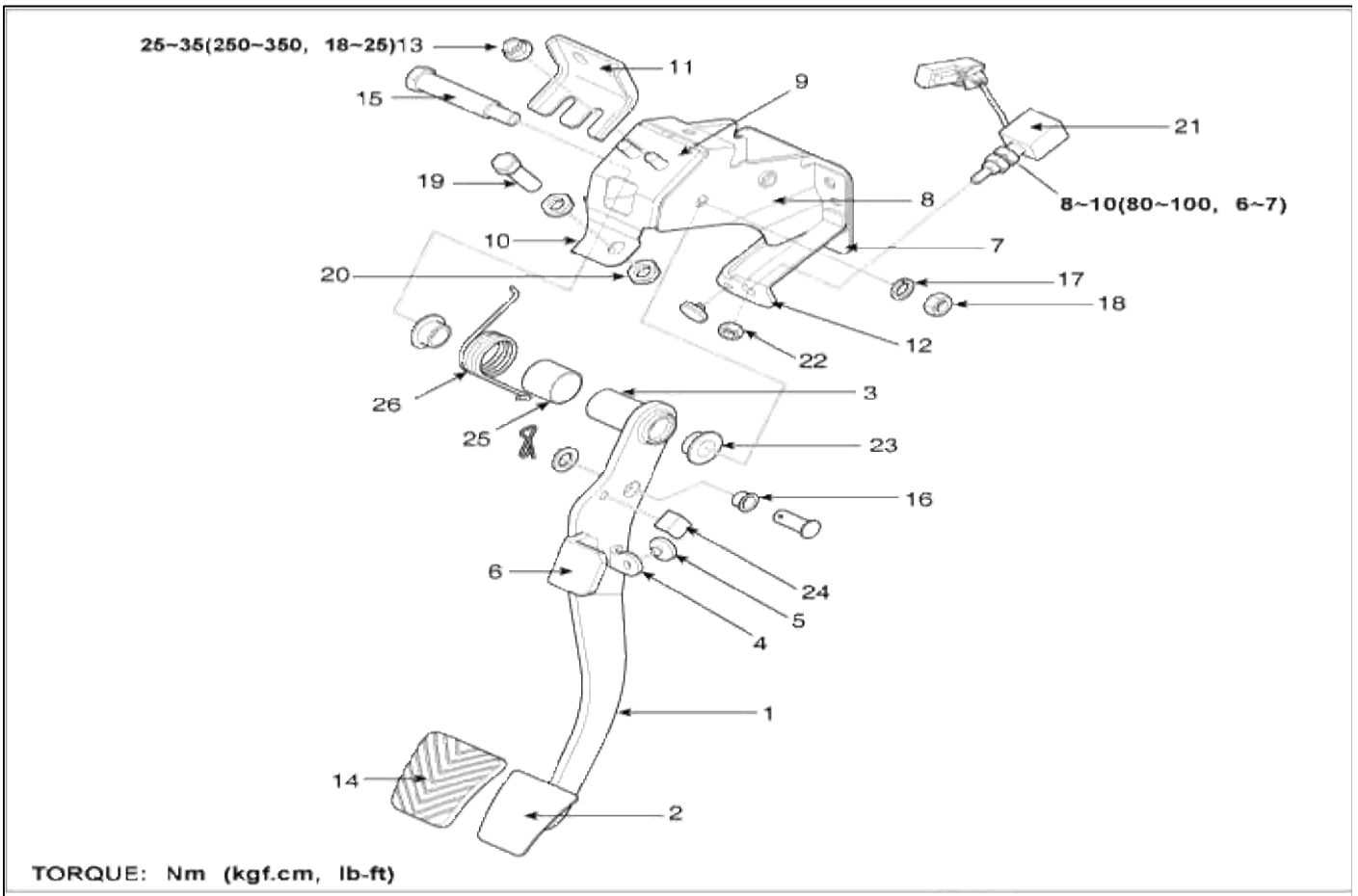
Specified fluid: Brake fluid DOT 3 or DOT 4

2. Install the piston assembly.
3. Install the piston snap ring.
4. Install the push rod assembly.



Clutch System > Clutch System > Clutch Pedal > Components and Components Location

COMPONENTS (1)

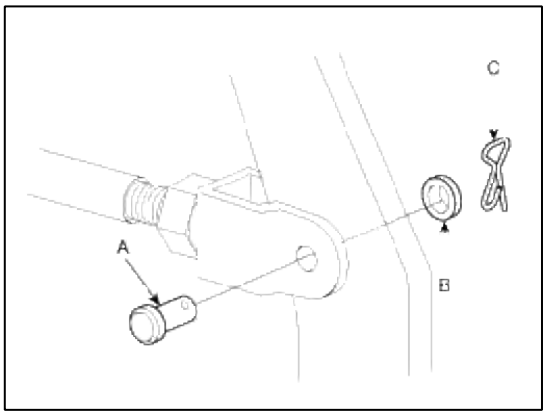


1. Clutch arm
2. Pedal plate
3. Pipe
4. Bracket
5. Pedal stopper
6. Arm bracket
7. Plate
8. Clutch member
9. Switch bracket
10. Bolt
11. Cowl bracket
12. Stopper bracket
13. Nut
14. Pedal pad
15. Bolt
16. Bush
17. Spring washeer
18. Nut
19. Bolt
20. Nut
21. Ignition lock switch
22. Switch nut
23. Bush
24. Brake pedal stopper
25. Bush
26. Return spring

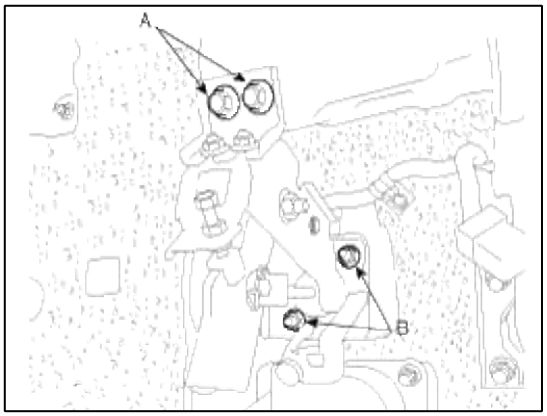
Clutch System > Clutch System > Clutch Pedal > Repair procedures

REMOVAL

1. Remove the clevis pin (A), washer (B), and snap pin (C).



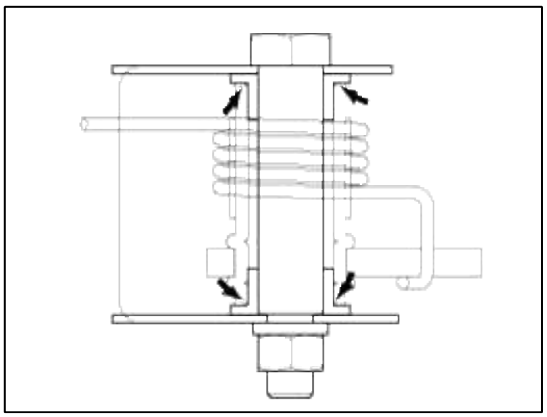
2. Remove the clutch pedal mounting bolts(A) and nuts(B).



INSTALLATION

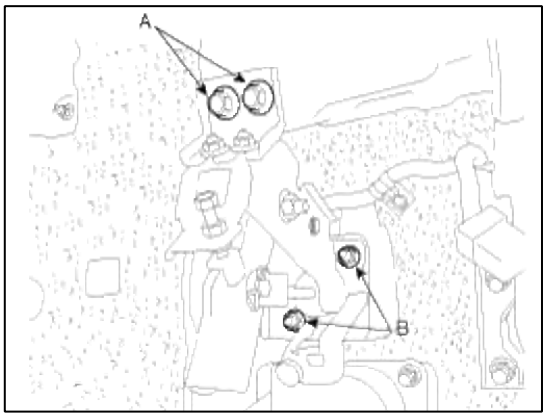
1. Apply the specified grease to the clutch pedal and bushings.

Chassis grease: SAE J310a, NLGI No.1



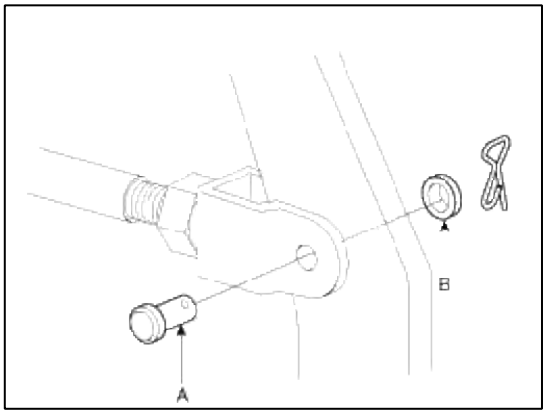
2. Install the clutch pedal mounting bolt(A) and nuts(B).

TORQUE :
10~17 Nm(100~170 kgf.cm, 7~12 lb-ft)



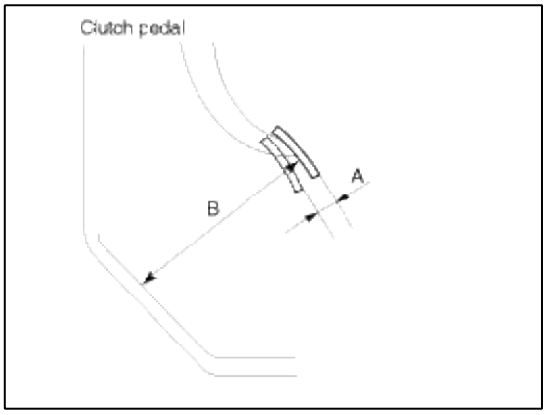
3. Apply the specified grease to the clevis pin(A) and washer(B).

Wheel bearing grease: SAE J310, NLGI No.2



4. Install the push rod to the clutch pedal.
5. 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)
163.9 mm (6.45 in)

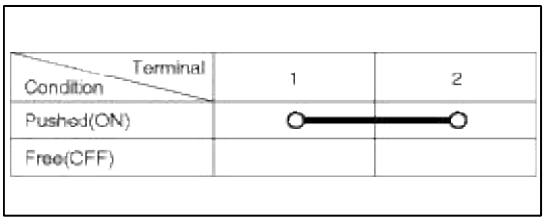


INSPECTION

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

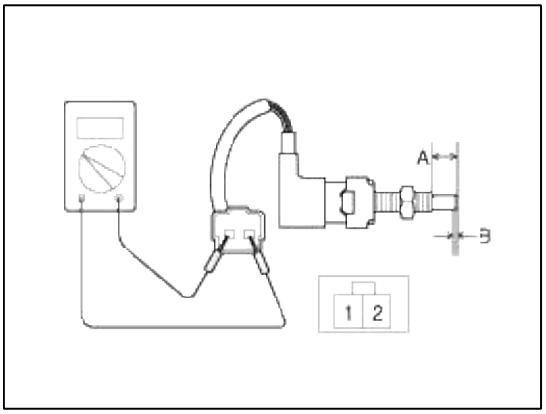
Remove the ignition lock switch and check for continuity between the terminals. If the continuity is not as specified, replace the switch.



Standard value

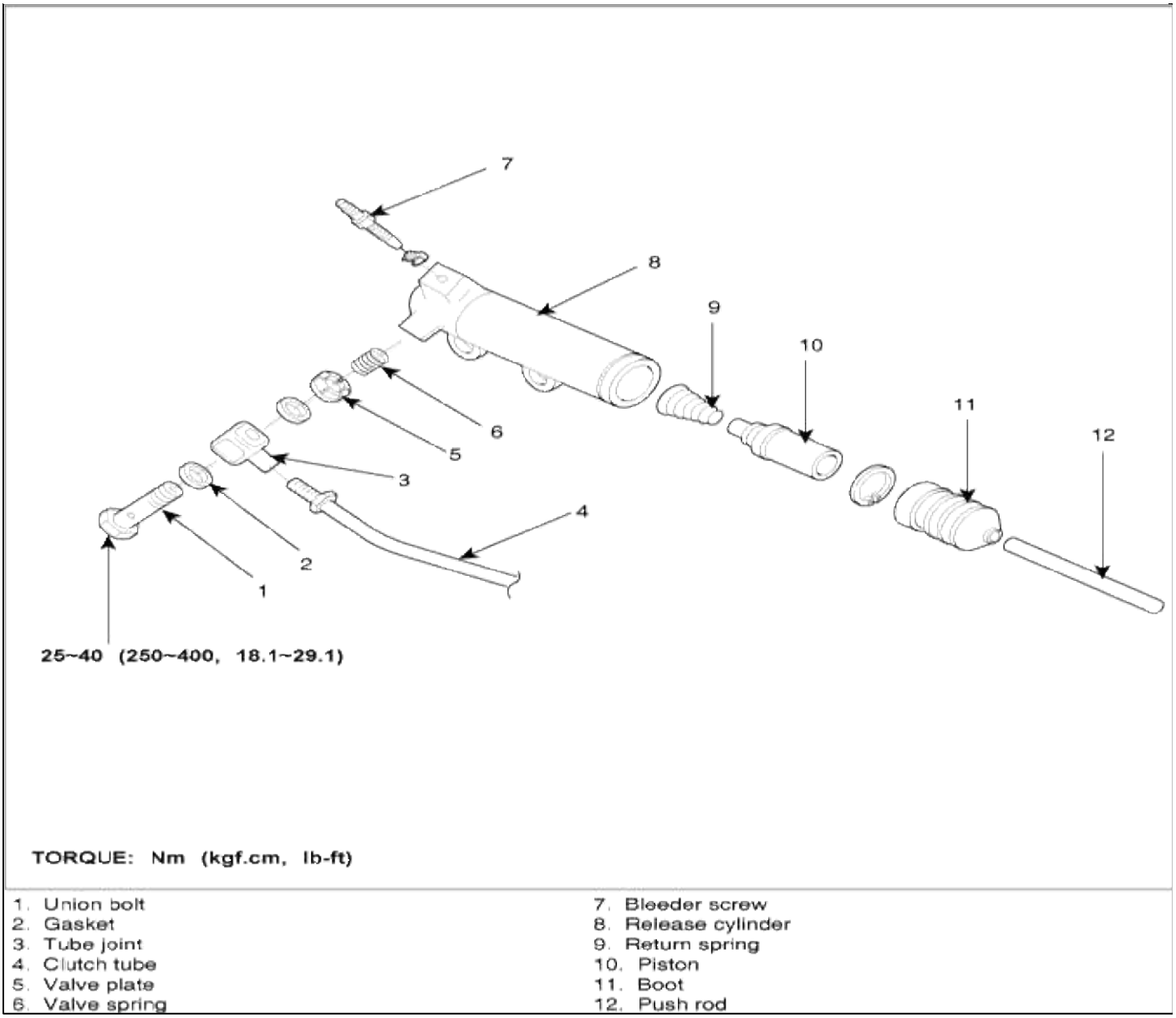
Full stroke(A) : 12.0 ± 0.3mm (0.472 ± 0.012 in.)

ON-OFF point (B) : 2.0 ± 0.3mm (0.078 ± 0.012 in)



Clutch System > Clutch System > Clutch Release Cylinder > Components and Components Location

COMPONENTS

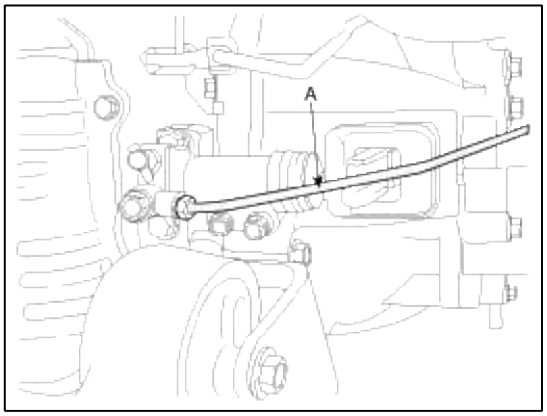


1. Union bolt
2. Gasket
3. Tube joint
4. Clutch tube
5. Valve plate
6. Valve spring
7. Bleeder screw
8. Release cylinder
9. Return spring
10. Piston
11. Boot
12. Push rod

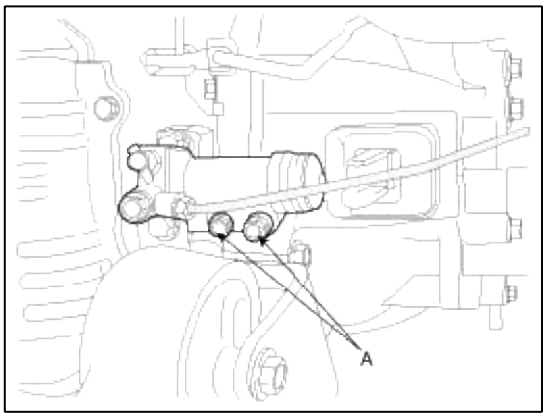
Clutch System > Clutch System > Clutch Release Cylinder > Repair procedures

REMOVAL

1. Disconnect the clutch tube(A).



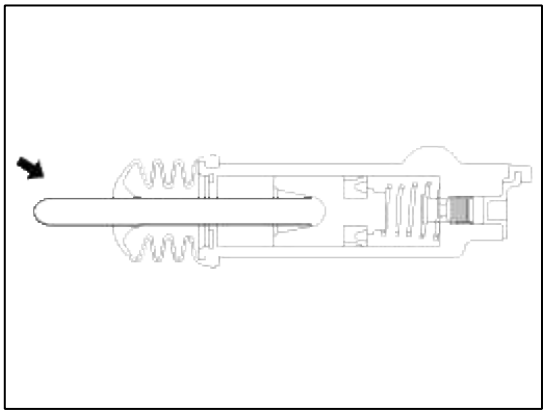
2. Remove the two clutch release cylinder mounting bolt(A).



INSTALLATION

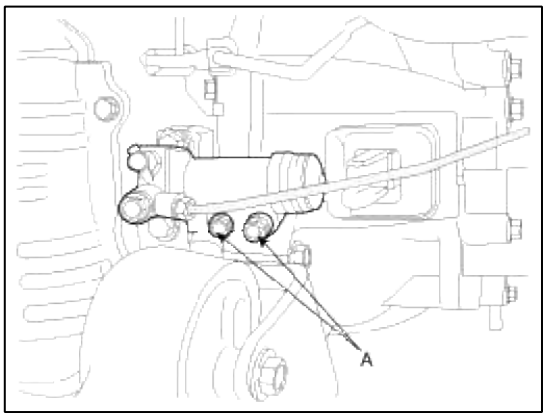
1. Coat the clutch clevis push rod specified grease.

Specified grease: CASMOLY L9508

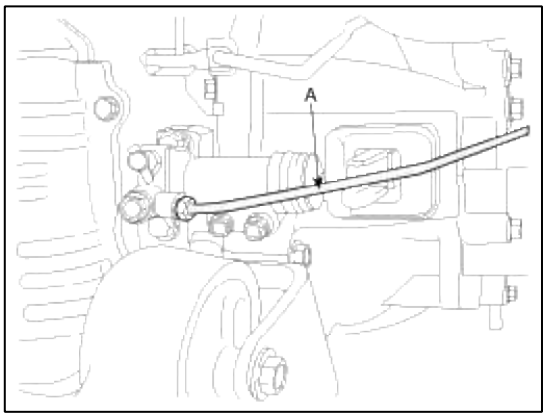


2. Install the release cylinder(A) to the transaxle.

TORQUE :
15 ~ 22Nm (150 ~220 kgf.cm, 11 ~ 16 lb-ft)



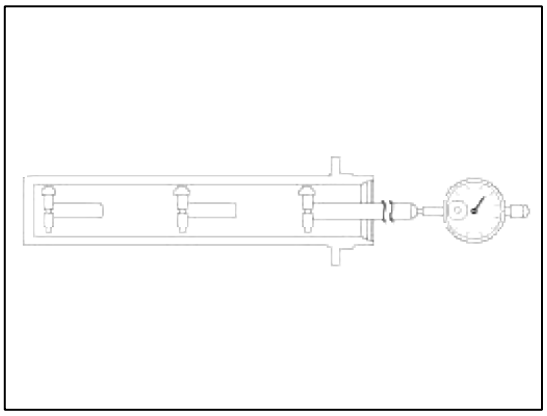
3. Install the clutch tube(A).



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: 0.15 mm (0.006 in.)



3. Check the clutch release cylinder for fluid leakage.
4. Check the clutch release cylinder boots for damage.

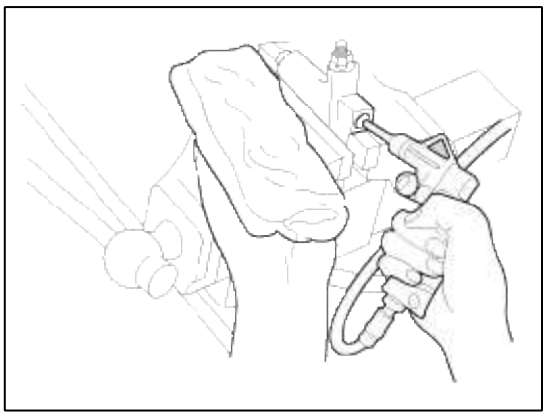
DISASSEMBLY

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.

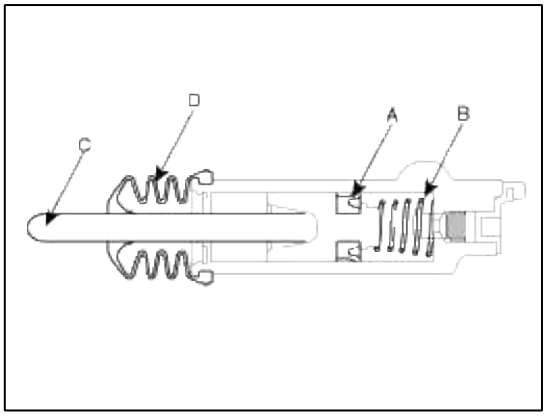


REASSEMBLY

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

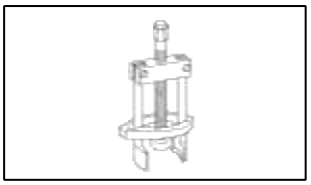
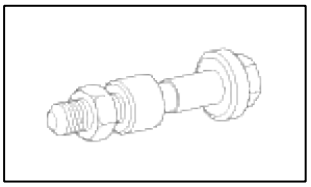
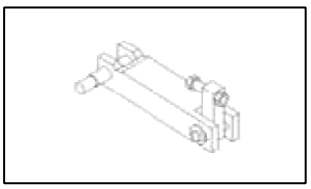
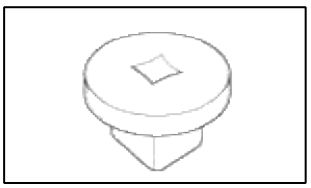
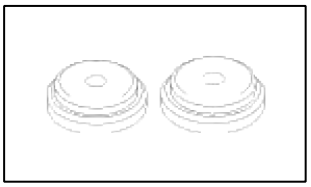
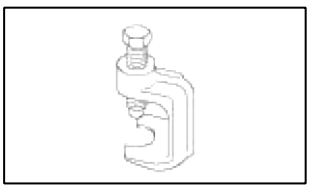
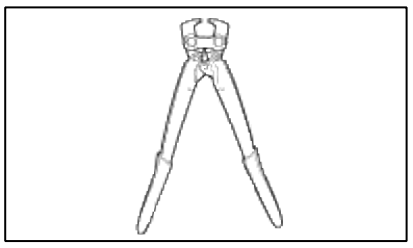
2. Install the valve plate(A), Spring(B), push rod(C) and boot(D).



ACCENT(MC) > 2008 > G 1.6 DOHC > Driveshaft and axle

Driveshaft and axle > General Information > Special Service Tools

SPECIAL SERVICE TOOLS

Tool (Number and Name)	Illustration	Use
09495-33000 Puller		Removal of wheel bearing inner race from a hub.
09517-21500 Front hub remover and installer		1. Removal of a front hub from a knuckle. (use with 09517-29000) 2. Measurement of a front wheel bearing pre-load. (use with 09532-11600)
09517-29000 Knuckle arm bridge		1. Removal of a front hub from a knuckle. (use with 09517-21500) 2. Removal of a wheel bearing outer race from a knuckle. (use with 09495-33100)
09532-11600 Preload socket		Measurement of a front wheel bearing pre-load. (use with 09517-21500)
09532-11500 Bearing outer race installer		Installation of a wheel bearing to knuckle.
09568-4A000 Ball joint puller		Separation of a lower arm and a tie rod end ball joint.
09495-3K000 Band installer		Installation of ear type boot band

Driveshaft and axle > General Information > Troubleshooting

TROUBLESHOOTING

GENERAL DIAGNOSTICS AND TESTS

To assist the service adviser and the technician, check the drive shaft condition with the questions listed below by

filling them.
It serves as a place to record information reported as well as data from the testing to be carried out.
To begin a successful diagnosis, fill out the questions.

DRIVE SHAFT CONDITION : Noise ☐ Vibration ☐

Balance Weights Missing/Other Visual Defects? **Yes / No**

Maximum Allowable Runout : _____

Actual Runout : Front _____ Middle _____ Rear _____

Two-Piece Drive shaft Runout : Front _____ Rear _____

Middle Support Bearing : Loose ☐ Damaged ☐ Worn ☐ Others_____

Suspect Drive shaft Balanced ? **Yes / No**

Pinion Angle : Engine Height : Specification _____ Actual _____

Pinion Angle : Specification _____ Actual _____

Drive shaft Angle - Truck : Specification _____ Actual _____

Once the concern is narrowed down to a symptom/condition, proceed to condition and Symptom Categories below.
Condition and Symptom Categories.
Operation Condition Vehicle is moving.
Depends more one how the vehicle is operated.

1. Speed related
   - Related to vehicle speed
   A. Noise occurs at specific vehicle speed. A high pitch noise (whine).
      Go to troubleshooting.
   B. Loudness proportional to vehicle speed. Low frequency noise at high speeds, noise and loundness increase with speed. Go to Troubleshooting.
2. Acceleration
   - Light/moderate acceleration
   A. Driveline shudder. Go to Troubleshooting.
3. Cruising speeds
   -Driveline vibration. Go to Troubleshooting.

Symptom	Cause	Remedy
Hub howling or whine - Hub or transfer case	Axle lubricant low	Check the lubricant level. Fill the axle to specification
	Damaged or worn wheel bearings or axle bearings	Check for abnormal wheel bearing play or roughness. Refer to wheel Bearing Check in this section. Adjust or Install new wheel bearings as necessary.
Driveline clunk - loud clunk when shifting from reverse to drive	Excessive backlash in the axle or transmission	Carry out a total backlash check
	Loosen suspension components	Inspect the suspension for damage or wear.Repair or Install new components as necessary.

	Broken powertrain mounts	Inspect the powertrain mounts. Install new mounts as necessary.
	Idle speed too high	Check for the correct idle speed
Driveline clunk-occurs as the vehicle starts to move forward following a stop	Worn drive shaft joints with excessive play	Inspect the joints for a worn condition. Install a new driveshaft as necessary.
Driveline clunk-occurs during acceleration or from cruise to coast/deceleration	Damaged or worn tripod joints	Inspect the joint and boot. Repair or Install a new joint as necessary.
Noise from the rear hub, occurs when driving on rugged roads	Cap seperation from the hub bearing	Remove the rear hub check the hub bearing cap. Install a new cap if necessary.
Clicking, popping or grinding-occurs while vehicle is turning	Inadequate or contaminated lubrication in the joints	Check the joint boots and joints for wear or damage. Repair or Install new components as necessary.
	Another component contacting the drive shaft	Check the drive shafts and around the drive shafts. Repair as necessary.
	Brake components	Inspect the front brakes for wear or damage. Repair as necessary.
	Suspension components	Inspect the lower arm ball joints for wear or damage. Repair as necessary.
	Damaged or worn wheel bearings	Check for abnormal wheel bearing play or roughness. Refer to wheel bearing check in this section. Adjust or Install new wheel bearings as necessary.
Clicking or snapping-occurs when accelerating around a corner	Damaged or worn birfield joints	Inspect the Birfield joints and boots. Repair or Install a new joint as necessary.
Buzz-buzzing noise is the same at cruise or coast/deceleration	Damaged or worn tires	Check for abnormal tire wear or damage. Install a new tire as necessary.
Driveline shudder-occurs during acceleration from a slow speed or stop	Rear axle assembly mispositioned	Check the axle mounts and the rear suspension for damage or wear. Repair as necessary.
	Loose rear axle bolts	Inspect the bolts. Tighten the bolt nuts to specification.
	Damaged or worn front suspension components	Check for a loose stabilizerbar, damagedor loose strut/strut bushings or looseor worn ball joints. Inspect the steering linkage for wear or damage. Repair or Install new components as necessary.

	Binding the drive shaft joint	Inspect the drive shaft shaft joint for worn, or damaged condition. Install a new drive shaft assembly as necessary. Repair as necessary.
	Loose rear axle bolts	Inspect the bolts. Tighten the bolts to specification.
Driveline vibration-occurs at cruising speeds	Binding or damaged drive shaft joint	Inspect the drive shaft joint for wear or damage. Install a new drive shaft assembly as necessary.
	Incorrect lateral and radial tire/wheel runout	Inspect the tire and wheels. Measure tire runouts. Repair or Install new components as necessary.
	Incorrectly seated joint in the front wheel hub	Check the Birfield joint for correct seating into the hub. Repair as necessary.

Driveshaft and axle > General Information > Specifications

SPECIFICATIONS

Driveshaft					
Engine	Transaxle	Joint type			
		LH		RH	
		Inner	Outer	Inner	Outer
1.6 MPI	M/T	TJ82	BJ82	TJ82	BJ82
	A/T	UTJ-II22	BJ22	TJ22	BJ22
Front wheel bearing					
Bearing type	Double row angular contact ball bearing				
Starting torque	1.28Nm (13 kgf·cm, 0.95lb-ft)				
Rear hub & bearing assembly					
Bearing type	Double row angular contact ball bearing				
Starting torque	1.28Nm (13 kgf·cm, 0.95lb·ft)				

TIGHTENING TORQUES

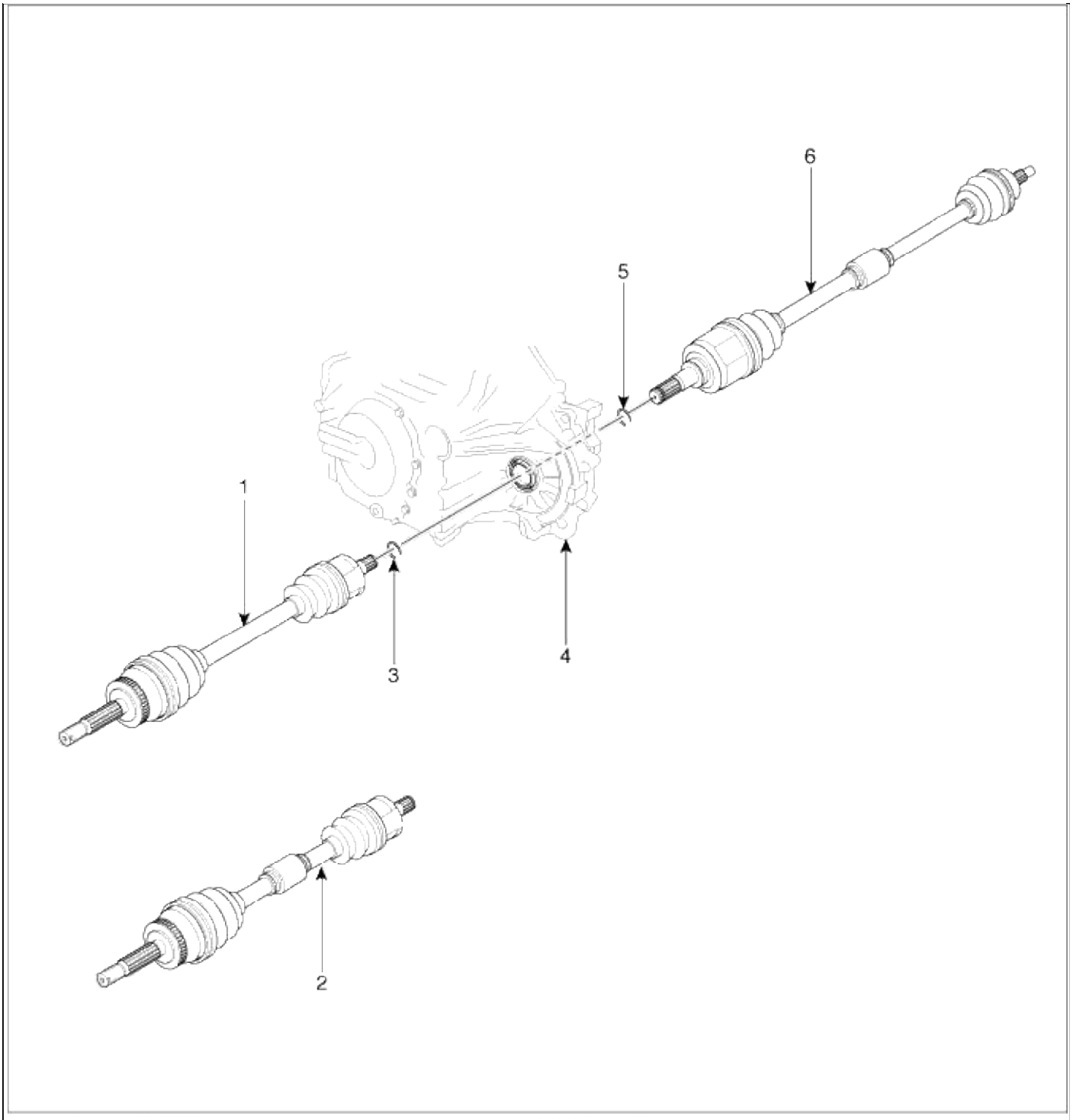
Items	Nm	Kgf·m	lb·ft
Hub nut	90 ~ 110	9.0 ~ 11.0	65 ~ 80
Driveshaft nut (Castle nut)	200 ~ 260	20.0 ~ 26.0	145 ~ 188
Ball joint assembly to knuckle bolts	100 ~ 120	10.0 ~ 12.0	72 ~ 86
Wheel speed sensor bolt	7 ~ 10	0.7 ~ 1.0	5 ~ 6.5
Front caliper assembly to knuckle bolts	65 ~ 75	6.5 ~ 7.5	47 ~ 54
Tie rod end to knuckle bolt	24 ~ 34	2.4 ~ 3.4	17 ~ 25
Front strut assembly to knuckle bolts	100 ~ 120	10.0 ~ 12.0	72 ~ 86
Rear caliper assembly to carrier assembly bolts	65 ~ 75	6.5 ~ 7.5	47 ~ 54
Rear hub & carrier assembly to torsion axle bolts	50 ~ 60	5.0 ~ 6.0	36 ~ 43

LUBRICANT

Joint type	Recommended grease	Quantity
BJ82	GAMRO ROLLUBE	85 ± 6 g
BJ22	SK chemical RBA	100 ± 10 g
TJ82	JANGAM MX-13KT	95 ± 6 g
TJ22	JANGAM MX-13KT	100 ± 6 g
UTJ-II22	JANGAM MX-13KT	180 ± 10 g

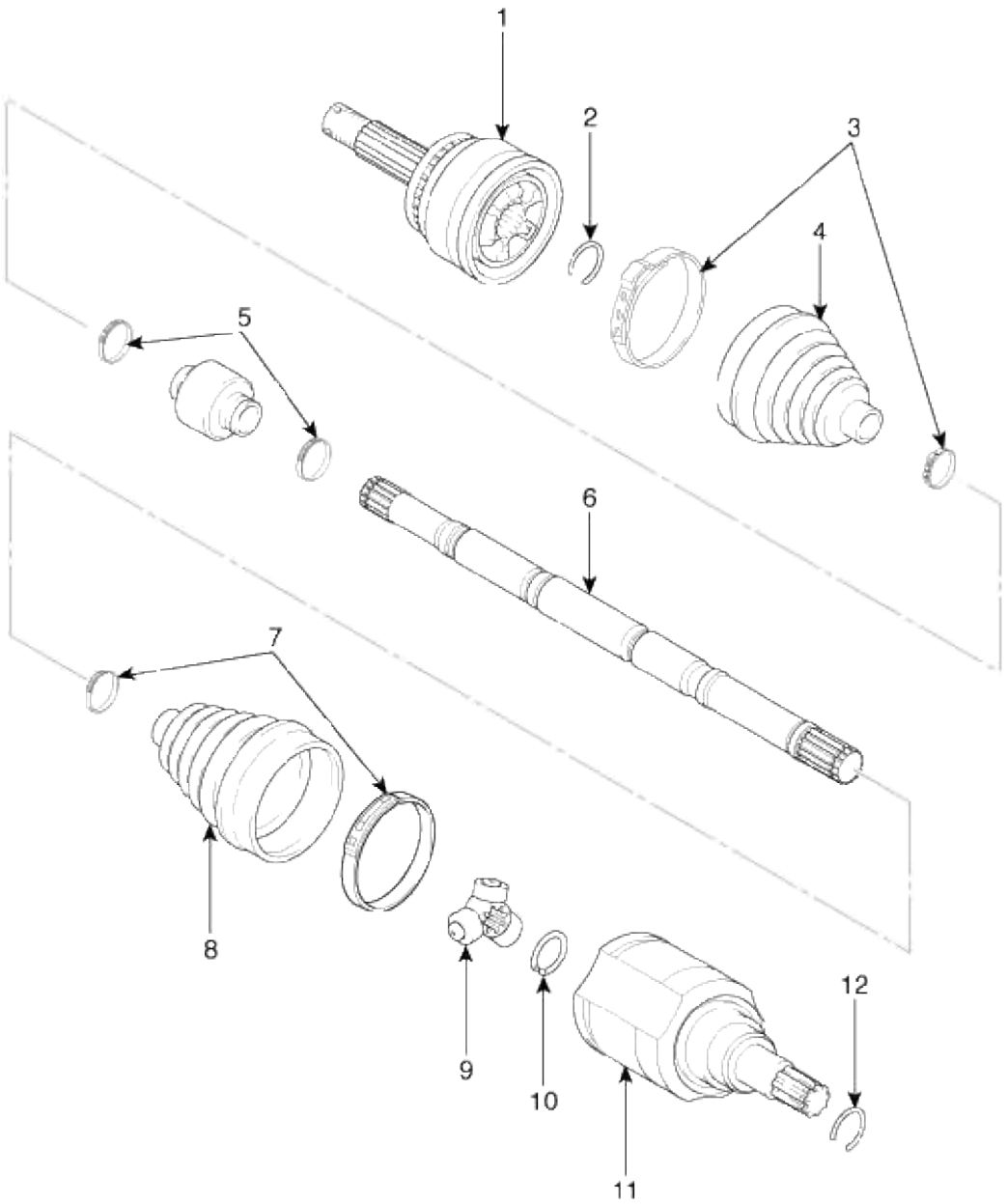
Driveshaft and axle > Driveshaft Assembly > Front Driveshaft > Components and Components Location

COMPONENTS



1. LH Driveshaft (A/T)
2. LH Driveshaft (M/T)
3. Circlip
4. Transaxle
5. Circlip
6. RH Driveshaft

COMPONENTS



1. BJ assembly
2. Circlip
3. BJ boot bands
4. BJ boot
5. Dynamic damper bands
6. Shaft
7. UTJ boot bands
8. UTJ boot
9. Spider assembly
10. Circlip
11. UTJ case
12. Clip

Driveshaft and axle > Driveshaft Assembly > Front Driveshaft > Repair procedures

REMOVAL

1. Raise the vehicle and remove the wheel & tire assembly.

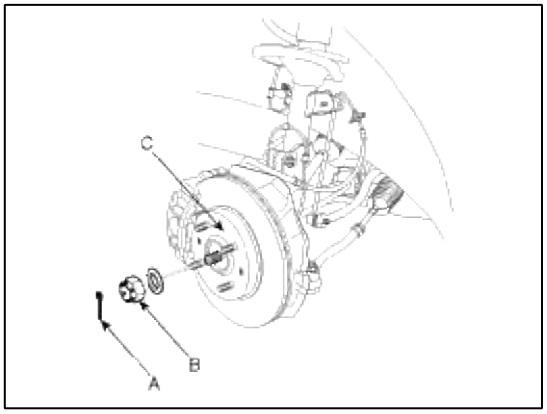
Tightening torque Nm (kgf·m, lb·ft):
90 ~ 110 (9 ~ 11, 65 ~ 80)

2. Remove the drain plug and drain the transaxle oil.

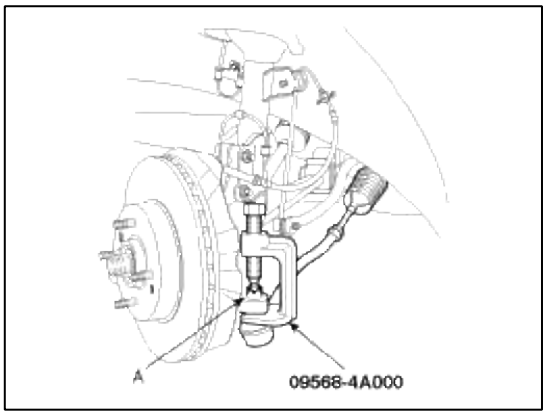
Tightening torque Nm (kgf·m, lb·ft):
35 ~ 45 (3.5 ~ 4.5, 25 ~ 32)

3. Remove the split pin (A), castle nut (B) and washer from the front hub (C) assembly.

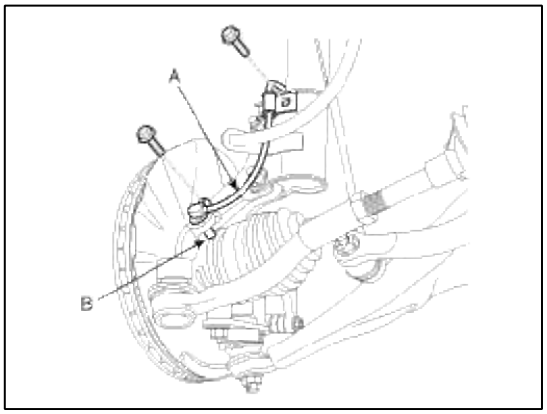
Tightening torque Nm (kgf·m, lb·ft):
200 ~ 260 (20 ~ 26, 145 ~ 188)



4. Disconnect the tie rod end ball joint (A) from the knuckle using a special tool (09568 - 4A000).

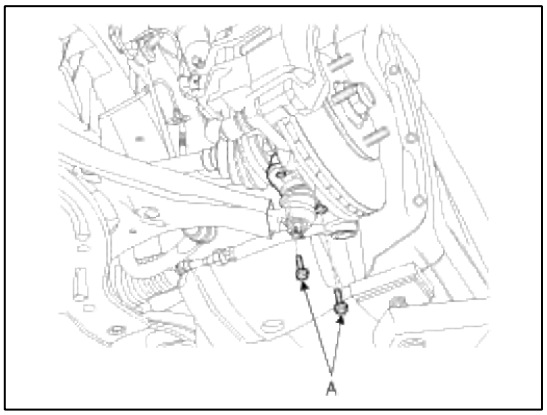


5. Remove the wheel speed sensor (A) from the knuckle (B).

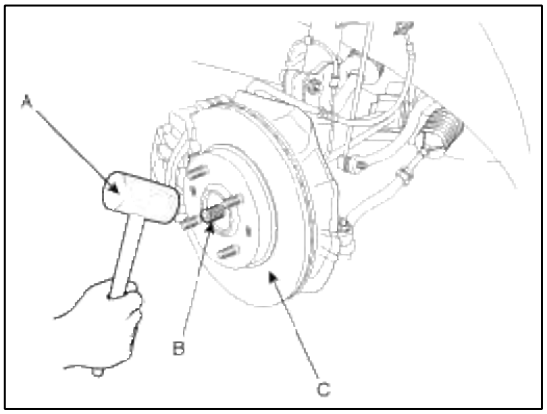


6. Remove the ball joint assembly mounting bolt (A) from the knuckle.

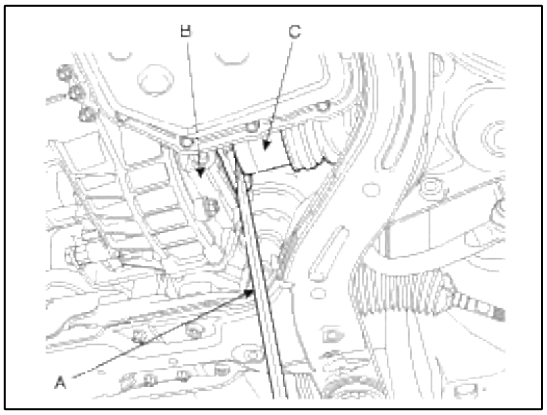
Tightening torque Nm (kgf·m, lb·ft):
100 ~ 120 (10 ~ 12, 72 ~ 86)



7. Using a plastic hammer (A), driveshaft (B) from the front hub assembly (C).



8. Push the front hub assembly outward and separate the driveshaft from the hub assembly.
9. Insert a pry bar (A) between the transaxle case (B) and joint (C), separate the driveshaft from the transaxle assembly



CAUTION

- Use a pry bar being careful not to damage the transaxle and joint.
- Do not insert a pry bar too deep, as this may cause damage to the oil seal.
- Do not pry on the driveshaft by excessive force it may cause components inside the joint kit to dislodge resulting in a torn boot or a damaged bearing.

10. Pull out the driveshaft from the transaxle case.

CAUTION

- Plug the hole of the transaxle case with the oil seal cap to prevent contamination.
- Support the drive shaft properly.
- Replace the retainer ring whenever the driveshaft is removed from the transaxle case.

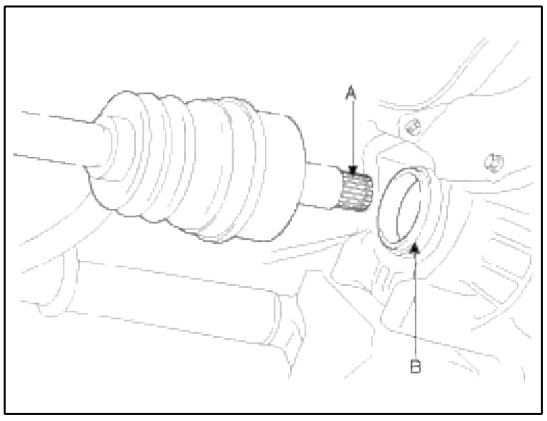
11. Repeat on the other side of driveshaft.

INSTALLATION

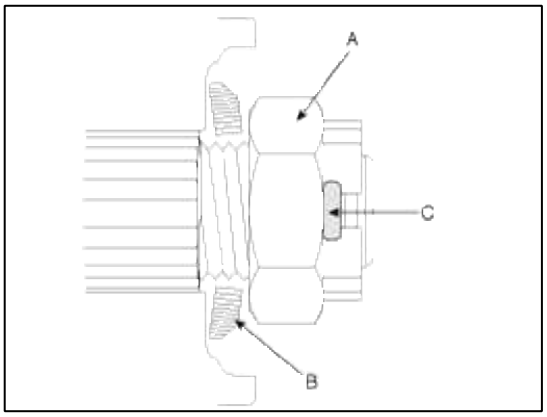
1. Installation is the reverse of removal.

CAUTION

- Replace the circlip with new ones before the installation.
- Before the installation, apply the gear oil on the driveshaft splines (A) and contacting surface of differential case oil seal (B).



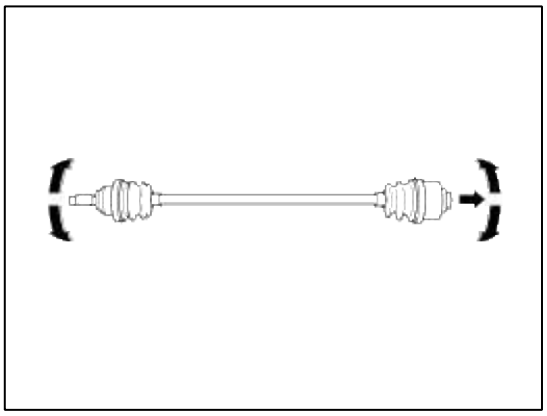
- The washer (B) should be assembled with convex surface outward when installing the castle (A) nut and split pin (C).



INSPECTION

1. Check the driveshaft boots for damage and deterioration.
2. Check the joints for wear and damage.
3. Check the splines for wear and damage.

4. Check the dynamic damper for cracks and wear.

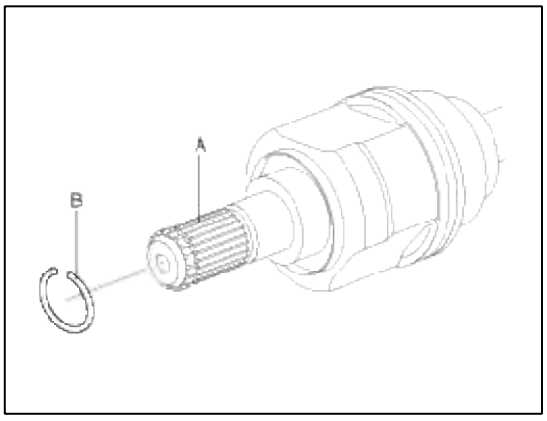


DISASSEMBLY

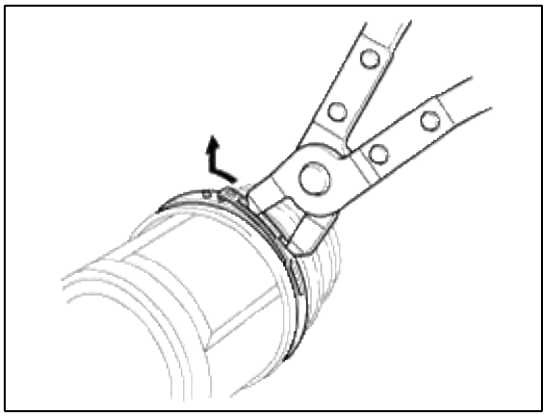
NOTE

- Do not disassemble the BJ assembly.
- Special grease must be applied to the drive shaft joint. Do not substitute with another type of grease.
- The boot band should be replaced with a new one.

1. Remove the clip (B) from drive shaft splines (A) of the transaxle side.

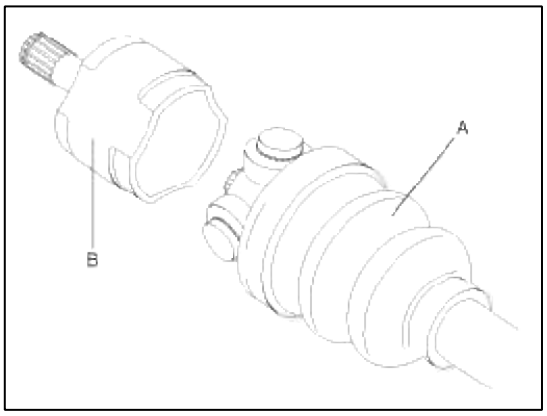


2. Remove both boot bands from the transaxle side UTJ case.



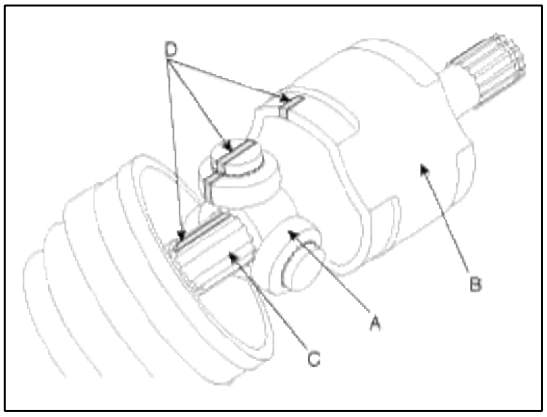
3. Pull out the boot from the transaxle side joint(UTJ).

4. When separating the joint and boot (A), remove the grease from the UTJ case (B).

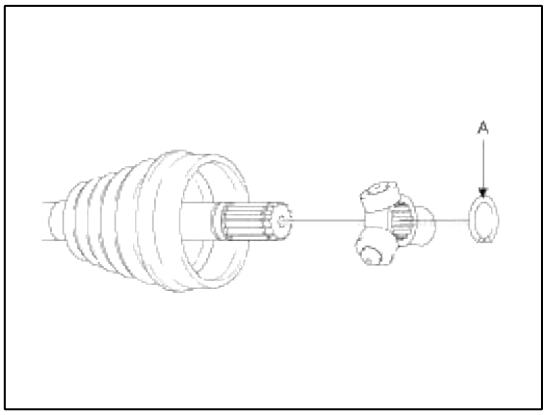


CAUTION

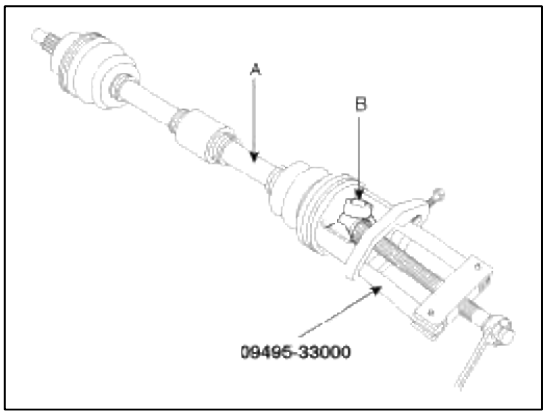
- Be careful not to damage the boot.
- According to illustration below, put across spider assembly (A), UTJ case (B), and shaft splines (C) to aid in reassembly.



5. Using a plier or flat-tipped (-) screwdriver, remove the snap ring (A).

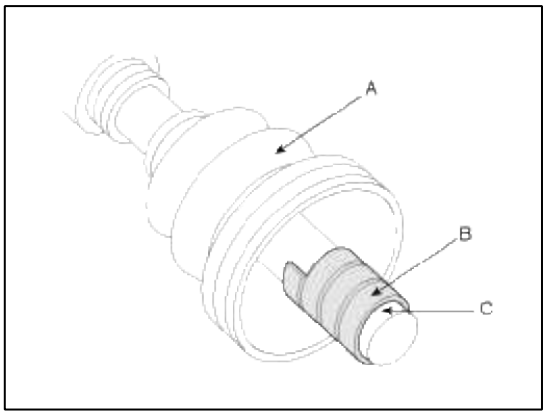


6. Remove the spider assembly (B) from drive shaft (A) by using the Special Tool(09495-33000).

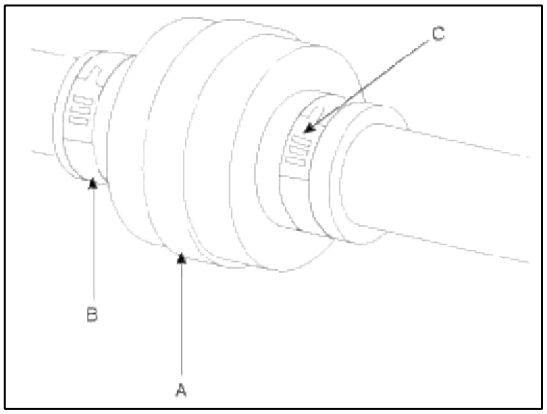


7. Clean the spider assembly.
8. Remove the boot (A), of the transaxle side joint(UTJ).

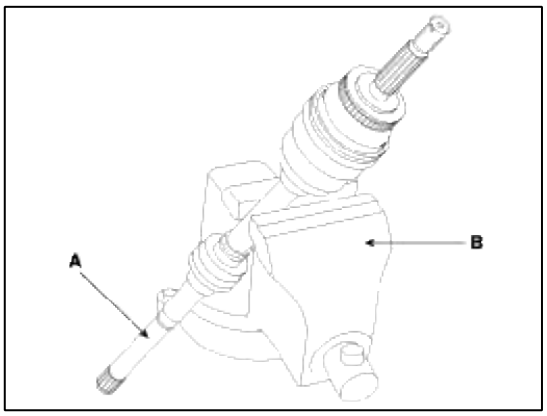
> CAUTION
>
> Wrap tape (B) around the driveshaft splines (C) to protect the boot (A).



9. Remove both side of bands (B,C) of the dynamic damper (A).

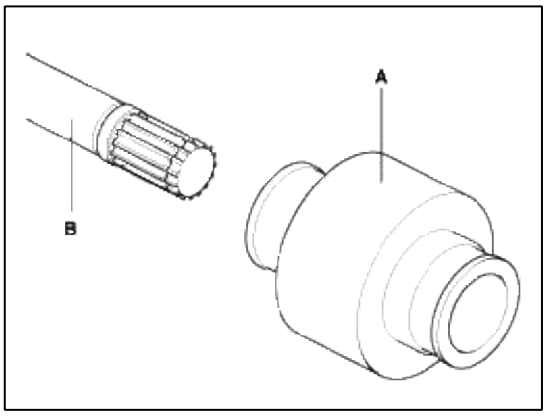


10. Fix the drive shaft (A) with a vice (B) as illustrated.

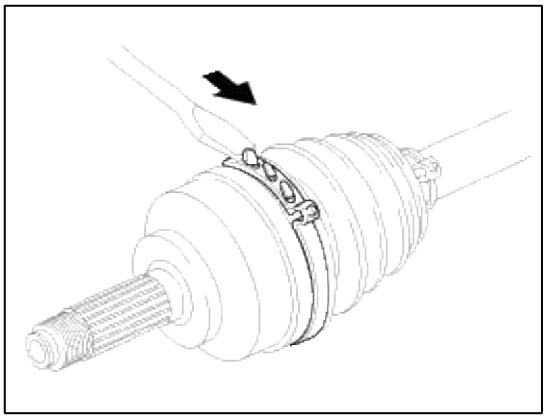


11. Apply soap powder on the shaft to prevent being damaged between the shaft spline and the dynamic damper when the dynamic damper is removed.

12. Separate dynamic damper (A) from the shaft (B) carefully.



13. Remove both bands on the side of wheel.

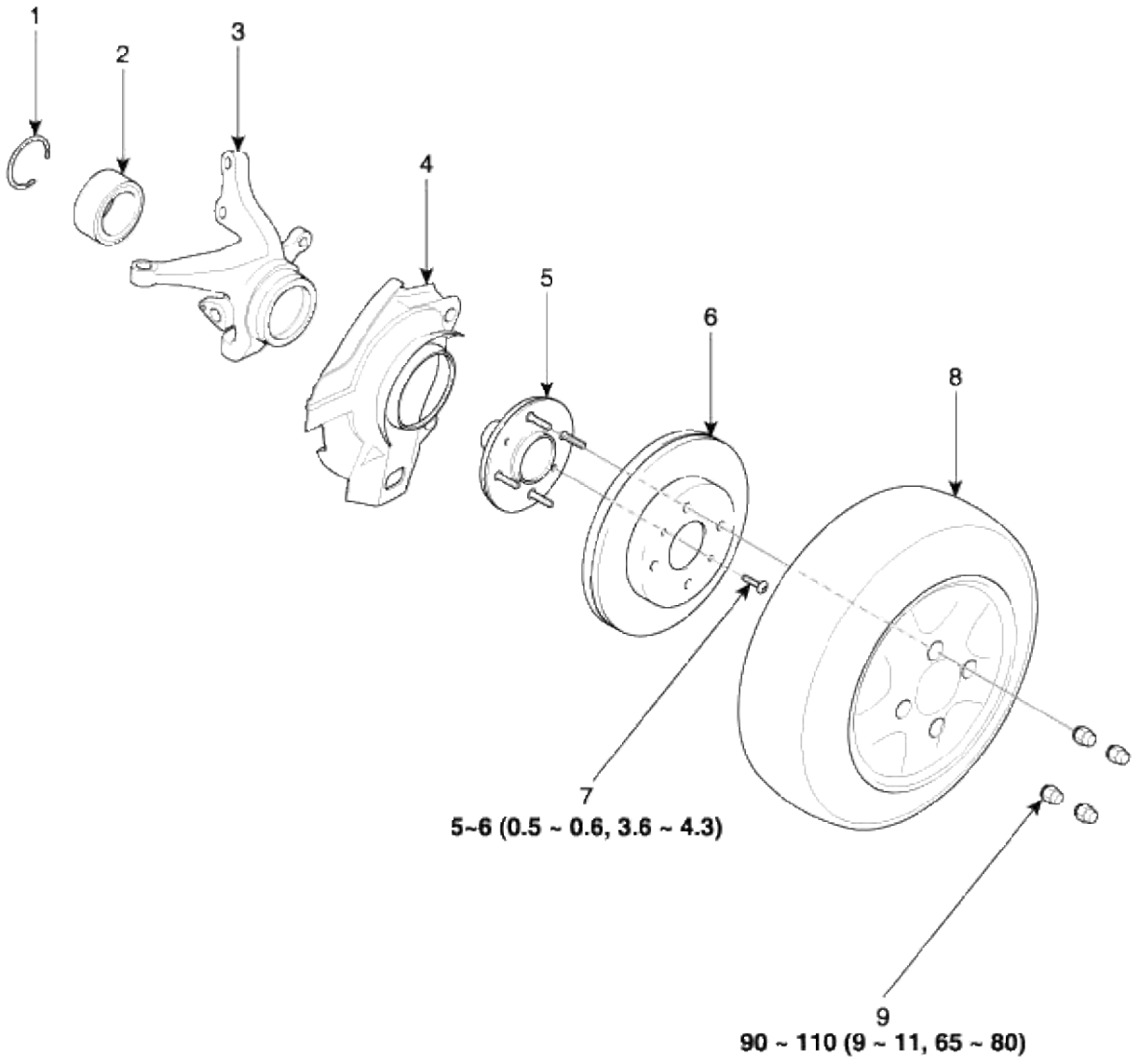


14. Pull out the joint(BJ) boot on the side of wheel into the transaxle direction.

> CAUTION
>
> Be careful not to damage the boot.

Driveshaft and axle > Front Axle Assembly > Front Hub - Axle > Components and Components Location

COMPONENTS



1. Snap ring
2. Front wheel hub bearing
3. Front axle assembly
4. Front brake disc dust cover
5. Front wheel hub assembly
6. Front wheel brake disc
7. Front brake disc fixing screw
8. Front wheel/tire
9. Front wheel nut

Driveshaft and axle > Front Axle Assembly > Front Hub - Axle > Repair procedures

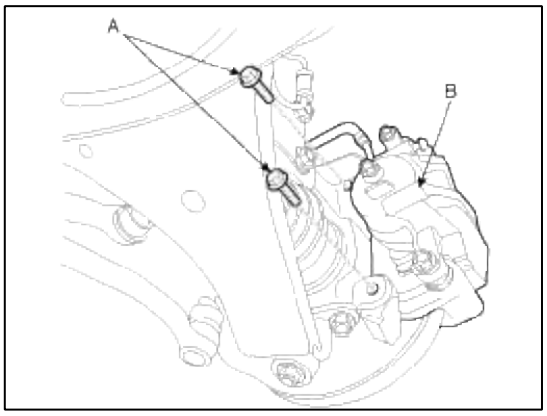
REMOVAL

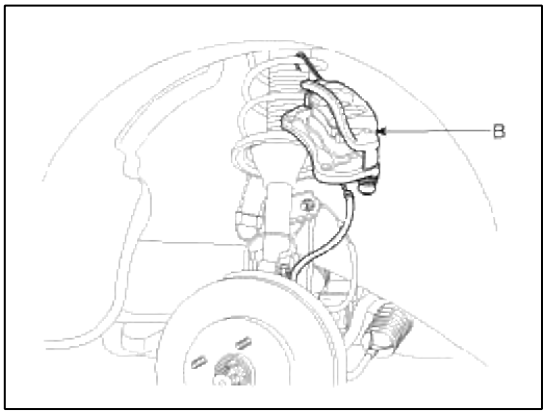
1. Raise the vehicle and remove the wheel & tire assembly.

Tightening torque Nm (kgf·m, lb·ft):
90 ~ 110 (9 ~ 11, 65 ~ 80)

2. Remove the caliper assembly (A) from knuckle (B) and suspend it with wire.

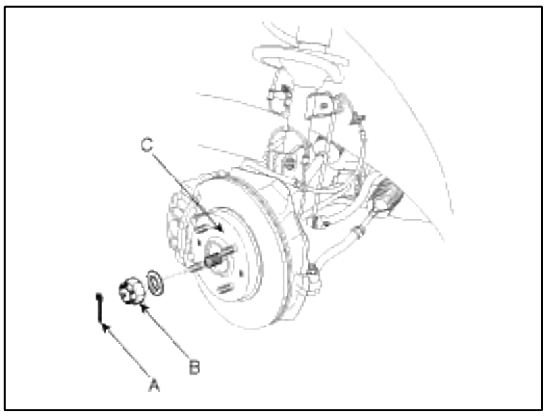
Tightening torque Nm (kgf·m, lb·ft):
65 ~ 75 (6.5 ~ 7.5, 47 ~ 54)



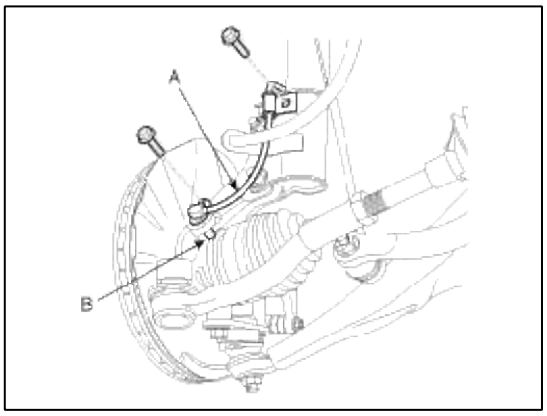


3. Remove the split pin (A), castle nut (B) and washer from the front hub assembly(C).

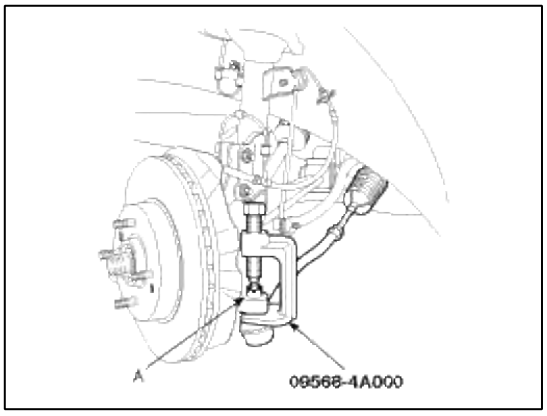
Tightening torque Nm (kgf·m, lb·ft):
200 ~ 260 (20 ~ 26, 145 ~ 188)



4. Remove the wheel speed sensor (A) from the knuckle (B).

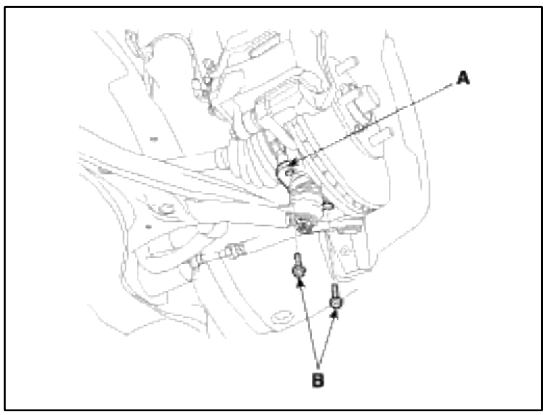


5. Disconnect the tie rod end ball joint (A) from the knuckle using a special tool (09568 - 4A000).



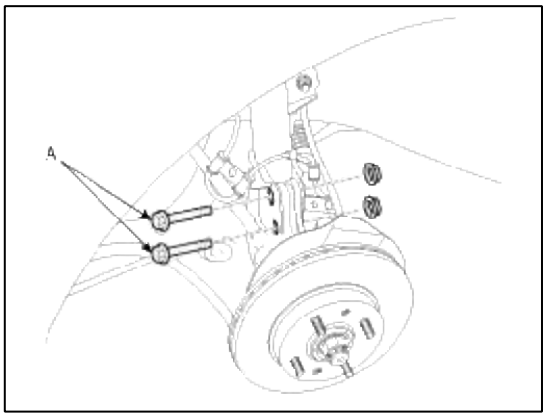
6. Remove the ball joint assembly mounting bolt (A) from the knuckle.

Tightening torque Nm (kgf·m, lb·ft):
100 ~ 120 (10 ~ 120, 72 ~ 86)



7. Remove the strut assembly mounting bolts (A).

Tightening torque Nm (kgf·m, lb·ft):
100 ~ 120 (10 ~ 120, 72 ~ 86)



8. Remove the hub and knuckle as an assembly.

CAUTION

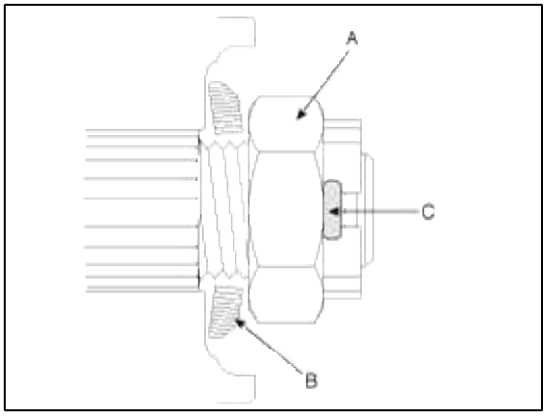
Be careful not to damage the boot and tone wheel.

INSTALLATION

1. Installation is the reverse of removal.

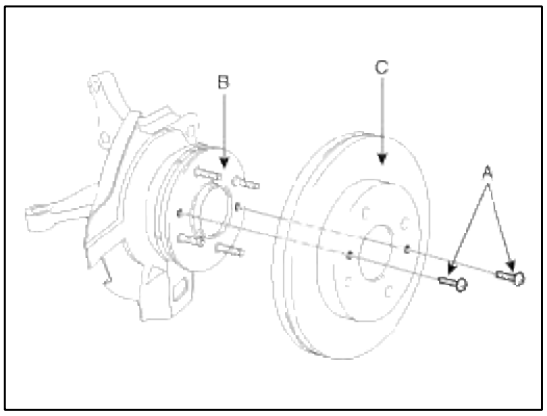
CAUTION

The washer (B) should be assembled with convex surface outward when installing the castle (A) nut and split pin (C).

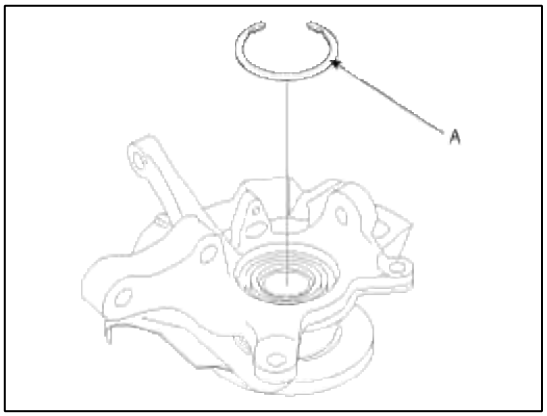


DISASSEMBLY

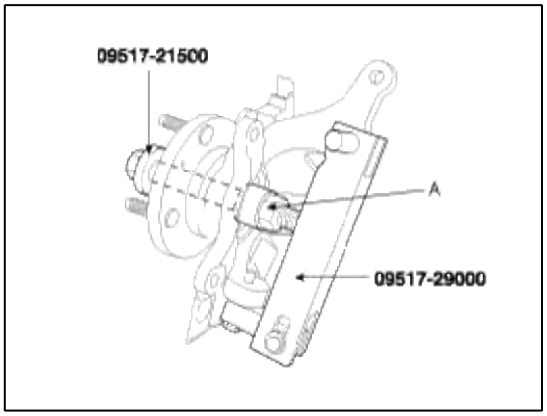
1. After removing the fixed screws(A) mounting the brake disc(C), remove the brake disc(C) from the hub(B).



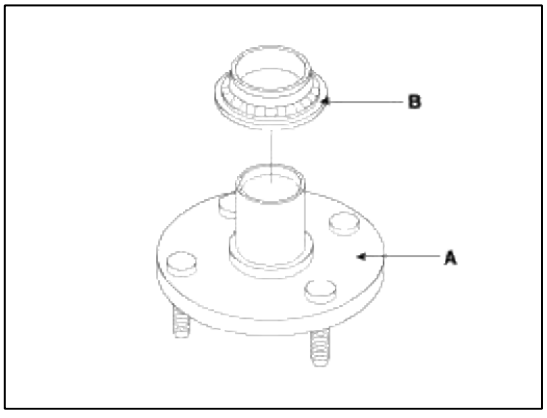
2. Remove the snap ring(A).



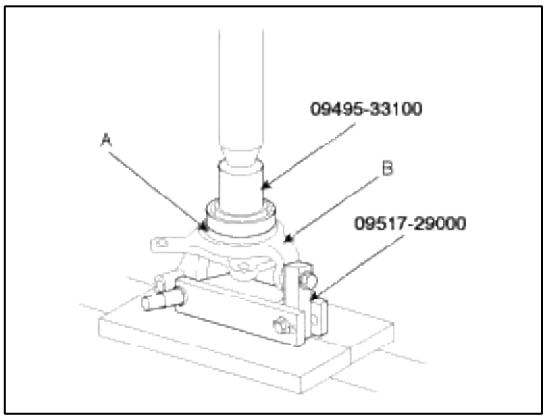
3. Install the special tools(09517-29000, 09517-21500) as shown in illustration below.



4. Separate the hub from the knuckle by turning nut(A) of the special tool(09517-21500).
5. Using a plastic hammer, remove the dust cover from the knuckle.
6. Remove the bearing inner race(B) from the hub(A) using the special tool (09495-33000).



7. Using the special tools (09495-33100, 09517-29000), remove the wheel bearing outer race(A)from the knuckle(B).

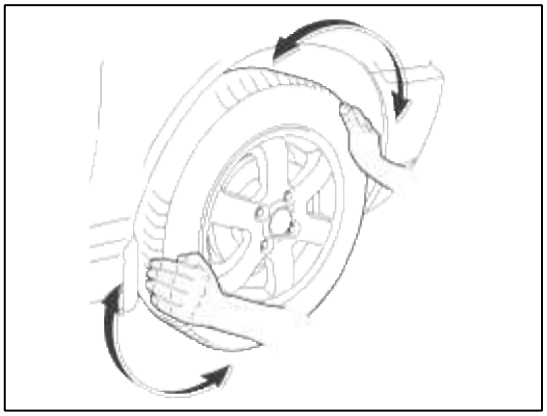


INSPECTION

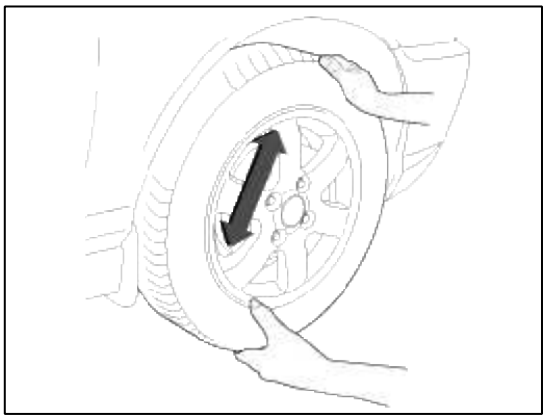
Wheel Bearing Check

1. Raise the vehicle until the front tires are off the floor.
   - Make sure the wheels are in a straight forward position.

> NOTE
>
> Make sure the wheel rotates freely and that the brake pads are retraced sufficiently to allow free movement of the tire and wheel assembly.
> Spin the tire by hand to check the wheel bearings for roughness.



2. Grip each front tire at the top and bottom and move the wheel inward and outward while lifting the weight of the tire off the front wheel bearings.



3. If the tire and wheel (hub) is loose on the spindle, does not rotate freely, or has a rough feeling when spun, carry out one of the following.
   On vehicles with inner and outer bearings, inspect the bearings and races for wear or damage. Adjust or install new bearing and races as necessary.
4. Check the hub for cracks and the splines for wear.

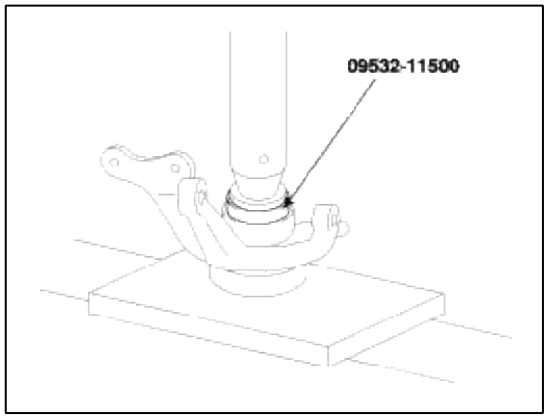
5. Check the brake disc for scoring and damage.
6. Check the knuckle for cracks.
7. Check the bearing for cracks or damage.

REASSEMBLY

1. Apply multi-purpose grease to the contacting surface of the knuckle hub and bearing thinly.
2. Using the Special Tool (09532-11500), press-in the bearing to the knuckle.
   A. Install the snap ring.

NOTE

- Press-in the outer race of the wheel bearing to prevent damage to the bearing assembly.
- When installing a bearing assembly, always use a new one.
- The right and the left bearings must be replaced as a matched set.



3. Using a plastic hammer, install the dust cover.
4. Press-in the hub to the knuckle.

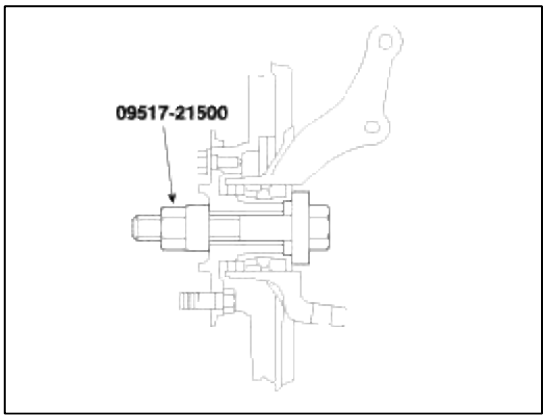
Press fit load : 20 ~ 25 KN (2000 ~ 2500 kgf)

NOTE

Press-in the inner race of the wheel bearing to prevent damage to the bearing assembly.

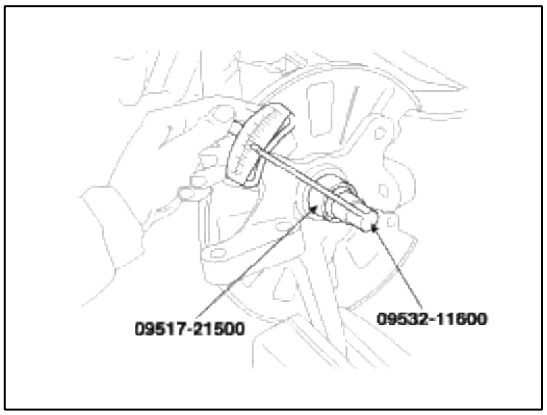
5. Tighten the hub and the knuckle to the specified torque using the Special Tool (09517-21500).

Specified torque Nm (kgf·m, lb-ft) :
200 ~ 260 (20 ~ 26, 144 ~ 188)

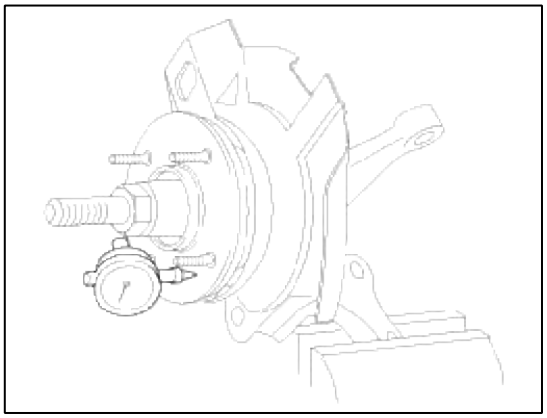


6. Measure the hub bearing starting torque.

Hub bearing starting torque [Limit]
1.3 Nm (13 kgf·m, 0.94 lb-ft) or less



7. If the starting torque is 0 Nm (0 kg·cm, 0 lb·ft), measure the hub bearing axial play.



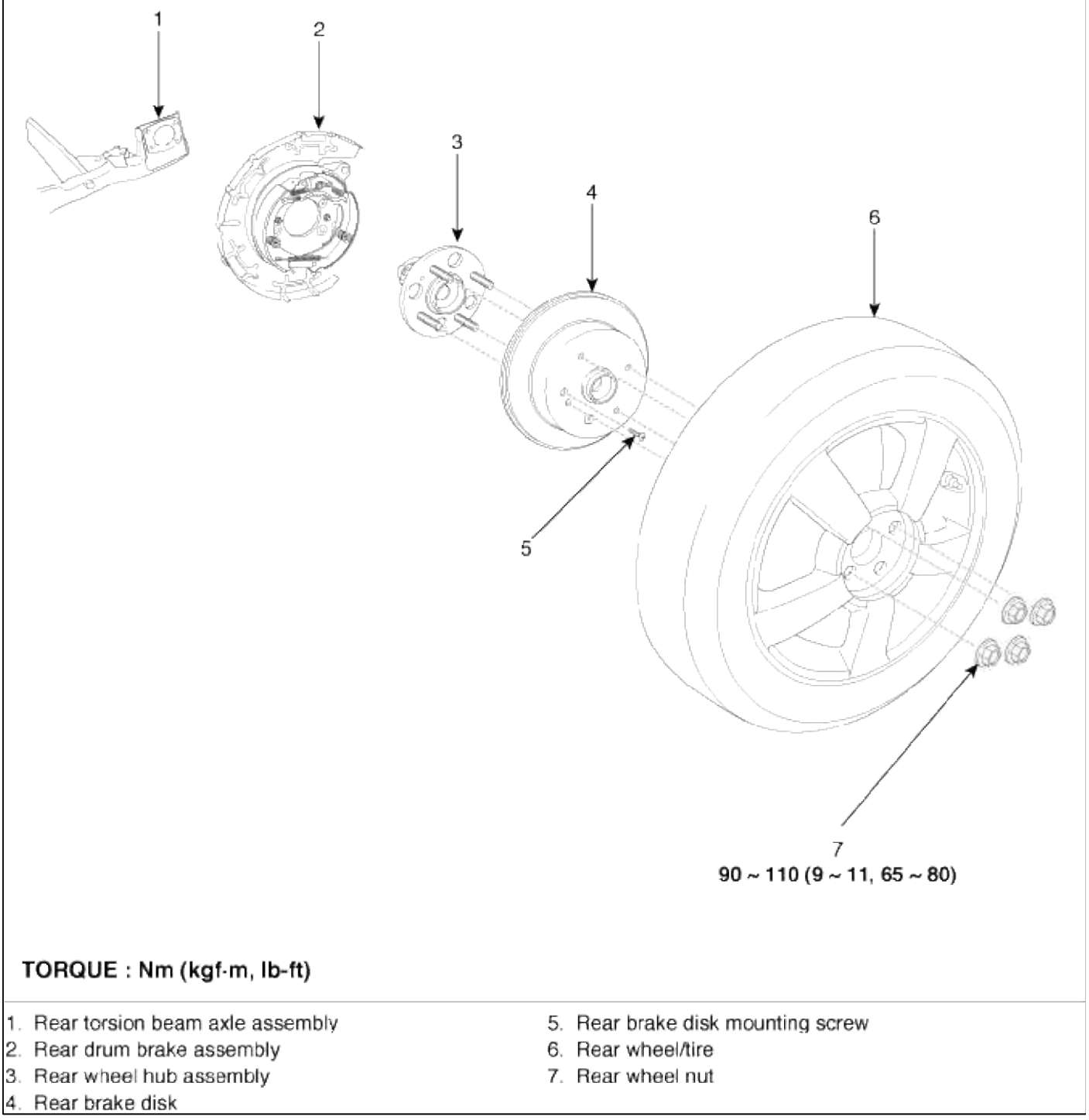
8. If the hub axial play exceeds the limit while the nut is tightened to 200 ~ 260 Nm (20 ~ 26 kgf·m, 145 ~ 188 lb-ft), the bearing, hub and knuckle are not installed correctly. Repeat the disassembly and assemblyprocedure.

Hub bearing axial play [Limit]
0.008 mm (0.0003 in) or less

9. Remove the Special Tool.
10. Fix the brake disc with the mounting screws.

Driveshaft and axle > Rear Axle Assembly > Rear Hub - Carrier > Components and Components Location

COMPONENTS



1. Rear torsion beam axle assembly
2. Rear drum brake assembly
3. Rear wheel hub assembly
4. Rear brake disk
5. Rear brake disk mounting screw
6. Rear wheel/tire
7. Rear wheel nut

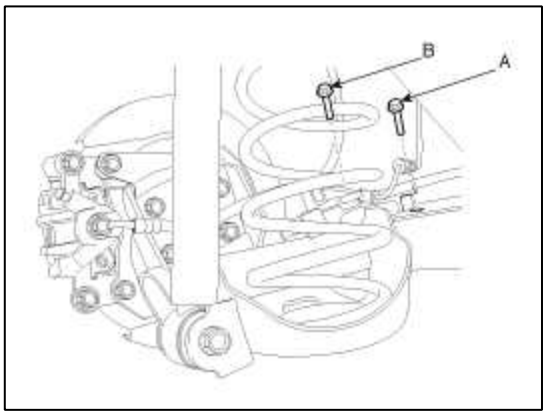
Driveshaft and axle > Rear Axle Assembly > Rear Hub - Carrier > Repair procedures

Removal

1. Raise the vehicle and remove the rear wheel & tire assembly.

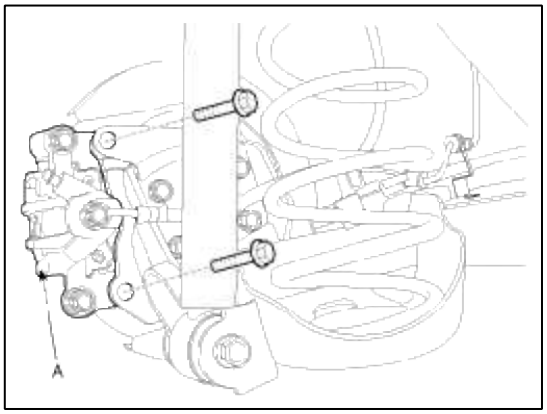
Tightening torque Nm (kgf·m, lb·ft):
90 ~ 110 (9 ~ 11, 65 ~ 80)

2. Remove the wheel speed sensor bracket bolt (A) and parking brake wire bracket bolt (B).

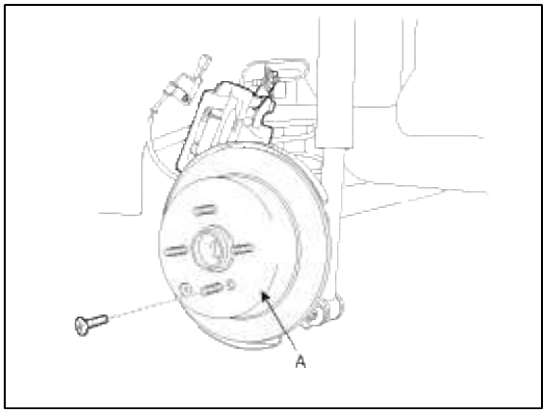


3. Remove the brake caliper assembly (A) from the carrier assembly and suspend it with wire.

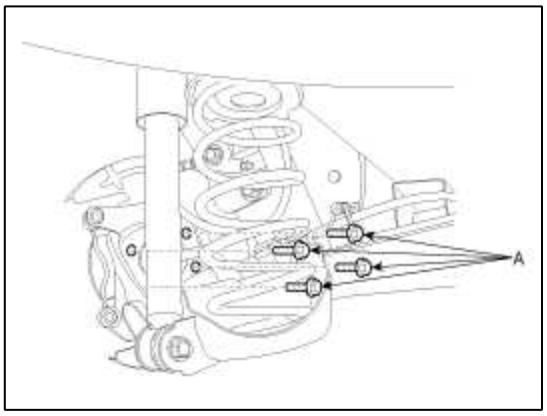
Tightening torque Nm (kgf·m, lb·ft):
65 ~ 75 (6.5 ~ 7.5, 47 ~ 54)



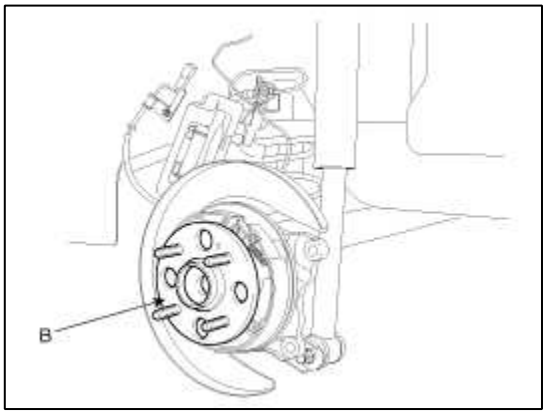
4. Loosen the screw and remove the rear brake disc assembly (A).



5. Loosen the bolts (A) and remove the rear hub & carrier assembly (B) from torsion axle.



Tightening torque Nm (kgf·m, lb·ft):
50 ~ 60 (5.0 ~ 6.0, 36 ~ 43)



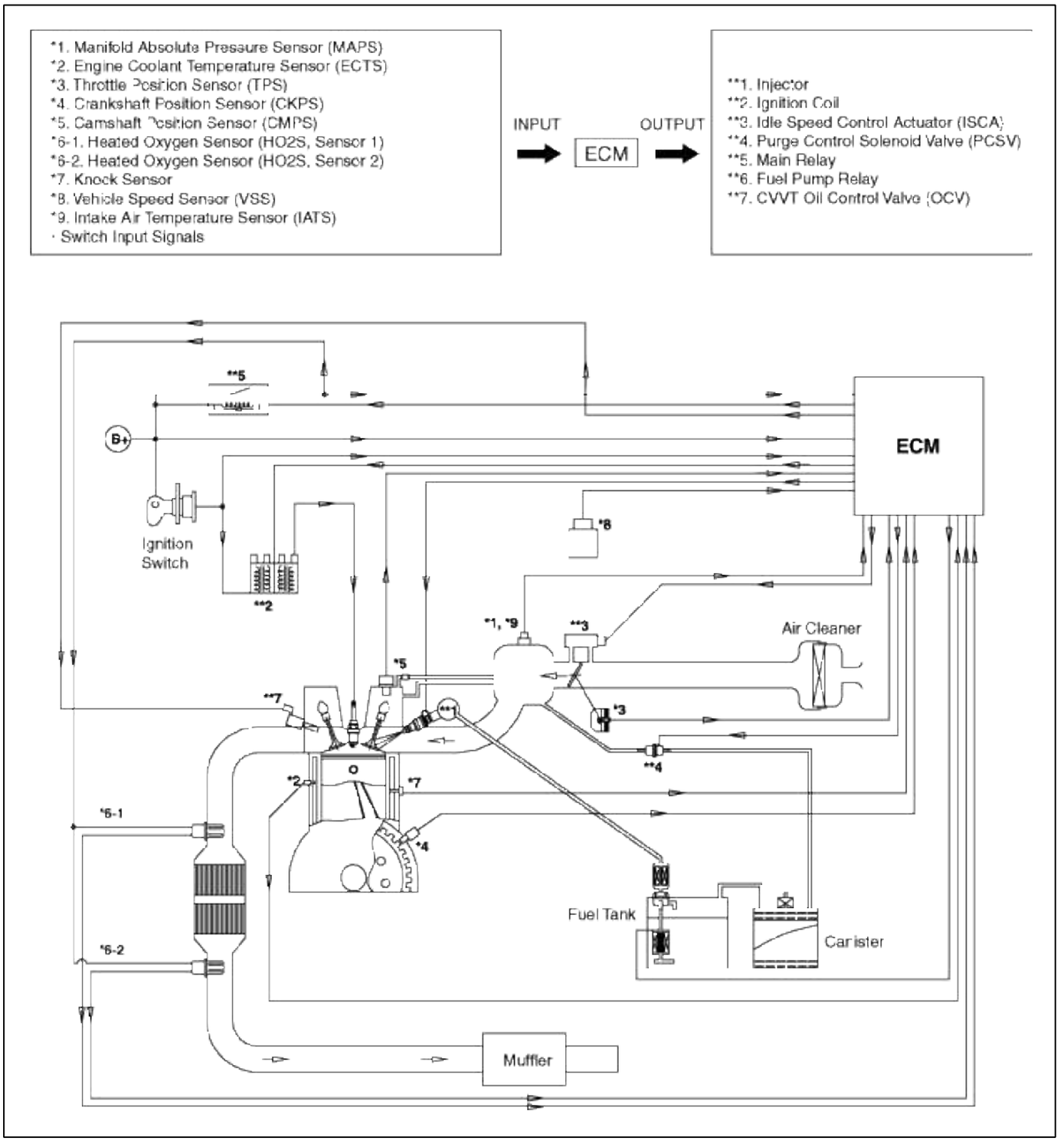
INSTALLATION

1. Installation is the reverse of removal.

ACCENT(MC) > 2008 > G 1.6 DOHC > Emission Control System

Emission Control System > General Information > Schematic Diagrams

SCHEMATIC DIAGRAM



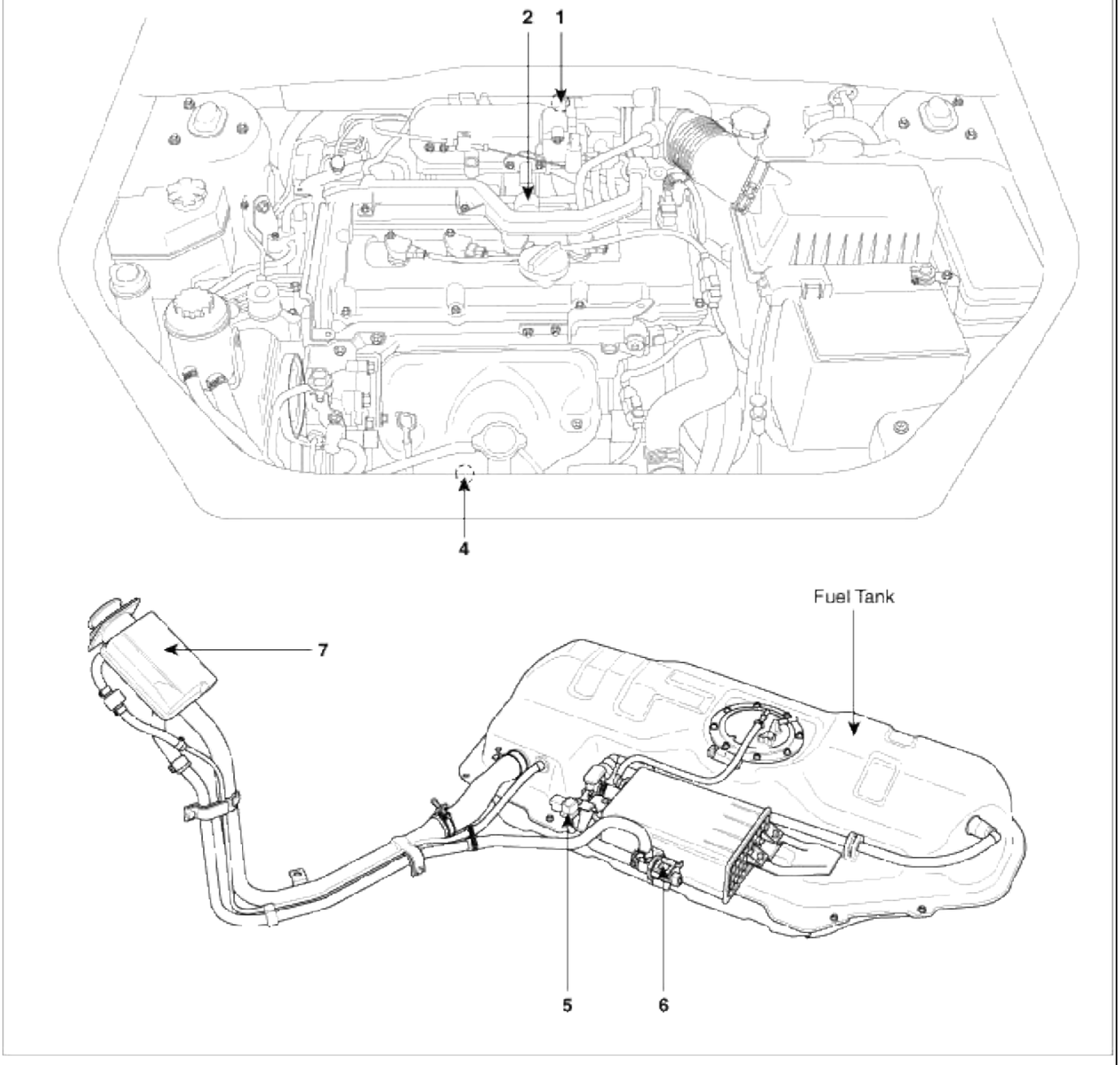
Emission Control System > General Information > Description and Operation

DESCRIPTION

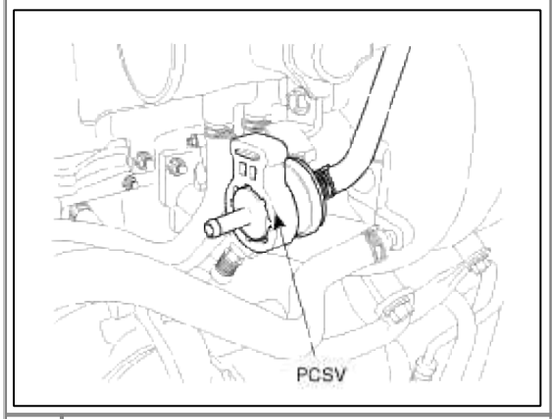
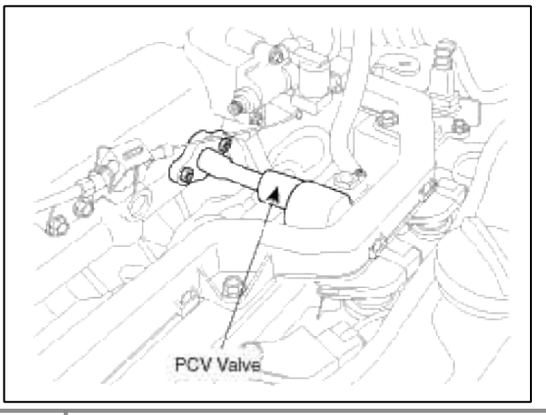
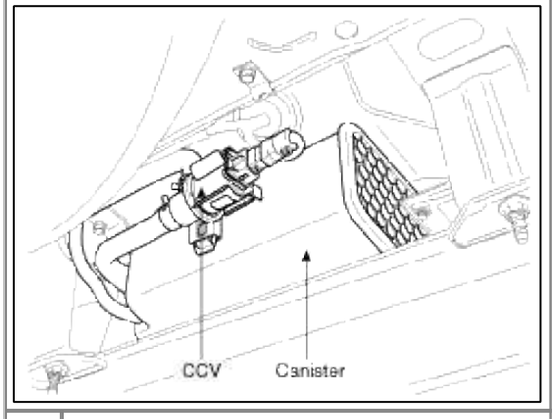
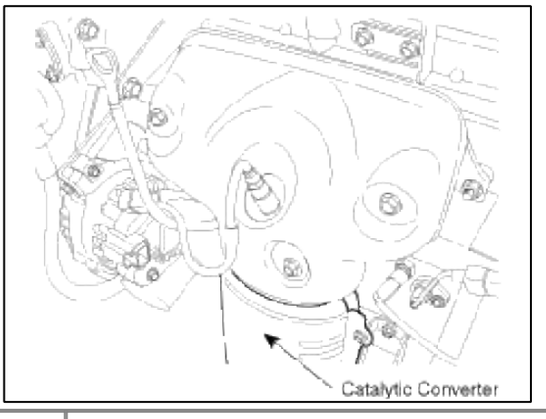
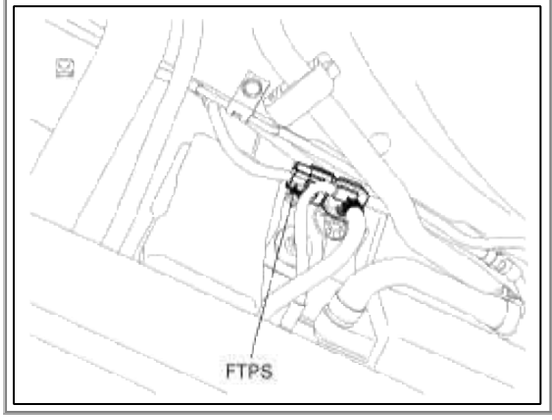
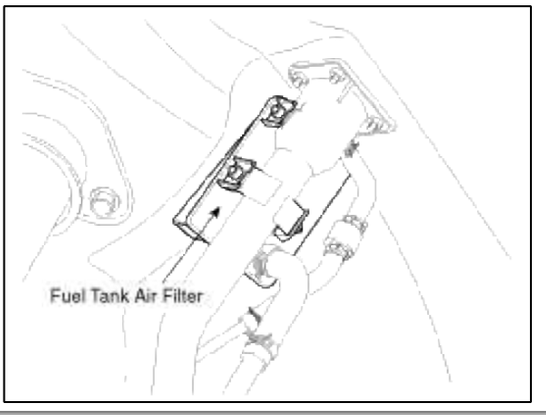
Components	Function	Remarks
Crankcase Emission System - Positive Crankcase Ventilation (PCV) valve	HC reduction	Variable flow rate type
Evaporative Emission System - Evaporative emission canister - Purge Control Solenoid Valve (PCSV)	 HC reduction HC reduction	 Duty control solenoid valve
Exhaust Emission System - MFI system (air-fuel mixtrue control device) - Three-way catalytic converter	CO, HC, NOx reduction O, HC, NOx reduction	Heated oxygen sensor (feedback type) Monolithic type

Emission Control System > General Information > Components and Components Location

COMPONENT LOCATION



1. Purge Control Solenoid Valve (PCSV)
2. PCV Valve
3. Canister
4. Catalytic Converter
5. Fuel Tank Pressure Sensor (FTPS)
6. Canister Close Vlave (CCV)
7. Fuel Tank Air Fillter

1	Purge Control Solenoid Valve (PCSV)	2	Positive Crankcase Ventilation (PCV) Valve
			
3	Canister	4	Catalytic Converter
6	Canister Close Valve (CCV)		
			
5	Fuel Tank Pressure Sensor (FTPS)	7	Fuel Tank Air Filter
			

Emission Control System > General Information > Troubleshooting

TROUBLESHOOTING

Symptom	Suspect area	Remedy
Engine will not start or hard to start	Vacuum hose disconnected or damaged	Repair or replace
	Malfunction of the EVAP. Canister Purge Solenoid Valve	Repair or replace
Rough idle or engine stalls	Vacuum hose disconnected or damaged	Repair or replace
	Malfunction of the PCV valve	Replace
	Malfunction of the evaporative emission canister purge system	Check the system; if there is a problem, check related components parts
Excessive oil consumption	Positive crankcase ventilation line clogged	Check positive crankcase ventilation system

Emission Control System > General Information > Specifications

SPECIFICATIONS

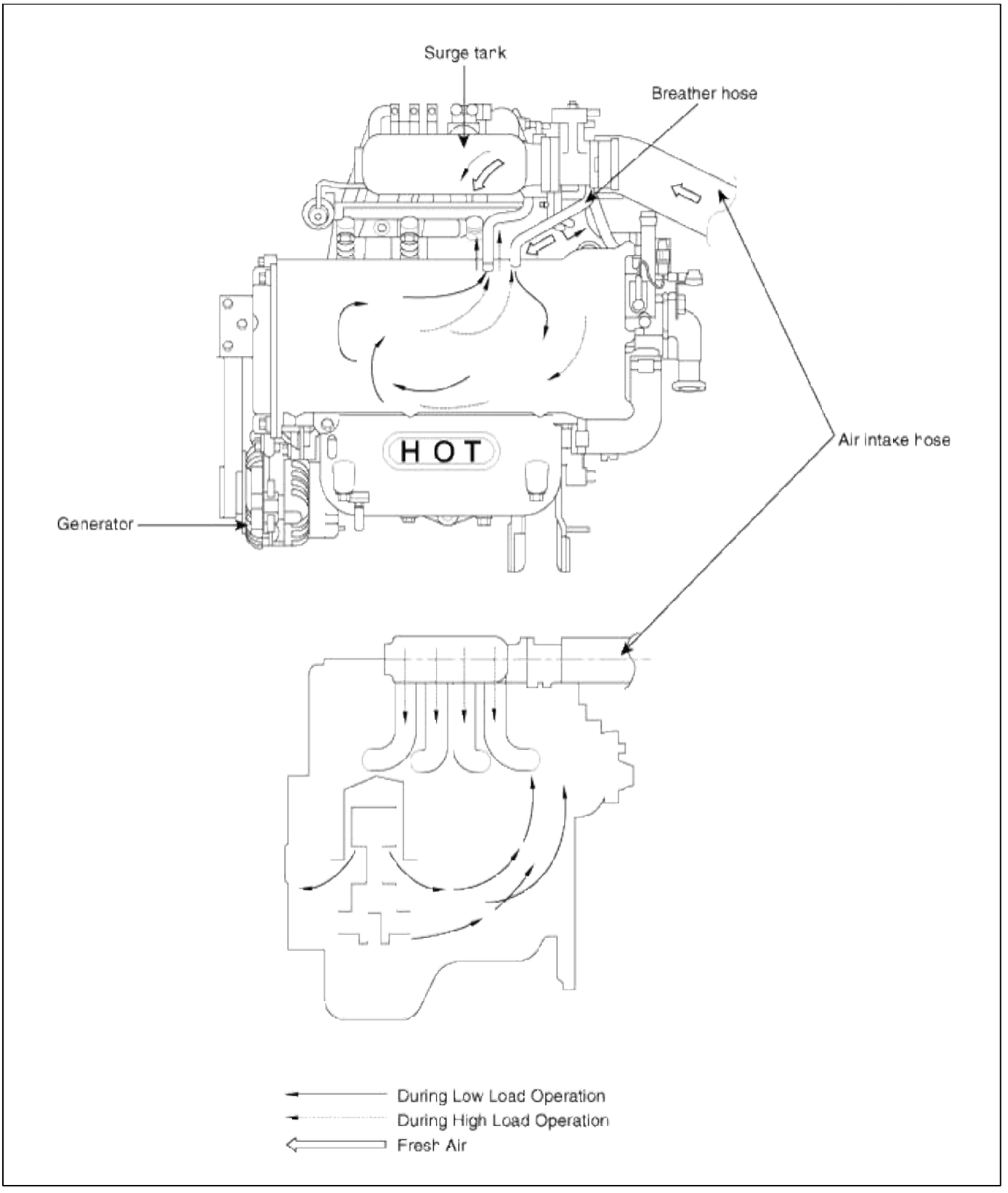
Item	Specification	
Purge Control Solenoid Valve (PCSV)	Type	Duty Control type
	Resistance (Ω)	16.0Ω at 20 °C (68 °F)

TIGHTENING TORQUES

Item	N·m	kgf·m	lbf·ft
Positive Crankcase Ventilation Valve	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7

Emission Control System > Crankcase Emission Control System > Components and Components Location

COMPONENT LOCATION



Emission Control System > Crankcase Emission Control System > Repair procedures

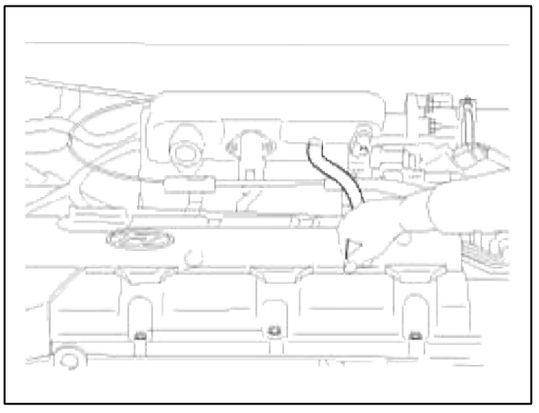
INSPECTION

1. Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve. Remove the PCV valve from the rocker cover and reconnect it to the ventilation hose.

2. Run the engine at idle and put a finger on the open end of the PCV valve and make sure that intake manifold vacuum can be felt.

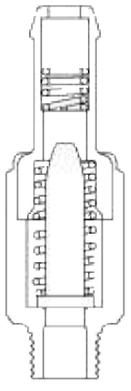
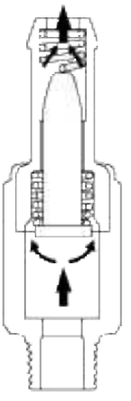
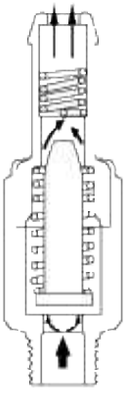
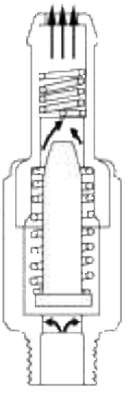
NOTE

The plunger inside the PCV valve will move back and forth.



Emission Control System > Crankcase Emission Control System > Positive Crankcase Ventilation (PCV) Valve > Description and Operation

OPERATION

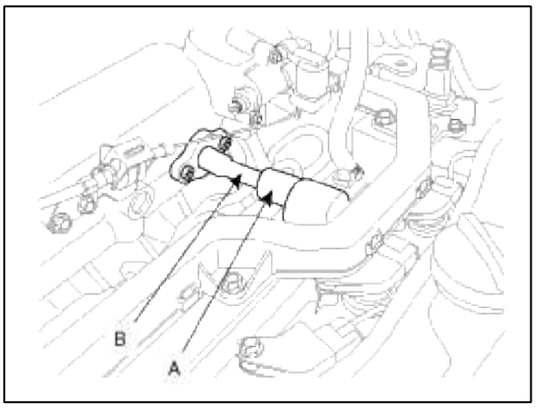
Intake manifold side (No vacuum)  Rocker cover side		Intake manifold side (High vacuum)  Rocker cover side	
Engine condition	Not running	Engine condition	Idling or decelerating
PCV valve	Not operating	PCV valve	Fully operating
Vacuum passage	Restricted	Vacuum passage	Small
Intake manifold side (Moderate vacuum)  Rocker cover side		Intake manifold side (Low vacuum)  Rocker cover side	
Engine condition	Normal operation	Engine condition	Accelerating and high load

PCV valve	Properly operating	PCV valve	Slightly operating
Vacuum passage	Large	Vacuum passage	Very large

Emission Control System > Crankcase Emission Control System > Positive Crankcase Ventilation (PCV) Valve > Repair procedures

REMOVAL

1. Remove the valve pad (A) and disconnect the vacuum hose (B).



2. Remove the PCV Valve.

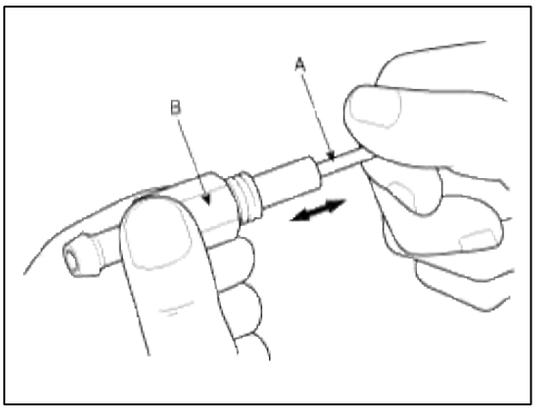
INSTALLATION

1. Install the PCV valve according to the reverse order of the "REMOVAL" procedure.

PCV Valve Installation : 7.8 ~ 11.8 N·m (0.8 ~ 1.2 kgf·m, 5.8 ~ 8.7 lbf·ft)

INSPECTION

1. Remove the PCV valve.
2. Insert a thin stick(A) into the PCV valve(B) from the threaded side to check that the plunger moves.
3. If the plunger does not move, the PCV valve is clogged. Clean it or replace.



Emission Control System > Evaporative Emission Control System > Description and Operation

DESCRIPTION

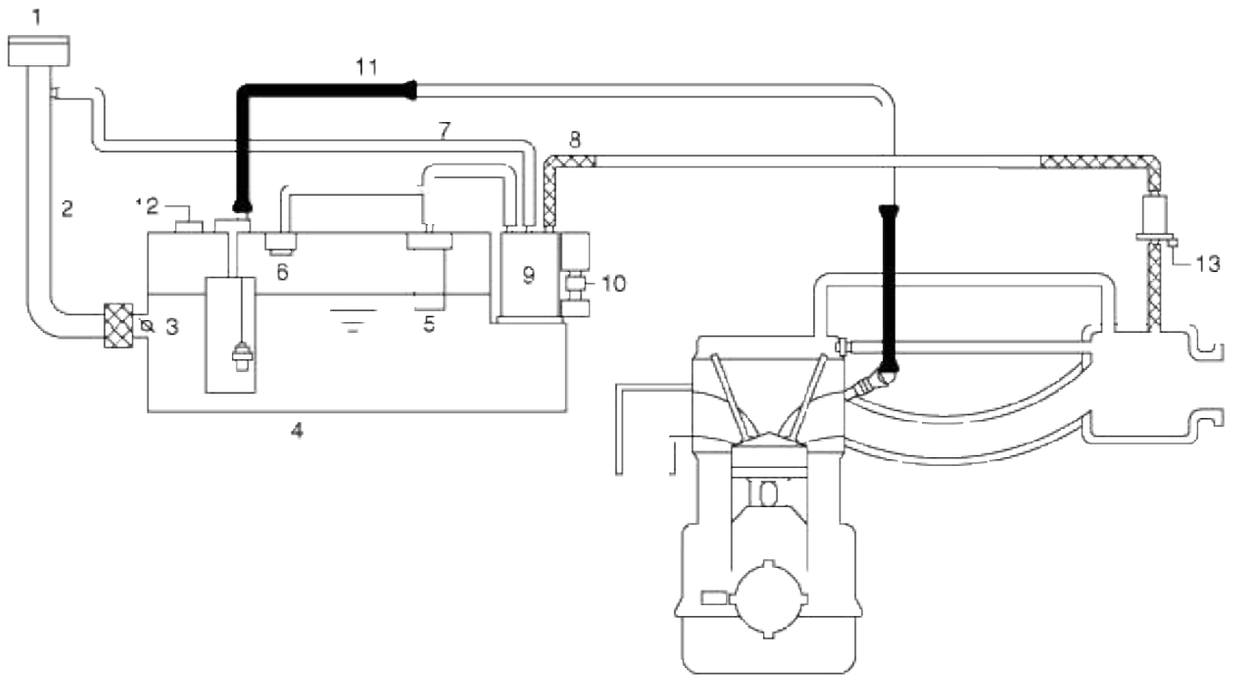
This system consists of a fill vent valve, fuel shut-off valve, fuel cut valve (for roll over), two way valve (pressure/vacuum relief), fuel liquid/vapor separator which is installed beside the filler pipe, charcoal canister which is mounted under the rear floor LH side member and protector, tubes and miscellaneous connections.

While refueling, ambient air is drawn into the filler pipe so as not to emit fuel vapors in the air. The fuel vapor in the tank is then forced to flow into the canister via the fill vent valve. The fuel liquid/vapor separator isolates liquid fuel and passes the pure vapor to the charcoal canister.

While the engine is operating, the trapped vapor in the canister is drawn into the intake manifold and then into the

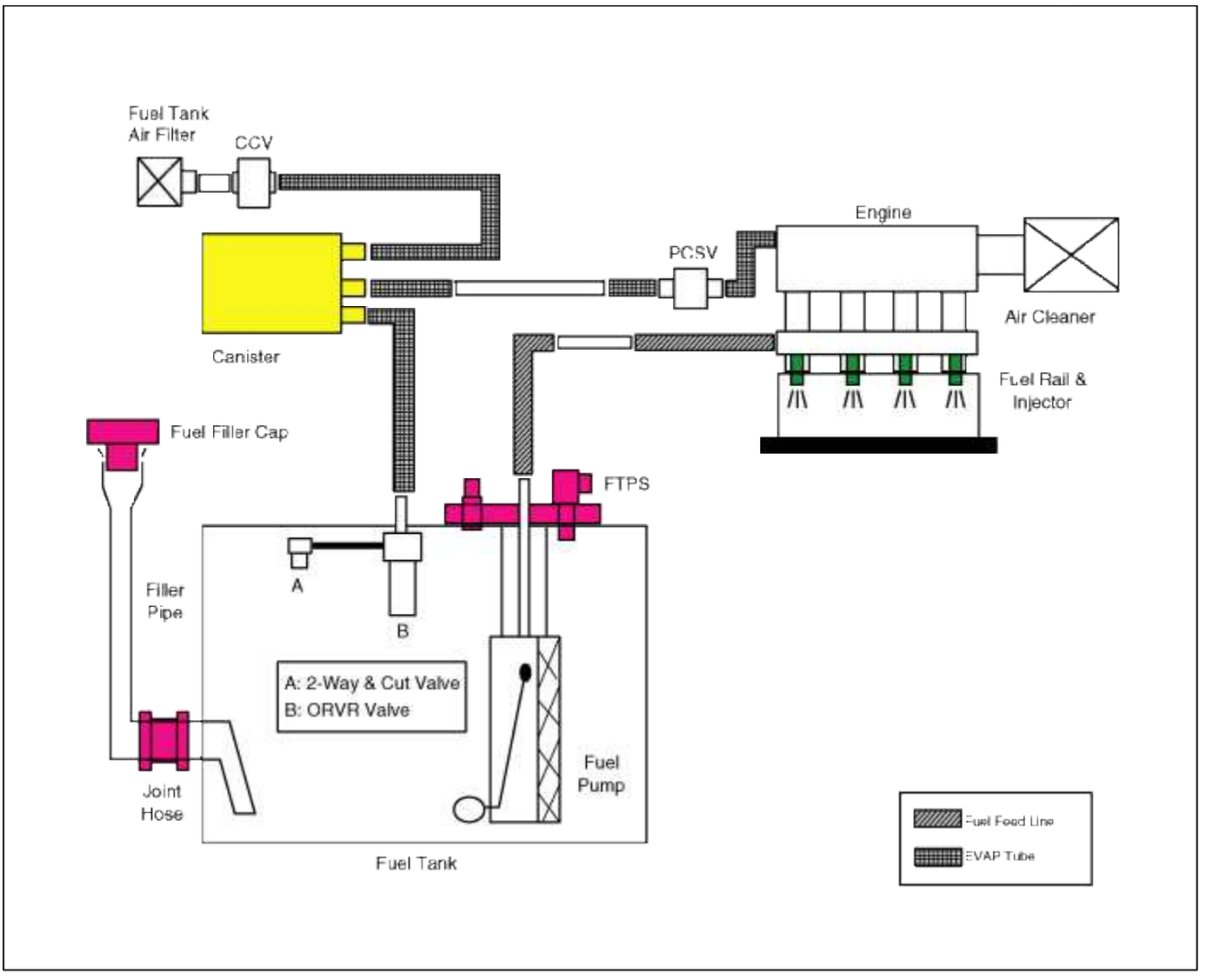
engine combustion chamber. According to this purge process, the charcoal canister is purged and recovers its absorbing capability.

COMPONENTS

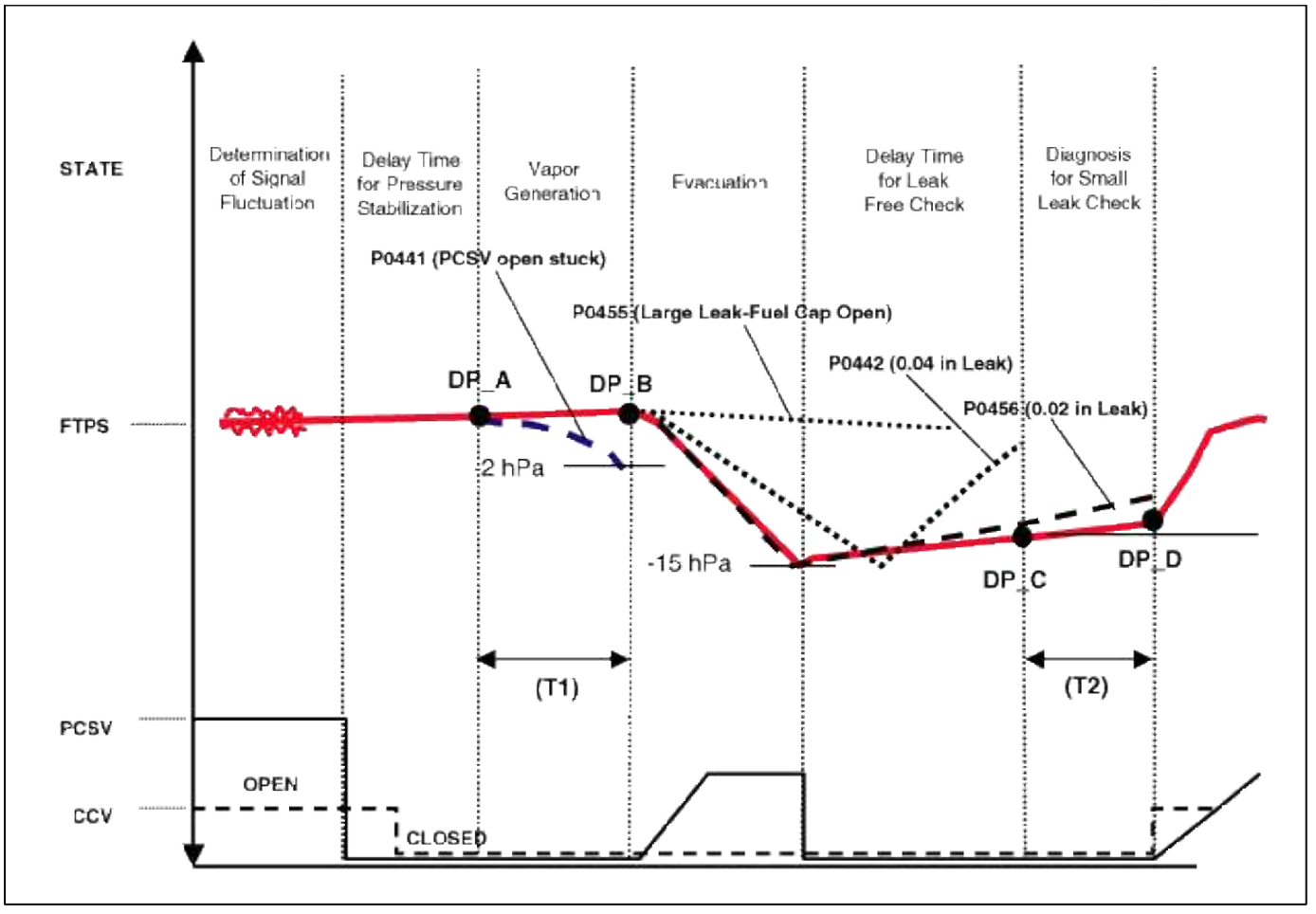


1. Fuel Filler Cap
2. Fuel Filler Pipe
3. Fuel Shut-OFF Valve
4. Fuel Tank
5. ORVR Valve
6. 2-Way & Cut Valve
7. Evaporative Hose
8. Evaporative Hose
9. Canister
10. Canister Close Valve (CCV)
11. Fuel Feed Line
12. Fuel Tank Pressure Sensor (FTPS)
13. Purge Control Solenoid Valve (PCSV)

DESCRIPTION



EVAPORATIVE SYSTEM MONITORING



Emission Control System > Evaporative Emission Control System > Repair procedures

INSPECTION

1. Disconnect the vacuum hose from the throttle body, and connect a vacuum pump to the vacuum hose.
2. Check the following points when the engine is cold [engine coolant temperature 60°C(140°F) or below] and when it is warm [engine coolant temperature 80°C(176°F) or higher].

WHEN ENGINE IS COLD

Engine operating condition	Applied vacuum	Result
Idling	50 kPa (7.3 psi)	Vacuum is held
3,000 rpm		

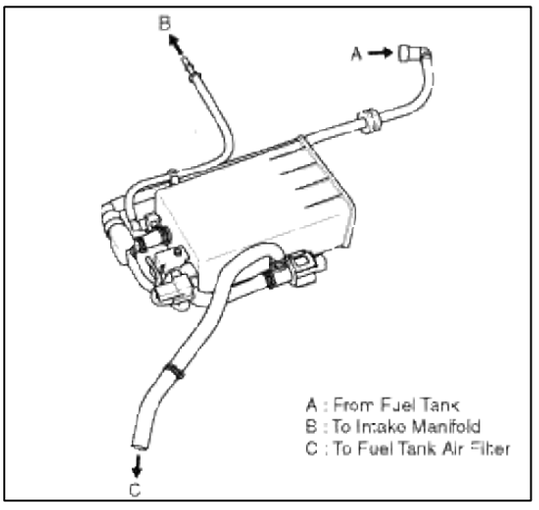
WHEN ENGINE IS WARM

Engine operating condition	Applied vacuum	Result
Idling	50 kPa (7.3 psi)	Vacuum is held
Within 3 minutes after engine start at 3,000 rpm	Try to apply vacuum	Vacuum is released
After 3 minutes have passed after engine start at 3,000 rpm	50 kPa (7.3 psi)	Vacuum will be held momentarily, after which, it will be released

Emission Control System > Evaporative Emission Control System > Canister > Repair procedures

INSPECTION

1. Look for loose connections, sharp bends or damage to the fuel vapor lines.
2. Look for distortion, cracks or fuel leakage.
3. After removing the EVAP. canister, inspect for cracks or damage.



Emission Control System > Evaporative Emission Control System > Purge Control Solenoid Valve (PCSV) > Repair procedures

INSPECTION

NOTE

When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to its original position.

1. Disconnect the vacuum hose from the solenoid valve.
2. Detach the harness connector.
3. Connect a vacuum pump to the nipple to which the red-striped vacuum hose was connected.
4. Apply vacuum and check when voltage is applied to the PCSV and when the voltage is discontinued.

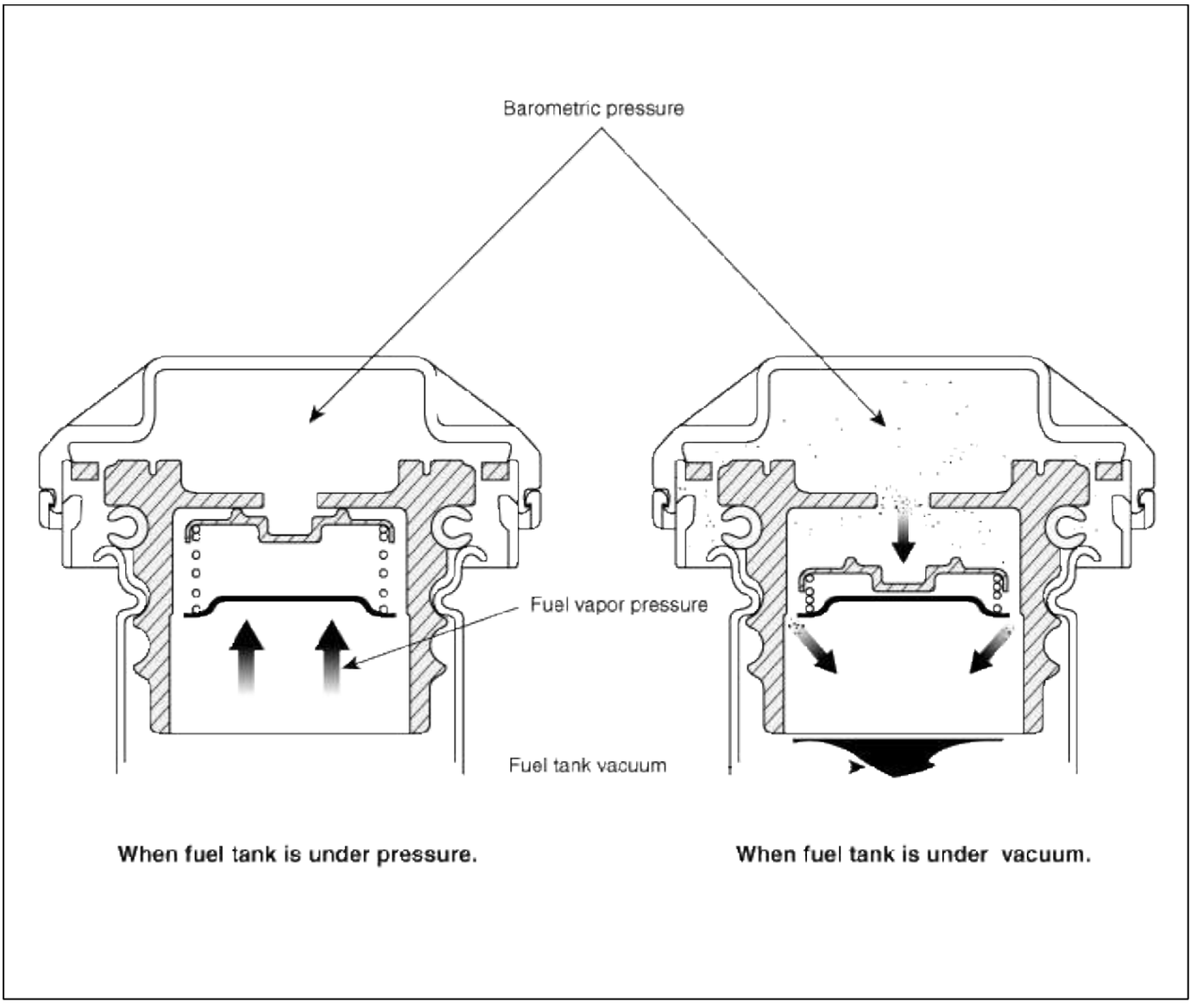
Battery voltage	Normal condition
When applied	Vacuum is released
When discontinued	Vacuum is maintained

5. Measure the resistance between the terminals of the solenoid valve.

PCSV coil resistance (Ω) : 16.0 Ω at 20°C (68°F)

Emission Control System > Evaporative Emission Control System > Fuel Filler Cap > Description and Operation

DESCRIPTION



Emission Control System > Exhaust Emission Control System > Description and Operation

DESCRIPTION

Modifications to the combustion chamber, intake manifold, camshaft and ignition system form the basic control system.

These items have been integrated into a highly effective system which controls exhaust emissions while maintaining good driveability and fuel economy.

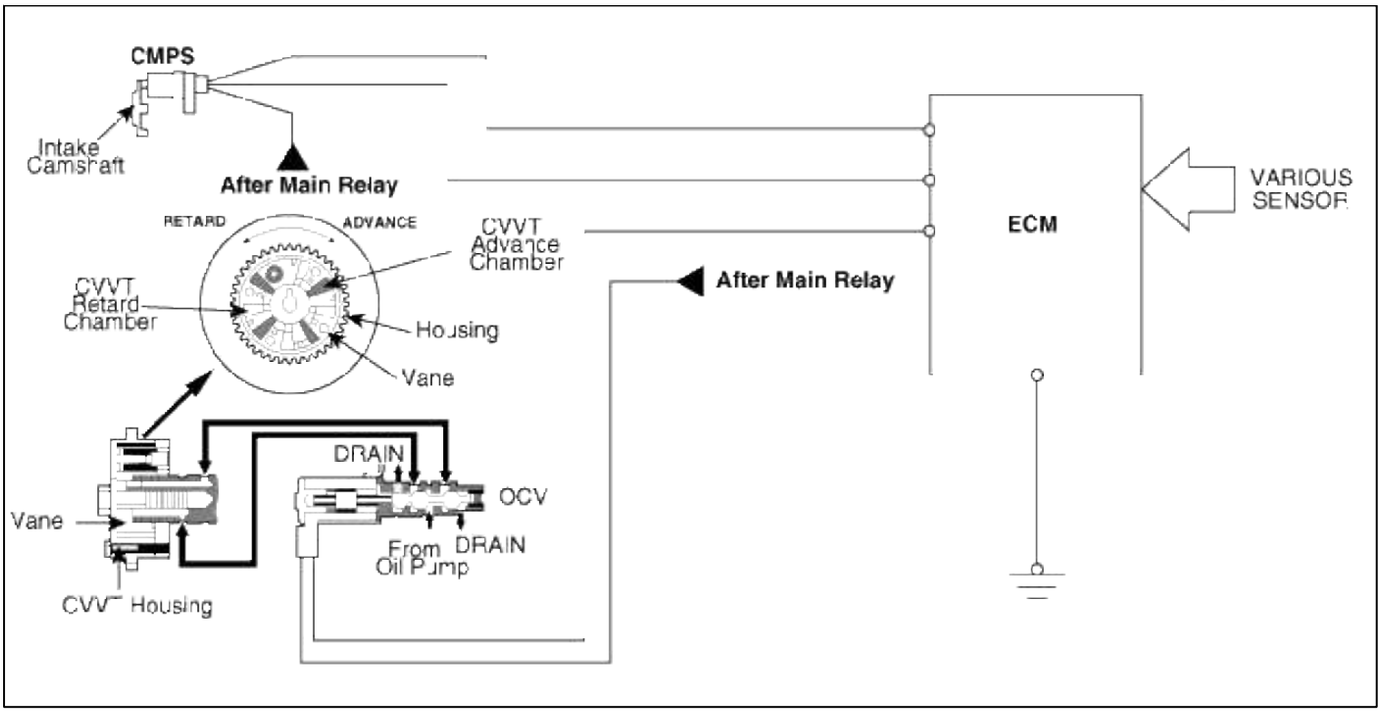
AIR/FUEL MIXTURE CONTROL SYSTEM [MULTIPORT FUEL INJECTION (MFI) SYSTEM]

This in turn allows the engine to produce exhaust gases of the proper composition to permit the use of a three way catalyst. The three way catalyst is designed to convert the three pollutants (1) hydrocarbons (HC), (2) carbon monoxide (CO), and (3) oxides of nitrogen (NOx) into harmless substances. There are two operating modes in the MFI system.

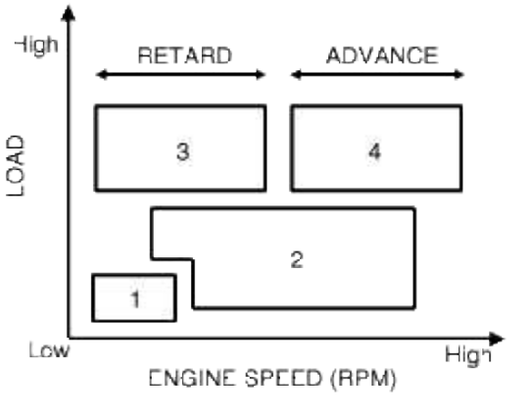
1. Open Loop air/fuel ratio is controlled by information programmed into the ECM.
2. Closed Loop air/fuel ratio is adjusted by the ECM based on information supplied by the oxygen sensor.

Emission Control System > Exhaust Emission Control System > CVVT (Continuously Variable Valve Timing) System > Description and Operation

DESCRIPTION



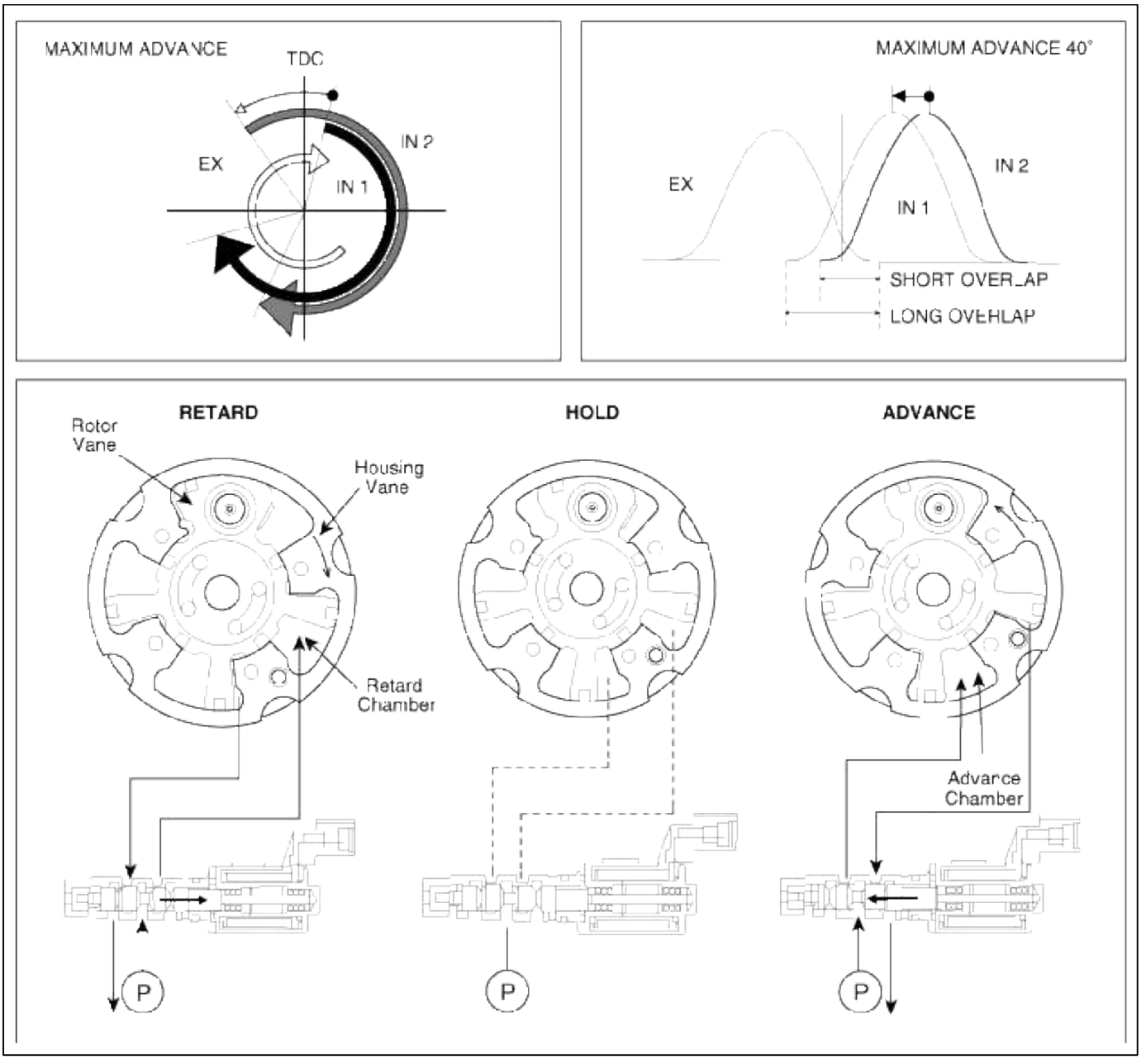
The CVVT (Continuously Variable Valve Timing) which is installed on the exhaust camshaft controls intake valve open and close timing in order to improve engine performance.
The intake valve timing is optimized by the CVVT system depending on engine rpm.
This CVVT system improves fuel efficiency and reduces NOx emissions at all levels of engine speed, vehicle speed, and engine load by EGR effect because of valve over-lap optimization.
The CVVT changes the phase of the intake camshaft via oil pressure.
It changes the intake valve timing continuously.



Driving Condition	Intake Valve Timing	Effect
Light load (1)	Retard	Stable combustion
Part load (2)	Advance	Enhanced fuel economy and exhaust emissions
High load& Low rpm (3)	Advance	Enhanced torque
High load& High rpm (4)	Retard	Enhanced Power

OPERATION

The CVVT system makes continuous intake valve timing changes based on operating conditions.
Intake valve timing is optimized to allow the engine to produce maximum power.
Cam angle is advanced to obtain the EGR effect and reduce pumping loss. The intake valve is closed quickly to reduce the entry of the air/fuel mixture into the intake port and improve the changing effect.
Reduces the cam advance at idle, stabilizes combustion, and reduces engine speed.
If a malfunction occurs, the CVVT system control is disabled and the valve timing is fixed at the fully retarded position.



1. The above figure shows the relative operation structures of the housing vane to the rotor vane.
2. If the CVVT is held a certain control angle, to hold this state, oil is replenished as much as oil leaks from the oil pump.

The OCV (Oil-flow Control Valve) spool location at this time is as follows.

Oil pump → Advance oil chamber (Little by little open the inflow side to the advance oil chamber) → Almost close the drain side

Be sure there might be a difference in the position according to the engine running state (rpm, oil temperature, and oil pressure).

ACCENT(MC) > 2008 > G 1.6 DOHC > Engine Electrical System

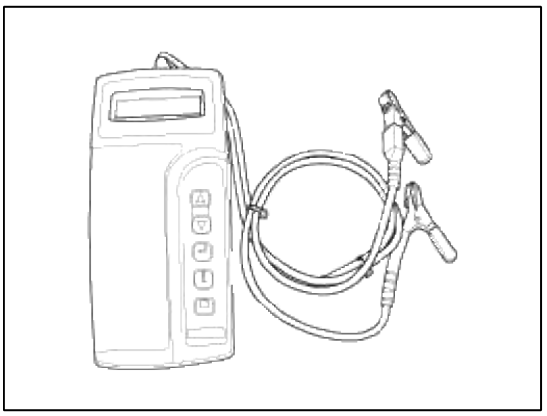
Engine Electrical System > General Information > General Information

THE MICRO 570 ANALYZER

The MICRO 570 Analyzer provides the ability to test the charging and starting systems, including the battery, starter and alternator.

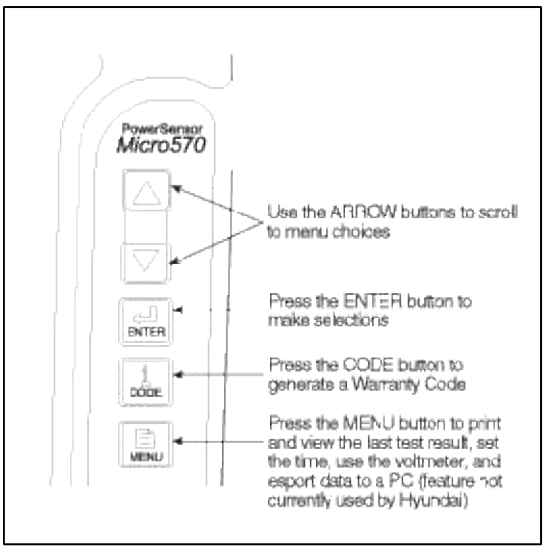
CAUTION

Because of the possibility of personal injury, always use extreme caution and appropriate eye protection when working with batteries.



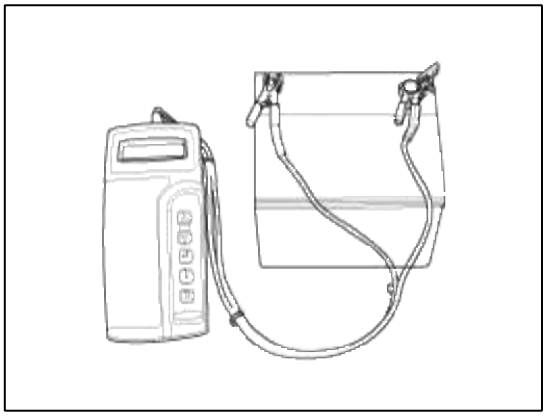
KEYPAD

The MICRO570 button on the key pad provide the following functions :



BATTERY TEST PROCEDURE

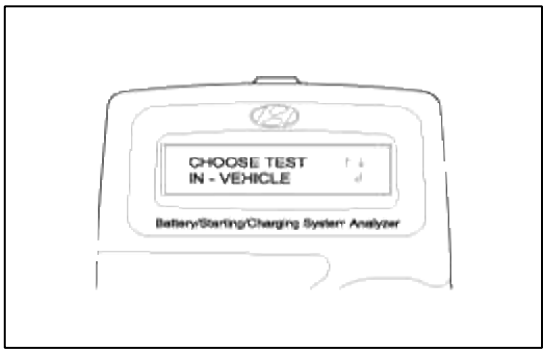
1. Connect the tester to the battery.
   A. Red clamp to battery positive (+) terminal.
   B. Black clamp to battery negative (-) terminal.



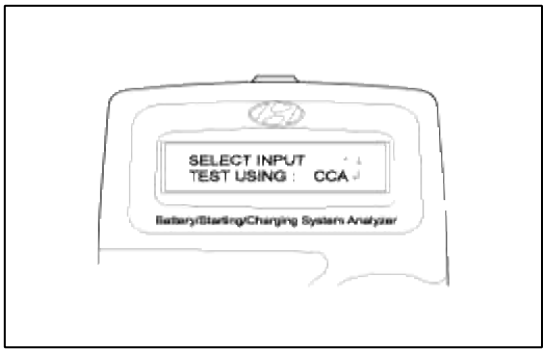
CAUTION

Connect clamps securely. If "CHECK CONNECTION" message is displyed on the screen, reconnect clamps securely.

2. The tester will ask if the battery is connected "IN A VEHICLE" or "OUT OF A VEHICLE".
   Make your selection by pressing the arrow buttons; then press ENTER.



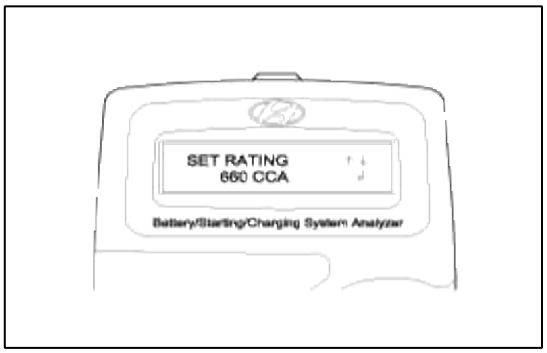
3. Choose either CCA or CCP and press the ENTER button.



NOTE

- CCA : Cold cranking amps, is an SAE specification for cranking batteried at 0°F (-18°C).
- CCP : Cold cranking amps, is an SAe specification for korean manufacturer's for cranking batteried at 0°F (-18°C).

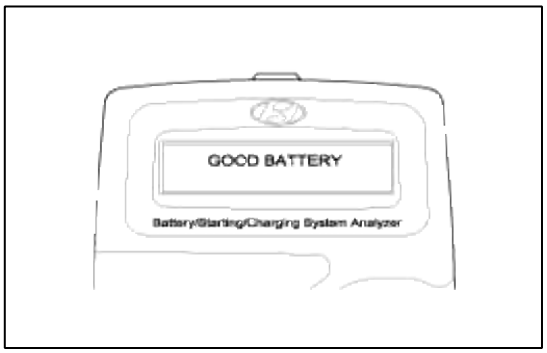
4. Set the CCA value displyed on the screen to the CCA value marked on the battery label by pressing up and down buttons and press ENTER.



NOTE

The battery ratings(CCA) displyed on the tester must be identical to the ratings marked on battery label.

5. The tester (Micro570) displays battery test results including voltage and battery ratings.
A relevant action must be given according to the test results by referring to the battery test results as shown in the table below.



6. To conduct starter test, continuously, press ENTER.

BATTERY TEST RESULTS

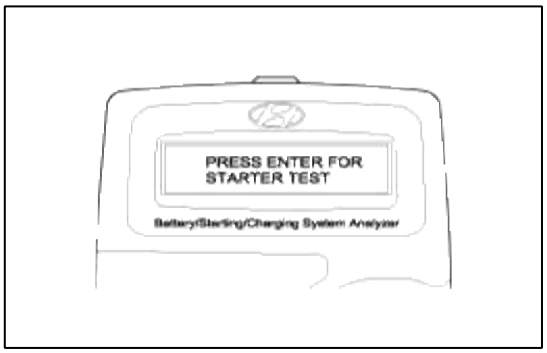
RESULT ON PRINTER	REMEDY
Good battery	No action is required
Good recharge	Battery is in a good state Recharge the battery and use
Charge & Retest	Battery is not charged properly → Charge and test the battery again (Failure to charge the battery fully may read incorrect measurement value)
Replace battery	→ Replace battery and recheck the charging system. (Improper connection between battery andvehicle 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. And than, test results may cause "REPLACE BATTERY", replacebattery and recheck the charging system

WARNING

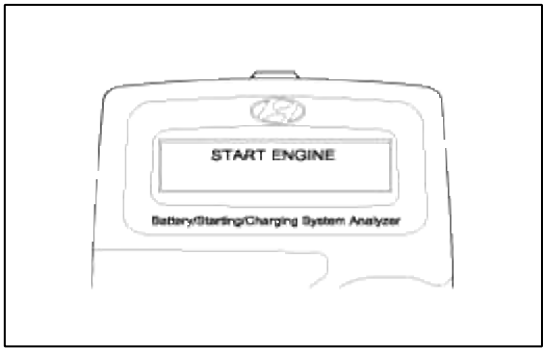
Whenever filing a claim for battery, the print out of the battery test results must be attached.

STARTER TEST PROCEDURE

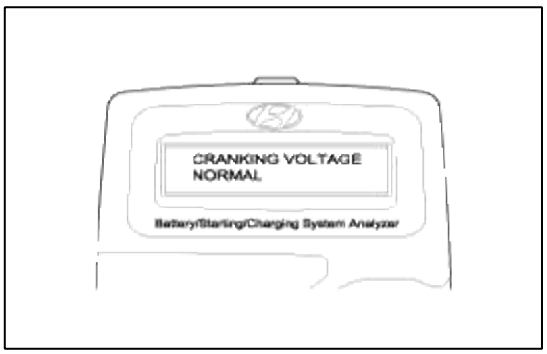
1. After the battery test, press ENTER immediately for the starter test.



2. After pressing ENTER key, start the engine.



3. Cranking voltage and starter test results will be displayed on the screen.
   Take a relevant action according to the test results by referring to the starter test results as given below.



4. To continue charging system test, press ENTER.

STARTER TEST RESULTS

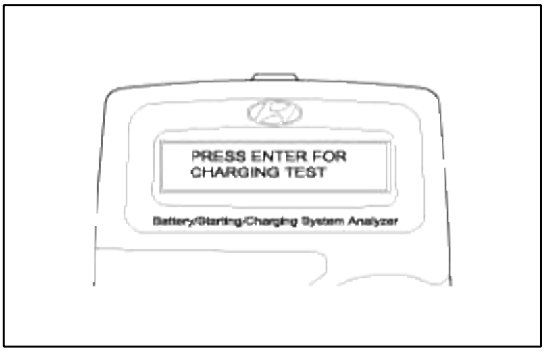
RESULT ON PRINTER	REMEDY
Cranking voltage normal	System shows a normal starter draw
Cranking voltage low	Cranking voltage is lower than normal level → Check starter
Charge battery	The state of battery charge is too low to test → Charge the battery and retest
Replace battery	→ Replace battery If the vehicle is not started though the battery condition of "Good and fully charged" is displayed. → Check wiring for open circuit, battery cable connection, starter and repair or replace as necessary. → If the engine does crank, check fuel system.

NOTE

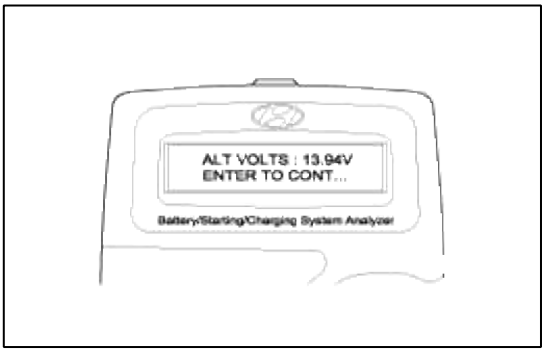
When testing the vehicle with old diesel engines, the test result will not be favorable if the glow plug is not heated. Conduct the test after warming up the engine for 5 minutes.

CHARGING SYSTEM TEST PROCEDURE

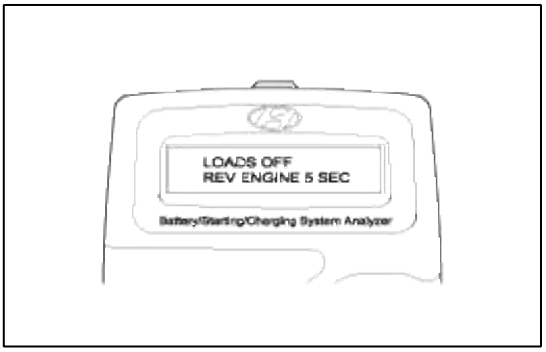
1. Press ENTER to begin charging system test.



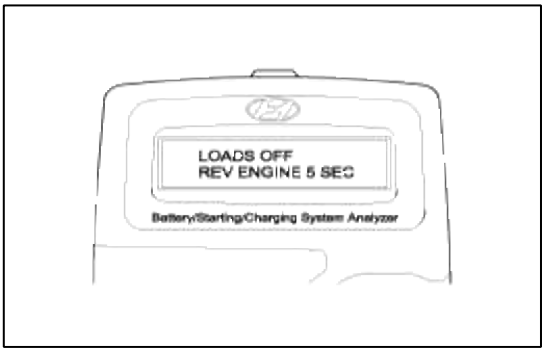
2. If ENTER button is pressed, the tester displays the actual voltage of alternator.
   Press ENTER to test the charging system.



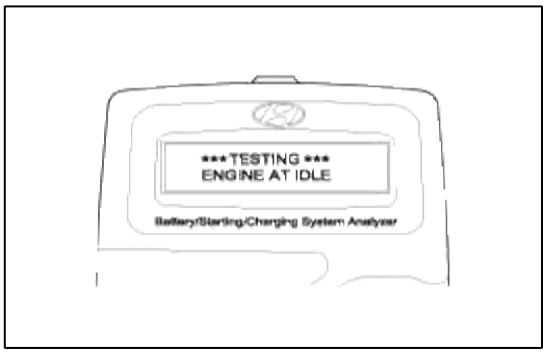
3. Turn off all electrical load and rev engine for 5 seconds with pressing the accelerator pedal.



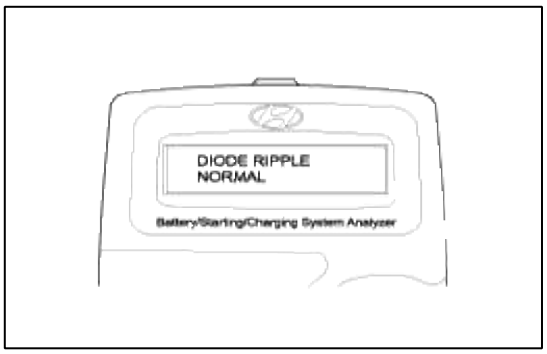
4. Press ENTER.



5. The MICRO 570 analyzer charging system output at idle for comparision to other readings.



6. Take a relevant action according to the test results by referring to the table below after shutting off the engine and disconnect the tester clamps from the battery.



CHARGING SYSTEM TEST RESULTS

RESULT ON PRINTER	REMEDY
Charging system normal/Diode ripple normal	Charging system is normal
No charging voltage	Alternator does not supply charging current to battery → Check belts, connection between alternator and battery Replace belts or cable or alternator as necessary
Low charging voltage	Alternator does not supply charging current to battery and electrical load to system fully → Check belts and alternator and replace as necessary
High charging voltage	The voltage from alternator to battery is higher than normal limit during voltage regulating. → Check connection and ground and replace regulator as necessary → Check electrolyte level in the battery
Excess ripple detected	One or more diodes in the alternator is not functioning properly → Check alternator mounting and belts and replace as necessary

Engine Electrical System > General Information > Troubleshooting

TROUBLESHOOTING

IGNITION SYSTEM

Symptom	Suspect area	Remedy
Engine will not start or is hard to start (Cranks OK)	Ignition lock switch Ignition coil Spark plugs Ignition wiring disconnected or broken	Inspect ignition lock switch, or replace as required Inspect ignition coil, or replace as required Inspect spark plugs, or replace as required Repair wiring, or replace as required
Rough idle or stalls	Ignition wiring Ignition coil	Repair wiring, or replace as required Inspect ignition coil, or replace as required
Engine hesitates / poor acceleration	Spark plugs Ignition wiring	Inspect spark plugs or replace as required Repair wiring, or replace as required
Poor mileage	Spark plugs	Inspect spark plugs or replace as required

CHARGING SYSTEM

Symptom	Suspect area	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off.	Fuse blown Light burned out Wiring connection loose Electronic voltage regulator	Check fuses Replace light Tighten loose connection Replace voltage regulator
Charging warning indicator does not go out with engine running. (Battery requires frequent recharging)	Drive belt loose or worn Battery cable loose, corroded or worn Electronic voltage regulator or alternator Wiring	Adjust belt tension or replace belt Inspect cable connection, repair or replace cable Replace voltage regulator or alternator Repair or replace wiring
Overcharge	Electronic voltage regulator Voltage sensing wire	Replace voltage regulator Repair or replace wiring
Discharge	Drive belt loose or worn Wiring connection loose or short circuit Electronic voltage regulator or alternator Poor grounding Worn battery	Adjust belt tension or replace belt Inspect wiring connection, repair or replace wiring Replace voltage regulator or alternator Inspect ground or repair Replace battery

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) Fuse blown Starter motor faulty Ignition switch faulty	Charge or replace battery Repair or replace cables Refer to TR group-automatic transaxle Replace fuse Replace Replace
Engine cranks slowly	Battery charge low Battery cables loose, corroded or worn out Starter motor faulty	Charge or replace battery Repair or replace cables Replace
Starter keeps running	Starter motor Ignition switch	Replace Replace
Starter spins but engine will not crank	Short in wiring Pinion gear teeth broken or starter motor Ring gear teeth broken	Repair wiring Replace Replace fly wheel or torque converter

Engine Electrical System > General Information > Specifications

SPECIFICATIONS

IGNITION SYSTEM

Items		**Specification**
		1.6 CVVT
Ignition coil	Primary resistance	0.75 ± 15 % (Ω)
	Secondary resistance	-
Spark plugs (Unleaded)	NGK	BKR5ES-11
	CHAMPION	RC10YC4
	Gap	1.0 ~ 1.1 mm (0.0394 ~ 0.0433in.)

STARTING SYSTEM

Items			Specification
			1.6 CVVT
Starter	Rated voltage		12 V, 0.9 KW
	No. of pinion teeth		8
	No-load characteristics	Voltage	11.5 V
		Ampere	60A, MAX
		Speed	5000 rpm, MIN
	Commutator diameter	Standard	33 mm
	Under cut depth	Standard	0.4 ~ 1.0 mm (0.0157 ~ 0.0394in.)
		Limit	0.2 mm (0.0079in.)

CHARGING SYSTEM

Items		Specification
		1.6 CVVT
Alternator	Type	I.C. regulator built-in
	Rate voltage	13.5 V, 90A
	Speed in use	1,000 ~ 18,000 rpm
	Voltage regulator	Electronic built-in type
	Regulator setting voltage	14.55 ± 0.2 V
	Temperature compensation	-7 ± 3 mV / °C
Battery	Type	44-21GL
	Cold cranking amperage [at -18°C(-0.4°F)]	500 A
	Reserve capacity	85 min
	Specific gravity [at 20°C(68°F)]	1.280 ± 0.01

CAUTION

- COLD CRANKING AMPERAGE is the amperage a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2V or greater at a specified temperature.
- RESERVE CAPACITY RATING is amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5V at 26.7°C(80.1°F).

- Battery type notation: □□ - □□ □ □
  (① ② ③ ④)

① : 5HR capacity
② : Battery length
③ : Battery width
④ : Terminal location

TIGHTENING TORQUES

ITEM	Nm	kgf.m	lb-ft
Spark plug	19.6 ~29.4	2.0 ~ 3.0	14.5 ~ 21.7

Engine Electrical System > Ignition System > Description and Operation

DESCRIPTION

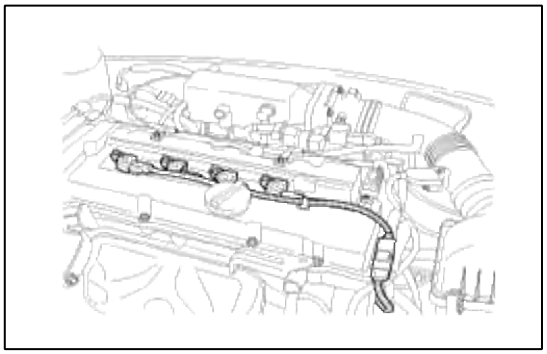
Ignition timing is controlled by the electronic control ignition timing system. The standard reference ignition timing data for the engine operating conditions are pre-programmed in the memory of the ECM (Engine Control Module). The engine operating conditions (speed, load, warm-up condition, etc.) are detected by the various sensors. Based on these sensor signals and the ignition timing data, signals to interrupt the primary current are sent to the ECM. The ignition coil is activated, and timing is controlled.

Engine Electrical System > Ignition System > Repair procedures

ON-VEHICLE INSPECTION

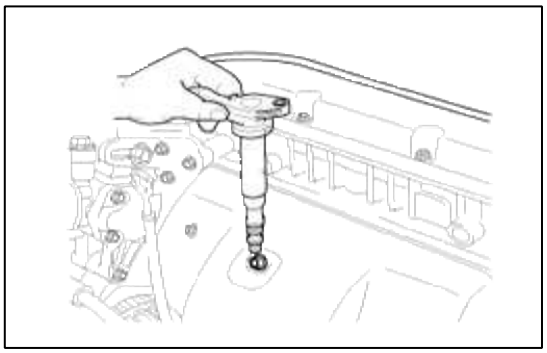
SPARK TEST

1. Remove the ignition coil.



2. Using a spark plug socket, remove the spark plug.
3. Install the spark plug to the ignition coil.

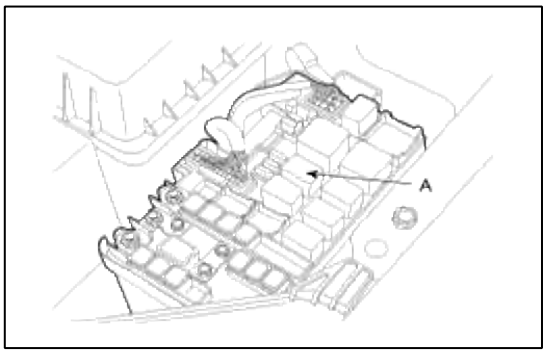
4. Ground the spark plug to the engine.



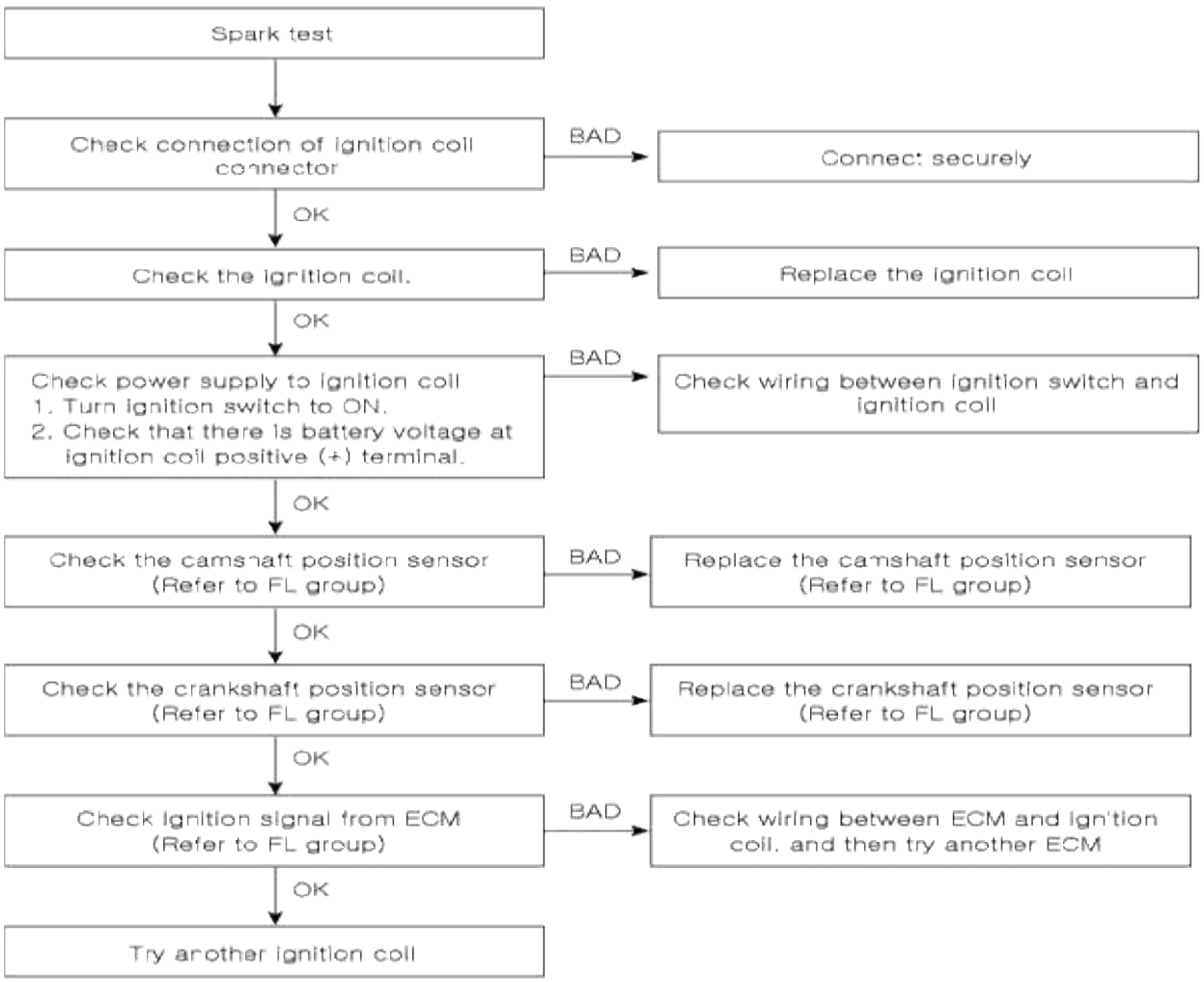
5. Check if spark occurs while engine is being cranked.

NOTE

To prevent fuel being injected from injectors while the engine is being cranked, remove the fuel pump relay(A) from the fuse box.
Crank the engine for no more than 5 ~ 10 seconds.



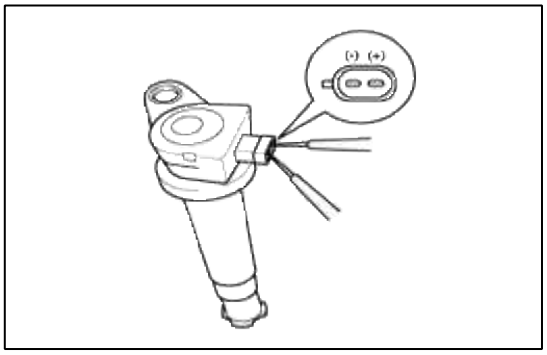
6. Inspect all the spark plugs.
7. Using a spark plug socket, install the spark plug.
8. Install the ignition coil.



Engine Electrical System > Ignition System > Ignition Coil > Repair procedures

INSPECTION

1. Measure the primary coil resistance between terminals (+) and (-).



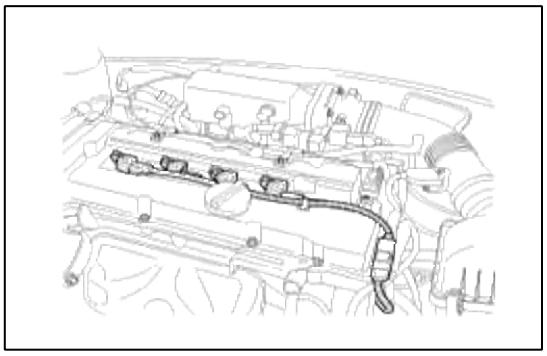
Standard value: 0.75Ω ± 15%

REPLACEMENT

1. Remove the engine cover.

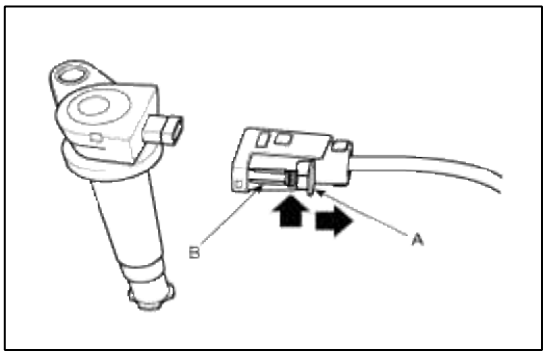
2. Remove the ignition coil with bolt.

Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



NOTE

When removing the ignition coil connector, pull the lock pin(A) and push the clip(B).



3. Installation is the reverse of removal.

Engine Electrical System > Ignition System > Spark Plug > Description and Operation

DESCRIPTION

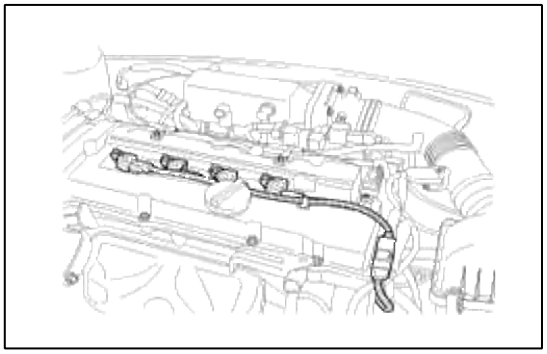
Gasoline engine has been equipped with the spark plugs which are manufactured by NGK or CHAMPION.
The spark plugs have an internal resistance to reduce noise when fuel is ignited and there are two types of internal resistances. NGK spark plugs have only carbon glass type of internal resistance, but CHAMPION spark plugs have two different types of internal resistances, cartridge type of internal resistace or carbon glass type of internal resistance, depending on model and engine.
The color of terminal stud can discriminate the CHAMPION spark plugs with cartridge type of internal resistance from the CHAMPION spark plugs with carbon glass type of internal resistance. The CHAMPION spark plug with cartridge type of internal resistance has a silver terminal stud and the CHAMPION spark plug with carbon glass type of internal resistance has a dark gray terminal stud.
Carbon glass type of internal resistance may be measured with a 12V Multi-Tester, but the internal resistance measurement must not be used as a way to inspect the spark plug because accurate measurement of the internal resistance is not possible. Although the measured internal resistance value is not within specification, 3-10 kΩ, do not replace the spark plug.
Cartridge type of internal resistance can not be measured with a 12V Multi-Tester. If measuring the internal resistance with a 12V Multi-Tester, the tester may show a reading much higher than the actual resistance value because both ends of the cartridge type of internal resistance are very rough. If you insist on measuring the cartridge type of internal resistance, a 1000V Mega-Ohmmeter should be used. However, like the carbon glass type of internal resistance, the internal resistance measurement must not be used as a way to inspect the spark plug because accurate measurement of the internal resistance is not possible. Although the measured internal resistance value is not

within specification, 5-15 kΩ, do not replace the spark plug.
Spark plugs replacement frequently occurred in repair shops when a vehicle exhibited engine misfiring, rough idling, etc. because the spark plug internal resistance is measured in most of the repair shops as a way for spark plug inspection. However, accurate measurement of spark plug internal resistance is not possible as mentioned above and we could not generally find any defects in the collected inferior spark plugs.

Engine Electrical System > Ignition System > Spark Plug > Repair procedures

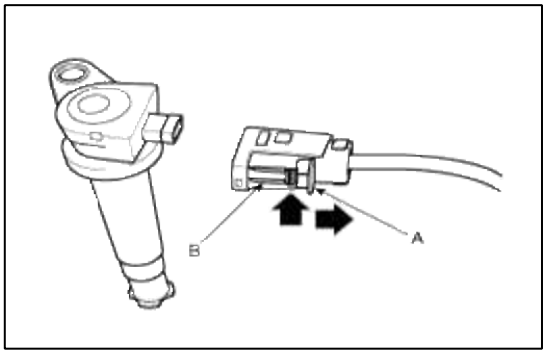
INSPECTION

1. Remove the ignition coil with bolt.



NOTE

When removing the ignition coil connector, pull the lock pin(A) and push the clip(B).

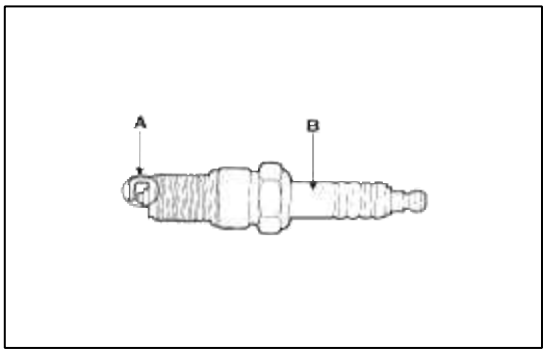


2. Using a spark plug socket, remove the spark plug.

CAUTION

Be careful that no contaminates enter through the spark plug holes.

3. Inspect the electrodes (A) and ceramic insulator (B).



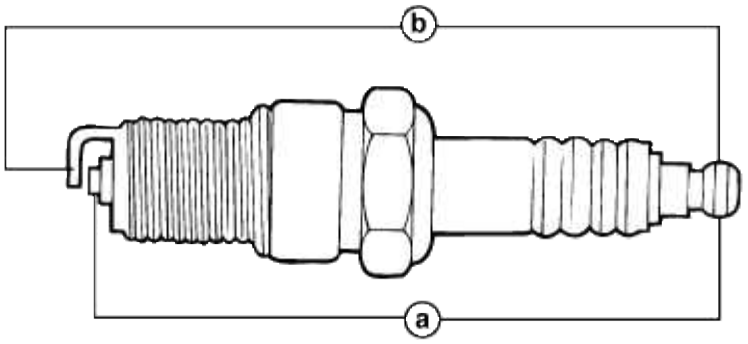
INSPECTION OF ELECTRODES

Condition	Dark deposits	White deposits
Description	- Fuel mixture too rich - Low air intake	- Fuel mixture too lean - Advanced ignition timing - Insufficient plug tightening torque

4. Check the electrode gap (A).

Standard
1.0 ~ 1.1 mm (0.0394 ~ 0.0433 in.)

RESISTANCE INSPECTION



1) Open/Short resistance -ⓐ

Result	Specification		Remedy	Probable cause and state
	Champion	NGK		
Normal	∞		-	-
Not OK	NOT∞		Relpace	· Cause : Open in spark plugs · State : Misfire→engine skipping or hesitation

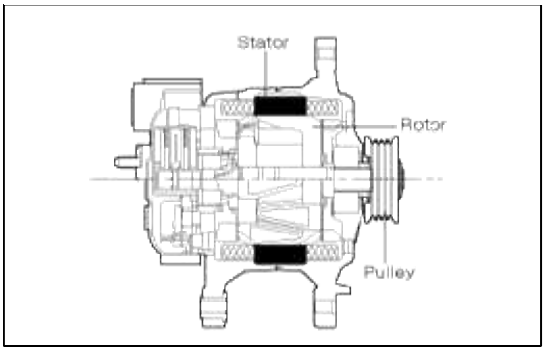
2) Insulation resistance (with 500~1000V voltmeter)-ⓑ

Result	Specification		Remedy	Probable cause and state
	Champion	NGK		
Normal	50 MΩ above		-	-
Not OK	50 MΩ below		Relpace	· Cause : Carbon or insulator crack · State : Engine skipping or hesitation

Engine Electrical System > Charging System > Description and Operation

DESCRIPTION

The charging system includes a battery, alternator with a built-in regulator, and the charging indicator light and wiring. The alternator has eight built-in diodes, each rectifying AC current to DC current.
Therefore, DC current appears at alternator "B" terminal.
In addition, the charging voltage of this alternator is regulated by the battery voltage detection system.
The alternator is regulated by the battery voltage detection system. The main components of the alternator are the rotor, stator, rectifier, capacitor brushes, bearings and V-ribbed belt pulley. The brush holder contains a built-in electronic voltage regulator.



Engine Electrical System > Charging System > Repair procedures

ON-VEHICLE INPECTION

CAUTION

- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Never disconnect the battery while the engine is running.

CHECK THE BATTERY TERMINALS AND FUSES

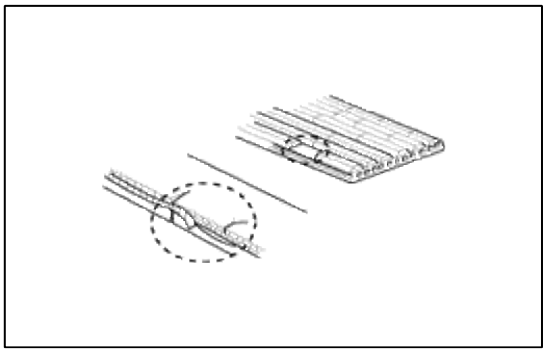
1. Check that the battery terminals are not loose or corroded.
2. Check the fuses for continuity.

INSPECT DRIVE BELT

1. Visually check the belt for excessive wear, frayed cords etc.
   If any defect has been found, replace the drive belt.

NOTE

Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.

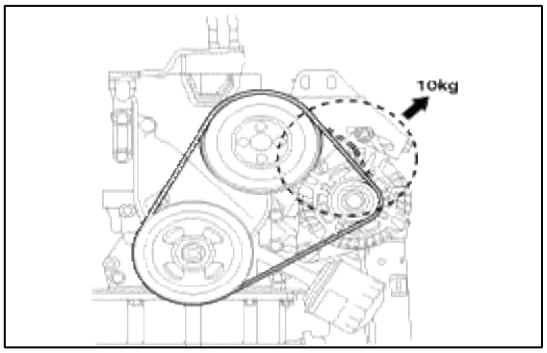


2. Measure the drive belt tension and adjust it.
   Apply a force of 98N (10kg, 22lb), and measure the deflection between the alternator and the water pump pulley.

DEFLECTION

New belt	3.3 ~ 3.7mm (0.1299 ~ 0.1457in.)
Used belt	4.2 ~ 4.7mm (0.1654 ~ 0.1850in.)

If the belt tension is not as specified, adjust it.



NOTE

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the 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 lit.
4. Start the engine. Check that the light is lit.
   If the light does not go off as specified, troubleshoot the discharge light circuit.

INSPECT CHARGING SYSTEM

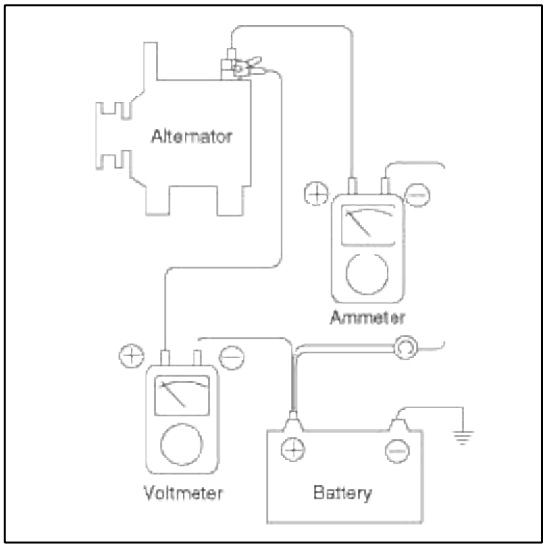
VOLTAGE DROP TEST OF ALTERNATOR OUTPUT WIRE

This test determines whether or not the wiring between the alternator "B" terminal and the battery (+) terminal is good by the voltage drop method.

PREPARATION

1. Turn the ignition switch to "OFF".

2. Disconnect the output wire from the alternator "B" terminal. Connect the (+) lead wire of ammeter to the "B" terminal of alternator and the (-) lead wire of ammeter to the output wire. Connect the (+) lead wire of voltmeter to the "B" terminal of alternator and the (-) lead wire of voltmeter to the (+) terminal of battery.



TEST

1. Start the engine.
2. Turn on the headlamps and blower motor, and set the engine speed until the ammeter indicates 20A.
   And then, read the voltmeter at this time.

RESULT

1. The voltmeter may indicate the standard value.

   Standard value: 0.2V max

2. If the value of the voltmeter is higher than expected (above 0.2V max.), poor wiring is suspected. In this case check the wiring from the alternator "B" terminal to the battery (+) terminal. Check for loose connections, color change due to an over-heated harness, etc. Correct them before testing again.
3. Upon completion of the test, set the engine speed at idle.
   Turn off the headlamps, blower motor and the ignition switch.

OUTPUT CURRENT TEST

This test determines whether or not the alternator gives an output current that is equivalent to the normal output.

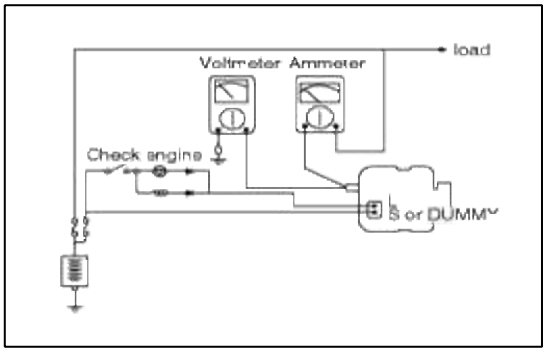
PREPARATION

1. Prior to the test, check the following items and correct as necessary.
   Check the battery installed in the vehicle to ensure that it is good condition. The battery checking method is described in the section "Battery".
   The battery that is used to test the output current should be one that has been partially discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.
   Check the tension of the alternator drive belt. The belt tension check method is described in the section "Inspect drive belt".
2. Turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Disconnect the alternator output wire from the alternator "B" terminal.
5. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the ammeter to the disconnected output wire.

NOTE

Tighten each connection securely, as a heavy current will flow. Do not rely on clips.

6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the alternator "B" terminal and (-) lead wire to a good ground.
7. Attach an engine tachometer and connect the battery ground cable.
8. Leave the engine hood open.



TEST

1. Check to see that the voltmeter reads as the same value as the battery voltage. If the voltmeter reads 0V, and the open circuit in the wire between alternator "B" terminal and battery (-) terminal or poor grounding is suspected.
2. Start the engine and turn on the headlamps.
3. Set the headlamps to high beam and the heater blower switch to HIGH, quickly increase the engine speed to 2,500 rpm and read the maximum output current value indicated by the ammeter.

> NOTE
>
> After the engine start up, the charging current quickly drops.
> Therefore, the above operation must be done quickly to read the maximum current value correctly.

RESULT

1. The ammeter reading must be higher than the limit value. If it is lower but the alternator output wire is in good condition, remove the alternator from the vehicle and test it.

Limit value (90A alternator): 45A min.

> NOTE
>
> - 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 headlamps 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.

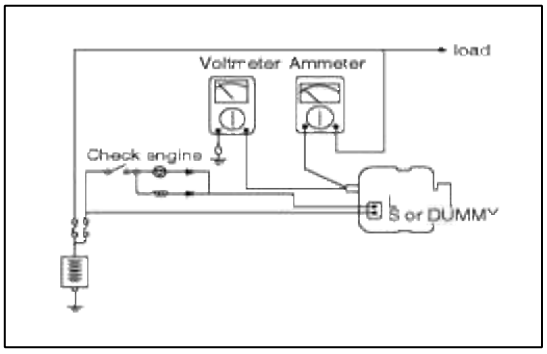
2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the ammeter and voltmeter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

REGULATED VOLTAGE TEST

The purpose of this test is to check that the electronic voltage regulator controls voltage correctly.

PREPARATION

1. Prior to the test, check the following items and correct if necessary.
   Check that the battery installed on the vehicle is fully charged. The battery checking method is described in the section "Battery".
   Check the alternator drive belt tension. The belt tension check method is described in the section "Inspect drive belt".
2. Turn ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the "B" terminal of the alternator and ground. Connect the (+) lead of the voltmeter to the "B" terminal of the alternator. Connect the (-) lead to good ground or the battery (-) terminal.
5. Disconnect the alternator output wire from the alternator "B" terminal.
6. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Connect the (-) lead wire of the ammeter to the disconnected output wire.
7. Attach the engine tachometer and connect the battery ground cable.



TEST

1. Turn on the ignition switch and check to see that the voltmeter indicates the following value.

   Voltage: Battery voltage

   If it reads 0V, there is an open circuit in the wire between the alternator "B" terminal and the battery and the battery (-) terminal.
2. Start the engine. Keep all lights and accessories off.
3. Run the engine at a speed of about 2,500 rpm and read the voltmeter when the alternator output current drops to 10A or less

RESULT

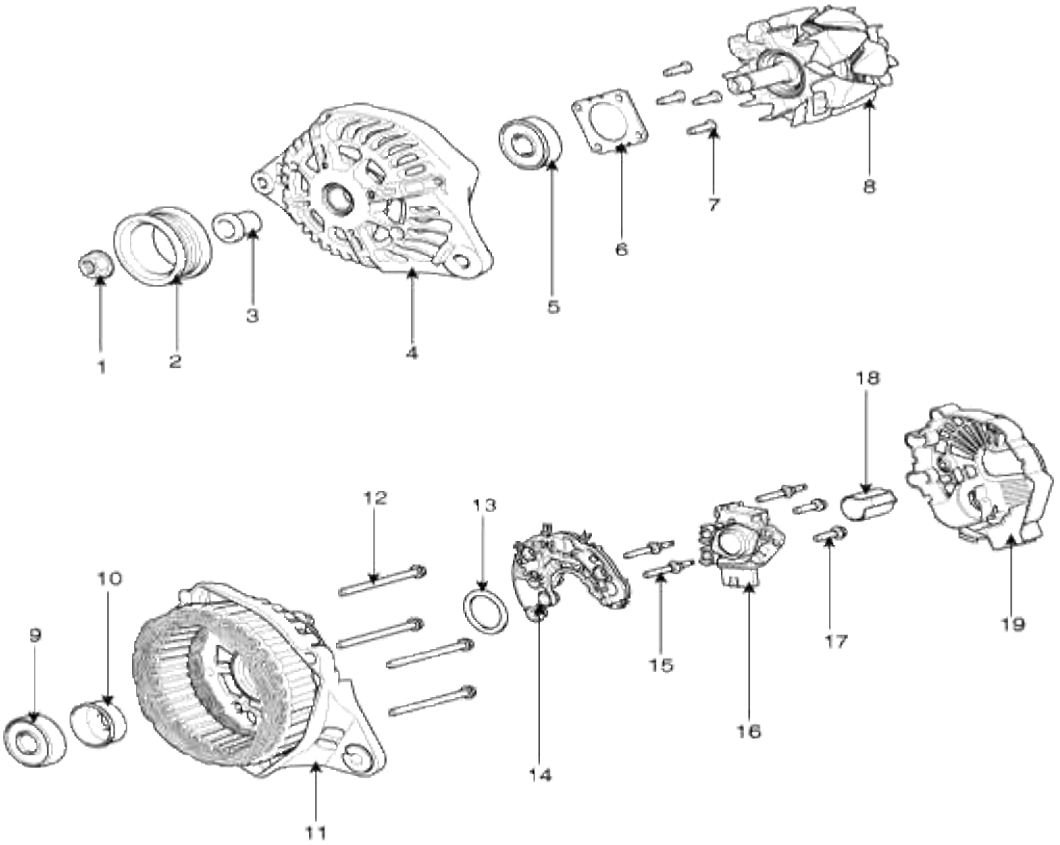
1. If the voltmeter reading agrees with the value listed in the regulating voltage table below, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the alternator is faulty.
   REGULATING VOLTAGE TABLE

Voltage regulator ambient temperature °C (°F)	Regulating voltage (V)
-20 (-4)	14.2 ~ 15.4
20 (68)	14.0 ~ 15.0
60 (140)	13.7 ~ 14.9
80 (176)	13.5 ~ 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.

Engine Electrical System > Charging System > Alternator > Components and Components Location

COMPONENTS

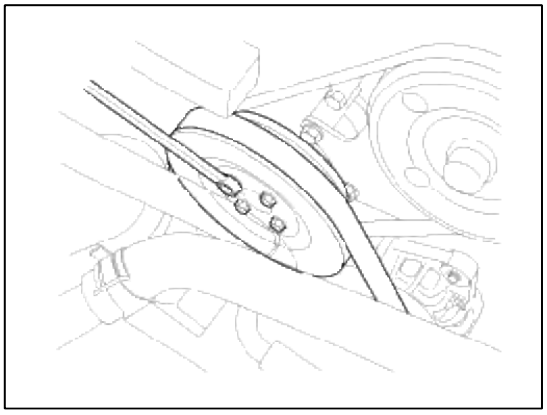


1. 너트
2. 풀리
3. 스페이서
4. 프론트 브라켓
5. 프론트 베어링
6. 버어링 커버
7. 버어링 커버 볼드
8. 로터 코일
9. 리어 베어링
10. 베어링 커버
11. 리어 브라켓
12. 관통 볼드
13. 씰
14. 정류기 어쎈블리
15. 스터드 볼트
16. 브러시 홀더 어쎈블리
17. 브러시 홀더 볼트
18. 슬립 링 가이드
19. 리어 커버

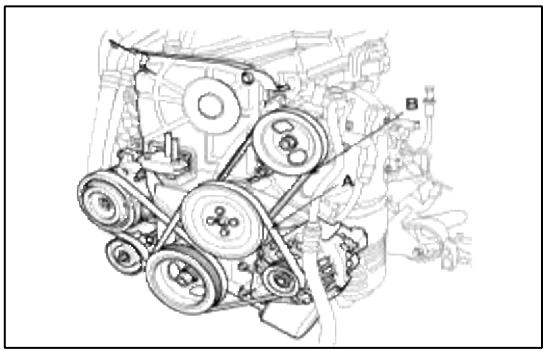
Engine Electrical System > Charging System > Alternator > Repair procedures

REPLACEMENT

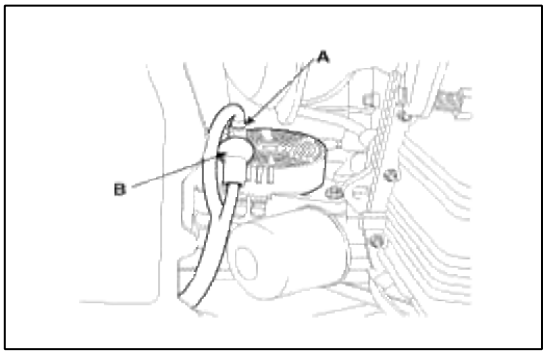
1. Disconnect the battery negative terminal first, then the positive terminal.
2. Temporarily loosen the water pump pulley bolts.



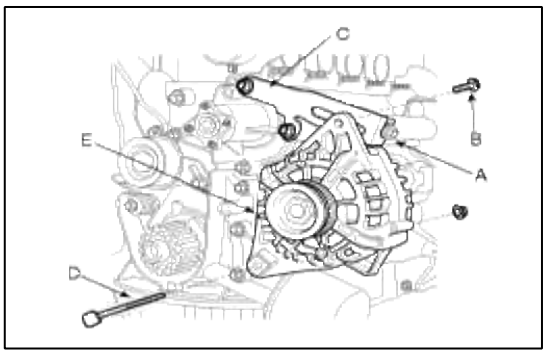
3. Remove the alternator drive belt(A) , after loosening the adjusting bolt and mounting bolt. (Refer to step 9)
4. Remove the power steering pump belt(B). (Refer to ST group)



5. Remove the water pump pulley.
6. Remove the power steering pump. (Refer to power steering pump in ST Group)
7. Remove the power steering pump bracket.
8. Disconnect the alternator connector (A), and remove the cable (B) from alternator “B” terminal.



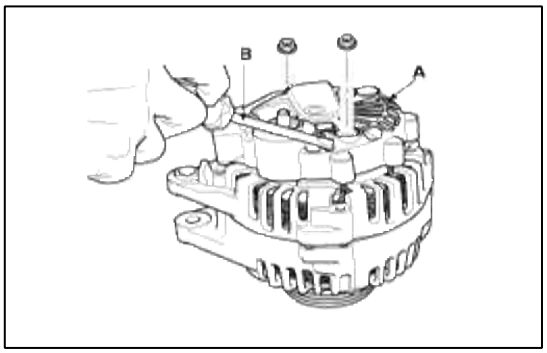
9. Remove the adjusting bolt (A) and mounting bolt (B).
10. Remove the alternator brace(C).
11. Pull out the through bolt (D) and then remove the alternator (E).



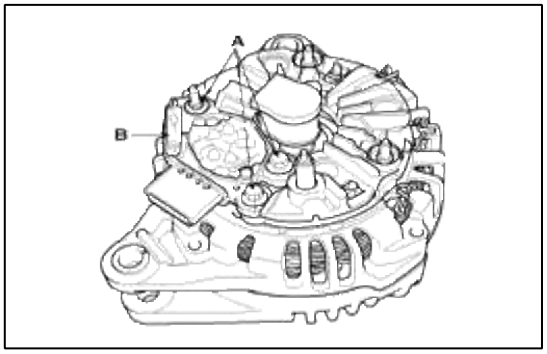
12. Installation is the reverse order of removal.
13. Pretighten the water pump pulley bolts.
14. Adjust the power steering pump belt tension. (Refer to power steering pump in ST Group)
15. Adjust the alternator belt tension after installation.
16. Tighten the water pump pulley bolts.

DISASSEMBLY

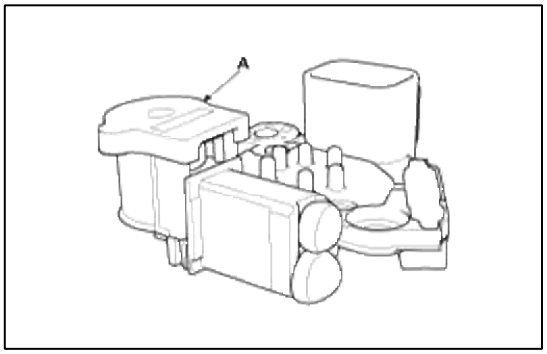
1. Remove the alternator cover(A) using a screw driver(B).



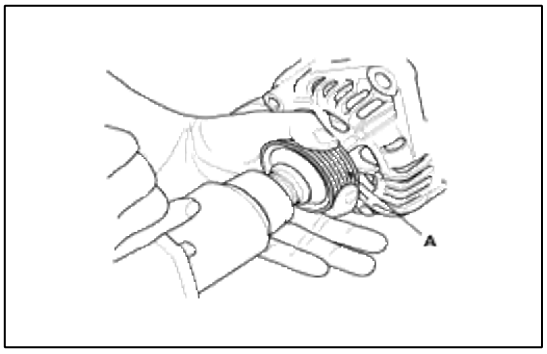
2. Loosen the mounting bolts(A) and disconnect the brush holder assembly(B).



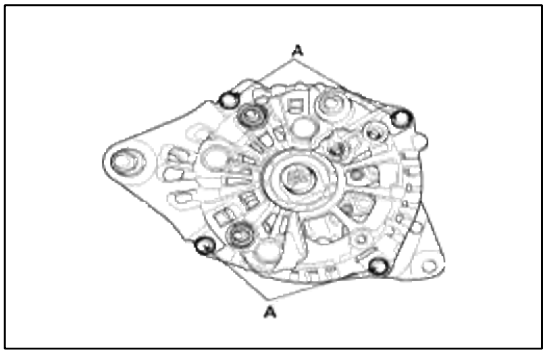
3. Remove the slip ring guide(A).



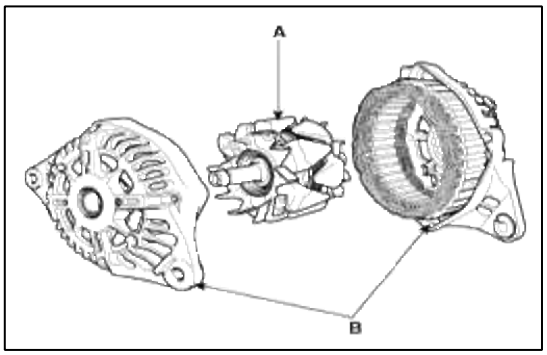
4. Remove the nut, pulley(A) and spacer.



5. Loosen the 4 through bolts(A).



6. Disconnect the rotor(A) and cover(B).

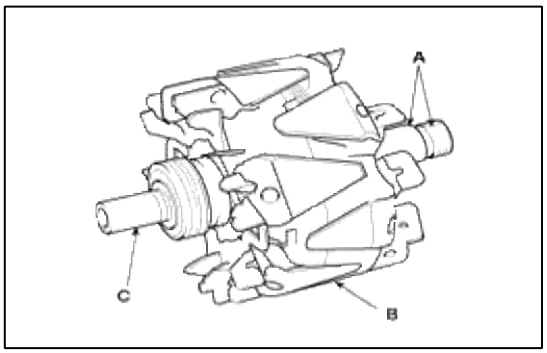


7. Reassembly is the reverse of disassembly.

INSPECTION

ROTOR

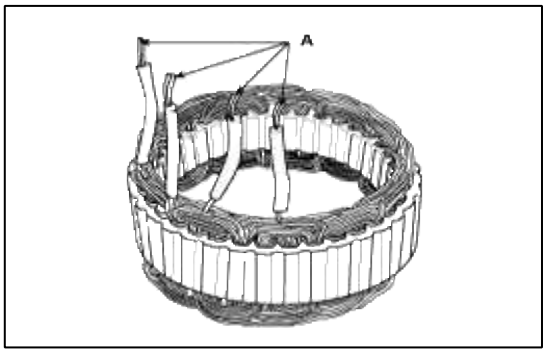
1. Check that there is continuity between the slip rings (A).



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.

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.

ALTERNATOR BELT INSPECTION AND ADJUSTMENT

NOTE

When using a new belt, first adjust the deflection or tension to the values for the new belt, then readjust the deflection or tension to the value for the used belt after running engine for five minutes.

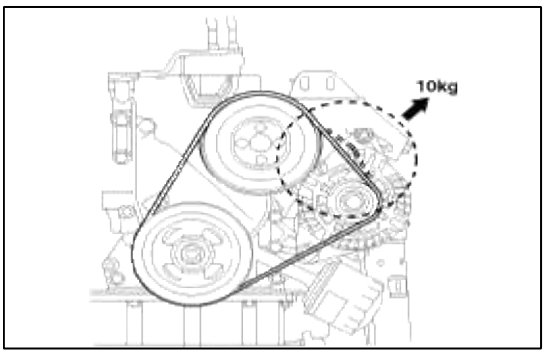
Deflection method:

Apply a force of 98N (10kg, 22lb), and measure the deflection between the alternator and the water pump pulley.

Deflection
Used belt: 4.2 ~ 4.7 mm (0.1654 ~ 0.1850 in)
New belt: 3.3 ~ 3.7 mm (0.1299 ~ 0.1457 in)

NOTE

If the belt is worn or damaged, replace it.

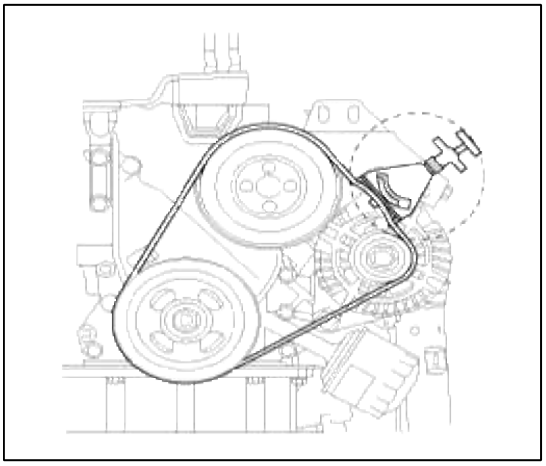


Belt tension gauge method:
Attach the belt tension gauge to the belt and measure the tension. Follow the gauge manufacturer's instructions.

Tension
Used belt: 392.3 ~ 490.3N (40 ~ 50kg, 88.2 ~ 110.2lb)
New belt: 637.4 ~ 735.5N (65 ~ 75kg, 143.3 ~ 165.3lb)

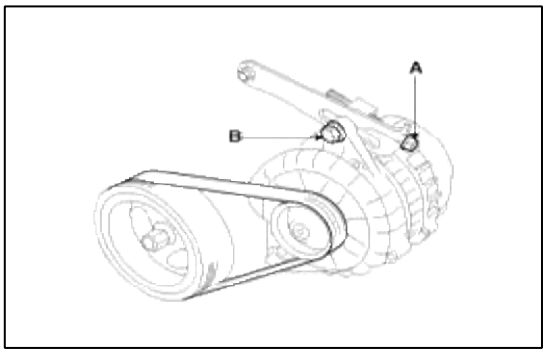
NOTE

If the belt is worn or damaged, replace it.



If adjustment is necessary:
1. Loosen adjusting bolt (A) and the lock bolt (B).

2. Move the alternator to obtain the proper belt tension, then retighten the nuts.



3. Recheck the deflection or tension of the belt.

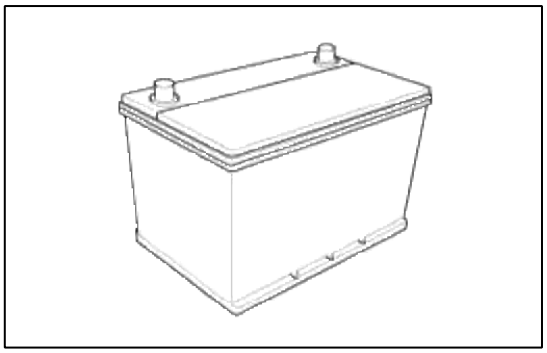
NOTE

For the power steering pump belt and A/C compressor belt adjustments, refer to power steering pump in ST Group and air compressor in HA Group.

Engine Electrical System > Charging System > Battery > Description and Operation

DESCRIPTION

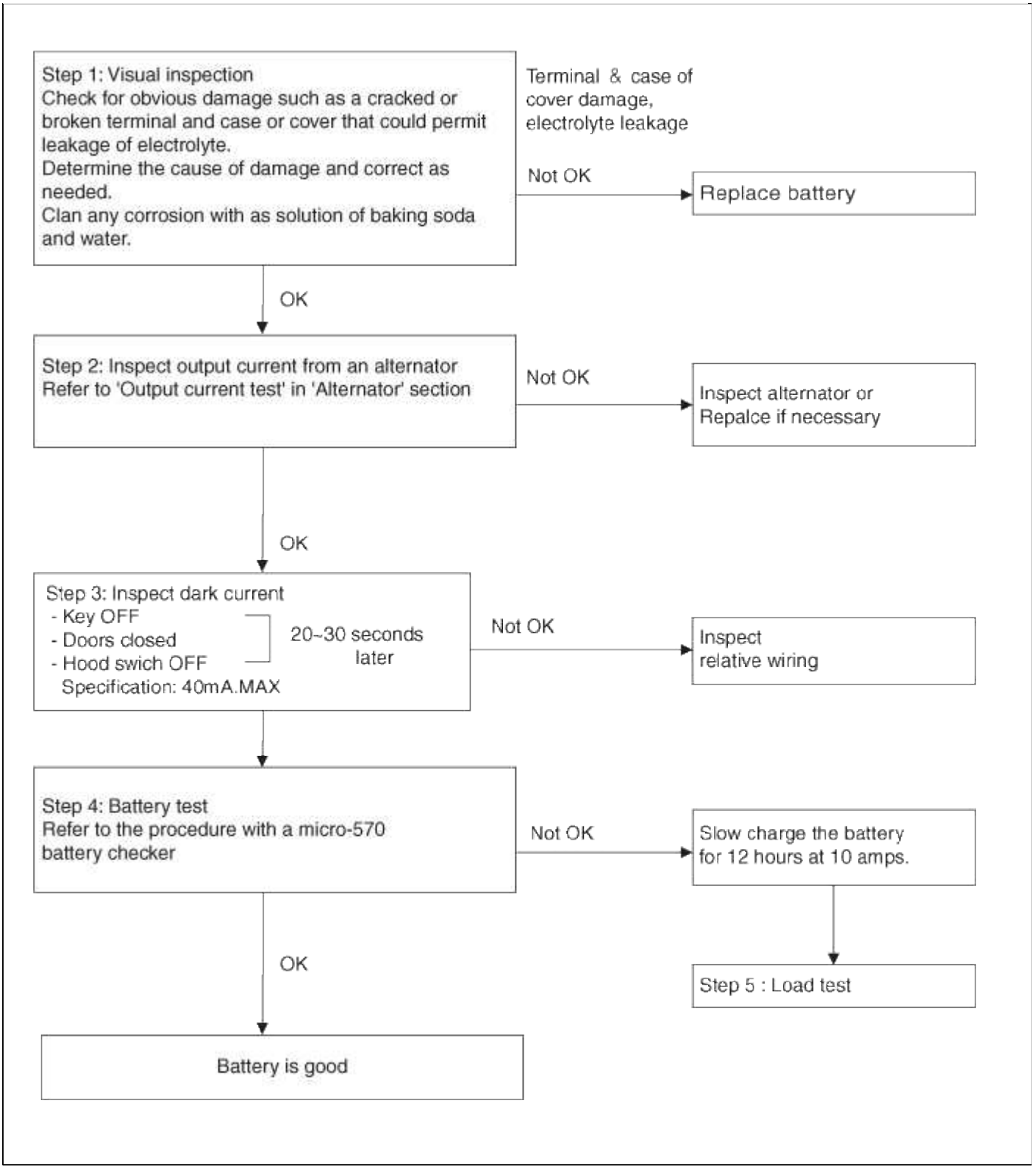
1. As the demands on vehicle batteries increase with the complexity of electrical systems, it is important to follow a consistent and repeatable procedure for battery maintenance, diagnosis, charging and replacement.
2. The maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
3. Water never needs to be added to the maintenance-free battery.
4. The battery is completely sealed, except for small vent holes in the cover.



Engine Electrical System > Charging System > Battery > Repair procedures

INSPECTION

BATTERY DIAGNOSTIC FLOW



LOAD TEST

1. Perform the following steps to complete the load test procedure for maintenance free batteries.

2. Connect the load tester clamps to the terminals and proceed with the test as follows:
   (1) If the battery has been on charge, remove the surface charge by connect a discharging the battery for 10 seconds at 200 ampere load.
   (2) Allow the battery to recover 15 seconds before doing the next load test.
   (3) Discharge the battery for 15 seconds at 300 ampere load and measure the battery terminal voltage with load.
   (4) Compare the voltage reading with the specification below and replace the battery if the measured voltage is below the specification in the voltage table.

Voltage	Temperature
9.6V	20°C (68.0°F) and above
9.5V	16°C (60.8°F)
9.4V	10°C (50.0°F)
9.3V	4°C (39.2°F)
9.1V	-1°C (30.2°F)
8.9V	-7°C (19.4°F)
8.7V	-12°C (10.4°F)
8.5V	-18°C (-0.4°F)

NOTE

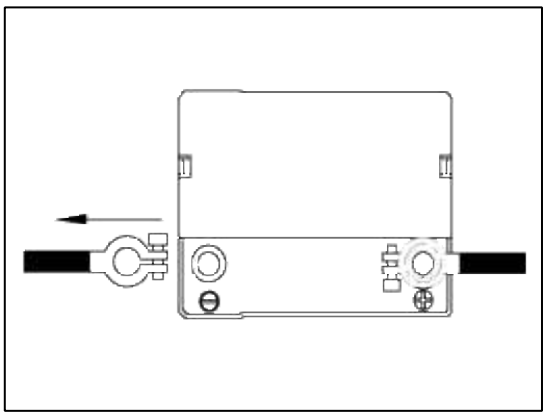
- If the voltage is greater shown in the table, the battery is good.
- If the voltage is less than shown in the table, replace the battery.

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.

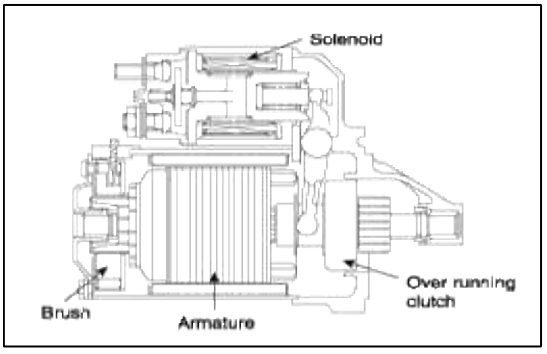
CAUTION

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.

Engine Electrical System > Starting System > Description and Operation

DESCRIPTION

The starting system includes the battery, starter, solenoid switch, ignition switch, inhibitor switch (A/T), ignition lock switch, connection wires and the battery cable.
When the ignition key is turned to the start position, current flows and energizes the starter motor's solenoid coil. The solenoid plunger and clutch shift lever are activated, and the clutch pinion engages the ring gear.
The contacts close and the starter motor cranks. In order to prevent damage caused by excessive rotation of the starter armature when the engine starts, the clutch pinion gear overruns.



Engine Electrical System > Starting System > Repair procedures

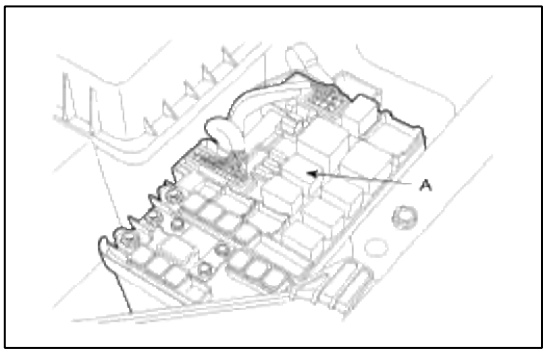
TROUBLESHOOTING

STARTER CIRCUIT

NOTE

The battery must be in good condition and fully charged.

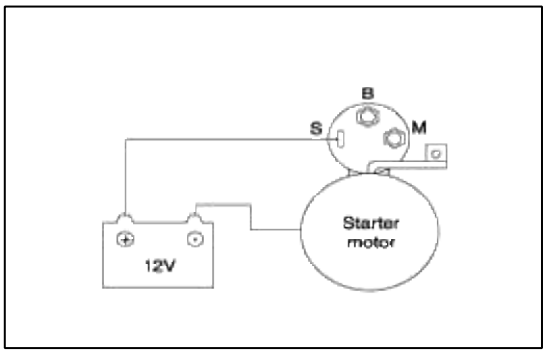
1. Remove the fuel pump relay from the fuse box.



2. With the shift lever in N or P (A/T) or clutch pedal pressed (M/T), turn the ignition switch to "START"
   If the starter normally cranks the engine, starting system is OK. If the starter will not crank the engine at all, go to next step.
   If it won't disengage from the ring gear when you release key, check for the following until you find the cause.
   A. Solenoid plunger and switch malfunction.
   B. Dirty pinion gear or damaged overrunning clutch.
3. Check the battery condition. Check electrical connections at the battery, battery negative cable connected to the body, engine ground cables, and the starter for looseness and corrosion. Then try starting the engine again.
   If the starter cranks normally the engine, repairing the loose connection repaired the problem. The starting system is now OK.
   If the starter still does not crank the engine, go to next step.
4. Disconnect the connector from the S-terminal of solenoid. Connect a jumper wire from the B-terminal of solenoid to the S-terminal of solenoid.
   If the starter cranks the engine, go to next step.
   If the starter still does not crank the engine, remove the starter, and repair or replace as necessary.
5. Check the following items in the order listed until you find the open circuit.
   A. Check the wire and connectors between the driver's under-dash fuse/relay box and the ignition switch, and between the driver's under-dash fuse/relay box and the starter.
   B. Check the ignition switch (Refer to ignition system in BE Group).
   C. Check the transaxle range switch connector or ignition lock switch connector.
   D. Inspect the starter relay.

STATER SOLENOID TEST

1. Disconnect the field coil wire from the M-terminal of solenoid switch.
2. Connect a 12V battery between S-terminal and the starter body.



3. Connect the field coil wire to the M-terminal.

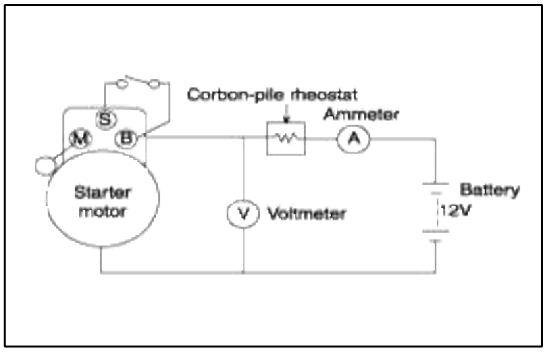
> CAUTION
>
> This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

4. If the pinion moves out, the pull-in coil of solenoid is working properly.
   If the pinion does not move, replace the solenoid.

5. Diconnect the field coil wire from the M-terminal.
6. If the pinion has moved out, the hold-in coil of the solenoid is working properly.
   If the pinion moves in, replace the solenoid.

FREE RUNNING TEST

1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows.
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostats shown is the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.

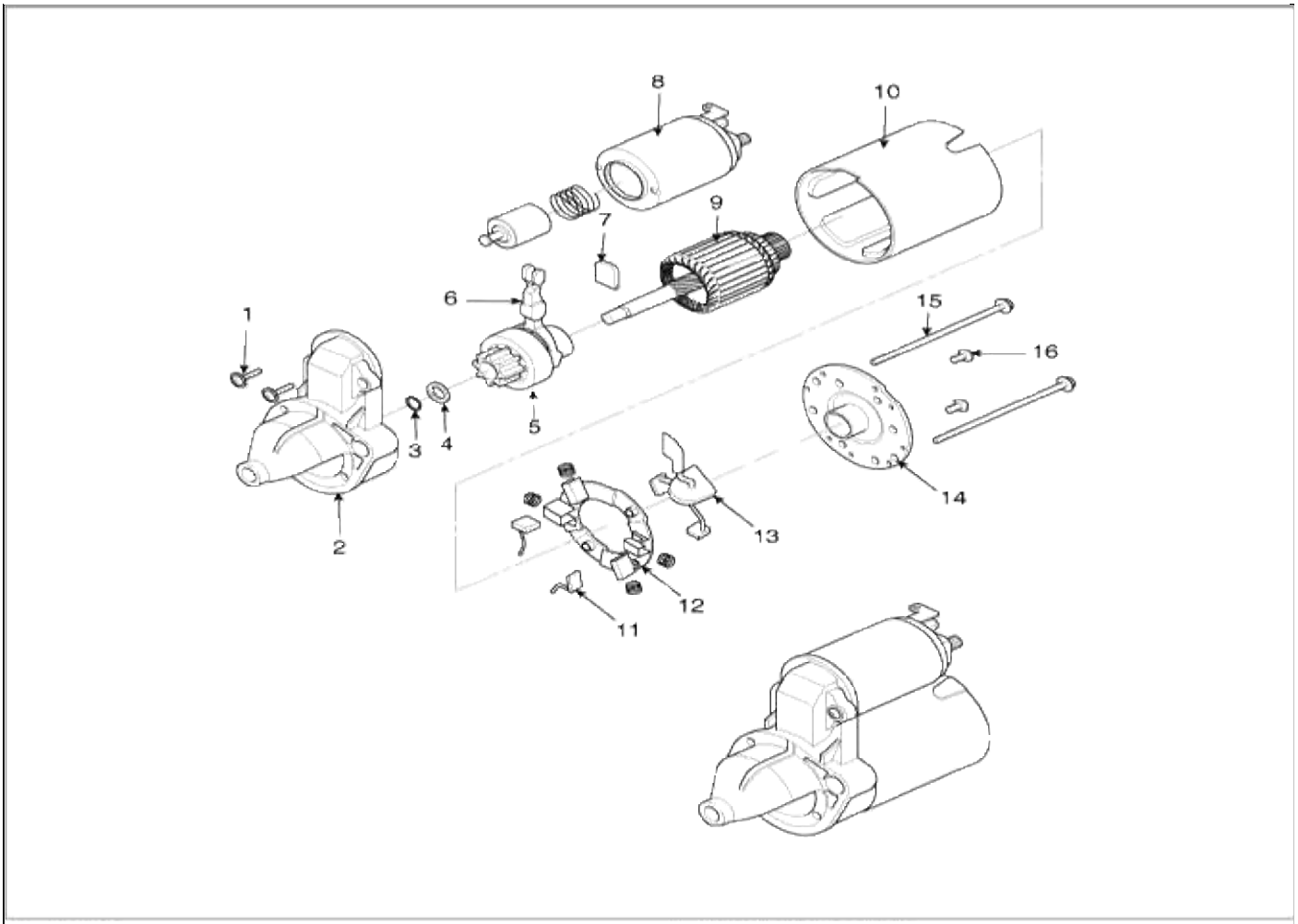


4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the starter motor body.
6. Adjust until battery voltage shown on the voltmeter reads 11volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Current : 60A max
Speed : 5000 rpm

Engine Electrical System > Starting System > Starter > Components and Components Location

COMPONENTS



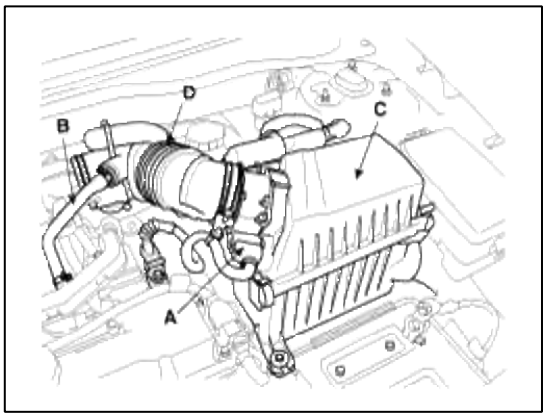
1. Screw
2. Front bracket assembly
3. Stop ring
4. Stopper
5. Overruning clutch assembly
6. Lever
7. Lever packing
8. Magnet switch assembly
9. Armature assembly
10. Yoke assembly
11. Brush (-)
12. Brush holder assembly
13. Brush (+)
14. Rear bracket
15. Through bolt
16. Screw

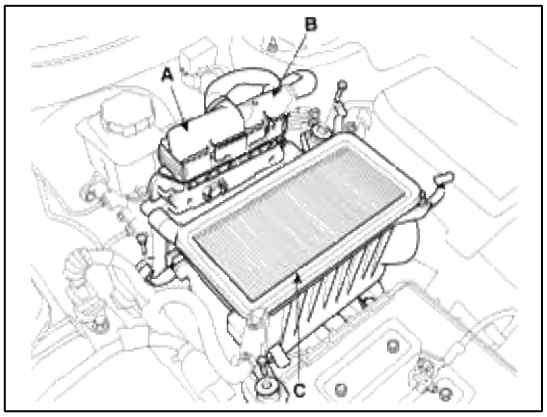
Engine Electrical System > Starting System > Starter > Repair procedures

REPLACEMENT

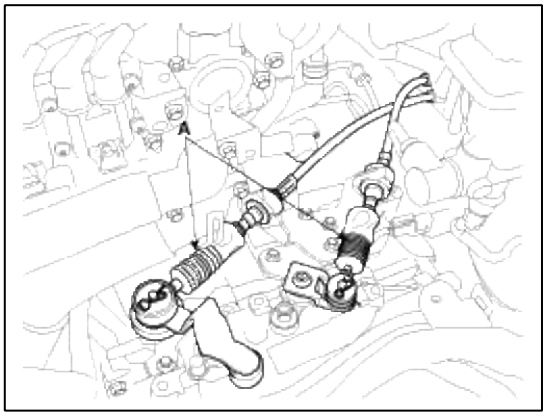
1. Disconnect the battery negative cable.

2. Remove the air cleaner assembly.

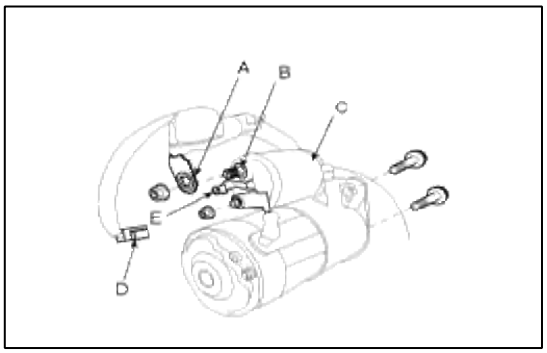




3. Remove the shift cable and bracket. (M/T)



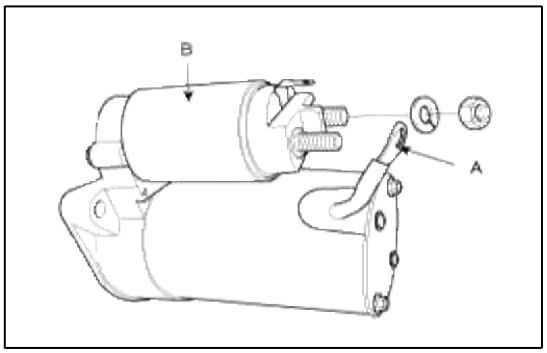
4. Disconnect the starter cable (A) from the B terminal (B) on the solenoid (C), then disconnect the connector (D) from the S terminal (E).



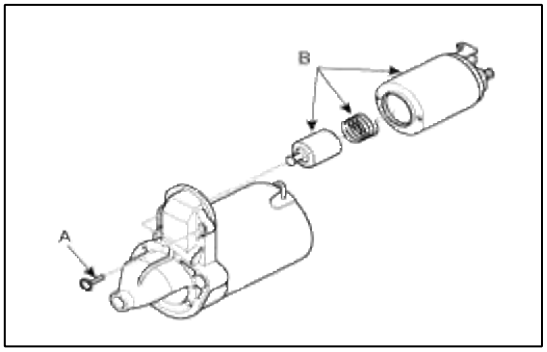
5. Remove the 2 bolts holding the starter, then remove the starter.
6. Installation is the reverse of removal.
7. Connect the battery negative cable to the battery.

DISASSEMBLY

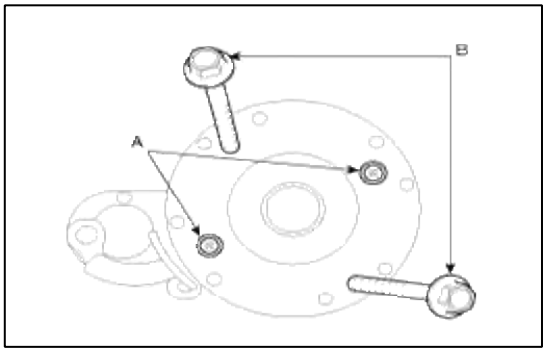
1. Disconnect the M-terminal (A) on the magnet switch assembly (B).



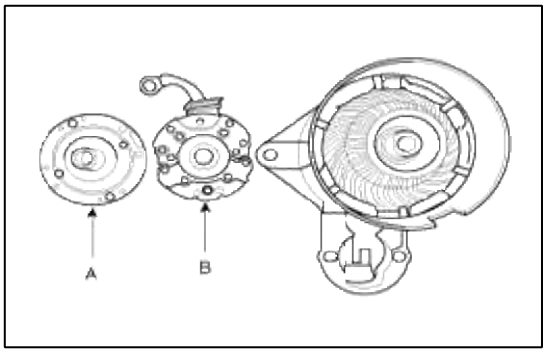
2. After loosening the 2 screws (A), detach the magnet switch assembly (B).



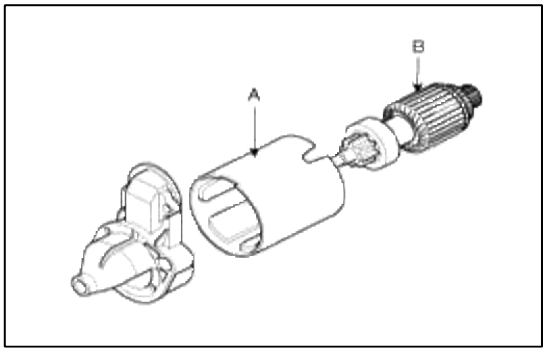
3. Loosen the brush holder mounting screw (A) and through bolts (B).



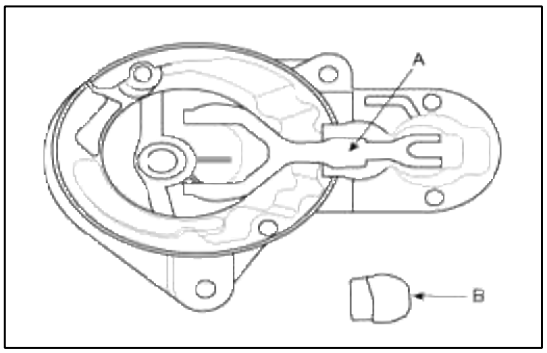
4. Remove the rear bracket (A) and brush holder assembly (B).



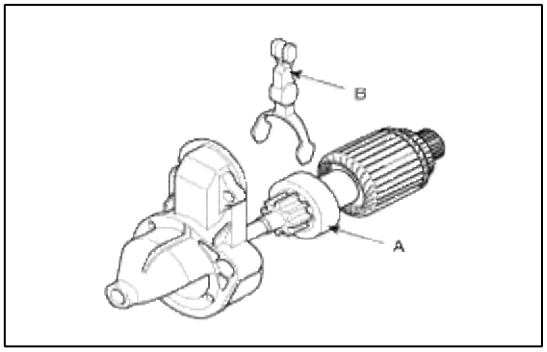
5. Remove the yoke (A) and armature (B).



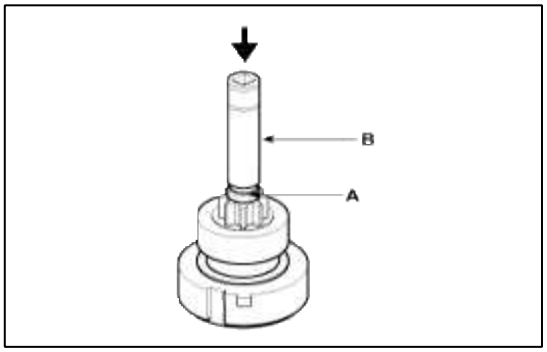
6. Remove the, lever plate (A) and packing (B).



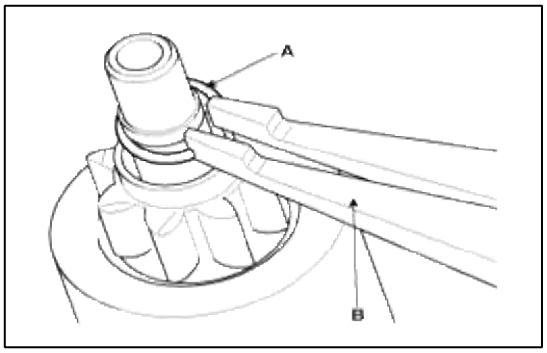
7. Remove the overrunning clutch (A) and lever (B).



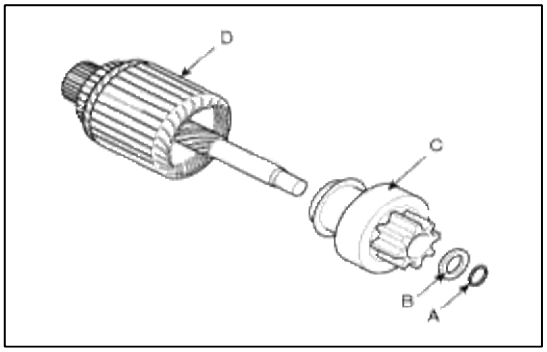
8. Press the stop ring (A) using a socket (B).



9. After removing the stopper (A) using stopper pliers (B).



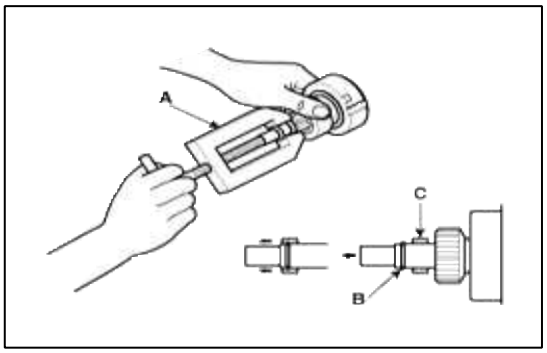
10. Remove the stopper (A), stop ring (B), overrunning clutch (C) and armature (D).



11. Reassembly is the reverse of disassembly.

NOTE

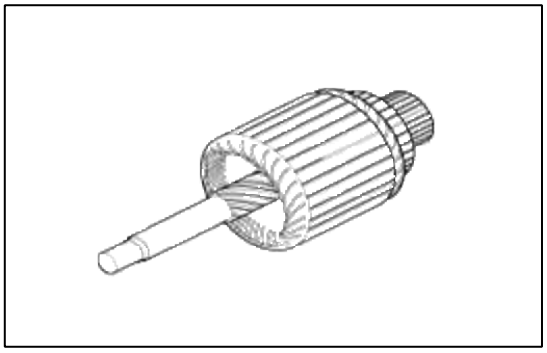
Using a suitable pulling tool (A), pull the overrunning clutch stop ring (B) over the stopper (C).



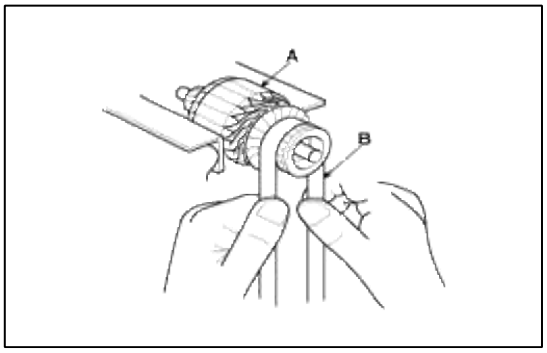
INSPECTION

ARMATURE

1. Remove the starter.
2. Disassemble the starter as shown at the beginning of this procedure.
3. Inspect the armature for wear or damage from contact with the permanent magnet. If there is wear or damage, replace the armature.

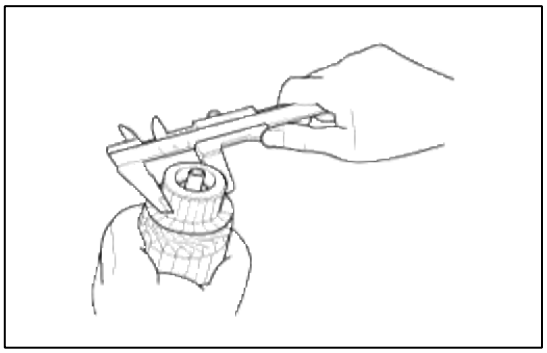


4. Check the commutator (A) surface. If the surface is dirty or burnt, resurface with emery cloth or a lathe within the following specifications, or recondition with #500 or #600 sandpaper (B).



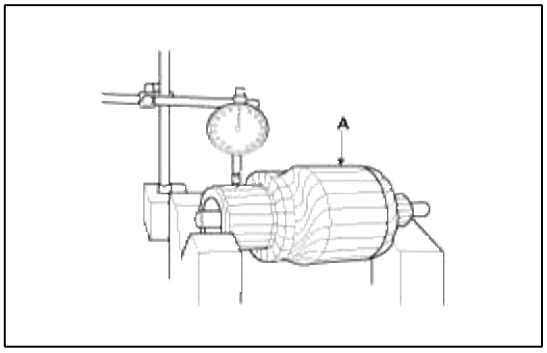
5. Check the commutator diameter. If the diameter is below the service limit, replace the armature.

Commutator diameter
Standard (New) : 29.3 ~ 29.4 mm (1.1535 ~ 1.1575 in)



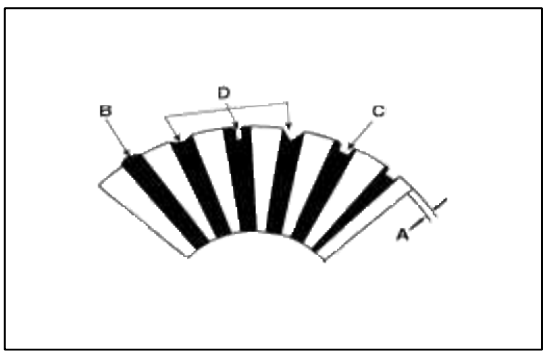
6. Measure the commutator (A) runout.
   A. If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   B. If the commutator run out is not within the service limit, replace the armature.

Commutator runout
Standard (New): 0.02mm (0.0008in.) max
Service limit: 0.05mm (0.0020in.)

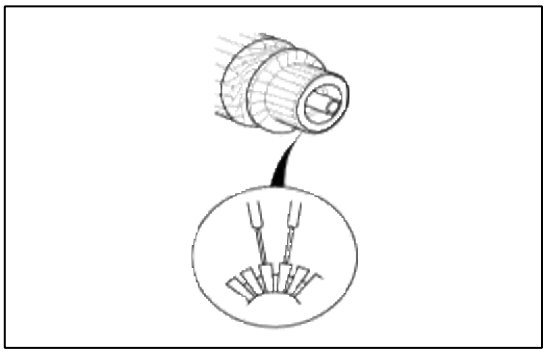


7. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or v-shaped (D).

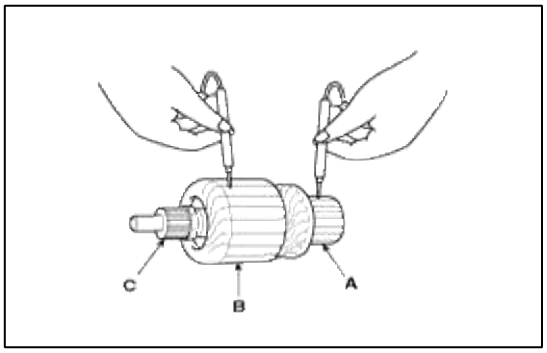
Commutator mica depth
Standard (New) : 0.4 ~ 1.0 mm (0.0157 ~ 0.0394 in.)
Limit : 0.2mm (0.0079 in.)



8. Check for continuity between the segments of the commutator. If an open circuit exists between any segments, replace the armature.

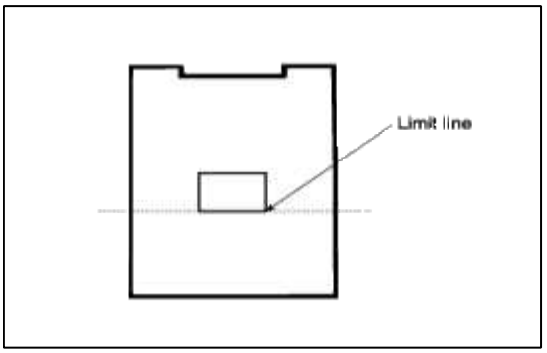


9. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.



STARTER BRUSH

Brushes that are worm out, or oil-soaked, should be replaced.

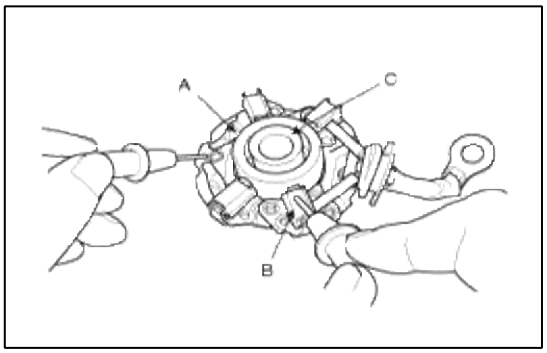


NOTE

To seat new brushes, slip a strip of #500 or #600 sandpaper, with the grit side up, between the commutator and each brush, and smoothly rotate the armature. The contact surface of the brushes will be sanded to the same contour as the commutator.

STARTER BRUSH HOLDER TEST

1. Make sure there is no continuity between the (+) brush holder (A) and (-) plate (B). If there is continuity, replace the brush holder assembly.

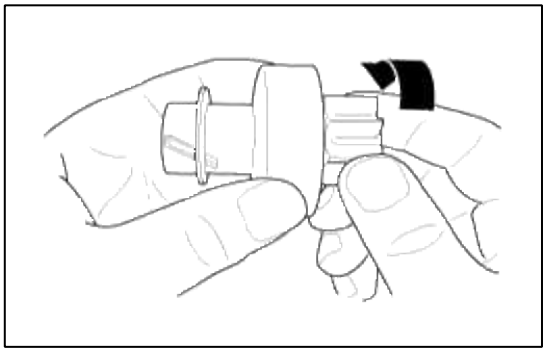


NOTE

Use a pipe (C) of suitable size for the brushes not to get removed from the brush holder.

OVERRUNNING CLUTCH

1. Slide the overrunning clutch along the shaft.
   Replace it if does not slide smoothly.
2. Rotate the overrunning clutch both ways.
   Does it lock in one direction and rotate smoothly in reverse? If it does not lock in either direction of it locks in both directions, replace it.



3. If the starter drive gear is worn or damaged, replace the overrunning clutch assembly. (the gear is not available separately).
   Check the condition of the flywheel or torque converter ring gear if the starter drive gear teeth are damaged.

CLEANING

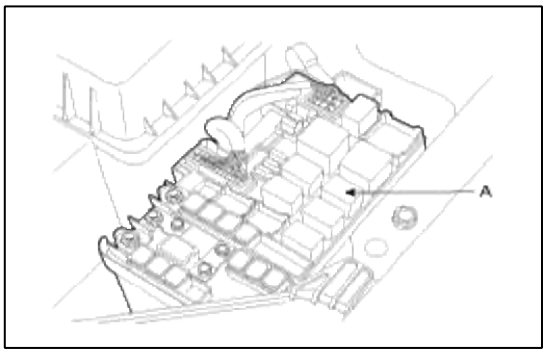
1. Do not immerse parts in cleaning solvent. Immersing the yoke assembly and/or armature will damage the insulation. Wipe these parts with a cloth only.
2. Do not immerse the drive unit in cleaning solvent. The overrun clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

Engine Electrical System > Starting System > Starter Relay > Repair procedures

INSPECTION

1. Remove the fuse box cover.

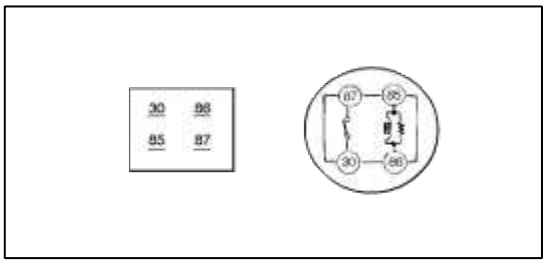
2. Remove the starter relay (A).



3. Using an ohmmeter, check that there is continuity between each terminal.

Terminal	Continuity
30 - 87	NO
85 - 86	YES

4. Apply 12V to terminal 85 and ground to terminal 86.
   Check for continuity between terminals 30 and 87.



5. If there is no continuity, replace the starter relay.
6. Install the starter relay.
7. Install the fuse box cover.

ACCENT(MC) > 2008 > G 1.6 DOHC > Engine Mechanical System

Engine Mechanical System > General Information > Specifications

Specifications

Description		Specifications	Limit
General			
Type		In-line, DOHC	
Number of cylinders		4	
Bore		76.5mm (3.0118in)	
Stroke		87mm (3.4252in)	
Total displacement		1,599 cc (97.57 cu.in)	
Compression ratio		10.0 : 1	
Firing order		1-3-4-2	
Valve timing			
Intake valve	Opens (BTDC)	-8°	
	Closes (ABDC)	60°	
Exhaust valve	Opens (BBDC)	46°	
	Closes (ATDC)	10°	
Cylinder head			
Flatness of gasket surface		Less than 0.03mm (0.0012in)	
Flatness of manifold	Intake	Less than 0.15mm (0.0059in)	
mounting surface	Exhaust	Less than 0.15mm (0.0059in)	
Valve guide hole diameter	STD	11.000 ~ 11.018mm (0.4331 ~ 0.4338in)	
(Intake, Exhaust)	0.05 OS	11.050 ~ 11.068mm (0.4350 ~ 0.4357in)	
	0.25 OS	11.250 ~ 11.268mm (0.4429 ~ 0.4436in)	
	0.50 OS	11.500 ~ 11.518mm (0.4528 ~ 0.4535in)	
Intake valve seat ring hole diameter	STD	30.400 ~ 30.421mm (1.1968 ~ 1.1977in)	
	0.3 OS	30.700 ~ 30.721mm (1.2087 ~ 1.2095in)	
	0.6 OS	31.000 ~ 31.021mm (1.2205 ~ 1.2213in)	
Exhaust valve seat ring hole diameter	STD	27.000 ~ 27.021mm (1.0630 ~ 1.0638in)	
	0.3 OS	27.300 ~ 27.321mm (1.0748 ~ 1.0756in)	
	0.6 OS	27.600 ~ 27.621mm (1.0866 ~ 1.0874in)	
Camshaft			

Cam height	Intake	43.7492 ~ 43.9492mm (1.72241 ~ 1.73028in)	
	Exhaust	44.1494 ~ 44.3494mm (1.73816 ~ 1.74604in)	
Journal outer diameter (Intake, Exhaust)		26.964 ~ 26.980mm (1.0616 ~ 1.0622in)	
Camshaft cap oil clearance		0.02 ~ 0.061mm (0.0008 ~ 0.0024in)	
End play		0.10 ~ 0.20mm (0.0039 ~ 0.0079in)	
Valve			
Valve length	Intake	91.8mm (3.6142in)	
	Exhaust	92.4mm (3.6378in)	
Stem outer diameter	Intake	5.965 ~ 5.980mm (0.2348 ~ 0.2354in)	
	Exhaust	5.950 ~ 5.965mm (0.2343 ~ 0.2348in)	
Face angle		45° ~ 45° 30'	
Thickness of valve head (margin)	Intake	1.1mm (0.0433in)	0.8mm (0.0315in)
	Exhaust	1.3mm (0.0512in)	1.0mm (0.0394in)
Valve stem to valve guide clearance	Intake	0.02 ~ 0.05mm (0.0008 ~ 0.0020in)	0.10mm (0.0039in)
	Exhaust	0.035 ~ 0.065mm (0.0014 ~ 0.0026in)	0.15mm (0.0059in)
Valve guide			
Length	Intake	36.3 ~ 36.7mm (1.4291 ~ 1.4449in)	
	Exhaust	39.3 ~ 39.7mm (1.5472 ~ 1.5630in)	
Valve seat			
Width of seat contact	Intake	0.8 ~ 1.2mm (0.0315 ~ 0.0472in)	
	Exhaust	1.3 ~ 1.7mm (0.0512 ~ 0.0669in)	
Seat angle	Intake	45° ~ 45° 30'	
	Exhaust	45° ~ 45° 30'	
Valve spring			
Free length		44.0mm (1.7323in)	
Load		21.6±1.1kg/35mm(47.6±2.4 lb/1.3780in)	
		45.1±2.2kg/27.2mm(99.4±4.9 lb/1.0709in)	
Out of squareness		Less than 1.5°	3°
Cylinder block			
Cylinder bore		76.50 ~ 76.53mm (3.0118 ~ 3.0130in)	
Flatness of gasket surface		Less than 0.05mm (0.0020in)	
Piston			

Piston outer diameter		76.47 ~ 76.50mm (3.0106 ~ 3.0118in)	
Piston to cylinder clearance		0.020 ~ 0.040mm (0.0008 ~ 0.0016in)	
Ring groove width	No. 1 ring groove	1.230 ~ 1.255mm (0.0484 ~ 0.0494in)	
	No. 2 ring groove	1.230 ~ 1.255mm (0.0484 ~ 0.0494in)	
	Oil ring groove	2.030 ~ 2.055mm (0.0799 ~ 0.0809in)	
Piston ring			
Side clearance	No.1 ring	0.04 ~ 0.085mm (0.0016 ~ 0.0033in)	0.1 mm (0.0039in)
	No.2 ring	0.04 ~ 0.085mm (0.0016 ~ 0.0033in)	0.1 mm (0.0039in)
	Oil ring	0.08 ~ 0.175mm (0.0031 ~ 0.0069in)	
End gap	No. 1 ring	0.15 ~ 0.30mm (0.0059 ~ 0.0118in)	1.0mm (0.0394in)
	No. 2 ring	0.35 ~ 0.50mm (0.0138 ~ 0.0197in)	1.0mm (0.0394in)
	Oil ring	0.20 ~ 0.70mm (0.0079 ~ 0.0276in)	1.0mm (0.0394in)
Piston pin			
Piston pin outer diameter		18.001 ~ 18.007mm (0.7087 ~ 0.7089in)	
Piston pin hole inner diameter		18.016 ~ 18.021mm (0.7093 ~ 0.7095in)	
Piston pin hole clearance		0.011 ~ 0.018mm (0.0004 ~ 0.0007in)	
Connecting rod small end hole inner diameter		17.974 ~ 17.985mm (0.7076 ~ 0.7081in)	
Connecting rod small end hole clearance		-0.032 ~ -0.016mm (-0.0013 ~ -0.0006in)	
Piston pin press-in load		500~1,500 kg (1,102 ~ 3,306 lb)	
Connecting rod			
Connecting rod big end inner diameter		48.000 ~ 48.018mm (1.8898 ~ 1.8905in)	
Connecting rod bearing oil clearance		0.018 ~ 0.036mm (0.0007 ~ 0.0014in)	
Side clearance		0.10 ~ 0.25mm (0.0039 ~ 0.0098in)	0.4mm (0.0157in)
Crankshaft			
Main journal outer diameter		49.950 ~ 49.968mm (1.9665 ~ 1.9672in)	
Pin journal outer diameter		44.954 ~ 44.972mm (1.7698 ~ 1.7705in)	
Main bearing oil clearance	No. 1, 2, 4, 5	0.022 ~ 0.040mm (0.0009 ~ 0.0016in)	0.1mm (0.0039in)
	No. 3	0.028 ~ 0.046mm (0.0011 ~ 0.0018in)	0.1mm (0.0039in)
End play		0.05 ~ 0.175mm (0.0020 ~ 0.0069in)	0.2mm (0.0079in)
Flywheel			

Runout		0.1mm (0.0039in)	0.13mm (0.0051in)
Oil pump			
Side clearance	Inner rotor	0.040 ~ 0.085mm (0.0016 ~ 0.0033in)	
	Outer rotor	0.040 ~ 0.090mm (0.0016 ~ 0.0035in)	
Body clearance		0.060 ~ 0.090mm (0.0024 ~ 0.0035in)	
Relief valve opening pressure		500±49.0kpa (5.1±0.5kg/cm², 72.5±7.1psi)	
Relief spring	Free length	46.6mm (1.8346in)	
	Load	6.1±0.4kg/40.1mm (13.4±0.9 lb/1.5787in)	
Engine oil			
Oil quantity (Total)		3.8 L (4.01 US qts, 3.34 lmp qts)	
Oil quantity (Oil pan)		3.0 L (3.17 US qts, 2.63 lmp qts)	
Oil quantity (Drain and refill including oil filter)		3.3 L (3.48 US qts, 2.90 lmp qts)	
Oil quality		Above API SJ/SL or SAE 5W-20	
Oil pressure (Idle)		107.8kpa (1.1kg/cm², 15.6psi)	
Cooling system			
Cooling method		Forced circulation with cooling fan	
Coolant quantity		5.5 ~ 5.8 L (5.81 ~6.13 US qt, 4.84 ~5.10 lmp qt)	
Thermostat	Type	Wax pellet type	
	Opening temperature	82±1.5 °C (179.6±2.7 °F)	
	Pull opening temperature	95 °C (203 °F)	
Radiator cap	Main valve opening pressure	93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm², 13.51 ~ 17.78psi)	
	Vacuum valve opening pressure	0.98 ~ 4.90 kpa (0.01 ~ 0.05kg/cm², 0.14 ~ 0.71 psi)	
Water temperature sensor			
Type		Thermister type	
Resistance	20°C (68°F)	2.45±0.14 kΩ	
	80°C (176°F)	0.3222 kΩ	

Tightening Torques

Item	Quantity	N.m	kgf.m	lb-ft
Cylinder block				
Engine support bracket bolt	2	44.1 ~ 53.9	4.5 ~ 5.5	32.5 ~ 39.8
Engine support bracket nut	1	44.1 ~ 53.9	4.5 ~ 5.5	32.5 ~ 39.8

Engine support bracket stay bolt	2	44.1 ~ 53.9	4.5 ~ 5.5	32.5 ~ 39.8
Rear plate bolt	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Engine mounting				
Engine mounting bracket and body fixing bolt	3	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Engine mounting insulator and engine mounting support bracket fixing nut	1	68.6 ~ 93.2	7.0 ~ 9.5	50.6 ~ 68.7
Engine mounting support bracket and engine support bracket fixing bolt	2	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Engine mounting support bracket and engine support bracket fixing nut	1	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Transaxle mounting bracket and body fixing bolt	3	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Transaxle mounting insulator and transaxle support bracket fixing bolt	2	68.6 ~ 93.2	7.0 ~ 9.5	50.6 ~ 68.7
Front roll stopper bracket and sub frame fixing bolt	3	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Front roll stopper insulator and front roll stopper support bracket fixing bolt,nut	1	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Rear roll stopper bracket and sub frame fixing bolt	3	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Rear roll stopper insulator and rear roll stopper support bracket fixing bolt,nut	1	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Main moving system				
Connecting rod cap nut	8	31.4 ~ 34.3	3.2 ~ 3.5	23.1 ~ 25.3
Crankshaft main bearing cap bolt	10	53.9 ~ 58.8	5.5 ~ 6.0	39.8 ~ 43.4
Flywheel bolt (M/T)	5	117.7 ~ 127.5	12.0 ~ 13.0	86.8 ~ 94.0
Drive plate bolt (A/T)	5	117.7 ~ 127.5	12.0 ~ 13.0	86.8 ~ 94.0
Timing belt				
Timing belt front upper cover bolt	4	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Timing belt front lower cover bolt	5	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Timing belt rear lower LH cover bolt	3	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing belt rear upper LH cover bolt	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing belt rear upper RH cover bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Crankshaft pulley bolt	1	137.3 ~ 147.1	14.0 ~ 15.0	101.3 ~ 108.5
Camshaft sprocket bolt	1	78.5 ~ 98.1	8.0 ~ 10.0	57.9 ~ 72.3
Timing belt tensioner bolt	1	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Timing belt idler bolt	1	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Cylinder head				
Engine cover bolt	4	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3

Cylinder head cover bolt	12	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Camshaft bearing cap bolt	24	11.8 ~ 13.7	1.2 ~ 1.4	8.7 ~ 10.1
Intake camshaft and CMP sensor target wheel fixing bolt	1	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Exhaust camshaft and CVVT assembly fixing bolt	1	64.7 ~ 76.5	6.6 ~ 7.8	47.7 ~ 56.4
Timing chain auto tensioner bolt	2	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
OCV(oil control valve) bolt	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
OCV(oil control valve) filter	1	40.2 ~ 50.0	4.1 ~ 5.1	29.7 ~ 36.9
Cylinder head bolt	10	29.4+90° → Release all bolts → 29.4+90°	3.0+90° → Release all bolts → 3.0+90°	21.7+90° → Release all bolts → 21.7+90°
Cooling system				
Water pump pulley bolt	4	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Water pump bolt (8 X 28)	3	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Water pump and alternator brace fixing bolt (8 X 45)	1	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Water pump and alternator brace fixing bolt (8 X 65)	1	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Thermostat housing nut	2	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Water outlet fitting nut	2	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Water inlet fitting bolt	3	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.5
Water temperature sensor	1	19.6 ~ 39.2	2.0 ~ 4.0	14.5 ~ 28.9
Water pipe fixing bolt	1	9.8 ~ 14.7	1.0 ~ 1.5	7.2 ~ 10.8
Lubrication system				
Oil filter	1	11.8 ~ 15.7	1.2 ~ 1.6	8.7 ~ 11.6
Front case bolt (8 X 22)	1	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Front case bolt (8 X 30)	3	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Front case bolt (8 X 45)	1	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Front case bolt (8 X 60)	1	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Oil pan bolt	18	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pan drain plug	1	39.2 ~ 44.1	4.0 ~ 4.5	28.9 ~ 32.5
Oil screen bolt	2	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Oil pressure switch	1	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Rear oil seal case	5	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Intake and exhaust system				
Intake manifold and cylinder head fixing nut	6	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5

Intake manifold and cylinder head fixing bolt(8X45)	2	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Intake manifold and cylinder head fixing bolt(8X22)	1	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Intake manifold stay bolt	4	17.7 ~ 24.5	1.8 ~ 2.5	13.0 ~ 18.1
Exhaust manifold and cylinder head fixing nut	9	29.4 ~ 34.3	3.0 ~ 3.5	21.7 ~ 25.3
O2 sensor to exhaust manifold	1	49.0 ~ 58.8	5.0 ~ 6.0	36.2 ~ 43.4
Exhaust manifold heat cover and exhaust manifold fixing bolt	3	16.7 ~ 21.6	1.7 ~ 2.2	12.3 ~ 15.9
Air cleaner lower cover fixing bolt	3	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Throttle body and surge tank fixing bolt and nut	4	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
Exhaust manifold and front muffler fixing nut	2	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9
Front muffler and center muffler fixing nut	2	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9
Center muffler and main muffler fixing nut	2	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9

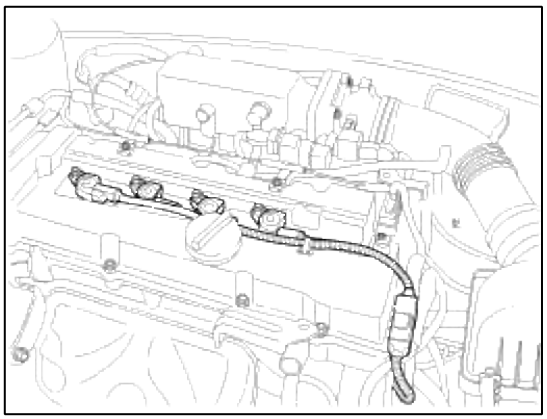
Engine Mechanical System > General Information > General Information

Compession Pressure Inspection

NOTE

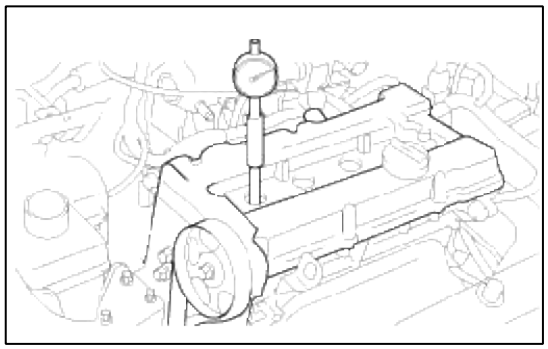
If the there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. Warm up and stop engine.
   Allow the engine to warm up to normal operating temperature.
2. Disconnect the ignition coil connectors and the spark plug cables. (Refer to Ignition system in EE Group).



3. Remove the spark plugs.
   Using a 16mm plug wrench, remove the 4 spark plugs.

4. Check the cylinder compression pressure.
   (1) Insert a compression gauge into the spark plug hole.



   (2) Fully open the throttle.
   (3) While cranking the engine, measure the compression pressure.

> NOTE
>
> Always use a fully charged battery to obtain engine speed of 250rpm or more.

   (4) Repeat step 1) through 3) for each cylinder.

> NOTE
>
> This measurement must be done in as short a time as possible.

Compression pressure
Standard : 1,422kPa (14.5kg/cm², 206psi) (250~400 rpm)
Minimum : 1,275kPa (13.0kg/cm², 185psi)
Difference between each cylinder :
98kPa (1.0kg/cm², 14psi) or less

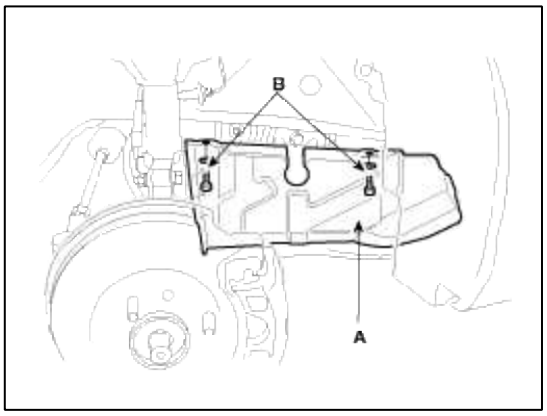
   (5) If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat step 1) through 3) for cylinders with low compression.
      A. If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
      B. If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

5. Reinstall the spark plugs.
6. Connect the ignition coil connectors and the spark plug cables. (Refer to Ignition system in EE Group).

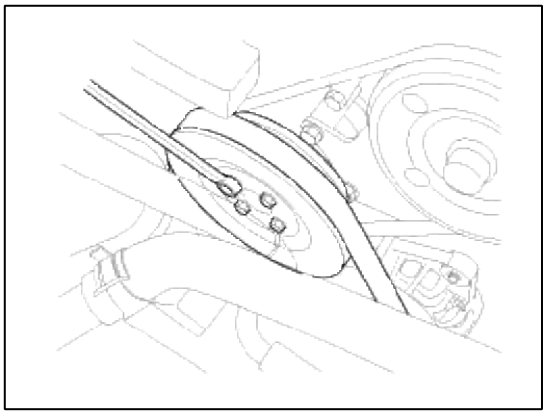
Timing Belt Tension Adjustment

1. Remove the engine cover.
2. Remove the RH front wheel.

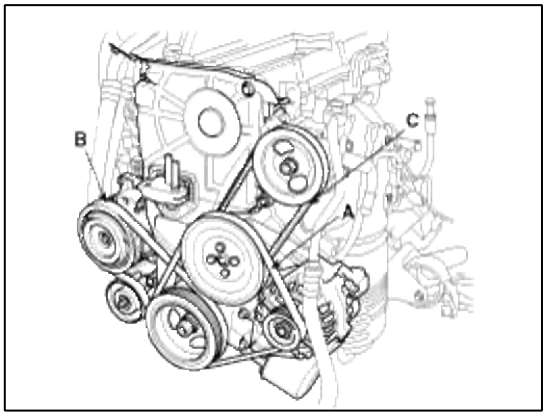
3. Remove the bolts(B) and RH side cover(A).



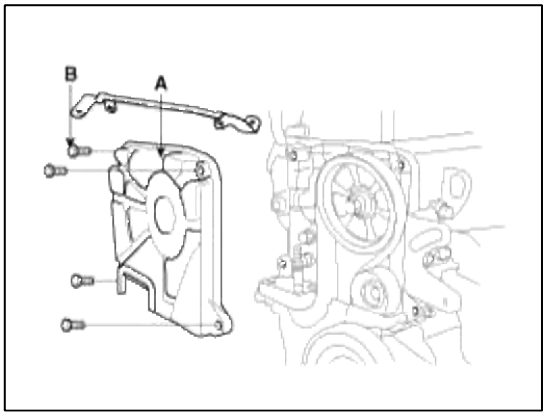
4. Loosen the water pump pulley bolts.



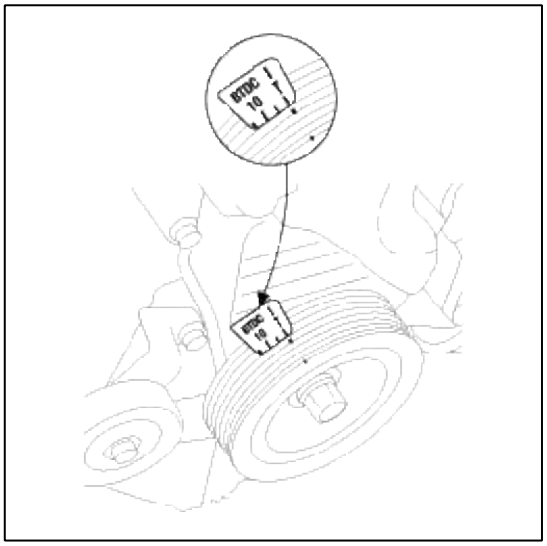
5. Remove the alternator drive belt(A). (Refer to Alternator in EE Group).

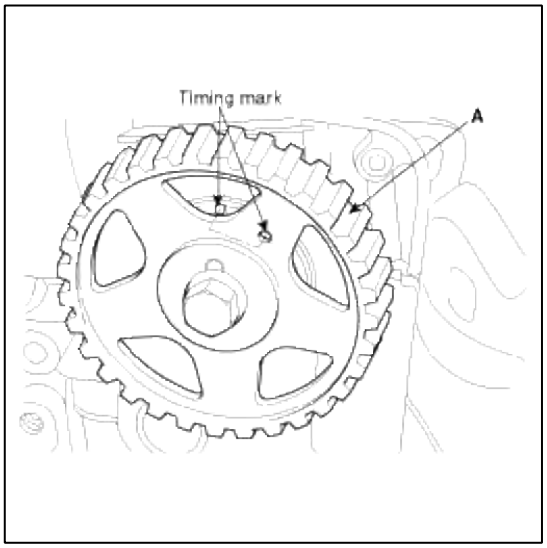


6. Remove the air conditioner compressor drive belt(B).
   (Refer to Air conditioner in HA Group).
7. Remove the power steering pump drive belt(C).
   (Refer to Power steering pump in ST Group).
8. Remove the water pump pulley.
9. Remove the 4 bolts(B) and timing belt upper cover (A).

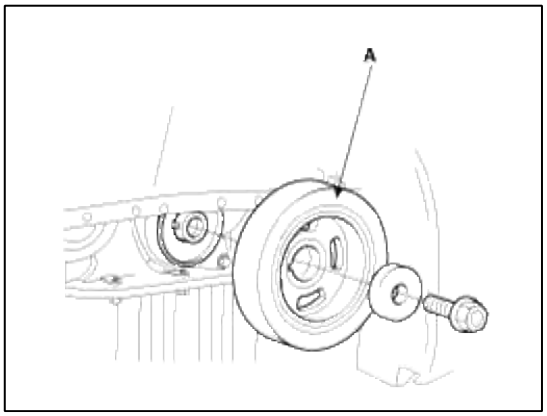


10. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover. Check that the timing mark of camshaft sprocket(A) is aligned with the timing mark of cylinder head cover. (No.1 cylinder compression TDC position)

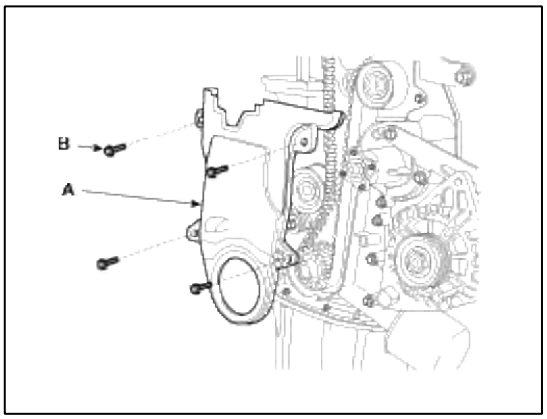




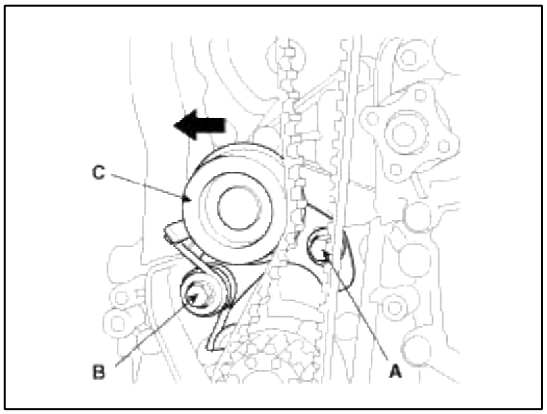
11. Remove the crankshaft pulley(A).



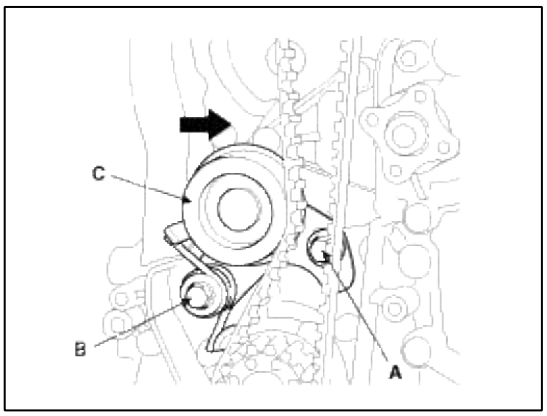
12. Remove the 4 bolts(B) and timing belt lower cover(A).



13. Move the tensioner pulley(C) in the direction of the arrow shown after loosen the mounting bolt (A, B). And temporarily tighten mouting bolt (A, B).



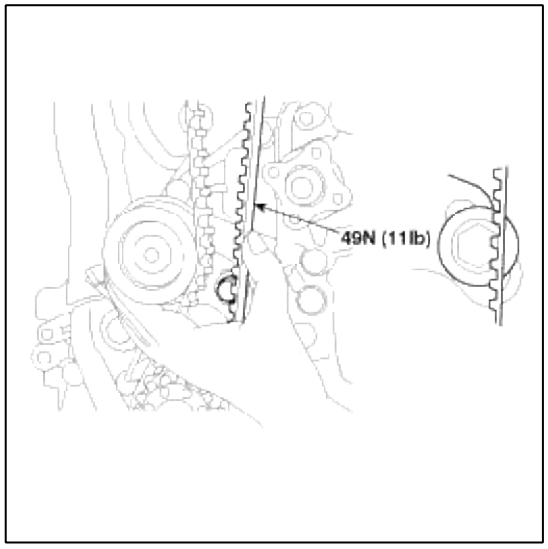
14. Adjust the timing belt tension.
    (1) After inspecting the timing belt, replace it if necessary.
    (2) Loosen the tensioner pulley mounting bolt and apply tension to the timing belt.



    (3) After checking the alignment between each sprocket and each timing belt tooth, tighten the mounting bolt (A) and (B) one by one.

Tightening torque :
19.6 ~ 26.5N.m (2.0 ~ 2.7kgf.m, 14.5 ~ 19.5lb-ft)

(4) Then recheck the belt tension.
Verify that when the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49N (11lb)], the timing belt cog end is aprox. 1/2 of the tensioner mounting bolt head radius (across flats) away from the bolt head center.



(5) Timing belt tension measuring procedure (by a sonic tension guage)
Rotate crankshaft in clockwise direction to set 1st piston on top dead center (TDC) and rotate crankshaft in counterclockwise to 90° then measure the belt tension in the middle of tension side span (in arrow direction of above illustration) by free vibration method.

CAUTION

Avoid rotating the crankshaft in a counter clock wise direction.
Engine damage could occur.

Conversion equation of frequency into tension :
$T = (4 / 9.8) \times S^2 \times M \times W \times f^2 / 100000000$
S: Measured belt span (mm)
M: Unit weight of belt (gf/cm^2)
W: Belt width (mm)
f: Transverse natural frequency of belt (Hz)

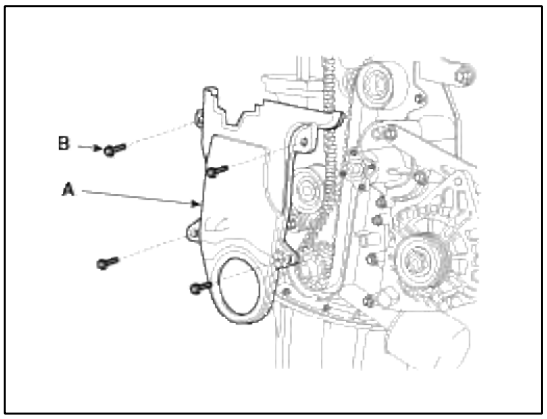
Timing Belt Specifications

Item	Specifications
S (mm)	249.6
M (gf/cm^2)	0.4543
W (mm)	22
f (Hz)	70.4 ~ 87.9
T (kgf)	16 ± 3.5

15. Turn the crankshaft two turns in the operating direction (clockwise) and realign the crankshaft sprocket and camshaft sprocket timing mark.

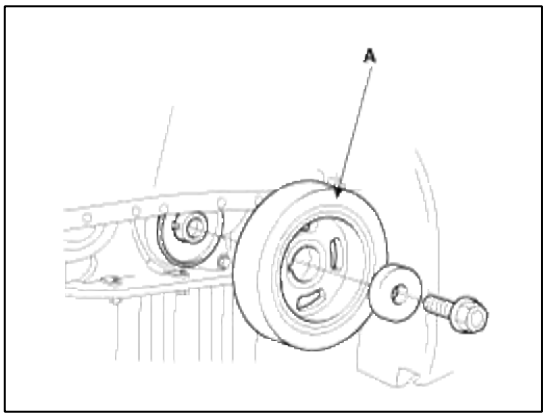
16. Install the timing belt lower cover(A) with bolts(B).

Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



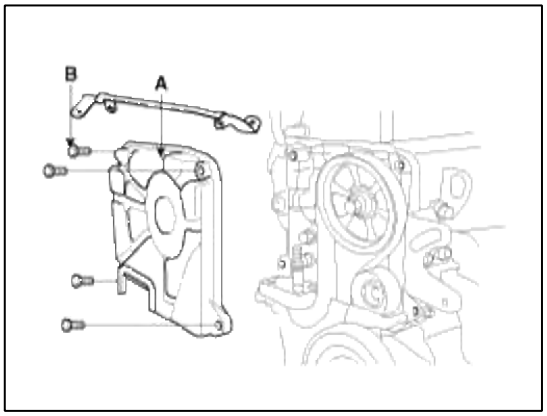
17. Install the crankshaft pulley(A).

Tightening torque :
137.3 ~ 147.1N.m (14.0 ~ 15.0kgf.m, 101.3 ~ 108.5lb-ft)



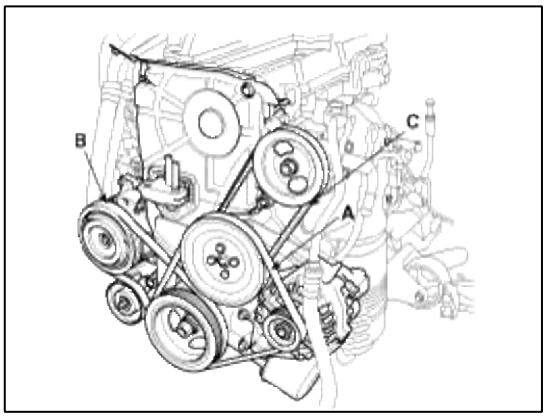
18. Install the timing belt upper cover(A) with bolts(B).

Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

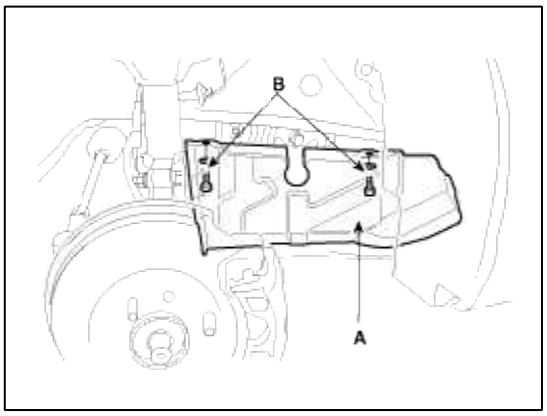


19. Install the water pump pulley.

20. Install the power steering pump drive belt(C). (Refer to Power steering pump in ST Group).



21. Install the air conditioner compressor drive belt(B).
(Refer to Air conditioner in HA Group).
22. Install the alternator drive belt(A). (Refer to Alternator in EE group).
23. Install the RH side cover(A) with bolts(B)



24. Install the RH front wheel.

Tightening torque :
88.3 ~ 107.9N.m (9 ~ 11kgf.m, 65.1 ~ 79.6lb-ft)

25. Install the engine cover with bolts.

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

Engine Mechanical System > General Information > Troubleshooting

Troubleshooting

Symptom	Suspect area	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	Stuck valves.	Repair or replace as required.

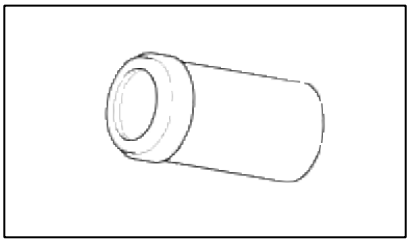
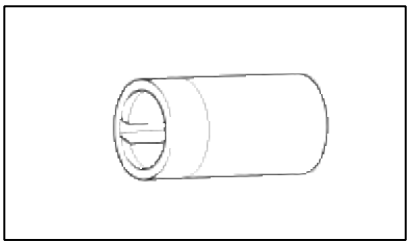
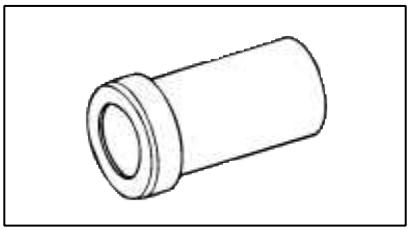
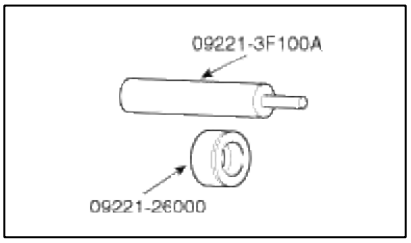
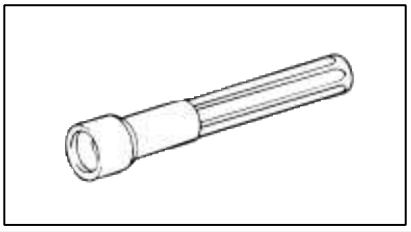
abnormal valve train noise.	(Carbon buildup on the valve stem can cause the valve not to close properly.)	
	Excessive worn or mis-aligned timing chain.	Replace the timing chain and sprocket as required.
	Worn camshaft lobes.	Replace the camshaft and valve lifers.
Engine misfire with coolant consumption.	• Faulty cylinder head gasket and/or cracking or other damage to the cylinder head and engine block cooling system. • Coolant consumption may or may not cause the engine to overheat.	• Inspect the cylinder head and engine block for damage to the coolant passages and/or a faulty head gasket. • Repair or replace as required.
Engine misfire with excessive oil consumption.	Worn valves, 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)	Inspection 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 chain and/or damaged sprocket teeth.	Replace the timing chain and sprockets.
	Worn timing chain tensioner, if applicable.	Replace the timing chain tensioner as required.
	Worn camshaft lobes.	Inspect the camshaft lobes. Replace the 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 valves and valve guides, then repair as required.
Lower engine noise, regardless of engine speed.	Low oil pressure.	Repair or replace damaged components as required.
	Loose or damaged flywheel.	Repair or replace the flywheel.
	Damaged oil pan, contacting the oil pump screen.	Inspect the oil pan. Inspect the oil pump screen. Repair or replace as required.
	Oil pump screen loose, damaged or restricted.	Inspect the oil pump screen. Repair or replace as required.

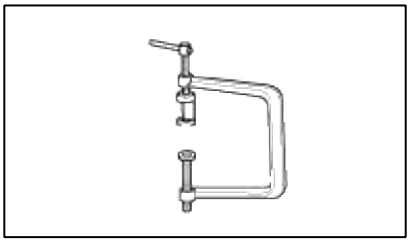
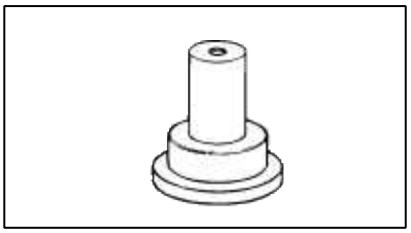
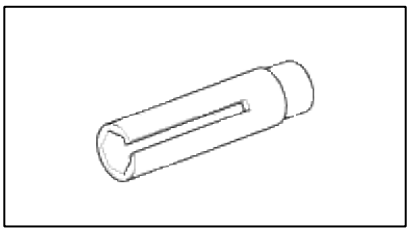
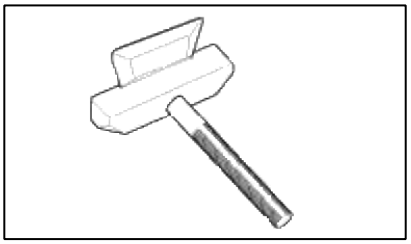
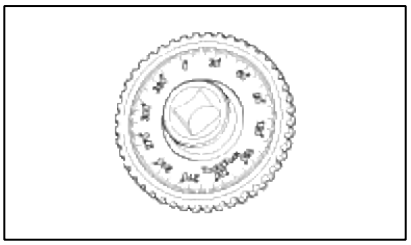
	Excessive piston-to-cylinder bore clearance.	Inspect the piston and cylinder bore. Repair as required.
	Excessive piston pin-to-bore clearance.	Inspect the piston, piston pin and the connecting rod. Repair or replace as required.
	Excessive connecting rod bearing clearance.	Inspect the following components 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 clearance.	Inspect the following components and repair as required. • The crankshaft bearings. • The crankshaft journals. • The cylinder block crankshaft bearing bore.
Engine will not crank. (crankshaft will not rotate)	Hydraulically locked cylinder. • Coolant/antifreeze in cylinder. • Oil in cylinder. • Fuel in cylinder.	Remove spark plugs and check for fluid. Inspect for broken head gasket. Inspect for cracked engine block or cylinder head. Inspect for a sticking fuel injector and/or leaking fuel regulator.
	Broken timing chain and/or timing chain gears.	Inspect timing chain and gears. Repair as required.
	Foreign material in cylinder. • Broken valve. • Piston material. • Foreign material.	Inspect cylinder for damaged components and/or foreign materials. Repair or replace as required.

	Seized crankshaft or connecting rod bearings.	Inspect crankshaft and connecting rod bearing. Repair or replace as required.
	Bent or broken connecting rod.	Inspect connecting rods. Repair or replace as required.
	Broken crankshaft.	Inspect crankshaft. Repair or replace as required.

Engine Mechanical System > General Information > Special Service Tools

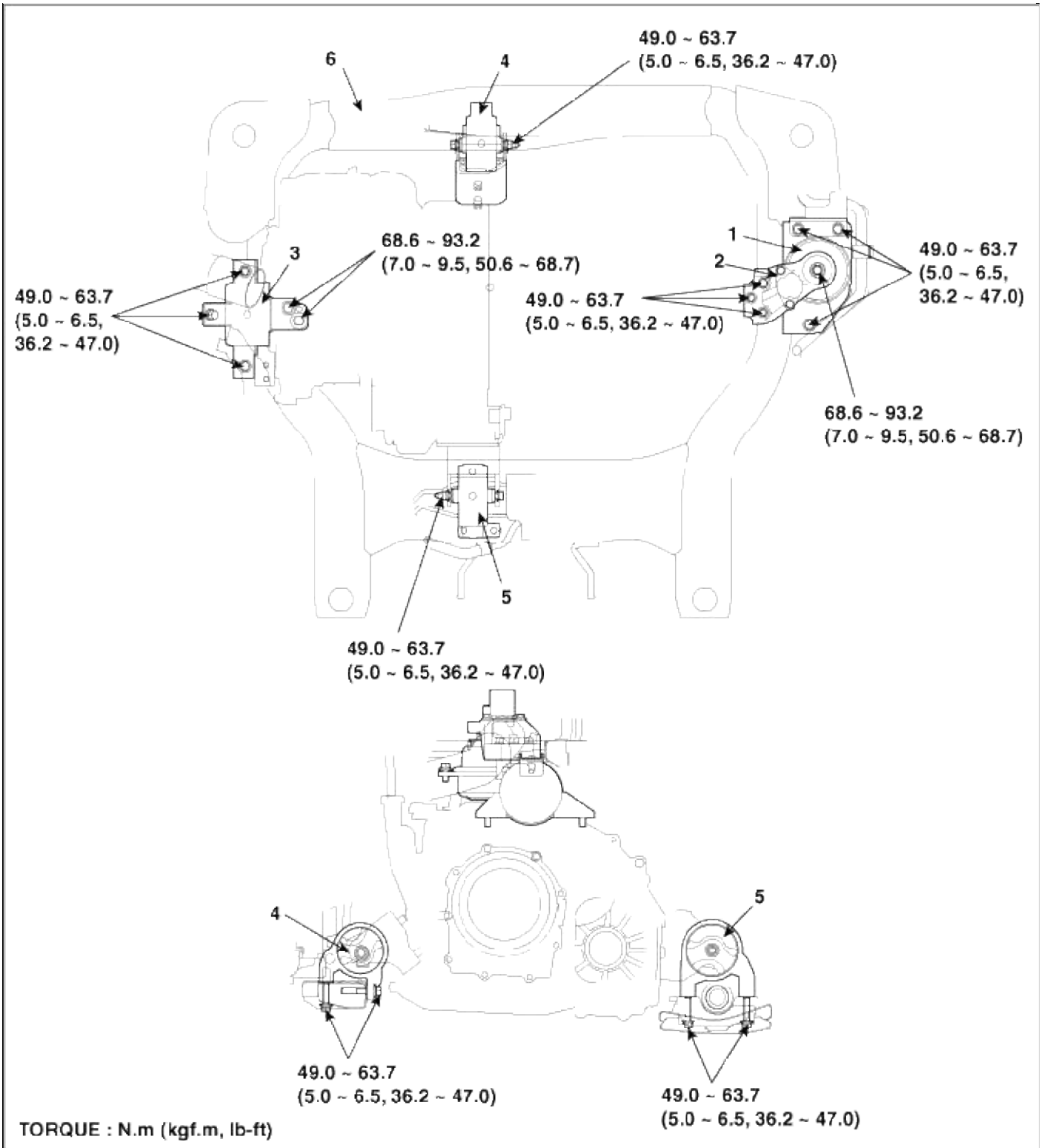
Special Service Tools

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer (09214-32000)		Installation of the front oil seal
Crankshaft front oil seal guide (09214-32100)		Installation of the front oil seal
Camshaft oil seal installer (09221-21000)		Installation of the camshaft oil seal
Valve guide remover (09209221-3F100 (A)) Valve guide installer (09221-26000)		Removal and installation of the valve guide
Valve stem oil seal installer (09222-22001)		Installation of the valve stem oil seal

Valve spring compressor (09222-28000) Valve spring compressor adaptor (09222-28100)		Removal and installation of the intake or exhaust valve
Crankshaft rear oil seal installer (09231-21000)		Installation of the crankshaft rear oil seal
Water temperature sensor socket wrench (09221-25100)		Removal and installation of water temperature sensor
Oil pan remover (09215-3C000)		Removal of oil pan
Torque angle adapter (09221-4A000)		Installation of bolts & nuts needing an angular method

Engine Mechanical System > Engine And Transaxle Assembly > Components and Components Location

Components



1. Engine mounting bracket
2. Engine mounting support bracket
3. Transaxle mounting bracket
4. Front roll stopper
5. Rear roll stopper
6. Sub-frame

Engine Mechanical System > Engine And Transaxle Assembly > Repair procedures

Removal

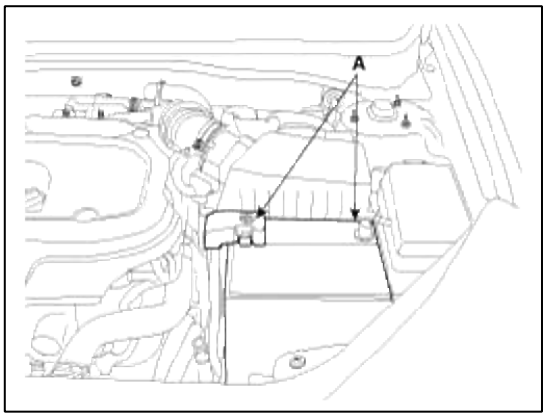
CAUTION

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

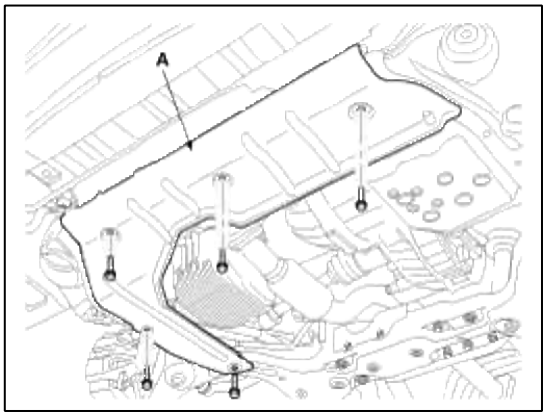
NOTE

• Mark all wiring and hoses to avoid misconnection.

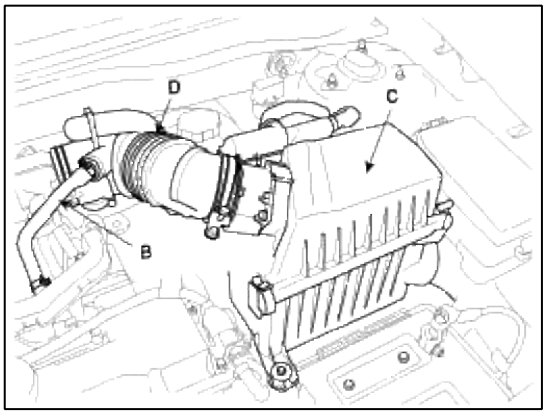
1. Disconnect the terminals(A) from battery and remove the battery.



2. Remove the engine cover.
3. Remove the under cover(A).

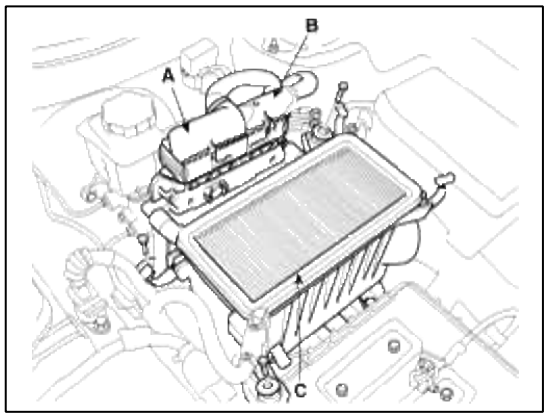


4. Drain the engine coolant.
   Remove the radiator cap to speed draining.
5. Remove the intake air hose and air cleaner assembly.
   (1) Disconnect the breather hose(B) from intake air hose(D).
   (2) Remove the intake air hose(D) and air cleaner upper cover(C).

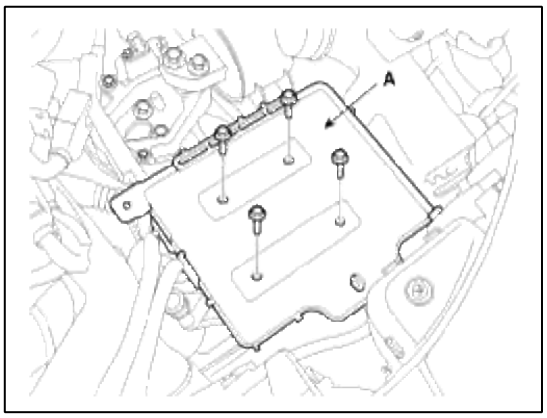


   (3) Disconnect the ECM connector(A) and ECM connector(B) (A/T only).

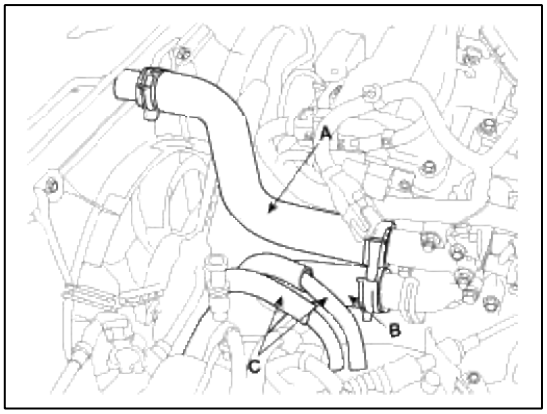
(4) Remove the air cleaner element and air cleaner lower cover(C).



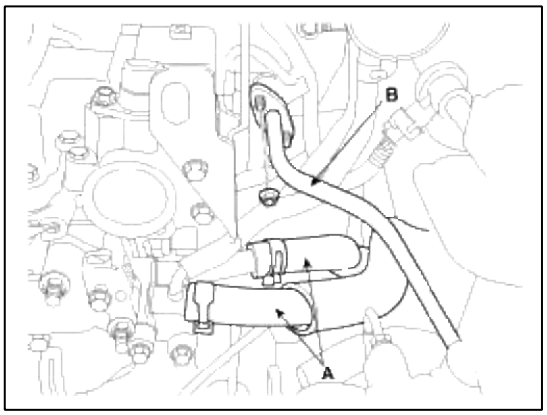
6. Remove the battery tray(A).



7. Disconnect the upper radiator hose(A) and lower radiator hose(B).
8. Disconnect the ATF oil cooler hoses(C).

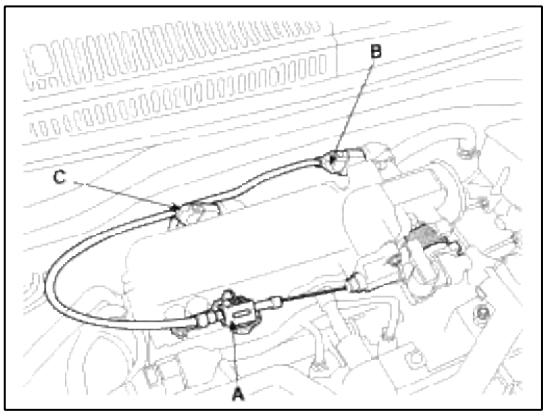


9. Disconnect the heater hoses(A).
10. Disconnect the fuel hose(B).

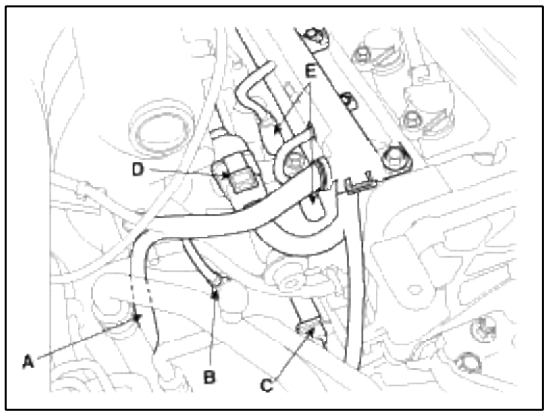


11. Remove the accelerator cable(A) by loosening the lock-nut, then slip the cable end out of the throttle linkage.

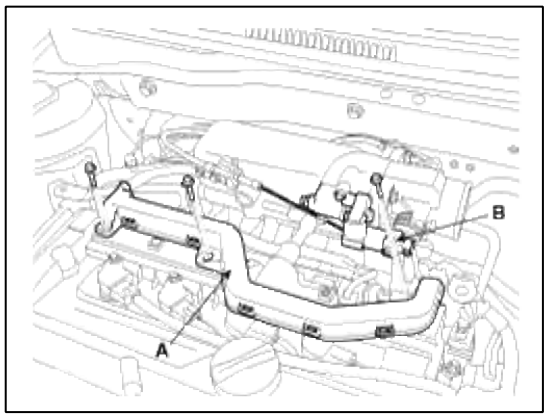
12. Disconnect the TPS (Throttle Position Sensor) connector(B) and the MAP sensor connector(C).



13. Remove the engine wire harness connectors and wire harness clamps from cylinder head and the intake manifold.
    (1) Disconnect the rear oxygen sensor connector (A).
    (2) Disconnect the air conditioner compressor switch connector (B).
    (3) Disconnect the knock sensor connector (C).
    (4) Disconnect the injector connectors(No.3,4) (D).
    (5) Disconnect the injector connectors(No.1,2) (E)

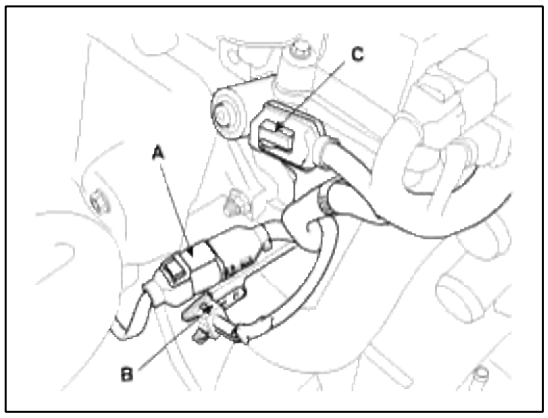


    (6) Remove the wire harness bracket(A).
    (7) Disconnect the ISA (Idle Speed Actuator) connector (B).



    (8) Disconnect the front oxygen sensor connector(A).
    (9) Disconnect the CKP(Crankshaft Position Sensor) connector (B).

(10) Disconnect the OCV(Oil Control Valve) connector (C).



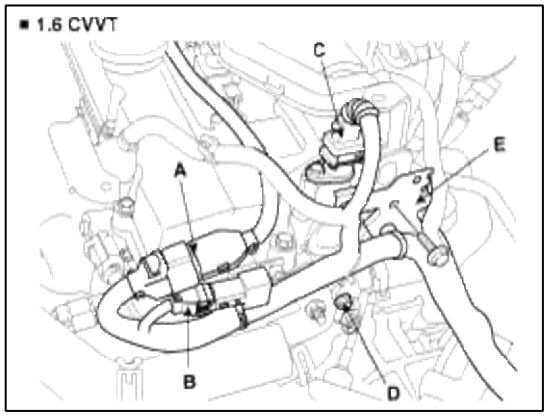
(11) Disconnect the ignition coil connector(A).

(12) Disconnect the ignition coil condenser connector(B).

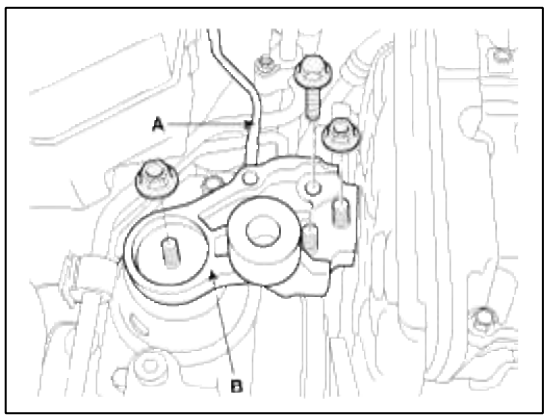
(13) Disconnect the CMP(Camshaft Position Sensor) connector(C).

(14) Disconnect the ground cable(D).

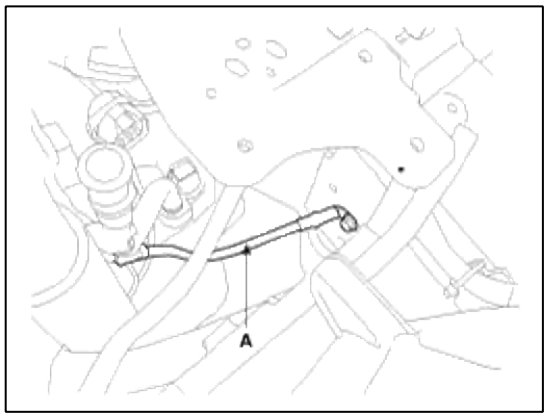
(15) Remove the wire harness bracket(E).



(16) Remove the ground cable(A) between engine mounting and vehicle body.



(17) Remove the ground cable(A) between transaxle housing and vehicle body.

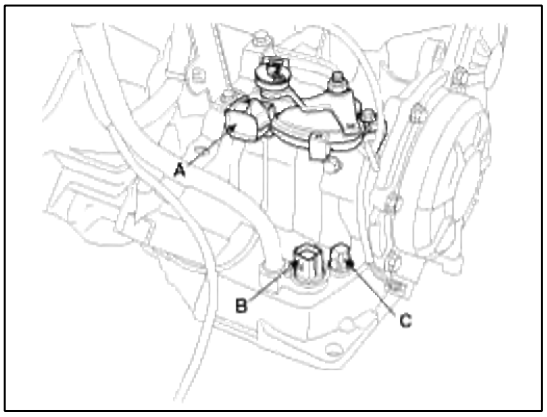


14. Remove the transaxle wire harness connectors and control cable from transaxle (A/T).

(1) Disconnect the transaxle range switch connector (A).

(2) Disconnect the solenoid valve connector(B).

(3) Disconnect the ATF oil temperature sensor connector (C).

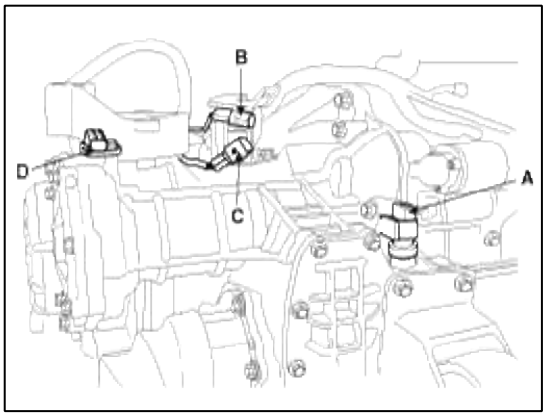


(4) Disconnect the vehicle speed sensor connector(A).

(5) Disconnect the band server switch connector(B).

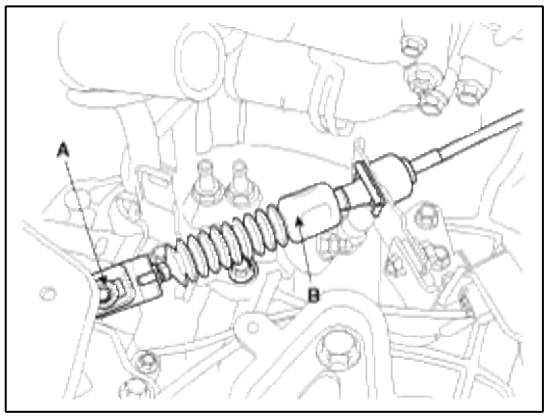
(6) Disconnect the pulse generator(A) connector(C).

(7) Disconnect the pulse generator(B) connector(D).



(8) Remove the control cable nut(A) from transaxle range switch.

(9) Remove the control cable(B).

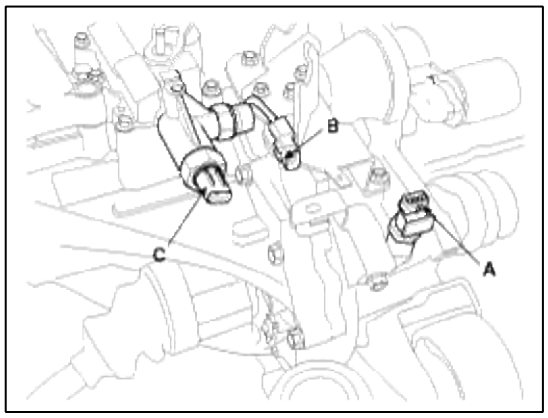


15. Remove the transaxle wire harness connectors and control cable from transaxle (M/T).

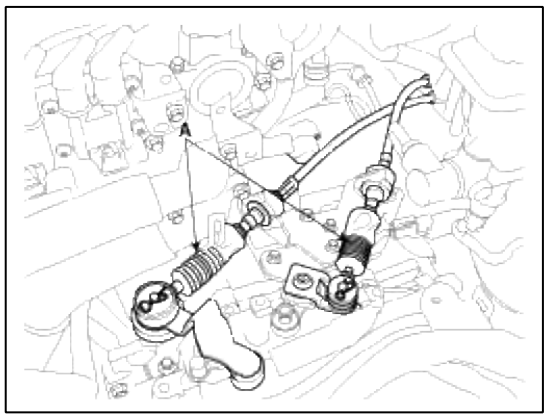
(1) Disconnect the vehicle speed sensor connector(A).

(2) Disconnect the neutral switch connector(B).

(3) Disconnect the back-up lamp switch connector(C).

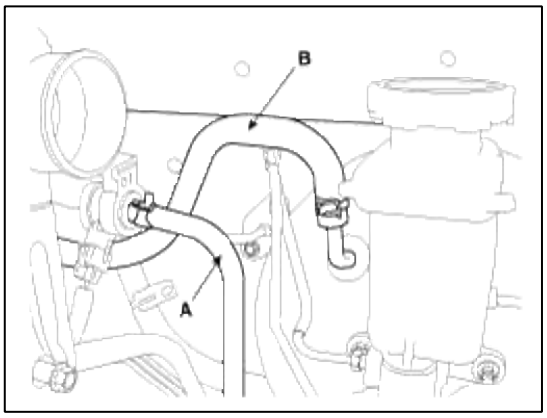


(4) Remove the control cable(A).

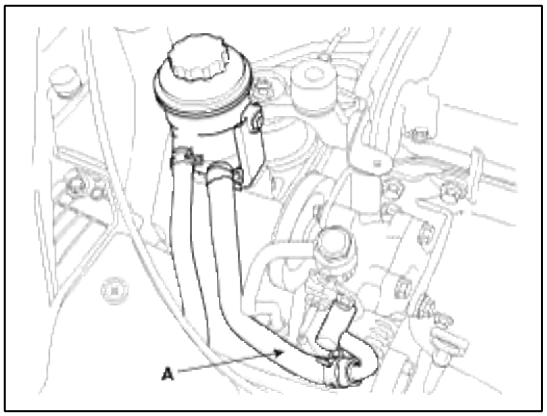


16. Move the disconnected wire harnesses to the fuse box side so as to prevent interfering with other parts.
17. Disconnect the hose(A) of the PCSV (Purge Control Solenoid Valve) side.

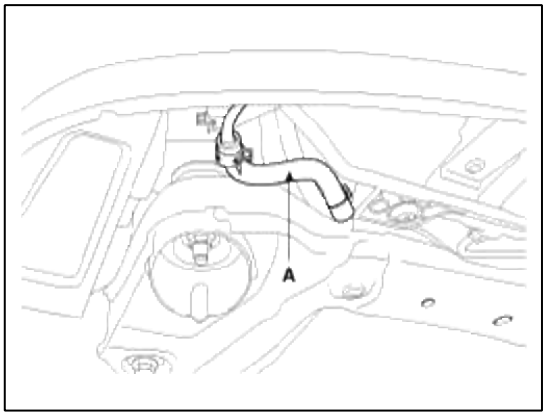
18. Remove the brake booster vacuum hose(B).



19. Remove the power steering oil hose(A) and drain the power steering oil.



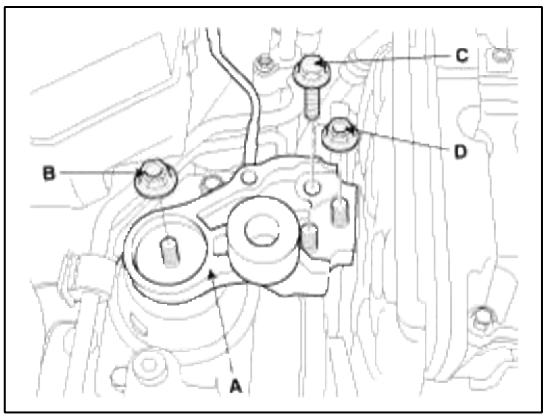
20. Remove the power steering return hose(A).



21. Recovering refrigerant and remove the high & low pressure pipe. (Refer to Air conditioner compressor in HA Group).

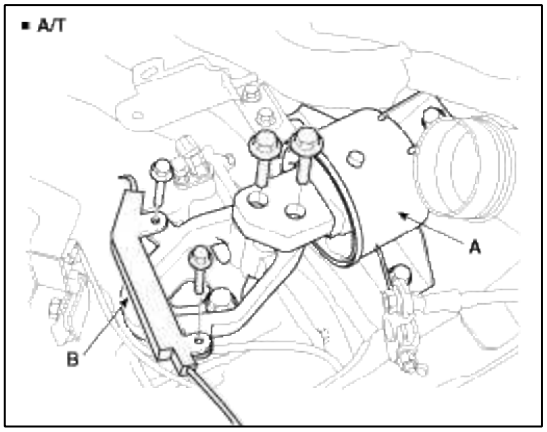
22. Remove the nuts(B,D), bolt(C) and engine mounting support bracket(A).

Tightening torque :
Nut (B) :
68.6 ~ 93.2N.m (7.0~ 9.5kgf.m, 50.6 ~ 68.7lb-ft)
Bolt(C),Nut(D):
49.0~63.7N.m(5.0~6.5kgf.m,36.2~47.0lb-ft)

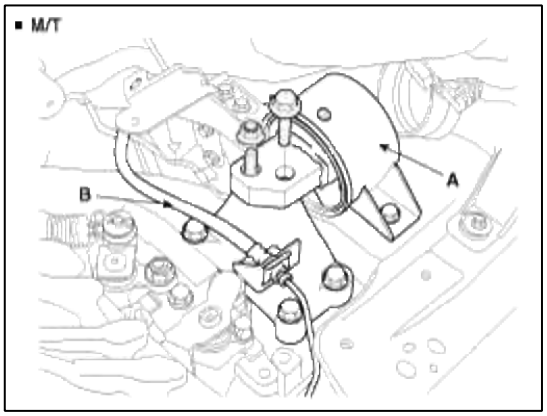


23. Remove the transaxle mounting bracket(A).

Tightening torque :
Bolt, Nut (B) :
68.6 ~ 93.2N.m (7.0~ 9.5kgf.m, 50.6 ~ 68.7lb-ft)

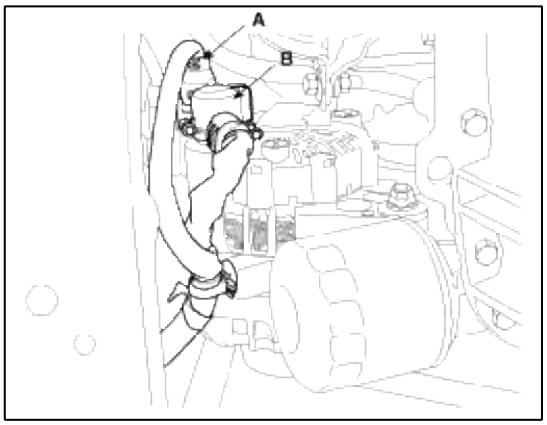


* A/T : Remove the wire harness protector(B) on the transaxle mounting support braket.

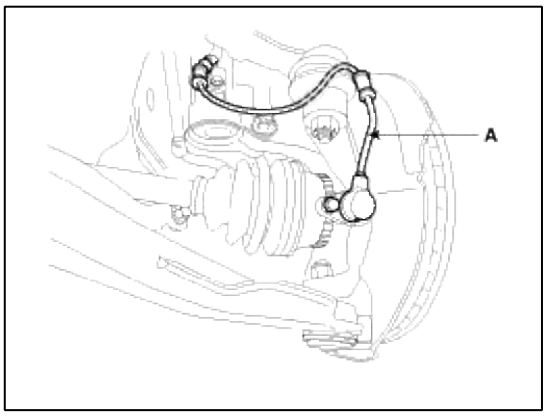


* M/T : Remove the clutch realese cylinder oil hose(B) on the transaxle mouting support bracket.

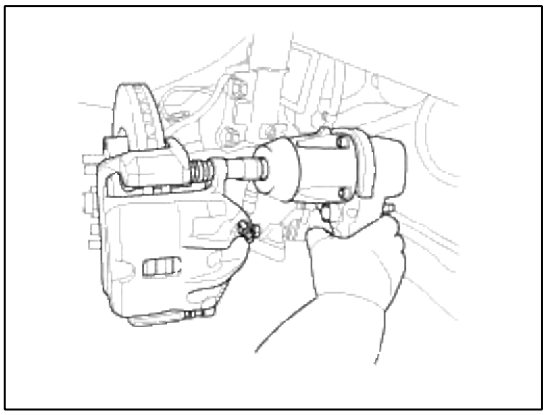
24. Disconnect the alternator connector(A) and "B" terminal (B).

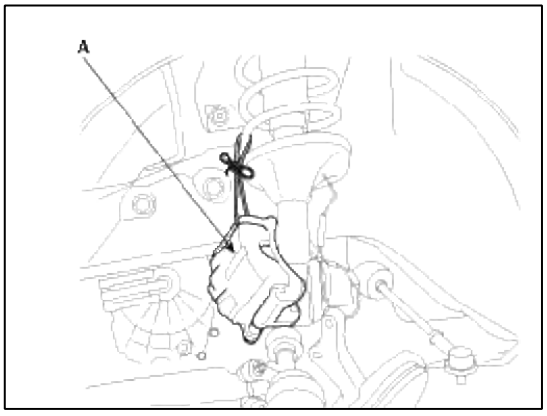


25. Remove the front tires.
26. Remove the ABS wheel speed sensor(A).

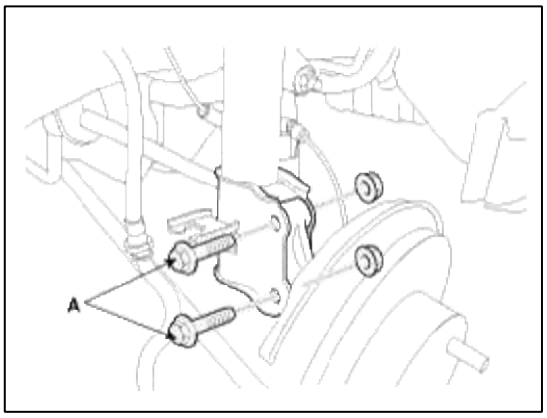


27. Remove the caliper and hang assembly(A).

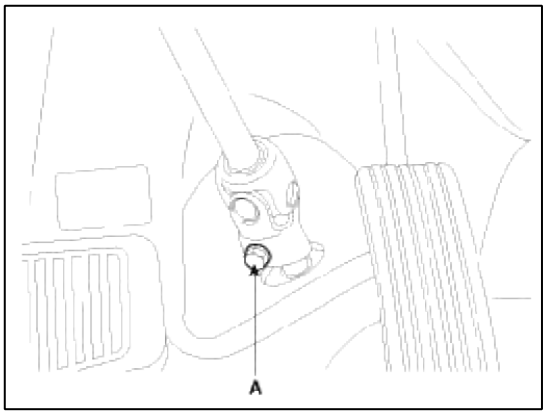




28. Remove the knuckle mounting bolts(A).

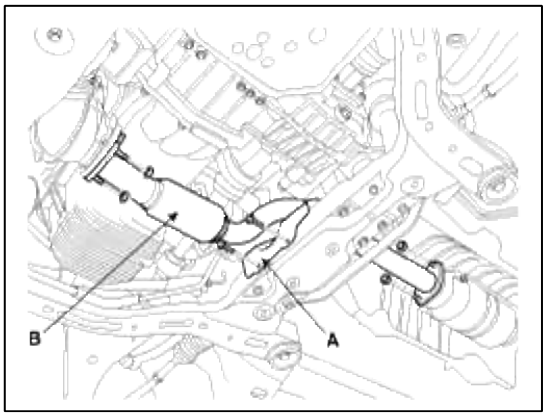


29. Remove the steering u-joint mounting bolt(A).



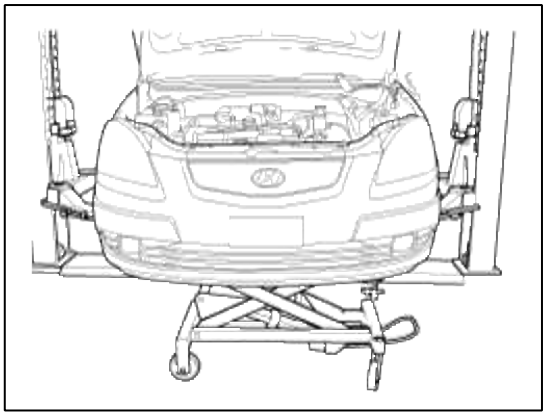
30. Remove the front muffler heat protector(A).
31. Remove the front muffler(B).

Tightening torque :
29.4 ~ 39.2N.m(3.0 ~ 4.0kgf.m,21.7 ~ 28.9lb-ft)



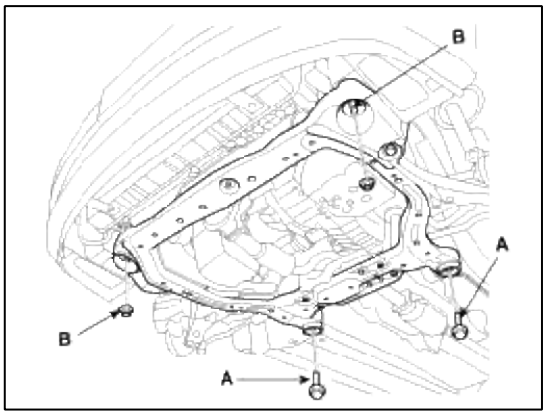
32. Using a floor jack, support the engine and transaxle assembly.

> NOTE
>
> After removing the sub frame mounting bolt , the engine and transaxle assembly may fall downward, and so support them securely with floor jack.
> Verify that the hoses and connectors are disconnected before removing the engine and transaxle assembly.



33. Remove the sub frame bolts and nuts.

Tightening torque :
Bolt(A), Nut(B):
93.2 ~ 117.7N.m (9.5 ~ 12.0kgf.m, 68.7 ~ 86.8lbf.ft)



34. Remove the engine and transaxle assembly by lifting vehicle.

> NOTE
>
> When remove the engine and transaxle assembly, be careful not to damage any surrounding parts or body components.

Installation

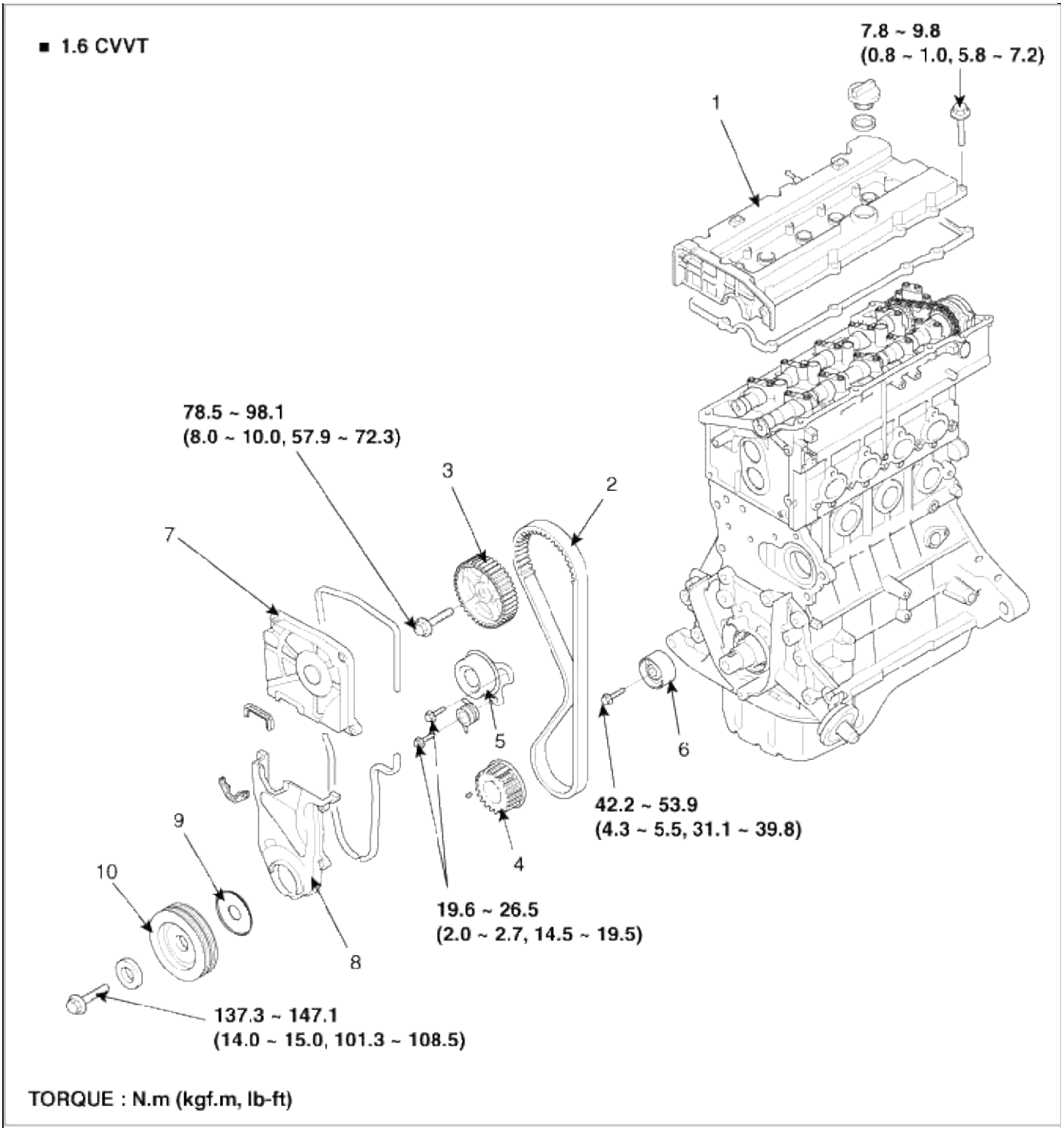
Installation is in the reverse order of removal.
Perform the following :

- Adjust the shift cable.
- Adjust the throttle cable.
- Refill the engine with engine oil.
- Refill the transaxle with fluid.
- Refill the radiator and reservoir tank with engine coolant.
- Place the heater control knob on "HOT" position.

- Bleed air from the cooling system
  - Start engine and let it run until it warms up. (until the radiator fan operates 3 or 4 times.)
  - Turn Off the engine. Check the level in the radiator, add coolant if needed. This will allow trapped air to be removed from the cooling system.
  - Put the radiator cap on tightly, then run the engine again and check for leaks.
- Clean the battery posts and cable terminals with sandpaper assemble them, then apply grease to prevent corrosion.
- Inspect for fuel leakage.
  - After assemble the fuel line, turn on the ignition switch (do not operate the starter) so that the fuel pump runs for approximately two seconds and fuel line pressurizes.
  - Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.

Engine Mechanical System > Timing System > Timing Belt > Components and Components Location

Components



1. Cylinder head cover
2. Timing belt
3. Camshaft sprocket
4. Crankshaft sprocket
5. Tensioner
6. Idler
7. Timing belt upper cover
8. Timing belt lower cover
9. Flange
10. Crankshaft pulley

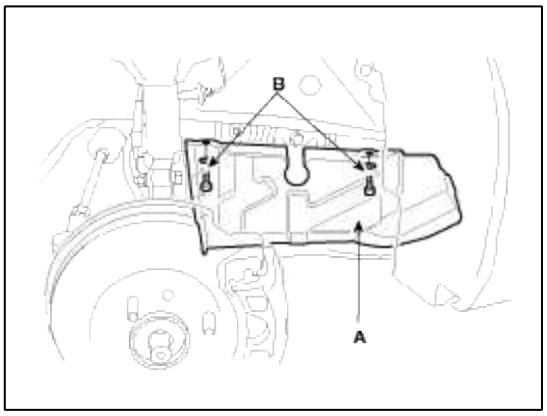
Engine Mechanical System > Timing System > Timing Belt > Repair procedures

Removal

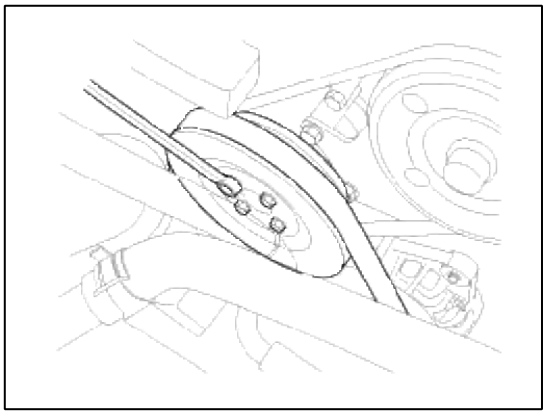
Engine removal is not required for this procedure.

1. Remove the engine cover.
2. Remove the RH front wheel.

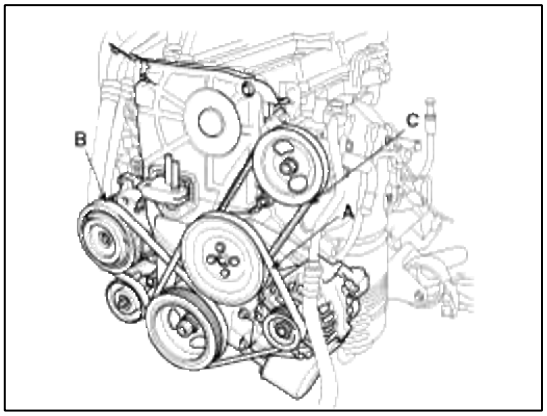
3. Remove the 2 bolts(B) and RH side cover(A).



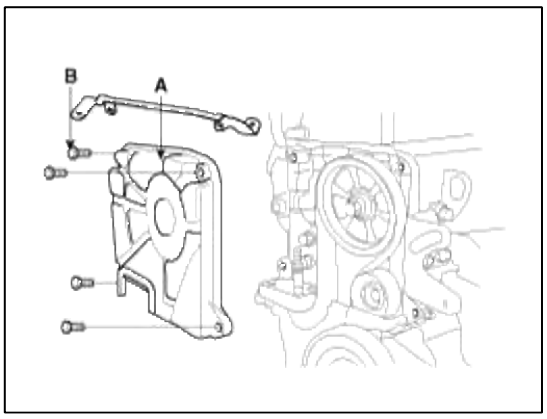
4. Temporarily loosen the water pump pulley bolts.



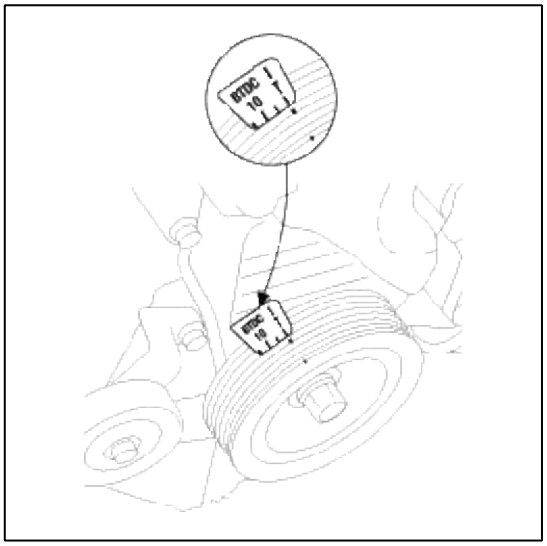
5. Remove the alternator drive belt(A). (Refer to Alternator in EE Group).

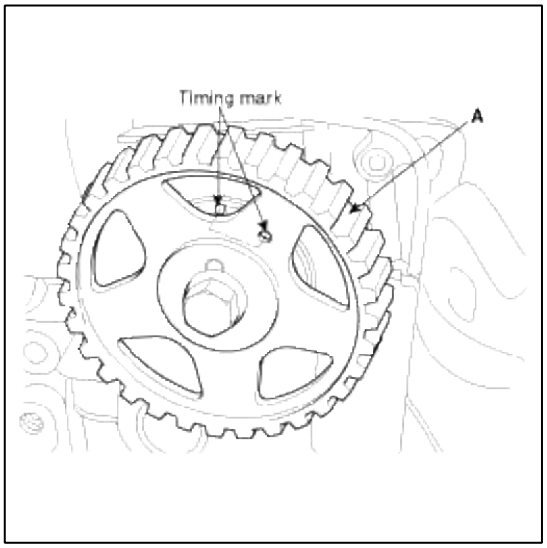


6. Remove the air conditioner compressor drive belt(B).
   (Refer to Air conditioner compressor in HA Group).
7. Remove the power steering pump drive belt(C).
   (Refer to Power steering pump ST Group).
8. Remove the 4 bolts and water pump pulley.
9. Remove the 4 bolts(B) and timing belt upper cover(A).

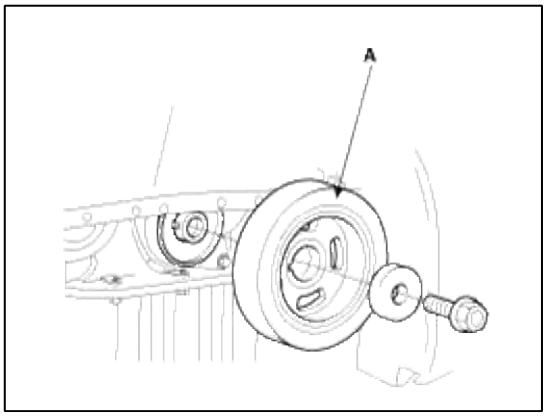


10. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover. Check that the timing mark of camshaft sprocket is aligned with the timing mark of cylinder head cover. (No.1 cylinder compression TDC position)

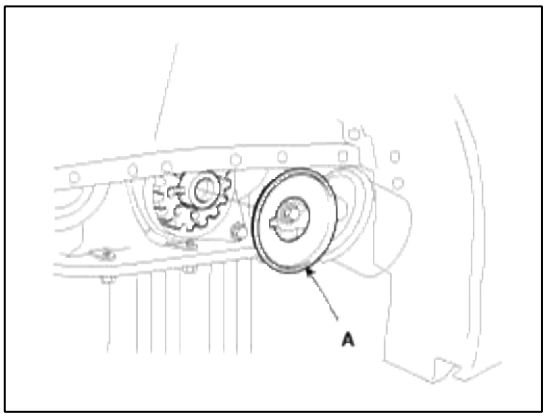




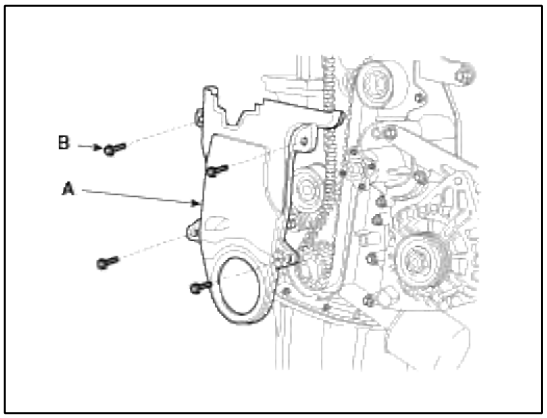
11. Remove the crankshaft pulley bolt and crankshaft pulley(A).



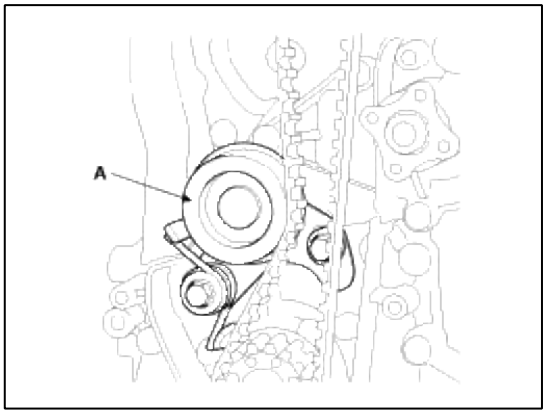
12. Remove the crankshaft flange(A).

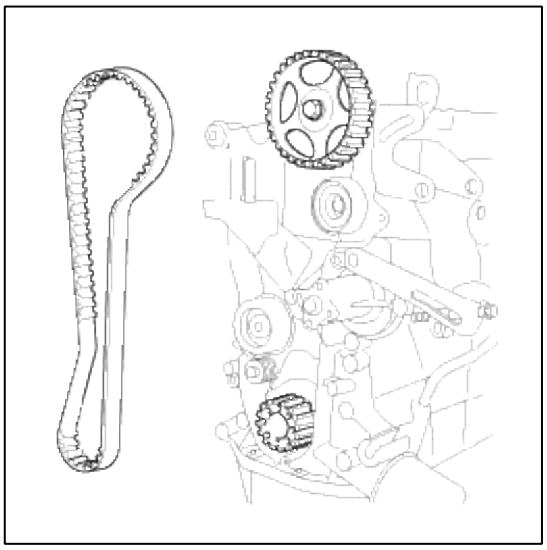


13. Remove the 4 bolts(B) and timing belt lower cover(A).



14. Remove the timing belt tensioner(A) and timing belt.

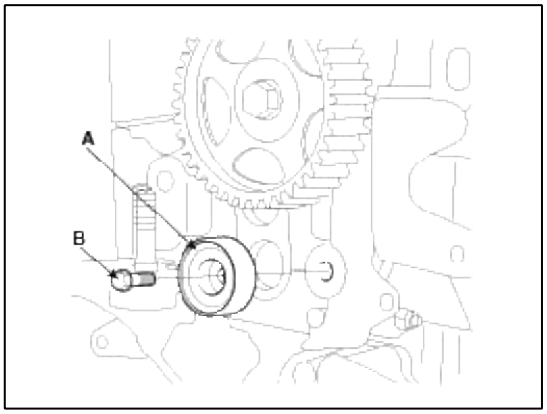




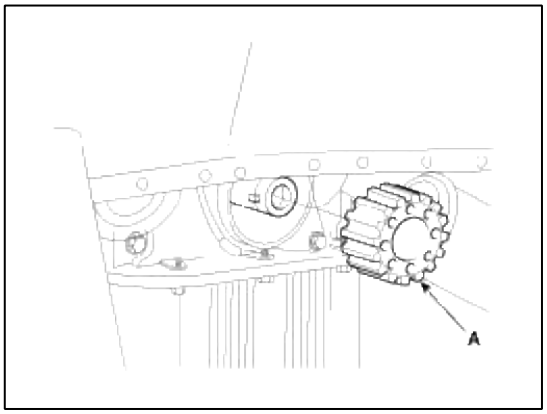
NOTE

If the timing belt reused, make an arrow indicating the turning direction to make sure that the belt is reinstalled in the same direction as before.

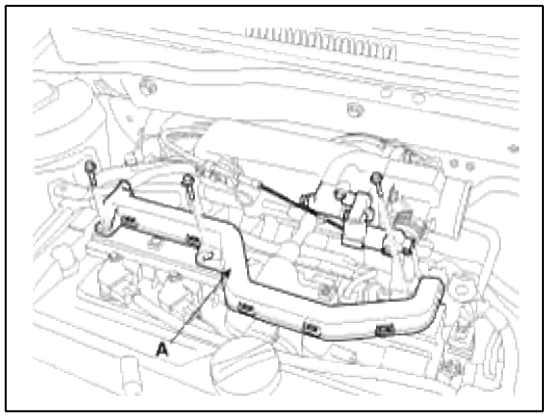
15. Remove the bolt(B) and timing belt idler(A).



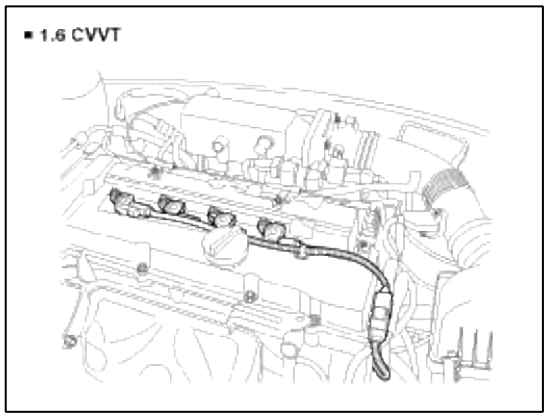
16. Remove the crankshaft sprocket(A).



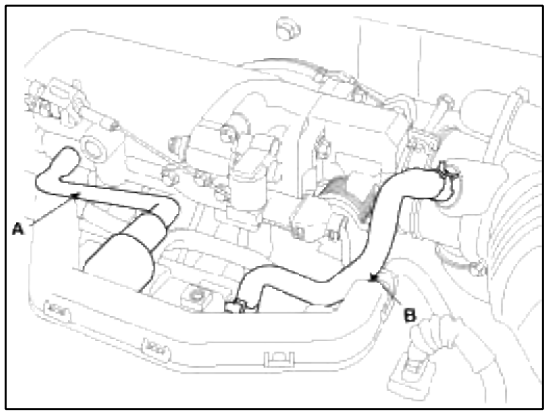
17. Remove the cylinder head cover.
    (1) Remove the wire harness bracket(A).



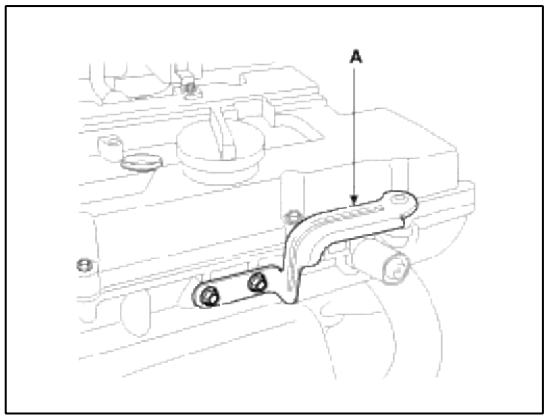
(2) Remove the ignition coil.



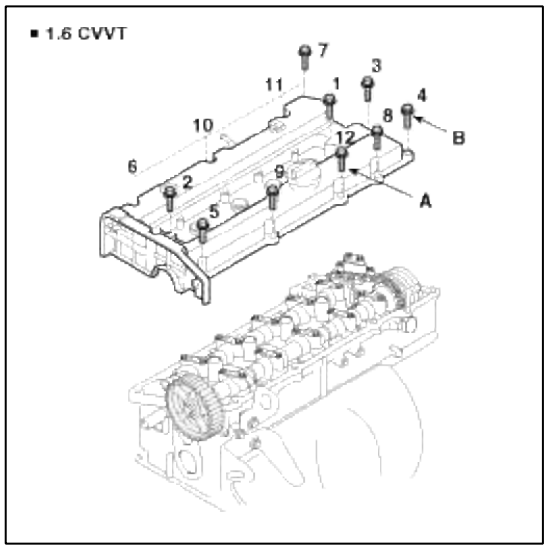
(3) Remove the PCV (Positive Crankcase Ventilation) hose(A) and the breather hose(B) from the cylinder head cover.



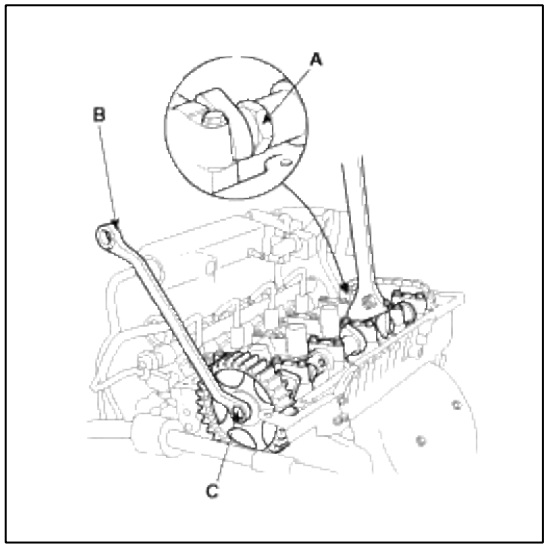
(4) Remove the engine cover bracket(A).



(5) Loosen the cylinder head cover bolts(B) and then remove the cover(A) and gasket.



18. Remove the camshaft sprocket.
    (1) Hold the portion(A) of the camshaft with a hexagonal wrench, and remove the bolt(C) with a wrench(B) and remove the camshaft sprocket.



CAUTION

Be careful not to damage the cylinder head and valve lifter with the wrench.

Inspection

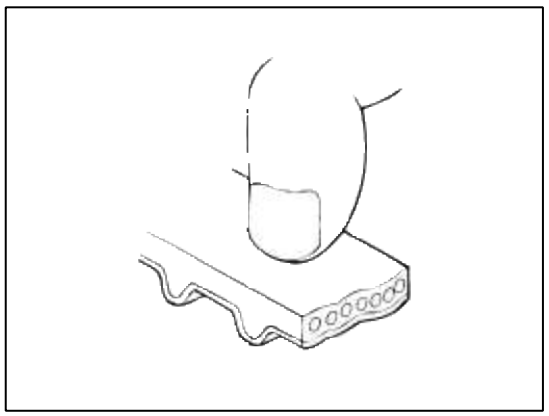
Timing Belt

1. Check the belt for oil or dust deposits.
   Replace, if necessary.
   Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.
2. When the engine is overhauled or belt tension adjusted, check the belt carefully. If any of the following flaws are evident, replace the belt.

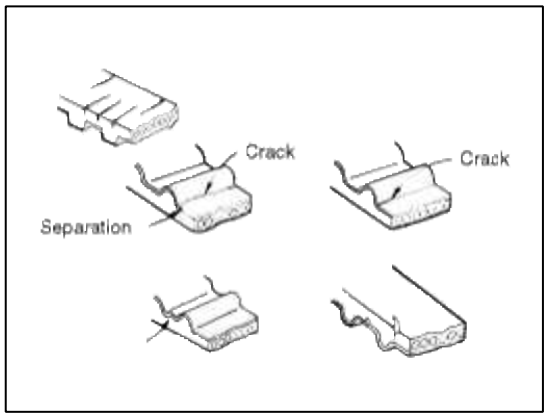
NOTE

- Do not bend, twist or turn the timing belt inside out.
- Do not allow timing belt to come into contact with oil, water and steam.

3. Inspect the belt closely. If the following problems are evident, replace the belt with a new one.
   (1) Hardened back surface of rubber.
   Back surface is glossn, non-elastic and so hard that when the nail of your finger is pressed into it, no mark is produced.



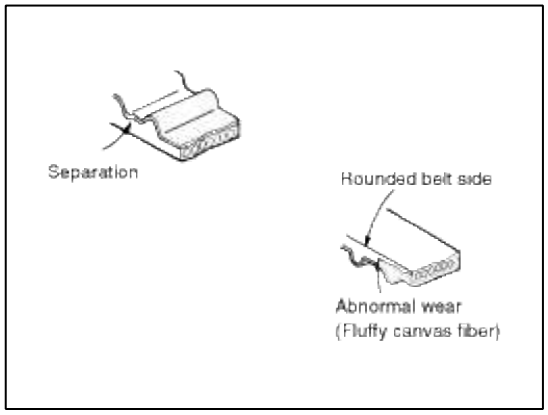
(2) Cracked back surface of rubber.



(3) Side of belt is badly worn.

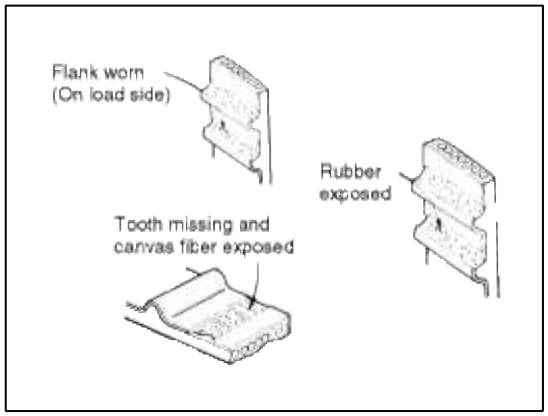
NOTE

A belt in good condition should have clear-cut sides as if it were cut with a sharp knife.



(4) Teeth are badly worn out.
Initial stage : Canvas on load side of the tooth flank worn (fluffy canvas fibers, rubber gone, color changed to white, and unclear canvas texture)
Last stage : Canvas on the load side of the tooth flank worn down and rubber exposed (tooth width reduced).

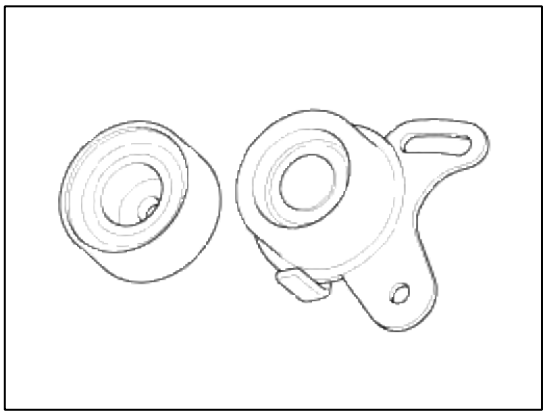
(5) Missing tooth.



Sprockets, Tensioner, Idler

1. Check the camshaft sprocket, crankshaft sprocket, tensioner pulley and idler pulley for abnormal wear, cracks, or damage.
   Replace as necessary.

2. Inspect the tensioner pulley and the idler pulley for easy and smooth rotation and check for play or noise. Replace as necessary.

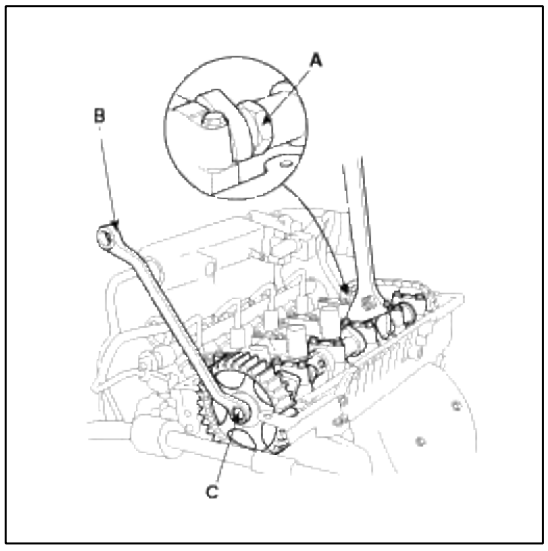


3. Replace the pulley if there is a grease leak from its bearing.

Installation

1. Install the camshaft sprocket and tighten the bolt to the specified torque.
   (1) Temporarily install the camshaft sprocket bolt(C).
   (2) Hold the portion(A) of the camshaft with a hexagonal wrench, and tighten the bolt(C) with a wrench(B) .

Tightening torque :
78.5 ~ 98.1N.m (8.0 ~ 10.0kgf.m, 57.9 ~ 72.3lb-ft)



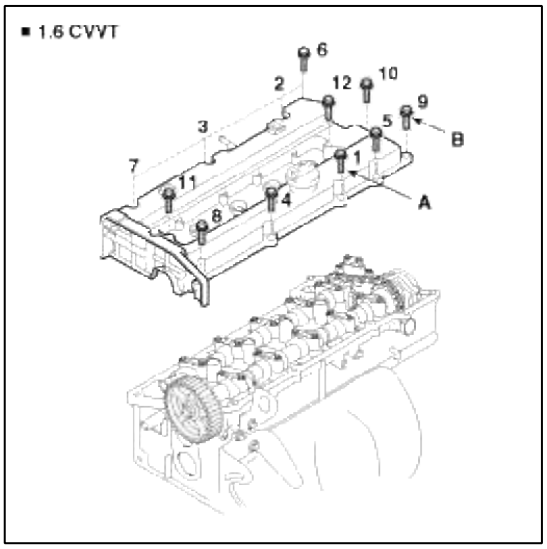
2. Install the cylinder head cover.

(1) Install the cylinder head cover(A) and bolts(B).

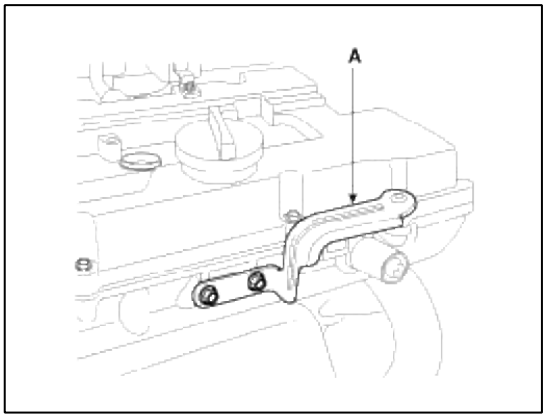
Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

NOTE

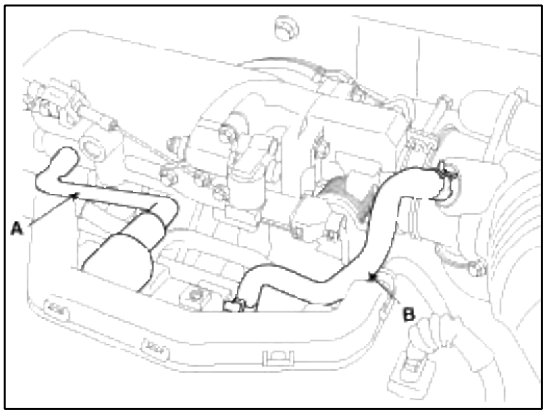
Tighten the cylinder head cover bolts as following method.



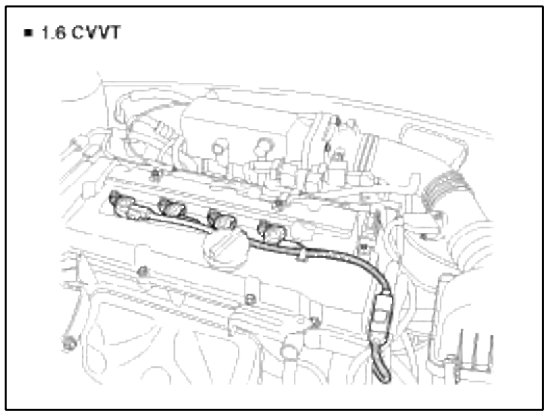
(2) Install the engine cover bracket(A).



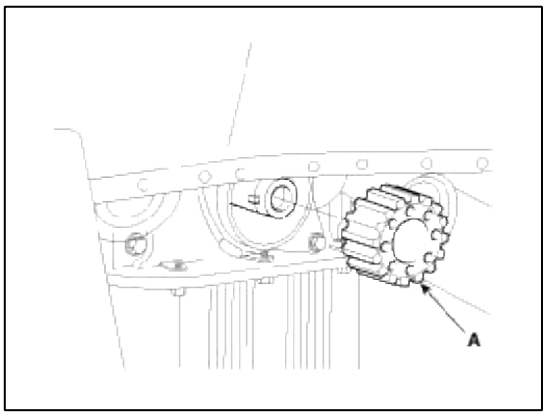
(3) Install the PCV(Positive Crankcase Ventilation) hose(A) and breather hose(B) to the cylinder head cover.



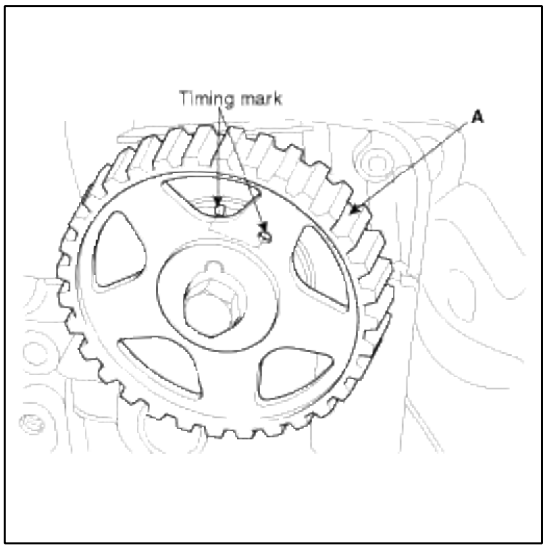
(4) Install the ignition coil.

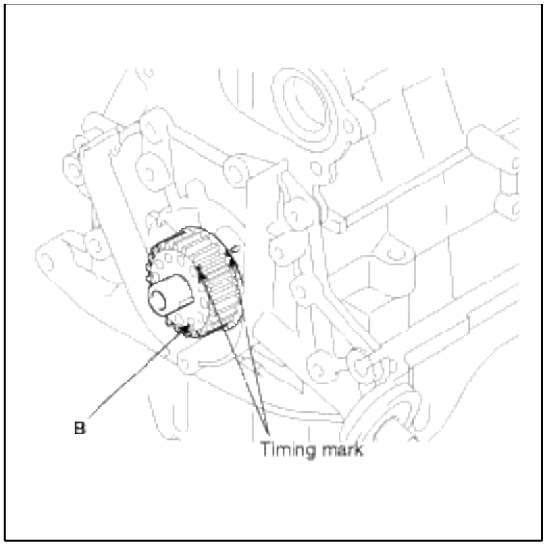


3. Install the crankshaft sprocket(A).



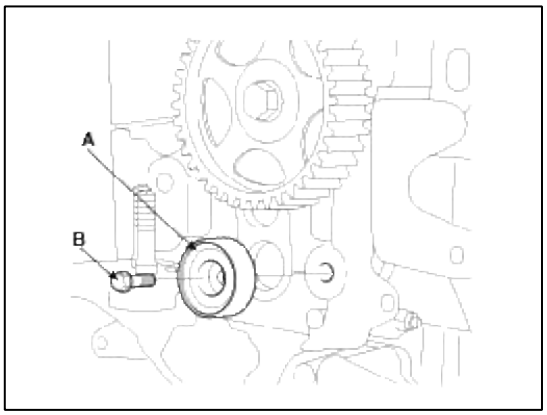
4. Align the timing marks of the camshaft sprocket(A) and crankshaft sprocket(B) with the No.1 piston placed at top dead center and its compression stroke.



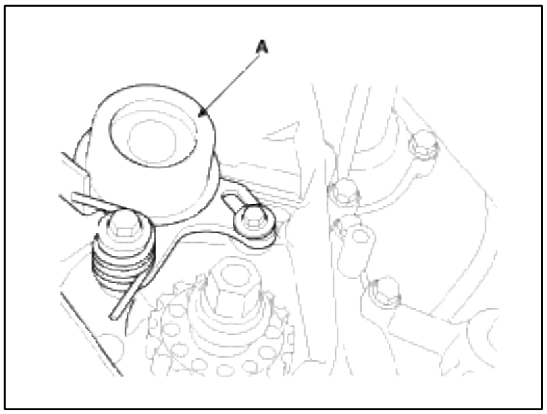


5. Install the idler pulley(A) and tighten the bolt(B) to the specified torque.

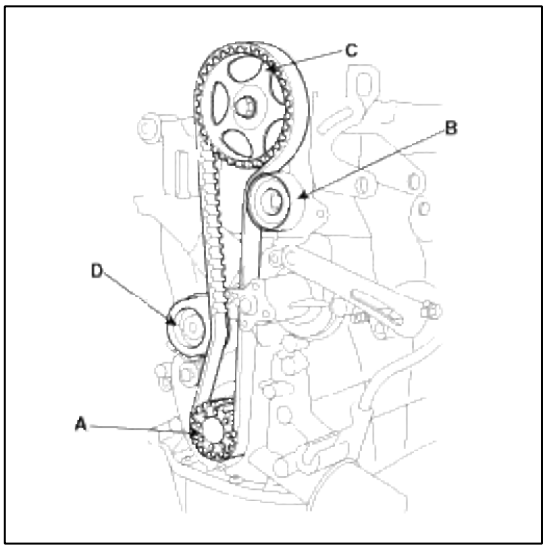
Tightening torque :
42.2 ~ 53.9N.m (4.3 ~ 5.5kgf.m, 31.1 ~ 39.8lb-ft)



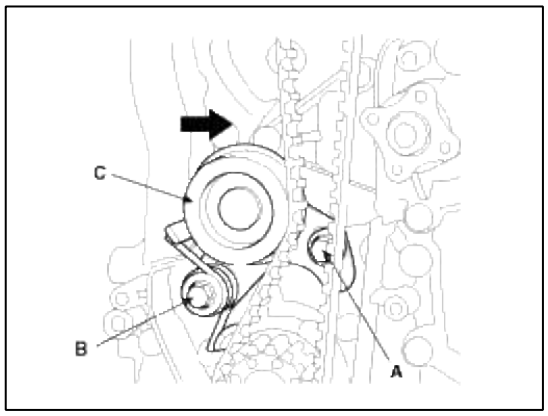
6. Temporarily install the timing belt tensioner(A).



7. Install the belt so as not give slack at each center of shaft. Use the following order when installing timing belt.
   Crankshaft sprocket(A) →idler pulley(B) →camshaft sprocket(C) →timing belt tensioner(D).



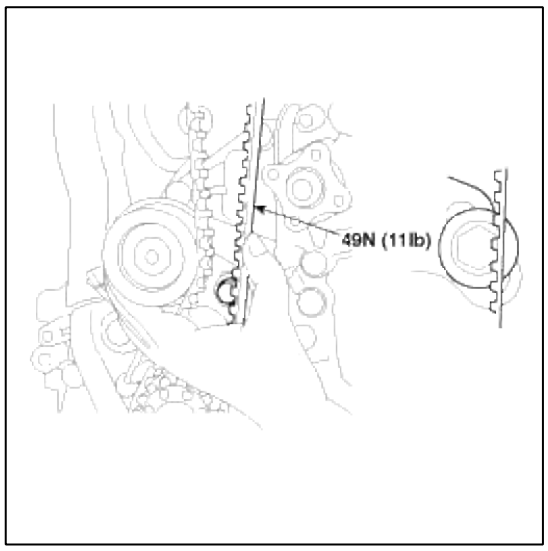
8. Adjust the timing belt tension.
   (1) Loosen the tensioner pulley mounting bolt and apply tension to the timing belt.



   (2) After checking the alignment between each sprocket and each timing belt tooth, tighten the mounting bolt (A) and (B) one by one.

Tightening torque :
19.6 ~ 26.5N.m (2.0 ~ 2.7kgf.m, 14.5 ~ 19.5lb-ft)

(3) Then recheck the belt tension.
Verify that when the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49N (11lb)], the timing belt cog end is aprox. 1/2 of the tensioner mounting bolt head radius (across flats) away from the bolt head center.



(4) Timing belt tension measuring procedure [Using a mechanical tension gauge (BT-33-73F, BTG-2 type)]
Rotate crankshaft in clockwise direction to set 1st piston on top dead center (TDC) and rotate crankshaft in counterclockwise to 90° then measure the belt tension in the middle of tension side span (in both arrow direction of above illustration) by free vibration method.

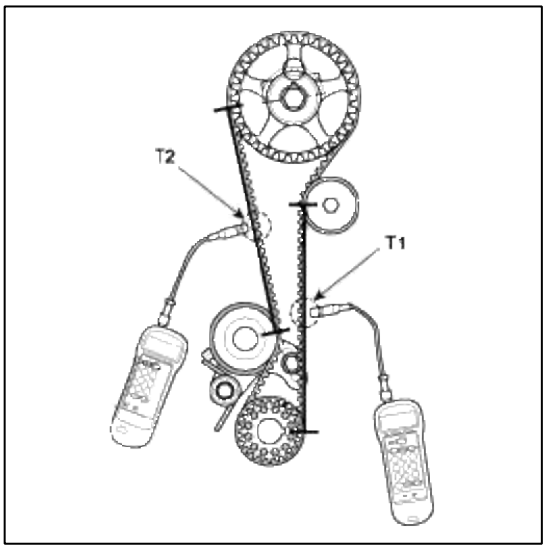
CAUTION

When rotating the crankshaft counter-clockwise, be sure to rotate the crankshaft at a time.

A. Input the belt specifications into the tension meter.

Location of measurement		Input data		
		M (Mass, g/m.mm)	W (Width, mm)	S (Span, mm)
T1	Camshaft sprocket to crankshaft sprocket	4.5	22	250
T2	Camshaft sprocket to tensioner	4.5	22	231

B. Locate the micro phone close to the center of belt span (T1, T2) and bounce the belt by finger 2~3 times. Read a value on the display.



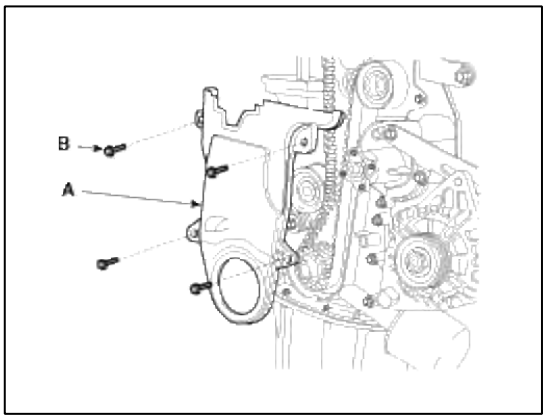
C. Measure both T1 and T2 at the A and B points respectively and then calculatethe average

$$\text{Average Belt Tension (T)} = \frac{(T1) + (T2)}{2}$$

Average Belt Tension (T)
Without CVVT(1.4L/1.6L): 20±3.5 kgf
With CVVT(1.6L): 18±3.5 kgf

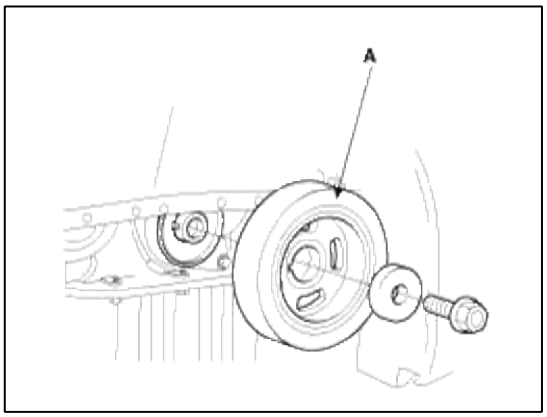
9. Turn the crankshaft two turns in the operating direction (clockwise) and realign crankshaft sprocket and camshaft sprocket timing mark.
10. Install the timing belt lower cover(A) with 5bolts(B).

Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



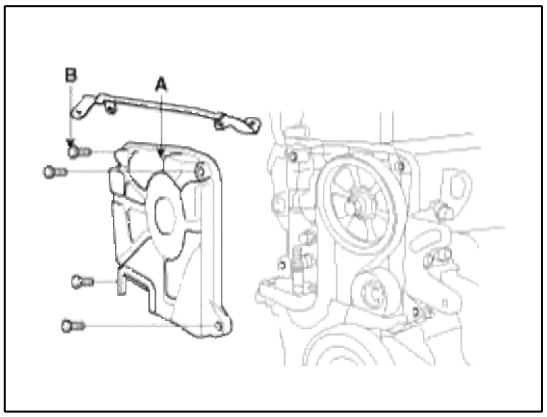
11. Install the flange and crankshaft pulley(A), and then tighten crankshaft pulley bolt.
Make sure that crankshaft sprocket pin fits the small hole in the pulley.

Tightening torque :
137.3 ~ 147.1N.m (14.0 ~ 15.0kgf.m, 101.3 ~ 108.5lb-ft)

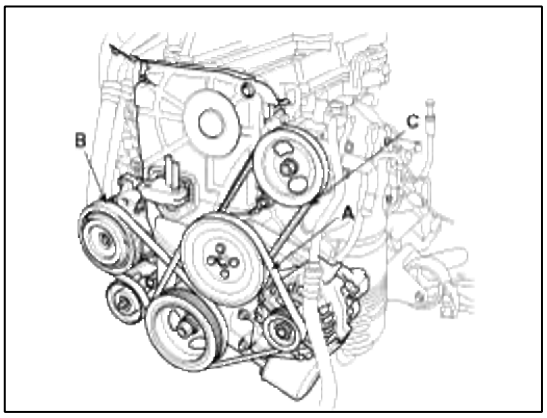


12. Install the timing belt upper cover(A) with 4 bolts(B).

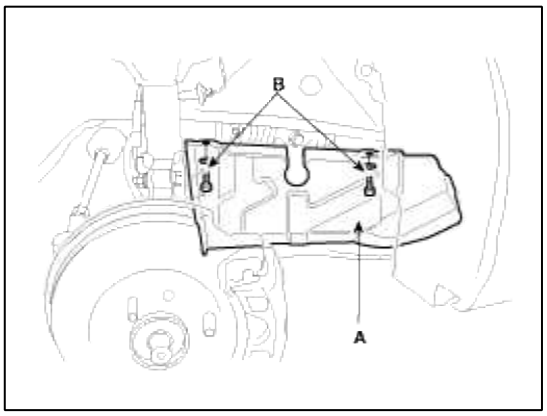
Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



13. Install the water pump pulley and 4 bolts.
14. Install the power steering pump drive belt(C). (Refer to Power steering pump in ST Group).



15. Install the air conditioner compressor drive belt(B).
    (Refer to Air conditioner compressor in HA Group).
16. Install the alternator drive belt(A). (Refer to Alternator in EE Group).
17. Install the RH side cover(A) with 2 bolts(B).



18. Install the RH front wheel.

Tightening torque :
88.3 ~ 98.1N.m (9.0 ~ 10.0kgf.m, 65.1 ~ 72.3lb-ft)

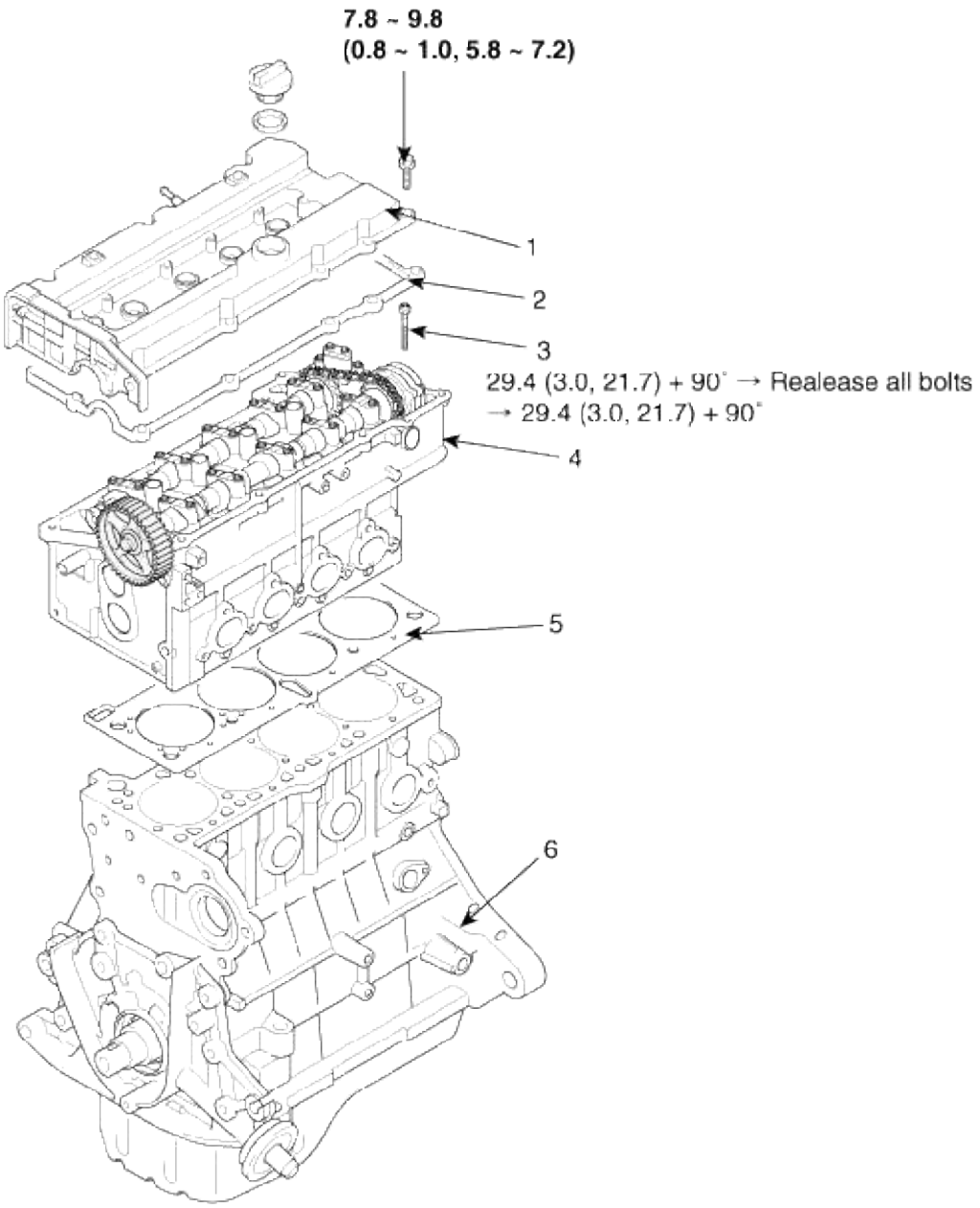
19. Install the engine cover with bolts.

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

Engine Mechanical System > Cylinder Head Assembly > Components and Components Location

Components

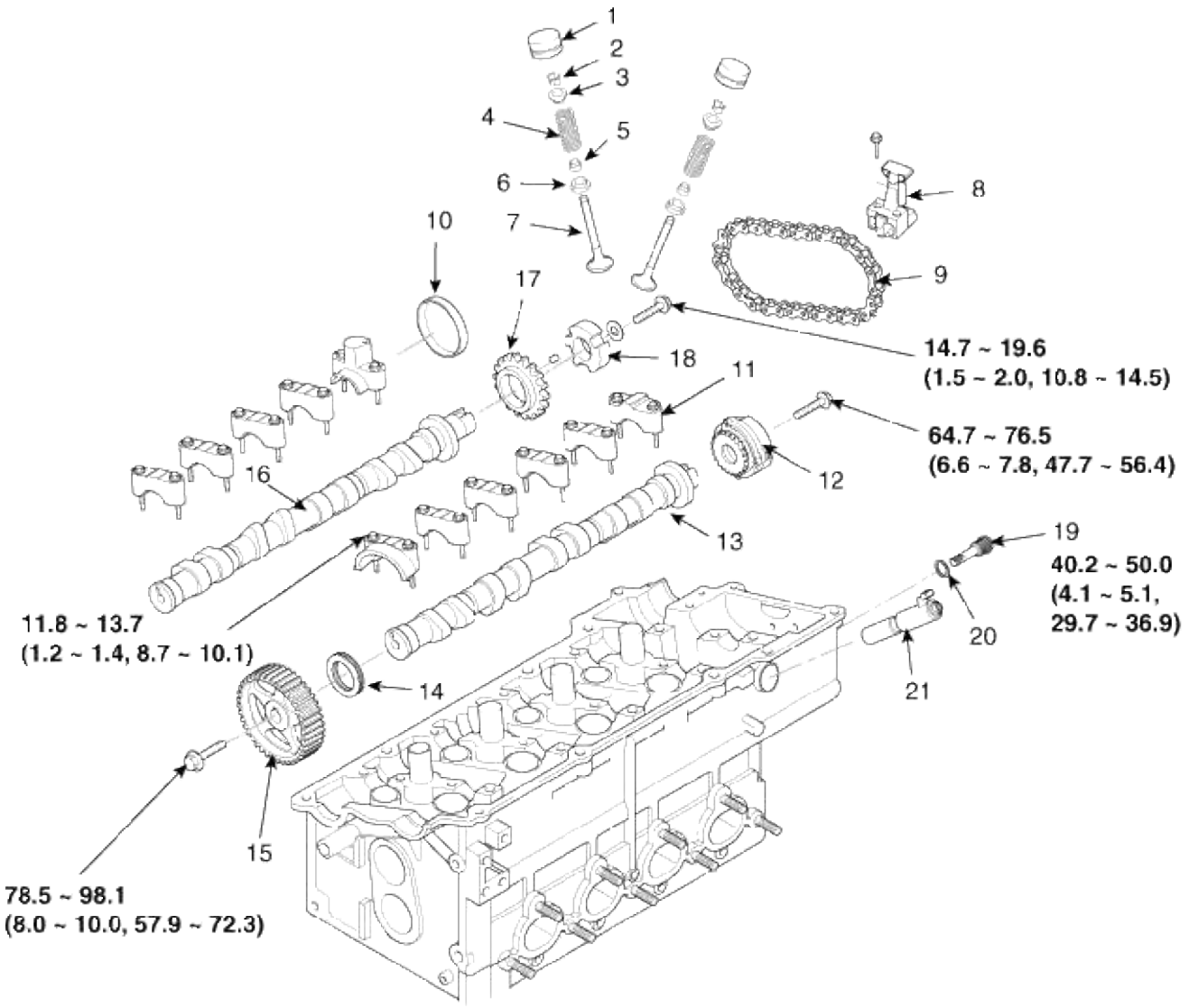
■ 1.6 CVVT



TORQUE : N.m (kgf.m, lb-ft)

1. Cylinder head cover
2. Gasket
3. Cylinder head bolt
4. Cylinder head
5. Cylinder head gasket
6. Cylinder block

■ 1.6 CVVT



TORQUE : N.m (kgf.m, lb-ft)

1. HLA (Hydraulic Lash Adjuster)
2. Retainer lock
3. Retainer
4. Valve spring
5. Stem seal
6. Spring seat
7. Valve
8. Auto tensioner
9. Timing chain
10. Oil seal cap
11. Camshaft bearing cap
12. CVVT (Continuously Variable Valve Timing) assembly
13. Exhaust camshaft
14. Oil seal
15. Camshaft sprocket
16. Intake camshaft
17. Chain sprocket
18. Camshaft position sensor target wheel
19. OCV (Oil Control Valve) Filter
20. Washer
21. OCV (Oil Control Valve)

Engine Mechanical System > Cylinder Head Assembly > Repair procedures

Removal

Engine removal is not required for this procedure.

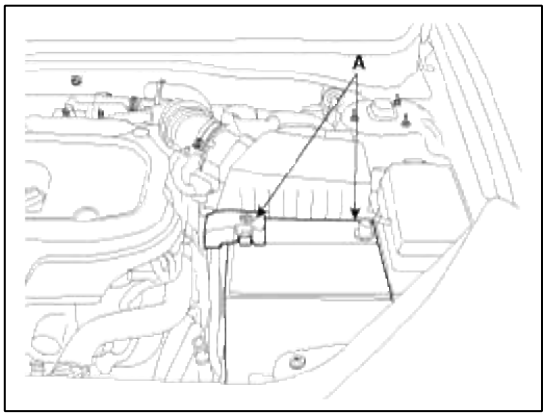
CAUTION

- Use Fender cover to avoid damaging painted surfaces.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below normal temperature before removing it.
- When handling a metal gasket, take care not to fold the gasket or damage the contact surface of the gasket.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

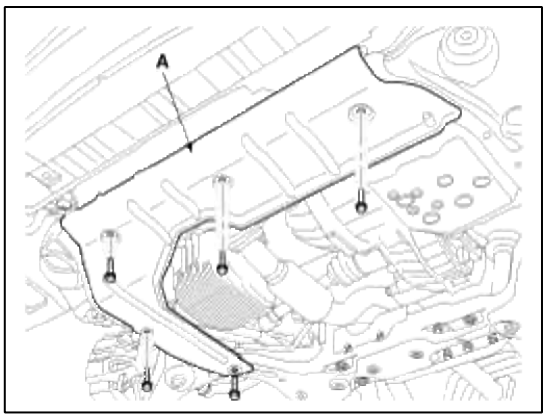
NOTE

- Mark all wiring and hoses to avoid misconnection.
- Inspect the timing belt before removing the cylinder head.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center.

1. Disconnect the terminals(A) from battery and remove the battery.

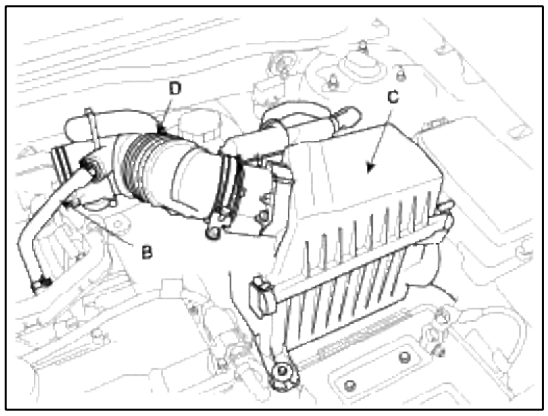


2. Remove the engine cover.
3. Remove the under cover(A).

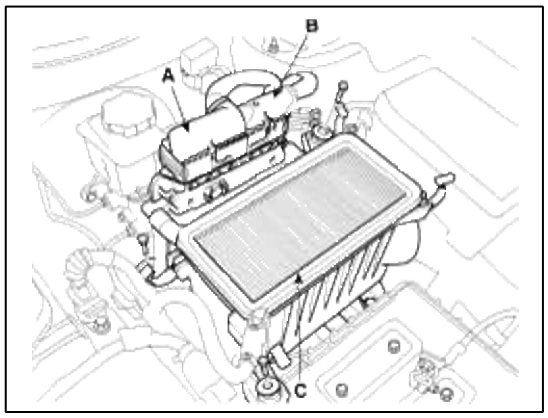


4. Drain the engine coolant.
   Remove the radiator cap to speed draining.

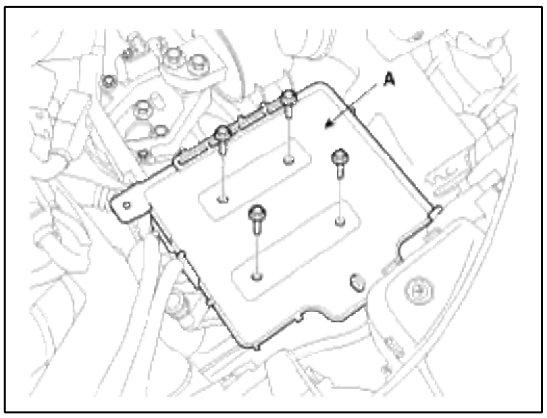
5. Remove the intake air hose and air cleaner assembly.
   (1) Disconnect the breather hose(B) from intake air hose(D).
   (2) Remove the intake air hose(D) and air cleaner upper cover(C).



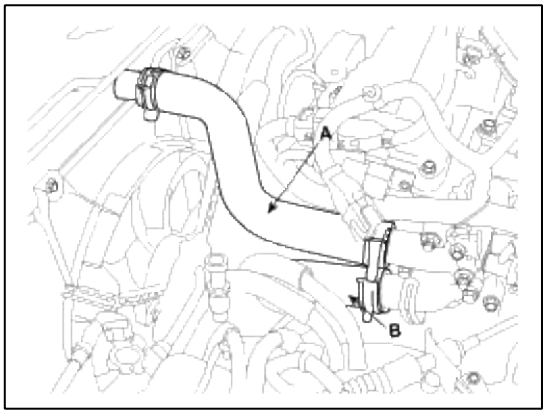
   (3) Disconnect the ECM connector(A) and ECM connector(B) (A/T only).
   (4) Remove the air cleaner element and air cleaner lower cover(C).



6. Remove the battery tray(A).

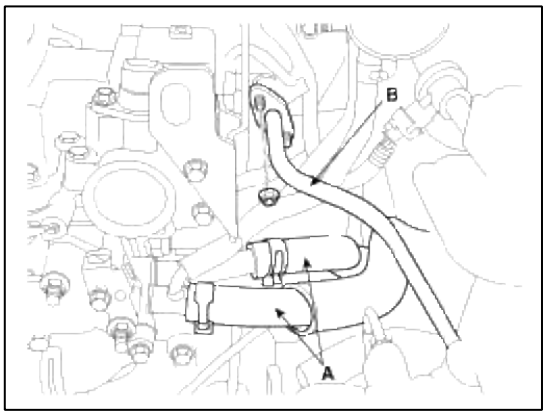


7. Remove the upper radiator hose(A) and lower radiator hose(B).

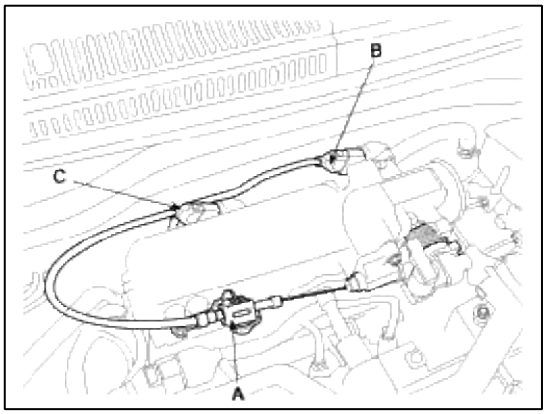


8. Remove the heater hoses(A).

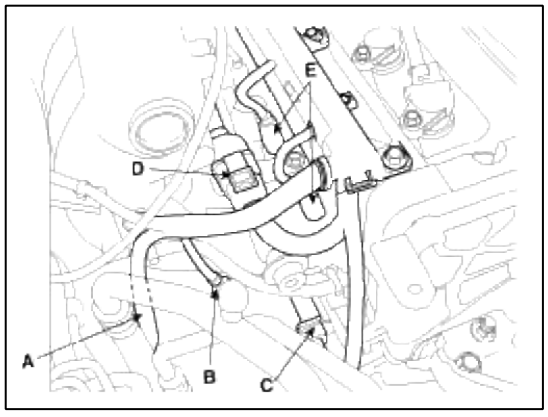
9. Remove the fuel hose(B).



10. Remove the accelerator cable(A) by loosening the lock-nut, then slip the cable end out of the throttle linkage.
11. Disconnect the TPS (Throttle Position Sensor) connector(B) and the MAP sensor connector(C).

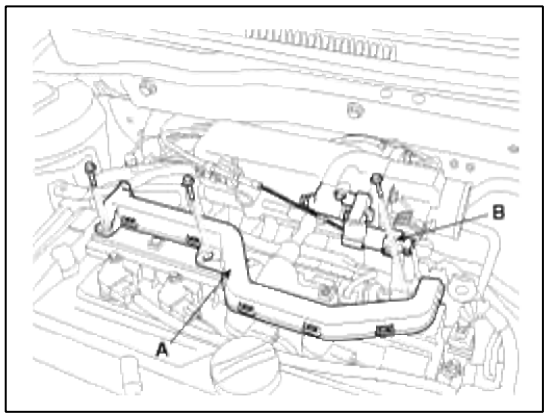


12. Remove the engine wire harness connectors and wire harness clamps from cylinder head and the intake manifold.
    (1) Disconnect the rear oxygen sensor connector (A).
    (2) Disconnect the air conditioner compressor switch connector (B).
    (3) Disconnect the knock sensor connector (C).
    (4) Disconnect the injector connectors(No.3,4) (D).
    (5) Disconnect the injector connectors(No.1,2) (E)



    (6) Remove the wire harness bracket(A).

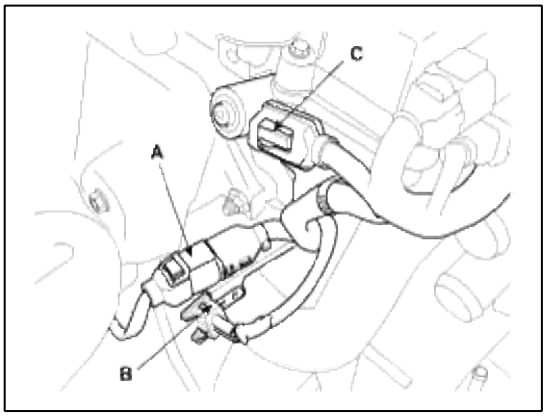
(7) Disconnect the ISA (Idle Speed Actuator) connector (B).



(8) Disconnect the front oxygen sensor connector(A).

(9) Disconnect the CKP(Crankshaft Position Sensor) connector (B).

(10) Disconnect the OCV(Oil Control Valve) connector (C).



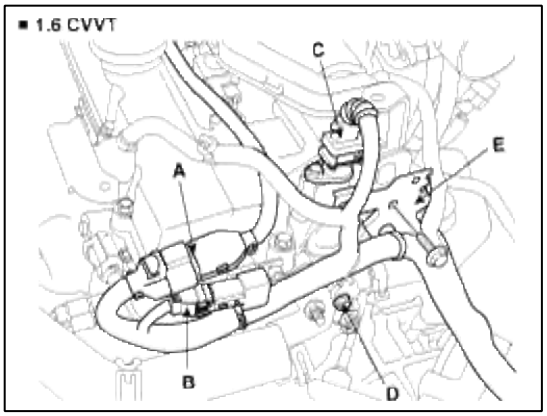
(11) Disconnect the ignition coil connector(A).

(12) Disconnect the ignition coil condenser connector(B).

(13) Disconnect the CMP(Camshaft Position Sensor) connector(C).

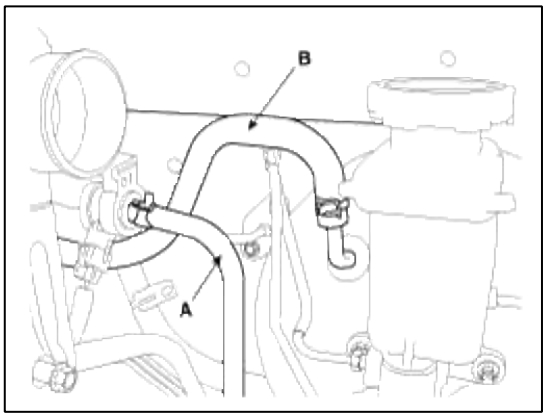
(14) Disconnect the ground cable(D).

(15) Remove the wire harness bracket(E).

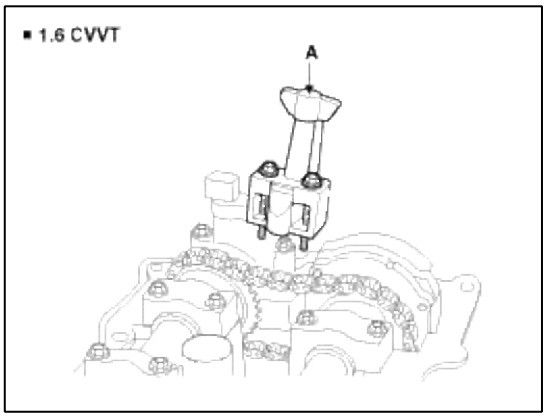


13. Disconnect the hose(A) of the PCSV (Purge Control Solenoid Valve) side.

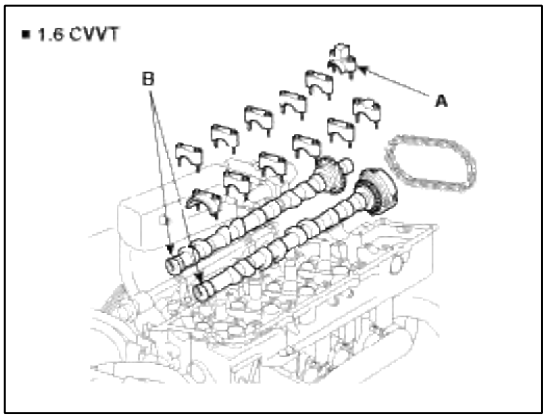
14. Remove the brake booster vacuum hose(B).



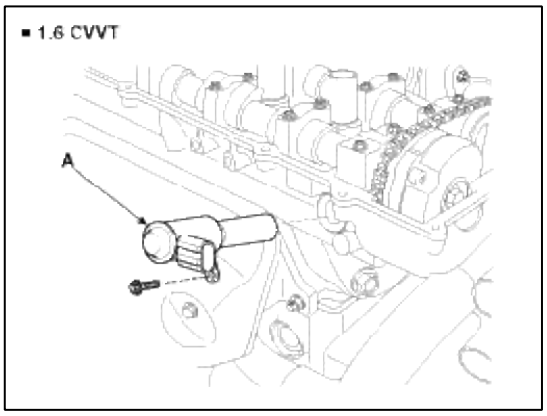
15. Remove the power steering pump and fix the pump to vehicle with a wire. (Refer to Power steering pump in ST Group).
16. Remove the ignition coil. (Refer to Ignition system in EE Group).
17. Remove the exhaust manifold.
18. Remove the intake manifold.
19. Remove the timing belt.
20. Remove the cylinder head cover.
21. Remove the camshaft sprocket.
22. Remove the timing chain auto tensioner(A).



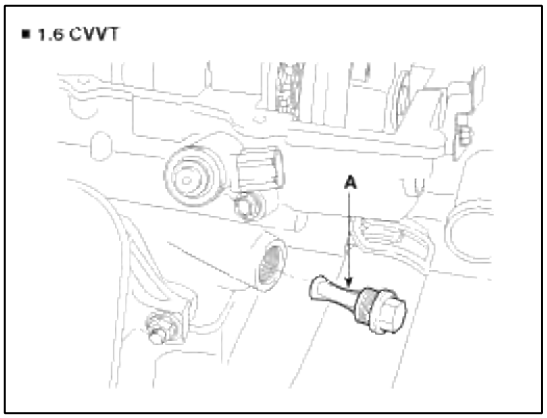
23. Remove the camshaft bearing caps(A) and camshafts (B).



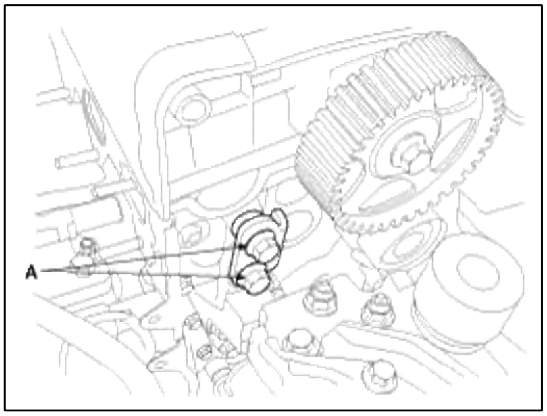
24. Remove the OCV(Oil Control Valve)(A).



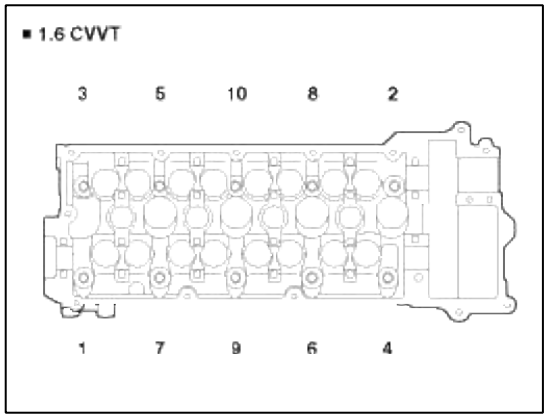
25. Remove the OCV(Oil Control Valve) filter(A).



26. Remove the engine mounting support bracket fixing bolts(A).



27. Remove the cylinder head bolts, then remove the cylinder head.
    (1) Using 8mm hexagon wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown.



> CAUTION
>
> Head warpage or cracking could result from removing bolts in an incorrect order.

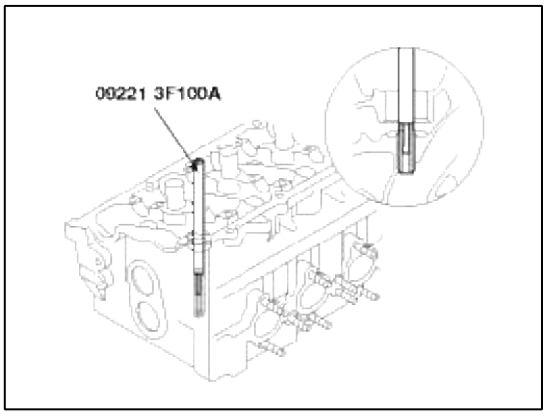
    (2) Lift the cylinder head from the dowels on the cylinder block and replace the cylinder head on wooden blocks on a bench.

> CAUTION
>
> Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

Replacement

Valve Guide

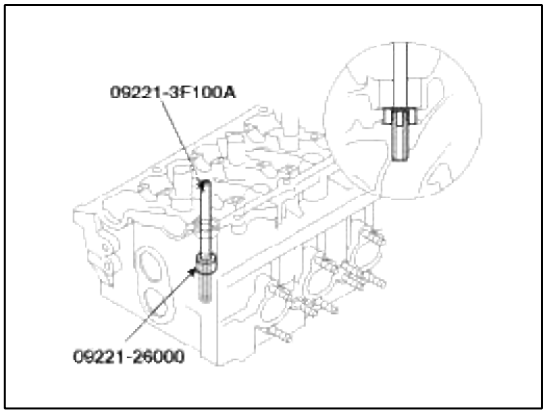
1. Using the SST(09221 - 3F100A), withdraw the old valve guide toward the bottom of cylinder head.



2. Recondition the valve guide hole of cylinder head so that it can match the newly press-fitted oversize valve guide.

3. Using the SST (09221-3F100A, 09221-26000), press-fit the valve guide. The valve guide must be press-fitted from the upper side of the cylinder head. Keep in mind that the intake and exhaust valve guides are different in length.

Valve guide length
Intake : 36.3 ~ 36.7mm (1.4291 ~ 1.4449in)
Exhaust : 40.8 ~ 41.2mm (1.6063 ~ 1.6220in)



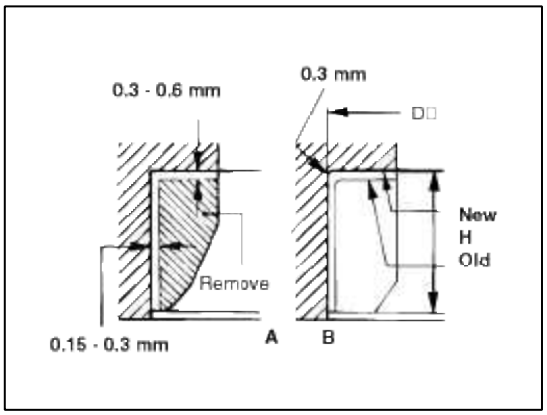
4. After the valve guide is press-fitted, insert a new valve and check for proper stem-to-guide clearance.
5. After the valve guide is replaced, check that the valve is seated properly. Recondition the valve seats as necessary.

Valve Guide Oversize

Item	Oversize [mm (in)]	Size mark	Valve guide hole inner diameter [mm (in)]	Valve guide outer diameter [mm (in)]	Valve guide protrusion height [mm (in)]
Valve guide	STD	-	11.000 ~ 11.018 (0.4331 ~ 0.4338)	11.050 ~ 11.060 (0.4350 ~ 0.4354)	12.8 (0.5039)
	0.05 (0.002) OS	5	11.050 ~ 11.068 (0.4350 ~ 0.4357)	11.100 ~ 11.110 (0.4370 ~ 0.4374)	
	0.25 (0.010) OS	25	11.250 ~ 11.268 (0.4429 ~ 0.4436)	11.300 ~ 11.310 (0.4449 ~ 0.4453)	
	0.50 (0.020) OS	50	11.500 ~ 11.518 (0.4528 ~ 0.4535)	11.550 ~ 11.560 (0.4547 ~ 0.4551)	

Valve Seat Ring

1. Cut away the inner face of the valve seat to reduce the wall thickness.



2. Enlarge the seat ring hole of cylinder head so that matches the specified cylinder head hole inner diameter of new valve seat ring.
3. Heat the cylinder head to about 250°C(480°F) and press-fit an oversize seat ring for the cylinder head hole size.

4. Using lapping compound, lap the valve to the new seat.

Valve Seat Ring Oversize

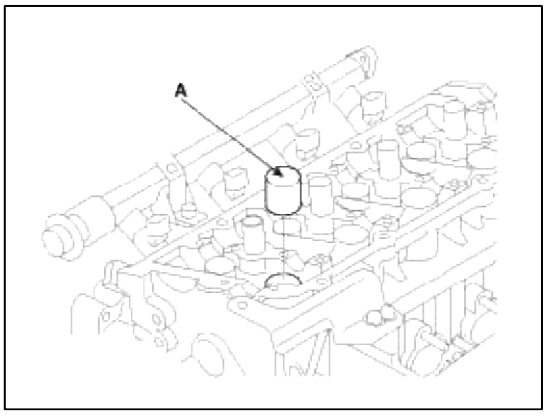
Item	Over size [mm (in.)]	Size mark	Seat ring hole inner diameter [mm (in)]	Seat ring outer diameter [mm (in)]	Seat ring height [mm (in)]
Intake valve seat ring	STD	-	30.400 ~ 30.421 (1.1968 ~ 1.1977)	30.490 ~ 30.505 (1.2004 ~ 1.2010)	4.800 ~ 5.000 (0.1890 ~ 0.1969)
	0.3(0.012)OS	30	30.700 ~ 30.721 (1.2087 ~ 1.2095)	30.790 ~ 30.805 (1.2122 ~ 1.2128)	5.100 ~ 5.300 (0.2008 ~ 0.2087)
	0.6(0.024)OS	60	31.000 ~ 31.021 (1.2205 ~ 1.2213)	31.090 ~ 31.105 (1.2240 ~ 1.2246)	5.400 ~ 5.600 (0.2126 ~ 0.2205)
Exhaust valve seat ring	STD	-	27.000 ~ 27.021 (1.0630 ~ 1.0638)	27.095 ~ 27.115 (1.0667 ~ 1.0675)	5.900 ~ 6.100 (0.2323 ~ 0.2402)
	0.3(0.012)	30	27.300 ~ 27.321 (1.0748 ~ 1.0756)	27.395 ~ 27.415 (1.0785 ~ 1.0793)	6.200 ~ 6.400 (0.2441 ~ 0.2520)
	0.6(0.024)	60	27.600 ~ 27.621 (1.0866 ~ 1.0874)	27.695 ~ 27.715 (1.0904 ~ 1.0911)	6.500 ~ 6.700 (0.2559 ~ 0.2638)

Disassembly

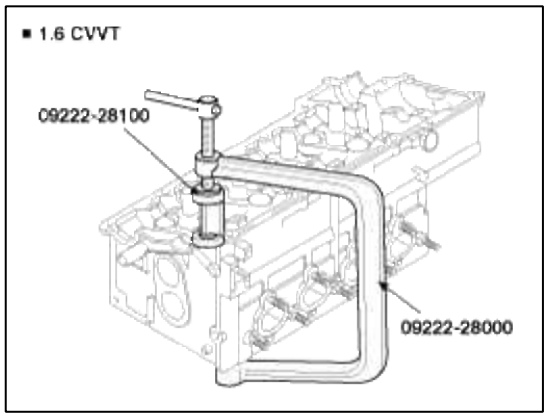
NOTE

Identify HLA(Hydraulic Lash Adjuster), valves, valve springs as they are removed so that each item can be reinstalled in its original position.

1. Remove the HLAs(A).



2. Remove the valves.
   (1) Using the SST (09222 - 28000, 09222 - 28100), compress the valve spring and remove the retainer lock.



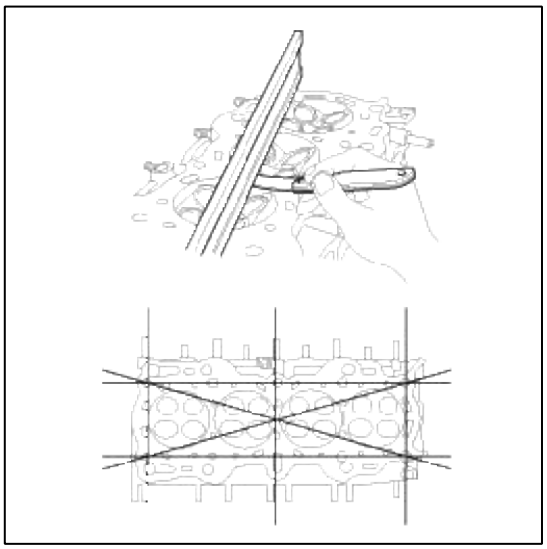
   (2) Remove the spring retainer.
   (3) Remove the valve spring.
   (4) Remove the valve.
   (5) Using a needle-nose pliers, remove the oil seal.
   (6) Using a magnetic finger, remove the spring seat.

Inspection

Cylinder Head

1. Inspect for flatness.
   Using a precision straight edge and feeler gauge, measure the surface the contacting the cylinder block and the manifolds for warpage.

Flatness of cylinder head gasket surface
Standard : Less than 0.03mm (0.0012in)
Limit : 0.05mm (0.0020in)
Flatness of manifold mating surface
Standard : Less than 0.15mm (0.0059in)
Limit : 0.20mm (0.0079in)

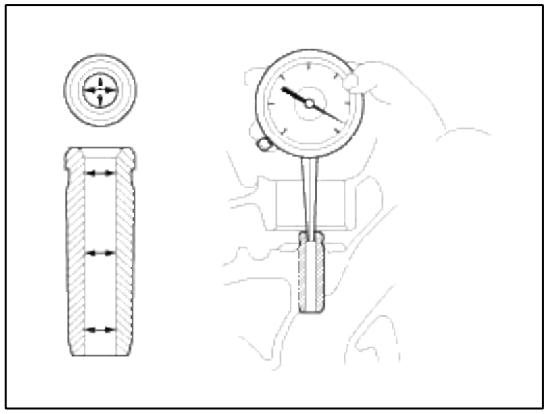


2. Inspect for cracks.
   Check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

Valve And Valve Spring

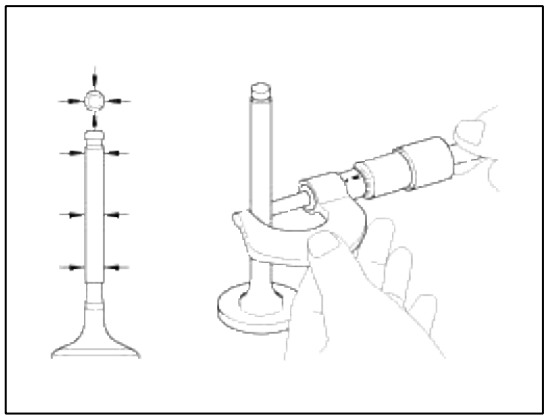
1. Inspect the valve stems and valve guides.
   (1) Using a caliper gauge, measure the inner diameter of valve guide.

Valve guide inner diameter :
6.000 ~ 6.015mm (0.2362 ~ 0.2368in)



   (2) Using a micrometer, measure the outer diameter of valve stem.

Valve stem outer diameter
Intake : 5.965 ~ 5.980mm (0.2348 ~ 0.2354in)
Exhaust : 5.950 ~ 5.965mm (0.2343 ~ 0.2348in)



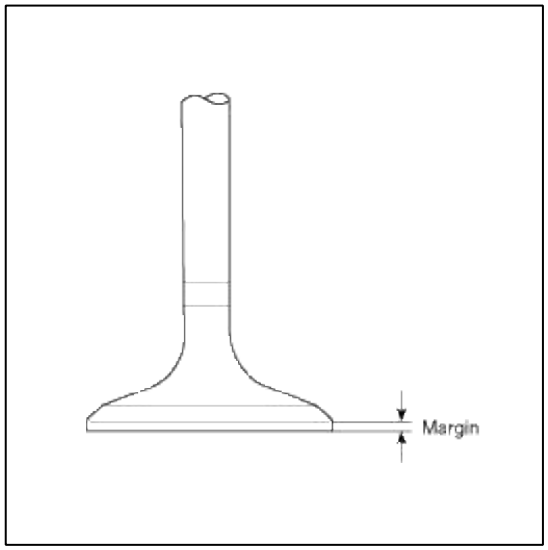
   (3) Subtract the valve stem outer diameter measurement from the valve guide inner diameter measurement.

Valve stem- to-guide clearance
Standard
Intake : 0.02 ~ 0.05mm (0.0008 ~ 0.0020in)
Exhaust : 0.035 ~ 0.065mm (0.0014 ~ 0.0026in)
Limit
Intake : 0.10mm (0.0039in)
Exhaust : 0.15mm (0.0059in)

If the clearance is greater than maximum, replace the valve and valve guide.

2. Inspect the valves.
   (1) Check the valve is ground to the correct valve face angle.
   (2) Check the surface of valve for wear.
   If the valve face is worn, replace the valve.
   (3) Check the valve head margin thickness.
   If the margin thickness is less than minimum, replace the valve.

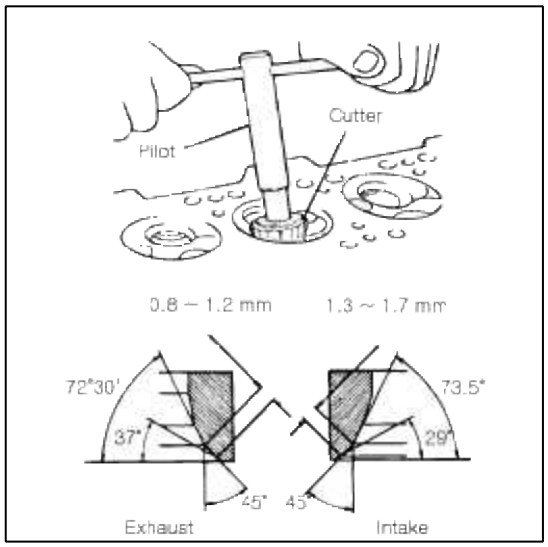
Margin
Standard
Intake : 1.1mm (0.0433in)
Exhaust : 1.3mm (0.0512in)
Limit
Intake : 0.8mm (0.0315in)
Exhaust : 1.0mm (0.0394in)



   (4) Check the surface of valve stem tip for wear.
   If the valve stem tip is worn, replace the valve.

3. Inspect the valve seats.
   (1) Check the valve seat for evidence of overheating and improper contact with the valve face.
   Replace the seat if necessary.
   (2) Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it, then recondition the seat.

(3) Recondition the valve seat with a valve seat grinder or cutter. The valve seat contact width should be within specifications and centered on the valve face.

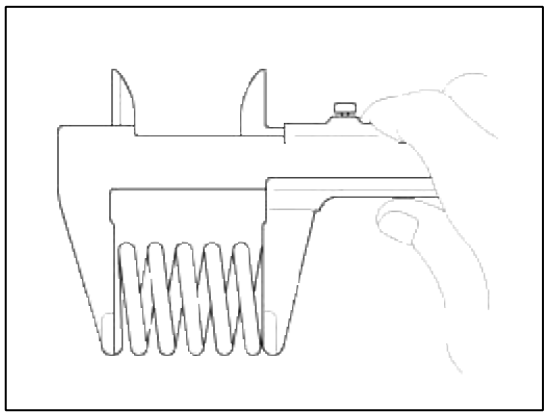


4. Inspect the valve springs.

(1) Using a steel square, measure the out-of-square of valve spring.

(2) Using a vernier calipers, measure the free length of valve spring.

Valve spring
Standard
Free height : 44mm (1.7323in)
Load : 21.6±1.1kg/35.0mm (47.6±2.4lb/1.3780in)
45.1±2.2kg/27.2mm (99.4±4.9lb/1.0709in)
Out of square : Less than 1.5°
Limit
Out of square : 3°

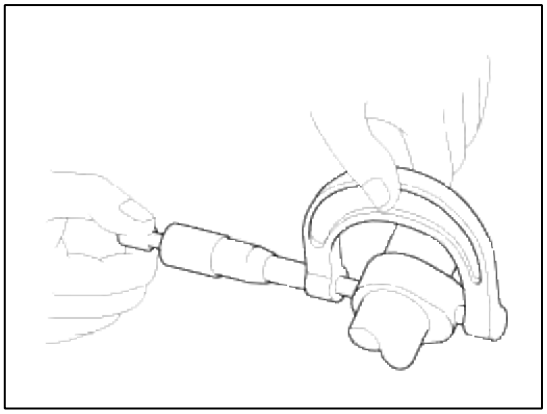


If the loads is not as specified, replace the valve spring.

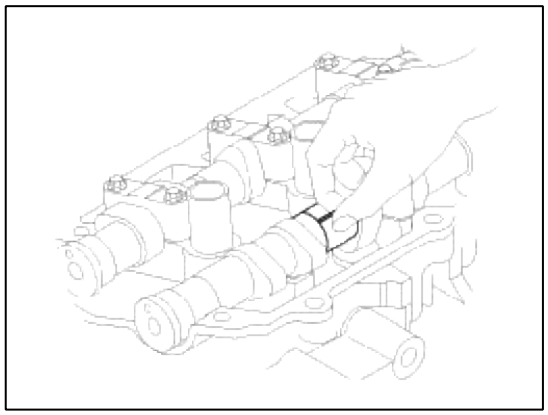
Camshaft

1. Inspect the cam lobes.
   Using a micrometer, measure the cam lobe height.

Cam height
Intake : 43.7492 ~ 43.9492mm (1.72241 ~ 1.73028in)
Exhaust : 44.1494 ~ 44.3494mm (1.73816 ~ 1.74604in)



   If the cam lobe height is less than specified, replace the camshaft.
2. Inspect the camshaft journal clearance.
   (1) Clean the bearing caps and camshaft journals.
   (2) Place the camshafts on the cylinder head.
   (3) Lay a strip of plastigage across each of the camshaft journal.



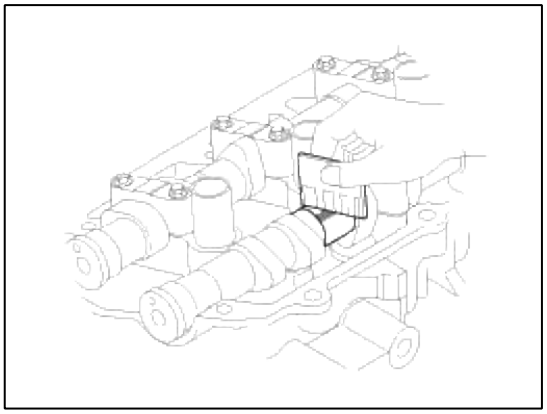
   (4) Install the bearing caps and tighten the bolts with specified torque.

> CAUTION
>
> Do not turn the camshaft.

   (5) Remove the bearing caps.

(6) Measure the plastigage at its widest point.

Bearing oil clearance
Standard : 0.020 ~ 0.061mm (0.0008 ~ 0.0024in)
Limit : 0.1mm (0.0039in)



If the oil clearance is greater than specified, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(7) Completely remove the plastigage.

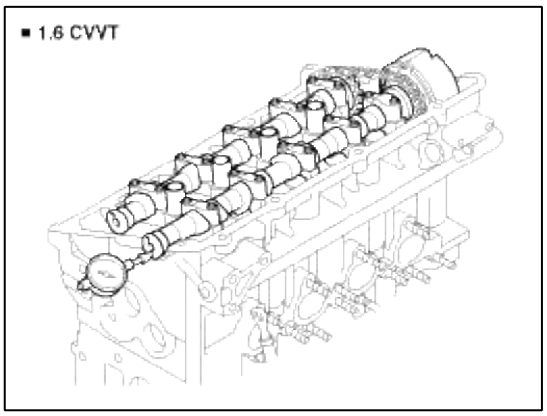
(8) Remove the camshafts.

3. Inspect the camshaft end play.

(1) Install the camshafts.

(2) Using a dial indicator, measure the end play while moving the camshaft back and forth.

Camshaft end play
Standard : 0.1 ~ 0.2mm (0.0039 ~ 0.0079in)

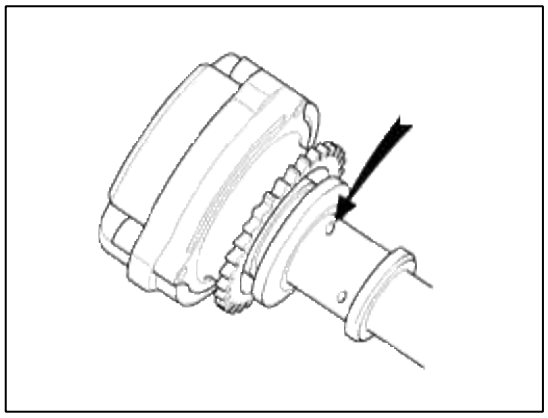


If the end play is greater than specified, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

(3) Remove the camshafts.

CVVT(Continuous Variable Valve Timing) Assembly

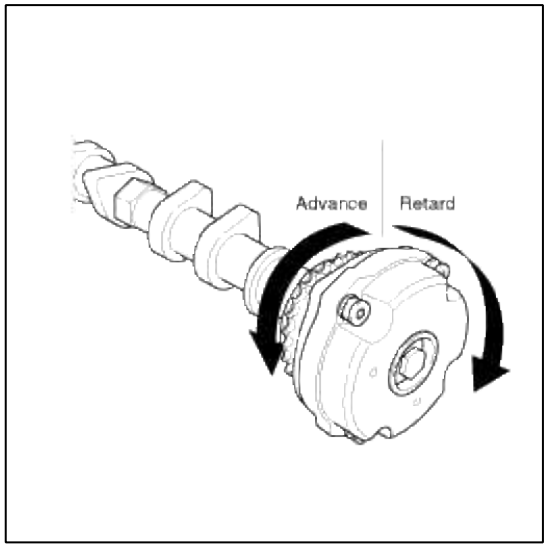
1. Inspect the CVVT (Continuous Variable Valve Timing) assembly.
   (1) Check that the CVVT (Continuous Variable Valve Timing) assembly will not turn.
   (2) Apply vinyl tape to all the parts except the one indicated by the arrow in the illustration.



   (3) Wrap tape around the tip of the air gun and apply air of approx. 98kpa (1kg/cm², 14psi) to the port of the camshaft.
   Perform this order to release the lock pin for the maximum delay angle locking.)

> NOTE
>
> Wrap around it with a shop rag and the likes, because the oil splashes.

   (4) Under the condition of 3), turn the CVVT assembly to the advance angle side with your hand.
   A. Depending on the air pressure, the CVVT assembly will turn to the advance side.
   B. If air is leaking from the port and air pressure cannot be maintained, the locking pin will not release.



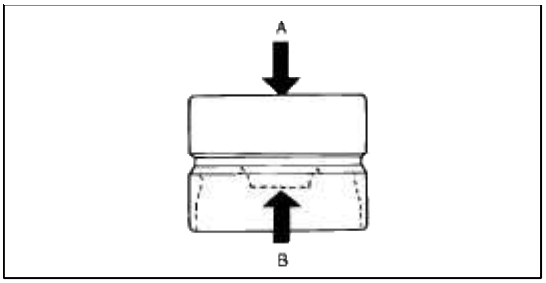
   (5) Except the position where the lock pin meets at the maximum delay angle, let the CVVT assembly turn back and forth and check the movable range and that there is no disturbance.

   : Movable smoothly in the range about 20°

   (6) Turn the CVVT assembly with your hand and lock it at the maximum delay angle position.

HLA (Hydraulic Lash Adjuster)

With the HLA filled with engine oil, hold A and press B by hand. If B moves, replace the HLA.



No.	Problem	Possible cause	Action
1	Temporary noise when starting a cold engine	Normal	This noise will disappear after the oil in the engine reaches the normal pressure.
2	Continuous noise when the engine is started after parking more than 48 hours.	Oil leakage of the high pressure chamber on the HLA, allowing air to get in.	Noise will disappear within 15 minutes when engine runs at 2,000~3,000 rpm.If it doesn't disappear, refer to step 7 below. **CAUTION** Do not run engine at a speed higher than 3,000 rpm, as this may damage the HLA.
3	Continuous noise when the engine is first started after rebuilding cylinder head.	Insufficient oil in cylinder head oil gallery.	
4	Continuous noise when the engine is started after excessively cranking the engine by the starter motor.	Oil leakage of the high-pressure chamber in the HLA, allowing air to get in. Insufficient oil in the HLA.	
5	Continuous noise when the engine is running after changing the HLA.		
6	Continuous noise during idle after high engine speed.	Engine oil level too high or too low.	Check oil level. Drain or add oil as necessary.
		Excessive amount of air in the oil at high engine speed.	Check oil supply system
		Deteriorated oil.	Check oil quality. If deteriorated, replace with specified type.
7	Noise continues for more than 15 minutes.	Low oil pressure	Check oil pressure and oil supply system of each part of engine.
		Faulty HLA.	Remove the cylinder head cover and press HLA down by hand. If it moves, replace the HLA.

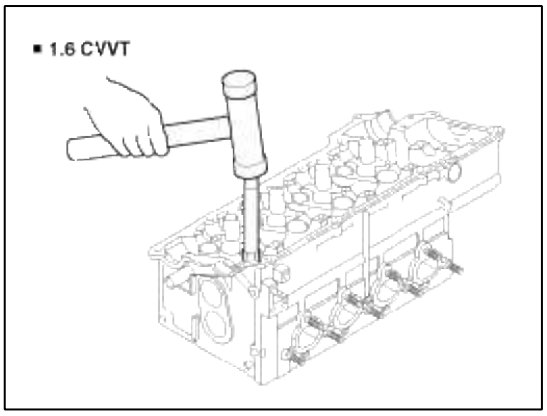
Reassembly

NOTE

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surface.
- Replace oil seals with new ones.

1. Install the valves.
   (1) Install the spring seats.
   (2) Using the SST (09222 - 22001), push in a new oil seal.

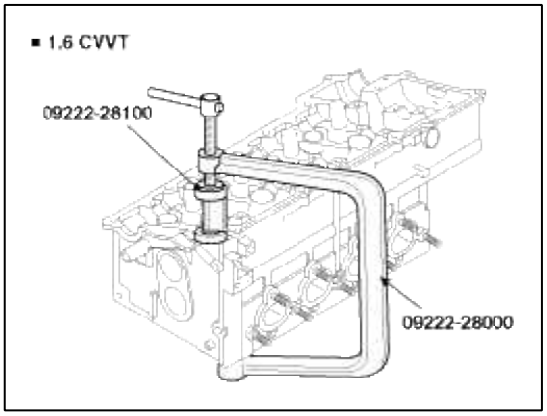
> NOTE
>
> Do not reuse old valve stem oil seals.
> Incorrect installation of the seal could result in oil leakage past the valve guides.



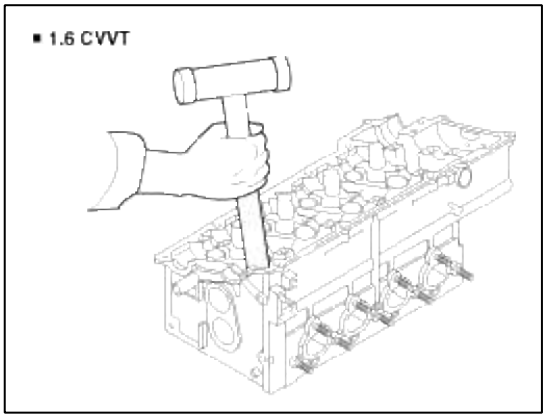
   (3) Install the valve, valve spring and spring retainer.

> NOTE
>
> Place the valve springs so that the side coated with enamel faces toward the valve spring retainer and then installs the retainer.

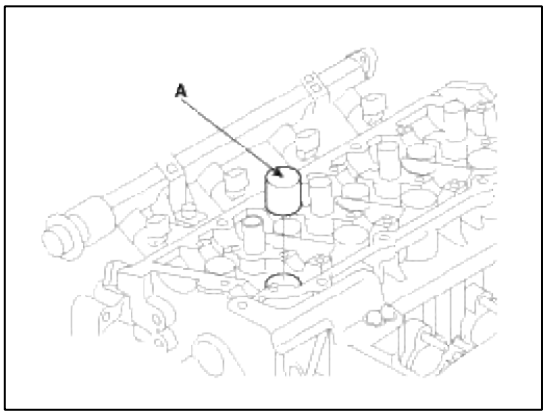
   (4) Using the SST(09222 - 28000, 09222 - 28100), compress the spring and install the retainer locks.
   After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.



   (5) Lightly tap the end of each valve stem two or three times with the wooden handle of a hammer to ensure proper seating of the valve and retainer lock.



2. Install the HLA(Hydraulic Lash Adjuster)s.
   Check that the HLA rotates smoothly by hand.



Installation

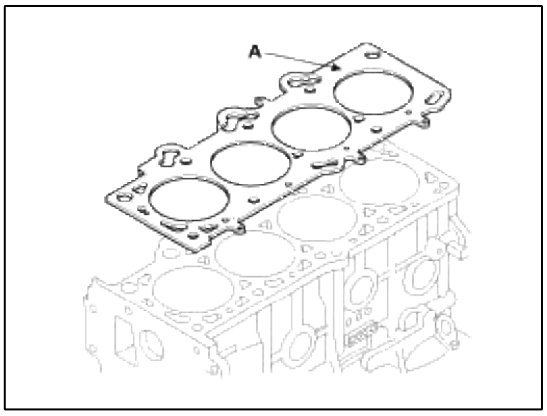
NOTE

- Thoroughly clean all parts to be assembled.
- Always use a new cylinder head and manifold gasket.
- Always use a new cylinder head bolt.
- The cylinder head gasket is a metal gasket. Take care not to bend it.
- Rotate the crankshaft, set the No.1 piston at TDC.

1. Install the cylinder head gasket(A) on the cylinder block.

NOTE

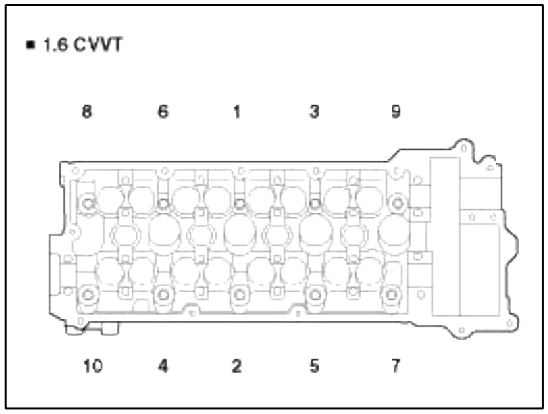
Be careful of the installation direction.



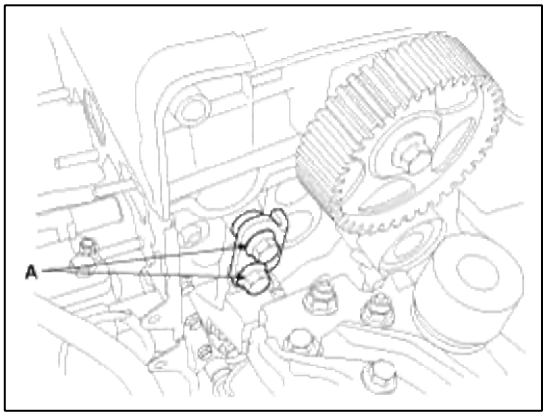
2. Place the cylinder head quietly in order not to damage the gasket with the bottom part of the end.

3. Install the cylinder head bolts.
   (1) Apply a light coat if engine oil on the threads and under the heads of the cylinder head bolts.
   (2) Using 8mm and 10mm hexagon wrench, install and tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.

Tightening torque :
29.4N.m (3.0kgf.m, 21.7lb-ft) + 90° → Release all bolts → 29.4N.m (3.0kgf.m, 21.7lb-ft) + 90°

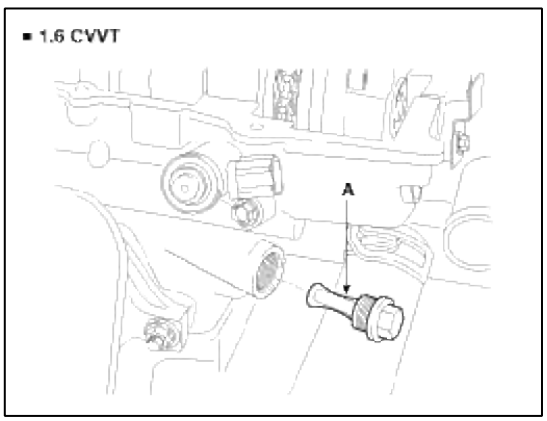


4. Install the engine mounting support bracket fixing bolts(A).



5. Install the OCV(Oil Control Valve) filter(A).

Tightening torque :
40.2 ~ 50.0N.m (4.1 ~ 5.1kgf.m, 29.7 ~ 36.9lb-ft)

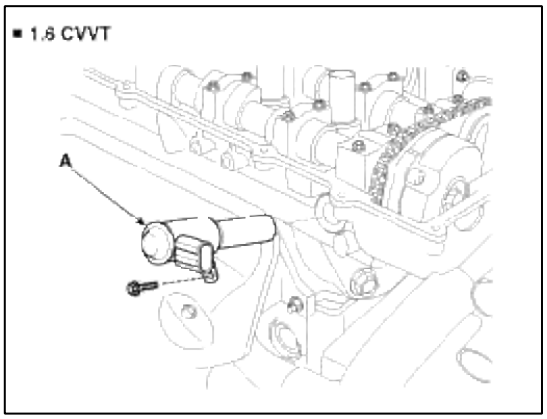


NOTE

- Always use a new OCV(Oil Control Valve) filter gasket.
- Keep clean the OCV(Oil Control Valve) filter.

6. Install the OCV(Oil Control Valve)(A).

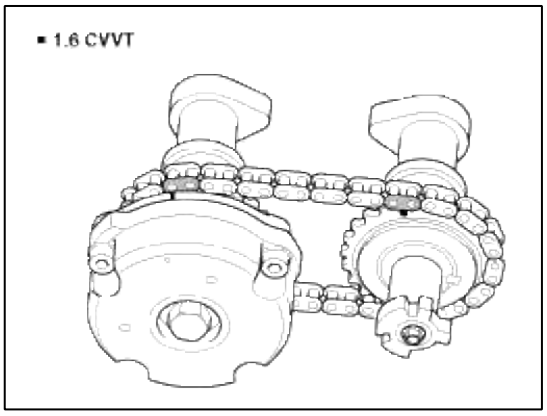
Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



CAUTION

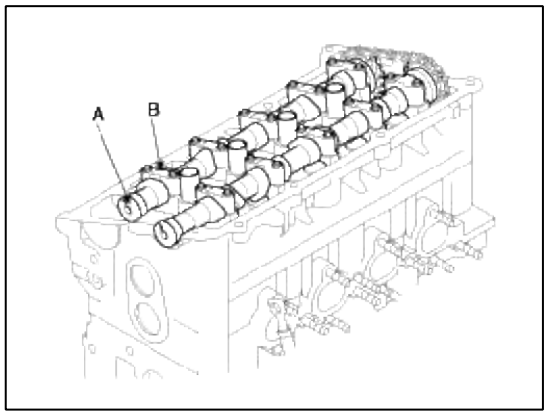
- Do not reuse the OCV(Oil Control Valve) when dropped.
- Keep clean the OCV(Oil Control Valve).
- Do not hold the OCV(Oil Control Valve) sleeve during servicing.
- When the OCV(Oil Control Valve) is installed on the engine, do not move the engine with holding the OCV(Oil Control Valve) yoke.

7. Install the camshafts.
   (1) Align the camshaft timing chain with the intake timing chain sprocket and exhaust timing chain sprocket as shown.



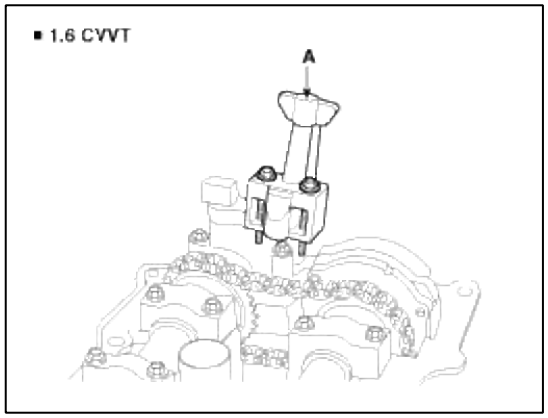
(2) Install the camshaft(A) and bearing caps(B).

Tightening torque :
11.8 ~ 13.7N.m (1.2 ~ 1.4kgf.m, 8.7 ~ 10.1lb-ft)

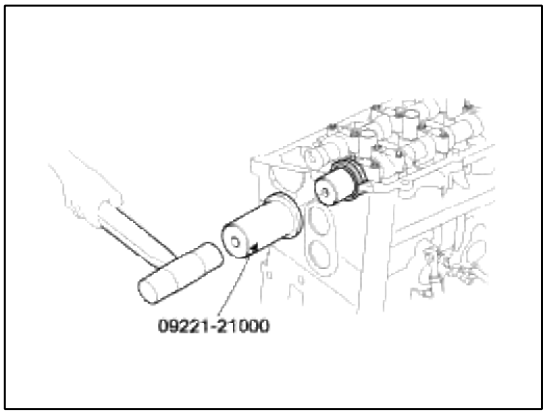


(3) Install the timing chain auto tensioner(A).

Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

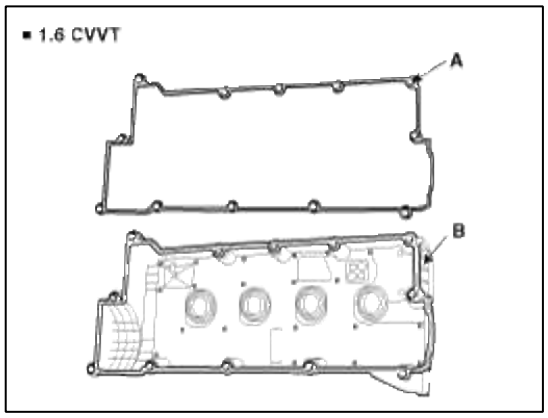


8. Using the SST (09221 - 21000), install the camshaft bearing oil seal.



9. Install the camshaft sprocket.
10. Install the cylinder head cover.

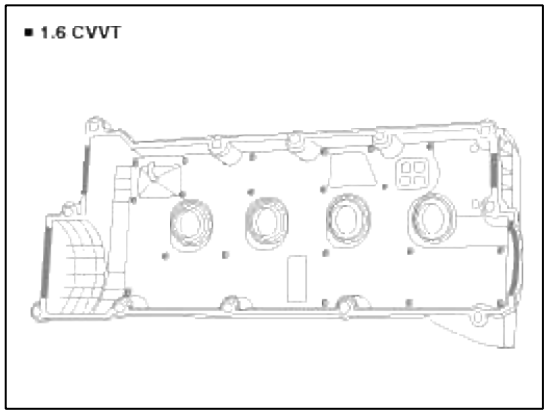
(1) Install the cylinder head cover gasket(A) in the groove of the cylinder head cover(B).



NOTE

- Before installing the cylinder head cover gasket, thoroughly clean the cylinder head cover and the groove.
- When installing, make sure the cylinder head cover gasket is seated securely in the corners of the recesses with no gap.

(2) Apply liquid gasket to the head cover gasket at the corners of the recess.

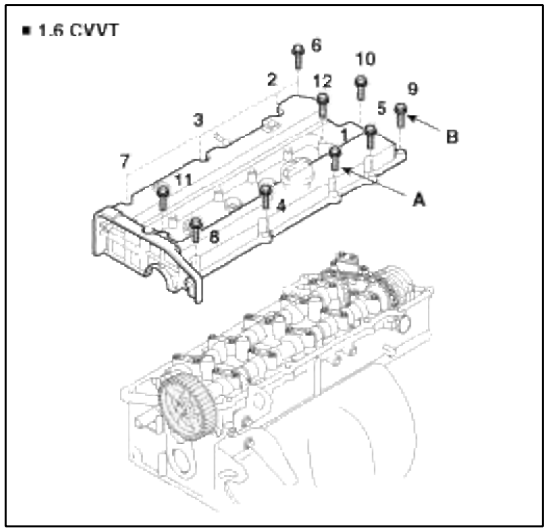


NOTE

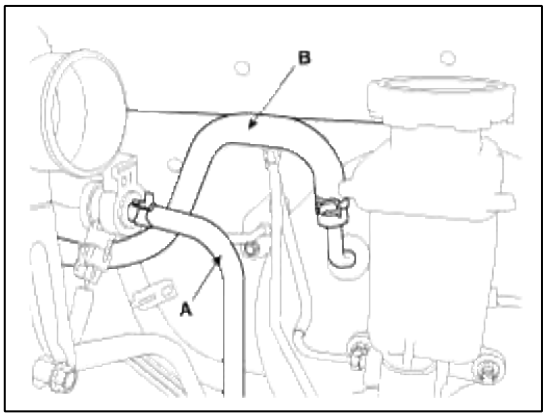
- Use liquid gasket, loctite No. 5999.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- After assembly, wait at least 30 minutes before filling the engine with oil.

(3) Install the cylinder head cover(A) with bolts(B).
Uniformly tighten the bolts in several passes.
Pre-tighten all bolts by 3.9~4.9N.m (0.4~0.5kgf.m, 2.9~3.6lb-ft) and then tighten by the specified torque.

Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

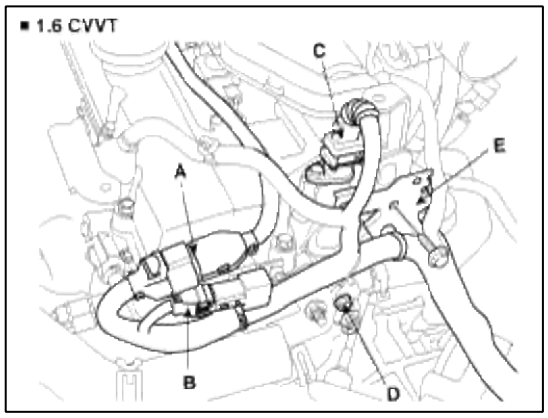


11. Install the timing belt.
12. Install the intake manifold.
13. Install the exhaust manifold.
14. Install the ignition coil. (Refer to Ignition system in EE Group).
15. Install the power steering pump. (Refer to Power steering pump in ST Group).
16. Install the brake booster hose(B).
17. Connect the hose(A) of the PCSV (Purge Control Solenoid Valve) side.



18. Install the engine wire harness connectors and wire harness clamps to the cylinder head and the intake manifold.
    (1) Install the wire harness bracket(E).
    (2) Connect the ground cable(D).
    (3) Connect the CMP(Camshaft position sensor) connector(C).
    (4) Connect the ignition coil condenser connector(B).

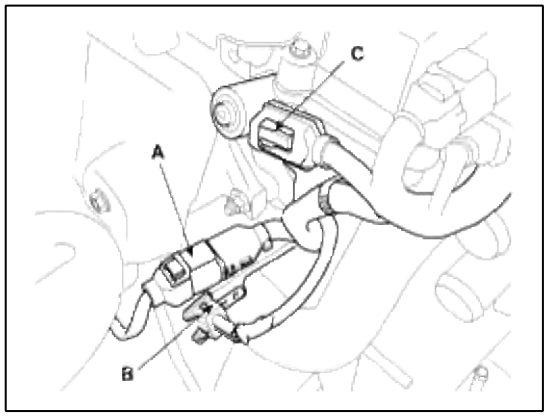
(5) Connect the ignition coil connector(A).



(6) Connect the OCV(Oil Control Valve) connector(C).

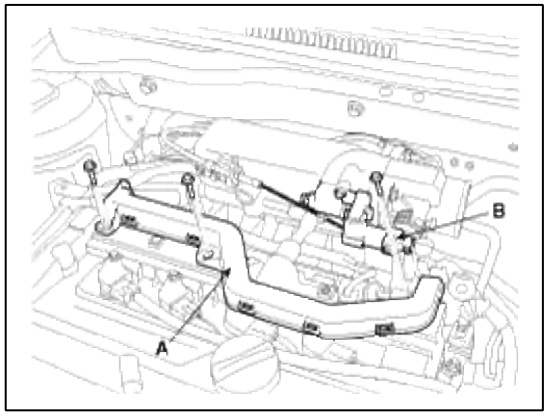
(7) Connect the CKP(Crankshaft Position Sensor) connector(B).

(8) Connect the front oxygen sensor connector(A).



(9) Connect the ISA(Idle Speed Actuator) connector(B).

(10) Install the wire harness bracket(A).



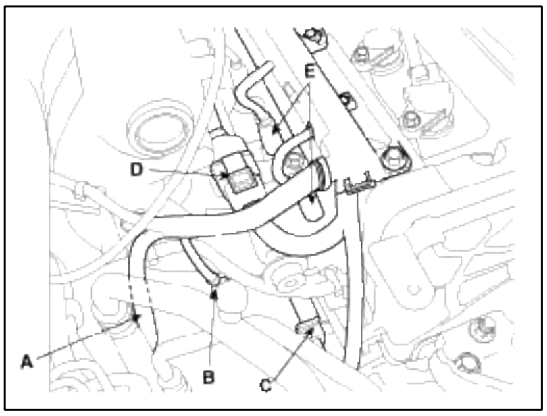
(11) Connect the injector connectors (No.1,2) (E).

(12) Connect the injector connectors (No.3,4) (D).

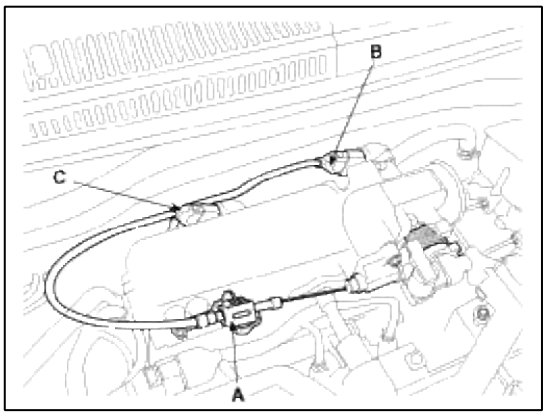
(13) Connect the knock sensor connector(C).

(14) Connect the air conditioner compressor switch connector(B).

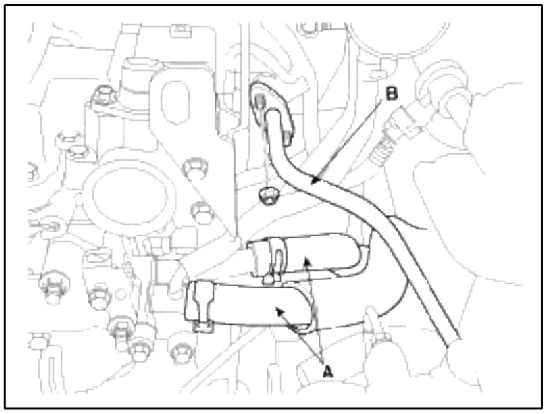
(15) Connect the rear oxygen sensor connector(A).



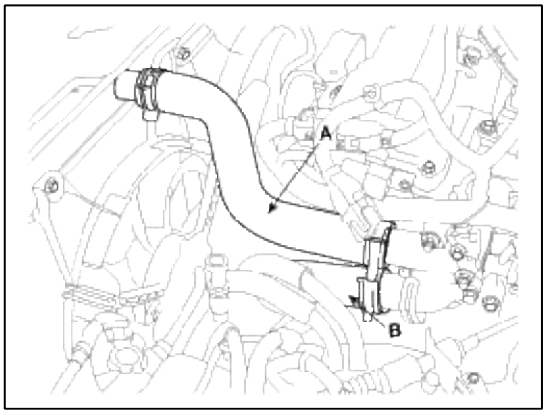
19. Connect the TPS (Throttle Position Sensor) connector(B) and the MAP sensor connector(C).
20. Install the accelerator cable(A).



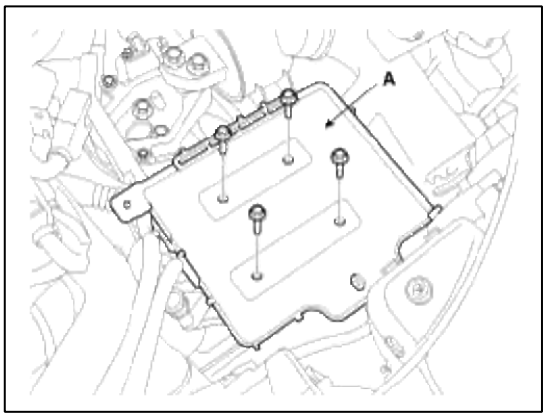
21. Install the fuel hose(B).
22. Install the heater hoses(A).



23. Install the upper radiator hose(A) and lower radiator hose(B).



24. Install the battery tray(A).

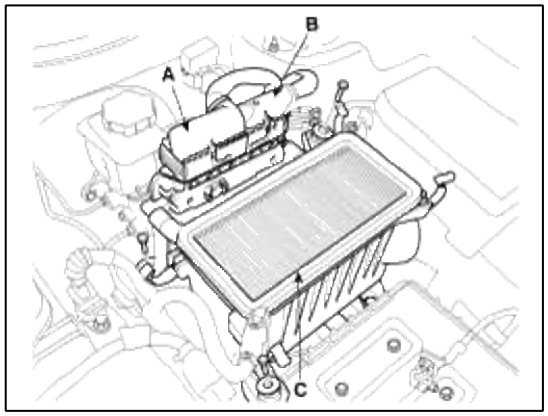


25. Install the intake air hose and air cleaner assembly.

(1) Install the air cleaner element and air cleaner lower cover(C).

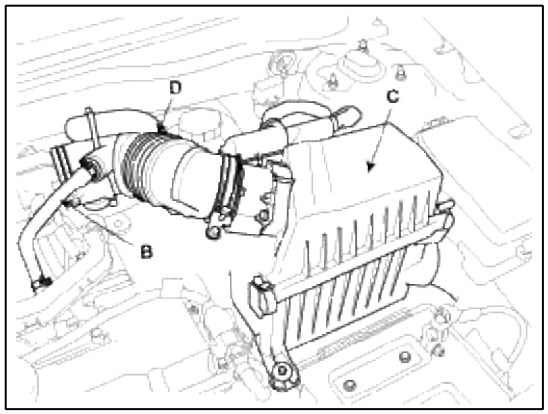
Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

(2) Connect the ECM connector(A) and ECM connector(B) (A/T only).

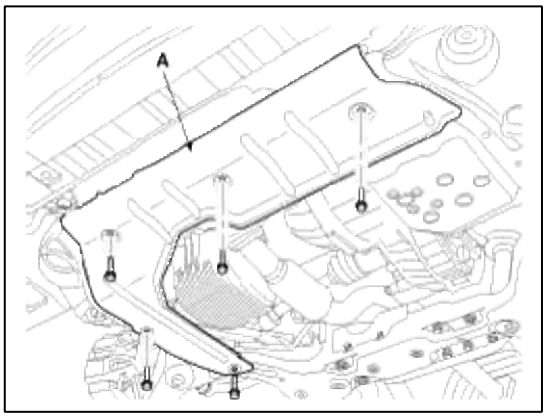


(3) Install the intake air hose(D) and air cleaner upper cover(C).

(4) Connect the breather hose(B) to intake air hose(D).



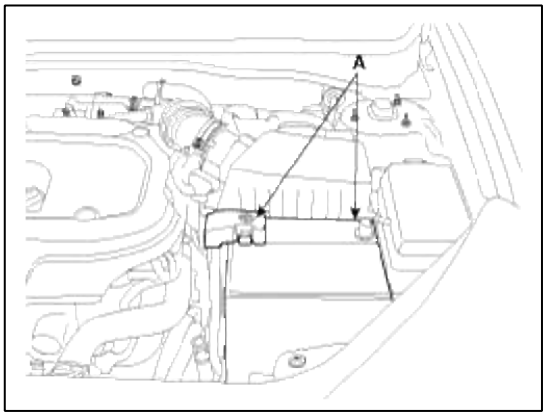
26. Install the under cover(A).



27. Install the engine cover.

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

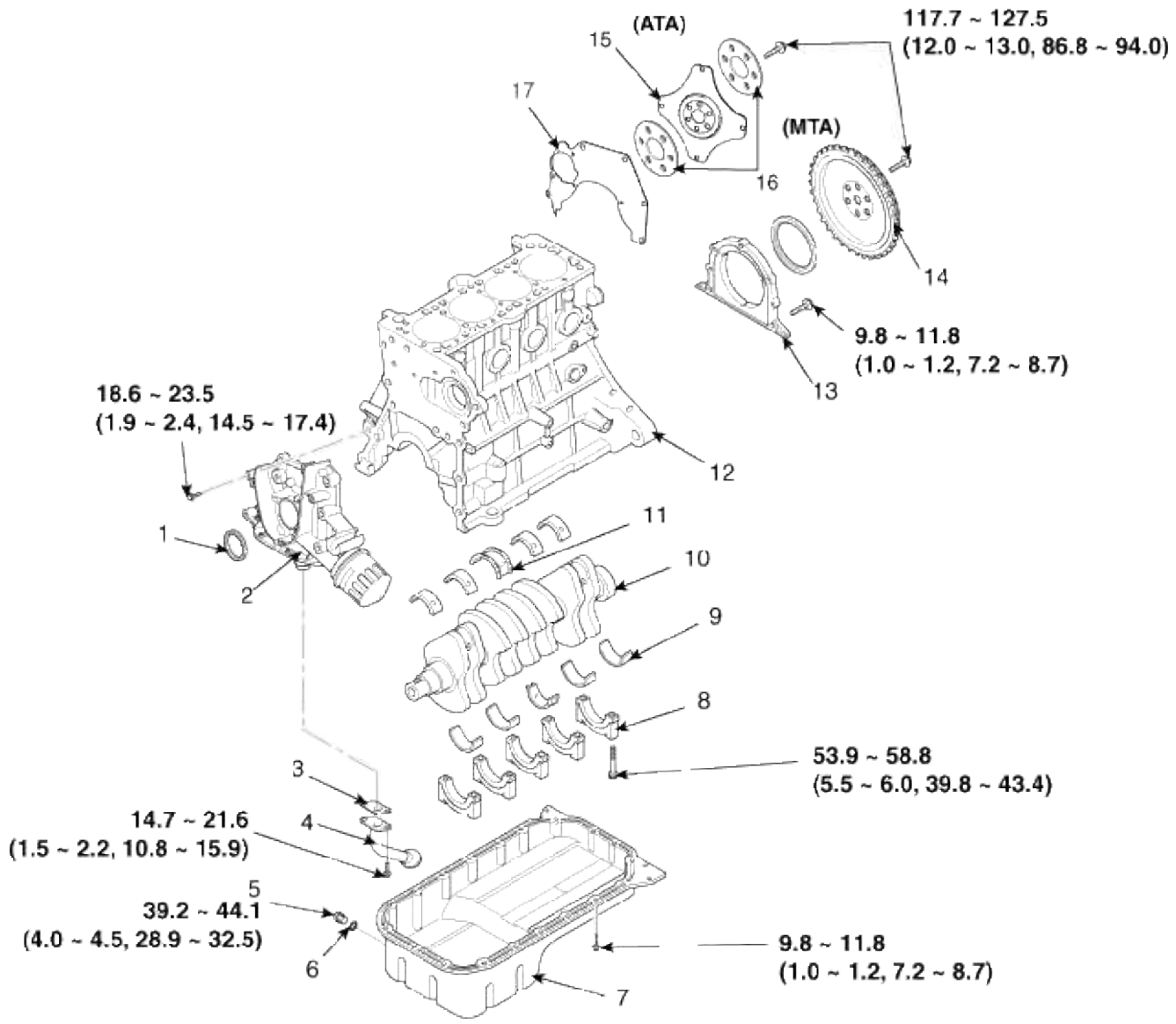
28. Install the battery and connect the battery terminals(A).



29. Fill with engine coolant.
30. Start the engine and check for leaks.
31. Recheck engine coolant level and oil level.

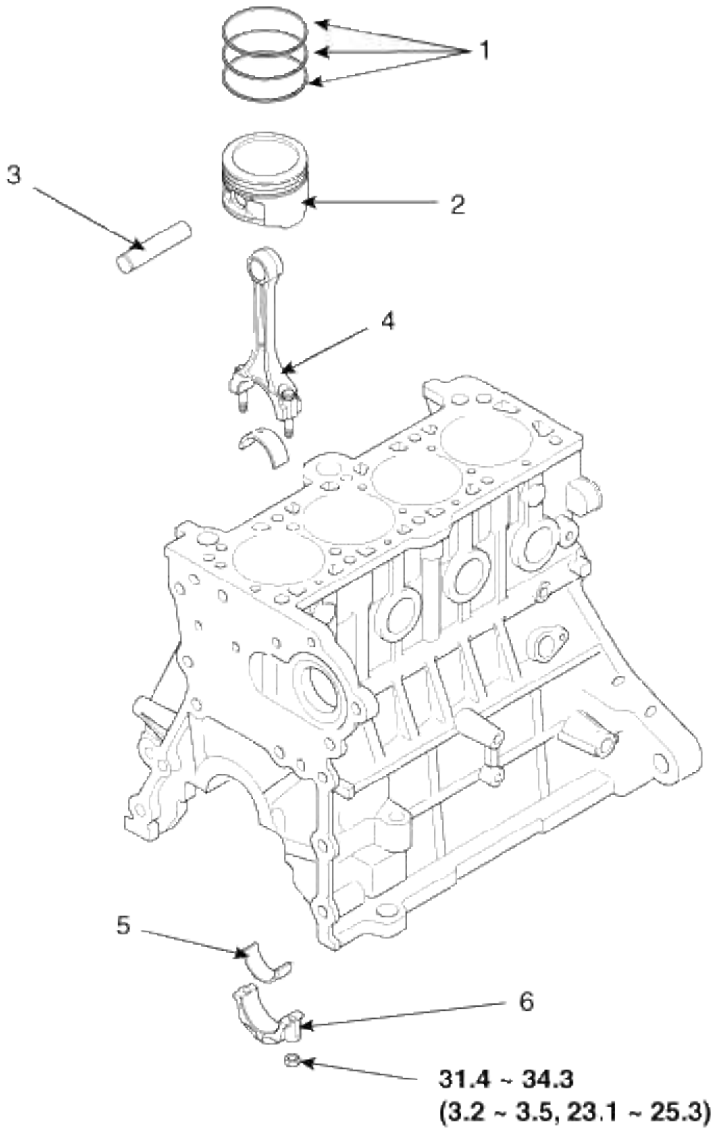
Engine Mechanical System > Cylinder Block > Components and Components Location

Components



TORQUE : N.m (kgf.m, lb-ft)

1. Oil seal
2. Front case
3. Gasket
4. Oil screen
5. Drain plug
6. Gasket
7. Oil pan
8. Main bearing cap
9. Main bearing
10. Crankshaft
11. Center bearing
12. Cylinder block
13. Rear oil seal case
14. Flywheel
15. Drive plate
16. Washer
17. Rear plate



TORQUE : N.m (kgf.m, lb-ft)

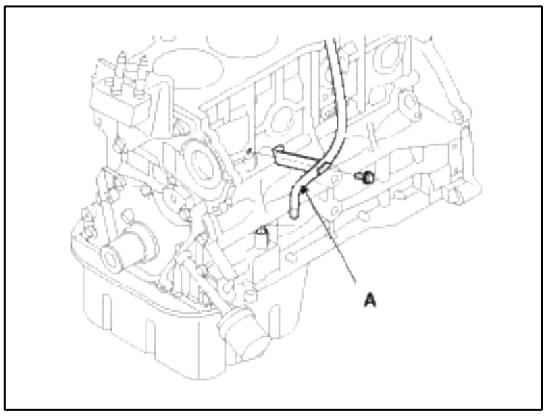
1. Piston ring
2. Piston
3. Piston pin
4. Connecting rod
5. Connecting rod bearing
6. Connecting rod bearing cap

Engine Mechanical System > Cylinder Block > Repair procedures

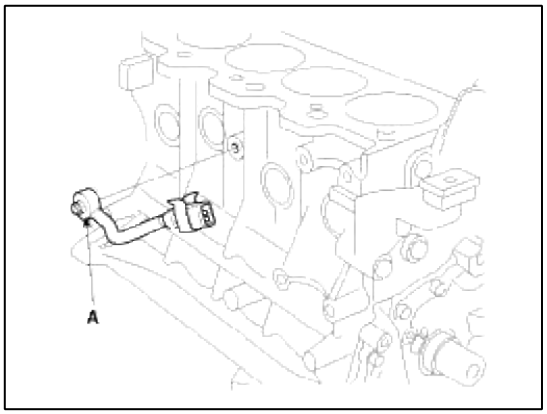
Disassembly

1. M/T : Remove the fly wheel.
2. A/T : Remove the drive plate.
3. Install the engine to engine stand for disassembly.
4. Remove the timing belt.
5. Remove the cylinder head.

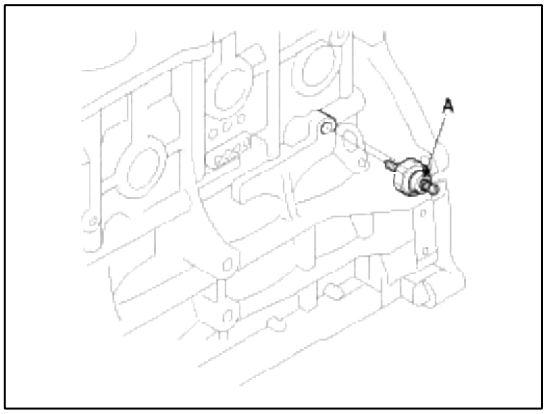
6. Remove the oil level gauge tube(A).



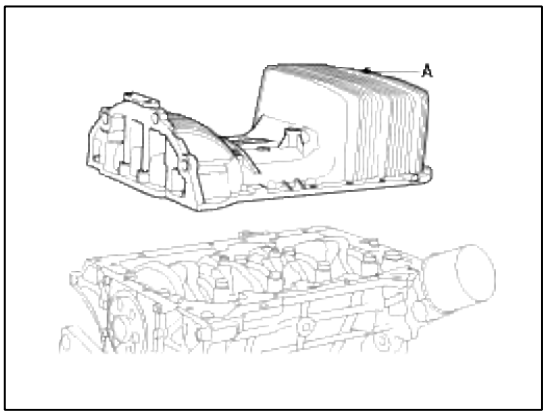
7. Remove the knock sensor(A).



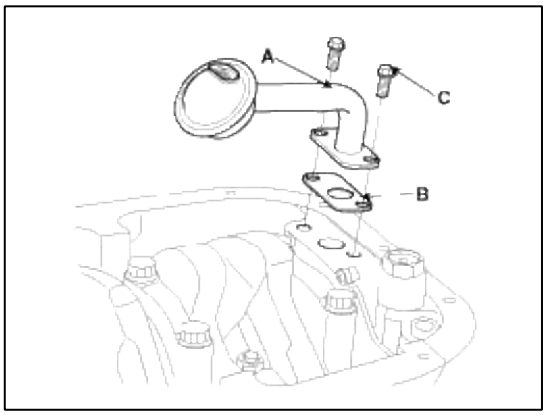
8. Remove the oil pressure switch(A).



9. Remove the water pump.
10. Remove the oil pan(A).



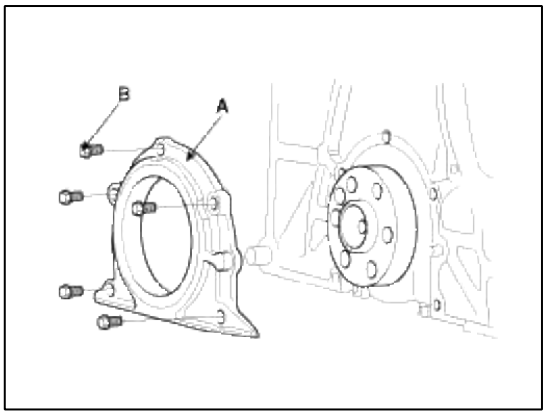
11. Remove the oil screen.
    Remove the 2bolts(C), oil screen(A) and gasket(B).



12. Check the connecting rod end play.
13. Remove the connecting rod caps and check oil clearance.
14. Remove the piston and connecting rod assemblies.
    (1) Using a ridge reamer, remove all the carbon from the top of the cylinder.
    (2) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

> NOTE
>
> • Keep the bearings, connecting rod and cap together.
> • Arrange the piston and connecting rod assemblies in the correct order.

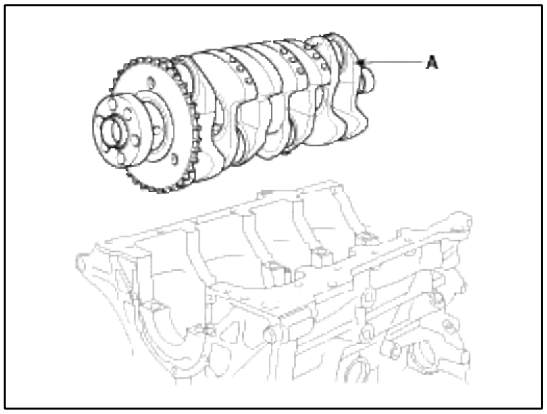
15. Remove the front case.
16. Remove the rear oil seal case.
    Remove the 5bolts(B) and rear oil seal case(A).



17. Remove the crankshaft bearing cap and check oil clearance.
18. Check the crankshaft end play.

19. Lift the crankshaft(A) out of the engine, being careful not to damage journals.

> NOTE
>
> Arrange the main bearings and thrust bearings in the correct order.



20. Check fit between piston and piston pin.
    Try to move the piston back and forth on the piston pin.
    If any movement is felt, replace the piston and pin as a set.
21. Remove the piston rings.
    (1) Using a piston ring expender, remove the 2 compression rings.
    (2) Remove the 2 side rails and oil ring by hand.

> NOTE
>
> Arrange the piston rings in the correct order only.

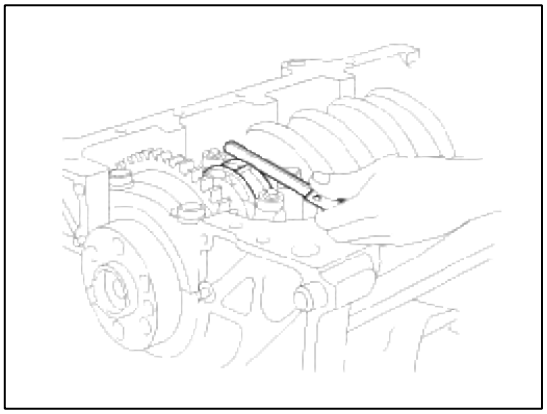
22. Remove the connecting rod from the piston.
    Using a press, remove the piston pin from piston.
    (Press-in load : 500 ~ 1,500kg(1,102 ~ 3,306lb))

Inspection

Connecting Rod And Crankshaft

1. Check the connecting rod end play.
   Using feeler gauge, measure the end play while moving the connecting rod back and forth.

End play
Standard : 0.1 ~ 0.25mm (0.0039 ~ 0.0098in)
Maximum : 0.4mm (0.0157in)



A. If out-of-tolerance, install a new connecting rod.

B. If still out-of-tolerance, replace the crankshaft.

2. Check the connecting rod bearing oil clearance.

(1) Check the match marks on the connecting rod and cap are aligned to ensure correct reassembly.

(2) Remove the 2 connecting rod cap nuts.

(3) Remove the connecting rod cap and lower bearing.

(4) Clean the crankshaft pin journal and bearing.

(5) Place a plastigage across the crankshaft pin journal.

(6) Reinstall the lower bearing and cap, and tighten the nuts.

Tightening torque :
31.4 ~ 34.3N.m (3.2 ~ 3.5kgf.m, 23.1 ~ 25.3lb-ft)

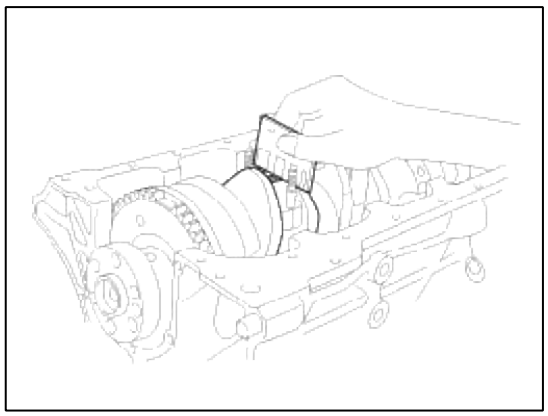
NOTE

Do not turn the crankshaft.

(7) Remove the 2nuts, connecting rod cap and lower bearing .

(8) Measure the plastigage at its widest point.

Standard oil clearance
0.018 ~ 0.036mm (0.0007 ~ 0.0014in)



(9) If the plastigage measures too wide or too narrow, remove the upper and lower bearing and then install a new bearings with the same color mark.(Refer to connecting rod bearing selection table).
Recheck the oil clearance.

CAUTION

Do not file, shim, of scrape the bearings or the caps to adjust clearance.

(10) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing.(Refer to connecting rod bearing selection table).
Recheck the oil clearance.

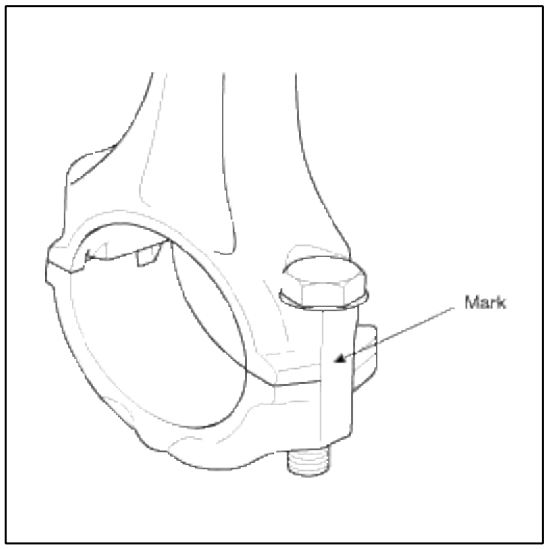
NOTE

If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

CAUTION

If the marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

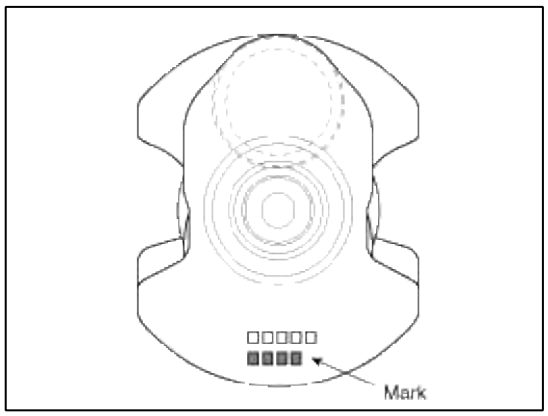
Connecting Rod Mark Location



Identification Of Connecting Rod

Mark	Connecting rod big-end inner diameter
^	48.000 ~ 48.006mm (1.8898 ~ 1.8900in)
b	48.006 ~ 48.012mm (1.8900 ~ 1.8902in)
c	48.012 ~ 48.018mm (1.8902 ~ 1.8905in)

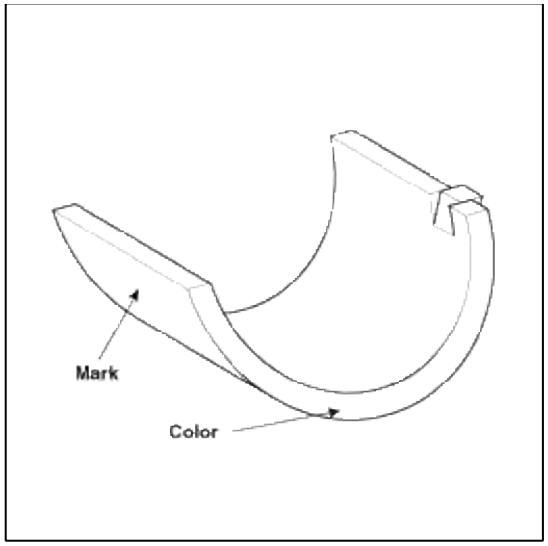
Crankshaft Pin Journal Mark Location



Identification Of Crankshaft Pin Journal

Mark	Crankshaft pin journal outer diameter
^	44.966 ~ 44.972mm (1.7703 ~ 1.7705in)
b	44.960 ~ 44.966mm (1.7701 ~ 1.7703in)
c	44.954 ~ 44.960mm (1.7698 ~ 1.7701in)

Connecting Rod Bearing Mark Location



Identification Of Connecting Rod Bearing

Mark	Color	Connecting rod bearing thickness
AA	Blue	1.514 ~ 1.517mm (0.0596 ~ 0.0597in)
A	Black	1.511 ~ 1.514mm (0.0595 ~ 0.0596in)
B	None	1.508 ~ 1.511mm (0.0594 ~ 0.0595in)
C	Green	1.505 ~ 1.508mm (0.0593 ~ 0.0594in)
D	Yellow	1.502 ~ 1.505mm (0.0591 ~ 0.0593in)

(11) Select the bearing by using selection table.

Connecting Rod Bearing Selection Table

		Connecting rod mark		
		^	b	c
Crank shaft pin journal mark	^	D (Yellow)	C (Green)	B (None)
	b	C (Green)	B (None)	A (Black)
	c	B (None)	A (Black)	AA (Blue)

3. Check the connecting rods.
   (1) When reinstalling, make sure that cylinder numbers put on the connecting rod and cap at disassembly match. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.
   (2) Replace the connecting rod if it is damaged on the thrust faces at either end. Also if step wear or a severely rough surface of the inside diameter of the small end is apparent, the rod must be replaced as well.
   (3) Using a connecting rod aligning tool, check the rod for bend and twist. If the measured value is close to the repair limit, correct the rod by a press. Any connecting rod that has been severely bent or distorted should be replaced.

Allowable bend of connecting rod :
0.05mm / 100mm (0.0020in / 3.94in) or less
Allowable twist of connecting rod :
0.1mm / 100mm (0.0039in / 3.94in) or less

4. Check the crankshaft bearing oil clearance.
   (1) To check main bearing-to-journal oil clearance, remove the main bearing caps and lower bearings.
   (2) Clean each main journal and lower bearing with a clean shop towel.
   (3) Place one strip of plastigage across each main journal.
   (4) Reinstall the lower bearings and caps, then tighten the bolts.

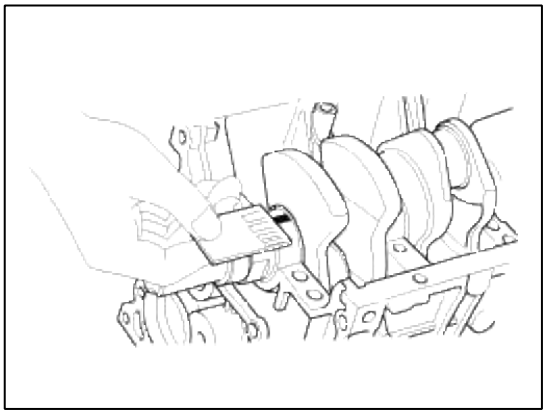
Tightening torque :
53.9 ~ 58.8N.m(5.5 ~ 6.0kgf.m, 39.8 ~ 43.4lb-ft)

NOTE

Do not turn the crankshaft.

   (5) Remove the cap and lower bearing again, and measure the widest part of the plastigage.

Standard oil clearance :
No.1, 2, 4, 5 : 0.022 ~ 0.040mm (0.0009 ~ 0.0016in)



(6) If the plastigage measures too wide or too narrow, remove the upper and lower bearing and then install a new bearings with the same color mark.(Refer to crankshaft main bearing selection table).
Recheck the oil clearance.

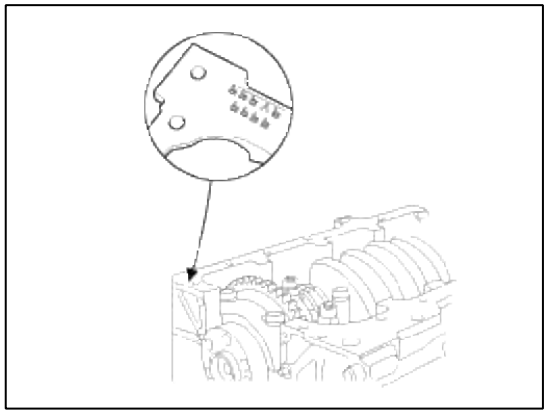
> CAUTION
>
> Do not file, shim, or scrape the bearings or the cap to adjust clearance.

(7) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing.(Refer to crankshaft main bearing selection table).
Recheck the oil clearance.

> NOTE
>
> If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

> CAUTION
>
> If the marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

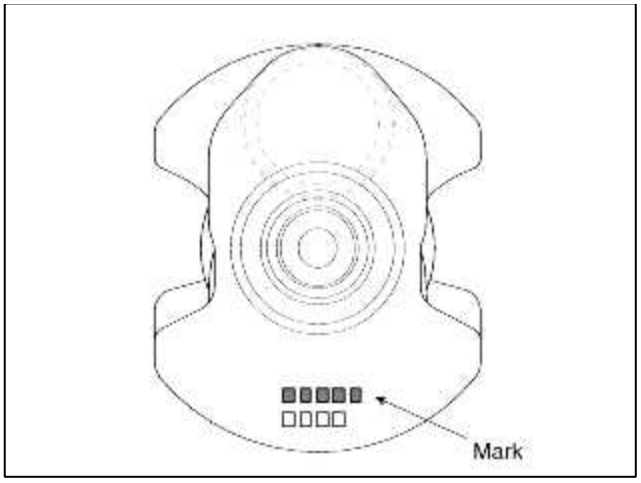
Cylinder block crankshaft journal bore mark location
Letters have been stamped on the end of the block as a mark for the size of each of the 5 main journal bores. Use them, and the numbers or letters stamped on the crank (marks for main journal size), to choose the correct bearings.



Identification Of Cylinder Block Crankshaft Journal Bore

Mark	Cylinder block crankshaft journal bore inner diameter
^	54.000 ~ 54.006mm (2.1260 ~ 2.1262in)
b	54.006 ~ 54.012mm (2.1262 ~ 2.1265in)
c	54.012 ~ 54.018mm (2.1265 ~ 2.1267in)

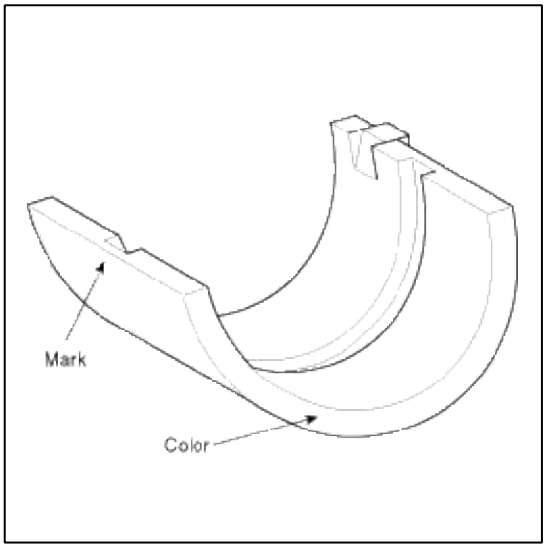
Crankshaft main journal mark location



Identification of crankshaft main journal

Mark	Crankshaft main journal outer diameter
^	49.962 ~ 49.968mm (1.9670 ~ 1.9672in)
b	49.956 ~ 49.962mm (1.9668 ~ 1.9670in)
c	49.950 ~ 49.956mm (1.9665 ~ 1.9668in)

Crankshaft main bearing mark location



Identification of crankshaft main bearing

Mark	Color	Crankshaft main bearing thickness	
		No.1, 2, 4, 5	No. 3
AA	Blue	2.014 ~ 2.017 (0.0793 ~ 0.0794)	2.011 ~ 2.014 (0.0792 ~ 0.0793)
A	Black	2.011 ~ 2.014 (0.0792 ~ 0.0793)	2.008 ~ 2.011 (0.0791 ~ 0.0792)
B	None	2.008 ~ 2.011 (0.0791 ~ 0.0792)	2.005 ~ 2.008 (0.0789 ~ 0.0791)
C	Green	2.005 ~ 2.008 (0.0789 ~ 0.0791)	2.002 ~ 2.005 (0.0788 ~ 0.0789)
D	Yellow	2.002 ~ 2.005 (0.0788 ~ 0.0789)	1.999 ~ 2.002 (0.0787 ~ 0.0788)

(8) Select the bearing by using selection table.

Crankshaft main bearing selection table

		Cylinder block crankshaft journal bore mark		
		^	b	c
Crank shaft main journal mark	^	D (Yellow)	C (Green)	B (None)
	b	C (Green)	B (None)	A (Black)
	c	B (None)	A (Black)	AA (Blue)

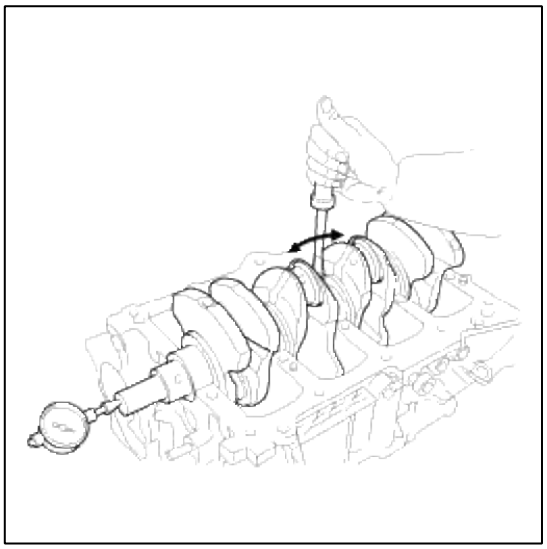
5. Check the crankshaft end play.

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

End play

Standard: 0.05 ~ 0.175mm (0.0020 ~ 0.0069in)

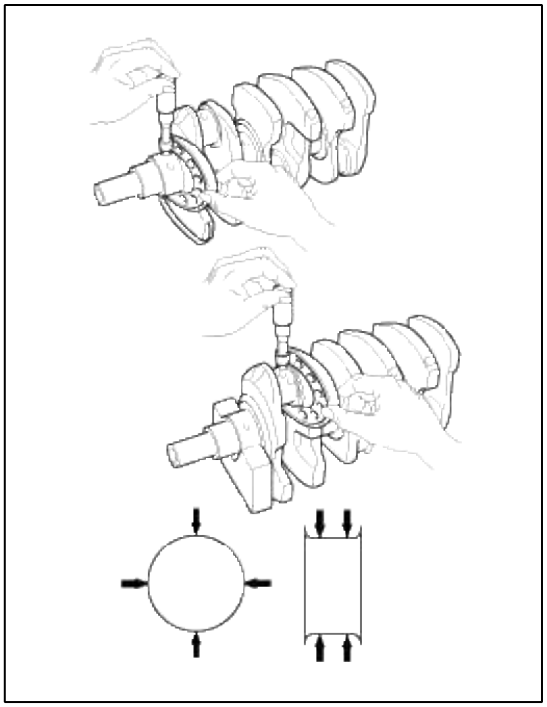
Limit : 0.20mm (0.0079in)



If the end play is greater than maximum, replace the center bearing.

6. Inspect the crankshaft main journals and pin journals.
   Using a micrometer, measure the diameter of each main journal and pin journal.

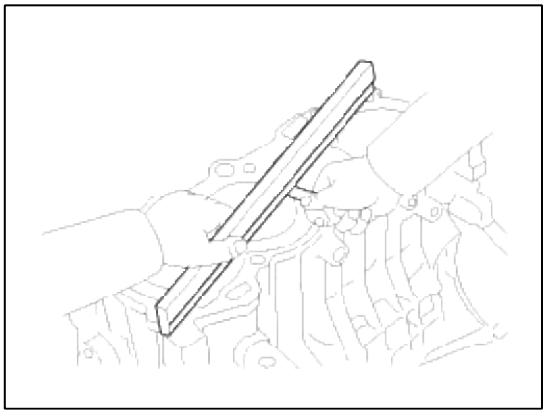
Main journal diameter :
49.950 ~ 49.968mm (1.9665 ~ 1.9672in)
Pin journal diameter :
44.954 ~ 44.972mm (1.7698 ~ 1.7705in)



Cylinder Block

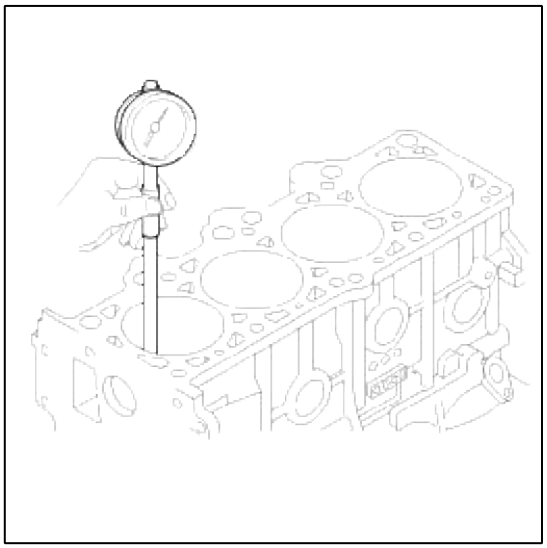
1. Remove the gasket material.
   Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.
2. Clean the cylinder block
   Using a soft brush and solvent, thoroughly clean the cylinder block.
3. Inspect the top surface of cylinder block for flatness.
   Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Flatness of cylinder block gasket surface
Standard : Less than 0.05mm (0.0020in)

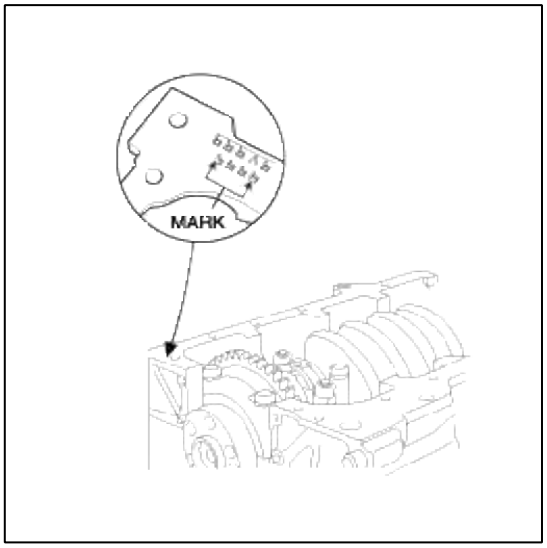


4. Inspect the cylinder bore.
   Visually check the cylinder for vertical scratchs.
   If deep scratchs are present, replace the cylinder block.
5. Inspect the cylinder bore diameter.
   Using a cylinder bore gauge, measure the cylinder bore diameter at position in the thrust and axial direction.

Standard diameter :
1.6 CVVT : 76.50 ~ 76.53mm (3.0118 ~ 3.0130in)



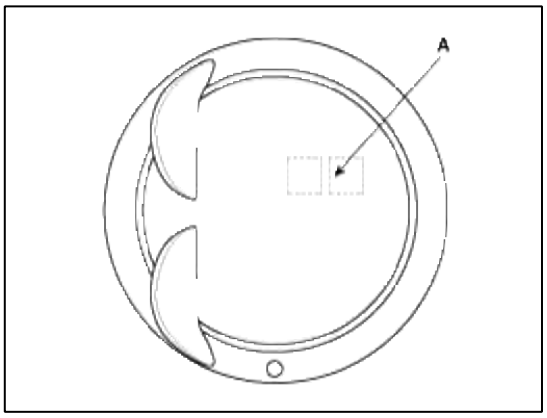
6. Check the cylinder bore size code on the cylinder block bottom face.



Identification of cylinder bore size

Mark	Cylinder bore inner diameter
A	76.50 ~ 76.51mm (3.0118 ~ 3.0122in)
B	76.51 ~ 76.52mm (3.0122 ~ 3.0126in)
C	76.52 ~ 76.53mm (3.0126 ~ 3.0130in)

7. Check the piston size mark(A) on the piston top face.



Discrimination of piston outer diameter

Mark	Piston outer diameter
A	76.47 ~ 76.48mm (3.0106 ~ 3.0110in)
B	76.48 ~ 76.49mm (3.0110 ~ 3.0114in)
C	76.49 ~ 76.50mm (3.0114 ~ 3.0118in)

8. Select the piston related to cylinder bore class.

Piston -to-cylinder clearance :
0.02 ~ 0.04mm (0.0008 ~ 0.0016in)

Boring cylinder

1. Oversize pistons should be selected according to the largest bore cylinder.

NOTE

The size of piston is stamped on top of the piston.

2. Measure the outside diameter of the piston to be used.
3. According to the measured O.D(Outer Diameter), calculate the new bore size.

New bore size = piston O.D + 0.02 to 0.04mm (0.0008 to 0.0016in)
(clearance between piston and cylinder) - 0.01mm (0.0004in) (honing margin.)

4. Bore each of the cylinders to the calculated size.

CAUTION

To prevent distortion that may result from temperature rise during honing, bore the cylinder holes in the firing order.

5. Hone the cylinders, finishing them to the proper dimension (piston outside diameter + gap with cylinder).

6. Check the clearance between the piston and cylinder.

Standard : 0.02 ~ 0.04mm (0.0008 ~ 0.0016in)

NOTE

When boring the cylinders, finish all of the cylinders to the same oversize. Do not bore only one cylinder to the oversize.
(1.6 CVVT : Don't use over size)

Piston And Piston Rings

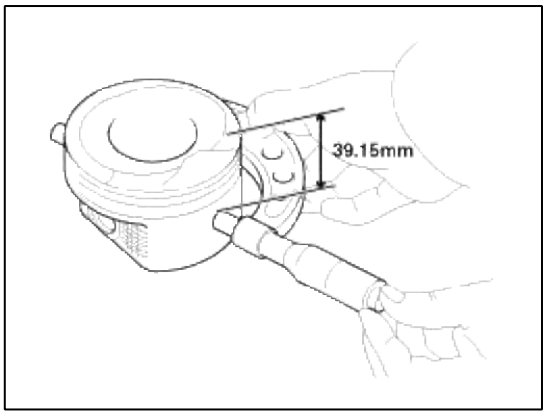
1. Clean the piston.
   (1) Using a gasket scraper, remove the carbon from the piston top.
   (2) Using a groove cleaning tool or broken ring, clean the piston ring grooves.
   (3) Using solvent and a brush, thoroughly clean the piston.

   NOTE

   Do not use a wire brush.

2. The standard measurement of the piston outside diameter is taken, 39.15mm(1.5413in) from top land of the piston.

Standard diameter :
76.47 ~ 76.50mm (3.0106 ~ 3.0118in)

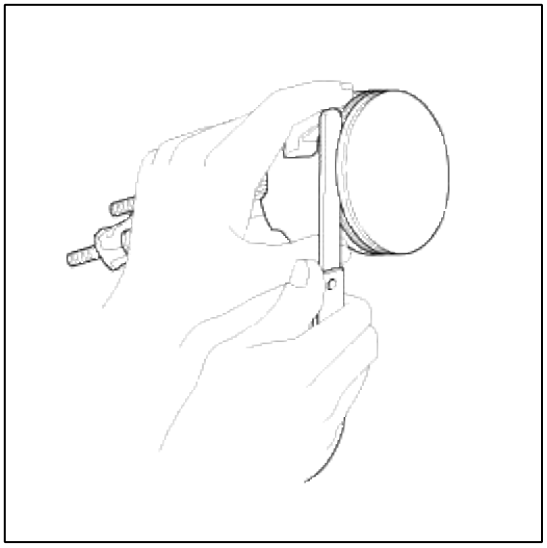


3. Calculate the difference between the cylinder bore inner diameter and the piston outer diameter.

Piston-to-cylinder clearance :
0.02 ~ 0.04mm (0.0008 ~ 0.0016in)

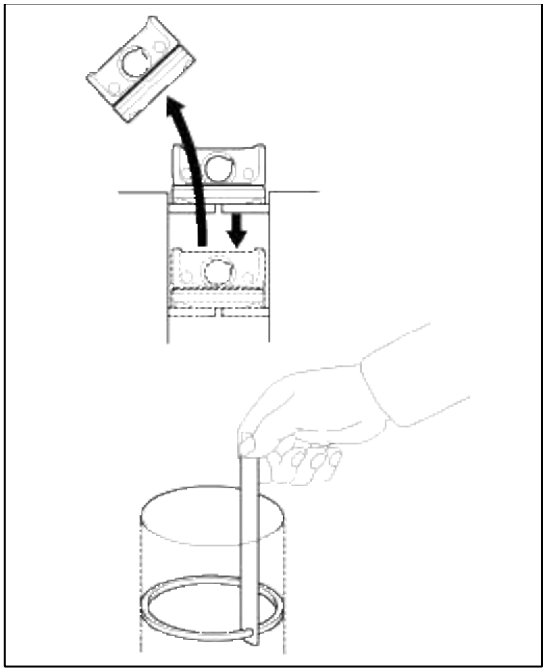
4. Inspect the piston ring side clearance.
   Using a feeler gauge, measure the clearance between new piston ring and the wall of ring groove.

Piston ring side clearance
No.1 ring : 0.04 ~ 0.085mm (0.0016 ~ 0.0033in)
No.2 ring : 0.04 ~ 0.085mm (0.0016 ~ 0.0033in)
Oil ring : 0.08 ~ 0.175mm (0.0031 ~ 0.0069in)
Limit
No.1 ring : 0.1mm (0.0039in)
No.2 ring : 0.1mm (0.0039in)



   If the clearance is greater than maximum, replace the piston.
5. Inspect the piston ring end gap.
   To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to the cylinder wall by gently pressing it down with a piston. Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston rings. If the gap is too large, recheck the cylinder bore inner diameter. If the bore is over the service limit, the cylinder block must be rebored.

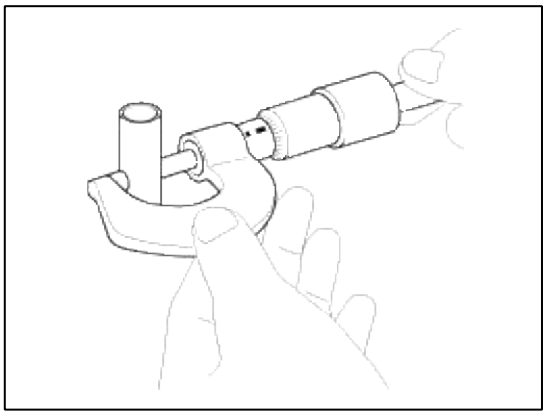
Piston ring end gap
Standard
No.1 ring : 0.15 ~ 0.30mm (0.0059 ~ 0.0118in)
No.2 ring : 0.35 ~ 0.50mm (0.0138 ~ 0.0197in)
Oil ring : 0.20 ~ 0.70mm(0.0079 ~ 0.0276in)
Limit
No.1, 2, oil ring : 1.0mm(0.0394in)



Piston Pins

1. Measure the outer diameter of piston pin

Piston pin diameter :
18.001 ~ 18.007mm (0.7087 ~ 0.7089in)



2. Measure the piston pin-to-piston clearance.

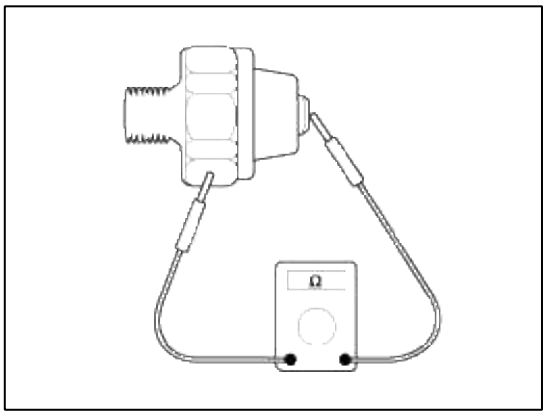
Piston pin-to-piston clearance :
0.011 ~ 0.018mm (0.0004 ~ 0.0007in)

3. Check the difference between the piston pin outer diameter and the connecting rod small end inner diameter.

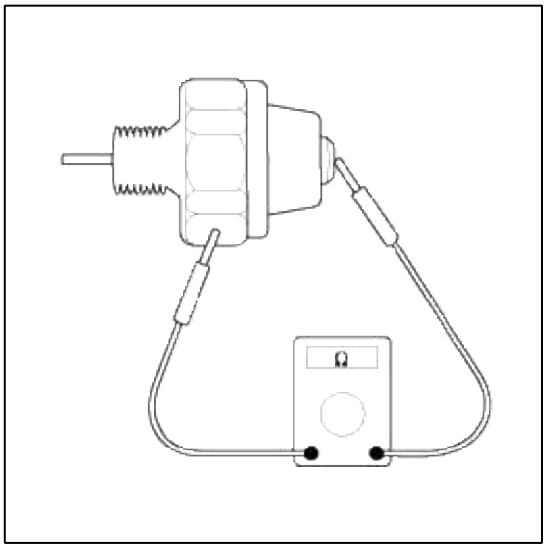
Piston pin-to-connecting rod interference :
-0.033 ~ -0.016mm (-0.0013 ~ -0.0006in)

Oil Pressure Switch

1. Check the continuity between the terminal and the body with an ohmmeter. If there is no continuity, replace the oil pressure switch.



2. Check the continuity between the terminal and the body when the fine wire is pushed. If there is continuity even when the fine wire is pushed, replace the switch.



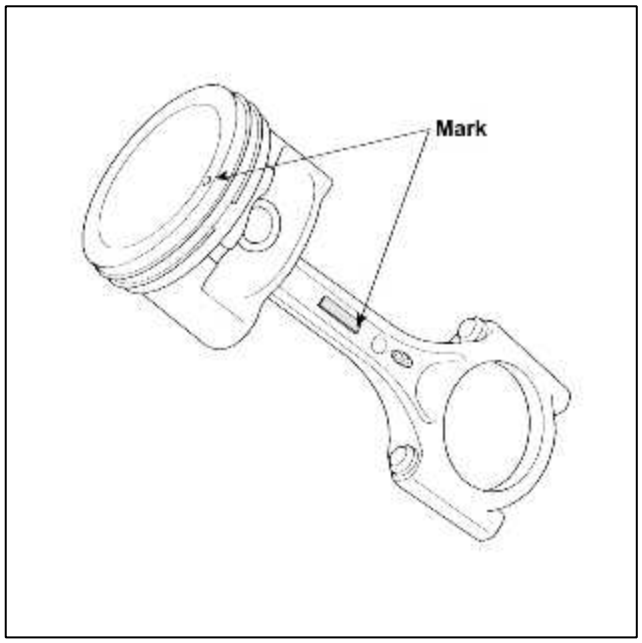
3. If there is no continuity when a 49.0kpa (0.5kg/cm², 7.1psi) is applied through the oil hole, the switch is operating properly.
   Check for air leakage. If air leaks, the diaphragm is broken. Replace it.

Reassembly

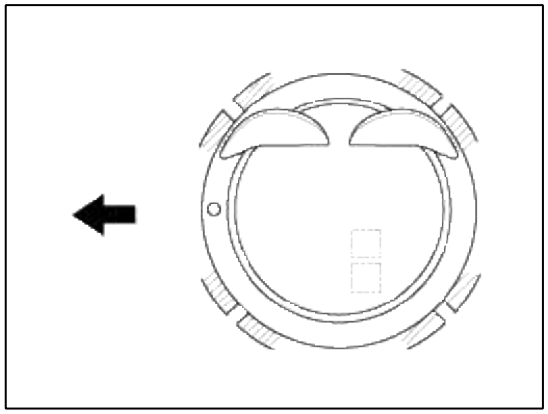
NOTE

- Thoroughly clean all parts to assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

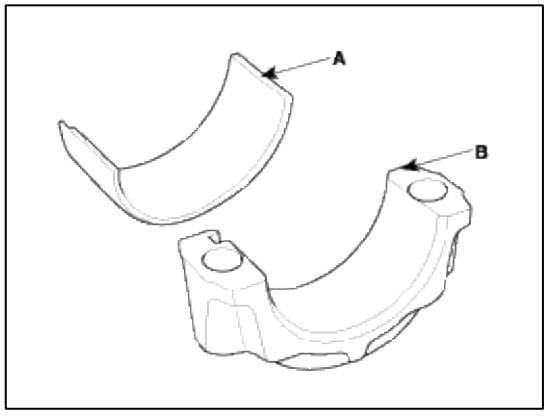
1. Assemble the piston and connecting rod.
   (1) Use a hydraulic press for installation
   (2) The piston front mark and the connecting rod front mark must face the timing belt side of the engine.



2. Install the piston rings.
   (1) Install the oil ring expander and 2 side rails by hand.
   (2) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
   (3) Position the piston rings so that the ring ends are as shown.



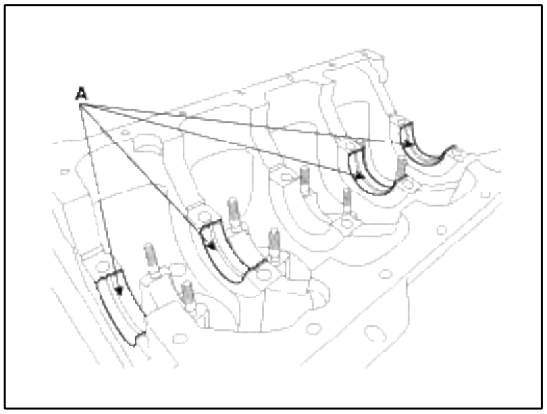
3. Install the connecting rod bearings.
   (1) Align the bearing(A) claw with the groove of the connecting rod or connecting rod cap(B).
   (2) Install the bearings(A) in the connecting rod and connecting rod cap(B).



4. Install the crankshaft main bearings.

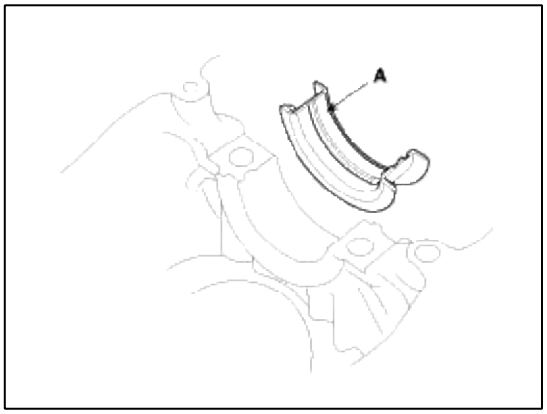
> NOTE
>
> Upper bearings have an oil groove of oil holes ; Lower bearings do not.

(1) Align the bearing claw with the claw groove of the cylinder block, push in the 4 upper bearings(A).



(2) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

5. Install the center bearing.
   Install the center bearing(A) under the No.3 journal position of the cylinder block with the oil grooves facing outward.



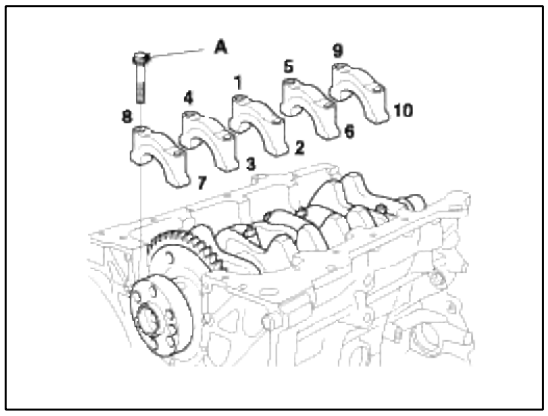
6. Place the crankshaft on the cylinder block.
7. Place the main bearing caps on the cylinder block.
8. Install the main bearing cap bolts.

> NOTE
>
> The main bearing cap bolts are tightened in 2 progressive steps.
> If any of the bearing cap bolts in broken or deformed, replace it.

(1) Apply a light coat of engine oil on the threads and under the bearing cap bolts.

(2) Install and uniformly tighten the 10 bearing cap bolts(A),in several passes, in the sequence shown.

Tightening torque :
53.9 ~ 58.8N.m (5.5 ~ 6.0kgf.m, 39.8 ~ 43.4lb-ft)



(3) Check that the crankshaft turns smoothly.

9. Check the crankshaft end play.
10. Install the piston and connecting rod assemblies.

NOTE

Before installing the piston, apply a coat of engine oil to the ring grooves and cylinder bores.

(1) Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts

(2) Install the ring compressor, check that the rings are securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.

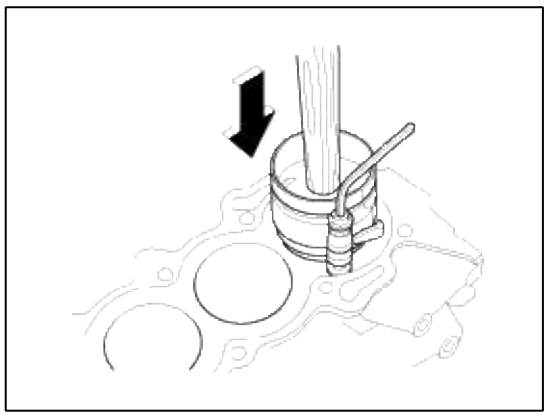
(3) Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.

(4) Apply engine oil to the bolt threads. install the rod caps with bearings, and tighten the nuts.

Tightening torque :
31.4 ~ 34.3N.m (3.2 ~ 3.5kgf.m, 23.1 ~ 25.3lb-ft)

NOTE

Maintain downward force on the ring compressor to prevent the rings from expending before entering the cylinder bore.



11. Install the rear oil seal case.
    (1) Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

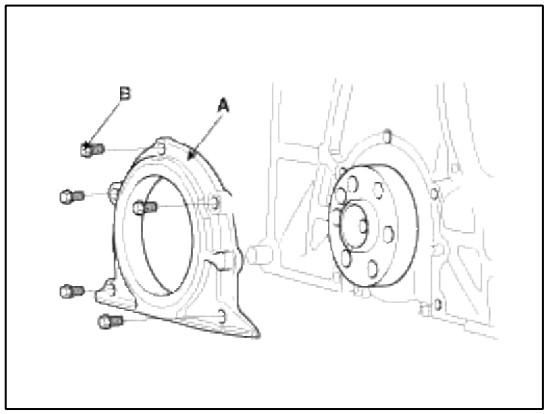
> NOTE
>
> Check that the mating surfaces are clean and dry before applying liquid gasket.

    (2) Apply liquid gasket as an even bead, centered between the edges of the mating surface.

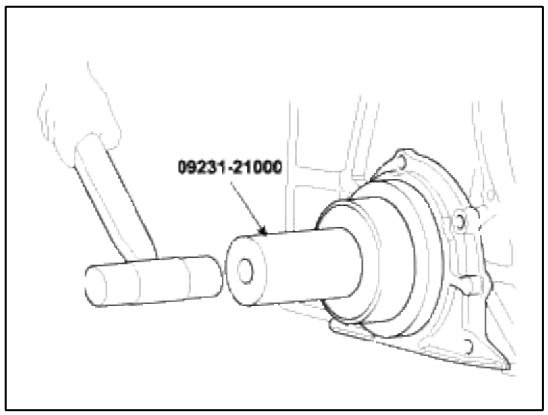
Liquid gasket : LOCTITE 5900 or equivalent

    (3) Install the rear oil seal case(A) with 5 bolts(B).

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



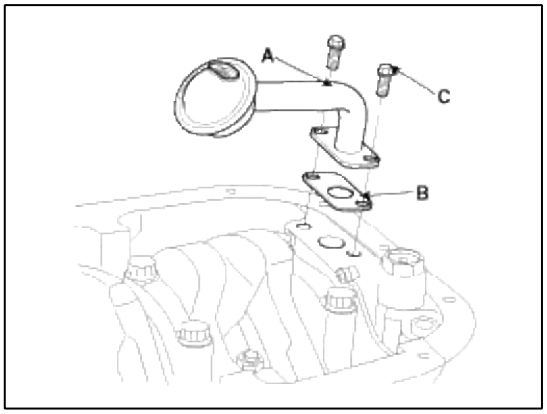
12. Install the rear oil seal.
    (1) Apply engine oil to a new oil seal lip.
    (2) Using the SST(09231-21000) and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.



13. Install the front case.

14. Install the oil screen.
Install a new gasket(B) and oil screen(A) with 2 bolts(C).

Tightening torque :
14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lb-ft)



15. Install the oil pan.
(1) Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

NOTE

Check that the mating surfaces are clean and dry before applying liquid gasket.

(2) Apply liquid gasket as an even bead, centered between the edges of the mating surface.

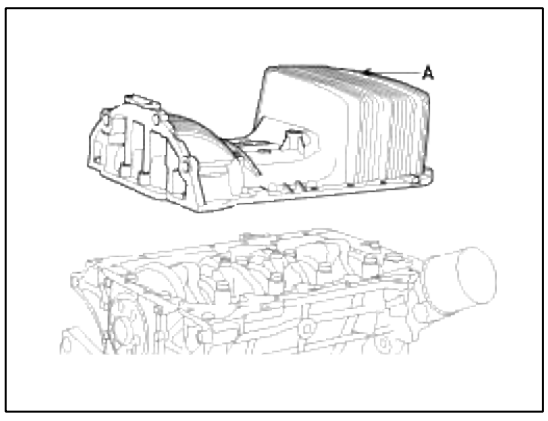
Liquid gasket : TB1217H or equivalent

NOTE

- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- D not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

(3) Install the oil pan(A) with the bolts.
Uniformly tighten the bolts in several passes.

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

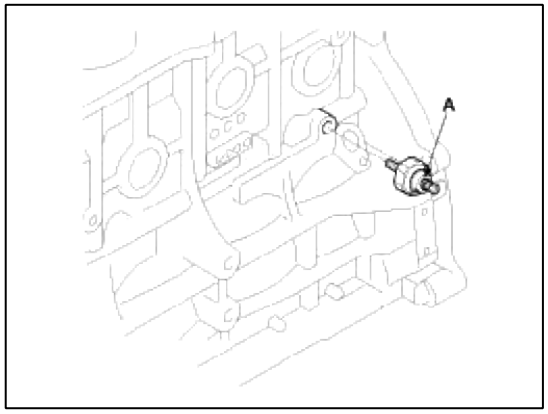


16. Install the water pump.
17. Install the oil pressure switch.
    (1) Apply adhesive to 2 or 3 threads.

    Adhesive : TB 2310/2350 or equivalent.

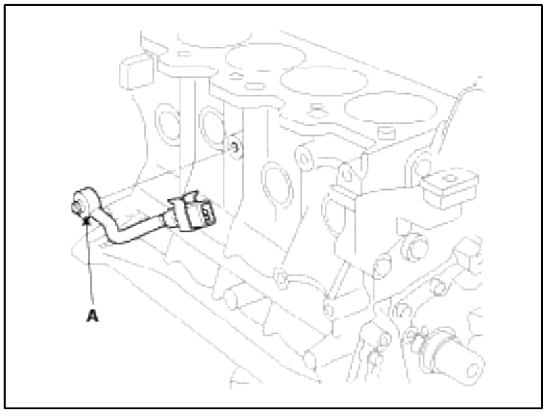
    (2) Install the oil pressure switch(A).

    Tightening torque :
    14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lb-ft)



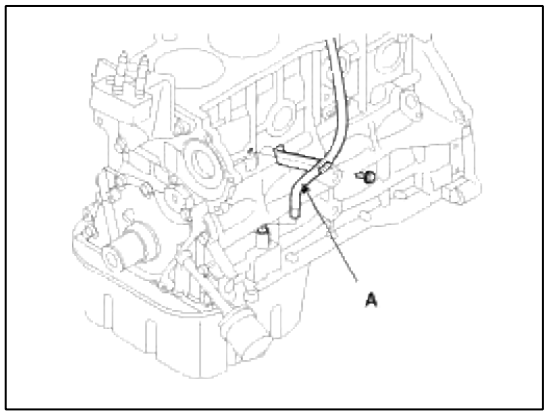
18. Install the knock sensor(A).

    Tightening torque :
    16.7 ~ 26.5N.m (1.7 ~ 2.7kgf.m, 12.3 ~ 19.5lb-ft)



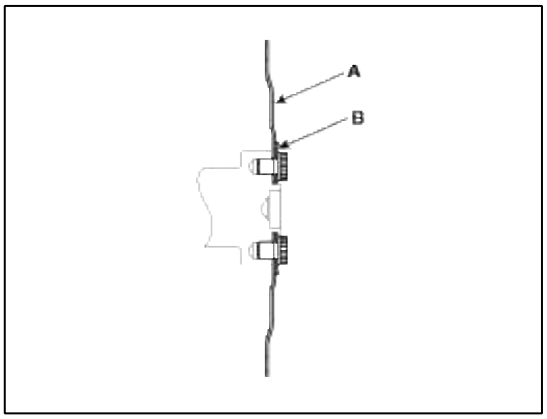
19. Install the oil level gauge tube(A).
    (1) Install a new O-ring on the oil level gauge tube.
    (2) Apply engine oil on the O-ring.
    (3) Install the oil level gauge tube(A) with the bolt.

Tightening torque :
11.8 ~ 14.7N.m (1.2 ~ 1.5kgf.m, 8.7 ~ 10.8lb-ft)



20. Install the cylinder head.
21. Install the timing belt.
22. Remove the engine stand.
23. A/T :install the drive plate.

Tightening torque :
117.7 ~ 127.5N.m (12.0 ~ 13.0kgf.m, 86.8 ~ 94.0lb-ft)

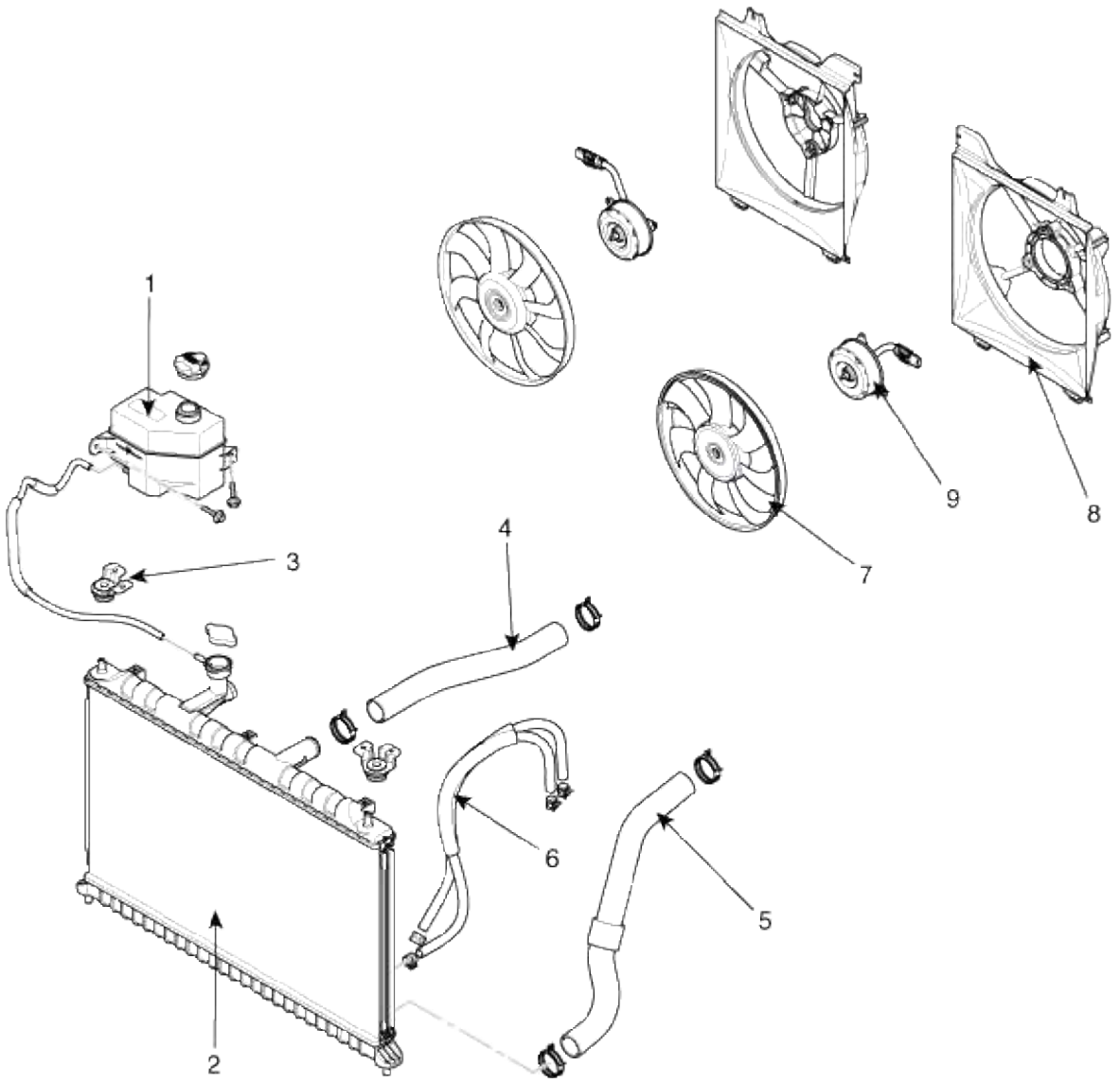


24. M/T :install the fly wheel.

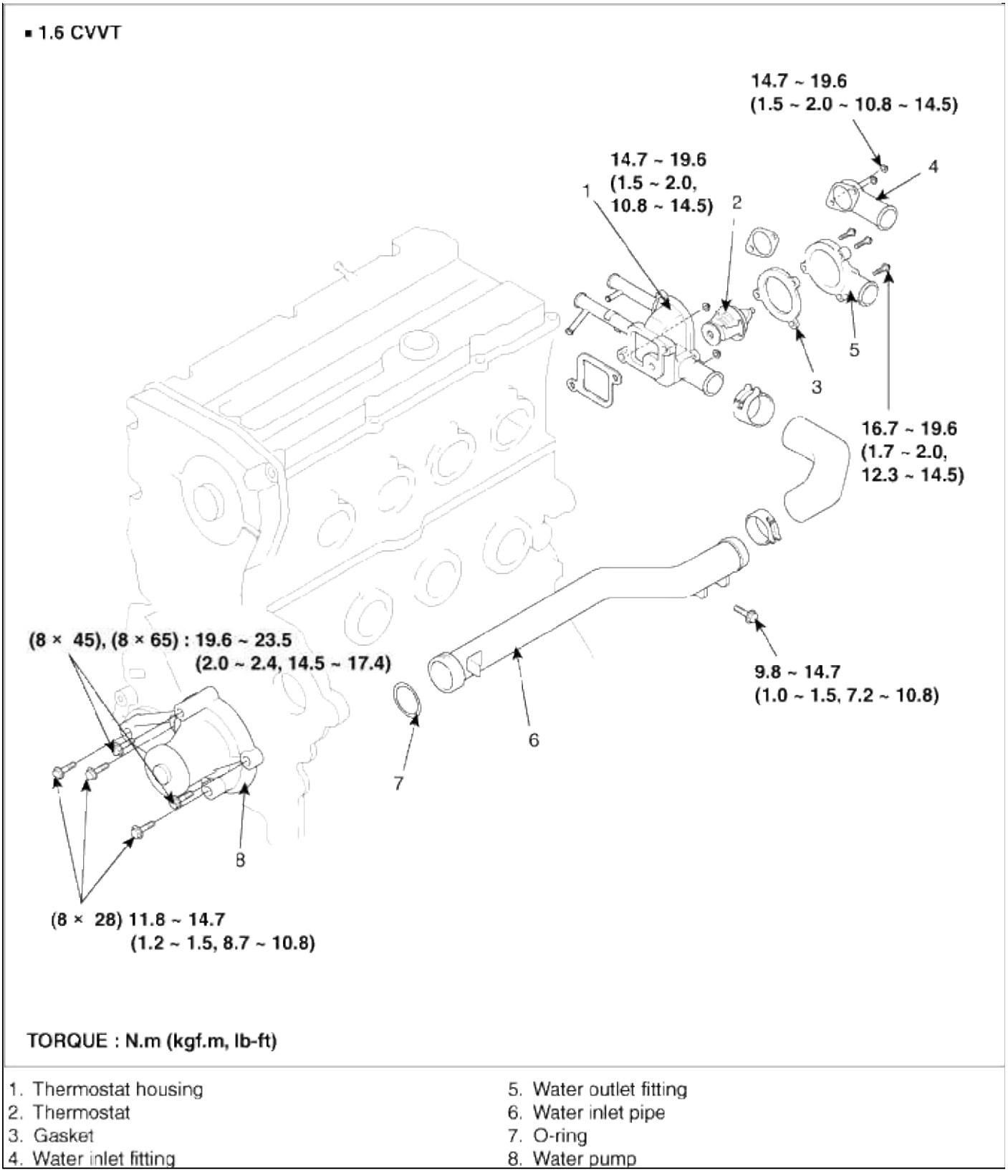
Tightening torque :
117.7 ~ 127.5N.m (12.0 ~ 13.0kgf.m, 86.8 ~ 94.0lb-ft)

Engine Mechanical System > Cooling System > Components and Components Location

Components



1. Coolant reservoir tank
2. Radiator
3. Radiator mounting bracket
4. Radiator upper hose
5. Radiator lower hose
6. ATF oil cooler hose
7. Cooling fan
8. Cooling fan shroud
9. Cooling fan motor



1. Thermostat housing
2. Thermostat
3. Gasket
4. Water inlet fitting
5. Water outlet fitting
6. Water inlet pipe
7. O-ring
8. Water pump

Engine Mechanical System > Cooling System > Repair procedures

Engine Coolant Refilling And Bleeding

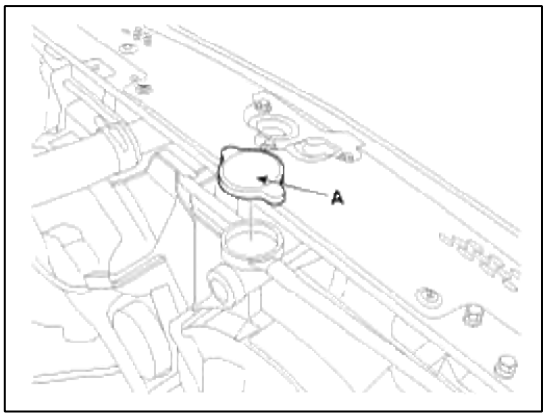
WARNING

Never remove the radiator cap when the engine is hot.
Serious scalding could be caused by hot fluid under high pressure escaping from the radiator.

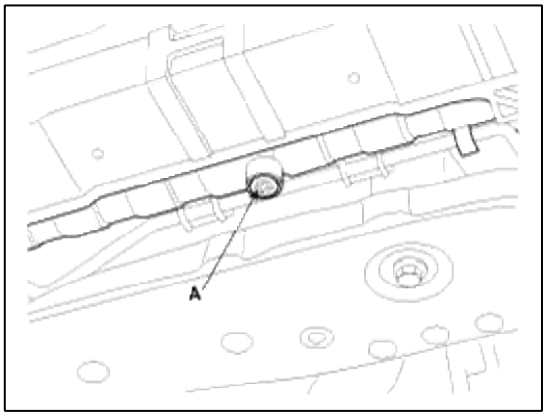
CAUTION

When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on the electrical parts of the paint. If any coolant spills, rinse it off immediately.

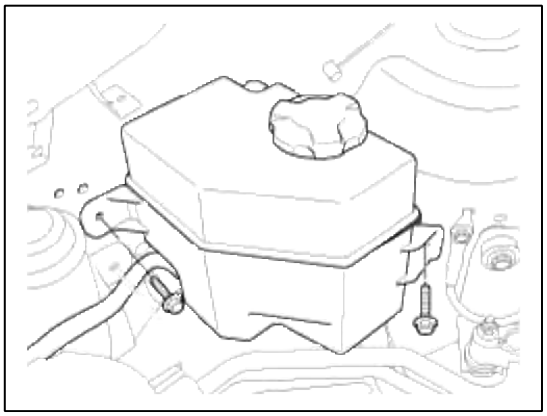
1. Slide the heater temperature control lever to maximum heat. Make sure the engine and radiator are cool to the touch.
2. Remove the radiator cap(A).



3. Loosen the drain plug(A), and drain the coolant.



4. Tighten the radiator drain plug(A) securely.
5. Remove the coolant reservoir tank. Drain the coolant and reinstall the coolant reservoir tank. Fill the coolant reservoir tank to the MAX mark with the coolant.



6. Fill the coolant into the radiator to the base of filler neck. Gently squeeze the upper/lower hoses of radiator so as to bleed air easily.

> NOTE
>
> - Mix the recommended antifreeze with an equal amount of water in a clean container.
> - Use only genuine antifreeze/coolant.
> - For best corrosion protection, the coolant concentration must be maintained year-round at 50% minimum. Coolant concentrations less than 50% may not provide sufficient protection against corrosion of freezing.
> - Coolant concentrations greater then 60% will impair cooling efficiency and are not recommended.

> CAUTION
>
> - Do not mix different brands of antifreeze/coolants.
> - Do not use additional rust inhibitors or antirust products; they may not be compatible with the coolant.

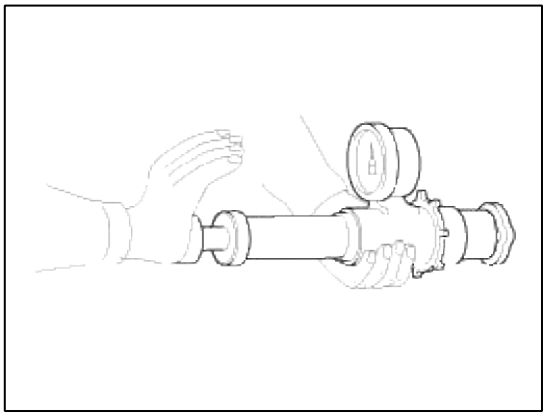
7. Start the engine and allow coolant to circulates.
   When the cooling fan operates and coolant circulates, refill coolant through the radiator filler neck.
8. Repeat step 7 until the cooling fan cycles on and off three to five times to sufficiently bleed air out of the cooling system.
9. Install the radiator cap and fill the reservoir tank to the "MAX" line with coolant.
10. Run the vehicle under idle until the cooling fan operates 2~3 times.
11. Stop the engine and allow coolant to cool.
12. Repeat steps 6 to 11 until the coolant level stays constant and all air is bleed out of the cooling system.

> NOTE
>
> Recheck the coolant level in the reservoir tank for 2~3 days after replacing coolant.

Coolant capacity :
5.5~5.8 liters(5.8~6.1 US qt, 4.8~5.1 lmp qt)

Radiator Cap Testing

1. Remove the radiator cap, wet the seal with coolant, then install it onto pressure tester.

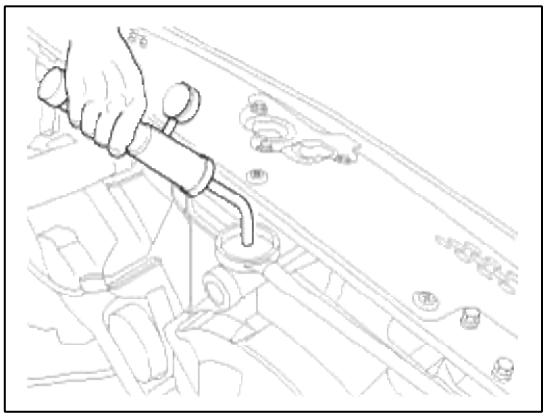


2. Apply a pressure of 93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm², 13.51 ~ 17.78psi)
3. Check for a drop in pressure.
4. If the pressure drops, replace the cap.

Radiator Leakge Test

1. Wait until engine is cool, then carefully remove the radiator cap and fill the radiator with engine coolant, then install it on the pressure tester.

2. Apply a pressure tester to the radiator and apply a pressure of 93.16 ~ 122.58kpa (0.95 ~ 1.25kg/cm², 13.51 ~ 17.78psi).



3. Inspect for engine coolant leaks and a drop in pressure.
4. Remove the tester and reinstall the radiator cap.

> NOTE
>
> Check for engine oil in the coolant and/or coolant in the engine oil.

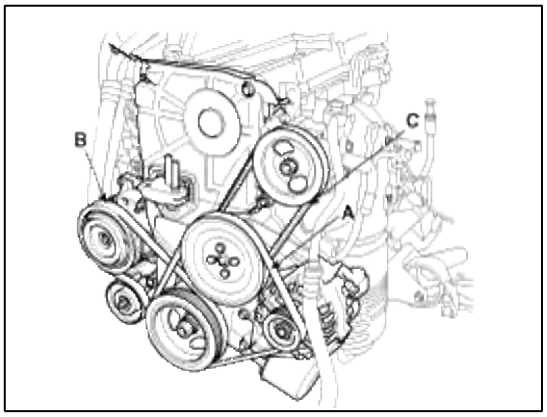
Removal

Water Pump

1. Drain the engine coolant.

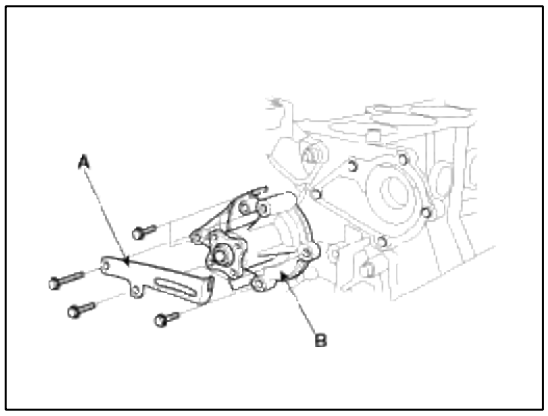
> WARNING
>
> System is under high pressure when the engine is hot.
> To avoid danger of releasing scalding engine coolant, remove the cap only when the engine is cool.

2. Loosen the water pump pulley bolts.
3. Remove the drive belts.



4. Remove the water pump pulley.
5. Remove the timing belt.
6. Remove the timing belt idler.

7. Remove the water pump.
   (1) Remove the 2 bolts and alternator brace(A).
   (2) Remove the 3 bolts and remove the water pump(B) and gasket.

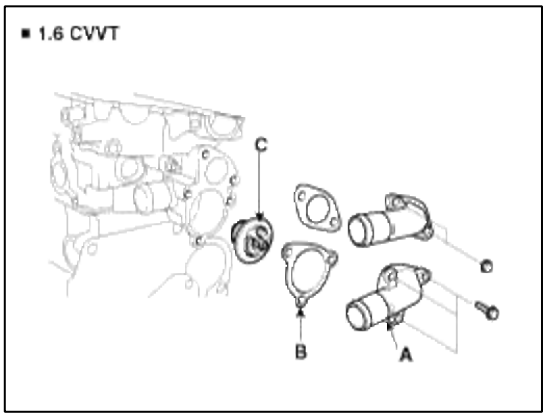


Thrmostat

NOTE

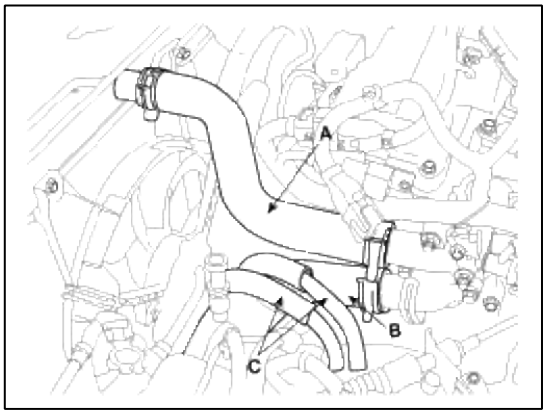
Disassembly of the thermostat would have an adverse effect, causing a lowering of cooling efficiency.

1. Drain the engine coolant so its level is below thermostat.
2. Remove the water inlet fitting(A), gasket(B) and thermostat(C).

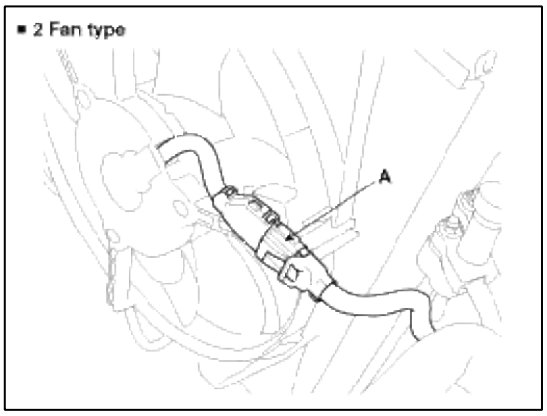


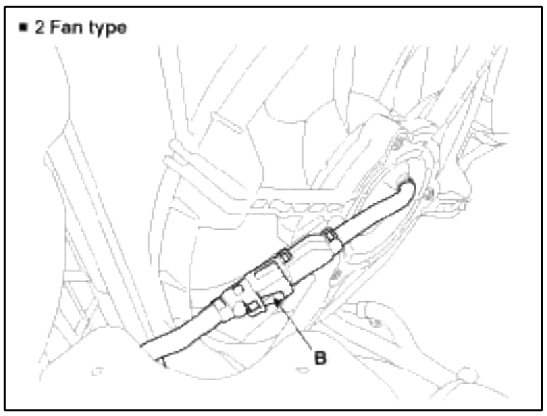
Radiator

1. Drain the engine coolant.
   Remove the radiator cap to speed draining.
2. Remove the upper radiator hose(A) and lower radiator hose(B).
3. Remove the ATF(Automatic Transaxle Fluid) oil cooler hoses(C). (A/T)

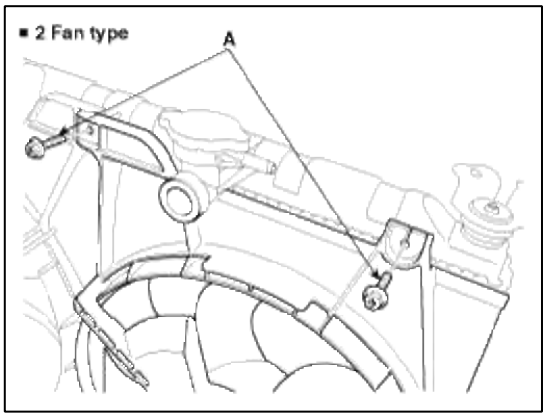


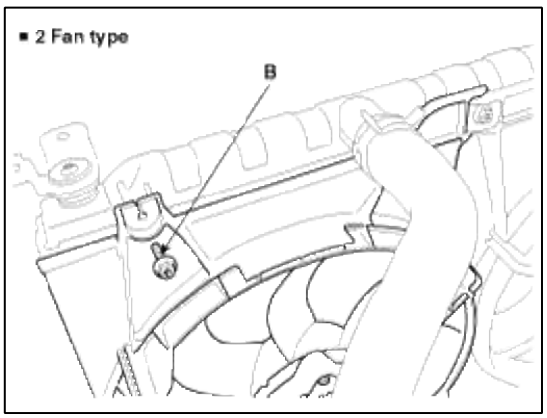
4. Disconnect the fan motor connector(A,B).



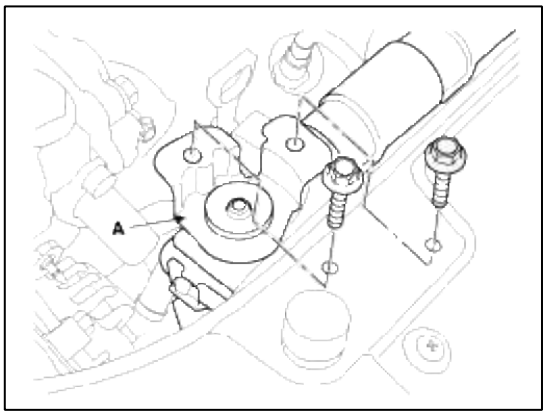


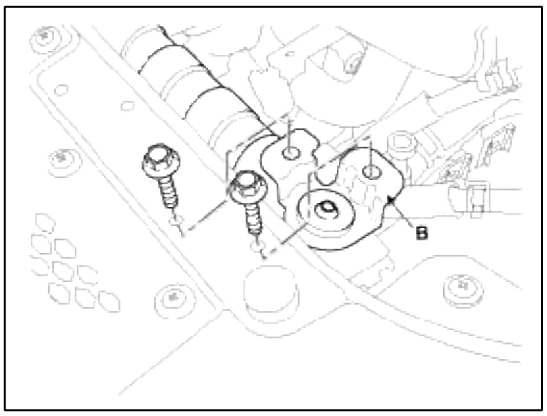
5. Remove the cooling fan mounting bolt(A,B) and remove cooling fan.





6. Remove the radiator upper bracket(A,B), then pull up the radiator.

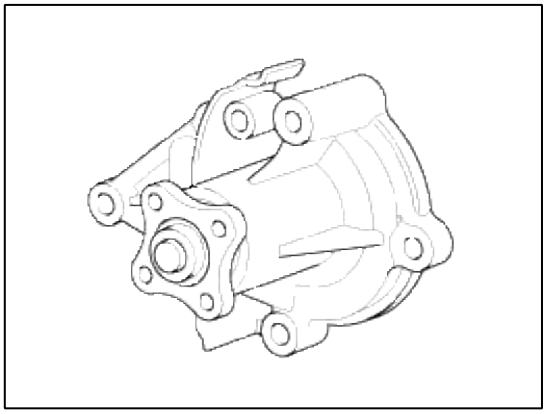




Inspection

Water Pump

1. Check each part for cracks, damage or wear, and replace the coolant pump assembly if necessary.
2. Check the bearing for damage, abnormal noise and sluggish rotation, and replace the coolant pump assembly if necessary.

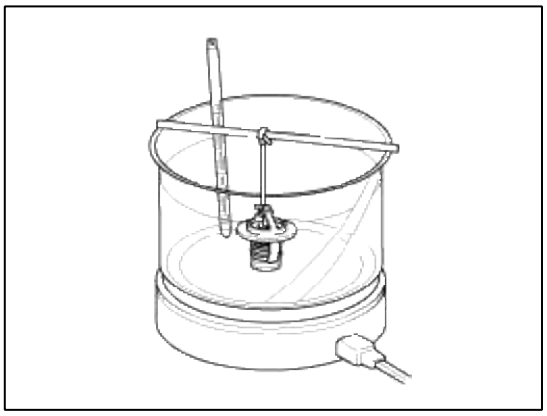


3. Check for coolant leakage. If coolant leaks from hole, the seal is defective. Replace the coolant pump assembly.

> NOTE
>
> A small amount of "weeping" from the bleed hole is normal.

Thermostat

1. Immerse the thermostat in water and gradually heat the water.



2. Check the valve opening temperature.

Valve opening temperature : 82±1.5°C (179.6±2.7°F)
Full opening temperature : 95°C (203°F)

If the valve opening temperature is not as specified, replace the thermostat.

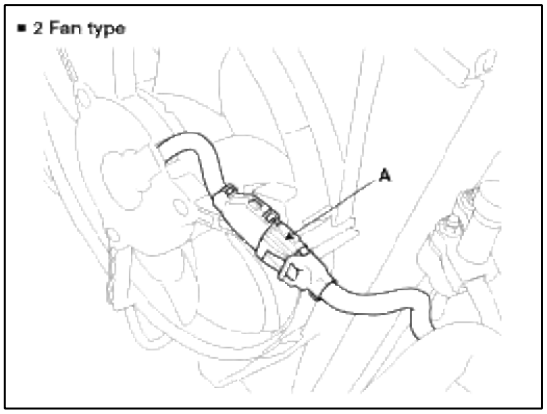
3. Check the valve lift.

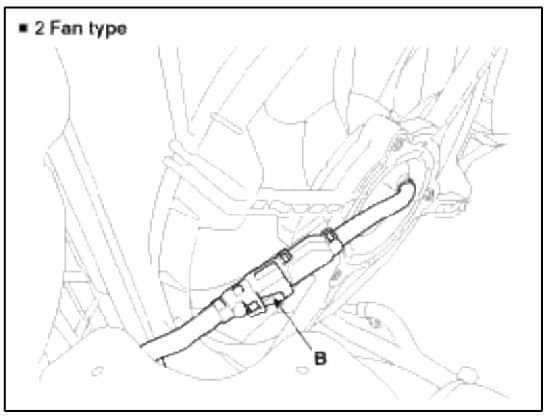
Valve lift : 8mm(0.3in) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermostat.

Cooling Fan

1. Disconnect the cooling fan motor connector.





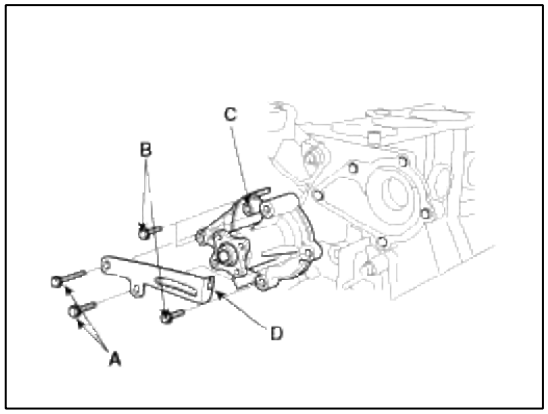
2. Check that the radiator fan rotates when battery voltage is applied between (+) and (-) terminals.

Installation

Water Pump

1. Install the water pump.
   (1) Install the water pump(C) and a new gasket with the 3 bolts(B).

Tightening torque :
11.8 ~ 14.7N.m (1.2 ~ 1.5kgf.m, 8.7 ~ 10.8lb-ft)



   (2) Install the alternator brace(D) with the 2 bolts(A).

Tightening torque :
19.6 ~ 23.5N.m (2.0 ~ 2.4kgf.m, 14.5 ~ 17.4lb-ft)

2. Install the timing belt idler.
3. Install the timing belt.
4. Install the water pump pulley.
5. Install the drive belts.
6. Tighten the water pump pulley bolts.

Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

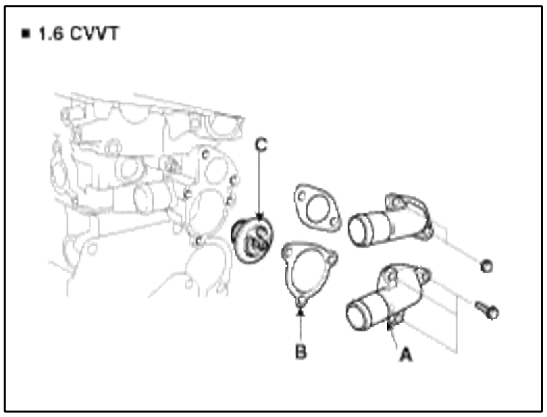
7. Fill with engine coolant.
8. Start engine and check for leaks.
9. Recheck engine coolant level.

Thermostat

1. Place the thermostat in thermostat housing.
   (1) Install the thermostat(B) with the jiggle valve upward.
   (2) Install a new gasket(A) to the thermostat(B).

2. Install the water inlet fitting(A).

Tightening torque :
14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.5lb-ft)

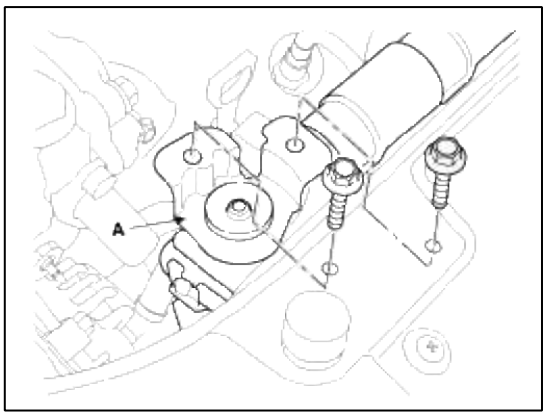


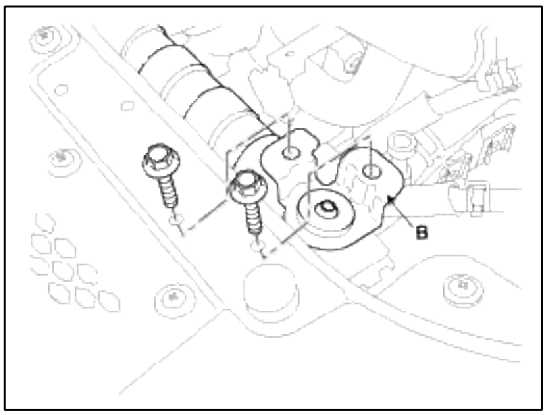
3. Fill with engine coolant.
4. Start engine and check for leaks.

Radiator

1. Install the radiator.
2. Install the radiator upper bracket(A,B).

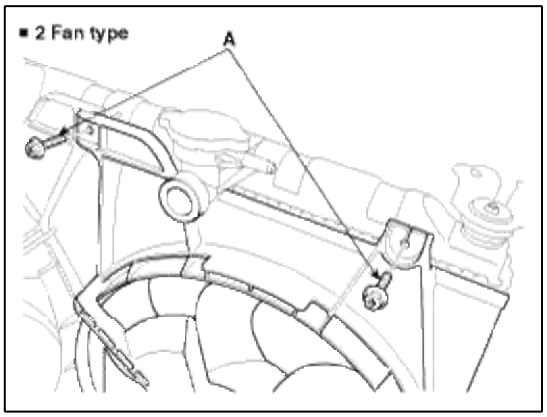
Tightening torque :
6.9 ~ 10.8N.m (0.7 ~ 1.1kgf.m, 5.1 ~ 8.0lb-ft)

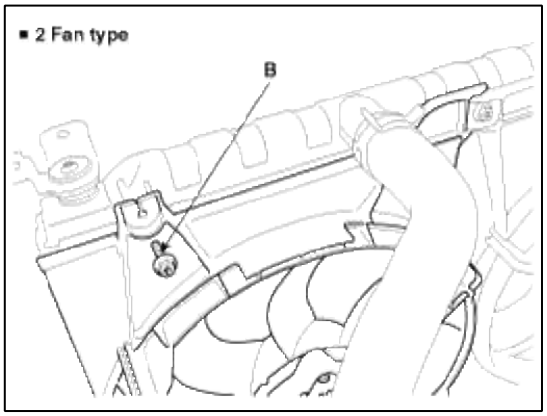




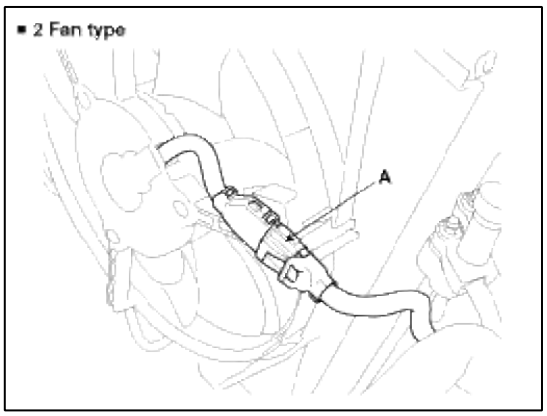
3. Install the cooling fan mounting bolts(A,B).

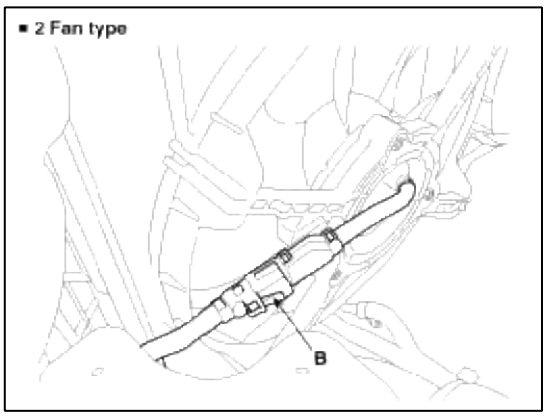
Tightening torque :
6.9 ~ 10.8N.m (0.7 ~ 1.1kgf.m, 5.1 ~ 8.0lb-ft)





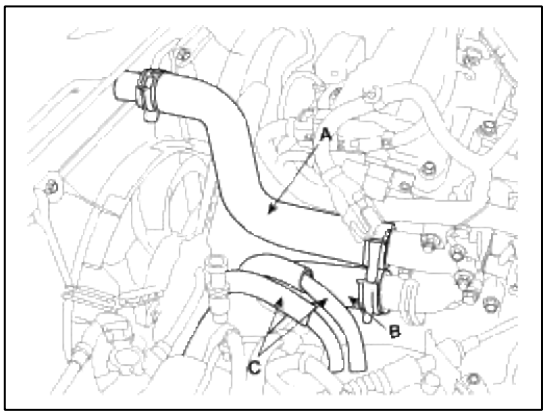
4. Connect the fan motor connector(A,B).





5. Install the upper radiator hose(A) and lower radiator hose(B).

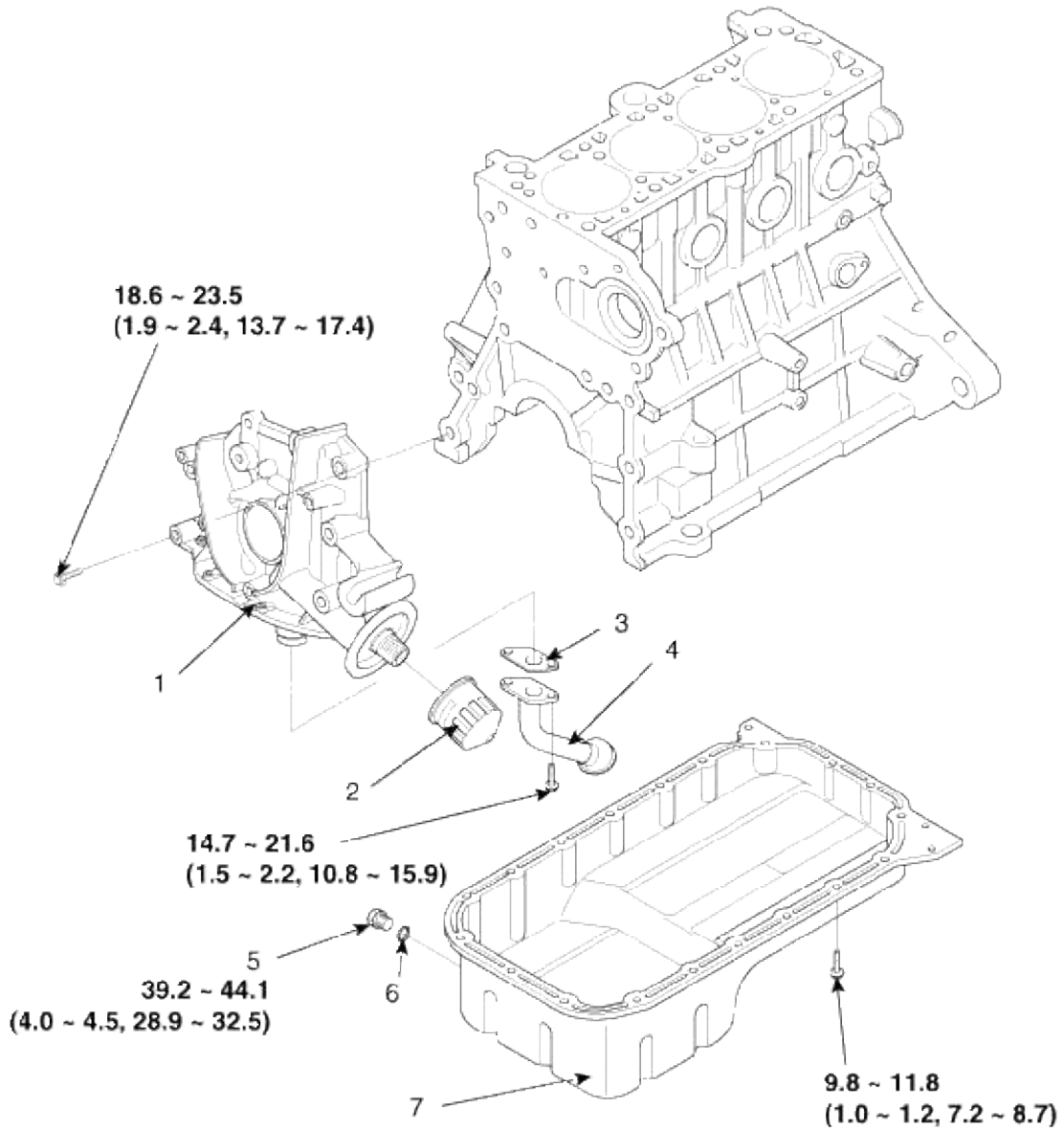
6. Install the ATF(Automatic Transaxle Fluid) oil cooler hoses(C).



7. Fill with engine coolant.
8. Start engine and check for leaks.

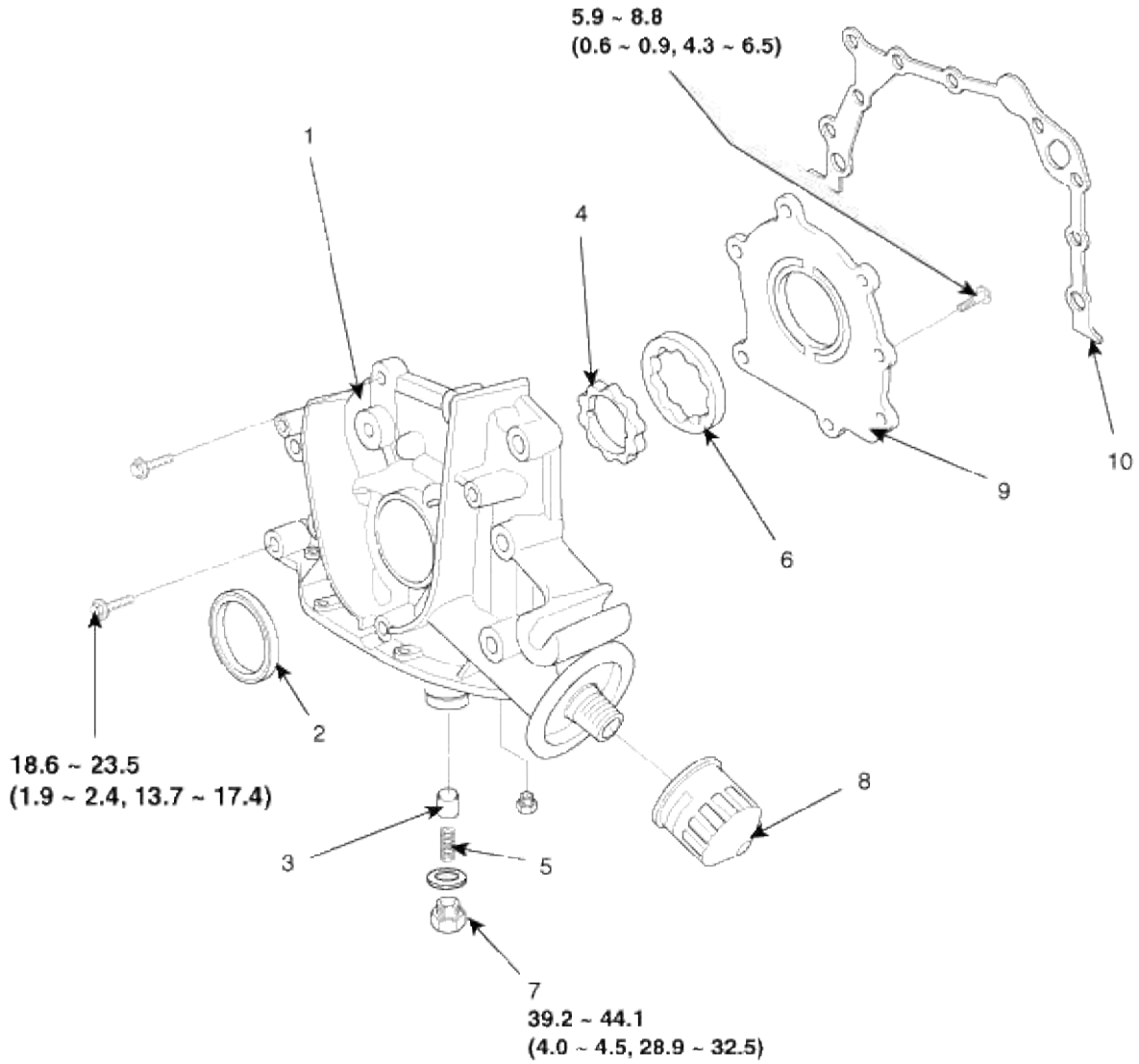
Engine Mechanical System > Lubrication System > Components and Components Location

Components



TORQUE : N.m (kgf.m, lb-ft)

1. Front case
2. Filter
3. Gasket
4. Oil screen
5. Drain plug
6. Gasket
7. Oil pan



1. Front case
2. Oil seal
3. Relief plunger
4. Inner rotor
5. Relief spring
6. Outer rotor
7. Plug
8. Oil filter
9. Pump cover
10. Gasket

Engine Mechanical System > Lubrication System > Repair procedures

Oil And Filter Replacement

CAUTION

- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water-less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.

1. Drain the engine oil.
   (1) Remove the oil filler cap.
   (2) Remove the oil drain plug, and drain the oil into a container.
2. Replace the oil filter.
   (1) Remove the oil filter.
   (2) Check and clean the oil filter installation surface.
   (3) Check the part number of the new oil filter is as same as old one.
   (4) Apply clean engine oil to the gasket of a new oil filter.
   (5) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
   (6) Tighten it an additional 3/4 turn.
3. Refill with engine oil.
   (1) Clean and install the oil drain plug with a new gasket.

   Tightening torque :
   39.2 ~ 44.1N.m (4.0 ~ 4.5kgf.m, 28.9 ~ 32.5lb-ft)

   (2) Fill with fresh engine oil.

   Oil Capacity
   Total : 3.8 L (4.01 US qts, 3.34 lmp qts)
   Oil pan : 3.0 L (3.17 US qts, 2.63 lmp qts)
   Drain and refill including oil filter : 3.3 L (3.48 US qts, 2.90 lmp qts)
   Oil quality : Above API SJ/SL or SAE 5W-20

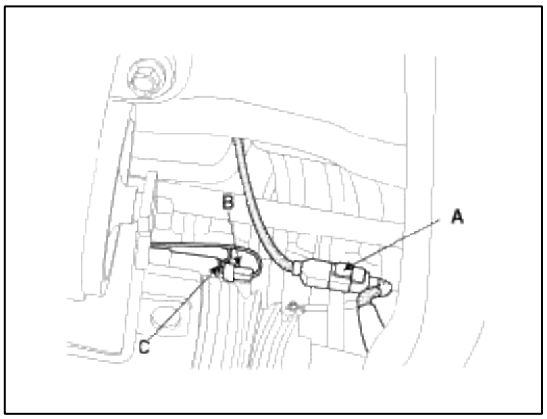
   (3) Install the oil filler cap.
4. Start engine and check for oil leaks.
5. Recheck the engine oil level.

Removal

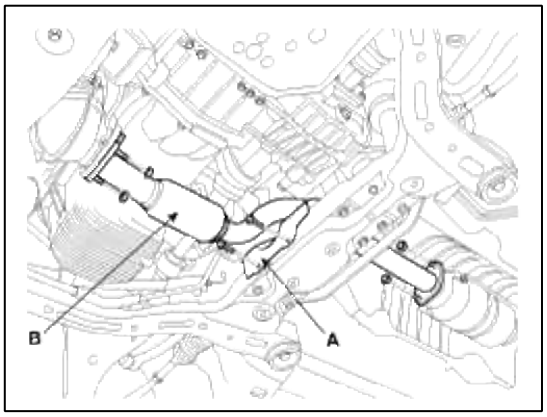
Oil Pan

1. Drain the engine oil.

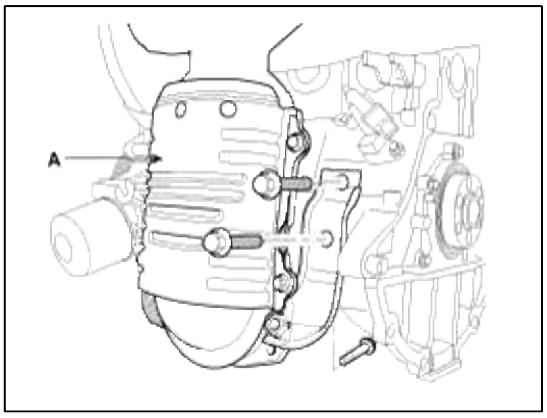
2. Disconnect the rear oxygen sensor connector(A).



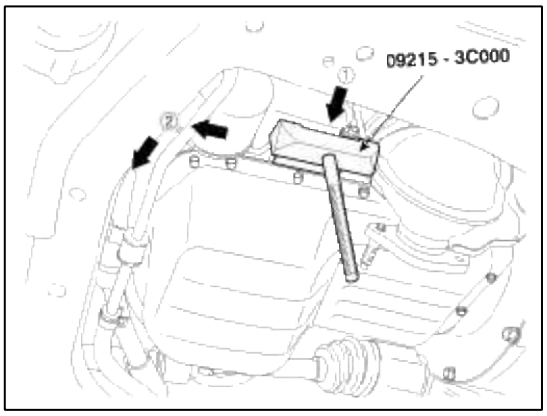
3. Remove the front muffler heat protector(A)
4. Remove the front muffler(B).



5. Remove the exhaust manifold and catalytic converter assembly(A).



6. Using the SST(09215-3C000) and remove the oil pan.

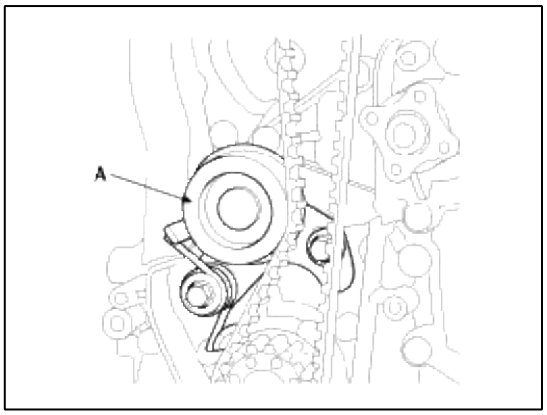


CAUTION

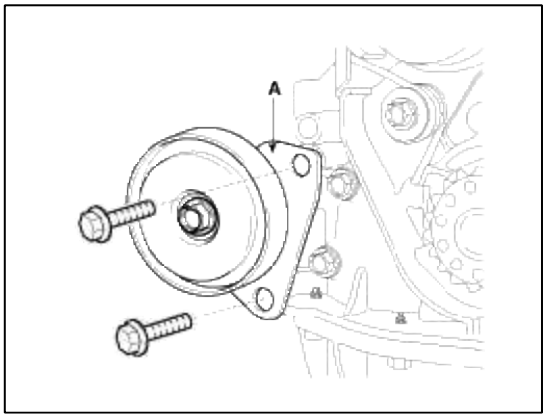
- Insert the SST between the oil pan and the ladder frame by tapping it with a plastic hammer in the direction of ① arrow.
- After tapping the SST with a plastic hammer along the direction of ② arrow around more than 2/3 edge of the oil pan, remove it from the ladder frame.
- Do not turn over the SST abruptly without tapping. It can be result in damage of the SST.

Oil Pump

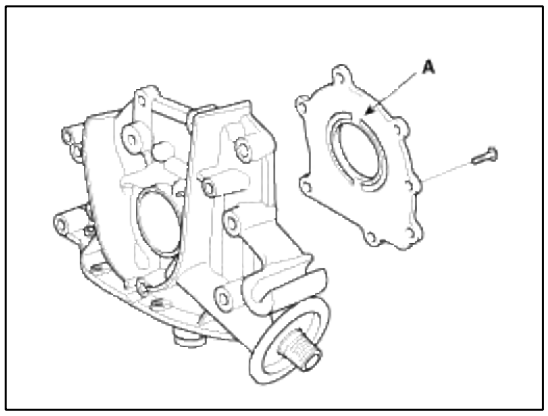
1. Drain the engine oil.
2. Remove the drive belts.
3. Turn the crankshaft pulley, and align its groove with timing mark "T" of the timing belt cover.
4. Remove the timing belt.
5. Remove the timing belt tensioner(A).



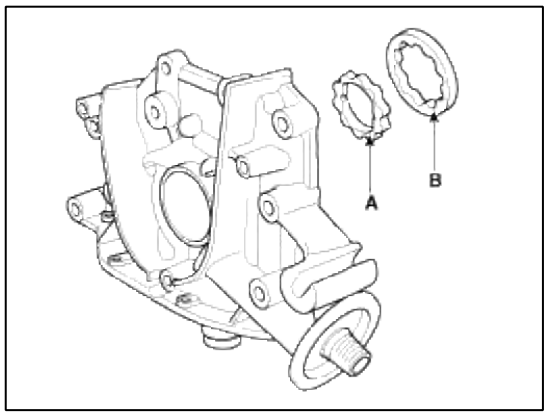
6. Remove the oil pan and oil screen.
7. Remove the alternator. (Refer to Alternator in EE Group).
8. Remove the air conditioner compressor tensioner bracket(A).



9. Remove the front case.
   (1) Remove the screw from the pump housing, then separate the housing and cover(A).



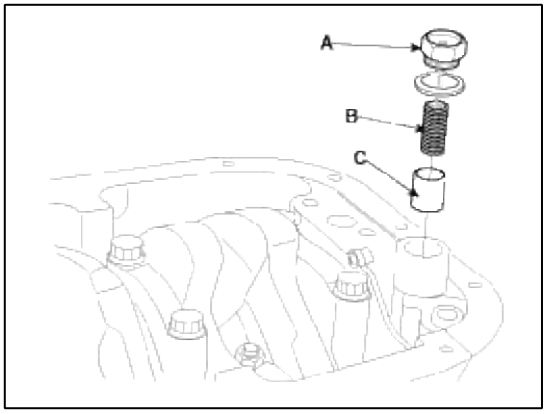
   (2) Remove the inner rotor(A) and outer rotor(B).



Disassembly

Relief Plunger

1. Remove the relief plunger.
   Remove the plug(A), spring(B) and relief plunger(C).



Inspection

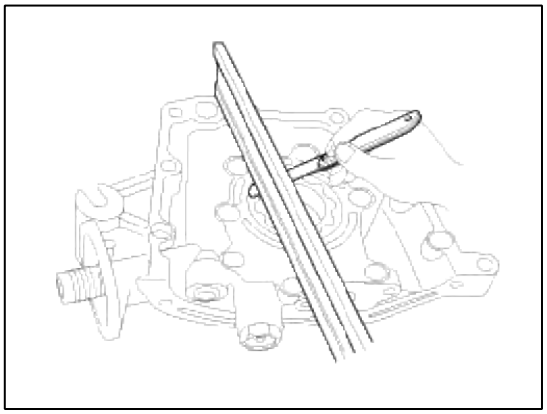
1. Inspect the relief plunger.
   Coat the plunger with engine oil and check that it falls smoothly into the plunger hole by its own weight.
   If it does not, replace the relief plunger. If necessary, replace the front case.

2. Inspect the relief valve spring.
   Inspect for distorted or broken relief valve spring.

Standard value
Free height : 46.6mm (1.8346in)
Load : 6.1±0.4kg/40.1mm (13.4±0.9 lb/1.5787in)

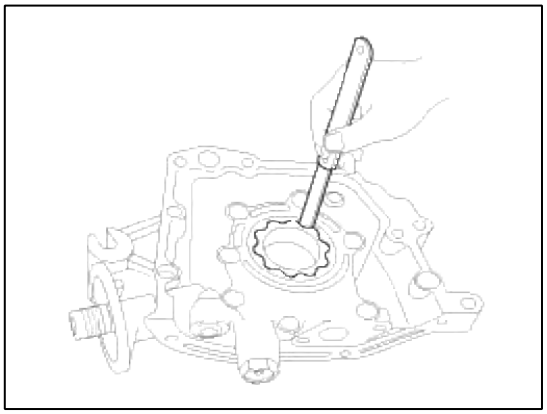
3. Inspect the rotor side clearance.
   Using a feeler gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Side clearance	Inner rotor	0.04 ~ 0.085mm (0.0016 ~ 0.0033in)
	Outer rotor	0.04 ~ 0.09mm (0.0016 ~ 0.0035in)



   If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the front case.
4. Inspect the rotor tip clearance.
   Using a feeler gauge, measure the tip clearance between the inner and outer rotor tips.

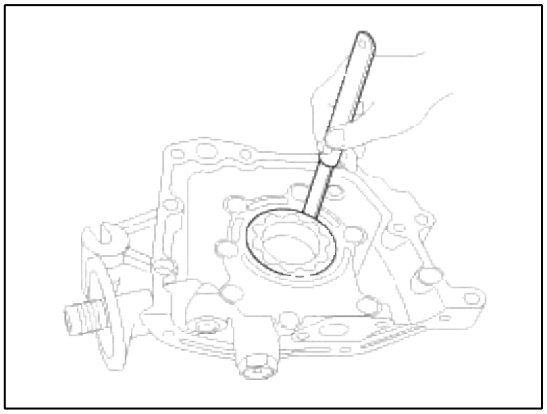
Tip clearance
0.025 ~ 0.069mm (0.0010 ~ 0.0027in)



   If the tip clearance is greater than specified, replace the rotors as a set.

5. Inspect the rotor body clearance.
   Using a feeler gauge, measure the clearance between the outer rotor and body.

Body clearance
0.060 ~ 0.090mm (0.0024 ~ 0.0035in)



If the body clearance is greater than specified, replace the rotors as a set. If necessary, replace the front case.

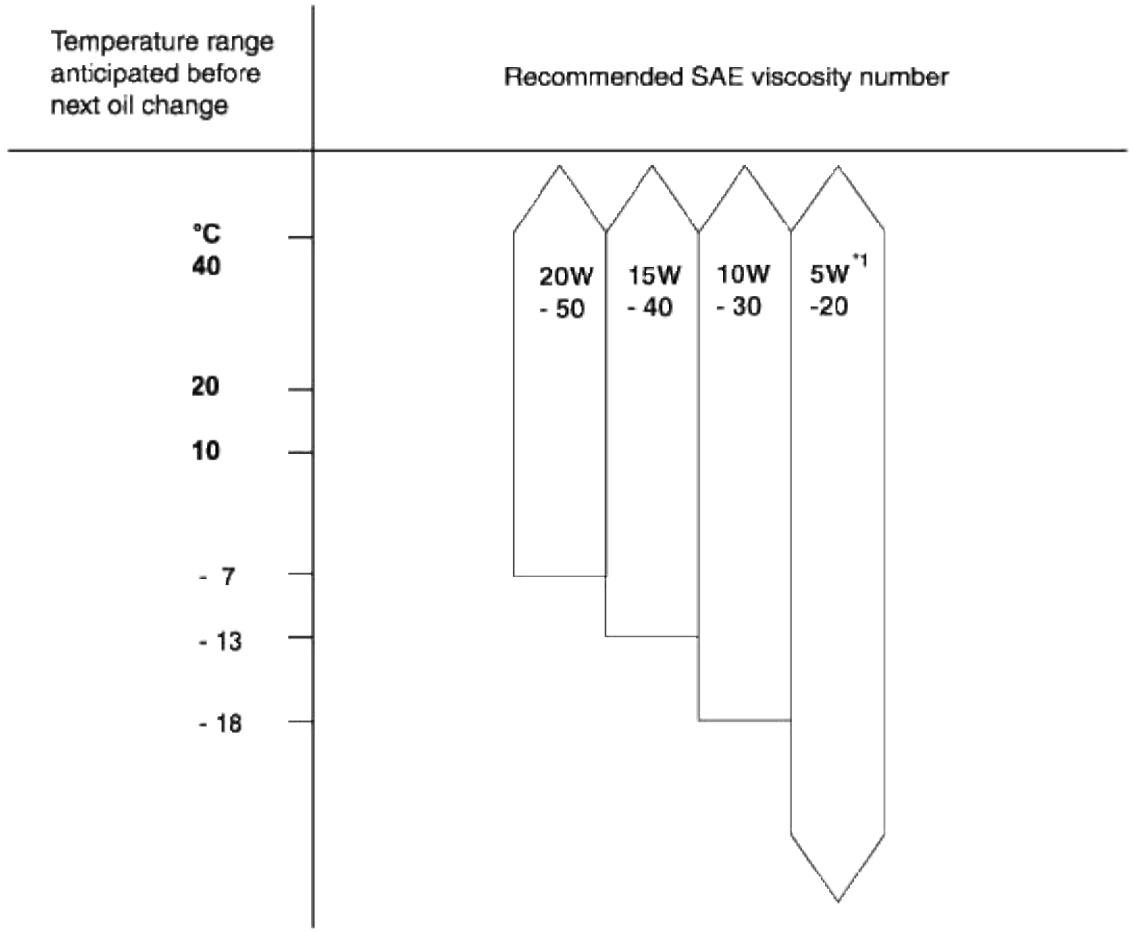
Engine Oil

1. Check the engine oil quality.
   Check the oil deterioration, entry of water, discoloring of thinning.
   If the quality is visibly poor, replace the oil.
2. Check the engine oil level.
   After warning up the engine and then 5 minutes after the engine stop, oil level should be between the "L" and "F" marks in the dipstick.
   If low, check for leakage and add oil up to the "F" mark.

NOTE

Do not fill with engine oil above the "F" mark.

Selection Of Engine Oil
Recommended ILSAC classification : GF3 OR ABOVE
Recommended API classification : SJ / SL OR ABOVE
Recommended SAE viscosity grades :



*1 : Recommended regardless of environment.
If not available, refer to the recommended SAE viscosity numbers.

NOTE

For best performance and maximum protection of all types of operation, select only those lubricants which :

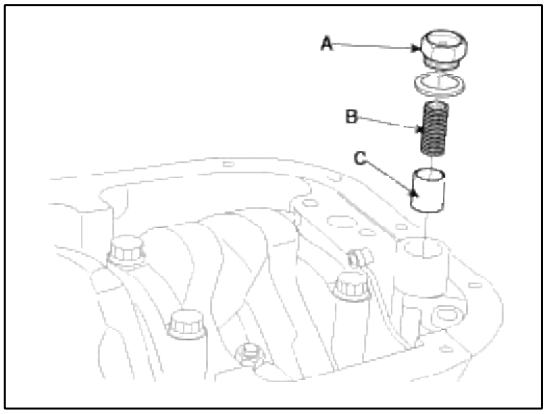
1. Satisfy the requirement of the API classification.
2. Have proper SAE grade number for expected ambient temperature range.
3. Lubricants that do not have both an SAE grade number and API service classification on the container should not be used.

Reassembly

Relief Plunger

1. Install the relief plunger.
   Install relief plunger(C) and spring(B) into the front case hole, and install the plug(A).

Tightening torque :
39.2 ~ 49.0N.m (4.0 ~ 5.0kgf.m, 28.9 ~ 36.2lb-ft)

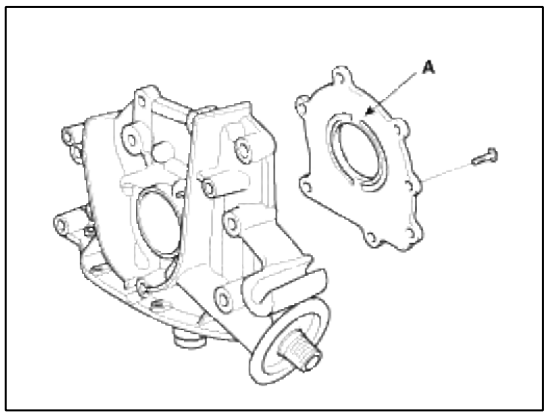


Installation

Oil Pump

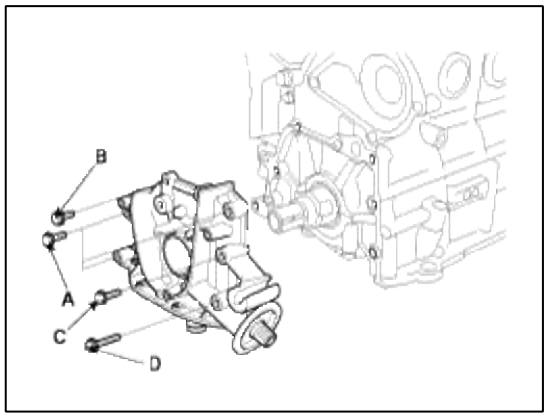
1. Install the oil pump.
   (1) Place the inner and outer rotors into front case with the marks facing the oil pump cover side.
   (2) Install the oil pump cover(A) to front case with the 7 screws.

Tightening torque :
5.9 ~ 6.9N.m (0.6 ~ 0.7kgf.m, 4.3 ~ 5.1lb-ft)



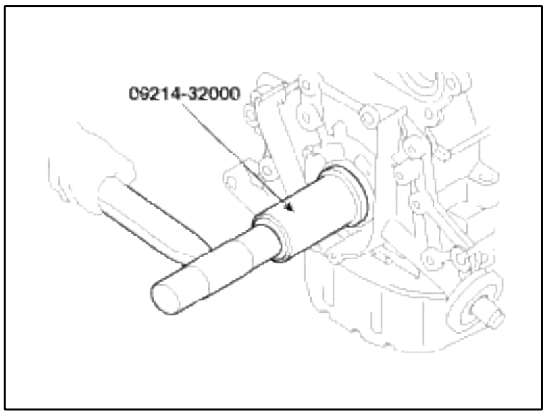
2. Check that the oil pump turns freely.

3. Install the oil pump on the cylinder block.
   (1) Place a new front case gasket on the cylinder block.
   (2) Apply engine oil to the lip of the oil pump seal. Then, install the oil pump onto the crankshaft.
   (3) When the pump is in place, clean any excess grease off the crankshaft and check that the oil seal lip is not distorted.

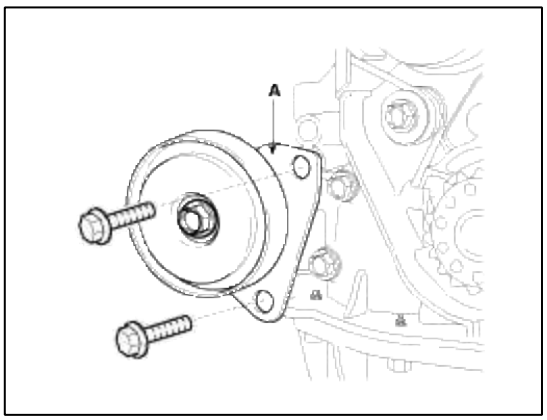


Bolt length
(A) : 30mm (1.181in), (B) : 22mm (0.866in),
(C) : 45mm (1.772in), (D) : 60mm (2.362in)
Tightening torque :
18.6 ~ 23.5N.m (1.9 ~ 2.4kgf.m, 13.7 ~ 17.4lb-ft)

4. Apply a light coat of oil to the front case oil seal lip.
5. Using the SST(09214-32000),install the front case oil seal.



6. Install the air conditioner compressor tensioner bracket (A).



7. Install the alternator. (Refer to Alternator in EE Group).

8. Install the oil screen.

Tightening torque :
14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lb-ft)

9. Install the oil pan.

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

NOTE

Clean the oil pan gasket mating surfaces.

10. Install the timing belt tensioner.
11. Install the timing belt.
12. Install the drive belts.
13. Fill with engine oil.

Oil Pan

1. Install the oil pan.
   (1) Using a razor blade and gasket scraper, remove all the old packing material from the gasket surfaces.

NOTE

Check that the mating surfaces are clean and dry before applying liquid gasket.

   (2) Apply liquid gasket as an even bead, centered between the edges of the mating surface.

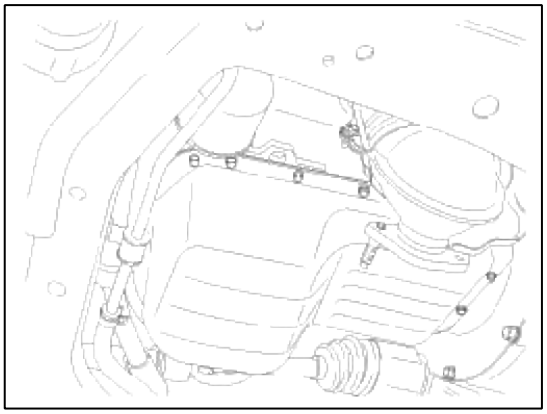
Liquid gasket : TB1217H or equivalent

NOTE

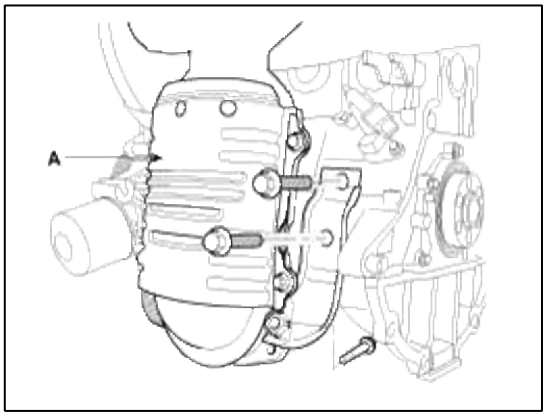
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

(3) Install the oil pan(A) with the bolts.
Uniformly tighten the bolts in several passes.

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



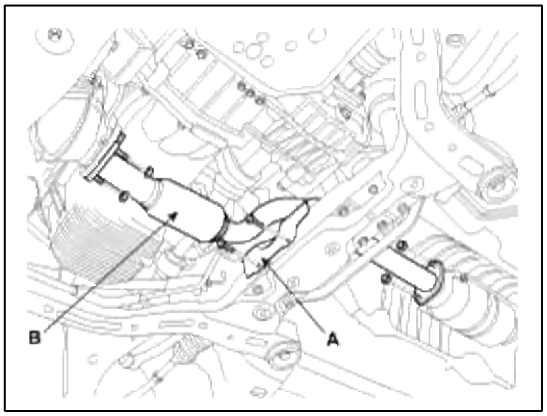
2. Install the exhaust manifold and catalytic converter assembly(A).



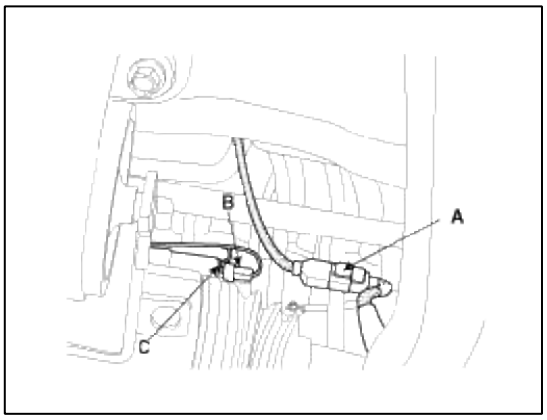
3. Install the front muffler(B).

Tightening torque :
29.4 ~ 39.2N.m (3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)

4. Install the front muffler heat protector(A).



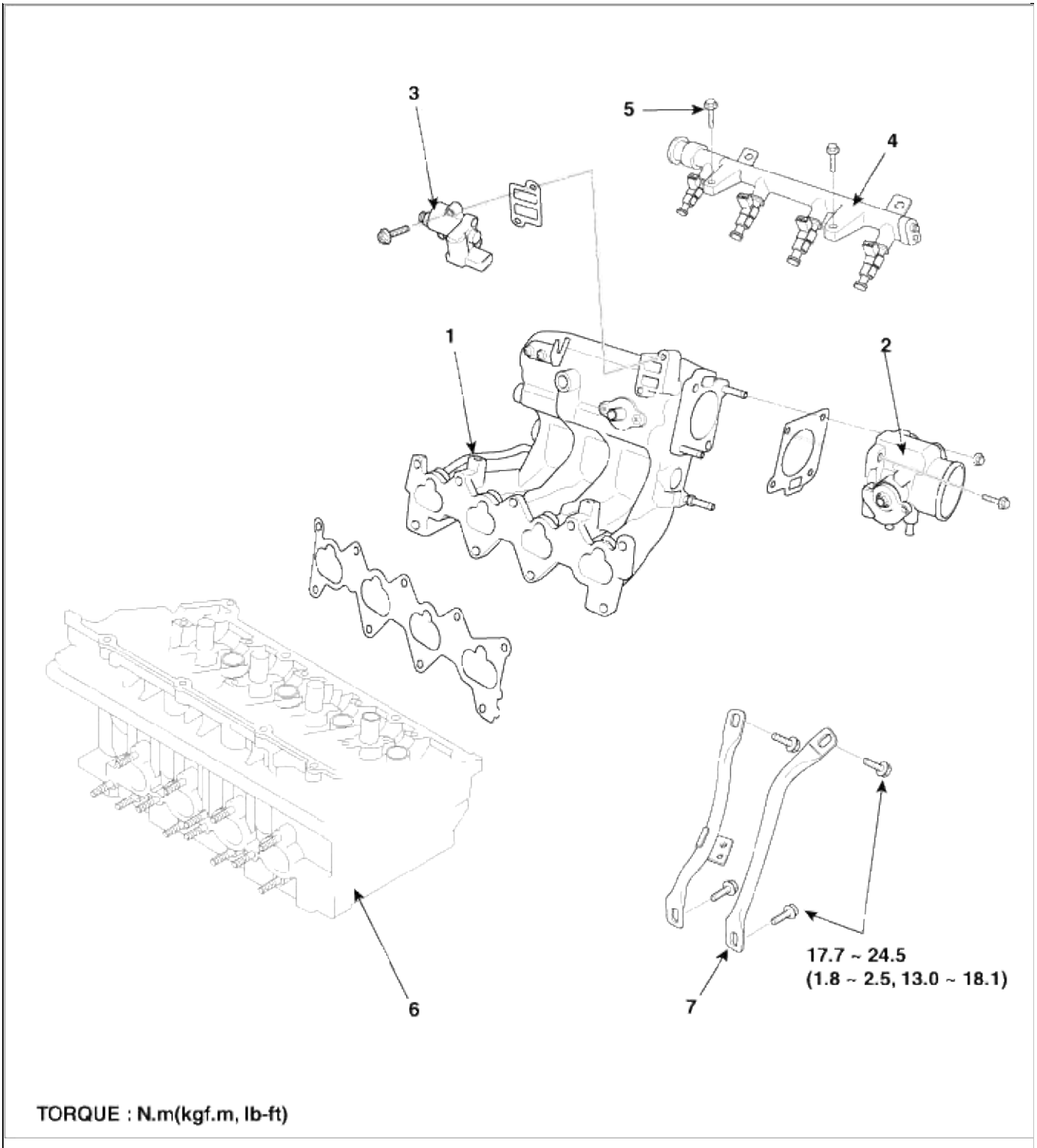
5. Connect the rear oxygen sensor connector(A).



6. Fill with engine oil

Engine Mechanical System > Intake And Exhaust System > Intake Manifold > Components and Components Location

Components



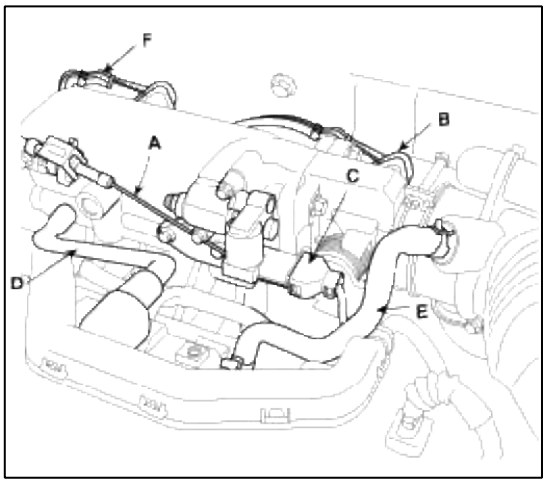
1. Intake manifold
2. Throttle body
3. ISA(Idle Speed Actuator)
4. Delivery pipe
5. Gasket
6. Cylinder head
7. Intake manifold stay

Engine Mechanical System > Intake And Exhaust System > Intake Manifold > Repair procedures

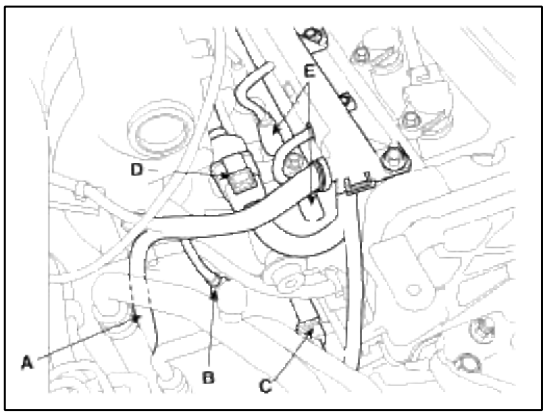
Removal

1. Remove the engine cover.
2. Remove the accelerator cable(A).
3. Disconnect the TPS (Throttle Position Sensor) connector (B) and the MAP sensor connector(F).
4. Disconnect the ISA(Idle Speed Actuator) connector(B).

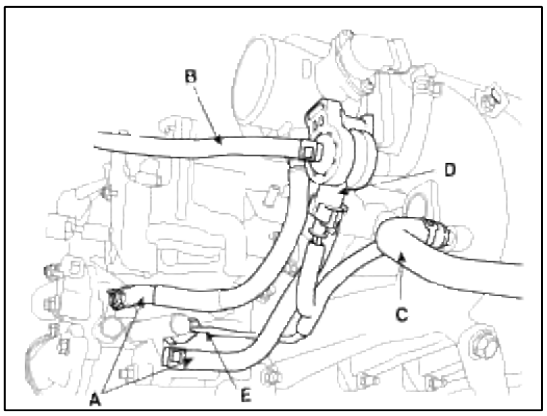
5. Disconnect the PCV(Positive Crankcase Ventilation) hose(D) and breather hose(E).



6. Disconnect the injector connector (No. 3, 4) (A).
7. Disconnect the injector connector (No. 1, 2) (B).

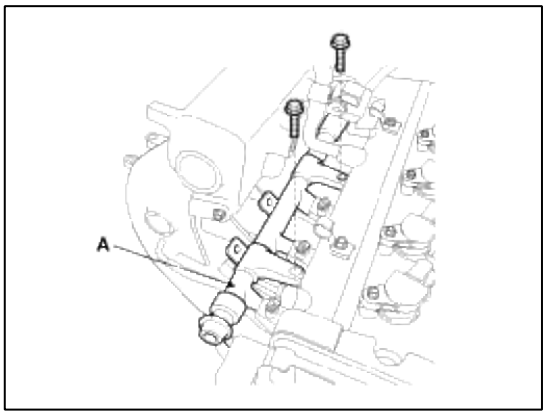


8. Remove the heater hose(A), PCSV(Purge Control Solenoid Valve)(B) and the brake vacuum hose(C) from throttle body and intake manifold.
9. Disconnect the PCSV(Purge Control Solenoid Valve) (D) and water temperature sensor connector(E).



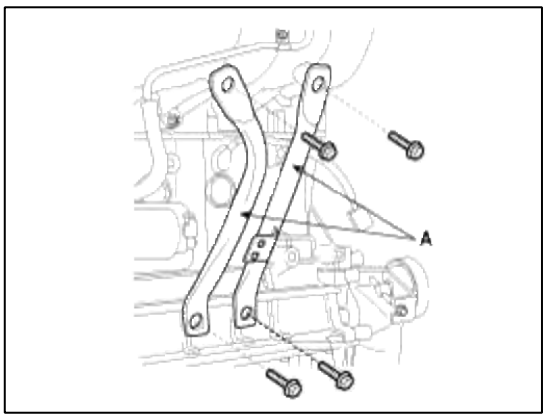
10. Remove the delivery pipe(A).

Tightening torque :
18.6 ~ 27.5N.m (1.9 ~ 2.8kgf.m, 13.7 ~ 20.3lb-ft)



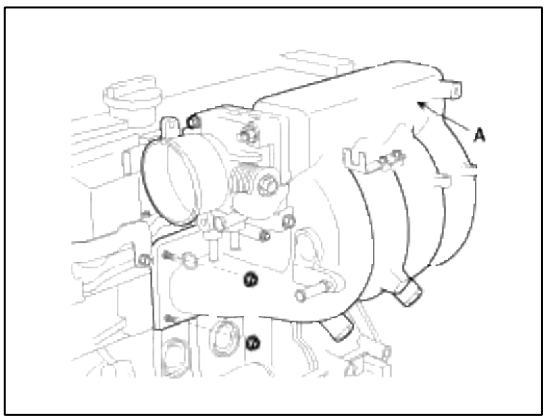
11. Remove the intake manifold stay(A).

Tightening torque :
17.7 ~ 24.5N.m (1.8 ~ 2.5kgf.m, 13.0 ~ 18.1lb-ft)



12. Remove the intake manifold.

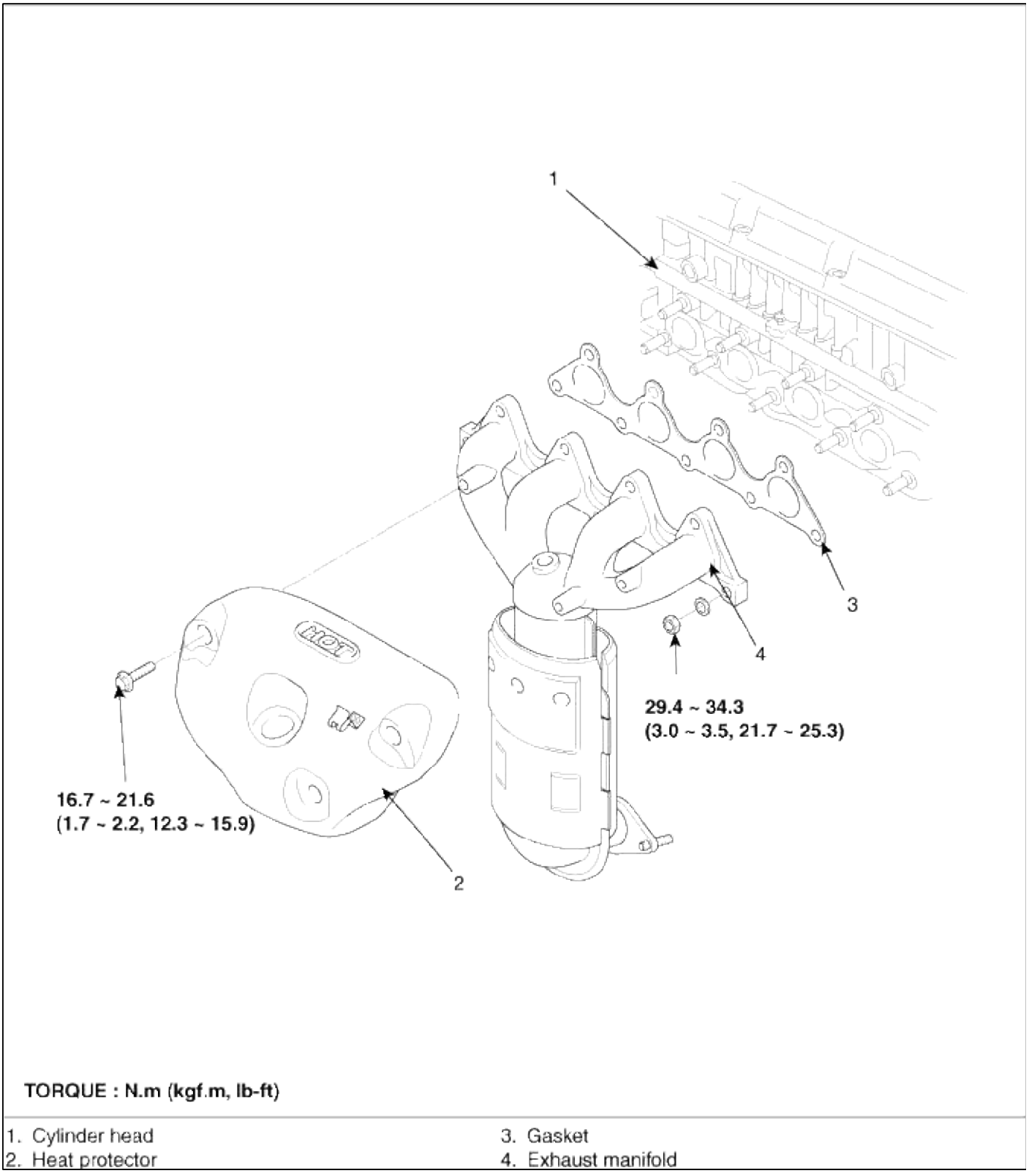
Tightening torque :
14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.5lb-ft)



13. Installation is in the reverse order of removal with new gasket.

Engine Mechanical System > Intake And Exhaust System > Exhaust Manifold > Components and Components Location

Components



1. Cylinder head
2. Heat protector
3. Gasket
4. Exhaust manifold

Engine Mechanical System > Intake And Exhaust System > Exhaust Manifold > Repair procedures

Removal

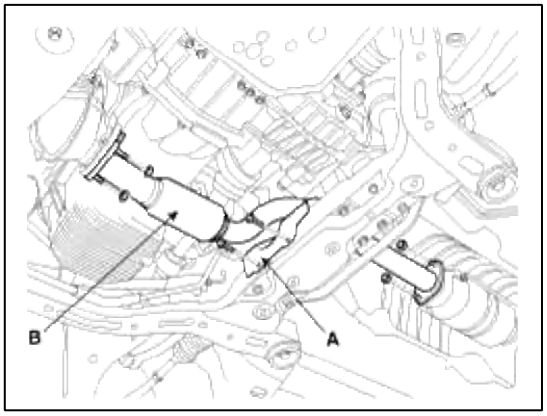
1. Remove the engine cover.
2. Disconnect the front oxygen sensor connector.

3. Remove the front muffler heat protector(A).

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

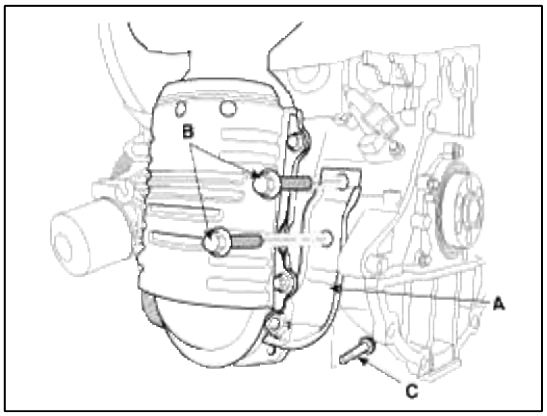
4. Remove the front muffler(B).

Tightening torque :
29.4 ~ 39.2N.m (3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)



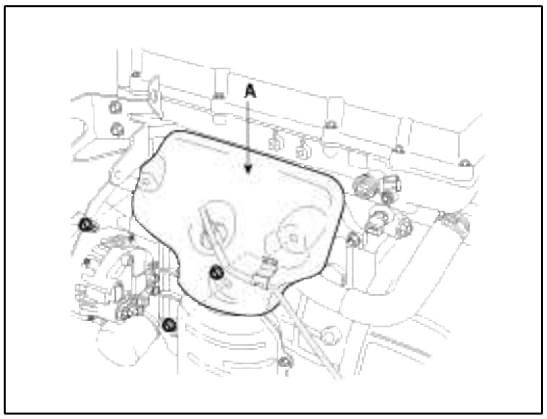
5. Remove the stay(A) of the exhaust manifold and catalytic converter assembly .

Tightening torque :
Bolts(B) :
34.3 ~ 39.2N.m (3.5 ~ 5.5kgf.m, 25.3 ~ 28.9lb-ft)
Bolts(C) :
29.4 ~ 39.2N.m (3.0 ~ 5.5kgf.m, 21.7 ~ 28.9lb-ft)



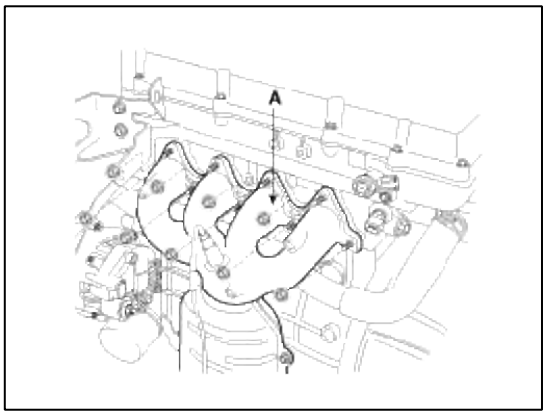
6. Remove the heat protector(A).

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



7. Remove the exhaust manifold and catalytic converter assembly(A).

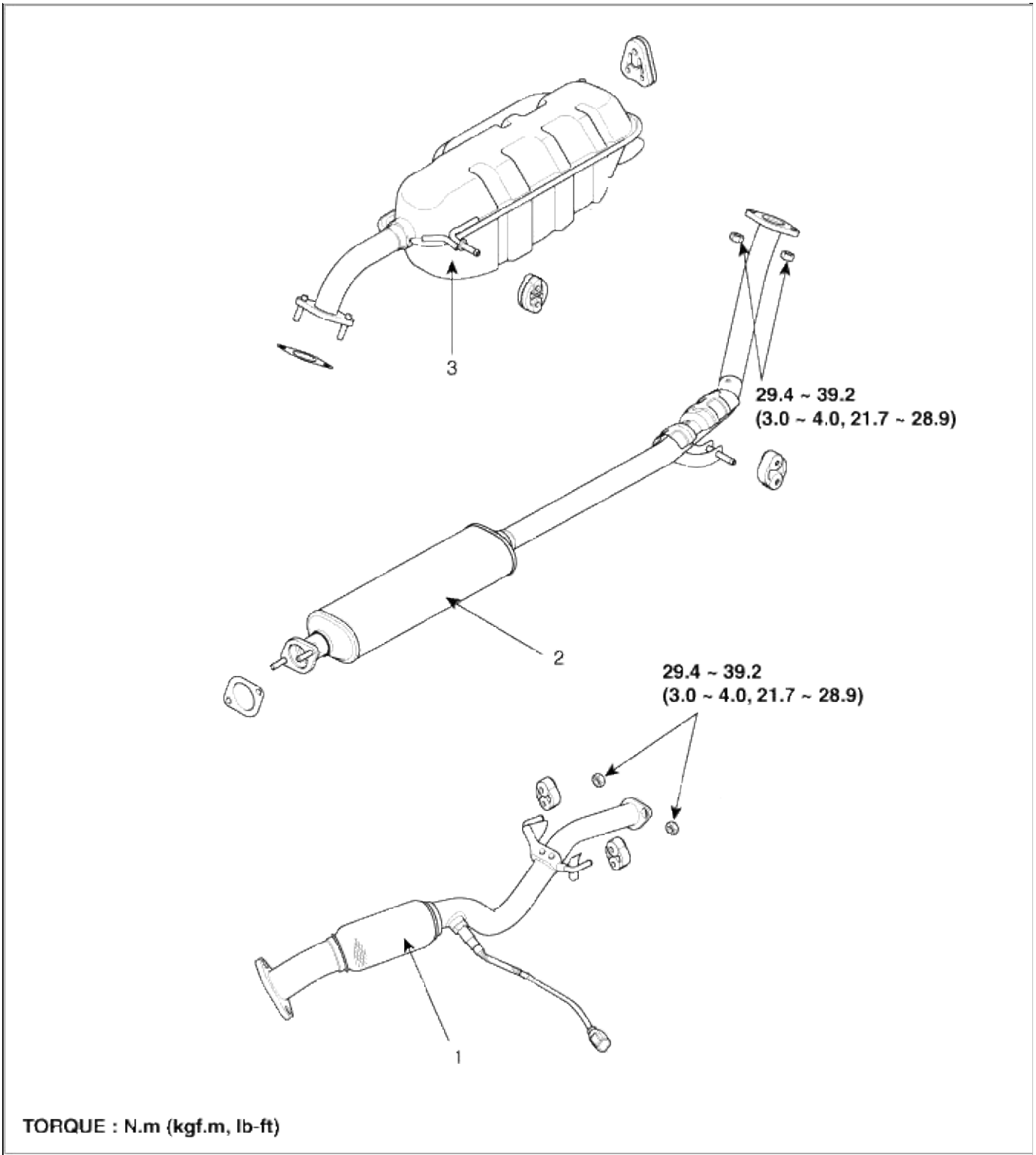
Tightening torque :
29.4 ~ 34.3N.m (3.0 ~ 3.5kgf.m, 21.7 ~ 25.3lb-ft)



8. Installation is in the reverse order of removal.

Engine Mechanical System > Intake And Exhaust System > Front Exhaust Pipe > Components and Components Location

Components



1. Front muffler
2. Center muffler
3. Main muffler

Engine Mechanical System > Intake And Exhaust System > Front Exhaust Pipe > Repair procedures

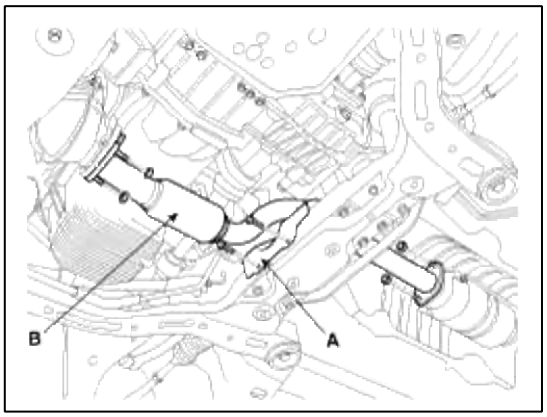
Removal

1. Remove the front muffler heat protector(A).

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

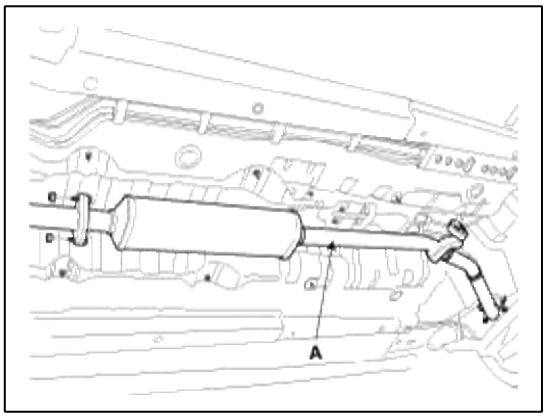
2. Remove the front muffler(B).

Tightening torque :
29.4 ~ 39.2N.m (3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)



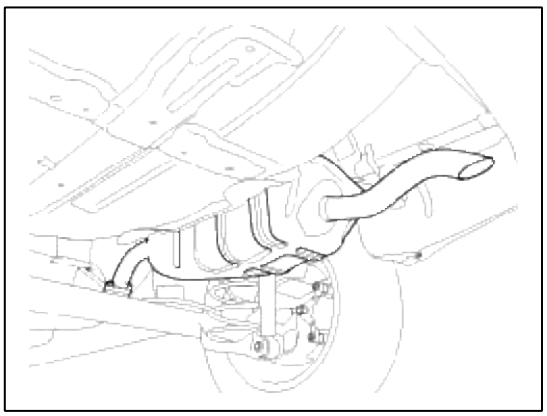
3. Remove the center muffler(A).

Tightening torque :
29.4 ~ 39.2N.m (3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)



4. Remove the main muffler(A).

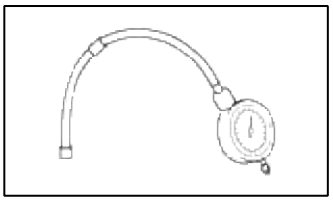
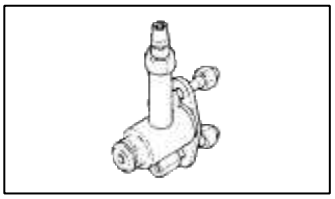
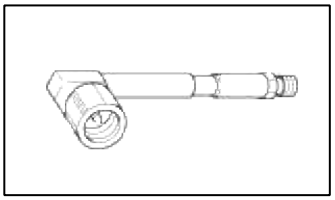
Tightening torque :
29.4 ~ 39.2N.m (3.0 ~ 4.0kgf.m, 21.7 ~ 28.9lb-ft)



ACCENT(MC) > 2008 > G 1.6 DOHC > Fuel System

Fuel System > General Information > Special Service Tools

SPECIAL SERVICE TOOLS

Tool (Number and name)	Illustration	Application
09353-24100 Fuel Pressure Gauge		Measuring the fuel line pressure
09353-38000 Fuel Pressure Gauge Adapter		Connection between the delivery pipe and fuel feed line
09353-24000 Fuel Pressure Gauge Connector		Connection between Fuel Pressure Gauge (09353-24100) and Fuel Pressure Gauge Adapter (09353-38000)

Fuel System > General Information > Troubleshooting

BASIC TROUBLESHOOTING

BASIC TROUBLESHOOTING GUIDE

1	**Bring Vehicle to Workshop**

2	**Analyze Customer's Problem**

- Ask the customer about the conditions and environment relative to the issue (Use CUSTOMER PROBLEM ANALYSIS SHEET).

3	**Verify Symptom, and then Check DTC and Freeze Frame Data**

- Connect Hi-Scan (Pro) to Diagnostic Link Connector (DLC).
- Record the DTC and freeze frame data.

NOTE

To erase DTC and freeze frame data, refer to Step 5.

4	**Confirm the Inspection Procedure for the System or Part**

- Using the SYMPTOM TROUBLESHOOTING GUIDE CHART, choose the correct inspection procedure for the system or part to be checked.

5	**Erase the DTC and Freeze Frame Data**

WARNING

NEVER erase DTC and freeze frame data before completing Step 2 MIL/DTC in "CUSTOMER PROBLEM ANALYSIS SHEET".

6	**Inspect Vehicle Visually**

- Go to Step 11, if you recognize the problem.

7	**Recreate (Simulate) Symptoms of the DTC**

- Try to recreate or simulate the symptoms and conditions of the malfunction as described by customer.
- If DTC(s) is/are displayed, simulate the condition according to troubleshooting procedure for the DTC.

8	**Confirm Symptoms of Problem**

- If DTC(s) is/are not displayed, go to Step 9.
- If DTC(s) is/are displayed, go to Step 11.

9	**Recreate (Simulate) Symptom**

- Try to recreate or simulate the condition of the ma function 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**

1. VEHICLEINFORMAITON

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 there is any notice.

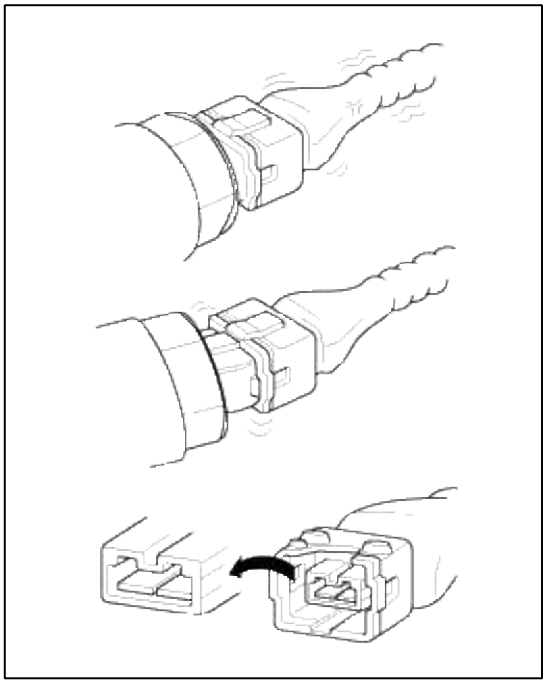
NOTE

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

1) Sensors and Actuators

: Slightly vibrate sensors, actuators or relays with finger.

> WARNING
>
> Strong vibration may break sensors, actuators or relays

2) Connectors and Harness

: Lightly shake the connector and wiring harness vertically and then horizontally.

● SIMULATING HEAT

1) Heat components suspected of causing the malfunction with a hair dryer or other heat sourre.

> WARNING
>
> • DO NOT heat components to the point where they may be damaged.
> • DO NOT heat the ECM/PCM directly.

● SIMULATING WATER SPRINKLING

1) Sprinkle water onto vehicle to simulate a rainy day or a high humidity condition.

> WARNING
>
> DO NOT sprinkle water directly into the engine compartment or electronic components.

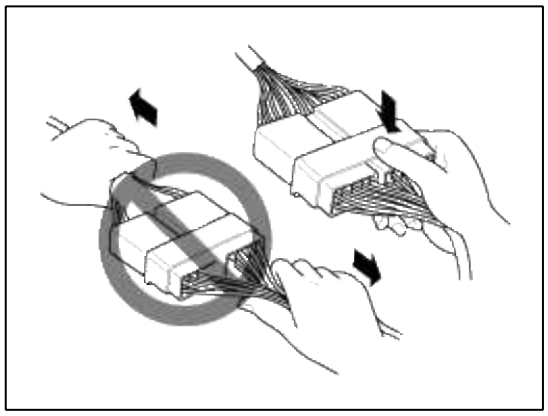
● SIMULATING ELECTRICAL LOAD

1) Turn on all electrical systems to simulate excessive electrical loads (Radios, fans, lights, etc.).

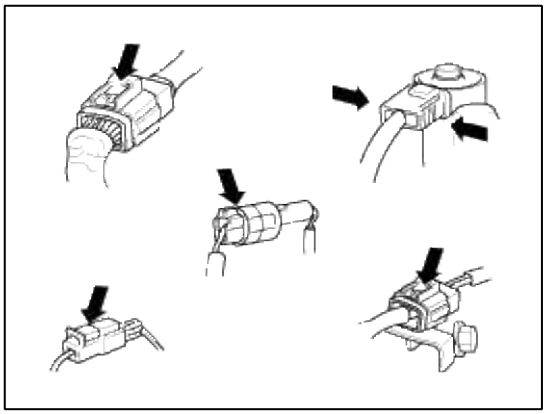
CONNECTOR INSPECTION PROCEDURE

1. Handling of Connector

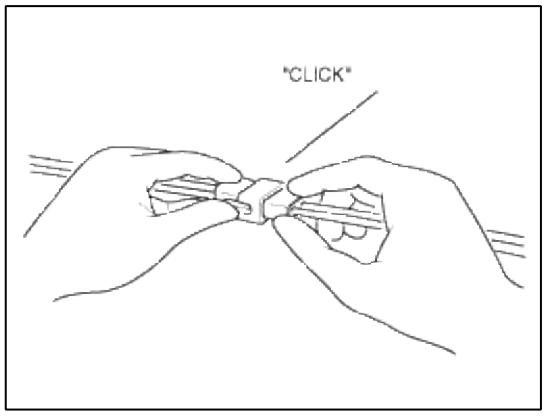
A. Never pull on the wiring harness when disconnecting connectors.



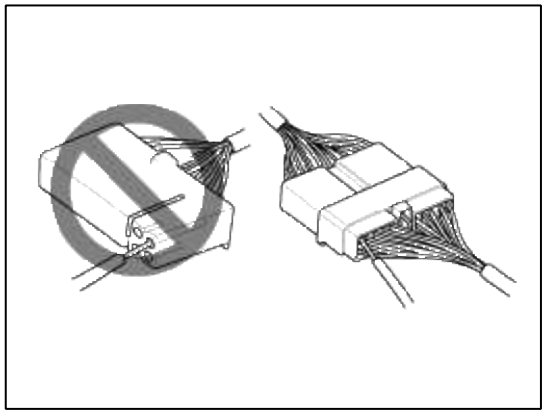
B. When removing the connector with a lock, press or pull locking lever.



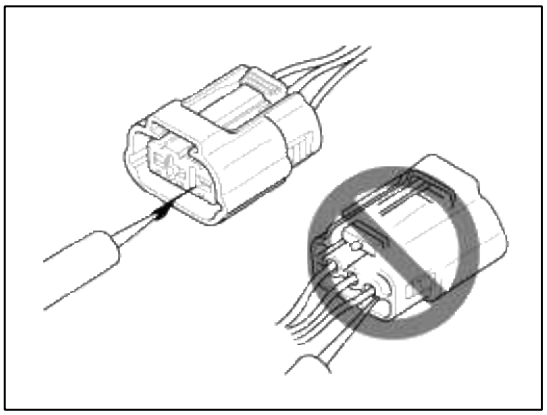
C. Listen for a click when locking connectors. This sound indicates that they are securely locked.



D. When a tester is used to check for continuity, or to measure voltage, always insert tester probe from wire harness side.



E. Check waterproof connector terminals from the connector side. Waterproof connectors cannot be accessed from harness side.



NOTE

- Use a fine wire to prevent damage to the terminal.
- Do not damage the terminal when inserting the tester lead.

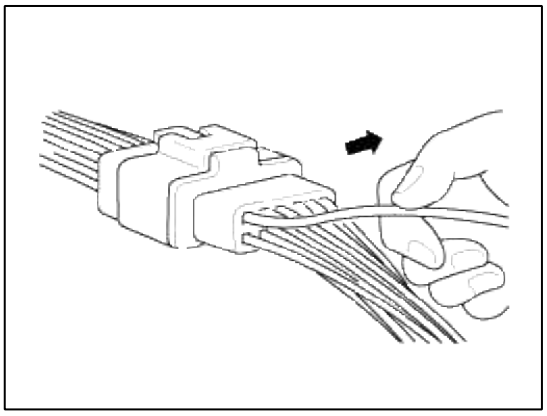
2. Checking Point for Connector

A. While the connector is connected:
Hold the connector, check connecting condition and locking efficiency.

B. When the connector is disconnected:
Check for missing terminal, crimped terminal or broken core wire by slightly pulling the wire harness.
Visually check for rust, contamination, deformation and bend.

C. Check terminal tightening condition:
Insert a spare male terminal into a female terminal, and then check terminal tightening conditions.

D. Pull lightly on individual wires to ensure that each wire is secured in the terminal.



3. Repair Method of Connector Terminal

A. Clean the contact points using air gun and/or shop rag.

NOTE

Never use sand paper when polishing the contact points, otherwise the contact point may be damaged.

B. In case of abnormal contact pressure, replace the female terminal.

WIRE HARNESS INSPECTION PROCEDURE

1. Before removing the wire harness, check the wire harness position and crimping in order to restore it correctly.
2. Check whether the wire harness is twisted, pulled or loosened.
3. Check whether the temperature of the wire harness is abnormally high.
4. Check whether the wire harness is rotating, moving or vibrating against the sharp edge of a part.
5. Check the connection between the wire harness and any installed part.

6. If the covering of wire harness is damaged; secure, repair or replace the harness.

ELECTRICAL CIRCUIT INSPECTION PROCEDURE

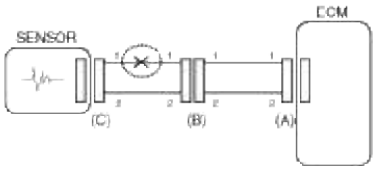
1. Procedures for Open Circuit

A. Continuity Check

B. Voltage Check

If an open circuit occurs (as seen in [FIG. 1]), it can be found by performing Step 2 (Continuity Check Method) or Step 3 (Voltage Check Method) as shown below.

FIG 1



2. Continuity Check Method

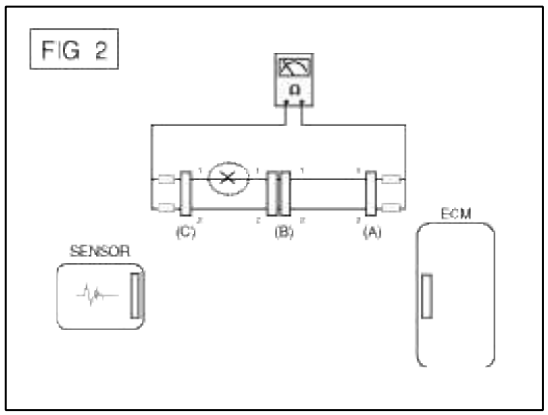
NOTE

When measuring for resistance, lightly shake the wire harness above and below or from side to side.

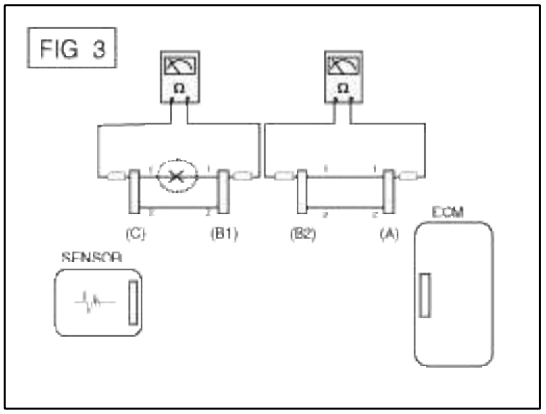
Specification (Resistance)
1Ω or less → Normal Circuit
1MΩ or Higher → Open Circuit

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

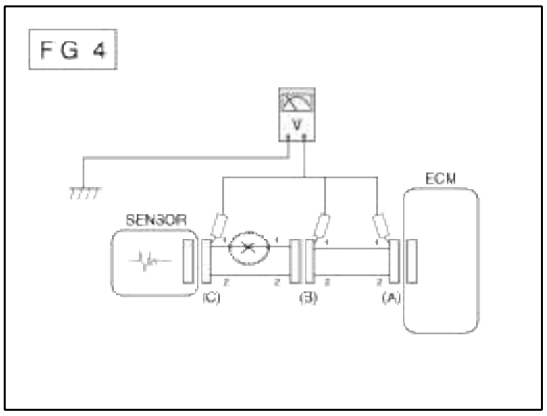


B. Disconnect connector (B), and measure for resistance between connector (C) and (B1) and between (B2) and (A) as shown in [FIG. 3].
In this case the measured resistance between connector (C) and (B1) is higher than 1MΩ and the open circuit is between terminal 1 of connector (C) and terminal 1 of connector (B1).



3. Voltage Check Method

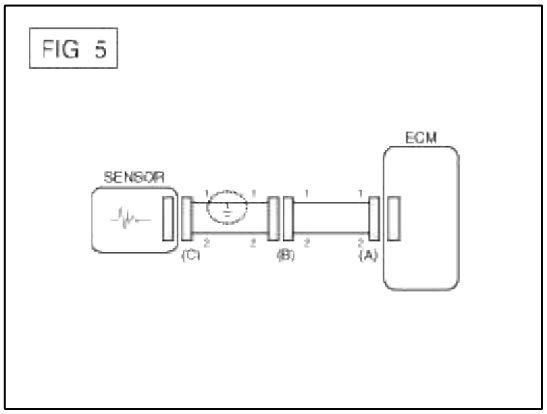
A. With each connector still connected, measure the voltage between the chassis ground and terminal 1 of each connectors (A), (B) and (C) as shown in [FIG. 4].
The measured voltage of each connector is 5V, 5V and 0V respectively. So the open circuit is between connector (C) and (B).



4. Test Method for Short to Ground Circuit

A. Continuity Check with Chassis Ground

If short to ground circuit occurs as shown in [FIG. 5], the broken point can be found by performing below Step 2 (Continuity Check Method with Chassis Ground) as shown below.



5. Continuity Check Method (with Chassis Ground)

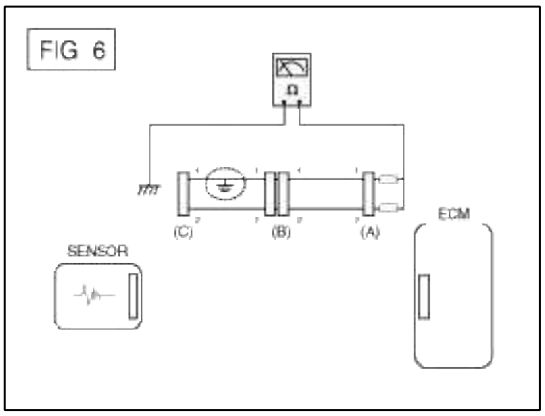
NOTE

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

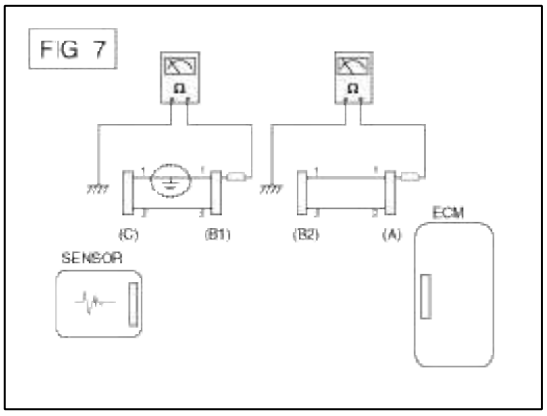
A. Disconnect connectors (A), (C) and measure for resistance between connector (A) and Chassis Ground as shown in [FIG. 6].
The measured resistance of line 1 and 2 in this example is below 1 Ω and higher than 1MΩ respectively. Specifically the short to ground circuit is line 1 (Line 2 is normal). To 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 CHART

MAIN SYMPTOM	DIAGNOSTIC PROCEDURE	ALSO CHECK FOR
Unable to start (Engine does not turn over)	1. Test the battery 2. Test the starter 3. Inhibitor switch (A/T) or clutch start switch (M/T)	
Unable to start (Incomplete	1. Test the battery 2. Check the fuel pressure 3. Check the ignition circuit	• DTC • Low compression • Intake air leaks

combustion)	4. Troubleshooting the immobilizer system (In case of immobilizer lamp ON)	• Slipped or broken timing belt • Contaminated fuel
Difficult to start	1. Test the battery 2. Check the fuel pressure 3. Check the ECT sensor and circuit (Check DTC) 4. Check the ignition circuit	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Poor idling (Rough, unstable or incorrect Idle)	1. Check the fuel pressure 2. Check the Injector 3. Check the long term fuel trim and short term fuel trim (Refer to CUSTOMER DATASTREAM) 4. Check the idle speed control circuit (Check DTC) 5. Inspect and test the Throttle Body 6. Check the ECT sensor and circuit (Check DTC)	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Engine stall	1. Test the Battery 2. Check the fuel pressure 3. Check the idle speed control circuit (Check DTC) 4. Check the ignition circuit 5. Check the CKPS Circuit (Check DTC)	• DTC • Intake air leaks • Contaminated fuel • Weak ignition spark
Poor driving (Surge)	1. Check the fuel pressure 2. Inspect and test Throttle Body 3. Check the ignition circuit 4. Check the ECT Sensor and Circuit (Check DTC) 5. Test the exhaust system for a possible restriction 6. Check the long term fuel trim and short term fuel trim (Refer to CUSTOMER DATASTREAM)	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Knocking	1. Check the fuel pressure 2. Inspect the engine coolant 3. Inspect the radiator and the electric cooling fan 4. Check the spark plugs	• DTC • Contaminated fuel
Poor fuel economy	1. Check customer's driving habits • Is A/C on full time or the defroster mode on? • Are tires at correct pressure? • Is excessively heavy load being carried? • Is acceleration too much, too often? 2. Check the fuel pressure 3. Check the injector 4. Test the exhaust system for a possible restriction 5. Check the ECT sensor and circuit	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
	1. Test the canister close valve 2. Inspect the fuel filler hose/pipe	

Hard to refuel (Overflow during refueling)	2. Inspect the fuel filler hose/pipe • Pinched, kinked or blocked? • Filler hose is torn 3. Inspect the fuel tank vapor vent hose between the EVAP. canister and air filter 4. Check the EVAP. canister	• Malfunctioning gas station filling nozzle (If this problem occurs at a specific gas station during refueling)

Fuel System > General Information > Specifications

SPECIFICATIONS

FUEL DELIVERY SYSTEM

Items	Specification	
Fuel Tank	Capacity	45 lit. (11.9 U.S. gal, 9.9 Imp.gal.)
Fuel Filter (built in Fuel Pump Assembly)	Type	High pressure type
Fuel Pressure Regulator (built in Fuel Pump Assembly)	Regulated Fuel Pressure	343 kpa (3.5 kgf/cm², 49.8 psi)
Fuel Pump	Type	Electrical, in-tank type
	Driven by	Electric motor
Fuel Retrun System	Type	Returnless

INPUT SENSORS

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAPS)

Type : Piezo-resistive pressure sensor type

Specification

Pressure (kPa)	Output Voltage (V)
20.0kPa	0.79V
46.66kPa	1.84V
101.32kPa	4.00V

Type : Thermister type

Specification

Temperature (°C)		Resistnace (kΩ)
°C	°F	
-40°C	-40°F	38.88 ~ 50.77kΩ
-20°C	-4°F	13.20 ~ 16.83kΩ
0°C	32°F	5.12 ~ 6.12kΩ
20°C	68°F	2.20 ~ 2.69kΩ
40°C	104°F	1.02 ~ 1.27kΩ
60°C	140°F	0.52 ~ 0.65kΩ
80°C	176°F	0.28 ~ 0.35kΩ

Type: Thermister type
Specification

Temperature		Resistance (kΩ)
°C	°F	
-40°C	-40°F	48.14kΩ
-20°C	-4°F	14.13 ~ 16.83kΩ
0°C	32°F	5.79kΩ
20°C	68°F	2.31 ~ 2.59kΩ
40°C	104°F	1.15kΩ
60°C	140°F	0.59kΩ
80°C	176°F	0.32kΩ

Type: Variable resistor type
Specification

Throttle Angle	Output Voltage (V)
C.T	0.2 ~ 0.7V
W.O.T	Min. 4.0V

Items	Specification
Sensor Resistance (kΩ)	1.6 ~ 2.4 kΩ

Type: Zirconia (ZrO2) Type
Specification

A/F Ratio	Output Voltage (V)
Rich	0.6 ~ 1.0V
Lean	0 ~ 0.4V

Items	Specification
Heater Resistance (Ω)	Approximately 9.0Ω at 20°C (68°F)

Type: Hall effect type
Type: Magnetic field sensitive Type
Type: Piezo-electricity type
Specification

Items	Specification
Capacitance (pF)	950 ~ 1,350pF
Resistance (MΩ)	4.87MΩ ± 20%

Type : Piezo-Resistivity type
Specification

Pressure (kPa)	Output Votlage (V)
-6.67 kPa	0.5V
0 kPa	2.5V
6.67 kPa	4.5V

OUTPUT ACTUATORS
Number: 4
Specification

Items	Specification
Coil Resistance (Ω)	13.8 ~ 15.2Ω at 20°C (68°F)

Type: Double coil type
Specification

Items	Specification
Closing Coil Resistance (Ω)	14.6 ~ 16.2Ω at 20°C (68°F)
Opening Coil Resistance (Ω)	11.1 ~ 12.7Ω at 20°C (68°F)

Specification

Items	Specification
Coil Resistance (Ω)	16.0Ω at 20°C (68°F)

Specification

Items	Specification
Coil Resistance (Ω)	6.9 ~ 7.9Ω at 20°C (68°F)

Type : Stick type
Specification

Items	Resistance
Primary Coil	0.71Ω±15 at 20°C (68°F)
Secondary Coil	-

Type: ON/OFF control type
Specification

Items	Resistance
Coil Resistance (Ω)	23.0 ~ 26.0Ω at 20°C (68°F)

SERVICE STANDARD

Ignition Timing (After warm up, at idle)		BTDC 5°± 5°
Basic Idle rpm(After warm up)	Neutral,N,P-range	720 ± 100 rpm
	D-range	660 ± 100 rpm

TIGHTENING TORQUES

ENGINE CONTROL SYSTEM

Items	N·m	kgf·m	lbf·ft
ECM/PCM installation bolts	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Heated oxygen sensor (Bank 1 / Sensor 1) installation	49.1 ~ 58.9	5.0 ~ 6.0	36.2 ~ 43.4
Heated oxygen sensor (Bank 1 / Sensor 2) installation	49.1 ~ 58.9	5.0 ~ 6.0	36.2 ~ 43.4
Engine Coolant Temperature Sensor installation	24.5 ~ 29.4	2.5 ~ 3.0	18.1 ~ 21.7
Throttle Position Sensor installation bolt	1.5 ~ 2.5	0.15 ~ 0.25	1.1 ~ 1.8
Manifold Absolute Pressure Sensor installation bolt	4.9	0.5	3.6
Camshaft Position Sensor installation bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Crankshaft Position Sensor targt wheel installation screw	4.9 ~ 5.9	0.5 ~ 0.6	3.6 ~ 4.3
Crankshaft Position Sensor installation bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Knock sensor installation	16.7 ~ 25.5	1.7 ~ 2.6	12.3 ~ 18.8
CVVT oil control valve installation bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
CVVT oil filter installation	40.2 ~ 50.0	4.1 ~ 5.1	29.7 ~ 36.9
Throttle body installation bolt/nut	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Oil pressure switch installation	11.8 ~ 17.7	1.2 ~ 1.8	8.7 ~ 13

FUEL DELIVERY SYSTEM

Item	N·m	kgf·m	lbf·ft
Fuel tank installation bolt/nut	39.2 ~ 54.0	4.0 ~ 5.5	28.9 ~ 39.8
Delivery pipe installation bolt	14.7 ~ 19.6	1.5 ~ 2.0	10.9 ~ 14.5
Fuel pump installation bolt	2.0 ~ 2.9	0.2 ~ 0.3	1.4 ~ 2.2

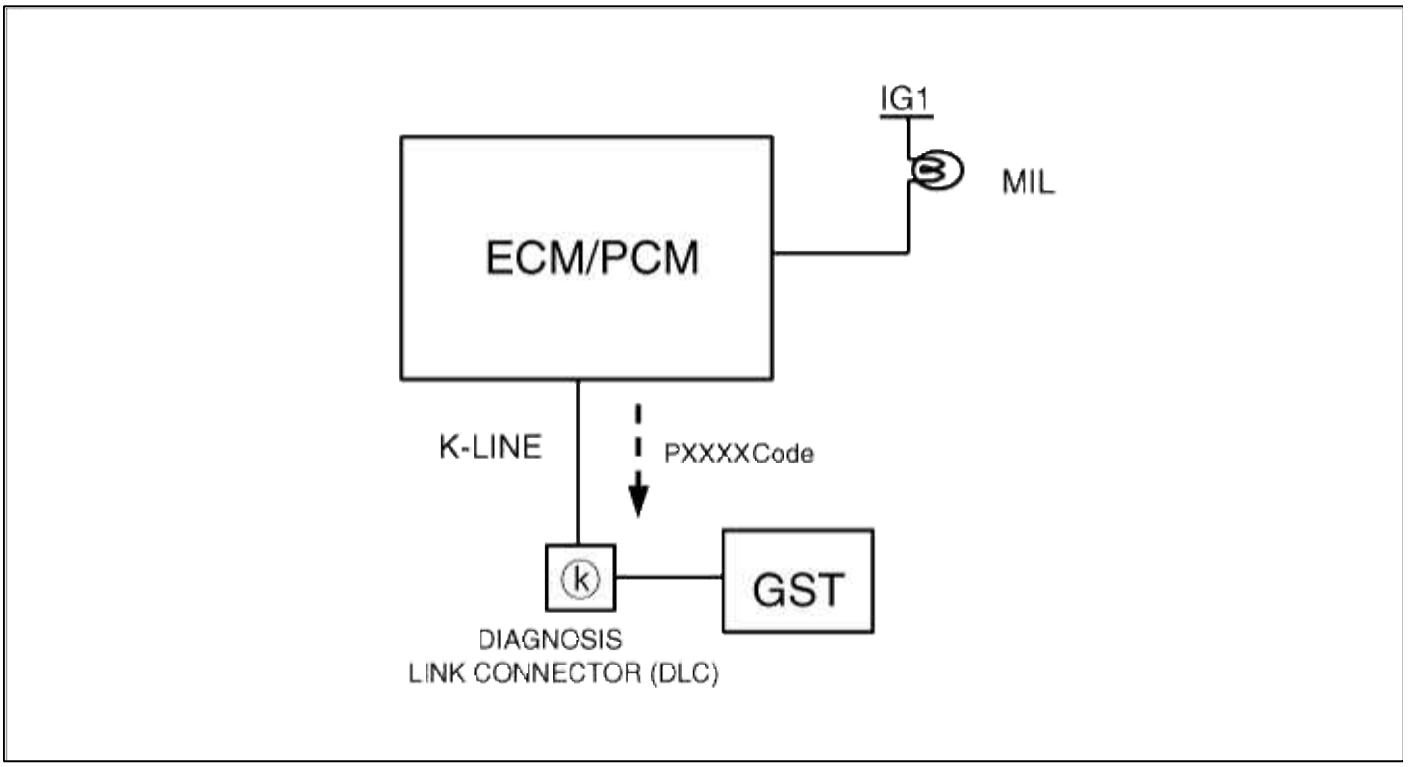
Fuel System > Engine Control System > Description and Operation

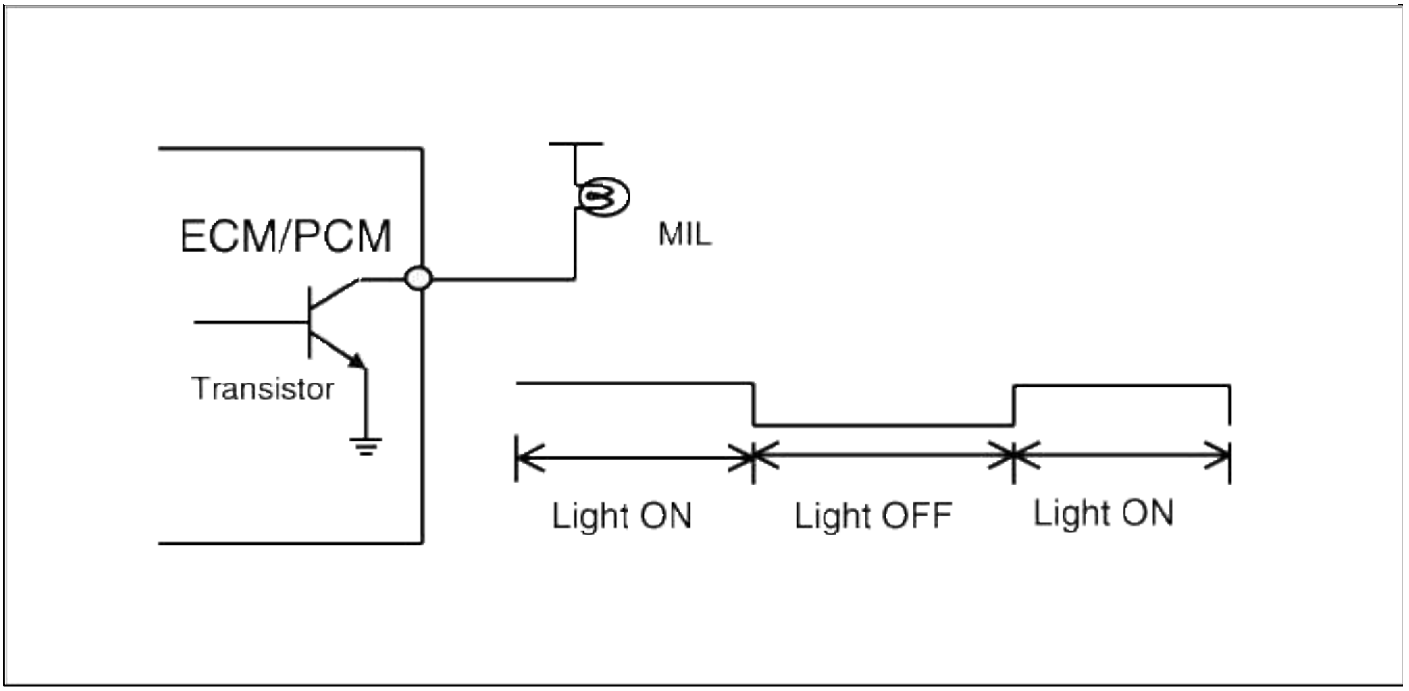
OBD-II REVIEW

1. OVERVIEW

The California Air Resources Board (CARB) began regulation of On Board Diagnostics (OBD) for vehicles sold in california beginning with the 1988 model year. The first phase, OBD-I, required monitoring of the fuel metering system, Exhust Gas Recirculation (EGR) system and additional emission related components. The Malfunction Indicator Lamp (MIL) was required to light and alert the driver of the fault and the need for repair of the emission control system. Associated with the MIL was a fault code or Diagnostic Trouble Code (DTC) idenfying the specific

area of the fault.
The OBD system was proposed by CARB to improve air quality by identifying vehicle exceeding emission standards. Passage of the Federal Clean Air Act Amendments in 1990 has also prompted the Environmental Protection Agency (EPA) to develop On Board Diagnostic requirements. CARB OBD-II regulations were followed until 1999 when the federal regulations were used.
The OBD-II system meets government regulations by monitoring the emission control system. When a system or component exceeds emission threshold or a component operates outside tolerance, a DTC will be stored and the MIL illuminated.
The diagnostic executive is a computer program in the Engine Control Module (ECM) or PowertrainControl Module (PCM) that coordinates the OBD-II self-monitoring system. This program controls all the monitors and interactions, DTC and MIL operation, freeze frame data and scan tool interface.
Freeze frame data describes stored engine conditions, such as state of the engine, state of fuel control, spark, RPM, load and warm status at the point the first fault is detected. Previously stored conditions will be replaced only if a fuel or misfire fault is detected. This data is accessible with the scan tool to assist in repairing the vehicle.
The center of the OBD-II system is a microprocessor called the Engine Control Module (ECM) or Powertrain Control Module(PCM).
The ECM/PCM receives input from sensors and other electronic components (switches, relays, and others) based on information received and programmed into its memory (keep alive random access memory, and others), the ECM/PCM generates output signals to control various relays, solenoids and actuators.
2. CONFIGURATION OF HARDWARE AND RELATED TERMS





The Malfunction Indicator Lamp (MIL) is connected between ECM/PCM-terminal Malfunction Indicator Lamp and battery supply (open collector amplifier).
In most cars, the MIL will be installed in the instrument panel. The lamp amplifier can not be damaged by a short circuit.
Lamps with a power dissipation much greater than total dissipation of the MIL and lamp in the tester may cause a fault indication.
At ignition ON and engine revolution (RPM)< MIN. RPM, the MIL is switched ON for an optical check by the driver.
When the ECM/PCM detects a malfunction related emission during the first driving cycle, the DTC and engine data are stored in the freeze frame memory. The MIL is illuminated only when the ECM/PCM detects the same malfunction related the DTC in two consecutive driving cycles.
● Misfire and Fuel System Malfunctions:
For misfire or fuel system malfunctions, the MIL may be eliminated if the same fault does not reoccur during monitoring in three subsequent sequential driving cycles in which conditions are similar to those under which the malfunction was first detected.
● All Other Malfunctions:
For all other faults, the MIL may be extinguished after three subsequent sequential driving cycles during which the monitoring system responsible for illuminating the MIL functions without detecting the malfunction and if no other malfunction has been identified that would independently illuminate the MIL according to the requirements outlined above.
The diagnostic system may erase a fault code if the same fault is not re-registered in at least 40 engine warm-up cycles, and the MIL is not illuminated for that fault code.

- Bidirectional line
- K-Line is defined as the line which provides information in a serial digital form from ECM/PCM to the diagnostic tester. K-Line is used bidirectionally, in which case it may carry commands or data from the diagnostic tester to the ECM/PCM. K-Line is also used to initialize the serial communication.

A driving cycle consists of engine start up, and engine shut off.
A warm-up cycle means sufficient vehicle operation such that the engine coolant temperature has risen by at least 40 degrees Fahrenheit from engine starting and reaches a minimum has risen by at least 40 degrees Fahrenheit from engine starting and reaches a minimum temperature of at least 160 degrees Fahrenheit.
A trip means vehicle operation (following an engine-off period) of duration and driving mode such that all components and systems are monitored at least once by the diagnostic system except catalyst efficiency or evaporative system monitoring when a steady-speed check is used, subject to the limitation that the manufacturer-

defined trip monitoring conditions shall all be encountered at least once during the first engine start portion of the applicable FTP cycle.

- Diagnostic Trouble Code (SAE J2012)
- DTCs used in OBD-II vehicles will begin with a letter and are followed by four numbers.

The letter of the beginning of the DTC identifies the function of the monitored device that has failed. A "P" indicates a powertrain device, "C" indicates a chassis device. "B" is for body device and "U" indicates a network or data link code. The first number indicates if the code is generic (common to all manufacturers) or if it is manufacturer specific. A "0" & "2" indicates generic, "1" indicates manufacturer-specific. The second number indicates the system that is affected with a number between 1 and 7.
The following is a list showing what numbers are assigned to each system.
1) Fuel and air metering
2) Fuel and air metering(injector circuit malfunction only)
3) Ignition system or misfire
4) Auxiliary emission controls
5) Vehicle speed controls and idle control system
6) Computer output circuits
7) Transmission
The last two numbers of the DTC indicates the component or section of the system where the fault is located.
When a freeze frame event is triggered by an emission related DTC, the ECM/PCM stores various vehicle information as it existed the moment the fault ocurred. The DTC number along with the engine data can be useful in aiding a technician in locating the cause of the fault. Once the data from the 1st driving cycle DTC ocurrence is stored in the freeze frame memory, it will remain there even when the fault ocurrs again (2nd driving cycle) and the MIL is illuminated.

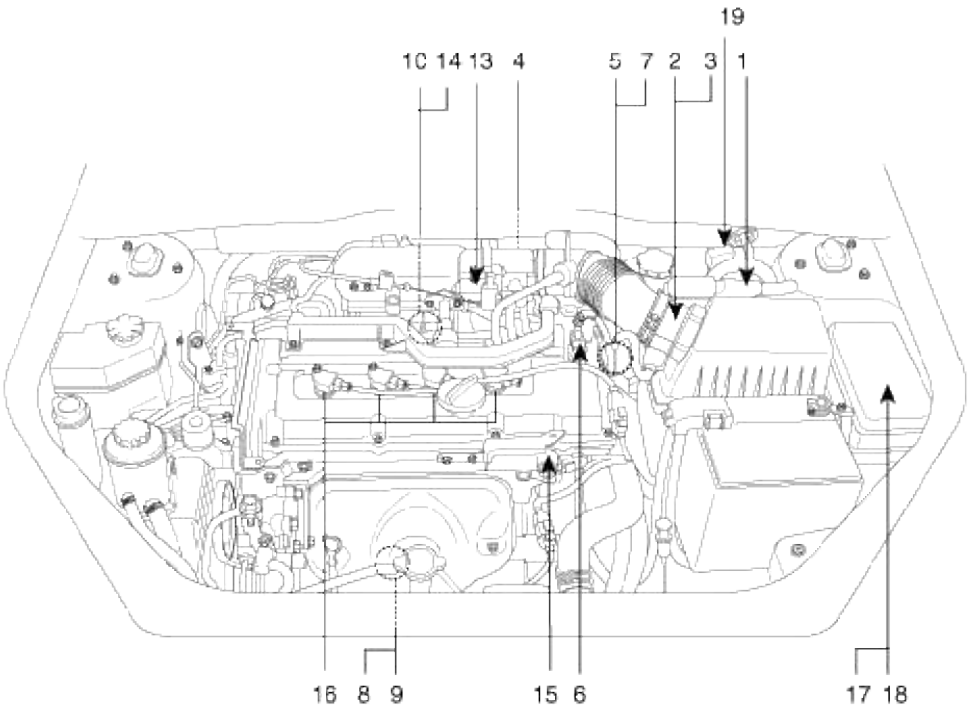
- Freeze Frame List
  1) Calculated Load Value
  2) Engine RPM
  3) Fuel Trim
  4) Fuel Pressure (if available)
  5) Vehicle Speed (if available)
  6) Coolant Temperature
  7) Intake Manifold Pressure (if available)
  8) Closed-or Open-loop operation
  9) Fault code

3. OBD-II SYSTEM READINESS TESTS
The catalyst efficiency monitor is a self-test strategy within the ECM/PCM that uses the downstream Heated Oxygen Sensor (HO2S) to determine when a catalyst has fallen below the minimum level of effectiveness in its ability to control exhaust emission.
Misfire is defined as the lack of proper combustion in the cylinder due to the absence of spark, poor fuel metering, or poor compression. Any combustion that does not occur within the cylinder at the proper time is also a misfire. The misfire detection monitor detects fuel, ignition or mechanically induced misfires. The intent is to protect the catalyst from permanent damage and to alert the customer of an emission failure or an inspection maintenance failure by illuminating the MIL . When a misfire is detected, special software called freeze frame data is enabled. The freeze frame data captures the operational state of the vehicle when a fault is detected from misfire detection monitor strategy.
The fuel system monitor is a self-test strategy within the ECM/PCM that monitors the adaptive fuel table The fuel control system uses the adaptive fuel table to compensate for normal variability of the fuel system components caused by wear or aging. During normal vehicle operation, if the fuel system appears biased lean or rich, the adaptive value table will shift the fuel delivery calculations to remove bias.
The cooling system monitoring is a self-test strategy within the ECM/PCM that monitors ECTS (Engine Coolant

Temperature Sensor) and thermostat about circuit continuity, output range, rationality faults.
OBD-II regulations require monitoring of the upstream Heated O2 Sensor (H2OS) to detect if the deterioration of the sensor has exceeded thresholds. An additional HO2S is located downstream of the Warm-Up Three Way Catalytic Converter (WU-TWC) to determine the efficiency of the catalyst.
Although the downstream H2OS is similar to the type used for fuel control, it functions differently. The downstream HO2S is monitored to determine if a voltage is generated. That voltage is compared to a calibrated acceptable range.
The EVAP. monitoring is a self-test strategy within the ECM/PCM that tests the integrity of the EVAP. system. The complete evaporative system detects a leak or leaks that cumulatively are greater than or equal to a leak caused by a 0.040 inch and 0.020 inch diameter orifice.
The A/C system monitoring is a self-test strategy within the ECM/PCM that monitors malfunction of all A/C system component at A/C ON.
The comprehensive components monitoring is a self-test strategy within the ECM/PCM that detects fault of any electronic powertrain components or system that provides input to the ECM/PCM and is not exclusively an input to any other OBD-II monitor.

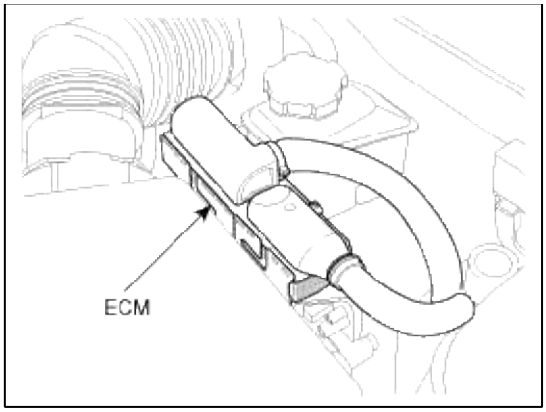
Fuel System > Engine Control System > Components and Components Location

COMPONENTS

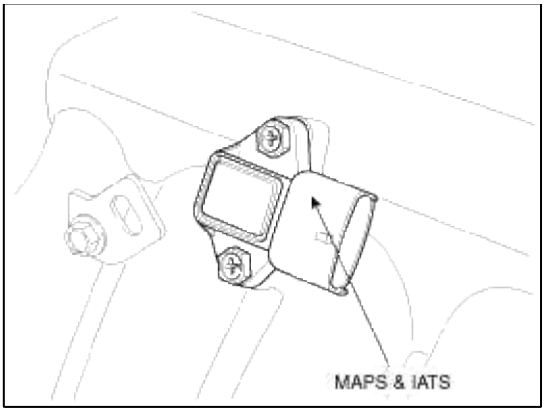


1. ECM (for M/T) / PCM (for A/T)
2. Mass Air Flow Sensor (MAFS)
3. Intake Air Temperature Sensor (IATS)
4. Throttle Position Sensor (TPS)
5. Engine Coolant Temperature Sensor (ECTS)
6. Camshaft Position Sensor (CMPS)
7. Crankshaft Position Sensor (CKPS)
8. Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1]
9. Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2]
10. Knock Sensor (KS)
11. Wheel Speed Sensor (WSS)
12. Injector
13. Idle Speed Control Actuator (ISCA)
14. Purge Control Solenoid Valve (PCSV)
15. CVVT Oil Control Valve (OCV)
16. Ignition Coil
17. Main Relay
18. Fuel Pump Relay
19. Multi Purpose Check Connector (20 pin)
20. Data Link Connector (DLC : 16 pin)
21. Fuel Tank Pressure Sensor (FTPS)
22. Canister Close Valve (CCV)
23. Fuel Level Sensor (FLS)

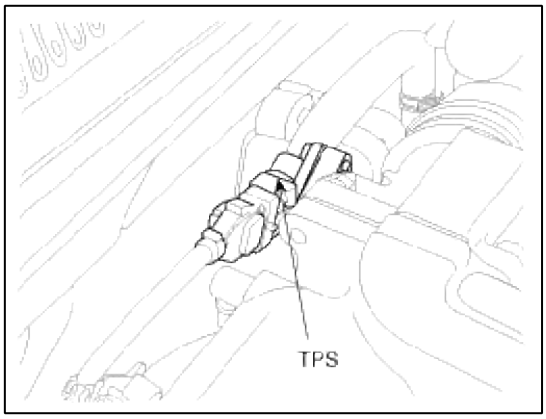
1. ECM (Engine Control Module) [M/T] 1. PCM (Powetrain Control Module) [A/T]	2. Manifold Absolute Pressure Sensor (MAPS) 3. Intake Air Temperature Sensor (IATS)



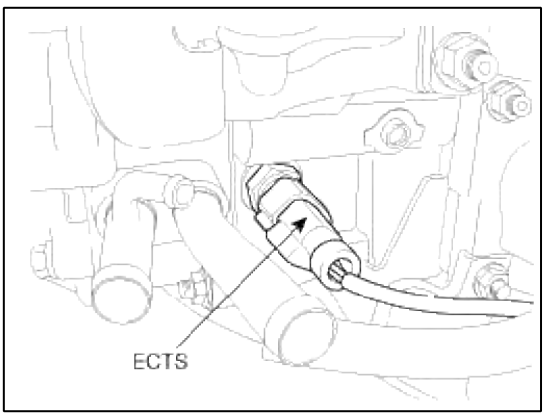
4. Throttle Position Sensor (TPS)



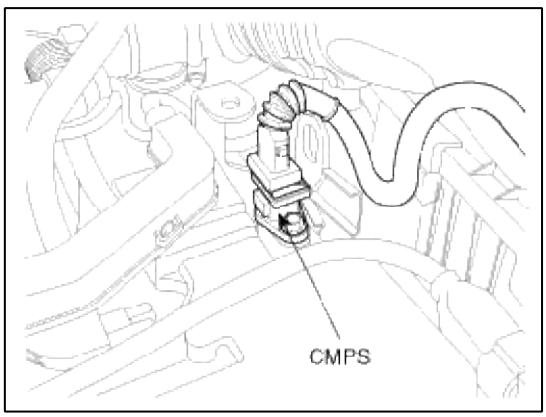
5. Engine Coolant Temperature Sensor (ECTS)



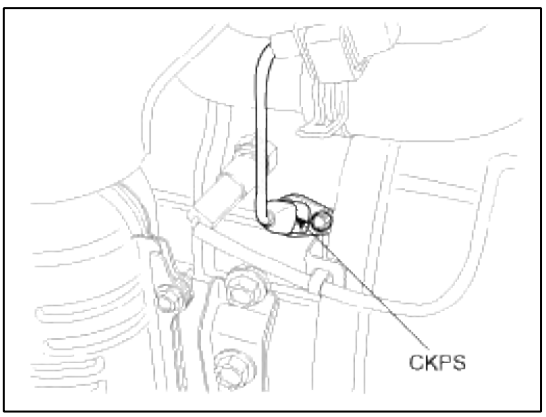
6. Camshaft Position Sensor (CMPS)



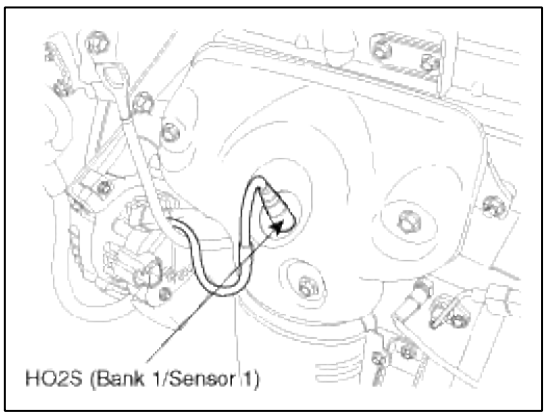
7. Crankshaft Position Sensor (CKPS)



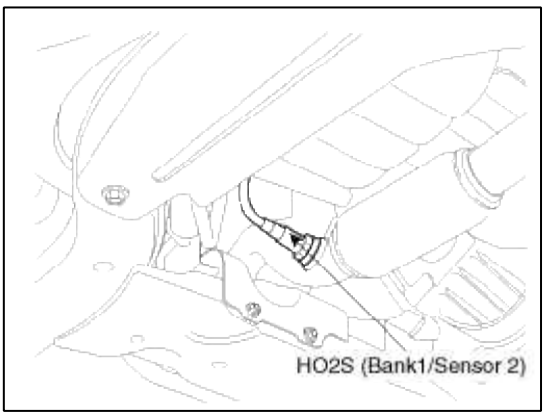
8. Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1]



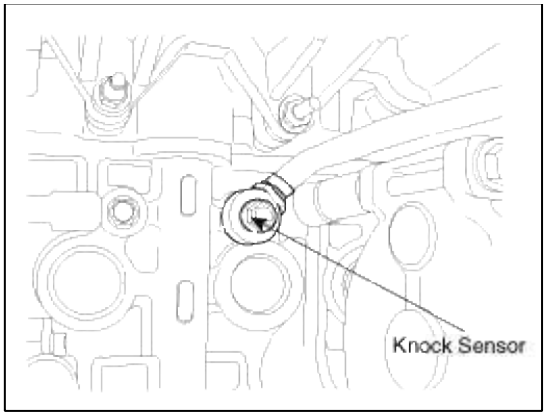
9. Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2]



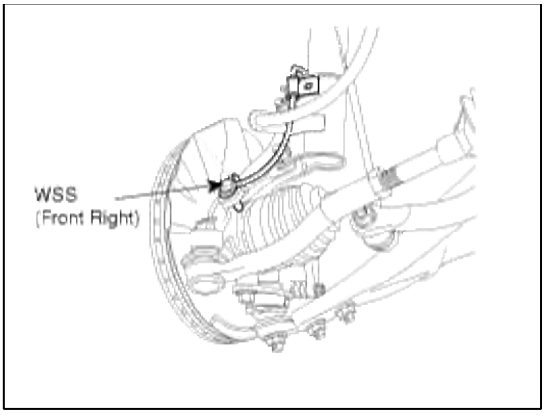
10. Knock Sensor (KS)



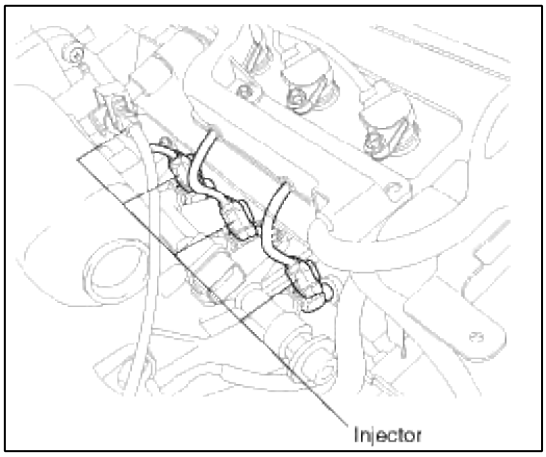
11. Wheel Speed Sensor (WSS)



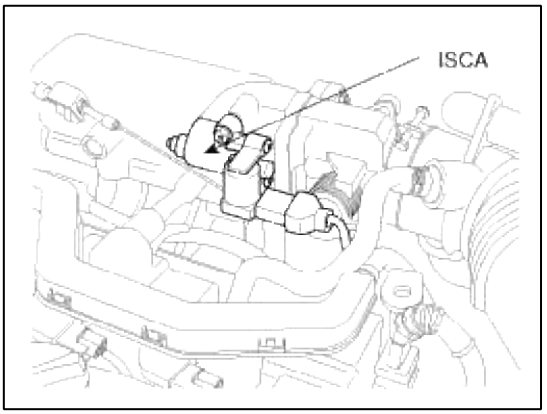
12. Injector



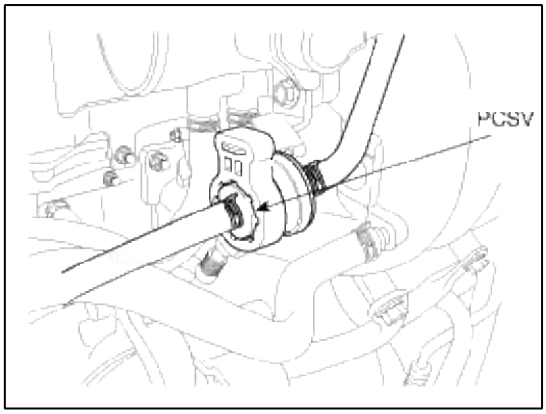
13. Idle Speed Control Actuator (ISCA)



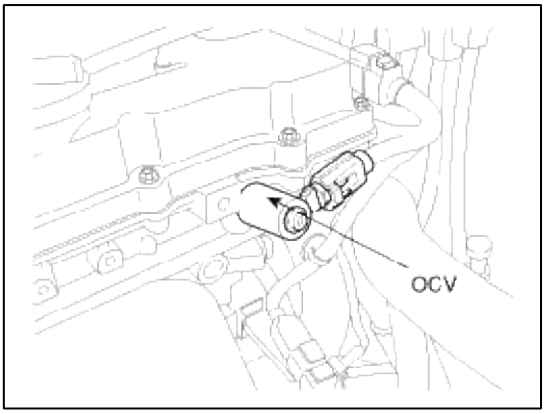
14. Purge Control Solenoid Valve (PCSV)



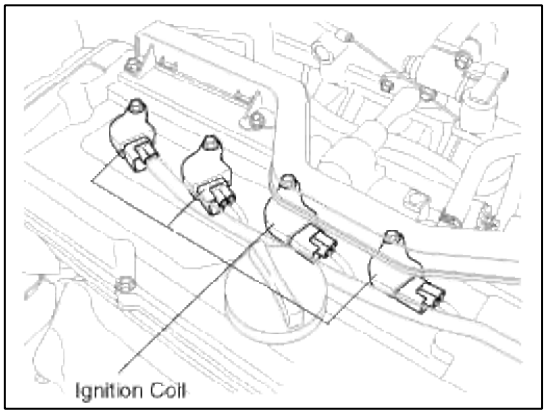
15. CVVT Oil Control Valve (OCV)



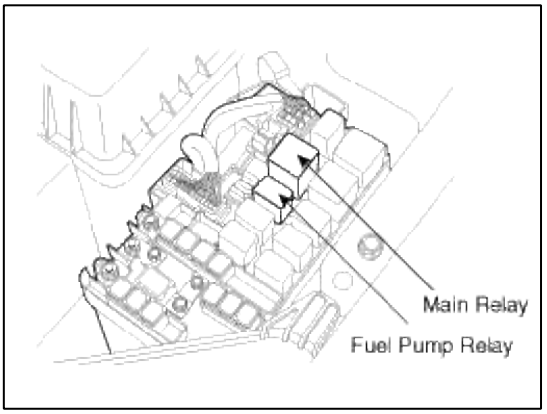
16. Ignition Coil



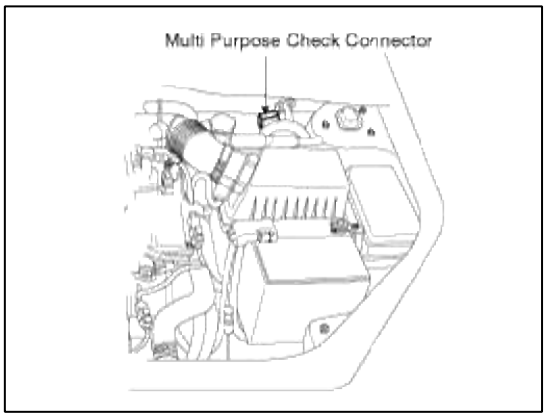
17. Main Relay
18. Fuel Pump Realy

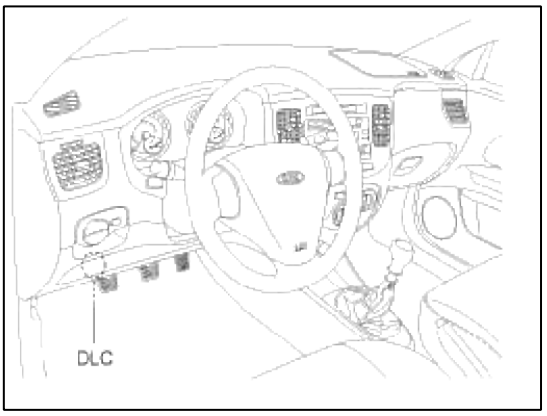


19.Multi Purpose Check Connector (20 pin)



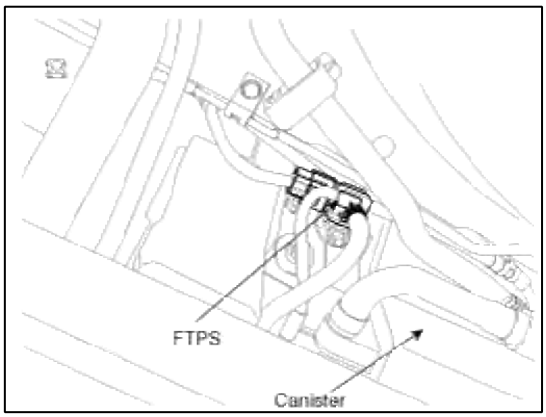
20. Data Link Connector (DLC : 16 pin)

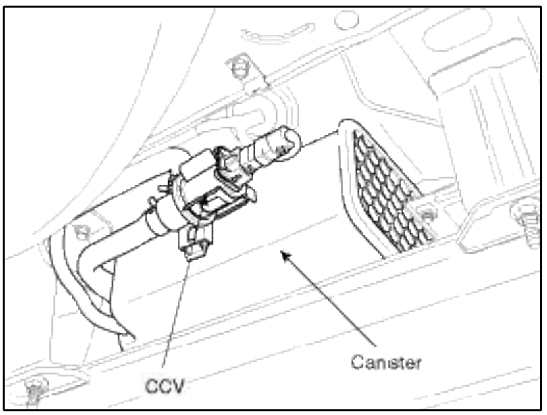




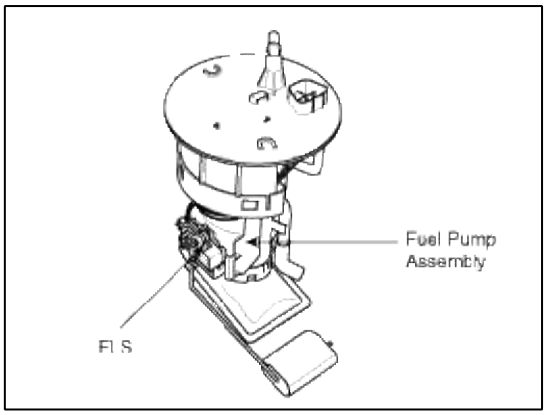
21. Fuel Tank Pressure Sensor (FTPS)

22. Canister Close Valve (CCV)





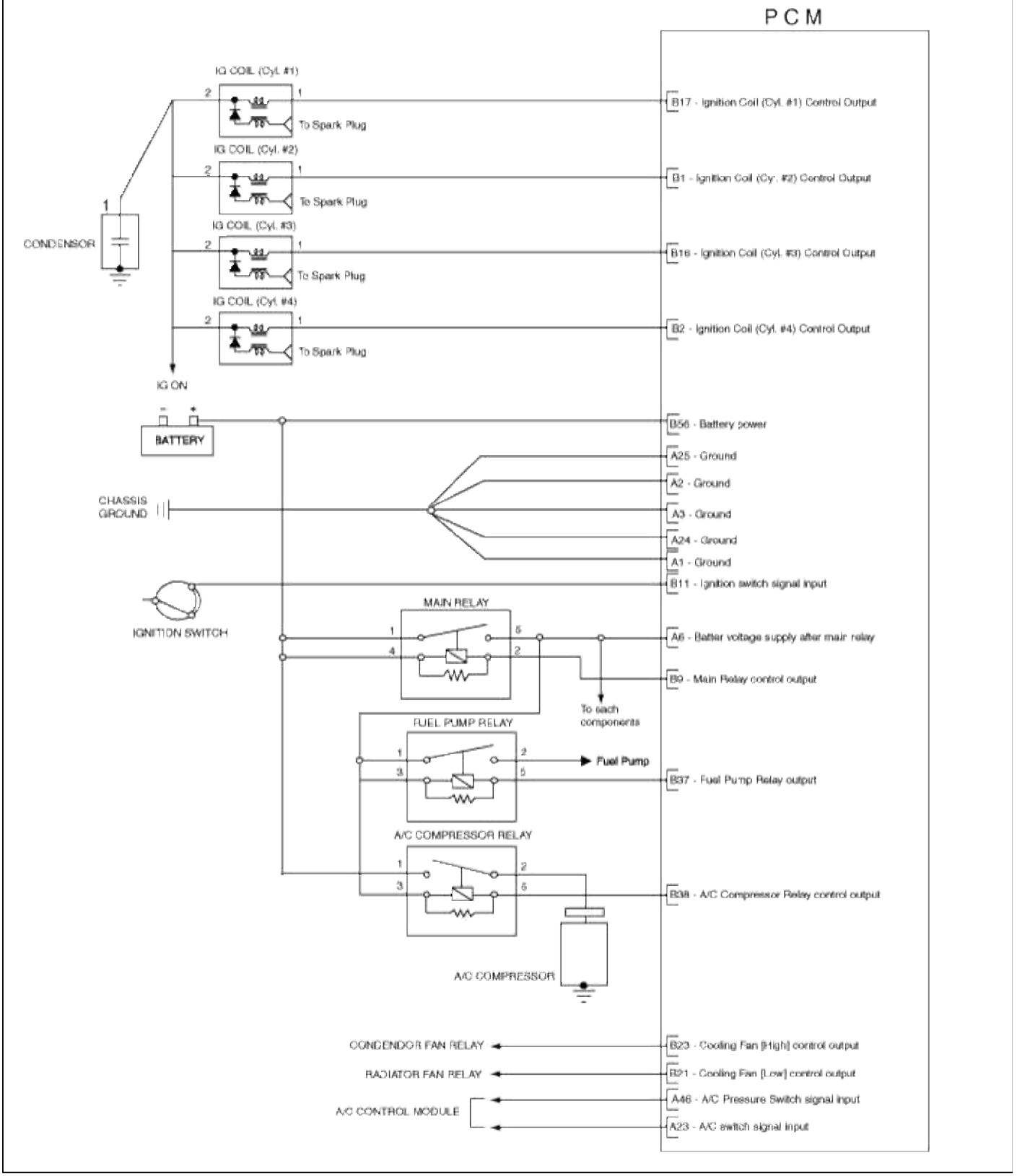
23. Fuel Level Sensor (FLS)

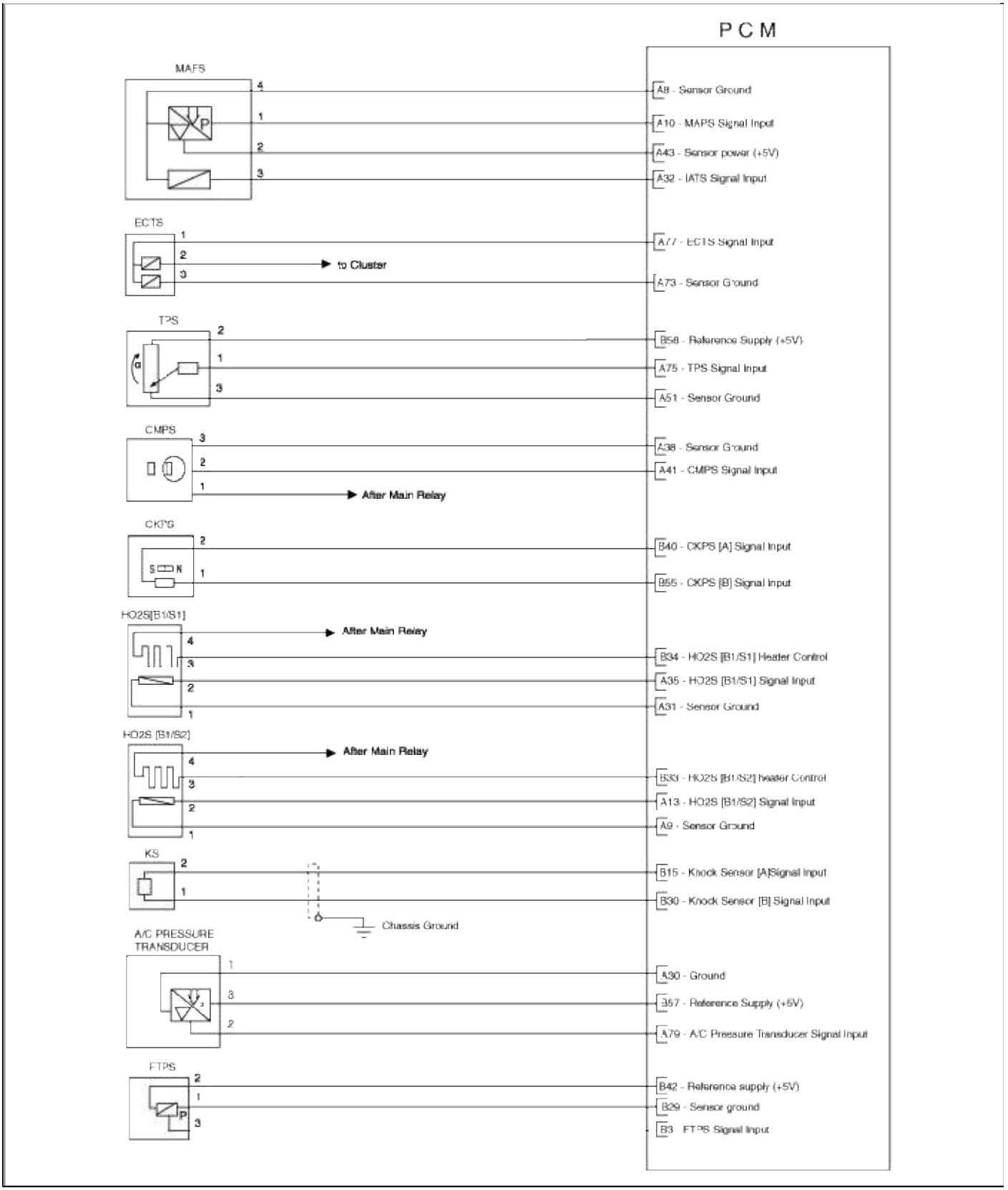


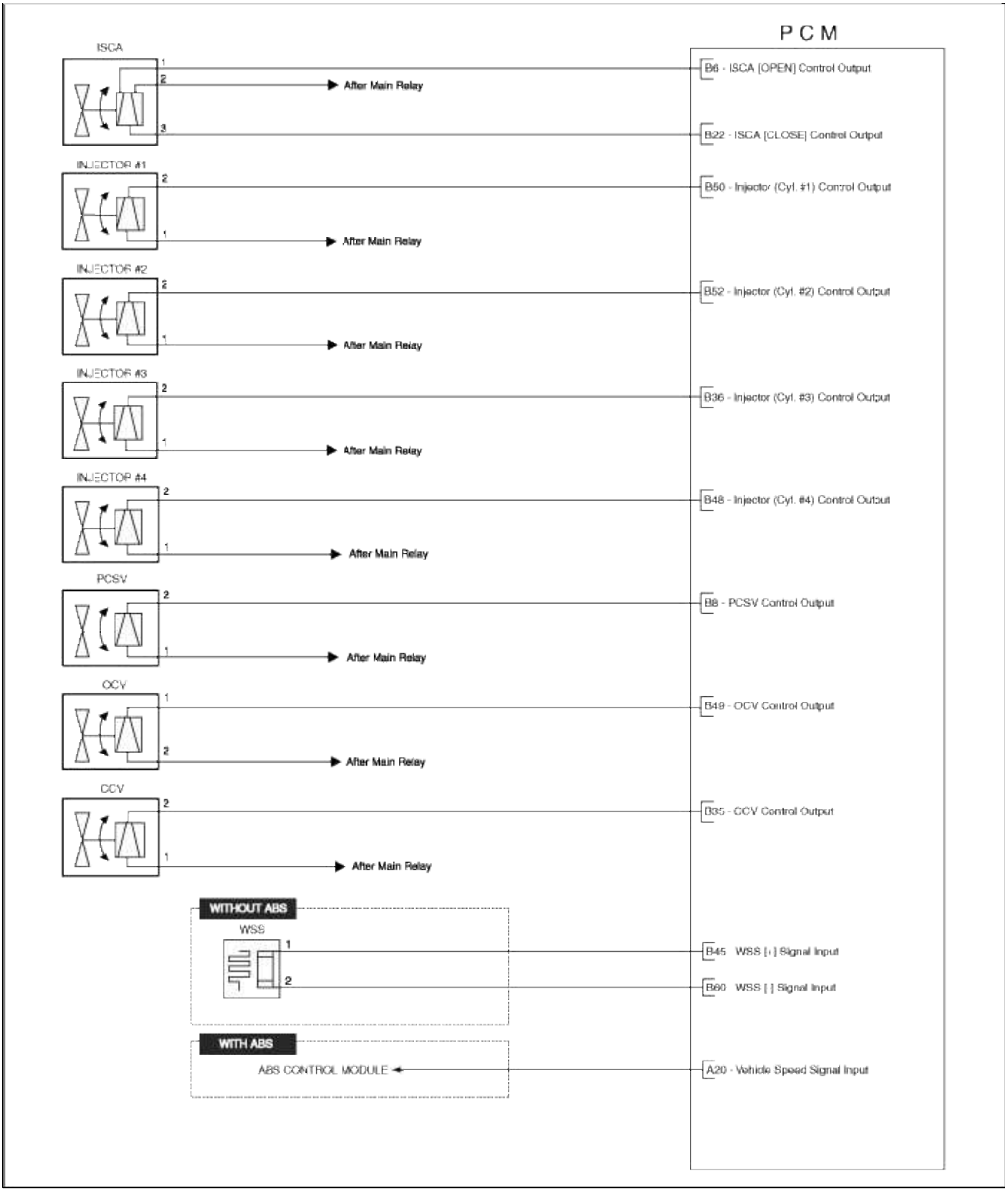
Fuel System > Engine Control System > Powertrain Control Module (PCM) > Schematic Diagrams

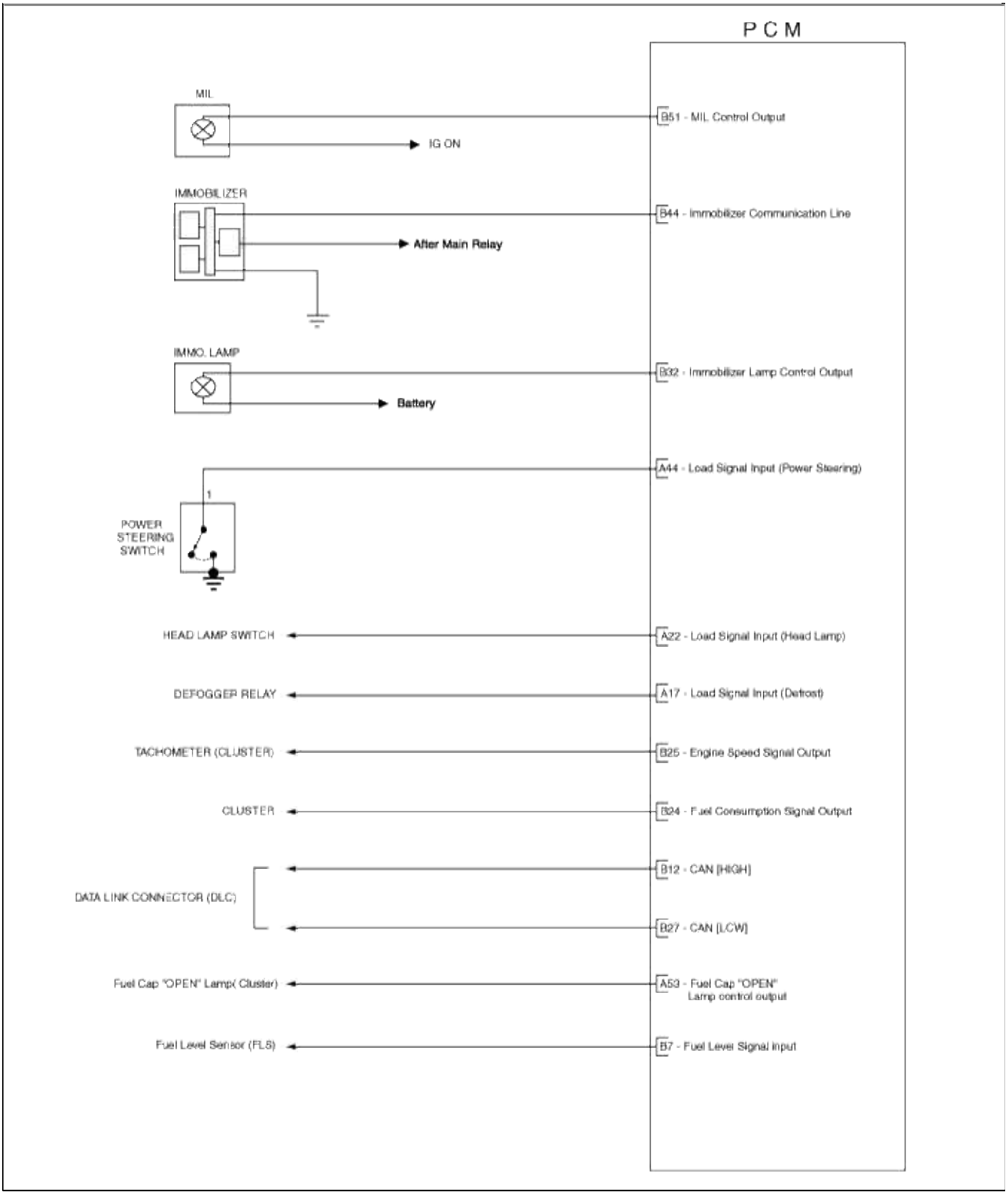
CIRCUIT DIAGRAM

[A/T]

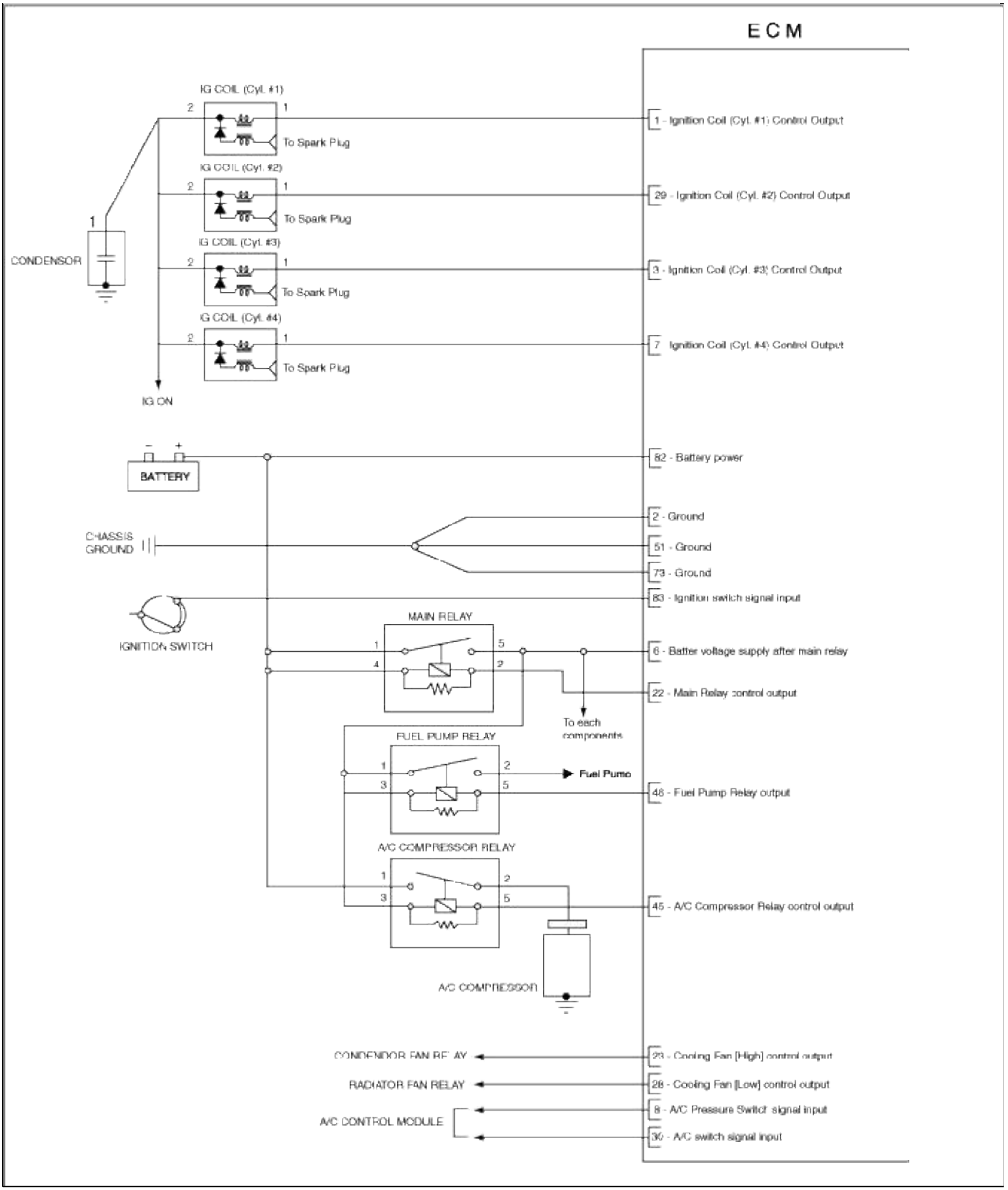

PCM
IG COIL (Cyl. #1)
To Spark Plug
IG COIL (Cyl. #2)
To Spark Plug
IG COIL (Cyl. #3)
To Spark Plug
IG COIL (Cyl. #4)
To Spark Plug
CONDENSOR
IG ON
BATTERY
CHASSIS GROUND
IGNITION SWITCH
MAIN RELAY
FUEL PUMP RELAY
Fuel Pump
A/C COMPRESSOR RELAY
A/C COMPRESSOR
To each components
B17 - Ignition Coil (Cyl. #1) Control Output
B1 - Ignition Coil (Cyl. #2) Control Output
B16 - Ignition Coil (Cyl. #3) Control Output
B2 - Ignition Coil (Cyl. #4) Control Output
B56 - Battery power
A25 - Ground
A2 - Ground
A3 - Ground
A24 - Ground
A1 - Ground
B11 - Ignition switch signal input
A6 - Batter voltage supply after mair relay
B9 - Main Relay control output
B37 - Fuel Pump Relay output
B38 - A/C Compressor Relay control output
CONDENDOR FAN RELAY
RADIATOR FAN RELAY
A/C CONTROL MODULE
B23 - Cooling Fan [High] control output
B21 - Cooling Fan [Low] control output
A46 - A/C Pressure Switch signal input
A23 - A/C switch signal input

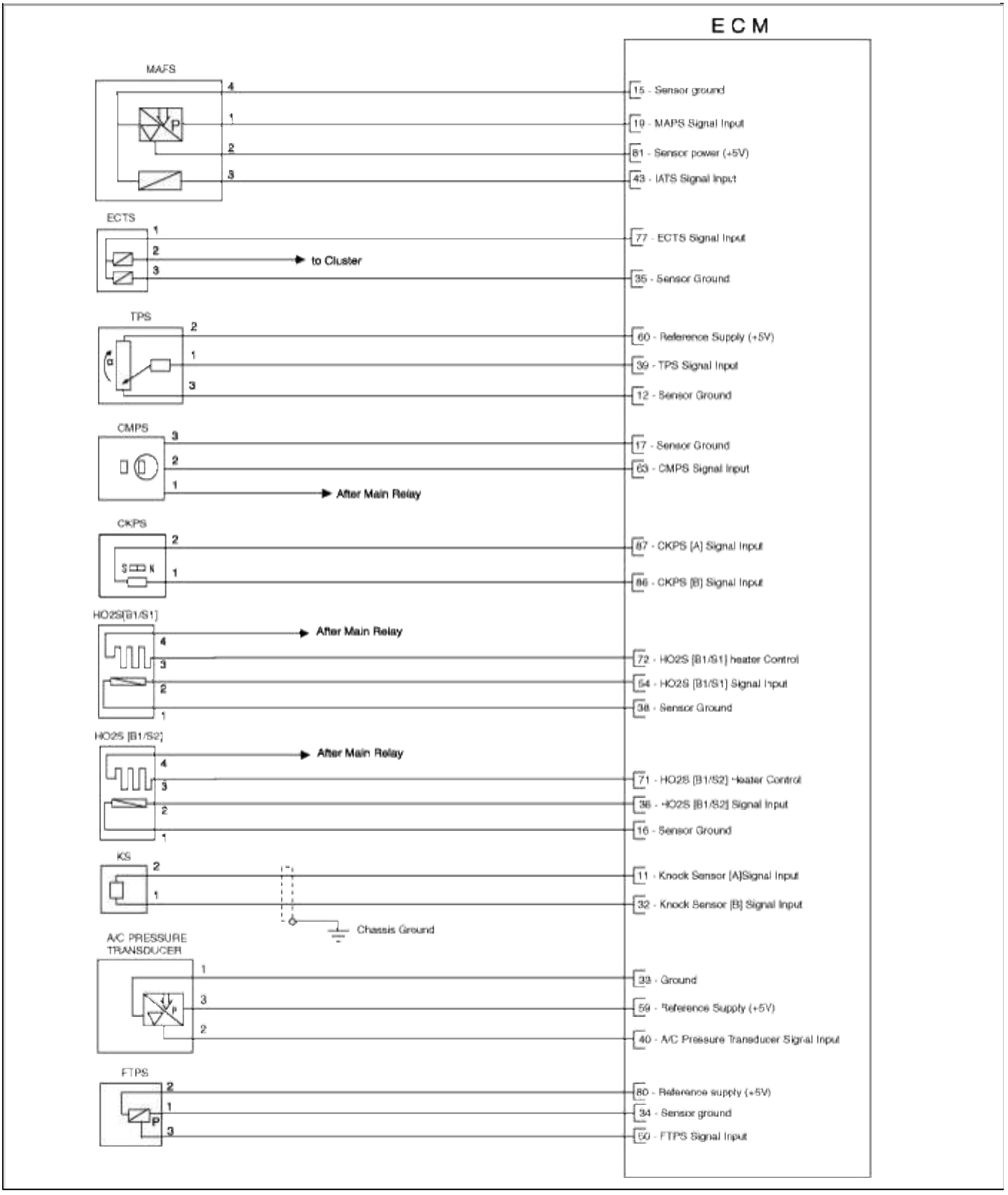

PCM
MAFS
4
1
2
3
A8 - Sensor Ground
A10 - MAPS Signal Input
A43 - Sensor power (+5V)
A32 - IATS Signal Input
ECTS
1
2
3
to Cluster
A77 - ECTS Signal Input
A73 - Sensor Ground
TPS
2
1
3
B58 - Reference Supply (+5V)
A75 - TPS Signal Input
A51 - Sensor Ground
CMPS
3
2
1
After Main Relay
A38 - Sensor Ground
A41 - CMPS Signal Input
CKPS
2
1
B40 - CKPS [A] Signal Input
B55 - CKPS [B] Signal Input
HO2S[B1/S1]
After Main Relay
4
3
2
1
B34 - HO2S [B1/S1] Heater Control
A35 - HO2S [B1/S1] Signal Input
A31 - Sensor Ground
HO2S [B1/S2]
After Main Relay
4
3
2
1
B33 - HO2S [B1/S2] heater Control
A13 - HO2S [B1/S2] Signal Input
A9 - Sensor Ground
KS
2
1
Chassis Ground
B15 - Knock Sensor [A]Signal Input
B30 - Knock Sensor [B] Signal Input
A/C PRESSURE TRANSDUCER
1
3
2
A30 - Ground
B57 - Reference Supply (+5V)
A79 - A/C Pressure Transducer Signal Input
FTPS
2
1
3
B42 - Reference supply (+5V)
B29 - Sensor ground
B3 - FTPS Signal Input

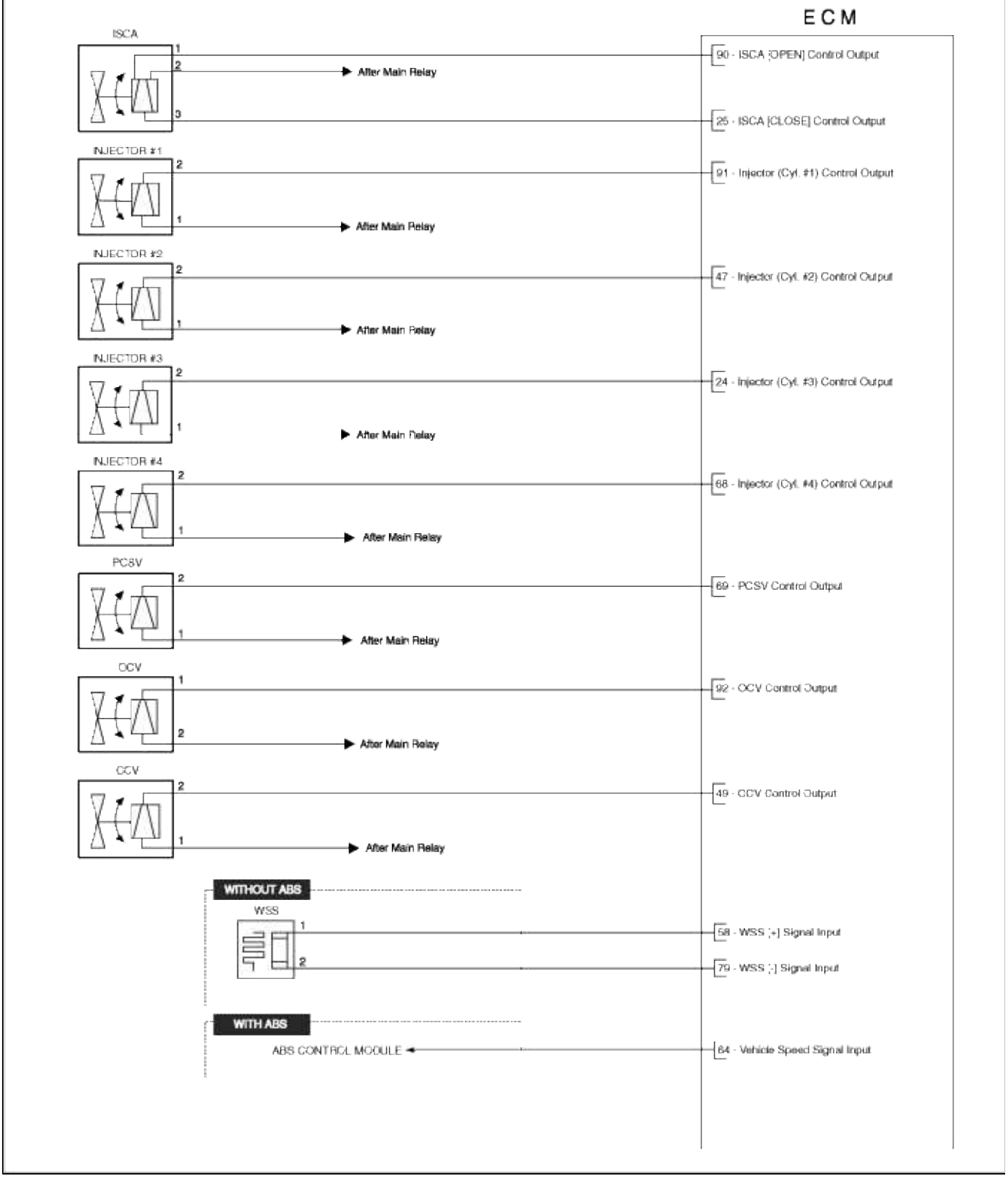

PCM
ISCA
1
2
3
After Main Relay
B6 - ISCA [OPEN] Control Output
B22 - ISCA [CLOSE] Control Output
INJECTOR #1
2
1
After Main Relay
B50 - Injector (Cyl. #1) Control Output
INJECTOR #2
2
1
After Main Relay
B52 - Injector (Cyl. #2) Control Output
INJECTOR #3
2
1
After Main Relay
B36 - Injector (Cyl. #3) Control Output
INJECTOR #4
2
1
After Main Relay
B48 - Injector (Cyl. #4) Control Output
PCSV
2
1
After Main Relay
B8 - PCSV Control Output
OCV
1
2
After Main Relay
B49 - OCV Control Output
CCV
2
1
After Main Relay
B35 - CCV Control Output
WITHOUT ABS
WSS
1
2
B45 WSS [ ] Signal Input
B60 WSS [ ] Signal Input
WITH ABS
ABS CONTROL MODULE
A20 - Vehicle Speed Signal Input

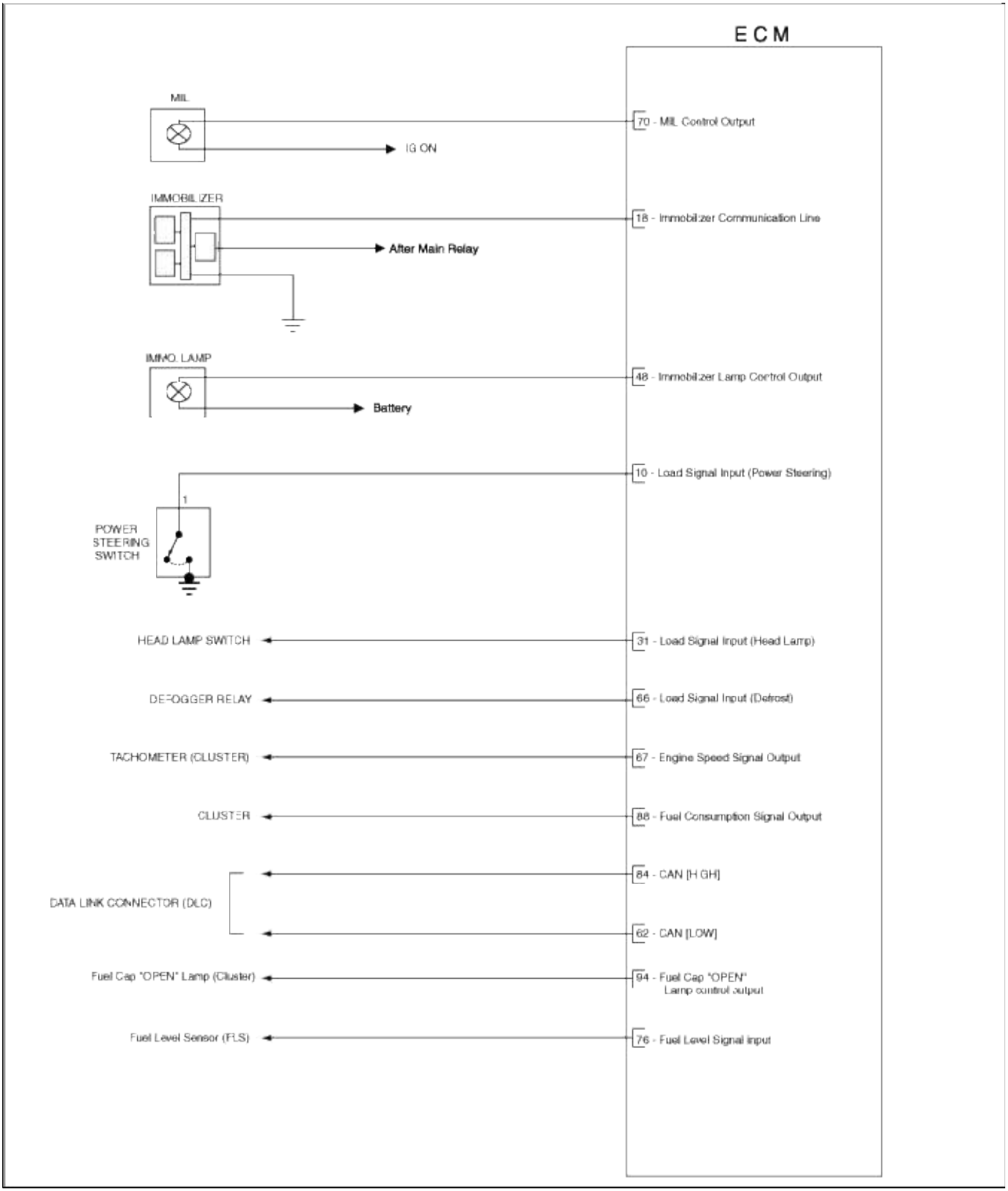

P C M
MIL
IG ON
B51 - MIL Control Output
IMMOBILIZER
After Main Relay
B44 - Immobilizer Communication Line
IMMO. LAMP
Battery
B32 - Immobilizer Lamp Control Output
A44 - Load Signal Input (Power Steering)
1
POWER STEERING SWITCH
HEAD LAMP SWITCH
A22 - Load Signal Input (Head Lamp)
DEFOGGER RELAY
A17 - Load Signal Input (Defrost)
TACHOMETER (CLUSTER)
B25 - Engine Speed Signal Output
CLUSTER
B24 - Fuel Consumption Signal Output
DATA LINK CONNECTOR (DLC)
B12 - CAN [HIGH]
B27 - CAN [LOW]
Fuel Cap "OPEN" Lamp(Cluster)
A53 - Fuel Cap "OPEN" Lamp control output
Fuel Level Sensor (FLS)
B7 - Fuel Level Signal Input

[M/T]


ECM
IG COIL (Cyl. #1)
IG COIL (Cyl. #2)
IG COIL (Cyl. #3)
IG COIL (Cyl. #4)
To Spark Plug
CONDENSOR
IG ON
1 - Ignition Coil (Cyl. #1) Control Output
29 - Ignition Coil (Cyl. #2) Control Output
3 - Ignition Coil (Cyl. #3) Control Output
7 - Ignition Coil (Cyl. #4) Control Output
BATTERY
82 - Battery power
CHASSIS GROUND
2 - Ground
51 - Ground
73 - Ground
IGNITION SWITCH
83 - Ignition switch signal input
MAIN RELAY
6 - Batter voltage supply after main relay
22 - Main Relay control output
To each components
FUEL PUMP RELAY
Fuel Pump
48 - Fuel Pump Relay output
A/C COMPRESSOR RELAY
45 - A/C Compressor Relay control output
A/C COMPRESSOR
CONDENSOR FAN RELAY
23 - Cooling Fan [High] control output
RADIATOR FAN RELAY
26 - Cooling Fan [Low] control output
A/C CONTROL MODULE
8 - A/C Pressure Switch signal input
30 - A/C switch signal input


ECM
MAFS
4
1
2
3
15 - Sensor ground
19 - MAPS Signal Input
61 - Sensor power (+5V)
43 - IATS Signal Input
ECTS
1
2
3
to Cluster
77 - ECTS Signal Input
35 - Sensor Ground
TPS
2
1
3
60 - Reference Supply (+5V)
39 - TPS Signal Input
12 - Sensor Ground
CMPS
3
2
1
After Main Relay
17 - Sensor Ground
63 - CMPS Signal Input
CKPS
2
1
87 - CKPS [A] Signal Input
86 - CKPS [B] Signal Input
HO2S[B1/S1]
After Main Relay
4
3
2
1
72 - HO2S [B1/S1] heater Control
54 - HO2S [B1/S1] Signal Input
38 - Sensor Ground
HO2S [B1/S2]
After Main Relay
4
3
2
1
71 - HO2S [B1/S2] Heater Control
36 - HO2S [B1/S2] Signal Input
16 - Sensor Ground
KS
2
1
11 - Knock Sensor [A]Signal Input
32 - Knock Sensor [B] Signal Input
Chassis Ground
A/C PRESSURE TRANSDUCER
1
3
2
33 - Ground
59 - Reference Supply (+5V)
40 - A/C Pressure Transducer Signal Input
FTPS
2
1
3
80 - Reference supply (+5V)
34 - Sensor ground
50 - FTPS Signal Input


ECM
ISCA
1
2
3
After Main Relay
90 - ISCA [OPEN] Control Output
25 - ISCA [CLOSE] Control Output
INJECTOR #1
2
1
After Main Relay
91 - Injector (Cyl. #1) Control Output
INJECTOR #2
2
1
After Main Relay
47 - Injector (Cyl. #2) Control Output
INJECTOR #3
2
1
After Main Relay
24 - Injector (Cyl. #3) Control Output
INJECTOR #4
2
1
After Main Relay
68 - Injector (Cyl. #4) Control Output
PCSV
2
1
After Main Relay
69 - PCSV Control Output
OCV
1
2
After Main Relay
92 - OCV Control Output
CCV
2
1
After Main Relay
49 - CCV Control Output
WITHOUT ABS
WSS
1
2
58 - WSS [+] Signal Input
79 - WSS [-] Signal Input
WITH ABS
ABS CONTROL MODULE
64 - Vehicle Speed Signal Input



Fuel System > Engine Control System > Powertrain Control Module (PCM) > Repair procedures

ECM/PCM PROBLEM INSPECTION PROCEDURE

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

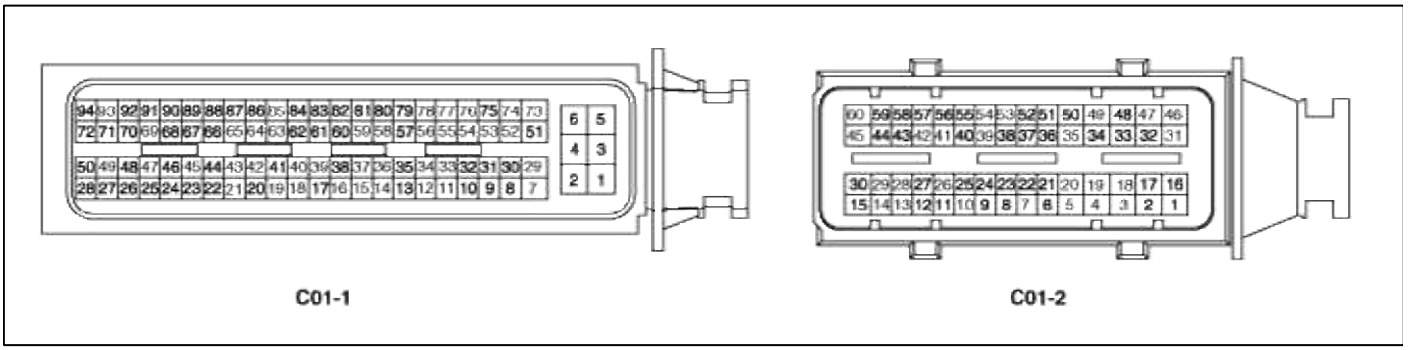
Specification (Resistance): 1Ω or less

2. TEST ECM/PCM CONNECTOR: Disconnect the ECM/PCM connector and visually check the ground terminal on ECM/PCM side and harness side for bent pins or poor contact pressure, If the problem is found, repair it.
3. If problem is not found in Step 1 and 2, the ECM/PCM could be faulty. If so, replace the ECM/PCM with a new one, and then check the vehicle agaon. If the vehicle operates normally then the problem was likely with the ECM/PCM.
4. RE-TEST THE ORIGINAL ECM/PCM : Install the original ECM/PCM (may be broken) into a known-good vehicle and check the vehicle. If the problem occurs again, replace the original ECM/PCM with a new one. If problem dose not occur, this is intermittent problem (Refer to INTERMITTENT PROBLEM PROCEDURE in BASIC INSPECTION PROCEDURE).

Fuel System > Engine Control System > Powertrain Control Module (PCM) > Specifications

PCM (POWERTRAIN CONTROL MODULE)

1. PCM HARNESS CONNECTOR (A/T)



2. PCM TERMINAL FUNCTION (A/T)

CONNECTOR [C01-1]

Pin	Description	Connected to
1	Ground	Chassis Ground
2	Ground	Chassis Ground
3	Ground	Chassis Ground
4	For Autotransaxle Control	
5	For Autotransaxle Control	
6	Batter voltage supply after main relay	Main Relay
7	-	
8	Sensor ground	MAPS & IATS
9	Sensor ground	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]
10	Manifold Absolute Pressure Sensor (MAPS) signal input	Manifold Absolute Pressure Sensor (MAPS)
11	-	
12	-	
13	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2] signal input	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]
14	-	

15	-	
16	-	
17	Load signal input (Defrost)	Defrost Relay
18	-	
19	-	
20	Vehicle speed signal input	ABS Control Module [with ABS]
21	-	
22	Load Signal input (Head Lamp)	Multi Function Switch
23	A/C switch signal input	A/C Control Module
24	Ground (For Autotransaxle)	Chassis Ground
25	Ground (For Autotransaxle)	Chassis Ground
26	For Autotransaxle Control	
27	For Autotransaxle Control	
28	-	
29	Sensor ground	Fuel Tank Pressure Sensor (FTPS)
30	Ground	A/C Pressure Transducer
31	Sensor ground	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
32	Intake Air Temperature Sensor (IATS) signal input	Intake Air Temperature Sensor (IATS)
33	-	
34	-	
35	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1] signal input	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
36	-	
37	-	
38	Sensor ground	Camshaft Position Sensor (CMPS)
39	-	
40	-	
41	Camshaft Position Sensor (CMPS) signal input	Camshaft Position Sensor (CMPS)
42	-	
43	-	
44	Load signal input (Power Steering)	Power Steering Switch
45	-	
46	A/C Pressure Switch signal input	A/C Control Module
47	-	
48	For Autotransaxle Control	
49	-	

50	For Autotransaxle Control	
51	Sensor ground	Throttle Position Senosr (TPS)
52	-	
53	Fuel Level Sensor (FLS) signal input	Fuel Level Sensor (FLS)
54	-	
55	-	
56	-	
57	For Autotransaxle Control	
58	-	
59	-	
60	For Autotransaxle Control	
61	For Autotransaxle Control	
62	For Autotransaxle Control	
63	For Autotransaxle Control	
64	For Autotransaxle Control	
65	For Autotransaxle Control	
66	For Autotransaxle Control	
67	For Autotransaxle Control	
68	For Autotransaxle Control	
69	-	
70	For Autotransaxle Control	
71	For Autotransaxle Control	
72	For Autotransaxle Control	
73	Sensor ground	Engine Coolant Temperature Sensor (ECTS)
74	-	
75	Throttle Position Senosr (TPS) signal input	Throttle Position Senosr (TPS)
76	-	
77	Engine Coolant Temperature Sensor (ECTS) signal input	Engine Coolant Temperature Sensor (ECTS)
78	-	
79	A/C Pressure Transducer signal input	A/C Pressure Transducer
80	For Autotransaxle Control	
81	For Autotransaxle Control	
82	For Autotransaxle Control	
83	For Autotransaxle Control	
84	For Autotransaxle Control	

85	-	
86	-	
87	For Autotransaxle Control	
88	For Autotransaxle Control	
89	For Autotransaxle Control	
90	For Autotransaxle Control	
91	For Autotransaxle Control	
92	For Autotransaxle Control	
93	-	
94	For Autotransaxle Control	

CONNECTOR [C01-2]

Pin	Description	Connected to
1	Ignition Coil (Cylinder #2) control output	Ignition Coil (Cylinder #2)
2	Ignition Coil (Cylinder #4) control output	Ignition Coil (Cylinder #4)
3	Fuel Tank Pressure Sensor (FTPS) signal input	Fuel Tank Pressure Sensor (FTPS)
4	-	
5	-	
6	Idle Speed Control Actuator (ISCA) [OPEN] control output	Idle Speed Control Actuator (ISCA)
7	Fuel Filler Cap "OPEN" Lamp control output	Fuel Filler Cap "OPEN" Lamp (Cluster)
8	Purge Control Solenoid Valve (PCSV) control output	Purge Control Solenoid Valve (PCSV)
9	Main Relay control output	Main Relay
10	-	
11	Ignition switch signal input	Ignition switch
12	CAN [High]	Data Link Connector (DLC)
13	-	
14	-	
15	Knock Sensor [A] signal input	Knock Sensor
16	Ignition Coil (Cylinder #3) control output	Ignition coil (Cylinder #3)
17	Ignition Coil (Cylinder #1) control output	Ignition Coil (Cylinder #1)
18	-	
19	-	
20	-	
21	Cooling Fan [Low] control output	Radiator Fan Relay
22	Idle Speed Control Actuator (ISCA) [CLOSE] control output	Idle Speed Control Actuator (ISCA)

23	Cooling Fan [High] control output	Condensor Fan Relay
24	Fuel consumption signal output	Trip computer
25	Engine speed signal output	Tachometer (Cluster)
26	-	
27	CAN [Low]	Data Link Connector (DLC)
28	-	
29	-	
30	Knock Sensor [B] signal input	Knock Sensor
31	-	
32	Immobilizer Lamp control output	Immobilizer Lamp (Cluster)
33	HO2S [Bank 1 / Sensor 2] heater control output	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]
34	HO2S [Bank 1 / Sensor 1] heater control output	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
35	Canister Close Valve (CCV) control output	
36	Injector (Cylinder #3) control output	Injector (Cylinder #3)
37	Fuel Pump Relay output	Fuel Pump Relay
38	A/C Compressor Relay control output	A/C Compressor Relay
39	-	
40	Crankshaft Position Sensor (CKPS) [A] signal input	Crankshaft Position Sensor (CKPS)
41	-	
42	Reference supply (+5V)	Fuel Tank Pressure Sensor (FTPS)
43	Reference supply (+5V)	Manifold Absolute Pressure Sensor (MAPS)
44	Immobilizer Communication Line	Immobilizer Control Module
45	Wheel Speed Sensor (WSS) [+] signal input	Wheel Speed Sensor (WSS) [Without ABS]
46	-	
47	-	
48	Injector (Cylinder #4) control output	Injector (Cylinder #4)
49	CVVT Oil Control Valve (OCV) control output	CVVT Oil Control Valve (OCV)
50	Injector (Cylinder #1) control output	Injector (Cylinder #1)
51	Malfunction Indicator Lamp (MIL) control output	Malfunction Indicator Lamp (Cluster)
52	Injector (Cylinder #2) control output	Injector (Cylinder #2)
53	-	
54	-	
55	Crankshaft Position Sensor (CKPS) [B] signal input	Crankshaft Position Sensor (CKPS)
56	Battery power	Battery
57	Reference supply (+5V)	A/C Pressure Transducer

58	Reference supply (+5V)	Throttle Position Senosr (TPS)
59	-	
60	Wheel Speed Sensor (WSS) [-] signal input	Wheel Speed Sensor (WSS) [Without ABS]

3. PCM TERMINAL IN/OUT SIGNAL (A/T)

CONNECTOR [C01-1]

Pin No.	Description	Condition	Type	Level	Test Result
1	Ground	Idle	DC	Max. 50mV	0.0V
2	Ground	Idle	DC	Max. 50mV	2.4mV
3	Ground	Idle	DC	Max. 50mV	1.8mV
4	For Autotransaxle Control				
5	For Autotransaxle Control				
6	Batter voltage supply after main relay	IG OFF	DC	Max. 1.0V	0V
		IG ON		Battery Voltage	12.81V
7	-				
8	Sensor ground	Idle	DC	Max. 50mV	13.2mV
9	Sensor ground	Idle	DC	Max. 50mV	8.9mV
10	Manifold Absolute Pressure Sensor (MAPS) signal input	IG ON	Analog	3.9 ~ 4.1V	4.05V
		Idle		0.8 ~ 1.6V	1.55V
11	-				
12	-				
13	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2] signal input	Racing	Analog	Rich: 0.6 ~ 1.0V	872mV
				Lean: Max. 0.4V	155mV
14	-				
15	-				
16	-				
17	Load signal input (Defrost)	S/W OFF	DC	Max. 0.5V	0mV
		S/W ON		Battery Voltage	13.19V
18	-				
19	-				
20	Vehicle speed signal input [With ABS]	Vehicle Run	Pulse	HI : Min. 5.0V	12.4V
				LO : Max. 1.0V	17mV
					432Hz at 30kph

21	-				
22	Load signal input (Head Lamp)	S/W OFF	DC	Battery Voltage	12.96V
		S/W ON		Max. 0.5V	274mV
23	A/C switch signal input	S/W OFF	DC	Max. 1.0V	10.6mV
		S/W ON		Battery Voltage	11.78V
24	Ground (For Autotransaxle)	Idle	DC	Max. 50mV	2.1mV
25	Ground (For Autotransaxle)	Idle	DC	Max. 50mV	1.8mV
26	For Autotransaxle Control				
27	For Autotransaxle Control				
28	-				
29	Sensor ground	Idle	DC	Max. 50 mV	9.2 mV
30	Ground	Idle	DC	Max. 50mV	8.7mV
31	Sensor ground	Idle	DC	Max. 50mV	7.2mV
32	Intake Air Temperature Sensor (IATS) signal input	Idle	Analog	0 ~ 5V	1.89V at 35°C
33	-				
34	-				
35	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1] signal input	Racing	Analog	Rich : 0.6 ~ 1.0V	880mV
				Lean : Max. 0.4V	208mV
36	-				
37	-				
38	Sensor ground	Idle	DC	Max. 50mV	3.7mV
39	-				
40	-				
41	Camshaft Position Sensor (CMPS) signal input	Idle	Pulse	HI : Battery Voltage	13.86V
				LO : Max. 0.5V	450mV
42	-				
43	-				
44	Load signal input (Power Steering)	S/W ON	DC	Battery Voltage	11.81V
		S/W OFF		Max. 0.5V	351mV
45	-				
46	A/C Pressure Switch signal input	S/W OFF	DC	Max. 1.0V	0.0mV
		S/W ON		Battery Voltage	12.77V
47	-				

48	For Autotransaxle Control				
49	-				
50	For Autotransaxle Control				
51	Sensor ground	Idle	DC	Max. 50mV	6.8mV
52	-				
53	Fuel Level Sensor (FLS) signal input	IG ON	DC	0 ~ Battery Voltage	2.14V
54	-				
55	-				
56	-				
57	For Autotransaxle Control				
58	-				
59	-				
60	For Autotransaxle Control				
61	For Autotransaxle Control				
62	For Autotransaxle Control				
63	For Autotransaxle Control				
64	For Autotransaxle Control				
65	For Autotransaxle Control				
66	For Autotransaxle Control				
67	For Autotransaxle Control				
68	For Autotransaxle Control				
69	-				
70	For Autotransaxle Control				
71	For Autotransaxle Control				
72	For Autotransaxle Control				
73	Sensor ground	Idle	DC	Max. 50mV	2.1mV
74	-				
75	Throttle Position Senosr (TPS) signal input	C.T	Analog	0.2 ~ 0.7V	0.31V
		W.O.T		Min. 4.0V	4.21V
76	-				
77	Engine Coolant Temperature Sensor (ECTS) signal input	Idle	Analog	0.5 ~ 4.5V	0.85V at 95.1°C
78	-				
79	A/C Pressure Transducer signal input	A/C ON	Analog	Max. 4.8V	2.51V
80	For Autotransaxle Control				
81	For Autotransaxle Control				

82	For Autotransaxle Control				
83	For Autotransaxle Control				
84	For Autotransaxle Control				
85	-				
86	For Autotransaxle Control				
87	For Autotransaxle Control				
88	For Autotransaxle Control				
89	For Autotransaxle Control				
90	For Autotransaxle Control				
91	For Autotransaxle Control				
92	For Autotransaxle Control				
93	-				
94	For Autotransaxle Control				

CONNECTOR [C01-2]

Pin No.	Description	Condition	Type	Level	Test Result
1	Ignition Coil (Cylinder #2) control output	Idle	Pulse	1st Voltage: 300~400V	365V
				ON Voltage: Max. 2V	1.69V
					5.0Hz
2	Ignition Coil (Cylinder #4) control output	Idle	Pulse	1st Voltage: 300~400V	362V
				ON Voltage: Max. 2V	1.69V
					5.0Hz
3	Fuel Tank Pressure Sensor (FTPS) signal input	Idle	DC	0.4 ~ 4.6V	2.45V
4	-				
5	-				
6	Idle Speed Control Actuator (ISCA) [OPEN] control output	Idle	Pulse	HI: Battery Voltage	14.8V
				LO: Max. 1.0V	128mV
					250Hz at duty 32.5%
7	Fuel Filler camp "OPEN" Lamp control output	Lamp OFF	DC	Battery Voltage	
		Lamp ON		Max 1.0V	
				HI: Battery	

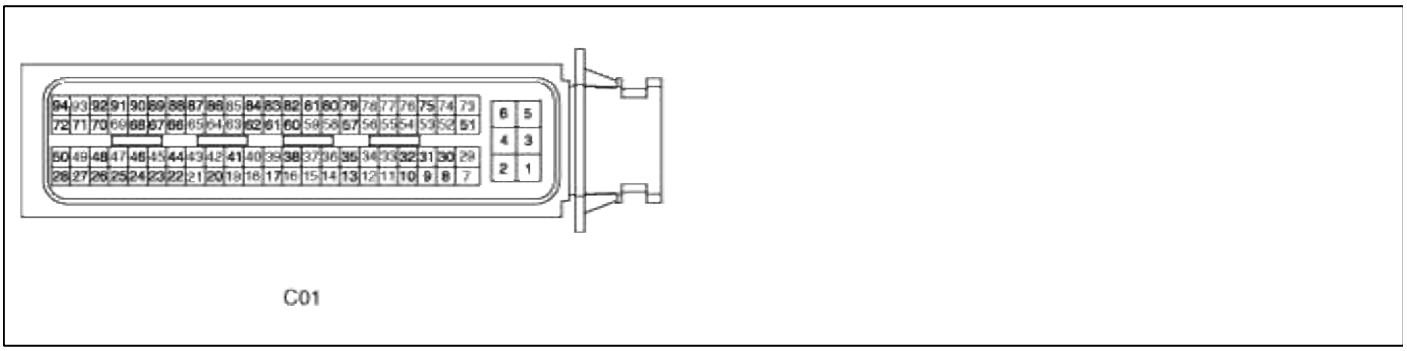
				HI: Battery Voltage	14.2V
8	Purge Control Solenoid Valve (PCSV) control output	Active Inactive	Pulse	LO: Max. 1.0V	215mV
				Vpeak: Max. 70V	45.2V
					13.68Hz
9	Main Relay control output	Relay OFF	DC	Battery Voltage	12.97V
		Relay ON		Max. 1.0V	791mV
10	-				
11	Ignition switch signal input	IG OFF	DC	Max 0.5V	2.8mV
		IG ON		Battery Voltage	12.18V
12	CAN [High]	Recessive	Pulse	2.0 ~ 3.0V	2.36V
		Dominant		2.75 ~ 4.5V	3.44V
13	-				
14	-				
15	Knock Sensor [A] signal input	Knocking	Variable Frequency		
		Normal			
16	Ignition Coil (Cylinder #3) control output	Idle	Pulse	1st Voltage: 300 ~ 400V	358V
				ON Voltage : Max. 2V	1.68V
					5.0Hz
17	Ignition Coil (Cylinder #1) control output	Idle	Pulse	1st Voltage: 300 ~ 400V	349V
				ON Voltage: Max. 2V	1.68V
					5.0Hz
18	-				
19	-				
20	-				
21	Cooling Fan [Low] control output	Relay OFF	DC	Battery Voltage	14.05V
		Relay ON		Max. 1.0V	52.1mV
22	Idle Speed Control Actuator (ISCA) [CLOSE] control output	Idle	Pulse	HI : Battery Voltage	14.9V
				LO : Max. 1.0V	204mV
					250Hz at duty 67.5%

23	Cooling Fan [High] control output	Relay OFF	DC	Battery Voltage	14.12V
		Relay ON		Max. 1.0V	198mV
24	Fuel consumption signal output	Idle	Pulse	HI: Battery Voltage	13.9V
				LO: Max. 0.5V	16.1mV
25	Engine speed signal output	Idle	Pulse	HI: Battery Voltage	13.9V
				LO: Max. 0.5V	12.1mV
				20 ~ 26Hz	21.9Hz
26	-				
27	CAN [Low]	Recessive	Pulse	2.0 ~ 3.0V	2.36V
		Dominant		0.5 ~ 2.25V	1.44V
28	-				
29	-				
30	Knock Sensor [B] signal input	Knocking	Variable Frequency		
		Normal			
31	-				
32	Immobilizer Lamp control output	Lamp OFF	DC	Battery Voltage	11.98V
		Lamp ON		Max. 1.0V	27mV
33	HO2S [Bank 1 / Sensor 2] heater control output	Engine Run	Pulse (2Hz)	HI: Battery Voltage	14.1V
				LO: Max. 1.0V	304mV
34	HO2S [Bank 1 / Sensor 1] heater control output	Engine Run	Pulse (2Hz)	HI: Battery Voltage	14.1V
				LO: Max. 1.0V	326mV
35	Canister Close Valve (CCV) control output	Active Inactive	Pulse	HI : Battery Voltage	12.5V
				LO : Max. 1.0V	121V
				Vpeak : Max. 70V	44.7V
36	Injector (Cylinder #3) control output	Idle	Pulse (5.5Hz)	HI: Battery Voltage	14.2V
				LO: Max. 1.0V	330mV
				Vpeak: Max. 80V	69.6V
37	Fuel Pump Relay output	Relay OFF	DC	Battery Voltage	12.3V
		Relay ON		Max. 1.0V	30mV

38	A/C Compressor Relay control output	A/C OFF	DC	Battery Voltage	14.32V
		A/C ON		Max. 1.0V	114mV
39	-				
40	Crankshaft Position Sensor (CKPS) [A] signal input	Idle	Sine Wave	Vp_p : Min. 1.0V	8.44V
					718.4Hz
41	-				
42	Reference Supply (+5V)	IG OFF	DC	Max. 0.5V	
		IG ON		4.9 ~ 5.1V	
43	Reference supply (+5V)	IG OFF	DC	Max. 0.5V	
		IG ON		4.9 ~ 5.1V	
44	Immobilizer Communication Line	When communication after IG ON	Pulse	HI: Min. 8.5V	12.31V
				LO: Max. 3.5V	1.17V
45	Wheel Speed Sensor (WSS) [+] signal input [Without ABS]	Vehicle Run	Sine Wave	Vp_p : Min. 0.2V	
46	-				
47	-				
48	Injector (Cylinder #4) control output	Idle	Pulse (5.5Hz)	HI: Battery Voltage	14.2V
				LO: Max. 1.0V	330mV
				Vpeak: Max. 80V	69.6V
49	CVVT Oil Control Valve (OCV) control output	Idle	Pulse	HI: Battery Voltage	14.9V
				LO: Max. 1.0V	36.2mV
					300.26Hz at duty 6.1%
50	Injector (Cylinder #1) control output	Idle	Pulse (5.5Hz)	HI: Battery Voltage	14.2V
				LO: Max. 1.0V	330mV
				Vpeak: Max. 80V	69.6V
51	Malfunction Indicator Lamp (MIL) control output	Lamp OFF	DC	Battery Voltage	13.03V
		Lamp ON		Max.1.0V	716mV
52	Injector (Cylinder #2) control output	Idle	Pulse (5.5Hz)	HI: Battery Voltage	13.6V
				LO: Max. 1.0V	340mV

				Vpeak: Max. 80V	69.7V
53	-				
54	-				
55	Crankshaft Position Sensor (CKPS) [B] signal input	Idle	Sine Wave	Vp_p: Min.1.0V	8.44V
					718.4Hz
56	Battery power	Always	DC	Battery Voltage	12.91V
57	Reference supply (+5V)	IG OFF	DC	Max. 0.5V	4.2mV
		IG ON		4.9 ~ 5.1V	5.04V
58	Reference supply (+5V)	IG OFF	DC	Max. 0.5V	0.0mV
		IG ON		4.9 ~ 5.1V	5.04V
59	-				
60	Wheel Speed Sensor (WSS) [-] signal input [Without ABS]	Vehicle Run	Sine Wave	Vp-p: Min. 0.2V	

1. ECM HARNESS CONNECTOR (M/T)



2. ECM TERMINAL FUNCTION (M/T)

CONNECTOR [C01]

Pin	Description	Connected to
1	Ignition Coil (Cylinder #1) control output	Ignition Coil (Cylinder #1)
2	Ground	Chassis Ground
3	Ignition Coil (Cylinder #3) control output	Ignition Coil (Cylinder #3)
4	-	
5	-	
6	Batter voltage supply after main relay	Main Relay
7	Ignition Coil (Cylinder #4) control output	Ignition Coil (Cylinder #4)
8	A/C Pressure Switch signal input	A/C Control Module
9	-	
10	Load signal input (Power Steering)	Power Steering Switch
11	Knock Sensor [A] signal input	Knock Sensor

12	Sensor ground	Throttle Position Senosr (TPS)
13	-	
14	-	
15	Sensor ground	MAPS & IATS
16	Sensor ground	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]
17	Sensor ground	Camshaft Position Sensor (CMPS)
18	Immobilizer Communication Line	Immobilizer Control Module
19	Manifold Absolute Pressure Sensor (MAPS) signal input	Manifold Absolute Pressure Sensor (MAPS)
20	-	
21	-	
22	Main Relay control output	Main Relay
23	Cooling Fan [High] control output	Condensor Fan Relay
24	Injector (Cylinder #3) control output	Injector (Cylinder #3)
25	Idle Speed Control Actuator (ISCA) [CLOSE] control output	Idle Speed Control Actuator (ISCA)
26	-	
27	-	
28	Cooling Fan [Low] control output	Radiator Fan Relay
29	Ignition Coil (Cylinder #2) control output	Ignition Coil (Cylinder #2)
30	A/C switch signal input	A/C Control Module
31	Load signal input (Head Lamp)	Multi Function Switch
32	Knock Sensor [B] signal input	Knock Sensor
33	Ground	A/C Pressure Transducer
34	Sensor ground	Fuel Tank Pressure Sensor (FTPS)
35	Sensor ground	Engine Coolant Temperature Sensor (ECTS)
36	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2] signal input	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]
37	-	
38	Sensor ground	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
39	Throttle Position Senosr (TPS) signal input	Throttle Position Senosr (TPS)
40	A/C Pressure Transducer signal input	A/C Pressure Transducer
41	-	
42	-	
43	Intake Air Temperature Sensor (IATS) signal input	Intake Air Temperature Sensor (IATS)
44	-	

45	A/C Compressor Relay control output	A/C Compressor Relay
46	Fuel Pump Relay output	Fuel Pump Relay
47	Injector (Cylinder #2) control output	Injector (Cylinder #2)
48	Immobilizer Lamp control output	Immobilizer Lamp (Cluster)
49	Canister Close Valve (CCV) control output	Canister Close Valve (CCV)
50	Fuel Tank Pressure Sensor (FTPS) signal input	Fuel Tank Pressure Sensor (FTPS)
51	Ground	Chassis Ground
52	-	
53	-	
54	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1] signal input	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
55	-	
56	-	
57	-	
58	Wheel Speed Sensor (WSS) [+] signal input	Wheel Speed Sensor (WSS) [Without ABS]
59	Reference supply (+5V)	A/C Pressure Transducer
60	Reference supply (+5V)	Throttle Position Senosr (TPS)
61	-	
62	CAN [Low]	Data Link Connector (DLC)
63	Camshaft Position Sensor (CMPS) signal input	Camshaft Position Sensor (CMPS)
64	Vehicle speed signal input	ABS Control Module [With ABS]
65	-	
66	Load signal input (Defrost)	Defrost Relay
67	Engine speed signal output	Tachometer (Cluster)
68	Injector (Cylinder #4) control output	Injector (Cylinder #4)
69	Purge Control Solenoid Valve (PCSV) control output	Purge Control Solenoid Valve (PCSV)
70	Malfunction Indicator Lamp (MIL) control output	Malfunction Indicator Lamp (Cluster)
71	HO2S [Bank 1 / Sensor 2] heater control output	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]
72	HO2S [Bank 1 / Sensor 1] heater control output	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
73	Ground	Chassis Ground
74	-	
75	-	
76	Fuel Level Sensor (FLS) signal input	Fuel Level Sensor (FLS)
77	Engine Coolant Temperature Sensor (ECTS) signal input	Engine Coolant Temperature Sensor (ECTS)

78	-	
79	Wheel Speed Sensor (WSS) [-] signal input	Wheel Speed Sensor (WSS) [Without ABS]
80	Reference supply (+5V)	Fuel Tank Pressure Sensor (FTPS)
81	Reference supply (+5V)	Manifold Absolute Pressure Sensor (MAPS)
82	Battery power	Battery
83	Ignition switch signal input	Ignition switch
84	CAN [High]	Data Link Connector (DLC)
85	-	
86	Crankshaft Position Sensor (CKPS) [B] signal input	Crankshaft Position Sensor (CKPS)
87	Crankshaft Position Sensor (CKPS) [A] signal input	Crankshaft Position Sensor (CKPS)
88	Fuel consumption signal output	Trip computer
89	-	
90	Idle Speed Control Actuator (ISCA) [OPEN] control output	Idle Speed Control Actuator (ISCA)
91	Injector (Cylinder #1) control output	Injector (Cylinder #1)
92	CVVT Oil Control Valve (OCV) control output	CVVT Oil Control Valve (OCV)
93	-	
94	Fuel Filler Cap "OPEN" Lamp control output	Fuel Filler Cap "OPEN" Lamp (Cluster)

3. ECM HARNESS CONNECTOR (M/T)

CONNECTOR [C01]

Pin	Description	Condition	Type	Level	Test Result
1	Ignition Coil (Cylinder #1) control output	Idle	Pulse	1st Voltage: 300 ~ 400V	349V
				ON Voltage: Max. 2V	1.68V
					5.0Hz
2	Ground	Idle	DC	Max. 50mV	0.0V
3	Ignition Coil (Cylinder #3) control output	Idle	Pulse	1st Voltage: 300 ~ 400V	358V
				ON Voltage: Max. 2V	1.68V
					5.0Hz
4	-				
5	-				
6	Batter voltage supply after main relay	IG OFF	DC	Max. 1.0V	0V
		IG ON		Battery Voltage	12.81V

7	Ignition Coil (Cylinder #4) control output	Idle	Pulse	1st Voltage: 300~400V	362V
				ON Voltage: Max. 2V	1.69V
					5.0Hz
8	A/C Pressure Switch signal input	S/W OFF	DC	Max. 1.0V	0.0mV
		S/W ON		Battery Voltage	12.77V
9	-				
10	Load signal input (Power Steering)	S/W ON	DC	Battery Voltage	11.81V
		S/W OFF		Max. 0.5V	351mV
11	Knock Sensor [A] signal input	Knocking	VariableFrequency		
		Normal			
12	Sensor ground	Idle	DC	Max. 50mV	13.2V
13	-				
14	-				
15	Sensor ground	Idle	DC	Max. 50mV	8.9mV
16	Sensor ground	Idle	DC	Max. 50mV	7.2mV
17	Sensor ground	Idle	DC	Max. 50mV	6.8mV
18	Immobilizer Communication Line	When communication after IG ON	Pulse	HI: Min. 8.5V	12.31V
				LO: Max. 3.5V	1.17V
19	Manifold Absolute Pressure Sensor (MAPS) signal input	IG ON	Analog	3.9 ~ 4.1V	4.05V
		Idle		0.8 ~ 1.6V	1.55V
20	-				
21	-				
22	Main Relay control output	Relay OFF	DC	Battery Voltage	12.97V
		Relay ON		Max. 1.0V	791mV
23	Cooling Fan [High] control output	Relay OFF	DC	Battery Voltage	14.12V
		Relay ON		Max. 1.0V	198mV
24	Injector (Cylinder #3) control output	Idle	Pulse (5.5 Hz)	HI: Battery Voltage	14.2V
				LO: Max. 1.0V	330mV
				Vpeak: Max. 80V	69.6V

25	Idle Speed Control Actuator (ISCA) [CLOSE] control output	Idle	Pulse	HI: Battery Voltage	14.9V
				LO: Max. 1.0V	204mV
				Vpeak: Max.80V	250Hz at duty 67.5%
26	-				
27	-				
28	Cooling Fan [Low] control output	Relay OFF	DC	Battery Voltage	14.05V
		Relay ON		Max. 1.0V	52.1mV
29	Ignition Coil (Cylinder #2) control output	Idle	Pulse	1st Voltage: 300~400V	365V
				ON Voltage: Max. 2V	1.69V
					5.0Hz
30	A/C switch signal input	S/W OFF	DC	Max. 1.0V	10.6mV
		S/W ON		Battery Voltage	11.78V
31	Load signal input (Head Lamp)	S/W OFF	DC	Battery Voltage	12.96V
		S/W ON		Max. 0.5V	274mV
32	Knock Sensor [B] signal input	Knocking	VariableFrequency		
		Normal			
33	Ground	Idle	DC	Max. 50mV	2.4mV
34	Sensor ground	Idle	DC	Max. 50mV	9.2mV
35	Sensor ground	Idle	DC	Max. 50mV	3.7mV
36	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2] signal input	Racing	Analog	Rich: 0.6 ~ 1.0V	872mV
				Lean: Max. 0.4V	155mV
37	-				
38	Sensor ground	Idle	DC	Max. 50mV	2.1mV
39	Throttle Position Senosr (TPS) signal input	C.T	Analog	0.2 ~ 0.7V	0.31V
		W.O.T		Min. 4.0V	4.21V
40	A/C Pressure Transducer signal input	A/C ON	Analog	Max. 4.8V	2.51V
41	-				
42	-				

43	Intake Air Temperature Sensor (IATS) signal input	Idle	Analog	0 ~ 5V	1.89V at 35°C
44	-				
45	A/C Compressor Relay control output	A/C OFF	DC	Battery Voltage	14.32V
		A/C ON		Max. 1.0V	114mV
46	Fuel Pump Relay output	Relay OFF	DC	Battery Voltage	12.3V
		Relay ON		Max. 1.0V	30mV
47	Injector (Cylinder #2) control output	Idle	Pulse (5.5Hz)	HI: Battery Voltage	13.6V
				LO: Max. 1.0V	340mV
				Vpeak: Max. 80V	69.7V
48	Immobilizer Lamp control output	Lamp OFF	DC	Battery Voltage	11.98V
		Lamp ON		Max. 1.0V	27mV
49	Canister Close Valve (CCV) control output	Active Inactive	Pulse	HI : Battery Voltage	12.5V
				LO : MAx. 1.0V	121mV
				Vpeak : Max. 70V	44.7V
50	Fuel Tank Pressure Sensor (FTPS) signal input	Idle	DC	0.4 ~ 4.6V	2.45V
51	Ground	Idle	DC	Max. 50mV	1.8mV
52	-				
53	-				
54	Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1] signal input	Racing	Analog	Rich: 0.6 ~ 1.0V	880mV
				Lean: Max. 0.4V	208mV
55	-				
56	-				
57	-				
58	Wheel Speed Sensor (WSS) [+] signal input	Vehicle Run	Sine Wave	Vp-p: Min. 0.2V	
59	Reference supply (+5V)	IG OFF	DC	Max. 0.5V	4.2mV
		IG ON		4.9 ~ 5.1V	5.04V

60	Reference supply (+5V)	IG OFF	DC	Max. 0.5V	0.0mV
		IG ON		4.9 ~ 5.1V	5.04V
61	-				
62	CAN [Low]	Recessive	Pulse	2.0 ~ 3.0 V	2.36V
		Dominant		0.5 ~ 2.25 V	1.44V
63	Camshaft Position Sensor (CMPS) signal input	Idle	Pulse	HI: Battery Voltage	13.86V
				LO: Max . 0.5V	450mV
64	Vehicle speed signal input	Vehicle Run	Pulse	HI: Min. 5.0V	12.4V
				LO: Max. 1.0V	17mV
					432Hz at 30kph
65	-				
66	Load signal input (Defrost)	S/W OFF	DC	Max. 0.5V	0mV
		S/W ON		Battery Voltage	13.19V
67	Engine speed signal output	Idle	Pulse	HI: Battery Voltage	13.9V
				LO: Max. 0.5V	12.1mV
				20 ~ 26Hz	21.9Hz
68	Injector (Cylinder #4) control output	Idle	Pulse (5.5Hz)	HI: Battery Voltage	14.2V
				LO: Max. 1.0V	330mV
				Vpeak: Max. 80V	69.6V
69	Purge Control Solenoid Valve (PCSV) control output	Active Inactive	Pulse	HI: Battery Voltage	14.2V
				LO: Max. 1.0V	215mV
				Vpeak: Max. 70V	45.2V
					13.68Hz
70	Malfunction Indicator Lamp (MIL) control output	Lamp OFF	DC	Battery Voltage	13.03V
		Lamp ON		Max. 1.0V	716mV

71	HO2S [Bank 1 / Sensor 2] heater control output	Engine Run	Pulse (2Hz)	HI: Battery Voltage	14.1V
				LO: Max. 1.0V	304mV
72	HO2S [Bank 1 / Sensor 1] heater control output	Engine Run	Pulse (2Hz)	HI: Battery Voltage	14.1V
				LO: Max. 1.0V	326mV
73	Ground	Idle	DC	Max. 50mV	2.1mV
74	-				
75	-				
76	-				
77	Engine Coolant Temperature Sensor (ECTS) signal input	Idle	Analog	0.5 ~ 4.5V	0.85V at 95.1°C
78	-				
79	Wheel Speed Sensor (WSS) [-] signal input	Vehicle Run	Sine Wave	Vp-p: Min.0.2V	
80	-				
81	Reference supply (+5V)	IG OFF	DC	Max. 0.5V	
		IG ON		4.9 ~ 5.1V	
82	Battery power	Always	DC	Battery Voltage	
83	Ignition switch signal input	IG OFF	DC	Max. 0.5V	2.8mV
		IG ON		Battery Voltage	12.18V
84	CAN [High]	Recessive	Rulse	2.0 ~ 3.0V	2.36V
		Dominant		2.75 ~ 4.5V	3.44V
85	-				
86	Crankshaft Position Sensor (CKPS) [B] signal input	Idle	Sine Wave	Vp_p: Min.1.0V	8.44V
					718.4Hz
87	Crankshaft Position Sensor (CKPS) [A] signal input	Idle	Sine Wave	Vp_p: Min. 1.0V	8.44V
					718.4Hz
88	Fuel consumption signal output	Idle	Pulse	HI: Battery Voltage	13.9V
				LO: Max. 0.5V	16.1mV
89	-				

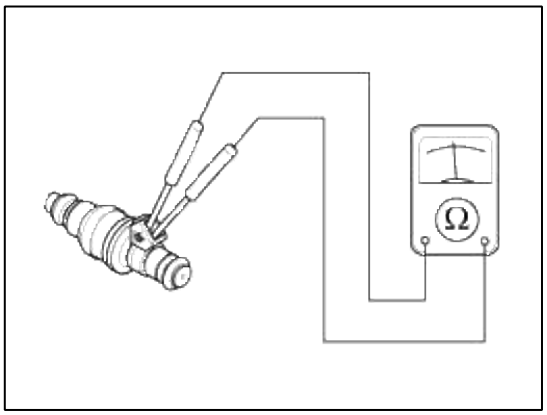
				HI: Battery Voltage	14.8V
90	Idle Speed Control Actuator (ISCA) [OPEN] control output	Idle	Pulse	LO: Max. 1.0V	128mV
					250Hz at duty 32.5%
91	Injector (Cylinder #1) control output	Idle	Pulse (5.5Hz)	HI: Battery Voltage	14.2V
				LO: Max. 1.0V	330mV
				Vpeak: Max. 80V	69.6V
92	CVVT Oil Control Valve (OCV) control output	Idle	Pulse	HI: Battery Voltage	14.9V
				LO: Max. 1.0V	36.2mV
					300.26Hz at duty 6.1%
93	-				
94	Fuel Filler Cap "OPEN" Lamp control output	Lamp OFF	DC	Battery Voltage	
		Lamp ON		Max. 1.0V	

Fuel System > Engine Control System > Injector > Repair procedures

INSPECTION

1. Measure resistance between the terminal 1 and 2 of the injector.

Injector Resistance: 13.8 ~ 15.2 Ω at 20°C (68°F)



2. If the resistance is not within specification, replace the injector.

Fuel System > Troubleshooting > Troubleshooting

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES (DTC)

DTC	Description	MIL
P0011	"A" Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)	●
P0012	"A" Camshaft Position-Timing Over-Retarded (Bank 1)	●
P0016	Crankshaft Position-Camshaft Position Correlation (Bank 1 Sensor A)	●
P0030	HO2S Heater Control Circuit (Bank 1 / Sensor 1)	●
P0031	HO2S Heater Circuit Low (Bank 1 / Sensor 1)	●
P0032	HO2S Heater Circuit High (Bank 1 / Sensor 1)	●
P0036	HO2S Heater Control Circuit (Bank 1 / Sensor 2)	●
P0037	HO2S Heater Circuit Low (Bank 1 / Sensor 2)	●
P0038	HO2S Heater Circuit High (Bank 1 / Sensor 2)	●
P0068	MAFS/MAPS-TPS Correlation	●
P0075	Intake Valve Control Solenoid Circuit (Bank 1)	●
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	●
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	●
P0106	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	●
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	●
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	●
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	●
P0112	Intake Air Temperature Sensor 1 Circuit Low Input	●
P0113	Intake Air Temperature Sensor 1 Circuit High Input	●
P0115	Engine Coolant Temperature Circuit	●
P0116	Engine Coolant Temperature Circuit Range/Performance	●
P0117	Engine Coolant Temperature Circuit Low Input	●
P0118	Engine Coolant Temperature Circuit High Input	●
P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance	●
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low Input	●
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High Input	●
P0124	Throttle/Pedal Position Sensor/Switch "A" Circuit Intermittant	▲
P0128	Coolant Thermostat (Coolant Temp. below Thermostat Regulating Temp.)	●
P0130	HO2S Circuit (Bank 1/ Sensor 1)	●
P0131	HO2S Circuit Low Voltage (Bank 1 / Sensor 1)	●
P0132	HO2S Circuit High Voltage (Bank 1 / Sensor 1)	●
P0133	HO2S Circuit Slow Response (Bank 1 / Sensor 1)	●
P0134	HO2S Circuit No Activity Detected (Bank 1 / Sensor 1)	●

P0135	HO2S Heater Circuit (Bank 1 / Sensor 1)	●
P0136	HO2S Circuit (Bank 1/ Sensor 2)	●
P0137	HO2S Circuit Low Voltage (Bank 1 / Sensor 2)	●
P0138	HO2S Circuit High Voltage (Bank 1 / Sensor 2)	●
P0139	HO2S Circuit Slow Response (Bank 1 / Sensor 2)	●
P0140	HO2S Circuit No Activity Detected (Bank 1 / Sensor 2)	●
P0141	HO2S Heater Circuit (Bank 1 / Sensor 2)	●
P0171	System Too Lean (Bank 1)	●
P0172	System Too Rich (Bank 1)	●
P0201	Injector Circuit/Open-Cylinder 1	●
P0202	Injector Circuit/Open-Cylinder 2	●
P0203	Injector Circuit/Open-Cylinder 3	●
P0204	Injector Circuit/Open-Cylinder 4	●
P0230	Fuel Pump Primary Circuit	▲
P0231	Electric Fuel Pump Relay-Open or Short Circuit	▲
P0232	Electric Fuel Pump Relay-Short Circuit	▲
P0261	Cylinder 1-Injector Circuit Low	●
P0262	Cylinder 1-Injector Circuit High	●
P0264	Cylinder 2-Injector Circuit Low	●
P0265	Cylinder 2-Injector Circuit High	●
P0267	Cylinder 3-Injector Circuit Low	●
P0268	Cylinder 3-Injector Circuit High	●
P0270	Cylinder 4-Injector Circuit Low	●
P0271	Cylinder 4-Injector Circuit High	●
P0300	Random/Multiple Cylinder Misfire Detected	●
P0301	Cylinder 1-Misfire detected	●
P0302	Cylinder 2-Misfire detected	●
P0303	Cylinder 3-Misfire detected	●
P0304	Cylinder 4-Misfire detected	●
P0326	Knock Sensor 1 Circuit Range/Performance (Bank 1)	▲
P0327	Knock Sensor 1 Circuit Low Input	▲
P0328	Knock Sensor 1 Circuit High Input	▲
P0335	Crankshaft Position Sensor A Circuit	●
P0336	Crankshaft Position Sensor A Circuit Range/Performance	●
P0337	Crankshaft Position Sensor A Circuit Low Input	●
P0338	Crankshaft Position Sensor A Circuit High Input	●

P0339	Crankshaft Position Sensor A Circuit	●
P0340	Camshaft Position Sensor A Circuit Malfunction (Bank 1 or Single Sensor)	●
P0341	Camshaft Position Sensor A Circuit Range/Performance (Bank 1 or Single Sensor)	●
P0342	Camshaft Position Sensor A Circuit Low Input	●
P0343	Camshaft Position Sensor A Circuit High Input	●
P0420	Catalyst System Efficiency below Threshold (Bank 1)	●
P0442	Evap. Emission System-Leak detected (Small leak)	●
P0444	Evap. Emission System-Purge Ctrl. Valve Circuit Open	●
P0446	Evap. Emission System-Vent Control Circuit	●
P0449	Evap. Emission System-Vent Valve / Solenoid Circuit	●
P0450	Evap. Emission System-Pressure Sensor/Switch	●
P0451	Evap. Emission System-Pressure Sensor Range / Performance	●
P0452	Evap. Emission System-Pressure Sensor Low Input	●
P0453	Evap. Emission System-Pressure Sensor High Input	●
P0455	Evap. Emission System-Leak detected (Large leak)	●
P0456	Evap. Emission System-Leak detected (Very Small Leak)	●
P0457	Evap. Emission System-Leak detected (Fuel Tank Cap Loose/Off)	▲
P0458	Evap. Emission System-Purge Control Valve Circuit Low	●
P0459	Evap. Emission System-Purge Control Valve Circuit High	●
P0461	Fuel Level Sensor "A" Circuit Range/Performance	●
P0462	Fuel Level Sensor "A" Circuit Low Input	●
P0463	Fuel Level Sensor "A" Circuit High Input	●
P0496	Evap. Emission System-High Purge Flow	●
P0497	Evap. Emission System-Low Purge Flow	●
P0498	Evap. Emission System-Vent Valve Control Circuit Low	●
P0499	Evap. Emission System-Vent Valve Control Circuit High	●
P0501	Vehicle Speed Sensor A Range/Performance	●
P0505	Idle Air Control System	●
P0506	Idle Air Control System-RPM Lower Than Expected	●
P0507	Idle Air Control System-RPM Higher Than Expected	●
P0532	A/C Refrigerant Pressure Sensor "A" Circuit Low Input	▲
P0533	A/C Refrigerant Pressure Sensor "A" Circuit High Input	▲
P0560	System Voltage	▲
P0561	System Voltage Unstable	●
P0562	System Voltage Low	●

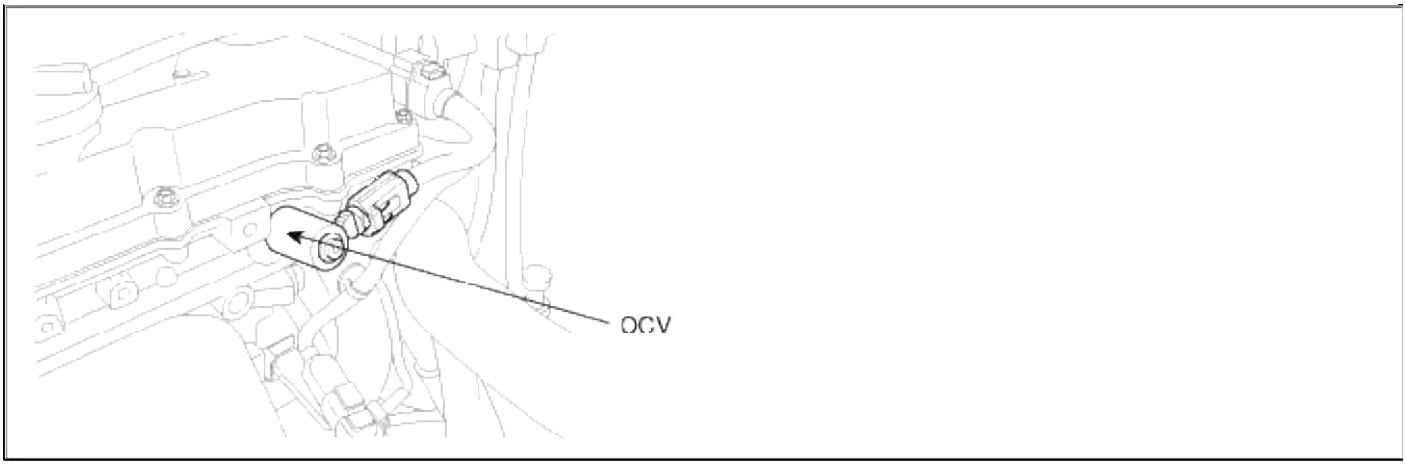
P0563	System Voltage High	●
P0605	Internal Control Module Read Only Memory (ROM) Error	●
P0624	Fuel Cap Lamp Control Circuit	▲
P0630	VIN not Programmed or Incompactible-ECM/PCM	●
P0642	Sensor Reference Voltage "A" Circuit Low	●
P0643	Sensor Reference Voltage "A" Circuit High	●
P0645	A/C Clutch Relay Control Circuit	▲
P0646	A/C Clutch Relay Control Circuit Low	▲
P0647	A/C Clutch Relay Control Circuit High	▲
P0650	Malfunction Indicator Lamp (MIL) Control Circuit	▲
P0700	TCU Reguest for MIL ON	●
P1505	Idle Charge Actuator Signal Low of Coil #1	●
P1506	Idle Charge Actuator Signal High of Coil #1	●
P1507	Idle Charge Actuator Signal Low of Coil #2	●
P1508	Idle Charge Actuator Signal High of Coil #2	●
P1550	Knock Sensor Evaluation IC	▲
P1560	Knock Control SPI (Serial Port Interface) Check	▲
P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	●
P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	●
P2226	Barometric Pressure Circuit	●
P2227	Barometric Pressure Circuit Range/Performance	●
P2228	Barometric Pressure Circuit Low Input	●
P2229	Barometric Pressure Circuit High Input	●
P2232	HO2S Signal Circuit Shorted to Heater Circuit (Bank 1 / Sensor 2)	●
U0001	Vehicle Communication Bus A	●
U0101	Lost Communication with ECM/PCM "A"	●

NOTE

● : MIL ON & MEMORY
▲ : MIL OFF & MEMORY

Fuel System > Troubleshooting > P0011 \'A\' Camshaft Position-Timing Over-Advanced or System Performance (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

Different from the existing fixed cam phase angle type, CVVT(Continuously Variable Valve Timing) is the device which varies cam phase angle continuously to be optimum. And with engine oil pressure, it operates. CVVT consists of OCV(Oil Control Valve) and cam phaser. OCV, mounted on cylinder head, controlls the amount and direction of oil delivered to cam phaser by oil valve which is connected to a solenoid. Cam phaser, rotating cam phaser rotor with pressure and amount of oil produced by OCV, rotates cam shaft forcefully for or against the rotating direction and finally, cam shaft phase changes. With the appliance of CVVT, engine power,fuel efficiency and the quality of exhaust gas are improved.

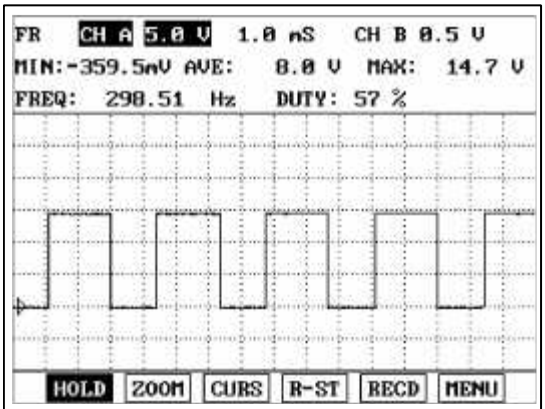
DTC DESCRIPTION

This diagnostic monitors the phasing response rate and determineswhether the response rate is fast enough. A state machine is used to capture the response rate. Themeasured results are then compared to an allowable threshold. If "Counter of Δ (original target - actual angle) <3 Deg" is over 10 times under enable conditions, ECM/PCM sets DTC P0011.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Slow response check	• Poor connection • Contamination of Oil / Clog of Oil path • OCV • CVVT • ECM/PCM
Enable Conditions	• Difference of target and actual angle > 10 Deg(2 sec and above) • Adaptation of alignment between camshaft and crankshaft finished • Time after engine start > 10~60s • Coolant temperature 60~110°C • Engine oil temperature (model) 60~110°C • Engine speed 1000~5000rpm	
Threshold Value	• l Counter of Δ (original target - actual angle) < 3 Deg l > 10 times	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



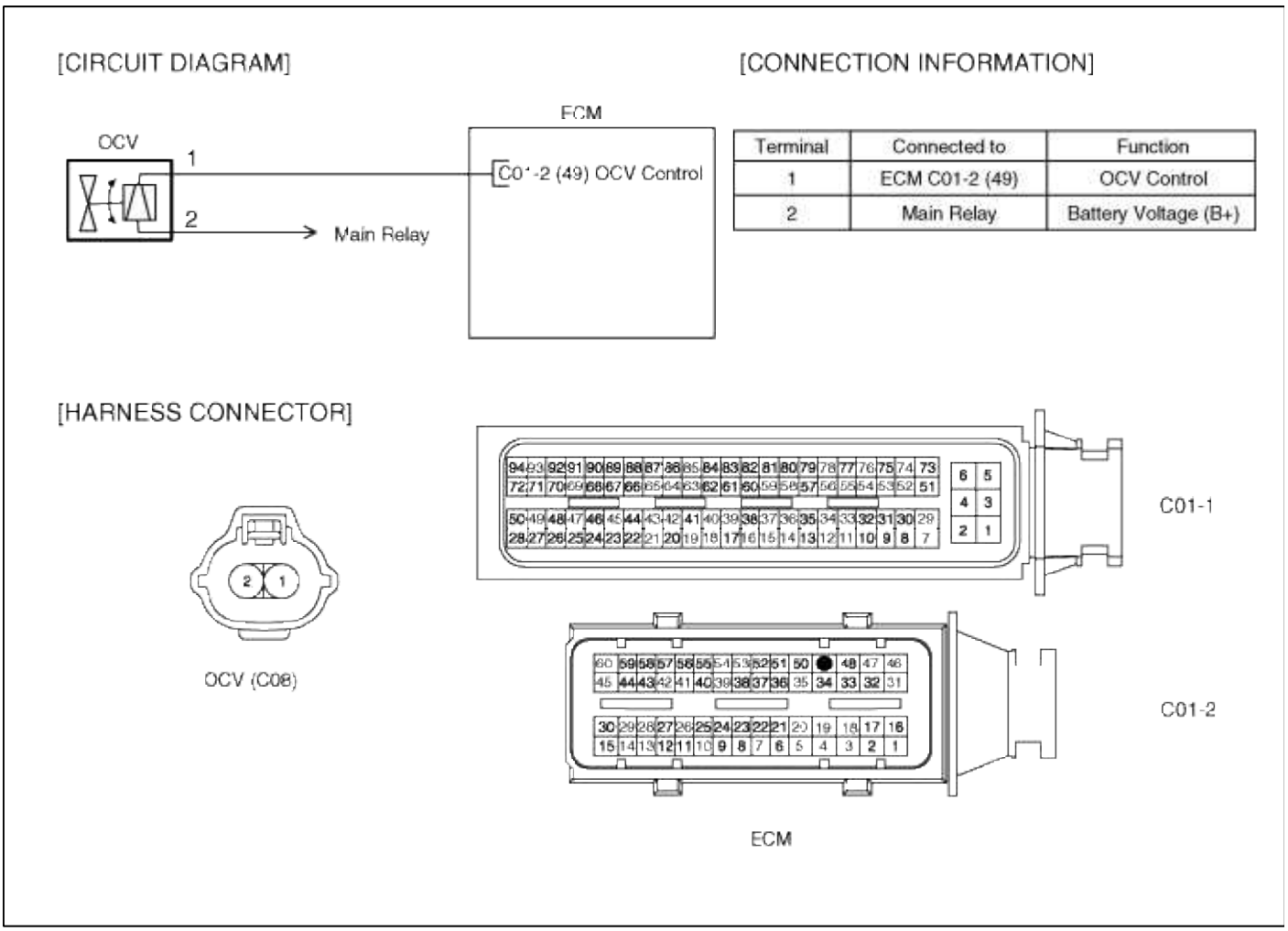
The ECM/PCM controls OCV by duty value.

SPECIFICATION

ITEM	SPECIFICATION
Coil Resistance (Ω)	6.9 ~ 7.9Ω at 20°C (68°F)

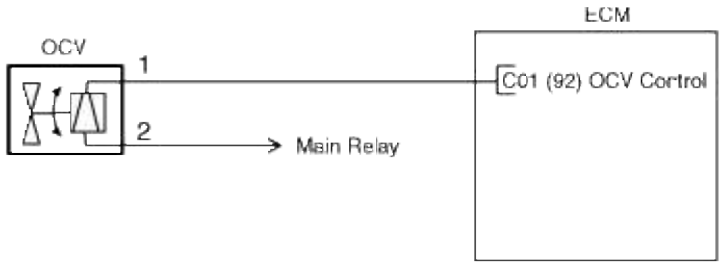
SCHEMATIC DIAGRAM

(A/T)



(M/T)

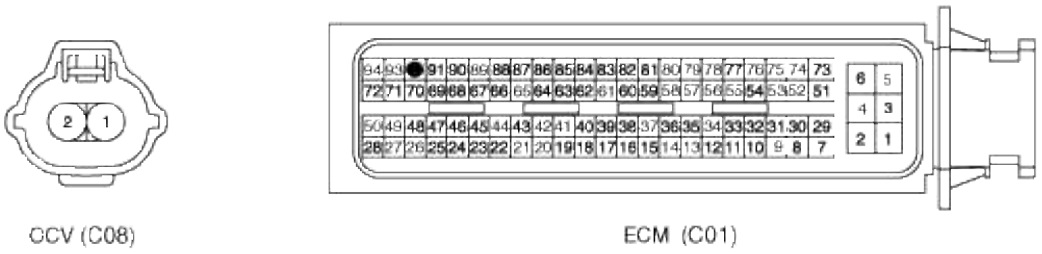
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

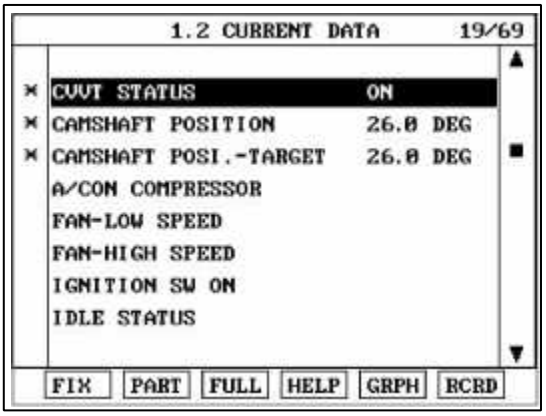
Terminal	Connected to	Function
1	ECM C01 (92)	OCV Control
2	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "OCV" parameters on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, eterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Visual check.
   (1) Check engine oil gauge.
   (2) Check contamination of engine oil.
   (3) Check contamination of OCV filter.
   (4) Check clog of oil path.
   (5) Is there any problem?

YES

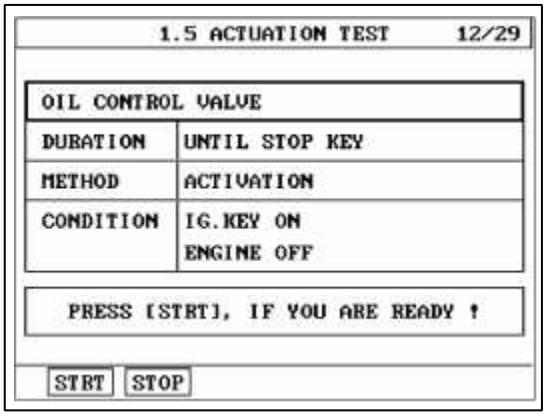
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Component inspection" procedure.

COMPONENT INSPECTION

1. Check OCV
   (1) Connect scantool to Data Link Connector(DLC).
   (2) Key "ON".
   (3) Perform "Actuation Test" for OCV.



   (4) Does the OCV work normally (Check Clicking sound)?

YES

Substitute with a known-good CVVT and check for proper operation. If the problem is corrected, replace CVVT and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good OCV and check for proper operation. If the problem is corrected, replace OCV and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

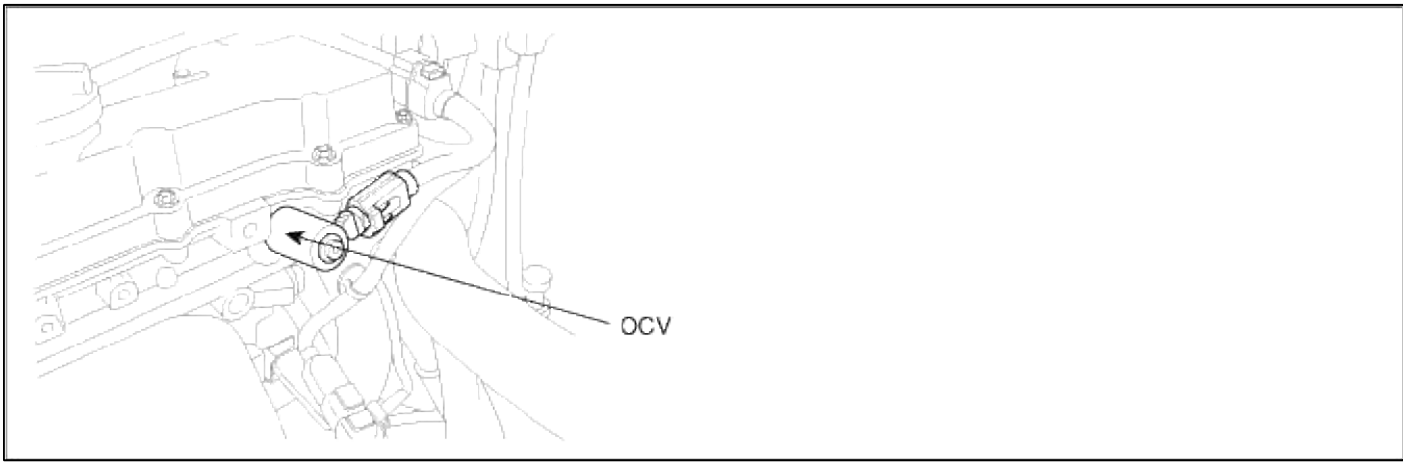
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0012 \'A\' Camshaft Position-Timing Over-Retarded (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

Different from the existing fixed cam phase angle type, CVVT(Continuously Variable Valve Timing) is the device which varies cam phase angle continuously to be optimum. And with engine oil pressure, it operates. CVVT consists of OCV(Oil Control Valve) and cam phaser. OCV, mounted on cylinder head, controlls the amount and direction of oil delivered to cam phaser by oil valve which is connected to a solenoid. Cam phaser, rotating cam phaser rotor with pressure and amount of oil produced by OCV, rotates cam shaft forcefully for or against the rotating direction and finally, cam shaft phase changes. With the appliance of CVVT, engine power,fuel efficiency and the quality of exhaust gas are improved.

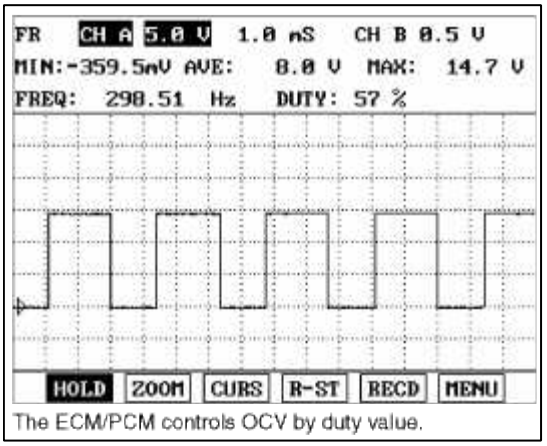
DTC DESCRIPTION

If "Counter of Δ (original target - actual angle) > 3 Deg" is over 10 times under enable conditions, ECM/PCM sets DTC P0012.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Target error check	• Poor connection • Contamination of Oil / Clog of Oil path • OCV • CVVT • ECM/PCM
Enable Conditions	• Difference of target and actual angle > 10 Deg (2 sec and above) • Adaptation of alignment between camshaft and crankshaft finished • Time after engine start > 10~60s • Coolant temperature 60~110°C • Engine oil temperature (model) 60~110°C • Engine speed 1000~5000rpm	
Threshold Value	• l Counter of Δ (original target - actual angle) > 3 Deg l > 10 times	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



The ECM/PCM controls OCV by duty value.

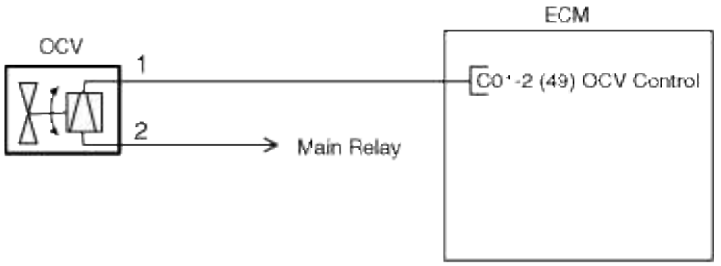
SPECIFICATION

ITEM	SPECIFICATION
Coil Resistance (Ω)	6.9 ~ 7.9Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



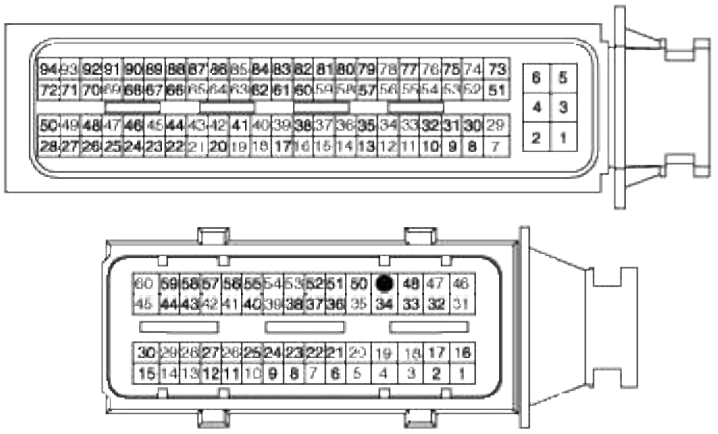
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (49)	OCV Control
2	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

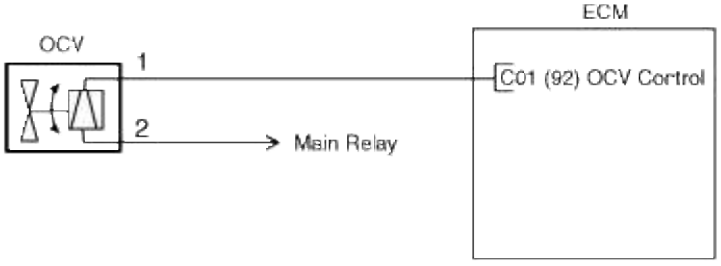


OCV (C08)



(M/T)

[CIRCUIT DIAGRAM]



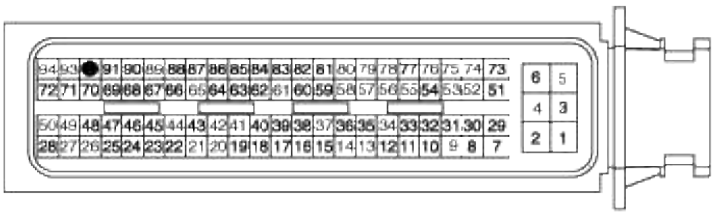
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (92)	OCV Control
2	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



OCV (C08)

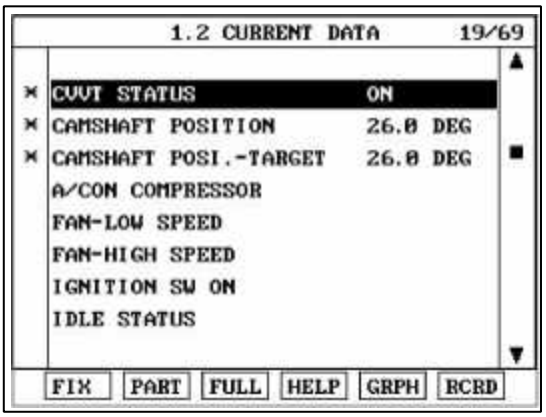


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).

2. Warm up the engine to normal operating temperature.
3. Monitor the "OCV" parameters on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, eterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Terminal and Connector Inspection"" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Visual check.
   (1) Check engine oil gauge.
   (2) Check contamination of engine oil.
   (3) Check contamination of OCV filter.
   (4) Check clog of oil path.
   (5) Is there any problem?

YES

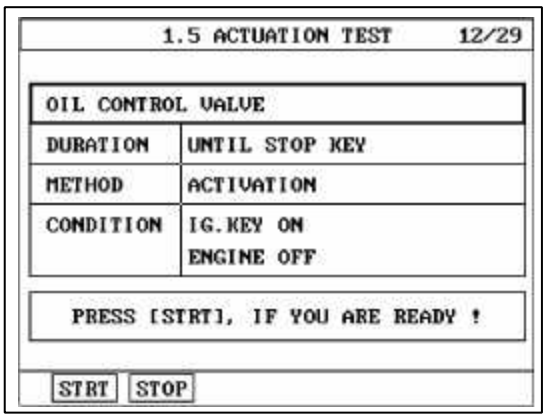
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Component inspection" procedure.

COMPONENT INSPECTION

1. Check OCV
   (1) Connect scantool to Data Link Connector(DLC).
   (2) Key "ON".
   (3) Perform "Actuation Test" for OCV.



   (4) Does the OCV work normally (Check Clicking Sound)?

YES

Substitute with a known-good CVVT and check for proper operation. If the problem is corrected, replace CVVT and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good OCV and check for proper operation. If the problem is corrected, replace OCV and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

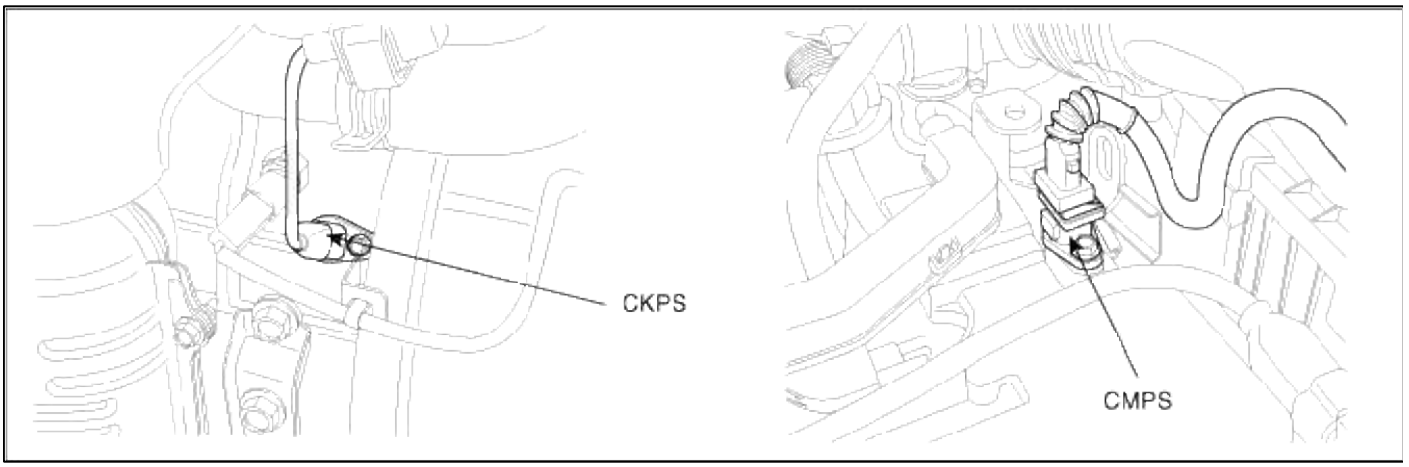
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0016 Crankshaft Position–Camshaft Position Correlation (Bank 1 Sensor A)

COMPONENT LOCATION



GENERAL DESCRIPTION

A Crankshaft Position Sensor (CKPS) is a magnetic type sensor that generates voltage using a sensor and a target wheel mounted on the crankshaft. The ECM/PCM calculates engine RPM by using the sensor' s signal and controls the injection duration and the ignition timing.
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. This CMPS signal is sent to the ECM/PCM and it uses CMPS signals for determining the ignition timing with CKPS signals. CMPS makes Sequential Injection possible.

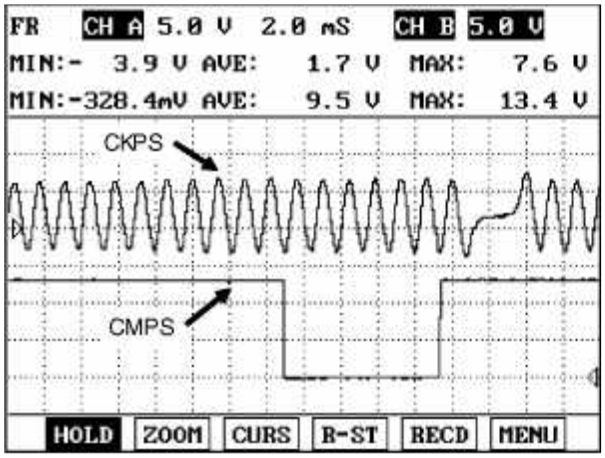
DTC DESCRIPTION

If the deviation between CKPS and CMPS is bigger than the threshold value, ECM/PCM sets DTC P0016.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Camshaft and crankshaft alignment check	• Poor connection • Contamination of Oil / Clog of Oil path • CKPS, CMPS • OCV • CVVT • ECM/PCM
Case1	Enable Conditions	• Adaptation of alignment between camshaft and crankshaft finished	
	Threshold Value	• Deviation of the camshaft position from the set point> 15 Deg	
	Diagnostic Time	• 2 sec	
Case2	Enable Conditions	• Difference of the adapted and actual value > 15 Deg	
	Threshold Value	• 2.6 sec	
MIL ON Condition		• 2 driving cycle	

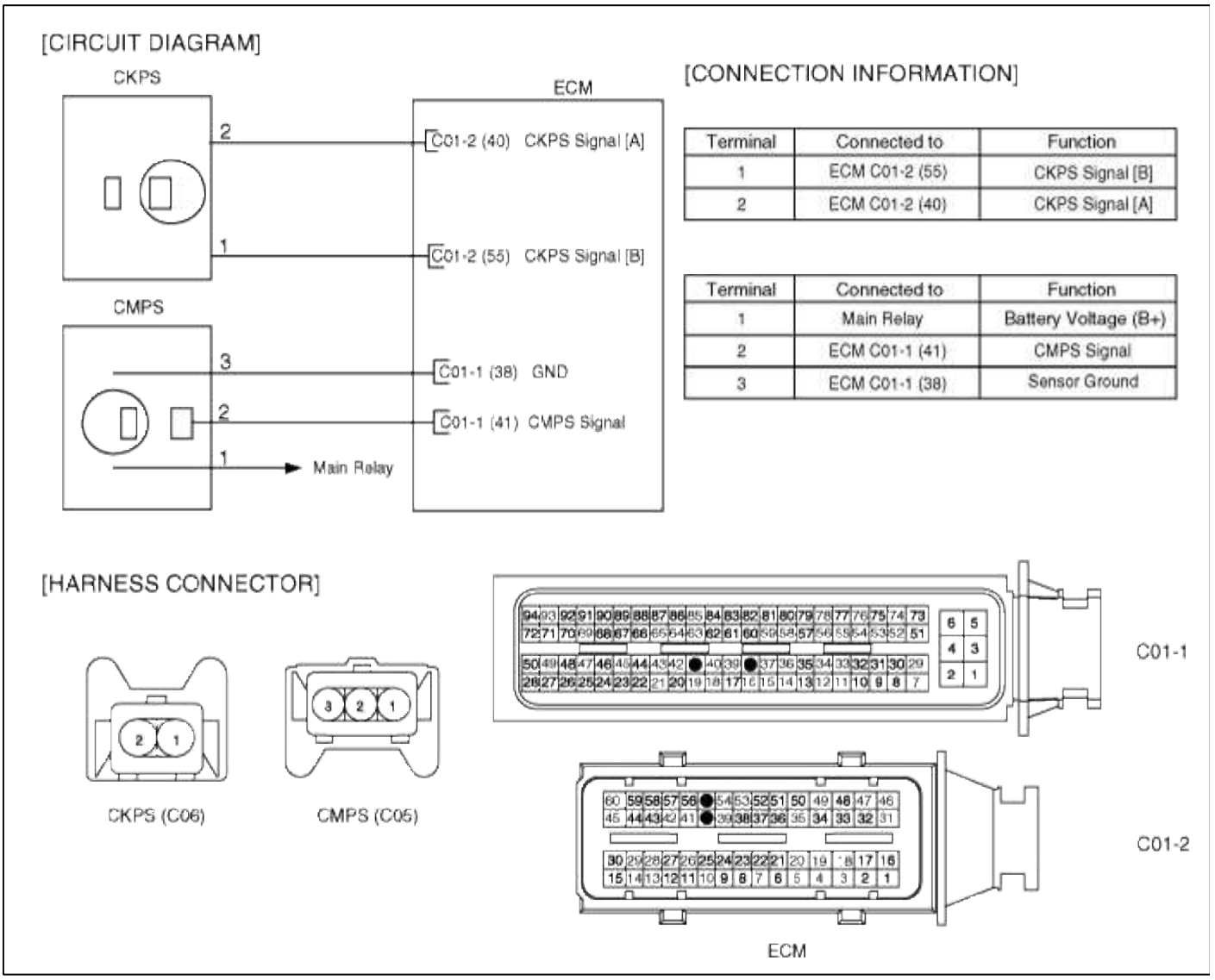
SIGNAL WAVEFORM & DATA



This example shows a typical Crankshaft Position Sensor(CKPS) and Camshaft Position Sensor(CMPS) waveform at idle. The ECM/PCM controls the injection and ignition timing by using these signals. Generally CKPS signal is used to detect the piston's position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

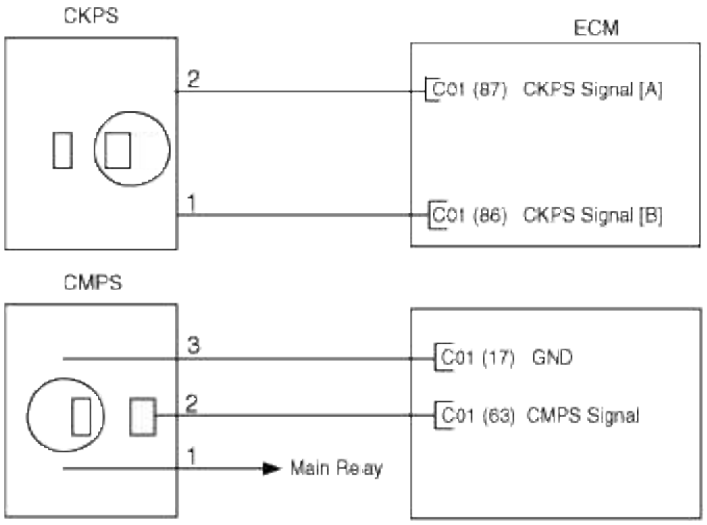


Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

(M/T)

[CIRCUIT DIAGRAM]

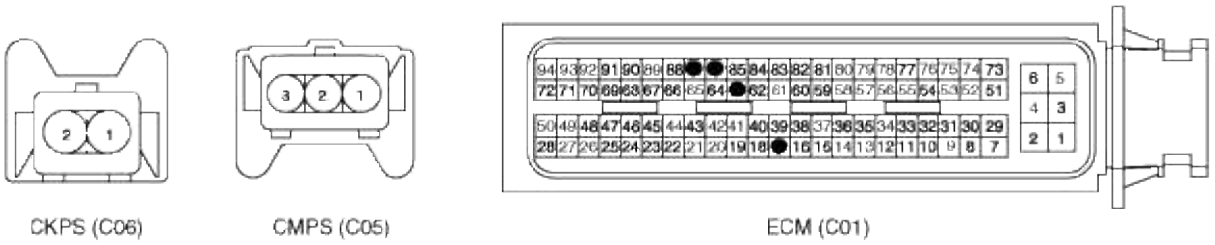


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

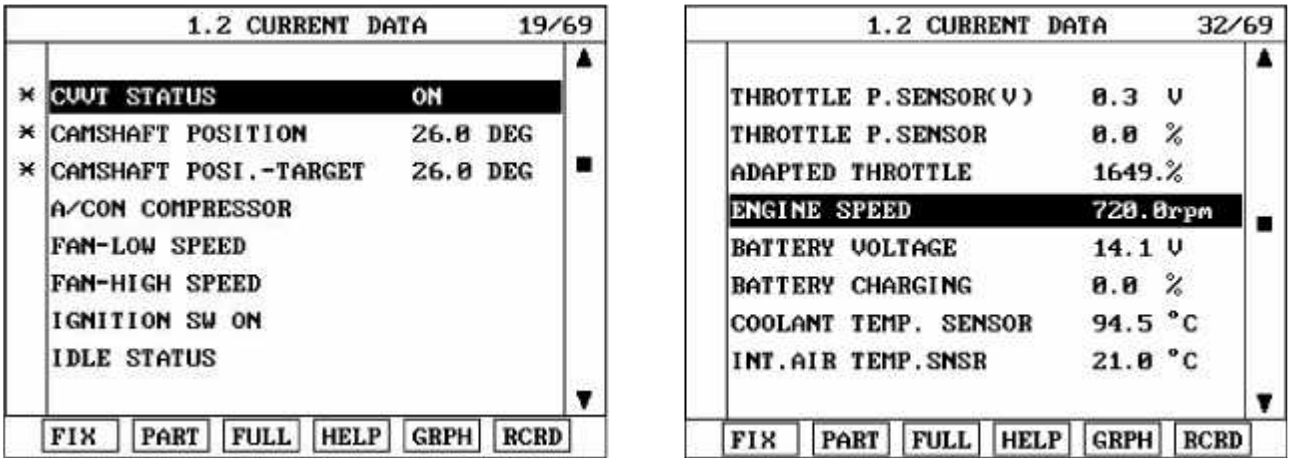
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "OCV and RPM" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, eterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

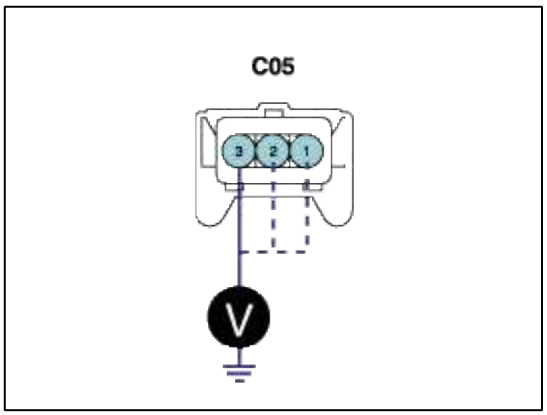
NO

Go to "CMPS circuit inspection" procedure.

CMPS CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect the CMPS connector.
3. Key "ON".
4. Measure the voltage between terminal 1, 2, 3 of CMPS harness connector and chassis ground.

Specification :
Terminal 1 B+
Terminal 2 Approx. 12V
Terminal 3 Approx. 0V



5. Is the measured voltage within specifications?

YES

Go to "CKPS circuit inspection" procedure.

NO

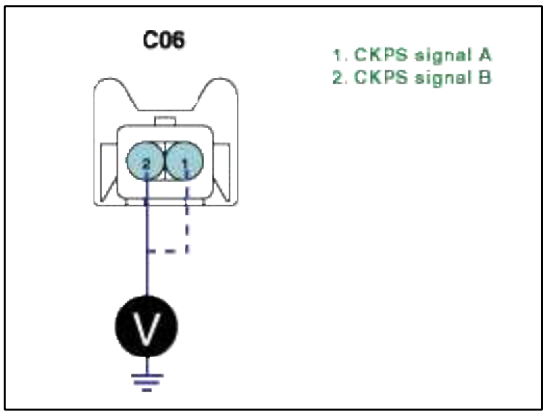
Repair Open or Short in CMPS circuit, and go to " Verification of Vehicle Repair" procedure.

CKPS CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CKPS connector.
3. Key "ON".

4. Measure the voltage Between terminal 1, 2 of CKPS harness connector and chassis ground.

Specification : Approx. 2.5 V



5. Is the measured voltage within specifications?

YES

Go to "System Inspection" procedure.

NO

Repair Open in CKPS circuit, and go to " Verification of Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Visual check.
   (1) Check engine oil gauge.
   (2) Check contamination of engine oil.
   (3) Check contamination of OCV filter.
   (4) Check clog of oil path.
   (5) Is there any problem?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

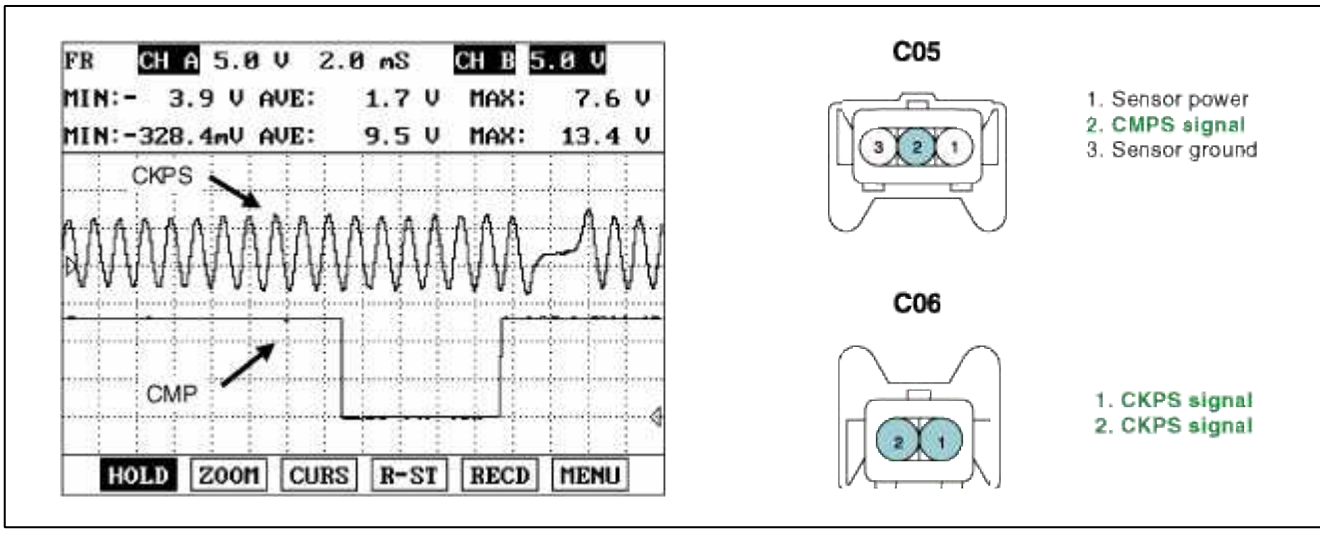
NO

Go to "Component inspection" procedure.

COMPONENT INSPECTION

1. Check CMPS, CKPS.
   (1) Key "OFF". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 2 of CKPS harness connector.
   (3) Connect Channel B of scantool with terminal 1 or 2 of CMPS harness connector.
   (4) Engine start. And check the signal waveforms.

   Specification :



   (5) Is the measured signal waveforms of CKPS/CMPS normal?

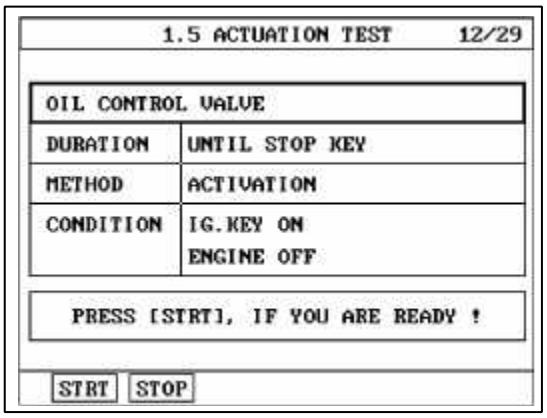
   YES

   Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, rep ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

   NO

   Go to "OCV" procedure.

2. Check OCV.
   (1) Connect scantool to Data Link Connector(DLC).
   (2) Key "ON".
   (3) Perform "Actuation Test" for OCV.



   (4) Does the OCV work normally (Check Clicking Sound)?

   YES

   Go to "Check timing mark" procedure.

   NO

   Substitute with a known-good OCV and check for proper operation. If the problem iscorrected, replace OCV and then go to "Verification of Vehicle Repair" procedure.

3. Check timing mark.
   (1) Key "OFF".
   (2) Check timing mark.
   (3) Is timing mark normal?

YES

Substitute with a known-good CVVT and check for proper operation. If the problem is corrected, replace CVVT and then go to "Verification of Vehicle Repair" procedure.

NO

Reset timing mark, and go to " Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

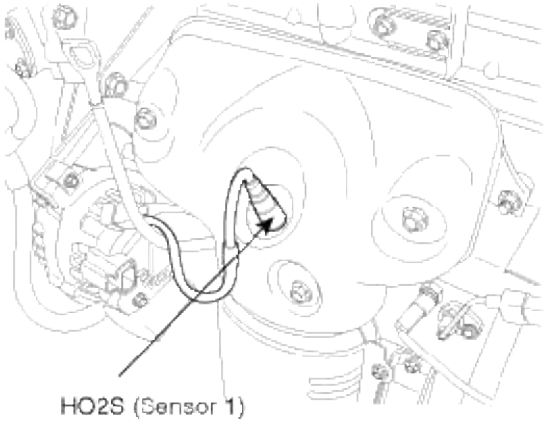
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0030 HO2S Heater Control Circuit (Bank 1 / Sensor 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

In order to control emissions of the CO, HC and NOx components of the exhaust gas, heated oxygen sensor (HO2S), mounted on the front side and rear side of catalytic converter, detects the oxygen content in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation.

The HO2S requires a minimum temperature to operate properly and provide a closed loop fuel control system. The HO2S contains the heater element to reduce its warming-up time and ensure its performance during all driving conditions.

The ECM/PCM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM/PCM provides a ground circuit for activating the heater.

DTC DESCRIPTION

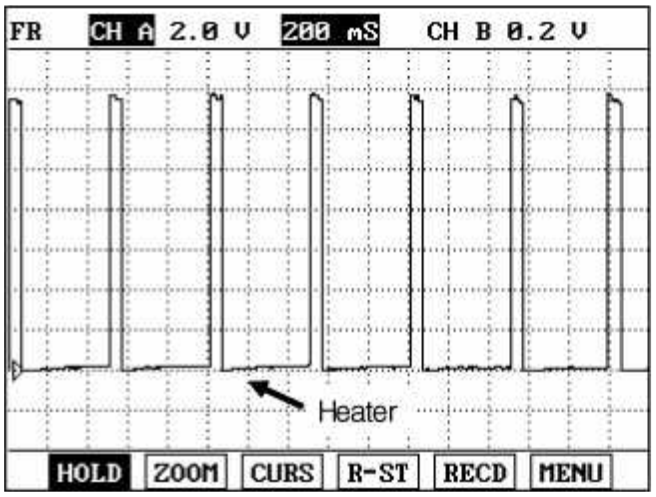
When ECM/PCM detects open in the heater control circuit(B1S1), ECM/PCM sets DTC P0030.

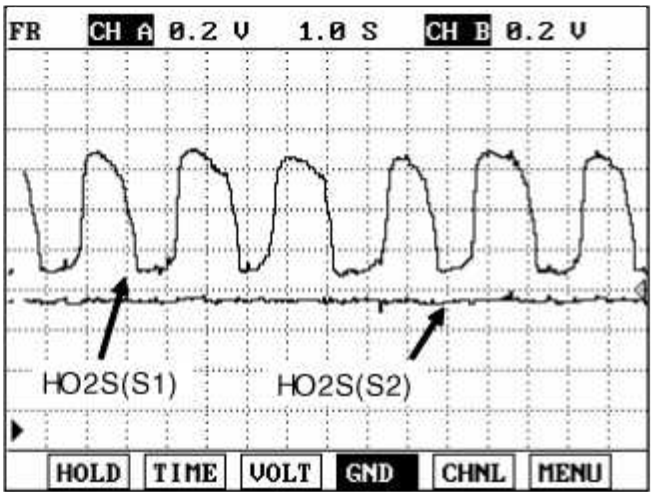
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Heater check open	• Poor connection • Open or short to ground in power circuit • Open in control circuit • B1S1 • ECM/PCM
Enable Conditions		
Threshold Value	• Open	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA





The HO2S requires a minimum temperature to provide a closed loop fuel control system. So the HO2S contains a heater element to reduce its warm-up t me and ensure its performance during all driving conditions. The HO2S heater is controlled ON after engine start except for Cold condition and high speed accelleration. The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM provides a ground circuit for activating the heater.

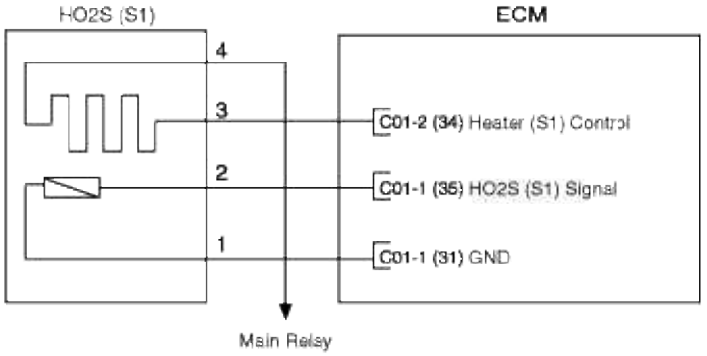
SPECIFICATION

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

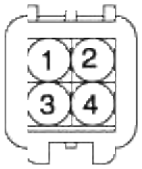
[CIRCUIT DIAGRAM]



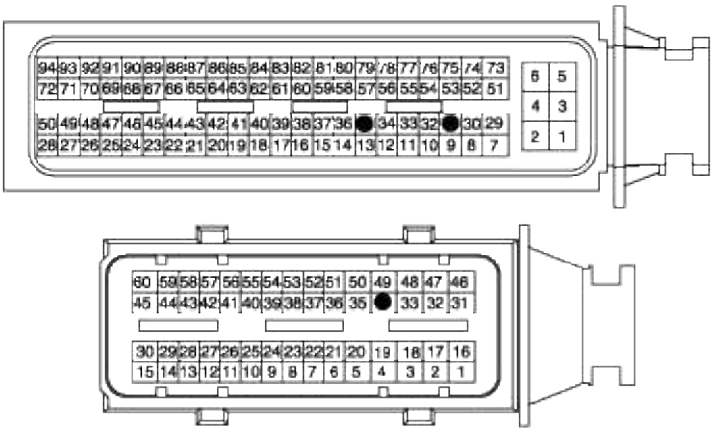
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

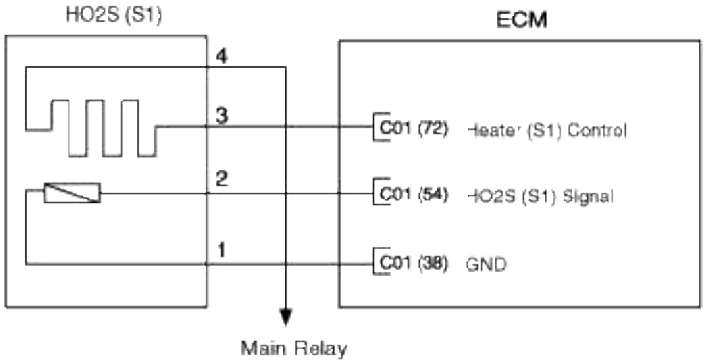


HO2S [S1] (C18)



(M/T)

[CIRCUIT DIAGRAM]



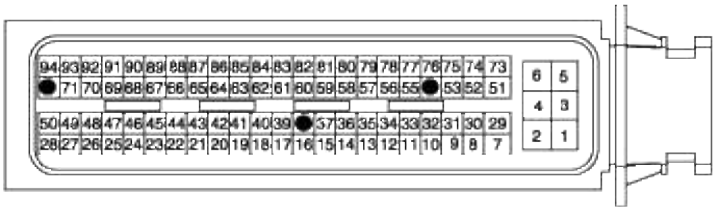
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



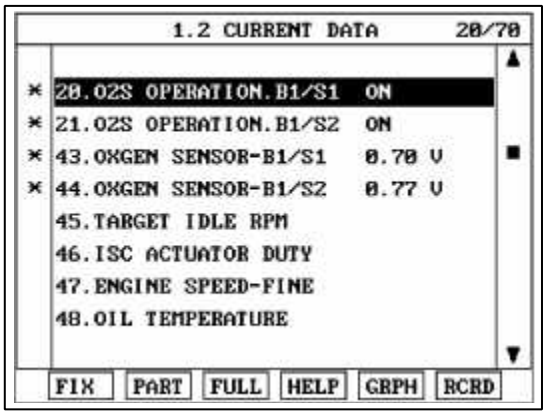
HO2S [S1] (C18)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter operating correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

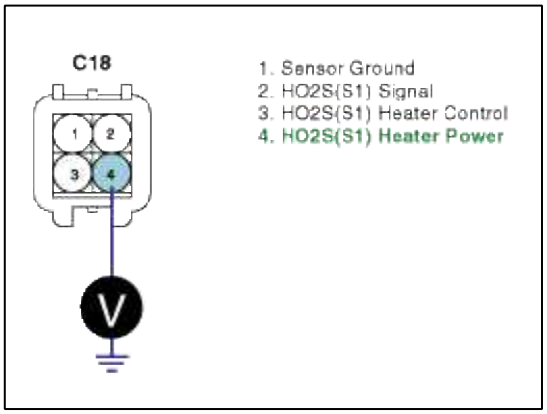
NO

Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S1) connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 4 of HO2S(S1) harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

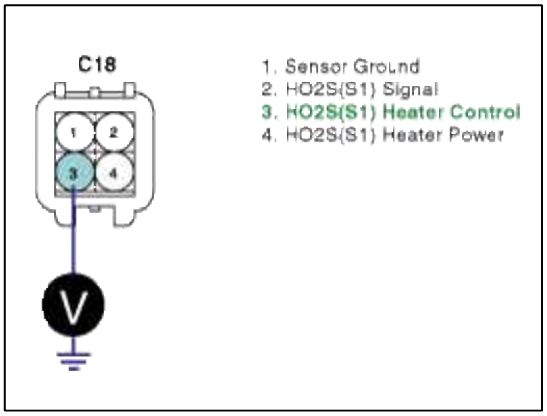
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedue.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S1) connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of HO2S(S1) harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Check resistance.

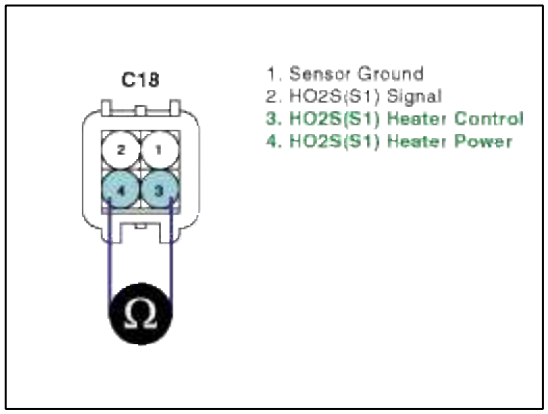
(1) IG "OFF".

(2) Disconnect HO2S(S1) connector.

(3) Measure resistance between terminal 3 and 4 of HO2S(S1)(Component Side)

Specification :

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)



(4) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good HO2S(S1) and check for proper operation.
If the problem is corrected, replace HO2S(S1) and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

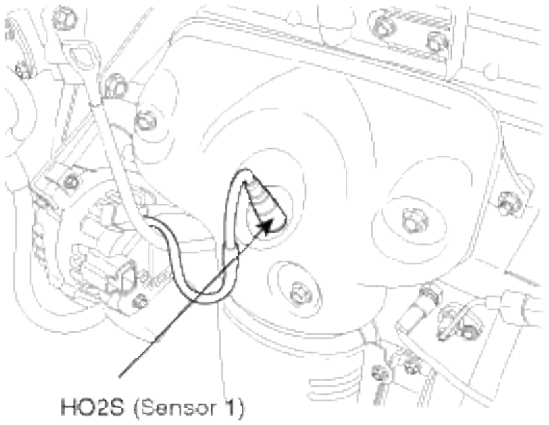
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0031 HO2S Heater Control Circuit Low (Bank 1 / Sensor 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

In order to control emissions of the CO, HC and NOx components of the exhaust gas, heated oxygen sensor (HO2S), mounted on the front side and rear side of catalytic converter, detects the oxygen content in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation.
The HO2S requires a minimum temperature to operate properly and provide a closed loop fuel control system. The HO2S contains the heater element to reduce its warming-up time and ensure its performance during all driving conditions.The ECM/PCM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM/PCM provides a ground circuit for activating the heater.

DTC DESCRIPTION

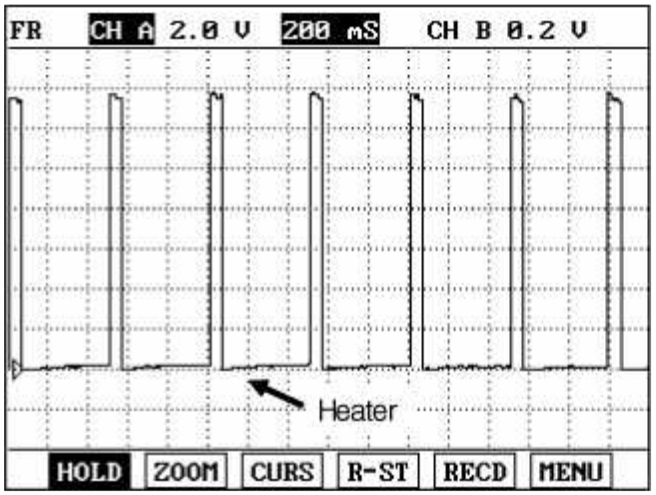
When ECM/PCM detects short to ground in the heater control circuit(B1S1), ECM/PCM sets DTC P0031.

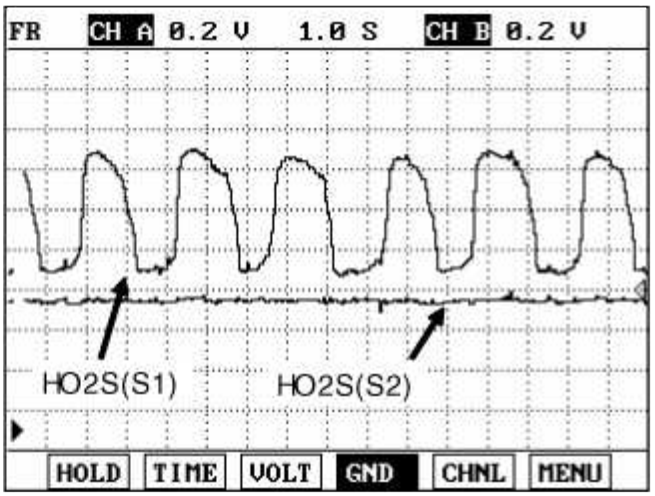
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Heater check low	• Poor connection • Short to ground in control circuit • B1S1 • ECM/PCM
Enable Conditions		
Threshold Value	• Short to ground	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA





The HO2S requires a minimum temperature to provide a closed loop fuel control system. So the HO2S contains a heater element to reduce its warm-up t me and ensure its performance during all driving conditions. The HO2S heater is controlled ON after engine start except for Cold condition and high speed accelleration. The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM provides a ground circuit for activating the heater.

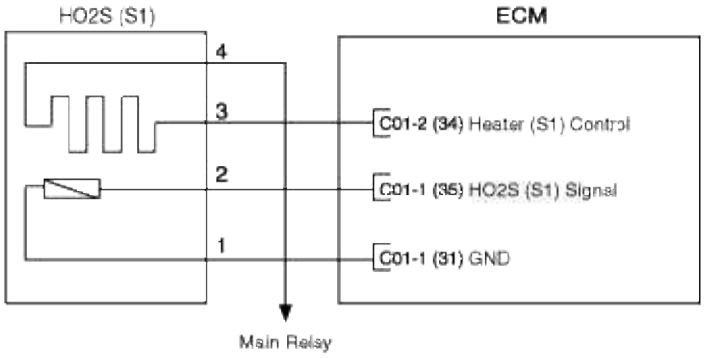
SPECIFICATION

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

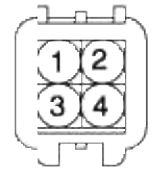
[CIRCUIT DIAGRAM]



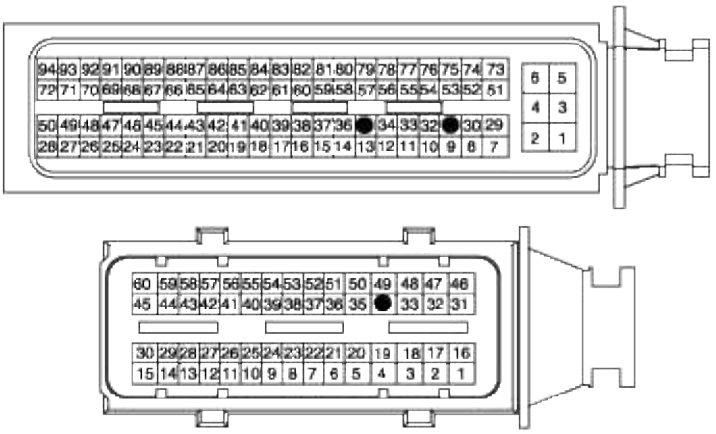
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

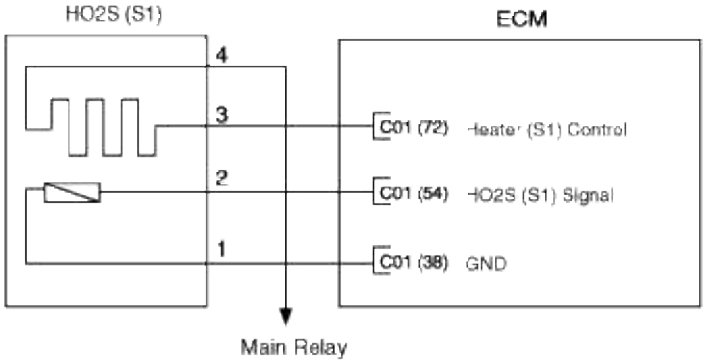


HO2S [S1] (C18)



(M/T)

[CIRCUIT DIAGRAM]



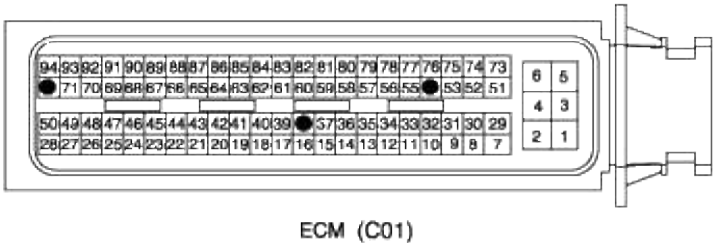
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

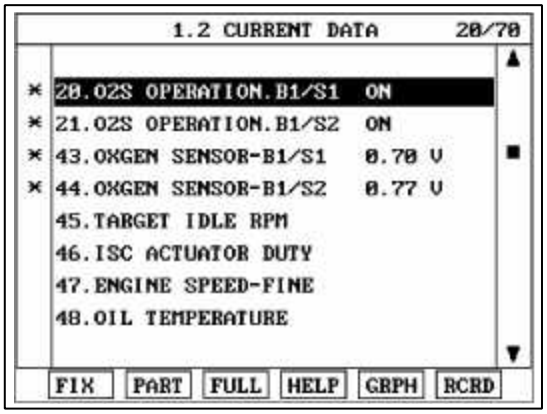


HO2S [S1] (C18)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter operating correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

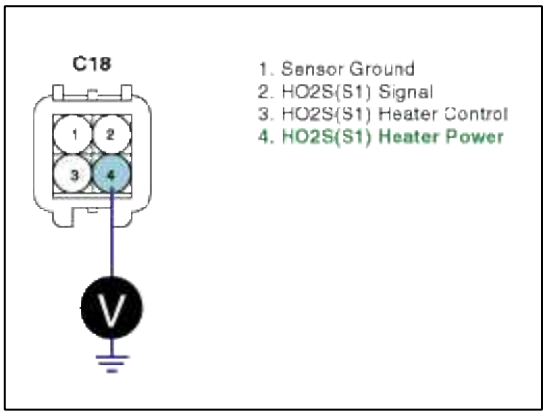
Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S1) connector.
3. IG "ON" & ENG "OFF"

4. Measure voltage between terminal 4 of HO2S(S1) harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

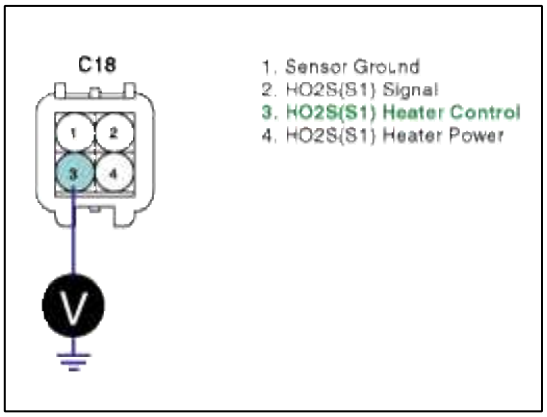
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedue.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S1) connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of HO2S(S1) harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

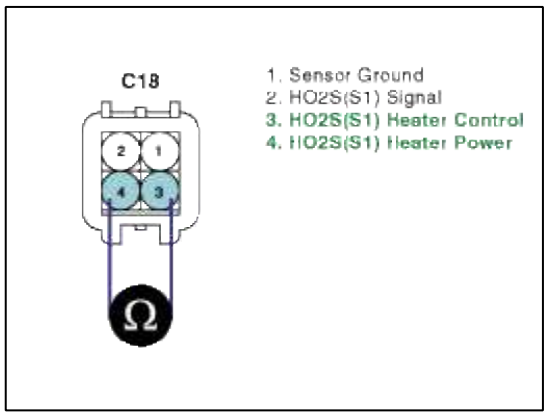
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Check resistance.
   (1) IG "OFF".
   (2) Disconnect HO2S(S1) connector.
   (3) Measure resistance between terminal 3 and 4 of HO2S(S1)(Component Side)
   Specification :

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good HO2S(S1) and check for proper operation.
   If the problem is corrected, replace HO2S(S1) and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

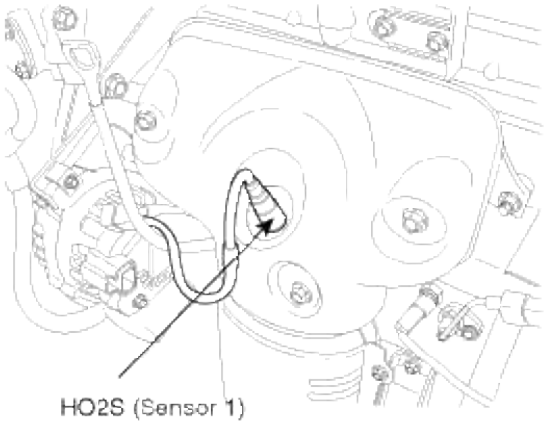
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0032 HO2S Heater Control Circuit High (Bank 1 / Sensor 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

In order to control emissions of the CO, HC and NOx components of the exhaust gas, heated oxygen sensor (HO2S), mounted on the front side and rear side of catalytic converter, detects the oxygen content in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation.
The HO2S requires a minimum temperature to operate properly and provide a closed loop fuel control system. The HO2S contains the heater element to reduce its warming-up time and ensure its performance during all driving conditions.The ECM/PCM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM/PCM provides a ground circuit for activating the heater.

DTC DESCRIPTION

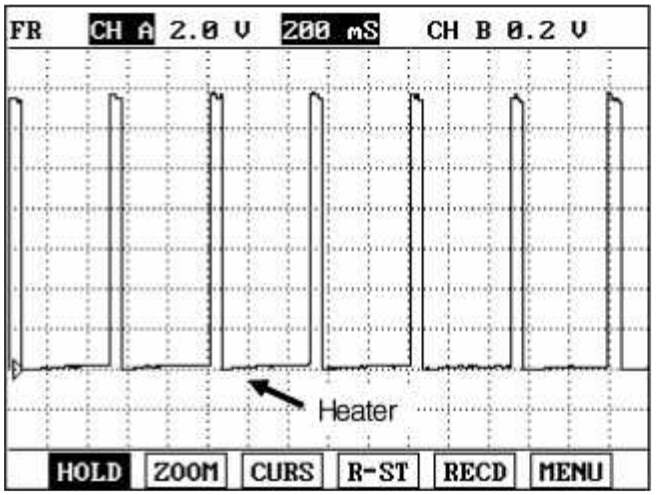
When ECM/PCM detects short to ground in the heater control circuit(B1S1), ECM/PCM sets DTC P0031.

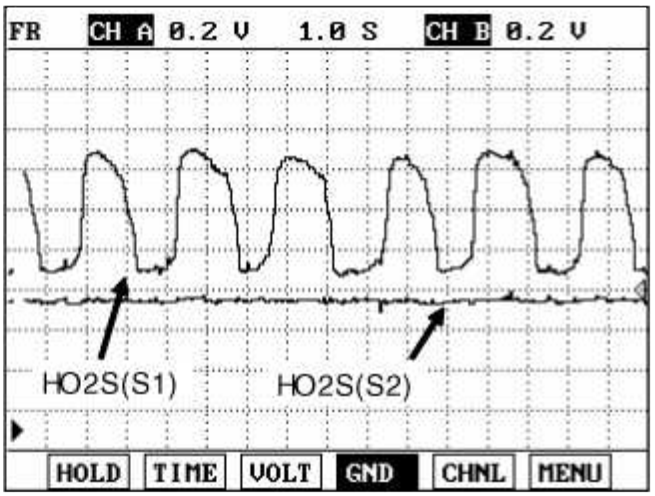
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Heater check high	• Poor connection • Short to battery in control circuit • B1S1 • ECM/PCM
Enable Conditions		
Threshold Value	• Short to battery	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA





The HO2S requires a minimum temperature to provide a closed loop fuel control system. So the HO2S contains a heater element to reduce its warm-up t me and ensure its performance during all driving conditions. The HO2S heater is controlled ON after engine start except for Cold condition and high speed accelleration. The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM provides a ground circuit for activating the heater.

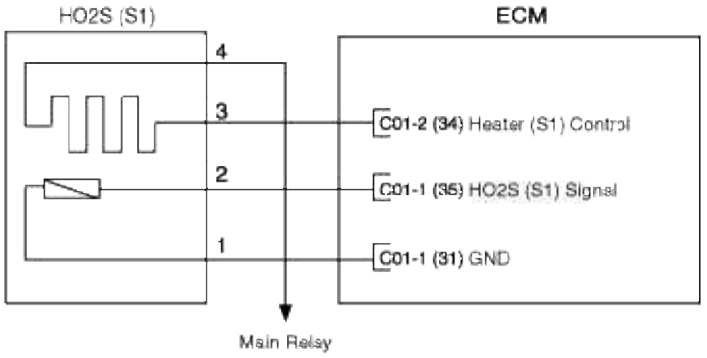
SPECIFICATION

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

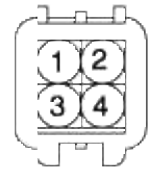
[CIRCUIT DIAGRAM]



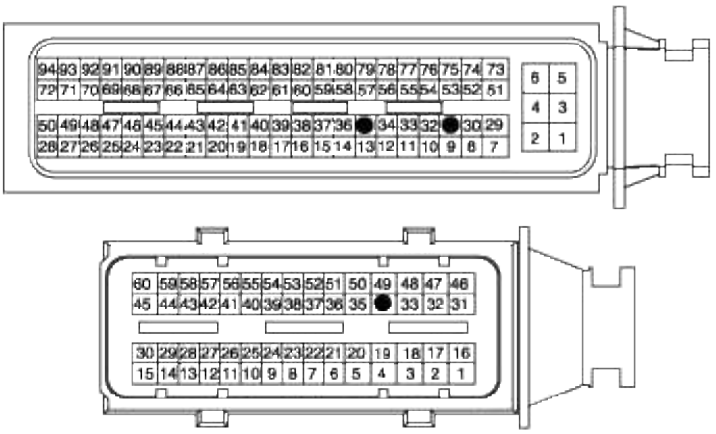
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

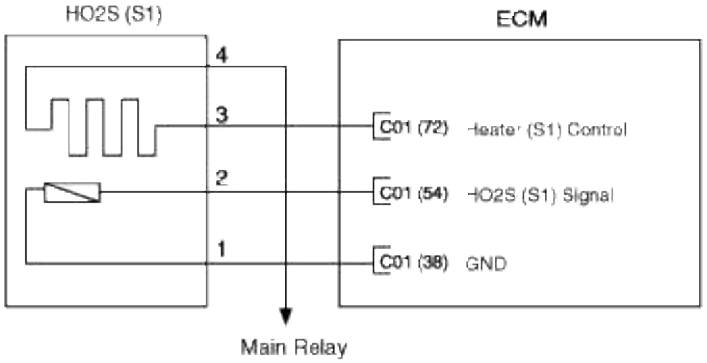


HO2S [S1] (C18)



(M/T)

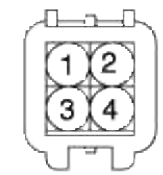
[CIRCUIT DIAGRAM]



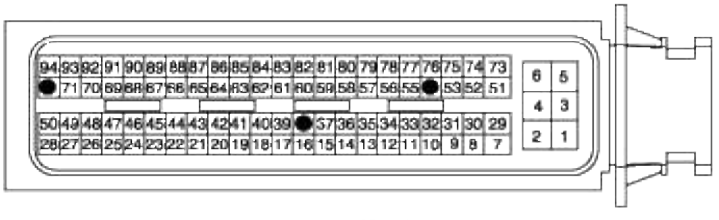
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

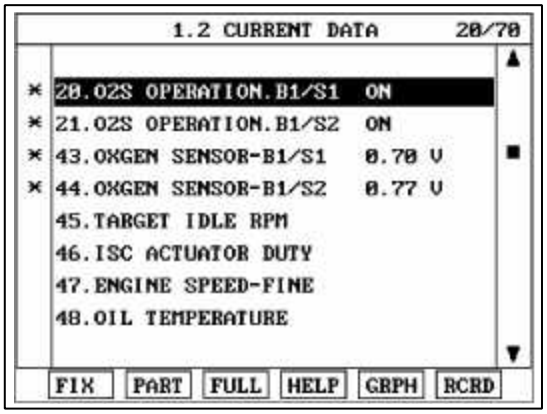


HO2S [S1] (C18)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter operating correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

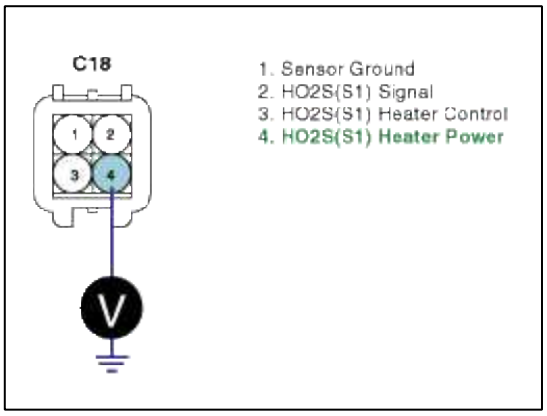
Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S1) connector.
3. IG "ON" & ENG "OFF"

4. Measure voltage between terminal 4 of HO2S(S1) harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

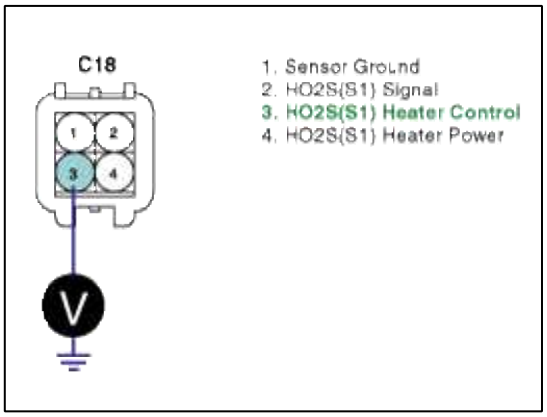
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedue.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S1) connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of HO2S(S1) harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

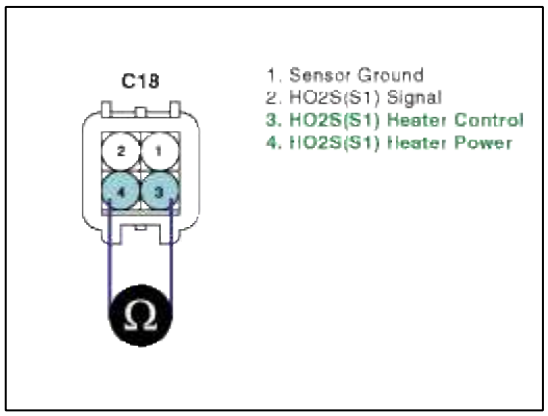
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Check resistance.
   (1) IG "OFF".
   (2) Disconnect HO2S(S1) connector.
   (3) Measure resistance between terminal 3 and 4 of HO2S(S1)(Component Side)
   Specification :

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good HO2S(S1) and check for proper operation.
   If the problem is corrected, replace HO2S(S1) and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

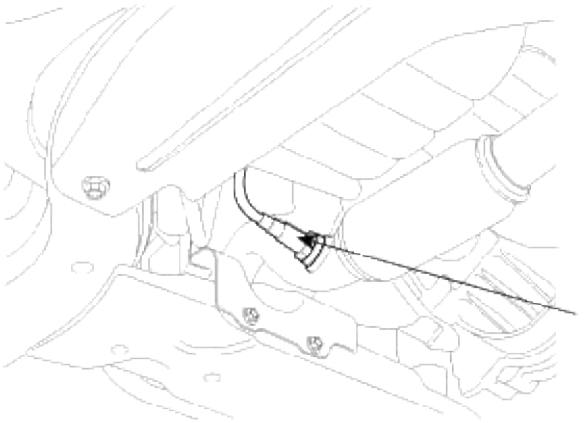
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0036 HO2S Heater Control Circuit (Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

In order to control emissions of the CO, HC and NOx components of the exhaust gas, heated oxygen sensor (HO2S), mounted on the front side and rear side of catalytic converter, detects the oxygen content in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation.
The HO2S requires a minimum temperature to operate properly and provide a closed loop fuel control system. The HO2S contains the heater element to reduce its warming-up time and ensure its performance during all driving conditions.The ECM/PCM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM/PCM provides a ground circuit for activating the heater.

DTC DESCRIPTION

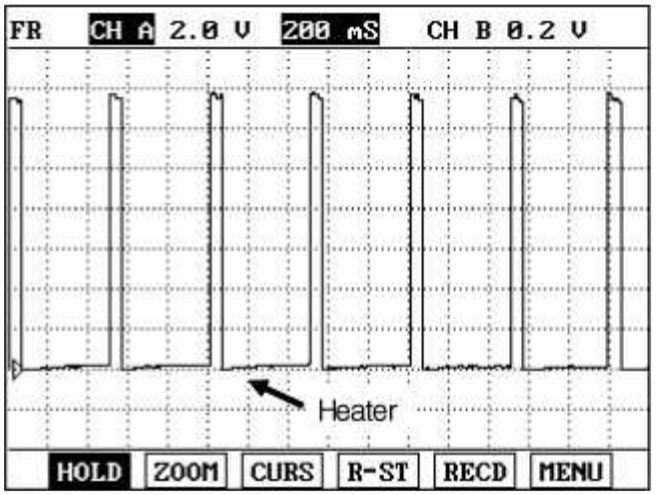
When ECM/PCM detects the open in the heater control circuit(B1S2), ECM/PCM sets DTC P0036.

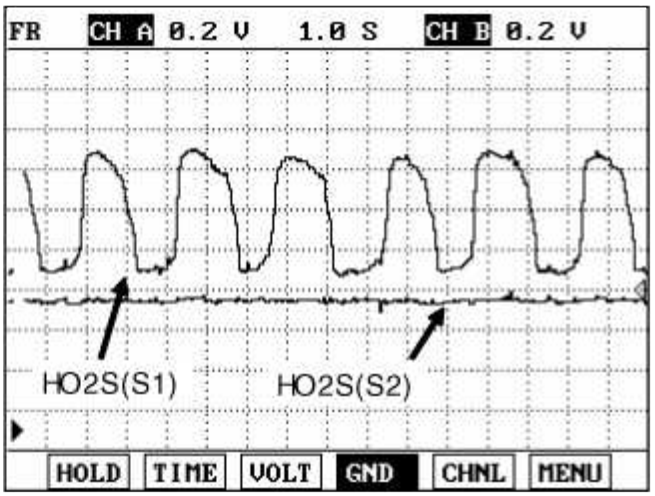
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Heater check open	• Poor connection • Open or Short to ground in power circuit • Open in control circuit • H1S2 • ECM/PCM
Enable Conditions		
Threshold Value	• Open in control circuit	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA





The HO2S requires a minimum temperature to provide a closed loop fuel control system. So the HO2S contains a heater element to reduce its warm-up t me and ensure its performance during all driving conditions. The HO2S heater is controlled ON after engine start except for Cold condition and high speed accelleration. The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM provides a ground circuit for activating the heater.

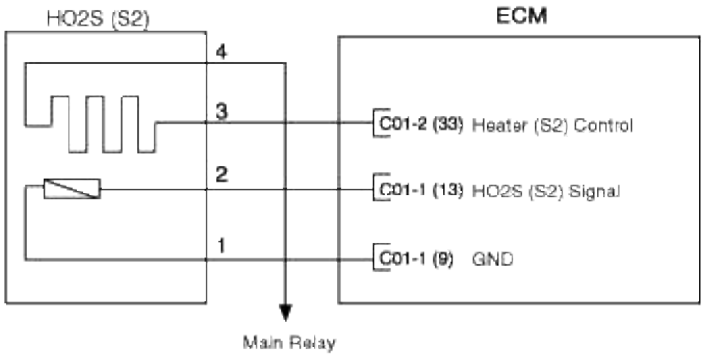
SPECIFICATION

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

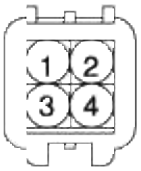
[CIRCUIT DIAGRAM]



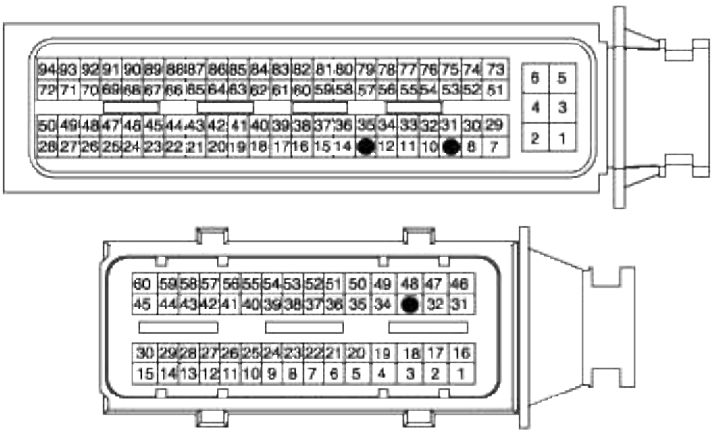
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (9)	Sensor Ground
2	ECM C01-1 (13)	HO2S (S2) Signal
3	ECM C01-2 (33)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

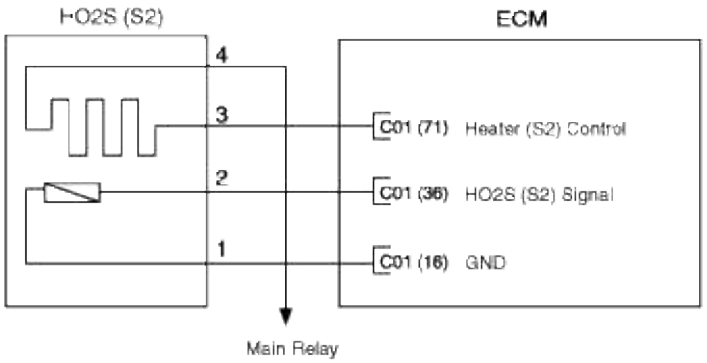


HO2S [S2] (C17)



(M/T)

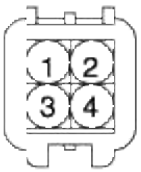
[CIRCUIT DIAGRAM]



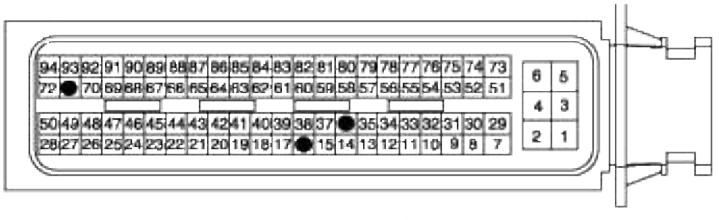
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

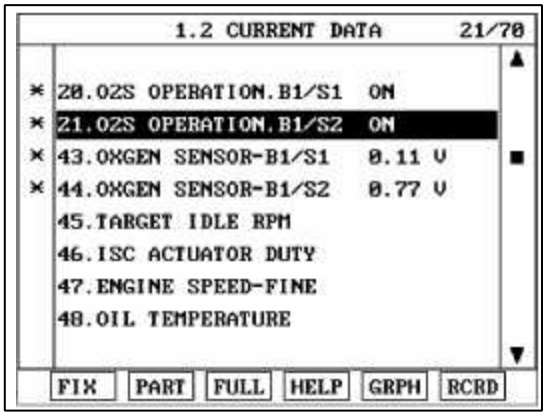


HO2S [S2] (C17)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S Heater(B1/S2)" data displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

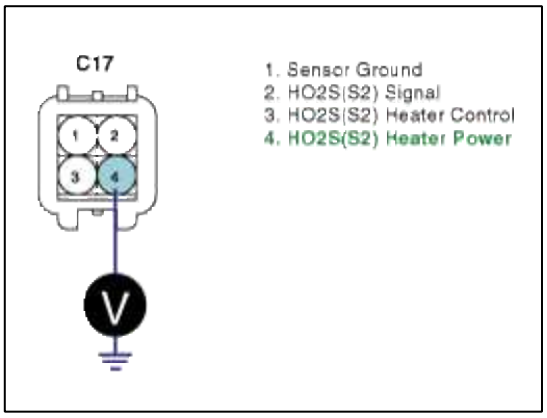
Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S2) connector.
3. IG "ON" & ENG "OFF"

4. Measure voltage between terminal 4 of HO2S(S2) harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

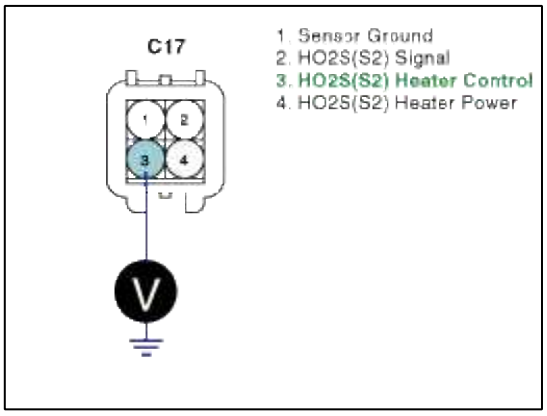
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedue.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S2) connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of HO2S(S2) harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

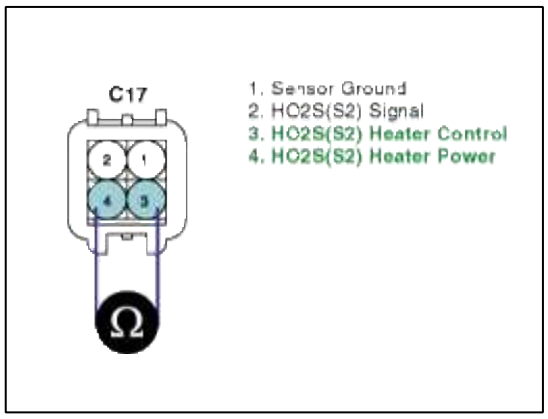
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Check resistance.
   (1) IG "OFF".
   (2) Disconnect HO2S(S2) connector.
   (3) Measure resistance between terminal 3 and 4 of HO2S(S2) (Component Side)
   Specification :

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good HO2S(S2) and check for proper operation.
   If the problem is corrected, replace HO2S(S2) and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

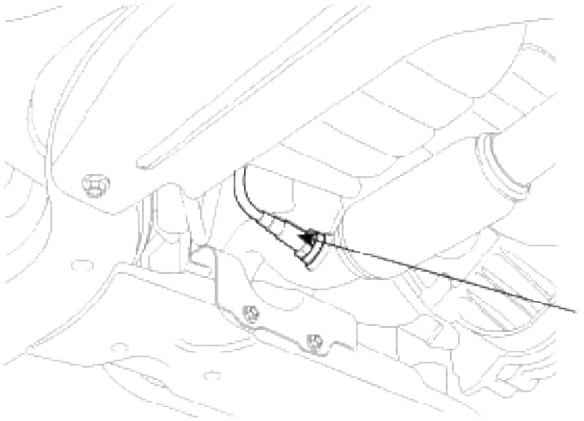
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0037 HO2S Heater Control Circuit Low (Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

In order to control emissions of the CO, HC and NOx components of the exhaust gas, heated oxygen sensor (HO2S), mounted on the front side and rear side of catalytic converter, detects the oxygen content in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation.
The HO2S requires a minimum temperature to operate properly and provide a closed loop fuel control system. The HO2S contains the heater element to reduce its warming-up time and ensure its performance during all driving conditions.The ECM/PCM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM/PCM provides a ground circuit for activating the heater.

DTC DESCRIPTION

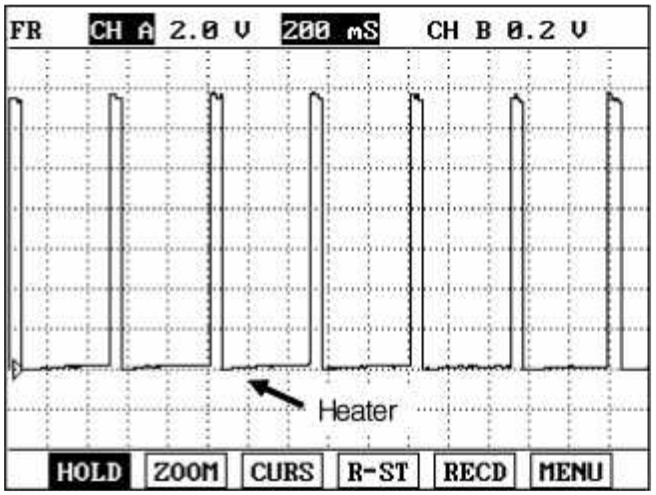
When ECM/PCM detects short to ground in the heater control circuit(B1S2), ECM/PCM sets DTC P0037.

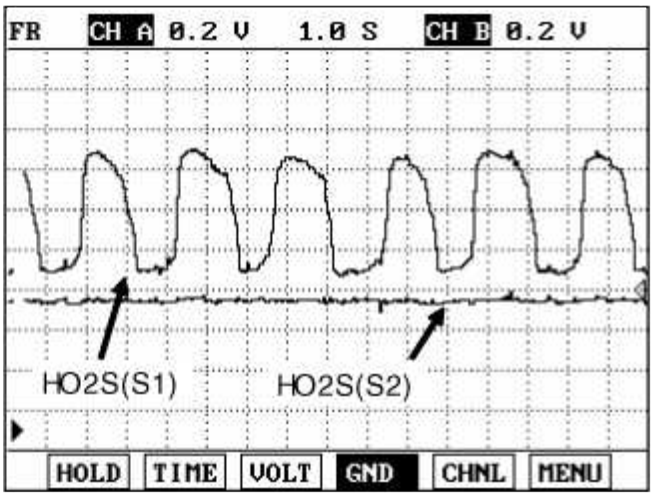
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Heater check low	• Poor connection • Short to ground in control circuit • B1S2 • ECM/PCM
Enable Conditions		
Threshold Value	• Short to ground	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA





The HO2S requires a minimum temperature to provide a closed loop fuel control system. So the HO2S contains a heater element to reduce its warm-up t me and ensure its performance during all driving conditions. The HO2S heater is controlled ON after engine start except for Cold condition and high speed accelleration. The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM provides a ground circuit for activating the heater.

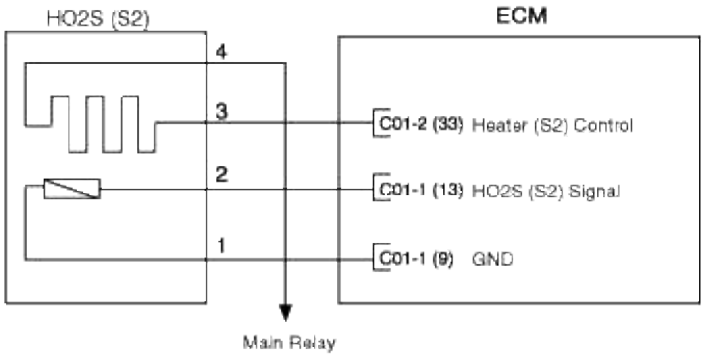
SPECIFICATION

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

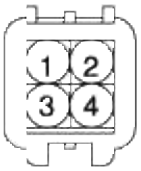
[CIRCUIT DIAGRAM]



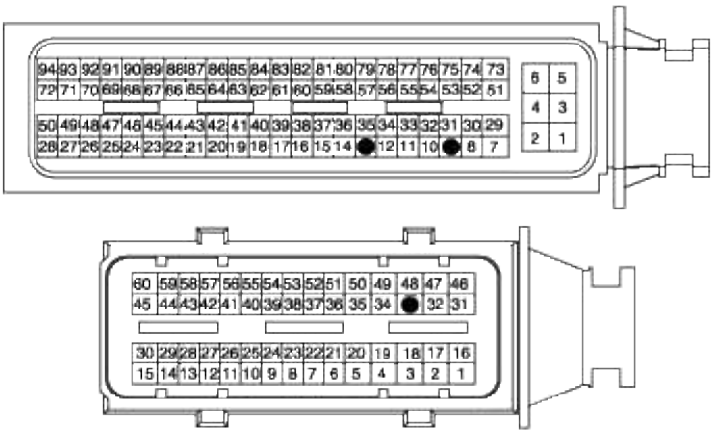
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (9)	Sensor Ground
2	ECM C01-1 (13)	HO2S (S2) Signal
3	ECM C01-2 (33)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

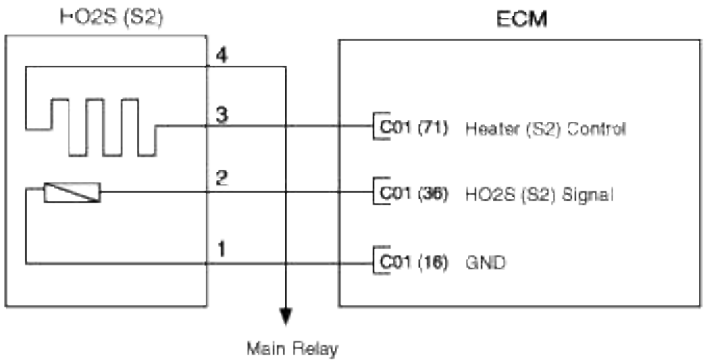


HO2S [S2] (C17)



(M/T)

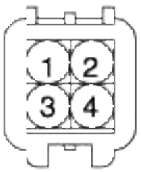
[CIRCUIT DIAGRAM]



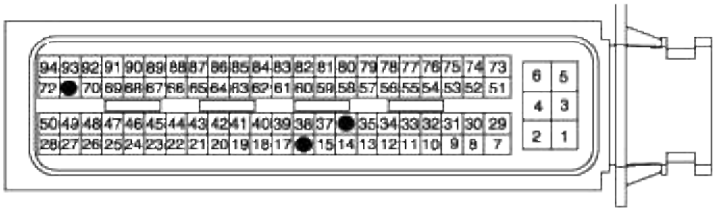
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

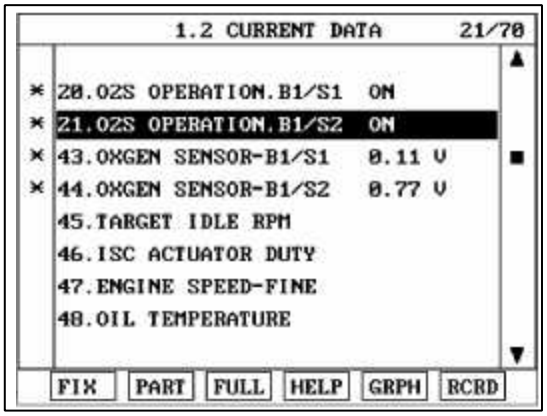


HO2S [S2] (C17)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S Heater(B1/S2)" data displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection"procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

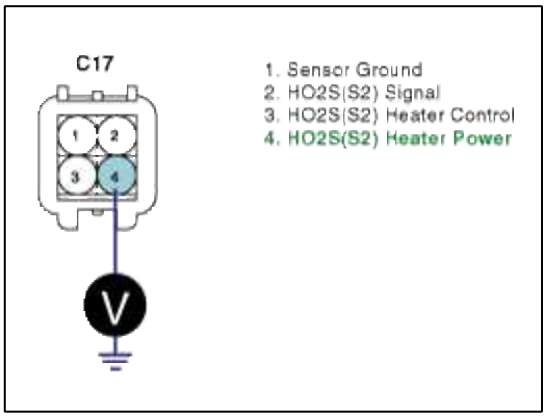
Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S2) connector.
3. IG "ON" & ENG "OFF"

4. Measure voltage between terminal 4 of HO2S(S2) harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

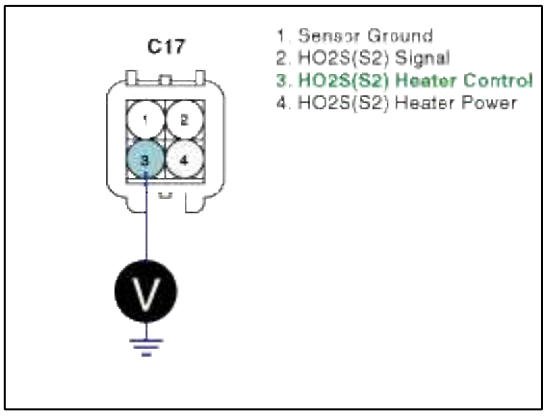
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedue.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S2) connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of HO2S(S2) harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

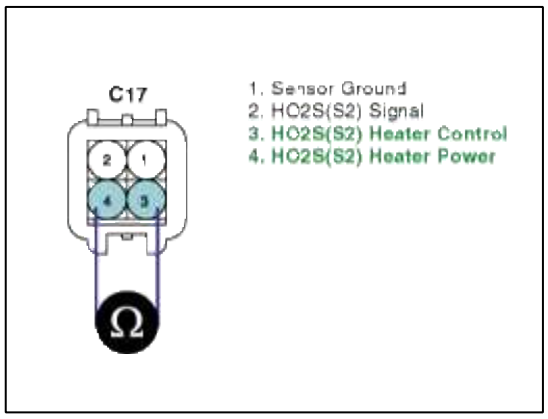
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Check resistance (S2).
   (1) IG "OFF".
   (2) Disconnect HO2S(S2) connector.
   (3) Measure resistance between terminal 3 and 4 of HO2S(S2) (Component Side)
   Specification :

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good HO2S(S2) and check for proper operation.
   If the problem is corrected, replace HO2S(S2) and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

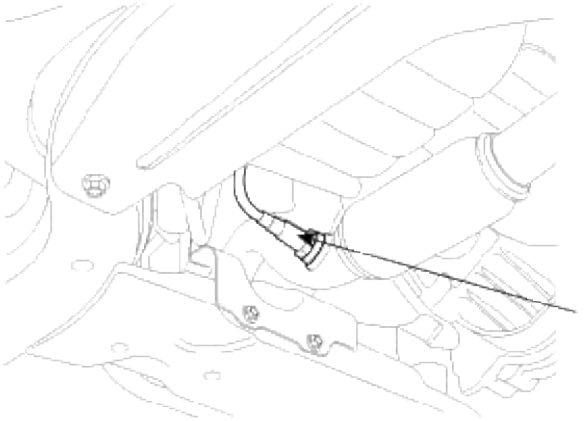
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0038 HO2S Heater Control Circuit High (Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

In order to control emissions of the CO, HC and NOx components of the exhaust gas, heated oxygen sensor (HO2S), mounted on the front side and rear side of catalytic converter, detects the oxygen content in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation.
The HO2S requires a minimum temperature to operate properly and provide a closed loop fuel control system. The HO2S contains the heater element to reduce its warming-up time and ensure its performance during all driving conditions.The ECM/PCM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM/PCM provides a ground circuit for activating the heater.

DTC DESCRIPTION

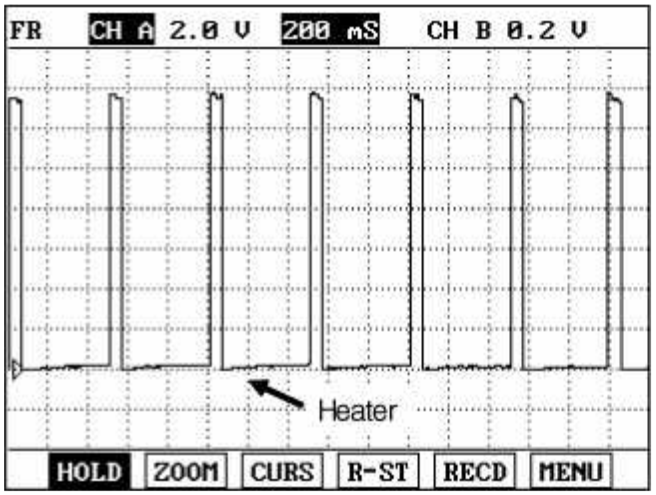
When ECM/PCM detects short to power in the heater control circuit, ECM/PCM sets DTC P0038.

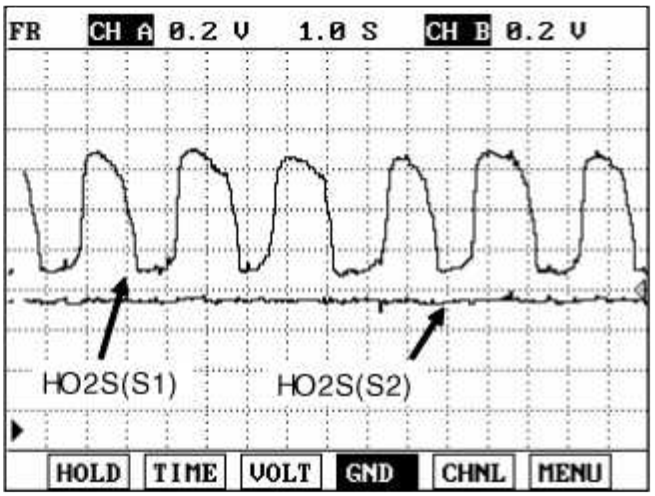
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Heater check high	• Poor connection • Short to power in control circuit • B1S2 • ECM/PCM
Enable Conditions		
Threshold Value	• Short to battery	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA





The HO2S requires a minimum temperature to provide a closed loop fuel control system. So the HO2S contains a heater element to reduce its warm-up t me and ensure its performance during all driving conditions. The HO2S heater is controlled ON after engine start except for Cold condition and high speed accelleration. The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM provides a ground circuit for activating the heater.

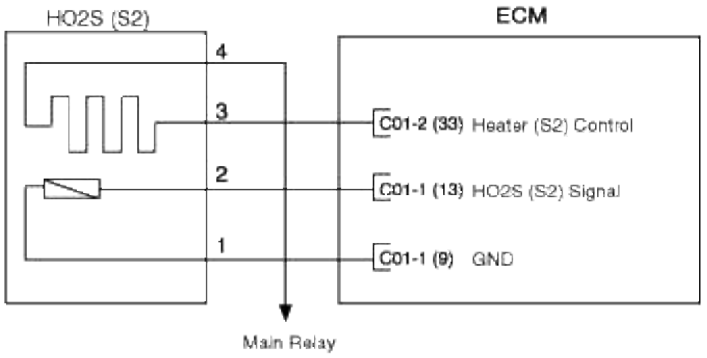
SPECIFICATION

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

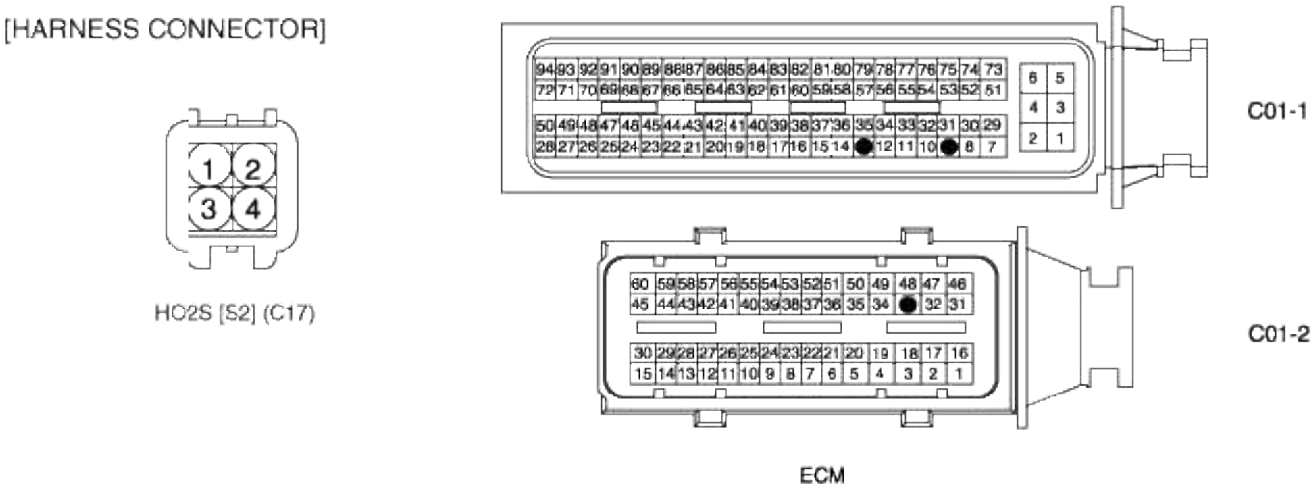
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

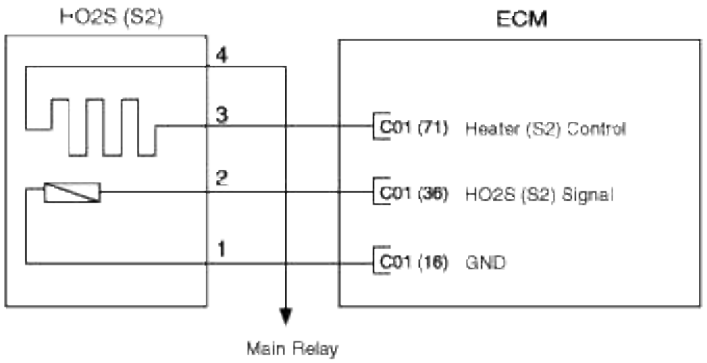
Terminal	Connected to	Function
1	ECM C01-1 (9)	Sensor Ground
2	ECM C01-1 (13)	HO2S (S2) Signal
3	ECM C01-2 (33)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



(M/T)

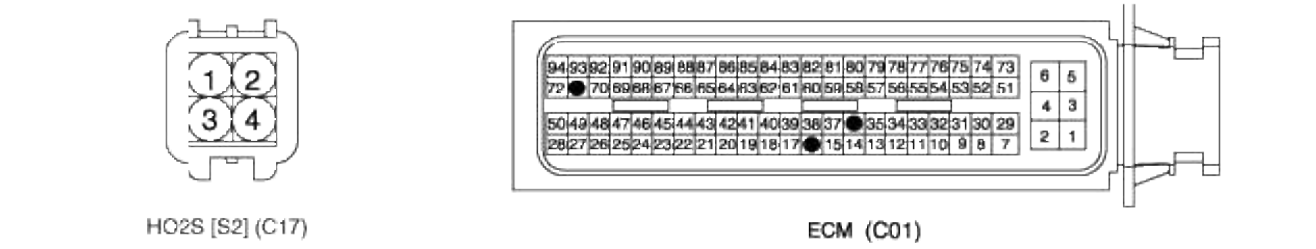
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

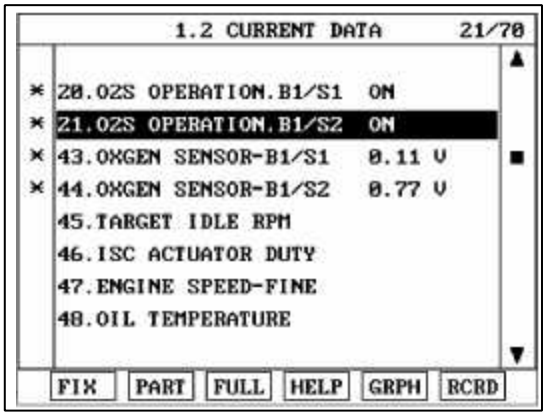
Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S Heater(B1/S2)" data displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

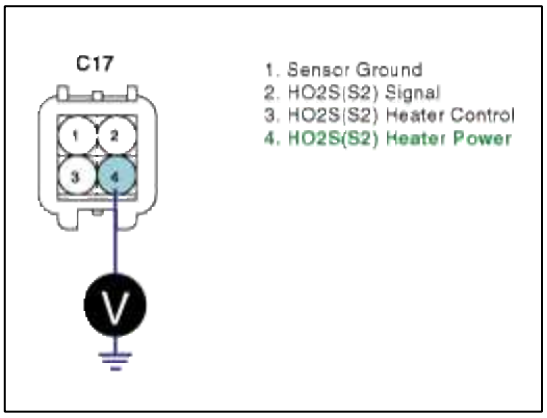
Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S2) connector.
3. IG "ON" & ENG "OFF"

4. Measure voltage between terminal 4 of HO2S(S2) harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

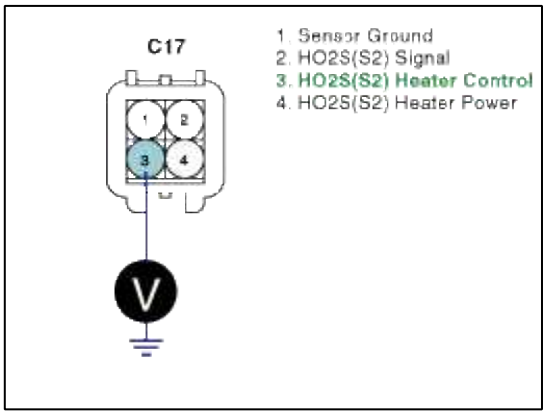
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedue.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(S2) connector.
3. IG "ON"& ENG "OFF"
4. Measure voltage between terminal 3 of HO2S(S2) harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

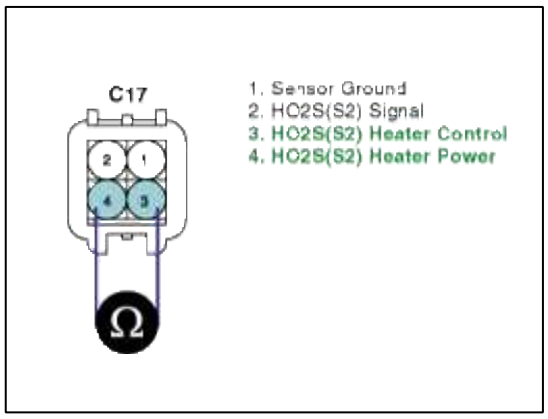
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Check resistance (S2).
   (1) IG "OFF".
   (2) Disconnect HO2S(S2) connector.
   (3) Measure resistance between terminal 3 and 4 of HO2S(S2) (Component Side)
   Specification :

ITEM	Specification
Heater Resistance(Ω)	Approx. 9.0Ω at 20°C (68°F)



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good HO2S(S2) and check for proper operation.
   If the problem is corrected, replace HO2S(S2) and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

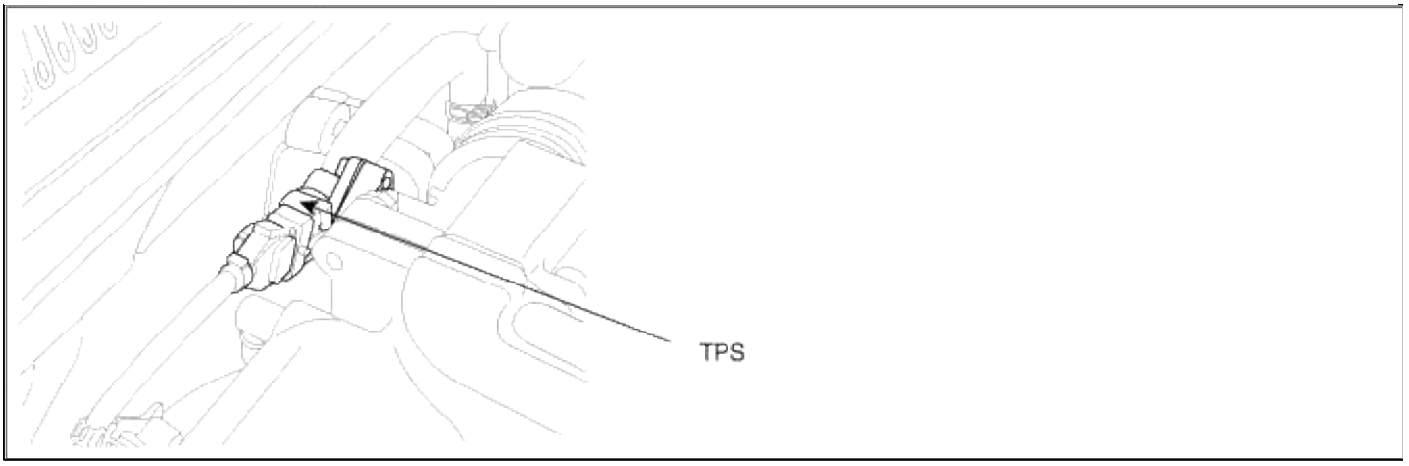
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0068 MAP(MAF)-Throttle Position Sensor Correlation

COMPONENT LOCATION



GENERAL DESCRIPTION

The Throttle Position Sensor (TPS) is mounted on the throttle body and detects the opening angle of the throttle plate.
The TPS has a variable resistor (potentiometer) whose characteristic is the resistance changing according to the throttle angle. During acceleration, the TPS resistance between the reference 5V and the signal terminal decreases and output voltage increases; during deceleration, the TPS resistance increases and TPS output voltage decreases. The ECM/PCM supplies a reference 5V to the TPS and the output voltage increases directly with the opening of the throttle valve. The TPS output voltage will vary from 0.2~0.8V at closed throttle to 4.3~4.8V at wide-open throttle. The ECM/PCM determines operating conditions such as idle (closed throttle), part load, acceleration/deceleration, and wide-open throttle from the TPS. Also The ECM/PCM uses the Mass Air Flow Sensor (MAFS) or Manifold Absolute Pressure Sensor (MAPS) signal along with the TPS signal to adjust fuel injection duration and ignition timing.

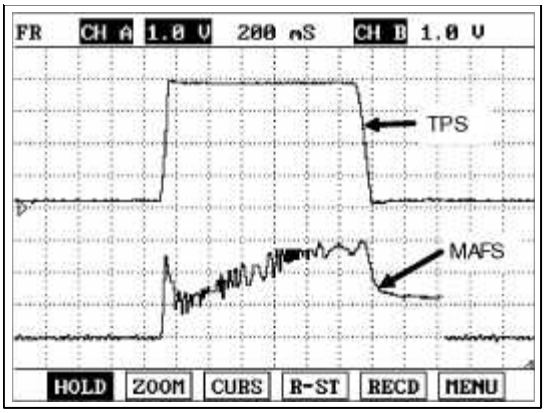
DTC DESCRIPTION

If the sensor input value of TPS is lower or higher than the threshold value which is depending on MAF more 300sec, ECM/PCM sets DTC P0068.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check (Correlation of actual and secondary load)	• Poor connection • TPS • MAFS • ECM/PCM
Enable Conditions	• Correction factor for secondary load > 1.2 or Correction factor for secondary load < 0.8	
Threshold Value	• Time for secondary load adaptation > 300s	
Diagnostic Time	• 1sec	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

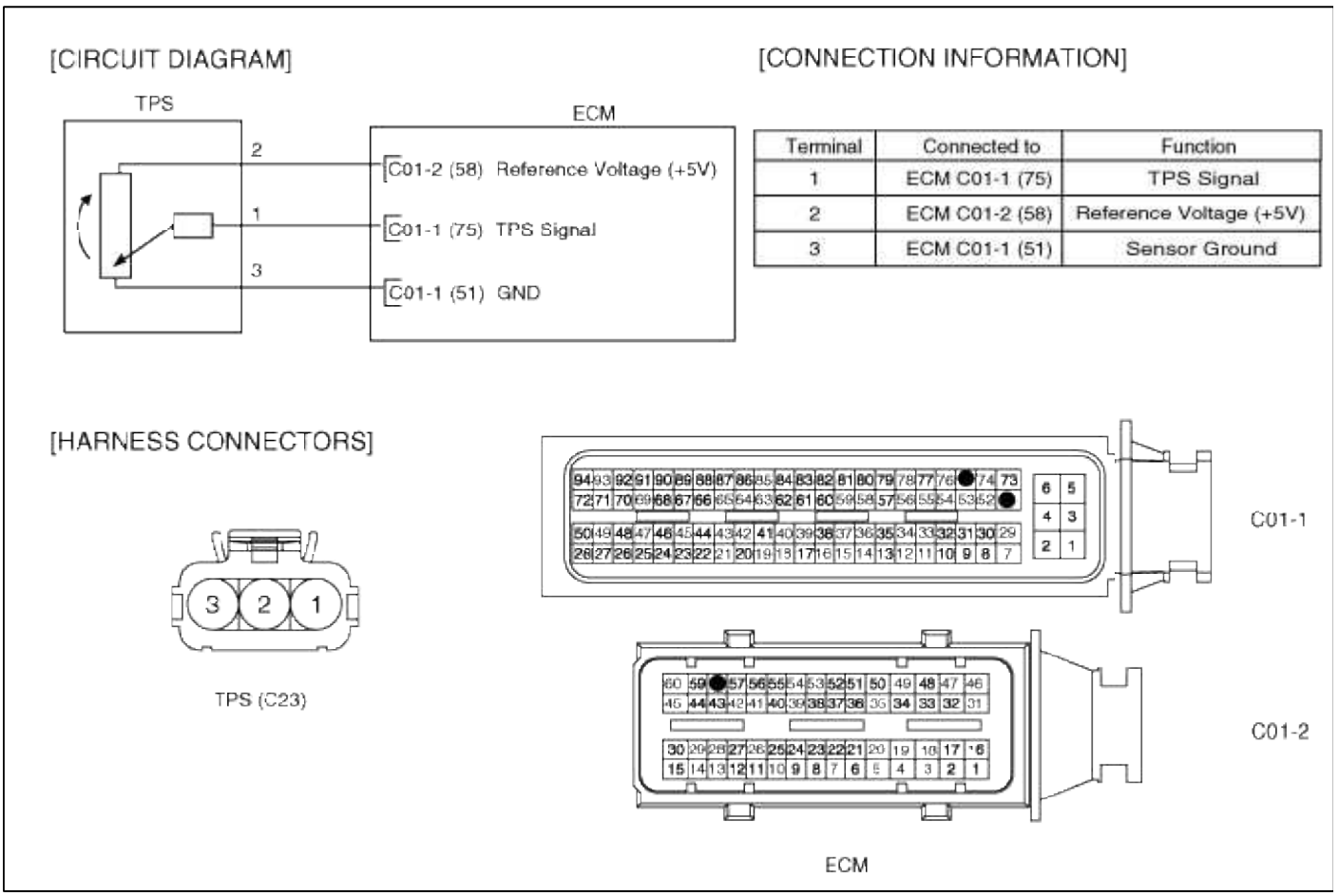


SPECIFICATION

ITEM	Specification
TPS Resistance(kΩ)	1.6 ~ 2.4 kΩ at 20°C (68°F)

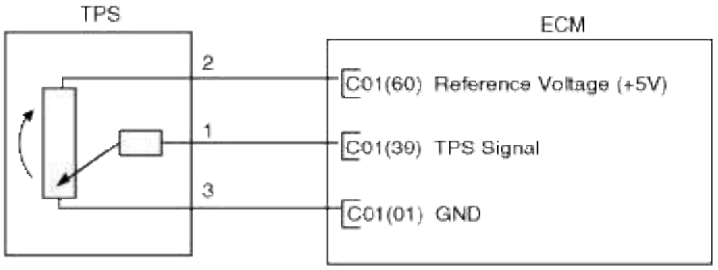
SCHEMATIC DIAGRAM

(A/T)



(M/T)

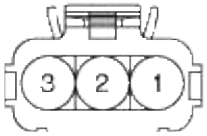
[CIRCUIT DIAGRAM]



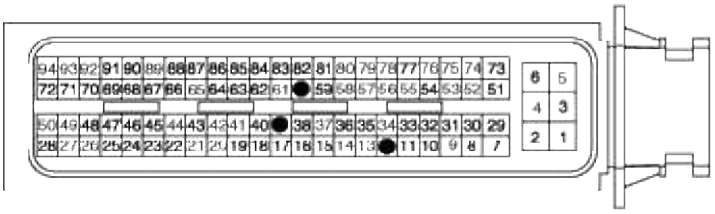
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (39)	TPS Signal
2	ECM C01 (60)	Reference Voltage (+5V)
3	ECM C01 (12)	Sensor Ground

[HARNESS CONNECTORS]



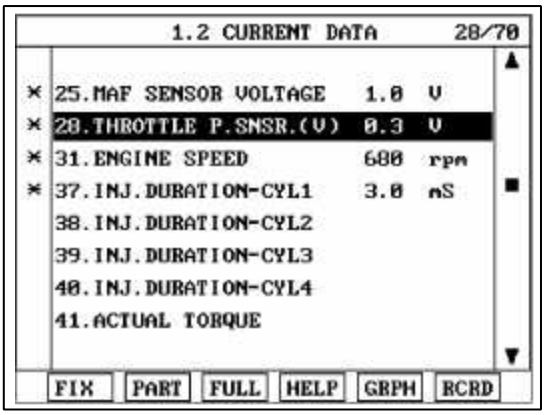
TPS (C23)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "TPS and MAFS" parameters on the scantool.



4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, tamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Component inspection" procedure.

COMPONENT INSPECTION

1. Check TPS.

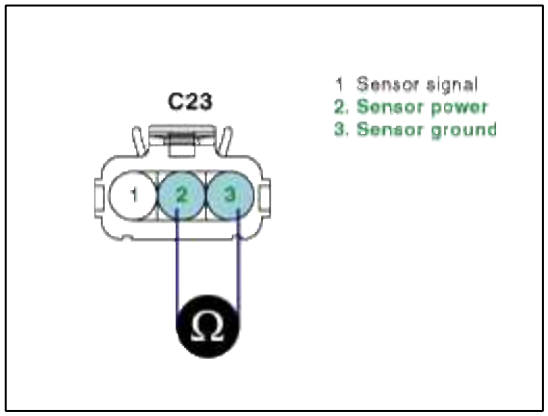
(1) Ignition "OFF".

(2) Disconnect TPS connector.

(3) Measure resistance terminal 2 and 3 of TP sensor connector(Component side).

Specification :

ITEM	Specification
TPS Resistance(kΩ)	1.6 ~ 2.4 kΩ at 20°C (68°F)



(4) Is the measured resistance within specifications?

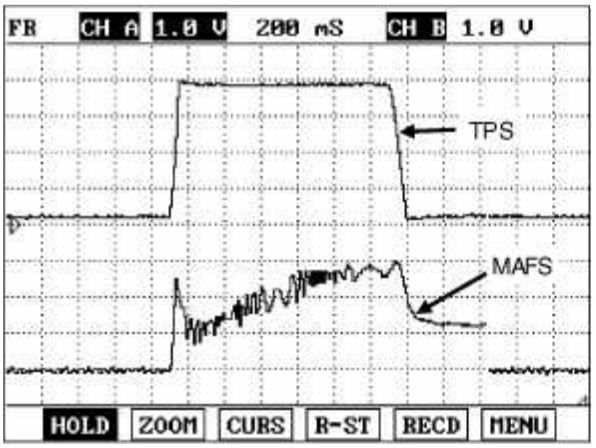
YES

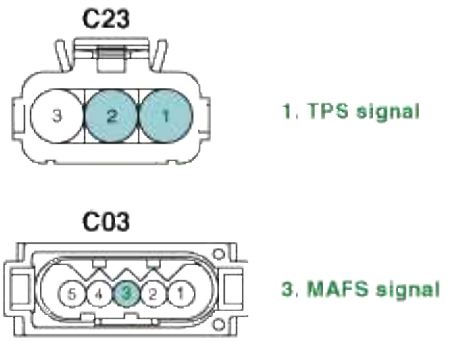
Go to "Check ECM/PCM" as below.

NO

Check TPS for contamination, deterioration, or damage. Substitute with a known-good TPS and check for proper operation. If the problem is corrected, replace TPS and then go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) Key "OFF". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 1 of TPS harness connector.
   (3) Connect channel B of scantool with terminal 3 of MAFS harness connector.
   (4) Engine start. And check the signal waveforms with stepping on accelerator pedal.





   (5) Is the signal waveform within specifications?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, rep ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute the sensor which outputs abnormal waveform with a known-good sensor and check for proper operation. If the problem is corrected, replace the sensor and then go to "Verification of Vehicle Repair" proc

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

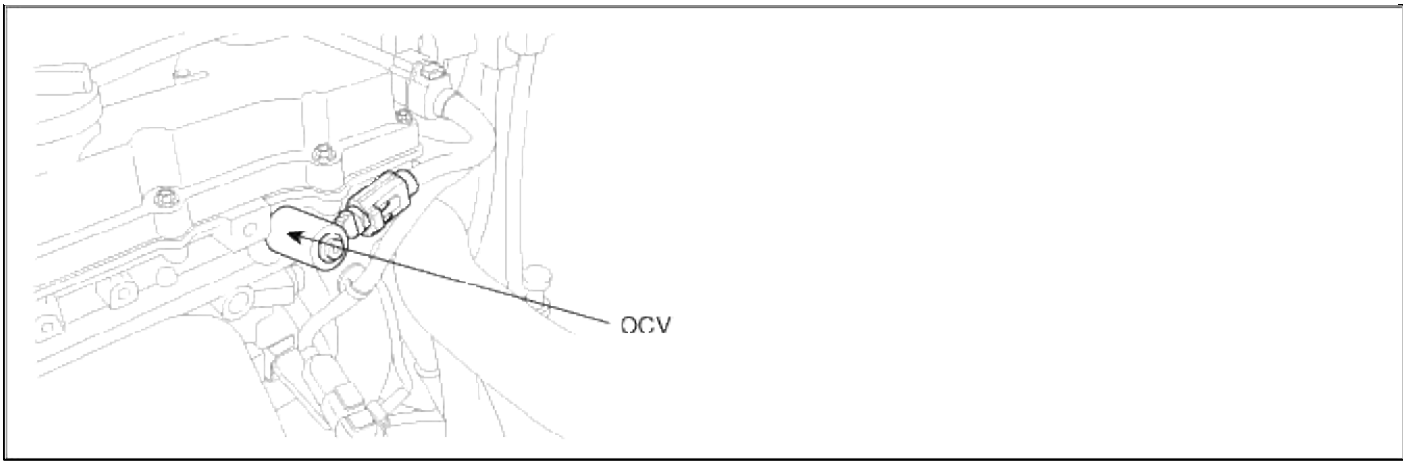
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0075 Intake Valve Control Solenoid Circuit (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

PCM controls OCV(Oil Contol Valve) with PWM (Pulse Width Modulator) signal to change oil passages supplying oil to CVVT that makes CAM position changes (advance or retard). OCV is integrated with oil filter and located on the engine block.

The oil control valve is controlled by a pulse-width-modulated signal from the engine control unit. A duty cycle of zero commands the cam phaser to its default position. A duty cycle of 100% commands the phaser to its maximum phased position. When the phaser must be controlled to an intermediate position, the duty cycle is maintained in the region of the 'hold position'. This is a medium duty cycle, usually between 35% and 65%, depending on temperature and voltage conditions. As the cam phaser is advanced and retarded, its position is measured using a toothed wheel. The wheel is attached to the camshaft, or to the cam phaser rotor. A sensor picks up the signal from the wheel and its output is read by the engine control unit. A cam signal is generated for each cam phaser on the engine. This requires a separate toothed wheel and cam sensorcombination for each cam phaser. The cam signal and crankwheel signal are comparedas the engine turns, and the phasing position is determined. The position is displayedin crank angle degrees, relative position from default. This position measurementis used as feedback for the position control software, which determines the requiredpercent duty cycle commanded to the oil control valve.

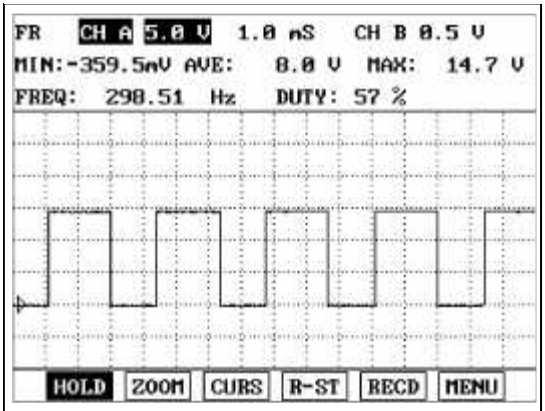
DTC DESCRIPTION

When ECM/PCM detects open in the OCV control circuit, ECM/PCM sets DTC P0075.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or Short to ground in power circuit • Open in control circuit • OCV • ECM/PCM
Enable Conditions		
Threshold Value	• Disconnected	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



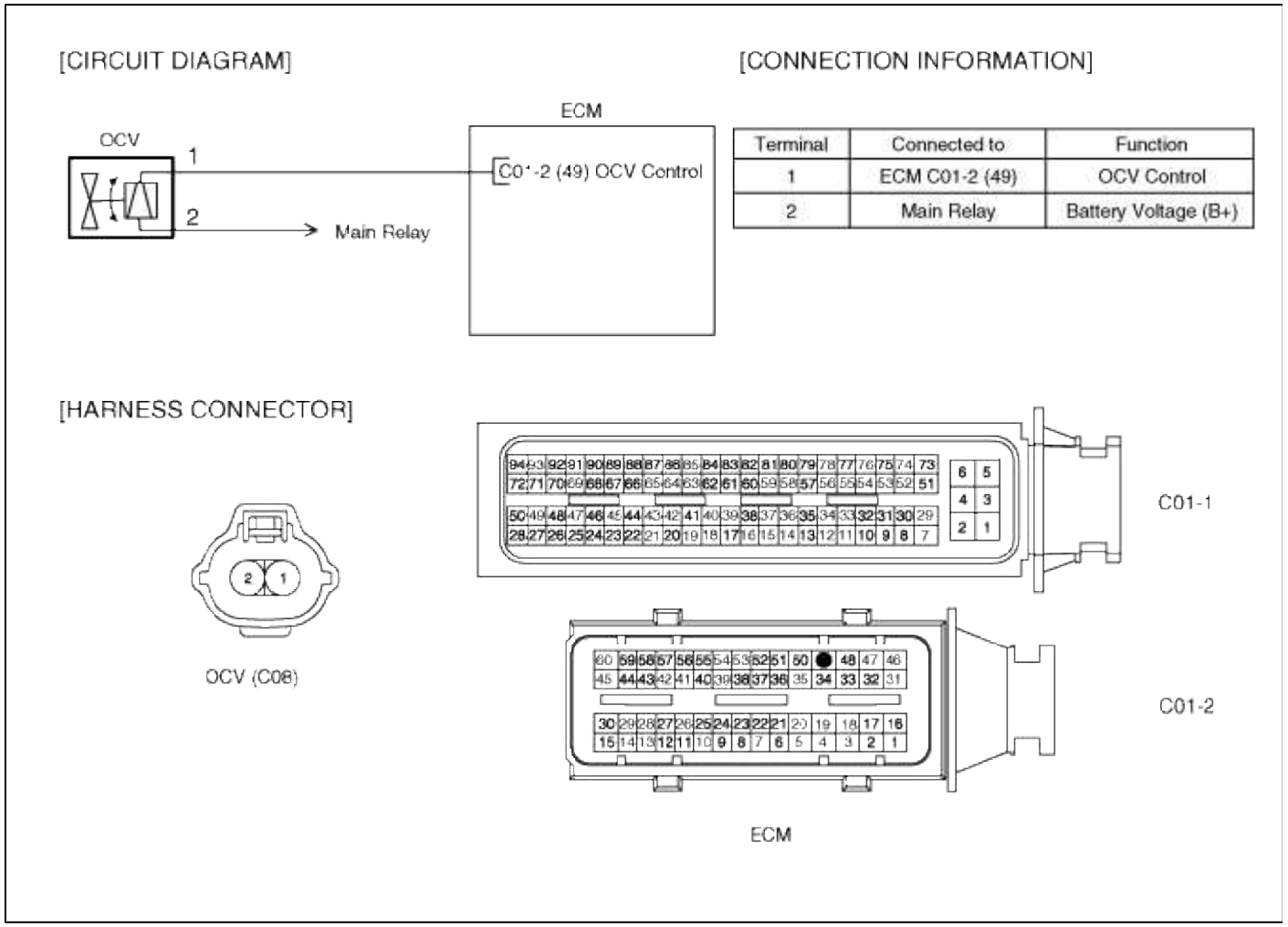
The ECM/PCM controls OCV by duty value.

SPECIFICATION

Temp.	Coil Resistance
20°C (68°F)	6.9 ~ 7.9Ω

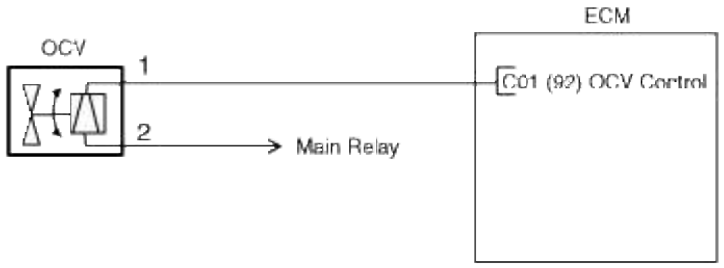
SCHEMATIC DIAGRAM

(A/T)



(M/T)

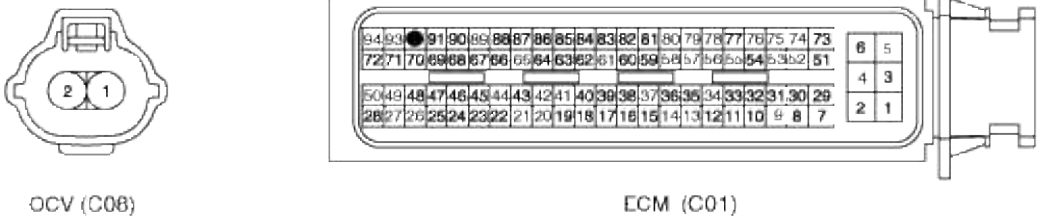
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

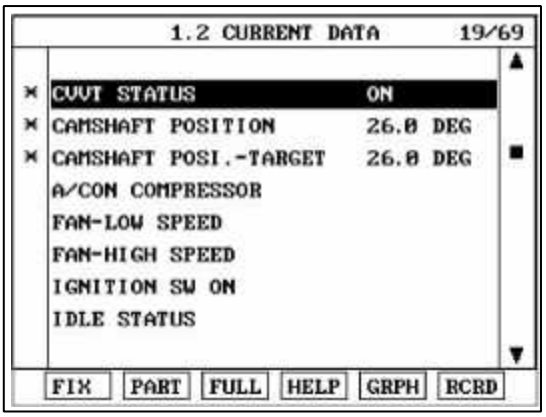
Terminal	Connected to	Function
1	ECM C01 (92)	OCV Control
2	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "OCV" parameter on scantool.



4. Is the "OCV" data displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

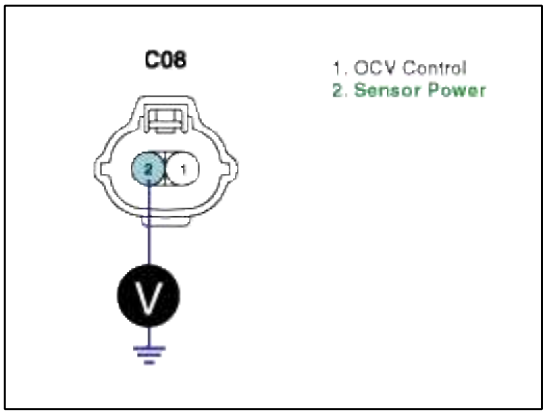
NO

Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect OCV connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 2 of OCV harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

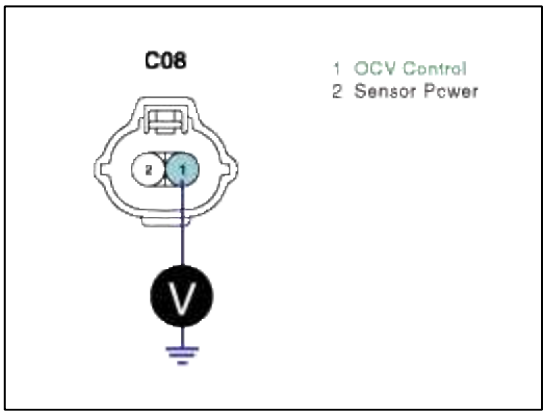
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect OCV connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 1 of OCV harness connector and chassis ground.

Specification : Approx. 3.2V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

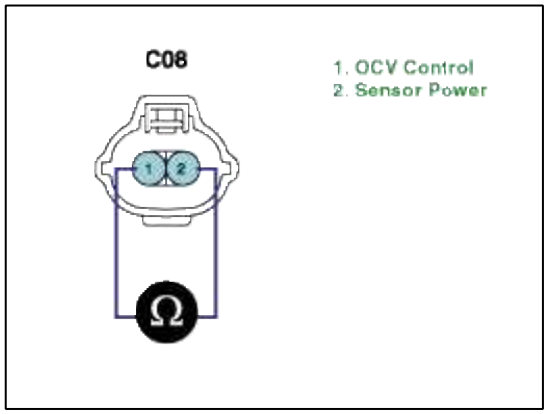
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check OCV.
   (1) IG "OFF"
   (2) Disconnect OCV connector.
   (3) Measure resitance between terminal 1 and 2 of OCV connector.(Component Side)

Specification :

Temp.	Coil Resistance
20°C (68°F)	6.9 ~ 7.9Ω



   (4) Is the measured resistance within specification ?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good OCV and check for proper operation.
If the problem is corrected, replace OCV and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

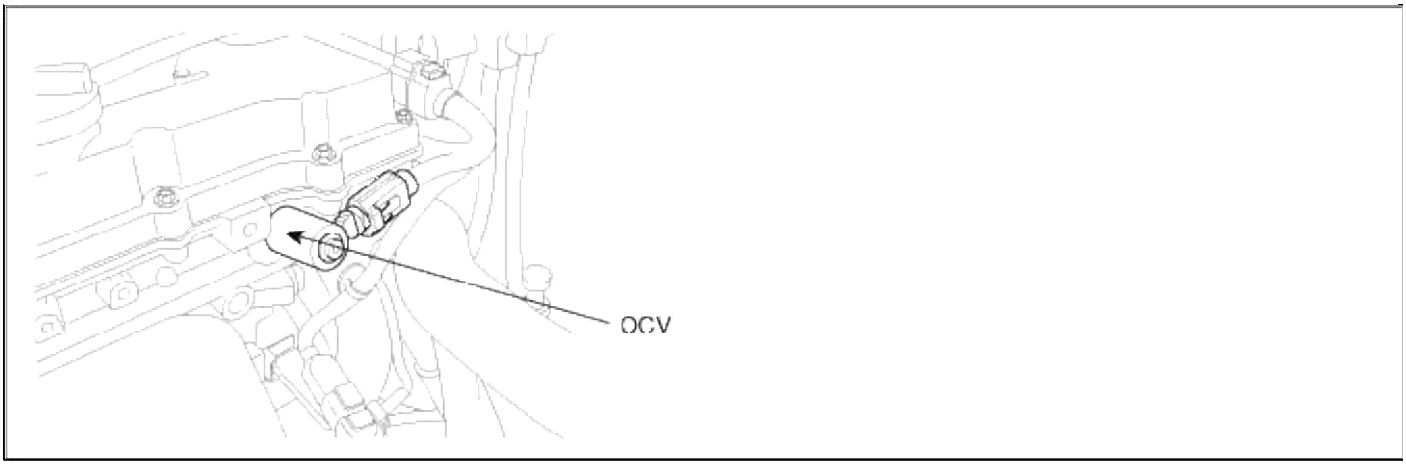
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0076 Intake Valve Control Solenoid Circuit-Low (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

PCM controls OCV(Oil Contol Valve) with PWM (Pulse Width Modulator) signal to change oil passages supplying oil to CVVT that makes CAM position changes (advance or retard). OCV is integrated with oil filter and located on the engine block.

The oil control valve is controlled by a pulse-width-modulated signal from the engine control unit. A duty cycle of zero commands the cam phaser to its default position. A duty cycle of 100% commands the phaser to its maximum phased position. When the phaser must be controlled to an intermediate position, the duty cycle is maintained in the region of the 'hold position'. This is a medium duty cycle, usually between 35% and 65%, depending on temperature and voltage conditions. As the cam phaser is advanced and retarded, its position is measured using a toothed wheel. The wheel is attached to the camshaft, or to the cam phaser rotor. A sensor picks up the signal from the wheel and its output is read by the engine control unit. A cam signal is generated for each cam phaser on the engine. This requires a separate toothed wheel and cam sensorcombination for each cam phaser. The cam signal and crankwheel signal are comparedas the engine turns, and the phasing position is determined. The position is displayedin crank angle degrees, relative position from default. This position measurementis used as feedback for the position control software, which determines the requiredpercent duty cycle commanded to the oil control valve.

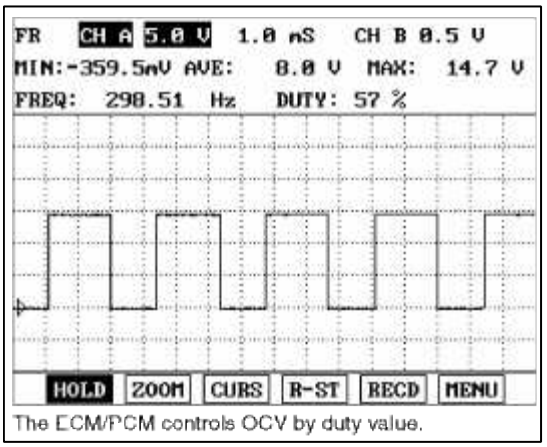
DTC DESCRIPTION

When ECM/PCM detects short to ground in OCV control circuit, ECM/PCM sets DTC P0076.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • Short to ground in control circuit • OCV • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to ground	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



The ECM/PCM controls OCV by duty value.

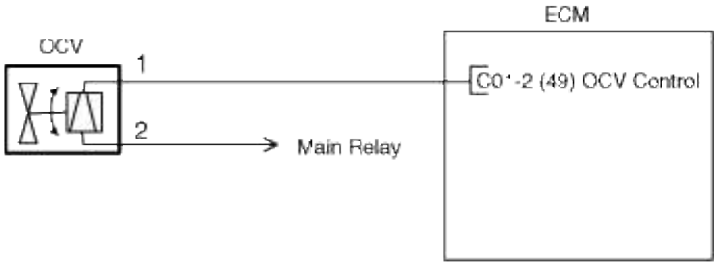
SPECIFICATION

Temp.	Coil Resistance
20°C (68°F)	6.9 ~ 7.9Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



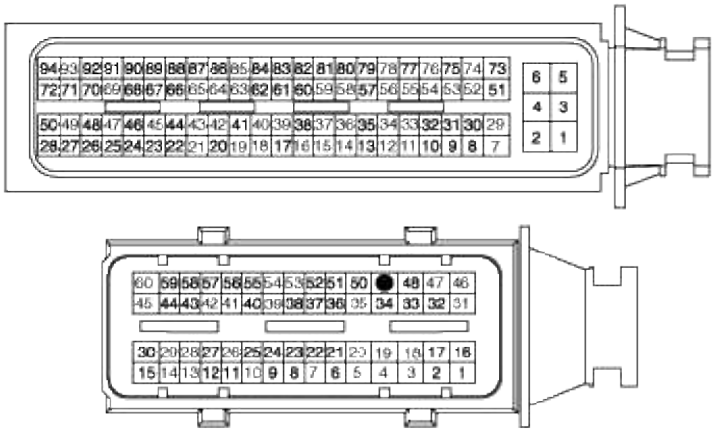
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (49)	OCV Control
2	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

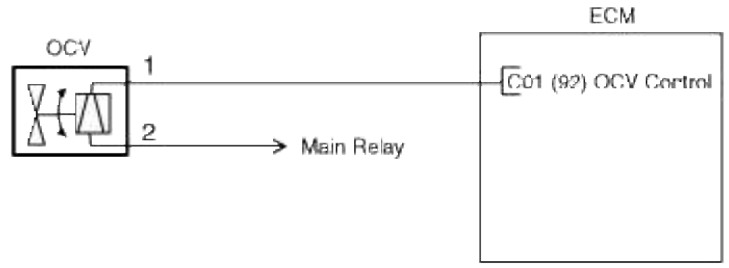


OCV (C08)



(M/T)

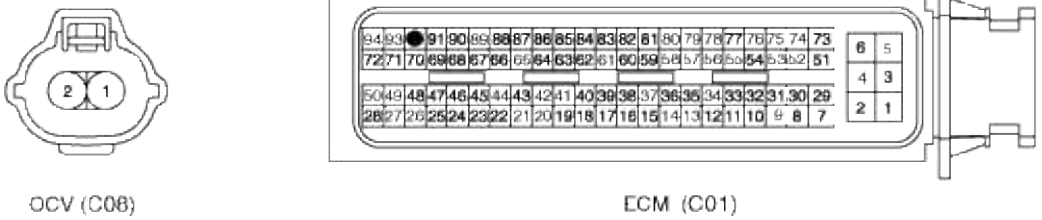
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

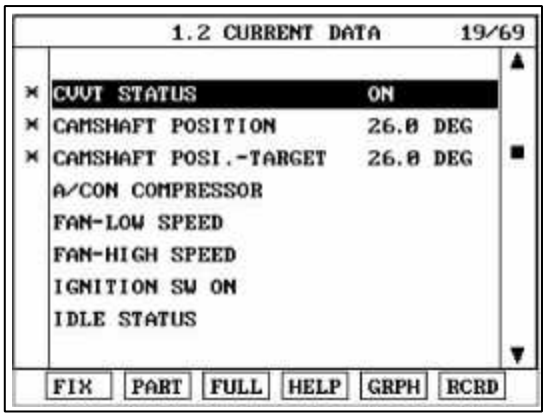
Terminal	Connected to	Function
1	ECM C01 (92)	OCV Control
2	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "OCV" parameter on scantool.



4. Is the "OCV" data displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

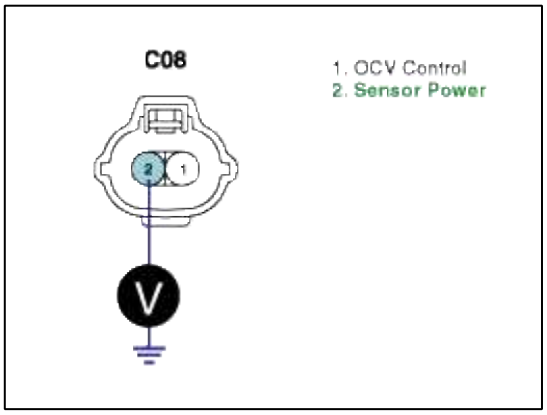
NO

Go to "Power Circuit Inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect OCV connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 2 of OCV harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

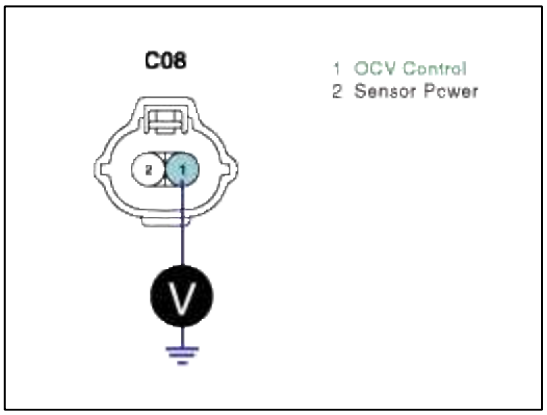
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect OCV connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 2 of OCV harness connector and chassis ground.

Specification : Approx. 3.2V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

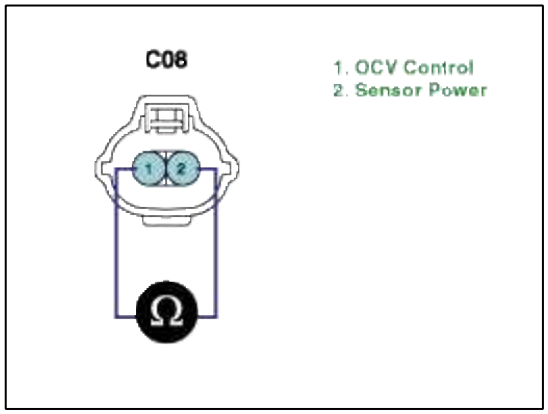
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check OCV.
   (1) IG "OFF"
   (2) Disconnect OCV connector.
   (3) Measure resitance between terminal 1 and 2 of OCV connector.(Component Side)

Specification :

Temp.	Coil Resistance
20°C (68°F)	6.9 ~ 7.9Ω



   (4) Is the measured resistance within specification ?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good OCV and check for proper operation.
If the problem is corrected, replace OCV and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

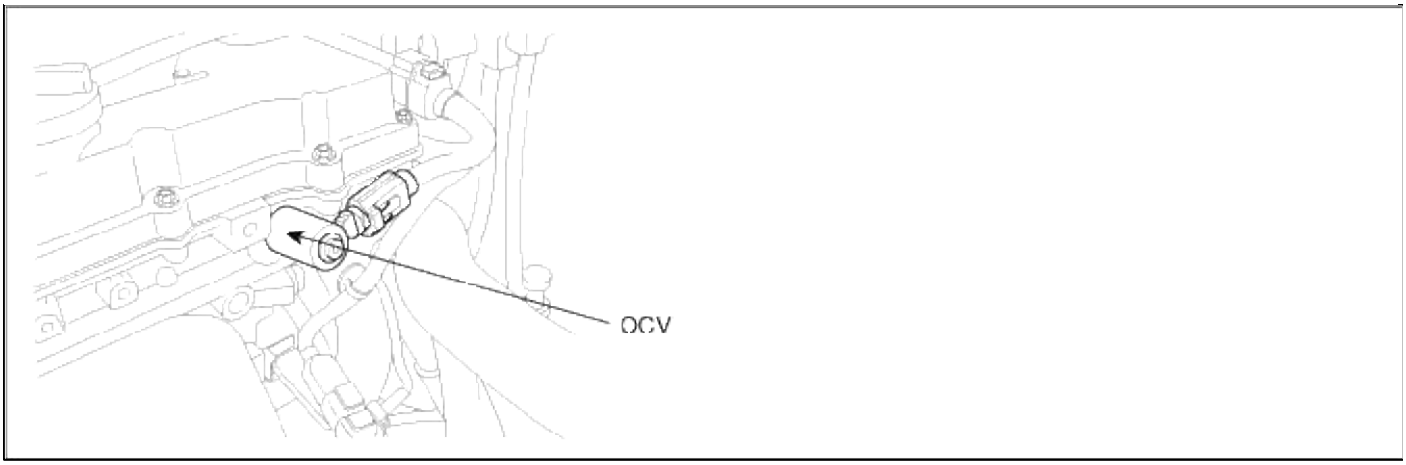
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0077 Intake Valve Control Solenoid Circuit-High (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

PCM controls OCV(Oil Contol Valve) with PWM (Pulse Width Modulator) signal to change oil passages supplying oil to CVVT that makes CAM position changes (advance or retard). OCV is integrated with oil filter and located on the engine block.

The oil control valve is controlled by a pulse-width-modulated signal from the engine control unit. A duty cycle of zero commands the cam phaser to its default position. A duty cycle of 100% commands the phaser to its maximum phased position. When the phaser must be controlled to an intermediate position, the duty cycle is maintained in the region of the 'hold position'. This is a medium duty cycle, usually between 35% and 65%, depending on temperature and voltage conditions. As the cam phaser is advanced and retarded, its position is measured using a toothed wheel. The wheel is attached to the camshaft, or to the cam phaser rotor. A sensor picks up the signal from the wheel and its output is read by the engine control unit. A cam signal is generated for each cam phaser on the engine. This requires a separate toothed wheel and cam sensorcombination for each cam phaser. The cam signal and crankwheel signal are comparedas the engine turns, and the phasing position is determined. The position is displayedin crank angle degrees, relative position from default. This position measurementis used as feedback for the position control software, which determines the requiredpercent duty cycle commanded to the oil control valve.

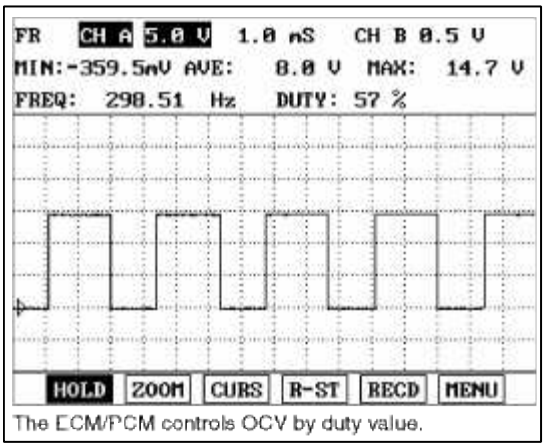
DTC DESCRIPTION

When ECM/PCM detects short to power in OCV control circuit, ECM/PCM sets DTC P0077.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • Short to battery in control circuit • OCV • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to battery	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



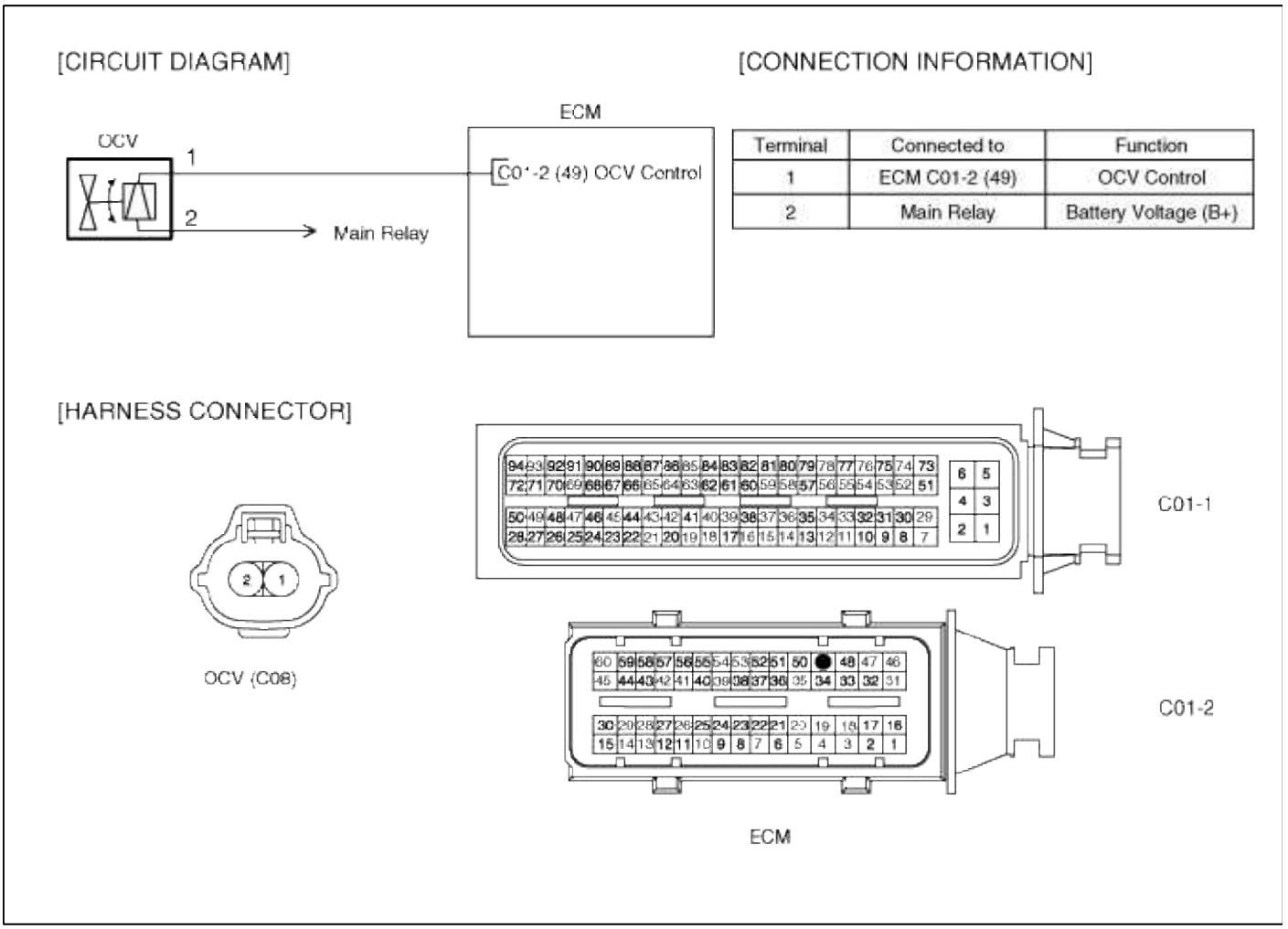
The ECM/PCM controls OCV by duty value.

SPECIFICATION

Temp.	Coil Resistance
20°C (68°F)	6.9 ~ 7.9Ω

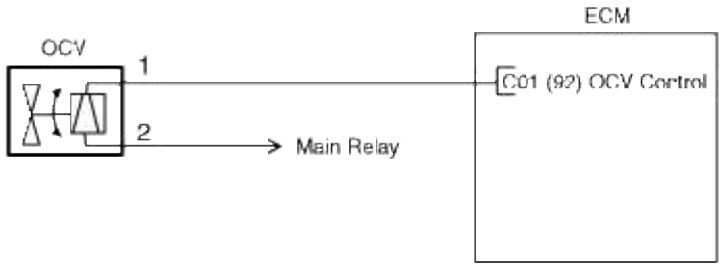
SCHEMATIC DIAGRAM

(A/T)



(M/T)

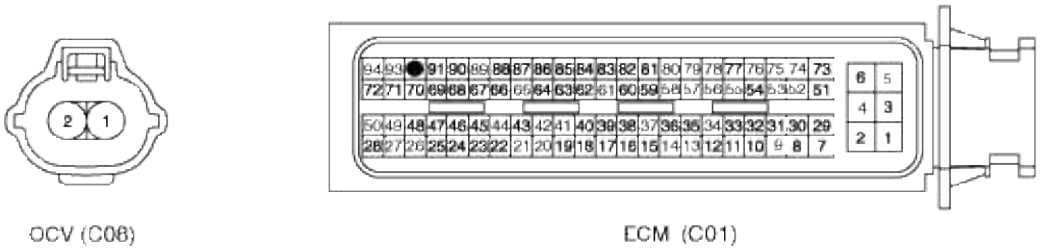
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

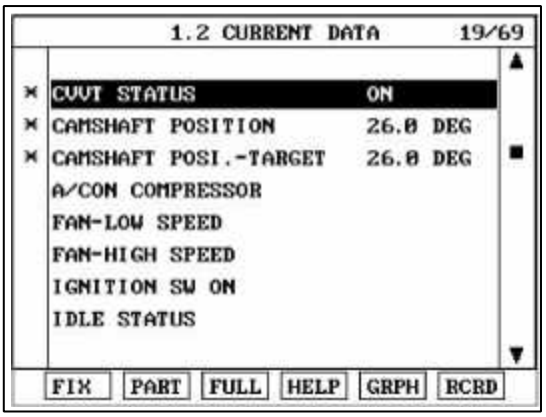
Terminal	Connected to	Function
1	ECM C01 (92)	OCV Control
2	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "OCV" parameter on scantool.



4. Is the "OCV" data displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control Circuit Inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. Check short to ground.

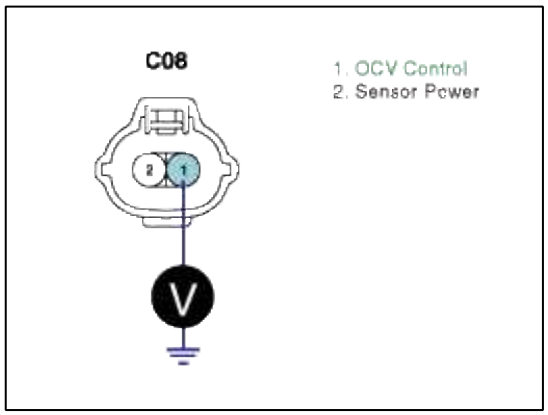
(1) IG "OFF".

(2) Disconnect OCV connector.

(3) IG "ON" & ENG "OFF".

(4) Measure voltage between terminal 1 of OCV harness connector and chassis ground.

Specification : Approx. 3.2V



(5) Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to 'Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check OCV.

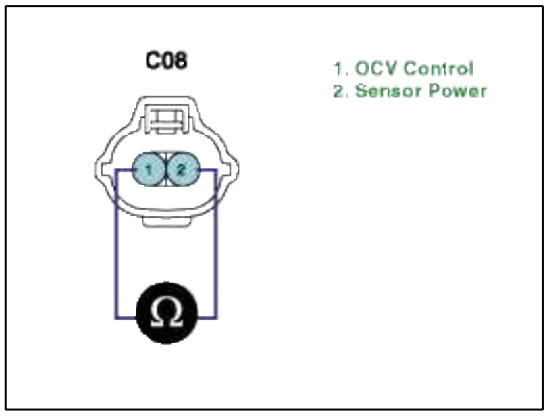
(1) IG "OFF"

(2) Disconnect OCV connector.

(3) Measure resistance between terminal 1 and 2 of OCV harness connector.(Component Side)

Specification :

Temp.	Coil Resistance
20°C (68°F)	6.9 ~ 7.9Ω



(4) Is the measured resistance within specification ?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good OCV and check for proper operation.
If the problem is corrected, replace OCV and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

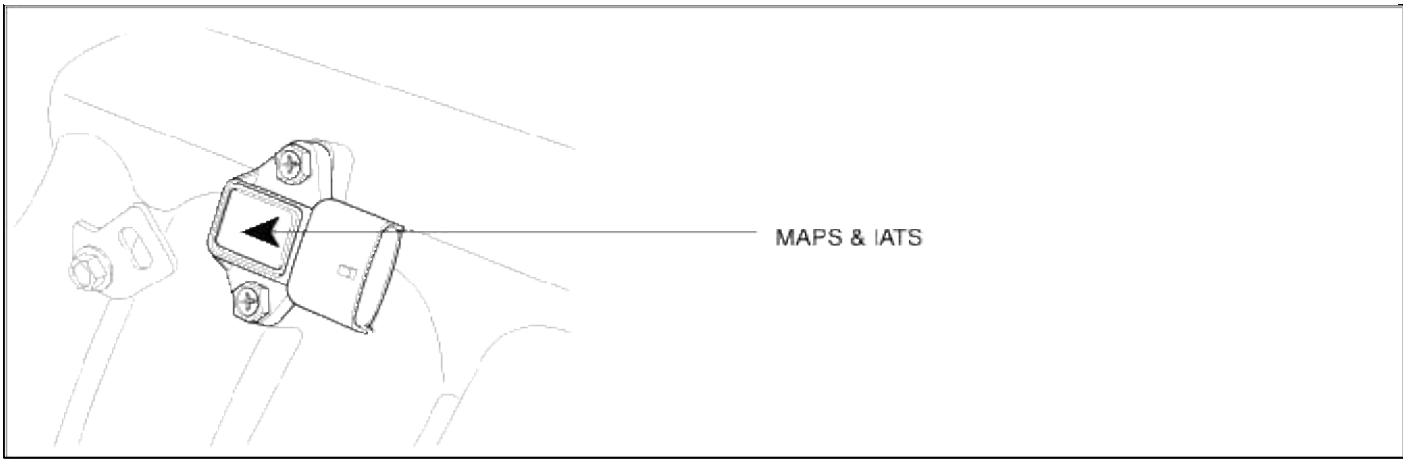
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0106 Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance

COMPONENT LOCATION



GENERAL DESCRIPTION

The amount of intake air flow must be inputted to ECM in order to determine the fuel injection quantity.
MAPS(Manifold Absolute Pressure) calculates the amount of air indirectly as measuring the pressure inside of intake manifold. This mechanism is alsl called Speed-Density Type.
MAPS transfers analog output signal which is proportional to the change of intake manifold pressure, then, with this signal and RPM, ECM calculates the amount of intake air flow.
MAPS is mounted on surge tank to measure the pressure inside of intake manifold, and it consists of a piezo electric element and hybrid IC which amplifies output signal from the element. A piezo electric element is a sort of a diaphragm using piezo electric effect. One side of the diaphragm is surrounded with vacuum chamber while intake pressure is applied to the other side. Thus, signals are output by the transformation of diagphragm according to the change of pressure inside of intake manifold.

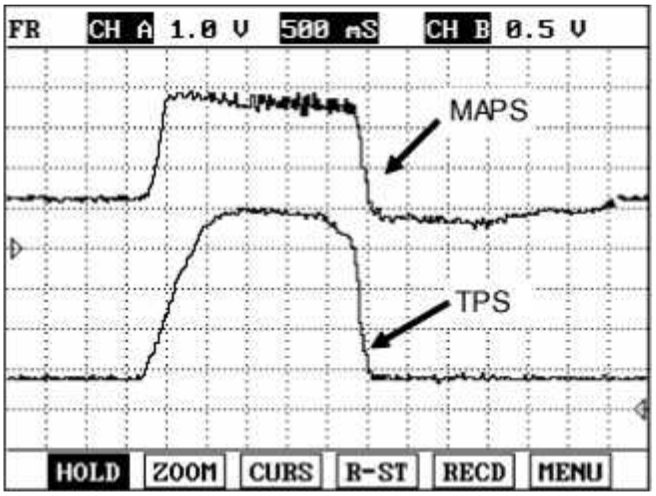
DTC DESCRIPTION

If intake manifold pressure is lower than the minimum threshold value or higher than the maximum threshold value according to RPM and TPS under normal TPS signal input condition, ECM sets DTC P0106.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Poor connection • MAPS • ECM
Enable Conditions	• No TPS error detected	
Threshold Value	• Intake manifold pressure > max. Threshold f(Eng. Speed, TPS) • Intake manifold pressure < min. Threshold f(Eng. Speed, TPS)	
Diagnostic Time		
MIL ON Condition		

SIGNAL WAVEFORM & DATA



As often as possible, the MAPS signal should be compared with the TPS signal. Check whether the MAPS and TPS signals increase at the same time when accelerating. During acceleration, the MAPS output voltage increases; during deceleration, the MAPS output voltage decreases.

SPECIFICATION

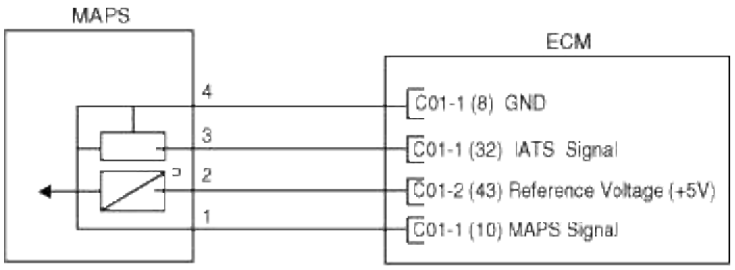
Pressure [Pa]	20	35	60	95	107
Voltag [V]	0.789 ± 0.045	1.382 ± 0.045	2.369 ± 0.045	3.75 ± 0.045	4.224 ± 0.045

Acceptable temperature range : (23 ±5) °C

SCHEMATIC DIAGRAM

(A/T)

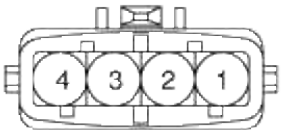
[CIRCUIT DIAGRAM]



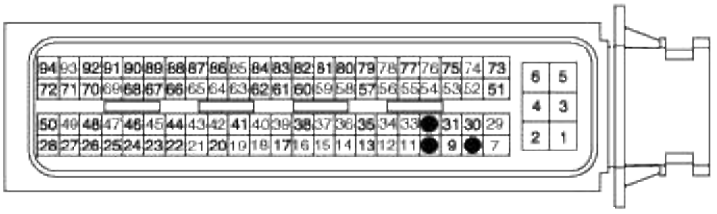
[CONNECTION INFORMATION]

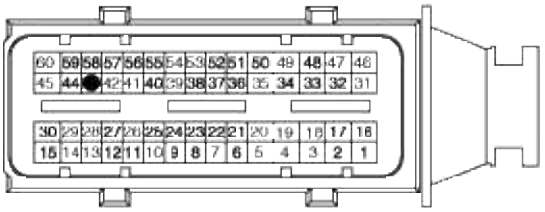
Terminal	Connected to	Function
1	ECM C01-1 (10)	MAPS Signal
2	ECM C01-2 (43)	Reference Voltage (+5V)
3	ECM C01-1 (32)	IATS Signal
4	ECM C01-1 (8)	Sensor Ground

[HARNESS CONNECTORS]



MAPS & IATS (C16)

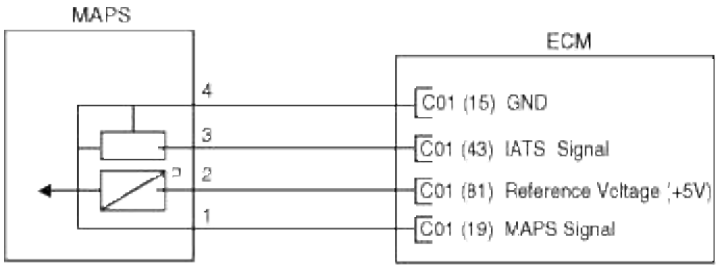




ECM

(M/T)

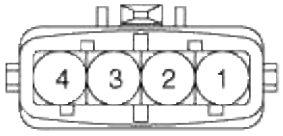
[CIRCUIT DIAGRAM]



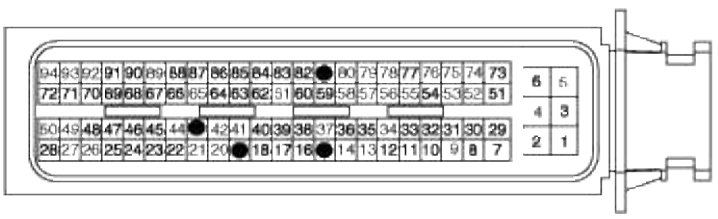
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (19)	MAPS Signal
2	ECM C01 (81)	Reference Voltage (+5V)
3	ECM C01 (43)	IATS Signal
4	ECM C01 (15)	Sensor Ground

[HARNESS CONNECTORS]



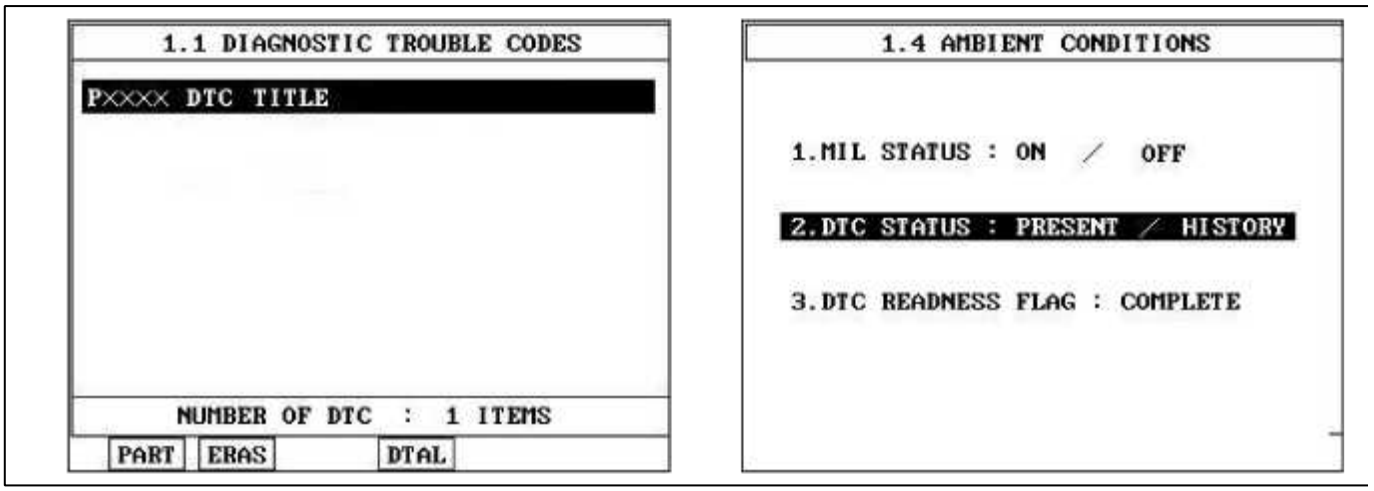
MAPS & IATS (C16)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC's information from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditions noted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

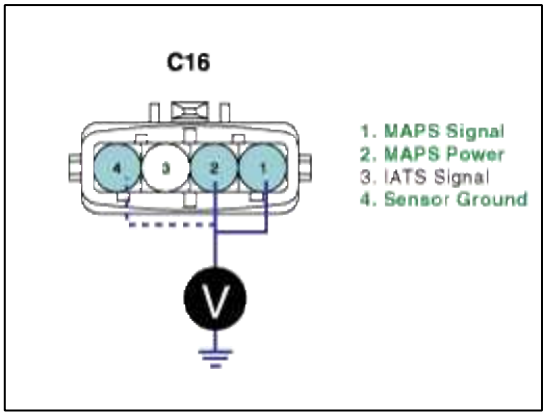
Go to " Voltage Inspection " procedure.

VOLTAGE INSPECTION

1. IG "OFF".
2. Disconnect MAPS connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 1, 2,4 of MAPS harness connector and chassis ground.

Specification :
Terminal 1 : Approx. 5V
Terminal 2 : Approx. 5V
Terminal 4 : Below 0V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection " procedure.

NO

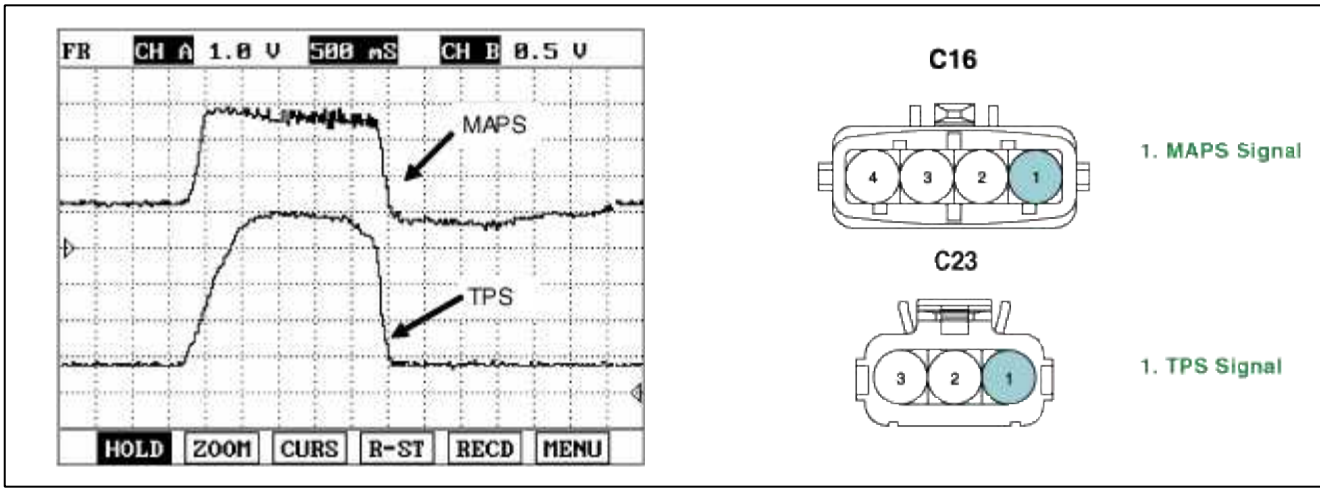
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check MAPS performance.
   (1) IG "OFF".
   (2) Connnect CH A probe to terminal 1 of MAPS and CH B probe to terminal 1 of TPS connector.
   (3) Warm up the engine to normal operating temperature.
   (4) Measure signal waveform of MAPS and TPS together by stepping on and off the accellerator padel.

Specification : Accepatable temperature range : (23 ±5)°C

Pressure [Pa]	20	35	60	95	107
Voltag [V]	0.789 ± 0.045	1.382 ± 0.045	2.369 ± 0.045	3.75 ± 0.045	4.224 ± 0



(5) Is the measured signal waveform(Comparison response of TPS with MAPS) O.K?

YES

Go to "Check ECM" as follows.

NO

Substitute with a known - good MAPS and check for proper operation.
If the problem is corrected, replace MAPS and go to "Verification of Vehicle Repair" procedure.

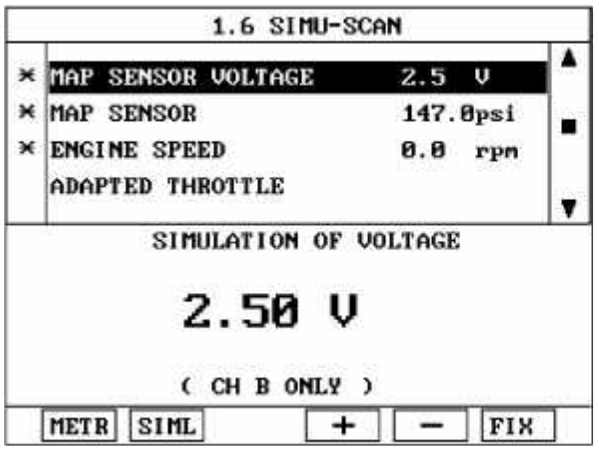
2. Check ECM.

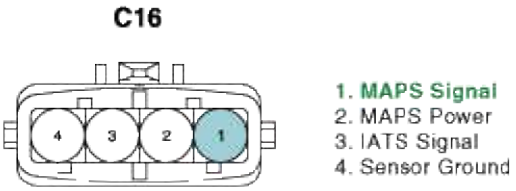
(1) IG "OFF" and disconnect MAPS connector.

(2) Connect scantool and Key "ON".

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of MAPS signal connector.





(5) Does the signal value of MAPS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

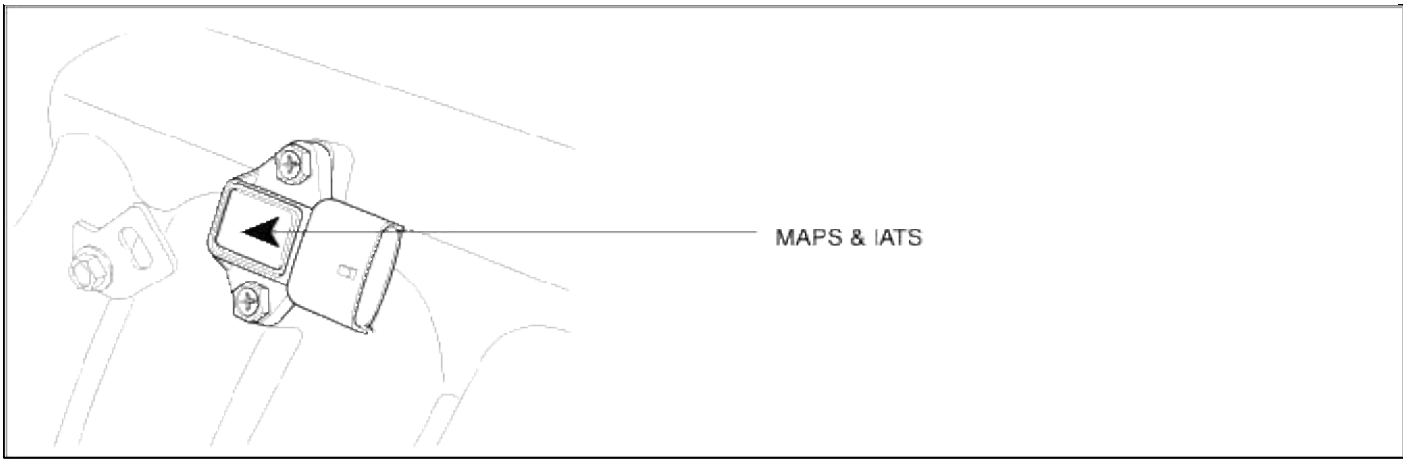
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0107 Manifold Absolute Pressure/Barometric Pressure Circuit Low Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The amount of intake air flow must be inputted to ECM in order to determine the fuel injection quantity.
MAPS(Manifold Absolute Pressure) calculates the amount of air indirectly as measuring the pressure inside of intake manifold. This mechanism is alsl called Speed-Density Type.
MAPS transfers analog output signal which is proportional to the change of intake manifold pressure, then, with this signal and RPM, ECM calculates the amount of intake air flow.
MAPS is mounted on surge tank to measure the pressure inside of intake manifold, and it consists of a piezo electric element and hybrid IC which amplifies output signal from the element. A piezo electric element is a sort of a diaphragm using piezo electric effect. One side of the diaphragm is surrounded with vacuum chamber while intake pressure is applied to the other side. Thus, signals are output by the transformation of diagphragm according to the change of pressure inside of intake manifold.

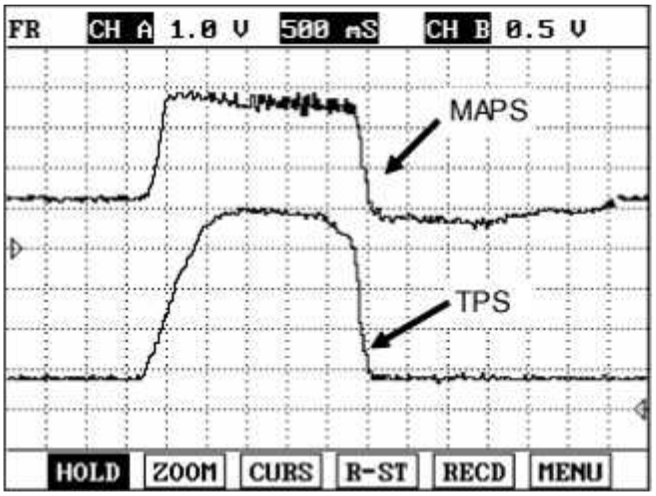
DTC DESCRIPTION

If sensor signal input is lower than 0.25V during 5 sec, ECM sets DTC P0107.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Open or short to ground in power circuit • Short to ground in signal circuit • MAPS • ECM
Enable Conditions	• 5sec after engine start	
Threshold Value	• Sensor voltage < 0.25 V	
Diagnostic Time	• 5 sec	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



As often as possible, the MAPS signal should be compared with the TPS signal. Check whether the MAPS and TPS signals increase at the same time when accelerating. During acceleration, the MAPS output voltage increases; during deceleration, the MAPS output voltage decreases.

SPECIFICATION

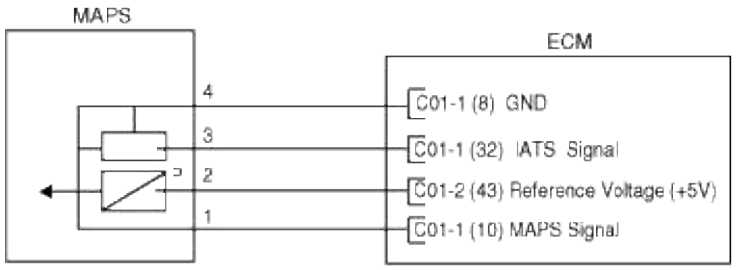
Pressure [Pa]	20	35	60	95	107
Voltag [V]	0.789 ± 0.045	1.382 ± 0.045	2.369 ± 0.045	3.75 ± 0.045	4.224 ± 0.045

Acceptable temperature range : (23 ±5) °C

SCHEMATIC DIAGRAM

(A/T)

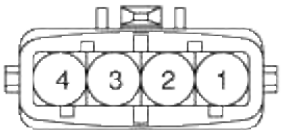
[CIRCUIT DIAGRAM]



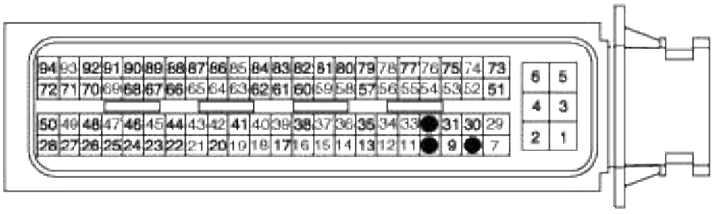
[CONNECTION INFORMATION]

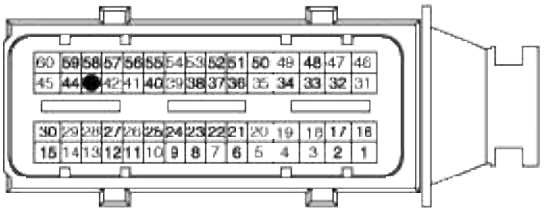
Terminal	Connected to	Function
1	ECM C01-1 (10)	MAPS Signal
2	ECM C01-2 (43)	Reference Voltage (+5V)
3	ECM C01-1 (32)	IATS Signal
4	ECM C01-1 (8)	Sensor Ground

[HARNESS CONNECTORS]



MAPS & IATS (C16)

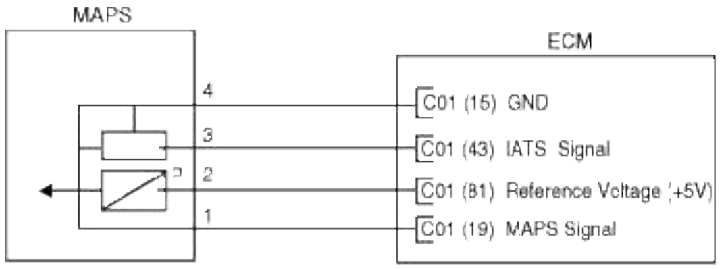




ECM

(M/T)

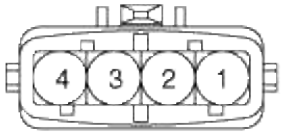
[CIRCUIT DIAGRAM]



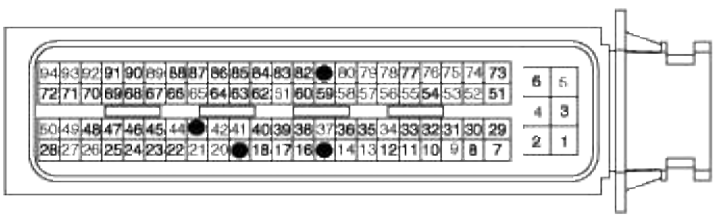
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (19)	MAPS Signal
2	ECM C01 (81)	Reference Voltage (+5V)
3	ECM C01 (43)	IATS Signal
4	ECM C01 (15)	Sensor Ground

[HARNESS CONNECTORS]



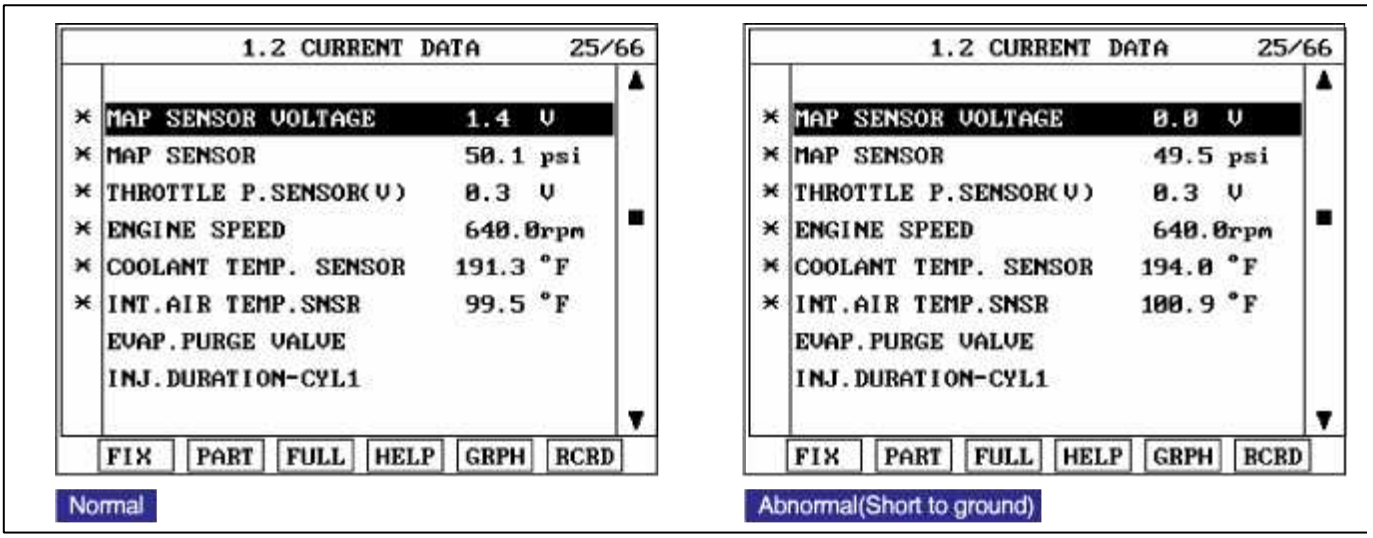
MAPS & IATS (C16)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "MAPS" parameter on scantool.



4. Is the "MAPS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

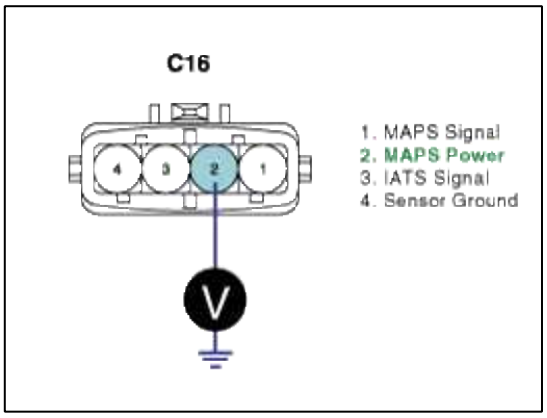
Go to "Power Circuit Inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect MAPS connector.
3. IG "ON" & ENG "OFF"

4. Measure voltage between terminal 2 of MAPS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification?

YES

Go to "Signal Circuit Inspection" procedure.

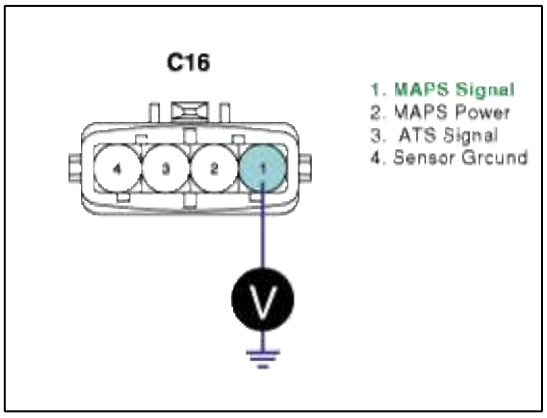
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect MAPS connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage terminal 1 of MAPS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

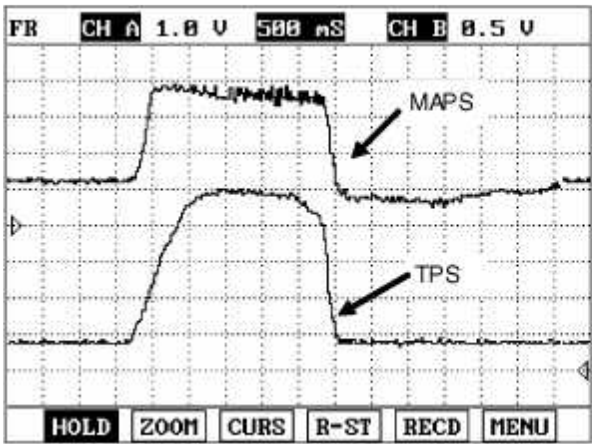
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

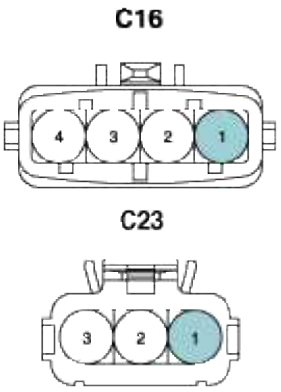
COMPONENT INSPECTION

1. Check MAPS performance.
   (1) IG "OFF".
   (2) Connnect CH A probe to terminal 1 of MAPS and CH B probe to terminal 1 of TPS connector.
   (3) Warm up the engine to normal operating temperature.
   (4) Measure signal waveform of MAPS and TPS together by stepping on and off the accellerator padel.

Specification : Accepatable temperature range : (23 ±5)°C

Pressure [Pa]	20	35	60	95	107
Voltag [V]	0.789 ± 0.045	1.382 ± 0.045	2.369 ± 0.045	3.75 ± 0.045	4.224 ± 0





   (5) Is the measured signal waveform(Comparison response of TPS with MAPS) O.K?

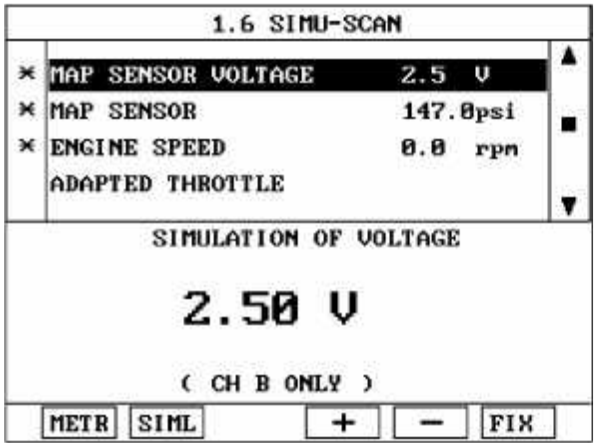
YES

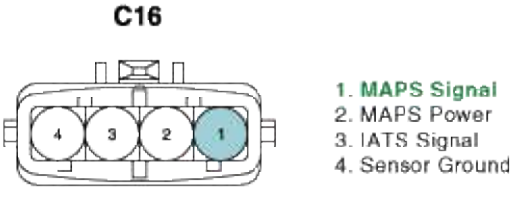
Go to "Check ECM" as follows

NO

Substitute with a known - good MAPS and check for proper operation.
If the problem is corrected, replace MAPS and go to "Verification of Vehicle Repair" procedure..

2. Check ECM.
   (1) IG "OFF" and disconnect MAPS connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 1 of MAPS signal connector.





(5) Does the signal value of MAPS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

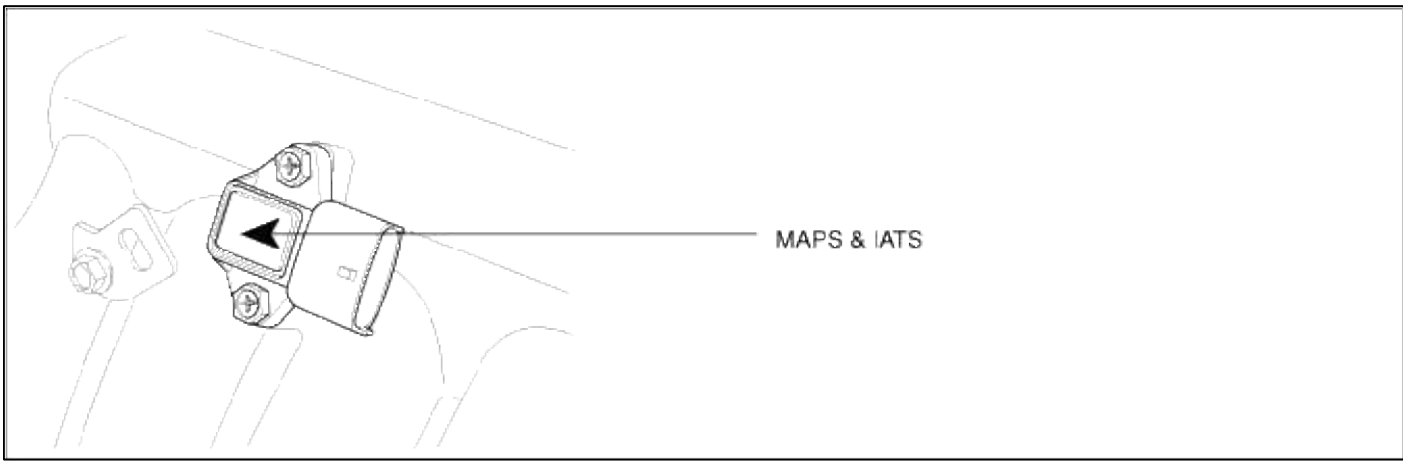
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0108 Manifold Absolute Pressure/Barometric Pressure Circuit High Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The amount of intake air flow must be inputted to ECM in order to determine the fuel injection quantity.
MAPS(Manifold Absolute Pressure) calculates the amount of air indirectly as measuring the pressure inside of intake manifold. This mechanism is alsl called Speed-Density Type.
MAPS transfers analog output signal which is proportional to the change of intake manifold pressure, then, with this signal and RPM, ECM calculates the amount of intake air flow.
MAPS is mounted on surge tank to measure the pressure inside of intake manifold, and it consists of a piezo electric element and hybrid IC which amplifies output signal from the element. A piezo electric element is a sort of a diaphragm using piezo electric effect. One side of the diaphragm is surrounded with vacuum chamber while intake pressure is applied to the other side. Thus, signals are output by the transformation of diagphragm according to the change of pressure inside of intake manifold.

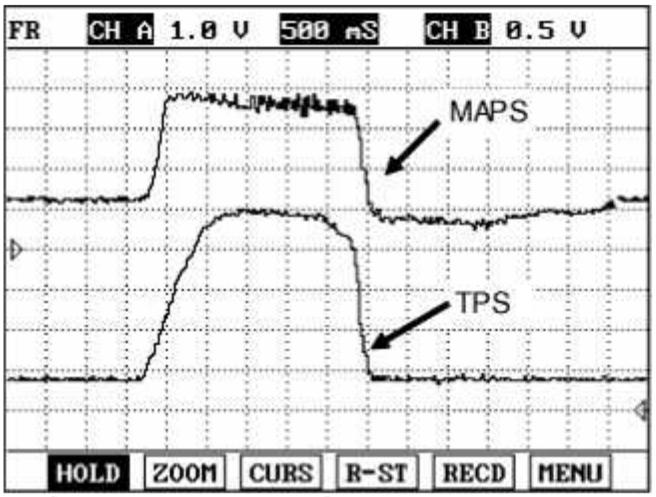
DTC DESCRIPTION

If sensor signal input is higher than 0.25V during 5 sec, ECM sets DTC P0108.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Open or short to power in signal circuit • Open in ground circuit • MAPS • ECM
Enable Conditions	• 5sec after engine start	
Threshold Value	• Sensor voltage > 4.88V	
Diagnostic Time	• 5 sec	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



As often as possible, the MAPS signal should be compared with the TPS signal. Check whether the MAPS and TPS signals increase at the same time when accelerating. During acceleration, the MAPS output voltage increases; during deceleration, the MAPS output voltage decreases.

SPECIFICATION

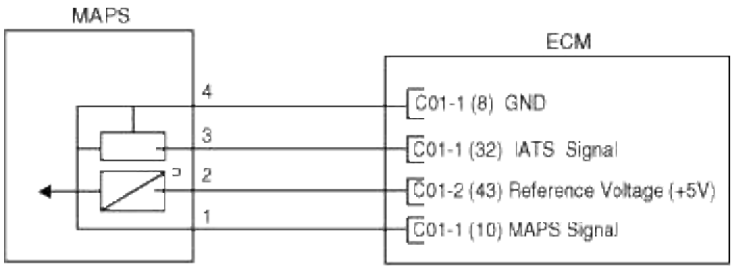
Pressure [Pa]	20	35	60	95	107
Voltag [V]	0.789 ± 0.045	1.382 ± 0.045	2.369 ± 0.045	3.75 ± 0.045	4.224 ± 0.045

Acceptable temperature range : (23 ±5) °C

SCHEMATIC DIAGRAM

(A/T)

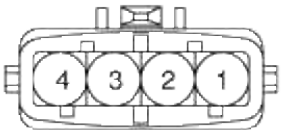
[CIRCUIT DIAGRAM]



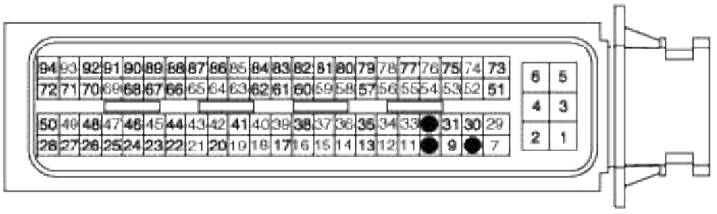
[CONNECTION INFORMATION]

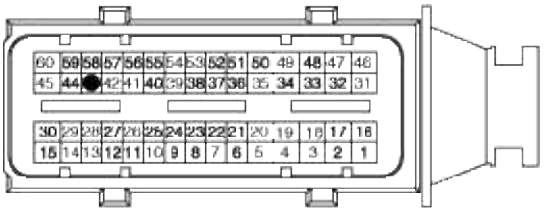
Terminal	Connected to	Function
1	ECM C01-1 (10)	MAPS Signal
2	ECM C01-2 (43)	Reference Voltage (+5V)
3	ECM C01-1 (32)	IATS Signal
4	ECM C01-1 (8)	Sensor Ground

[HARNESS CONNECTORS]



MAPS & IATS (C16)

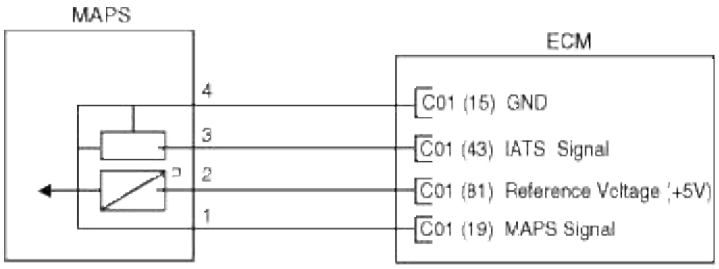




ECM

(M/T)

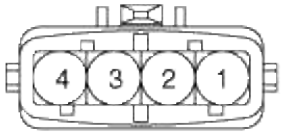
[CIRCUIT DIAGRAM]



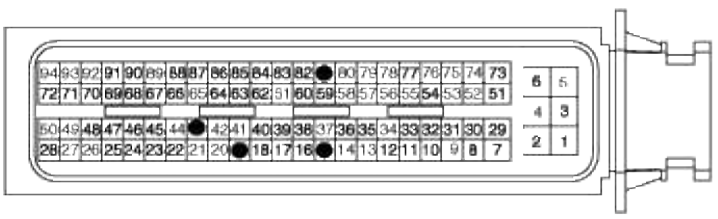
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (19)	MAPS Signal
2	ECM C01 (81)	Reference Voltage (+5V)
3	ECM C01 (43)	IATS Signal
4	ECM C01 (15)	Sensor Ground

[HARNESS CONNECTORS]



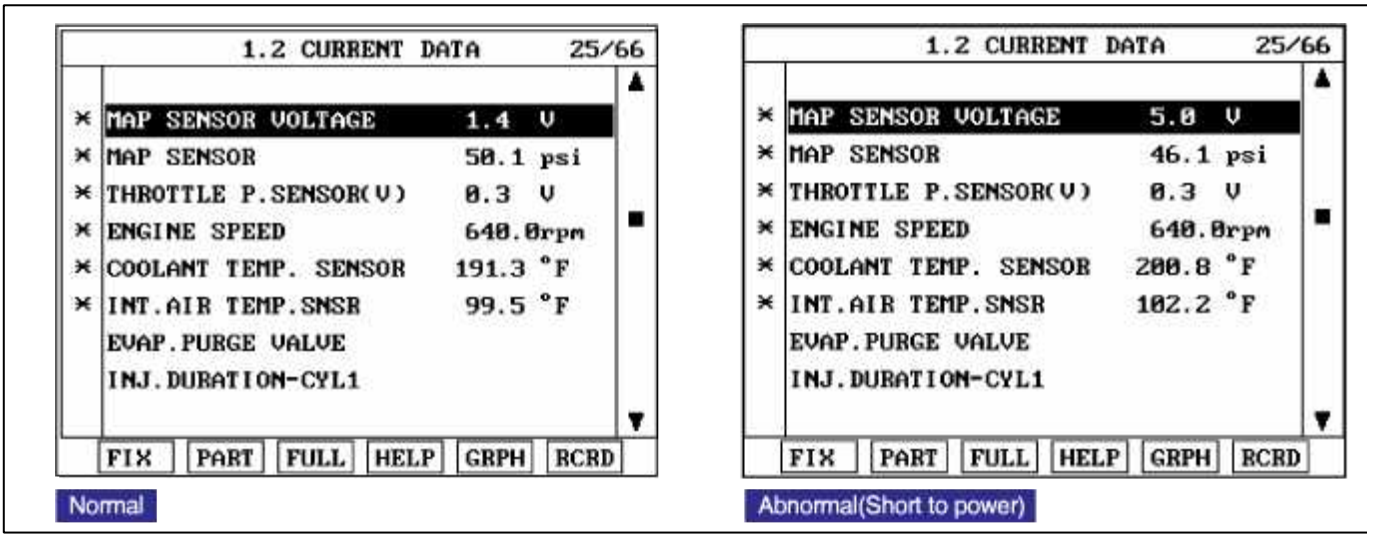
MAPS & IATS (C16)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "MAPS" parameter on scantool.



4. Is the "MAPS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

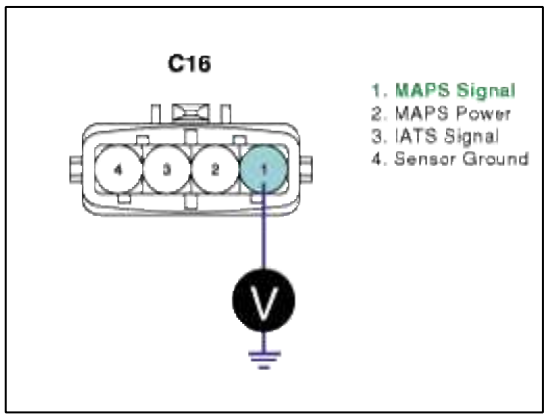
NO

Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. Check open in harness.
   (1) IG "OFF".
   (2) Disconnect MAPS connector.
   (3) IG "ON" & ENG "OFF"
   (4) Measure voltage between terminal 1 of MAPS harness connector and chassis ground.

   Specification : Approx. 5V



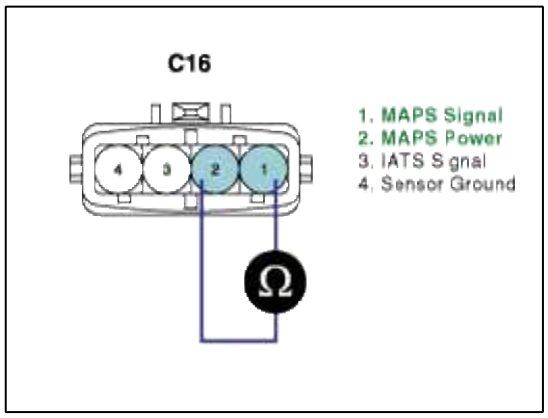
   (5) Is the measured voltage within specification?

   YES
   Go to "Check short to battery in harness" as follows.

   NO
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

2. Check short to battery in harness.
   (1) IG "OFF".
   (2) Disconnect MAPS and ECM connector.
   (3) Measure resistance between terminal 1 and 2 MAPS harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specification?

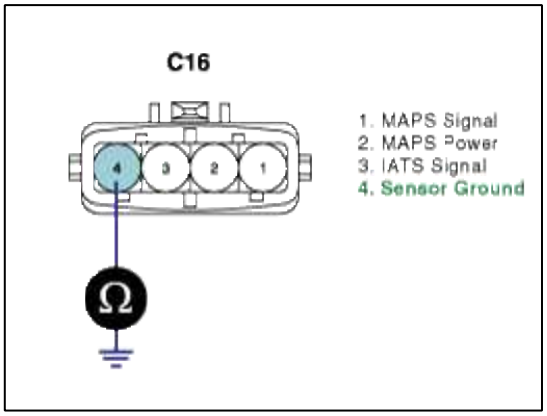
   YES
   Go to "Ground Circuit Inspection" procedure.

   NO
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect MAPS connector.
3. Measure resistance between terminal 4 of MAPS harness connector and chassis ground.

Specification : Below 1Ω



4. Is the measured resistance within specification?

YES

Go to "Component Inspection" procedure.

NO

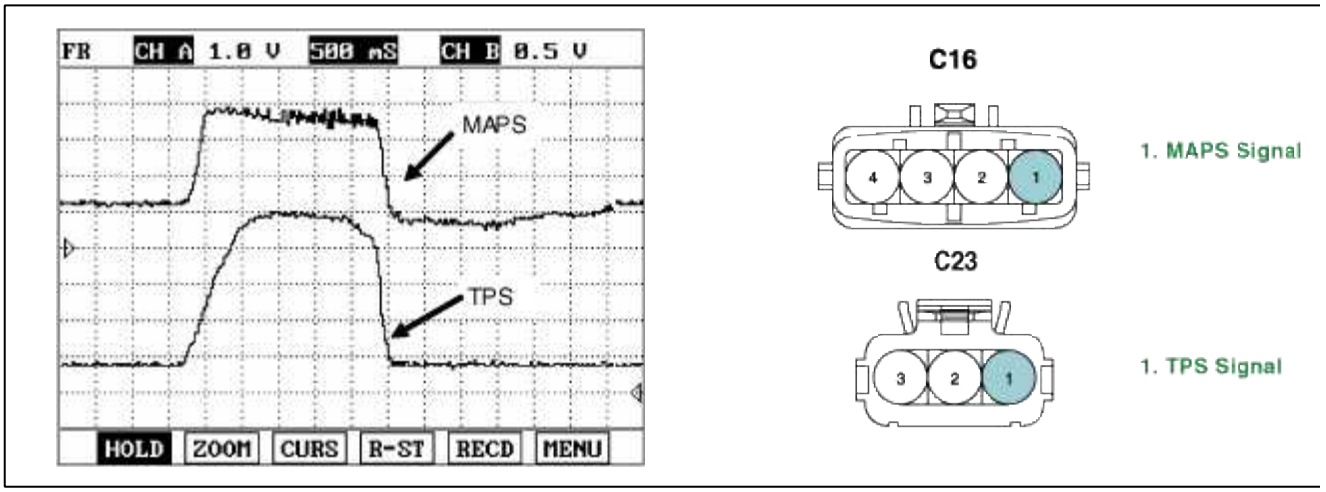
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check MAPS performance.
   (1) IG "OFF".
   (2) Connnect CH A probe to terminal 1 of MAPS and CH B probe to terminal 1 of TPS connector.
   (3) Warm up the engine to normal operating temperature.
   (4) Measure signal waveform of MAPS and TPS together by stepping on and off the accellerator padel.

Specification : Accepatable temperature range : (23 ±5)°C

Pressure [Pa]	20	35	60	95	107
Voltag [V]	0.789 ± 0.045	1.382 ± 0.045	2.369 ± 0.045	3.75 ± 0.045	4.224 ± 0



(5) Is the measured signal waveform(Comparison response of TPS with MAPS) O.K?

YES

Go to "Check ECM" as follows.

NO

Substitute with a known - good MAPS and check for proper operation.
If the problem is corrected, replace MAPS and go to "Verification of Vehicle Repair" procedure.

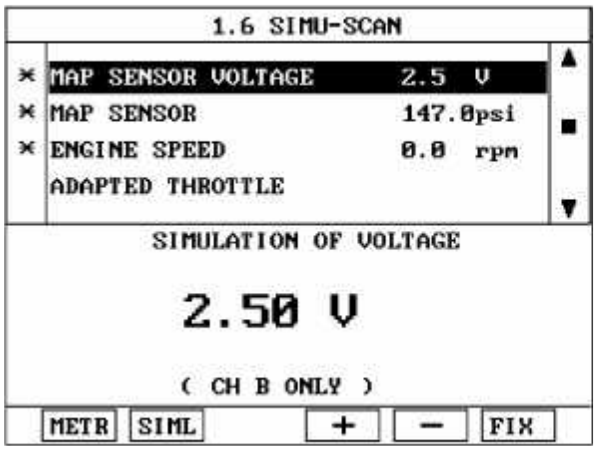
2. Check ECM.

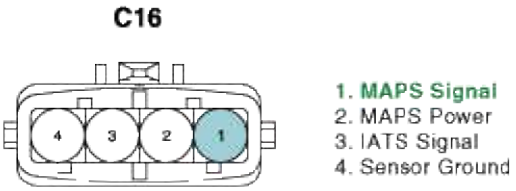
(1) IG "OFF" and disconnect MAPS connector.

(2) Connect scantool and Key "ON".

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of MAPS signal connector.





(5) Does the signal value of MAPS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

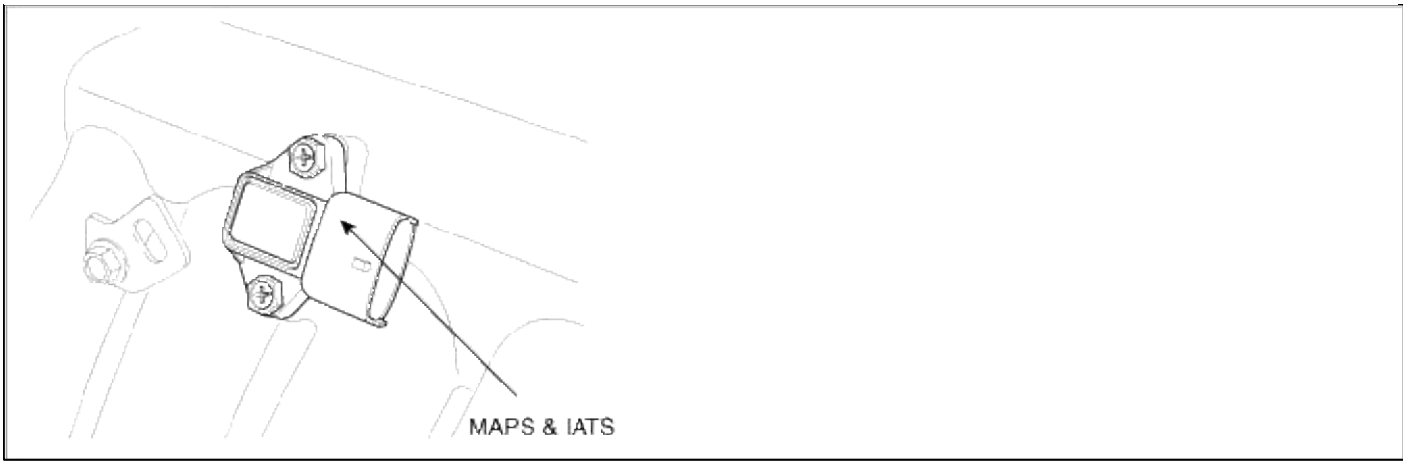
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0111 Intake Air Temperature Sensor 1 Circuit Range / Performance

COMPONENT LOCATION



GENERAL DESCRIPTION

The Intake Air Temperature (IAT) sensor measures the temperature of engine intake air. The Intake Air Temperature (IAT) sensor is a thermistor (a variable resistor that changes along with outside air temperature) in series with a fixed resistor in the ECM/PCM. The ECM/PCM applies 5V to the IAT sensor. The ECM/PCM monitors the voltage across the IAT sensor and converts it into a temperature reading. When the outside air temperature is cold the IAT sensor resistance is high, and when the outside air temperature is warm the IAT sensor resistance is low. Therefore, when the air temperature is cold the ECM/PCM will receive a high voltage input, and when the air temperature is warm the ECM/PCM will receive a low voltage input. The signal from IAT sensor is used for injection duration correction, ignition timing correction and idle speed correction(Air-density correction).

DTC DESCRIPTION

If measured temperature is satisfied with threshold value during 10sec, ECM/PCM sets DTC P0111.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Rationality check	• Poor connection • Short to ground in signal circuit • Open in ground circuit • Faulty ECTS • Faulty IATS • Faulty ECM/PCM
Case1	Enable Conditions	• Idle mode counter ≥ 2 • Driving mode counter ≥ 2	
	Threshold Value	• Max. temp - Min. temp < 1.5°C(27°F)	
Case2	Enable Conditions	• Cold start detected • No block heater detected • Time after start < 40s	
	Threshold Value	• Difference of coolant temp and intake air temp > 20°C(36 °F)	
Case3	Enable Conditions	• Vehicle speed > 50kph(31mph) • Air mass : 60~300kg/h (132.3 ~ 661.4 lb/h)	
	Threshold Value	• Measured temperature > 105°C(221 °F)	
Diagnostic Time		• 5 sec	

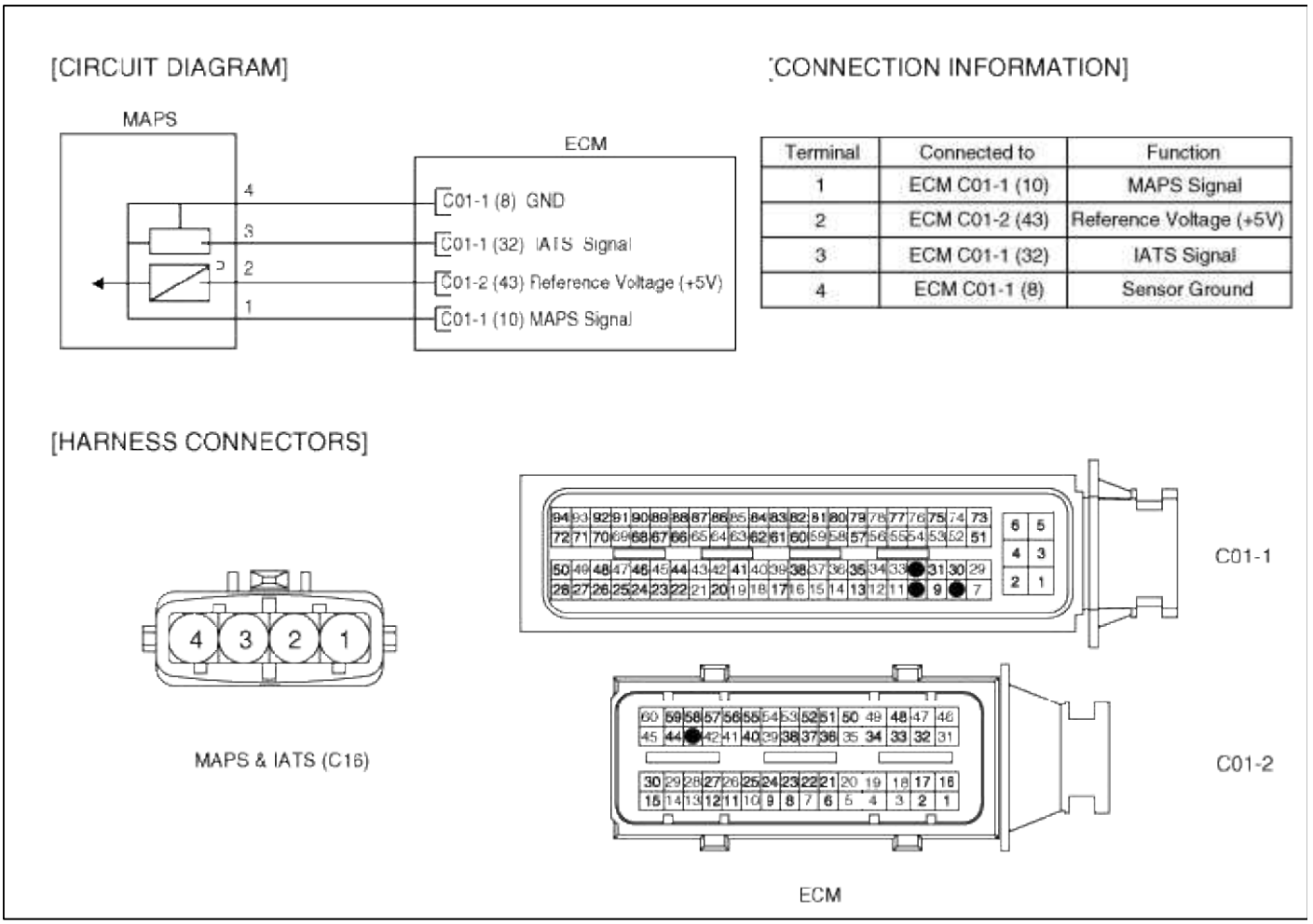
MIL ON Condition	• 2 driving cycle	

SPECIFICATION

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	40.93 ~ 48.35kΩ
-20	-4	13.89 ~ 16.02kΩ
0	32	5.38 ~ 6.08kΩ
20	68	2.31 ~ 2.56kΩ
40	104	1.08 ~ 1.21kΩ
60	140	0.54 ~ 0.62kΩ
80	176	0.29 ~ 0.34kΩ

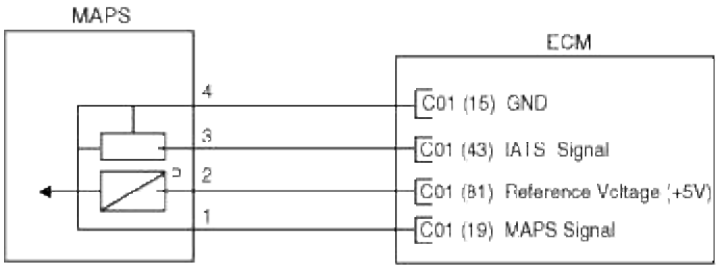
SCHEMATIC DIAGRAM

(A/T)



(M/T)

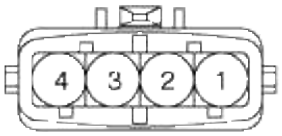
[CIRCUIT DIAGRAM]



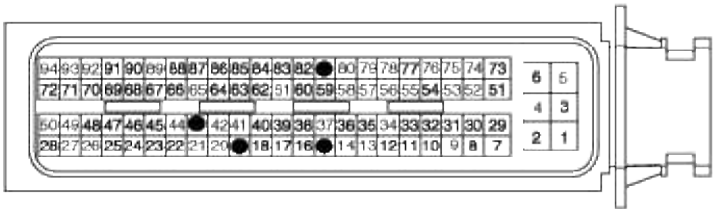
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (19)	MAPS Signal
2	ECM C01 (81)	Reference Voltage (+5V)
3	ECM C01 (43)	IATS Signal
4	ECM C01 (15)	Sensor Ground

[HARNESS CONNECTORS]



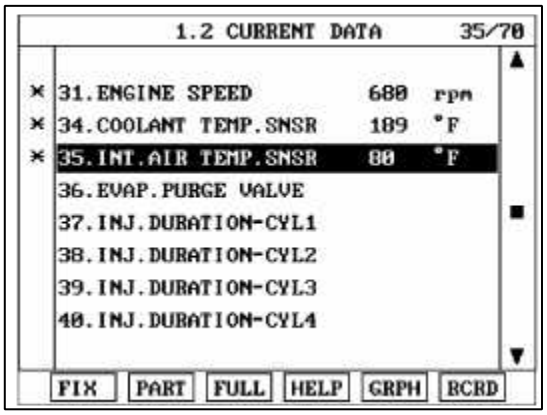
MAPS & IATS (C16)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "IATS" & "ECTS" parameter on scantool.



4. Is the "IATS"& "ECTS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

If there is faulty on "ECTS" circuit or itself, check "ECTS" circuit or itself according to thedesignated "ECTS" troubleshooting guide.

If there is not faulty on "ECTS" circuit or itself, Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

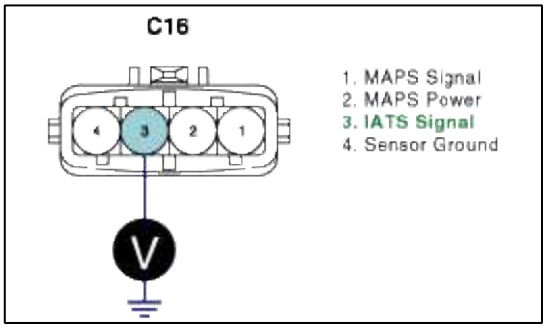
NO

Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect IATS connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 3 of IATS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification?

YES

Go to "Ground Circuit Inspection" procedure.

NO

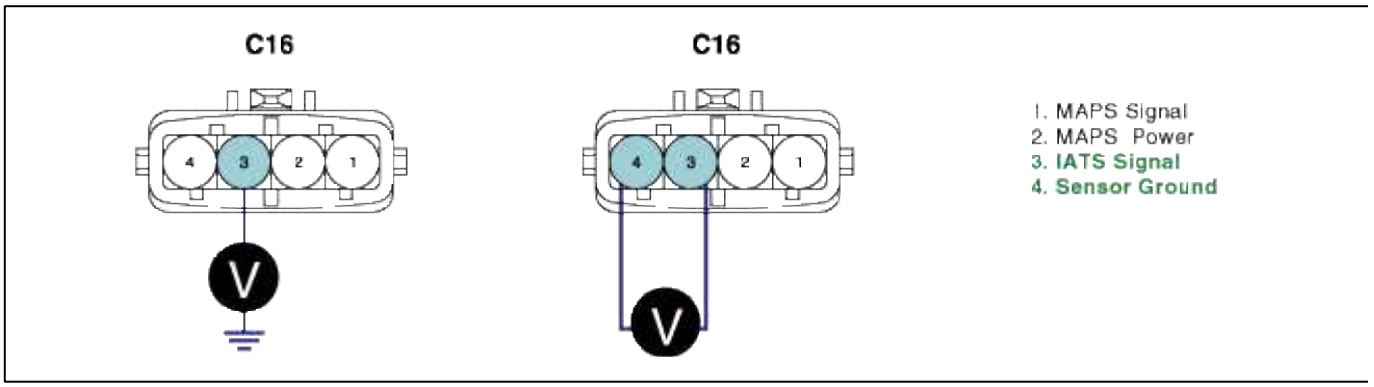
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect IATS connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of IATS harness connector and chassis ground.(A)

5. Measure voltage between terminal 3 and 4 of IATS harness connector.(B)

Specification : "A" - "B" = Below 200mV



6. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

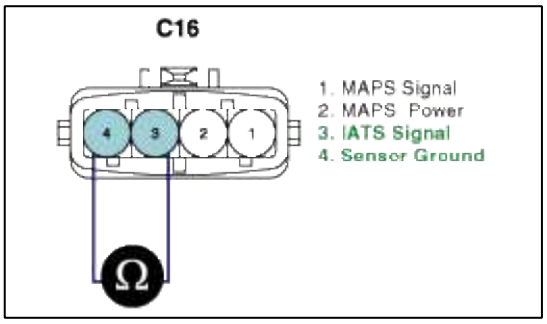
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check IATS resistance.
   (1) IG "OFF".
   (2) Disconnect IATS connector.
   (3) Measure resistance between terminal 3 and 4 of IATS connector.(Component Side)

Specification :

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	40.93 ~ 48.35kΩ
-20	-4	13.89 ~ 16.02kΩ
0	32	5.38 ~ 6.08kΩ
20	68	2.31 ~ 2.56kΩ
40	104	1.08 ~ 1.21kΩ
60	140	0.54 ~ 0.62kΩ
80	176	0.29 ~ 0.34kΩ



(4) Is the measured resistance within specification ?

YES

Go to "Check PCM" as follows.

NO

Substitute with a known - good IATS and check for proper operation.
If the problem is corrected, replace IATS and go to "Verification of Vehicle Repair" procedure.

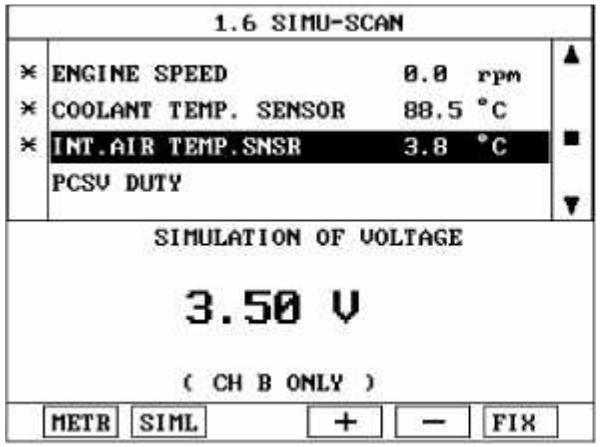
2. Check ECM/PCM.

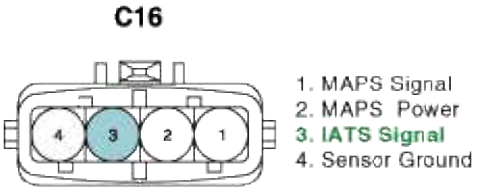
(1) IG "OFF".

(2) Connect scantool and Engine "ON".

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 3 of IATS signal connector.





(5) Does the signal value of IATS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

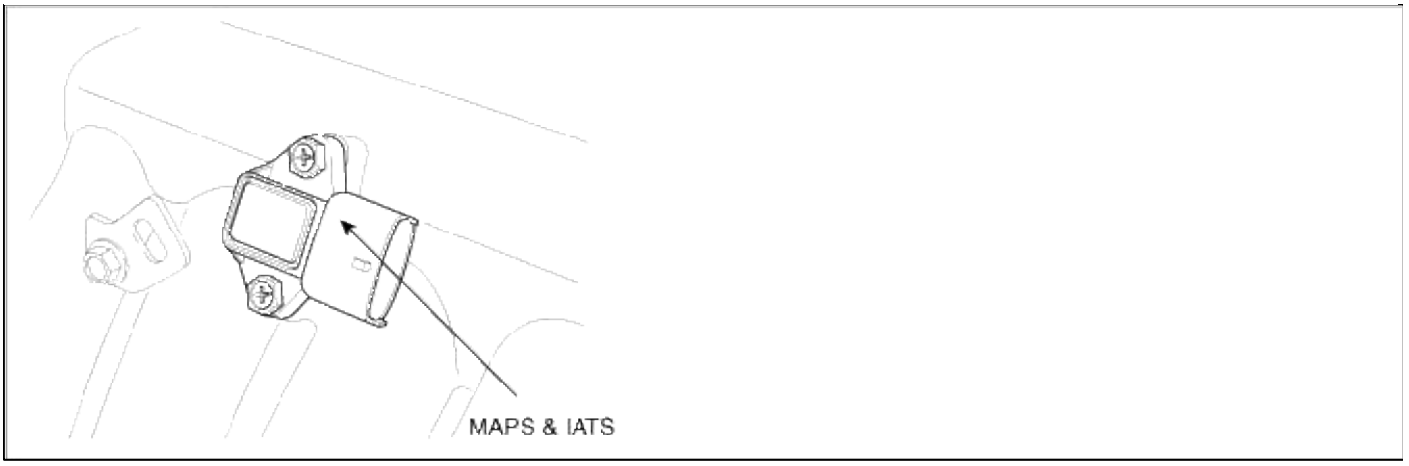
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0112 Intake Air Temperature Sensor 1 Circuit Low Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The Intake Air Temperature (IAT) sensor measures the temperature of engine intake air. The Intake Air Temperature (IAT) sensor is a thermistor (a variable resistor that changes along with outside air temperature) in series with a fixed resistor in the ECM/PCM. The ECM/PCM applies 5V to the IAT sensor. The ECM/PCM monitors the voltage across the IAT sensor and converts it into a temperature reading. When the outside air temperature is cold the IAT sensor resistance is high, and when the outside air temperature is warm the IAT sensor resistance is low. Therefore, when the air temperature is cold the ECM/PCM will receive a high voltage input, and when the air temperature is warm the ECM/PCM will receive a low voltage input. The signal from IAT sensor is used for injection duration correction, ignition timing correction and idle speed correction(Air-density correction).

DTC DESCRIPTION

If measured temperature is higher than the maximum threshold value during 2sec, ECM/PCM sets DTC P0112. (In this case, the input signal voltage is the minimum threshold vaue.)

DTC DETECTING CONDITION

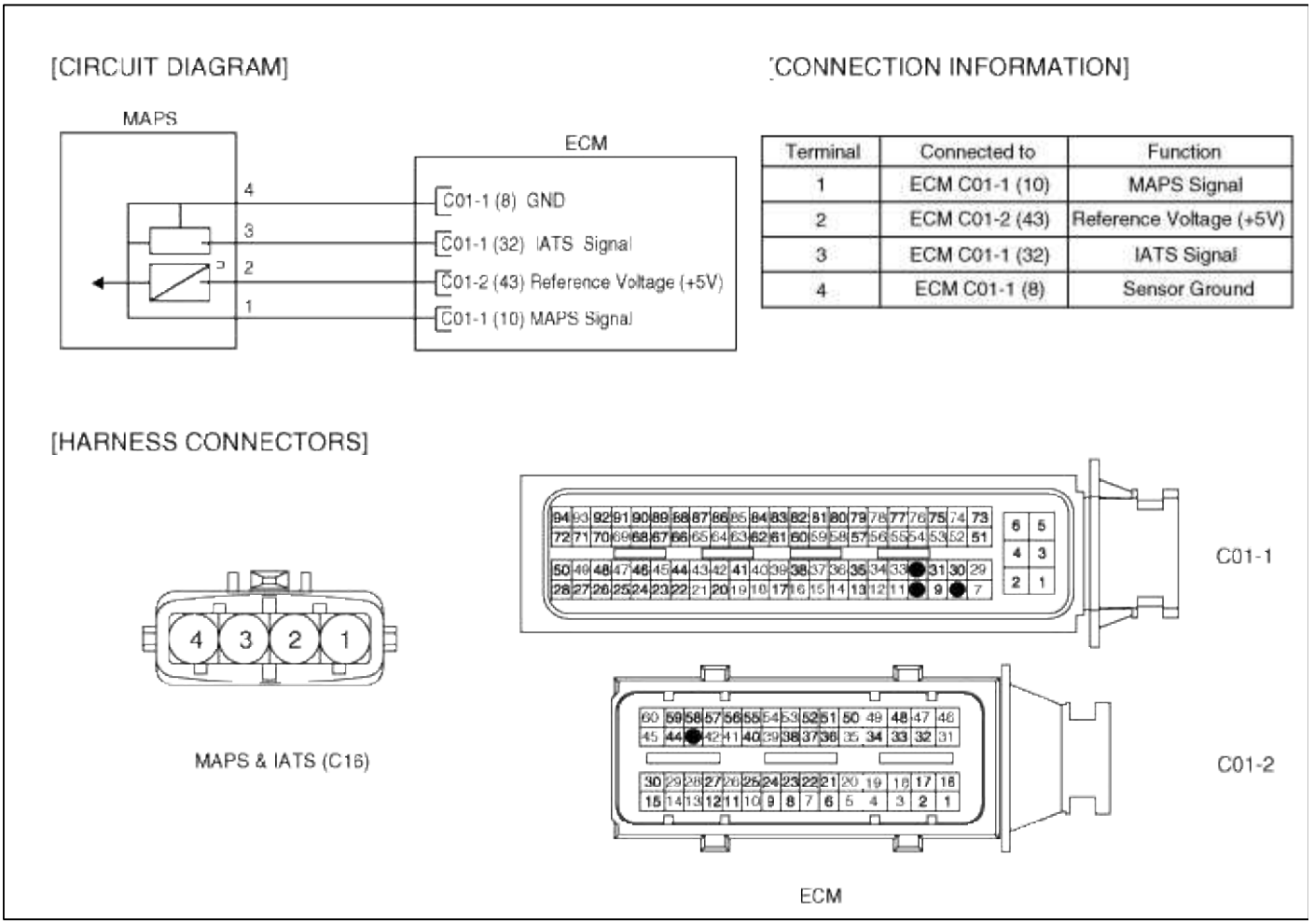
Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Short to ground in signal circuit • IATS • ECM/PCM
Enable Conditions		
Threshold Value	• Measured temperature > 128.3 °C (262.9 °F)	
Diagnostic Time	• 2 sec	
MIL ON Condition	• 2 driving cycle	

SPECIFICATION

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	40.93 ~ 48.35kΩ
-20	-4	13.89 ~ 16.02kΩ
0	32	5.38 ~ 6.08kΩ
20	68	2.31 ~ 2.56kΩ
40	104	1.08 ~ 1.21kΩ
60	140	0.54 ~ 0.62kΩ
80	176	0.29 ~ 0.34kΩ

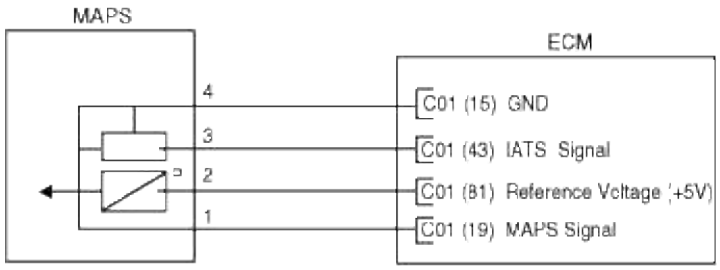
SCHEMATIC DIAGRAM

(A/T)



(M/T)

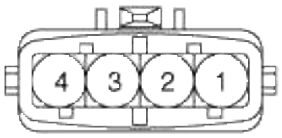
[CIRCUIT DIAGRAM]



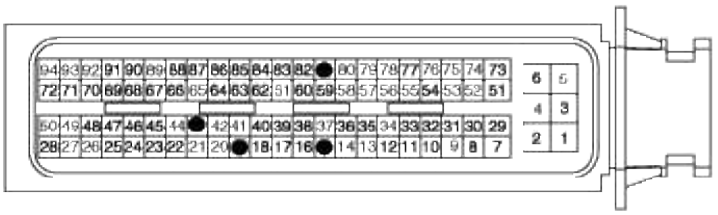
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (19)	MAPS Signal
2	ECM C01 (81)	Reference Voltage (+5V)
3	ECM C01 (43)	IATS Signal
4	ECM C01 (15)	Sensor Ground

[HARNESS CONNECTORS]



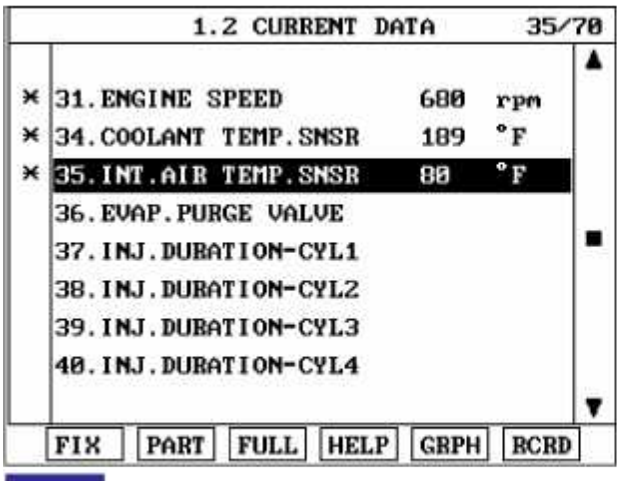
MAPS & IATS (C16)

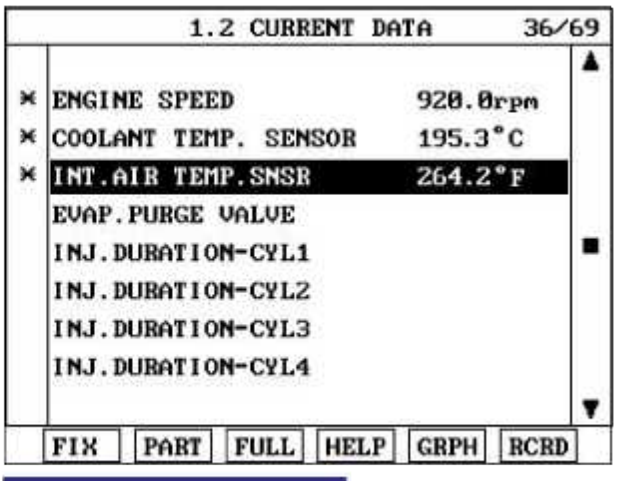


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "IATS" parameter on scantool.





4. Is the "IATS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

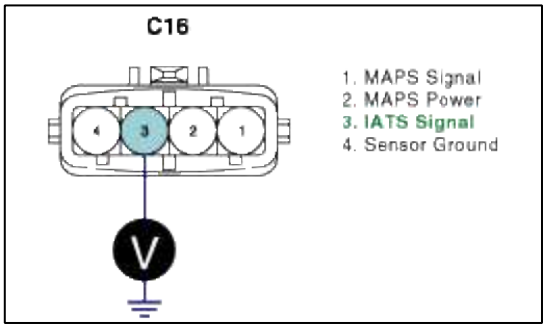
NO

Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect IATS connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 3 of IATS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

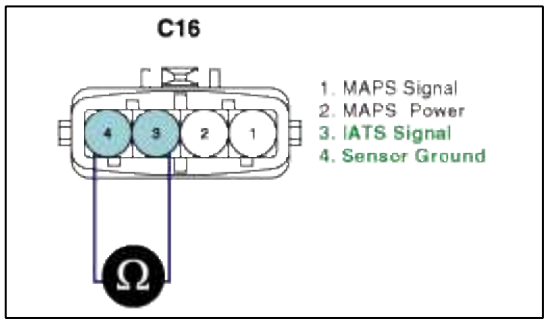
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check IATS resistance.
   (1) IG "OFF".
   (2) Disconnect IATS connector.
   (3) Measure resistance between terminal 3 and 4 of IATS connector.(Component Side)
   Specification :

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	40.93 ~ 48.35kΩ
-20	-4	13.89 ~ 16.02kΩ
0	32	5.38 ~ 6.08kΩ
20	68	2.31 ~ 2.56kΩ
40	104	1.08 ~ 1.21kΩ
60	140	0.54 ~ 0.62kΩ
80	176	0.29 ~ 0.34kΩ



   (4) Is the measured resistance within specification ?

   YES

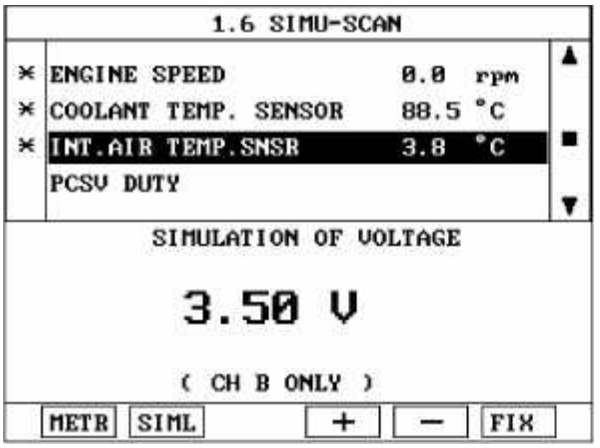
   Go to "Check ECM/PCM" as follows.

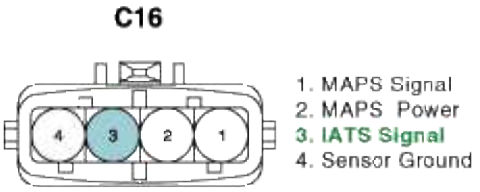
   NO

   Substitute with a known - good IATS and check for proper operation.
   If the problem is corrected, replace IATS and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF" and disconnect MAFS/MAPS connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.

(4) Simulate voltage at terminal 3 of IATS signal connector.





(5) Does the signal value of IATS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

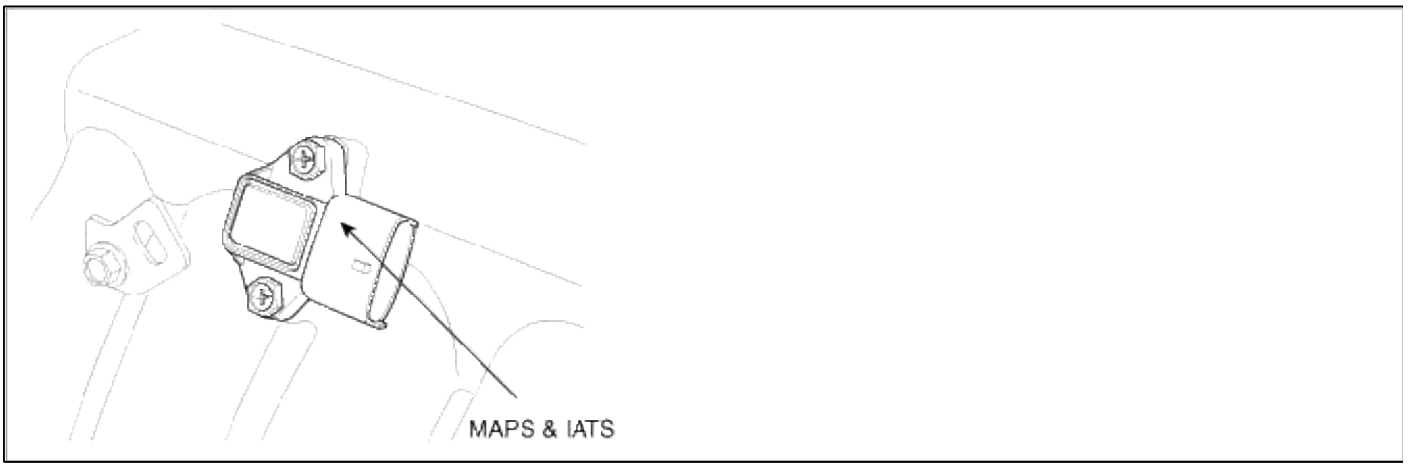
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0113 Intake Air Temperature Sensor 1 Circuit High Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The Intake Air Temperature (IAT) sensor measures the temperature of engine intake air. The Intake Air Temperature (IAT) sensor is a thermistor (a variable resistor that changes along with outside air temperature) in series with a fixed resistor in the ECM/PCM. The ECM/PCM applies 5V to the IAT sensor. The ECM/PCM monitors the voltage across the IAT sensor and converts it into a temperature reading. When the outside air temperature is cold the IAT sensor resistance is high, and when the outside air temperature is warm the IAT sensor resistance is low. Therefore, when the air temperature is cold the ECM/PCM will receive a high voltage input, and when the air temperature is warm the ECM/PCM will receive a low voltage input. The signal from IAT sensor is used for injection duration correction, ignition timing correction and idle speed correction(Air-density correction).

DTC DESCRIPTION

If measured temperature is lower than the minimum threshold value during 2sec, ECM/PCM sets DTC P0113. (In this case, the input signal voltage is the maximum threshold vaue.)

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Open or short to power in signal circuit • Open in ground circuit • IATS • ECM/PCM
Enable Conditions	• Idle and no fuel cut-off • Time after engine start > 28s • Integrated air mass > 1.0kg (2.2 lb) • Increase of measured temp. after start < 3.0°C (37.4 °F)	
Threshold Value	• Measured temperature < -39.0°C (-38.2°F)	
Diagnostic Time	• 2 sec	
MIL ON Condition	• 2 driving cycle	

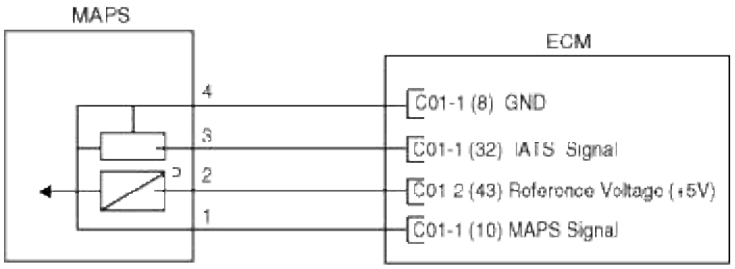
SPECIFICATION

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	40.93 ~ 48.35kΩ
-20	-4	13.89 ~ 16.02kΩ
0	32	5.38 ~ 6.08kΩ
20	68	2.31 ~ 2.56kΩ
40	104	1.08 ~ 1.21kΩ
60	140	0.54 ~ 0.62kΩ
80	176	0.29 ~ 0.34kΩ

SCHEMATIC DIAGRAM

(A/T)

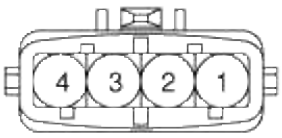
[CIRCUIT DIAGRAM]



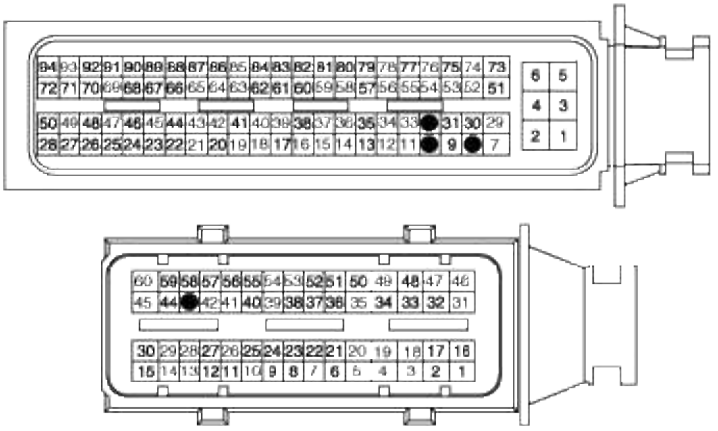
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (10)	MAPS Signal
2	ECM C01-2 (43)	Reference Voltage (+5V)
3	ECM C01-1 (32)	IATS Signal
4	ECM C01-1 (8)	Sensor Ground

[HARNESS CONNECTORS]



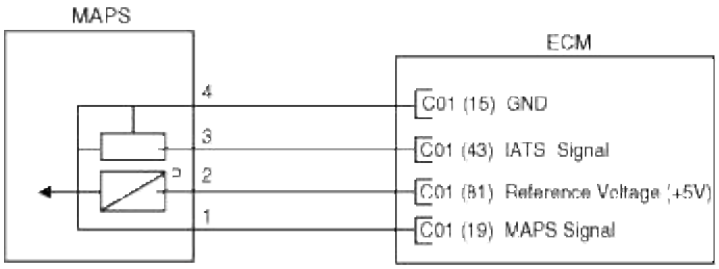
MAPS & IATS (C16)



ECM

(M/T)

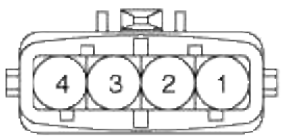
[CIRCUIT DIAGRAM]



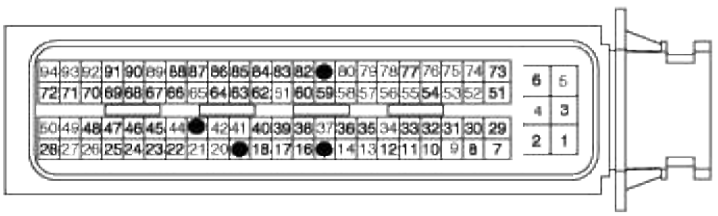
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (19)	MAPS Signal
2	ECM C01 (81)	Reference Voltage (+5V)
3	ECM C01 (43)	IATS Signal
4	ECM C01 (15)	Sensor Ground

[HARNESS CONNECTORS]



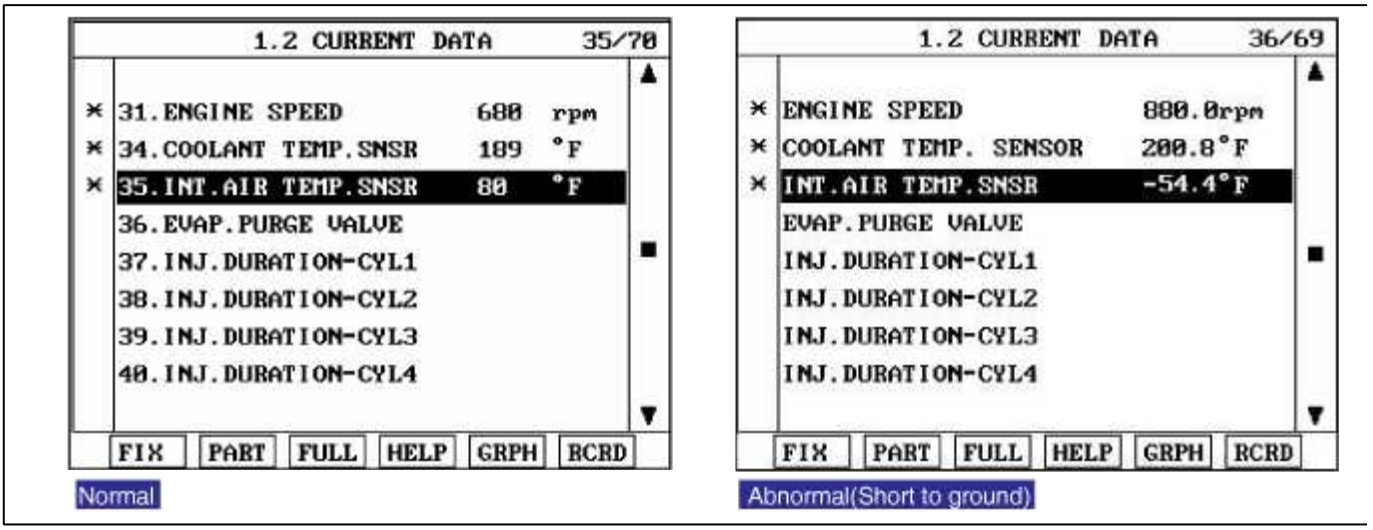
MAPS & IATS (C16)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "IATS" parameter on scantool.



4. Is the "IATS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

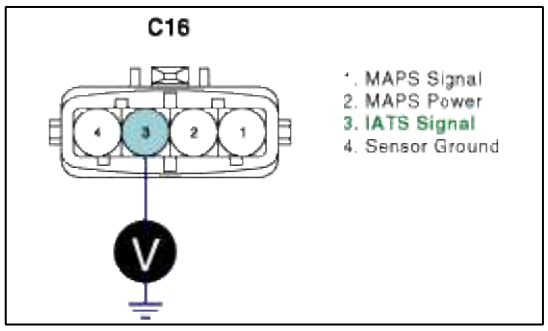
NO

Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. Check open in harness.
   (1) IG "OFF".
   (2) Disconnect IATS connector.
   (3) IG "ON" & ENG "OFF"
   (4) Measure voltage between terminal 3 of IATS harness connector and chassis ground.

   Specification : Approx. 5V



   (5) Is the measured voltage within specification?

   YES

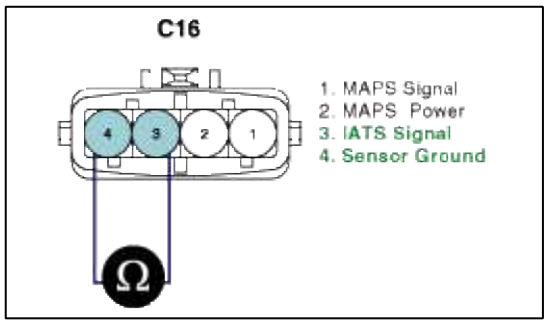
   Go to "Check short to ground in harness" as follows.

   NO

   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

2. Check short to ground in harness.
   (1) IG "OFF".
   (2) Disconnect IATS and ECM/PCM connector.
   (3) Measure resistance between terminal 3 and 4 of IATS harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specification?

   YES

   Go to "Ground Circuit Inspection" procedure.

   NO

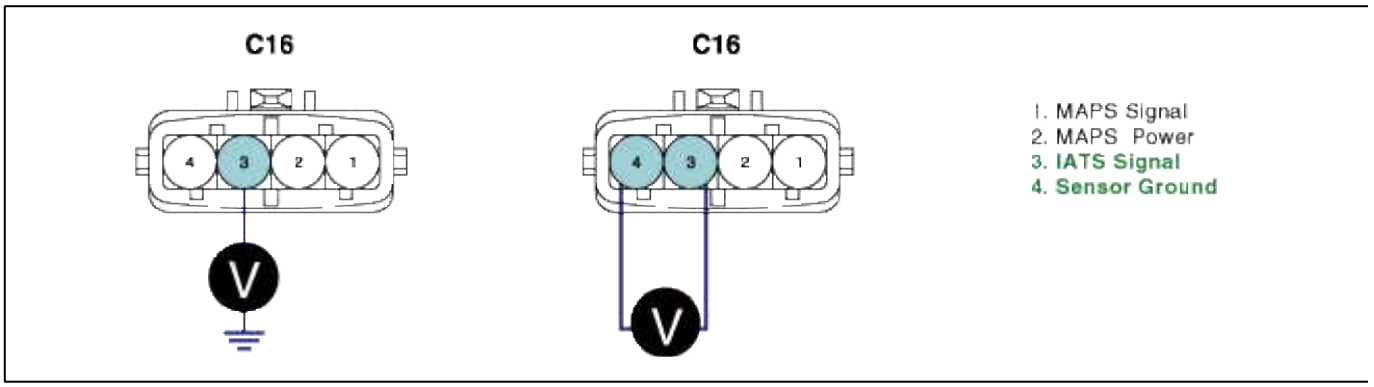
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect IATS connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of IATS harness connector and chassis ground.(A)

5. Measure voltage between terminal 3 and 4 of IATS harness connector.(B)

Specification : "A" - "B" = Below 200mV



6. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

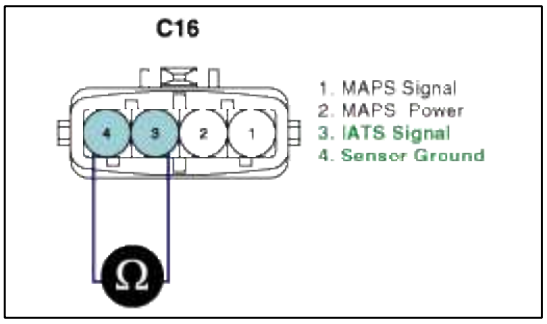
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check IATS resistance.
   (1) IG "OFF".
   (2) Disconnect IATS connector.
   (3) Measure resistance between terminal 3 and 4 of IATS connector.(Component Side)

Specification :

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	40.93 ~ 48.35kΩ
-20	-4	13.89 ~ 16.02kΩ
0	32	5.38 ~ 6.08kΩ
20	68	2.31 ~ 2.56kΩ
40	104	1.08 ~ 1.21kΩ
60	140	0.54 ~ 0.62kΩ
80	176	0.29 ~ 0.34kΩ



(4) Is the measured resistance within specification ?

YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good IATS and check for proper operation.
If the problem is corrected, replace IATS and go to "Verification of Vehicle Repair" procedure.

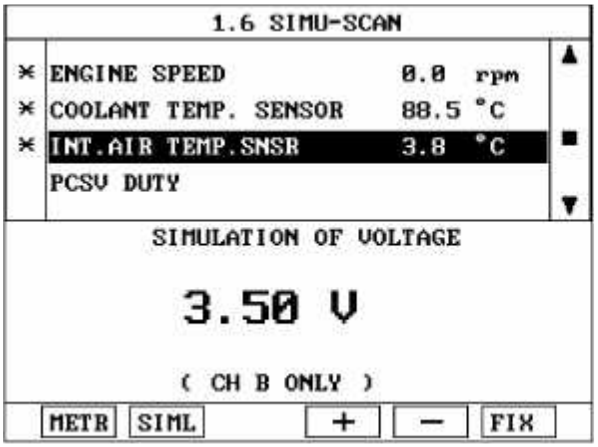
2. Check ECM/PCM.

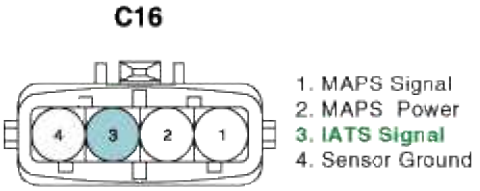
(1) IG "OFF" and disconnect MAFS/MAPS connector.

(2) Connect scantool and Key "ON".

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 3 of IATS signal connector.





(5) Does the signal value of IATS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

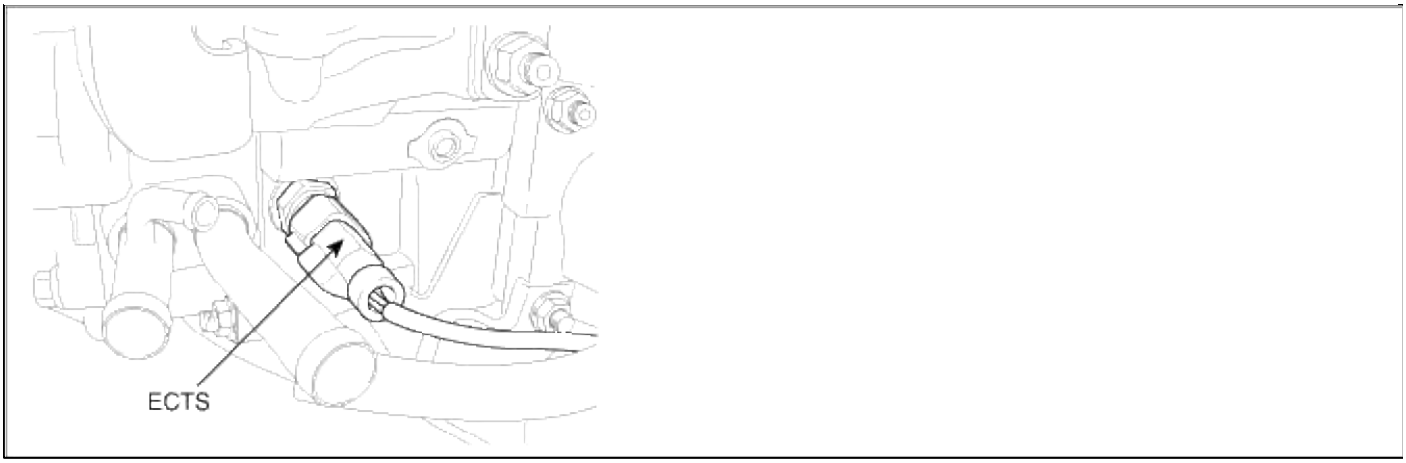
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0115 Engine Coolant Temperature Circuit

COMPONENT LOCATION



GENERAL DESCRIPTION

The Engine Coolant Temperature(ECT) Sensor measures the temperature of engine coolant. The Engine Coolant Temperature (ECT) Sensor is located near the thermostat housing of the cylinder head. ECT Sensor is a thermistor (A Variable Resistor that Changes Along with ECT) in series with a fixed resistor in the Engine Control Module (ECM). The ECM/PCM applies 5 volts to the ECT sensor. The ECM/PCM monitors the voltage across the ECT sensor and converts it into a temperature reading. When the engine is cold the ECT sensor resistance is high, and when the engine is warm the ECT sensor resistance is low. Therefore, when the engine is cold the ECM/PCM will receive a high voltage input, and when the engine is warm the ECM/PCM will receive a low voltage input. The signal from ECT sensor is used for Injection control, ignition timing, idle speed and cooling fan control.

DTC DESCRIPTION

ECM monitors ECTS's output value at cranking, and the value of ECTS is out of the threshold value, ECM/PCM sets DTC P0115.

DTC DETECTING CONDITION

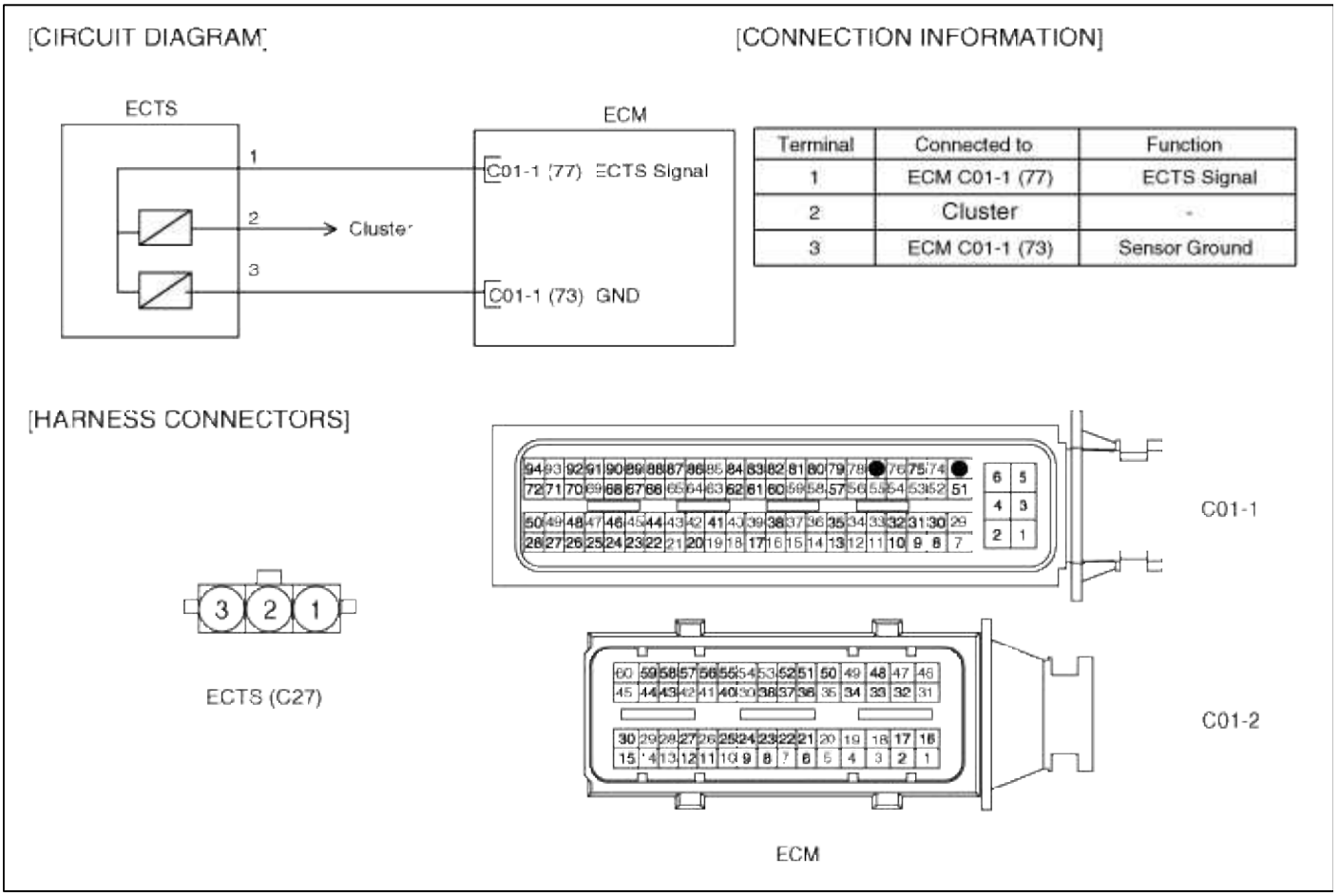
Item		Detecting Condition	Possible Cause
DTC Strategy		• Signal check, stuck in high range	• Poor connection • ECTS • ECM/PCM
Case1	Enable Conditions	• Cold start detected	
	Threshold Value	• Coolant temp at cranking - intake temp at cranking> 30°C (54°F)	
Case2	Enable Conditions	• No block heater detected	
	Threshold Value	• Intake temp at cranking -coolant temp at cranking> 20°C (36°F)	
Case3	Enable Conditions	• Cooling without external fan was detected duringsoaking	
	Threshold Value	• Coolant temp at cranking - intake temp at cranking >[20°C(36°F)+the final difference during after-run]	
MIL ON Condition		• 2 driving cycle	

SPECIFICATION

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	48.14kΩ
-20	-4	14.13 ~ 16.83kΩ
0	32	5.79kΩ
20	68	2.31 ~ 2.59kΩ
40	104	1.15kΩ
60	140	0.59kΩ
80	176	0.32kΩ

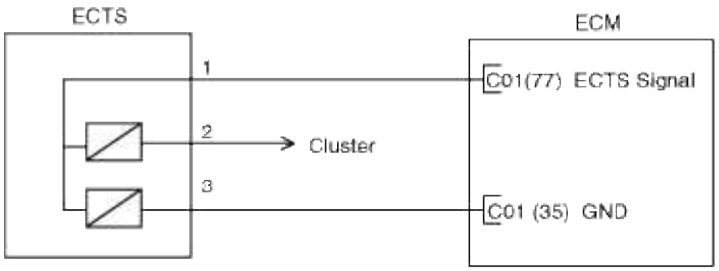
SCHEMATIC DIAGRAM

[AT]



[MT]

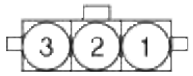
[CIRCUIT DIAGRAM]



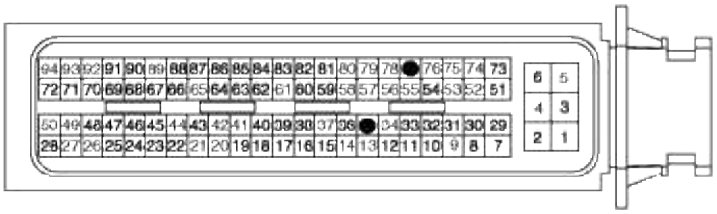
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (77)	ECTS Signal
2	Cluster	-
3	ECM C01 (35)	Sensor Ground

[HARNESS CONNECTORS]



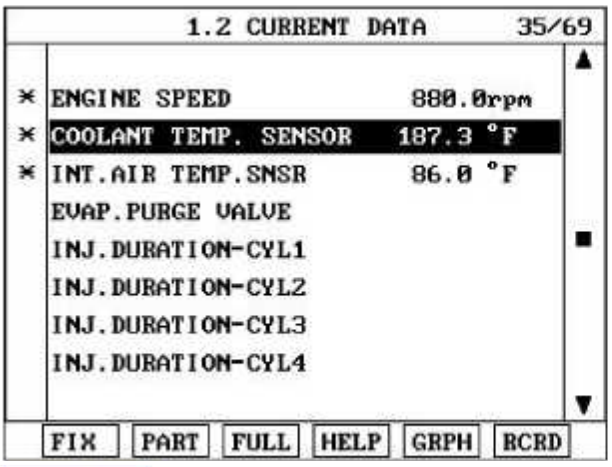
ECTS (C27)

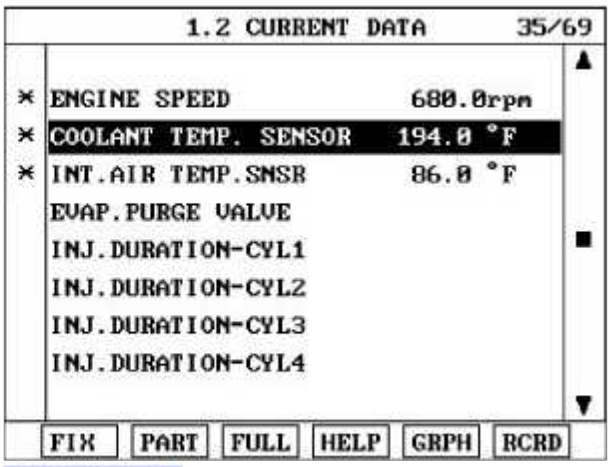


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "ECTS" parameter on scantool.





4. Is the "ECTS" parameter displayed correctly?

YES

Case1] This DTC can caused by Intake Air Temperature Sensor(IATS). So, if there is(are) DTC(s)of IATS, refer to IATS's DTC Guide.

Case2] Fault is intermittent caused by poor contact in the sensor's and/or ECM's connectoror was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replaceas necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

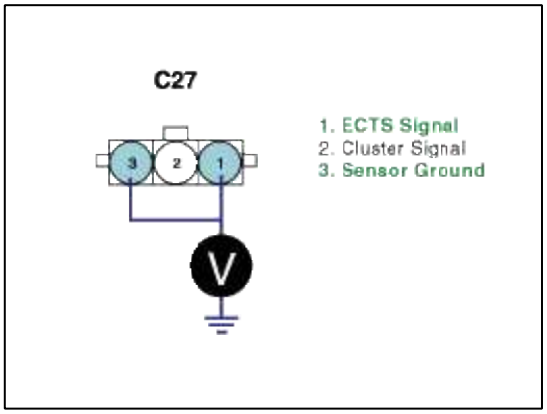
NO

Go to "Voltage Inspection " procedure.

VOLTAGE INSPECTION

1. IG "OFF".
2. Disconnect ECTS connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 1 of ECTS harness connector and chassis ground.
5. Measure voltage between terminal 3 of ECTS harness connector and chassis ground.

Specification :
Terminal 1 Approx. 5V
Terminal 3 Approx. 0V



6. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

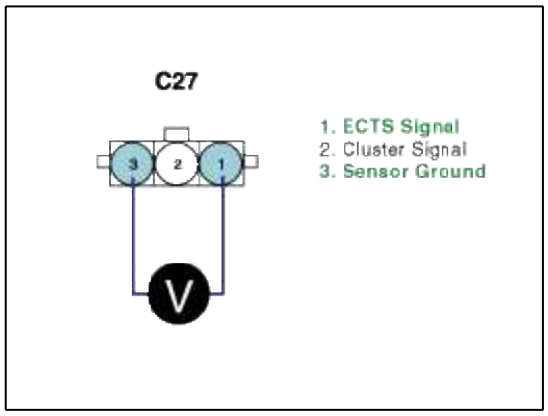
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ECTS resistance.
   (1) IG "OFF".
   (2) Disconnect ECTS connector.
   (3) Measure resistance between terminal 1 and 3 of ECTS harness connector.(Component Side)
   Specification :

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	48.14kΩ
-20	-4	14.13 ~ 16.83kΩ
0	32	5.79kΩ
20	68	2.31 ~ 2.59kΩ
40	104	1.15kΩ
60	140	0.59kΩ
80	176	0.32kΩ



   (4) Is the measured resistance within specification?

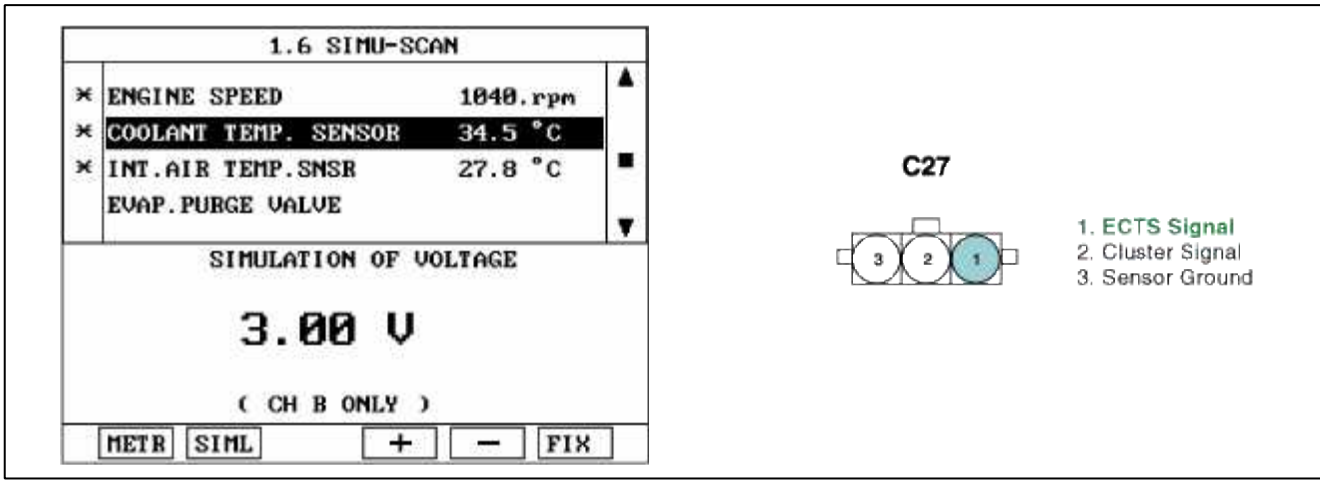
   YES

   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good ECTS and check for proper operation.
   If the problem is corrected, replace ECTS and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF" and disconnect ECTS connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 1 of ECTS signal connector.



   (5) Does the signal value of ECTS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

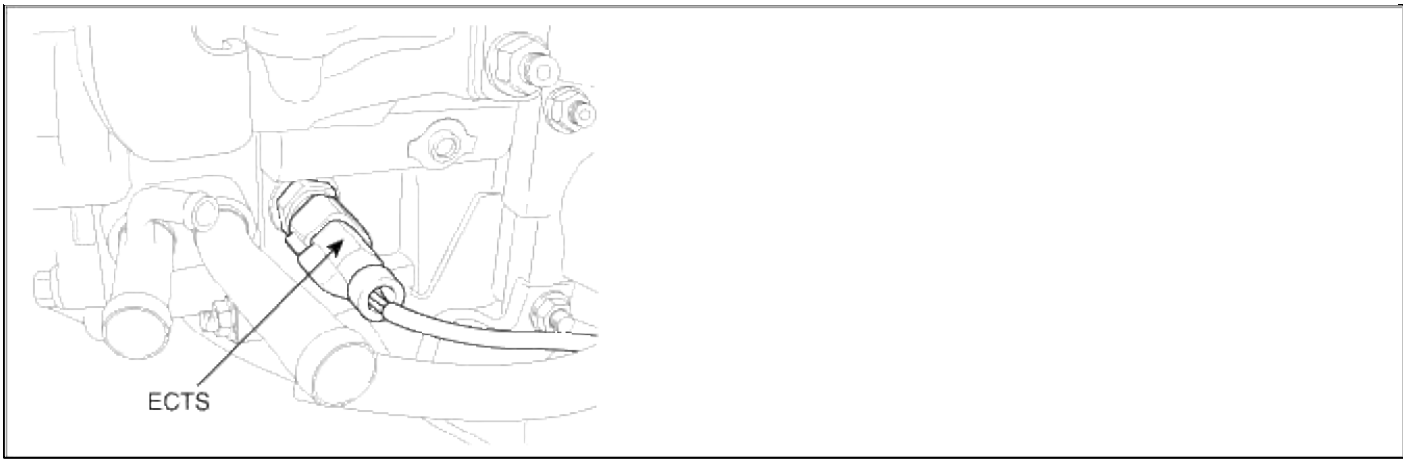
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0116 Engine Coolant Temperature Circuit Range / Performance

COMPONENT LOCATION



GENERAL DESCRIPTION

The Engine Coolant Temperature(ECT) Sensor measures the temperature of engine coolant. The Engine Coolant Temperature (ECT) Sensor is located near the thermostat housing of the cylinder head. ECT Sensor is a thermistor (A Variable Resistor that Changes Along with ECT) in series with a fixed resistor in the Engine Control Module (ECM). The ECM/PCM applies 5 volts to the ECT sensor. The ECM/PCM monitors the voltage across the ECT sensor and converts it into a temperature reading. When the engine is cold the ECT sensor resistance is high, and when the engine is warm the ECT sensor resistance is low. Therefore, when the engine is cold the ECM/PCM will receive a high voltage input, and when the engine is warm the ECM/PCM will receive a low voltage input. The signal from ECT sensor is used for Injection control, ignition timing, idle speed and cooling fan control.

DTC DESCRIPTION

If the deviation between the measured value and model value exceeds the threshold, P0116 is set.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Rationality check	• Poor connection • ECTS • ECM/PCM
Case1	Enable Conditions	• No block heater detected • Low side model temp = f(air mass, current model temp.)	
	Threshold Value	• Measured Temp. - Low side model temp< -15°C (-27°F)	
	Diagnostic Time		
Case2	Enable Conditions	• Integrated air mass >1.0kg (2.2 lb) • Measured temperature >110°C (230°F) • High side model temp = f(air mass, current model temp.)+ correction	
	Threshold Value	• Measured temp. - High side model temp >10°C (18°F)	
	Diagnostic Time	• 250 sec	
	Enable	• Low heat power mode driving counter ≥ 2	

Case3	Conditions	• High heat power mode driving counter ≥ 2	
	Threshold Value	• Max temp. - Min temp. < 0.8~3.0 °C (1.44~5.4 °F)	
	Diagnostic Time	• 250 sec	
MIL ON Condition		• 2 driving cycle	

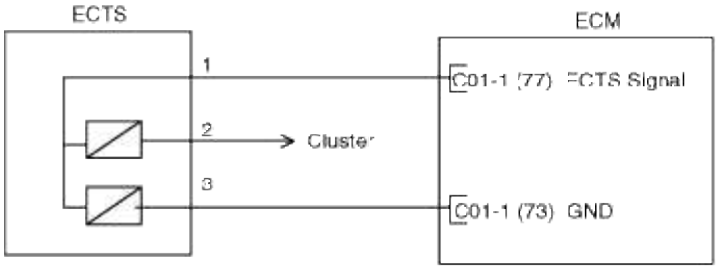
SPECIFICATION

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	48.14kΩ
-20	-4	14.13 ~ 16.83kΩ
0	32	5.79kΩ
20	68	2.31 ~ 2.59kΩ
40	104	1.15kΩ
60	140	0.59kΩ
80	176	0.32kΩ

SCHEMATIC DIAGRAM

[AT]

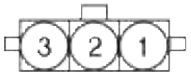
[CIRCUIT DIAGRAM]



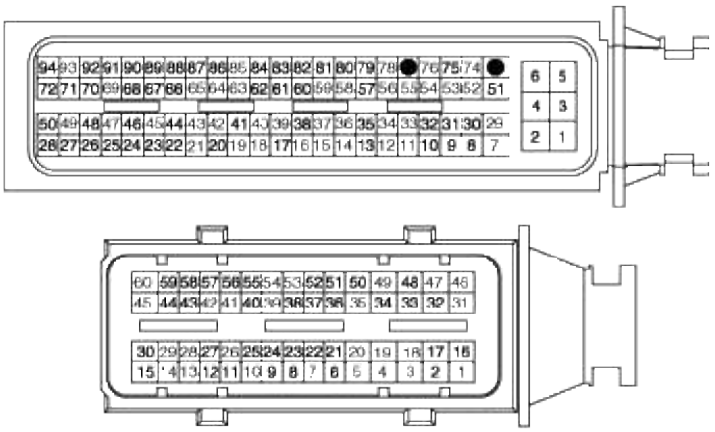
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (77)	ECTS Signal
2	Cluster	-
3	ECM C01-1 (73)	Sensor Ground

[HARNESS CONNECTORS]

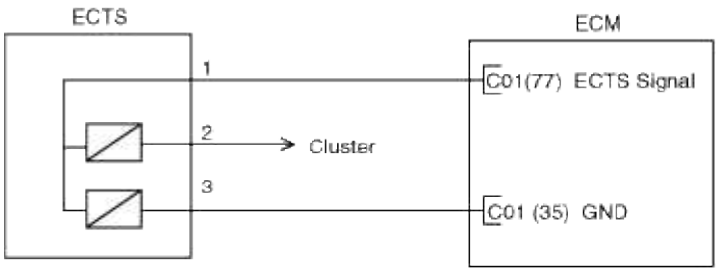


ECTS (C27)



[MT]

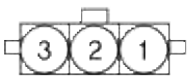
[CIRCUIT DIAGRAM]



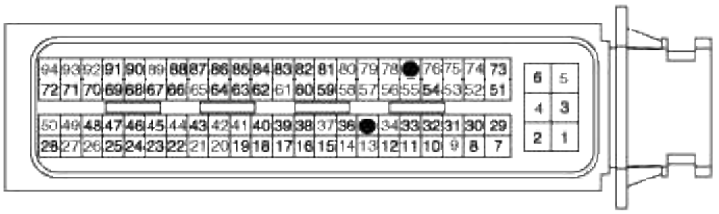
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (77)	ECTS Signal
2	Cluster	-
3	ECM C01 (35)	Sensor Ground

[HARNESS CONNECTORS]



ECTS (C27)

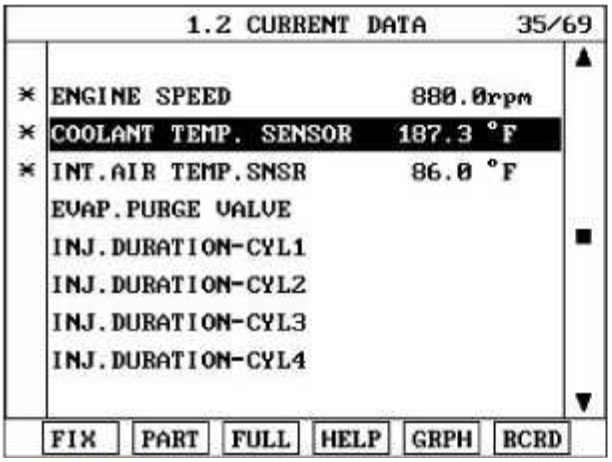


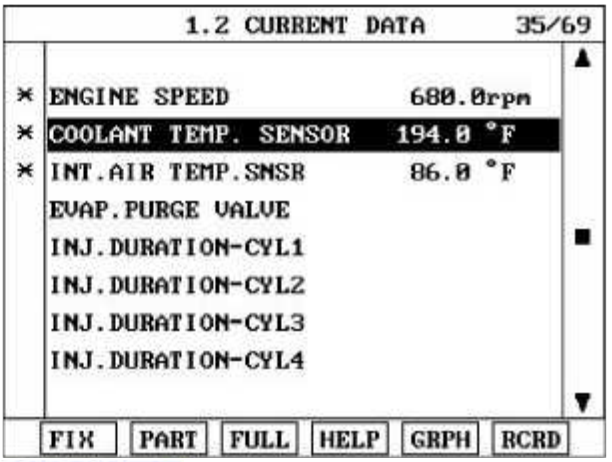
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.

3. Monitor "ECTS" parameter on scantool.





4. Is the "ECTS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

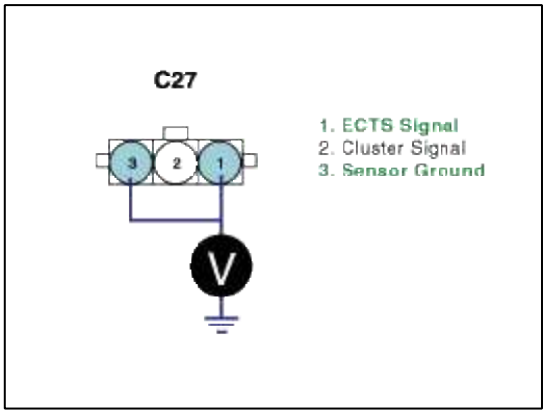
Go to "Voltage Inspection " procedure.

VOLTAGE INSPECTION

1. IG "OFF".
2. Disconnect ECTS connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 1 of ECTS harness connector and chassis ground.

5. Measure voltage between terminal 3 of ECTS harness connector and chassis ground.

Specification :
Terminal 1 Approx. 5V
Terminal 3 Approx. 0V



6. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

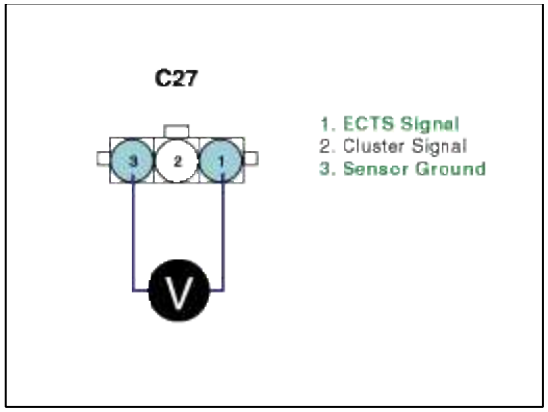
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ECTS resistance.
   (1) IG "OFF".
   (2) Disconnect ECTS connector.
   (3) Measure resistance between terminal 1 and 3 of ECTS harness connector.(Component Side)

Specification :

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	48.14kΩ
-20	-4	14.13 ~ 16.83kΩ
0	32	5.79kΩ
20	68	2.31 ~ 2.59kΩ
40	104	1.15kΩ
60	140	0.59kΩ
80	176	0.32kΩ



(4) Is the measured resistance within specification?

YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good ECTS and check for proper operation.
If the problem is corrected, replace ECTS and go to "Verification of Vehicle Repair" procedure.

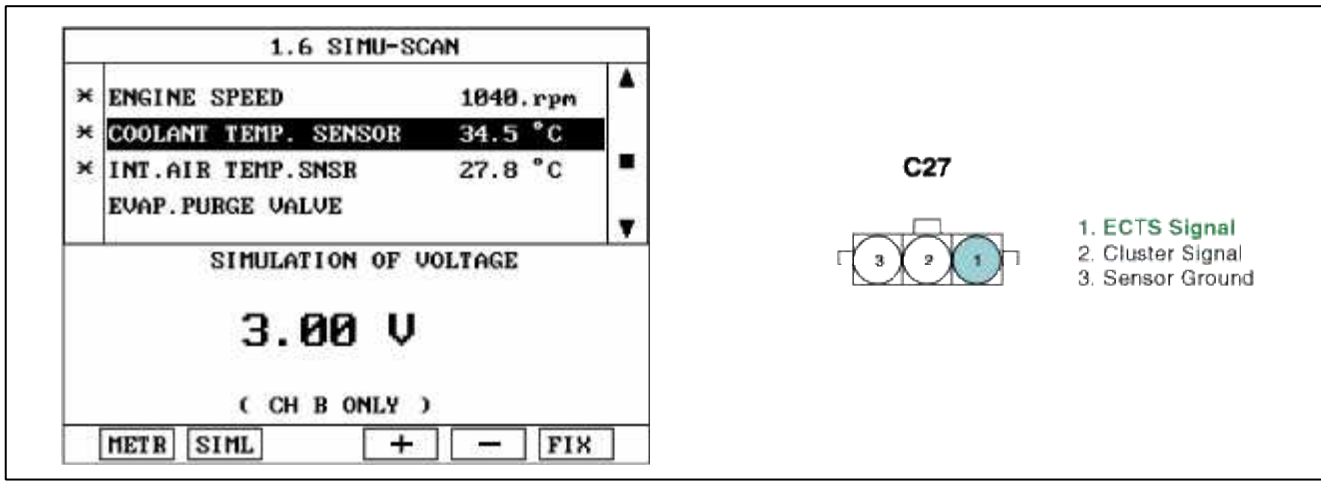
2. Check ECM/PCM.

(1) IG "OFF" and disconnect ECTS connector.

(2) Connect scantool and Key "ON".

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of ECTS signal connector.



(5) Does the signal value of ECTS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

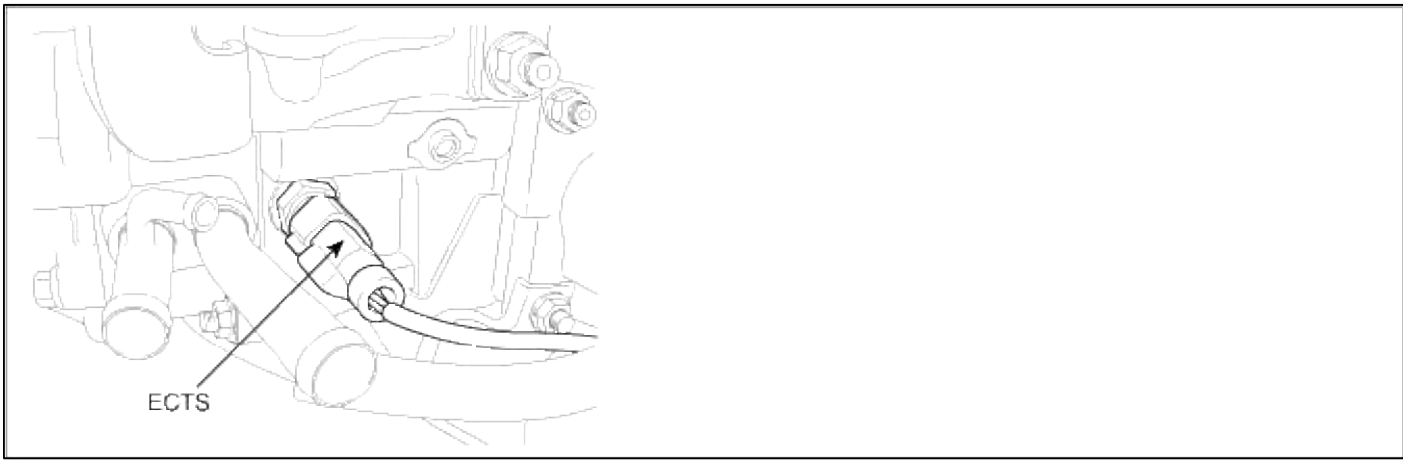
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0117 Engine Coolant Temperature Circuit Low Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The Engine Coolant Temperature(ECT) Sensor measures the temperature of engine coolant. The Engine Coolant Temperature (ECT) Sensor is located near the thermostat housing of the cylinder head. ECT Sensor is a thermistor (A Variable Resistor that Changes Along with ECT) in series with a fixed resistor in the Engine Control Module (ECM). The ECM/PCM applies 5 volts to the ECT sensor. The ECM/PCM monitors the voltage across the ECT sensor and converts it into a temperature reading. When the engine is cold the ECT sensor resistance is high, and when the engine is warm the ECT sensor resistance is low. Therefore, when the engine is cold the ECM/PCM will receive a high voltage input, and when the engine is warm the ECM/PCM will receive a low voltage input. The signal from ECT sensor is used for Injection control, ignition timing, idle speed and cooling fan control.

DTC DESCRIPTION

If measured temperature is higher than the maximum threshold value, ECM/PCM sets DTC P0117.
(In this case, the input signal voltage is the minimum threshold vaue.)

DTC DETECTING CONDITION

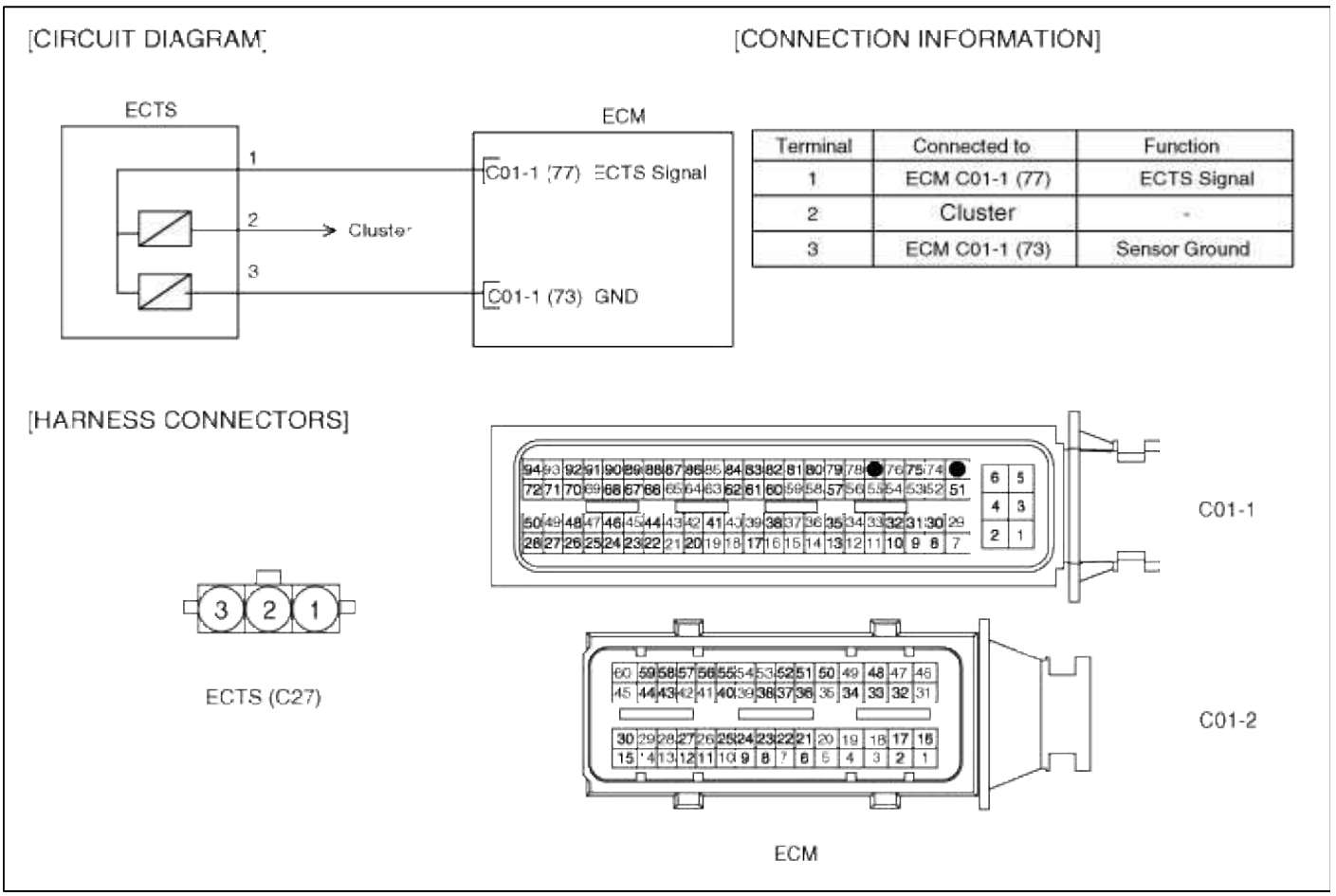
Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Short to ground in signal circuit • ECTS • ECM/PCM
Enable Conditions		
Threshold Value	• Measured temperature > 138.8 °C (281.8°F)	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SPECIFICATION

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	48.14kΩ
-20	-4	14.13 ~ 16.83kΩ
0	32	5.79kΩ
20	68	2.31 ~ 2.59kΩ
40	104	1.15kΩ
60	140	0.59kΩ
80	176	0.32kΩ

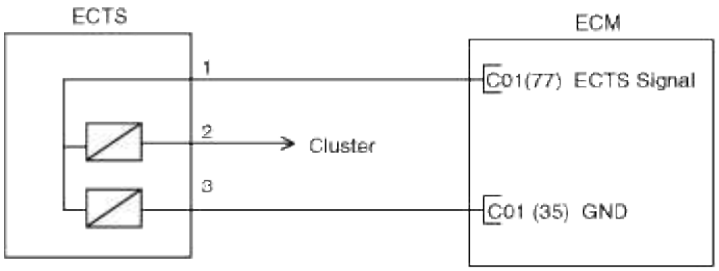
SCHEMATIC DIAGRAM

[AT]



[MT]

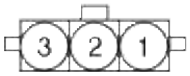
[CIRCUIT DIAGRAM]



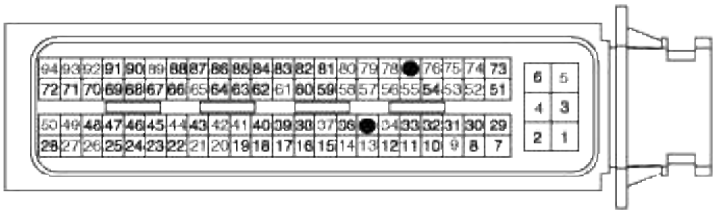
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (77)	ECTS Signal
2	Cluster	-
3	ECM C01 (35)	Sensor Ground

[HARNESS CONNECTORS]



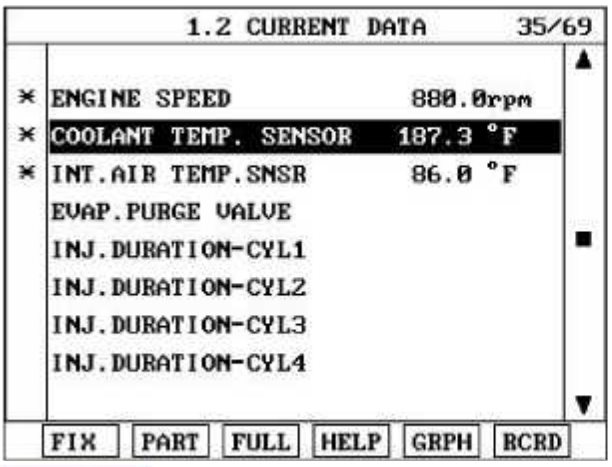
ECTS (C27)

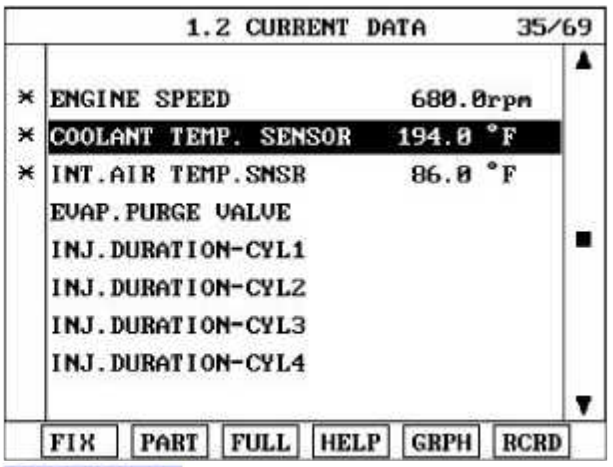


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "ECTS" parameter on scantool.





4. Is the "ECTS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

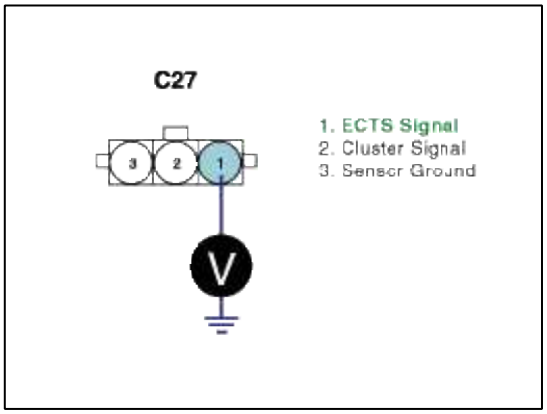
NO

Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect ECTS connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 1 of ECTS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

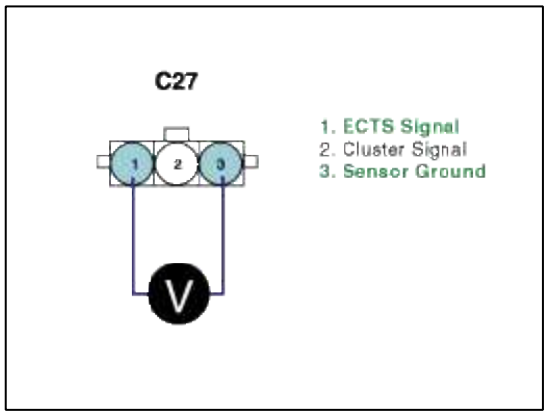
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ECTS resistance.
   (1) IG "OFF".
   (2) Disconnect ECTS connector.
   (3) Measure resistance between terminal 1 and 3 of ECTS harness connector.(Component Side)
   Specification :

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	48.14kΩ
-20	-4	14.13 ~ 16.83kΩ
0	32	5.79kΩ
20	68	2.31 ~ 2.59kΩ
40	104	1.15kΩ
60	140	0.59kΩ
80	176	0.32kΩ



   (4) Is the measured resistance within specification?

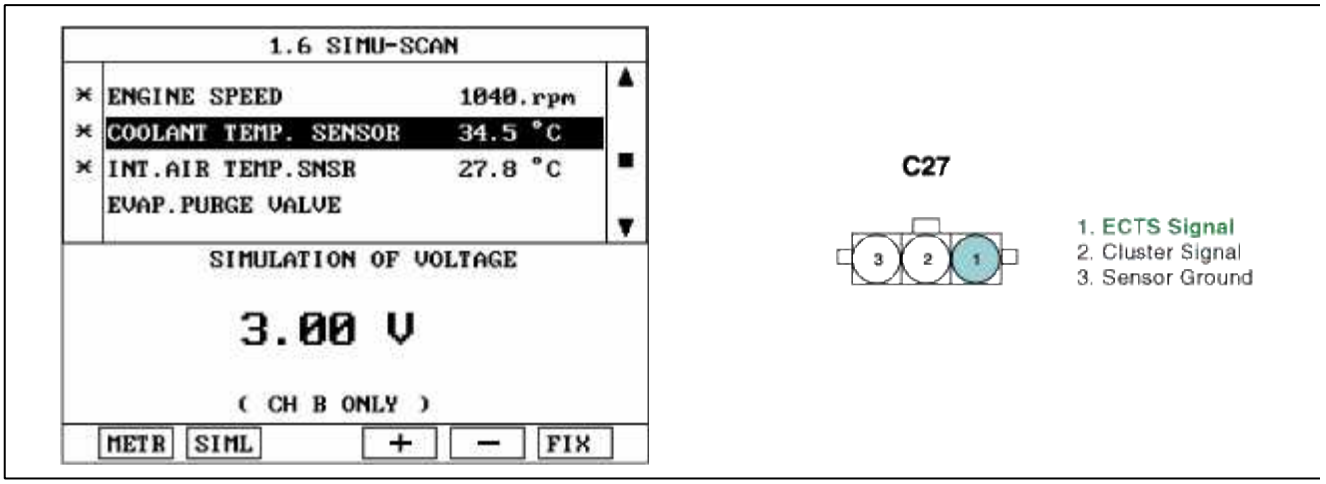
   YES

   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good ECTS and check for proper operation.
   If the problem is corrected, replace ECTS and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF" and disconnect ECTS connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 1 of ECTS signal connector.



   (5) Does the signal value of ECTS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

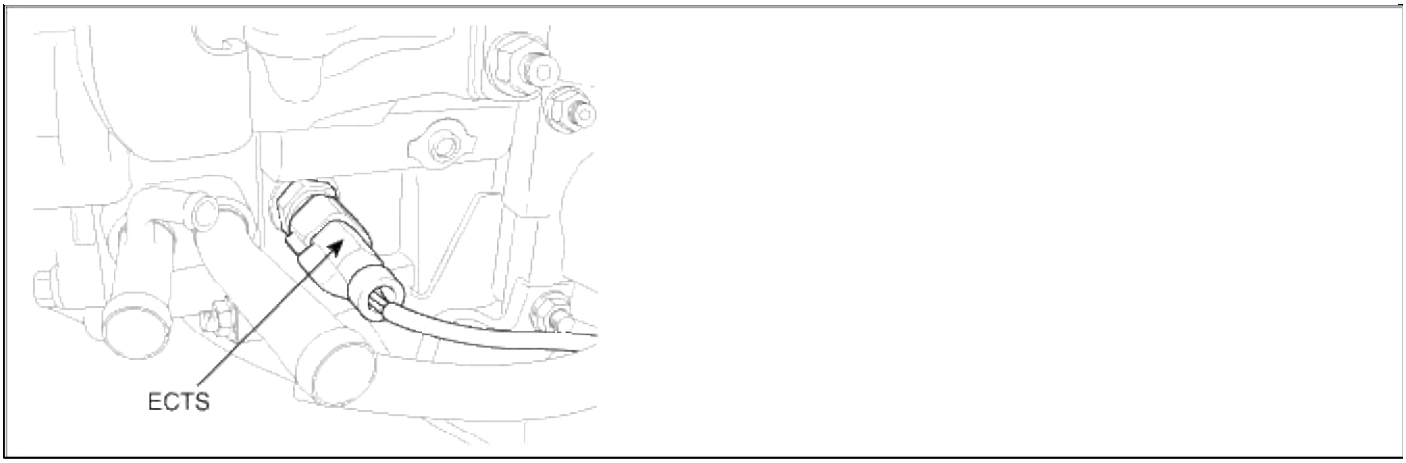
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0118 Engine Coolant Temperature Circuit High Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The Engine Coolant Temperature(ECT) Sensor measures the temperature of engine coolant. The Engine Coolant Temperature (ECT) Sensor is located near the thermostat housing of the cylinder head. ECT Sensor is a thermistor (A Variable Resistor that Changes Along with ECT) in series with a fixed resistor in the Engine Control Module (ECM). The ECM/PCM applies 5 volts to the ECT sensor. The ECM/PCM monitors the voltage across the ECT sensor and converts it into a temperature reading. When the engine is cold the ECT sensor resistance is high, and when the engine is warm the ECT sensor resistance is low. Therefore, when the engine is cold the ECM/PCM will receive a high voltage input, and when the engine is warm the ECM/PCM will receive a low voltage input. The signal from ECT sensor is used for Injection control, ignition timing, idle speed and cooling fan control.

DTC DESCRIPTION

If measured temperature is lower than the minimum threshold value, ECM/PCM sets DTC P0118.
(In this case, the input signal voltage is the maximum threshold vaue.)

DTC DETECTING CONDITION

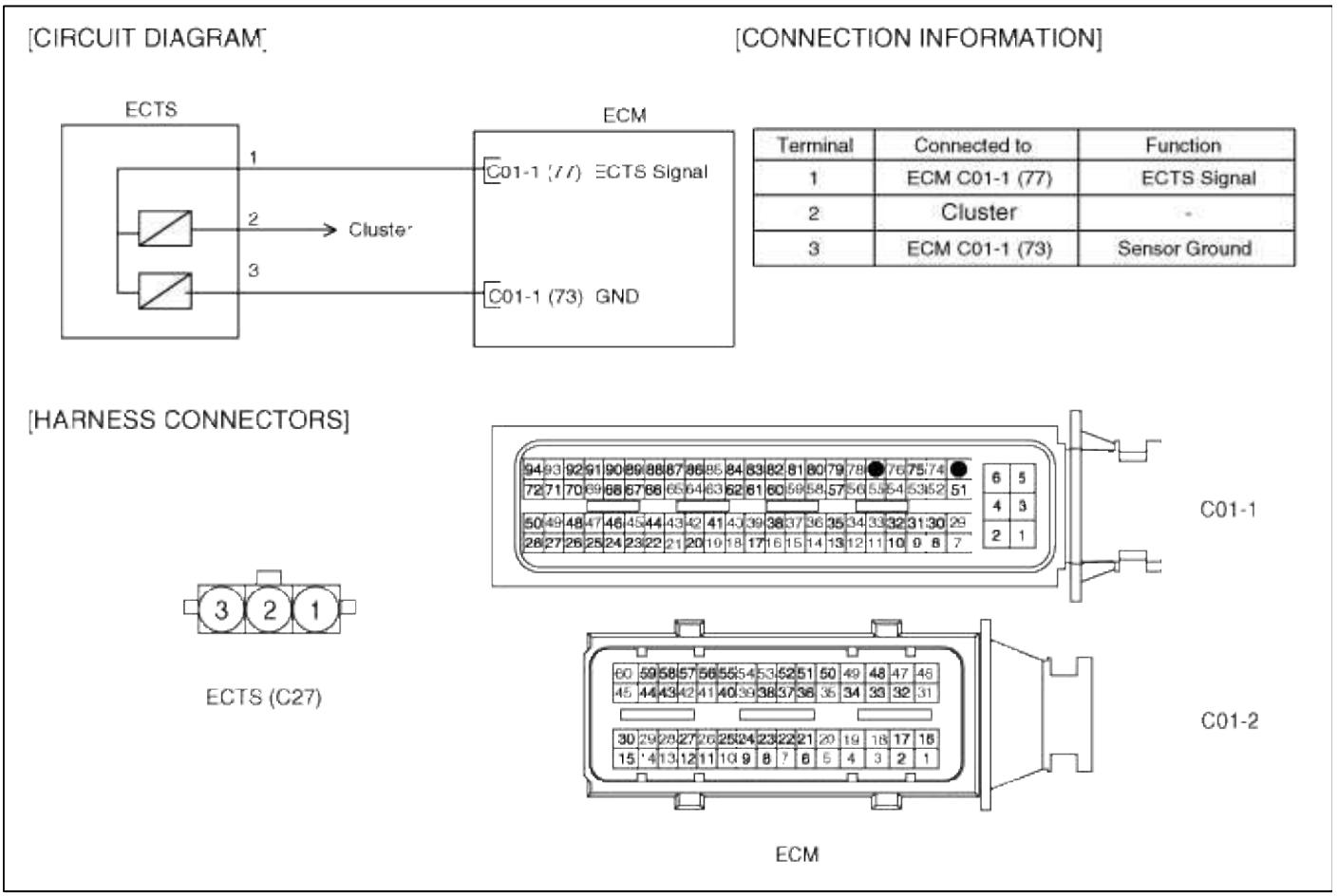
Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Open or short to power in signal circuit • Open in ground circuit • ECTS • ECM/PCM
Enable Conditions	• [Time after Integrated air mass > 0.4lb] > 2.0s • Increase of measured temp. after start < 3°C (5.4°F)	
Threshold Value	• Measured temperature < -38.3 °C (-36.9°F)	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SPECIFICATION

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	48.14kΩ
-20	-4	14.13 ~ 16.83kΩ
0	32	5.79kΩ
20	68	2.31 ~ 2.59kΩ
40	104	1.15kΩ
60	140	0.59kΩ
80	176	0.32kΩ

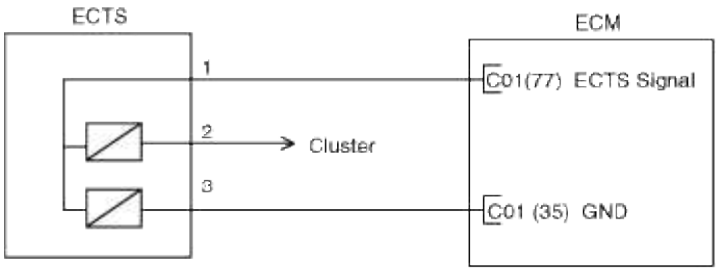
SCHEMATIC DIAGRAM

[AT]



[MT]

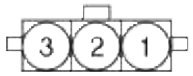
[CIRCUIT DIAGRAM]



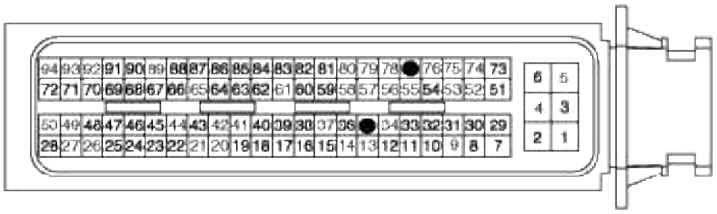
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (77)	ECTS Signal
2	Cluster	-
3	ECM C01 (35)	Sensor Ground

[HARNESS CONNECTORS]



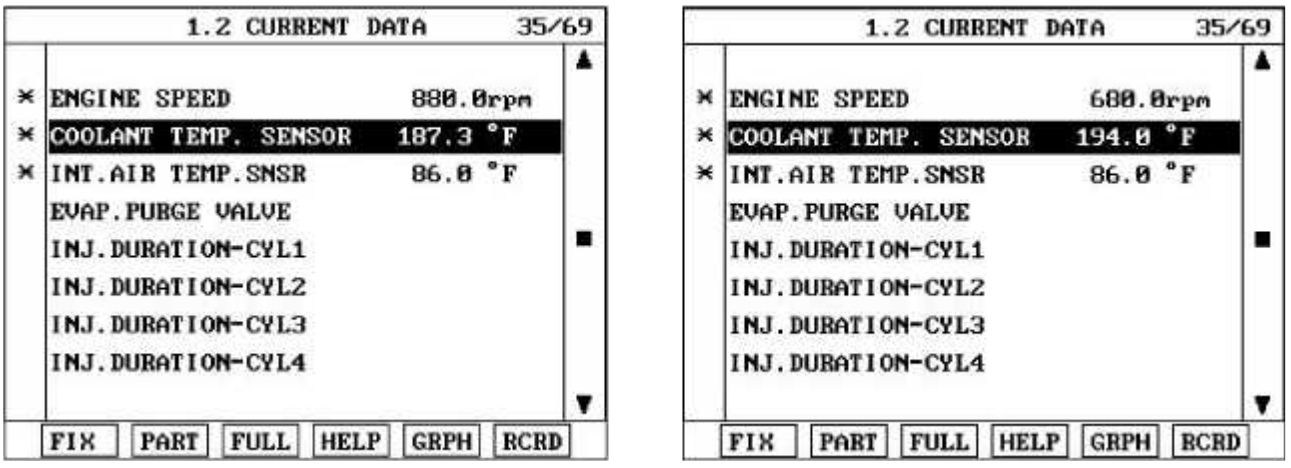
ECTS (C27)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "ECTS" parameter on scantool.



4. Is the "ECTS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

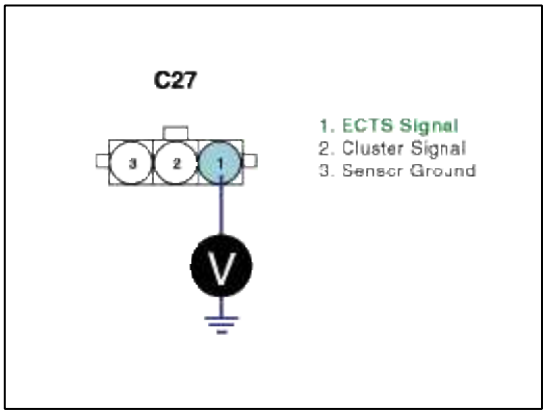
NO

Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect ECTS connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 1 of ECTS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification?

YES

Go to "Ground Circuit Inspection" procedure.

NO

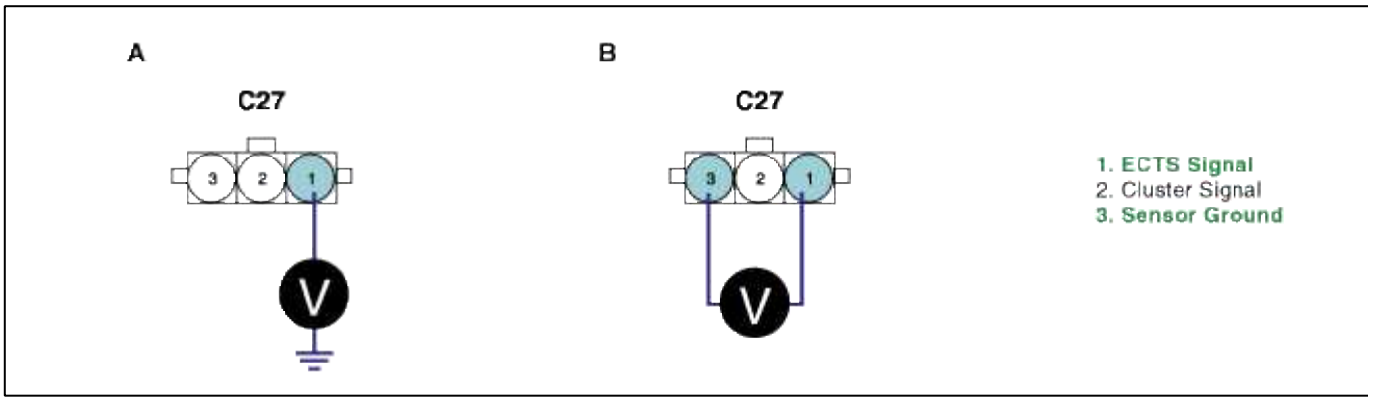
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect ECTS connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 1 of ECTS harness connector and chassis ground.(A)

5. Measure voltage between terminal 1 and 3 of ECTS harness connector.(B)

Specification : "A" - "B" = Below 200mV`



6. Is the measured voltage within specification?

YES

Go to "Component Insepction" procedure.

NO

Repair or replace as necessary and then, go to 'Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ECTS resistance.

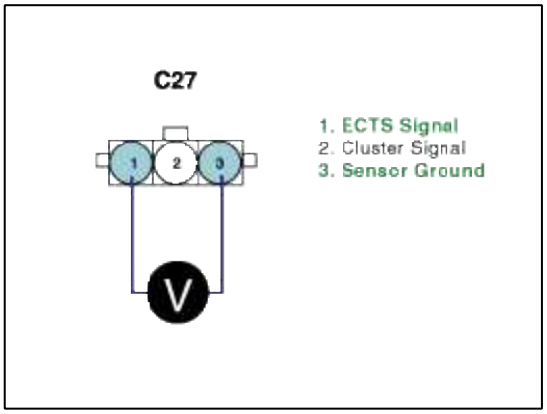
(1) IG "OFF".

(2) Disconnect ECTS connector.

(3) Measure resistance between terminal 1 and 3 of ECTS harness connector.(Component Side)

Specification :

Temperature		Resistance [kΩ]
°C	°F	
-40	-40	48.14kΩ
-20	-4	14.13 ~ 16.83kΩ
0	32	5.79kΩ
20	68	2.31 ~ 2.59kΩ
40	104	1.15kΩ
60	140	0.59kΩ
80	176	0.32kΩ



(4) Is the measured resistance within specification?

YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good ECTS and check for proper operation.
If the problem is corrected, replace ECTS and go to "Verification of Vehicle Repair" procedure.

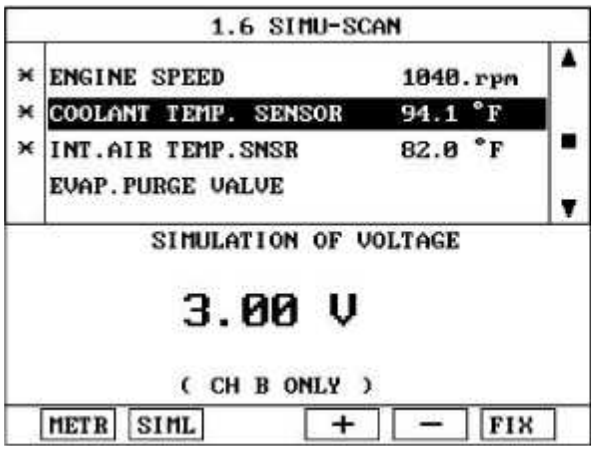
2. Check ECM/PCM.

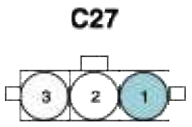
(1) IG "OFF" and disconnect ECTS connector.

(2) Connect scantool and Key "ON".

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of ECTS signal connector.





1. ECTS Signal
2. Cluster Signal
3. Sensor Ground

(5) Does the signal value of ECTS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

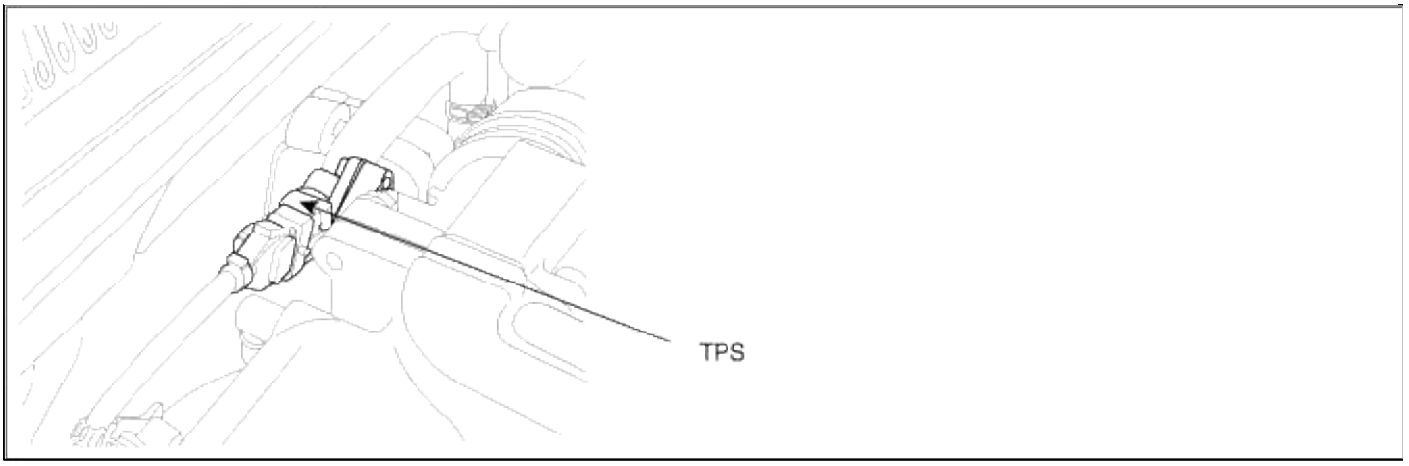
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0121 Throttle/Pedal Position Sensor/Switch \'A\' Circuit Range/Performance

COMPONENT LOCATION



GENERAL DESCRIPTION

The Throttle Position Sensor (TPS) is mounted on the throttle body and detects the opening angle of the throttle plate.The TPS has a variable resistor (potentiometer) whose characteristic is the resistance changing according to the throttle angle. During acceleration, the TPS resistance between the reference 5V and the signal terminal decreases and output voltage increases; during deceleration, the TPS resistance increases and TPS output voltage decreases.The ECM/PCM supplies a reference 5V to the TPS and the output voltage increases directly with the opening of the throttle valve. The TPS output voltage will vary from 0.2~0.8V at closed throttle to 4.3~4.8V at wide-open throttle.The ECM/PCM determines operating conditions such as idle (closed throttle), part load, acceleration/deceleration, and wide-open throttle from the TPS. Also The ECM/PCM uses the Mass Air Flow Sensor (MAFS) or Manifold Absolute Pressure Sensor (MAPS) signal along with the TPS signal to adjust fuel injection duration and ignition timing.

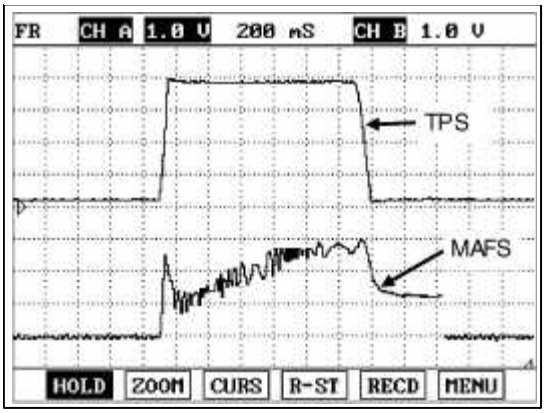
DTC DESCRIPTION

Once enable conditions are met, if the number of times that the throttle angle input signal rapidly increases over 30% is greater than or equal to 3, P0121 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check (Jittering)	• Poor connection • TPS • ECM/PCM
Enable Conditions	• Engine speed > 600 rpm	
Threshold Value	• Counter of Δ throttle angle > 30% ≥ 3 times	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

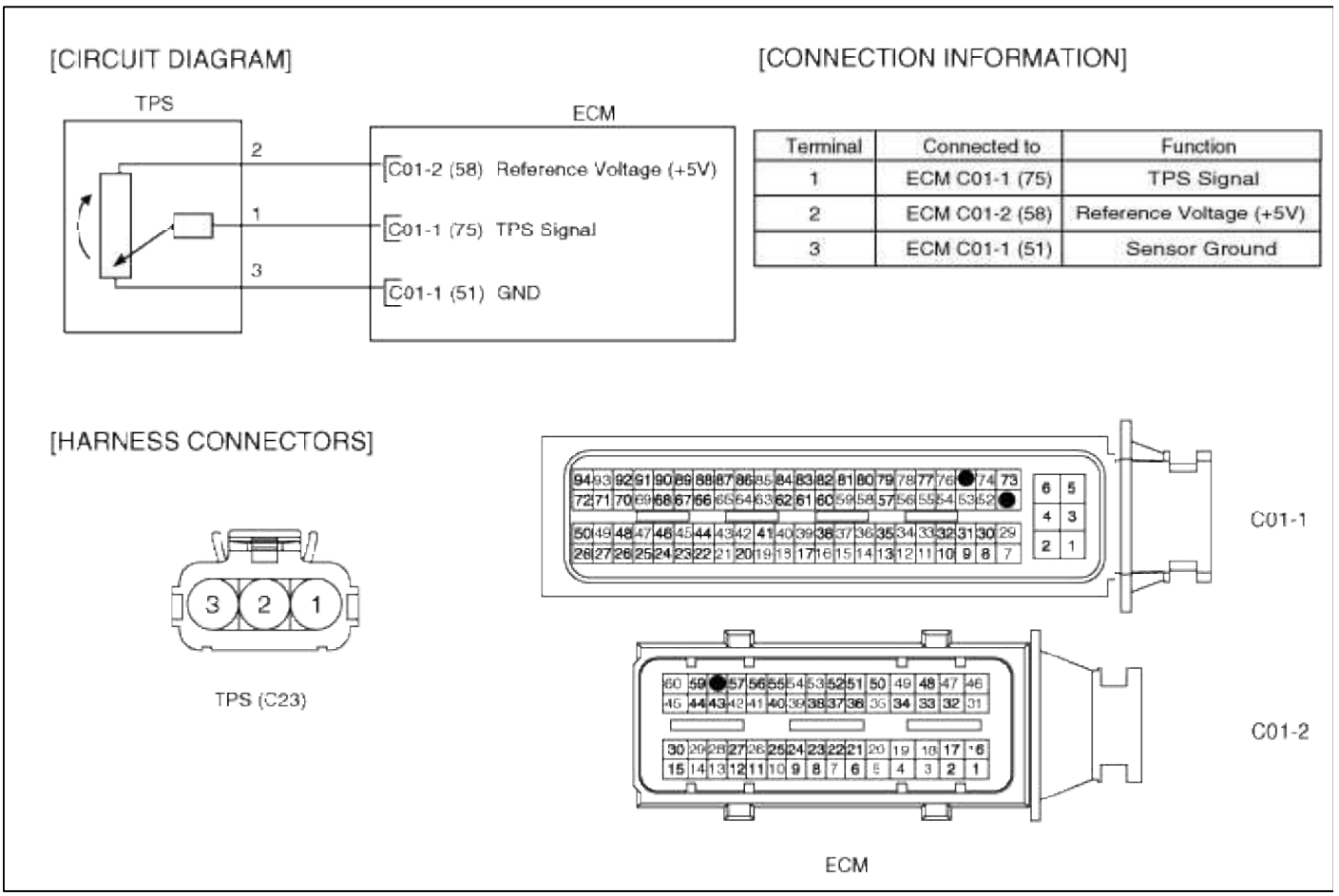


SPECIFICATION

ITEM	Specification
TPS Resistance (kΩ)	1.6 ~ 2.4kΩ at 20°C (68°F)

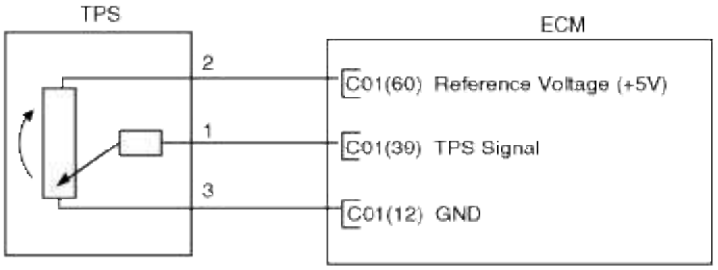
SCHEMATIC DIAGRAM

[AT]



[MT]

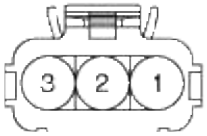
[CIRCUIT DIAGRAM]



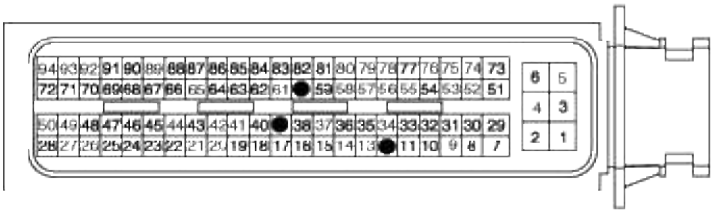
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (39)	TPS Signal
2	ECM C01 (60)	Reference Voltage (+5V)
3	ECM C01 (12)	Sensor Ground

[HARNESS CONNECTORS]



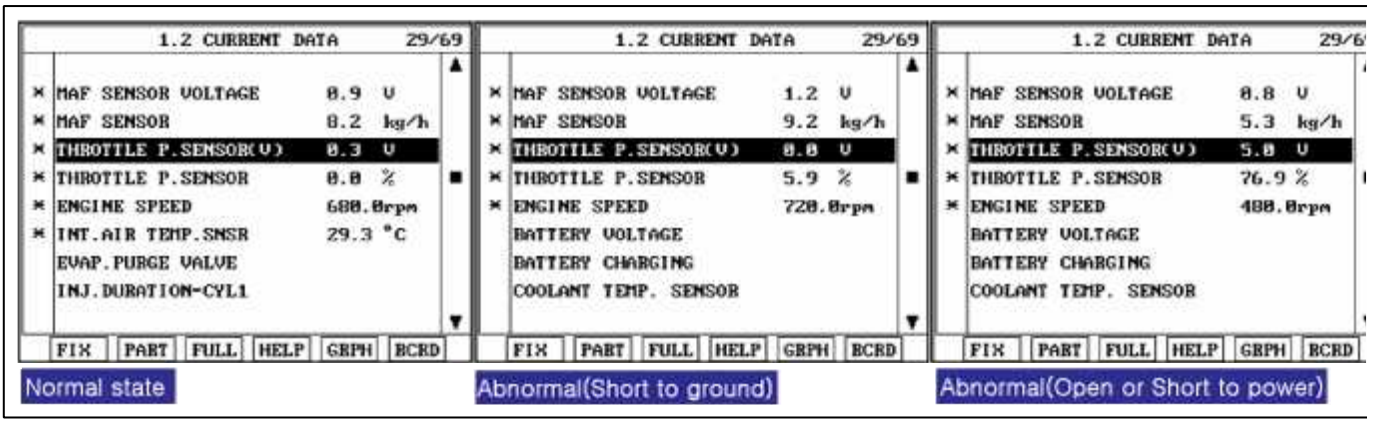
TPS (C23)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "TPS" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

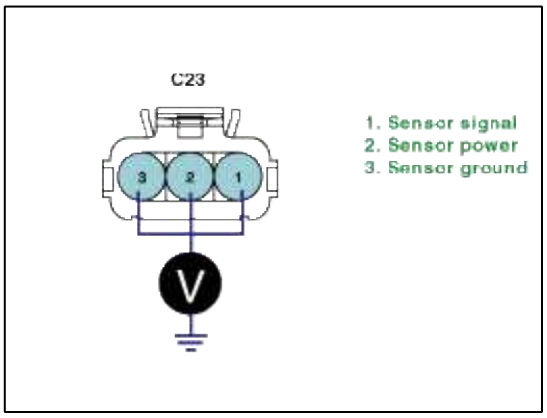
NO

Go to "TPS circuit inspection" procedure.

TPS CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect TPS connector.
3. Key "ON".
4. Measure the voltage between terminal 1, 2, 3 of TPS harness connector and chassis ground.

Specification :
Terminal 1 : Approx. 5V
Terminal 2 : Approx. 5V
Terminal 3 : Approx. 0V



5. Is the measured voltage within specifications?

YES

Go to "Component inspection" procedure.

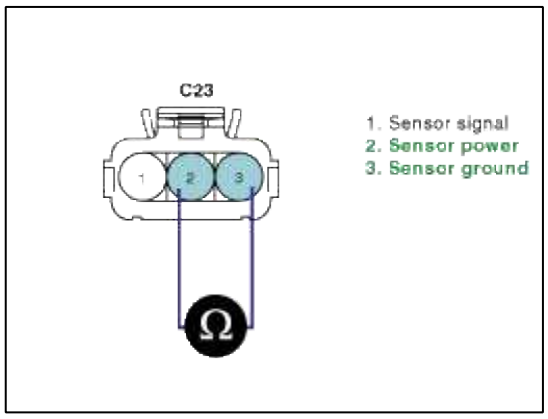
NO

Check for Open or Short in TPS circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check TPS resistance.
   (1) Key "OFF".
   (2) Disconnect TPS connector.
   (3) Measure the resistance between terminal 2 and 3 of TPS component side.
   Specification :

ITEM	Specification
TPS Resistance (kΩ)	1.6 ~ 2.4kΩ at 20°C (68°F)



   (4) Is the measured resistance within specifications?

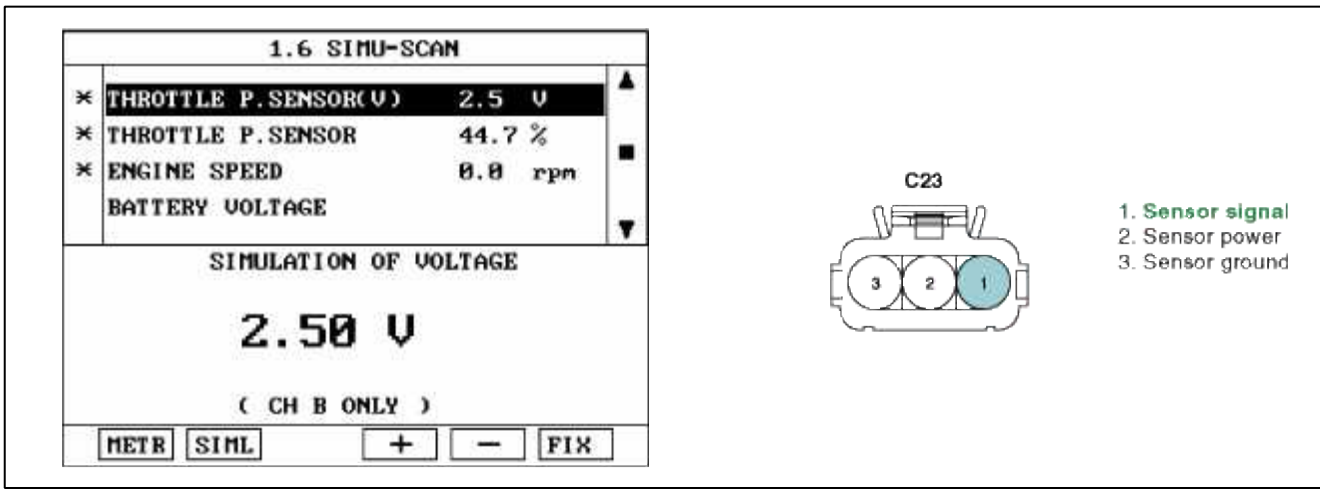
   YES

   Go to "Check ECM/PCM" procedure.

   NO

   Substitute with a known-good TPS and check for proper operation. If the problem iscorrected, replace TPS and then go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) Key "OFF".
   (2) Connect the scantool and select "Simulation SCAN" in the menu.
   (3) Connect channel A of scantool with terminal 1 of TPS harness connector, and key "ON".
   (4) Simulate voltage at signal line.



(5) Does the signal output of TPS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

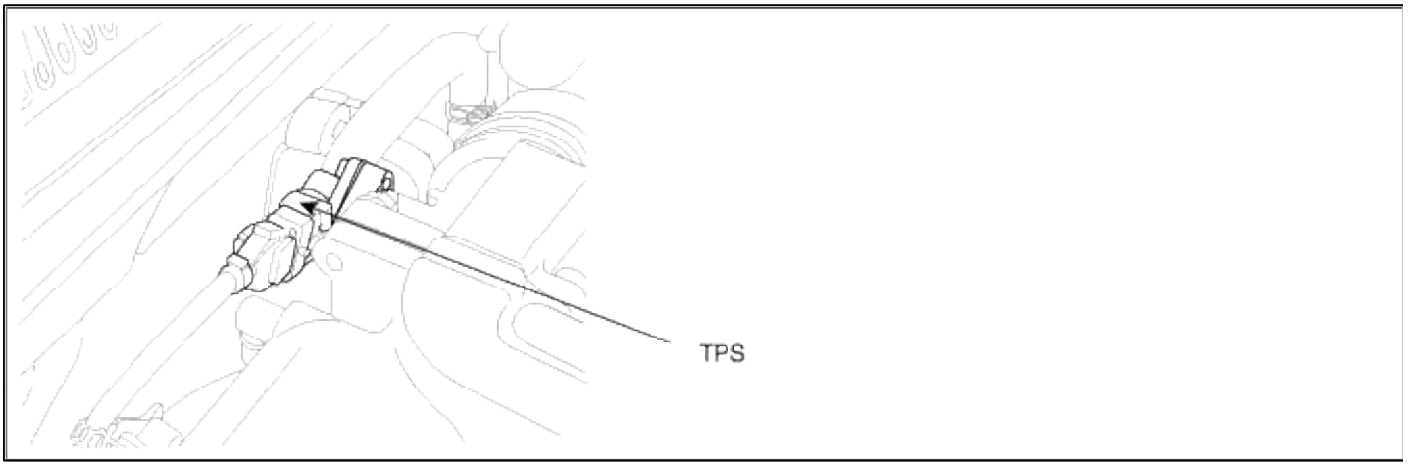
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0122 Throttle/Pedal Position Sensor/Switch \'A\' Circuit Low Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The Throttle Position Sensor (TPS) is mounted on the throttle body and detects the opening angle of the throttle plate.The TPS has a variable resistor (potentiometer) whose characteristic is the resistance changing according to the throttle angle. During acceleration, the TPS resistance between the reference 5V and the signal terminal decreases and output voltage increases; during deceleration, the TPS resistance increases and TPS output voltage decreases.The ECM/PCM supplies a reference 5V to the TPS and the output voltage increases directly with the opening of the throttle valve. The TPS output voltage will vary from 0.2~0.8V at closed throttle to 4.3~4.8V at wide-open throttle.The ECM/PCM determines operating conditions such as idle (closed throttle), part load, acceleration/deceleration, and wide-open throttle from the TPS. Also The ECM/PCM uses the Mass Air Flow Sensor (MAFS) or Manifold Absolute Pressure Sensor (MAPS) signal along with the TPS signal to adjust fuel injection duration and ignition timing.

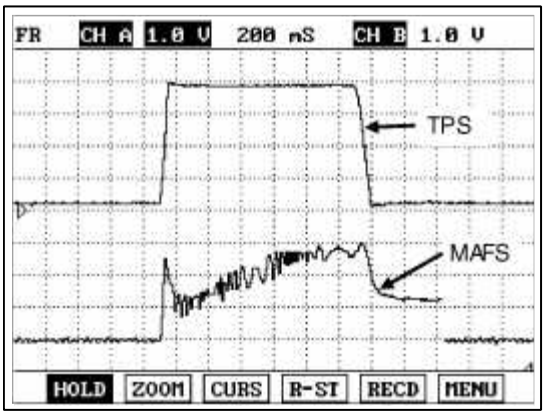
DTC DESCRIPTION

If the sensor input voltage is lower than the minimum threshold value during 0.08 sec under normal driving condition, ECM/PCM sets DTC P0122.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Open or short to ground in power circuit • Short to ground in signal circuit • TPS • ECM/PCM
Enable Conditions	• Engine speed > 600 rpm	
Threshold Value	• Calculated signal from sensor voltage < 3.1%	
Diagnostic Time	• 0.08 sec	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



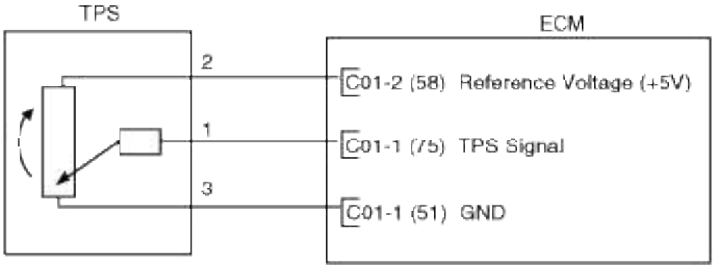
SPECIFICATION

ITEM	Specification
TPS Resistance (kΩ)	1.6 ~ 2.4kΩ at 20°C (68°F)

SCHEMATIC DIAGRAM

[AT]

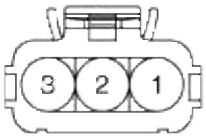
[CIRCUIT DIAGRAM]



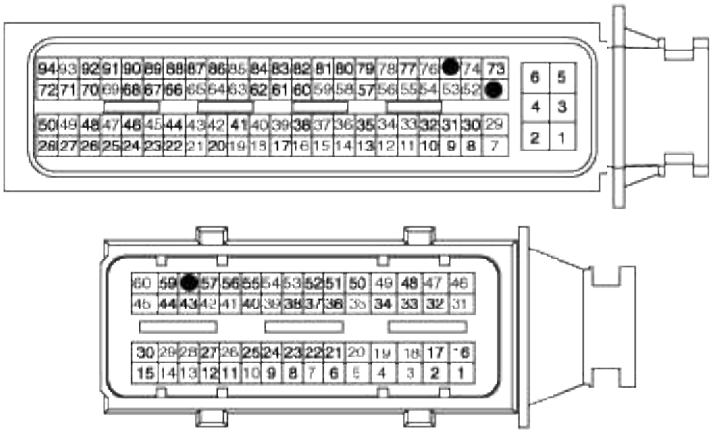
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (75)	TPS Signal
2	ECM C01-2 (58)	Reference Voltage (+5V)
3	ECM C01-1 (51)	Sensor Ground

[HARNESS CONNECTORS]



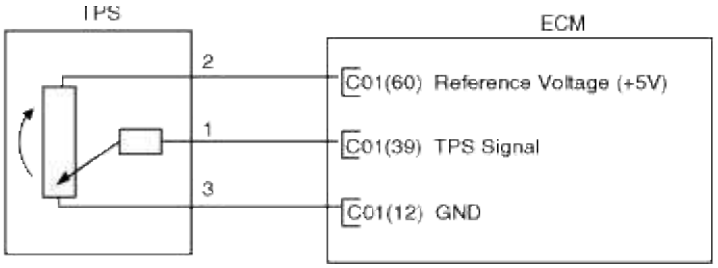
TPS (C23)



ECM

[MT]

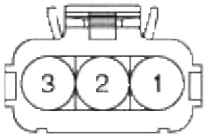
[CIRCUIT DIAGRAM]



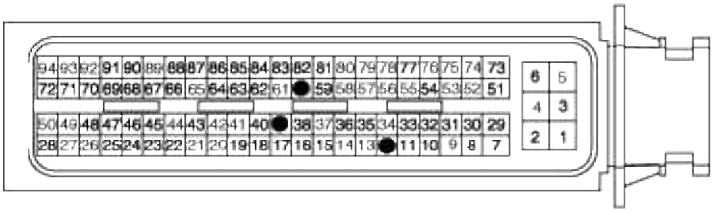
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (39)	TPS Signal
2	ECM C01 (60)	Reference Voltage (+5V)
3	ECM C01 (12)	Sensor Ground

[HARNESS CONNECTORS]



TPS (C23)

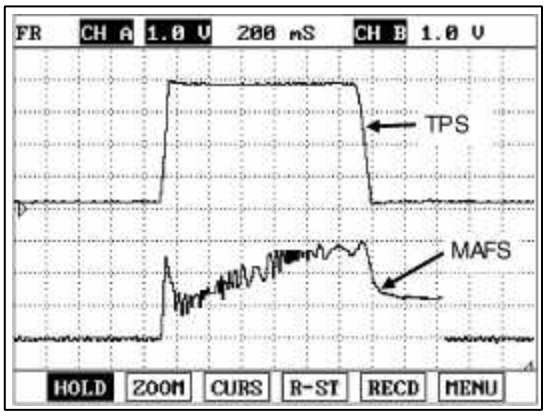


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "TPS" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

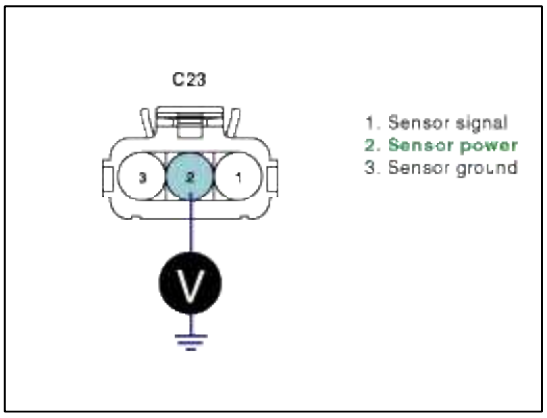
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect TPS connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of TPS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specifications?

YES

Go to "Signal circuit inspection" procedure.

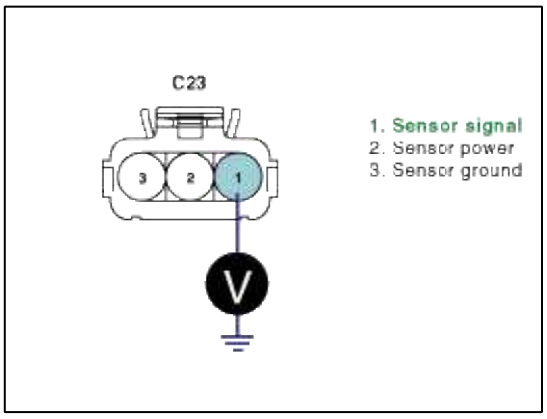
NO

Check for Open or Short to ground in TPS circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect TPS connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of TPS harness connecto and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to ground in signal circuit and go to "Verification of Vehicle Repair" procedure.

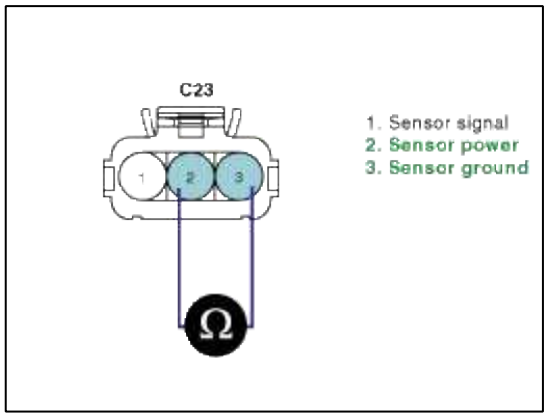
COMPONENT INSPECTION

1. Check TPS resistance.
   (1) Key "OFF".
   (2) Disconnect TPS connector.

(3) Measure the resistance between terminal 2 and 3 of TPS component side.

Specification :

ITEM	Specification
TPS Resistance (kΩ)	1.6 ~ 2.4kΩ at 20°C (68°F)



(4) Is the measured resistance within specifications?

YES

Go to "Check ECM/PCM" procedure.

NO

Substitute with a known-good TPS and check for proper operation. If the problem iscorrected, replace TPS and then go to "Verification of Vehicle Repair" procedure.

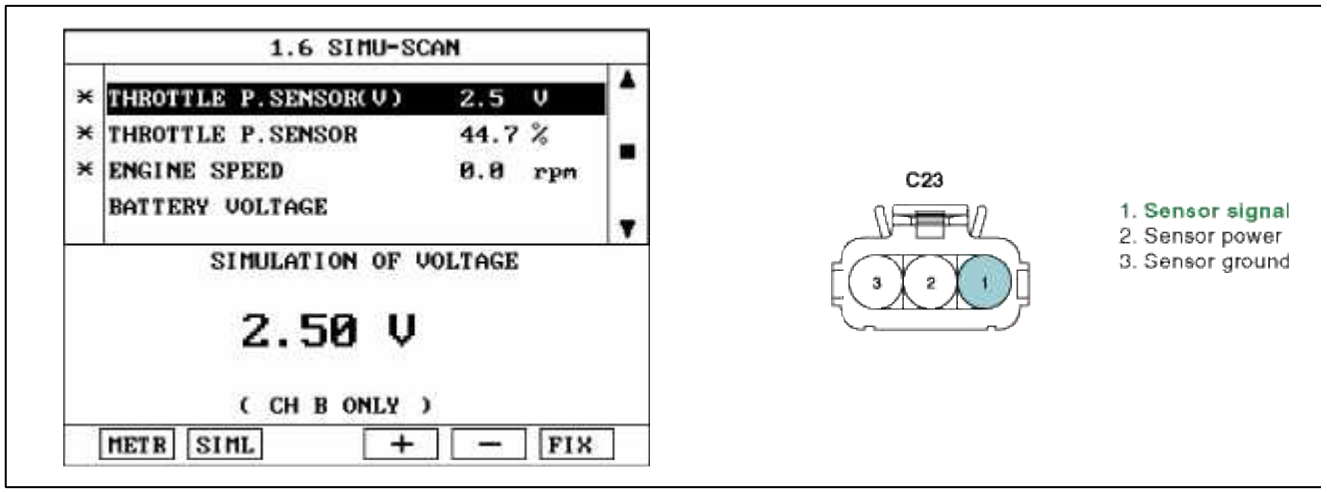
2. Check ECM/PCM.

(1) Key "OFF".

(2) Connect the scantool and select "Simulation SCAN" in the menu.

(3) Connect channel A of scantool with terminal 1 of TPS harness connector, and key "ON".

(4) Simulate voltage at signal line.



(5) Does the signal output of TPS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.

If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

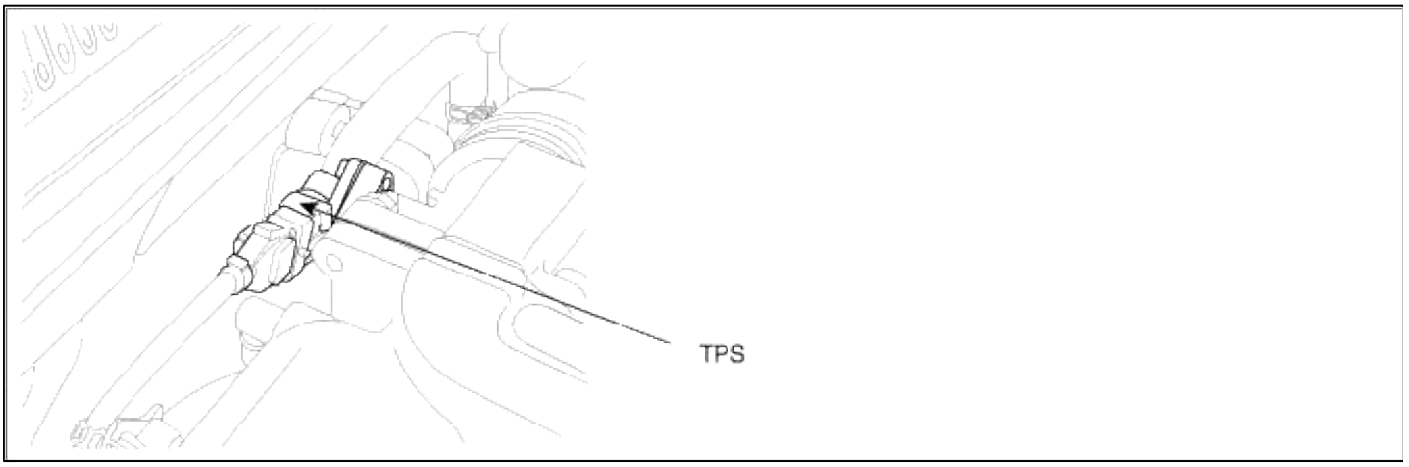
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0123 Throttle/Pedal Position Sensor/Switch \'A\' Circuit High Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The Throttle Position Sensor (TPS) is mounted on the throttle body and detects the opening angle of the throttle plate.The TPS has a variable resistor (potentiometer) whose characteristic is the resistance changing according to the throttle angle. During acceleration, the TPS resistance between the reference 5V and the signal terminal decreases and output voltage increases; during deceleration, the TPS resistance increases and TPS output voltage decreases.The ECM/PCM supplies a reference 5V to the TPS and the output voltage increases directly with the opening of the throttle valve. The TPS output voltage will vary from 0.2~0.8V at closed throttle to 4.3~4.8V at wide-open throttle.The ECM/PCM determines operating conditions such as idle (closed throttle), part load, acceleration/deceleration, and wide-open throttle from the TPS. Also The ECM/PCM uses the Mass Air Flow Sensor (MAFS) or Manifold Absolute Pressure Sensor (MAPS) signal along with the TPS signal to adjust fuel injection duration and ignition timing.

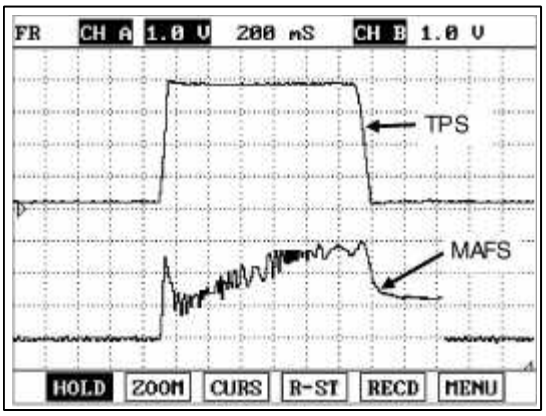
DTC DESCRIPTION

If the sensor input voltage is higher than the maximum threshold value during 0.08 sec under normal driving condition, ECM/PCM sets DTC P0123.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Open or short to power in signal circuit • Open in ground circuit • TPS • ECM/PCM
Enable Conditions	• Engine speed > 600 rpm	
Threshold Value	• Calculated signal from sensor voltage > 95.7%	
Diagnostic Time	• 0.08 sec	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



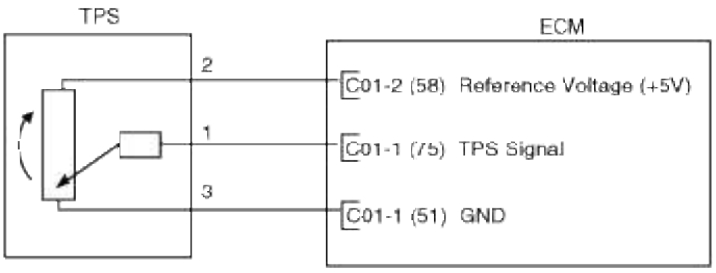
SPECIFICATION

ITEM	Specification
TPS Resistance (kΩ)	1.6 ~ 2.4kΩ at 20°C (68°F)

SCHEMATIC DIAGRAM

[AT]

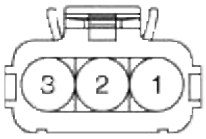
[CIRCUIT DIAGRAM]



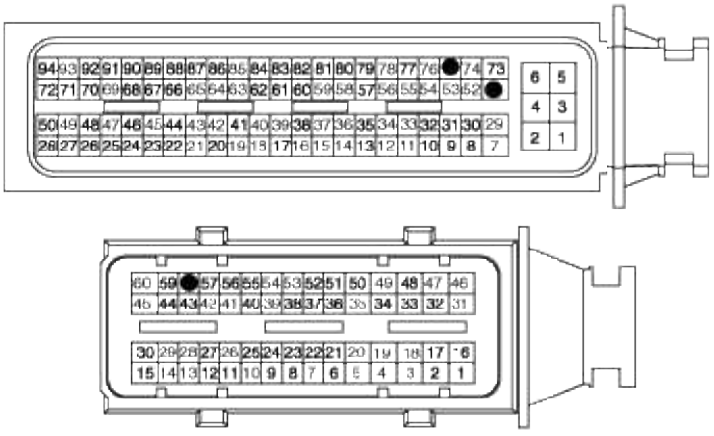
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (75)	TPS Signal
2	ECM C01-2 (58)	Reference Voltage (+5V)
3	ECM C01-1 (51)	Sensor Ground

[HARNESS CONNECTORS]



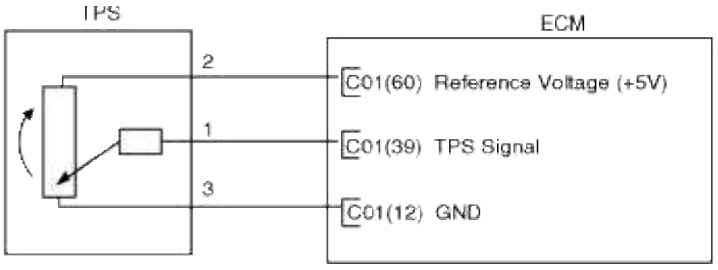
TPS (C23)



ECM

[MT]

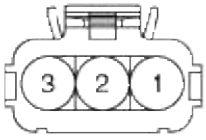
[CIRCUIT DIAGRAM]



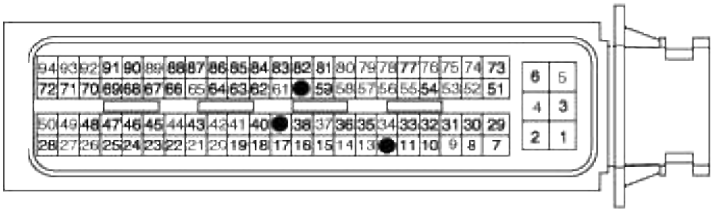
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (39)	TPS Signal
2	ECM C01 (60)	Reference Voltage (+5V)
3	ECM C01 (12)	Sensor Ground

[HARNESS CONNECTORS]



TPS (C23)

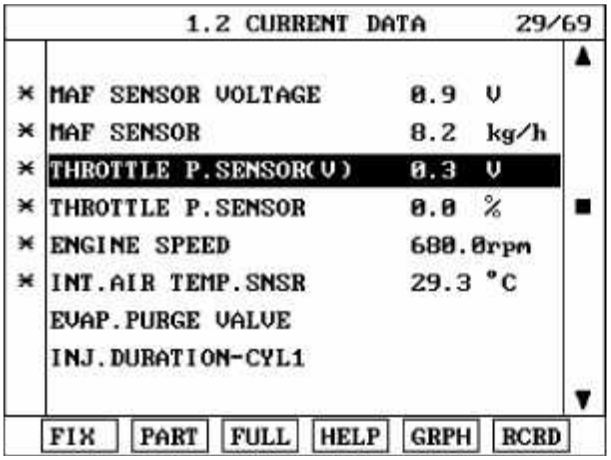


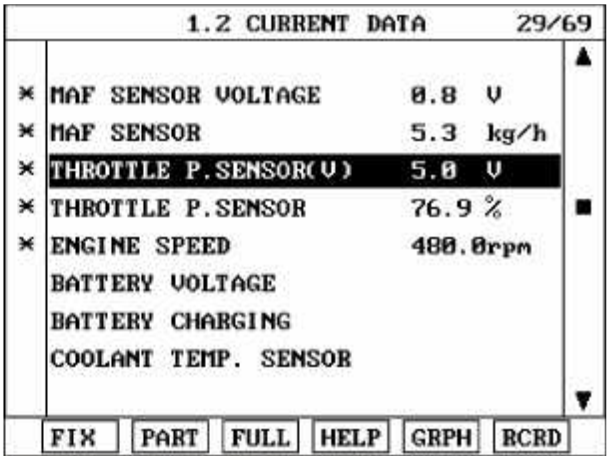
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "TPS" parameters on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

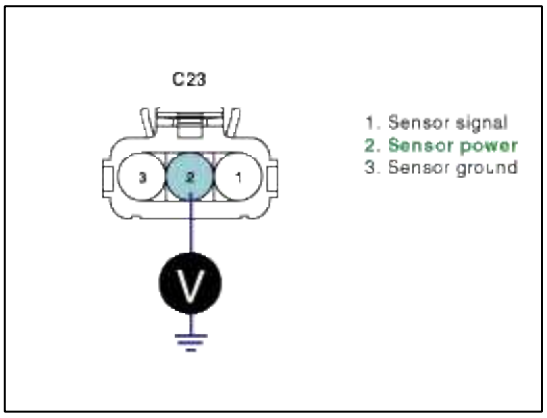
Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect TPS connector.
3. Key "ON".

4. Measure the voltage between terminal 2 of TPS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specifications?

YES

Go to "Ground circuit inspection" procedure.

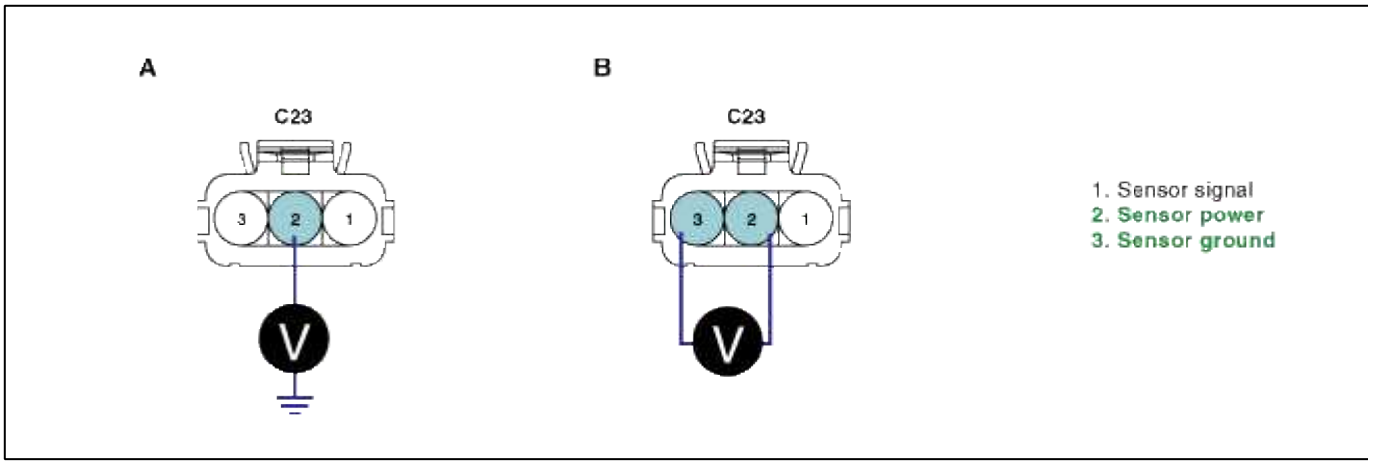
NO

Check for Open or Short to ground in TPS circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect TPS connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of TPS harness connector and chassis ground.(A)
5. Measure the voltage between terminal 2 and 3 of TPS harness connector.(B)

Specification : "A" - "B" = Below 200mV



6. Is the measured voltage within specifications?

YES

Go to "Signal circuit inspection" procedure.

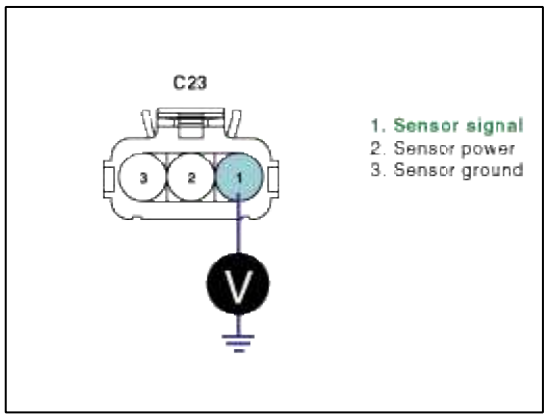
NO

Check for Open in ground circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for open in signal circuit.
   (1) Key "OFF".
   (2) Disconnect TPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 1 of TPS harness connector and chassis ground.

   Specification : Approx. 5V



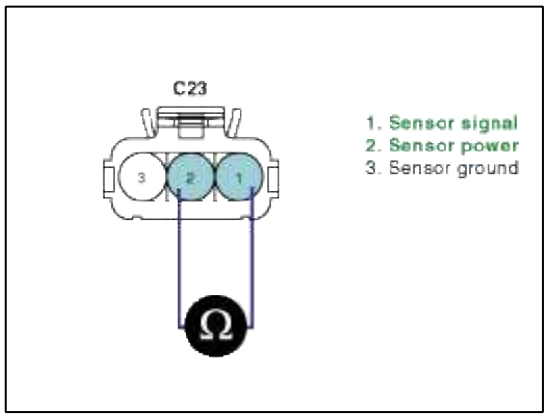
   (5) Is the measured voltage within specification?

   YES
   Go to "Check for Short in signal circuit" procedure.

   NO
   Repair Open or Short to power in signal circuit and go to "Verification of Vehicle Repair" procedure.

2. Check for short in signal circuit.
   (1) Key "OFF".
   (2) Disconnect TPS connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 1 and 2 of TPS harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specification ?

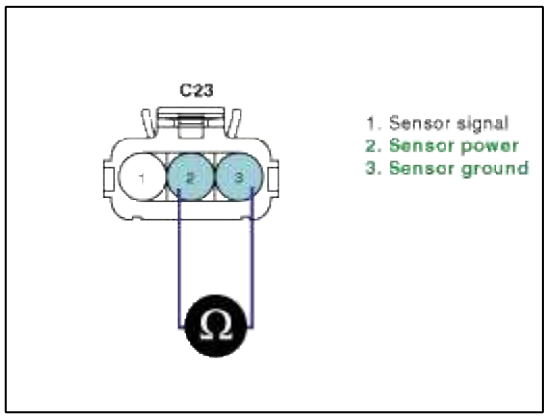
   YES
   Go to "Component inspection" procedure.

   NO
   Repair Short to power in signal circuit and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check TPS resistance.
   (1) Key "OFF".
   (2) Disconnect TPS harness connector.
   (3) Measure the resistance between terminal 2 and 3 of TPS component side connector.
   Specification :

ITEM	Specification
TPS Resistance (kΩ)	1.6 ~ 2.4kΩ at 20°C (68°F)



   (4) Is the measured resistance within specifications?

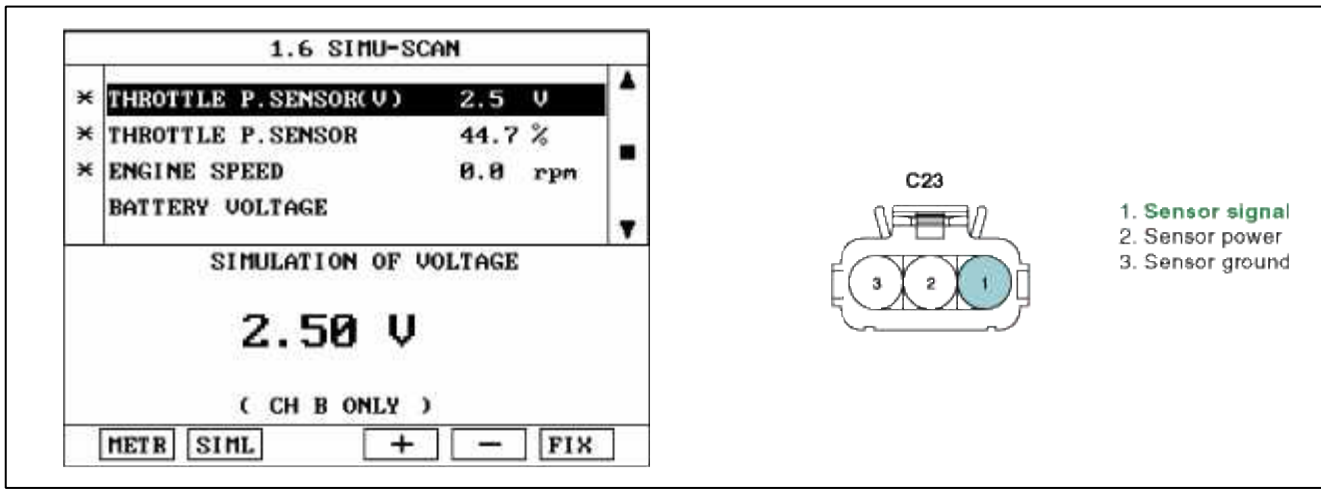
   YES

   Go to "Check ECM/PCM" procedure.

   NO

   Substitute with a known-good TPS and check for proper operation. If the problem iscorrected, replace TPS and then go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) Key "OFF".
   (2) Connect the scantool and select "Simulation SCAN" in the menu.
   (3) Connect channel A of scantool with terminal 1 of TPS harness connector, and key "ON".
   (4) Simulate voltage at signal line.



(5) Does the signal output of TPS change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

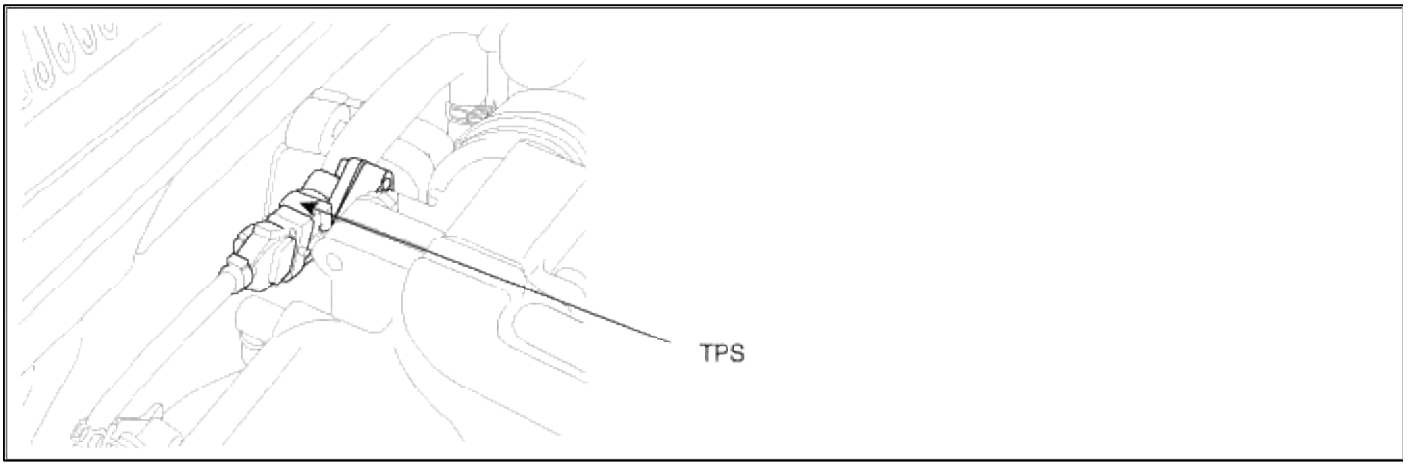
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0124 Throttle/Pedal Position Sensor/Switch \'A\' Circuit Intermittent

COMPONENT LOCATION



GENERAL DESCRIPTION

The Throttle Position Sensor (TPS) is mounted on the throttle body and detects the opening angle of the throttle plate.The TPS has a variable resistor (potentiometer) whose characteristic is the resistance changing according to the throttle angle. During acceleration, the TPS resistance between the reference 5V and the signal terminal decreases and output voltage increases; during deceleration, the TPS resistance increases and TPS output voltage decreases.The ECM/PCM supplies a reference 5V to the TPS and the output voltage increases directly with the opening of the throttle valve. The TPS output voltage will vary from 0.2~0.8V at closed throttle to 4.3~4.8V at wide-open throttle.The ECM/PCM determines operating conditions such as idle (closed throttle), part load, acceleration/deceleration, and wide-open throttle from the TPS. Also The ECM/PCM uses the Mass Air Flow Sensor (MAFS) or Manifold Absolute Pressure Sensor (MAPS) signal along with the TPS signal to adjust fuel injection duration and ignition timing.

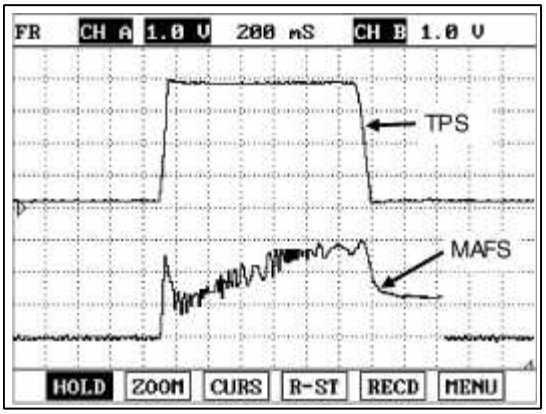
DTC DESCRIPTION

If the difference between modeled relative load and measured relative load is over the threshold value according to throttle position under enable conditions, ECM/PCM sets DTC P0124.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Poor connection • TPS • ECM/PCM
Enable Conditions	• Rate of change of throttle angle < 0.1221% • Engine speed > 600rpm • Coolant temperature > 75°C (167°F) • Rate of change of predicted eng. load < 15% • Altitude > 0m (0 ft) • Time in idling > 30s	
Threshold Value	• Difference between modeled relative load and measured relative load > threshold f(throttle position)	
Diagnostic Time	• 2.5sec	
MIL ON Condition	• DTC only	

SIGNAL WAVEFORM & DATA



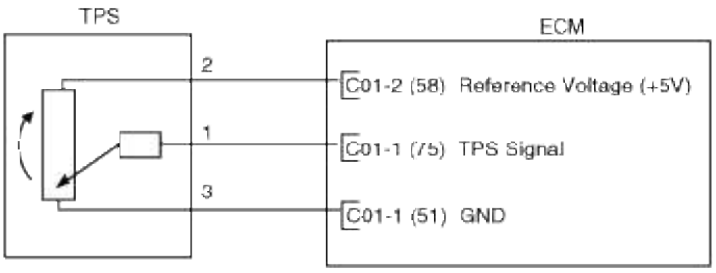
SPECIFICATION

ITEM	Specification
TPS Resistance (kΩ)	1.6 ~ 2.4kΩ at 20°C (68°F)

SCHEMATIC DIAGRAM

[AT]

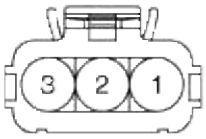
[CIRCUIT DIAGRAM]



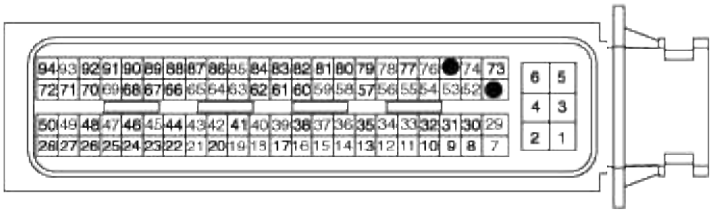
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (75)	TPS Signal
2	ECM C01-2 (58)	Reference Voltage (+5V)
3	ECM C01-1 (51)	Sensor Ground

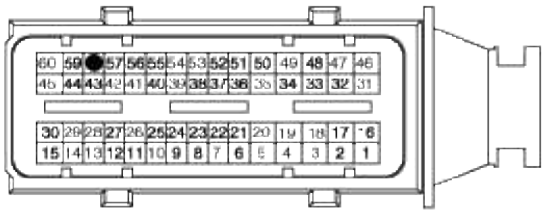
[HARNESS CONNECTORS]



TPS (C23)



C01-1

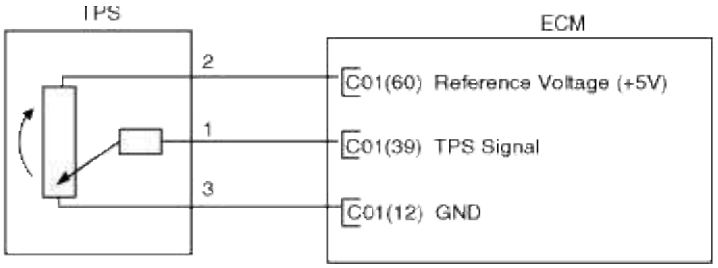


C01-2

ECM

[MT]

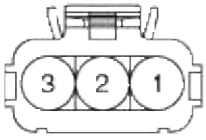
[CIRCUIT DIAGRAM]



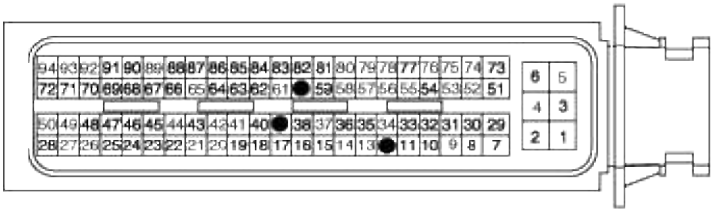
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (39)	TPS Signal
2	ECM C01 (60)	Reference Voltage (+5V)
3	ECM C01 (12)	Sensor Ground

[HARNESS CONNECTORS]



TPS (C23)

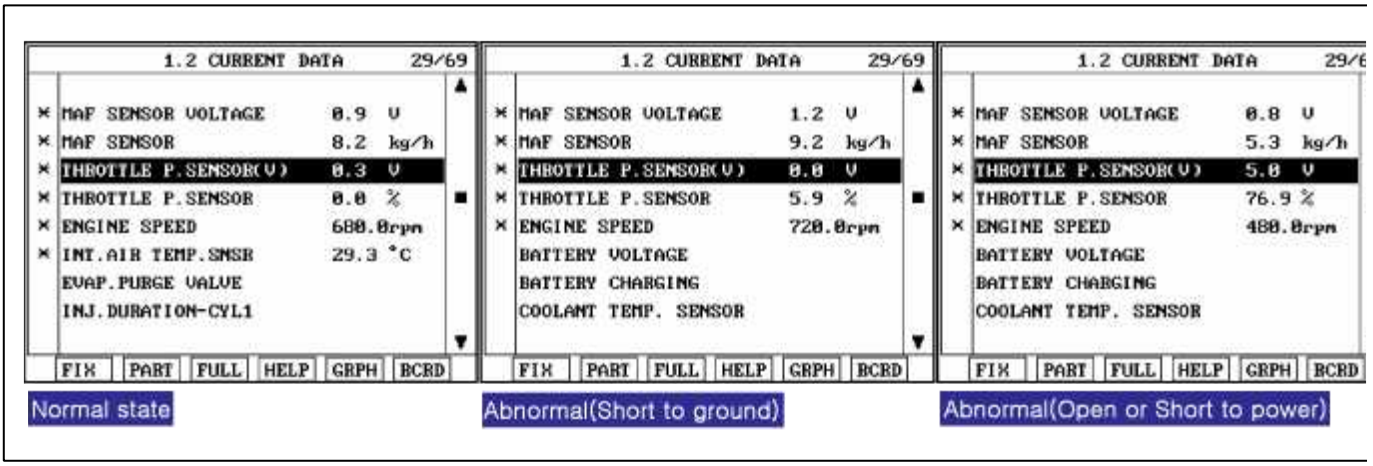


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "TPS" parameters on the scantool.



4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, tamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

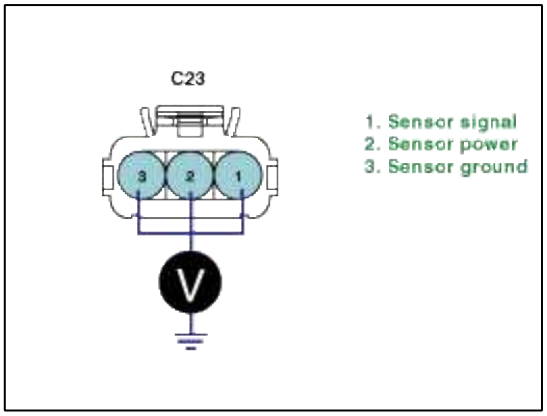
Go to "TPS circuit inspection" procedure.

TPS CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect TPS connector.
3. Ignition "ON"

4. Measure voltage between terminal "1","2" and "3" of sensor harness connector and chassis ground

Specification :
Terminal 1 : Approx. 5V
Terminal 2 : Approx. 5V
Terminal 3 : Approx. 0V



5. Is the measured voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

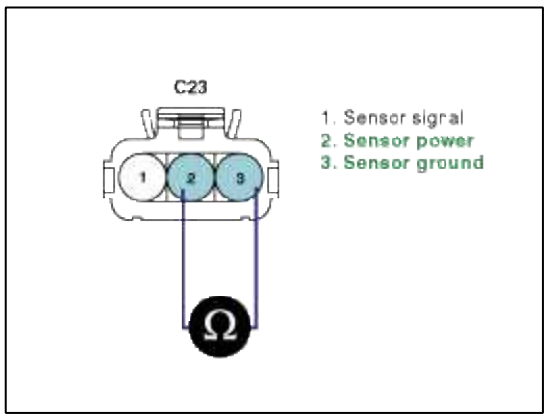
Check for Open or Short in TPS circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check TPS.
   (1) Ignition "OFF"
   (2) Disconnect TPS connector
   (3) Measure resistance terminal 2 and 3 of TPS Component side connector.

Specification :

ITEM	Specification
TPS Resistance (kΩ)	1.6 ~ 2.4kΩ at 20°C (68°F)



(4) Is the measured resistance within specifications?

YES

Go to "Check ECM/PCM" procedure.

NO

Check TPS for contamination, deterioration, or damage. Substitute with a known-good TPS andcheck for proper operation. If the problem is corrected, replace TPS and then go to "Verification of Vehicle Repair" procedure.

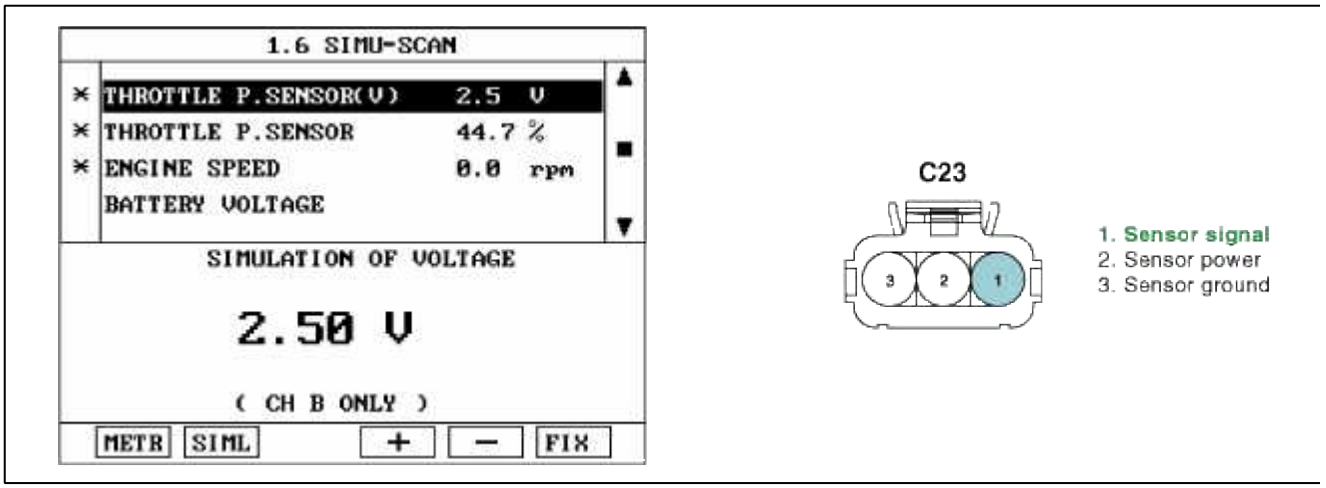
2. Check ECM/PCM.

(1) Ignition "OFF"

(2) Connect the scantool and select "Simulation SCAN" in the menu.

(3) Connect channel A of scantool with terminal 1 of TPS harness connector, and key "ON".

(4) Simulate voltage at signal line.



(5) Is TPS signal value changed according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deteriorati damage. Repair or replace as necessary and then go to "Verification of VehicleRepair" procedure..

NO

Substitute with a known-good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

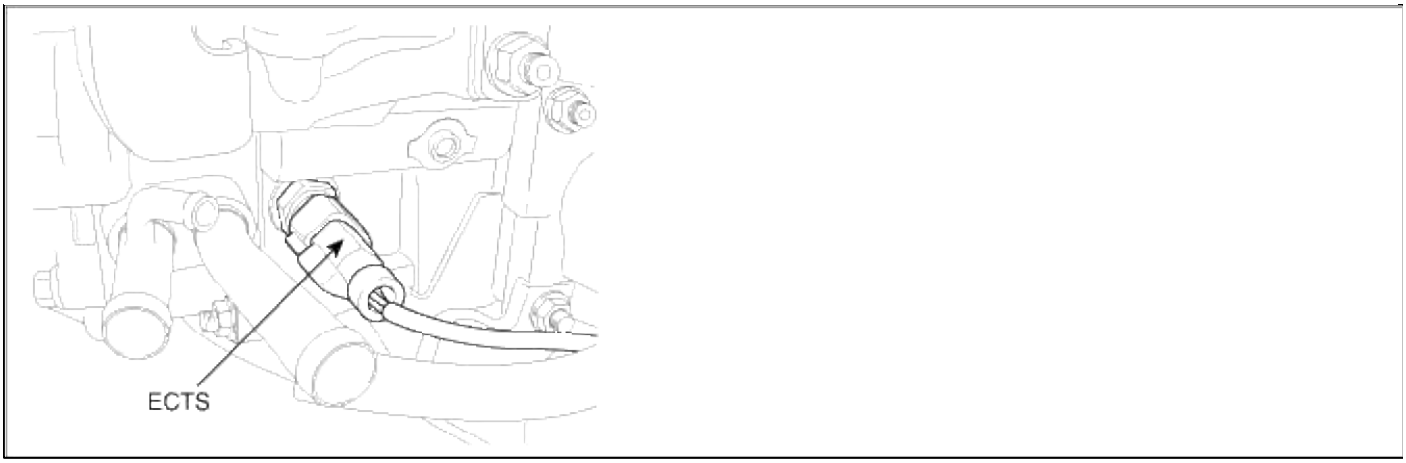
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0128 Coolant Thermostat (Coolant Temperature below Thermostat Regulating Temperature)

COMPONENT LOCATION



GENERAL DESCRIPTION

The Thermostat is a mechanical (thermal) device located in an engine coolant passage that allows passage of coolant into the radiator once the coolant has reached a manufacturer specified temperature called the Regulating Temperature. It has a metallic frame with a spring-loaded,centrally mounted, wax filled cylinder/piston assembly that expands and contracts with changes in temperature, thereby controlling the passage of coolant into the radiator.

DTC DESCRIPTION

If the engine coolant temperature does not reach the specified value within the allocated period, the ECM/PCM sets DTC P0128.

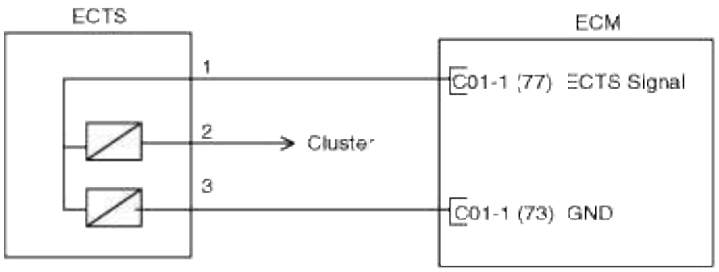
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Coolant temperature Check	• Poor connection • Thermostat
Enable Conditions	• Ambient temperature (model): -7.5~45°C(18.5~113°F) • Engine speed : 600~5000rpm • Integrated air mass > 0.18kg (0.4 lb) • Soak time (model) > 21600s • Coolant temperature at start:-7.5~45°C (18.5~113°F) • Cranking intake air temp - int. air temp > 7.5°C (45.5°F) • Low speed drive (<25MPH) ratio < 0.7 • Coolant temp. sensor diagnosis finished without error	
Threshold Value	• Coolant temperature when the accumulated air mass reaches a threshold, f(start coolant temp., amb. temp.) < 75.8°C (168.4°F)	
Diagnostic Time	• 3 sec	
MIL ON Condition	• 2 driving cycle	

SCHEMATIC DIAGRAM

[AT]

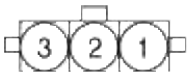
[CIRCUIT DIAGRAM]



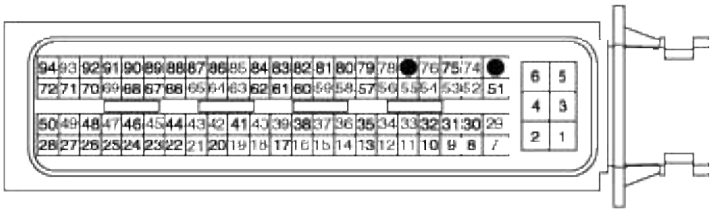
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (77)	ECTS Signal
2	Cluster	-
3	ECM C01-1 (73)	Sensor Ground

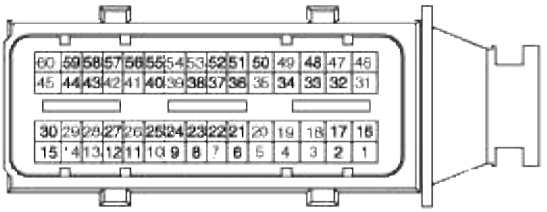
[HARNESS CONNECTORS]



ECTS (C27)



C01-1

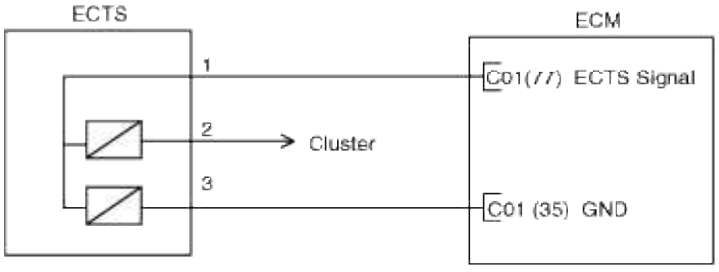


C01-2

ECM

[MT]

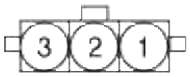
[CIRCUIT DIAGRAM]



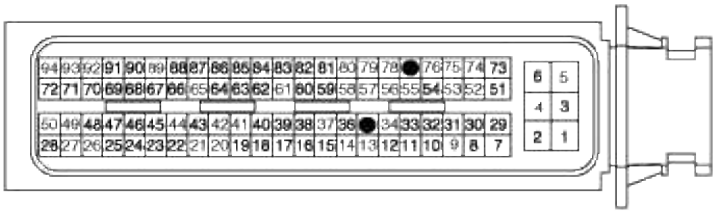
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (77)	ECTS Signal
2	Cluster	-
3	ECM C01 (35)	Sensor Ground

[HARNESS CONNECTORS]



ECTS (C27)

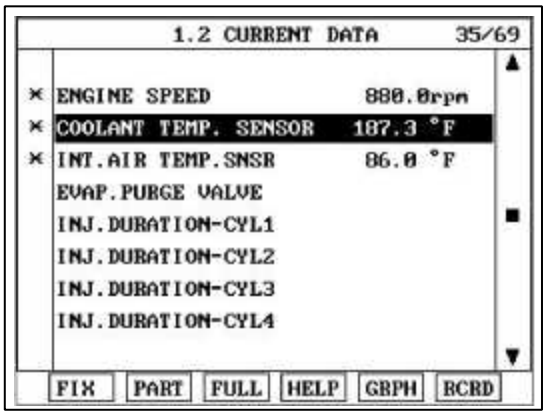


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).

2. Warm up the engine to normal operating temperature.
3. Monitor "ECTS" parameter on scantool.



4. Is the "ECTS" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure

NO

Go to "Component Inspection" procedure.

COMPONENT INSPECTION

1. Check Thermostat.
   (1) Check cooling system coolant level and fill if low.
   (2) Check for a proper cooling system operation. Especially check that cooling and condenser fanworking normally.
   (3) Remove the thermostat and check the following items:
      A. Stuck or damaged
      B. Verify the temperature at which the valve is open
         : 80 ~84°C(176~183.2°F)
   (4) Has a problem been found?

YES

Substitute with a known - good Thermostat and check for proper operation. If the problem is corrected, replace Thermostat and go to "Verification of Vehicle Repair" proprocedure.

NO

Go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

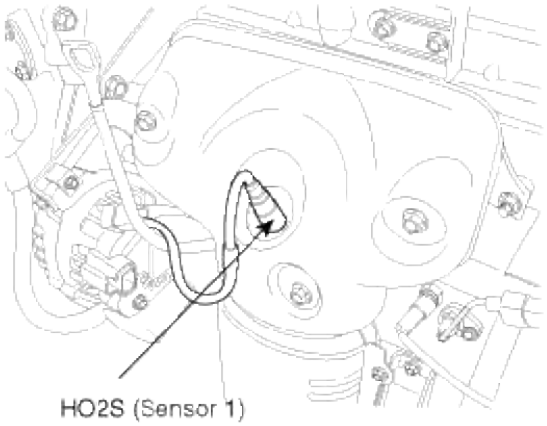
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

COMPONENT LOCATION



GENERAL DESCRIPTION

The heated oxygen sensors are mounted on the front side and the rear side of Catalytic Converter (warm-up catalytic converter), which detects the oxygen concentration in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation. The heated oxygen sensor (HO2S) produces a voltage that varies between 0V and 1V. When the air/fuel ratio is lean, the oxygen concentration in the exhaust gas increases and the front HO2S outputs a low voltage (approximately 0 ~ 0.4 V).When the air/fuel ratio is rich, the oxygen concentration in the exhaust gas decreases and the front HO2S outputs a high voltage (approximately 0.6 ~ 1 V). The ECM/PCM constantly monitors the HO2S and increases or decreases the fuel injection duration by using the HO2S signal, which is called closed-loop fuel control operation.

DTC DESCRIPTION

If ECM/PCM detects that the output signal satisfies the threshold values under enable conditions, ECM/PCM sets DTC P0130.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

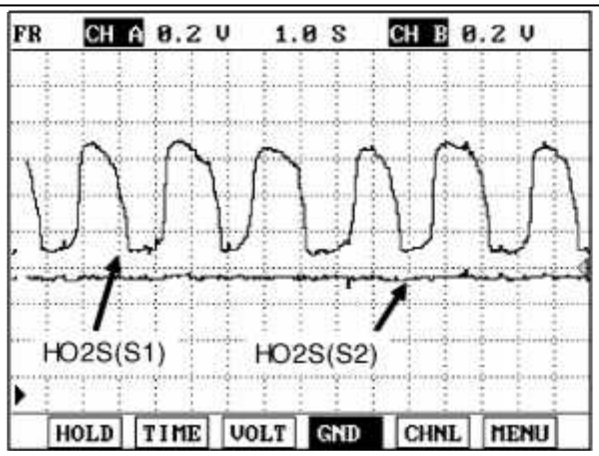
DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Rationality check	• Poor connection • Open or short power/ground in signal circuit
General Enable Conditions		• Dew point end detected • Required lambda = 1 • Battery voltage > 10.7V • Exhaust gas temperature (model) < 800°C (1472°F) • Heater control enabled	
Case1	Enable Conditions	• B1S2 sensor voltage > 0.5V	
	Threshold Value	• B1S1 sensor voltage : 0.06 ~ 0.4V	
	Diagnostic Time	• 25 sec	

Case2	Enable Conditions	• B1S2 sensor voltage < 0.1V	• B1S1 • ECM/PCM
	Threshold Value	• B1S1 sensor voltage : 0.6 ~ 1.08V	
	Diagnostic Time	• 10 sec	
Case3	Enable Conditions	• Time after dew point end detected > 10s	
	Threshold Value	• Counter of l Δusvk > 2V during 0.04 secafter heater on→off l > 5 times	
MIL ONCondition		• 2 driving cycle	

Δusvk : Sum of the signal voltage change value (B1S1)
B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



If you release the accelerator pedal suddenly after engine running about 4000 rpm, fuel supply will stop for short period and the O2 sensor service data in the Hi-Scan (Pro) will display values 200mV or lower.
When you suddenly press on the accelerator pedal down, the voltage will reach 0.6 ~ 1.0 V.
When you let the engine idle again, the voltage will fluctuate between 200 mV or lower and 0.6 ~ 1.0 V.
In this case, the O2sensor can be determined as good.

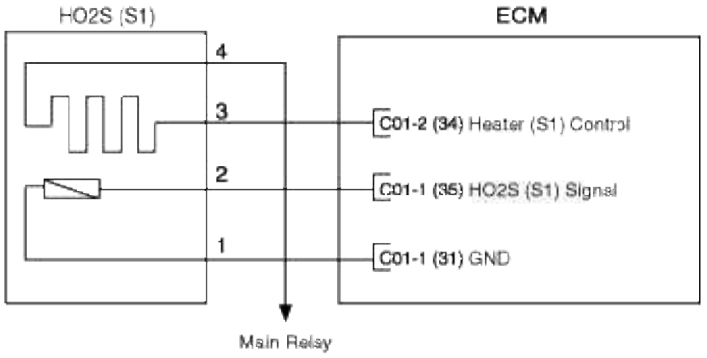
SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

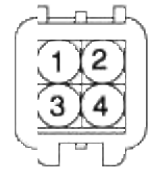
[CIRCUIT DIAGRAM]



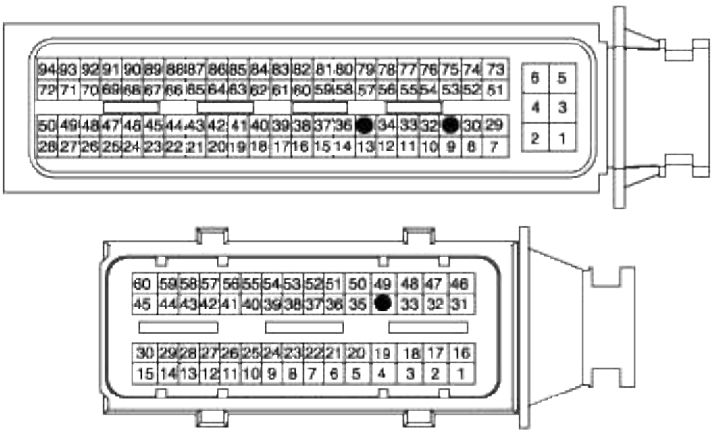
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

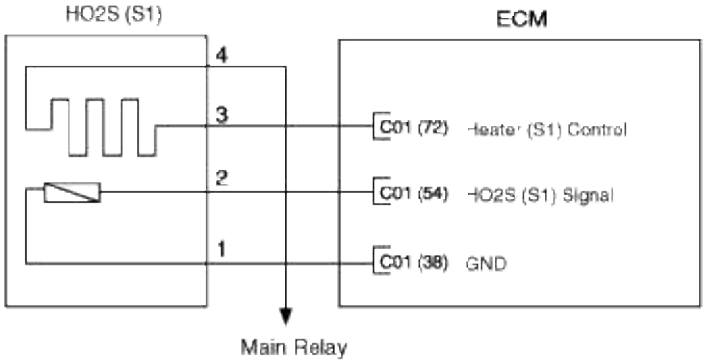


HO2S [S1] (C18)



(M/T)

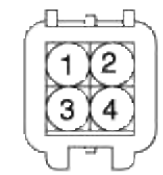
[CIRCUIT DIAGRAM]



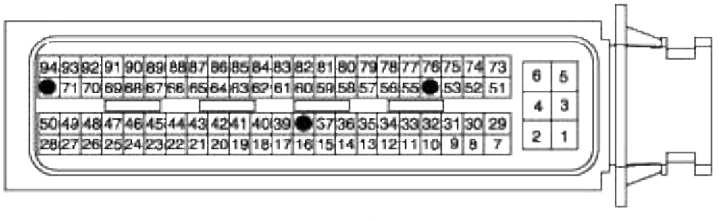
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

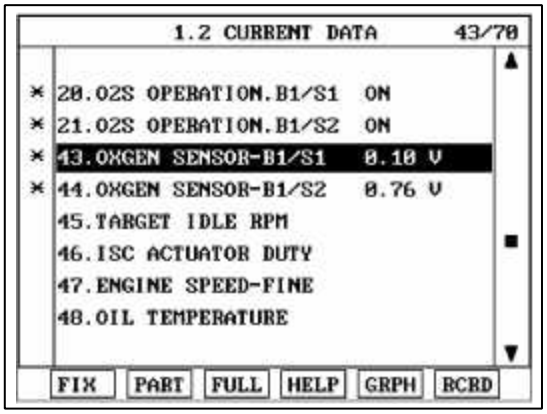


HO2S [S1] (C18)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter operating correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

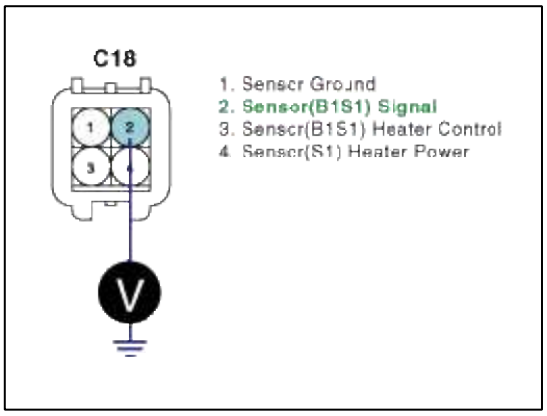
Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S1) connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of HO2S(B1/S1) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Ground Circuit Inspection" procedure.

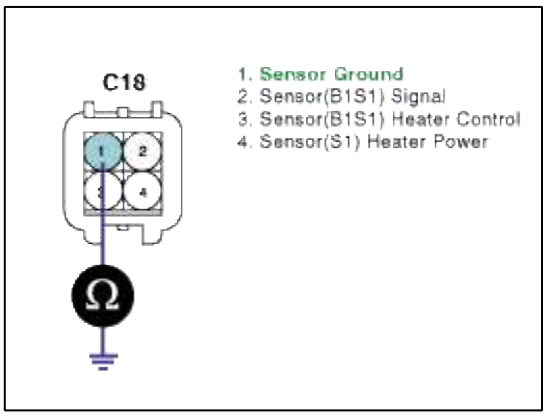
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

GROUND CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S1) connector.
3. Measure resistance between terminal 1 of HO2S(B1/S1) and chassis ground.

Specification : Approx. below 1Ω



4. Is the measured resistance within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S1) connector.
   (3) Check that HO2S(B1S1) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

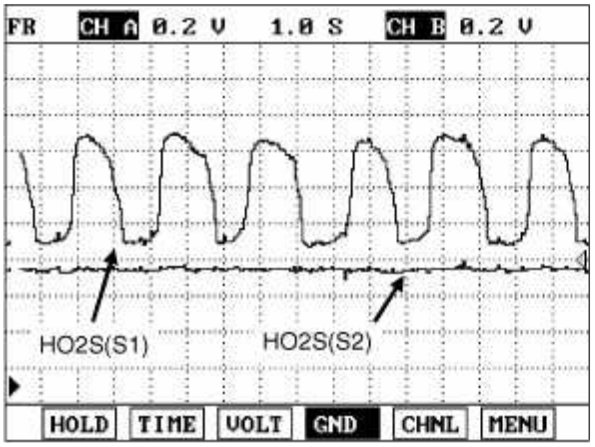
   YES

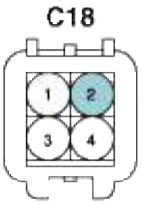
   Go to "Check HO2S(B1/S1) performance" as follows.

   NO

   Substitute with a known - good HO2S(B1/S1) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.

2. Check HO2S(B1/S1) performance.
   (1) IG "OFF".
   (2) Connect probe to terminal 2 of HO2S(B1/S1) connector and select oscilloscope function with scantool.
   (3) Warm up the engine to normal operating temperature.
   (4) Measure signal waveform of HO2S(B1/S1) with scantool.





1. Sensor Ground
2. Sensor(B1S1) Signal
3. Sensor(B1S1) Heater Control
4. Sensor(S1) Heater Power

   (1) Is the measured signal waveform within specification?

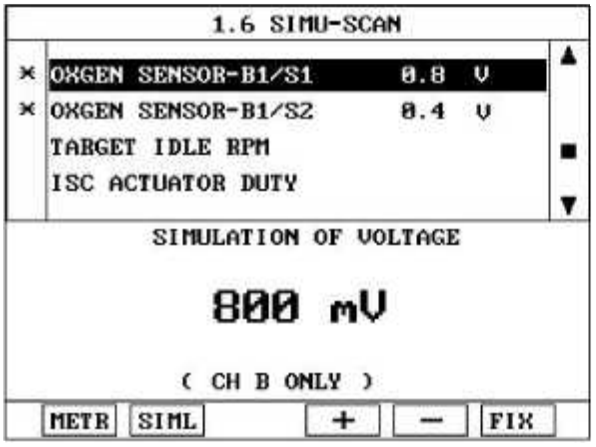
   YES

   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good HO2S(B1/S1) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.

3. Check ECM/PCM.
   (1) IG "OFF" and disconnect B1S1 connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 2 of HO2S(B1/S1) signal connector.





   (1) Does the signal value of HO2S(B1/S1) change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati or damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

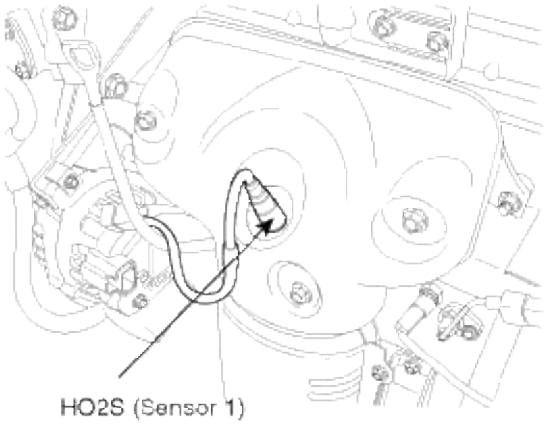
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0131 O2 Sensor Circuit Low Voltage(Bank 1 / Sensor 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

The heated oxygen sensors are mounted on the front side and the rear side of Catalytic Converter (warm-up catalytic converter), which detects the oxygen concentration in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation. The heated oxygen sensor (HO2S) produces a voltage that varies between 0V and 1V. When the air/fuel ratio is lean, the oxygen concentration in the exhaust gas increases and the front HO2S outputs a low voltage (approximately 0 ~ 0.4 V).When the air/fuel ratio is rich, the oxygen concentration in the exhaust gas decreases and the front HO2S outputs a high voltage (approximately 0.8 ~ 0.6 V). The ECM/PCM constantly monitors the HO2S and increases or decreases the fuel injection duration by using the HO2S signal, which is called closed-loop fuel control operation.

DTC DESCRIPTION

If the sensor output is below 0.06 V under enable conditions, ECM/PCM sets DTC P0131.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

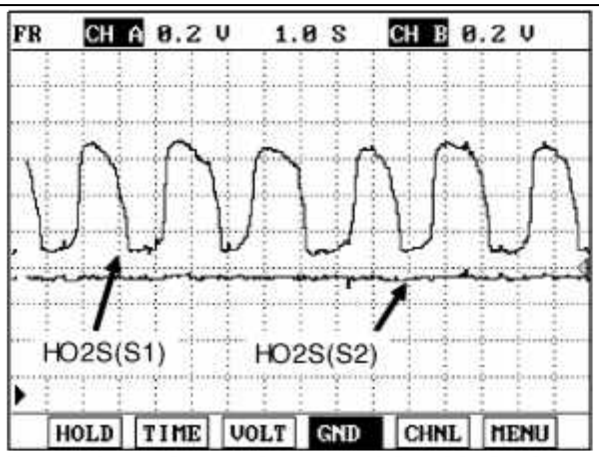
DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Signal check, low	• Poor connection • Short to ground in signal circuit • B1S1 • ECM/PCM
General Enable Conditions		• Dew point end detected • Required lambda = 1 • Battery voltage > 10.7V • Exhaust gas temperature (model) < 800°C (1472°F) • Heater control enabled	
Case1	Enable Conditions	• B1S2 sensor voltage > 0.5V	
	Diagnostic Time	• 25 sec.	
Case2	Enable Conditions	• Sensor in cold condition	
	Diagnostic Time	• 0.1 sec	
Case3	Threshold Value	• Sensor voltage < 0.06V	

MIL ONCondition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



If you release the accelerator pedal suddenly after engine running about 4000 rpm, fuel supply will stop for short period and the O2 sensor service data in the Hi-Scan (Pro) will display values 200mV or lower.
When you suddenly press on the accelerator pedal down, the voltage will reach 0.6 ~ 1.0 V.
When you let the engine idle again, the voltage will fluctuate between 200 mV or lower and 0.6 ~ 1.0 V.
In this case, the O2sensor can be determined as good.

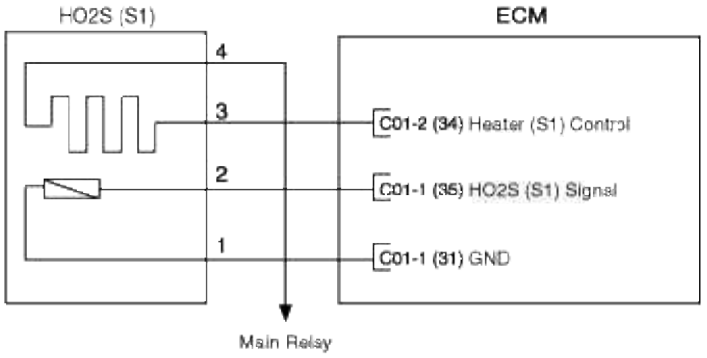
SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

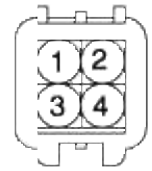
[CIRCUIT DIAGRAM]



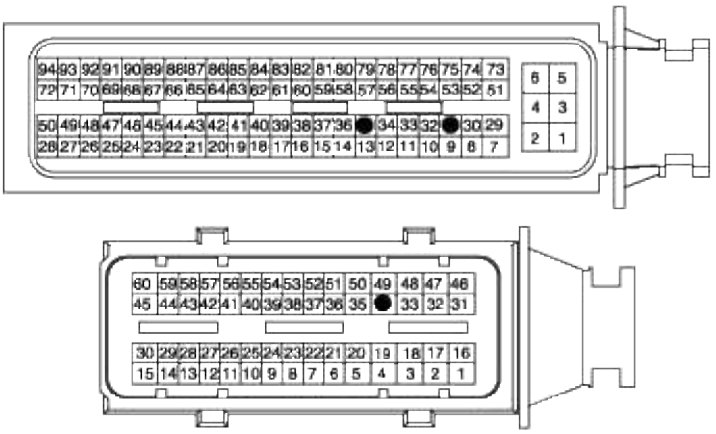
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

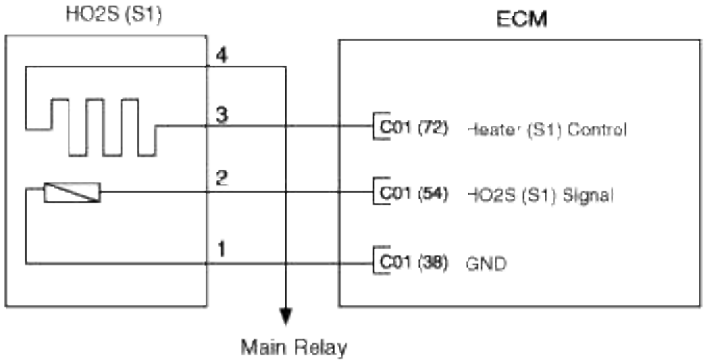


HO2S [S1] (C18)



(M/T)

[CIRCUIT DIAGRAM]



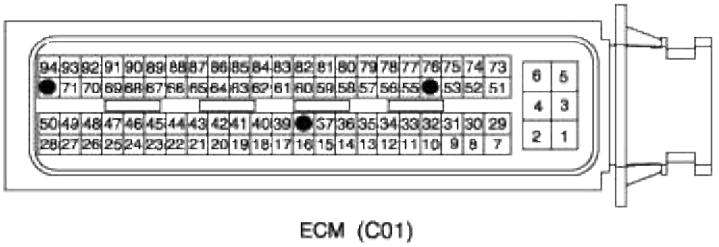
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

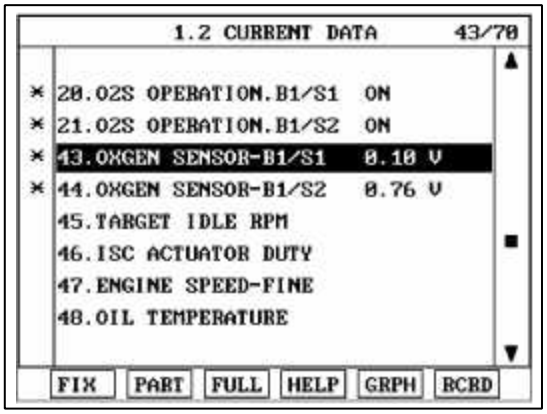


HO2S [S1] (C18)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure

NO

Go to "Terminal and Connector Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

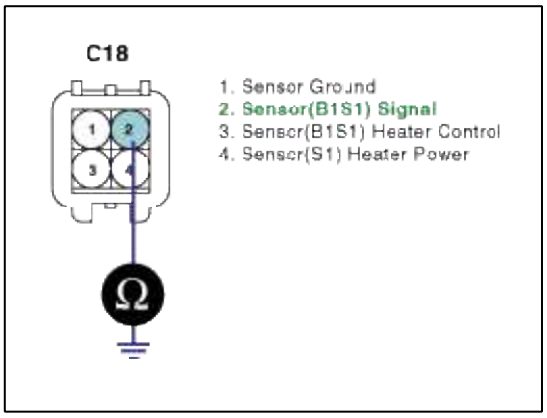
Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S1) connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of HO2S(B1/S1) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S1) connector.
   (3) Check that HO2S(B1S1) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

   YES

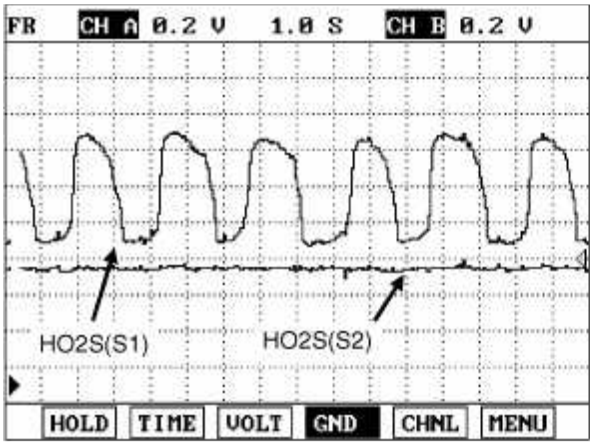
   Go to "Check HO2S(B1/S1) performance" as follows.

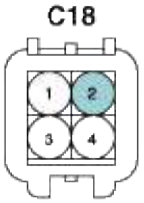
   NO

   Substitute with a known - good HO2S(B1/S1) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.

2. Check HO2S(B1/S1) performance.
   (1) IG "OFF".
   (2) Connect probe to terminal 2 of HO2S(B1/S1) connector and select oscilloscope function with scantool.
   (3) Warm up the engine to normal operating temperature.

(4) Measure signal waveform of HO2S(B1/S1) with scantool.





1. Sensor Ground
2. Sensor(B1S1) Signal
3. Sensor(B1S1) Heater Control
4. Sensor(S1) Heater Power

(5) Is the measured signal waveform within specification?

YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good HO2S(B1/S1) and check for proper operation.
If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.

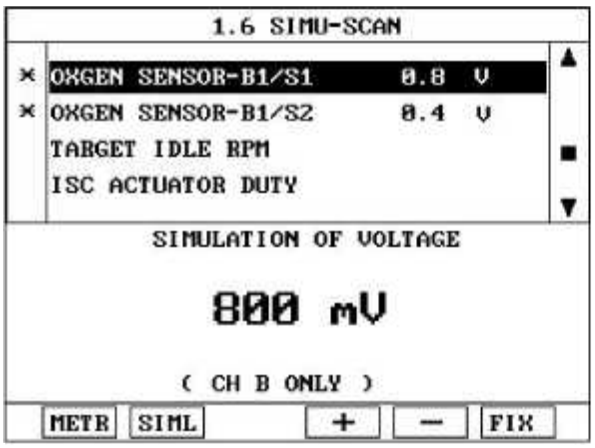
3. Check ECM/PCM.

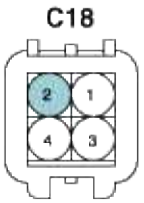
(1) IG "OFF" and disconnect B1S1 connector.

(2) Connect scantool and Key "ON".

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 2 of HO2S(B1/S1) signal connector.





1. Sensor Ground
2. Sensor(B1S1) Signal
3. Sensor(B1S1) Heater Control
4. Sensor(S1) Heater Power

(5) Does the signal value of HO2S(B1/S1) change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

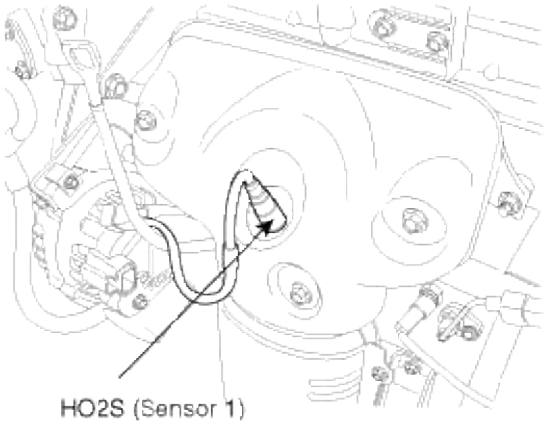
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0132 O2 Sensor Circuit High Voltage(Bank 1 / Sensor 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

The heated oxygen sensors are mounted on the front side and the rear side of Catalytic Converter (warm-up catalytic converter), which detects the oxygen concentration in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation. The heated oxygen sensor (HO2S) produces a voltage that varies between 0V and 1V. When the air/fuel ratio is lean, the oxygen concentration in the exhaust gas increases and the front HO2S outputs a low voltage (approximately 0 ~ 0.4V).When the air/fuel ratio is rich, the oxygen concentration in the exhaust gas decreases and the front HO2S outputs a high voltage (approximately 0.8 ~ 0.6V). The ECM/PCM constantly monitors the HO2S and increases or decreases the fuel injection duration by using the HO2S signal, which is called closed-loop fuel control operation.

DTC DESCRIPTION

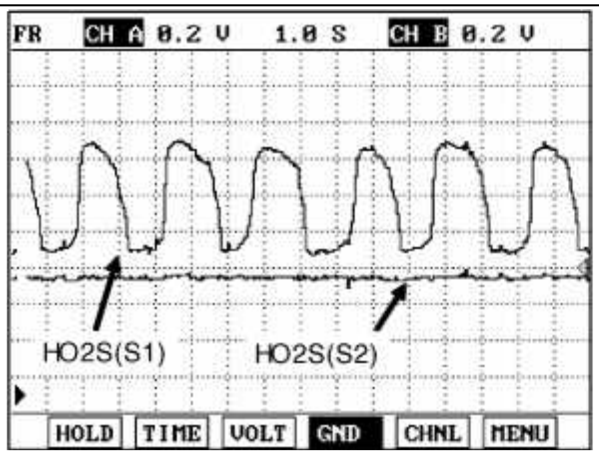
If the sensor output is over 1.08 V under enable conditions, ECM/PCM sets P0132.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Short to battery in signal circuit • B1S1 • ECM/PCM
Enable Conditions	• Dew point end detected • Required lambda = 1 • Battery voltage > 10.7V • Exhaust gas temperature (model) < 800°C (1472°F) • Heater control enabled	
Threshold Value	• B1S1 sensor voltage > 1.08V	
Diagnostic Time	• 5 sec	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



If you release the accelerator pedal suddenly after engine running about 4000 rpm, fuel supply will stop for short period and the O2 sensor service data in the Hi-Scan (Pro) will display values 200mV or lower.
When you suddenly press on the accelerator pedal down, the voltage will reach 0.6 ~ 1.0 V.
When you let the engine idle again, the voltage will fluctuate between 200 mV or lower and 0.6 ~ 1.0 V.
In this case, the O2sensor can be determined as good.

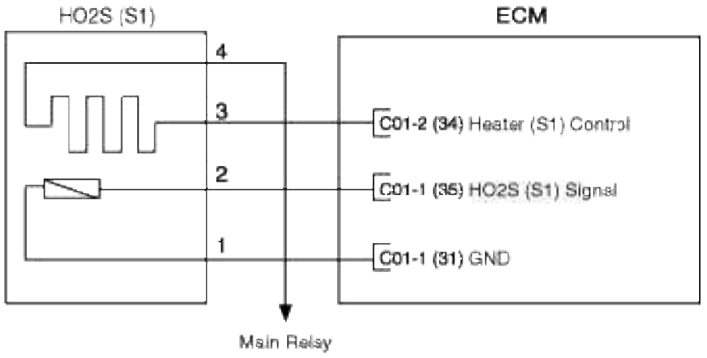
SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

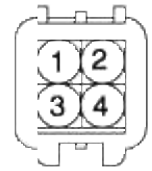
[CIRCUIT DIAGRAM]



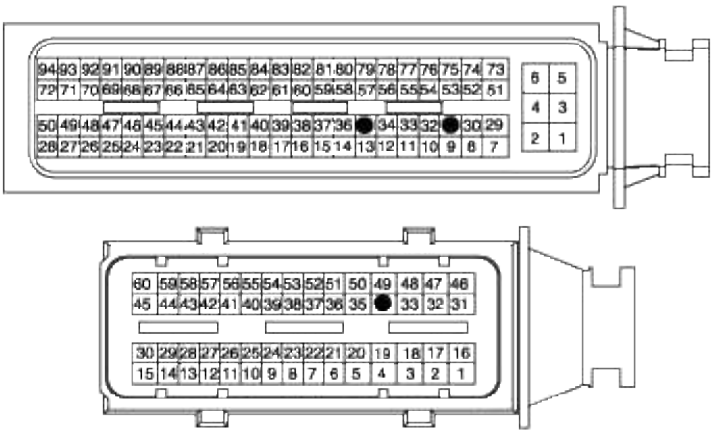
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

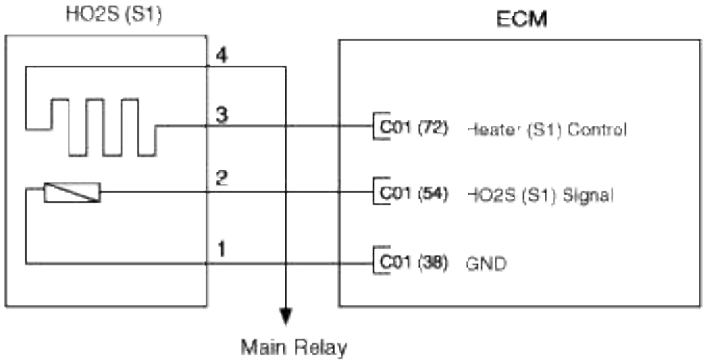


HO2S [S1] (C18)



(M/T)

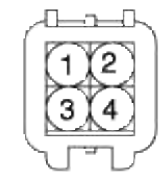
[CIRCUIT DIAGRAM]



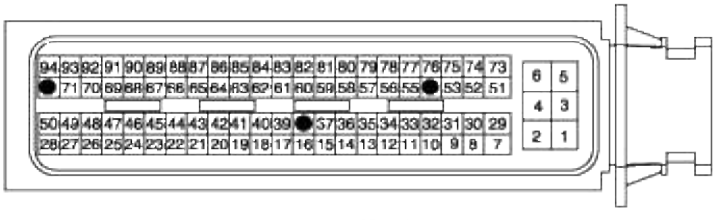
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

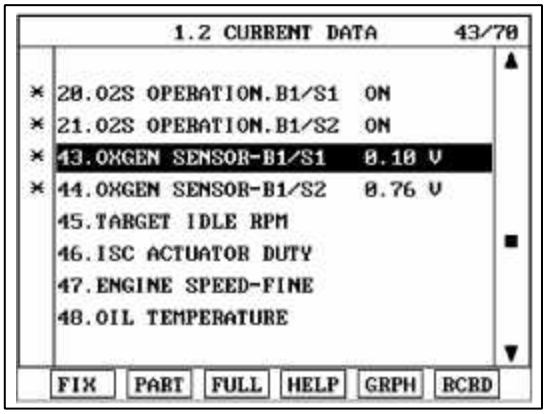


HO2S [S1] (C18)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

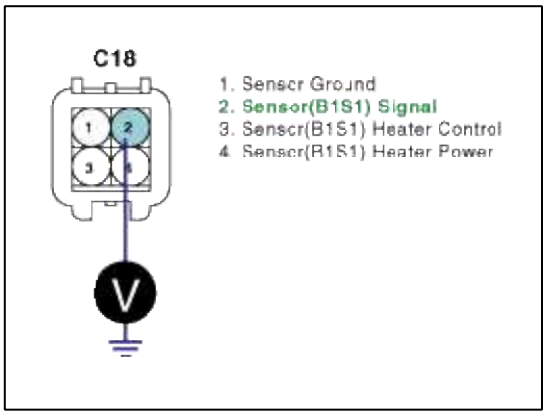
Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S1) connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of HO2S(B1/S1) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S1) connector.
   (3) Check that HO2S(B1S1) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

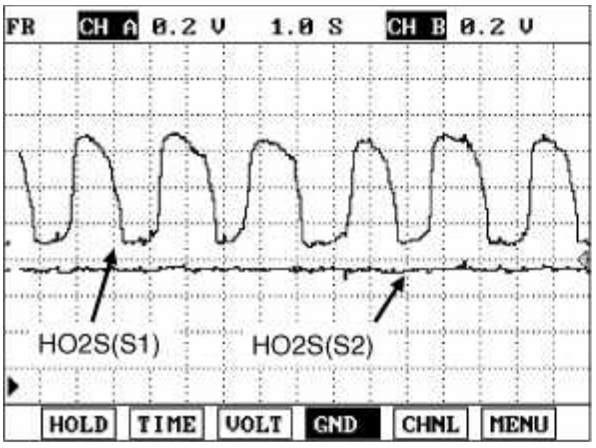
   YES

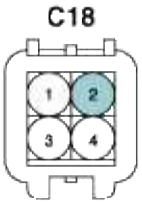
   Go to "Check HO2S(B1/S1) performance" as follows.

   NO

   Substitute with a known - good HO2S(B1/S1) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.
2. Check HO2S(B1/S1) performance.
   (1) IG "OFF".
   (2) Connect probe to terminal 2 of HO2S(B1/S1) connector and select oscilloscope function with scantool.
   (3) Warm up the engine to normal operating temperature.

(4) Measure signal waveform of HO2S(B1/S1) with scantool.





1. Sensor Ground
2. Sensor(B1S1) Signal
3. Sensor(B1S1) Heater Control
4. Sensor(B1S1) Heater Power

(5) Is the measured signal waveform within specification?

YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good HO2S(B1/S1) and check for proper operation.
If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.

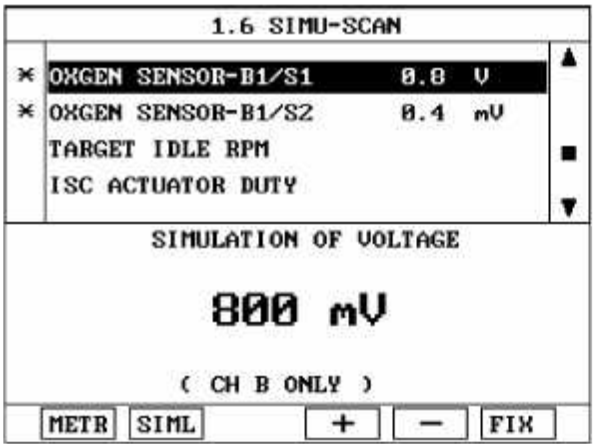
3. Check ECM/PCM.

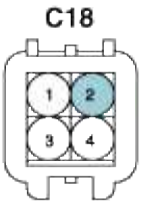
(1) IG "OFF" and disconnect B1S1 connector.

(2) Connect scantool and Key "ON".

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 2 of HO2S(B1/S1) signal connector.





1. Sensor Ground
2. Sensor(B1S1) Signal
3. Sensor(B1S1) Heater Control
4. Sensor(B1S1) Heater Power

(5) Does the signal value of HO2S(B1/S1) change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

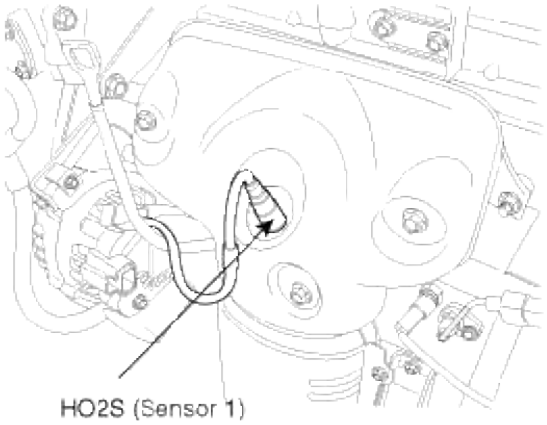
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0133 O2 Sensor Circuit Slow Response (Bank 1 / Sensor 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

The heated oxygen sensors are mounted on the front side and the rear side of Catalytic Converter (warm-up catalytic converter), which detects the oxygen concentration in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation. The heated oxygen sensor (HO2S) produces a voltage that varies between 0V and 1V. When the air/fuel ratio is lean, the oxygen concentration in the exhaust gas increases and the front HO2S outputs a low voltage (approximately 0 ~ 0.1 V).When the air/fuel ratio is rich, the oxygen concentration in the exhaust gas decreases and the front HO2S outputs a high voltage (approximately 0.8 ~ 1 V). The ECM/PCM constantly monitors the HO2S and increases or decreases the fuel injection duration by using the HO2S signal, which is called closed-loop fuel control operation.

DTC DESCRIPTION

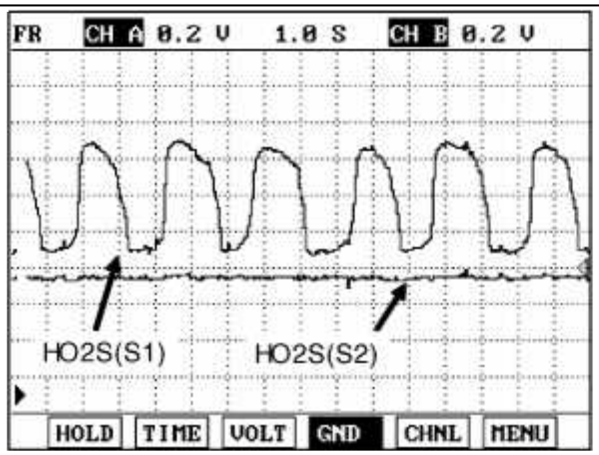
If there is abnormal response rate of HO2S under enable conditions, ECM/PCM sets DTC P0133.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Response rate	• Poor connection • leak or clog in intake air system • Injector • Fuel pressure • B1S1 • ECM/PCM
Enable Conditions	• Engine speed 1800~2800rpm • Engine load 30~65% • Exhaust gas temperature (model) > 450°C (842°F)	
Threshold Value	• Cycle period of B1S1 signal > 3 sec	
Diagnostic Time	• 12 cycle	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



If you release the accelerator pedal suddenly after engine running about 4000 rpm, fuel supply will stop for short period and the O2 sensor service data in the Hi-Scan (Pro) will display values 200mV or lower.
When you suddenly press on the accelerator pedal down, the voltage will reach 0.6 ~ 1.0 V.
When you let the engine idle again, the voltage will fluctuate between 200 mV or lower and 0.6 ~ 1.0 V.
In this case, the O2sensor can be determined as good.

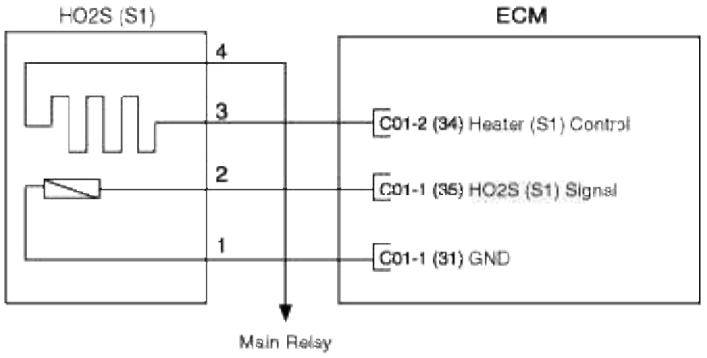
SPECIFICATION

A/F Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

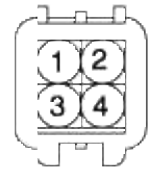
[CIRCUIT DIAGRAM]



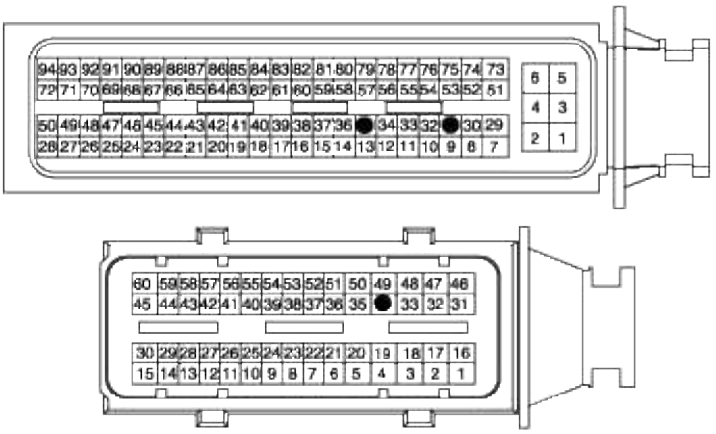
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

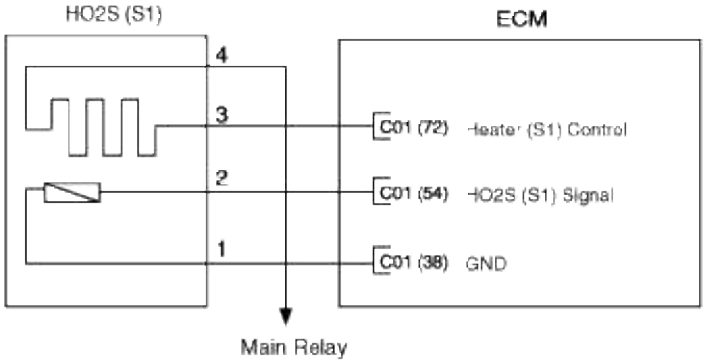


HO2S [S1] (C18)



(M/T)

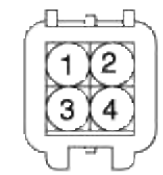
[CIRCUIT DIAGRAM]



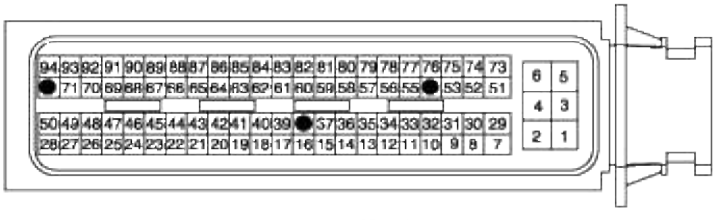
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

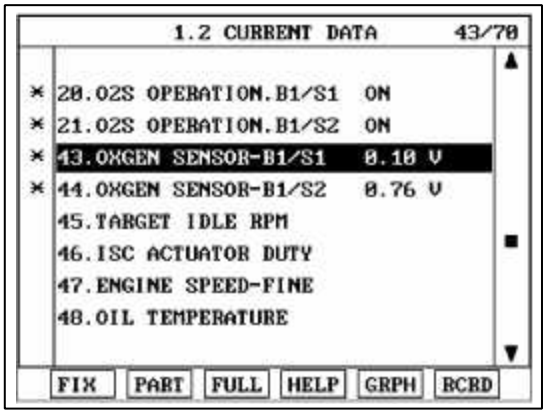


HO2S [S1] (C18)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

SYSTEM INSPECTION

1. Check leakage or clog of air.
   (1) Check contamination, clog and installation of gasket
   Any damage or installation of throttle body gasket.
   Any damage or installation of gasket between intake manifold and surge tank.
   Clog or contamination of intake manifold and injector by foreign materials
   Contamination between surge tank and PCSV or stuck open condition of PCSV.
   Any damage or contamination of HO2S(B1/S1) by foreign materials.
   (2) Has a problem been found?

YES

Go to " Check Fuel Line" as follows.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

2. Check Fuel Line.

(1) Check Clog, contamination and installation of Fuel Line as follows.

Connection for each connectors in Fuel Line.
Damage, interference and installation of vaccum hose connected to Fuel Line.
Bend, Leakage and squeeze of pipe in Fuel Line.

(2) Has a problem been found?

YES

Go to "Check Fuel Pressure" as follows.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

3. Check Fuel Pressure.

(1) IG "OFF".

(2) Disconnect fuel pump relay from junction box in passenger compartment.

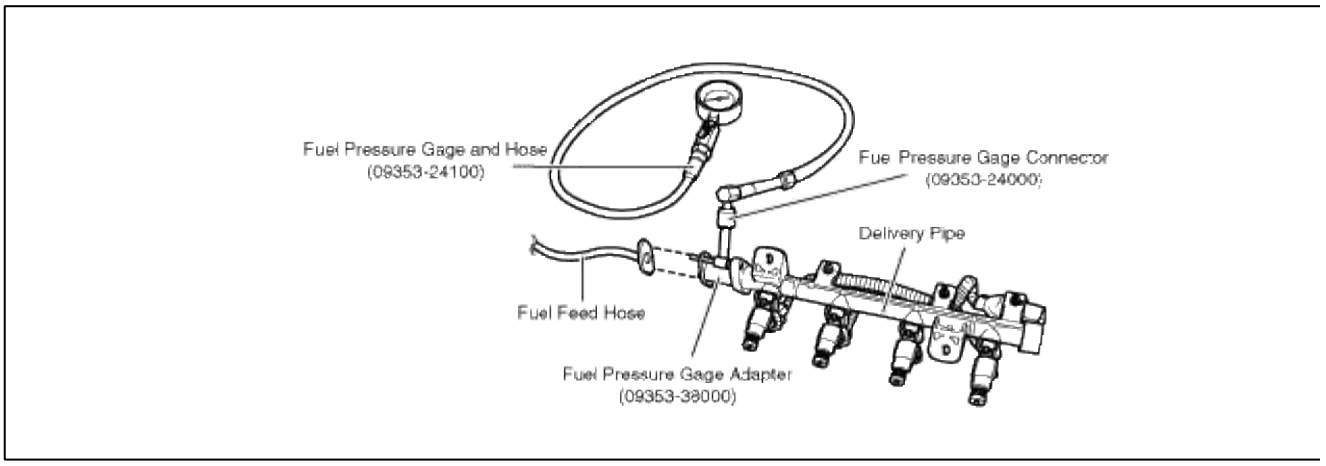
(3) Start engine and await until engine is off and then, IG "OFF".

(4) Connect fuel pump relay again.

(5) Connect fuel pressure gauge on the fuel filter with fuel pressure gauge adaptor.

(6) Start engine again and measure fuel pressure.

Specification : Approx. 3.5 kgf/cm²



(7) Is the fuel pressue normal?

YES

Go to "Component Inspection" procedure.

NO

Check any damage of fuel return hose or pipe.
Check for improper fuel pressure regulator operation.
Repair or replace as necessary and then, go to 'Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check PCV.
   (1) IG "OFF"
   (2) Disconnect PCV.
   (3) Check that PCV is properly operating.
   (4) Is the PCV O.K?

   YES

   Go to "Check PCSV" as follows.

   NO

   Substitute with a known - good PCV and check for proper operation.
   If the problem is corrected, replace PCV and go to "Verification of Vehicle Repair" procedure.

2. Check the PCSV.
   (1) Ignition "OFF".
   (2) Disconnect PCSV and Vacuum Hose.
   (3) Apply vacuum on PCSV with Hand Vacuum Gauge.
   (4) Is the PCSV keeping the Vacuum?

   YES

   Go to "Check Injector" as below.

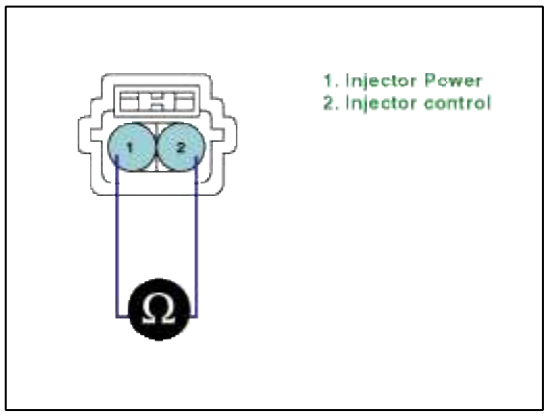
   NO

   Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure.

3. Check Injector.
   (1) Ignition "OFF"
   (2) Remove Injector.
   (3) Check Leakage and clog on Injector.
   (4) Measure resistance terminal 1 and 2 of Injector connector(Component side).

   Specification :

Temperature	Resistance [Ω]
20°C (68°F)	13.8 ~ 15.2Ω



   (5) Is the measured resistance within specifications?

   YES

   Go to "Check sensors related to Fuel Trim " as below.

   NO

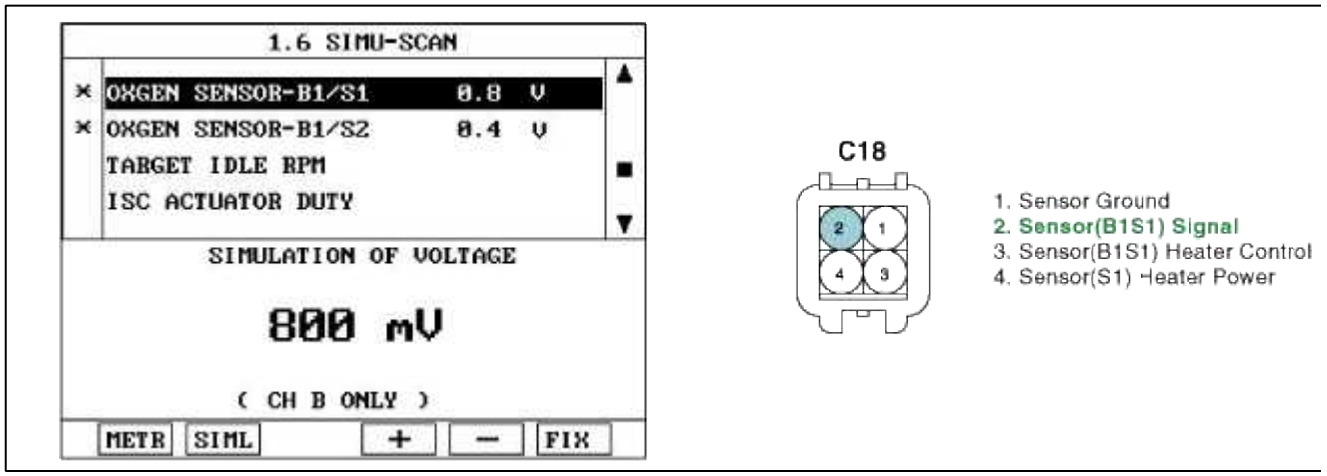
   Substitute with a known-good Injector and check for proper operation. If the problem is corrected, replace Injector and then go to "Verification of Vehicle Repair" procedure.

4. Check Sensors related to Fuel Trim.
   (1) Check the Input Voltage of Sensors related to Fuel Trim(MAPS, TPS, ECTS, PCSV, Injector, and etc) - Refer to Trouble Shooting Guide -
   (2) Are the sensors related to Fuel Trim O.K?

   YES
   Go to "Check ECM/PCM" as below.

   NO
   Repair as necessary and go to "Verification of Vehicle Repair" procedure.

5. Check ECM/PCM.
   (1) IG "OFF" and disconnect B1S1 connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 2 of HO2S(B1S1) sensor signal connector.



   (5) Is the HO2S(B1/S1) signal value changed according to simulation voltage ?

   YES
   Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deteriorati damage. Repair or replace as necessary and then go to "Verification of VehicleRepair" procedure.

   NO
   Substitute with a known-good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

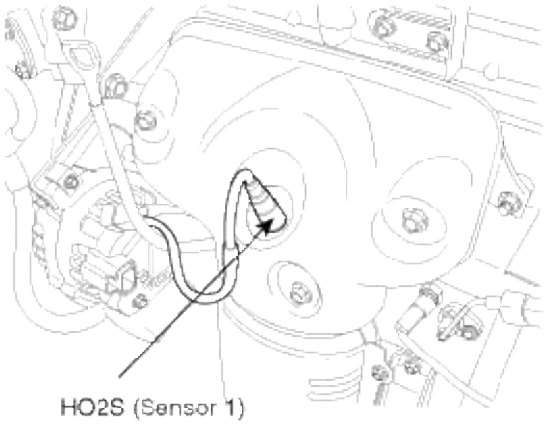
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES
Go to the applicable troubleshooting procedure.

NO
System is performing to specification at this time.

Fuel System > Troubleshooting > P0134 O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

The heated oxygen sensors are mounted on the front side and the rear side of Catalytic Converter (warm-up catalytic converter), which detects the oxygen concentration in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation. The heated oxygen sensor (HO2S) produces a voltage that varies between 0V and 1V. When the air/fuel ratio is lean, the oxygen concentration in the exhaust gas increases and the front HO2S outputs a low voltage (approximately 0 ~ 0.4 V).When the air/fuel ratio is rich, the oxygen concentration in the exhaust gas decreases and the front HO2S outputs a high voltage (approximately 0.6 ~ 1 V). The ECM/PCM constantly monitors the HO2S and increases or decreases the fuel injection duration by using the HO2S signal, which is called closed-loop fuel control operation.

DTC DESCRIPTION

If the signal output satisfies the threshold value under enable conditions, ECM/PCM sets DTC P0134.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

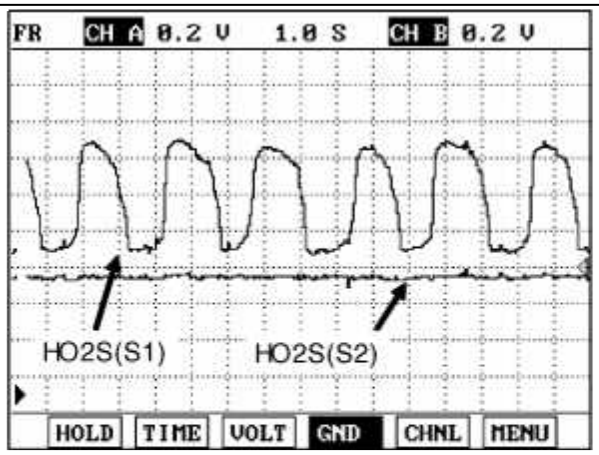
DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Signal check, wiring interruption	• Poor connection • Open or short in signal circuit • B1S1 • ECM/PCM
General Enable Conditions		• Dew point end detected • Required lambda = 1 • Battery voltage > 10.7V • Exhaust gas temperature (model) < 800°C (1472°F) • Heater control enabled	
Case1	Enable Conditions	• Time after fuel cut-off > 3.0s • B1S2 sensor voltage > 0.2V	
	Diagnostic Time	• 0.1 sec	
	Threshold Value	• Sensor voltage > 0.2V	
Case2	Threshold Value	• Sensor voltage : 0.4~0.6V	
	Diagnostic Time	• 5 sec	

Case3	Enable Conditions	• Exhaust gas temperature (model) > 600°C (1112°F)
	Threshold Value	• Internal resistance > 20 kΩ
MIL ONCondition		• 2 driving cycle

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



If you release the accelerator pedal suddenly after engine running about 4000 rpm, fuel supply will stop for short period and the O2 sensor service data in the Hi-Scan (Pro) will display values 200mV or lower.
When you suddenly press on the accelerator pedal down, the voltage will reach 0.6 ~ 1.0 V.
When you let the engine idle again, the voltage will fluctuate between 200 mV or lower and 0.6 ~ 1.0 V.
In this case, the O2sensor can be determined as good.

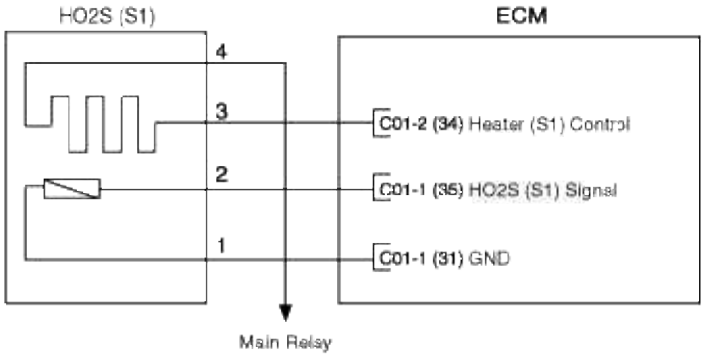
SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

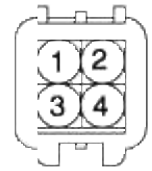
[CIRCUIT DIAGRAM]



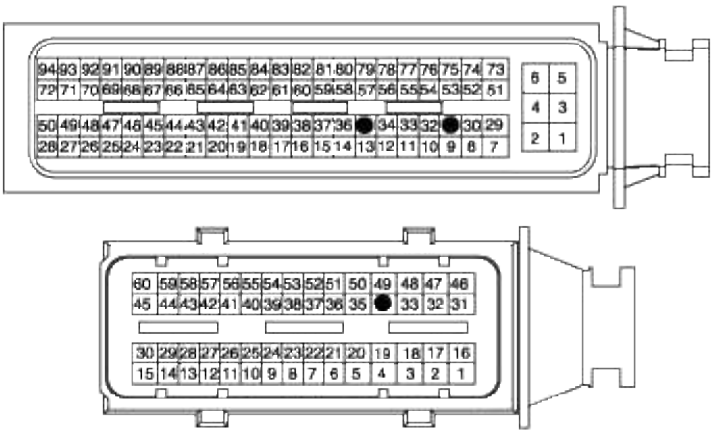
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

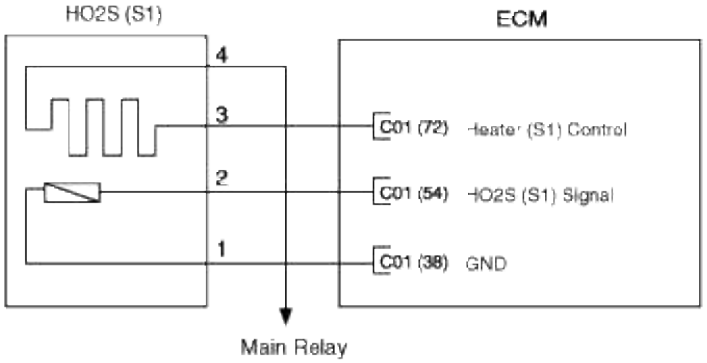


HO2S [S1] (C18)



(M/T)

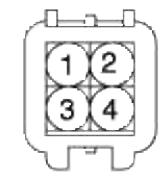
[CIRCUIT DIAGRAM]



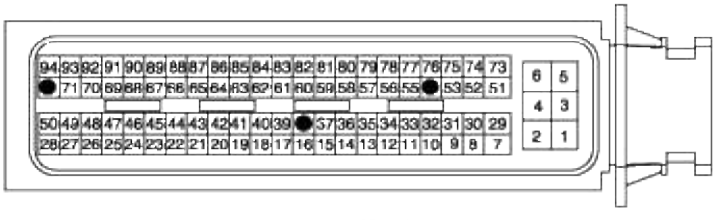
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

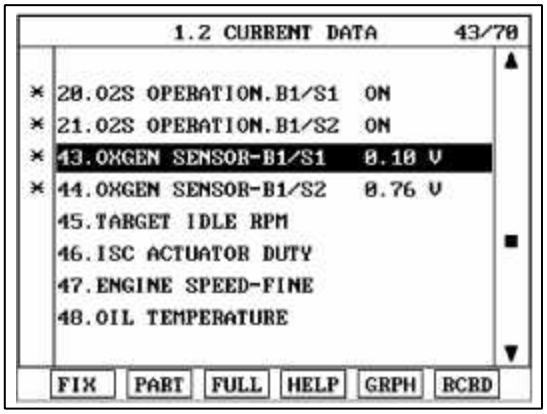


HO2S [S1] (C18)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter operating correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

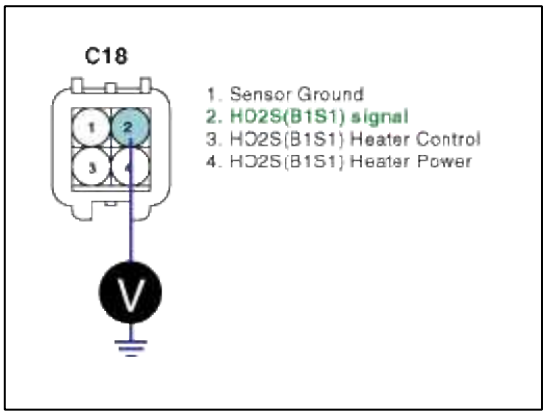
Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S1) connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of HO2S(B1/S1) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Groud Circuit Inspection" procedure.

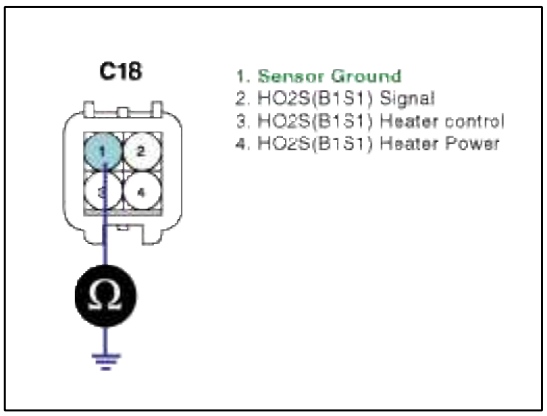
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

GROUND CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S1) connector.
3. Measure resistance between terminal 1 of HO2S(B1/S1) and chassis ground.

Specification : Approx. below 1Ω



4. Is the measured resistance within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S1) connector.
   (3) Check that HO2S(B1S1) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

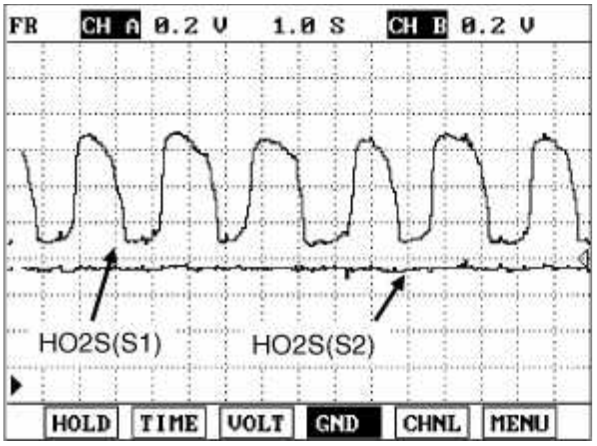
   YES

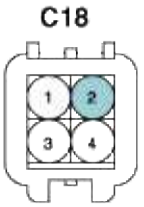
   Go to "Check HO2S(B1/S1) performance" as follows.

   NO

   Substitute with a known - good HO2S(B1/S1) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.

2. Check HO2S(B1/S1) performance.
   (1) IG "OFF".
   (2) Connect probe to terminal 2 of HO2S(B1/S1) connector and select oscilloscope function with scantool.
   (3) Warm up the engine to normal operating temperature.
   (4) Measure signal waveform of HO2S(B1/S1) with scantool.





1. Sensor Ground
2. HO2S(B1S1) Signal
3. HO2S(B1S1) Heater control
4. HO2S(B1S1) Heater Power

   (5) Is the measured signal waveform within specification?

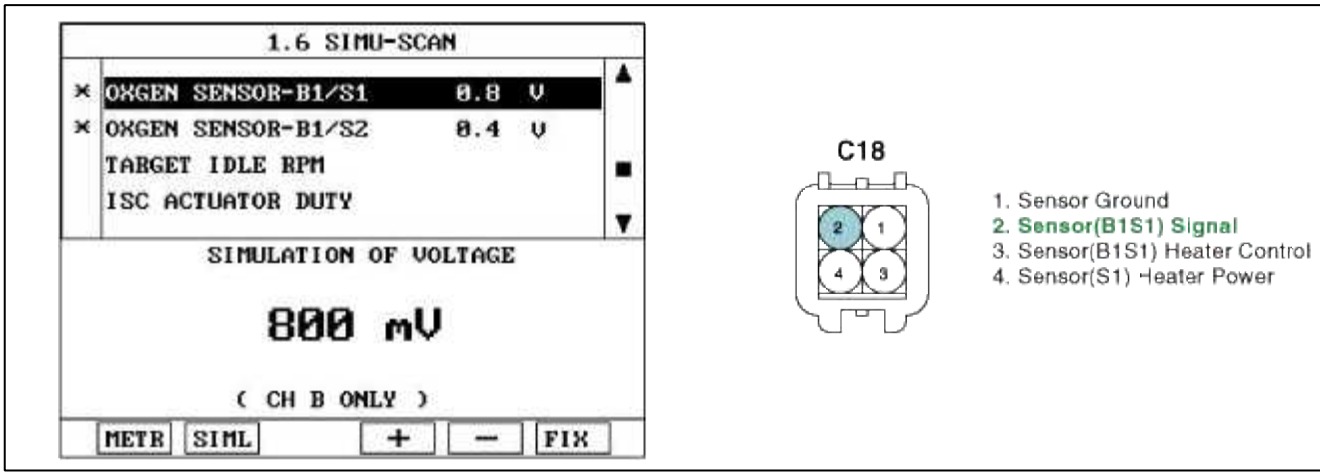
   YES

   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good HO2S(B1/S1) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.

3. Check ECM/PCM.
   (1) IG "OFF" and disconnect B1S1 connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 2 of HO2S(B1/S1) signal connector.



   (5) Does the signal value of HO2S(B1/S1) change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

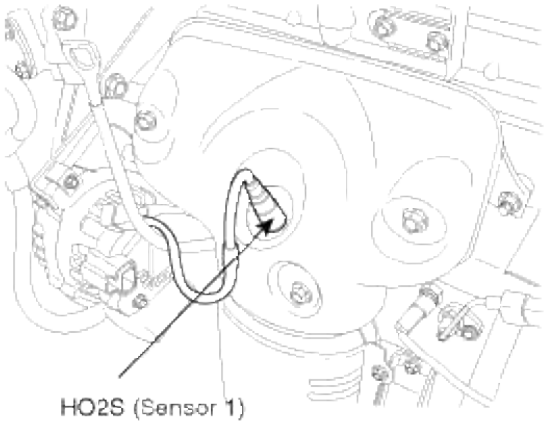
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0135 O2 Sensor Heater Circuit(Bank 1 / Sensor 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

The heated oxygen sensors are mounted on the front side and the rear sied of Catalytic Converter (warm-up catalytic converter), which detects the oxygen concentration in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation. The heated oxygen sensor (HO2S) produces a voltage that varies between 0V and 1V. When the air/fuel ratio is lean, the oxygen concentration in the exhaust gas increases and the front HO2S outputs a low voltage (approximately 0 ~ 0.4V).When the air/fuel ratio is rich, the oxygen concentration in the exhaust gas decreases and the front HO2S outputs a high voltage (approximately 0.6 ~ 1 V). The ECM/PCM constantly monitors the HO2S and increases or decreases the fuel injection duration by using the HO2S signal, which is called closed-loop fuel control operation.

DTC DESCRIPTION

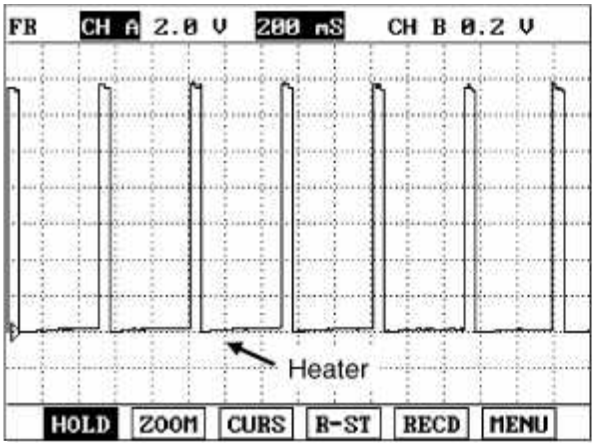
If ECM/PCM detects that the internal resistance of heater is out of threshold value, ECM/PCM sets DTC P0135.

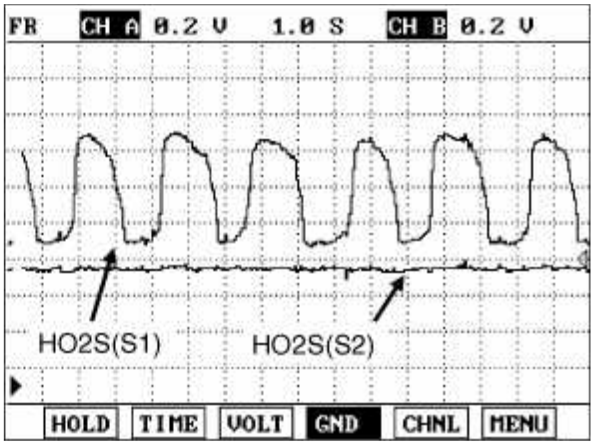
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Heater current check	• Poor connection • Open or short to ground in control circuit • B1S1 • ECM/PCM
Enable Conditions	• Exhaust gas temperature (model) :200~550 °C (392~1022°F) • Intake air temperature > -7 °C (19.4°F) • Battery voltage 10.7~16.1 V	
Threshold Value	• Internal resistance > threshold f(exh. temp., heater power)	
Diagnostic Time	• Above 15 sec	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA





The HO2S requires a minimum temperature to provide a closed loop fuel control system. So the HO2S contains a heater element to reduce its warm-up time and ensure its performance during all drivingconditions.
The HO2S heater is controlled ON after engine start except for Cold condition and high speed accelleration.
The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM provides a ground circuit for activating the heater.

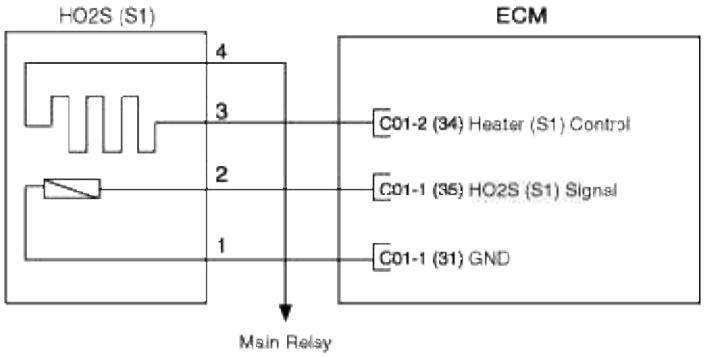
SPECIFICATION

Item	Specification
Heater Resistance	Approx. 9.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

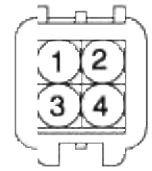
[CIRCUIT DIAGRAM]



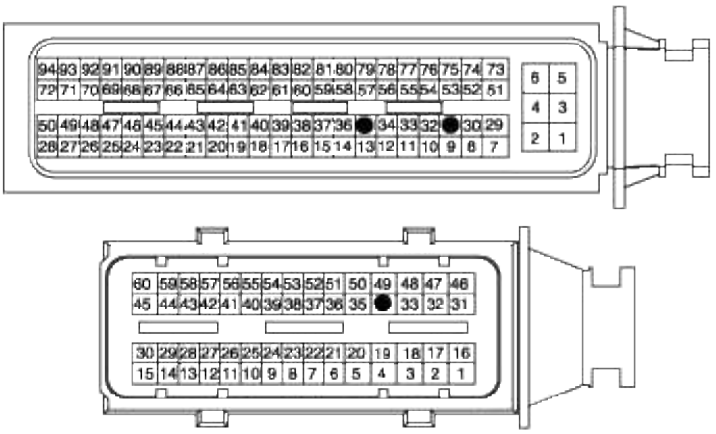
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (31)	Sensor Ground
2	ECM C01-1 (35)	HO2S (S1) Signal
3	ECM C01-2 (34)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

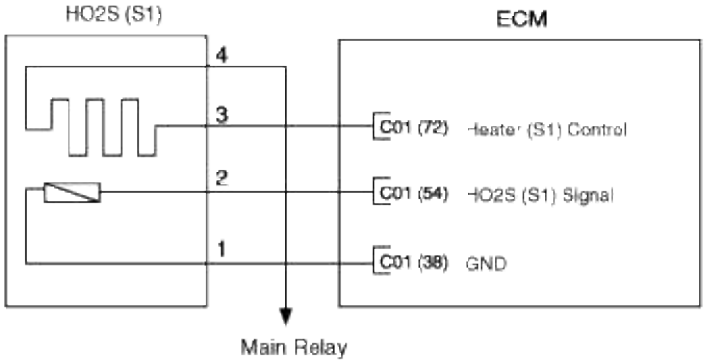


HO2S [S1] (C18)



(M/T)

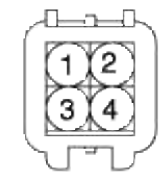
[CIRCUIT DIAGRAM]



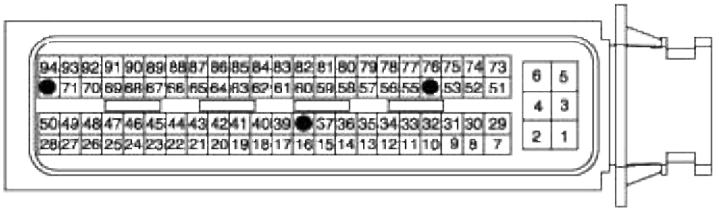
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (38)	Sensor Ground
2	ECM C01 (54)	HO2S (S1) Signal
3	ECM C01 (72)	Heater (S1) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

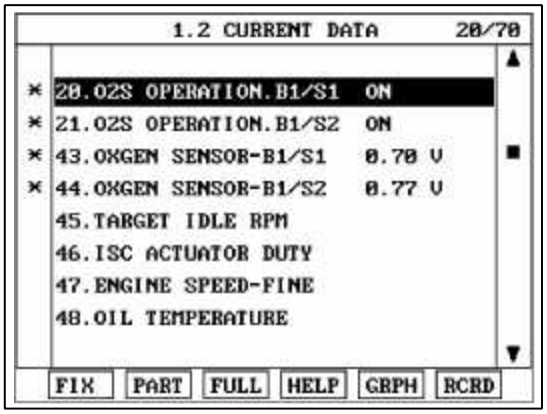


HO2S [S1] (C18)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S1)" parameter on scantool.



4. Is the "HO2S(B1S1)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

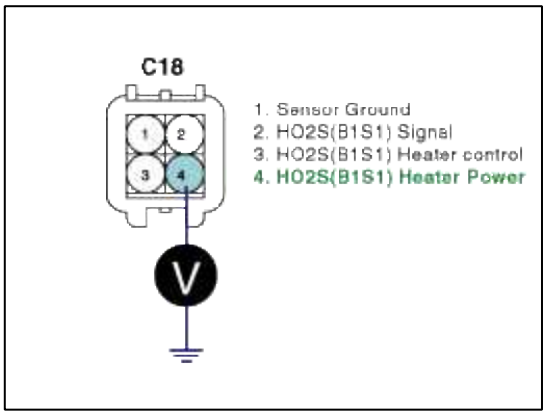
Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1S1) connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 4 of HO2S (B1S1) harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

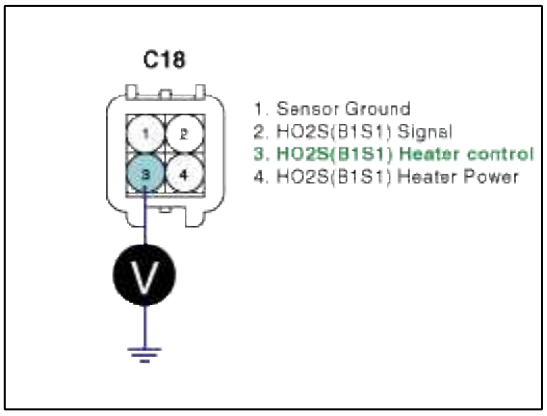
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1S1) connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of HO2S(B1S1) harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

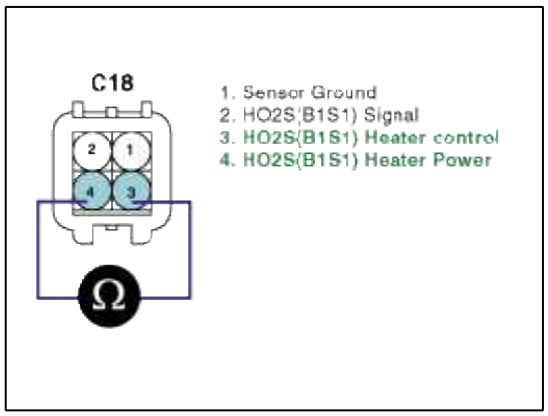
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Heater resistance.
   (1) IG "OFF".
   (2) Disconnect HO2S(B1S1) connector.
   (3) Measure resistance bwteen terminal 3 and 4 of HO2S(B1S1) connector.(Component Side)
   Specification :

Item	Specification
Heater Resistance	Approx. 9.0Ω at 20°C (68°F)



   (4) Is the measured resistance within specification ?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good HO2S(B1/S1) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S1) and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

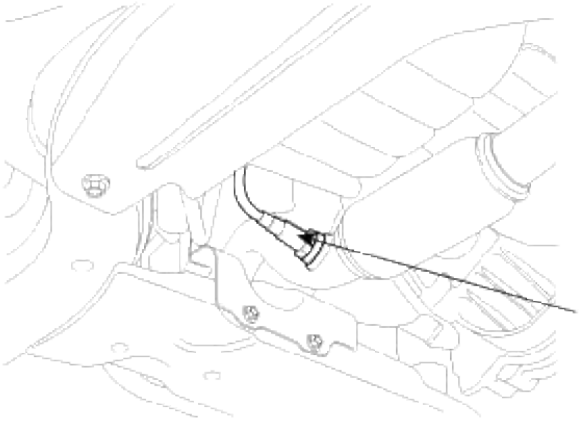
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0136 O2 Sensor Circuit(Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

HO2S(B1/S2) is in the rear side of Catalytic Converter to check the proper operation of catalyst. Oxygen density after the catalytic converter has to be within specific range (around 0.5V when there is no acceclation and deceleration.)If the oxygen density changes in accordance with HO2S(B1/S1), it means the poor performance of catalytic converter.

DTC DESCRIPTION

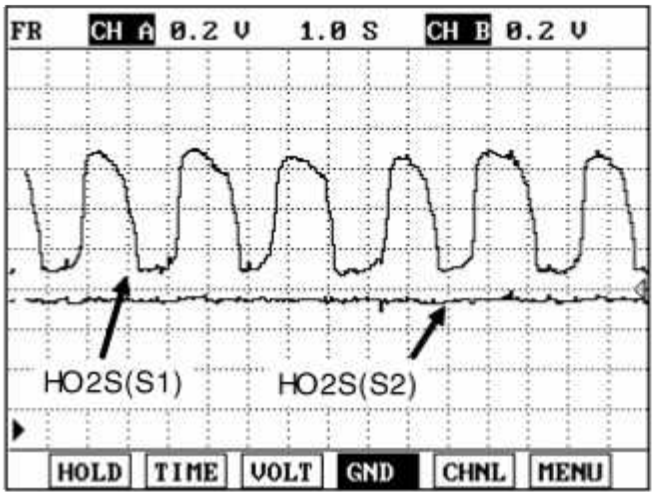
In case the sensor output is 0.4~0.52 V during 600sec or the internal resistance is over 40 kΩ under enable conditions, ECM/PCM sets DTC P0136.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Signal check, wiring interruption	• Poor connection • Open or short in signal circuit • B1S2 • ECM/PCM
General Enable Conditions		• After enough heated • Battery voltage > 10.7V • Catalyst temperature (model) < 800°C (1472°F)	
Case1	Threshold Value	• Sensor voltage : 0.4~0.52 V	
	Diagnostic Time	• 600 sec	
Case2	Enable Conditions	• Catalyst temperature (model) > 600 °C (1112°F)	
	Threshold Value	• Internal resistance > 40 kΩ	
MIL ONCondition		• 2 driving cycle	

B1S2 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



The rear HO2S amplitude is lower when compared to the front HO2S because the oxygen is stored/consumed during the conversion process.
This is the normal signal waveform of the rear HO2S at idle.

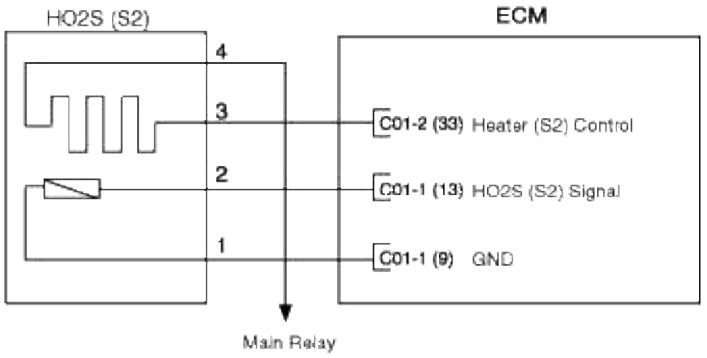
SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

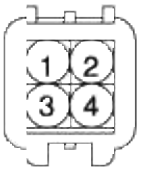
[CIRCUIT DIAGRAM]



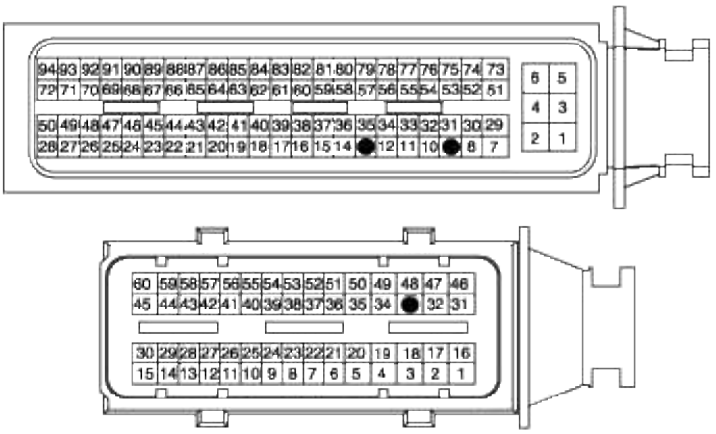
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (9)	Sensor Ground
2	ECM C01-1 (13)	HO2S (S2) Signal
3	ECM C01-2 (33)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

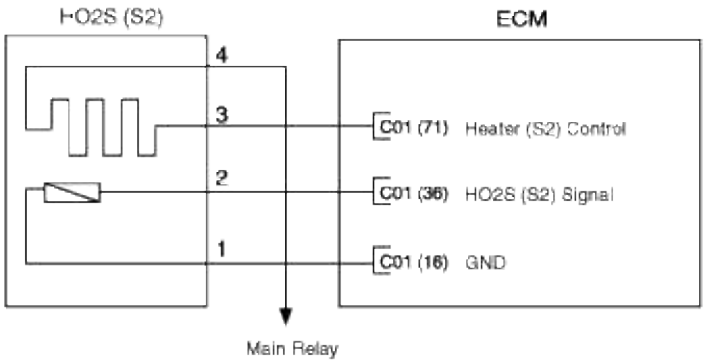


HO2S [S2] (C17)



(M/T)

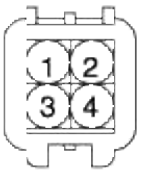
[CIRCUIT DIAGRAM]



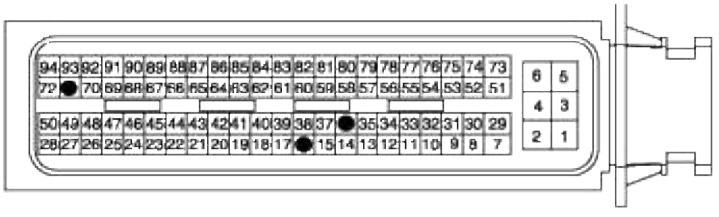
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

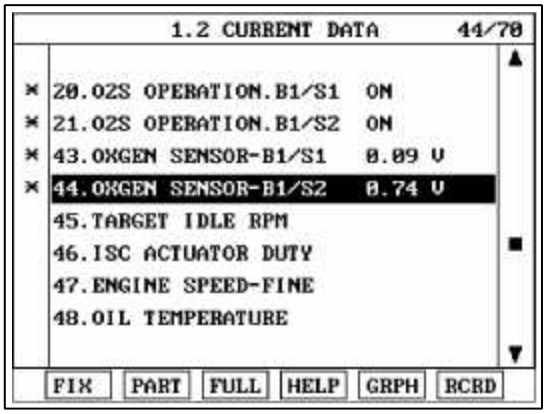


HO2S [S2] (C17)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S(B1S2)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

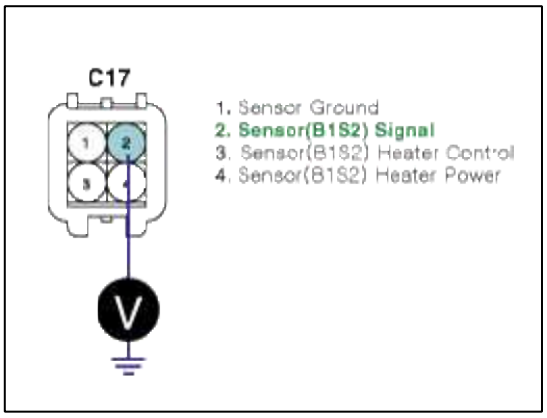
Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S2) connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of HO2S(B1/S2) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Groud Circuit Inspection" procedure.

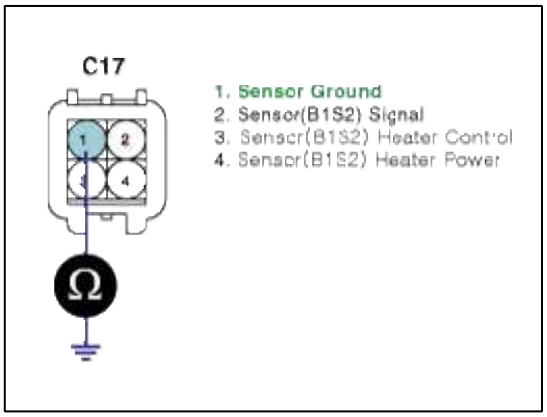
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

GROUND CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S2) connector.
3. Measure resistance between terminal 1 of HO2S(B1/S2) and chassis ground.

Specification : Approx. below 1Ω



4. Is the measured resistance within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S2) connector.
   (3) Check that HO2S(B1S2) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

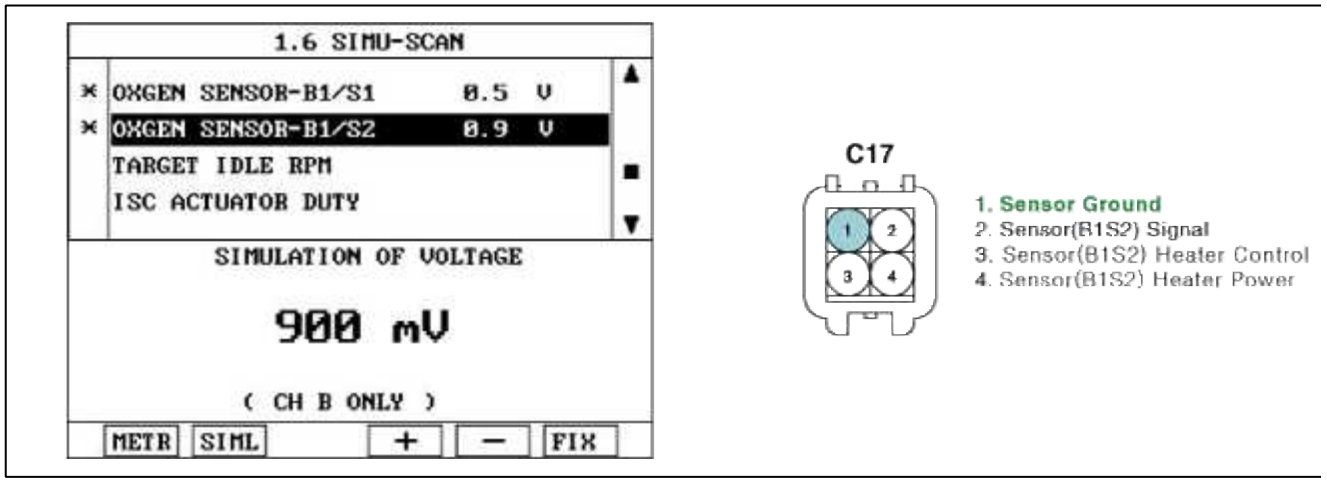
   YES

   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good HO2S(B1/S2) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S2) and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF" and disconnect B1S2 connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 2 of HO2S(B1/S2) signal connector.



   (5) Does the signal value of HO2S(B1/S2) change according to simulation voltage?

   YES

   Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

   NO

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

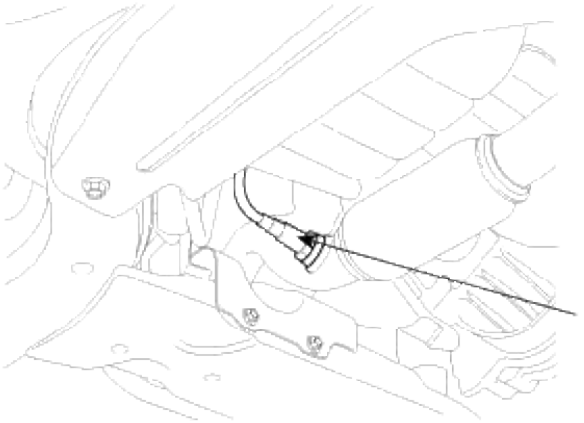
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0137 O2 Sensor Circuit Low Voltage (Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

HO2S(B1/S2) is in the rear side of Catalytic Converter to check the proper operation of catalyst. Oxygen density after the catalytic converter has to be within specific range (around 0.5V when there is no acceclation and deceleration.)If the oxygen density changes in accordance with HO2S(B1/S1), it means the poor performance of catalytic converter.

DTC DESCRIPTION

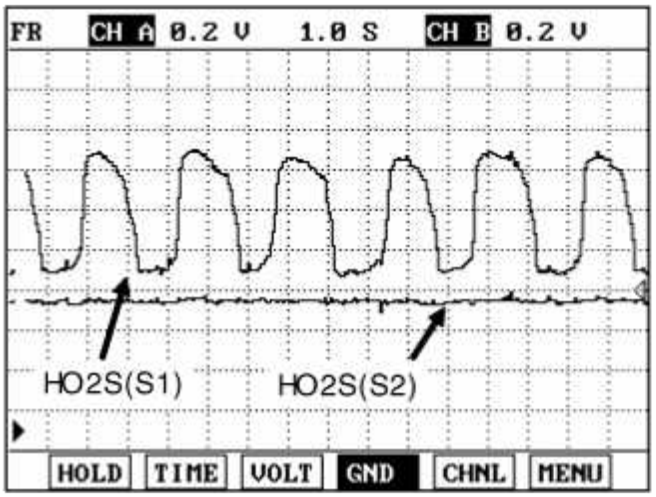
If the sensor output is below 0.06V under enable conditions, ECM/PCM sets DTC P0137.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Signal check, low	• Poor connection • Short to ground in signal circuit • B1S2 • ECM/PCM
General Enable Conditions		• After enough heated • Battery voltage > 10.7V • Catalyst temperature (model) < 800°C (1472°F)	
Case1	Enable Conditions	• Engine speed : 1000 ~ 3800 rpm • Engine load : 18 ~ 60%	
	Threshold Value	• B1S2 sensor voltage < 0.06 V	
	Diagnostic Time	• 25 sec	
Case2	Enable Conditions	• Sensor in cold condition	
	Threshold Value	• B1S2 sensor voltage < 0.06 V	
	Diagnostic Time	• 0.1 sec	
MIL ONCondition		• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



The rear HO2S amplitude is lower when compared to the front HO2S because the oxygen is stored/consumed during the conversion process.
This is the normal signal waveform of the rear HO2S at idle.

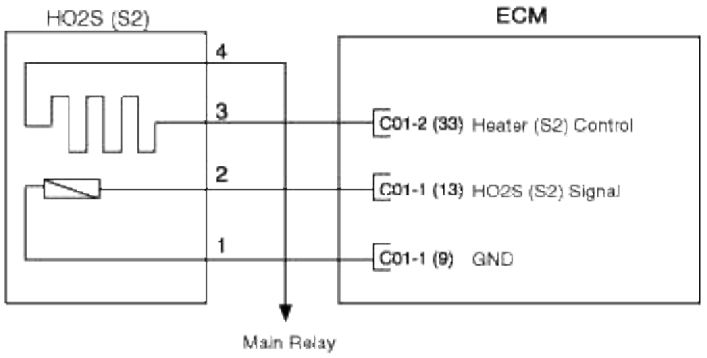
SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

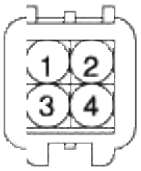
[CIRCUIT DIAGRAM]



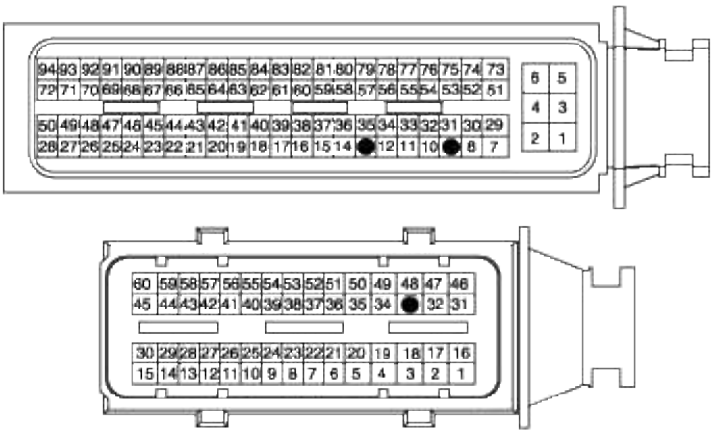
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-1 (9)	Sensor Ground
2	ECM C01-1 (13)	HO2S (S2) Signal
3	ECM C01-2 (33)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

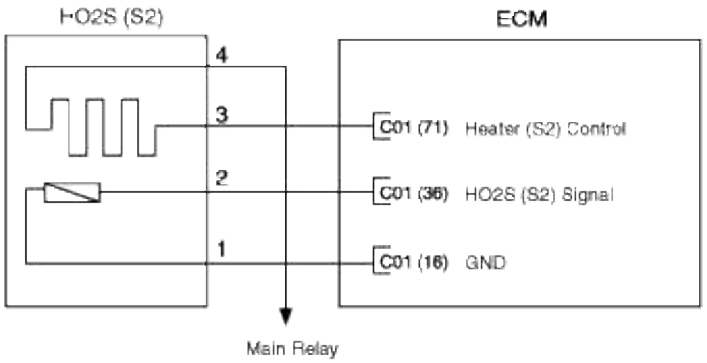


HO2S [S2] (C17)



(M/T)

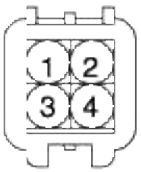
[CIRCUIT DIAGRAM]



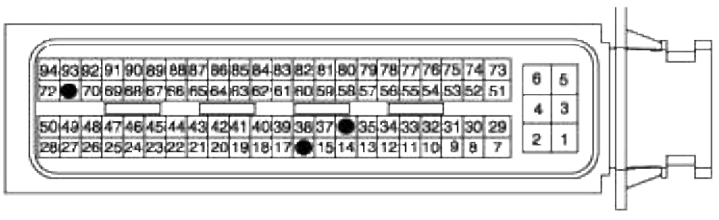
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]

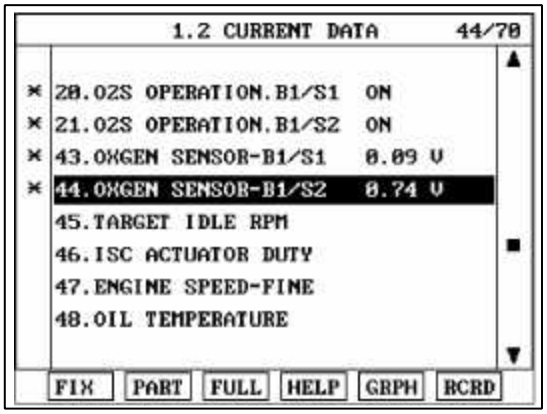


HO2S [S2] (C17)



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S(B1S2)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

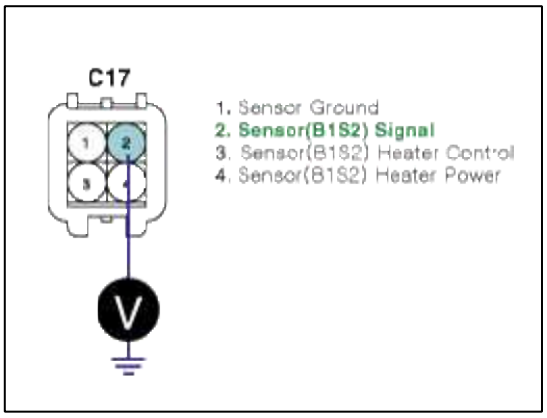
Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S2) connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of HO2S(B1/S2) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S2) connector.
   (3) Check that HO2S(B1S2) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

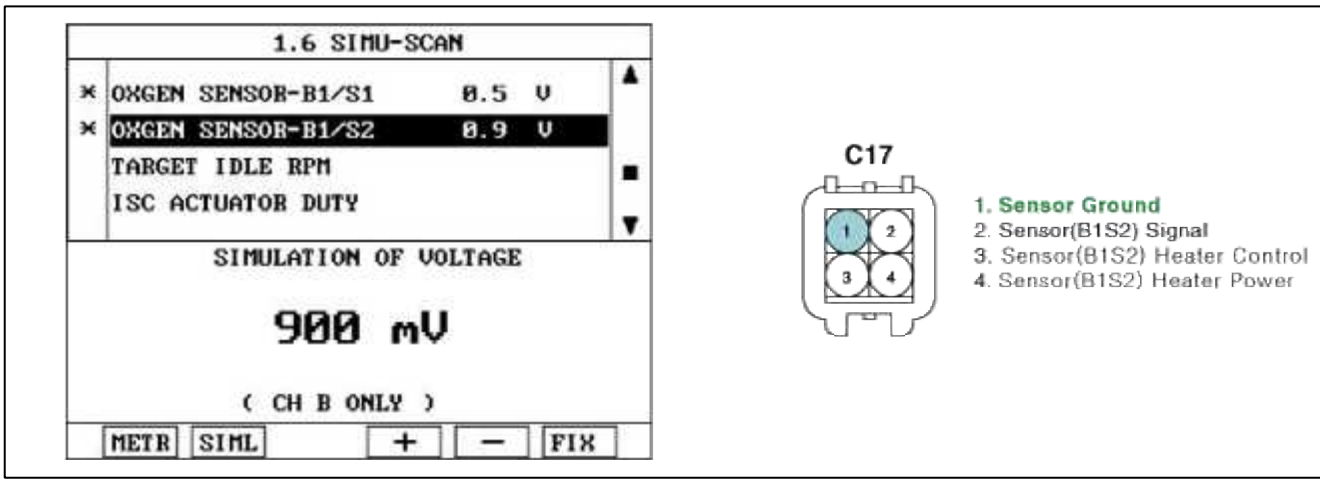
   YES

   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good HO2S(B1/S2) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S2) and go to "Verification of Vehicle Repair" procedure.
2. Check ECM/PCM.
   (1) IG "OFF" and disconnect B1S2 connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.

(4) Simulate voltage at terminal 2 of HO2S(B1/S2) signal connector.



(5) Does the signal value of HO2S(B1/S2) change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

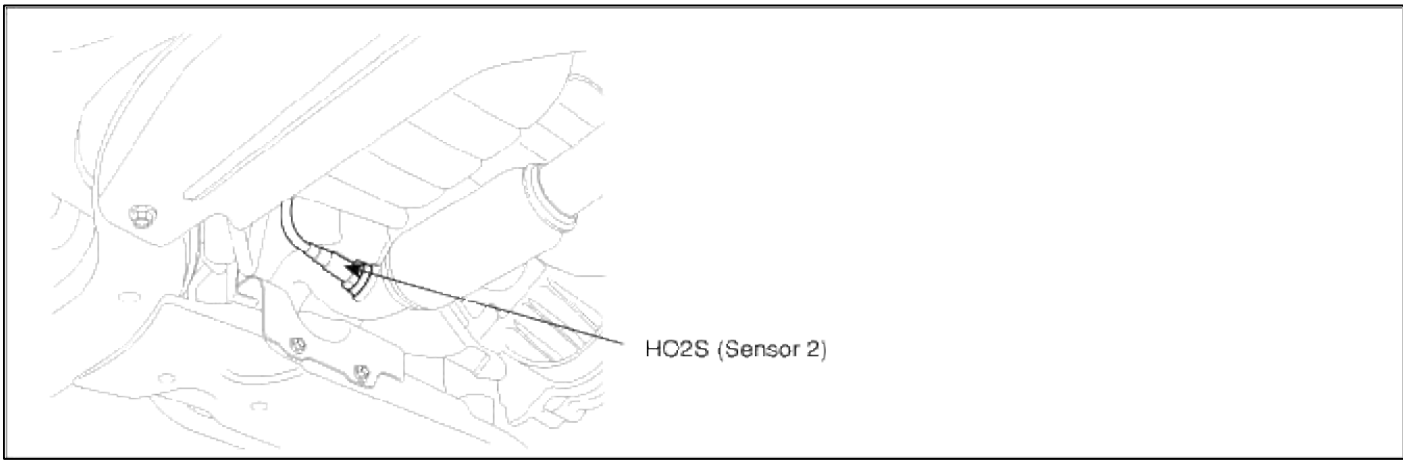
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0138 O2 Sensor Circuit High Voltage (Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

HO2S(B1/S2) is in the rear side of Catalytic Converter to check the proper operation of catalyst. Oxygen density

after the catalytic converter has to be within specific range (around 0.5V when there is no acceclation and deceleration). If the oxygen density changes in accordance with HO2S(B1/S1), it means the poor performance of catalytic converter.

DTC DESCRIPTION

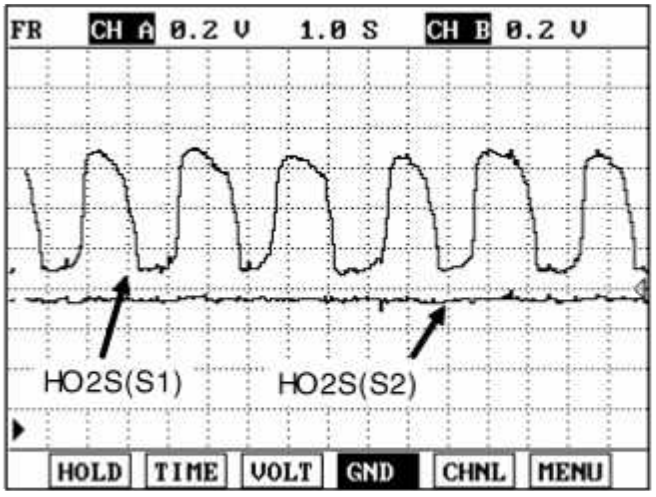
If the sensor output is over 1.08V under enable conditions, ECM/PCM sets DTC P0138.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Short to power in signal circuit • B1S2 • ECM/PCM
Enable Conditions	• After enough heated • Battery voltage > 10.7V • Catalyst temperature (model) < 800°C (1472°F)	
Threshold Value	• B1S2 sensor voltage > 1.08 V	
Diagnostic Time	• 5 sec	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



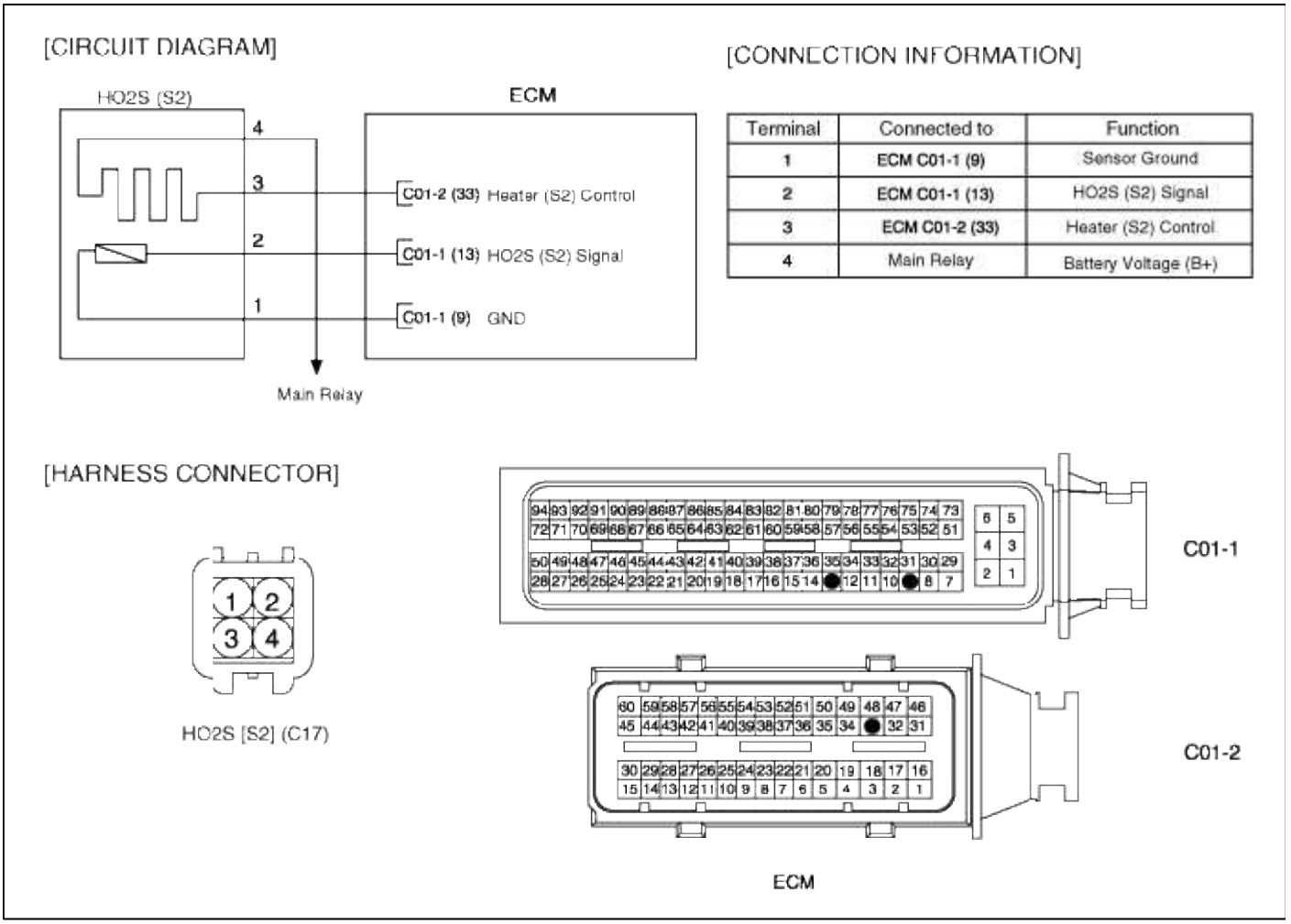
The rear HO2S amplitude is lower when compared to the front HO2S because the oxygen is stored/consumed during the conversion process.
This is the normal signal waveform of the rear HO2S at idle.

SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

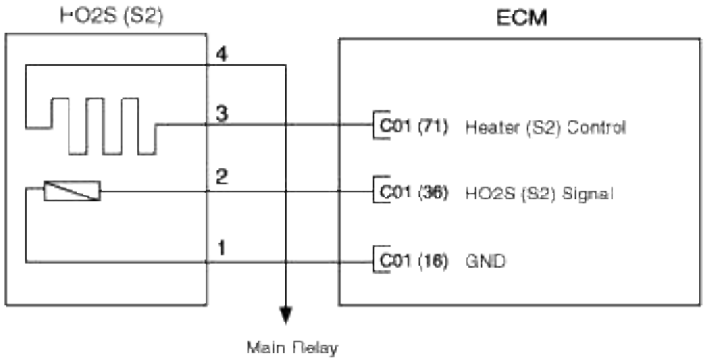
SCHEMATIC DIAGRAM

(A/T)



(M/T)

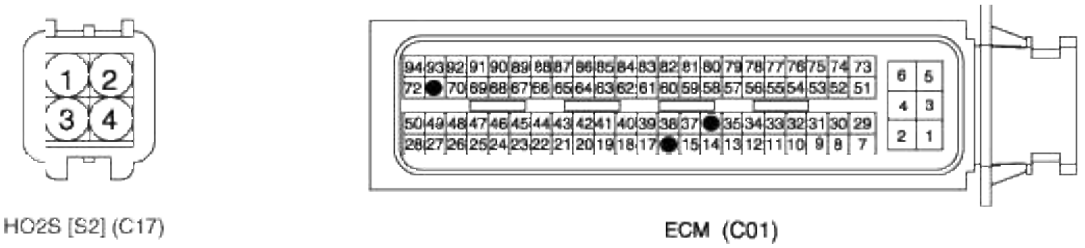
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

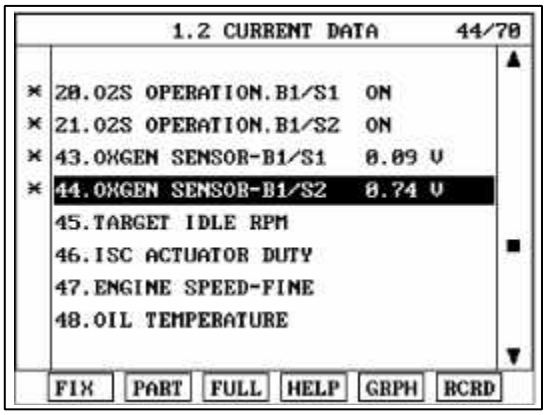
Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S(B1S2)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

NOTE

This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

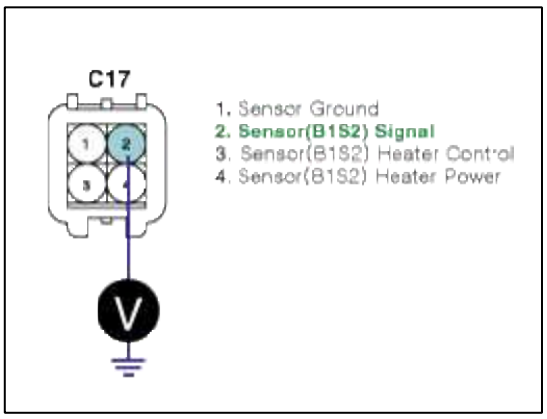
NO

Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S2) connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of HO2S(B1/S2) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S2) connector.
   (3) Check that HO2S(B1S2) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

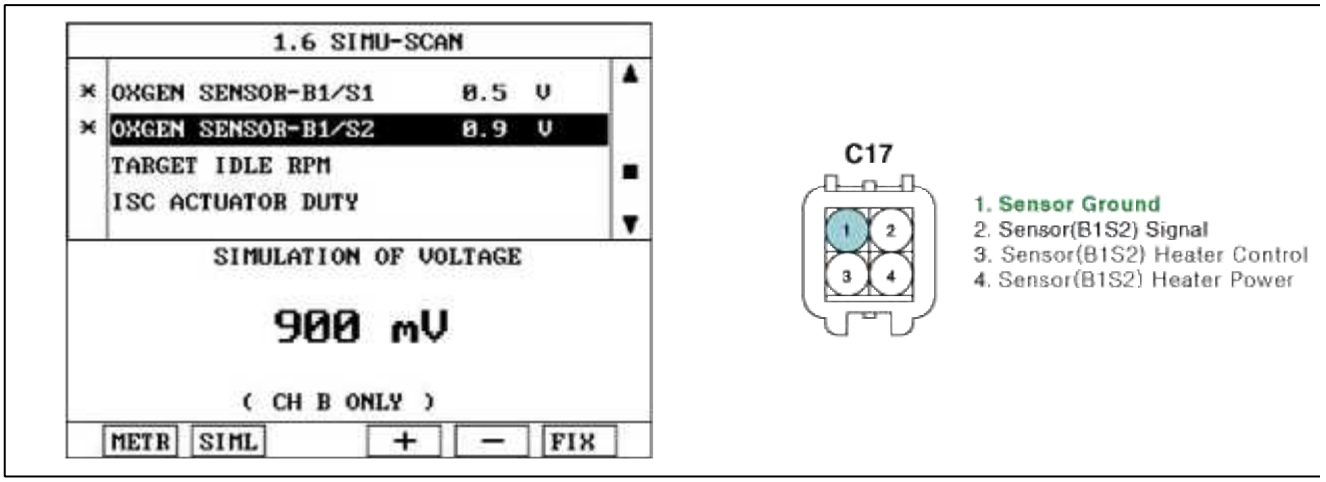
YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good HO2S(B1/S2) and check for proper operation.
If the problem is corrected, replace HO2S(B1/S2) and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF" and disconnect B1S2 connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 2 of HO2S(B1/S2) signal connector.



   (5) Does the signal value of HO2S(B1/S2) change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

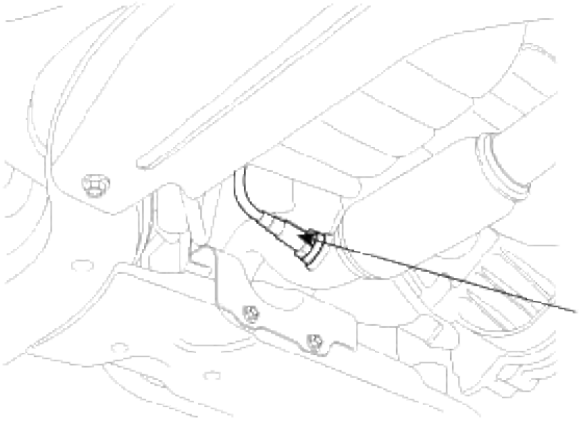
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0139 O2 Sensor Circuit Slow Response(Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

HO2S(B1/S2) is in the rear side of Catalytic Converter to check the proper operation of catalyst. Oxygen density after the catalytic converter has to be within specific range (around 0.5V when there is no acceclation and deceleration). If the oxygen density changes in accordance with HO2S(B1/S1), it means the poor performance of catalytic converter.

DTC DESCRIPTION

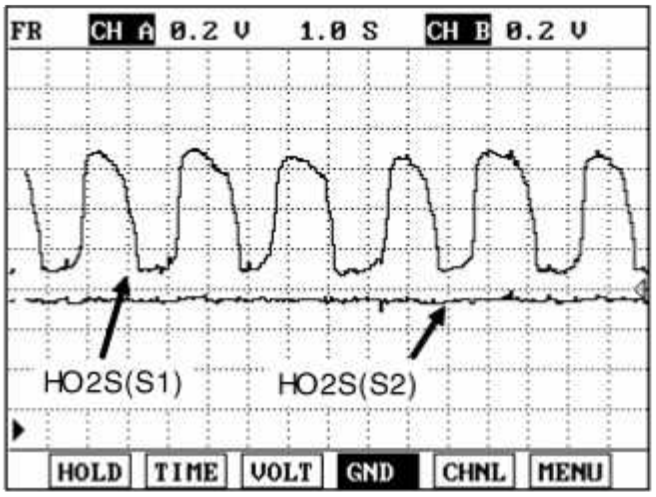
If the sensor output is over 0.15 V under enable conditions, ECM/PCM sets DTC P0139.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Response rate	• Poor connection • leak or clog in intake air system • Injector • Fuel pressure • B1S2 • ECM/PCM
Enable Conditions	• Time after fuel cut-off > 5 s • Integrated air mass after fuel cut-off > 15 g (0.53 oz.) • Time after dew point end detected > 30 s	
Threshold Value	• B1S2 sensor voltage > 0.15 V	
Diagnostic Time	• 0.2 sec	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



The rear HO2S amplitude is lower when compared to the front HO2S because the oxygen is stored/consumed during the conversion process.
This is the normal signal waveform of the rear HO2S at idle.

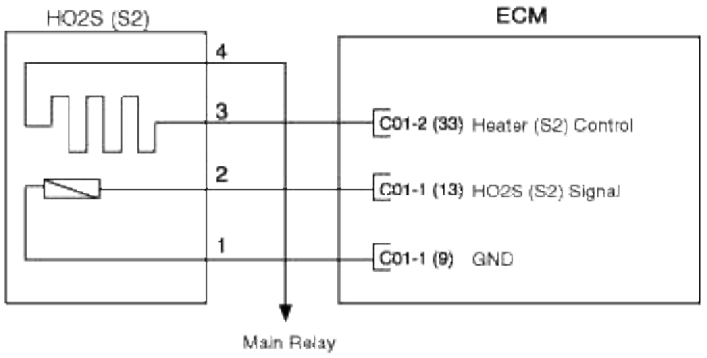
SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

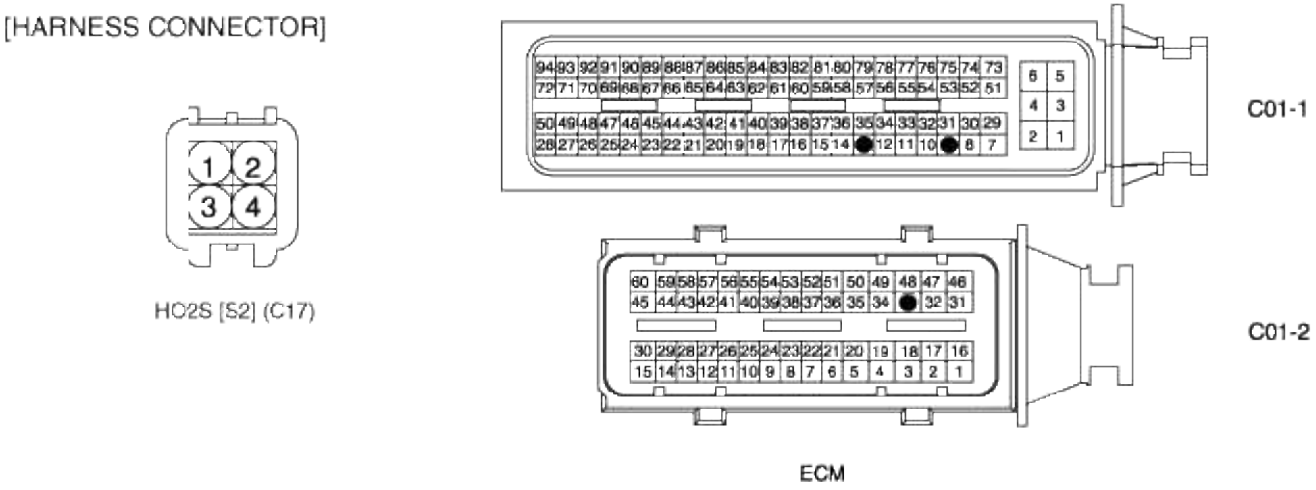
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

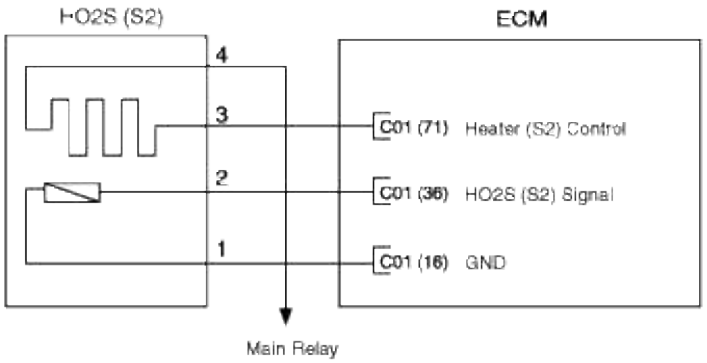
Terminal	Connected to	Function
1	ECM C01-1 (9)	Sensor Ground
2	ECM C01-1 (13)	HO2S (S2) Signal
3	ECM C01-2 (33)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



(M/T)

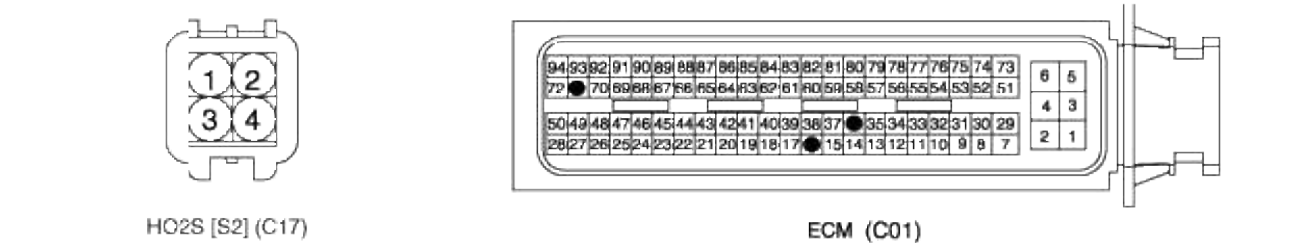
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

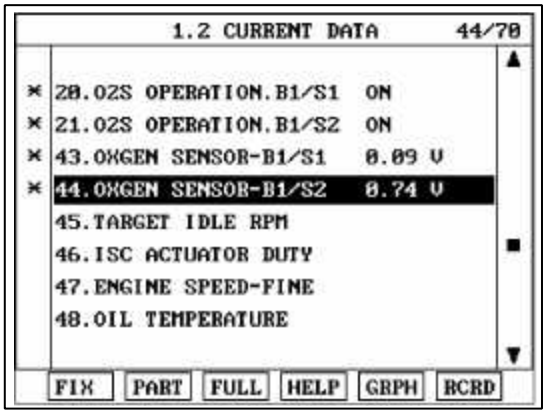
Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S(B1S2)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "System Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

SYSTEM INSPECTION

1. Check leakage or clog of air.
   (1) Check contamination, clog and installation of gasket
   Any damage or installation of throttle body gasket.
   Any damage or installation of gasket between intake manifold and surge tank.
   Clog or contamination of intake manifold and injector by foreign materials
   Contamination between surge tank and PCSV or stuck open condition of PCSV.
   Any damage or contamination of HO2S(B1/S2) by foreign materials.
   (2) Has a problem been found?

YES

Go to " Check Fuel Line" as follows.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

2. Check Fuel Line.
   (1) Check fuel lines for contamination, restriction, improper installation, or damage.
      Connection for each connectors in Fuel Line.
      Damage, interference and installation of vaccum hose connected to Fuel Line.
      Bend, Leakage and squeeze of pipe in Fuel Line.
   (2) Has a problem been found?

   YES

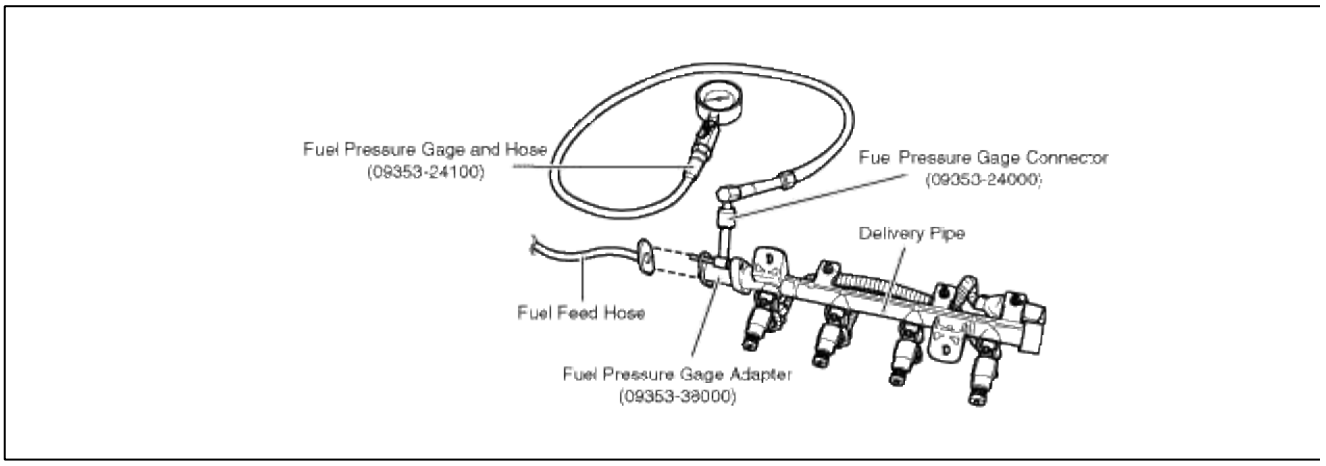
      Go to "Check Fuel Pressure" as follows.

   NO

      Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

3. Check Fuel Pressure.
   (1) IG "OFF".
   (2) Disconnect fuel pump relay from junction box in passenger compartment.
   (3) Start engine and await until engine is off and then, IG "OFF".
   (4) Connect fuel pump relay again.
   (5) Connect fuel pressure gauge on the fuel filter with fuel pressure gauge adaptor.
   (6) Start engine again and measure fuel pressure.

      Specification : Approx. 3.5 kgf/cm²



   (7) Is the fuel pressue normal?

   YES

      Go to "Component Inspection" procedure.

   NO

      Check any damage of fuel return hose or pipe.
      Check for improper fuel pressure regulator operation.
      Repair or replace as necessary and then, go to 'Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check PCV.
   (1) IG "OFF"
   (2) Disconnect PCV.
   (3) Check that PCV is properly operating.
   (4) Is the PCV O.K?

   YES

   Go to "Check PCSV" as follows.

   NO

   Substitute with a known - good PCV and check for proper operation.
   If the problem is corrected, replace PCV and go to "Verification of Vehicle Repair" procedure.

2. Check the PCSV.
   (1) Ignition "OFF".
   (2) Disconnect PCSV and Vacuum Hose.
   (3) Apply vacuum on PCSV with Hand Vacuum Gauge.
   (4) Is the PCSV keeping the Vacuum?

   YES

   Go to "Check Injector" as below.

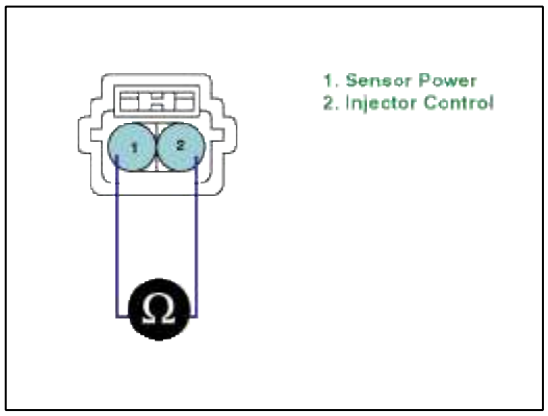
   NO

   Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure.

3. Check Injector.
   (1) Ignition "OFF"
   (2) Remove Injector.
   (3) Check Leakage and clog on Injector.
   (4) Measure resistance terminal 1 and 2 of Injector connector(Component side).

   Specification :

Temperature	Resistance [Ω]
20°C (68°F)	13.8 ~ 15.2 Ω



   (5) Is the measured resistance within specifications?

   YES

   Go to "Check sensors related to Fuel Trim " as below.

   NO

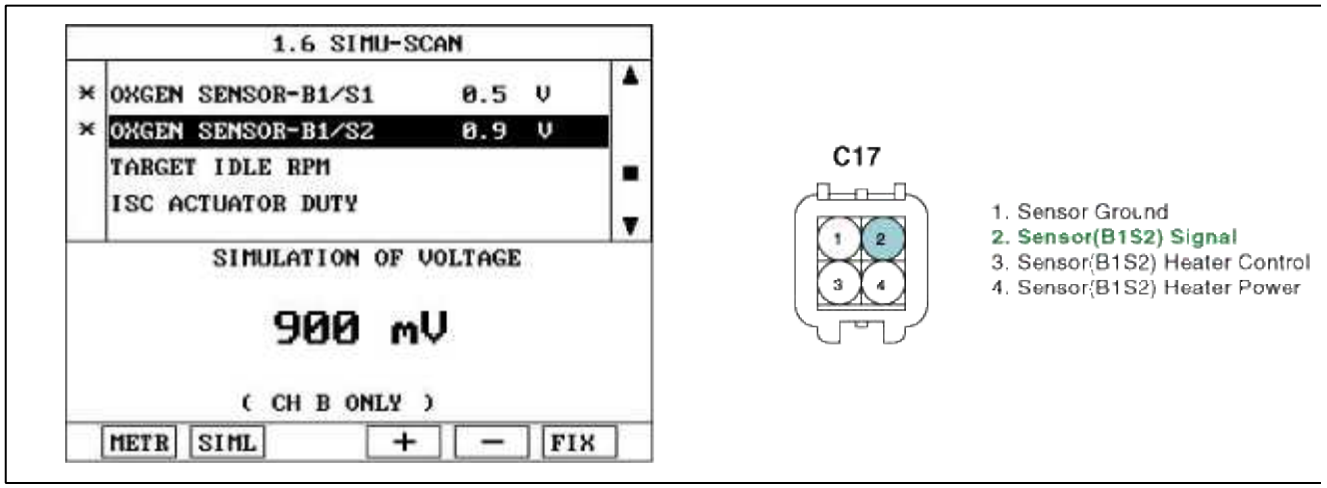
   Substitute with a known-good Injector and check for proper operation. If the problem is corrected, replace Injector and then go to "Verification of Vehicle Repair" procedure.

4. Check Sensors related to Fuel Trim.
   (1) Check the Input Voltage of Sensors related to Fuel Trim(MAPS, TPS, ECTS, PCSV, Injector, and etc) - Refer to Trouble Shooting Guide -
   (2) Are the sensors related to Fuel Trim O.K?

   YES
   Go to "Check ECM/PCM" as below.

   NO
   Repair as necessary and go to "Verification of Vehicle Repair" procedure.

5. Check ECM/PCM.
   (1) IG "OFF" and disconnect B1S2 connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 2 of HO2S(B1S2) sensor signal connector.



   (5) Is the HO2S(B1/S2) signal value changed according to simulation voltage ?

   YES
   Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deteriorati damage. Repair or replace as necessary and then go to "Verification of VehicleRepair" procedure.

   NO
   Substitute with a known-good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

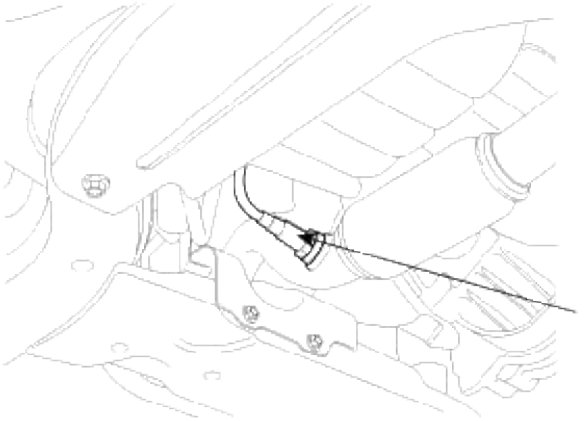
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES
Go to the applicable troubleshooting procedure.

NO
System is performing to specification at this time.

Fuel System > Troubleshooting > P0140 O2 Sensor Circuit No Activity Detected (Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

HO2S(B1/S2) is in the rear side of Catalytic Converter to check the proper operation of catalyst. Oxygen density after the catalytic converter has to be within specific range (around 0.5V when there is no acceclation and deceleration.)If the oxygen density changes in accordance with HO2S(B1/S1), it means the poor performance of catalytic converter.

DTC DESCRIPTION

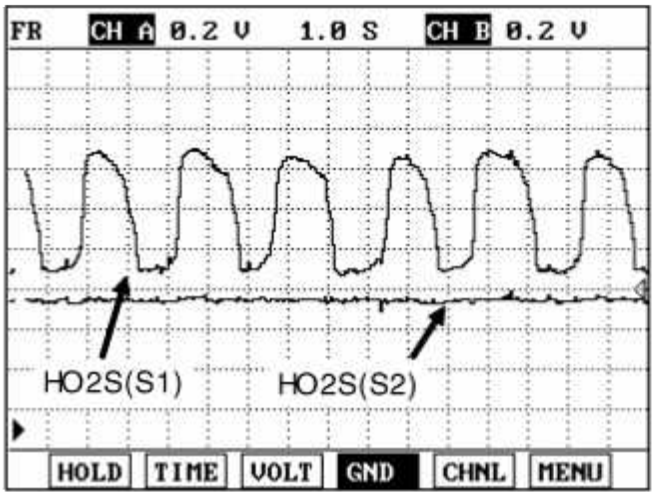
If there is not any signal activity, ECM/PCM sets DTC P0140.
(This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.)

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• No signal activity	• Poor connection • Open or short in signal circuit • B1S2 • ECM/PCM
Enable Conditions	• After oscillation check finished	
Threshold Value	• No signal activity	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



The rear HO2S amplitude is lower when compared to the front HO2S because the oxygen is stored/consumed during the conversion process.
This is the normal signal waveform of the rear HO2S at idle.

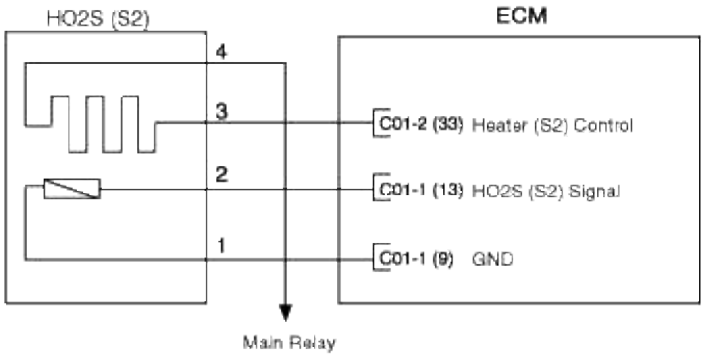
SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

SCHEMATIC DIAGRAM

(A/T)

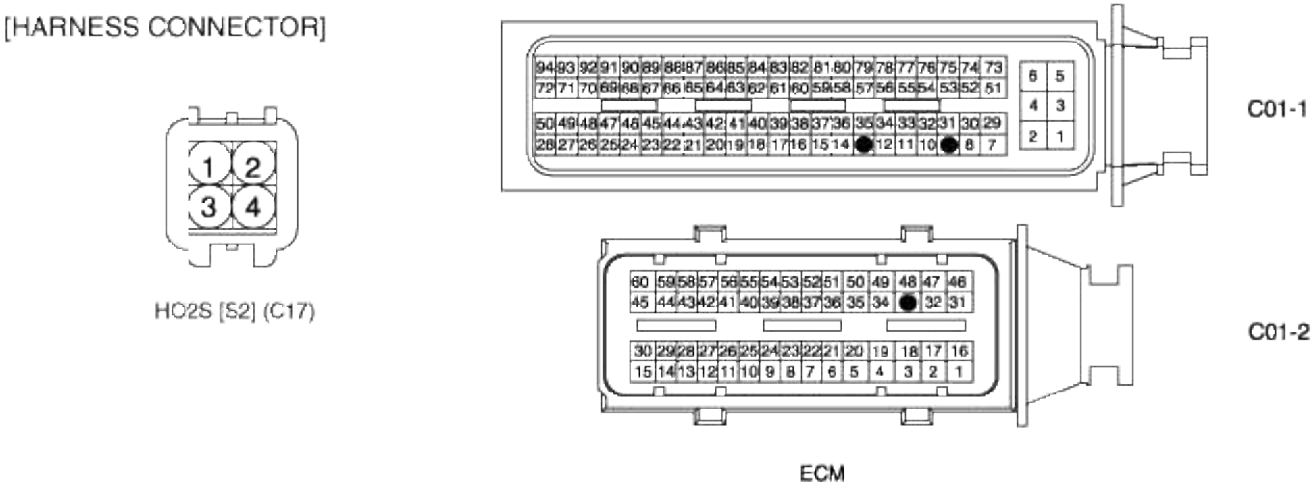
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

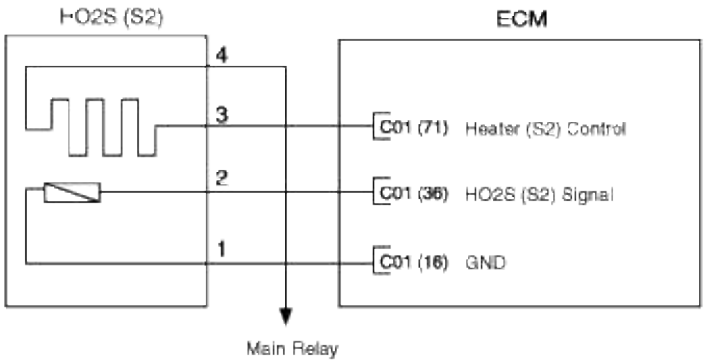
Terminal	Connected to	Function
1	ECM C01-1 (9)	Sensor Ground
2	ECM C01-1 (13)	HO2S (S2) Signal
3	ECM C01-2 (33)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



(M/T)

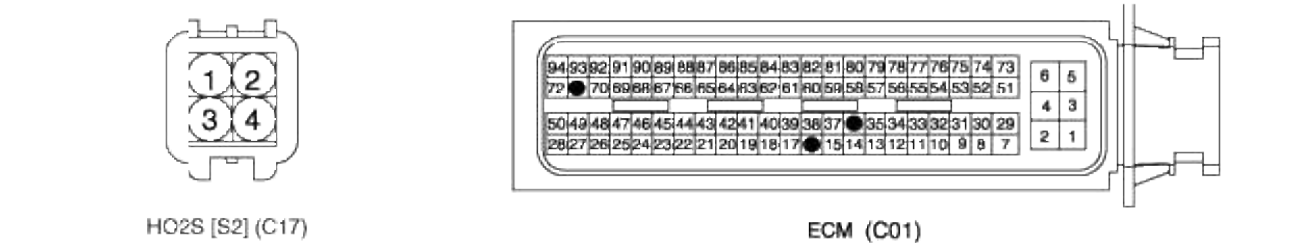
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

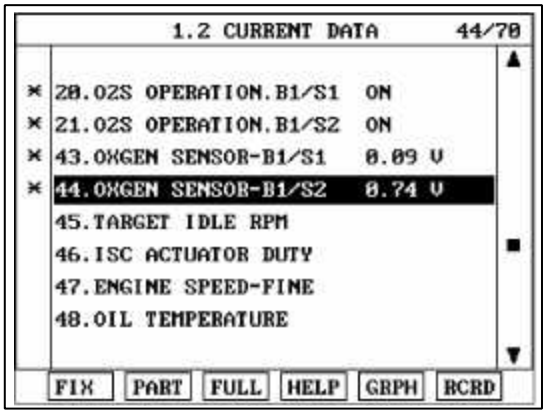
Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S(B1S2)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

> **NOTE**
>
> This DTC might be caused by the malfunction of Heater circuit, so, check the heater circuit first.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

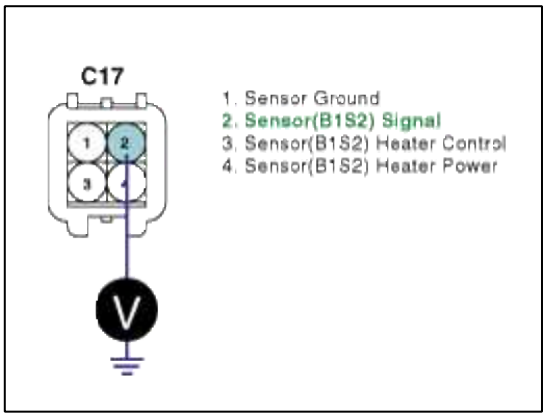
Go to " Signal Circuit Inspection " procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S2) connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of HO2S(B1/S2) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S2) connector.
   (3) Check that HO2S(B1S2) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

   YES

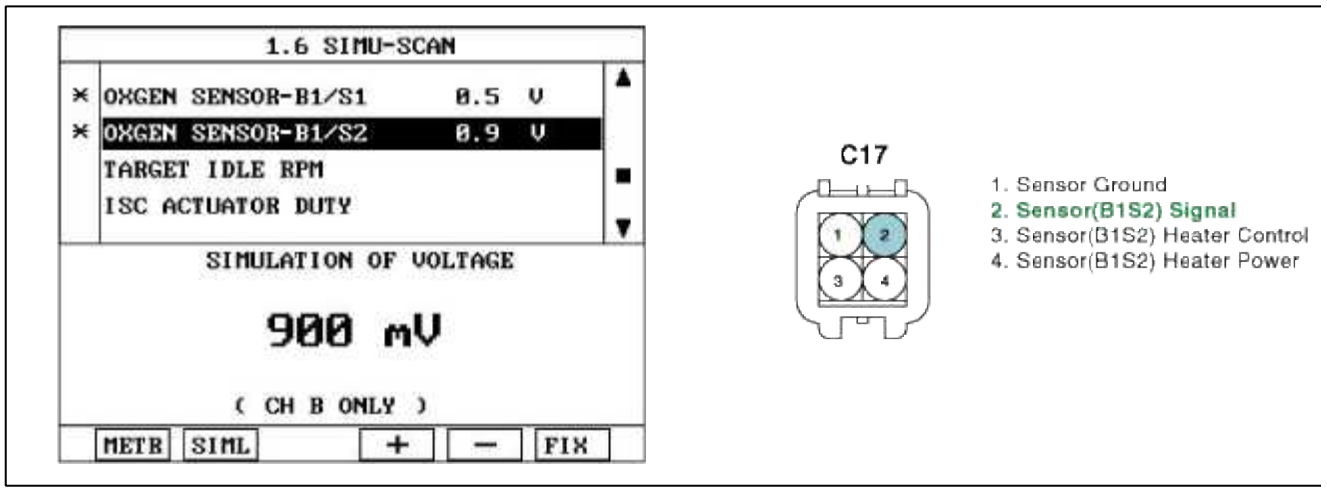
   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good HO2S(B1/S2) and check for proper operation.
   If the problem is corrected, replace HO2S(B1/S2) and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF" and disconnect B1S2 connector.
   (2) Connect scantool and Key "ON".
   (3) Select simulation function on scantool.

(4) Simulate voltage at terminal 2 of HO2S(B1/S2) signal connector.



(5) Does the signal value of HO2S(B1/S2) change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

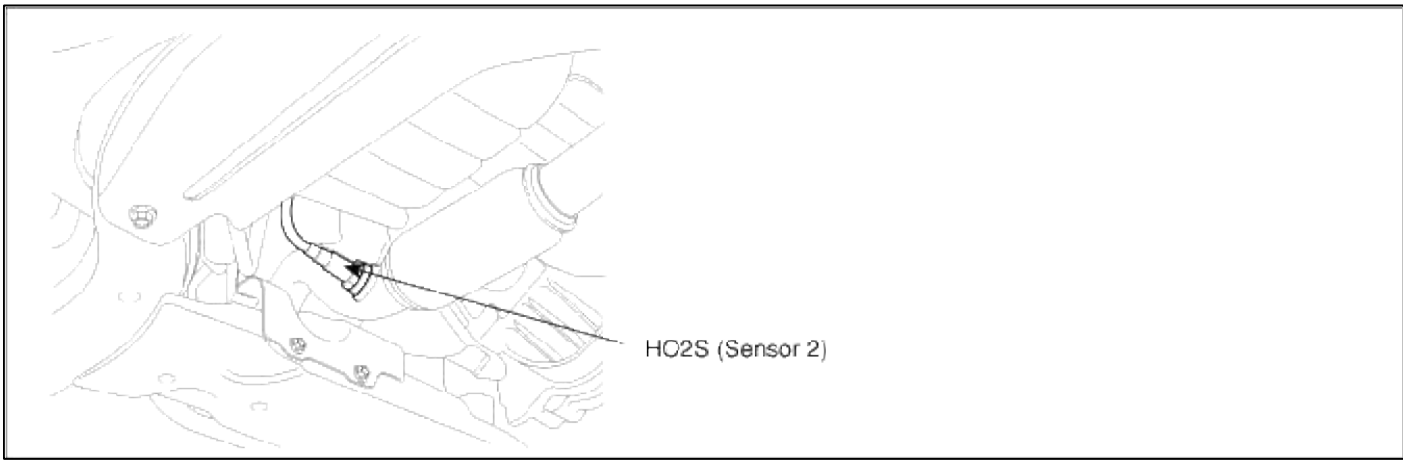
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0141 O2 Sensor Heater Circuit(Bank 1 / Sensor 2)

COMPONENT LOCATION



GENERAL DESCRIPTION

HO2S(B1/S2) is in the rear side of Catalytic Converter to check the proper operation of catalyst. Oxygen density after the catalytic converter has to be within specific range (around 0.5V when there is no acceclation and deceleration.)If the oxygen density changes in accordance with HO2S(B1/S1), it means the poor performance of catalytic converter.

DTC DESCRIPTION

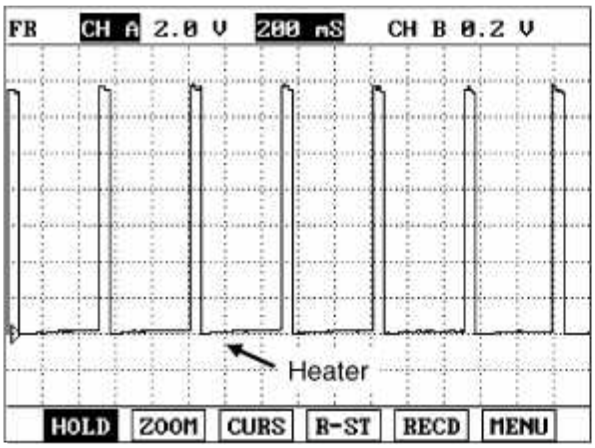
If the internal resistance of heater is over the threshold value under enable conditins, ECM/PCM sets DTC P0141.

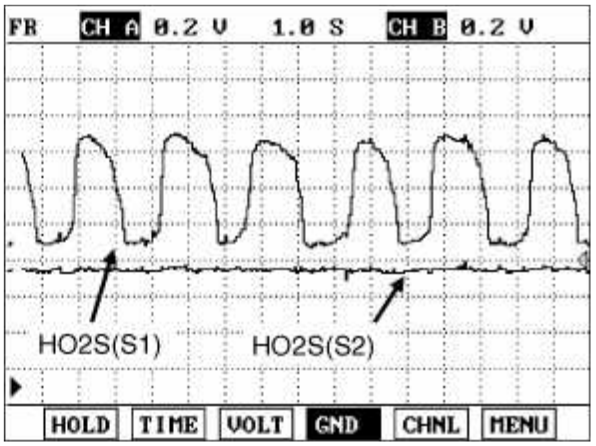
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Heater current check	• Poor connection • Open or short to ground in signal circuit • B1S2 • ECM/PCM
Enable Conditions	• Catalyst temperature (model) 200~550°C (392 ~ 1022°F) • Intake air temperature > -7°C (19.4°F) • Battery voltage 10.7~16.1V	
Threshold Value	• Internal resistance > threshold f (cat. temp., heater power)	
Diagnostic Time	• Above 6 sec	
MIL ON Condition	• 2 driving cycle	

B1S2 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA





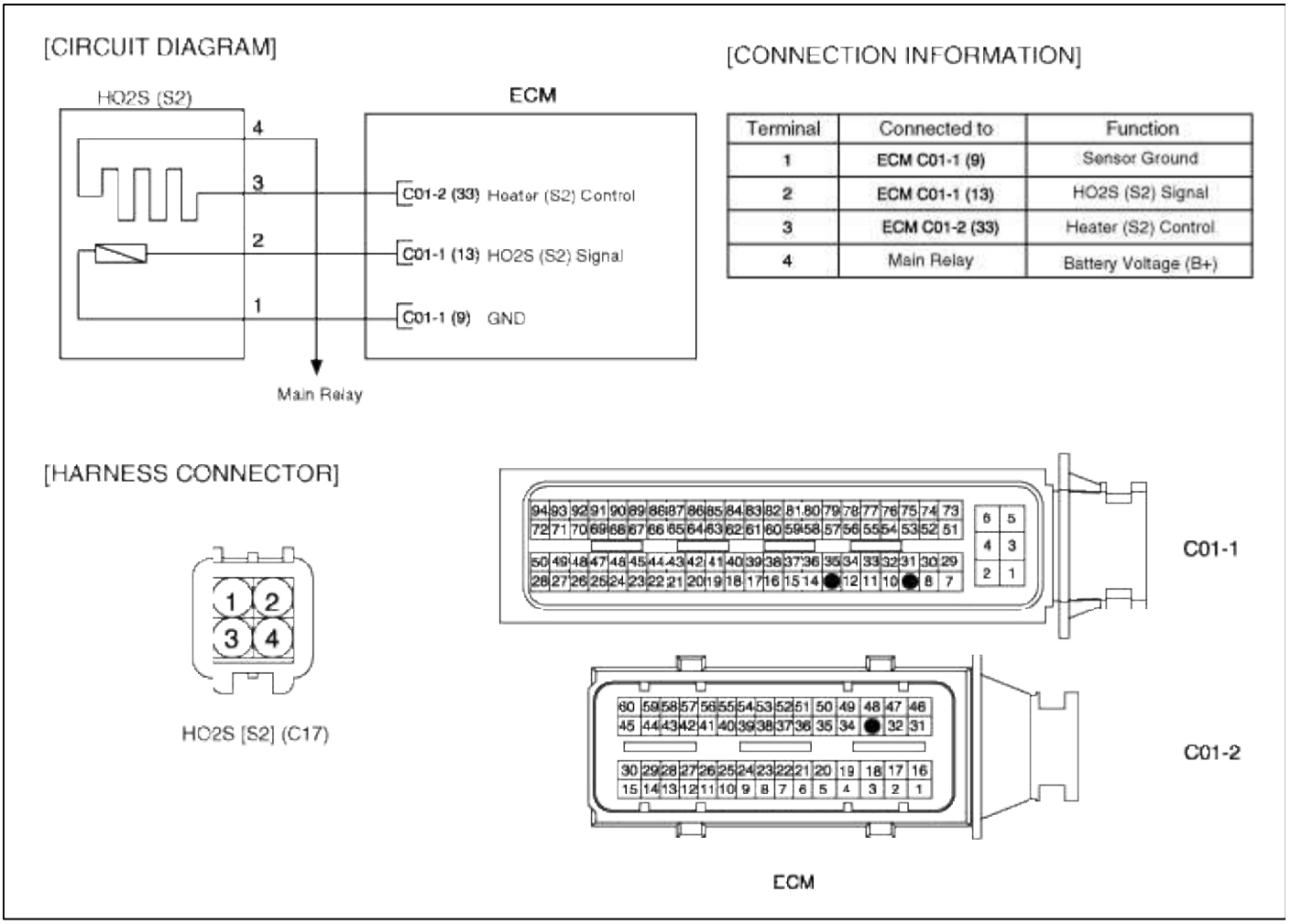
The HO2S requires a minimum temperature to provide a closed loop fuel control system. So the HO2S contains a heater element to reduce its warm-up time and ensure its performance during all drivingconditions.
The HO2S heater is controlled ON after engine start except for Cold condition and high speed accelleration.
The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the ECM provides a ground circuit for activating the heater.

SPECIFICATION

Item	Specification
Heater Resistance	Approx. 9.0 at 20°C (68°F)

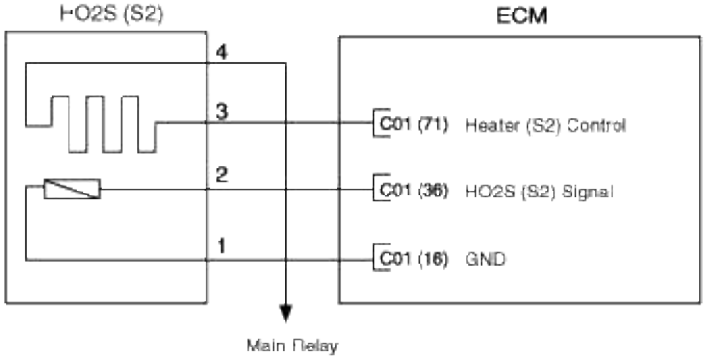
SCHEMATIC DIAGRAM

(A/T)



(M/T)

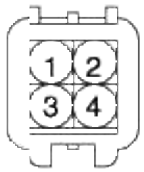
[CIRCUIT DIAGRAM]



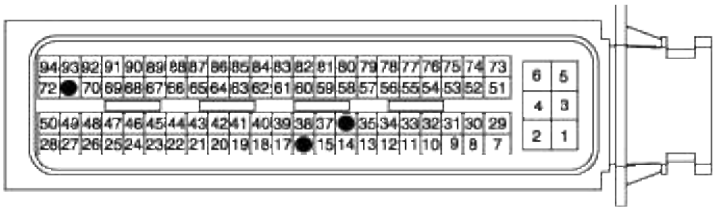
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (16)	Sensor Ground
2	ECM C01 (36)	HO2S (S2) Signal
3	ECM C01 (71)	Heater (S2) Control
4	Main Relay	Battery Voltage (B+)

[HARNESS CONNECTOR]



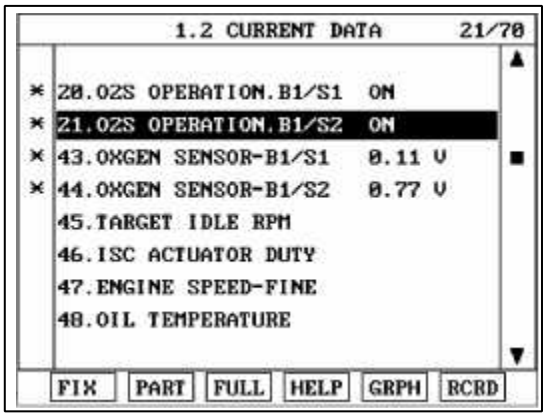
HO2S [S2] (C17)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "HO2S(B1S2)" parameter on scantool.



4. Is the "HO2S(B1S2)" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

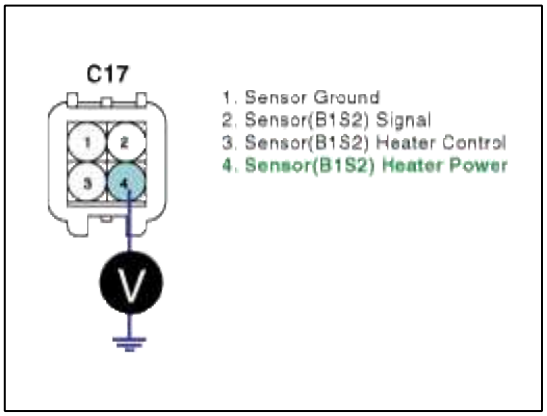
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1S2) connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 4 of HO2S (B1S2) harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

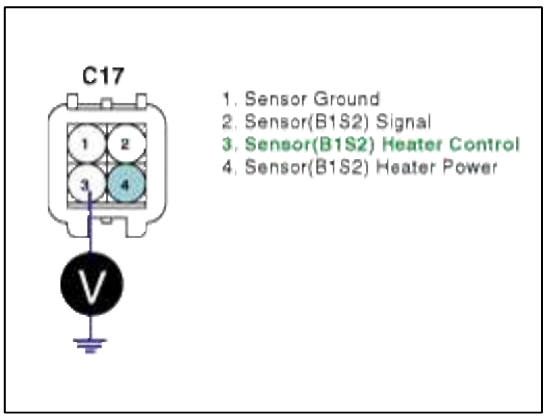
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1S2) connector.
3. IG "ON" & ENG "OFF"
4. Measure voltage between terminal 3 of HO2S(B1S2) harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Heater resistance.

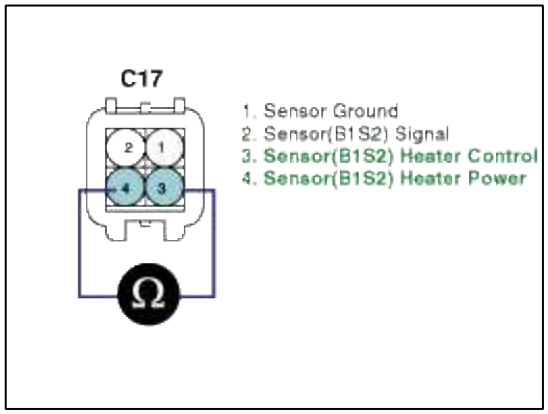
(1) IG "OFF".

(2) Disconnect HO2S(B1S2) connector.

(3) Measure resistance bwteen terminal 3 and 4 of HO2S(B1S2) connector.(Component Side)

Specification :

Item	Specification
Heater Resistance	Approx. 9.0 at 20°C (68°F)



(4) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good HO2S and check for proper operation.
If the problem is corrected, replace HO2S and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0171 System too Lean (Bank 1)

GENERAL DESCRIPTION

The catalyst’s efficiency is demonstrated by its ability to oxidize CO and hydrocarbon emissions. The ECM/PCM

compares the output signals of the front and rear oxygen sensors to determine whether the output of the rear sensor is beginning to match the output of the front oxygen sensor. Air/fuel mixture compensation keeps the frequency of the front oxygen sensor high due to the changes from rich-to-lean combusition. The catalyst causes the rear oxygen sensor to have a lower frequency. As the catalyst wears, the rear oxygen sensor's signal trace begins to match the front oxygen sensor's signal trace. That is because the catalyst becomes saturated with oxygen and cannot use the oxygen to convert hydrocarbon and CO into H O and CO with the same efficiency as when it was new. A completely worn catalyst shows a 100% match between the frequency of the front and rear sensors.

DTC DESCRIPTION

If the correction value of air-fuel ratio is higher than the threshold value, ECM/PCM sets DTC P0171.

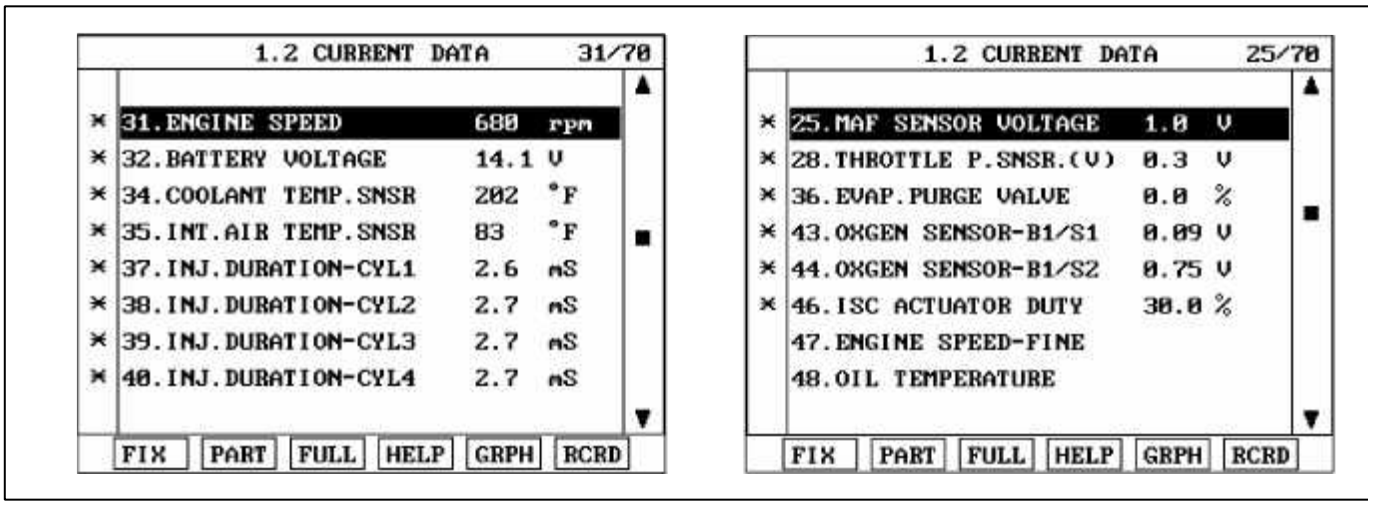
DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Long-term fuel trim limit	• Poor connection • Related sensor • Intake air system • Fuel pressure • ECM/PCM
General Enable Conditions		• Coolant temperature > 70°C (158°F) • Intake air temperature < 80°C (176°F) • Throttle angle < 60% • Closed loop control enabled • No transient control phase • No canister purge phase	
Case1	Enable Conditions	• Engine load : 30~75 % • Air mass : 40~200 kg/h (88.2~441 lb/h)	
	Threshold Value	• Multiplicative > 1.23	
	Diagnostic Time	• 30 sec	
Case2	Enable Conditions	• Engine speed ≤ 920 rpm • Air mass ≤ 24 kg/h (53 lb/h)	
	Threshold Value	• Additive value > 8.5 %	
	Diagnostic Time	• 20 sec	
MIL ONCondition		• 2 driving cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "Parameters related to air/fuel ratio(HO2S, MAF, MAP, TPS, ECTS, PCSV, Injector, etc)" on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Air leakage check.
   (1) Check "Air intake system"
   Check looseness, deterioration or contamination on throttle body and gasket.
   Check contamination, damage or crack on intake manifold, ISCA and injectors.
   (2) Is there any leakage?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure

NO

Go to "Fuel line check" procedure.

2. Fuel line check.
   (1) Check "Fuel line system"
      Check looseness of connectors on fuel line.
      Check looseness, damage, or interference of vacuum hose on fuel line.
      Check damage, leakage or bending on fuel line pipe.
   (2) Is fuel line normal?

YES

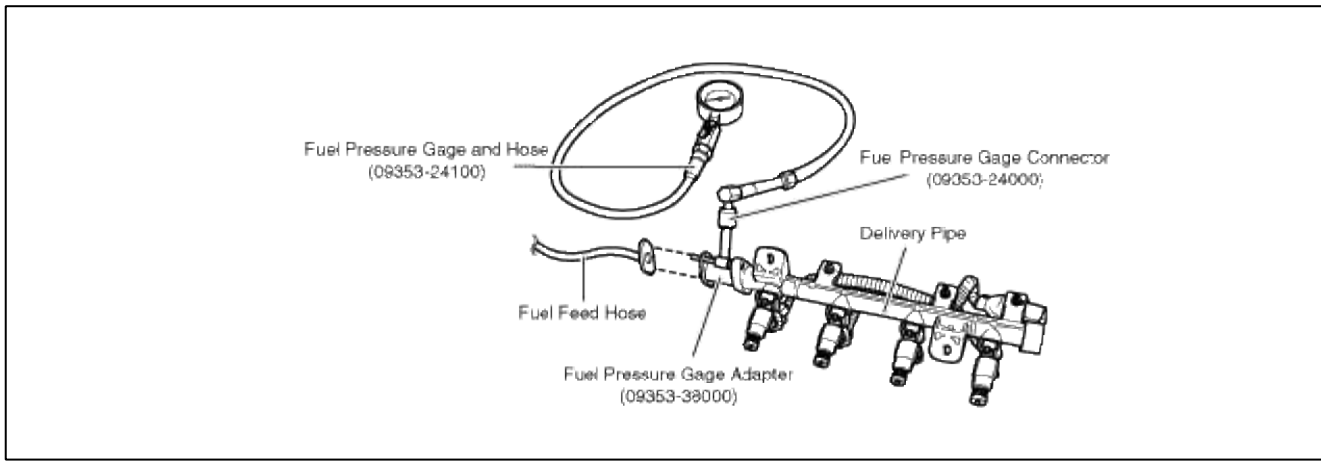
Go to "Fuel line pressure check" procedure.

NO

Repair as necessary and go to "Verification of vehicle Repair" procedure.

3. Fuel line pressure check.
   (1) Key "OFF".
   (2) Remove fuel pump relay.
   (3) Engine start and wait until engine stop. and then key "OFF".
   (4) Install a fuel pump relay.
   (5) Connect fuel pressure gauge using the correct adapter.
   (6) Start the engine, and record fuel pressure.

Specification : Approx. 3.5 kgf/cm² (343.2 kPa, 50psi)



   (7) Is the fuel pressure normal?

YES

Go to "Component inspection" procedure.

NO

Check clogging on the fuel filter.
Check the supply pressure of fuel pump.
Repair as necessary and go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. PCV(Positive Crankcase Ventilation) valve check.
   (1) Key "OFF".
   (2) Disconnect PCV valve.
   (3) Check PCV plunger movement.
   (4) Is the movement of plunger normal?

   YES

   Go to "PCSV check" procedure.

   NO

   Substitute with a known - good PCV valve and check for proper operation.
   If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

2. PCSV check.
   (1) Key "OFF".
   (2) Disconnect PCSV and vacuum hose.
   (3) Apply a vacuum by a hand vacuum gauge on PCSV.
   (4) Does PCSV keep the vacuum condition normally?

   YES

   Go to "Injector check" procedure.

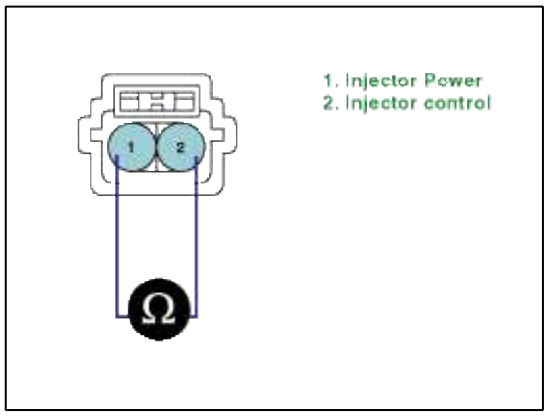
   NO

   Substitute with a known - good PCSV and check for proper operation.
   If the problem is corrected, replace PCSV and go to "Verification of Vehicle Repair" procedure.

3. Injector check.
   (1) Key "OFF".
   (2) Disconnect injectors.
   (3) Check clog on injectors.
   (4) Measure the resistance between terminal 1 and 2 of injectors(Component side).

   Specification :

Temperature (°F)	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (5) Is the measured resistance within specifications?

   YES

   Go to "Sensors related to air/fuel ratio check" procedure.

   NO

   Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure.

4. Sensors related to air/fuel ratio check.
   (1) Check the output data of sensors related to air/fuel ratio (HO2S, MAPS, TPS, ECTS, PCSV, Injectors, etc) on scantool. (Refer to each DTC guide procedure.)
   (2) Are those sensors normal?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0172 System too Rich (Bank 1)

GENERAL DESCRIPTION

The catalyst's efficiency is demonstrated by its ability to oxidize CO and hydrocarbon emissions. The Powertrain Control Module (PCM) compares the output signals of the front and rear oxygen sensors to determine whether the output of the rear sensor is beginning to match the output of the front oxygen sensor. Air/fuel mixture compensation keeps the frequency of the front oxygen sensor high due to the changes from rich-to-lean combusition. The catalyst causes the rear oxygen sensor to have a lower frequency. As the catalyst wears, the rear oxygen sensor's signal trace begins to match the front oxygen sensor's signal trace. That is because the catalyst becomes saturated with oxygen and cannot use the oxygen to convert hydrocarbon and CO into H O and CO with the same efficiency as when it was new. A completely worn catalyst shows a 100% match between the frequency of the front and rear sensors.

DTC DESCRIPTION

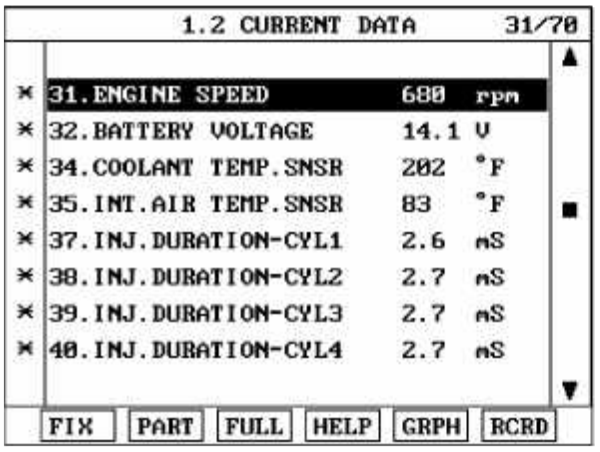
If the correction value of air-fuel ratio is lower than the threshold value, ECM/PCM sets DTC P0172.

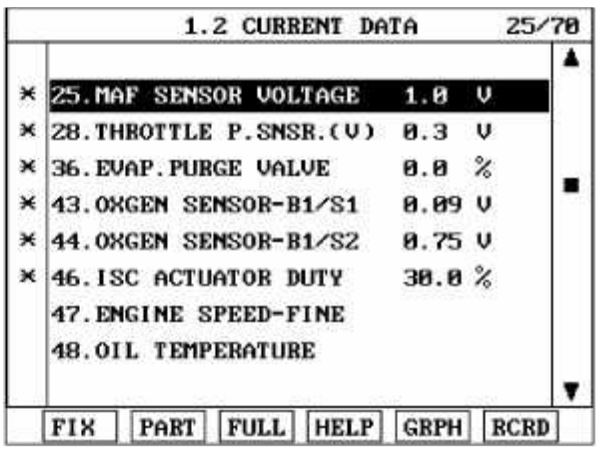
DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Long-term fuel trim limit	• Poor connection • Related sensor • Intake air system • Fuel pressure • ECM/PCM
General Enable Conditions		• Coolant temperature >70°C (158°F) • Intake air temperature < 80°C (176°F) • Throttle angle < 60% • Closed loop control enabled • No transient control phase • No canister purge phase	
Case1	Enable Conditions	• Engine load : 30~75 % • Air mass : 40~200 kg/h (88.2~441 lb/h)	
	Threshold Value	• multiplicative value < 0.77	
	Diagnostic Time	• 30 sec	
Case2	Enable Conditions	• Engine speed ≤ 920 rpm • Air mass ≤ 24 kg/h (53 lb/h)	
	Threshold Value	• additive value < -8.5%	
	Diagnostic Time	• 20 sec	
MIL ONCondition		• 2 driving cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Parameters related to air/fuel ratio(HO2S, MAF, MAP, TPS, ECTS, PCSV, Injector, etc)" on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Air clog check
   (1) Check "Air intake system"
   Check clog of air-cleaner.
   Check deterioration or contamination on throttle body and gasket.
   Check contamination, damage, stuck or clog on intake manifold, PCSV, ISCA and injectors.
   (2) Is there any problem?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure

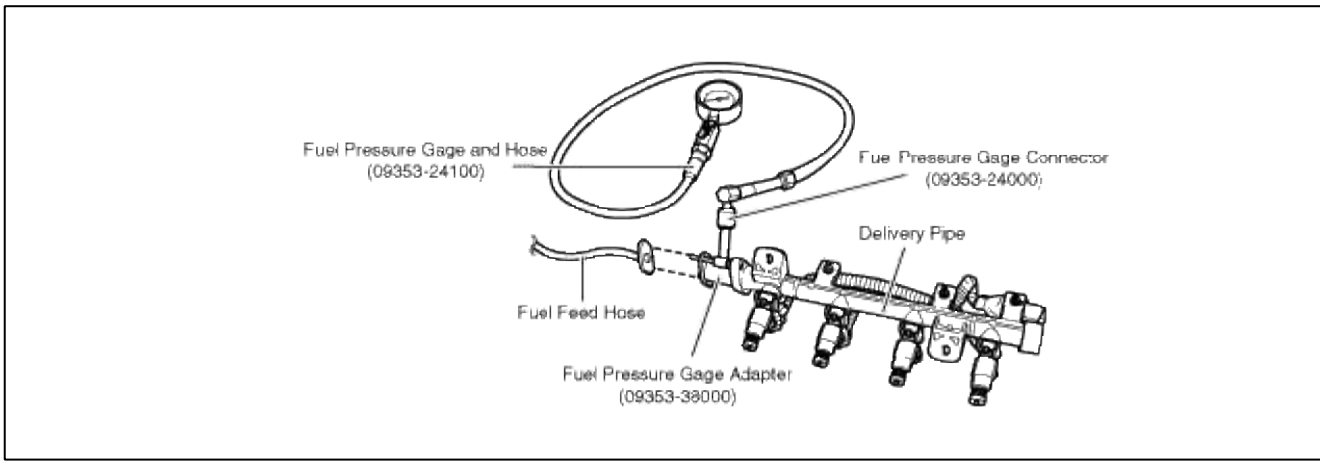
NO

Go to "Fuel pressure check" procedure

2. Fuel pressure check.
   (1) Key "OFF".
   (2) Remove fuel pump relay.
   (3) Engine start and wait until engine stop. and then key "OFF".
   (4) Install fuel pump relay.
   (5) Connect fuel pressure gauge using the correct adapter.

(6) Start the engine, and record fuel pressure.

Specification : Approx. 3.5kgf/cm² (343.2 kPa, 50psi)



(7) Is the fuel pressure normal?

YES

Go to "Component inspection" procedure.

NO

Check the supply pressure of fuel pump.
Repair as necessary and go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. PCV(Positive Crankcase Ventilation) valve check.
   (1) Key "OFF".
   (2) Disconnect PCV valve.
   (3) Check PCV plunger movement.
   (4) Is the movement of plunger normal?

YES

Go to "PCSV check" procedure.

NO

Substitute with a known - good PCV valve and check for proper operation.
If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

2. PCSV check.
   (1) Key "OFF".
   (2) Disconnect PCSV and vacuum hose.
   (3) Apply a vacuum by a hand vacuum gauge on PCSV.
   (4) Does PCSV keep the vacuum condition normally?

YES

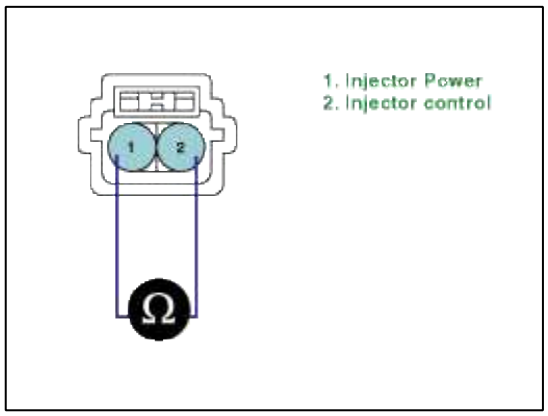
Go to "Injector check" procedure.

NO

Substitute with a known - good PCSV and check for proper operation.
If the problem is corrected, replace PCSV and go to "Verification of Vehicle Repair" procedure.

3. Injector check.
   (1) Key "OFF".
   (2) Disconnect injectors.
   (3) Check clog on injectors.
   (4) Measure the resistance between terminal 1 and 2 of injectors(Component side).
   Specification :

Temperature (°F)	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (5) Is the measured resistance within specifications?

   YES
   Go to "Sensors related to air/fuel ratio check" procedure.

   NO
   Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure.

4. Sensors related to air/fuel ratio check.
   (1) Check the output data of sensors related to air/fuel ratio (HO2S, MAPS, TPS, ECTS, PCSV, Injectors, etc) on scantool. (Refer to each DTC guide procedure.)
   (2) Are those sensors normal?

   YES
   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO
   Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

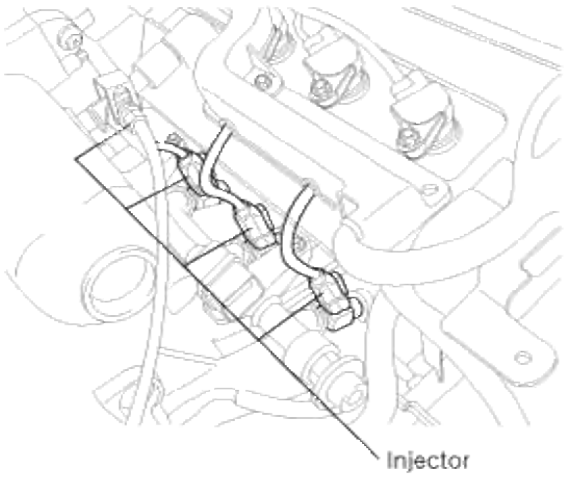
After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES
Go to the applicable troubleshooting procedure.

NO
System is performing to specification at this time.

Fuel System > Troubleshooting > P0201 Injector Circuit/Open-Cylinder 1

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

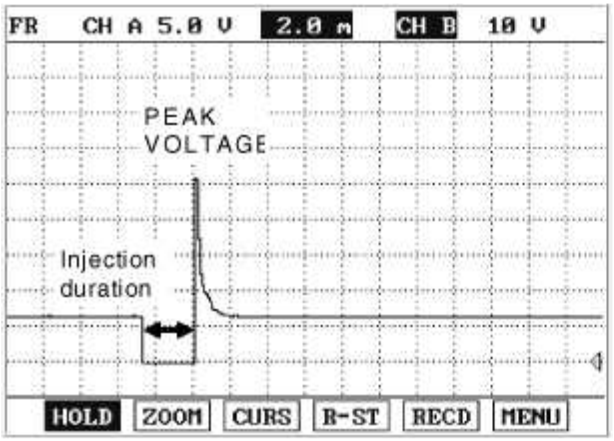
DTC DESCRIPTION

If there is Open in injector #1 circuit, ECM/PCM sets DTC P0201.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or short to ground in power circuit • Open in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

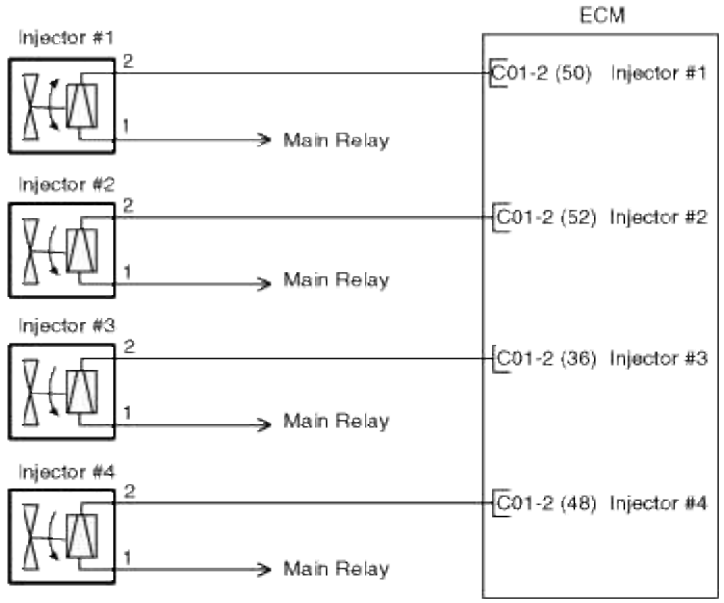
SPECIFICATION

Temperature	**Resistance (Ω)20**
20°C (68°F)	13.8 ~15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

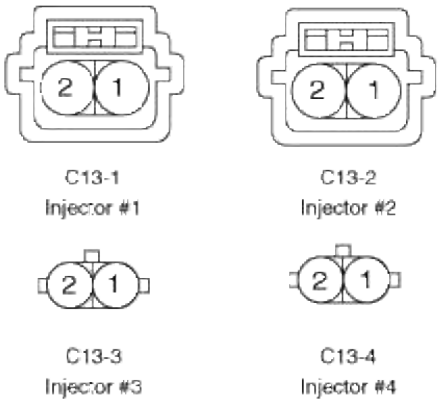
Injector #3

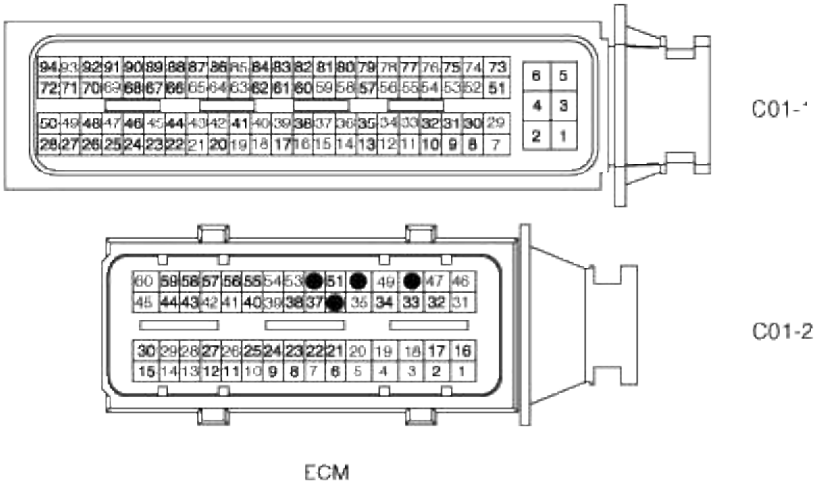
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

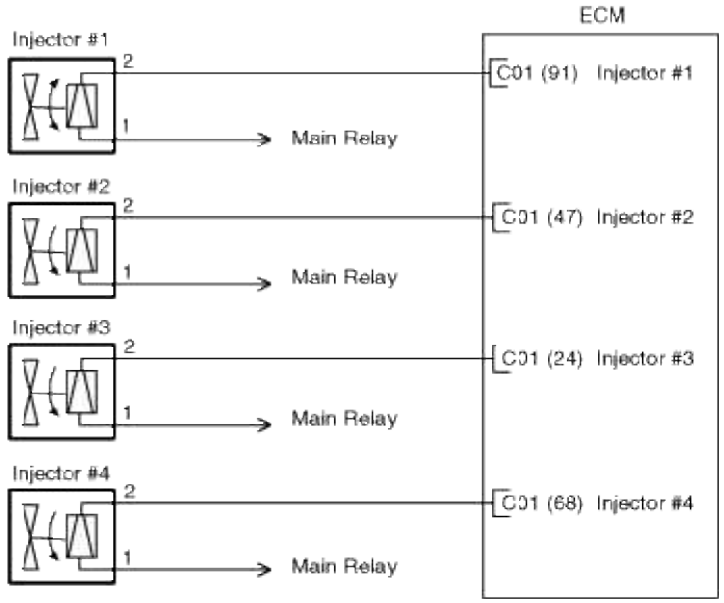
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

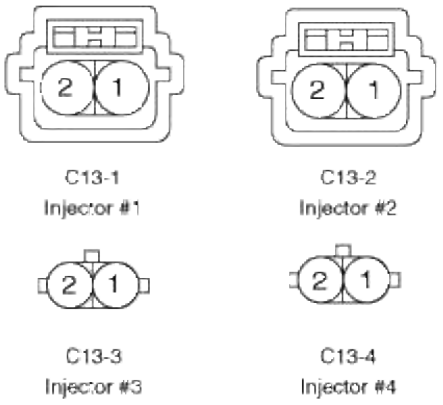
Injector #3

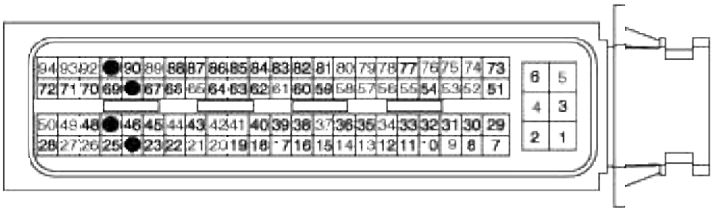
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

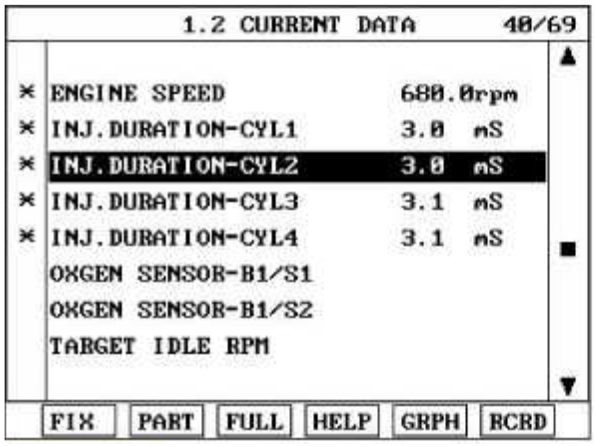
[HARNESS CONNECTORS]

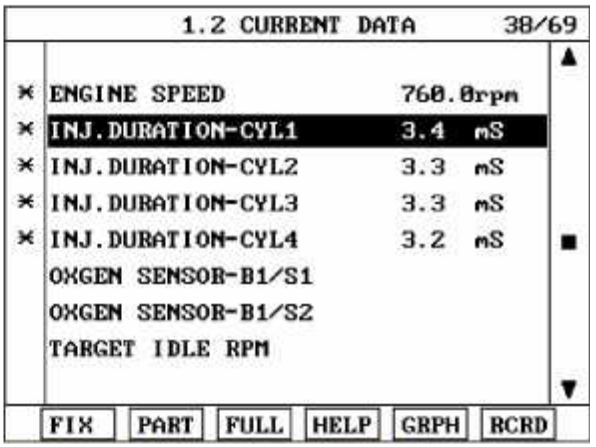




MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.





4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

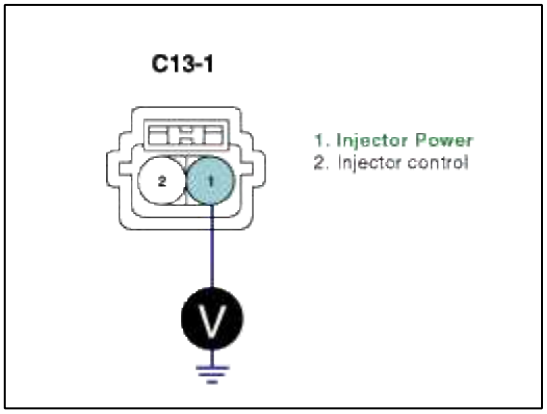
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 1 of injector harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

NO

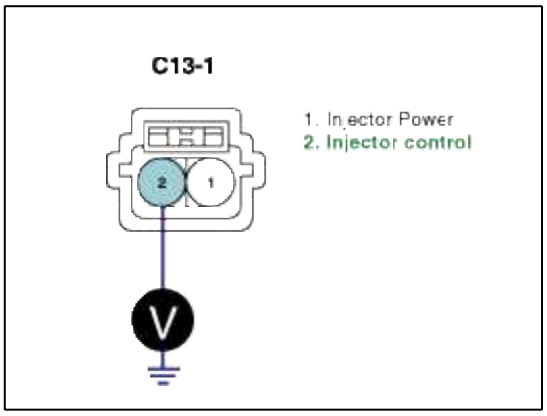
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

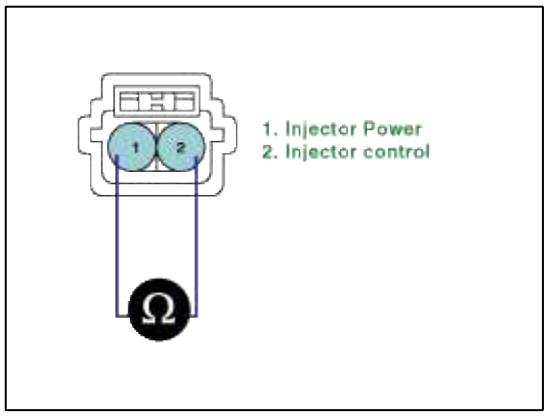
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)

Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good injector and check for proper operation.
If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

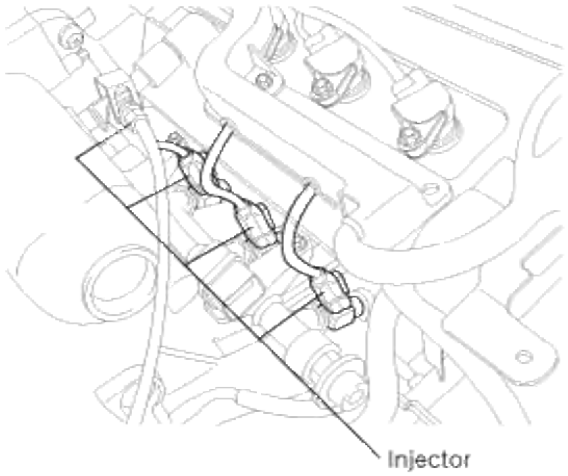
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0202 Injector Circuit/Open-Cylinder 2

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

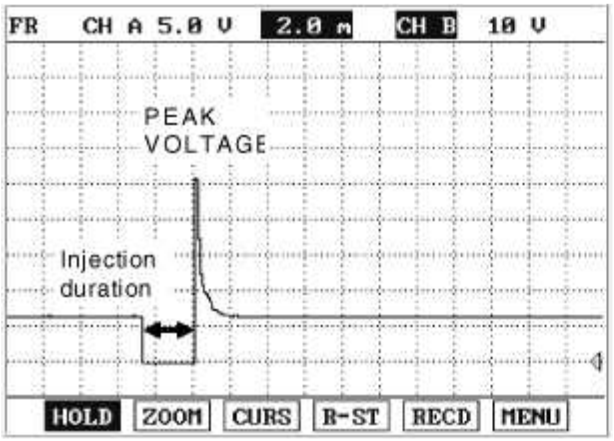
DTC DESCRIPTION

If there is Open in injector #2 circuit, ECM/PCM sets DTC P0202.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or short to ground in power circuit • Open in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

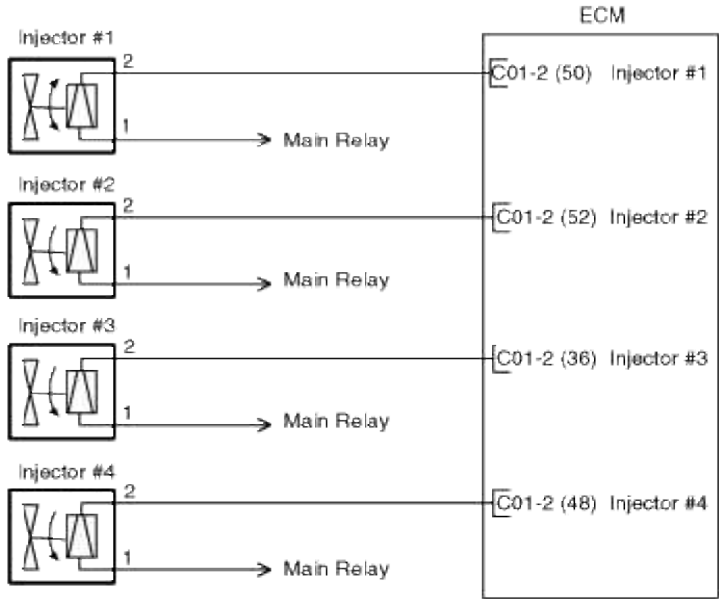
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

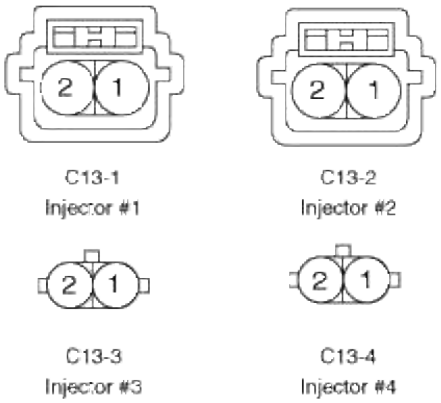
Injector #3

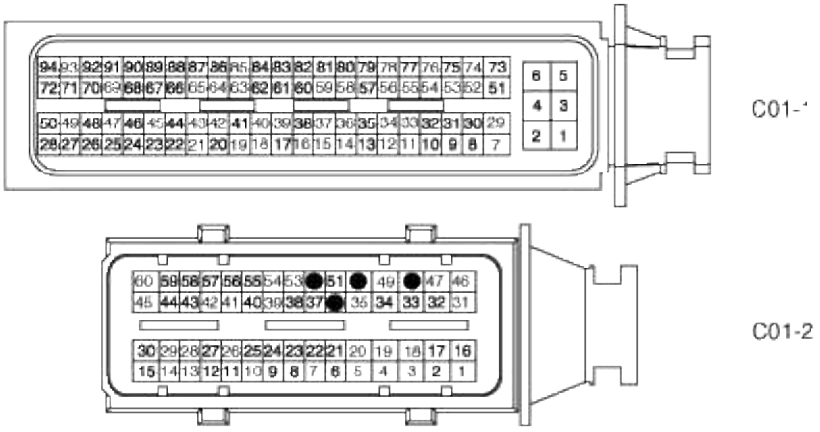
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

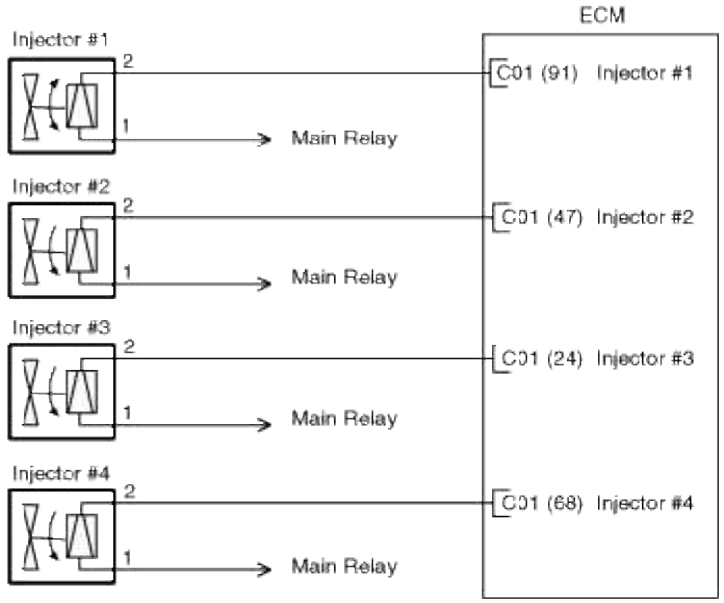
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

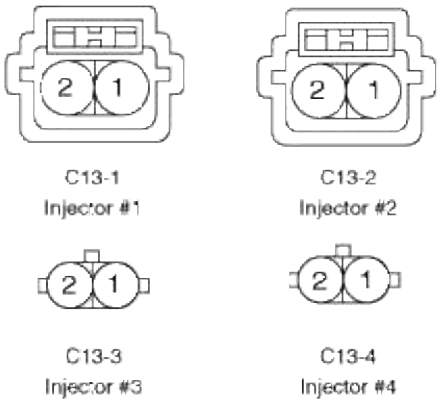
Injector #3

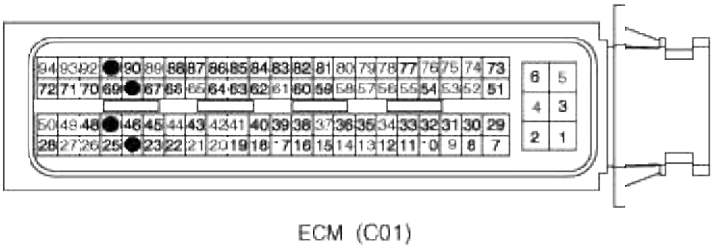
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

[HARNESS CONNECTORS]

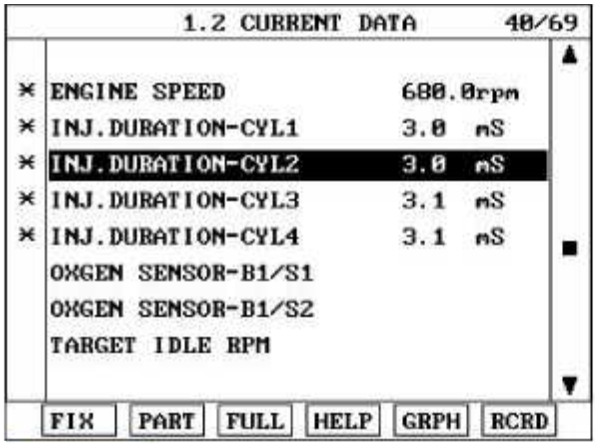




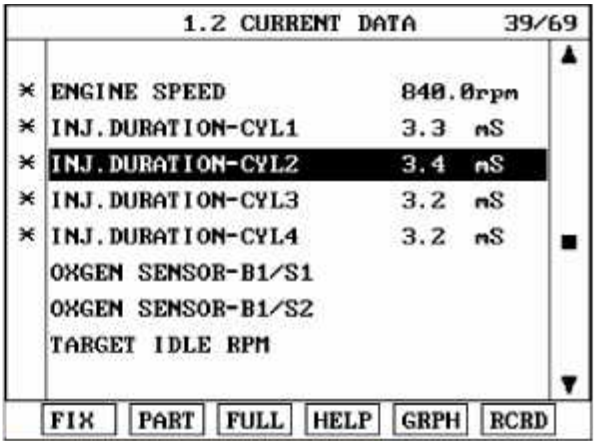
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.



Normal State



Abnormal State (#2 disconnected)

4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

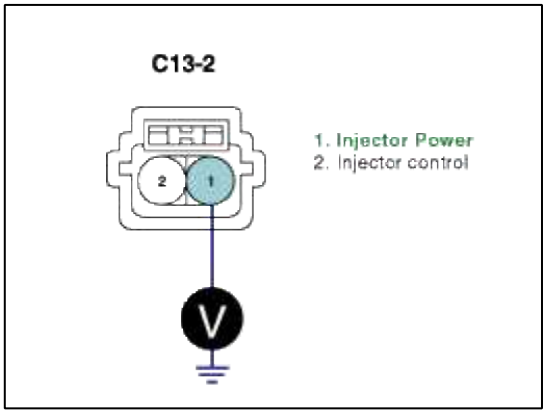
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 1 of injector harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

NO

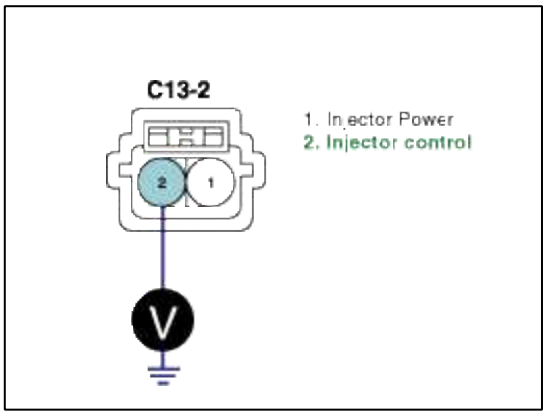
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

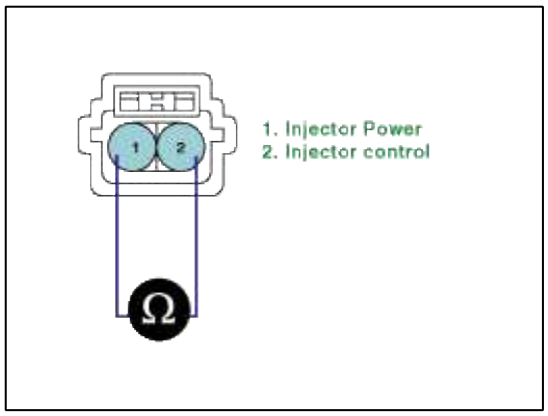
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)

Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good injector and check for proper operation.
If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

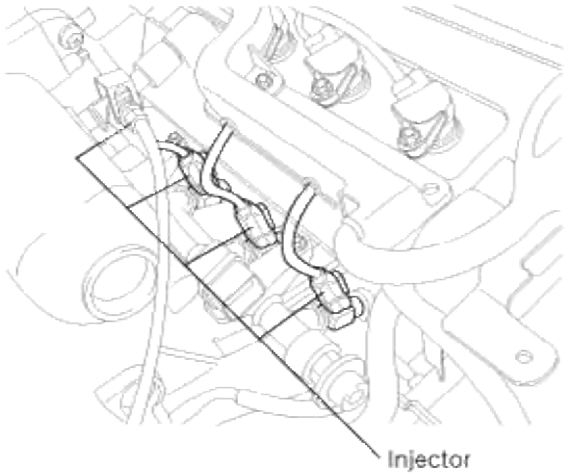
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0203 Injector Circuit/Open-Cylinder 3

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

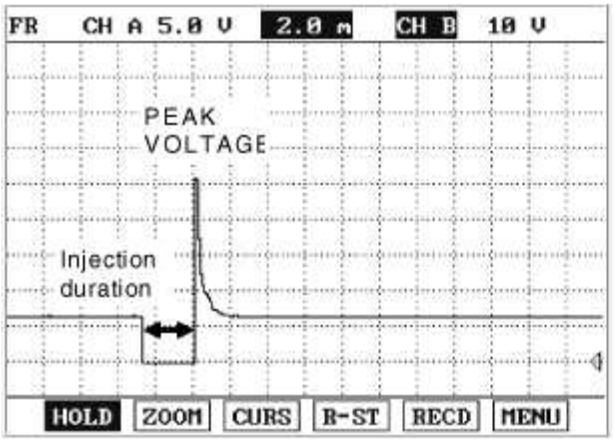
DTC DESCRIPTION

If there is Open in injector #3 circuit, ECM/PCM sets DTC P0203.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or short to ground in power circuit • Open in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

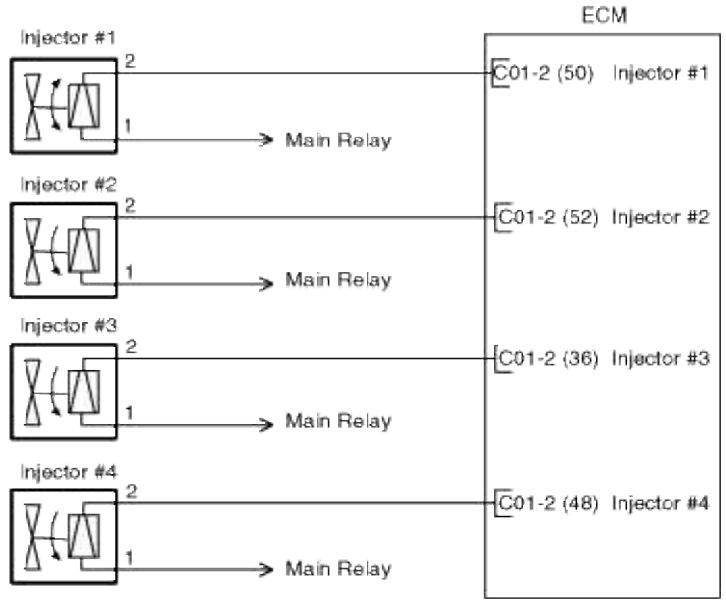
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

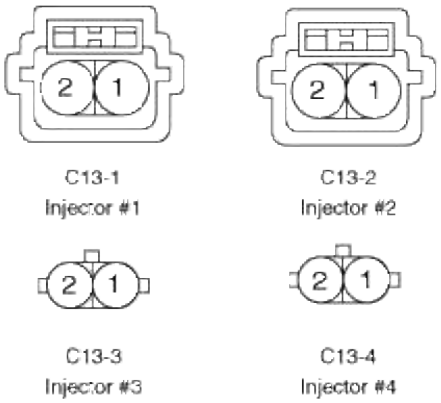
Injector #3

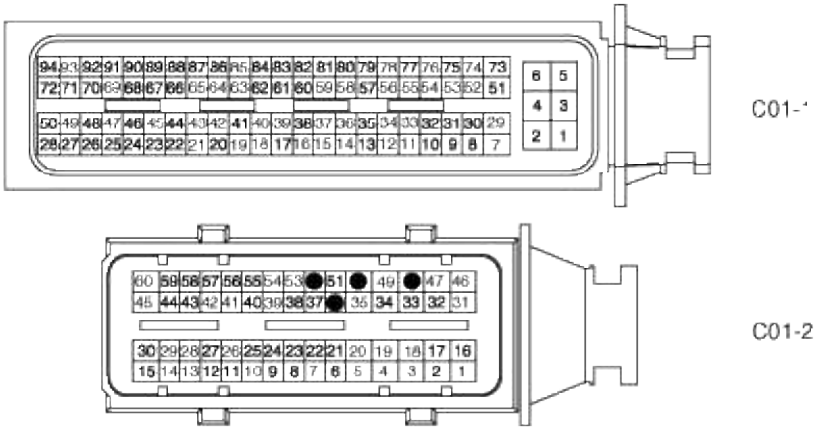
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

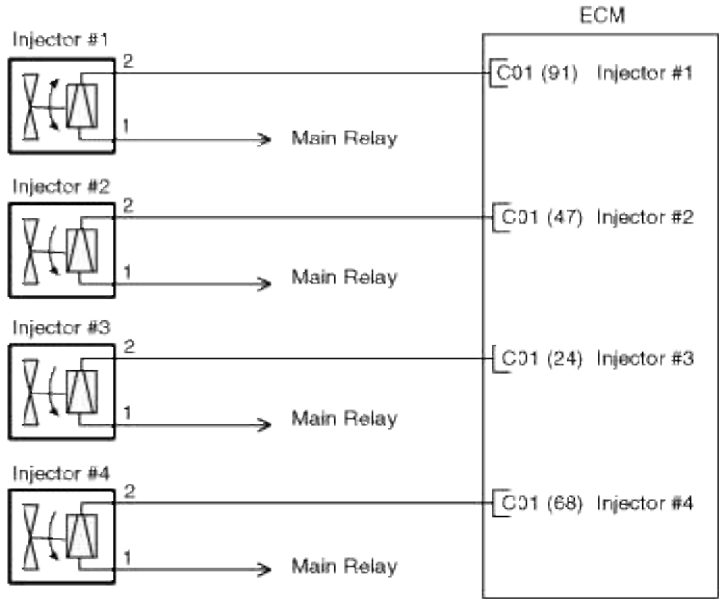
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

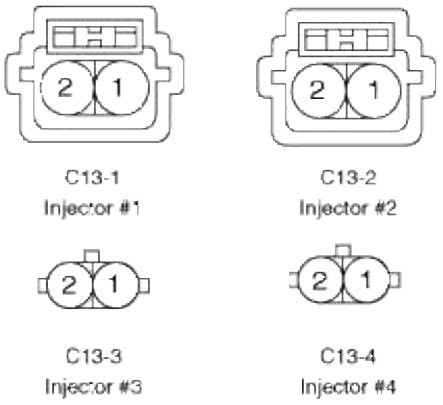
Injector #3

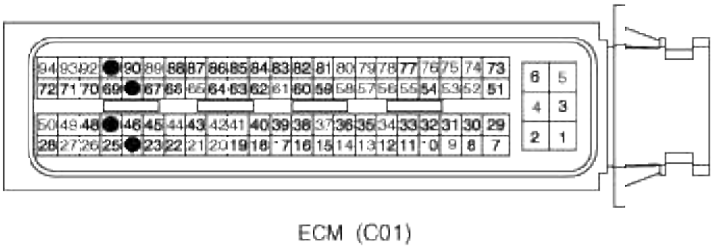
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

[HARNESS CONNECTORS]

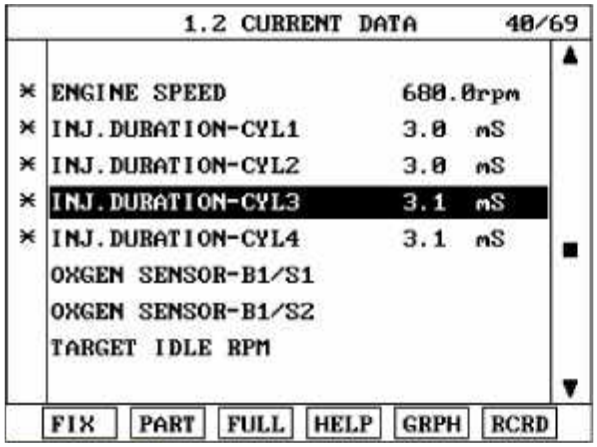




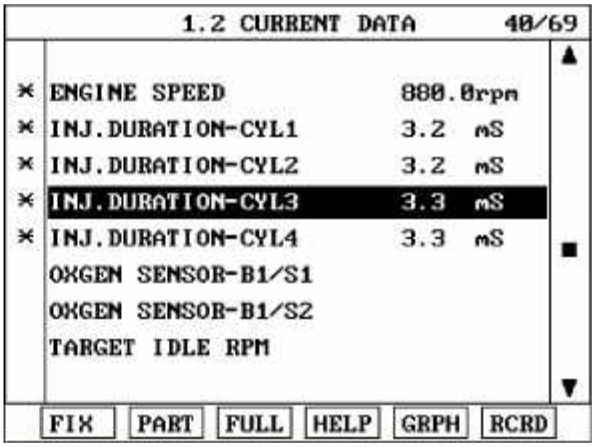
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.



Normal State



Abnormal State (#3 disconnected)

4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

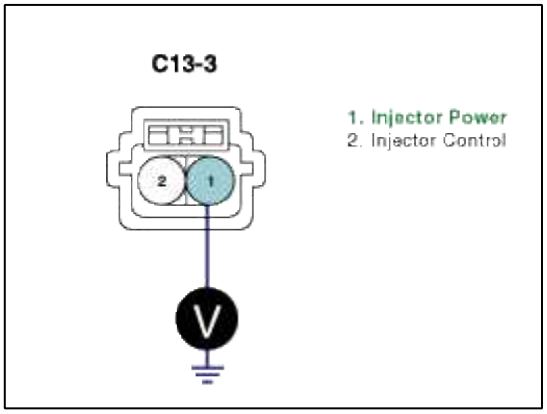
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 1 of injector harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

NO

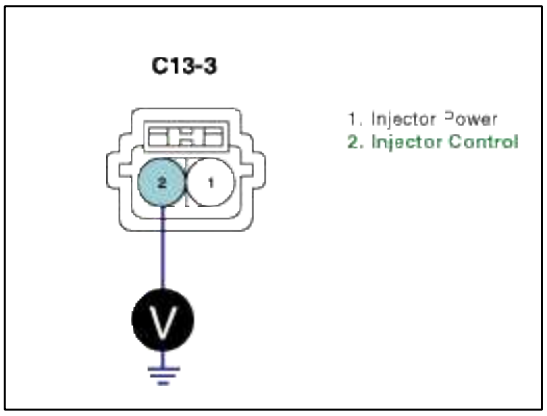
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

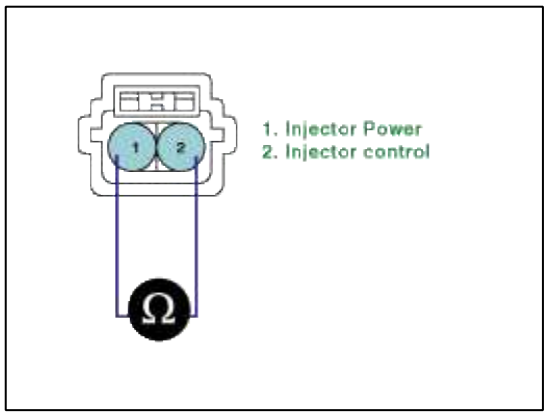
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)

Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good injector and check for proper operation.
If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

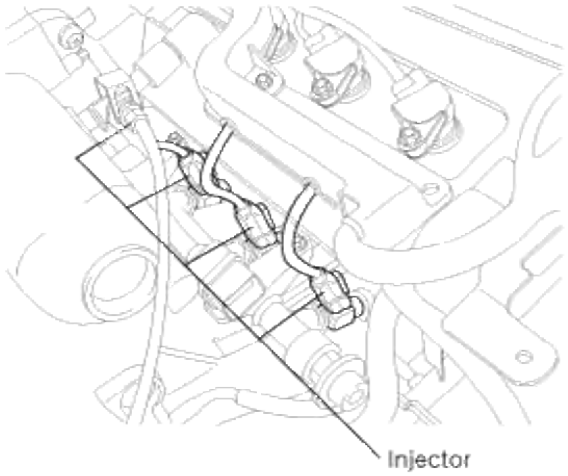
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0204 Injector Circuit/Open-Cylinder 4

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

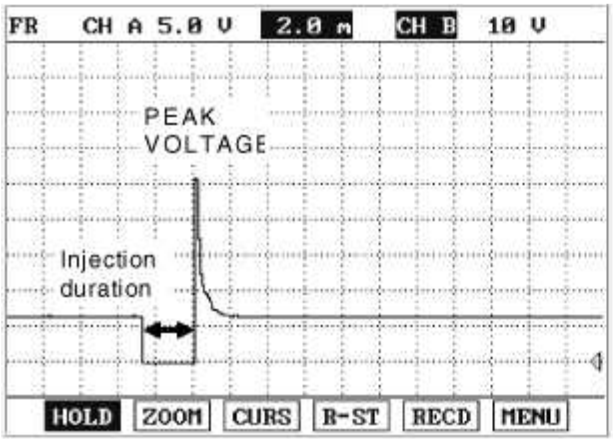
DTC DESCRIPTION

If there is Open in injector #4 circuit, ECM/PCM sets DTC P0204.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or short to ground in power circuit • Open in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

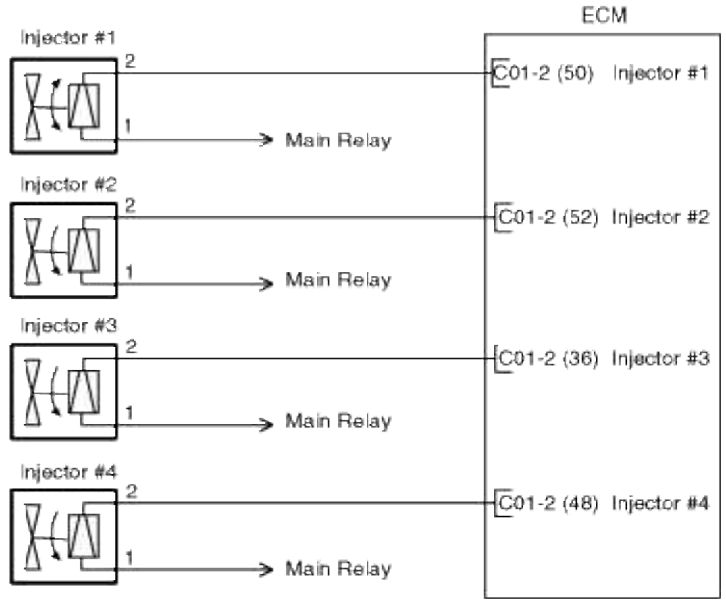
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

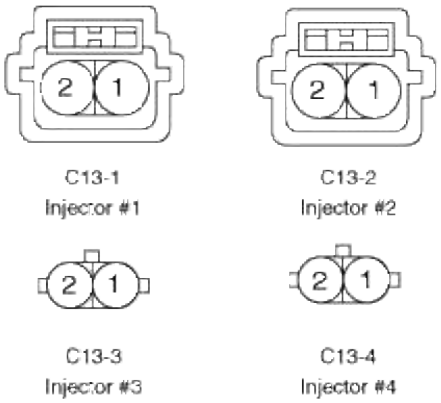
Injector #3

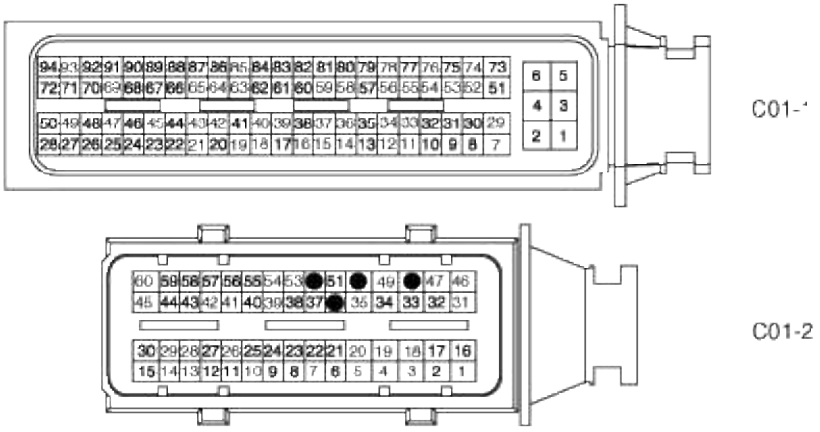
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

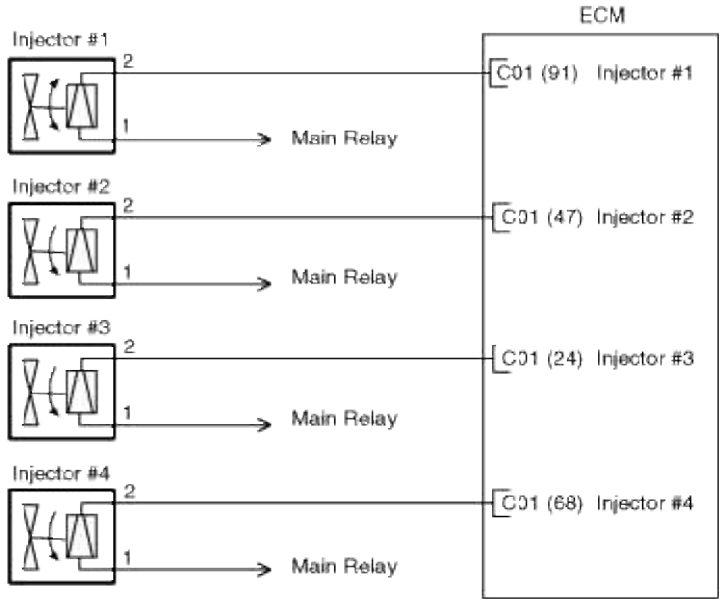
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

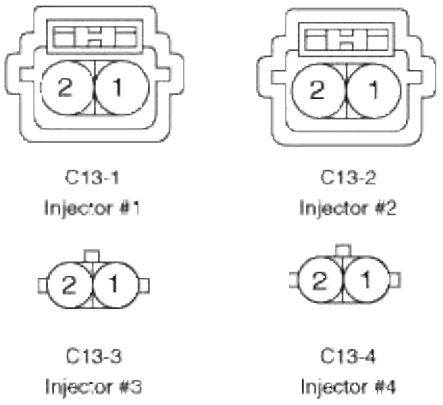
Injector #3

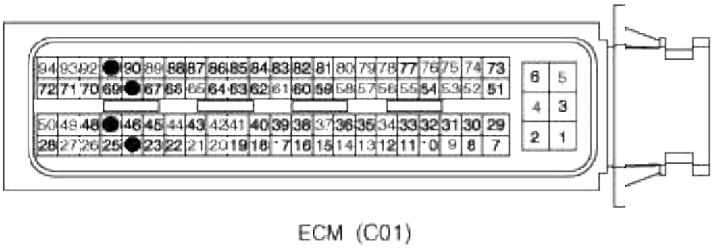
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

[HARNESS CONNECTORS]

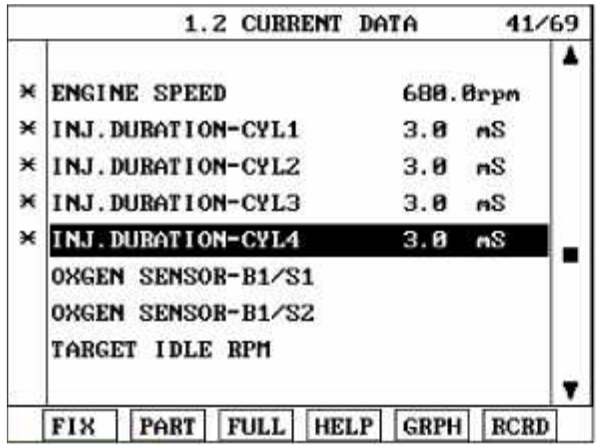


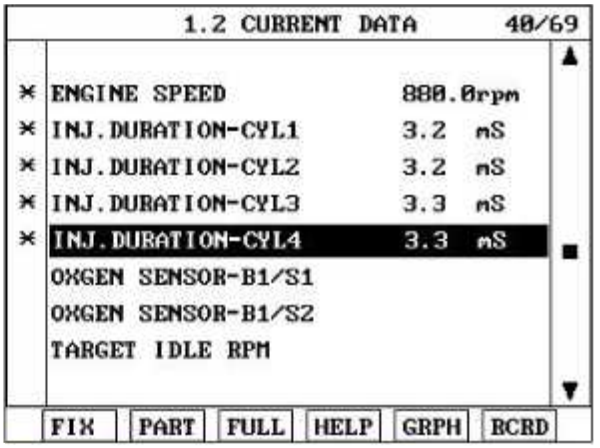


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.





4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

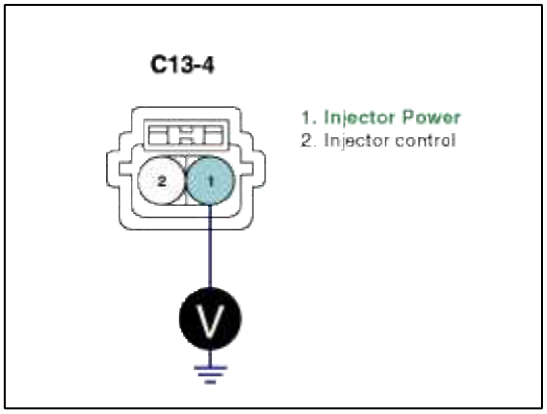
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 1 of injector harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control Circuit Inspection" procedure.

NO

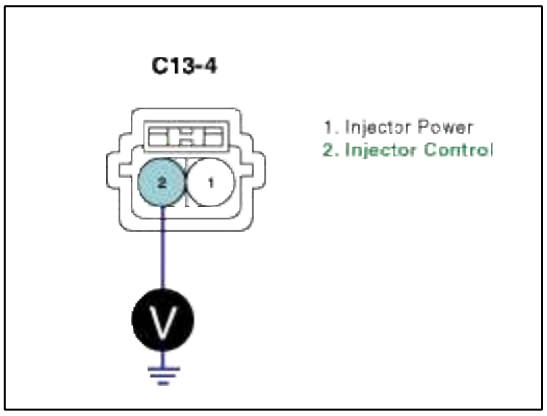
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".

4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

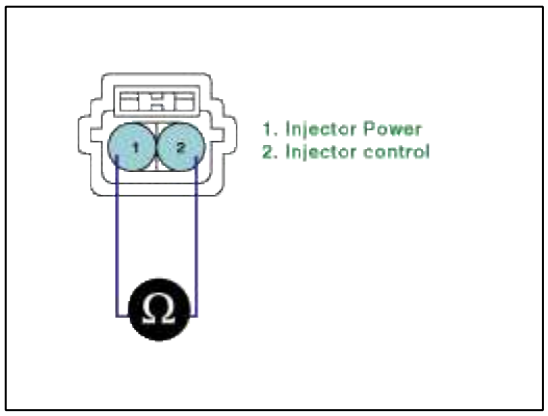
Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)

Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good injector and check for proper operation.
If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

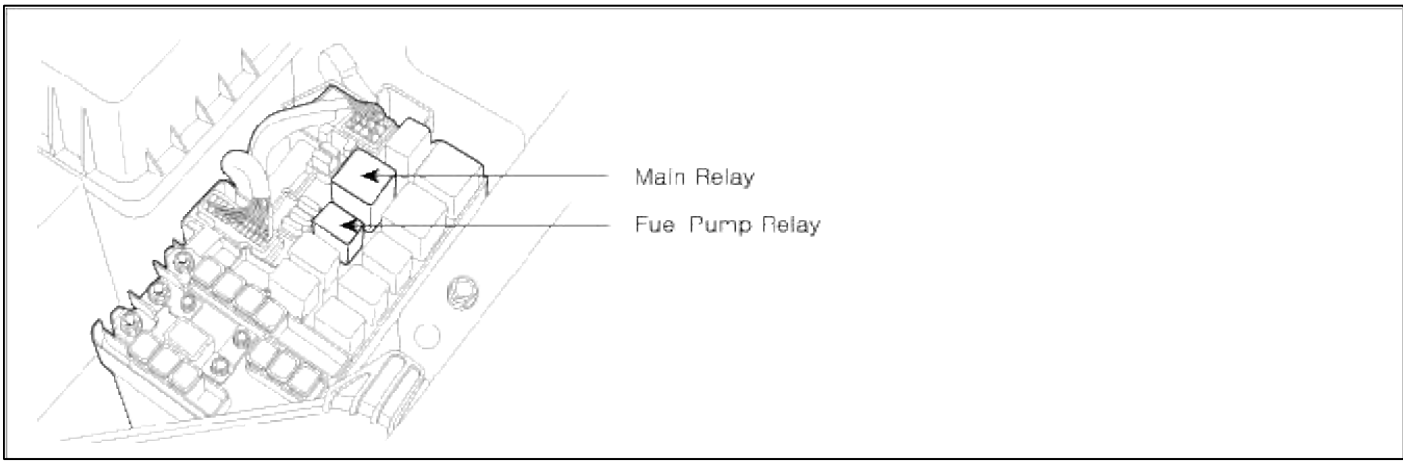
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0230 Fuel Pump Primary Circuit

COMPONENT LOCATION



GENERAL DESCRIPTION

The main relay supplies power to one side of the fuel pump relay coil. The other side of the fuel pump relay coil is ECM/PCM controlled. When the ignition switch is turned ON, the ECM/PCM energizes the fuel pump relay. The ECM/PCM monitors the fuel pump relay control circuit for malfunctions.

DTC DESCRIPTION

If there is Open in fuel pump circuit, ECM/PCM sets DTC P0230.

DTC DETECTING CONDITION

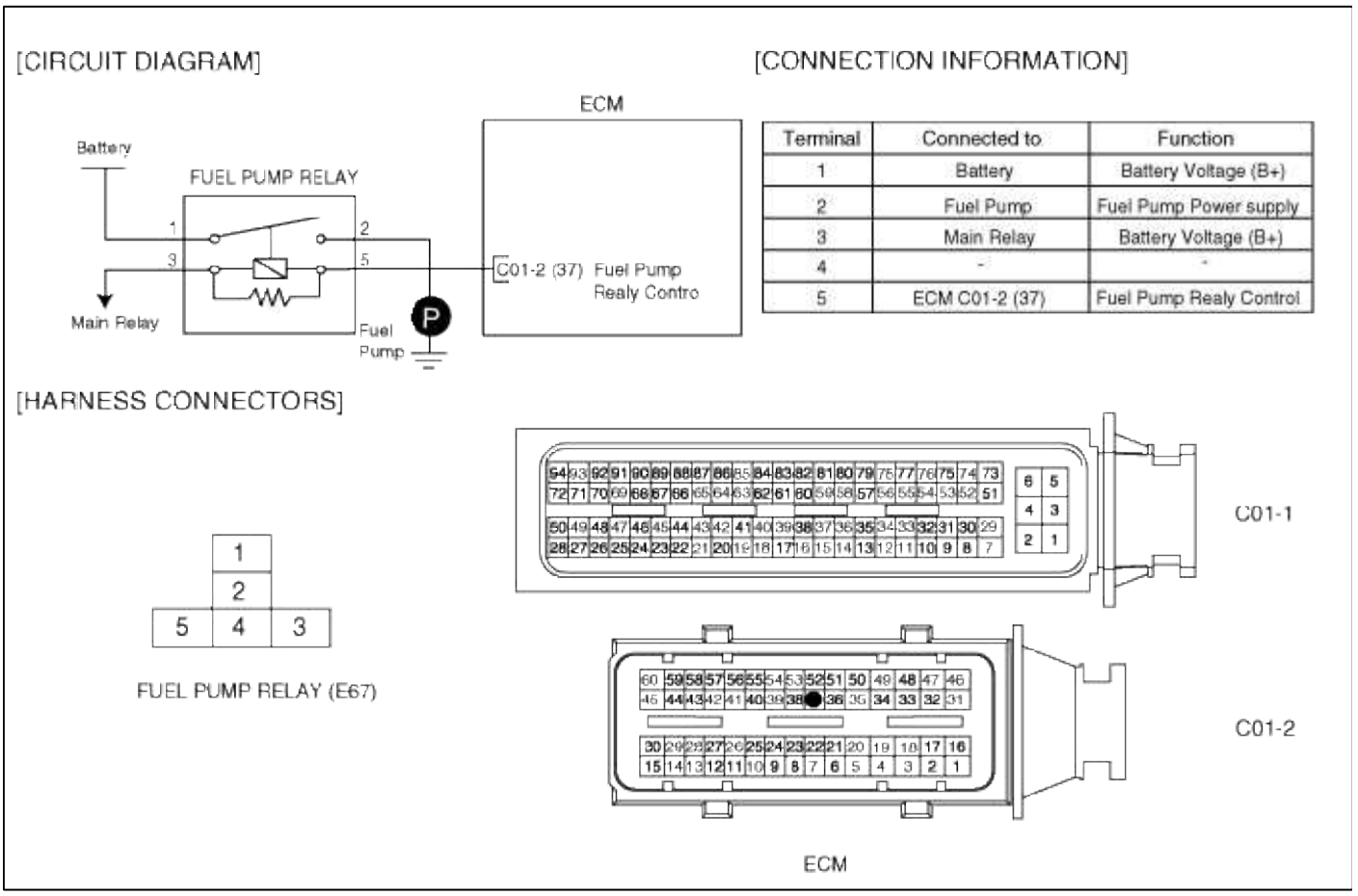
Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or short to ground in power circuit • Open in control circuit • Fuel pump relay • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Disconnected	
MIL ON Condition	• Continuous	

SPECIFICATION

Item	Specification
Coil Resistance	70Ω ~ 120Ω

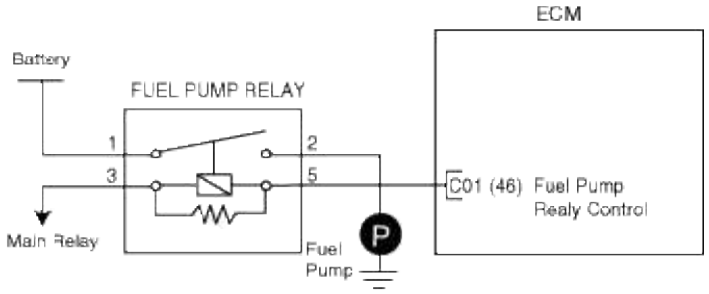
SCHEMATIC DIAGRAM

(A/T)



(M/T)

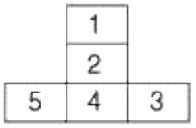
[CIRCUIT DIAGRAM]



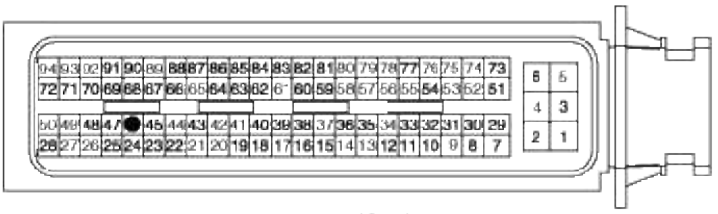
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	Fuel Pump	Fuel Pump Power supply
3	Main Relay	Battery Voltage (B+)
4	-	-
5	ECM C01 (46)	Fuel Pump Realy Control

[HARNESS CONNECTORS]



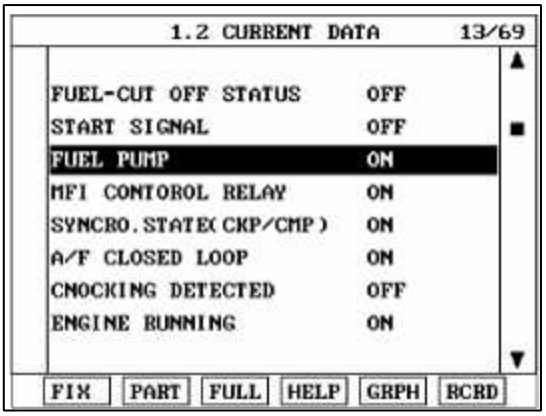
FUEL PUMP RELAY (F67)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Engine start.
3. Monitor the "Fuel pump relay" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

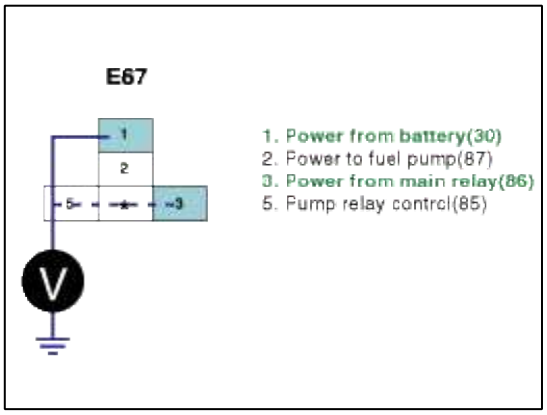
NO

Go to "Fuel pump relay circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect fuel pump relay.
3. Key "ON".
4. Measure the voltage between terminal 1 and 3 of fuel pump relay harness connector.

Specification : B+



5. Is the measured voltage within specifications?

YES

Go to "Control circuit inspection" procedure.

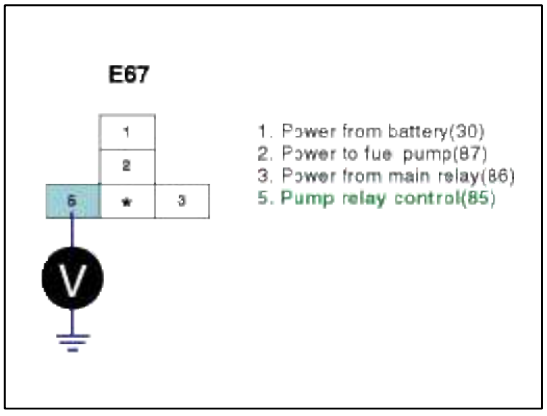
NO

Check "INJ15A" fuse between fuel pump relay and main relay.
Check "ECU A 30A" fuse between fuel pump relay and battery.
Repair Open or Short in power circuit, and go to "Verification of vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect fuel pump relay.
3. Key "ON".
4. Measure the voltage between terminal 5 of fuel pump relay harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

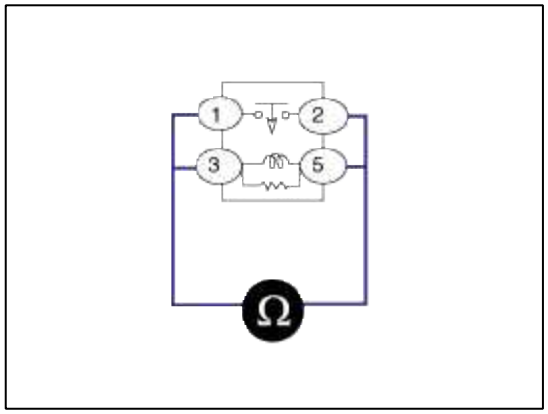
Repair Open in control circuit, and go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. Fuel pump relay check.
   (1) Key "OFF".
   (2) Disconnect fuel pump relay.
   (3) Measure the resistance between terminal 1 and 2 of fuel pump relay component side.
   (4) Measure the resistance between terminal 3 and 5 of fuel pump relay component side.

Specification :

Terminal	Power Approval
1~2	NO
3~5	YES (70 ~ 120Ω)



   (5) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good Fuel pump relay and check for proper operation.
If the problem is corrected, replace Fuel pump relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

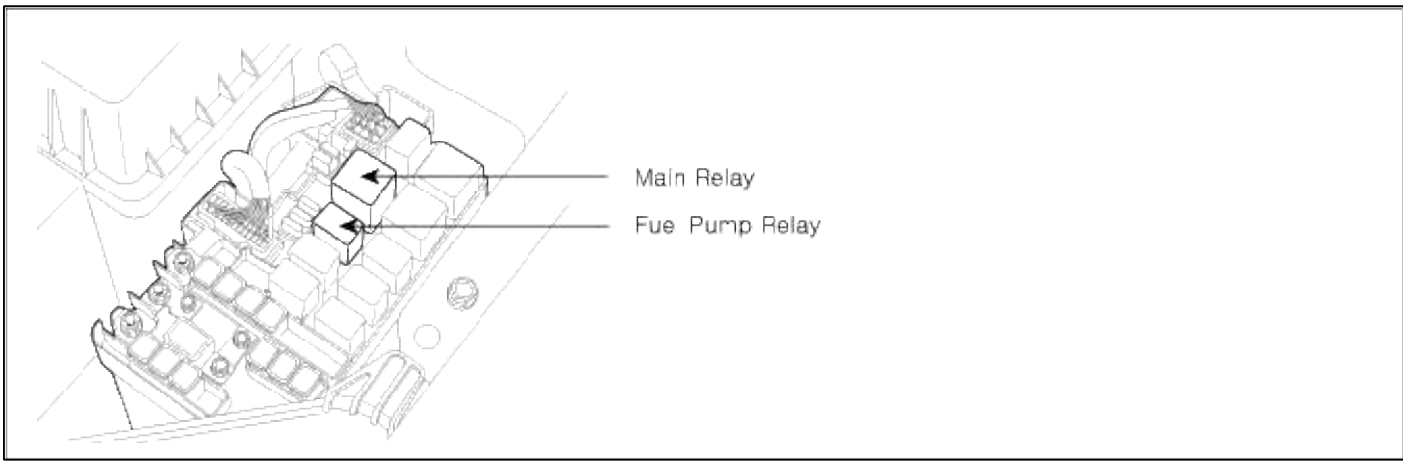
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0231 Fuel Pump Secondary Circuit Low

COMPONENT LOCATION



GENERAL DESCRIPTION

The main relay supplies power to one side of the fuel pump relay coil. The other side of the fuel pump relay coil is ECM/PCM controlled. When the ignition switch is turned ON, the ECM/PCM energizes the fuel pump relay. The ECM/PCM monitors the fuel pump relay control circuit for malfunctions.

DTC DESCRIPTION

If there is a short circuit in fuel pump circuit, P0231 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • Short to ground in control circuit • Fuel pump relay • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Short circuit to Ground	
MIL ON Condition	• Continuous	

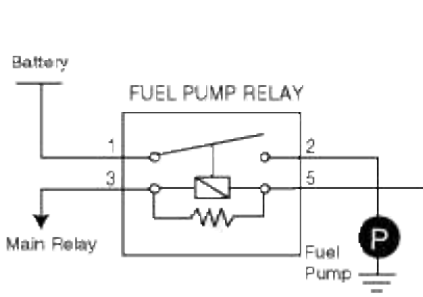
SPECIFICATION

Item	Specification
Coil Resistance	70Ω ~ 120Ω

SCHEMATIC DIAGRAM

(A/T)

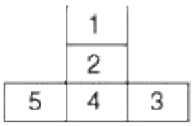
[CIRCUIT DIAGRAM]



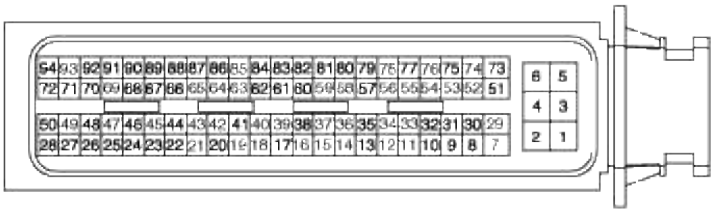
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	Fuel Pump	Fuel Pump Power supply
3	Main Relay	Battery Voltage (B+)
4	-	-
5	ECM C01-2 (37)	Fuel Pump Realy Control

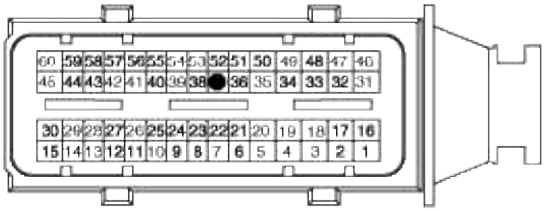
[HARNESS CONNECTORS]



FUEL PUMP RELAY (E67)



C01-1

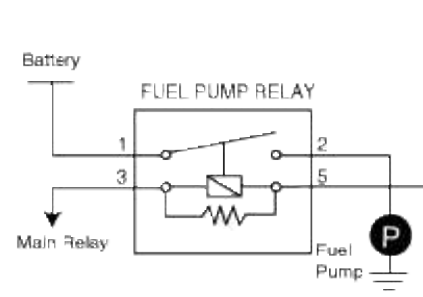


C01-2

ECM

(M/T)

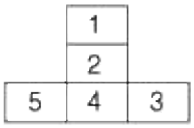
[CIRCUIT DIAGRAM]



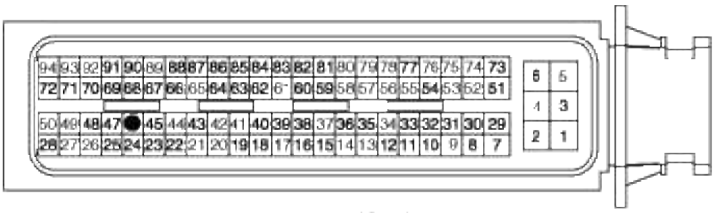
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	Fuel Pump	Fuel Pump Power supply
3	Main Relay	Battery Voltage (B+)
4	-	-
5	ECM C01 (46)	Fuel Pump Realy Control

[HARNESS CONNECTORS]



FUEL PUMP RELAY (E67)

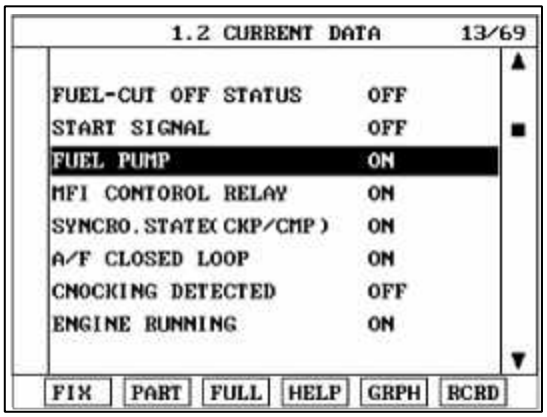


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).

2. Engine start.
3. Monitor the "Fuel pump relay" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

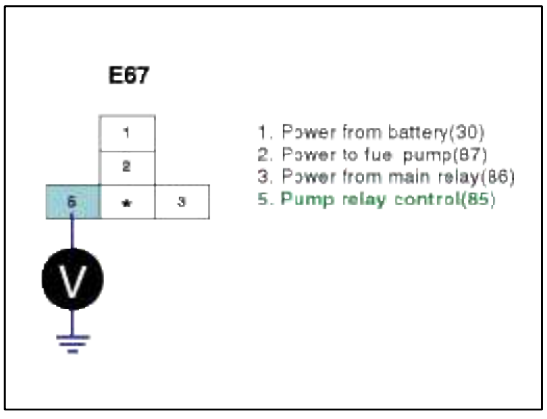
NO

Go to "Fuel pump relay circuit inspection" procedure.

FUEL PUMP RELAY CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect fuel pump relay.
3. Key "ON".
4. Measure the voltage between terminal 5 of fuel pump relay harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

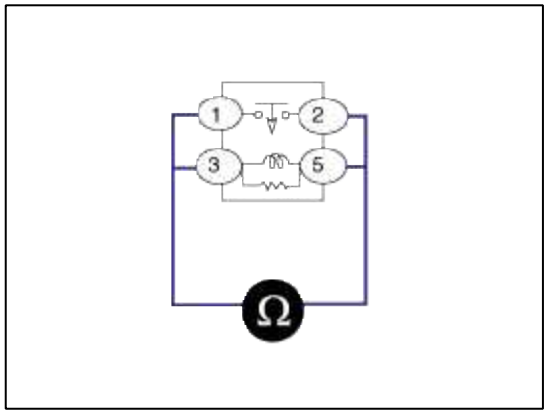
Repair Open in control circuit, and go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. Fuel pump relay check.
   (1) Key "OFF".
   (2) Disconnect fuel pump relay.
   (3) Measure the resistance between terminal 1 and 2 of fuel pump relay component side.
   (4) Measure the resistance between terminal 3 and 5 of fuel pump relay component side.

Specification :

Terminal	Power Approval
1~2	NO
3~5	YES (70 ~ 120Ω)



   (5) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good Fuel pump relay and check for proper operation.
If the problem is corrected, replace Fuel pump relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

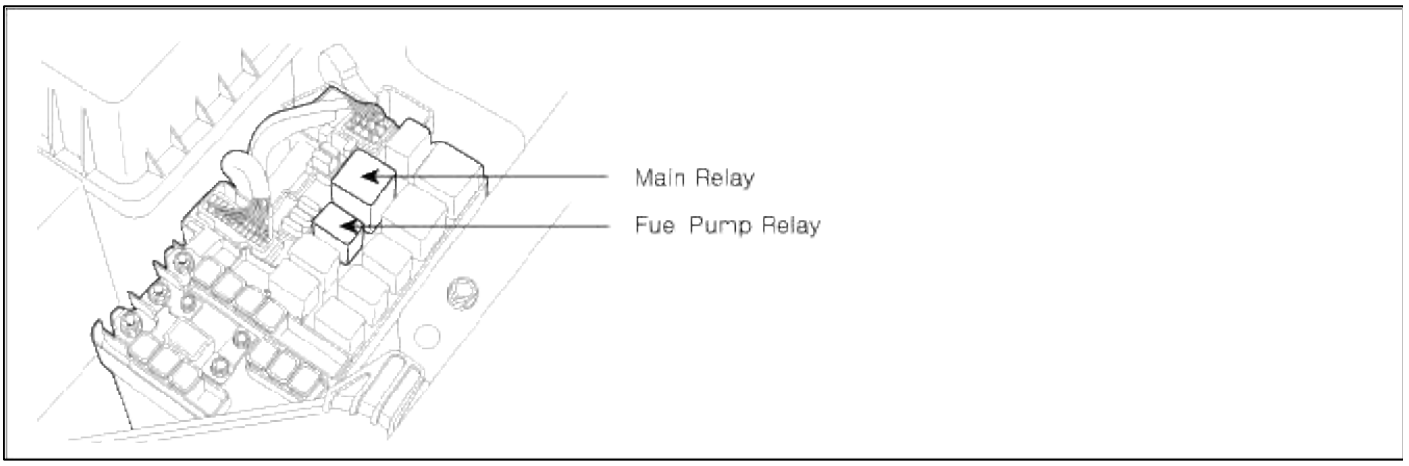
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0232 Fuel Pump Secondary Circuit High

COMPONENT LOCATION



GENERAL DESCRIPTION

The main relay supplies power to one side of the fuel pump relay coil. The other side of the fuel pump relay coil is ECM/PCM controlled. When the ignition switch is turned ON, the ECM/PCM energizes the fuel pump relay. The ECM/PCM monitors the fuel pump relay control circuit for malfunctions.

DTC DESCRIPTION

If there is Short to battery in fuel pump circuit, ECM/PCM sets DTC P0232.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • Short to power in control circuit • Fuel pump relay • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Short circuit to battery	
MIL ON Condition	• Continuous	

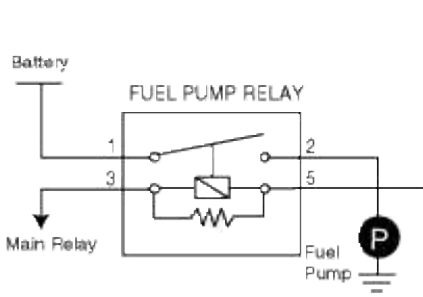
SPECIFICATION

Item	Specification
Coil Resistance	70Ω ~ 120Ω

SCHEMATIC DIAGRAM

(A/T)

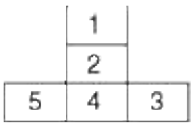
[CIRCUIT DIAGRAM]



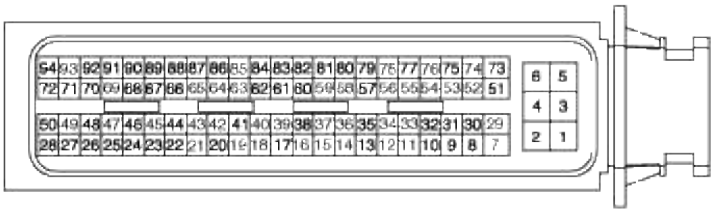
[CONNECTION INFORMATION]

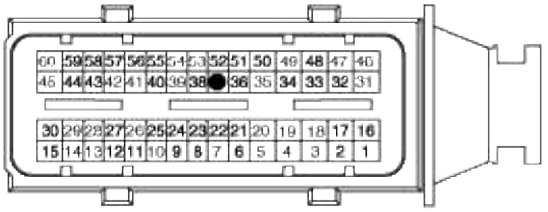
Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	Fuel Pump	Fuel Pump Power supply
3	Main Relay	Battery Voltage (B+)
4	-	-
5	ECM C01-2 (37)	Fuel Pump Realy Control

[HARNESS CONNECTORS]



FUEL PUMP RELAY (E67)

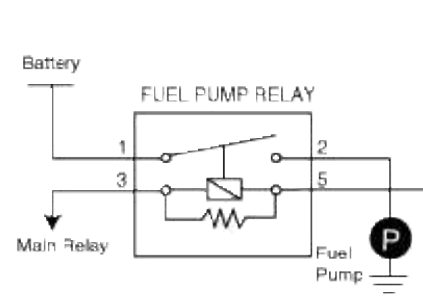




ECM

(M/T)

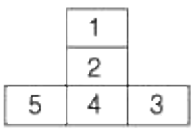
[CIRCUIT DIAGRAM]



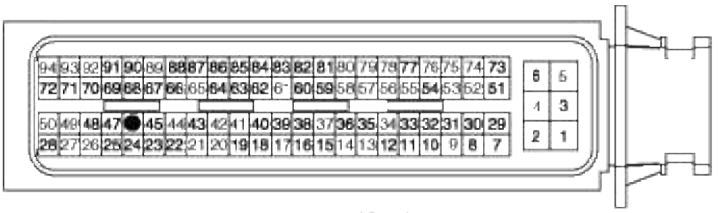
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	Fuel Pump	Fuel Pump Power supply
3	Main Relay	Battery Voltage (B+)
4	-	-
5	ECM C01 (46)	Fuel Pump Realy Control

[HARNESS CONNECTORS]



FUEL PUMP RELAY (E67)

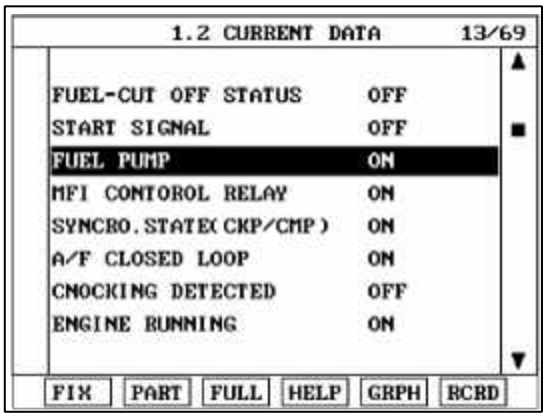


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).

2. Engine start.
3. Monitor the "Fuel pump relay" parameters on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

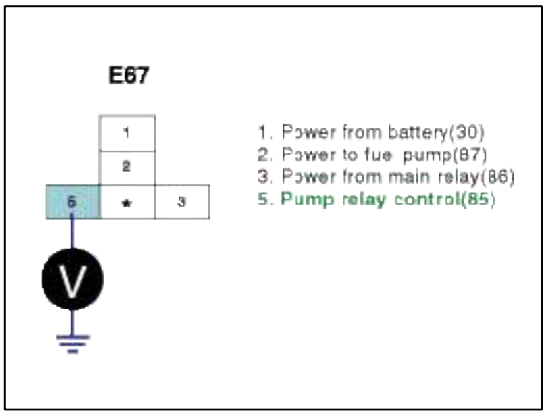
NO

Go to "Fuel pump relay circuit inspection" procedure.

FUEL PUMP RELAY CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect fuel pump relay.
3. Key "ON".
4. Measure the voltage between terminal 5 of fuel pump relay harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specifications?

YES

Go to "Component inspection" procedure.

NO

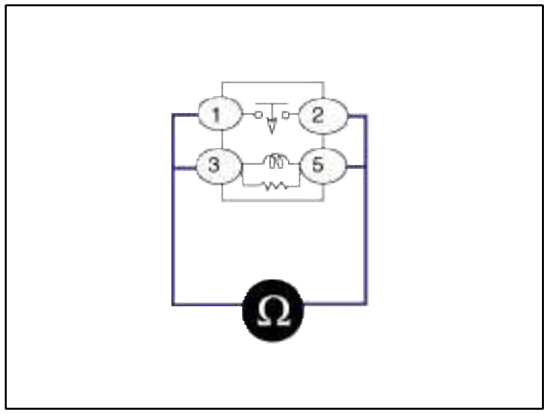
Repair Open in control circuit, and go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. Fuel pump relay check.
   (1) Key "OFF".
   (2) Disconnect fuel pump relay.
   (3) Measure the resistance between terminal 1 and 2 of fuel pump relay component side.
   (4) Measure the resistance between terminal 3 and 5 of fuel pump relay component side.

Specification :

Terminal	Power Approval
1~2	NO
3~5	YES (70 ~ 120Ω)



   (5) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good Fuel pump relay and check for proper operation.
If the problem is corrected, replace Fuel pump relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

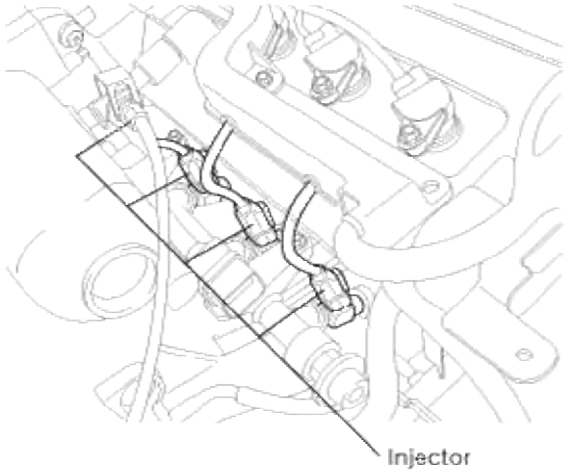
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0261 Cylinder 1 Injector Circuit Low

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

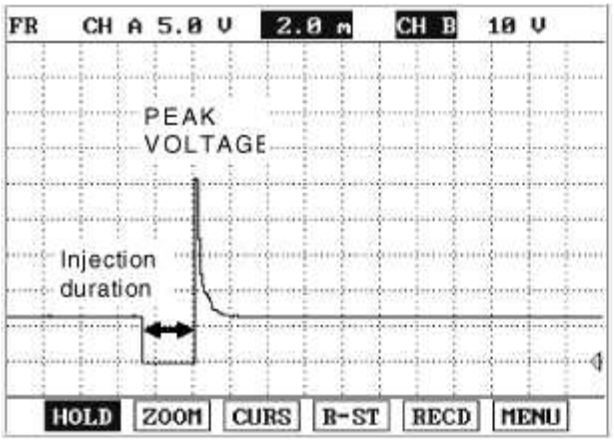
DTC DESCRIPTION

If there is Short to ground in injector #1 circuit, ECM/PCM sets DTC P0261.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • Short to ground in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

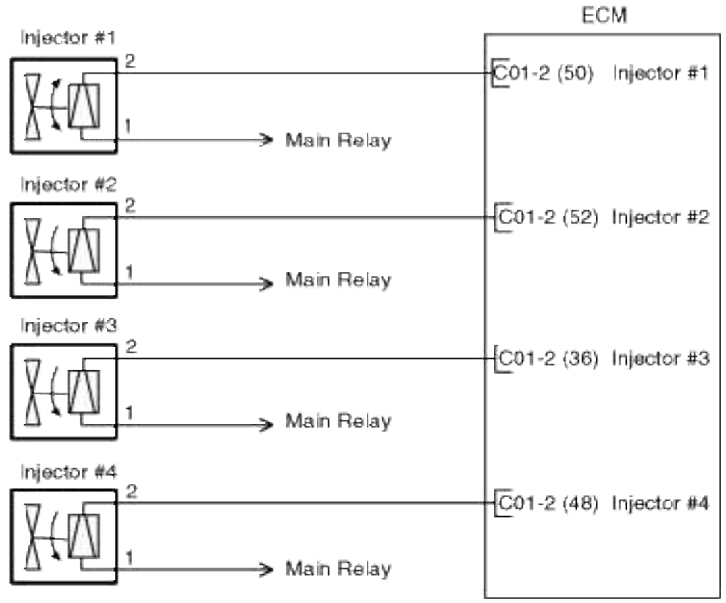
SPECIFICATION

Temperature	**Resistance (Ω)**
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

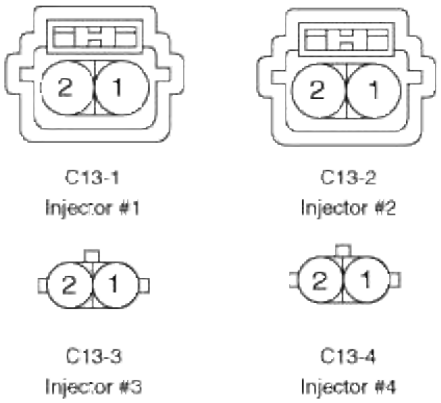
Injector #3

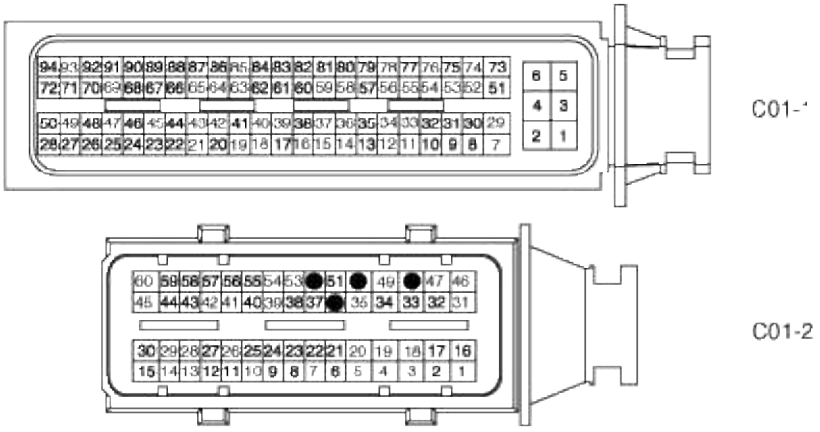
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

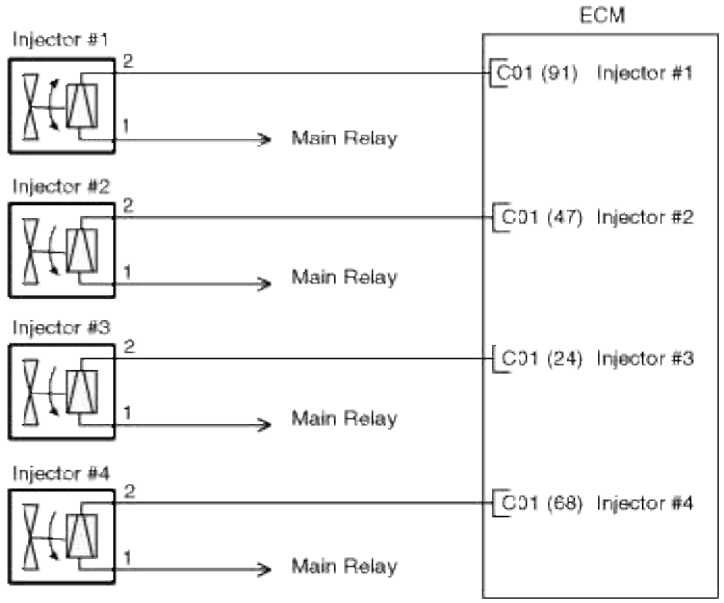
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

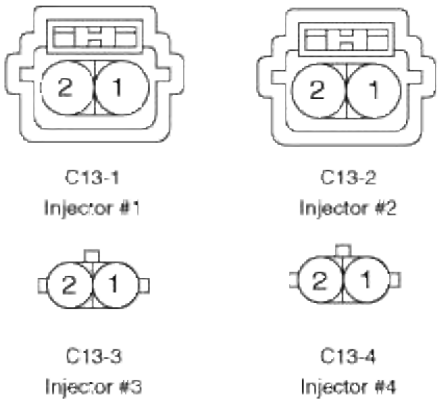
Injector #3

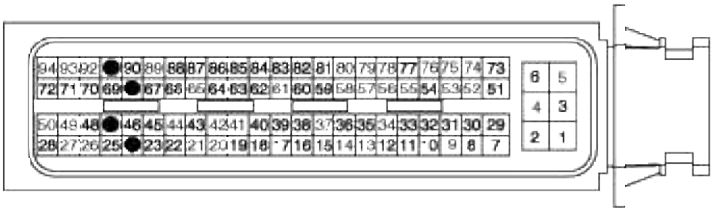
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

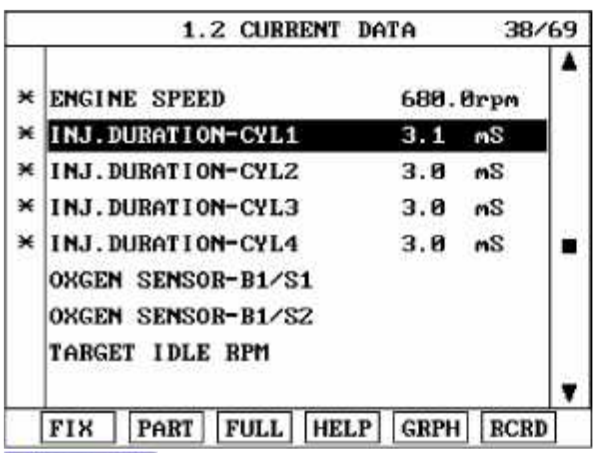
[HARNESS CONNECTORS]





MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.



4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

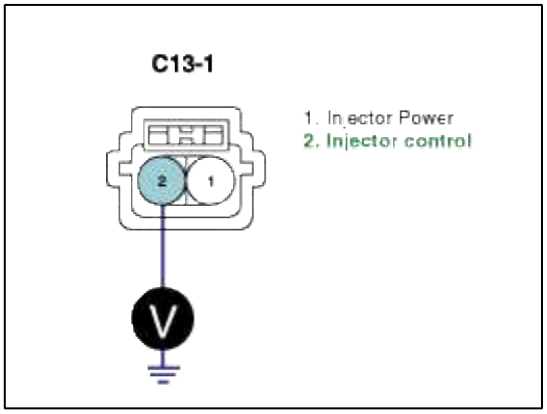
NO

Go to " Control Circuit Inspection " procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

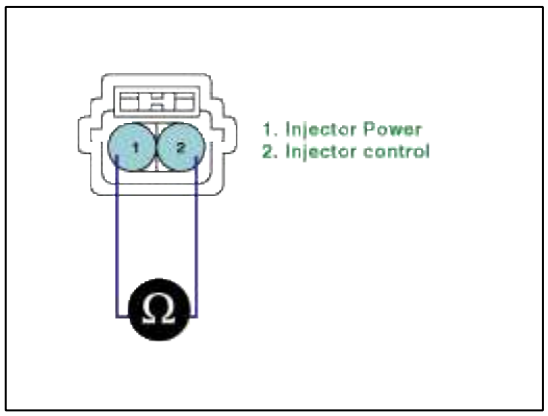
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

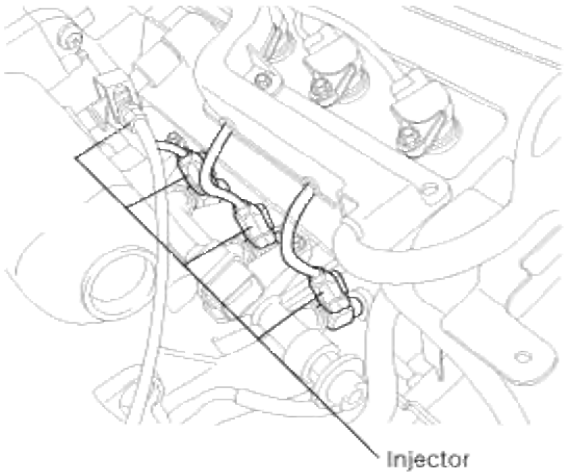
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0262 Cylinder 1 Injector Circuit High

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

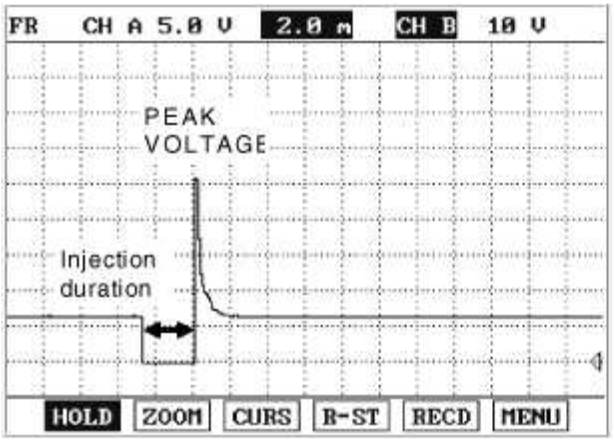
DTC DESCRIPTION

If there is Short to battery in injector #1 circuit, ECM/PCM sets DTC P0262.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • Short to power in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuouss	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

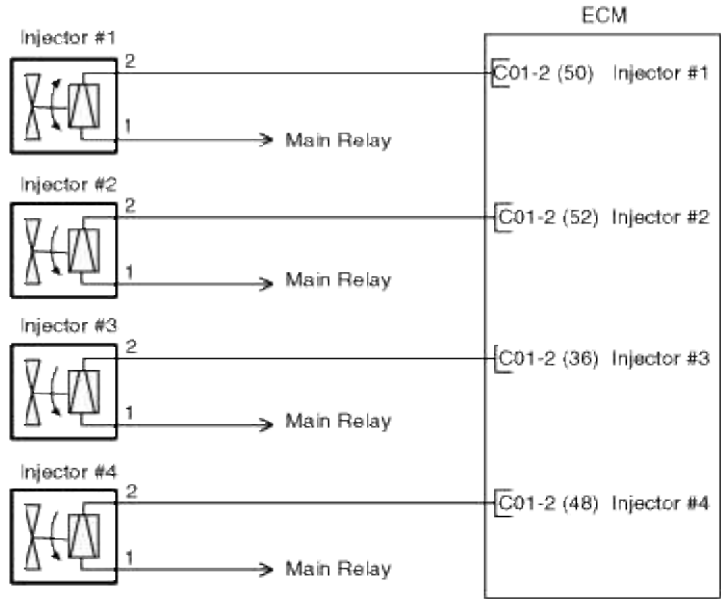
SPECIFICATION

Temperature	**Resistance (Ω)**
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

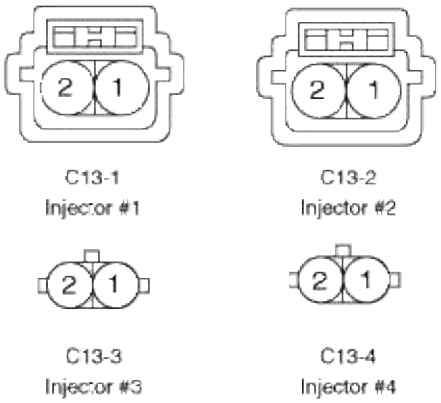
Injector #3

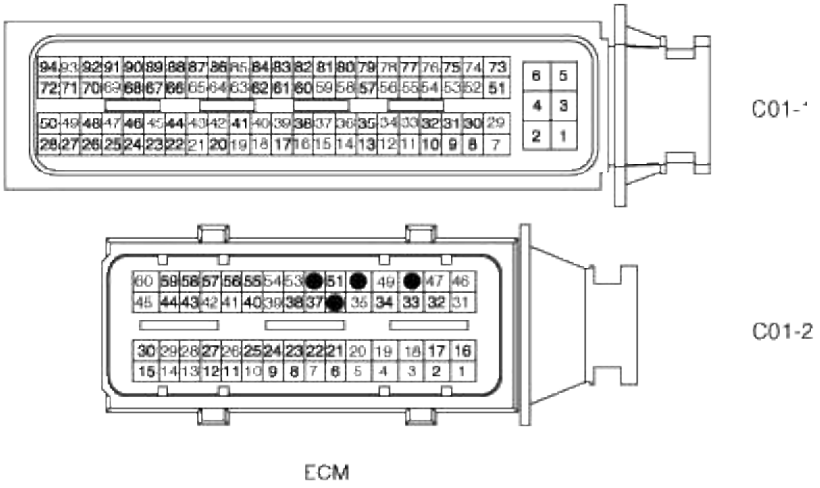
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

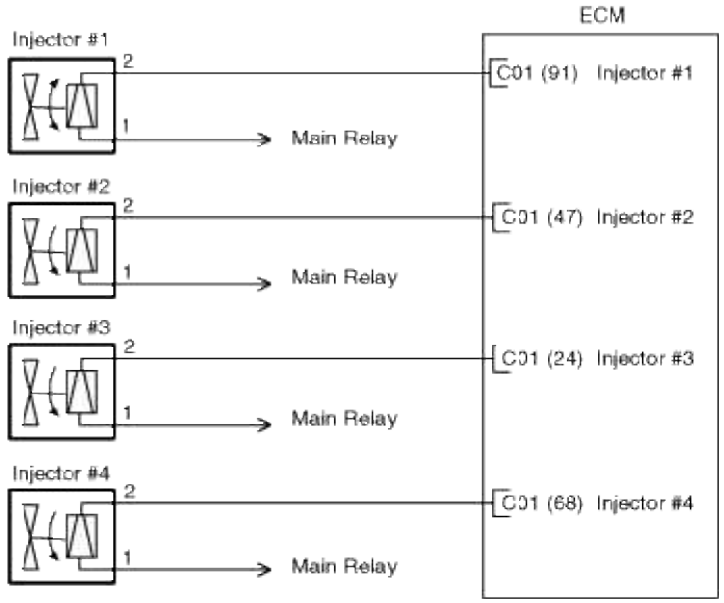
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

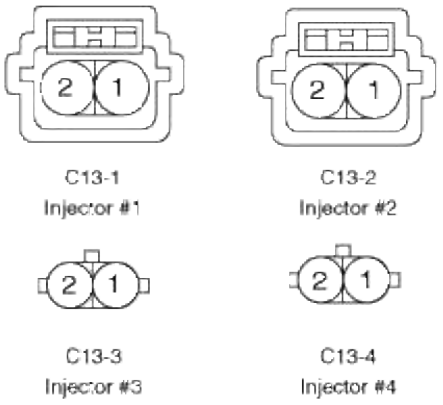
Injector #3

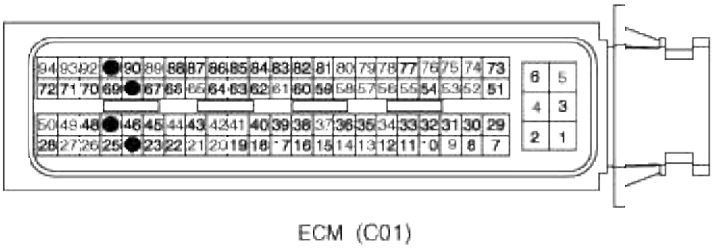
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

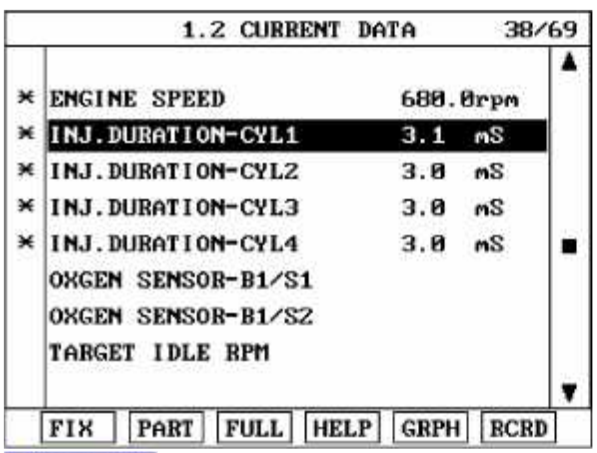
[HARNESS CONNECTORS]





MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.



4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

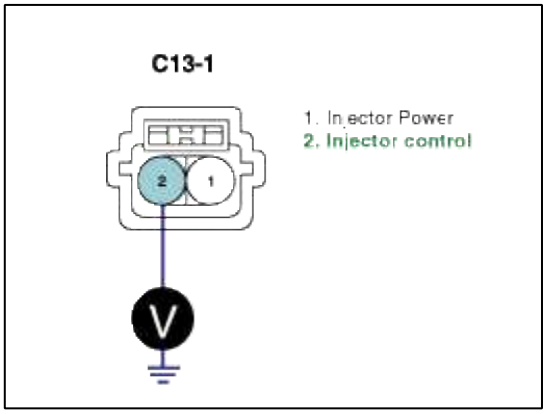
NO

Go to " Control Circuit Inspection " procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

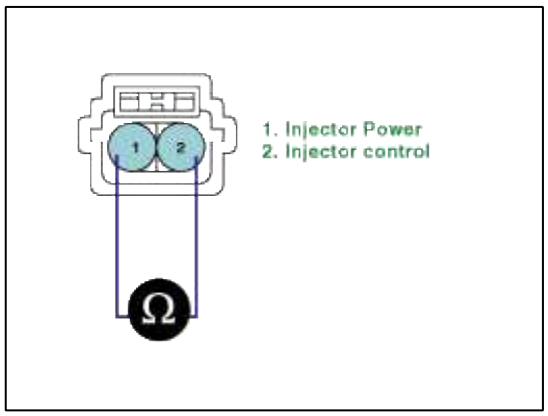
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

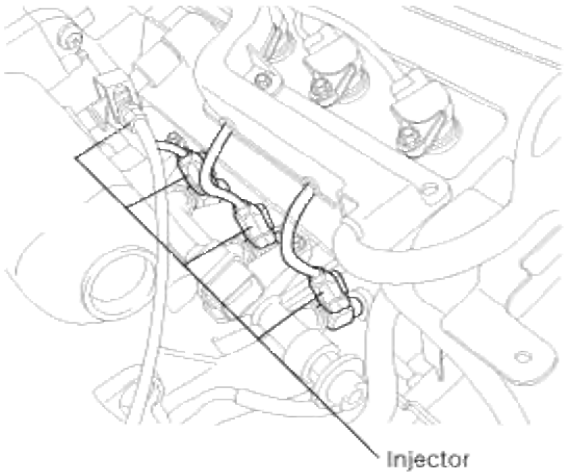
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0264 Cylinder 2 Injector Circuit Low

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

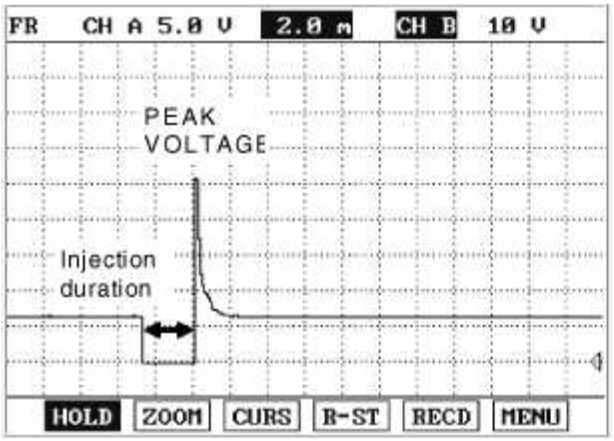
DTC DESCRIPTION

If there is Short to ground in injector #2 circuit, ECM/PCM sets DTC P0264.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • Short to ground in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

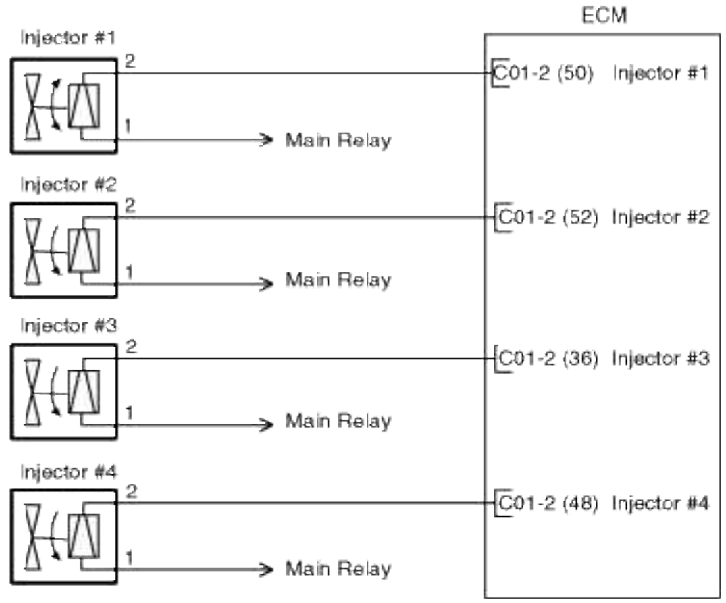
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

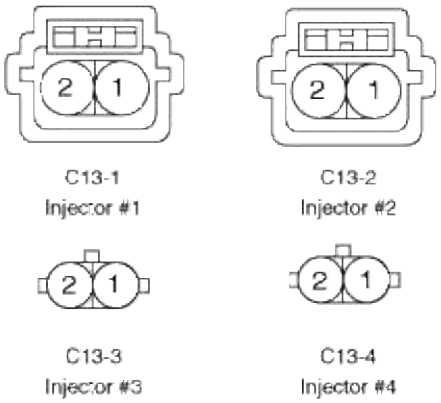
Injector #3

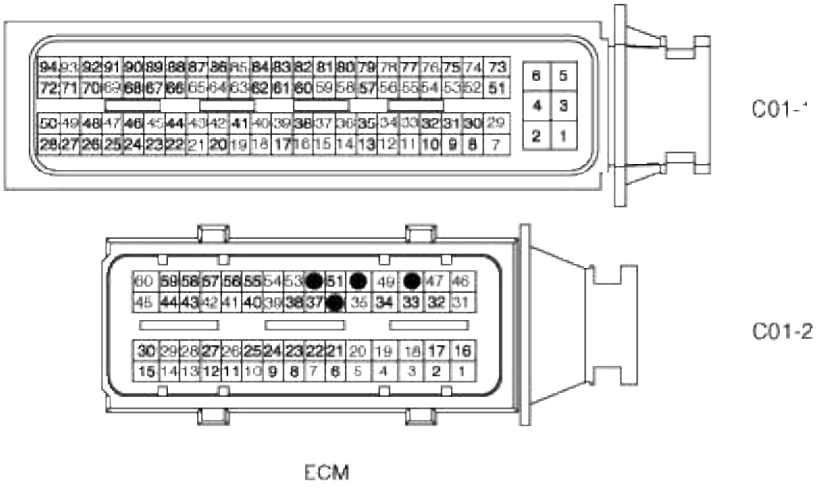
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

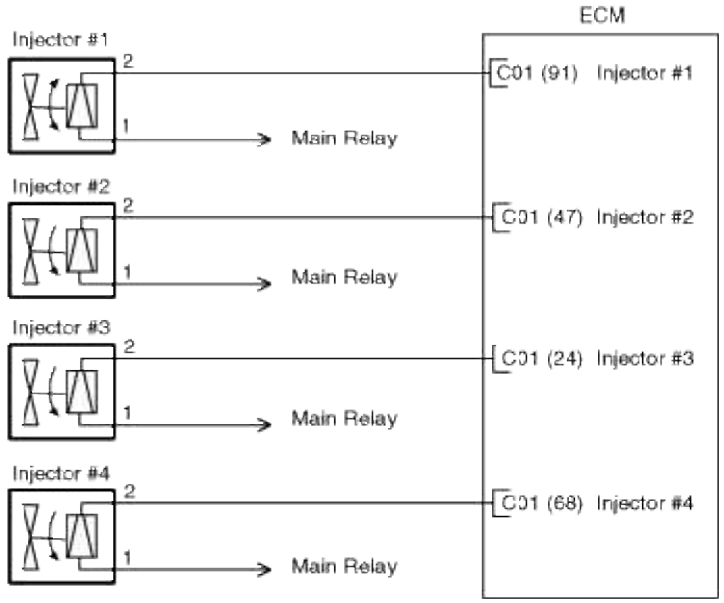
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

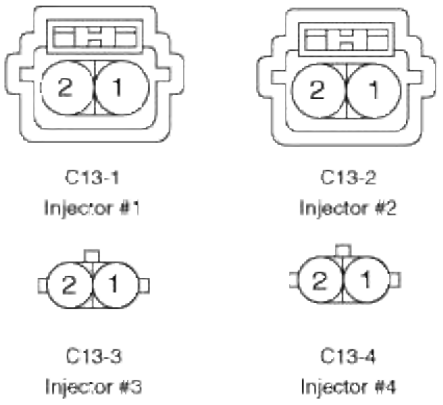
Injector #3

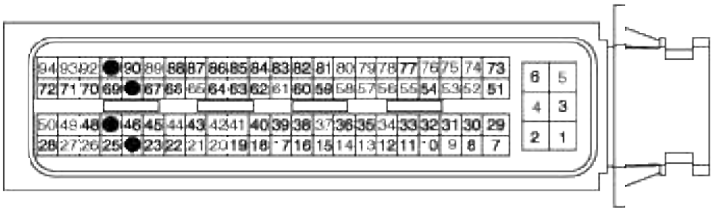
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

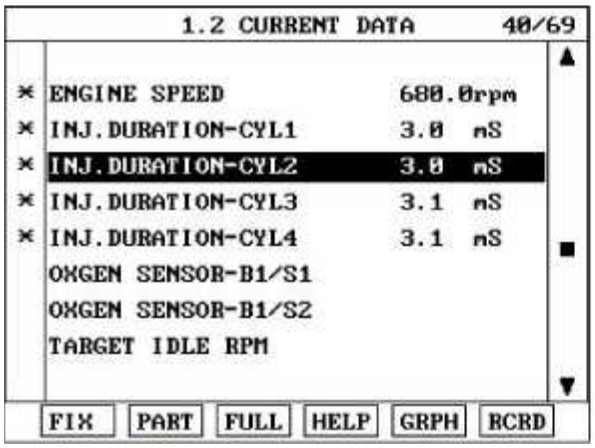
[HARNESS CONNECTORS]

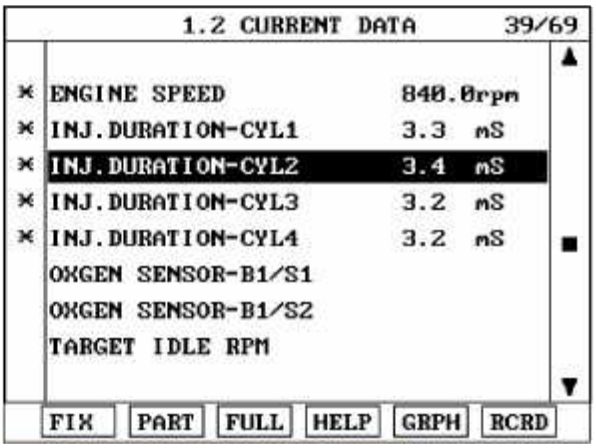




MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.





4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

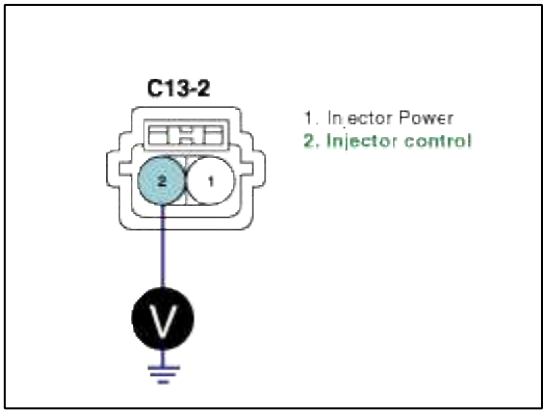
NO

Go to " Control Circuit Inspection " procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

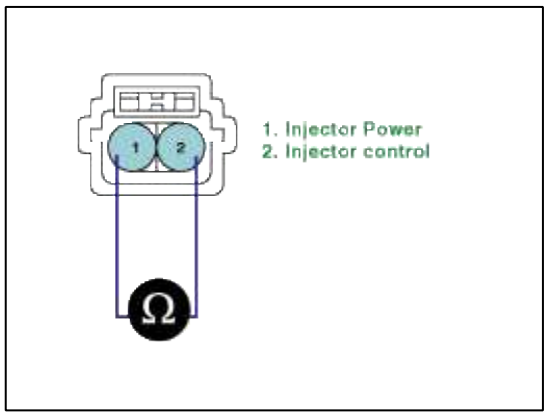
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

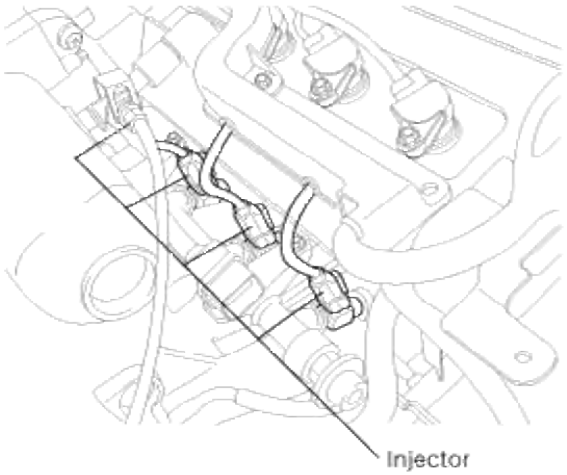
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0265 Cylinder 2 Injector Circuit High

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

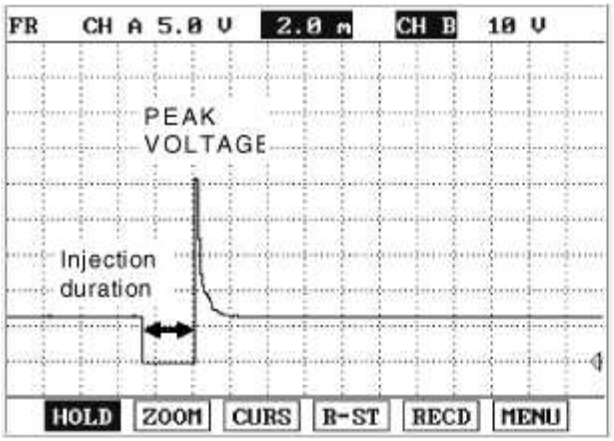
DTC DESCRIPTION

If there is Short to battery in injector #2 circuit, ECM/PCM sets DTC P0265.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • Short to power in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec.	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

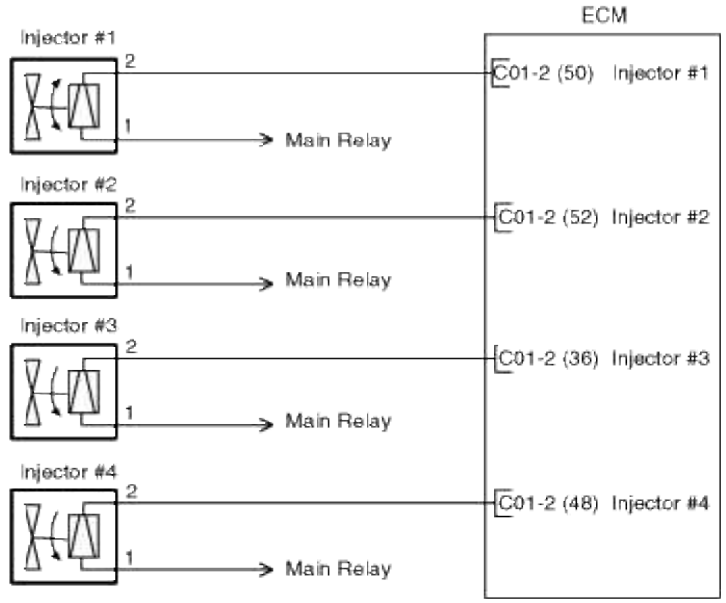
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

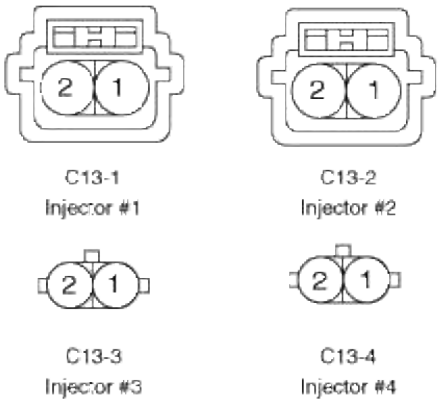
Injector #3

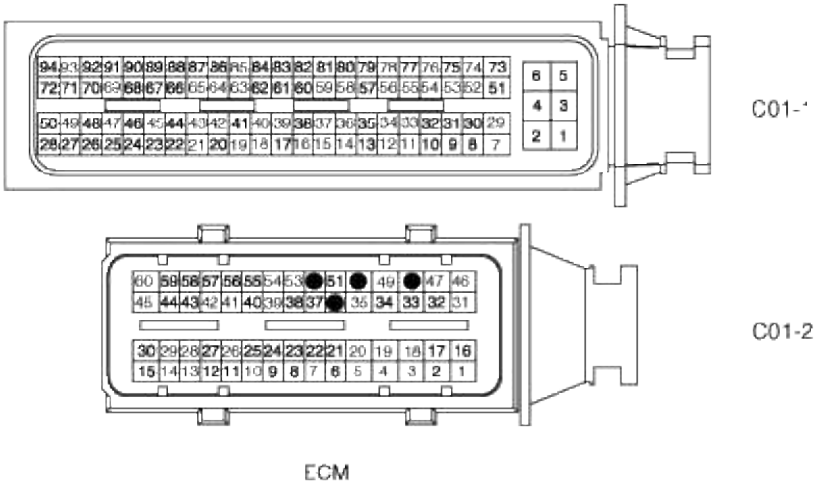
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

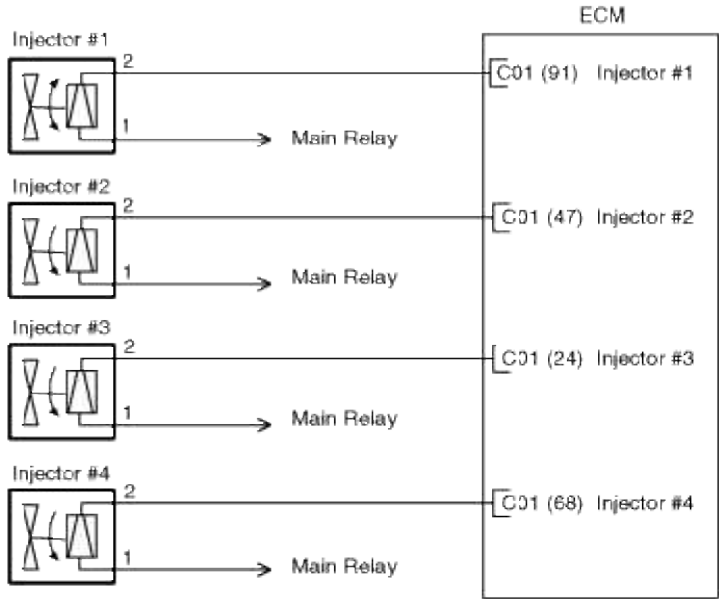
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

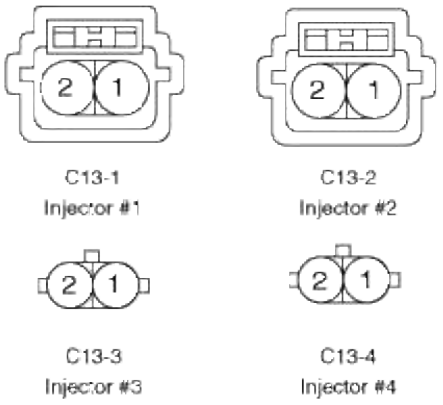
Injector #3

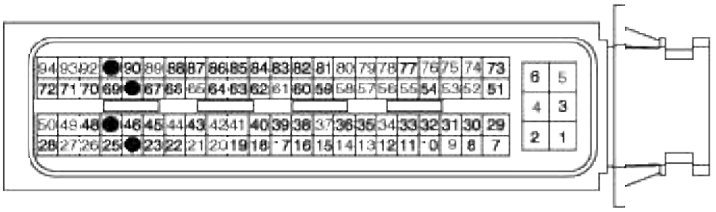
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

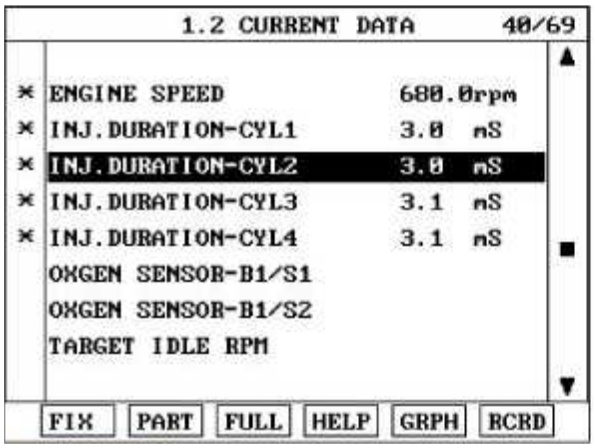
[HARNESS CONNECTORS]

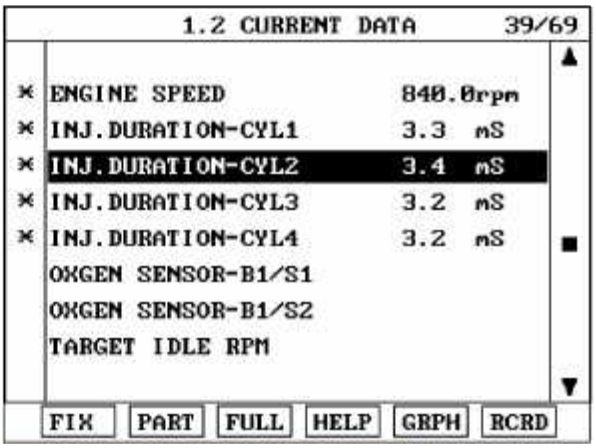




MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.





4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

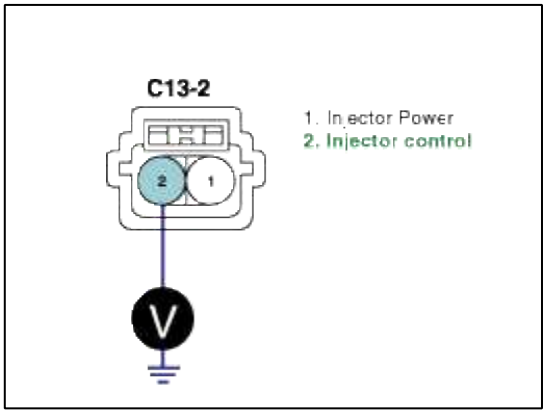
NO

Go to " Control Circuit Inspection " procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

   (4) Is the measured resistance within specification?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good injector and check for proper operation.
If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

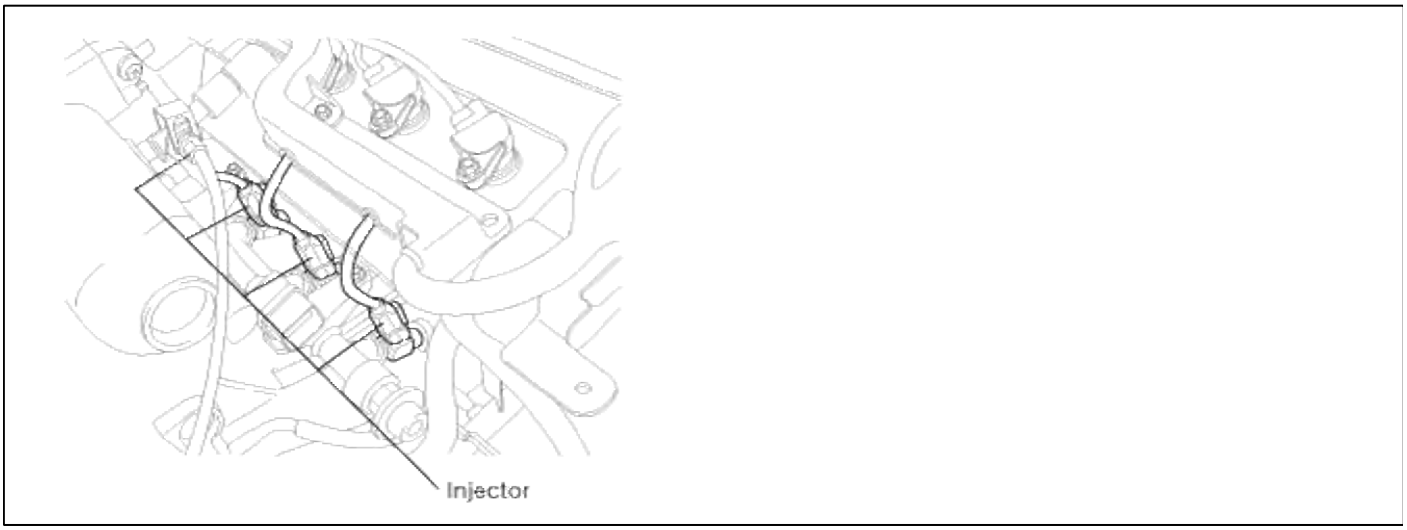
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0267 Cylinder 3 Injector Circuit Low

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

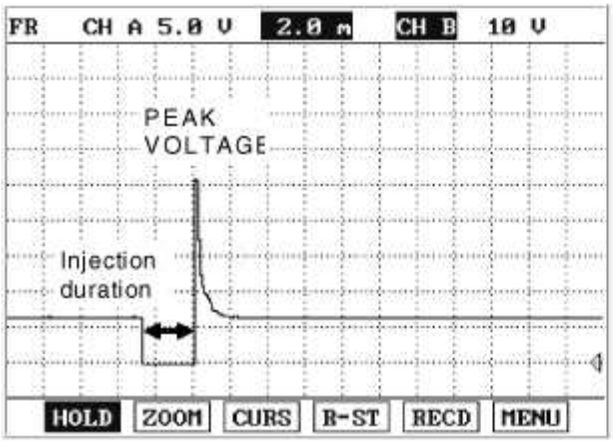
DTC DESCRIPTION

If there is Short to ground in injector #3 circuit, ECM/PCM sets DTC P0267.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • Short to ground in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

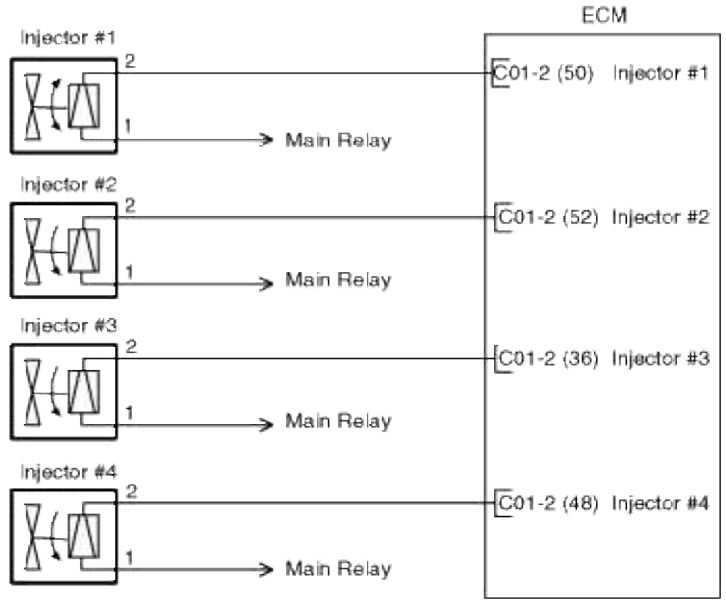
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

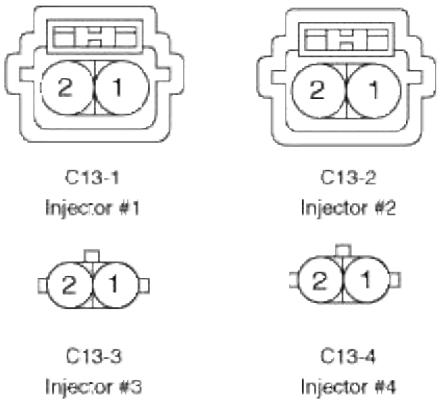
Injector #3

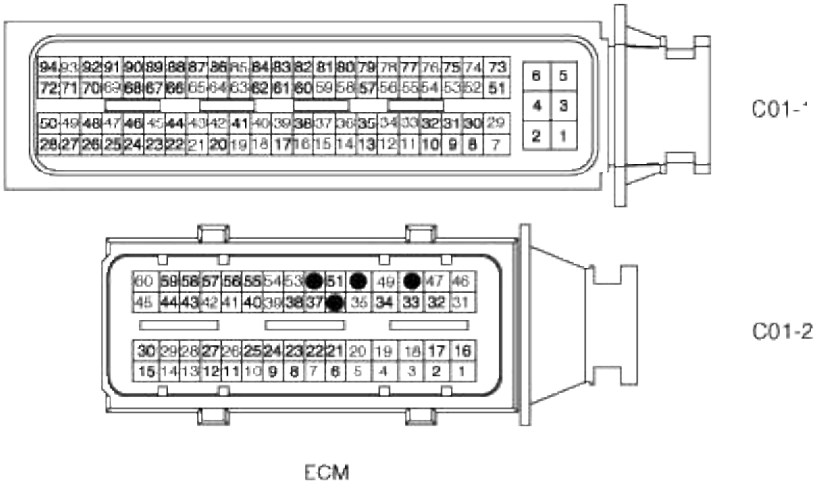
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

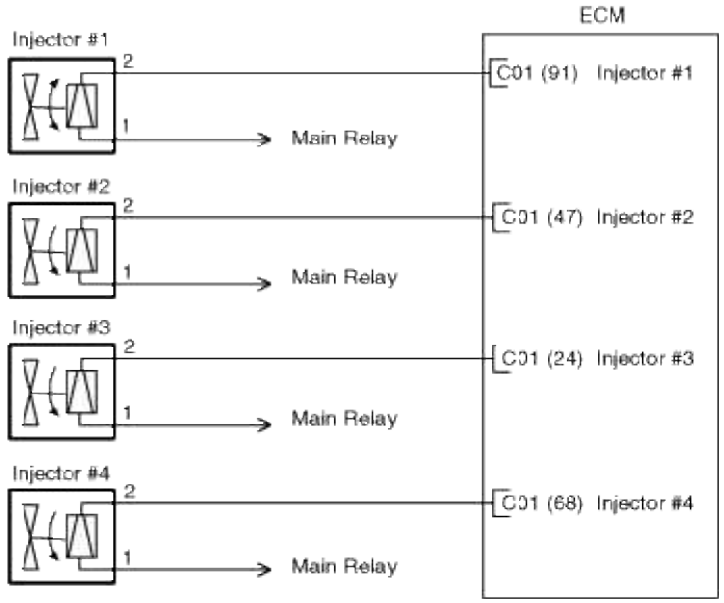
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

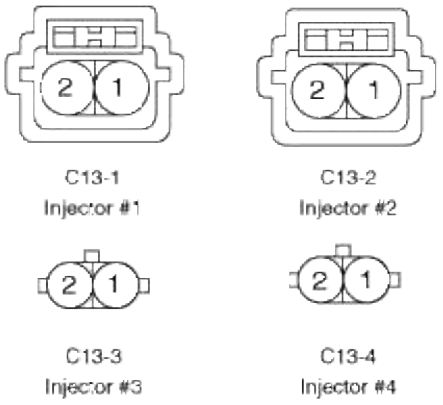
Injector #3

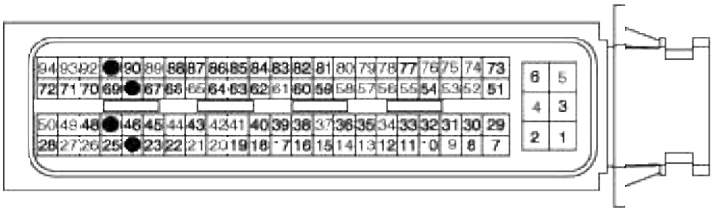
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

[HARNESS CONNECTORS]

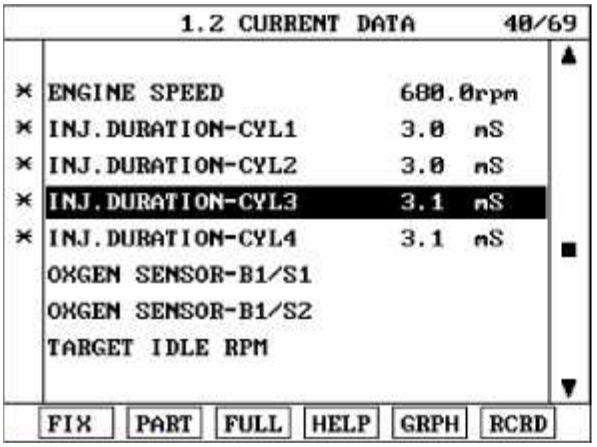




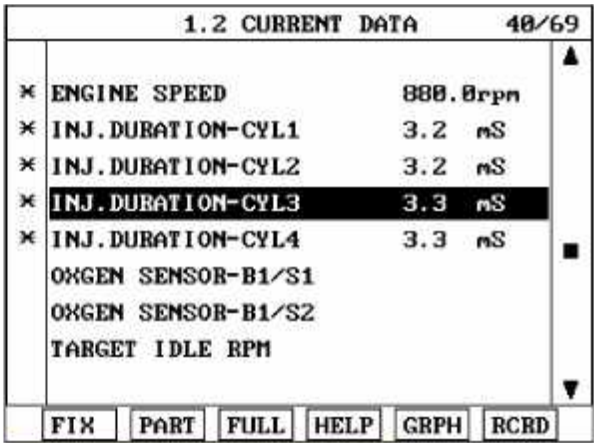
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.



Normal State



Abnormal State (#3 disconnected)

4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

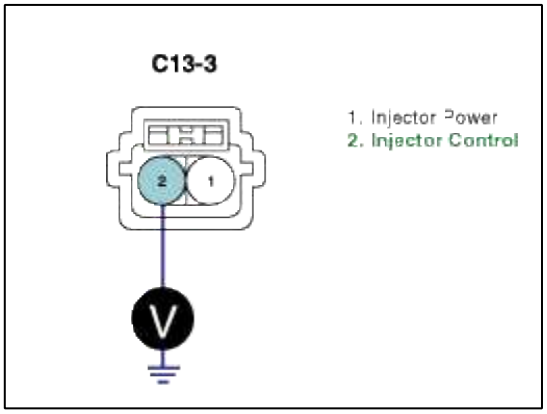
NO

Go to " Control Circuit Inspection " procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

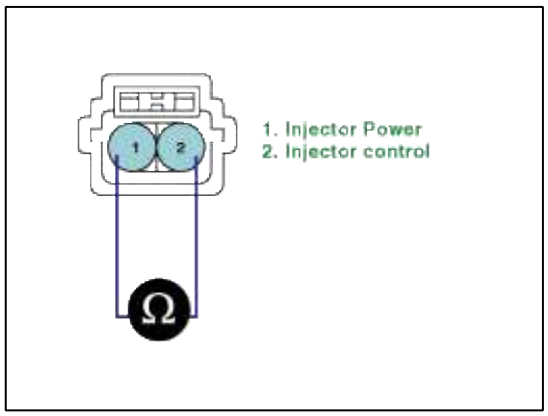
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

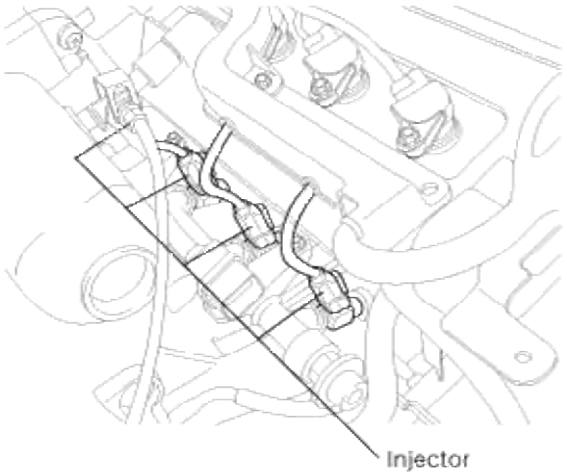
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0268 Cylinder 3 Injector Circuit High

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

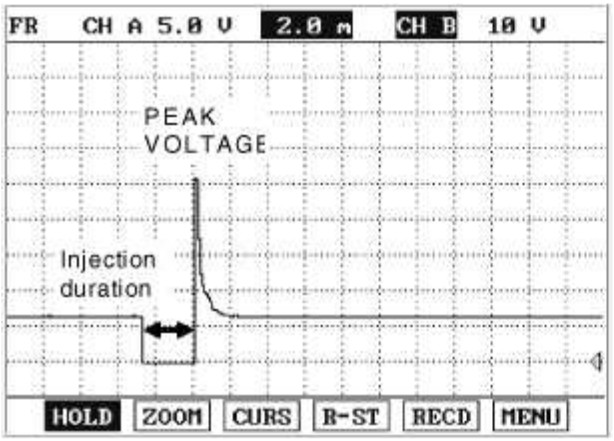
DTC DESCRIPTION

If there is Short to battery in injector #3 circuit, ECM/PCM sets DTC P0268.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • Short to power in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

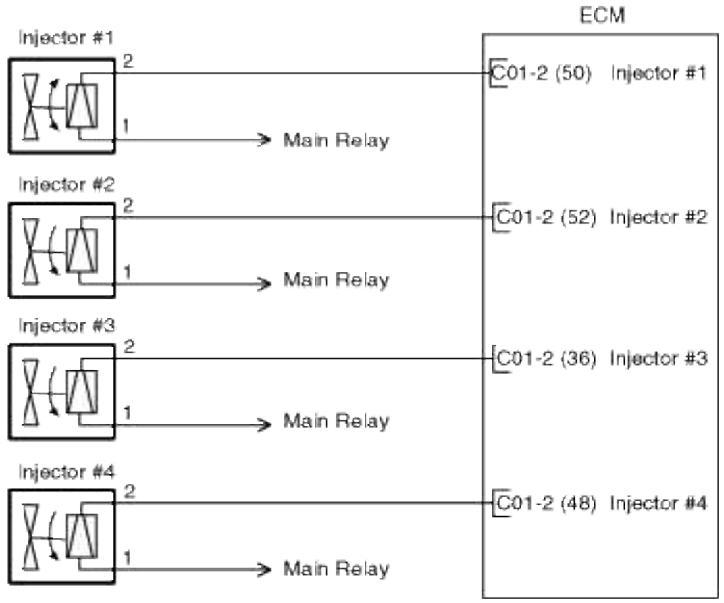
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

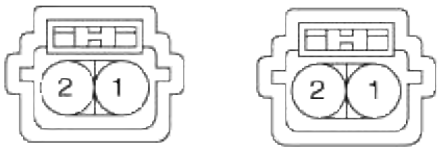
Injector #3

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

[HARNESS CONNECTORS]



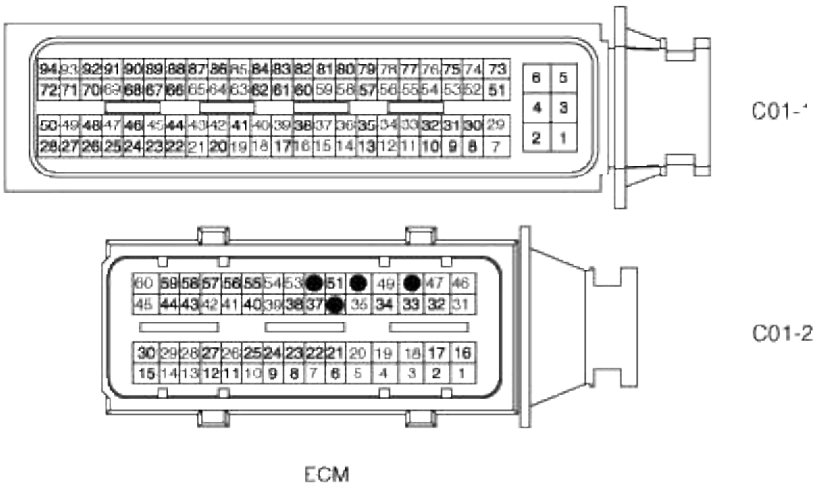
C13-1
Injector #1

C13-2
Injector #2



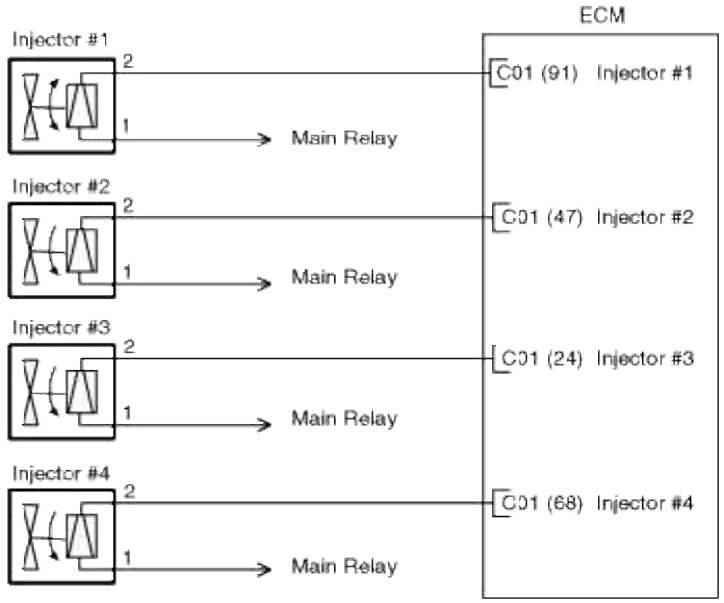
C13-3
Injector #3

C13-4
Injector #4



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

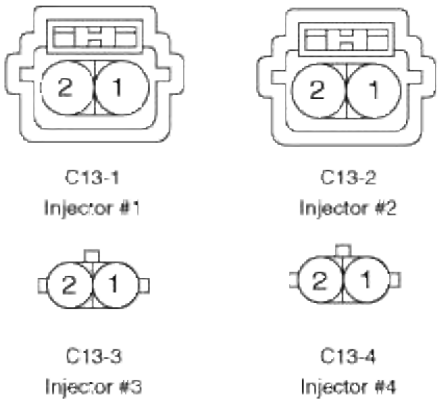
Injector #3

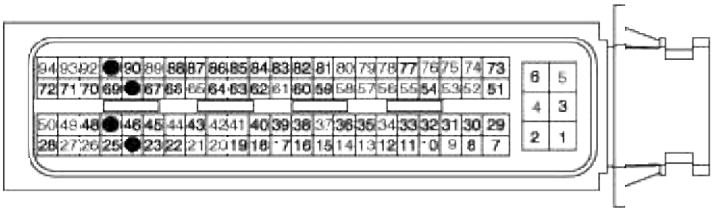
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

[HARNESS CONNECTORS]

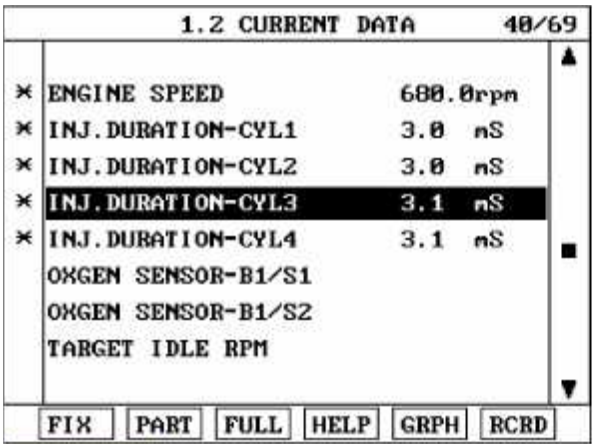




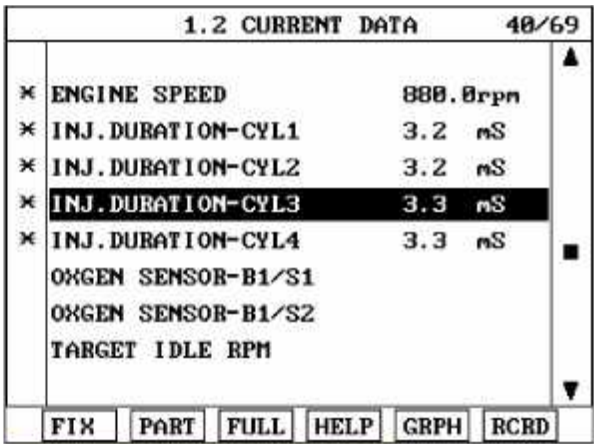
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.



Normal State



Abnormal State (#3 disconnected)

4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

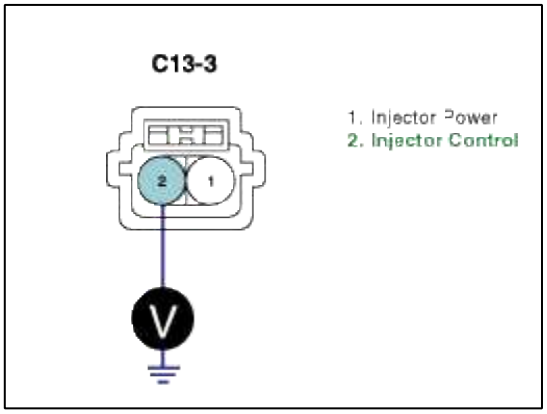
NO

Go to " Control Circuit Inspection " procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

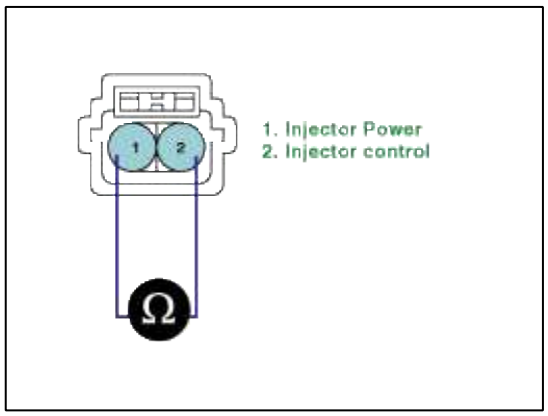
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

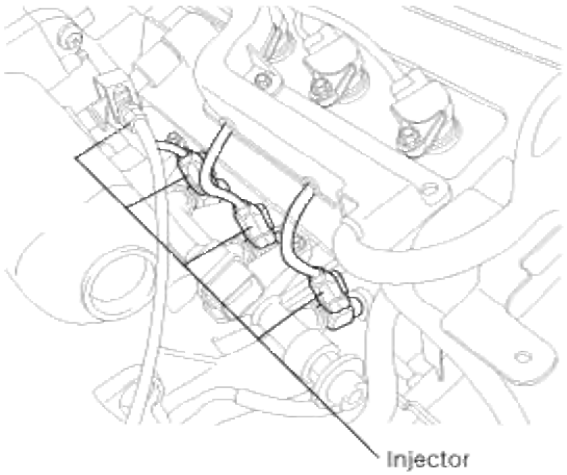
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0270 Cylinder 4 Injector Circuit Low

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

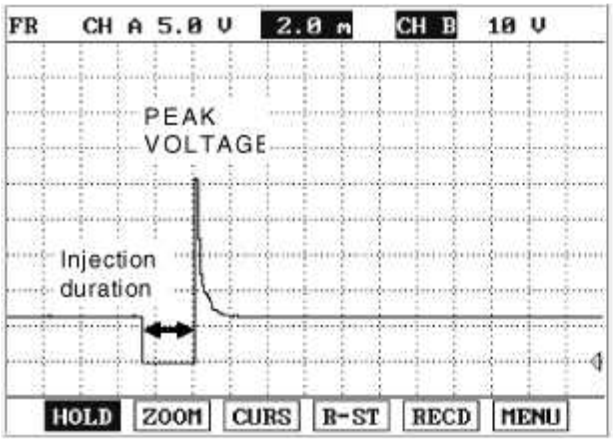
DTC DESCRIPTION

If there is Short to ground in injector #4 circuit, ECM/PCM sets DTC P0270.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • Short to ground in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

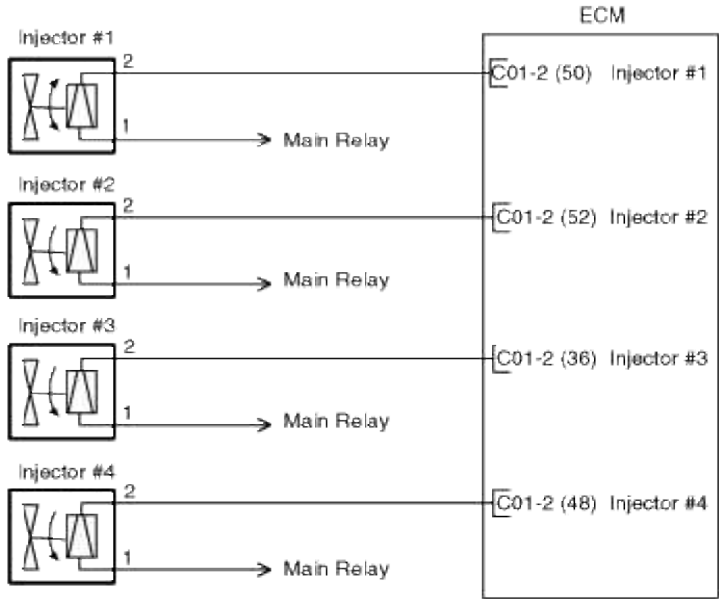
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

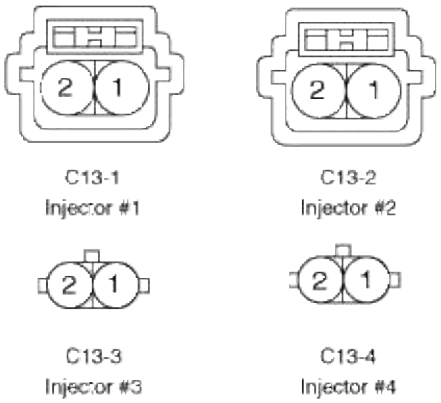
Injector #3

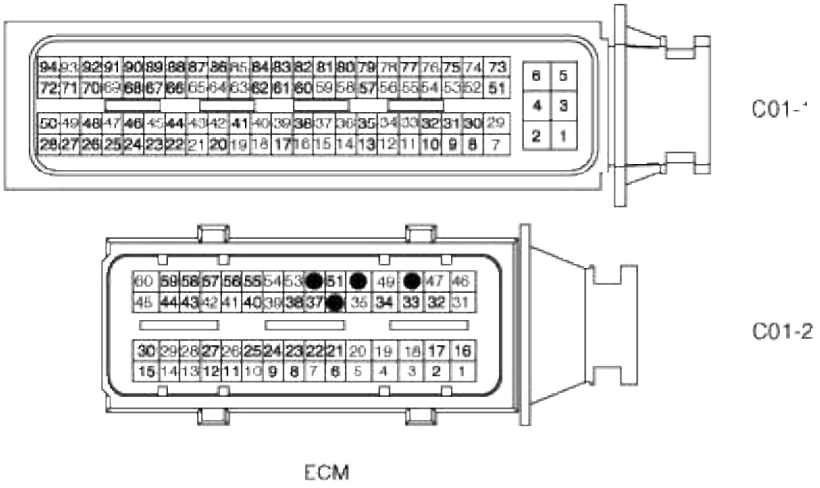
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

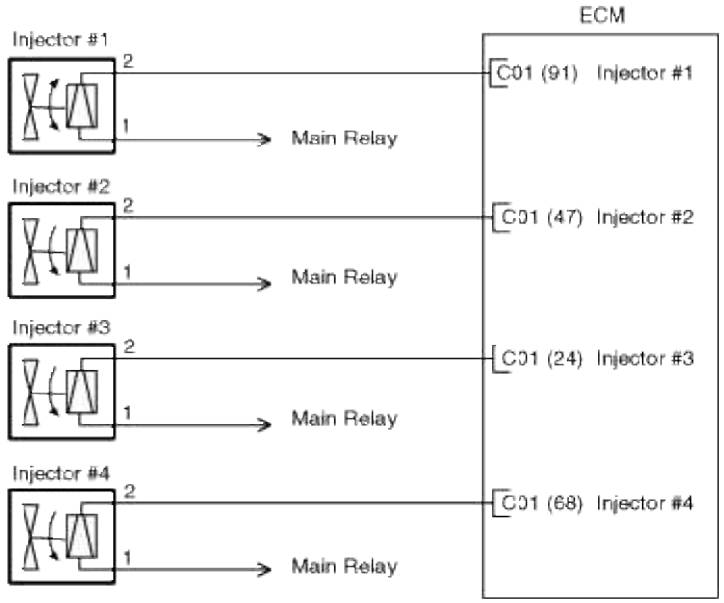
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

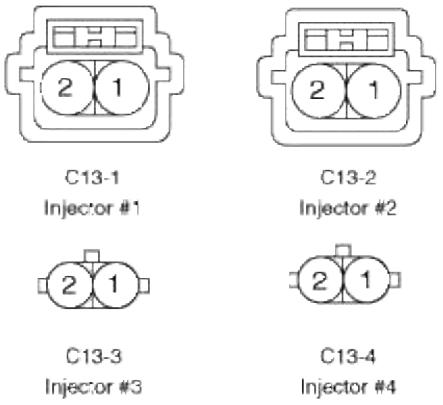
Injector #3

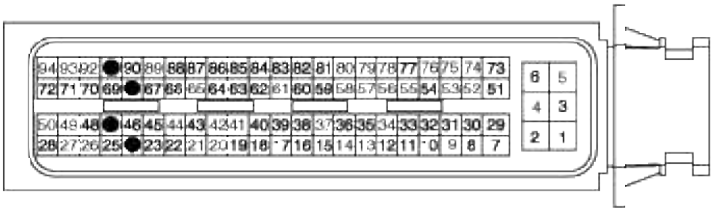
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

[HARNESS CONNECTORS]

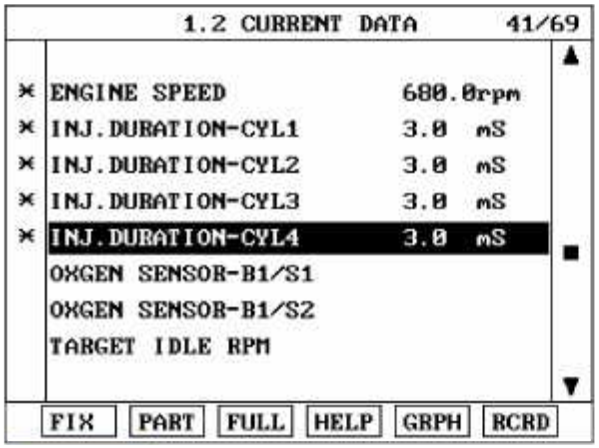




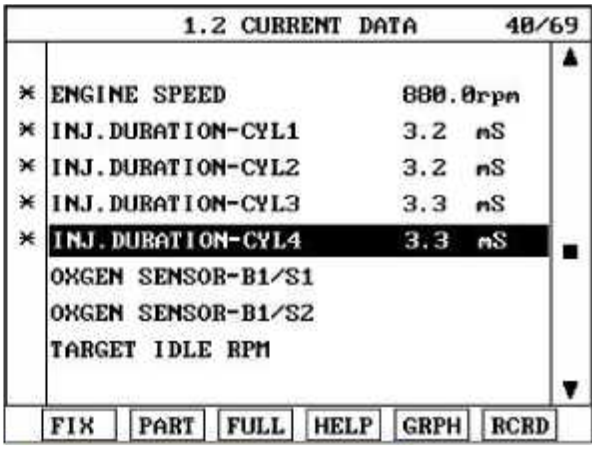
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.



Normal State



Abnormal State (#4 disconnected)

4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

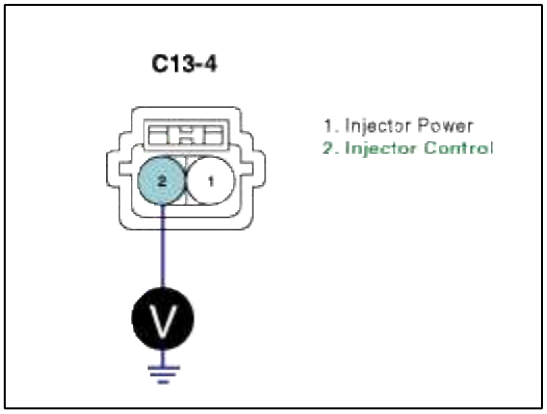
NO

Go to " Control Circuit Inspection " procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

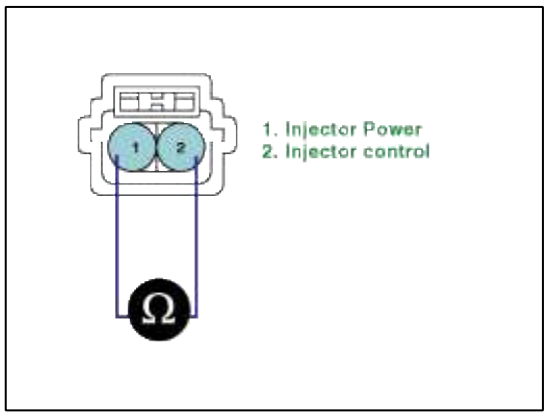
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

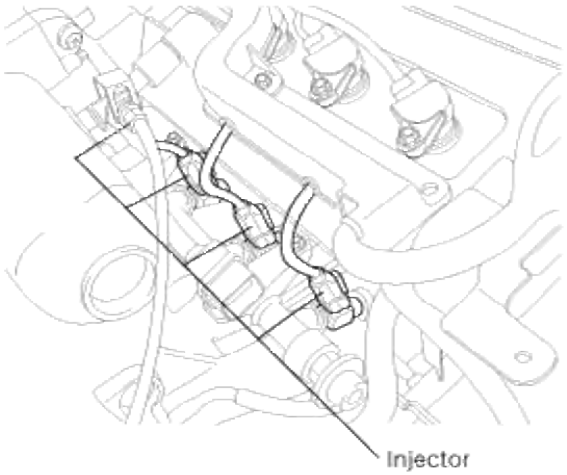
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0271 Cylinder 4 Injector Circuit High

COMPONENT LOCATION



GENERAL DESCRIPTION

The fuel injector is a solenoid valve used to supply the correct fuel quantity for optimum combustion under varying speed and load conditions. The ECM/PCM regulates fuel injection quantity by controlling the injection duration based on load, speed, and (in closed-loop mode) HO2S feedback.

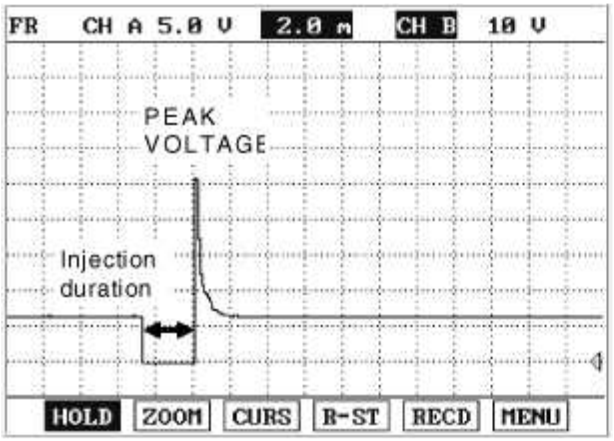
DTC DESCRIPTION

If there is Short to battery in injector #4 circuit, ECM/PCM sets DTC P0271.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • Short to power in control circuit • Injector • ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

SIGNAL WAVEFORM & DATA



When the ECM/PCM energizes the injector by grounding the control circuit, the circuit voltage will drop (theoretically 0V) and fuel is injected. When the injector in de-energized, the fuel injector is closed and the circuit voltage will momentarily peak.

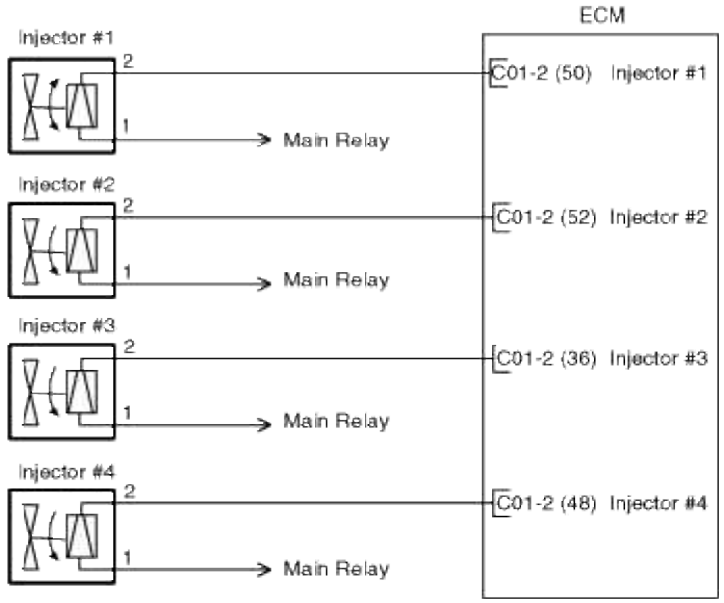
SPECIFICATION

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (50)	Injector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (52)	Injector #2 Control

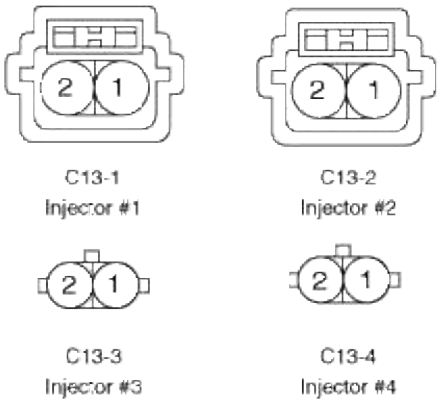
Injector #3

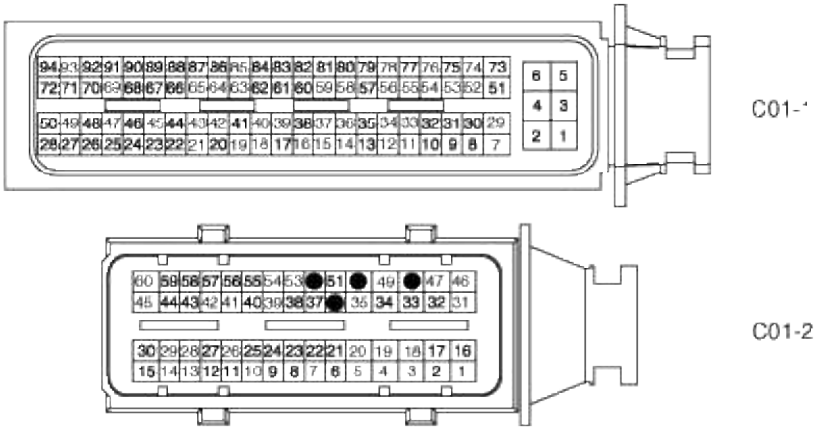
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (36)	Injector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (48)	Injector #4 Control

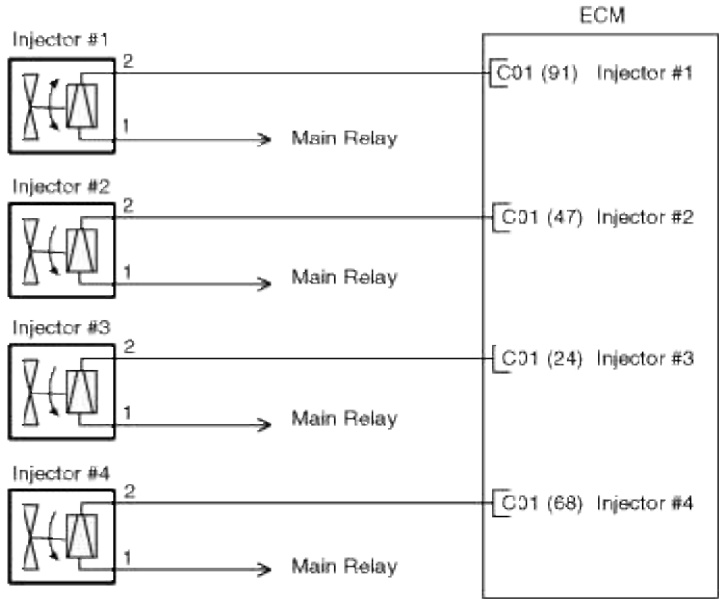
[HARNESS CONNECTORS]





(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Injector #1

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (91)	INjector #1 Control

Injector #2

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (47)	INjector #2 Control

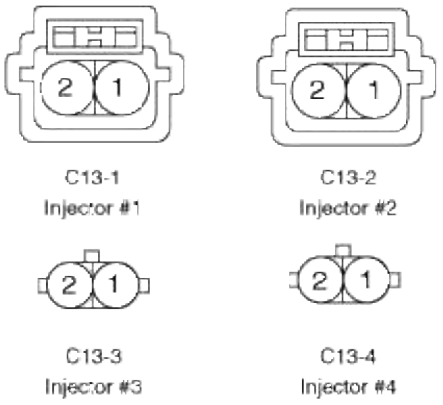
Injector #3

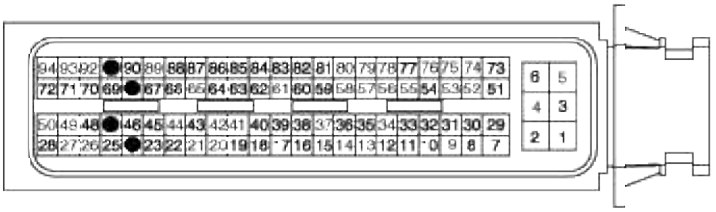
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (24)	INjector #3 Control

Injector #4

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (68)	INjector #4 Control

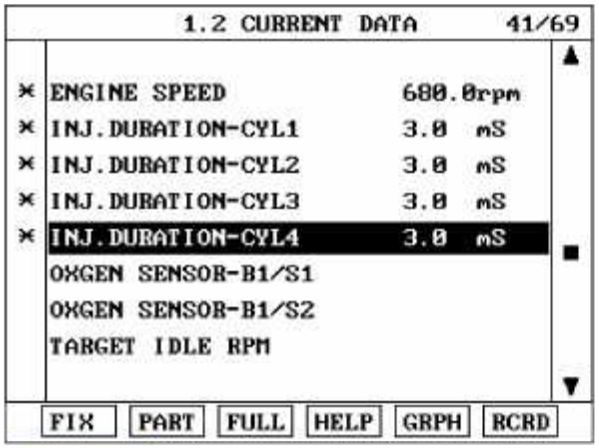
[HARNESS CONNECTORS]



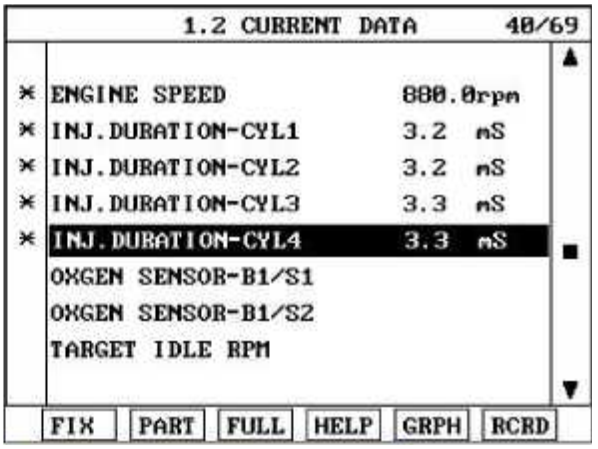


MONITOR SCANTOOL DATA

1. Connect scantool to DLC (Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor "injector" parameter on scantool.



Normal State



Abnormal State (#4 disconnected)

4. Is the "Injector" parameter displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

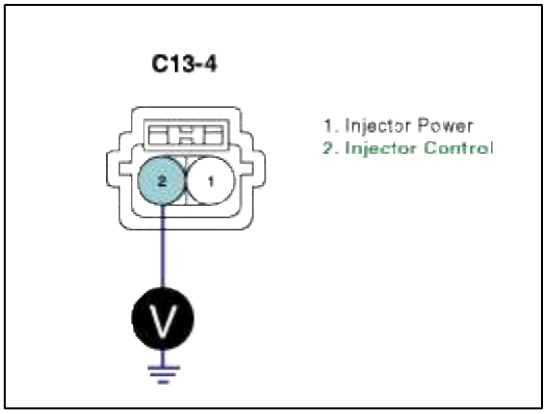
NO

Go to " Control Circuit Inspection " procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect injector connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of injector harness connector and chassis ground.

Specification : Approx. 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

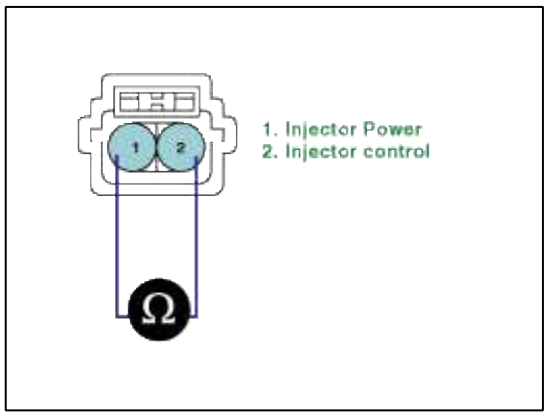
NO

Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check injecotor resistance.
   (1) IG "OFF".
   (2) Disconnect injector connector.
   (3) Measure resistance between terminal 1 and 2 of injector connector.(Component Side)
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (4) Is the measured resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

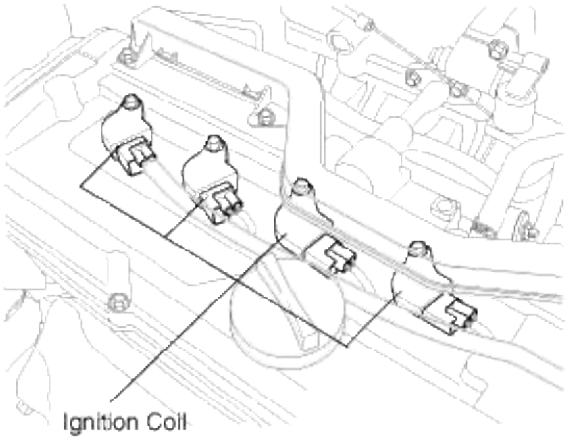
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0300 Random/Multiple Cylinder Misfire Detected

COMPONENT LOCATION



GENERAL DESCRIPTION

Misfires can be caused by lack of combustion in a cylinder due to absence of spark, poor fuel metering, poor compression, or many other causes. Even a small number of misfires may result in excessive exhaust emissions due to the unburned mixture. Increased misfire rates cause damage to the catalytic converter. The PCM monitors the crankshaft speed variation to determine if any misfiring generated. The PCM identifies the specific cylinder in which the misfire has occurred and counts individual misfire events by monitoring changes in the crankshaft rotation for each cylinder. A random misfire indicates one or more cylinders are misfiring.

DTC DESCRIPTION

If a misfire exists that exceeds the threshold value, P0300 is set.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Engine roughness through crankshaft speed fluctuation	• Poor connection • Ignition system • Fuel system • Intake/exhaust air system • Ignition timing • Injector • ECM/PCM
Enable Conditions		• Engine speed 510 ~ 6480rpm • Engine load > Zero torq. • Eng. load change < Max. • Eng. speed change < Max. • Calculated wheel acceleration < 20~38 • Time after engine start > 0 • Intake air temperature > -30°C (-22°F)	
Case1	Threshold Value	• Misfire rate for FTP(Federal Test Procedure) emission thresh >5	
	Diagnostic Time	• 1000 revs	
	MIL ON Condition	• 2 driving cycle	
Case2	Threshold Value	• 4% < Misfire rate for catalyst damage < 22%	
	Diagnostic Time	• 200 revs	

	MIL ON Condition	• Immediately (Blink)	

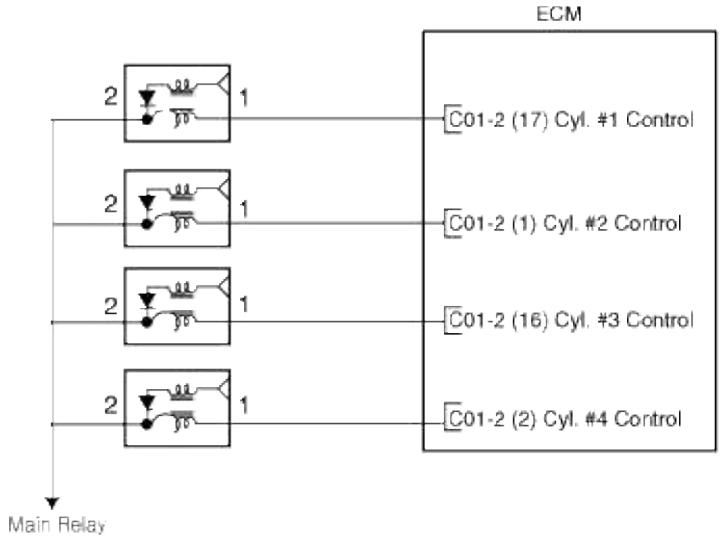
SPECIFICATION

Ignitioncoil resistance	
Primary coil	Secondary coil
0.71 ± 0.11Ω at 20°C (68°F)	-

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01-2 (17)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01-2 (1)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

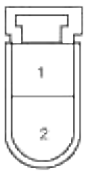
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01-2 (16)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

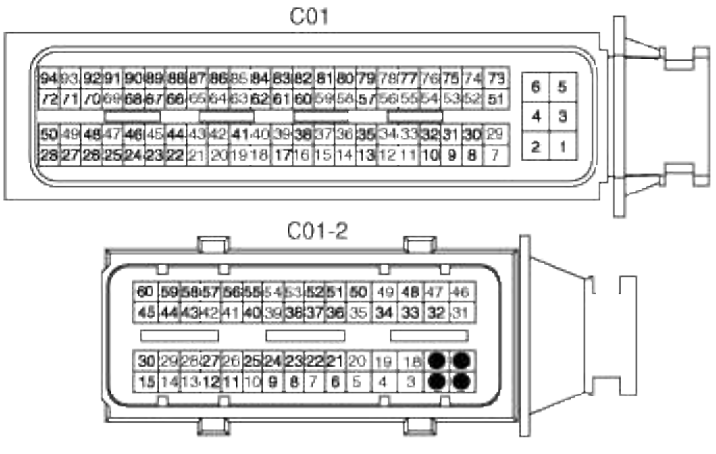
IG COIL (CYL. #4)

Terminal	Connected to	Function
1	ECM C01-2 (2)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]

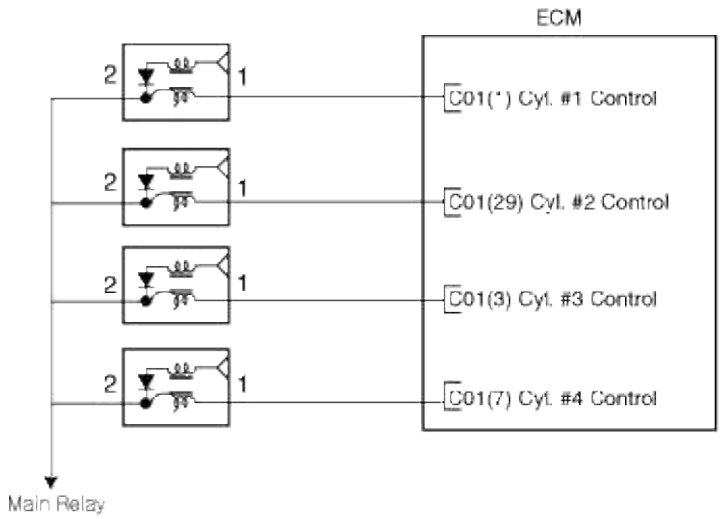


C10-1,2,3,4
IG COIL (CYL #1,2,3,4)



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01 (1)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01(29)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

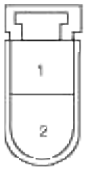
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01(3)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #4)

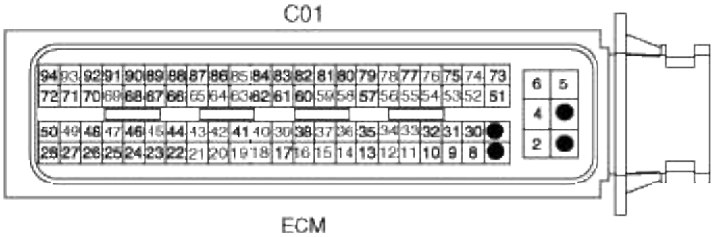
Terminal	Connected to	Function
1	ECM C01-2 (7)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]



C10-1,2,3,4
IG COIL (CY_ #1,2,3,4)

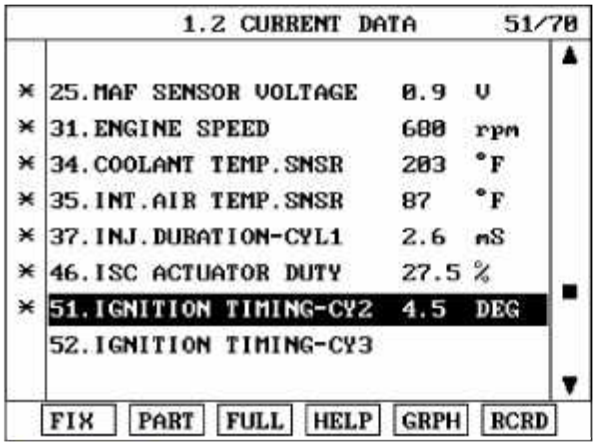
C01



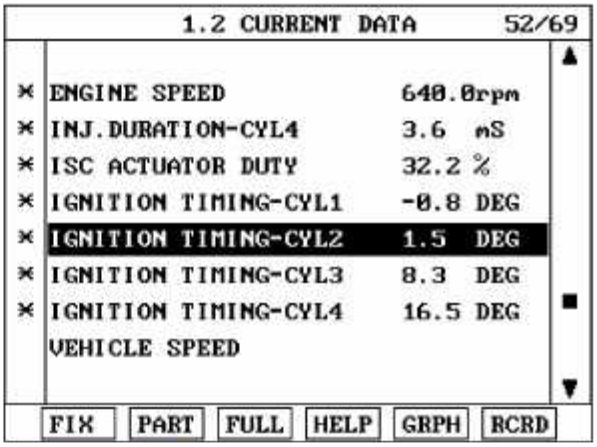
ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Parameters related to Ignition and Misfire" on the scantool.



Normal State



Abnormal State

4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Spark plug check.
   (1) Remove cylinder's spark plugs.
   (2) Visually/physically inspect the following items:
      A. Damaged insulation, Worn electrodes, Oil or fuel fouled, Loose terminals and cracks
      B. Check for plug gap : 1.0 - 1.1 mm (0.039 - 0.043 in.)
      C. Check if the spark plug for the relevant cylinder is lighter in color than the other plugs.
   (3) Has a problem been found in any of the above areas?

      YES

      Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure

      NO

      Go to "Compression pressure check" procedure.
2. Compression pressure check.
   (1) Warm up the engine to normal operating temperature.
   (2) Disconnect the spark plug cables. And remove the spark plugs and fuel pump relay.
   (3) Crank the engine to remove any foreign material in the cylinders.
   (4) Put compression pressure gauge into spark pulg hole.
   (5) Check compression pressure at each cylinder.

Specification : Approx. 15kg/cm² (1.471MPa / 213.4psi)

(6) Is compression pressure for each cylinder displayed within specifications?

YES

Go to "Ignition system check" procedure.

NO

Add a small amount of oil through the spark plug hole, and repeat above steps.

If the addition of oil causes the compression to rise, the cause is a worn or damaged piston ring or cylinder inner surface.

If the compression remains the same, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

3. Ignition system check

(1) Key "OFF".

(2) Disconnect Ignition coil connector.

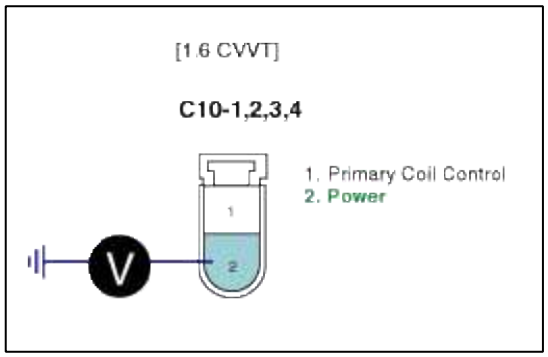
(3) Do visual inspection.

Check contamination or damege on ignition coil.

(4) Key "ON".

(5) Measure the voltage between terminal 2 of ignition coil #1, #2, #3, #4 harness connector and chassis ground.

Specification : Approx. B+



(6) Is the measured voltage within specifications?

YES

Go to "Ignition coil check" procedure.

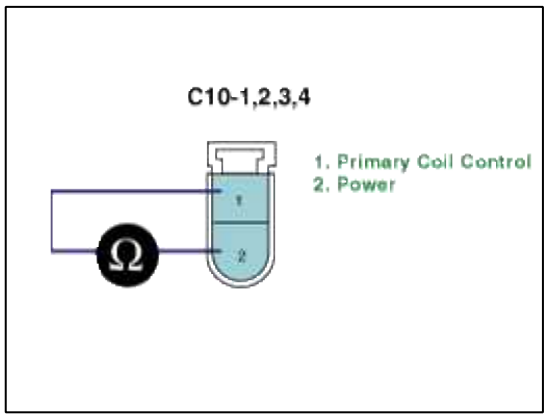
NO

Repair Open or Short to ground in power circuit, and go to "Verification of Vehicle Repair" procedure.

4. Ignition coil check
   (1) Measure the resistance between terminal 1 and 2 of ingnition coil connector #1, #2, #3, #4.
   (Component side / Primary coil)
   Specification :

1.6 CVVT

Ignition Coil Resistance (Primary)
0.71 ± 0.11 Ω at 20°C (68°F)



   (2) Is the measured resistance within specifications?

   YES

   Go to "Timing mark check" procedure.

   NO

   Substitute with a known - good ignition coil and check for proper operation.
   If the problem is corrected, replace ignition coil and go to "Verification of Vehicle Repair" procedure.

5. Timing mark check.
   (1) Key "OFF".
   (2) Check the timing mark.
   (3) Is the timing mark normal?

   YES

   Go to "Air leakage check" procedure.

   NO

   Repair and go to "Verification of Vehicle Repair" procedure.

6. Air leakage check.
   (1) Visually/physically inspect the air leakage in intake/exhaust system as following items,
   A. Vacuum hoses for splits, kinks and improper connections.
   B. Throttle body gasket
   C. Gasket between intake manifold and cylinder head
   D. Seals between intake manifold and fuel injectors
   E. Exhaust system between HO2S and Three way catalyst for air leakage.
   (2) Has a problem been found in any of the above areas?

   YES

   Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

   NO

   (3) Go to "PCV(Positive Crankcase Ventilation) valve check" procedure.

7. PCV(Positive Crankcase Ventilation) valve check.
   (1) Key "OFF".
   (2) Disconnect PCV valve.
   (3) Check the movement of plunger by putting in and out a thin stick.
   (4) Is the movement of plunger normal?

   YES

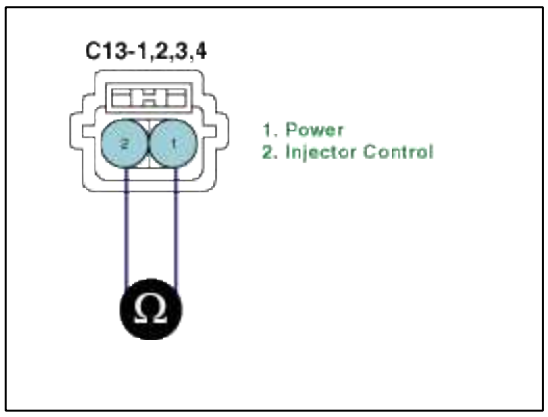
   Go to "Injector check" procedure.

   NO

   Substitute with a known - good PCV valve and check for proper operation.
   If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

8. Injector check.
   (1) Key "OFF".
   (2) Remove injectors.
   (3) Check leakage or clog on injectors.
   (4) Measure the resistance between terminal 1 and 2. (Component side)
   Specification :

Temperature (°C)	Resistance (Ω)
20	14.5 ± 0.7Ω



   (5) Is the measured resistance within specification?

   YES

   Go to "Fuel line check" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

9. Fuel line check.
   (1) Check clog, contamination and damage on fuel line.
      A. Splits, kinks and improper connections of fuel line pipe.
      B. Interference, damage and improper connections of vacuum hose on fuel line.
      C. Improper connection of connectors on fuel line.
   (2) Is the fuel line normal?

   YES

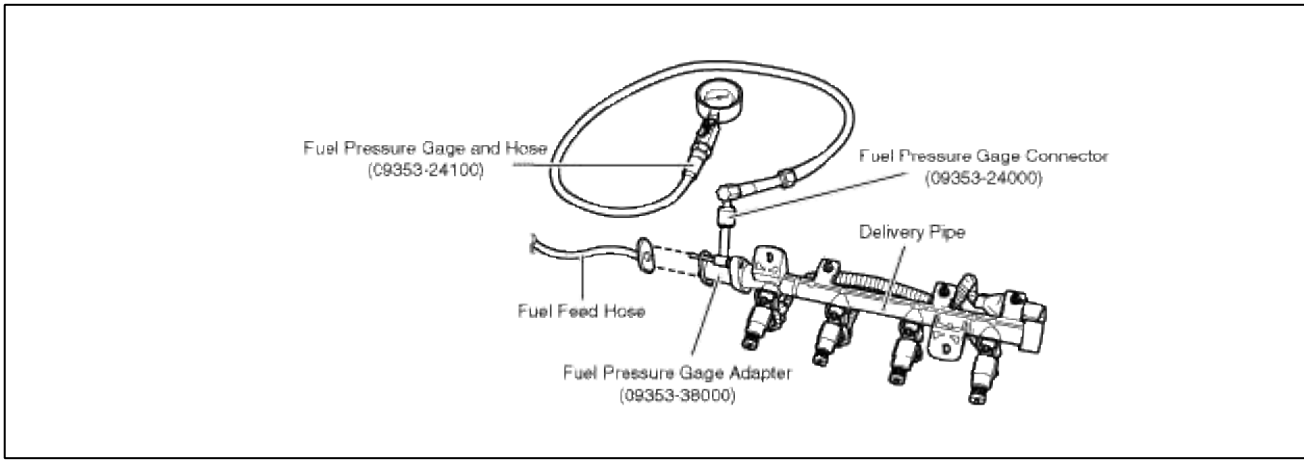
   Go to "Fuel pressure check" procedure.

   NO

   Repair as necessary and go to "Verification of Vehicle Repair" procedure.

10. Fuel pressure check.
    (1) Key "OFF".
    (2) Disconnect a fuel pump relay.
    (3) Engine start and wait until engine stop. and then key "OFF".
    (4) Install fuel pump relay.
    (5) Start the engine , and record fuel pressure.
    (6) Connect fuel pressure guage using the correct adaptor.

Specification : Approx. 3.5 kg/cm²



    (7) Is the fuel pressure normal?

YES

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

NO

Check clogging on the fuel filter.
Check the fuel supply and return line.
Repair as necessary and go to "Verification of vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

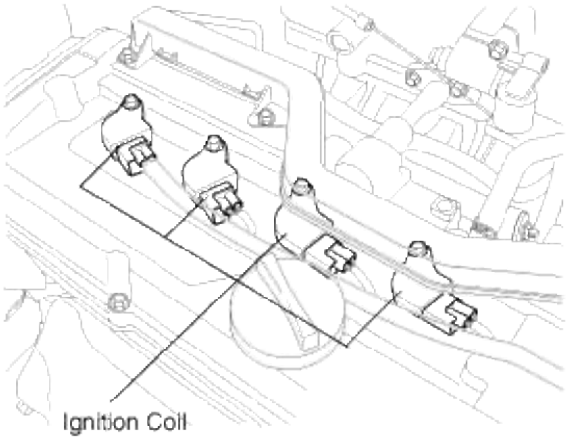
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0301 Cylinder 1-Misfire detected

COMPONENT LOCATION



GENERAL DESCRIPTION

Misfires can be caused by lack of combustion in a cylinder due to absence of spark, poor fuel metering, poor compression, or many other causes. Even a small number of misfires may result in excessive exhaust emissions due to the unburned mixture. Increased misfire rates cause damage to the catalytic converter. The ECM/PCM monitors the crankshaft speed variation to determine if any misfiring generated. The ECM/PCM identifies the specific cylinder in which the misfire has occurred and counts individual misfire events by monitoring changes in the crankshaft rotation for each cylinder. A random misfire indicates one or more cylinders are misfiring.

DTC DESCRIPTION

If a misfire exists that exceeds the threshold value, P0301 is set.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Engine roughness through crankshaft speed fluctuation	• Poor connection • Ignition system • Fuel system • Intake/exhaust air system • Ignition timing • Injector • ECM/PCM
Enable Conditions		• Engine speed 510~6480rpmEngine load > Zero torq. • Eng. load change < Max. • Eng. speed change < Max. • Calculated wheel acceleration < 20~38 • Time after engine start > 0 • Intake air temperature > -30°C (-22°F)	
Case1	Threshold Value	• Misfire rate for FTP(Federal Test Procedure) emission thresh >5	
	Diagnostic Time	• 1000 revs	
	MIL ON Condition	• 2 driving cycle	
Case2	Threshold Value	• 4% < Misfire rate for catalyst damage < 22%	
	Diagnostic Time	• 200 revs	
	MIL ON Condition	• Immediately (Blink)	

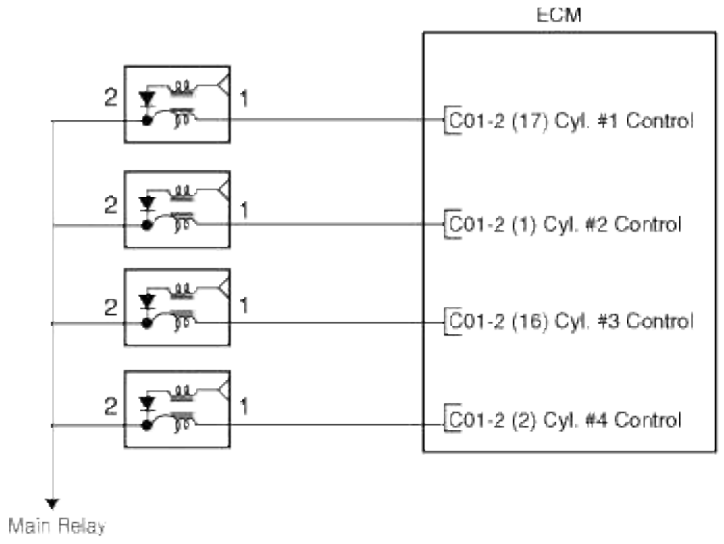
SPECIFICATION

Ignitioncoil resistance	
Primary coil	Secondary coil
0.71 ± 0.11Ω at 20°C (68°F)	-

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01-2 (17)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01-2 (1)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

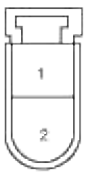
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01-2 (16)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

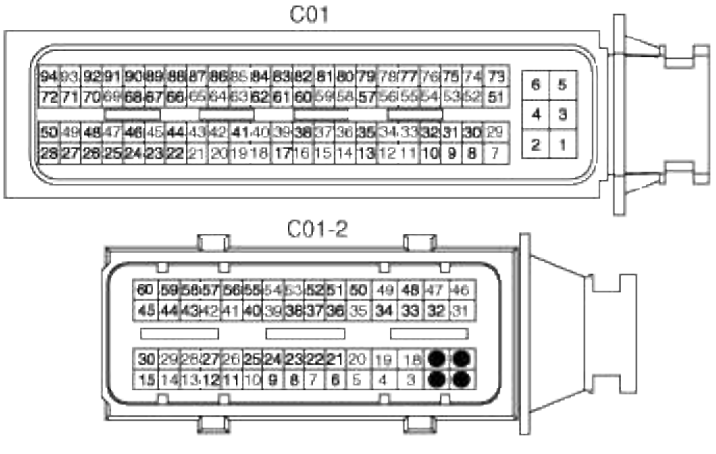
IG COIL (CYL. #4)

Terminal	Connected to	Function
1	ECM C01-2 (2)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]

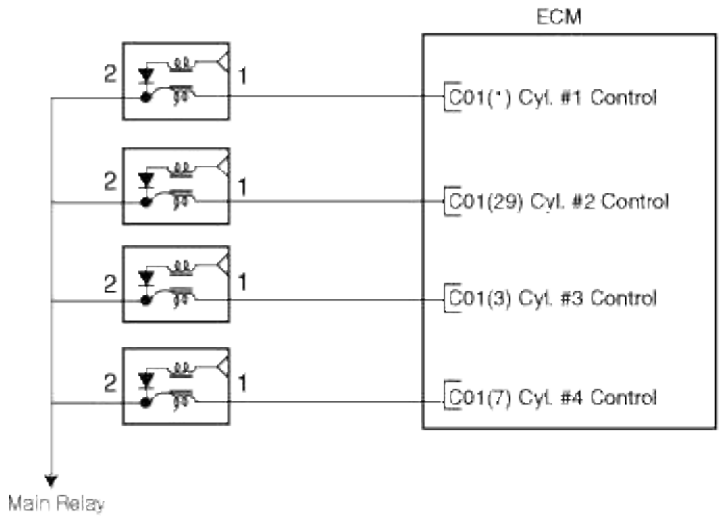


C10-1,2,3,4
IG COIL (CYL #1,2,3,4)



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01 (1)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01(29)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

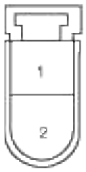
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01(3)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #4)

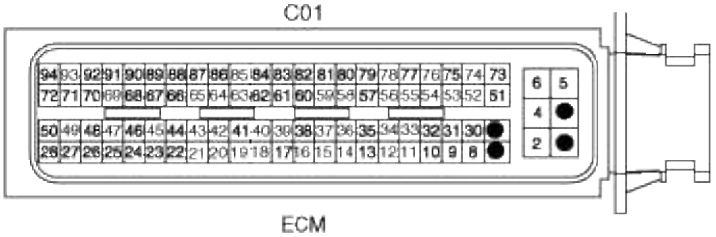
Terminal	Connected to	Function
1	ECM C01-2 (7)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]



C10-1,2,3,4
IG COIL (CY_ #1,2,3,4)

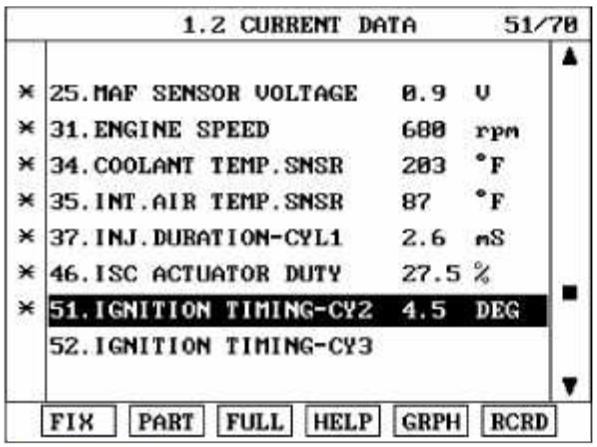
C01



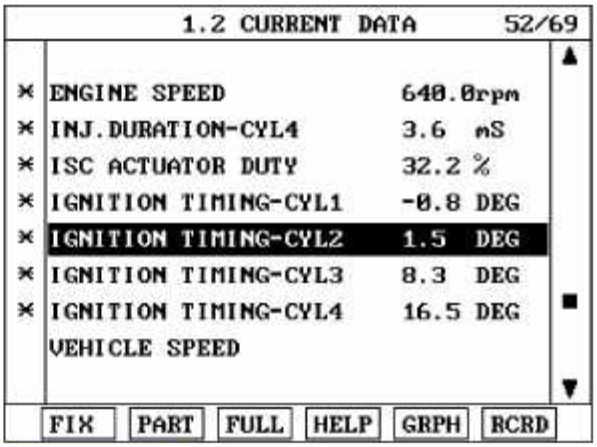
ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Parameters related to Ignition and Misfire" on the scantool.



Normal State



Abnormal State

4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Spark plug check.
   (1) Remove cylinder's spark plugs.
   (2) Visually/physically inspect the following items:
      A. Damaged insulation, Worn electrodes, Oil or fuel fouled, Loose terminals and cracks
      B. Check for plug gap : 1.0 - 1.1 mm (0.039 - 0.043 in.)
      C. Check if the spark plug for the relevant cylinder is lighter in color than the other plugs.
   (3) Has a problem been found in any of the above areas?

      YES

      Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure

      NO

      Go to "Compression pressure check" procedure.
2. Compression pressure check.
   (1) Warm up the engine to normal operating temperature.
   (2) Disconnect the spark plug cables. And remove the spark plugs and fuel pump relay.
   (3) Crank the engine to remove any foreign material in the cylinders.
   (4) Put compression pressure gauge into spark pulg hole.
   (5) Check compression pressure at each cylinder.

Specification : Approx. 15kg/cm² (1.471MPa / 213.4psi)

(6) Is compression pressure for each cylinder displayed within specifications?

YES

Go to "Ignition system check" procedure.

NO

Add a small amount of oil through the spark plug hole, and repeat above steps.

If the addition of oil causes the compression to rise, the cause is a worn or damaged piston ring or cylinder inner surface.

If the compression remains the same, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

3. Ignition system check

(1) Key "OFF".

(2) Disconnect Ignition coil connector.

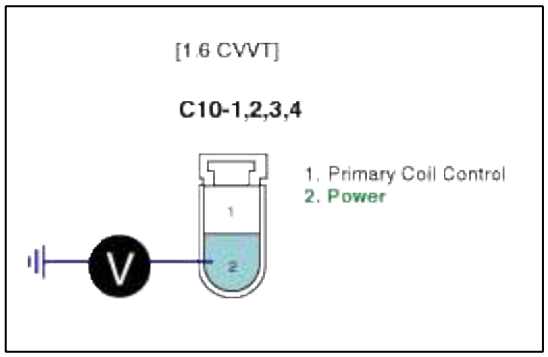
(3) Do visual inspection.

Check contamination or damege on ignition coil.

(4) Key "ON".

(5) Measure the voltage between terminal 2 of ignition coil #1, #2, #3, #4 harness connector and chassis ground.

Specification : Approx. B+



(6) Is the measured voltage within specifications?

YES

Go to "Ignition coil check" procedure.

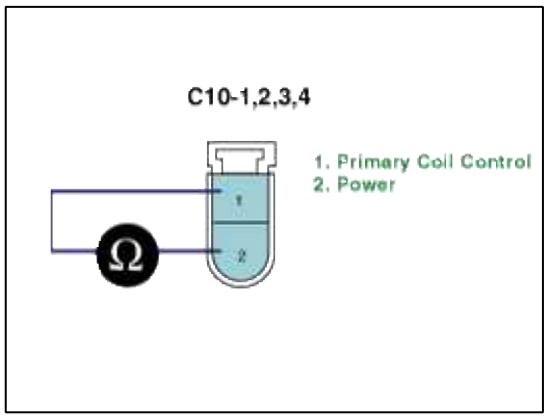
NO

Repair Open or Short to ground in power circuit, and go to "Verification of Vehicle Repair" procedure.

4. Ignition coil check
   (1) Measure the resistance between terminal 1 and 2 of ingnition coil connector #1, #2, #3, #4.
   (Component side / Primary coil)
   Specification :

1.6 CVVT

Ignition Coil Resistance (Primary)
0.71 ± 0.11 Ω at 20°C (68°F)



   (2) Is the measured resistance within specifications?

   YES

   Go to "Timing mark check" procedure.

   NO

   Substitute with a known - good ignition coil and check for proper operation.
   If the problem is corrected, replace ignition coil and go to "Verification of Vehicle Repair" procedure.

5. Timing mark check.
   (1) Key "OFF".
   (2) Check the timing mark.
   (3) Is the timing mark normal?

   YES

   Go to "Air leakage check" procedure.

   NO

   Repair and go to "Verification of Vehicle Repair" procedure.

6. Air leakage check.
   (1) Visually/physically inspect the air leakage in intake/exhaust system as following items,
   A. Vacuum hoses for splits, kinks and improper connections.
   B. Throttle body gasket
   C. Gasket between intake manifold and cylinder head
   D. Seals between intake manifold and fuel injectors
   E. Exhaust system between HO2S and Three way catalyst for air leakage.
   (2) Has a problem been found in any of the above areas?

   YES

   Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

   NO

   (3) Go to "PCV(Positive Crankcase Ventilation) valve check" procedure.

7. PCV(Positive Crankcase Ventilation) valve check.
   (1) Key "OFF".
   (2) Disconnect PCV valve.
   (3) Check the movement of plunger by putting in and out a thin stick.
   (4) Is the movement of plunger normal?

   YES

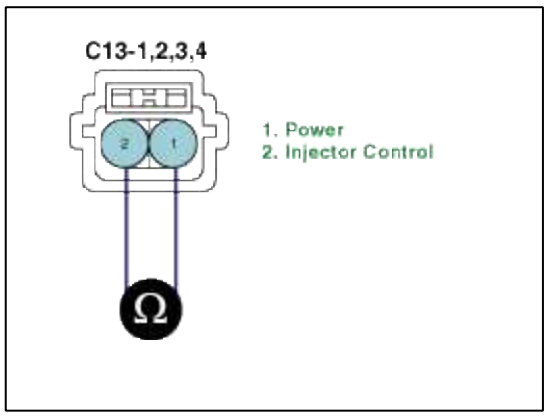
   Go to "Injector check" procedure.

   NO

   Substitute with a known - good PCV valve and check for proper operation.
   If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

8. Injector check.
   (1) Key "OFF".
   (2) Remove injectors.
   (3) Check leakage or clog on injectors.
   (4) Measure the resistance between terminal 1 and 2. (Component side)
   Specification :

Temperature (°C)	Resistance (Ω)
20	14.5 ± 0.7Ω



   (5) Is the measured resistance within specification?

   YES

   Go to "Fuel line check" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

9. Fuel line check.
   (1) Check clog, contamination and damage on fuel line.
      A. Splits, kinks and improper connections of fuel line pipe.
      B. Interference, damage and improper connections of vacuum hose on fuel line.
      C. Improper connection of connectors on fuel line.
   (2) Is the fuel line normal?

   YES

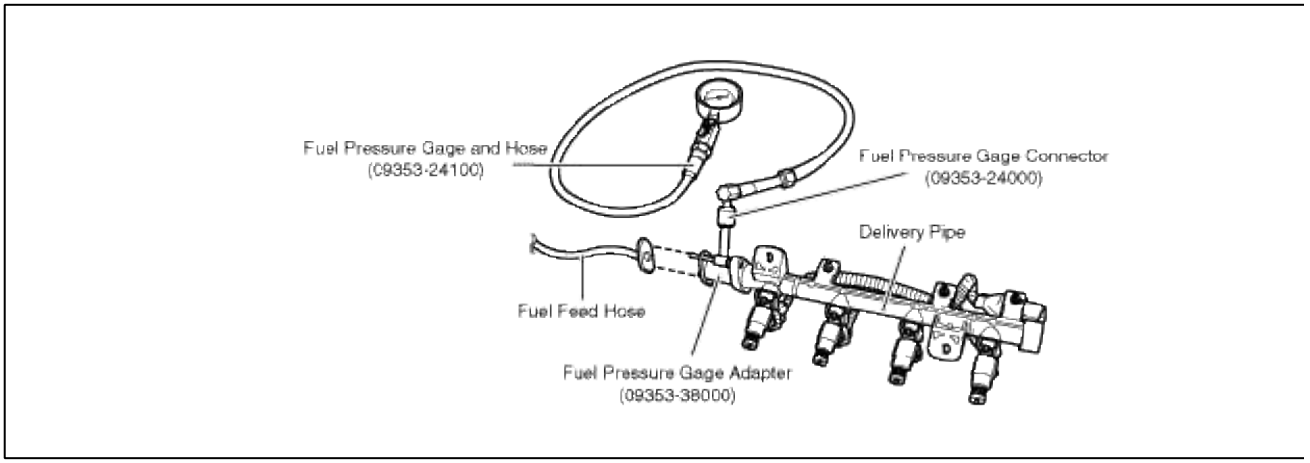
   Go to "Fuel pressure check" procedure.

   NO

   Repair as necessary and go to "Verification of Vehicle Repair" procedure.

10. Fuel pressure check.
    (1) Key "OFF".
    (2) Disconnect a fuel pump relay.
    (3) Engine start and wait until engine stop. and then key "OFF".
    (4) Install fuel pump relay.
    (5) Start the engine , and record fuel pressure.
    (6) Connect fuel pressure guage using the correct adaptor.

Specification : Approx. 3.5 kg/cm²



    (7) Is the fuel pressure normal?

YES

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

NO

Check clogging on the fuel filter.
Check the fuel supply and return line.
Repair as necessary and go to "Verification of vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

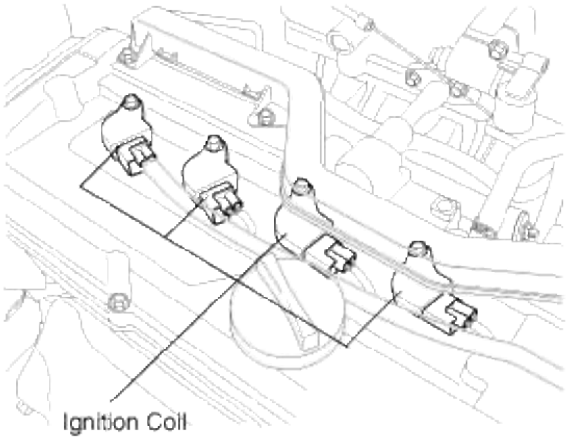
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0302 Cylinder 2-Misfire detected

COMPONENT LOCATION



GENERAL DESCRIPTION

Misfires can be caused by lack of combustion in a cylinder due to absence of spark, poor fuel metering, poor compression, or many other causes. Even a small number of misfires may result in excessive exhaust emissions due to the unburned mixture. Increased misfire rates cause damage to the catalytic converter. The ECM/PCM monitors the crankshaft speed variation to determine if any misfiring generated. The ECM/PCM identifies the specific cylinder in which the misfire has occurred and counts individual misfire events by monitoring changes in the crankshaft rotation for each cylinder. A random misfire indicates one or more cylinders are misfiring.

DTC DESCRIPTION

If a misfire exists that exceeds the threshold value, P0302 is set.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Engine roughness through crankshaft speed fluctuation	• Poor connection • Ignition system • Fuel system • Intake/exhaust air system • Ignition timing • Injector • ECM/PCM
Enable Conditions		• Engine speed 510~6480rpm • Engine load > Zero torq. • Eng. load change < Max. • Eng. speed change < Max. • Calculated wheel acceleration < 20~38 • Time after engine start > 0 • Intake air temperature > -30°C (-22°F)	
Case1	Threshold Value	• Misfire rate for FTP(Federal Test Procedure) emission thresh >5	
	Diagnostic Time	• 1000 revs	
	MIL ON Condition	• 2 driving cycle	
Case2	Threshold Value	• 4% < Misfire rate for catalyst damage < 22%	
	Diagnostic Time	• 200 revs	

	MIL ON Condition	• Immediately (Blink)	

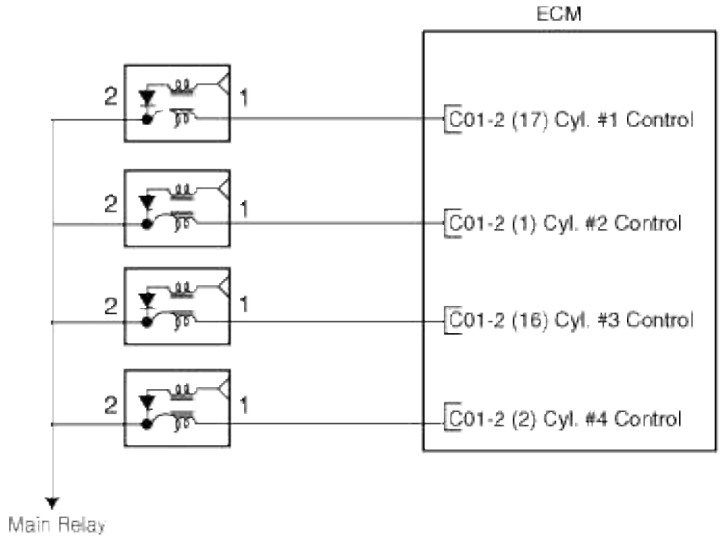
SPECIFICATION

Ignitioncoil resistance	
Primary coil	Secondary coil
0.71 ± 0.11Ω at 20°C (68°F)	-

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01-2 (17)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01-2 (1)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

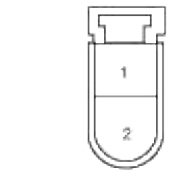
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01-2 (16)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

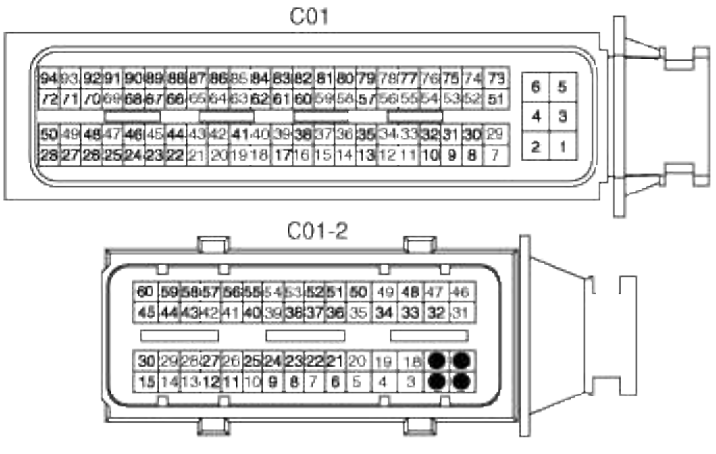
IG COIL (CYL. #4)

Terminal	Connected to	Function
1	ECM C01-2 (2)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]

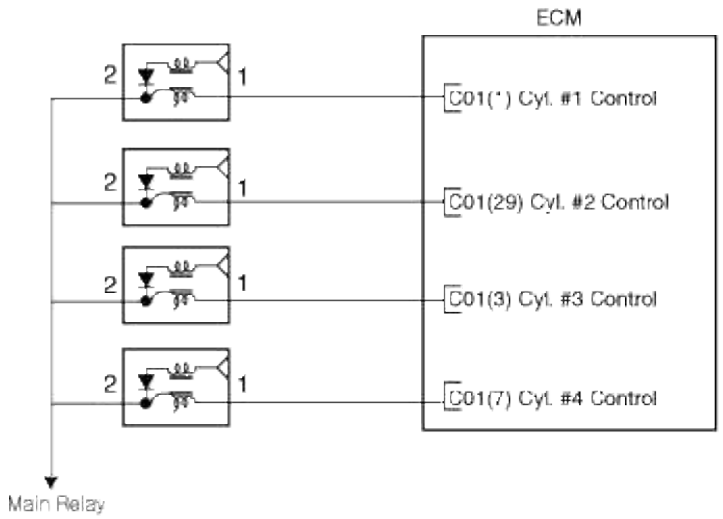


C10-1,2,3,4
IG COIL (CYL #1,2,3,4)



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01 (1)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01(29)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

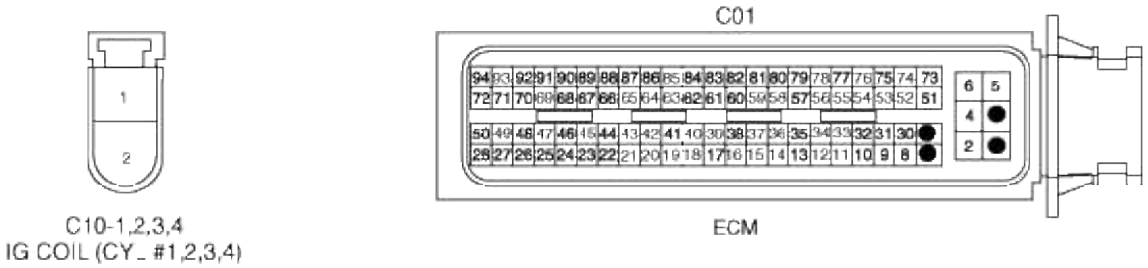
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01(3)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #4)

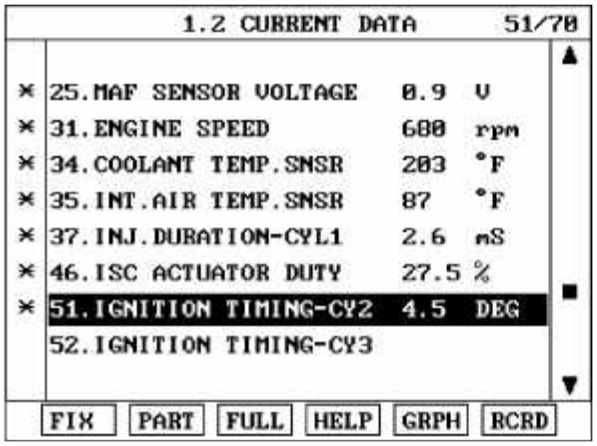
Terminal	Connected to	Function
1	ECM C01-2 (7)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

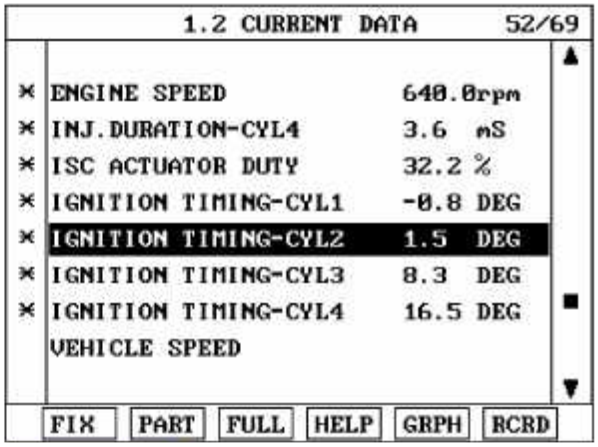
[HARNESS CONNECTORS]



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Parameters related to Ignition and Misfire" on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Spark plug check.
   (1) Remove cylinder's spark plugs.
   (2) Visually/physically inspect the following items:
      A. Damaged insulation, Worn electrodes, Oil or fuel fouled, Loose terminals and cracks
      B. Check for plug gap : 1.0 - 1.1 mm (0.039 - 0.043 in.)
      C. Check if the spark plug for the relevant cylinder is lighter in color than the other plugs.
   (3) Has a problem been found in any of the above areas?

      YES

      Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure

      NO

      Go to "Compression pressure check" procedure.
2. Compression pressure check.
   (1) Warm up the engine to normal operating temperature.
   (2) Disconnect the spark plug cables. And remove the spark plugs and fuel pump relay.
   (3) Crank the engine to remove any foreign material in the cylinders.
   (4) Put compression pressure gauge into spark pulg hole.
   (5) Check compression pressure at each cylinder.

Specification : Approx. 15kg/cm² (1.471MPa / 213.4psi)

(6) Is compression pressure for each cylinder displayed within specifications?

YES

Go to "Ignition system check" procedure.

NO

Add a small amount of oil through the spark plug hole, and repeat above steps.

If the addition of oil causes the compression to rise, the cause is a worn or damaged piston ring or cylinder inner surface.

If the compression remains the same, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

3. Ignition system check

(1) Key "OFF".

(2) Disconnect Ignition coil connector.

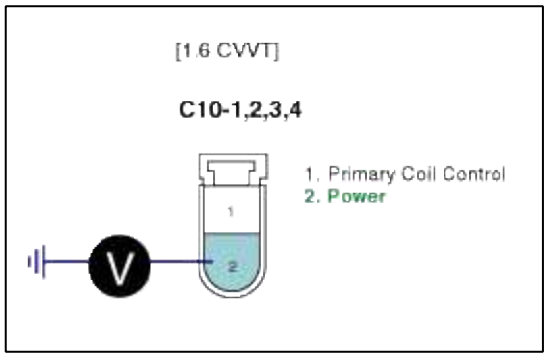
(3) Do visual inspection.

Check contamination or damege on ignition coil.

(4) Key "ON".

(5) Measure the voltage between terminal 2 of ignition coil #1, #2, #3, #4 harness connector and chassis ground.

Specification : Approx. B+



(6) Is the measured voltage within specifications?

YES

Go to "Ignition coil check" procedure.

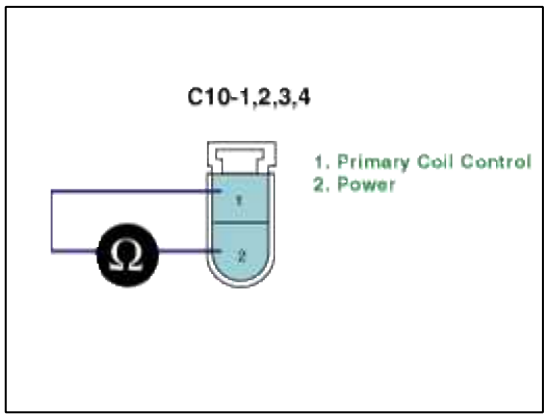
NO

Repair Open or Short to ground in power circuit, and go to "Verification of Vehicle Repair" procedure.

4. Ignition coil check
   (1) Measure the resistance between terminal 1 and 2 of ingnition coil connector #1, #2, #3, #4.
   (Component side / Primary coil)
   Specification :

1.6 CVVT

Ignition Coil Resistance (Primary)
0.71 ± 0.11 Ω at 20°C (68°F)



   (2) Is the measured resistance within specifications?

   YES

   Go to "Timing mark check" procedure.

   NO

   Substitute with a known - good ignition coil and check for proper operation.
   If the problem is corrected, replace ignition coil and go to "Verification of Vehicle Repair" procedure.

5. Timing mark check.
   (1) Key "OFF".
   (2) Check the timing mark.
   (3) Is the timing mark normal?

   YES

   Go to "Air leakage check" procedure.

   NO

   Repair and go to "Verification of Vehicle Repair" procedure.

6. Air leakage check.
   (1) Visually/physically inspect the air leakage in intake/exhaust system as following items,
   A. Vacuum hoses for splits, kinks and improper connections.
   B. Throttle body gasket
   C. Gasket between intake manifold and cylinder head
   D. Seals between intake manifold and fuel injectors
   E. Exhaust system between HO2S and Three way catalyst for air leakage.
   (2) Has a problem been found in any of the above areas?

   YES

   Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

   NO

   (3) Go to "PCV(Positive Crankcase Ventilation) valve check" procedure.

7. PCV(Positive Crankcase Ventilation) valve check.
   (1) Key "OFF".
   (2) Disconnect PCV valve.
   (3) Check the movement of plunger by putting in and out a thin stick.
   (4) Is the movement of plunger normal?

   YES

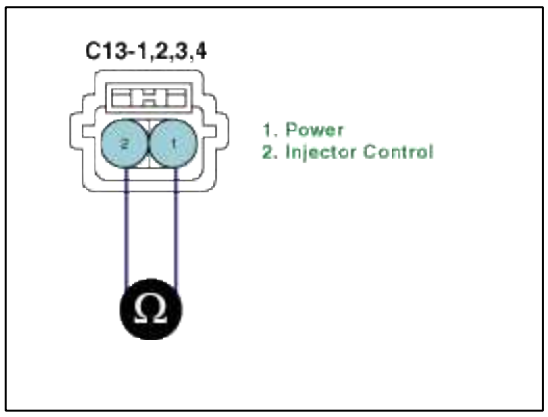
   Go to "Injector check" procedure.

   NO

   Substitute with a known - good PCV valve and check for proper operation.
   If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

8. Injector check.
   (1) Key "OFF".
   (2) Remove injectors.
   (3) Check leakage or clog on injectors.
   (4) Measure the resistance between terminal 1 and 2. (Component side)
   Specification :

Temperature (°C)	Resistance (Ω)
20	14.5 ± 0.7Ω



   (5) Is the measured resistance within specification?

   YES

   Go to "Fuel line check" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

9. Fuel line check.
   (1) Check clog, contamination and damage on fuel line.
      A. Splits, kinks and improper connections of fuel line pipe.
      B. Interference, damage and improper connections of vacuum hose on fuel line.
      C. Improper connection of connectors on fuel line.
   (2) Is the fuel line normal?

   YES

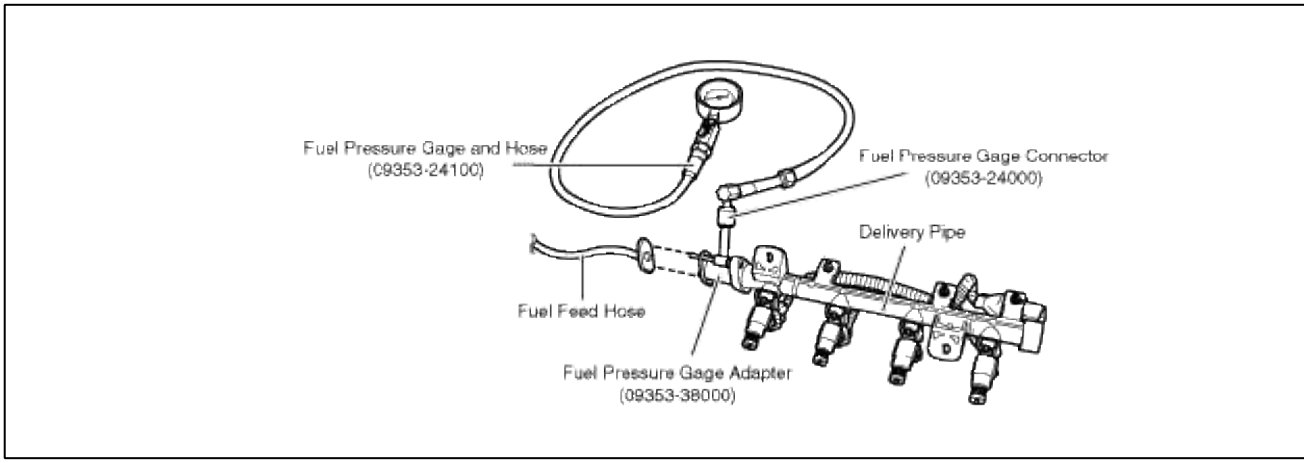
   Go to "Fuel pressure check" procedure.

   NO

   Repair as necessary and go to "Verification of Vehicle Repair" procedure.

10. Fuel pressure check.
    (1) Key "OFF".
    (2) Disconnect a fuel pump relay.
    (3) Engine start and wait until engine stop. and then key "OFF".
    (4) Install fuel pump relay.
    (5) Start the engine , and record fuel pressure.
    (6) Connect fuel pressure guage using the correct adaptor.

Specification : Approx. 3.5 kg/cm²



    (7) Is the fuel pressure normal?

YES

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

NO

Check clogging on the fuel filter.
Check the fuel supply and return line.
Repair as necessary and go to "Verification of vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

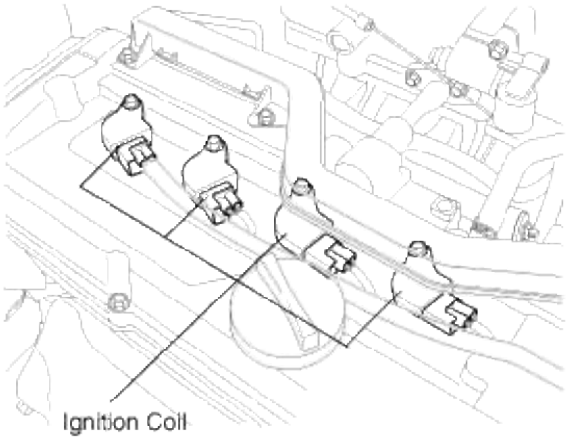
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0303 Cylinder 3-Misfire detected

COMPONENT LOCATION



GENERAL DESCRIPTION

Misfires can be caused by lack of combustion in a cylinder due to absence of spark, poor fuel metering, poor compression, or many other causes. Even a small number of misfires may result in excessive exhaust emissions due to the unburned mixture. Increased misfire rates cause damage to the catalytic converter. The ECM/PCM monitors the crankshaft speed variation to determine if any misfiring generated. The ECM/PCM identifies the specific cylinder in which the misfire has occurred and counts individual misfire events by monitoring changes in the crankshaft rotation for each cylinder. A random misfire indicates one or more cylinders are misfiring.

DTC DESCRIPTION

If a misfire exists that exceeds the threshold value, P0301 is set.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Engine roughness through crankshaft speed fluctuation	• Poor connection • Ignition system • Fuel system • Intake/exhaust air system • Ignition timing • Injector • ECM/PCM
Enable Conditions		• Engine speed 510~6480rpm • Engine load > Zero torq. • Eng. load change < Max. • Eng. speed change < Max. • Calculated wheel acceleration < 20~38 • Time after engine start > 0 • Intake air temperature > -30°C (-22°F)	
Case1	Threshold Value	• Misfire rate for FTP(Federal Test Procedure) emission thresh >5	
	Diagnostic Time	• 1000 revs	
	MIL ON Condition	• 2 driving cycle	
Case2	Threshold Value	• 4% < Misfire rate for catalyst damage < 22%	
	Diagnostic Time	• 200 revs	

	MIL ON Condition	• Immediately (Blink)	

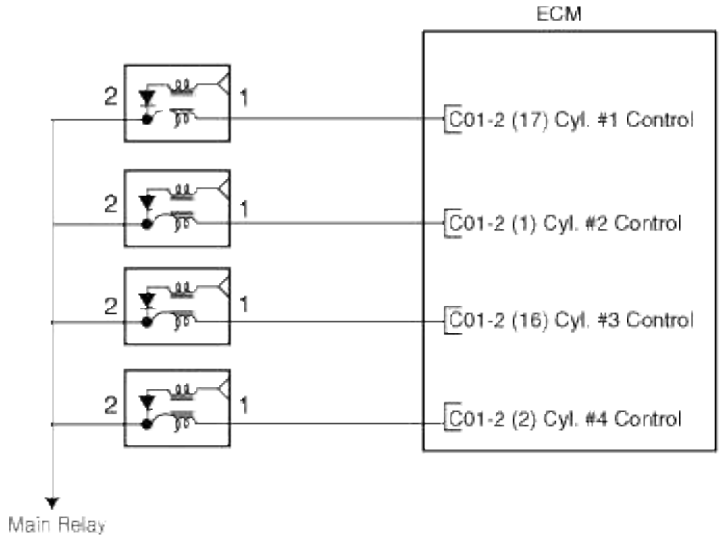
SPECIFICATION

Ignitioncoil resistance	
Primary coil	Secondary coil
0.71Ω ± 0.11Ω at 20°C (68°F)	-

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01-2 (17)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01-2 (1)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

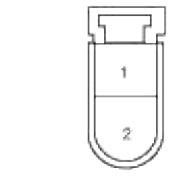
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01-2 (16)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

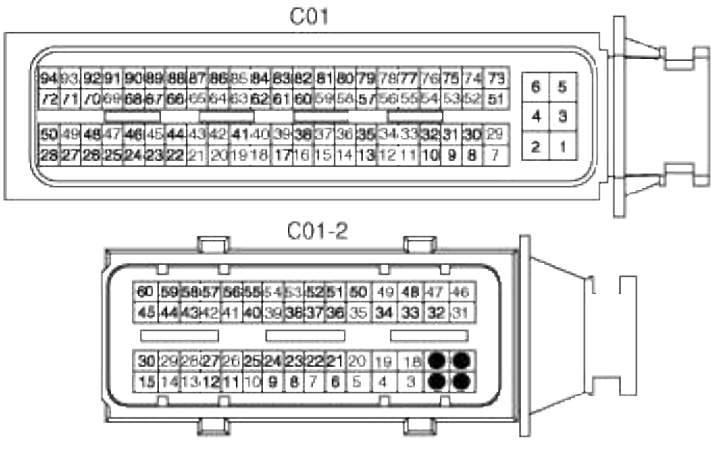
IG COIL (CYL. #4)

Terminal	Connected to	Function
1	ECM C01-2 (2)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]

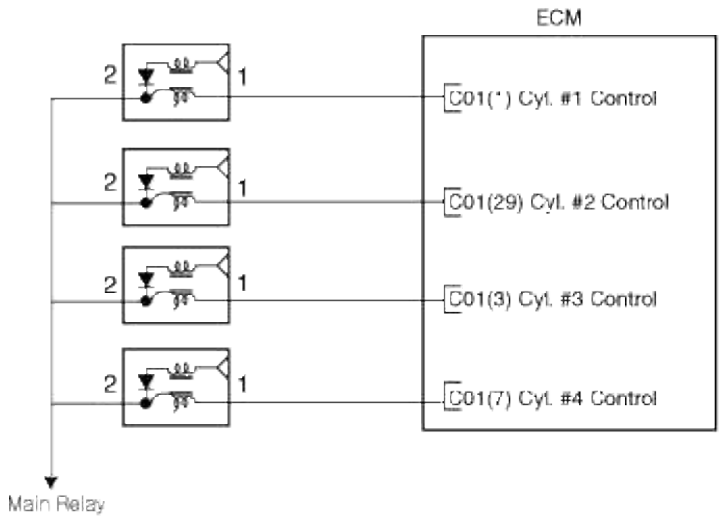


C10-1,2,3,4
IG COIL (CYL #1,2,3,4)



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01 (1)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01(29)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

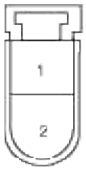
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01(3)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

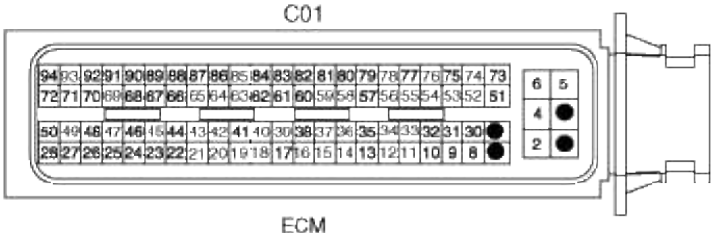
IG COIL (CYL. #4)

Terminal	Connected to	Function
1	ECM C01-2 (7)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]

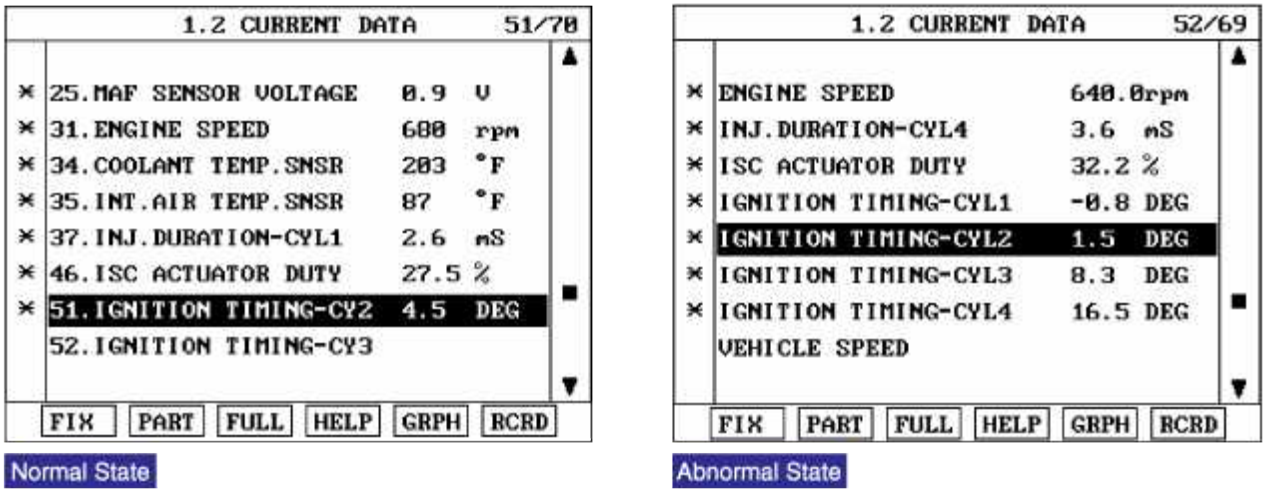


C10-1,2,3,4
IG COIL (CY_ #1,2,3,4)



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Parameters related to Ignition and Misfire" on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Spark plug check.
   (1) Remove cylinder's spark plugs.
   (2) Visually/physically inspect the following items:
      A. Damaged insulation, Worn electrodes, Oil or fuel fouled, Loose terminals and cracks
      B. Check for plug gap : 1.0 - 1.1 mm (0.039 - 0.043 in.)
      C. Check if the spark plug for the relevant cylinder is lighter in color than the other plugs.
   (3) Has a problem been found in any of the above areas?

      YES

      Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure

      NO

      Go to "Compression pressure check" procedure.
2. Compression pressure check.
   (1) Warm up the engine to normal operating temperature.
   (2) Disconnect the spark plug cables. And remove the spark plugs and fuel pump relay.
   (3) Crank the engine to remove any foreign material in the cylinders.
   (4) Put compression pressure gauge into spark pulg hole.
   (5) Check compression pressure at each cylinder.

Specification : Approx. 15kg/cm² (1.471MPa / 213.4psi)

(6) Is compression pressure for each cylinder displayed within specifications?

YES

Go to "Ignition system check" procedure.

NO

Add a small amount of oil through the spark plug hole, and repeat above steps.

If the addition of oil causes the compression to rise, the cause is a worn or damaged piston ring or cylinder inner surface.

If the compression remains the same, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

3. Ignition system check

(1) Key "OFF".

(2) Disconnect Ignition coil connector.

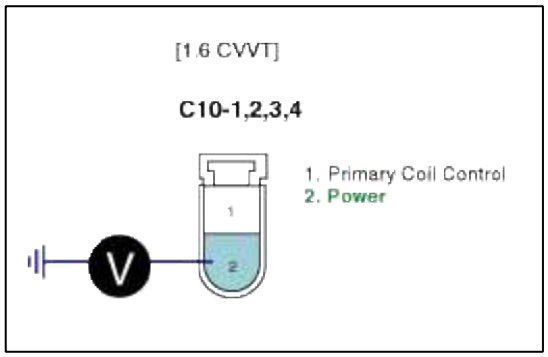
(3) Do visual inspection.

Check contamination or damege on ignition coil.

(4) Key "ON".

(5) Measure the voltage between terminal 2 of ignition coil #1, #2, #3, #4 harness connector and chassis ground.

Specification : Approx. B+



(6) Is the measured voltage within specifications?

YES

Go to "Ignition coil check" procedure.

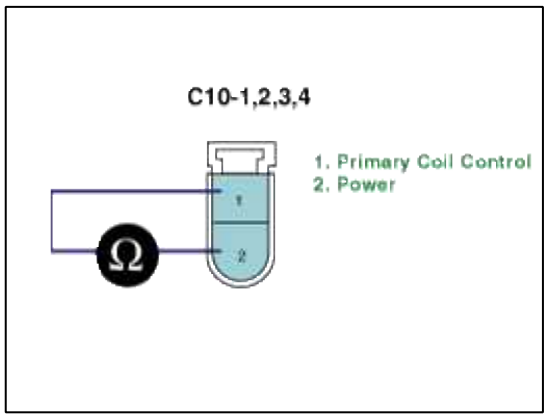
NO

Repair Open or Short to ground in power circuit, and go to "Verification of Vehicle Repair" procedure.

4. Ignition coil check
   (1) Measure the resistance between terminal 1 and 2 of ingnition coil connector #1, #2, #3, #4.
   (Component side / Primary coil)
   Specification :

1.6 CVVT

Ignition Coil Resistance (Primary)
0.71 ± 0.11 Ω at 20°C (68°F)



   (2) Is the measured resistance within specifications?

   YES

   Go to "Timing mark check" procedure.

   NO

   Substitute with a known - good ignition coil and check for proper operation.
   If the problem is corrected, replace ignition coil and go to "Verification of Vehicle Repair" procedure.

5. Timing mark check.
   (1) Key "OFF".
   (2) Check the timing mark.
   (3) Is the timing mark normal?

   YES

   Go to "Air leakage check" procedure.

   NO

   Repair and go to "Verification of Vehicle Repair" procedure.

6. Air leakage check.
   (1) Visually/physically inspect the air leakage in intake/exhaust system as following items,
   A. Vacuum hoses for splits, kinks and improper connections.
   B. Throttle body gasket
   C. Gasket between intake manifold and cylinder head
   D. Seals between intake manifold and fuel injectors
   E. Exhaust system between HO2S and Three way catalyst for air leakage.
   (2) Has a problem been found in any of the above areas?

   YES

   Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

   NO

   (3) Go to "PCV(Positive Crankcase Ventilation) valve check" procedure.

7. PCV(Positive Crankcase Ventilation) valve check.
   (1) Key "OFF".
   (2) Disconnect PCV valve.
   (3) Check the movement of plunger by putting in and out a thin stick.
   (4) Is the movement of plunger normal?

   YES

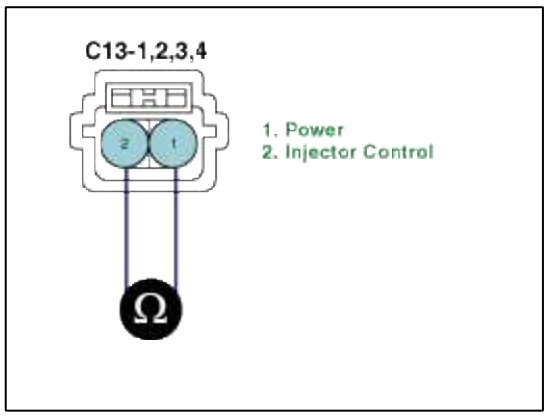
   Go to "Injector check" procedure.

   NO

   Substitute with a known - good PCV valve and check for proper operation.
   If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

8. Injector check.
   (1) Key "OFF".
   (2) Remove injectors.
   (3) Check leakage or clog on injectors.
   (4) Measure the resistance between terminal 1 and 2. (Component side)
   Specification :

Temperature (°C)	Resistance (Ω)
20	14.5 ± 0.7Ω



   (5) Is the measured resistance within specification?

   YES

   Go to "Fuel line check" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

9. Fuel line check.
   (1) Check clog, contamination and damage on fuel line.
      A. Splits, kinks and improper connections of fuel line pipe.
      B. Interference, damage and improper connections of vacuum hose on fuel line.
      C. Improper connection of connectors on fuel line.
   (2) Is the fuel line normal?

   YES

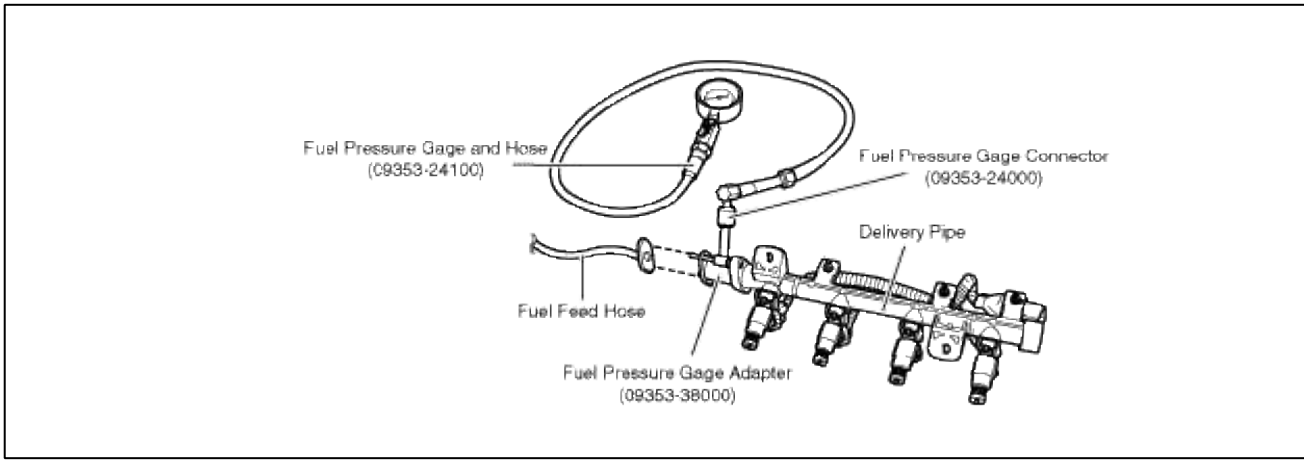
   Go to "Fuel pressure check" procedure.

   NO

   Repair as necessary and go to "Verification of Vehicle Repair" procedure.

10. Fuel pressure check.
    (1) Key "OFF".
    (2) Disconnect a fuel pump relay.
    (3) Engine start and wait until engine stop. and then key "OFF".
    (4) Install fuel pump relay.
    (5) Start the engine , and record fuel pressure.
    (6) Connect fuel pressure guage using the correct adaptor.

Specification : Approx. 3.5 kg/cm²



    (7) Is the fuel pressure normal?

YES

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

NO

Check clogging on the fuel filter.
Check the fuel supply and return line.
Repair as necessary and go to "Verification of vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

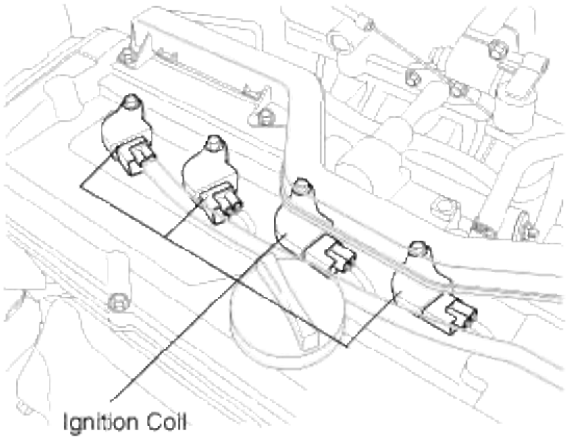
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0304 Cylinder 4-Misfire detected

COMPONENT LOCATION



GENERAL DESCRIPTION

Misfires can be caused by lack of combustion in a cylinder due to absence of spark, poor fuel metering, poor compression, or many other causes. Even a small number of misfires may result in excessive exhaust emissions due to the unburned mixture. Increased misfire rates cause damage to the catalytic converter. The ECM/PCM monitors the crankshaft speed variation to determine if any misfiring generated. The ECM/PCM identifies the specific cylinder in which the misfire has occurred and counts individual misfire events by monitoring changes in the crankshaft rotation for each cylinder. A random misfire indicates one or more cylinders are misfiring.

DTC DESCRIPTION

If a misfire exists that exceeds the threshold value, P0304 is set.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Engine roughness through crankshaft speed fluctuation	• Poor connection • Ignition system • Fuel system • Intake/exhaust air system • Ignition timing • Injector • ECM/PCM
Enable Conditions		• Engine speed 510~6480rpm • Engine load > Zero torq. • Eng. load change < Max. • Eng. speed change < Max. • Calculated wheel acceleration < 20~38 • Time after engine start > 0 • Intake air temperature > -30°C (-22°F)	
Case1	Threshold Value	• Misfire rate for FTP(Federal Test Procedure) emission thresh >5	
	Diagnostic Time	• 1000 revs	
	MIL ON Condition	• 2 driving cycle	
Case2	Threshold Value	• 4% < Misfire rate for catalyst damage < 22%	
	Diagnostic Time	• 200 revs	

	MIL ON Condition	• Immediately (Blink)	

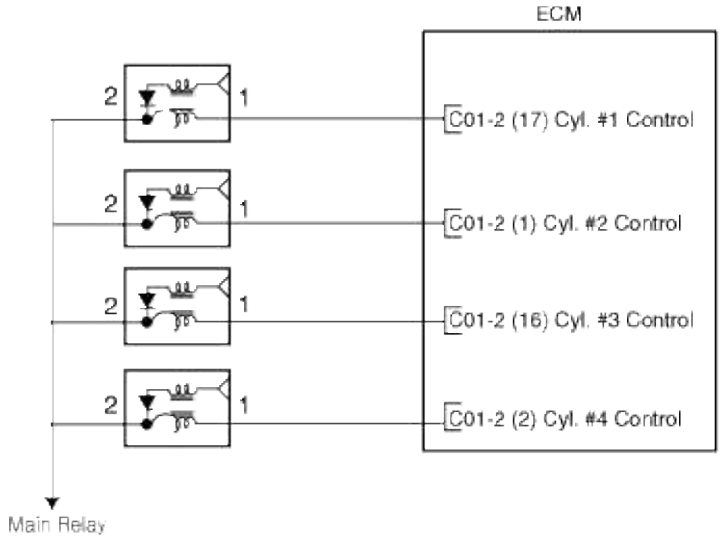
SPECIFICATION

Ignitioncoil resistance	
Primary coil	Secondary coil
0.71Ω ± 0.11Ω at 20°C (68°F)	-

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01-2 (17)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01-2 (1)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

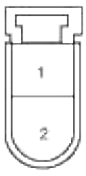
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01-2 (16)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

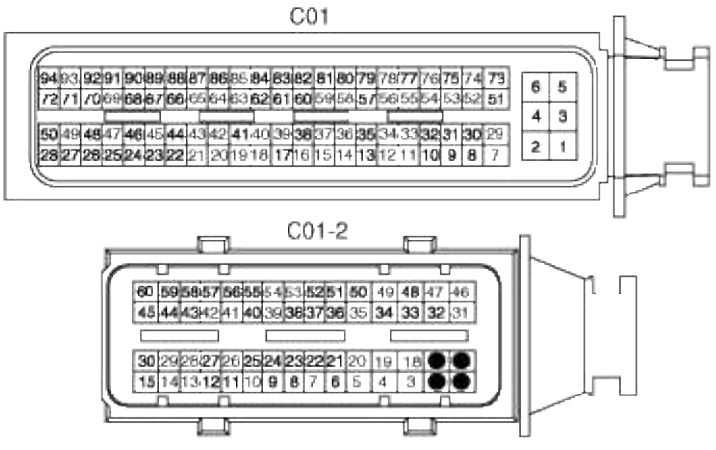
IG COIL (CYL. #4)

Terminal	Connected to	Function
1	ECM C01-2 (2)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]

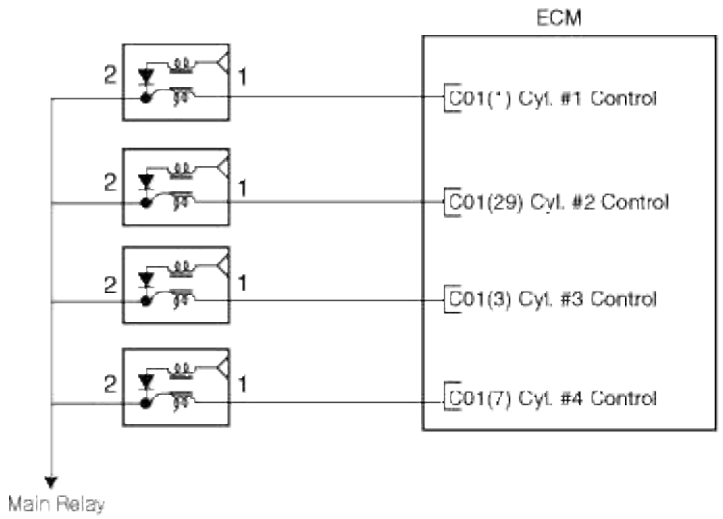


C10-1,2,3,4
IG COIL (CYL #1,2,3,4)



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

IG COIL (CYL. #1)

Terminal	Connected to	Function
1	ECM C01 (1)	IG Coil (Cyl. #1) Control
2	IG ON	Battery Voltage (B+)

IG COIL (CYL. #2)

Terminal	Connected to	Function
1	ECM C01(29)	IG Coil (Cyl. #2) Control
2	IG ON	Battery Voltage (B+)

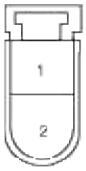
IG COIL (CYL. #3)

Terminal	Connected to	Function
1	ECM C01(3)	IG Coil (Cyl. #3) Control
2	IG ON	Battery Voltage (B+)

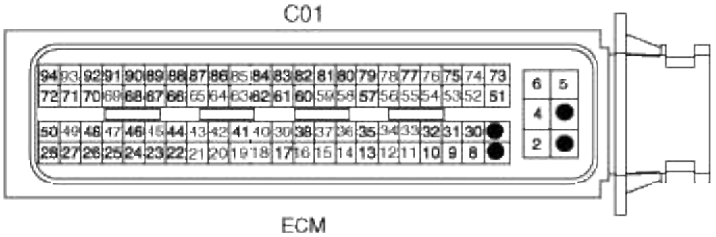
IG COIL (CYL. #4)

Terminal	Connected to	Function
1	ECM C01-2 (7)	IG Coil (Cyl. #4) Control
2	IG ON	Battery Voltage (B+)

[HARNESS CONNECTORS]

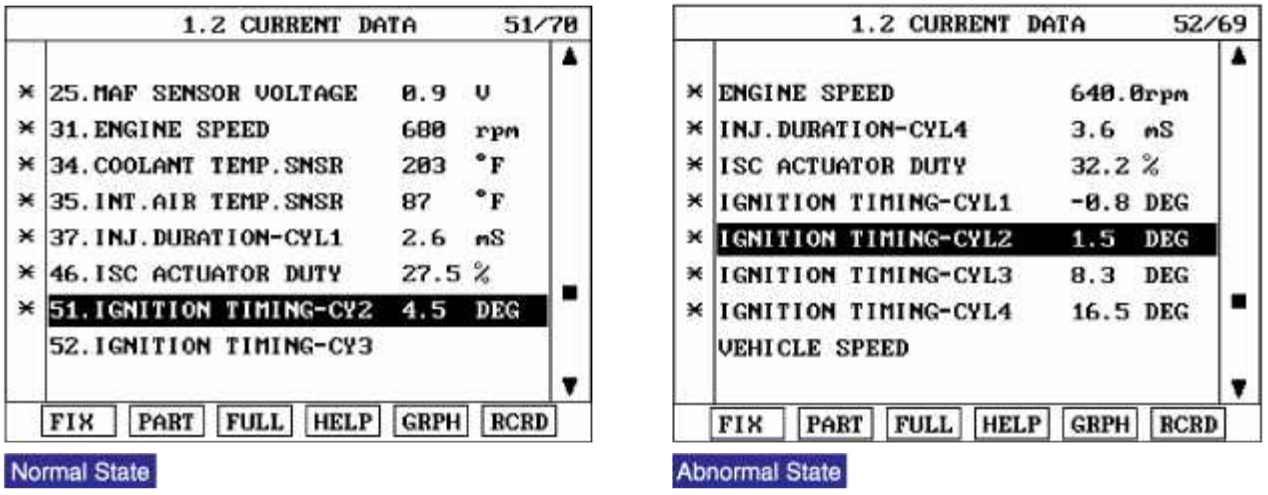


C10-1,2,3,4
IG COIL (CY_ #1,2,3,4)



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Parameters related to Ignition and Misfire" on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Spark plug check.
   (1) Remove cylinder's spark plugs.
   (2) Visually/physically inspect the following items:
      A. Damaged insulation, Worn electrodes, Oil or fuel fouled, Loose terminals and cracks
      B. Check for plug gap : 1.0 - 1.1 mm (0.039 - 0.043 in.)
      C. Check if the spark plug for the relevant cylinder is lighter in color than the other plugs.
   (3) Has a problem been found in any of the above areas?

      YES

      Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure

      NO

      Go to "Compression pressure check" procedure.
2. Compression pressure check.
   (1) Warm up the engine to normal operating temperature.
   (2) Disconnect the spark plug cables. And remove the spark plugs and fuel pump relay.
   (3) Crank the engine to remove any foreign material in the cylinders.
   (4) Put compression pressure gauge into spark pulg hole.
   (5) Check compression pressure at each cylinder.

Specification : Approx. 15kg/cm² (1.471MPa / 213.4psi)

(6) Is compression pressure for each cylinder displayed within specifications?

YES

Go to "Ignition system check" procedure.

NO

Add a small amount of oil through the spark plug hole, and repeat above steps.

If the addition of oil causes the compression to rise, the cause is a worn or damaged piston ring or cylinder inner surface.

If the compression remains the same, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

3. Ignition system check

(1) Key "OFF".

(2) Disconnect Ignition coil connector.

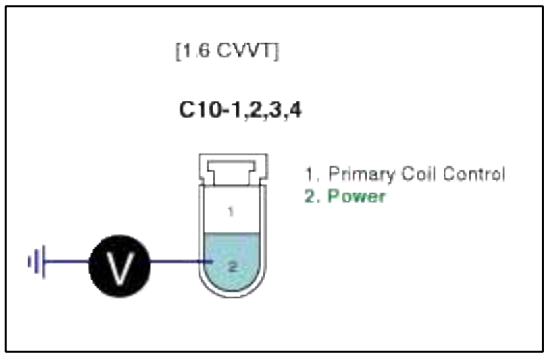
(3) Do visual inspection.

Check contamination or damege on ignition coil.

(4) Key "ON".

(5) Measure the voltage between terminal 2 of ignition coil #1, #2, #3, #4 harness connector and chassis ground.

Specification : Approx. B+



(6) Is the measured voltage within specifications?

YES

Go to "Ignition coil check" procedure.

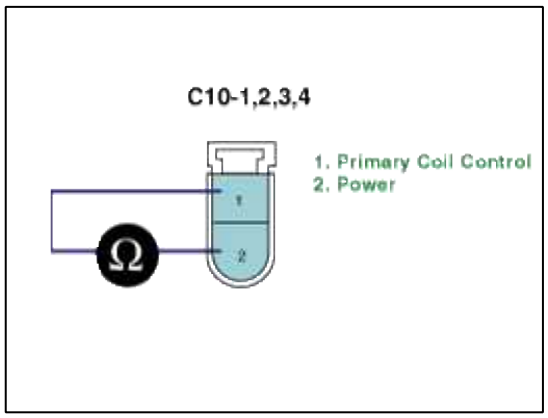
NO

Repair Open or Short to ground in power circuit, and go to "Verification of Vehicle Repair" procedure.

4. Ignition coil check
   (1) Measure the resistance between terminal 1 and 2 of ingnition coil connector #1, #2, #3, #4.
   (Component side / Primary coil)
   Specification :

1.6 CVVT

Ignition Coil Resistance (Primary)
0.71 ± 0.11 Ω at 20°C (68°F)



   (2) Is the measured resistance within specifications?

   YES

   Go to "Timing mark check" procedure.

   NO

   Substitute with a known - good ignition coil and check for proper operation.
   If the problem is corrected, replace ignition coil and go to "Verification of Vehicle Repair" procedure.

5. Timing mark check.
   (1) Key "OFF".
   (2) Check the timing mark.
   (3) Is the timing mark normal?

   YES

   Go to "Air leakage check" procedure.

   NO

   Repair and go to "Verification of Vehicle Repair" procedure.

6. Air leakage check.
   (1) Visually/physically inspect the air leakage in intake/exhaust system as following items,
   A. Vacuum hoses for splits, kinks and improper connections.
   B. Throttle body gasket
   C. Gasket between intake manifold and cylinder head
   D. Seals between intake manifold and fuel injectors
   E. Exhaust system between HO2S and Three way catalyst for air leakage.
   (2) Has a problem been found in any of the above areas?

   YES

   Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

   NO

   (3) Go to "PCV(Positive Crankcase Ventilation) valve check" procedure.

7. PCV(Positive Crankcase Ventilation) valve check.
   (1) Key "OFF".
   (2) Disconnect PCV valve.
   (3) Check the movement of plunger by putting in and out a thin stick.
   (4) Is the movement of plunger normal?

   YES

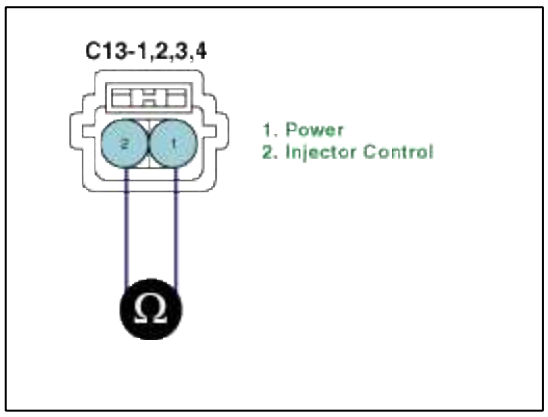
   Go to "Injector check" procedure.

   NO

   Substitute with a known - good PCV valve and check for proper operation.
   If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

8. Injector check.
   (1) Key "OFF".
   (2) Remove injectors.
   (3) Check leakage or clog on injectors.
   (4) Measure the resistance between terminal 1 and 2. (Component side)
   Specification :

Temperature (°C)	Resistance (Ω)
20	14.5 ± 0.7Ω



   (5) Is the measured resistance within specification?

   YES

   Go to "Fuel line check" procedure.

   NO

   Substitute with a known - good injector and check for proper operation.
   If the problem is corrected, replace injector and go to "Verification of Vehicle Repair" procedure.

9. Fuel line check.
   (1) Check clog, contamination and damage on fuel line.
      A. Splits, kinks and improper connections of fuel line pipe.
      B. Interference, damage and improper connections of vacuum hose on fuel line.
      C. Improper connection of connectors on fuel line.
   (2) Is the fuel line normal?

   YES

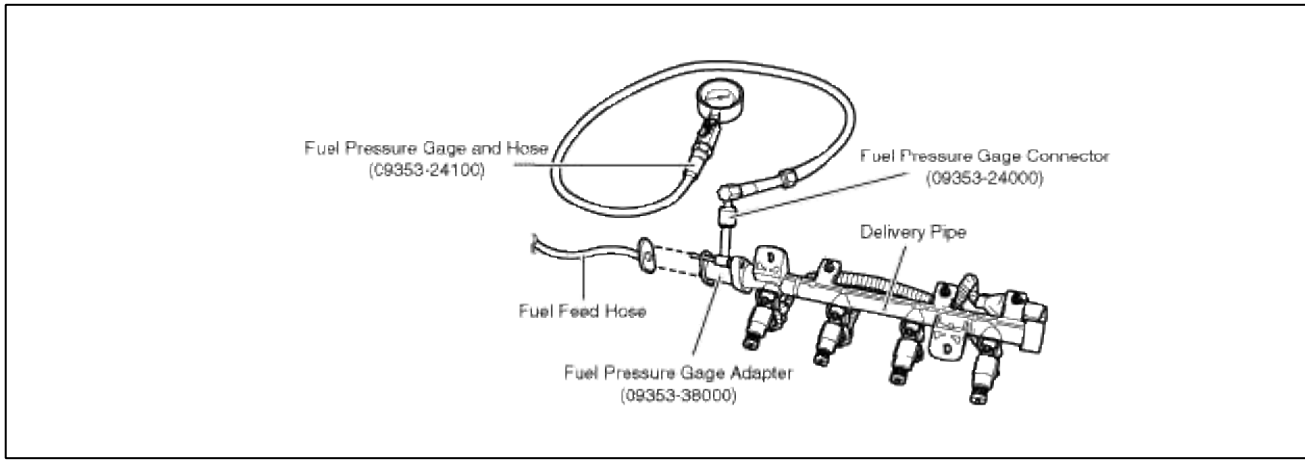
   Go to "Fuel pressure check" procedure.

   NO

   Repair as necessary and go to "Verification of Vehicle Repair" procedure.

10. Fuel pressure check.
    (1) Key "OFF".
    (2) Disconnect a fuel pump relay.
    (3) Engine start and wait until engine stop. and then key "OFF".
    (4) Install fuel pump relay.
    (5) Start the engine , and record fuel pressure.
    (6) Connect fuel pressure guage using the correct adaptor.

Specification : Approx. 3.5 kg/cm²



    (7) Is the fuel pressure normal?

YES

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

NO

Check clogging on the fuel filter.
Check the fuel supply and return line.
Repair as necessary and go to "Verification of vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

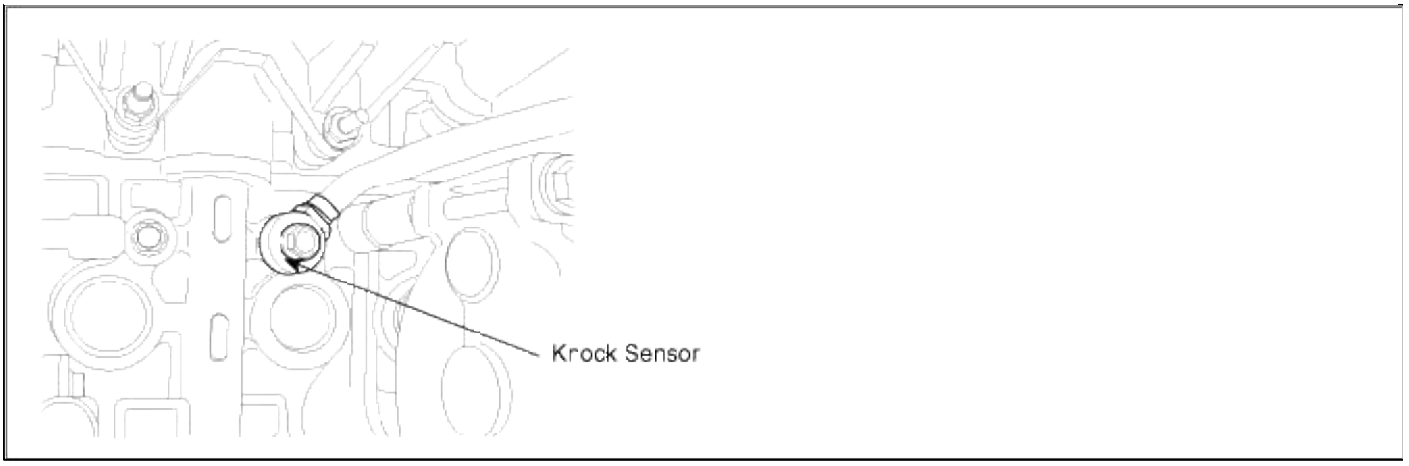
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0326 Knock Sensor 1 Circuit Range/Performance (Bank 1 or Single Sensor)

COMPONENT LOCATION



GENERAL DESCRIPTION

Knocking is a phenomenon characterized by undesirable vibration and noise that can cause engine damage. A knock sensor (KS) is mounted on the cylinder block and senses engine knocking. A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. A knock sensor (KS) detects vibration when RPM rises or drops and generates voltages based on this vibration. The ECM/PCM controls the ignition timing based on the amplitude and frequency of the knock sensor signal. For example, if engine knocking occurs, the ignition timing is retarded to prevent it.

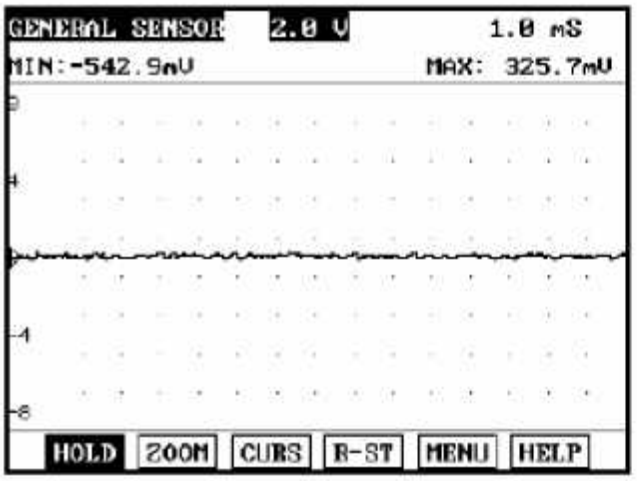
DTC DESCRIPTION

If the number of knock sensor errors is over 25 times, ECM/PCM sets P0326.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Poor connection • Open or short in signal circuit • Knock sensor • ECM/PCM
Enable Conditions		
Threshold Value	• Number of knock sensor errors > 25	
Diagnostic Time	• Continuous	
MIL ON Condition	• DTC only	

SIGNAL WAVEFORM & DATA



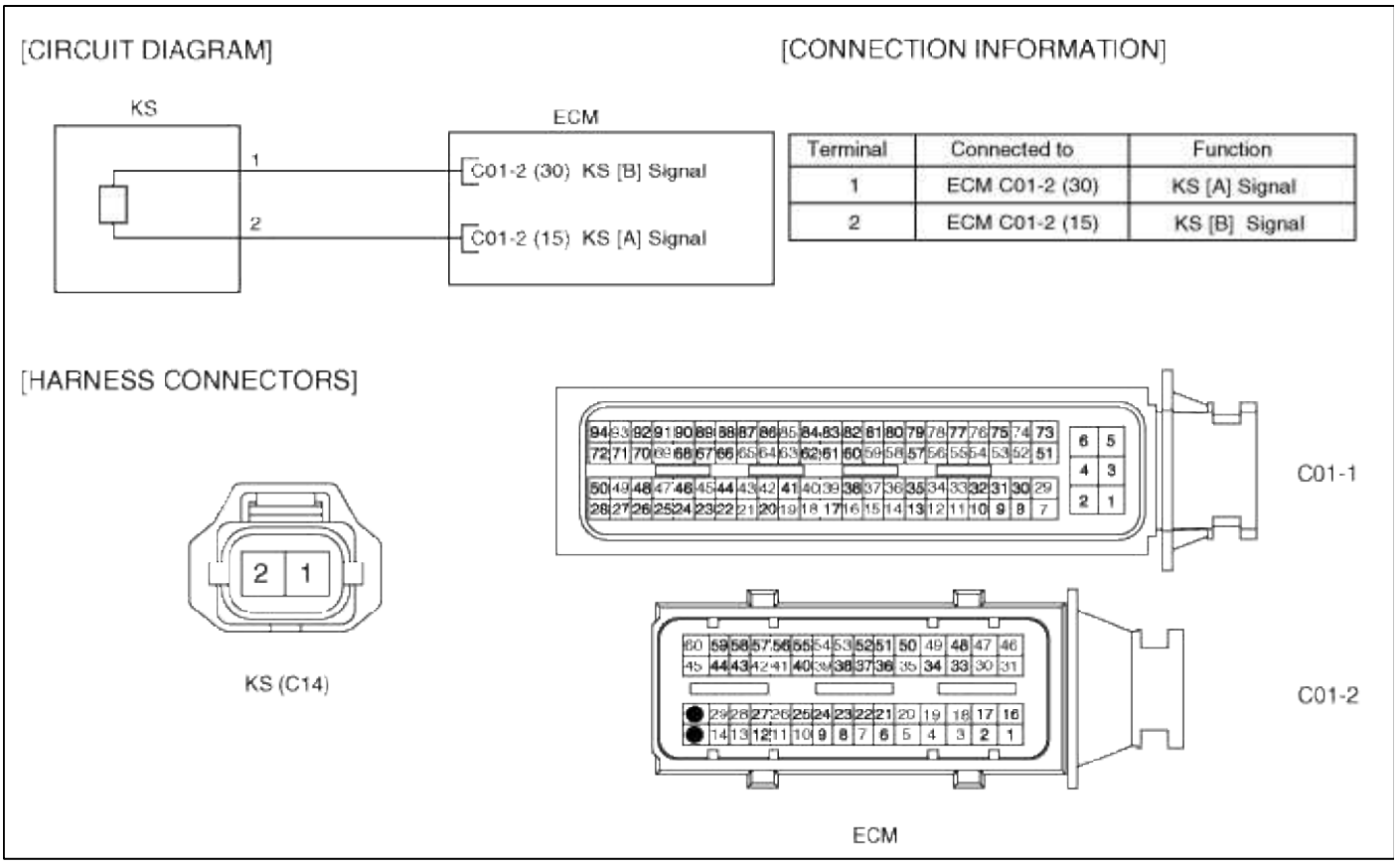
This is a normal signal waveform of knock sensor. Generally, there would be much more noise on knock sensor signal than the other sensors.

SPECIFICATION

Item	Specification
Capacitance	950 ~ 1,350pF

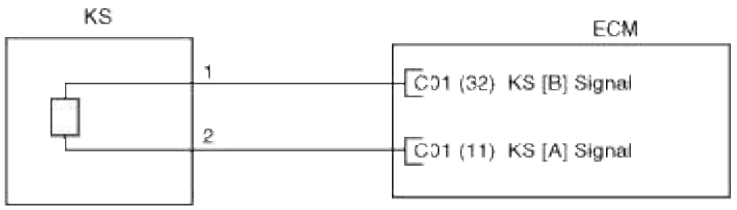
SCHEMATIC DIAGRAM

(A/T)



(M/T)

[CIRCUIT DIAGRAM]



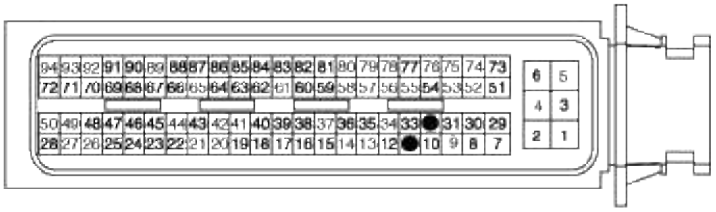
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (32)	KS [A] Signal
2	ECM C01 (11)	KS [B] Signal

[HARNESS CONNECTORS]



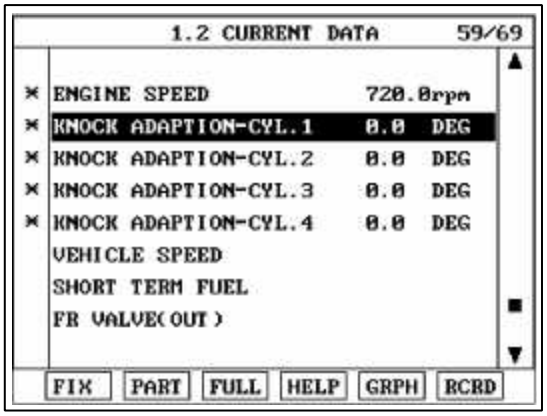
KS (C14)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Knock sensor" parameters on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection"procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Knock sensor circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check voltage.

(1) Key "OFF".

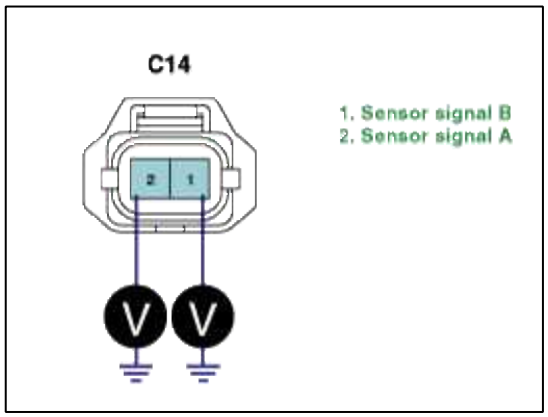
(2) Disconnect Knock sensor connector.

(3) Key "ON".

(4) Measure the voltage between terminal 1 of knock sensor harness connector and chassis ground.

(5) Measure the voltage between terminal 2 of knock sensor harness connector and chassis ground.

Specification : Approx 2.4V



(6) Is the measured voltage within specification?

YES

Go to "Check Short in signal circuit" procedure.

NO

Repair Oepn or Short in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

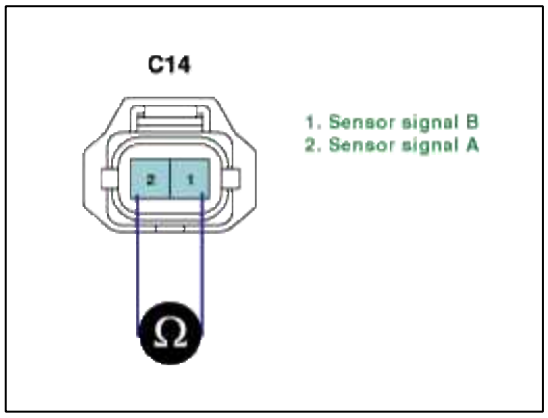
2. Check Short in signal circuit.

(1) Key "OFF".

(2) Disconnect Knock sensor connector and ECM/PCM connector.

(3) Measure the resistance between terminal 1 and 2 of knock sensor harness connector.

Specification : Infinite



(4) Is the measured resistance within specifications?

YES

Go to "Component inspection" procedure.

NO

Repair Short in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Knock sensor.
   (1) Substitute with a known - good Knock sensor and check for proper operation.
   (2) Is the signal normal?

YES

Replace Knock sensor and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

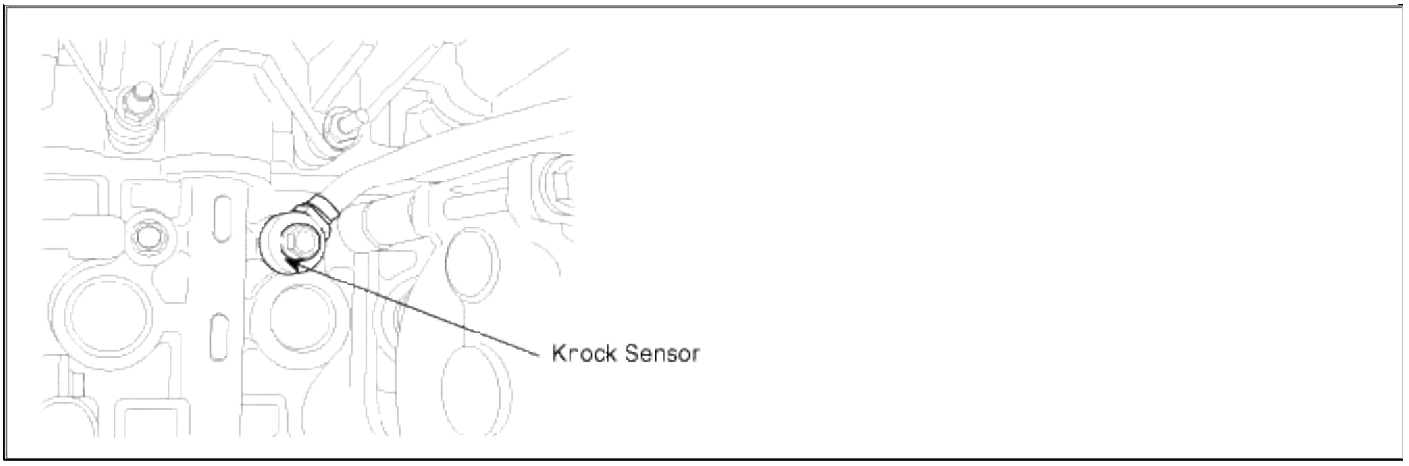
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0327 Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)

COMPONENT LOCATION



GENERAL DESCRIPTION

Knocking is a phenomenon characterized by undesirable vibration and noise that can cause engine damage. A knock sensor (KS) is mounted on the cylinder block and senses engine knocking. A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. A knock sensor (KS) detects vibration when RPM rises or drops and generates voltages based on this vibration. The ECM/PCM controls the ignition timing based on the amplitude and frequency of the knock sensor signal. For example, if engine knocking occurs, the ignition timing is retarded to prevent it.

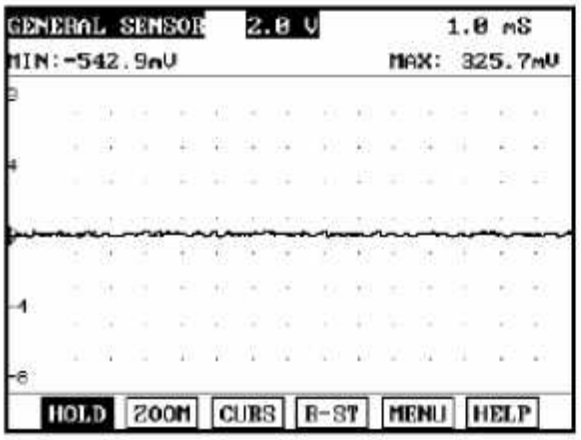
DTC DESCRIPTION

If the normalized reference signal is less than the lower limit based on RPM, P0327 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check	• Poor connection • Open or short to ground in signal circuit • Knock sensor • ECM/PCM
Enable Conditions	• Engine speed > 2600rpm	
Threshold Value	• Normalized reference level < lower limit, f(rpm)	
Diagnostic Time	• Continuous	
MIL ON Condition	• DTC only	

SIGNAL WAVEFORM & DATA



This is a normal signal waveform of knock sensor. Generally, there would be much more noise on knock sensor signal than the other sensors.

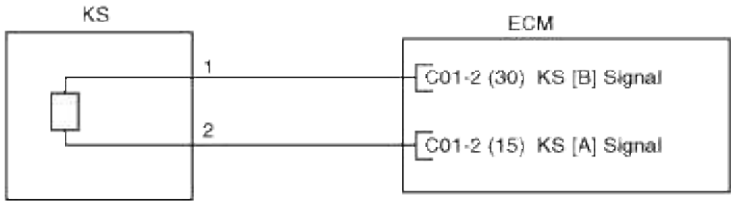
SPECIFICATION

Item	Specification
Capacitance	950 ~ 1,350pF

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



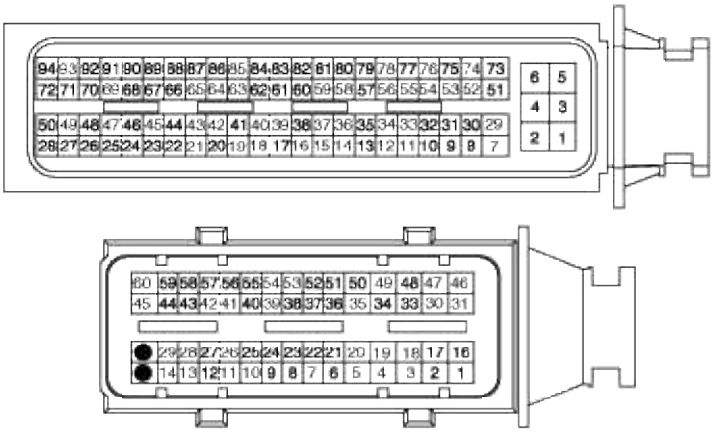
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (30)	KS [A] Signal
2	ECM C01-2 (15)	KS [B] Signal

[HARNESS CONNECTORS]



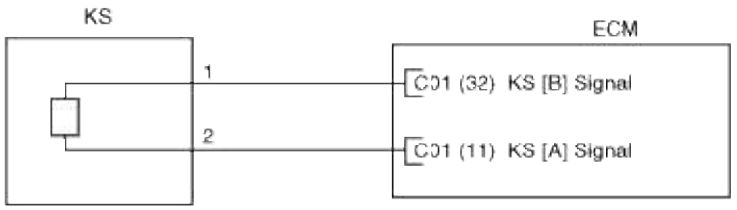
KS (C14)



ECM

(M/T)

[CIRCUIT DIAGRAM]



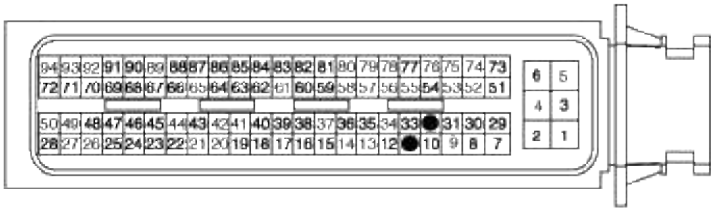
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (32)	KS [A] Signal
2	ECM C01 (11)	KS [B] Signal

[HARNESS CONNECTORS]



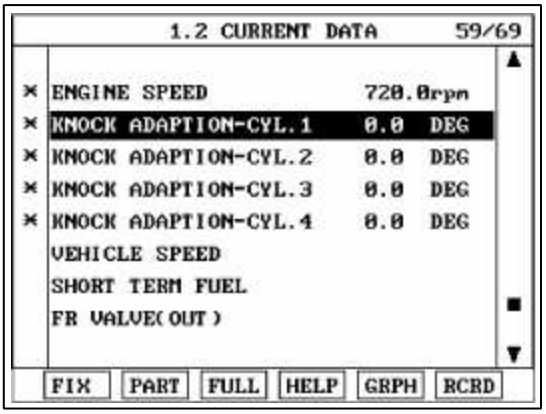
KS (C14)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Knock sensor" parameters on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Knock sensor circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check voltage.

(1) Key "OFF".

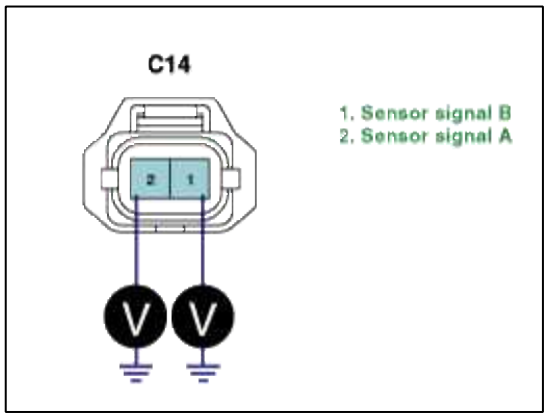
(2) Disconnect Knock sensor connector.

(3) Key "ON".

(4) Measure the voltage between terminal 1 of knock sensor harness connector and chassis ground.

(5) Measure the voltage between terminal 2 of knock sensor harness connector and chassis ground.

Specification : Approx 2.4V



(6) Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Go to "Check resistance" procedure.

2. Check resistance.

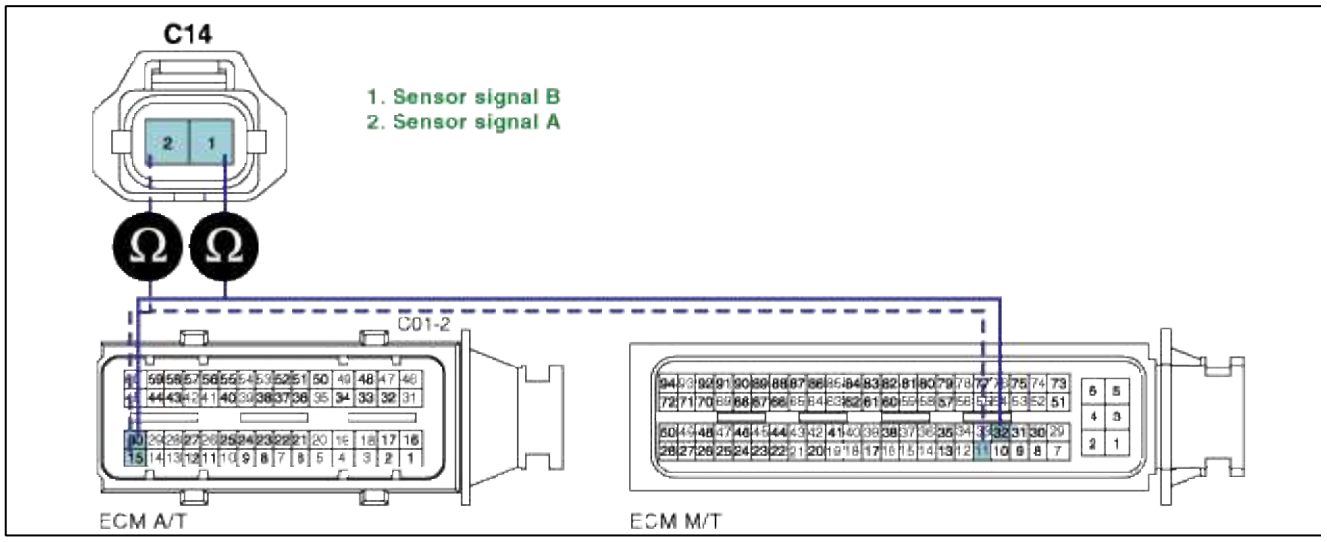
(1) Key "OFF".

(2) Disconnect Knock sensor connector and ECM/PCM connector.

(3) Measure the resistance between terminal 1 of knock sensor harness connector and 30/C01-2 (32/C01) of PCM(ECM) harness connector.

(4) Measure the resistance between terminal 2 of knock sensor harness connector and 15/C01-2 (11/C01) of PCM(ECM) harness connector.

Specification : Below approx. 1Ω



(5) Is the measured resistance within specifications?

YES

Repair Short to ground in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

NO

Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Knock sensor.
   (1) Substitute with a known - good Knock sensor and check for proper operation.
   (2) Is the signal normal?

YES

Replace Knock sensor and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

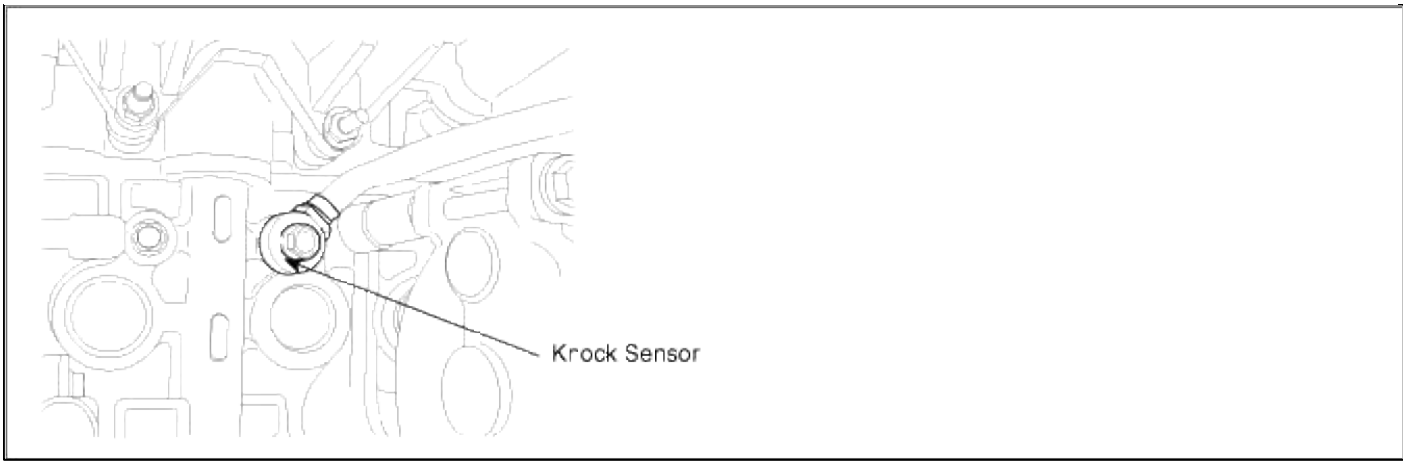
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0328 Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)

COMPONENT LOCATION



GENERAL DESCRIPTION

Knocking is a phenomenon characterized by undesirable vibration and noise that can cause engine damage. A knock sensor (KS) is mounted on the cylinder block and senses engine knocking. A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. A knock sensor (KS) detects vibration when RPM rises or drops and generates voltages based on this vibration. The ECM/PCM controls the ignition timing based on the amplitude and frequency of the knock sensor signal. For example, if engine knocking occurs, the ignition timing is retarded to prevent it.

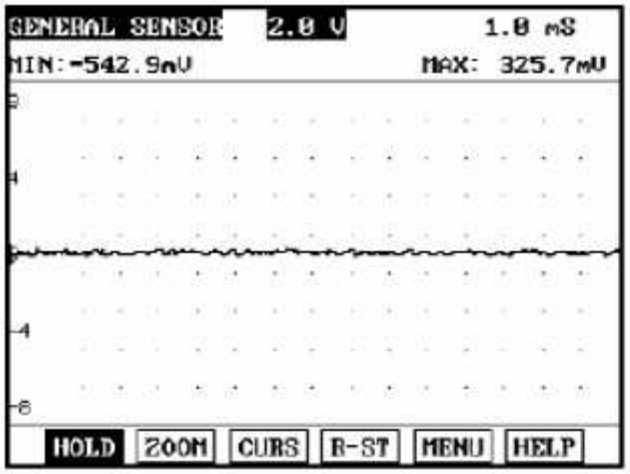
DTC DESCRIPTION

If the normalized reference signal exceeds the upper limit based on engine RPM, P0328 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check	• Poor connection • Short to power in signal circuit • Knock sensor • ECM/PCM
Enable Conditions	• Coolant temperature > 40 °C(104°F)	
Threshold Value	• Normalized reference level > upper limit, f(rpm)	
Diagnostic Time	• Continuous	
MIL ON Condition	• DTC only	

SIGNAL WAVEFORM & DATA



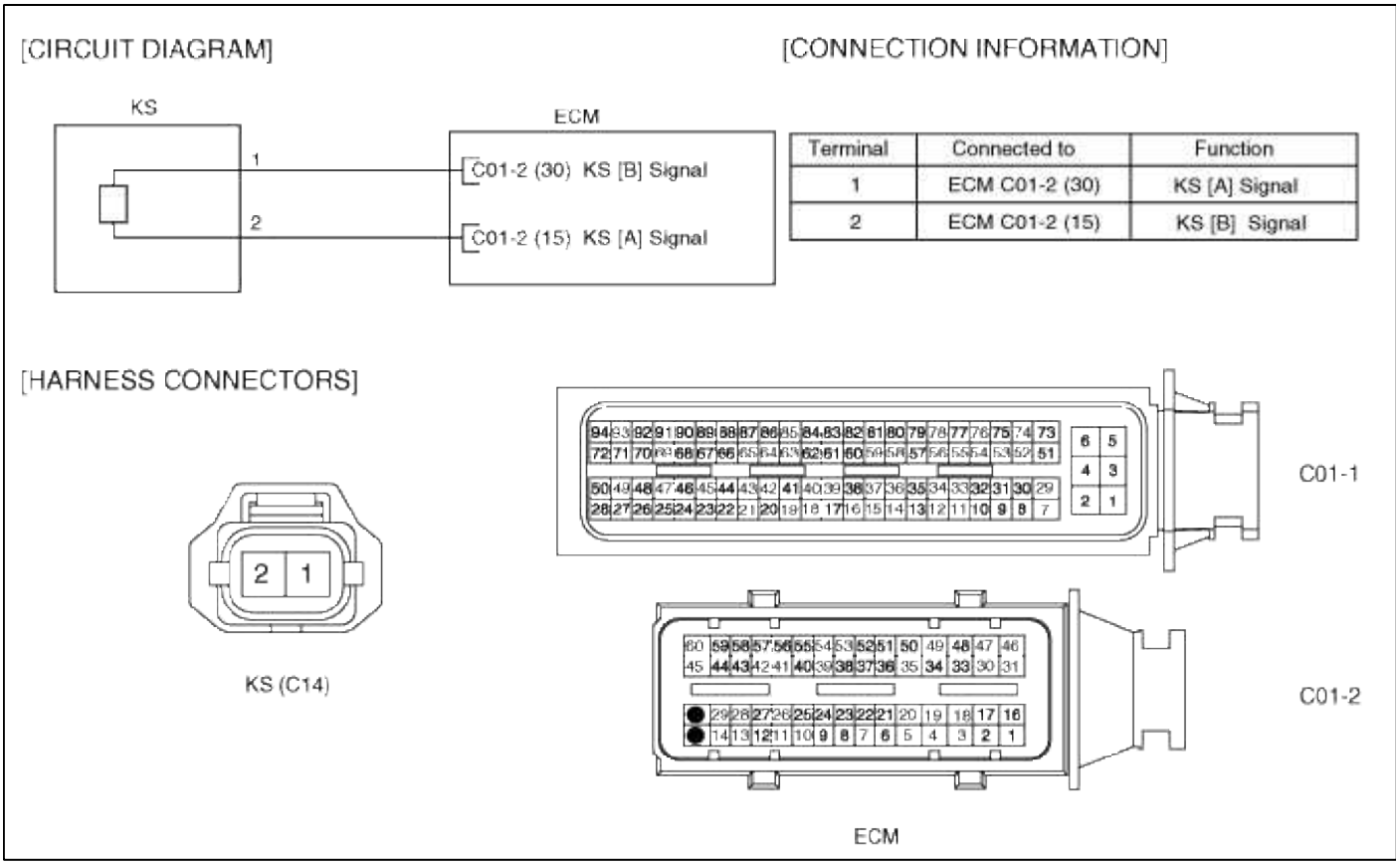
This is a normal signal waveform of knock sensor. Generally, there would be much more noise on knock sensor signal than the other sensors.

SPECIFICATION

Item	Specification
Capacitance	950 ~ 1,350pF

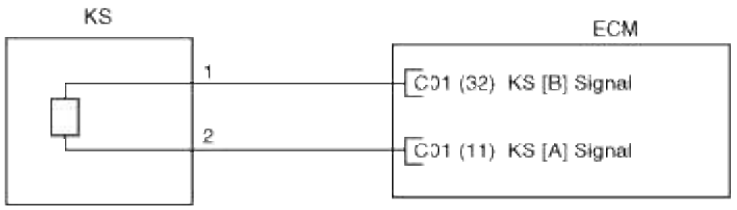
SCHEMATIC DIAGRAM

(A/T)



(M/T)

[CIRCUIT DIAGRAM]



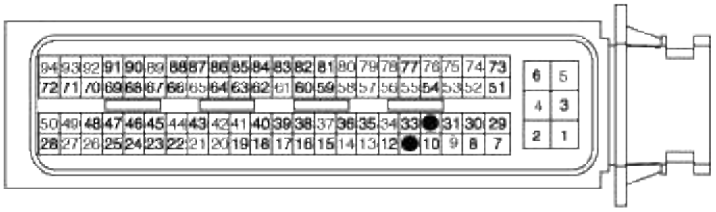
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (32)	KS [A] Signal
2	ECM C01 (11)	KS [B] Signal

[HARNESS CONNECTORS]



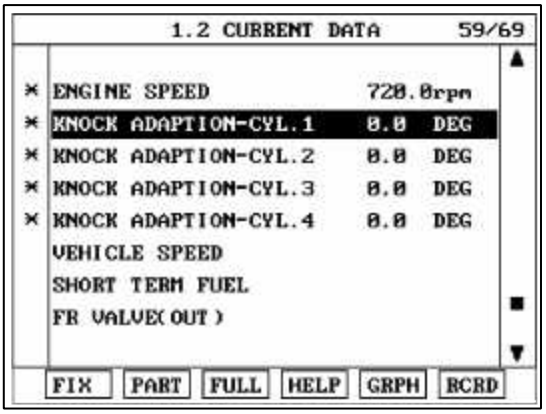
KS (C14)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Knock sensor" parameters on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

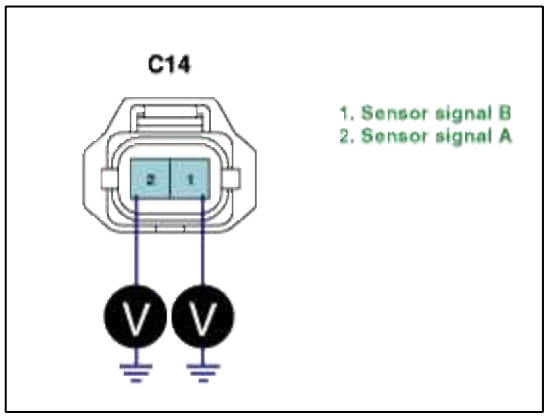
NO

Go to "Knock sensor circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check voltage.
   (1) Key "OFF".
   (2) Disconnect Knock sensor connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 1 of knock sensor harness connector and chassis ground.
   (5) Measure the voltage between terminal 2 of knock sensor harness connector and chassis ground.

Specification : Approx 2.4V



   (6) Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to power in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Knock sensor.
   (1) Substitute with a known - good Knock sensor and check for proper operation.
   (2) Is the signal normal?

YES

Replace Knock sensor and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

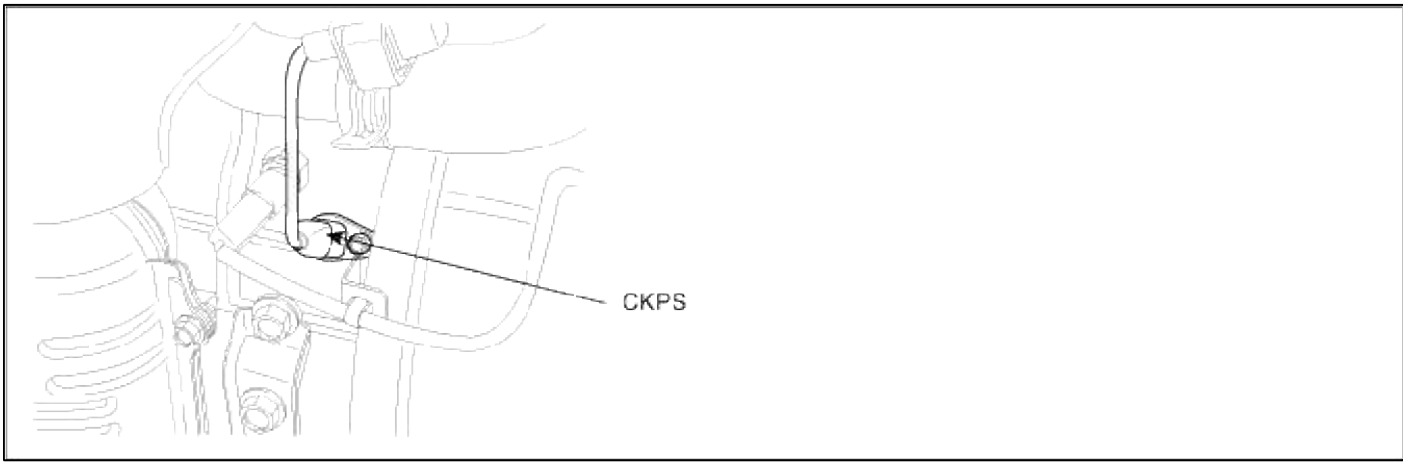
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0335 Crankshaft Position Sensor \'A\' Circuit

COMPONENT LOCATION



GENERAL DESCRIPTION

A Crankshaft Position Sensor (CKPS) is a magnetic type sensor that generates voltage using a sensor and a target wheel mounted on the crankshaft; there are 58 slots in the target wheel where one is longer than the others. When the slot in the wheel aligns with the sensor, the sensor voltage output is low. When the metal (tooth) in the wheel aligns with the sensor, the sensor voltage output is high. During one crankshaft rotation there are 58 rectangular signals and one longer signal. The ECM/PCM calculates engine RPM by using the sensor' s signal and controls the injection duration and the ignition timing. Using the signal differences caused by the longer slot, the ECM/PCM identifies which cylinder is at top dead center.

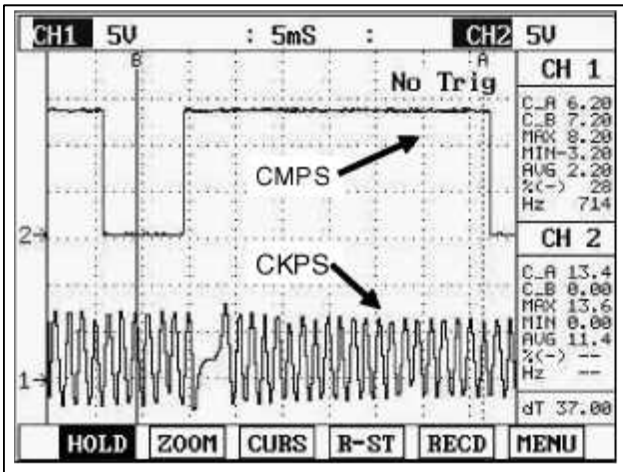
DTC DESCRIPTION

If CKPS cannot find reference mark after 6 or more engine revolutions, P0335 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Reference mark check	• Poor connection • Open or short in signal circuit • CKPS • ECM/PCM
Enable Conditions		
Threshold Value	• No reference mark > 6 times	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

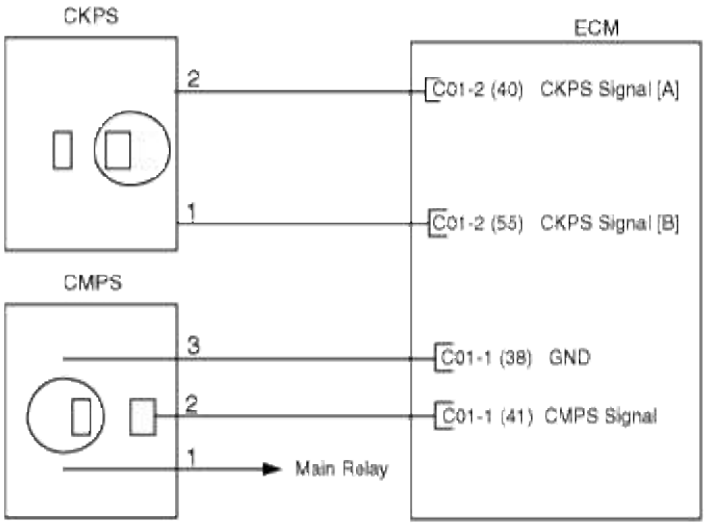


This example shows a typical Crankshaft Position Sensor(CKPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ignition timing by using these signals. Generally CKPS signal is used to detect the piston's position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

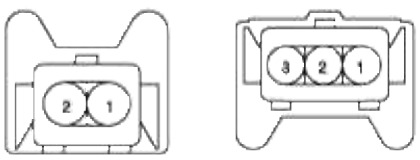


[CONNECTION INFORMATION]

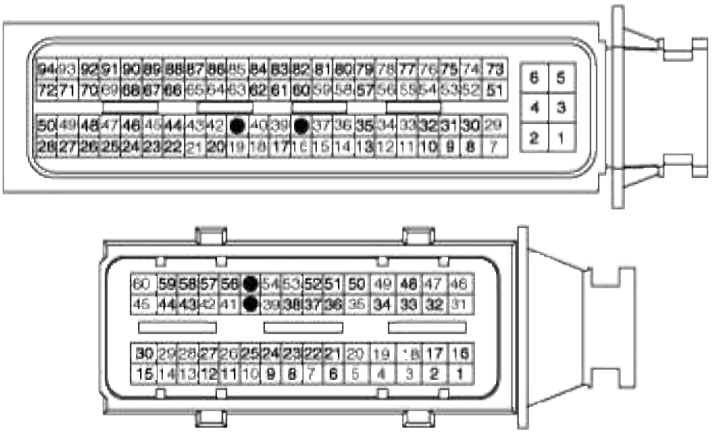
Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

[HARNESS CONNECTOR]

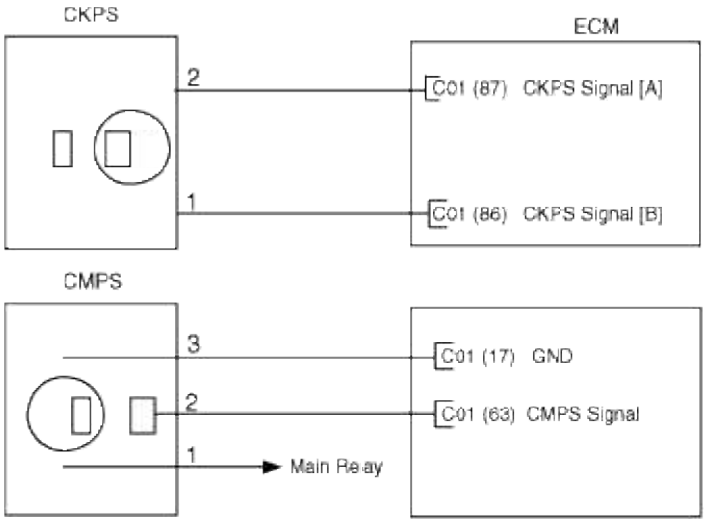


CKPS (C06) CMPS (C05)



(M/T)

[CIRCUIT DIAGRAM]

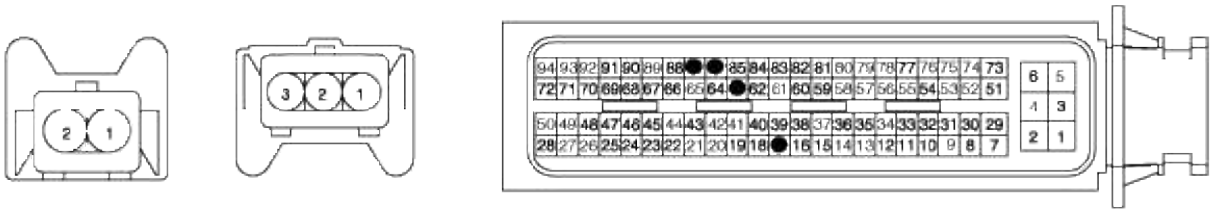


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

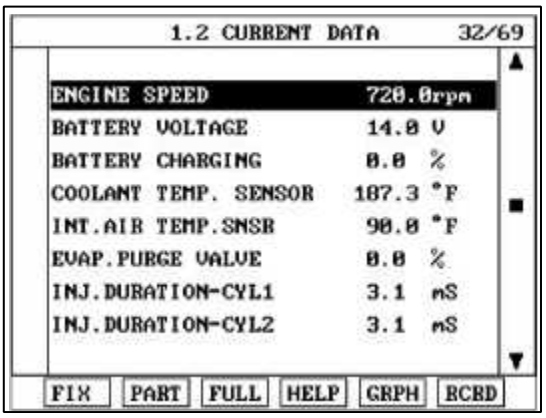
[HARNESS CONNECTOR]



CKPS (C06) CMPS (C05) ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Engine start.
3. Monitor the "CKP" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

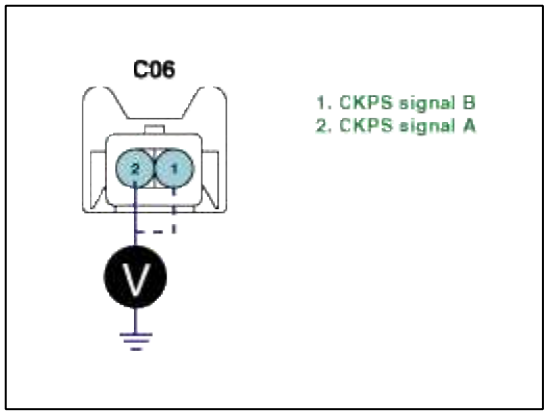
NO

Go to "CKPS circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check Oepn in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 1 of CKPS harness connector and chassis ground. Then, measure the voltage between terminal 2 of CKPS harness connector and chassis ground.

Specification : Approx 2.5V



   (5) Is the measured voltage within specification?

YES

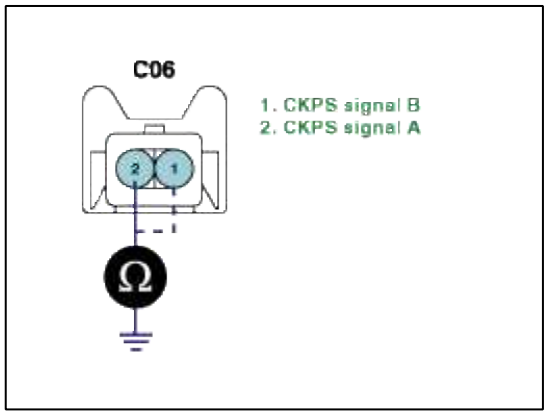
Go to "Check Short in signal circuit" procedure.

NO

Go to "Check Short to ground in signal circuit" procedure.

2. Check Short to ground in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 1 of CKPS harness connector and chassis ground. Then, measure the resistance between terminal 2 of CKPS harness connector and chassis ground.

   Specification : Infinite



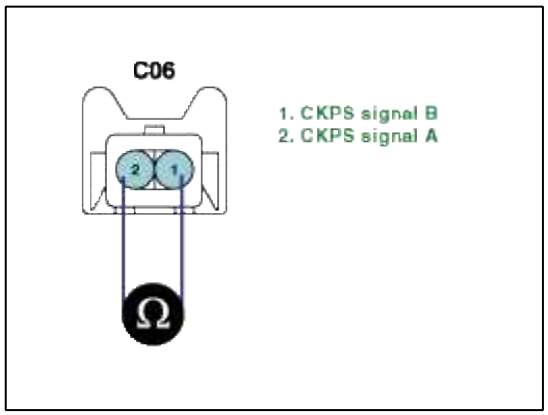
   (4) Is the measured resistance within specifications?

   YES
   Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

   NO
   Repair Short to ground in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

3. Check Short in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector and ECM/PCM connector.
   (3) Measure the resistance between terminals 1 and 2 of CKPS harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specifications?

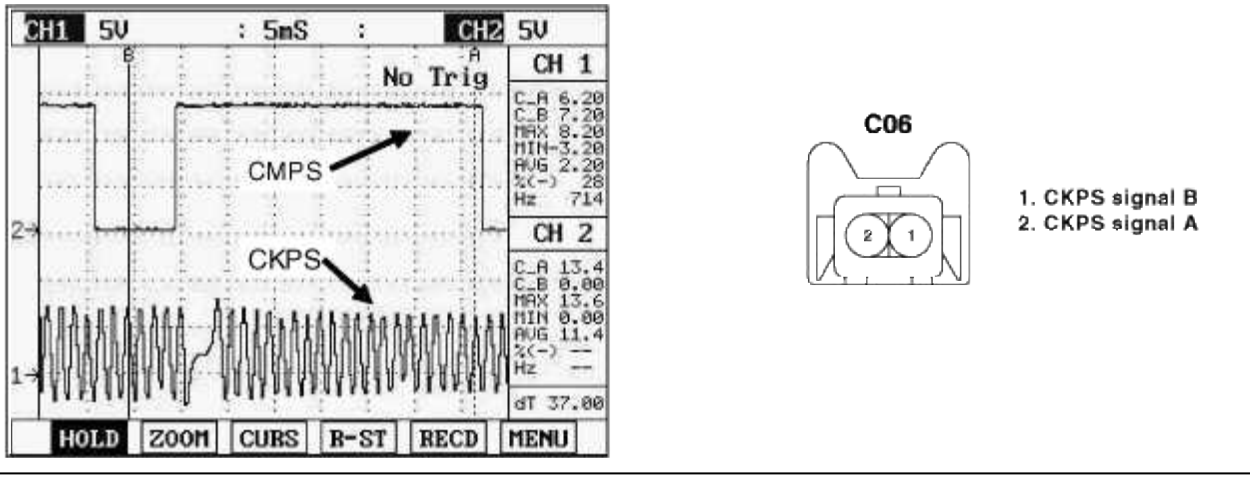
   YES
   Go to "Component inspection" procedure.

   NO
   Repair Short in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check CKPS.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 1 of CKPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :



   (4) Is the measured signal waveform O.K?

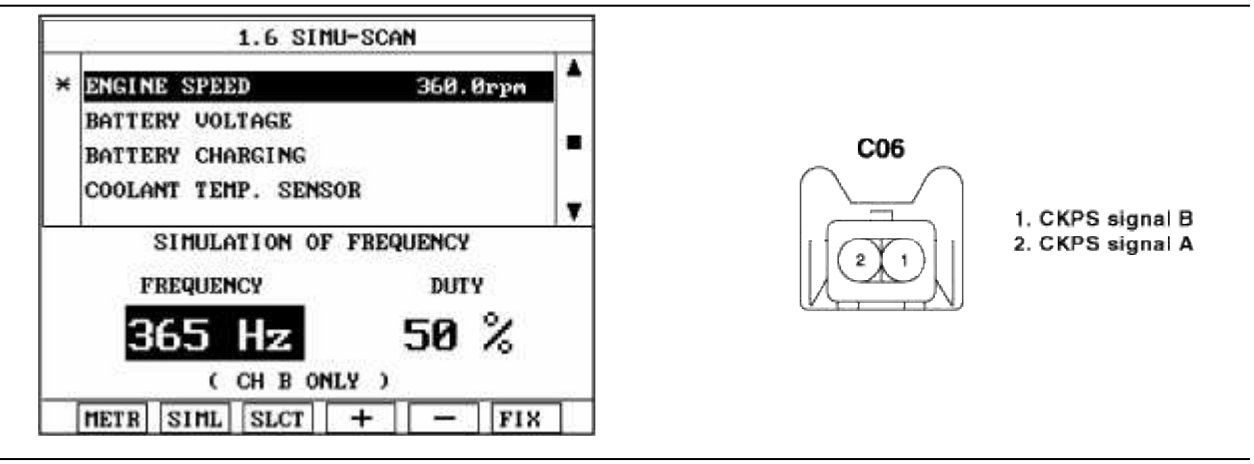
   YES

   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good CKPS and check for proper operation.
   If the problem is corrected, replace CKPS and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF".
   (2) Connect scantool and Engine "ON".
   (3) Select simulation function on scantool.
   (4) Simulate frequency(Hz) at terminal 1 of CKPS signal connector.



(5) Does the signal value of CKPS change according to simulation frequency?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

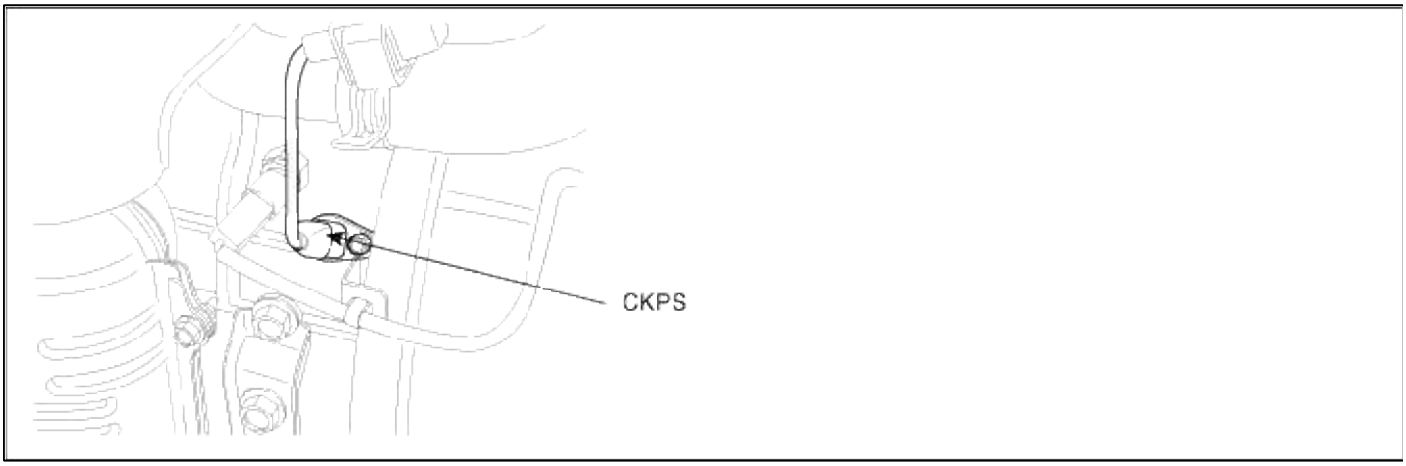
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0336 Crankshaft Position Sensor \'A\' Circuit Range/Performance

COMPONENT LOCATION



GENERAL DESCRIPTION

A Crankshaft Position Sensor (CKPS) is a magnetic type sensor that generates voltage using a sensor and a target wheel mounted on the crankshaft; there are 58 slots in the target wheel where one is longer than the others. When the slot in the wheel aligns with the sensor, the sensor voltage outputs low. When the metal (tooth) in the wheel aligns with the sensor, the sensor voltage outputs high. During one crankshaft rotation there are 58 rectangular signals and one longer signal. The ECM/PCM calculates engine RPM by using the sensor’ s signal and controls the injection duration and the ignition timing. Using the signal differences caused by the longer slot, the ECM/PCM identifies which cylinder is at top dead center.

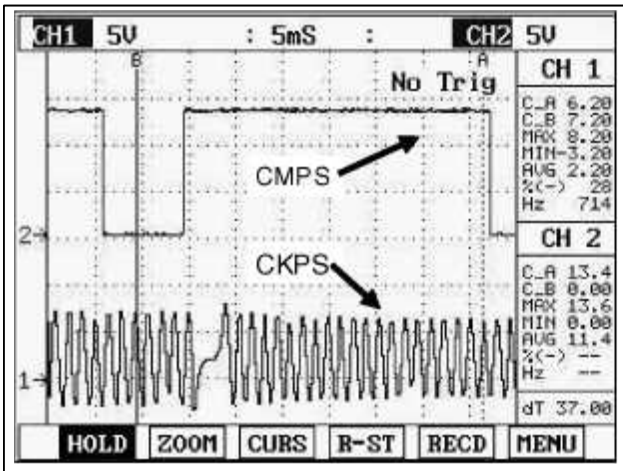
DTC DESCRIPTION

If frequency counter of the lost reference gap is over 2000, ECM/PCM sets DTC P0336.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Reference mark check	• Poor connection • Open or short in signal circuit • CKPS • ECM/PCM
Enable Conditions	• No back turn of engine detected	
Threshold Value	• Frequency counter of the lost reference gap > 2000	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

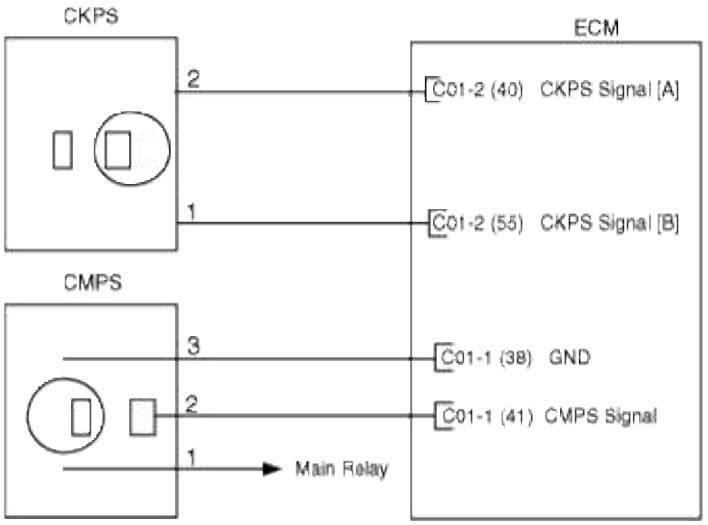


This example shows a typical Crankshaft Position Sensor(CKPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ign tion timing by using these signals. Generally CKPS signal is used to detec: the piston's position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

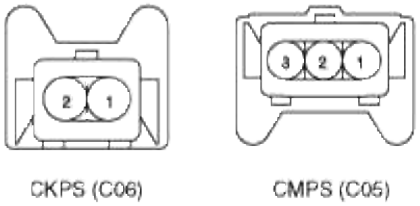


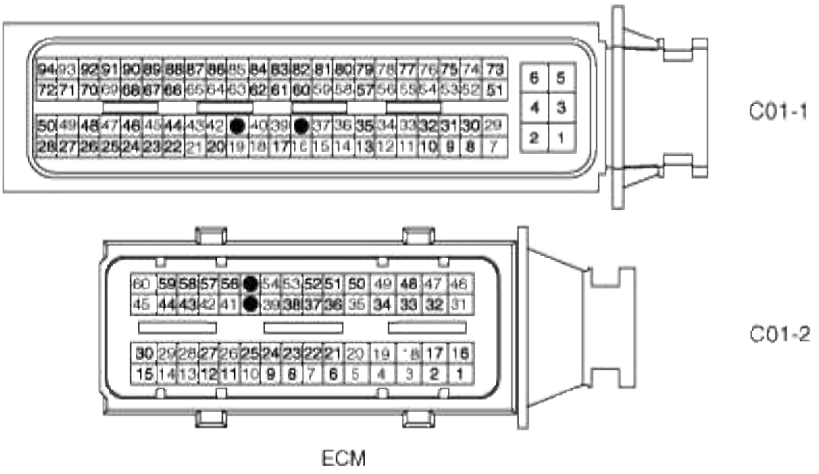
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

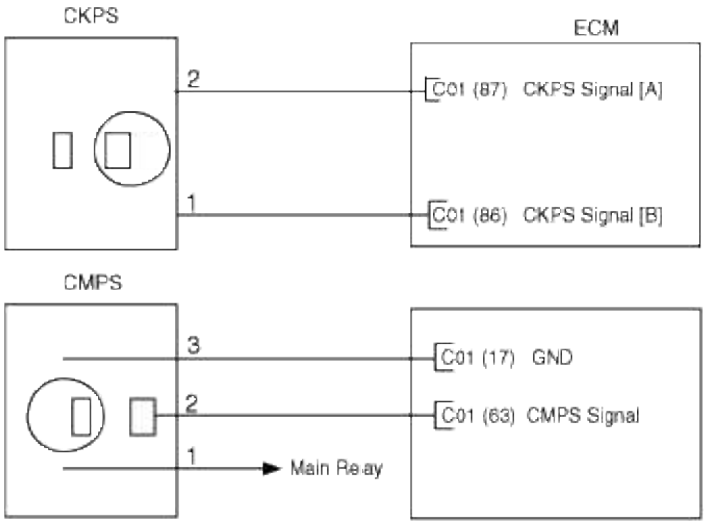
[HARNESS CONNECTOR]





(M/T)

[CIRCUIT DIAGRAM]

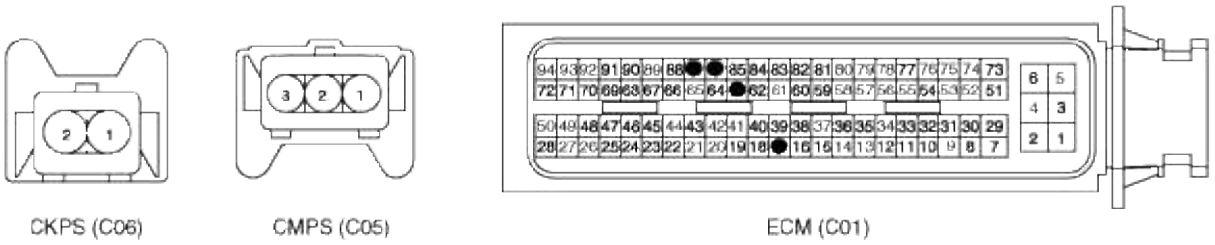


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

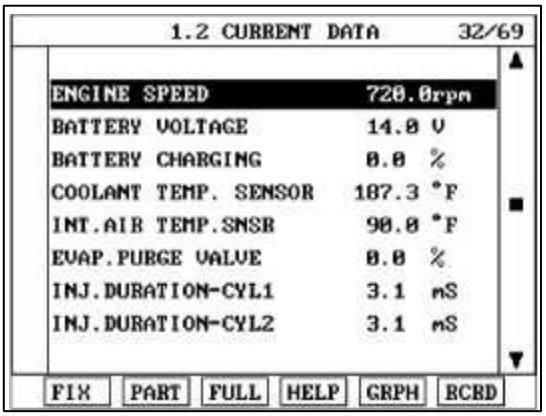
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Engine Start.
3. Monitor the "CKP" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

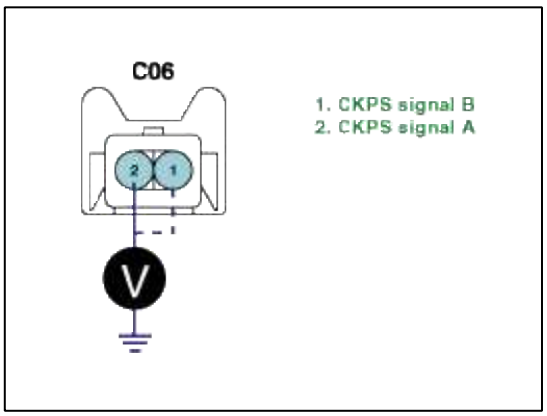
NO

Go to "CKPS circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CKPS connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of CKPS harness connector and chassis ground. Then, measure the voltage between terminal 2 of CKPS harness connector and chassis ground.

Specification : Approx 2.5V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

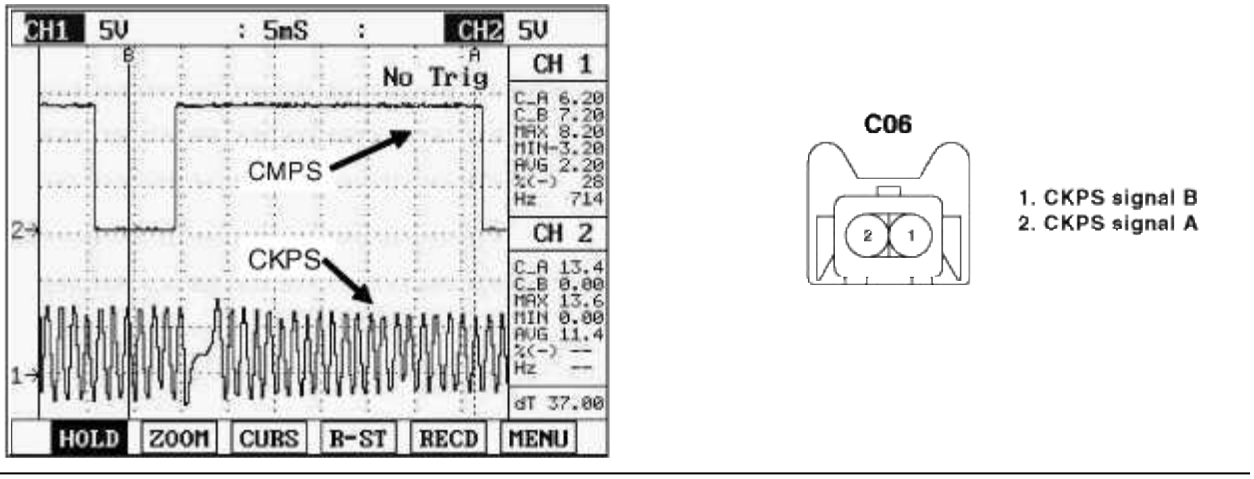
NO

Repair Open or Short in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check CKPS.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 1 of CKPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :



   (4) Is the measured signal waveform O.K?

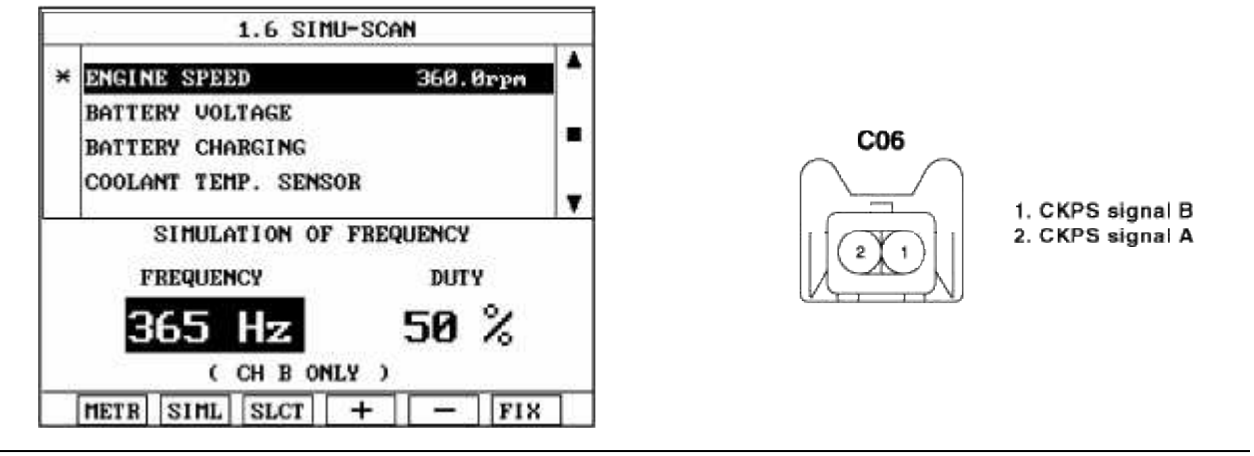
   YES

   Go to "Check ECM/PCM" as follows.

   NO

   Substitute with a known - good CKPS and check for proper operation.
   If the problem is corrected, replace CKPS and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF".
   (2) Connect scantool and Engine "ON".
   (3) Select simulation function on scantool.
   (4) Simulate frequency(Hz) at terminal 1 of CKPS signal connector.



(5) Does the signal value of CKPS change according to simulation frequency?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

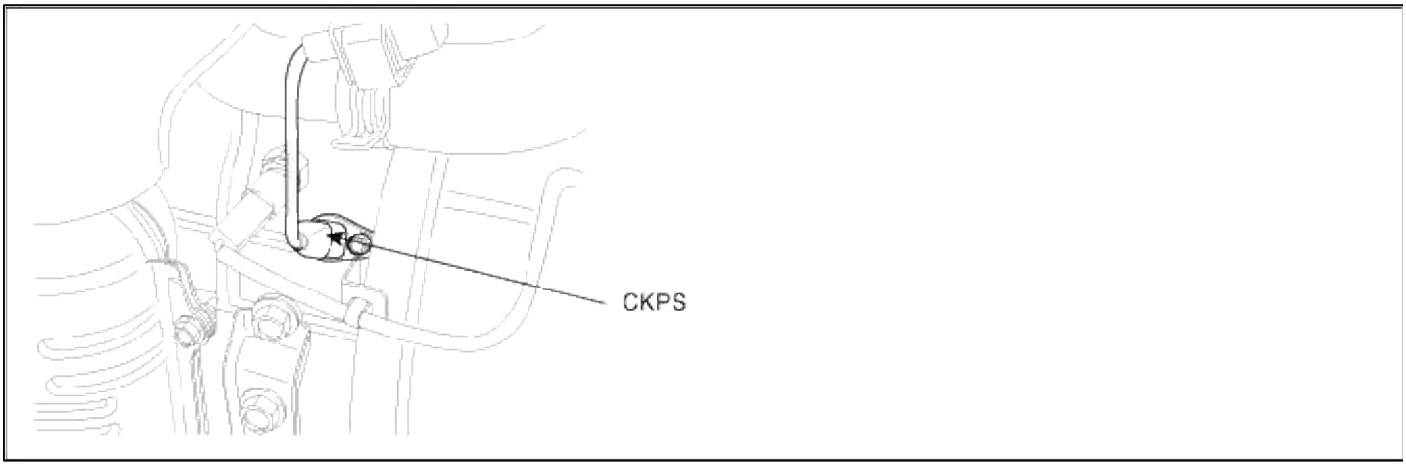
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0337 Crankshaft Position Sensor \'A\' Circuit Low Input

COMPONENT LOCATION



GENERAL DESCRIPTION

A Crankshaft Position Sensor (CKPS) is a magnetic type sensor that generates voltage using a sensor and a target wheel mounted on the crankshaft; there are 58 slots in the target wheel where one is longer than the others. When the slot in the wheel aligns with the sensor, the sensor voltage outputs low. When the metal (tooth) in the wheel aligns with the sensor, the sensor voltage outputs high. During one crankshaft rotation there are 58 rectangular signals and one longer signal. The ECM/PCM calculates engine RPM by using the sensor’ s signal and controls the injection duration and the ignition timing. Using the signal differences caused by the longer slot, the ECM/PCM identifies which cylinder is at top dead center.

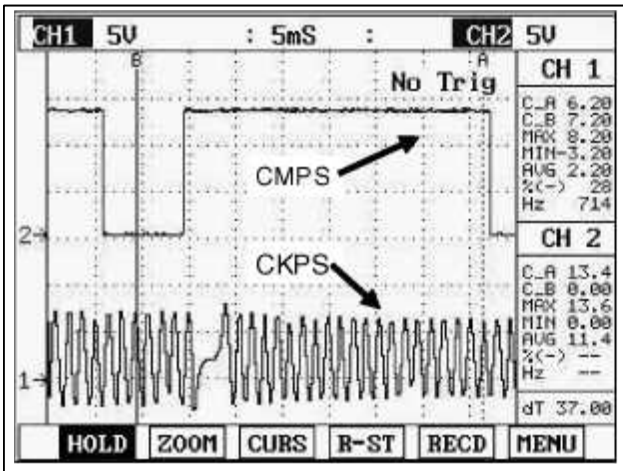
DTC DESCRIPTION

If frequency counter of the gap correction is retarded over 265, ECM/PCM sets DTC P0337.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Reference mark check	• Poor connection • Open or short in signal circuit • CKPS • ECM/PCM
Enable Conditions	• Idle engine speed > target speed - 50rpm	
Threshold Value	• Frequency counter of the gap correction (Minus side)> 265	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

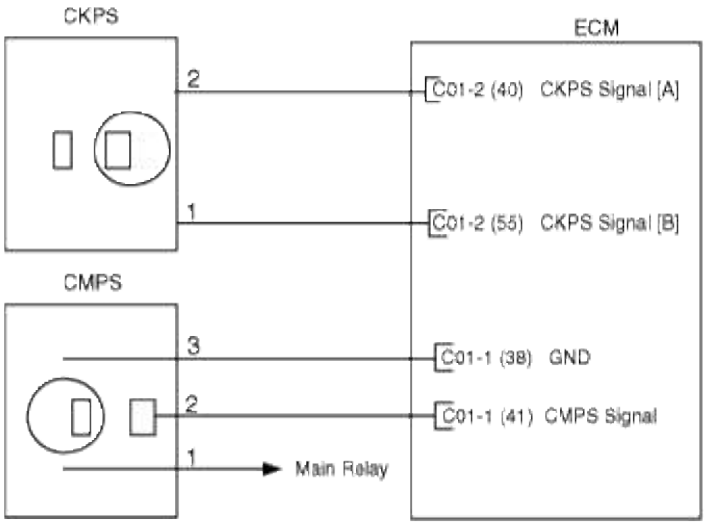


This example shows a typical Crankshaft Position Sensor(CKPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ign tion timing by using these signals. Generally CKPS signal is used to detec: the piston's position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

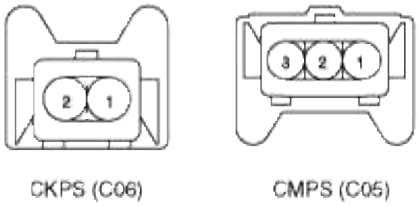


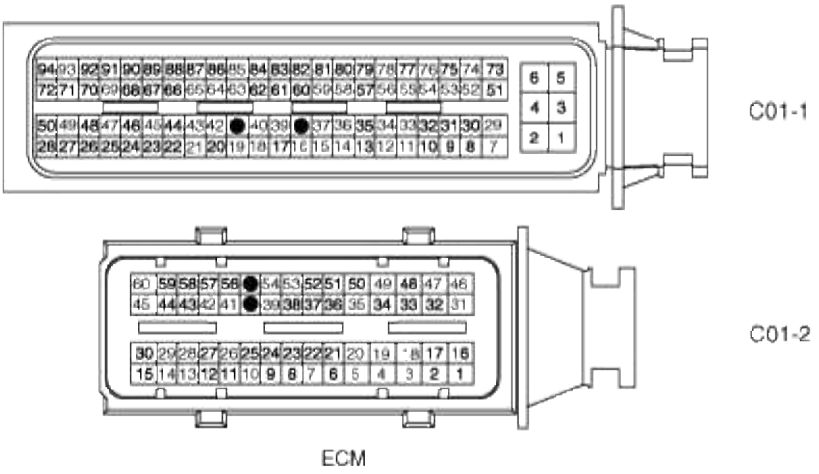
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

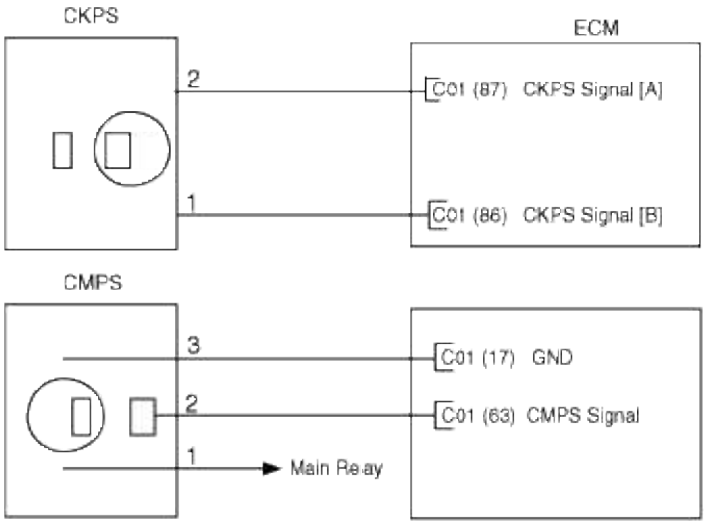
[HARNESS CONNECTOR]





(M/T)

[CIRCUIT DIAGRAM]

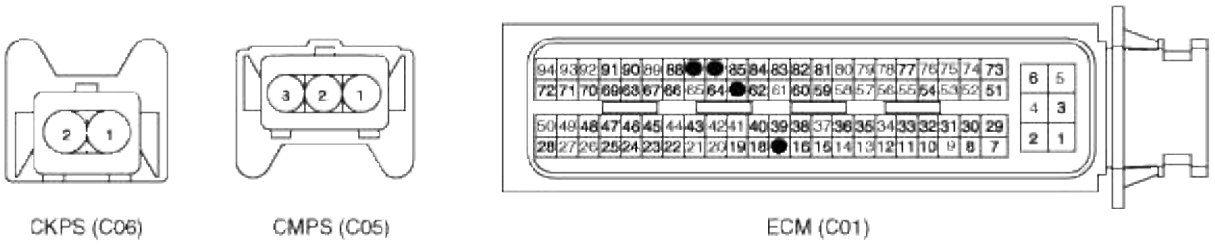


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

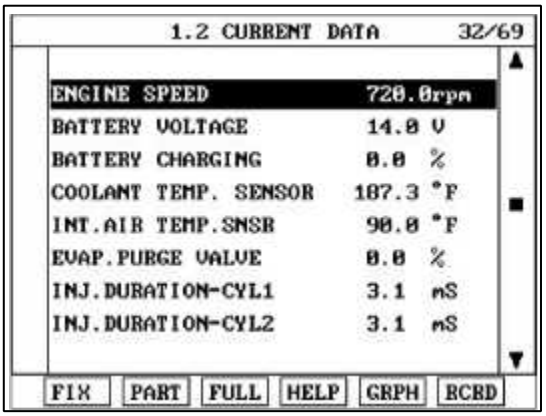
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Engine start.
3. Monitor the "CKP" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

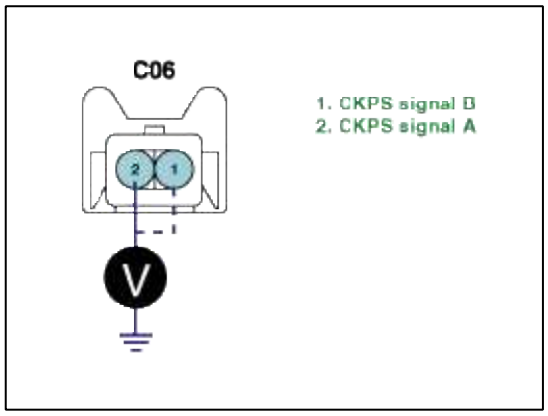
NO

Go to "CKPS circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check Oepn in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 1 of CKPS harness connector and chassis ground. Then, measure the voltage between terminal 2 of CKPS harness connector and chassis ground.

   Specification : Approx 2.5V



   (5) Is the measured voltage within specification?

YES

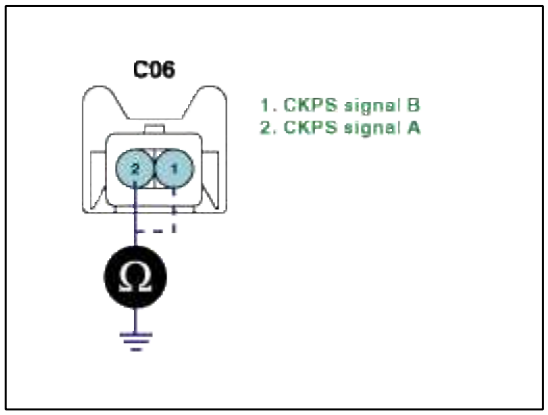
Go to "Component inspection" procedure.

NO

Go to "Check Short to ground in signal circuit" procedure.

2. Check Short to ground in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector and ECM/PCM connector.
   (3) Measure the resistance between1 of CKPS harness connector and chassis ground. Then, measure the resistance between terminal 2 of CKPS harness connector and chassis ground.

   Specification : Infinite



   (4) Is the measured resistance within specifications?

YES

Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

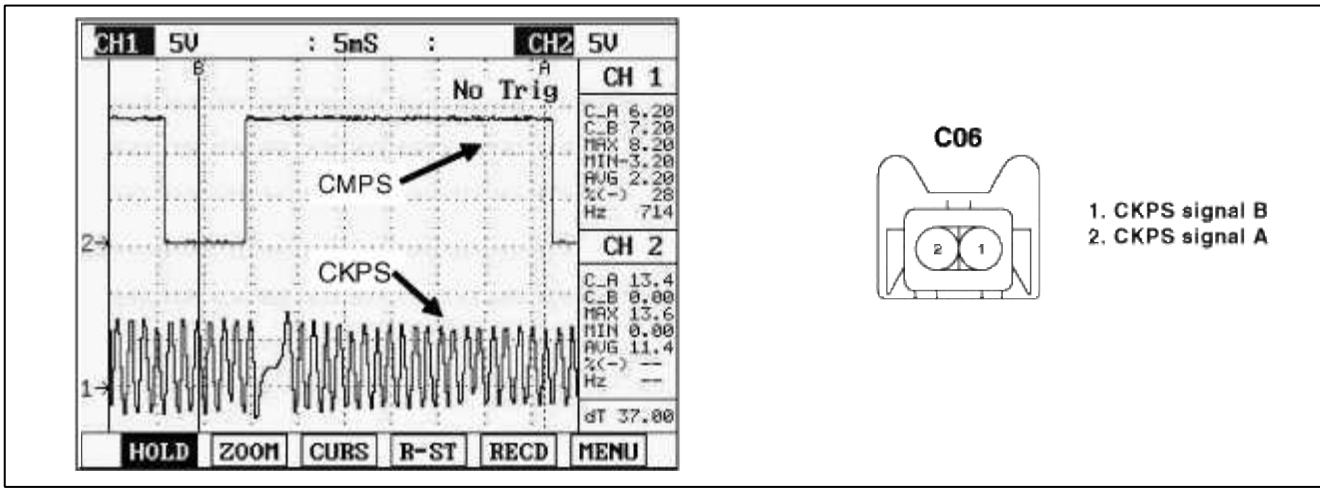
NO

Repair Short to ground in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check CKPS.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 1 of CKPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :



(4) Is the measured signal waveform O.K?

YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good CKPS and check for proper operation.
If the problem is corrected, replace CKPS and go to "Verification of Vehicle Repair" procedure.

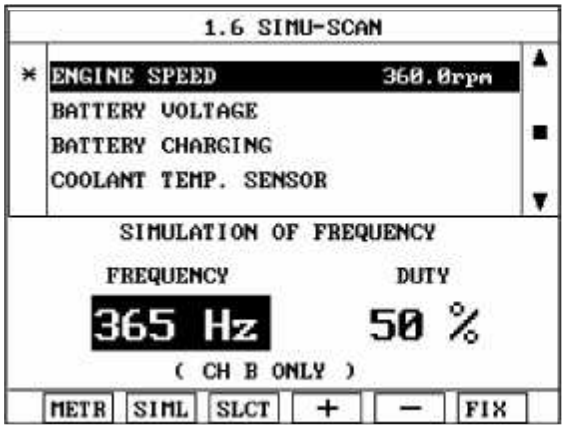
2. Check ECM/PCM.

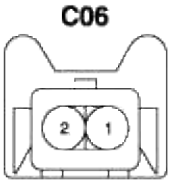
(1) IG "OFF".

(2) Connect scantool and Engine "ON".

(3) Select simulation function on scantool.

(4) Simulate frequency(Hz) at terminal 1 of CKPS signal connector.





1. CKPS signal B
2. CKPS signal A

(5) Does the signal value of CKPS change according to simulation frequency?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

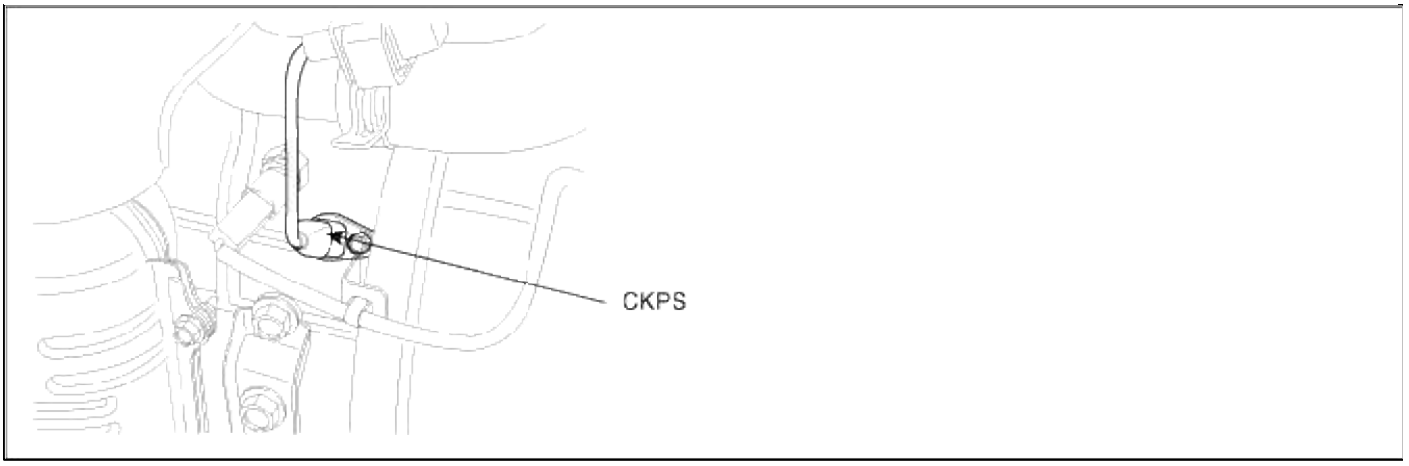
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0338 Crankshaft Position Sensor \'A\' Circuit High Input

COMPONENT LOCATION



GENERAL DESCRIPTION

A Crankshaft Position Sensor (CKPS) is a magnetic type sensor that generates voltage using a sensor and a target wheel mounted on the crankshaft; there are 58 slots in the target wheel where one is longer than the others. When the slot in the wheel aligns with the sensor, the sensor voltage outputs low. When the metal (tooth) in the wheel aligns with the sensor, the sensor voltage outputs high. During one crankshaft rotation there are 58 rectangular signals and one longer signal. The ECM/PCM calculates engine RPM by using the sensor' s signal and controls the injection duration and the ignition timing. Using the signal differences caused by the longer slot, the ECM/PCM identifies which cylinder is at top dead center.

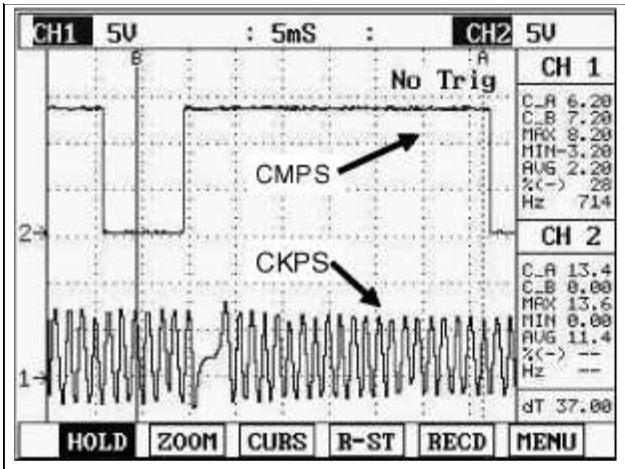
DTC DESCRIPTION

If frequency counter of the gap correction is advanced over 265, ECM/PCM sets DTC P0338.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Reference mark check	• Poor connection • Open or short in signal circuit • CKPS • ECM/PCM
Enable Conditions	• Vehicle speed < 1kph (0.6mph) or >25kph (15.5mph)	
Threshold Value	• Frequency counter of the gap correction (Plus side)> 265	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

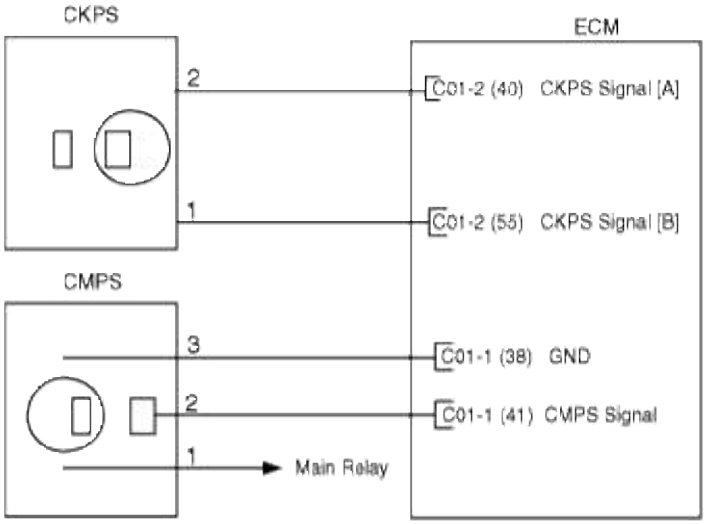


This example shows a typical Crankshaft Position Sensor(CKPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ignition timing by using these signals. Generally CKPS signal is used to detect the piston's position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

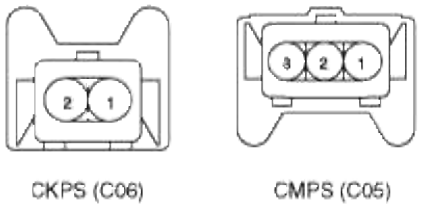


[CONNECTION INFORMATION]

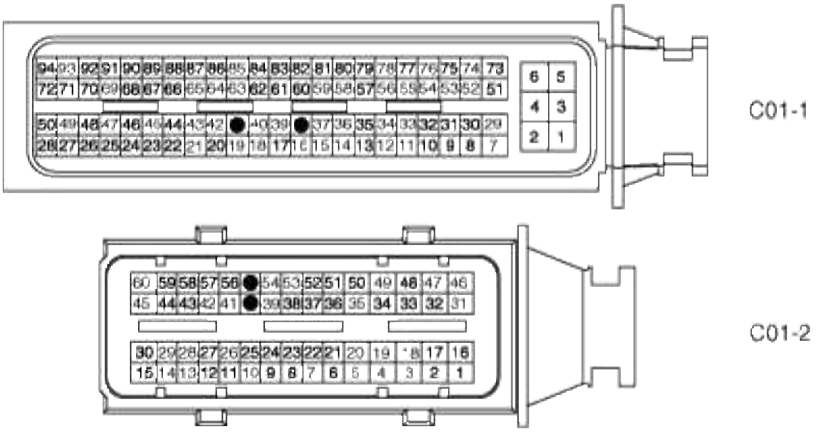
Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

[HARNESS CONNECTOR]

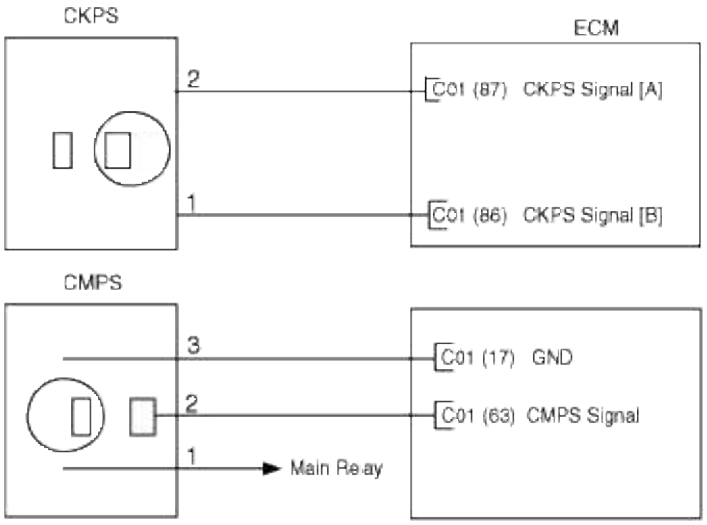


CKPS (C06) CMPS (C05)



(M/T)

[CIRCUIT DIAGRAM]

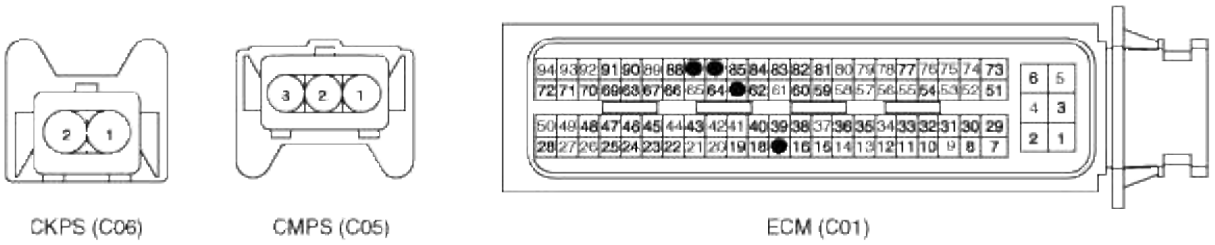


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

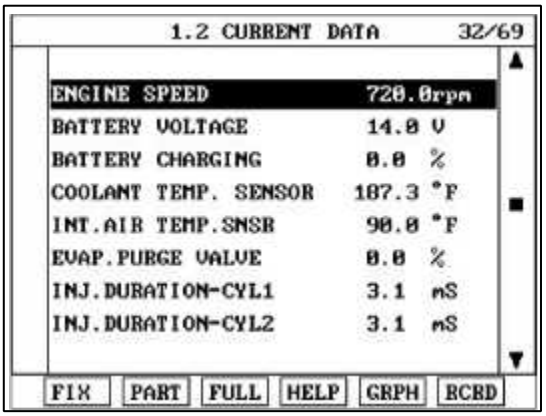
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Engine start.
3. Monitor the "CKP" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

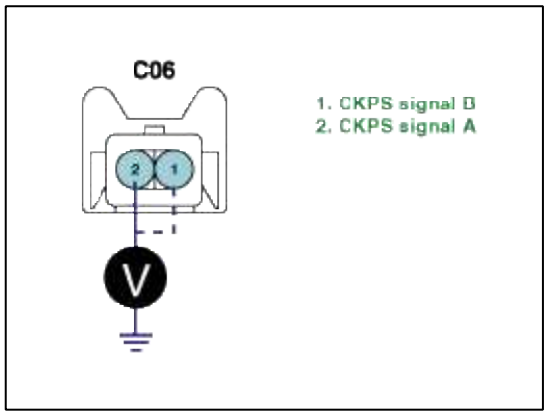
NO

Go to "CKPS circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check Oepn in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 1 of CKPS harness connector and chassis ground. Then, measure the voltage between terminal 2 of CKPS harness connector and chassis ground.

Specification : Approx 2.5V



   (5) Is the measured voltage within specification?

YES

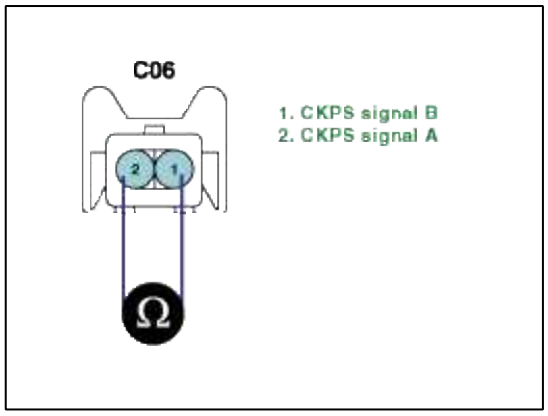
Go to "Check Short in signal circuit" procedure.

NO

Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

2. Check Short in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector and ECM/PCM connector.
   (3) Measure the resistance between terminals 1 and 2 of CKPS harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specifications?

   YES

   Go to "Component inspection" procedure.

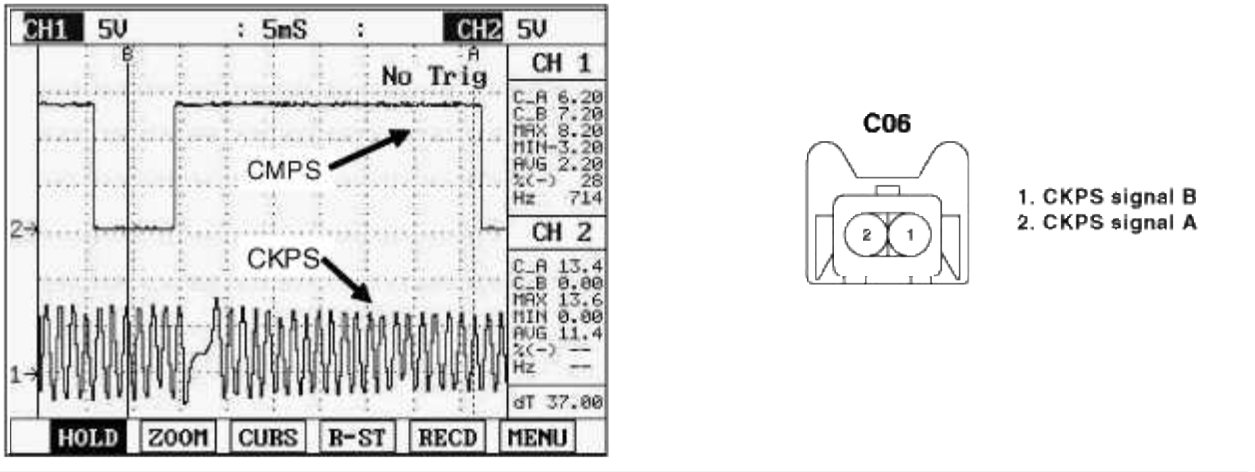
   NO

   Repair Short in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check CKPS.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 1 of CKPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :



(4) Is the measured signal waveform O.K?

YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good CKPS and check for proper operation.
If the problem is corrected, replace CKPS and go to "Verification of Vehicle Repair" procedure.

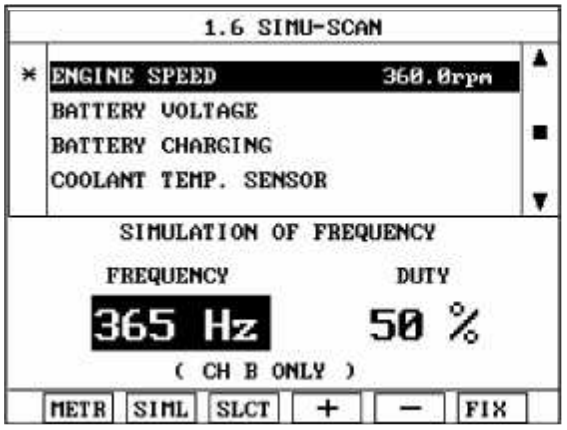
2. Check ECM/PCM.

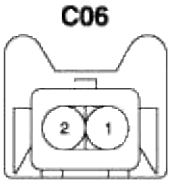
(1) IG "OFF".

(2) Connect scantool and Engine "ON".

(3) Select simulation function on scantool.

(4) Simulate frequency(Hz) at terminal 1 of CKPS signal connector.





1. CKPS signal B
2. CKPS signal A

(5) Does the signal value of CKPS change according to simulation frequency?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

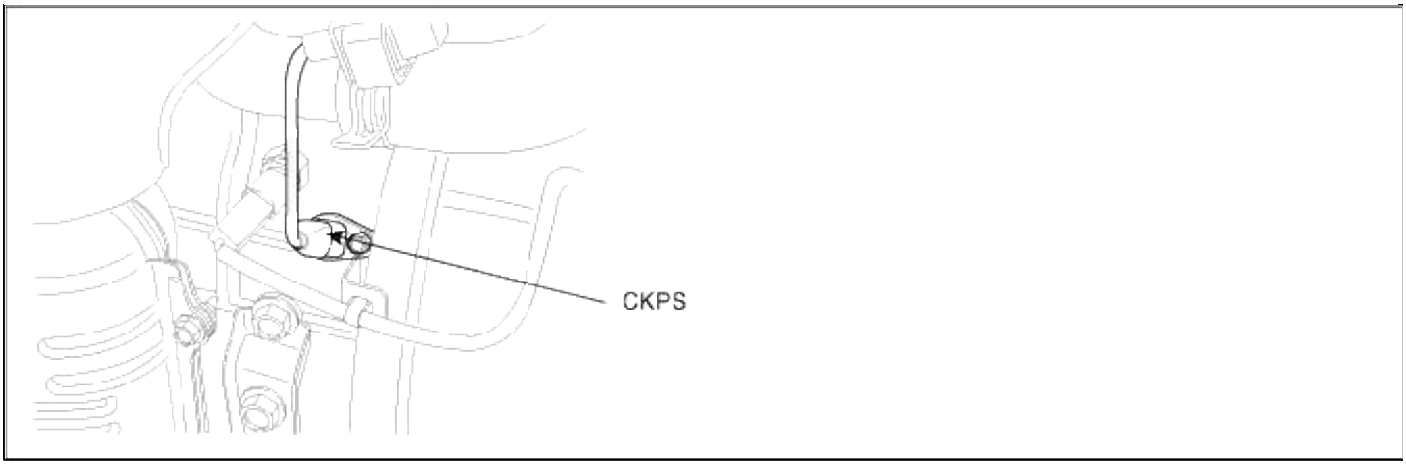
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0339 Crankshaft Position Sensor \'A\' Circuit Intermittent

COMPONENT LOCATION



GENERAL DESCRIPTION

A Crankshaft Position Sensor (CKPS) is a magnetic type sensor that generates voltage using a sensor and a target wheel mounted on the crankshaft; there are 58 slots in the target wheel where one is longer than the others. When the slot in the wheel aligns with the sensor, the sensor voltage outputs low. When the metal (tooth) in the wheel aligns with the sensor, the sensor voltage outputs high. During one crankshaft rotation there are 58 rectangular signals and one longer signal. The ECM/PCM calculates engine RPM by using the sensor' s signal and controls the injection duration and the ignition timing. Using the signal differences caused by the longer slot, the ECM/PCM identifies which cylinder is at top dead center.

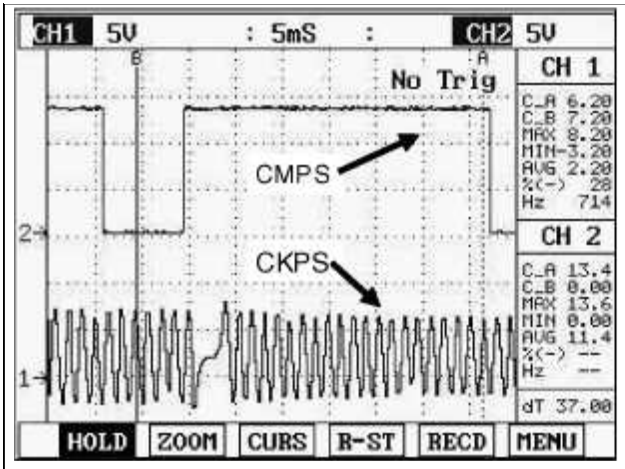
DTC DESCRIPTION

If there is no signal from CKPS while there is CMPS signal, PCM sets DTC P0339.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check	• Poor connection • Open or short in signal circuit • CKPS • ECM/PCM
Enable Conditions	• Edge counter of camshaft position sensor > 8	
Threshold Value	• No signal	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

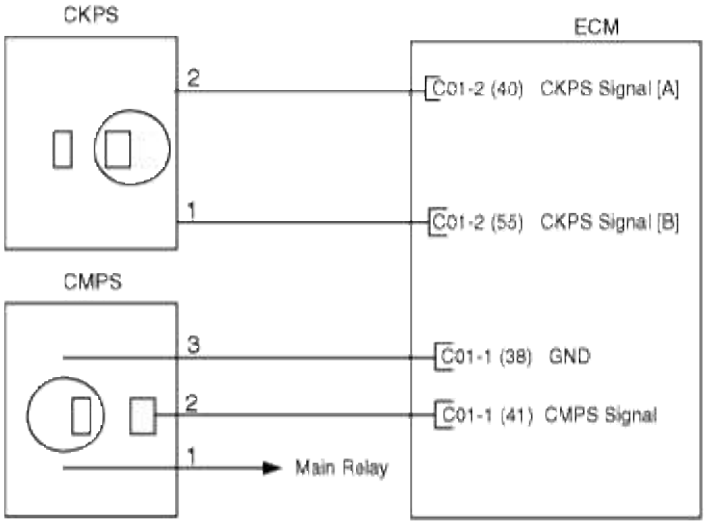


This example shows a typical Crankshaft Position Sensor(CKPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ignition timing by using these signals. Generally CKPS signal is used to detect the piston's position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

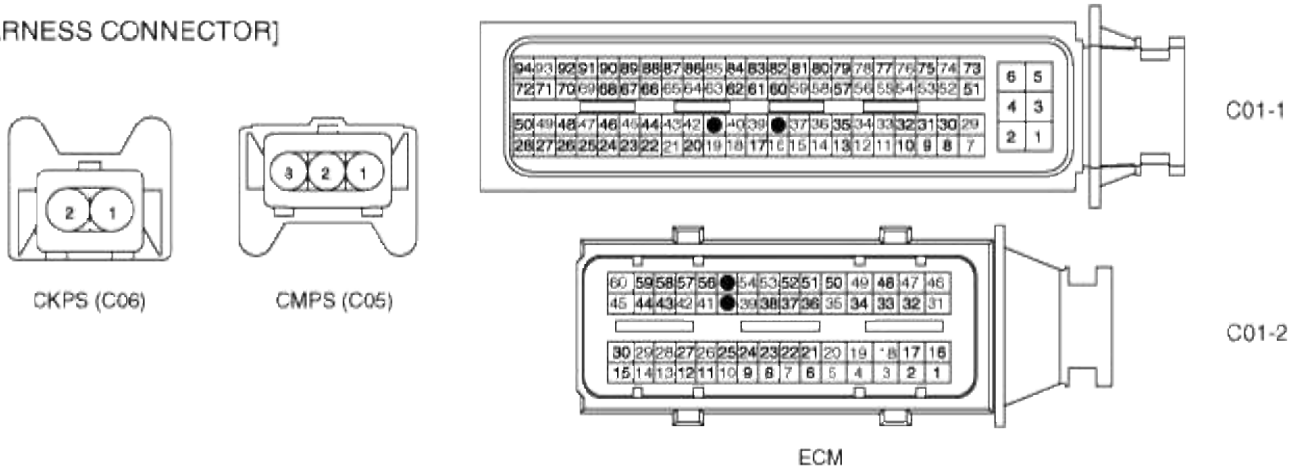


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

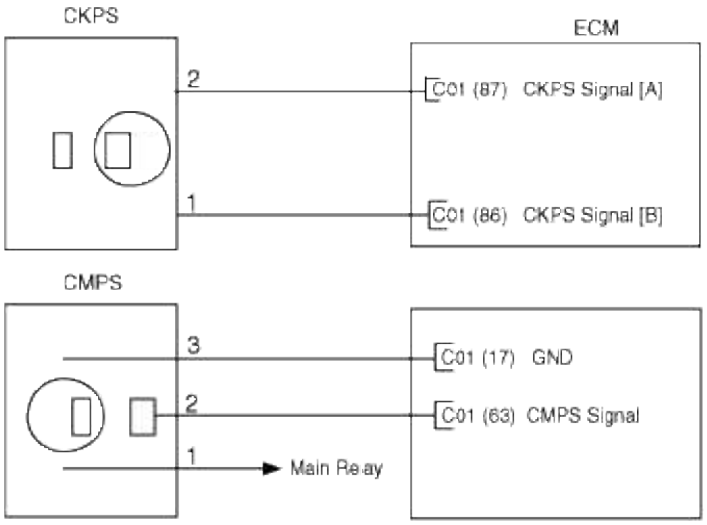
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

[HARNESS CONNECTOR]



(M/T)

[CIRCUIT DIAGRAM]

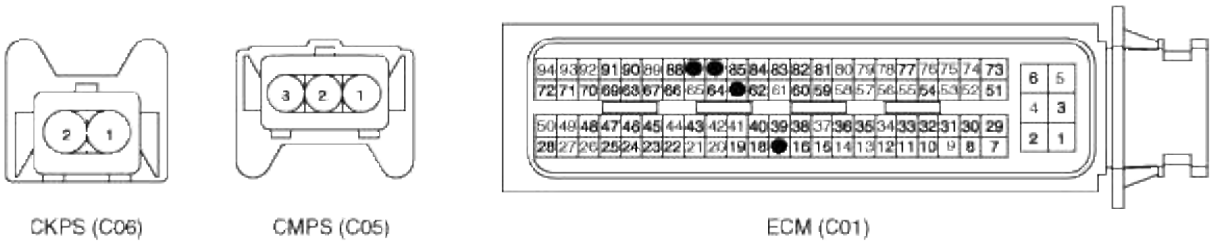


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

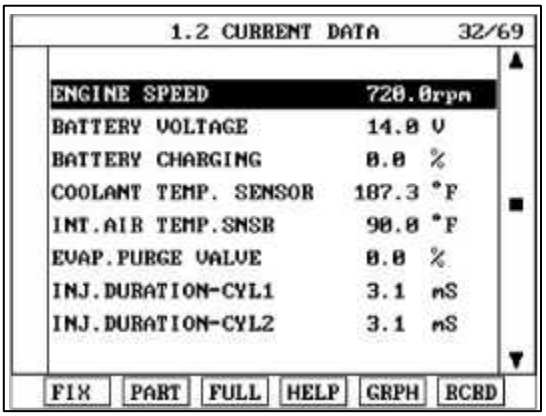
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Engine start.
3. Monitor the "CKP" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

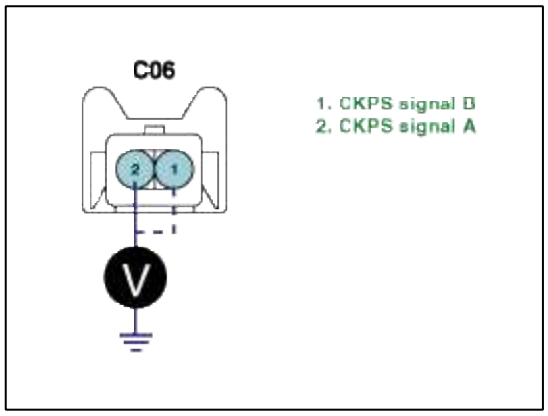
NO

Go to "CKPS circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check Oepn in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 1 of CKPS harness connector and chassis ground. Then, measure the voltage between terminal 2 of CKPS harness connector and chassis ground.

   Specification : Approx 2.5V



   (5) Is the measured voltage within specification?

YES

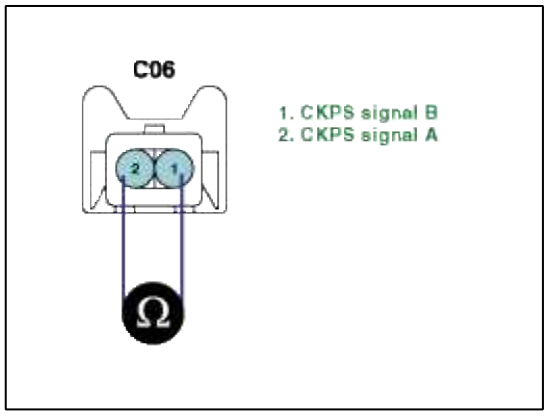
Go to "Component inspection" procedure.

NO

Go to "Check Short to ground in signal circuit" procedure.

2. Check Short to ground in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CKPS connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 1 of CKPS harness connector and chassis ground. Then, measure the resistance between terminal 2 of CKPS harness connector and chassis ground.

   Specification : Infinite



   (4) Is the measured resistance within specifications?

YES

Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

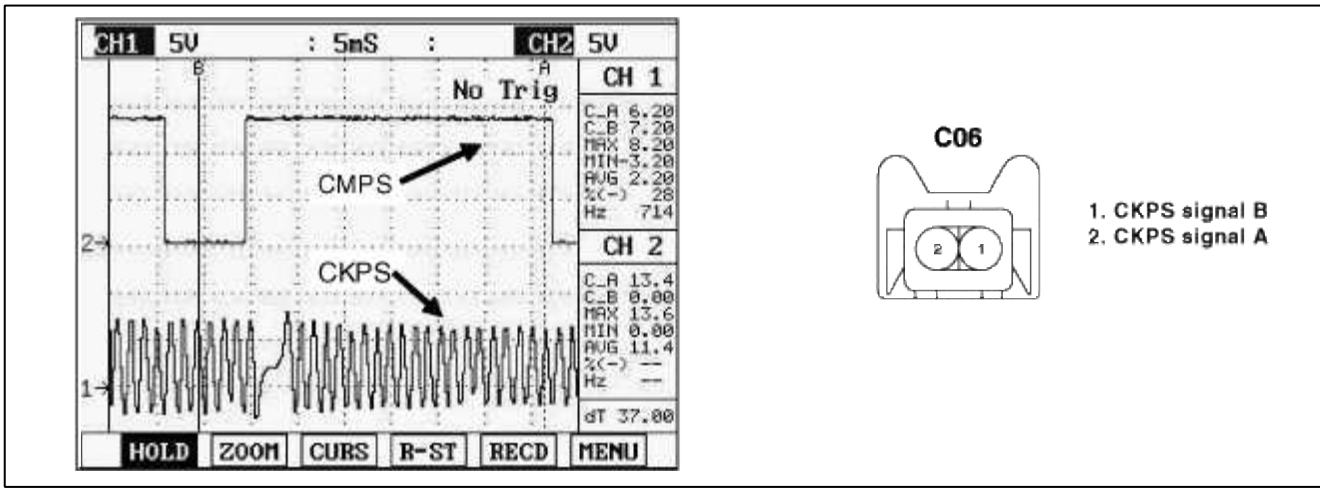
NO

Repair Short to ground in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check CKPS.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 1 of CKPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :



(4) Is the measured signal waveform O.K?

YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good CKPS and check for proper operation.
If the problem is corrected, replace CKPS and go to "Verification of Vehicle Repair" procedure.

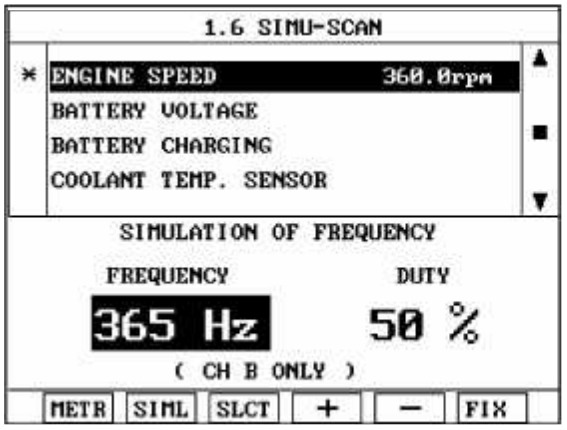
2. Check ECM/PCM.

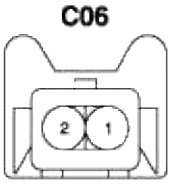
(1) IG "OFF".

(2) Connect scantool and Engine "ON".

(3) Select simulation function on scantool.

(4) Simulate frequency(Hz) at terminal 1 of CKPS signal connector.





1. CKPS signal B
2. CKPS signal A

(5) Does the signal value of CKPS change according to simulation frequency?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

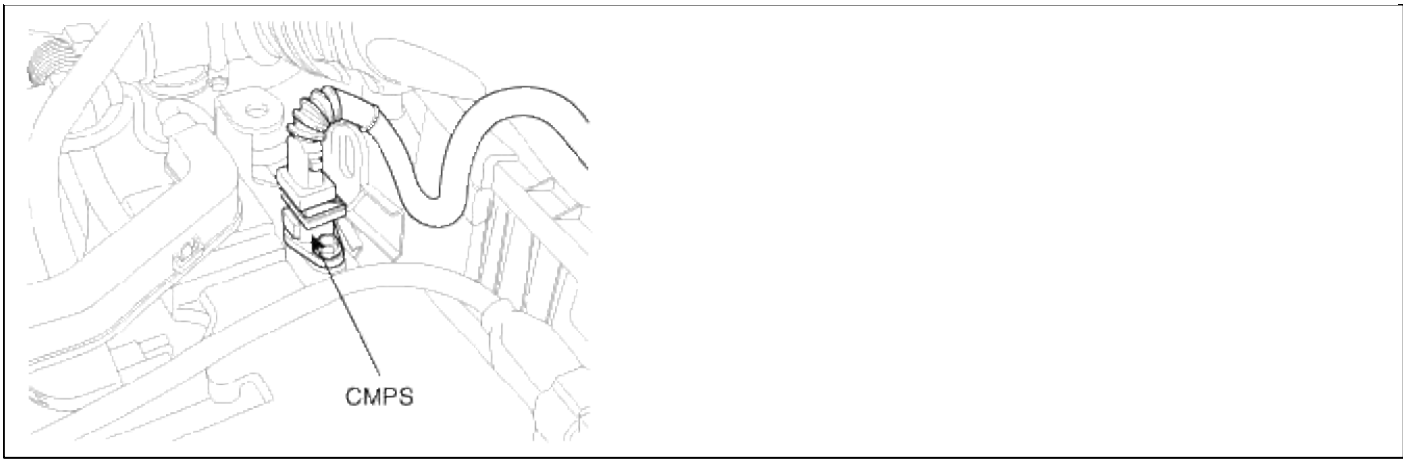
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0340 Camshaft Position Sensor \'A\' Circuit (Single Sensor)

COMPONENT LOCATION



GENERAL DESCRIPTION

Camshaft Position Sensor (CMPS) is a hall sensor and detects the camshaft position by using a hall element. It is related with Crankshaft Position Sensor (CKPS) and detects the piston position of the each cylinder which the CKPS can't detect. The 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. When teeth on the target wheel trigger the sensor, output voltage is 12V. If not, it is 0V. These CMP signal is sent to the ECM/PCM and used for determining the ignition timing along with CKP signal. CMPS makes Sequential Injection possible.

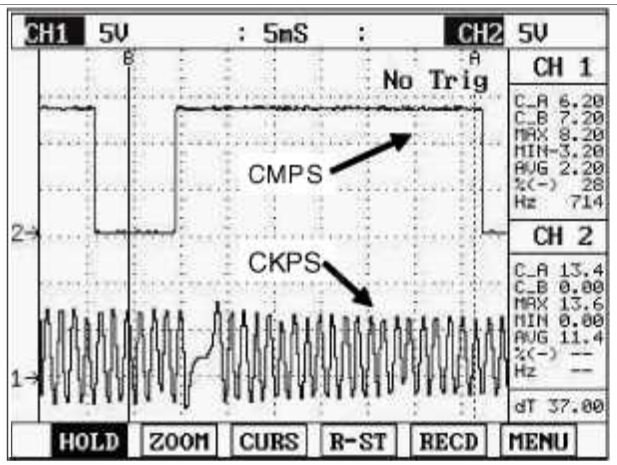
DTC DESCRIPTION

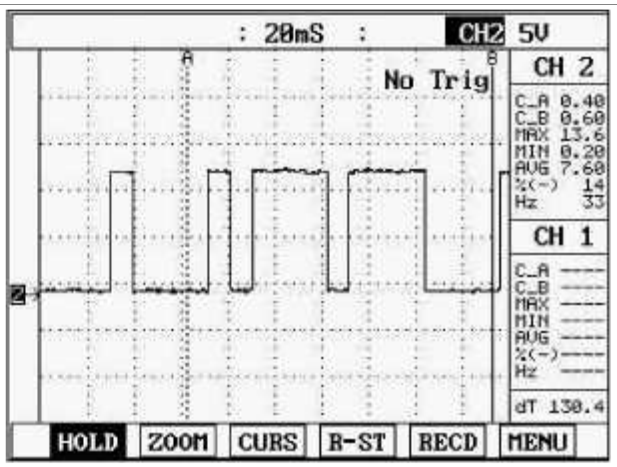
If signal input phase is abnormal over 12 times, ECM/PCM sets DTC P0340.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check (check the assembling state)	• Poor connection • abnormal assembling state • CMPS • ECM/PCM
Enable Conditions	• Sensor signal requested	
Threshold Value	• Abnormal phase edges > 12 times	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



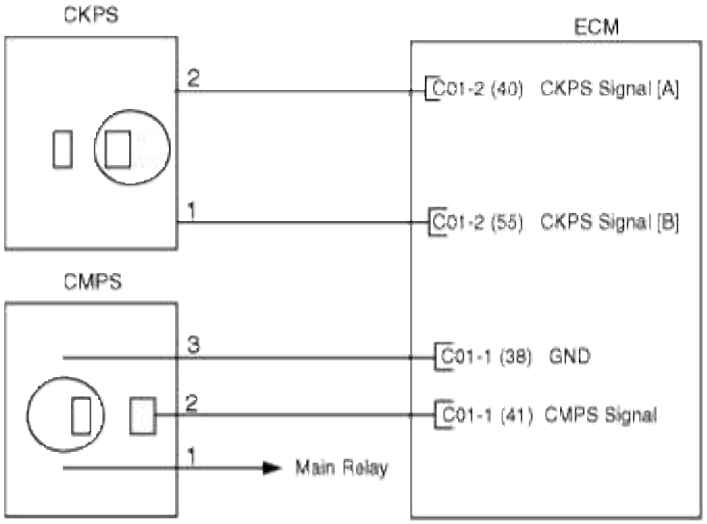


This example shows a typical Crankshaft Position Sensor(CkPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ignition timing by using these signals. Generally CkPS signal is used to detect the piston' s position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

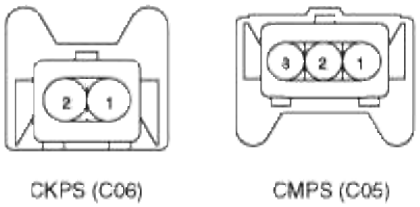


[CONNECTION INFORMATION]

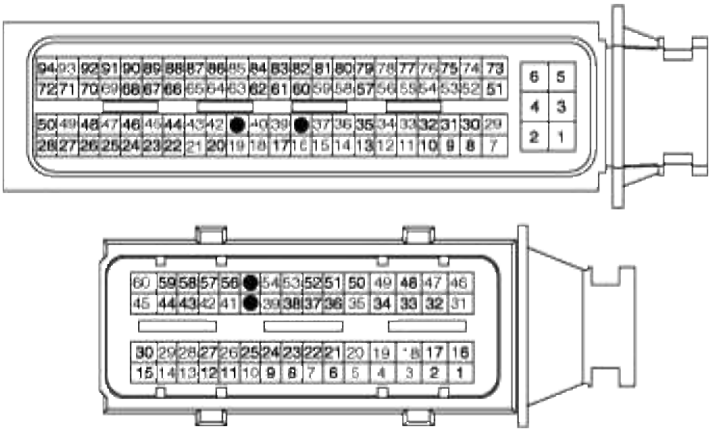
Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

[HARNESS CONNECTOR]

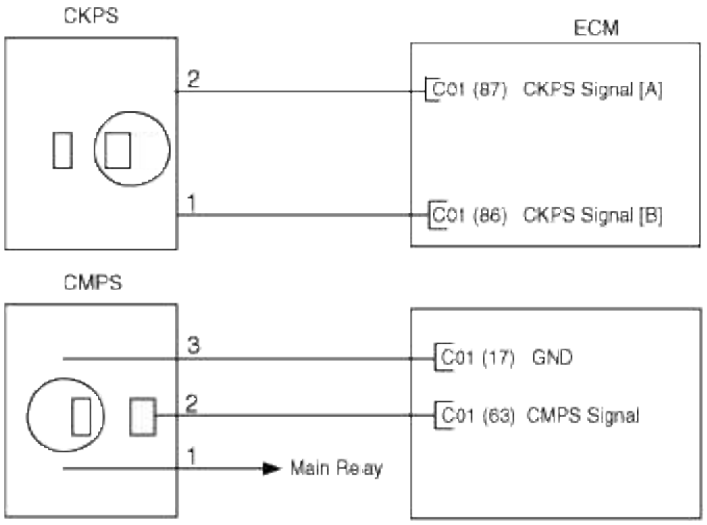


CKPS (C06) CMPS (C05)



(M/T)

[CIRCUIT DIAGRAM]

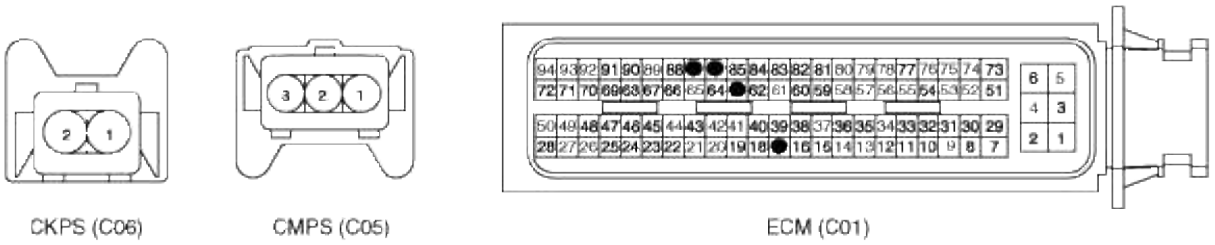


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

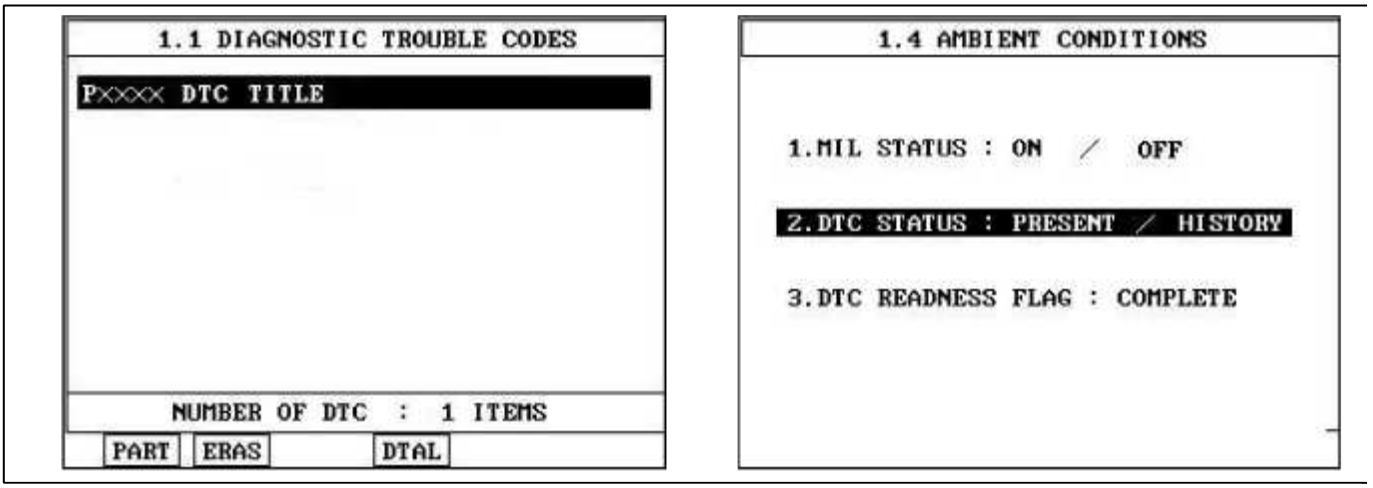
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

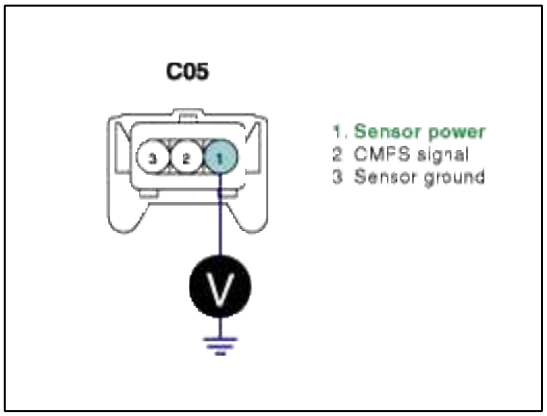
NO

Go to "CMPS Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CMPS connector.
3. key "ON".
4. Measure the voltage between terminal 1 of CMPS harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

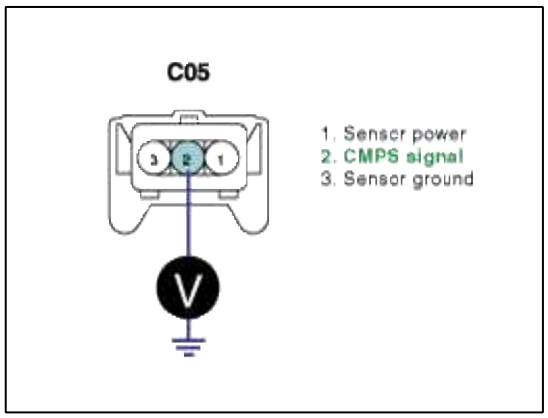
NO

Repair Open or Short circuit and then, go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check Oepn in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CMPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 2 of CMPS harness connector and chassis ground.

   Specification : Approx 12V



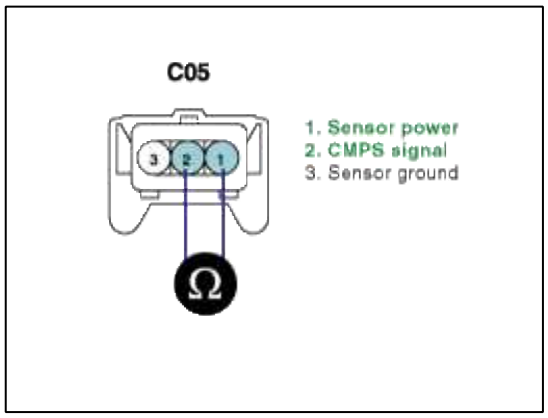
   (5) Is the measured voltage within specification?

   YES
   Go to "Short to power circuit inspection" procedure

   NO
   Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

2. Check Short to power in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CMPS connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 1 and 2 of CMPS harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specifications?

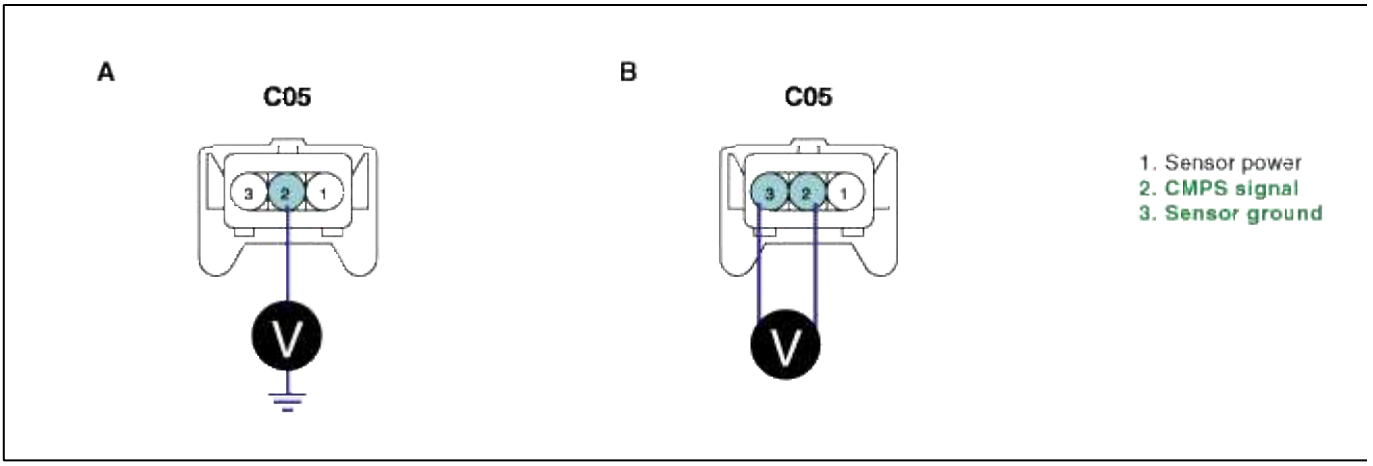
   YES
   Go to "Ground circuit inspection" procedure.

   NO
   Repair Short to power in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CMPS connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of CMPS harness connector and chassis ground.(A)
5. Measure the voltage between terminal 2 and 3 of CMPS harness connector.(B)

Specification : "A" - "B" = Below 200mV



6. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. CMPS visual check.
   (1) Key "OFF".
   (2) Check physical condition of CMPS.
   (3) Check the projection of cam-shaft visually after remove the CMPS.
   (4) Is everything O.K?

   YES

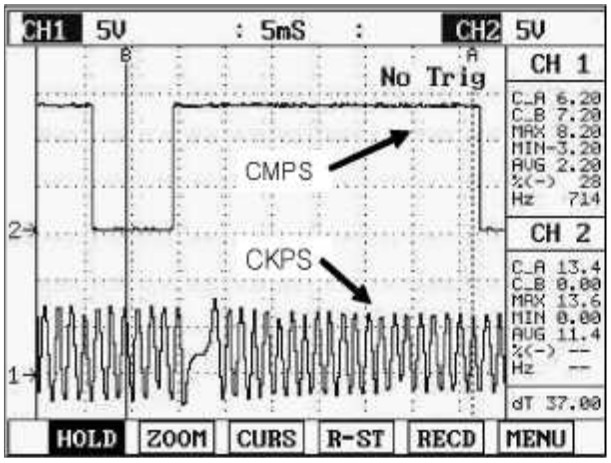
   Go to "CMPS check" procedure.

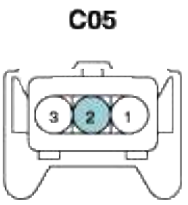
   NO

   Repair as necessary and then, go to "Verification of Vehicle Repair" procedure.

2. CMPS check.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 2 of CMPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :





1. Sensor power
2. CMPS signal
3. Sensor ground

   (4) Is the signal waveform within specifications?

   YES

   Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, rep ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known-good CMPS and check for proper operation. If the problem is corrected, replace CMPS and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

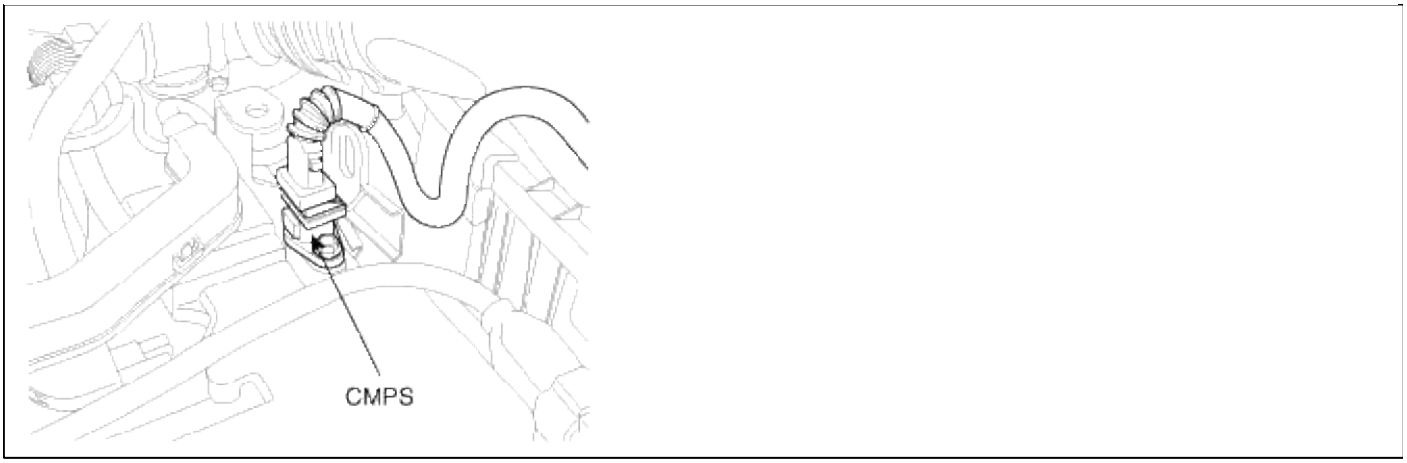
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0341 Camshaft Position Sensor A Circuit Range/Performance (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

Camshaft Position Sensor (CMPS) is a hall sensor and detects the camshaft position by using a hall element. It is related with Crankshaft Position Sensor (CKPS) and detects the piston position of the each cylinder which the CKPS can't detect. The 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. When teeth on the target wheel trigger the sensor, output voltage is 12V. If not, it is 0V. These CMPS signal is sent to the ECM/PCM and it uses CMPS signals for determining the ignition timing with CKPS signals. CMPS makes Sequential Injection possible.

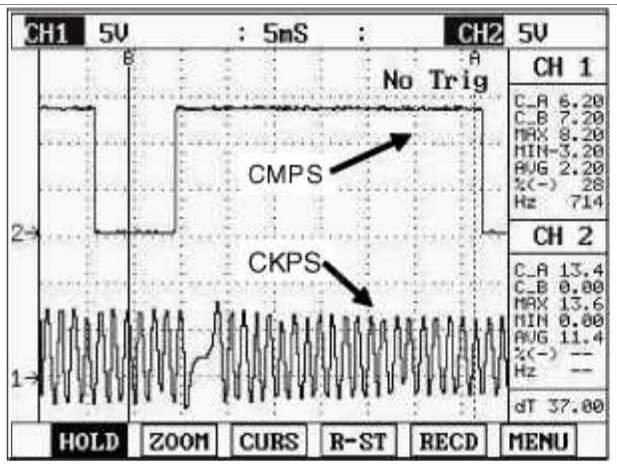
DTC DESCRIPTION

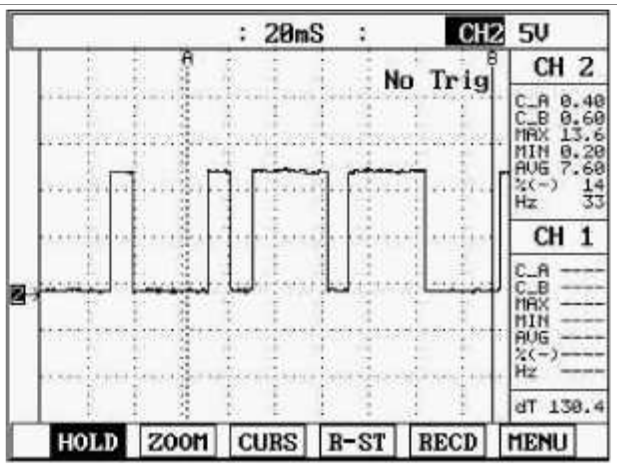
If signal input phase is abnormal over 12 times, ECM/PCM sets DTC P0341.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check (check the wiring state)	• Poor connection • Open or short in power/ground/ signal circuit • CMPS • ECM/PCM
Enable Conditions	• Sensor signal requested	
Threshold Value	• Abnormal phase edges > 12 times	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



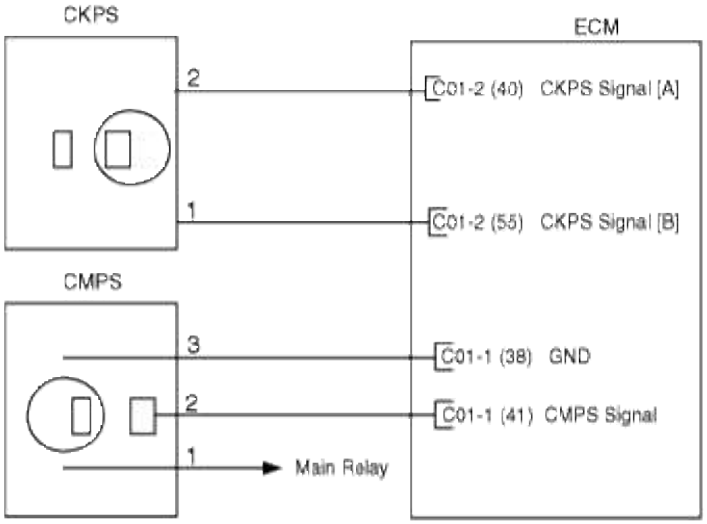


This example shows a typical Crankshaft Position Sensor(CkPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ignition timing by using these signals. Generally CkPS signal is used to detect the piston' s position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

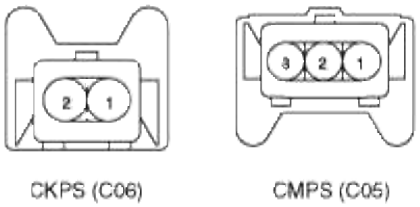


[CONNECTION INFORMATION]

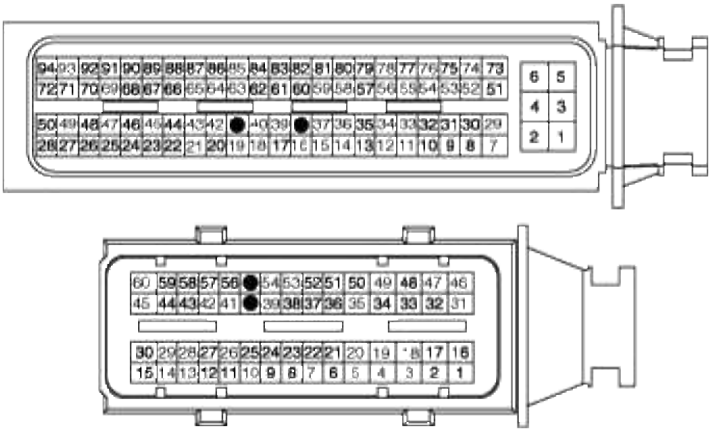
Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

[HARNESS CONNECTOR]

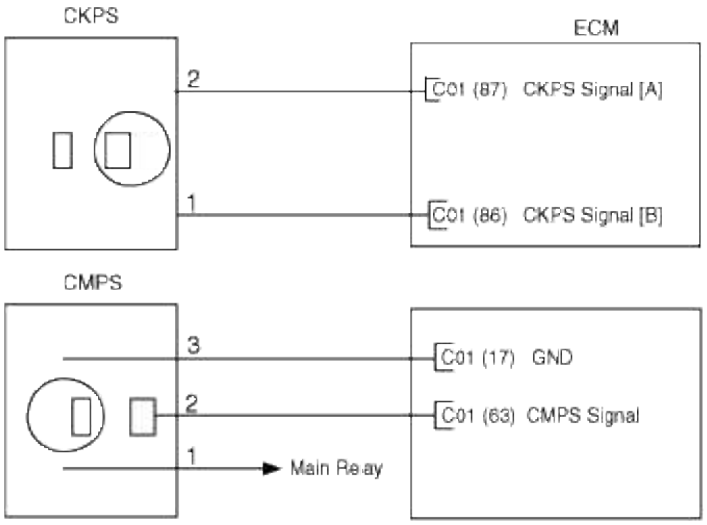


CKPS (C06) CMPS (C05)



(M/T)

[CIRCUIT DIAGRAM]

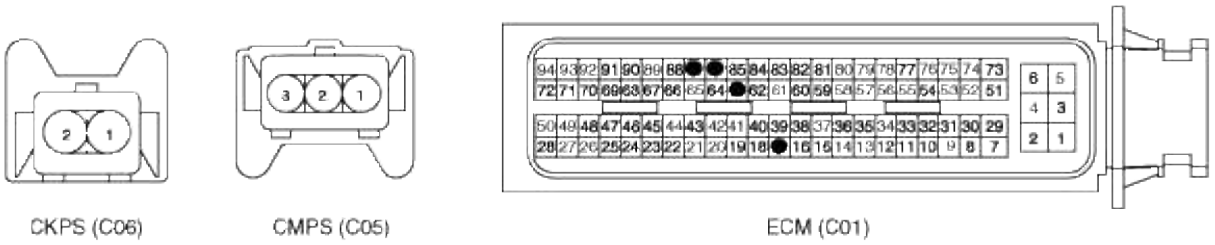


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

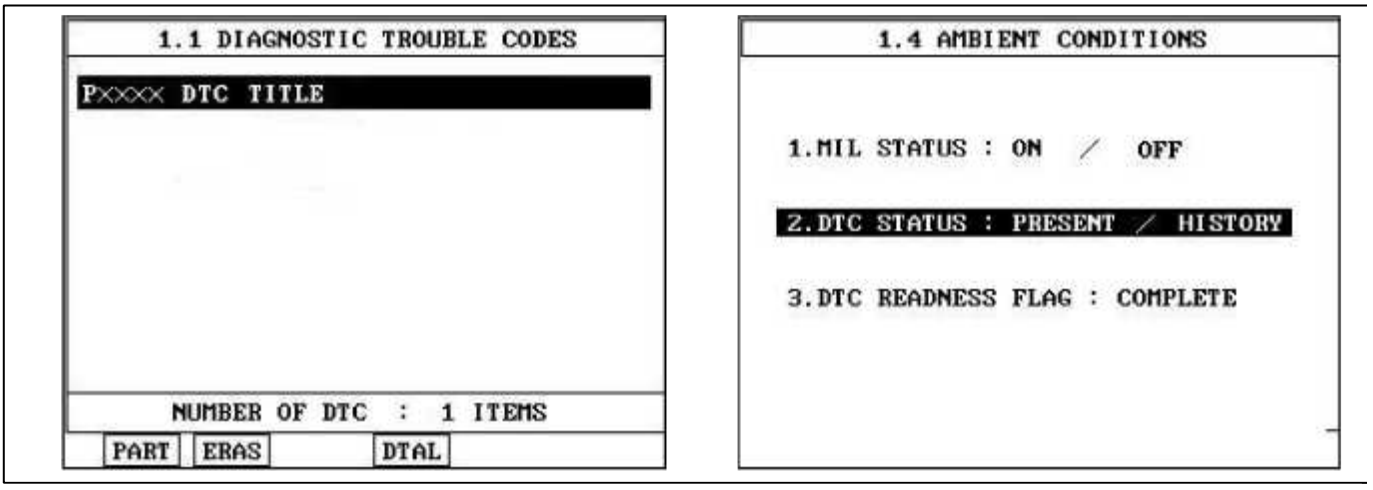
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

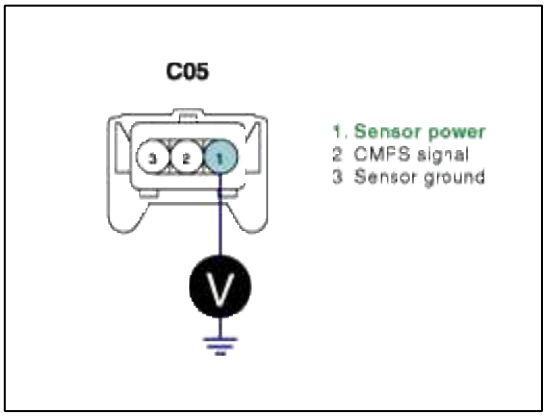
NO

Go to "CMPS Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CMPS connector.
3. key "ON".
4. Measure the voltage between terminal 1 of CMPS harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

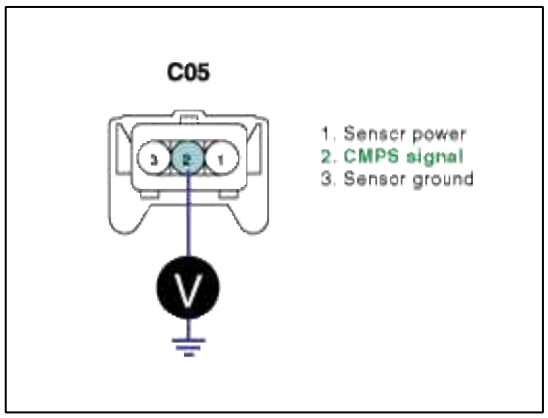
NO

Repair Open or Short circuit and then, go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check Oepn in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CMPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 2 of CMPS harness connector and chassis ground.

   Specification : Approx 12V



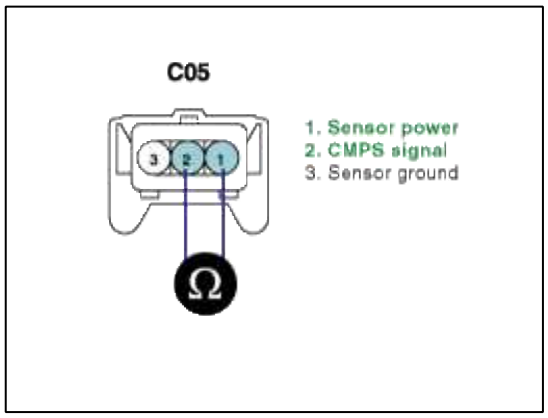
   (5) Is the measured voltage within specification?

   YES
   Go to "Short to power circuit inspection" procedure

   NO
   Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

2. Check Short to power in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CMPS connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 1 and 2 of CMPS harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specifications?

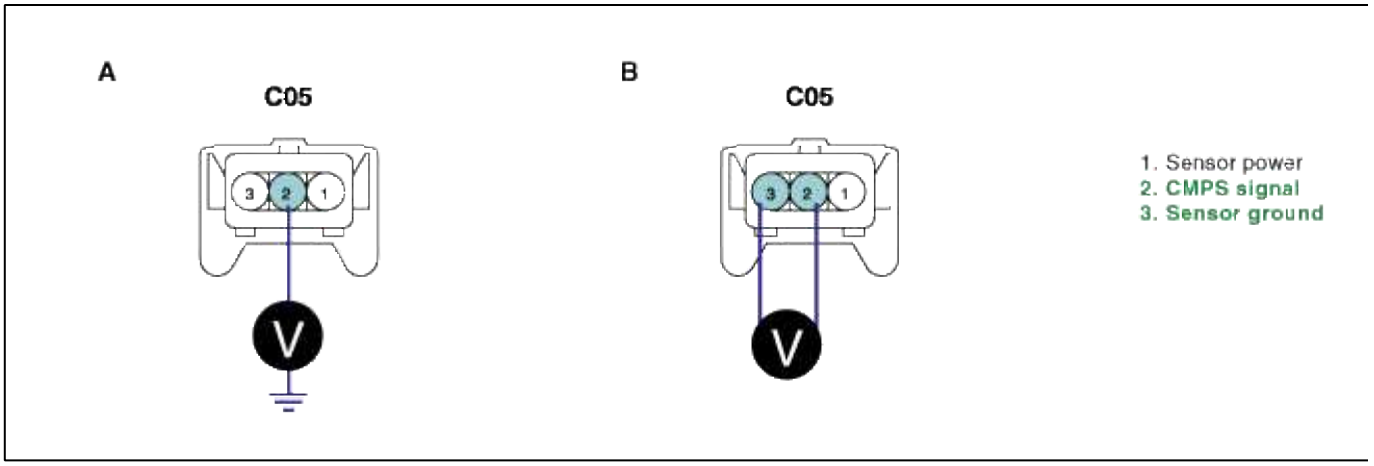
   YES
   Go to "Ground circuit inspection" procedure.

   NO
   Repair Short to power in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CMPS connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of CMPS harness connector and chassis ground.(A)
5. Measure the voltage between terminal 2 and 3 of CMPS harness connector.(B)

Specification : "A" - "B" = Below 200mV



6. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

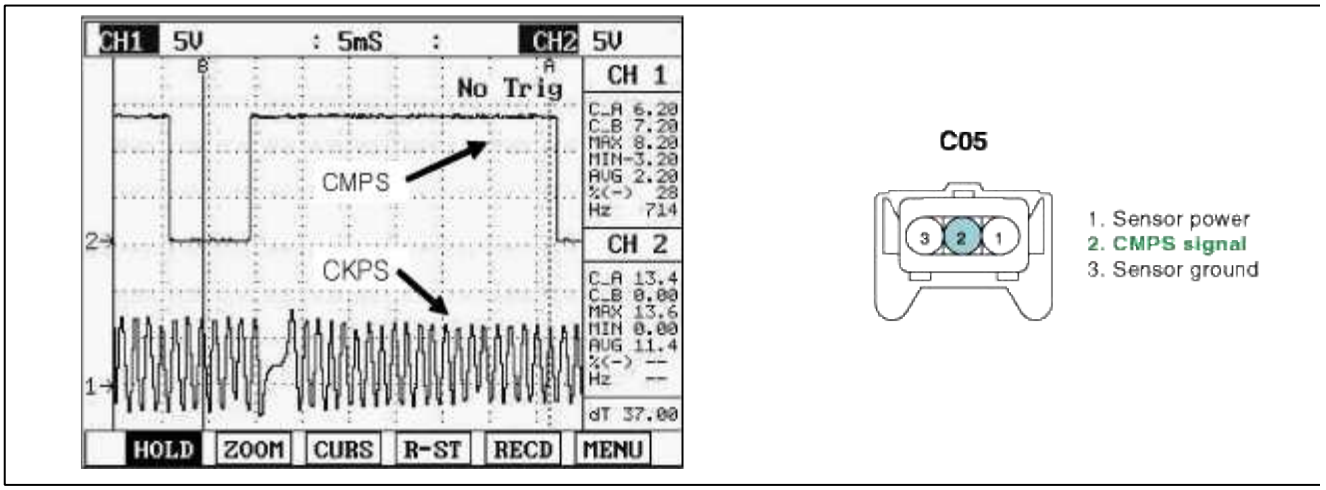
NO

Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. CMPS check.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 2 of CMPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :



(4) Is the signal waveform within specifications?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, rep ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good CMPS and check for proper operation. If the problem is corrected, replace CMPS and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

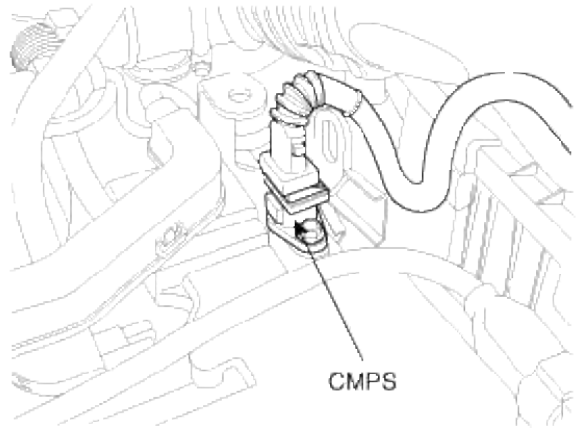
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0342 Camshaft Position Sensor A Circuit Low Input (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

Camshaft Position Sensor (CMPS) is a hall sensor and detects the camshaft position by using a hall element. It is related with Crankshaft Position Sensor (CKPS) and detects the piston position of the each cylinder which the CKPS can’t detect. The 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. When teeth on the target wheel trigger the sensor, output voltage is 12V. If not, it is 0V. These CMPS signal is sent to the ECM/PCM and it uses CMPS signals for determining the ignition timing with CKPS signals. CMPS makes Sequential Injection possible.

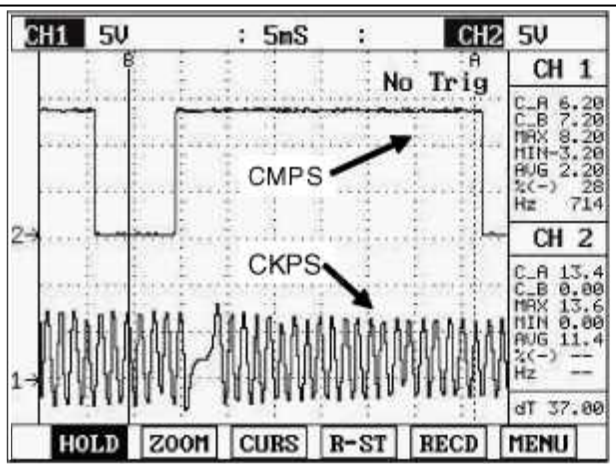
DTC DESCRIPTION

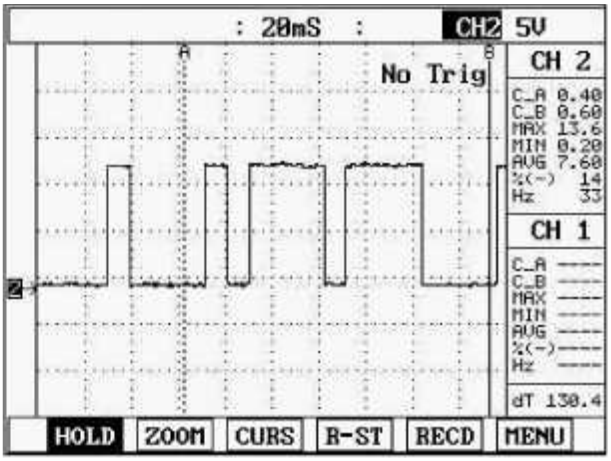
If the signal input is low with no phase edge over 12 times, ECM/PCM sets DTC P0342.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check	• Poor connection • Short to ground in signal circuit • CMPS • ECM/PCM
Enable Conditions	• Sensor signal requested	
Threshold Value	• Signal low and no phase edge > 12 times	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



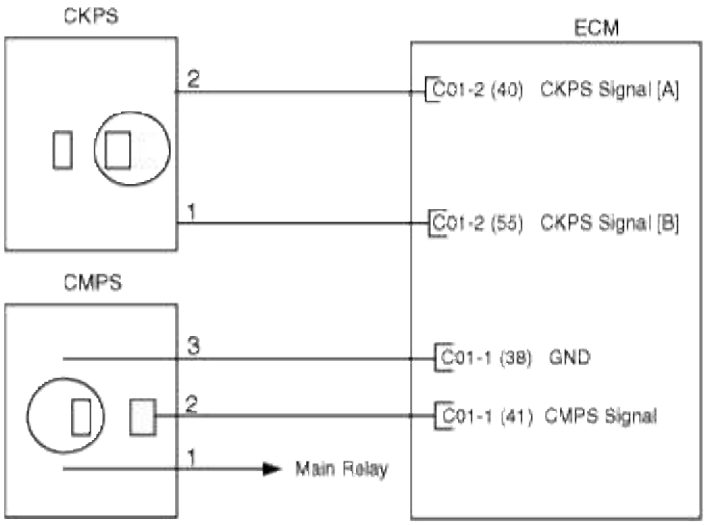


This example shows a typical Crankshaft Position Sensor(CkPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ignition timing by using these signals. Generally CkPS signal is used to detect the piston's position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

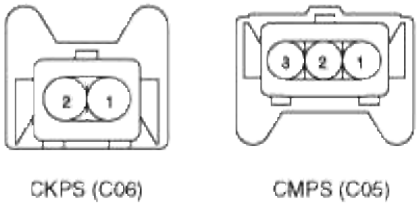


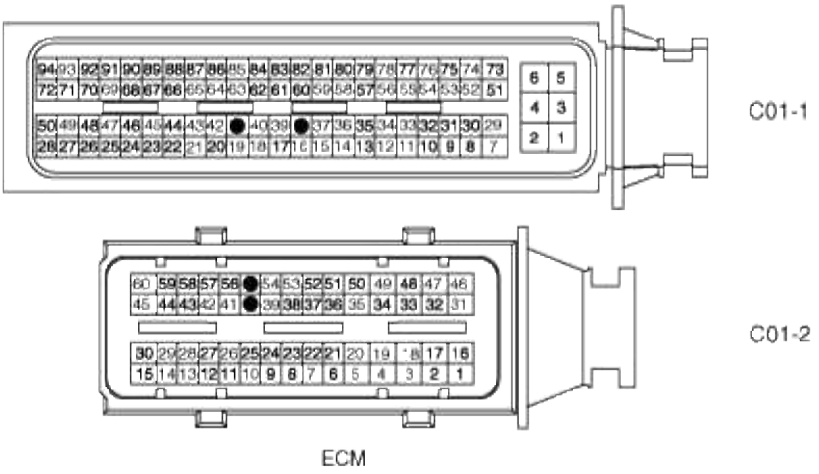
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

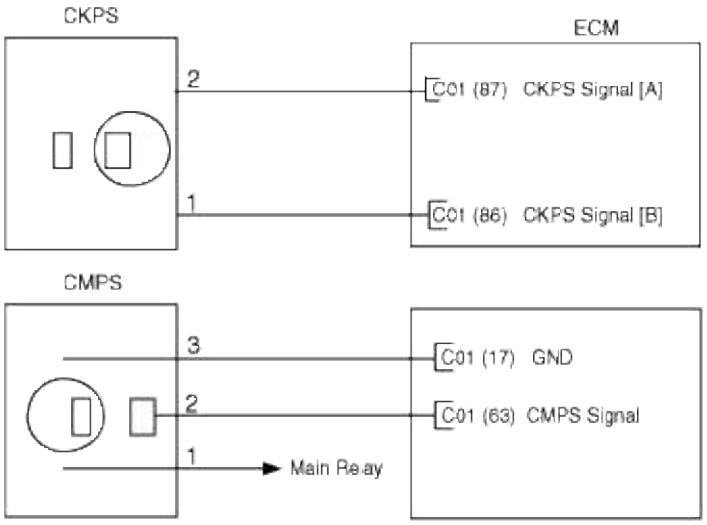
[HARNESS CONNECTOR]





(M/T)

[CIRCUIT DIAGRAM]

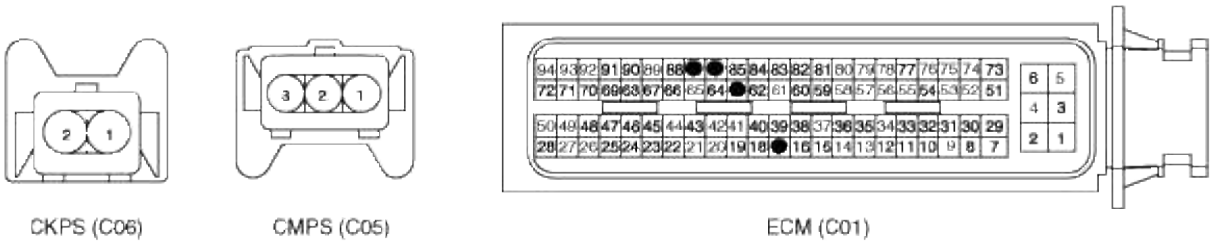


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

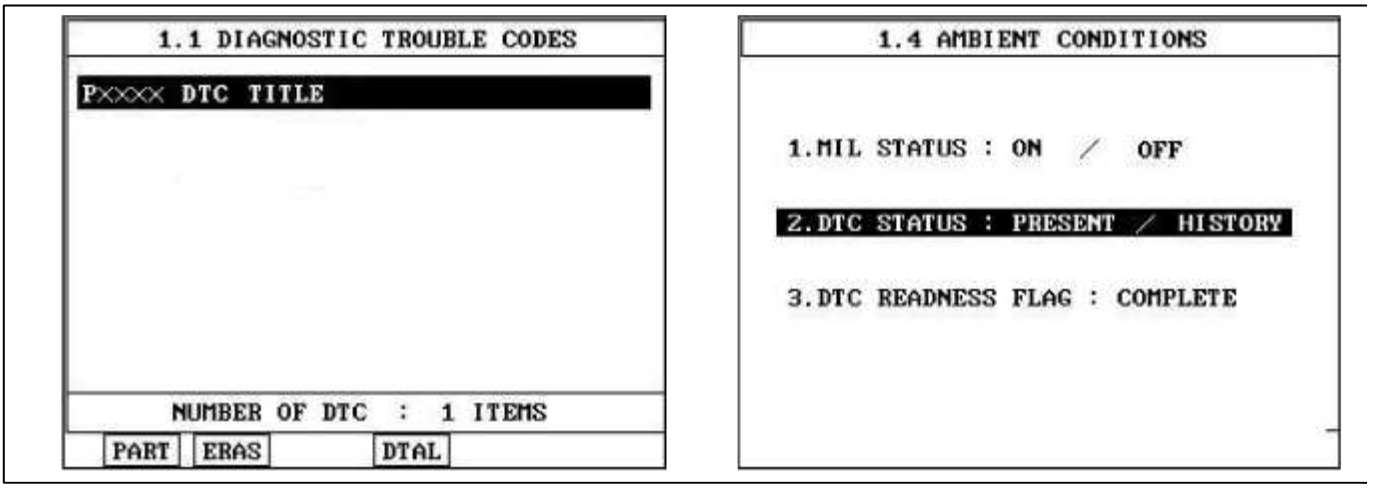
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

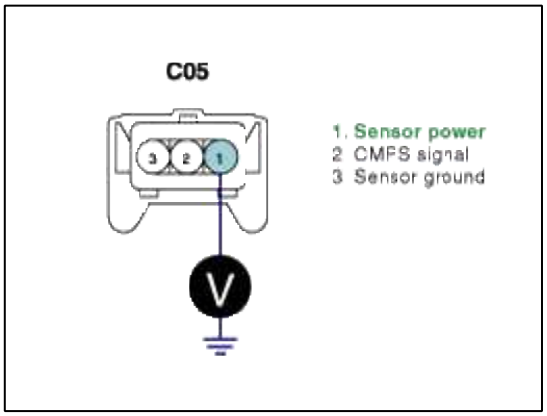
NO

Go to "CMPS Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CMPS connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of CMPS harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

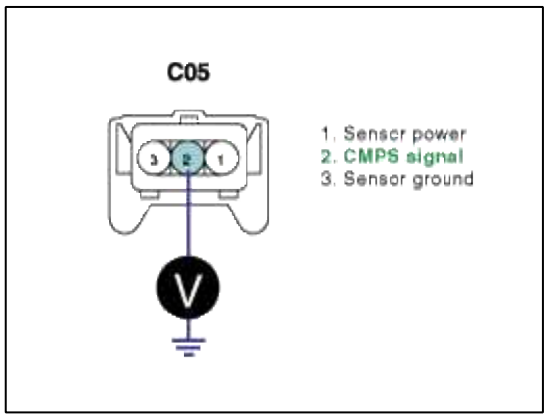
NO

Repair Open or Short circuit and then, go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check Short in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CMPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 2 of CMPS harness connector and chassis ground.

   Specification : Approx 12V



   (5) Is the measured voltage within specification?

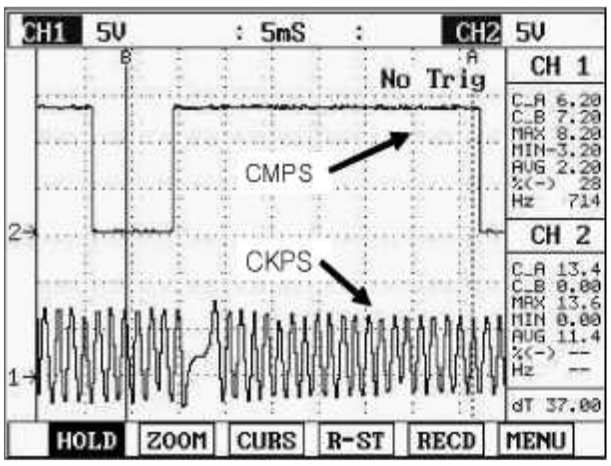
   YES
   Go to "Component Inspection" procedure.

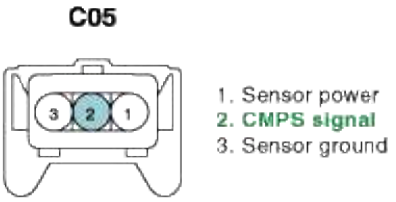
   NO
   Repair Short to ground in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. CMPS check.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 2 of CMPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :





(4) Is the signal waveform within specifications?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, rep ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good CMPS and check for proper operation. If the problem is corrected, replace CMPS and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

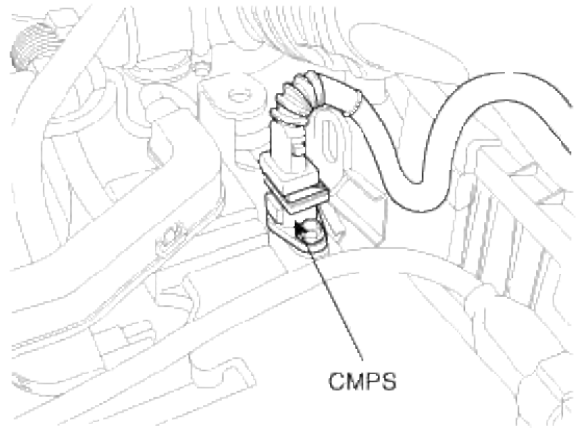
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0343 Camshaft Position Sensor A Circuit High Input (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

Camshaft Position Sensor (CMPS) is a hall sensor and detects the camshaft position by using a hall element. It is related with Crankshaft Position Sensor (CKPS) and detects the piston position of the each cylinder which the CKPS can’t detect. The 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. When teeth on the target wheel trigger the sensor, output voltage is 12V. If not, it is 0V. These CMPS signal is sent to the ECM/PCM and it uses CMPS signals for determining the ignition timing with CKPS signals. CMPS makes Sequential Injection possible.

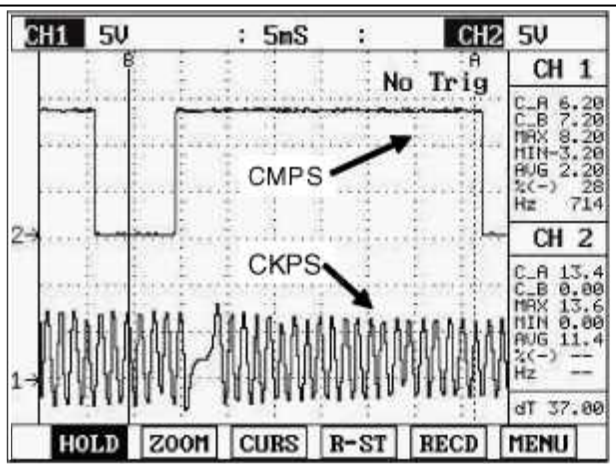
DTC DESCRIPTION

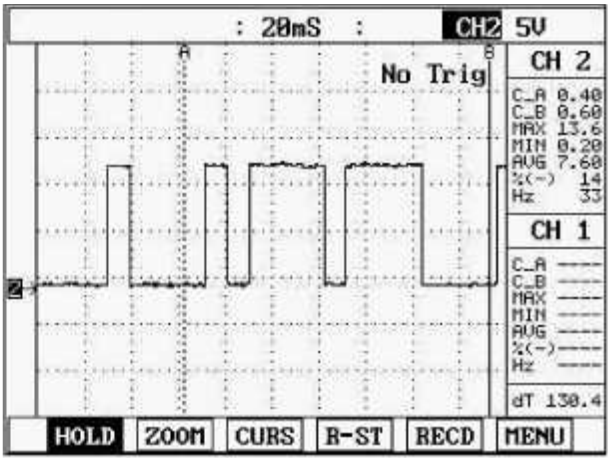
If the signal input is high with no phase edge over 12 times, ECM/PCM sets DTC P0343.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check	• Poor connection • Open in signal/ground circuit • Short to power in signal circuit • CMPS • ECM/PCM
Enable Conditions	• Sensor signal requested	
Threshold Value	• Signal high and no phase edge > 12 times	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



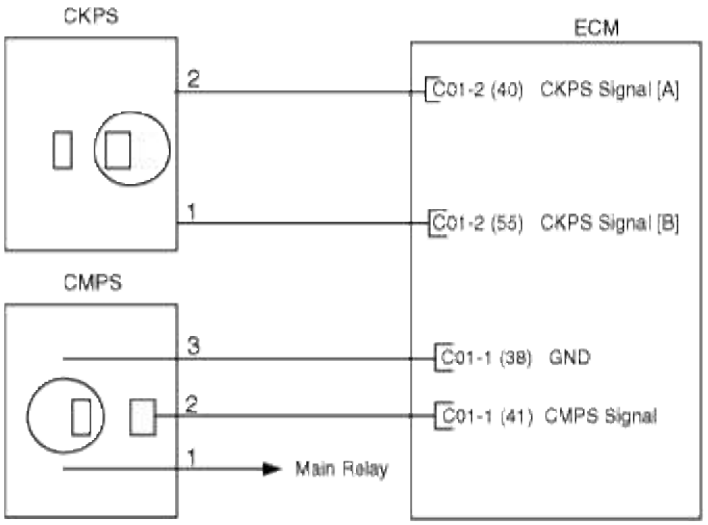


This example shows a typical Crankshaft Position Sensor(CkPS) and Camshaft Position Sensor(CMPS) waveform at idle. The PCM controls the injection and ignition timing by using these signals. Generally CkPS signal is used to detect the piston' s position and CMPS signal is used to detect the Top Dead Center of each cylinder.

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

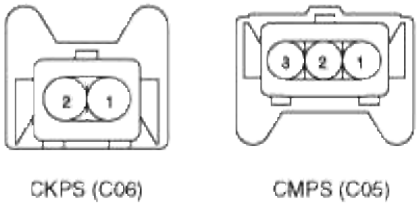


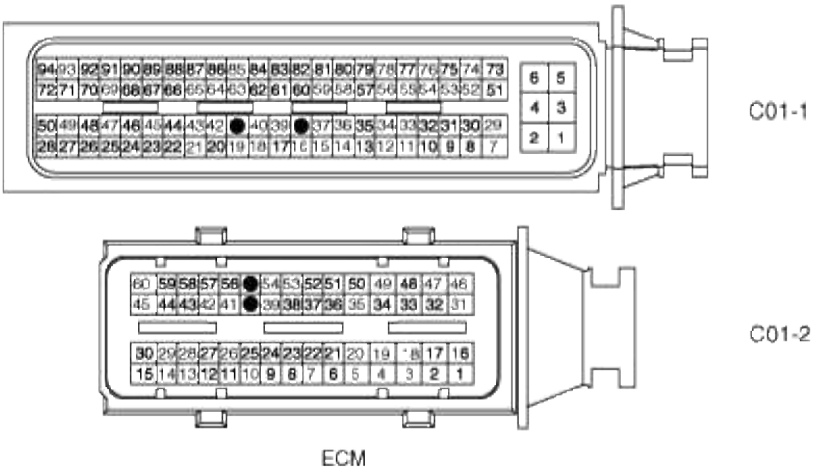
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (55)	CKPS Signal [B]
2	ECM C01-2 (40)	CKPS Signal [A]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-1 (41)	CMPS Signal
3	ECM C01-1 (38)	Sensor Ground

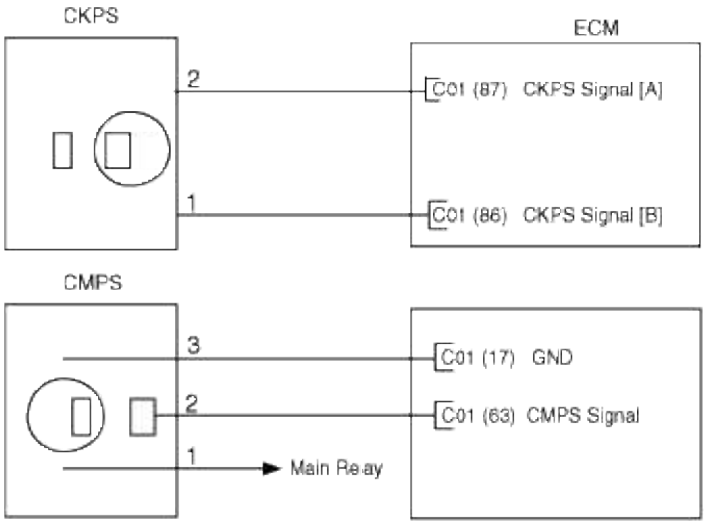
[HARNESS CONNECTOR]





(M/T)

[CIRCUIT DIAGRAM]

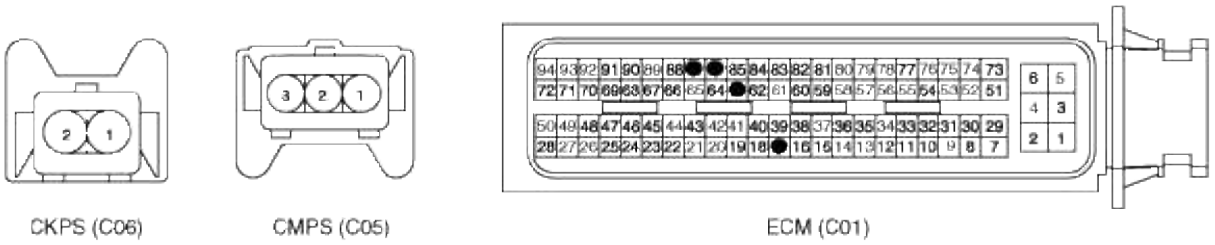


[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (86)	CKPS Signal [B]
2	ECM C01 (87)	CKPS Signal [A]

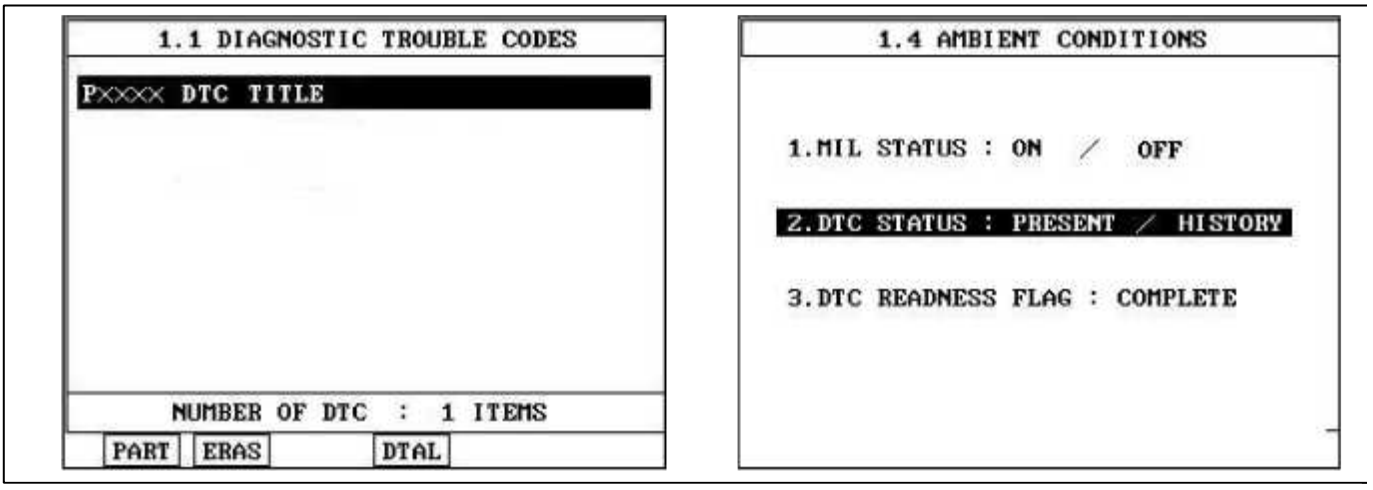
Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (63)	CMPS Signal
3	ECM C01 (17)	Sensor Ground

[HARNESS CONNECTOR]



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

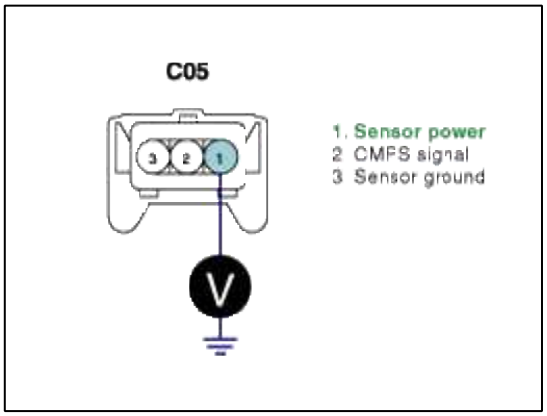
NO

Go to "CMPS Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CMPS connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of CMPS harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Ground circuit inspection" procedure.

NO

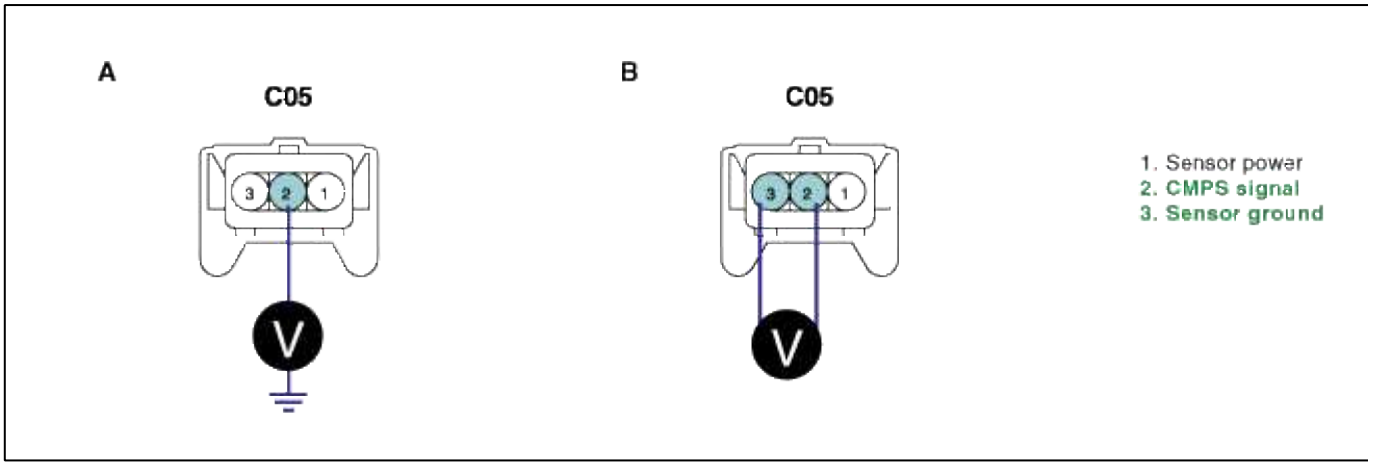
Repair Open or Short circuit and then, go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Key "OFF".

2. Disconnect CMPS connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of CMPS harness connector and chassis ground.(A)
5. Measure the voltage between terminal 2 and 3 of CMPS harness connector.(B)

Specification : "A" - "B" = Below 200mV



6. Is the measured voltage within specification?

YES

Go to "Signal circuit inspection" procedure.

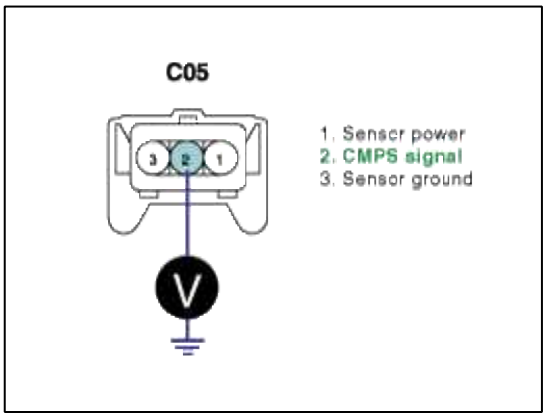
NO

Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check Open in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CMPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 2 of CMPS harness connector and chassis ground.

   Specification : Approx 12V



   (5) Is the measured voltage within specification?

YES

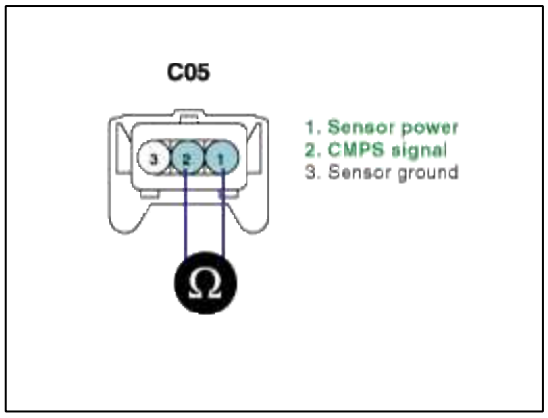
Go to "Short to power circuit inspection" procedure.

NO

Repair Open in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

2. Check Short to power in signal circuit.
   (1) Key "OFF".
   (2) Disconnect CMPS connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 1 and 2 of CMPS harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specifications?

   YES

   Go to "Component inspection" procedure.

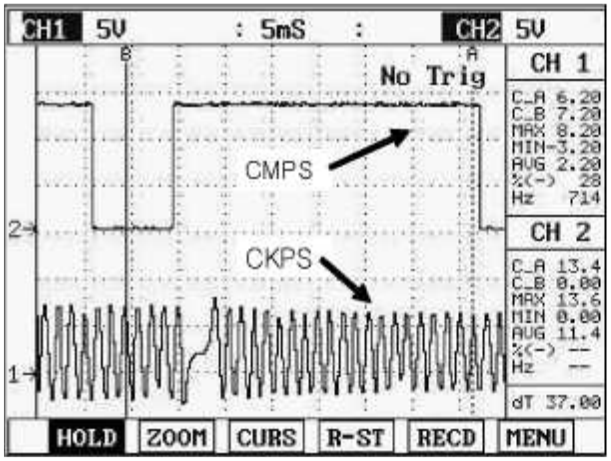
   NO

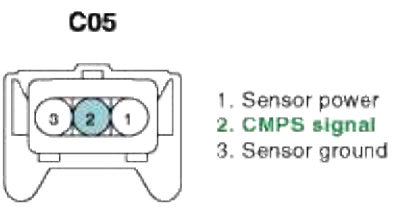
   Repair Short to power in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. CMPS check.
   (1) Key "ON". (Don't disconnect sensors.)
   (2) Select "vehicle scopemeter" in the menu, and connect channel A of scantool with terminal 2 of CMPS harness connector.
   (3) Engine start. And check the signal waveforms.

   Specification :





(4) Is the signal waveform within specifications?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, rep ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good CMPS and check for proper operation. If the problem is corrected, replace CMPS and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0420 Catalyst System Efficiency below Threshold (Bank 1)

GENERAL DESCRIPTION

The catalyst's efficiency is demonstrated by its ability to oxidize CO and hydrocarbon emissions. The ECM/PCM compares the output signals of the front and rear oxygen sensors to determine whether the output of the rear sensor is beginning to match the output of the front oxygen sensor. Air/fuel mixture compensation keeps the frequency of the front oxygen sensor high due to the changes from rich-to-lean combusition. The catalyst causes the rear oxygen sensor to have a lower frequency. As the catalyst wears, the rear oxygen sensor's signal trace begins to match the front oxygen sensor's signal trace. That is because the catalyst becomes saturated with oxygen and cannot use the oxygen to convert hydrocarbon and CO into H O and CO with the same efficiency as when it was new. A completely worn catalyst shows a 100% match between the frequency of the front and rear sensors.

DTC DESCRIPTION

If amplitude of B1S2 is over 0.5 voltage during 60 sec under enable conditions, ECM/PCM sets DTC P0420.

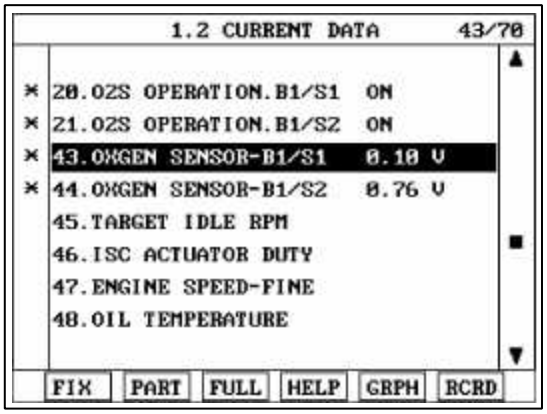
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Oxygen storage capacity	• Exhaust system • B1S2 • Catalyst converter • ECM/PCM
Enable Conditions	• Engine speed 1200~3000rpm • Engine load 15~50% • Catalyst temp.(model) 470~700°C (878~1292°F) • Purge factor (high load canister) < 12 • Closed loop control	
Threshold Value	• Amplitude of downstream O2 sensor signal > 0.5	
Diagnostic Time	• 60 sec	
MIL ON Condition	• 2 driving cycle	

B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "B1S1 and B1S2" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System Inspection" procedure.

SYSTEM INSPECTION

1. Exhaust gas system check.
   (1) Visual check.
      A. Check air leakage at junction of HO2S or Catalyst converter.
      B. Check looseness, poor connection, or damage.
   (2) Is there something wrong?
      YES
      Repair as necessary and then, go to "Verification of Vehicle Repair" procedure.
      NO
      Go to "Component inspection" procedure.

COMPONENT INSPECTION

1. Rear HO2S(B1S2) check.
   (1) B1S2 visual check
      A. Check assembling state of B1S2. (Check the interference between sensor wiring and exhaust pipe.)
      B. Check corrosion, contamination, or damage on sensor terminal and connector.
   (2) Is there something wrong?
      YES
      Repair as necessary and then, go to "Verification of Vehicle Repair" procedure.
      NO
      Go to "Catalyst converter check" procedure.
2. Catalyst converter check.
   (1) Catalyst converter visual check.
      A. Check discoloration by over-heating.
      B. Check deflection or crack(hole).
      C. Check noise.
   (2) Check whether the catalyst converter is genuine.
   (3) Is there something wrong?
      YES
      Substitute with a known-good Catalyst Converter and check for proper operation. If the problem iscorrected, replace Catalyst Converter and then go to "Verification of Vehicle Repair" procedure.
      NO
      Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?
   YES
   Go to the applicable troubleshooting procedure.
   NO
   System is performing to specification at this time.

Fuel System > Troubleshooting > P0442 Evaporative Emission System-Leak detected (small leak)

GENERAL DESCRIPTION

Due to the increasing ambient temperature of the fuel, fuel vapors are generated in the tank. In order to control the release of these vapors to the atmosphere, the evaporative emissions control system is used. The evaporative emission control system reduces hydrocarbon (HC) emissions by trapping fuel tank vapors until they can be burned in the combustion process. Evaporating fuel is stored in a charcoal canister until it can be flushed into the intake manifold. The evaporative emission control system is made up of a fuel tank that can be completely sealed from outside air, a Fuel Tank Pressure Sensor (FTPS), a Canister Close Valve (CCV) that seals the canister from the outside air, a canister filled with activated charcoal granules, a Purge Control Solenoid Valve (PCSV). The evaporative emission system can be checked for leaks by sealing the system off from the outside air, creating a vacuum, and monitoring if the system can hold that vacuum sufficiently for a set amount of time. If it cannot, a leak exists somewhere in the system.

DTC DESCRIPTION

This test detects a leak by measuring an increase of vacuum in the fuel evaporative system. A leak in evaporative system can allow hydrocarbons to leak from the tank to the atmosphere when the engine is off. The test should be calibrated to detect a 0.02” ~ 0.04” (0.5 ~ 1mm) leak.
If there is a small leak above the threshold value in the fuel evaporative system, ECM/PCM sets P0442.

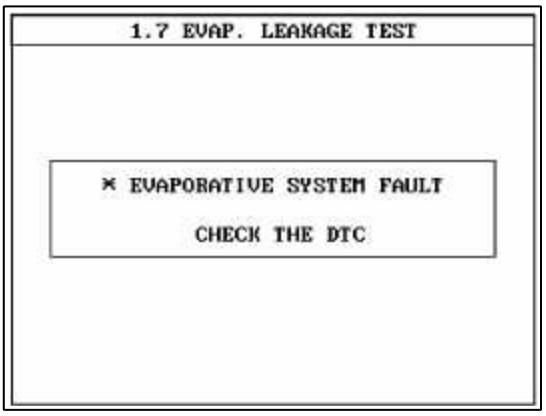
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Fuel tank pressure behavior (small leak)	• Fuel line or Evaporative Emission System line leakage check • PCSV / CCV / Canister / Fuel Tank leakage check • ECM/PCM
Enable Conditions	• Time after engine start > 600sec. • Idle speed controller activated • Mixture adaptation activated • Coolant temperature at start - ambient temperature < 6.6°C (11.88°F) • Ambient temperature : 4~35°C (39.2 ~ 95°F) • Ambient pressure >680hPa (10 lbf/in²) • Fuel level : 6.45 ~ 38.7 L (1.7 ~ 10.2 gal) • Tank ventilation must be active >10sec. • No misfire	
Threshold Value	• Pressure gradient when the intrusive diagnosis activated>threshold f (fuel level)	
Diagnostic Time		
MIL ON Condition	• 2 Driving Cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable)
2. Warm -up the engine to normal operatig temperature.
3. Erase DTC currently displayed.

4. Perform the "EVAP. LEAKAGE TEST" with scantool.



5. Is the same DTC displayed after "EVAP. LEAKAGE TEST" has done ?

YES

Go to "System Insepction" procedure.

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure

SYSTEM INSPECTION

1. Check evaporative emission system
   (1) Visually checks connections and components for leakage the evaporative emission system as follows.
      A. Between Surge tank and PCSV.
      B. Between PCSV and Canister
      C. Between Canister and CCV
      D. Between Canister and Fuel Tank.
   (2) Has a problem been found ?

      YES

      Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

      NO

      Go to "Check Leakage in Fuel Line" as follows.

2. Check Leakage in Fuel Line
   (1) Check that fuel cap is firmly tightened.
   (2) Check any damage or leakage in fuel line.
   (3) Has a problem been found ?

      YES

      Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

      NO

      Go to "Component Insepction" procedure.

COMPONENT INSPECTION

1. Check PCSV
   (1) Disconnect vacuum Hose connected between Surge tank and PCSV.
   (2) Connect vacuum pump to disconnected vacuum hose.
   (3) Does PCSV retain vacuum ?
   YES
   Go to "Check CCV" as follows.
   NO
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
2. Check CCV
   (1) Disconnect vacuum hose between Canister and CCV from Canister
   (2) Connect a vacuum pump and apply vacuum to each hose.
   (3) Does CCV retain vacuum ?
   YES
   Repair or replace as necessary and then, go to "Verification of Vehile Repair" procedure.
   NO
   Go to "Check canister" as follows.
3. Check Canister
   (1) Disconnect vacuum hoses connected to canister.
      A. Check any damage or leakage on vacuum hose between Canister and CCV.
      B. Check any damage or leakage on vacuum hose betwen Canister and Fuel Tank.
      C. Check any damage or leakage on vacuum hose between Canister and PCSV.
   (2) Connect vacuum gauge to one of vacuum hoses and apply vacuum one by one.(The rest of vacuum hose should be blocked.)
   (3) Is the vacuum retained ?
   YES
   Go to "Check Fuel Tank" as follows.
   NO
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
4. Check Fuel Tank.
   (1) Check any damage or leakage on Fuel Tank.
   (2) Has a problem been found ?
   YES
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
   NO
   Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

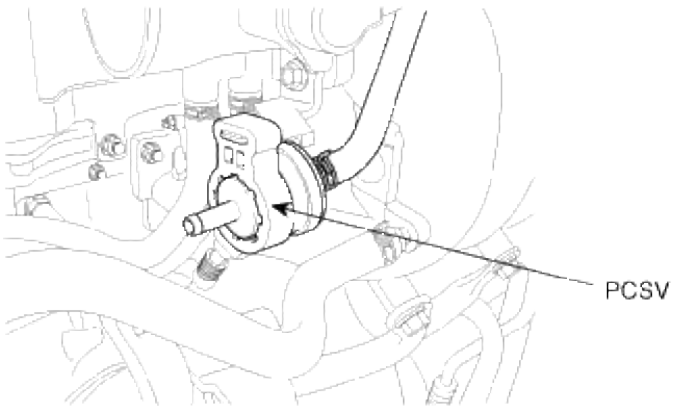
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0444 Evaporative Emission System-Purge Control Valve Circuit Open

COMPONENT LOCATION



GENERAL DESCRIPTION

The purge control solenoid valve (PCSV) is a device used to meter vapor flow to the engine. The ECM/PCM controls the PCSV using a duty cydle signal.

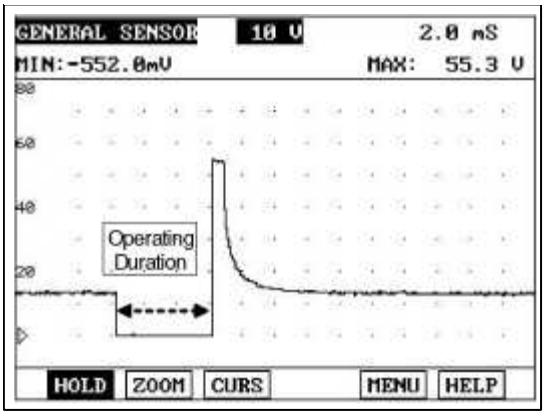
DTC DESCRIPTION

If there is Open in PCSV circuit, ECM/PCM sets DTC P0444.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or Short to ground in power circuit • Open in control circuit • PCSV • ECM/PCM
Enable Conditions		
Threshold Value	• Disconnected	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

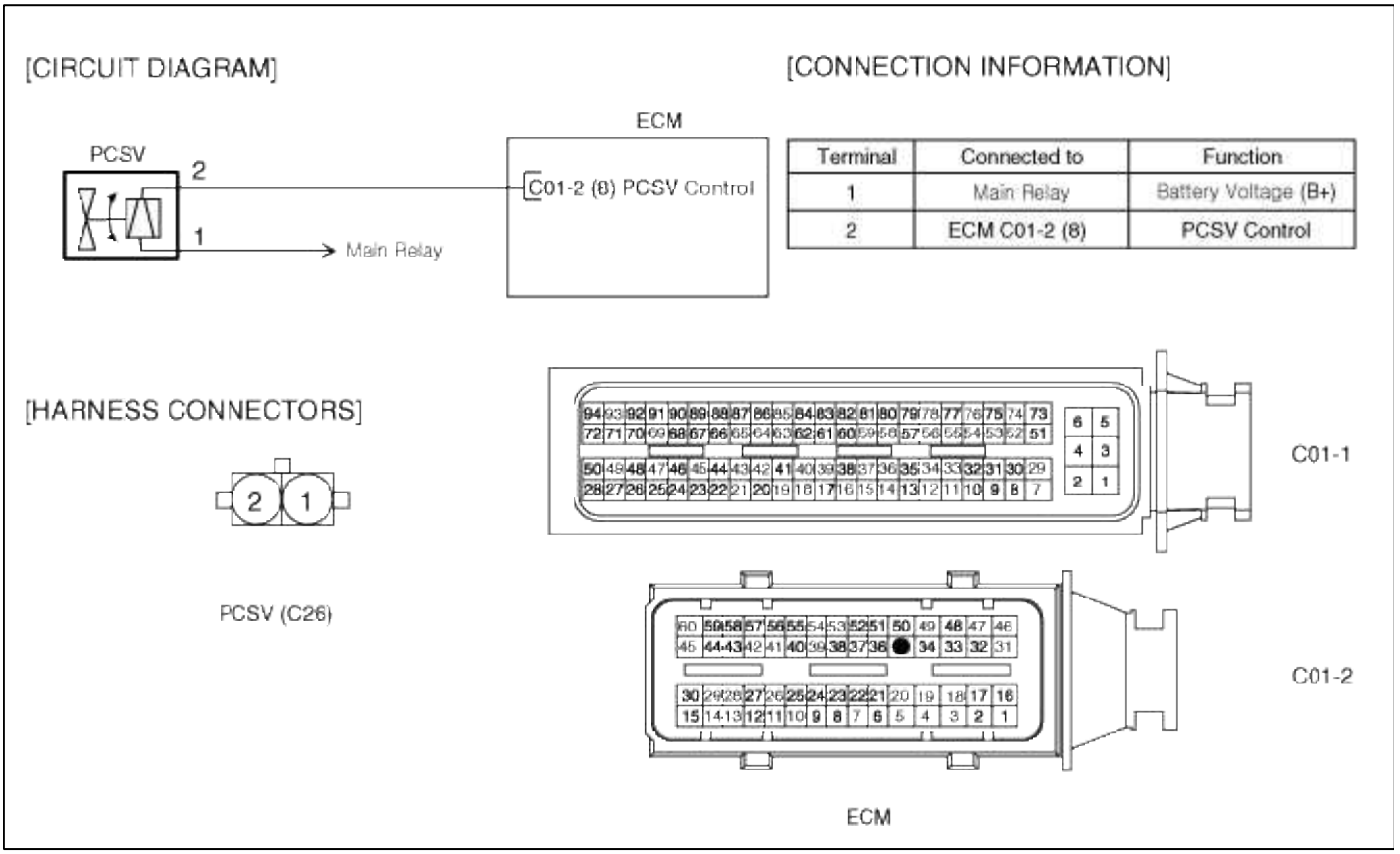


SPECIFICATION

Item	Specification
PCSV Coil Resistance	16Ω at 20°C (68°F)

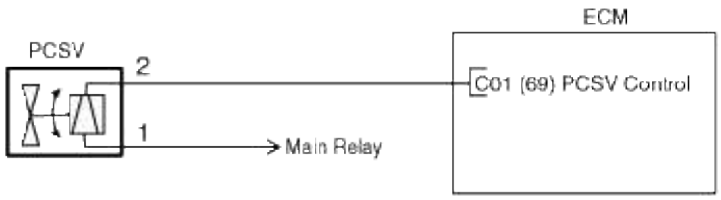
SCHEMATIC DIAGRAM

(A/T)



(M/T)

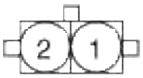
[CIRCUIT DIAGRAM]



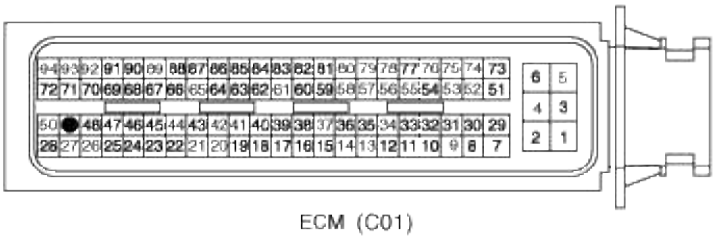
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (69)	PCSV Control

[HARNESS CONNECTORS]



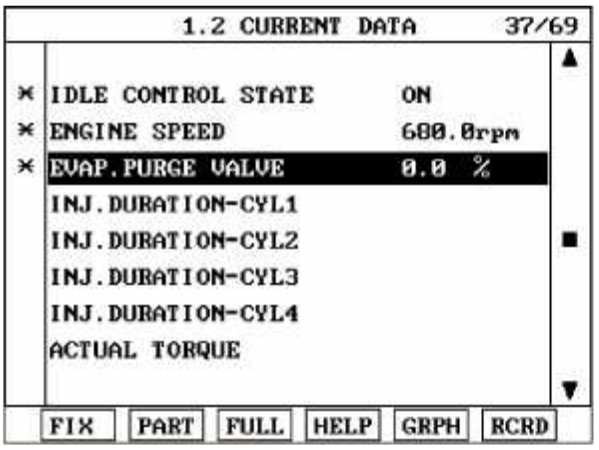
PCSV (C26)

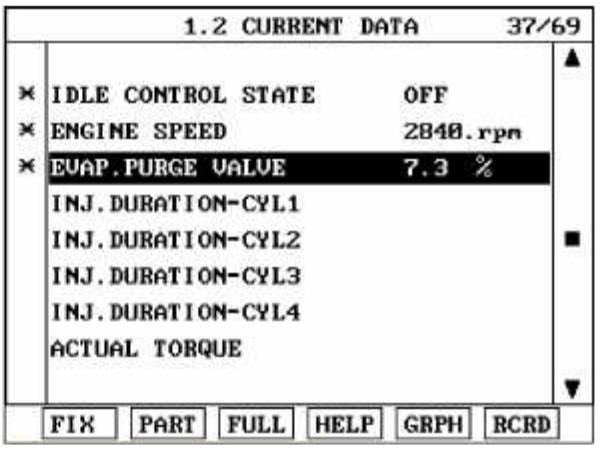


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "PCSV" parameters on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

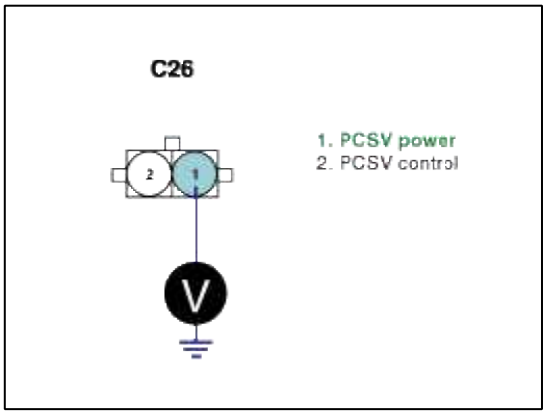
NO

Go to "PCSV circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect PCSV connector.
3. key "ON".
4. Measure the voltage between terminal 1 of PCSV harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Control circuit inspection" procedure.

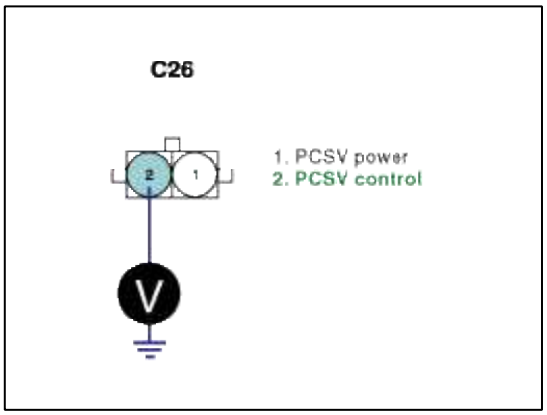
NO

Repair Open or Short to ground circuit and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect PCSV connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of PCSV harness connector and chassis ground.

Specification : Approx 3.5V



5. Is the measured voltage within specification?

6. Go to "Component inspection" procedure.

NO

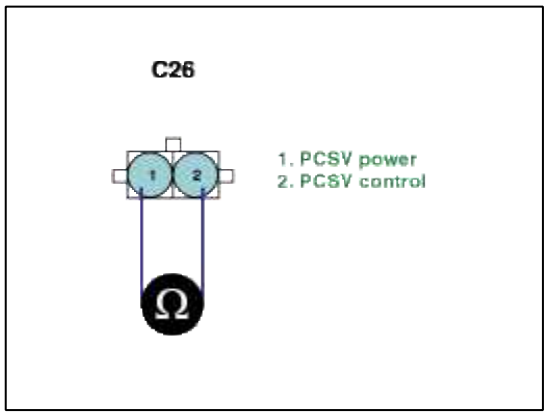
Repair Open circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. PCSV check.
   (1) Key "OFF".
   (2) Disconnect PCSV harness connector.
   (3) Measure the resistance between terminal 1 and 2 of PCSV harness connector.(Component side)

Specification :

Item	Specification
PCSV Coil Resistance	16Ω at 20°C (68°F)



   (4) Is the measured resistance within specification?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

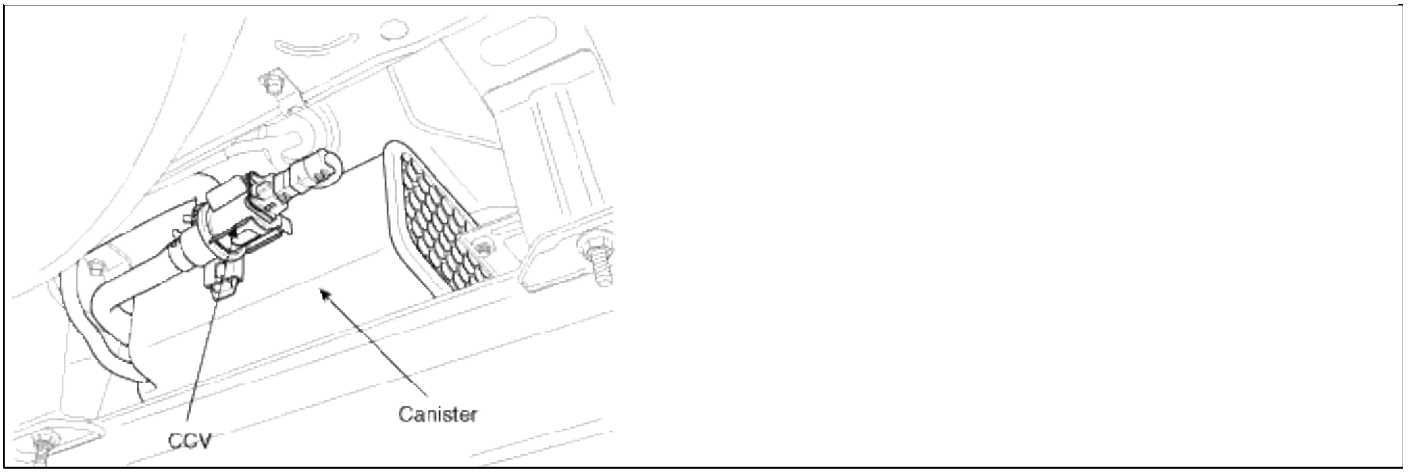
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0446 Evaporative Emission System-Vent Control Circuit

COMPONENT LOCATION



GENERAL DESCRIPTION

The evaporative emissions system prevents hydrocarbon (HC) vapors from the fuel tank from escaping into the atmosphere where they could form photochemical smog. Gasoline vapors are collected in the charcoal canister. The Canister Close Valve (CCV) closes off the air inlet into the canister for leak detection of the evaporative emissionsystem. The CCV also prevents fuel vapors from escaping from the canister. When the engine purges the HC vapors from the canister, the clean air comes into the canister through the canister air-filter and the CCV.

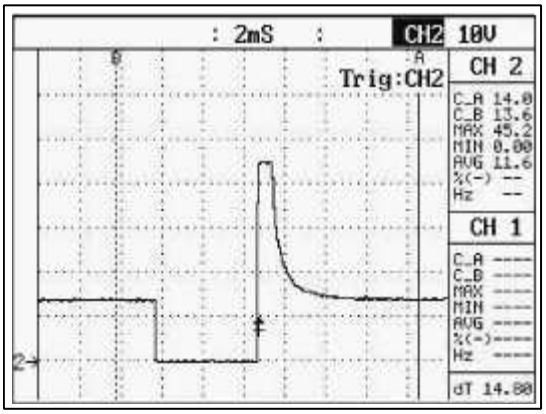
DTC DESCRIPTION

Following a negative pressure test, the ECM/PCM opens the CCV. At that time, fuel tank pressure is monitored to ensure return to ambient pressure. If the fuel tank pressure does not return to ambient pressure, P0446 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Fuel tank pressure behavior (CCV stuck closed)	• Poor connection • CCV • ECM/PCM
Enable Conditions	• Time after engine start > 600sec. • Idle speed controller activated • Mixture adaptation activated • Coolant temperature at start - ambient temperature < 6.6°C (11.88°F) • Ambient temperature : 4~35°C (39.2 ~ 95°F) • Ambient pressure >680hPa (10 lbf/in²) • Fuel level : 6.45 ~ 38.7 L (1.7 ~ 10.2 gal) • Tank ventilation must be active >10sec. • No misfire • Not much evaporation in the fuel tank	
Threshold Value	• Fuel tank pressure does not go up to the ambient pressure, when the intrusive diagnosis activated	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

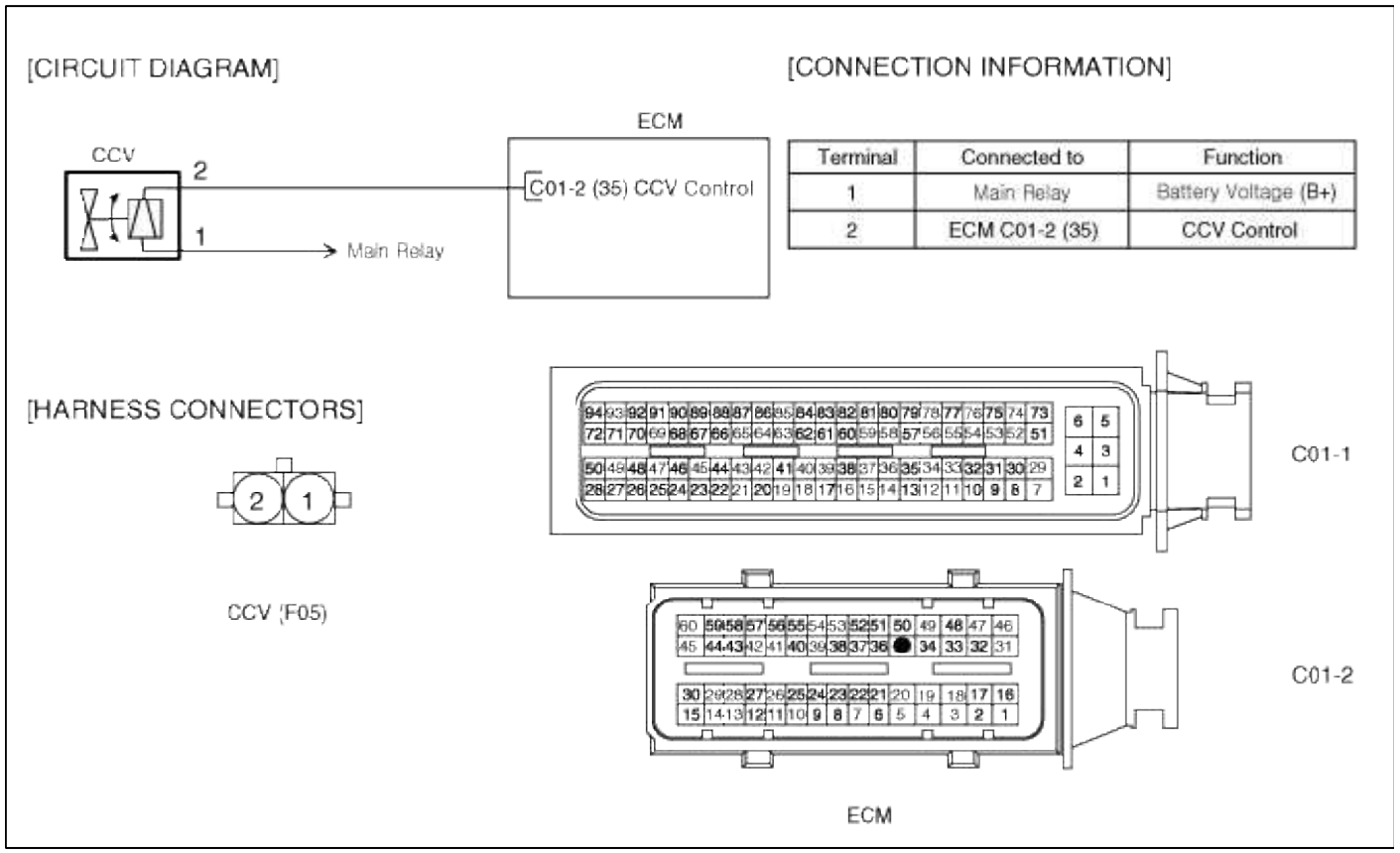


Specification

Item	Specification
CCV Coil Resistance	23.0 ~ 26.0Ω at 20°C (68°F)

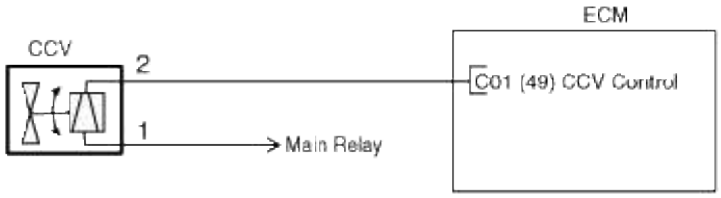
SCHEMATIC DIAGRAM

(A/T)



(M/T)

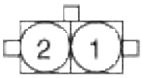
[CIRCUIT DIAGRAM]



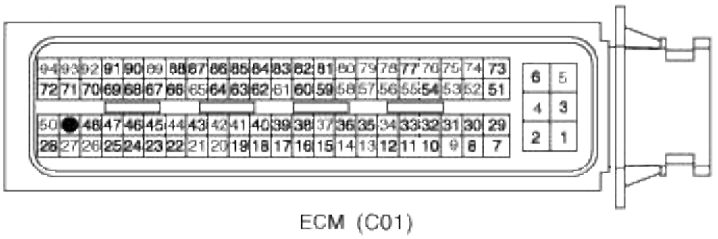
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (49)	CCV Control

[HARNESS CONNECTORS]



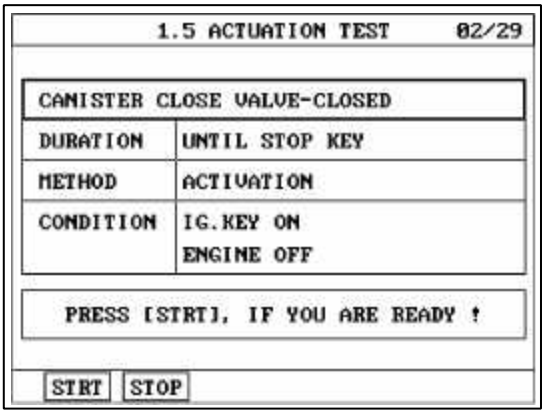
CCV (F05)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool on the DLC(Data Link Connector)
2. Perform Action Test for Canister Vent Solenoid Valve with scantool
3. Check that clicking sound can be heard by actuation test.



4. Is the CCV normal ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

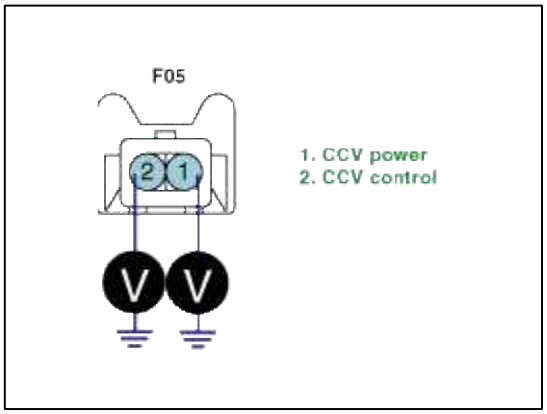
NO

Go to "CCV Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CCV connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of CCV harness connector and chassis ground.
   Measure the voltage between terminal 2 of CCV harness connector and chassis ground.

Specification : Terminal 1 B+
Terminal 2 Approx. 3.5V



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair as necessary, and then go to "Verification of Vehicle Repair" procedure.

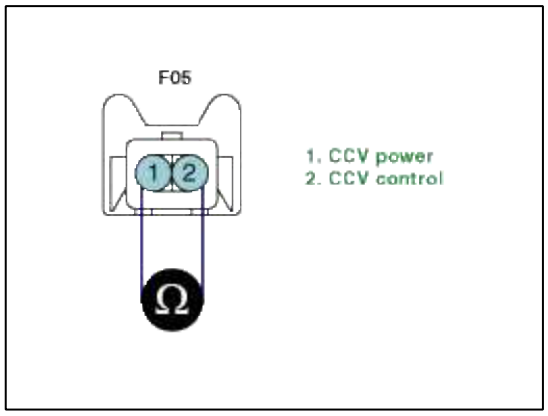
COMPONENT INSPECTION

1. CCV check.
   (1) Key "OFF".
   (2) Disconnect CCV harness connector.

(3) Measure the resistance between terminal 1 and 2 of CCV harness connector.(Component side)

Specification :

Item	Specification
CCV Coil Resistance	23.0 ~ 26.0Ω at 20°C (68°F)



(4) Is the measured resistance within specification?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good CCV and check for proper operation. If the problem is corrected, replace CCV and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0449 Evaporative Emission System-Vent Valve / Solenoid Circuit

COMPONENT LOCATION



GENERAL DESCRIPTION

The evaporative emissions system prevents hydrocarbon (HC) vapors from the fuel tank from escaping into the atmosphere where they could form photochemical smog. Gasoline vapors are collected in the charcoal canister. The Canister Close Valve (CCV) closes off the air inlet into the canister for leak detection of the evaporative emissionsystem. The CCV also prevents fuel vapors from escaping from the canister. When the engine purges the HC vapors from the canister, the clean air comes into the canister through the canister air-filter and the CCV.

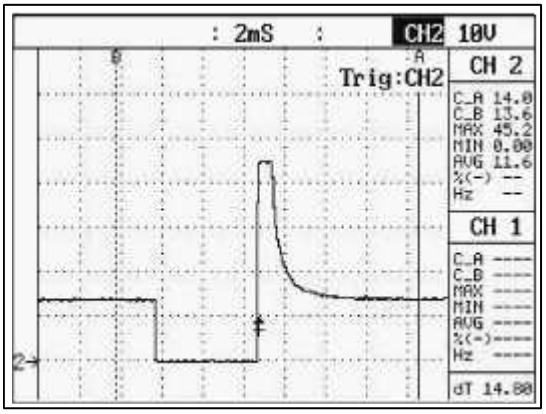
DTC DESCRIPTION

If there is Open in CCV circuit, ECM/PCM sets DTC P0449.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or Short to ground in power circuit • Open in control circuit • CCV • ECM/PCM
Enable Conditions		
Threshold Value	• Disconnected	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



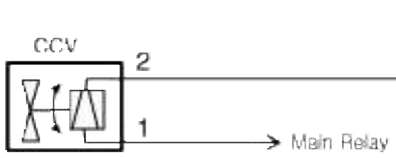
SPECIFICATION

Item	Specification
CCV Coil Resistance	23.0 ~ 26.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



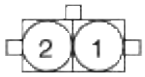
ECM

C01-2 (35) CCV Control

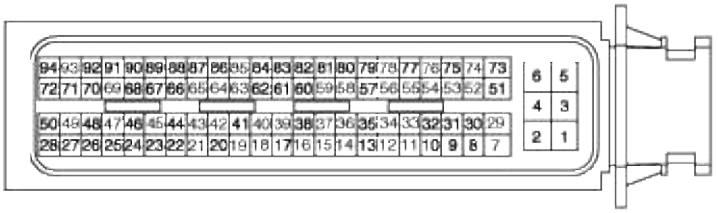
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (35)	CCV Control

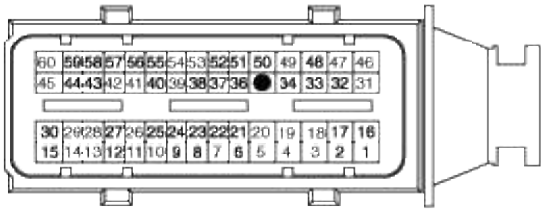
[HARNESS CONNECTORS]



CCV (F05)



C01-1

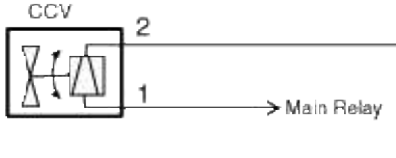


C01-2

ECM

(M/T)

[CIRCUIT DIAGRAM]



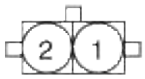
ECM

C01 (49) CCV Control

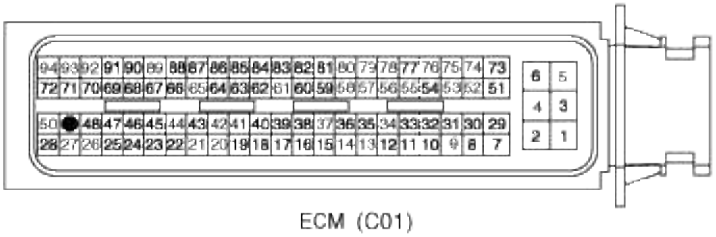
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (49)	CCV Control

[HARNESS CONNECTORS]



CCV (F05)

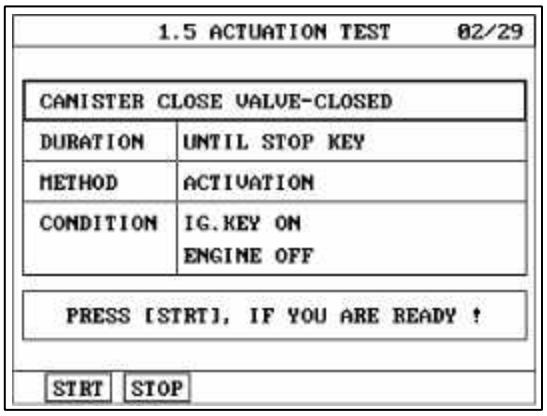


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool on the DLC(Data Link Connector)
2. Perform Action Test for Canister Vent Solenoid Valve with scantool

3. Check that clicking sound can be heard by actuation test.



4. Is the CCV normal ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

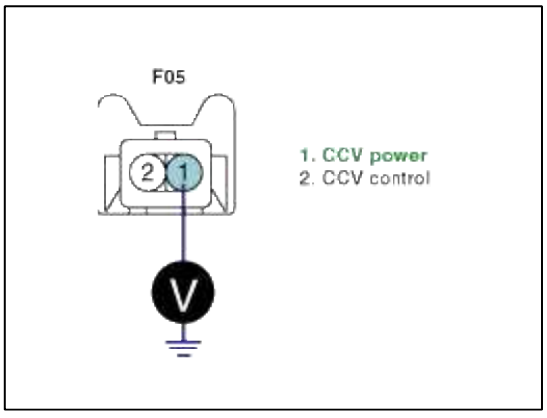
NO

Go to "CCV Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CCV connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of CCV harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Control circuit inspection" procedure.

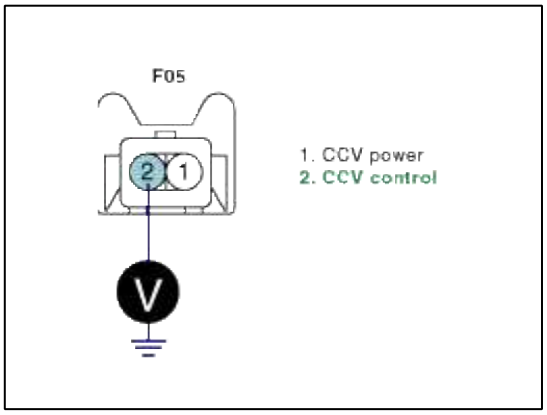
NO

Repair as necessary, and then go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CCV connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of CCV harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair as necessary, and then go to "Verification of Vehicle Repair" procedure.

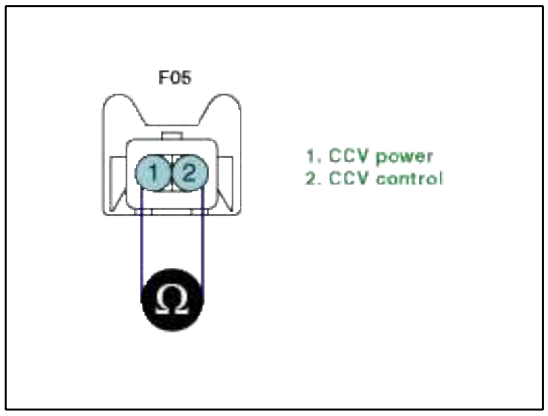
COMPONENT INSPECTION

1. CCV check.
   (1) Key "OFF".
   (2) Disconnect CCV harness connector.

(3) Measure the resistance between terminal 1 and 2 of CCV harness connector.(Component side)

Specification :

Item	Specification
CCV Coil Resistance	23.0 ~ 26.0Ω at 20°C (68°F)



(4) Is the measured resistance within specification?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good CCV and check for proper operation. If the problem is corrected, replace CCV and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

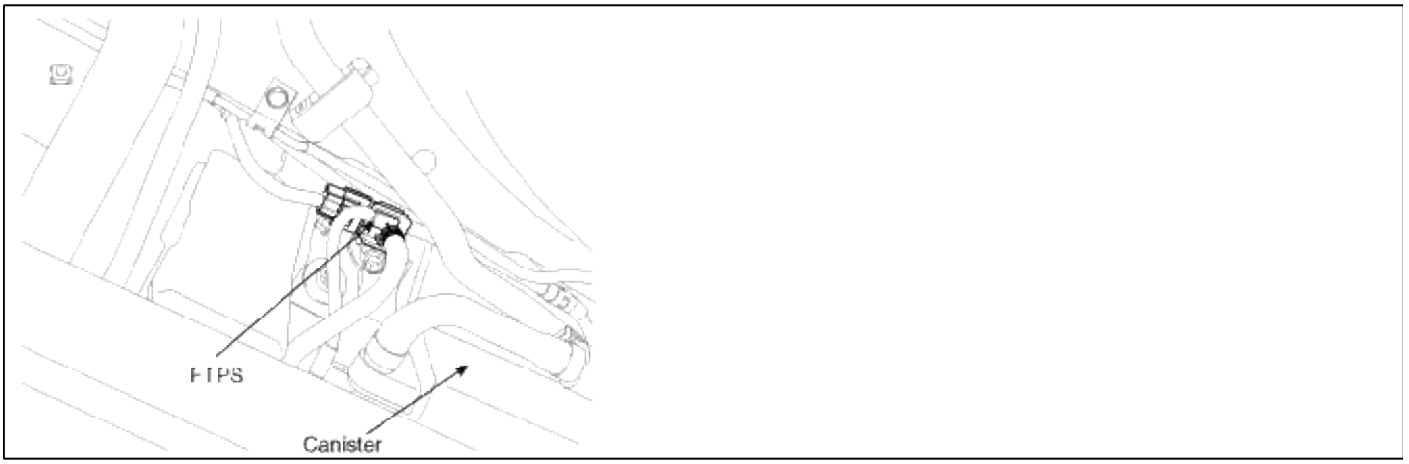
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0450 Evaporative Emission System Pressure Sensor/Switch

COMPONENT LOCATION



GENERAL DESCRIPTION

The evaporative emissions system prevents hydrocarbon (HC) vapors from the fuel tank from escaping into the atmosphere where they could form photochemical smog. The fuel tank pressure sensor is a component of the evaporative emission system.The Tank Pressure Sensor converts fuel tank pressure to a proportional analog voltage signal which is read by the engine controller for evaluation during execution of the Evaporative System Diagnostic. The Tank Pressure may be below atmospheric pressure (ie. a vacuum) or above atmospheric pressure.The fuel tank pressure is used to measure the difference between the air pressure (or vacuum) in the fuel tank and the ambient air pressure. ECM/PCM supplies a 5-volt reference and a ground to the sensor, which allows the sensor's output voltage to range from 0.1 to 4.9 volts.

DTC DESCRIPTION

If the differential tank pressure change is over 17 lbf/ft² during 25.5 sec under low speed condition, ECM/PCM sets DTC P0450.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Poor connection • FTPS • ECM/PCM
Enable Conditions	• Idle controller activated • Time after engine start >3.0 sec • Vehicle speed < 18.64 MPH	
Threshold Value	• Differential tank pressure change >8.13hPa(17 lbf/ft²)	
Diagnostic Time	• 15 sec	
MIL ON Condition	• 2 driving cycle	

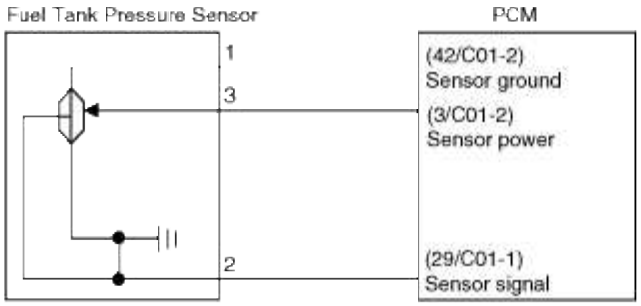
SPECIFICATION

FTPS	Normal Parameter		
Gauge pressure	-66.66 hpa(-139.2 lbf/ft²)	0 hpa	66.66 hpa (139.2 lbf/ft²)
Voltage	0.5 V	2.5 V	4.5 V

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

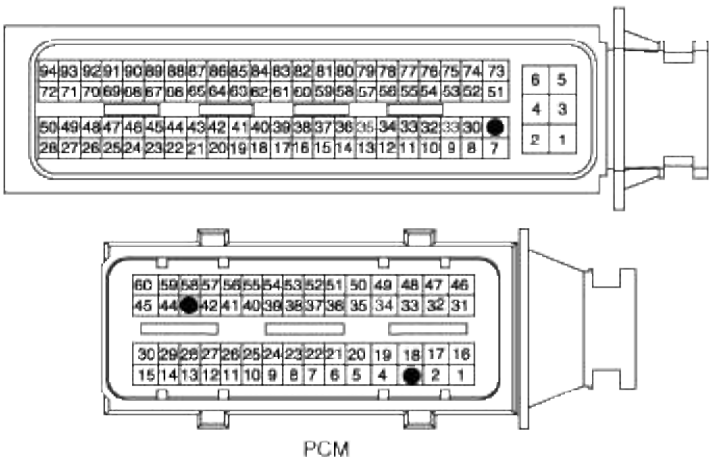
(A/T)

Terminal	Connected to	Funtion
1	PCM Terminal 42/C01-2	Sensor power (5V)
2	PCM Terminal 29/C01-1	Sensor ground
3	PCM Terminal 3/C01-2	FTPS signal

[HARNESS CONNECTORS]

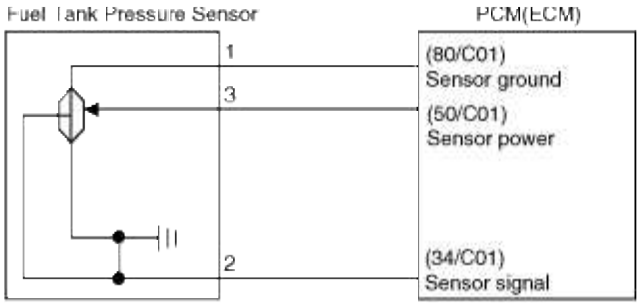


E22
FTPS



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

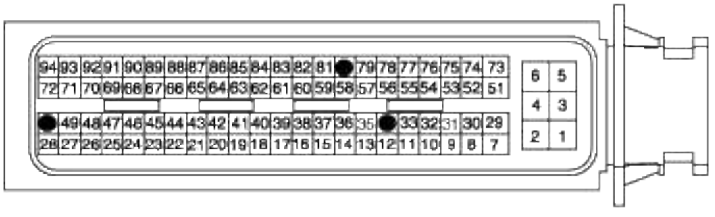
M/T

Terminal	Connected to	Funtion
1	ECM Terminal 80/C01	Sensor power (5V)
2	ECM Terminal 34/C01	Sensor ground
3	ECM Terminal 50/C01	FTPS signal

[HARNESS CONNECTORS]

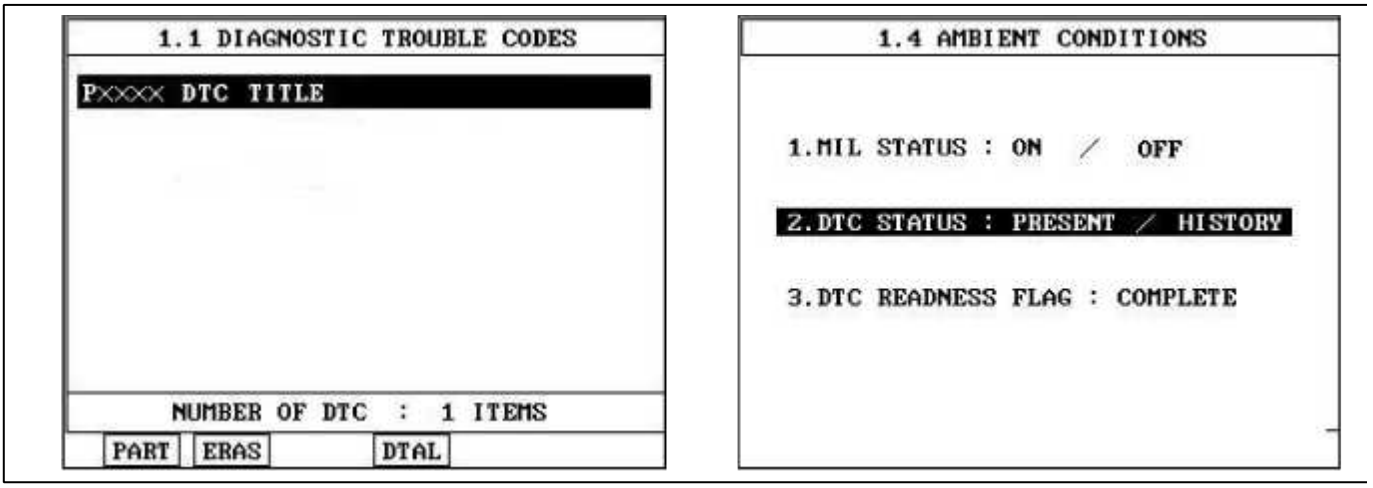


E22
FTPS



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

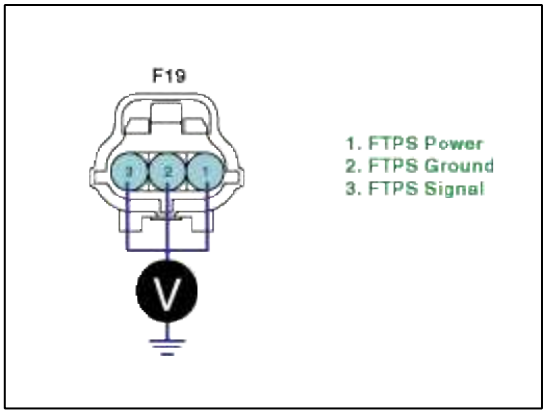
Go to " Circuit Voltage Check " procedure.

Circuit Voltage Check

1. IG "OFF" and disconnect FTPS connector.
2. IG "ON" & ENG "OFF"

3. Measure voltage between terminal 1 of FTPS harness connector and chassis ground.
   Measure voltage between terminal 2 of FTPS harness connector and chassis ground.
   Measure voltage between terminal 3 of FTPS harness connector and chassis ground.

Specification Terminal 1 Approx. 5V
Terminal 2 Approx. 0V
Terminal 3 Approx. 5V



4. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

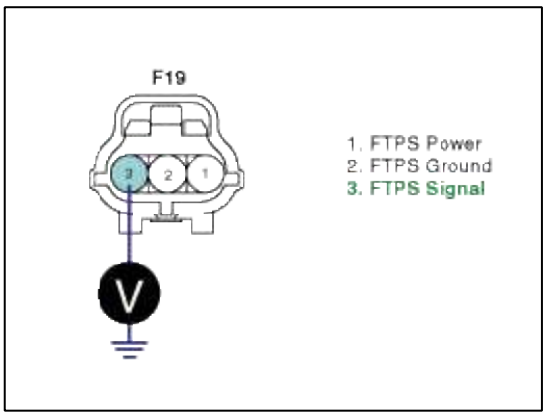
Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check FTPS
   (1) Key "ON".
   (2) Disassemble FTPS. (Don't disconnect FTPS connector.)
   (3) Connect the vacuum guage.
   (4) Measure the output voltage with using the vacuum guage.
   * Caution : Be careful while you do this procedure. FTPS would be damaged if you apply vacuum excessively.

Specification :

FTPS	Normal Parameter		
Gauge pressure	-66.66 hpa(-139.2 lbf/ft²)	0 hpa	66.66 hpa (139.2 lbf/ft²)
Voltage	0.5 V	2.5 V	4.5 V



(5) Is the measured voltage within specification ?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good FTPS and check for proper operation. If the problem is corrected, replace FTPS and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

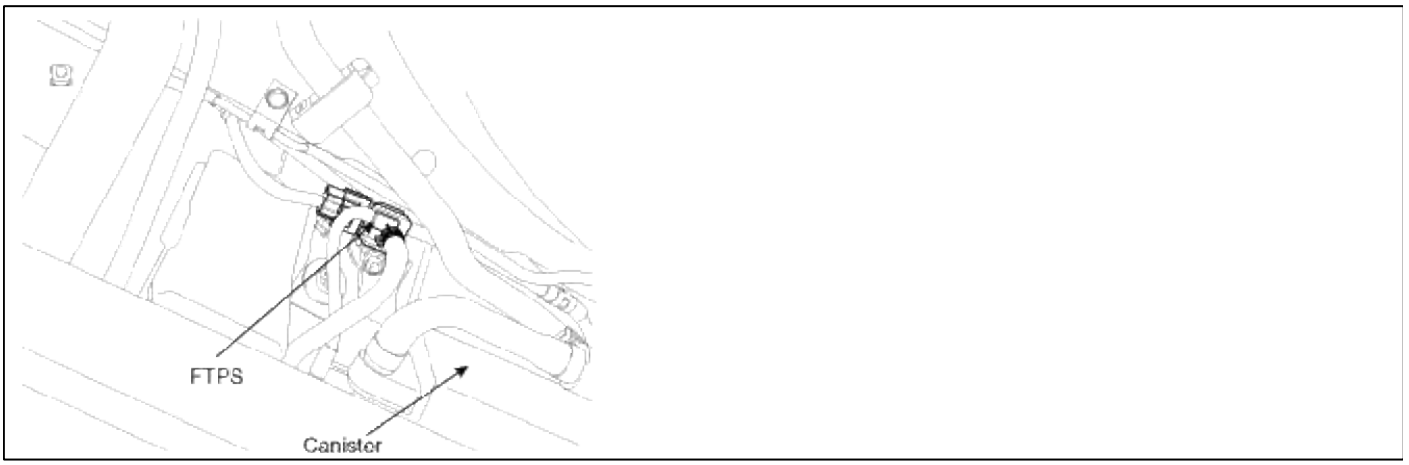
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0451 Evaporative Emission System-Pressure Sensor Range / Performance

COMPONENT LOCATION



GENERAL DESCRIPTION

The evaporative emissions system prevents hydrocarbon (HC) vapors from the fuel tank from escaping into the atmosphere where they could form photochemical smog. The fuel tank pressure sensor is a component of the evaporative emission system.The Tank Pressure Sensor converts fuel tank pressure to a proportional analog voltage signal which is read by the engine controller for evaluation during execution of the Evaporative System Diagnostic. The Tank Pressure may be below atmospheric pressure (ie. a vacuum) or above atmospheric pressure.The fuel tank pressure is used to measure the difference between the air pressure (or vacuum) in the fuel tank and the ambient air pressure. ECM/PCM supplies a 5-volt reference and a ground to the sensor, which allows the sensor’s output voltage to range from 0.1 to 4.9 volts.

DTC DESCRIPTION

If ECM/PCM detects the abnormal signal input of FTPS, ECM/PCM sets DTC P0451.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Rationality check	• Poor connection • FTPS • ECM/PCM
Case 1	Enable Conditions	• Idle controller activated	
	Threshold Value	• Filtered fuel tank pressure >20.0hPa (41.8 lbf/ft²)	
	Diagnostic Time	• 15 sec	
Case 2	Enable Conditions	• Time after engine start > 3.0s	
	Threshold Value	• Filtered fuel tank pressure < -30hPa (-62.7 lbf/ft²)	
	Diagnostic Time	• 15 sec	
Case 3	Enable Conditions	• Canister purge phase activated • Intake manifold press. / amb. press. < 0.62 • Ambient pressure > 680hPa (1420.21 lbf/ft²)	
	Threshold Value	• Counter of Δpressure < 0.8hPa(1.67 lbf/ft²) when the duty cycle of PCSV is increased more than 30%] ≥ 2 times	
	Diagnostic Time	• 15 sec	
MIL ONCondition		• 2 driving cycle	

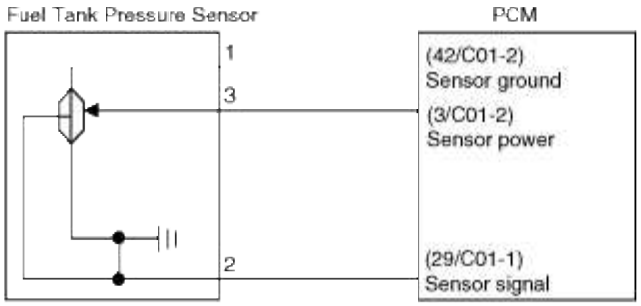
SPECIFICATION

FTPS	Normal Parameter		
Gauge pressure	-66.66 hpa(-139.2 lbf/ft²)	0 hpa	66.66 hpa (139.2 lbf/ft²)
Voltage	0.5 V	2.5 V	4.5 V

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

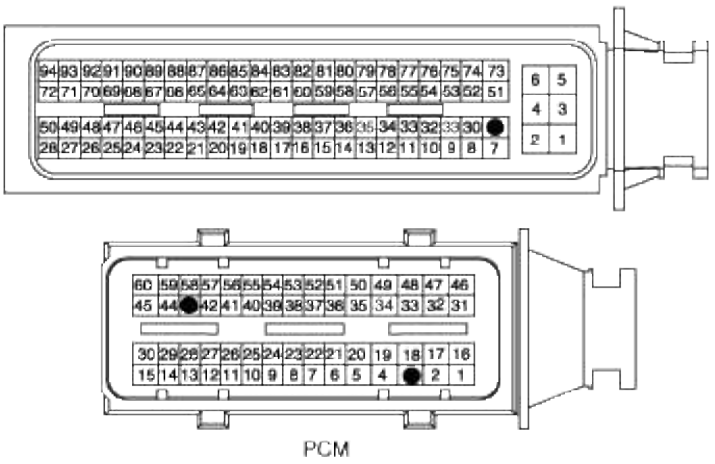
(A/T)

Terminal	Connected to	Funtion
1	PCM Terminal 42/C01-2	Sensor power (5V)
2	PCM Terminal 29/C01-1	Sensor ground
3	PCM Terminal 3/C01-2	FTPS signal

[HARNESS CONNECTORS]

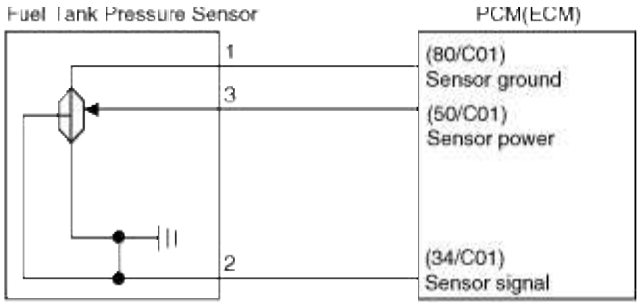


E22
FTPS



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

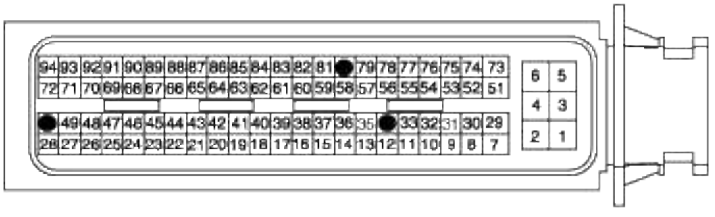
M/T

Terminal	Connected to	Funtion
1	ECM Terminal 80/C01	Sensor power (5V)
2	ECM Terminal 34/C01	Sensor ground
3	ECM Terminal 50/C01	FTPS signal

[HARNESS CONNECTORS]

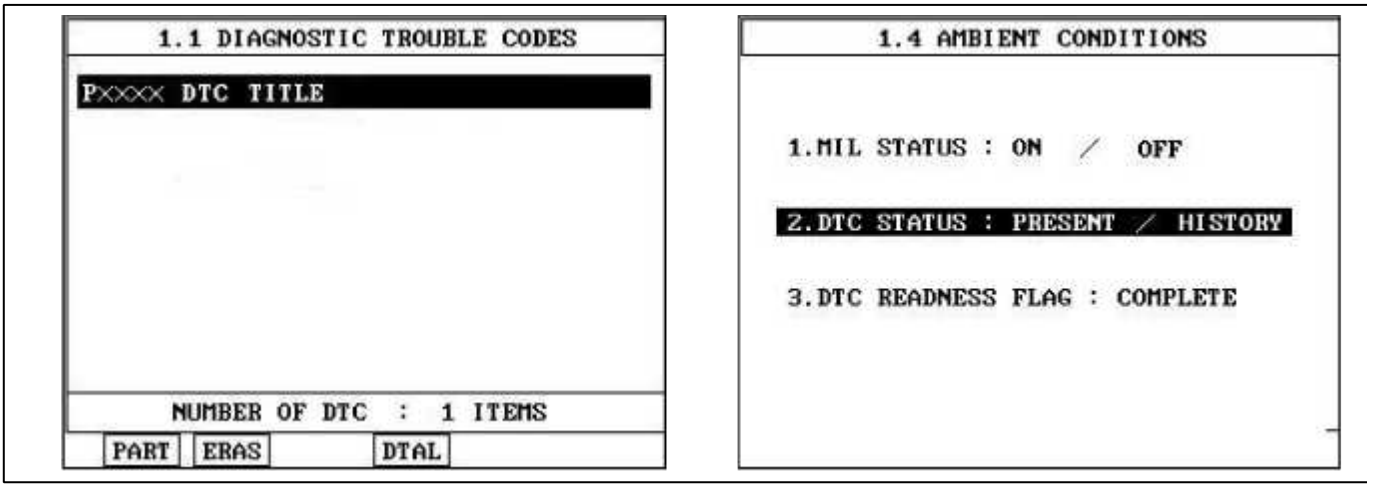


E22
FTPS



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

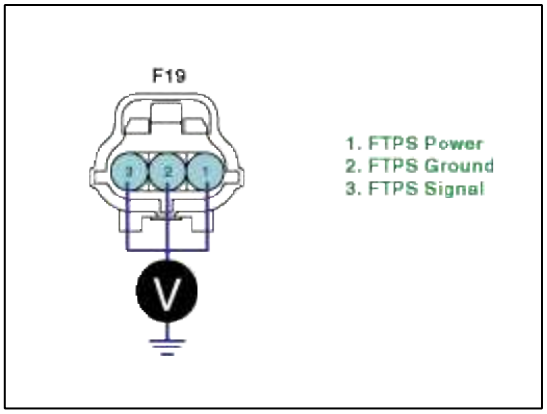
Go to " Circuit Voltage Check " procedure.

Circuit Voltage Check

1. IG "OFF" and disconnect FTPS connector.
2. IG "ON" and ENG "OFF"

3. Measure voltage between terminal 1 of FTPS harness connector and chassis ground.
   Measure voltage between terminal 2 of FTPS harness connector and chassis ground.
   Measure voltage between terminal 3 of FTPS harness connector and chassis ground.

Specification Terminal 1 Approx. 5V
Terminal 2 Approx. 0V
Terminal 3 Approx. 5V



4. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

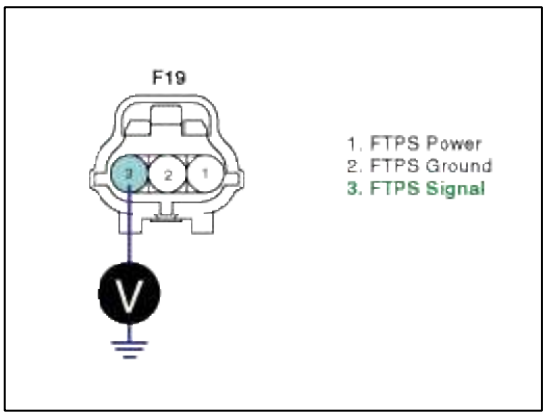
Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check FTPS
   (1) Key "ON".
   (2) Disassemble FTPS. (Don't disconnect FTPS connector.)
   (3) Connect the vacuum guage.
   (4) Measure the output voltage with using the vacuum guage.
   * Caution : Be careful while you do this procedure. FTPS would be damaged if you apply vacuum excessively.

Specification :

FTPS	Normal Parameter		
Gauge pressure	-66.66 hpa(-139.2 lbf/ft²)	0 hpa	66.66 hpa (139.2 lbf/ft²)
Voltage	0.5 V	2.5 V	4.5 V



(5) Is the measured voltage within specification ?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good FTPS and check for proper operation. If the problem is corrected, replace FTPS and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

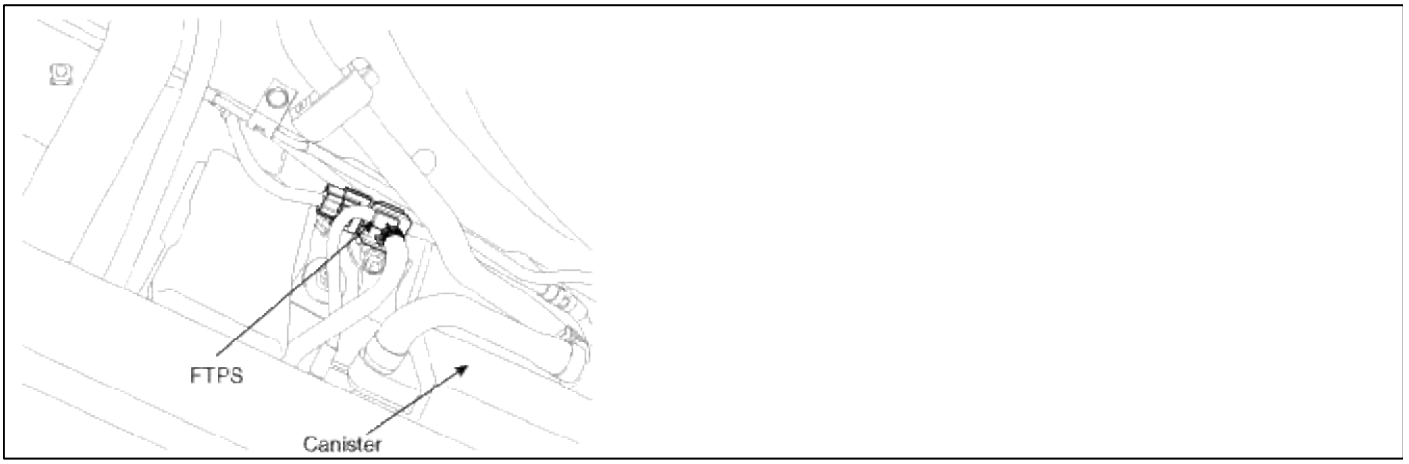
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0452 Evaporative Emission System-Pressure Sensor Low Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The evaporative emissions system prevents hydrocarbon (HC) vapors from the fuel tank from escaping into the atmosphere where they could form photochemical smog. The fuel tank pressure sensor is a component of the evaporative emission system.The Tank Pressure Sensor converts fuel tank pressure to a proportional analog voltage signal which is read by the engine controller for evaluation during execution of the Evaporative System Diagnostic. The Tank Pressure may be below atmospheric pressure (ie. a vacuum) or above atmospheric pressure.The fuel tank pressure is used to measure the difference between the air pressure (or vacuum) in the fuel tank and the ambient air pressure. ECM/PCM supplies a 5-volt reference and a ground to the sensor, which allows the sensor’s output voltage to range from 0.1 to 4.9 volts.

DTC DESCRIPTION

If signal input is below -39.06hPa (-81.6 lbf/ft²), ECM/PCM sets DTC P0452.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Open or Short to ground in power circuit • Short to ground in signal circuit • TPMS • ECM/PCM
Enable Conditions	• No start phase	
Threshold Value	• Fuel Tank Pressure < -39.06hPa (-81.6 lbf/ft²)	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

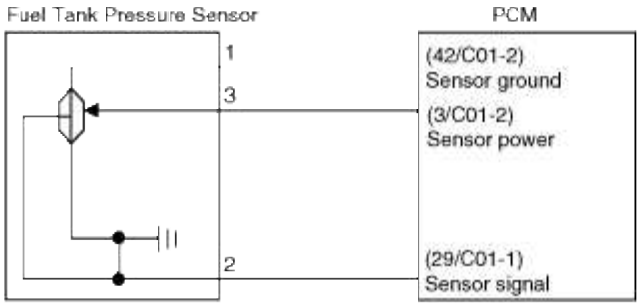
SPECIFICATION

FTPS	Normal Parameter		
Gauge pressure	-66.66 hpa(-139.2 lbf/ft²)	0 hpa	66.66 hpa (139.2 lbf/ft²)
Voltage	0.5 V	2.5 V	4.5 V

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

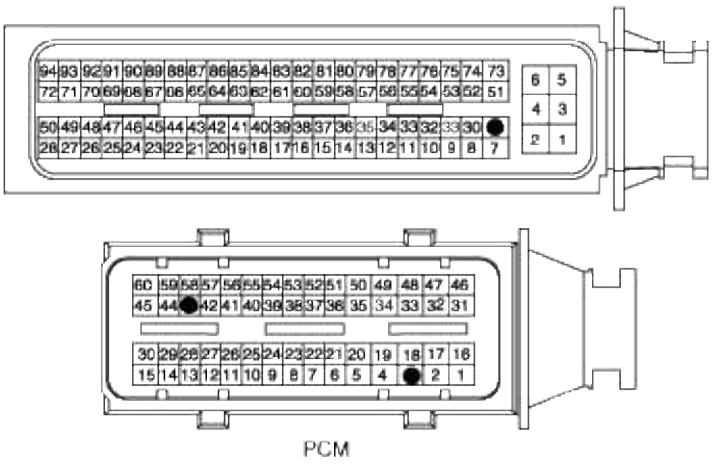
(A/T)

Terminal	Connected to	Funtion
1	PCM Terminal 42/C01-2	Sensor power (5V)
2	PCM Terminal 29/C01-1	Sensor ground
3	PCM Terminal 3/C01-2	FTPS signal

[HARNESS CONNECTORS]

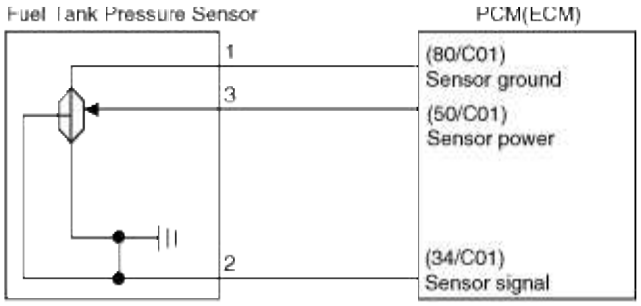


E22
FTPS



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

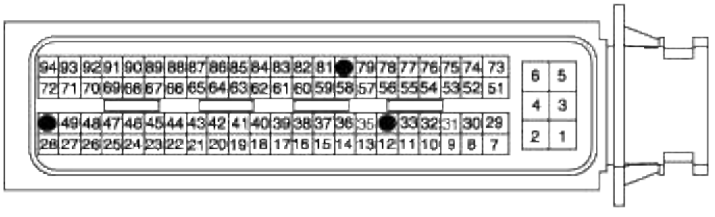
M/T

Terminal	Connected to	Funtion
1	ECM Terminal 80/C01	Sensor power (5V)
2	ECM Terminal 34/C01	Sensor ground
3	ECM Terminal 50/C01	FTPS signal

[HARNESS CONNECTORS]

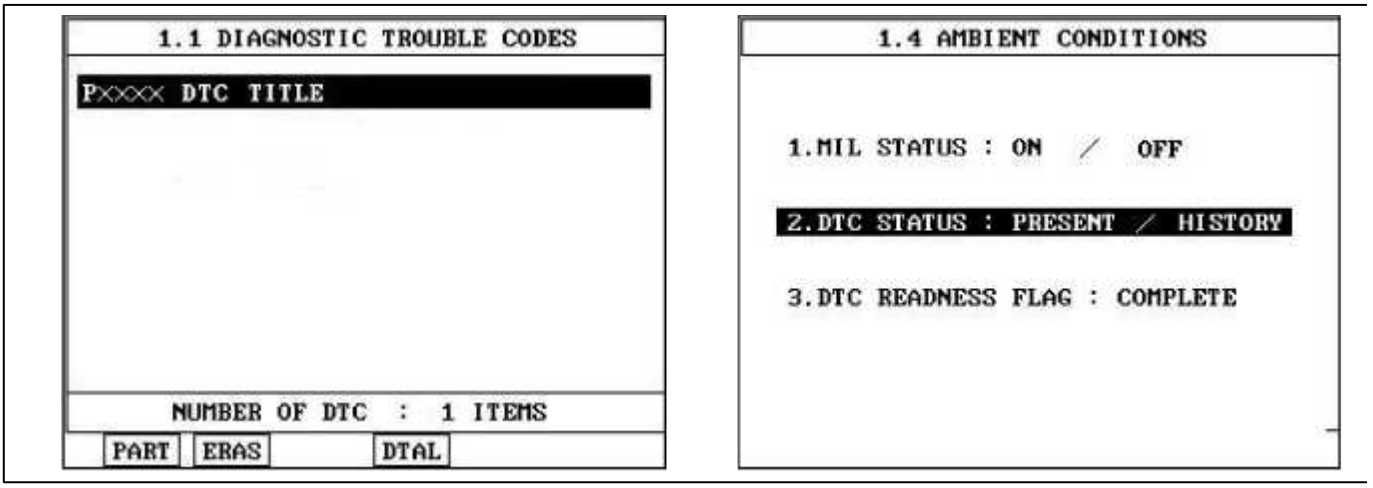


E22
FTPS



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

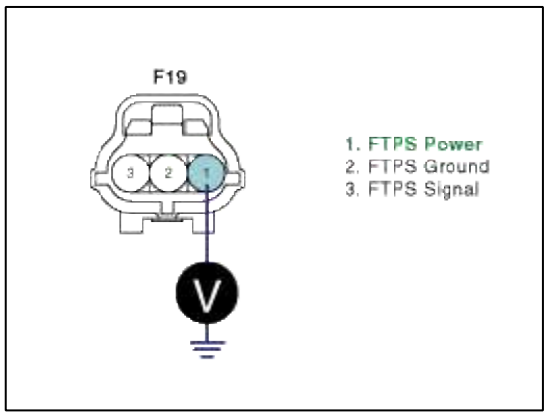
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. Check voltage of power circuit
   (1) Key "OFF".
   (2) Disconnect FTPS connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 1 of FTPS harness connector and chassis ground.

   Specification : Approx. 5V



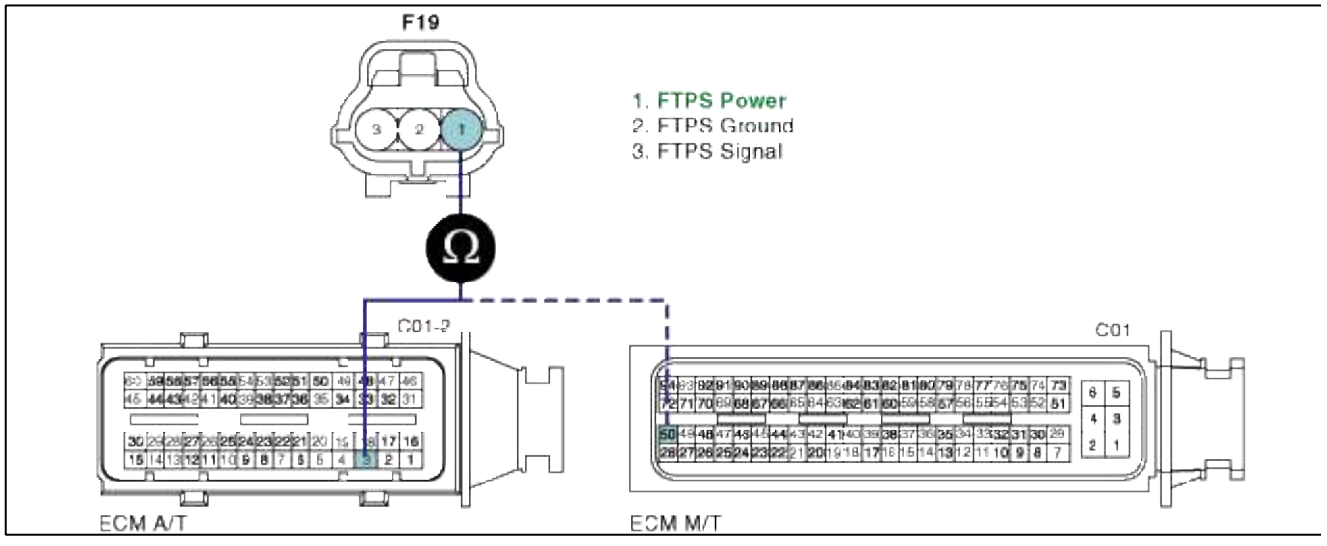
   (5) Is the measured voltage within specification ?

   YES
   Go to "Signal circuit inspection" procedure.

   NO
   Go to "Check Open or Short in power circuit inspection" procedure.

2. Check Open or Short in power circuit inspection
   (1) Key "OFF".
   (2) Disconnect FTPS harness connector and ECM/PCM harness connector.
   (3) Measure the resistance between terminal 1 of FTPS harness connector and terminal 3/C01-2 of ECM/PCM h connector. (A/T)
   Measure the resistance between terminal 1 of FTPS harness connector and terminal 50/C01 of ECM/PCM ha connector. (M/T)

   Specification : Approx. 1Ω



(4) Is the measured resistance within specification ?

YES

Go to "Component inspection" procedure.

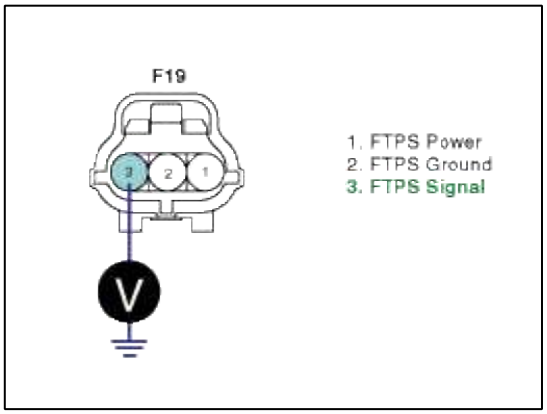
NO

Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect FTPS harness connector.
3. Key "ON".
4. Measure the voltage between terminal 3 of FTPS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair Short to ground in signal circuit and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

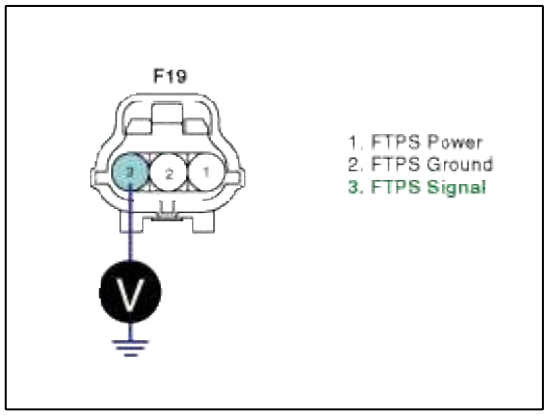
1. Check FTPS
   (1) Key "ON".
   (2) Disassemble FTPS. (Don't disconnect FTPS connector.)
   (3) Connect the vacuum guage.

(4) Measure the output voltage with using the vacuum guage.

* Caution : Be careful while you do this procedure. FTPS would be damaged if you apply vacuum excessively.

Specification :

FTPS	Normal Parameter		
Gauge pressure	-66.66 hpa(-139.2 lbf/ft²)	0 hpa	66.66 hpa (139.2 lbf/ft²)
Voltage	0.5 V	2.5 V	4.5 V



(5) Is the measured voltage within specification ?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good FTPS and check for proper operation. If the problem is corrected, replace FTPS and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

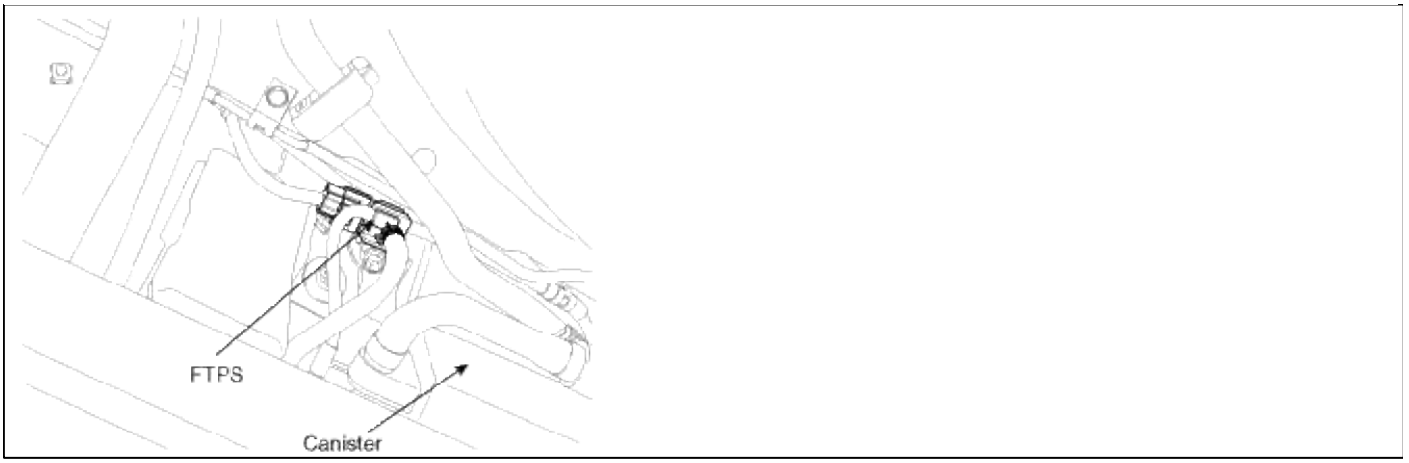
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0453 Evaporative Emission System-Pressure Sensor High Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The evaporative emissions system prevents hydrocarbon (HC) vapors from the fuel tank from escaping into the atmosphere where they could form photochemical smog. The fuel tank pressure sensor is a component of the evaporative emission system.The Tank Pressure Sensor converts fuel tank pressure to a proportional analog voltage signal which is read by the engine controller for evaluation during execution of the Evaporative System Diagnostic. The Tank Pressure may be below atmospheric pressure (ie. a vacuum) or above atmospheric pressure.The fuel tank pressure is used to measure the difference between the air pressure (or vacuum) in the fuel tank and the ambient air pressure. ECM/PCM supplies a 5-volt reference and a ground to the sensor, which allows the sensor's output voltage to range from 0.1 to 4.9 volts.

DTC DESCRIPTION

If signal input is over 39.06hPa (81.6 lbf/ft²), ECM/PCM sets DTC P0453.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Open or Short to power in control circuit • Open in ground circuit • TPMS • ECM/PCM
Enable Conditions	• No start phase	
Threshold Value	• Fuel Tank Pressure > 39.06hPa (81.6 lbf/ft²)	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

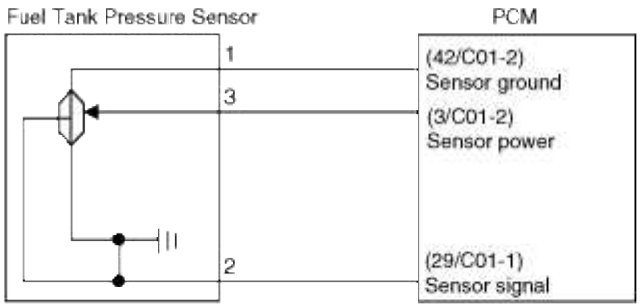
SPECIFICATION

FTPS	Normal Parameter		
Gauge pressure	-66.66 hpa(-139.2 lbf/ft²)	0 hpa	66.66 hpa (139.2 lbf/ft²)
Voltage	0.5 V	2.5 V	4.5 V

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

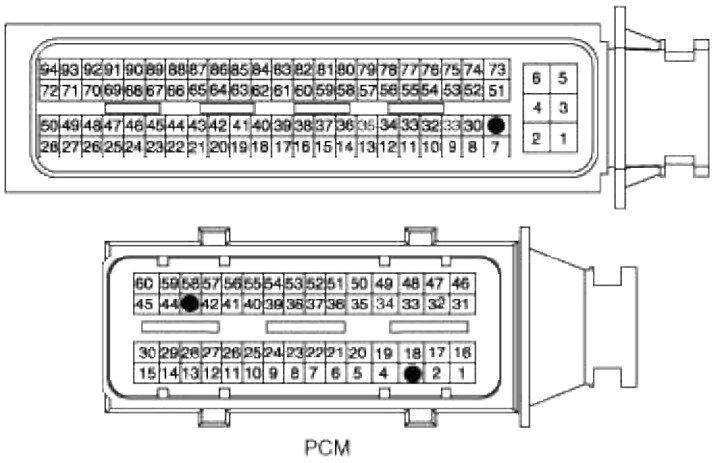
(A/T)

Terminal	Connected to	Funtion
1	PCM Terminal 42/C01-2	Sensor power (5V)
2	PCM Terminal 29/C01-1	Sensor ground
3	PCM Terminal 3/C01-2	FTPS signal

[HARNESS CONNECTORS]

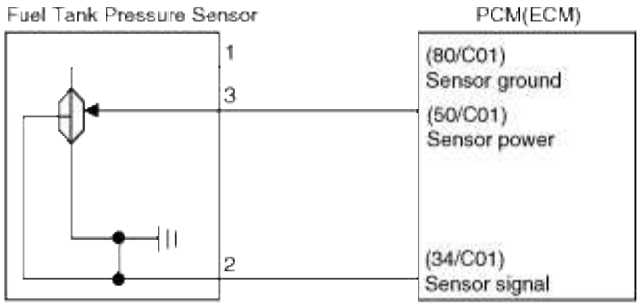


E22
FTPS



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

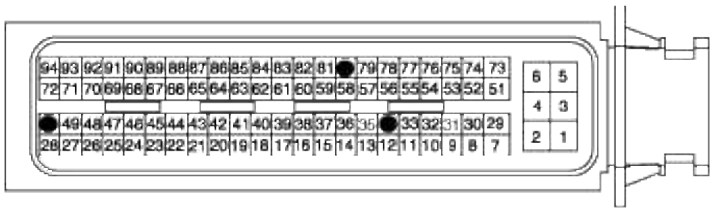
M/T

Terminal	Connected to	Funtion
1	ECM Terminal 80/C01	Sensor power (5V)
2	ECM Terminal 34/C01	Sensor ground
3	ECM Terminal 50/C01	FTPS signal

[HARNESS CONNECTORS]



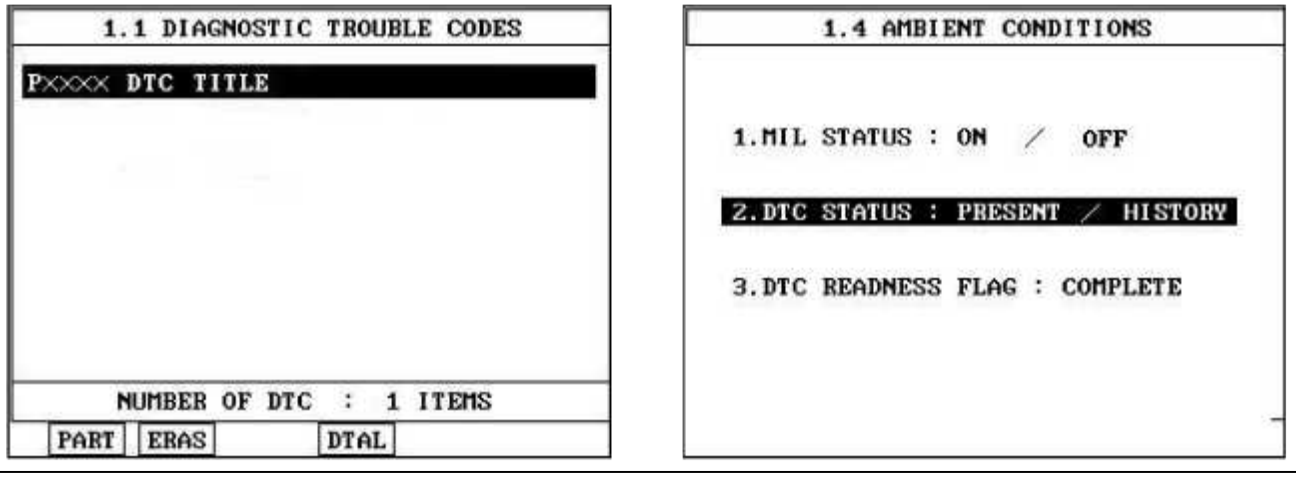
E22
FTPS



ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

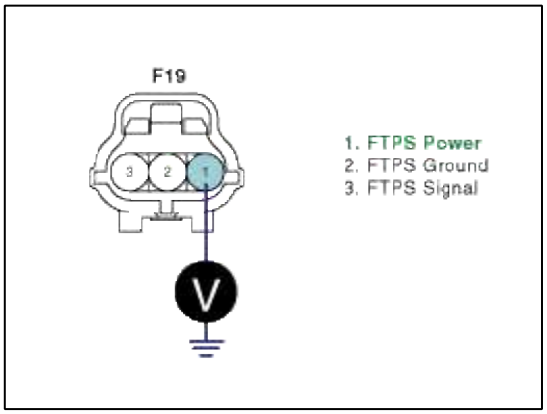
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect FTPS connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of FTPS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

NO

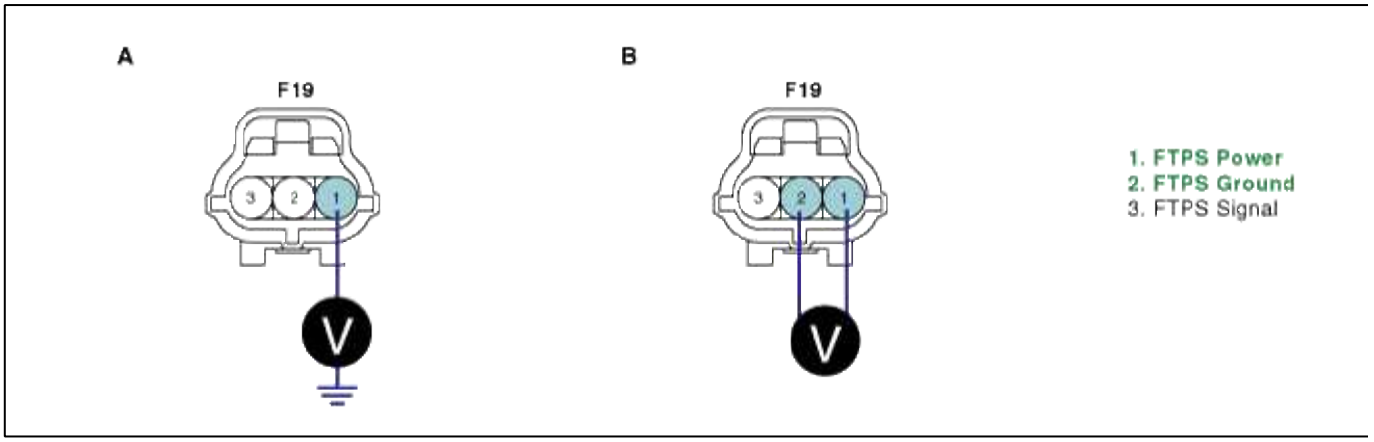
Go to "Check Open or Short in power circuit inspection" procedure.

GROUND CIRCUIT INSPECTION

1. Key "OFF".

2. Disconnect FTPS harness connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of FTPS harness connector and chassis ground. (A)
5. Measure the voltage between terminal 2 and 3 of FTPS harness connector. (B)

Specification : A-B is below 200mV.



6. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

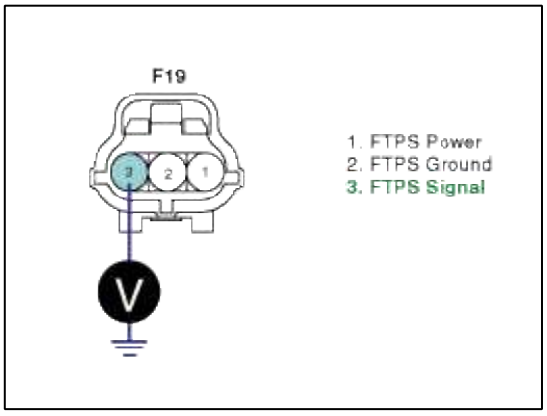
NO

Repair or replace as necessary and go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect FTPS harness connector.
3. Key "ON".
4. Measure the voltage between terminal 3 of FTPS harness connector and chassis ground.

Specification : Approx. 5V



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

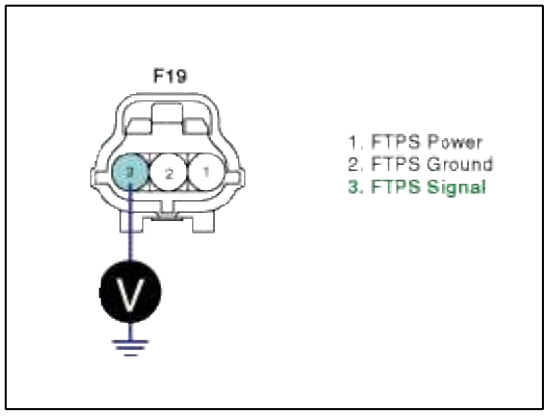
Repair Short to ground in signal circuit and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check FTPS
   (1) Key "ON".
   (2) Disassemble FTPS. (Don't disconnect FTPS connector.)
   (3) Connect the vacuum guage.
   (4) Measure the output voltage with using the vacuum guage.
   * Caution : Be careful while you do this procedure. FTPS would be damaged if you apply vacuum excessively.

Specification :

FTPS	Normal Parameter		
Gauge pressure	-66.66 hpa(-139.2 lbf/ft²)	0 hpa	66.66 hpa (139.2 lbf/ft²)
Voltage	0.5 V	2.5 V	4.5 V



   (5) Is the measured voltage within specification ?

   YES

   Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known-good FTPS and check for proper operation. If the problem is corrected, replace FTPS and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0455 Evaporative Emission System-Leak detected(Large leak)

GENERAL DESCRIPTION

Due to the increasing ambient temperature of the fuel, fuel vapors are generated in the tank. In order to control the release of these vapors to the atmosphere, the evaporative emissions control system is used. The evaporative emission control system reduces hydrocarbon (HC) emissions by trapping fuel tank vapors until they can be burned in the combustion process. Evaporating fuel is stored in a charcoal canister until it can be flushed into the intake

manifold. The evaporative emission control system is made up of a fuel tank that can be completely sealed from outside air, a Fuel Tank Pressure Sensor (FTPS), a Canister Close Valve (CCV) that seals the canister from the outside air, a canister filled with activated charcoal granules, a Purge Control Solenoid Valve (PCSV). The evaporative emission system can be checked for leaks by sealing the system off from the outside air, creating a vacuum, and monitoring if the system can hold that vacuum sufficiently for a set amount of time. If it cannot, a leak exists somewhere in the system.

DTC DESCRIPTION

This test detects a leak by measuring an increase of vacuum in the fuel evaporative system. A leak in evaporative system can allow hydrocarbons to leak from the tank to the atmosphere when the engine is off. The test should be calibrated to detect a 0.04" (1mm) leak.
If there is a large leak above the threshold value in the fuel evaporative system, ECM/PCM sets P0455.

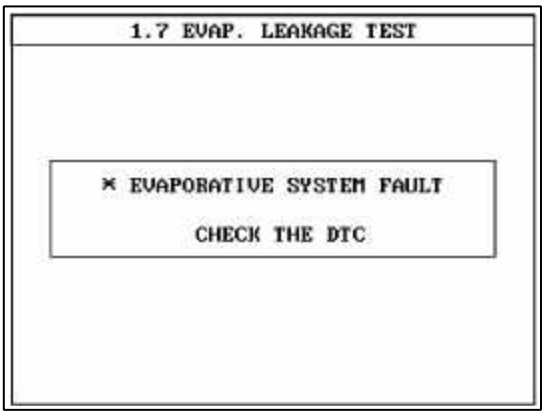
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Fuel tank pressure behavior (large leak)	• Fuel line or Evaporative Emission System line leakage check • PCSV / CCV / Canister / Fuel Tank leakage check • ECM/PCM
Enable Conditions	• Time after engine start > 600sec. • Idle speed controller activated • Mixture adaptation activated • Coolant temperature at start - ambient temperature < 6.6°C (11.88°F) • Ambient temperature : 4~35°C (39.2 ~ 95°F) • Ambient pressure >680hPa (10 lbf/in²) • Fuel level : 6.45 ~ 38.7 L (1.7 ~ 10.2 gal) • Tank ventilation must be active >10sec. • No misfire	
Threshold Value	• Pressure gradient when the intrusive diagnosis activated>threshold f (fuel level)	
Diagnostic Time		
MIL ON Condition	• 2 Driving Cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable)
2. Warm-up the engine to normal operatig temperature.
3. Erase DTC currently displayed.

4. Perform the "EVAP. LEAKAGE TEST" with scantool.



5. Is the same DTC displayed after "EVAP. LEAKAGE TEST" has done ?

YES

Go to "System Insepction" procedure.

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure

SYSTEM INSPECTION

1. Check evaporative emission system
   (1) Visually checks connections and components for leakage the evaporative emission system as follows.
      A. Between Surge tank and PCSV.
      B. Between PCSV and Canister
      C. Between Canister and CCV
      D. Between Canister and Fuel Tank.
   (2) Has a problem been found ?

      YES

      Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

      NO

      Go to "Check Leakage in Fuel Line" as follows.

2. Check Leakage in Fuel Line
   (1) Check that fuel cap is firmly tightened.
   (2) Check any damage or leakage in fuel line.
   (3) Has a problem been found ?

      YES

      Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

      NO

      Go to "Component Insepction" procedure.

COMPONENT INSPECTION

1. Check PCSV
   (1) Disconnect vacuum Hose connected between Surge tank and PCSV.
   (2) Connect vacuum pump to disconnected vacuum hose.
   (3) Does PCSV retain vacuum ?
   YES
   Go to "Check CCV" as follows.
   NO
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
2. Check CCV
   (1) Disconnect vacuum hose between Canister and CCV from Canister
   (2) Connect a vacuum pump and apply vacuum to each hose.
   (3) Does CCV retain vacuum ?
   YES
   Repair or replace as necessary and then, go to "Verification of Vehile Repair" procedure.
   NO
   Go to "Check canister" as follows.
3. Check Canister
   (1) Disconnect vacuum hoses connected to canister.
      A. Check any damage or leakage on vacuum hose between Canister and CCV.
      B. Check any damage or leakage on vacuum hose betwen Canister and Fuel Tank.
      C. Check any damage or leakage on vacuum hose between Canister and PCSV.
   (2) Connect vacuum gauge to one of vacuum hoses and apply vacuum one by one.(The rest of vacuum hose should be blocked.)
   (3) Is the vacuum retained ?
   YES
   Go to "Check Fuel Tank" as follows.
   NO
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
4. Check Fuel Tank.
   (1) Check any damage or leakage on Fuel Tank.
   (2) Has a problem been found ?
   YES
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
   NO
   Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0456 Evaporative Emission System-Leak detected (very small leak)

GENERAL DESCRIPTION

Due to the increasing ambient temperature of the fuel and the return of unused hot fuel from the engine, fuel vapors are generated in the tank. In order to control the release of these vapors to the atmosphere, the evaporative emissions control system is used. The evaporative emission control system reduces hydrocarbon (HC) emissions by trapping fuel tank vapors until they can be burned in the combustion process. Evaporating fuel is stored in a charcoal canister until it can be flushed into the intake manifold. The evaporative emission control system is made up of a fuel tank that can be completely sealed from outside air, a Fuel Tank Pressure Sensor (FTPS), a Canister Close Valve (CCV) that seals the canister from the outside air, a canister filled with activated charcoal granules, a Purge Control Solenoid Valve (PCSV). The evaporative emission system can be checked for leaks by sealing the system off from the outside air, creating a vacuum, and monitoring if the system can hold that vacuum sufficiently for a set amount of time. If it cannot, a leak exists somewhere in the system.

DTC DESCRIPTION

This test detects a leak by measuring an increase of vacuum in the fuel evaporative system. A leak in evaporative system can allow to leak hydrocarbons from the tank to the atmosphere when the engine is off. The test should be calibrated to detect 0.02”(0.5mm) leakage or less.
If there is a very small leak above the threshold value in the fuel evaporative system, ECM/PCM sets P0456.

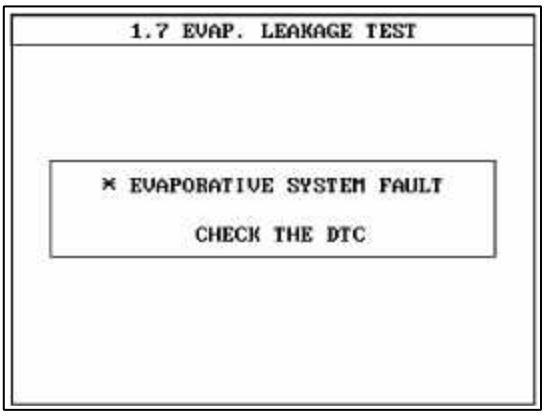
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Fuel tank pressure behavior (very small leak)	• Fuel line or Evaporative Emission System line leakage check • PCSV / CCV / Canister / Fuel Tank leakage check • ECM/PCM
Enable Conditions	• Time after engine start > 600sec. • Idle speed controller activated • Mixture adaptation activated • Coolant temperature at start - ambient temperature< 6.6°C (11.88°F) • Ambient temperature : 4~35°C (39.2 ~ 95°F) • Ambient pressure >680hPa (10 lbf/in²) • Fuel level : 6.45 ~ 38.7 L (1.7 ~ 10.2 gal) • Tank ventilation must be active >10sec. • No misfire	
Threshold Value	• Pressure gradient when the intrusive diagnosis activated>threshold f (fuel level)	
Diagnostic Time		
MIL ON Condition	• 2 Driving Cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable)
2. Warm -up the engine to normal operatig temperature.
3. Erase DTC currently displayed.

4. Perform the "EVAP. LEAKAGE TEST" with scantool.



5. Is the same DTC displayed after "EVAP. LEAKAGE TEST" has done?

YES

Go to "System Insepction" procedure.

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Check evaporative emission system
   (1) Visually checks connection or any leakage on the evaporative emission system as follows.
      A. Between Surge tank and PCSV.
      B. Between PCSV and Canister
      C. Between Canister and CCV
      D. Between Canister and Fuel Tank.
   (2) Has a problem been found ?

      YES

      Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

      NO

      Go to "Check Leakage in Fuel Line" as follows.

2. Check Leakage in Fuel Line
   (1) Check that fuel cap is firmly tightened.
   (2) Check any damage or leakage in fuel line.
   (3) Has a problem been found ?

      YES

      Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

      NO

      Go to "Component Insepction" procedure.

COMPONENT INSPECTION

1. Check PCSV
   (1) Disconnect vacuum Hose connected between Surge tank and PCSV.
   (2) Connect vacuum gauge to disconnected vacuum hose.
   (3) Does PCSV retain vacuum ?
   YES
   Go to "Check CCV" as follows.
   NO
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
2. Check CCV
   (1) Disconnect vacuum hose between Canister and CCV from Canister
   (2) Connect vacuum gauge to disconnected vacuum hose and apply vacuum.
   (3) Does CCV retain vacuum ?
   YES
   Go to "Check canister" as follows.
   NO
   Repair or replace as necessary and then, go to "Verification of Vehile Repair" procedure.
3. Check Canister
   (1) Disconnect vacuum hoses connected to canister.
   A. Check any damage or leakage on vacuum hose between Canister and CCV.
   B. Check any damage or leakage on vacuum hose betwen Canister and Fuel Tank.
   C. Check any damage or leakage on vacuum hose between Canister and PCSV.
   (2) Connect vacuum gauge to one of vacuum hoses and apply vacuum one by one.(The rest of vacuum hose should be blocked.)
   (3) Is the vacuum retained ?
   YES
   Go to "Check Fuel Tank" as follows.
   NO
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
4. Check Fuel Tank.
   (1) Check any damage or leakage on Fuel Tank.
   (2) Has a problem been found ?
   YES
   Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
   NO
   Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES
Go to the applicable troubleshooting procedure.

NO
System is performing to specification at this time.

Fuel System > Troubleshooting > P0457 Evaporative Emission System-Leak detected(tank cap loose/off)

GENERAL DESCRIPTION

Due to the increasing ambient temperature of the fuel, fuel vapors are generated in the tank. In order to control the release of these vapors to the atmosphere, the evaporative emissions control system is used. The evaporative emission control system reduces hydrocarbon (HC) emissions by trapping fuel tank vapors until they can be burned in the combustion process. Evaporating fuel is stored in a charcoal canister until it can be flushed into the intake manifold. The evaporative emission control system is made up of a fuel tank that can be completely sealed from outside air, a Fuel Tank Pressure Sensor (FTPS), a Canister Close Valve (CCV) that seals the canister from the outside air, a canister filled with activated charcoal granules, a Purge Control Solenoid Valve (PCSV). The evaporative emission system can be checked for leaks by sealing the system off from the outside air, creating a vacuum, and monitoring if the system can hold that vacuum sufficiently for a set amount of time. If it cannot, a leak exists somewhere in the system.

DTC DESCRIPTION

If there is a large leak caused by as a fuel cap loosened, ECM/PCM sets DTC P0457.

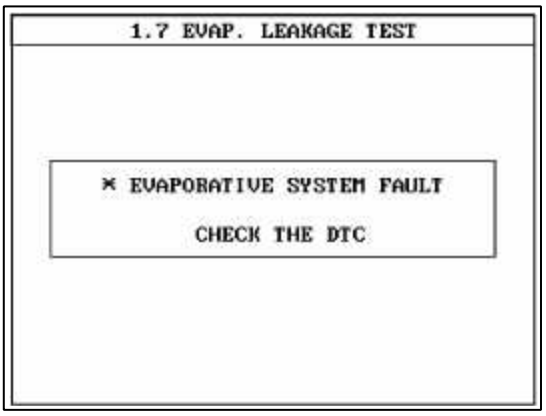
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Fuel tank pressure behavior (large leak)	• Fuel Cap • ECM/PCM
Enable Conditions	• Refueling > 10.0L (2.642 GAL) • Vehicle speed > 30kph (18.64mph) • Drive mileage > 300m (328 yd) • Suspicion of large leak	
Threshold Value	• Pressure when the intrusive diagnosis activated > threshold f (fuel level)	
Diagnostic Time		
MIL ON Condition	• DTC only ; "CHECK FUEL CAP" lamp illuminated	

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable)
2. Warm -up the engine to normal operatig temperature.
3. Erase DTC currently displayed.

4. Perform the "EVAP. LEAKAGE TEST" with scantool.



5. Is the same DTC displayed after "EVAP. LEAKAGE TEST" has done ?

YES

Go to "System Insepction" procedure.

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, ending, corrosion, contamination, deterioration, or damage. Repair or replace asnecessary and go to "Verification of Vehicle Repair" procedure

SYSTEM INSPECTION

1. Check Fuel Cap
   (1) Check fuel cap is firmly tightened.
   (2) Check damage or leakage of fuel cap.
   (3) Has a problem been found ?

YES

Repair or replace as necessary and then, Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

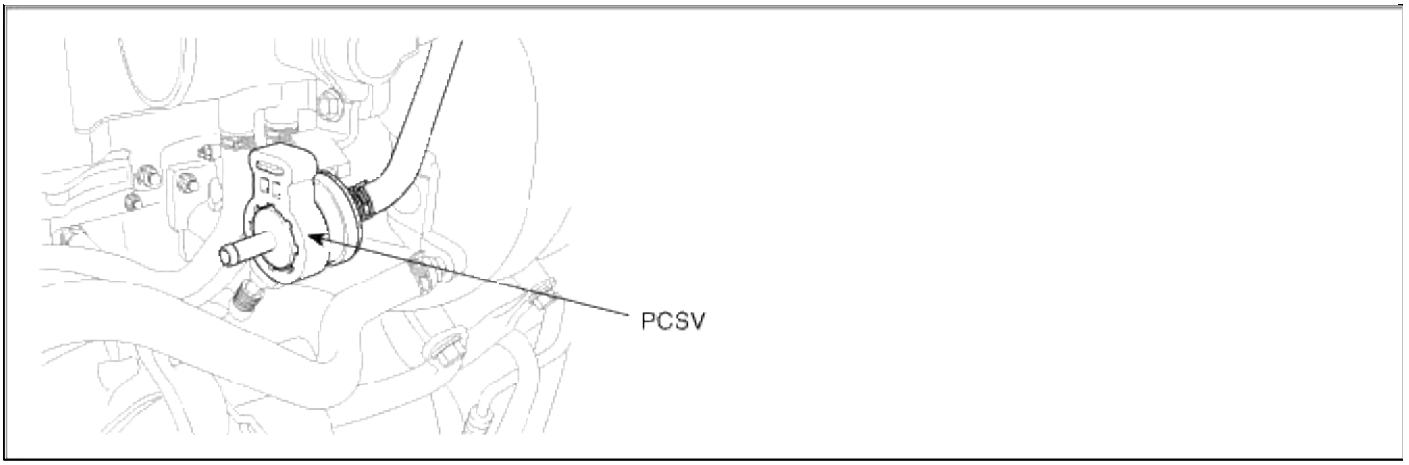
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0458 Evaporative Emission System Purge Control Valve Circuit Low

COMPONENT LOCATION



GENERAL DESCRIPTION

The purge control solenoid valve (PCSV) is a device used to meter vapor flow to the engine. The ECM/PCM controls the PCSV using a duty cydle signal.

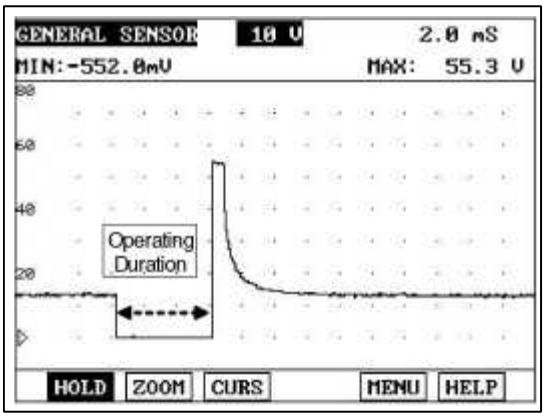
DTC DESCRIPTION

If there is Short to ground in PCSV circuit, ECM/PCM sets DTC P0458.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • Short to ground in control circuit • PCSV • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to ground	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

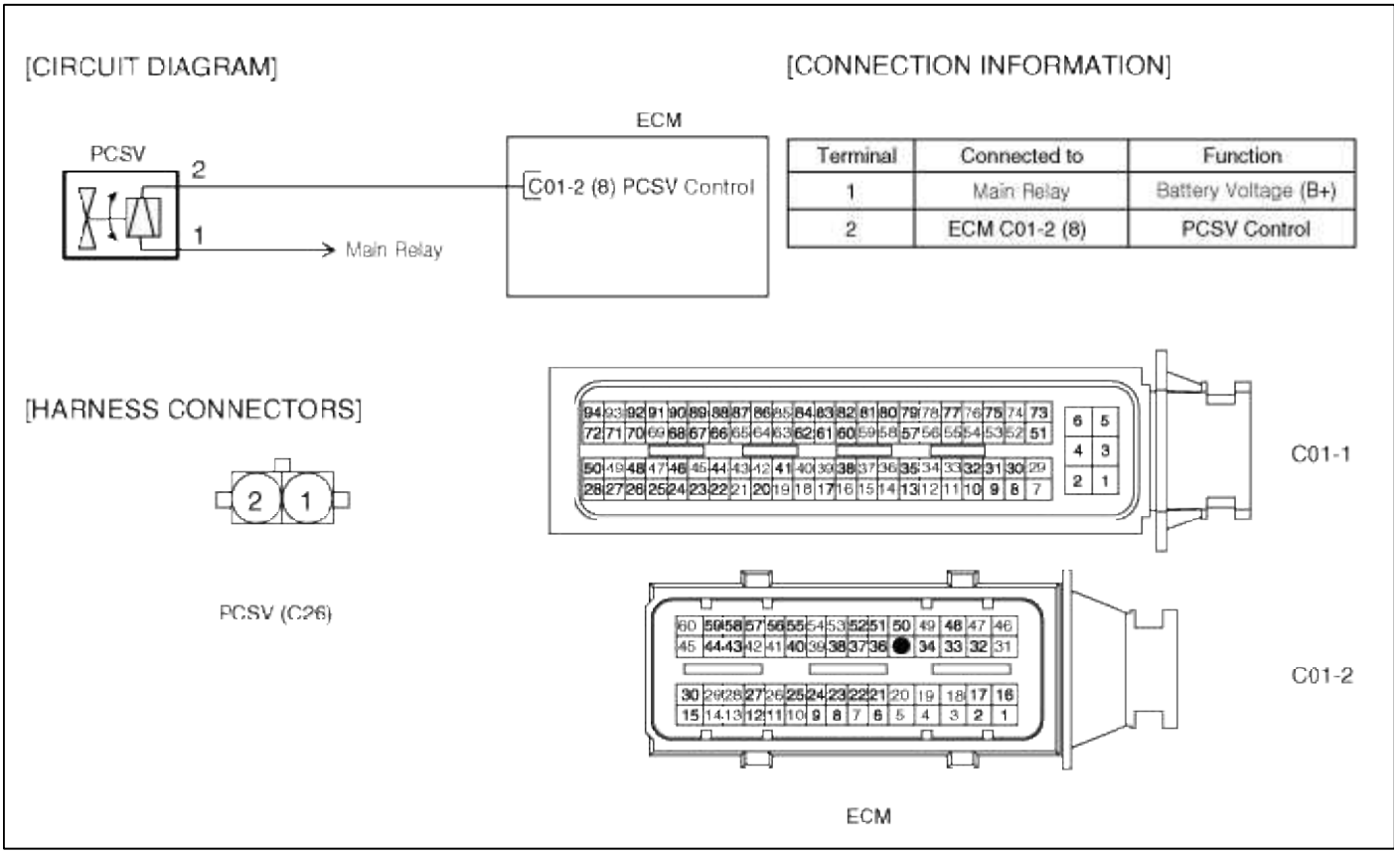


SPECIFICATION

Item	Specification
PCSV Coil Resistance	16Ω at 20°C (68°F)

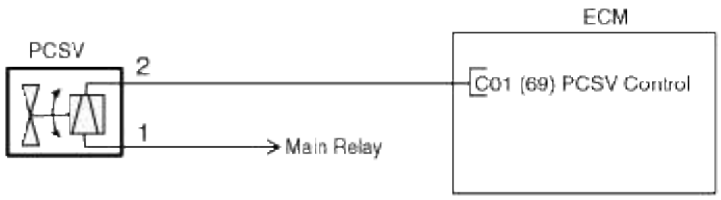
SCHEMATIC DIAGRAM

(A/T)



(M/T)

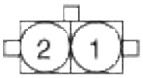
[CIRCUIT DIAGRAM]



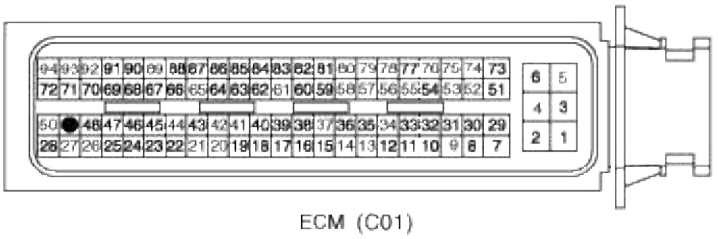
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (69)	PCSV Control

[HARNESS CONNECTORS]



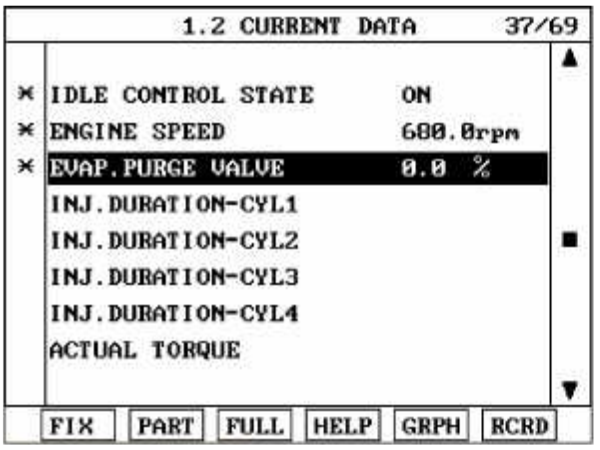
PCSV (C26)

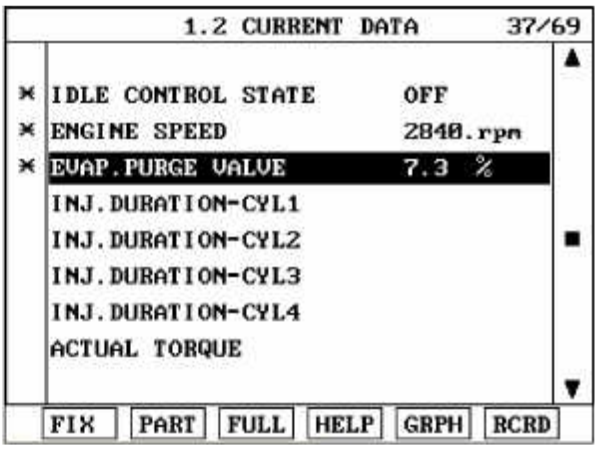


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "PCSV" parameters on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

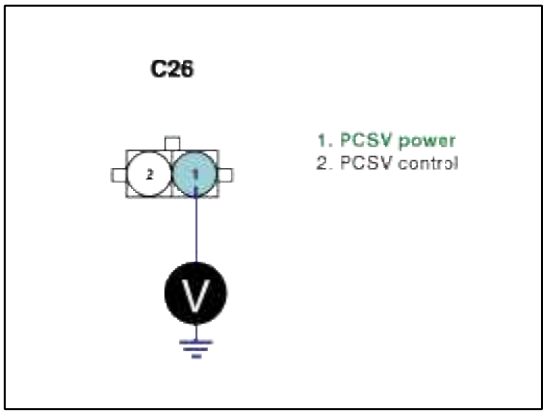
NO

Go to "PCSV circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect PCSV connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of PCSV harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Control circuit inspection" procedure.

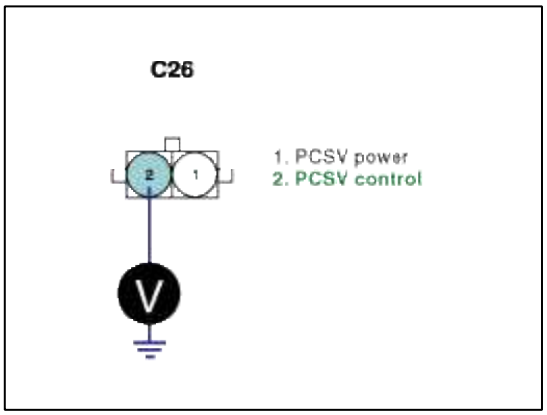
NO

Repair circuit as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect PCSV connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of PCSV harness connector and chassis ground.

Specification : Approx 3.5V



5. Is the measured voltage within specification?

6. Go to "Component inspection" procedure.

NO

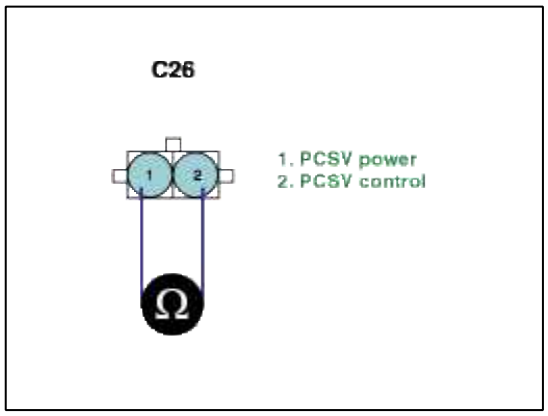
Repair Short to ground circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. PCSV check.
   (1) Key "OFF".
   (2) Disconnect PCSV harness connector.
   (3) Measure the resistance between terminal 1 and 2 of PCSV harness connector.(Component side)

Specification :

Item	Specification
PCSV Coil Resistance	16Ω at 20°C (68°F)



   (4) Is the measured resistance within specification?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

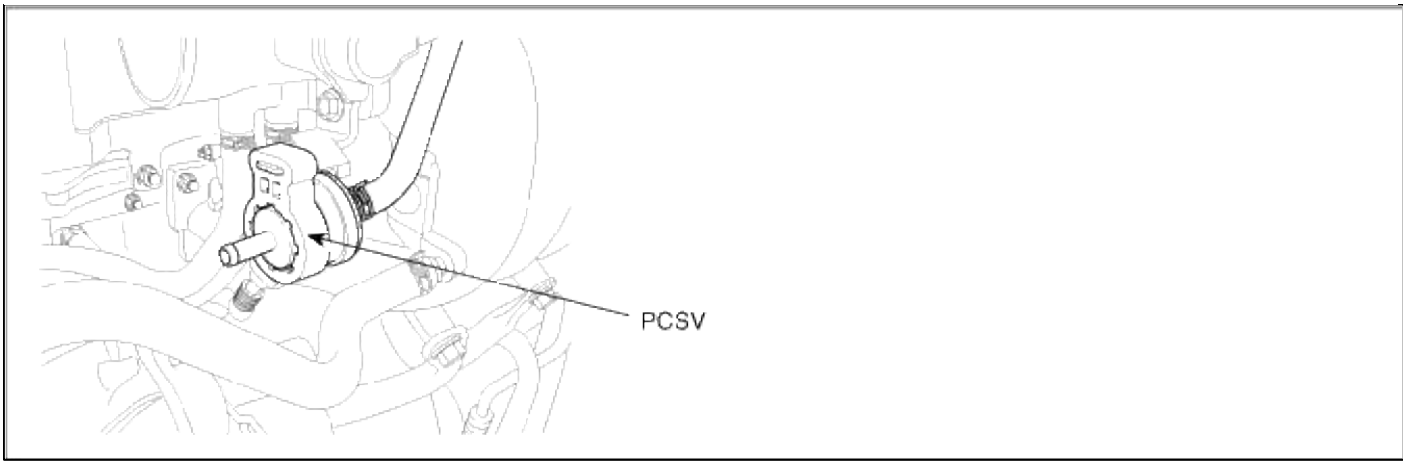
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0459 Evaporative Emission System Purge Control Valve Circuit High

COMPONENT LOCATION



GENERAL DESCRIPTION

The purge control solenoid valve (PCSV) is a device used to meter vapor flow to the engine. The ECM/PCM controls the PCSV using a duty cydle signal.

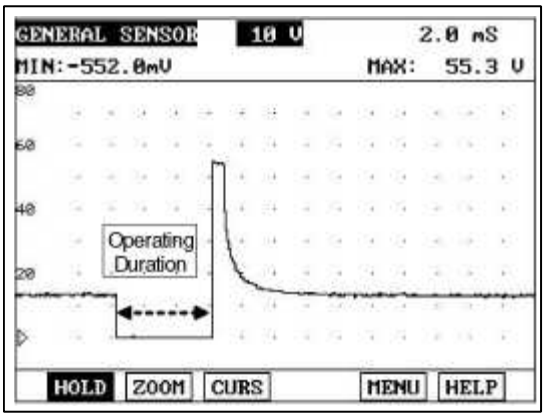
DTC DESCRIPTION

If there is Short to power in PCSV circuit, ECM/PCM sets DTC P0459.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • Short to power in control circuit • PCSV • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to battery	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA

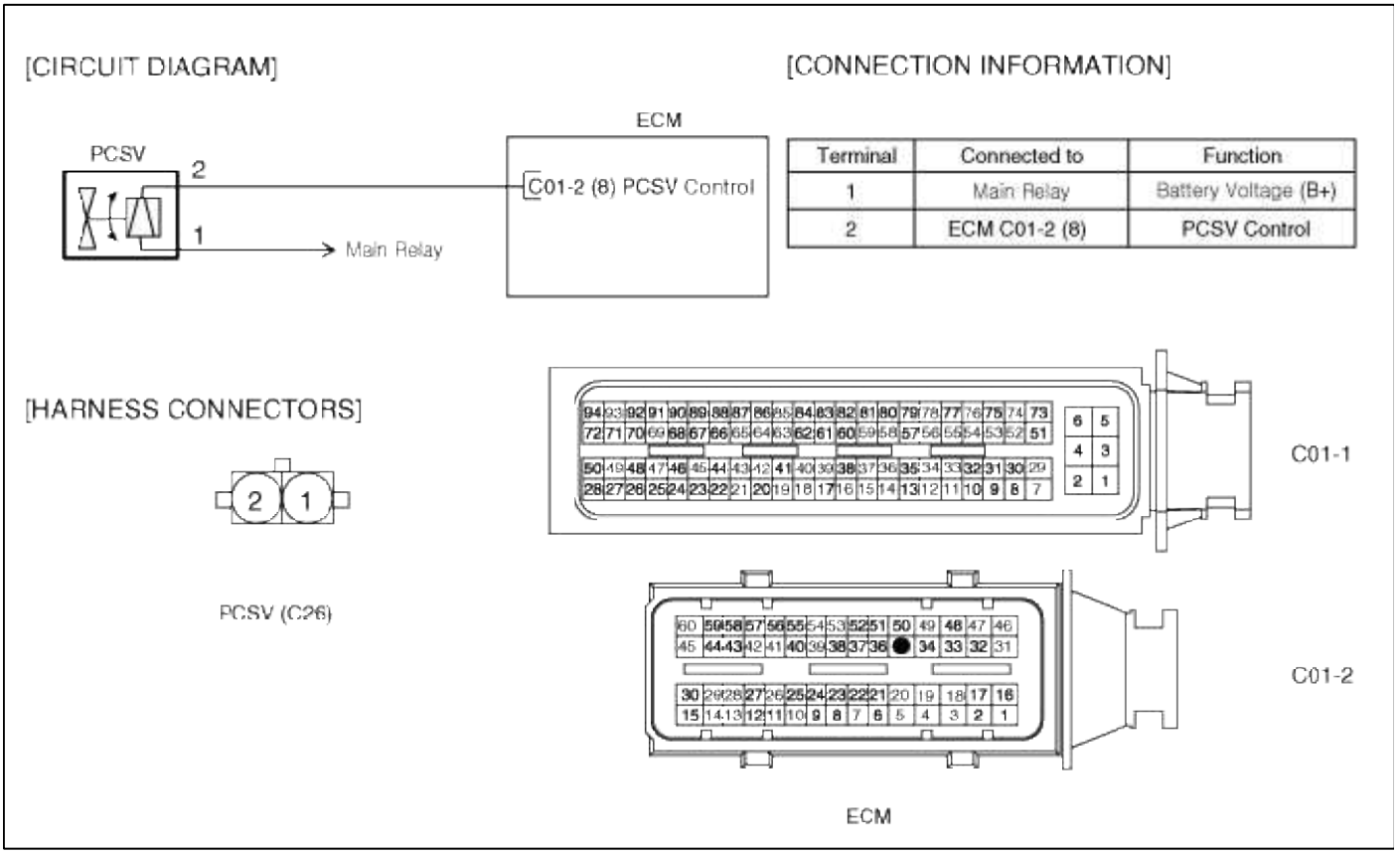


SPECIFICATION

Item	Specification
PCSV Coil Resistance	16Ω at 20°C (68°F)

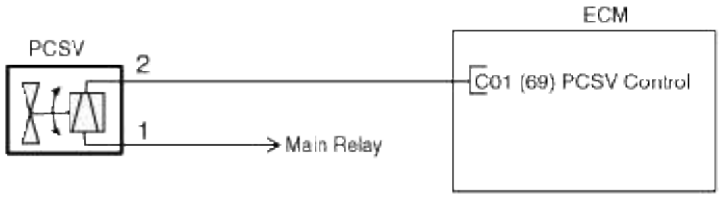
SCHEMATIC DIAGRAM

(A/T)



(M/T)

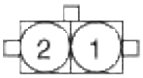
[CIRCUIT DIAGRAM]



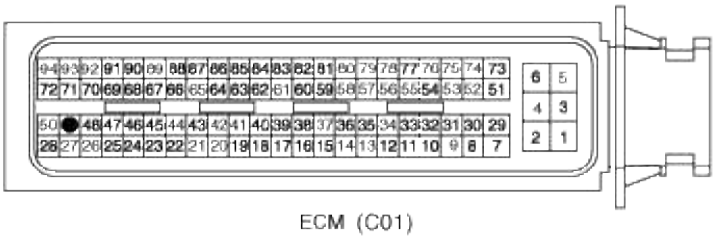
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (69)	PCSV Control

[HARNESS CONNECTORS]



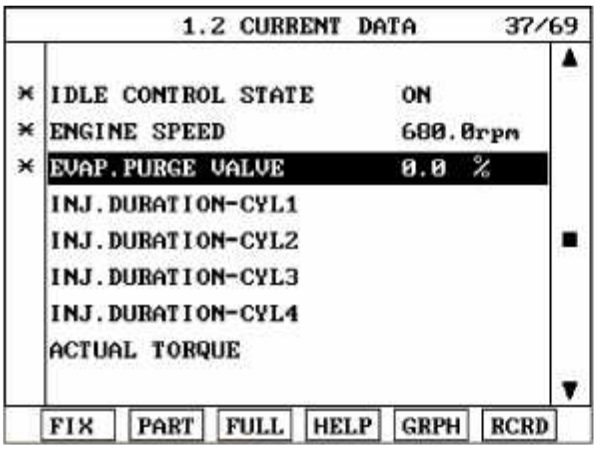
PCSV (C26)

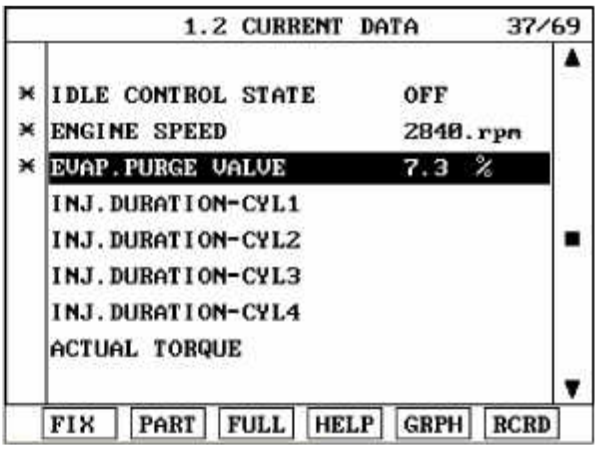


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "PCSV" parameters on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

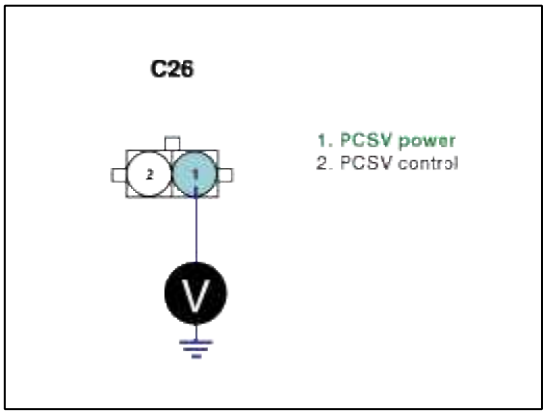
NO

Go to "PCSV circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect PCSV connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of PCSV harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification ?

YES

Go to "Control circuit inspection" procedure.

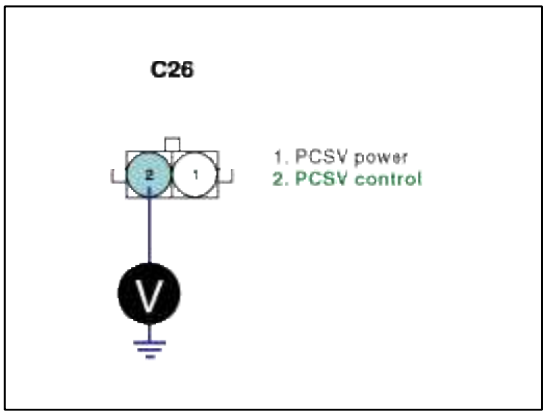
NO

Repair circuit as necessary and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect PCSV connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of PCSV harness connector and chassis ground.

Specification : Approx 3.5V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to power circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. PCSV check.

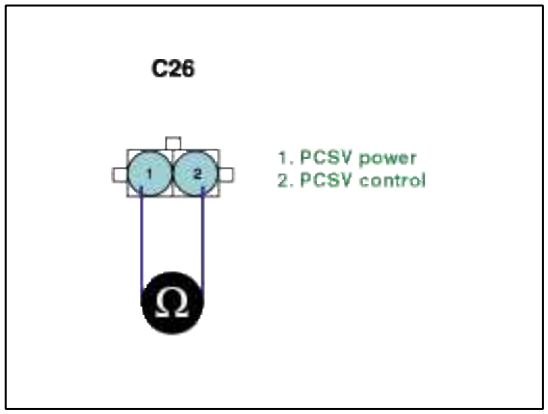
(1) Key "OFF".

(2) Disconnect PCSV harness connector.

(3) Measure the resistance between terminal 1 and 2 of PCSV harness connector.(Component side)

Specification :

Item	Specification
PCSV Coil Resistance	16Ω at 20°C (68°F)



(4) Is the measured resistance within specification?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

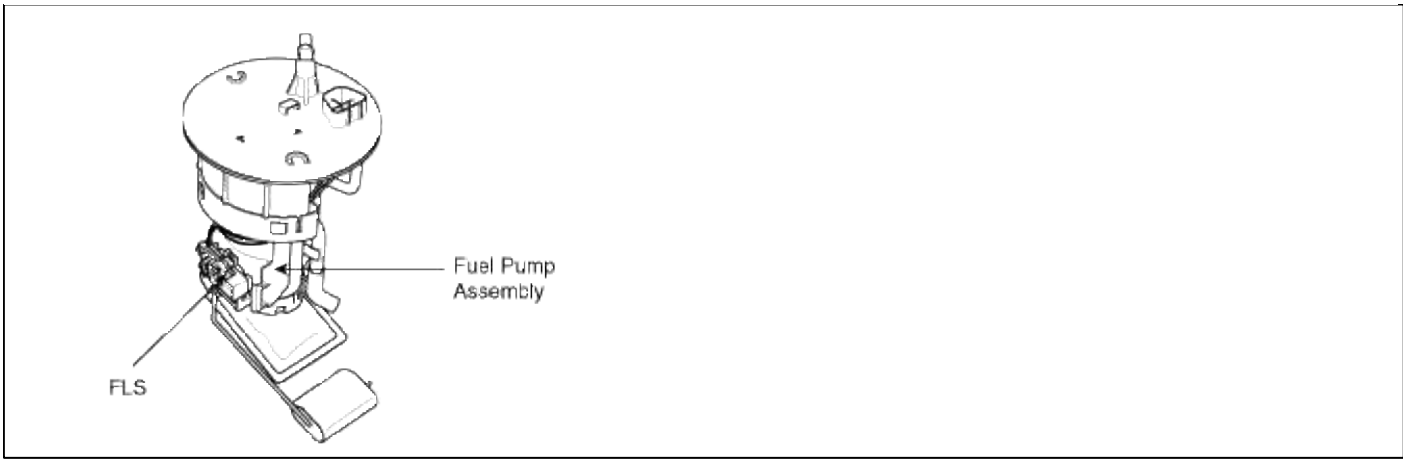
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0461 Fuel Level Sensor \'A\' Circuit Range/Performance

COMPONENT LOCATION



GENERAL DESCRIPTION

The ECM/PCM uses the fuel level input in order to calculate the expected vapor pressure within the fuel system. The vapor pressure varies as the fuel level changes. The vapor pressure is critical in determining if the evaporative emission system is operating properly. The ECM/PCM also uses the fuel level in order to determine if the fuel level is too high or too low to be able to accurately detect evaporative system malfunctions.

DTC DESCRIPTION

When the difference between actual consumed fuel and model consumed fuel is over the threshold value, ECM/PCM sets DTC P0461.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Poor connection • Fuel Level Sensor • ECM/PCM
Enable Conditions	• Fuel level signal is valid • Consumed fuel (model) >15ℓ (4 gal) • Fuel level change at instant < 0.4ℓ (0.1 gal) • 5 sec after ignition on	
Threshold Value	• Consumed fuel (model) - consumed fuel (actual) >10ℓ (2.6 gal) Consumed fuel (model) - consumed fuel (actual)< -10ℓ (-2.6 gal)	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SPECIFICATION

Float Position	Sender Resistence (Ω)	Fuel Height at Tank Bottom (mm)	Fuel Tank Volume Reference only	
			lit.	U.S.gal.
S/F	6.0±2	155.6±2	43.0	11.4
G/F	15.0±2	151.8±2	42.0	11.1
7/8	25.0±2	135.6±2	37.5	9.9
6/8	36.0±2	120.6±2	33.0	8.7
5/8	50.0±2	106.2±2	28.5	7.5
4/8	66.0±2	93.1±2	24.0	6.3
3/8	86.0±2	79.9±2	19.5	5.2
2/8	110.2±2	66.4±2	15.0	4.0
1/8	142.0±2	51.8±2	10.5	2.8
W/G	170.0±2	34.5±2	6.6	1.7
G/E	184.0±2	29.6±2	5.0	1.3
S/E	200.0±2	25.2±2	4.0	1.1

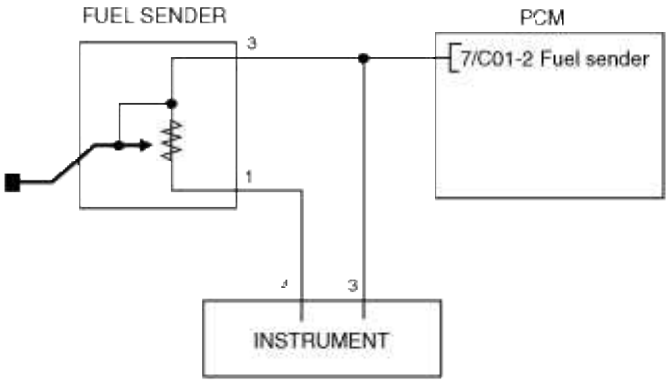
NOTE

- S/F : Sensor Full
- G/F : Guage Full
- W/G : Warning Point
- G/E : Guage End
- S/E : Sensor End
- 7/8, 6/8, 5/8, 4/8, 3/8, 2/8, 1/8 : Indicator Position in cluster

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

PCM (A/T)

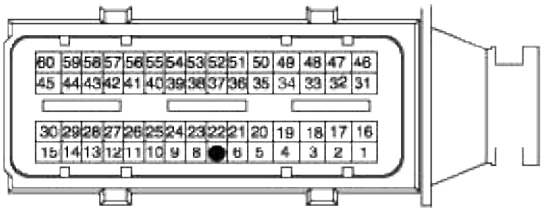
Terminal	Connected to	Function
1	Instrument Cluster	Fuel Sender Ground
2	-	-
3	PCM terminal 7/C01-2	Fuel Sender Signal
4	Main Relay	Fuel Pump Power
5	Chassis Ground	Fuel Pump Ground

[HARNESS CONNECTOR]

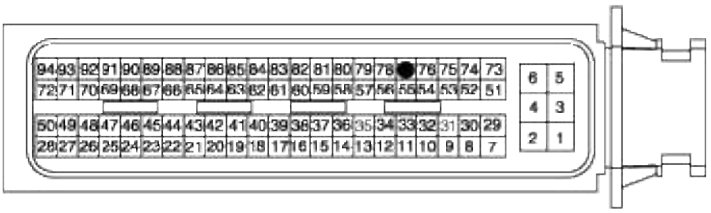


F18

Fue Sender & Fuel Pump Motor



C01-2

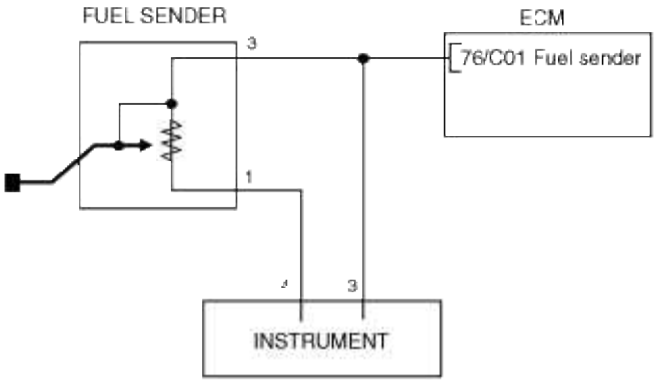


C01

ECM

(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

ECM

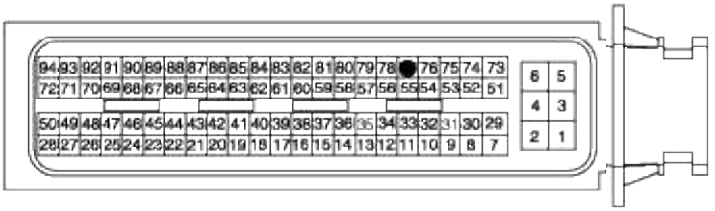
Terminal	Connected to	Function
1	Instrument Cluster	Fuel Sender Ground
2	-	-
3	ECM terminal 76/C01-2	Fuel Sender Signal
4	Main Relay	Fuel Pump Power
5	Chassis Ground	Fuel Pump Ground

[HARNESS CONNECTOR]



F18

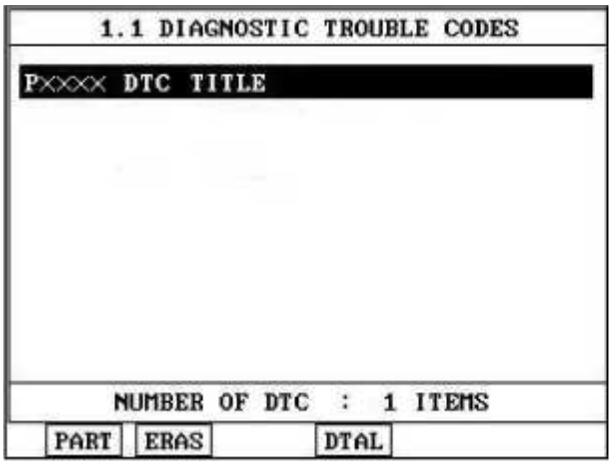
Fuel Sender & Fuel Pump Motor

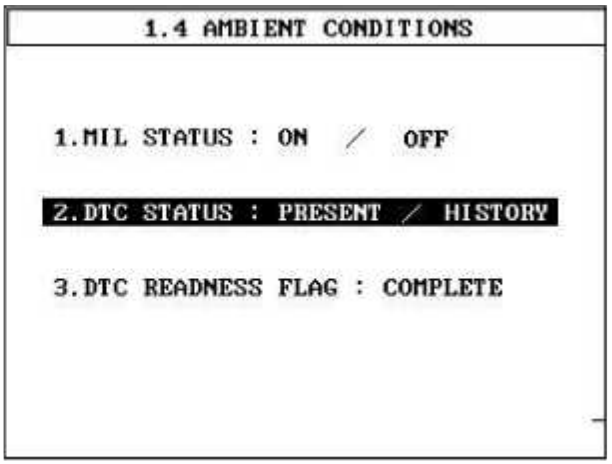


ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.





6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Component inspection" procedure.

COMPONENT INSPECTION

1. IG "OFF".
2. Disconnect Fuel Level Sensor harness connector.
3. Measure the resistance between terminal 1 and 3 of Fuel Level Sensor harness connector. (Component side) (Measure the resistance while changing the float position)

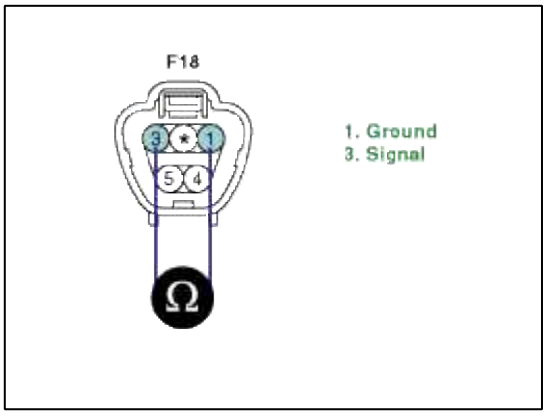
Specification :

Float Position	**Sender Resistence (Ω)**	**Fuel Height at Tank Bottom (mm)**	**Fuel Tank Volume Reference only**	
			lit.	U.S.gal.
S/F	6.0±2	155.6±2	43.0	11.4
G/F	15.0±2	151.8±2	42.0	11.1
7/8	25.0±2	135.6±2	37.5	9.9
6/8	36.0±2	120.6±2	33.0	8.7
5/8	50.0±2	106.2±2	28.5	7.5
4/8	66.0±2	93.1±2	24.0	6.3
3/8	86.0±2	79.9±2	19.5	5.2
2/8	110.2±2	66.4±2	15.0	4.0
1/8	142.0±2	51.8±2	10.5	2.8
W/G	170.0±2	34.5±2	6.6	1.7
G/E	184.0±2	29.6±2	5.0	1.3

S/E	200.0±2	25.2±2	4.0	1.1

NOTE

- S/F : Sensor Full
- G/F : Guage Full
- W/G : Warning Point
- G/E : Guage End
- S/E : Sensor End
- 7/8, 6/8, 5/8, 4/8, 3/8, 2/8, 1/8 : Indicator Position in cluster



(1) Is the measured resistance within specification ?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Fuel Level Sensor and check for proper operation.If the problem is corrected, replace Fuel Level Sensor and then go to"Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

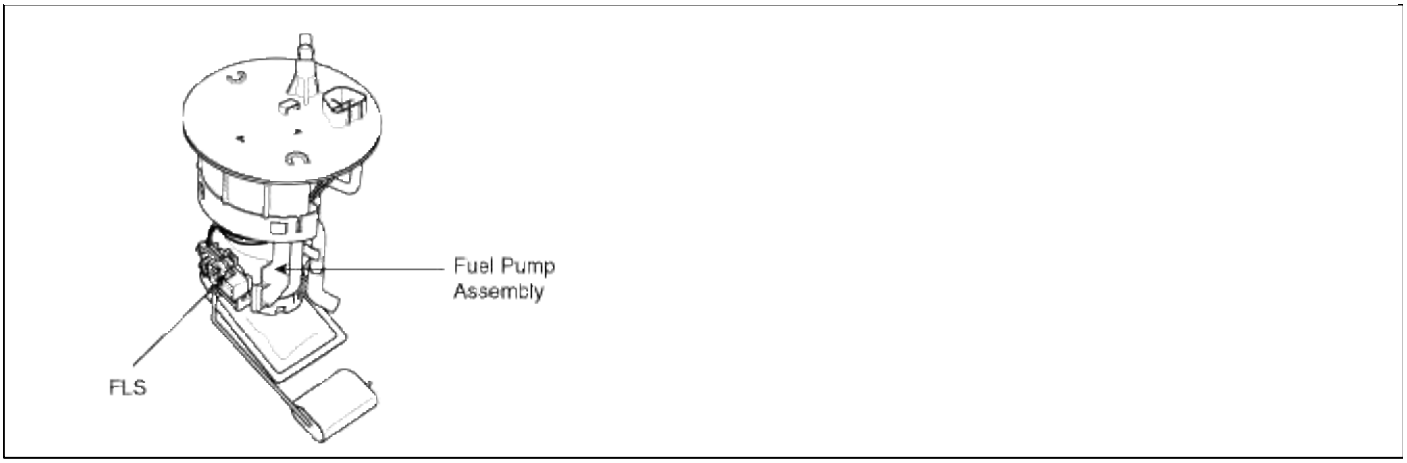
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0462 Fuel Level Sensor \'A\' Circuit Low Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The ECM/PCM uses the fuel level input in order to calculate the expected vapor pressure within the fuel system. The vapor pressure varies as the fuel level change. The vapor pressure is critical in determining if the evaporative emission system is operating properly. The ECM/PCM also uses the fuel level in order to determine if the fuel level is too high or too low to be able to accurately detect evaporative system malfunctions.

DTC DESCRIPTION

If the signal voltage is below 0.1V during 60 sec or more, ECM/PCM sets DTC P0462.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Short to ground in signal circuit • Fuel Level Sensor • ECM/PCM
Enable Conditions	• After engine start	
Threshold Value	• Signal voltage< 0.1V	
Diagnostic Time	• 60 sec	
MIL ON Condition	• 2 driving cycle	

SPECIFICATION

Float Position	Sender Resistence (Ω)	Fuel Height at Tank Bottom (mm)	Fuel Tank Volume Reference only	
			lit.	U.S.gal.
S/F	6.0±2	155.6±2	43.0	11.4
G/F	15.0±2	151.8±2	42.0	11.1
7/8	25.0±2	135.6±2	37.5	9.9
6/8	36.0±2	120.6±2	33.0	8.7
5/8	50.0±2	106.2±2	28.5	7.5
4/8	66.0±2	93.1±2	24.0	6.3
3/8	86.0±2	79.9±2	19.5	5.2
2/8	110.2±2	66.4±2	15.0	4.0
1/8	142.0±2	51.8±2	10.5	2.8
W/G	170.0±2	34.5±2	6.6	1.7
G/E	184.0±2	29.6±2	5.0	1.3
S/E	200.0±2	25.2±2	4.0	1.1

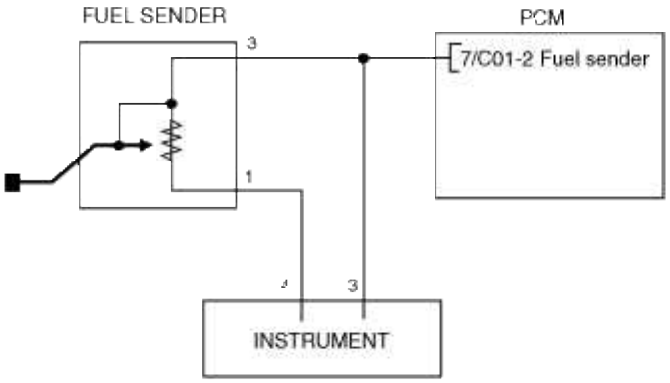
NOTE

- S/F : Sensor Full
- G/F : Guage Full
- W/G : Warning Point
- G/E : Guage End
- S/E : Sensor End
- 7/8, 6/8, 5/8, 4/8, 3/8, 2/8, 1/8 : Indicator Position in cluster

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

PCM (A/T)

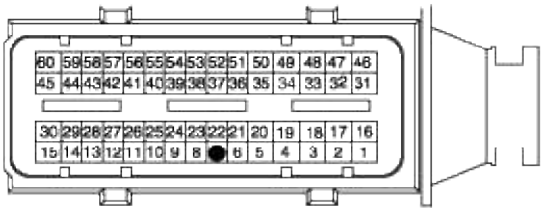
Terminal	Connected to	Function
1	Instrument Cluster	Fuel Sender Ground
2	-	-
3	PCM terminal 7/C01-2	Fuel Sender Signal
4	Main Relay	Fuel Pump Power
5	Chassis Ground	Fuel Pump Ground

[HARNESS CONNECTOR]

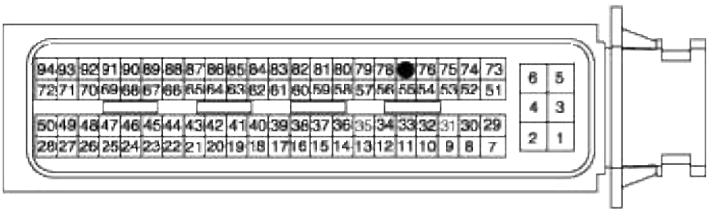


F18

Fue Sender & Fuel Pump Motor



C01-2

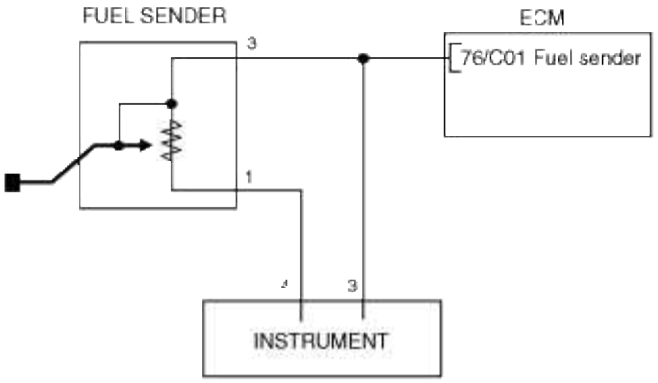


C01

ECM

(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

ECM

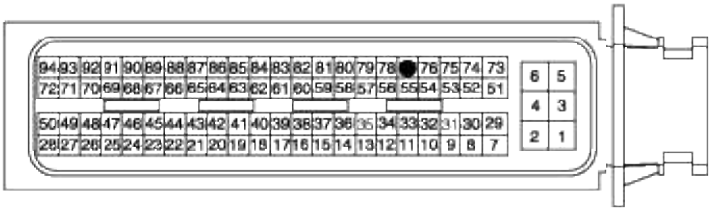
Terminal	Connected to	Function
1	Instrument Cluster	Fuel Sender Ground
2	-	-
3	ECM terminal 76/C01-2	Fuel Sender Signal
4	Main Relay	Fuel Pump Power
5	Chassis Ground	Fuel Pump Ground

[HARNESS CONNECTOR]



F18

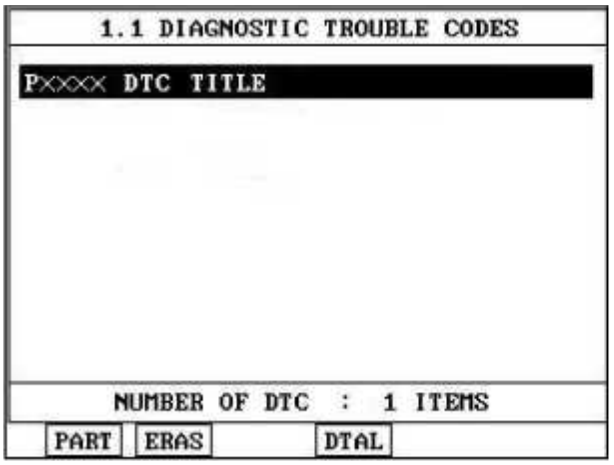
Fuel Sender & Fuel Pump Motor

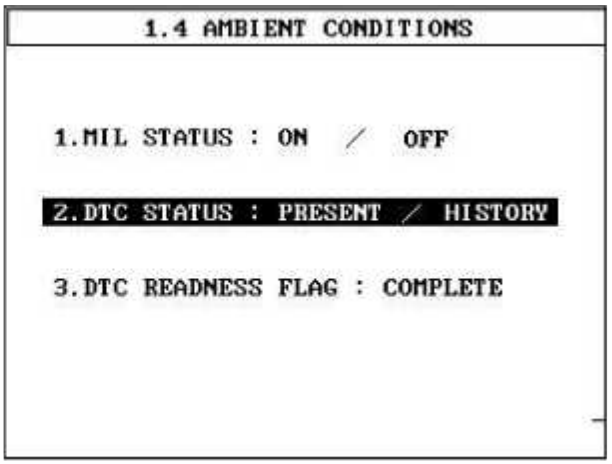


ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.





6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

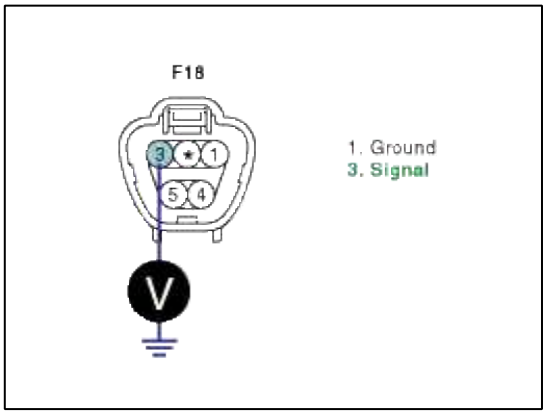
NO

Go to "Fuel level sensor circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect Fuel Level Sensor connector.
3. IG "ON".
4. Measure the voltage between terminal 3 of Fuel Level Sensor harness connector and ground.

Specification : Approx. 11 V



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair Short to ground circuit and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

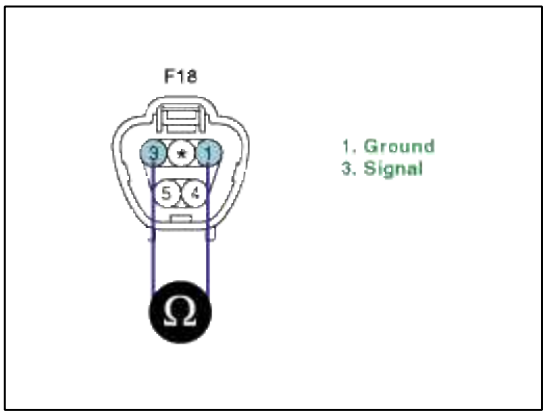
1. IG "OFF".
2. Disconnect Fuel Level Sensor harness connector.
3. Measure the resistance between terminal 1 and 3 of Fuel Level Sensor harness connector. (Component side) (Measure the resistance with Change the position of a float.)

Specification :

Float Position	Sender Resistence (Ω)	Fuel Height at Tank Bottom (mm)	Fuel Tank Volume Reference only	
			lit.	U.S.gal.
S/F	6.0±2	155.6±2	43.0	11.4
G/F	15.0±2	151.8±2	42.0	11.1
7/8	25.0±2	135.6±2	37.5	9.9
6/8	36.0±2	120.6±2	33.0	8.7
5/8	50.0±2	106.2±2	28.5	7.5
4/8	66.0±2	93.1±2	24.0	6.3
3/8	86.0±2	79.9±2	19.5	5.2
2/8	110.2±2	66.4±2	15.0	4.0
1/8	142.0±2	51.8±2	10.5	2.8
W/G	170.0±2	34.5±2	6.6	1.7
G/E	184.0±2	29.6±2	5.0	1.3
S/E	200.0±2	25.2±2	4.0	1.1

NOTE

- S/F : Sensor Full
- G/F : Guage Full
- W/G : Warning Point
- G/E : Guage End
- S/E : Sensor End
- 7/8, 6/8, 5/8, 4/8, 3/8, 2/8, 1/8 : Indicator Position in cluster



4. Is the measured resistance within specification ?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Fuel Level Sensor and check for proper operation.If the problem is corrected, replace Fuel Level Sensor and then go to"Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

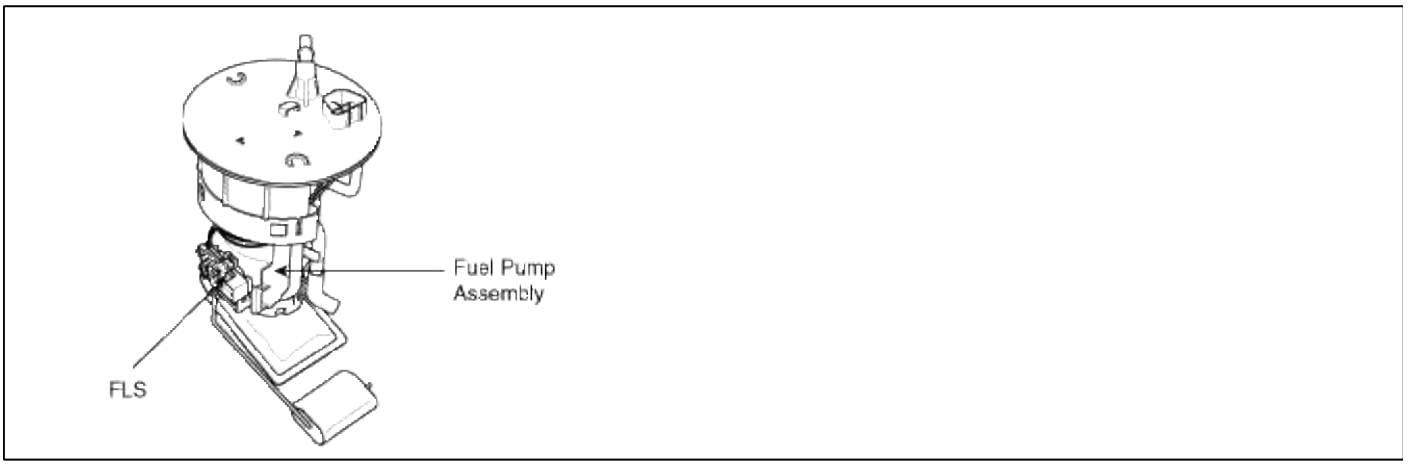
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0463 Fuel Level Sensor \'A\' Circuit High Input

COMPONENT LOCATION



GENERAL DESCRIPTION

The ECM/PCM uses the fuel level input in order to calculate the expected vapor pressure within the fuel system. The vapor pressure varies as the fuel level change. The vapor pressure is critical in determining if the evaporative emission system is operating properly. The ECM/PCM also uses the fuel level in order to determine if the fuel level is too high or too low to be able to accurately detect evaporative system malfunctions.

DTC DESCRIPTION

If the signal voltage is over 4.0 V during 60 sec or more, ECM/PCM sets DTC P0463.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Short to power in signal circuit • Open in signal circuit • Open in ground circuit • Fuel Level Sensor • ECM/PCM
Enable Conditions	• Battery voltage 10~16V	
Threshold Value	• Signal voltage > 4.0V	
Diagnostic Time	• 60 sec	
MIL ON Condition	• 2 driving cycle	

SPECIFICATION

Float Position	Sender Resistence (Ω)	Fuel Height at Tank Bottom (mm)	Fuel Tank Volume Reference only	
			lit.	U.S.gal.
S/F	6.0±2	155.6±2	43.0	11.4
G/F	15.0±2	151.8±2	42.0	11.1
7/8	25.0±2	135.6±2	37.5	9.9
6/8	36.0±2	120.6±2	33.0	8.7
5/8	50.0±2	106.2±2	28.5	7.5
4/8	66.0±2	93.1±2	24.0	6.3
3/8	86.0±2	79.9±2	19.5	5.2
2/8	110.2±2	66.4±2	15.0	4.0
1/8	142.0±2	51.8±2	10.5	2.8
W/G	170.0±2	34.5±2	6.6	1.7
G/E	184.0±2	29.6±2	5.0	1.3
S/E	200.0±2	25.2±2	4.0	1.1

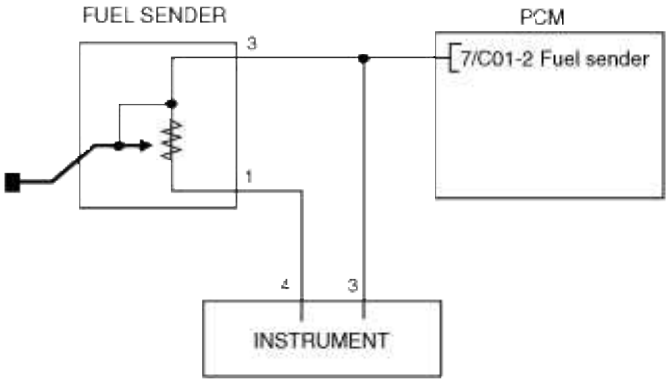
NOTE

- S/F : Sensor Full
- G/F : Guage Full
- W/G : Warning Point
- G/E : Guage End
- S/E : Sensor End
- 7/8, 6/8, 5/8, 4/8, 3/8, 2/8, 1/8 : Indicator Position in cluster

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

PCM (A/T)

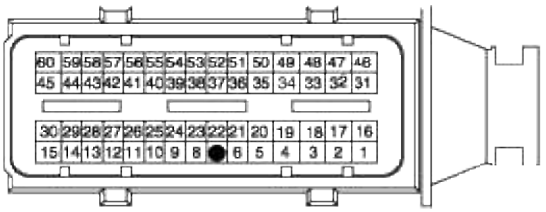
Terminal	Connected to	Function
1	Instrument Cluster	Fuel Sender Ground
2	-	-
3	PCM terminal 7/C01-2	Fuel Sender Signal
4	Main Relay	Fuel Pump Power
5	Chassis Ground	Fuel Pump Ground

[HARNESS CONNECTOR]

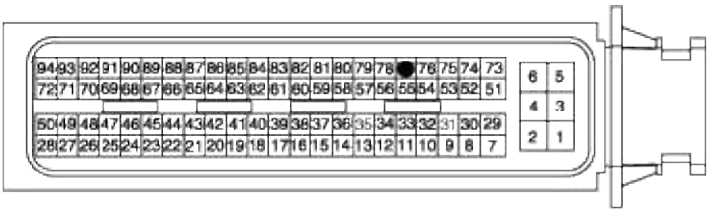


F18

Fuel Sender & Fuel Pump Motor



C01-2

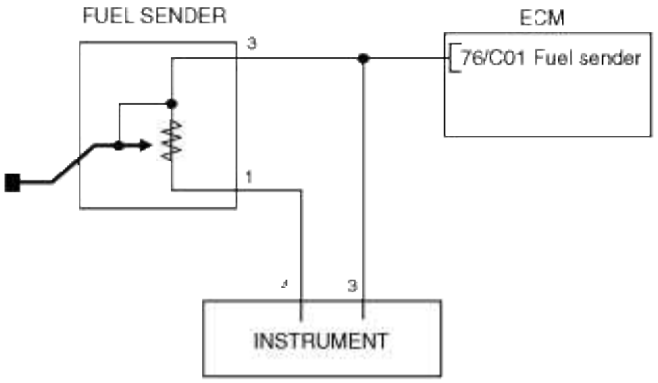


C01

ECM

(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

ECM

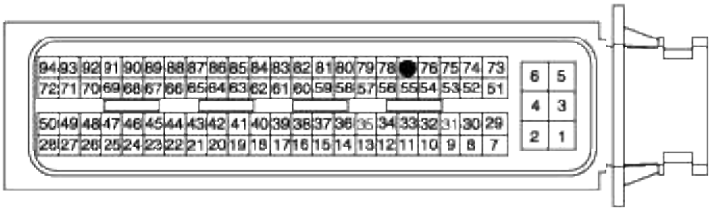
Terminal	Connected to	Function
1	Instrument Cluster	Fuel Sender Ground
2	-	-
3	ECM terminal 76/C01-2	Fuel Sender Signal
4	Main Relay	Fuel Pump Power
5	Chassis Ground	Fuel Pump Ground

[HARNESS CONNECTOR]



F18

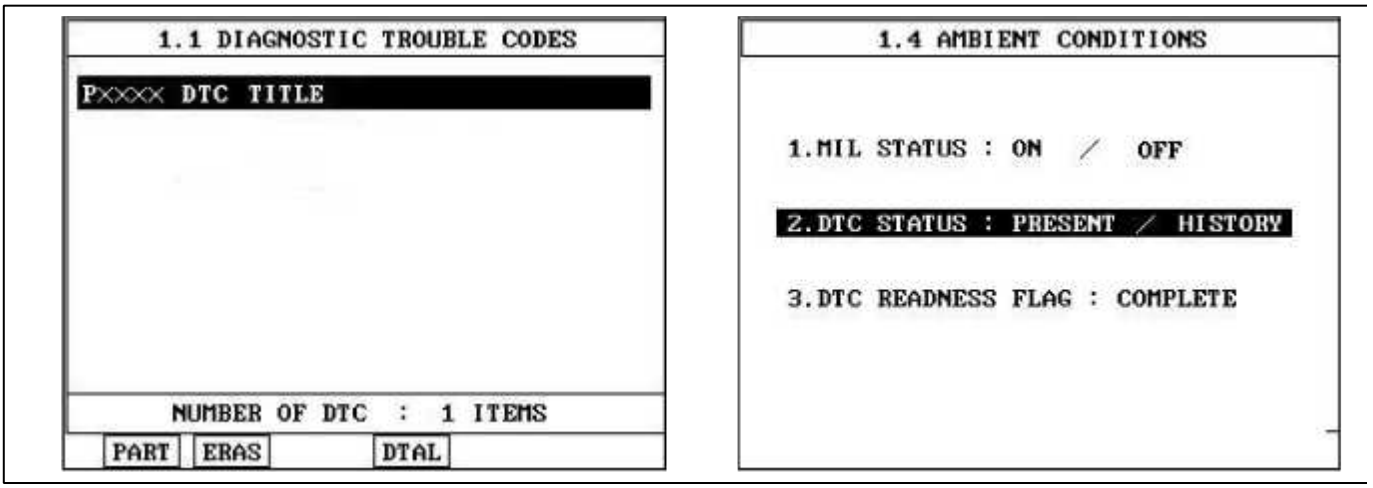
Fuel Sender & Fuel Pump Motor



ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

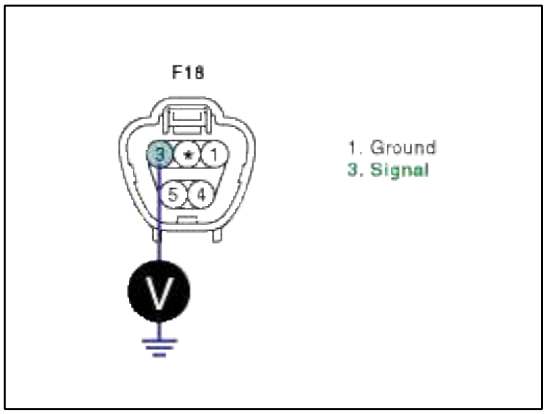
NO

Go to "Fuel level sensor circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect Fuel Level Sensor connector.
3. IG "ON".
4. Measure the voltage between terminal 3 of Fuel Level Sensor harness connector and ground.

Specification : Approx. 11 V



5. Is the measured voltage within specification ?

YES

Go to "Ground circuit inspection" procedure.

NO

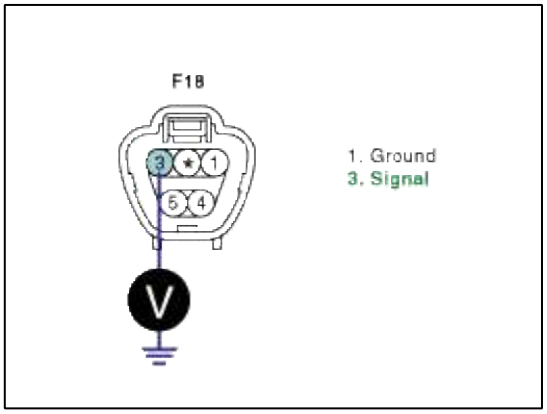
Repair Short to ground circuit and then go to "Verification of Vehicle Repair" procedure.

In case of 0V, repair Open in signal circuit and then go to "Verification of Vehicle Repair" procedure. In case of 12V, repair Short to power in signal circuit and then go to"Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect Fuel Level Sensor connector.
3. IG "ON".
4. Measure the voltage between terminal 4 of Fuel Level Sensor harness connector and ground.(A)
   Measure the voltage between terminal 1 and 4 of Fuel Level Sensor harness connector.(B)

   Specification : "A" - "B" = Below 200mV



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair Open in ground circuit and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. IG "OFF".
2. Disconnect Fuel Level Sensor harness connector.
3. Measure the resistance between terminal 1 and 3 of Fuel Level Sensor harness connector. (Component side) (Measure the resistance with Change the position of a float.)

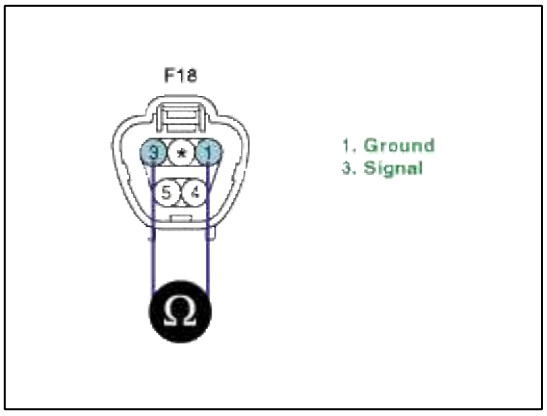
Specification :

Float Position	Sender Resistence (Ω)	Fuel Height at Tank Bottom (mm)	Fuel Tank Volume Reference only	
			lit.	U.S.gal.
S/F	6.0±2	155.6±2	43.0	11.4
G/F	15.0±2	151.8±2	42.0	11.1
7/8	25.0±2	135.6±2	37.5	9.9
6/8	36.0±2	120.6±2	33.0	8.7
5/8	50.0±2	106.2±2	28.5	7.5
4/8	66.0±2	93.1±2	24.0	6.3
3/8	86.0±2	79.9±2	19.5	5.2
2/8	110.2±2	66.4±2	15.0	4.0
1/8	142.0±2	51.8±2	10.5	2.8
W/G	170.0±2	34.5±2	6.6	1.7
G/E	184.0±2	29.6±2	5.0	1.3

S/E	200.0±2	25.2±2	4.0	1.1

NOTE

- S/F : Sensor Full
- G/F : Guage Full
- W/G : Warning Point
- G/E : Guage End
- S/E : Sensor End
- 7/8, 6/8, 5/8, 4/8, 3/8, 2/8, 1/8 : Indicator Position in cluster



(1) Is the measured resistance within specification ?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Fuel Level Sensor and check for proper operation.If the problem is corrected, replace Fuel Level Sensor and then go to"Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0496 Evaporative Emission System High Purge Flow

GENERAL DESCRIPTION

The purge control solenoid valve (PCSV) is a device used to meter vapor flow to the engine. The ECM/PCM controls the PCSV using a duty cydle signal.

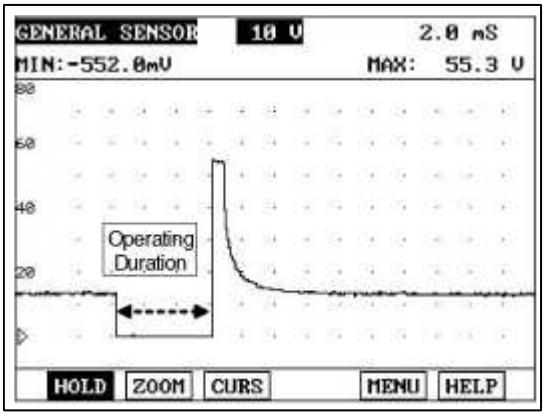
DTC DESCRIPTION

If the Reference value of differential tank pressure is below -0.6hPa(-1.253 lbf/ft²), ECM/PCM determines that PCSV is stuck open and sets DTC P0496.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Fuel tank pressure behavior (Canister purge valve stuck check)	• Leakage on the fuel Evaporative system hose • PCSV • ECM/PCM
Enable Conditions	• Time after engine start > 600sec. • Idle speed controller activated • Mixture adaptation activated • Coolant temperature at start - ambient temperature< 6.6°C (11.88°F) • Ambient temperature : 4~35°C (39.2 ~ 95°F) • Ambient pressure >680hPa (10 lbf/in²) • Fuel level : 6.45 ~ 38.7 L (1.7 ~ 10.2 gal) • Tank ventilation must be active >10sec. • No misfire	
Threshold Value	• Reference value of differential tank pressure< -0.6hPa (-1.253 lbf/ft²)	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



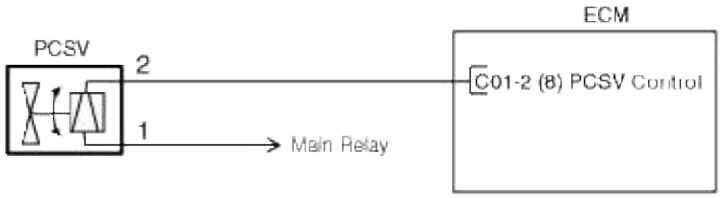
SPECIFICATION

Item	Specification
PCSV Coil Resistance	16Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

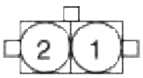
[CIRCUIT DIAGRAM]



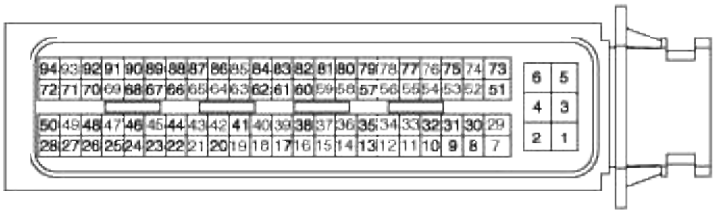
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (8)	PCSV Control

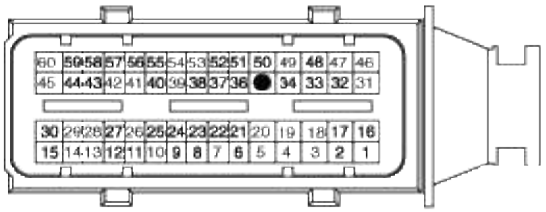
[HARNESS CONNECTORS]



PCSV (C26)



C01-1

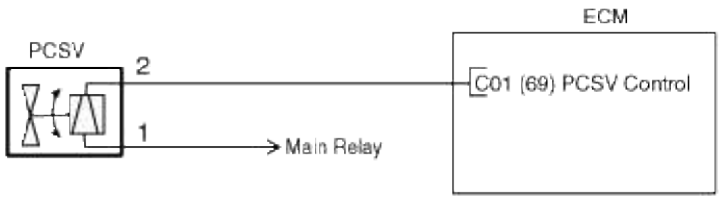


C01-2

ECM

(M/T)

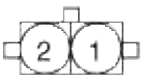
[CIRCUIT DIAGRAM]



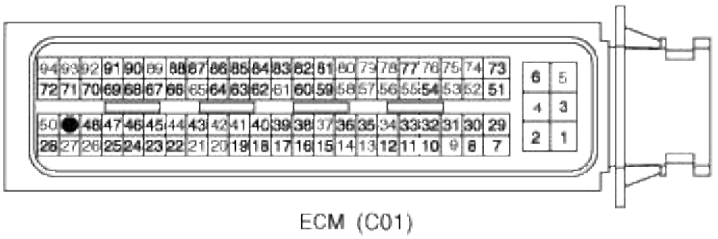
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (69)	PCSV Control

[HARNESS CONNECTORS]



PCSV (C26)

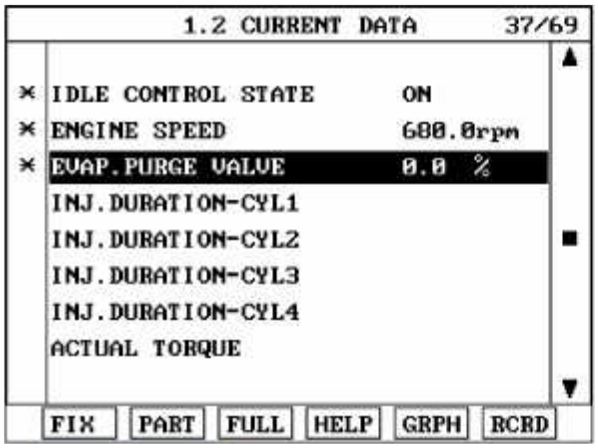


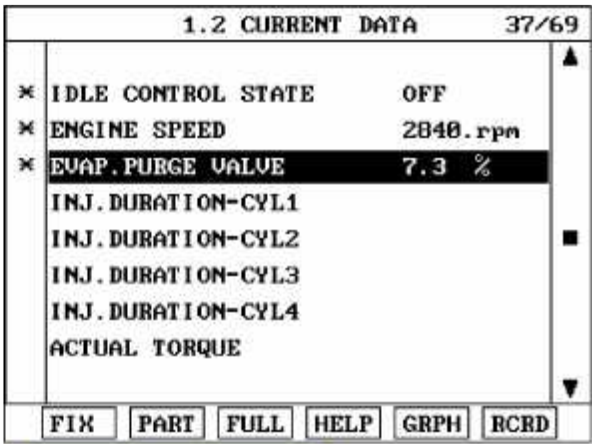
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "PCSV" parameters on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

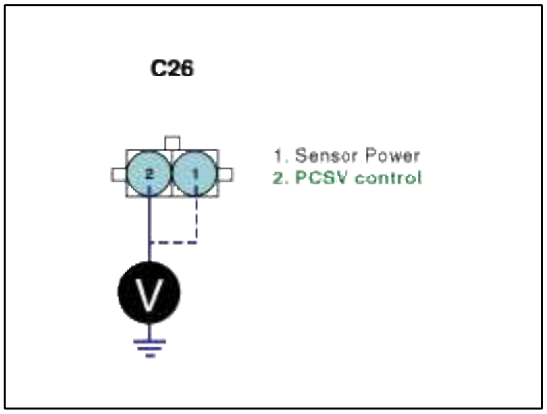
Go to "PCSV Voltage Check" procedure.

Voltage Check

1. IG "OFF".
2. Disconnect PCSV connector.
3. IG "ON".

4. Measure the voltage between terminal 1 of PCSV harness connector and chassis ground.
   Measure the voltage between terminal 2 of PCSV harness connector and chassis ground.

Specification : Terminal 1 B+
Terminal 2 Approx. 3.5V



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair Open or Short in circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Visual Inspection
   (1) Check damage, looseness or poor connection on hoses for the fuel evaporative system.
   (2) Has a problem been found?

   YES

   Repair as necessary and go to "Verification of vehicle Repair" procedure

   NO

   Go to "Check PCSV" procedure.

2. Check PCSV
   (1) Disconnect a hose between a surge tank and PCSV. (Surge tank side only)
   (2) Connect a vacuum guage to a hose, and apply vacuum.
   (3) Is it possibe to make vacuum?

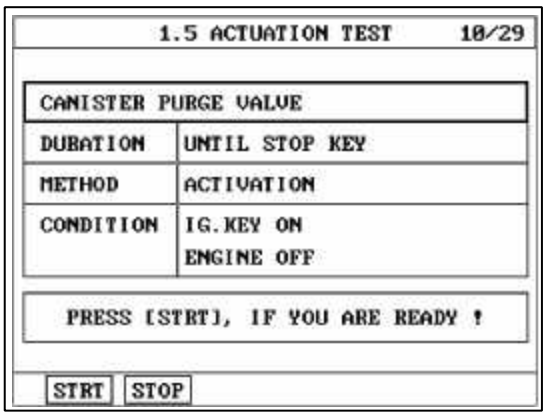
   YES

   Go to "Check ECM/PCM" procedure.

   NO

   Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure.

3. Check ECM/PCM
   (1) Connect scantool on the DLC(Data Link Connector)
   (2) Perform Action Test for Canister Vent Solenoid Valve with scantool
   (3) Check clicking sound of PCSV.



   (4) Is the PCSV normal ?

YES

Thoroughly check connectors for looseness, poor connection, ending, corrosion,contamination, deterioration, or damage. Repair or replace as necessaryand go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0497 Evaporative Emission System Low Purge Flow

GENERAL DESCRIPTION

The purge control solenoid valve (PCSV) is a device used to meter vapor flow to the engine. The ECM/PCM controls the PCSV using a duty cydle signal.

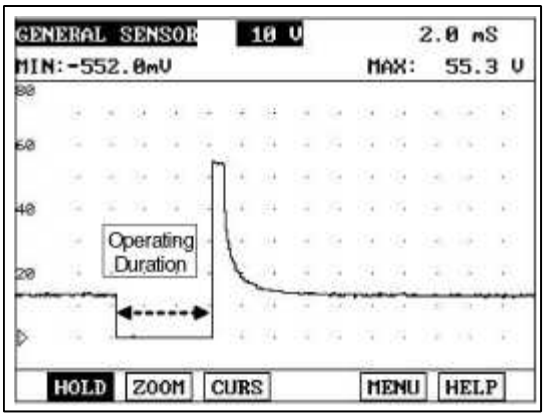
DTC DESCRIPTION

If the Reference value of differential tank pressure is over 5hPa (10.443 lbf/ft²), ECM/PCM determines that PCSV is stuck closed and sets DTC P0497.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Fuel tank pressure behavior (Canister purge valve stuck check)	• Clog on the fuel Evaporative system hose • PCSV • ECM/PCM
Enable Conditions	• Time after engine start > 600sec. • Idle speed controller activated • Mixture adaptation activated • Coolant temperature at start - ambient temperature< 6.6°C (11.88°F) • Ambient temperature : 4~35°C (39.2 ~ 95°F) • Ambient pressure >680hPa (10 lbf/in²) • Fuel level : 6.45 ~ 38.7 L (1.7 ~ 10.2 gal) • Tank ventilation must be active >10sec. • No misfire	
Threshold Value	• Reference value of differential tank pressure > 5hPa (10.443 lbf/ft²)	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



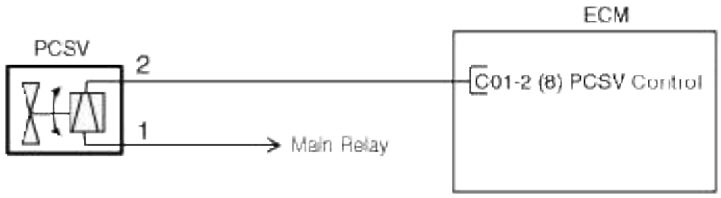
SPECIFICATION

Item	Specification
PCSV Coil Resistance	16Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

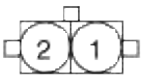
[CIRCUIT DIAGRAM]



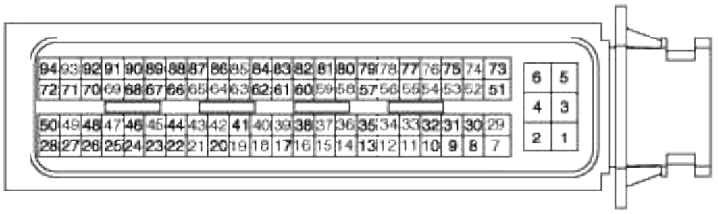
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (8)	PCSV Control

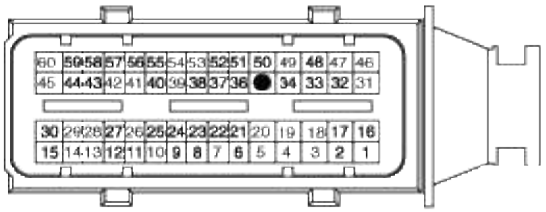
[HARNESS CONNECTORS]



PCSV (C26)



C01-1

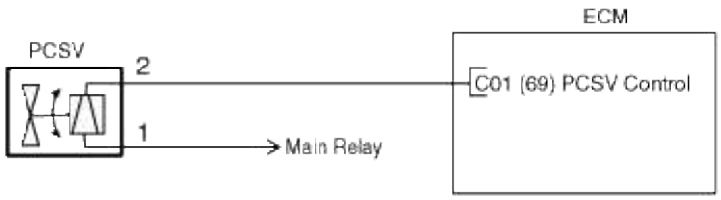


C01-2

ECM

(M/T)

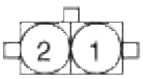
[CIRCUIT DIAGRAM]



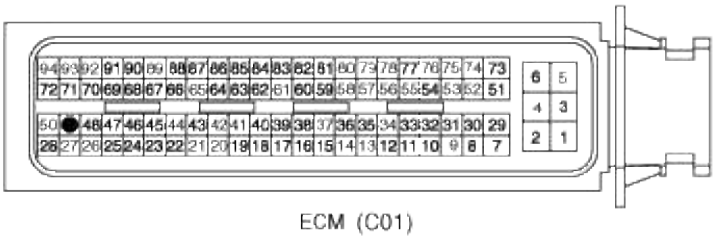
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (69)	PCSV Control

[HARNESS CONNECTORS]



PCSV (C26)

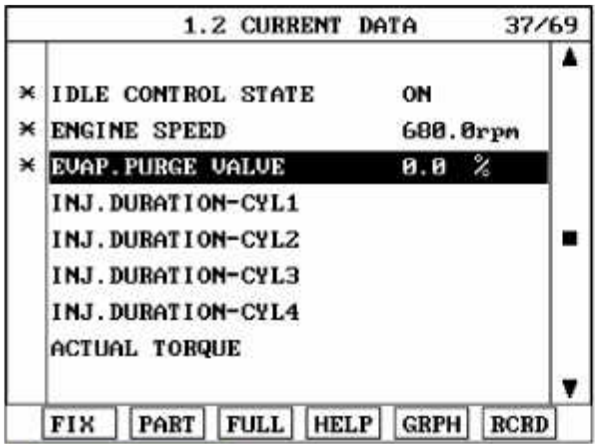


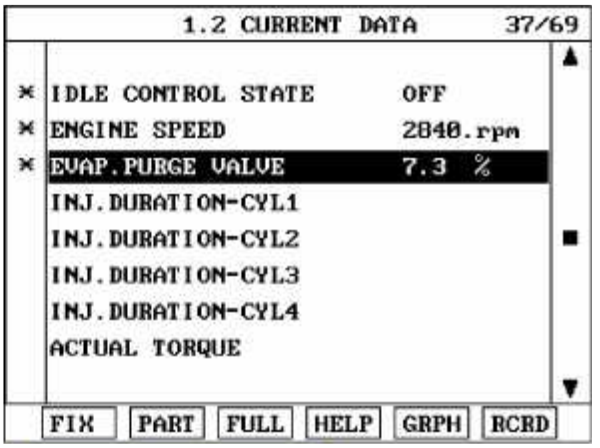
ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "PCSV" parameters on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

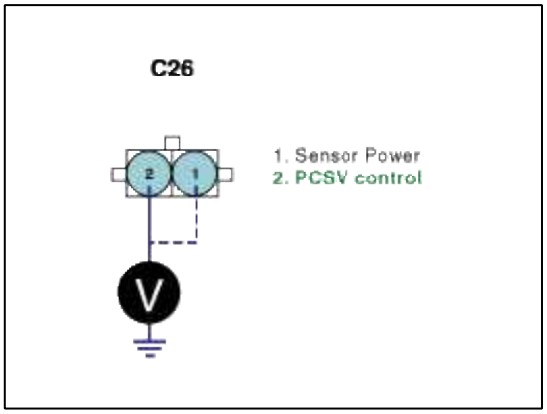
Go to "PCSV Voltage Check" procedure.

Voltage Check

1. IG "OFF".
2. Disconnect PCSV connector.
3. IG "ON".

4. Measure the voltage between terminal 1 of PCSV harness connector and chassis ground.
   Measure the voltage between terminal 2 of PCSV harness connector and chassis ground.

Specification : Terminal 1 B+
Terminal 2 Approx. 3.5V



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair Open or Short in circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Visual Inspection
   (1) Check damage, looseness or poor connection on hoses for the fuel evaporative system.
   (2) Has a problem been found?

   YES

   Repair as necessary and go to "Verification of vehicle Repair" procedure

   NO

   Go to "Check PCSV" procedure.

2. Check PCSV
   (1) Disconnect a hose between a surge tank and PCSV. (Surge tank side only)
   (2) Connect a vacuum guage to a hose, and apply vacuum.
   (3) Is it possibe to make vacuum?

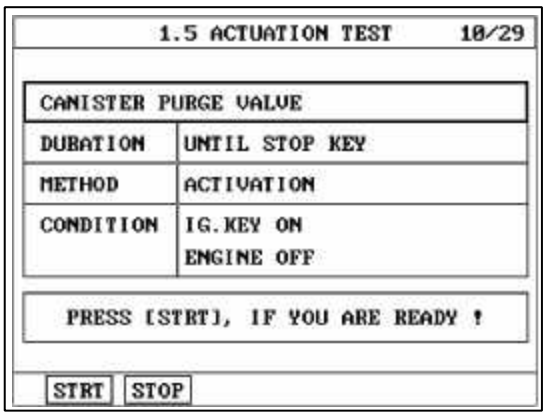
   YES

   Go to "Check PCM" procedure.

   NO

   Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure.

3. Check PCM
   (1) Connect scantool on the DLC(Data Link Connector)
   (2) Perform Action Test for Canister Vent Solenoid Valve with scantool
   (3) Check clicking sound of PCSV.



   (4) Is the PCSV normal ?

YES

Thoroughly check connectors for looseness, poor connection, ending, corrosion,contamination, deterioration, or damage. Repair or replace as necessaryand go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

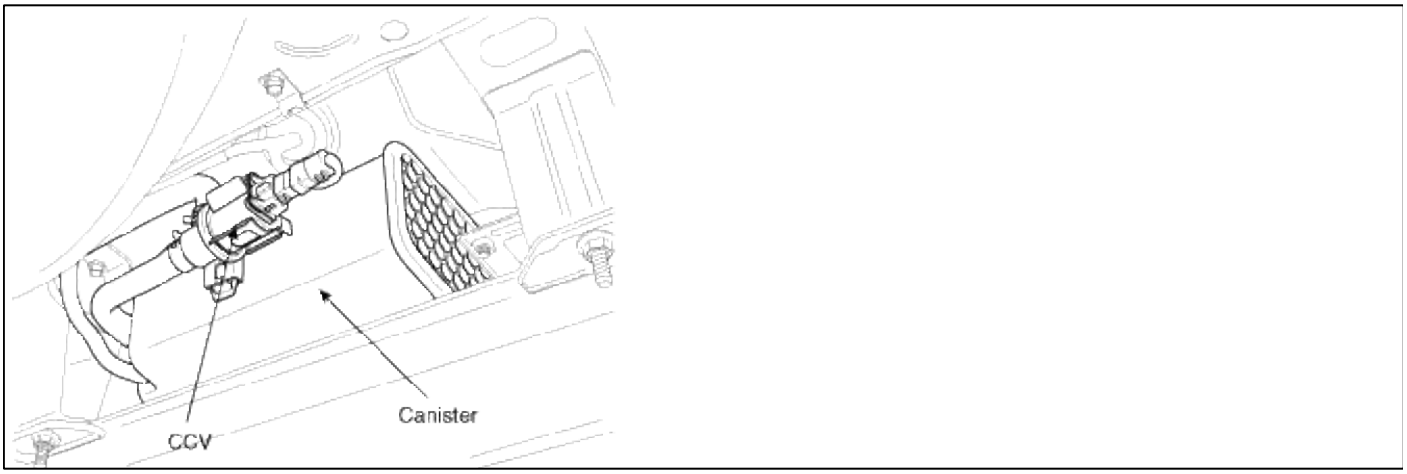
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0498 Evaporative Emission System Vent Valve Control Circuit Low

COMPONENT LOCATION



GENERAL DESCRIPTION

The evaporative emissions system prevents hydrocarbon (HC) vapors from the fuel tank from escaping into the atmosphere where they could form photochemical smog. Gasoline vapors are collected in the charcoal canister. The Canister Close Valve (CCV) closes off the air inlet into the canister for leak detection of the evaporative emissionsystem. The CCV also prevents fuel vapors from escaping from the canister. When the engine purges the HC vapors from the canister, the clean air comes into the canister through the canister air-filter and the CCV.

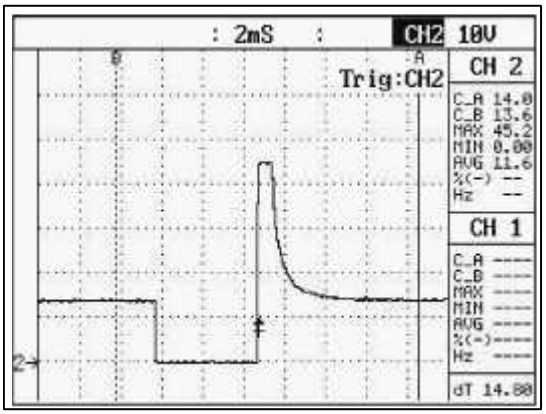
DTC DESCRIPTION

If there is Short to ground in control circuit, ECM/PCM sets DTC P0498.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • Short to ground in control circuit • CCV • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to ground	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



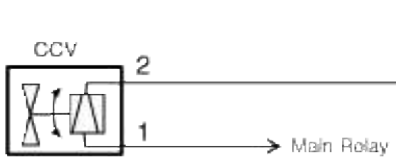
SPECIFICATION

Item	Specification
CCV Coil Resistance	23.0 ~ 26.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



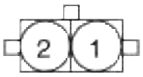
ECM

C01-2 (35) CCV Control

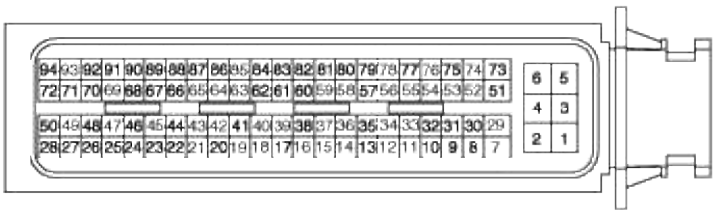
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01-2 (35)	CCV Control

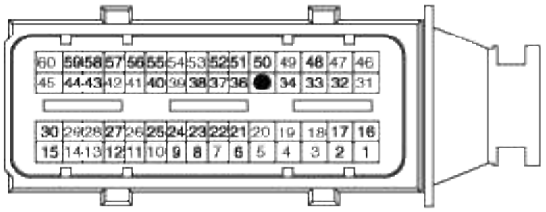
[HARNESS CONNECTORS]



CCV (F05)



C01-1

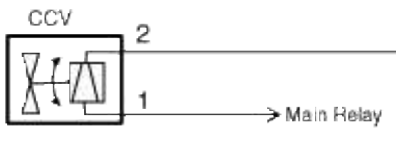


C01-2

ECM

(M/T)

[CIRCUIT DIAGRAM]



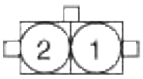
ECM

C01 (49) CCV Control

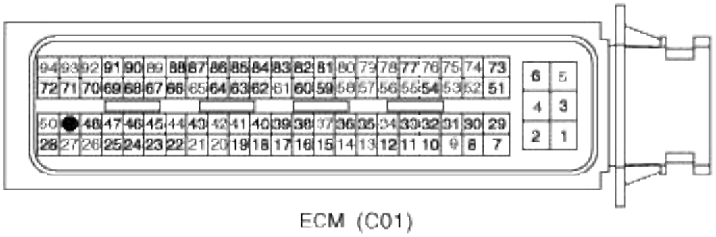
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (49)	CCV Control

[HARNESS CONNECTORS]



CCV (F05)

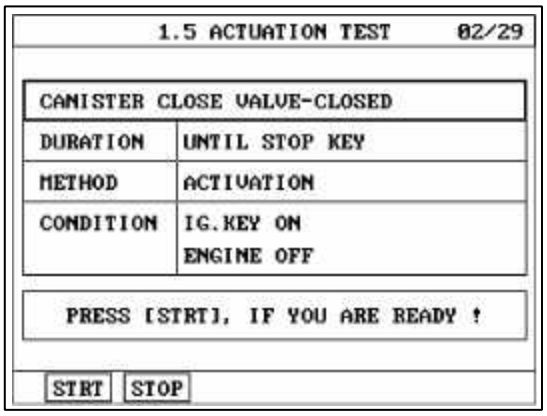


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Perform Action Test for Canister Vent Solenoid Valve with scantool

3. Check that clicking sound can be heard by actuation test.



4. Is the CCV normal ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

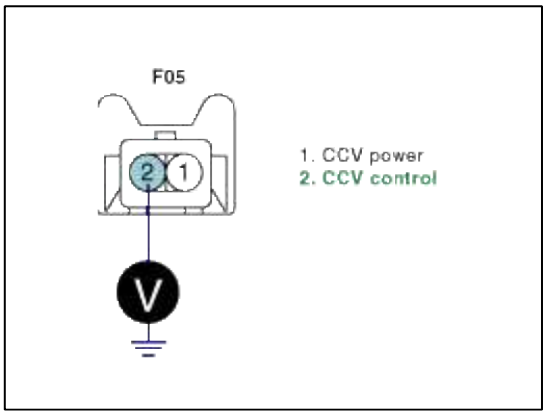
NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CCV connector.
3. key "ON".
4. Measure the voltage between terminal 2 of CCV harness connector and chassis ground.

Specification : Approx 3.5V



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair Short to ground in control circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. CCV Check

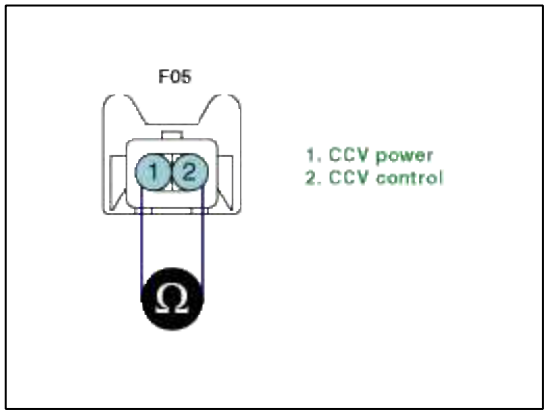
(1) Key "OFF".

(2) Disconnect CCV harness connector.

(3) Measure the resistance between terminal 1 and 2 of CCV harness connector.(Component side)

Specification :

Item	Specification
CCV Coil Resistance	23.0 ~ 26.0Ω at 20°C (68°F)



(4) Is the measured resistance within specification ?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good CCV and check for proper operation. If the problem is corrected, replace CCV and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

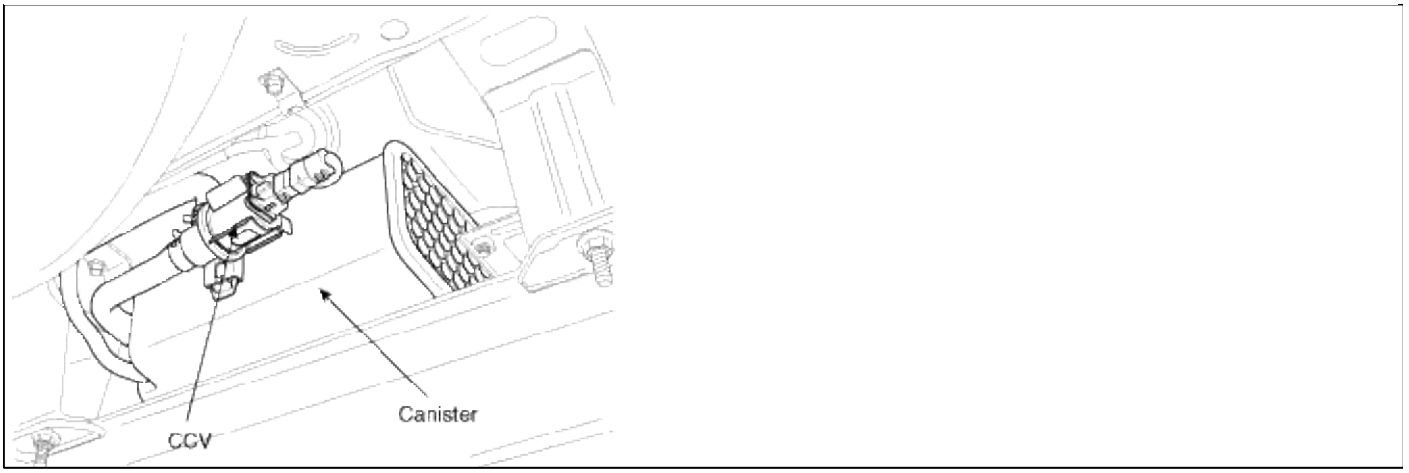
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0499 Evaporative Emission System Vent Valve Control Circuit High

COMPONENT LOCATION



GENERAL DESCRIPTION

The evaporative emissions system prevents hydrocarbon (HC) vapors from the fuel tank from escaping into the atmosphere where they could form photochemical smog. Gasoline vapors are collected in the charcoal canister. The Canister Close Valve (CCV) closes off the air inlet into the canister for leak detection of the evaporative emissionsystem. The CCV also prevents fuel vapors from escaping from the canister. When the engine purges the HC vapors from the canister, the clean air comes into the canister through the canister air-filter and the CCV.

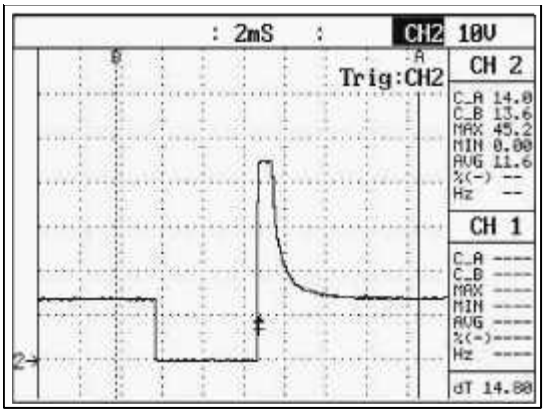
DTC DESCRIPTION

If there is Short to power in control circuit, ECM/PCM sets DTC P0499.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • Short to power in control circuit • CCV • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to battery	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



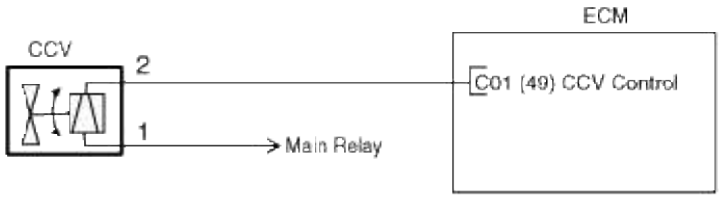
SPECIFICATION

Item	Specification
CCV Coil Resistance	23.0 ~ 26.0Ω at 20°C (68°F)

SCHEMATIC DIAGRAM

(A/T)

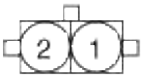
[CIRCUIT DIAGRAM]



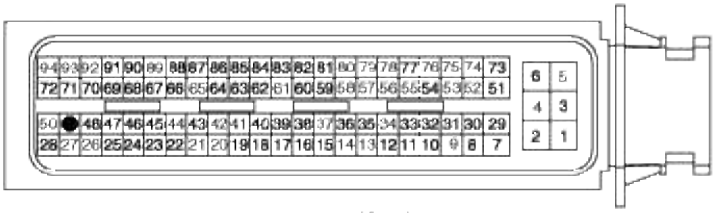
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage (B+)
2	ECM C01 (49)	CCV Control

[HARNESS CONNECTORS]



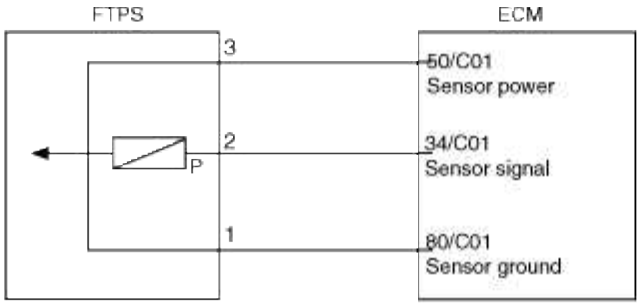
CCV (F05)



ECM (C01)

(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

ECM (M/T)

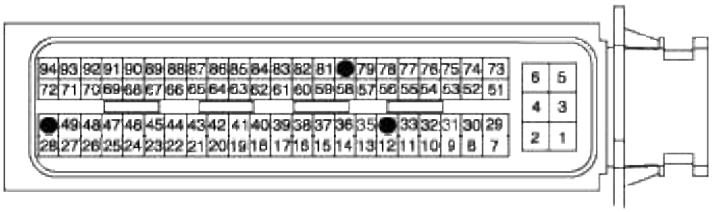
Terminal	Connected to	Funtion
1	ECM Terminal 80/C01	Sensor ground
2	ECM Terminal 34/C01	FTPS signal
3	ECM Terminal 50/C01	Sensor power (5V)

[HARNESS CONNECTORS]



E22

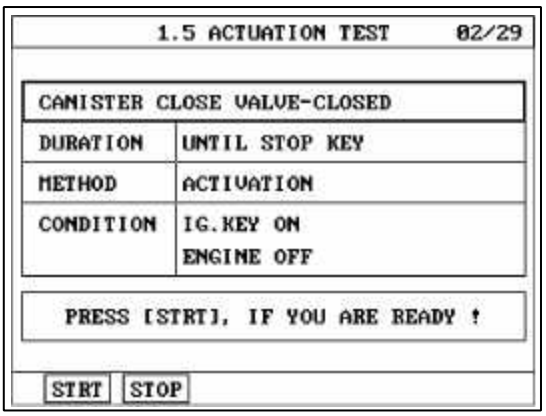
FTPS



C01

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Perform Action Test for Canister Vent Solenoid Valve with scantool
3. Check that clicking sound can be heard by actuation test.



4. Is the CCV normal ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

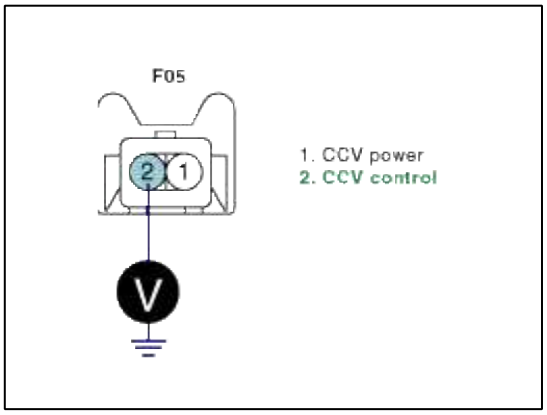
NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect CCV connector.
3. key "ON".
4. Measure the voltage between terminal 2 of CCV harness connector and chassis ground.

Specification : Approx 3.5V



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

Repair Short to ground in control circuit and then, go to "Verification of Vehicle Repair" procedure.

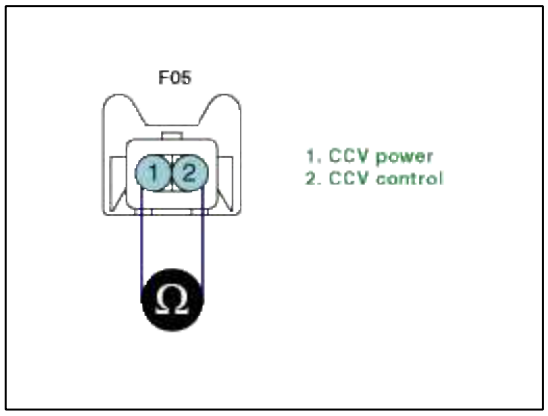
COMPONENT INSPECTION

1. CCV Check
   (1) Key "OFF".
   (2) Disconnect CCV harness connector.

(3) Measure the resistance between terminal 1 and 2 of CCV harness connector.(Component side)

Specification :

Item	Specification
CCV Coil Resistance	23.0 ~ 26.0Ω at 20°C (68°F)



(4) Is the measured resistance within specification ?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good CCV and check for proper operation. If the problem is corrected, replace CCV and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

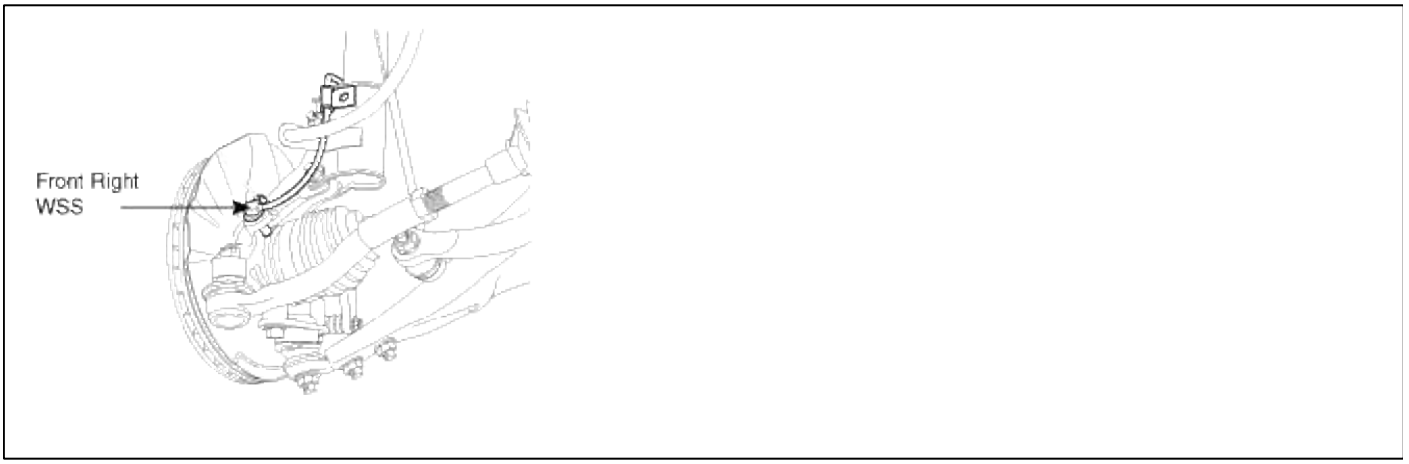
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0501 Vehicle Speed Sensor \'A\' Range/Performance

COMPONENT LOCATION



GENERAL DESCRIPTION

A Wheel Speed Sensor(RF) is used by the ECM/PCM to calculate vehicle speed. This sensor is connected directly to the ECM/PCM in non-ABS vehicles. On ABS vehicles, the sensor feeds the ABS control module first; the signal is then sent to the ECM/PCM.

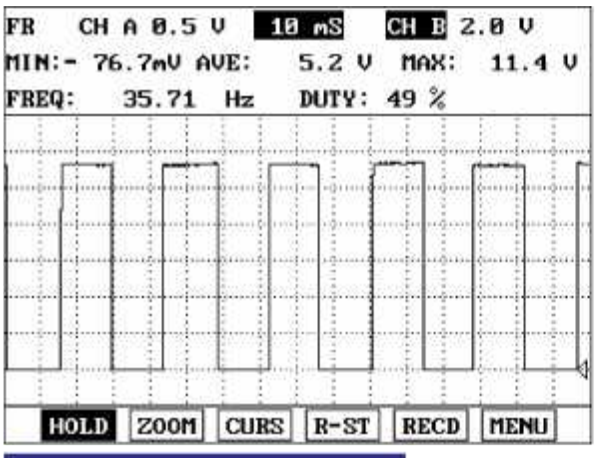
DTC DESCRIPTION

If the vehicle speed signal is below 0.62 MPH during 2 sec under enable conditions, ECM/PCM sets P0501.

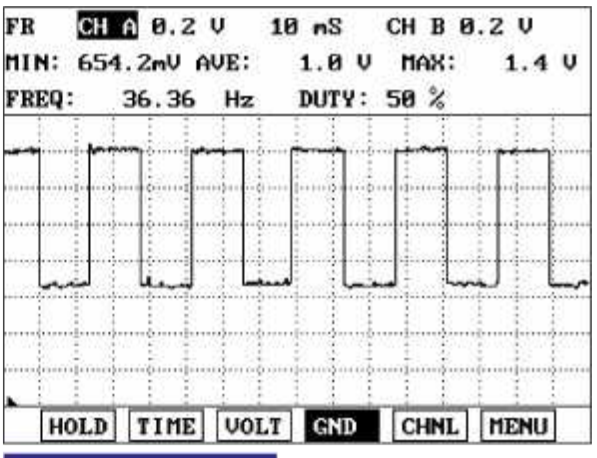
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check	[ABS/ESP Vehicle] • Poor connection • Open or short in signal circuit • ABS/ESP Module • PCM [Non-ABS/ESP Vehicle] • Poor connection • Open or short in power circuit • Open or short in signal circuit • WSS • PCM
Enable Conditions	• (M/T or A/T) Engine speed during fuel cut-off 1520~3520rpm • (only A/T at D or R position) Engine speed > 3000rpm, Engine load > 49.5% Coolant temperature > -48°C (-54.4°F)	
Threshold Value	• Vehicle speed signal < 1.0 Km/h (0.62MPH)	
Diagnostic Time	• 2 sec	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



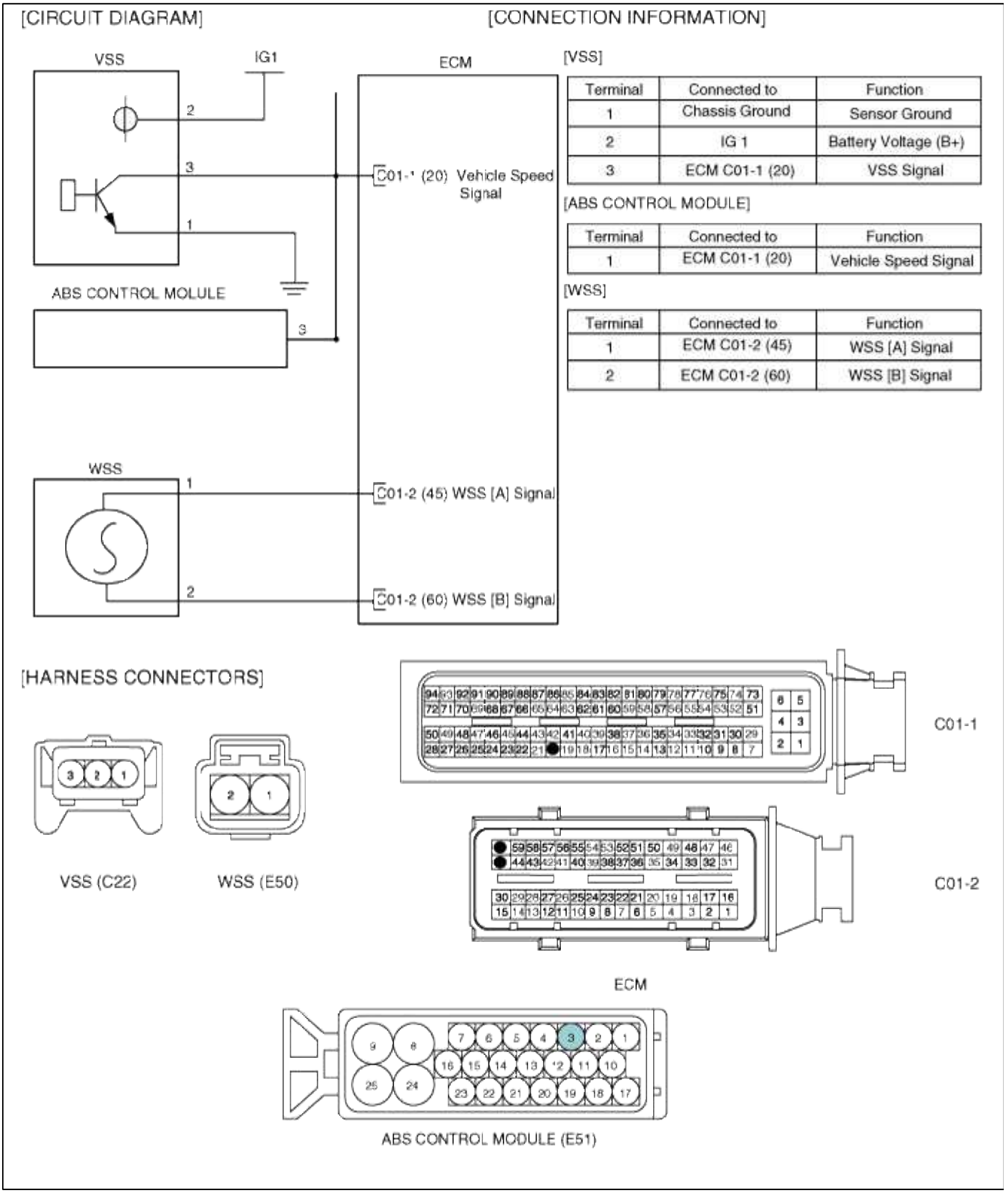
Signal from ABS/ESP Module to ECM



Signal from WSS to ECM

SCHEMATIC DIAGRAM

(A/T)

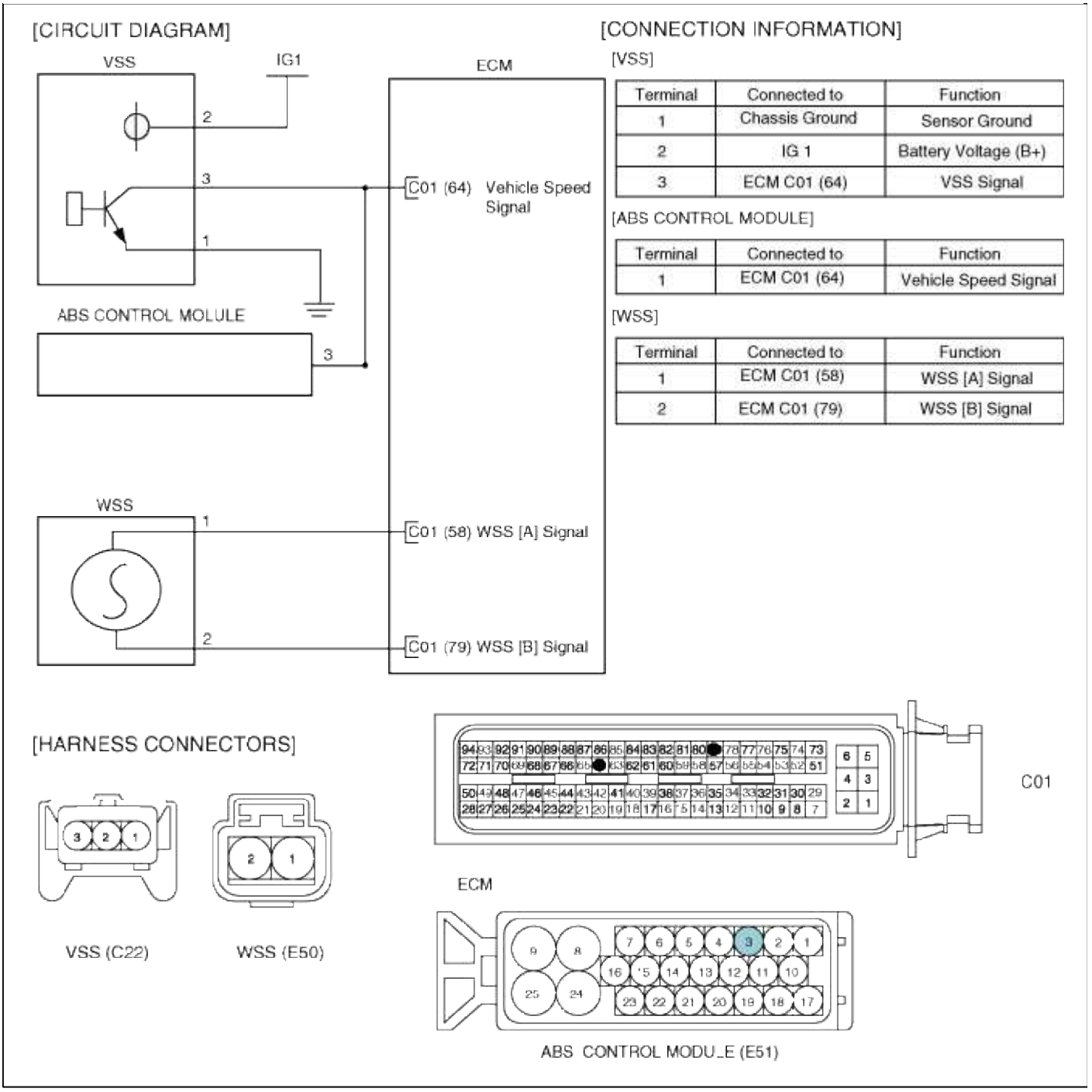


Terminal	Connected to	Function
1	Chassis Ground	Sensor Ground
2	IG 1	Battery Voltage (B+)
3	ECM C01-1 (20)	VSS Signal

Terminal	Connected to	Function
1	ECM C01-1 (20)	Vehicle Speed Signal

Terminal	Connected to	Function
1	ECM C01-2 (45)	WSS [A] Signal
2	ECM C01-2 (60)	WSS [B] Signal

(M/T)



[CONNECTION INFORMATION]

[VSS]

Terminal	Connected to	Function
1	Chassis Ground	Sensor Ground
2	IG 1	Battery Voltage (B+)
3	ECM C01 (64)	VSS Signal

[ABS CONTROL MODULE]

Terminal	Connected to	Function
1	ECM C01 (64)	Vehicle Speed Signal

[WSS]

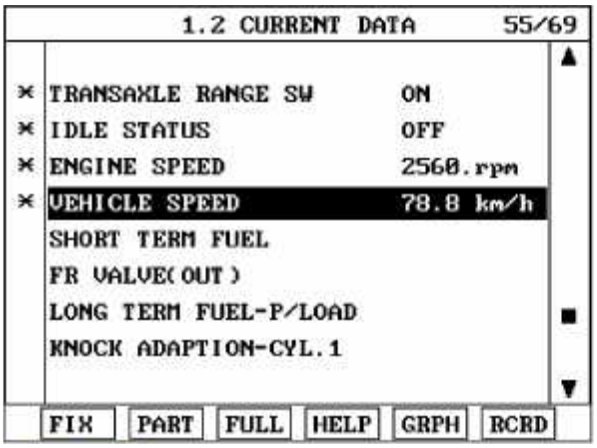
Terminal	Connected to	Function
1	ECM C01 (58)	WSS [A] Signal
2	ECM C01 (79)	WSS [B] Signal

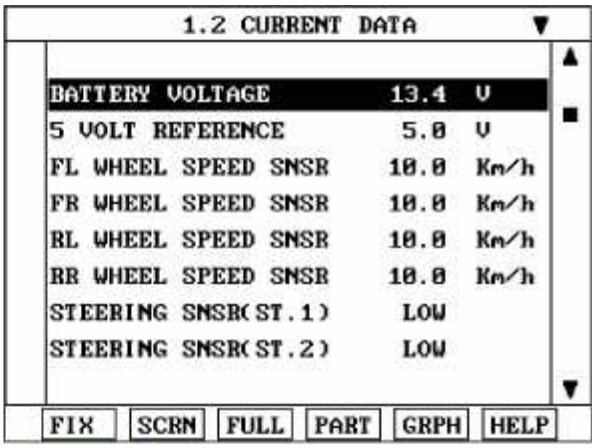
MONITOR SCANTOOL DATA

ABS Vehicle

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "VSS" parameters on the scantool.(ENG. Control)

4. Monitor the "WHEEL SPEED SENSOR-FR" parameter on the Scantool. (ABS Control)





5. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Check the DTCs on ABS(ESP) Module first. If there are DTCs on ABS(ESP) Module, Refer to the Trouble Shooting Guide for ABS(ESP). But, if there isn't DTC on ABS(ESP) Module, go to "Terminal & Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

ABS Vehicle

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

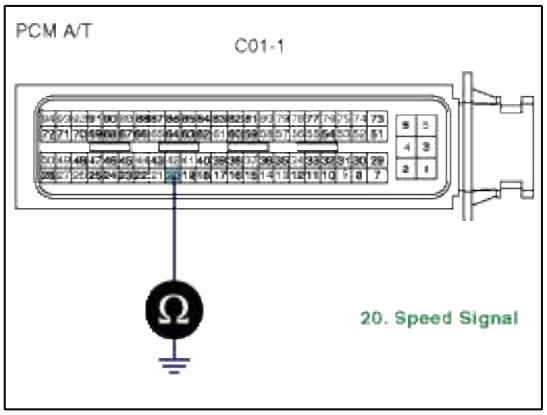
NO

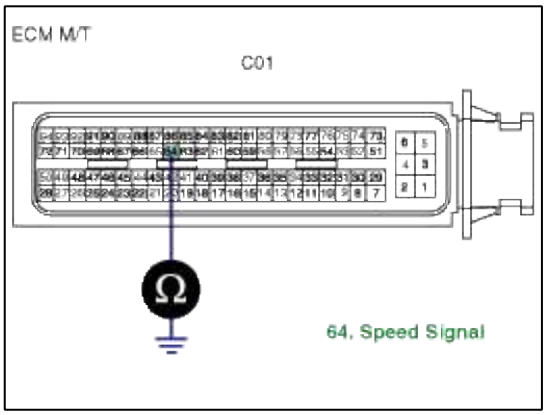
Go to "Signal Circuit Inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check short to ground in harness.
   (1) Key "OFF".
   (2) Disconnect ECM/PCM connector.
   (3) Disconnect ABS control unit.
   (4) Measure resistance between terminal 20/C01-1 of ECM/PCM harness connector and chassis ground.
   Measure resistance between terminal 64/C01 of ECM/PCM harness connector and chassis ground

   Specification : Infinite





   (5) Is the measured resistance within specification?

   YES

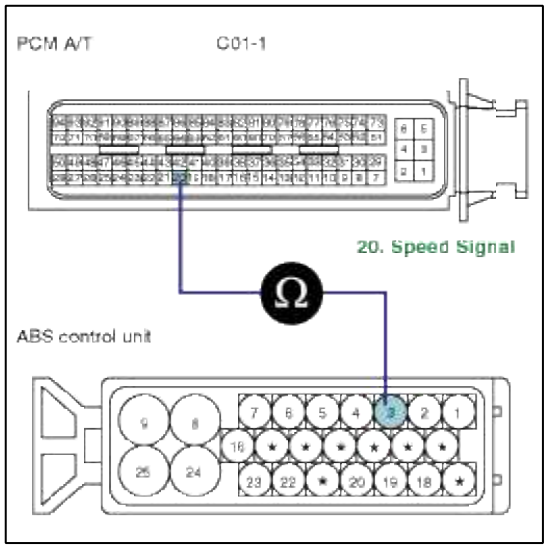
   Go to "Check open in harness" as follows.

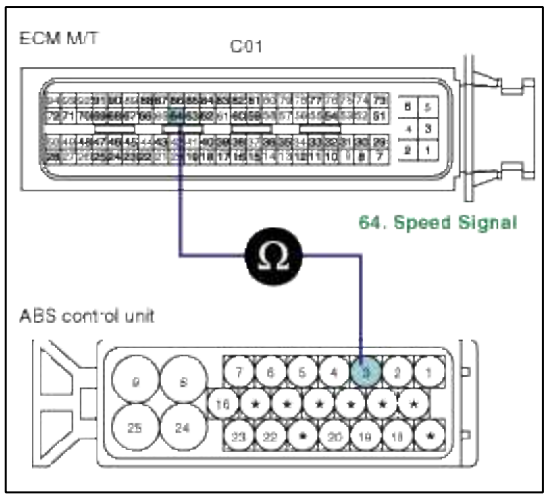
   NO

   Repair short to ground in harness, and go to "Verification of Vehicle Repair" procedure.

2. Check for open in harness.
   (1) Key "OFF".
   (2) Disconnect ECM/PCM connector.
   (3) Disconnect ABS control unit connector.
   (4) Measure resistance between terminal 20/C01-1 of ECM/PCM harness connector and terminal 3/E51of ABS control module harness connector.(A/T)
   Measure resistance between terminal 64/C01 of ECM/PCM harness connector and terminal 3/E51of ABS control module harness connector.(M/T)

   Specification : Approx. below 1Ω





   (5) Is the measured resistance within specifications?

   YES

   Go to "Component inspection" procedure.

   NO

   Repair Open circuit and then, go to "Verification of Vehicle Repair" procedure.

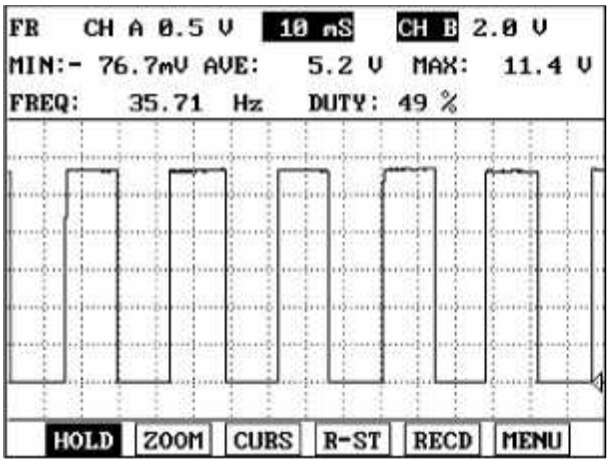
COMPONENT INSPECTION

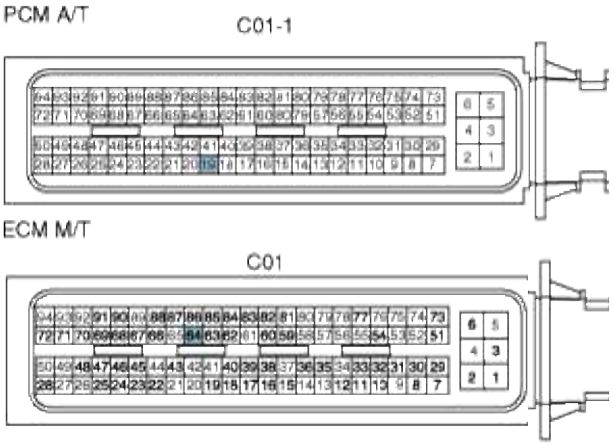
ABS Vehicle

1. ENG "ON".

2. Measure signal waveform of Vehicle Speed from ABS to ECM/PCM while driving.

Specification :





3. Is the signal waveform normal?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

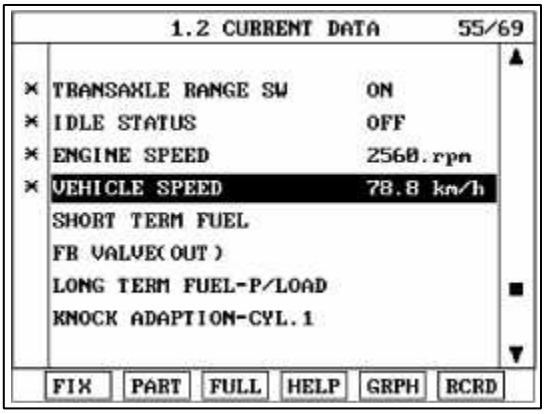
NO

Substitute with a known - good ABS control unit and check for proper operation. If the problem is corrected, replace ABS control unit and go to "Verification of Vehicle Repair" procedure.

MONITOR SCANTOOL DATA

Non-ABS Vehicle

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "VSS" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or ECM’s connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "W/Harness Inspection " procedure.

TERMINAL AND CONNECTOR INSPECTION

Non-ABS Vehicle

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

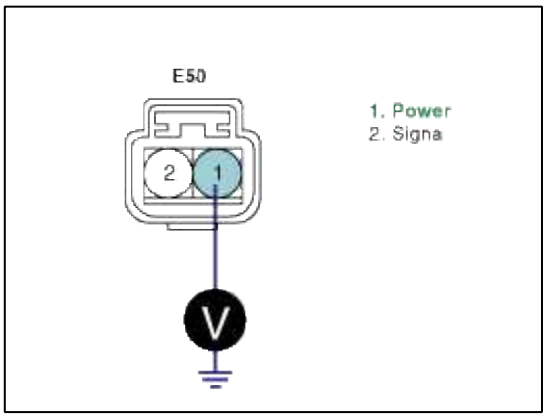
NO

Go to "Power Circuit Inspection" procedure.

POWER SUPPLY CIRCUIT INSPECTION

1. Key "ON".
2. Measure voltage between terminal 1/E50 of the wheel speed sensor harness connector and chassis ground. (Connect wheel speed sensor connector)

Specification : Approx. B+



3. Is the measured voltage within specification?

YES

Go to "Signal Circuit Inspection" procedure.

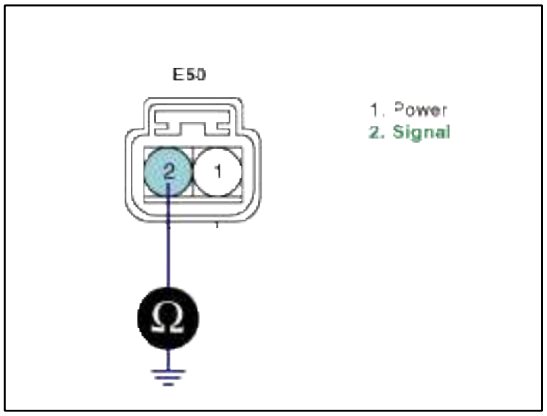
NO

Repair open or short to ground in harness, and go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Key "ON".
2. Measure the voltage between terminal 2/E50 of wheel speed sensor harness connector and chassis ground. (Don't disconnect the WSS connector.)

Specification : 0.7 V or 1.4 V



3. Is the measured voltage within specifications?

YES

Go to "Component Inspection" as follows.

NO

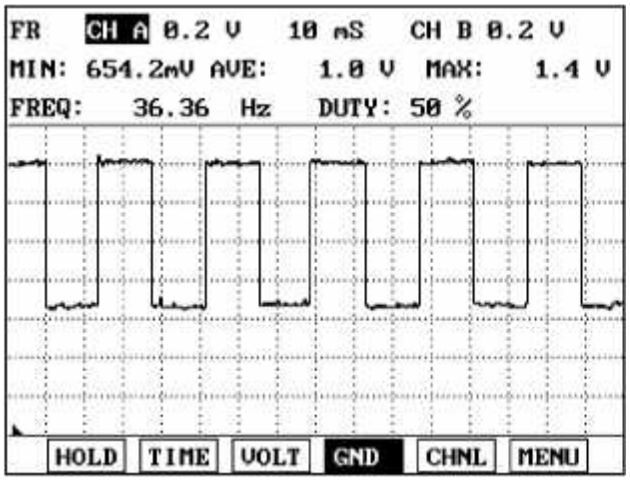
Repair Open or Short in harness, and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

Non-ABS Vehicle

1. Engine "ON".
2. Measure signal waveform of wheel speed sensor while driving.

Specification :





1. Power
2. Signal

3. Is the signal waveform normal?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good wheel speed sensor and check for proper operation. If the problem is corrected, replace wheel speed sensor and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

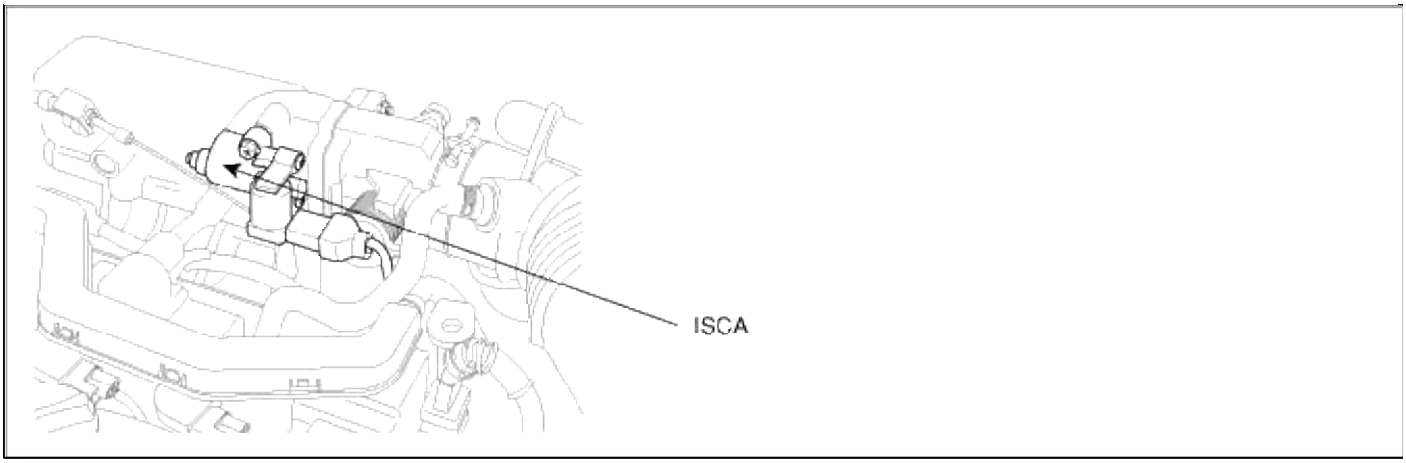
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0505 Idle Air Control System

COMPONENT LOCATION



GENERAL DESCRIPTION

The ISCA (Idle Speed Control Actuator) is designed to maintain a steady desired idle speed. Idle airflow is adjustedthrough the idle air actuator in order to maintain the desired idle speed under various load conditions. Load conditions vary due to numerous factors, such as engine temperature, air conditioning, electrical load and power steering load.

DTC DESCRIPTION

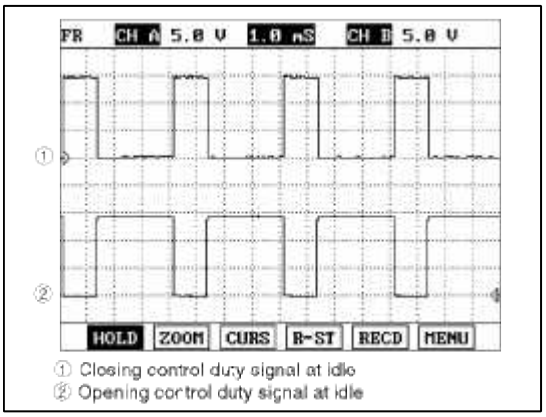
If the real engine speed is lower or higher than the threshold value of desired engine speed during catalyst heating, ECM/PCM sets P0505.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
General EnableConditions		• Vehicle speed = 0 • Coolant temperature > 70°C (158°F) • Intake air temperature > -7.5°C (18.5°F) • Altitude < 3000m (9841ft) • Idle status	• Poor connection • Leak or clog in intake air system • Carbon pile • ISCA • ECM
Case1	DTC Strategy	• Rationality check, low (During catalyst heating)	
	Enable Conditions	• Idle controller I part = 15.0% • Engine load < 35% • Catalyst heating is activated.	
	Threshold Value	• Desired engine speed - Engine speed > 100rpm	
	Diagnostic Time	• 8sec	
Case 2	DTC Strategy	• Rationality check, high (During catalyst heating)	
	Enable Conditions	• Idle controller I part = -15.0% • Catalyst heating is activated.	
	Threshold Value	• Desired engine speed - Engine speed < -200rpm	

		• Fuel cut-off ≥ 3 times	
	Diagnostic Time	• 8sec	
MIL ON Condition		• 2 driving cycle	

SIGNAL WAVEFORM & DATA



① Closing control duty signal at idle
② Opening control duty signal at idle

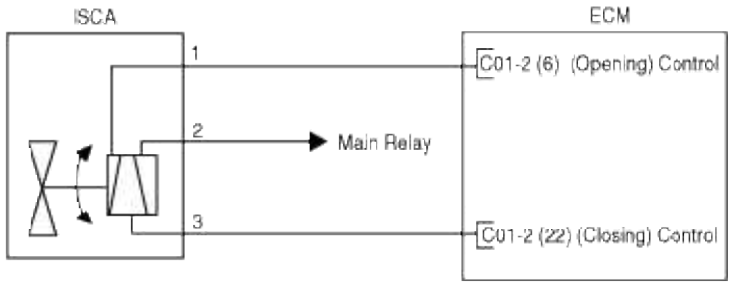
SPECIFICATION

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω

SCHEMATIC DIAGRAM

(A/T)

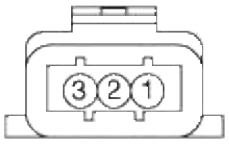
[CIRCUIT DIAGRAM]



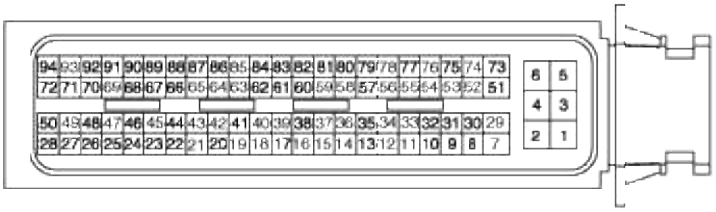
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (6)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01-2 (22)	Closing Control

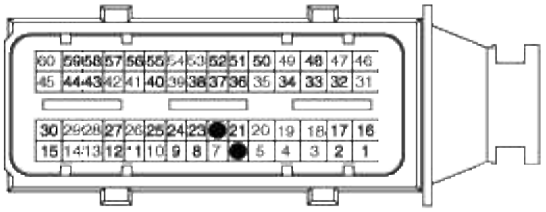
[HARNESS CONNECTORS]



ISCA (C09)



C01-1

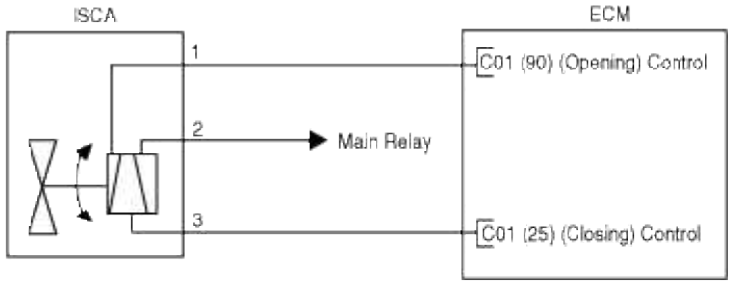


C01-2

ECM

(M/T)

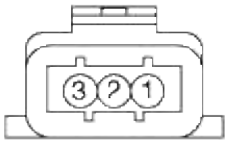
[CIRCUIT DIAGRAM]



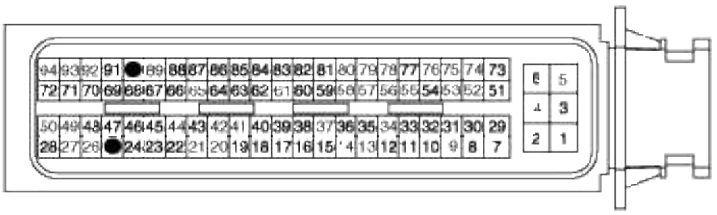
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (90)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01 (25)	Closing Control

[HARNESS CONNECTORS]



ISCA (C09)

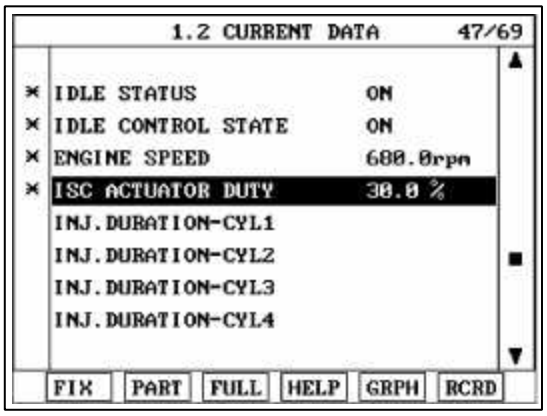


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).

2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

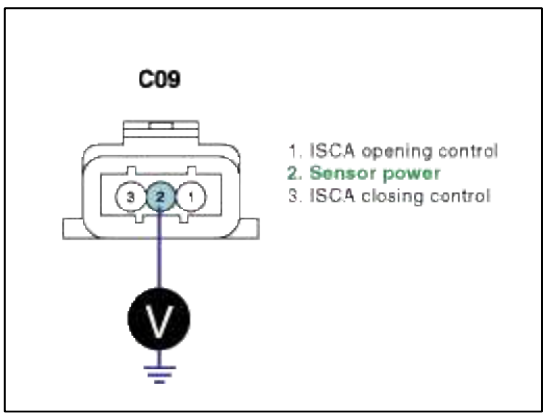
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ISCA connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of ISCA harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

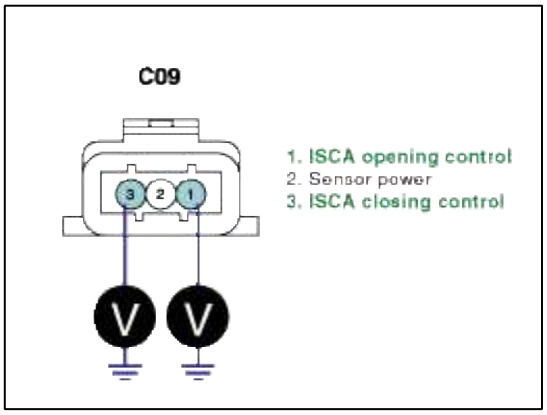
NO

Repair Open or Short in power circuit and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ISCA connector and Key "ON".
3. Measure the voltage between terminal 1 of ISCA harness connector and chassis ground.
4. Measure the voltage between terminal 3 of ISCA harness connector and chassis ground.

Specification : Approx 1.3V (at terminal 1), Approx 2V (at terminal 3)



5. Is the measured voltage within specification?

YES

Go to "System inspection" procedure.

NO

Repair Open or Short in control circuit and then, go to "Verification of Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Visual inspection.
   (1) Key "OFF".
   (2) Check "Air intake/exhaust system"
   Check assembling/sealing state and damage on MAFS and PCV valve.
   Check looseness, deterioration or contamination on air cleaner, throttle body and gasket.
   Check contamination, damage or clog on exhaust gas system.
   (3) Is everything O.K?

YES

Go to "Component inspection" procedure.

NO

Repair as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. ISCA visual check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Check contamination, damage or stuck on ISCA.
   (4) Check the operating sound when key turns "OFF" to "ON".
   (5) Is ISCA O.K?

   YES

   Go to "ISCA check" procedure.

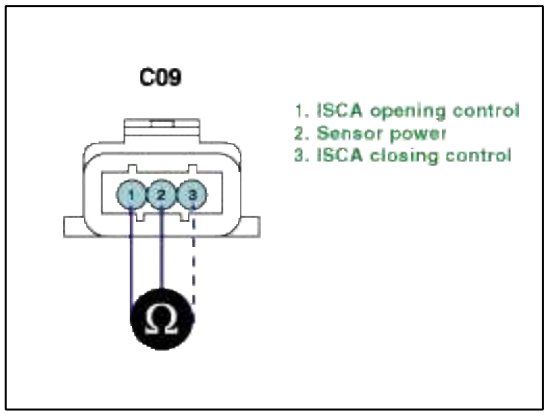
   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

2. ISCA check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Measure the resistance between terminal 1 and 2 of ISCA harness connector. (Component side)
   (4) Measure the resistance between terminal 2 and 3 of ISCA harness connector. (Component side)

   Specification :

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω



   (5) Is the measured resistance within specifications?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

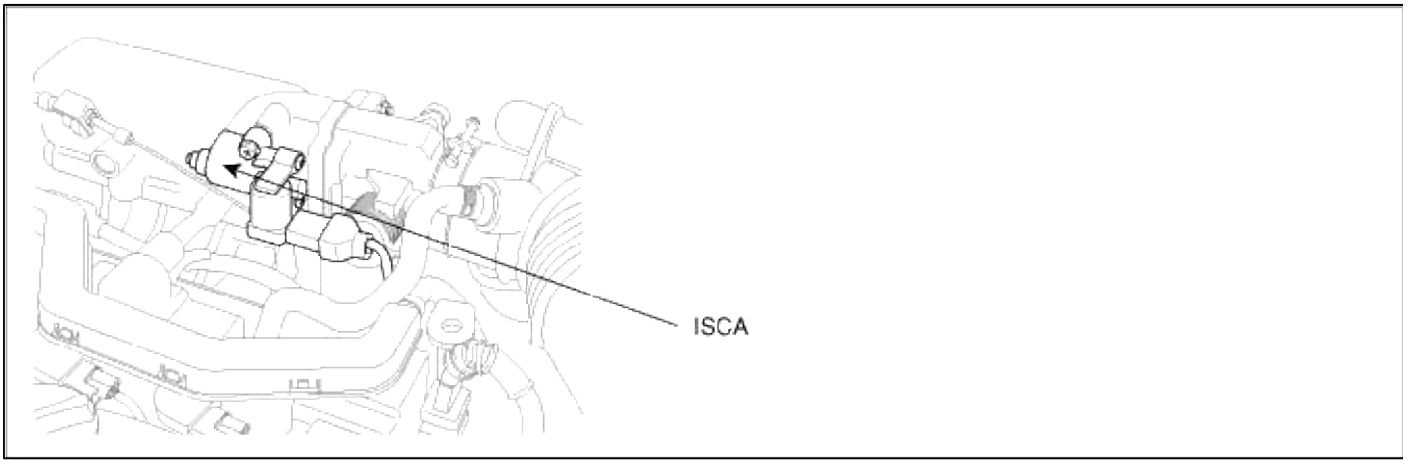
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0506 Idle Air Control System-RPM Lower than Expected

COMPONENT LOCATION



GENERAL DESCRIPTION

The ISCA (Idle Speed Control Actuator) is designed to maintain a steady desired idle speed. Idle airflow is adjustedthrough the idle air actuator in order to maintain the desired idle speed under various load conditions. Load conditions vary due to numerous factors, such as engine temperature, air conditioning, electrical load and power steering load.

DTC DESCRIPTION

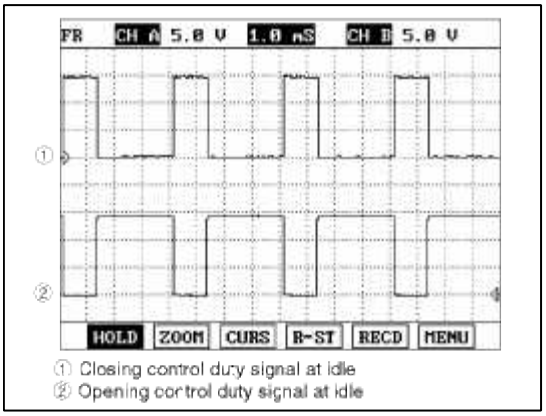
If actual engine speed is more than 100rpm lower than desired engine speed, P0506 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check, low	• Poor connection • Clog in intake air system • Carbon pile • ISCA • ECM/PCM
Enable Conditions	• Vehicle speed = 0 • Coolant temperature > 70°C (158°F) • Intake air temperature > -7.5°C (18.5°F) • Altitude < 3000m (9841 ft) • Idle status • Idle controller I part = 15.0% • Engine load < 35%	
Threshold Value	• Desired engine speed - Engine speed > 100rpm	
Diagnostic Time	• 8 sec	

MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



① Closing control duty signal at idle
② Opening control duty signal at idle

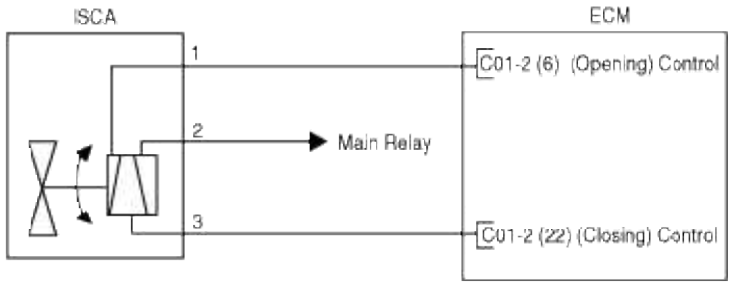
SPECIFICATION

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
°C	°F		
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω

SCHEMATIC DIAGRAM

(A/T)

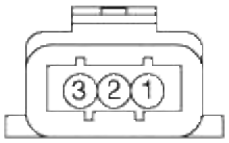
[CIRCUIT DIAGRAM]



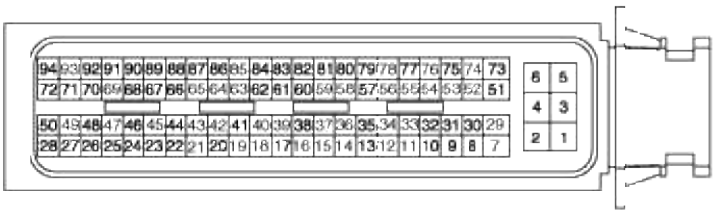
[CONNECTION INFORMATION]

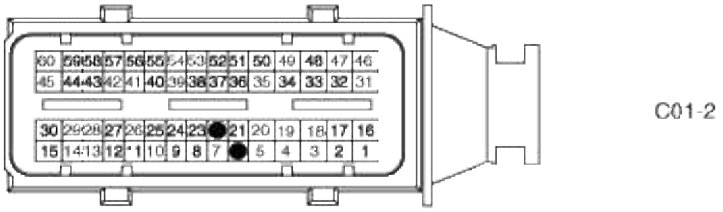
Terminal	Connected to	Function
1	ECM C01-2 (6)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01-2 (22)	Closing Control

[HARNESS CONNECTORS]



ISCA (C09)

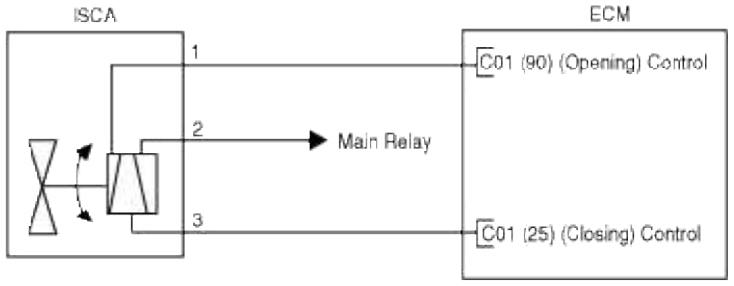




ECM

(M/T)

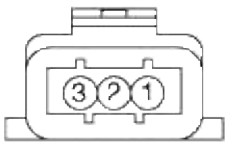
[CIRCUIT DIAGRAM]



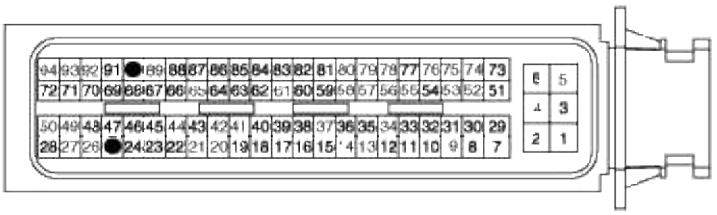
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (90)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01 (25)	Closing Control

[HARNESS CONNECTORS]



ISCA (C09)

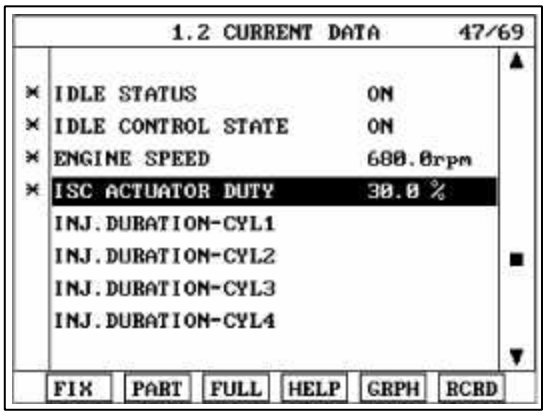


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).

2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Visual Inspection.
   (1) Check "Air intake/exhaust system."
   Check looseness, deterioration or contamination on air cleaner, throttle body and gasket.
   Check contamination, damage or clog on exhaust gas system.
   (2) Is the air intake/exhaust system O.K?

YES

Go to "Component inspection" procedure.

NO

Repair as necessary and go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. ISCA visual check.
   (1) Key "OFF".
   (2) Remove ISCA.
   (3) Check contamination, damage or stuck on ISCA.
   (4) Check the operating sound when key turns "OFF" to "ON".
   (5) Is ISCA O.K?

   YES

   Go to "ISCA check" procedure.

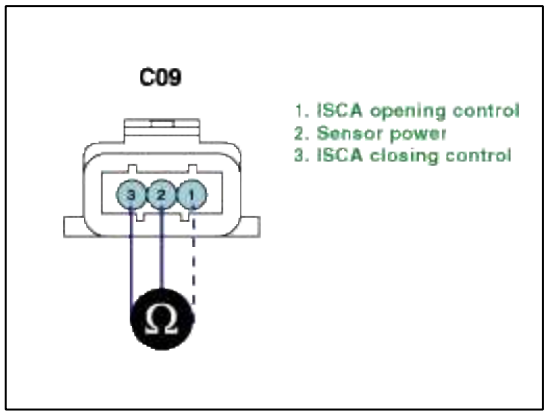
   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

2. ISCA check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Measure the resistance between terminal 1 and 2 of ISCA harness connector. (Component side)
   (4) Measure the resistance between terminal 2 and 3 of ISCA harness connector. (Component side)

   Specification :

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω



   (5) Is the measured resistance within specifications?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

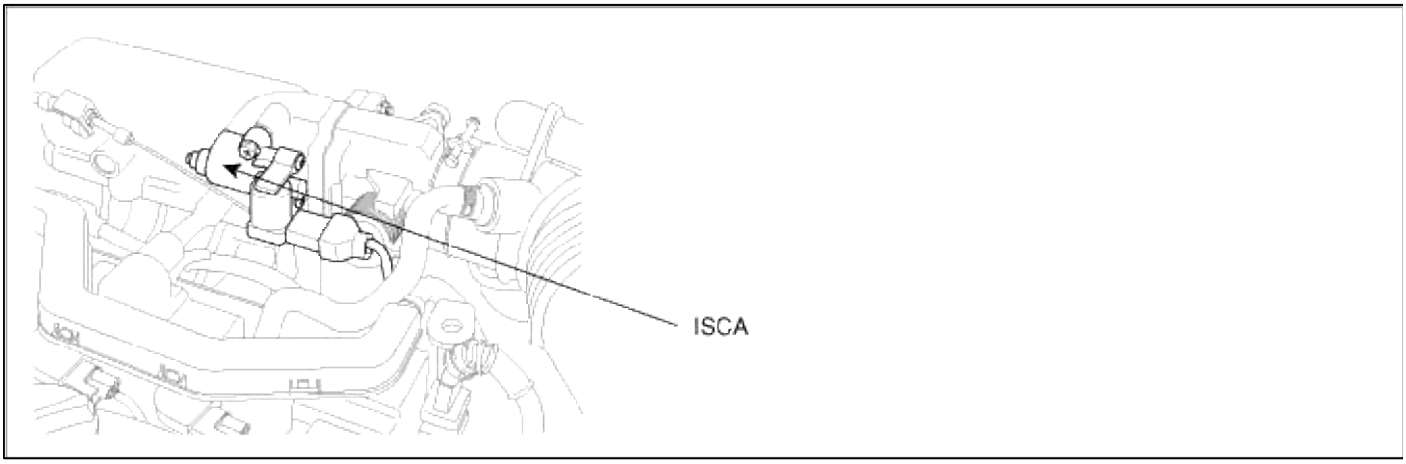
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0507 Idle Air Control System-RPM Higher than Expected

COMPONENT LOCATION



GENERAL DESCRIPTION

The ISCA (Idle Speed Control Actuator) is designed to maintain a steady desired idle speed. Idle airflow is adjustedthrough the idle air actuator in order to maintain the desired idle speed under various load conditions. Load conditions vary due to numerous factors, such as engine temperature, air conditioning, electrical load and power steering load.

DTC DESCRIPTION

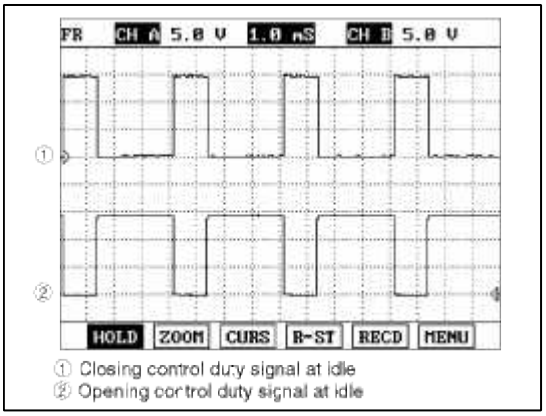
If actual engine speed is more than 200RPM higher than desired engine speed, P0507 is set.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Rationality check, high	• Poor connection • Leak in intake air system • Carbon pile • ISCA • ECM/PCM
General Enable Conditions		• Vehicle speed = 0 • Coolant temperature > 70°C (158°F) • Intake air temperature > -7.5°C (18.5°F) • Altitude < 3000m (1.86mi) • Idle status	
Case 1	Enable Conditions	• Idle controller I part = -15%	
	Threshold Value	• Desired engine speed - Engine speed < -200rpm	
Case 2	Threshold Value	• Fuel cut-off ≥ 3times	

Diagnostic Time	• 15 sec	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



① Closing control duty signal at idle
② Opening control duty signal at idle

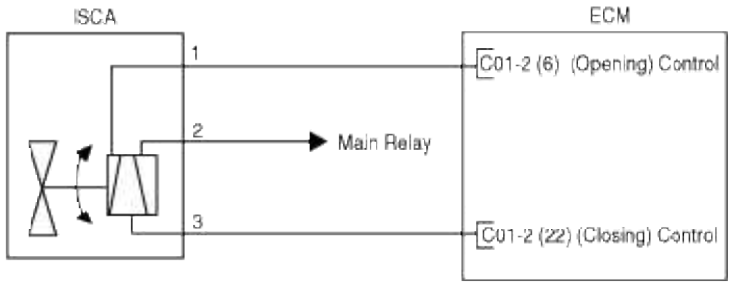
SPECIFICATION

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω

SCHEMATIC DIAGRAM

(A/T)

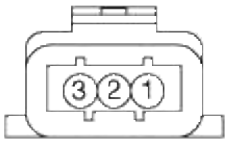
[CIRCUIT DIAGRAM]



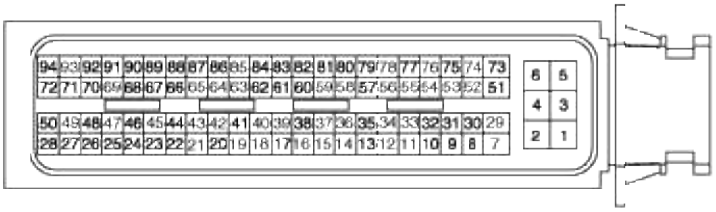
[CONNECTION INFORMATION]

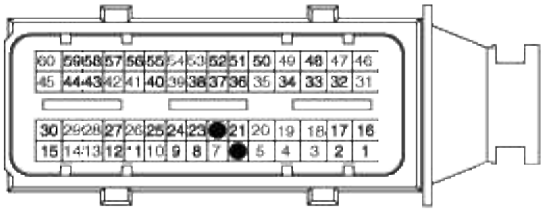
Terminal	Connected to	Function
1	ECM C01-2 (6)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01-2 (22)	Closing Control

[HARNESS CONNECTORS]



ISCA (C09)

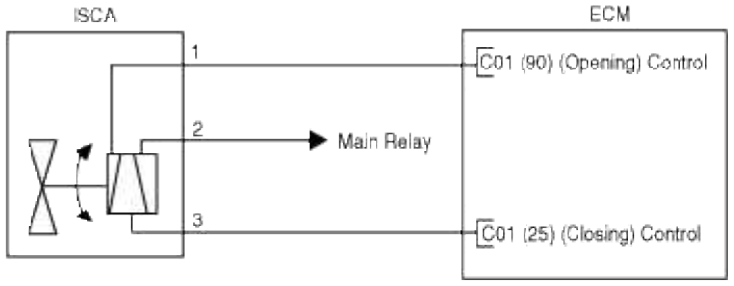




ECM

(M/T)

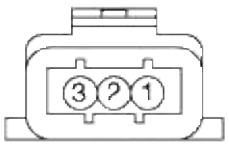
[CIRCUIT DIAGRAM]



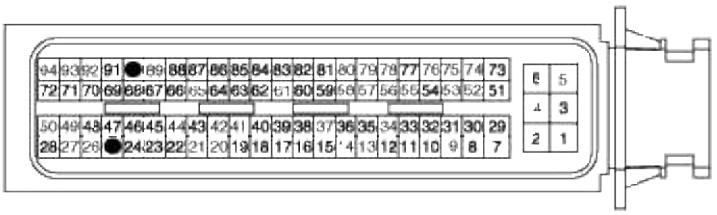
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (90)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01 (25)	Closing Control

[HARNESS CONNECTORS]



ISCA (C09)

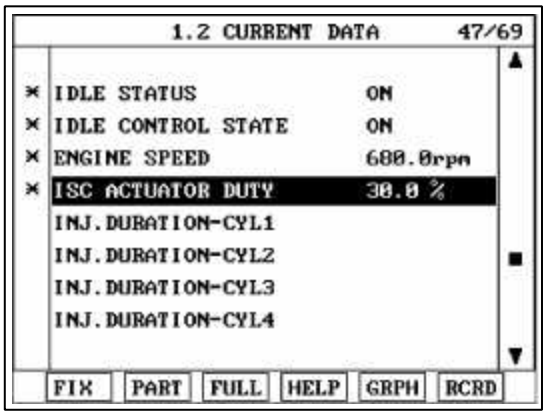


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).

2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

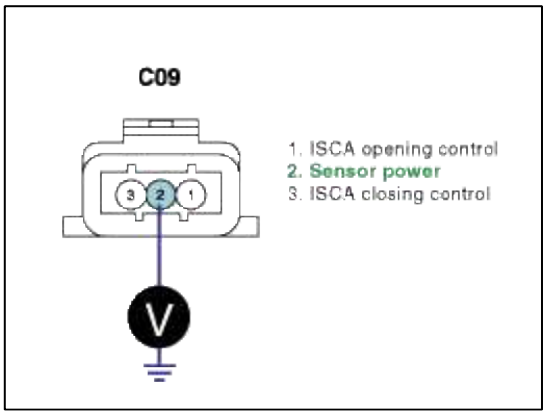
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ISCA connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of ISCA harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

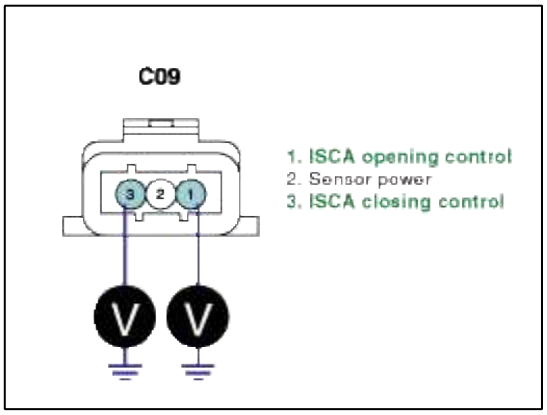
NO

Repair Open or Short in power circuit and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ISCA connector and Key "ON".
3. Measure the voltage between terminal 1 of ISCA harness connector and chassis ground.
4. Measure the voltage between terminal 3 of ISCA harness connector and chassis ground.

Specification : Approx 2V (at terminal 1), Approx 1.3V (at terminal 3)



5. Is the measured voltage within specification?

YES

Go to "System inspection" procedure.

NO

Repair Open or Short in control circuit and then, go to "Verification of Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Visual inspection.
   (1) Key "OFF".
   (2) Check intake air system
   Check assembling state and damage on throttle body gasket.
   Check assembling/sealing state and damage on MAFS and PCV valve.
   (3) Is everything O.K?

YES

Go to "Component inspection" procedure.

NO

Repair as necessary and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. ISCA visual check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Check contamination, damage or stuck on ISCA.
   (4) Check the operating sound when key turns "OFF" to "ON".
   (5) Is ISCA O.K?

   YES

   Go to "ISCA check" procedure.

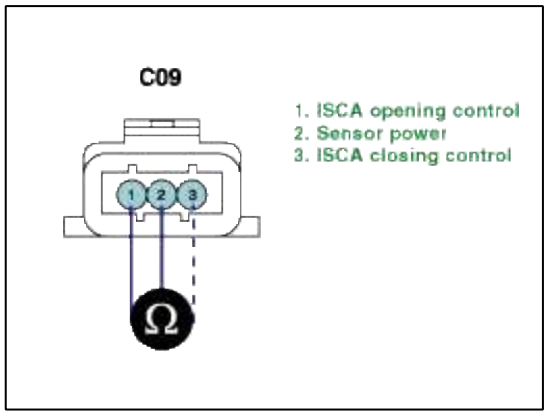
   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

2. ISCA check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Measure the resistance between terminal 1 and 2 of ISCA harness connector. (Component side)
   (4) Measure the resistance between terminal 2 and 3 of ISCA harness connector. (Component side)

   Specification :

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω



   (5) Is the measured resistance within specifications?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0532 A/C Refrigerant Pressure Sensor \'A\' Circuit Low Input

GENERAL DESCRIPTION

An A/C refrigerant pressure sensor is installed near the expansion valve. This sensor is used by the ECM/PCM to evaluate A/C system pressure for the purposes of idle speed correction, cooling/condenser fan control, and A/C compressor control.

DTC DESCRIPTION

If signal is below 0.195V under detecting condition, ECM/PCM sets P0532.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Open in power circuit • Open or short to ground in signal circuit • Faulty A/C pressure sensor • Faulty ECM/PCM
Enable Conditions	• Ambient temperature > - 10.5 °C (13°F)	
Threshold Value	• Sensor output voltage < 0.195V	
Diagnostic Time	• Continuous	
MIL ON Condition	• DTC only	

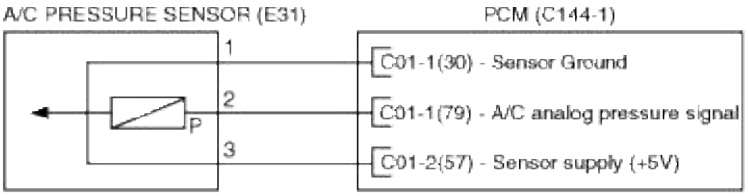
SPECIFICATION

Pressure(psi)	14.7	100	200	300	470
Voltage(V)	0.5	1.25	2.13	3.00	4.50

SCHEMATIC DIAGRAM

(A/T)

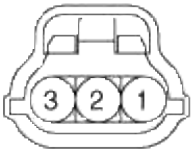
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

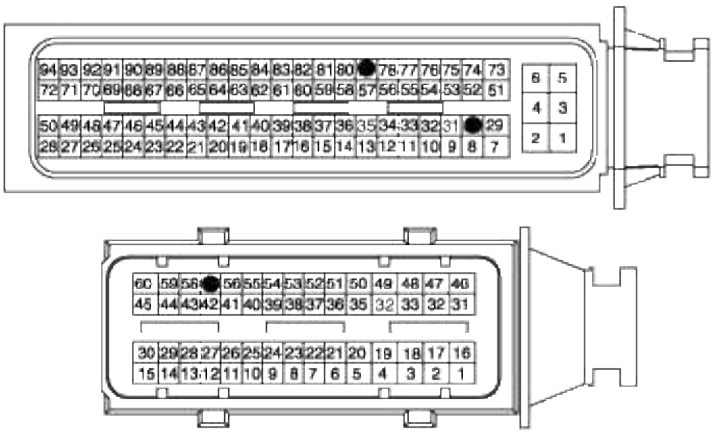
Terminal	Connected to	Function
1	PCM C01-1 (30)	Sensor Ground
2	PCM C01-1 (79)	A/C analog pressure signal
3	PCM C01-2 (57)	Sensor supply (+5V)

[HARNESS CONNECTOR]



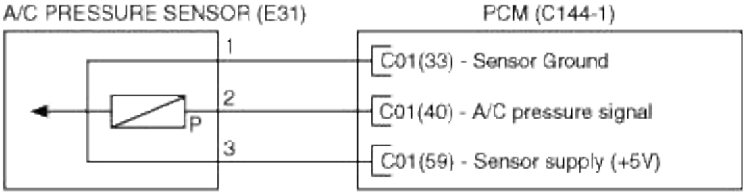
E08

A/C PRESSURE SENSOR



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

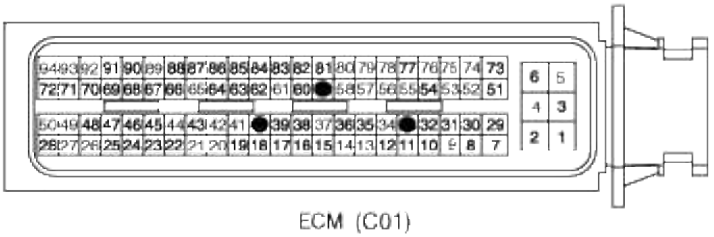
Terminal	Connected to	Function
1	PCM C01 (33)	Sensor Ground
2	PCM C01 (40)	A/C pressure signal
3	PCM C01 (59)	Sensor supply (+5V)

[HARNESS CONNECTOR]



E08

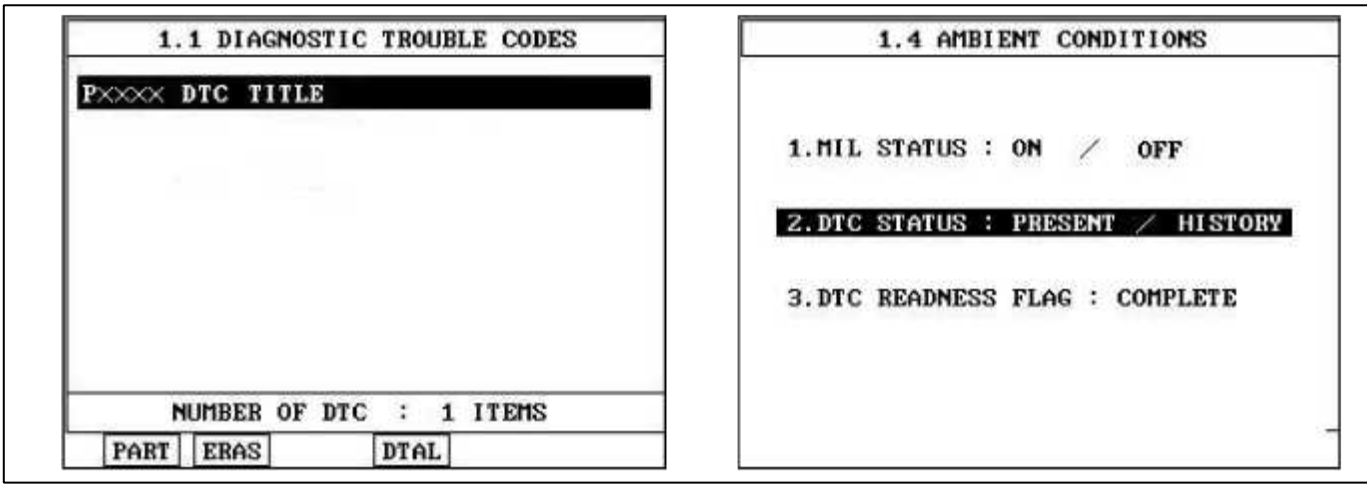
A/C PRESSURE SENSOR



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu.

4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

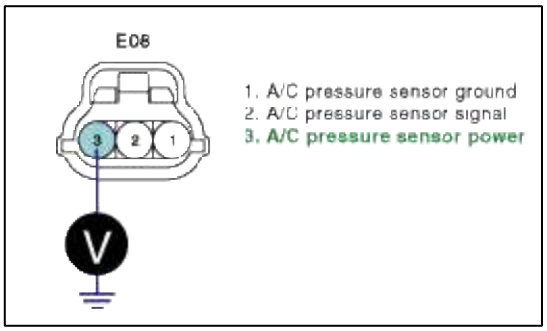
Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect the A/C pressure sensor connector.
3. Key "ON".

4. Measure the voltage between terminal 3 of A/C pressure sensor harness connector and chassis ground.

Specification : 5V



5. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

NO

Repair Open or Short to ground in A/C pressure sensor power circuit and go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

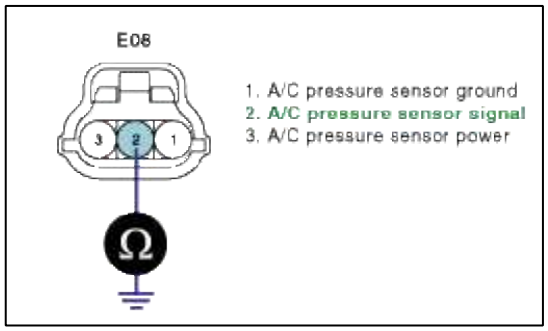
1. Check short to ground

(1) Key "OFF".

(2) Disconnect A/C pressure sensor and ECM/PCM connector.

(3) Measure the resistance between terminal 2 of A/C pressure sensor harness connector and chassis ground.

Specification : Infinite



(4) Is the measured resistance within specification ?

YES

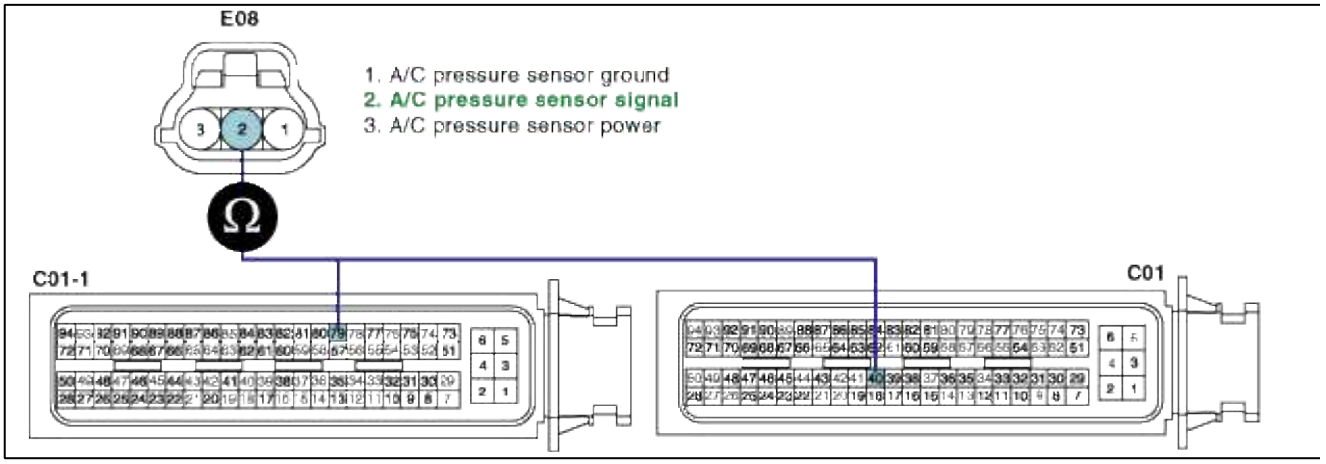
Go to "Check open in harness" procedure.

NO

Repair Short to ground in A/C pressure sensor signal circuit and go to "Verification of Vehicle Repair" procedure.

2. Check open in harness
   (1) Key "OFF".
   (2) Disconnect A/C pressure sensor and ECM/PCM connector.
   (3) Measure the resistance between terminal 2 of A/C pressure sensor harness connector and terminal 79/C01-1 ECM/PCM harness connector. [A/T]
   Measure the resistance between terminal 2 of A/C pressure sensor harness connector and terminal 40/C01 of ECM/PCM harness connector. [M/T]

   Specification : Approx. below 1Ω



   (4) Is the measured resistance within specification ?

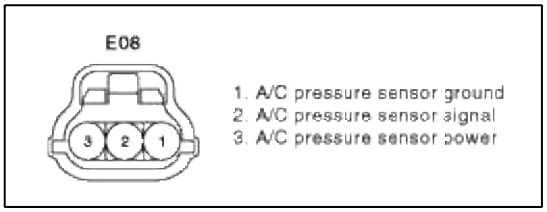
   YES
   Go to "Component inspection" procedure.

   NO
   Repair Open in signal circuit and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. A/C pressure sensor inspection
   (1) Key "OFF" and connect the scantool.
   (2) Connect the probe to A/C pressure sensor signal and select the oscilloscope in the menu.
   (3) Check the change of waveform with A/C "ON" and A/C "OFF" after engine start.
   Specification :

Pressure(psi)	14.7	100	200	300	470
Voltage(V)	0.5	1.25	2.13	3.00	4.50



(4) Is the measured waveform of A/C pressure sensor normal?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good A/C pressure sensor and check for proper operation. If the problem is corrected, replace A/C pressure sensor and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0533 A/C Refrigerant Pressure Sensor \'A\' Circuit High Input

GENERAL DESCRIPTION

An A/C refrigerant pressure sensor is installed near the expansion valve. This sensor is used by the ECM/PCM to evaluate A/C system pressure for the purposes of idle speed correction, cooling/condenser fan control, and A/C compressor control.

DTC DESCRIPTION

If signal is over 4.648V under detecting condition, ECM/PCM sets P0533.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Short to power in signal circuit • Open in ground circuit • Faulty A/C Pressure sensor • Faulty ECM/PCM
Enable Conditions	• Ambient temperature > - 10.5 °C (13°F)	
Threshold Value	• Sensor output voltage > 4.648V	
Diagnostic Time	• Continuous	
MIL ON Condition	• DTC only	

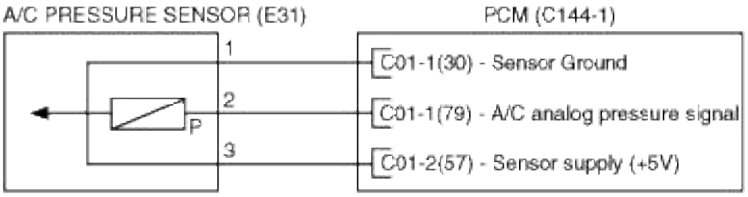
SPECIFICATION

Pressure(psi)	14.7	100	200	300	470
Voltage(V)	0.5	1.25	2.13	3.00	4.50

SCHEMATIC DIAGRAM

(A/T)

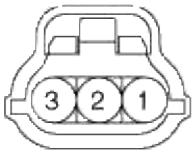
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

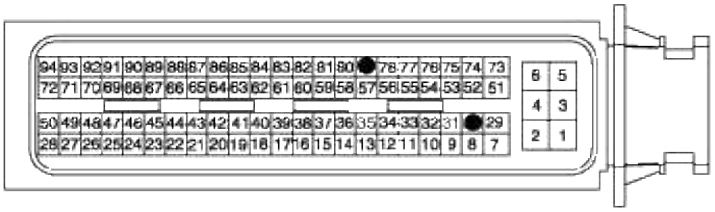
Terminal	Connected to	Function
1	PCM C01-1 (30)	Sensor Ground
2	PCM C01-1 (79)	A/C analog pressure signal
3	PCM C01-2 (57)	Sensor supply (+5V)

[HARNESS CONNECTOR]

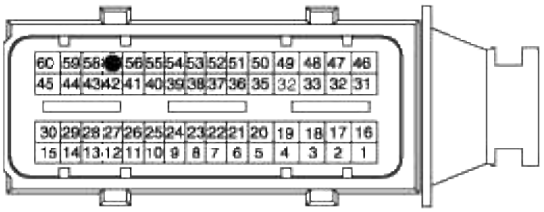


E08

A/C PRESSURE SENSOR



C01-1

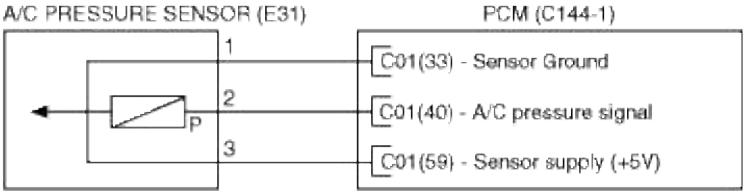


C01-2

ECM

(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

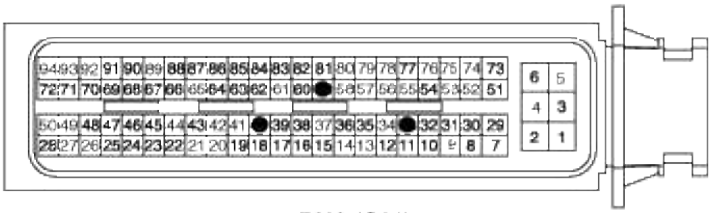
Terminal	Connected to	Function
1	PCM C01 (33)	Sensor Ground
2	PCM C01 (40)	A/C pressure signal
3	PCM C01 (59)	Sensor supply (+5V)

[HARNESS CONNECTOR]



E08

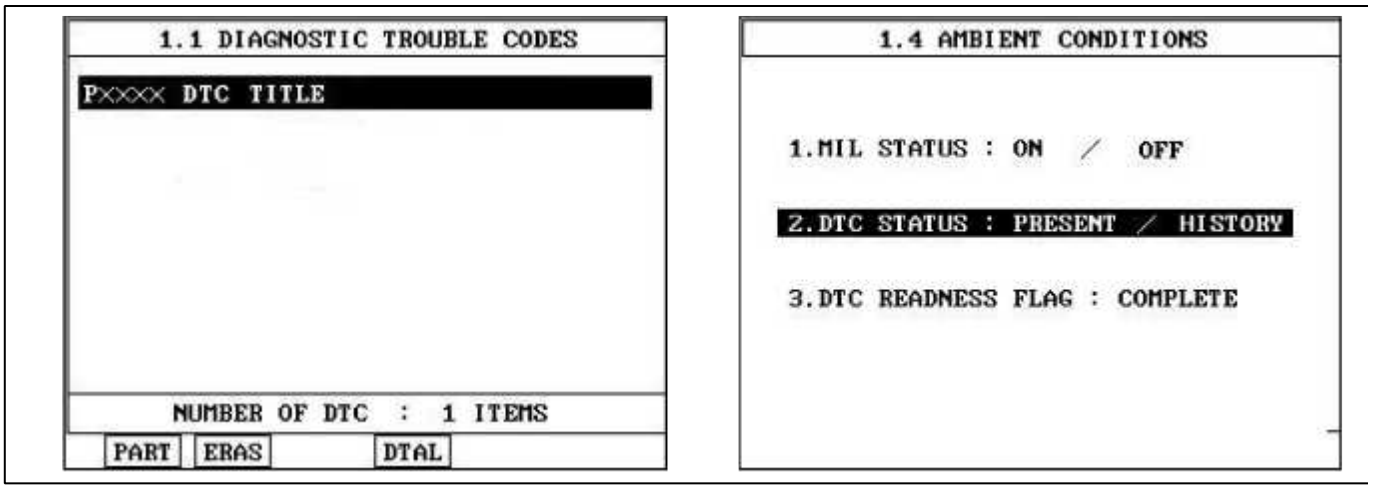
A/C PRESSURE SENSOR



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu.
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

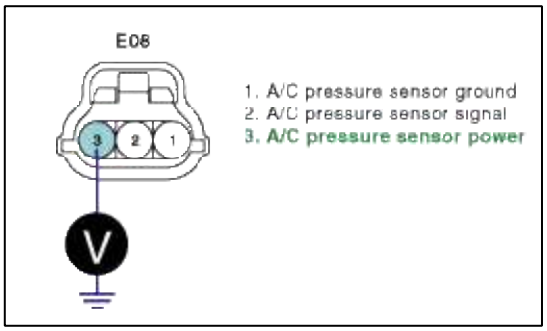
Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect the A/C pressure sensor connector.
3. Key "ON".

4. Measure the voltage between terminal 3 of A/C pressure sensor harness connector and chassis ground.

Specification : 5V



5. Is the measured voltage within specification ?

YES

Go to "Ground inspection" procedure.

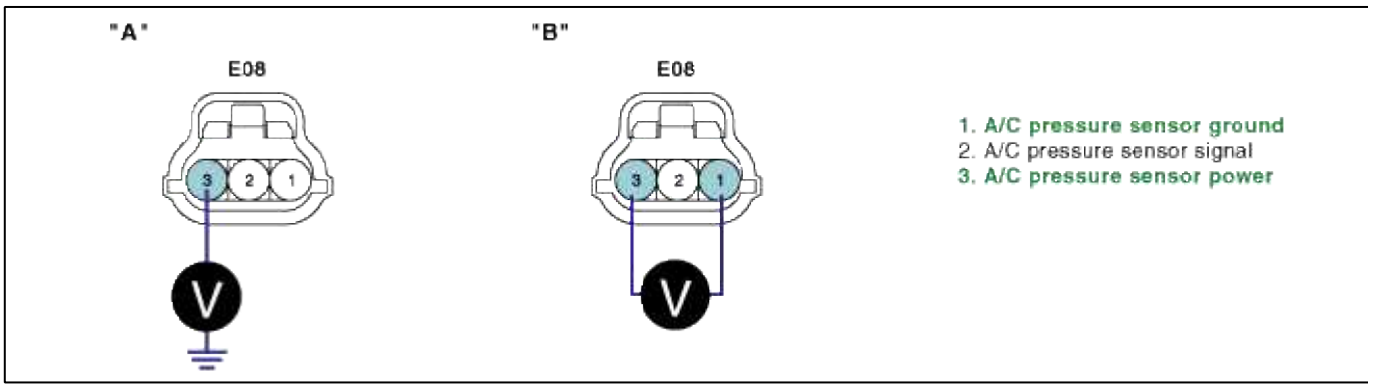
NO

Repair Open in power circuit and go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect the A/C pressure sensor connector.
3. Key "ON".
4. Measure the voltage between terminal 3 of A/C pressure sensor harness connector and chassis ground. (Fig A)
5. Measure the voltage between terminal 3 and terminal 1 of A/C pressure sensor harness connector.(Fig B)

Specification : The Difference between "A" and "B" is below 200mV.



6. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

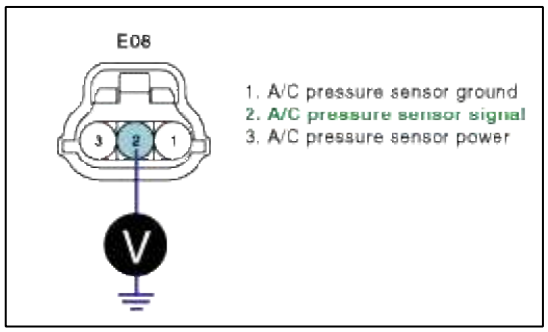
NO

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Voltage inspection
   (1) Key "OFF".
   (2) Disconnect the A/C pressure sensor connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 2 of A/C pressure sensor harness connector and chassis ground.

   Specification : Approx. 0V



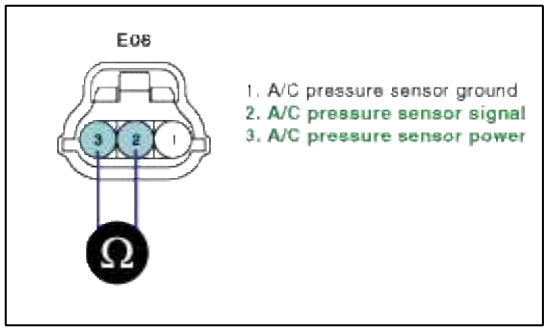
   (5) Is the measured voltage within specification ?

   YES
   Go to "Component inspection" procedure.

   NO
   Go to "Short in circuit inspection" procedure.

2. Short in circuit inspection
   (1) Key "OFF".
   (2) Disconnect A/C pressure sensor connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 2 and terminal 3 of A/C pressure sensor harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specification ?

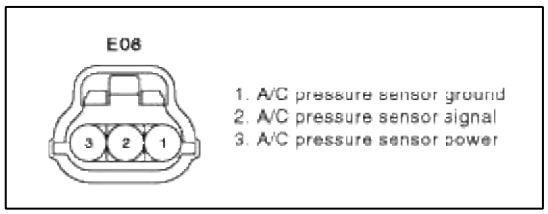
   YES
   Go to "Component inspection" procedure.

   NO
   Repair Short in signal circuit and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. A/C pressure sensor inspection
   (1) Key "OFF" and connect the scantool.
   (2) Connect the probe to A/C pressure sensor signal and select the oscilloscope in the menu.
   (3) Check the change of Cwaveform with A/C "ON" and A/C "OFF" after engine start.
   Specification :

Pressure(psi)	14.7	100	200	300	470
Voltage(V)	0.5	1.25	2.13	3.00	4.50



   (4) Is the measured waveform of A/C pressure sensor normal?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good A/C pressure sensor and check for proper operation. If the problem is corrected, replace A/C pressure sensor and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

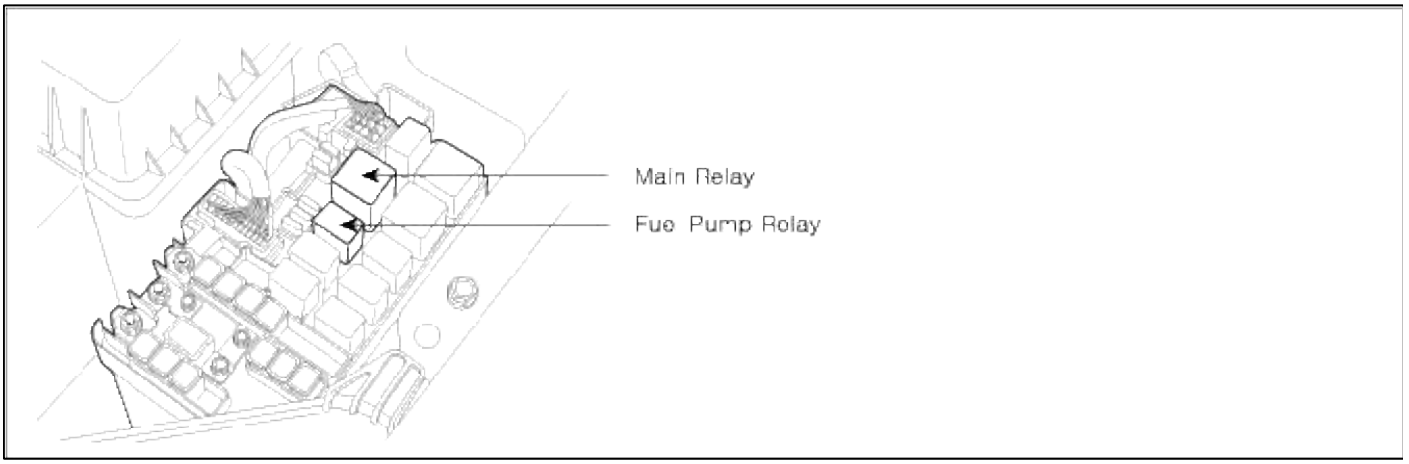
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0560 System Voltage

COMPONENT LOCATION



GENERAL DESCRIPTION

The main relay voltage is monitored for high or low voltage values that may indicate main relay, main relay circuit, or engine electrical system malfunctions.

DTC DESCRIPTION

If ECM/PCM detects malfunction in power supply system, ECM/PCM sets DTC P0560.

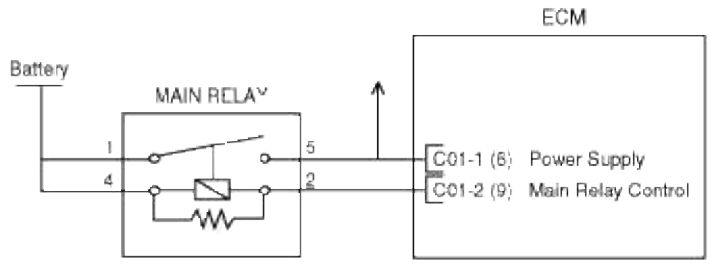
DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Signal check	• Poor connection • Open / Short • Main relay • ECM/PCM
Case1	Threshold Value	• Signal Voltage < 0.5V & Engine stall	
Case1	Threshold Value	• Time after engine start > 120s • Vehicle Speed > 25kph	
	Enable Conditions	• Signal Voltage > 22V	
Diagnostic Time		• 0.2 sec	
MIL ONCondition		• DTC only	

SCHEMATIC DIAGRAM

(A/T)

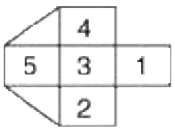
[CIRCUIT DIAGRAM]



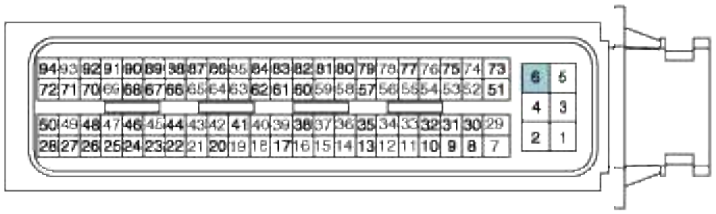
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	ECM C01-2 (9)	Relay Control
3	-	-
4	Battery	Battery Voltage (B+)
5	ECM C01-1 (6)	Power Supply

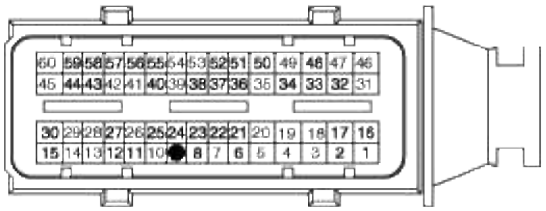
[HARNESS CONNECTORS]



Main Relay (E63)



C01-1

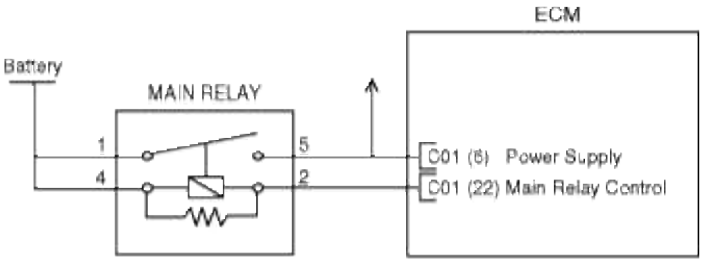


C01-2

ECM

(M/T)

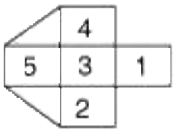
[CIRCUIT DIAGRAM]



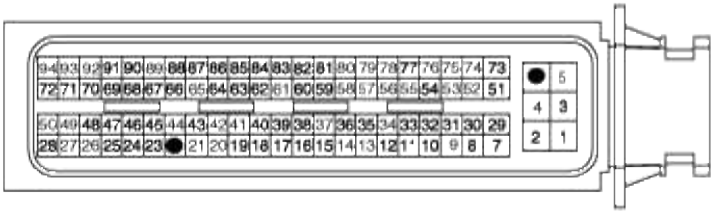
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	ECM C01-2 (22)	Relay Control
3	-	-
4	Battery	Battery Voltage (B+)
5	ECM C01 (6)	Power Supply

[HARNESS CONNECTORS]



Main Relay (E63)

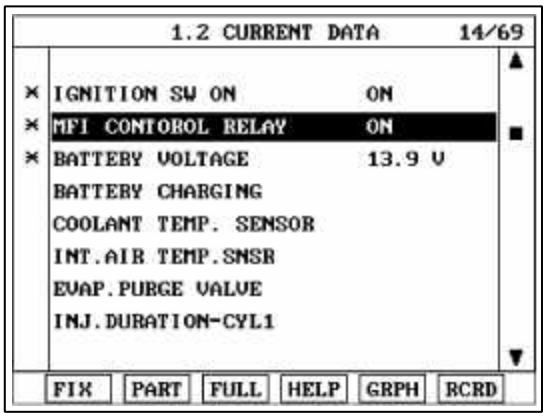


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "Main relay" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

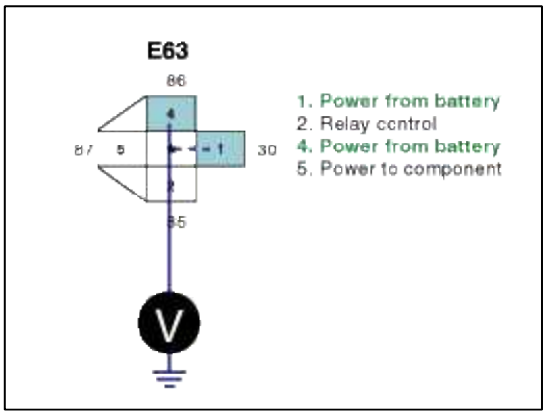
NO

Go to "Main relay circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect Main relay and Key "ON".
3. Measure the voltage between terminal 30 of main relay harness connector and chassis ground.
4. Measure the voltage between terminal 86 of main relay harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

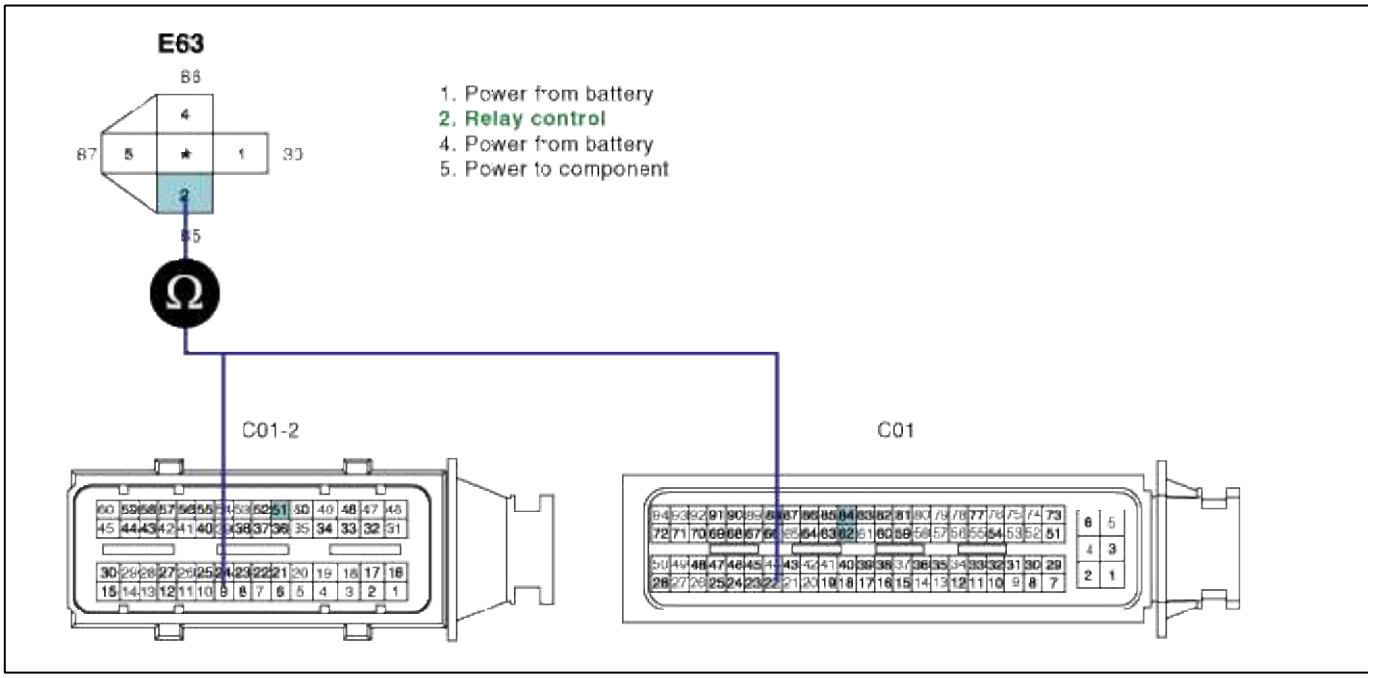
NO

Check the fuse(ECU A 30A) between battery and main relay.
Repair Open in power circuit and then go to "Verification of vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect main relay and ECM/PCM connector.
3. Measure the resistance between terminal 85 of main relay harness connectorand terminal 9/C01-2 of ECM/PCM harness connector. (AT)
4. Measure the resistance between terminal 85 of main relay harness connectorand terminal 22/C01 of ECM/PCM harness connector. (MT

Specification : Approx 1Ω



5. Is the measured resistance within specification?

YES

Go to "Power supply circuit inspection" procedure.

NO

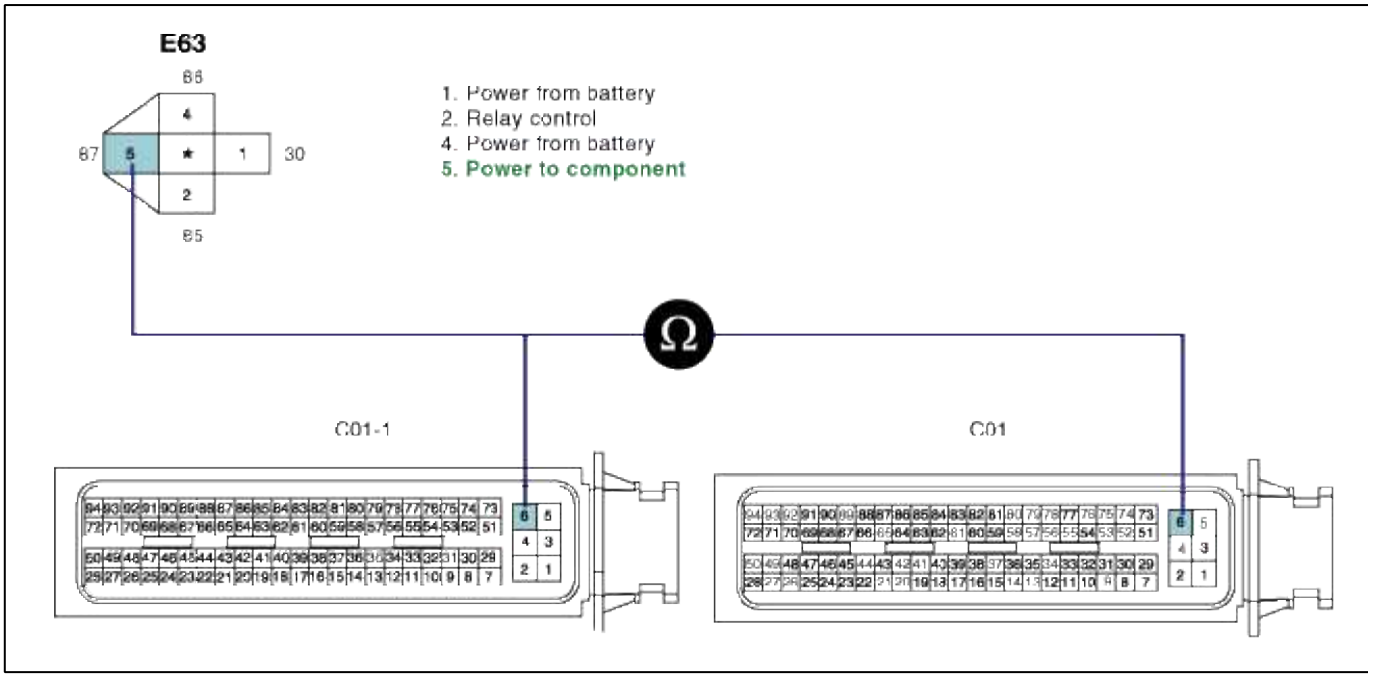
Repair Open in control circuit and then go to "Verification of vehicle Repair" procedure.

POWER SUPPLY CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect main relay and ECM/PCM connector.

3. Measure the resistance between terminal 87 of main relay harness connectorand terminal 6/C01-1 of ECM/PCM harness connector. (AT)
   Measure the resistance between terminal 87 of main relay harness connectorand terminal 6/C01 of ECM/PCM harness connector.(MT)

   Specification : Approx 1Ω



4. Is the measured resistance within specification?

YES

Go to "System inspection" procedure.

NO

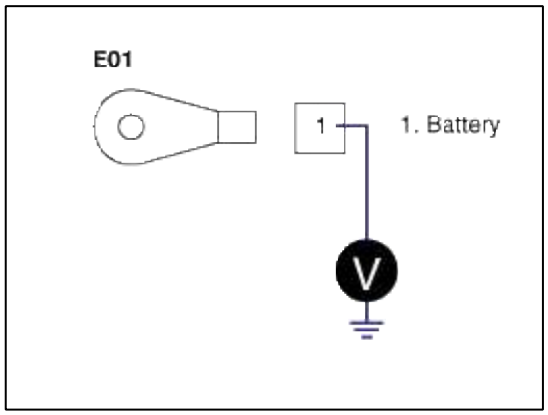
Repair Open in power supply circuit and then go to "Verification of vehicle Repair" procedure.

SYSTEM INSPECTION

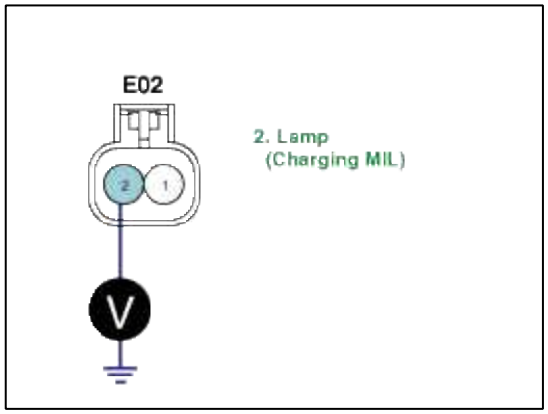
1. Alternator circuit check
   (1) Key "OFF".
   (2) Disconnect alternator connector.
   (3) Key "ON".

(4) Measure the voltage between terminal 1/E01 of alternator harness connector and chassis ground.
Measure the voltage between terminal 2/E02 of alternator harness connector and chassis ground.

Specification : 12 V



Specification : 10.5~11.5 V



(5) Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

In case the voltage is not stable at terminal 1/E01, check Open circuit, Battery voltage and Fuse(MAIN 120 A). And then go to "Verification of vehicle Repair" procedure.

In case the voltage is not stable at terminal 2/E02, check Open circuit, MIL circuit and MIL resistor. And then go to "Verification of vehicle Repair" procedure.

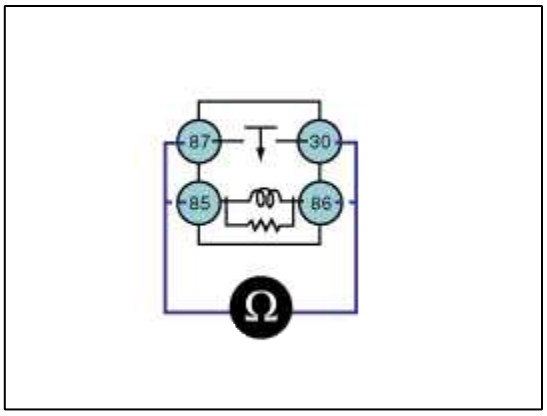
COMPONENT INSPECTION

1. Key "OFF".
2. Disconnect main relay.
3. Measure the resistance between terminal 30 and 87 of main relay. (Component side)

4. Measure the resistance between terminal 85 and 86 of main relay. (Component side)

Specification :

Terminal	Power Approval
30~87	NO
85~86	YES (Approx. 70 ~ 120Ω)



5. Is the measured resistance within specifications?

YES

Go to "Alternator Check" procedure.

NO

Substitute with a known - good Main relay and check for proper operation.
If the problem is corrected, replace Main relay and go to "Verification of Vehicle Repair" procedure.

6. Alternator check.

(1) Key "OFF".

(2) Check the tension of alternator belt.

(3) Check corrosion, damage or looseness of Battery terminal and Alternator terminal.

(4) Engine start.

(5) Operate electrical parts(Head lamp, Defoger, etc).

(6) Measure the voltage at 2000rpm.

Specification : Approx 12.5V ~ 14.5V

(7) Is the measured voltage within specifications ?

YES

Substitute with a known - good ECM and check for proper operation.
If the problem is corrected, replace ECM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good Alternator and check for proper operation.
If the problem is corrected, replace Alternator and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

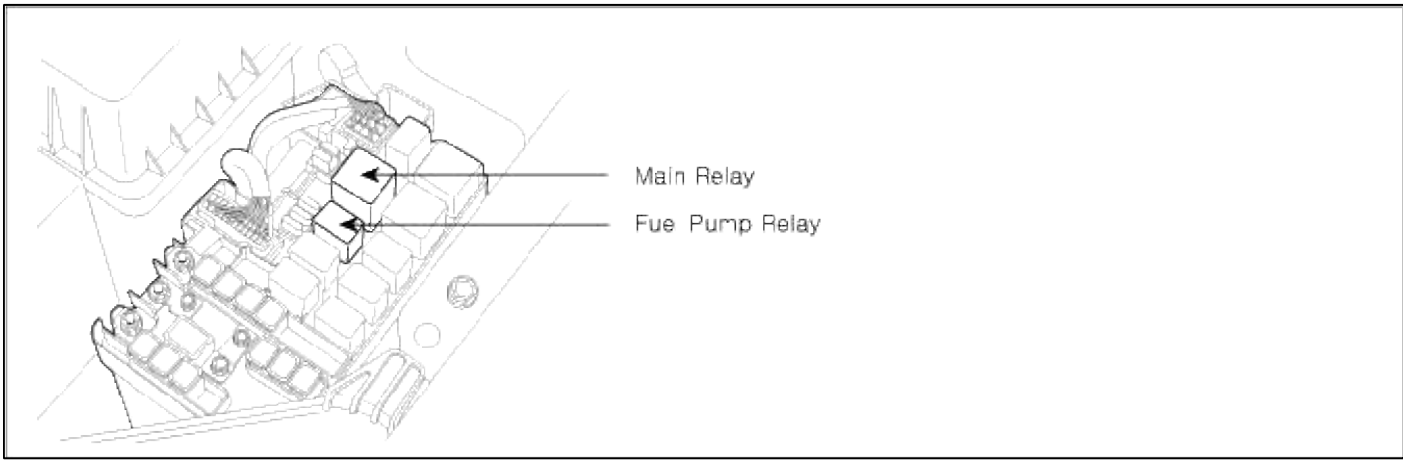
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0561 System Voltage Unstable

COMPONENT LOCATION



GENERAL DESCRIPTION

The main relay voltage is monitored for high or low voltage values that may indicate main relay, main relay circuit, or engine electrical system malfunctions.

DTC DESCRIPTION

If the system voltage is below 2.54V during 0.2 sec, ECM/PCM sets DTC P0561.

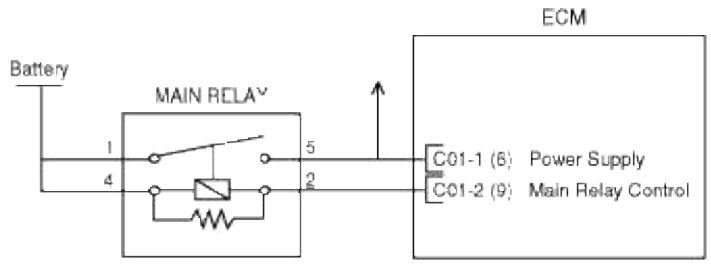
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Poor connection • Open/short to ground in control circuit • Charging system • Main relay • ECM/PCM
Enable Conditions		
Threshold Value	• Voltage < 2.54 V	
Diagnostic Time	• 0.2 sec	
MIL ON Condition	• 2 driving cycle	

SCHEMATIC DIAGRAM

(A/T)

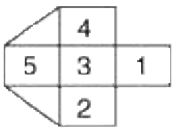
[CIRCUIT DIAGRAM]



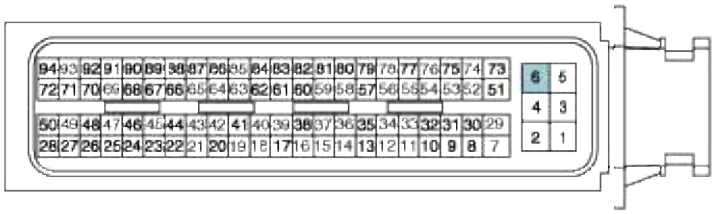
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	ECM C01-2 (9)	Relay Control
3	-	-
4	Battery	Battery Voltage (B+)
5	ECM C01-1 (6)	Power Supply

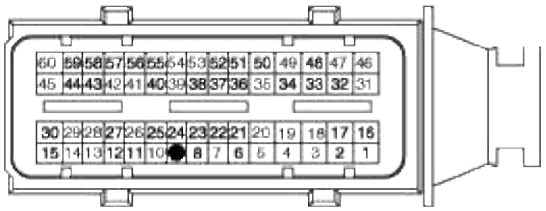
[HARNESS CONNECTORS]



Main Relay (E63)



C01-1

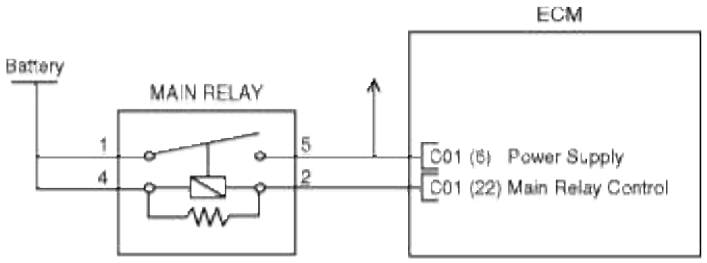


C01-2

ECM

(M/T)

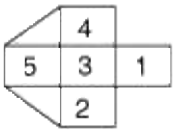
[CIRCUIT DIAGRAM]



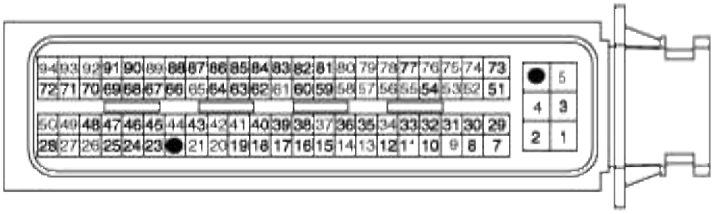
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	ECM C01-2 (22)	Relay Control
3	-	-
4	Battery	Battery Voltage (B+)
5	ECM C01 (6)	Power Supply

[HARNESS CONNECTORS]



Main Relay (E63)

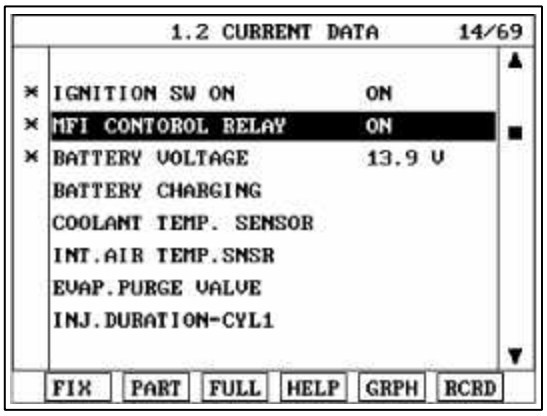


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "Main relay" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

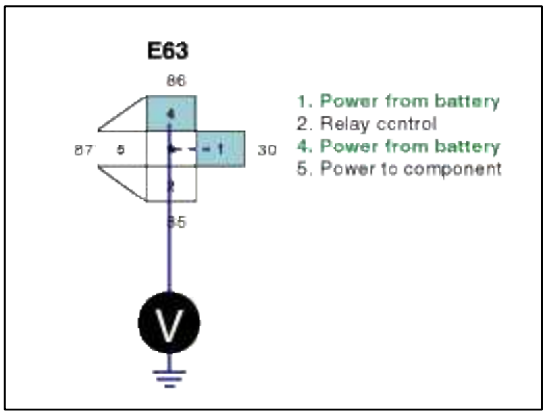
NO

Go to "Terminal and connector inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect Main relay and Key "ON".
3. Measure the voltage between terminal 30 of main relay harness connector and chassis ground.
4. Measure the voltage between terminal 86 of main relay harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "System inspection" procedure.

NO

Check the fuse(ECU A 30A) between battery and main relay.
Repair Open in power circuit and then go to "Verification of vehicle Repair" procedure.

SYSTEM INSPECTION

1. Alternator circuit check

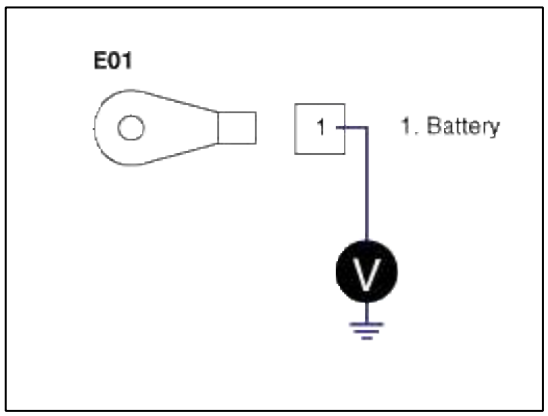
(1) Key "OFF".

(2) Disconnect alternator connector.

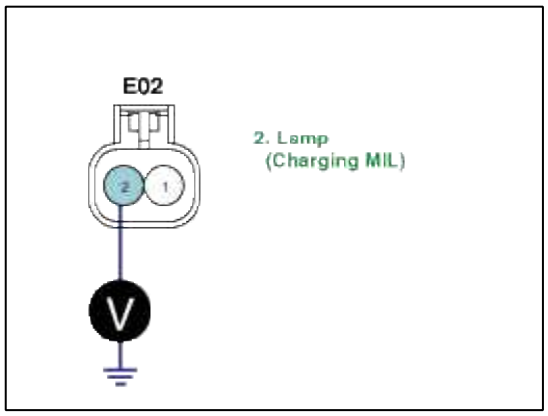
(3) Key "ON".

(4) Measure the voltage between terminal 1/E01 of alternator harness connector and chassis ground.
Measure the voltage between terminal 2/E02 of alternator harness connector and chassis ground.

Specification : 12 V



Specification : 10.5~11.5 V



(5) Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

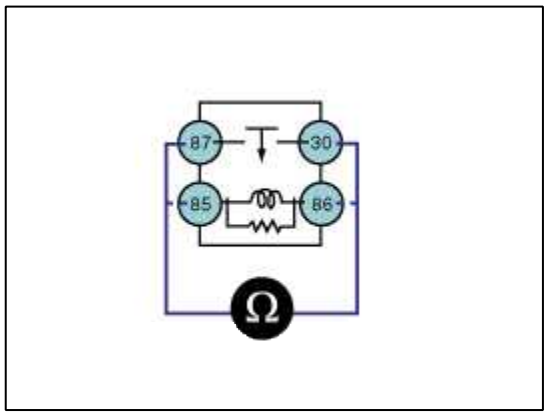
In case the voltage is not stable at terminal 1/E01, check Open circuit, Battery voltage and Fuse(MAIN 120 A). And then go to "Verification of vehicle Repair" procedure.

In case the voltage is not stable at terminal 2/E02, check Open circuit, MIL circuit and MIL resistor. And then go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. Main relay check.
   (1) Key "OFF".
   (2) Disconnect Main relay.
   (3) Measure the resistance between terminal 30 and 87 of main relay. (Component side)
   (4) Measure the resistance between terminal 85 and 86 of main relay. (Component side)
   Specification :

Terminal	Power Approval
30~87	NO
85~86	YES (Approx. 70 ~ 120Ω)



   (5) Is the measured resistance within specifications?

   YES

   Go to "Alternator check" procedure.

   NO

   Substitute with a known - good Main relay and check for proper operation.
   If the problem is corrected, replace Main relay and go to "Verification of Vehicle Repair" procedure.

2. Alternator check.
   (1) Key "OFF".
   (2) Check the tension of alternator belt.
   (3) Check corrosion, damage or looseness of Battery terminal and Alternator terminal.
   (4) Engine start.
   (5) Operate electrical parts(Head lamp, Defoger, etc).
   (6) Measure the voltage at 2000rpm.

   Specification : Approx 12.5V ~ 14.5V

(7) Is the measured voltage within specifications?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good Alternator and check for proper operation.
If the problem is corrected, replace Alternator and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

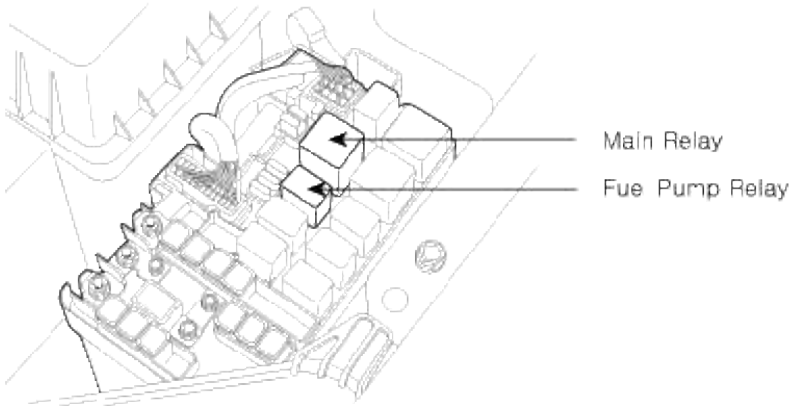
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0562 System Voltage Low

COMPONENT LOCATION



GENERAL DESCRIPTION

The main relay voltage is monitored for high or low voltage values that may indicate main relay, main relay circuit, or engine electrical system malfunctions.

DTC DESCRIPTION

If the system voltage is 2.54~10 V during 0.2 sec, ECM/PCM sets DTC P0562.

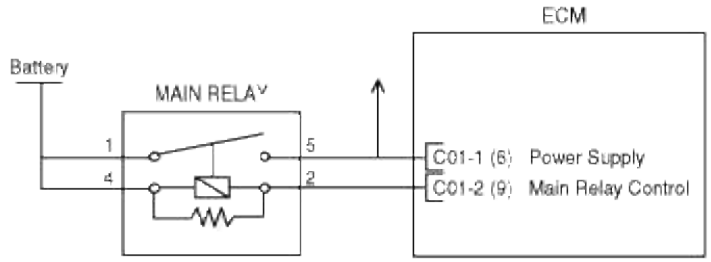
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Short to ground in control circuit • Charging system • Main relay • ECM/PCM
Enable Conditions	• Time after engine start > 120 sec	
Threshold Value	• Voltage : 2.54 ~ 10 V	
Diagnostic Time	• 0.2 sec	
MIL ON Condition	• 2 driving cycle	

SCHEMATIC DIAGRAM

(A/T)

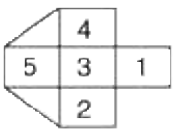
[CIRCUIT DIAGRAM]



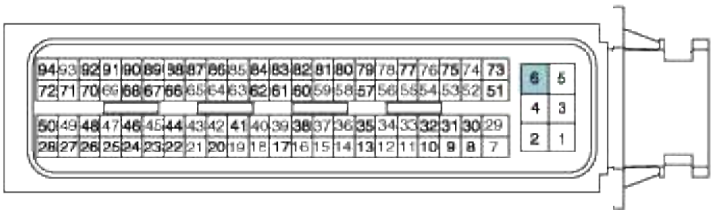
[CONNECTION INFORMATION]

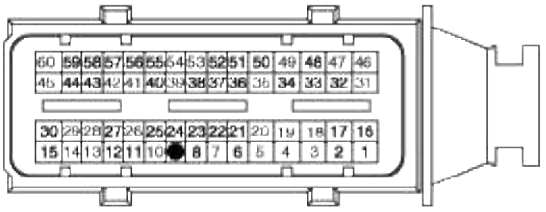
Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	ECM C01-2 (9)	Relay Control
3	-	-
4	Battery	Battery Voltage (B+)
5	ECM C01-1 (6)	Power Supply

[HARNESS CONNECTORS]



Main Relay (E63)

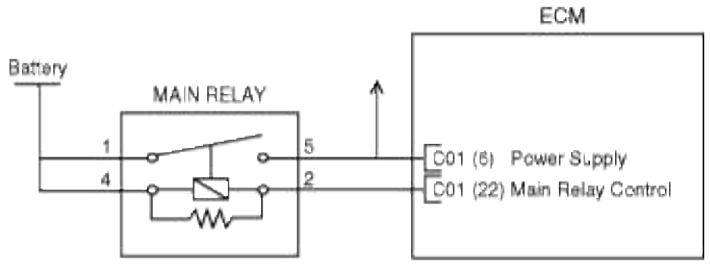




ECM

(M/T)

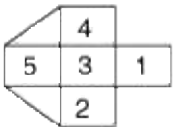
[CIRCUIT DIAGRAM]



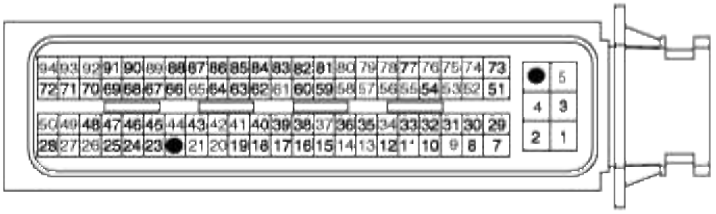
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	ECM C01-2 (22)	Relay Control
3	-	-
4	Battery	Battery Voltage (B+)
5	ECM C01 (6)	Power Supply

[HARNESS CONNECTORS]



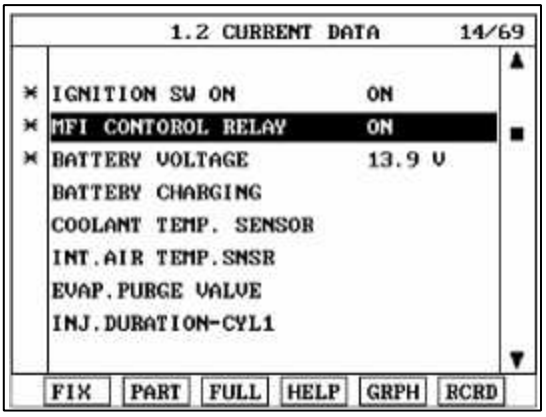
Main Relay (E63)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Main relay" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

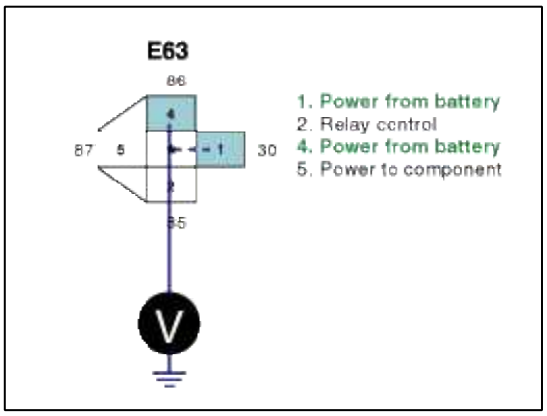
NO

Go to "Main relay circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect Main relay and Key "ON".
3. Measure the voltage between terminal 30 of main relay harness connector and chassis ground.
4. Measure the voltage between terminal 86 of main relay harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "System inspection" procedure.

NO

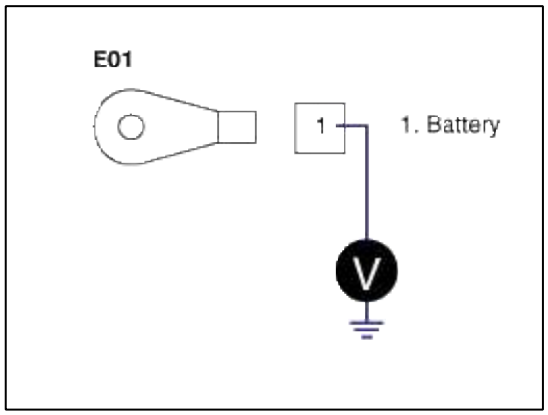
Check the fuse(ECU A 30A) between battery and main relay.
Repair Open or short to ground in power circuit and then go to "Verification of vehicle Repair" procedure.

SYSTEM INSPECTION

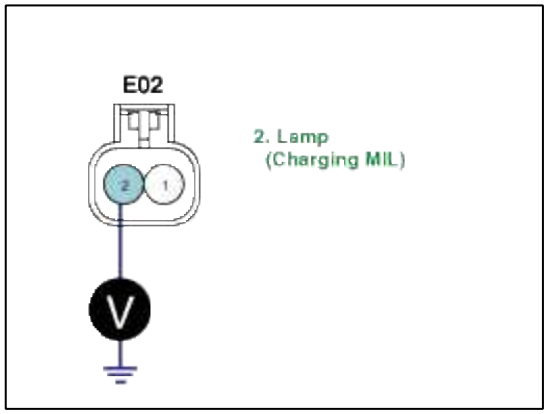
1. Alternator circuit check
   (1) Key "OFF".
   (2) Disconnect alternator connector.
   (3) Key "ON".

(4) Measure the voltage between terminal 1/E01 of alternator harness connector and chassis ground.
Measure the voltage between terminal 2/E02 of alternator harness connector and chassis ground.

Specification : 12 V



Specification : 10.5~11.5 V



(5) Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

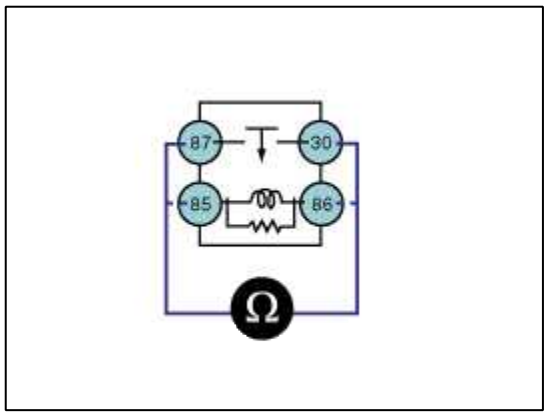
In case the voltage is not stable at terminal 1/E01, check Open circuit, Battery voltage and Fuse(MAIN 120 A). And then go to "Verification of vehicle Repair" procedure.

In case the voltage is not stable at terminal 2/E02, check Open circuit, MIL circuit and MIL resistor. And then go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. Main relay check.
   (1) Key "OFF".
   (2) Disconnect Main relay.
   (3) Measure the resistance between terminal 30 and 87 of main relay. (Component side)
   (4) Measure the resistance between terminal 85 and 86 of main relay. (Component side)
   Specification :

Terminal	Power Approval
30~87	NO
85~86	YES (Approx. 70 ~ 120Ω)



   (5) Is the measured resistance within specifications?

   YES
   Go to "Alternator check" procedure.

   NO
   Substitute with a known - good Main relay and check for proper operation.
   If the problem is corrected, replace Main relay and go to "Verification of Vehicle Repair" procedure.

2. Alternator check.
   (1) Key "OFF".
   (2) Check the tension of alternator belt.
   (3) Check corrosion, damage or looseness of Battery terminal and Alternator terminal.
   (4) Engine start.
   (5) Operate electrical parts(Head lamp, Defoger, etc).
   (6) Measure the voltage at 2000rpm.

   Specification : Approx 12.5 ~ 14.5V

   (7) Is the measured voltage within specifications?

   YES
   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO
   Substitute with a known - good Alternator and check for proper operation.
   If the problem is corrected, replace Alternator and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

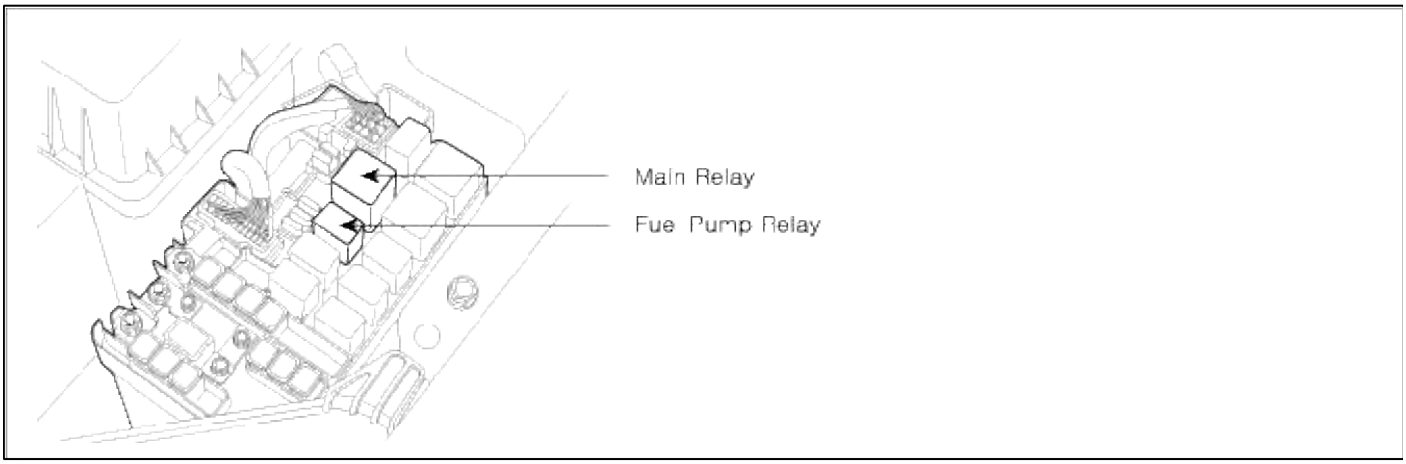
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0563 System Voltage High

COMPONENT LOCATION



GENERAL DESCRIPTION

The main relay voltage is monitored for high or low voltage values that may indicate main relay, main relay circuit, or engine electrical system malfunctions.

DTC DESCRIPTION

If the system voltage is over 17 V during 0.2 sec, ECM/PCM sets DTC P0563.

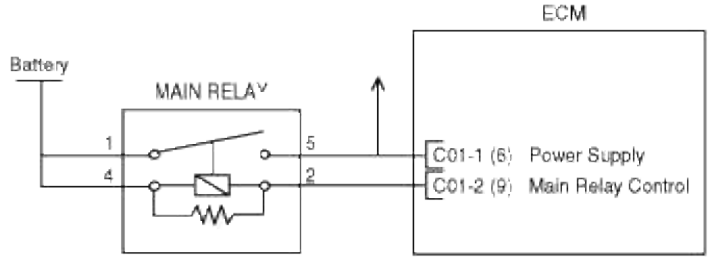
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Charging system • Main relay • ECM/PCM
Enable Conditions	• Time after engine start > 120 sec • Vehicle speed > 25 kph (15.5 MPH)	
Threshold Value	• Voltage > 17 V	
Diagnostic Time	• 0.2 sec	
MIL ON Condition	• 2 driving cycle	

SCHEMATIC DIAGRAM

(A/T)

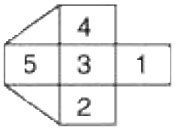
[CIRCUIT DIAGRAM]



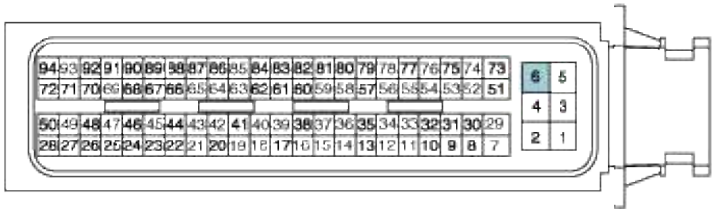
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	ECM C01-2 (9)	Relay Control
3	-	-
4	Battery	Battery Voltage (B+)
5	ECM C01-1 (6)	Power Supply

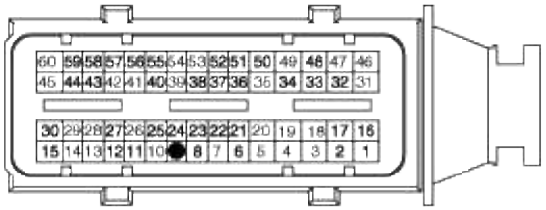
[HARNESS CONNECTORS]



Main Relay (E63)



C01-1

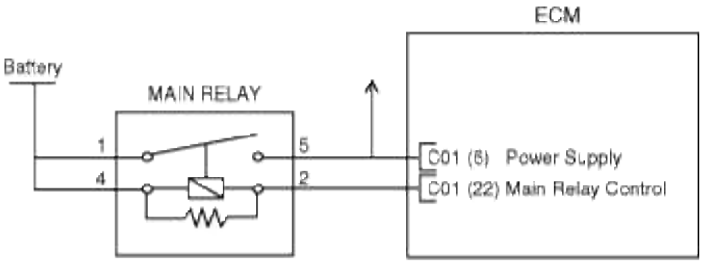


C01-2

ECM

(M/T)

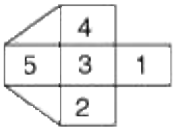
[CIRCUIT DIAGRAM]



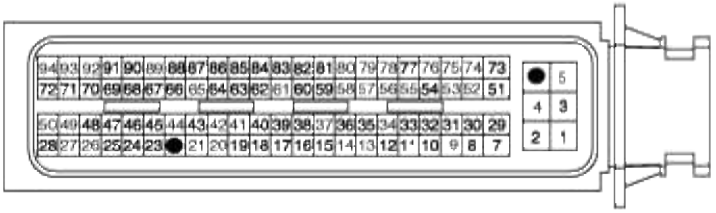
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage (B+)
2	ECM C01-2 (22)	Relay Control
3	-	-
4	Battery	Battery Voltage (B+)
5	ECM C01 (6)	Power Supply

[HARNESS CONNECTORS]



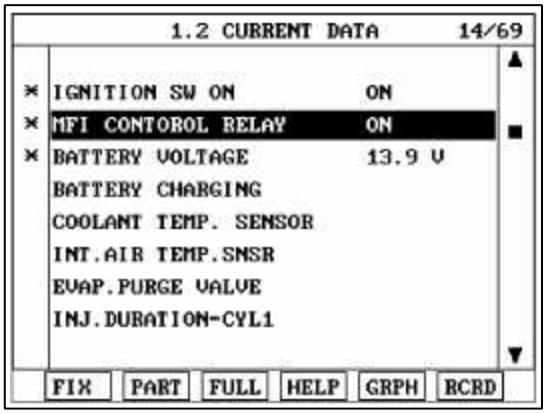
Main Relay (E63)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Main relay" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

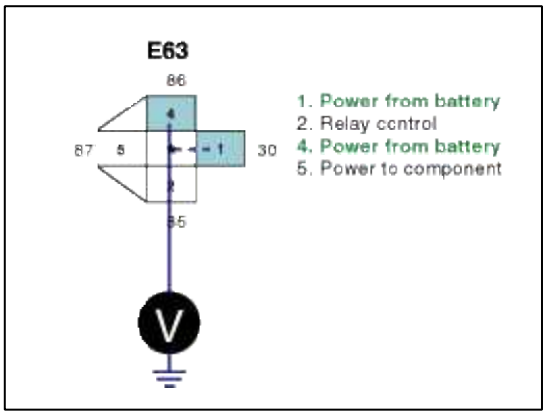
Go to "Main relay circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect Main relay and Key "ON".
3. Measure the voltage between terminal 30 of main relay harness connector and chassis ground.

4. Measure the voltage between terminal 86 of main relay harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "System inspection" procedure.

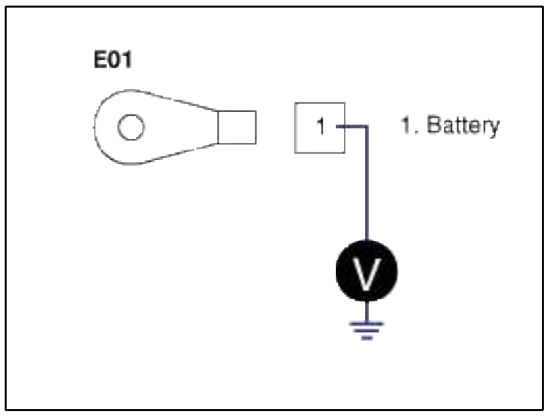
NO

Check the fuse(ECU A 30A) between battery and main relay.
Repair short in power circuit and then go to "Verification of vehicle Repair" procedure.

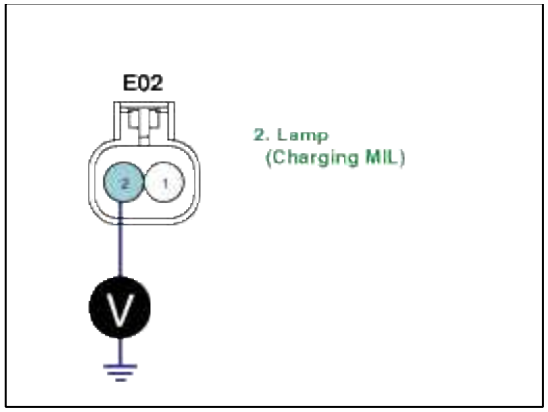
SYSTEM INSPECTION

1. Alternator circuit check
   (1) Key "OFF".
   (2) Disconnect alternator connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 1/E01 of alternator harness connector and chassis ground.
   Measure the voltage between terminal 2/E02 of alternator harness connector and chassis ground.

Specification : 12 V



Specification : 10.5~11.5 V



(5) Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

In case the voltage is not stable at terminal 1/E01, check Open circuit, Battery voltage and Fuse(MAIN 120 A). And then go to "Verification of vehicle Repair" procedure.

In case the voltage is not stable at terminal 2/E02, check Open circuit, MIL circuit and MIL resistor. And then go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. Main relay check.

(1) Key "OFF".

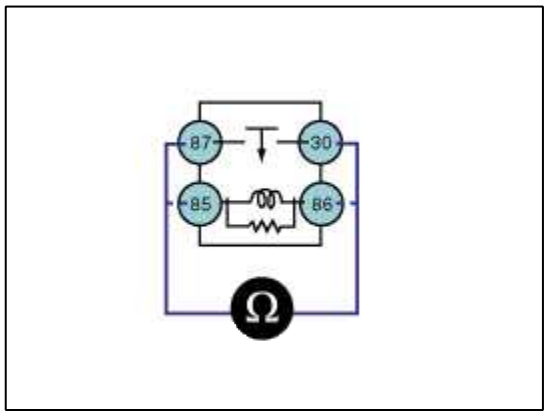
(2) Disconnect Main relay.

(3) Measure the resistance between terminal 30 and 87 of main relay. (Component side)

(4) Measure the resistance between terminal 85 and 86 of main relay. (Component side)

Specification :

Terminal	Power Approval
30~87	NO
85~86	YES (Approx. 70 ~ 120Ω)



(5) Is the measured resistance within specifications?

YES

Go to "Alternator check" procedure.

NO

Substitute with a known - good Main relay and check for proper operation.
If the problem is corrected, replace Main relay and go to "Verification of Vehicle Repair" procedure.

2. Alternator check.

(1) Key "OFF".

(2) Check the tension of alternator belt.

(3) Check corrosion, damage or looseness of Battery terminal and Alternator terminal.

(4) Engine start.

(5) Operate electrical parts(Head lamp, Defoger, etc).

(6) Measure the voltage at 2000rpm.

Specification : Approx 12.5 ~ 14.5V

(7) Is the measured voltage within specifications?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good Alternator and check for proper operation.
If the problem is corrected, replace Alternator and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0605 Internal Control Module Read Only Memory(ROM) Error

GENERAL DESCRIPTION

PCM monitors errors through checksum. Every information consists of the combination of 0 and 1, checksum means summing up all values in a row. Thus, errors are recognized comparing checksum value and the memory value at ECM/PCM.

DTC DESCRIPTION

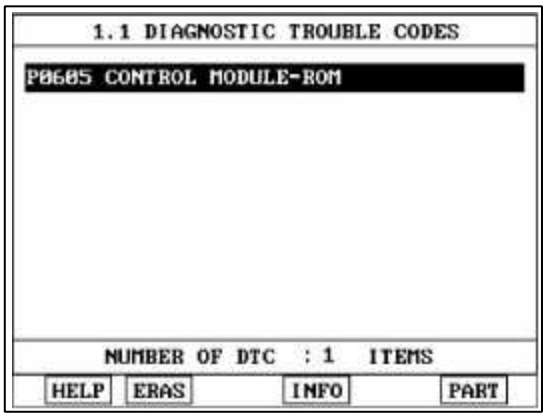
ECM detects the signal exchages between micro-processor and sensor/actuator.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Poor connection • ECM/PCM
Enable Conditions		
Threshold Value	• Each check sum of several blocks (Actual check sum ≠ check sum data)	
Diagnostic Time		
MIL ONCondition	• Immediately	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Key "ON".
3. Monitor DTC(Diagnostics Trouble Code) on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0624 Fuel Cap Lamp Control Circuit

GENERAL DESCRIPTION

Due to the increasing ambient temperature, fuel vapors are generated in the tank. In order to control the release of these vapors to the atmosphere, the evaporative emissions control system is used. The evaporative emission control system reduces hydrocarbon (HC) emissions by trapping fuel tank vapors until they can be burned in the combustion process. Evaporating fuel is stored in a charcoal canister until it can be flushed into the intake manifold. The evaporative emission control system is made up of a fuel tank that can be completely sealed from outside air, a Fuel Tank Pressure Sensor (FTPS), a Canister Close Valve (CCV) that seals the canister from the outside air, a canister filled with activated charcoal granules, a Purge Control Solenoid Valve (PCSV). The evaporative emission system can be checked for leaks by sealing the system off from the outside air, creating a vacuum, and monitoring if the system can hold that vacuum sufficiently for a set amount of time. If it cannot, a leak exists somewhere in the system.

DTC DESCRIPTION

When ECM/PCM detects Open or Short in circuit, ECM/PCM sets DTC P0624.

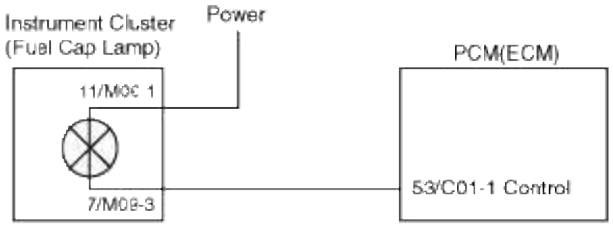
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check (high, low, or open)	• Poor connection • Open / Short • Instrument cluster • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to battery • Short circuit to ground • Disconnected	
Diagnostic Time		
MIL ONCondition	• DTC only	

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

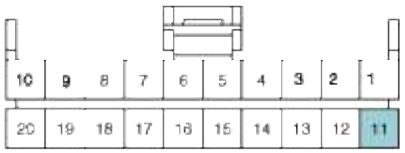


[CONNECTION INFORMATION]

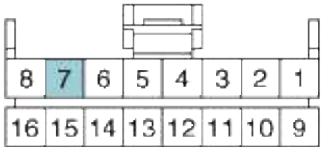
PCM A/T

Terminal	Connected to	Function
11/M09-1	Battery	Power
7/M09-3	PCM Terminal 53/C01-1	Control

[HARNESS CONNECTORS]

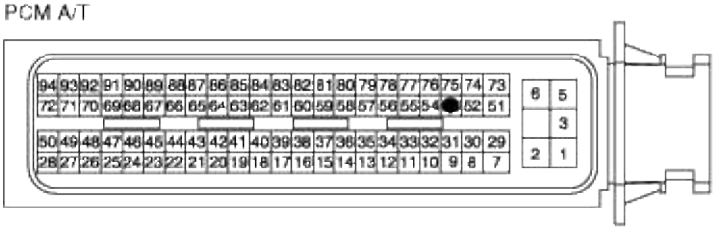


M09-1



M09-3

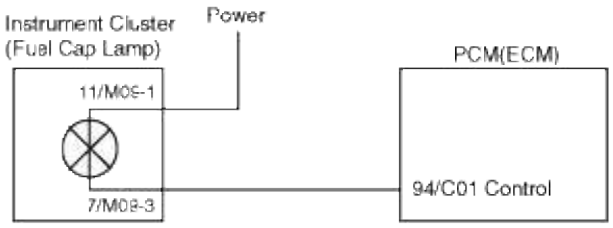
PCM A/T



C01 1

(M/T)

[CIRCUIT DIAGRAM]

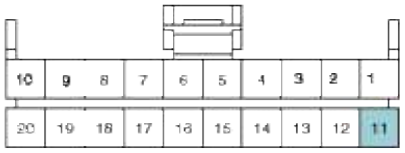


[CONNECTION INFORMATION]

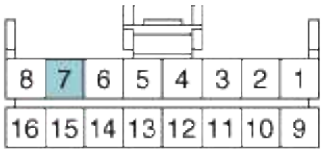
ECM M/T

Terminal	Connected to	Function
11/M09-1	Battery	Power
7/M09-3	ECM Terminal 94/C01	Control

[HARNESS CONNECTORS]

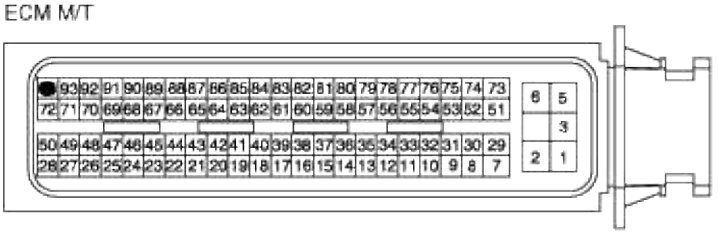


M09-1



M09-3

ECM M/T

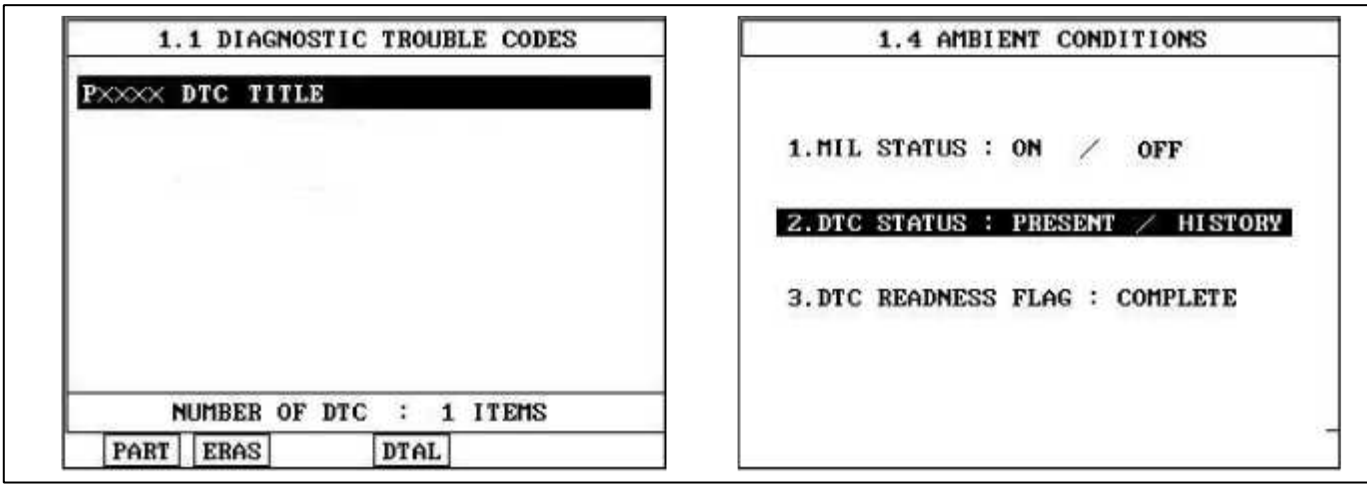


C01

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".

3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC information from the DTCs menu.
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

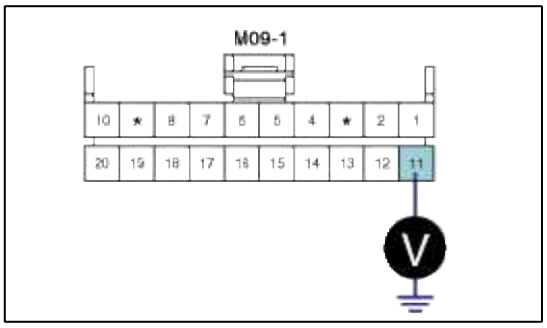
Go to "Main relay circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect the instrument cluster harness connector.

3. Measure the voltage between terminal 11/M09-1 of harness connector and ground.

Specification : B+



4. Is the measured voltage within specification ?

YES

Go to "Control circuit inspection" procedure.

NO

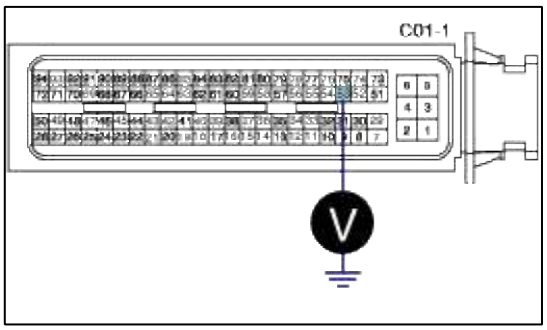
Check the fuse(ECU A 30A) between battery and cluster.
Repair Open or Short in power circuit and then go to "Verification of vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

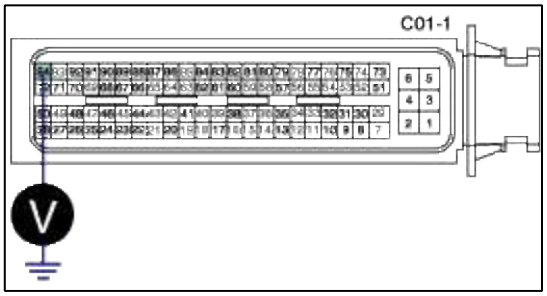
1. IG "OFF".
2. Disconnect ECM/PCM harness connector.
3. IG "ON".
4. Measure the voltage between terminal 53/C01-1 (94/C01) of PCM(ECM) harness connectorand ground.

Specification : B+

PCM A/T



ECM M/T



5. Is the measured voltage within specification ?

YES

Go to "Component inspection" procedure.

NO

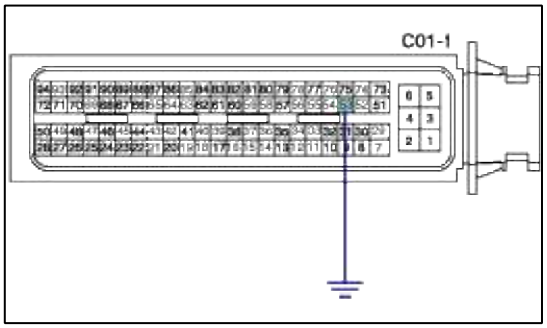
Check the bulb and repair as necessary.
Repair Open or Short in control circuit and then go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

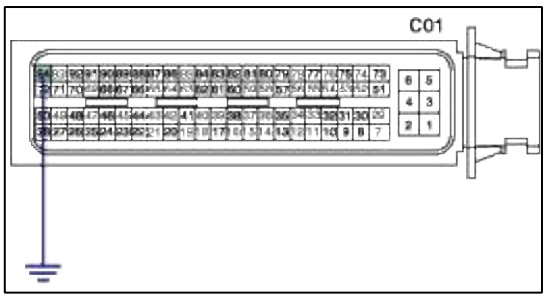
1. IG "OFF".
2. Disconnect ECM/PCM harness connector.
3. Short terminal 53/C01-1 (94/C01) of PCM(ECM) harness connector to ground.

Specification : Fuel filler cap lamp ON

PCM A/T



ECM M/T



4. Is the Fuel filler cap warning lamp turned on normally?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good instrument cluster and check for proper operation. If the problemis corrected, replace instrument cluster and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0630 VIN Not Programmed or Incompatible-ECM/PCM

GENERAL DESCRIPTION

Regulations require that all 2005 and subsequent model year vehicles shall have the Vehicle Identification Number(VIN) available in a standardized format through the standardized data link connector in accordance with SAE J1979 specifications. Using a scan tool, PERFORM "VIN WRITING" procedure after replacing or reflashing a ECM/PCM.

DTC DESCRIPTION

If the VIN writing is not programmed or incompatible, the ECM/PCM determines that a fault exists and a DTC P0630 is stored.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Vehicle ID comparison	• VIN is not programmed. • Faulty ECM/PCM
Enable Conditions		
Threshold Value		
Diagnostic Time	• 100 sec	
MIL ONCondition	• immediately	

MONITOR SCANTOOL DATA

1. Ignition "OFF"
2. Connect Scantool and Ignition "ON"
3. Monitor the ECM/PCM status using the VIN READING function.
4. Is the ECM/PCM status Virgin ?

YES

Perform VIN writing procedure according to the direction on the scantool screen and go to "Verification of Vehicle Reapair" procedure.

NO

Fault is intermittent caused by poor contact in Sensor’s and/or PCM’s connector or was repairedand ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and goto "Verification of Vehicle Repair" procedure

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0642 Sensor Reference Voltage \'A\' Circuit Low

GENERAL DESCRIPTION

The 5V reference line is monitored for malfunctions that could result in improper sensor operation.

DTC DESCRIPTION

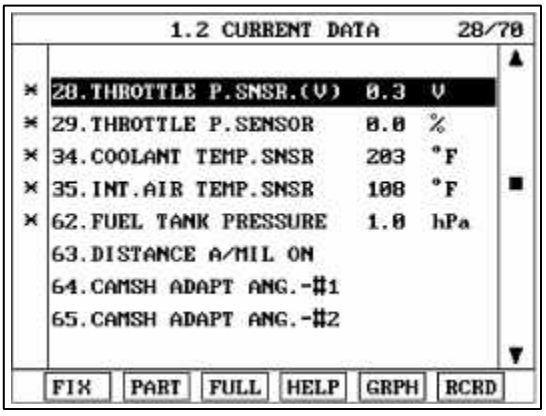
When ECM/PCM detects that the power for sensors(5V) is below 4.24V during 3 sec or more, ECM/PCM sets DTC P0642.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Short to ground in 5V-voltage circuit • ECM/PCM
Enable Conditions	• Battery voltage : 11~16V	
Threshold Value	• 5V- voltage < 4.24V	
Diagnostic Time	• 3sec	
MIL ONCondition	• 2 driving cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the sensors which use 5V for power(ex. TPS, ECTS, IATS, FTPS, etc) on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

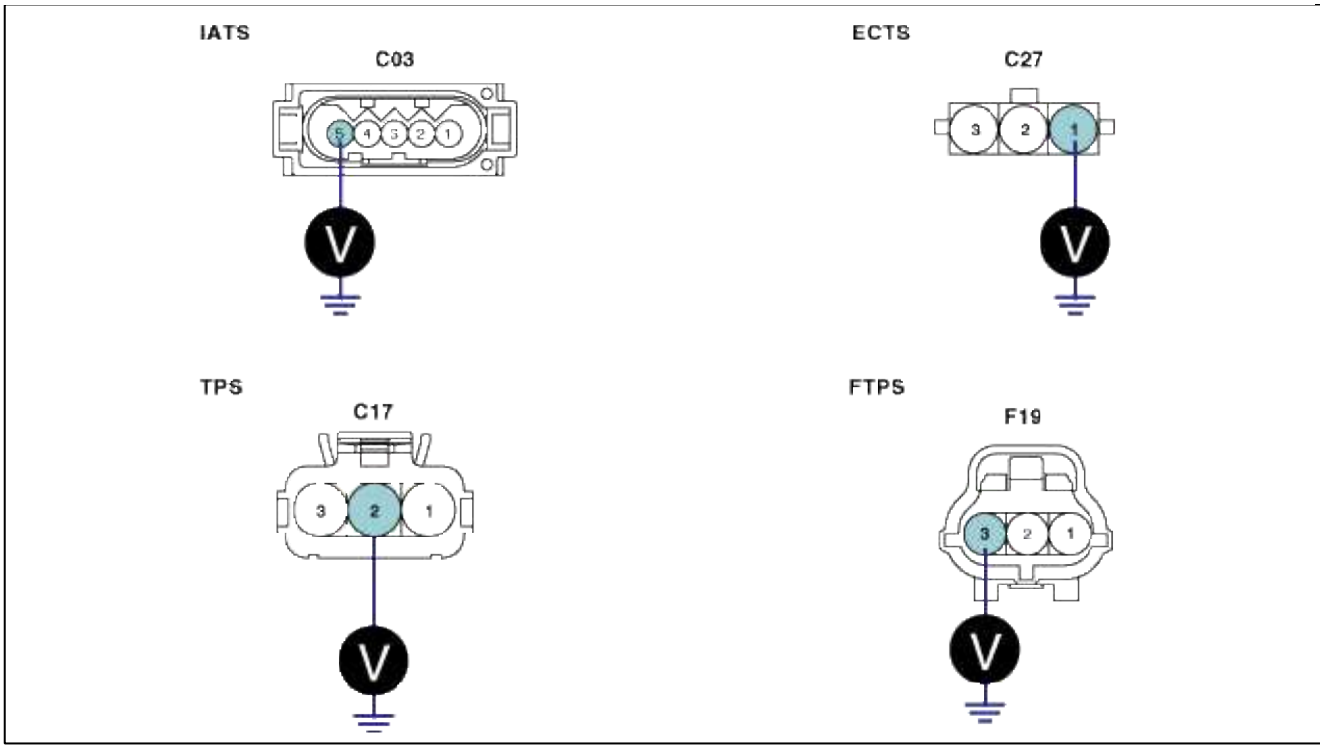
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check voltage
   (1) IG "OFF".
   (2) Disconnect IATS, ECTS, TPS and FTPS' harness connector.
   (3) IG "ON".
   (4) Measure the voltage between terminal 5 of IATS harness connector and ground.
   Measure the voltage between terminal 1 of ECTS harness connector and ground.
   Measure the voltage between terminal 2 of TPS harness connector and ground.
   Measure the voltage between terminal 3 of FTPS harness connector and ground.

Specification : approx. 5 V



(5) Is the measured voltage within specification?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Go to "Check Short to ground" procedure.

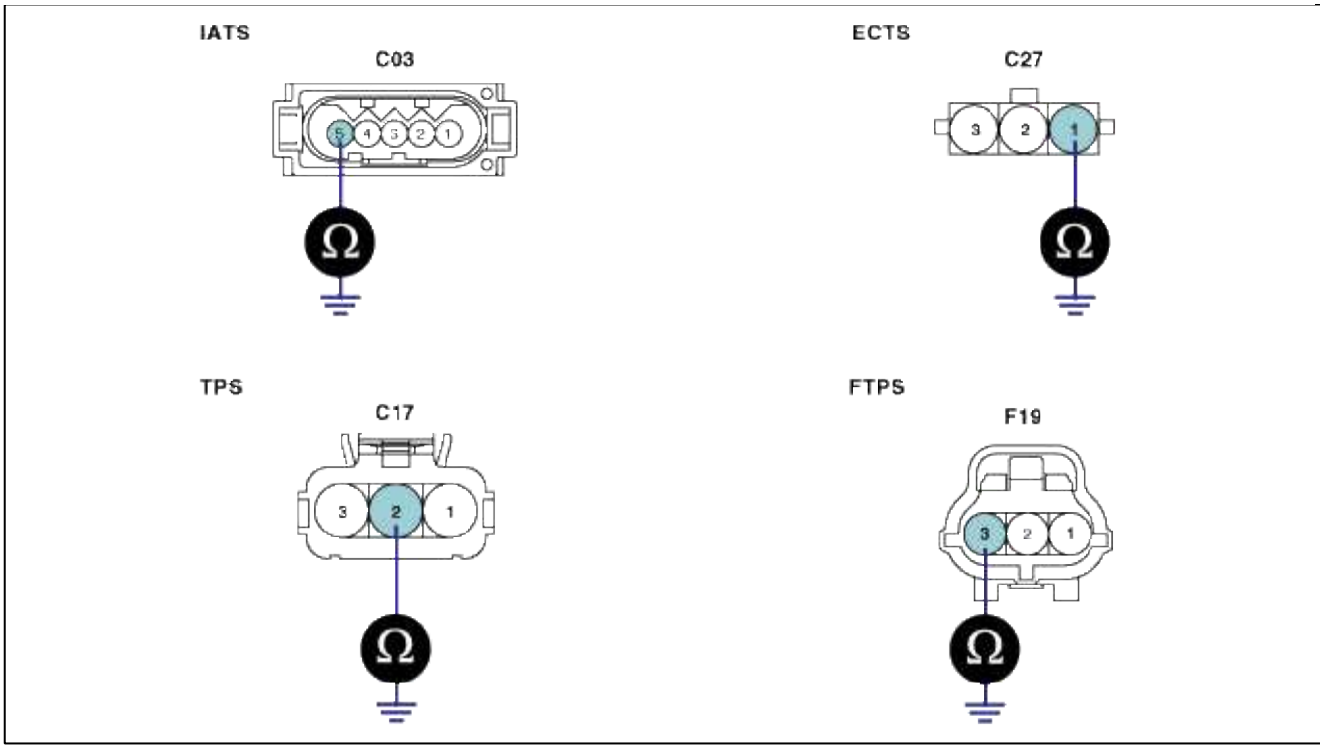
2. Check Short to ground

(1) IG "OFF".

(2) Disconnect IATS, ECTS, TPS, FTPS and ECM/PCM harness connector.

(3) Measure the resistance between terminal 5 of IATS harness connector and ground.
Measure the resistance between terminal 1 of ECTS harness connector and ground.
Measure the resistance between terminal 2 of TPS harness connector and ground.
Measure the resistance between terminal 3 of FTPS harness connector and ground.

Specification : Infinite



(4) Is the resistance within specification?

YES

This DTC is caused by Open in power circuit or Malfunction of ECM/PCM. so, Repair as necessary and tl to "Verification of Vehicle Repair" procedure.

NO

Repair Short to ground in power circuit and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0643 Sensor Reference Voltage \'A\' Circuit High

GENERAL DESCRIPTION

The 5V reference line is monitored for malfunctions that could result in improper sensor operation.

DTC DESCRIPTION

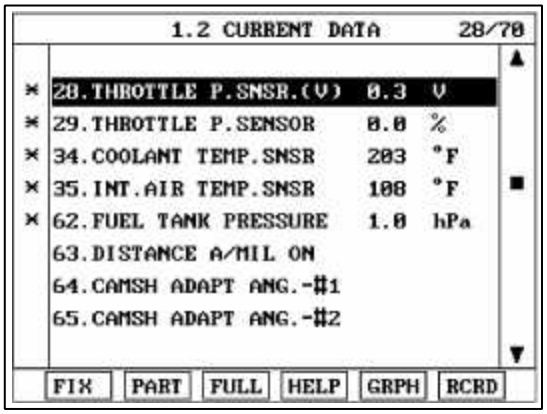
When ECM/PCM detects that the power for sensors(5V) is over 5.75V during 3 sec or more, ECM/PCM sets DTC P0643.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Short to power in 5V-voltage circuit • ECM/PCM
Enable Conditions	• Battery voltage : 11~16V	
Threshold Value	• 5V- voltage > 5.75V	
Diagnostic Time	• 3sec	
MIL ONCondition	• 2 driving cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the sensors which use 5V for power(ex. TPS, ECTS, IATS, FTPS, etc) on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

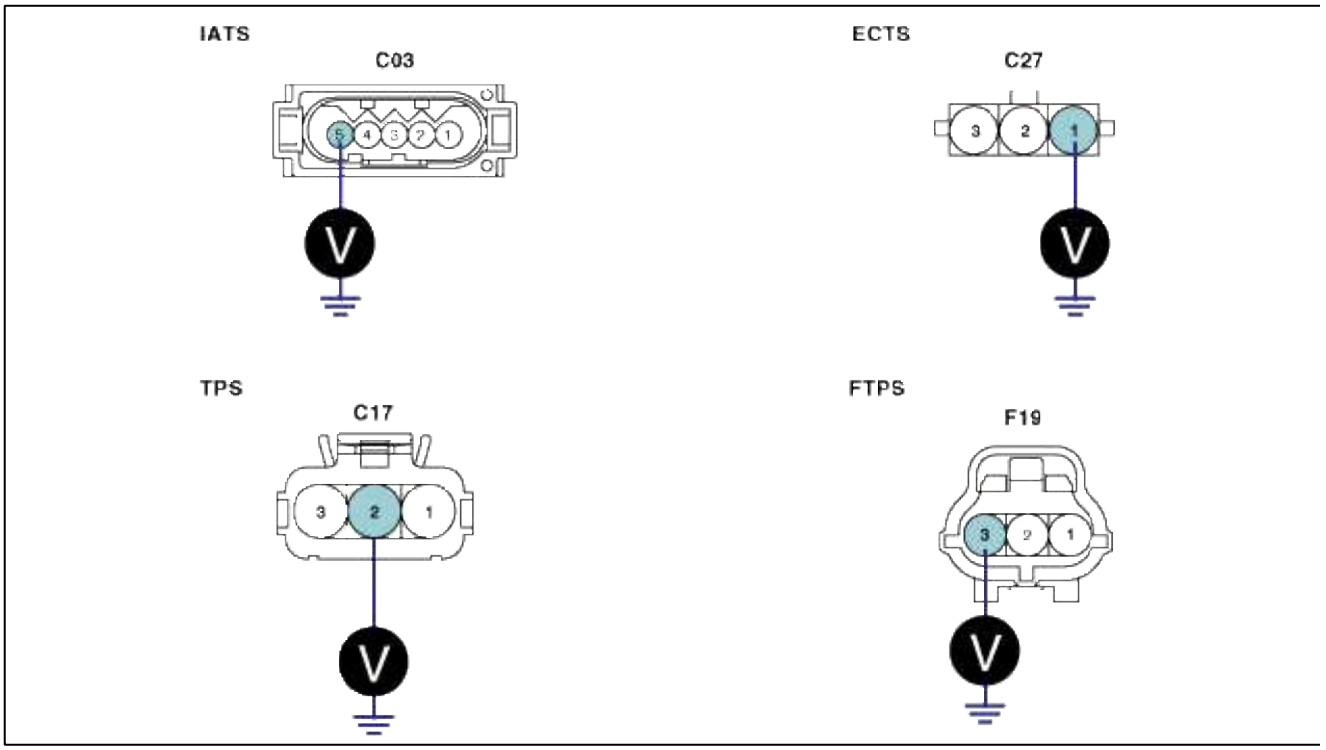
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check voltage
   (1) IG "OFF".
   (2) Disconnect IATS, ECTS, TPS and FTPS' harness connector.
   (3) IG "ON".
   (4) Measure the voltage between terminal 5 of IATS harness connector and ground.
   Measure the voltage between terminal 1 of ECTS harness connector and ground.
   Measure the voltage between terminal 2 of TPS harness connector and ground.
   Measure the voltage between terminal 3 of FTPS harness connector and ground.

   Specification : approx. 5 V



   (5) Is the measured voltage within specification?

   YES

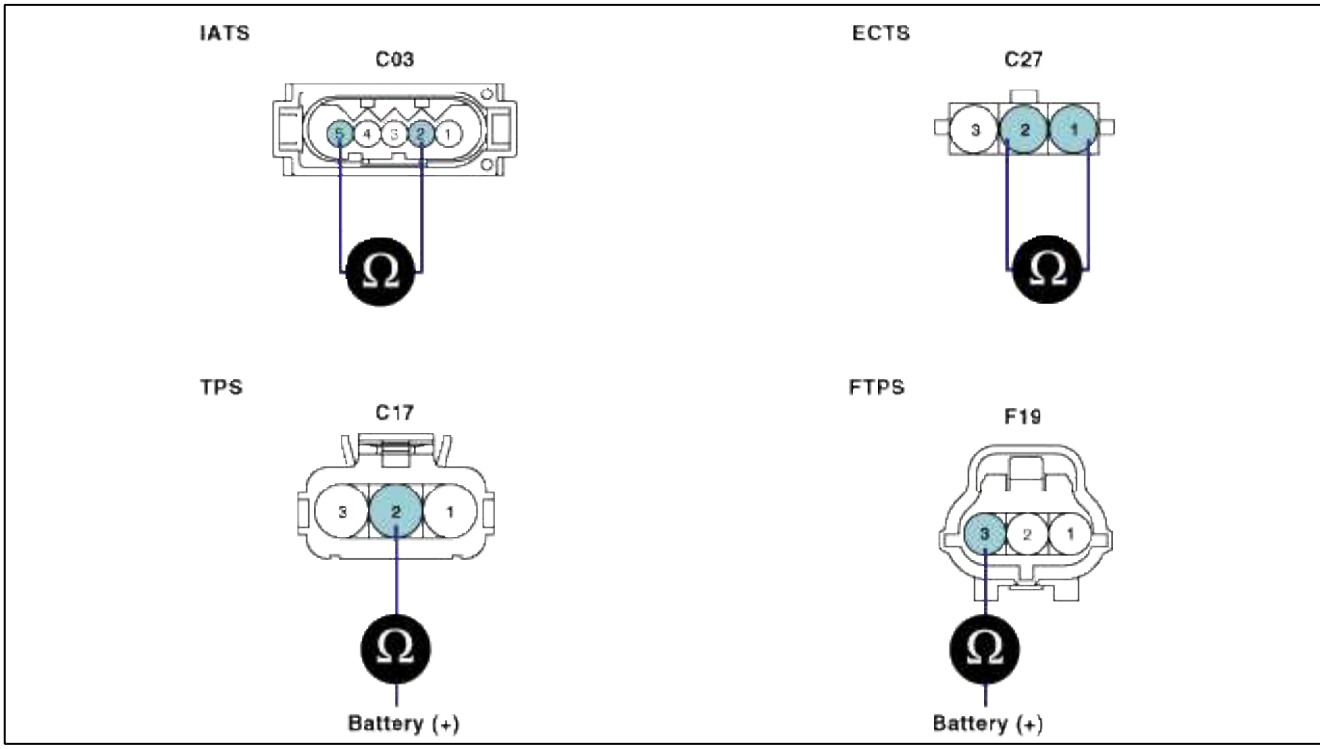
   Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

   NO

   Go to "Check Short to power" procedure.

2. Check Short to ground
   (1) IG "OFF".
   (2) Disconnect IATS, ECTS, TPS, FTPS and ECM/PCM harness connector.
   (3) Measure the resistance between terminal 5 and 2 of IATS harness connector.
   Measure the resistance between terminal 1 and 2 of ECTS harness connector.
   Measure the resistance between terminal 2 of TPS harness connector and Battery(+).
   Measure the resistance between terminal 3 of FTPS harness connector and Battery(+).

   Specification : Infinite



   (4) Is the resistance within specification?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, re
   ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Repair Short to battery in power circuit and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0645 A/C Clutch Relay Control Circuit

GENERAL DESCRIPTION

The A/C relay is activated if the A/C switch is ON while the blower is running and system operation is enabled the ECM/PCM. Power is then supplied to the A/C compressor electromagnetic clutch and A/C system is operated. The A/C compressor is switched out to prevent it running when full engine output is required or there is a risk of overheating.The ECM/PCM also inhibits compressor operation on starting to permit running conditions to stabilize.

DTC DESCRIPTION

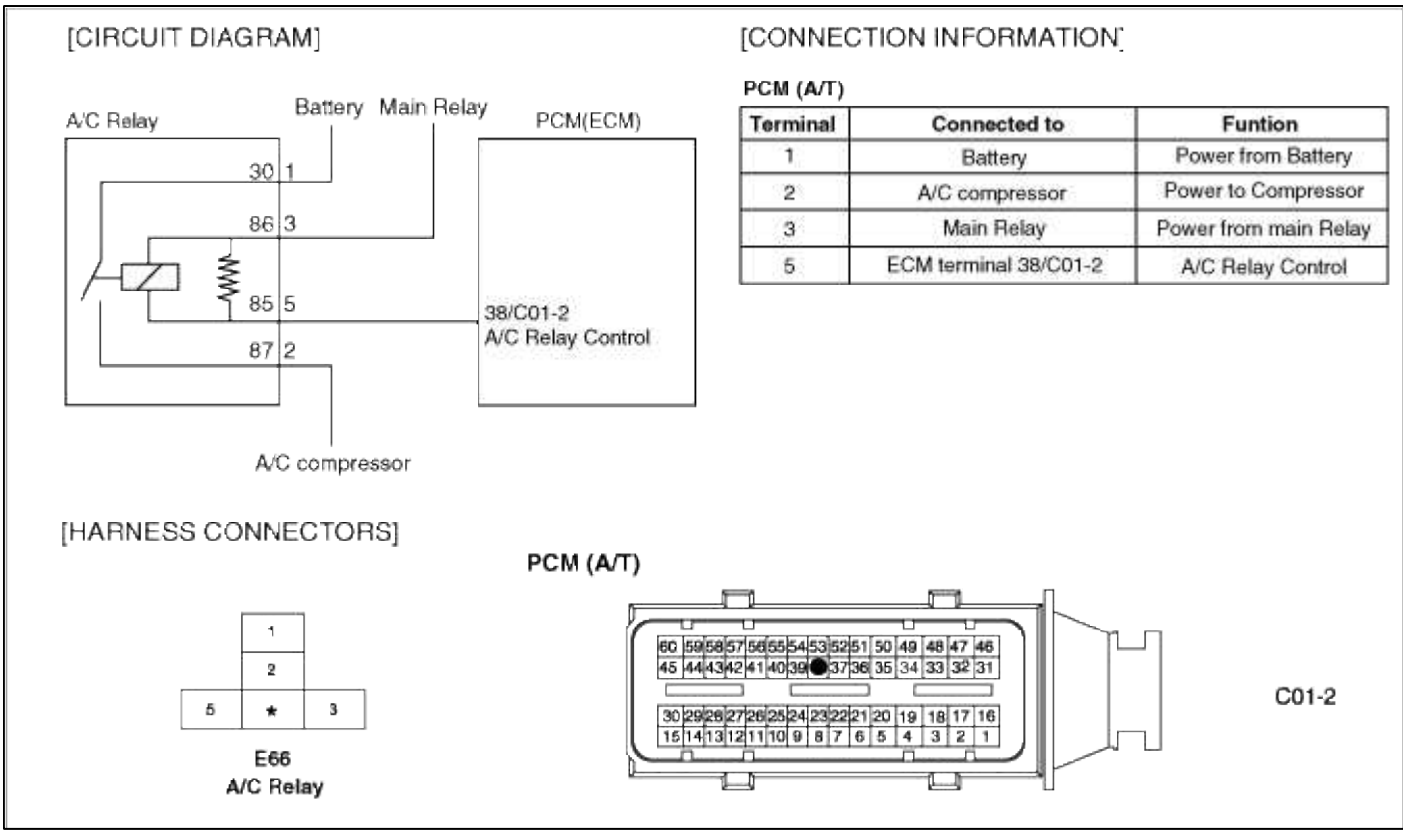
If there is Open in A/C control relay control circuit, ECM/PCM sets DTC P0645.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or short to ground in power circuit • Open in control circuit • A/C relay • ECM/PCM
Enable Conditions		
Threshold Value	• Disconnected	
Diagnostic Time	• Continuous	
MIL ONCondition	• DTC only	

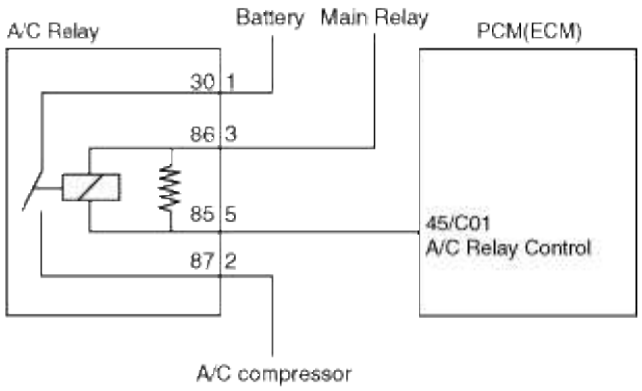
SCHEMATIC DIAGRAM

(A/T)



(M/T)

[CIRCUIT DIAGRAM]

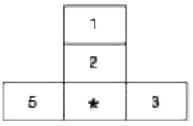


[CONNECTION INFORMATION]

ECM (M/T)

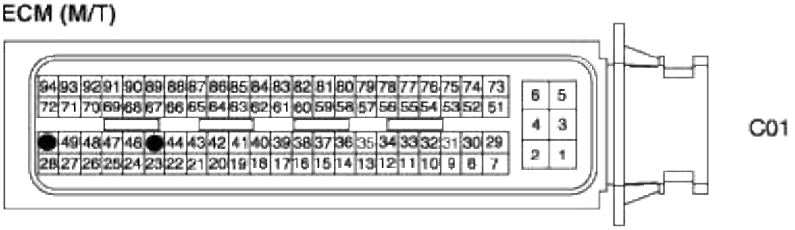
Terminal	Connected to	Funtion
1	Battery	Power from Battery
2	A/C compressor	Power to Compressor
3	Main Relay	Power from main Relay
5	ECM terminal 45/C01	A/C Relay Control

[HARNESS CONNECTORS]



E66
A/C Relay

ECM (M/T)

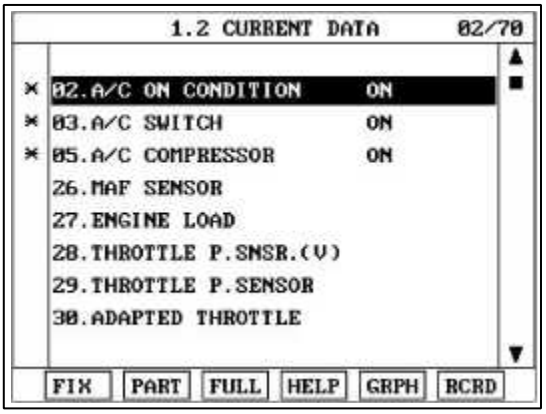


C01

ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor "A/C Relay" parameters on scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

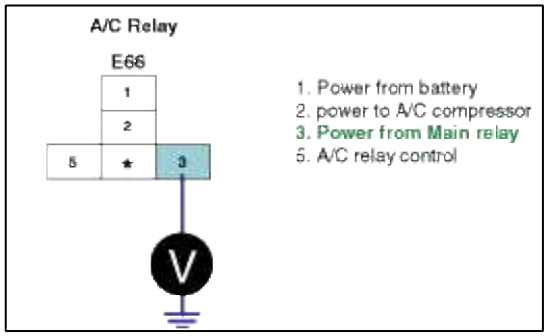
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check Voltage of power circuit from battery
   (1) IG "OFF".
   (2) Disconnect A/C Relay.
   (3) IG "ON".
   (4) Measure the voltage between terminal 3 of A/C Relay harness connector and ground.

Specification : B+



   (5) Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

NO

Check "10A SNSR" fuse between a main relay and a A/C relay.

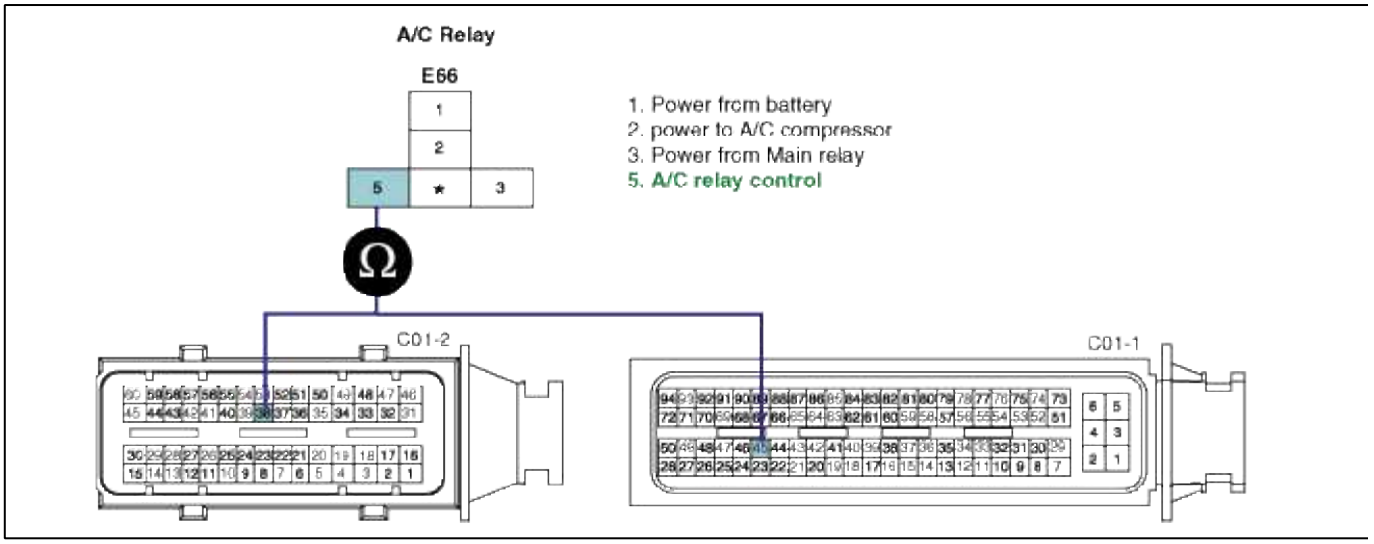
Check Open or Short to ground in power circuit of A/C relayand then go to "Verification of vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect A/C relay and ECM/PCM harness connector.
3. IG "ON".

4. Measure the resistance between terminal 5 of A/C relay harness connector and terminal 38/C01-2of ECM/PCM harness connector.(AT)
   Measure the resistance between terminal 5 of A/C relay harness connector and terminal 45/C01of ECM/PCM harness connector.(MT)

   Specification : below 1Ω



5. Is the measured resistance within specification?

YES

Go to "Component inspection" procedure.

NO

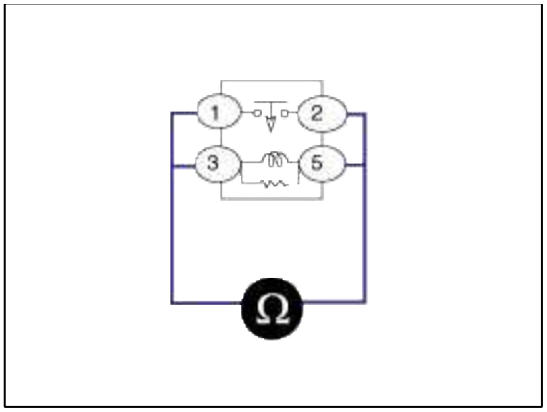
Repair Open in A/C relay control circuit and then go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION

1. A/C relay check
   (1) Key "OFF".
   (2) Disconnect A/C relay.
   (3) Measure the resistance between terminal 1 and 2 of A/C relay component side.
   (4) Measure the resistance between terminal 3 and 5 of A/C relay component side.

   Specification :

Terminal	Power Approval
1 ~ 2	NO
3 ~ 5	YES (Approx. 70 ~ 120Ω)



(5) Is the measured resistance within specification ?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good A/C relay and check for proper operation. If the problem is corrected, replace A/C relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0646 A/C Clutch Relay Control Circuit Low

GENERAL DESCRIPTION

The A/C relay is activated if the A/C switch is ON while the blower is running and system operation is enabled the ECM/PCM. Power is then supplied to the A/C compressor electromagnetic clutch and A/C system is operated. The A/C compressor is switched out to prevent it running when full engine output is required or there is a risk of overheating.The ECM/PCM also inhibits compressor operation on starting to permit running conditions to stabilize.

DTC DESCRIPTION

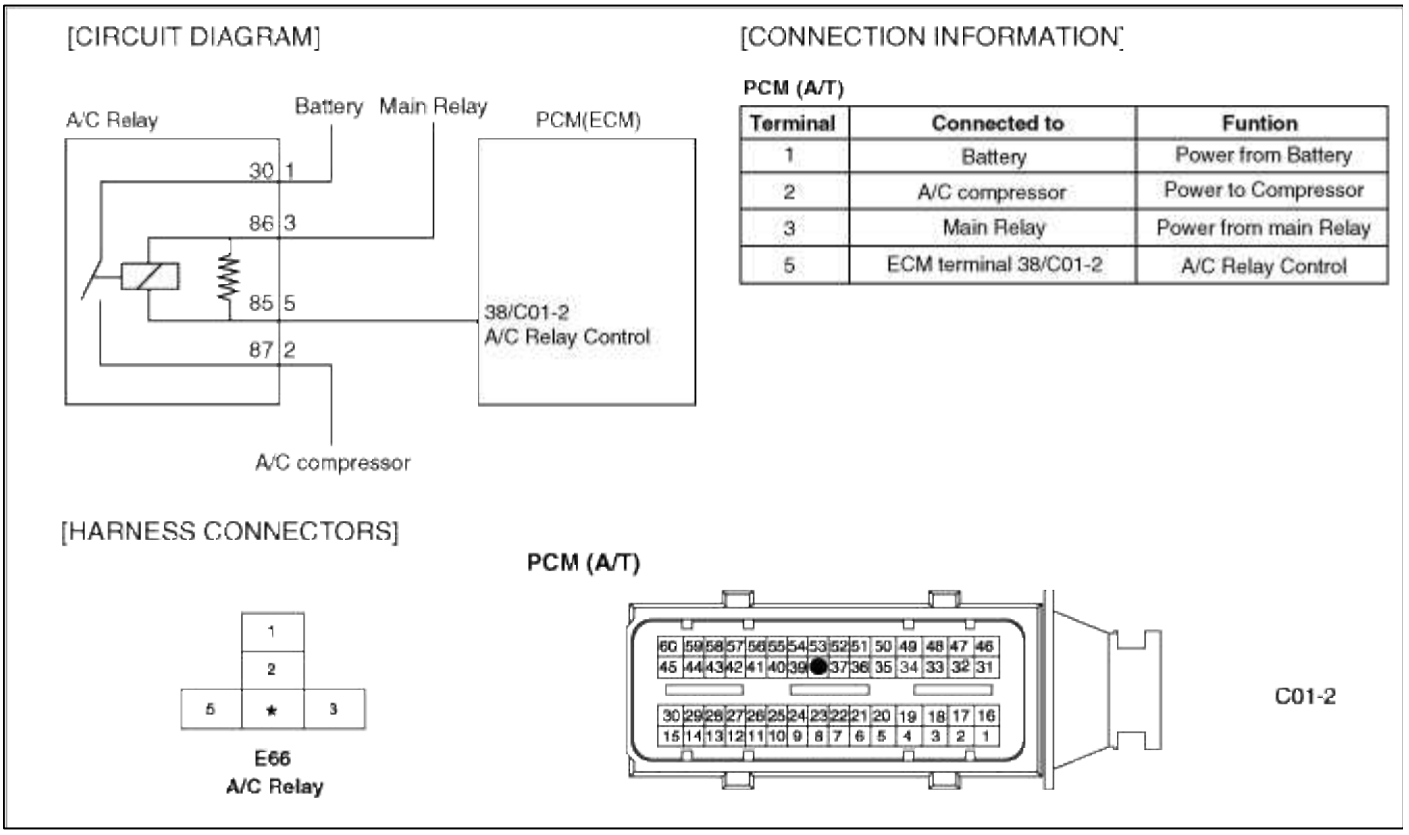
If there is Short to ground in A/C control relay control circuit, ECM/PCM sets DTC P0646.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • short to ground in control circuit • A/C relay • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to ground	
Diagnostic Time	• Continuous	
MIL ONCondition	• DTC only	

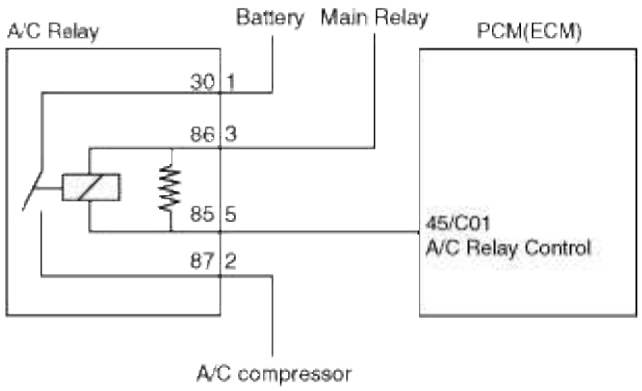
SCHEMATIC DIAGRAM

(A/T)



(M/T)

[CIRCUIT DIAGRAM]

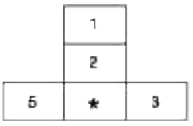


[CONNECTION INFORMATION]

ECM (M/T)

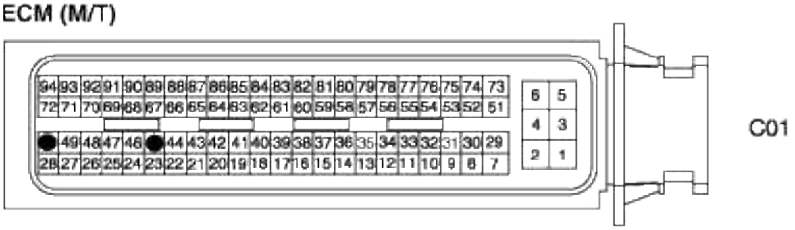
Terminal	Connected to	Funtion
1	Battery	Power from Battery
2	A/C compressor	Power to Compressor
3	Main Relay	Power from main Relay
5	ECM terminal 45/C01	A/C Relay Control

[HARNESS CONNECTORS]



E66
A/C Relay

ECM (M/T)

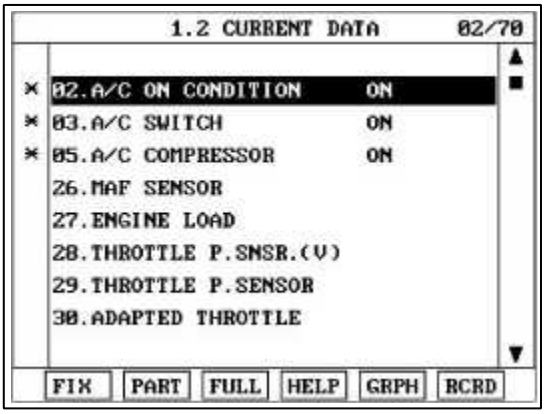


C01

ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor "A/C Relay" parameters on scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

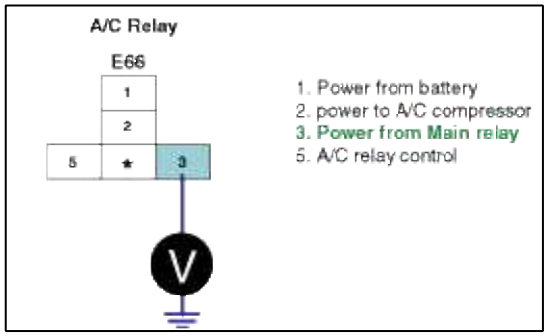
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check Voltage of power circuit from battery
   (1) IG "OFF".
   (2) Disconnect A/C Relay.
   (3) IG "ON".
   (4) Measure the voltage between terminal 3 of A/C Relay harness connector and ground.

Specification : B+



   (5) Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

NO

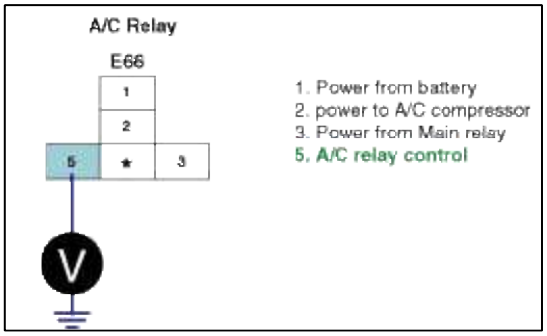
Check "10A SNSR" fuse between a main relay and a A/C relay.

Check Open or Short to ground in power circuit of A/C relayand then go to "Verification of vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect A/C Relay.
3. IG "ON".
4. Measure the voltage between terminal 5 of A/C relay and ground.

Specification : Approx. 11V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to ground in A/C relay control circuit and then go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. A/C relay check

(1) Key "OFF".

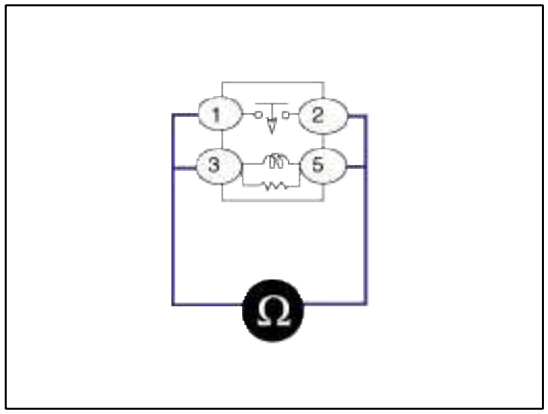
(2) Disconnect A/C relay.

(3) Measure the resistance between terminal 1 and 2 of A/C relay component side.

(4) Measure the resistance between terminal 3 and 5 of A/C relay component side.

Specification :

Terminal	Power Approval
1 ~ 2	NO
3 ~ 5	YES (Approx. 70 ~ 120Ω)



(5) Is the measured resistance within specification ?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good A/C relay and check for proper operation. If the problem is corrected, replace A/C relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0647 A/C Clutch Relay Control Circuit High

GENERAL DESCRIPTION

The A/C relay is activated if the A/C switch is ON while the blower is running and system operation is enabled the ECM/PCM. Power is then supplied to the A/C compressor electromagnetic clutch and A/C system is operated. The A/C compressor is switched out to prevent it running when full engine output is required or there is a risk of overheating.The ECM/PCM also inhibits compressor operation on starting to permit running conditions to stabilize.

DTC DESCRIPTION

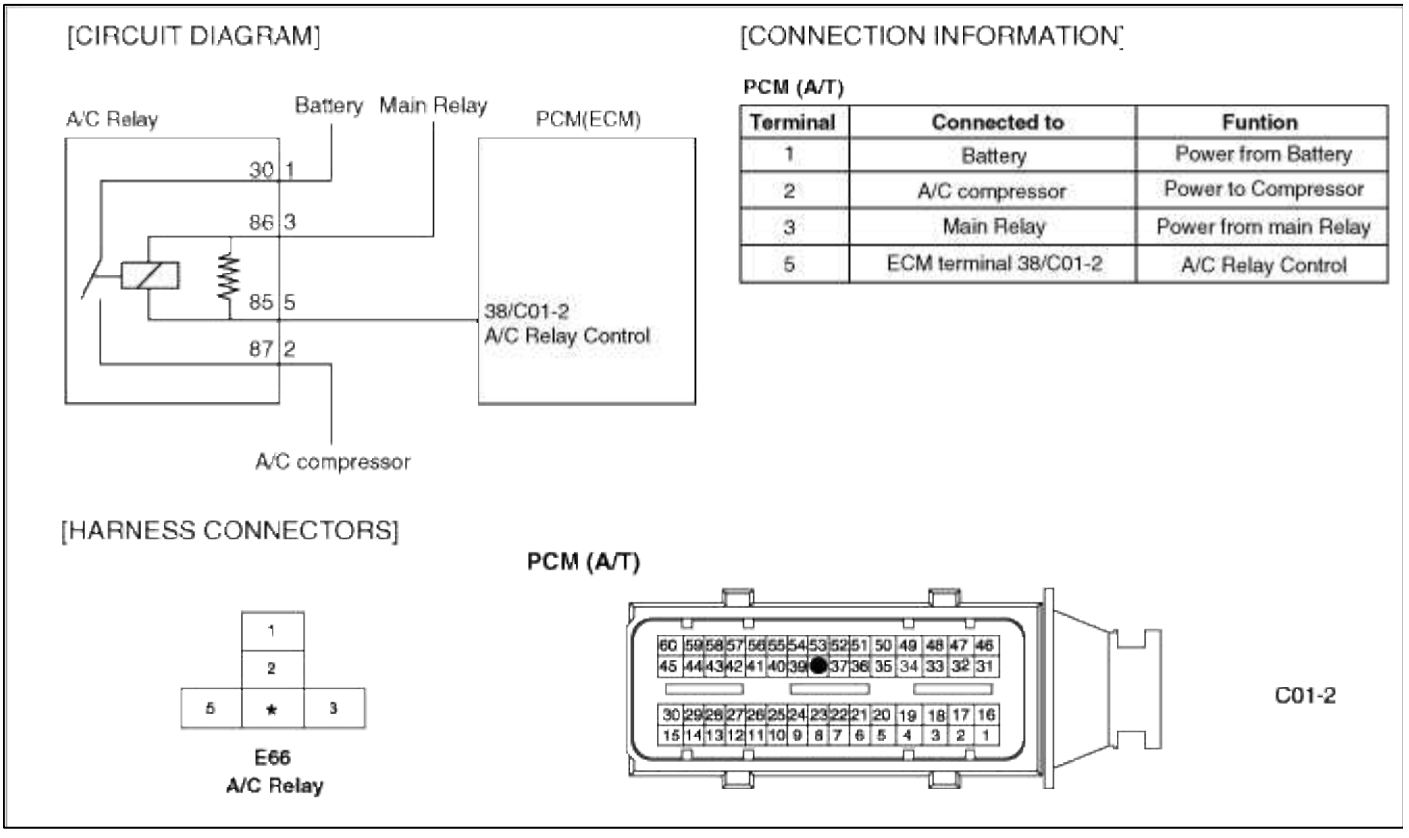
If there is Short to power in A/C control relay control circuit, ECM/PCM sets DTC P0647.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • short to power in control circuit • A/C relay • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to battery	
Diagnostic Time	• Continuous	
MIL ONCondition	• DTC only	

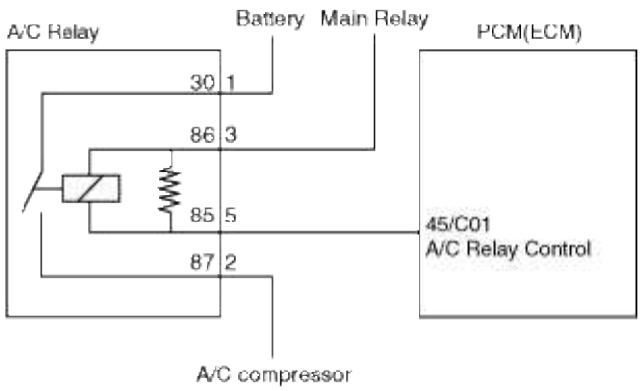
SCHEMATIC DIAGRAM

(A/T)



(M/T)

[CIRCUIT DIAGRAM]

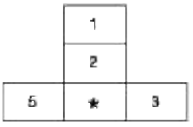


[CONNECTION INFORMATION]

ECM (M/T)

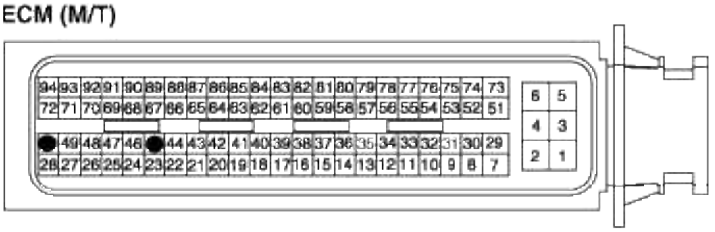
Terminal	Connected to	Funtion
1	Battery	Power from Battery
2	A/C compressor	Power to Compressor
3	Main Relay	Power from main Relay
5	ECM terminal 45/C01	A/C Relay Control

[HARNESS CONNECTORS]



E66
A/C Relay

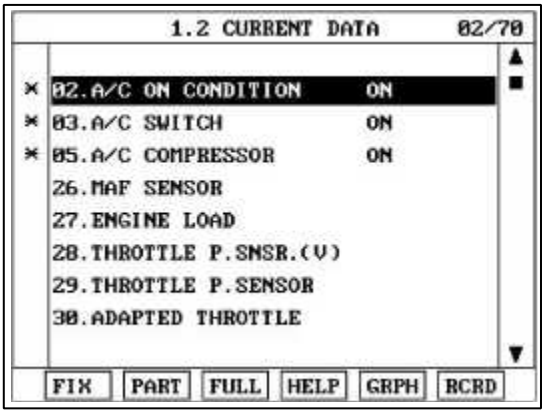
ECM (M/T)



ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor "A/C Relay" parameters on scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

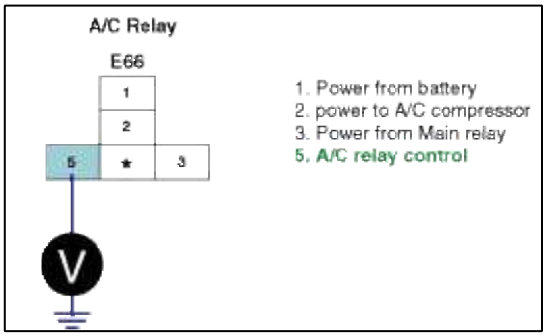
NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect A/C Relay.
3. IG "ON".
4. Measure the voltage between terminal 5 of A/C relay and ground.

Specification : Approx. 11V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to power in A/C relay control circuit and then go to "Verification of Vehicle Repair"procedure.

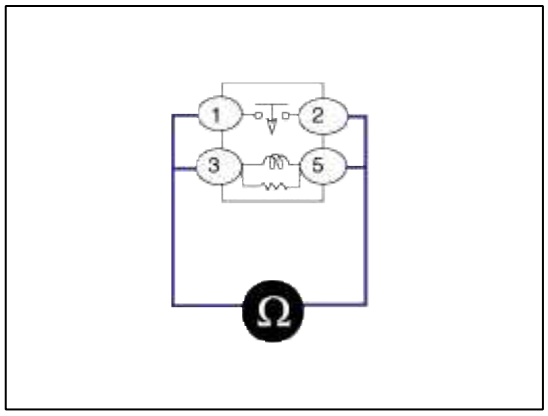
COMPONENT INSPECTION

1. A/C relay check
   (1) Key "OFF".
   (2) Disconnect A/C relay.
   (3) Measure the resistance between terminal 1 and 2 of A/C relay component side.

(4) Measure the resistance between terminal 3 and 5 of A/C relay component side.

Specification :

Terminal	Power Approval
1 ~ 2	NO
3 ~ 5	YES (Approx. 70 ~ 120Ω)



(5) Is the measured resistance within specification ?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good A/C relay and check for proper operation. If the problem is corrected, replace A/C relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

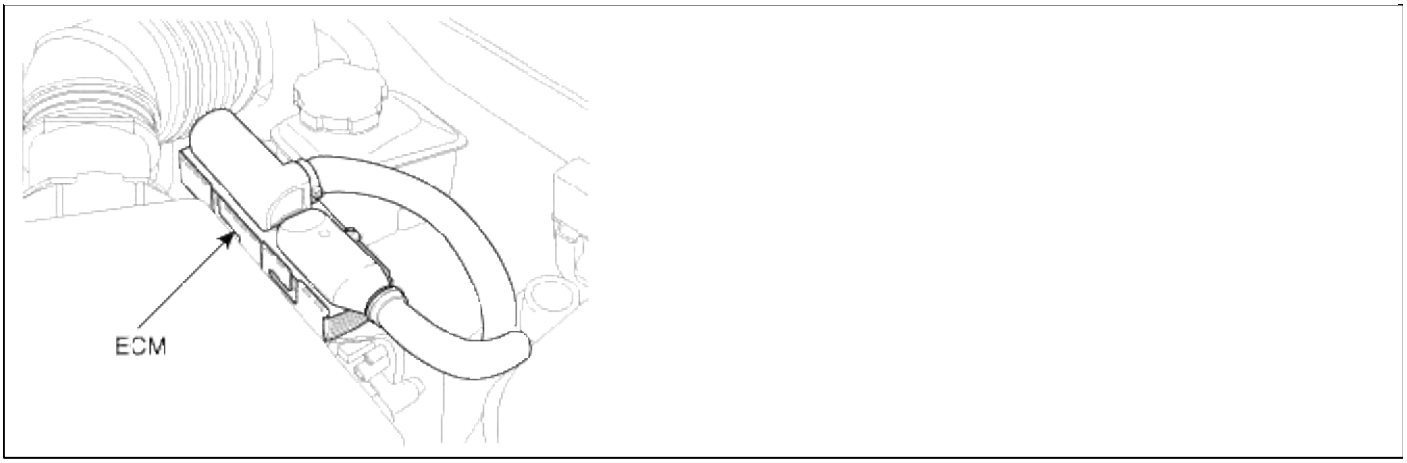
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0650 Malfunction Indicator Lamp (MIL) Control Circuit

COMPONENT LOCATION



GENERAL DESCRIPTION

A Malfunction Indicator Lamp (MIL) is used to notify the driver of malfunctions within the monitored powertrain (engine and transaxle) system that have an effect on emissions.

DTC DESCRIPTION

If there is Open, Short to ground or Short to power in MIL circuit, ECM/PCM sets DTC P0650.

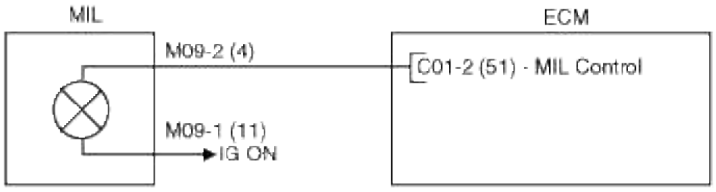
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high, low, or open	• Poor connection • Open or short in power/control circuit • Instrument cluster • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to battery, ground, or disconnected	
Diagnostic Time	• Continuous	
MIL ON Condition	• DTC only	

SCHEMATIC DIAGRAM

(A/T)

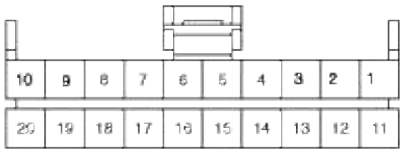
[CIRCUIT DIAGRAM]



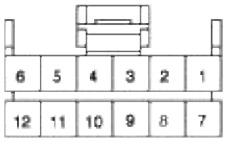
[CONNECTION INFORMATION]

Terminal	Connected to	Function
M09-2 (4)	ECM C01-2 (51)	MIL Control
M09-1 (11)	IG ON	Battery Voltage (B+)

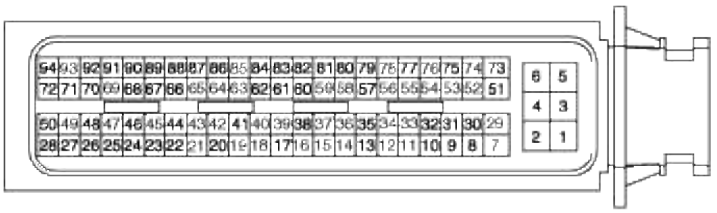
[HARNESS CONNECTORS]



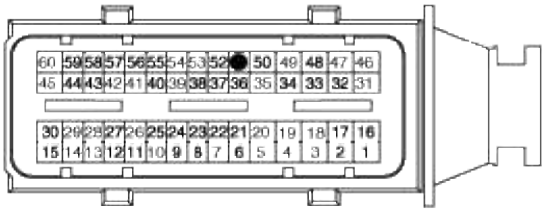
Cluster (M09-1)



Cluster (M09-2)



C01-1

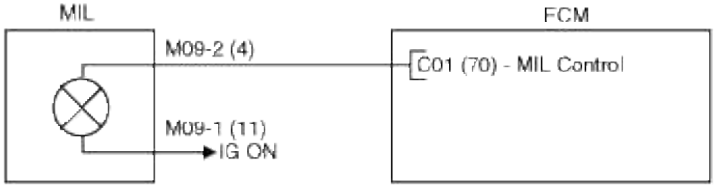


C01-2

ECM

(M/T)

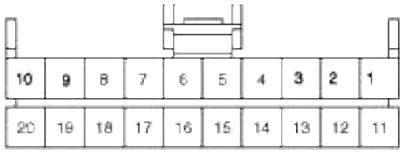
[CIRCUIT DIAGRAM]



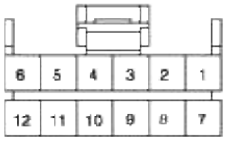
[CONNECTION INFORMATION]

Terminal	Connected to	Function
M09-2 (4)	ECM C01 (70)	MIL Control
M09-1 (11)	IG ON	Battery Voltage (B+)

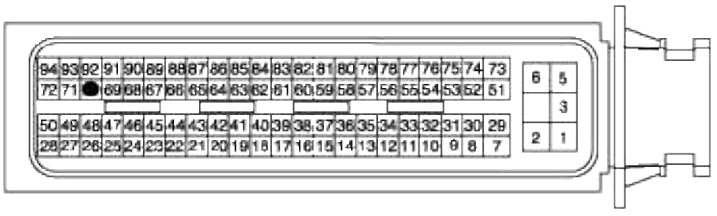
[HARNESS CONNECTORS]



Cluster (M09-1)



Cluster (M09-2)

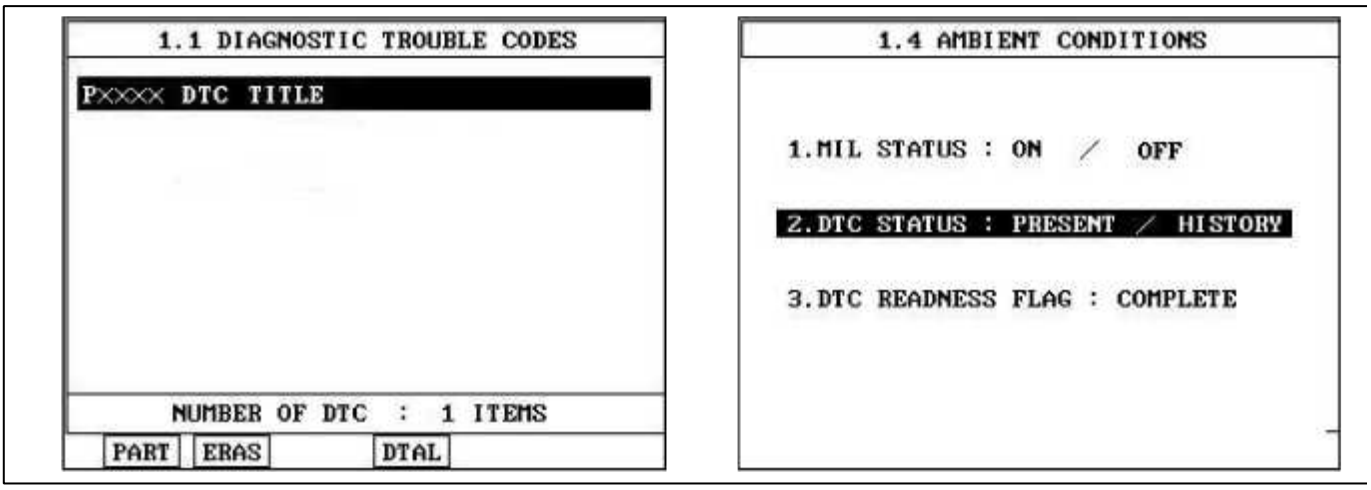


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).

2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal & Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

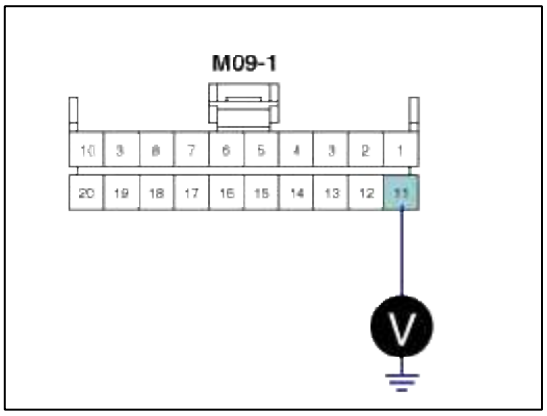
Go to "MIL circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect Cluster connector(M09-1).

3. Measure the voltage between terminal 11 of Cluster harness connector and chassis ground.

Specification : B+



4. Is the measured voltage within specification?

YES

Go to "Control ciruit inspection" procedure.

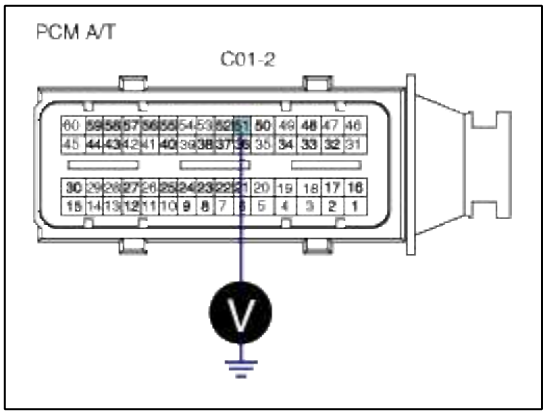
NO

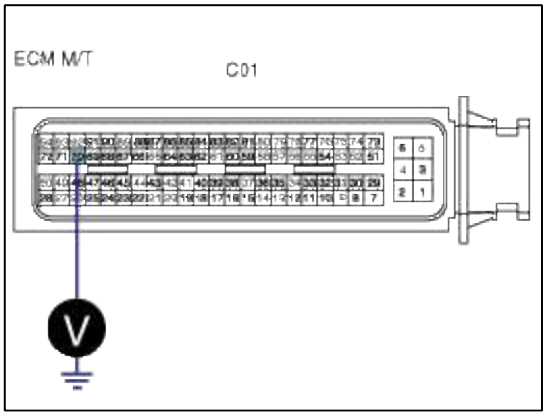
Check the fuse(CLUSTER 10A) between Battery and Engine MIL.
Repair Open or Short in power circuit, and then go to "Verification of vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ECM/PCM connector.
3. Key "ON".
4. Measure the voltage between terminal 51/C01-2 of ECM/PCM harness connectorand chassis ground. [A/T]
   Measure the voltage between terminal 70/C01 of ECM/PCM harness connectorand chassis ground. [M/T]

Specification : MIL ON





5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

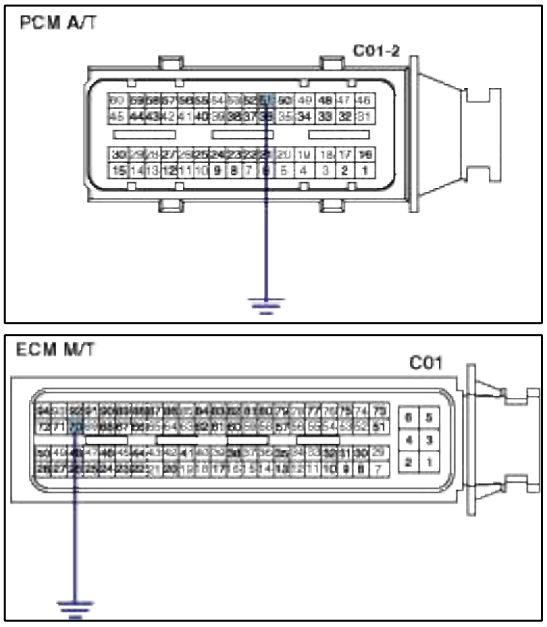
NO

Check the filament of Engine MIL lamp.
Repair Open or Short in control circuit, and then go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. Key "OFF".
2. Disconnect ECM/PCM connector.
3. Short terminal 51/C01-2 of ECM/PCM harness connector to Ground. [A/T]
   Short terminal 70/C01 of ECM/PCM harness connector to Ground. [M/T]

Specification : MIL ON



4. Is the Engine MIL lamp lighting normally?

YES

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Cluster and check for proper operation. If the problem is corrected, replace Cluster and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

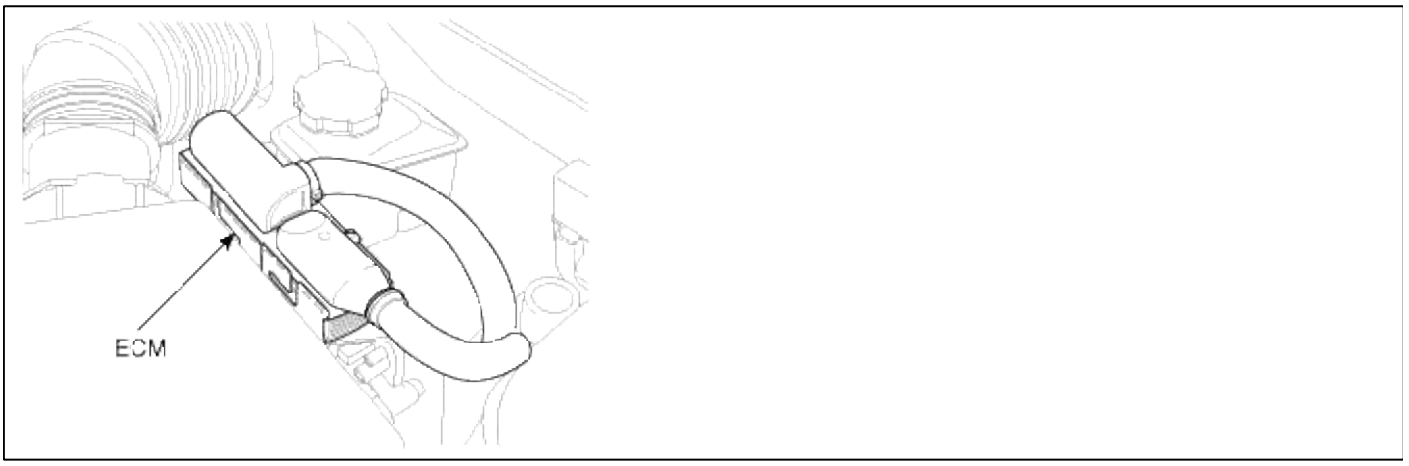
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P0700 Transmission Control System (MIL Request)

COMPONENT LOCATION



DTC DESCRIPTION

A P0700 DTC is stored by the Engine Control section of the ECM/PCM to permit MIL illumination and Freeze Frame data storage for automatic transaxle malfunctions. Check the Automatic Transaxle section for additional DTC's if a P0700 is retrieved.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal interference	• Poor connection • TCM • ECM/PCM
Enable Conditions		
Threshold Value	• When TCM demands	
Diagnostic Time		

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor A/T DTC(Diagnostics Trouble Code) on the scantool.
   Then refer to "Automatic-Transmission's DTC Guide".

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.

3. Are any DTCs present ?

YES

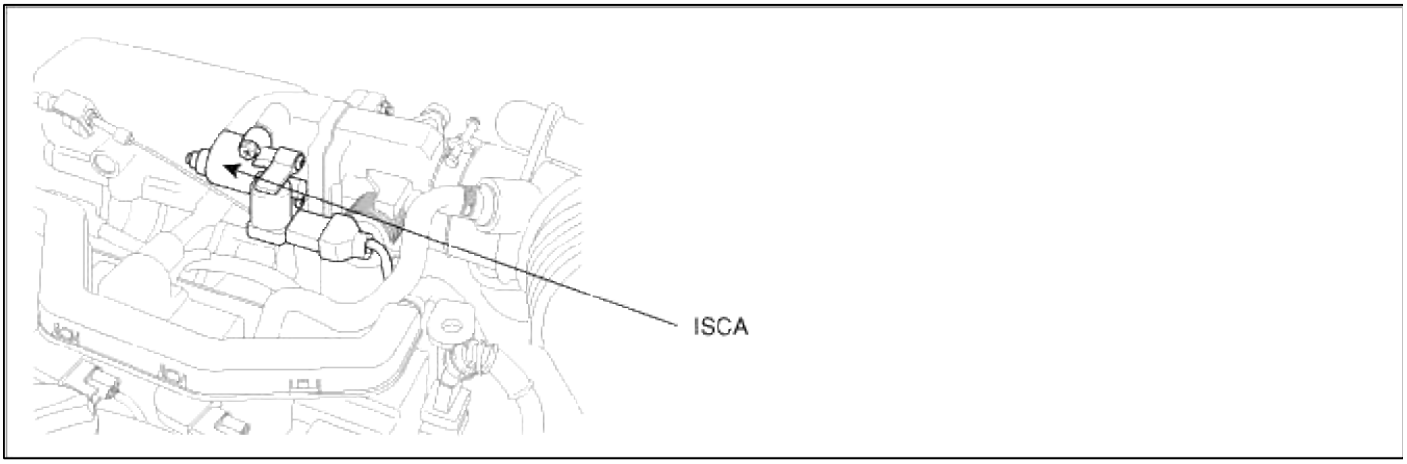
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P1505 Idle Speed Control Actuator Signal Low of Coil #1

COMPONENT LOCATION



GENERAL DESCRIPTION

The ISCA (Idle Speed Control Actuator) is designed to maintain a steady desired idle speed. Idle airflow is adjustedthrough the idle air actuator in order to maintain the desired idle speed under various load conditions. Load conditions vary due to numerous factors, such as engine temperature, air conditioning, electrical load and power steering load.

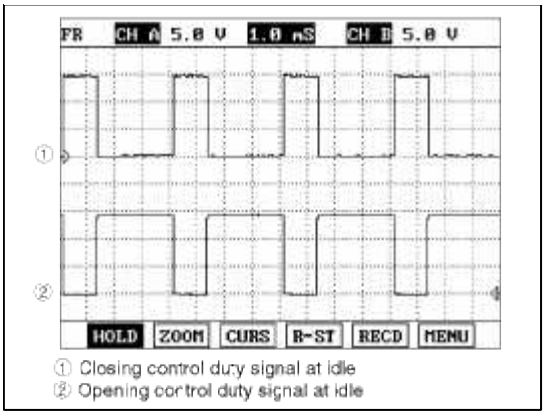
DTC DESCRIPTION

If there is Open or Short to ground in ISCA(opening coil) circuit, ECM/PCM sets DTC P1505.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low (opening coil)	• Poor connection • Open or short to ground in control circuit • ISCA • ECM/PCM
Enable Conditions		
Threshold Value	• Shorted to ground or disconnected	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



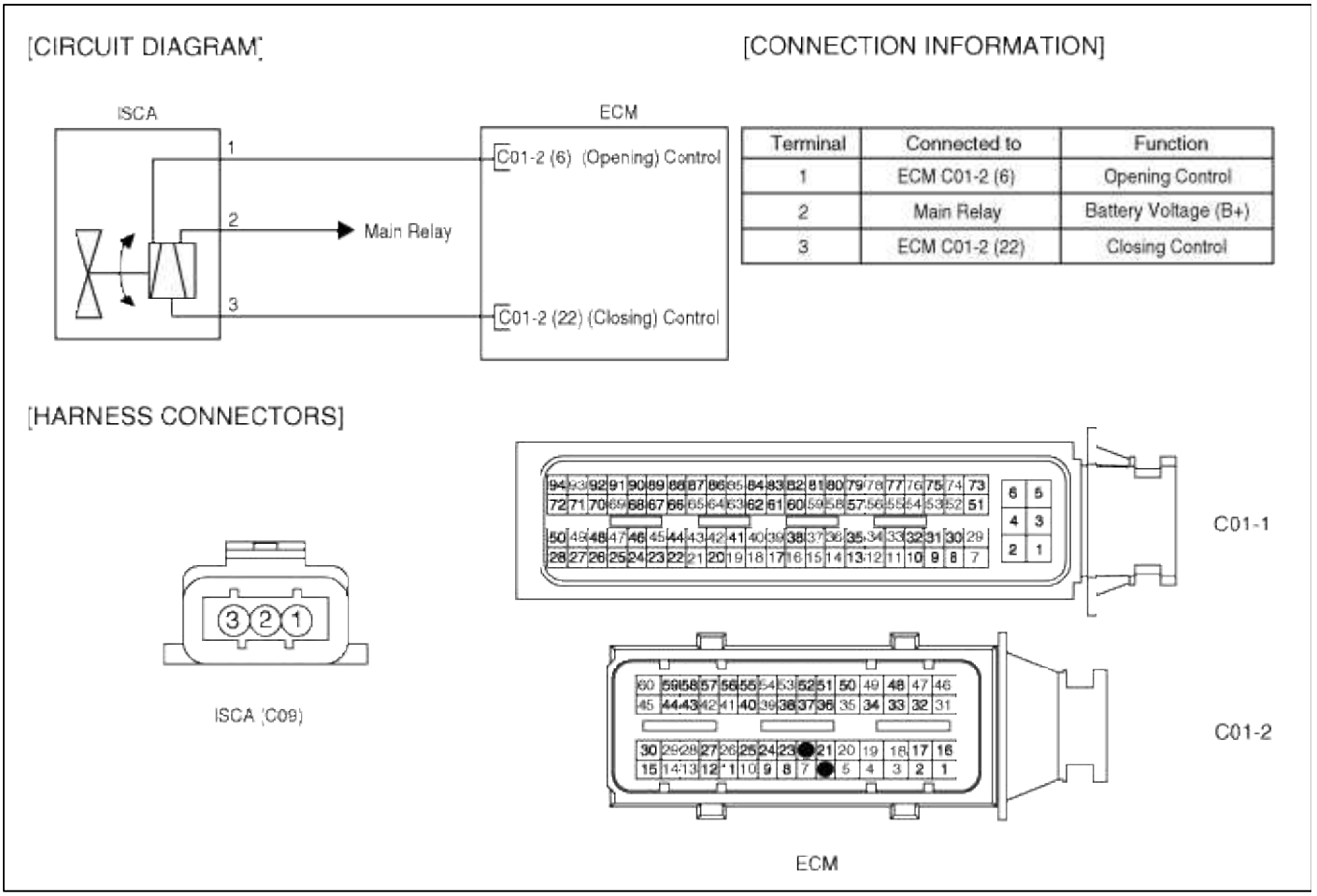
① Closing control duty signal at idle
② Opening control duty signal at idle

SPECIFICATION

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω

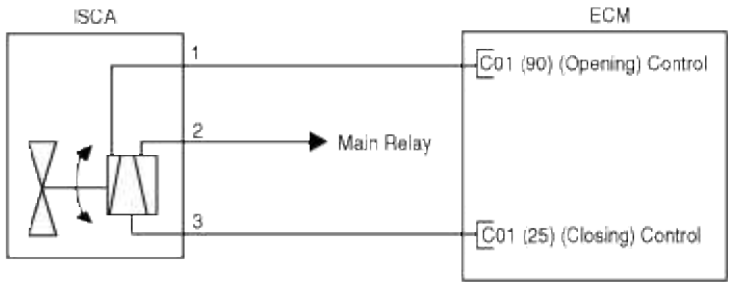
SCHEMATIC DIAGRAM

(A/T)



(M/T)

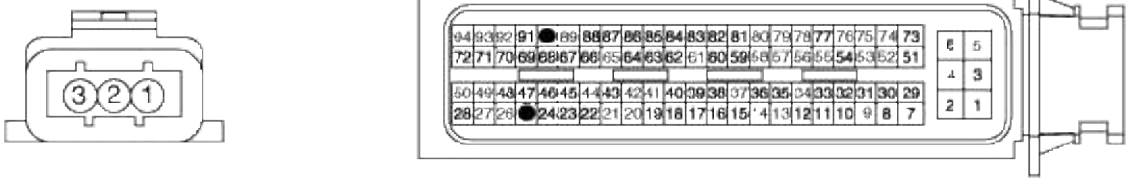
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (90)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01 (25)	Closing Control

[HARNESS CONNECTORS]

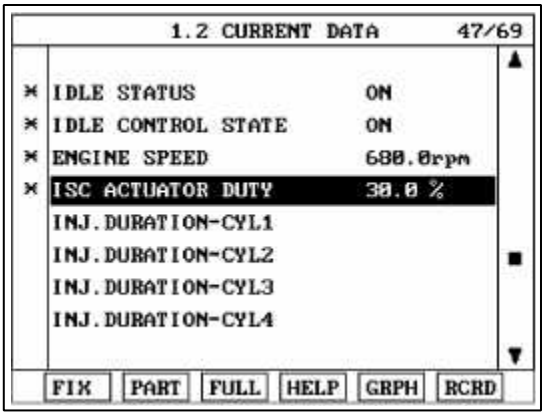


ISCA (C09)

ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

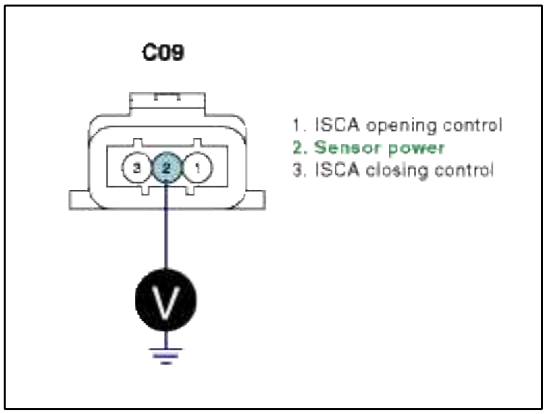
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ISCA connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of ISCA harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

NO

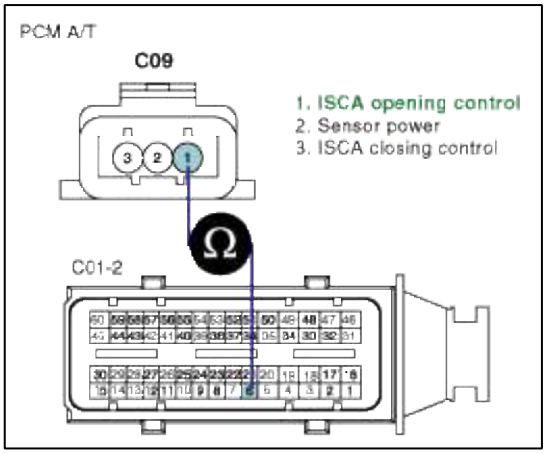
Repair Open or Short in power circuit and then, go to "Verification of Vehicle Repair" procedure.

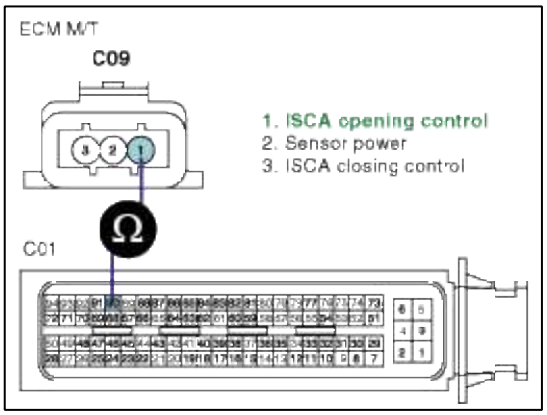
CONTROL CIRCUIT INSPECTION

1. Check Open in control circuit.
   (1) Key "OFF".
   (2) Disconnect ISCA connector and ECM/PCM connector.

(3) Measure the resistance between terminal 1 of ISCA harness connector andterminal 6/C01-2 of ECM/PCM harness connector. [A/T]
Measure the resistance between terminal 1 of ISCA harness connector andterminal 90/C01 of ECM/PCM harness connector. [M/T]

Specification : Below approx. 1Ω





(4) Is the measured resistance within specification?

YES

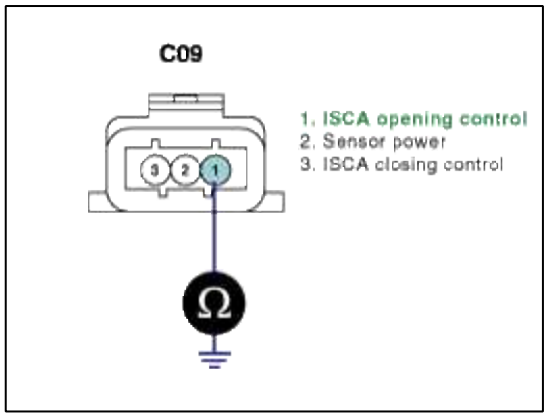
Go to "Check Short in Control circuit" procedure.

NO

Repair Open in control circuit and then, go to "Verification of Vehicle Repair" procedure.

2. Check Short in control circuit.
   (1) Key "OFF".
   (2) Disconnect ISCA connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 1 of ISCA harness connector and chassis ground.

   Specification : Infinite



   (4) Is the measured resistance within specification?

   YES

   Go to "Component inspection" procedure.

   NO

   Repair Short to ground in control circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. ISCA visual check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Check contamination, damage or stuck on ISCA.
   (4) Check the operating sound when key turns "OFF" to "ON".
   (5) Is ISCA O.K?

   YES

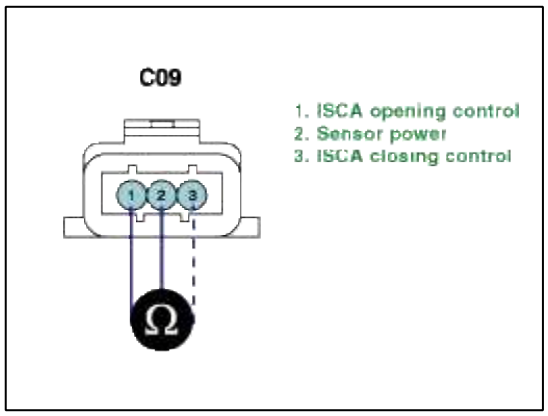
   Go to "ISCA check" procedure.

   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

2. ISCA check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Measure the resistance between terminal 1 and 2 of ISCA harness connector. (Component side)
   (4) Measure the resistance between terminal 2 and 3 of ISCA harness connector. (Component side)
   Specification :

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω



   (5) Is the measured resistance within specifications?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

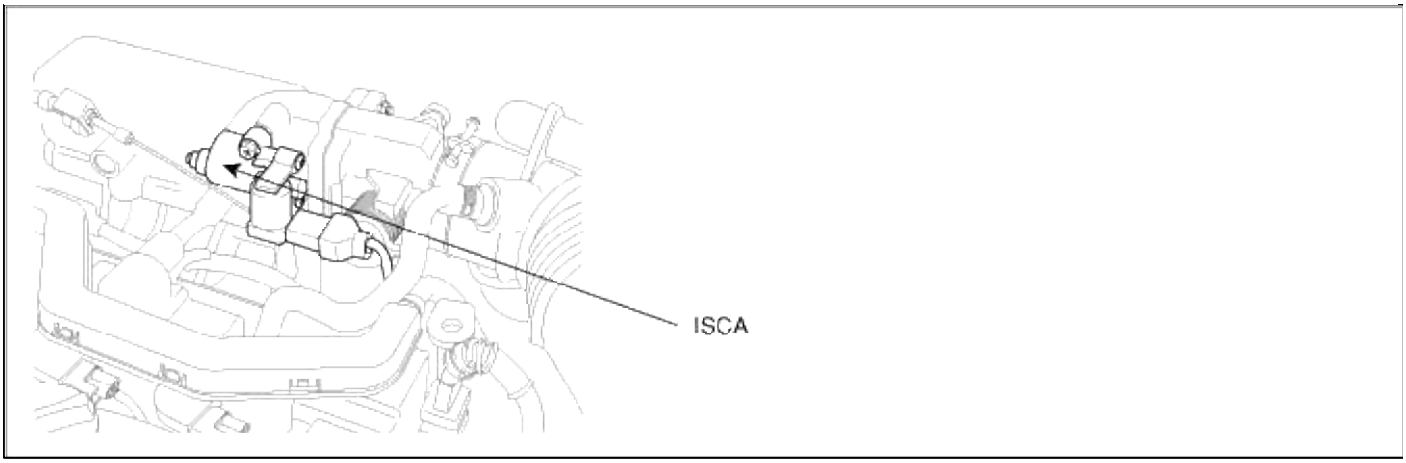
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P1506 Idle Speed Control Actuator Signal High of Coil #1

COMPONENT LOCATION



GENERAL DESCRIPTION

The ISCA (Idle Speed Control Actuator) is designed to maintain a steady desired idle speed. Idle airflow is adjustedthrough the idle air actuator in order to maintain the desired idle speed under various load conditions. Load conditions vary due to numerous factors, such as engine temperature, air conditioning, electrical load and power steering load.

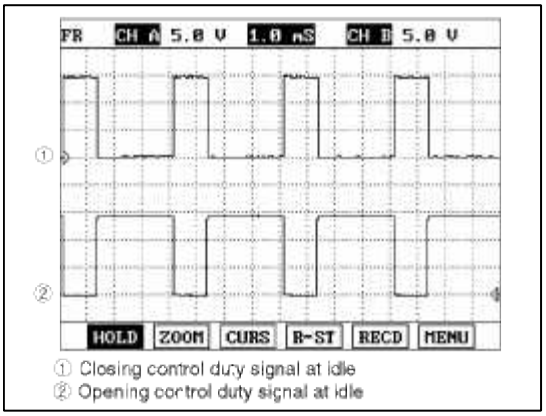
DTC DESCRIPTION

If there is Short to power in ISCA(opening coil) circuit, ECM/PCM sets DTC P1506.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high (opening coil)	• Poor connection • Short to power in control circuit • ISCA • ECM/PCM
Enable Conditions		
Threshold Value	• Shorted to battery voltage	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



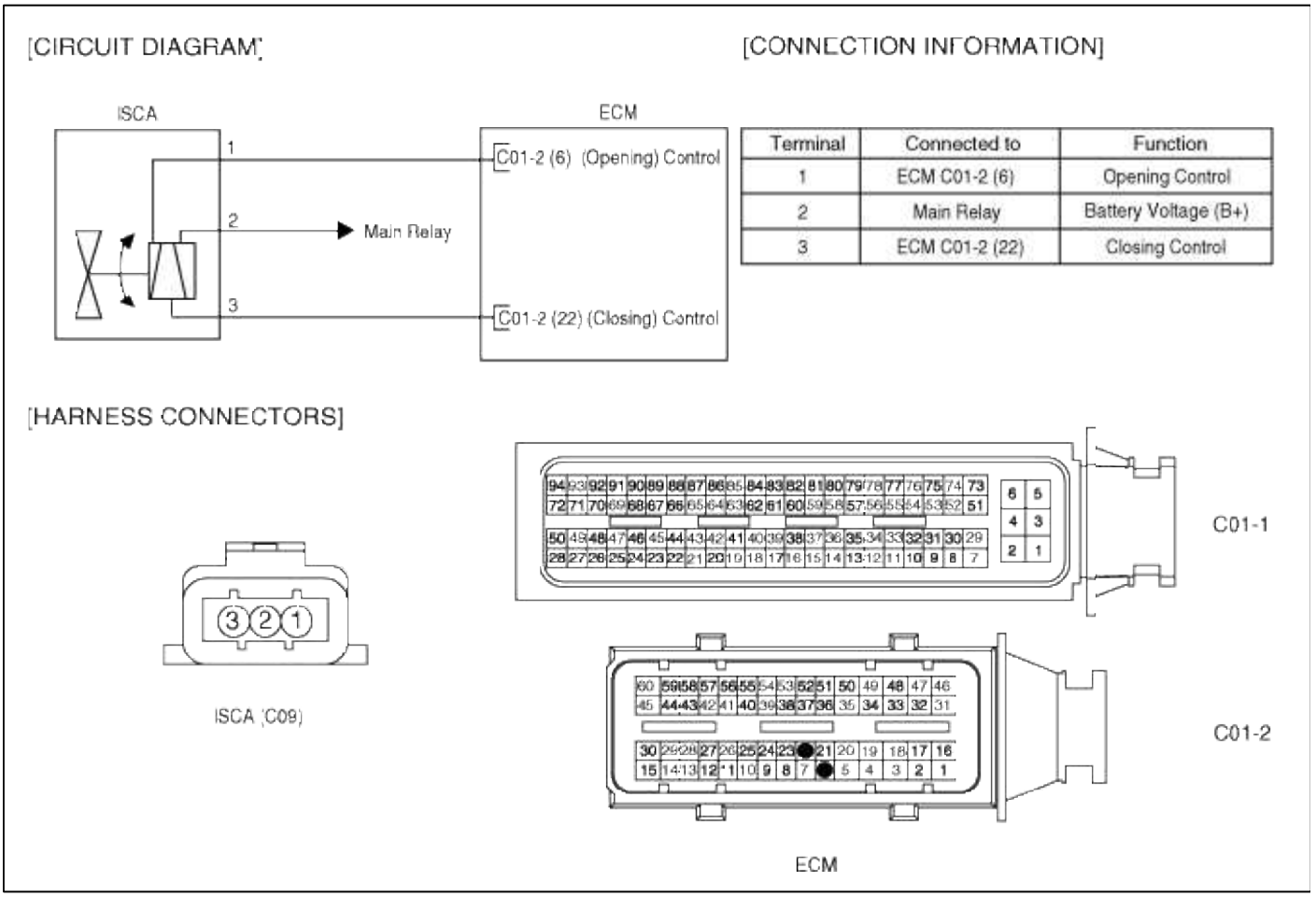
① Closing control duty signal at idle
② Opening control duty signal at idle

SPECIFICATION

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω

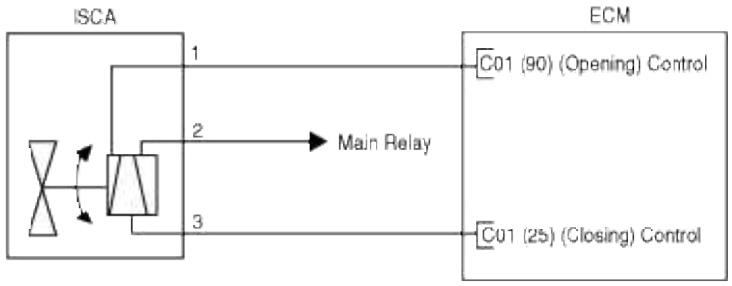
SCHEMATIC DIAGRAM

(A/T)



(M/T)

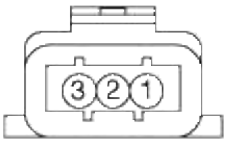
[CIRCUIT DIAGRAM]



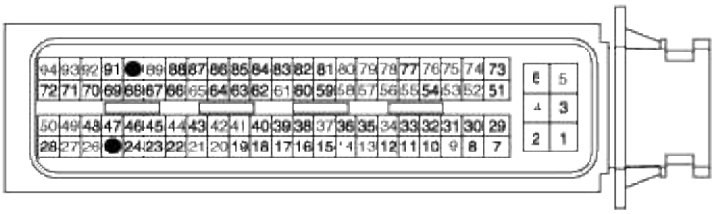
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (90)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01 (25)	Closing Control

[HARNESS CONNECTORS]



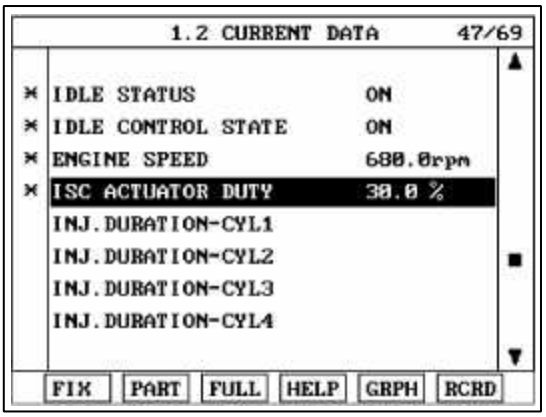
ISCA (C09)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

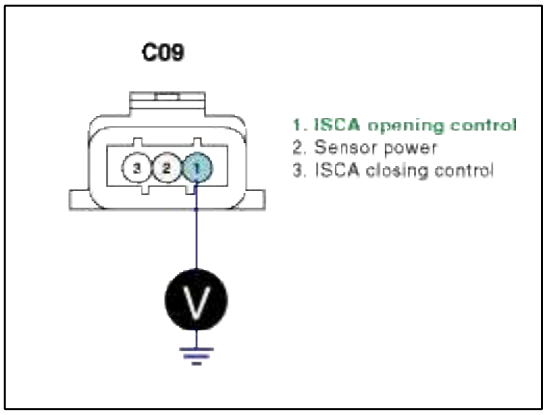
NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ISCA connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of ISCA harness connector and chassis ground.

Specification : Approx 2V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to power in control circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. ISCA visual check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Check contamination, damage or stuck on ISCA.
   (4) Check the operating sound when key turns "OFF" to "ON".
   (5) Is ISCA O.K?

YES

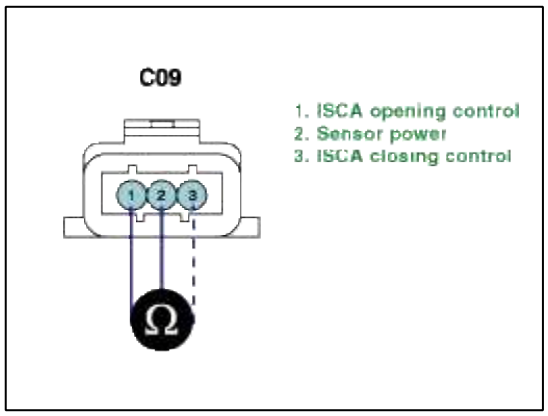
Go to "ISCA check" procedure.

NO

Substitute with a known - good ISCA and check for proper operation.
If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

2. ISCA check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Measure the resistance between terminal 1 and 2 of ISCA harness connector. (Component side)
   (4) Measure the resistance between terminal 2 and 3 of ISCA harness connector. (Component side)
   Specification :

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω



   (5) Is the measured resistance within specifications?

   YES
   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO
   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

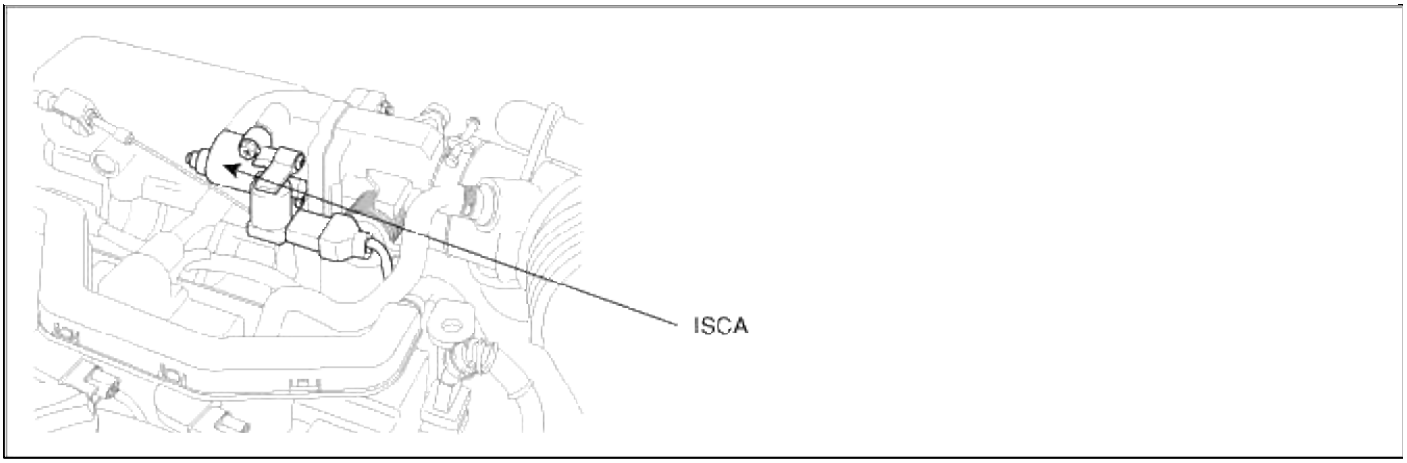
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES
Go to the applicable troubleshooting procedure.

NO
System is performing to specification at this time.

Fuel System > Troubleshooting > P1507 Idle Speed Control Actuator Signal Low of Coil #2

COMPONENT LOCATION



GENERAL DESCRIPTION

The ISCA (Idle Speed Control Actuator) is designed to maintain a steady desired idle speed. Idle airflow is adjustedthrough the idle air actuator in order to maintain the desired idle speed under various load conditions. Load conditions vary due to numerous factors, such as engine temperature, air conditioning, electrical load and power steering load.

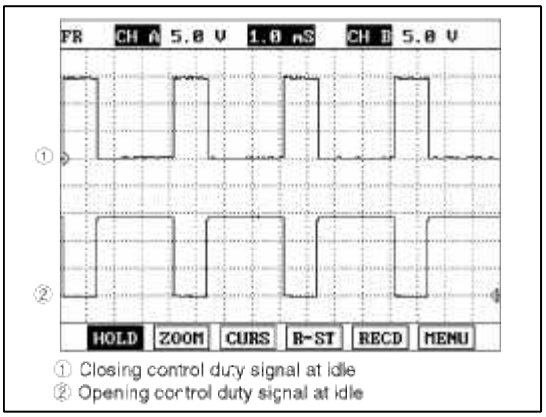
DTC DESCRIPTION

If there is Open or Short to ground in ISCA(closing coil) circuit, ECM/PCM sets DTC P1507.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low (Closing coil)	• Poor connection • Open or short to ground in control circuit • ISCA • ECM/PCM
Enable Conditions		
Threshold Value	• Shorted to ground or disconnected	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



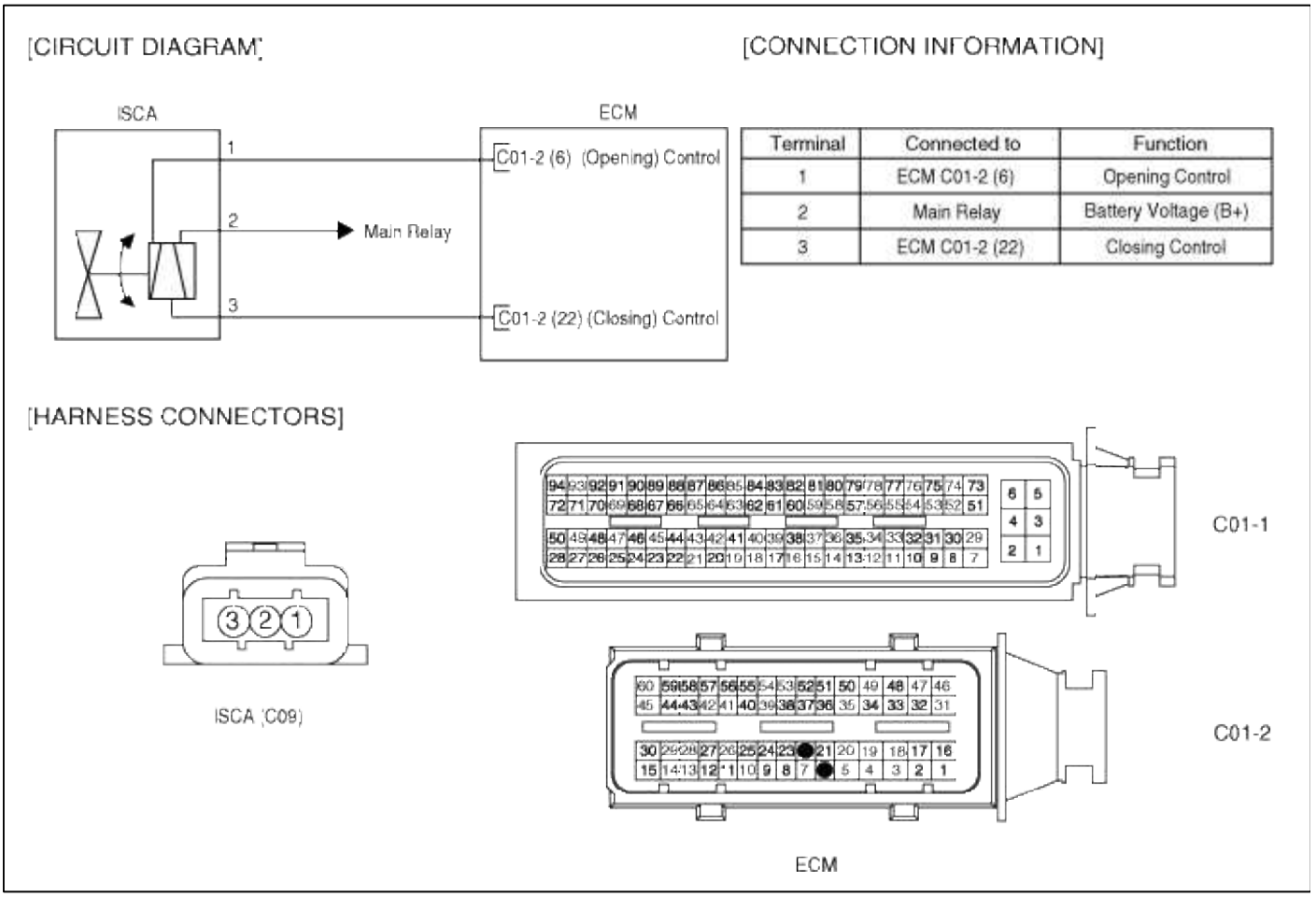
① Closing control duty signal at idle
② Opening control duty signal at idle

SPECIFICATION

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω

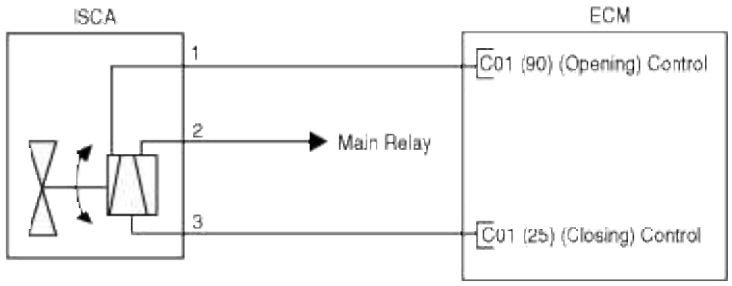
SCHEMATIC DIAGRAM

(A/T)



(M/T)

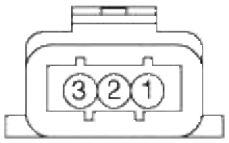
[CIRCUIT DIAGRAM]



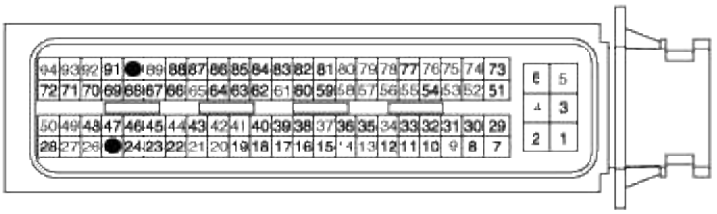
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (90)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01 (25)	Closing Control

[HARNESS CONNECTORS]



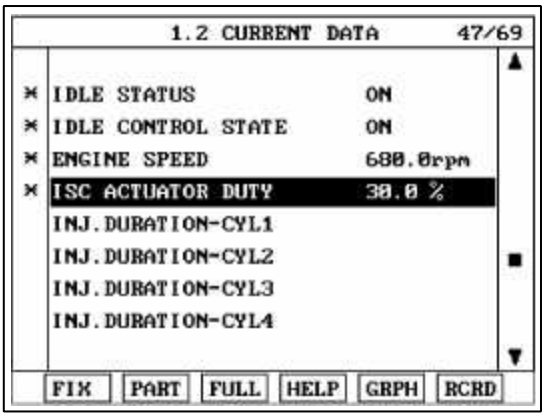
ISCA (C09)



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

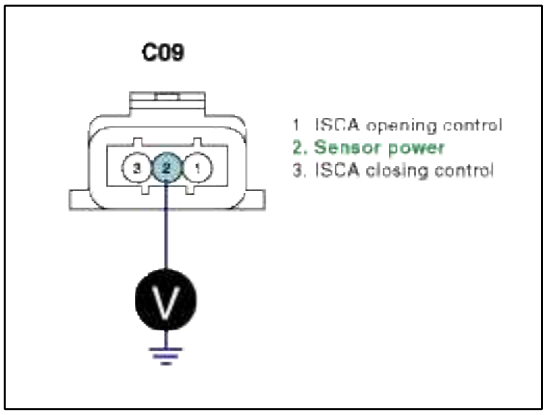
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ISCA connector.
3. Key "ON".
4. Measure the voltage between terminal 2 of ISCA harness connector and chassis ground.

Specification : B+



5. Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

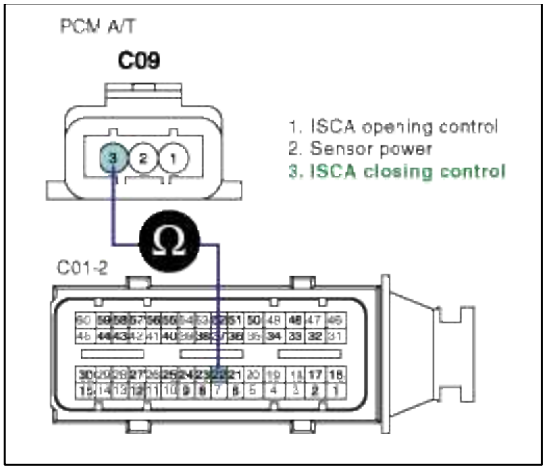
NO

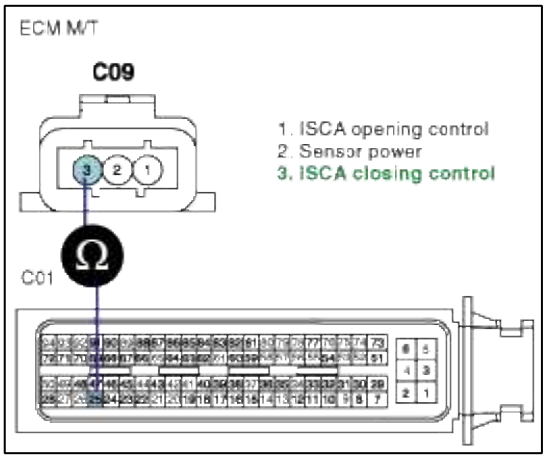
Repair Open or Short in power circuit and then, go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Check Open in control circuit.
   (1) Key "OFF".
   (2) Disconnect ISCA connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 3 of ISCA harness connector andterminal 22/C01-2 of ECM/PCM harness connector. [A/T]
   Measure the resistance between terminal 3 of ISCA harness connector andterminal 25/C01 of ECM/PCM harness connector. [M/T]

   Specification : Below approx. 1Ω





(4) Is the measured resistance within specification?

YES

Go to "Check Short in Control circuit" procedure.

NO

Repair Open in control circuit and then, go to "Verification of Vehicle Repair" procedure.

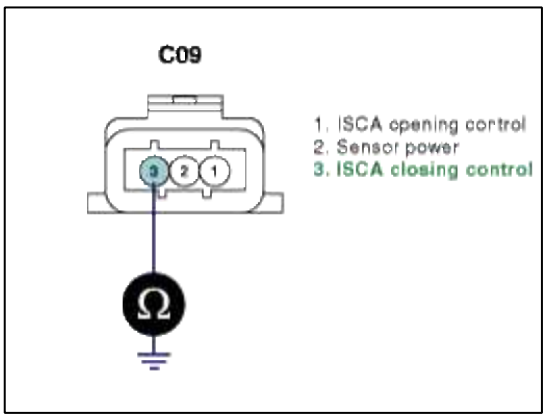
2. Check Short in control circuit.

(1) Key "OFF".

(2) Disconnect ISCA connector and ECM/PCM connector.

(3) Measure the resistance between terminal 3 of ISCA harness connector and chassis ground.

Specification : Infinite



(4) Is the measured resistance within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to ground in control circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. ISCA visual check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Check contamination, damage or stuck on ISCA.
   (4) Check the operating sound when key turns "OFF" to "ON".
   (5) Is ISCA O.K?

YES

Go to "ISCA check" procedure.

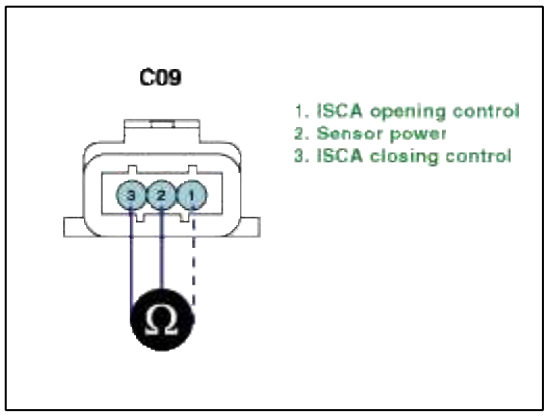
NO

Substitute with a known - good ISCA and check for proper operation.
If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

2. ISCA check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Measure the resistance between terminal 1 and 2 of ISCA harness connector. (Component side)
   (4) Measure the resistance between terminal 2 and 3 of ISCA harness connector. (Component side)

Specification :

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω



   (5) Is the measured resistance within specifications?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ISCA and check for proper operation.
If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

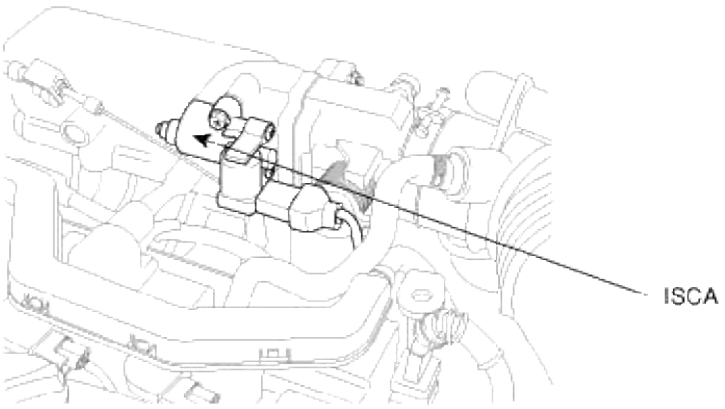
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P1508 Idle Speed Control Actuator Signal High of Coil #2

COMPONENT LOCATION



GENERAL DESCRIPTION

The ISCA (Idle Speed Control Actuator) is designed to maintain a steady desired idle speed. Idle airflow is adjustedthrough the idle air actuator in order to maintain the desired idle speed under various load conditions. Load conditions vary due to numerous factors, such as engine temperature, air conditioning, electrical load and power steering load.

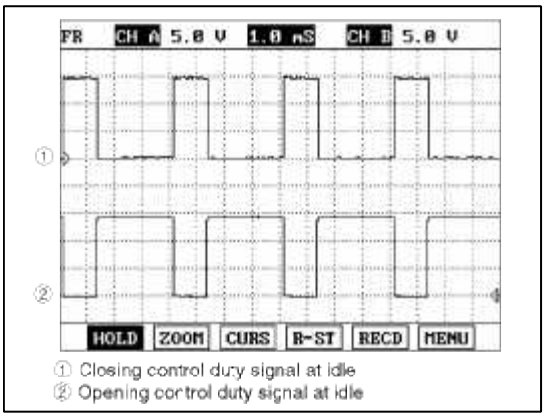
DTC DESCRIPTION

If there is Short to power in ISCA(closing coil) circuit, ECM/PCM sets DTC P1508.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high (closing coil)	• Poor connection • Short to power in control circuit • ISCA • ECM/PCM
Enable Conditions		
Threshold Value	• Shorted to battery voltage	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

SIGNAL WAVEFORM & DATA



① Closing control duty signal at idle
② Opening control duty signal at idle

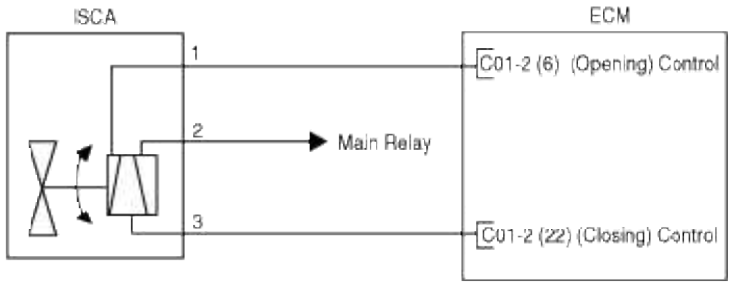
SPECIFICATION

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω

SCHEMATIC DIAGRAM

(A/T)

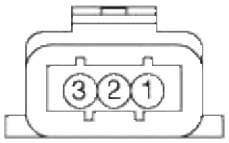
[CIRCUIT DIAGRAM]



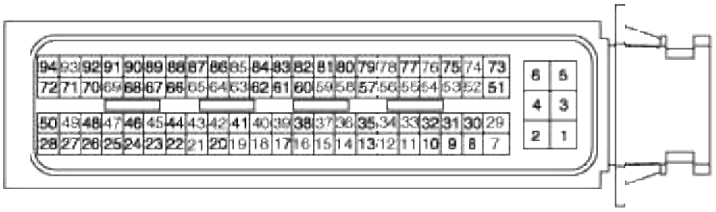
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (6)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01-2 (22)	Closing Control

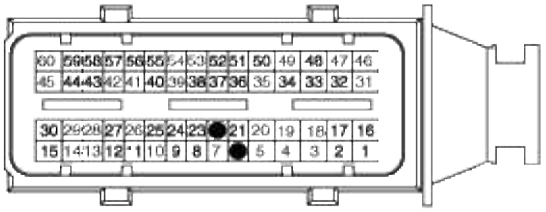
[HARNESS CONNECTORS]



ISCA (C09)



C01-1

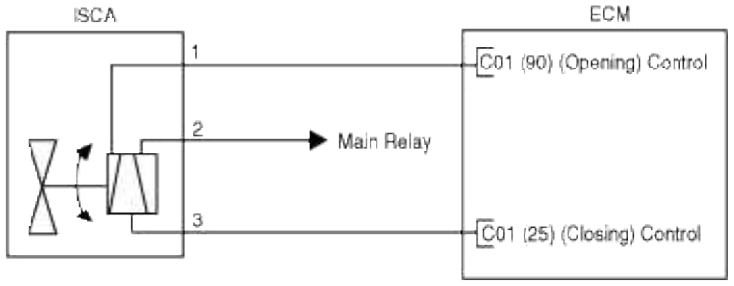


C01-2

ECM

(M/T)

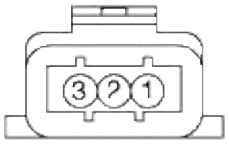
[CIRCUIT DIAGRAM]



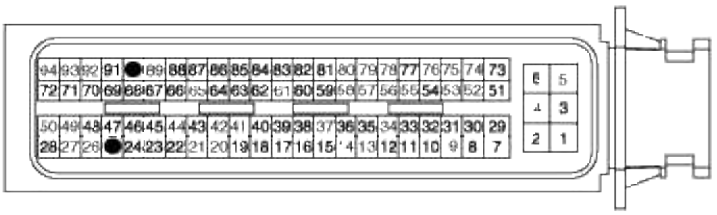
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (90)	Opening Control
2	Main Relay	Battery Voltage (B+)
3	ECM C01 (25)	Closing Control

[HARNESS CONNECTORS]



ISCA (C09)

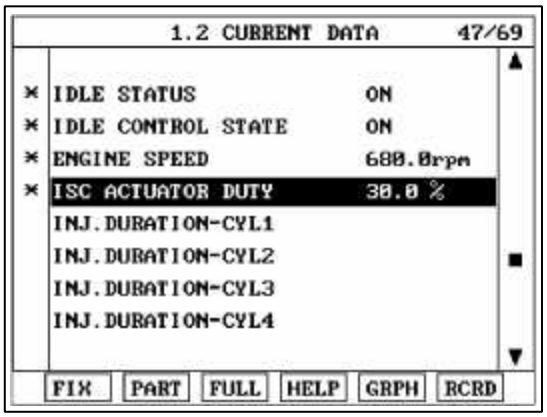


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).

2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

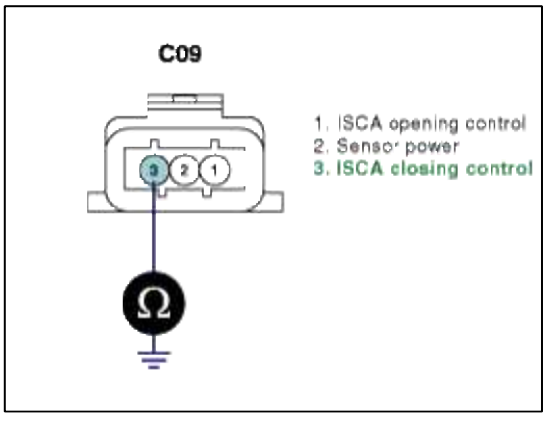
NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect ISCA connector.
3. Key "ON".
4. Measure the voltage between terminal 3 of ISCA harness connector and chassis ground.

Specification : Approx 1.3V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to power in control circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. ISCA visual check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Check contamination, damage or stuck on ISCA.
   (4) Check the operating sound when key turns "OFF" to "ON".
   (5) Is ISCA O.K?

   YES

   Go to "ISCA check" procedure.

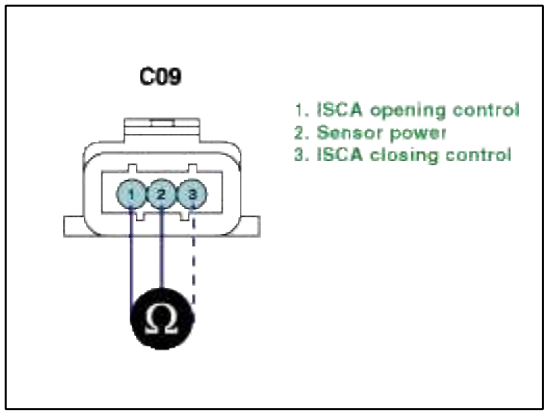
   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

2. ISCA check.
   (1) Key "OFF".
   (2) Disassemble ISCA.
   (3) Measure the resistance between terminal 1 and 2 of ISCA harness connector. (Component side)
   (4) Measure the resistance between terminal 2 and 3 of ISCA harness connector. (Component side)

   Specification :

Temperature		Closing Coil Resistance (Ω)	Opening Coil Resistance (Ω)
20 ~ 35°C	68 ~ 95°F	14.6 ~ 16.2Ω	11.1 ~ 12.7Ω



   (5) Is the measured resistance within specifications?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good ISCA and check for proper operation.
   If the problem is corrected, replace ISCA and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

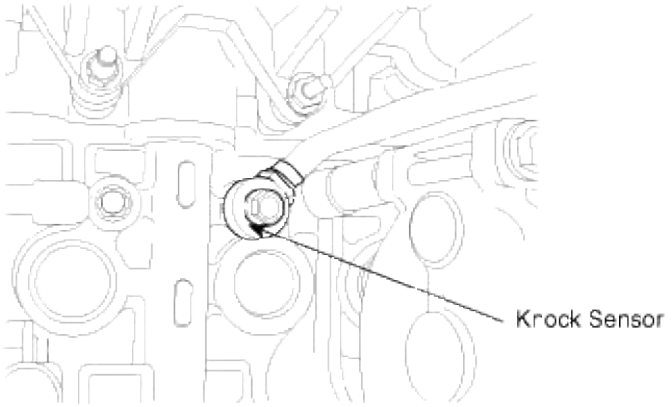
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P1550 Knock Sensor Evaluation IC

COMPONENT LOCATION



GENERAL DESCRIPTION

Knocking is a phenomenon characterized by undesirable vibration and noise that can cause engine damage. A knock sensor (KS) is mounted on the cylinder block and senses engine knocking. A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. A knock sensor (KS) detects vibration when RPM rises or drops and generates voltages based on this vibration. The ECM/PCM controls the ignition timing based on the amplitude and frequency of the knock sensor signal. For example, if engine knocking occurs, the ignition timing is retarded to prevent it.

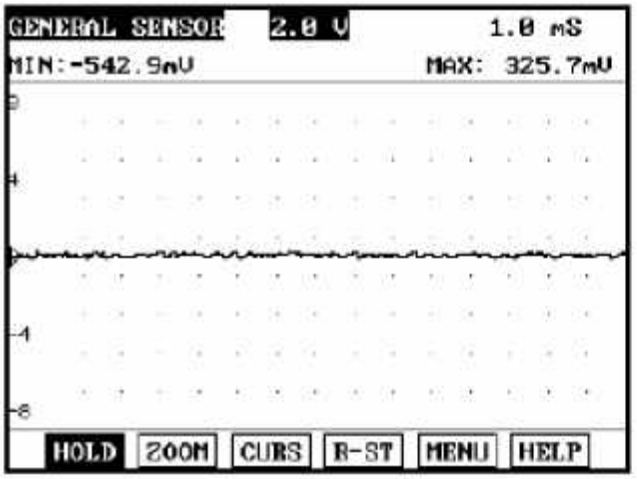
DTC DESCRIPTION

If the knock sensor signal is outside the acceptable parameters, P1550 is set.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
Case 1	DTC Strategy	• Circuit continuity check, pulse test	• Poor connection • Open or short in control circuit • Knock sensor • PCM
	Threshold Value	• Integrator value difference (End value - Start value) < 4V	
Case 2	DTC Strategy	• Circuit continuity check, zero test	
	Threshold Value	• Integrator gradient > 200 V/sec	
Case 3	DTC Strategy	• Parity check	
	Threshold Value	• Number of parity errors > 5	
Diagnostic Time		• Continuous	
MIL ON Condition		• DTC only	

SIGNAL WAVEFORM & DATA



This is a normal signal waveform of knock sensor. Generally, there would be much more noise on knock sensor signal than the other sensors.

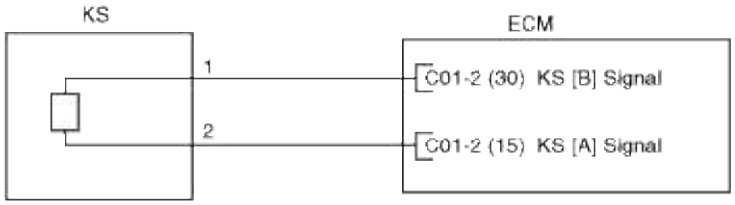
SPECIFICATION

Item	Specification
Capacitance	950 ~ 1,350pF

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



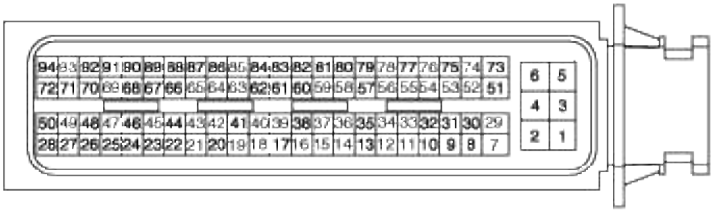
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (30)	KS [A] Signal
2	ECM C01-2 (15)	KS [B] Signal

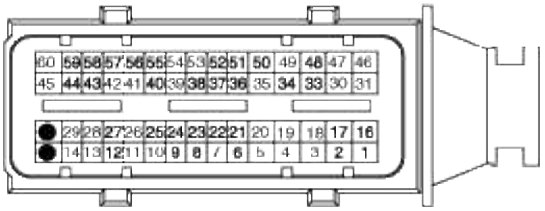
[HARNESS CONNECTORS]



KS (C14)



C01-1

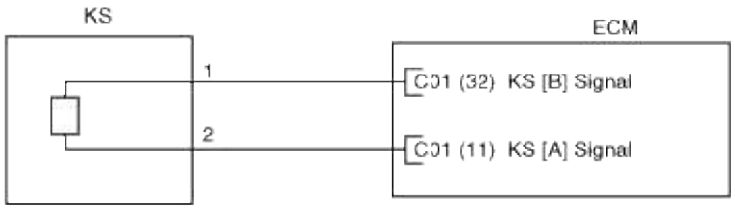


C01-2

ECM

(M/T)

[CIRCUIT DIAGRAM]



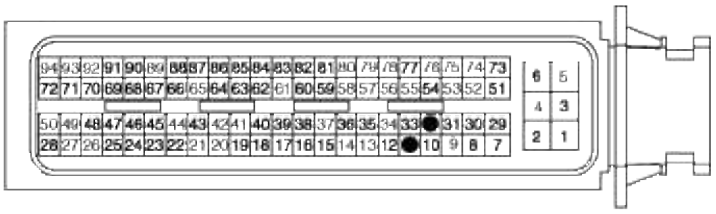
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (32)	KS [A] Signal
2	ECM C01 (11)	KS [B] Signal

[HARNESS CONNECTORS]



KS (C14)

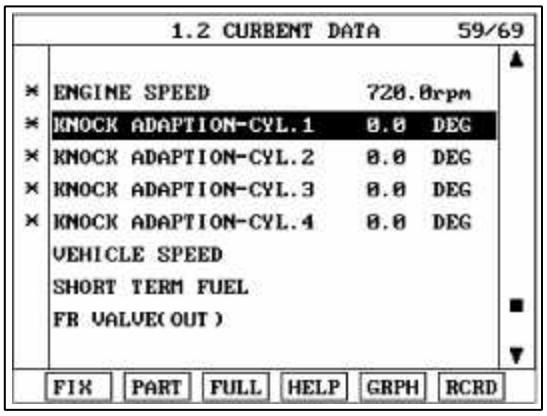


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.

3. Monitor the "Knock sensor" parameters on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

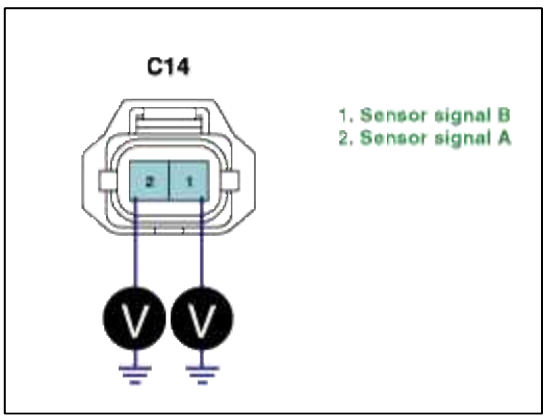
NO

Go to "Knock sensor circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect Knock sensor connector.
3. Key "ON".
4. Measure the voltage between terminal 1 of knock sensor harness connector and chassis ground.
5. Measure the voltage between terminal 2 of knock sensor harness connector and chassis ground.

Specification : Approx 2.4V



6. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Open or Short in signal circuit and then, go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Knock sensor.
   (1) Substitute with a known - good Knock sensor and check for proper operation.
   (2) Is the signal normal?

YES

Replace Knock sensor and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

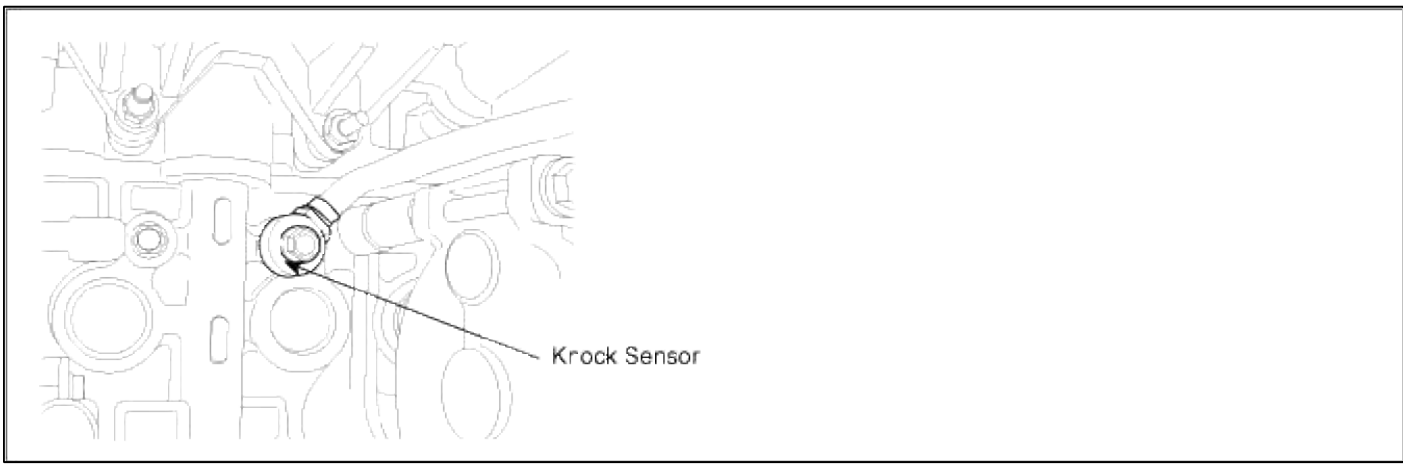
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P1560 Knock Control Serial Port Interface check (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

Knocking is a phenomenon characterized by undesirable vibration and noise that can cause engine damage. A knock sensor (KS) is mounted on the cylinder block and senses engine knocking. A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. A knock sensor (KS) detects vibration when RPM rises or drops and generates voltages based on this vibration. The ECM/PCM controls the ignition timing based on the amplitude and frequency of the knock sensor signal. For example, if engine knocking occurs, the

ignition timing is retarded to prevent it.

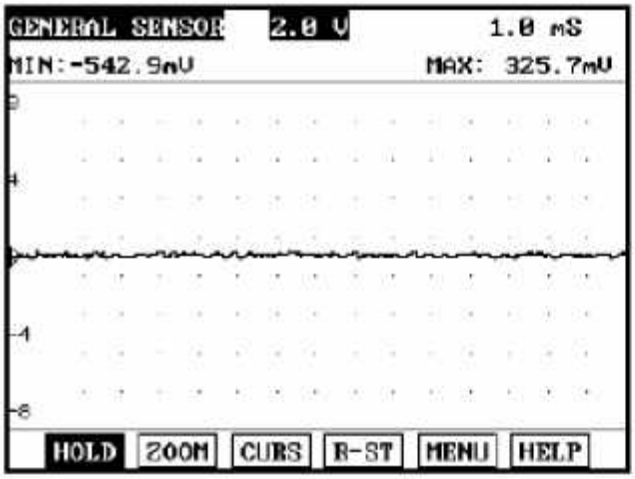
DTC DESCRIPTION

If a malfunction exists between the SPI (Serial Port Interface) and CPU, P1560 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• SPI communication check	• Poor connection • ECM/PCM
Enable Conditions		
Threshold Value	• Number of SPI errors >1	
Diagnostic Time	• Continuous	
MIL ONCondition	• DTC only	

SIGNAL WAVEFORM & DATA



This is a normal signal waveform of knock sensor. Generally, there would be much more noise on knock sensor signal than the other sensors.

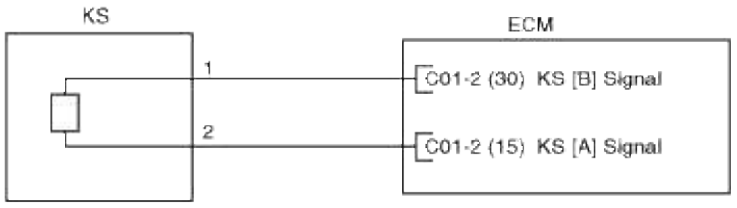
SPECIFICATION

Item	Specification
Capacitance	950 ~ 1,350pF

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]



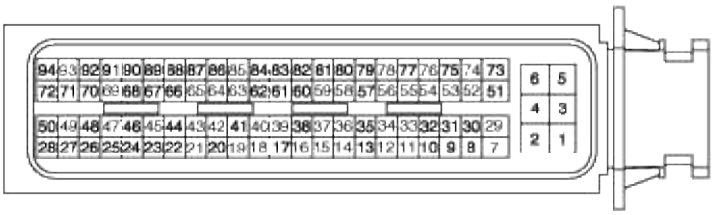
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01-2 (30)	KS [A] Signal
2	ECM C01-2 (15)	KS [B] Signal

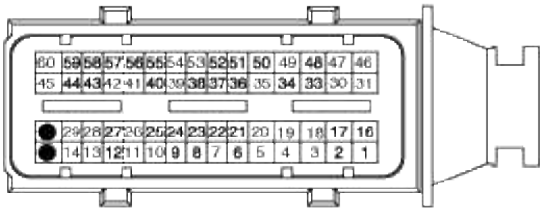
[HARNESS CONNECTORS]



KS (C14)



C01-1

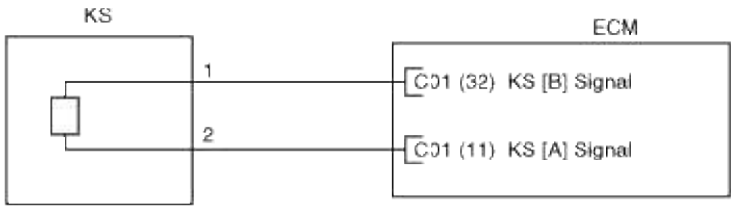


C01-2

ECM

(M/T)

[CIRCUIT DIAGRAM]



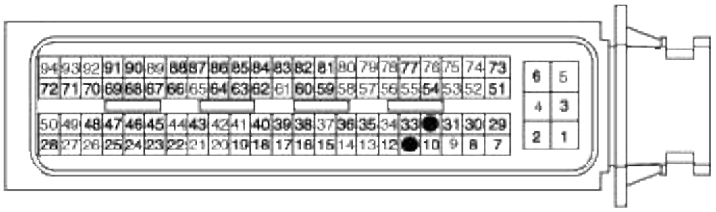
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM C01 (32)	KS [A] Signal
2	ECM C01 (11)	KS [B] Signal

[HARNESS CONNECTORS]



KS (C14)

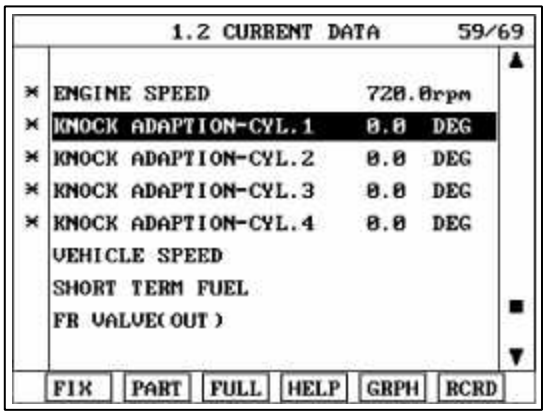


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to DLC(Data Link Cable).
2. Warm up the engine to normal operating temperature.

3. Monitor the "Knock sensor" parameters on the scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

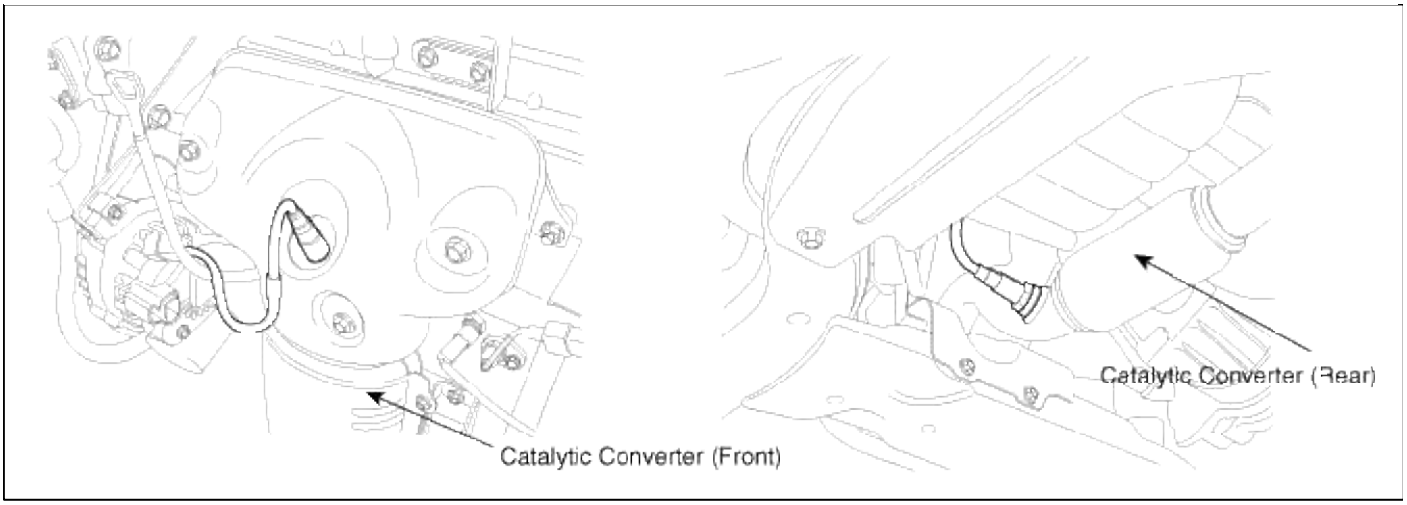
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P2096 Post Catalyst Fuel Trim System too Lean (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

The catalyst's efficiency is demonstrated by its ability to oxidize CO and hydrocarbon emissions. The Powertrain Control Module (PCM) compares the output signals of the front and rear oxygen sensors to determine whether the output of the rear sensor is beginning to match the output of the front oxygen sensor. Air/fuel mixture compensation keeps the frequency of the front oxygen sensor high due to the changes from rich-to-lean combusition. The catalyst causes the rear oxygen sensor to have a lower frequency. As the catalyst wears, the rear oxygen sensor's signal trace begins to match the front oxygen sensor's signal trace. That is because the catalyst becomes saturated with oxygen and cannot use the oxygen to convert hydrocarbon and CO into H O and CO with the same efficiency as when it was new. A completely worn catalyst shows a 100% match between the frequency of the front and rear sensors.

DTC DESCRIPTION

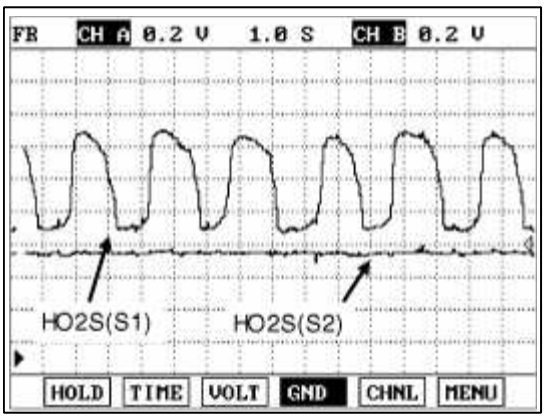
If the B1S1 signal is advanced compared to the B1S2 controller Value, P2096 is stored.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• O2 sensor characteristic line shift	• Catalyst converter • B1S1 • ECM
Enable Conditions	• Dew point end detected • Required lambda = 1 • Battery voltage > 10.7V • Exhaust gas temperature (model) < 800°C (1472°F) • Heater control enabled • 1000rpm < Engine speed < 3800rpm • Engine load : 18 ~ 60 %	
Threshold Value	• The second controller by B1S2 >1sec	
Diagnostic Time	• 50 sec	
MIL ON Condition	• 2 driving cycle	

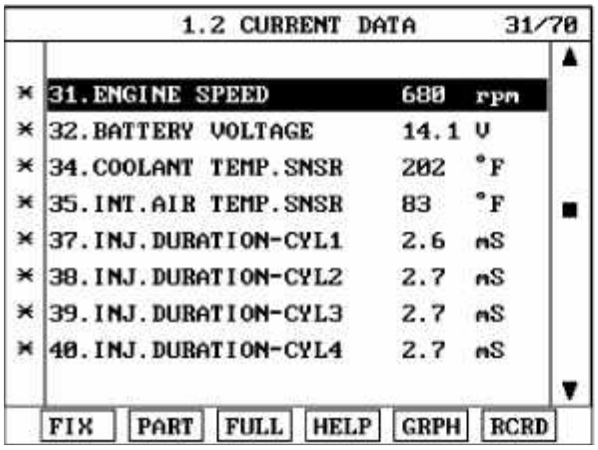
B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

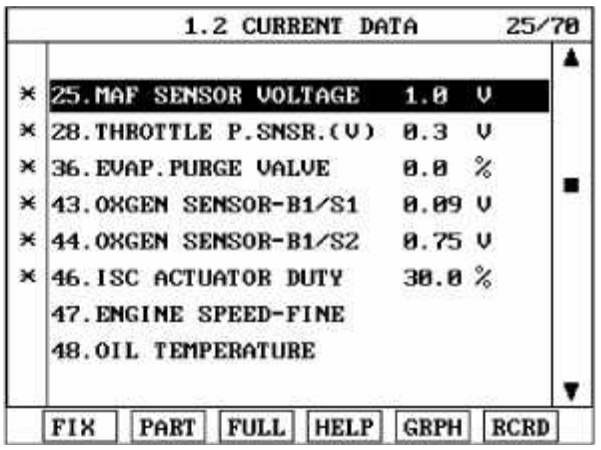
SIGNAL WAVEFORM & DATA



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Parameters related to air/fuel ratio(HO2S, MAF, MAP, TPS, ECTS, PCSV, Injector, etc)" on the scantool.





4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or ECM’s connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

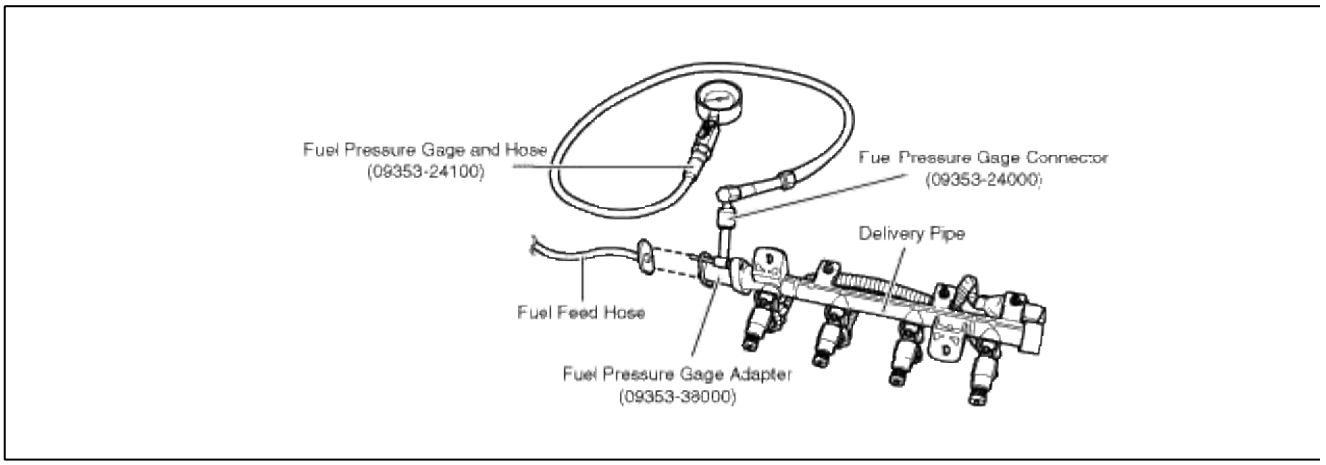
Go to "System Inspection" procedure

SYSTEM INSPECTION

1. Check clog on Exhaust gas system
   (1) Key "OFF".
   (2) Check clog on muffler or catalyst converter.
   (3) Is Exhaust gas system O.K?
   YES
   Go to "Intake air system check" procedure.
   NO
   Repair as necessary and go to "Verification of vehicle Repair" procedure.
2. Intake air system check.
   (1) Check leakage on Intake air system
   Check looseness, deterioration or contamination on throttle body and gasket.
   Check contamination, damage or crack on intake manifold, ISCA and injectors.
   Check for contamination or sticking on the ISCA assembly.
   (2) Is there any leakage?
   YES
   Repair as necessary and go to "Verification of vehicle Repair" procedure
   NO
   Go to "Fuel line check" procedure.
3. Fuel line check.
   (1) Check "Fuel line system"
   Check looseness of connectors on fuel line.
   Check looseness, damage, or interference of vacuum hose on fuel line.
   Check damage, leakage or bending on fuel line pipe.
   (2) Is fuel line normal?
   YES
   Go to "Fuel line pressure check" procedure.
   NO
   Repair as necessary and go to "Verification of vehicle Repair" procedure.
4. Fuel line pressure check.
   (1) Key "OFF".
   (2) Remove the fuel pump relay.
   (3) Engine start and wait until engine stop. and then key "OFF".
   (4) Install the fuel pump relay.
   (5) Connect fuel pressure gauge using the correct adapter.

(6) Start the engine, and record fuel pressure.

Specification : Approx. 3.5 kgf/cm² (343.2 kPa, 50psi)



(7) Is the fuel pressure normal?

YES

Go to "Component inspection" procedure.

NO

Check clogging on the fuel filter.
Check the supply pressure of fuel pump.
Repair as necessary and go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. PCV(Positive Crankcase Ventilation) valve check.

(1) Key "OFF".

(2) Disconnect PCV valve.

(3) Check the movement of plunger by putting in and out a thin stick.

(4) Is the movement of plunger normal?

YES

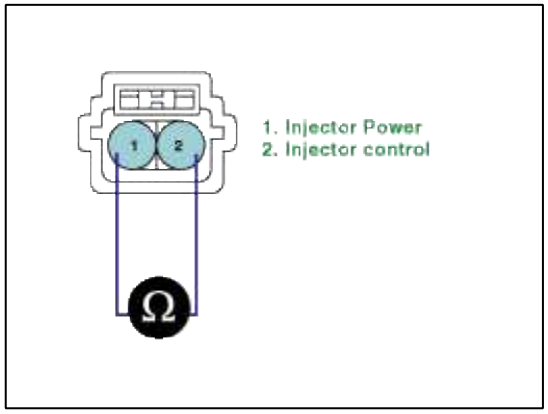
Go to "injectors check" procedure.

NO

Substitute with a known - good PCV valve and check for proper operation.
If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

2. Injector check
   (1) Key "OFF".
   (2) Disconnect injectors.
   (3) Check clog on injectors.
   (4) Measure the resistance between terminal 1 and 2 of injectors(Component side).
   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



   (5) Is the measured resistance within specifications ?

   YES
   Go to "Sensors related to air/fuel ratio check" procedure.

   NO
   Substitute with a known - good Injector and check for proper operation.
   If the problem is corrected, replace Injector and go to "Verification of Vehicle Repair" procedure.

3. Sensors related to air/fuel ratio check.
   (1) Check the output data of sensors related to air/fuel ratio (HO2S, MAPS, TPS, ECTS, PCSV, Injectors, etc) on scantool. (Refer to each DTC guide procedure.)
   (2) Are those sensors normal?

   YES
   Substitute with a known - good ECM/PCM and check for proper operation.
   If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO
   Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

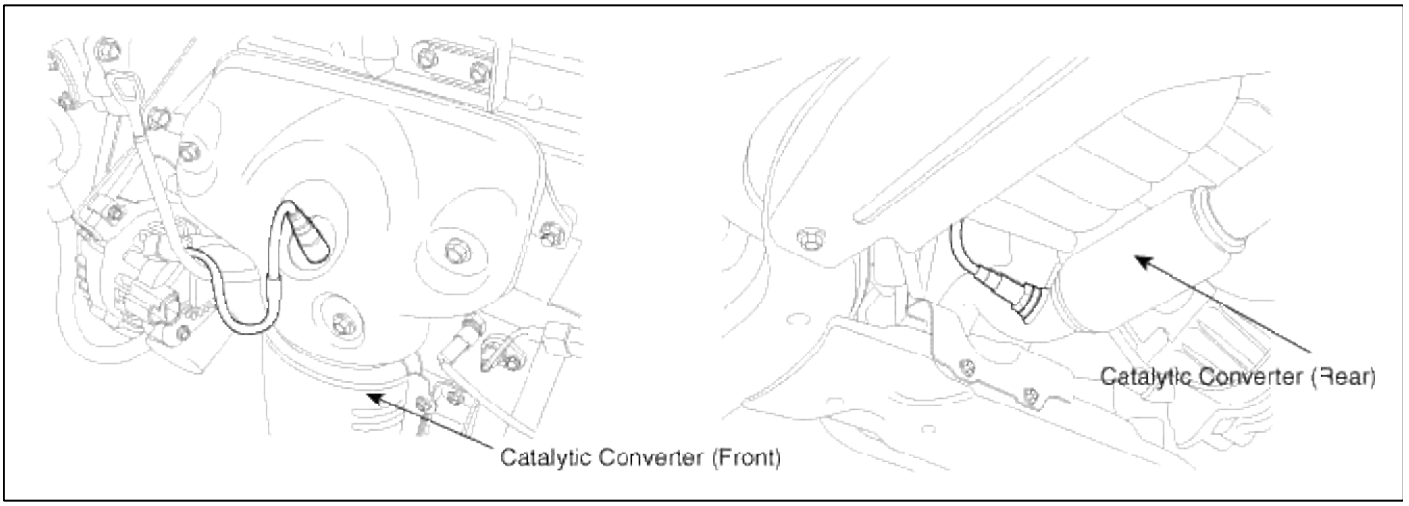
After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES
Go to the applicable troubleshooting procedure.

NO
System is performing to specification at this time.

Fuel System > Troubleshooting > P2097 Post Catalyst Fuel Trim System too Rich (Bank 1)

COMPONENT LOCATION



GENERAL DESCRIPTION

The catalyst's efficiency is demonstrated by its ability to oxidize CO and hydrocarbon emissions. The Powertrain Control Module (PCM) compares the output signals of the front and rear oxygen sensors to determine whether the output of the rear sensor is beginning to match the output of the front oxygen sensor. Air/fuel mixture compensation keeps the frequency of the front oxygen sensor high due to the changes from rich-to-lean combusition. The catalyst causes the rear oxygen sensor to have a lower frequency. As the catalyst wears, the rear oxygen sensor's signal trace begins to match the front oxygen sensor's signal trace. That is because the catalyst becomes saturated with oxygen and cannot use the oxygen to convert hydrocarbon and CO into H O and CO with the same efficiency as when it was new. A completely worn catalyst shows a 100% match between the frequency of the front and rear sensors.

DTC DESCRIPTION

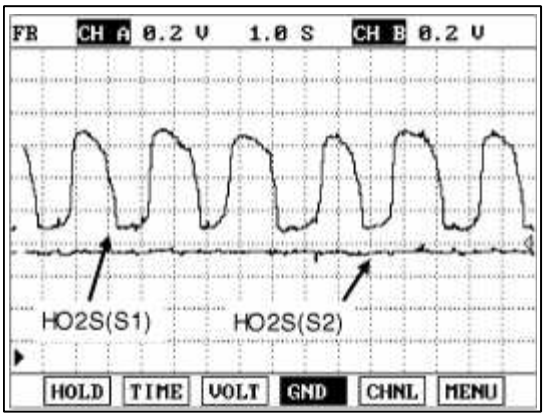
If the B1S1 signal is retarded compared to the B1S2 controller value, P2097 is stored.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• O2 sensor characteristic line shift	• Catalyst converter • B1S1 • ECM
Enable Conditions	• Dew point end detected • Required lambda = 1 • Battery voltage > 10.7V • Exhaust gas temperature (model) < 800°C (1472°F) • Heater control enabled • 1000rpm < Engine speed < 3800rpm • Engine load : 18 ~ 60 %	
Threshold Value	• The second controller by B1S2 >-1sec	
Diagnostic Time	• 50 sec	
MIL ON Condition	• 2 driving cycle	

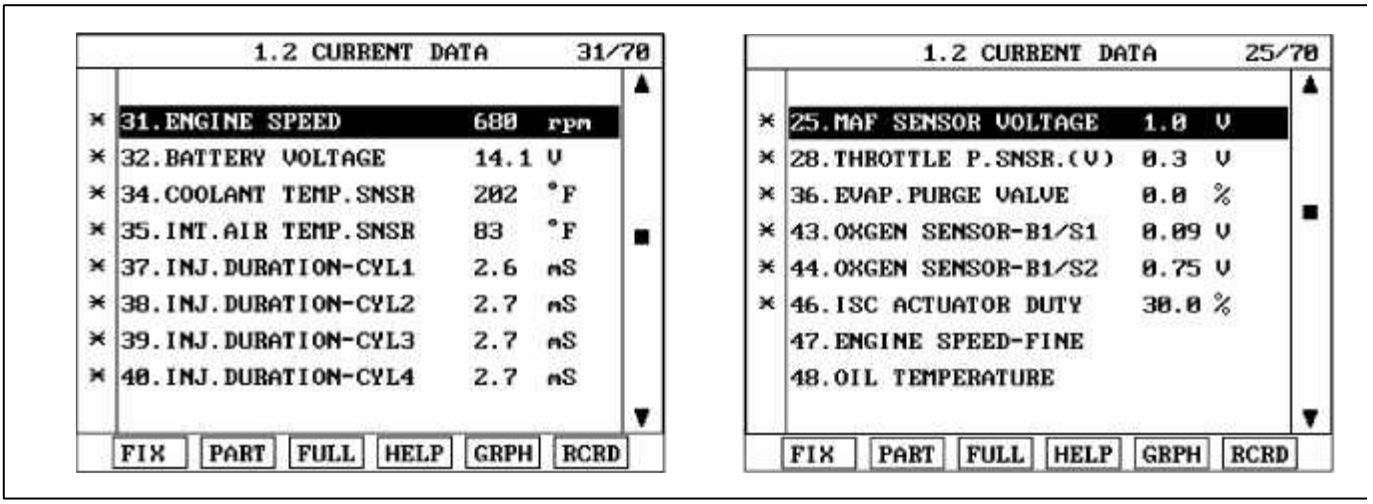
B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Parameters related to air/fuel ratio(HO2S, MAF, MAP, TPS, ECTS, PCSV, Injector, etc)" on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or ECM’s connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

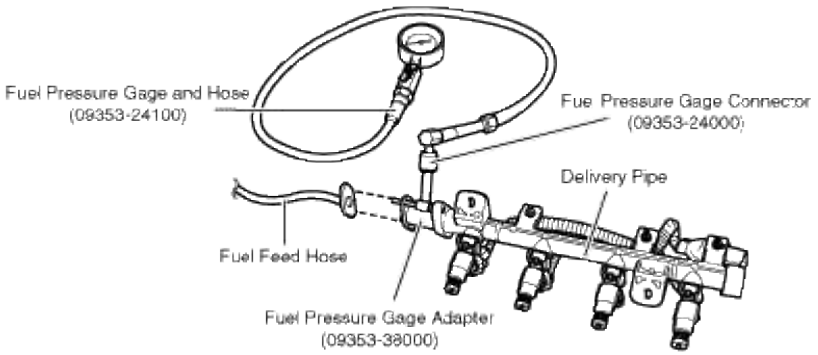
NO

Go to "System Inspection" procedure.

SYSTEM INSPECTION

1. Check clog on Exhaust gas system
   (1) Key "OFF".
   (2) Check clog on muffler or catalyst converter.
   (3) Is Exhaust gas system O.K?
   YES
   Go to "Intake air system check" procedure.
   NO
   Repair as necessary and go to "Verification of vehicle Repair" procedure.
2. Intake air system check.
   (1) Check clog on Intake air system"
   Check clog of air-cleaner.
   Check deterioration or contamination on throttle body and gasket.
   Check contamination, damage, stuck or clog on intake manifold, hoses, PCSV, ISCA and injectors.
   (2) Is there any problem?
   YES
   Repair as necessary and go to "Verification of vehicle Repair" procedure
   NO
   Go to "Fuel line check" procedure.
3. Fuel line pressure check.
   (1) Key "OFF".
   (2) Remove the fuel pump relay.
   (3) Engine start and wait until engine stop. and then key "OFF".
   (4) Install the fuel pump relay.
   (5) Connect fuel pressure gauge using the correct adapter.
   (6) Start the engine, and record fuel pressure.

   Specification : Approx. 3.5 kgf./cm² (343.2 kPa, 50 psi)



   (7) Is the fuel pressure normal?
   YES
   Go to "Component inspection" procedure.
   NO
   Check the supply pressure of fuel pump.
   Repair as necessary and go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

1. PCV(Positive Crankcase Ventilation) valve check.
   (1) Key "OFF".
   (2) Disconnect PCV valve.
   (3) Check the movement of plunger by putting in and out a thin stick.
   (4) Is the movement of plunger normal?

   YES

   Go to "PCSV check" procedure.

   NO

   Substitute with a known - good PCV valve and check for proper operation.
   If the problem is corrected, replace PCV valve and go to "Verification of Vehicle Repair" procedure.

2. PCSV check.
   (1) Key "OFF".
   (2) Disconnect PCSV and vacuum hose.
   (3) Apply a vacuum by a hand vacuum gauge on PCSV.
   (4) Does PCSV keep the vacuum condition normally?

   YES

   Go to "Injector check" procedure.

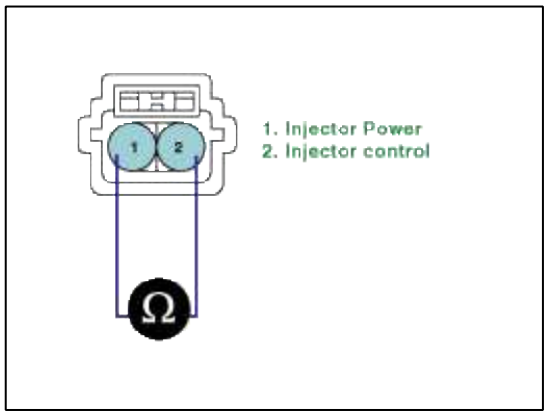
   NO

   Substitute with a known - good PCSV and check for proper operation.
   If the problem is corrected, replace PCSV and go to "Verification of Vehicle Repair" procedure.

3. Injector check
   (1) Key "OFF".
   (2) Disconnect injectors.
   (3) Check clog on injectors.
   (4) Measure the resistance between terminal 1 and 2 of injectors(Component side).

   Specification :

Temperature	Resistance (Ω)
20°C (68°F)	13.8 ~ 15.2Ω



(5) Is the measured resistance within specifications ?

YES

Go to "Sensors related to air/fuel ratio check" procedure.

NO

Substitute with a known - good Injector and check for proper operation.
If the problem is corrected, replace Injector and go to "Verification of Vehicle Repair" procedure.

4. Sensors related to air/fuel ratio check.

(1) Check the output data of sensors related to air/fuel ratio (HO2S, MAPS, TPS, ECTS, PCSV, Injectors, etc) on scantool. (Refer to each DTC guide procedure.)

(2) Are those sensors normal?

YES

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P2226 Barometric Pressure Circuit

GENERAL DESCRIPTION

A barometric pressure sensor is installed within the ECM/PCM to permit altitude corrections to be applied to fuel injection quantity calculations.

DTC DESCRIPTION

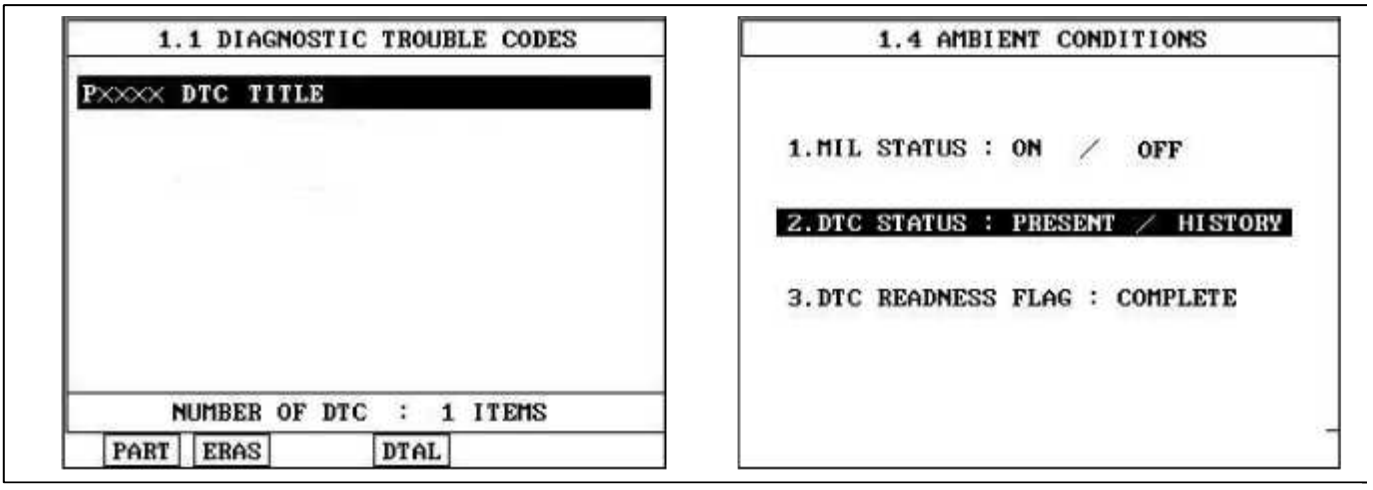
If the change of ambient pressure value is over 50 hPa during 20sec or more, ECM/PCM sets DTC P2226.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Clog at the sensing hole • ECM
Enable Conditions	• Difference of ambient pressure between measured and modeled > 200 hPa	
Threshold Value	• Change of ambient pressure in 20 sec >50hPa	
Diagnostic Time		
MIL ON Condition	• 2 driving cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON" and wait during 20 sec or more.
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC information from the DTCs menu.
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



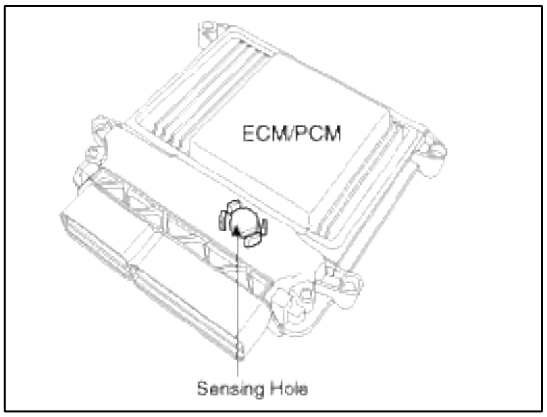
6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

The intermittent fault could be caused by
1st. Clog at the sensing hole



2nd. Poor connection of ECM/PCM connector
3rd. The previous DTC which has not been cleared after repairing
So, Thoroughly check the sensing hole and connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessaryand go to "Verification of vehicle Repair" procedure.

NO

1st. Check the sensing hole for clog or damage. If there is a problem, repair as necessary.
2nd. Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P2227 Barometric Pressure Circuit Range/Performance

GENERAL DESCRIPTION

A barometric pressure sensor is installed within the ECM/PCM to permit altitude corrections to be applied to fuel injection quantity calculations.

DTC DESCRIPTION

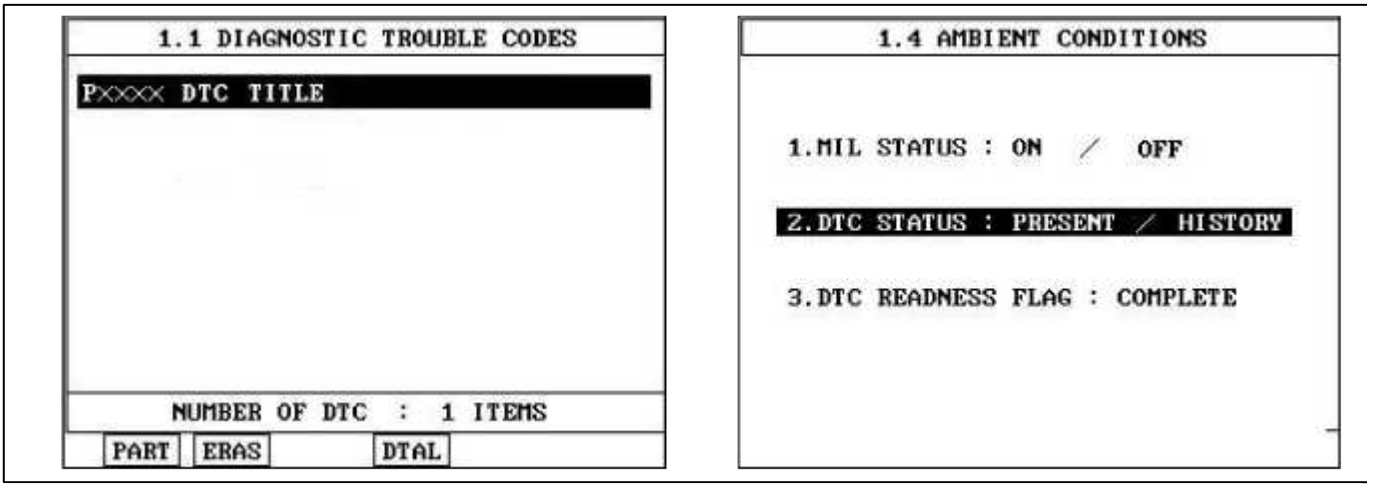
If the output of ambient pressure sensor is shown abnormal value(refer to DTC Detecting Condition), PCU sets DTC P2227.

DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		• Rationality check	• Clog at the sensing hole • ECM
Case1	Threshold Value	• Ambient pressure < 500 0r > 1150 hPa	
	Diagnostic Time	• 2 sec	
Case2	Enable Conditions	• Difference of ambient pressure between measured and modeled > 200 hPa	
	Threshold Value	• Difference of ambient pressure between current and last driving cycle > 100 hPa	
	Diagnostic Time	• 2 sec	
MIL ON Condition		• 2 driving cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC's information from the DTCs menu.
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditions noted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



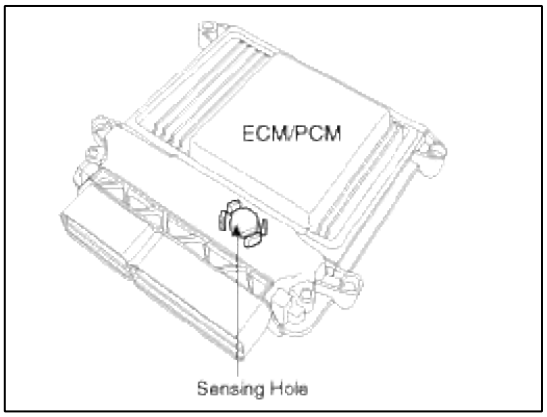
6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

The intermittent fault could be caused by
1st. Clog at the sensing hole



2nd. Poor connection of ECM/PCM connector
3rd. The previous DTC which has not been cleared after repairing
So, Thoroughly check the sensing hole and connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

1st. Check the sensing hole for clog or damage. If there is a problem, repair as necessary.
2nd. Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P2228 Barometric Pressure Circuit Low Input

GENERAL DESCRIPTION

A barometric pressure sensor is installed within the ECM/PCM to permit altitude corrections to be applied to fuel injection quantity calculations.

DTC DESCRIPTION

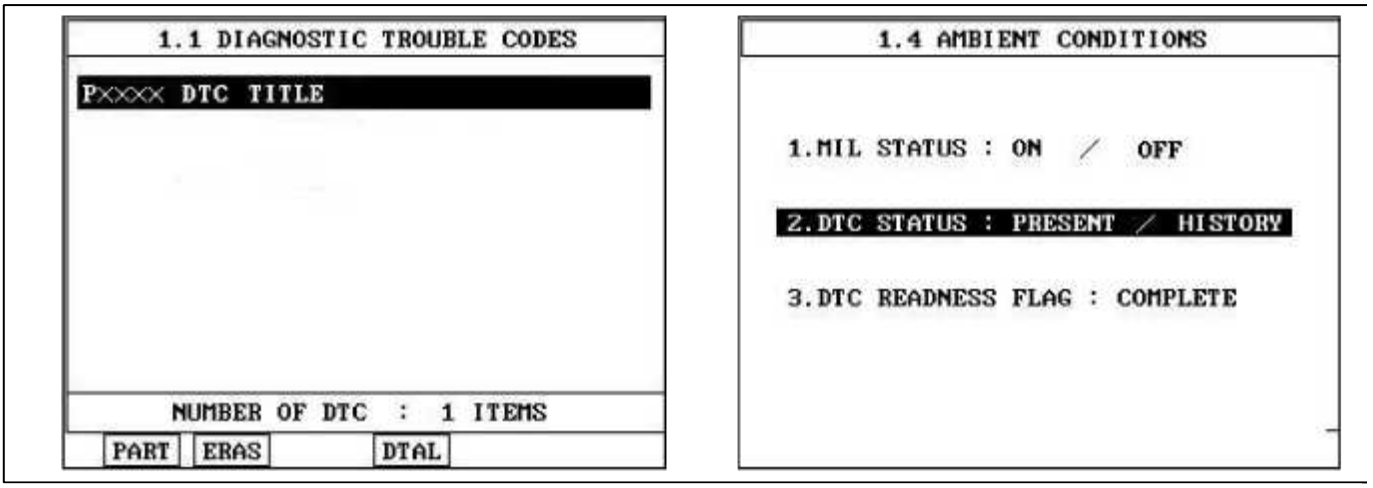
If the output of ambient pressure sensor is below 0.2 V, ECM/PCM sets DTC P2228.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• ECM
Enable Conditions		
Threshold Value	• Sensor voltage < 0.2 V	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC's information from the DTCs menu.
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditions noted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



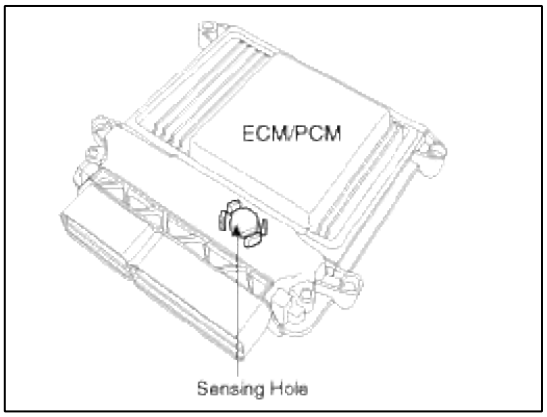
6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

The intermittent fault could be caused by
1st. Clog at the sensing hole



2nd. Poor connection of ECM/PCM connector
3rd. The previous DTC which has not been cleared after repairing
So, Thoroughly check the sensing hole and connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

1st. Check the sensing hole for clog or damage. If there is a problem, repair as necessary.
2nd. Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P2229 Barometric Pressure Circuit High Input

GENERAL DESCRIPTION

A barometric pressure sensor is installed within the ECM/PCM to permit altitude corrections to be applied to fuel injection quantity calculations.

DTC DESCRIPTION

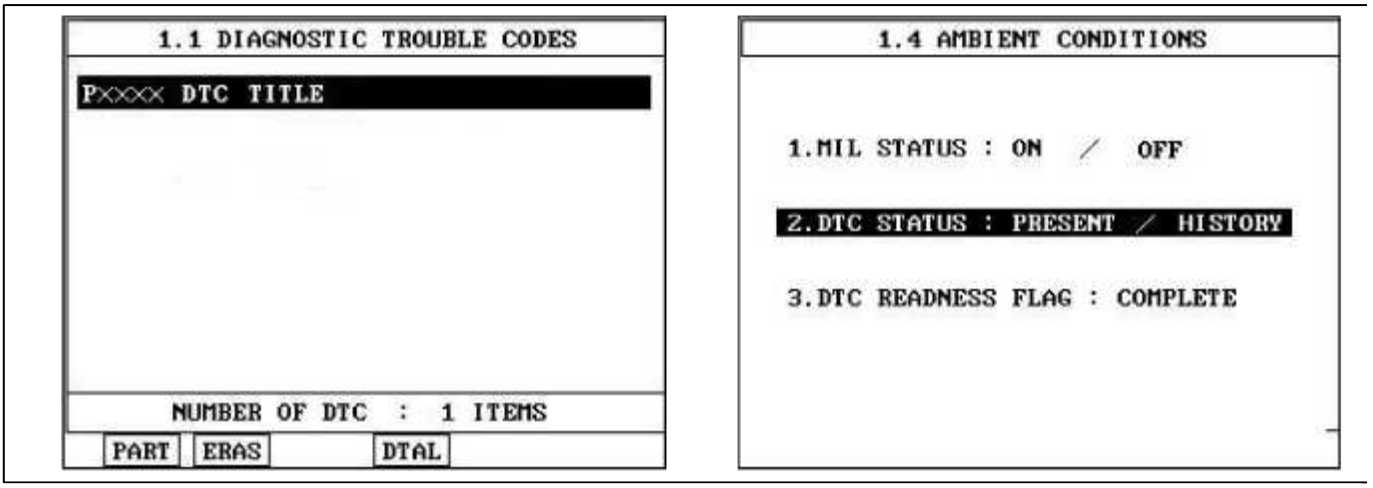
If the output of ambient pressure sensor is over 4.8 V, ECM/PCM sets DTC P2229.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• ECM
Enable Conditions		
Threshold Value	• Sensor voltage >4.8 V	
Diagnostic Time	• Continuous	
MIL ON Condition	• 2 driving cycle	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC's information from the DTCs menu.
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditions noted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



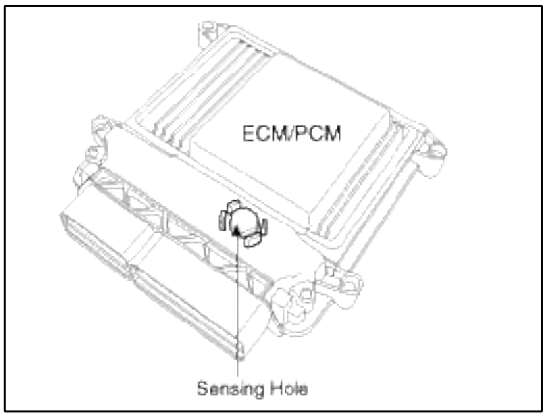
6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

The intermittent fault could be caused by
1st. Clog at the sensing hole



2nd. Poor connection of ECM/PCM connector
3rd. The previous DTC which has not been cleared after repairing
So, Thoroughly check the sensing hole and connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

1st. Check the sensing hole for clog or damage. If there is a problem, repair as necessary.
2nd. Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.
1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

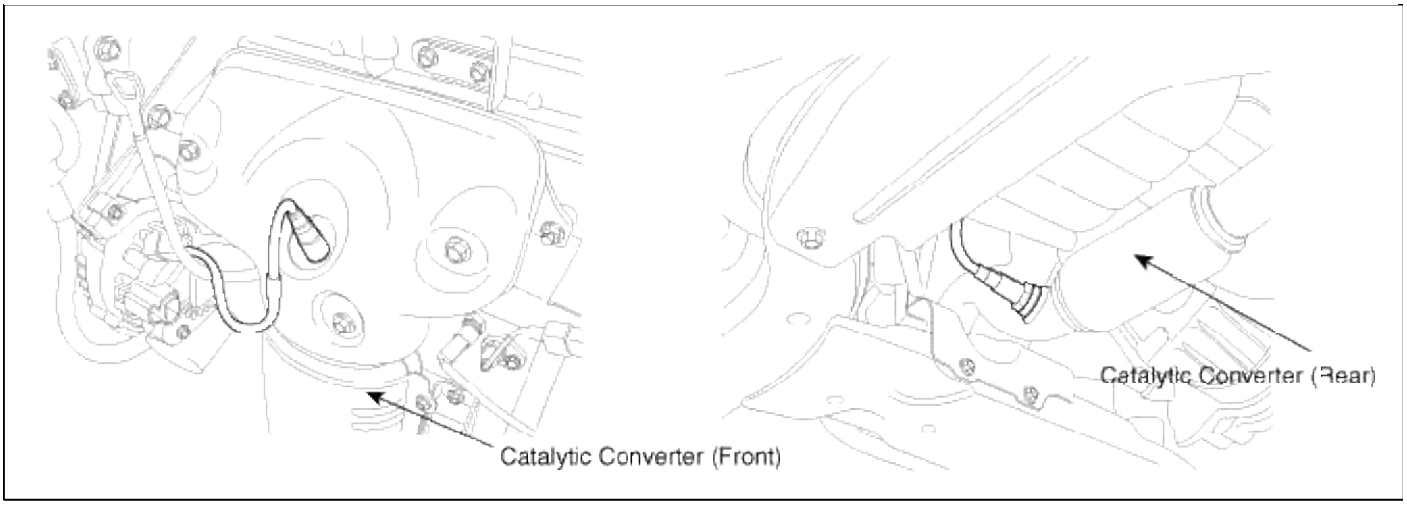
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > P2232 O2 Sensor Signal Circuit Shorted to Heater Circuit (Bank1 Sensor2)

COMPONENT LOCATION



GENERAL DESCRIPTION

HO2S(B1/S2) is in the rear side of Catalytic Converter to check the proper operation of catalyst. Oxygen density after the catalytic converter has to be within specific range (around 0.5V when there is no acceclation and deceleration.)If the oxygen density changes in accordance with HO2S(B1/S1), it means the poor performance of catalytic converter.

DTC DESCRIPTION

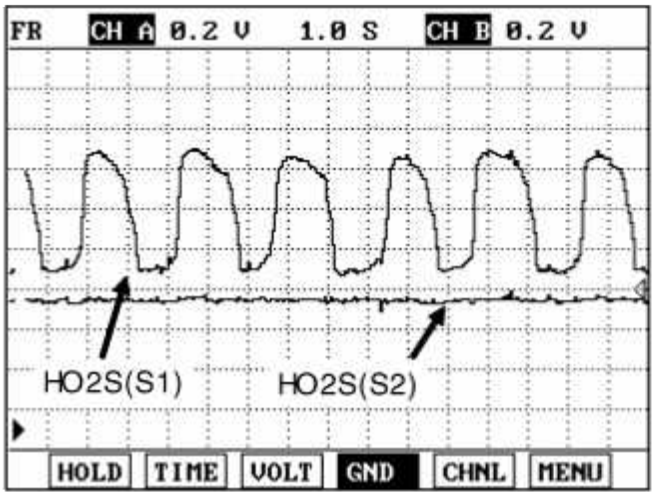
If the counter that records rapid signal voltage changes is greater than 5, P2232 is set.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Rationality check	• Poor connection • Short to power in signal circuit • B1S2 • ECM
Enable Conditions	• After enough heated • Battery voltage > 10.7V • Catalyst temperature (model) < 800°C (1472°F) • Time after dew point end detected > 10 sec	
Threshold Value	• Counter of [Δushk > 2V during 0.04 secafter heater on→off] > 5 times	
Diagnostic Time	• 2 driving cycle	

Δushk : Sum of the signal voltage change value (B1S2)
B1S1 : upstream oxygen sensor / B1S2 : downstream oxygen sensor

SIGNAL WAVEFORM & DATA



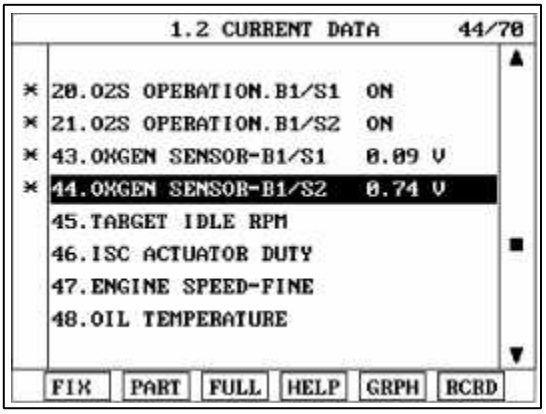
The rear HO2S amplitude is lower when compared to the front HO2S because the oxygen is stored/consumed during the conversion process.
This is the normal signal waveform of the rear HO2S at idle.

SPECIFICATION

AIF Ratio	Output Voltage (V)
RICH	0.6 ~ 1.0V
LEAN	0 ~ 0.4V

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "B1S2" parameters on the scantool.



4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

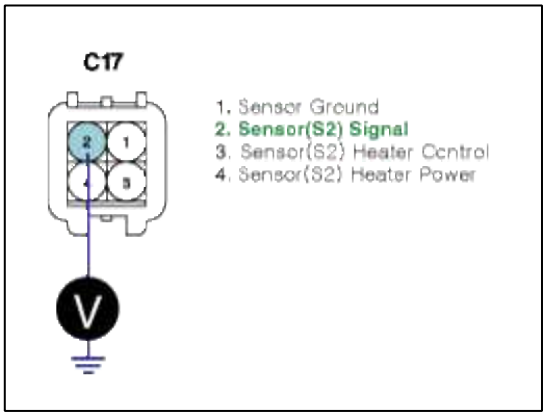
NO

Go to "B1S2 circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect HO2S(B1/S2) connector.
3. IG "ON" & ENG "OFF".
4. Measure voltage between terminal 2 of HO2S(B1/S2) and chassis ground.

Specification : Approx. 0.45V



5. Is the measured voltage within specification?

YES

Go to "Component Inspection" procedure.

NO

Repair short to power in signal circuit and then, go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. Visual Inspection.
   (1) IG "OFF"
   (2) Disconnect HO2S(B1/S2) connector.
   (3) Check that HO2S(B1S2) is contaminated or damaged by foreign materials.
   (4) Has a problem been found?

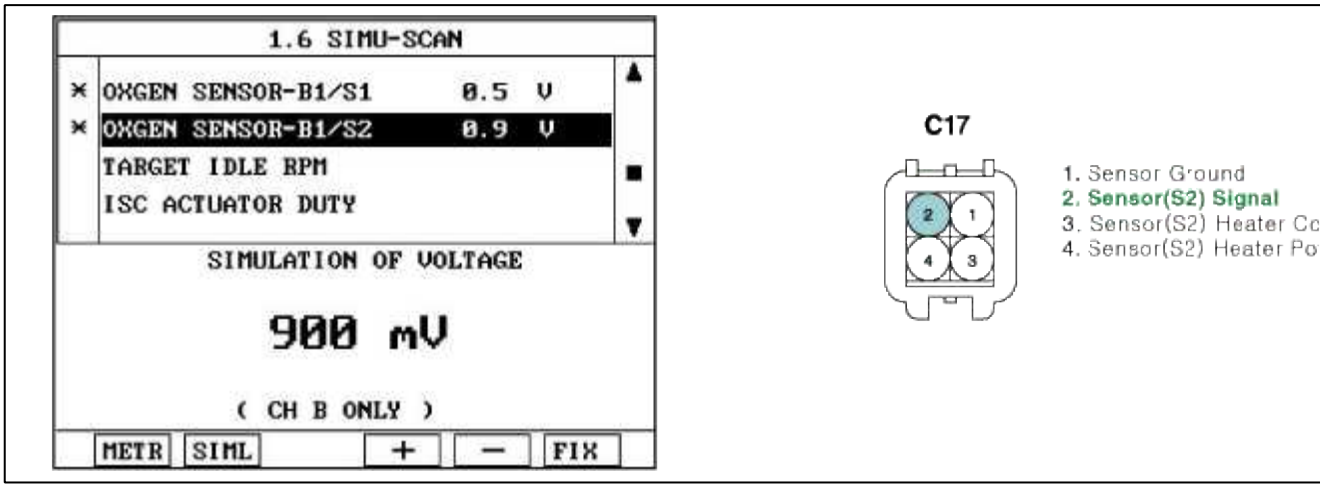
YES

Go to "Check ECM/PCM" as follows.

NO

Substitute with a known - good HO2S(B1/S2) and check for proper operation.
If the problem is corrected, replace HO2S(B1/S2) and go to "Verification of Vehicle Repair" procedure.

2. Check ECM/PCM.
   (1) IG "OFF".
   (2) Connect scantool and Engine "ON".
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 2 of HO2S(B1/S2) signal connector.



   (5) Does the signal value of HO2S(B1/S2) change according to simulation voltage?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination, deteriorati damage. Repair or replace as necessary and go to "Verificationof Vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > U0001 High Speed CAN Communication Bus off

GENERAL DESCRIPTION

As vehicles electronically controlled, various control unit is applied to vehicle and several units are controlled based on the signals from the sensors. Therefore sharing signals of sensors and information is required. To meet this requirement, CAN communication type, which is insensible to external noises and whose communication speed is fast, is applied to power train control.
Sharing signals from RPM, APS, gear shifting, torque reduction in ESP, ABS and various modules, addtive control is performed.

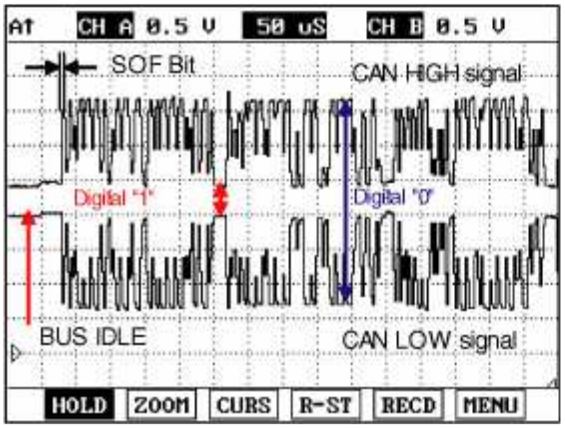
DTC DESCRIPTION

If it is impossible to communicate through internal or external CAN line over 500ms, ECM/PCM sets DTC U0001.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• CAN communication status check	• Poor connection • ECM/PCM
Enable Conditions	• Battery voltage > 10.7V • Ignition on, no start phase	
Threshold Value	• Bus-Off time vin CAN A > 500ms • Bus-Off time vin CAN B > 500ms	
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

Signal Waveform & Data



Monitoring CAN HIGH and LOW simultaneously is important in monitoring CAN communication waveform.
When CAN HIGH signal rise to 3.5V and LOW signal drops to 1.5V - voltage difference between HIGH and LOW signal is 2V - at BUS IDLE state(DIGITAL "1") whose reference voltage is 2.5V, "0" is recognized. Besides, comparing HIGH and LOW signal if opposite waveform is detected w th the reference voltage of 2.5V, Check if current CAM signal is transfers correctly. Continuous "0"signal above 6BIT means the occurence of error in CAN communication. 1BIT is easily distinguished as calculating the time when "SOF"(START OF FRAME) which notifies the start of frame occurs. Check if "0"signal above 6BIT is detected continuously when monitoring CAN communication waveform.

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "CAN" parameters on the scantool.
   A. Check the value of current data displayed normally.
   B. Check "Transaxle Range Switch" and "Torque Reqired from TCU" parameters among ECU's current data. (AT vehicle only)
   C. Check "TPS", "RPM", and "Idle Status" parameters among TCU's current data. (AT vehicle only)
   D. Check "RPM" and "TPS" parameters among ABS's current data. (ABS or ESP vehicle only)

4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Terminal and connector inspection" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

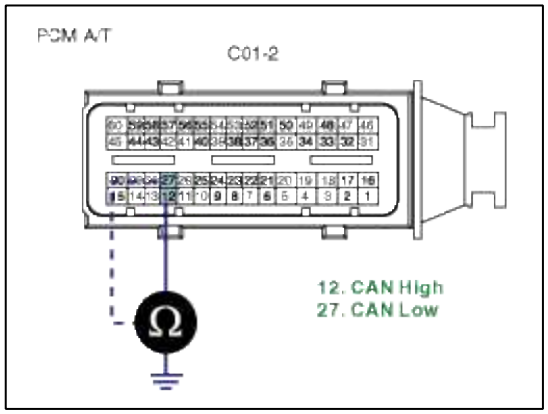
NO

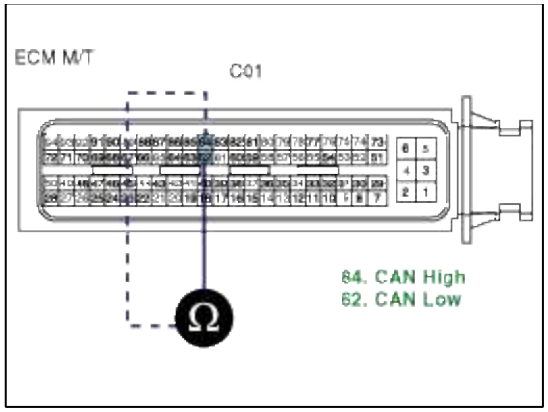
Go to "CAN communication circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check CAN BUS Short to Ground.
   (1) Key "OFF".
   (2) Disconnect ECM/PCM connector.
   (3) Measure the resistance between terminal 12/C01-2 of ECM/PCM harness connector and chassis ground. [A/T]
   Measure the resistance between terminal 84/C01 of ECM/PCM harness connector and chassis ground. [M/T]
   (4) Measure the resistance between terminal 27/C01-2 of ECM/PCM harness connector and chassis ground. [A/T]
   Measure the resistance between terminal 62/C01 of ECM/PCM harness connector and chassis ground. [M/T]

Specification : Infinite





(5) Is the measured resistance within specification?

YES

Go to "CAN BUS Terminus Resistance Check(Harness side)" procedure.

NO

Repair Short in signal circuit and then go to "Verification of vehicle Repair" procedure.

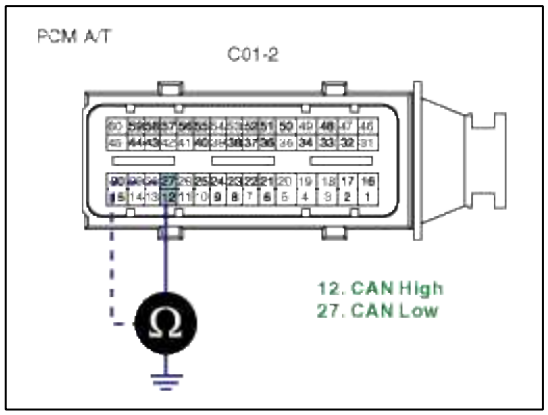
2. CAN BUS Terminus Resistance Check(Harness side)

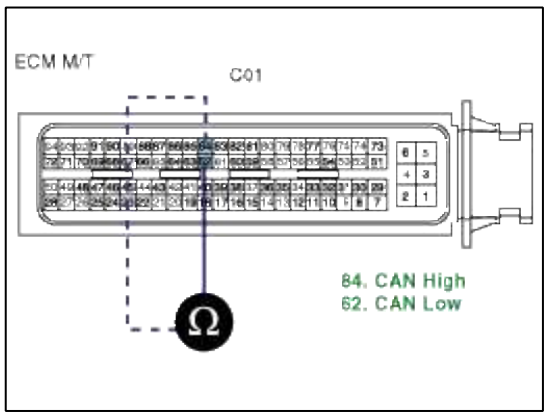
(1) Key "OFF".

(2) Disconnect ECM/PCM connector.

(3) Measure the resistance between terminal 12 and 27 of ECM/PCM harness connnector. (C01-2) [A/T]
Measure the resistance between terminal 84 and 62 of ECM/PCM harness connnector. (C01) [M/T]

Specification : 120Ω ± 10Ω





(4) Is the measured resistance within specification?

YES

Go to "Component Inspection" procedure.

NO

In case the measured resistance is around 1.0Ω : Repair Short in signal circuit and then go to "Verification of vehicle Repair" procedure.

In case the measured resistance is Infinite : Repair Open in signal circuit and then go to "Verification of vehicle Repair" procedure.

COMPONENT INSPECTION

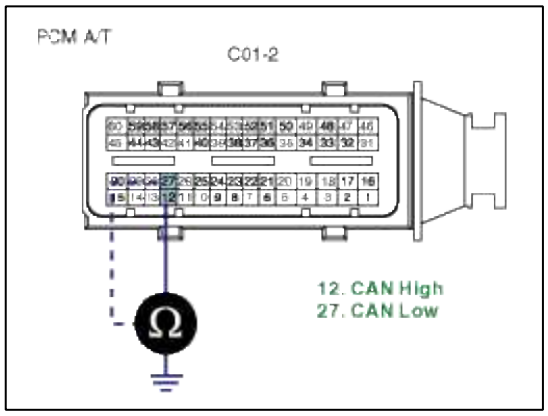
1. CAN BUS Terminus Resistance Check (Component side)

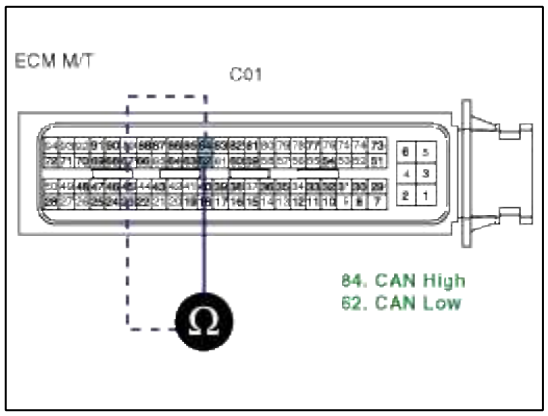
(1) Key "OFF".

(2) Disconnect ECM/PCM connector.

(3) Measure the resistance between terminal 12 and 27 of ECM/PCM connector. (C01-2) (Component side)
Measure the resistance between terminal 84 and 62 of ECM/PCM connector. (C01) (Component side)

Specification : 120Ω ± 10Ω





(4) Is the measured resistance within specification?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or ECM’s connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Substitute with a known - good ECM/PCM and check for proper operation.
If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Fuel System > Troubleshooting > U0101 Lost Communication With TCM

GENERAL DESCRIPTION

As vehicles electronically controlled, various control unit is applied to vehicle and several units are controlled based on the signals from the sensors. Therefore sharing signals of sensors and information is required. To meet this requirement, CAN communication type, which is insensible to external noises and whose communication speed is fast, is applied to power train control.

Sharing signals from RPM, APS, gear shifting, torque reduction in ESP, ABS and various modules, addtive control is performed.

DTC DESCRIPTION

If there is no message from TCU to ECM/PCM through CAN line over 500 ms, PCU sets DTC U0101.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• CAN communication status check	• Poor connection • TCM • ECM/PCM
Enable Conditions	• TCU is not coming via internal CAN	
Threshold Value	• No message time from TCU 1 or 2 via CAN A or B > 500ms	
Diagnostic Time	• Continuous	
MIL ON Condition	• 5 sec	

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "CAN" parameters on the scantool.
   A. Check "Transaxle type, Torque control request, etc" at the ECU service data mode.
   B. Check "TPS, RPM, IDLE STATE, etc" at the TCU service data mode.

4. Are the parameters displayed correctly?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure..

NO

Substitute with a known-good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

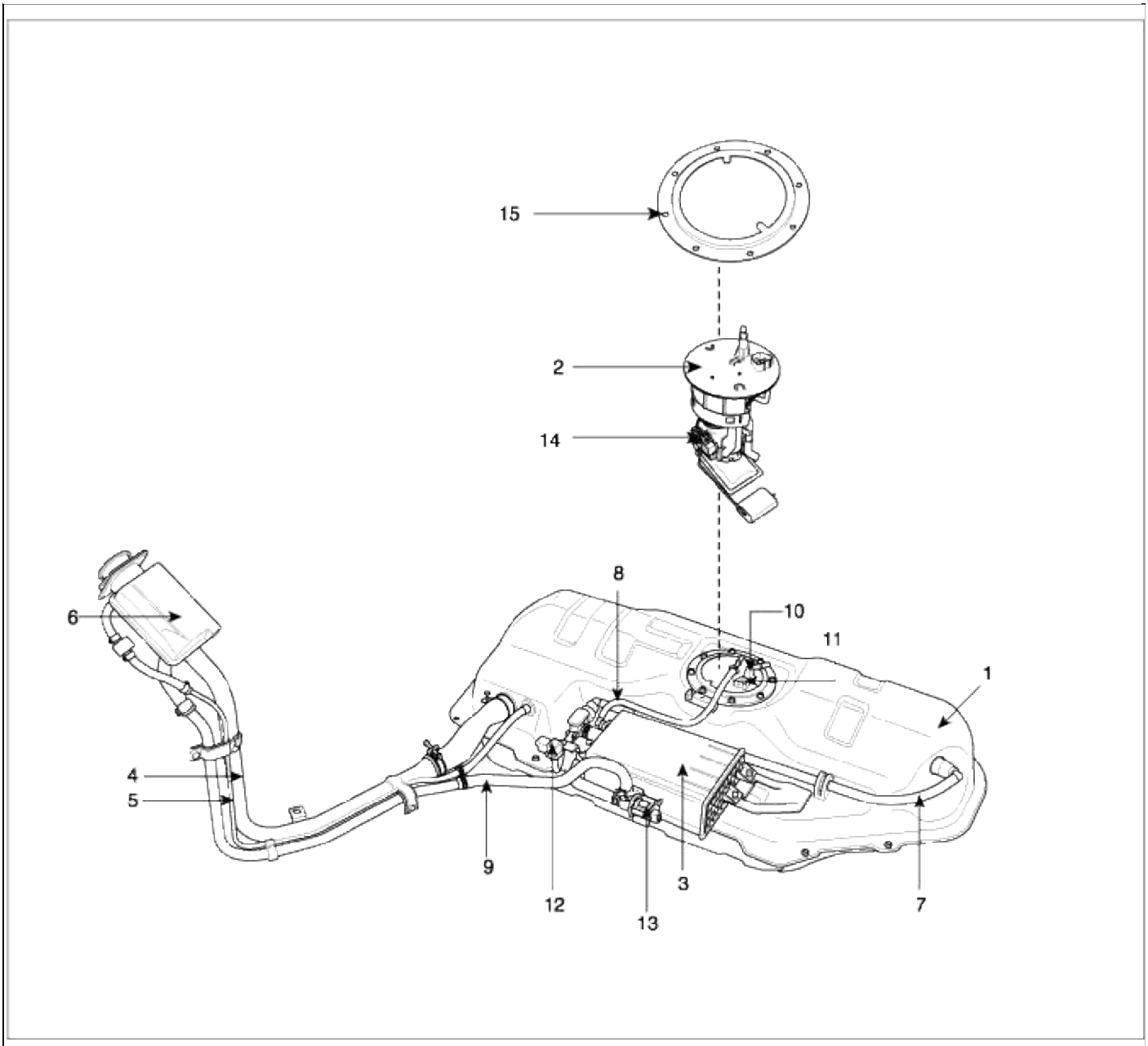
NO

System is performing to specification at this time.

Fuel System > Fuel Delivery System > Components and Components Location

FUEL DELIVERY SYSTEM

COMPONENTS



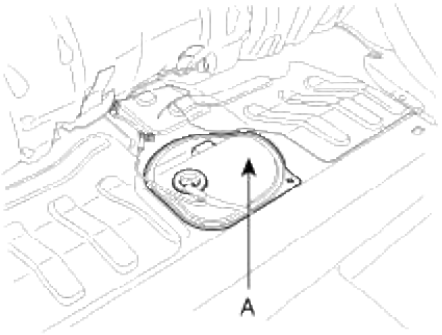
1. Fuel Tank
2. Fuel Pump Assembly (including Fuel Filter & Fuel Pressure Regulator)
3. Canister
4. Fuel Filler Pipe
5. Leveling Hose
6. Fuel Tank Air Filter
7. Tube (Canister ↔ Fuel Tank)
8. Tube (Canister ↔ Intake Manifold)
9. Hose (Canister ↔ Fuel Tank Air Filter)
10. Nipple-Fuel Feed Line
11. Fuel Pump Connector
12. Fuel Tank Pressure Sensor (FTPS)
13. Canister Close Valve (CCV)
14. Fuel Level Sensor (FLS)
15. Fuel Pump Locking Ring

Fuel System > Fuel Delivery System > Repair procedures

FUEL PRESSURE TEST

1. PREPARING

1. Remove the rear seat cushion (Refer to "BD" group in this WORKSHOP MANUAL).
2. Open the service cover (A).

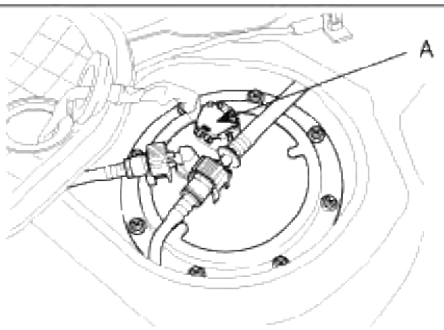


2. RELEASE THE INTERNAL PRESSURE

1. Disconnect the fuel pump connector (A).
2. Start the engine and wait until fuel in fuel line is exhausted.
3. After the engine stalls, turn the ignition switch to OFF position and diconnect the negative (-) terminal from the battery.

NOTE

Be sure to reduce the fuel pressure before disconnecting the fuel feed hose, otherwise fuel will spill out.



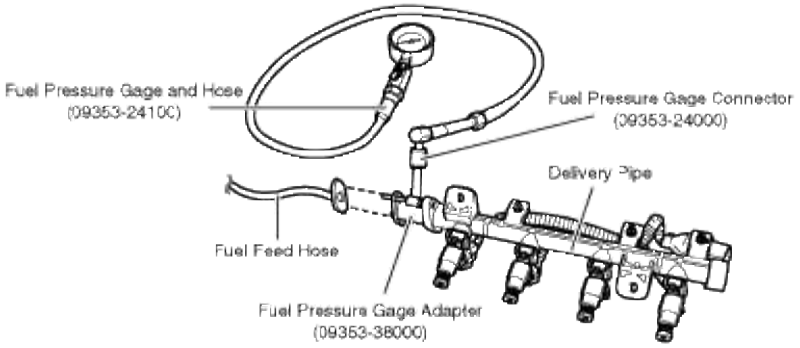
3. INSTALL THE SPECIAL SERVICE TOOL (SST) FOR MEASURING THE FUEL PRESSURE

1. Disconnect the fuel feed hose from the delivery pipe.

CAUTION

Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual pressure in the fuel line.

2. Install the Fuel Pressure Gage Adapter (09353-38000) between the delivery pipe and the fuel feed hose.
3. Connect the Fuel Pressure Gage Connector (09353-24000) to the Fuel Pressure Gage Adapter (09353-38000).
4. Connect the Fuel Pressure Gage and Hose (09353-24100) to Fuel Pressure Gage Connector (09353-24000).
5. Connect the fuel feed hose to the Fuel Pressure Gage Adapter (09353-38000).

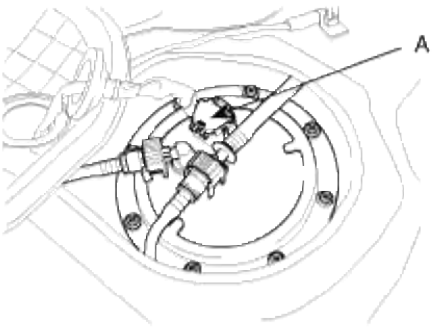


6. RELEASE THE INTERNAL PRESSURE

1. Disconnect the fuel pump connector (A).
2. Start the engine and wait until fuel in fuel line is exhausted.
3. After the engine stalls, turn the ignition switch to OFF position and diconnect the negative (-) terminal from the battery.

NOTE

Be sure to reduce the fuel pressure before disconnecting the fuel feed hose, otherwise fuel will spill out.



7. REMOVE THE SPECIAL SERVICE TOOL (SST) AND CONNECT THE FUEL LINE

1. Disconnect the Fuel Pressure Gage and Hose (09353-24100) from the Fuel Pressure Gage Connector (09353-24000).
2. Disconnect the Fuel Pressure Gage Connector (09353-24000) from the Fuel Pressure Gage Adapter (09353-38000).
3. Disconnect the fuel feed hose from the Fuel Pressure Gage Adapter (09353-38000).
4. Disconnect the Fuel Pressure Gage Adapter (09353-38000) from the delivery pipe.

CAUTION

Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual pressure in the fuel line.

5. Conenct the fuel feed hose to the delivery pipe.

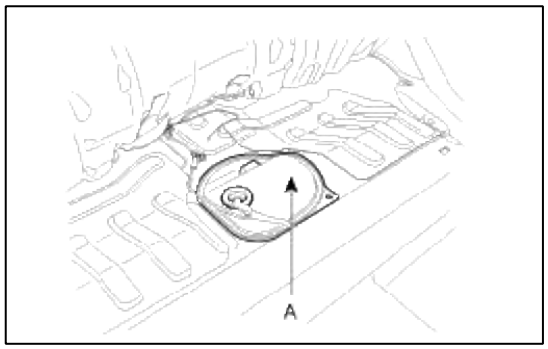
8. INSPECT FUEL LEAKAGE ON CONNECTION

1. Connect the battery negative (-) terminal.
2. Apply battery voltage to the fuel pump terminal and activate the fuel pump. With fuel pressure applied, check that there is no fuel leakage from the fuel pressure gauge or connection part.
3. If the vehicle is normal, connect the fuel pump connector.

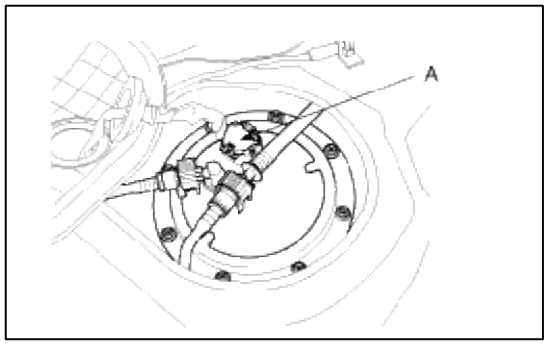
Fuel System > Fuel Delivery System > Fuel Tank > Repair procedures

REMOVAL

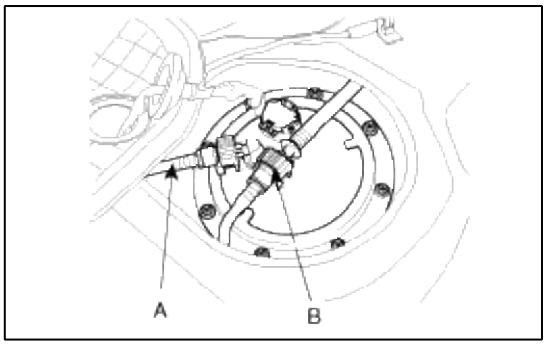
1. Preparation
   (1) Remove the rear seat cushion (Refer to "BD" group in this WORKSHOP MANUAL).
   (2) Remove the service cover (A).



   (3) Disconnect the fuel pump connector (A).

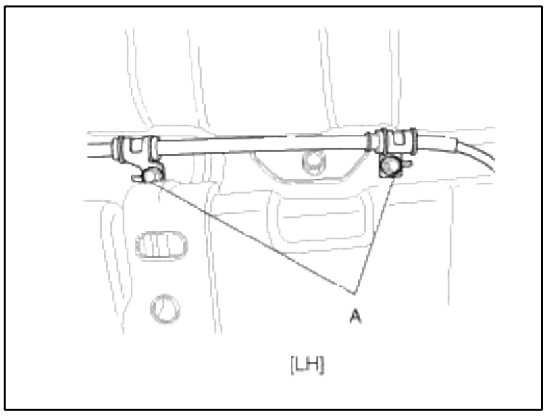


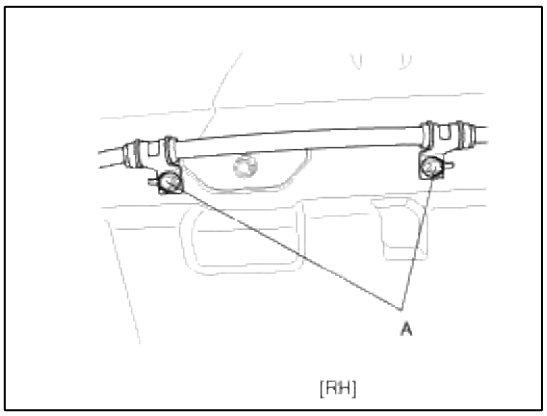
   (4) Start the engine and wait until fuel in fuel line is exhausted.
   (5) After engine stalls, turn the ignition switch to OFF position.
2. Disconnect the fuel feed line (A) and canister hose (B).



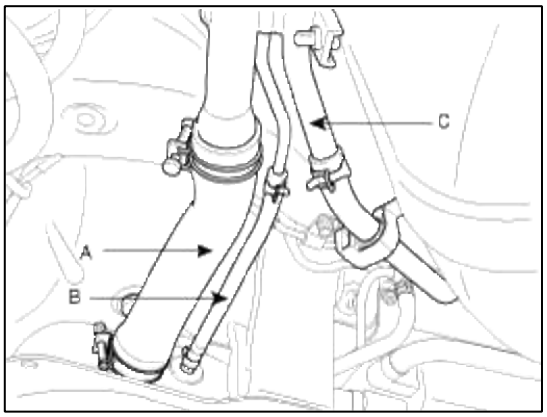
3. Life the vehicle.
4. Remove the center muffler (Refer to "EM" group in this WORKSHOP MANUAL).
5. Support the fuel tank with a jack.

6. Unscrew the brake hose mounting bolts (A).





7. Disconnect the fuel filler pipe (A), the leveling hose (B) and canister hose (C).



8. Unscrew the fuel tnak mounting bolts (2) and nuts (2), and then remove the fuel tnak.

INSTALLATION

Install the Fuel Tank according to the reverse order to REMOVAL procedure.

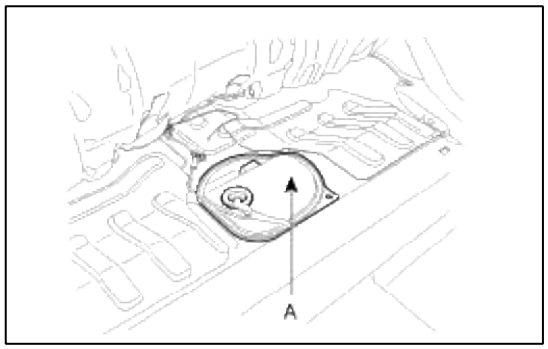
Tightening Torques

Fuel tank installation bolts: 39.2 ~ 54.0 N·m (4.0 ~ 5.5 kg·m, 28.9 ~ 39.8 lb·ft)

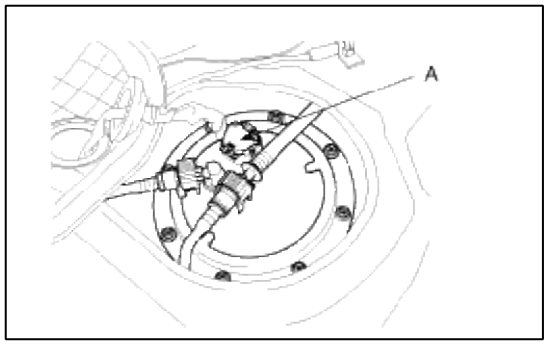
Fuel System > Fuel Delivery System > Fuel Pump > Repair procedures

REMOVAL (INCLUDING FUEL FILTER AND FUEL PRESSURE REGULATOR)

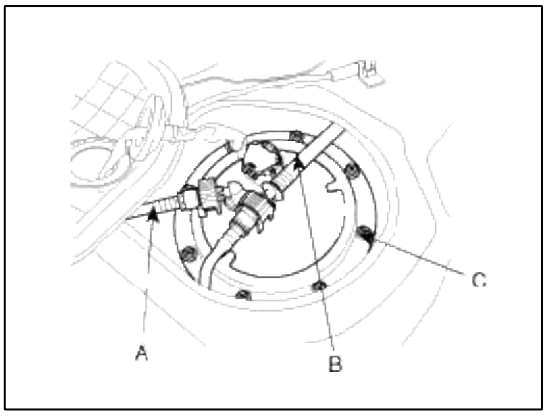
1. Preparation
   (1) Remove the rear seat cushion (Refer to "BD" group in this WORKSHOP MANUAL)/
   (2) Remove the service cover (A).



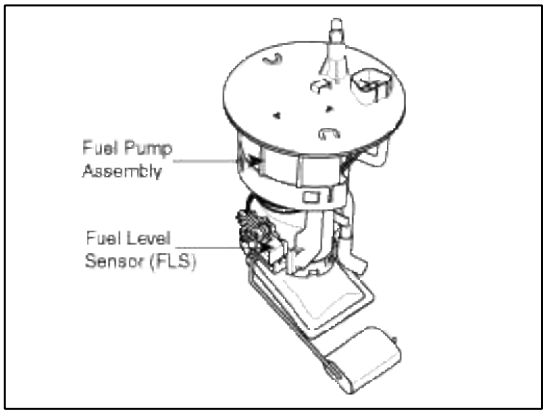
   (3) Disconnect the fuel pump connector (A).



   (4) Start the engine and wait until fuel in fuel line is exhausted.
   (5) After engine stalls, turn the ignition switch to OFF position.
2. Disconnect the fuel feed line (A) and canister hoses (B).



3. Unscrew the fuel pump mounting bolts (C) and remove the fuel pump assembly.



INSTALLATION

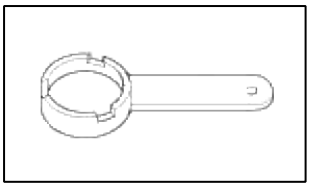
Install the Fuel Pump acording to the reverse order of REMOVAL procedure.

Tightening Torques
Fuel pump installation bolts/nuts: 2.0 ~ 2.9N·m (0.2 ~ 0.3kg·m, 1.4 ~ 2.2lb·ft)

ACCENT(MC) > 2008 > G 1.6 DOHC > Heating,Ventilation, Air Conditioning

Heating,Ventilation, Air Conditioning > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09977-29000 Disc & hub assembly bolt remover		Removal and installation of disc & hub assembly

Heating,Ventilation, Air Conditioning > General Information > Troubleshooting

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 & Blower resistor	
	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	
	1. Refrigerant capacity	

No cool comes out	2. Drive belt	
	3. Magnetic clutch	
	4. Compressor	
	5. A/C pressure transducer	
	6. Evaporator temperature sensor	
	7. A/C switch	
	8. Heater control assembly	
	9. Wire harness	
Insufficient cooling	1. Refrigerant capacity	
	2. Drive belt	
	3. Magnetic clutch	
	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	

Heating,Ventilation, Air Conditioning > General Information > Specifications

SPECIFICATION

AIR CONDITIONER

Item		Specification	
		α1.6	
Compressor	Type	VS16M	
	Oil type & Capacity	FD46XG(PAG), 150 ± 10cc	
	Pulley type	4PK-TYPE	5PK-TYPE
	Displacement	160cc/rev	
Condenser	Heat rejection	13,000 ± 5% kcal/hr	10,000 ± 5% kcal/hr
APT (A/C pressure transducer)	The method to measure the pressure	Voltage = 0.00878835 * Pressure + 0.037081095 [PSIA]	
Expansion valve	Type	Block	
Refrigerant	Type	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), 4 speed (Manual)
	Speed control	Power mosfet (Automatic), Blower resistor (Manual)
Air filter	Type	Particle filter

HEATER AND EVAPORATOR UNIT

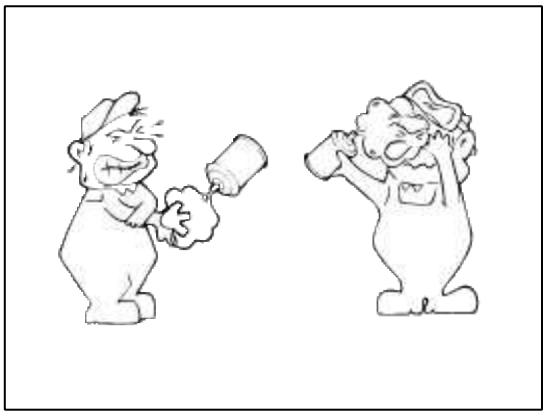
Item		Specification
Heater	Type	Pin & Tube type
	Heating capacity	4,450 ± 10% kcal/hr
	PTC heater capacity	1000W + 5%/-10%
	Mode operating method	Actuator
	Temperature operating method	Actuator (Automatic), Cable (Manual)
Evaporator	Temperature control type	Evaporator temperature sensor
	A/C ON/OFF [°C(°F)]	ON : 5.0 ± 0.5 (41 ± 32.9), OFF: 3.0 ± 0.5 (37.4 ± 32.9)

Heating,Ventilation, Air Conditioning > Air conditioning System > General Information

INSTRUCTIONS

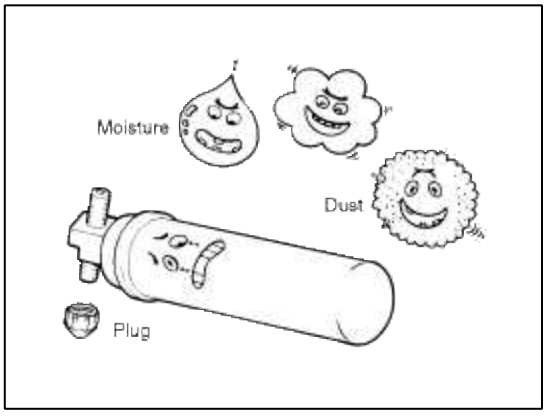
WHEN HANDLING REFRIGERANT

1. R-134a liquid refrigerant is highly volatile. A drop on the skin of your hand could result in localized frostbite. When handling the refrigerant, be sure to wear gloves.
2. It is standard practice to wear goggles or glasses to protect your eyes, and gloves to protect your hands. If the refrigerant splashes into your eyes, wash them with clean water immediately.
3. The R-134a container is highly pressurized. Never leave it in a hot place, and check 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:
   A. When removing refrigerant components from a vehicle, cap immediately the components to prevent from the entry of moisture.
   B. When installing refrigerant components to a vehicle, do not remove the cap until just before connecting the components.
   C. Complete the connection of all refrigerant tubes and hoses without delay to prevent the A/C system from taking on moisture.
   D. Use the recommended lubricant from a sealed container only.
7. If an accidental discharge in the system occurs, ventilate the work area before 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.

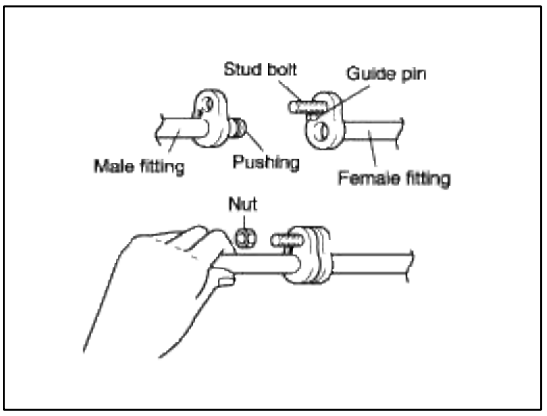


WHEN INSTALLING CONNECTING PARTS

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)

NOTE

T means tensile intensity, which is stamped on the head of bolt only numeral.

HANDLING TUBING AND FITTINGS

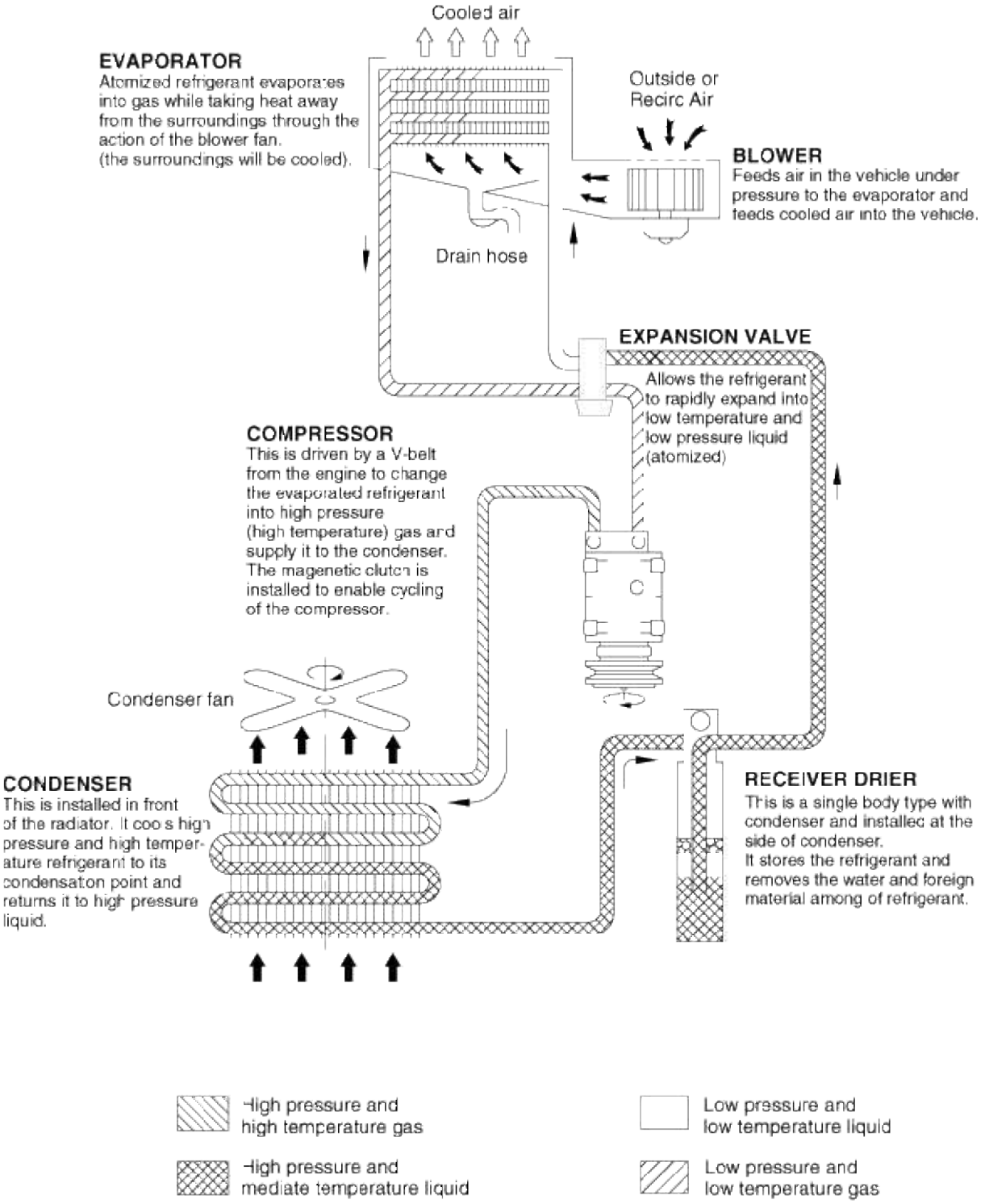
The internal parts of the refrigeration system will remain in a state of chemical stability as long as pure moisture-free refrigerant and refrigerant oil are used. Abnormal amounts of dirt, moisture or air can upset the chemical stability and cause problems or serious damage.

THE FOLLOWING PRECAUTIONS MUST BE OBSERVED

1. When it is necessary to open the refrigeration system, have everything you will need to service the system ready so the system will not be left open any longer than necessary.
2. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture.
3. All lines and components in parts stock should be capped or sealed until they are ready to be used.
4. Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing.
5. All tools, including the refrigerant dispensing manifold, the gauge set manifold and test hoses, should be kept clean and dry.

Heating,Ventilation, Air Conditioning > Air conditioning System > Description and Operation

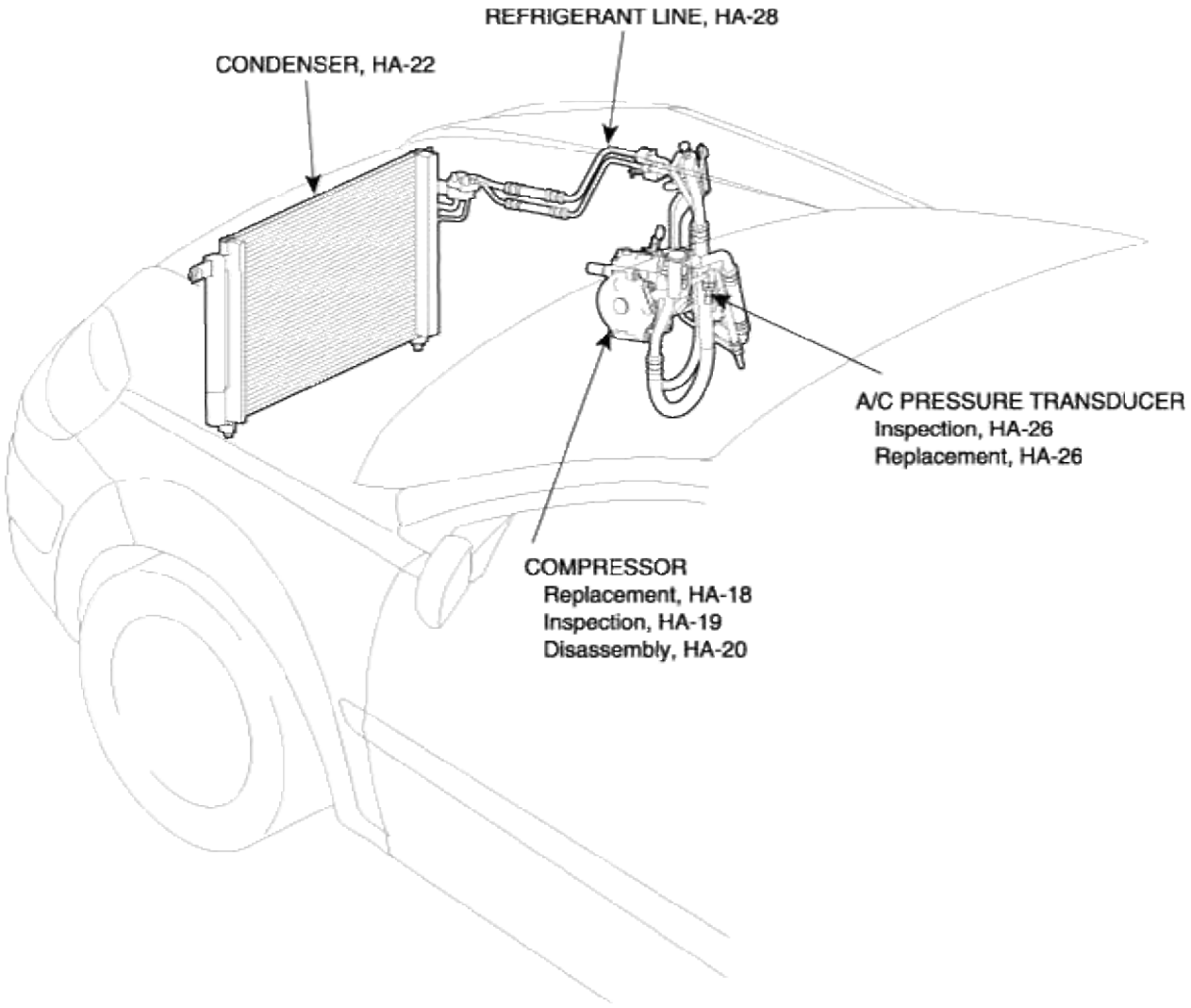
REFRIGERATION CYCLE



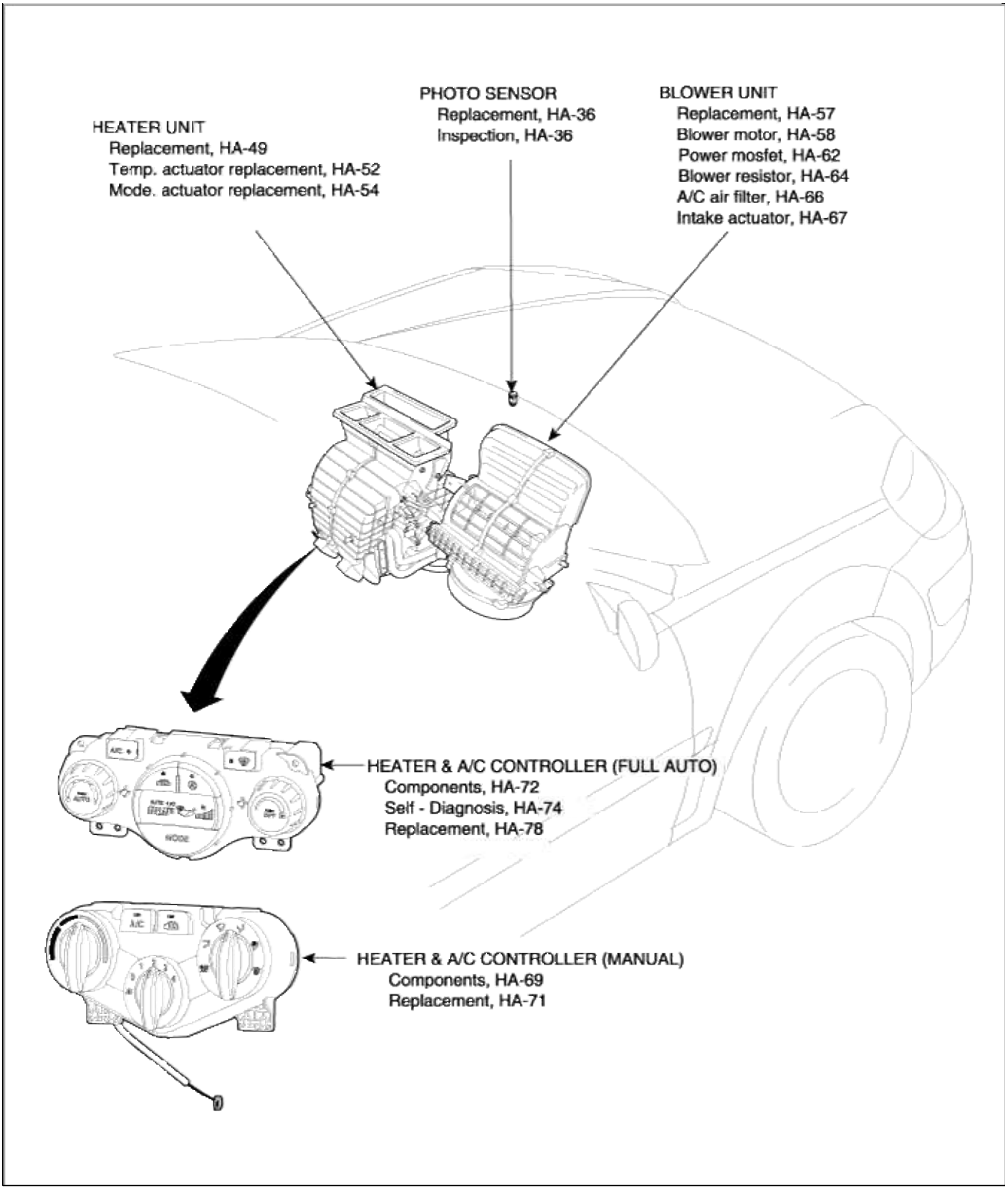
Heating,Ventilation, Air Conditioning > Air conditioning System > Components and Components Location

ENGINE ROOM

[Gasoline]



INTERIOR



Heating,Ventilation, Air Conditioning > Air conditioning System > Repair procedures

REFRIGERANT SYSTEM SERVICE BASICS

REFRIGERANT RECOVERY

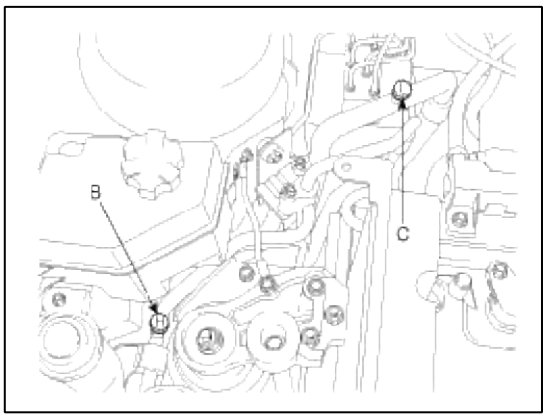
Use only service equipment that is U.L-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

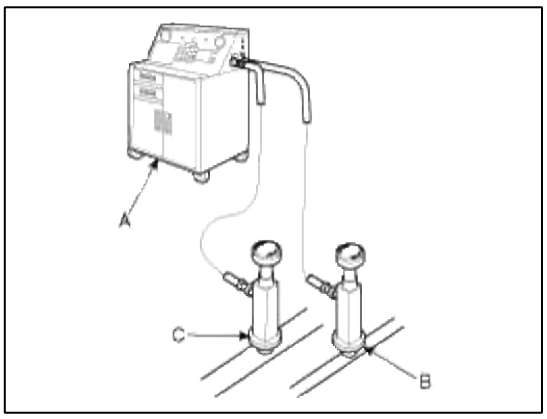
CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

If accidental system discharge occurs, ventilate work area before 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.

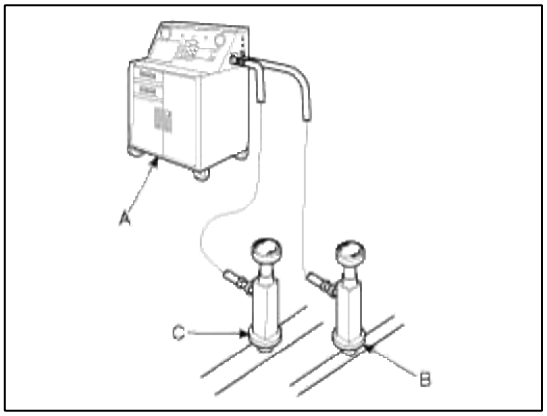
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If accidental system discharge occurs, ventilate work area before resuming service.
Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

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

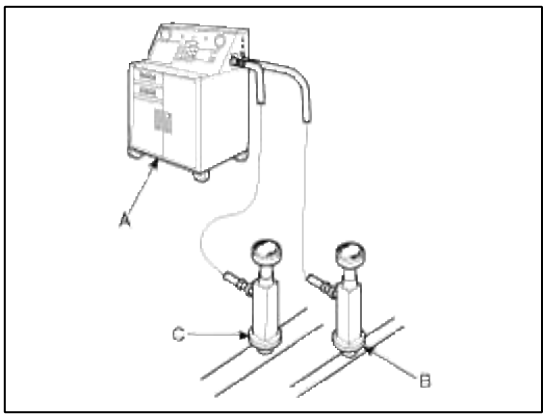
Use only service equipment that is U.L-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

CAUTION

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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 oz. (500 ± 25g) of R-134a refrigerant. Do not overcharge the system the compressor will be damaged.

REFRIGERANT LEAK TEST

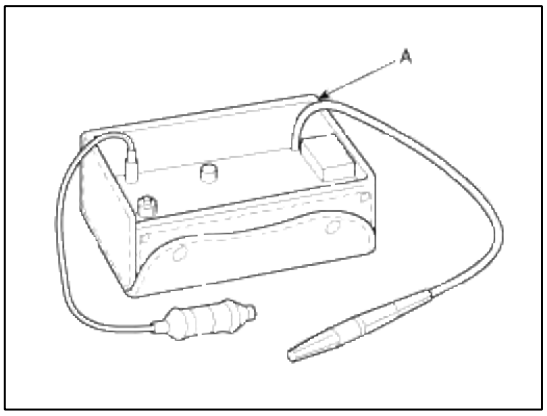
Always conduct a leak test with an electronic leak detector whenever leakage or refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening or connection fittings.

NOTE

In order to use the leak detector properly, read the manual supplied by the manufacturer.

If a gas leak is detected, proceed as follows:

1. Check the torque on the connection fittings and, if too loose, tighten to the proper torque. Check for gas leakage with a leak detector (A).
2. If leakage continues even after the fitting has been tightened, discharge the refrigerant from the system, disconnect the fittings, and check their seating faces for damage. Always replace, even if the damage is slight.
3. Check the compressor oil and add oil if required.
4. Charge the system and recheck for gas leaks. If no leaks are found, evacuate and charge the system again.



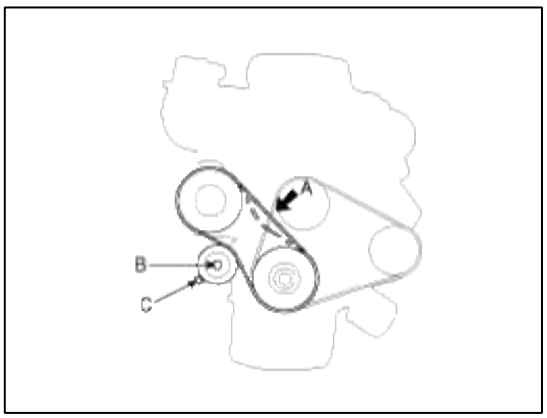
Heating,Ventilation, Air Conditioning > Air conditioning System > Drive belt > Repair procedures

INSPECTION

GASOLINE (α1.6 Engine)

1. Compressor shall be operated once or twice a month even in seasons air conditioning is not required, and compressor belt tension shall be adjusted from time to time.
2. Apply a force of 98N (10kgf, 22lbf), and measure the deflection at the mid point (A) between the air condition compressor and crankshaft pulley.

Item	Capacity [when 10kg (22 lb) load applied]	Tension
New belt	5 ~ 5.5 mm (0.197 ~ 0.217 in.)	65 ± 5 kg (143 ± 11 lb)
Used belt	6 ~ 7 mm (0.0236 ~ 0.276 in.)	36 ± 5 kg (79 ± 11 lb)
Check after operation	About 8 mm (0.315 in.)	25 ~ 50 kg (55 ~ 110 lb)

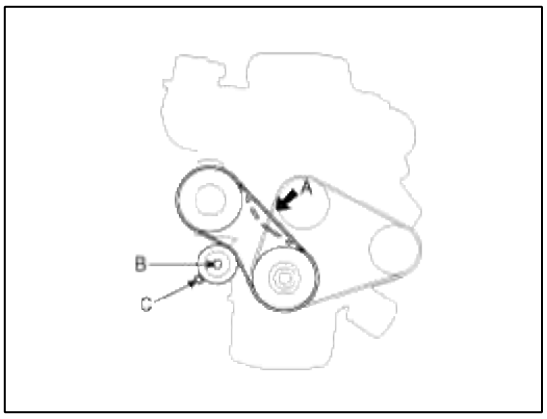


NOTE

These items when adjusting belt tension :
- If there are cracks or any damage evident on the belt, replace it with a new one.
- "Used belt" means a belt which has been used for five minutes or more.
- "New belt" means a belt which has been used for less than five minutes.

ADJUSTMENT

1. Loosen the tension mounting bolt (B).
2. Turn the adjusting bolt (C) to obtain the proper belt tension, and then retighten the mounting bolt (B).
3. Recheck the deflection of the A/C compressor belt.

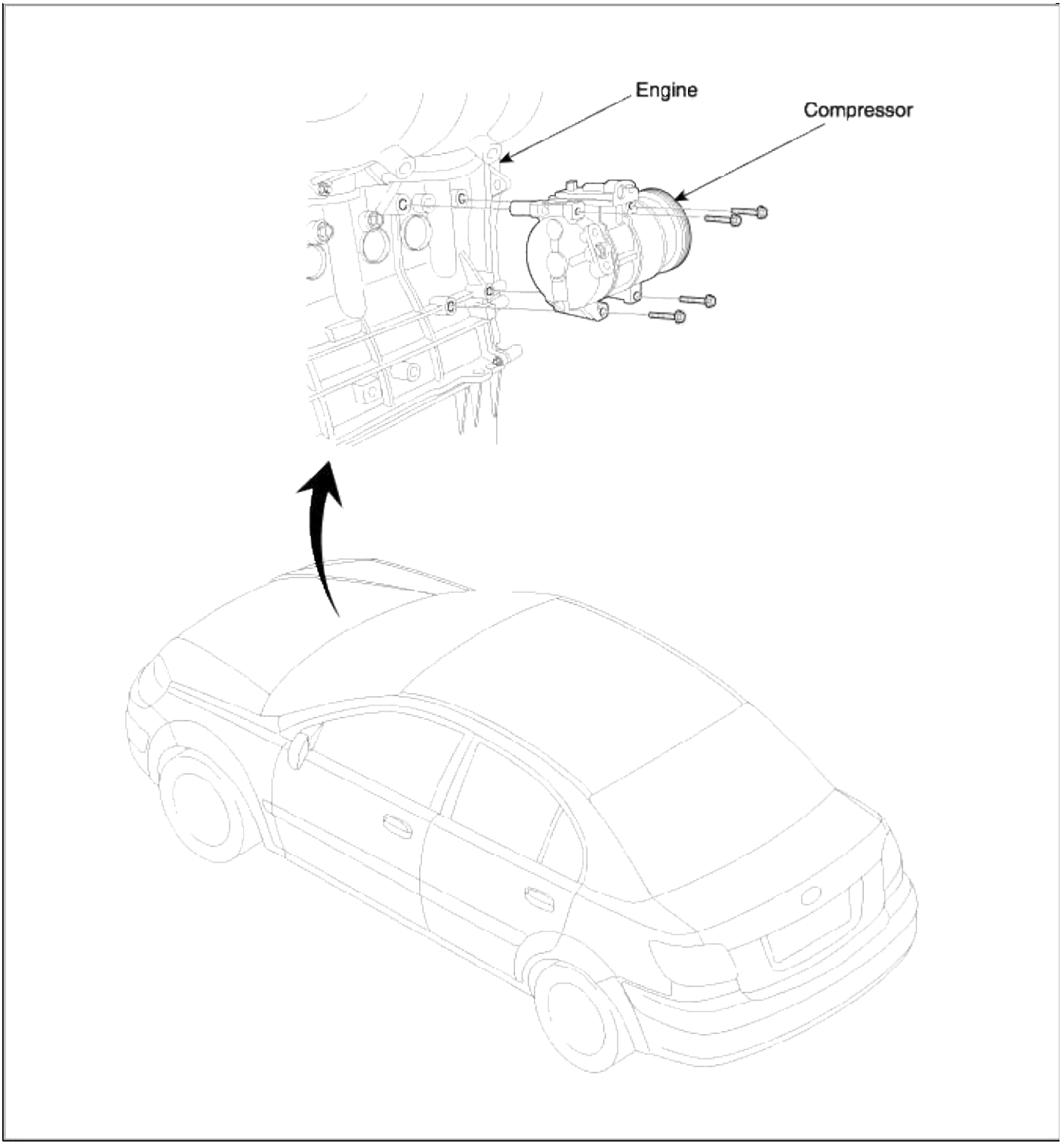


NOTE

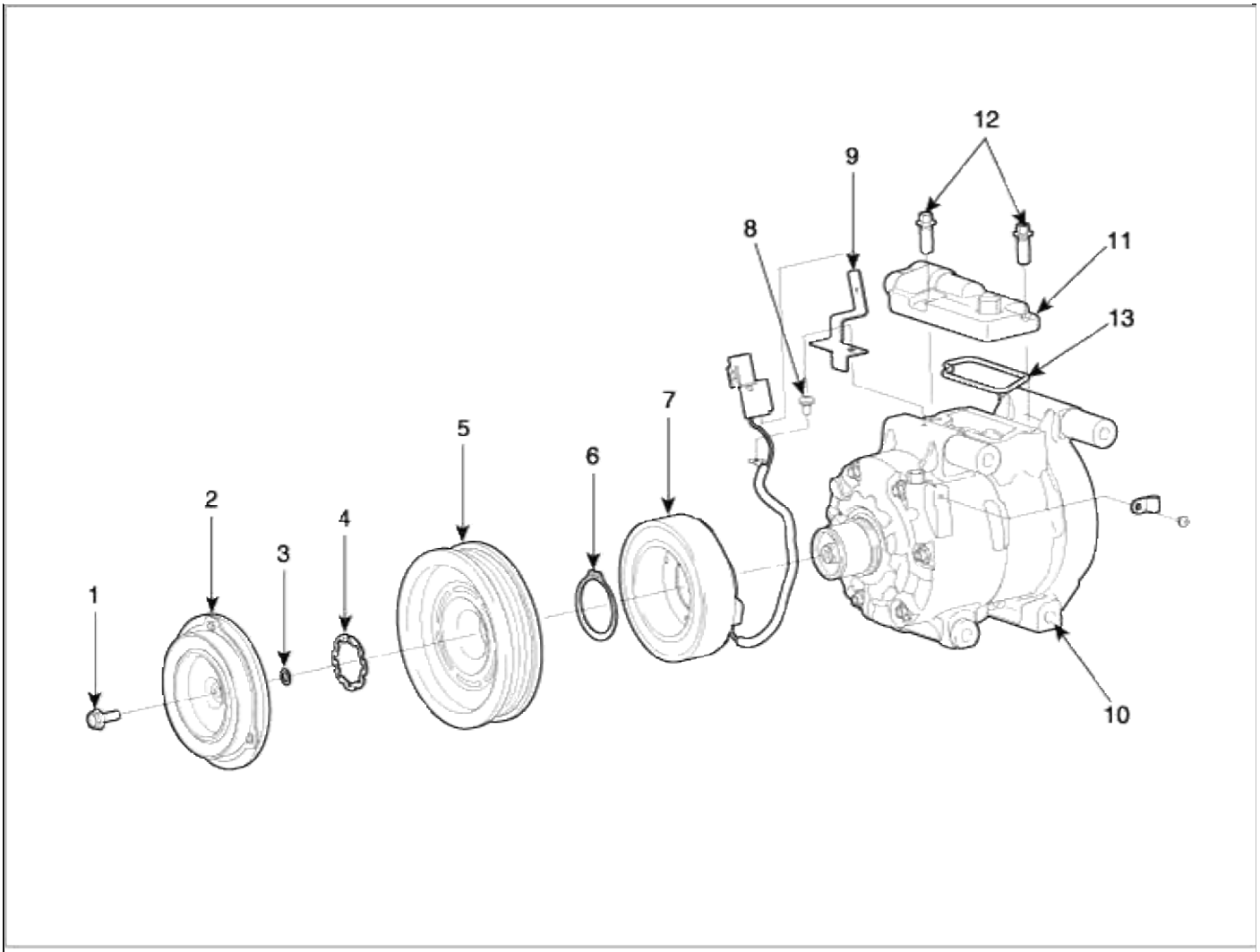
Do not adjustment the drive belt of Diesel engine.
Refer to EM group in case of Diesel engine.

Heating,Ventilation, Air Conditioning > Air conditioning System > Compressor > Components and Components Location

COMPONENT LOCATION



COMPONENT



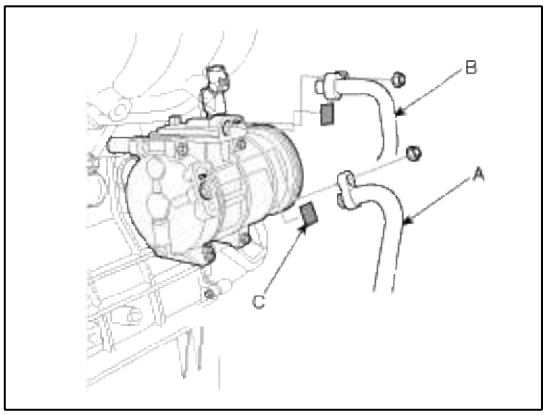
1. Bolt
2. Disc & hub assembly
3. Shim (Gap washer)
4. Retainer ring (Pulley)
5. Pulley
6. Retainer ring (Field coil)
7. Field coil
8. Screw
9. Connector bracket
10. Compressor assembly
11. Manifold
12. Bolt wrench
13. Gasket

Heating,Ventilation, Air Conditioning > Air conditioning System > Compressor > Repair procedures

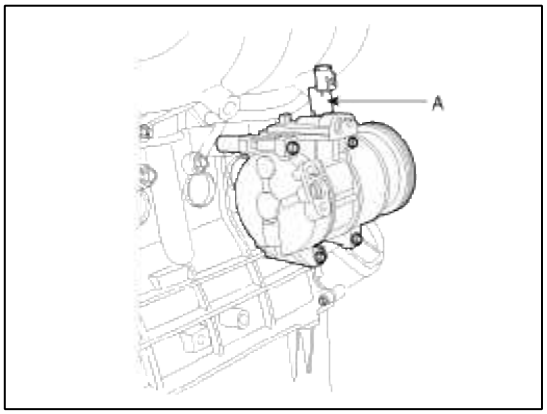
REMOVAL

1. If the compressor is marginally operable, run the engine at idle speed, and let the air conditioning work for a few minutes, then shut the engine off.
2. Disconnect the negative cable from the battery.
3. Recover the refrigerant with a recovery/charging station (Refer to HA-9).
4. Loosen the drive belt (Refer to HA-15).

5. Remove the bolts, then disconnect the suction line (A) and discharge line (B) from the compressor. Plug (C) or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.



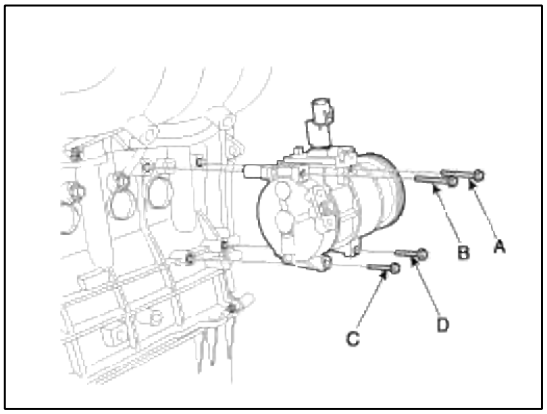
6. Disconnect the compressor clutch connector (A), and then remove 4 mounting bolts and the compressor.



INSTALLATION

1. Make sure of the length of compressor mounting bolts, and then tighten it A→B→C→D order.

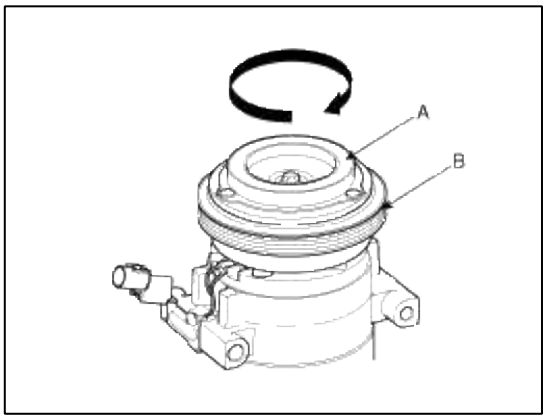
Bolt	α Engine (1.4, 1.6)	U Engine
A	132 mm (5.19in.)	109 mm (4.29in.)
B	132 mm (5.19in.)	100 mm (3.90in.)
C	100 mm (3.90in.)	100 mm (3.90in.)
D	100 mm (3.90in.)	100 mm (3.90in.)



2. Install in the reverse order of removal, and note these items.
   A. If you're installing a new compressor, drain all the refrigerant oil from the removed compressor, and measure its volume, Subtract the volume of drained oil from 120cc(4.20 oz.) the result is the amount of oil you should drain from the new compressor (through the suction fitting).
   B. Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
   C. To avoid contamination, do not return the oil to the container once dispensed, and never mix it with other refrigerant oils.
   D. Immediately after using the oil, replace the cap on the container and seal it to avoid moisture absorption.
   E. Do not spill the refrigerant oil on the vehicle; it may damage the paint; if the refrigerant oil contacts the paint, wash it off immediately.
   F. Adjust the drive belt. (Refer to HA-15)
   G. Charge the system and test its performance. (Refer to HA-11)

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.

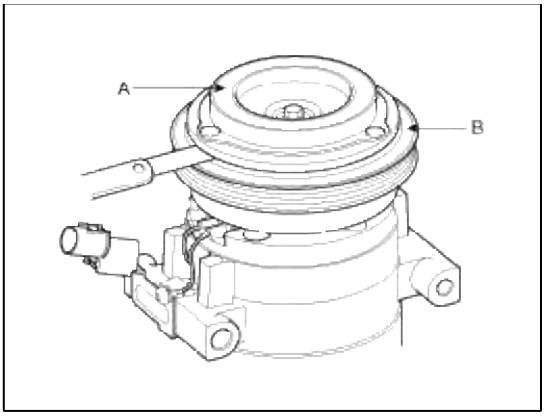


3. Measure the clearance between the pulley (B) and the disc & hub assembly (A) all the way around. If the clearance is not within specified limits, remove the disc & hub assembly and add or remove shim (gap washer) as needed to increase or decrease clearance.

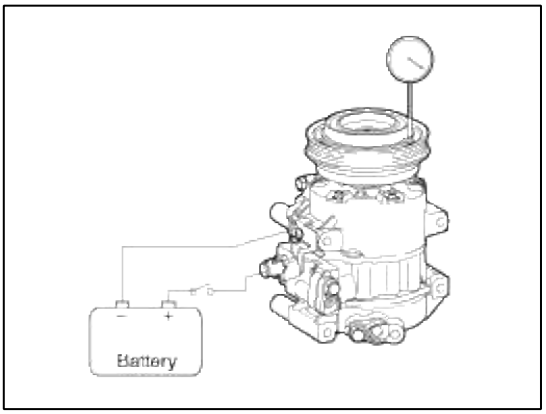
Clearance: 0.35 ± 0.65mm (0.013 ± 0.025 in.)

NOTE

The shims (gap washers) are available in seven thicknesses: 0.7mm, 0.8mm, 0.9mm, 1.0mm, 1.1mm, 1.2mm and 1.3mm.



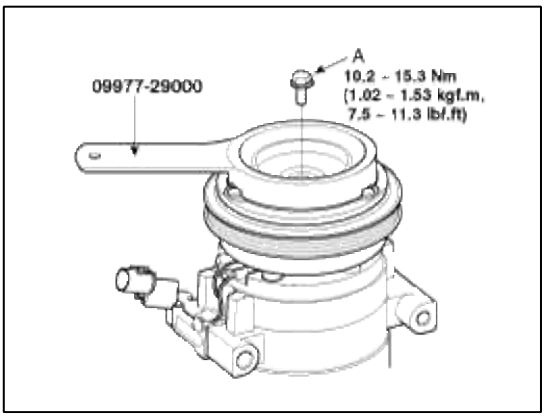
4. Check operation of the magnetic clutch.
   Connect the compressor side terminals to the battery (+) terminal and the ground battery (-) terminal to the compressor body.
   Check the magnetic clutch operating noise to determine the condition.



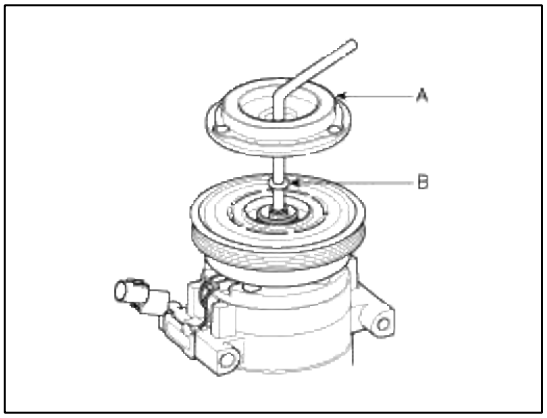
DISASSEMBLY

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, 7.37~11lbf.ft)



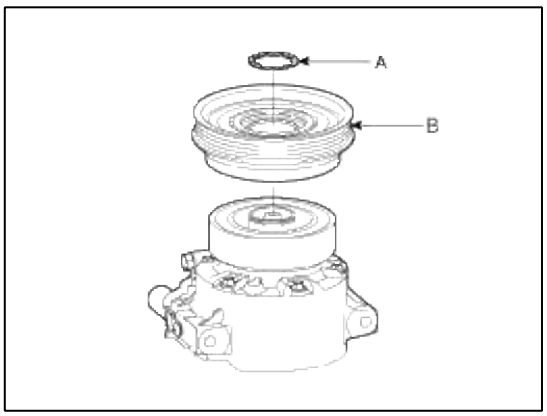
2. Remove the disc & hub assembly (A) and shim (gap washer) (B), taking care not to lose the shims. If the clutch needs adjustment, increase or decrease the number and thickness of shims as necessary, then reinstall the disc & hub assembly, and recheck its clearance (Refer to HA-20).



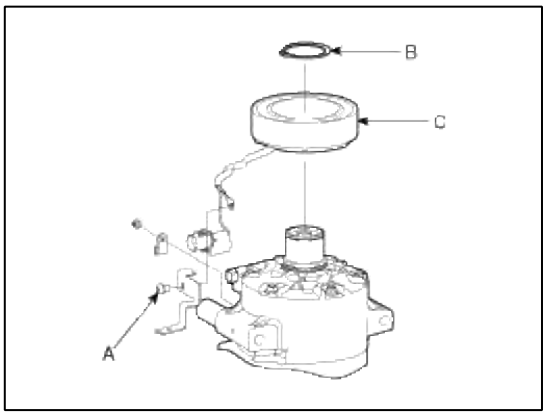
3. If you removal the field coil, remove retainer ring (A) with retainer ring pliers.

NOTE

- Be careful not to damage the pulley (B) and compressor during removal/installation.
- Once retainer ring (A) is removed, replace it with a new one.



4. Remove the screw (A) from the field coil ground terminal. Remove the retainer ring (B) and then remove the field coil (C) from the shaft with a puller. Be careful not to damage the coil and compressor.



5. Reassemble the compressor clutch in the reverse order of disassembly, and note these items :
   A. Clean the pulley and compressor sliding surfaces with non-petroleum solvent.
   B. Install new retainer rings, and make sure they are fully seated in the groove.
   C. Make sure that the pulley turns smoothly after its reassembled.

Heating,Ventilation, Air Conditioning > Air conditioning System > Compressor oil > Repair procedures

INSPECTION

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:
120±10cc (4.05±0.34 fl.oz) - α engine, U engine

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	60 cc (2.04 fl.oz)
Refrigerant line(One piece)	10 cc (0.34 fl.oz)

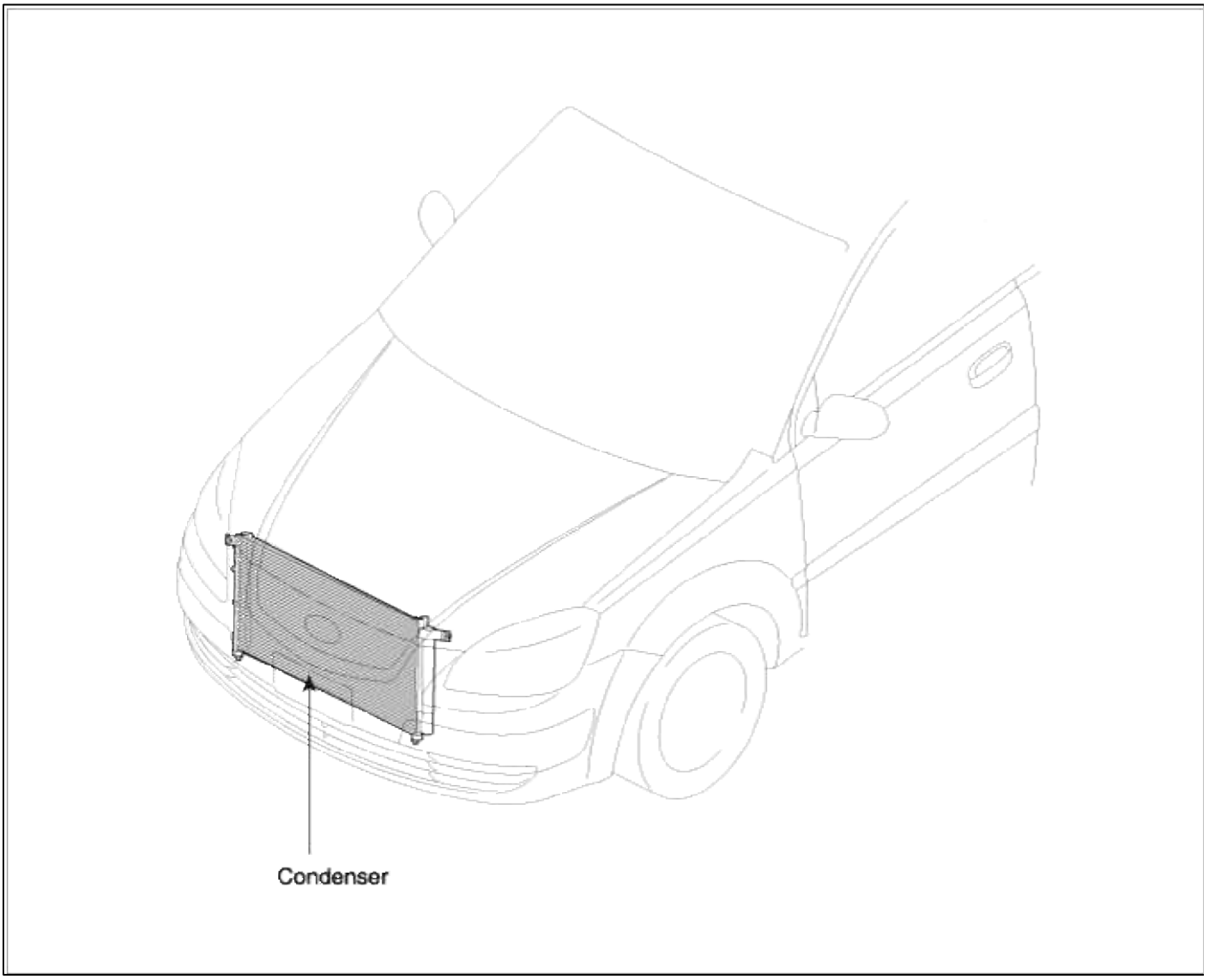
For compressor replacement, subtract the volume of oil drained from the removed compressor from the specified volume, and drain the calculated volume of oil from the new compressor :
The specified volume - volume of removed compressor = volume to drain from the new compressor.

NOTE

Even if no oil is drained from the removed compressor, don't drain more than 50cc from new compressor.

Heating,Ventilation, Air Conditioning > Air conditioning System > Condenser > Components and Components Location

COMPONENT LOCATION



Heating,Ventilation, Air Conditioning > Air conditioning System > Condenser > Repair procedures

INSPECTION

1. Check the condenser fins for clogging and damage. If clogged, clean them with water, and blow them with compressed air. If bent, gently bend them using a screwdriver or pliers.
2. Check the condenser connections for leakage, and repair or replace it, if required.

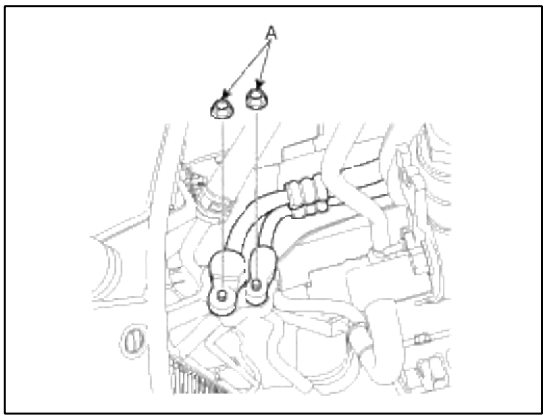
REPLACEMENT

CONDENSER ASSEMBLY

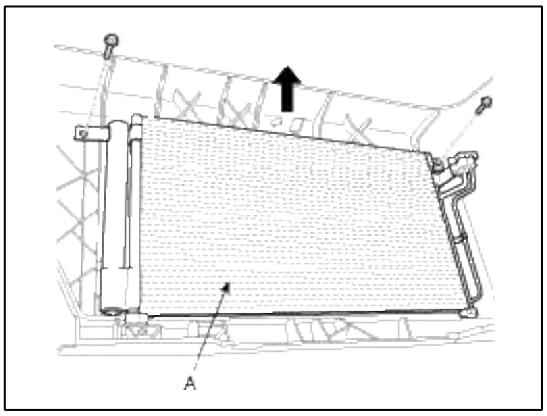
1. Recover the refrigerant with a recovery/ recycling/ charging station (Refer to HA-9).
2. Disconnect the negative (-) battery terminal.
3. Remove the radiator. (Refer to EM group)

4. 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, 5.9~8.7lbf.ft)



5. Remove 2 bolts, and then remove the condenser (A) by lifting it up. Be careful not to damage the radiator and condenser fins when removing the condenser.

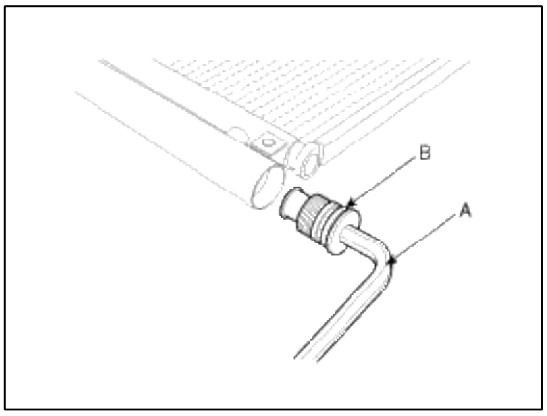


6. Install in the reverse order of removal, and note these items :
   A. If you're installing a new condenser, add refrigerant oil ND-OIL8.
   B. Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
   C. Be careful not to damage the radiator and condenser fins when installing the condenser.
   D. Be sure to install the lower mount cushions of condenser securely into the holes.
   E. Charge the system, and test its performance. (Refer to HA-11)

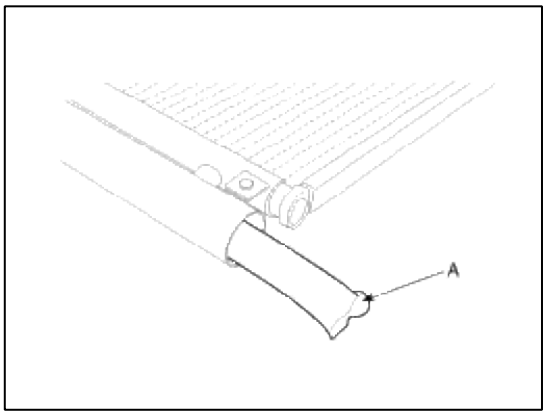
DESICCANT

1. Remove the condenser, and then remove the bottom cap (B) with L wrench (A) from the condenser.

   TORQUE: 20~25N.m (2.0~2.5kgf.m, 14.5~18.2lb-ft)



2. Remove the desiccant (A) from condenser using a long nose plier. Check for crumbled desiccant and clogged bottom cap filter.



3. Apply air conditioning compressor oil along the O-rings and threads of the new bottom cap.
4. Insert the new desiccant into the receiver drier tank. The desiccant must not be removed from its packaging until installation time.
5. Install the new bottom cap to the condenser.

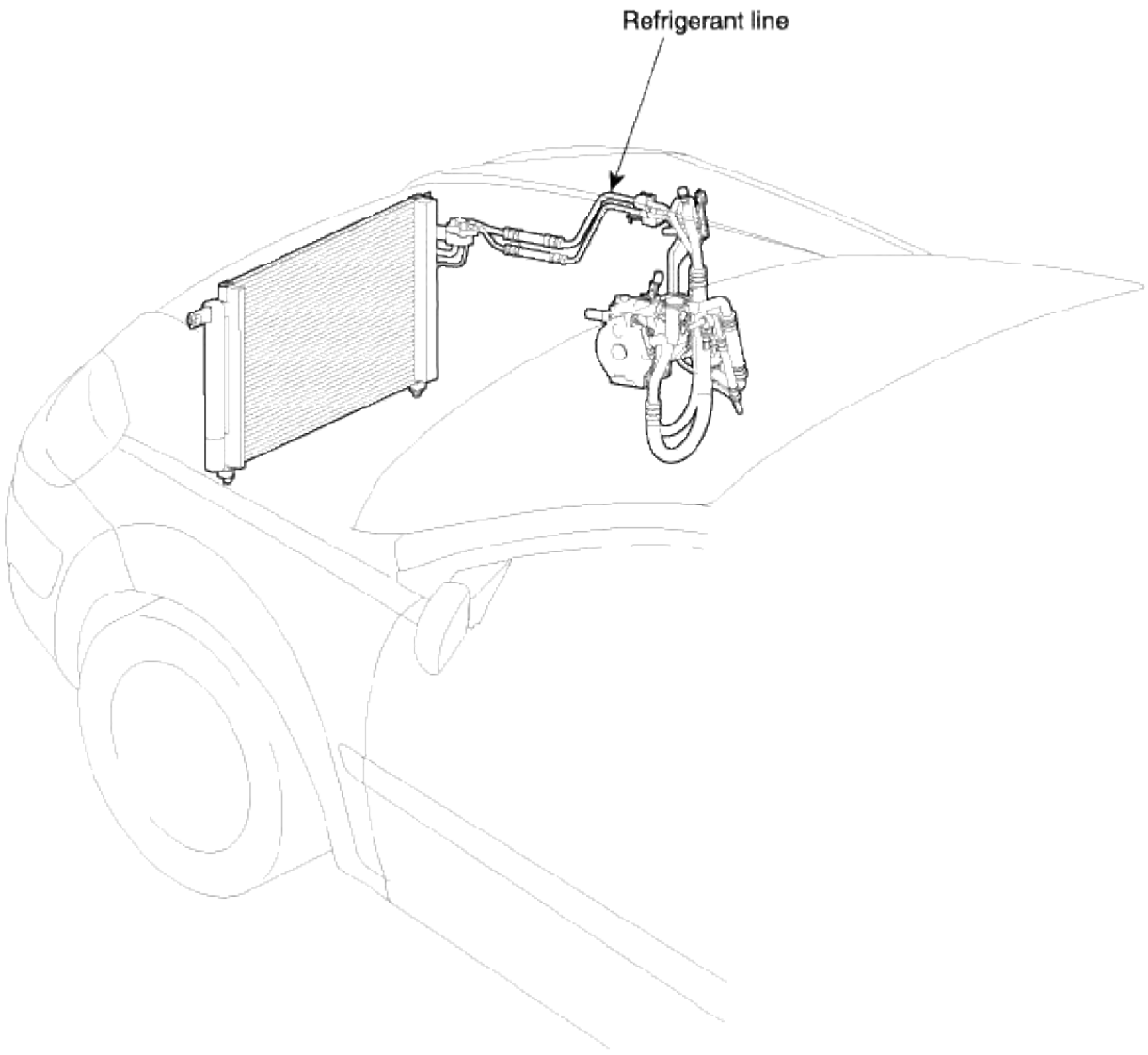
NOTE

- Always replace the desiccant and bottom cap at the same time.
- Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
- Be careful not to damage the radiator and condenser fins when installing the condenser.
- Be sure to install the lower mount cushions of condenser securely into the holes.
- Charge the system, and test its performance. (Refer to HA-11)

Heating,Ventilation, Air Conditioning > Air conditioning System > Refrigerant line > Components and Components Location

COMPONENT LOCATION

[Gasoline]



Heating,Ventilation, Air Conditioning > Air conditioning System > Refrigerant line > Repair procedures

REPLACEMENT

1. Discharge refrigerant from refrigeration system (Refer to HA-9).
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 x Discharge hose	8 ~ 12	0.8~1.2	5.8 ~ 8.7
Condenser x Liquid tube			
Compressor x Discharge hose			
Compressor x Suction hose			
Expansion valve x Evaporator			

4. Evacuate air in refrigeration system and charge system with refrigerant (Refer to HA-9).

Specified amount: 500 ± 25g

5. Inspect for leakage of refrigerant.
   Using a gas leak detector, check for leakage of refrigerant (Refer to HA-9).
6. Inspect A/C operation.

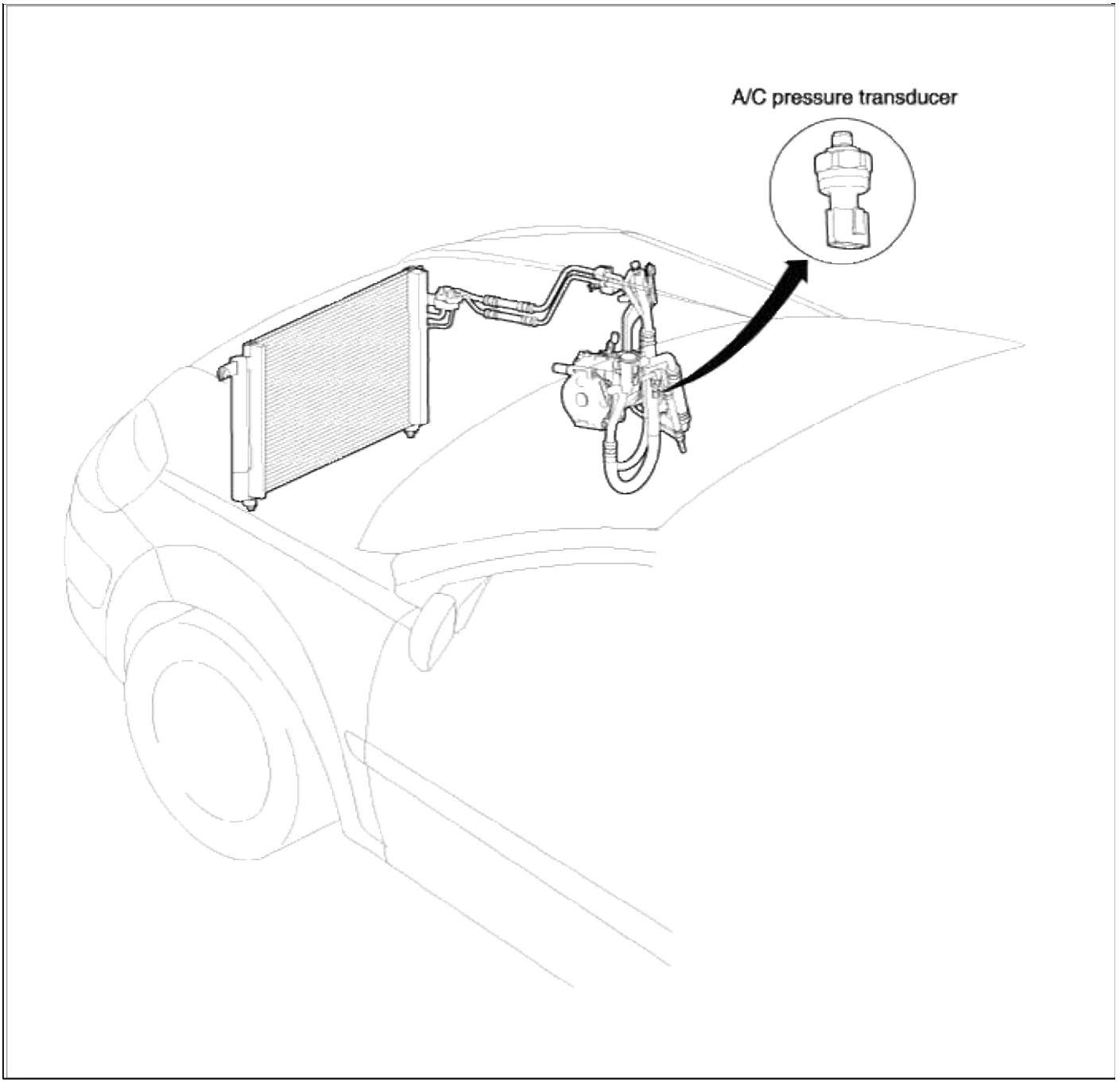
Heating,Ventilation, Air Conditioning > Air conditioning System > A/C pressure transducer > Description and Operation

DESCRIPTION

The A/C pressure transducer provides a voltage signal to the ECM/PCM that is used for compressor clutch and cooling/condenser fan control.

Heating,Ventilation, Air Conditioning > Air conditioning System > A/C pressure transducer > Components and Components Location

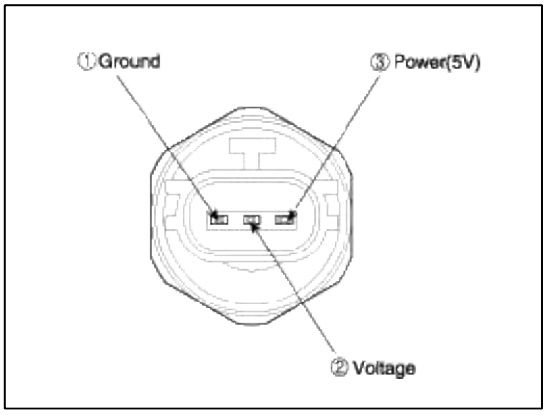
COMPONENT LOCATION



Heating,Ventilation, Air Conditioning > Air conditioning System > A/C pressure transducer > Repair procedures

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.

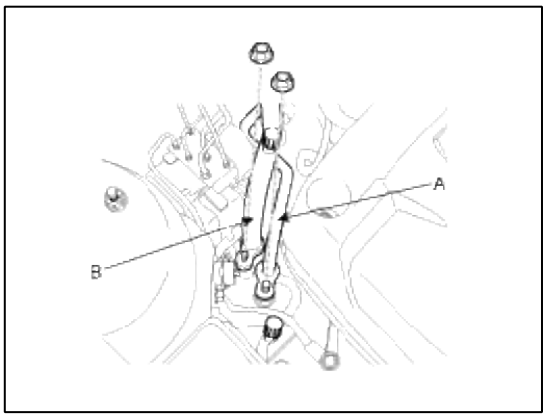
Voltage = 0.00878835 * Pressure + 0.037081095 [PSIA]

3. If the measured voltage value is not specification, replace the A/C pressure transducer.

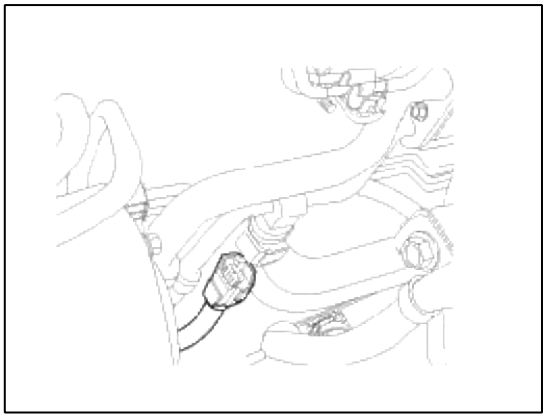
REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Recover the refrigerant with a recovery/charging station. (Refer to HA-9)
3. Remove the discharge line (A) & suction line (B) for wide space.

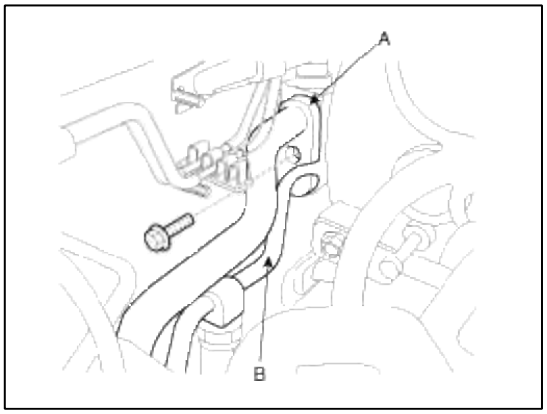
TORQUE: 8~12N.m (0.8~1.2kgf.m, 5.8~8.7lbf.ft)



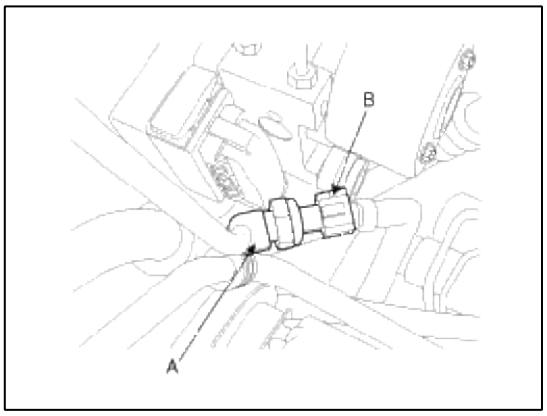
4. Disconnect A/C pressure transducer connector (3P) (A).



5. Remove the bolt, then disconnect the liquid/suction pipe (A) from the expansion valve.



6. Remove the A/C pressure transducer (B) while holding on to the fitting block (A).



CAUTION

Take care that liquid & suction pipe are not bent.

7. Installation is the reverse order of removal.

TORQUE: 10~12N.m (1.0~1.2kgf.m, 7.4~8.8lbf.ft)

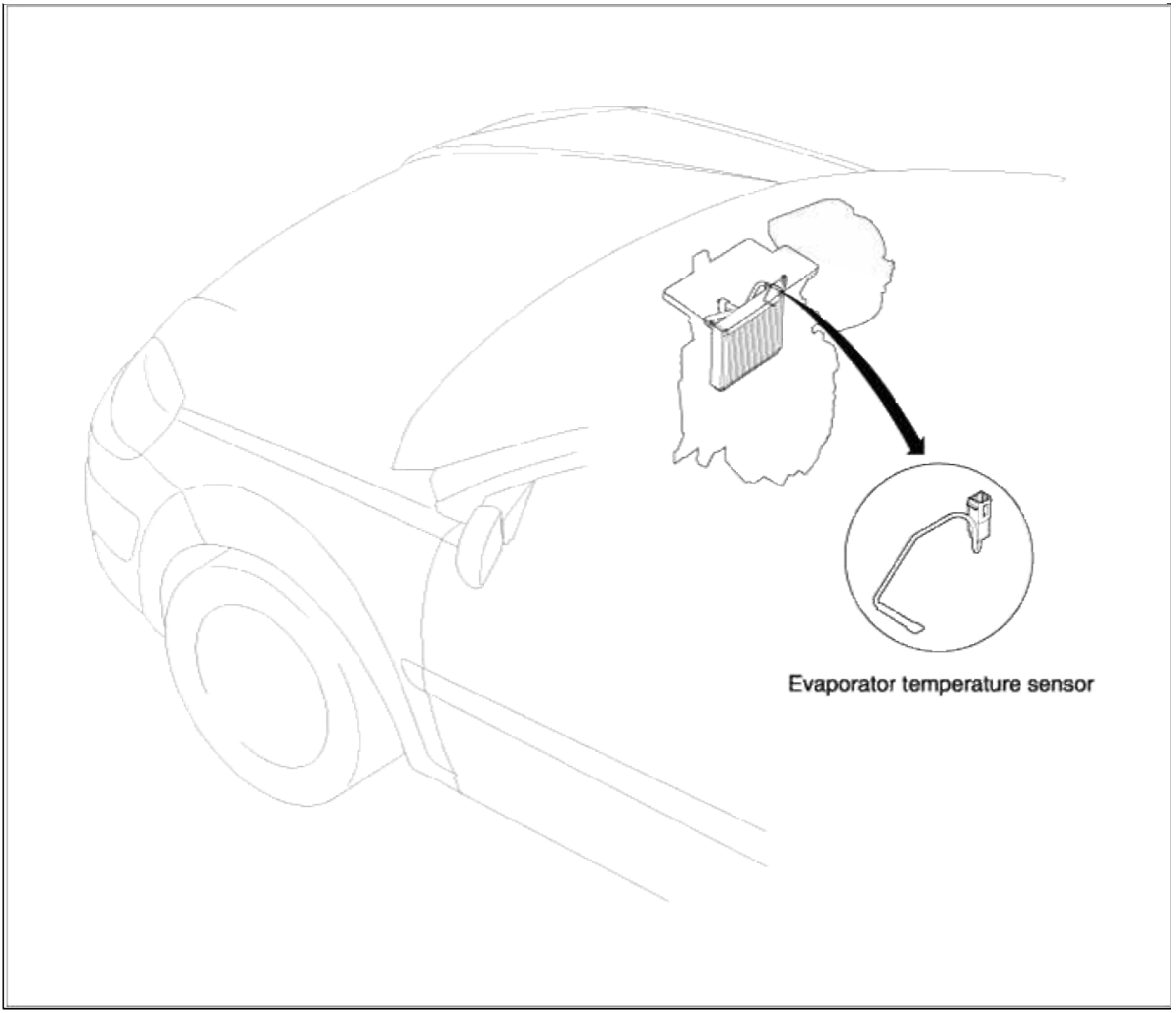
Heating,Ventilation, Air Conditioning > Air conditioning System > Evaporator temperature sensor > Description and Operation

DESCRIPTION

The evaporator temperature sensor will detect the evaporator core temperature and interrupt compressor relay power in order to prevent evaporator freezing by excessive cooling.
It is a negative type thermistor whose resistance is inversely proportional to temperature.

Heating,Ventilation, Air Conditioning > Air conditioning System > Evaporator temperature sensor > Components and Components Location

COMPONENT LOCATION



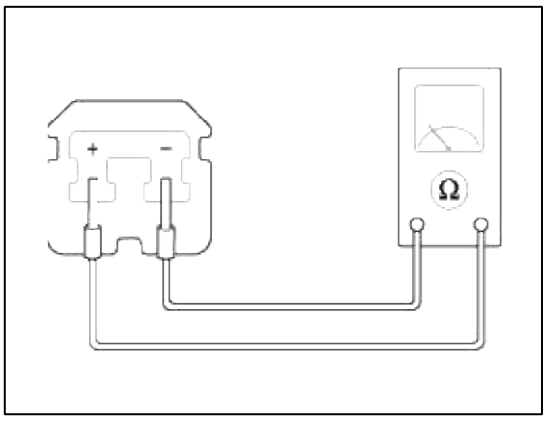
Heating,Ventilation, Air Conditioning > Air conditioning System > Evaporator temperature sensor > Repair procedures

INSPECTION

1. Ignition "ON"
2. A/C switch “ON”.

3. Using the multi-tester, Measure resistance between terminal "1" and "2" of evaporator temperature sensor.
[Specification]

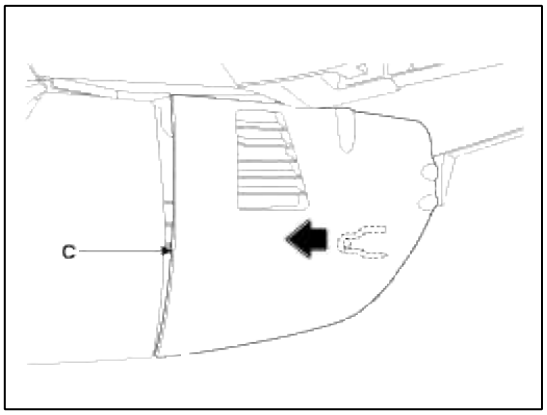
Evaporator core temperature [°C(°F)]	Resistance [KΩ]
-2(28.4)	30.16
0(32.0)	27.62 ± 1%
2(35.6)	25.32
4(39.2)	23.24
6(42.8)	21.35



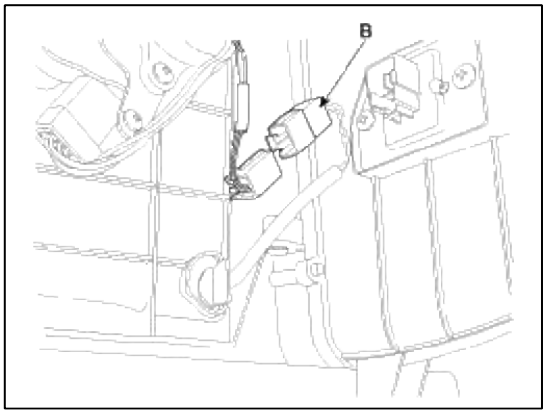
4. If the measured resistance is not specification, substitute with a known-good evaporator temperature sensor and check for proper operation.
5. If the problem is corrected, replace the evaporator temperature sensor.

REPLACEMENT

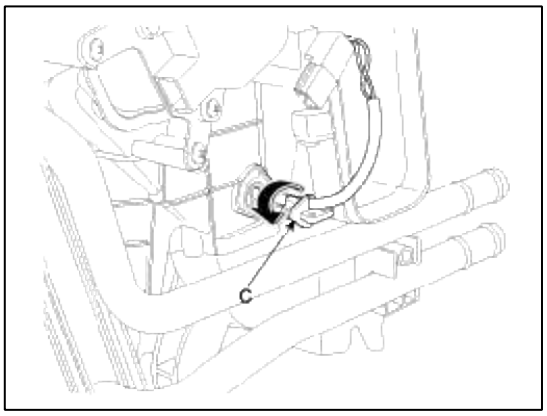
1. Disconnect the negative (-) battery terminal.
2. Remove the passenger's crash pad lower cover(C).



3. Disconnect the evaporator sensor connector (A).



4. Remove the evaporator temperature sensor (B) by pulling it after rotating 90° in a counterclockwise direction.



CAUTION

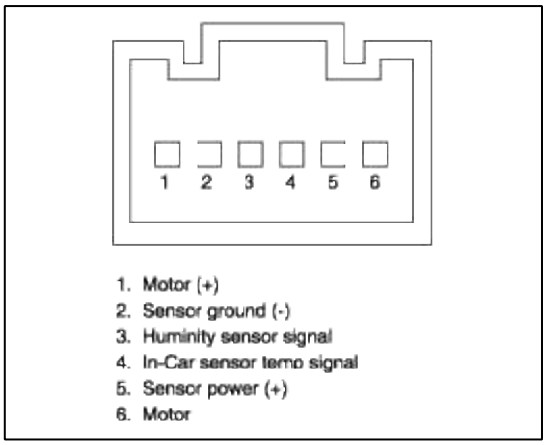
Take care that evaporator core pins are not bent.

5. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Air conditioning System > In-car sensor > Description and Operation

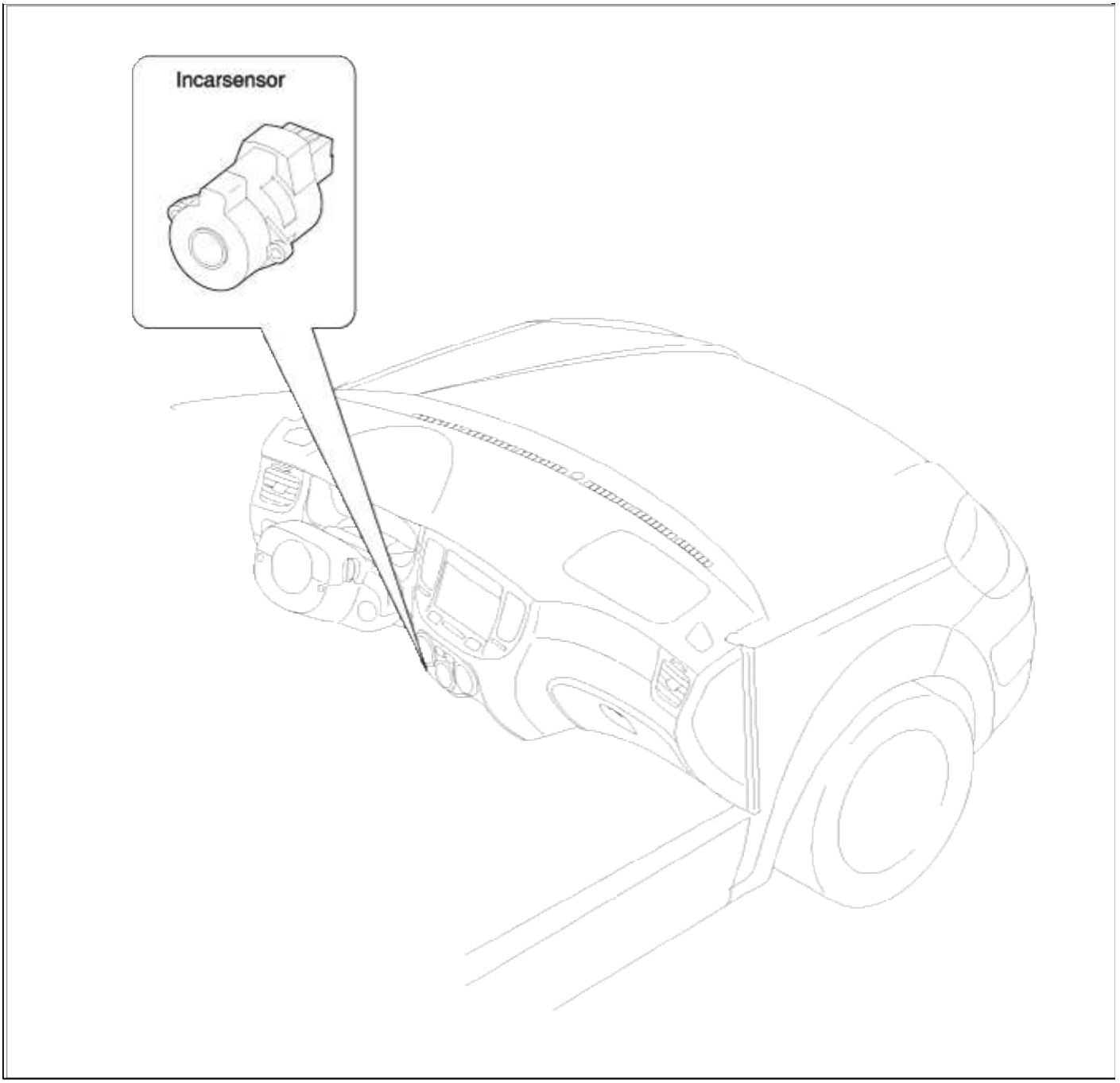
DESCRIPTION

1. In-car air temperature sensor is located at the center facia lower panel.
2. The sensor contains a thermistor which measures the temperature of the inside. The signal decided by the resistance value which changes in accordance with perceived inside temperature, is delivered to heater control unit and according to this signal the control unit regulates incar temperature to intended value.



Heating,Ventilation, Air Conditioning > Air conditioning System > In-car sensor > Components and Components Location

COMPONENT LOCATION



Heating,Ventilation, Air Conditioning > Air conditioning System > In-car sensor > Repair procedures

INSPECTION

1. Ignition "ON"

2. Blow air with changing temperature to the in car sensor air inlet. Measure sensor resistance between 2 and 4 terminals.

[Specification]

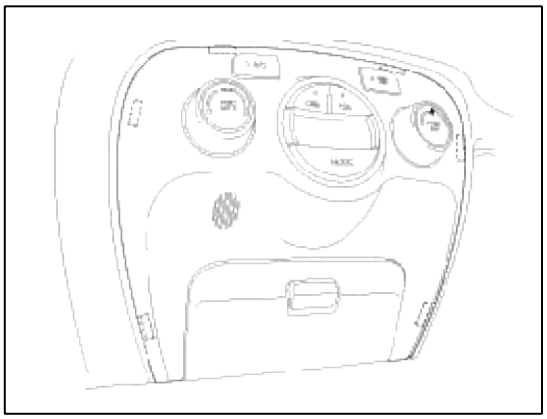
Temperature [°C(°F)]	Resistance between terminals 2and 4 (kΩ)
0 (32)	97.83 ± 2.61%
15 (59)	47.12 ± 1.45%
25 (77)	30.00 ± 1.20%
35 (95)	19.60 ± 1.44%
50 (122)	10.82 ± 2.26%

NOTE

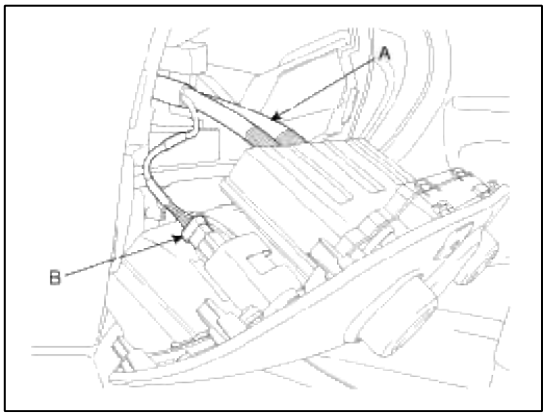
In car sensor is negative type thermistor that resistance will rise with lower temperature, and reduce with higher temperature.

REPLACEMENT

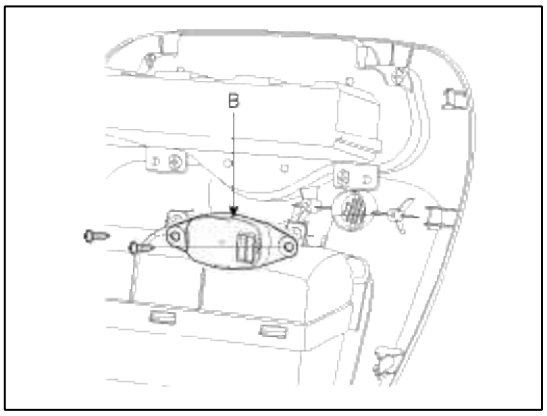
1. Disconnect the negative (-) battery terminal.
2. Remove the center facia lower panel.



3. Remove the controller connector(A), incar sensor connector(B).



4. Loosen the mounting 2 screws and then remove the in-car sensor (B).



5. Installation is the reverse order of removal.

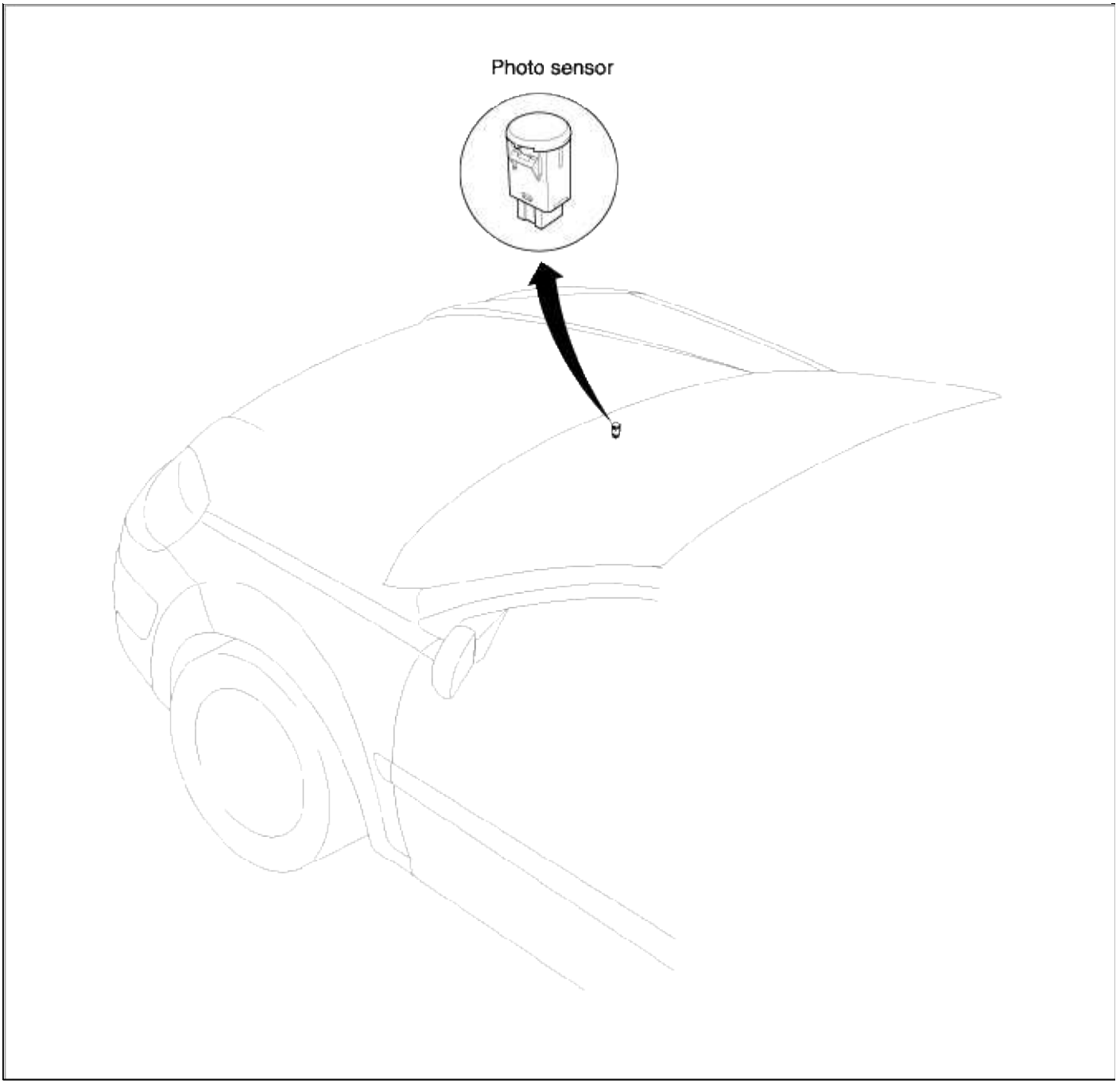
Heating,Ventilation, Air Conditioning > Air conditioning System > Photo sensor > Description and Operation

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.

Heating,Ventilation, Air Conditioning > Air conditioning System > Photo sensor > Components and Components Location

COMPONENT LOCATION

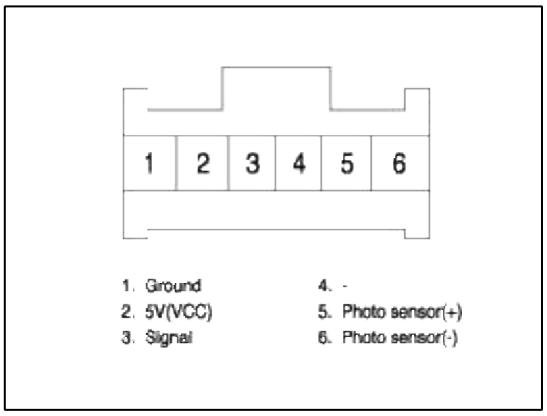


Heating,Ventilation, Air Conditioning > Air conditioning System > Photo sensor > Repair procedures

INSPECTION

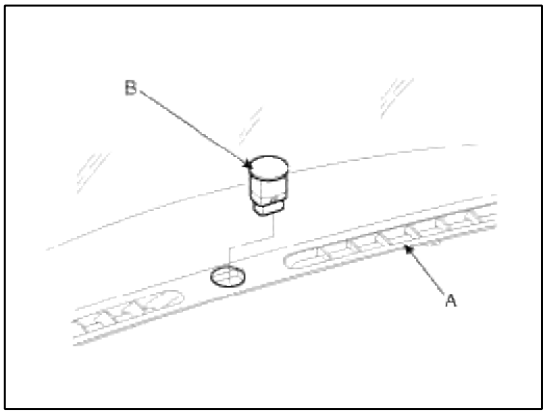
1. Ignition "ON"
2. Using the scan tool.
3. Emit intensive light toward photo sensor using a lamp, and check the output voltage change.

4. The voltage will rise with higher intensive light and reduce with lower intensive light.



REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. With the (-) driver, remove the photo sensor (B) from the center of defrost nozzle (A).

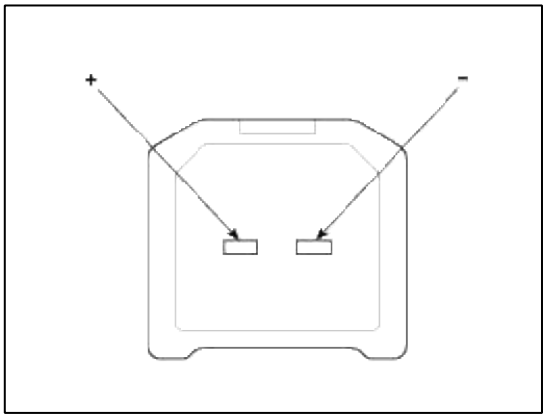


3. Install in the reverse order of removal.

Heating,Ventilation, Air Conditioning > Air conditioning System > Water temperature sensor > Description and Operation

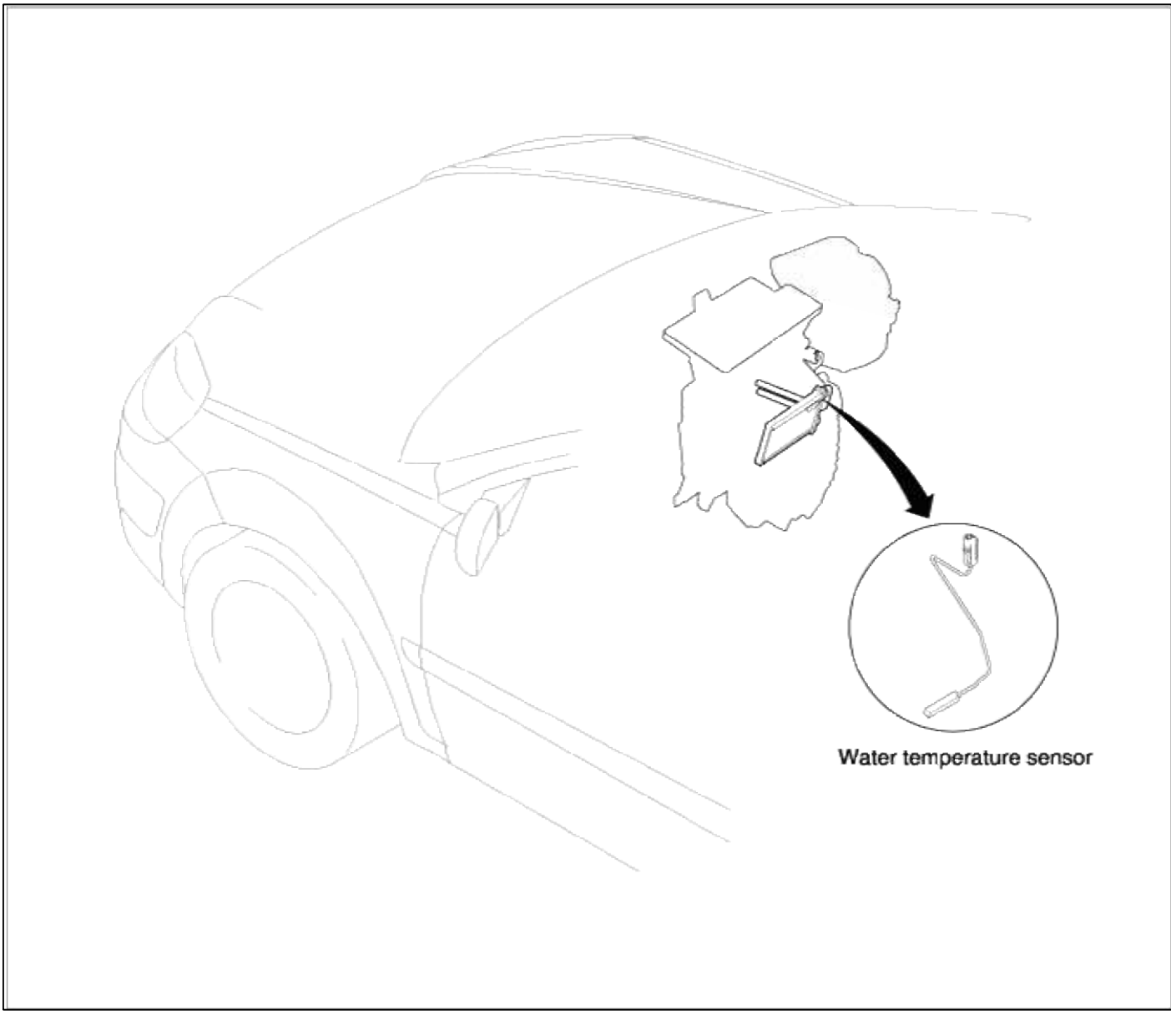
DESCRIPTION

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.



Heating,Ventilation, Air Conditioning > Air conditioning System > Water temperature sensor > Components and Components Location

COMPONENT LOCATION

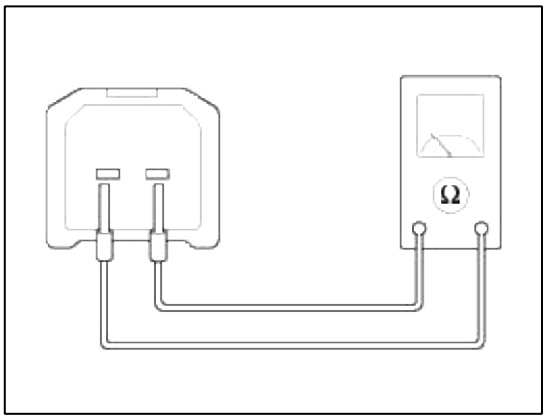


Heating,Ventilation, Air Conditioning > Air conditioning System > Water temperature sensor > Repair procedures

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%

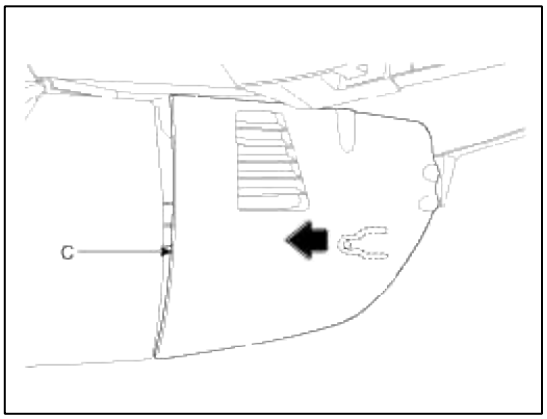
3. If the measured resistance is not specification, substitute with a known-good water temperature sensor and check for proper operation.
4. If the problem is corrected, replace the water temperature sensor.

NOTE

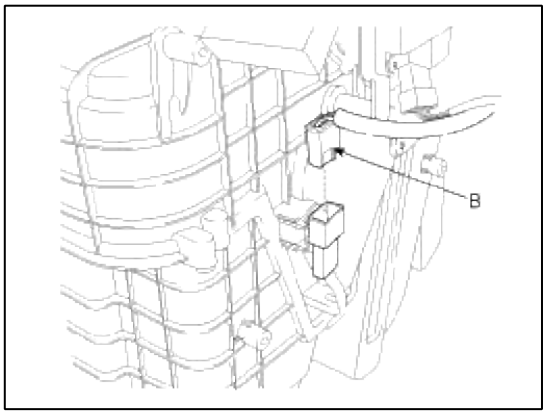
Negative type thermistor that resistance will rise with lower temperature, and reduce with higher temperature.

REPLACEMENT

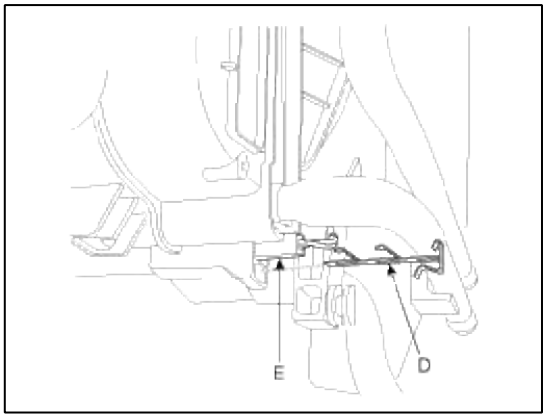
1. Disconnect the negative (-) battery terminal.
2. Remove the passenger's crash pad lower cover(C).



3. Disconnect the water temperature sensor connector (B).



4. Pull the water temperature sensor(E) out at the heater unit with the stopper(D).



5. Installation is the reverse order of removal.

NOTE

Take care that wire of water temperature sensor is not to be damaged.

Heating,Ventilation, Air Conditioning > Air conditioning System > Ambient sensor > Description and Operation

DESCRIPTION

1. The ambient temperature sensor is located at the front of the condenser and detects ambient air temperature. It is a negative type thermistor; resistance will increase with lower temperature, and decrease with higher temperatures.

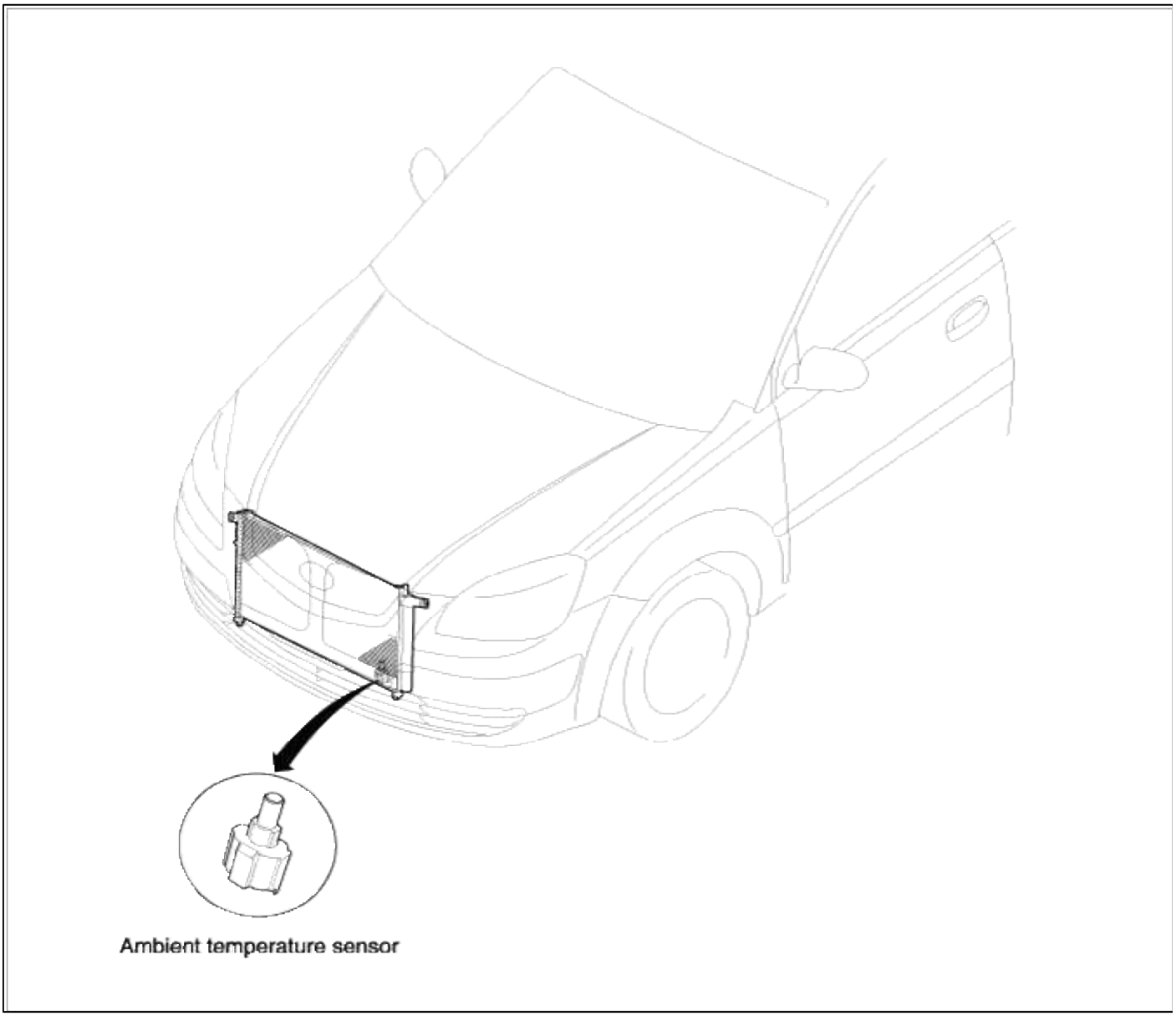
2. The sensor output will be used for discharge temperature control, temperature regulation door control, blower motor level control, mix mode control and in-car humidity control.

NOTE

If the ambient temperature is below 2.0°C (35.6°F), the A/C compressor will be stopped.
The compressor will be operated by manual operating.

Heating,Ventilation, Air Conditioning > Air conditioning System > Ambient sensor > Components and Components Location

COMPONENT LOCATION



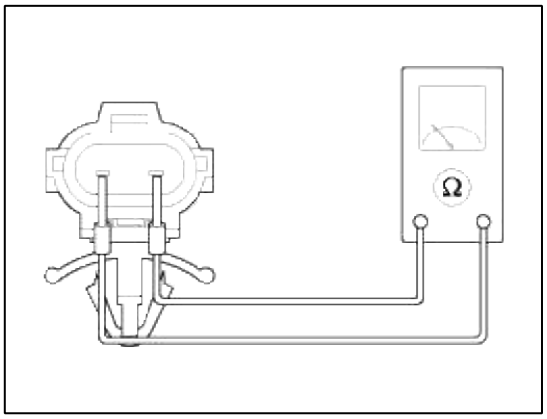
Heating,Ventilation, Air Conditioning > Air conditioning System > Ambient sensor > Repair procedures

INSPECTION

1. Ignition "OFF"
2. Disconnect ambient temperature sensor.

3. Check the resistance of ambient temperature sensor between terminals 1 and 2 whether it is changed by changing of the ambient temperature.
   [Specification]

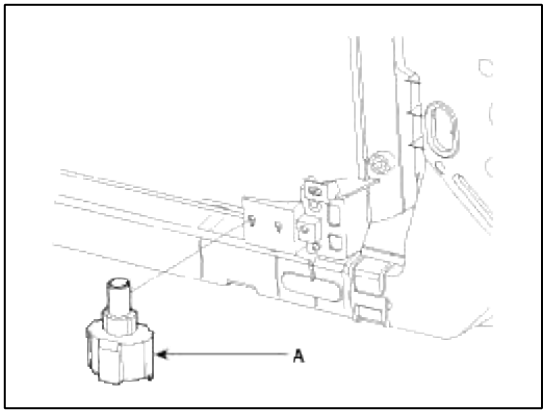
Ambient temperature [°C(°F)]	Resistance between terminals 1and 2 (kΩ)
-10(14	164 ± 3%
0 (32)	97.5 ± 3%
10 (50)	59.6 ± 3%
20 (68)	37.5 ± 3%



4. If the measured resistance is not specification, substitute with a known-good ambient temperature sensor and check for proper operation.
5. If the problem is corrected, replace the ambient temperature sensor.

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper. (Refer to BD group)
3. Remove the ambient temperature sensor (A).



4. Installation is the reverse order of removal.

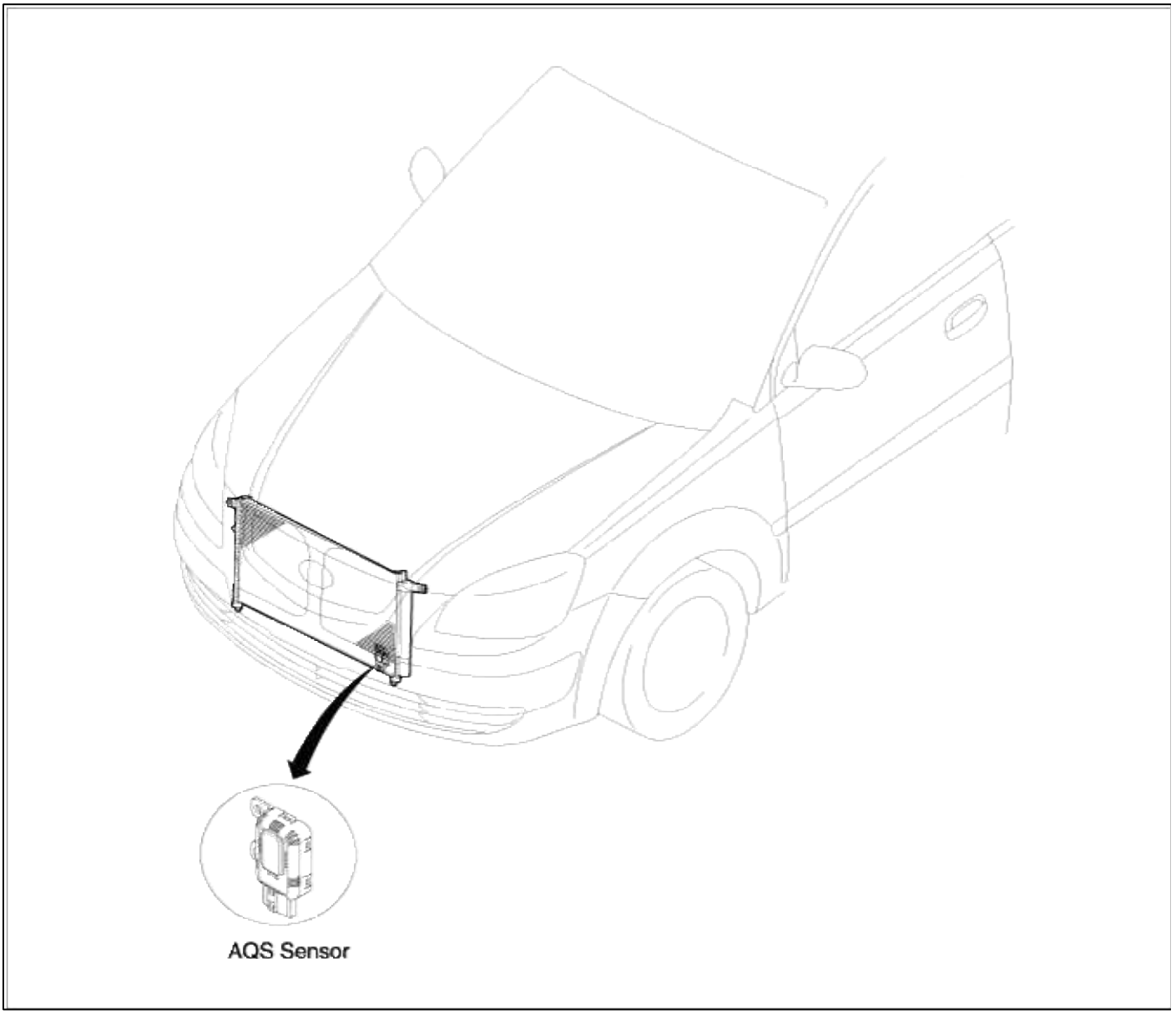
Heating,Ventilation, Air Conditioning > Air conditioning System > Air Quality Sensor(AQS) > Description and Operation

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.

Heating,Ventilation, Air Conditioning > Air conditioning System > Air Quality Sensor(AQS) > Components and Components Location

COMPONENT LOCATION



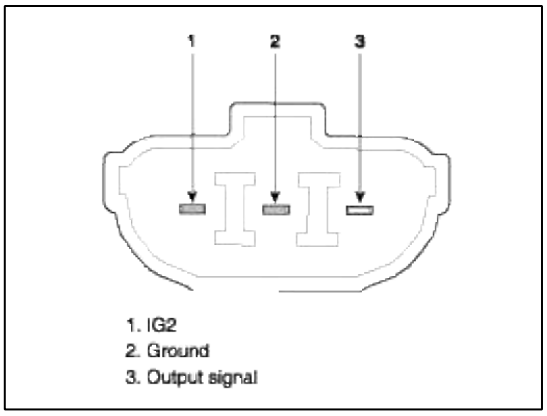
Heating,Ventilation, Air Conditioning > Air conditioning System > Air Quality Sensor(AQS) > Repair procedures

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
Normal condition	4 ~ 5V	Fresh
Hazardous gas detection	0 ~ 1V	Recirculation



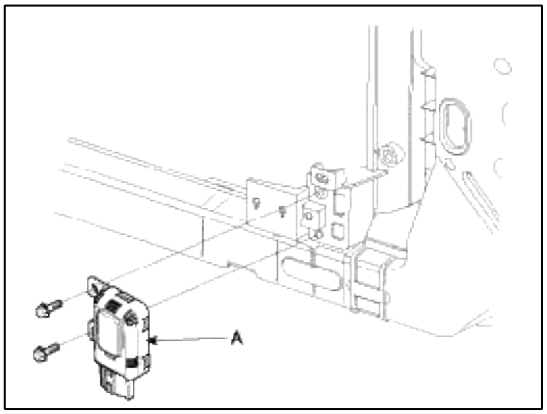
4. AQS diagnosis and fail safe.
Detect the open of signal for 7 seconds without choosing the AQS switch when IG on.
If 2.5V or more is detected for 3.5 seconds or more among 7 seconds, be judged the open of AQS signal.
Operate as below fail safe function, while choosing AQS.
Fail safe: Release the AQS (AQS cannot be selected), Fresh/recirculation maintains previous situation of AQS selection.

NOTE

When IG is turned ON, AQS heats for 34±5 seconds, it will output below 1.0 voltage during this time.

REPLACEMENT

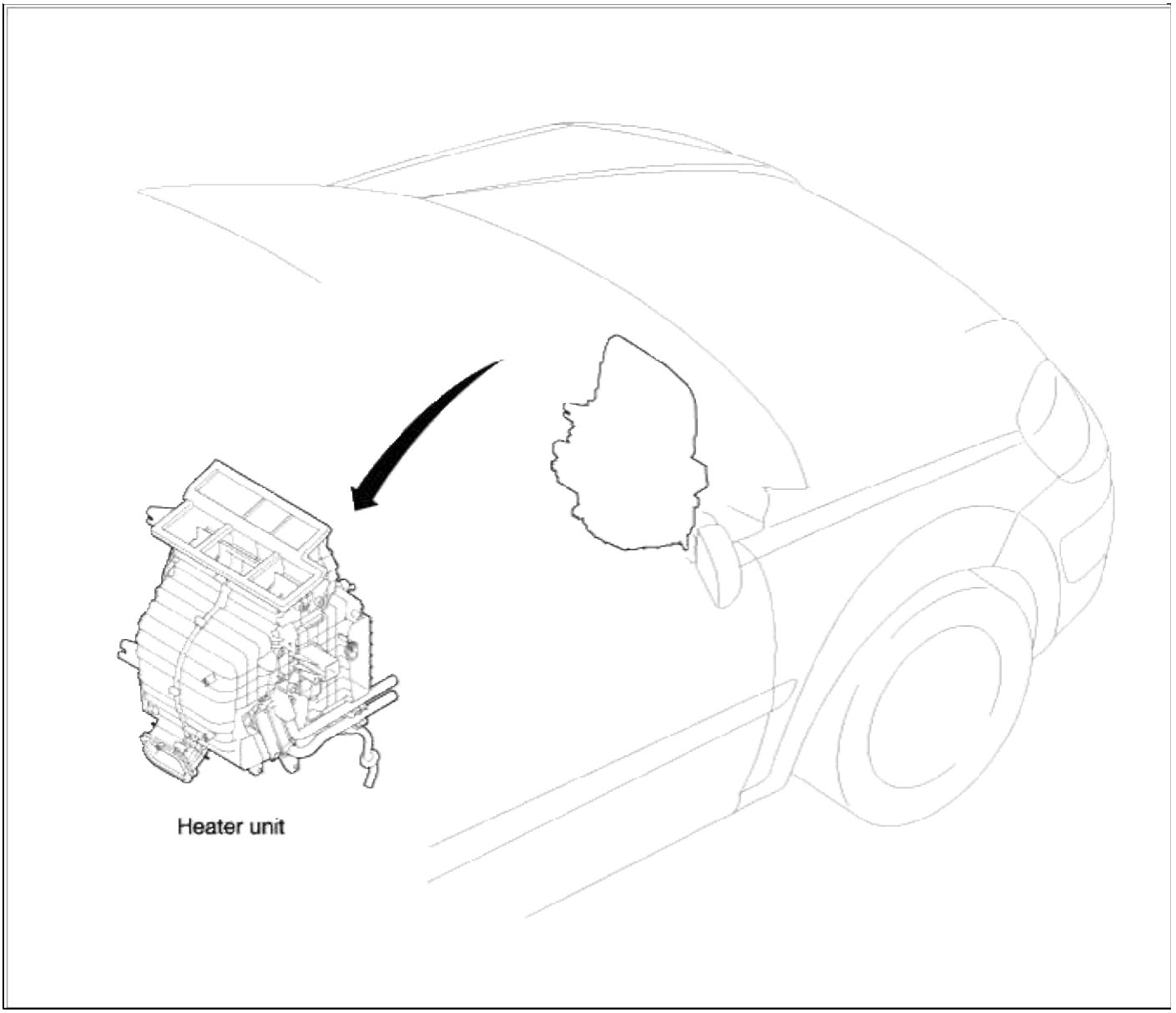
1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper (Refer to BD group).
3. Remove the AQS (B) after loosening the mounting bolts (A).



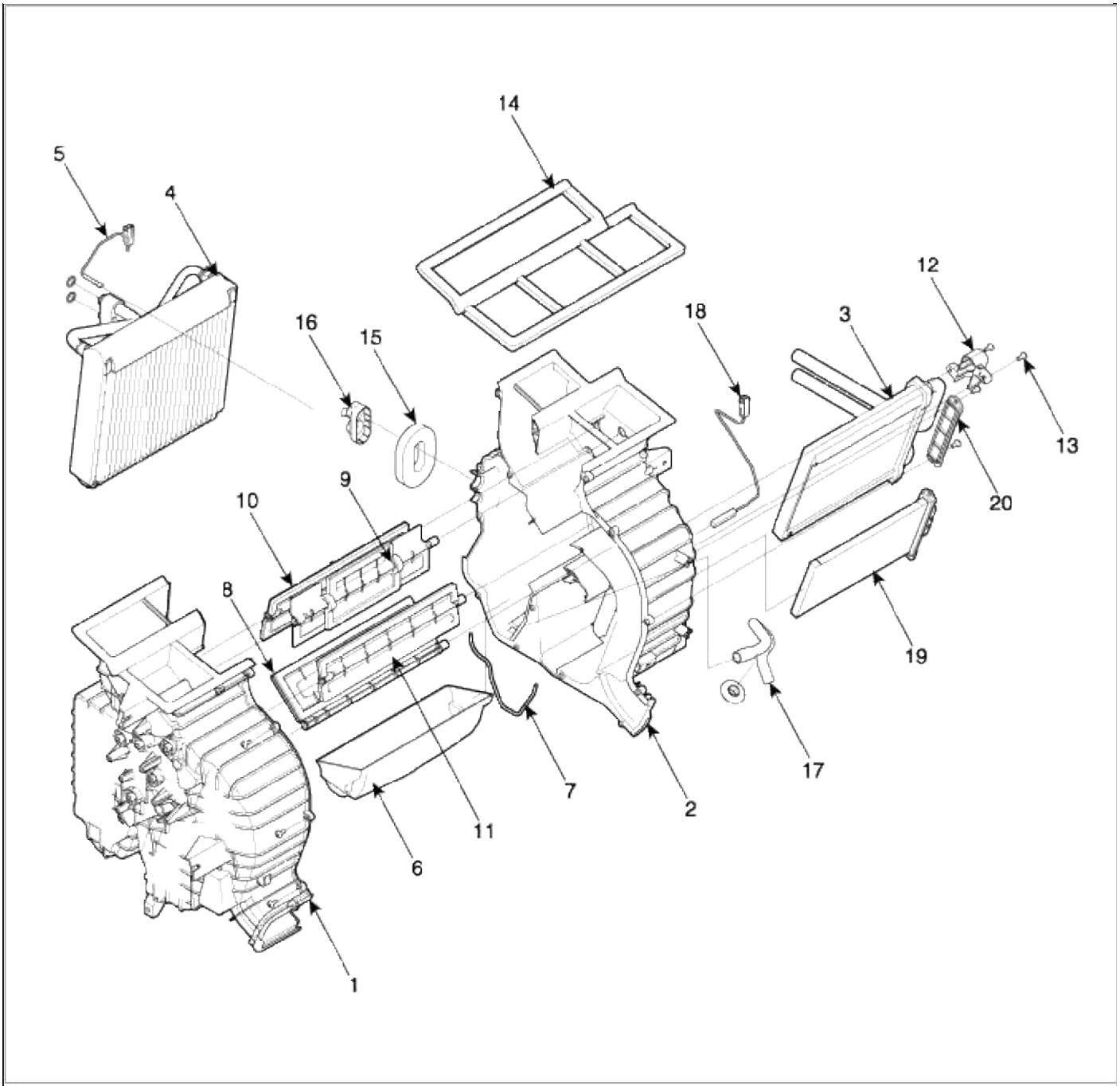
4. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Heater > Heater Unit > Components and Components Location

COMPONENT LOCATION



COMPONENTS



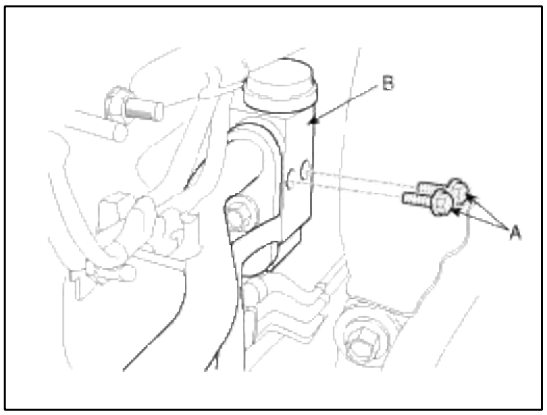
1. Heater case (L)	8. Temp door assembly	15. Flange seal
2. Heater case (R)	9. Vent door assembly	16. Flange cap
3. Heater core assembly	10. Defrost door assembly	17. Drain hose assembly
4. Evaporator assembly	11. Foot door assembly	18. Water temperature sensor
5. Evaporator sensor	12. Heater core cover	19. PTC heater
6. Lower case seal	13. Tapping screw	20. PTC heater cover
7. Insert case seal	14. Duct seal	

Heating,Ventilation, Air Conditioning > Heater > Heater Unit > Repair procedures

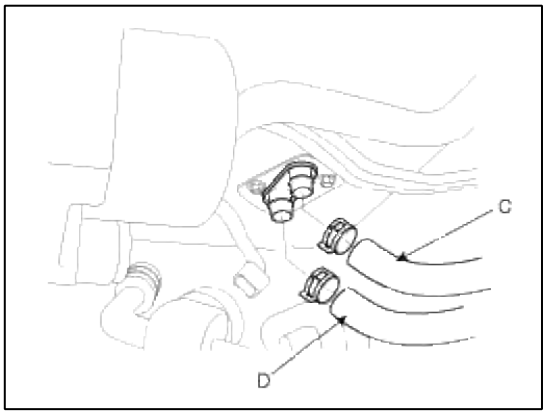
REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Recover the refrigerant with a recovery/ recycling/ charging station. (Refer to HA-8)
3. When the engine is cool, drain the engine coolant from the radiator.

4. Remove the bolts (A) and the expansion valve (B) from the evaporator core.
   Plug or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.



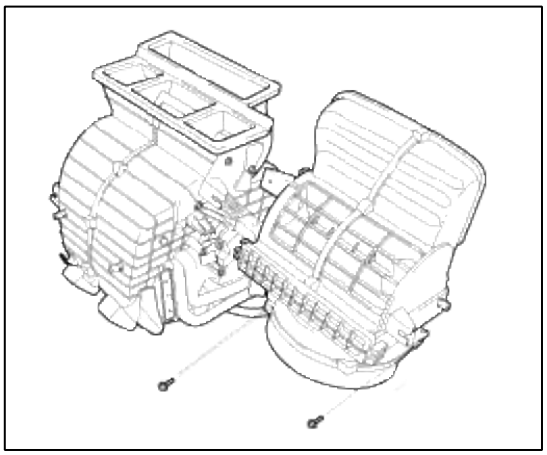
5. Disconnect the inlet (A) and outlet (B) heater hoses from the heater unit.



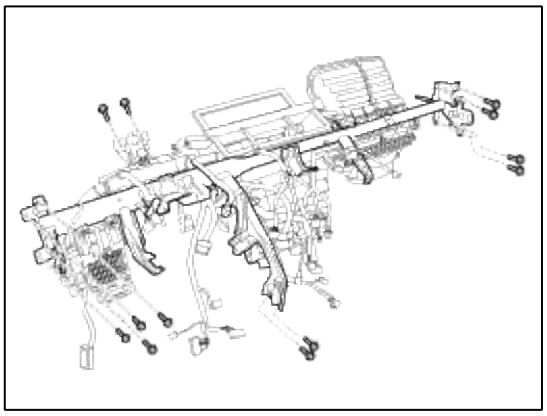
CAUTION

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.

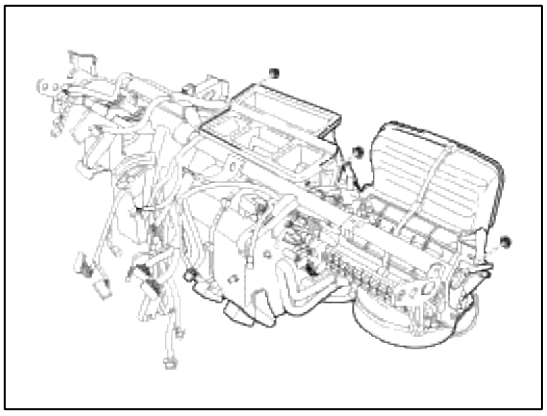
6. Remove the crash pad (Refer to BD group).
7. Remove the cowl cross bar assembly. (Refer to BD group)
8. Disconnect the connectors from the temperature control actuator, the mode control actuator and the evaporator temperature sensor.
9. Remove the heater & blower unit after loosening 2 mounting bolts.



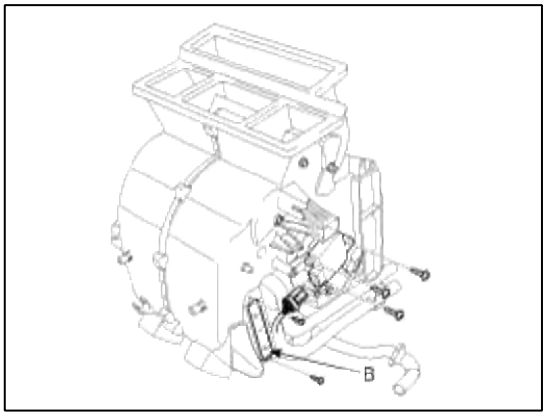
10. Unscrew 12 bolts and then remove the cowl cross bar and heater & blower unit assembly simultanously.



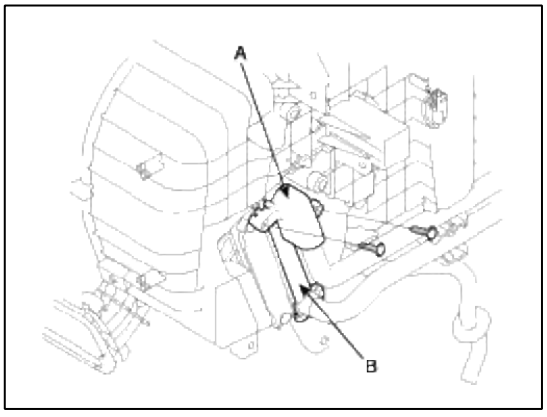
11. Disconnect the heater and blower unit from the cowl cross bar assembly.



12. Remove the self-tapping screws (A) and remove the PTC heater unit (B) or cover. (In case of PTC heater)



13. Remove the heater core (B) after remove the cover (A).



14. Be careful that the inlet and outlet pipe are not bent during heater core removal, and pull out the heater core.
15. Install the heater core in the reverse order of removal.

16. Installation is the reverse order of removal, and note these items :
    A. If you're installing a new evaporator, add refrigerant oil (ND-OIL8).
    B. Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
    C. Immediately after using the oil, replace the cap on the container, and seal it to avoid moisture absorption.
    D. Do not spill the refrigerant oil on the vehicle ; it may damage the paint ; if the refrigerant oil contacts the paint, wash it off immediately
    E. Apply sealant to the grommets.
    F. Make sure that there is no air leakage.
    G. Charge the system and test its performance.
    H. Do not interchange the inlet and outlet heater hoses and install the hose clamps securely.
    I. Refill the cooling system with engine coolant.

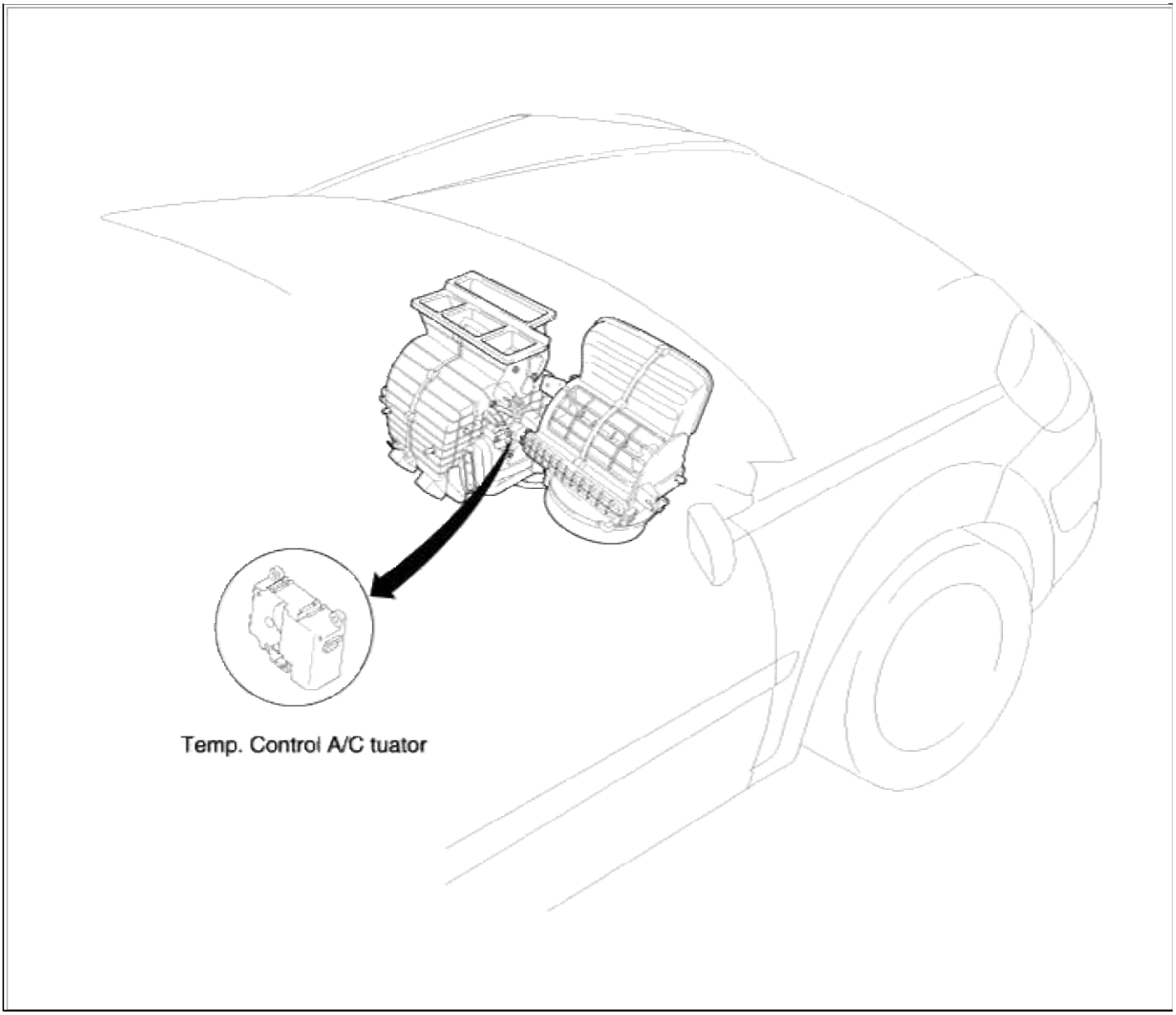
Heating,Ventilation, Air Conditioning > Heater > Temperature Control Actuator > Description and Operation

DESCRIPTION

1. Heater unit includes mode control actuator and temperature control actuator.
2. Temperature control actuator is located at the heater unit. It regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temperature door by operating temperature switch and then temperature will be regulated by the hot/cold air ratio decided by position of temperature door

Heating,Ventilation, Air Conditioning > Heater > Temperature Control Actuator > Components and Components Location

COMPONENT LOCATION

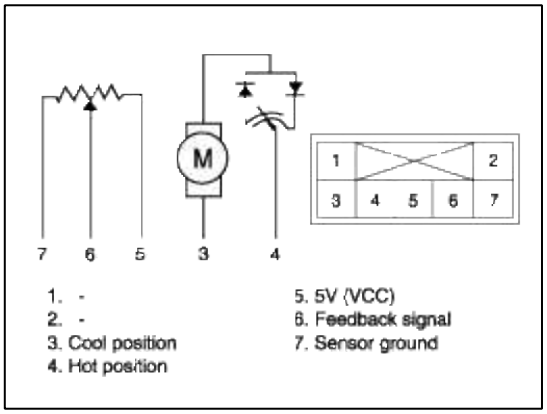


Heating,Ventilation, Air Conditioning > Heater > Temperature Control Actuator > Repair procedures

INSPECTION

1. Ignition "OFF"
2. Disconnect the connector of temperature control actuator.

3. Verify that the temperature control actuator operates to the hot position when connecting 12V to the terminal 3 and grounding terminal 4.
   Verify that the temperature control actuator operates to the cool position when connecting in the reverse.



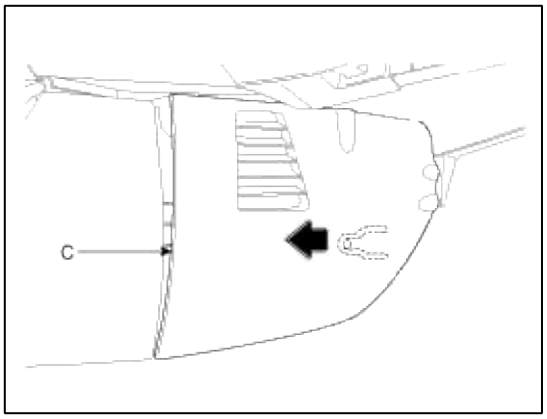
[Specification]

Door position	Voltage (6-7)	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.
4. If the measured voltage is not specification, substitute with a known-good temperature control actuator and check for proper operation.
5. If the problem is corrected, replace the temperature control actuator.

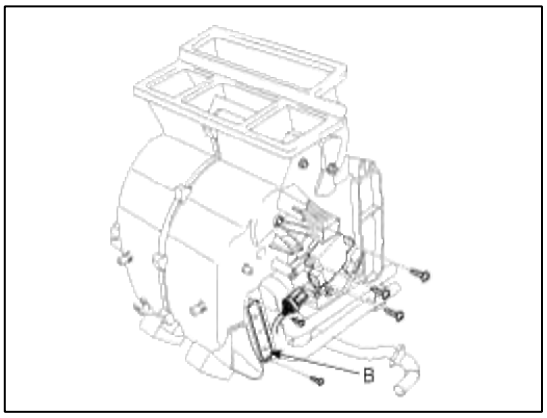
REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the passenger's crush pad lower cover(C).



3. Disconnect the temperature control actuator connector (A).

4. Loosen the mounting screw and then remove the temperature control actuator (B).



5. Installation is the reverse order of removal.

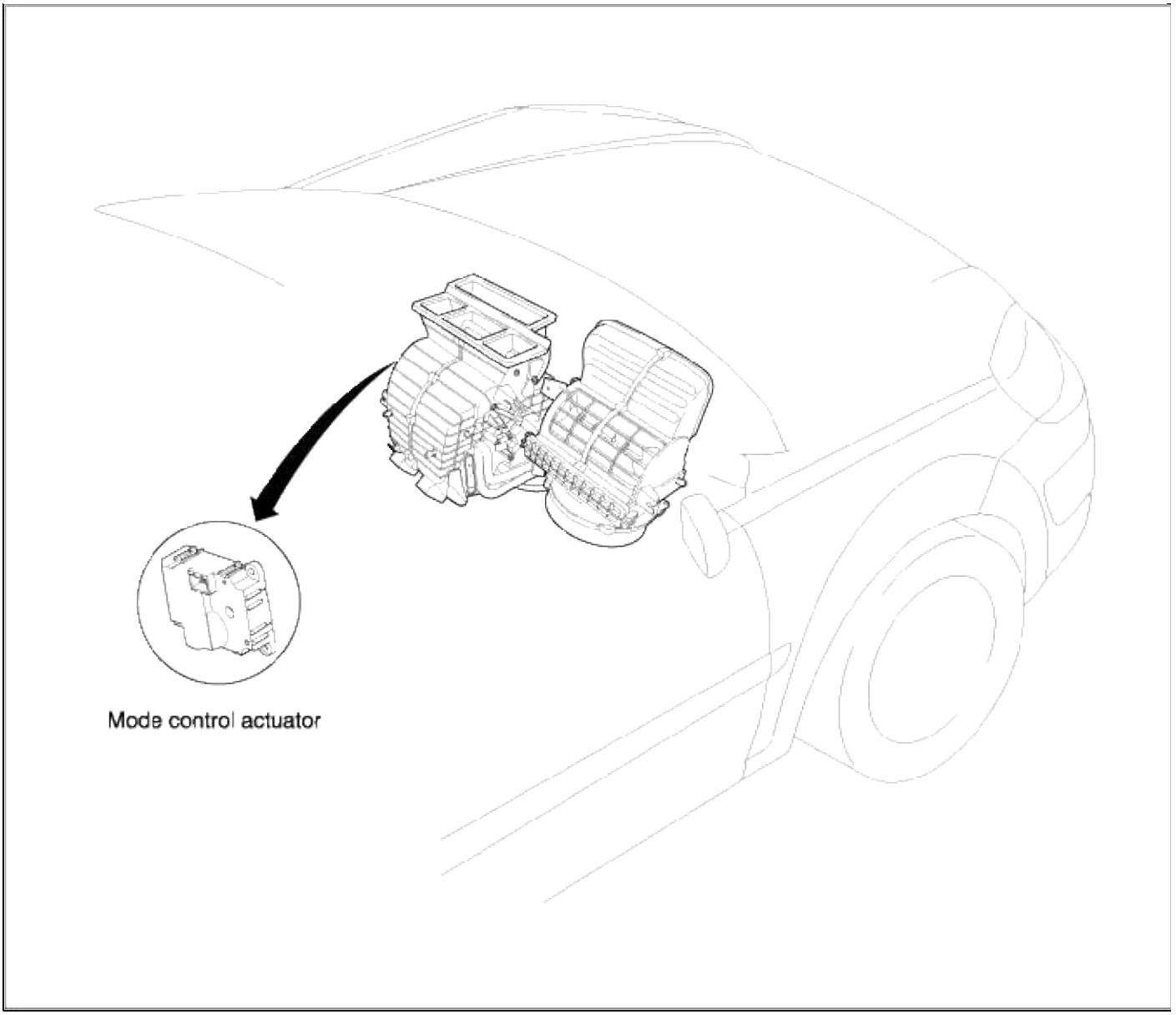
Heating,Ventilation, Air Conditioning > Heater > Mode Control Actuator > Description and Operation

DESCRIPTION

The mode control actuator is located at the heater unit.
It adjusts position of mode door by operating mode control actuator based on signal of A/C control unit. Turning mode select switch makes the mode control actuator shift in order of vent→ B/L → floor → mix→defrost.

Heating,Ventilation, Air Conditioning > Heater > Mode Control Actuator > Components and Components Location

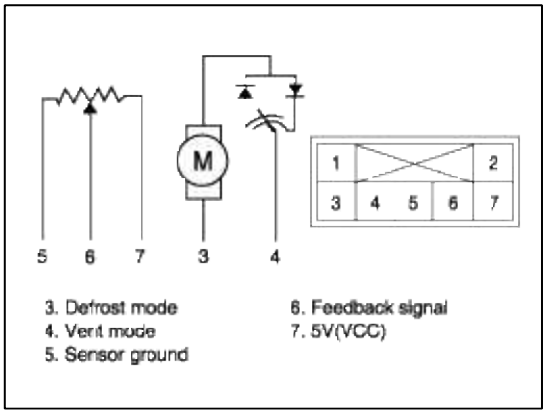
COMPONENT LOCATION



Heating,Ventilation, Air Conditioning > Heater > Mode Control Actuator > Repair procedures

INSPECTION

1. Ignition "OFF"
2. Disconnect the connector of mode control actuator.
3. Verify that the mode control actuator operates to the defrost mode when connecting 12V to the terminal 3 and grounding terminal 4.
4. Verify that the mode control actuator operates to the vent mode when connecting in the reverse.



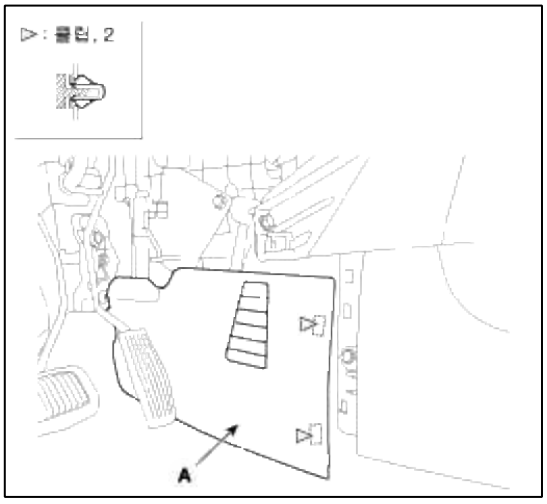
5. Check the voltage between terminals 3 and 4.

Door position	Voltage (3-4)	Error detecting
Vent	0.3 ± 0.15V	Low voltage : 0.1V or less
Defrost	4.7 ± 0.15V	High voltage : 4.9V or more

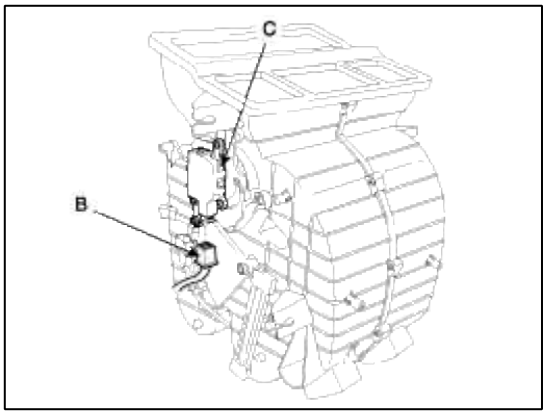
6. If the measured voltage is not specification, substitute with a known-good mode control actuator and check for proper operation.
7. If the problem is corrected, replace the mode control actuator.

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the driver's crush pad lower cover(A).



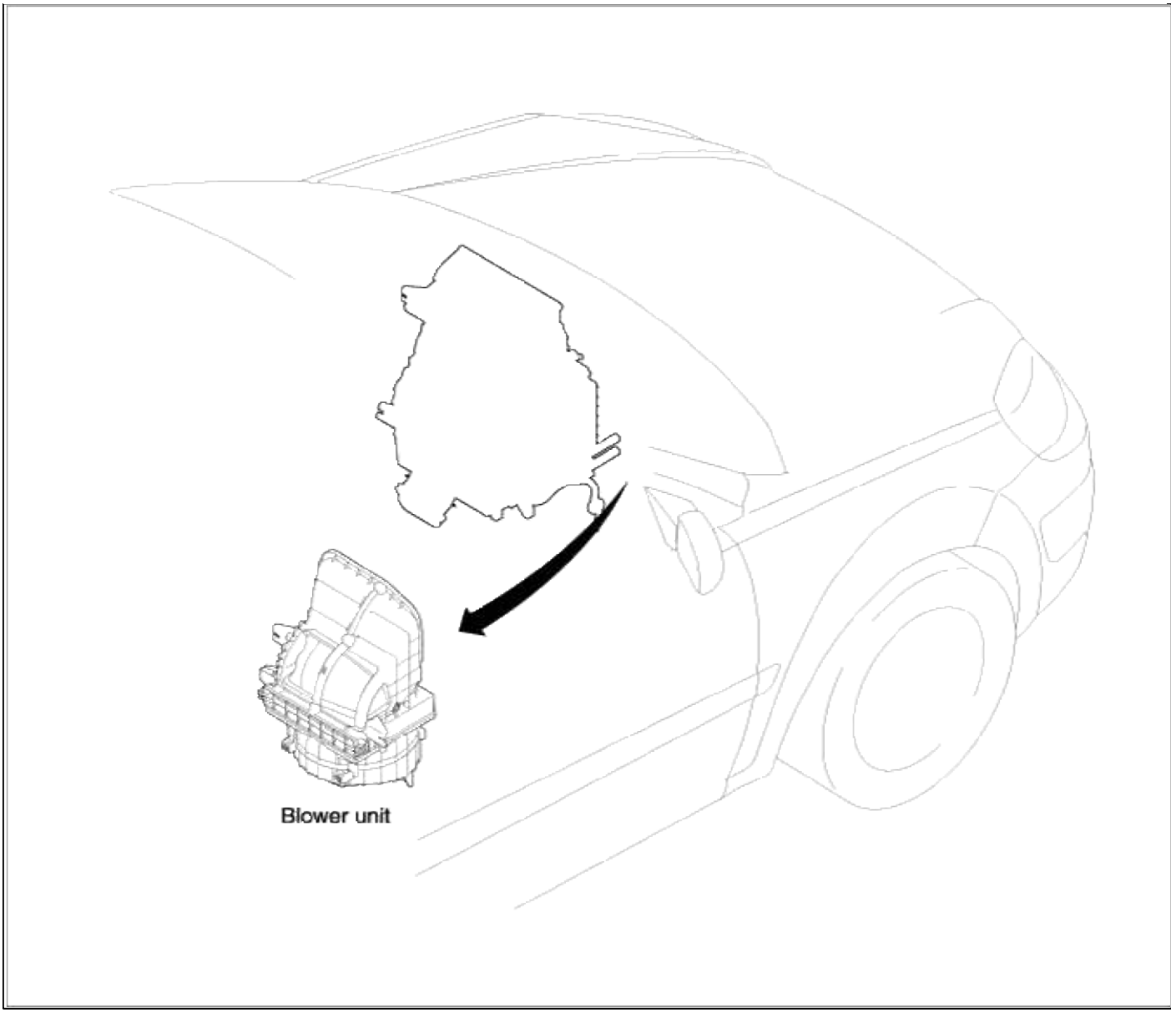
3. Disconnect the mode control actuator connector (B).
4. Loosen the mounting screws and then remove the mode control actuator (C).



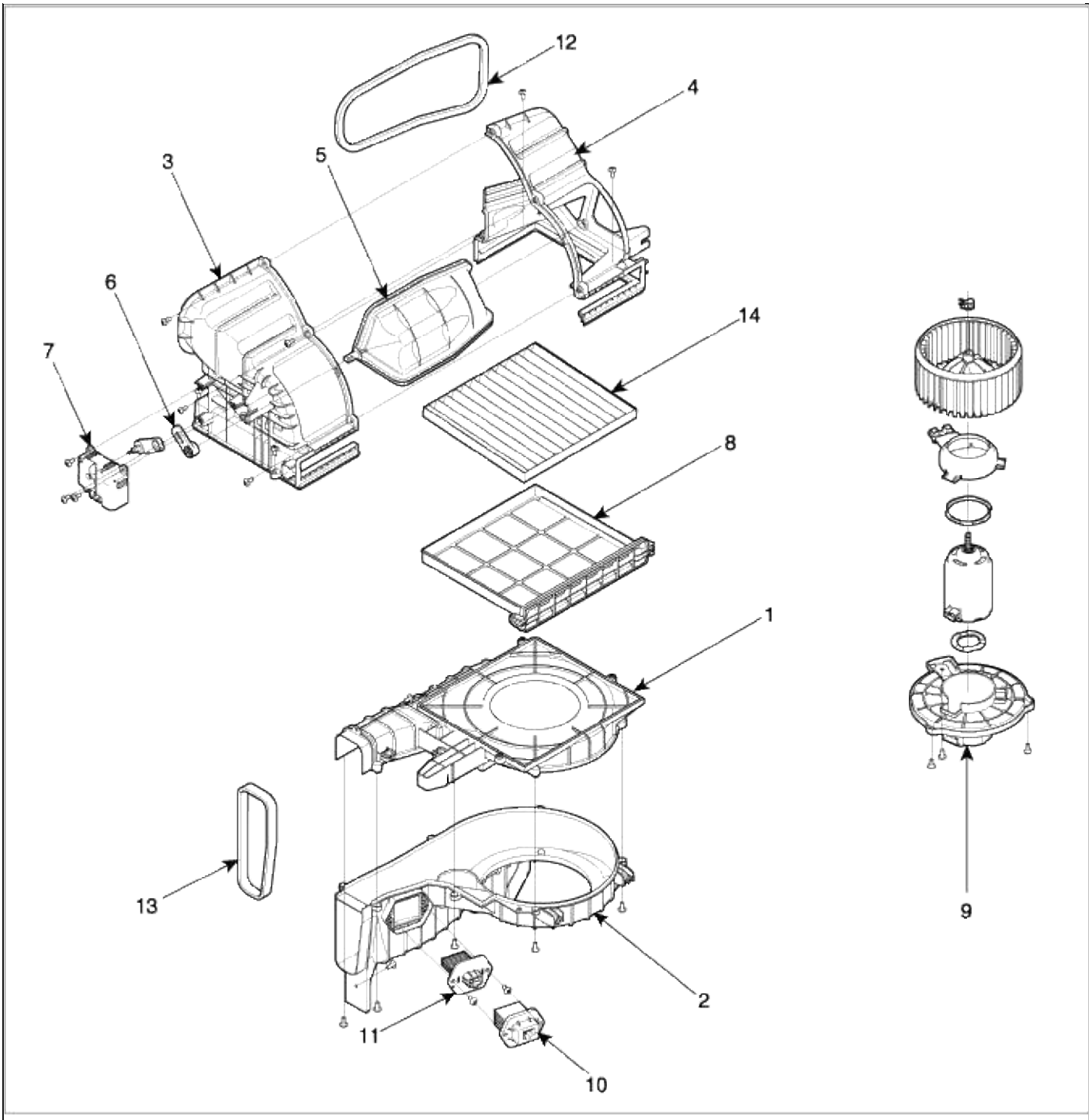
5. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Blower Unit > Components and Components Location

COMPONENT LOCATION



COMPONENTS



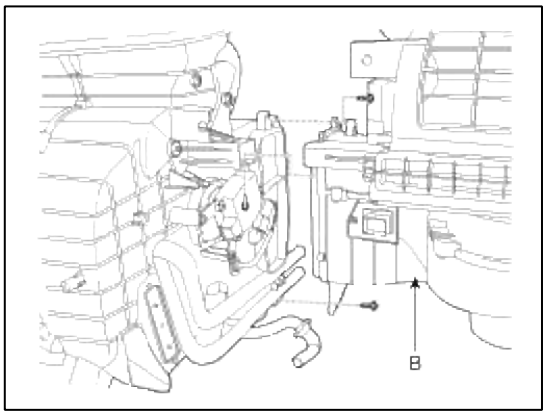
1. Upper case
2. Lower case
3. Intake case (L)
4. Intake case (R)
5. Intake door assembly
6. Intake door lever
7. Intake actuator
8. Filter cover
9. Blower motor assembly
10. Power mosfet
11. Blower resistor
12. Cowl seal
13. Heater mounting lining
14. Filter

Heating,Ventilation, Air Conditioning > Blower > Blower Unit > Repair procedures

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the crush pad.(Refer to BD group)
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)

5. Remove the blower unit (A) from the heater unit after loosening a mounting bolt and 3 screws.



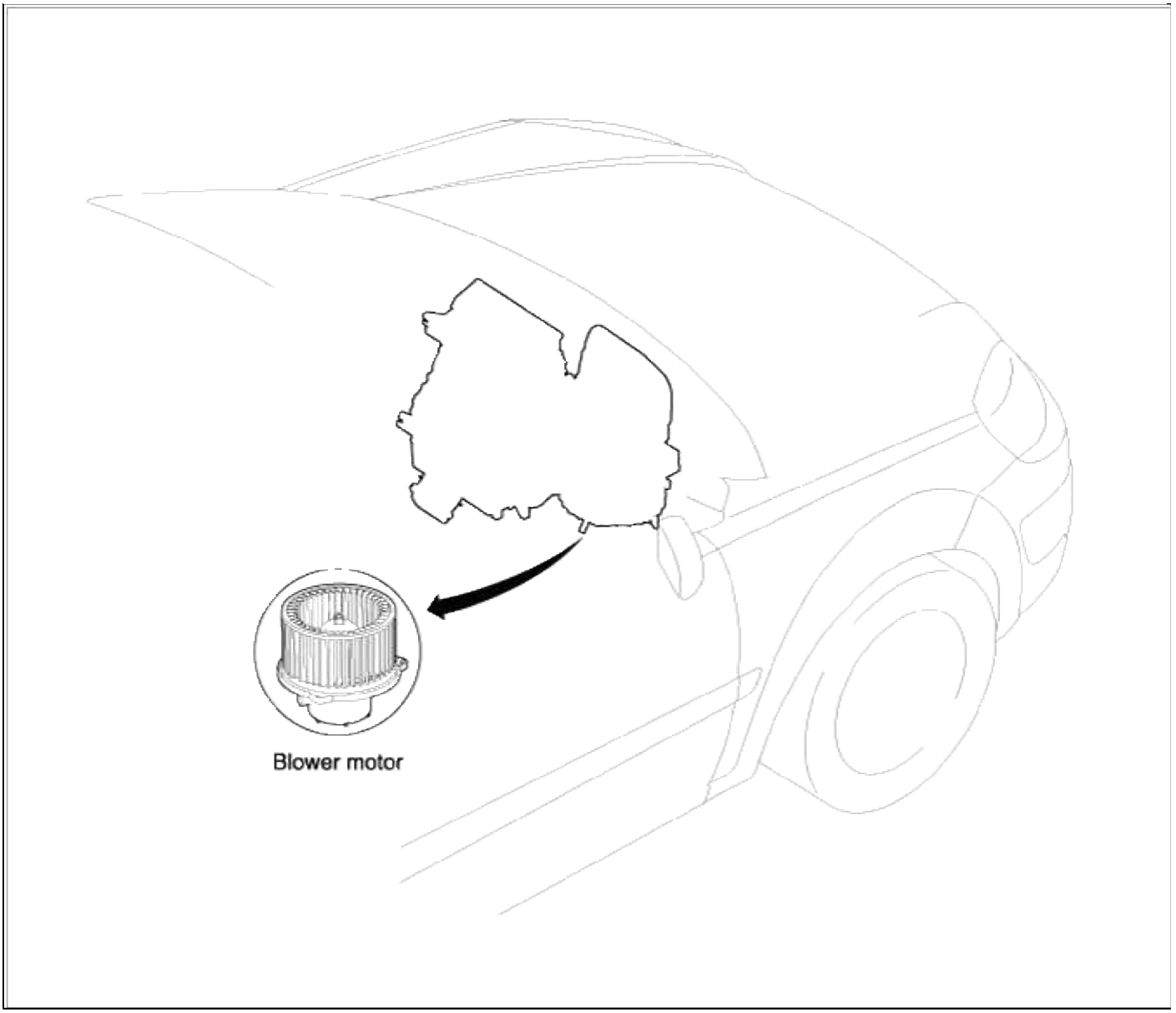
NOTE

Make sure that there is no air leaking out of the blower and duct joints.

6. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Blower Motor > Components and Components Location

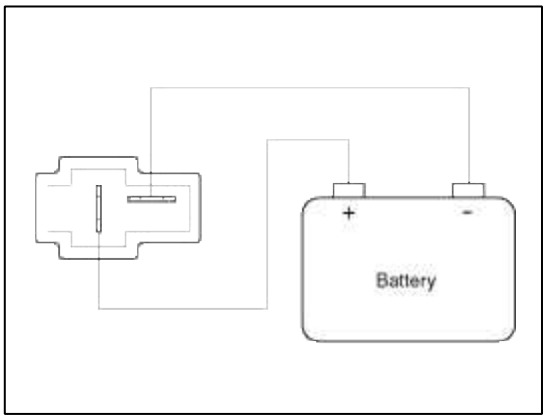
COMPONENT LOCATION



Heating,Ventilation, Air Conditioning > Blower > Blower Motor > Repair procedures

INSPECTION

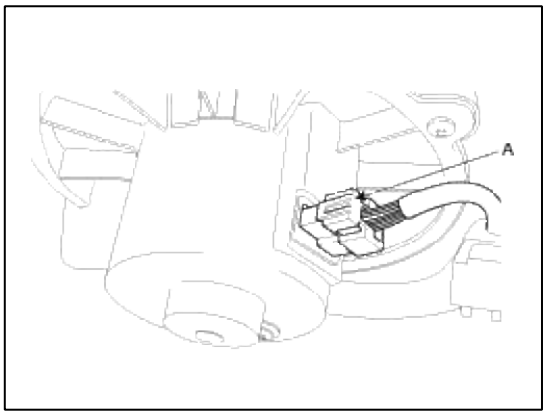
1. Connect the battery voltage and check the blower motor rotation.



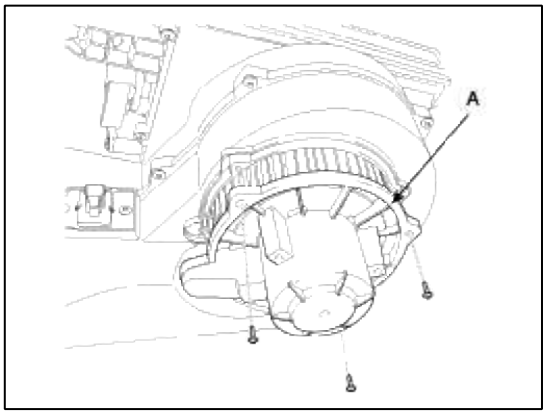
2. If the blower motor voltage does not operate properly, substitute with a known-good blower motor and check for proper operation.
3. If the problem is corrected, replace the blower motor.

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector (A) of the blower motor.



3. Remove the blower motor (A) after loosening the mounting screws.

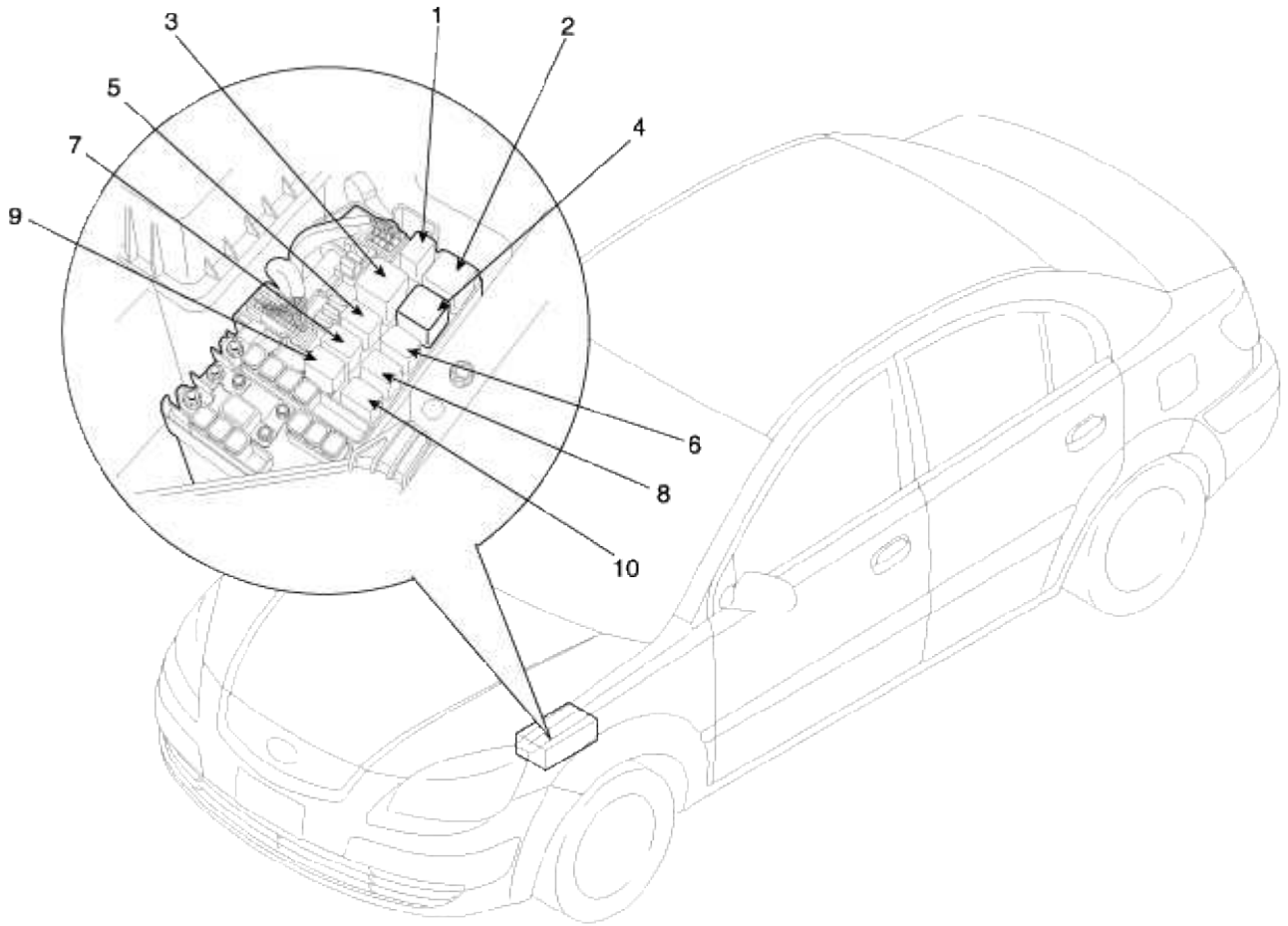


4. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Blower Relay > Components and Components Location

COMPONENT LOCATION

[Engine room relay box]



1. Horn relay
2. Fuel heater relay
3. Main relay
4. Blower relay
5. Fuel pump relay
6. Start relay
7. Radiator fan relay
8. Condenser fan relay 1
9. Condenser fan relay 2
10. A/C relay

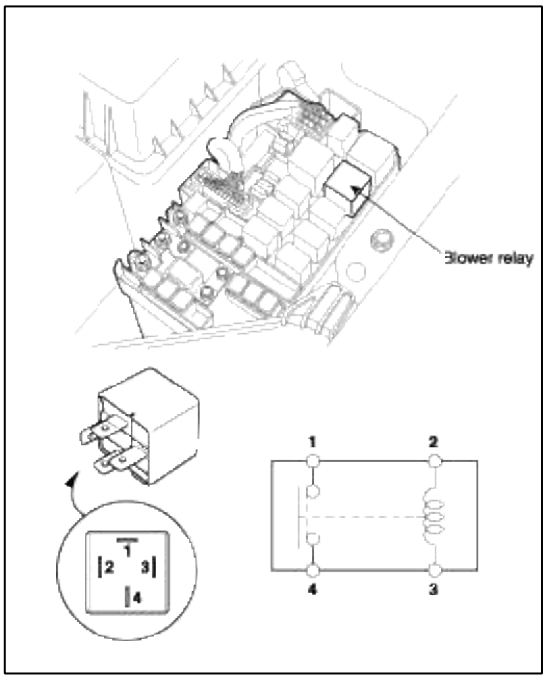
Heating,Ventilation, Air Conditioning > Blower > Blower Relay > Repair procedures

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.

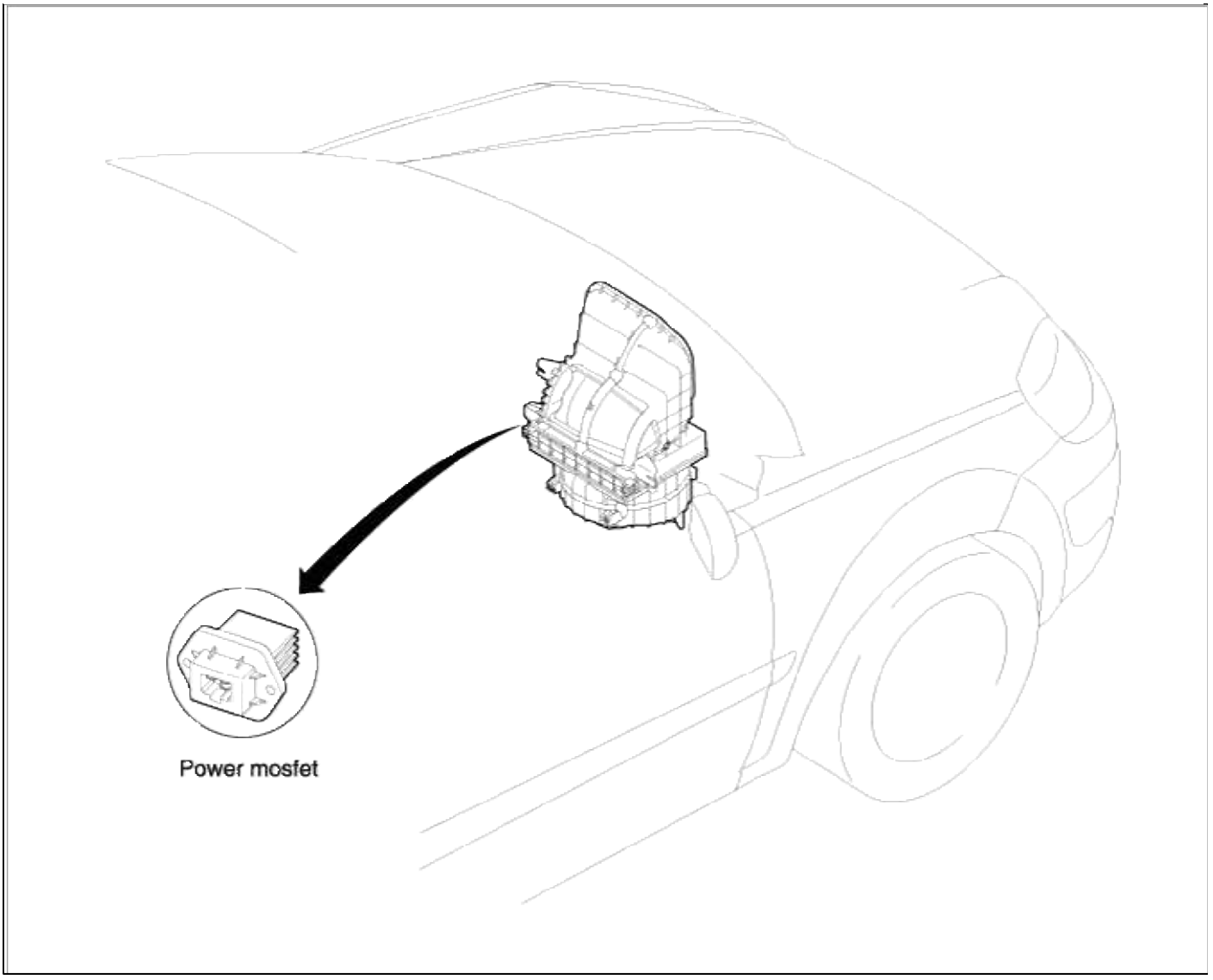


Terminal / Position	2	3	1	4
Disconnected	○	○		
Connected	⊖	⊕	○	○

3. If the blower motor voltage does not operate properly, substitute with a known-good blower relay and check for proper operation.
4. If the problem is corrected, replace the blower relay.

Heating,Ventilation, Air Conditioning > Blower > Power Mosfet > Components and Components Location

COMPONENT LOCATION

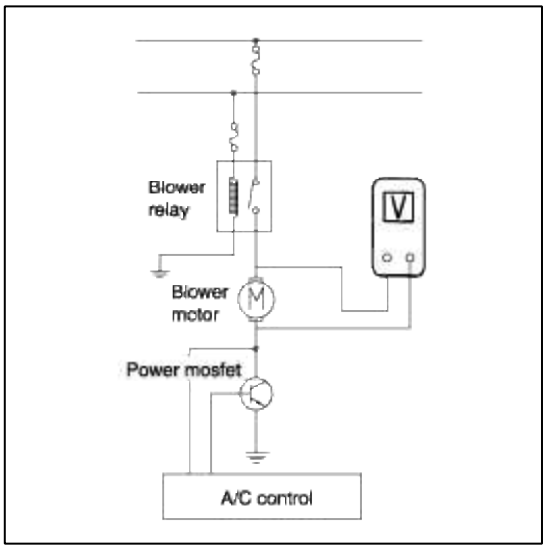


Heating,Ventilation, Air Conditioning > Blower > Power Mosfet > Repair procedures

INSPECTION

1. Ignition "ON"
2. Manually operate the control switch and measure the voltage of blower motor between pin 1 and 2.

3. Select the control switch to raise voltage until high speed.



[Specification]

Fan	Motor Voltage
	Manual
First speed	3.8 ±0.5V
Second speed	5.0 ±0.5V
Third speed	6.2 ±0.5V
Fourth speed	7.4 ±0.5V
Fifth speed	8.6 ±0.5V
Sixth speed	9.8 ±0.5V
Seventh speed	11.0 ±0.5V
eighth speed	Battery(+)

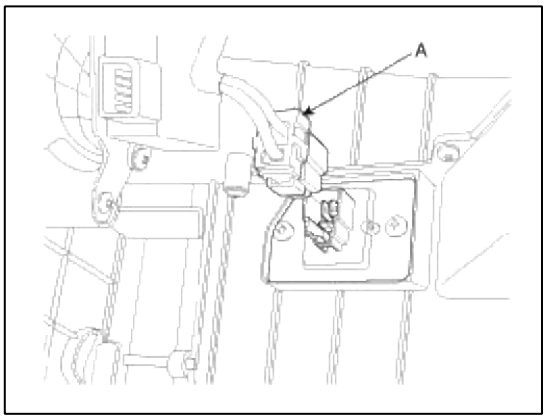
AUTO COOLING: Auto speed (4.5V~B+)
AUTO HEATING: Auto speed (4.5V~10.5V)

4. If the measured voltage is not specification, substitute with a known-good power mosfet and check for proper operation.
5. If the problem is corrected, replace the power mosfet.

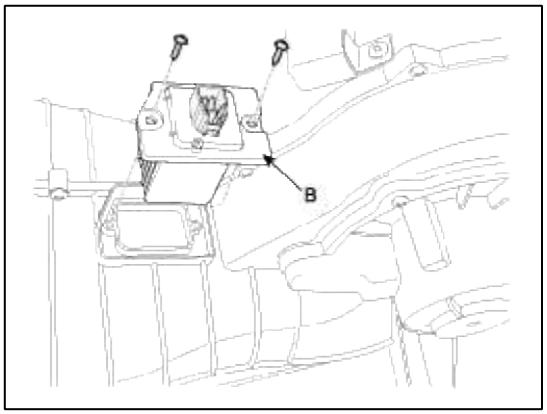
REPLACEMENT

1. Disconnect the negative (-) battery terminal.

2. Disconnect the power mosfet connector (A) at the connecting part between heater and blower unit.



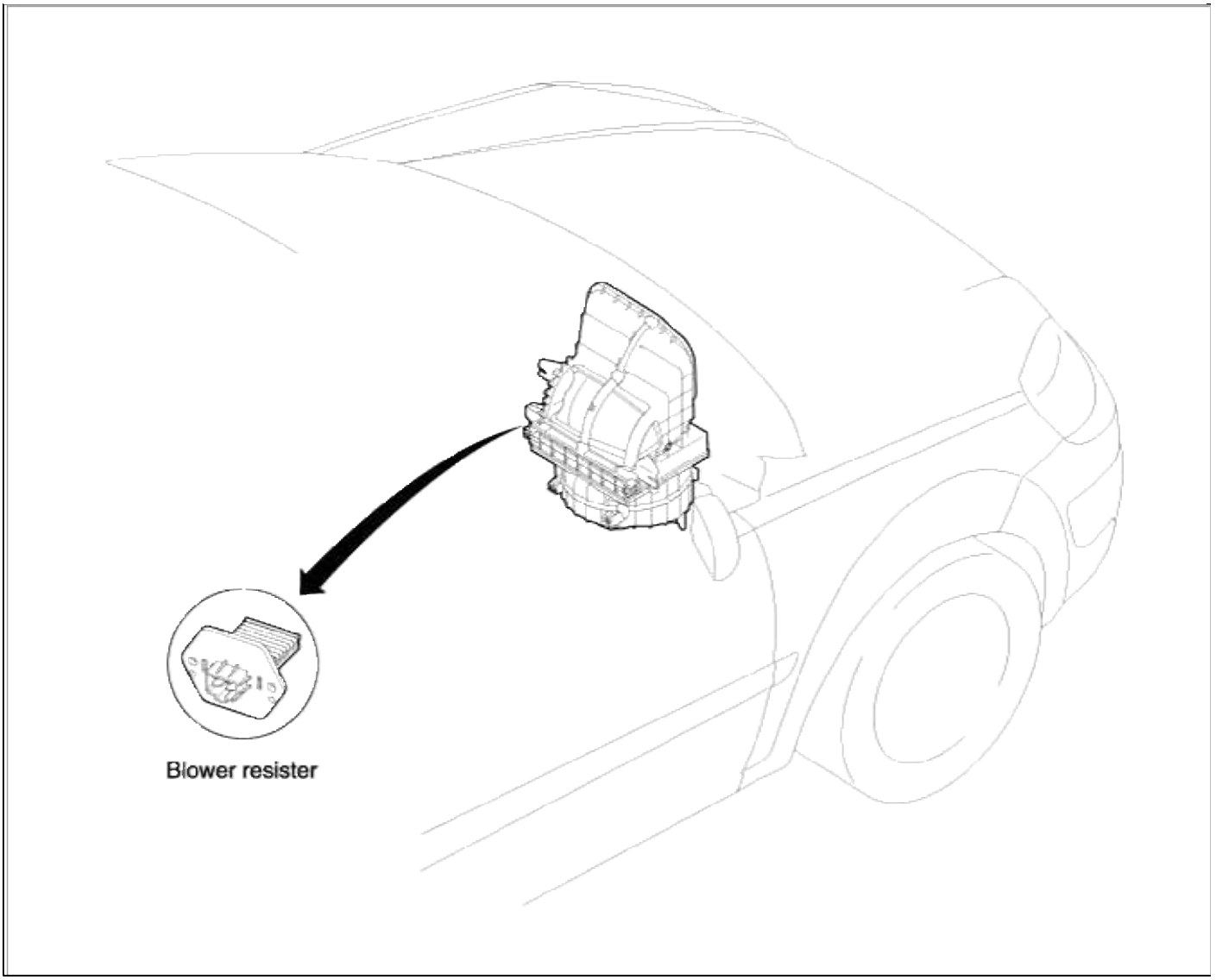
3. Remove the power mosfet (B) after loosening the mounting screws.



4. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Blower Resistor > Components and Components Location

COMPONENT LOCATION

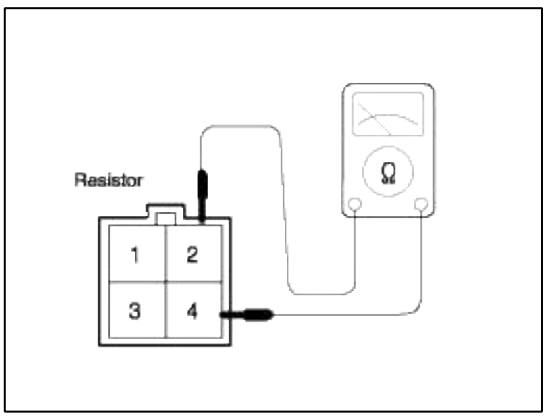


Heating,Ventilation, Air Conditioning > Blower > Blower Resistor > Repair procedures

INSPECTION

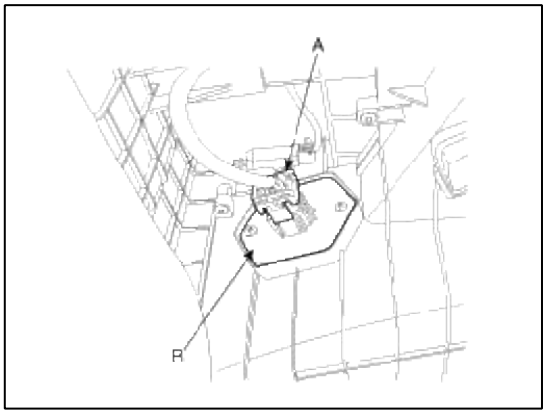
1. Measure terminal-to-terminal resistance of the blower resistor.
2. If measured resistance is not within specification, the blower resistor must be replaced. (After removing the resistor)

Terminal / Resistance (Ohmmeter) / Speed	2	1	4	3	Resistance (Ω)
	MH	ML	HI	LO	
Measurement of resistance between each terminal			○—○	○—○	2.9 ± 5%
		○—○	○—○		1.2 ± 5%
	○—○		○—○		0.4 ± 5%



REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Disconnect the blower resistor connector (A) at the connecting part blower unit.
3. Remove the blower resistor after loosening the mounting screws.

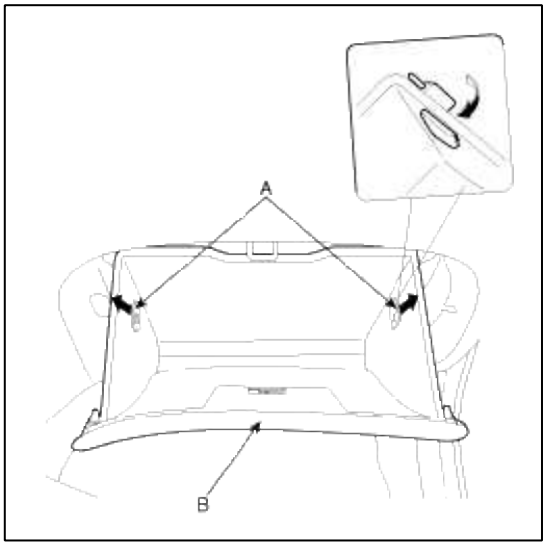


4. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Climate control air filtar > Repair procedures

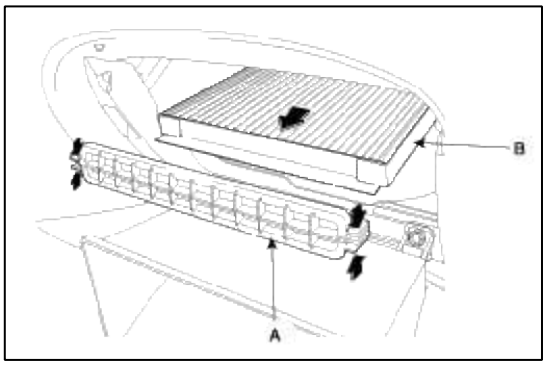
REPLACEMENT

1. Open the glove box (B). Lower the glove box down completely by removing the glove box stopper (A) to the glove box.



2. Remove the filter cover (A) with pushing the knob.

3. Replace the air filter (B), install it after making sure of the direction of air filter.



NOTE

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)

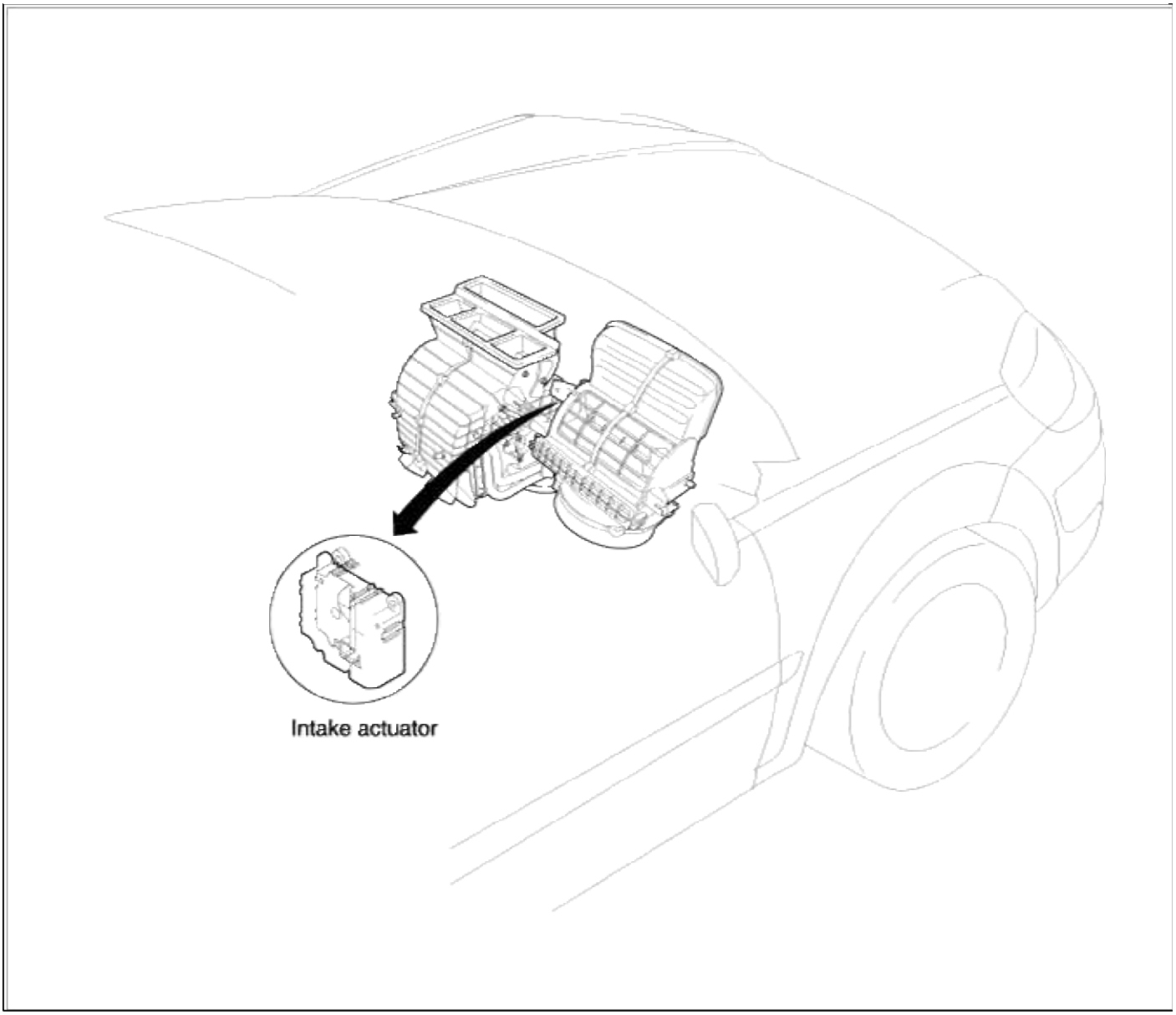
Heating,Ventilation, Air Conditioning > Blower > Intake Actuator > Description and Operation

DESCRIPTION

1. The intake actuator is located at the blower unit.
2. It regulates the intake door by signal from control unit.
3. Pressing the intake selection switch will shift between recirculation and fresh air modes.

Heating,Ventilation, Air Conditioning > Blower > Intake Actuator > Components and Components Location

COMPONENT LOCATION

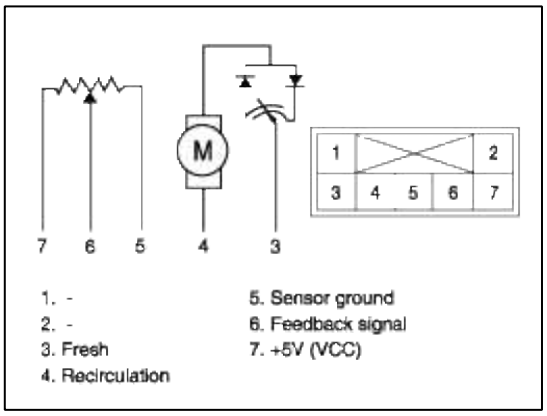


Heating,Ventilation, Air Conditioning > Blower > Intake Actuator > Repair procedures

INSPECTION

1. Ignition "OFF"
2. Disconnect the intake actuator connector.
3. Verify that the actuator operates to the recirculation position when connecting 12V to the terminal 4 and grounding terminal 3.

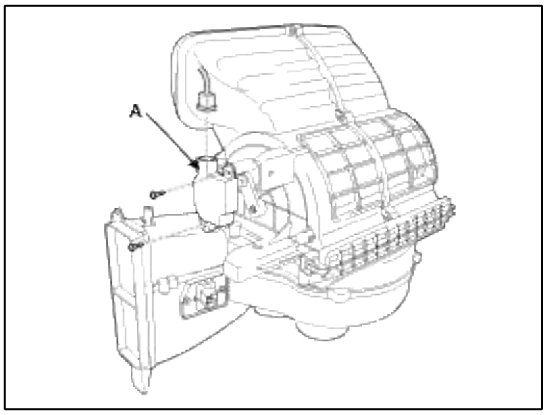
4. Verify that the intake actuator operates to the fresh position when connecting in the reverse.



Door position	Voltage (3-4)	Error detecting
Recirculation	0.3 ± 0.15V	Low voltage : 0.1V or less
Fresh	4.7 ± 0.15V	High voltage : 4.9V or more

REPLACEMENT

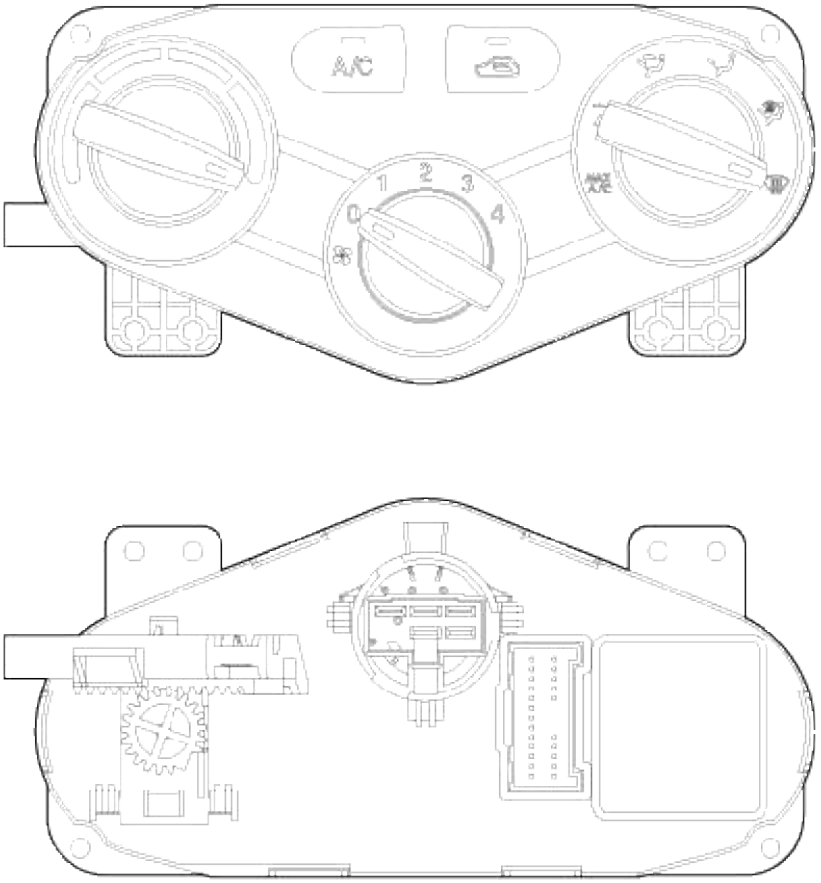
1. Disconnect the negative (-) battery terminal.
2. Remove the glove box (Refer to BD group).
3. Disconnect the intake actuator connector.
4. Loosen the mounting screw and then remove the intake actuator (A) from the blower unit.

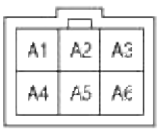


5. Installation is the reverse order of removal.

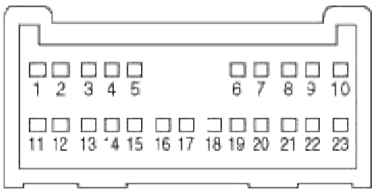
Heating,Ventilation, Air Conditioning > Blower > Control Panel > Components and Components Location

COMPONENT





A



B

CONNECTOR PIN FUNCTION

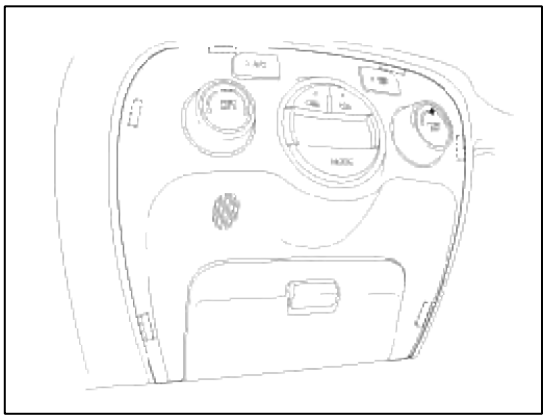
CONNECTOR	PIN	FUNCTION
Connector (A)	1	Ground
	2	Blower 1 step
	3	Ground
	4	Blower 2 step
	5	Blower 3 step
	6	Blower 4 step
Connector (B)	1	Tail lamp (+)
	2	Battery (+)
	3	A/C output
	4	Vent mode
	5	Defrost mode
	6	Intake actuator (Fresh)
	7	Intake actuator (Recirculation)
	8	Sensor VCC(+5V)
	9	IGN2
	10	Rheostat (-)
	11	Mode actuator feedback signal
	12	Intake actuator feedback signal
	13	Evaporator sensor(+)
	14	Blower ON signal
	15	A/C select
	16	Sensor Ground
	17	Ground
	18	PTC relay 2
	19	PTC relay 3
	20	Blower ON signal(ECU)
	21	PTC ON signal
	22	-
	23	-

Heating,Ventilation, Air Conditioning > Blower > Control Panel > Repair procedures

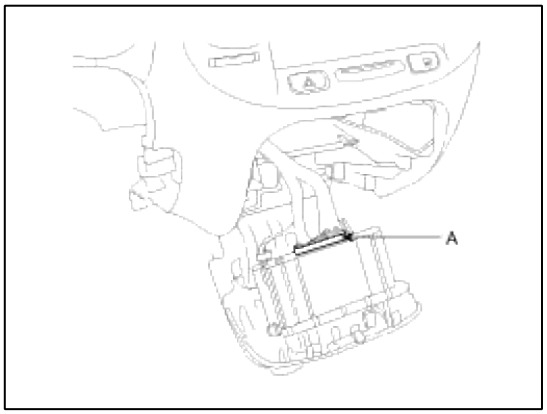
REPLACEMENT

1. Disconnect the negative (-) battery terminal.

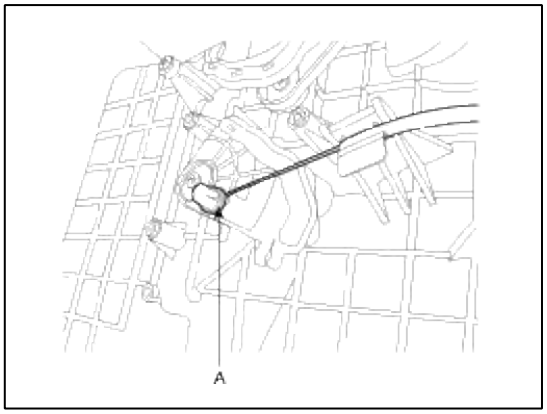
2. Remove the center facia lower panel by pulling it using a screw driver after disconneting a clips. Avoid damaging retaining clips.



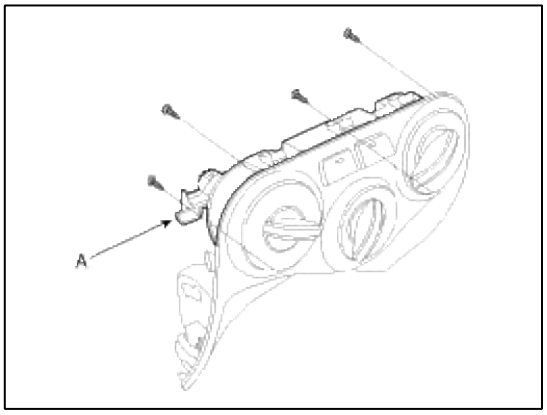
3. Disconnect the connectors (A) from the center facia.



4. Remove the heater & A/C controller temperature control cable (A).



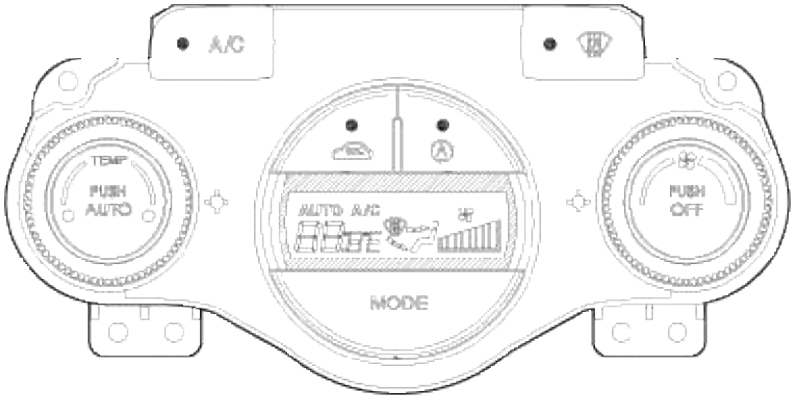
5. Remove the heater & A/C controller (A) after loosening 4 screws.

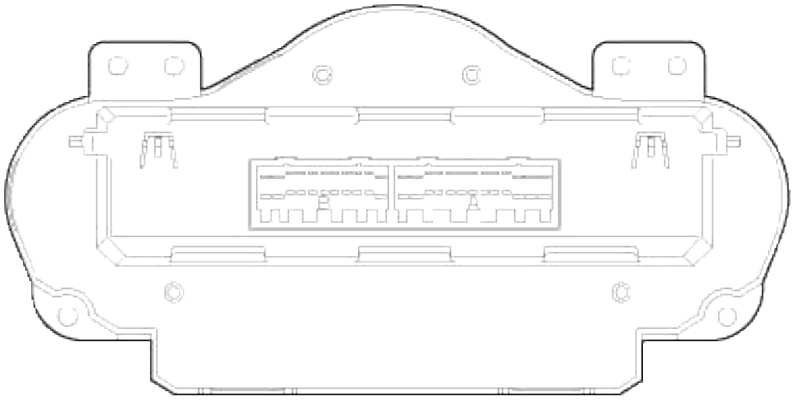


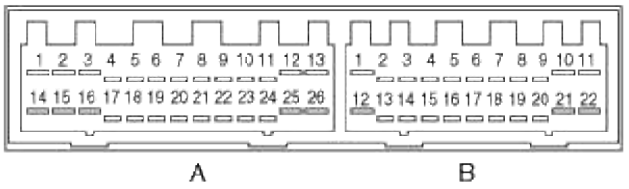
6. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Controller > Manual Controller > Components and Components Location

COMPONENT







CONNECTOR PIN FUNCTION

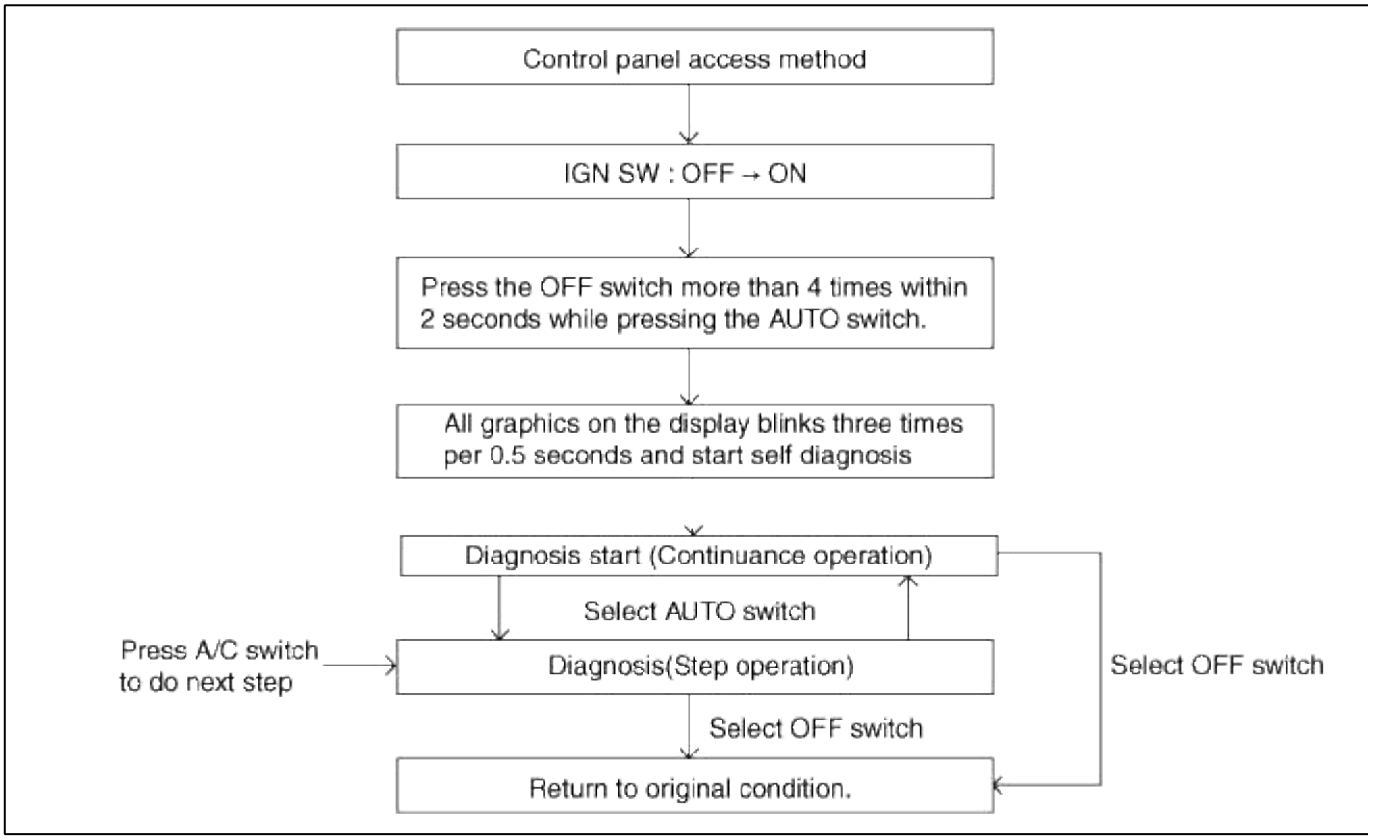
CONNECTOR	PIN	FUNCTION	CONNECTOR	PIN	FUNCTION
CONNECTOR (A)	1	Rheostat	CONNECTOR (B)	1	In car sensor (+)
	2	Tail lamp (+)		2	A/C select signal
	3	Battery (+)		3	Ambient sensor (+)
	4	Power mosfet (Gate)		4	Evaporator temperature sensor (+)
	5	Power mosfet (Drain)		5	Speed sensor
	6	PTC on signal		6	-
	7	In car sensor motor (+)		7	-
	8	In car sensor motor (-)		8	Sensor voltage (5V)
	9	Temp actuator (cool)		9	-
	10	Intake actuator (recirculation)		10	Temp actuator feedback signal
	11	-		11	Mode actuator feedback signal
	12	IGN 2		12	Photo sensor (+)
	13	Ground		13	Photo sensor ground
	14	Mode actuator (Vent)		14	Water temperature output
	15	Mode actuator (Defrost)		15	-
	16	Power mosfet (Drain)		16	Sensor ground
	17	A/C output			
	18	-			
	19	PTC relay 2			
	20	PTC relay 3			
	21	Blower (+)			
	22	Temp actuator (Warm)			
	23	Intake actuator (Fresh)			
	24	Blower select signal			
	25	IGN 2			
	26	Ground			

Heating,Ventilation, Air Conditioning > Controller > Manual Controller > Troubleshooting

SELF-DIAGNOSIS

1. Self-diagnosis process

The F.A.T.C. module self test feature will detect electrical malfunction and provide error codes for system components with suspected failures.



NOTE

DTC data can be retrieved from the control panel directly or from the DLC using the Hi-Scan Pro.

2. How to read self-diagnostic code

After the display panel flickers three times every 0.5 second, the corresponding fault code flickers on the setup temperature display panel every 0.5 second and will show two figures. Codes are displayed in numerical format.

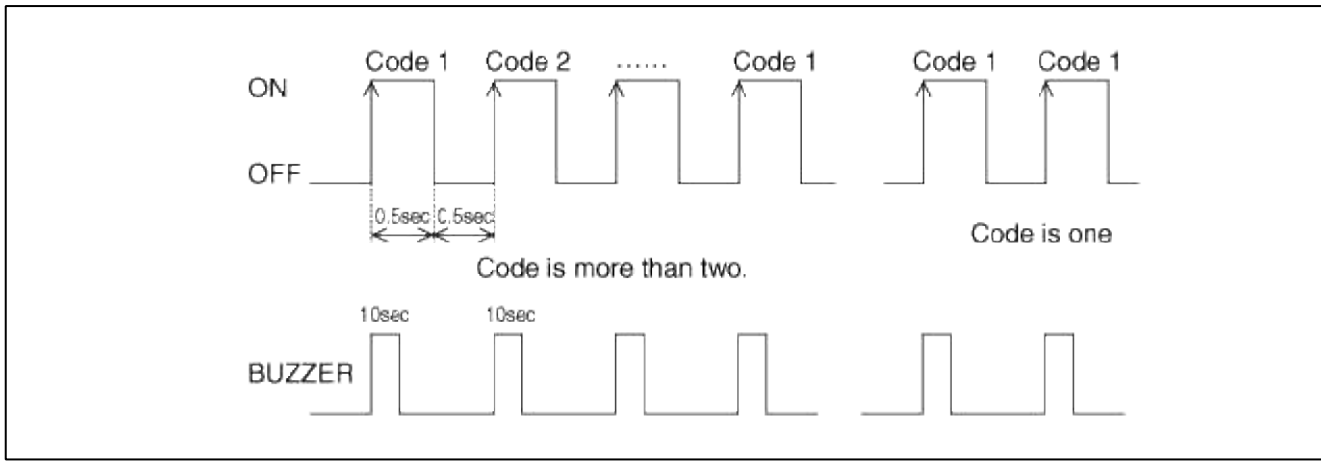
Fault code

Fault code Control unit	Fail description
00	Normal
11	In-car temperature sensor open (High)
12	In-car temperature sensor short (Low)
13	Ambient temperature sensor open (High)
14	Ambient temperature sensor short (Low)
15	Water temperature sensor open (High)
16	Water temperature sensor short (Low)
17	Evaporator temperature sensor open (High)
18	Evaporator temperature sensor short (Low)
19	Air mix potentiometer open (Low) - Driver
19	Air mix potentiometer short (High) - Driver
20	Air mix motor (Driver)

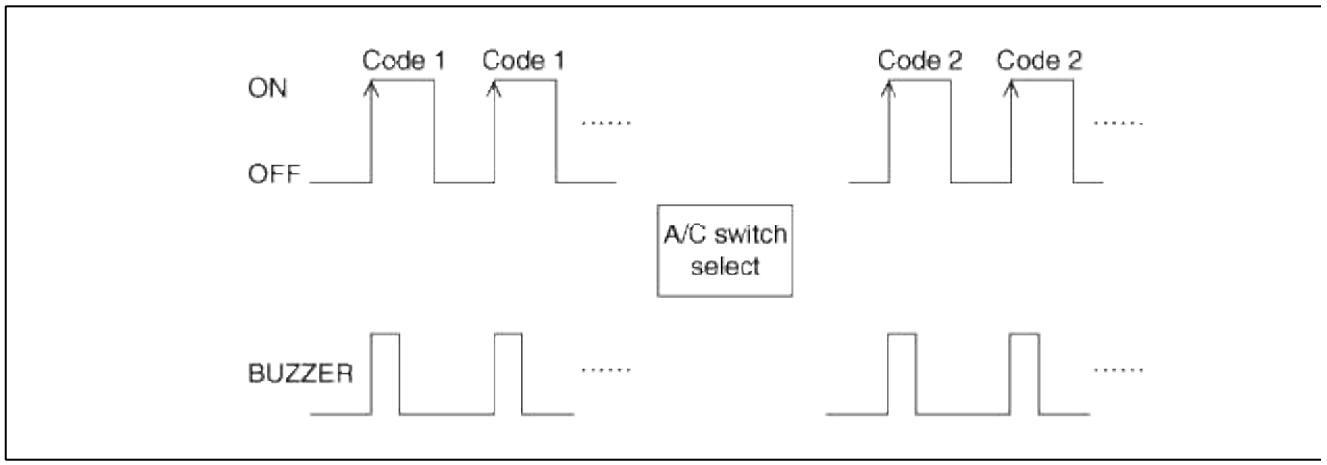
21	Direction potentiometer open (Low) - Driver
21	Direction potentiometer short (High) - Driver
22	Direction control motor (Driver)

3. Fault code display

(1) Continuance operation



(2) Step operation



4. If fault codes are displayed during the check, Inspect malfunction causes by referring to fault codes.

5. Fail safe

(1) In-car temperature 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) Photo sensor: None correction

(5) Temperature control actuator (Air mix potentiometer):

A. If temperature set 17°C-24.5°C, fix at maximum cooling position.

B. If temperature set 25°C-32°C, fix at maximum heating position.

(6) Mode control actuator (Direction potentiometer):

A. Fix vent position, while selecting vent mode.

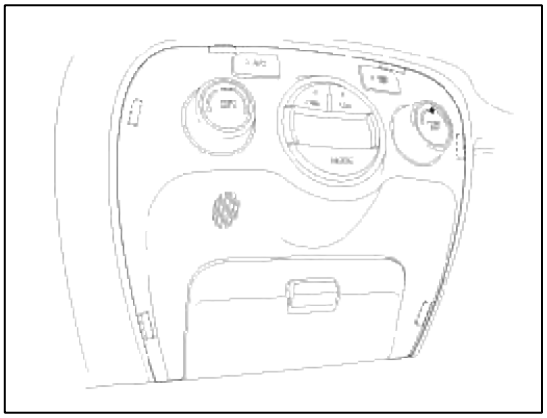
B. Fix defrost position, while selecting all except vent mode.

(7) A.Q.S sensor: Doesn't control.

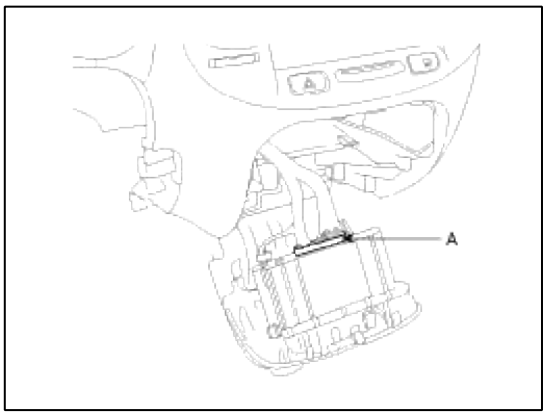
Heating,Ventilation, Air Conditioning > Controller > Manual Controller > Repair procedures

REPLACEMENT

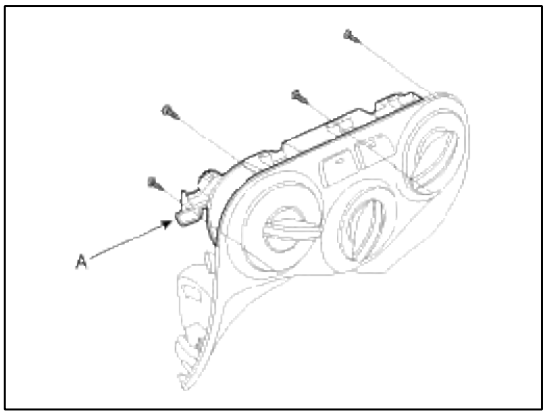
1. Disconnect the negative (-) battery terminal.
2. Remove the center facia lower panel by pulling it using a screw driver after disconnecting a clips. Avoid damaging retaining clips.



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.

Heating,Ventilation, Air Conditioning > Troubleshooting > P0532

GENERAL DESCRIPTION

An A/C refrigerant pressure sensor is installed near the expansion valve. This sensor is used by the ECM/PCM to evaluate A/C system pressure for the purposes of idle speed correction, cooling/condenser fan control, and A/C compressor control.

DTC DESCRIPTION

If signal is below 0.195V under detecting condition, ECM/PCM sets P0532.

DTC DETECTING CONDITION

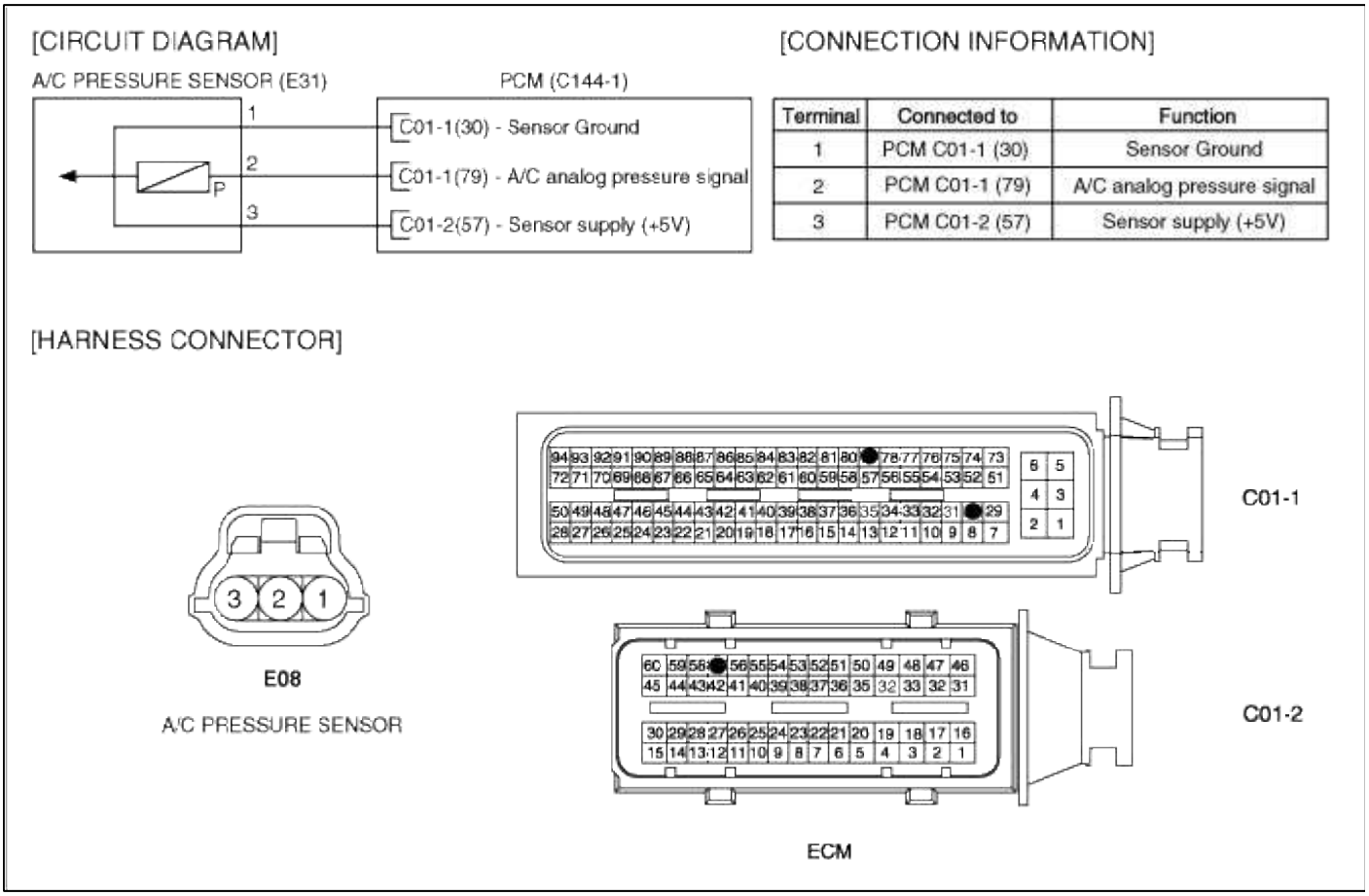
Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, low	• Poor connection • Open in power circuit • Open or short to ground in signal circuit • Faulty A/C pressure sensor • Faulty ECM/PCM
Enable Conditions	• Ambient temperature > - 10.5 °C (13°F)	
Threshold Value	• Sensor output voltage < 0.195V	
Diagnostic Time	• Continuous	
MIL ON Condition	• DTC only	

SPECIFICATION

Pressure(psi)	14.7	100	200	300	470
Voltage(V)	0.5	1.25	2.13	3.00	4.50

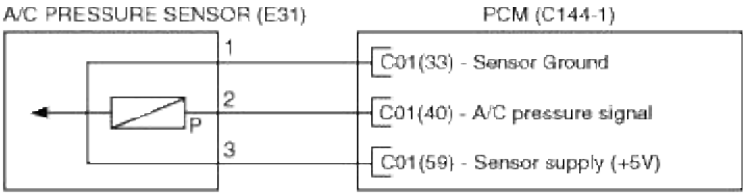
SCHEMATIC DIAGRAM

(A/T)



(M/T)

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

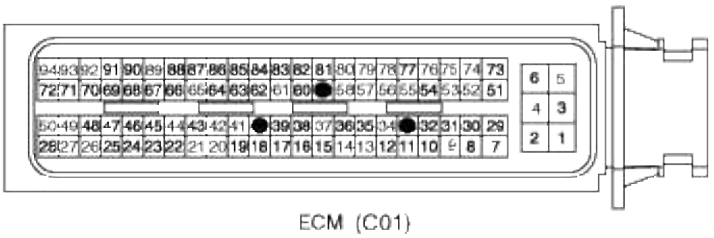
Terminal	Connected to	Function
1	PCM C01 (33)	Sensor Ground
2	PCM C01 (40)	A/C pressure signal
3	PCM C01 (59)	Sensor supply (+5V)

[HARNESS CONNECTOR]



E08

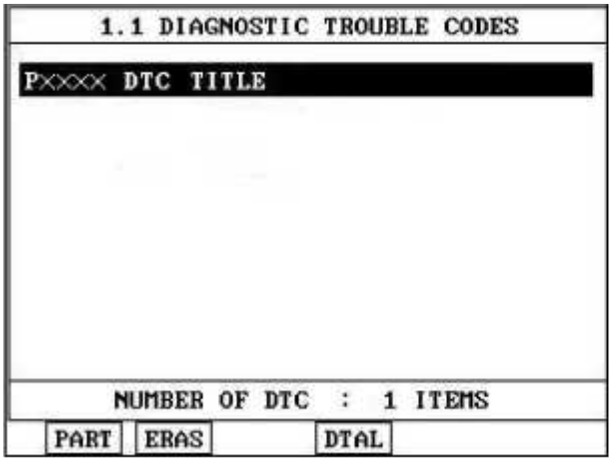
A/C PRESSURE SENSOR

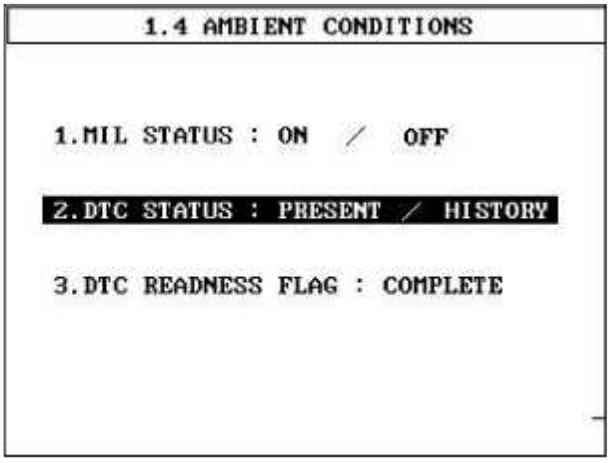


ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu.
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.





6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or was repaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

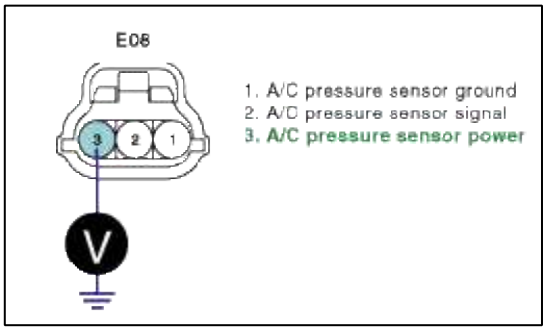
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect the A/C pressure sensor connector.
3. Key "ON".
4. Measure the voltage between terminal 3 of A/C pressure sensor harness connector and chassis ground.

Specification : 5V



5. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

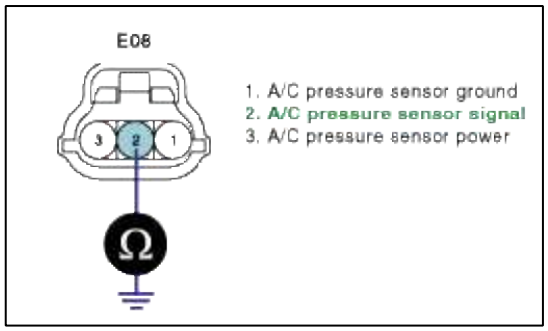
NO

Repair Open or Short to ground in A/C pressure sensor power circuit and go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check short to ground
   (1) Key "OFF".
   (2) Disconnect A/C pressure sensor and ECM/PCM connector.
   (3) Measure the resistance between terminal 2 of A/C pressure sensor harness connector and chassis ground.

   Specification : Infinite



   (4) Is the measured resistance within specification ?

   YES

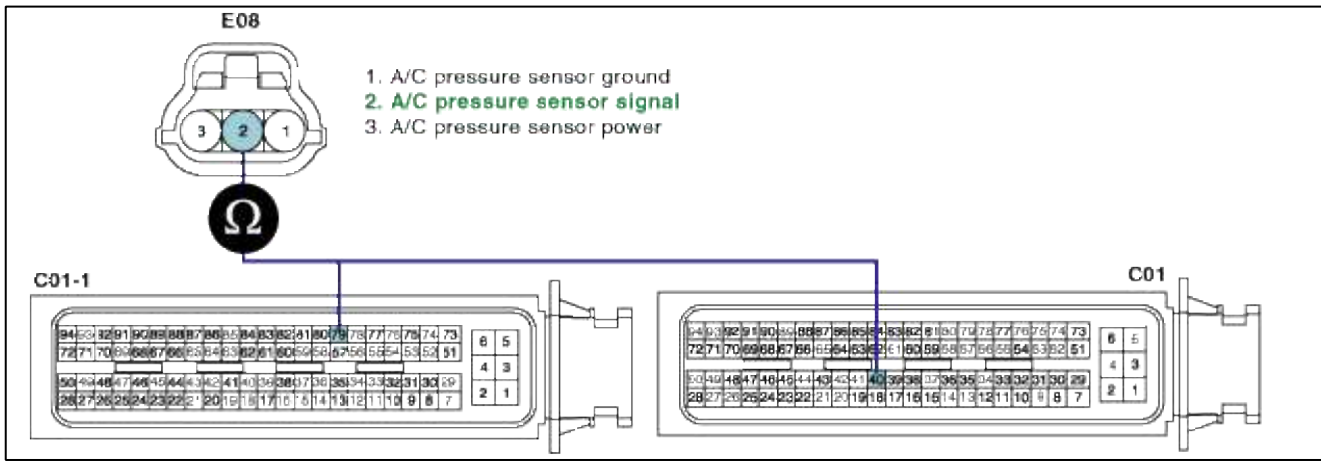
   Go to "Check open in harness" procedure.

   NO

   Repair Short to ground in A/C pressure sensor signal circuit and go to "Verification of Vehicle Repair" procedure.

2. Check open in harness
   (1) Key "OFF".
   (2) Disconnect A/C pressure sensor and ECM/PCM connector.
   (3) Measure the resistance between terminal 2 of A/C pressure sensor harness connector and terminal 79/C01-1 ECM/PCM harness connector. [A/T]
   Measure the resistance between terminal 2 of A/C pressure sensor harness connector and terminal 40/C01 of ECM/PCM harness connector. [M/T]

   Specification : Approx. below 1Ω



   (4) Is the measured resistance within specification ?

   YES

   Go to "Component inspection" procedure.

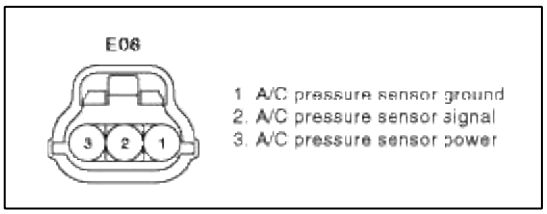
   NO

   Repair Open in signal circuit and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. A/C pressure sensor inspection
   (1) Key "OFF" and connect the scantool.
   (2) Connect the probe to A/C pressure sensor signal and select the oscilloscope in the menu.
   (3) Check the change of waveform with A/C "ON" and A/C "OFF" after engine start.
   Specification :

Pressure(psi)	14.7	100	200	300	470
Voltage(V)	0.5	1.25	2.13	3.00	4.50



   (4) Is the measured waveform of A/C pressure sensor normal?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good A/C pressure sensor and check for proper operation. If the problem is corrected, replace A/C pressure sensor and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Heating,Ventilation, Air Conditioning > Troubleshooting > P0533

GENERAL DESCRIPTION

An A/C refrigerant pressure sensor is installed near the expansion valve. This sensor is used by the ECM/PCM to evaluate A/C system pressure for the purposes of idle speed correction, cooling/condenser fan control, and A/C compressor control.

DTC DESCRIPTION

If signal is over 4.648V under detecting condition, ECM/PCM sets P0533.

DTC DETECTING CONDITION

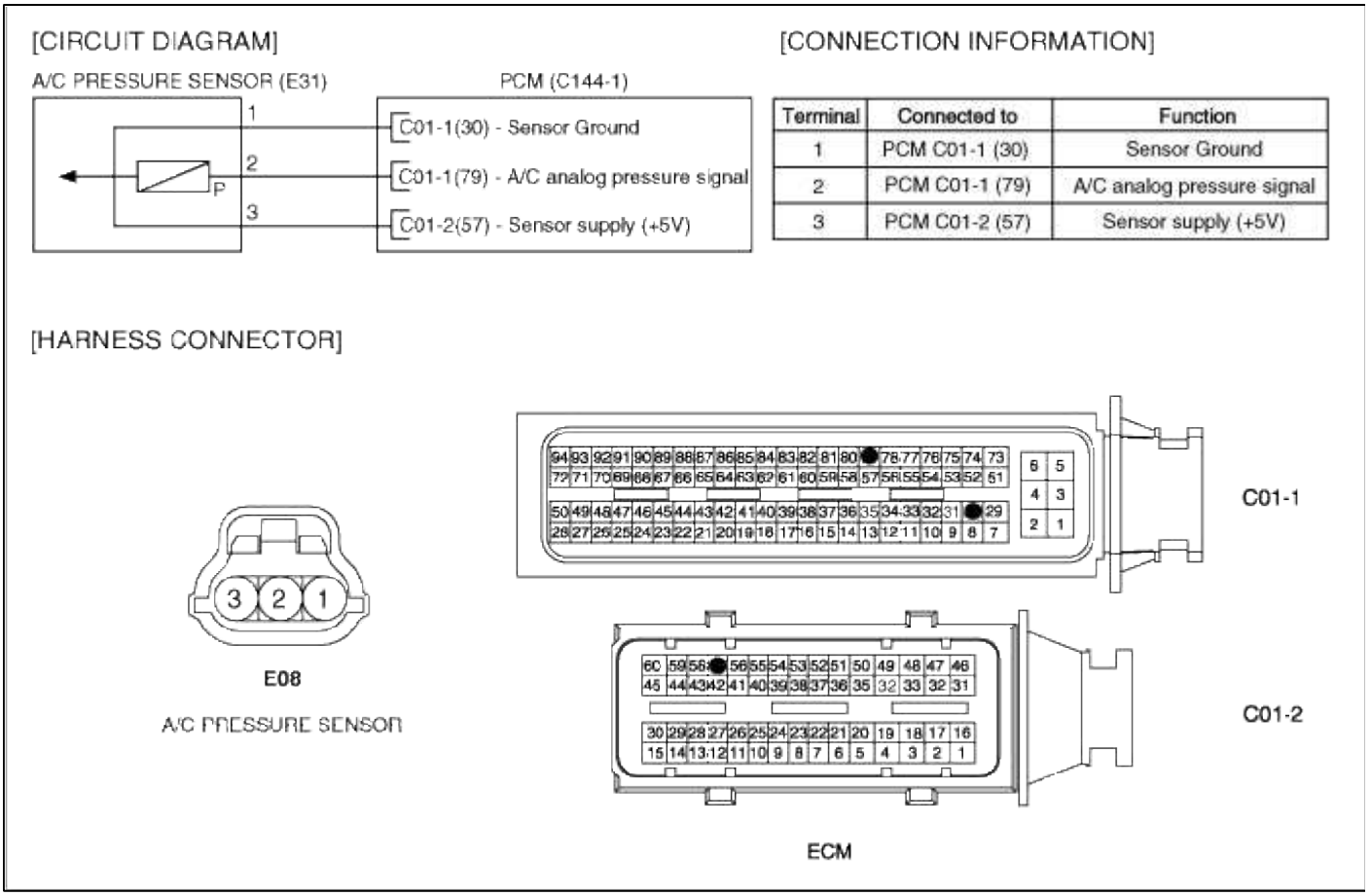
Item	Detecting Condition	Possible Cause
DTC Strategy	• Signal check, high	• Poor connection • Short to power in signal circuit • Open in ground circuit • Faulty A/C Pressure sensor • Faulty ECM/PCM
Enable Conditions	• Ambient temperature > - 10.5 °C (13°F)	
Threshold Value	• Sensor output voltage > 4.648V	
Diagnostic Time	• Continuous	
MIL ON Condition	• DTC only	

SPECIFICATION

Pressure(psi)	14.7	100	200	300	470
Voltage(V)	0.5	1.25	2.13	3.00	4.50

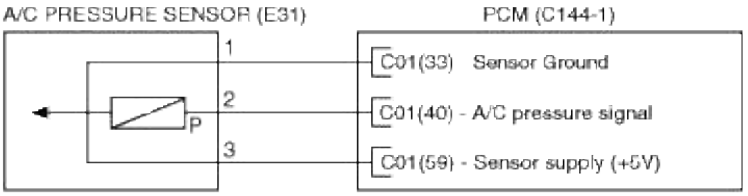
SCHEMATIC DIAGRAM

(A/T)



(M/T)

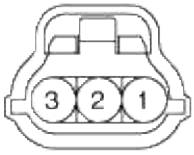
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

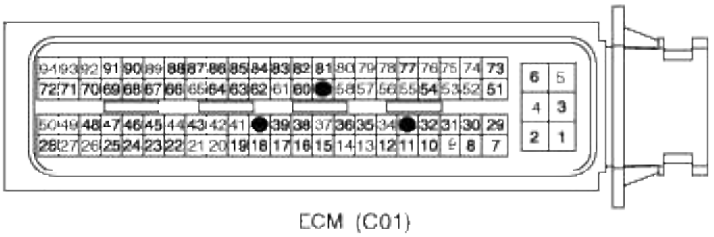
Terminal	Connected to	Function
1	PCM C01 (33)	Sensor Ground
2	PCM C01 (40)	A/C pressure signal
3	PCM C01 (59)	Sensor supply (+5V)

[HARNESS CONNECTOR]



E08

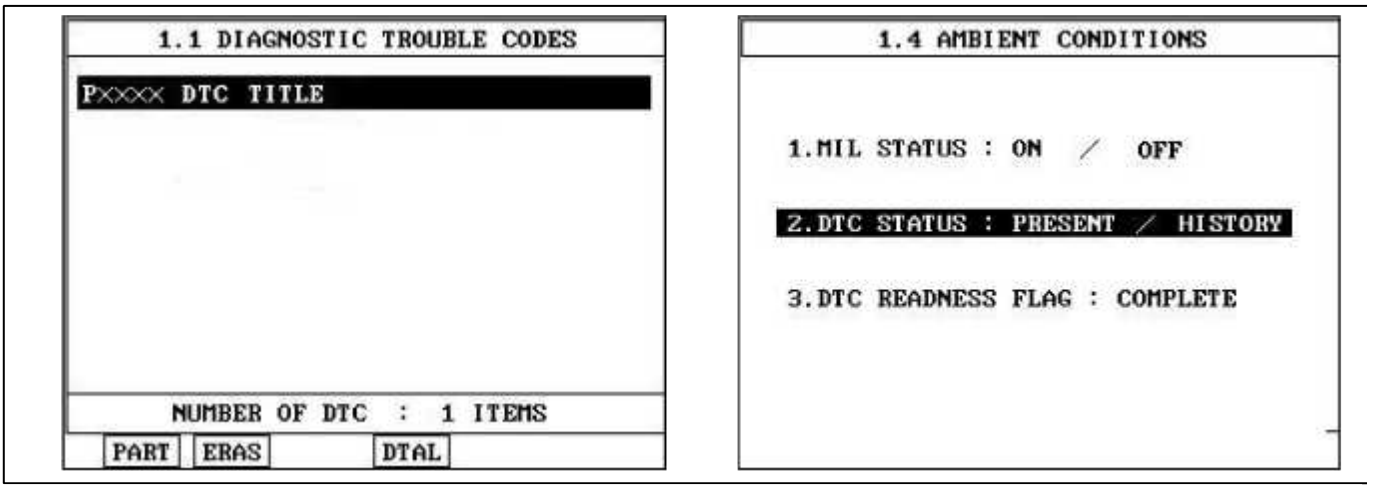
A/C PRESSURE SENSOR



ECM (C01)

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON".
3. Select "Diagnostic Trouble Codes(DTCs)" mode, and then Press F4(DTAL) to check DTC'sinformation from the DTCs menu.
4. Confirm that "DTC Readiness Flag" indicates "Complete". If not, drive the vehicle within conditionsnoted in the freeze frame data or enable conditions noted in the DTC detecting condition.
5. Read "DTC Status" parameter.



6. Is parameter displayed "History(Not Present) fault"?

NOTE

- History (Not Present) fault : DTC occurred but has been cleared.
- Present fault : DTC is occurring at present time.

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness,poor connection, bending, corrosion, contamination, deterioration, or damage.Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Terminal and Connector Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

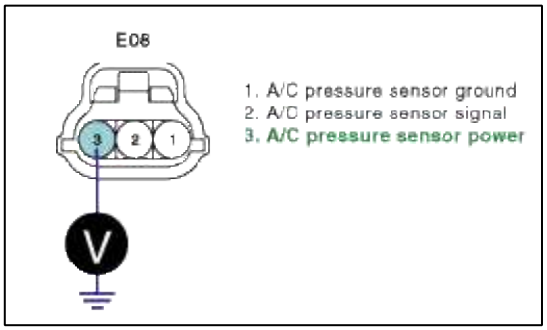
NO

Go to " Power Circuit Inspection " procedure.

POWER CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect the A/C pressure sensor connector.
3. Key "ON".
4. Measure the voltage between terminal 3 of A/C pressure sensor harness connector and chassis ground.

Specification : 5V



5. Is the measured voltage within specification ?

YES

Go to "Ground inspection" procedure.

NO

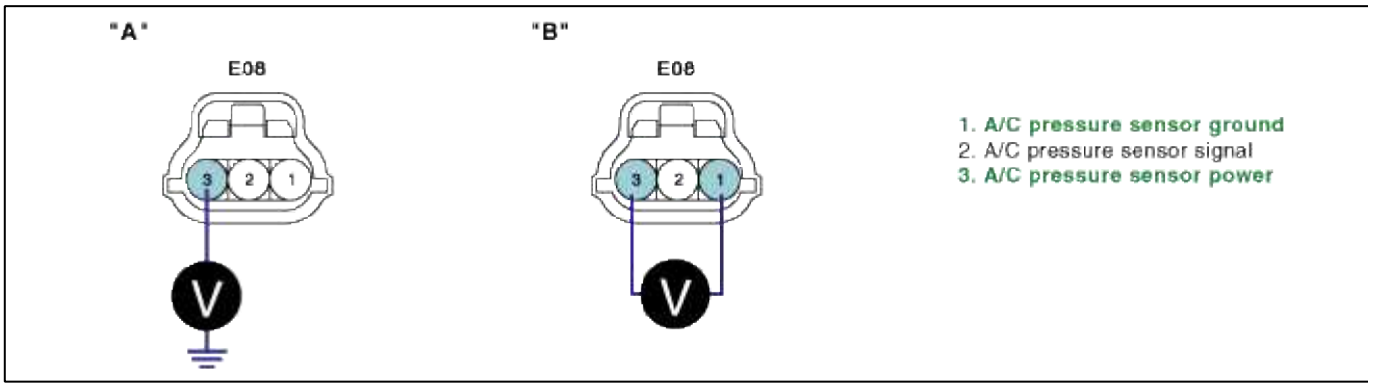
Repair Open in power circuit and go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Key "OFF".
2. Disconnect the A/C pressure sensor connector.
3. Key "ON".

4. Measure the voltage between terminal 3 of A/C pressure sensor harness connector and chassis ground. (Fig A)
5. Measure the voltage between terminal 3 and terminal 1 of A/C pressure sensor harness connector.(Fig B)

Specification : The Difference between "A" and "B" is below 200mV.



6. Is the measured voltage within specification ?

YES

Go to "Signal circuit inspection" procedure.

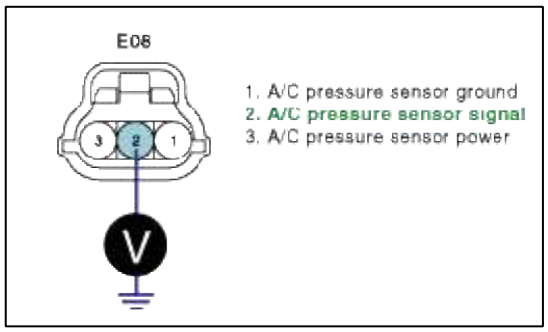
NO

Repair as necessary and go to "Verification of Vehicle Repair" procedure.

SIGNAL CIRCUIT INSPECTION

1. Voltage inspection
   (1) Key "OFF".
   (2) Disconnect the A/C pressure sensor connector.
   (3) Key "ON".
   (4) Measure the voltage between terminal 2 of A/C pressure sensor harness connector and chassis ground.

Specification : Approx. 0V



   (5) Is the measured voltage within specification ?

YES

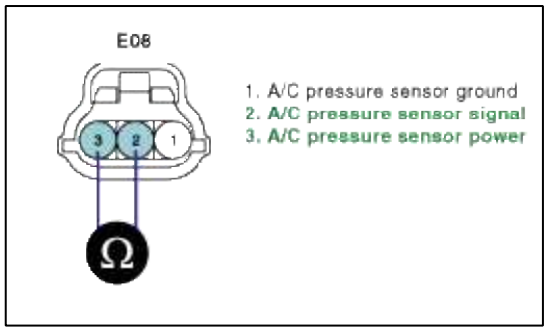
Go to "Component inspection" procedure.

NO

Go to "Short in circuit inspection" procedure.

2. Short in circuit inspection
   (1) Key "OFF".
   (2) Disconnect A/C pressure sensor connector and ECM/PCM connector.
   (3) Measure the resistance between terminal 2 and terminal 3 of A/C pressure sensor harness connector.

   Specification : Infinite



   (4) Is the measured resistance within specification ?

   YES

   Go to "Component inspection" procedure.

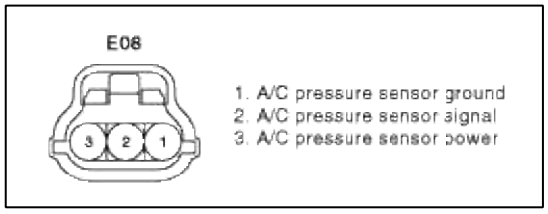
   NO

   Repair Short in signal circuit and go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. A/C pressure sensor inspection
   (1) Key "OFF" and connect the scantool.
   (2) Connect the probe to A/C pressure sensor signal and select the oscilloscope in the menu.
   (3) Check the change of Cwaveform with A/C "ON" and A/C "OFF" after engine start.
   Specification :

Pressure(psi)	14.7	100	200	300	470
Voltage(V)	0.5	1.25	2.13	3.00	4.50



   (4) Is the measured waveform of A/C pressure sensor normal?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good A/C pressure sensor and check for proper operation. If the problem is corrected, replace A/C pressure sensor and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.

2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Heating,Ventilation, Air Conditioning > Troubleshooting > P0645

GENERAL DESCRIPTION

The A/C relay is activated if the A/C switch is ON while the blower is running and system operation is enabled the ECM/PCM. Power is then supplied to the A/C compressor electromagnetic clutch and A/C system is operated. The A/C compressor is switched out to prevent it running when full engine output is required or there is a risk of overheating.The ECM/PCM also inhibits compressor operation on starting to permit running conditions to stabilize.

DTC DESCRIPTION

If there is Open in A/C control relay control circuit, ECM/PCM sets DTC P0645.

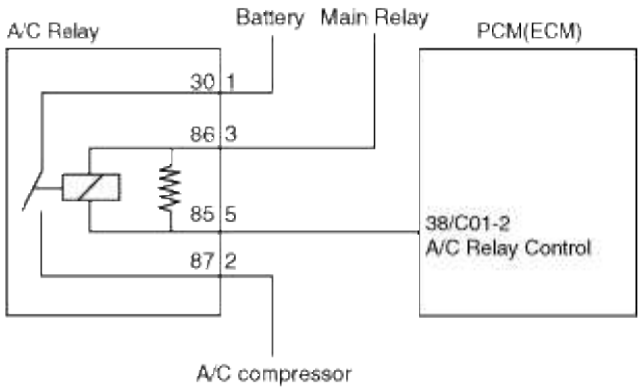
DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, open	• Poor connection • Open or short to ground in power circuit • Open in control circuit • A/C relay • ECM/PCM
Enable Conditions		
Threshold Value	• Disconnected	
Diagnostic Time	• Continuous	
MIL ONCondition	• DTC only	

SCHEMATIC DIAGRAM

(A/T)

[CIRCUIT DIAGRAM]

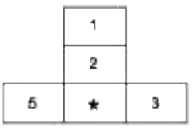


[CONNECTION INFORMATION]

PCM (A/T)

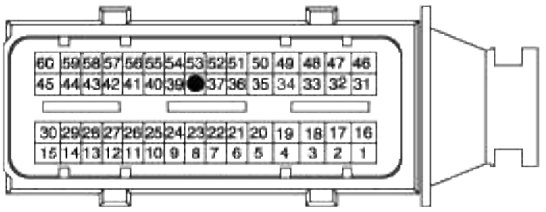
Terminal	Connected to	Funtion
1	Battery	Power from Battery
2	A/C compressor	Power to Compressor
3	Main Relay	Power from main Relay
5	ECM terminal 38/C01-2	A/C Relay Control

[HARNESS CONNECTORS]



E66
A/C Relay

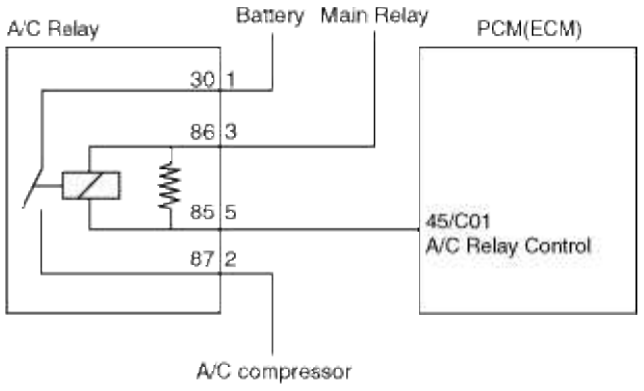
PCM (A/T)



C01-2

(M/T)

[CIRCUIT DIAGRAM]

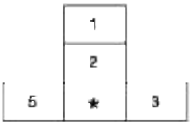


[CONNECTION INFORMATION]

ECM (M/T)

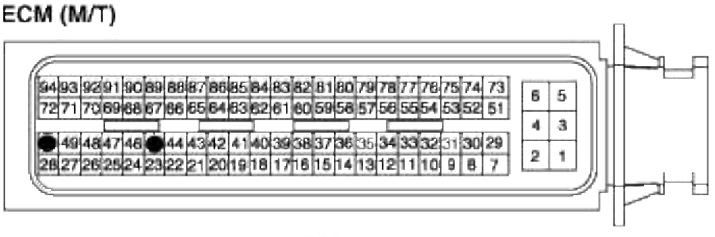
Terminal	Connected to	Funtion
1	Battery	Power from Battery
2	A/C compressor	Power to Compressor
3	Main Relay	Power from main Relay
5	ECM terminal 45/C01	A/C Relay Control

[HARNESS CONNECTORS]



E66
A/C Relay

ECM (M/T)



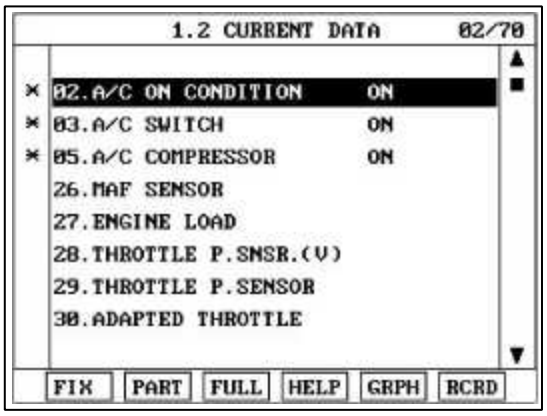
C01

ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor "A/C Relay" parameters on scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

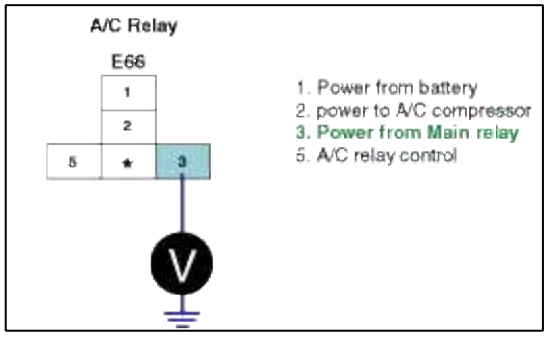
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check Voltage of power circuit from battery
   (1) IG "OFF".
   (2) Disconnect A/C Relay.
   (3) IG "ON".
   (4) Measure the voltage between terminal 3 of A/C Relay harness connector and ground.

Specification : B+



(5) Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

NO

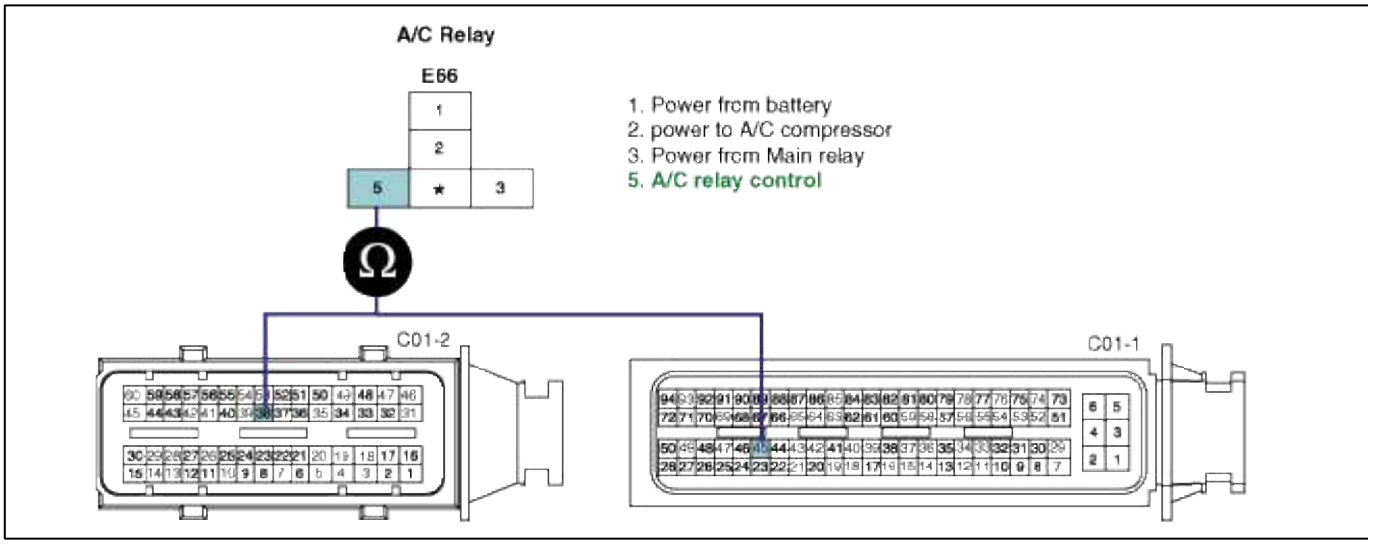
Check "10A SNSR" fuse between a main relay and a A/C relay.

Check Open or Short to ground in power circuit of A/C relayand then go to "Verification of vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect A/C relay and ECM/PCM harness connector.
3. IG "ON".
4. Measure the resistance between terminal 5 of A/C relay harness connector and terminal 38/C01-2of ECM/PCM harness connector.(AT)
   Measure the resistance between terminal 5 of A/C relay harness connector and terminal 45/C01of ECM/PCM harness connector.(MT)

   Specification : below 1Ω



5. Is the measured resistance within specification?

YES

Go to "Component inspection" procedure.

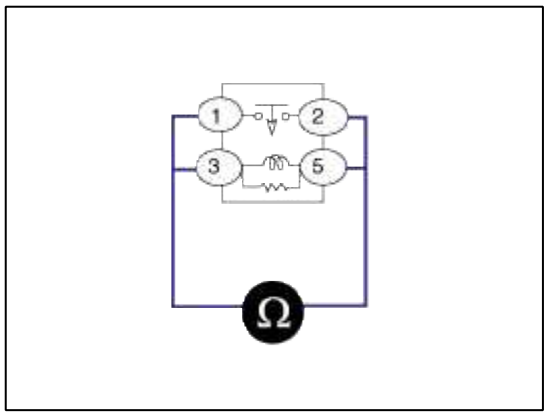
NO

Repair Open in A/C relay control circuit and then go to "Verification of vehicle repair" procedure.

COMPONENT INSPECTION

1. A/C relay check
   (1) Key "OFF".
   (2) Disconnect A/C relay.
   (3) Measure the resistance between terminal 1 and 2 of A/C relay component side.
   (4) Measure the resistance between terminal 3 and 5 of A/C relay component side.
   Specification :

Terminal	Power Approval
1 ~ 2	NO
3 ~ 5	YES (Approx. 70 ~ 120Ω)



   (5) Is the measured resistance within specification ?

   YES

   Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

   NO

   Substitute with a known - good A/C relay and check for proper operation. If the problem is corrected, replace A/C relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Heating,Ventilation, Air Conditioning > Troubleshooting > P0646

GENERAL DESCRIPTION

The A/C relay is activated if the A/C switch is ON while the blower is running and system operation is enabled the ECM/PCM. Power is then supplied to the A/C compressor electromagnetic clutch and A/C system is operated. The A/C compressor is switched out to prevent it running when full engine output is required or there is a risk of overheating.The ECM/PCM also inhibits compressor operation on starting to permit running conditions to stabilize.

DTC DESCRIPTION

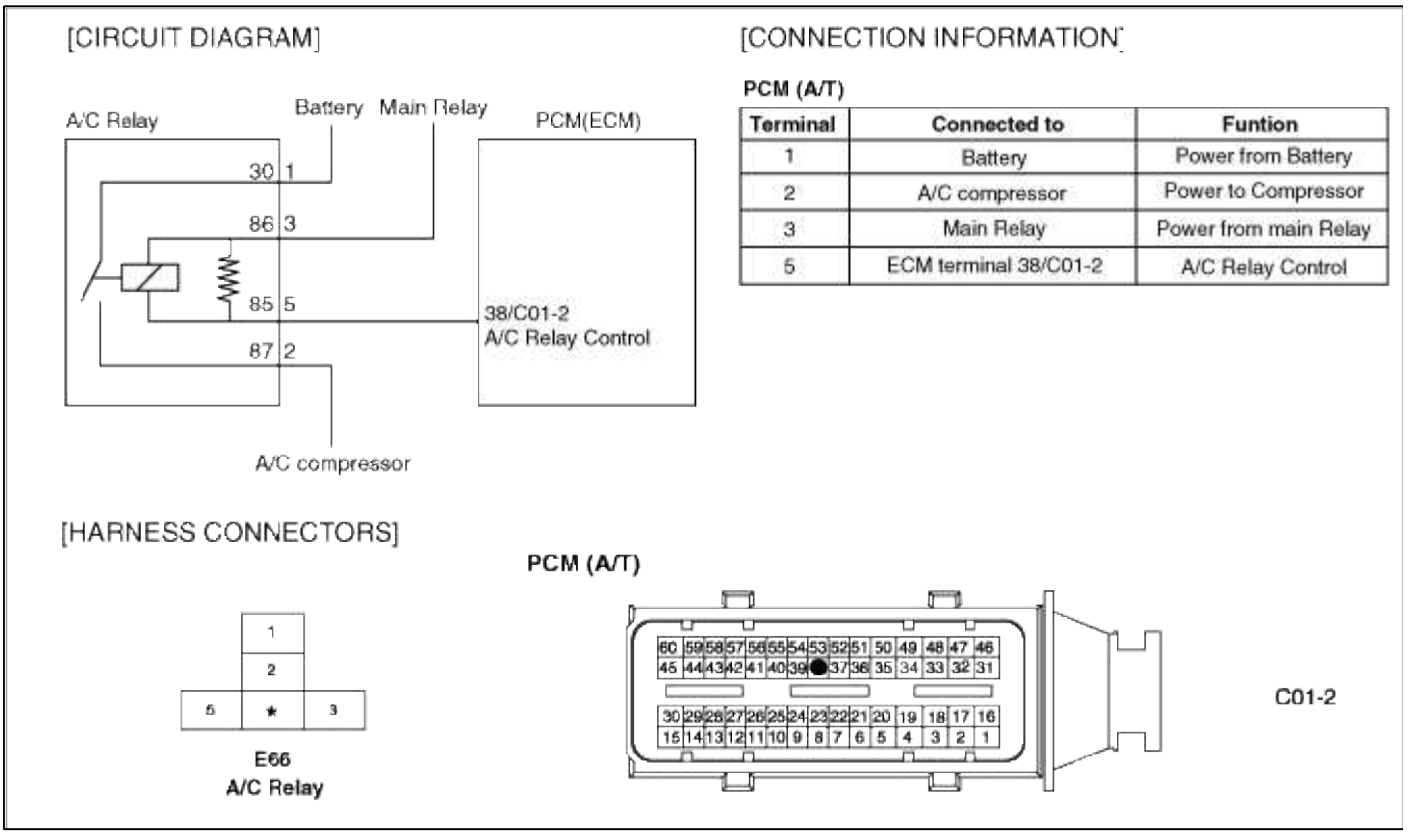
If there is Short to ground in A/C control relay control circuit, ECM/PCM sets DTC P0646.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, low	• Poor connection • short to ground in control circuit • A/C relay • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to ground	
Diagnostic Time	• Continuous	
MIL ONCondition	• DTC only	

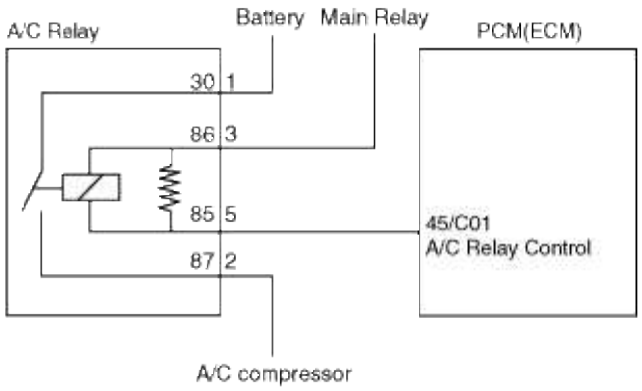
SCHEMATIC DIAGRAM

(A/T)



(M/T)

[CIRCUIT DIAGRAM]

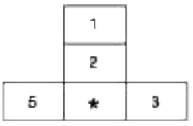


[CONNECTION INFORMATION]

ECM (M/T)

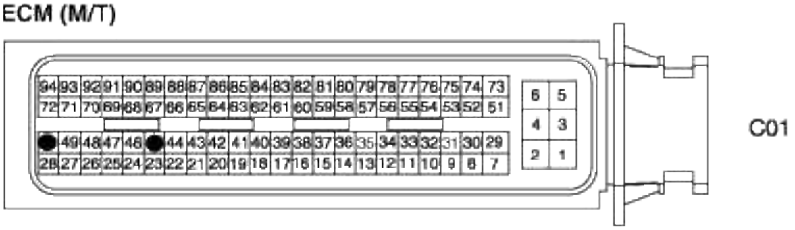
Terminal	Connected to	Funtion
1	Battery	Power from Battery
2	A/C compressor	Power to Compressor
3	Main Relay	Power from main Relay
5	ECM terminal 45/C01	A/C Relay Control

[HARNESS CONNECTORS]



E66
A/C Relay

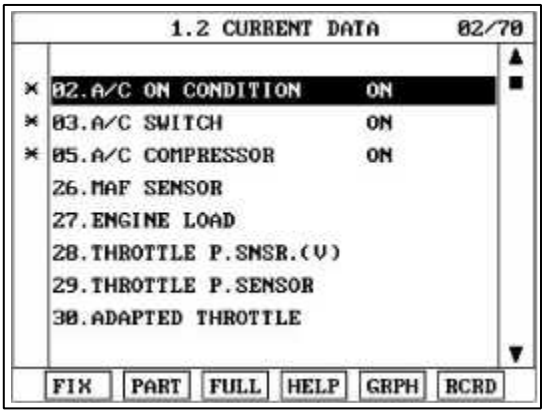
ECM (M/T)



ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor "A/C Relay" parameters on scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

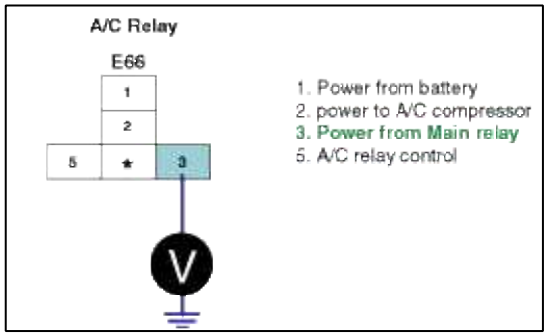
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check Voltage of power circuit from battery
   (1) IG "OFF".
   (2) Disconnect A/C Relay.
   (3) IG "ON".
   (4) Measure the voltage between terminal 3 of A/C Relay harness connector and ground.

Specification : B+



   (5) Is the measured voltage within specification?

YES

Go to "Control circuit inspection" procedure.

NO

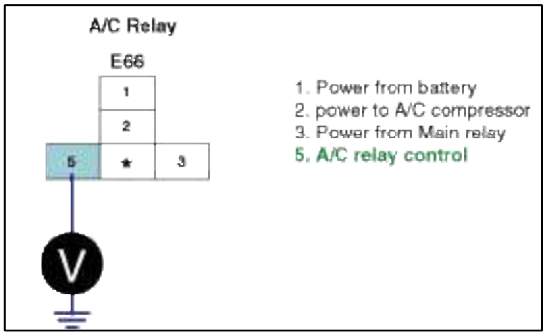
Check "10A SNSR" fuse between a main relay and a A/C relay.

Check Open or Short to ground in power circuit of A/C relayand then go to "Verification of vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect A/C Relay.
3. IG "ON".
4. Measure the voltage between terminal 5 of A/C relay and ground.

Specification : Approx. 11V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to ground in A/C relay control circuit and then go to "Verification of Vehicle Repair"procedure.

COMPONENT INSPECTION

1. A/C relay check

(1) Key "OFF".

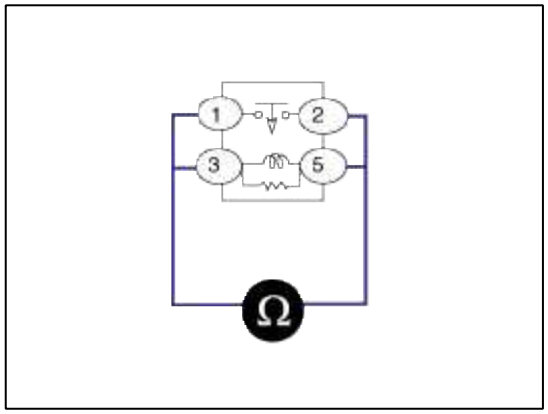
(2) Disconnect A/C relay.

(3) Measure the resistance between terminal 1 and 2 of A/C relay component side.

(4) Measure the resistance between terminal 3 and 5 of A/C relay component side.

Specification :

Terminal	Power Approval
1 ~ 2	NO
3 ~ 5	YES (Approx. 70 ~ 120Ω)



(5) Is the measured resistance within specification ?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good A/C relay and check for proper operation. If the problem is corrected, replace A/C relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

Heating,Ventilation, Air Conditioning > Troubleshooting > P0647

GENERAL DESCRIPTION

The A/C relay is activated if the A/C switch is ON while the blower is running and system operation is enabled the ECM/PCM. Power is then supplied to the A/C compressor electromagnetic clutch and A/C system is operated. The A/C compressor is switched out to prevent it running when full engine output is required or there is a risk of overheating.The ECM/PCM also inhibits compressor operation on starting to permit running conditions to stabilize.

DTC DESCRIPTION

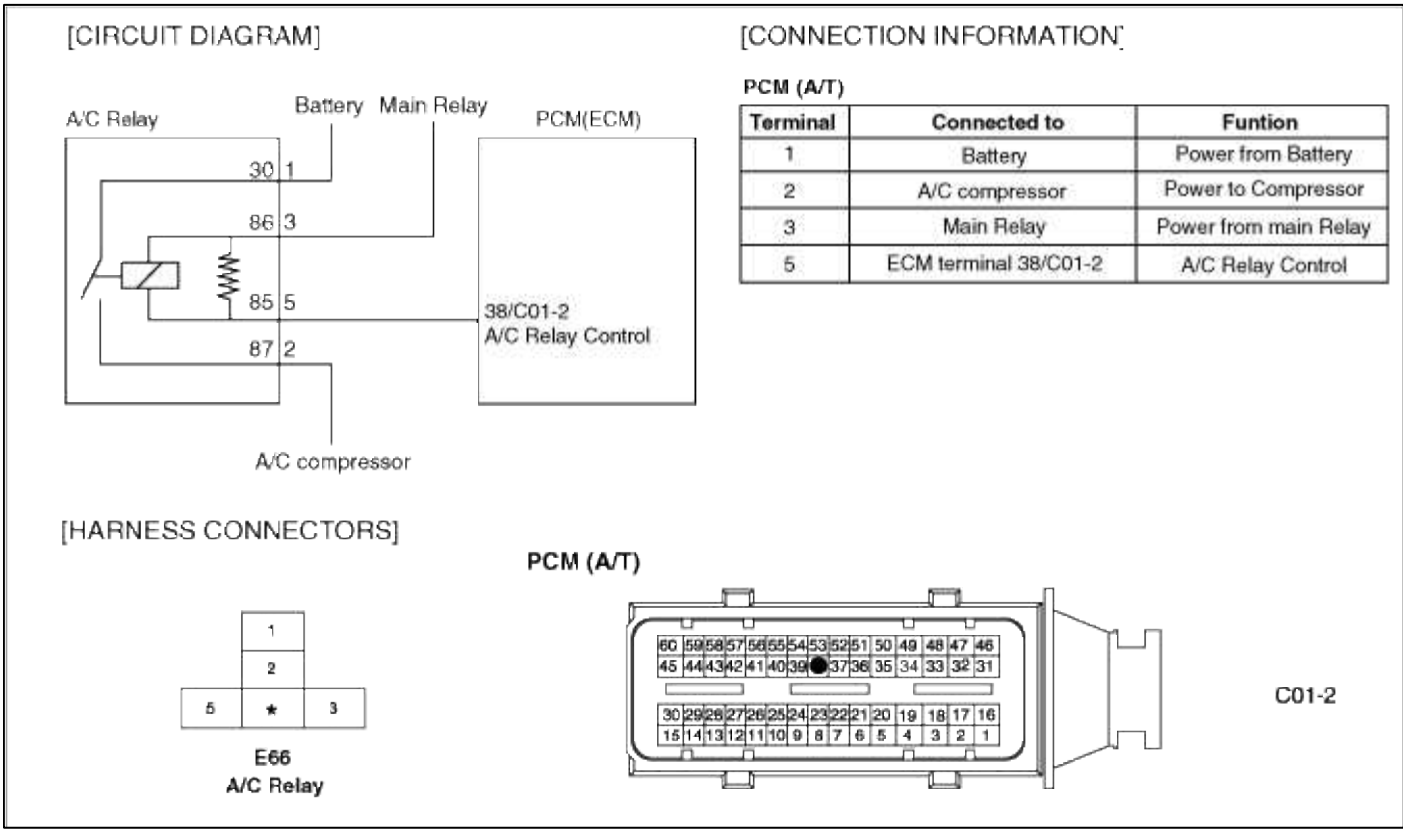
If there is Short to power in A/C control relay control circuit, ECM/PCM sets DTC P0647.

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	• Circuit continuity check, high	• Poor connection • short to power in control circuit • A/C relay • ECM/PCM
Enable Conditions		
Threshold Value	• Short circuit to battery	
Diagnostic Time	• Continuous	
MIL ONCondition	• DTC only	

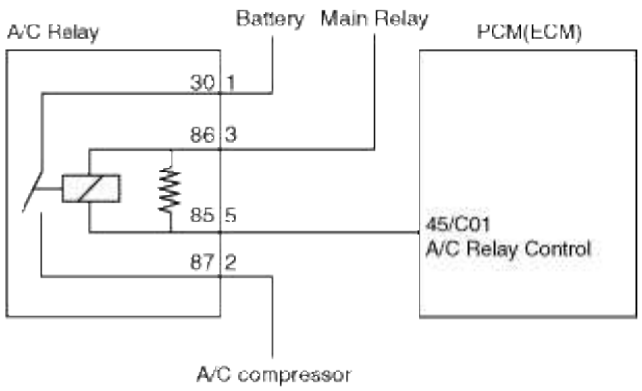
SCHEMATIC DIAGRAM

(A/T)



(M/T)

[CIRCUIT DIAGRAM]

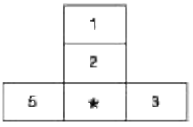


[CONNECTION INFORMATION]

ECM (M/T)

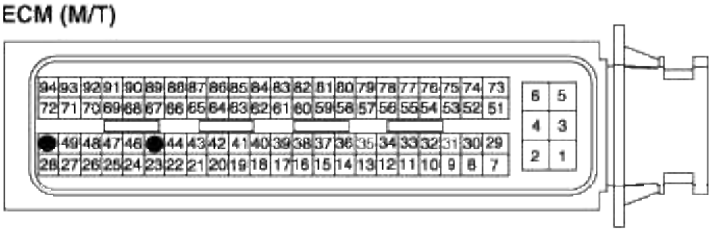
Terminal	Connected to	Funtion
1	Battery	Power from Battery
2	A/C compressor	Power to Compressor
3	Main Relay	Power from main Relay
5	ECM terminal 45/C01	A/C Relay Control

[HARNESS CONNECTORS]



E66
A/C Relay

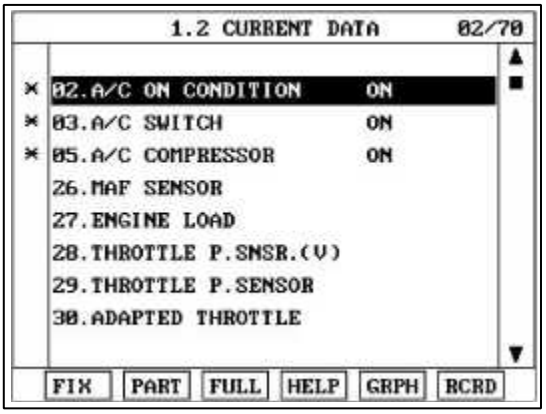
ECM (M/T)



ECM

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor "A/C Relay" parameters on scantool.



4. Are the parameters displayed correctly ?

YES

Fault is intermittent caused by poor contact in the sensor's and/or ECM's connector or wasrepaired and ECM/PCM memory was not cleared. Thoroughly check connectors for looseness, poorconnection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection & Repair" procedure.

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

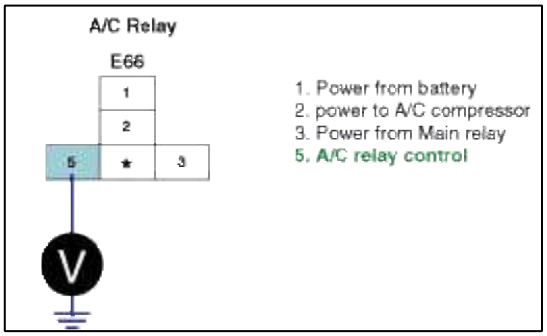
NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. IG "OFF".
2. Disconnect A/C Relay.
3. IG "ON".
4. Measure the voltage between terminal 5 of A/C relay and ground.

Specification : Approx. 11V



5. Is the measured voltage within specification?

YES

Go to "Component inspection" procedure.

NO

Repair Short to power in A/C relay control circuit and then go to "Verification of Vehicle Repair"procedure.

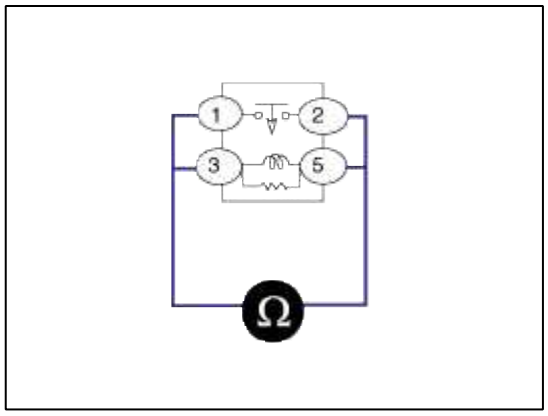
COMPONENT INSPECTION

1. A/C relay check
   (1) Key "OFF".
   (2) Disconnect A/C relay.
   (3) Measure the resistance between terminal 1 and 2 of A/C relay component side.

(4) Measure the resistance between terminal 3 and 5 of A/C relay component side.

Specification :

Terminal	Power Approval
1 ~ 2	NO
3 ~ 5	YES (Approx. 70 ~ 120Ω)



(5) Is the measured resistance within specification ?

YES

Substitute with a known - good ECM/PCM and check for proper operation. If the problem is corrected, replace ECM/PCM and go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known - good A/C relay and check for proper operation. If the problem is corrected, replace A/C relay and go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2. Clear the DTCs and Operate the vehicle within DTC Enable conditions in General information.
3. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

ACCENT(MC) > 2008 > G 1.6 DOHC > Manual Transaxle System

Manual Transaxle System > General Information > Specifications (M5CF1)

Specifications

Engine type		G4ED(1.6)
Transaxle type		M5CF1
Gear ratio	1st	3.615
	2nd	2.053
	3rd	1.370
	4th	1.031
	5th	0.837
	Reverse	3.583
Final gear ratio		4.056

Service Standard

Items	Standard value [in(mm)]
Input shaft rear bearing end play	0.00-0.0019L(0.00-0.05L)
Output shaft bearing end play (At 70kgf load)	0.0019T-0.0039T(0.05T-0.10T)
Input shaft front bearing end play	0.00-0.0019L(0.00-0.05L)
Differential bearing end play (At 70kgf load)	0.0059T-0.0078T(0.15T-0.20T)
Differential pinion backlash	0.001L-0.0039L(0.025L-0.10L)

T: Indicate tightening of -(minus) direction of end play
L: Indicate loosening of +(plus) direction of end play
Tightening Torques

Standard value	Nm	kgf.cm	lbf.ft
Clutch tube flare nut	13-17	130-170	9-12
Release cylinder bolt	15-22	150-220	10-16
Control shaft bolt	20-27	200-270	15-20
Oil drain plug	60-80	600-800	43-58
Oil filler plug	60-80	600-800	43-58
Poppet ball	40-60	400-600	29-43
Clutch housing to transmission case	43-55	430-550	32-40
Speedometer driven gear	3-5	30-50	2-4
Reverse idler bolt	43-55	430-550	32-40
Reverse shift lever assembly bolt	20-27	200-270	15-20
Input shaft bearing retainer	15-22	150-220	10-16
Shift control cable bracket on transaxle side	20-27	200-270	15-20
Rear roll support bracket bolt	60-80	600-800	43-58
Rear roll stopper insulator bolt and nut	50-65	500-650	36-47
Front roll stopper insulator bolt and nut	50-65	500-650	36-47
Front roll support bracket bolt	60-80	600-800	43-58
Transaxle support bracket bolts	60-80	600-800	43-58
Transaxle mounting bracket bolts	70-95	700-950	50-69
Differential drive gear seal bolt	130-140	1300-1400	94-101
Clutch release lever fulcrum bolt	55-60	550-600	40-43
Shift lever mounting bolts	9-14	90-140	6-9.5
Transaxle upper mounting bolts [Dia. 12mm (0.472in)]	60-80	600-800	43-58
Transaxle lower mounting bolts [Dia. 10mm (0.393in)]	43-55	430-550	32-40
Starter motor mounting bolt [Dia. 10mm (0.393in)]	27-34	270-340	19-24

WARNING

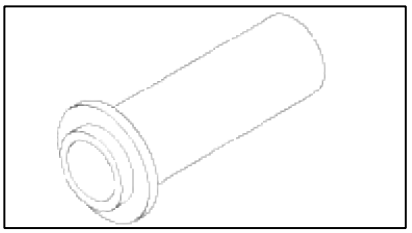
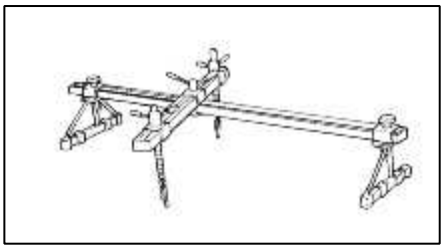
Always follow torque tightening levels. Failure to follow such levels can result in parts breaking if over-tightened or loosening if under-tightened. In either case, serious personal injury or death could result to vehicle occupants.

Lubricants

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, 1.67lmp 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

Manual Transaxle System > General Information > Special Service Tools (M5CF1)

Special Service Tools

TOOL (Number and Name)	Illustration	Use
09452-21200 Oil seal installer		Installation of differential oil seal
09200-38001 Engine support fixture		Removal and installation of the transaxle

Manual Transaxle System > General Information > Troubleshooting (M5CF1)

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 poppet spring	Replace shift fork or poppet spring
	Synchronizer hub-to-sleeve spline clearance too large	Replace synchronizer hub and sleeve

Manual Transaxle System > Manual Transaxle System > Repair procedures (M5CF1)

Service Adjustment Procedure

Transaxle Gear Oil Level

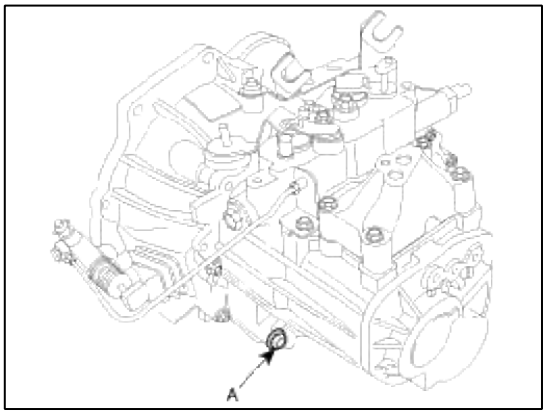
Inspection

Inspect each component for evidence of leakage.

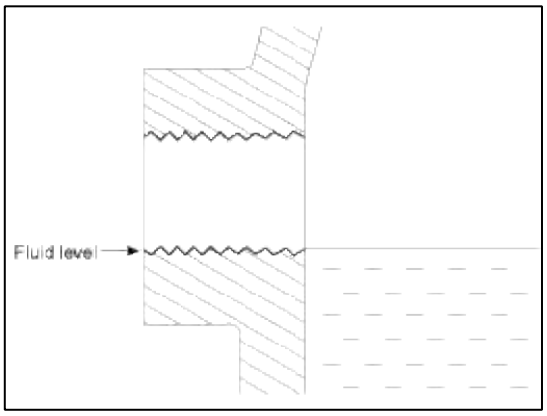
Check the gear oil level by removing the filler plug.

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, add oil until it runs over.

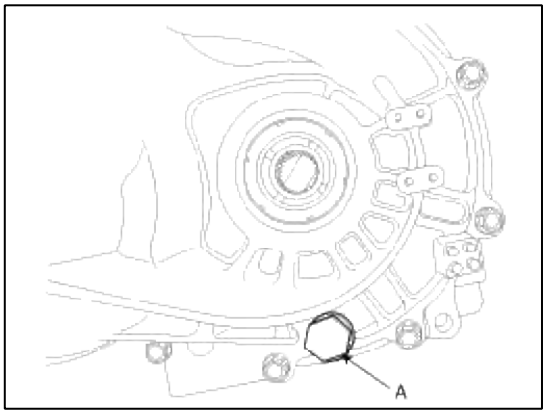


3. Install filler plug.

Filler plug tightening torque :
60-80 Nm (600-800 kg·cm, 43-58 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).



3. Install the drain plug with new washer.

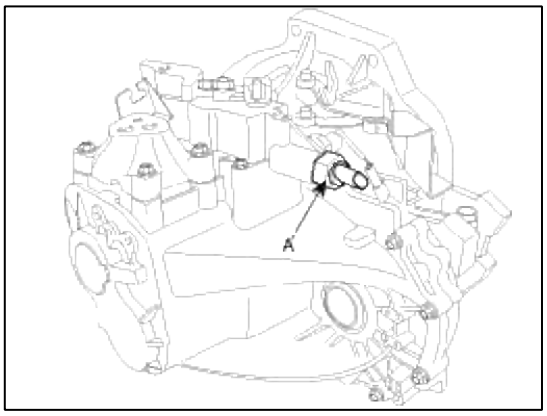
Drain plug tightening torque:
60-80 Nm (600-800 kg·cm, 43-58 lb·ft)

4. Add new oil through the fille plug hole and, fill it just below the plug opening.

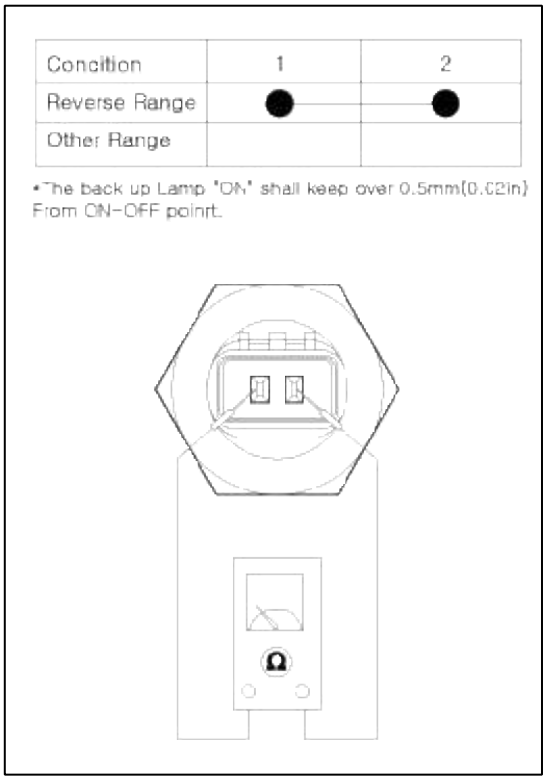
Standard oil SAE 75W/85, API GL-4
Oil capacity: 1.9 liter (2.0 US qt, 1.67 lmp qt)

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.

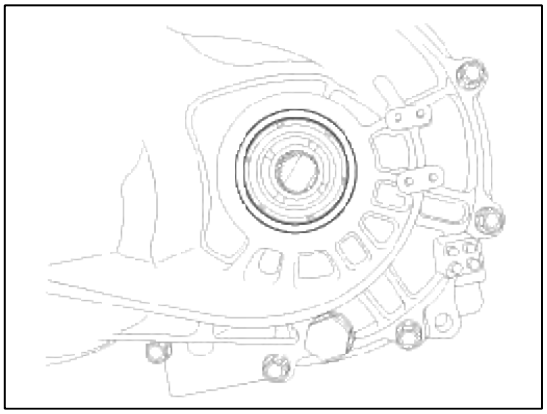


3. If necessary, repair or replace the backup lamp switch.

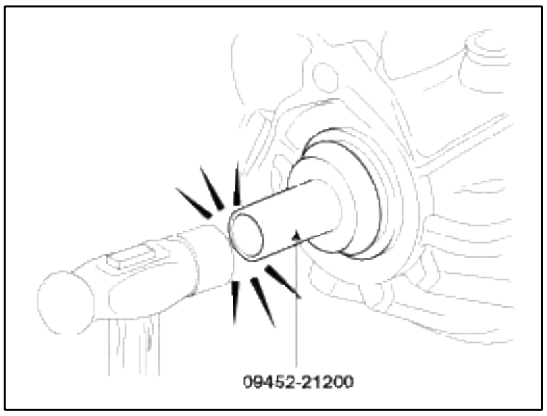
Drive Shaft Oil Seal

Replace

1. Disconnect the drive shaft from the transaxle. (see "DS" group)
2. Using a flat-tip screwdriver, remove the oil seal.

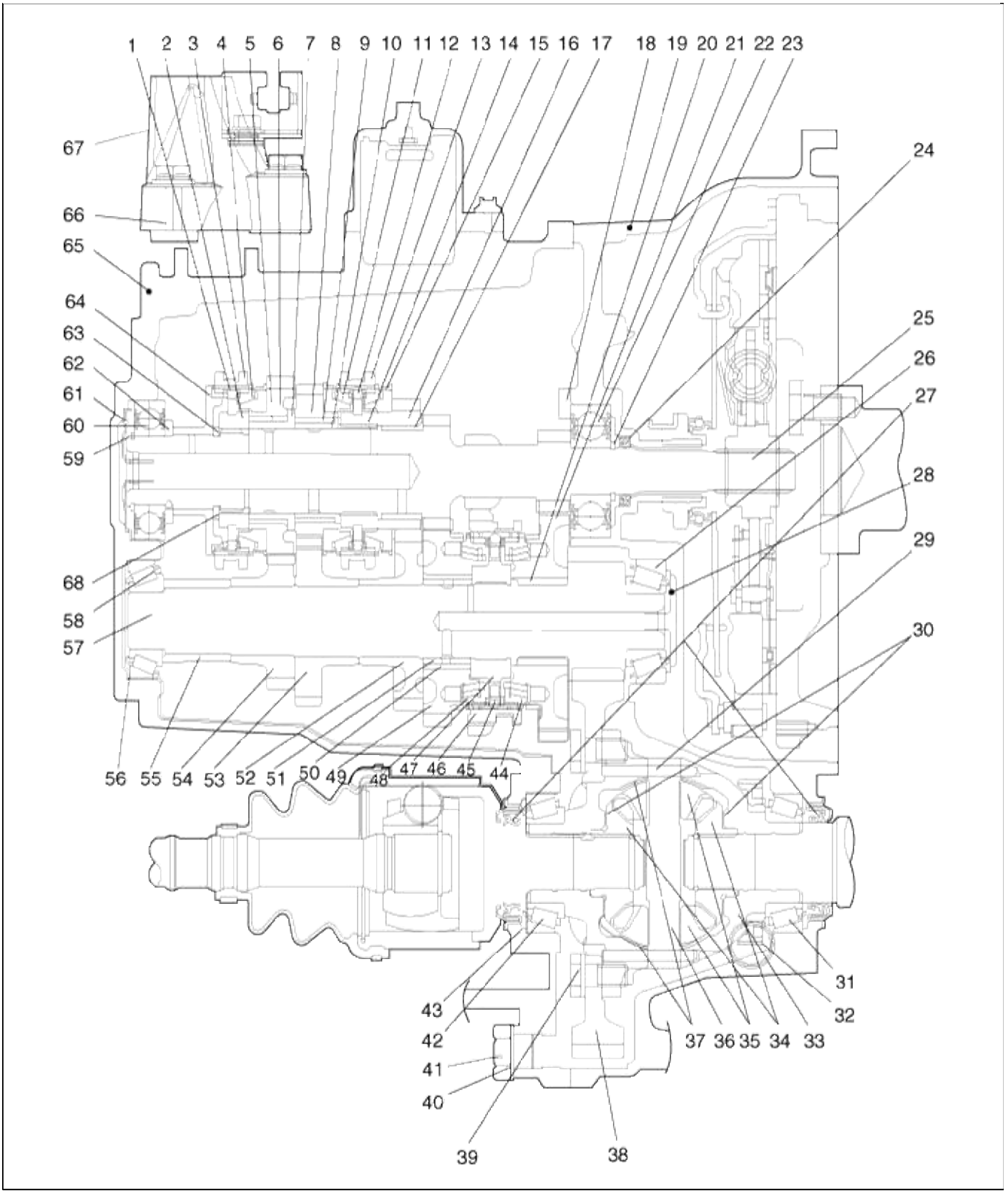


3. Using the special tool(09452-21200), tap the drive shaft oil seal into the transaxle.



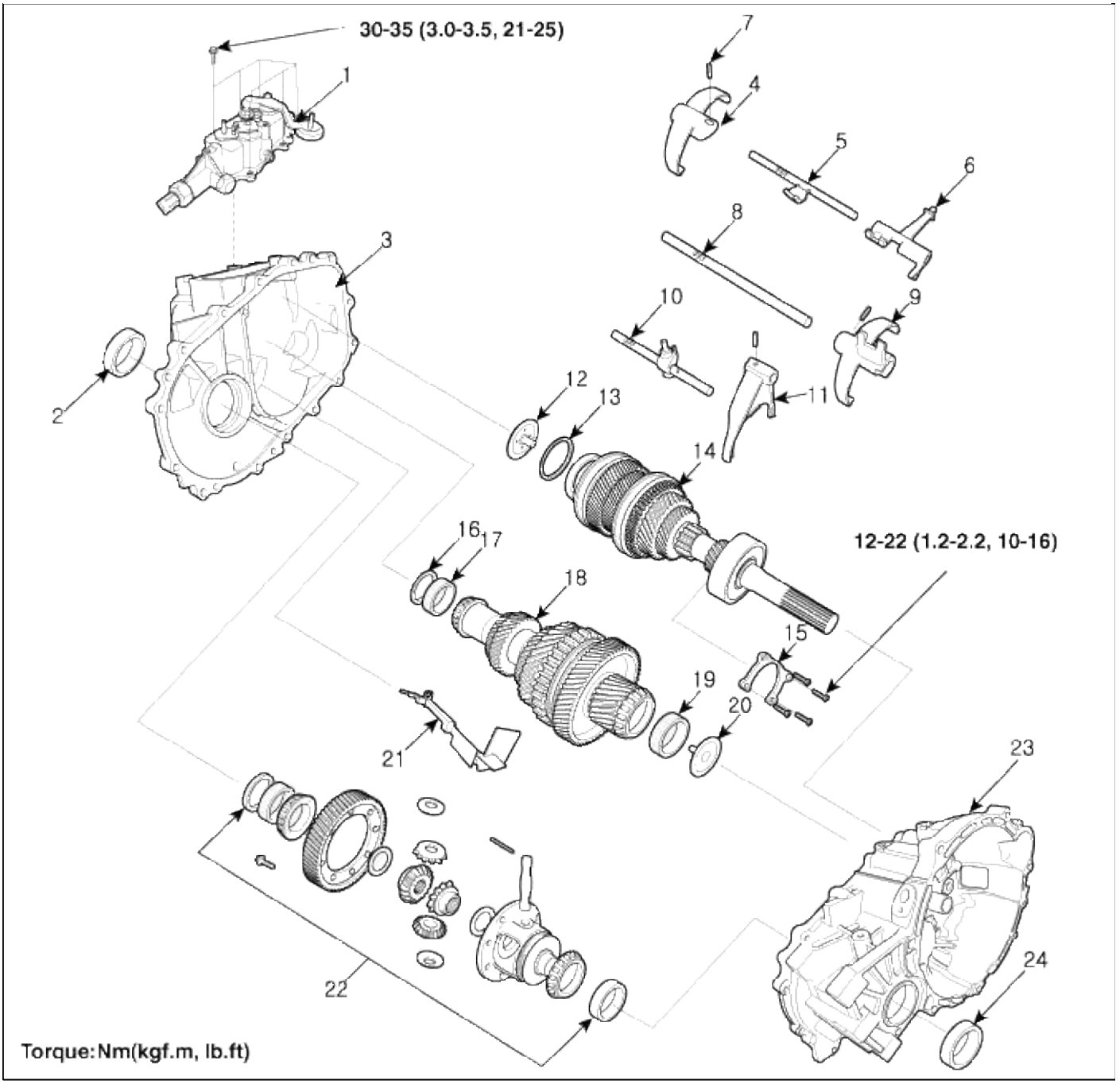
Manual Transaxle System > Manual Transaxle System > Manual Transaxle > Components and Components Location (M5CF1)

Components (1)


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
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37 36 35 34 33

1. 5th synchronizer key assembly	36. Pinion shaft
2. 5th synchronizer hub	37. Washer
3. 5th synchronizer sleeve	38. Differential drive gear
4. 5th synchronizer ring	39. Differential gear seal bolt
5. Needle roller bearing	40. Gasket
6. 5th speed gear assembly	41. Drain plug
7. 5th speed gear sleeve	42. Differential taper roller bearing
8. 4th speed gear assembly	43. Spacer
9. Needle roller bearing	44. 1st double cone assembly
10. 4th speed gear sleeve	45. 1st synchronizer key
11. 4th synchronizer ring	46. 1st & 2nd synchronizer sleeve
12. 4th synchronizer key assembly	47. 1st & 2nd synchronizer hub
13. 3rd & 4th synchronizer sleeve	48. 2nd double cone assembly
14. 3rd & 4th synchronizer hub	49. 2nd speed gear
15. 3rd double cone assembly	50. Needle roller bearing
16. 3rd speed gear	51. 2nd speed gear sleeve
17. Needle roller bearing	52. 3rd speed output gear
18. Input shaft bearing retainer	53. 4th speed output gear
19. Clutch housing	54. 5th speed output gear
20. Needle roller bearing	55. Spacer
21. 1st speed gear	56. Output bearing spacer
22. Input shaft front ball bearing	57. Output shaft
23. Input shaft front snap ring	58. Output shaft rear taper roller bearing
24. Input shaft front oil seal	59. Input shaft rear snap ring
25. Input shaft	60. Input shaft rear ball bearing
26. Output shaft front taper roller bearing	61. Input shaft oil guide
	62. Thrust washer
27. Differential oil seal	63. Input shaft 5th spacer
28. Output shaft oil guide	64. Spacer
29. Lock pin	65. Transaxle case
30. Differential spacer	66. Transaxle support bracket bolt
31. Differential taper roller bearing	67. Transaxle support bracket
32. Speedometer drive gear	68. Ring
33. Differential case	
34. Differential side gear	
35. Differential pinion gear	

Components (2)



1. Control shaft complete	9. 3rd & 4th shift lug and fork	17. Output shaft rear outer racer
2. Oil seal	10. 1st & 2nd shift rail	18. Output shaft assembly
3. Transaxle case	11. 1st & 2nd shift fork	19. Output shaft front outer racer
4. 5th shift fork	12. Input shaft oil guide	20. Output shaft oil guide
5. 5th shift rail	13. Snap ring	21. Oil guide
6. Reverse shift lug	14. Input shaft assembly	22. Differential assembly
7. Spring pin	15. Input shaft bearing retainer	23. Oil seal
8. 3rd & 4th shift rail	16. Spacer	24. Clutch housing

Manual Transaxle System > Manual Transaxle System > Manual Transaxle > Repair procedures (M5CF1)

Removal

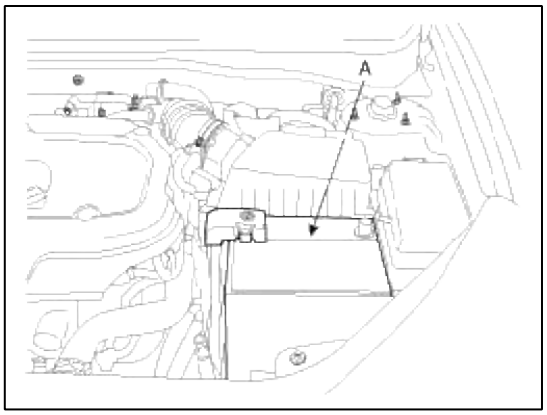
CAUTION

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

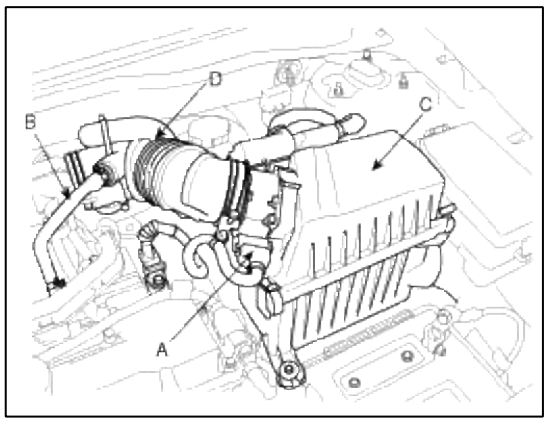
NOTE

- Mark all wiring and hoses to avoid misconnection.

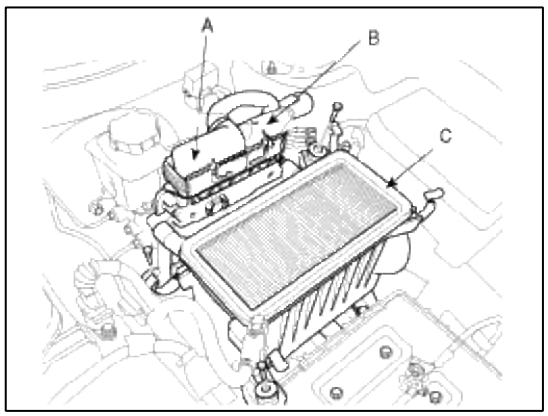
1. Remove the battery(A) after removing the battery terminal.



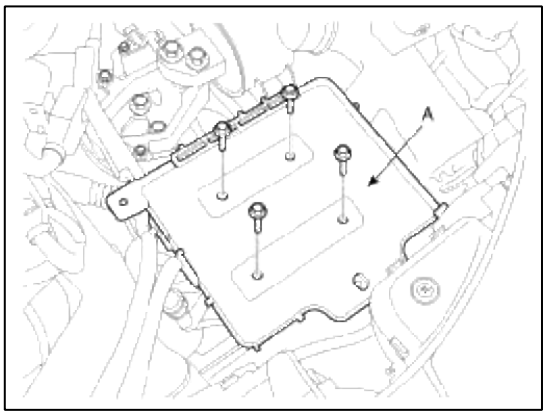
2. Remove the intake air hose and air cleaner assembly.
   (1) Disconnect the air flow sensor connector(A).
   (2) Disconnect the air cleaner hose(D) from the bleeder hose(B).
   (3) Remove the intake air hose and air cleaner upper cover(C).



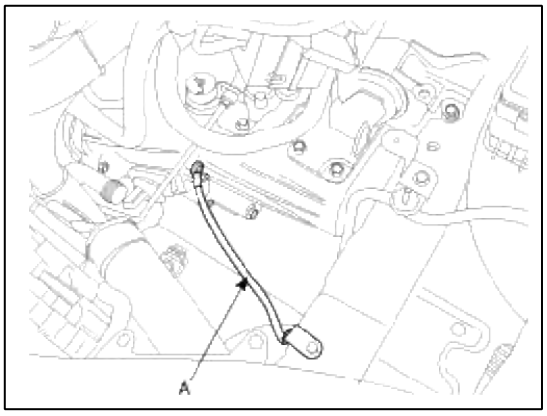
   (4) Disconnect the ECM connector(A, B).
   (5) Remove the air cleaner element and lower cover(C).



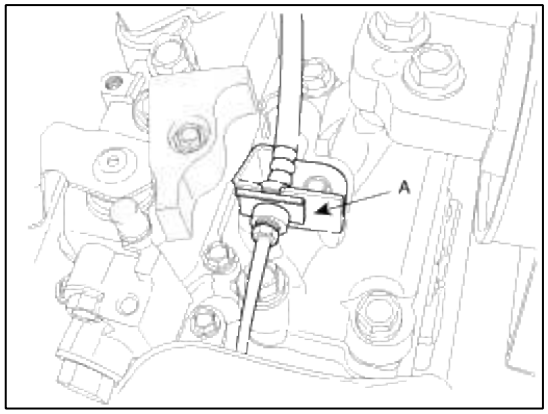
3. Remove the battery tray(A).



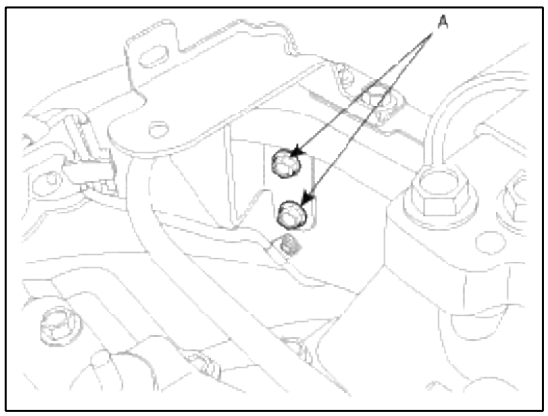
4. Remove the ground cable from transaxle(A).



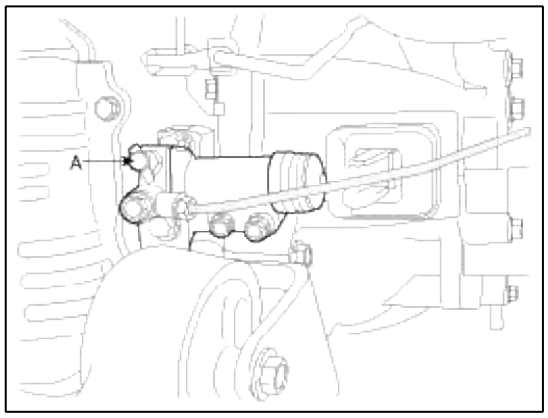
5. Remove the transaxle wire harness connectors and control cable from transaxle.
   (1) Remove the tube bracket (A) from the transaxle.



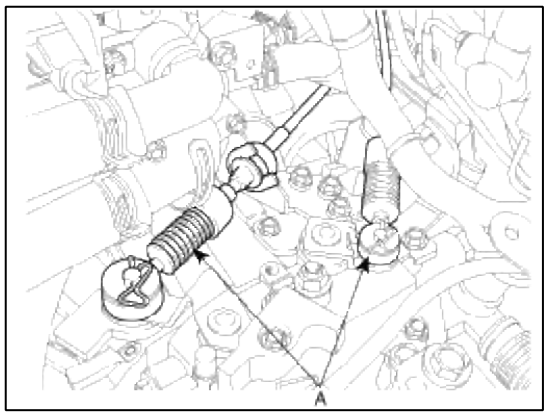
   (2) Remove the two bolts (A) of the bracket holding the flexible hose.



(3) Remove the clutch release cylinder (A).

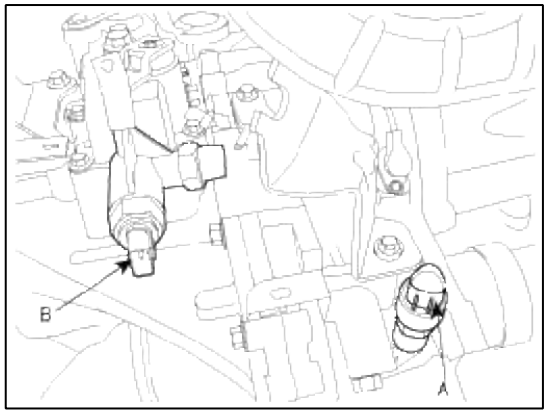


(4) Remove the transaxle control cable (A).

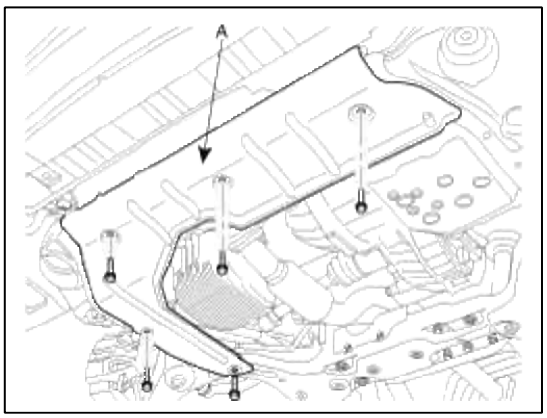


(5) Disconnect the vehicle speed sensor (A).

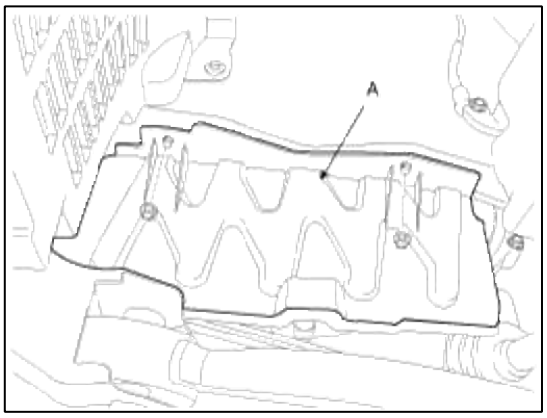
(6) Disconnect the back lamp switch connector (B).



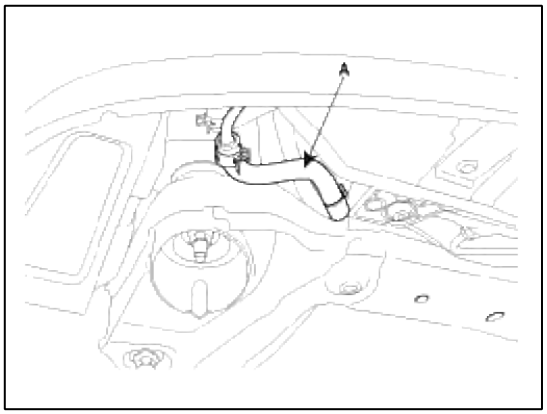
6. Remove the under cover (A).



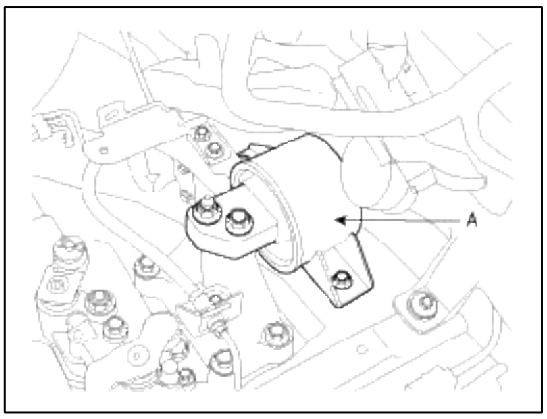
7. Remove the two side cover nut (A).



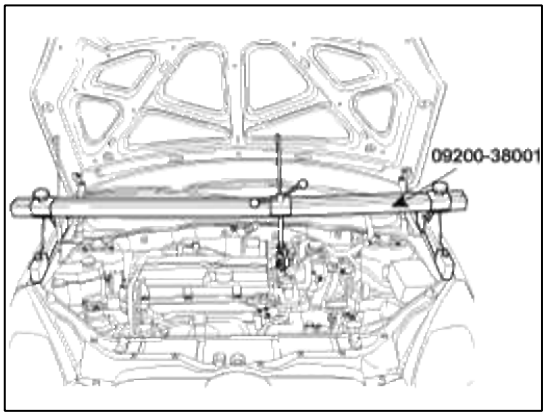
8. Disconnect the power steering return hose (A) to drain power steering oil.



9. Remove the bolt connecting the universal joint and the pinion shaft (Refer to 'ST'-group)
10. Remove the transaxle upper mounting bolts from the engine.
11. Remove the transaxle mounting support bracket (A).

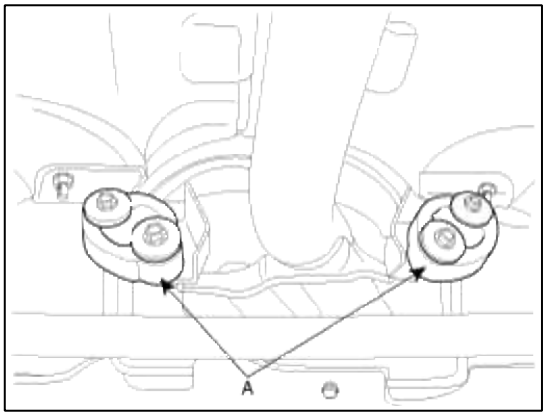


12. Using the SST(09200-38001), hold the engine and transaxle assembly safely.

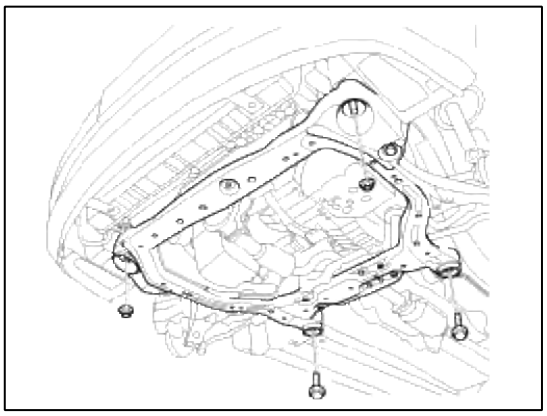


13. Disconnect the lower arm assembly from the knuckle. (see DS group)
14. Disconnect the tie rod end ball joint from the knuckle after removing the split pin. (see DS group)
15. Disconnect the stabilizer bar link. (see SS group)

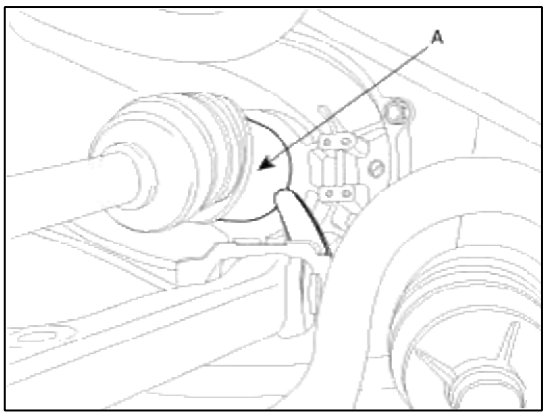
16. Remove the front roll stopper mounting bolt. (see ST group)
17. Remove the rear roll stopper mounting bolt. (see ST group)
18. Remove the exhaust pipe mounting rubber (A) from the sub frame.



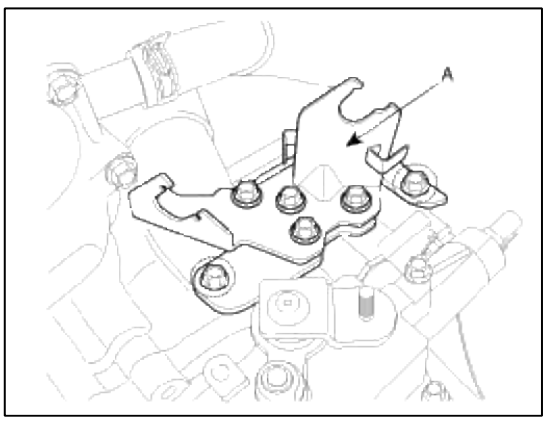
19. Remove the sub frame. (see ST group)



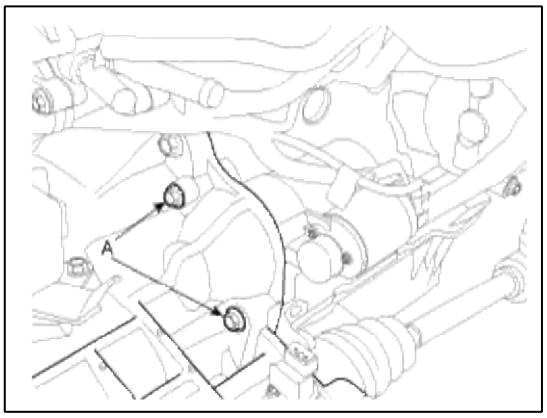
20. Remove drive shaft from transaxle. (See 'DS' group)



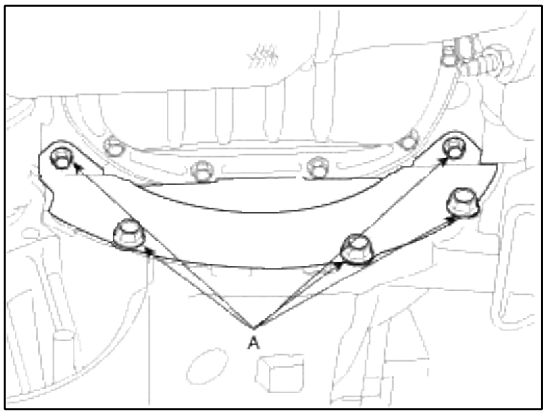
21. Remove the two cable bracket bolts (A).



22. Remove the engine start motor mounting bolts (A).

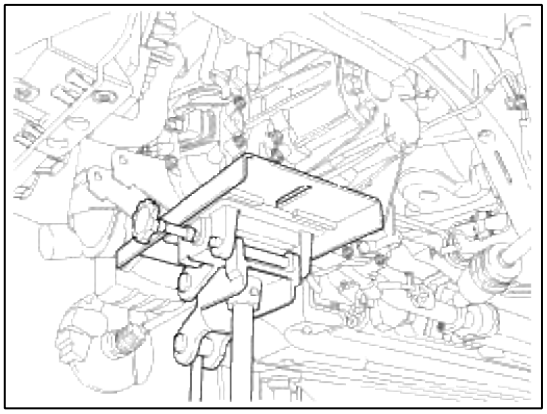


23. Remove the transaxle lower mounting bolts(A).



24. Remove the transaxle assembly by lifting the vehicle.

> **CAUTION**
>
> When removing the transaxle assembly, be careful not to damage any surrounding parts or body components.



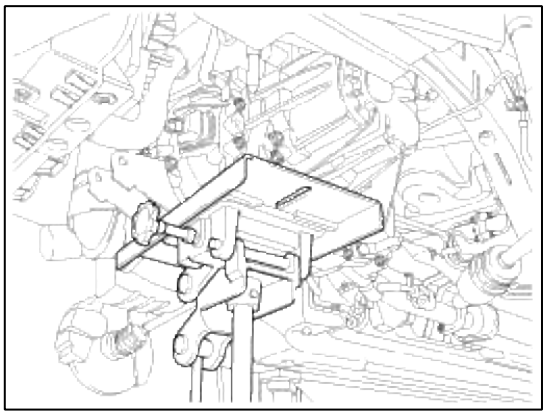
Installation

Installation is in the reverse order of removal.
Perform the following :

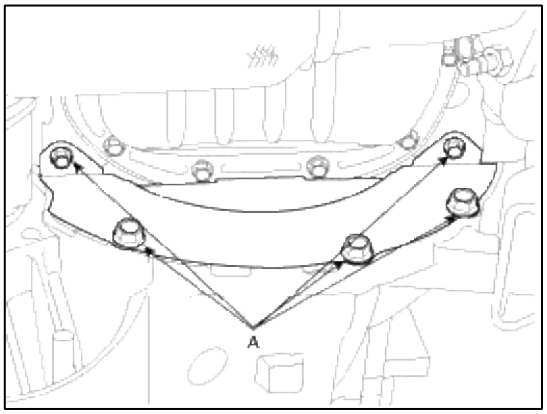
- Adjust the shift cable.
- Refill the transaxle with fluid.
- Refill the radiator with engine coolant.
- Bleed air from the cooling system with the heater valve open.
- Clean the battery posts and cable terminals with sandpaper, assemble them, and apply grease to prevent corrosion.

1. Lowering the vehicle or lifting up a jack, install the transaxle assembly.

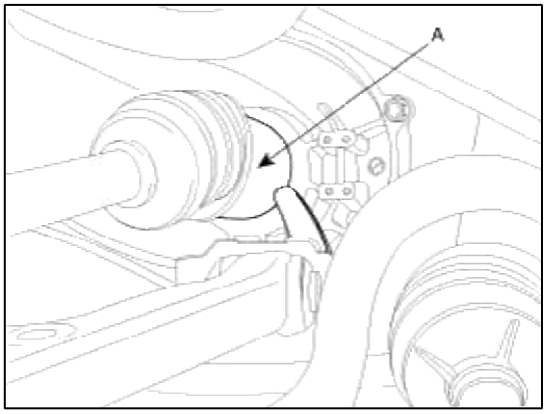
> CAUTION
>
> When installing the transaxle assembly, be careful not to damage any surrounding parts or body components.



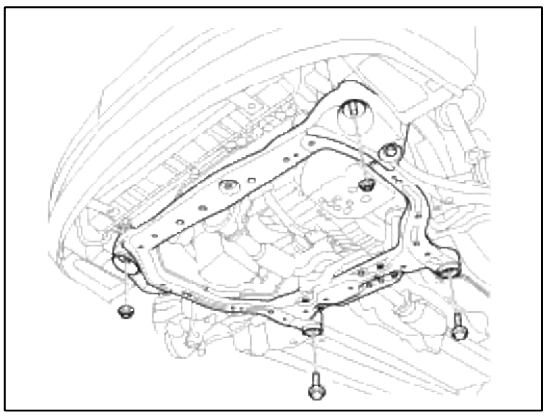
2. Install the transaxle lower mounting bolts(A).



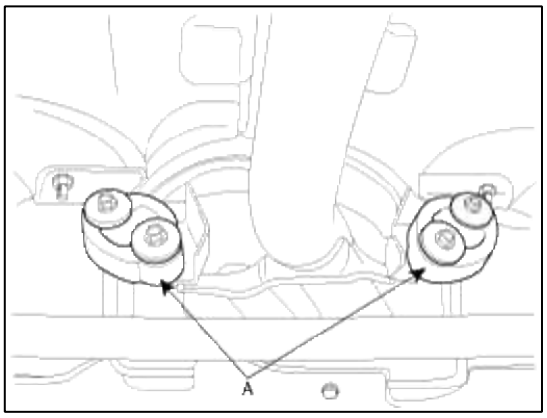
3. Install drive shaft to transaxle. (See DS-group)



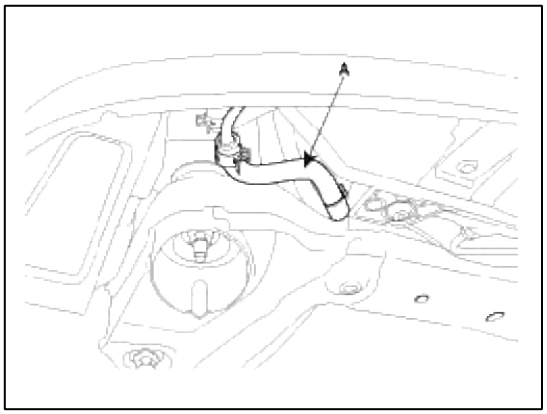
4. Install the sub frame. (see ST-group)



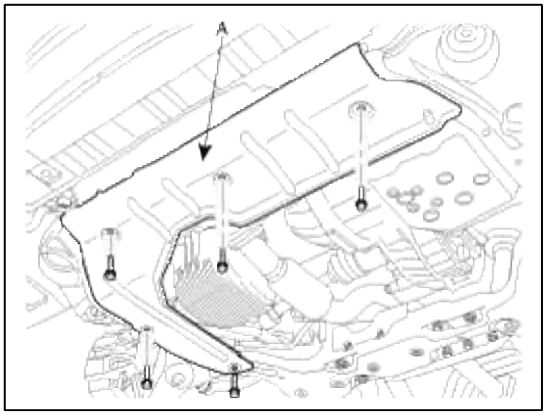
5. Install the exhaust pipe mounting rubber (A) to the sub frame.



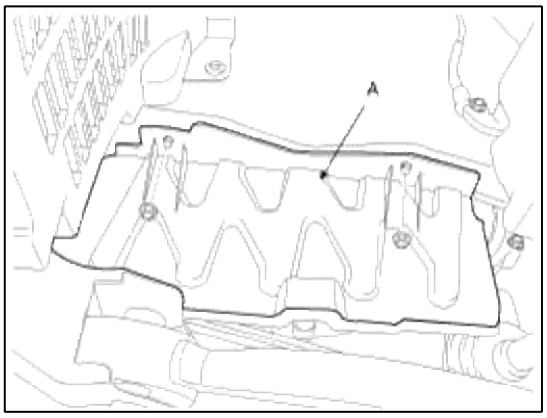
6. Connect the power steering return hose (A).



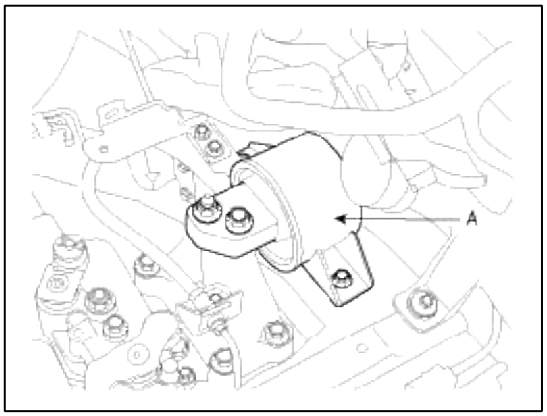
7. Install the rear roll stopper mounting bolt. (see ST-group)
8. Install the front roll stopper mounting bolt. (see ST-group)
9. Connect the stabilizer bar link. (see SS-group)
10. Connect the tie rod end ball joint from the knuckle after removing the split pin. (see DS-group)
11. Connect the lower arm assembly from the knuckle. (see DS-group)
12. Install the bolt connecting the universal joint and the pinion shaft. (Refer to 'ST-group)
13. Install the under cover (A).



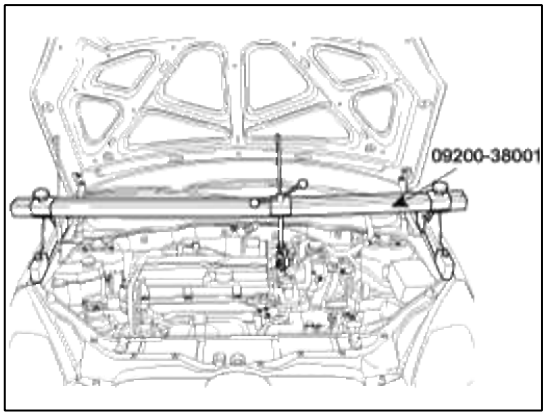
14. Install the two side cover nut (A).



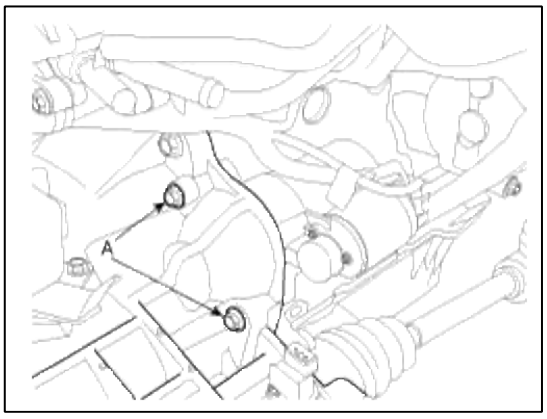
15. Install the transaxle upper mounting bolts from the engine.
16. Install the transaxle mounting support bracket (A).



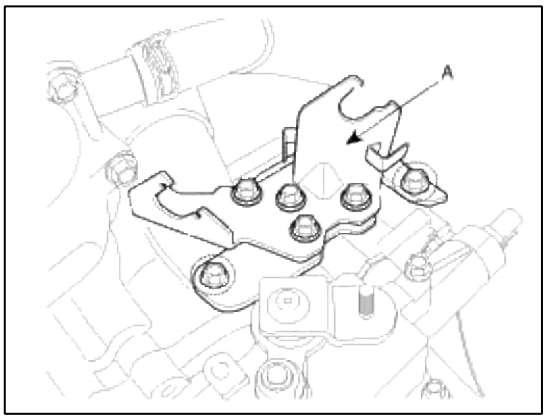
17. Remove the SST(09200-38001).



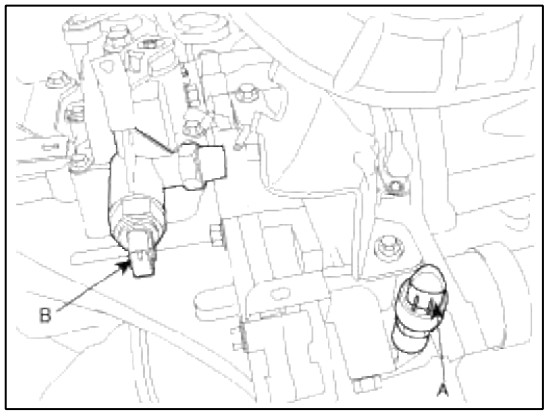
18. Install the engine start motor mounting bolts (A).



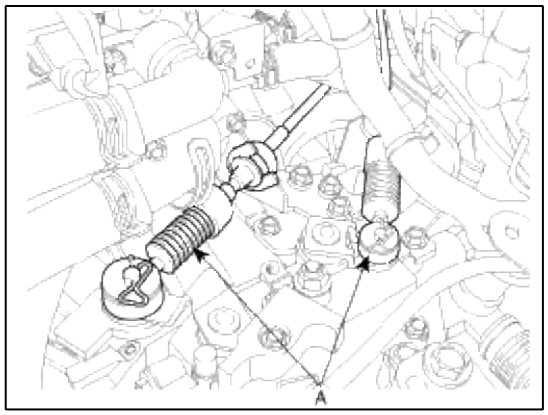
19. Install the two cable bracket bolts (A).



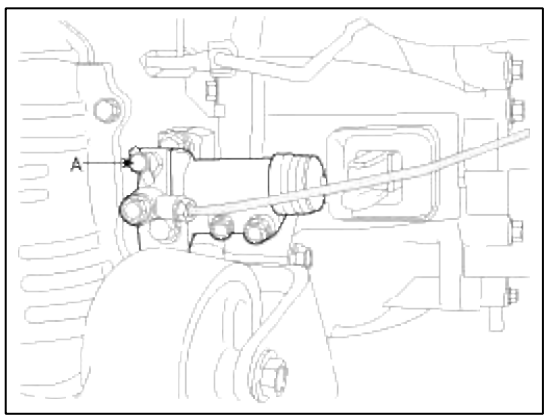
20. Install the transaxle wire harness connectors and control cable to transaxle.
    (1) Connect the back lamp switch connector (B).
    (2) Connect the vehicle speed sensor (A).



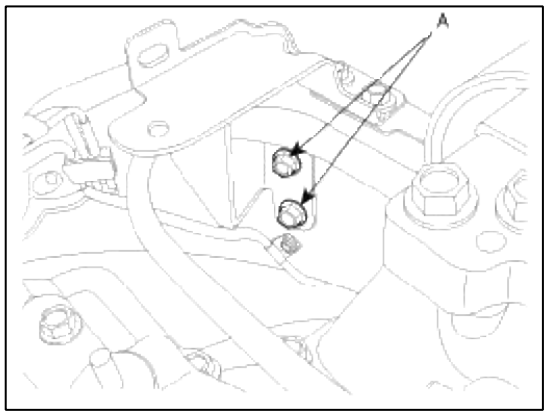
    (3) Install the transaxle control cable (A).



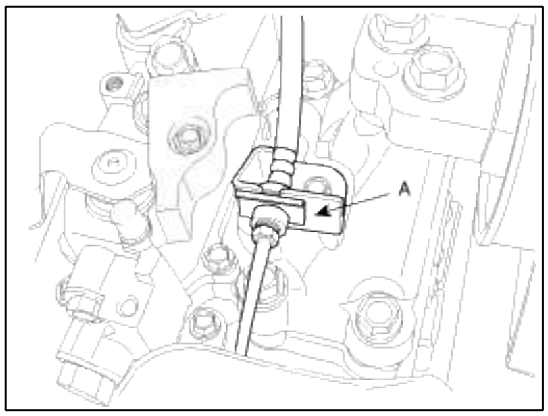
    (4) Install the clutch release cylinder (A).



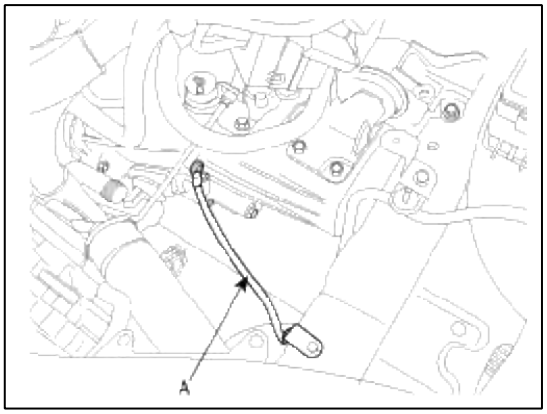
(5) Install the two bolts (A) of the bracket holding the flexible hose.



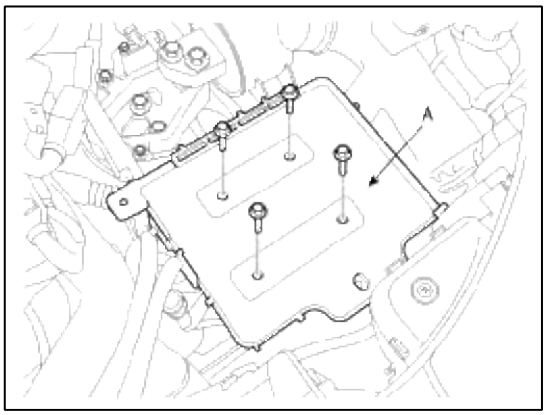
(6) Install the tube bracket (A) from the transaxle.



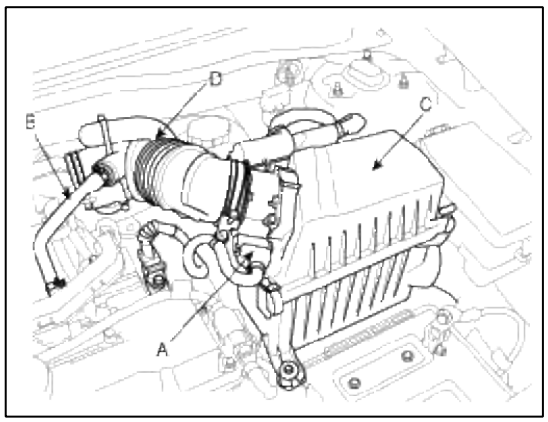
21. Install the ground cable to transaxle (A).



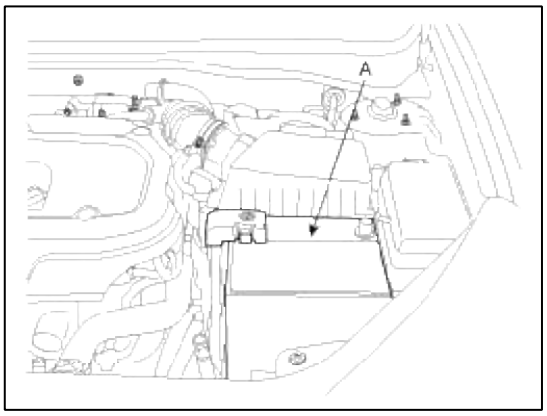
22. Install the battery tray(A).



23. Install the intake air hose and air cleaner assembly.
    (1) Install the air cleaner element and lower cover (C).
    (2) Connect the ECM connector (A, B).
    (3) Install the intake air hose and air cleaner upper cover (C).

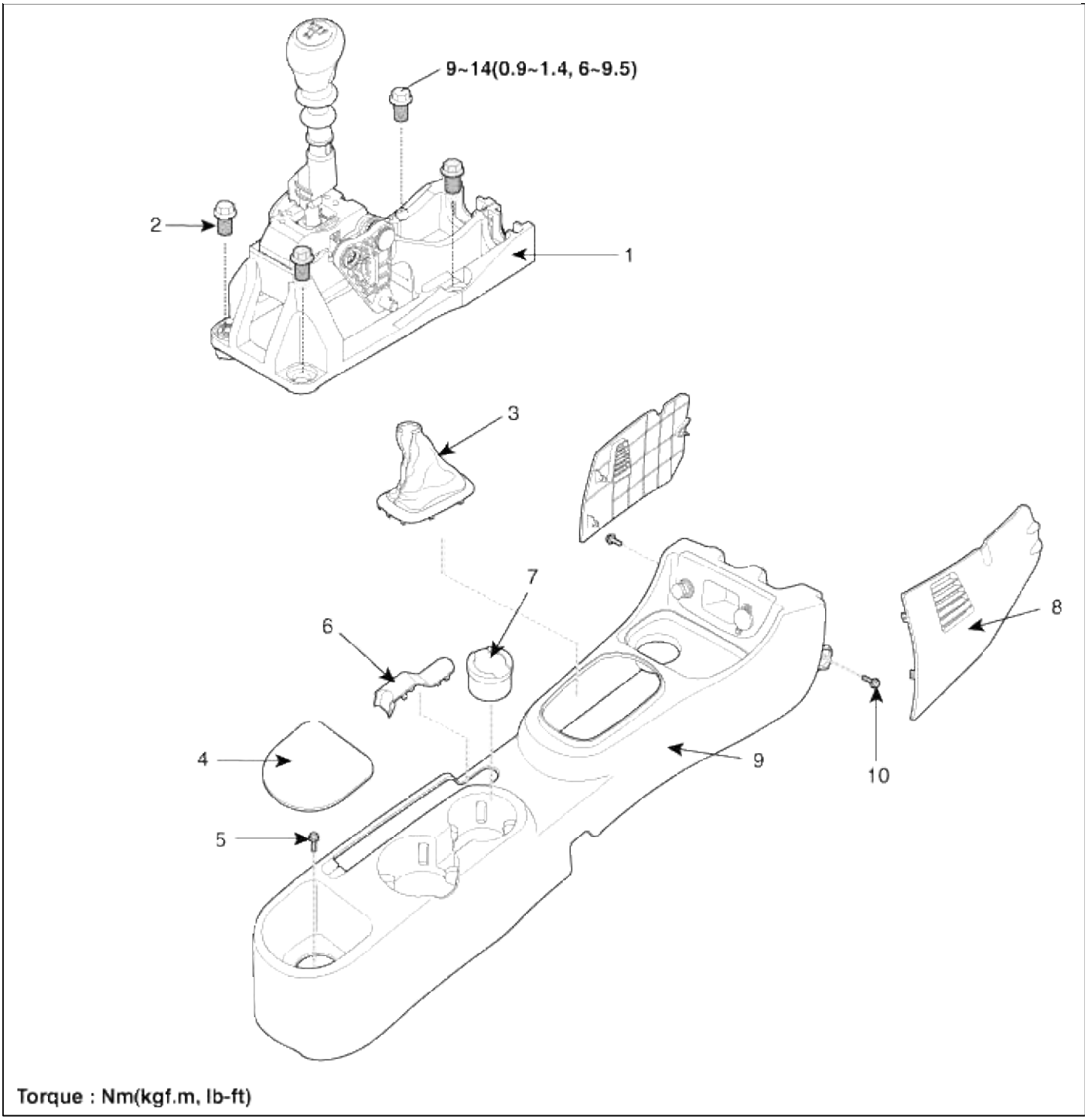


    (4) Connect the air cleaner hose (D) from the bleeder hose (B).
    (5) Connect the air flow sensor connector (A).
24. Install the battery (A) after installing the battery terminal.



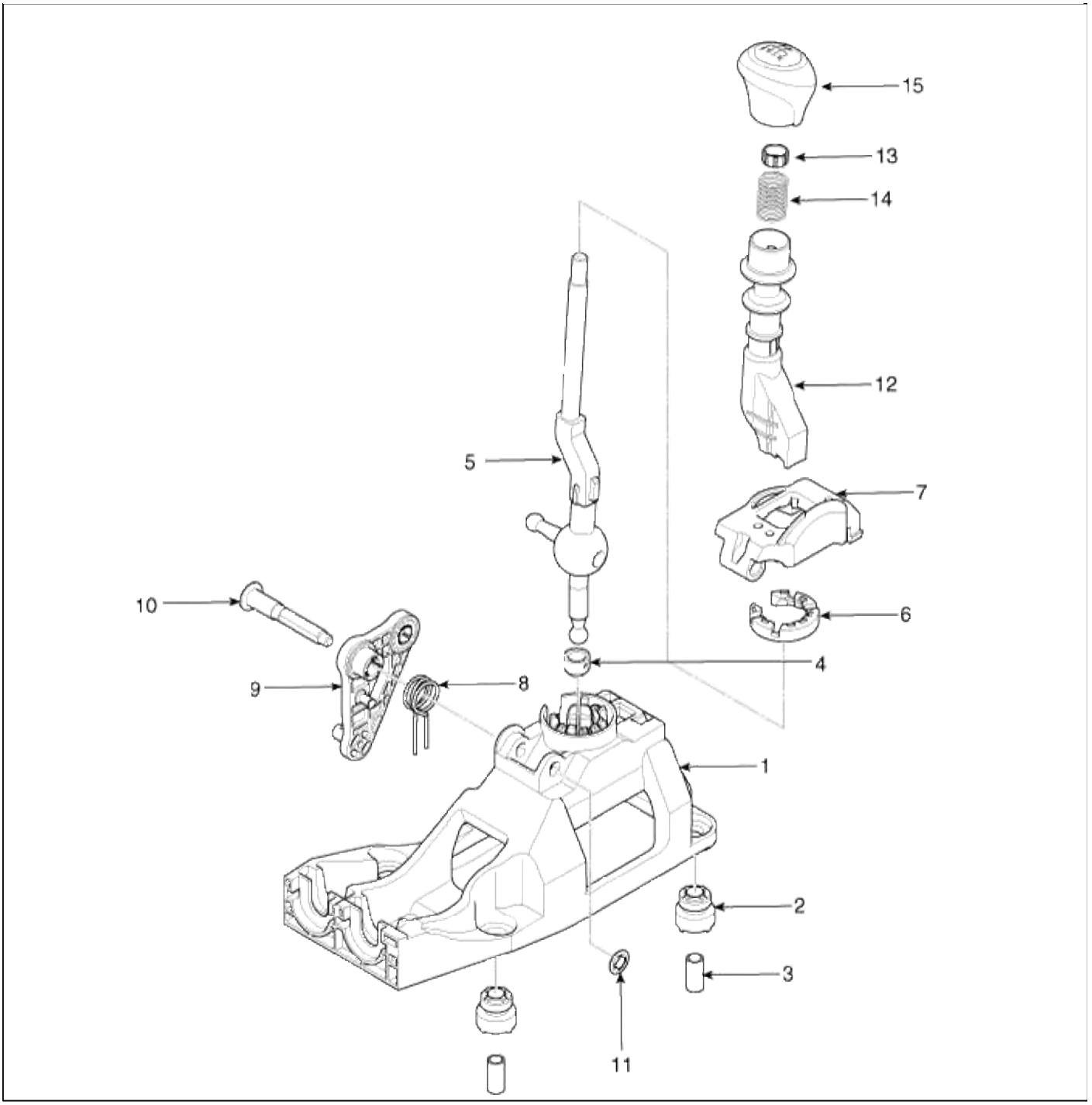
Manual Transaxle System > Manual Transaxle Control System > Manual Transaxle Shift Control > Components and Components Location (M5CF1)

Components(1)



1. Shift lever assembly	6. Parking brake cover
2. Bolt	7. Cup holder
3. Shift lever cover	8. Center console side cover
4. Center console rear cover	9. Center console
5. Bolt	10. Bolt

Components (2)

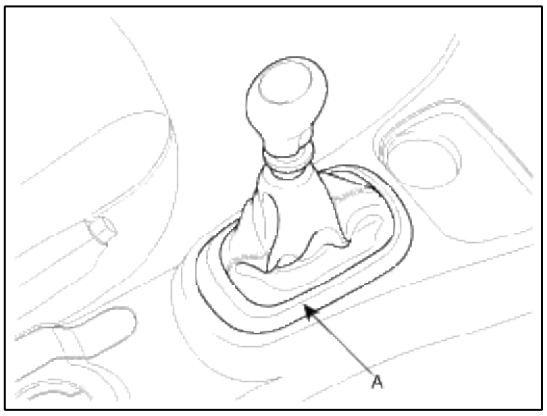


1. Shift lever bracket	6. Cushion	11. Push nut
2. Bush	7. Cover	12. Skirt
3. Color	8. Return spring	13. Spring
4. Bushing	9. Select lever	14. Damper
5. Shift lever shaft	10. Shaft	15. Knob

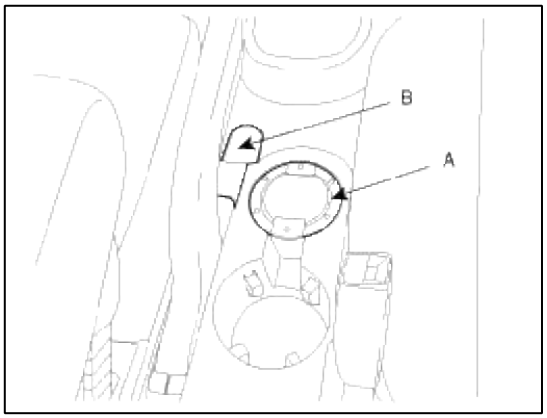
Manual Transaxle System > Manual Transaxle Control System > Manual Transaxle Shift Control > Repair procedures (M5CF1)

Removal

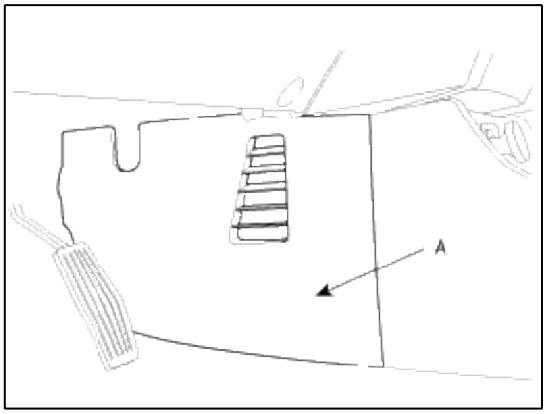
1. Remove the center console(A).(Refer to BD group.)



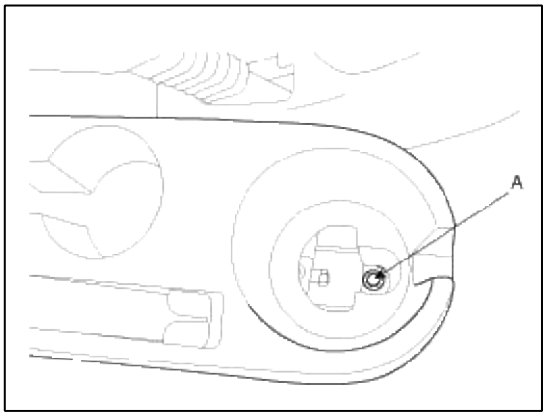
2. Remove the cup holder(A) and the parking brake cover(B).



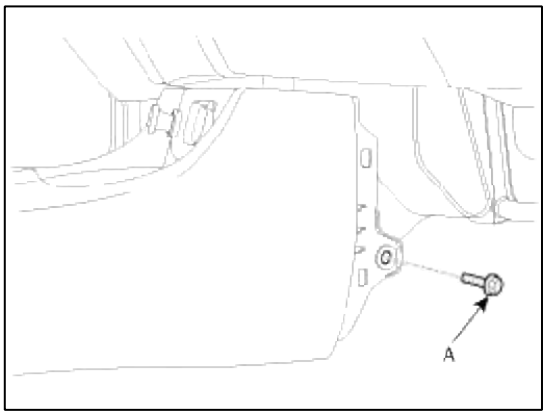
3. Remove the center console side cover(A).



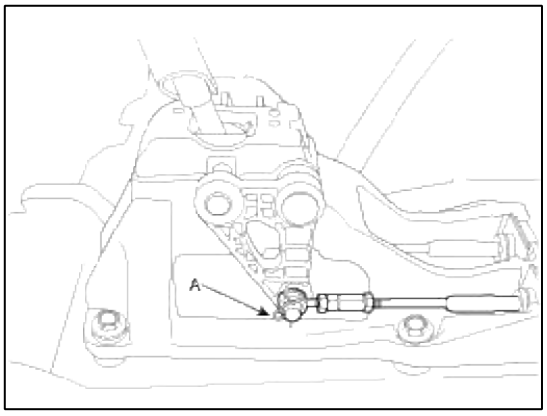
4. Remove rear mounting bolt(A) of the center console.



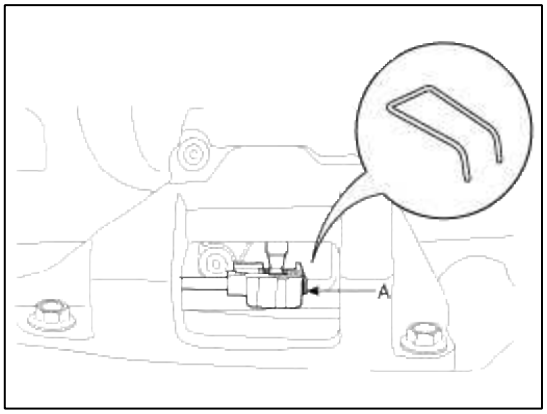
5. Remove front mounting bolt(A) of the center console and remove the center console.



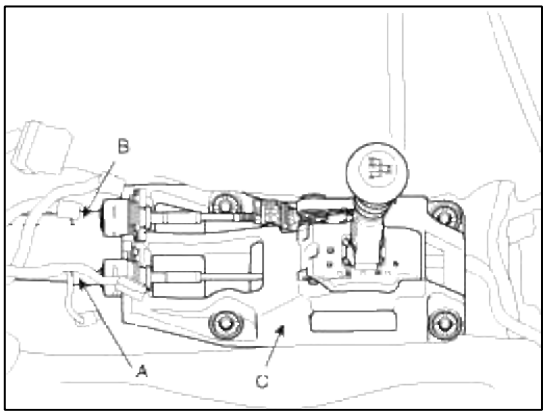
6. Remove the select cable snap pin(A).



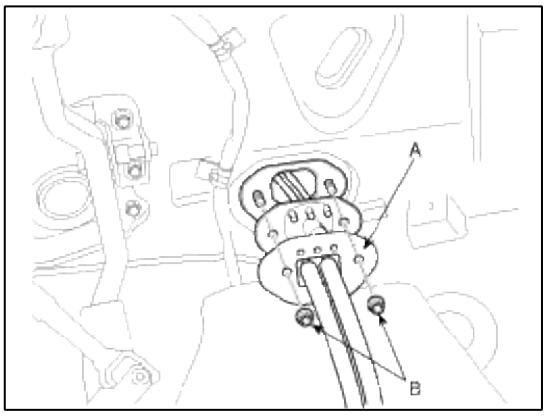
7. Remove the shift cable clip(A).



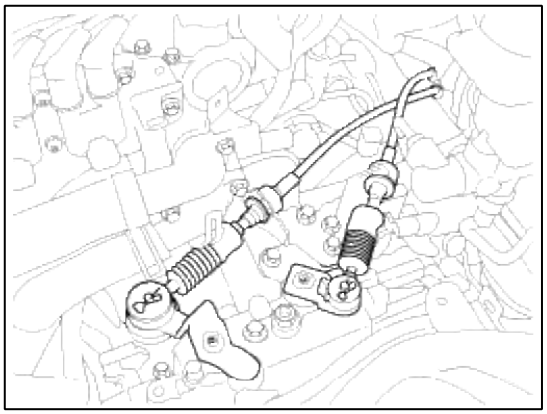
8. Remove the shift cable(A) and select cable(B).
9. Remove the shift lever assembly(C).



10. Remove the retainer(A) and nuts(B).



11. Remove the snap pins(2EA).(Transaxle side).



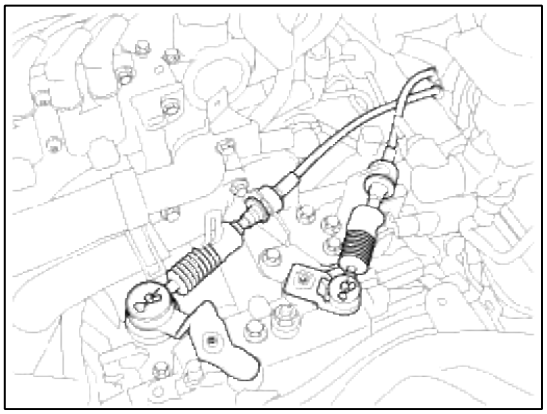
12. Remove the shift cable and select cable.

Installation

1. Install the shift cable and select cable after locating the shift lever and select lever at the neutral position.

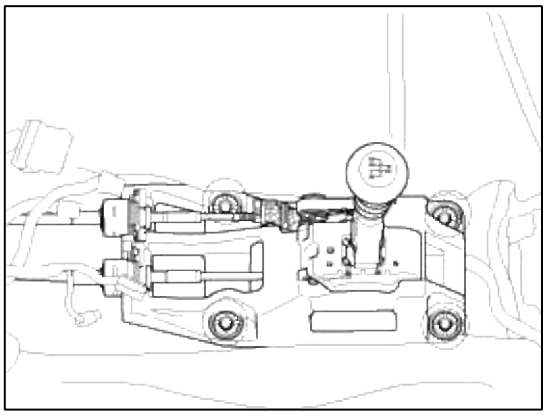
> NOTE
>
> When operating lever of body side, check secure operation of lever of transaxle side after assembly.

2. Install the snap pins(2EA) of transaxle side.



3. Install the shift lever assembly.

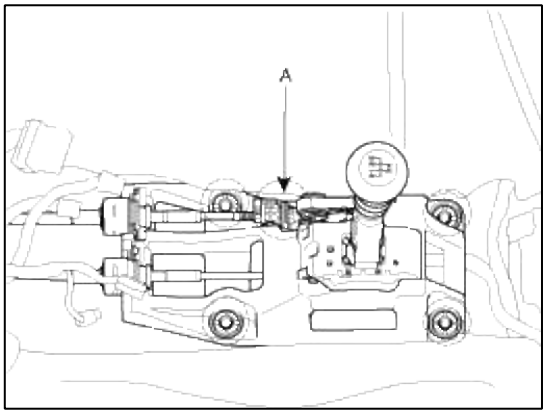
Tightening torque :
9-14Nm(90-140kgf.cm, 6-9.5lb.ft)



4. Install the shift cable and select cable to the shift lever side.

NOTE

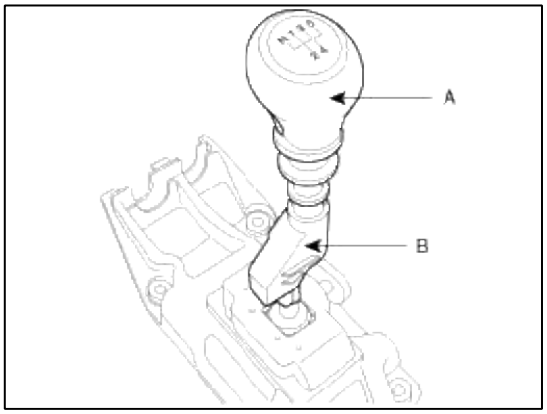
Adjust the cable length with select cable adjuster(A) in "N" position before installing the center console.



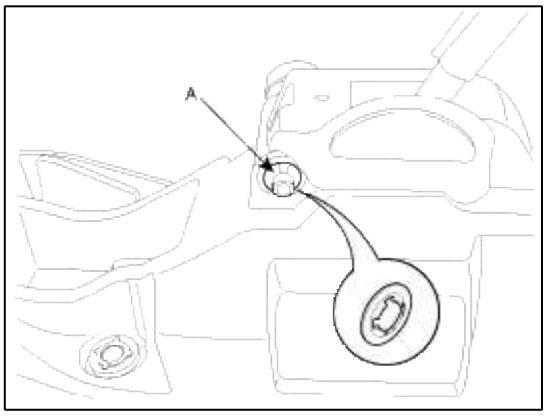
5. Install the center console.(Refer to BD group.)

Disassembly

1. Disassemble the shift lever knob(A) from the shift lever shaft(B).



2. Disassemble the push nut(A) from the shift lever bracket. And then disassemble the shift lever shaft and select lever.



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.

ACCENT(MC) > 2008 > G 1.6 DOHC > Restraint

Restraint > General Information > General Safety Information and Caution

Precautions

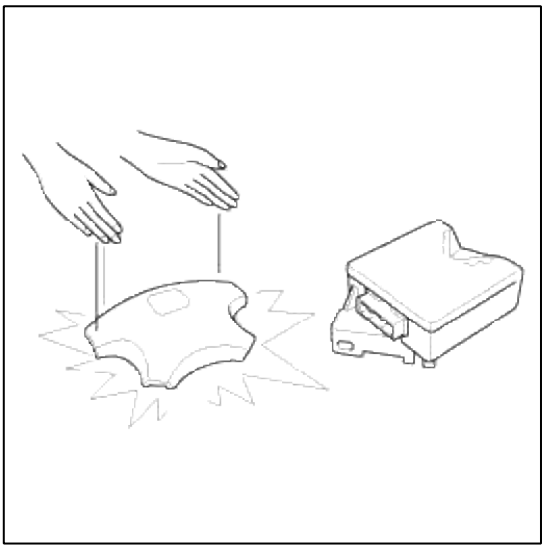
General Precautions

Please read the following precautions carefully before performing the airbag system service. Observe the instructions described in this manual, or the airbags could accidentally deploy and cause damage or injuries.

- Except when performing electrical inspections, always turn the ignition switch OFF and disconnect the negative cable from the battery, and wait at least three minutes before beginning work.

> NOTE
>
> The contents in the memory are not erased even if the ignition switch is turned OFF or the battery cables are disconnected from the battery.

- Use the replacement parts which are manufactured to the same standards as the original parts and quality.
  Do not install used SRS parts from another vehicle.
  Use only new parts when making SRS repairs.
- Carefully inspect any SRS part before you install it.
  Do not install any part that shows signs of being dropped or improperly handled, such as dents, cracks or deformation.



- Before removing any of the SRS parts (including the disconnection of the connectors), always disconnect the SRS connector.

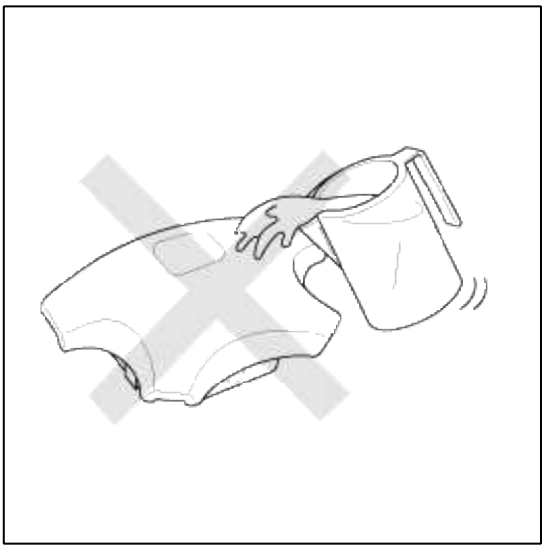
Airbag Handling and Storage

Do not disassemble the airbags; it has no serviceable parts. Once an airbag has been deployed, it cannot be repaired or reused.

For temporary storage of the air bag during service, please observe the following precautions.

- Store the removed airbag with the pad surface up.

- Keep free from any oil, grease, detergent, or water to prevent damage to the airbag assembly.

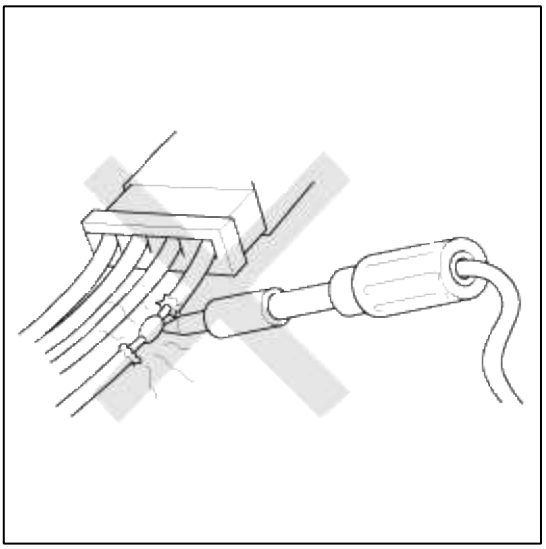


- Store the removed airbag on secure, flat surface away from any high heat source (exceeding 85°C/185°F).
- Never perform electrical inspections to the airbags, such as measuring resistance.
- Do not position yourself in front of the airbag assembly during removal, inspection, or replacement.
- Refer to the scrapping procedures for disposal of the damaged airbag.
- Be careful not to bump or impact the SRS unit or the side impact sensors 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 (less than 40°C/104°F) and dry (less than 80% relative humidity, no moisture) area.

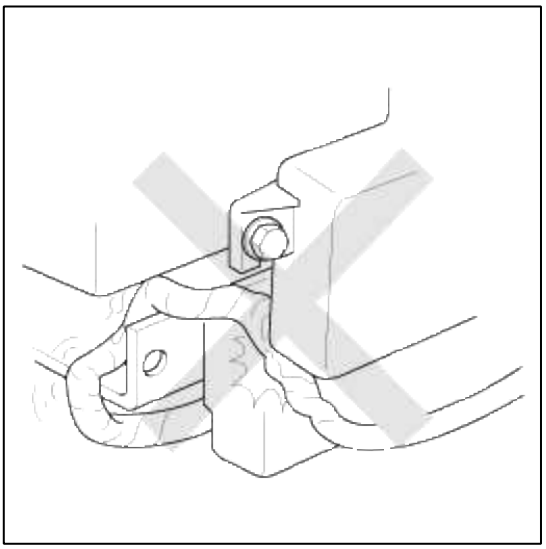
Wiring Precautions

SRS wiring can be identified by special yellow outer covering (except the SRS circuits under the front seats). 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.



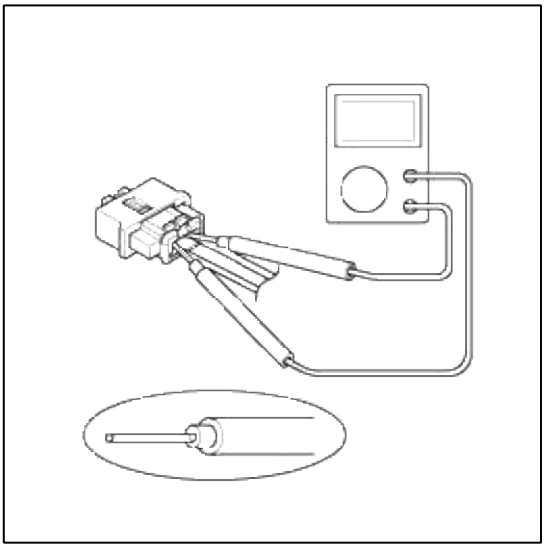
- Be sure to install the harness wires so that they are not pinched, or interfere with other parts.



- 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.

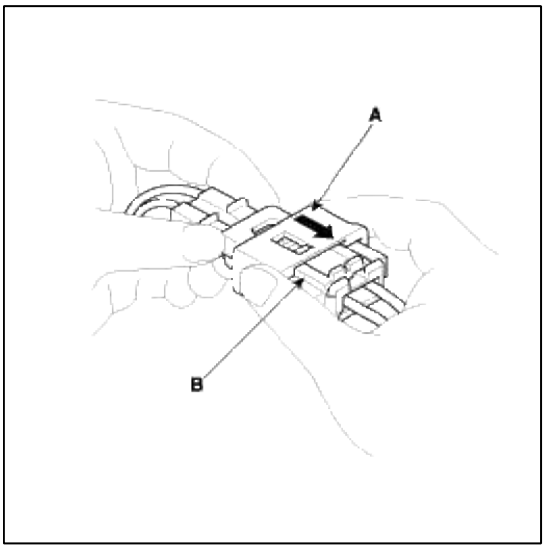
Precautions for Electrical Inspections

- 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.



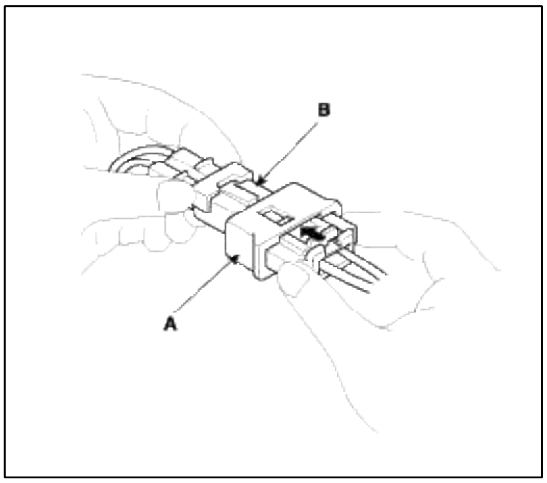
- Use a u-shaped probe. Do not insert the probe forcibly.
- Use specificed service connectors for troubleshooting.
  Using improper tools could cause an error in inspection due to poor metal contact.

Spring-loaded Lock Connector
Airbag Connector(I)

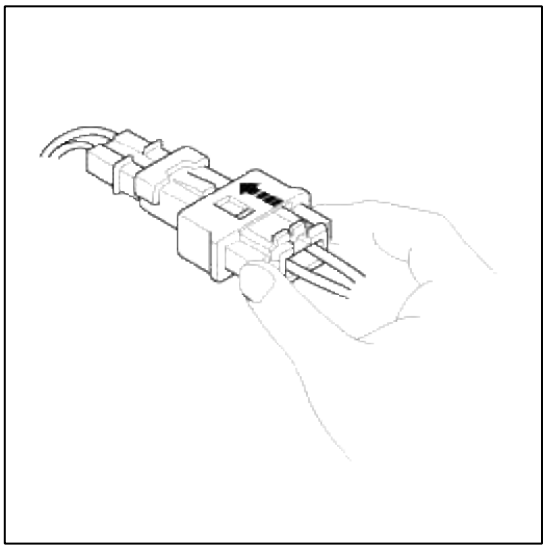


Connecting

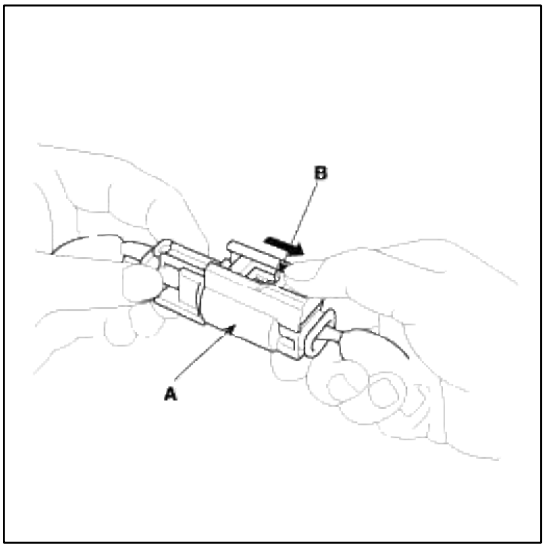
1. To reconnect, hold the pawl-side connector half, and press on the back of the sleeve-side connector half in the direction shown. As the two connector halves are pressed together, the sleeve (A) is pushed back by the pawl (C). Do not touch the sleeve.



2. When the connector halves are completely connected, the pawl is released, and the spring-loaded sleeve locks the connector.

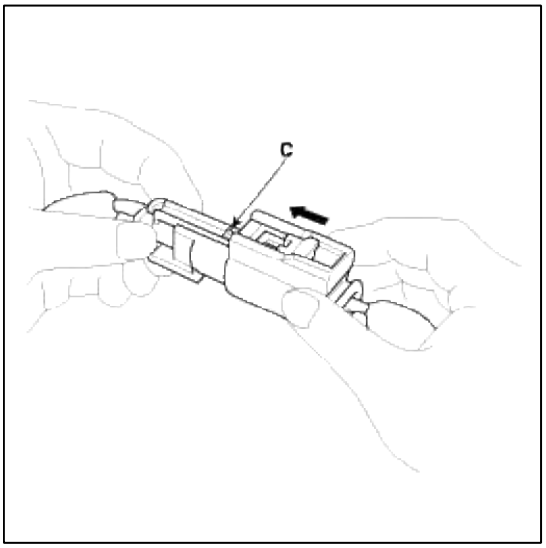


Airbag Connector(II)



Connecting

Hold both connector halves and press firmly until the projection (C) of the sleeve-side connector clicks to lock.



Restraint > General Information > General Information

General

The supplemental restraint system (SRS) is designed to supplement the seat belt to help reduce the risk or severity of injury to the driver and passenger by activating and deploying the driver, passenger, side airbag and belt pretensioner in certain frontal or side collisions.

The SRS (Airbag) consists of : a driver side airbag module located in the center of the steering wheel, which contains the folded cushion and an inflator unit ; a passenger side airbag module located in the passenger side crash pad contains the folded cushion assembled with inflator unit ; side airbag modules located in the driver and passenger 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.

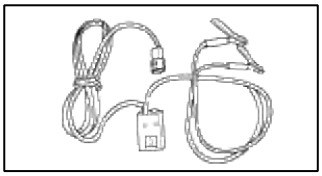
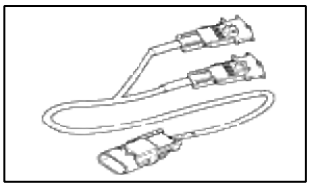
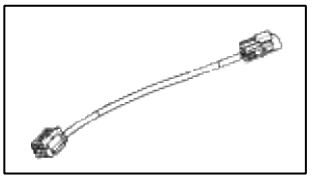
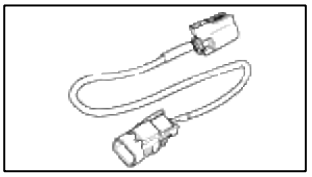
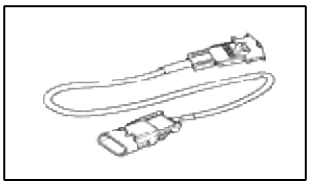
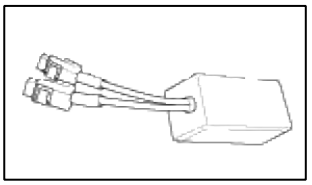
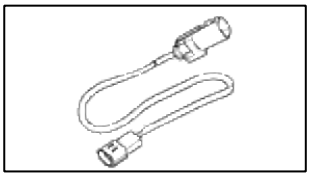
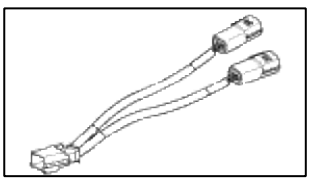
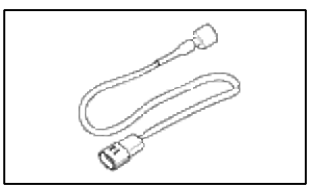
SRSCM (SRS Control Module)

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 scan tool. (Hi-Scan)
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 Hi-Scan. 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 Hi-Scan 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.
9. SRSCM will determine whether passenger put on seat belt by the signal from built-in switch in seat belt buckle, and deploy front seat airbag at each set crash speed.
10. Side airbag deployment will be determined by SRSCM that will detect satellite sensor impact signal upon side crash, irrespective to seat belt condition.

Restraint > General Information > Special Service Tools

SPECIAL SERVICE TOOLS

Tool(Number and Name)	Illustration	Use
Deployment tool 0957A-34100A		Airbag deployment tool
Deployment adapter 0757A-38510		Use with deployment tool (DAB, PAB)
Deployment adapter 0957A-2E110		Use with depolyment tool. (PAB)
Deployment adapter 0957A-3F100		Use with deployment tool. (SAB)
Deployment adapter 0957A-38500		Use with deployment tool. (CAB, BPT)
Dummy 0957A-38200		Simulator to check the resistance of each wiring harness
Dummy adapter 0957A-3F000		Use with dummy (SAB)
Dummy adapter 0957A-2E100		Use with dummy (PAB)
Dummy adapter 0957A-1C000		Use with dummy (DAB, CAB, BPT)

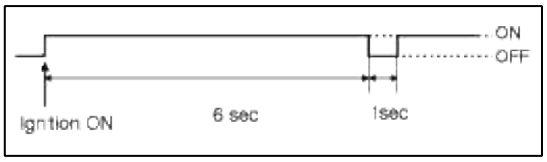
DAB : Driver Airbag
PAB : Passenger Airbag
SAB : Side Airbag

CAB : Curtain Airbag
BPT : Belt Pretensioner

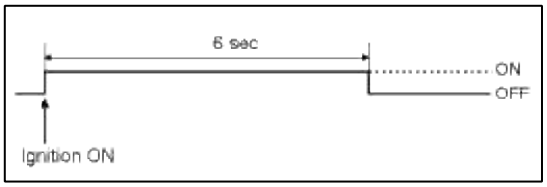
Restraint > General Information > Description and Operation

WARNING LAMP ACTIVATION

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:

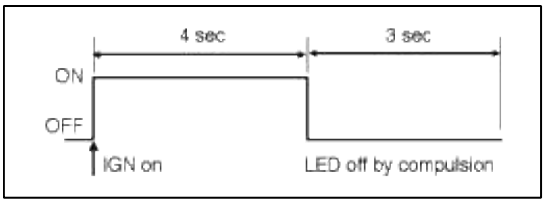
1. Loss of battery supply to the SRSCM : warning lamp turned on continuously.
2. Loss of internal operating voltage : warning lamp turned on continuously.
3. Loss of Microprocessor operation : warning lamp turned on continuously.
4. SRSCM not connected : warning lamp turned on continuously through the shorting bar.

TELLTALE LAMP ACTIVATION

The Telltale Lamp indicates the Passenger Airbag(PAB) enabled and disabled status based on occupant status of passenger seat. If the passenger seat is empty or occupied with child (or child seat), the Passenger Airbag is disabled and the Telltale Lamp is turned ON to inform the driver that the PAB is disabled. As soon as operating voltage is applied to the SRSCM ignition input, the SRSCM activates telltale lamp prove out. Occupant status information and telltale ststus are as below table.

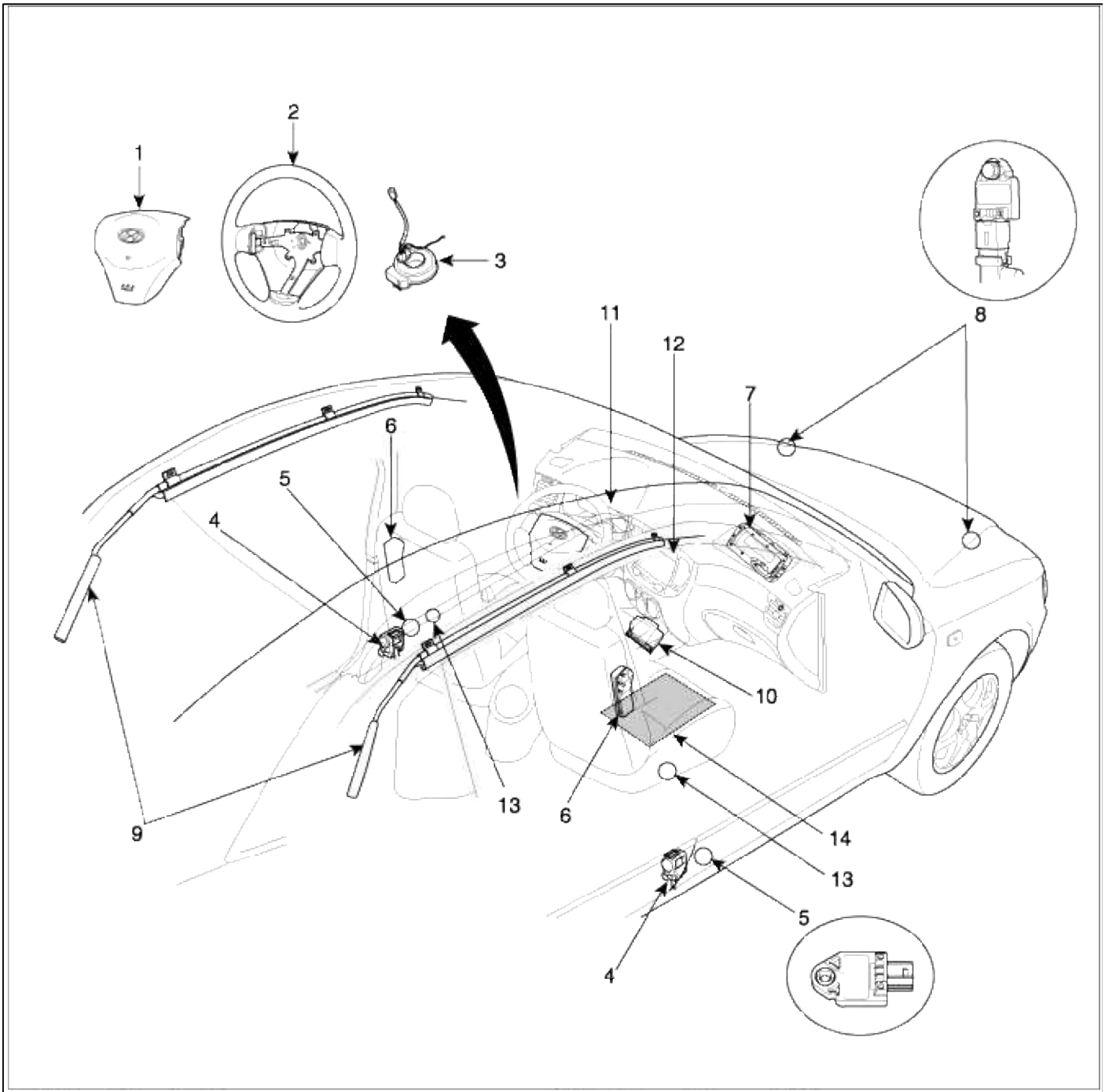
Occupant Status	Telltale Lamp	PAB
Empty	ON	Disabled
Child (Small Occupant)	ON	Disabled
Adult (Large Occupant)	OFF	Enabled
Defect	OFF	Enabled

After ignition on, telltale lamp will turn on for 4 seconds and turn off for 3 seconds during the initialization phase and be turned off afterward until receipt of first valid suppression message from OCS system.



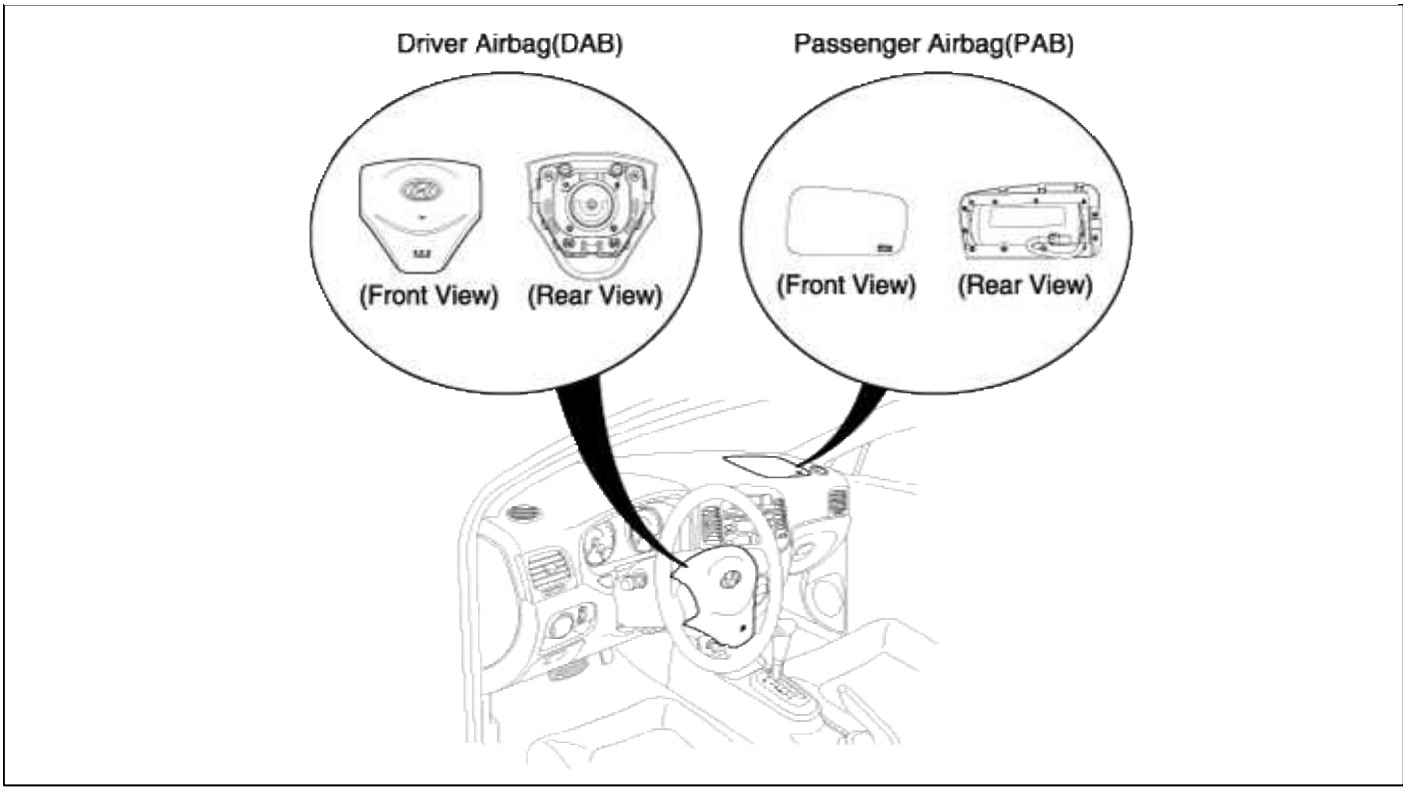
Restraint > General Information > Components and Components Location

components

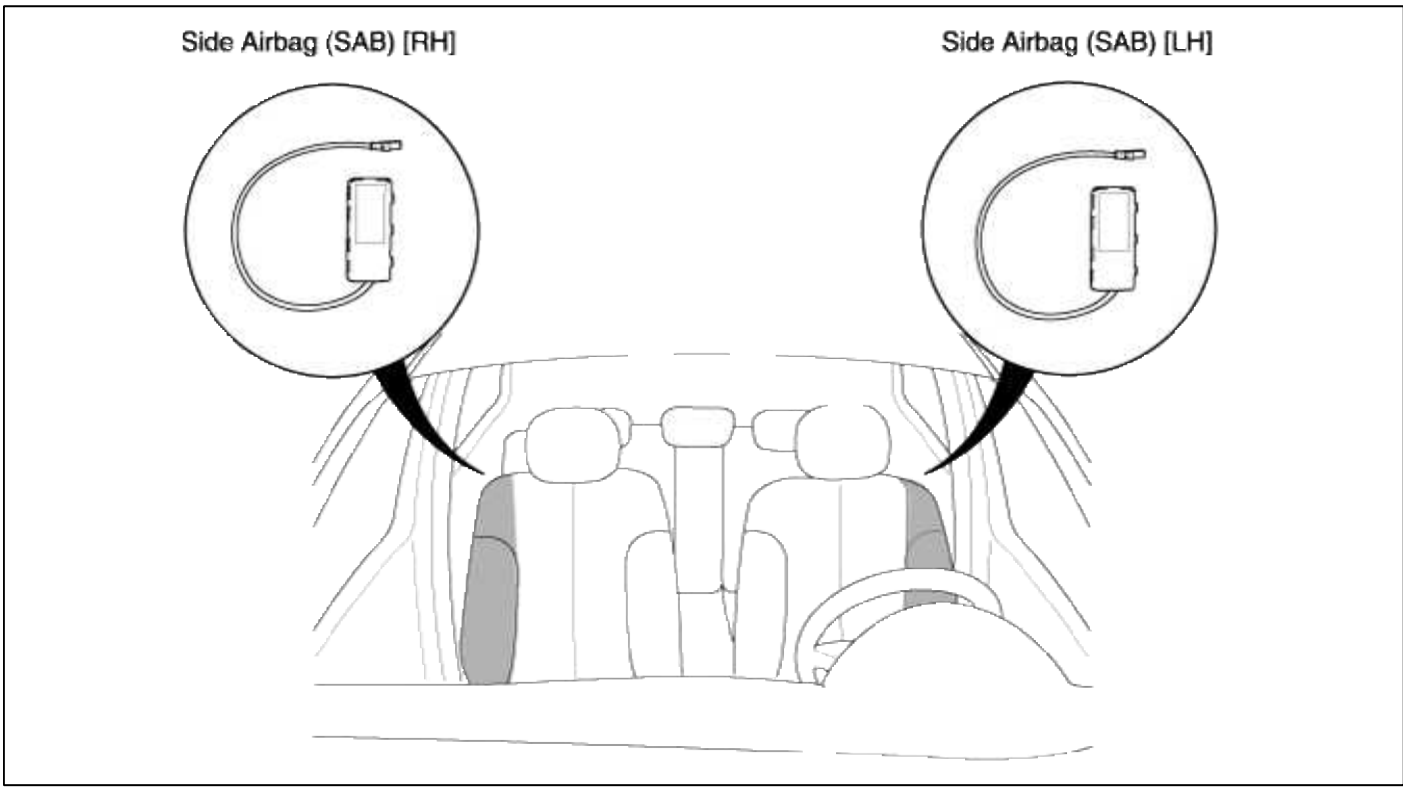


1. Driver Airbag (DAB)
2. Steering Wheel
3. Clock Spring
4. Seat Belt Pretensioner (BPT)
5. Side Impact Sensor (SIS)
6. Side Airbag (SAB)
7. Passenger Airbag (PAB)
8. Front Impact Sensor (FIS)
9. Curtain Airbag (CAB)
10. Supplemental Restraint System Control Module(SRSCM)
11. Airbag Warning Lamp
12. Telltale Lamp
13. Seat Track Position Sensor (STPS)
14. Occupant Classification Sensor (OCS)

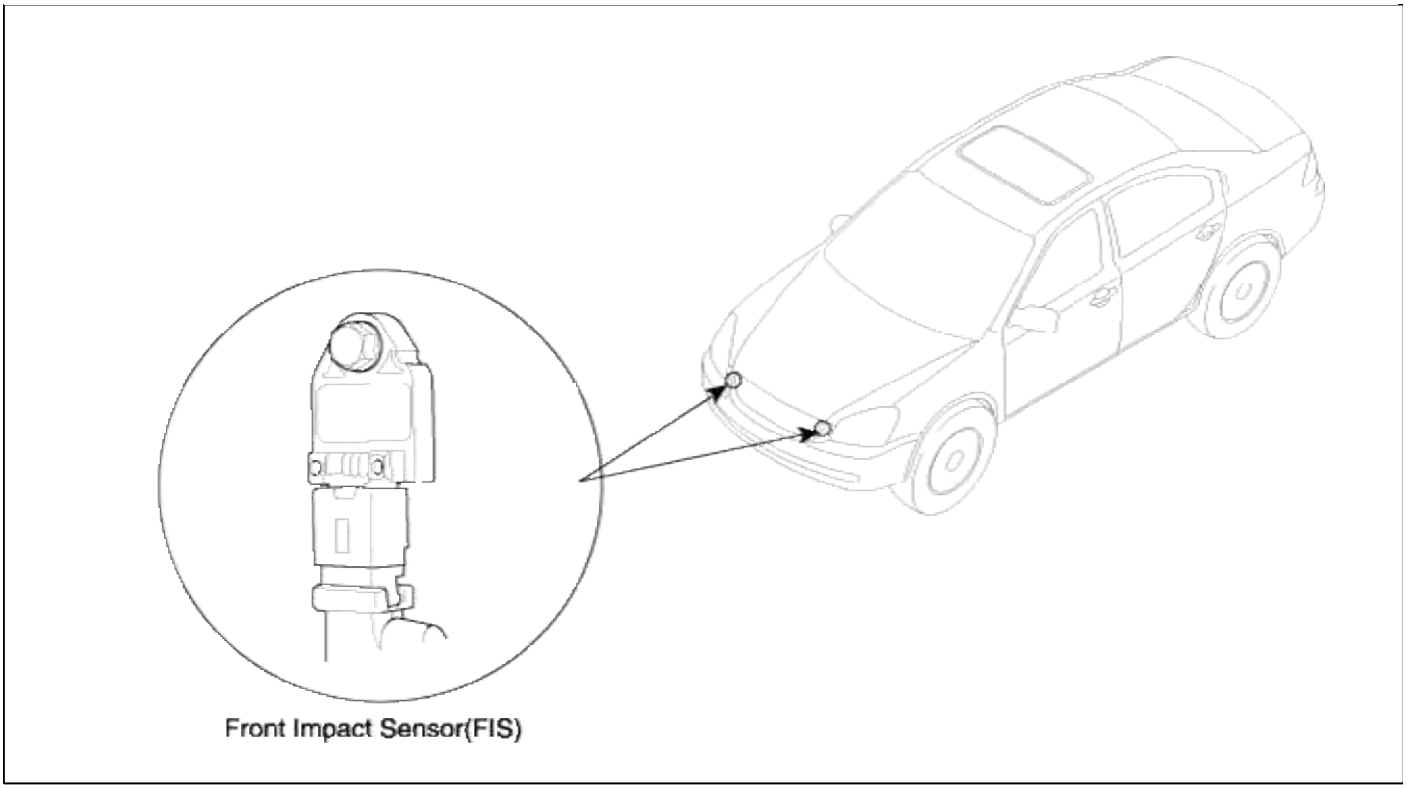
components location
driver airbag (DAB) / passenger airbag (PAB)



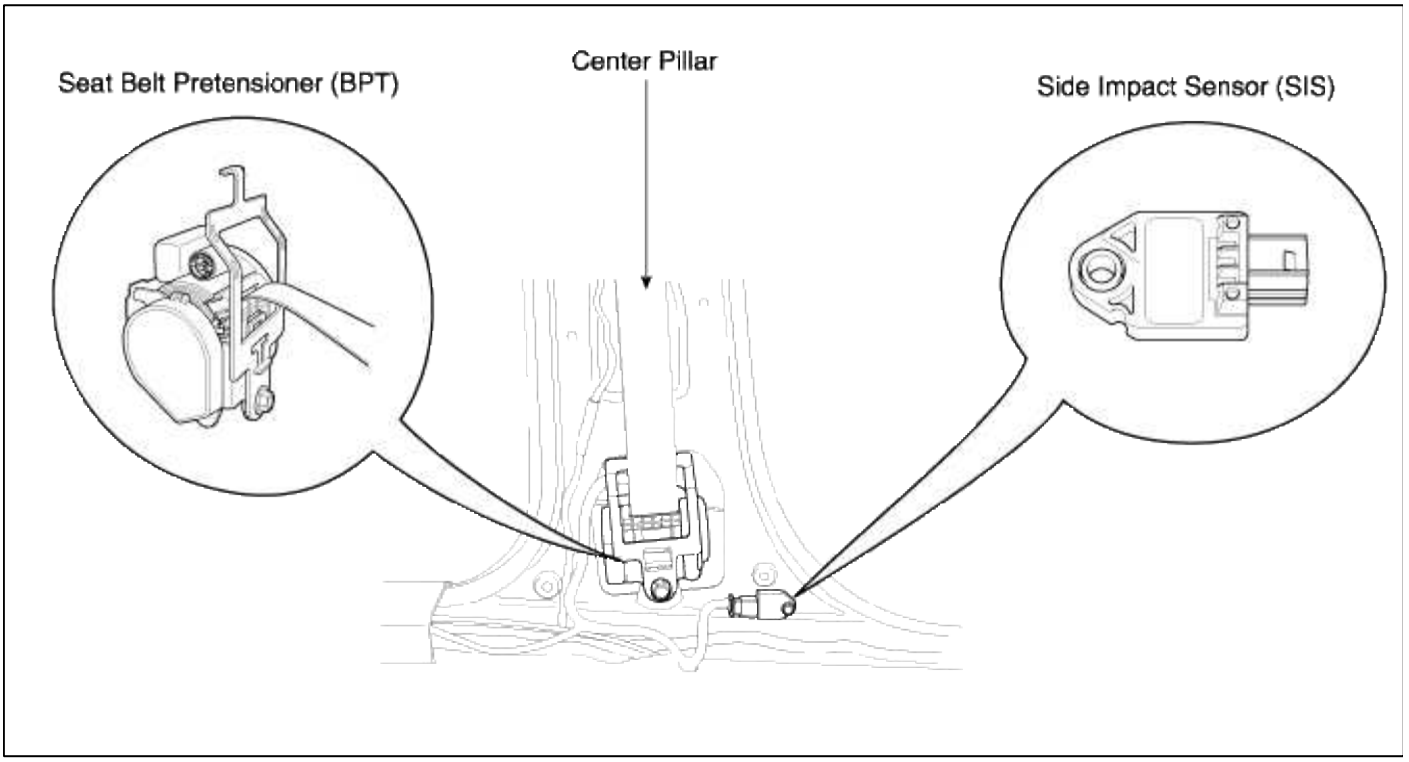
side airbag (SAB)



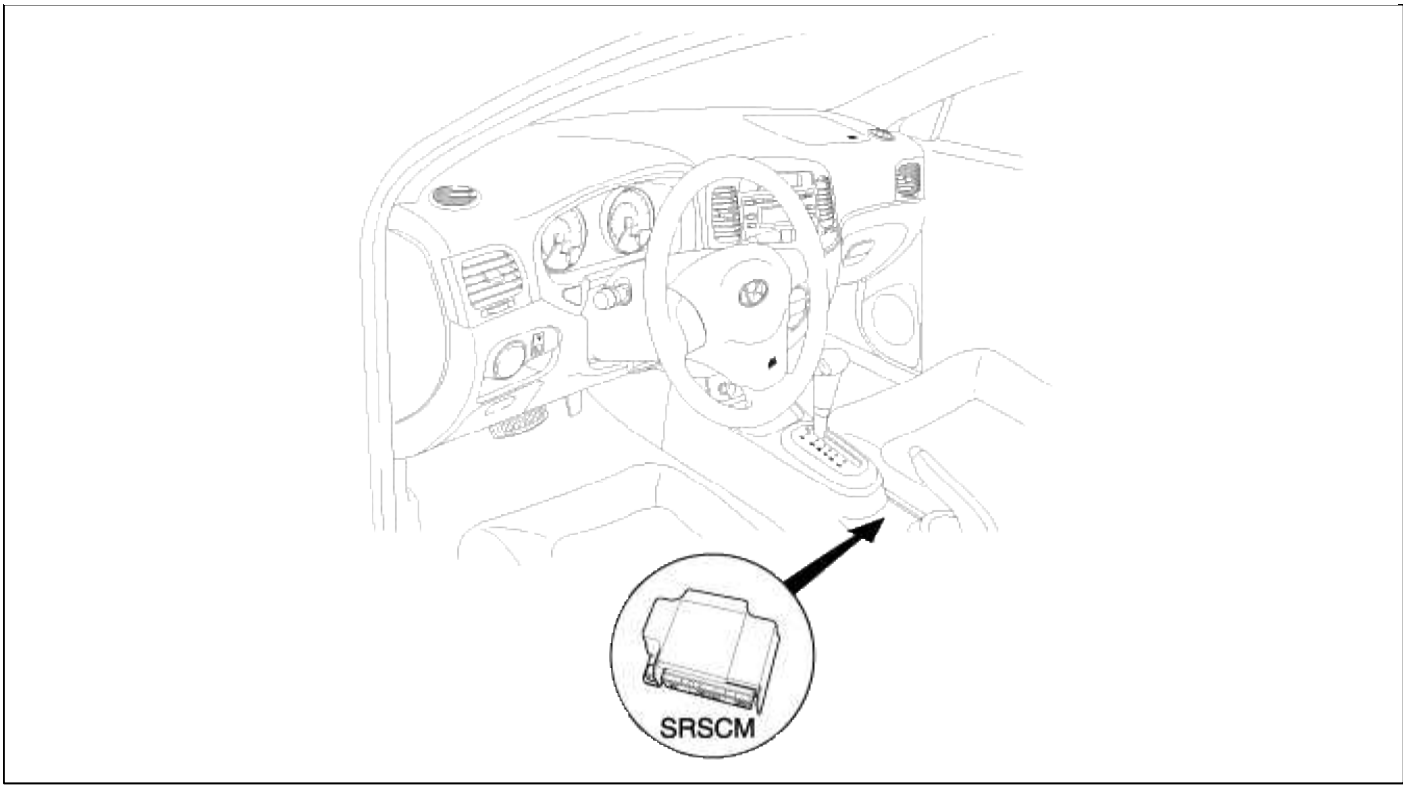
front impact sensor (fis)



seat belt pretensioner (bpt) / side impact sensor (sis)



SUPPLEMENTAL RESTRAINT SYSTEM CONTROL MODULE (SRSCM)



Restraint > General Information > Repair procedures

COMPONENT REPLACEMENT AFTER DEPLOYMENT

NOTE

Before doing any SRS repairs, use the Hi-Scan Pro to check for DTCs. Refer to the Diagnostic Trouble Code list for repairing of the related DTCs.

When the front airbag(s) deployed after a collision, replace the following items.

- SRSCM
- Deployed airbag(s)
- Seat belt pretensioner(s)
- Front impact sensors
- SRS wiring harnesses
- Inspect the clock spring for heat damage.
  If any damage found, replace the clock spring.

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.

Restraint > General Information > Specifications

SPECIFICATION

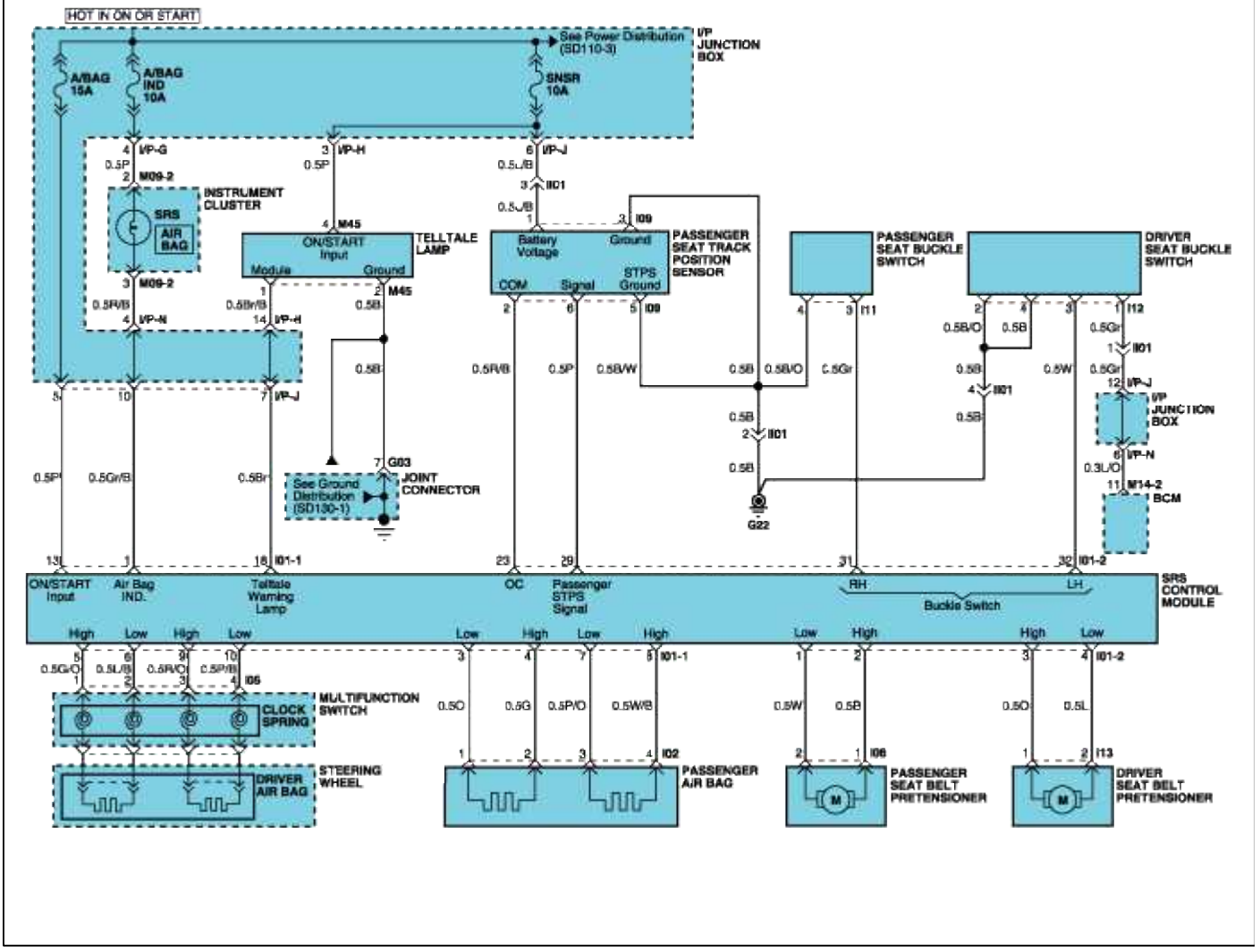
Item	Resistance (Ω)
Driver Airbag (DAB)	1.6 ~ 4.7
Passenger Airbag (PAB)	1.6 ~ 4.7
Side Airbag (SAB)	1.6 ~ 4.7
Curtain Airbag (CAB)	1.6 ~ 4.7
Seat Belt Pretensioner (BPT)	1.6 ~ 4.7

TIGHTENING TORQUES

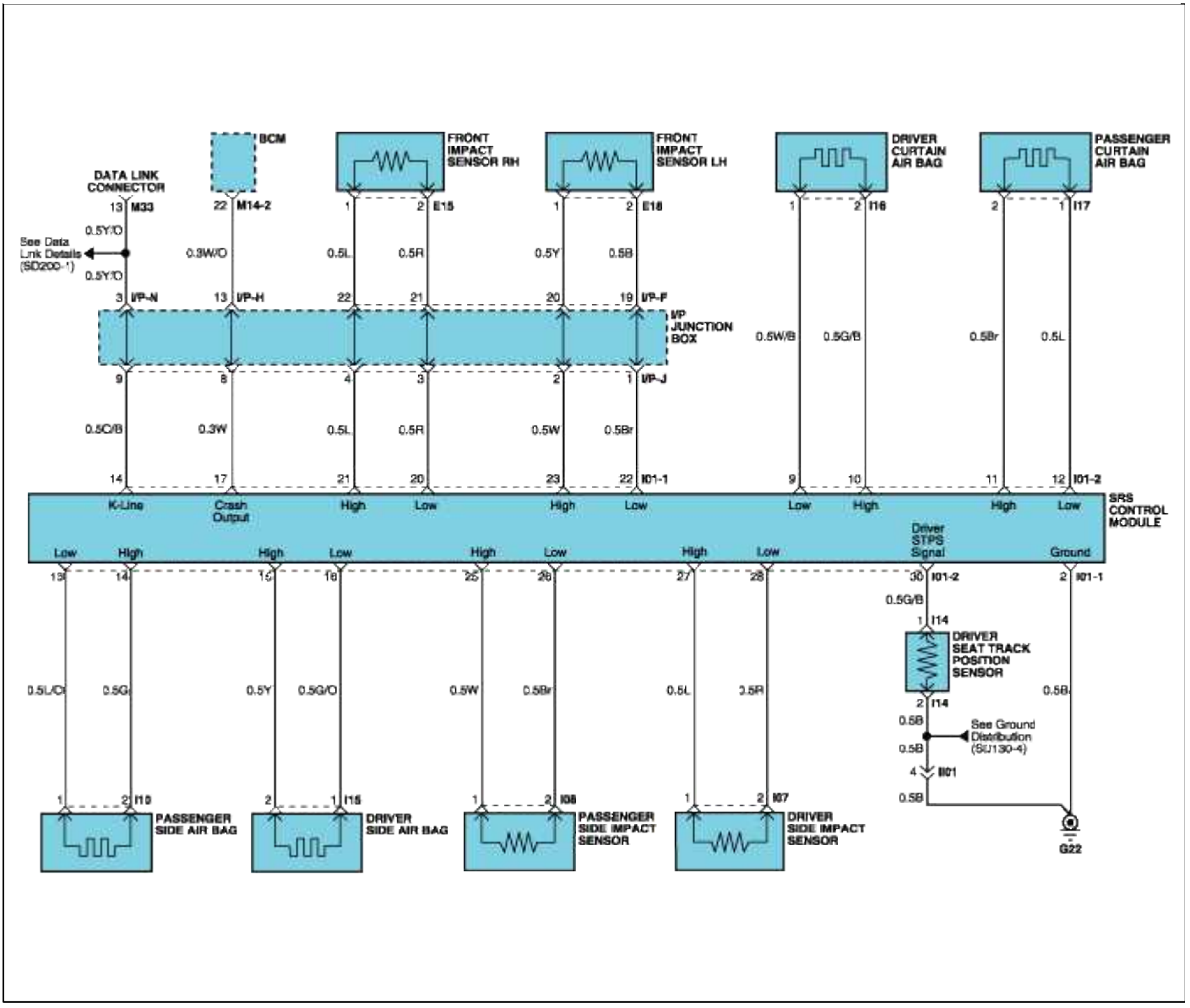
Item	kgf·m	Nm	lb-ft
Driver Airbag (DAB)	0.8 ~ 1.1	7.9 ~ 10.8	5.8 ~ 8.0
Passenger Airbag (PAB)	Bolt : 0.8 ~ 0.9 Nut : 0.2 ~ 0.3	8.0 ~ 9.0 2.0 ~ 3.0	5.9 ~ 6.6 1.5 ~ 2.2
Curtain Airbag (CAB)	0.5 ~ 0.7	4.9 ~ 6.9	3.6 ~ 5.1
Side Airbag (SAB)	0.5 ~ 0.7	4.9 ~ 6.9	3.6 ~ 5.1
Seat Belt Anchor Bolt (BPT)	4.0 ~ 5.5	39.2 ~ 53.9	28.9 ~ 39.8
SRSCM Mounting Bolt	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

Restraint > Supplemental Restraint System Control Module (SRSCM) > Schematic Diagrams

CIRCUIT DIAGRAM(1)

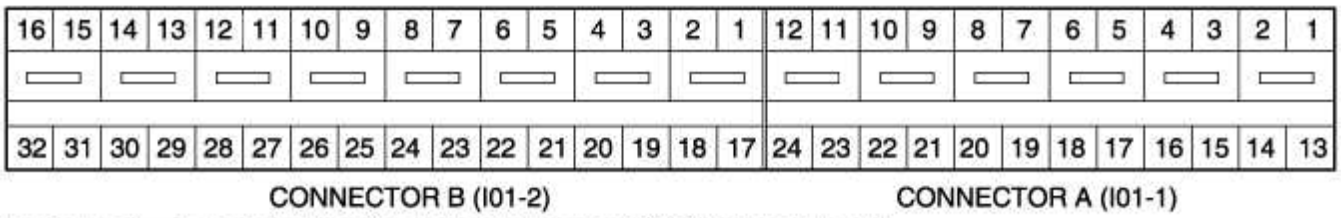


CIRCUIT DIAGRAM(2)



SRSCM CONNECTOR TERMINAL

SRSCM HARNESS CONNECTOR



Shorting bar (▭) : located between the upper and lower pins of SRSCM connector A and B
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	(1st Stage) Passenger Airbag Low	3	Seat Belt Pretensioner [Front-Driver] High
4	(1st Stage) Passenger Airbag High	4	Seat Belt Pretensioner [Front-Driver] Low
5	(1st Stage) Driver Airbag High	5	-
6	(1st Stage) Driver Airbag Low	6	-
7	(2nd Stage) Passenger Airbag Low	7	-
8	(2nd Stage) Passenger Airbag High	8	-
9	(2nd Stage) Driver Airbag High	9	Curtain Airbag [Driver] Low
10	(2nd Stage) Driver Airbag Low	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	Telltale 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 [Front-Driver] High	23	Occupant Classification
24	-	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	Seat Track Position Sensor [Passenger] High
		30	Seat Track Position Sensor [Driver] High
		31	Buckle Switch [Front-Passenger] High
		32	Buckle Switch [Front-Driver] High

DIAGNOSTIC TROUBLE CODES (DTC)

DTC	FAULT DESCRIPTION	REMARK
B1101	Battery Voltage too High	
B1102	Battery Voltage too Low	
B1328	Front Impact Sensor [Driver] Defect	
B1329	Front Impact Sensor [Driver] Communication Error	
B1333	Front Impact Sensor [Passenger] Defect	
B1334	Front Impact Sensor [Passenger] Communication Error	
B1346	(1st Stage) Driver Airbag Resistance too High	
B1347	(1st Stage) Driver Airbag Resistance too Low	

B1348	(1st Stage) Driver Airbag Circuit Short to Ground	
B1349	(1st Stage) Driver Airbag Circuit Short to Battery	
B1352	(1st Stage) Passenger Airbag Resistance too High	
B1353	(1st Stage) Passenger Airbag Resistance too Low	
B1354	(1st Stage) Passenger Airbag Circuit Short to Ground	
B1355	(1st Stage) Passenger Airbag Circuit Short to Battery	
B1361	Seat Belt Pretensioner [Front-Driver] Resistance too High	
B1362	Seat Belt Pretensioner [Front-Driver] Resistance too Low	
B1363	Seat Belt Pretensioner [Front-Driver] Circuit Short to Ground	
B1364	Seat Belt Pretensioner [Front-Driver] Circuit Short to Battery	
B1367	Seat Belt Pretensioner [Front-Passenger] Resistance too High	
B1368	Seat Belt Pretensioner [Front-Passenger] Resistance too Low	
B1369	Seat Belt Pretensioner [Front-Passenger] Circuit Short to Ground	
B1370	Seat Belt Pretensioner [Front-Passenger] Circuit Short to Battery	
B1378	Side Airbag [Front-Driver] Resistance too High	
B1379	Side Airbag [Front-Driver] Resistance too Low	
B1380	Side Airbag [Front-Driver] Circuit Short to Ground	
B1381	Side Airbag [Front-Driver] Circuit Short to Battery	
B1382	Side Airbag [Front-Passenger] Resistance too High	
B1383	Side Airbag [Front-Passenger] Resistance too Low	
B1384	Side Airbag [Front-Passenger] Circuit Short to Ground	
B1385	Side Airbag [Front-Passenger] Circuit Short to Battery	
B1387	Seat Track Position Sensor [Driver] Short or Short to Ground	
B1388	Seat track Position Sensor [Driver] Open or Short to Battery	
B1389	Seat Track Position Sensor [Driver] Defect	
B1390	Seat Track Position Sensor [Passenger] Short or Short to Ground	
B1391	Seat Track Position Sensor [Passenger] Open or Short to Battery	
B1392	Seat Track Position Sensor [Passenger] Defect	
B1395	Squib Interconnection Fault	
B1400	Side Impact Sensor [Front-Driver] Defect	
B1403	Side Impact Sensor [Front-Passenger] Defect	
B1409	Side Impact Sensor [Front-Driver] Communication Error	
B1410	Side Impact Sensor [Front-Passenger] Communication Error	
B1448	Passenger Occupant Classification (OC) Sensor Defect	
B1449	Passenger Occupant Classification (OC) System Communication Error	
B1450	Passenger Occupant Classification (OC) System Wrong ID	

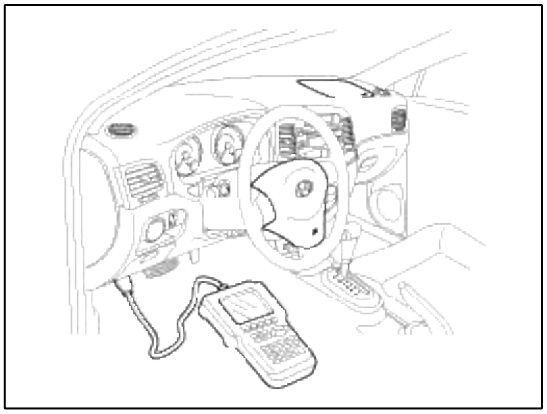
B1473	Curtain Airbag [Driver] Resistance too High	
B1474	Curtain Airbag [Driver] Resistance too Low	
B1475	Curtain Airbag [Driver] Circuit Short to Ground	
B1476	Curtain Airbag [Driver] Circuit Short to Battery	
B1477	Curtain Airbag [Passenger] Resistance too High	
B1478	Curtain Airbag [Passenger] Resistance too Low	
B1479	Curtain Airbag [Passenger] Circuit Short to Ground	
B1480	Curtain Airbag [Passenger] Circuit Short to Battery	
B1481	(2nd Stage) Driver Airbag Resistance too High	
B1482	(2nd Stage) Driver Airbag Resistance too Low	
B1483	(2nd Stage) Driver Airbag Circuit Short to Ground	
B1484	(2nd Stage) Driver Airbag Circuit Short to Battery	
B1485	(2nd Stage) Passenger Airbag Resistance too High	
B1486	(2nd Stage) Passenger Airbag Resistance too Low	
B1487	(2nd Stage) Passenger Airbag Circuit Short to Ground	
B1488	(2nd Stage) Passenger Airbag Circuit Short to Battery	
B1511	Seat Belt Buckle Switch [Driver] Open or Short to Battery	
B1512	Seat Belt Buckle Switch [Driver] Short or Short to Ground	
B1513	Seat Belt Buckle Switch [Passenger] Open or Short to Battery	
B1514	Seat Belt Buckle Switch [Passenger] Short or Short to Ground	
B1515	Seat Belt Buckle Switch [Driver] Defect	
B1516	Seat Belt Buckle Switch [Passenger] Defect	
B1517	Seat Belt Buckle Switch [Driver] Instability	
B1518	Seat Belt Buckle Switch [Passenger] Instability	
B1620	Supplemental Restraint System Control Module Internal Fault (Replace SRSCM)	
B1650	Crash Recorded - Frontal (Replace SRSCM)	
B1651	Crash Recorded - Driver Side (Replace SRSCM)	
B1652	Crash Recorded - Passenger Side (Replace SRSCM)	
B1655	Crash Recorded - Passenger Side with PAB inhibited (Replace SRSCM)	
B1657	Crash Recorded - Belt Pretensioner Only	
B1658	Belt Pretensioner 6 times Deployment (Replace SRSCM)	
B1659	Rear Impact Detected	
B1670	Crash recorded in Full Stage - Frontal (Replace SRSCM)	
B2500	SRS Warning Lamp Failure	
B2502	Passenger Airbag Tell Tale Lamp Failure	

Restraint > Supplemental Restraint System Control Module (SRSCM) > Troubleshooting

DESCRIPTION

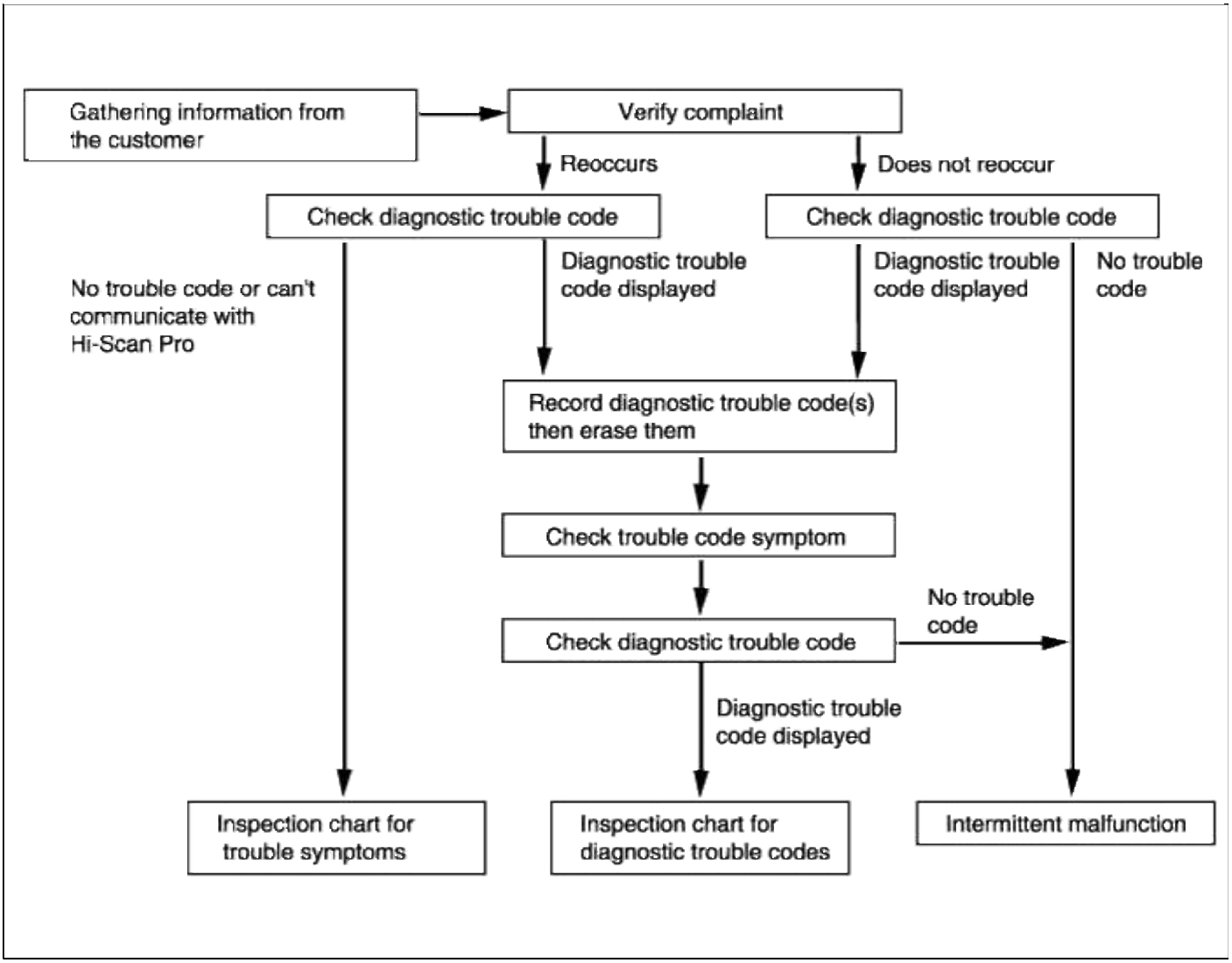
HI-SCAN CHECK

1. Turn the ignition switch off.
2. Connect the Hi-Scan Pro connector to the data link connector located under the crash pad.



3. Turn the ignition switch on and power on the Hi-Scan Pro.
4. Read DTCs.
5. Find and repair the trouble, and clear the DTCs using Hi-Scan Pro.
6. Disconnect the Hi-Scan Pro.

DIAGNOSTIC TROUBLESHOOTING FLOW



TERMINAL & CONNECTOR INSPECTION

Be sure to perform "TERMINAL & CONNECTOR INSPECTION" before doing "INSPECTION PROCEDURE" for troubleshooting of each DTC.

1. Visually inspect all connectors related to the affected circuit for damage and secure connection.
2. Inspect terminals for damage and corrosion.

> **CAUTION**
>
> Avoid damaging connectors during the inspection process.

3. Are any problems found?

NO

Go to next step (INSPECTION PROCEDURE).

YES

After repairing the trouble part, check whether DTC occurs or not.

PREPARATION OF INSPECTION

Refer to the following steps while doing "INSPECTION PROCEDURE" which is described in the DTC troubleshooting section.

1. Turn the ignition switch to LOCK.
2. Disconnect the battery negative cable from the battery and wait for at least 3 minutes.
3. Remove the DAB module and disconnect the DAB connector.
4. Disconnect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
5. Disconnect the SRSCM connector.

CHECKING OF SHORT OR OPEN CIRCUIT

Refer to the following tips for checking of short or open circuit.

1. Shorting bar is located between the upper and lower pins of SRSCM connector A and B.
2. When checking the short circuit shorting bar must be opened. Use a plastic clip to put into as a shorting bar opener for disconnecting shorting bar.
3. Use SST Dummy adapter (0957A-1C000) to measure resistance or voltage for checking of short or open circuit.
   Plug it into DAB (CAB, BPT) connector to avoid enlarging or damaging the connector pins.

CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

1. Install the DAB module and connect the DAB connector.
2. Connect the connector of the PAB, SAB, CAB, BPT, FIS and SIS.
3. Connect the SRSCM connector.
4. Connect the battery negative cable to the battery.
5. Connect a Hi-Scan(Pro) to the data link connector.
6. Turn the ignition switch to ON.
7. Clear the DTC stored in the SRSCM memory with the Hi-Scan(Pro)
8. Turn the ignition switch to LOCK and wait for at least 30 seconds.
9. Turn the ignition switch to ON and wait for at least 30 seconds.
10. Check the vehicle again with the Hi-Scan(Pro).
    Does the above DTC(s) go off?

YES

Problem is intermittent or was repaired and SRSCM memory was not cleared.

NO

Replace the SRSCM with a new one and then check the vehicle again. At this time, if the vehicle normally operates with a new one, the fault may be the SRSCM. Replace the SRSCM.

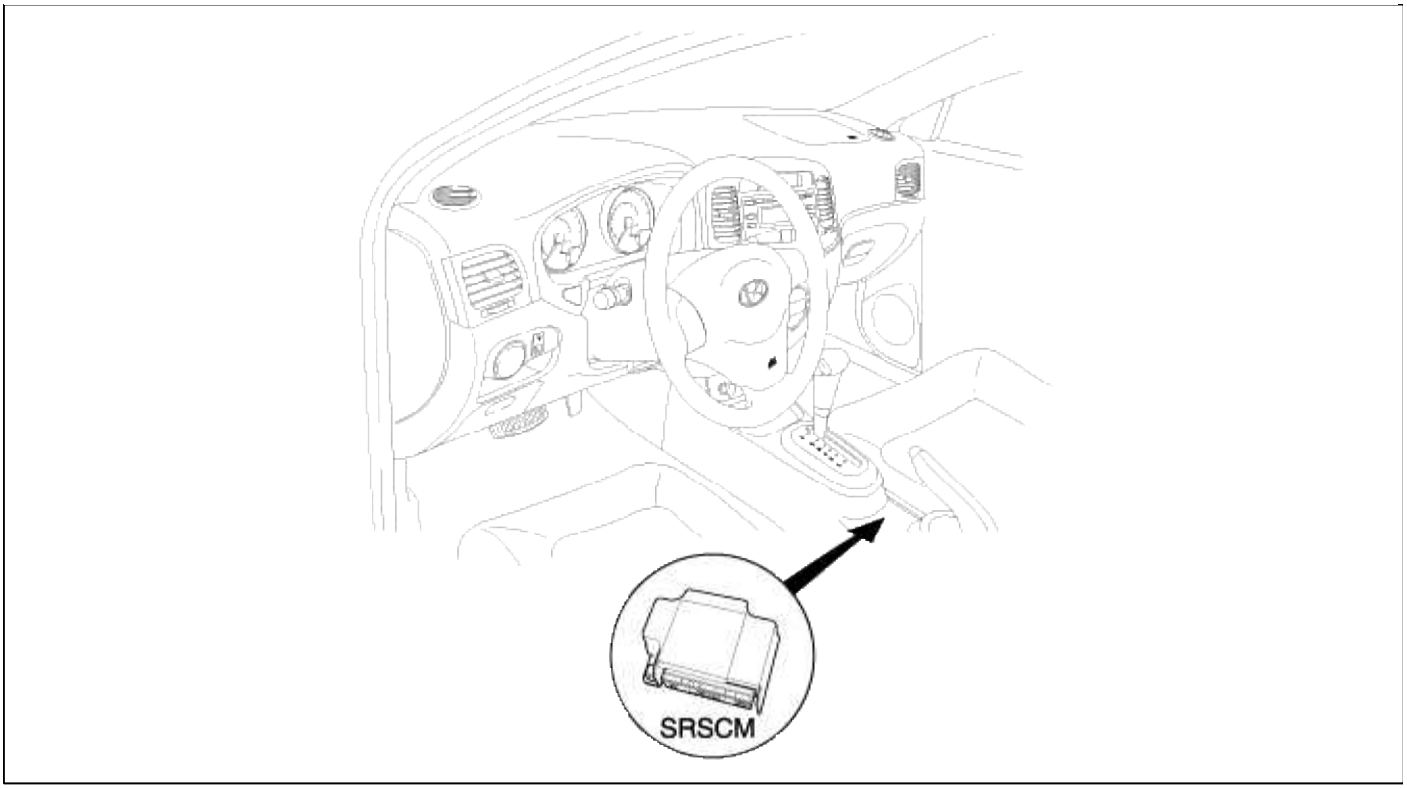
Restraint > Supplemental Restraint System Control Module (SRSCM) > SRS Control Module (SRSCM) > Description and Operation

DESCRIPTION

The primary purpose of the SRSCM (Supplemental Restraints System Control Module) is to discriminate between an event that warrants restraint system deployment and an event that does not. The SRSCM must decide whether to deploy the restraint system or not. After determining that pretensioners and/or airbag deployment is required, the SRSCM must supply sufficient power to the pretensioners and airbag igniters to initiate deployment. The SRSCM determines that an impact may require deployment of the pretensioners and airbags from data obtained from impact sensors and other components in conjunction with a safing function. The SRSCM will not be ready to detect a crash or to activate the restraint system devices until the signals in the SRSCM circuitry stabilize. It is possible that the SRSCM could activate the safety restraint devices in approximately 2 seconds but is guaranteed to fully function after prove-out is completed. The SRSCM must perform a diagnostic routine and light a system readiness indicator at key-on. The system must perform a continuous diagnostic routine and provide fault annunciation through a warning lamp indicator in the event of fault detection. A serial diagnostic communication interface will be used to facilitate servicing of the restraint control system.

Restraint > Supplemental Restraint System Control Module (SRSCM) > SRS Control Module (SRSCM) > Components and Components Location

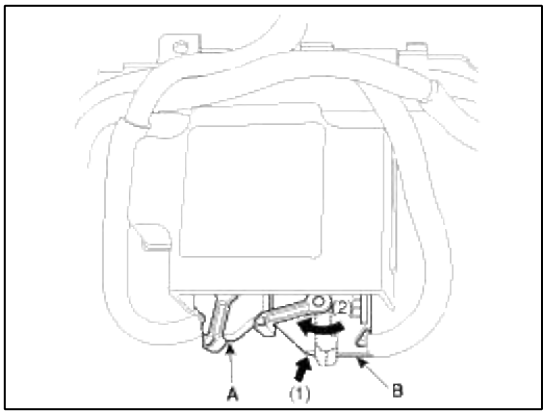
COMPONENTS



Restraint > Supplemental Restraint System Control Module (SRSCM) > SRS Control Module (SRSCM) > Repair procedures

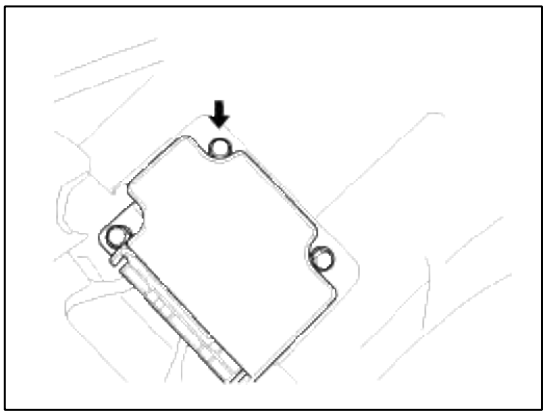
REMOVAL

1. Disconnect the negative (-) cable from battery and wait for at least three minutes.
2. Remove ignition key from the vehicle.
3. Disconnect the DAB, PAB, SAB, CAB and BPT connectors.
4. Remove the floor console. (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 bolts (3EA) from the SRSCM, then remove the SRSCM.



INSTALLATION

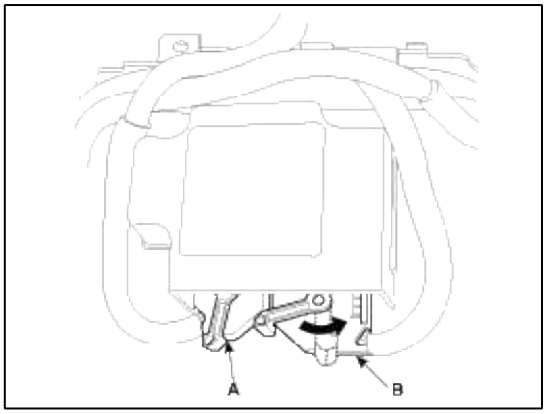
1. Disconnect the negative (-) cable from battery and wait for at least three minutes.
2. Remove ignition key from the vehicle.
3. Install the SRSCM with the SRSCM mounting bolts.

Tightening Torque (SRSCM Mounting Bolt)
: 1.0 ~ 1.4 kgf.m (9.5 ~ 13.6 Nm, 7.0 ~ 10.0 lb.ft)

NOTE

Use new mounting bolts when replacing th SRSCM after a collision.

4. Connect the SRSCM harness connector.



5. Install the 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:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

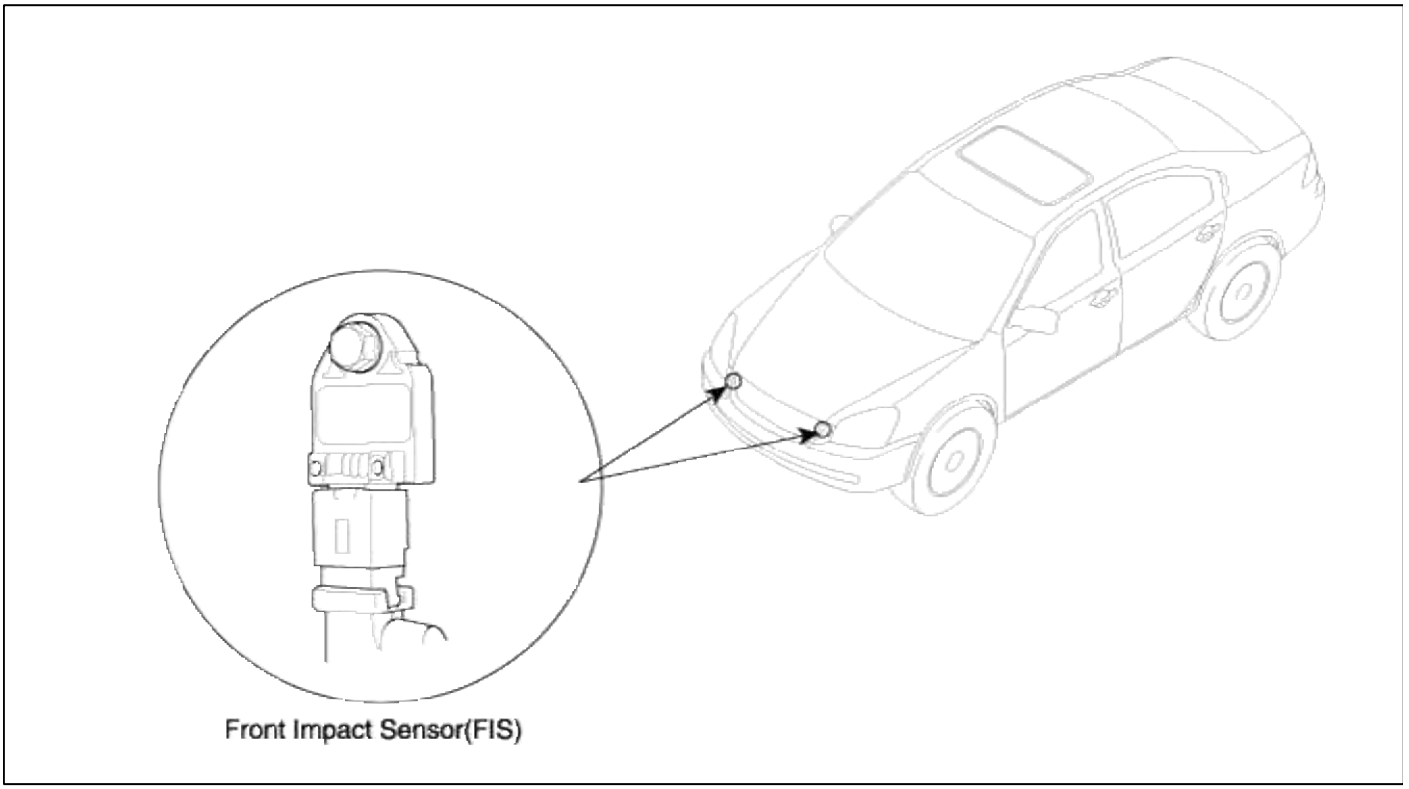
Restraint > Supplemental Restraint System Control Module (SRSCM) > Front Impact Sensor (FIS) > Description and Operation

DESCRIPTION

The front impact sensors (FIS) are installed in the side member. They are remote sensors that detect acceleration due to a collision at their mounting locations. The primary purpose of the Front Impact Sensor (FIS) is to provide an indication of a collision. The Front Impact Sensor(FIS) sends acceleration data to the SRSCM.

Restraint > Supplemental Restraint System Control Module (SRSCM) > Front Impact Sensor (FIS) > Components and Components Location

components



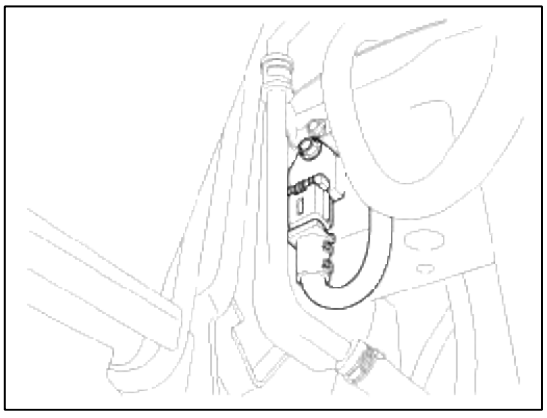
Restraint > Supplemental Restraint System Control Module (SRSCM) > Front Impact Sensor (FIS) > Repair procedures

removal

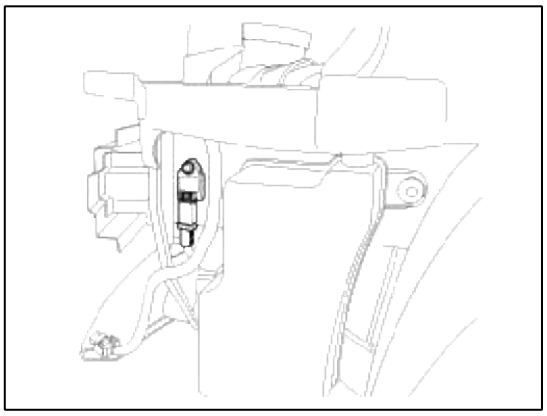
CAUTION

- Removal of the airbag must be performed according to the precautions/ procedures described previously.
- Before disconnecting the front impact sensor connector, disconnect the front airbag connector(s).
- Do not turn the ignition switch ON and do not connect the battery cable while replacing the front impact sensor.

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the FIS mounting bolt then remove the Front Impact Sensor(RH).



3. Remove the front bumper first(refer to BD group), then loosen the FIS mounting bolt to remove Front Impact Sensor.(LH)



4. Disconnect the Front Impact Sensor connector.

INSTALLATION

CAUTION

- Be sure to install the harness wire not to be pinched or interfere with other parts.
- 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 with bolt then connect the SRS harness connector to the Front Impact Sensor.

Tightening torque
: 0.7 ~ 0.8 kgf.m (6.8 ~ 7.9 Nm, 5.0 ~ 5.8 lb.ft)

2. Install the front bumper.(LH)
3. Reconnect the negative battery cable.
4. 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.

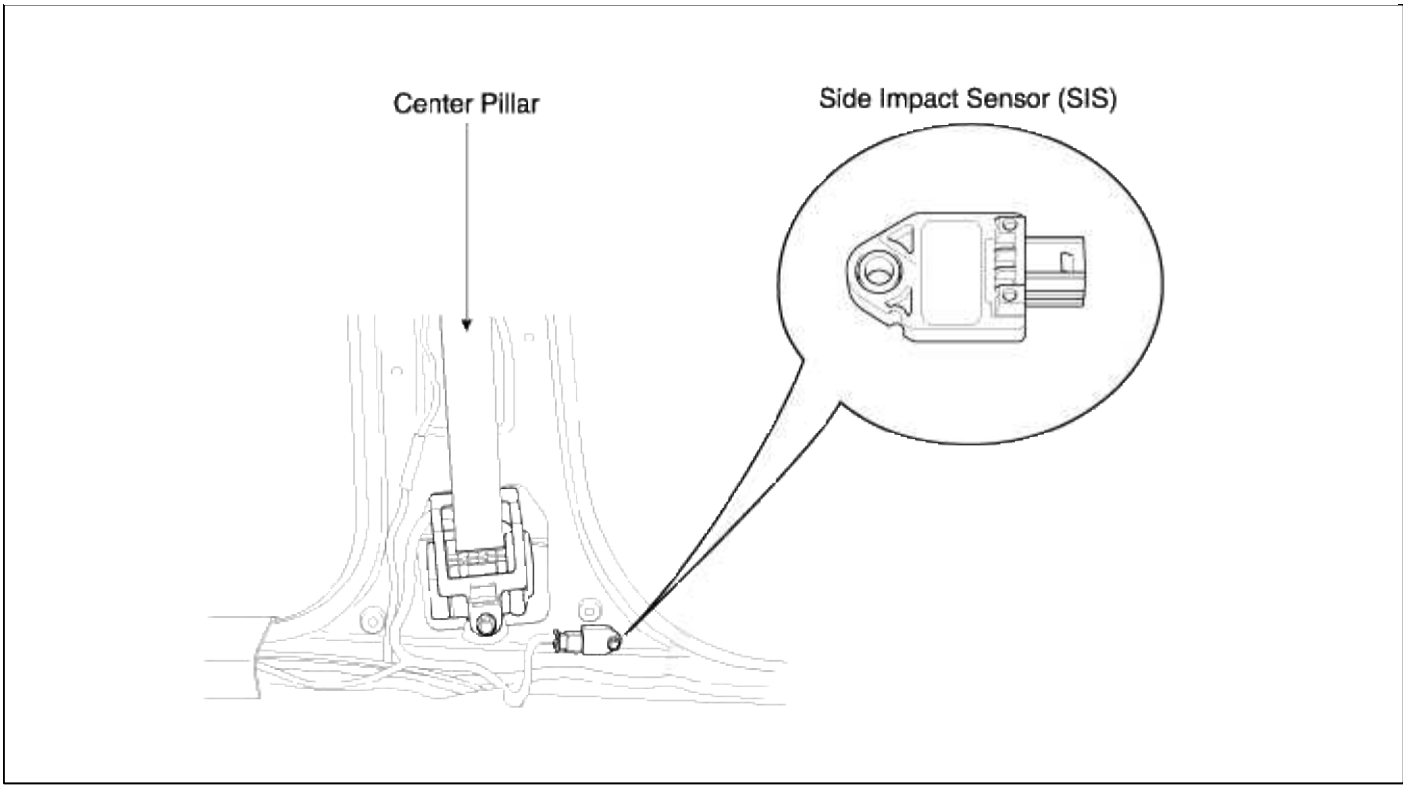
Restraint > Supplemental Restraint System Control Module (SRSCM) > Side Impact Sensor (SIS) > Description and Operation

DESCRIPTION

The Side Impact Sensor (SIS) system consists of two front SIS which are installed inside the B-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.

Restraint > Supplemental Restraint System Control Module (SRSCM) > Side Impact Sensor (SIS) > Components and Components Location

components



Restraint > Supplemental Restraint System Control Module (SRSCM) > Side Impact Sensor (SIS) > Repair procedures

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 front seat assembly. (Refer to BD group)
3. Remove the center pillar trim. (Refer to BD group)
4. Disconnect the Side Impact Sensor connector.
5. Remove the SIS mounting bolt then remove the Side Impact Sensor.

Installation

CAUTION

- Be sure to install the harness wires not to be pinched or interfered with other parts.
- 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 front seat assembly. (Refer to BD group)
4. Reconnect the negative battery cable.
5. 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.

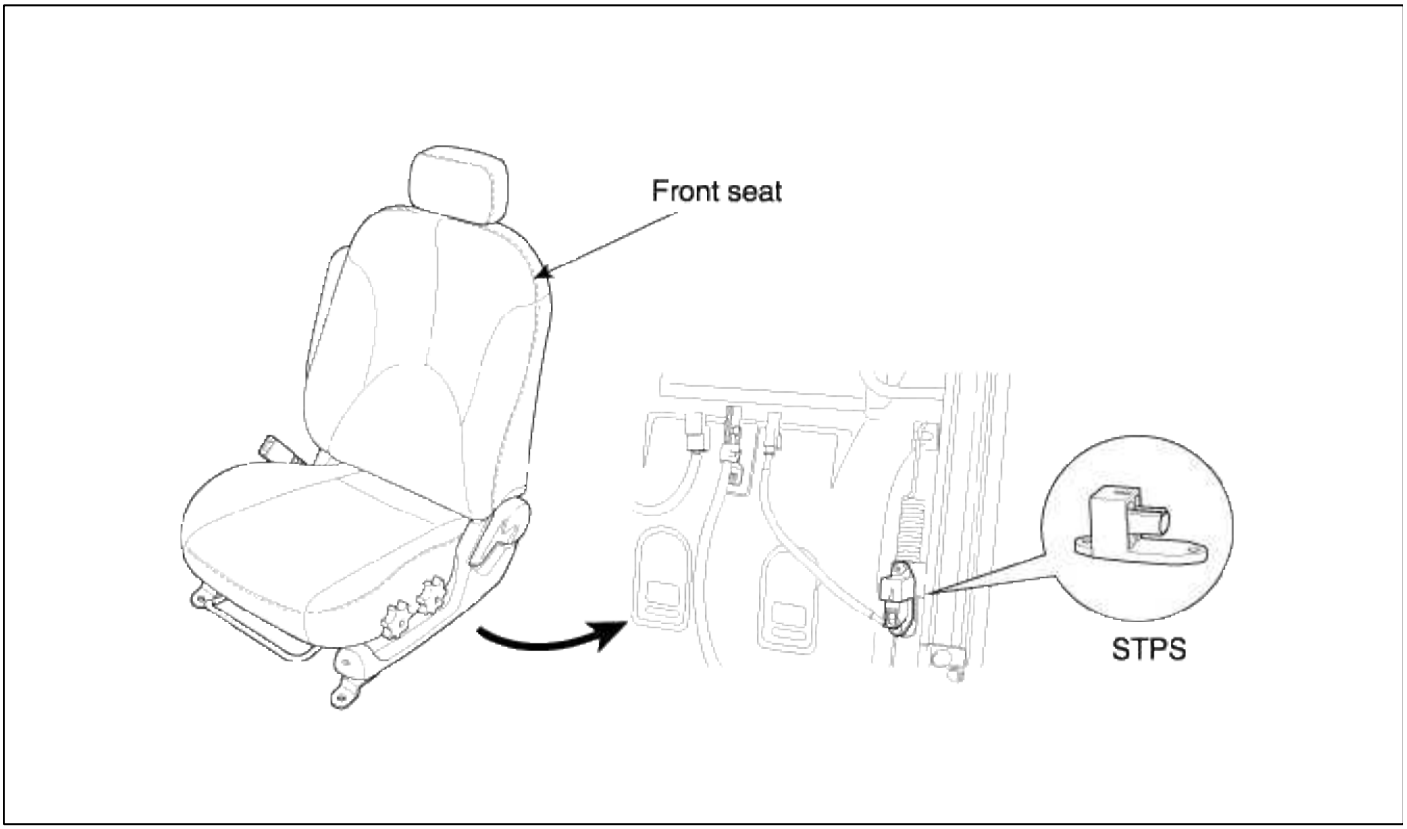
Restraint > Supplemental Restraint System Control Module (SRSCM) > Seat Track Position Sensor (STPS) > Description and Operation

DESCRIPTION

The STPS operated via a non-contacting magnetic proximity sensing device combined with a simple electronic circuit resulting in the ability of producing two separate and distinct logic level signals.The STPS output signal is altered by the proximity of a separate ferro-magnetic shunt, which is linked via the seat track. The logic signal produced is the result of the proximity device being activated or deactivated.When the seat is in the forward position zone of the track, the sensor gives a low current (prohibit) signal. When the seat is in the rear positon zone of the track, it gives a high current (enable) signal.

Restraint > Supplemental Restraint System Control Module (SRSCM) > Seat Track Position Sensor (STPS) > Components and Components Location

components



Restraint > Supplemental Restraint System Control Module (SRSCM) > Seat Track Position Sensor (STPS) > Repair procedures

REMOVAL

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the front seat assembly. (Refer to BD group)
3. Loosen the two STPS screws, then remove the STPS after disconnecting the STPS connector.

INSTALLATION

CAUTION

Be sure to install the harness wires not to be pinched or interfered with other parts.

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the ignition key from the vehicle.
3. Install the STPS with two screws.
4. Install the front seat assembly. (Refer to BD group)
5. Reconnect the battery negative cable.
6. After installing the Seat Track Position Sensor, confirm proper system operation:
   Turn the ignition switch ON, the SRS indicator should be turned on for about six seconds and then go off.

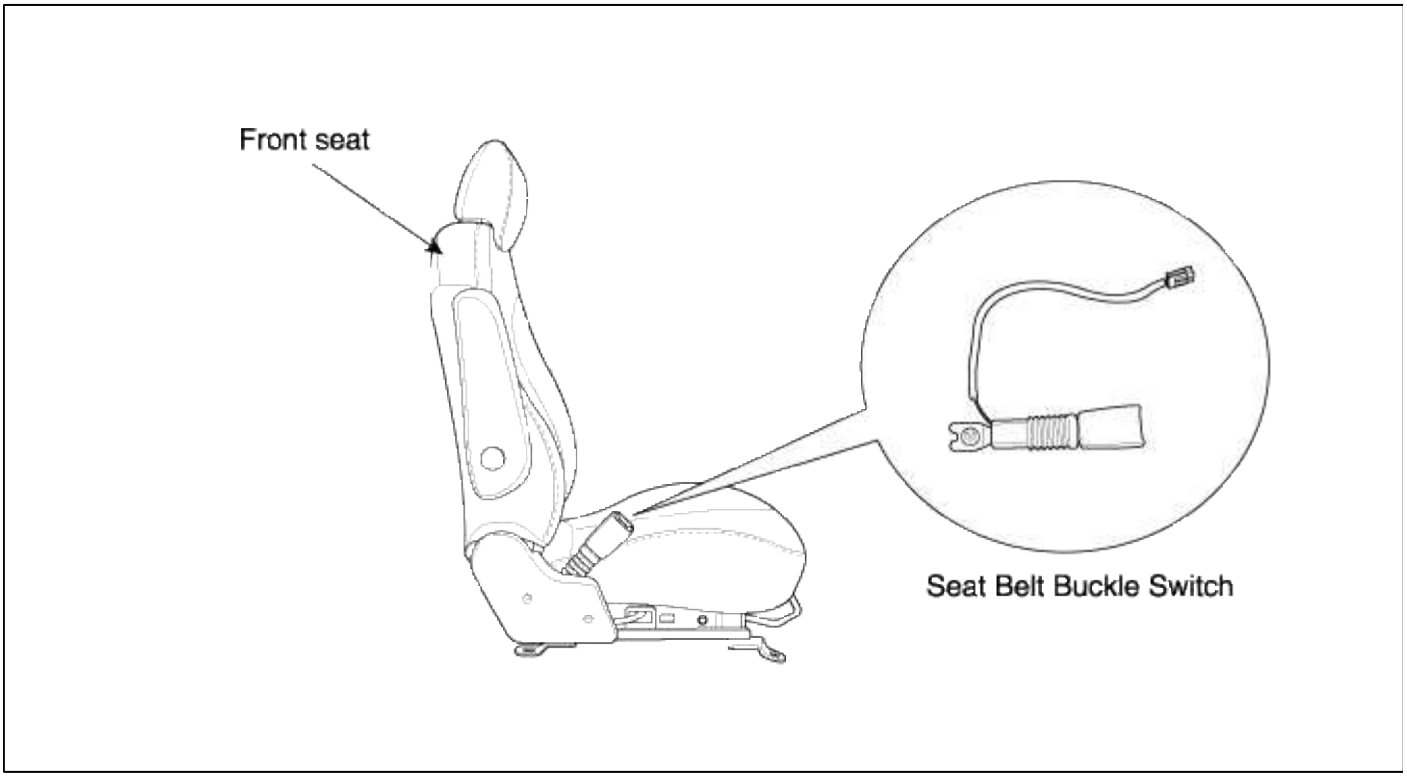
Restraint > Supplemental Restraint System Control Module (SRSCM) > Seat Belt Buckle Switch (BS) > Description and Operation

DESCRIPTION

The SRSCM shall monitor the status of the driver and front passenger seat belt buckle. The SRSCM provides one pin each for the driver and front passenger seat belt buckle status input. The seat belt buckle circuit operates from internal boost voltage supplied by the SRSCM, and uses chassis ground for the signal return. The buckle status shall modify the SRSCM deployment. If the buckle status is unbuckled, the corresponding pretensioner will be deactivated.

Restraint > Supplemental Restraint System Control Module (SRSCM) > Seat Belt Buckle Switch (BS) > Components and Components Location

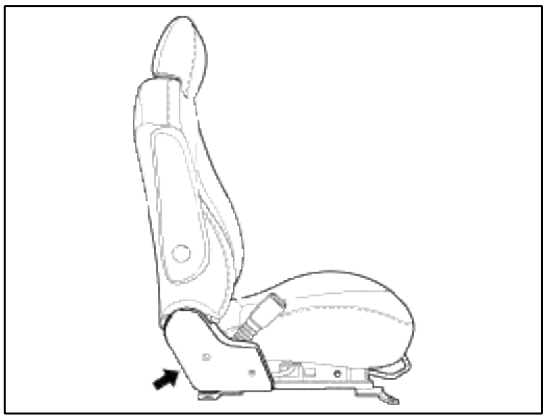
components



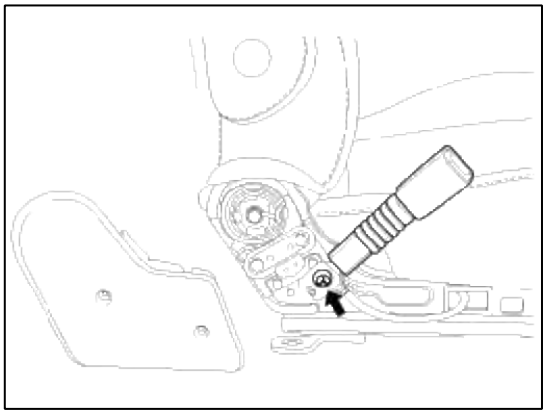
Restraint > Supplemental Restraint System Control Module (SRSCM) > Seat Belt Buckle Switch (BS) > Repair procedures

REMOVAL

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the front seat assembly. (Refer to BD group)
3. Remove the seat recliner cover.



4. Loosen the seat belt buckle mounting bolt and remove the seat belt buckle switch.



INSTALLATION

CAUTION

Be sure to install the harness wires not to be pinched or interfered with other parts.

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the ignition key from the vehicle.
3. Install the seat belt buckle switch.

Tightening Torque : 4.0 ~ 5.5 kgf.m (28.9 ~ 39.8 lb.ft)

4. Install the seat recliner cover with two screws.
5. Install the front seat assembly. (Refer to BD group)
6. Reconnect the battery negative cable.
7. After installing the Seat Belt Buckle Switch, confirm proper system operation:
   Turn the ignition switch ON, the SRS indicator should be turned on for about six seconds and then go off.

Restraint > Supplemental Restraint System Control Module (SRSCM) > Occupant Classification Sensor (OCS) > Description and Operation

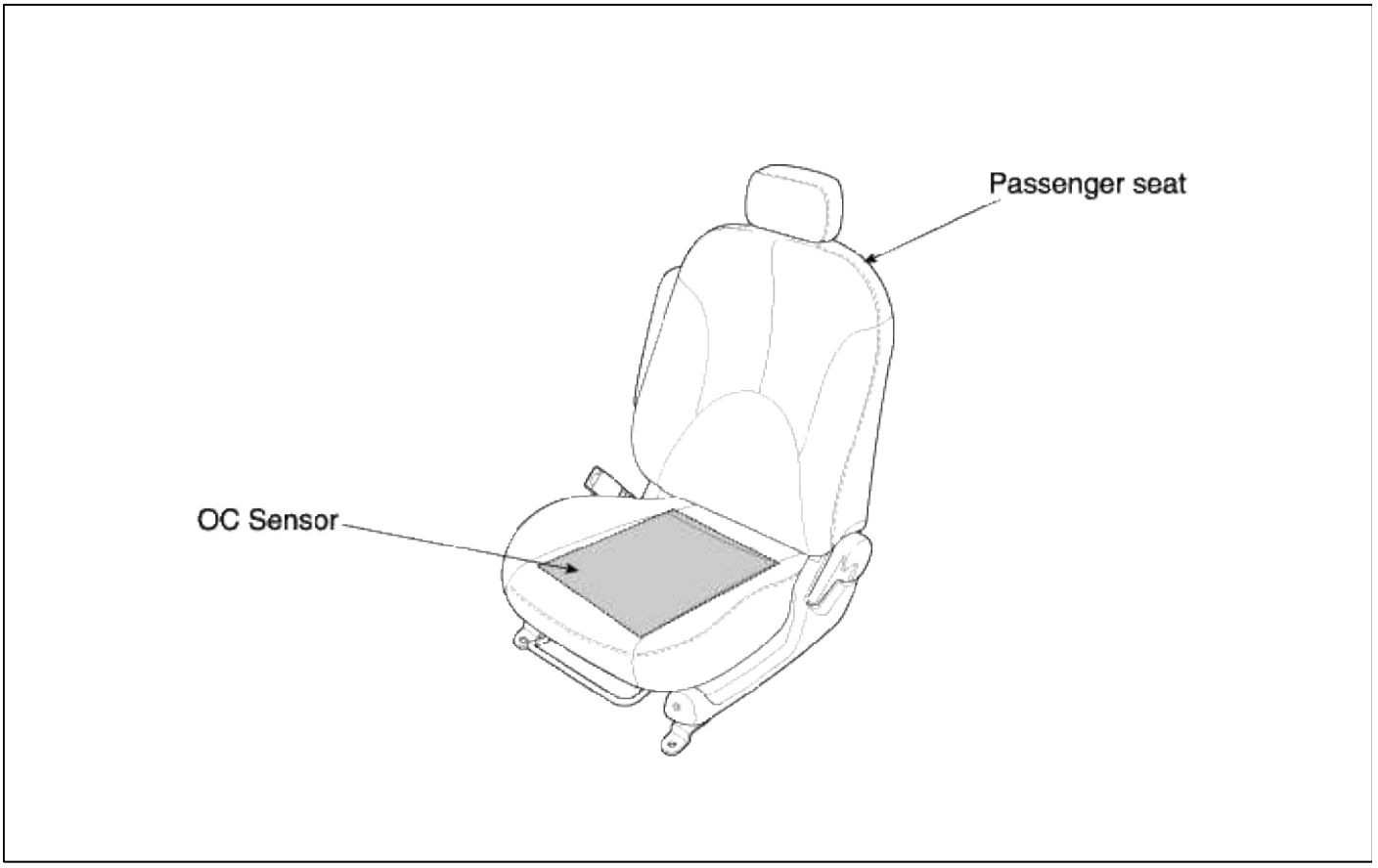
DESCRIPTION

In contrast to the initial one-stage airbag systems, newer restraint systems involve complex logic to select, or

alternatively suppress, various levels of safety system deployment. Inherent to an Advanced Restraint System is the ability to discern information regarding passenger occupancy. It is intended that these inputs be provided through the OC system. The object of such safety system is to reduce the risk and level of injuries by automatically adapting the airbag(s) and seat belt pretensioner to the driving status of the vehicle, its occupants, and the crash severity. The current OC system covered in this specification continually senses and classifies the front passenger side seat.

Restraint > Supplemental Restraint System Control Module (SRSCM) > Occupant Classification Sensor (OCS) > Components and Components Location

components



Restraint > Supplemental Restraint System Control Module (SRSCM) > Occupant Classification Sensor (OCS) > Repair procedures

REMOVAL

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the front seat assembly.
   (Refer to BD group)
3. Remove the seat cushion as an assembly.
   (Refer to BD group)

INSTALLATION

1. Install the OCS equipped seat cushion.
   (Refer to BD group)
2. Install the front seat assembly. (Refer to BD group)
3. Reconnect the battery negative cable.

4. After installing the OCS, confirm proper system operation : Turn the ignition switch ON, the SRS indicator should be turned on for about six seconds and then go off.
   Telltale lamp will turn on for 4 seconds and be turned off afterward.

Restraint > Airbag Module > Description and Operation

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-38510).
2. Install the driver's airbag on the steering wheel.

Front Passenger's Airbag :

1. Remove the glove box, then disconnect the 4P connector between the front passenger's airbag and SRS main harness.
2. Install the SST(0957A-2E110).

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.



Deploying the Airbag Out of the vehicle

If an intact airbag has been removed from a scrapped vehicle, or has been found defective or damage during transit, storage or service, it should be deployed as follows :

1. Confirm that the special is functioning properly by following the check procedure on this page.
2. Position the airbag face up, outdoors on flat ground at least thirty feet (10meters) from any obstacles or people.

Disposal of Damaged Airbag

1. If installed in a vehicle, follow the removal procedure of driver's airbag front passenger's and side airbag.
2. In all cases, make a short circuit by twisting together the two airbag inflator wires.
3. Package the airbag in exactly the same packing that the new replacement part come in.

Restraint > Airbag Module > Driver Airbag (DAB) Module and Clock Spring > Description and Operation

DESCRIPTION

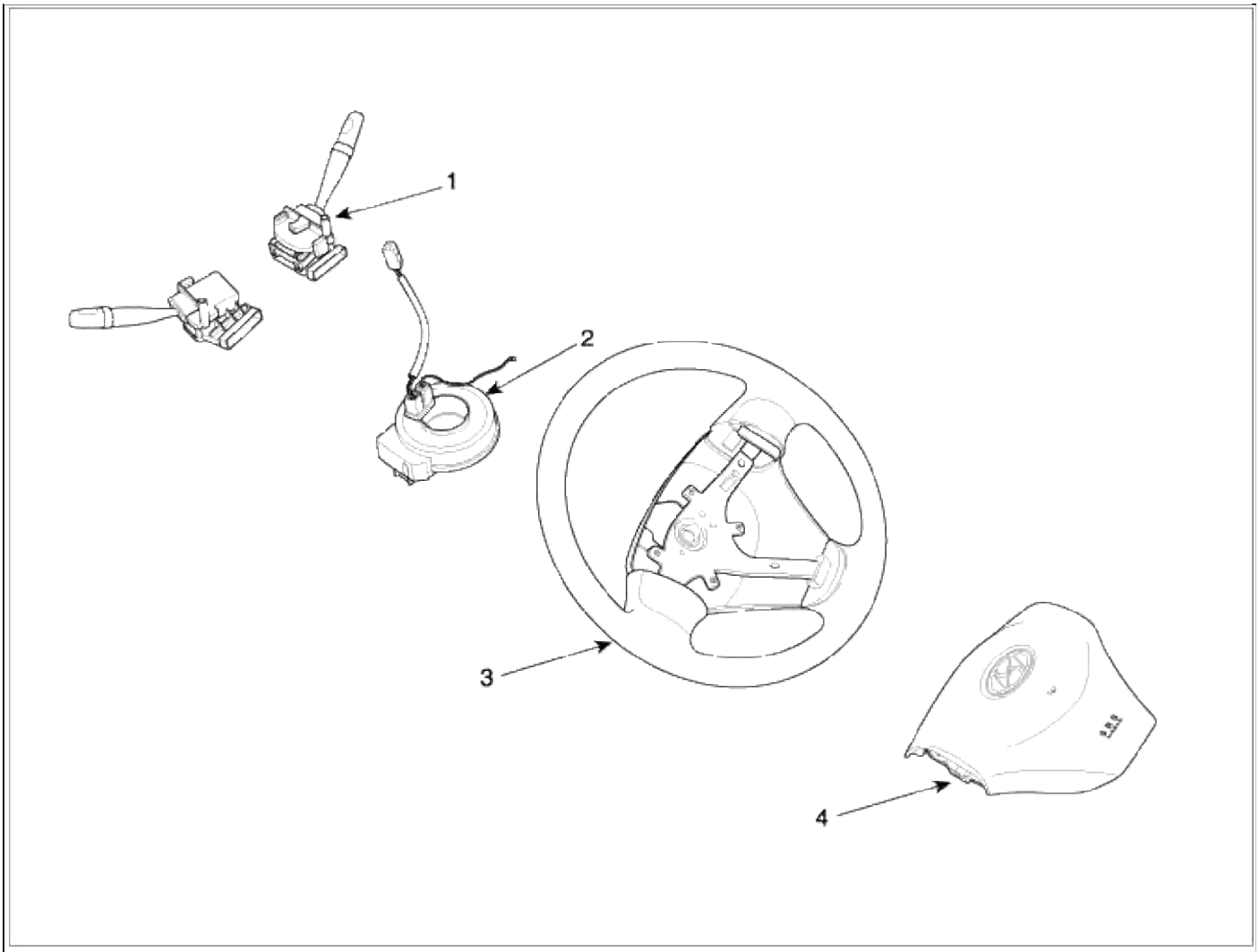
Driver Airbag (DAB) is installed in steering wheel and electrically connected to SRSCM via clockspring. It protects the driver from danger by deploying a bag when frontal crash occurs. The SRSCM determines deployment of Driver Airbag (DAB).

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.

Restraint > Airbag Module > Driver Airbag (DAB) Module and Clock Spring > Components and Components Location

components



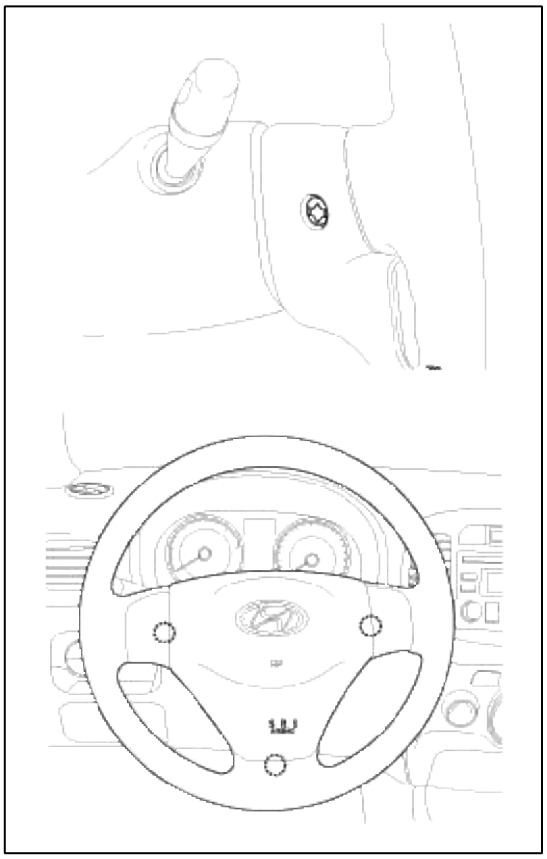
1. Multi-Function Switch
2. Clock Spring
3. Steering Wheel
4. Driver Airbag (DAB)

Restraint > Airbag Module > Driver Airbag (DAB) Module and Clock Spring > Repair procedures

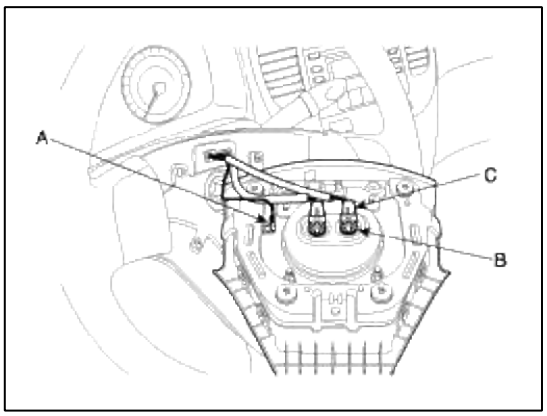
REMOVAL

1. Disconnect the battery negative cable and wait at least three minutes before beginning work.

2. Remove the three airbag module mounting bolts.



3. Disconnect the horn connector(A).

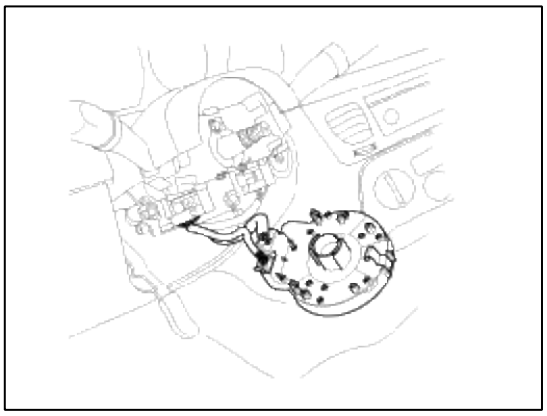


4. Release the connector locking pin(B), then disconnect the driver airbag module connector(C).

> **CAUTION**
>
> The removed airbag module should be stored in a clean, dry place with the pad cover face up.

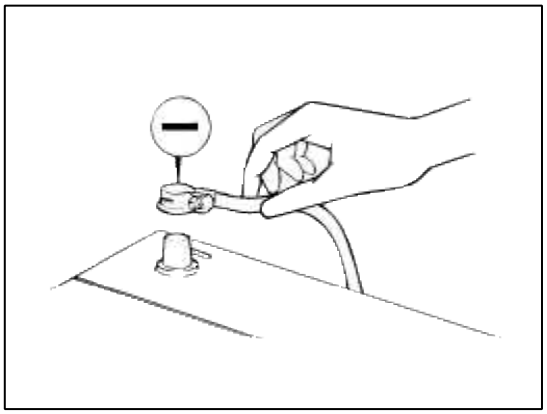
5. Remove the steering wheel and steering wheel column cover. (Refer to ST group)

6. Disconnect the clock spring and horn connector, then remove the clock spring.



INSTALLATION

1. Disconnect the negative (-) cable from battery and wait for at least three minutes.



2. Remove the ignition key from the vehicle.
3. Connect the clock spring harness connetor and horn harness connector to the clock spring.
4. Set the clock spring on neutral position and after turning the front wheels to the straight-ahead position, install the clock spring.
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 (7.9 ~ 10.8 Nm, 5.8 ~ 8.0 lb.ft)

8. Connect the battery negative cable.
9. After installing the airbag, confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.
   B. Make sure horn button works.

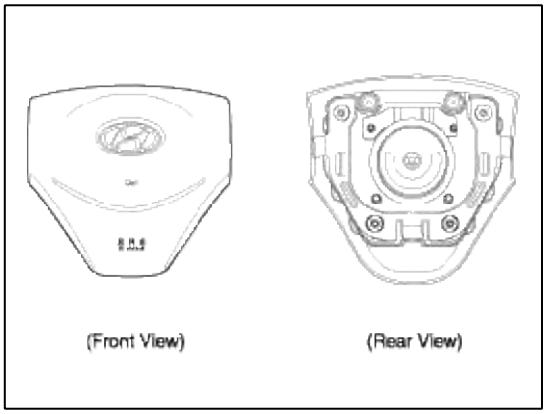
INSPECTION

CAUTION

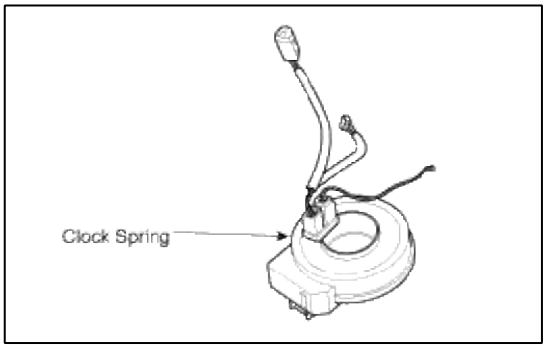
Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

1. Check pad cover for dents, cracks or deformities.

2. Check the airbag module for denting, cracking or deformation.
3. Check hooks and connectors for damage, terminals for deformities, and harness for binds.
4. Check airbag inflator case for dents, cracks or deformities.



5. Install the airbag module to the steering wheel to check for fit or alignment with the wheel.
   A. If, as a result of the following checks, even one abnormal point is discovered, replace the clock spring with a new one.
   B. Check connectors and protective tube for damage, and terminals for deformities.



Restraint > Airbag Module > Passenger Airbag (PAB) Module > Description and Operation

DESCRIPTION

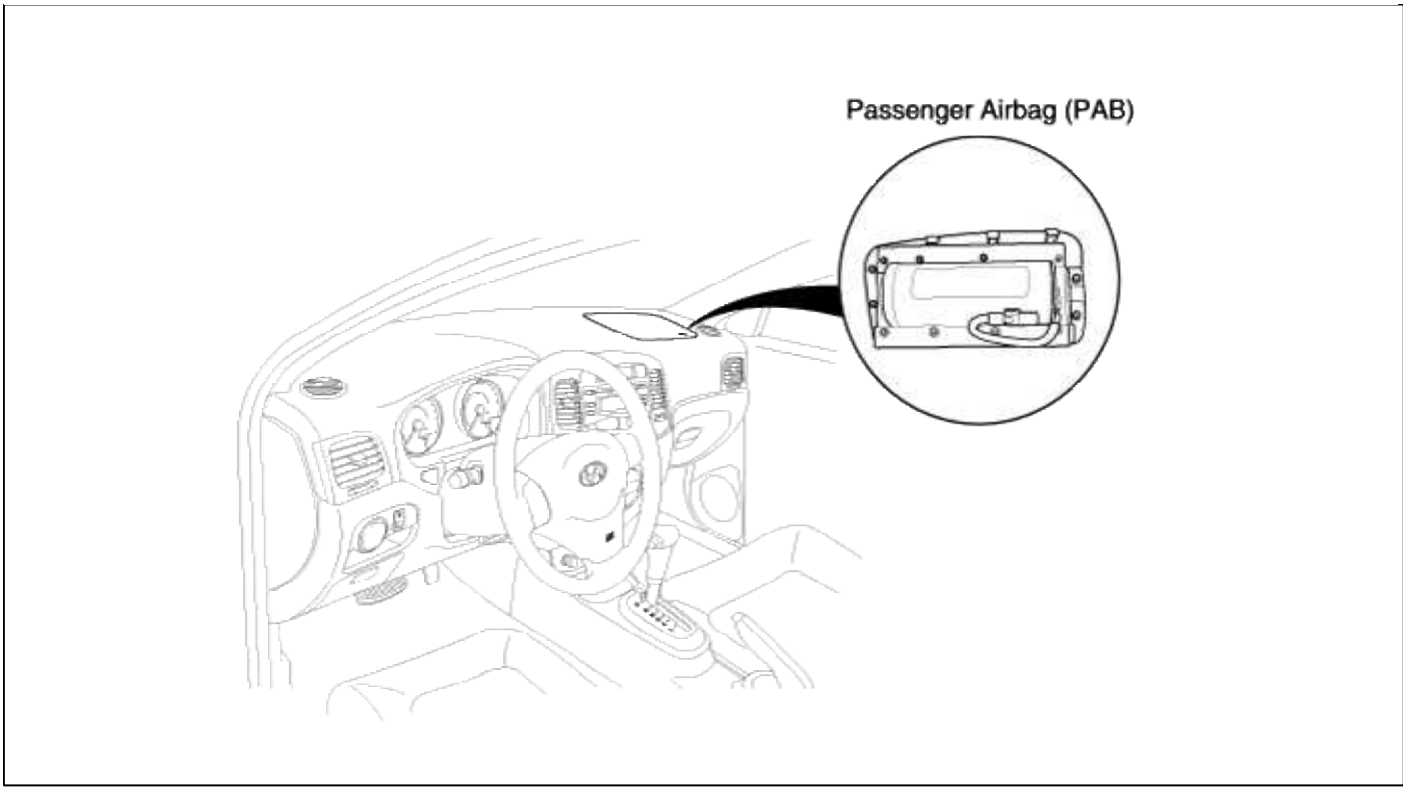
The passenger Airbag (PAB) is installed inside the crash pad and protects the front passenger in the event of a frontal crash. The SRSCM determines if and when to deploy the PAB.

CAUTION

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

Restraint > Airbag Module > Passenger Airbag (PAB) Module > Components and Components Location

components



Restraint > Airbag Module > Passenger Airbag (PAB) Module > Repair procedures

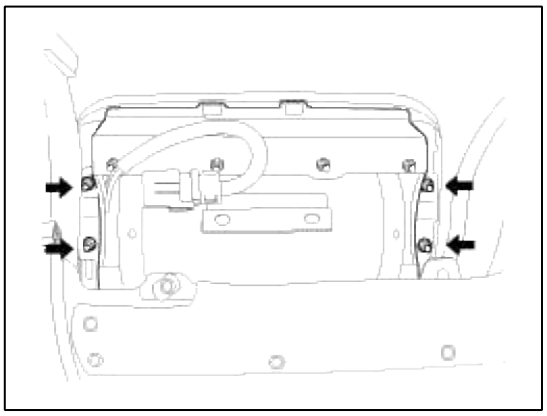
REMOVAL

1. Disconnect the battery negative cable and wait for at least three minutes before beginning work.
2. Remove the glove box. (Refer to BD group)
3. Disconnect the PAB connector and remove the PAB mounting bolts. (Refer to BD group)
4. Remove the crash pad. (Refer to BD group)

NOTE

Replace the crash pad which is damaged while PAB is deployed.

5. Remove the mounting nuts from the crash pad. Then remove the passenger airbag.



CAUTION

The removed airbag module should be stored in a clean, dry place with the pad cover face up.

INSTALLATION

1. Disconnect the negative (-) cable from battery and wait for at least three minutes.
2. Remove ignition key from the vehicle.
3. Place a Passenger Airbag (PAB) on the crash pad and tighten the Passenger Airbag (PAB) mounting nuts.

Tightening Torque
: 0.2 ~ 0.3 kgf.m (2.0 ~ 3.0 N.m, 1.5 ~ 2.2 lb.ft)

4. Install the crash pad. (Refer to BD group)
5. Tighten the PAB mounting bolts.

Tightening Torque
: 0.8 ~ 0.9 kgf.m (8.0 ~ 9.0 N.m, 5.9 ~ 6.6 lb.ft)

6. Connect the Passenger Airbag (PAB) harness connector to the SRS main harness connector.
7. Reinstall the bolve box. (Refer to BD group)
8. Reconnect the battery negative cable.
9. After installing the Passenger Airbag (PAB), confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Restraint > Airbag Module > Side Airbag (SAB) Module > Description and Operation

DESCRIPTION

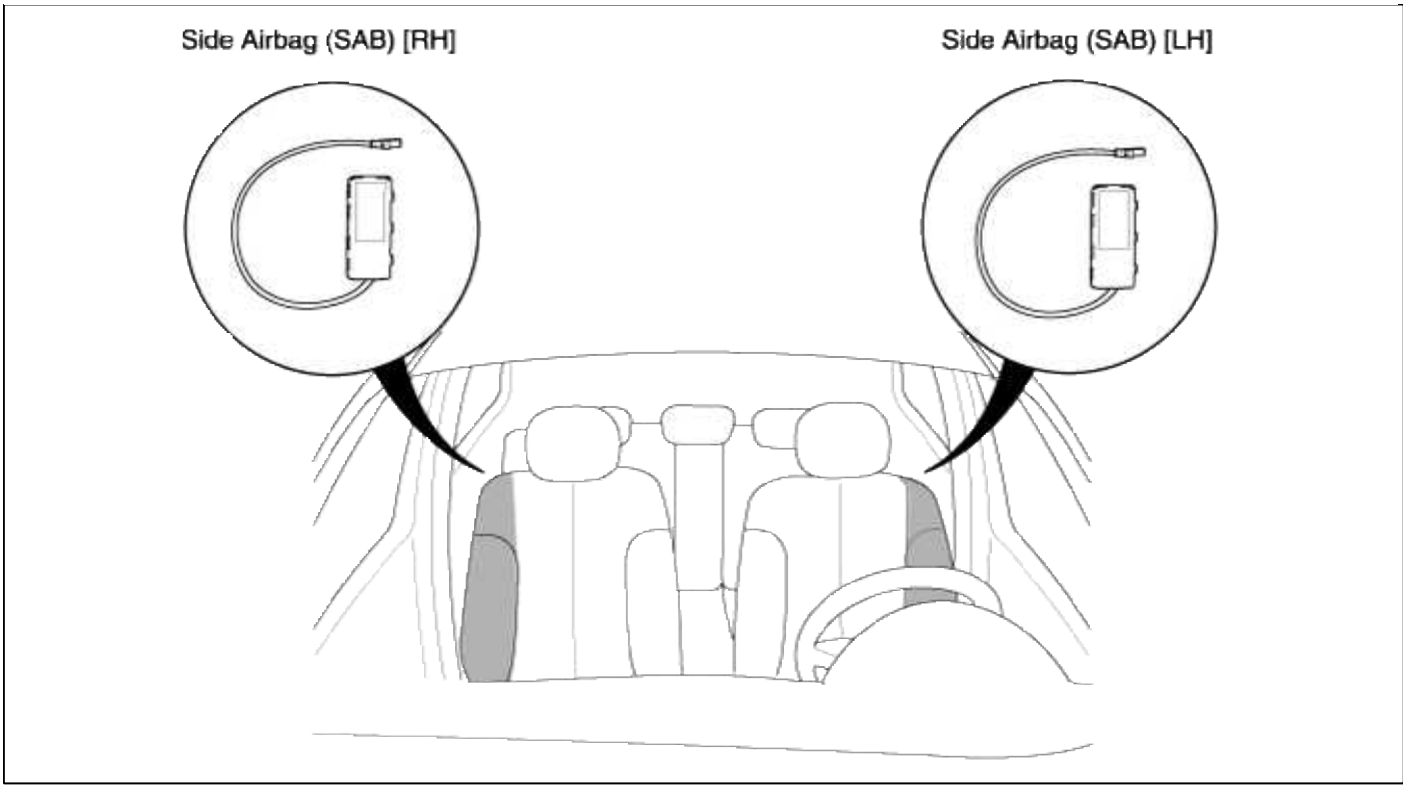
The two Side Airbags (SAB) are installed inside the driver and passenger seat and protects the driver and front passenger from danger when side crash occurs. The SRSCM determines deployment of side airbag by using Side Impact Sensor (SIS) signal.

CAUTION

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

Restraint > Airbag Module > Side Airbag (SAB) Module > Components and Components Location

components



Restraint > Airbag Module > Side Airbag (SAB) Module > Repair procedures

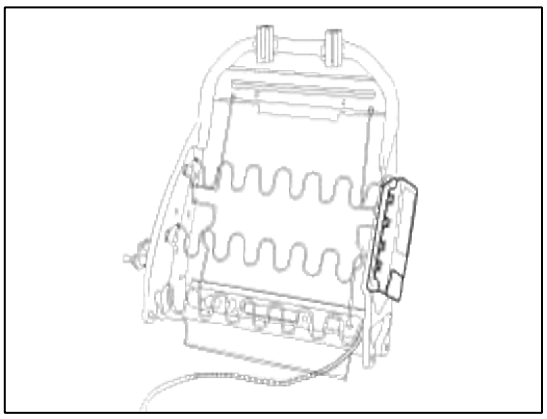
REMOVAL

1. Disconnect the battery negative cable and wait at least 3 minutes before beginning work.
2. Remove the front seat assambly.(Refer to BD group)
3. Remove the seatback cover.(Refer to BD group)

> NOTE
>
> When the side airbag deployed after a collision, replace the seatback as an assembly.

4. Loosen the SAB mounting nuts and remove the SAB module.

> CAUTION
>
> The removed airbag module should be stored in a clean, dry place with the pad cover face up.



INSTALLATION

CAUTION

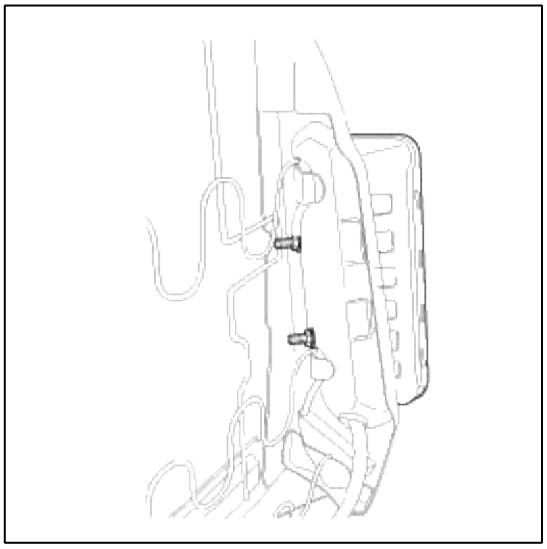
Be sure to install the harness wires not to be pinched or interfered with other parts.

NOTE

- Do not open the lid of the side airbag cover.
- Use a new mounting nuts when you replace a side airbag.
- Make sure that the seat-back cover is installed properly. Improper installation may prevent the proper deployment.

1. Disconnect the battery negative cable and wait for at least three minutes.
2. Remove the ignition key from the vehicle.
3. Place a Side Airbag (SAB) on the seat-back frame and tighten the side airbag mounting nuts.

Tightening torque
: 0.5 ~ 0.7 kgf.m (4.9 ~ 69 Nm, 3.6 ~ 5.1 lb.ft)



4. Install the new seat-back 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:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Restraint > Airbag Module > Curtain Airbag (CAB) Module > Description and Operation

DESCRIPTION

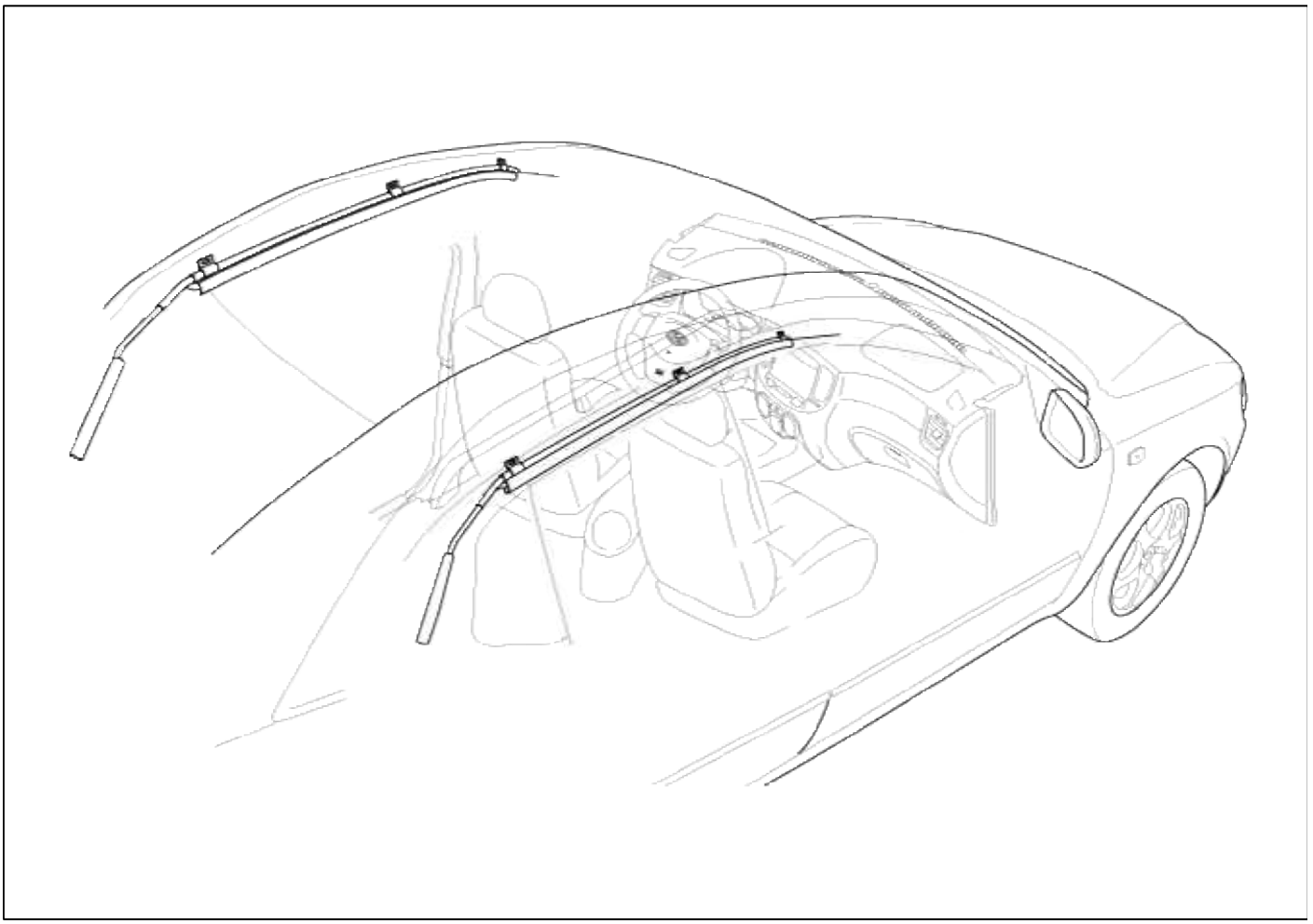
Curtain airbags are installed inside the headliner (LH and RH) and protect the driver and passanger from danger when side crash occurs. The SRSCM determines deployment of curtain airbag by using side impact sensor (SIS) signal.

CAUTION

Never attempt to measure the circuit resistance of the airbag module even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

Restraint > Airbag Module > Curtain Airbag (CAB) Module > Components and Components Location

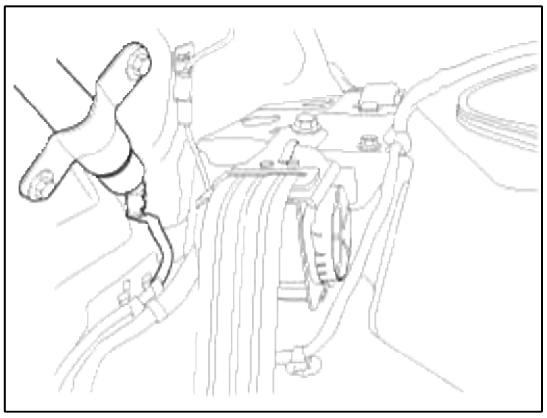
components



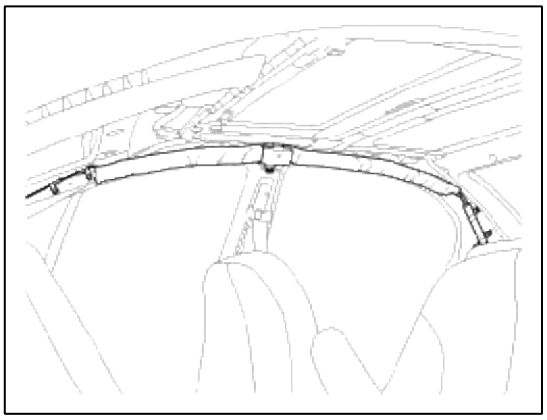
Restraint > Airbag Module > Curtain Airbag (CAB) Module > Repair procedures

removal

1. Disconnect the battery negative cable and wait for at of least 3 minutes before beginning work.
2. Remove the following parts. (Refer to BD group)
   A. Interior trim
   B. Headlining
3. Disconnect the Curtain Airbag harness connector.



4. After loosening the mounting bolts, remove the curtain airbag.



INSTALLATION

CAUTION

- Be sure to install the harness wires not to be pinched or interfered with other parts.

1. Disconnect the negative (-) cable from battery and wait for at least three minutes.
2. Remove the ignition key from the vehicle.
3. Install a Curtain Airbag (CAB) on the mounting bracket.

Tightening Torque (CAB Mounting Bolt)
: 0.5 ~ 0.7 kgf.m(4.9 ~ 6.9 Nm, 3.6 ~ 5.1 lb.ft)

CAUTION

- Never twist the airbag module when installing it. If the module is twisted, airbag module may operate abnormally.

4. Install the inflator on the bracket.
5. Connect the CAB connector.
6. Reconnect the battery negative cable.
7. After installing the Curtain Airbag (CAB), confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Restraint > Seat Belt Pretensioner > Seat Belt Pretensioner (BPT) > Description and Operation

DESCRIPTION

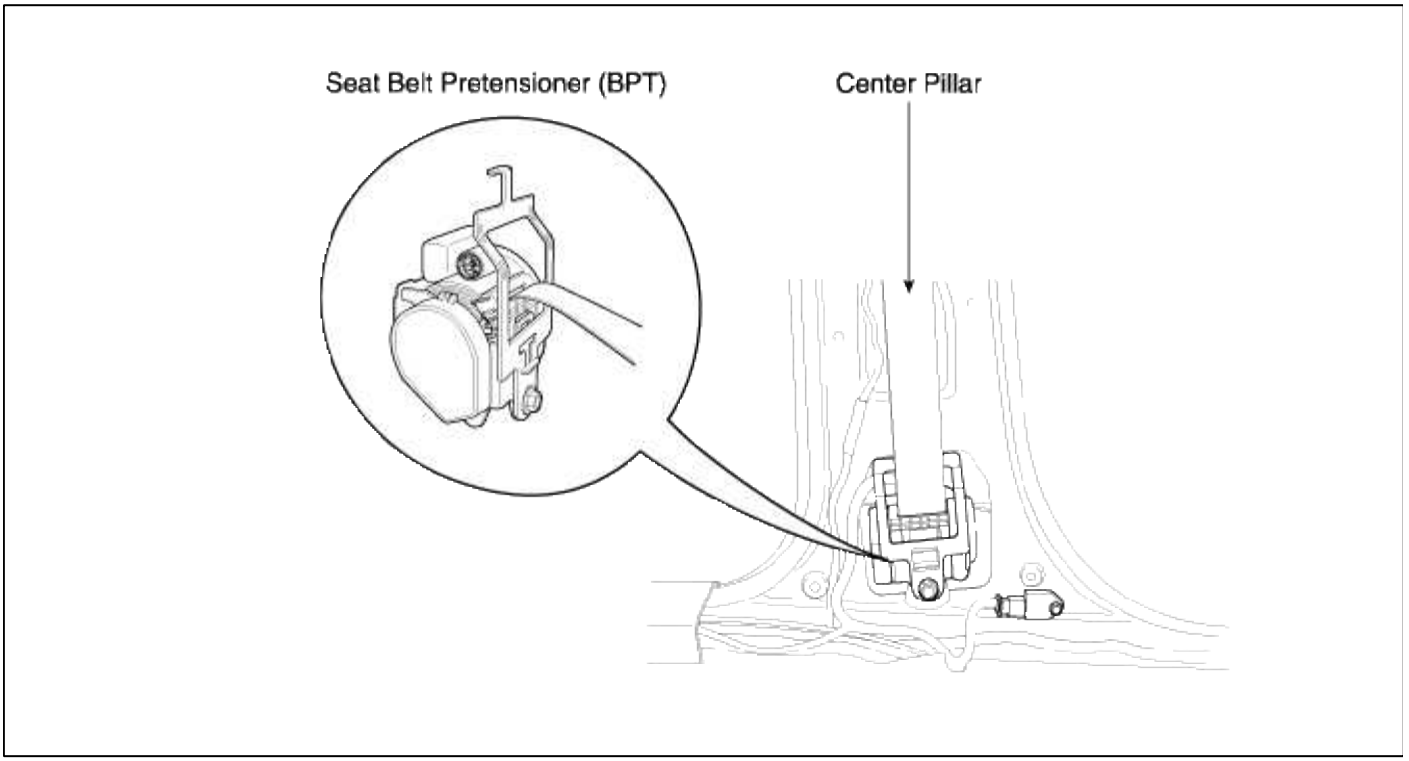
The Seat Belt Pretensioners (BPT) are installed inside the center pillar (LH & RH). When a vehicle crashes with a certain degree of frontal impact, the pretensioner seat belt helps to reduce the severity of injury to the front seat occupants by retracting the seat belt webbing. This prevents the front occupants from thrusting forward and hitting the steering wheel or the instrument panel when the vehicle crashes.

CAUTION

Never attempt to measure the circuit resistance of the Seat Belt Pretensioner (BPT) even if you are using the specified tester. If the circuit resistance is measured with a tester, the pretensioner will be ignited accidentally. This will result in serious personal injury.

Restraint > Seat Belt Pretensioner > Seat Belt Pretensioner (BPT) > Components and Components Location

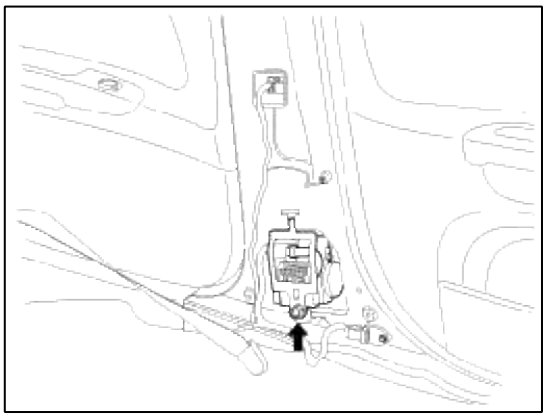
components



Restraint > Seat Belt Pretensioner > Seat Belt Pretensioner (BPT) > Repair procedures

REMOVAL

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the front seat assembly. (Refer to BD group)
3. Remove the center pillar trim. (Refer to BD group)
4. Remove the lower anchor bolt.
5. Remove the upper anchor bolt.
6. Loosen the Seat Belt Pretensioner mounting bolt and remove the Seat Belt Pretensioner.



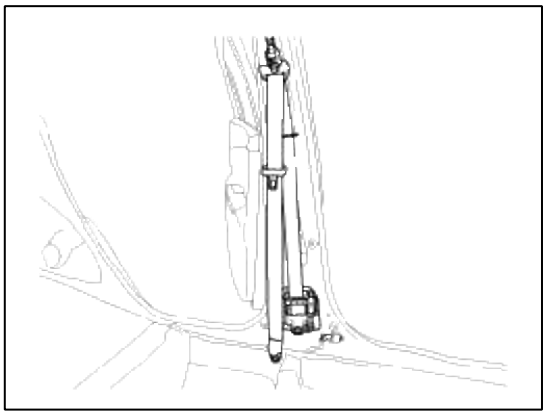
7. Disconnect the Seat Belt Pretensioner connector.

INSTALLATION

1. Disconnect the negative (-) cable from battery and wait for at least three minutes.
2. Remove the ignition key from the vehicle.
3. Install the Seat Belt Pretensioner (BPT) with bolt.

4. Install the upper and lower 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)



5. Install the center pillar trim.
6. Install the front seat assembly.
7. Reconnect the negative battery cable.
8. After installing the Seat Belt Pretensioner (BPT), confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Restraint > Troubleshooting > B1101

DTC Description

The SRSCM sets above DTC(s) if it detects that the battery voltage of restraints system is too high or too low. When the voltage returns to normal, the SRS warning light automatically goes off and a malfunction is no longer indicated.

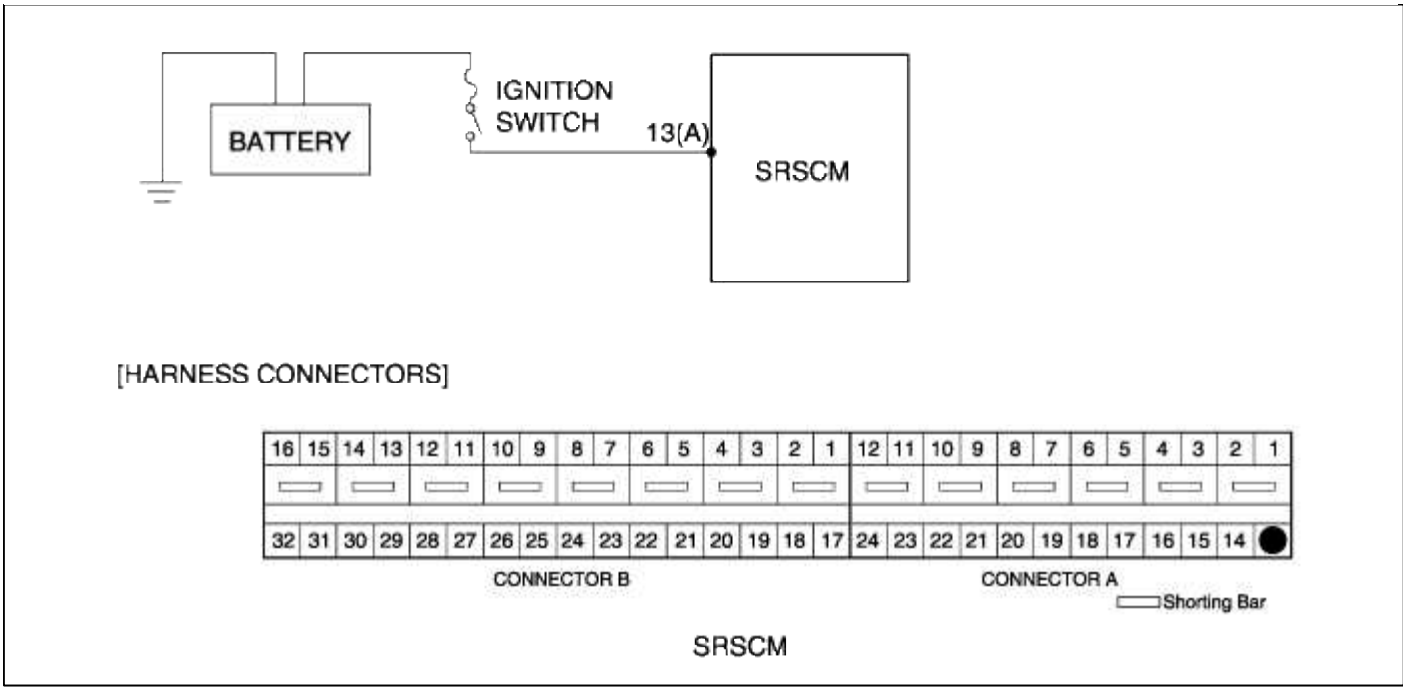
DTC Detecting Condition

DTC	Condition	Probable cause
B1101	Battery Voltage > 16.0 V for 4 seconds after IG ON	• Battery • Alternator • Wiring Harness • SRSCM
B1102	Battery Voltage < 9.0 V for 4 seconds after IG ON	

Specification

Voltage : 9.0 ~ 16.0 V

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

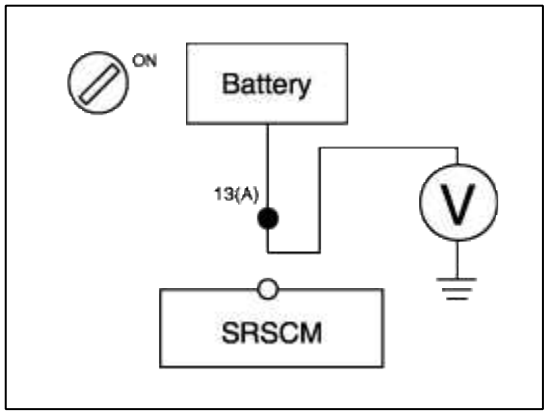
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SOURCE VOLTAGE

   (1) Turn the ignition switch to ON.

   (2) Measure voltage between the terminal 13(A) of SRSCM harness connector and chassis ground.

   Specification (voltage) : 9.0 ~ 16.0 V



   (3) Is the measured voltage within specification?

   NO

   Check the battery.

   YES

   Replace the SRSCM with a new one, and then check the vehicle again. At this time, if the vehicle normally operates with a new SRSCM, the fault may be the SRSCM(Replace SRSCM).

3. CHECK THE BATTERY
(1) Check the battery.
● Refer to "EE" group in this SERVICE MANUAL.
Is the battery normal?

YES
Check the generator.

NO
Repair or replace the battery.(Refer to "EE" group in this SERVICE MANUAL)

4. CHECK GENERATOR
(1) Check the generator.
● Refer to "EE" group in this SERVICE MANUAL.
Is the generator normal?

YES
Check wiring harness.

NO
Repair or replace the generator.(Refer to "EE" group in this SERVICE MANUAL)

5. CHECK WIRING HARNESS
(1) Check the wiring harness between the battery and SRSCM.
Is the wiring harness normal?

YES
Check the DTC again.

NO
Repair or replace the wiring harness.

6. CHECK THE DTC AGAIN
(1) Turn the ignition switch to LOCK and wait for at least 30 seconds.

CAUTION
Check again that the battery negative cable is disconnected from the battery.

(2) Install the DAB module and connect the DAB connector.
(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
(4) Connect the SRSCM connector.
(5) Connect the battery negative cable to the battery.
(6) Connect a Hi-Scan(Pro) to the data link connector.
(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC?

YES
Perform the troubleshooting procedures associated with those codes.

NO
Problem is intermittent or was repaired and SRSCM memory was not cleared.

Restraint > Troubleshooting > B1102

DTC Description

The SRSCM sets above DTC(s) if it detects that the battery voltage of restraints system is too high or too low. When the voltage returns to normal, the SRS warning light automatically goes off and a malfunction is no longer indicated.

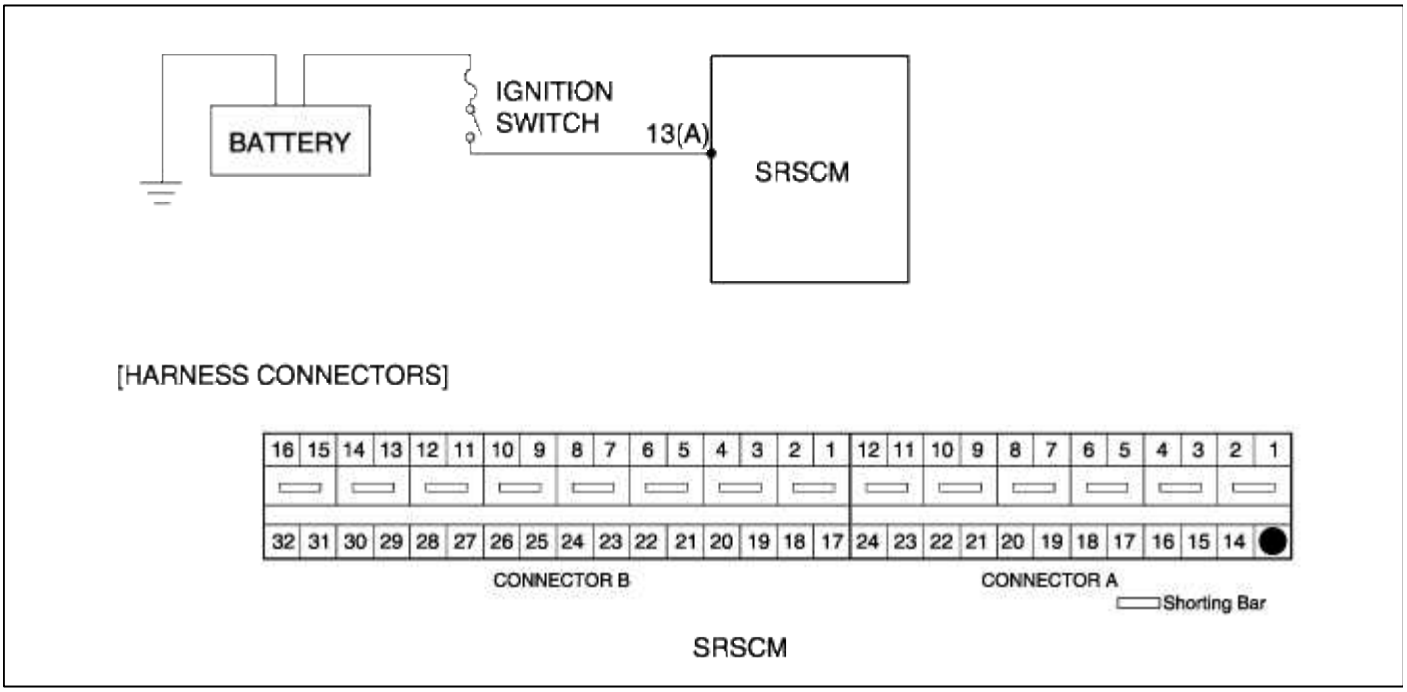
DTC Detecting Condition

DTC	Condition	Probable cause
B1101	Battery Voltage > 16.0 V for 4 seconds after IG ON	• Battery • Alternator • Wiring Harness • SRSCM
B1102	Battery Voltage < 9.0 V for 4 seconds after IG ON	

Specification

Voltage : 9.0 ~ 16.0 V

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

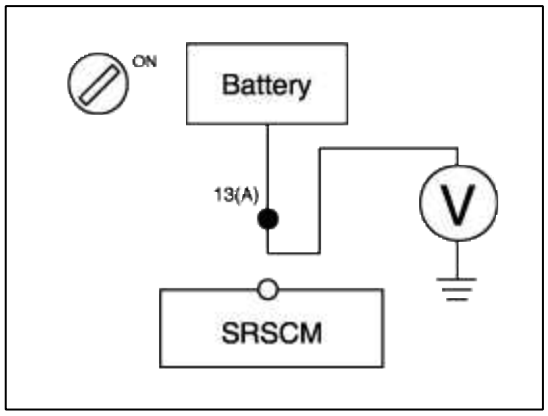
1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SOURCE VOLTAGE

(1) Turn the ignition switch to ON.

(2) Measure voltage between the terminal 13(A) of SRSCM harness connector and chassis ground.

Specification (voltage) : 9.0 ~ 16.0 V



(3) Is the measured voltage within specification?

NO

Check the battery.

YES

Replace the SRSCM with a new one, and then check the vehicle again. At this time, if the vehicle normally operates with a new SRSCM, the fault may be the SRSCM(Replace SRSCM).

3. CHECK THE BATTERY

(1) Check the battery.

● Refer to "EE" group in this SERVICE MANUAL.

Is the battery normal?

YES

Check the generator.

NO

Repair or replace the battery.(Refer to "EE" group in this SERVICE MANUAL)

4. CHECK GENERATOR

(1) Check the generator.

● Refer to "EE" group in this SERVICE MANUAL.

Is the generator normal?

YES

Check wiring harness.

NO

Repair or replace the generator.(Refer to "EE" group in this SERVICE MANUAL)

5. CHECK WIRING HARNESS

(1) Check the wiring harness between the battery and SRSCM.

Is the wiring harness normal?

YES

Check the DTC again.

NO

Repair or replace the wiring harness.

6. CHECK THE DTC AGAIN

(1) Turn the ignition switch to LOCK and wait for at least 30 seconds.

> CAUTION
>
> Check again that the battery negative cable is disconnected from the battery.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.

Does Hi-Scan (Pro) indicate any DTC?

YES

Perform the troubleshooting procedures associated with those codes.

NO

Problem is intermittent or was repaired and SRSCM memory was not cleared.

Restraint > Troubleshooting > B1328

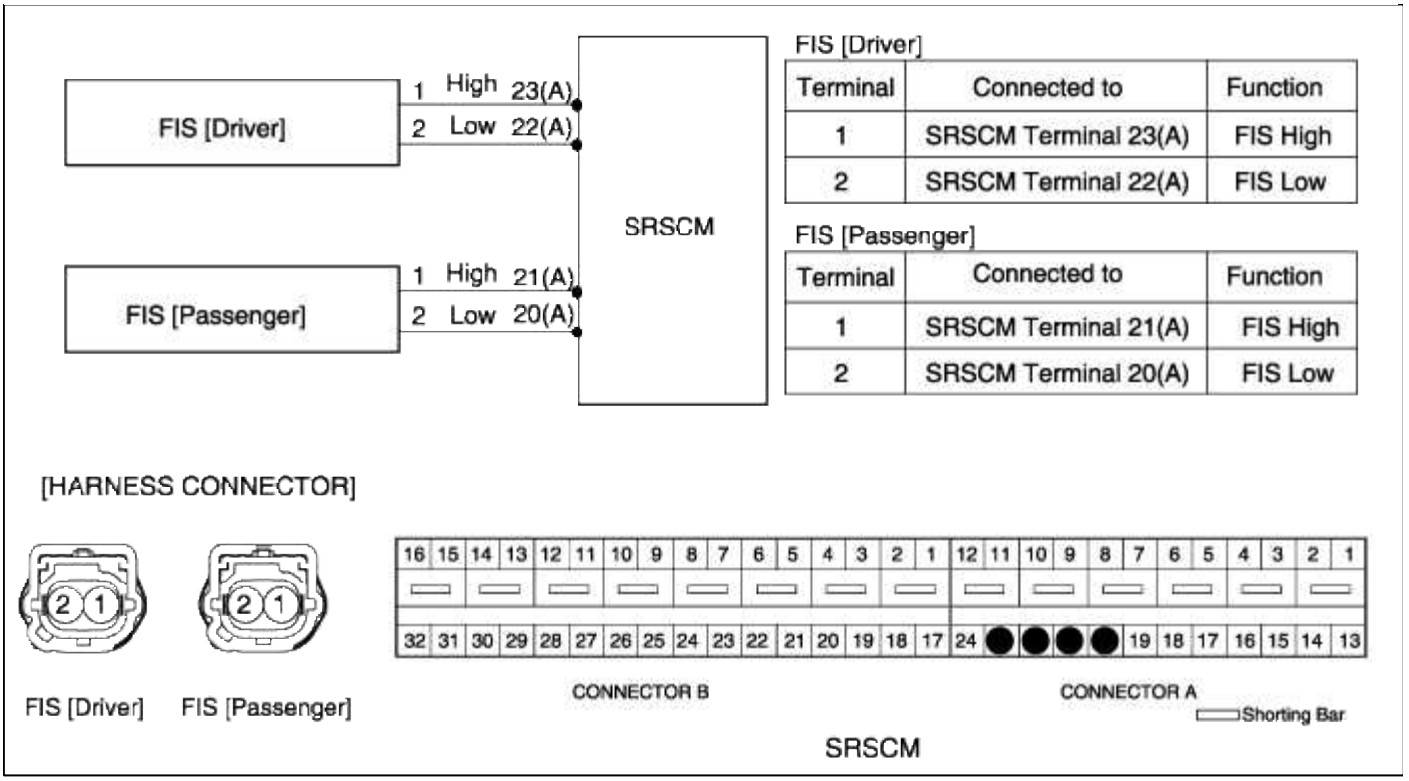
DTC Description

The detecting system for front crash consists of the SRSCM and two Front Impact Sensors (FIS). The SRSCM sets above DTC(s) if it detects that any FIS is defective or there is communication error between any FIS and the SRSCM.

DTC Detecting Condition

DTC	Condition	Probable cause
B1328 B1329 B1333 B1334	• Open between FIS and SRSCM • Front Impact Sensor(FIS) Malfunction • SRSCM Malfunction	• Wiring Harness • Front Impact Sensor(FIS) • SRSCM

Schematic Diagram



FIS [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 23(A)	FIS High
2	SRSCM Terminal 22(A)	FIS Low

FIS [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 21(A)	FIS High
2	SRSCM Terminal 20(A)	FIS Low

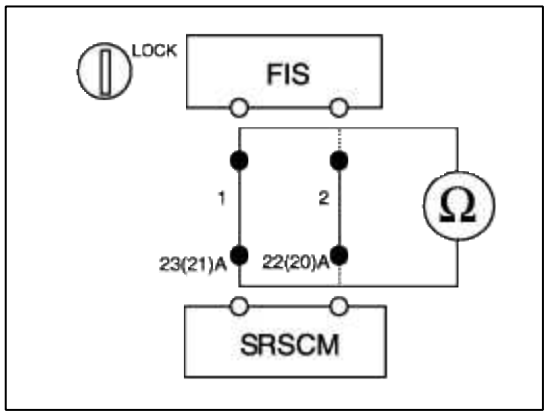
Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK FIS CIRCUIT
   (1) Measure resistance between the terminal 1 of FIS harness connector and the terminal A 23(21) of SRSCM harness connector.
   (2) Measure resistance between the terminal 2 of FIS harness connector and the terminal A 22(20) of SRSCM harness connector.

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check Front Impact Sensor.

NO

Repair or replace the wiring harness between the FIS and the SRSCM.

3. CHECK FRONT IMPACT SENSOR

(1) Replace the front impact sensor(FIS) with a new one.

● Refer to "Front Impact Sensor(FIS)" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to FIS?

YES

Go to next step.

NO

Replace the Front Impact Sensor(FIS).

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1329

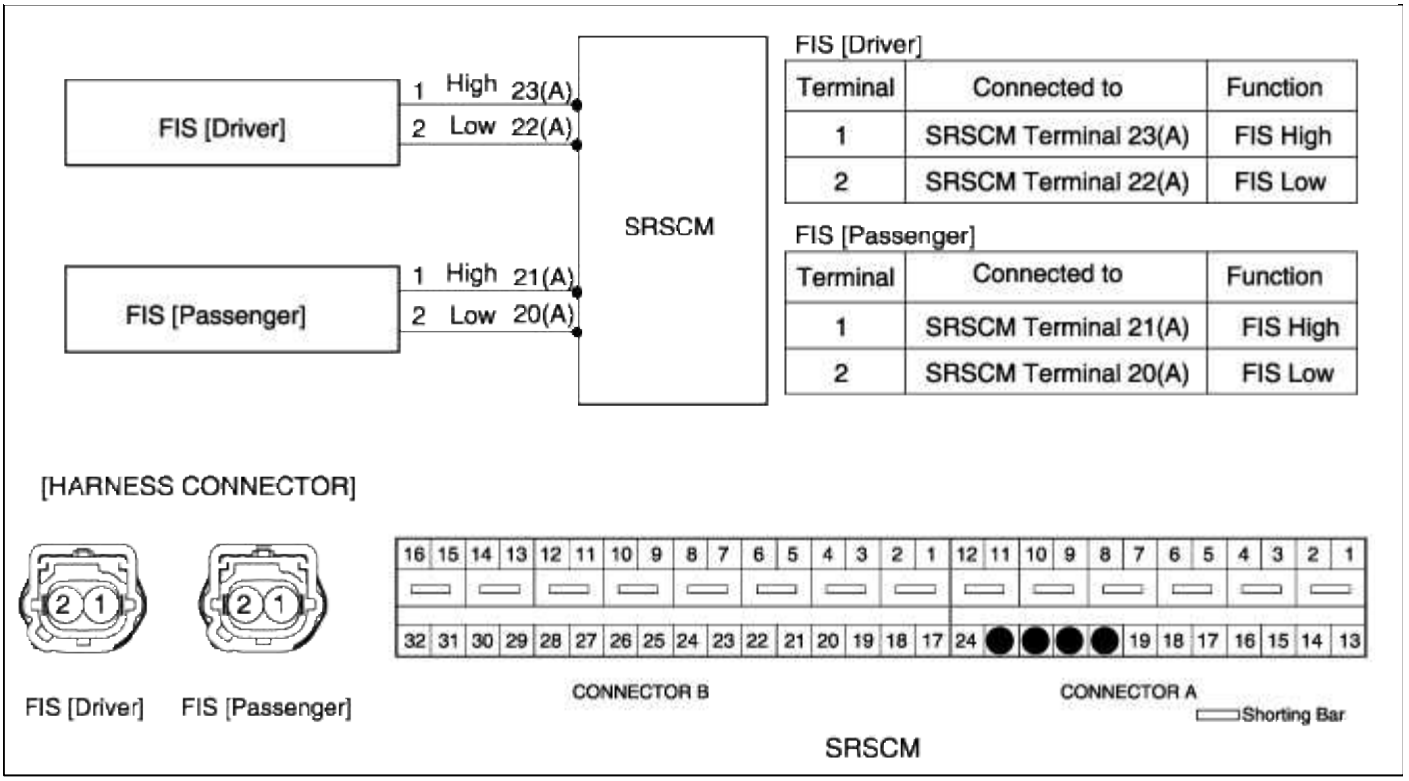
DTC Description

The detecting system for front crash consists of the SRSCM and two Front Impact Sensors (FIS). The SRSCM sets above DTC(s) if it detects that any FIS is defective or there is communication error between any FIS and the SRSCM.

DTC Detecting Condition

DTC	Condition	Probable cause
B1328 B1329 B1333 B1334	• Open between FIS and SRSCM • Front Impact Sensor(FIS) Malfunction • SRSCM Malfunction	• Wiring Harness • Front Impact Sensor(FIS) • SRSCM

Schematic Diagram



FIS [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 23(A)	FIS High
2	SRSCM Terminal 22(A)	FIS Low

FIS [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 21(A)	FIS High
2	SRSCM Terminal 20(A)	FIS Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

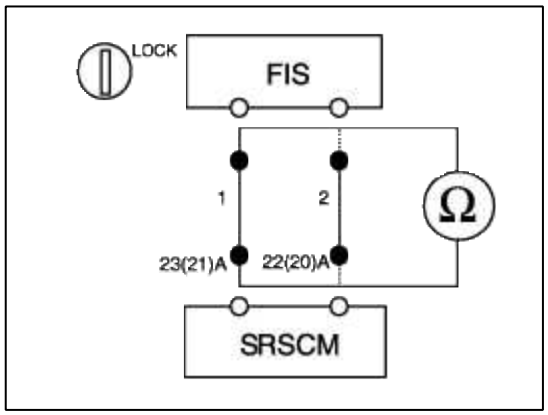
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK FIS CIRCUIT

   (1) Measure resistance between the terminal 1 of FIS harness connector and the terminal A 23(21) of SRSCM harness connector.

   (2) Measure resistance between the terminal 2 of FIS harness connector and the terminal A 22(20) of SRSCM harness connector.

   Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check Front Impact Sensor.

NO

Repair or replace the wiring harness between the FIS and the SRSCM.

3. CHECK FRONT IMPACT SENSOR

(1) Replace the front impact sensor(FIS) with a new one.

● Refer to "Front Impact Sensor(FIS)" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to FIS?

YES

Go to next step.

NO

Replace the Front Impact Sensor(FIS).

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1333

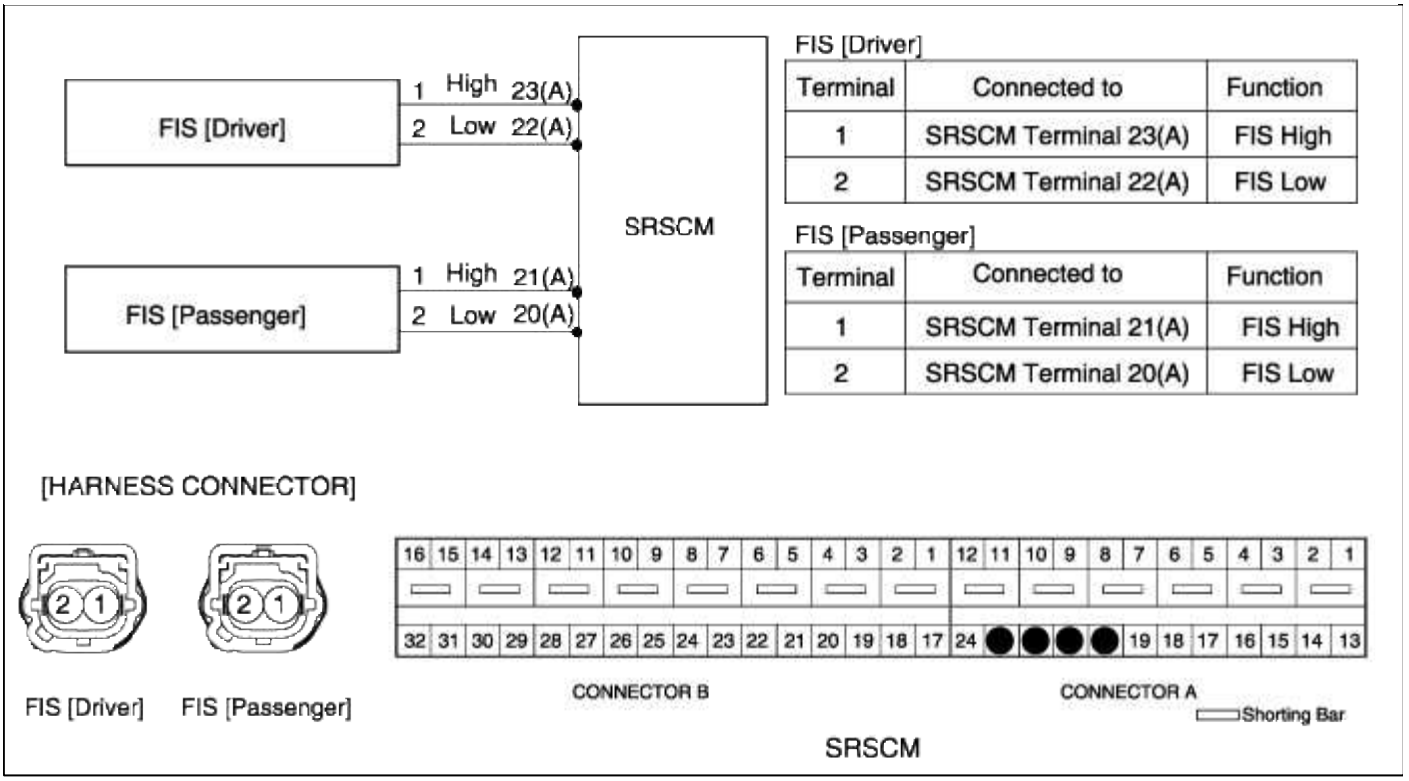
DTC Description

The detecting system for front crash consists of the SRSCM and two Front Impact Sensors (FIS). The SRSCM sets above DTC(s) if it detects that any FIS is defective or there is communication error between any FIS and the SRSCM.

DTC Detecting Condition

DTC	Condition	Probable cause
B1328 B1329 B1333 B1334	• Open between FIS and SRSCM • Front Impact Sensor(FIS) Malfunction • SRSCM Malfunction	• Wiring Harness • Front Impact Sensor(FIS) • SRSCM

Schematic Diagram



FIS [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 23(A)	FIS High
2	SRSCM Terminal 22(A)	FIS Low

FIS [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 21(A)	FIS High
2	SRSCM Terminal 20(A)	FIS Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

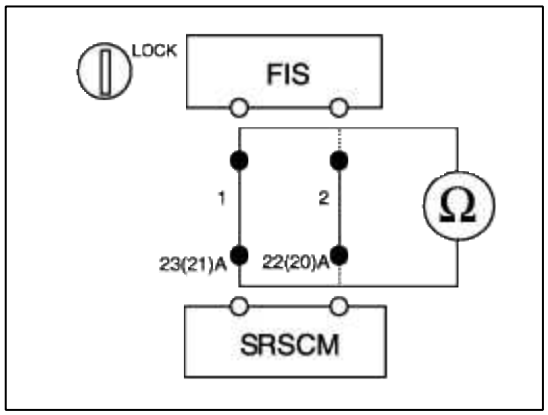
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK FIS CIRCUIT

   (1) Measure resistance between the terminal 1 of FIS harness connector and the terminal A 23(21) of SRSCM harness connector.

   (2) Measure resistance between the terminal 2 of FIS harness connector and the terminal A 22(20) of SRSCM harness connector.

   Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check Front Impact Sensor.

NO

Repair or replace the wiring harness between the FIS and the SRSCM.

3. CHECK FRONT IMPACT SENSOR

(1) Replace the front impact sensor(FIS) with a new one.

● Refer to "Front Impact Sensor(FIS)" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to FIS?

YES

Go to next step.

NO

Replace the Front Impact Sensor(FIS).

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1334

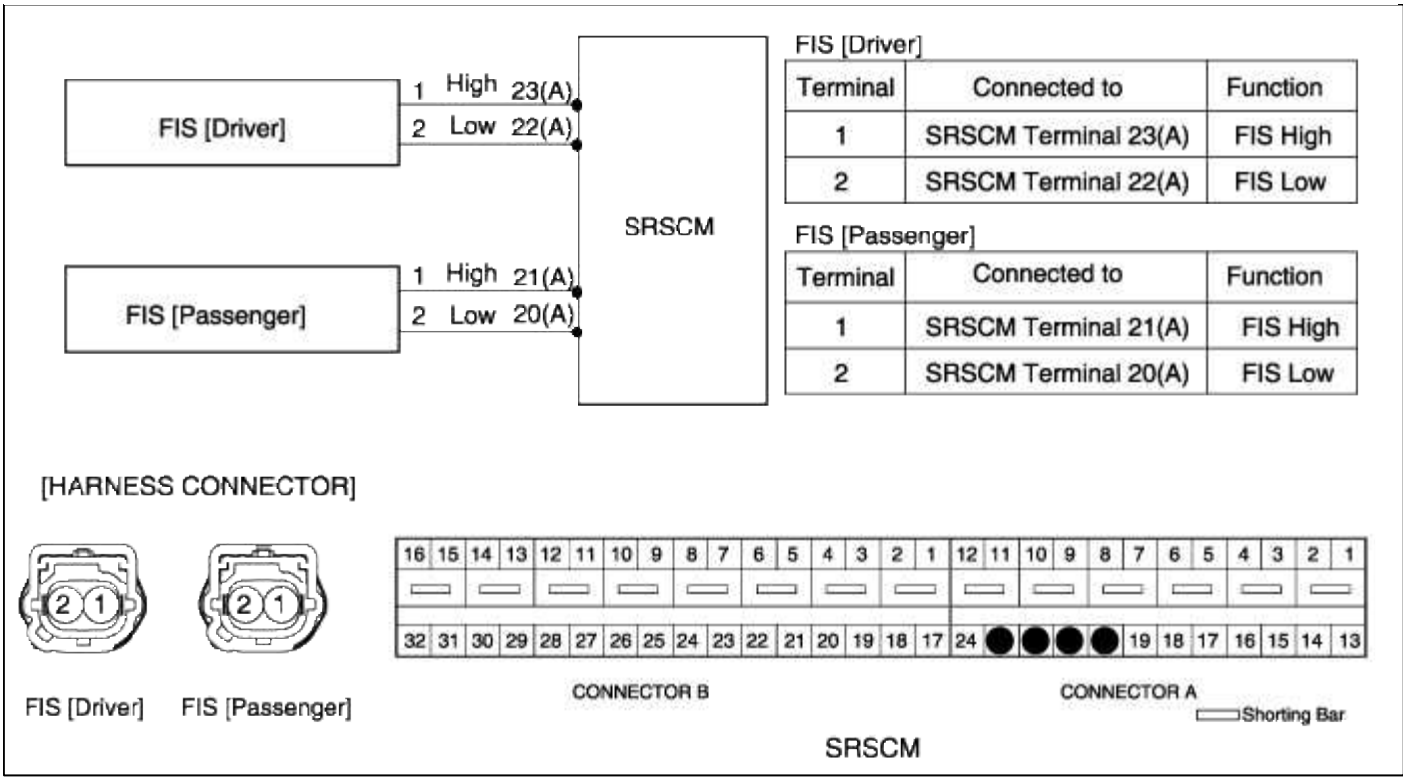
DTC Description

The detecting system for front crash consists of the SRSCM and two Front Impact Sensors (FIS). The SRSCM sets above DTC(s) if it detects that any FIS is defective or there is communication error between any FIS and the SRSCM.

DTC Detecting Condition

DTC	Condition	Probable cause
B1328 B1329 B1333 B1334	• Open between FIS and SRSCM • Front Impact Sensor(FIS) Malfunction • SRSCM Malfunction	• Wiring Harness • Front Impact Sensor(FIS) • SRSCM

Schematic Diagram



FIS [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 23(A)	FIS High
2	SRSCM Terminal 22(A)	FIS Low

FIS [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 21(A)	FIS High
2	SRSCM Terminal 20(A)	FIS Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

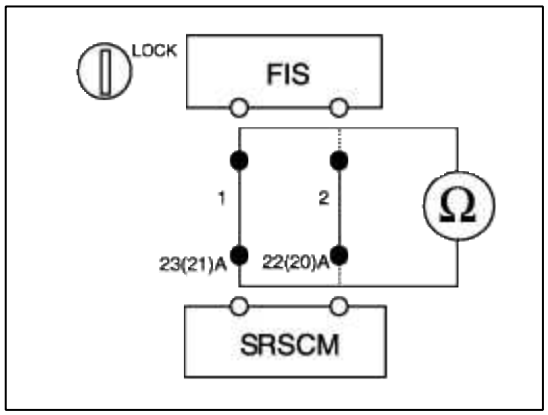
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK FIS CIRCUIT

   (1) Measure resistance between the terminal 1 of FIS harness connector and the terminal A 23(21) of SRSCM harness connector.

   (2) Measure resistance between the terminal 2 of FIS harness connector and the terminal A 22(20) of SRSCM harness connector.

   Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check Front Impact Sensor.

NO

Repair or replace the wiring harness between the FIS and the SRSCM.

3. CHECK FRONT IMPACT SENSOR

(1) Replace the front impact sensor(FIS) with a new one.

● Refer to "Front Impact Sensor(FIS)" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to FIS?

YES

Go to next step.

NO

Replace the Front Impact Sensor(FIS).

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1346

DTC Description

The Driver Airbag circuit consists of the SRSCM, Clockspring and the Driver Airbag (DAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects that the resistance of DAB squib is too high or low.

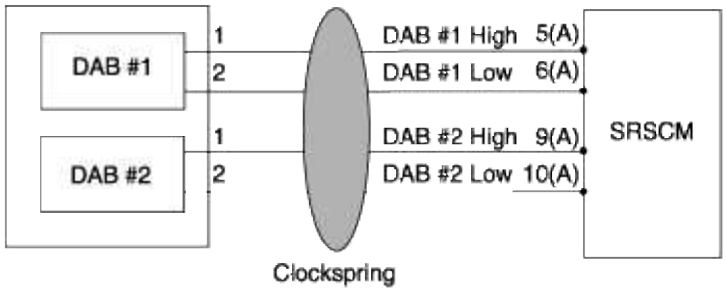
DTC Detecting Condition

DTC	Condition	Probable cause
B1346 B1347	• Too high or low resistance between DAB high(+) and DAB low (-) • Driver Airbag (DAB) Malfunction • Clockspring Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Driver Airbag (DAB) squib • Clockspring • SRSCM

Specification

DAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



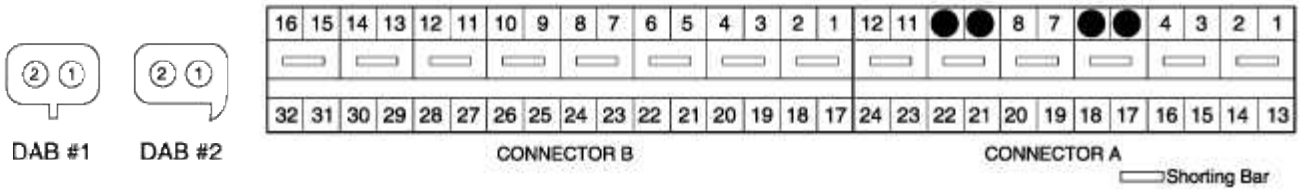
DAB #1

Terminal	Connected to	Function
1	SRSCM Terminal 5(A)	DAB #1 High
2	SRSCM Terminal 6(A)	DAB #1 Low

DAB #2

Terminal	Connected to	Function
1	SRSCM Terminal 9(A)	DAB #2 High
2	SRSCM Terminal 10(A)	DAB #2 Low

[HARNESS CONNECTOR]



SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK DAB RESISTANCE

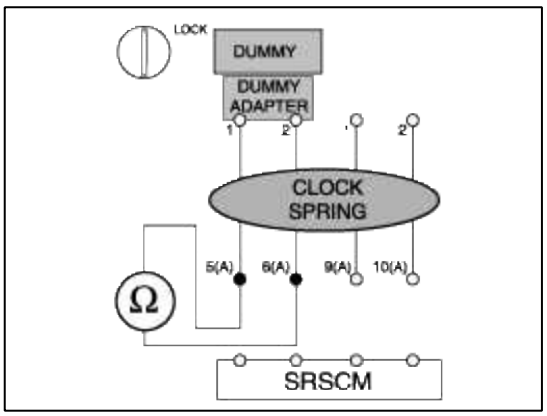
> **CAUTION**
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on DAB harness connector.

●Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 5 and 6 of SRSCM harness connector(A).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

NO

Check open circuit.

YES

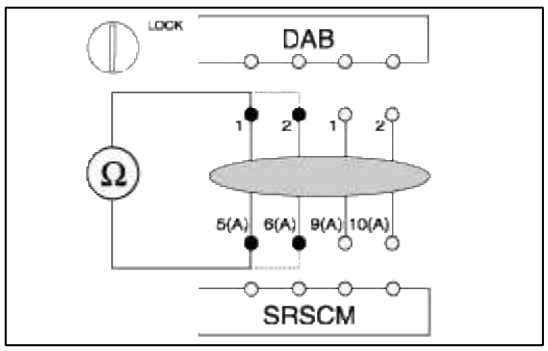
Replace the Driver Airbag(DAB) module.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of DAB harness connector and the terminal 5 of SRSCM harness connector(A).

(2) Measure resistance between the terminal 2 of DAB harness connector and the terminal 6 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

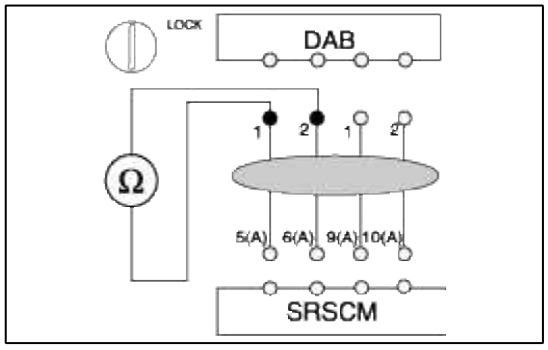
NO

Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of DAB harness connector.

Specification (resistance) : ∞ Ω



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1347

DTC Description

The Driver Airbag circuit consists of the SRSCM, Clockspring and the Driver Airbag (DAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects that the resistance of DAB squib is too high or low.

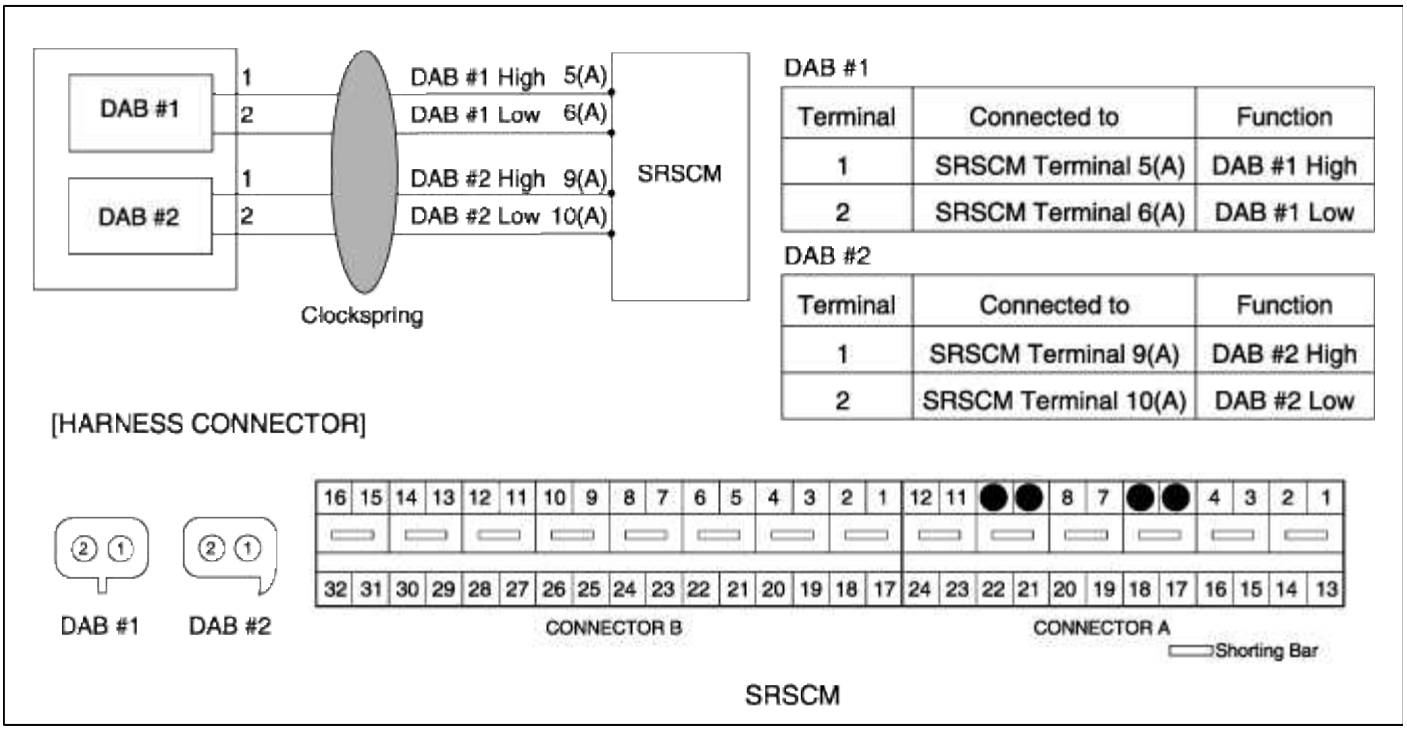
DTC Detecting Condition

DTC	Condition	Probable cause
B1346 B1347	• Too high or low resistance between DAB high(+) and DAB low (-) • Driver Airbag (DAB) Malfunction • Clockspring Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Driver Airbag (DAB) squib • Clockspring • SRSCM

Specification

DAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



DAB #1

Terminal	Connected to	Function
1	SRSCM Terminal 5(A)	DAB #1 High
2	SRSCM Terminal 6(A)	DAB #1 Low

DAB #2

Terminal	Connected to	Function
1	SRSCM Terminal 9(A)	DAB #2 High
2	SRSCM Terminal 10(A)	DAB #2 Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

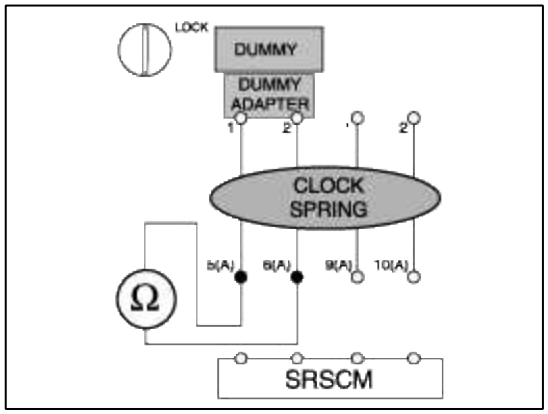
1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK DAB RESISTANCE

> **CAUTION**
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on DAB harness connector.
●Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 5 and 6 of SRSCM harness connector(A).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

NO
Check open circuit.

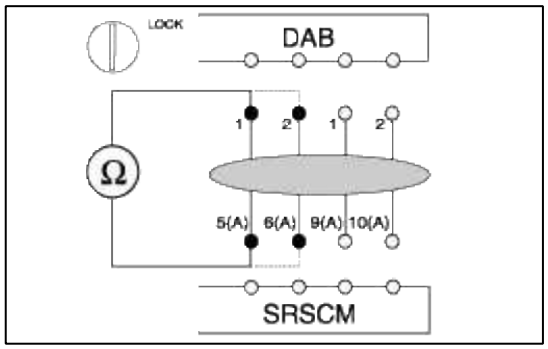
YES
Replace the Driver Airbag(DAB) module.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of DAB harness connector and the terminal 5 of SRSCM harness connector(A).

(2) Measure resistance between the terminal 2 of DAB harness connector and the terminal 6 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

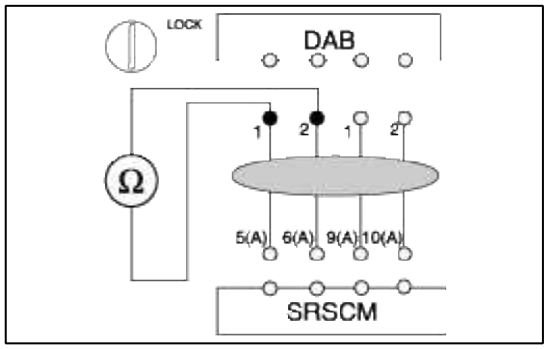
NO

Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of DAB harness connector.

Specification (resistance) : ∞ Ω



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1348

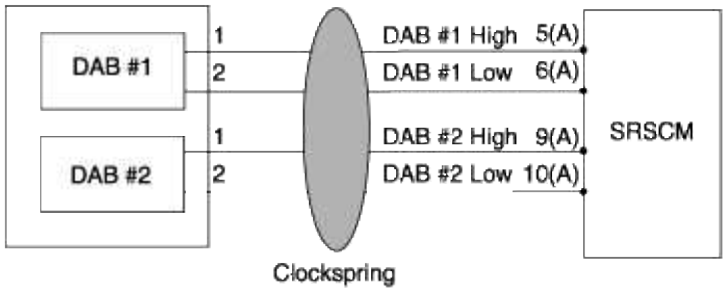
DTC Description

The Driver Airbag circuit consists of the SRSCM, Clockspring and the Driver Airbag (DAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects short to ground on the DAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1348 B1483	• Short to ground between DAB and clockspring • Short to ground between clockspring and SRSCM • Driver Airbag (DAB) Malfunction • Clockspring Malfunction • SRSCM Malfunction	• Short to ground circuit on wiring harness • Driver Airbag (DAB) squib • Clockspring • SRSCM

Schematic Diagram



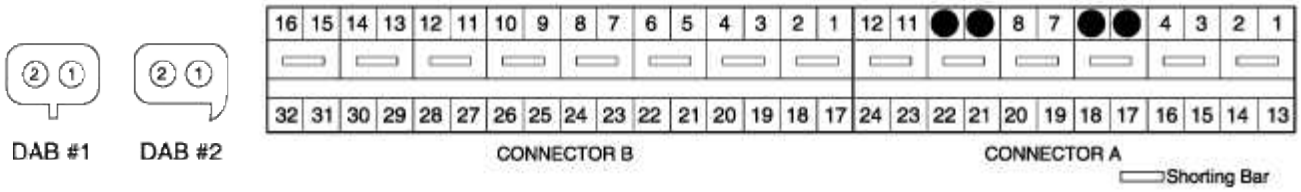
DAB #1

Terminal	Connected to	Function
1	SRSCM Terminal 5(A)	DAB #1 High
2	SRSCM Terminal 6(A)	DAB #1 Low

DAB #2

Terminal	Connected to	Function
1	SRSCM Terminal 9(A)	DAB #2 High
2	SRSCM Terminal 10(A)	DAB #2 Low

[HARNESS CONNECTOR]



SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

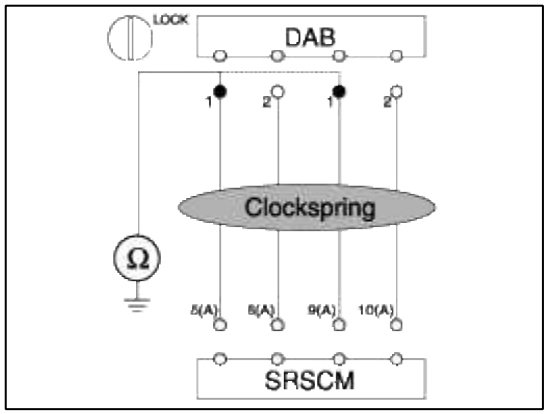
1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 1 of DAB harness connector and chassis ground.

   Specification (resistance) : infinite



   (2) Is the measured resistance within specification?

   YES

   Check the DAB Module.

   NO

   Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

3. CHECK THE DAB MODULE
   (1) Replace the Driver Airbag(DAB) with a new one.
   ● Refer to "Driver Airbag(DAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to DAB?
   YES
   Check the clockspring.
   NO
   Replace the Driver Airbag(DAB).
4. CHECK THE CLOCKSPRING
   (1) Check the clockspring.
   Is the clockspring normal?
   YES
   Go to next step.
   NO
   Replace the clockspring.
5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1349

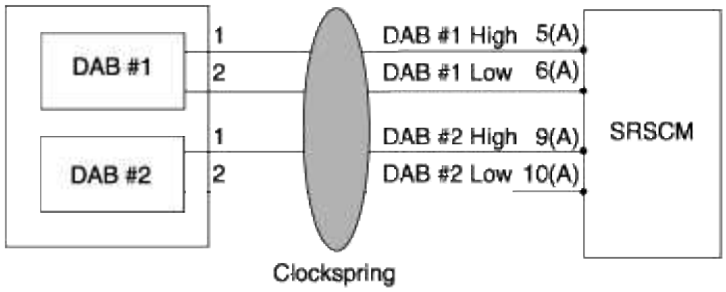
DTC Description

The Driver Airbag circuit consists of the SRSCM, Clockspring and the Driver Airbag (DAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects short to battery line on the DAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1349 B1484	• Short to battery line between DAB and clockspring • Short to battery line between clockspring and SRSCM • Driver Airbag (DAB) Malfunction • Clockspring Malfunction • SRSCM Malfunction	• Short to battery line on wiring harness • Driver Airbag (DAB) squib • Clockspring • SRSCM

Schematic Diagram



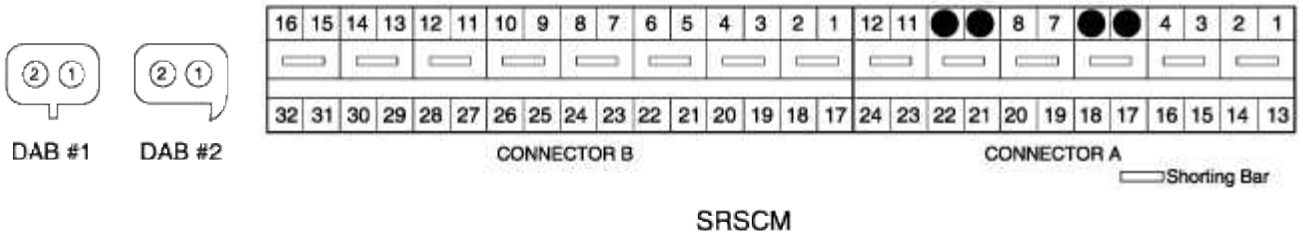
DAB #1

Terminal	Connected to	Function
1	SRSCM Terminal 5(A)	DAB #1 High
2	SRSCM Terminal 6(A)	DAB #1 Low

DAB #2

Terminal	Connected to	Function
1	SRSCM Terminal 9(A)	DAB #2 High
2	SRSCM Terminal 10(A)	DAB #2 Low

[HARNESS CONNECTOR]



SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

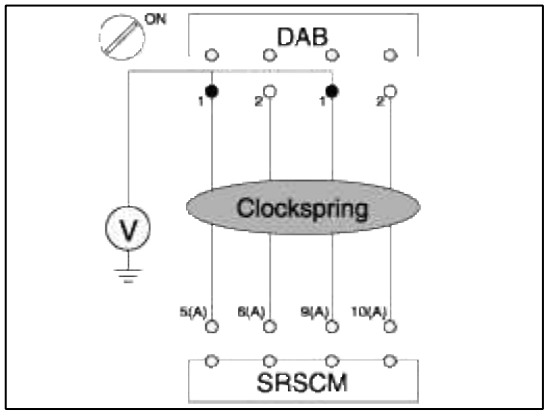
2. CHECK SHORT TO BATTERY LINE

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 1 of DAB harness connector and chassis ground.

   Specification (voltage) : Approximately 0 V



   (4) Is the measured voltage within specification?

   YES

   Check the DAB module.

   NO

   Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

3. CHECK THE DAB MODULE
(1) Replace the Driver Airbag(DAB) with a new one.
● "Refer to "Driver Airbag(DAB)" section in this SERVICE MANUAL.
(2) Install the DAB module and connect the DAB connector.
(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
(4) Connect the SRSCM connector.
(5) Connect the battery negative cable to the battery.
(6) Connect a Hi-Scan(Pro) to the data link connector.
(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to DAB?
YES
Check the clockspring.
NO
Replace the Driver Airbag(DAB).

4. CHECK THE CLOCKSPRING
(1) Check the clockspring.
Is the clockspring normal?
YES
Go to next step.
NO
Replace the clockspring.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1352

DTC Description

The Passenger Airbag circuit consists of the SRSCM and the Passenger Airbag (PAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects that the resistance of PAB squib is too high or low.

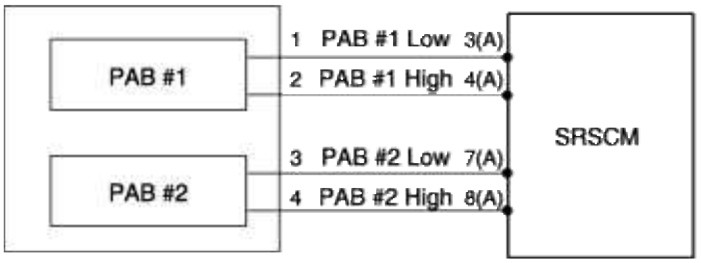
DTC Detecting Condition

DTC	Condition	Probable cause
B1352 B1353	• Too high or low resistance between PAB high(+) and PAB low (-) • Passenger Airbag (PAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Passenger Airbag (PAB) squib • SRSCM

Specification

PAB resistance : 1.6 ~ 4.7 Ω

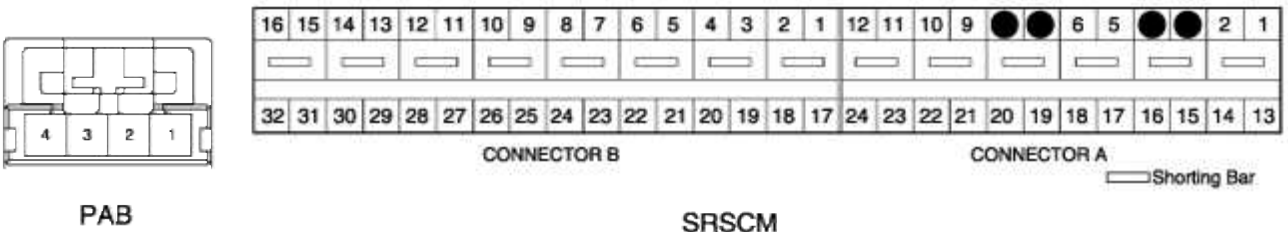
Schematic Diagram



PAB

Terminal	Connected to	Function
1	SRSCM Terminal 3(A)	PAB #1 Low
2	SRSCM Terminal 4(A)	PAB #1 High
3	SRSCM Terminal 7(A)	PAB #2 Low
4	SRSCM Terminal 8(A)	PAB #2 High

[HARNESS CONNECTOR]



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK PAB RESISTANCE

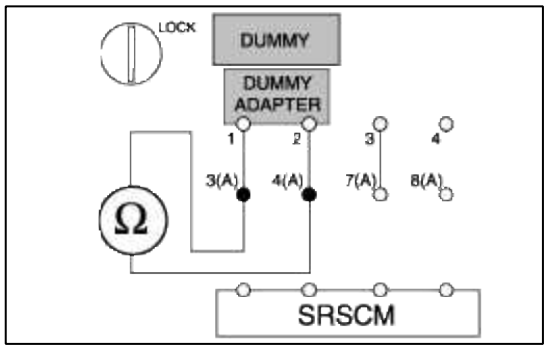
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on PAB harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 4 and 3 of SRSCM harness connector(A).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Passenger Airbag(PAB) module.

NO

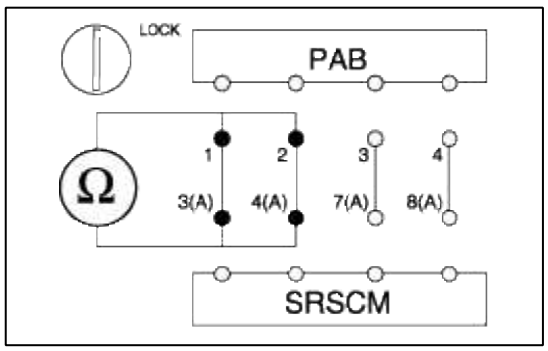
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of PAB harness connector and the terminal 4 of SRSCM harness connector(A).

(2) Measure resistance between the terminal 1 of PAB harness connector and the terminal 3 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

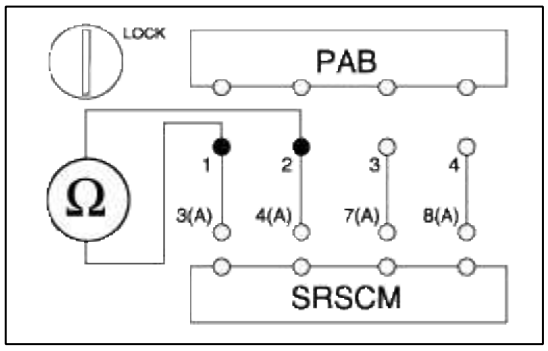
NO

Repair or replace the wiring harness between the PAB and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of PAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the PAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1353

DTC Description

The Passenger Airbag circuit consists of the SRSCM and the Passenger Airbag (PAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects that the resistance of PAB squib is too high or low.

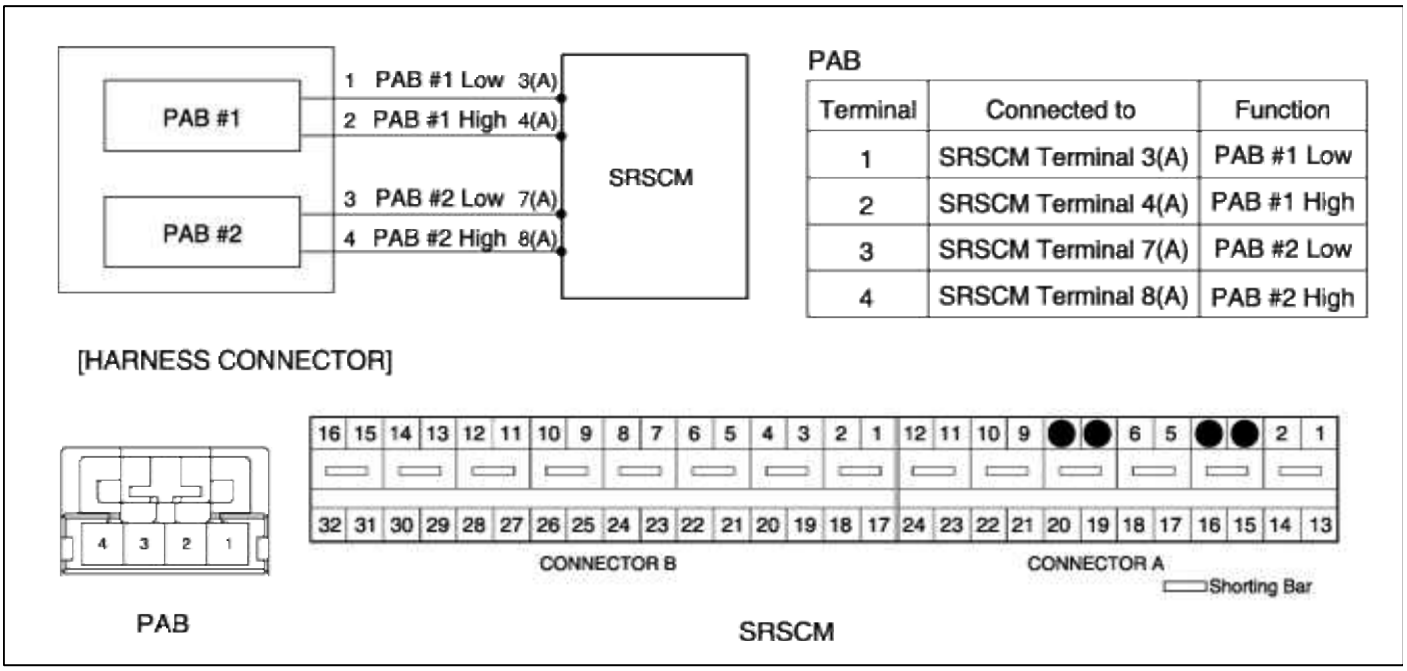
DTC Detecting Condition

DTC	Condition	Probable cause
B1352 B1353	• Too high or low resistance between PAB high(+) and PAB low (-) • Passenger Airbag (PAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Passenger Airbag (PAB) squib • SRSCM

Specification

PAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



PAB

Terminal	Connected to	Function
1	SRSCM Terminal 3(A)	PAB #1 Low
2	SRSCM Terminal 4(A)	PAB #1 High
3	SRSCM Terminal 7(A)	PAB #2 Low
4	SRSCM Terminal 8(A)	PAB #2 High

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK PAB RESISTANCE

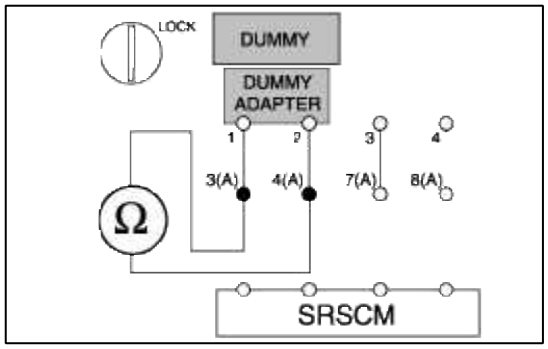
CAUTION

Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on PAB harness connector.
- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 4 and 3 of SRSCM harness connector(A).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Passenger Airbag(PAB) module.

NO

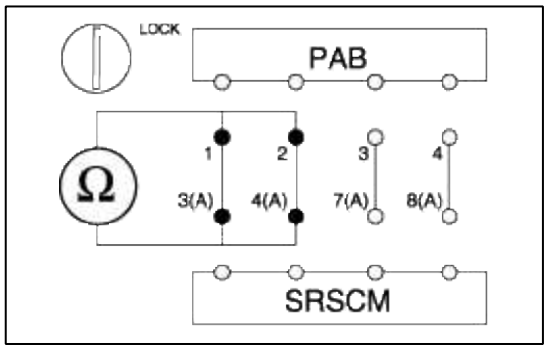
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of PAB harness connector and the terminal 4 of SRSCM harness connector(A).

(2) Measure resistance between the terminal 1 of PAB harness connector and the terminal 3 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

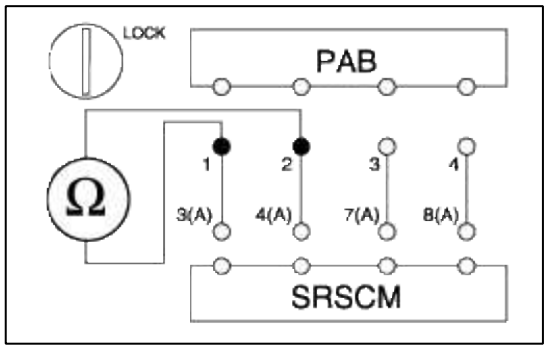
Check short circuit.

NO

Repair or replace the wiring harness between the PAB and the SRSCM.

4. CHECK SHORT CIRCUIT
(1) Measure resistance between the terminal 1 and 2 of PAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the PAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1354

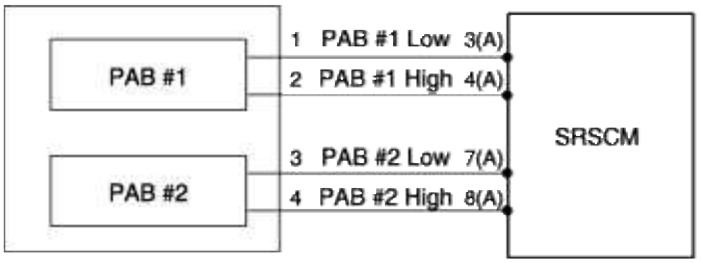
DTC Description

The Passenger Airbag circuit consists of the SRSCM and the Passenger Airbag (PAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects short to ground on the PAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1354 B1487	• Short to ground between PAB module and SRSCM • Passenger Airbag (PAB) Malfunction • SRSCM Malfunction	• Short to ground on wiring harness • Passenger Airbag (PAB) squib • SRSCM

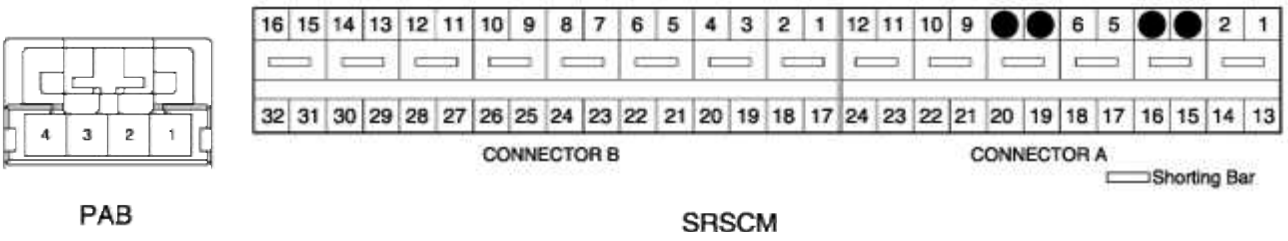
Schematic Diagram



PAB

Terminal	Connected to	Function
1	SRSCM Terminal 3(A)	PAB #1 Low
2	SRSCM Terminal 4(A)	PAB #1 High
3	SRSCM Terminal 7(A)	PAB #2 Low
4	SRSCM Terminal 8(A)	PAB #2 High

[HARNESS CONNECTOR]



PAB SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

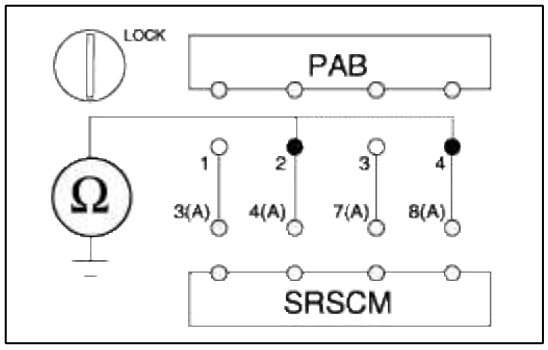
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 2 of PAB harness connector and chassis ground. (PAB stage 1)

   (2) Measure resistance between the terminal 4 of PAB harness connector and chassis ground. (PAB stage 2)

   Specification (resistance) : infinite



   (3) Is the measured resistance within specification?

   YES

   Check the PAB Module.

   NO

   Repair or replace the wiring harness between the PAB and the SRSCM.

3. CHECK THE PAB MODULE
   (1) Replace the Passenger Airbag (PAB) with a new one.
   ● Refer to "Passenger Airbag (PAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to PAB?
   YES
   Go to next step.
   NO
   Replace PAB module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1355

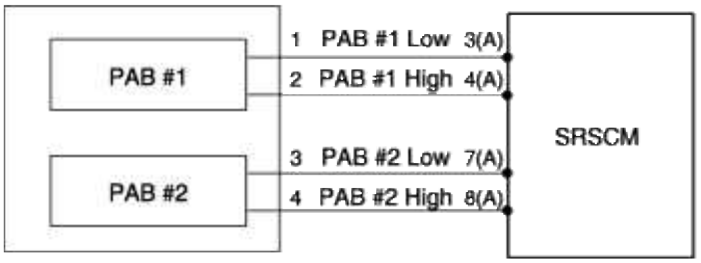
DTC Description

The Passenger Airbag circuit consists of the SRSCM and the Passenger Airbag (PAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects short to battery line on the PAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1355 B1488	• Short to battery line between PAB and SRSCM • Passenger Airbag (PAB) Malfunction • SRSCM Malfunction	• Short to battery line circuit on wiring harness • Passenger Airbag (PAB) squib • SRSCM

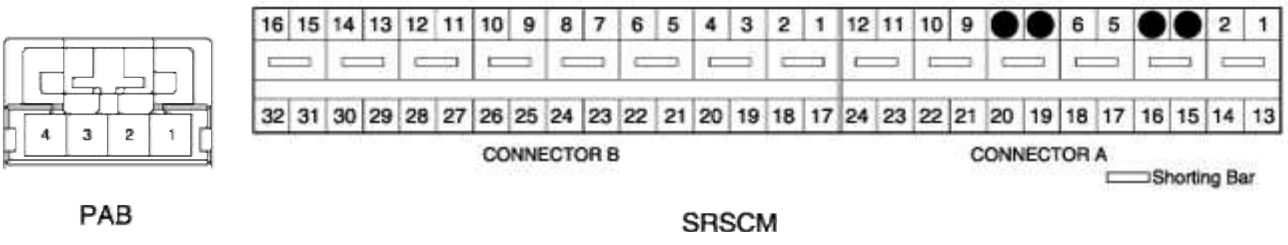
Schematic Diagram



PAB

Terminal	Connected to	Function
1	SRSCM Terminal 3(A)	PAB #1 Low
2	SRSCM Terminal 4(A)	PAB #1 High
3	SRSCM Terminal 7(A)	PAB #2 Low
4	SRSCM Terminal 8(A)	PAB #2 High

[HARNESS CONNECTOR]



PAB SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO BATTERY LINE

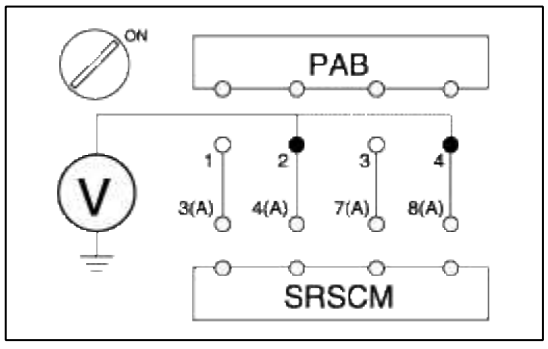
   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 2 of PAB harness connector and chassis ground. (PAB stage 1)

   (4) Measure voltage between the terminal 4 of PAB harness connector and chassis ground. (PAB stage 2)

   Specification (voltage) : Approximately 0 V



   (5) Is the measured voltage within specification?

   YES

   Check the PAB Module.

   NO

   Repair the short to battery line circuit on wiring harness between the PAB and the SRSCM.

3. CHECK THE PAB MODULE
   (1) Replace the Passenger Airbag(PAB) with a new one.
   ● Refer to "Passenger Airbag(PAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to PAB?
   YES
   Go to next step.
   NO
   Replace PAB module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1361

DTC Description

The Seat Belt Pretensioner circuit consists of the SRSCM and two Seat Belt Pretensioners (BPT).
The SRSCM sets above DTC(s) if it detects that the resistance of BPT squib is too high or low.

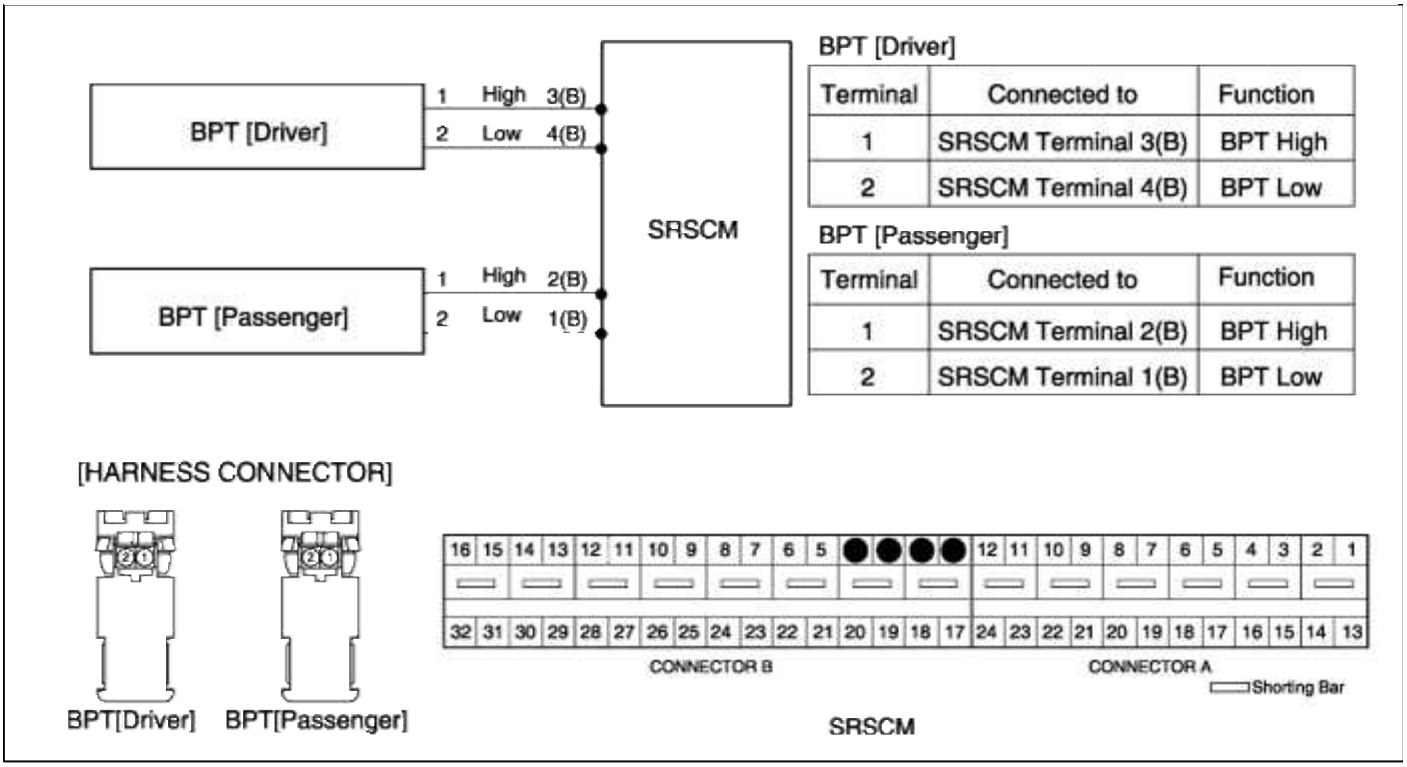
DTC Detecting Condition

DTC	Condition	Probable cause
B1361 B1362 B1367 B1368	• Too high or low resistance between BPT high(+) and BPT low (-) • Seat Belt Pretensioner (BPT) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Seat Belt Pretensioner (BPT) squib • SRSCM

Specification

BPT resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



BPT [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 3(B)	BPT High
2	SRSCM Terminal 4(B)	BPT Low

BPT [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 2(B)	BPT High
2	SRSCM Terminal 1(B)	BPT Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK BPT RESISTANCE

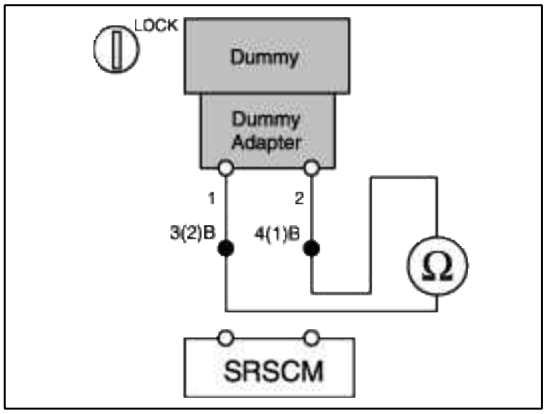
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on BPT harness connector.

● Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 3(2) and 4(1) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Seat Belt Pretensioner(BPT) module.

NO

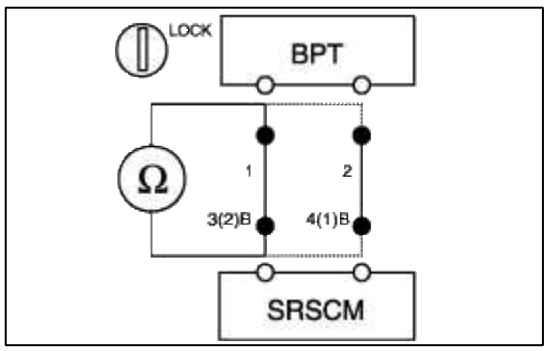
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of BPT harness connector and the terminal 3(2) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 2 of BPT harness connector and the terminal 4(1) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

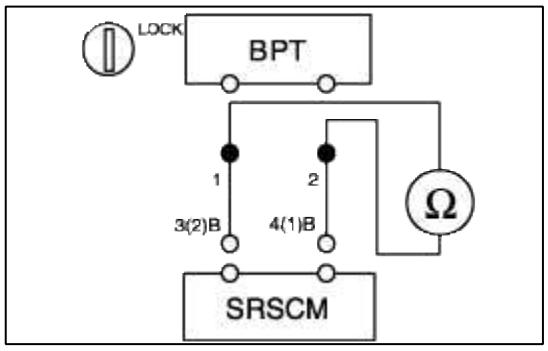
NO

Repair or replace the wiring harness between the BPT and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of BPT harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the BPT and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1362

DTC Description

The Seat Belt Pretensioner circuit consists of the SRSCM and two Seat Belt Pretensioners (BPT).
The SRSCM sets above DTC(s) if it detects that the resistance of BPT squib is too high or low.

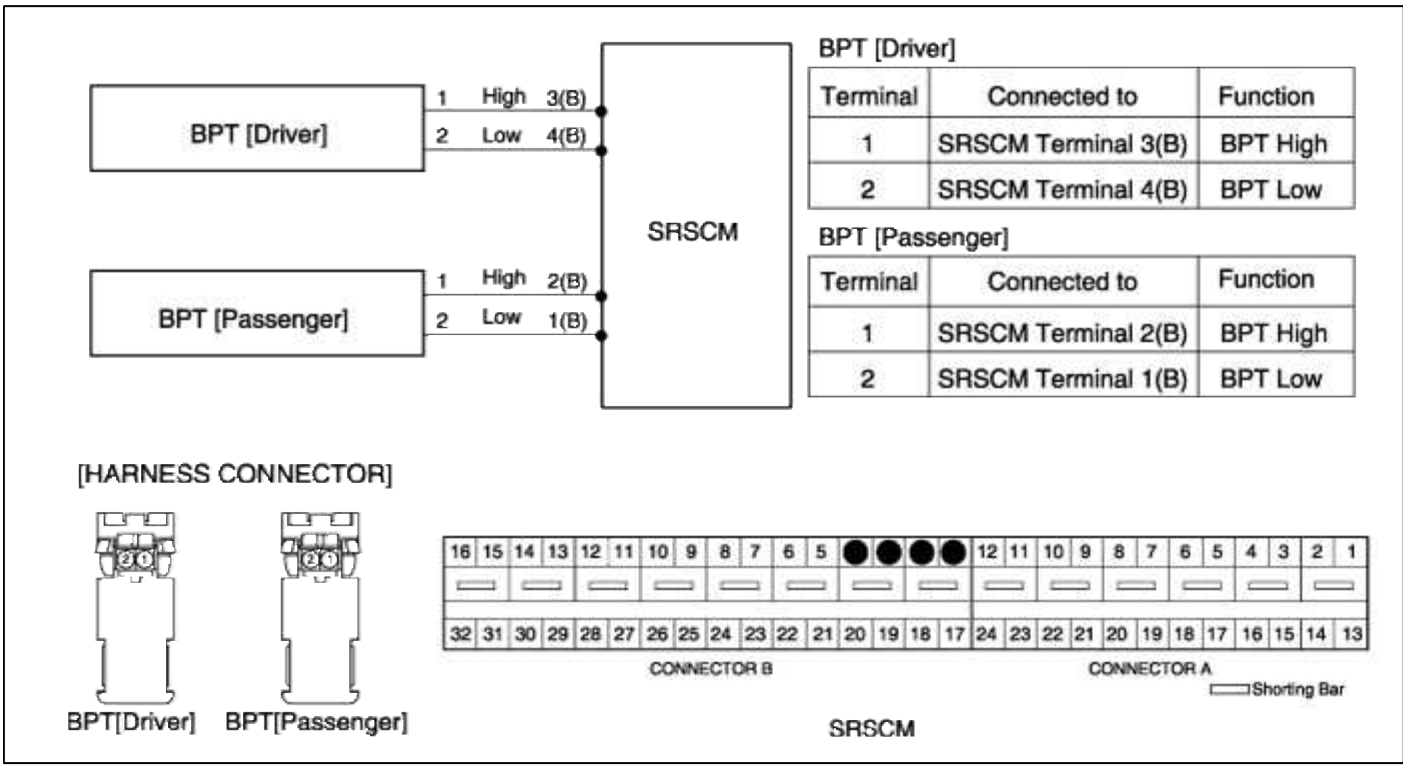
DTC Detecting Condition

DTC	Condition	Probable cause
B1361 B1362 B1367 B1368	• Too high or low resistance between BPT high(+) and BPT low (-) • Seat Belt Pretensioner (BPT) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Seat Belt Pretensioner (BPT) squib • SRSCM

Specification

BPT resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



BPT [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 3(B)	BPT High
2	SRSCM Terminal 4(B)	BPT Low

BPT [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 2(B)	BPT High
2	SRSCM Terminal 1(B)	BPT Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK BPT RESISTANCE

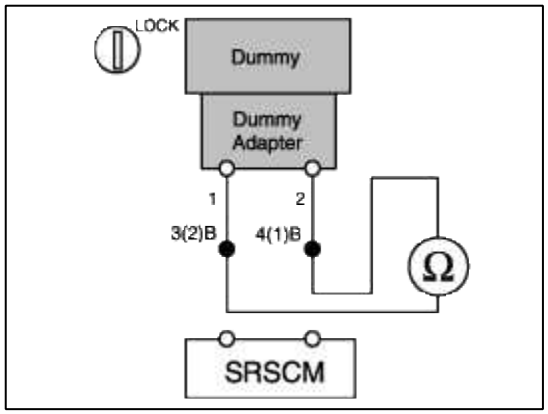
CAUTION

Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on BPT harness connector.
● Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 3(2) and 4(1) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Seat Belt Pretensioner(BPT) module.

NO

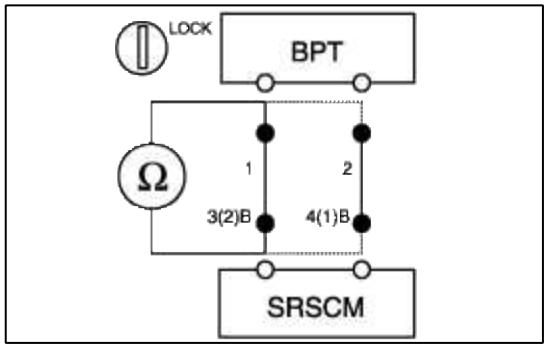
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of BPT harness connector and the terminal 3(2) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 2 of BPT harness connector and the terminal 4(1) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

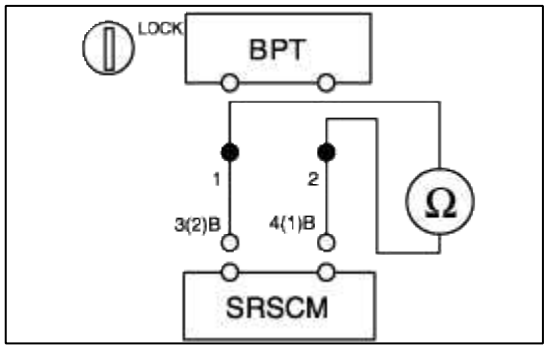
NO

Repair or replace the wiring harness between the BPT and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of BPT harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the BPT and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1363

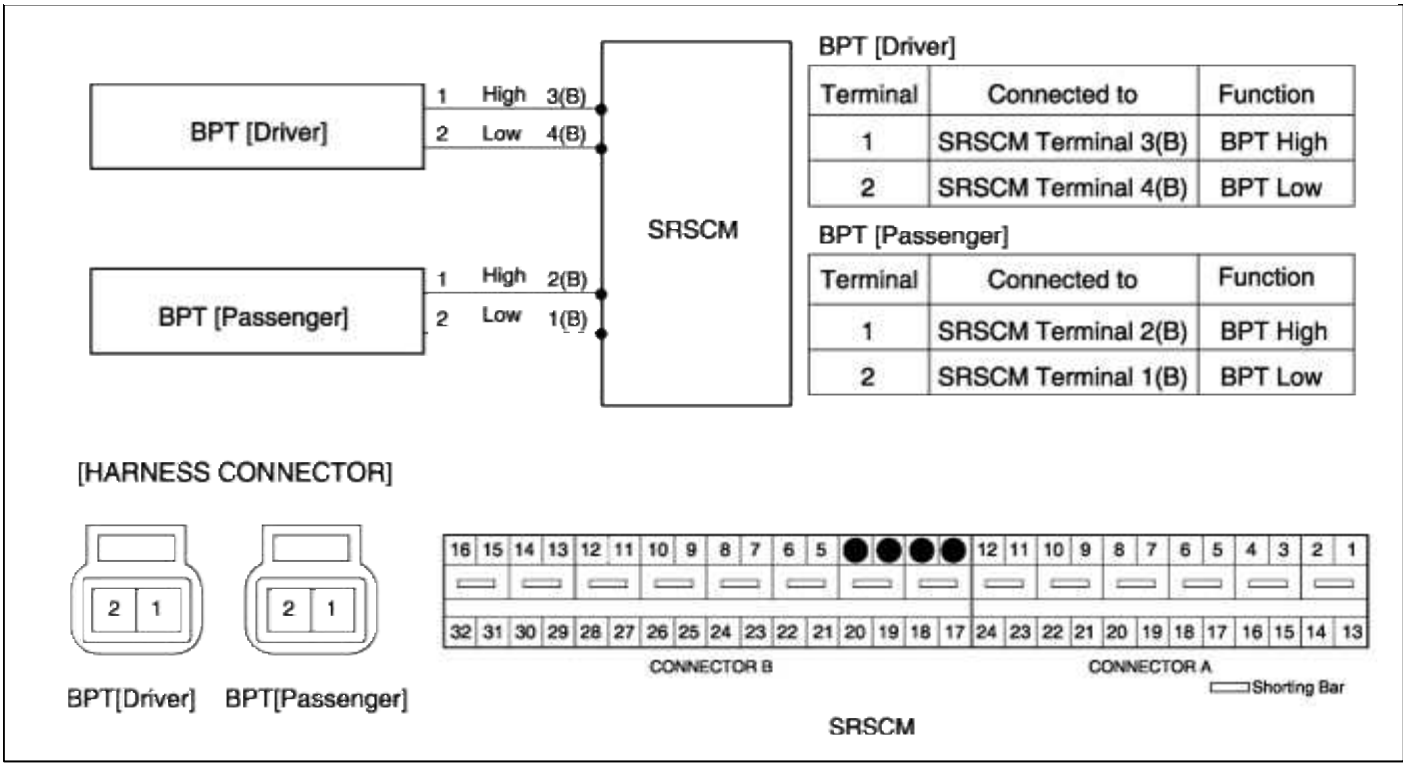
DTC Description

The Seat Belt Pretensioner consists of the SRSCM and two Seat Belt Pretensioners (BPT). The SRSCM sets above DTC(s) if it detects short to ground on the BPT circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1363 B1369	• Short to ground between BPT and SRSCM • Seat Belt Pretensioner (BPT) Malfunction • SRSCM Malfunction	• Short to ground circuit on wiring harness • Seat Belt Pretensioner (BPT) squib • SRSCM

Schematic Diagram



BPT [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 3(B)	BPT High
2	SRSCM Terminal 4(B)	BPT Low

BPT [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 2(B)	BPT High
2	SRSCM Terminal 1(B)	BPT Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

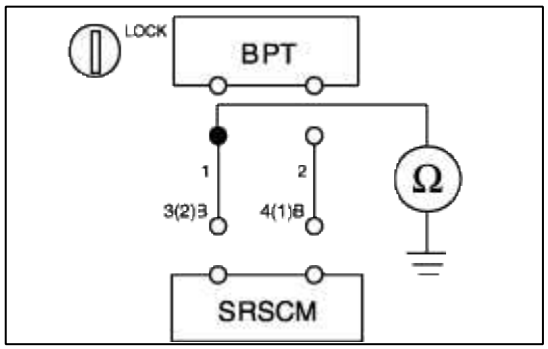
1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 1 of BPT harness connector and chassis ground.

   Specification (resistance) : infinite



   (2) Is the measured resistance within specification?

   YES

   Check the BPT Module.

   NO

   Repair or replace the wiring harness between the BPT and the SRSCM.

3. CHECK THE BPT MODULE
   (1) Replace the Belt Pretensioner (BPT) with a new one.
   ● Refer to "Belt Pretensioner (BPT)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Belt Pretensioner (BPT)?
   YES
   Go to next step.
   NO
   Replace BPT module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1364

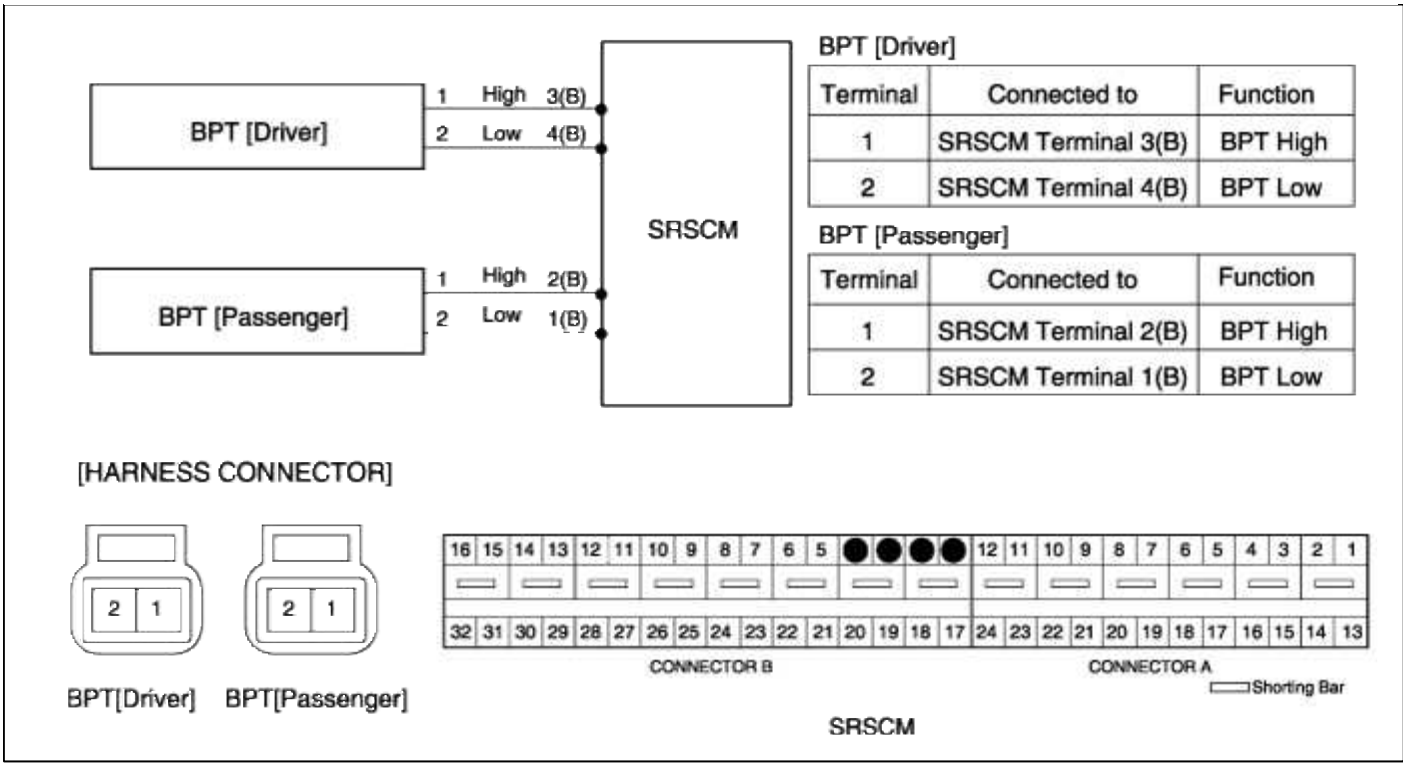
DTC Description

The Seat Belt Pretensioner consists of the SRSCM and two Seat Belt Pretensioners (BPT). The SRSCM sets above DTC(s) if it detects short to battery line on the BPT circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1364 B1370	• Short to battery line between BPT and SRSCM • Seat Belt Pretensioner (BPT) Malfunction • SRSCM Malfunction	• Short to battery line circuit on wiring harness • Seat Belt Pretensioner (BPT) squib • SRSCM

Schematic Diagram



BPT [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 3(B)	BPT High
2	SRSCM Terminal 4(B)	BPT Low

BPT [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 2(B)	BPT High
2	SRSCM Terminal 1(B)	BPT Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

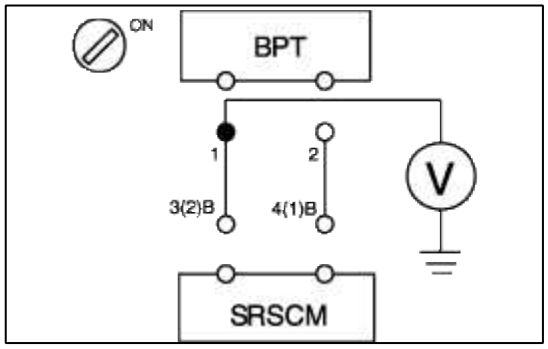
2. CHECK SHORT TO BATTERY LINE

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 1 of BPT harness connector and chassis ground.

   Specification (voltage) : Approximately 0 V



   (4) Is the measured voltage within specification?

   YES

   Check the BPT Module.

   NO

   Repair the short to battery line circuit on wiring harness between the BPT and the SRSCM.

3. CHECK THE BPT MODULE
(1) Replace the Belt Pretensioner (BPT) with a new one.
● Refer to "Belt Pretensioner (BPT)" section in this SERVICE MANUAL.
(2) Install the DAB module and connect the DAB connector.
(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
(4) Connect the SRSCM connector.
(5) Connect the battery negative cable to the battery.
(6) Connect a Hi-Scan(Pro) to the data link connector.
(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to Belt Pretensioner (BPT)?
YES
Go to next step.
NO
Replace BPT module.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1367

DTC Description

The Seat Belt Pretensioner circuit consists of the SRSCM and two Seat Belt Pretensioners (BPT).
The SRSCM sets above DTC(s) if it detects that the resistance of BPT squib is too high or low.

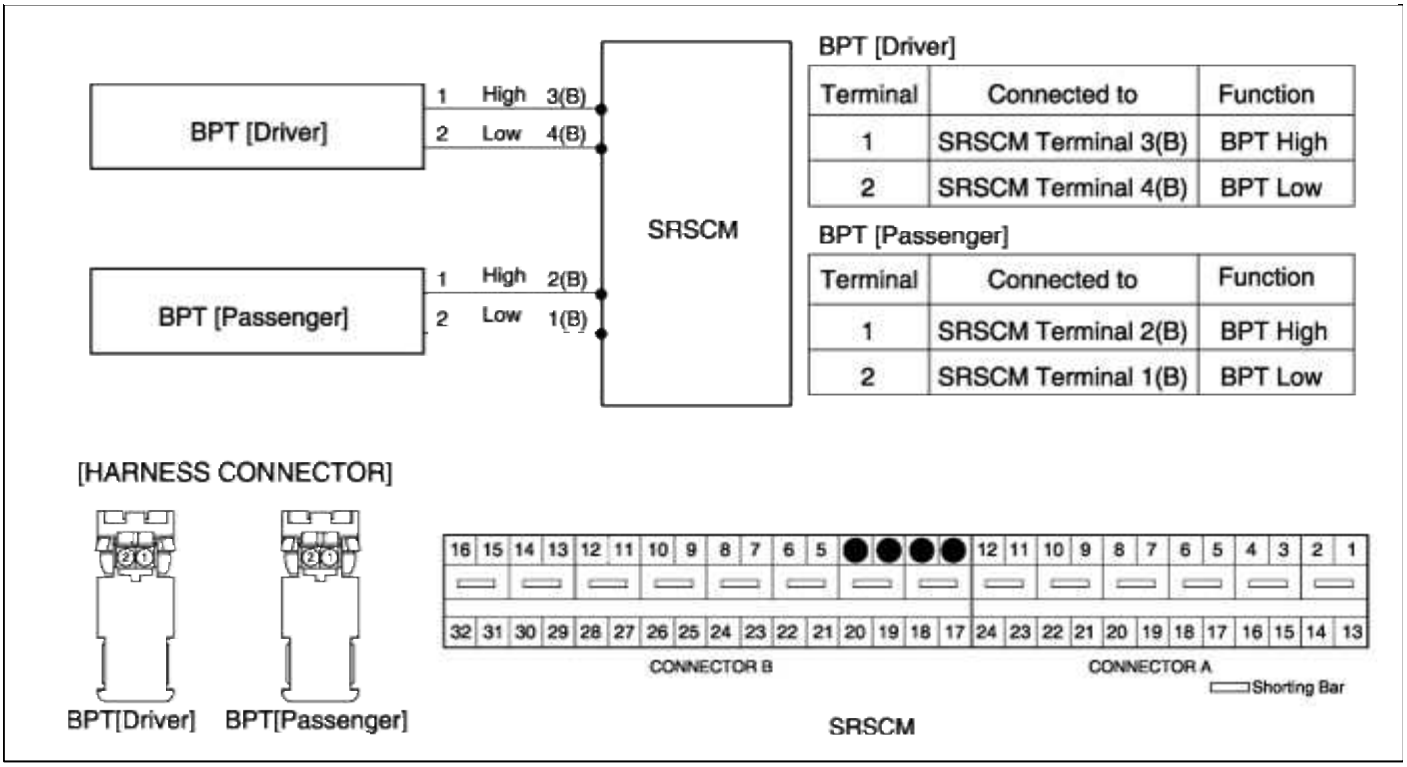
DTC Detecting Condition

DTC	Condition	Probable cause
B1361 B1362 B1367 B1368	• Too high or low resistance between BPT high(+) and BPT low (-) • Seat Belt Pretensioner (BPT) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Seat Belt Pretensioner (BPT) squib • SRSCM

Specification

BPT resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



BPT [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 3(B)	BPT High
2	SRSCM Terminal 4(B)	BPT Low

BPT [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 2(B)	BPT High
2	SRSCM Terminal 1(B)	BPT Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK BPT RESISTANCE

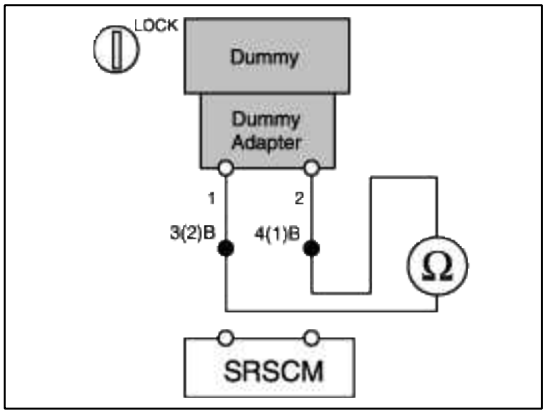
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on BPT harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 3(2) and 4(1) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Seat Belt Pretensioner(BPT) module.

NO

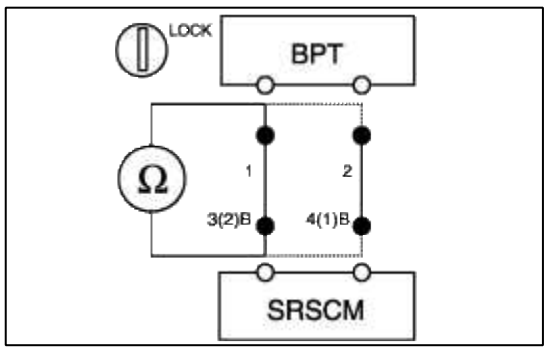
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of BPT harness connector and the terminal 3(2) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 2 of BPT harness connector and the terminal 4(1) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

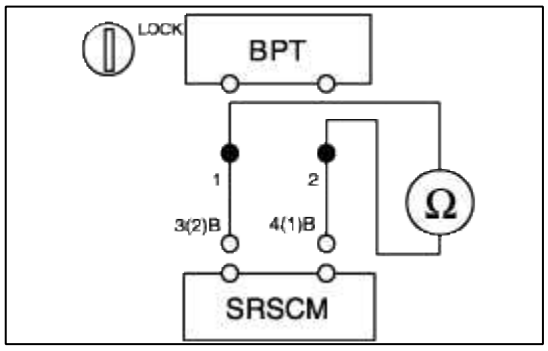
NO

Repair or replace the wiring harness between the BPT and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of BPT harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the BPT and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1368

DTC Description

The Seat Belt Pretensioner circuit consists of the SRSCM and two Seat Belt Pretensioners (BPT).
The SRSCM sets above DTC(s) if it detects that the resistance of BPT squib is too high or low.

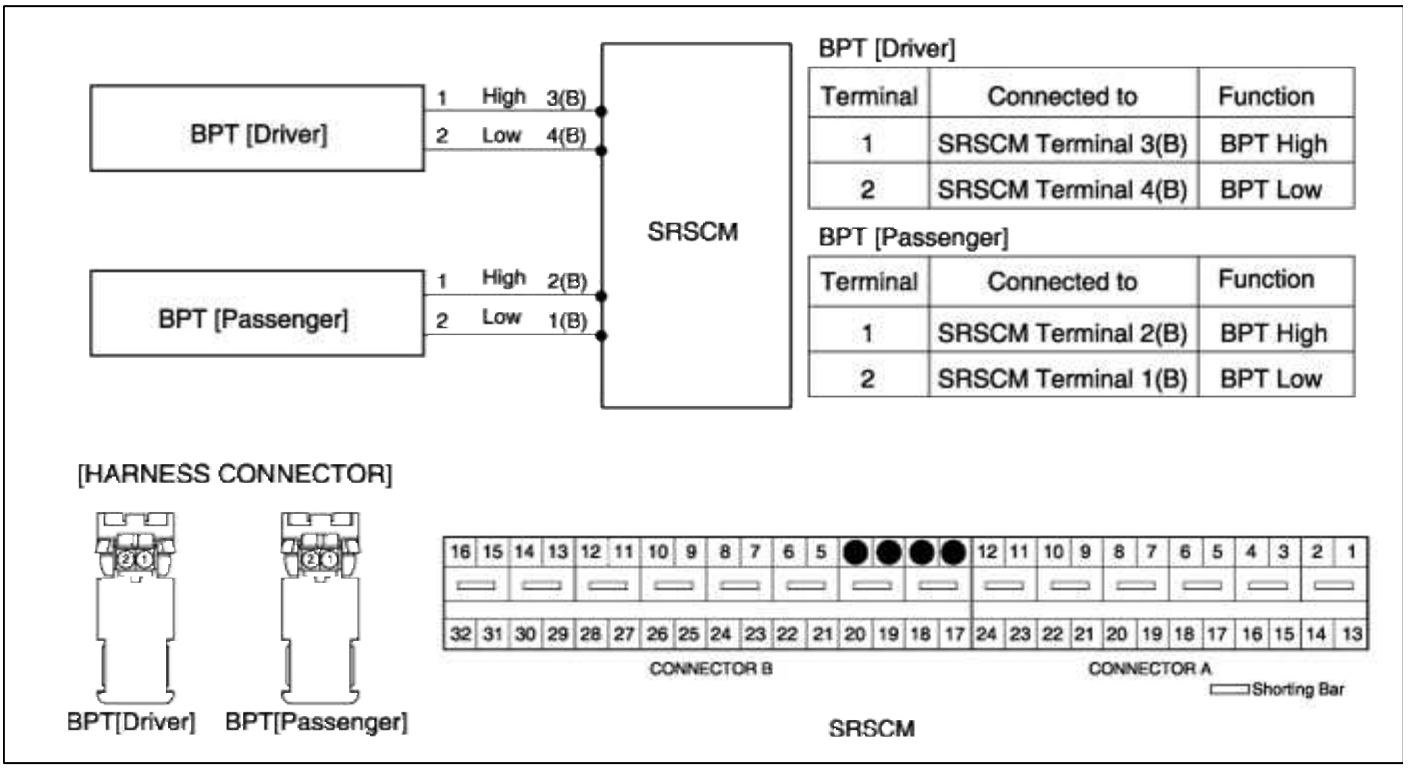
DTC Detecting Condition

DTC	Condition	Probable cause
B1361 B1362 B1367 B1368	• Too high or low resistance between BPT high(+) and BPT low (-) • Seat Belt Pretensioner (BPT) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Seat Belt Pretensioner (BPT) squib • SRSCM

Specification

BPT resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK BPT RESISTANCE

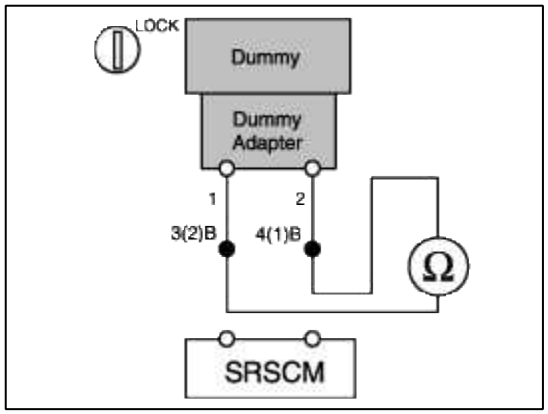
CAUTION

Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on BPT harness connector.
- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 3(2) and 4(1) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Seat Belt Pretensioner(BPT) module.

NO

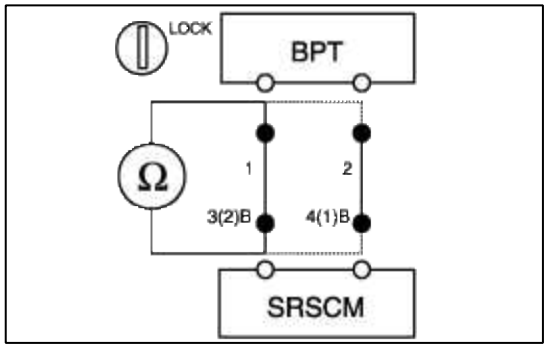
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of BPT harness connector and the terminal 3(2) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 2 of BPT harness connector and the terminal 4(1) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

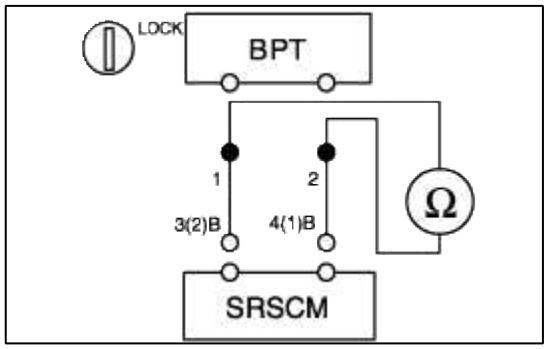
NO

Repair or replace the wiring harness between the BPT and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of BPT harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the BPT and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1369

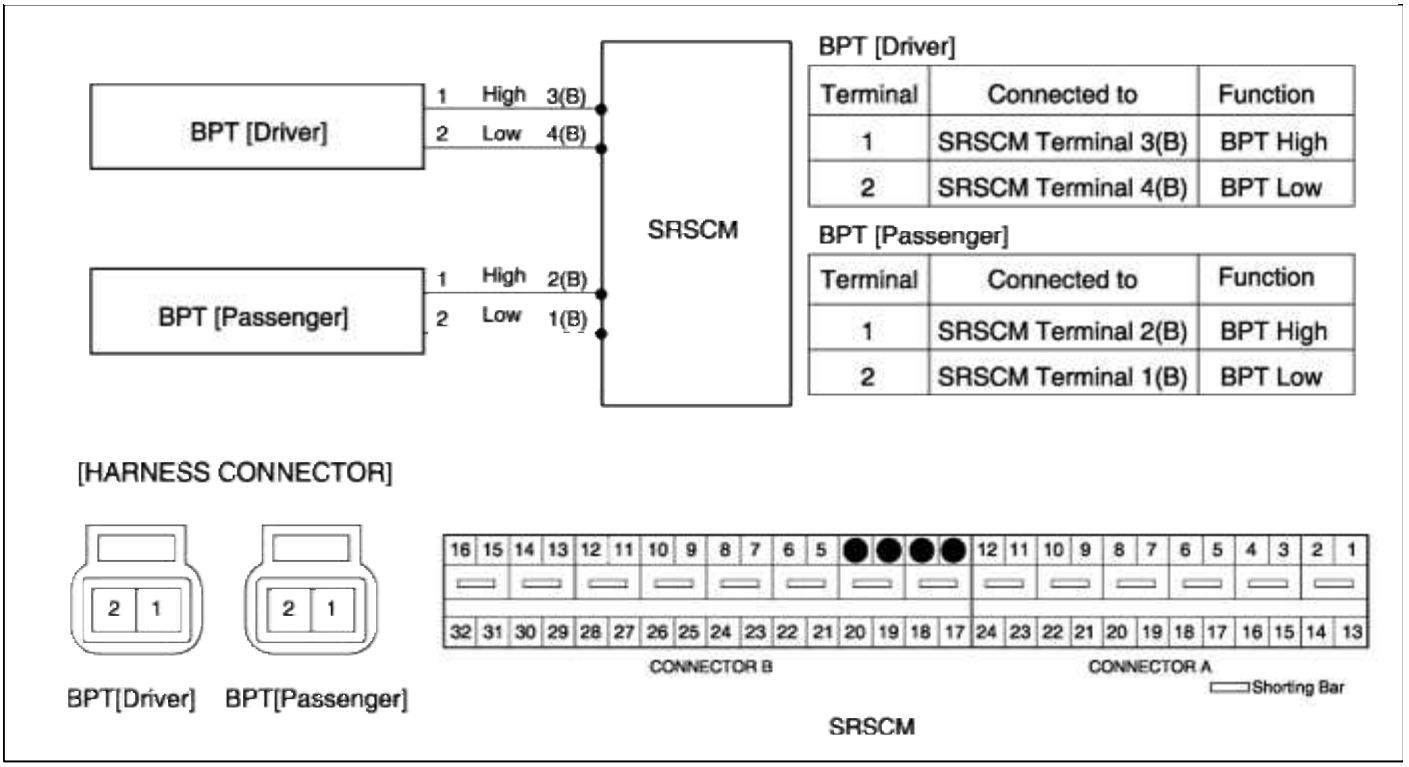
DTC Description

The Seat Belt Pretensioner consists of the SRSCM and two Seat Belt Pretensioners (BPT). The SRSCM sets above DTC(s) if it detects short to ground on the BPT circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1363 B1369	• Short to ground between BPT and SRSCM • Seat Belt Pretensioner (BPT) Malfunction • SRSCM Malfunction	• Short to ground circuit on wiring harness • Seat Belt Pretensioner (BPT) squib • SRSCM

Schematic Diagram



BPT [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 3(B)	BPT High
2	SRSCM Terminal 4(B)	BPT Low

BPT [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 2(B)	BPT High
2	SRSCM Terminal 1(B)	BPT Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

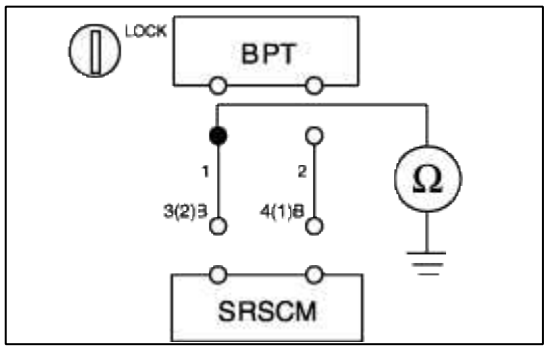
1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 1 of BPT harness connector and chassis ground.

   Specification (resistance) : infinite



   (2) Is the measured resistance within specification?

   YES

   Check the BPT Module.

   NO

   Repair or replace the wiring harness between the BPT and the SRSCM.

3. CHECK THE BPT MODULE
   (1) Replace the Belt Pretensioner (BPT) with a new one.
   ● Refer to "Belt Pretensioner (BPT)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Belt Pretensioner (BPT)?
   YES
   Go to next step.
   NO
   Replace BPT module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1370

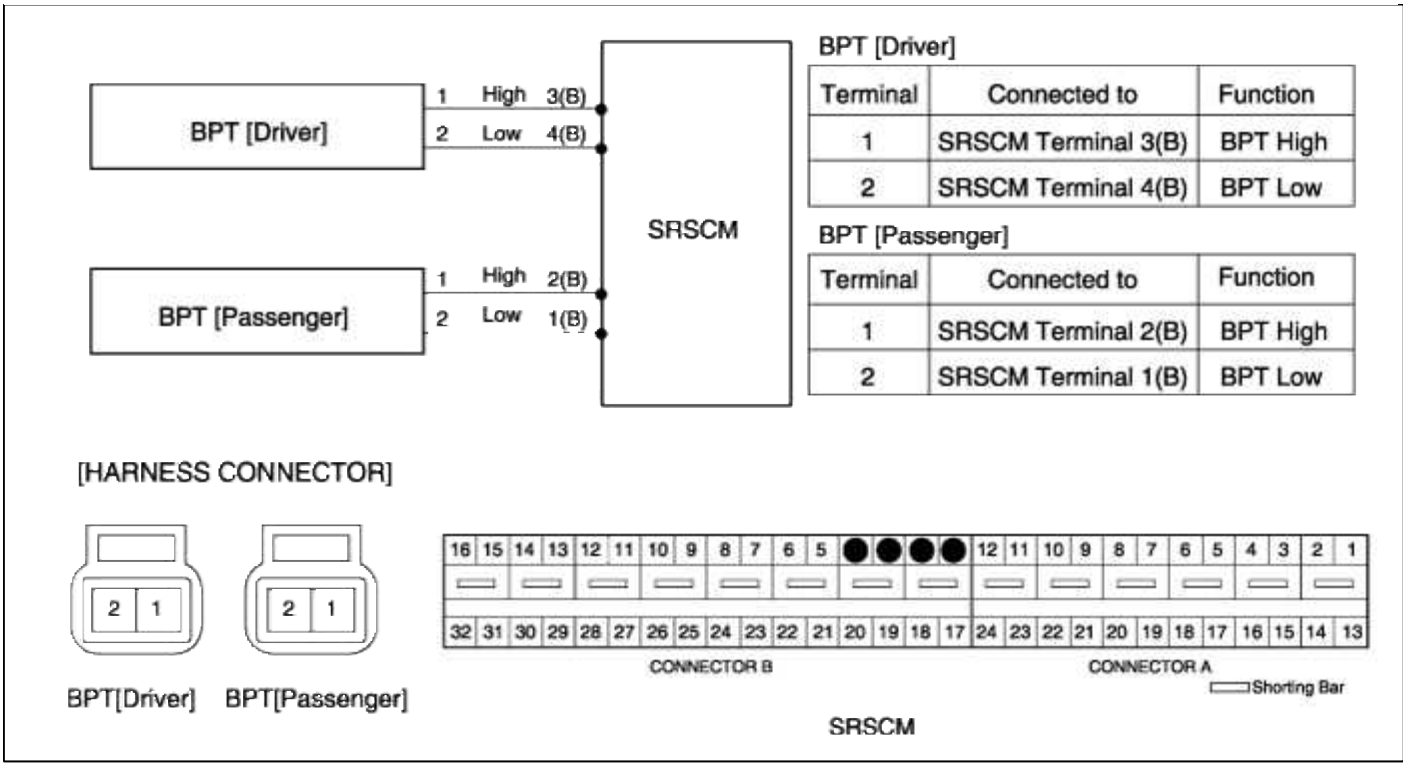
DTC Description

The Seat Belt Pretensioner consists of the SRSCM and two Seat Belt Pretensioners (BPT). The SRSCM sets above DTC(s) if it detects short to battery line on the BPT circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1364 B1370	• Short to battery line between BPT and SRSCM • Seat Belt Pretensioner (BPT) Malfunction • SRSCM Malfunction	• Short to battery line circuit on wiring harness • Seat Belt Pretensioner (BPT) squib • SRSCM

Schematic Diagram



BPT [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 3(B)	BPT High
2	SRSCM Terminal 4(B)	BPT Low

BPT [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 2(B)	BPT High
2	SRSCM Terminal 1(B)	BPT Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

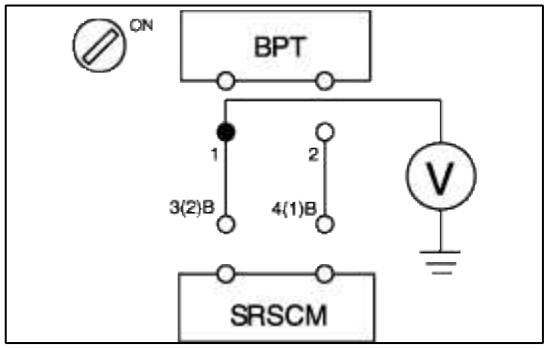
2. CHECK SHORT TO BATTERY LINE

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 1 of BPT harness connector and chassis ground.

   Specification (voltage) : Approximately 0 V



   (4) Is the measured voltage within specification?

   YES

   Check the BPT Module.

   NO

   Repair the short to battery line circuit on wiring harness between the BPT and the SRSCM.

3. CHECK THE BPT MODULE
   (1) Replace the Belt Pretensioner (BPT) with a new one.
   ● Refer to "Belt Pretensioner (BPT)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Belt Pretensioner (BPT)?
   YES
   Go to next step.
   NO
   Replace BPT module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1378

DTC Description

The Side Airbag circuit consists of the SRSCM and two Side Airbags (SAB). The SRSCM sets above DTC(s) if it detects that the resistance of SAB squib is too high or low.

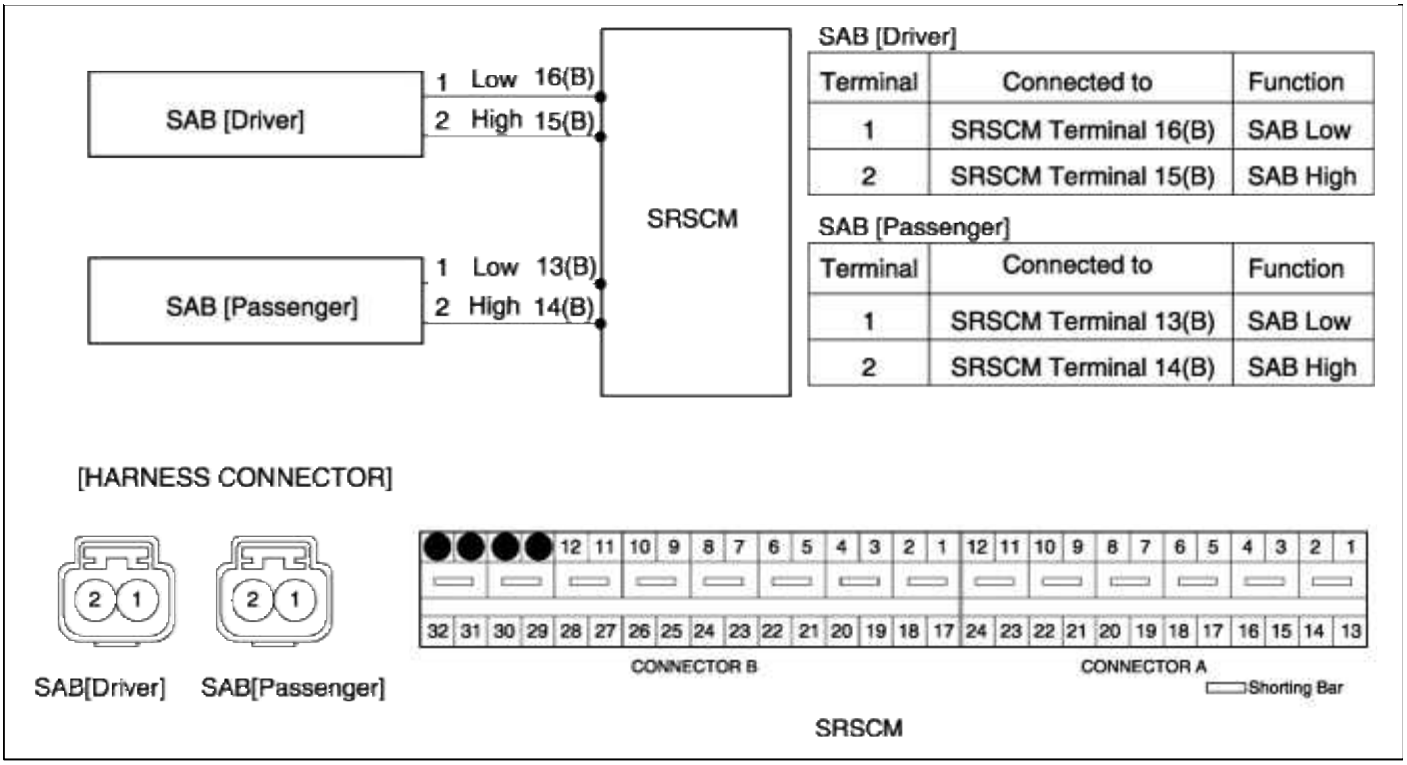
DTC Detecting Condition

DTC	Condition	Probable cause
B1378 B1379 B1382 B1383	• Too high or low resistance between SAB high(+) and SAB low (-) • Side Airbag (SAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Side Airbag (SAB) squib • SRSCM

Specification

SAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



SAB [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 16(B)	SAB Low
2	SRSCM Terminal 15(B)	SAB High

SAB [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 13(B)	SAB Low
2	SRSCM Terminal 14(B)	SAB High

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SAB RESISTANCE

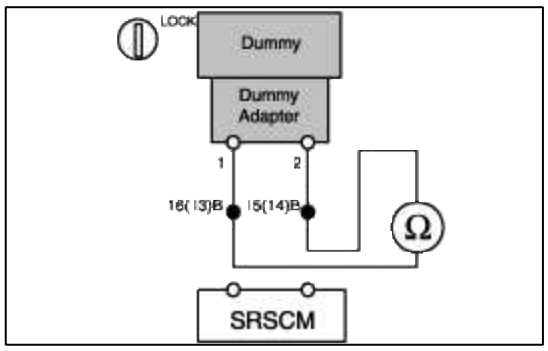
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on SAB harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 15(14) and 16(13) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Side Airbag(SAB) module.

NO

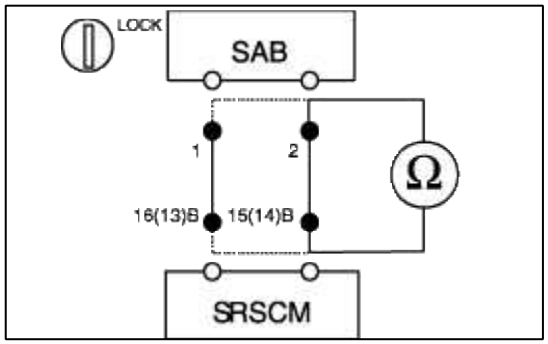
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of SAB harness connector and the terminal 15(14) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 1 of SAB harness connector and the terminal 16(13) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

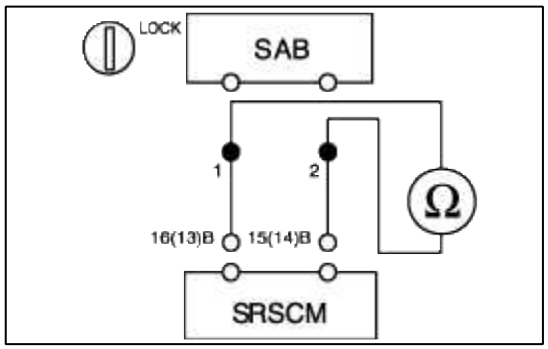
NO

Repair or replace the wiring harness between the SAB and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of SAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the SAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1379

DTC Description

The Side Airbag circuit consists of the SRSCM and two Side Airbags (SAB). The SRSCM sets above DTC(s) if it detects that the resistance of SAB squib is too high or low.

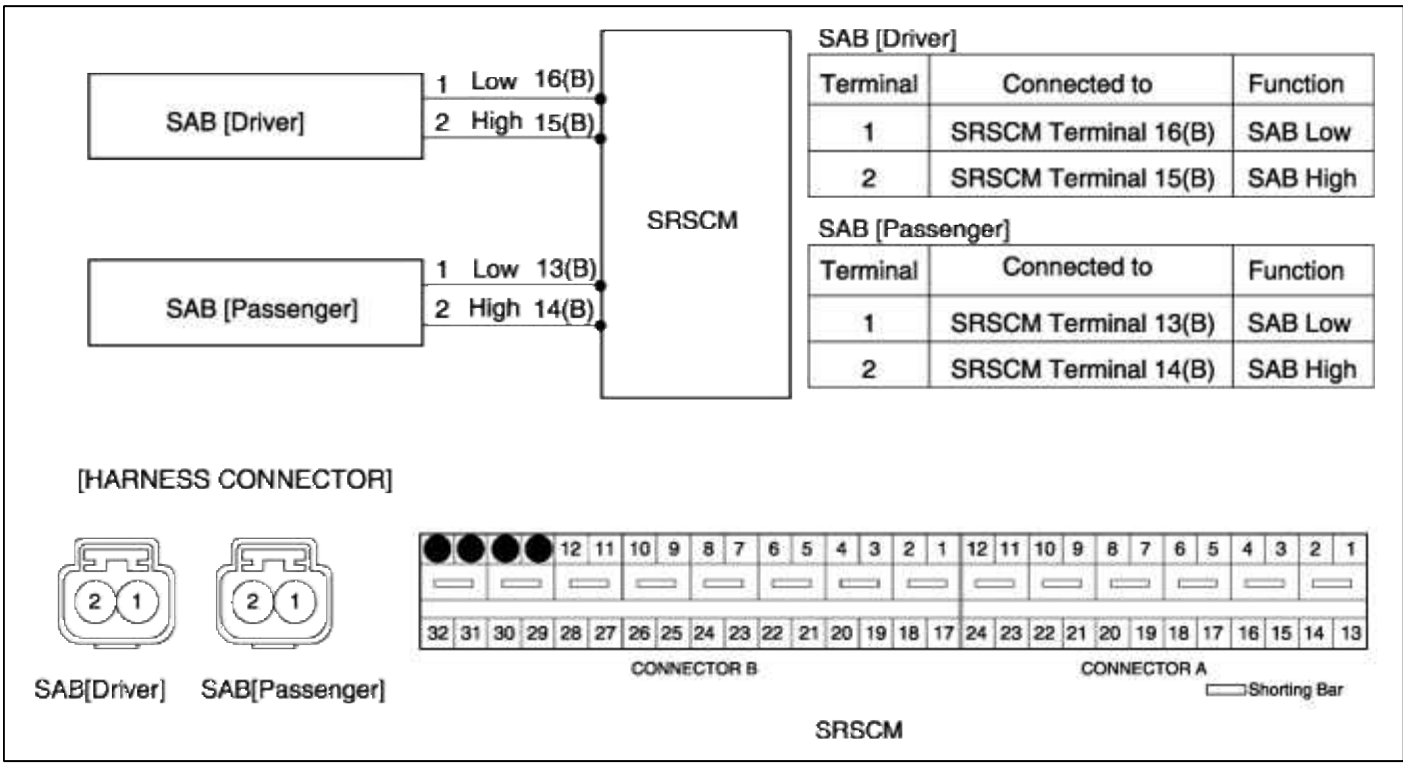
DTC Detecting Condition

DTC	Condition	Probable cause
B1378 B1379 B1382 B1383	• Too high or low resistance between SAB high(+) and SAB low (-) • Side Airbag (SAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Side Airbag (SAB) squib • SRSCM

Specification

SAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SAB RESISTANCE

CAUTION

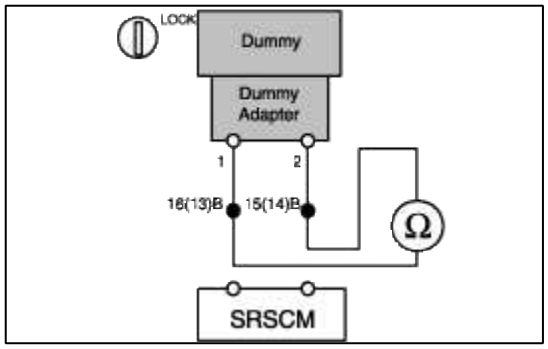
Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on SAB harness connector.

● Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 15(14) and 16(13) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Side Airbag(SAB) module.

NO

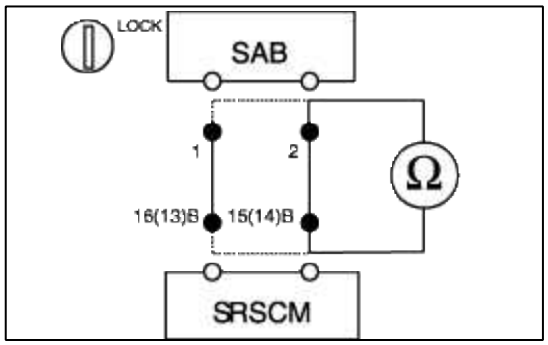
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of SAB harness connector and the terminal 15(14) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 1 of SAB harness connector and the terminal 16(13) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

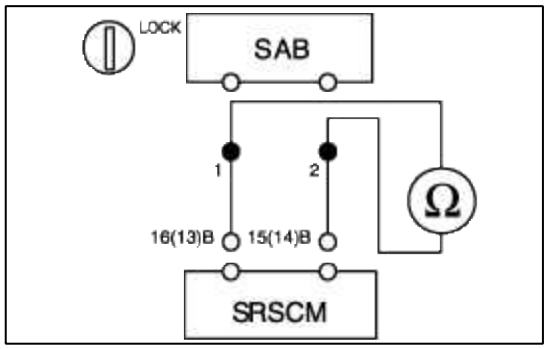
NO

Repair or replace the wiring harness between the SAB and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of SAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the SAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1380

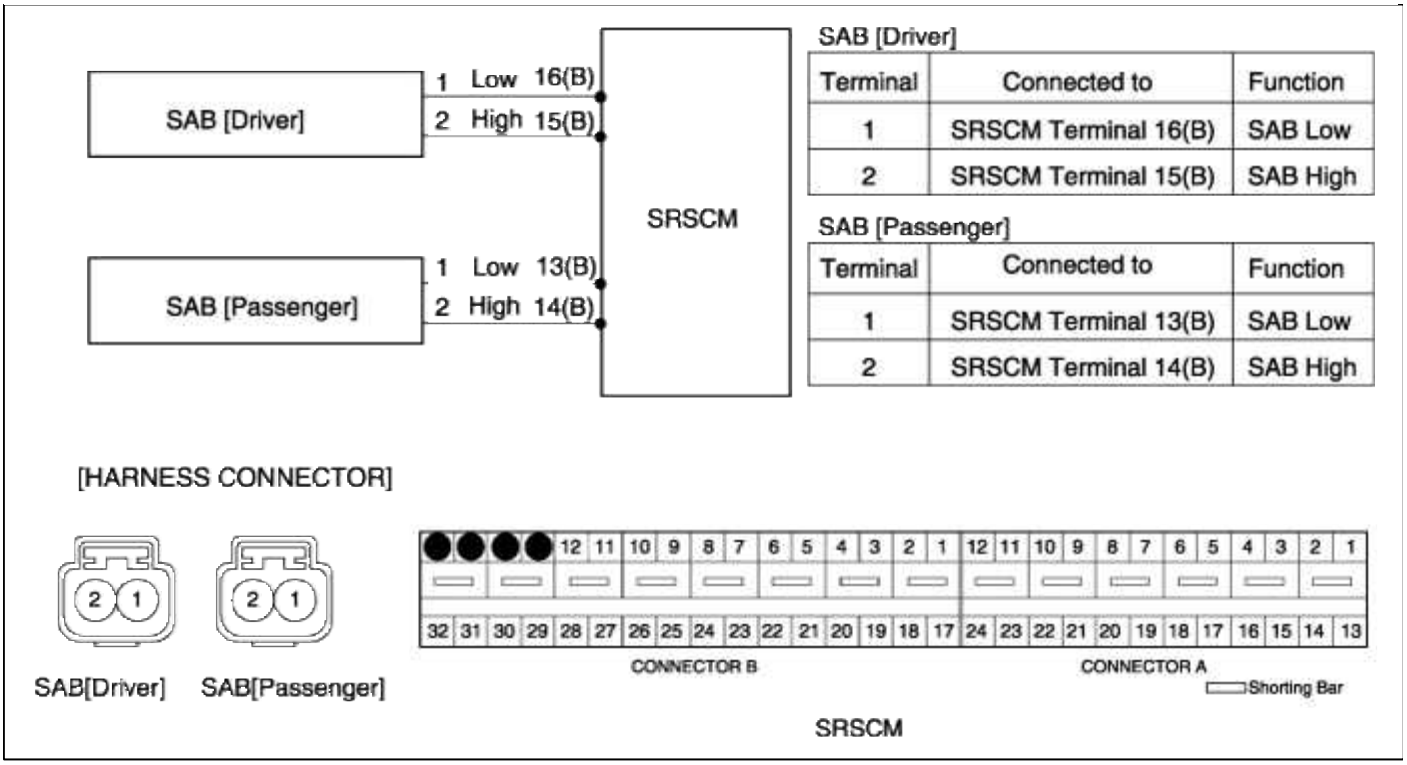
DTC Description

The Side Airbag circuit consists of the SRSCM and two Side Airbags (SAB). The SRSCM sets above DTC(s) if it detects short to ground on the SAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1380 B1384	• Short to ground between SAB and SRSCM • Side Airbag (SAB) Malfunction • SRSCM Malfunction	• Short to ground circuit on wiring harness • Side Airbag (SAB) squib • SRSCM

Schematic Diagram



SAB [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 16(B)	SAB Low
2	SRSCM Terminal 15(B)	SAB High

SAB [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 13(B)	SAB Low
2	SRSCM Terminal 14(B)	SAB High

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

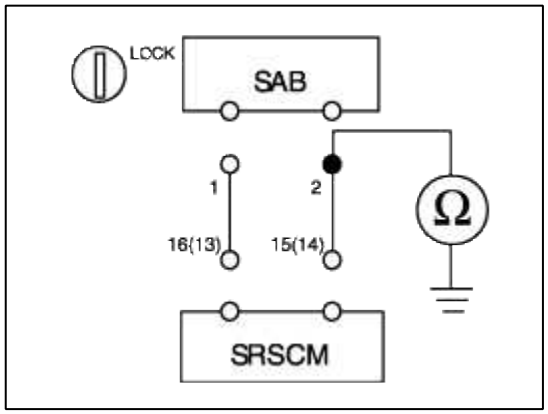
1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 2 of SAB harness connector and chassis ground.

   Specification (resistance) : infinite



   (2) Is the measured resistance within specification?

   YES

   Check the SAB Module.

   NO

   Repair or replace the wiring harness between the SAB and the SRSCM.

3. CHECK THE SAB MODULE
   (1) Replace the Side Airbag(SAB) with a new one.
   ● Refer to "Side Airbag(SAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Side Airbag(SAB)?
   YES
   Go to next step.
   NO
   Replace SAB module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1381

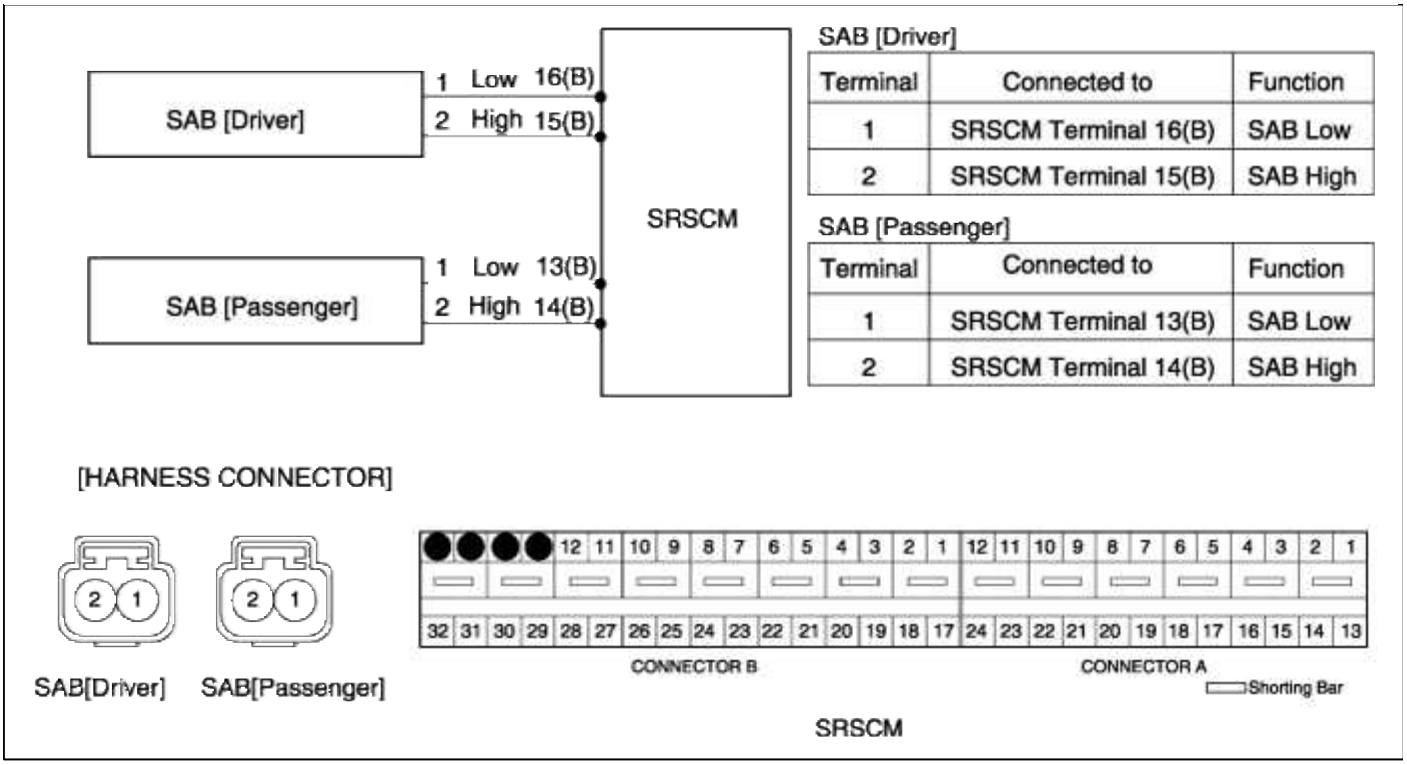
DTC Description

The Side Airbag circuit consists of the SRSCM and two Side Airbags (SAB). The SRSCM sets above DTC(s) if it detects short to battery line on the SAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1381 B1385	• Short to battery line between SAB and SRSCM • Side Airbag (SAB) Malfunction • SRSCM Malfunction	• Short to battery line circuit on wiring harness • Side Airbag (SAB) squib • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

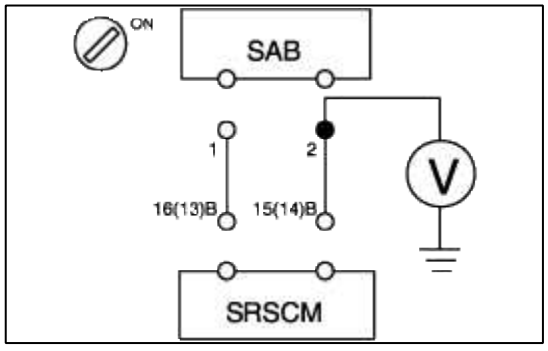
2. CHECK SHORT TO BATTERY LINE

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 2 of SAB harness connector and chassis ground.

   Specification (voltage) : Approximately 0 V



   (4) Is the measured voltage within specification?

   YES

   Check the SAB Module.

   NO

   Repair the short to battery line circuit on wiring harness between the SAB and the SRSCM.

3. CHECK THE SAB MODULE
   (1) Replace the Side Airbag(SAB) with a new one.
   ● Refer to "Side Airbag(SAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Side Airbag(SAB)?
   YES
   Go to next step.
   NO
   Replace SAB module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1382

DTC Description

The Side Airbag circuit consists of the SRSCM and two Side Airbags (SAB). The SRSCM sets above DTC(s) if it detects that the resistance of SAB squib is too high or low.

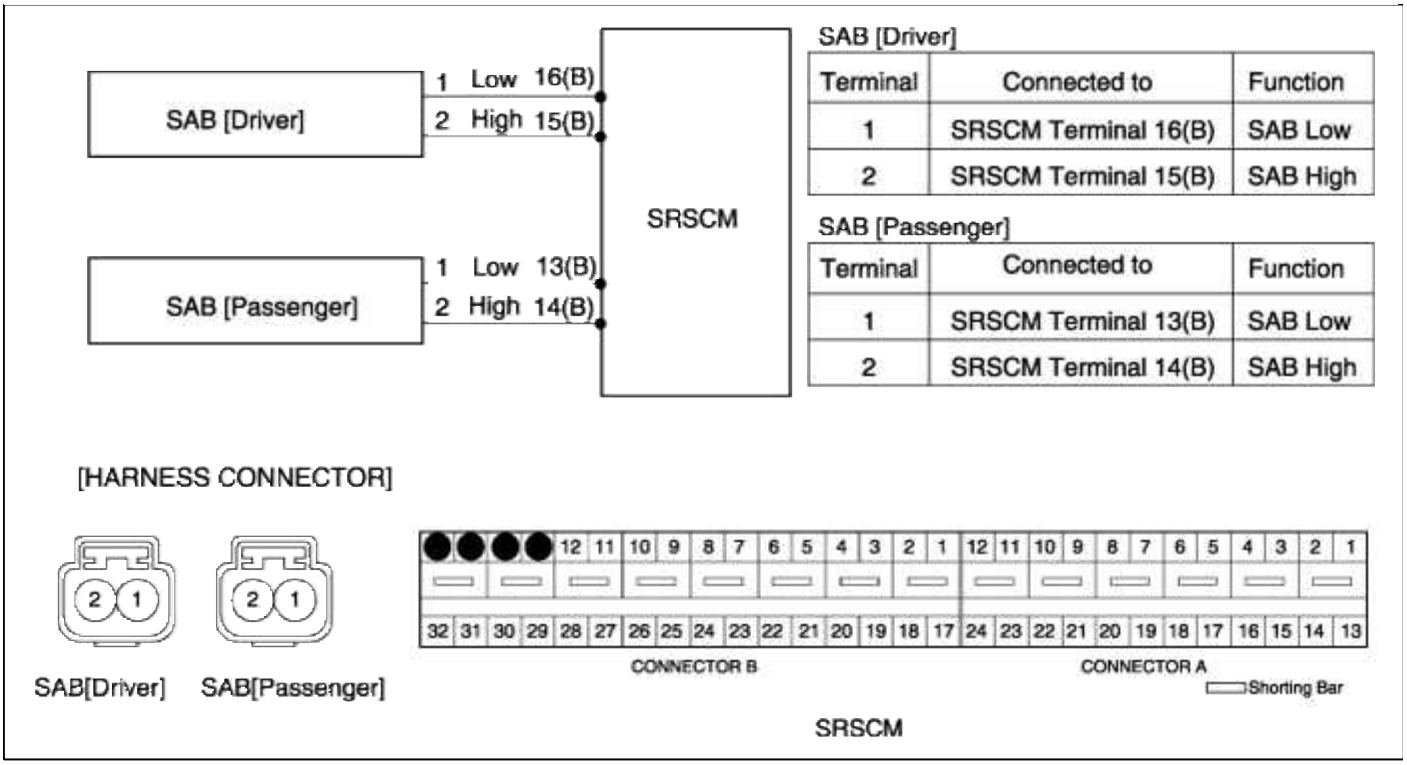
DTC Detecting Condition

DTC	Condition	Probable cause
B1378 B1379 B1382 B1383	• Too high or low resistance between SAB high(+) and SAB low (-) • Side Airbag (SAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Side Airbag (SAB) squib • SRSCM

Specification

SAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



SAB [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 16(B)	SAB Low
2	SRSCM Terminal 15(B)	SAB High

SAB [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 13(B)	SAB Low
2	SRSCM Terminal 14(B)	SAB High

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SAB RESISTANCE

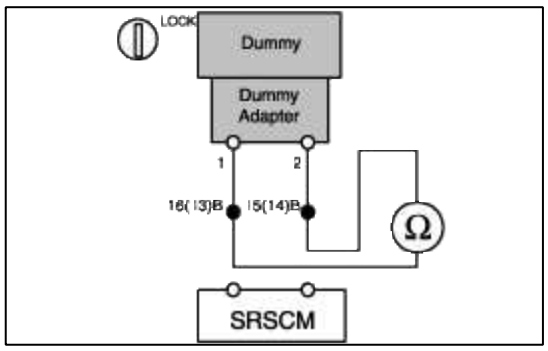
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on SAB harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 15(14) and 16(13) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Side Airbag(SAB) module.

NO

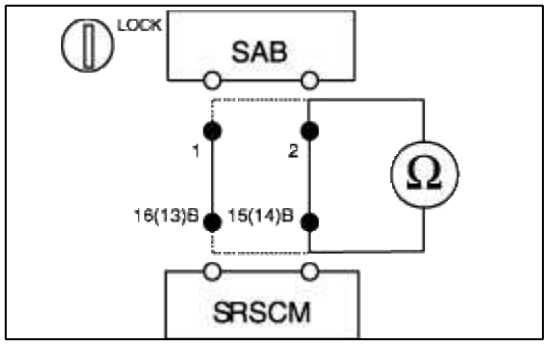
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of SAB harness connector and the terminal 15(14) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 1 of SAB harness connector and the terminal 16(13) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

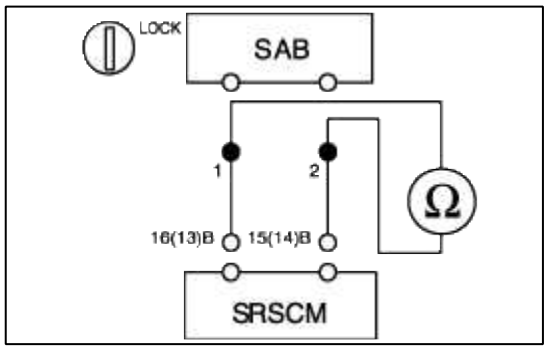
NO

Repair or replace the wiring harness between the SAB and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of SAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the SAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1383

DTC Description

The Side Airbag circuit consists of the SRSCM and two Side Airbags (SAB). The SRSCM sets above DTC(s) if it detects that the resistance of SAB squib is too high or low.

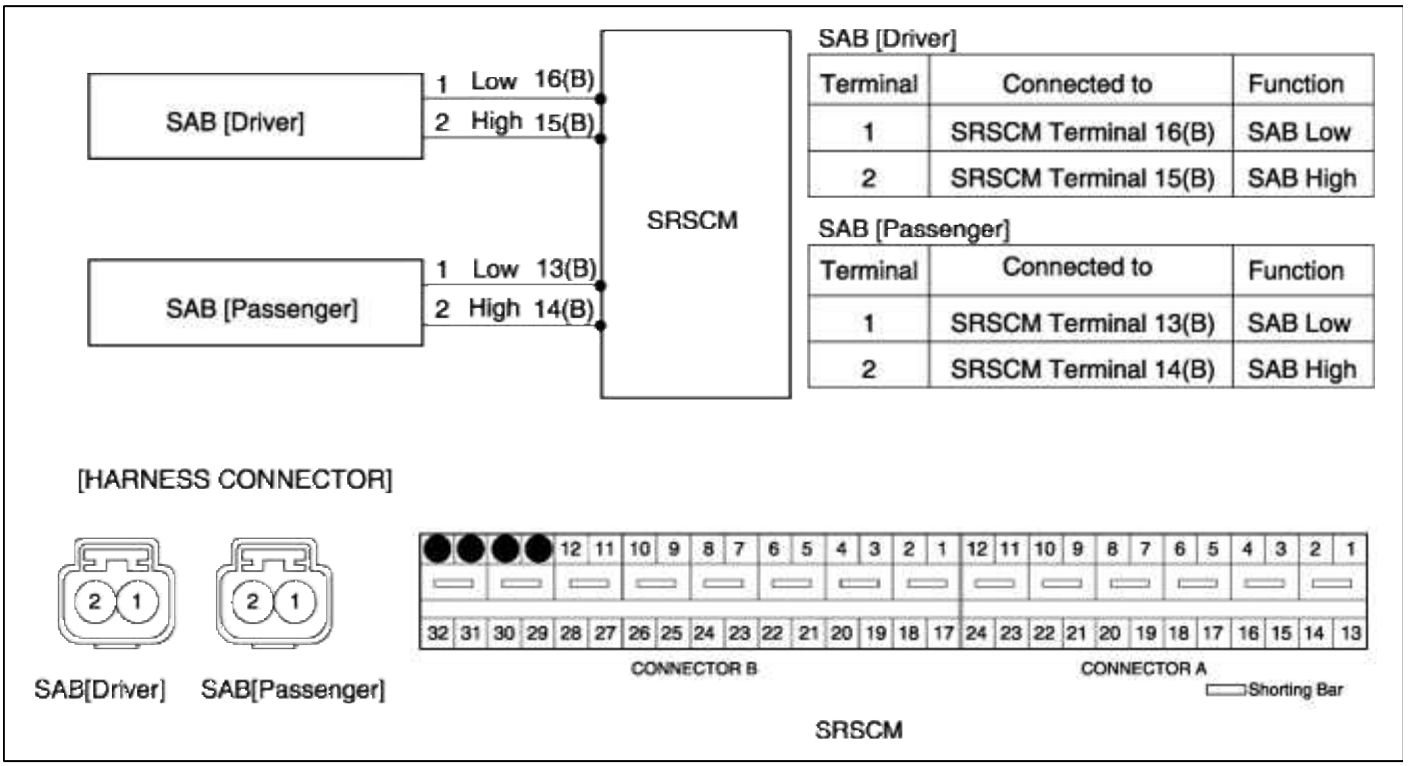
DTC Detecting Condition

DTC	Condition	Probable cause
B1378 B1379 B1382 B1383	• Too high or low resistance between SAB high(+) and SAB low (-) • Side Airbag (SAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Side Airbag (SAB) squib • SRSCM

Specification

SAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SAB RESISTANCE

CAUTION

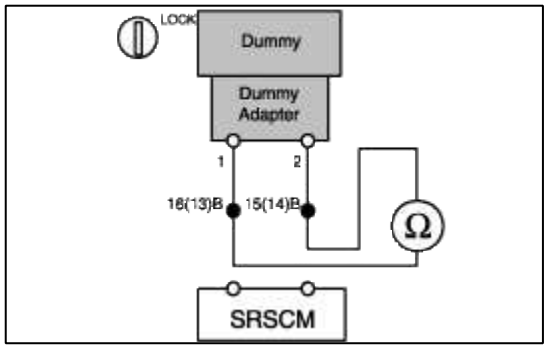
Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on SAB harness connector.

● Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 15(14) and 16(13) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Side Airbag(SAB) module.

NO

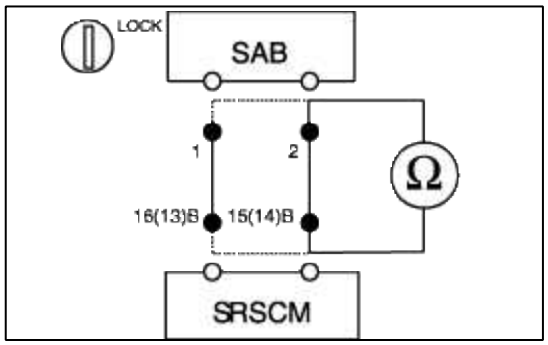
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of SAB harness connector and the terminal 15(14) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 1 of SAB harness connector and the terminal 16(13) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

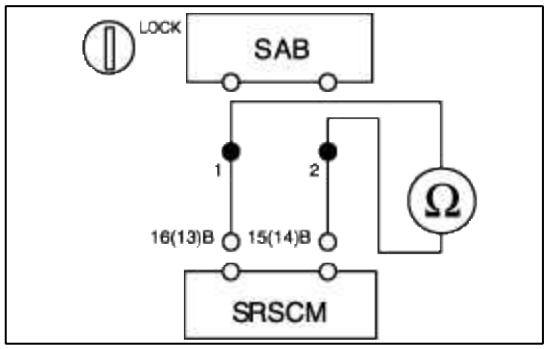
Check short circuit.

NO

Repair or replace the wiring harness between the SAB and the SRSCM.

4. CHECK SHORT CIRCUIT
(1) Measure resistance between the terminal 1 and 2 of SAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the SAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1384

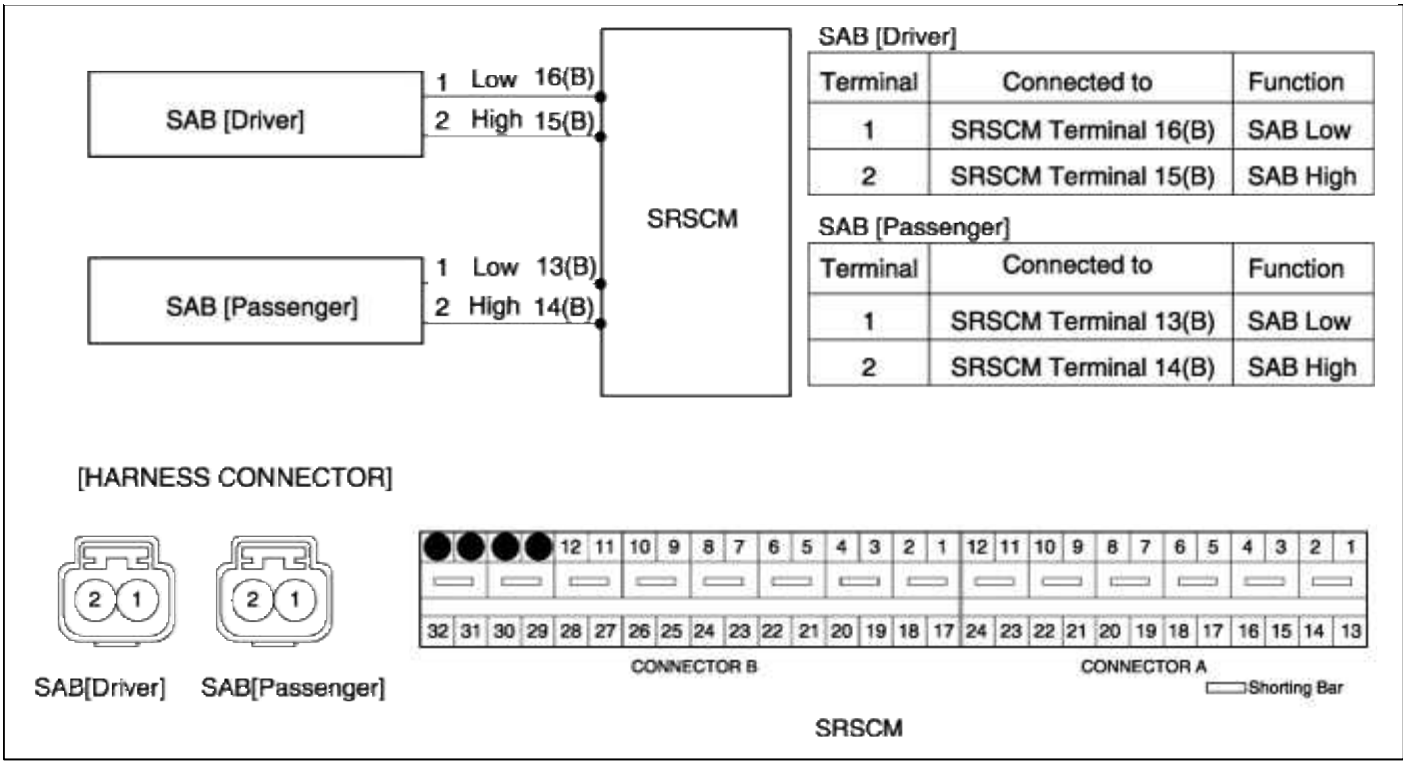
DTC Description

The Side Airbag circuit consists of the SRSCM and two Side Airbags (SAB). The SRSCM sets above DTC(s) if it detects short to ground on the SAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1380 B1384	• Short to ground between SAB and SRSCM • Side Airbag (SAB) Malfunction • SRSCM Malfunction	• Short to ground circuit on wiring harness • Side Airbag (SAB) squib • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

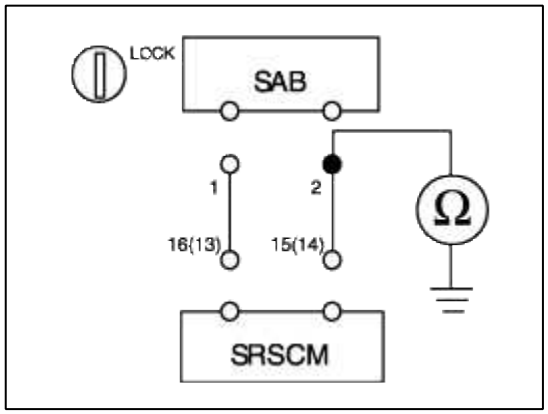
1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 2 of SAB harness connector and chassis ground.

   Specification (resistance) : infinite



   (2) Is the measured resistance within specification?

   YES

   Check the SAB Module.

   NO

   Repair or replace the wiring harness between the SAB and the SRSCM.

3. CHECK THE SAB MODULE
   (1) Replace the Side Airbag(SAB) with a new one.
   ● Refer to "Side Airbag(SAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Side Airbag(SAB)?
   YES
   Go to next step.
   NO
   Replace SAB module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1385

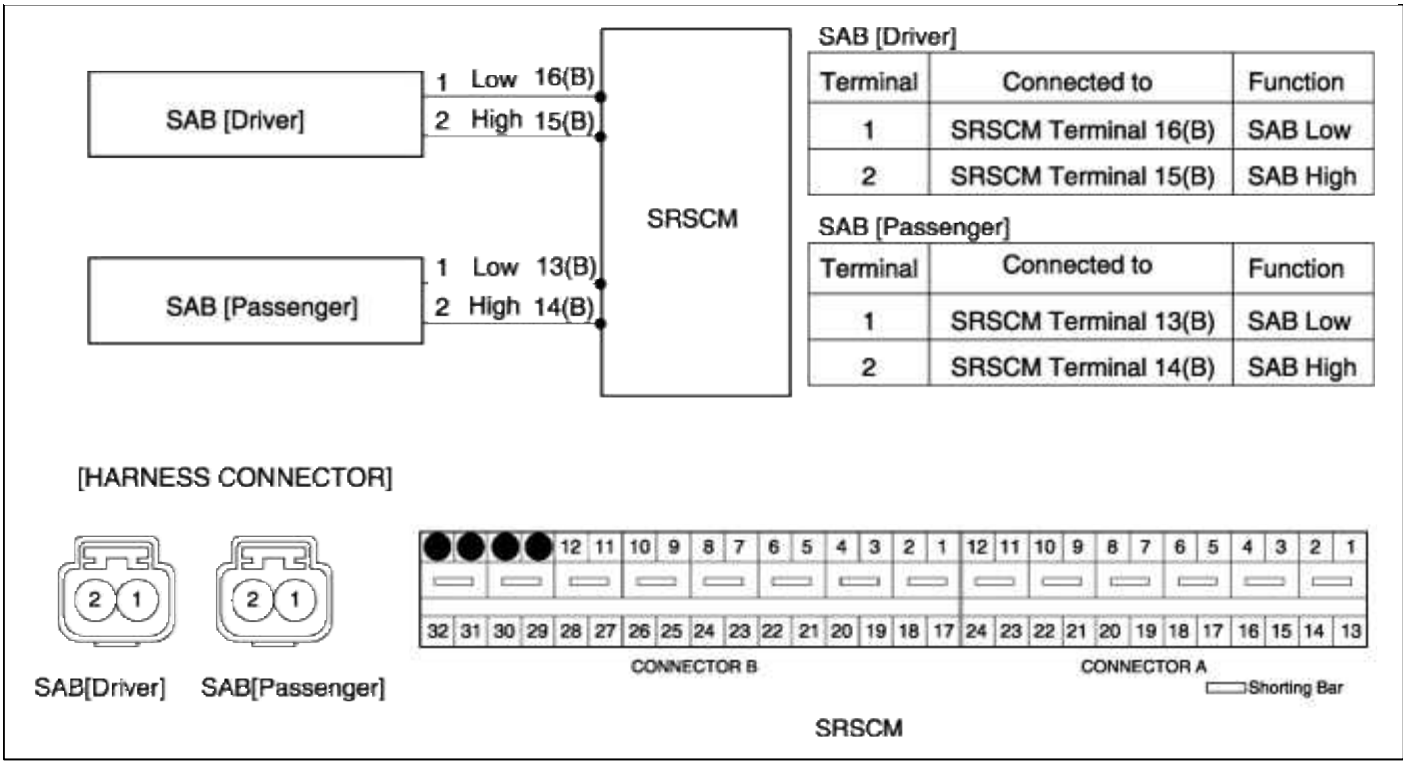
DTC Description

The Side Airbag circuit consists of the SRSCM and two Side Airbags (SAB). The SRSCM sets above DTC(s) if it detects short to battery line on the SAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1381 B1385	• Short to battery line between SAB and SRSCM • Side Airbag (SAB) Malfunction • SRSCM Malfunction	• Short to battery line circuit on wiring harness • Side Airbag (SAB) squib • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

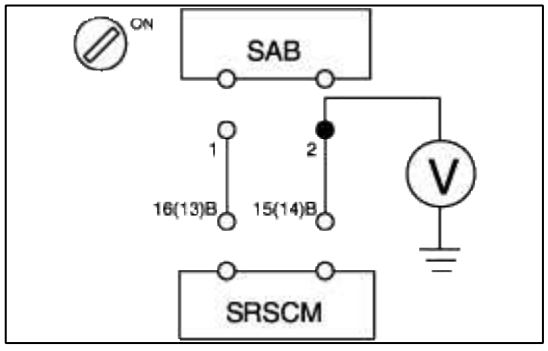
2. CHECK SHORT TO BATTERY LINE

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 2 of SAB harness connector and chassis ground.

   Specification (voltage) : Approximately 0 V



   (4) Is the measured voltage within specification?

   YES

   Check the SAB Module.

   NO

   Repair the short to battery line circuit on wiring harness between the SAB and the SRSCM.

3. CHECK THE SAB MODULE
   (1) Replace the Side Airbag(SAB) with a new one.
   ● Refer to "Side Airbag(SAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Side Airbag(SAB)?
   YES
   Go to next step.
   NO
   Replace SAB module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1387

DTC Description

The Seat Track Position Sensor (STPS) circuit consists of the SRSCM and two STPS. The SRSCM sets above DTC(s) if it detects short or short to ground on the STPS circuit. The "Seat Forward" status currently represents a seat position in which the deployment of the second stage airbag is prohibited.

DTC Detecting Condition

DTC	Condition	Probable cause
B1387 B1390	• Short between STPS and SRSCM • Short to ground between STPS and SRSCM • STPS Malfunction • SRSCM Malfunction	• Short or short to ground circuit on wiring harness • STPS • SRSCM

Specification

STPS Status	Current (mA)	Related DTC
Open or Short to Battery	< 3.98	B1388, B1391
Forward	5 ~ 7	
Defect	8.62 ~ 9.94	B1389, B1392
Rearward	12 ~ 17	
Short or Short to Ground	> 20.83	B1387, B1390

Schematic Diagram

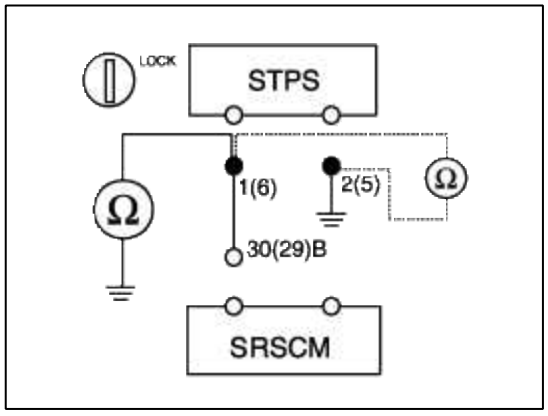
Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK SHORT OR SHORT TO GROUND
   (1) Disconnect the STPS connector.
   (2) Measure resistance between the terminal 1(6) of STPS harness connector and chassis ground.
   (3) Measure resistance between the terminal 1(6) and 2(5) of STPS harness connector.

   specification(resistance) : infinite



   (4) Is the measured resistance within specification?

   YES
   Check the STPS.

   NO
   Repair or replace the wiring harness between the STPS and the SRSCM.
3. CHECK THE SEAT TRACK POSITION SENSOR (STPS)
   (1) Measure current between the terminal 1(6) of STPS and 30(29) of SRSCM.

   Specification (current) : 12 ~ 17 mA (Rearward status), 5 ~ 7 mA (Forward status)

   (2) Is the measured current within specification?

   YES
   Go to next stop.

   NO
   Replace the STPS.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1388

DTC Description

The Seat Track Position Sensor (STPS) circuit consists of the SRSCM and two STPS. The SRSCM sets above

DTC(s) if it detects open or short to battery line on the STPS circuit. The "Seat Forward" status currently represents a seat position in which the deployment of the second stage airbag is prohibited.

DTC Detecting Condition

DTC	Condition	Probable cause
B1388 B1391	• Open between STPS and SRSCM • Short to battery line between STPS and SRSCM • STPS Malfunction • SRSCM Malfunction	• Open or short to battery line circuit on wiring harness • STPS • SRSCM

Specification

STPS Status	Current (mA)	Related DTC
Open or Short to Battery	< 3.98	B1388, B1391
Forward	5 ~ 7	
Defect	8.62 ~ 9.94	B1389, B1392
Rearward	12 ~ 17	
Short or Short to Ground	> 20.83	B1387, B1390

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

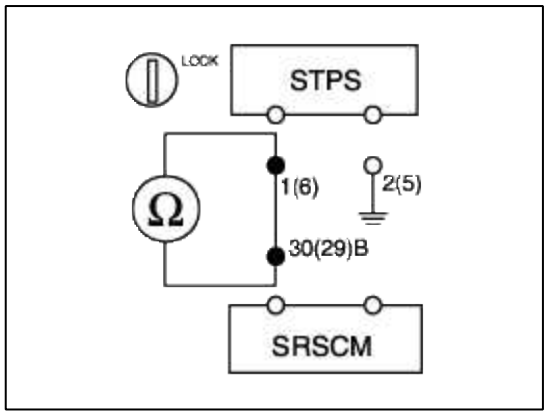
1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK OPEN CIRCUIT

(1) Disconnect the STPS connector.

(2) Measure resistance between the terminal 1(6) of STPS harness connector and the terminal 30(29) of SRSCM harness connector(B).

specification(resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short to ground.

NO

Repair the open circuit on wiring harness between the STPS and the SRSCM.

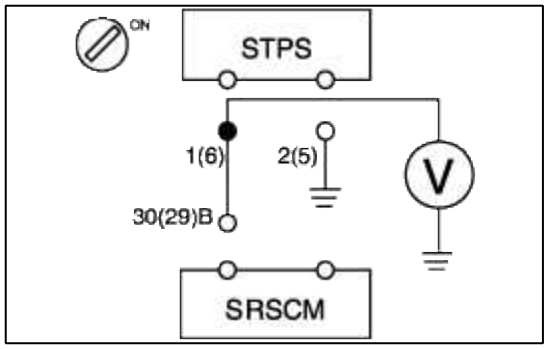
3. CHECK SHORT TO BATTERY LINE

(1) Connect the battery negative cable to the battery.

(2) Turn the ignition switch to ON.

(3) Measure voltage between the terminal 1(6) of STPS harness connector and chassis ground.

specification(voltage) : Approximately 0 V



(4) Is the measured voltage within specification?

YES

Check the STPS.

NO

Repair the short to battery line circuit on wiring harness between the STPS and the SRSCM.

4. CHECK THE SEAT TRACK POSITION SENSOR (STPS)
   (1) Measure current between the terminal 1(6) of STPS and 30(29) of SRSCM.

   Specification (current) : 12 ~ 17 mA (Rearward status), 5 ~ 7 mA (Forward status)

   (2) Is the measured current within specification?

   YES
   Go to next stop.

   NO
   Replace the STPS.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1389

DTC Description

The Seat Track Position Sensor (STPS) circuit consists of the SRSCM and two STPS. The SRSCM sets above DTC(s) if it detects the STPS fault. The "Seat Forward" status currently represents a seat position in which the deployment of the second stage airbag is prohibited.

DTC Detecting Condition

DTC	Condition	Probable cause
B1389 B1392	• STPS Malfunction • SRSCM Malfunction	• STPS • SRSCM

Specification

STPS Status	Current (mA)	Related DTC
Open or Short to Battery	< 3.98	B1388, B1391
Forward	5 ~ 7	
Defect	8.62 ~ 9.94	B1389, B1392
Rearward	12 ~ 17	
Short or Short to Ground	> 20.83	B1387, B1390

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK THE SEAT TRACK POSITION SENSOR (STPS)
   (1) Measure current between the terminal 1(6) of STPS and 30(29) of SRSCM.

   Specification (current) : 12 ~ 17 mA (Rearward status), 5 ~ 7 mA (Forward status)

   (2) Is the measured current within specification?

   YES
   Go to next stop.

   NO
   Replace the STPS.
3. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1390

DTC Description

The Seat Track Position Sensor (STPS) circuit consists of the SRSCM and two STPS. The SRSCM sets above DTC(s) if it detects short or short to ground on the STPS circuit. The "Seat Forward" status currently represents a seat position in which the deployment of the second stage airbag is prohibited.

DTC Detecting Condition

DTC	Condition	Probable cause
B1387 B1390	• Short between STPS and SRSCM • Short to ground between STPS and SRSCM • STPS Malfunction • SRSCM Malfunction	• Short or short to ground circuit on wiring harness • STPS • SRSCM

Specification

STPS Status	Current (mA)	Related DTC
Open or Short to Battery	< 3.98	B1388, B1391
Forward	5 ~ 7	
Defect	8.62 ~ 9.94	B1389, B1392
Rearward	12 ~ 17	
Short or Short to Ground	> 20.83	B1387, B1390

Schematic Diagram



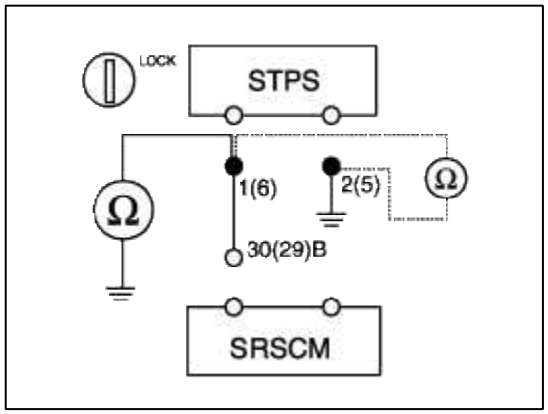
Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK SHORT OR SHORT TO GROUND
   (1) Disconnect the STPS connector.
   (2) Measure resistance between the terminal 1(6) of STPS harness connector and chassis ground.
   (3) Measure resistance between the terminal 1(6) and 2(5) of STPS harness connector.

   specification(resistance) : infinite



   (4) Is the measured resistance within specification?

   YES
   Check the STPS.

   NO
   Repair or replace the wiring harness between the STPS and the SRSCM.
3. CHECK THE SEAT TRACK POSITION SENSOR (STPS)
   (1) Measure current between the terminal 1(6) of STPS and 30(29) of SRSCM.

   Specification (current) : 12 ~ 17 mA (Rearward status), 5 ~ 7 mA (Forward status)

   (2) Is the measured current within specification?

   YES
   Go to next stop.

   NO
   Replace the STPS.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1391

DTC Description

The Seat Track Position Sensor (STPS) circuit consists of the SRSCM and two STPS. The SRSCM sets above DTC(s) if it detects open or short to battery line on the STPS circuit. The "Seat Forward" status currently represents a seat position in which the deployment of the second stage airbag is prohibited.

DTC Detecting Condition

DTC	Condition	Probable cause
B1388 B1391	• Open between STPS and SRSCM • Short to battery line between STPS and SRSCM • STPS Malfunction • SRSCM Malfunction	• Open or short to battery line circuit on wiring harness • STPS • SRSCM

Specification

STPS Status	Current (mA)	Related DTC
Open or Short to Battery	< 3.98	B1388, B1391
Forward	5 ~ 7	
Defect	8.62 ~ 9.94	B1389, B1392
Rearward	12 ~ 17	
Short or Short to Ground	> 20.83	B1387, B1390

Schematic Diagram



Terminal & Connector Inspection

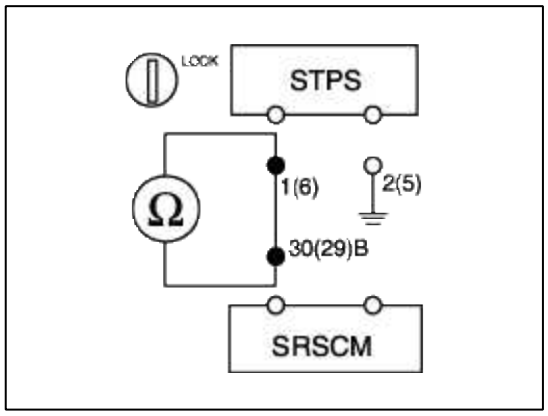
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK OPEN CIRCUIT
   (1) Disconnect the STPS connector.

(2) Measure resistance between the terminal 1(6) of STPS harness connector and the terminal 30(29) of SRSCM harness connector(B).

specification(resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short to ground.

NO

Repair the open circuit on wiring harness between the STPS and the SRSCM.

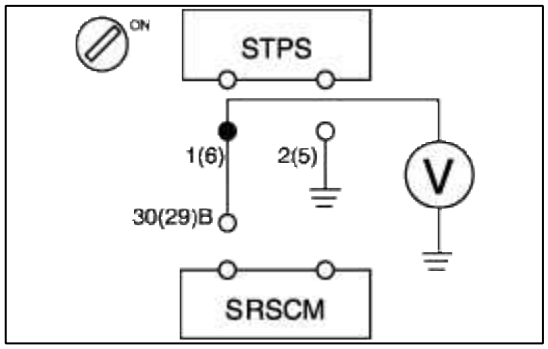
3. CHECK SHORT TO BATTERY LINE

(1) Connect the battery negative cable to the battery.

(2) Turn the ignition switch to ON.

(3) Measure voltage between the terminal 1(6) of STPS harness connector and chassis ground.

specification(voltage) : Approximately 0 V



(4) Is the measured voltage within specification?

YES

Check the STPS.

NO

Repair the short to battery line circuit on wiring harness between the STPS and the SRSCM.

4. CHECK THE SEAT TRACK POSITION SENSOR (STPS)
   (1) Measure current between the terminal 1(6) of STPS and 30(29) of SRSCM.

   Specification (current) : 12 ~ 17 mA (Rearward status), 5 ~ 7 mA (Forward status)

   (2) Is the measured current within specification?

   YES
   Go to next stop.

   NO
   Replace the STPS.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1392

DTC Description

The Seat Track Position Sensor (STPS) circuit consists of the SRSCM and two STPS. The SRSCM sets above DTC(s) if it detects the STPS fault. The "Seat Forward" status currently represents a seat position in which the deployment of the second stage airbag is prohibited.

DTC Detecting Condition

DTC	Condition	Probable cause
B1389 B1392	• STPS Malfunction • SRSCM Malfunction	• STPS • SRSCM

Specification

STPS Status	Current (mA)	Related DTC
Open or Short to Battery	< 3.98	B1388, B1391
Forward	5 ~ 7	
Defect	8.62 ~ 9.94	B1389, B1392
Rearward	12 ~ 17	
Short or Short to Ground	> 20.83	B1387, B1390

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK THE SEAT TRACK POSITION SENSOR (STPS)
   (1) Measure current between the terminal 1(6) of STPS and 30(29) of SRSCM.

   Specification (current) : 12 ~ 17 mA (Rearward status), 5 ~ 7 mA (Forward status)

   (2) Is the measured current within specification?

   YES
   Go to next stop.

   NO
   Replace the STPS.
3. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1395

DTC Description

While start up phase, SRSCM will measure cross link of squibs. If one of them is failed during interconnection test, then SRSCM will store interconnection fault. Once the interconnection fault is detected, it remains active continuously till the fault is erased. Only one fault code is assigned for all interconnection fault.

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK SHORT CIRCUIT
   (1) Measure resistance between following squibs.(DAB - PAB, DAB - SAB, DAB - CAB, DAB - BPT, PAB - SAB, PAB - CAB, PAB - BPT, SAB - PAB, SAB - CAB, SAB - BPT, CAB - BPT)

   Specification (resistance) : infinite

   (2) Is the measured resistance within specification?

   YES
   Go to nest stetp.

   NO
   Repair or replace the wiring harness between two squibs.
3. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1400

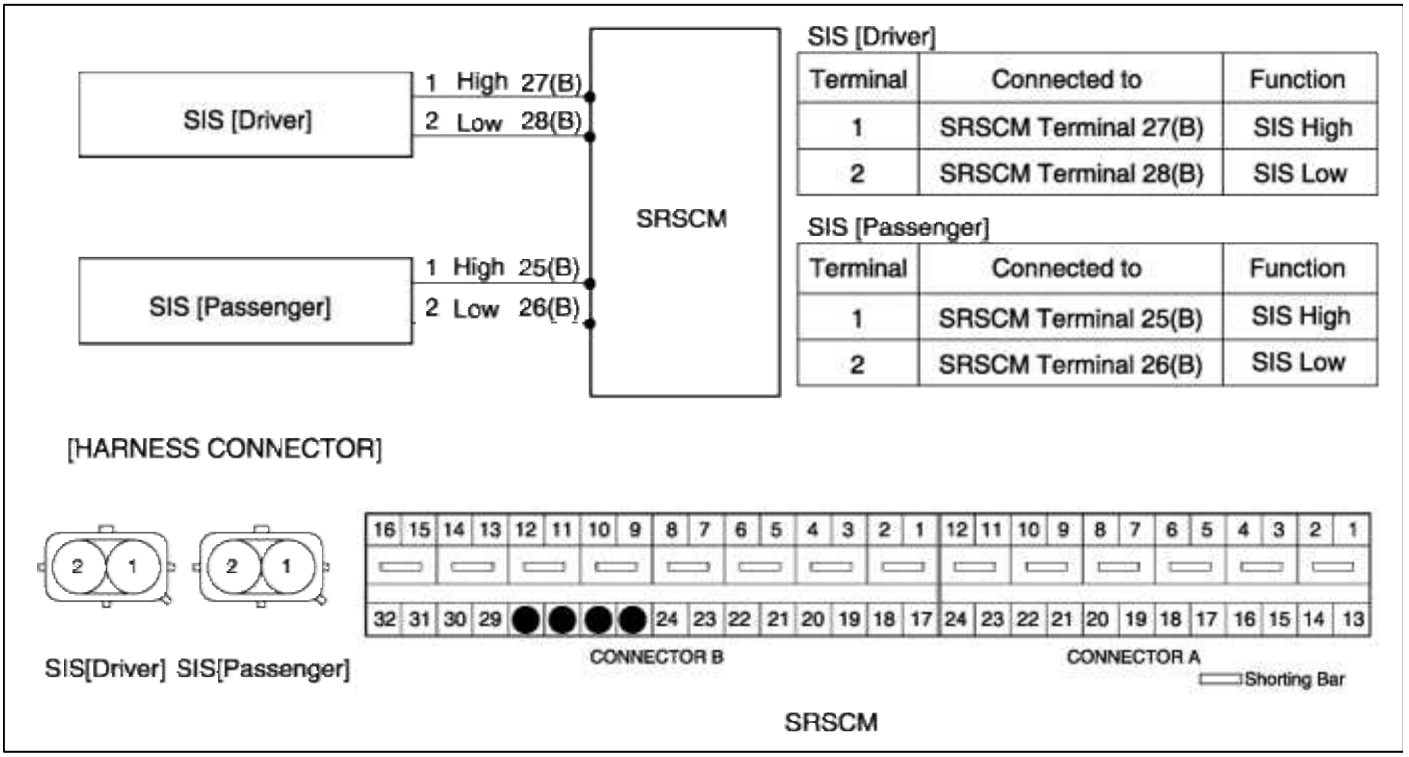
DTC Description

The detecting system for side crash consists of the SRSCM and two Side Impact Sensors (SIS). The SRSCM sets above DTC(s) if it detects that any SIS is defective or there is communication error between any SIS and the SRSCM.

DTC Detecting Condition

DTC	Condition	Probable cause
B1400 B1403 B1409 B1410	• Open between SIS and SRSCM • Side Impact Sensor (SIS) Malfunction • SRSCM Malfunction	• Wiring Harness • Side Impact Sensor (SIS) • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

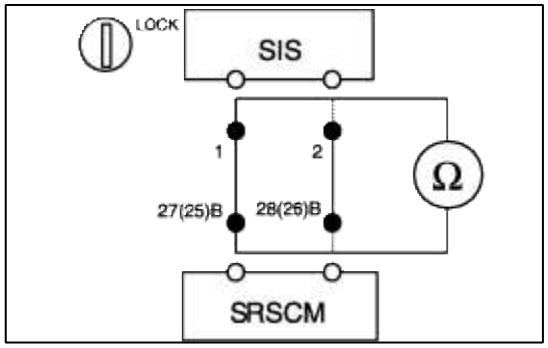
Inspection Procedure

1. PREPARATION

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SIS CIRCUIT
   (1) Measure resistance between the terminal 1 of SIS harness connector and the terminal 27(25) of SRSCM harness connector(B).
   (2) Measure resistance between the terminal 2 of SIS harness connector and the terminal 28(26) of SRSCM harness connector(B).

   Specification (resistance) : below 1 Ω



   (3) Is the measured resistance within specification?

   YES
   Check Side Impact Sensor.

   NO
   Repair or replace the wiring harness between the SIS and the SRSCM.

3. CHECK THE SIDE IMPACT SENSOR
   (1) Replace the Side Impact Sensor(SIS) with a new one.
   ● Refer to "Side Impact Sensor(SIS)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Side Impact Sensor(SIS)?

   YES
   Go to next step.

   NO
   Replace SIS.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1403

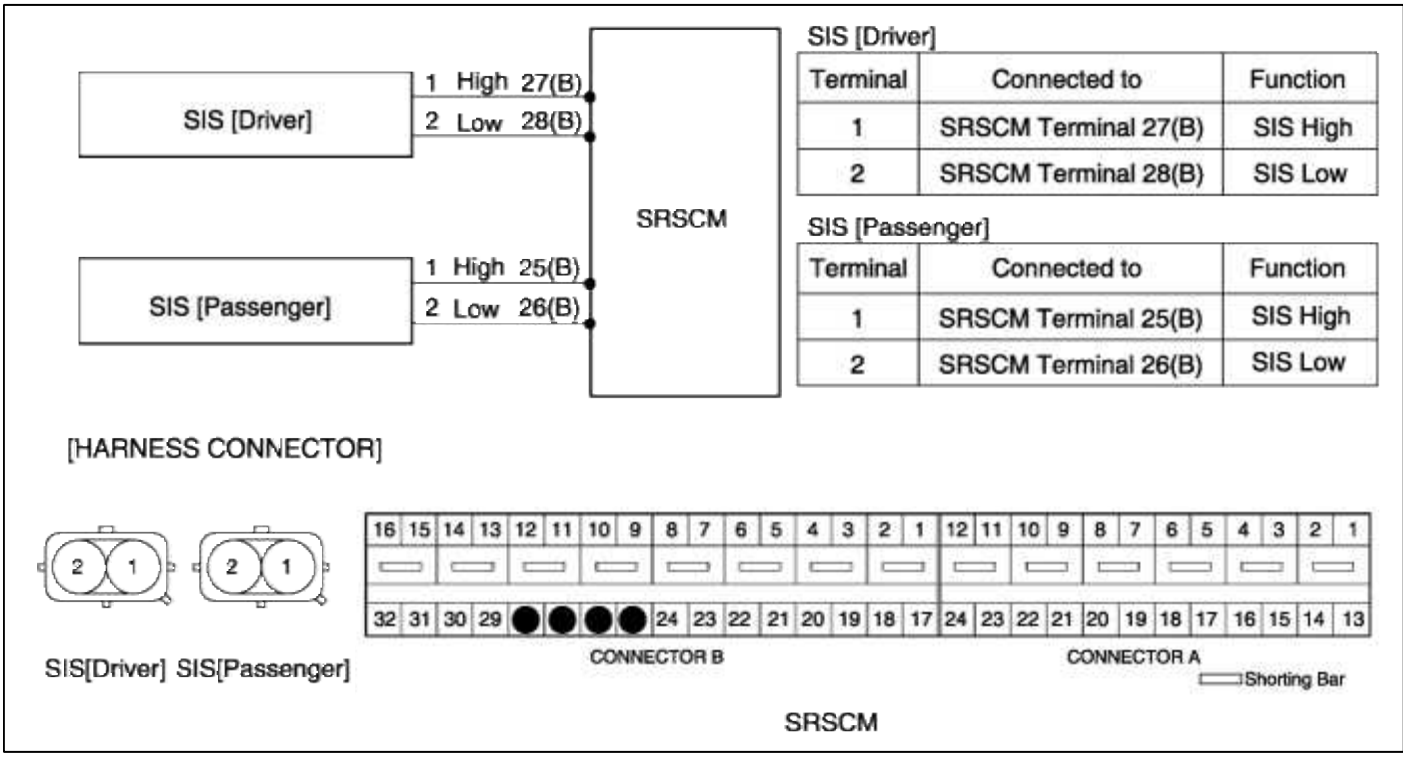
DTC Description

The detecting system for side crash consists of the SRSCM and two Side Impact Sensors (SIS). The SRSCM sets above DTC(s) if it detects that any SIS is defective or there is communication error between any SIS and the SRSCM.

DTC Detecting Condition

DTC	Condition	Probable cause
B1400 B1403 B1409 B1410	• Open between SIS and SRSCM • Side Impact Sensor (SIS) Malfunction • SRSCM Malfunction	• Wiring Harness • Side Impact Sensor (SIS) • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

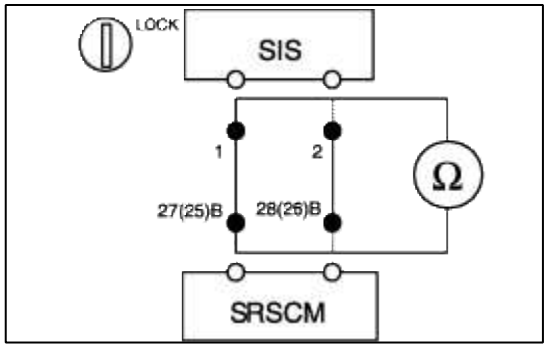
Inspection Procedure

1. PREPARATION

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SIS CIRCUIT
   (1) Measure resistance between the terminal 1 of SIS harness connector and the terminal 27(25) of SRSCM harness connector(B).
   (2) Measure resistance between the terminal 2 of SIS harness connector and the terminal 28(26) of SRSCM harness connector(B).

   Specification (resistance) : below 1 Ω



   (3) Is the measured resistance within specification?

   YES
   Check Side Impact Sensor.

   NO
   Repair or replace the wiring harness between the SIS and the SRSCM.

3. CHECK THE SIDE IMPACT SENSOR
   (1) Replace the Side Impact Sensor(SIS) with a new one.
   ● Refer to "Side Impact Sensor(SIS)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Side Impact Sensor(SIS)?

   YES
   Go to next step.

   NO
   Replace SIS.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1409

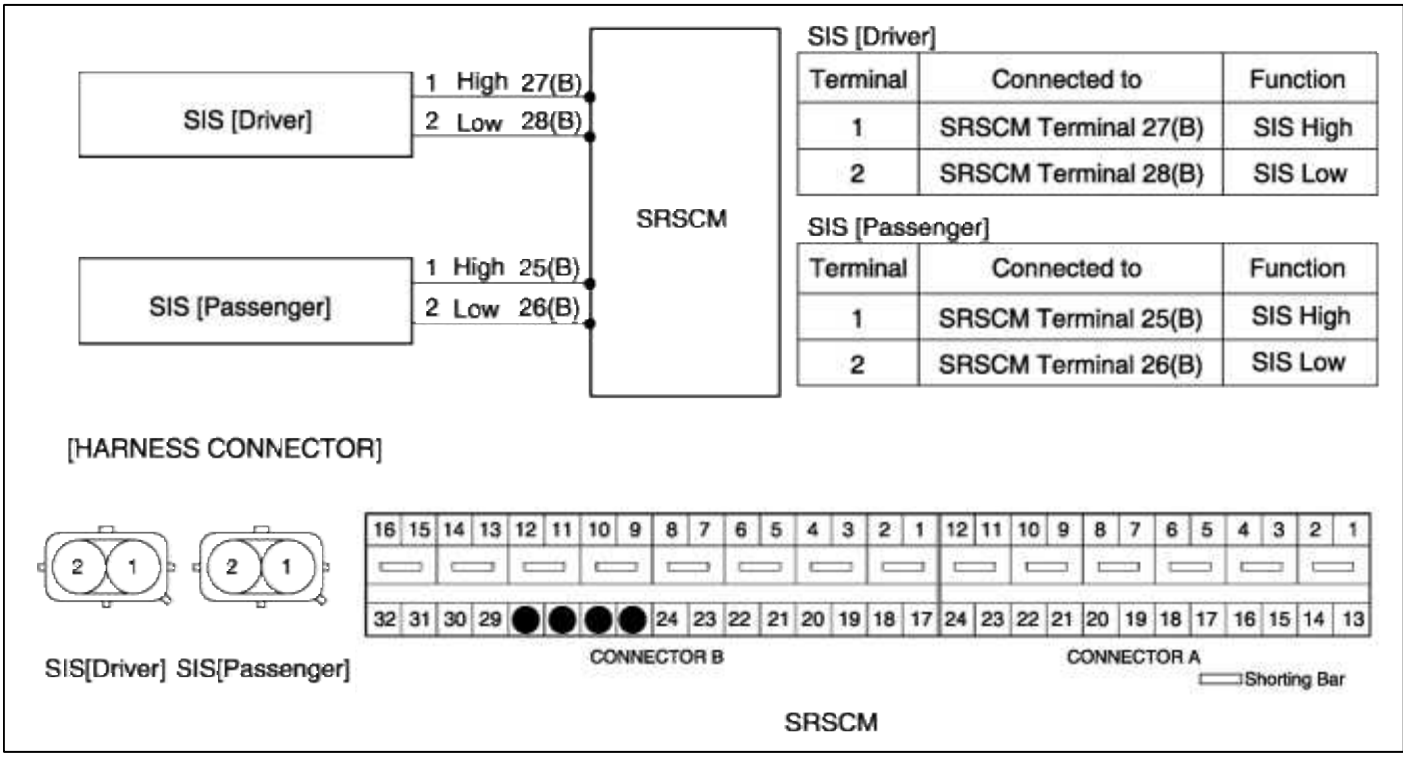
DTC Description

The detecting system for side crash consists of the SRSCM and two Side Impact Sensors (SIS). The SRSCM sets above DTC(s) if it detects that any SIS is defective or there is communication error between any SIS and the SRSCM.

DTC Detecting Condition

DTC	Condition	Probable cause
B1400 B1403 B1409 B1410	• Open between SIS and SRSCM • Side Impact Sensor (SIS) Malfunction • SRSCM Malfunction	• Wiring Harness • Side Impact Sensor (SIS) • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

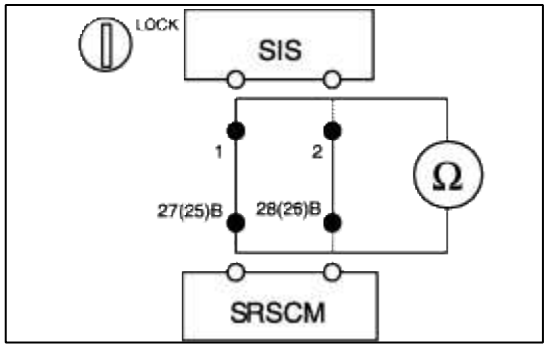
Inspection Procedure

1. PREPARATION

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SIS CIRCUIT
   (1) Measure resistance between the terminal 1 of SIS harness connector and the terminal 27(25) of SRSCM harness connector(B).
   (2) Measure resistance between the terminal 2 of SIS harness connector and the terminal 28(26) of SRSCM harness connector(B).

   Specification (resistance) : below 1 Ω



   (3) Is the measured resistance within specification?

   YES
   Check Side Impact Sensor.

   NO
   Repair or replace the wiring harness between the SIS and the SRSCM.

3. CHECK THE SIDE IMPACT SENSOR
   (1) Replace the Side Impact Sensor(SIS) with a new one.
   ● Refer to "Side Impact Sensor(SIS)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Side Impact Sensor(SIS)?

   YES
   Go to next step.

   NO
   Replace SIS.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1410

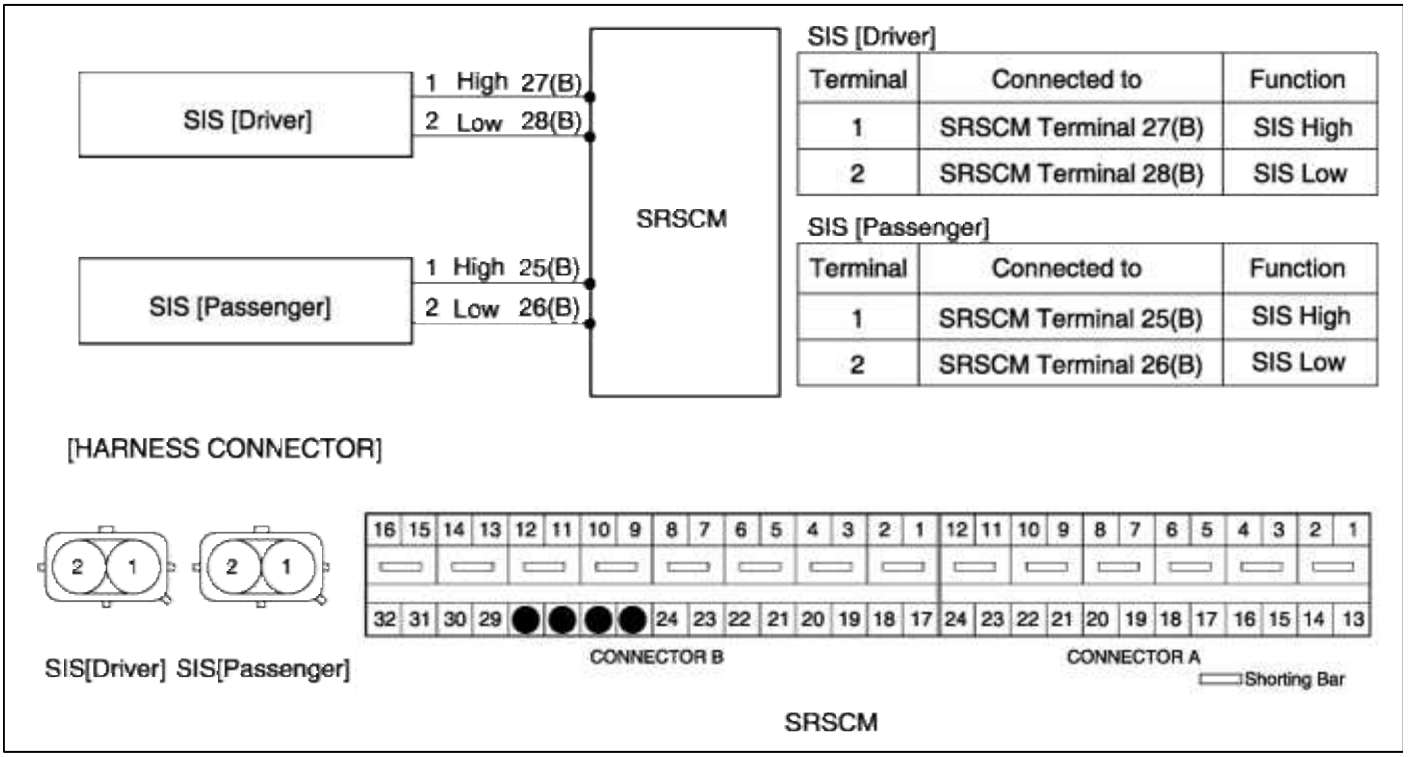
DTC Description

The detecting system for side crash consists of the SRSCM and two Side Impact Sensors (SIS). The SRSCM sets above DTC(s) if it detects that any SIS is defective or there is communication error between any SIS and the SRSCM.

DTC Detecting Condition

DTC	Condition	Probable cause
B1400 B1403 B1409 B1410	• Open between SIS and SRSCM • Side Impact Sensor (SIS) Malfunction • SRSCM Malfunction	• Wiring Harness • Side Impact Sensor (SIS) • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

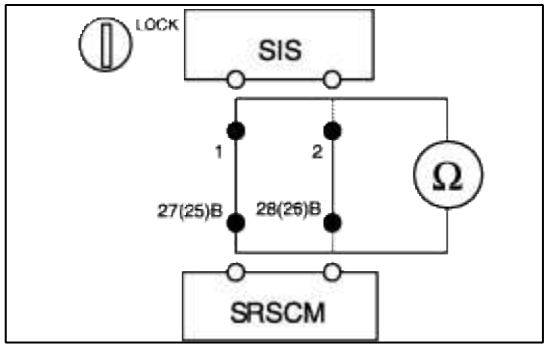
Inspection Procedure

1. PREPARATION

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SIS CIRCUIT
   (1) Measure resistance between the terminal 1 of SIS harness connector and the terminal 27(25) of SRSCM harness connector(B).
   (2) Measure resistance between the terminal 2 of SIS harness connector and the terminal 28(26) of SRSCM harness connector(B).

   Specification (resistance) : below 1 Ω



   (3) Is the measured resistance within specification?

   YES
   Check Side Impact Sensor.

   NO
   Repair or replace the wiring harness between the SIS and the SRSCM.

3. CHECK THE SIDE IMPACT SENSOR
   (1) Replace the Side Impact Sensor(SIS) with a new one.
   ● Refer to "Side Impact Sensor(SIS)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to Side Impact Sensor(SIS)?

   YES
   Go to next step.

   NO
   Replace SIS.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1448

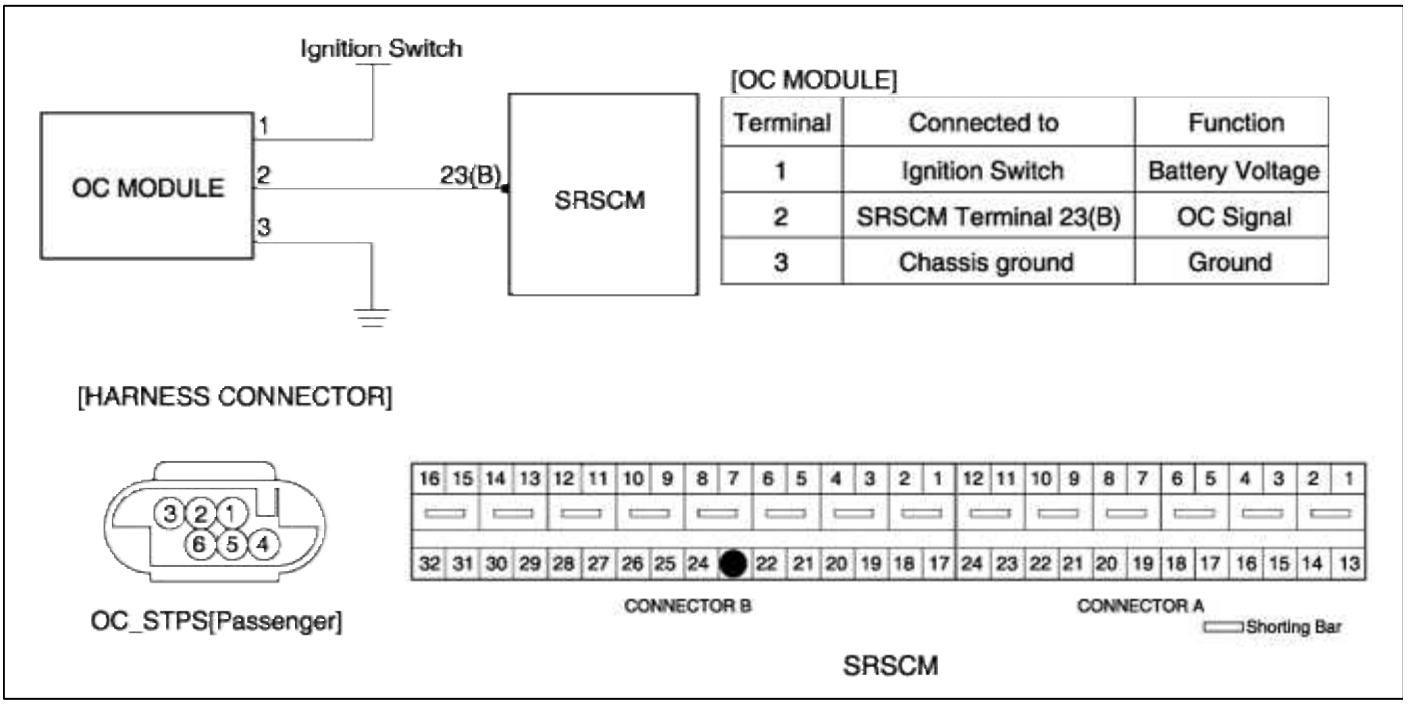
DTC Description

The passenger occupant classification (OC) system consists of the SRSCM and the OC module. The above DTC is recorded when a defect or communication error of the OC module is detected in the OC module circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1448 B1449 B1450	• OC module Malfunction • SRSCM Malfunction	• Wiring Harness • OC module • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

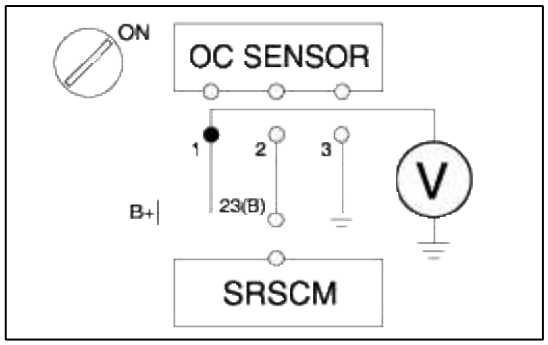
2. CHECK POWER TO OC SENSOR

(1) Connect the battery negative cable to the battery.

(2) Turn the ignition switch to ON.

(3) Measure voltage between the terminal 1 of OC Sensor harness connector and chassis ground.

specification(voltage) : Battery voltage



(4) Is the measured voltage within specification?

YES

Check short to battery line.

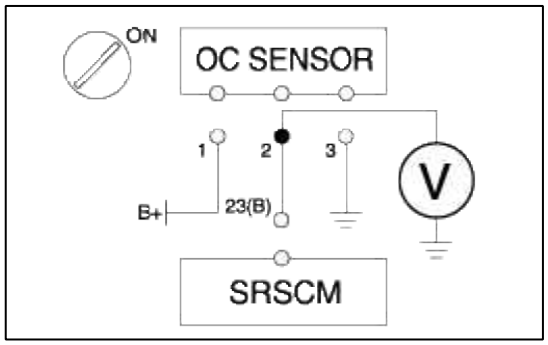
NO

Repair or replace the wiring harness between the OC Sensor and ignition switch.

3. CHECK SHORT TO BATTERY LINE

(1) Measure voltage between the terminal 2 of OC Sensor harness connector and chassis ground.

specification(voltage) : Approximately 0 V



(2) Is the measured voltage within specification?

YES

Check short to ground.

NO

Repair the short to battery line circuit on wiring harness between the OC Sensor and the SRSCM.

4. CHECK SHORT TO GROUND

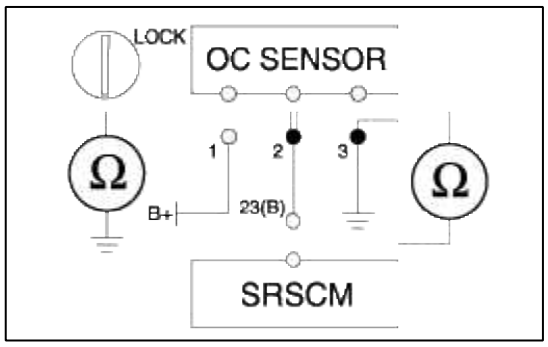
(1) Turn the ignition switch to LOCK.

(2) Disconnect the battery negative cable from the battery.

(3) Measure resistance between the terminal 2 of OC Sensor harness connector and chassis ground.

(4) Measure resistance between the terminal 2 and 3 of OC Sensor harness connector

Specification(resistance) : Infinite



(5) Is the measured resistance within specification?

YES

Check OC Sensor Circuit.

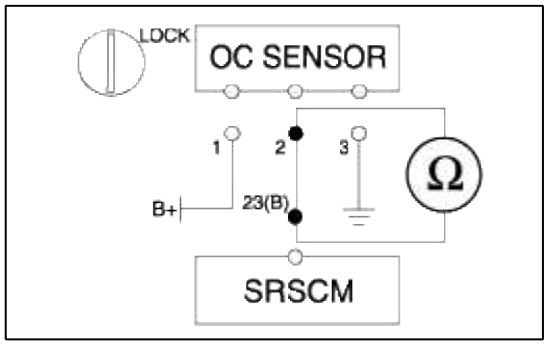
NO

Repair or replace the wiring harness between the OC Sensor and the SRSCM.

5. CHECK OC SENSOR CIRCUIT

(1) Measure resistance between the terminal 2 of OC Sensor harness connector and the terminal 23 of the SRSCM harness connector(B).

specification(resistance) : below 1 Ω



(2) Is the measured resistance within specification?

YES

Check OC Sensor.

NO

Repair or replace the wiring harness between the OC Sensor and the SRSCM.

6. CHECK OC SENSOR
   (1) Replace the OC Sensor with a new one.
      ● Refer to "OC SENSOR" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect the a Hi-Scan(Pro) the the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   (8) Does Hi-Scan(Pro) indicate any DTC related to OC Sensor?
      YES
      Go to next step.
      NO
      Replace the OC Sensor.
7. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1449

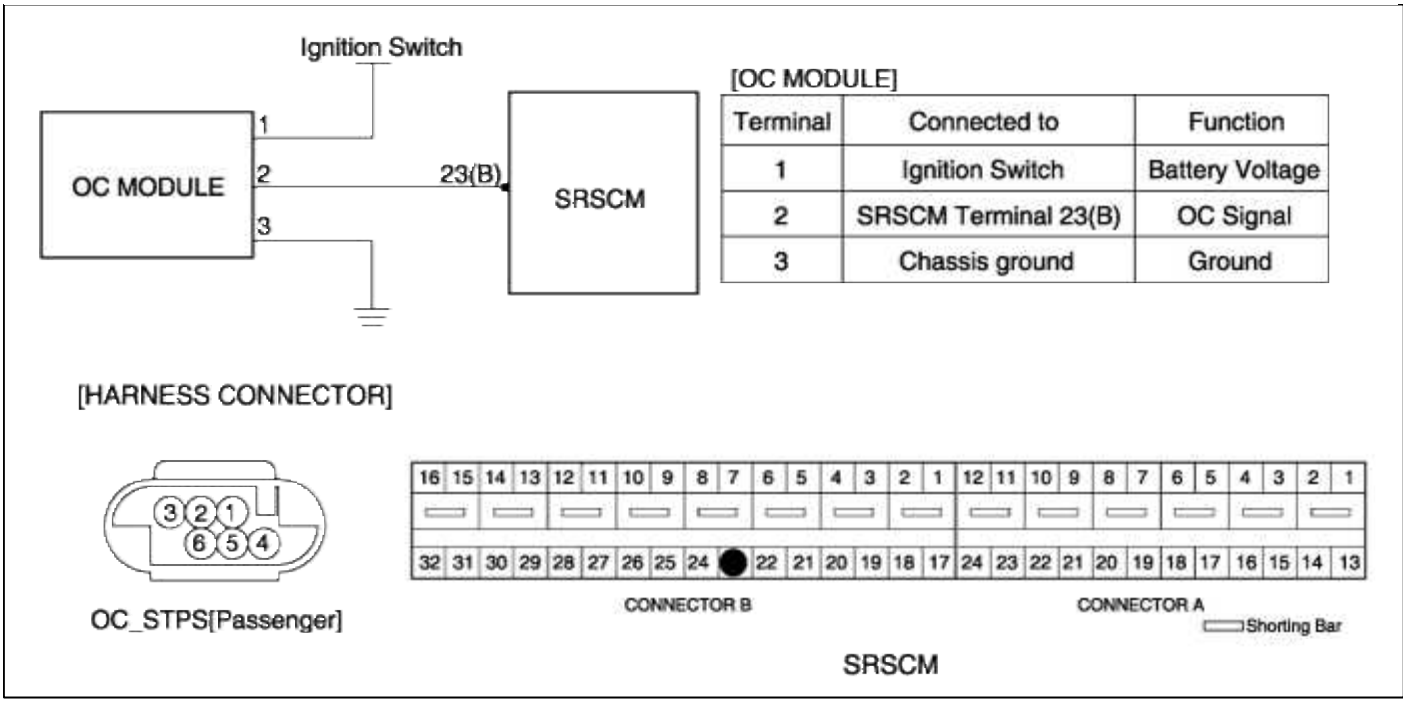
DTC Description

The passenger occupant classification (OC) system consists of the SRSCM and the OC module. The above DTC is recorded when a defect or communication error of the OC module is detected in the OC module circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1448 B1449 B1450	• OC module Malfunction • SRSCM Malfunction	• Wiring Harness • OC module • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

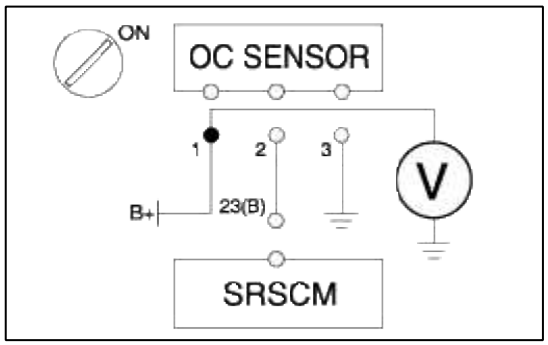
2. CHECK POWER TO OC SENSOR

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 1 of OC Sensor harness connector and chassis ground.

   specification(voltage) : Battery voltage



   (4) Is the measured voltage within specification?

   YES

   Check short to battery line.

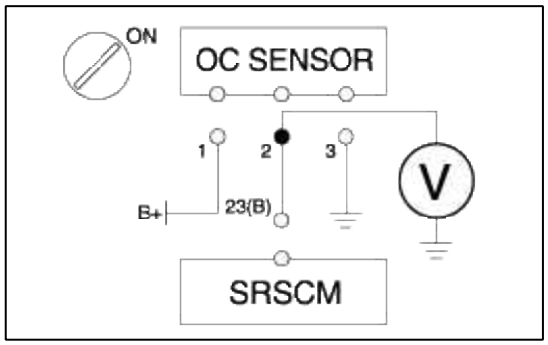
   NO

   Repair or replace the wiring harness between the OC Sensor and ignition switch.

3. CHECK SHORT TO BATTERY LINE

(1) Measure voltage between the terminal 2 of OC Sensor harness connector and chassis ground.

specification(voltage) : Approximately 0 V



(2) Is the measured voltage within specification?

YES

Check short to ground.

NO

Repair the short to battery line circuit on wiring harness between the OC Sensor and the SRSCM.

4. CHECK SHORT TO GROUND

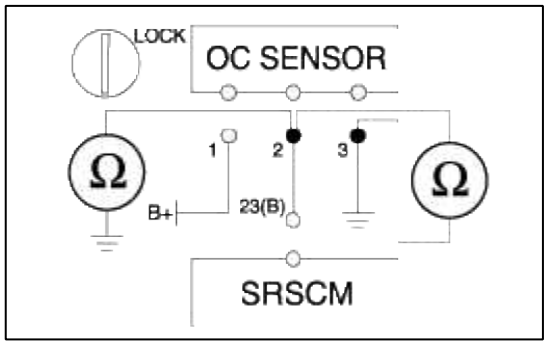
(1) Turn the ignition switch to LOCK.

(2) Disconnect the battery negative cable from the battery.

(3) Measure resistance between the terminal 2 of OC Sensor harness connector and chassis ground.

(4) Measure resistance between the terminal 2 and 3 of OC Sensor harness connector

Specification(resistance) : Infinite



(5) Is the measured resistance within specification?

YES

Check OC Sensor Circuit.

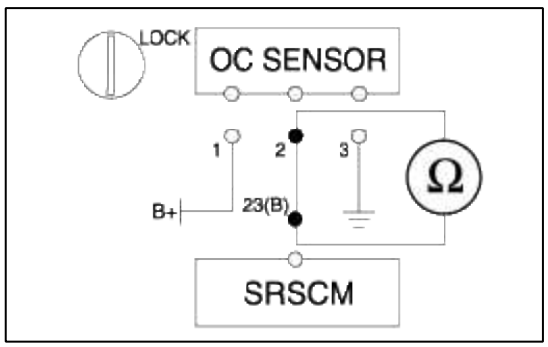
NO

Repair or replace the wiring harness between the OC Sensor and the SRSCM.

5. CHECK OC SENSOR CIRCUIT

(1) Measure resistance between the terminal 2 of OC Sensor harness connector and the terminal 23 of the SRSCM harness connector(B).

specification(resistance) : below 1 Ω



(2) Is the measured resistance within specification?

YES

Check OC Sensor.

NO

Repair or replace the wiring harness between the OC Sensor and the SRSCM.

6. CHECK OC SENSOR

(1) Replace the OC Sensor with a new one.

● Refer to "OC SENSOR" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect the a Hi-Scan(Pro) the the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.

(8) Does Hi-Scan(Pro) indicate any DTC related to OC Sensor?

YES

Go to next step.

NO

Replace the OC Sensor.

7. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1450

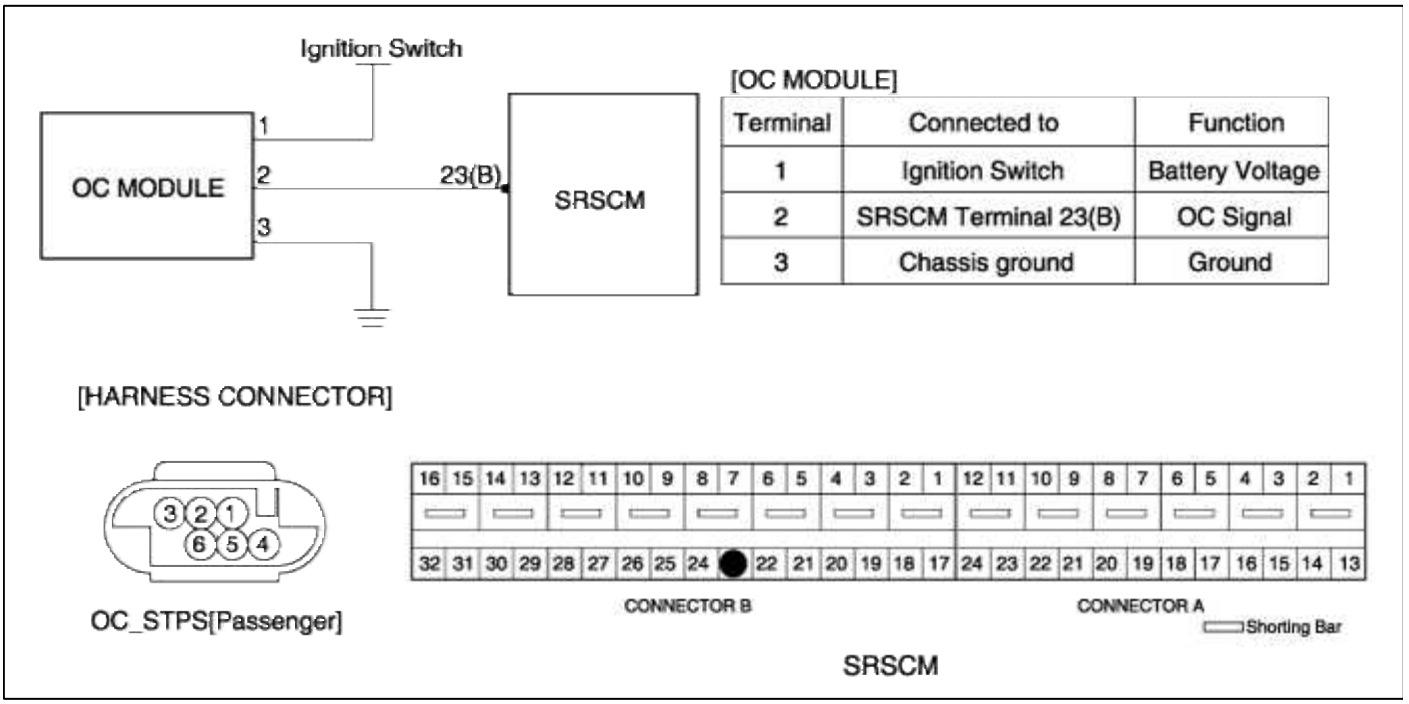
DTC Description

The passenger occupant classification (OC) system consists of the SRSCM and the OC module. The above DTC is recorded when a defect or communication error of the OC module is detected in the OC module circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1448 B1449 B1450	• OC module Malfunction • SRSCM Malfunction	• Wiring Harness • OC module • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

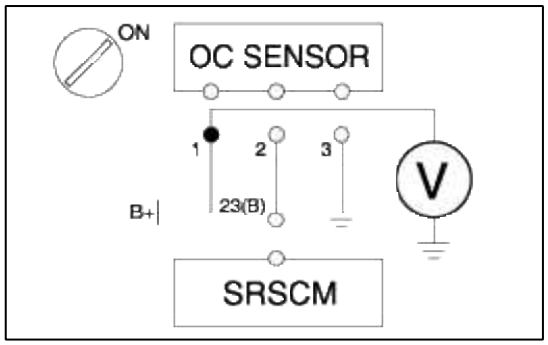
2. CHECK POWER TO OC SENSOR

(1) Connect the battery negative cable to the battery.

(2) Turn the ignition switch to ON.

(3) Measure voltage between the terminal 1 of OC Sensor harness connector and chassis ground.

specification(voltage) : Battery voltage



(4) Is the measured voltage within specification?

YES

Check short to battery line.

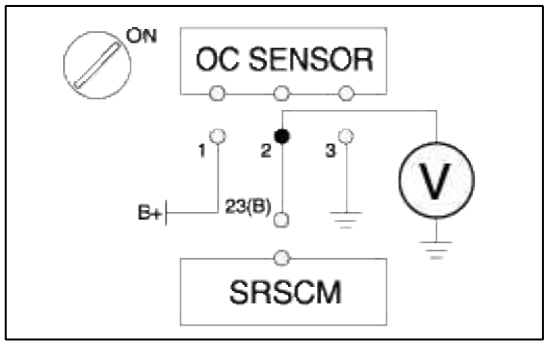
NO

Repair or replace the wiring harness between the OC Sensor and ignition switch.

3. CHECK SHORT TO BATTERY LINE

(1) Measure voltage between the terminal 2 of OC Sensor harness connector and chassis ground.

specification(voltage) : Approximately 0 V



(2) Is the measured voltage within specification?

YES

Check short to ground.

NO

Repair the short to battery line circuit on wiring harness between the OC Sensor and the SRSCM.

4. CHECK SHORT TO GROUND

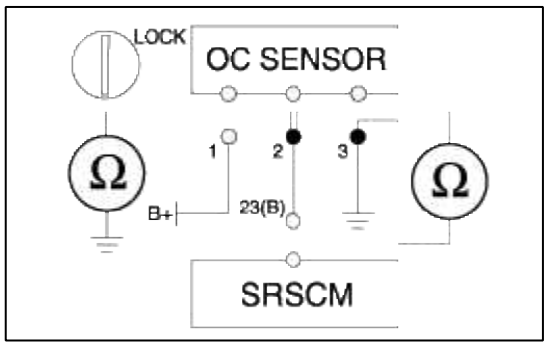
(1) Turn the ignition switch to LOCK.

(2) Disconnect the battery negative cable from the battery.

(3) Measure resistance between the terminal 2 of OC Sensor harness connector and chassis ground.

(4) Measure resistance between the terminal 2 and 3 of OC Sensor harness connector

Specification(resistance) : Infinite



(5) Is the measured resistance within specification?

YES

Check OC Sensor Circuit.

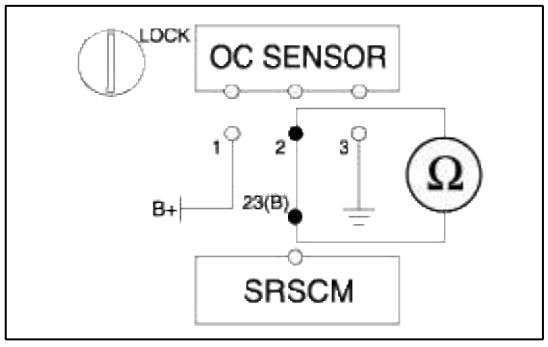
NO

Repair or replace the wiring harness between the OC Sensor and the SRSCM.

5. CHECK OC SENSOR CIRCUIT

(1) Measure resistance between the terminal 2 of OC Sensor harness connector and the terminal 23 of the SRSCM harness connector(B).

specification(resistance) : below 1 Ω



(2) Is the measured resistance within specification?

YES

Check OC Sensor.

NO

Repair or replace the wiring harness between the OC Sensor and the SRSCM.

6. CHECK OC SENSOR
   (1) Replace the OC Sensor with a new one.
      ● Refer to "OC SENSOR" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect the a Hi-Scan(Pro) the the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   (8) Does Hi-Scan(Pro) indicate any DTC related to OC Sensor?
      YES
      Go to next step.
      NO
      Replace the OC Sensor.
7. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1473

DTC Description

The CAB squib circuit consists of the SRSCM and two Curtain Airbags(CAB). It causes the SRS to deploy when the SRS deployment conditions are satisfied. The above DTC is recorded when the CAB resistance too high or low is detected in the CAB squib circuit.

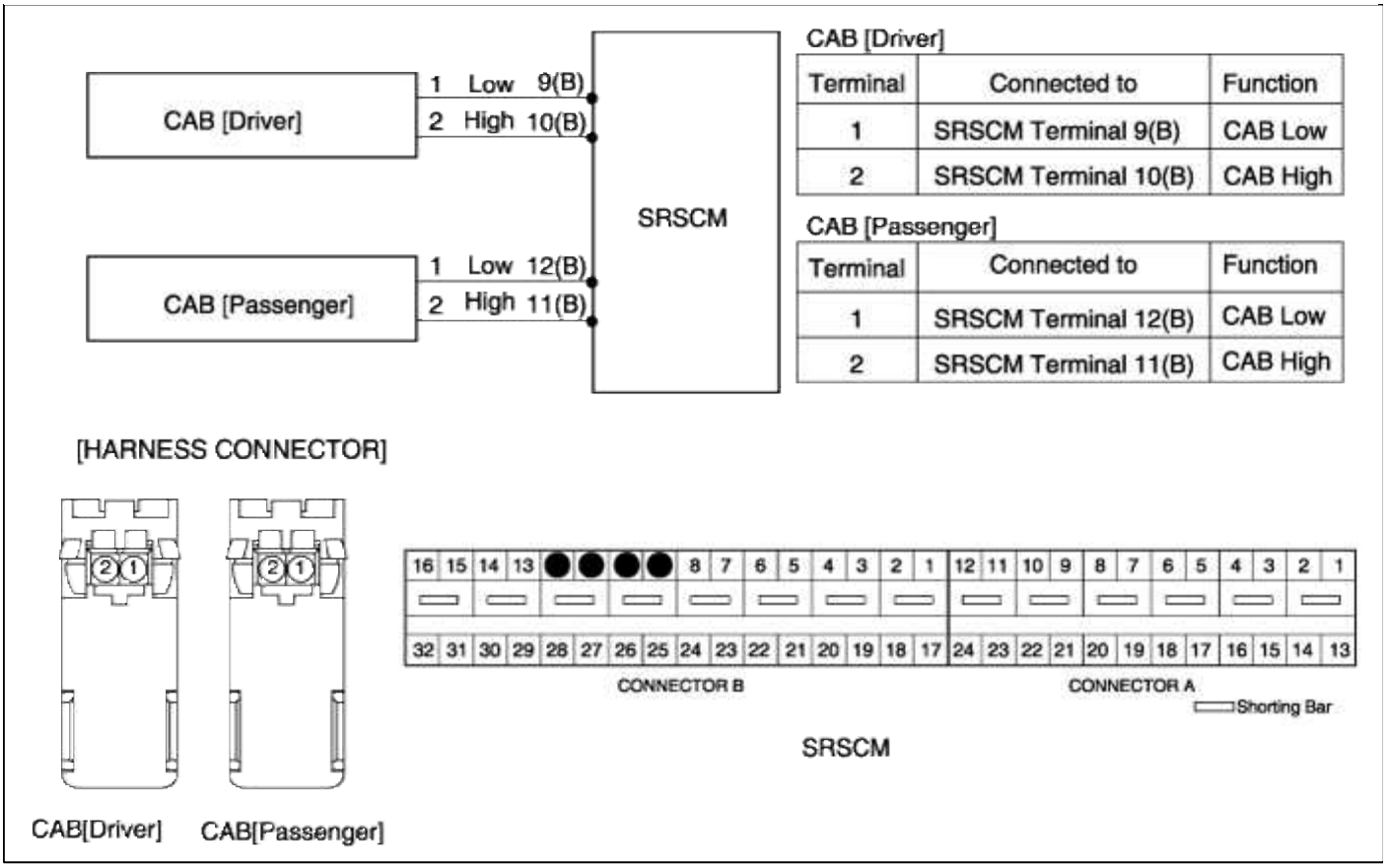
DTC Detecting Condition

DTC	Condition	Probable cause
B1473 B1474 B1477 B1478	• Too high or low resistance between CAB high(+) and CAB low(-) • Curtain Airbag (CAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Curtain Airbag (CAB) squib • SRSCM

Specification

CAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK CAB RESISTANCE

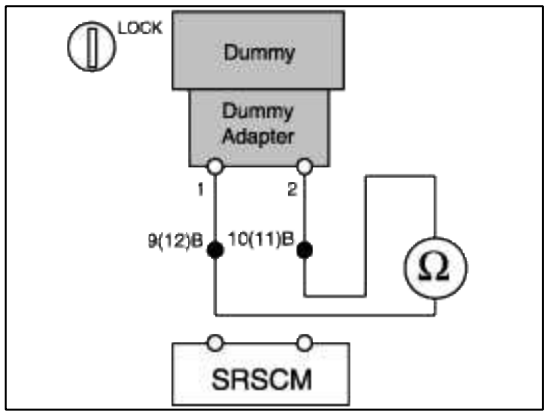
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on CAB harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 10(11) and 9(12) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Curtain Airbag(CAB) module.

NO

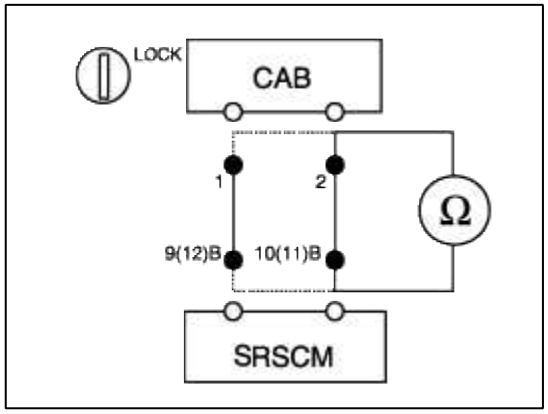
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of CAB harness connector and the terminal 10(11) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 1 of CAB harness connector and the terminal 9(12) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

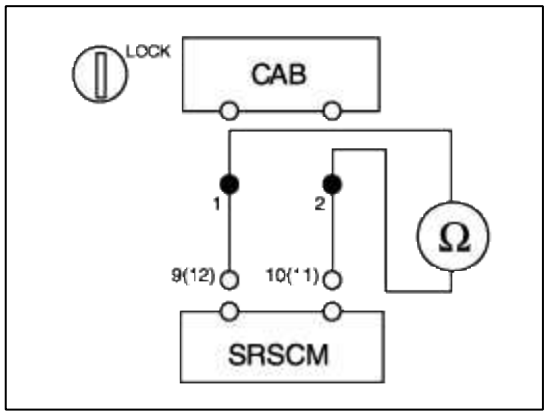
Check short circuit.

NO

Repair or replace the wiring harness between the CAB and the SRSCM.

4. CHECK SHORT CIRCUIT
(1) Measure resistance between the terminal 1 and 2 of CAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES
Go to next step.

NO
Repair or replace the wiring harness between the CAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1474

DTC Description

The CAB squib circuit consists of the SRSCM and two Curtain Airbags(CAB). It causes the SRS to deploy when the SRS deployment conditions are satisfied. The above DTC is recorded when the CAB resistance too high or low is detected in the CAB squib circuit.

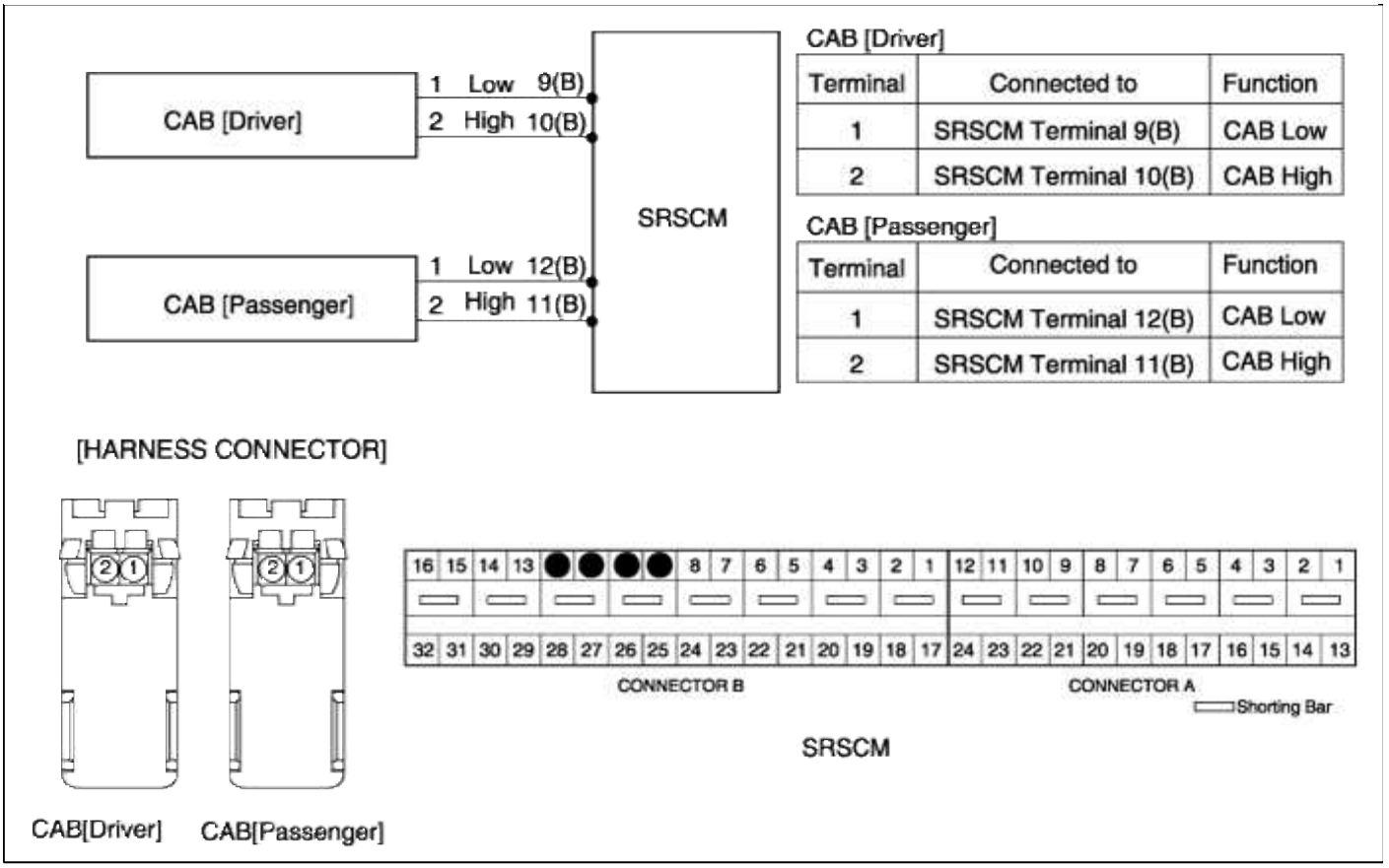
DTC Detecting Condition

DTC	Condition	Probable cause
B1473 B1474 B1477 B1478	• Too high or low resistance between CAB high(+) and CAB low(-) • Curtain Airbag (CAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Curtain Airbag (CAB) squib • SRSCM

Specification

CAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



CAB [Driver]

Terminal	Connected to	Function
1	SRSCM Terminal 9(B)	CAB Low
2	SRSCM Terminal 10(B)	CAB High

CAB [Passenger]

Terminal	Connected to	Function
1	SRSCM Terminal 12(B)	CAB Low
2	SRSCM Terminal 11(B)	CAB High

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK CAB RESISTANCE

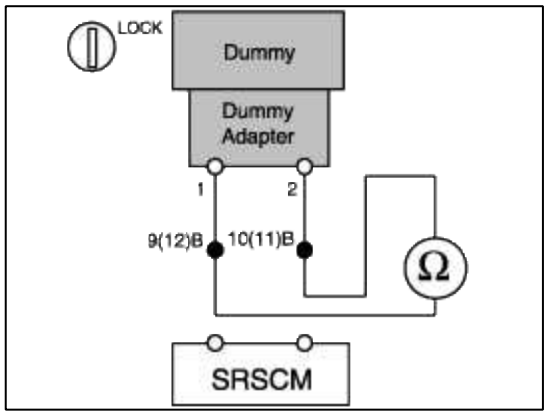
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on CAB harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 10(11) and 9(12) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Curtain Airbag(CAB) module.

NO

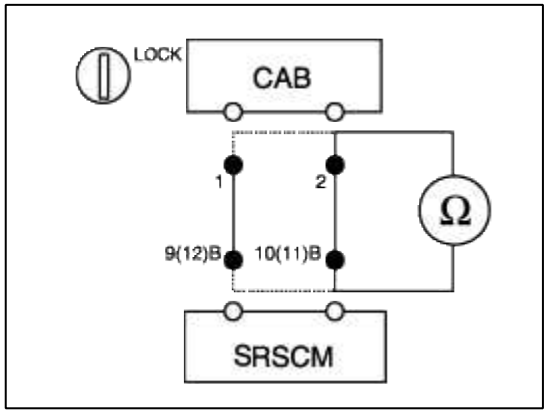
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of CAB harness connector and the terminal 10(11) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 1 of CAB harness connector and the terminal 9(12) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

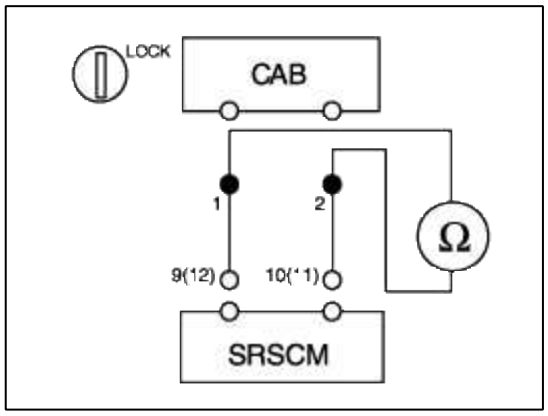
Check short circuit.

NO

Repair or replace the wiring harness between the CAB and the SRSCM.

4. CHECK SHORT CIRCUIT
(1) Measure resistance between the terminal 1 and 2 of CAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES
Go to next step.

NO
Repair or replace the wiring harness between the CAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1475

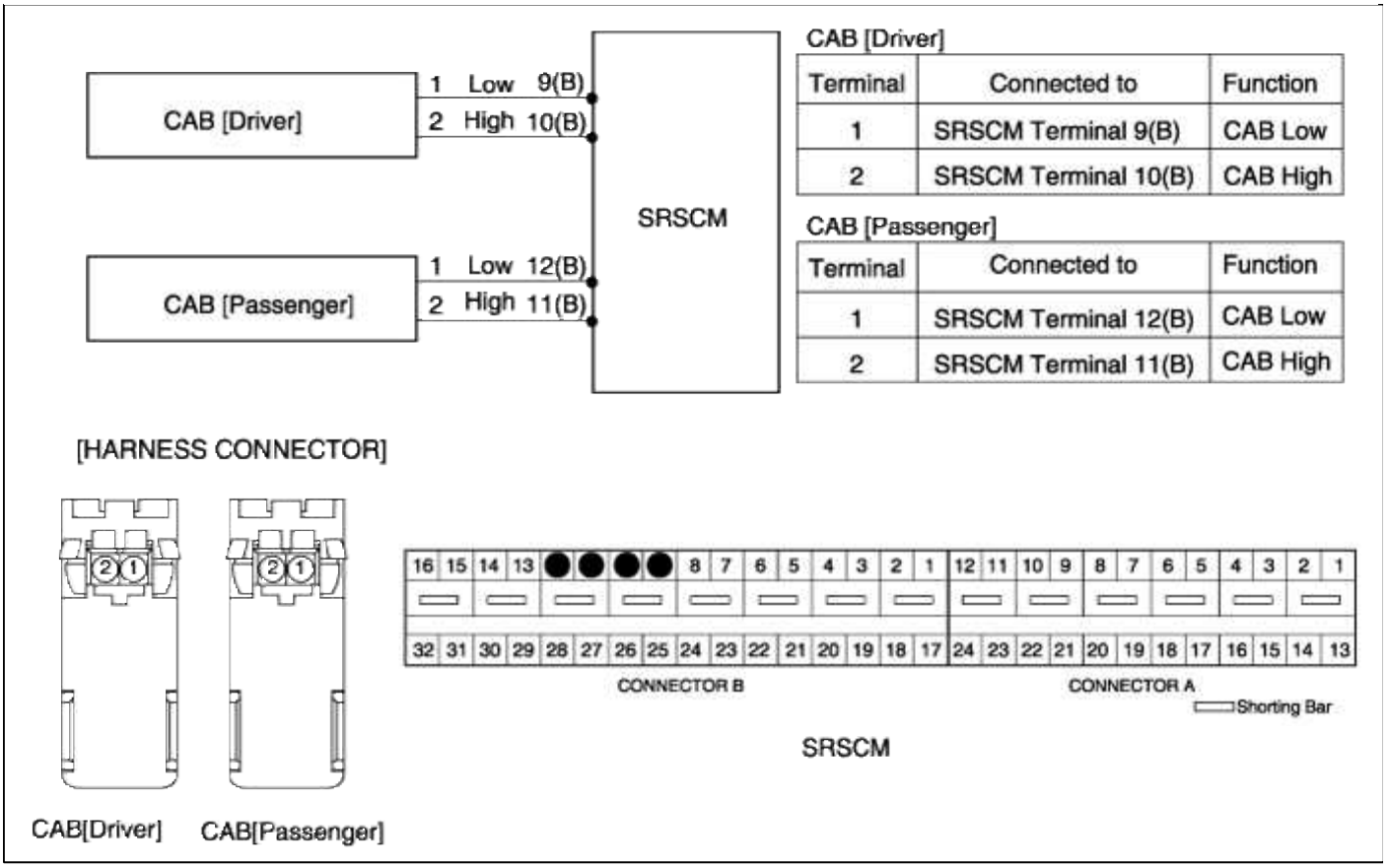
DTC Description

The CAB squib circuit consists of the SRSCM and CAB. It causes the SRS to deploy when the SRS deployment conditions are satisfied. The above DTC is recorded when short to ground is detected in the CAB squib circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1475 B1479	• Short to ground between CAB and SRSCM • Curtain Airbag (CAB) Malfunction • SRSCM Malfunction	• Short to ground circuit on wiring harness • Curtain Airbag (CAB) squib • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

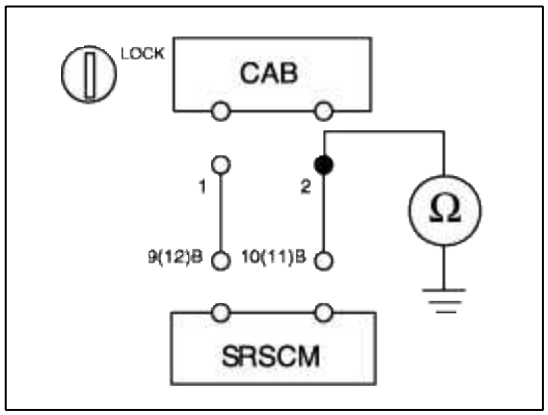
1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 2 of CAB harness connector and chassis ground.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Check the CAB Module..

NO

Repair or replace the wiring harness between the CAB and the SRSCM.

3. CHECK THE CAB MODULE

(1) Replace the Curtain Airbag(CAB) with a new one.

● Refer to "Curtain Airbag(CAB)" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to Curtain Airbag(CAB)?

YES

Go to next step.

NO

Replace CAB module.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1476

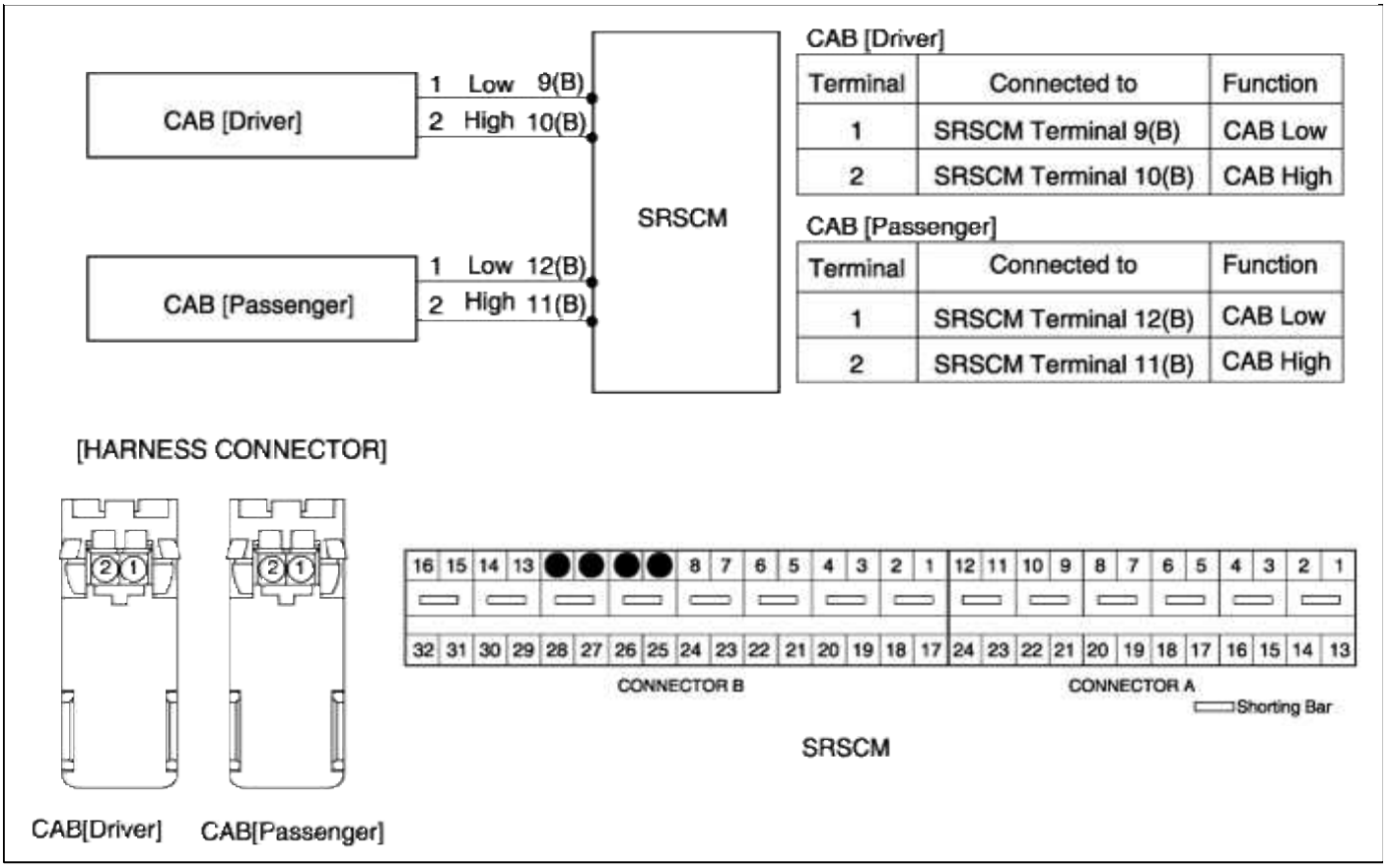
DTC Description

The CAB squib circuit consists of the SRSCM and CAB. It causes the SRS to deploy when the SRS deployment conditions are satisfied. The above DTC is recorded when short to battery is detected in the CAB squib circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1476 B1480	• Short to battery between CAB and SRSCM • Curtain Airbag (CAB) Malfunction • SRSCM Malfunction	• Short to battery line circuit on wiring harness • Curtain Airbag (CAB) squib • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

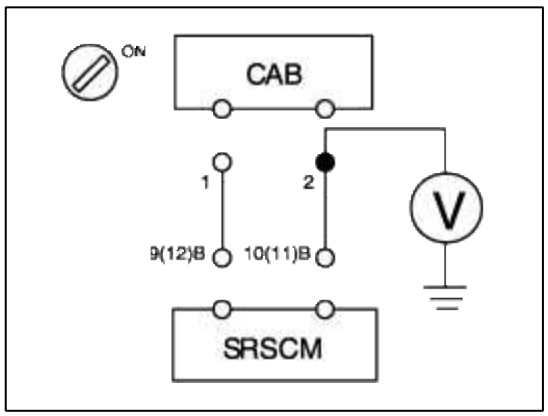
2. CHECK SHORT TO BATTERY LINE

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 1 of CAB harness connector and chassis ground.

Specification (voltage) : Approximately 0 V



(4) Is the measured voltage within specification?

YES

Check the CAB Module.

NO

Repair the short to battery line circuit on wiring harness between the CAB and the SRSCM.

3. CHECK THE CAB MODULE

(1) Replace the Curtain Airbag(CAB) with a new one.

● Refer to "Curtain Airbag(CAB)" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to Curtain Airbag(CAB)?

YES

Go to next step.

NO

Replace CAB module.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1477

DTC Description

The CAB squib circuit consists of the SRSCM and two Curtain Airbags(CAB). It causes the SRS to deploy when the SRS deployment conditions are satisfied. The above DTC is recorded when the CAB resistance too high or low is detected in the CAB squib circuit.

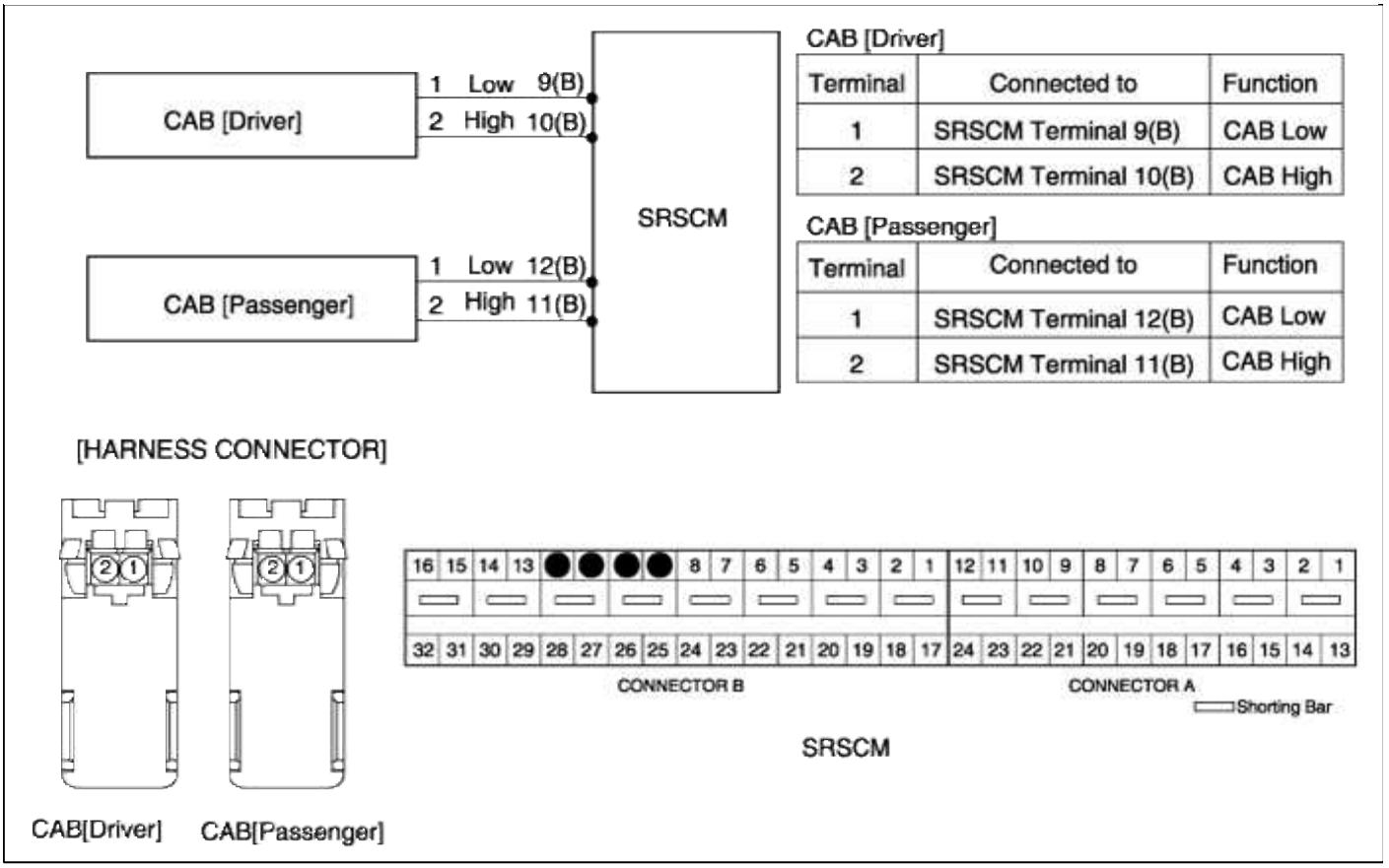
DTC Detecting Condition

DTC	Condition	Probable cause
B1473 B1474 B1477 B1478	• Too high or low resistance between CAB high(+) and CAB low(-) • Curtain Airbag (CAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Curtain Airbag (CAB) squib • SRSCM

Specification

CAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK CAB RESISTANCE

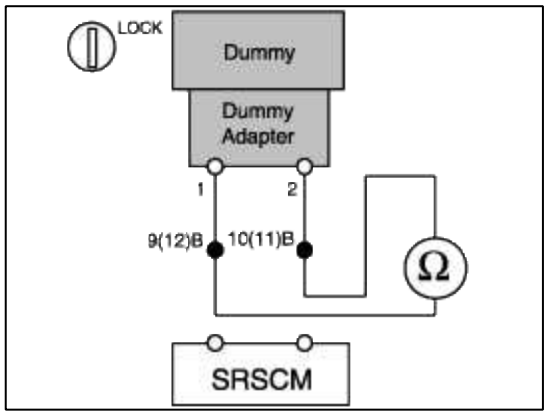
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on CAB harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 10(11) and 9(12) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Curtain Airbag(CAB) module.

NO

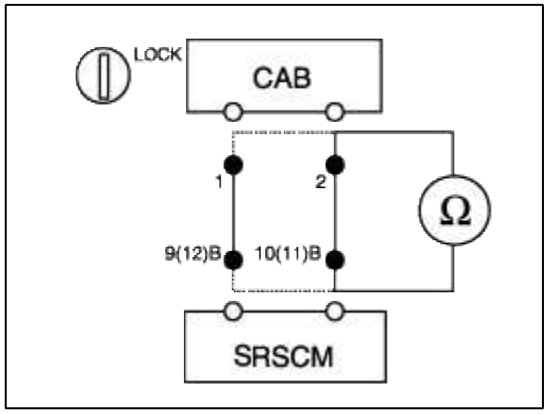
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of CAB harness connector and the terminal 10(11) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 1 of CAB harness connector and the terminal 9(12) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

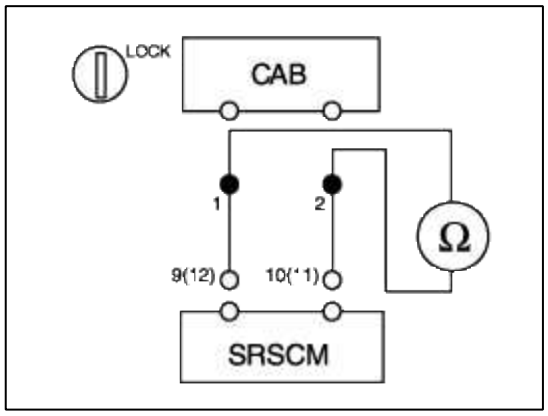
Check short circuit.

NO

Repair or replace the wiring harness between the CAB and the SRSCM.

4. CHECK SHORT CIRCUIT
(1) Measure resistance between the terminal 1 and 2 of CAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES
Go to next step.

NO
Repair or replace the wiring harness between the CAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1478

DTC Description

The CAB squib circuit consists of the SRSCM and two Curtain Airbags(CAB). It causes the SRS to deploy when the SRS deployment conditions are satisfied. The above DTC is recorded when the CAB resistance too high or low is detected in the CAB squib circuit.

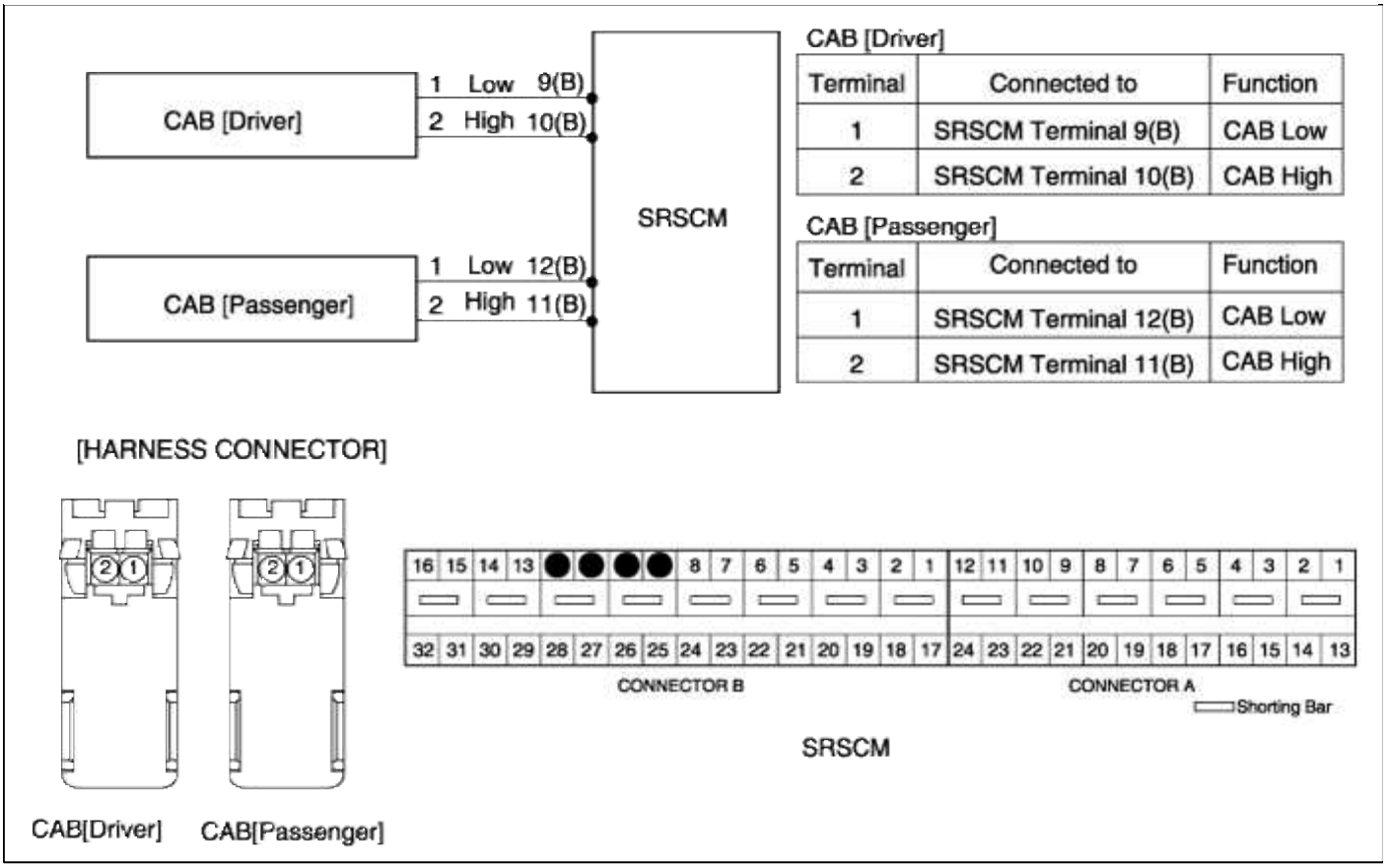
DTC Detecting Condition

DTC	Condition	Probable cause
B1473 B1474 B1477 B1478	• Too high or low resistance between CAB high(+) and CAB low(-) • Curtain Airbag (CAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Curtain Airbag (CAB) squib • SRSCM

Specification

CAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK CAB RESISTANCE

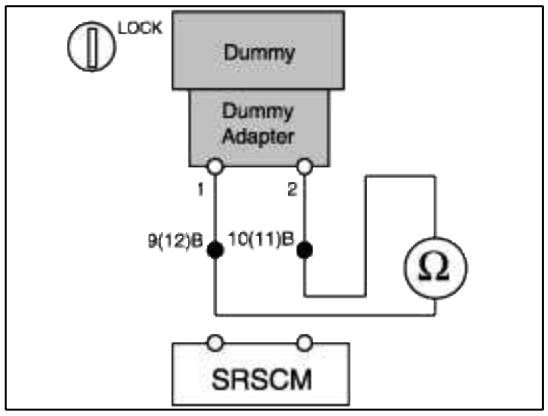
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on CAB harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 10(11) and 9(12) of SRSCM harness connector(B).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Curtain Airbag(CAB) module.

NO

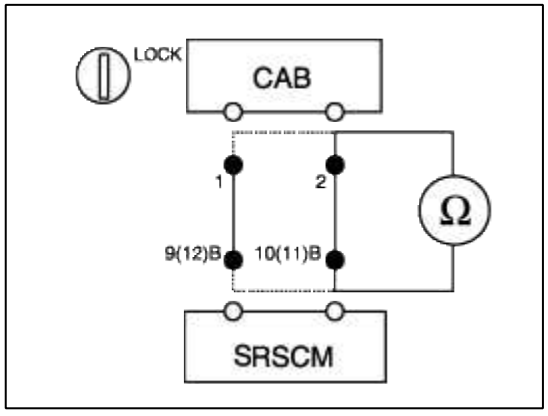
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 2 of CAB harness connector and the terminal 10(11) of SRSCM harness connector(B).

(2) Measure resistance between the terminal 1 of CAB harness connector and the terminal 9(12) of SRSCM harness connector(B).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

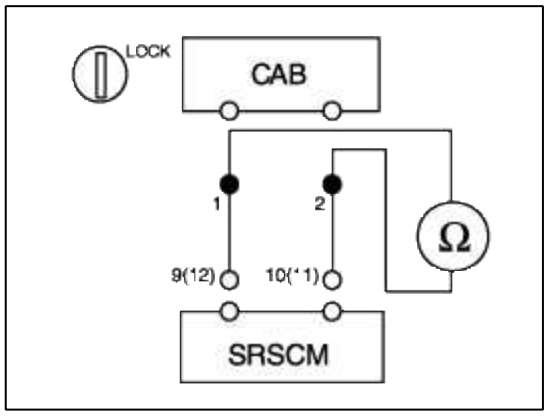
Check short circuit.

NO

Repair or replace the wiring harness between the CAB and the SRSCM.

4. CHECK SHORT CIRCUIT
(1) Measure resistance between the terminal 1 and 2 of CAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES
Go to next step.

NO
Repair or replace the wiring harness between the CAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1479

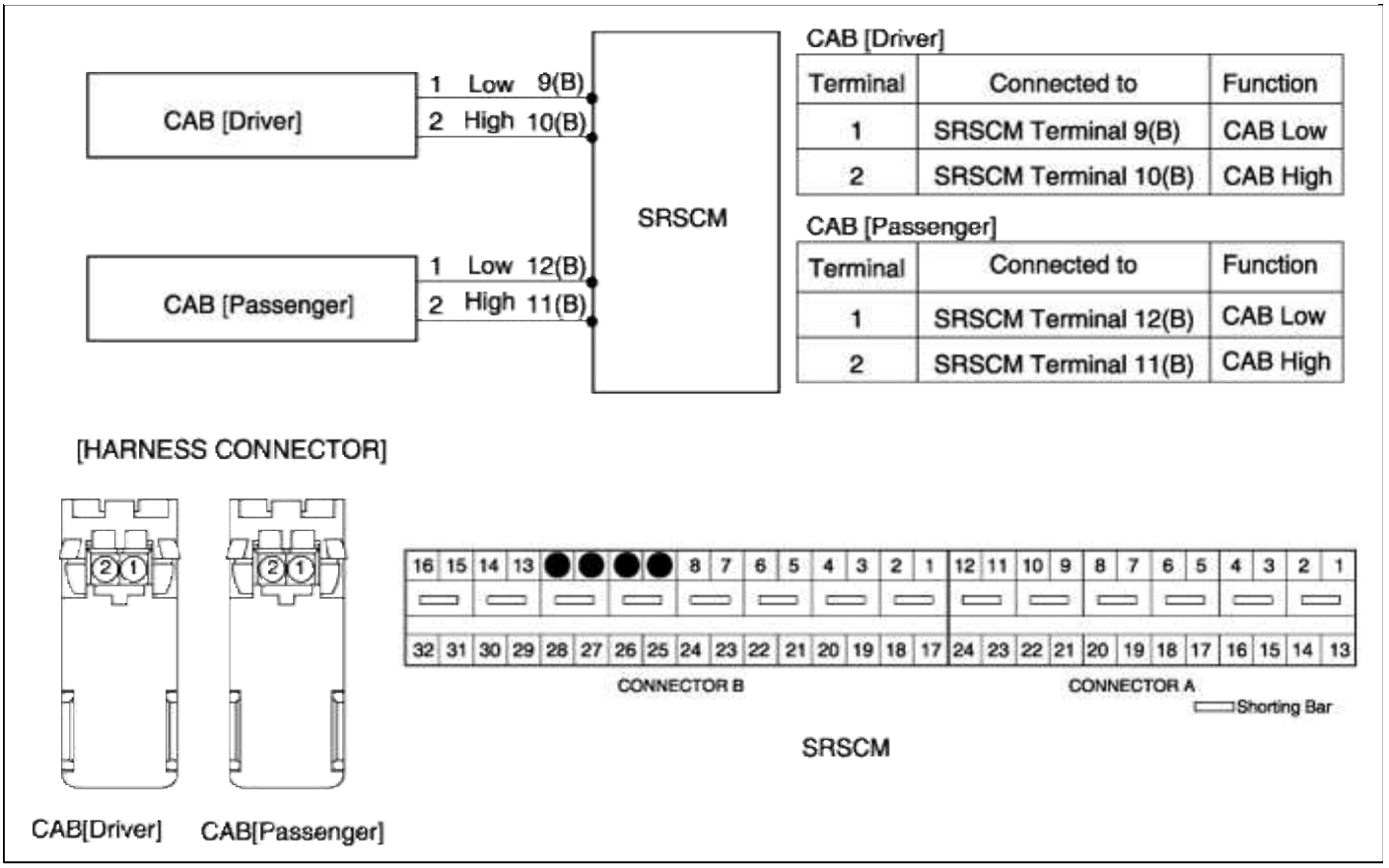
DTC Description

The CAB squib circuit consists of the SRSCM and CAB. It causes the SRS to deploy when the SRS deployment conditions are satisfied. The above DTC is recorded when short to ground is detected in the CAB squib circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1475 B1479	• Short to ground between CAB and SRSCM • Curtain Airbag (CAB) Malfunction • SRSCM Malfunction	• Short to ground circuit on wiring harness • Curtain Airbag (CAB) squib • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

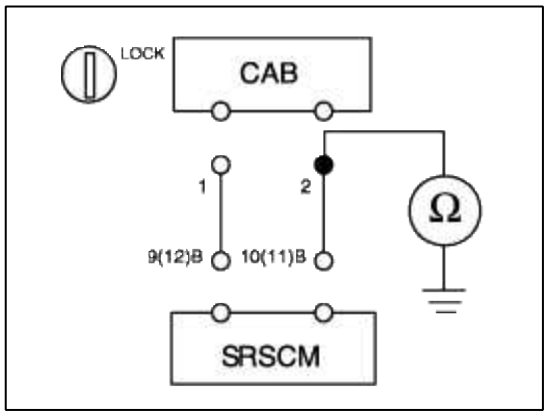
1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 2 of CAB harness connector and chassis ground.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Check the CAB Module..

NO

Repair or replace the wiring harness between the CAB and the SRSCM.

3. CHECK THE CAB MODULE

(1) Replace the Curtain Airbag(CAB) with a new one.

● Refer to "Curtain Airbag(CAB)" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to Curtain Airbag(CAB)?

YES

Go to next step.

NO

Replace CAB module.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1480

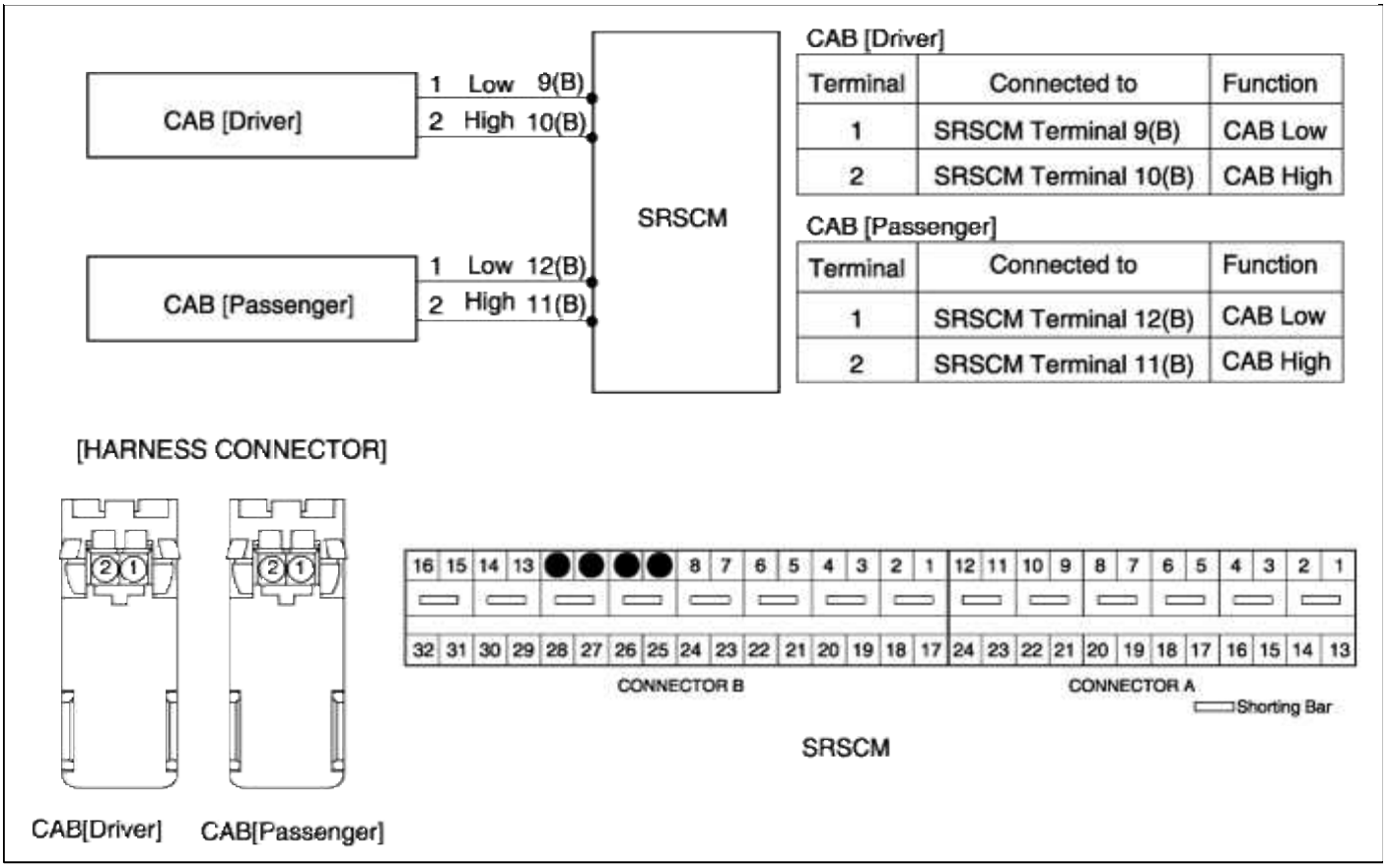
DTC Description

The CAB squib circuit consists of the SRSCM and CAB. It causes the SRS to deploy when the SRS deployment conditions are satisfied. The above DTC is recorded when short to battery is detected in the CAB squib circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1476 B1480	• Short to battery between CAB and SRSCM • Curtain Airbag (CAB) Malfunction • SRSCM Malfunction	• Short to battery line circuit on wiring harness • Curtain Airbag (CAB) squib • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

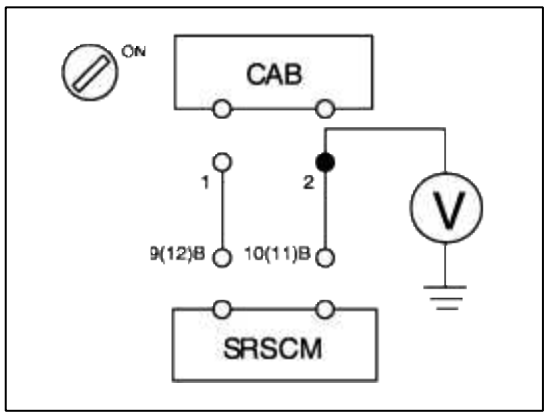
2. CHECK SHORT TO BATTERY LINE

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 1 of CAB harness connector and chassis ground.

   Specification (voltage) : Approximately 0 V



(4) Is the measured voltage within specification?

YES

Check the CAB Module.

NO

Repair the short to battery line circuit on wiring harness between the CAB and the SRSCM.

3. CHECK THE CAB MODULE

(1) Replace the Curtain Airbag(CAB) with a new one.

● Refer to "Curtain Airbag(CAB)" section in this SERVICE MANUAL.

(2) Install the DAB module and connect the DAB connector.

(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.

(4) Connect the SRSCM connector.

(5) Connect the battery negative cable to the battery.

(6) Connect a Hi-Scan(Pro) to the data link connector.

(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to Curtain Airbag(CAB)?

YES

Go to next step.

NO

Replace CAB module.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1481

DTC Description

The Driver Airbag circuit consists of the SRSCM, Clockspring and the Driver Airbag (DAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects that the resistance of DAB squib is too high or low.

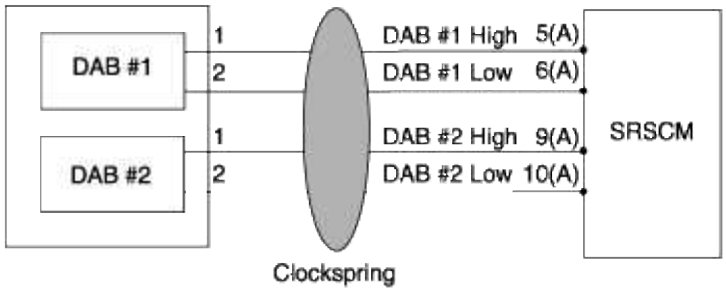
DTC Detecting Condition

DTC	Condition	Probable cause
B1481 B1482	• Too high or low resistance between DAB high(+) and DAB low (-) • Driver Airbag (DAB) Malfunction • Clockspring Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Driver Airbag (DAB) squib • Clockspring • SRSCM

Specification

DAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



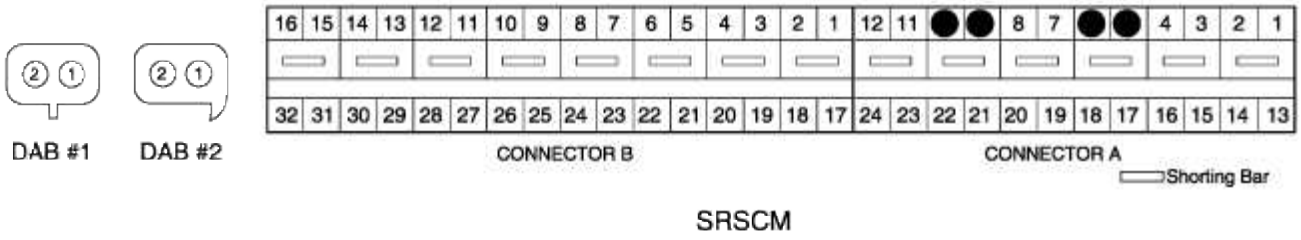
DAB #1

Terminal	Connected to	Function
1	SRSCM Terminal 5(A)	DAB #1 High
2	SRSCM Terminal 6(A)	DAB #1 Low

DAB #2

Terminal	Connected to	Function
1	SRSCM Terminal 9(A)	DAB #2 High
2	SRSCM Terminal 10(A)	DAB #2 Low

[HARNESS CONNECTOR]



SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK DAB RESISTANCE

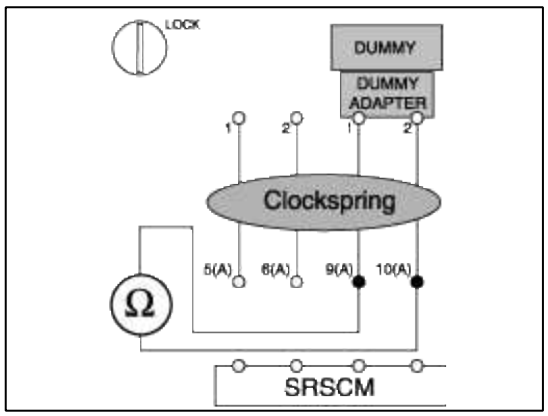
> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on DAB harness connector.

●Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 9 and 10 of SRSCM harness connector(A).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

NO

Check open circuit.

YES

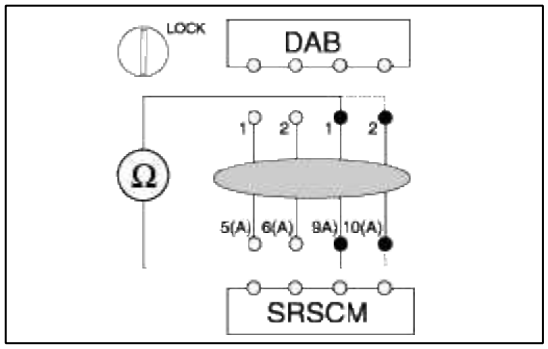
Replace the Driver Airbag(DAB) module.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of DAB harness connector and the terminal 9 of SRSCM harness connector(A).

(2) Measure resistance between the terminal 2 of DAB harness connector and the terminal 10 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

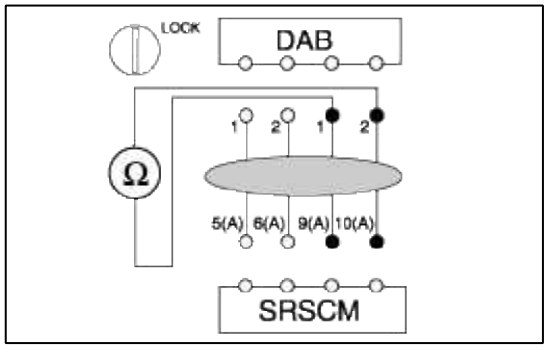
NO

Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of DAB harness connector.

Specification (resistance) : ∞ Ω



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1482

DTC Description

The Driver Airbag circuit consists of the SRSCM, Clockspring and the Driver Airbag (DAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects that the resistance of DAB squib is too high or low.

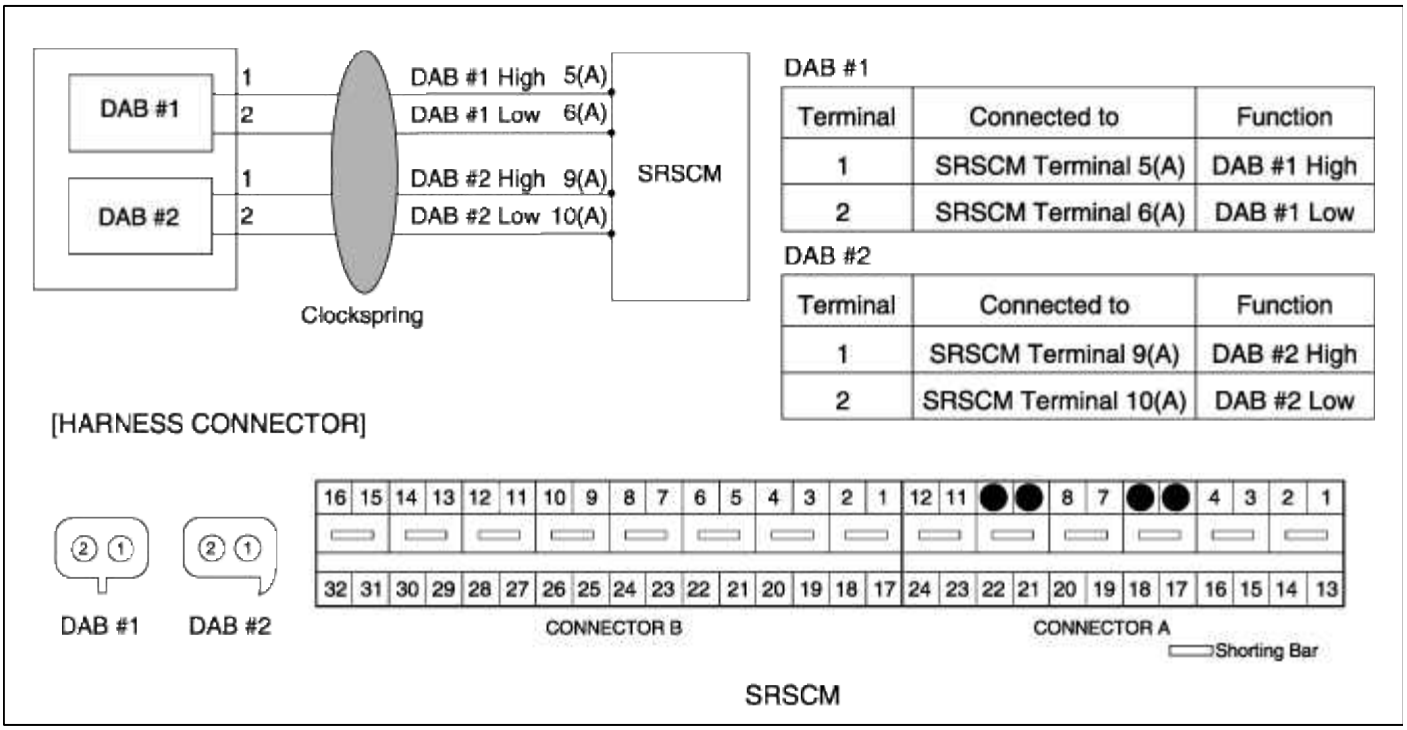
DTC Detecting Condition

DTC	Condition	Probable cause
B1481 B1482	• Too high or low resistance between DAB high(+) and DAB low (-) • Driver Airbag (DAB) Malfunction • Clockspring Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Driver Airbag (DAB) squib • Clockspring • SRSCM

Specification

DAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



DAB #1

Terminal	Connected to	Function
1	SRSCM Terminal 5(A)	DAB #1 High
2	SRSCM Terminal 6(A)	DAB #1 Low

DAB #2

Terminal	Connected to	Function
1	SRSCM Terminal 9(A)	DAB #2 High
2	SRSCM Terminal 10(A)	DAB #2 Low

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

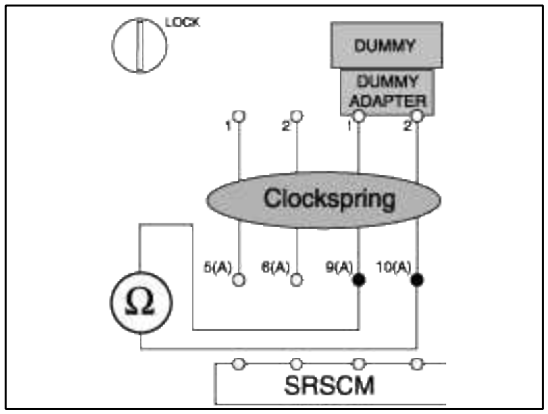
1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK DAB RESISTANCE

> CAUTION
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on DAB harness connector.
●Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 9 and 10 of SRSCM harness connector(A).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

NO
Check open circuit.

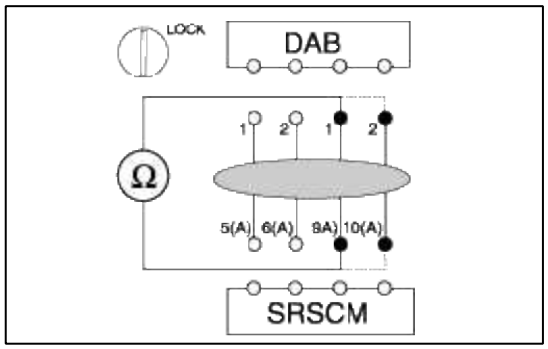
YES
Replace the Driver Airbag(DAB) module.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of DAB harness connector and the terminal 9 of SRSCM harness connector(A).

(2) Measure resistance between the terminal 2 of DAB harness connector and the terminal 10 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

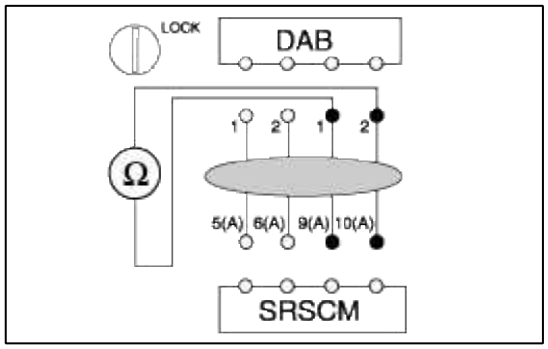
NO

Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 1 and 2 of DAB harness connector.

Specification (resistance) : ∞ Ω



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1483

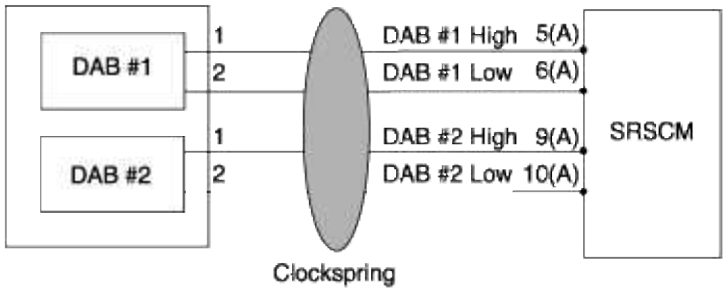
DTC Description

The Driver Airbag circuit consists of the SRSCM, Clockspring and the Driver Airbag (DAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects short to ground on the DAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1348 B1483	• Short to ground between DAB and clockspring • Short to ground between clockspring and SRSCM • Driver Airbag (DAB) Malfunction • Clockspring Malfunction • SRSCM Malfunction	• Short to ground circuit on wiring harness • Driver Airbag (DAB) squib • Clockspring • SRSCM

Schematic Diagram



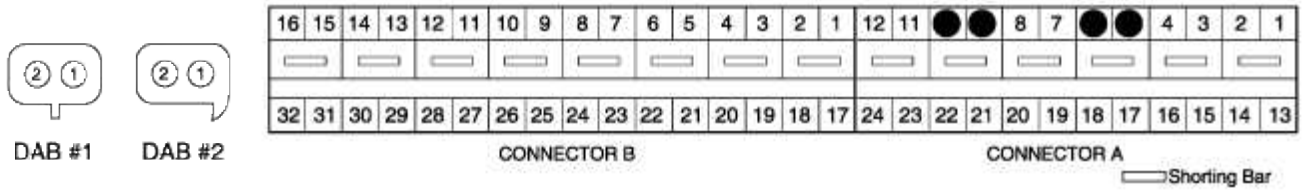
DAB #1

Terminal	Connected to	Function
1	SRSCM Terminal 5(A)	DAB #1 High
2	SRSCM Terminal 6(A)	DAB #1 Low

DAB #2

Terminal	Connected to	Function
1	SRSCM Terminal 9(A)	DAB #2 High
2	SRSCM Terminal 10(A)	DAB #2 Low

[HARNESS CONNECTOR]



SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

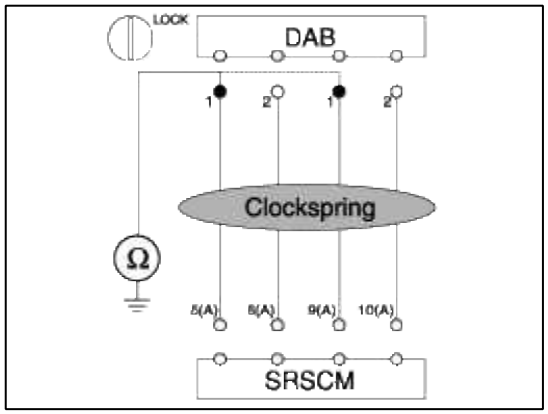
1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 1 of DAB harness connector and chassis ground.

   Specification (resistance) : infinite



   (2) Is the measured resistance within specification?

   YES

   Check the DAB Module.

   NO

   Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

3. CHECK THE DAB MODULE
   (1) Replace the Driver Airbag(DAB) with a new one.
   ● Refer to "Driver Airbag(DAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to DAB?
   YES
   Check the clockspring.
   NO
   Replace the Driver Airbag(DAB).
4. CHECK THE CLOCKSPRING
   (1) Check the clockspring.
   Is the clockspring normal?
   YES
   Go to next step.
   NO
   Replace the clockspring.
5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1484

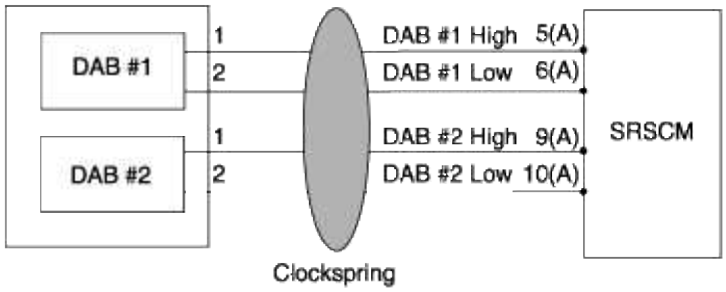
DTC Description

The Driver Airbag circuit consists of the SRSCM, Clockspring and the Driver Airbag (DAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects short to battery line on the DAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1349 B1484	• Short to battery line between DAB and clockspring • Short to battery line between clockspring and SRSCM • Driver Airbag (DAB) Malfunction • Clockspring Malfunction • SRSCM Malfunction	• Short to battery line on wiring harness • Driver Airbag (DAB) squib • Clockspring • SRSCM

Schematic Diagram



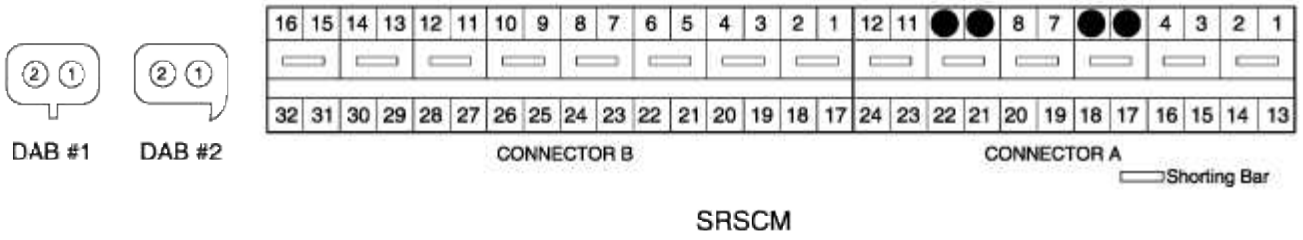
DAB #1

Terminal	Connected to	Function
1	SRSCM Terminal 5(A)	DAB #1 High
2	SRSCM Terminal 6(A)	DAB #1 Low

DAB #2

Terminal	Connected to	Function
1	SRSCM Terminal 9(A)	DAB #2 High
2	SRSCM Terminal 10(A)	DAB #2 Low

[HARNESS CONNECTOR]



SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

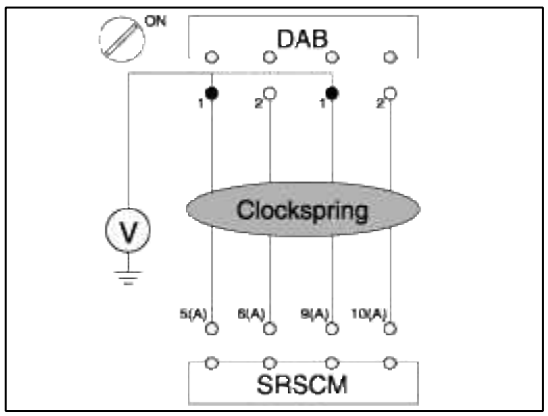
2. CHECK SHORT TO BATTERY LINE

   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 1 of DAB harness connector and chassis ground.

   Specification (voltage) : Approximately 0 V



   (4) Is the measured voltage within specification?

   YES

   Check the DAB module.

   NO

   Repair or replace the wiring harness between the DAB and the clockspring or between the clockspring and the SRSCM.

3. CHECK THE DAB MODULE
(1) Replace the Driver Airbag(DAB) with a new one.
● "Refer to "Driver Airbag(DAB)" section in this SERVICE MANUAL.
(2) Install the DAB module and connect the DAB connector.
(3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
(4) Connect the SRSCM connector.
(5) Connect the battery negative cable to the battery.
(6) Connect a Hi-Scan(Pro) to the data link connector.
(7) Turn the ignition switch to ON and check the vehicle again.
Does Hi-Scan (Pro) indicate any DTC related to DAB?
YES
Check the clockspring.
NO
Replace the Driver Airbag(DAB).

4. CHECK THE CLOCKSPRING
(1) Check the clockspring.
Is the clockspring normal?
YES
Go to next step.
NO
Replace the clockspring.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1485

DTC Description

The Passenger Airbag circuit consists of the SRSCM and the Passenger Airbag (PAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects that the resistance of PAB squib is too high or low.

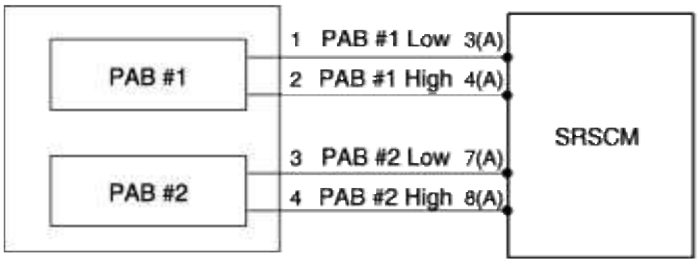
DTC Detecting Condition

DTC	Condition	Probable cause
B1485 B1486	• Too high or low resistance between PAB high(+) and PAB low (-) • Passenger Airbag (PAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Passenger Airbag (PAB) squib • SRSCM

Specification

PAB resistance : 1.6 ~ 4.7 Ω

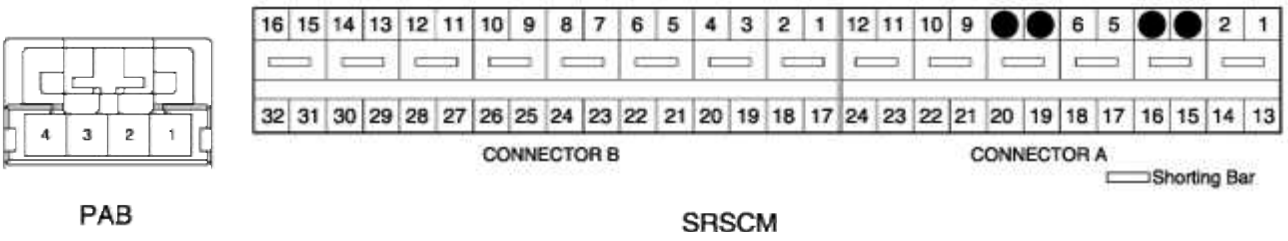
Schematic Diagram



PAB

Terminal	Connected to	Function
1	SRSCM Terminal 3(A)	PAB #1 Low
2	SRSCM Terminal 4(A)	PAB #1 High
3	SRSCM Terminal 7(A)	PAB #2 Low
4	SRSCM Terminal 8(A)	PAB #2 High

[HARNESS CONNECTOR]



PAB SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK PAB RESISTANCE

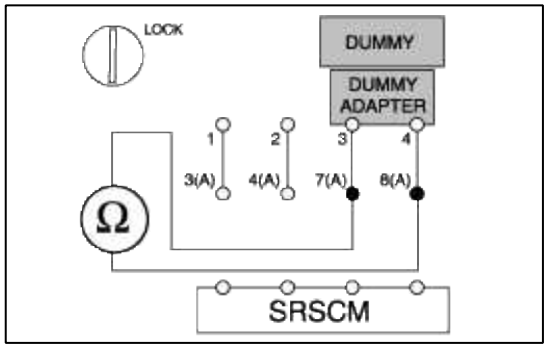
> **CAUTION**
>
> Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on PAB harness connector.

- Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 7 and 8 of SRSCM harness connector(A).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Passenger Airbag(PAB) module.

NO

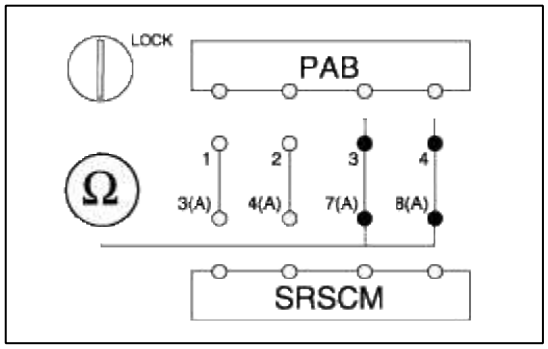
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 4 of PAB harness connector and the terminal 8 of SRSCM harness connector(A).

(2) Measure resistance between the terminal 3 of PAB harness connector and the terminal 7 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

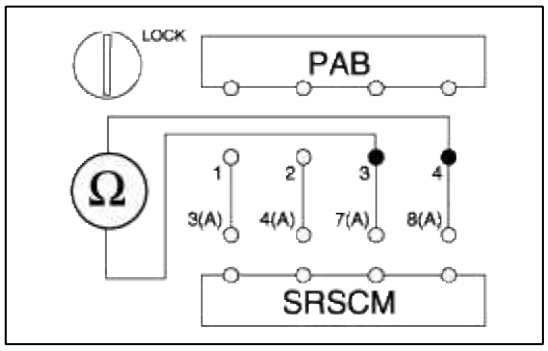
NO

Repair or replace the wiring harness between the PAB and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 3 and 4 of PAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the PAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1486

DTC Description

The Passenger Airbag circuit consists of the SRSCM and the Passenger Airbag (PAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects that the resistance of PAB squib is too high or low.

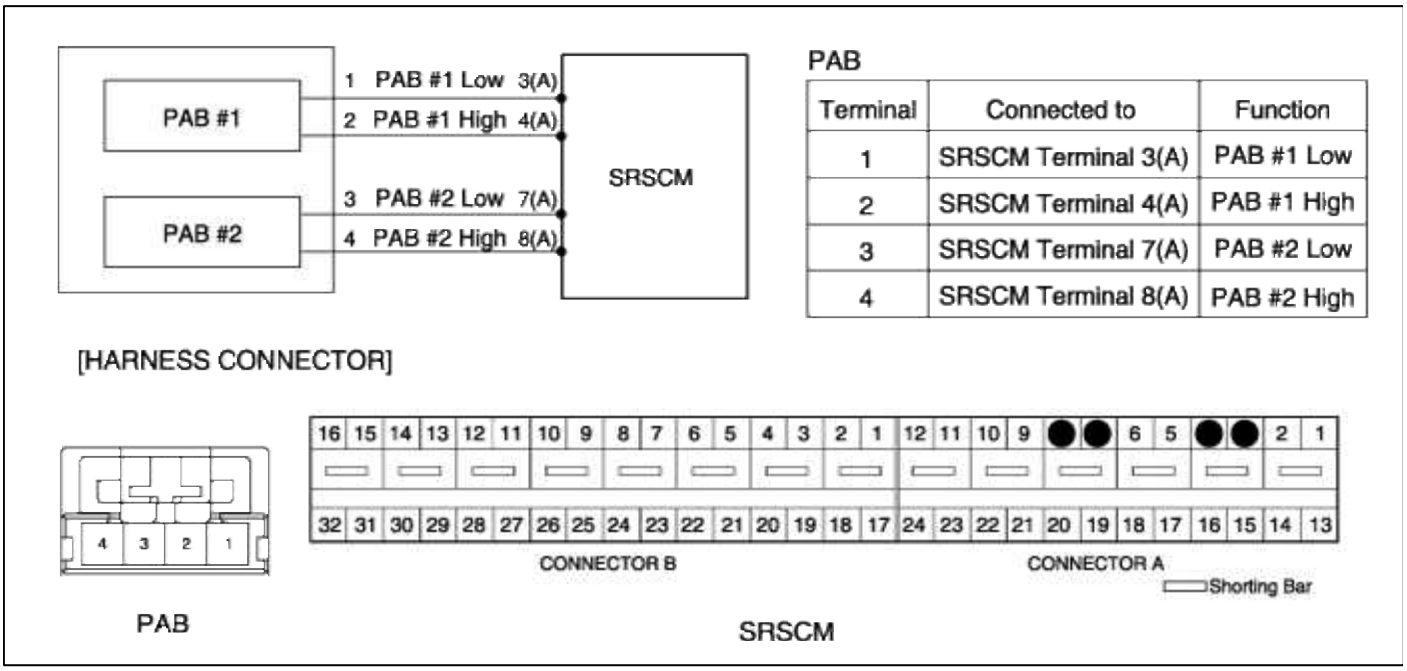
DTC Detecting Condition

DTC	Condition	Probable cause
B1485 B1486	• Too high or low resistance between PAB high(+) and PAB low (-) • Passenger Airbag (PAB) Malfunction • SRSCM Malfunction	• Open or short circuit on wiring harness • Passenger Airbag (PAB) squib • SRSCM

Specification

PAB resistance : 1.6 ~ 4.7 Ω

Schematic Diagram



PAB

Terminal	Connected to	Function
1	SRSCM Terminal 3(A)	PAB #1 Low
2	SRSCM Terminal 4(A)	PAB #1 High
3	SRSCM Terminal 7(A)	PAB #2 Low
4	SRSCM Terminal 8(A)	PAB #2 High

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK PAB RESISTANCE

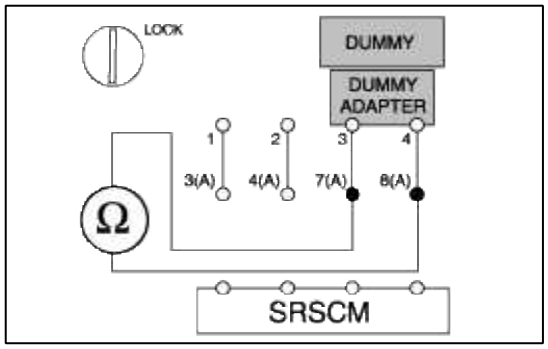
CAUTION

Never attempt to measure the circuit resistance of the airbag module(squib) even if you are using the specified tester.

(1) Connect the Dummy and the Dummy Adapter on PAB harness connector.
● Refer to "SPECIAL SERVICE TOOL" section in this SERVICE MANUAL for the SST No. of Dummy and Dummy Adapter.

(2) Measure resistance between the terminal 7 and 8 of SRSCM harness connector(A).

Specification (resistance) : 1.6 ~ 4.7 Ω



(3) Is the measured resistance within specification?

YES

Replace the Passenger Airbag(PAB) module.

NO

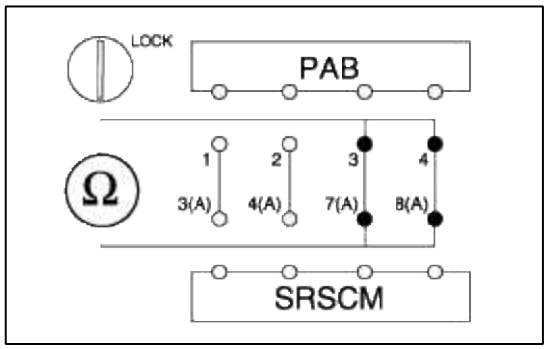
Check open circuit.

3. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 4 of PAB harness connector and the terminal 8 of SRSCM harness connector(A).

(2) Measure resistance between the terminal 3 of PAB harness connector and the terminal 7 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(3) Is the measured resistance within specification?

YES

Check short circuit.

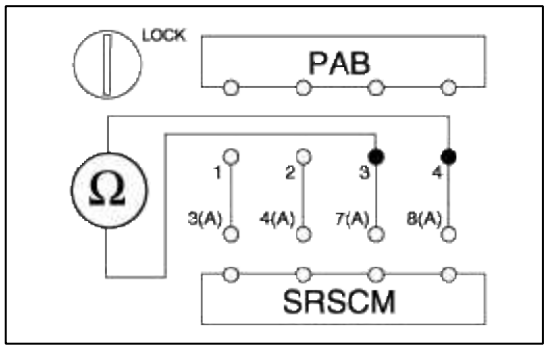
NO

Repair or replace the wiring harness between the PAB and the SRSCM.

4. CHECK SHORT CIRCUIT

(1) Measure resistance between the terminal 3 and 4 of PAB harness connector.

Specification (resistance) : infinite



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair or replace the wiring harness between the PAB and the SRSCM.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1487

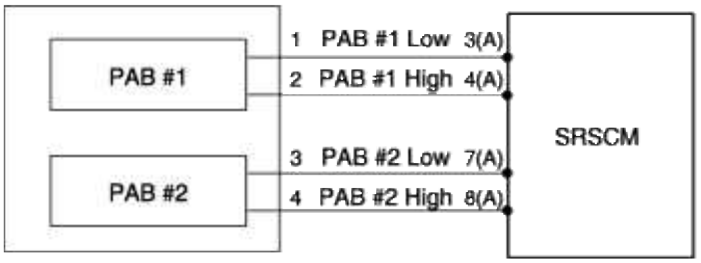
DTC Description

The Passenger Airbag circuit consists of the SRSCM and the Passenger Airbag (PAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects short to ground on the PAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1354 B1487	• Short to ground between PAB module and SRSCM • Passenger Airbag (PAB) Malfunction • SRSCM Malfunction	• Short to ground on wiring harness • Passenger Airbag (PAB) squib • SRSCM

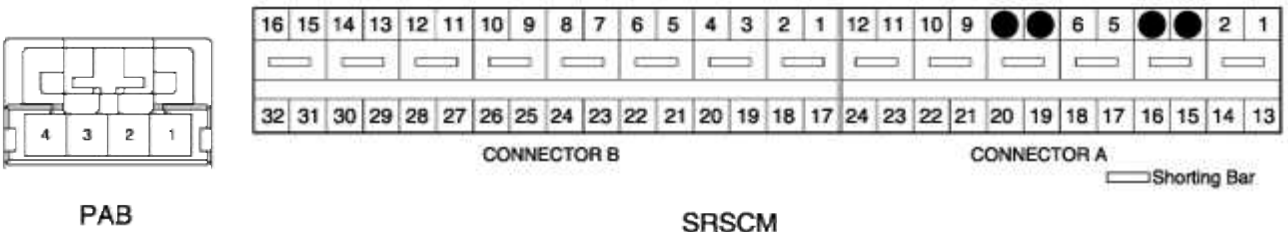
Schematic Diagram



PAB

Terminal	Connected to	Function
1	SRSCM Terminal 3(A)	PAB #1 Low
2	SRSCM Terminal 4(A)	PAB #1 High
3	SRSCM Terminal 7(A)	PAB #2 Low
4	SRSCM Terminal 8(A)	PAB #2 High

[HARNESS CONNECTOR]



PAB SRSCM

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

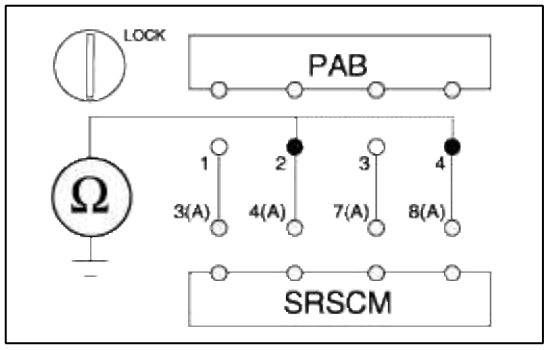
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO GROUND

   (1) Measure resistance between the terminal 2 of PAB harness connector and chassis ground. (PAB stage 1)

   (2) Measure resistance between the terminal 4 of PAB harness connector and chassis ground. (PAB stage 2)

   Specification (resistance) : infinite



   (3) Is the measured resistance within specification?

   YES

   Check the PAB Module.

   NO

   Repair or replace the wiring harness between the PAB and the SRSCM.

3. CHECK THE PAB MODULE
   (1) Replace the Passenger Airbag (PAB) with a new one.
   ● Refer to "Passenger Airbag (PAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to PAB?
   YES
   Go to next step.
   NO
   Replace PAB module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1488

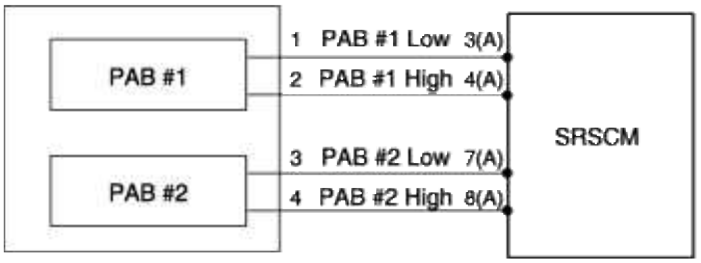
DTC Description

The Passenger Airbag circuit consists of the SRSCM and the Passenger Airbag (PAB) which has two squib circuits. The SRSCM sets above DTC(s) if it detects short to battery line on the PAB circuit.

DTC Detecting Condition

DTC	Condition	Probable cause
B1355 B1488	• Short to battery line between PAB and SRSCM • Passenger Airbag (PAB) Malfunction • SRSCM Malfunction	• Short to battery line circuit on wiring harness • Passenger Airbag (PAB) squib • SRSCM

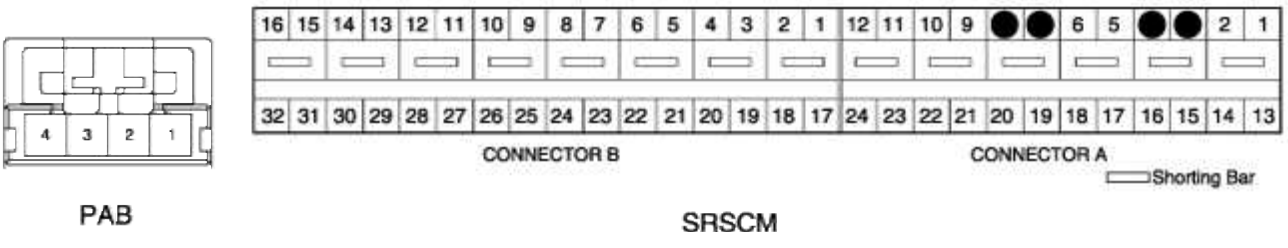
Schematic Diagram



PAB

Terminal	Connected to	Function
1	SRSCM Terminal 3(A)	PAB #1 Low
2	SRSCM Terminal 4(A)	PAB #1 High
3	SRSCM Terminal 7(A)	PAB #2 Low
4	SRSCM Terminal 8(A)	PAB #2 High

[HARNESS CONNECTOR]



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK SHORT TO BATTERY LINE

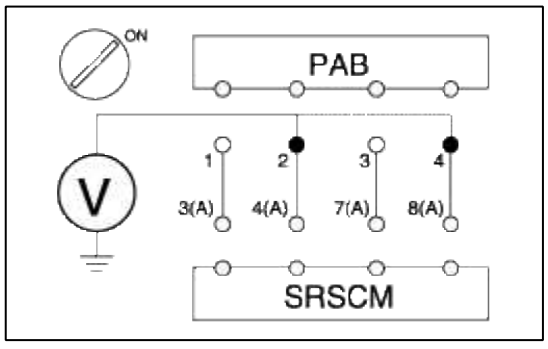
   (1) Connect the battery negative cable to the battery.

   (2) Turn the ignition switch to ON.

   (3) Measure voltage between the terminal 2 of PAB harness connector and chassis ground. (PAB stage 1)

   (4) Measure voltage between the terminal 4 of PAB harness connector and chassis ground. (PAB stage 2)

   Specification (voltage) : Approximately 0 V



   (5) Is the measured voltage within specification?

   YES

   Check the PAB Module.

   NO

   Repair the short to battery line circuit on wiring harness between the PAB and the SRSCM.

3. CHECK THE PAB MODULE
   (1) Replace the Passenger Airbag(PAB) with a new one.
   ● Refer to "Passenger Airbag(PAB)" section in this SERVICE MANUAL.
   (2) Install the DAB module and connect the DAB connector.
   (3) Connect the connectors of the PAB, SAB, CAB, BPT, FIS and SIS.
   (4) Connect the SRSCM connector.
   (5) Connect the battery negative cable to the battery.
   (6) Connect a Hi-Scan(Pro) to the data link connector.
   (7) Turn the ignition switch to ON and check the vehicle again.
   Does Hi-Scan (Pro) indicate any DTC related to PAB?
   YES
   Go to next step.
   NO
   Replace PAB module.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1511

DTC Description

The Seat Belt Buckle Switch (BS) circuit consists of the SRSCM and two BS. The SRSCM sets above DTC(s) if it detects open or short to battery line on the BS circuit. This system decides whether the driver or passenger seat belt is buckled or not.

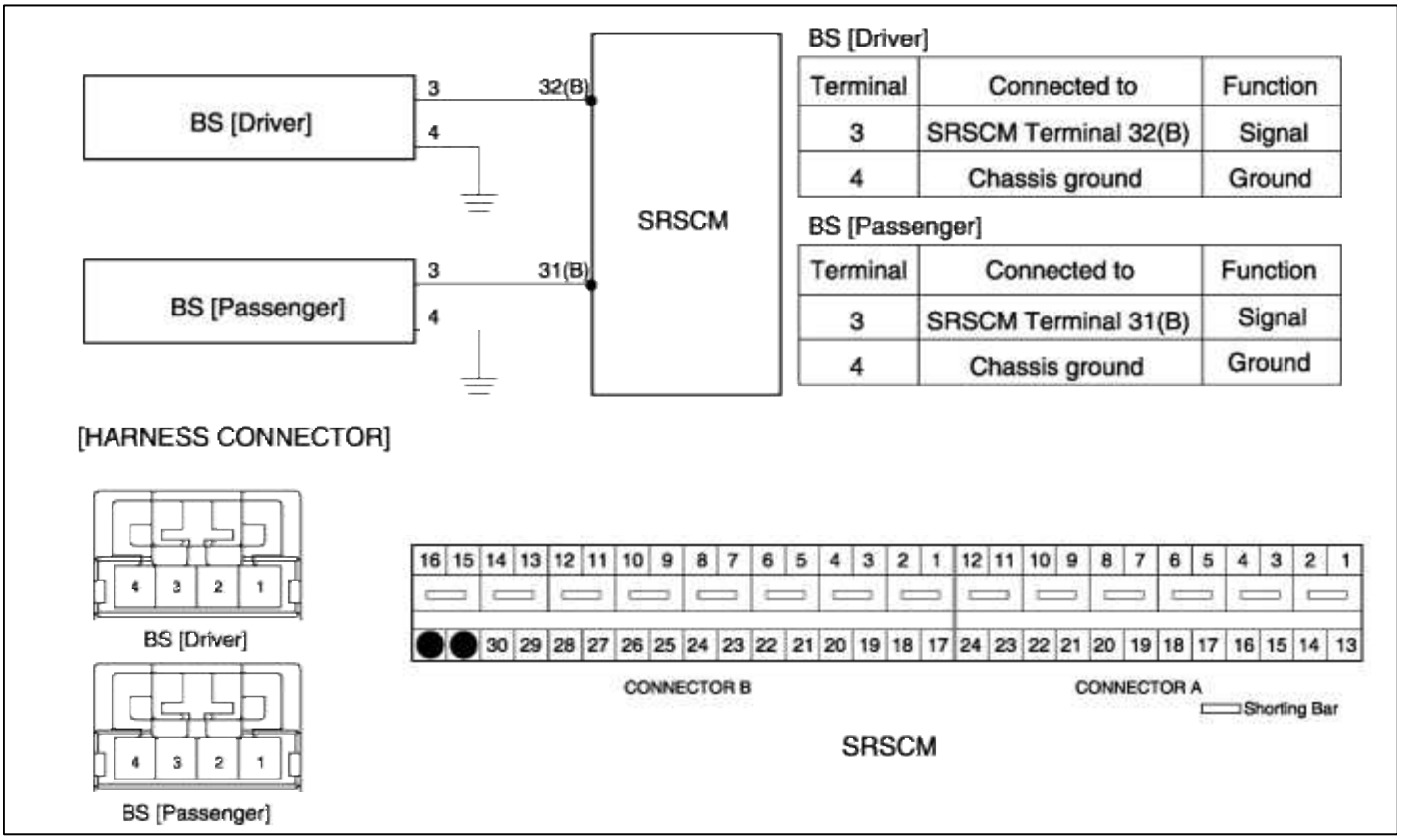
DTC Detecting Condition

DTC	Condition	Probable cause
B1511 B1513	• Open between BS and SRSCM (Current I < 2.98 mA). • Short to battery line between BS and SRSCM (Current I < 2.98 mA) • Seat Belt Buckle Switch (BS) Malfunction • SRSCM Malfunction	• Open or short to battery line circuit on wiring harness • Seat Belt Buckle Switch (BS) • SRSCM

Specification

BS Status	Current (mA)	Related DTC
Open or Short to Battery	< 2.98	B1511, B1513
Unbuckled	4 ~ 7	
Defect	8.9 ~ 9.7	B1515, B1516
Buckled	12 ~ 18	
Short or Short to Ground	> 22.0	B1512, B1514

Schematic Diagram



BS [Driver]

Terminal	Connected to	Function
3	SRSCM Terminal 32(B)	Signal
4	Chassis ground	Ground

BS [Passenger]

Terminal	Connected to	Function
3	SRSCM Terminal 31(B)	Signal
4	Chassis ground	Ground

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

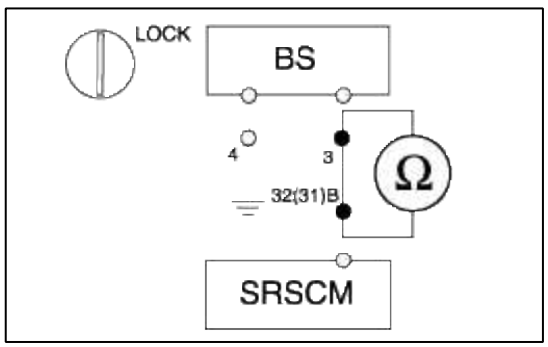
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK OPEN CIRCUIT

   (1) Disconnect the BS connector.

   (2) Measure resistance between the terminal 3 of BS harness connector and the terminal 32(31) of SRSCM harness connector (B).

   specification (Resistance) : below 1 Ω



   (3) Is the measured resistance within specification?

   YES

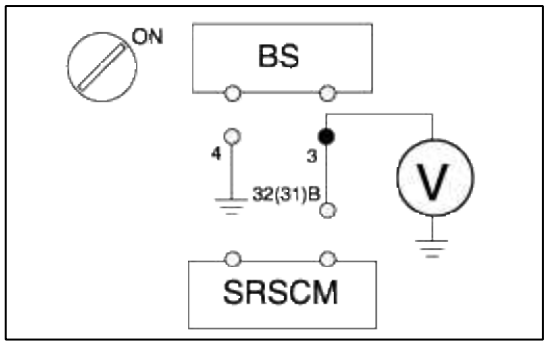
   Go to next step.

   NO

   Repair or replace the wiring harness between the BS and the SRSCM.

3. CHECK SHORT TO BATTERY LINE
   (1) Connect the battery negative cable to the battery.
   (2) Turn the ignition switch to ON.
   (3) Measure voltage between the terminal 3 of BS harness connector and chassis ground.

specification (voltage) : Approximately 0 V



   (4) Is the measured voltage within specification?

YES
Check the Seat belt buckle switch(BS).

NO
Repair the short to battery line circuit on wiring harness between the BS and the SRSCM.

4. CHECK THE SEAT BELT BUCKLE SWITCH (BS)
   (1) Measure current between the terminal 3 of BS and 32(31) of SRSCM harness connector(B).

specification (current) : 12 ~ 18 mA (Buckled status), 4 ~ 7 mA (Unbuckled status)

   (2) Is the wiring harness normal?

YES
Go to next stop.

NO
Replace the BS.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1512

DTC Description

The Seat Belt Buckle Switch (BS) circuit consists of the SRSCM and two BS. The SRSCM sets above DTC(s) if it detects short or short to ground on the BS circuit. This system decides whether the driver or passenger seat belt is buckled or not.

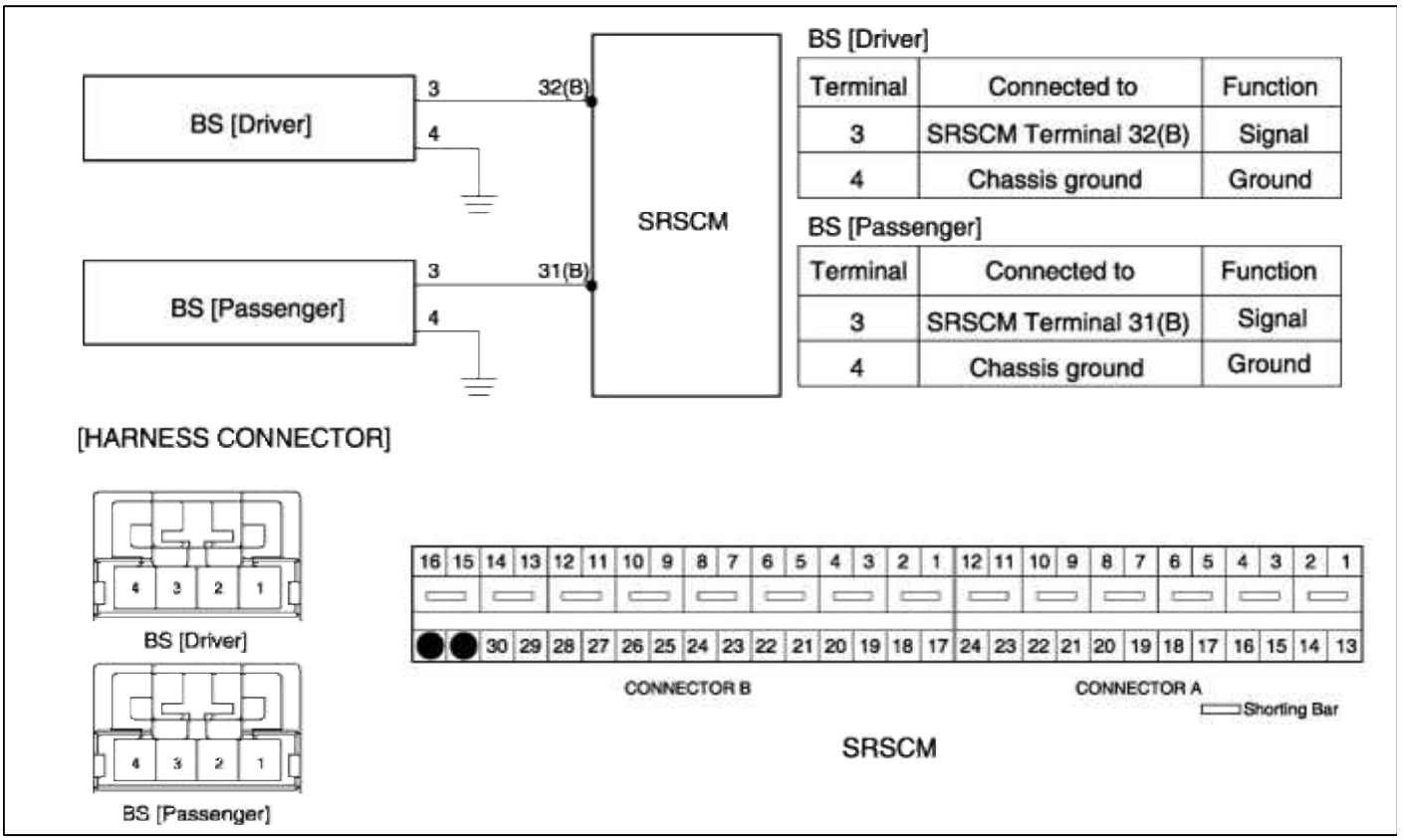
DTC Detecting Condition

DTC	Condition	Probable cause
B1512 B1514	• Short or Short to ground between BS and SRSCM (Current I > 22.0 mA) • Seat Belt Buckle Switch (BS) Malfunction • SRSCM Malfunction	• short or short to ground circuit on wiring harness • Seat Belt Buckle Switch (BS) • SRSCM

Specification

BS Status	Current (mA)	Related DTC
Open or Short to Battery	< 2.98	B1511, B1513
Unbuckled	4 ~ 7	
Defect	8.9 ~ 9.7	B1515, B1516
Buckled	12 ~ 18	
Short or Short to Ground	> 22.0	B1512, B1514

Schematic Diagram



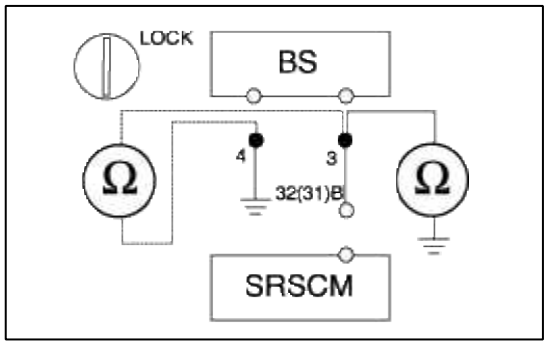
Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK SHORT OR SHORT TO GROUND
   (1) Disconnect the BS connector.
   (2) Measure resistance between the terminal 3 of BS harness connector and chassis ground.
   (3) Measure resistance between the terminal 3 and 4 of BS harness connector.

   specification (Resistance) : Infinite



   (4) Is the measured resistance within specification?
   YES
   (5) Go to next step.
   NO
   Repair the short or short to ground circuit on wiring harness between the BS and the SRSCM.
3. CHECK THE SEAT BELT BUCKLE SWITCH (BS)
   (1) Measure current between the terminal 3 of BS and 32(31) of SRSCM harness connector(B).

   specification (current) : 12 ~ 18 mA (Buckled status), 4 ~ 7 mA (Unbuckled status)

   (2) Is the wiring harness normal?
   YES
   Go to next stop.
   NO
   Replace the BS.
4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1513

DTC Description

The Seat Belt Buckle Switch (BS) circuit consists of the SRSCM and two BS. The SRSCM sets above DTC(s) if it detects open or short to battery line on the BS circuit. This system decides whether the driver or passenger seat belt is buckled or not.

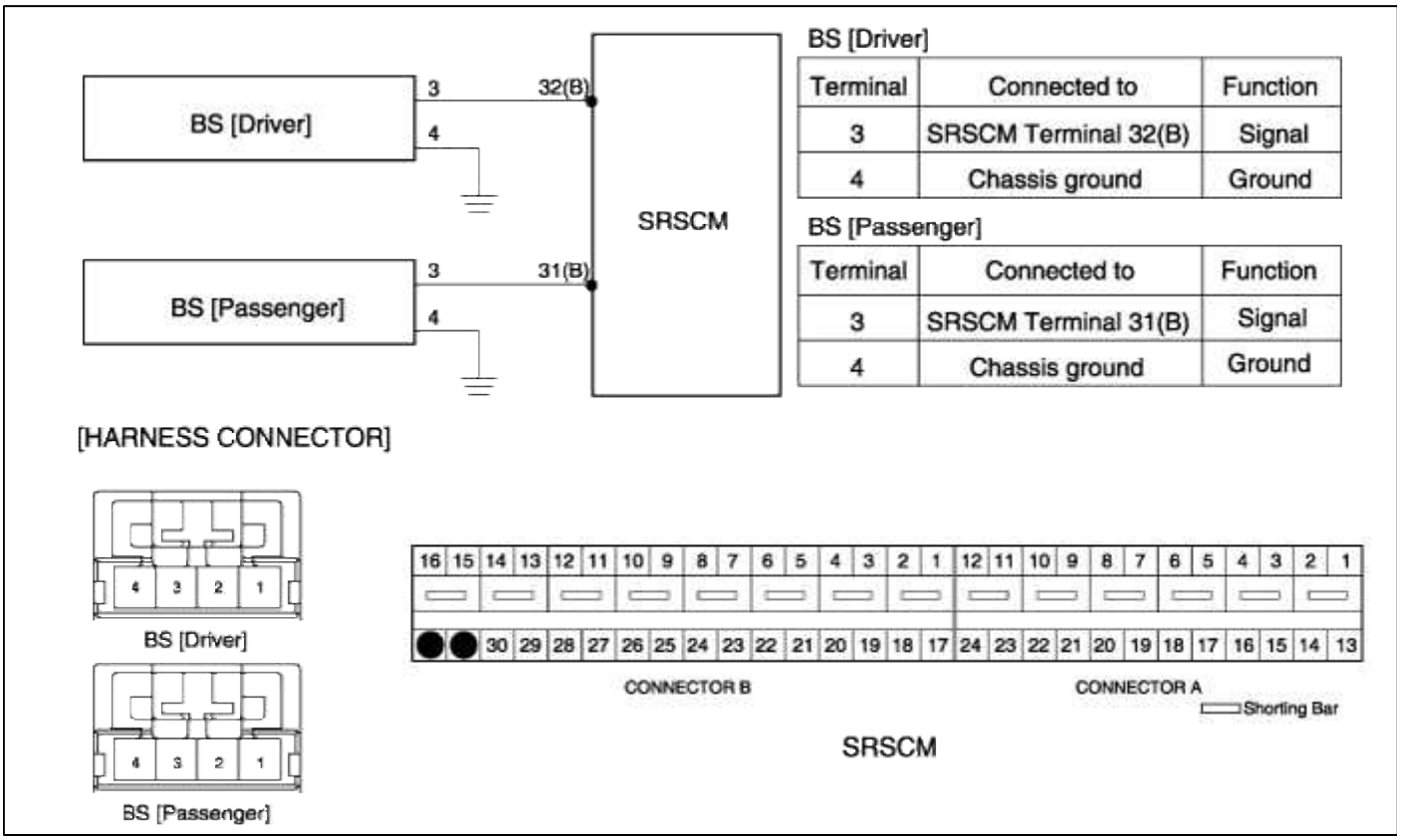
DTC Detecting Condition

DTC	Condition	Probable cause
B1511 B1513	• Open between BS and SRSCM (Current I < 2.98 mA). • Short to battery line between BS and SRSCM (Current I < 2.98 mA) • Seat Belt Buckle Switch (BS) Malfunction • SRSCM Malfunction	• Open or short to battery line circuit on wiring harness • Seat Belt Buckle Switch (BS) • SRSCM

Specification

BS Status	Current (mA)	Related DTC
Open or Short to Battery	< 2.98	B1511, B1513
Unbuckled	4 ~ 7	
Defect	8.9 ~ 9.7	B1515, B1516
Buckled	12 ~ 18	
Short or Short to Ground	> 22.0	B1512, B1514

Schematic Diagram



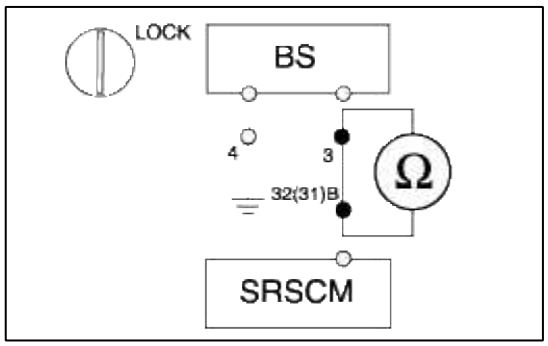
Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK OPEN CIRCUIT
   (1) Disconnect the BS connector.
   (2) Measure resistance between the terminal 3 of BS harness connector and the terminal 32(31) of SRSCM harness connector (B).

   specification (Resistance) : below 1 Ω



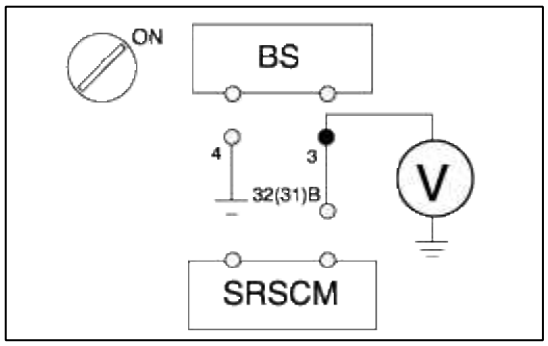
   (3) Is the measured resistance within specification?

   YES
   Go to next step.

   NO
   Repair or replace the wiring harness between the BS and the SRSCM.

3. CHECK SHORT TO BATTERY LINE
   (1) Connect the battery negative cable to the battery.
   (2) Turn the ignition switch to ON.
   (3) Measure voltage between the terminal 3 of BS harness connector and chassis ground.

   specification (voltage) : Approximately 0 V



   (4) Is the measured voltage within specification?

   YES
   Check the Seat belt buckle switch(BS).

   NO
   Repair the short to battery line circuit on wiring harness between the BS and the SRSCM.

4. CHECK THE SEAT BELT BUCKLE SWITCH (BS)
   (1) Measure current between the terminal 3 of BS and 32(31) of SRSCM harness connector(B).

   specification (current) : 12 ~ 18 mA (Buckled status), 4 ~ 7 mA (Unbuckled status)

   (2) Is the wiring harness normal?

   YES
   Go to next stop.

   NO
   Replace the BS.

5. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1514

DTC Description

The Seat Belt Buckle Switch (BS) circuit consists of the SRSCM and two BS. The SRSCM sets above DTC(s) if it detects short or short to ground on the BS circuit. This system decides whether the driver or passenger seat belt is buckled or not.

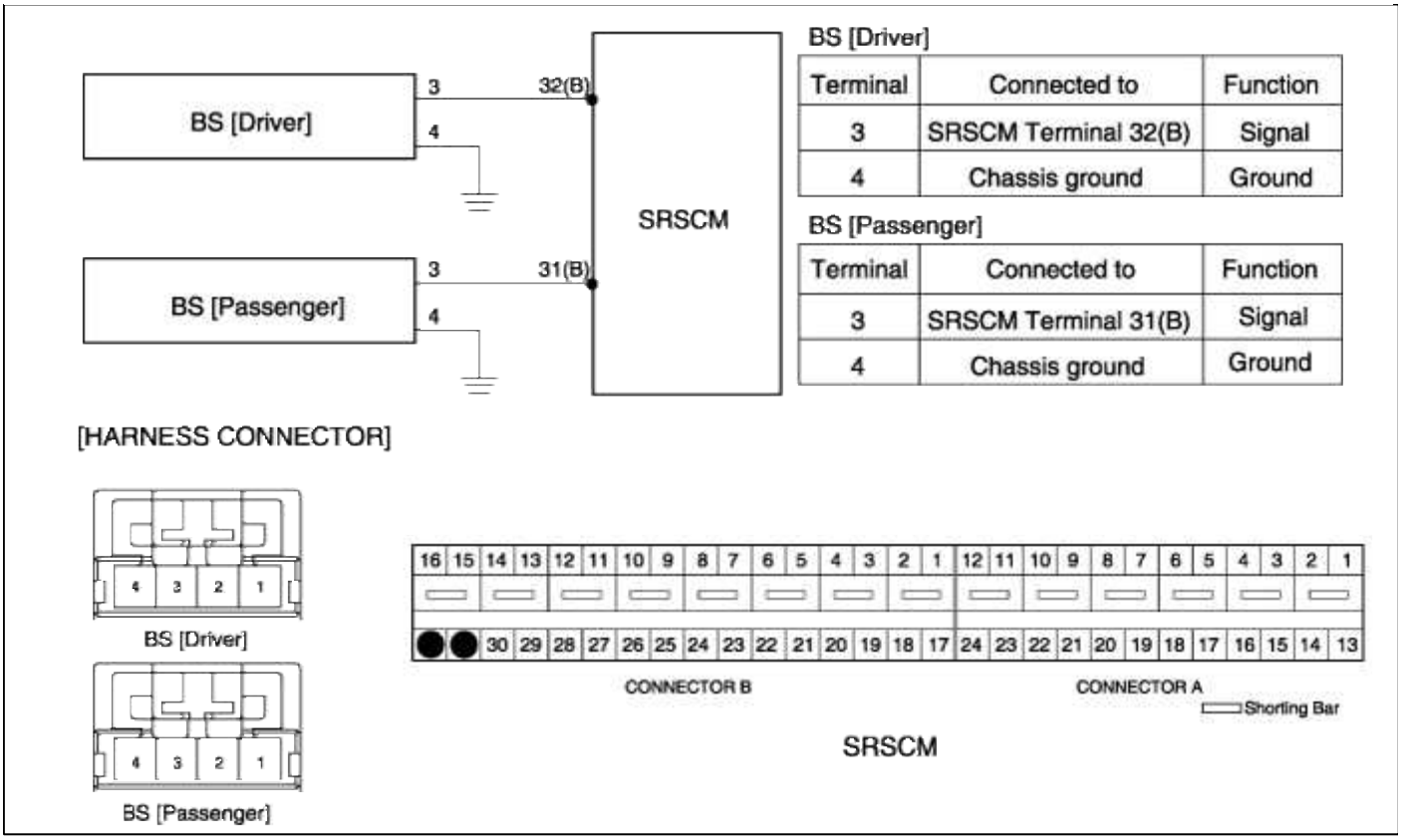
DTC Detecting Condition

DTC	Condition	Probable cause
B1512 B1514	• Short or Short to ground between BS and SRSCM (Current I > 22.0 mA) • Seat Belt Buckle Switch (BS) Malfunction • SRSCM Malfunction	• short or short to ground circuit on wiring harness • Seat Belt Buckle Switch (BS) • SRSCM

Specification

BS Status	Current (mA)	Related DTC
Open or Short to Battery	< 2.98	B1511, B1513
Unbuckled	4 ~ 7	
Defect	8.9 ~ 9.7	B1515, B1516
Buckled	12 ~ 18	
Short or Short to Ground	> 22.0	B1512, B1514

Schematic Diagram



BS [Driver]

Terminal	Connected to	Function
3	SRSCM Terminal 32(B)	Signal
4	Chassis ground	Ground

BS [Passenger]

Terminal	Connected to	Function
3	SRSCM Terminal 31(B)	Signal
4	Chassis ground	Ground

Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

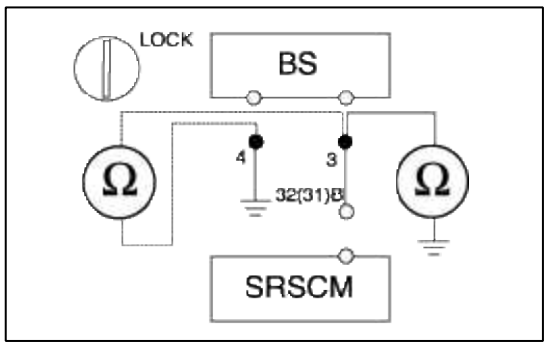
2. CHECK SHORT OR SHORT TO GROUND

   (1) Disconnect the BS connector.

   (2) Measure resistance between the terminal 3 of BS harness connector and chassis ground.

   (3) Measure resistance between the terminal 3 and 4 of BS harness connector.

   specification (Resistance) : Infinite



   (4) Is the measured resistance within specification?

   YES

(5) Go to next step.

NO

Repair the short or short to ground circuit on wiring harness between the BS and the SRSCM.

3. CHECK THE SEAT BELT BUCKLE SWITCH (BS)

(1) Measure current between the terminal 3 of BS and 32(31) of SRSCM harness connector(B).

specification (current) : 12 ~ 18 mA (Buckled status), 4 ~ 7 mA (Unbuckled status)

(2) Is the wiring harness normal?

YES

Go to next stop.

NO

Replace the BS.

4. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1515

DTC Description

The Seat Belt Buckle Switch (BS) circuit consists of the SRSCM and two BS. The SRSCM sets above DTC(s) if it detects the BS faults. This system decides whether the driver or passenger seat belt is buckled or not.

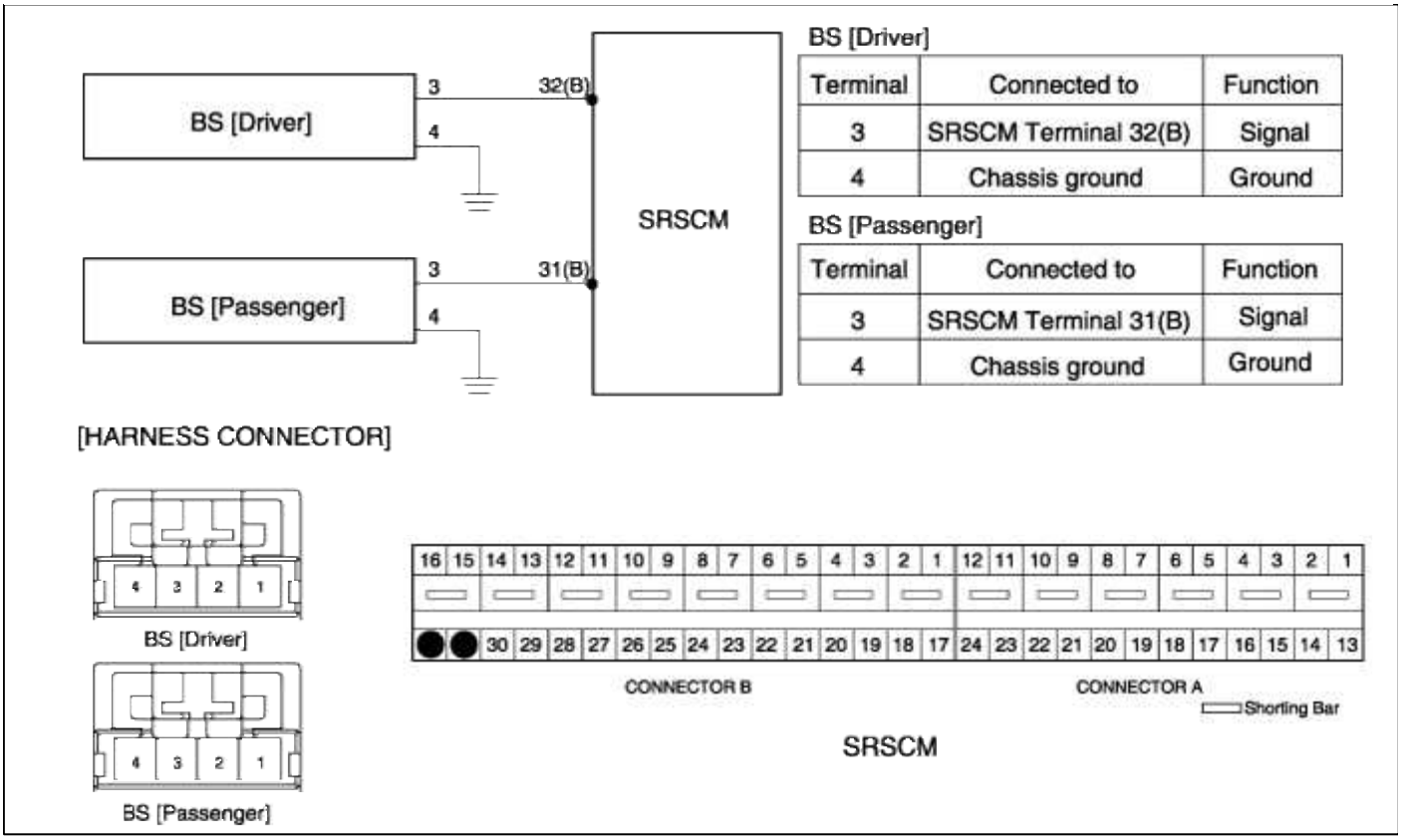
DTC Detecting Condition

DTC	Condition	Probable cause
B1515 B1516 B1517 B1518	• Seat Belt Buckle Switch (BS) Malfunction • SRSCM Malfunction	• Seat Belt Buckle Switch (BS) • SRSCM

Specification

BS Status	Current (mA)	Related DTC
Open or Short to Battery	< 2.98	B1511, B1513
Unbuckled	4 ~ 7	
Defect	8.9 ~ 9.7	B1515, B1516
Buckled	12 ~ 18	
Short or Short to Ground	> 22.0	B1512, B1514

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK THE SEAT BELT BUCKLE SWITCH (BS)
   (1) Measure current between the terminal 3 of BS and 32(31) of SRSCM harness connector(B).

   specification (current) : 12 ~ 18 mA (Buckled status), 4 ~ 7 mA (Unbuckled status)

   (2) Is the wiring harness normal?

   YES

   Go to next stop.

   NO

   Replace the BS.
3. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1516

DTC Description

The Seat Belt Buckle Switch (BS) circuit consists of the SRSCM and two BS. The SRSCM sets above DTC(s) if it detects the BS faults. This system decides whether the driver or passenger seat belt is buckled or not.

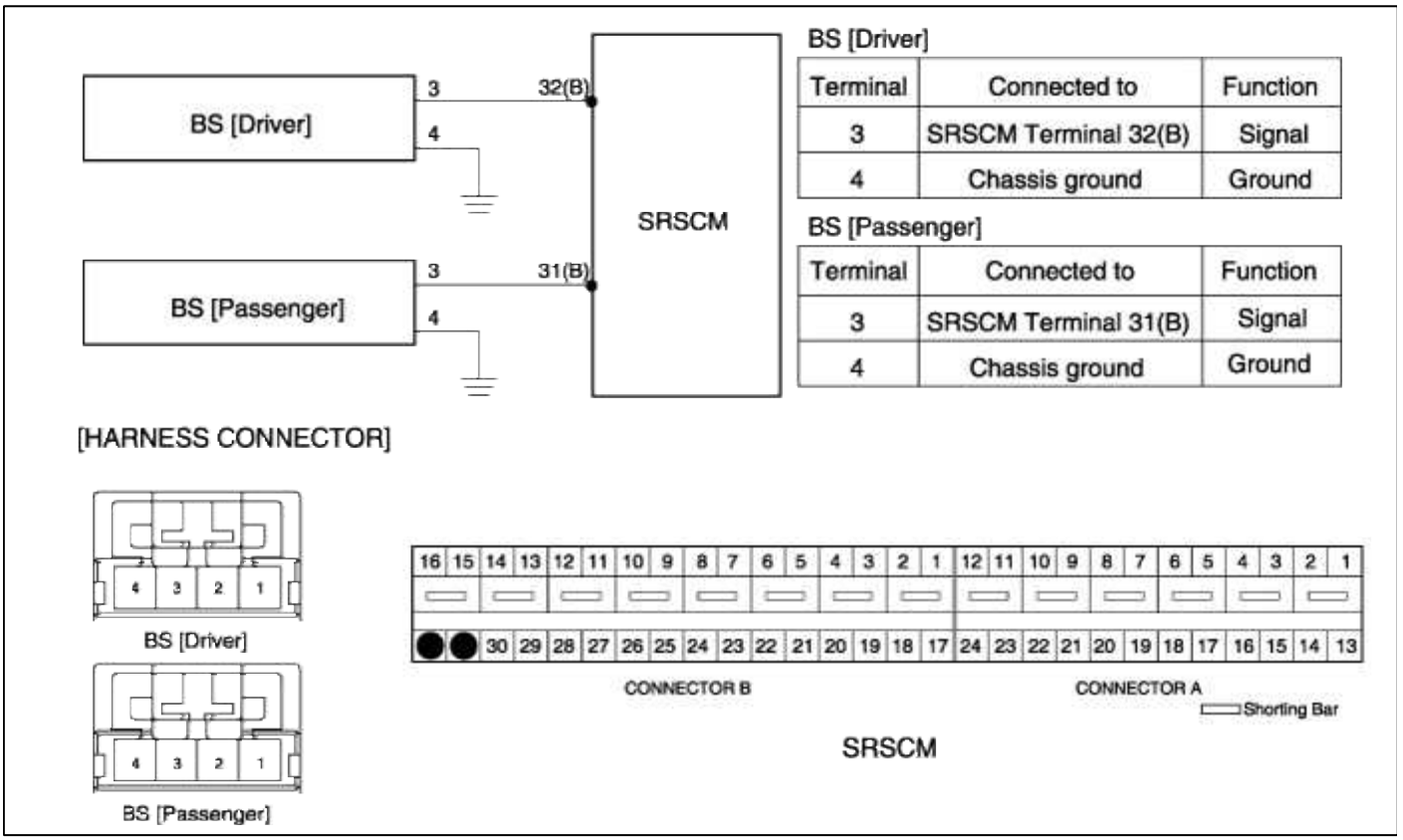
DTC Detecting Condition

DTC	Condition	Probable cause
B1515 B1516 B1517 B1518	• Seat Belt Buckle Switch (BS) Malfunction • SRSCM Malfunction	• Seat Belt Buckle Switch (BS) • SRSCM

Specification

BS Status	Current (mA)	Related DTC
Open or Short to Battery	< 2.98	B1511, B1513
Unbuckled	4 ~ 7	
Defect	8.9 ~ 9.7	B1515, B1516
Buckled	12 ~ 18	
Short or Short to Ground	> 22.0	B1512, B1514

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK THE SEAT BELT BUCKLE SWITCH (BS)
(1) Measure current between the terminal 3 of BS and 32(31) of SRSCM harness connector(B).

specification (current) : 12 ~ 18 mA (Buckled status), 4 ~ 7 mA (Unbuckled status)

(2) Is the wiring harness normal?

YES

Go to next stop.

NO

Replace the BS.

3. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1517

DTC Description

The Seat Belt Buckle Switch (BS) circuit consists of the SRSCM and two BS. The SRSCM sets above DTC(s) if it detects the BS faults. This system decides whether the driver or passenger seat belt is buckled or not.

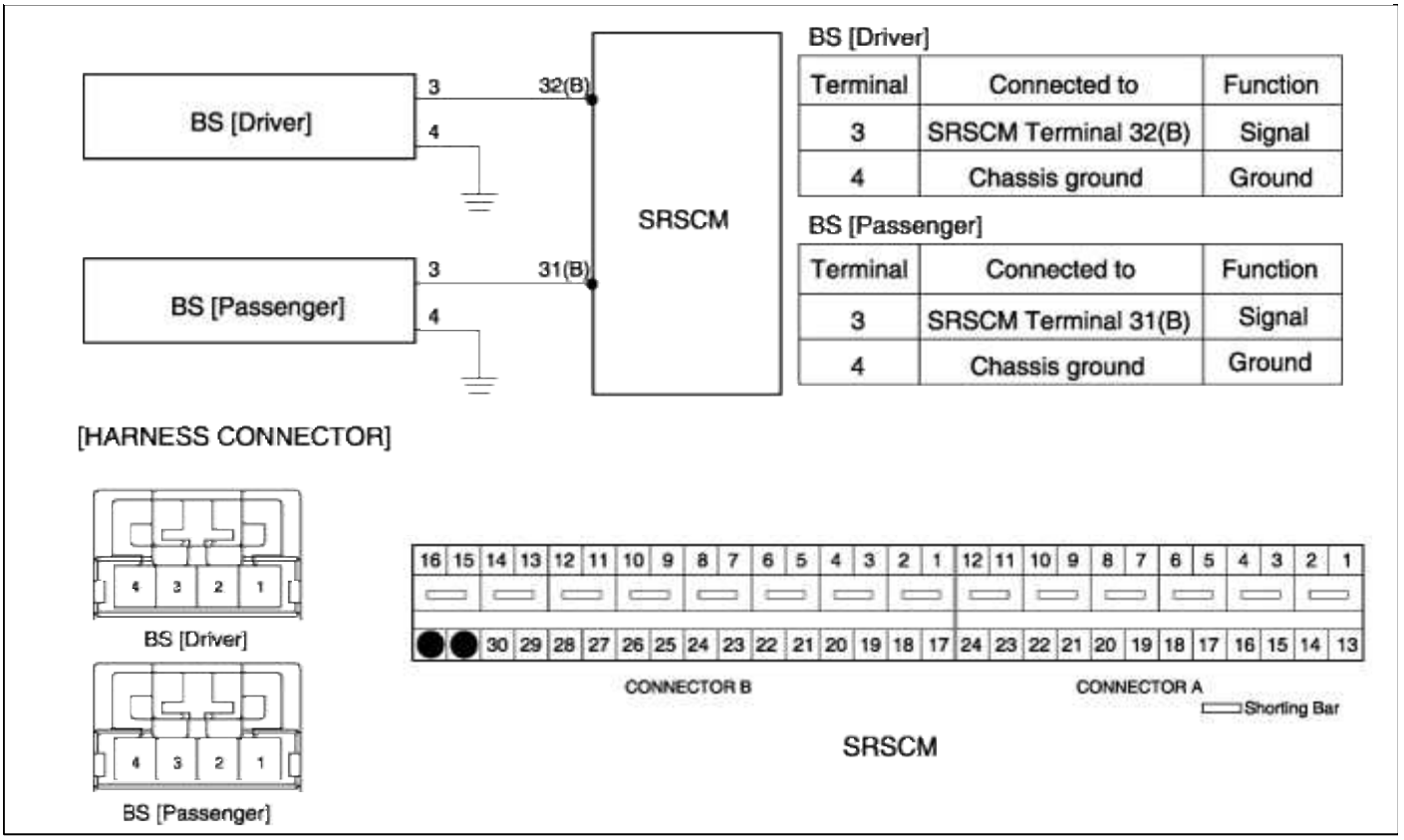
DTC Detecting Condition

DTC	Condition	Probable cause
B1515 B1516 B1517 B1518	• Seat Belt Buckle Switch (BS) Malfunction • SRSCM Malfunction	• Seat Belt Buckle Switch (BS) • SRSCM

Specification

BS Status	Current (mA)	Related DTC
Open or Short to Battery	< 2.98	B1511, B1513
Unbuckled	4 ~ 7	
Defect	8.9 ~ 9.7	B1515, B1516
Buckled	12 ~ 18	
Short or Short to Ground	> 22.0	B1512, B1514

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK THE SEAT BELT BUCKLE SWITCH (BS)
   (1) Measure current between the terminal 3 of BS and 32(31) of SRSCM harness connector(B).

   specification (current) : 12 ~ 18 mA (Buckled status), 4 ~ 7 mA (Unbuckled status)

   (2) Is the wiring harness normal?

   YES

   Go to next stop.

   NO

   Replace the BS.
3. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1518

DTC Description

The Seat Belt Buckle Switch (BS) circuit consists of the SRSCM and two BS. The SRSCM sets above DTC(s) if it detects the BS faults. This system decides whether the driver or passenger seat belt is buckled or not.

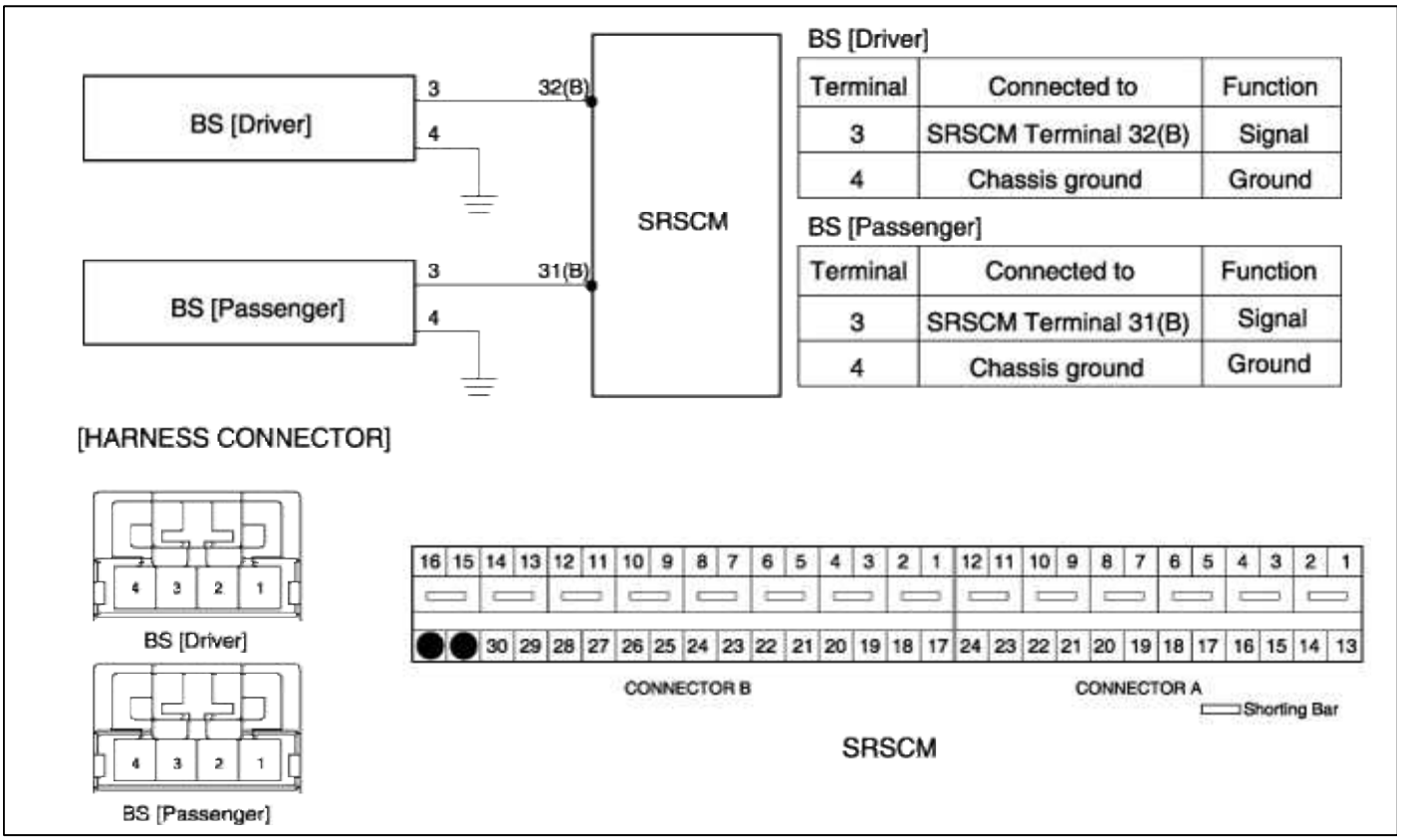
DTC Detecting Condition

DTC	Condition	Probable cause
B1515 B1516 B1517 B1518	• Seat Belt Buckle Switch (BS) Malfunction • SRSCM Malfunction	• Seat Belt Buckle Switch (BS) • SRSCM

Specification

BS Status	Current (mA)	Related DTC
Open or Short to Battery	< 2.98	B1511, B1513
Unbuckled	4 ~ 7	
Defect	8.9 ~ 9.7	B1515, B1516
Buckled	12 ~ 18	
Short or Short to Ground	> 22.0	B1512, B1514

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

2. CHECK THE SEAT BELT BUCKLE SWITCH (BS)
(1) Measure current between the terminal 3 of BS and 32(31) of SRSCM harness connector(B).

specification (current) : 12 ~ 18 mA (Buckled status), 4 ~ 7 mA (Unbuckled status)

(2) Is the wiring harness normal?

YES

Go to next stop.

NO

Replace the BS.

3. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN
Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B1620

DTC DESCRIPTION

The Supplemental Restraint System Control Module (SRSCM) runs diagnostics to monitor the condition of its internal circuits and all external components in the restraint system. If a fault is detected in the electronic accelerometor or in the microprocessor, the SRSCM will inhibit deployment to minimize the risk of inadvertent deployments.
Once an internal fault is qualified, the internal fault is latched and warning lamp will be turned on. If an internal fault is qulified, the SRSCM must be replaced. The Hi-Scan tool can't clear an internal fault. All internal faults are DTC B1620.

DTC Detecting Condition

DTC	Condition	Probable cause
B1620	• SRSCM internal fault : acceleration sensor, microcomputer power supply, watchdog etc	• SRSCM

INSPECTION PROCEDURE

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool, the SRSCM should be replaced.

Restraint > Troubleshooting > B1650

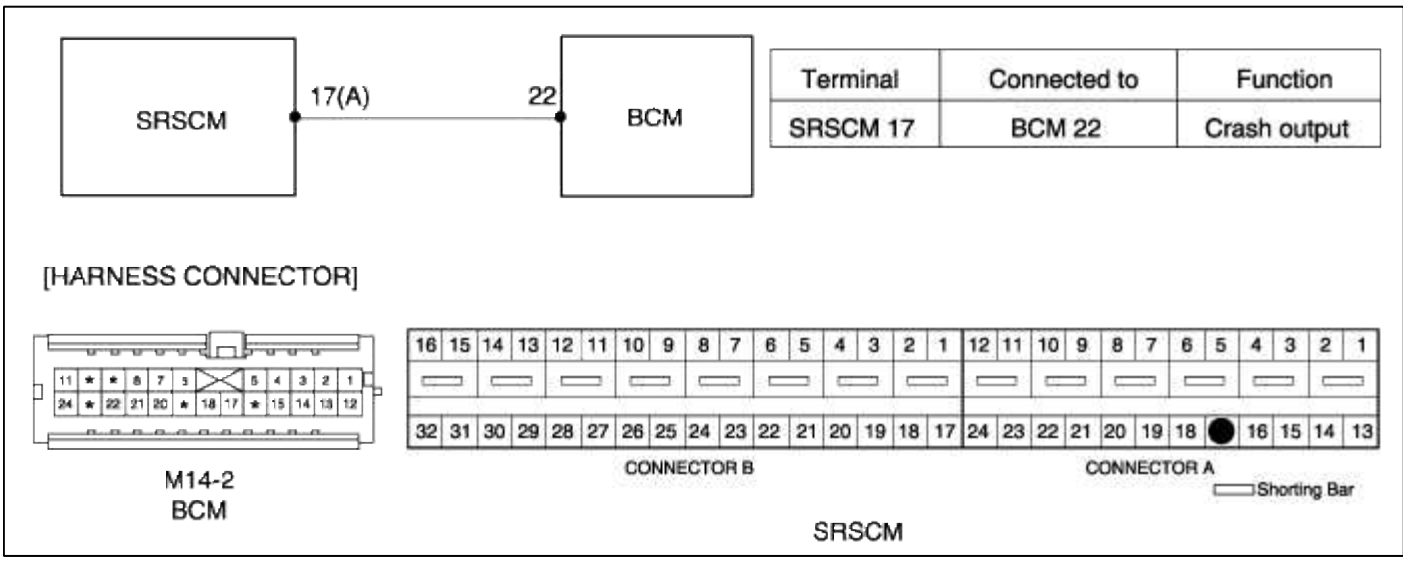
DTC Description

When a deployment of any restraint system for seat belt pretensioner and frontal and side air bags occurs, or when a rear crash is detected, the crash output is activated. The purpose of this output is to signal the BCM(Body Control Module) in the vehicle to unlock the vehicle doors. If a crash output is in progress, a second crash output signal will not be sent unless the first one is completed. The SRSCM doesn't perform diagnostics on the crash output function. After a frontal or side crash event is sensed and algorithm makes firing decision, above mentioned crash record is stored after squib deployment.

DTC Detecting Condition

DTC	Condition	Probable cause
B1650 B1651 B1652 B1655 B1657 B1658 B1659 B1670	• Frontal crash • Side crash • Rear crash • Seat belt pretensioner only deployed	• SRSCM • Front Impact Sensor • Side Impact Sensor • Seat Belt Pretensioner

Schematic Diagram



Inspection Procedure

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool except for the B1657 and B1659, and the SRSCM should be replaced. However, for the DTC B1657, Belt pretensioner only deployment, it can be erased for 5 times and the SRSCM can be reusable. If the deployment of Belt pretensioner reaches to 6 times, the SRSCM will set DTC B1658 and the SRSCM should be replaced accordingly. The DTC B1659, Rear impact detected, also can be erased.

Restraint > Troubleshooting > B1651

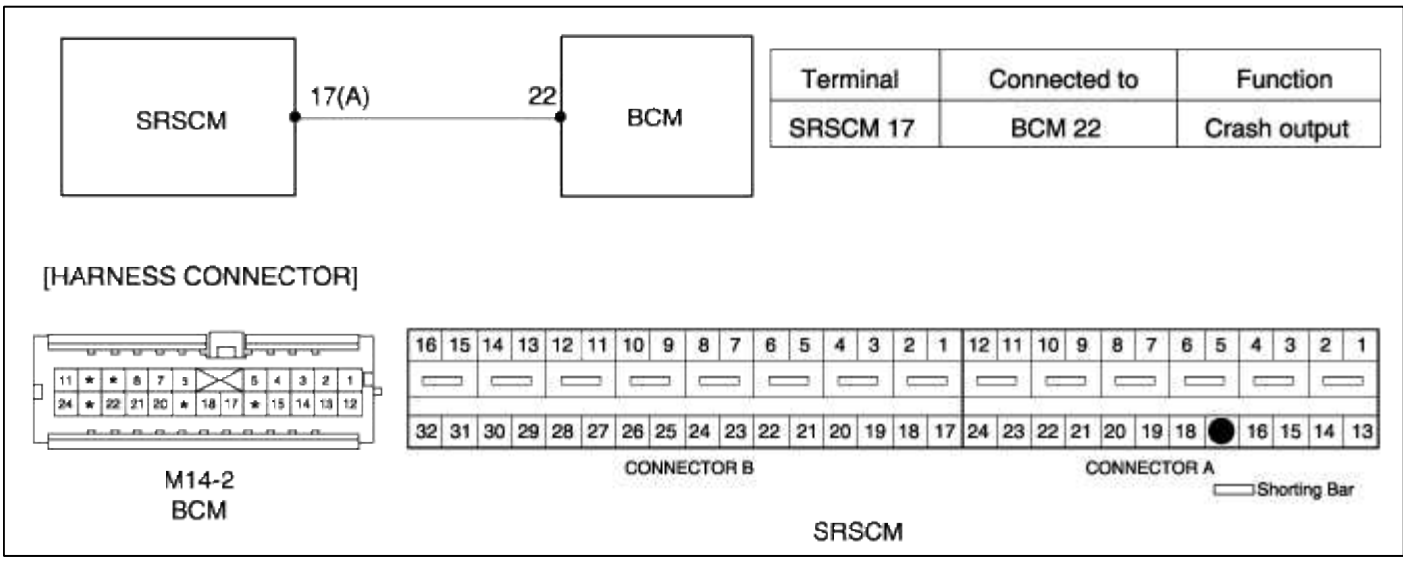
DTC Description

When a deployment of any restraint system for seat belt pretensioner and frontal and side air bags occurs, or when a rear crash is detected, the crash output is activated. The purpose of this output is to signal the BCM(Body Control Module) in the vehicle to unlock the vehicle doors. If a crash output is in progress, a second crash output signal will not be sent unless the first one is completed. The SRSCM doesn't perform diagnostics on the crash output function. After a frontal or side crash event is sensed and algorithm makes firing decision, above mentioned crash record is stored after squib deployment.

DTC Detecting Condition

DTC	Condition	Probable cause
B1650 B1651 B1652 B1655 B1657 B1658 B1659 B1670	• Frontal crash • Side crash • Rear crash • Seat belt pretensioner only deployed	• SRSCM • Front Impact Sensor • Side Impact Sensor • Seat Belt Pretensioner

Schematic Diagram



Inspection Procedure

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool except for the B1657 and B1659, and the SRSCM should be replaced. However, for the DTC B1657, Belt pretensioner only deployment, it can be erased for 5 times and the SRSCM can be reusable. If the deployment of Belt pretensioner reaches to 6 times, the SRSCM will set DTC B1658 and the SRSCM should be replaced accordingly. The DTC B1659, Rear impact detected, also can be erased.

Restraint > Troubleshooting > B1652

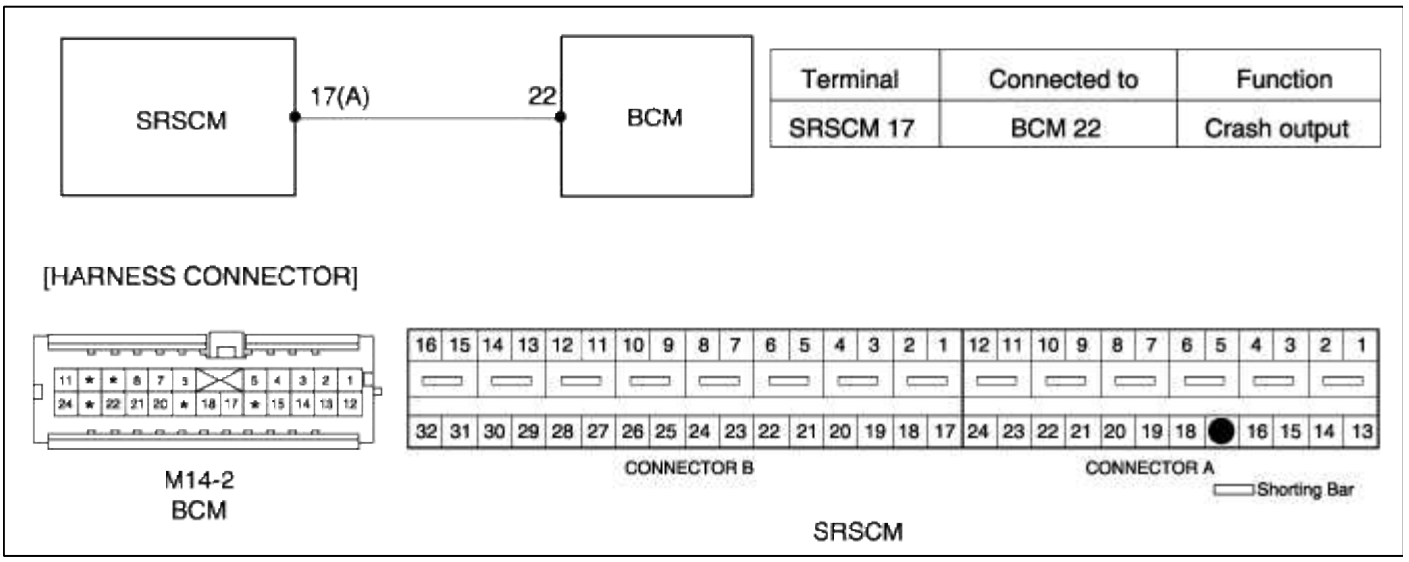
DTC Description

When a deployment of any restraint system for seat belt pretensioner and frontal and side air bags occurs, or when a rear crash is detected, the crash output is activated. The purpose of this output is to signal the BCM(Body Control Module) in the vehicle to unlock the vehicle doors. If a crash output is in progress, a second crash output signal will not be sent unless the first one is completed. The SRSCM doesn't perform diagnostics on the crash output function. After a frontal or side crash event is sensed and algorithm makes firing decision, above mentioned crash record is stored after squib deployment.

DTC Detecting Condition

DTC	Condition	Probable cause
B1650 B1651 B1652 B1655 B1657 B1658 B1659 B1670	• Frontal crash • Side crash • Rear crash • Seat belt pretensioner only deployed	• SRSCM • Front Impact Sensor • Side Impact Sensor • Seat Belt Pretensioner

Schematic Diagram



Inspection Procedure

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool except for the B1657 and B1659, and the SRSCM should be replaced. However, for the DTC B1657, Belt pretensioner only deployment, it can be erased for 5 times and the SRSCM can be reusable. If the deployment of Belt pretensioner reaches to 6 times, the SRSCM will set DTC B1658 and the SRSCM should be replaced accordingly. The DTC B1659, Rear impact detected, also can be erased.

Restraint > Troubleshooting > B1655

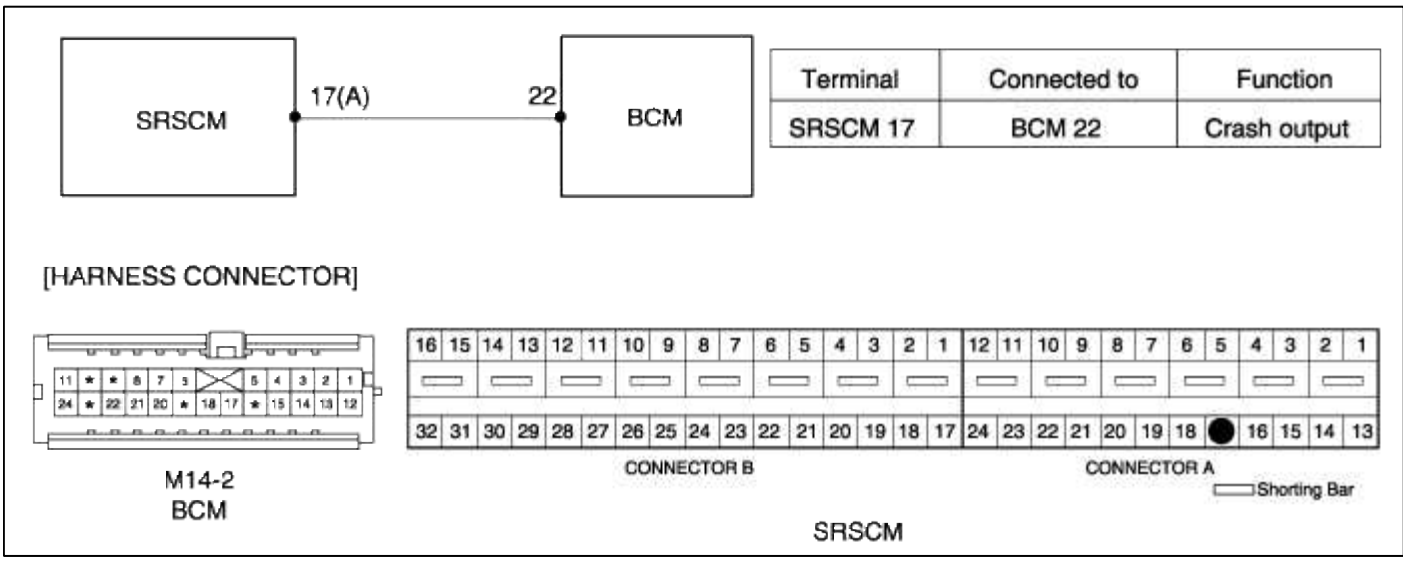
DTC Description

When a deployment of any restraint system for seat belt pretensioner and frontal and side air bags occurs, or when a rear crash is detected, the crash output is activated. The purpose of this output is to signal the BCM(Body Control Module) in the vehicle to unlock the vehicle doors. If a crash output is in progress, a second crash output signal will not be sent unless the first one is completed. The SRSCM doesn't perform diagnostics on the crash output function. After a frontal or side crash event is sensed and algorithm makes firing decision, above mentioned crash record is stored after squib deployment.

DTC Detecting Condition

DTC	Condition	Probable cause
B1650 B1651 B1652 B1655 B1657 B1658 B1659 B1670	• Frontal crash • Side crash • Rear crash • Seat belt pretensioner only deployed	• SRSCM • Front Impact Sensor • Side Impact Sensor • Seat Belt Pretensioner

Schematic Diagram



Inspection Procedure

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool except for the B1657 and B1659, and the SRSCM should be replaced. However, for the DTC B1657, Belt pretensioner only deployment, it can be erased for 5 times and the SRSCM can be reusable. If the deployment of Belt pretensioner reaches to 6 times, the SRSCM will set DTC B1658 and the SRSCM should be replaced accordingly. The DTC B1659, Rear impact detected, also can be erased.

Restraint > Troubleshooting > B1657

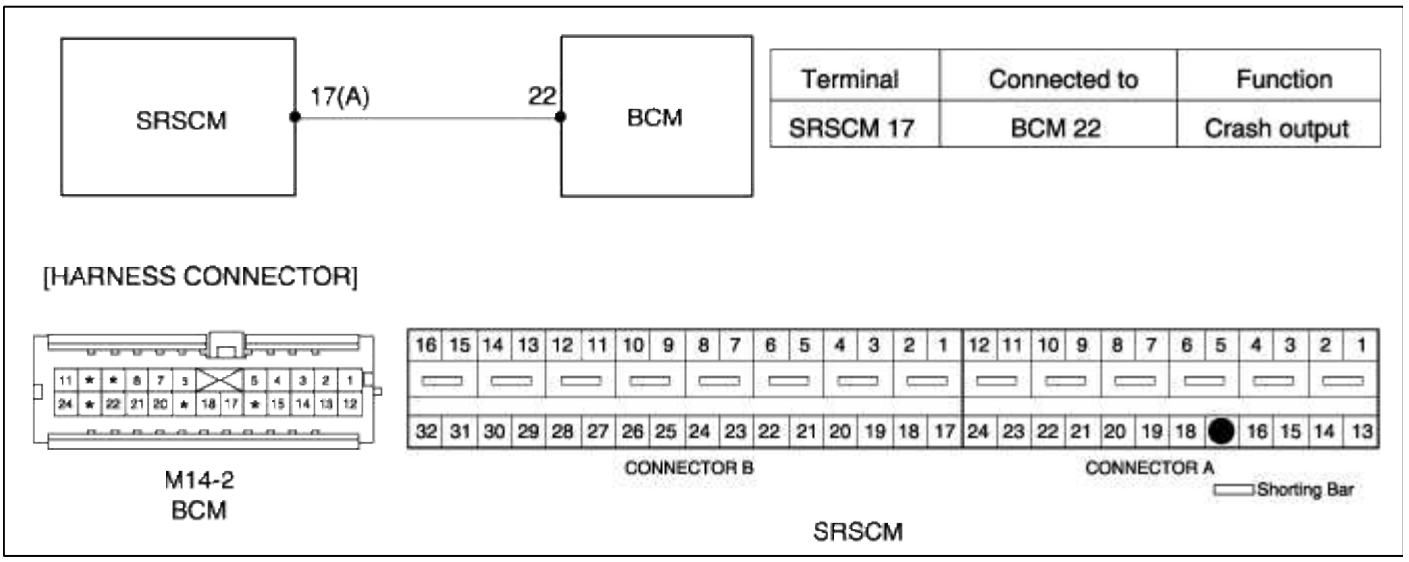
DTC Description

When a deployment of any restraint system for seat belt pretensioner and frontal and side air bags occurs, or when a rear crash is detected, the crash output is activated. The purpose of this output is to signal the BCM(Body Control Module) in the vehicle to unlock the vehicle doors. If a crash output is in progress, a second crash output signal will not be sent unless the first one is completed. The SRSCM doesn't perform diagnostics on the crash output function. After a frontal or side crash event is sensed and algorithm makes firing decision, above mentioned crash record is stored after squib deployment.

DTC Detecting Condition

DTC	Condition	Probable cause
B1650 B1651 B1652 B1655 B1657 B1658 B1659 B1670	• Frontal crash • Side crash • Rear crash • Seat belt pretensioner only deployed	• SRSCM • Front Impact Sensor • Side Impact Sensor • Seat Belt Pretensioner

Schematic Diagram



Inspection Procedure

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool except for the B1657 and B1659, and the SRSCM should be replaced. However, for the DTC B1657, Belt pretensioner only deployment, it can be erased for 5 times and the SRSCM can be reusable. If the deployment of Belt pretensioner reaches to 6 times, the SRSCM will set DTC B1658 and the SRSCM should be replaced accordingly. The DTC B1659, Rear impact detected, also can be erased.

Restraint > Troubleshooting > B1658

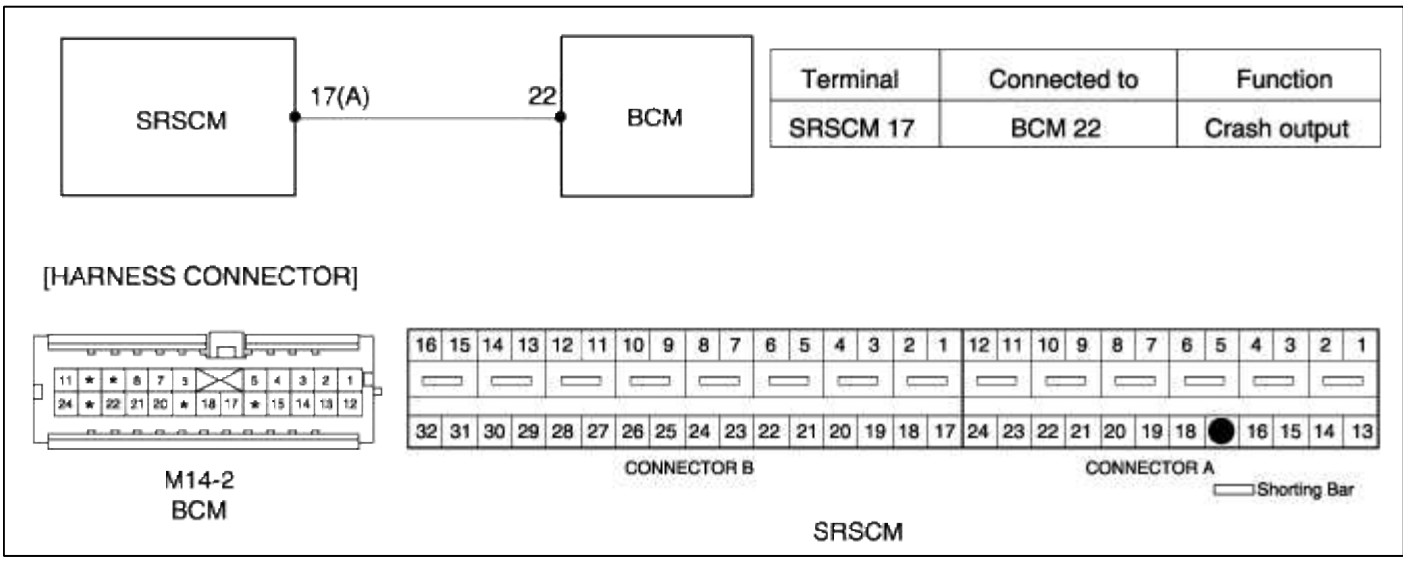
DTC Description

When a deployment of any restraint system for seat belt pretensioner and frontal and side air bags occurs, or when a rear crash is detected, the crash output is activated. The purpose of this output is to signal the BCM(Body Control Module) in the vehicle to unlock the vehicle doors. If a crash output is in progress, a second crash output signal will not be sent unless the first one is completed. The SRSCM doesn't perform diagnostics on the crash output function. After a frontal or side crash event is sensed and algorithm makes firing decision, above mentioned crash record is stored after squib deployment.

DTC Detecting Condition

DTC	Condition	Probable cause
B1650 B1651 B1652 B1655 B1657 B1658 B1659 B1670	• Frontal crash • Side crash • Rear crash • Seat belt pretensioner only deployed	• SRSCM • Front Impact Sensor • Side Impact Sensor • Seat Belt Pretensioner

Schematic Diagram



Inspection Procedure

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool except for the B1657 and B1659, and the SRSCM should be replaced. However, for the DTC B1657, Belt pretensioner only deployment, it can be erased for 5 times and the SRSCM can be reusable. If the deployment of Belt pretensioner reaches to 6 times, the SRSCM will set DTC B1658 and the SRSCM should be replaced accordingly. The DTC B1659, Rear impact detected, also can be erased.

Restraint > Troubleshooting > B1659

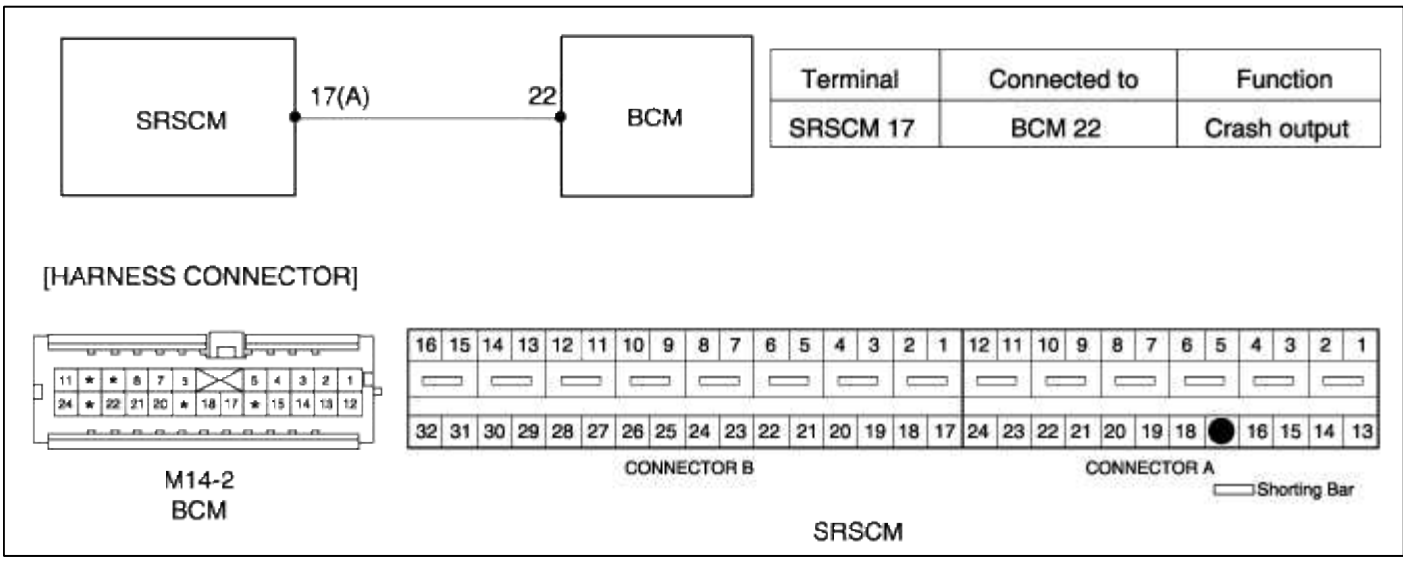
DTC Description

When a deployment of any restraint system for seat belt pretensioner and frontal and side air bags occurs, or when a rear crash is detected, the crash output is activated. The purpose of this output is to signal the BCM(Body Control Module) in the vehicle to unlock the vehicle doors. If a crash output is in progress, a second crash output signal will not be sent unless the first one is completed. The SRSCM doesn't perform diagnostics on the crash output function. After a frontal or side crash event is sensed and algorithm makes firing decision, above mentioned crash record is stored after squib deployment.

DTC Detecting Condition

DTC	Condition	Probable cause
B1650 B1651 B1652 B1655 B1657 B1658 B1659 B1670	• Frontal crash • Side crash • Rear crash • Seat belt pretensioner only deployed	• SRSCM • Front Impact Sensor • Side Impact Sensor • Seat Belt Pretensioner

Schematic Diagram



Inspection Procedure

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool except for the B1657 and B1659, and the SRSCM should be replaced. However, for the DTC B1657, Belt pretensioner only deployment, it can be erased for 5 times and the SRSCM can be reusable. If the deployment of Belt pretensioner reaches to 6 times, the SRSCM will set DTC B1658 and the SRSCM should be replaced accordingly. The DTC B1659, Rear impact detected, also can be erased.

Restraint > Troubleshooting > B1670

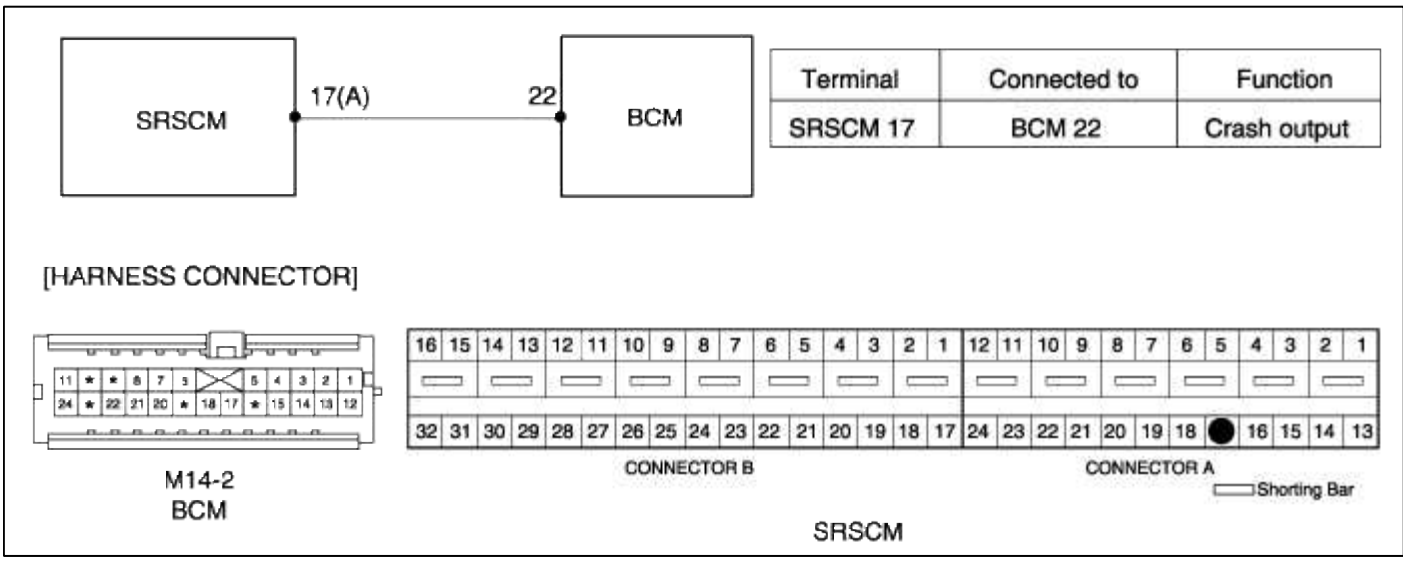
DTC Description

When a deployment of any restraint system for seat belt pretensioner and frontal and side air bags occurs, or when a rear crash is detected, the crash output is activated. The purpose of this output is to signal the BCM(Body Control Module) in the vehicle to unlock the vehicle doors. If a crash output is in progress, a second crash output signal will not be sent unless the first one is completed. The SRSCM doesn't perform diagnostics on the crash output function. After a frontal or side crash event is sensed and algorithm makes firing decision, above mentioned crash record is stored after squib deployment.

DTC Detecting Condition

DTC	Condition	Probable cause
B1650 B1651 B1652 B1655 B1657 B1658 B1659 B1670	• Frontal crash • Side crash • Rear crash • Seat belt pretensioner only deployed	• SRSCM • Front Impact Sensor • Side Impact Sensor • Seat Belt Pretensioner

Schematic Diagram



Inspection Procedure

If the above mentioned DTC is confirmed it can't be cleared by Hi-Scan tool except for the B1657 and B1659, and the SRSCM should be replaced. However, for the DTC B1657, Belt pretensioner only deployment, it can be erased for 5 times and the SRSCM can be reusable. If the deployment of Belt pretensioner reaches to 6 times, the SRSCM will set DTC B1658 and the SRSCM should be replaced accordingly. The DTC B1659, Rear impact detected, also can be erased.

Restraint > Troubleshooting > B2500

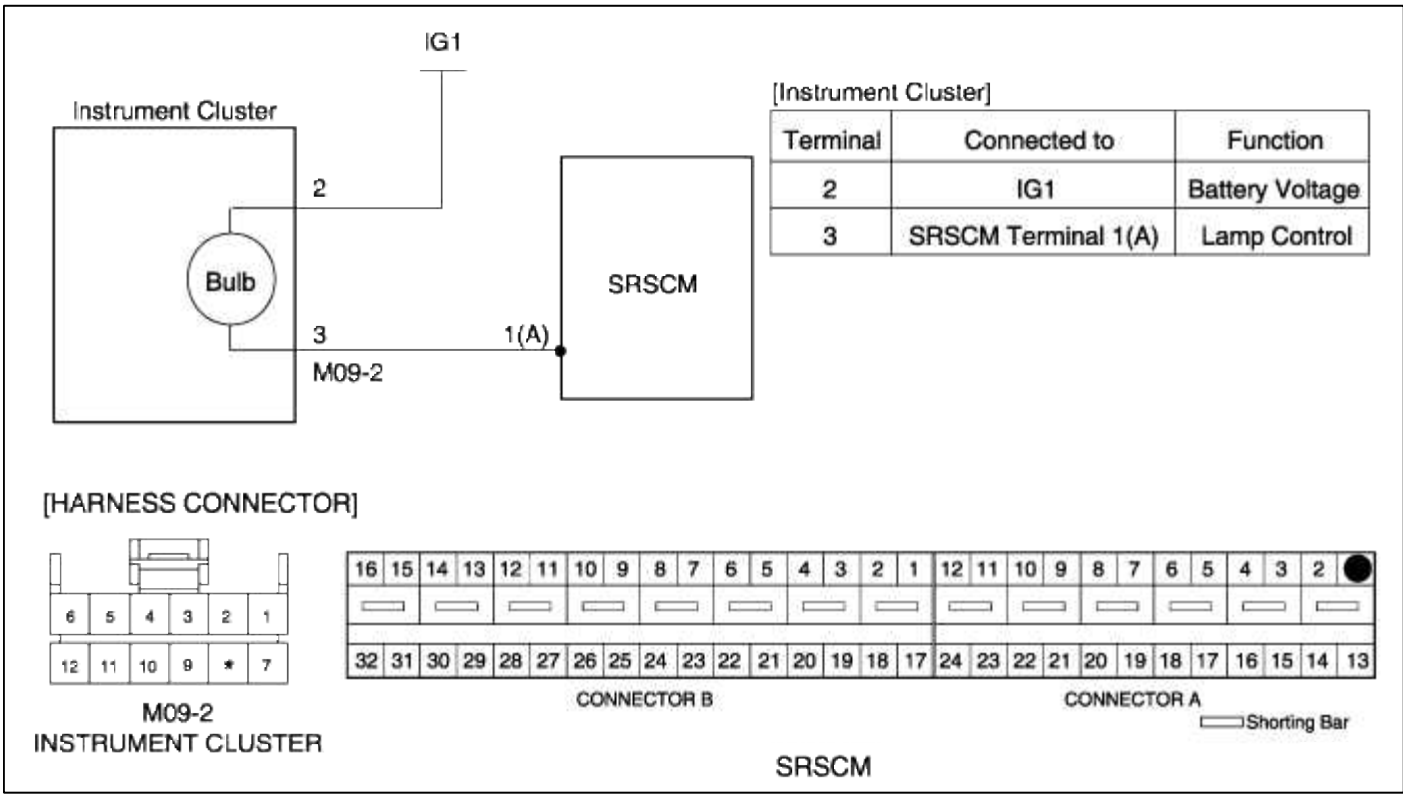
DTC Description

The SRS warning lamp is located in the cluster. When the airbag system is normal, the SRS warning lamp turns on for approx. 6 seconds after the ignition switch is turned to ON, and then turns off automatically. If there is a malfunction in the airbag system, the SRS warning lamp lights up to inform the driver of the abnormality. The SRSCM shall measure the voltage at the SRS warning lamp output pin, both when the lamp is on and when the lamp is off, to detect whether the commanded state matches the actual state.

DTC Detecting Condition

DTC	Condition	Probable cause
B2500	• Airbag fuse • Warning Lamp Bulb • Open between warning lamp and SRSCM • Short to ground or battery line between the warning lamp and SRSCM • SRSCM Malfunction	• Fuse • Warning lamp bulb • Wiring Harness • SRSCM

Schematic Diagram



Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK THE FUSE
   (1) Remove the airbag fuse and the airbag warning lamp fuse from junction box.
   (2) Inspect the fuses. Are the fuses normal?

YES

Check the warning lamp bulb.

NO

Repair or replace the fuses.

3. CHECK THE WARNING LAMP BULB

(1) Remove the bulb from the instrument cluster.

(2) Inspect the bulb. Is the bulb normal?

YES

Check source voltage.

NO

Repair or replace the bulb.

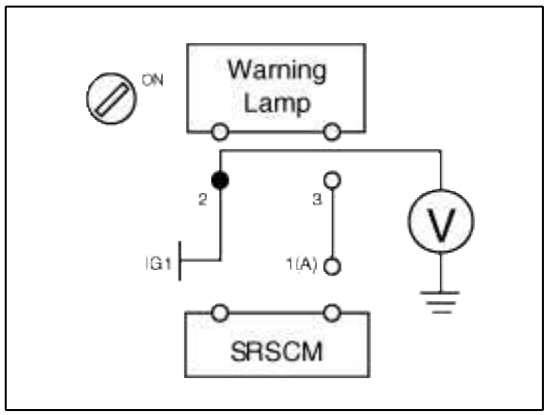
4. CHECK SOURCE VOLTAGE

(1) Connect the battery negative cable to the battery.

(2) Turn the ignition switch to ON.

(3) Measure voltage between the terminal 2 of the Instrument Cluster harness connector and chassis ground.

Specification (voltage) : 9 ~ 16 V



(4) Is the measured voltage within specification?

YES

Check short to battery line.

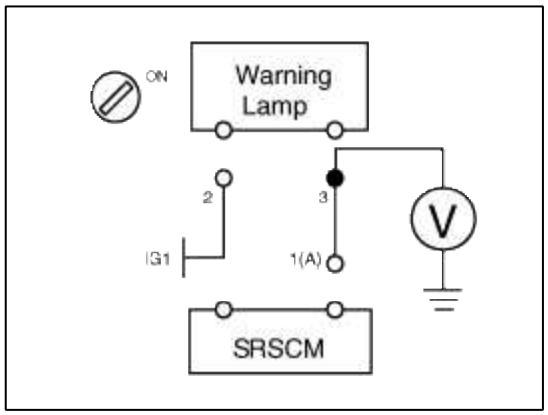
NO

Repair or replace the wiring harness between ignition switch and the Warning Lamp.

5. CHECK SHORT TO BATTERY LINE

(1) Measure voltage between the terminal 3 of the Instrument Cluster harness connector and chassis ground.

Specification (voltage) : Approximately 0 V



(2) Is the measured voltage within specification?

YES

Check short or short to ground.

NO

Repair the short to battery line circuit on wiring harness between the SRSCM and the Warning Lamp.

6. CHECK SHORT OR SHORT TO GROUND

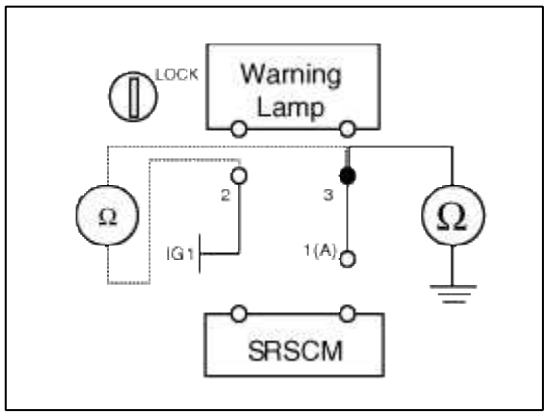
(1) Turn the ignition switch to LOCK.

(2) Disconnect the battery negative cable from the battery.

(3) Measure resistance between the terminal 3 of the Instrument Cluster harness connector and chassis ground.

(4) Measure resistance between the terminal 3 and 2 of the Instrument Cluster harness connector.

Specification (resistance) : infinite



(5) Is the measured resistance within specification?

YES

Check open circuit.

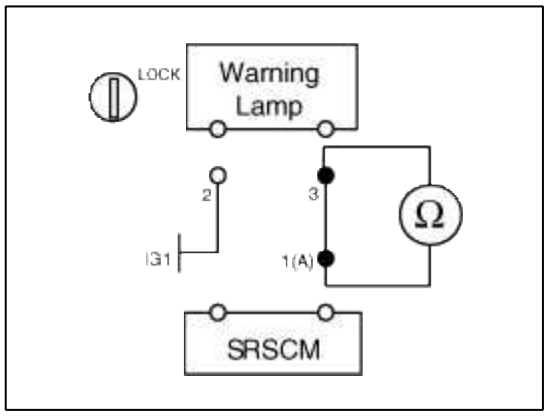
NO

Repair the short or short to ground circuit on wiring harness between the SRSCM and the Warning Lamp.

7. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 3 of the Instrument Cluster connector and the terminal 1 of SRSCM harness connector(A).

Specification (resistance) : below 1 Ω



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair the open circuit on wiring harness between the SRSCM and the Warning Lamp.

8. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Restraint > Troubleshooting > B2502

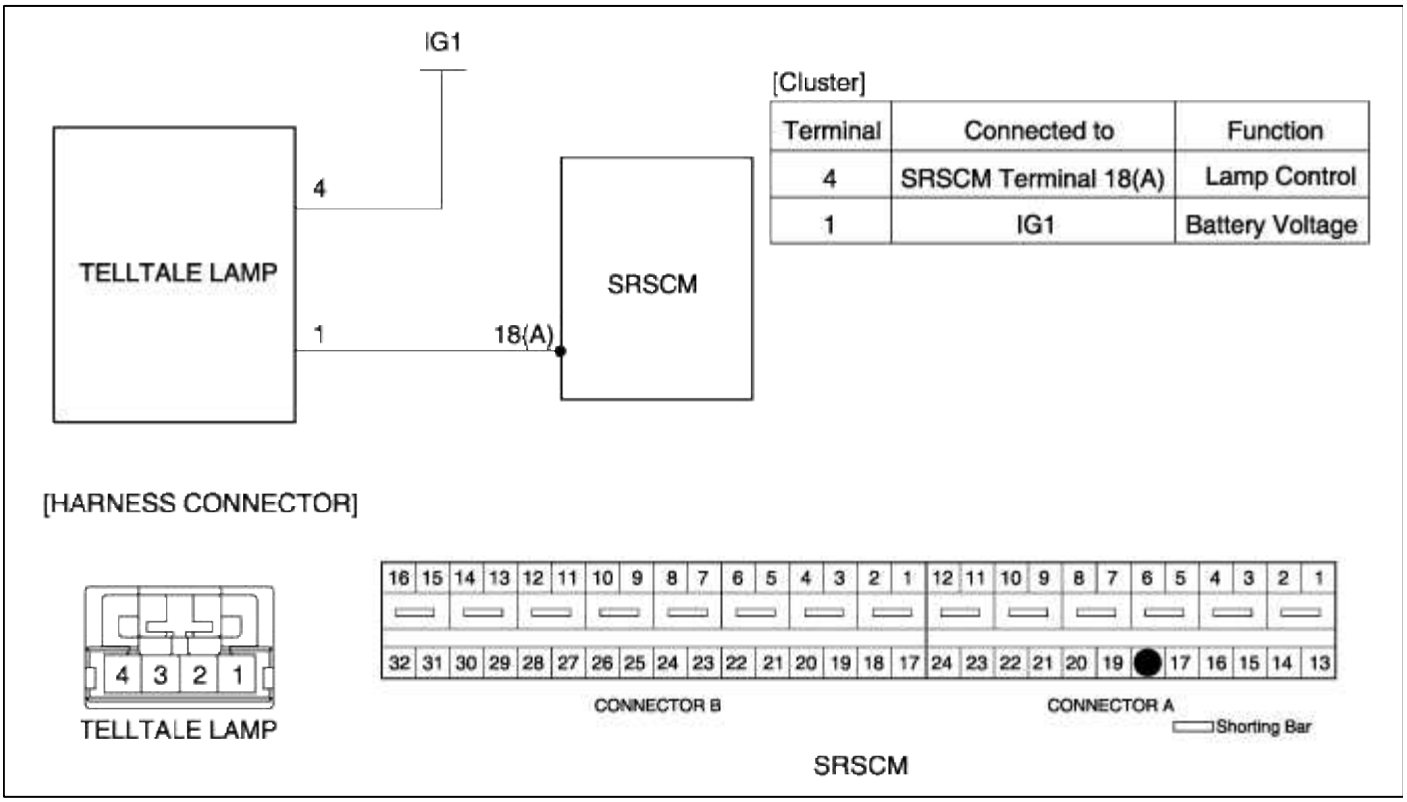
DTC Description

The Telltale Lamp circuit consisits of the Telltale Lamp and the SRSCM. SRSCM sets the above DTC if the Telltale Lamp failure is detected.

DTC Detecting Condition

DTC	Condition	Probable cause
B2502	• Airbag fuse • Telltale Lamp Bulb • Open between Telltale Lamp and SRSCM • Short to ground or battery line between the Telltale Lamp and SRSCM • SRSCM Malfunction	• Fuse • Telltale Lamp Bulb • Wiring Harness • SRSCM

Schematic Diagram



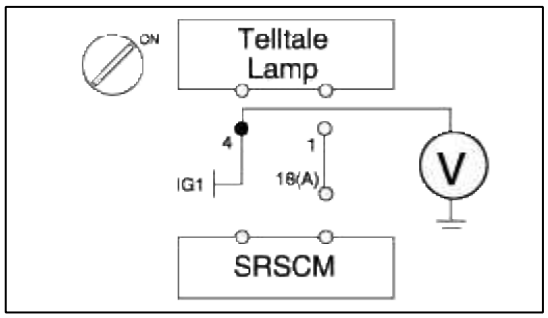
Terminal & Connector Inspection

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

Inspection Procedure

1. PREPARATION
   Refer to the DESCRIPTION in this TROUBLESHOOTING part.
2. CHECK THE FUSE
   (1) Remove the airbag fuse and the airbag telltale lamp fuse from junction block.
   (2) Inspect the fuses. Are the fuses normal?
   YES
   Check the telltale lamp bulb.
   NO
   Repair or replace the fuses.
3. CHECK THE TELLTALE LAMP BULB
   (1) Remove the bulb from the instrument cluster.
   (2) Inspect the bulb. Is the bulb normal?
   YES
   Check source voltage.
   NO
   Repair or replace the bulb.
4. CHECK SOURCE VOLTAGE
   (1) Connect the battery negative cable to the battery.
   (2) Turn the ignition switch to ON.
   (3) Measure voltage between the terminal 4 of the Telltale Lamp harness connector and chassis ground.

   specification(voltage) : 9 ~ 16 V

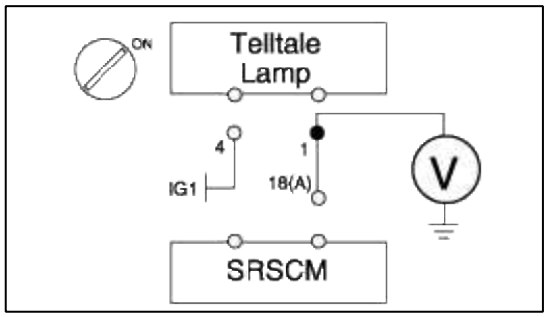


   (4) Is the measured voltage within specification?
   YES
   Check short to battery line.
   NO
   Repair or replace the wiring harness between ignition switch and the Telltale Lamp.

5. CHECK SHORT TO BATTERY LINE

(1) Measure voltage between the terminal 1 of the Telltale Lamp harness connector and chassis ground.

specification(voltage) : Approximately 0 V



(2) Is the measured voltage within specification?

YES

Check short or short to ground.

NO

Repair the short to battery line circuit on wiring harness between the SRSCM and the Telltale Lamp.

6. CHECK SHORT OR SHORT TO GROUND

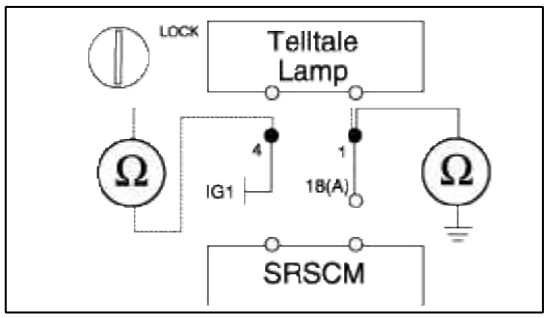
(1) Turn the ignition switch to LOCK.

(2) Disconnect the battery negative cable from the battery.

(3) Measure resistance between the terminal 1 of the Telltale Lamp harness connector and chassis ground.

(4) Measure resistance between the terminal 4 and 1 of the Telltale Lamp harness connector.

specification(resistance) : infinite



(5) Is the measured resistance within specification?

YES

Check open circuit.

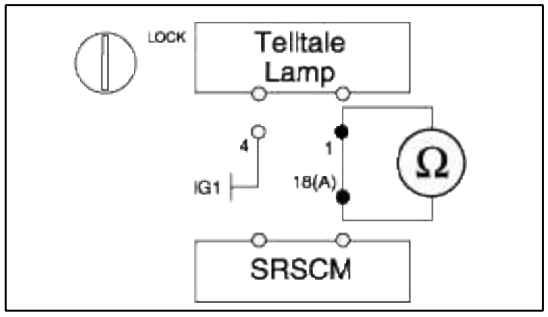
NO

Repair the short or short to ground circuit on wiring harness between the SRSCM and the Telltale Lamp.

7. CHECK OPEN CIRCUIT

(1) Measure resistance between the terminal 1 of the Telltale Lamp harness connector and the terminal 18(A) of SRSCM harness connector.

specification(resistance) : below 1 Ω



(2) Is the measured resistance within specification?

YES

Go to next step.

NO

Repair the open circuit on wiring harness between the SRSCM and the Telltale Lamp.

8. CLEAR THE DTC AND CHECK THE VEHICLE AGAIN

Refer to the DESCRIPTION in this TROUBLESHOOTING part.

ACCENT(MC) > 2008 > G 1.6 DOHC > Steering System

Steering System > General Information > General Information

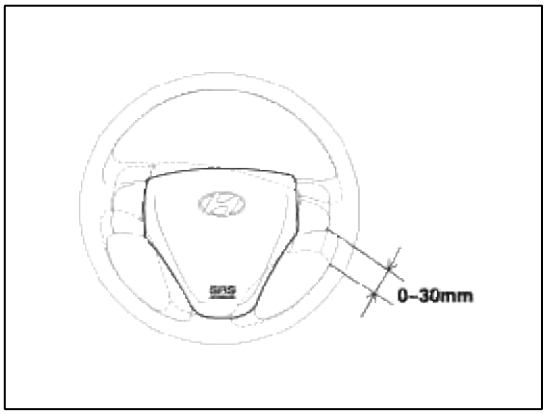
SERVICE ADJUSTMENT PROCEDURE

CHECKING STEERING WHEEL FREE PLAY

1. Start the engine with the steering wheel in the straight ahead position, apply a force of 5 N (1.1 lb) to the steering wheel in the peripheral direction.
2. Measure the play at the circumference of the steering wheel.

Standard value

Steering wheel free play : 0 ~ 30 mm (0 ~ 1.18 in)



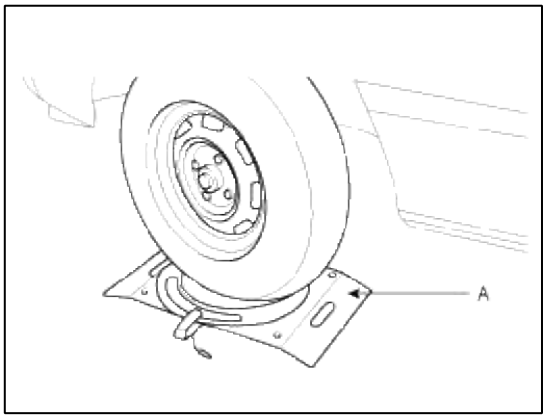
3. If the play exceeds the standard value, inspect the connection between the steering shaft and tie rod ends.

CHECKING STEERING ANGLE

1. Place the front wheel on a turning radius gauge and measure the steering angle.

Standard value

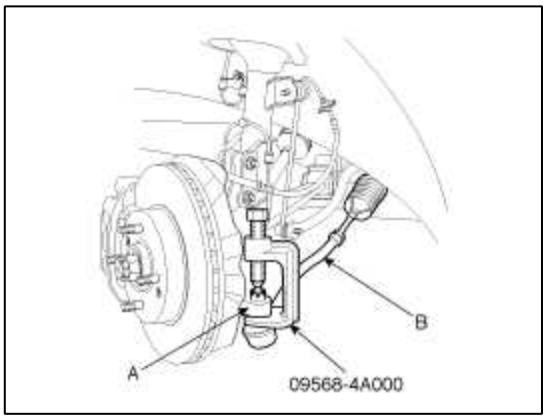
Steering angle : See page ST-2



2. If the measured value is not within the standard value, adjust the linkage.

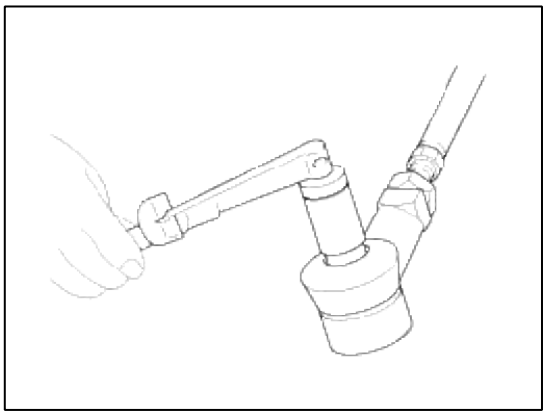
CHECKING THE TIE ROD END BALL JOINT STARTING TORQUE

1. Disconnect the tie rod(A) and knuckle(B) by using the special tool (09568-4A000).



2. Shake the ball joint stud several times to check for looseness.
3. Mount the nuts on the ball joint, and then measure the ball joint starting torque.

Standard value
0.5 ~ 2.5 Nm (0.05 ~ 0.25 kgf·m, 0.36 ~ 1.80 lb-ft)



4. If the starting torque exceeds the upper limit of the standard value, replace the tie rod end.
5. Even if the starting torque is below the lower limit of the standard value, check the play of the ball joint and replace if necessary.

CHECKING STATIONARY STEERING EFFORT

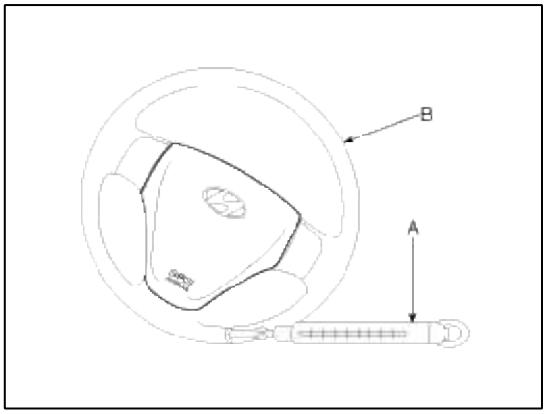
1. Place the vehicle on a level surface and place the steering wheel in the straight ahead position.
2. Increase the engine speed to 1000 ± 100 rpm.

NOTE

After checking, reset the engine speed to the standard value (idling speed).

3. Measure the turning force with a spring scale(A) by turning the steering wheel(B) clockwise and counterclockwise one and a quarter turns.

Standard value
Stationary steering effort :
34 N (3.5 kg, 7.7 lbs) or less



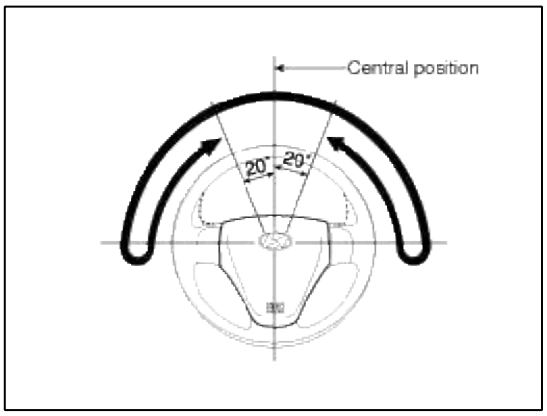
4. Check that there is no sudden change of force while turning the steering wheel.
5. If the stationary steering effort is excessive, check and adjust the following points.
   (1) Damage or cracks on the dust cover of the lower arm ball joint and tie rod end.
   (2) Pinion preload of the steering gear box and starting torque of the tie rod end ball joint.
   (3) Starting torque of the ball joint.

CHECKING STEERING WHEEL RETURN

1. The force required to turn and return the steering wheel should be the same for both left and right in case of moderate or sharp turns.
2. When the steering wheel is turned 90° and held for a couple of seconds while the vehicle is being driven at 35kph, the steering wheel should return to within 20° from the neutral position when it is released.

NOTE

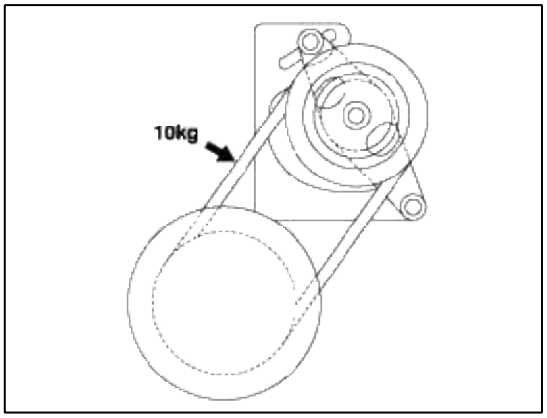
If the steering wheel is turned very quickly, steering may be momentarily difficult. This is not a malfunction because the oil pump output will be somewhat decreased.



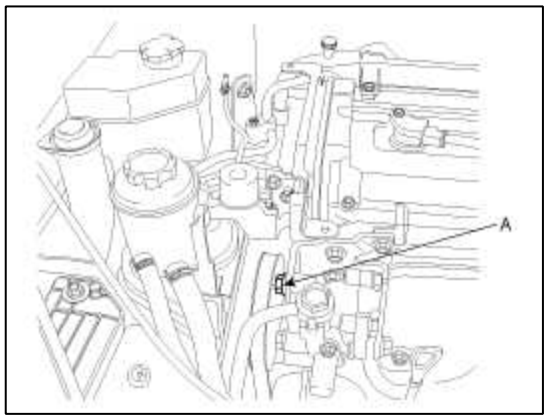
CHECKING POWER STEERING BELT TENSION

1. Press the V belt, applying a pressure of 98N (10kg, 22lb) at the specified point and measure the deflection to confirm that it is within the standard value.

Standard value
V belt deflection : 7 ~ 10 mm (0.27 ~ 0.39 in)



2. If the belt deflection is beyond the standard value, adjust the belt tension as follows.
   (1) Loosen the bolt(A) adjusting the power steering V belt tension.



   (2) Put a bar or equivalent, between the bracket and the oil pump and adjust the tension so that the belt deflection is within the standard value.
   (3) Tighten the bolt adjusting the power steering V belt tension.
   (4) Check the belt deflection and adjust it again if necessary.

> CAUTION
>
> After turning the V belt in the normal rotation direction more than once, recheck the belt deflection.

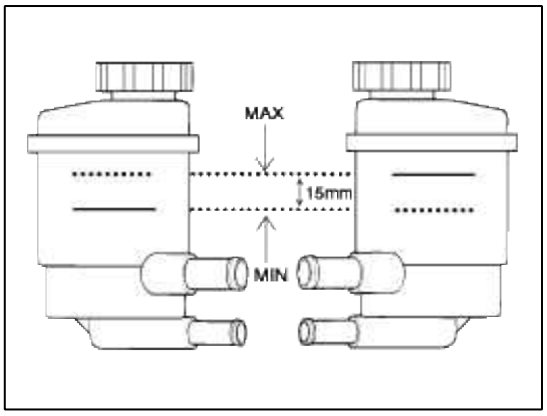
CHECKING POWER STEERING FLUID LEVEL

1. Position the vehicle on a surface level.
2. Start the engine. With the vehicle kept stationary, turn the steering wheel several times continuously to raise the fluid temperature to 50 - 60°C(122 to 140°F).
3. With the engine at idle, turn the steering wheel fully clockwise and counterclockwise several times.
4. Make sure there is no foaming or cloudiness in the reservoir fluid.

5. Stop the engine to check for any difference in fluid level between a stationary and a running engine.

NOTE

1. If the fluid level varies 15 mm (5.9 in) or more, bleed the system again.
2. If the fluid level suddenly rises after stopping the engine, further bleeding is required.
3. Incomplete bleeding will produce a chattering sound in the pump and noise in the flow control valve, and lead to decreased durability of the pump.



REPLACING POWER STEERING FLUID

1. Jack up the front wheels of the car and support them with jackstands.
2. Disconnect the return hose from the oil reservoir and plug the oil reservoir.
3. Connect a hose to the disconnected return hose, and drain the oil into a container.
4. Disconnect the high tension cables and ignition coils.While operating the starter motor intermittently, turn the steering wheel all the way to the left and then to the right several times to drain the fluid.
5. Connect the return hose and fix it with a clip.
6. Fill the power steering fluid reservoir with the specified fluid.

PSF-III : 0.8 lit. (0.84 gts.)

7. Start the engine.
   Check for fluid leaks from the hose, then stop the engine.
8. Pour the fluid into the bottom of the oil filter in the power steering fluid reservoir.
9. Bleed the air.

AIR BLEEDING

1. Fill the power steering fluid reservoir up to the "MAX" position with specified fluid.
2. Jack up the front wheels.
3. Disconnect the ignition coil high tension cable, and then, while operating the starter motor intermittently (for 15 to 20 seconds), turn the steering wheel all the way to the left and then to the right five or six times.

NOTE

1. When bleeding fluid, replenish with the fluid so that the level does not fall below the bottom of the filter.
2. If air bleeding is done while the vehicle is idling, the air will be broken up and absorbed into the fluid. Be sure to do the bleeding only while cranking.

4. Connect the high tension cable, and then start the engine (idling).
5. Turn the steering wheel to the left and then to the right, until there are no air bubbles in the oil reservoir.

NOTE

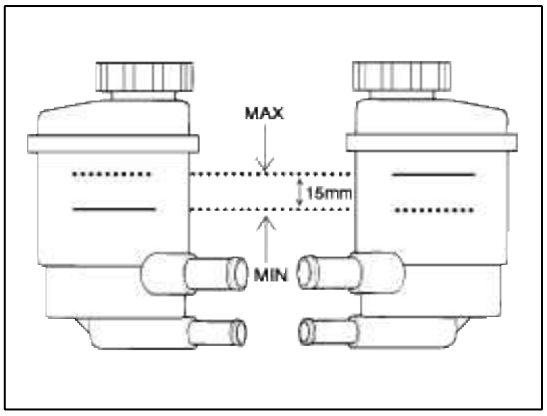
Do not hold the steering wheel turned all the way to either side for more than ten seconds.

6. Confirm that the fluid is not milky and that the level is between "MAX" and "MIN" mark on the reservoir.

7. Check that there is a little change in the fluid level when the steering wheel is turned left and right.

NOTE

1. If the fluid level varies 15mm (5.9 in) or more, bleed the air in the system again.
2. If the fluid level suddenly rises after stopping the engine, further bleeding is required.
3. Incomplete bleeding will produce a chattering sound in the pump and noise in the flow control valve, and lead to decreased durability of the pump.



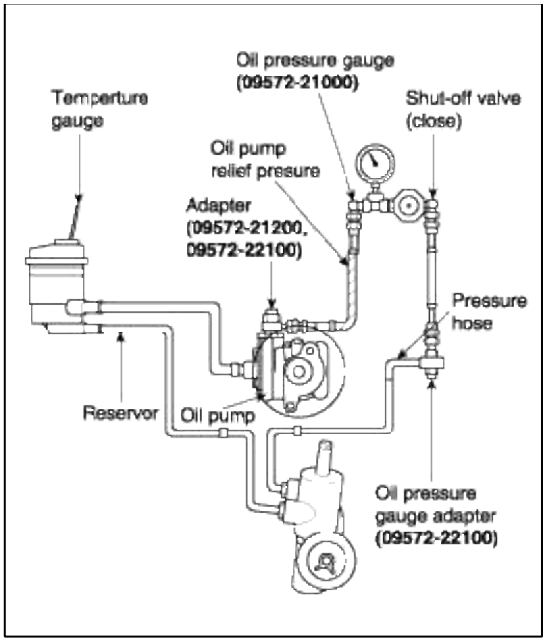
OIL PUMP PRESSURE TEST

1. Disconnect the pressure hose from the pump. Connect the special tool between the pump and the pressure hose as illustrated.
2. Bleed the air, and then start the engine and turn the steering wheel several times, measure the fluid temperature by Temperature gauge so that the fluid temperature can rise to approximately 50°C (122°F).
3. Increase the engine speed to 1,000 rpm.
4. Close the shut-off valve of the special tool and measure the fluid pressure to confirm that it is within the standard value range.

Standard value
Oil pump pressure
Relief pressure :
6.6 ~ 7.3 MPa (68 ~ 75 kg/cm², 967 ~ 1066 psi)

CAUTION

Do not keep the shut-off valve on the pressure gauge closed for more than ten seconds.



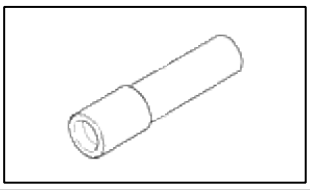
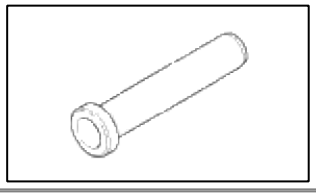
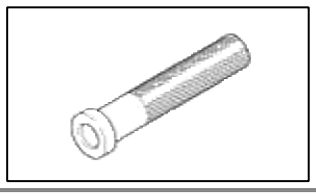
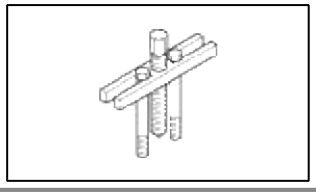
5. Remove the special tools, and tighten the pressure hose against the oil pump using the specified torque.

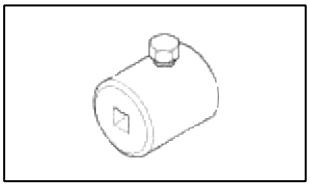
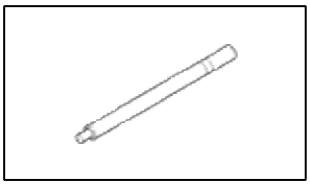
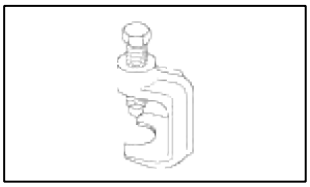
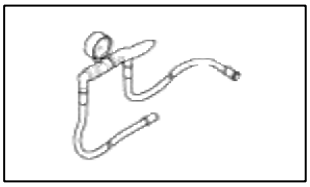
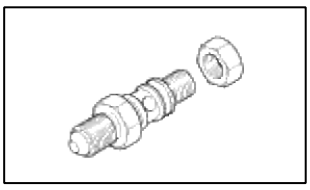
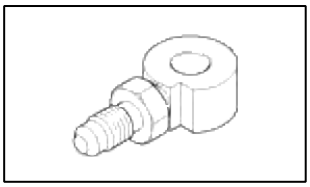
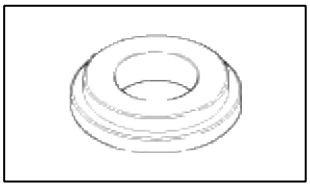
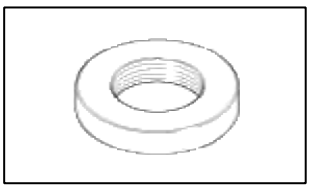
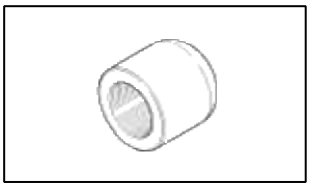
Tightening torque
55 ~ 65 Nm (5.5 ~ 6.5 kgf·m, 40 ~ 47 lb-ft)

6. Bleed the air in the system.

Steering System > General Information > Special Service Tools

SPECIAL SERVICE TOOLS

Tool (Number and name)	Illustration	Use
09222-32100 Valve stem oil seal installer		Installing the pinion gear bearing
09432-21600 Bearing installer		Installing the pinion gear bearing
09434-14200 Counter shaft bearing installer		Installing the gear box oil seal.
09561-11002 Steering wheel puller		Removing the steering wheel.

09565-11100 Preload socket		Measuring the pinion shaft preload.
09555-21000 Bar		Removing & installing the oil seal of the rack housing.
09568-4A000 Ball joint puller		Separating the tie rod end ball joint.
09572-21000 Oil pressure gauge		Measuring the power steering oil pressure (use with 09572-21200, 09572-22100)
09572-21200 Oil pressure gauge adapter		Measuring the power steering oil pressure (use with 09572-21000, 09572-22100)
09572-22100 Oil pressure gauge adapter		Measuring the power steering oil pressure (use with 09572-21000, 09572-21200)
09573-21000 Oil seal installer gauge		Installing the oil seal of the rack housing
09573-21100 Oil seal installer		Installing the oil seal of the rack housing
09573-21200 Oil seal guide		Removing & installing the oil seal of the rack housing

Steering System > General Information > Troubleshooting

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Excessive play in steering	Loose yoke plug	Retighten
	Loose steering gear mounting bolts	Retighten
	Loose or worn tie rod end	Retighten or replace as necessary
Steering wheel operation is not smooth (Insufficient power assist)	V-belt slippage	Readjust
	Damaged V-belt	Replace
	Low fluid level	Replenish
	Air in the fluid	Bleed air
	Twisted or damaged hoses	Correct the routing or replace
	Insufficient oil pump pressure	Repair or replace the oil pump
	Sticky flow control valve	Replace
	Excessive internal oil pump leakage	Replace the damaged parts
	Excessive oil leaks from rack and pinion in gear box	Replace the damaged parts
	Distorted or damaged gear box or valve body seals	Replace
Steering wheel does not return properly	Excessive turning resistance of tierod end	Replace
	Yoke plug excessively tight	Adjust
	Tie rod and/or ball joint cannot turn smoothly	Replace
	Loose mounting of gear box mounting bracket	Retighten
	Worn steering shaft joint and/or body grommet	Correct or replace
	Distorted rack	Replace
	Damaged pinion bearing	Replace
	Twisted or damaged hoses	Reposition or replace
	Damaged oil pressure control valve	Replace
	Damaged oil pump input shaft bearing	Replace
Noise	**Hissing Noise in Steering Gear** There is some noise with all power steering systems. One of the most common is a hissing sound when the steering wheel is turned and the car is not moving. This noise will be most evident when turning the wheel while the brakes are being applied. There is no relationship between this noise and steering performance. Do not replace the valve unless the "hissing" noise becomes extreme. A replaced valve will also make a slight noise, and is not always a solution for the condition.	
Rattling or chucking noise in the rack and pinion	Interference with hoses from vehicle body	Reposition
	Loose gear box bracket	Retighten
	Loose tie rod end and/or ball joint	Retighten

	Worn tie rod and/or ball joint	Replace
Noise in the oil pump	Low fluid level	Replenish
	Air in the fluid	Bleed air
	Loose pump mounting bolts	Retighten

NOTE

A slight "grinding noise" may be heard immediately after the engine is started in extremely cold weather conditions (below - 20°C). This is due to power steering fluid characteristics in extreme cold conditions and is not an indication of a malfunction.

Steering System > General Information > Specifications

SPECIFICATIONS

Items		Specifications
Steering column & joint type		Collapsible, cross
Steering gear type		Rack & pinion
Power steering pump	Type	Vane
	Max. pressure	70 kgf/cm²
	Discharge	9.6 cc/rev

SERVICE STANDARD

Items			Specifications
Steering wheel free play			30 mm (1.18 in)
Steering angle	Manual	Inner	38° 58′±1° 30′
		Outer	32° 38′
	Power	Inner	39° 57′±1° 30′
		Outer	32° 54′
Drive belt deflection			7 ~ 10mm (0.27 ~ 0.39in)
Power steering pump pressure			40 kgf/cm²
Tie rod swing resistance			1.5 ~ 5.0 Nm (0.15 ~ 0.5 kgf·m , 1.1 ~ 3.6 lb·ft)
Tie rod ball joint starting toque			0.5 ~ 2.5 Nm (0.05 ~ 0.25 kgf·m , 0.36 ~ 1.81 lb·ft)

TIGHTENING TORQUES

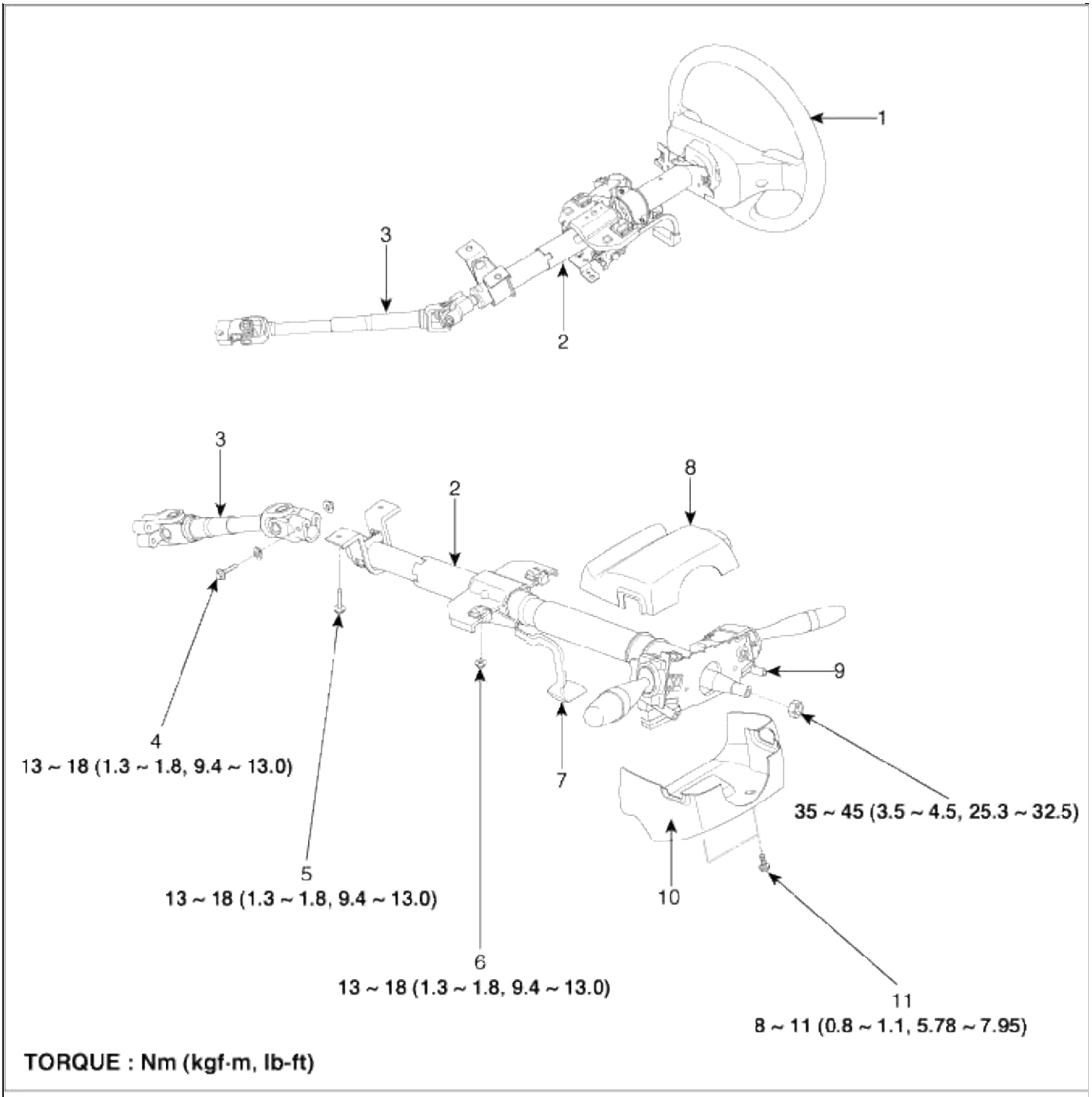
Items	Nm	Kgf·m	Lb·ft
Steering wheel lock nut	40 ~ 50	4.0 ~ 5.0	29 ~ 36
Steering column mounting bolts and nut	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13.0
Bolt connecting steering column to universal joint	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13.0
Bolt connecting universal joint to steering gear	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13.0
Steering column mounting bolts and nut	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13.0
Tie rod end castle nut	24 ~ 34	2.4 ~ 3.4	17 ~ 26
Front lower arm ball joint assembly bolts	100 ~ 120	10.0 ~ 12.0	72 ~ 86
Stabilizer link to strut assembly nut	35 ~ 45	3.5 ~ 4.5	25 ~ 33
Rear roll stopper to sub-frame bolts	50 ~ 60	5.0 ~ 6.0	36 ~ 43
Pressure tube to valve body housing nut	12 ~ 18	1.2 ~ 1.8	9 ~ 13
Pressure tube to oil pump eye bolt	55 ~ 65	5.5 ~ 6.5	40 ~ 47
Return tube to valve body housing nut	12 ~ 18	1.2 ~ 1.8	9 ~ 13
Power steering gear box to sub-frame bots	60 ~ 80	6.0 ~ 8.0	43 ~ 58

LUBRICANTS

Items	Recommended lubricant	Quantity
Ball joint of tie rod end	SHOWA SUNLIGHT MB-2 OR equivalent	4g
Contact area of gear box bellows & tie rod	SILICON GREASE	As required
Power steering fluid	PSF-III	0.8 liter (0.84 qts.)

Steering System > Steering Column & Shaft > Steering Column-Shaft > Components and Components Location

COMPONENTS

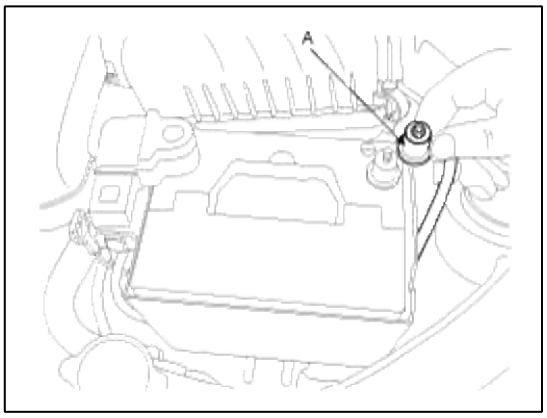


1. Steering wheel
2. Steering column
3. Universal joint assembly
4. Universal joint mounting bolt
5. Steering column shaft mounting bolt
6. Steering column shaft mounting nut
7. Tilt lever
8. Steering column upper shroud
9. Multifunction switch
10. Steering column lower shroud

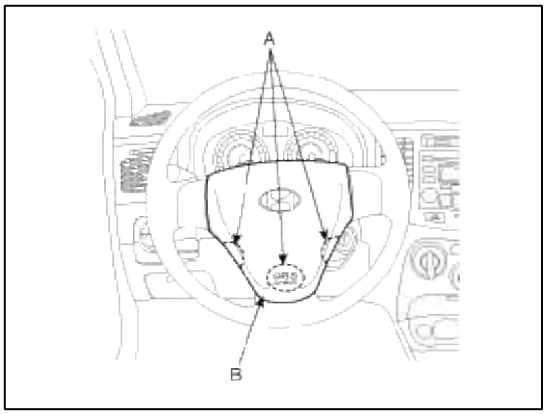
Steering System > Steering Column & Shaft > Steering Column-Shaft > Repair procedures

REMOVAL

1. Disconnect the negative terminal (A) from the battery.

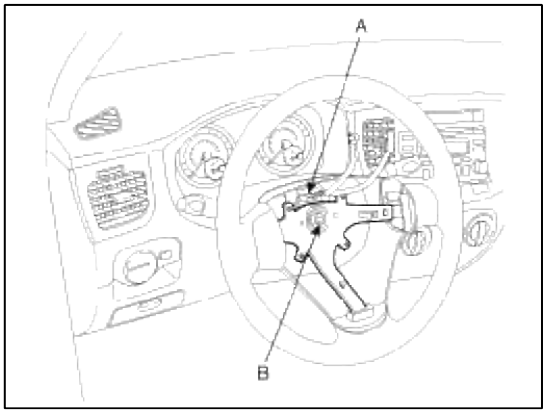


2. Loosen the bolts (A) in the illustration, and then remove the horn pad (B).



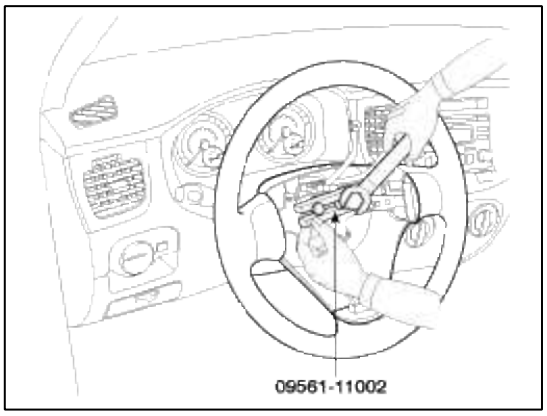
3. Disconnect the connector (A) and remove the steering wheel lock nut (B).

Tightening torque Nm (kgf·m, lb-ft):
40 ~ 50 (4.0 ~ 5.0, 29 ~ 36)

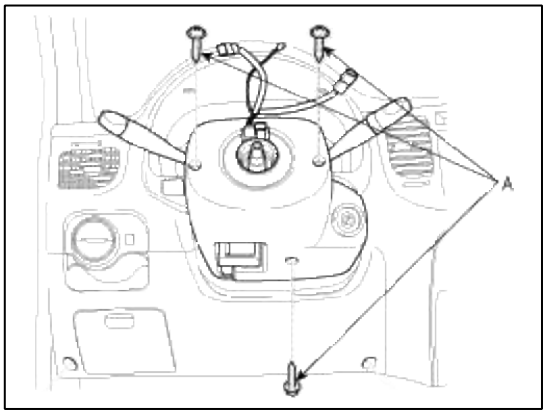


4. After making the marks on the steering wheel and shaft for reinstallation, remove the steering wheel using a SST (09561-11002).

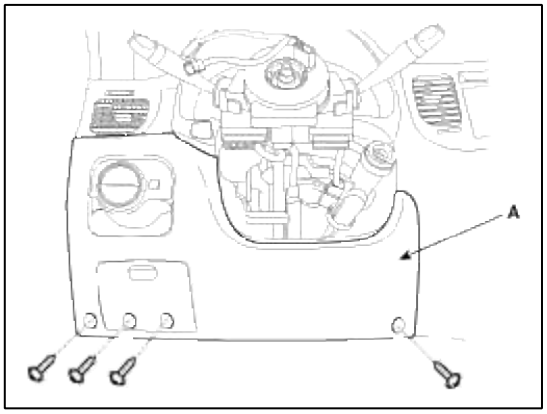
> **CAUTION**
>
> Do not hammer on the steering wheel to remove it ; it may damage the steering column.



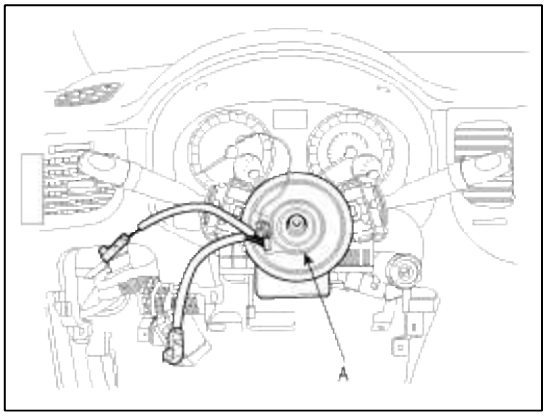
5. Loosen the screws (A), and then remove the steering column upper and lower shrouds.



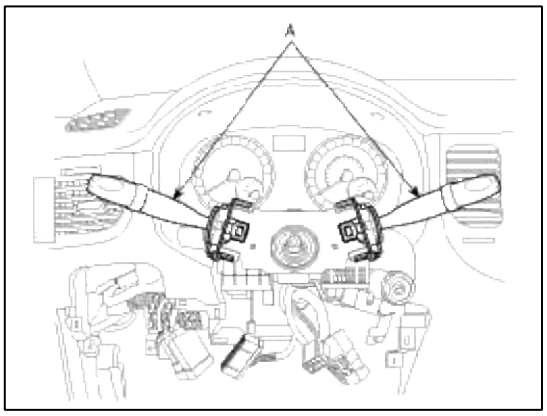
6. Loosen the screws and bolts, and then remove the lower crash pad (A).



7. Remove the clock sprig (A).

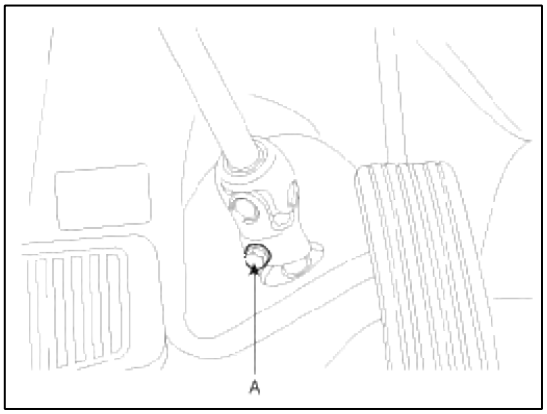


8. Disconnect the connectors and remove the mutifunction switch (A).



9. Remove the bolt (A) connecting steering gear to universal joint.

Tightening torque Nm (kgf·m, lb-ft) :
13 ~ 18 (1.3 ~ 1.8, 9.4 ~ 13.0)



CAUTION

Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

10. Remove the steering column after loosening the steering column mounting bolts and nut.

Tightening torque Nm (kgf·m, lb-ft) :
13 ~ 18 (1.3 ~ 1.8, 9.4 ~ 13.0)

INSTALLATION

1. Installation is the reverse of removal.

CAUTION

Align the marks on the steering wheel and shaft for reinstallation when installing the steering wheel. When installing the clock spring, refer o the RT group to prevent the damage of clock spring inner cable.

INSPECTION

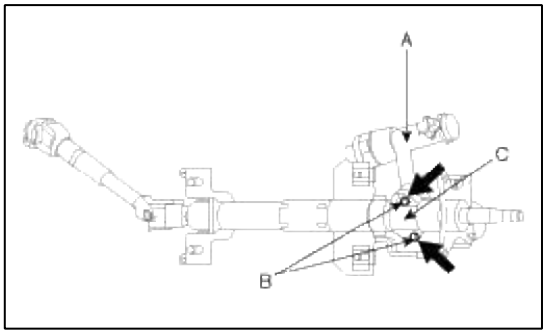
1. Check the steering column shaft for damage and deformation.
2. Check connections for play, damage and smooth operation.

3. Check the ball joint bearing for wear and damage.

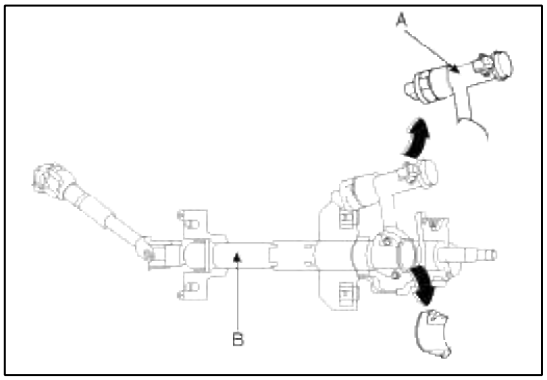
DISASSEMBLY AND REASSEMBLY

KEY LOCK ASSEMBLY

1. If it is necessary to remove the key lock assembly (A), use a punch to make a groove on the head of the special bolt (B), and then use a screwdriver to remove the key lock assembly mounting bracket (C).



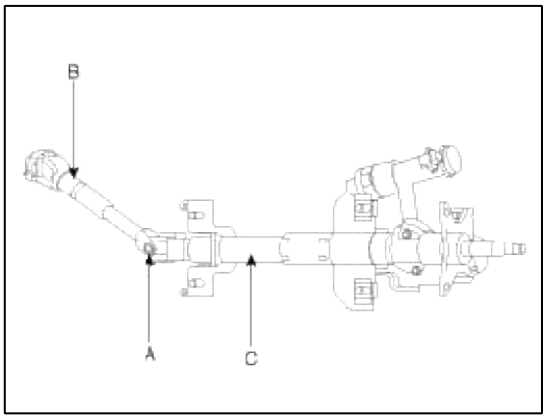
2. Disassemble the key lock assembly (A) from the steering column and shaft assembly (B).



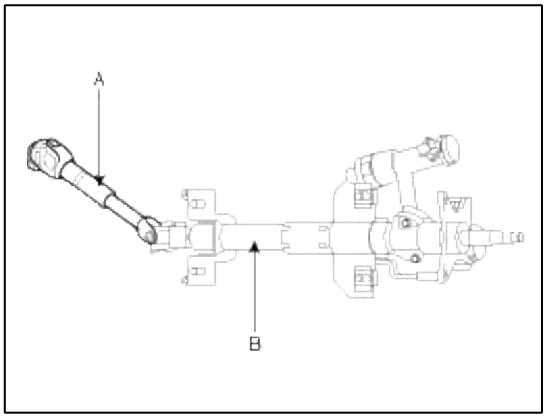
3. Reassembly is reverse of disassembly.

UNIVERSAL JOINT ASSEMBLY

1. Remove the bolt (A) connecting the universal joint assembly (B) and the steering column and shaft assembly (C).



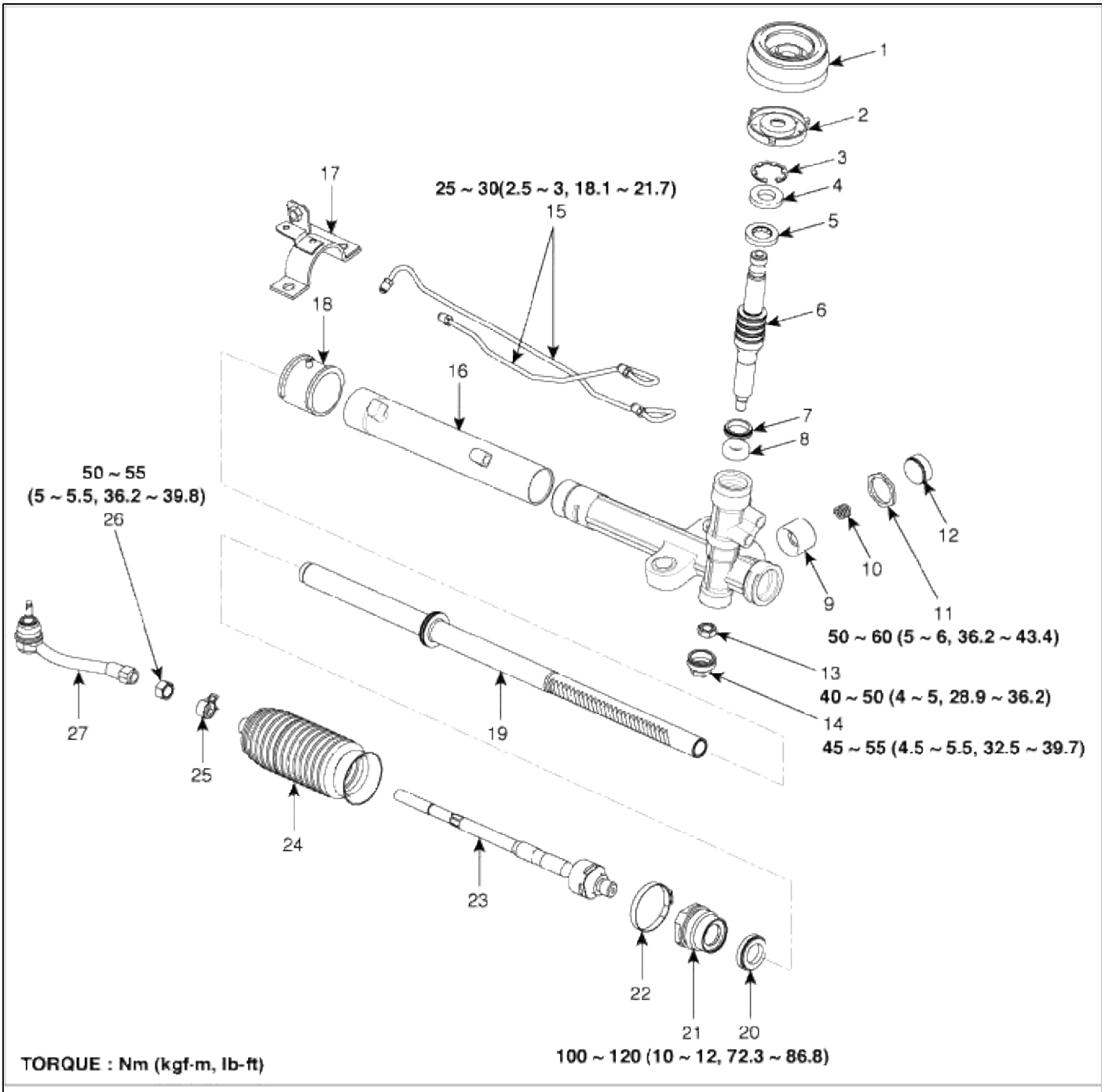
2. Remove the universal joint assembly (A) from the steering column and shaft assembly (B).



3. Reassembly is reverse of disassembly.

Steering System > Hydraulic Power Steering System > Power Steering Gear Box > Components and Components Location

COMPONENTS

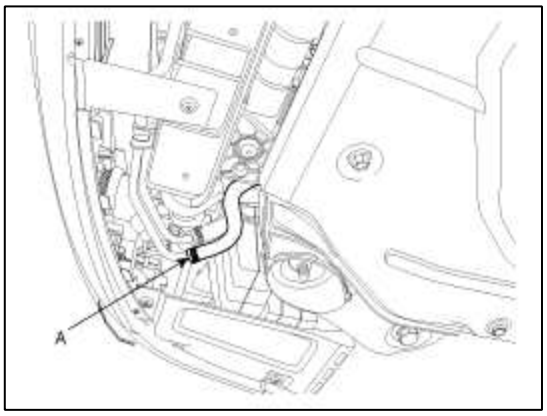


1. Protector rubber
2. Dust cap
3. Snap ring
4. Input shaft seal
5. Input shaft bearing
6. Pinion valve assembly
7. Pinion seal
8. Needle bearing
9. Rack support yoke
10. Rack support spring
11. Lock nut
12. Yoke plug
13. Pinion locking nut
14. Pinion plug
15. Feed tube
16. Rack housing
17. Mounting bracket
18. Mounting isolator
19. Rack
20. Oil seal
21. Rack stopper
22. Bellows band
23. Tie rod
24. Bellows
25. Bellows clip
26. Lock nut
27. Tie rod end

Steering System > Hydraulic Power Steering System > Power Steering Gear Box > Repair procedures

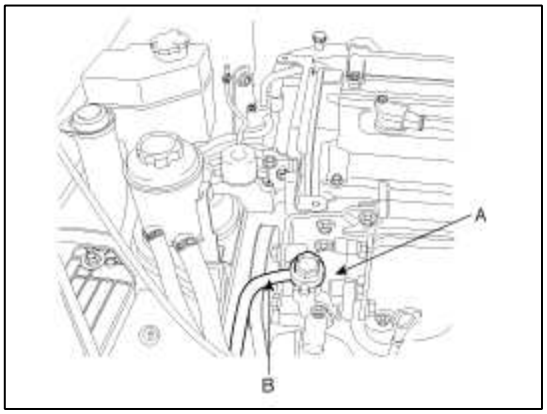
REMOVAL

1. Drain the power steering fluid by disconnecting the return hose (A).



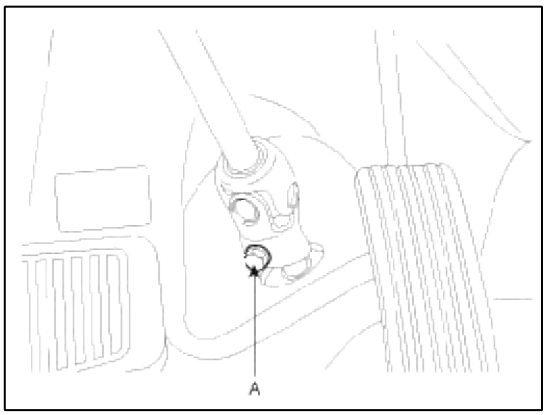
2. Disconnect the pressure tube (B) from the power steering oil pump (A) by loosening eye bolt.

Tightening torque Nm (kgf·m, lb-ft):
55 ~ 65 (5.5 ~ 6.5, 40 ~ 47)



3. Remove the bolt (A) connecting steering gear to universal joint.

Tightening torque Nm (kgf·m, lb-ft):
13 ~ 18 (1.3 ~ 1.8, 9.4 ~ 13.0)



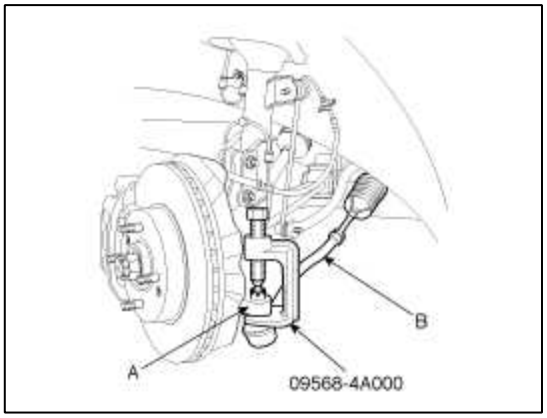
CAUTION

Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

4. Remove the both front wheel & tire assemblies.

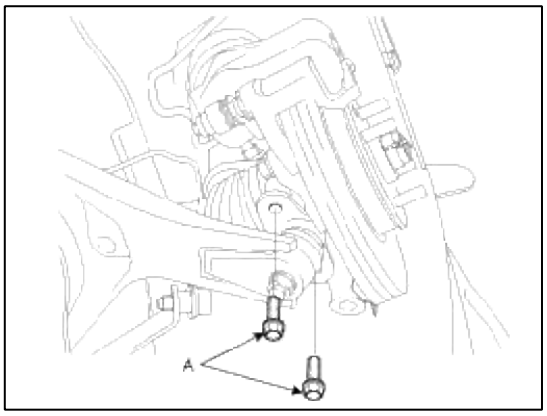
5. Loosen the Driveshaft castle nut, and then remove the tie rod end (A) from the knuckle (B) by using a SST 09568-4A000.

Tightening torque Nm (kgf·m, lb-ft):
24 ~ 34 (2.4 ~ 3.4, 17 ~ 26)



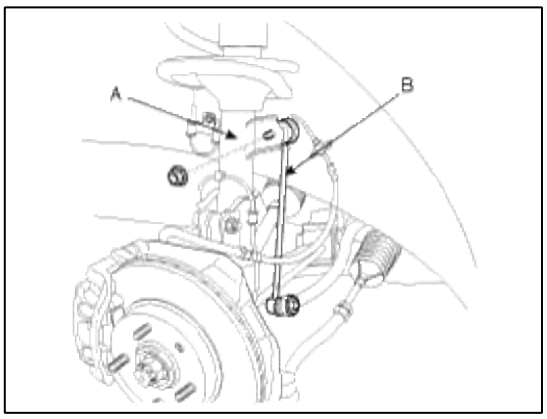
6. Remove lower arm ball joint assembly bolts (A).

Tightening torque Nm (kgf·m, lb-ft):
100 ~ 120 (10 ~ 12, 72 ~ 86)



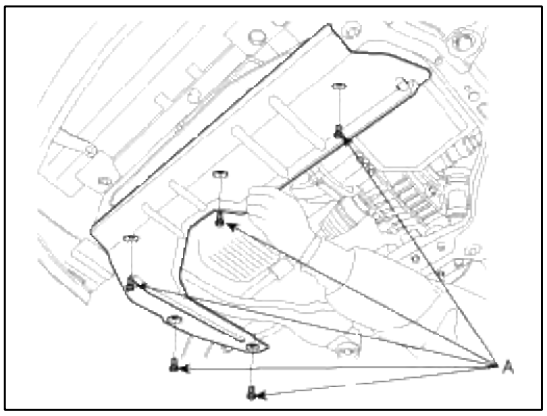
7. Disconnect the stabilizer link (B) from the strut assembly (A).

Tightening torque Nm (kgf·m, lb-ft):
35 ~ 45 (3.5 ~ 4.5, 25 ~ 33)

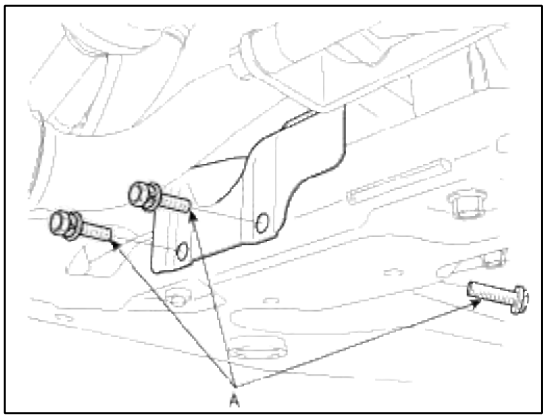


8. Repeat on the other side.

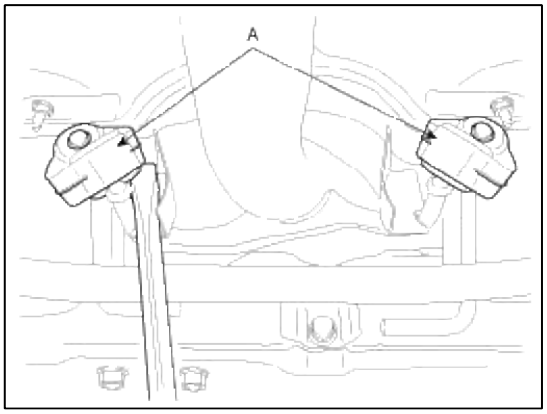
9. Remove the dust cover by loosening the bolts (A).



10. Loosen the bolts (A), and then remove the heat protector.

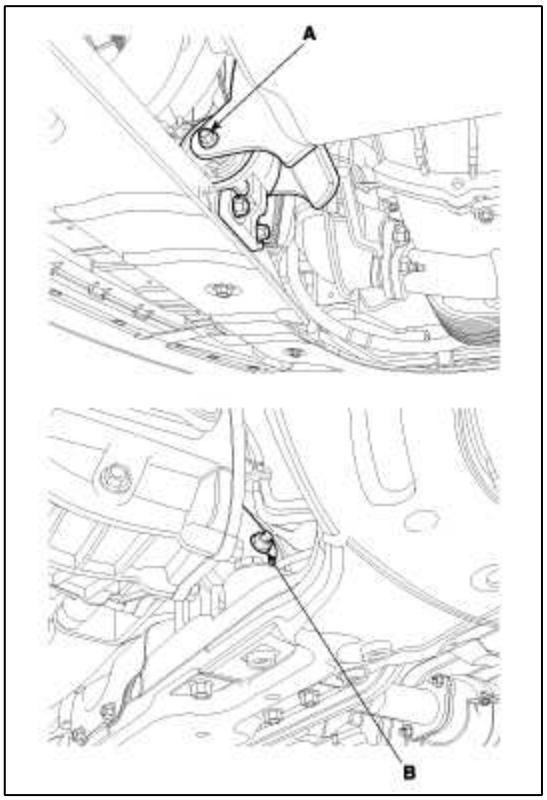


11. Remove the muffler mounting rubber (A).



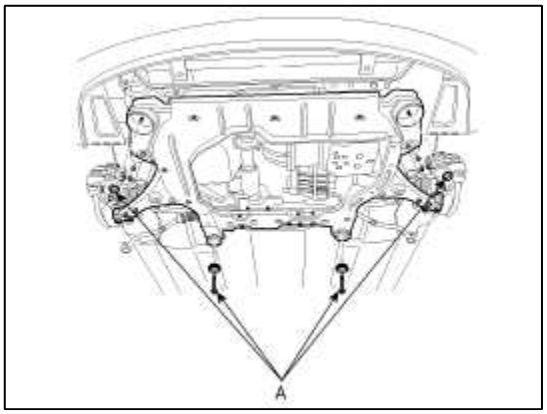
12. Remove the front and rear roll stopper bolt (A, B).

Tightening torque Nm (kgf·m, lb-ft):
50 ~ 65 (5.0 ~ 6.5, 36 ~ 47)



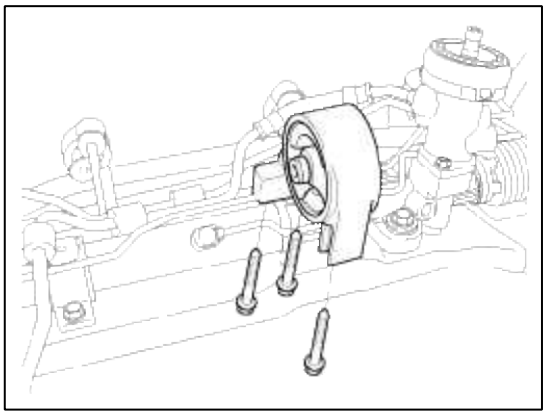
13. Remove the sub-frame by loosening the bolts and nuts (A).

Tightening torque Nm (kgf·m, lb-ft):
95 ~ 120 (9.5 ~ 12.0, 69 ~ 87)

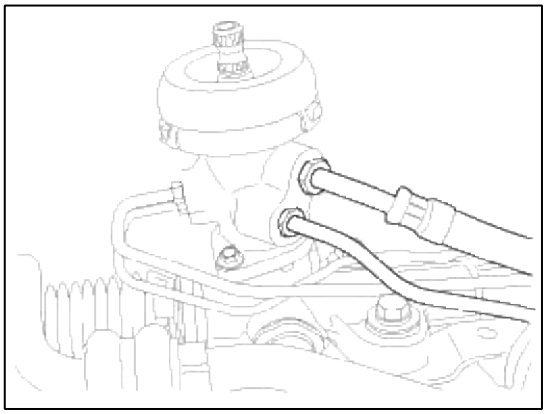


14. Remove the rear rool stopper by loosening the bolt.

Tightening torque Nm (kgf·m, lb-ft):
50 ~ 60 (5.0 ~ 6.0, 36 ~ 43)

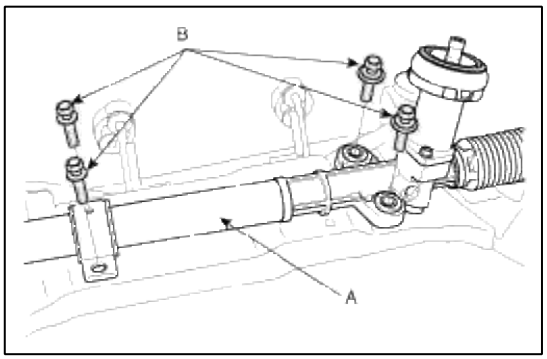


15. Disconnect the pressure hose and return tube & hose assembly from the valve body housing.



16. Remove the power steering gear box (A) by loosening the mounting bolt (B).

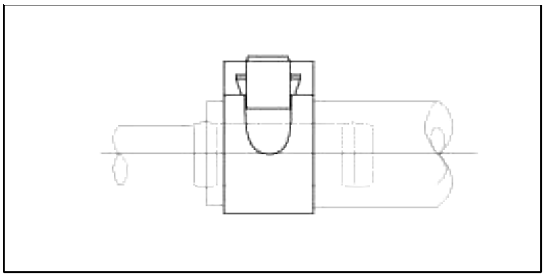
Tightening torque Nm (kgf·m, lb-ft):
60 ~ 80 (6.0 ~ 8.0, 43 ~ 58)



INSTALLATION

NOTE

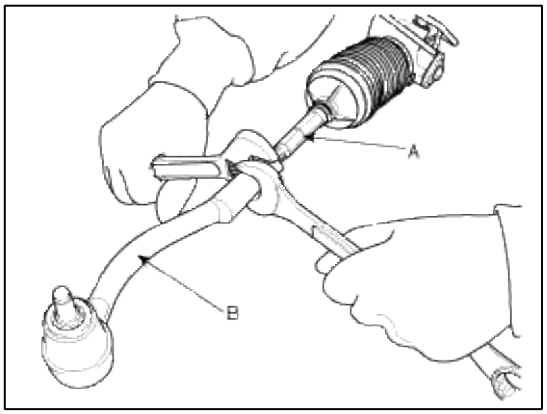
Be sure to connect between a tube and a hose as shown in the illustration.



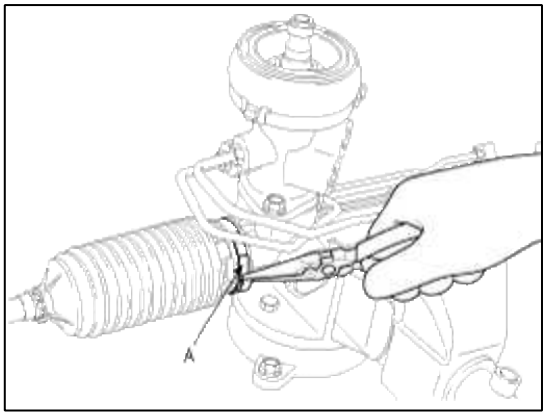
1. Installation is the reverse of removal.
2. After installation, bleed the power steering system.
3. Adjust the wheel alignment. (Refer to SS group)

DISASSEMBLY

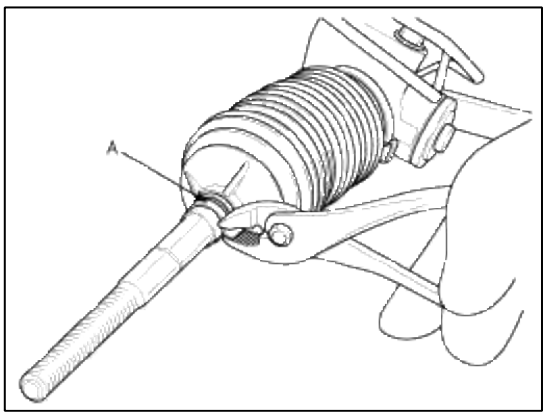
1. Remove the tie rod end (B) from the tie rod (A).



2. Remove the bellows band (A).



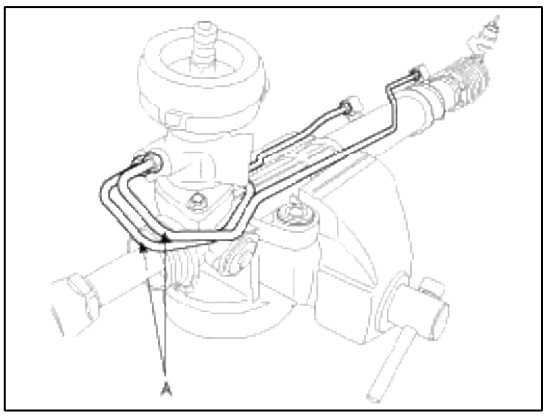
3. Remove the bellows clip (A).



4. Pull the bellows out toward the tie rod.

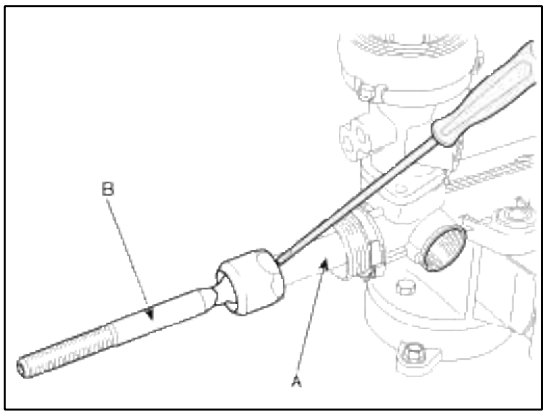
> NOTE
>
> Check for rust on the rack when the bellows are replaced.

5. Remove the feed tube (A) from the rack housing.

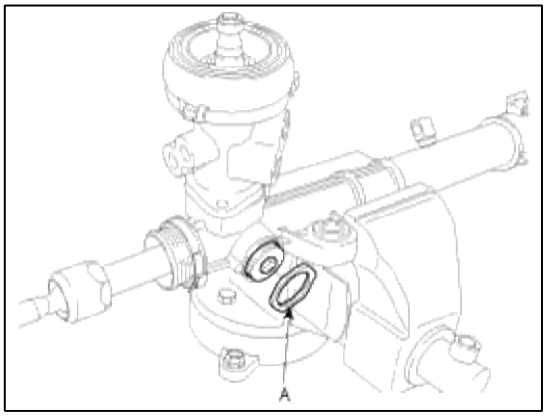


6. While moving the rack slowly, drain the fluid from the rack housing.
7. Remove the tie rod (B) from the rack (A).

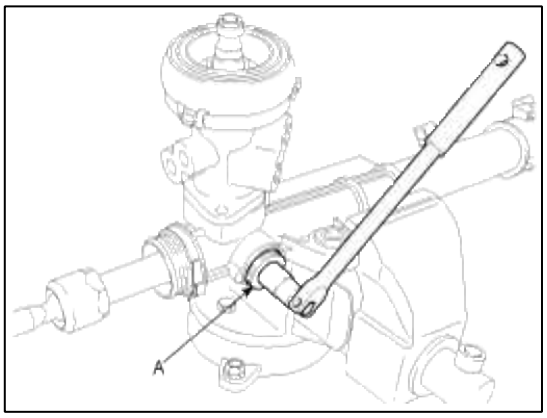
> CAUTION
>
> Remove the tie rod (B) from the rack (A), taking care not to twist the rack.



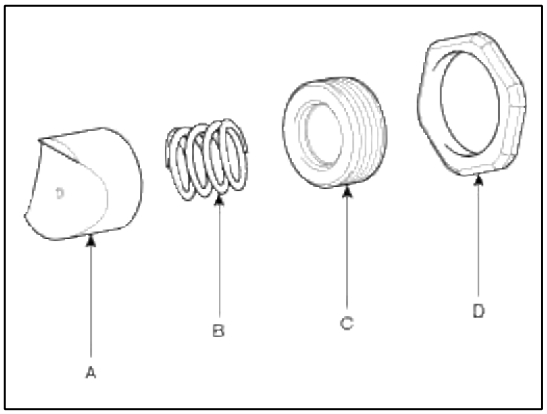
8. Remove the yoke plug locking nut (A).



9. Remove the yoke plug (A) with a 14 mm socket.



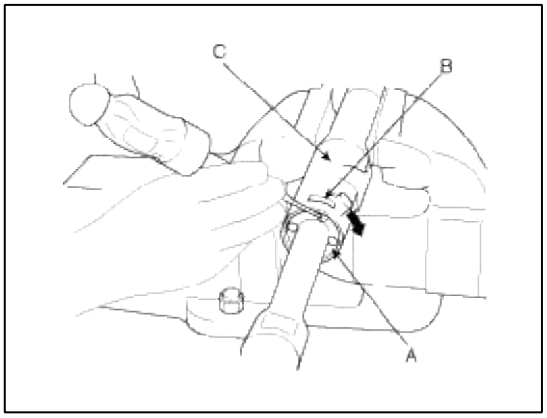
10. Remove the lock nut (D), yoke plug (C), rack support spring (B)and rack support yoke (A) from the gear box.



11. When the end of the circlip comes out of the notched hole (B) of the housing rack cylinder (C), turn the rack stopper (A) clockwise and remove the circlip.

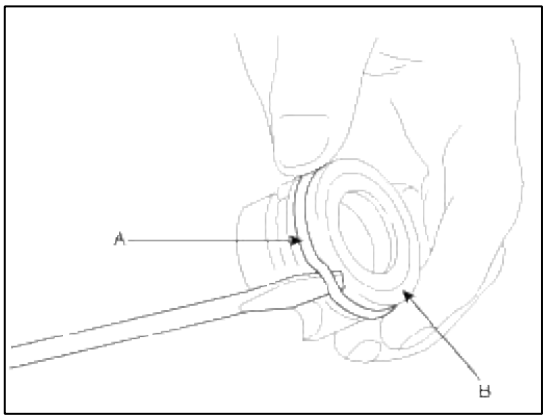
CAUTION

Be careful not to damage the rack.

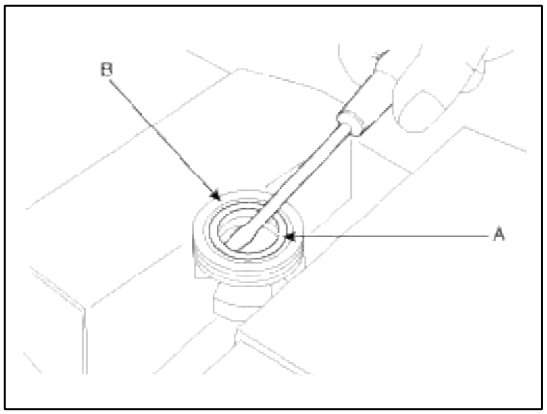


12. Remove the rack bushing and rack from the rack housing.

13. Remove the O-ring (A) from the rack bushing (B).



14. Remove the oil seal (B) from the rack bushing (A).

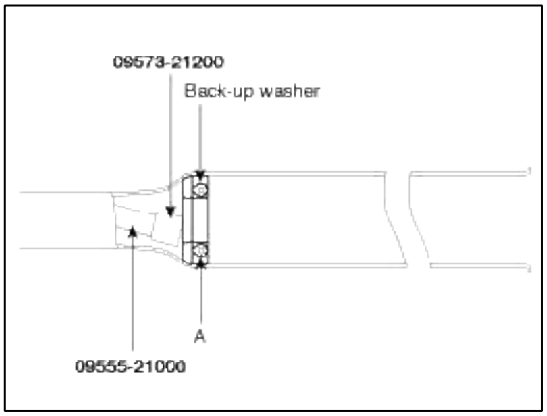


15. Remove the valve body from the valve body housing with a soft hammer.
16. Using the special tool, remove the oil seal and ball bearing from the valve body housing.
17. Remove the oil seal and O-ring from the rack housing.

> **CAUTION**
>
> Be careful not to damage the pinion valve cylinder inside of the rack housing.

18. Using the special tool (09573-21200, 09555-21000), remove the oil seal (A) from the rack housing.

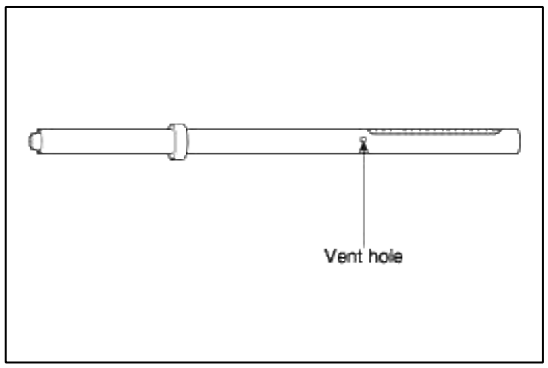
> **CAUTION**
>
> Be careful not to damage the rack cylinder inside of the rack housing.



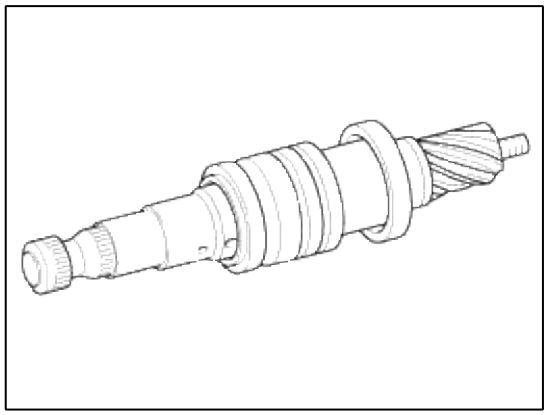
INSPECTION

1. Rack
   (1) Check for rack tooth face damage or wear
   (2) Check for oil seal contact surface damage
   (3) Check for rack bending or twisting
   (4) Check for oil seal ring damage or wear
   (5) Check for oil seal damage or wear

Vent hole



2. Pinion valve
   (1) Check for pinion gear tooth face damage or wear
   (2) Check for oil seal contact surface damage
   (3) Check for seal ring damage or wear
   (4) Check for oil seal damage or wear



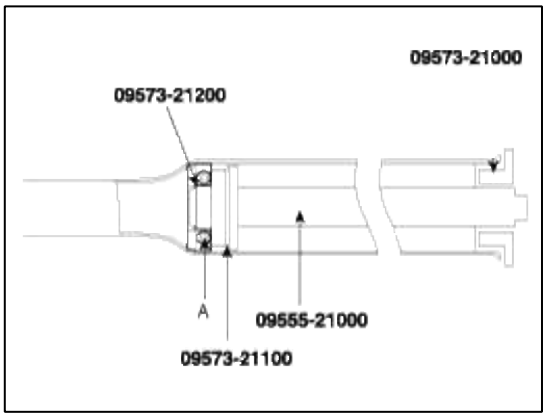
3. Bearing
   (1) Check for seizure or abnormal noise during a bearing rotation
   (2) Check for excessive play
   (3) Check for missing needle bearing rollers
4. Others
   (1) Check for damage of the rack housing cylinder bore
   (2) Check for boot damage, cracking or aging

REASSEMBLY

1. Apply the specified fluid to the entire surface of the rack oil seal.

PSF-III

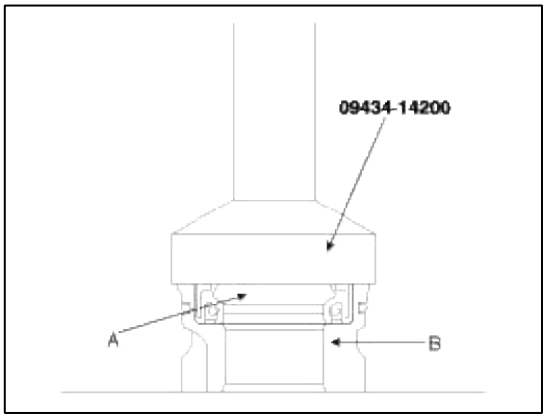
2. Install the backup washer and oil seal (A) to the specified position in the rack housing.



3. Apply the specified fluid to the entire surface of the rack bushing oil seal.

PSF-III

4. Install the oil seal (A) in the rack bushing (B).

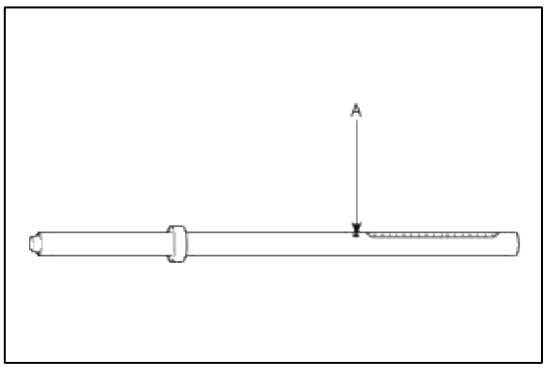


5. Apply the specified fluid to the entire surface of the O-ring and install it in the rack bushing.
6. Apply the specified grease to the rack teeth.

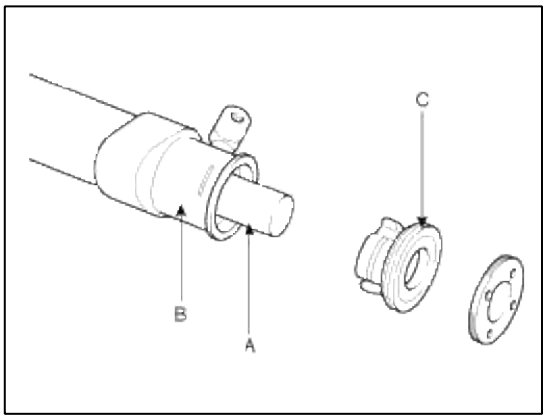
Recommended grease :
Multipurpose grease SAE J310a NLGI No.2

NOTE

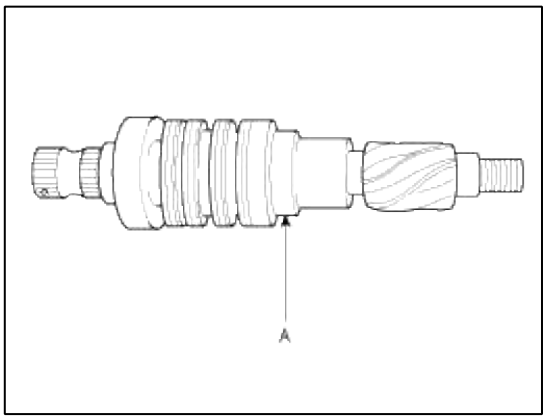
Do not plug the vent hole (A) in the rack with grease.



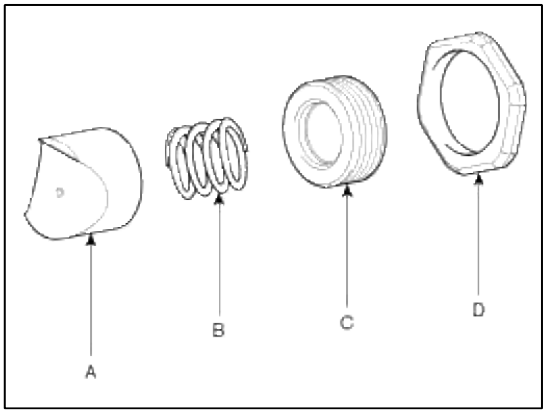
7. Insert the rack (A) into the rack housing (B) and install the rack bushing (C).



8. Using a special tool, install the oil seal and the ball bearing in the valve body housing.
9. After applying the specified fluid and grease to the pinion valve assembly (A), install it in the rack housing assembly.



10. Install the rack support yoke (A), rack support spring (B), yoke plug (C) and lock nut (D) in the order shown in the illustration. Apply semi-drying sealant to the threaded section of the yoke plug before installation.



11. Install the locking nut with a specified torque, after adjusting the rack support york as following instruction.
    (1) Place the rack in the center position.
    (2) Tighten the york plug with a specified torque.

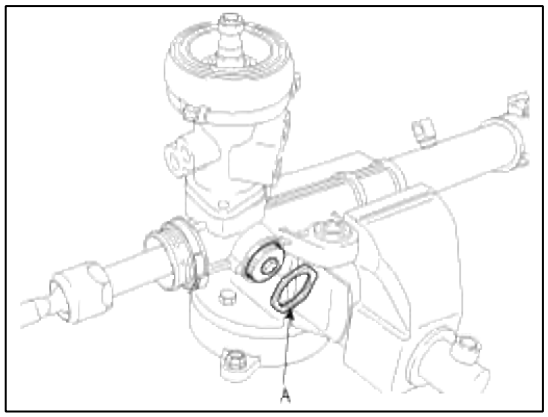
Specified torque Nm(kgf·m,lb-ft) :
Manual 9 ~ 11(0.9 ~ 1.1,6.5 ~ 7.9), Power 20(2,14.5)

    (3) Reciprocate the rack slowly 5 times.
    (4) Place the rack in the center position again, and then loosen the york plug.
    (5) Tighten the york with a specified torque, and turn at a certain degree in reverse.

Specified torque Nm(kgf·m,lb-ft) :
Manual 4.5 ~ 6.5(0.45 ~ 0.65,3.25 ~ 4.70),
Power 5 ~ 6(0.5 ~ 0.6,3.62 ~ 4.34)
Reverse angle :
25 ± 5 (Manual), 35 (Power)

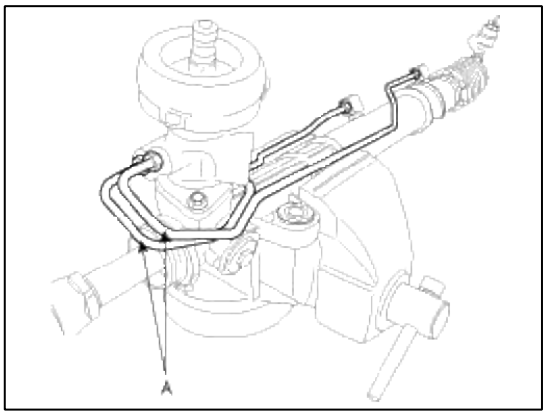
    (6) Tighten the yoke lock nut without moving yoke plug.

Specified torque Nm(kgf·m,lb-ft) :
Manual 40 ~ 50(4 ~ 5,28.9 ~ 36.2),
Power 50 ~ 60(5 ~ 6,36.2 ~ 43.4)



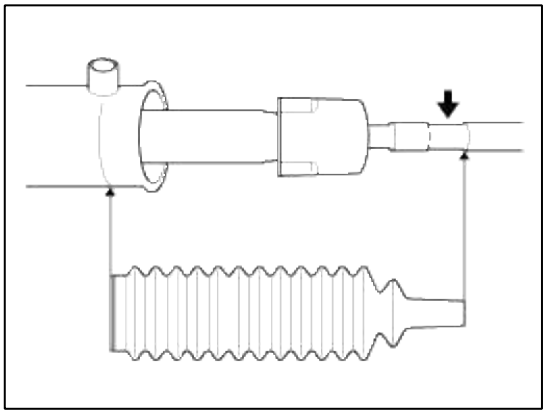
12. Tighten the feed tube (A) to the specified torque and install the mounting rubber using adhesive.

Tightening torque :
25 ~ 30 Nm (2.5 ~ 3 kgf·m, 18.0 ~ 21.7 lb-ft)



13. Apply the specified grease to the bellows mounting position (fitting groove) of the tie rod.

Silicone grease

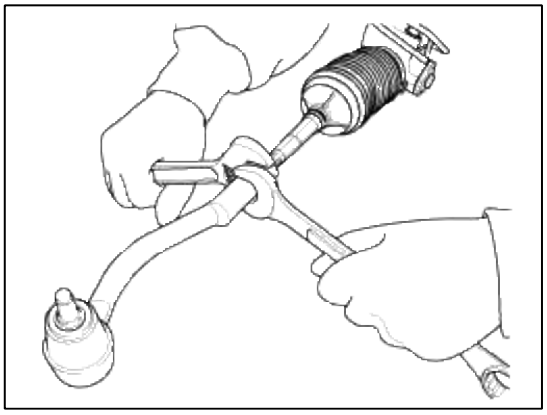


14. Install the new attaching band to the bellows.

NOTE

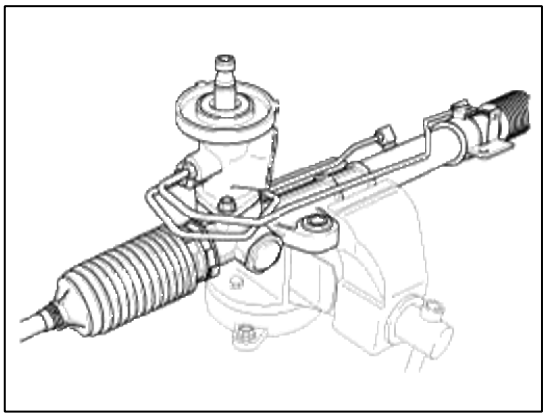
When the bellows are installed, a new band must be used.

15. Install the bellows in position, taking care not to twist it.
16. Temporarily install the tie rod (A) to the tie rod end (B).



17. Check for total pinion preload.

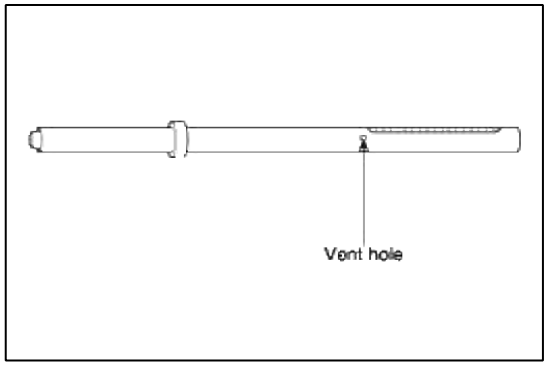
Total ponion preload :
0.6 ~ 1.3 Nm (6 ~ 13 kgf·cm, 0.4 ~ 1.0 lb-ft)



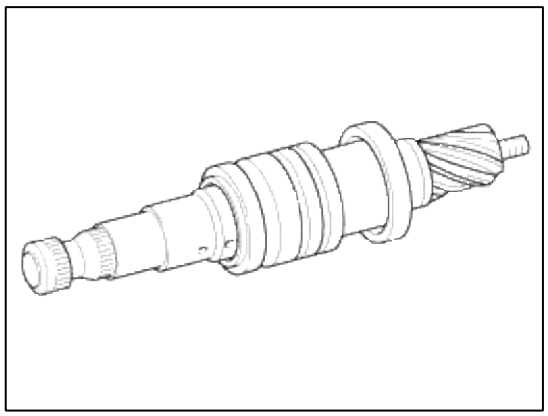
INSPECTION

1. Rack
   (1) Check for rack tooth face damage or wear
   (2) Check for oil seal contact surface damage
   (3) Check for rack bending or twisting
   (4) Check for oil seal ring damage or wear
   (5) Check for oil seal damage or wear

Vent hole



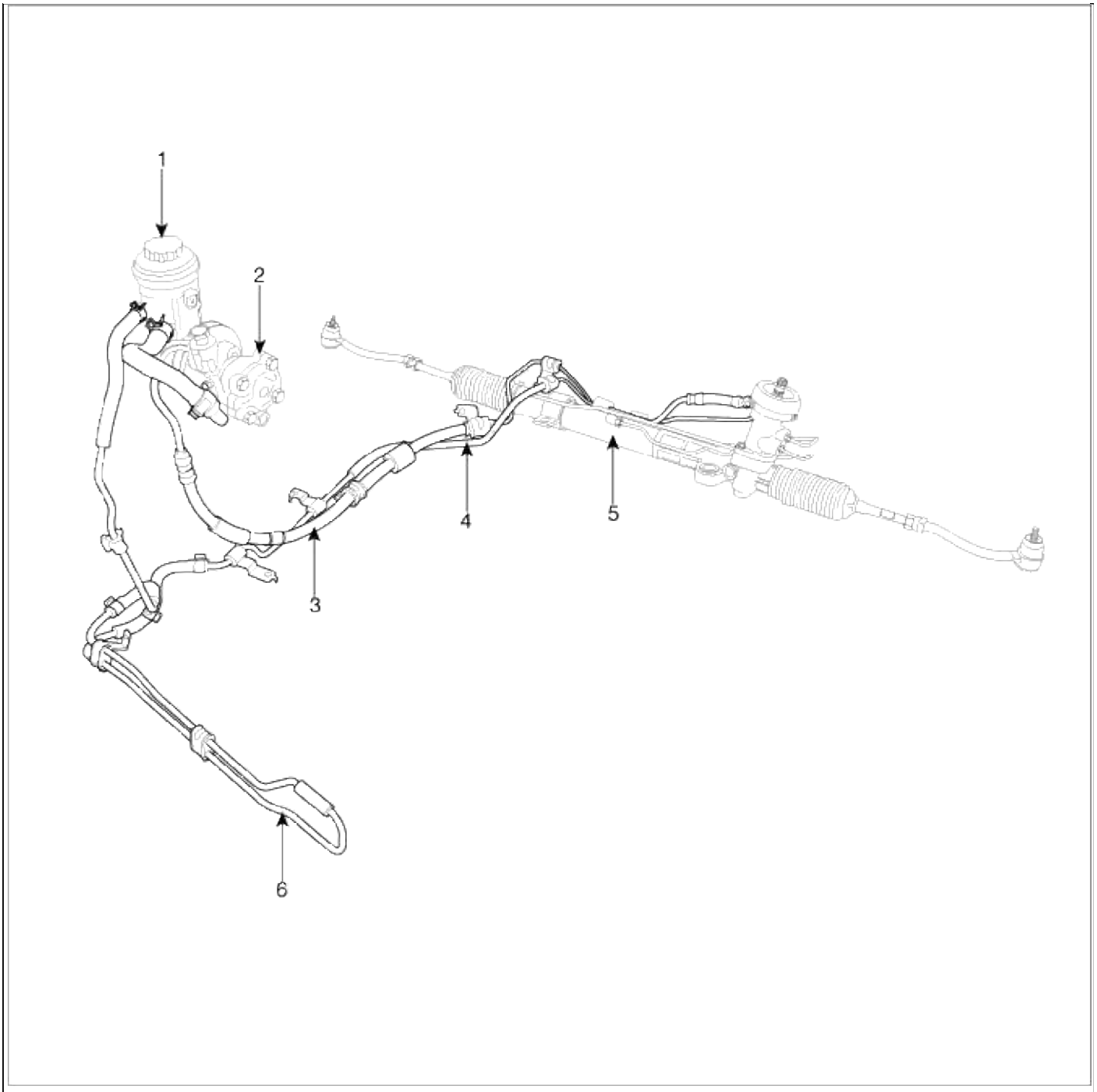
2. Pinion valve
   (1) Check for pinion gear tooth face damage or wear
   (2) Check for oil seal contact surface damage
   (3) Check for seal ring damage or wear
   (4) Check for oil seal damage or wear



3. Bearing
   (1) Check for seizure or abnormal noise during a bearing rotation
   (2) Check for excessive play
   (3) Check for missing needle bearing rollers
4. Others
   (1) Check for damage of the rack housing cylinder bore
   (2) Check for boot damage, cracking or aging

Steering System > Hydraulic Power Steering System > Power Steering Hoses > Components and Components Location

COMPONENTS



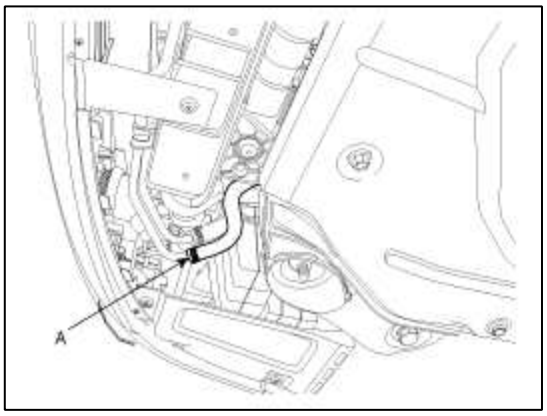
1. Power steering oil reservoir
2. Power steering pump
3. Pressure hose
4. Return hose
5. Power steering gear box
6. Cooler tube

Steering System > Hydraulic Power Steering System > Power Steering Hoses > Repair procedures

REPLACEMENT

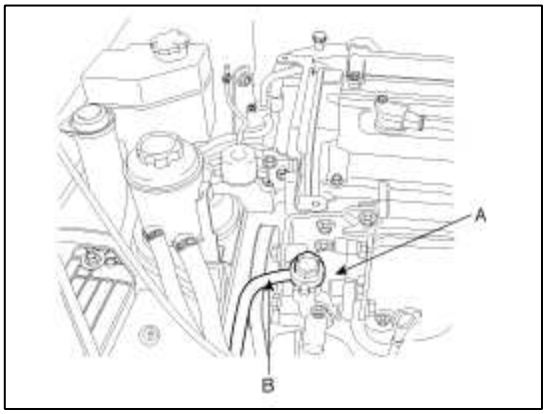
PRESSURE HOSE AND TUBE

1. Drain the power steering fluid by disconnecting the return hose (A).



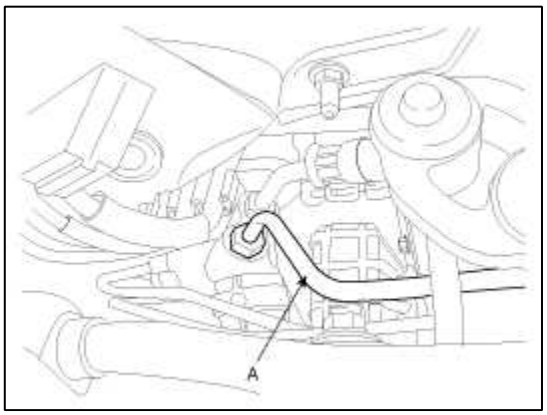
2. Disconnect the pressure tube (B) from the power steering oil pump (A) by loosening eye bolt.

Tightening torque Nm (kgf·m, lb-ft):
55 ~ 65 (4.5 ~ 5.5, 40 ~ 47)

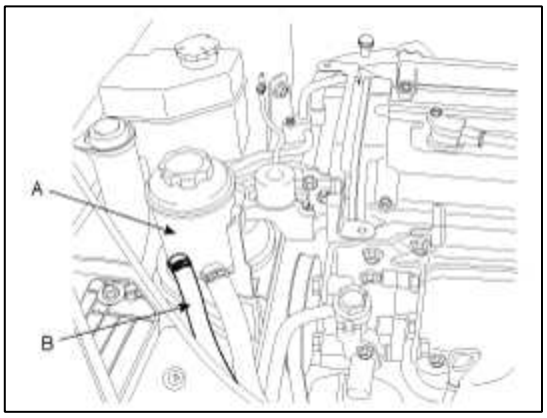


3. Disconnect the pressure tube (A) from the valve body housing.

Tightening torque Nm (kgf·m, lb-ft):
12 ~ 18 (1.2 ~ 1.8, 9 ~ 13)



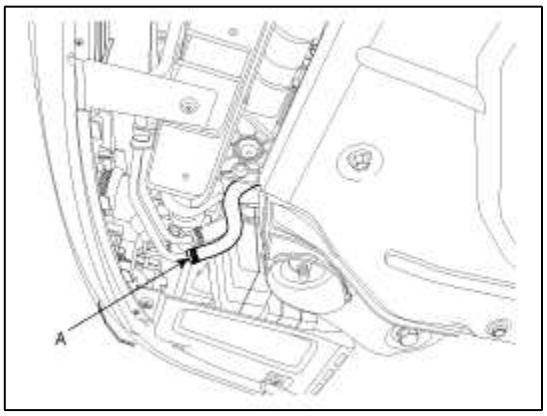
4. Remove the brackets of the pressure tube and hose from the sub-frame.



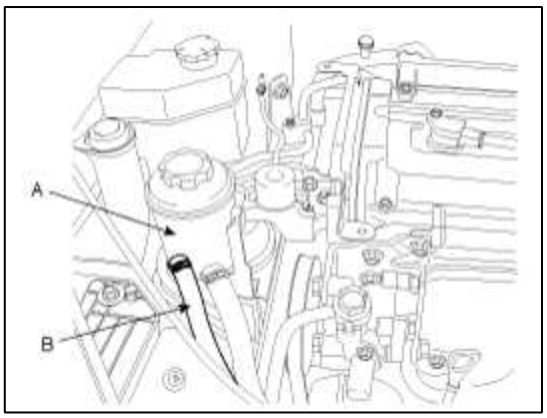
5. Installation is the reverse of removal.

RETUREN HOSE AND TUBE

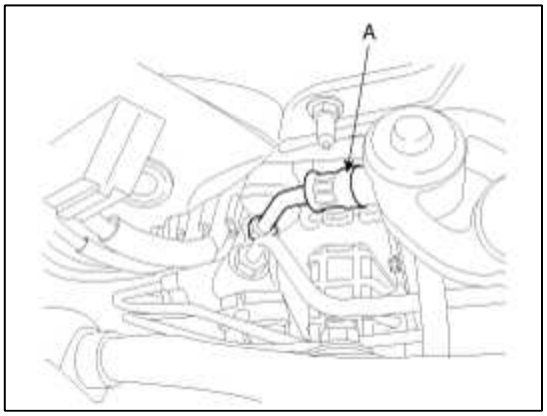
1. Drain the power steering fluid by disconnecting the return hose (A).



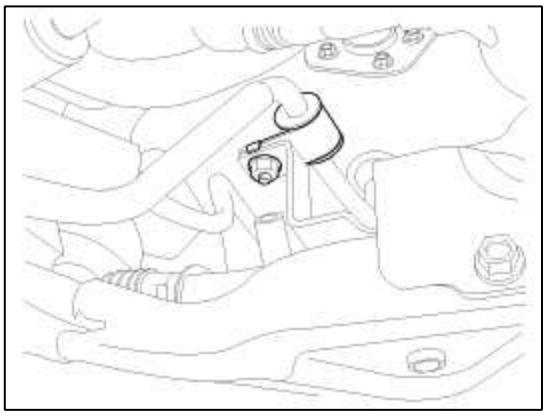
2. Disconnect the return hose (B) from the power steering fluid reservoir (A).



3. Disconnect the return tube (A) from the valve body housing.



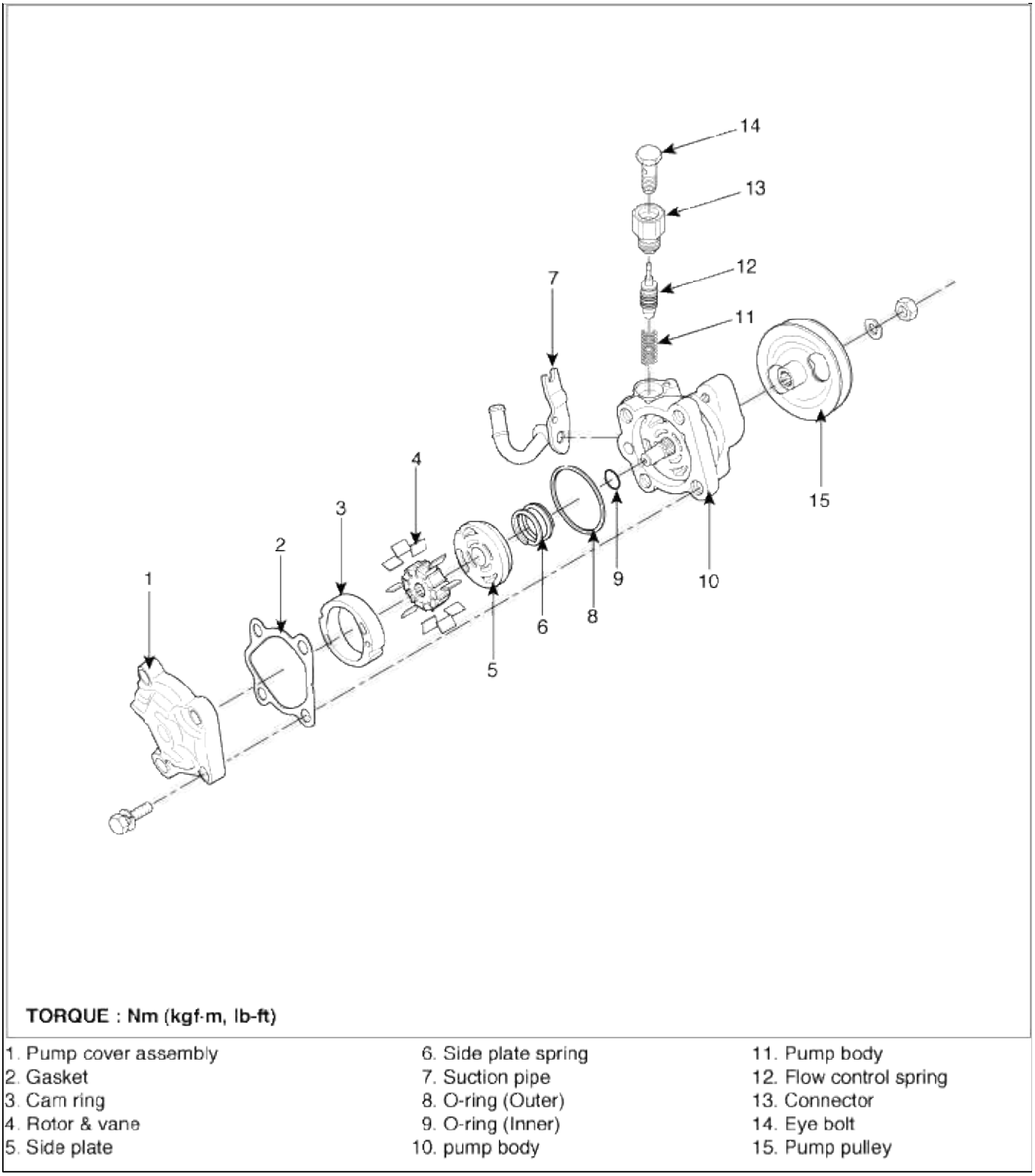
4. Remove the brackets of the return tube and hose from the sub-frame.



5. Installation is the reverse of removal.

Steering System > Hydraulic Power Steering System > Power Steering Oil Pump > Components and Components Location

COMPONENTS



TORQUE : Nm (kgf·m, lb-ft)

1. Pump cover assembly
2. Gasket
3. Cam ring
4. Rotor & vane
5. Side plate
6. Side plate spring
7. Suction pipe
8. O-ring (Outer)
9. O-ring (Inner)
10. pump body
11. Pump body
12. Flow control spring
13. Connector
14. Eye bolt
15. Pump pulley

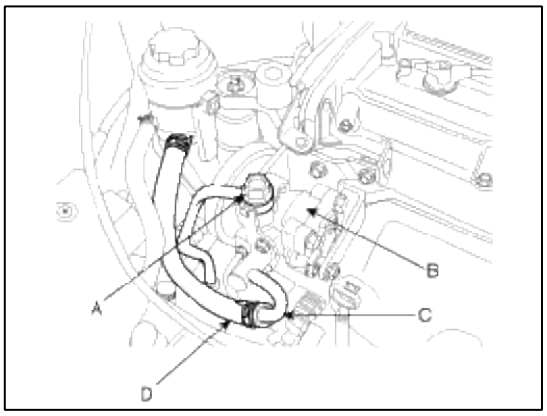
Steering System > Hydraulic Power Steering System > Power Steering Oil Pump > Repair procedures

REMOVAL

1. Disconnect the pressure tube (A) from the oil pump (B) by loosening the eye bolt.

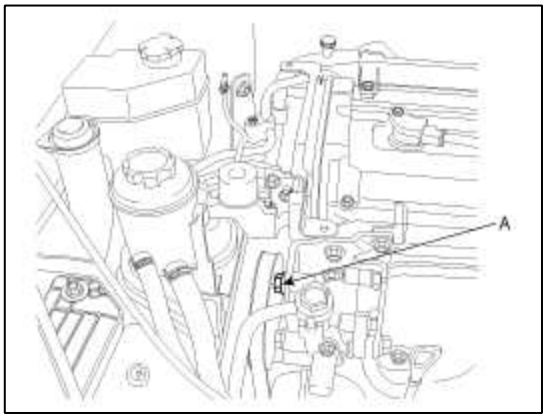
Tightening torque Nm (kgf·m, lb-ft):
55 ~ 65 (5.5 ~ 6.5, 40 ~ 47)

2. Disconnect the suction hose (C) from the suction pipe (D)



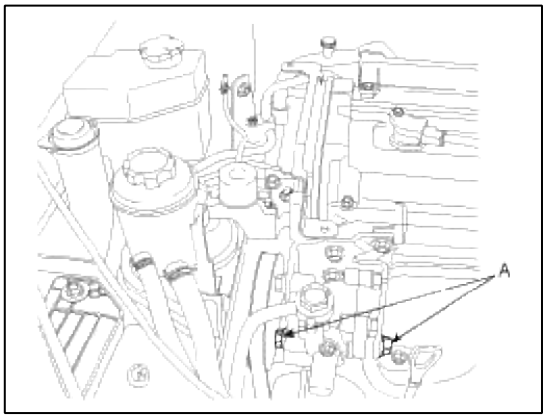
3. Loosen the tension adjusting bolt (A), and then remove the oil pump drive belt.

Tightening torque Nm (kgf·m, lb-ft):
25 ~ 33 (2.5 ~ 3.3, 18 ~ 24)



4. Loosen the power steering pump mounting bolt and nut (A), and then remove the power steering pump assembly from the pump bracket.

Tightening torque Nm (kgf·m, lb-ft):
20 ~ 27 (2.0 ~ 2.7, 14 ~ 20)



NOTE

Be careful not to spill fluid from the power steering oil pump.

INSTALLATION

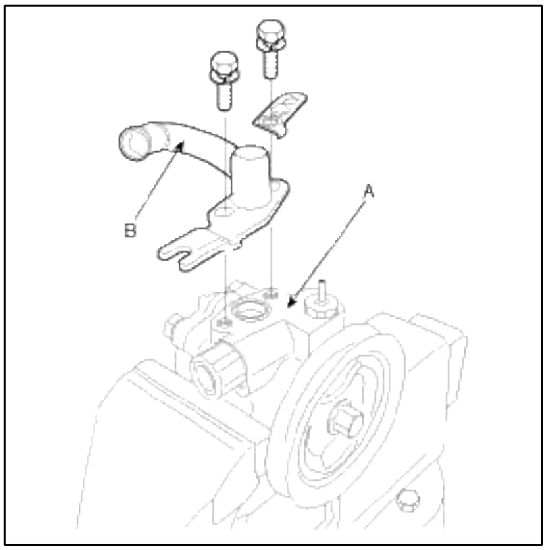
1. Installation is the reverse of removal.

> **CAUTION**
>
> The pressure tube does not twist and come in contact with other components.

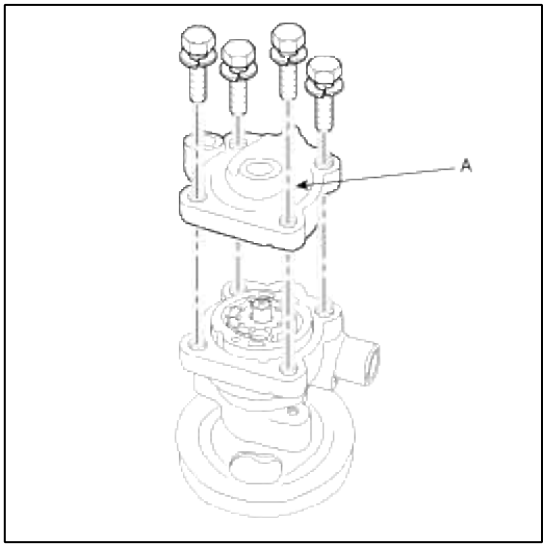
2. Adjust the drive belt tension.
3. Add power steering fluid
4. Bleed the power steering system.
5. Check the oil pump pressure.

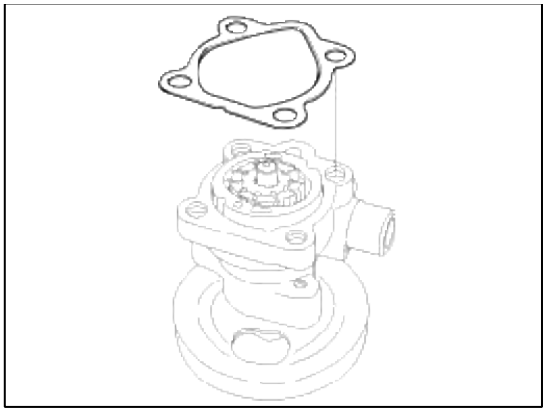
DISASSEMBLY

1. Remove two bolts from the oil pump body (A), and then remove the suction pipe (B) and O-ring.

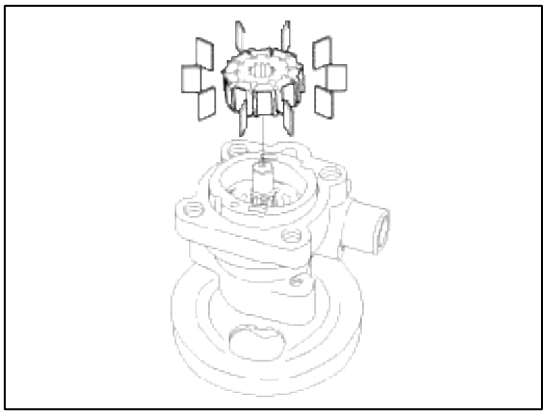


2. Loosen the four bolts and remove the oil pump cover assembly (A) and the gasket.

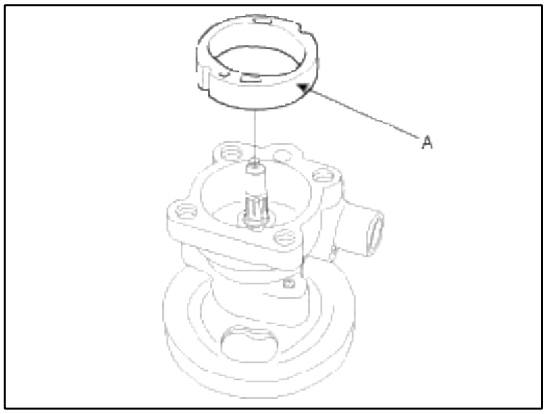




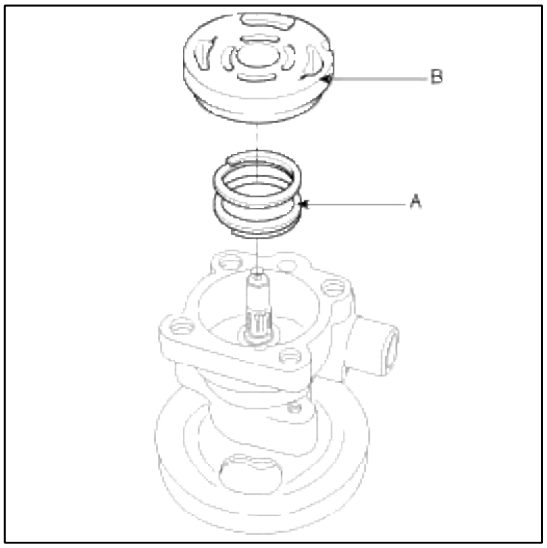
3. Remove the rotor and vanes.



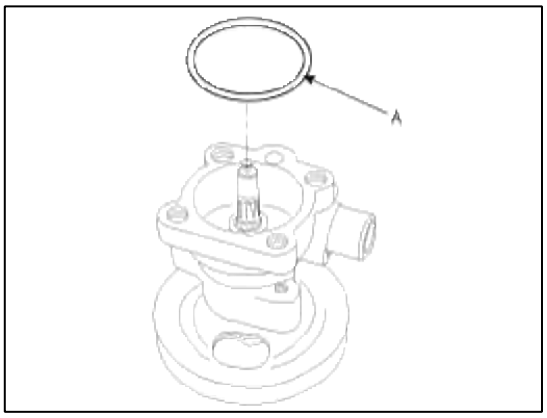
4. Remove the cam ring.



5. Remove the oil pump side plate (B) and the side plate spring (A).



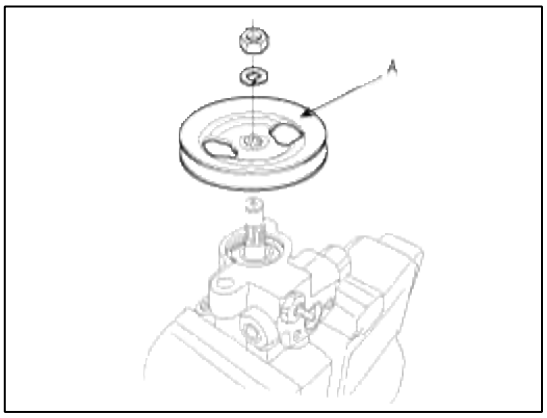
6. Remove the inner and outer O-ring (A).



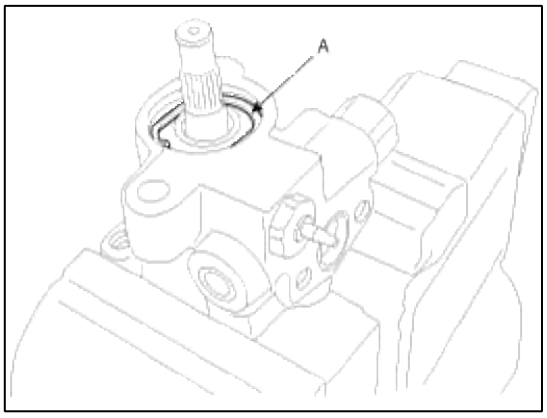
NOTE

When assembling, use a new gasket and O-ring.

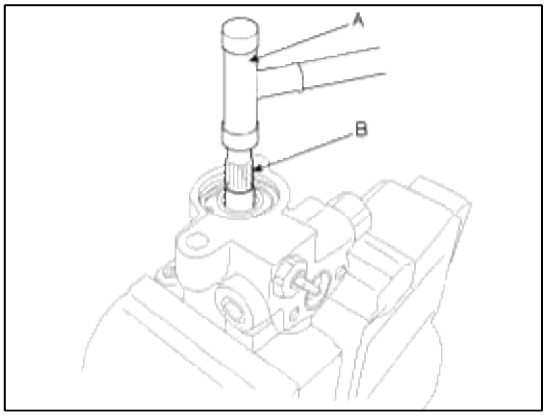
7. Mount the pump in a vise and remove the pulley (A) nut and the spring washer.



8. After removing the snap ring (A) of the shaft with snap ring pliers, remove the dust spacer.



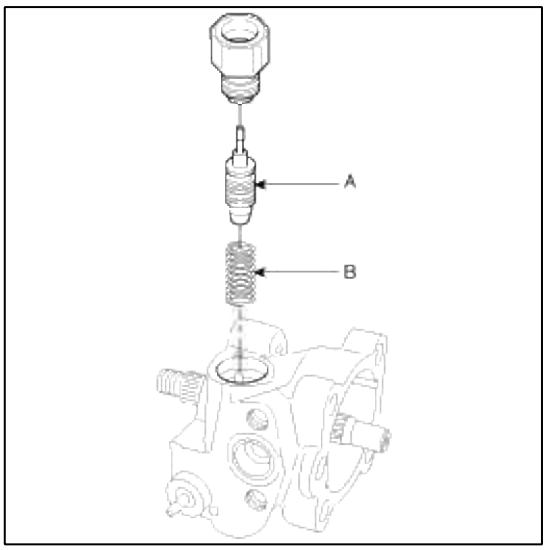
9. Tap the rotor side of the shaft slightly with a plastic hammer (A) to remove the shaft (B).



10. Remove the oil seal from the oil pump body.

> NOTE
>
> When assembling, use a new oil seal.

11. Remove the connector from the oil pump body, and take out the flow control valve (A) and the flow control spring (B).



12. Remove the O-ring from the connector.

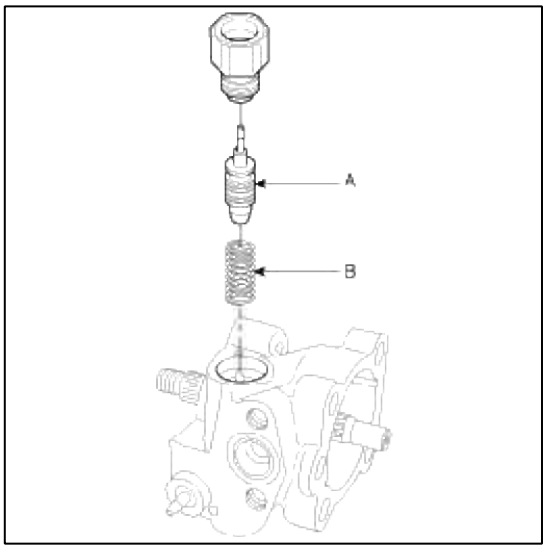
> CAUTION
>
> Do not disassemble the flow control valve.

INSPECTION

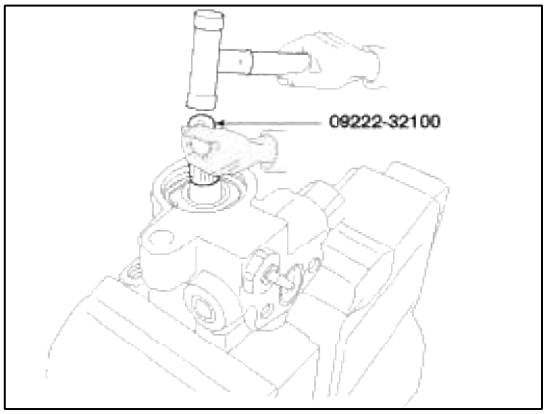
1. Check that the flow control valve is not bent.
2. Check the shaft for wear and damage.
3. Check the V belt for wear and deterioration.
4. Check the grooves of the rotor and vanes for stratified abrasion.
5. Check the contact surface of the cam ring and vanes for stratified abrasion.
6. Check vanes for damage.
7. Check that there is no striped wear in the side plate or contacting part between the shaft and the pump cover surface.

REASSEMBLY

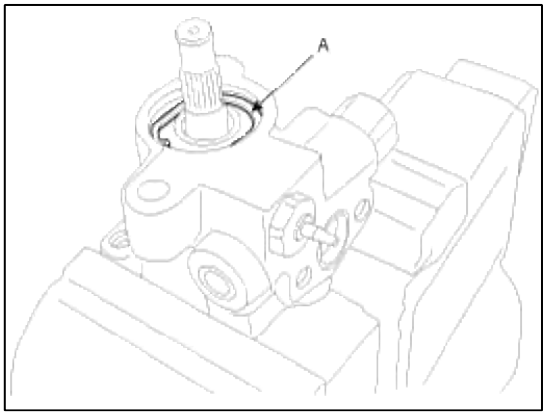
1. Install the flow control spring (B), the flow control valve (A) and the connector into the pump body.



2. Install the oil seal in the pump body by using the special tool (09222-32100).

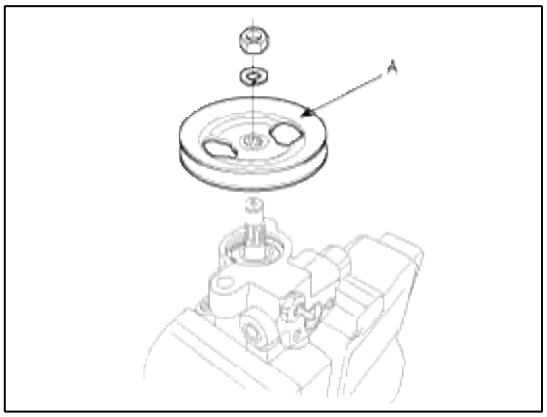


3. After inserting the shaft assembly into the pump body, install the dust spacer and snap ring (A).

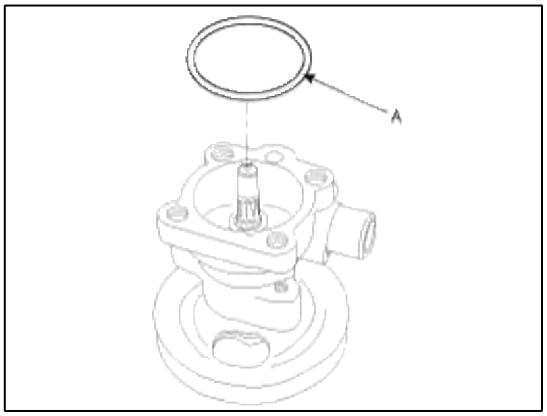


4. Install the pump pulley(A).

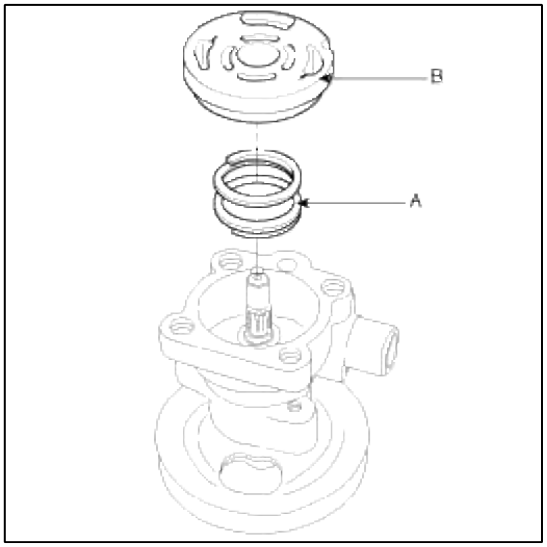
Tightening torque :
55 ~ 69 Nm (5.5 ~ 6.9 kgf·m, 39.8 ~ 49.9 lb-ft)



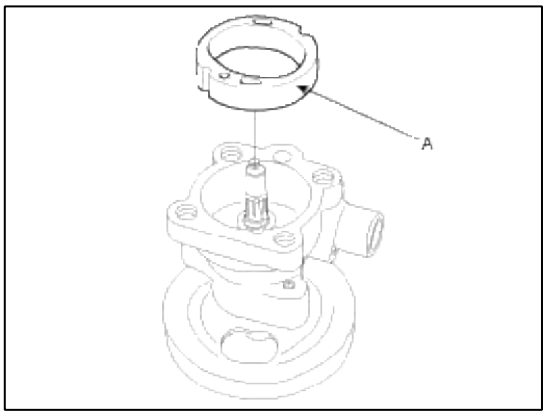
5. Install the inner O-ring and outer O-ring (A).



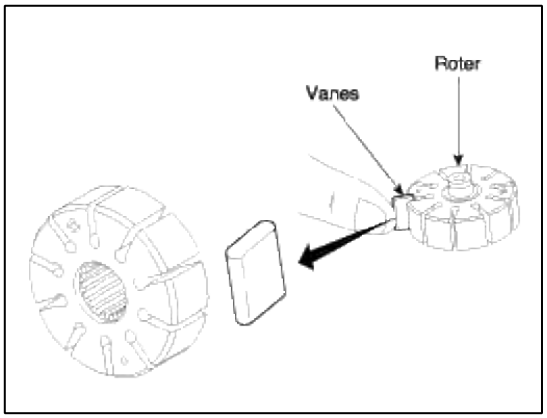
6. Insert the spring (A) and the oil pump side plate (B) in the pump body.

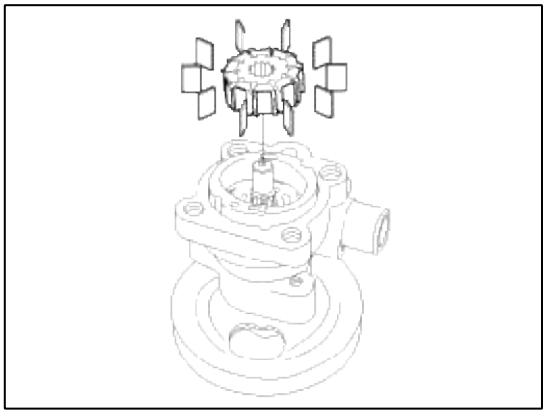


7. After inserting the lock pin into the groove of the front housing, install the camring (A) attending to the direction.

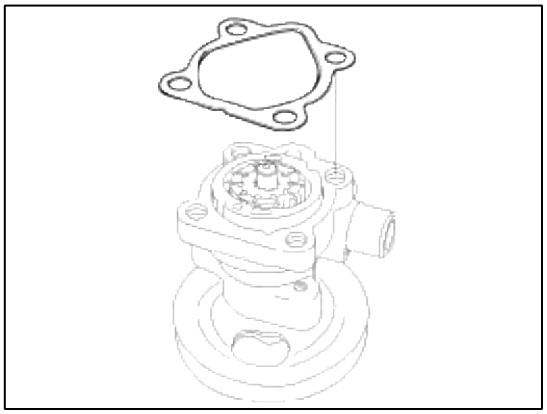


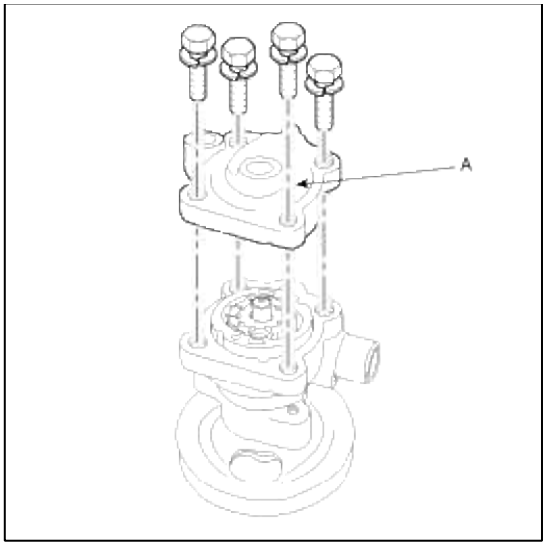
8. Install the rotor and the vanes.





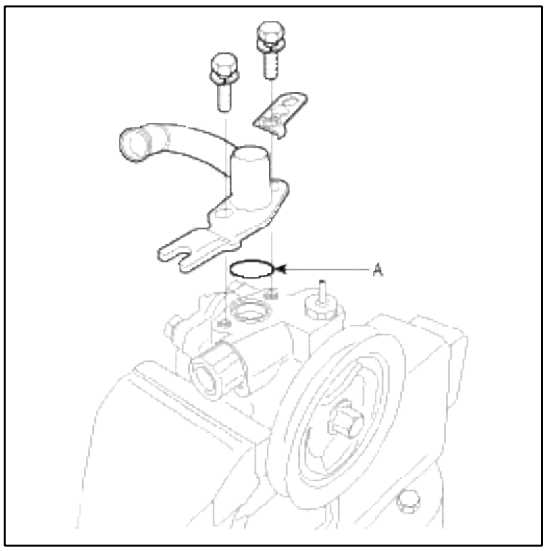
9. Install the gasket and oil pump cover assembly (A).





10. Install the O-ring (A) and the suction pipe mounting bolt.

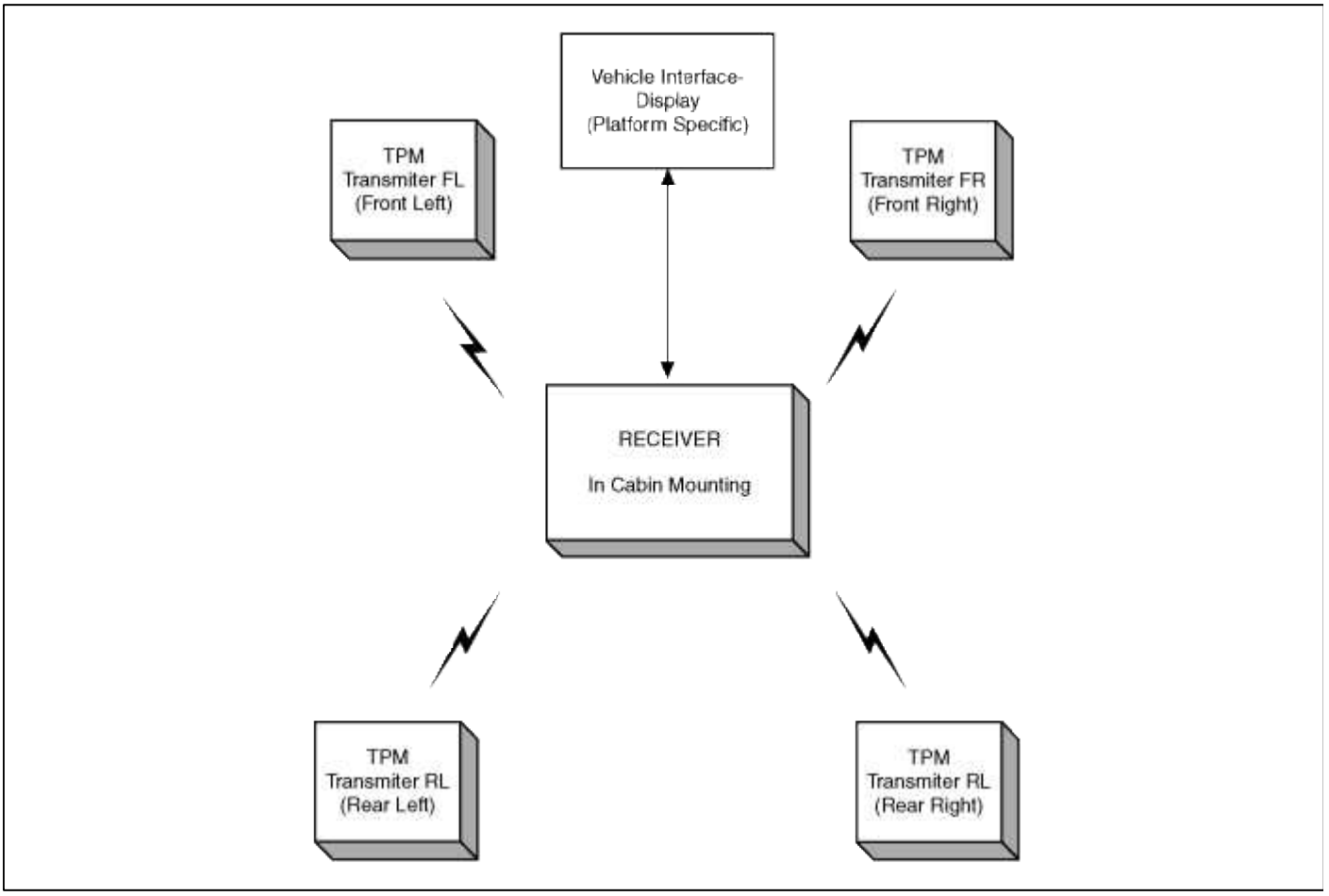
Tightening torque :
13.6 ~ 18.4 Nm (1.36 ~ 1.84 kgf·m, 9.84 ~ 13.3 lb-ft)



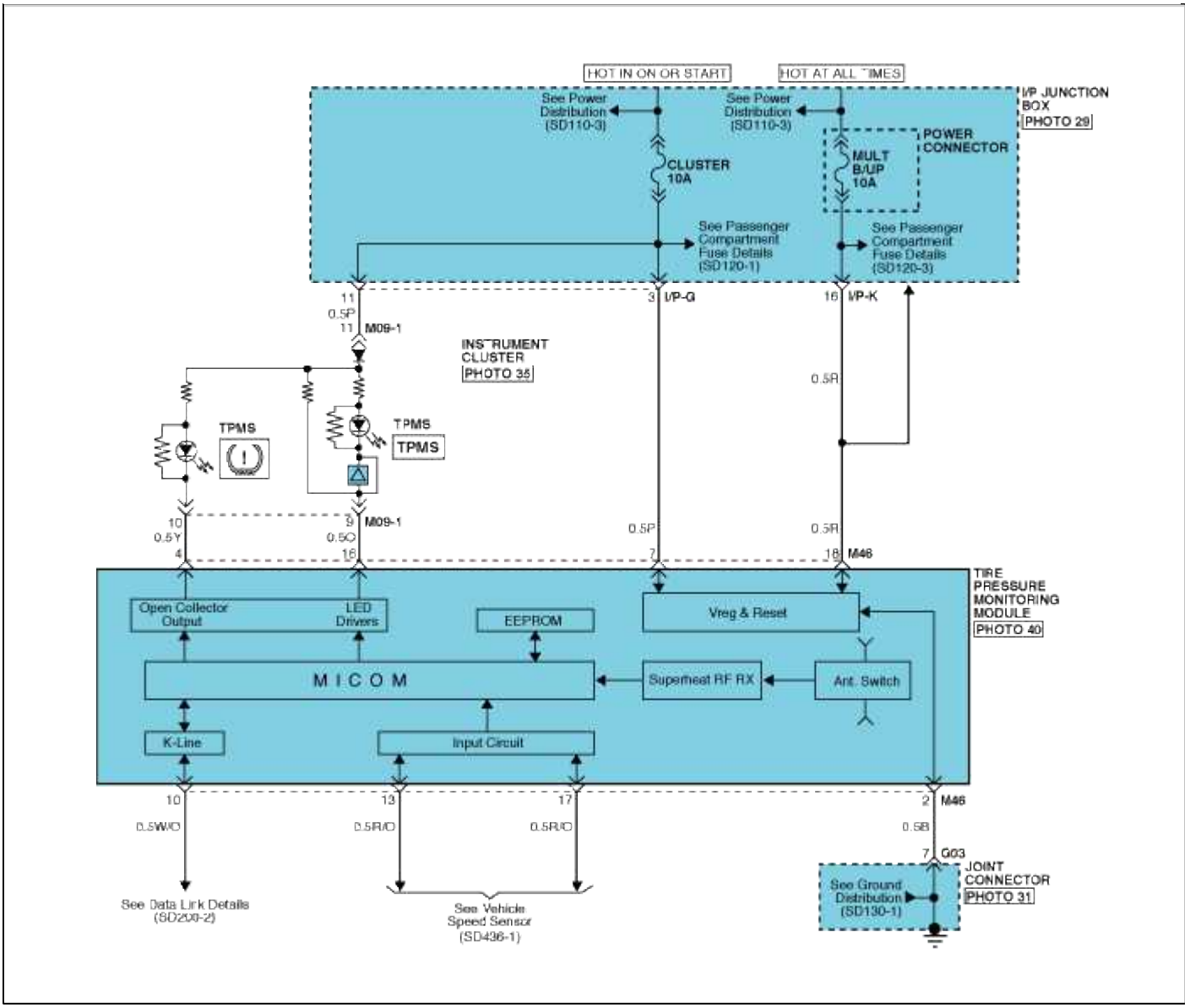
ACCENT(MC) > 2008 > G 1.6 DOHC > Suspension System

Suspension System > Tire Pressure Monitoring System > Schematic Diagrams

SCHEMATIC DIAGRAM



circuit diagram



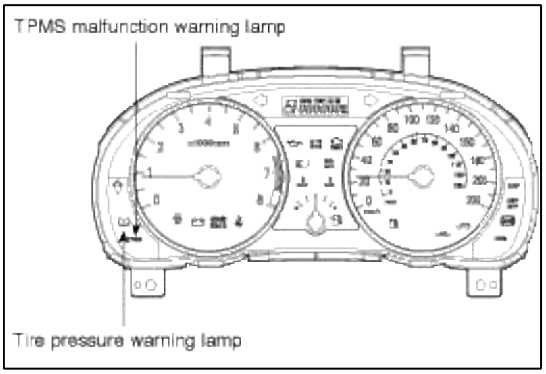
1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18

NO	PIN-OUT ASSIGNMENT	NO	PIN-OUT ASSIGNMENT
1	-	10	K-LINE
2	GND	11	-
3	-	12	-
4	TREAD LED	13	Speed Signal 2
5	-	14	-
6	-	15	-
7	IG	16	Diagnostic LED
8	-	17	Speed Signal 1
9	-	18	Battery

Suspension System > Tire Pressure Monitoring System > Description and Operation

DESCRIPTION

WARNING LAMPS



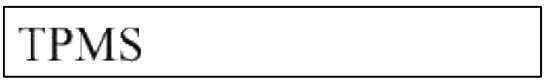
TREAD Lamp

- Tire Under Inflation / Leak Warning.



1. Turn on condition
   A. When tire pressure is below allowed threshold
   B. When rapid leak is detected by the sensor.
   C. Indicates that tire needs to be re-inflated to placard pressure / repaired.
2. Turn off condition
   A. Under-inflation ; When tire pressure is above (warning threshold + hysteresis).
   B. Rapid Leak ; When tire pressure is above (leak warning threshold).

DTC Warning



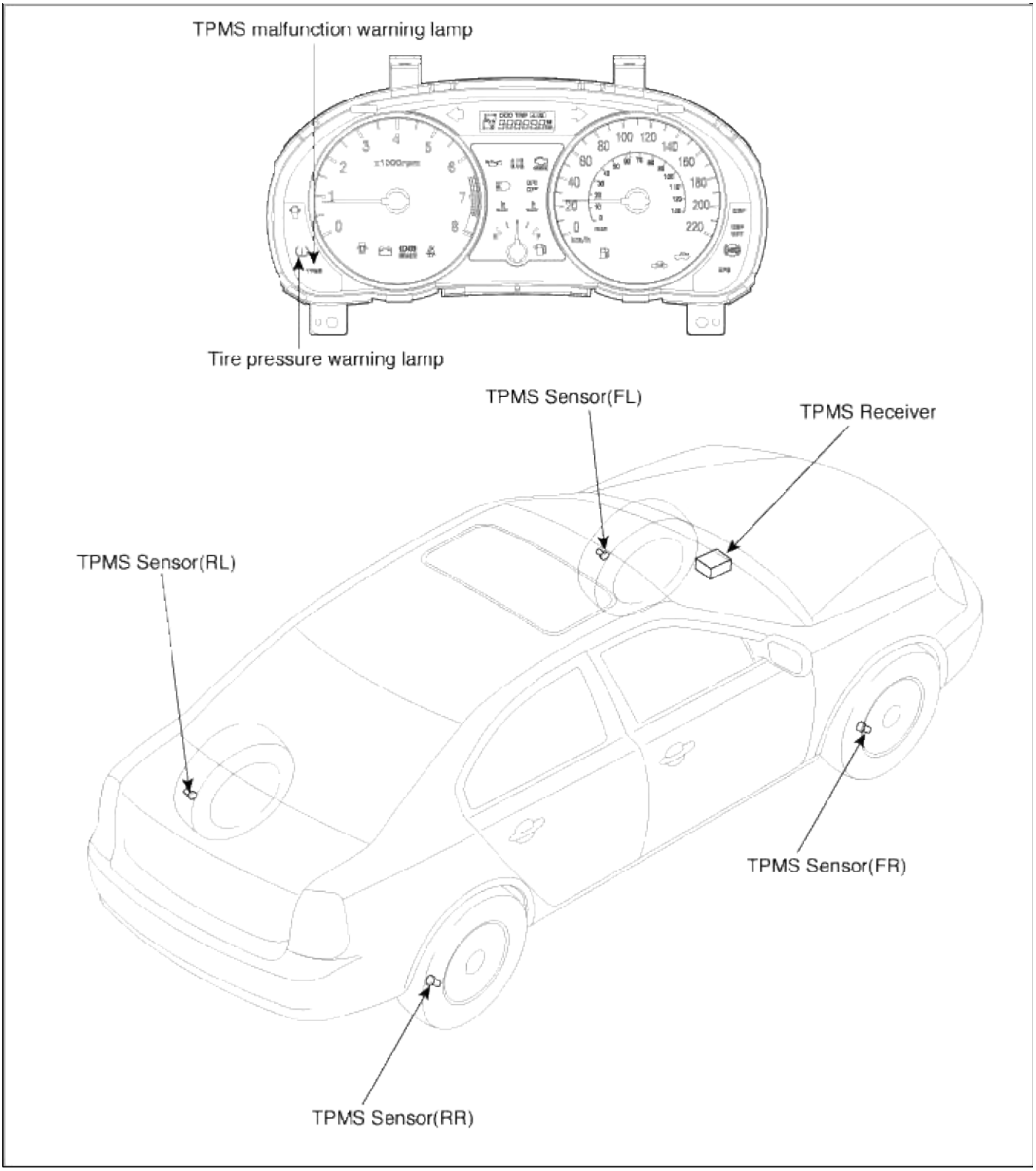
1. Turn on condition
   A. When the system detects a fault that is external to the receiver/ sensor.
   B. When the system detects a receiver fault.
   C. When the system detects a sensor fault.
2. Turn off condition
   A. If the fault is considered as 'critical', then the lamp is held on throughout the current Ignition cycle (even if the DTC has been demoted). This is because it is important to bring the problem to the drivers attention. On the following Ignition cycle, the demotion conditions will be re-checked. If the demotion conditions occur, the lamp will be turned off. It will be held on until DTC demotion checking is completed.
   B. 'Non critical' faults are those that can occur temporarily e.g. vehicle battery under voltage. The lamp is therefore turned off when the DTC demotion condition occurs.

SYSTEM FAULT

1. General Function
   A. The system monitors a number of inputs across time in order to determine that a fault exists.
   B. Faults are prioritized according to which has the most likely cause.
   C. Maximum fault store is equal to 15.
   D. Certain faults are not covered through DTC. The main ones are:
      1) Sensor thermal shutdown (over 257°F/125°C).
      2) Ignition Line stuck ; requires observation of lamps at Ignition ON to diagnose.

Suspension System > Tire Pressure Monitoring System > Components and Components Location

components



Suspension System > Tire Pressure Monitoring System > Troubleshooting

TROUBLESHOOTING

- the lamp check should occur and then all lamps / LED's should turn off.
- **If the lamp test does not occur:**

- Check connector is pushed all the way into the receiver connector slot.
- Check connectors and fuse/harnessing - open / short circuits.
- Check DTC's.
- If diagnostics cannot be entered, replace the receiver with a known good one (follow configuration & learning procedure).

TREAD warnings

- **Information to ascertain (TREAD Lamp):**
  - Was puncture repair fluid used (it should not be)?
    - This can cause the sensor pressure port to block and incorrect warning to occur.
  - What temperature were tires last inflated at?
    At what temperature did warnings occur?
    - Pressure change is approx. 1.5psi / 10°C increase.
  - Have the tires been checked / inflated since the lamp first came on?
- **If the TREAD Lamp is on:**
  - Check for short circuits.
  - Enter Diagnostics and read TREAD Warnings Local Identifier Data.
  - Check to see if warning type is under inflation or leak.
  - If the warning is for under inflation, then:
    a. Re-inflate the wheel with the matching sensor ID to it's desired Placard pressure and check the pressure by reading the sensor state with TPMS exciter.
    b. Check to make sure that the TREAD lamp turns off (this may take up to 4 minutes if the tire is not rapidly re-inflated).
  - If the warning is for a leak, then:
    a. Fix any puncture and re-inflate the tire to the desired Placard pressure.
    b. Wait up to 4 minutes and make sure that the TREAD lamp turns off and the lamp does not turn on again.
    c. If lamp comes on again:
    d. Re-check pressure for signs of a puncture and Re-Check TREAD Warnings Local Identifier Data.
- **If the Placard pressure is OK and the TREAD lamp still does not turn off:**
  - Turn wheel a quarter turn and again wait 4 minutes (the sensor may be in an RF null).
  - If the lamp still does not turn off:
    check for loose receiver wiring and replace the receiver with a known good one if necessary (follow configuration & learning procedure).
    - If the problem still exists, replace sensor.
    - Ensure that all tires are inflated to their correct Placard pressures.
    - Re-enter sensor IDs.
    - Test drive the vehicle and ensure that the TREAD lamp does not come back on.

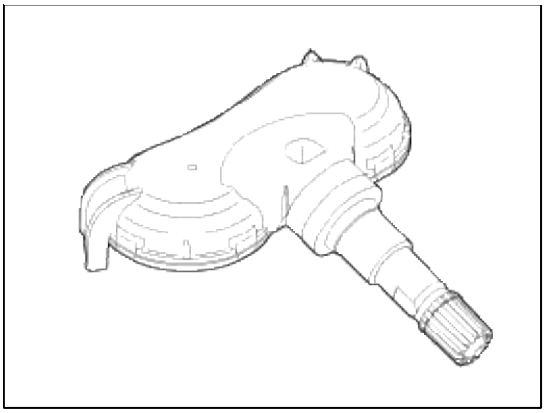
DTC's

- Information to ascertain (DTC Lamp):
  - At what temperature did the DTC occur? Under certain conditions (approx.-40°C/F), a RF channel missing / hardware failure DTC may occur. This is due to the battery behavior.
- DTC's should be retrieved by using Hi-Scan diagnostic tool.
- The fault should then be diagnosed and rectified.
- DTC's should then be cleared.

DTC	Warning Type	Trouble Description	Diagnostic Lamp
C1121	Battery Level	Sensor 1 Battery Low.	Permanent during detection.
C1122		Sensor 2 Battery Low.	
C1123		Sensor 3 Battery Low.	
C1124		Sensor 4 Battery Low.	
C1126		Vehicle / TPMS receiver Battery Low.	
C1127		Vehicle / TPMS receiver Battery High.	
C1212	Speed input 1	Speed input 1 open / short circuit	Permanent during detction
C1240	Speed input 2	Speed input 2 open / short circuit	
C1300	LF / RF External Interference	LF/RF Interference Failure.	Permanent during detection.
C1306	RF Internal Interference	Internal vehicle RF source e.g. scanner.	Permanent
C1312	Individual RF channel failure.	Sensor RF Failure.	Permanent
C1313		Sensor RF Failure.	
C1314		Sensor RF Failure.	
C1315		Sensor RF Failure.	
C1322	Sensor over Temperature	Sensor 1 / Front Left Sensor over 230°F(110°C).	Permanent
C1323		Sensor 2 / Front Right Sensor over 230°F(110°C).	
C1324		Sensor 3 / Rear Left Sensor over 230°F(110°C).	
C1325		Sensor 4 / Rear Right Sensor over 230°F(110°C).	
C1332	Sensor Failure	Sensor 1 / Front Left Sensor Fault.	Permanent
C1333		Sensor 2 / Front Right Sensor Fault.	
C1334		Sensor 3 / Rear Left Sensor Fault.	
C1335		Sensor 4 / Rear Right Sensor Fault.	
C1660	System Hardware	TPMS receiver RF circuit.	Permanent
C1661	EEPROM Failure	TPMS receiver EEPROM Failure.	Permanent
C1668	Micro controller error	Internal failure detection.	Permanent
C2510	Lamp Short Circuit	TREAD lamp short circuit to 12 V.	Permanent

Suspension System > Tire Pressure Monitoring System > TPMS Sensor > Description and Operation

DESCRIPTION



1. MODE
   (1) Configuration State
      A. All sensors should be in the Low Line (Base) state.
      B. In Low Line (Base) configuration, sensor transmissions occur every 3 minutes 20 seconds (nominal) and pressure is measured every 20 seconds.
   (2) Normal Fixed Base State
      A. Sensor transmissions continue at the Low Line (Base) configuration defined rates until the state is either changed by LF command or by the sensor detecting a condition that requires a temporary change to another state.
      B. The LF command to this state must contain the sensors ID.
   (3) Storage Auto State:
      A. This state is a Low current consumption state.
      B. Sensors are in this state when they first arrive at the dealership (either on the vehicle or as replacement spares).
      C. In this state, the sensor does not measure pressure / temperature / battery level.
      D. The sensor will not transmit in this state unless requested to do so by the initiate command.
   (4) Alert State:
      A. The sensor automatically enters this state if the measured temperature exceeds 230 °F(110 °C) and over temperature shutdown is likely.
      B. In this state, pressure is measured every 4 seconds and RF data transmitted every 4 seconds.
      C. The state lasts for 1 minute if it is pressure triggered.
      D. This state is alse entered when a 3 psi change in pressure from the last RF transmission occurs.

> NOTE
>
> Sensor mode is used to configure sensor between high line and low line system. TPM sensor for MC should be set to low line.

Suspension System > Tire Pressure Monitoring System > TPMS Sensor > Repair procedures

REMOVAL

Tire Removal

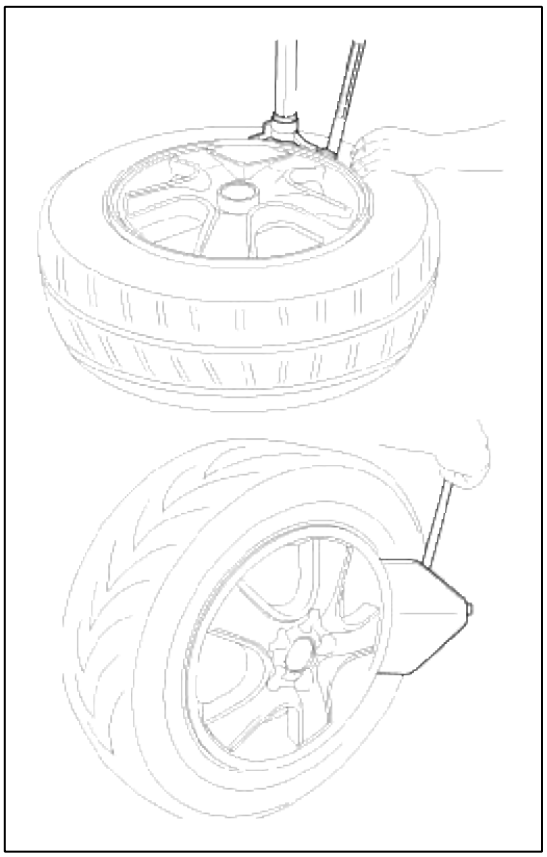
1. Deflate tire & remove balance weights.

NOTE

Sensor can be unscrewed before unseating the tire bead.

CAUTION

- The tire bead should be broken approx. 90° from the valve side of the wheel. The bead breaker should not be set too deep.
- Avoid tire/tool contact with the valve on dismount.
- Dismount should end near the valve.

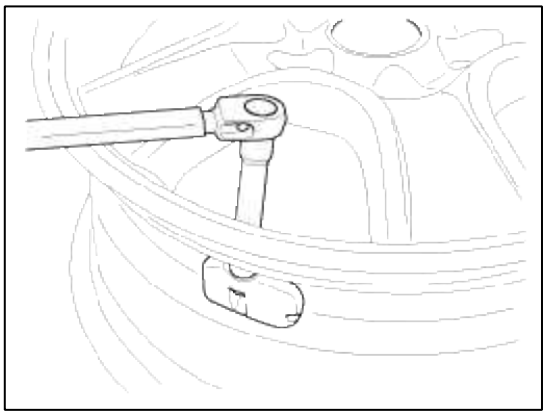


Sensor Removal

CAUTION

Handle the sensor with care.

1. Remove the valve nut.



CAUTION

The valve nut should not be re-used.

2. Discard the valve assembly.

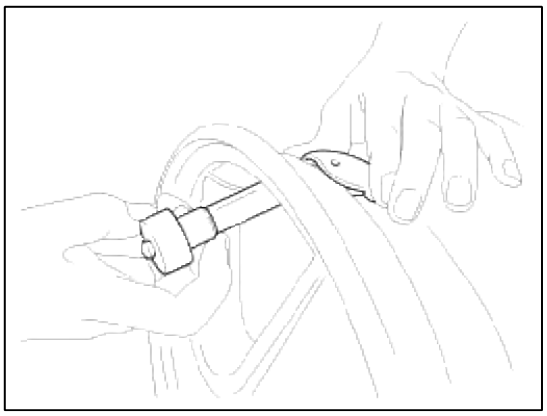
INSTALLATION

Sensor Fit

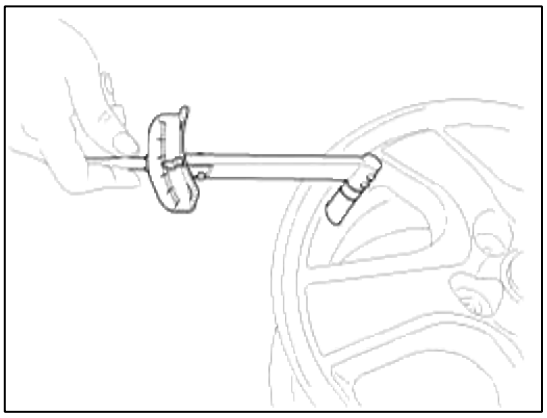
CAUTION

- Handle the sensor with care.
- Avoid lubricant contact.
- Ensure that the wheel to be fitted is designed for sensor mount. There should normally be a mark to indicate this.
- Ensure that the valve hole and mating face of the wheel are clean.

1. Slide the sensor-valve unit through the valve hole of the rim. Hold the sensor against the rim and the rubber grommet against the sealing surface.
2. Insert the nut over the valve stem and then tighten the nut.



3. Continue to tightening the nut until contact with the rim and then tighten to 3.5 ~ 4.5Nm.



CAUTION

- Tighten slowly with quarter turn steps until the final torque is reached.
- Do not exceed allowed torque.
- Do not use electric or pneumatic tools.

4. Check that the sensor is firmly attached to the rim.

CAUTION

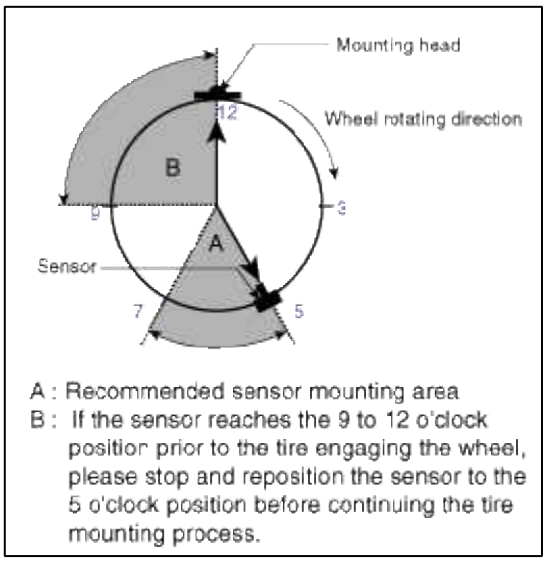
Risk of damage during the tire installation/ removal if the sensor is not firmly attached to the rim.

Tire Fit

CAUTION

Only use wheels designed to accommodate the TPMS sensor.

1. Lubricate the tire bead not the rim. Excessive lubrication should not be applied.
2. Mount the tire to the rim by referring illustration below.



A : Recommended sensor mounting area
B : If the sensor reaches the 9 to 12 o'clock position prior to the tire engaging the wheel, please stop and reposition the sensor to the 5 o'clock position before continuing the tire mounting process.

3. Move the mounting tool away from the valve.

CAUTION

Avoid tire / tool contact with the valve.

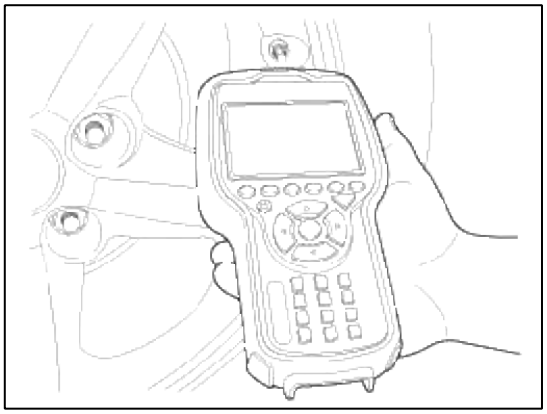
4. Finish with mounting tool near to valve.
5. Carry out inflation / pressure correction and then fit valve cap.

Sensor Initiating Procedure

NOTE

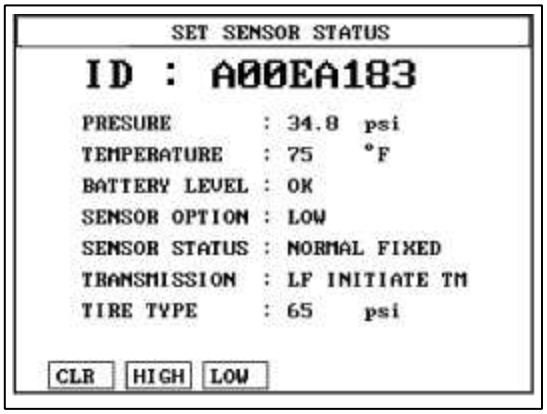
The sensor's default state will be Storage Auto (High Line).

1. Change the newly installed sensor mode to Normal Fixed Base(Low Line) with the 'TPMS exciter'.



NOTE

Mode (Status/option) of the sensor installed to the vehicle should be Normal Fixed Base (Low).

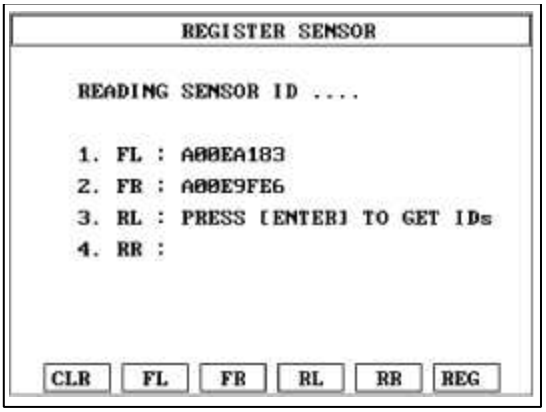


2. Read the four sensor's ids starting with sensor 1 (1 normally front left, 2 front right, 3 rear left, 4 rear right).

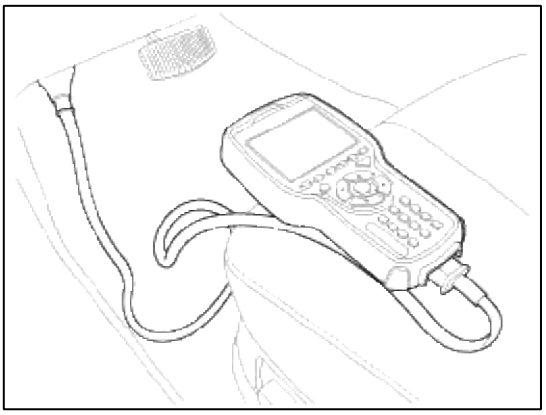
NOTE

Note that sensors which were already configured as Base (Low Line) will take longer to read.

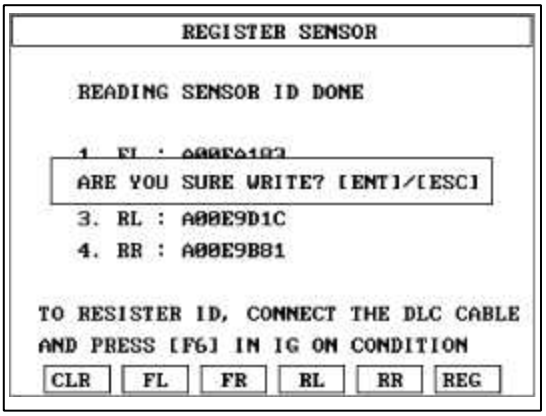


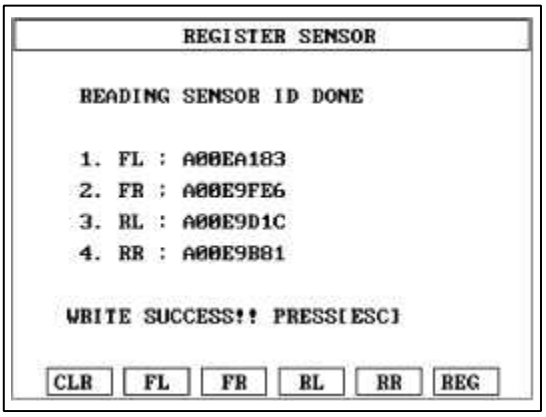


3. Connect 'TPMS exciter' to the diagnostic connector.



4. Register the four sensor's ids to the receiver.





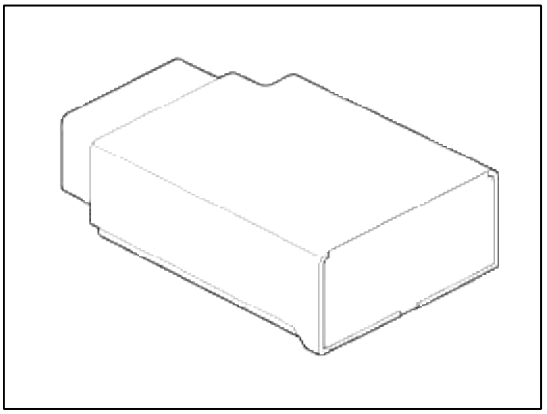
5. Cycle Ignition, wait 15 seconds before turn Ignition back on then related DTC should be erased from the receiver.

> NOTE
>
> In order for the system to correctly monitor tires for under-inflation, there should be a total of exactly 4 sensors fitted to each of the four driven wheel positions. There should be no other sensors in the vehicle since this could cause the system to monitor the wrong sensors or fail to lean new sensor.

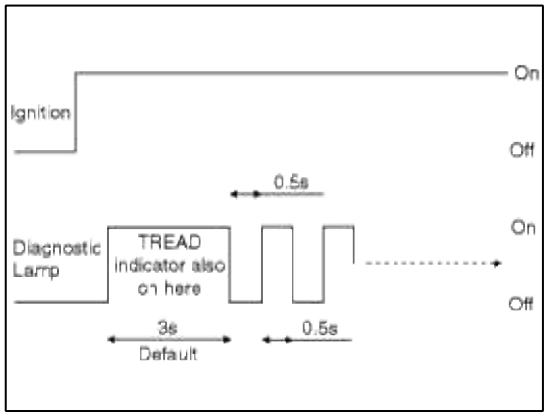
> CAUTION
>
> Ensure that there are only 4 sensors in the vehicle.

Suspension System > Tire Pressure Monitoring System > TPMS Receiver > Description and Operation

DESCRIPTION



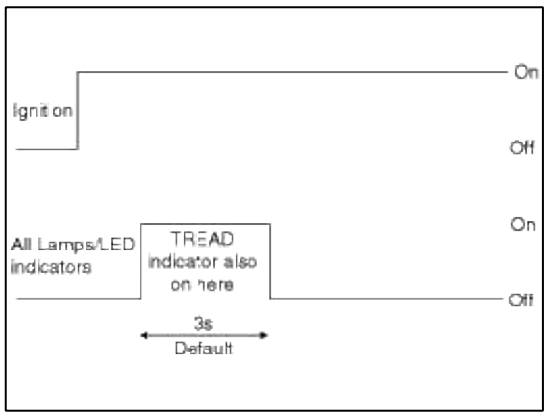
1. **Mode**
   (1) Virgin State
      A. The receiver as a sole part is shipped in this state. Replacement parts should therefore arrive in this state.
      B. In this state, there is no sensor monitoring and no DTC monitoring.
      C. The state indicates that platform specific parameters must be written to the receiver and that sensors are un-learned.



(2) Normal State

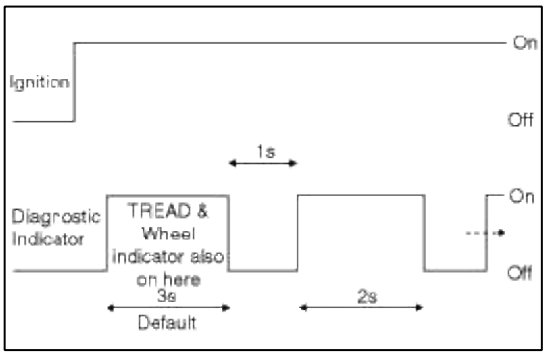
A. In order for tire inflation state and DTC monitoring to occur, the receiver must be in this state.

B. In this state, automatic sensor learning is enabled.



(3) Test State

A. This state is only used in manufacturing plant to check RF transmission between sensor and receiver.



2. **Overview**

A. Receives RF data from sensor.

B. Uses sensor data to decide whether to turn on TREAD Lamp.

C. Learn TPM sensor for under inflation monitoring automatically.

D. Uses sensor information, distance travelled, background noise levels, Auto-learn status, short / open circuit output status, vehicle battery level, internal receiver states to determine if there is a system or a vehicle fault.

OPERATION

1. General Function

A. Auto-learn takes place only once per Ignition cycle.

B. On successful completion, 4 road wheel sensor ID's are latched into memory for monitoring.

C. Until Auto-learn completes, previously learned sensors are monitored for under inflation / leak warnings.

2. General Conditions to Learn New Sensors:

A. Receiver must determine that it is confident that sensor is not temporary:

1) Uses vehicle speed.

2) Uses confidence reduction of previously learned sensors.

B. Typical time at driving continuously over 12.4 mph(20 kph) to learn a new sensor is up to 20 minutes.

3. General Conditions to Un-Learn a sensor that is removed:

A. It takes less than 20 minutes at 12.4~18.6 mph(20~30kph).

B. Confidence reduction is dependent on time which vehicle is driven at speed greater than or equal to 12.4 mph(12 kph).

Suspension System > Tire Pressure Monitoring System > TPMS Receiver > Repair procedures

REPLACEMENT

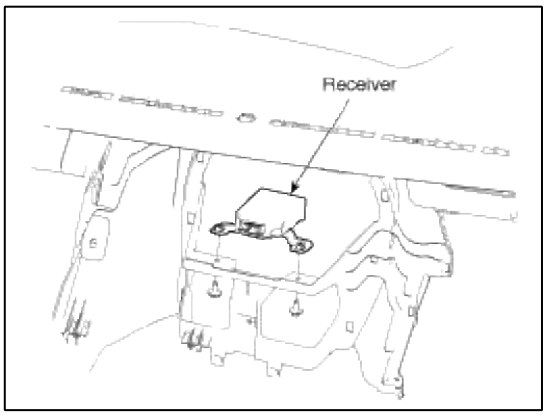
NOTE

When the receiver first arrives for replacement:
1) It will be in Virgin State.
2) It will not be configured for any specific platform.
3) It will not have any sensor ID's memorized.

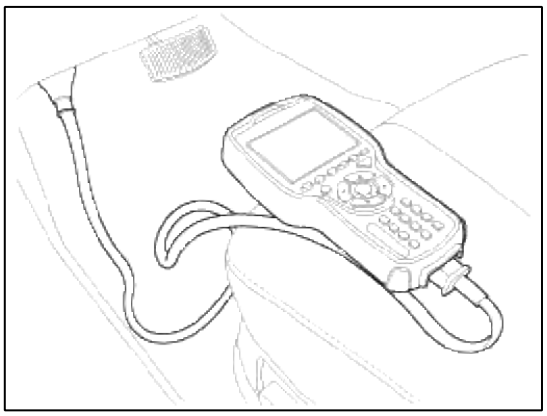
CAUTION

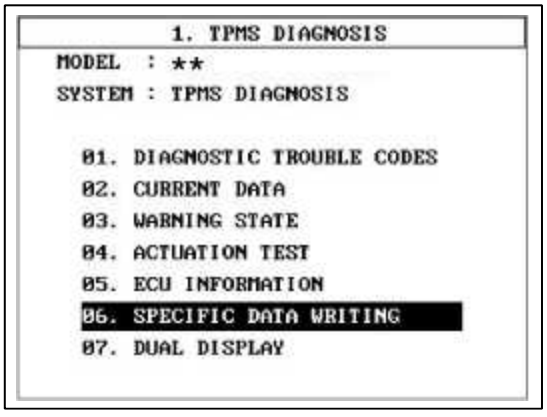
It is important to make sure that the correct receiver is used to replace the faulty part i.e. it must be Low Line and not High Line in order to have the correct inflation warning thresholds set.

1. Disconnect vehicle battery.
2. Remove faulty part and fit bracket assembly to new part.

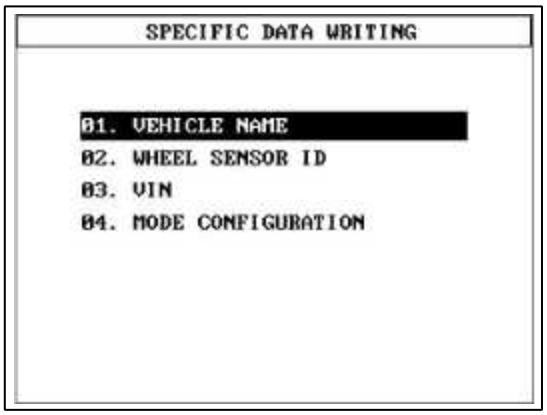


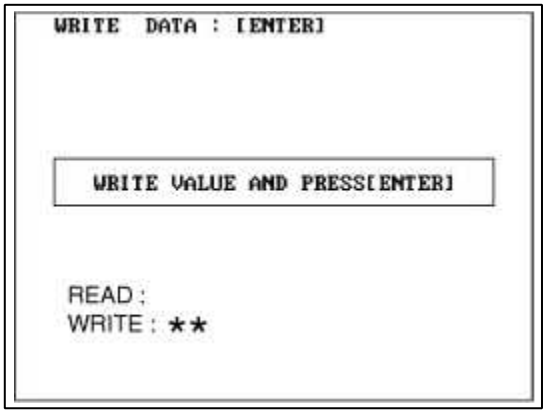
3. Secure new part to vehicle and fit connector.
4. Re-connect battery and turn Ignition on.
5. Check that DTC flash rate matches Virgin State indication.
6. Connect 'TPMS exciter' to the diagnostic connector.





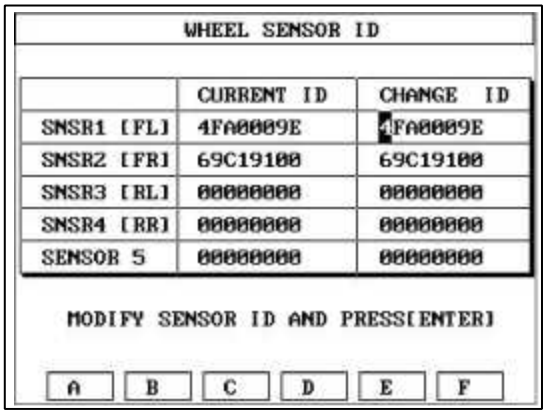
7. Write vehicle name to receiver. receiver will now automatically update monitoring parameters.



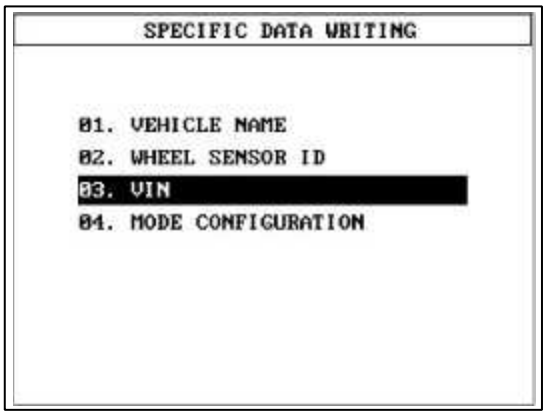


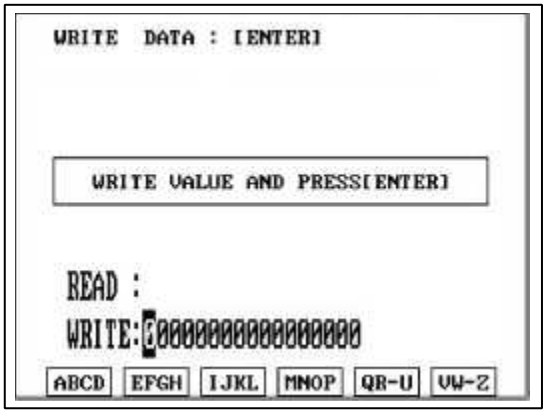
8. Read sensor's ids with the 'TPMS exciter'.
   (Refer to 'SENSOR INITIATING PROCEDURE')
9. Register sensor's ids to receiver.



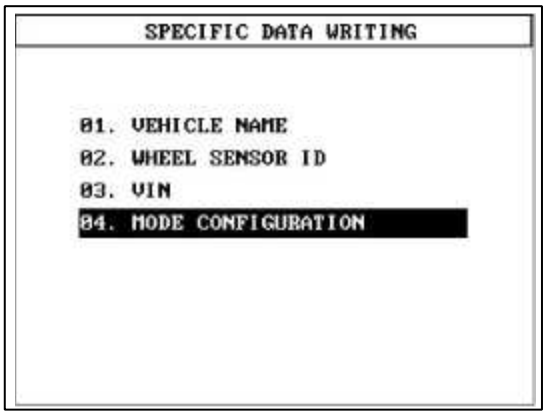


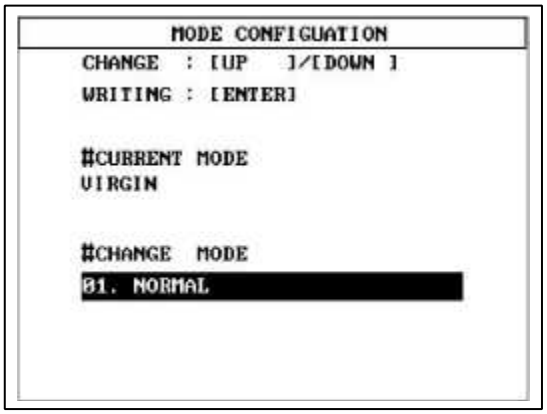
10. Register VIN number of the vehicle.(17 digits)





11. Change receiver state from Virgin to Normal.





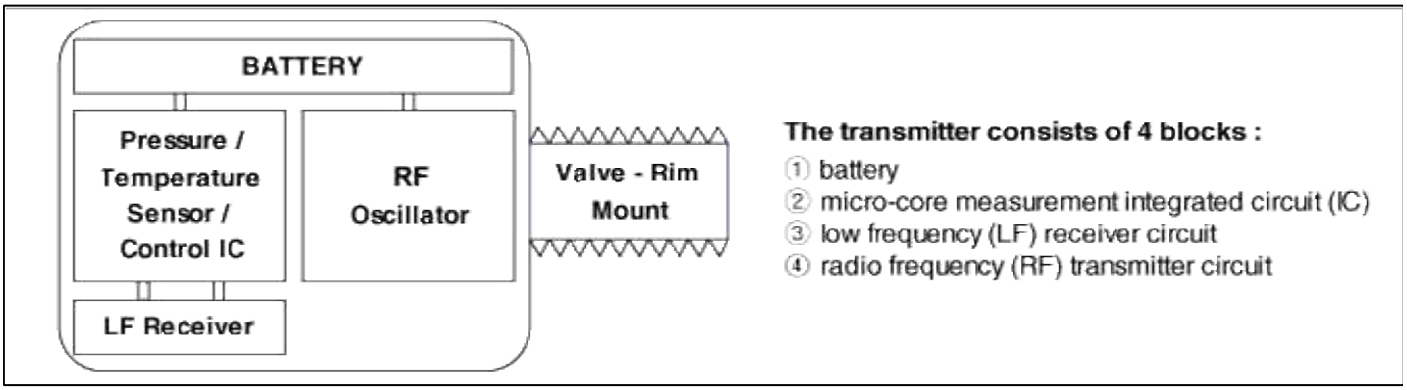
12. Disconnect diagnostic link.
13. Turn ignition off for approximately 10 seconds then turn it back on and check that Normal State is now indicated.

Suspension System > Troubleshooting > C1121

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 °F (-5/7 °C) at this temperature, therefore the actual temperature may be 244.4 °F (118 °C). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

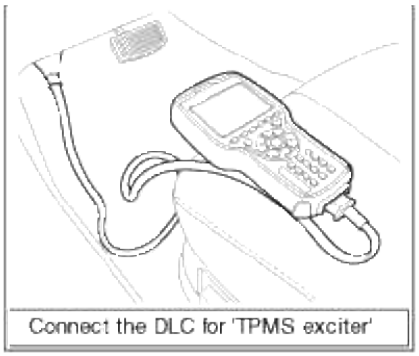
This DTC indicates that the sensor battery voltage level is Low. The most likely cause is battery passing it's expected life / excessively Low temperatures / sensor failure.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Sensor battery check	• Sensor temperature low • Sensor battery low • Faulty TPMS sensor
Enable conditions	• Latest Lowest sensor Temp. > -4 °F(-20 °C) • Distance travelled during 12 min. > 4 km	
Threshold value	• Sensor voltage <2.2 V	
Diagnosis time	• 12 ~13 minutes	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).


Connect the DLC for 'TPMS exciter'

3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mod of "CURRENT DATA" function.
5. Monitor the parameter of SENSOR 1 on the 'TPMS exciter' or scantool after 13 minutes.

Specification : 'Sensor Temp.' is more than -4 °F(-20 °C)and 'Sensor battery value' is 'Normal'.

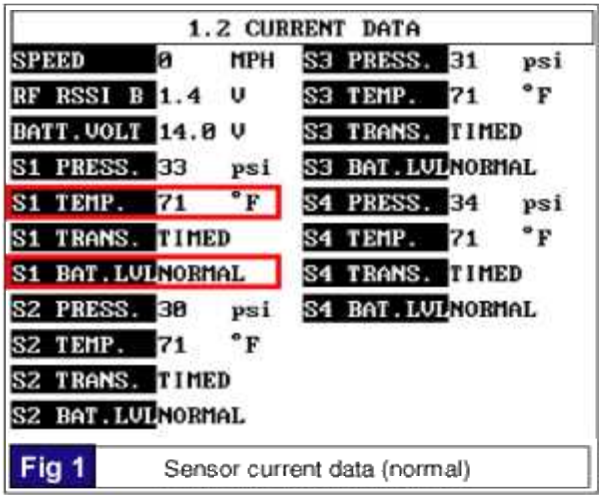


Fig 1 Sensor current data (normal)

6. Is parameter within specifications?

YES

Fault is intermittent. It might have been caused by low temperature.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.

Specification : 'Sensor battery value' is 'Normal' and 'Sensor Temp.' is more than -4 °F(-20 °C).

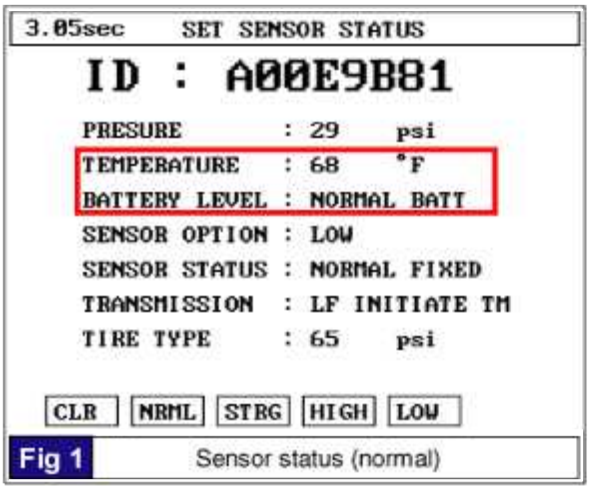
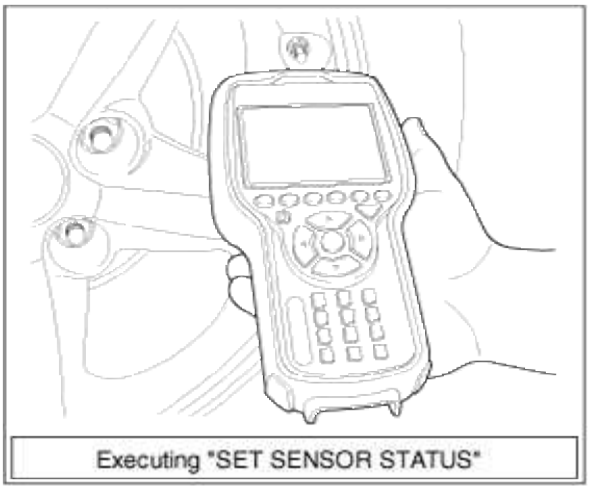


Fig 1 Sensor status (normal)



Executing "SET SENSOR STATUS"

4. Is any sensor data outside specification?

YES

Check wheel / tire where abnormal sensor data was detected. Check for tire / wheel damage and overheated brake condition.
Repair or replace if necessary and go to "Verification of Vehicle Repair" procedure.
If it is OK, go to "Check wheel / tire" as follows.

NO

Check for sensor if unable to retrieve data with 'TPMS exciter'.
Replace TPMS sensor if necessary and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

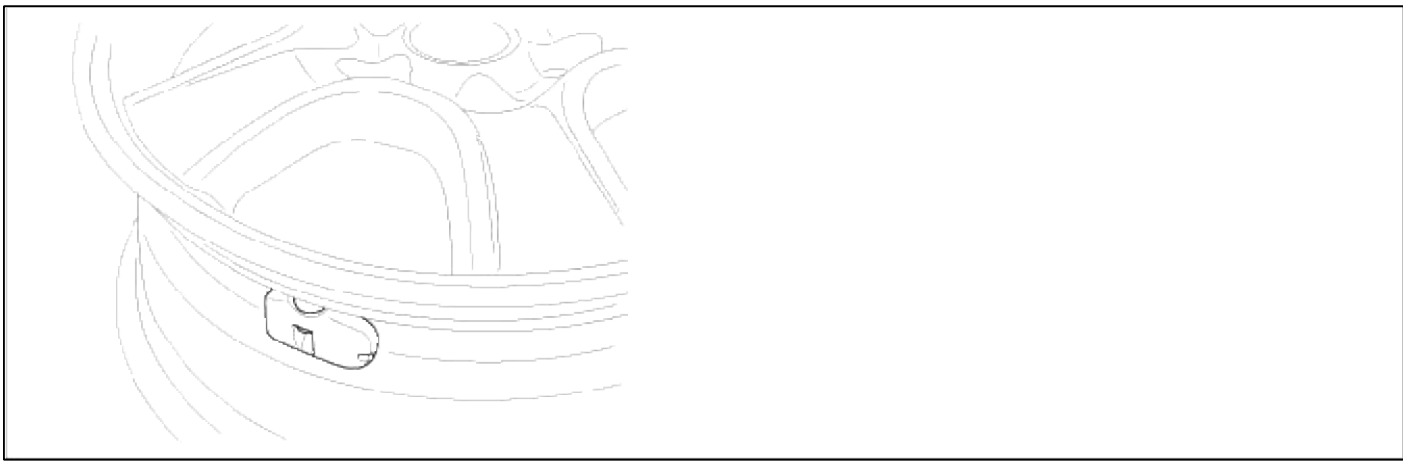
Go to the applicable troubleshooting procedure.

NO

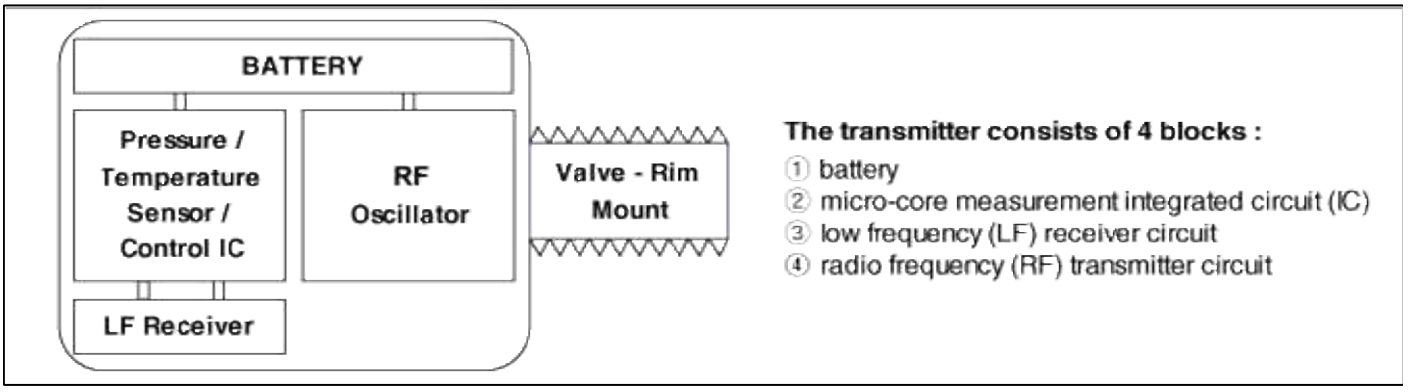
System performing to specification at this time.

Suspension System > Troubleshooting > C1122

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
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Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40

to 120 degree Fahrenheit).

DTC Description

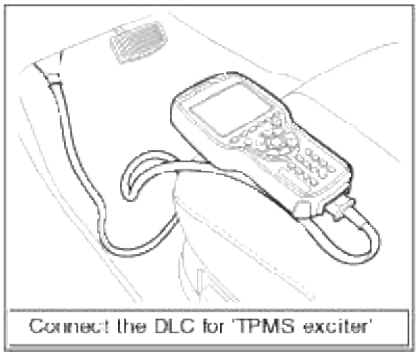
This DTC indicates that the sensor battery voltage level is Low. The most likely cause is battery passing it's expected life / excessively Low temperatures / sensor failure.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Sensor battery check	• Sensor temperature low • Sensor battery low • Faulty TPMS sensor
Enable conditions	• Latest Lowest sensor Temp. > -4 °F(-20 °C) • Distance travelled during 12 min. > 4 km	
Threshold value	• Sensor voltage <2.2 V	
Diagnosis time	• 12 ~13 minutes	

Monitor Scantool Data

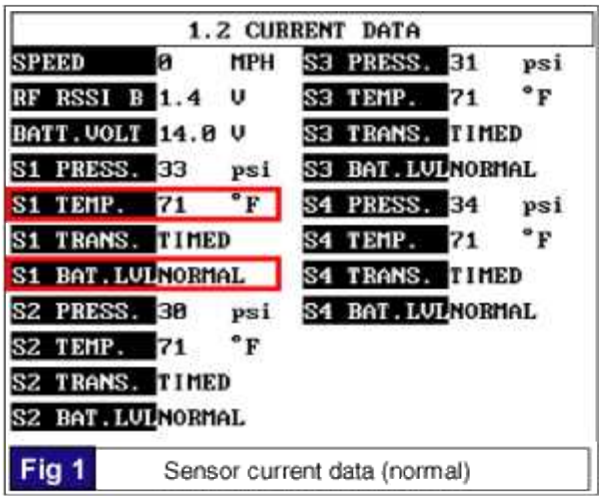
1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mod of "CURRENT DATA" function.

5. Monitor the parameter of SENSOR 1 on the 'TPMS exciter' or scantool after 13 minutes.

Specification : 'Sensor Temp.' is more than -4 °F(-20 °C)and 'Sensor battery value' is 'Normal'.



6. Is parameter within specifications?

YES

Fault is intermittent. It might have been caused by low temperature.
Go to "Verification of vehicle Repair" procedure.

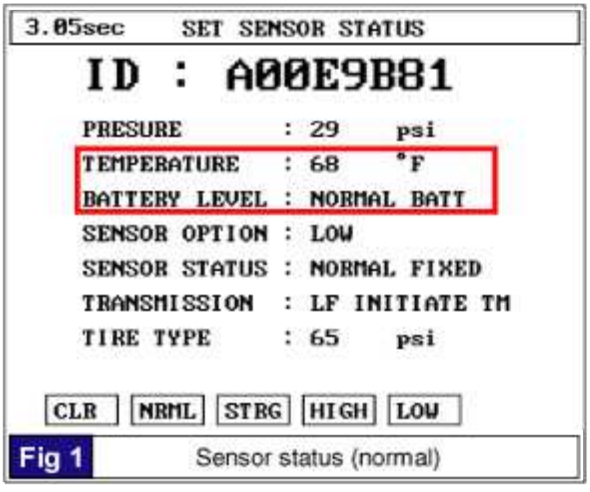
NO

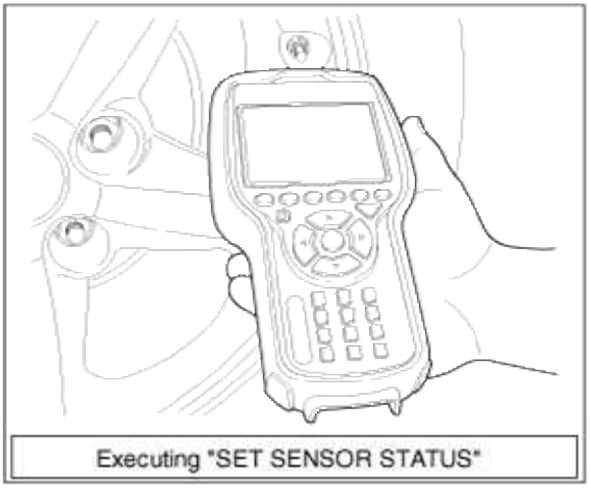
Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.

Specification : 'Sensor battery value' is 'Normal' and 'Sensor Temp.' is more than -4 °F(-20 °C).





4. Is any sensor data outside specification?

YES

Check wheel / tire where abnormal sensor data was detected. Check for tire / wheel damage and overheated brake condition.

Repair or replace if necessary and go to "Verification of Vehicle Repair" procedure.

If it is OK, go to "Check wheel / tire" as follows.

NO

Check for sensor if unable to retrieve data with 'TPMS exciter'.

Replace TPMS sensor if necessary and register sensor ID with 'TPMS exciter'.

Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

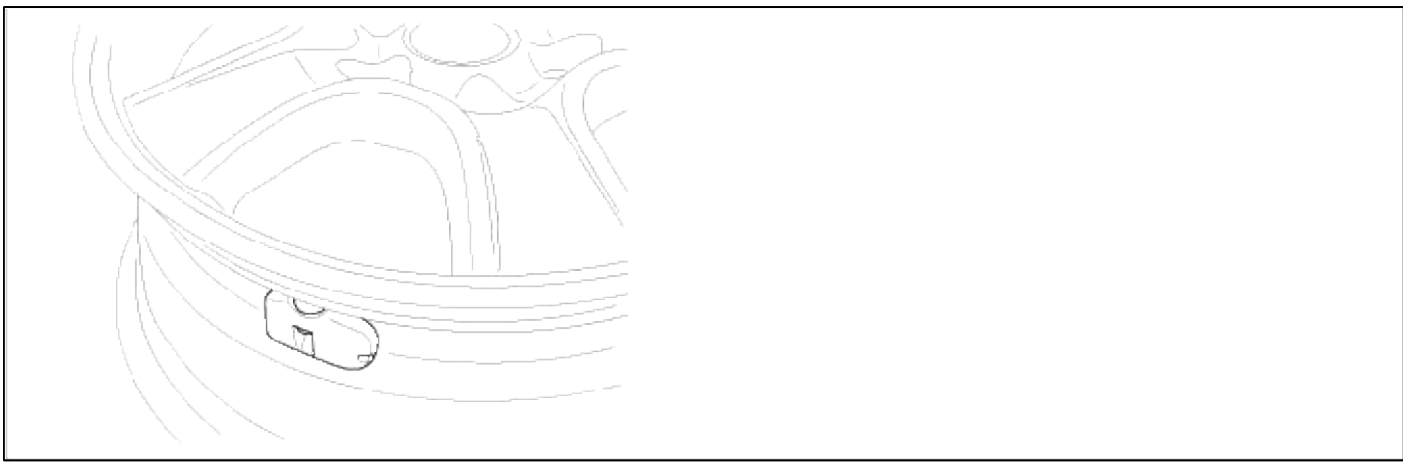
Go to the applicable troubleshooting procedure.

NO

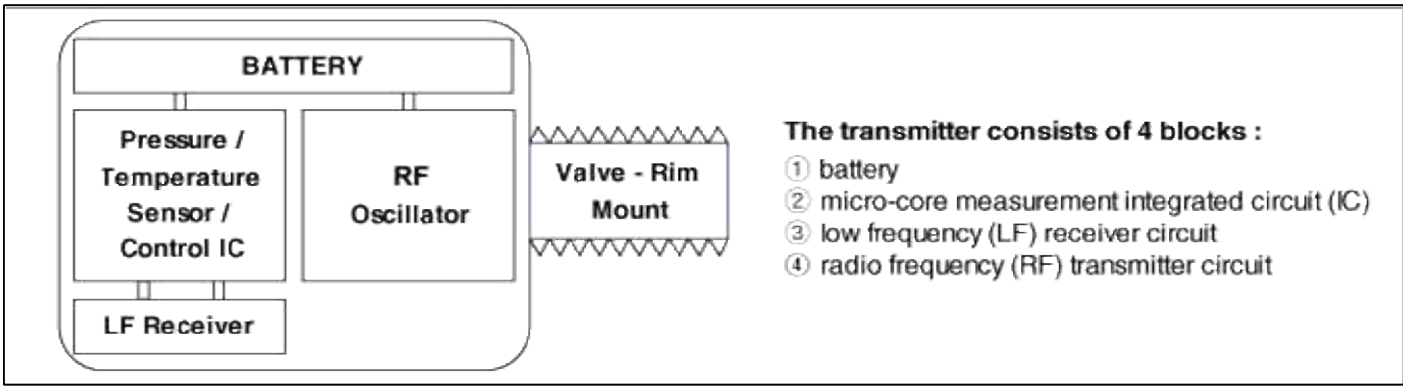
System performing to specification at this time.

Suspension System > Troubleshooting > C1123

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 °F (-5/7 °C) at this temperature, therefore the actual temperature may be 244.4 °F (118 °C). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

This DTC indicates that the sensor battery voltage level is Low. The most likely cause is battery passing it's expected life / excessively Low temperatures / sensor failure.

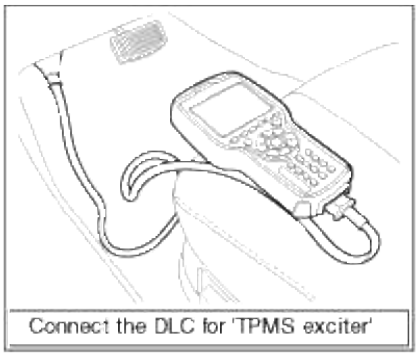
DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Sensor battery check	• Sensor temperature low • Sensor battery low • Faulty TPMS sensor
Enable conditions	• Latest Lowest sensor Temp. > -4 °F(-20 °C) • Distance travelled during 12 min. > 4 km	
Threshold value	• Sensor voltage <2.2 V	
Diagnosis time	• 12 ~13 minutes	

Monitor Scantool Data

1. Park the vehicle on a level surface.

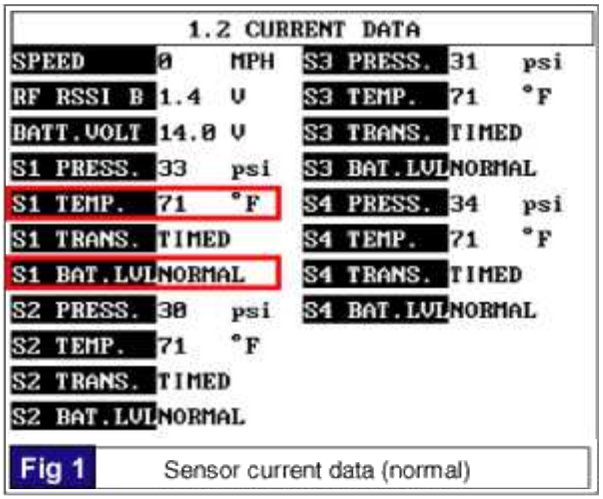
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



Connect the DLC for 'TPMS exciter'

3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mod of "CURRENT DATA" function.
5. Monitor the parameter of SENSOR 1 on the 'TPMS exciter' or scantool after 13 minutes.

Specification : 'Sensor Temp.' is more than -4 °F(-20 °C)and 'Sensor battery value' is 'Normal'.



1.2 CURRENT DATA

SPEED	0	MPH	S3 PRESS.	31	psi
RF RSSI B	1.4	V	S3 TEMP.	71	°F
BATT.VOLT	14.0	V	S3 TRANS.	TIMED	
S1 PRESS.	33	psi	S3 BAT.LVL	NORMAL	
S1 TEMP.	71	°F	S4 PRESS.	34	psi
S1 TRANS.	TIMED		S4 TEMP.	71	°F
S1 BAT.LVL	NORMAL		S4 TRANS.	TIMED	
S2 PRESS.	30	psi	S4 BAT.LVL	NORMAL	
S2 TEMP.	71	°F			
S2 TRANS.	TIMED				
S2 BAT.LVL	NORMAL				

Fig 1 Sensor current data (normal)

6. Is parameter within specifications?

YES

Fault is intermittent. It might have been caused by low temperature.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.

3. Execute "SET SENSOR STATUS" of each wheel.

Specification : 'Sensor battery value' is 'Normal' and 'Sensor Temp.' is more than -4 °F(-20 °C).

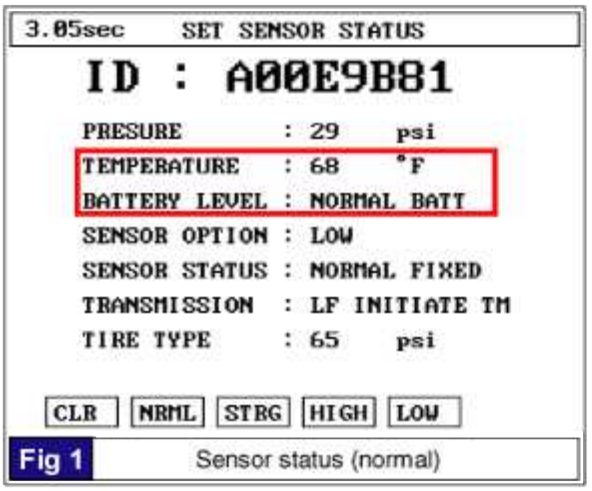
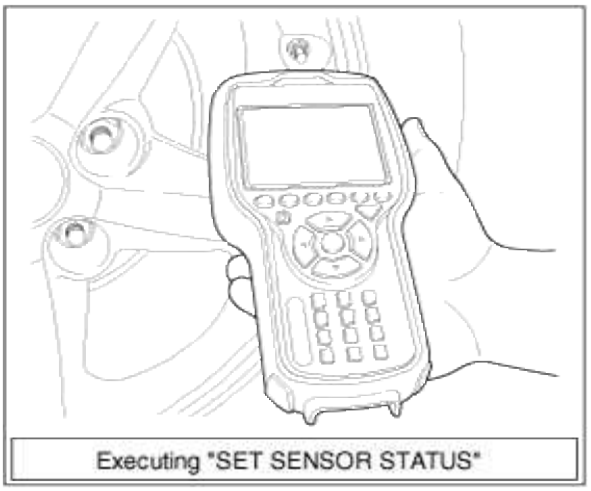


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

4. Is any sensor data outside specification?

YES

Check wheel / tire where abnormal sensor data was detected. Check for tire / wheel damage and overheated brake condition.

Repair or replace if necessary and go to "Verification of Vehicle Repair" procedure.

If it is OK, go to "Check wheel / tire" as follows.

NO

Check for sensor if unable to retrieve data with 'TPMS exciter'.

Replace TPMS sensor if necessary and register sensor ID with 'TPMS exciter'.

Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

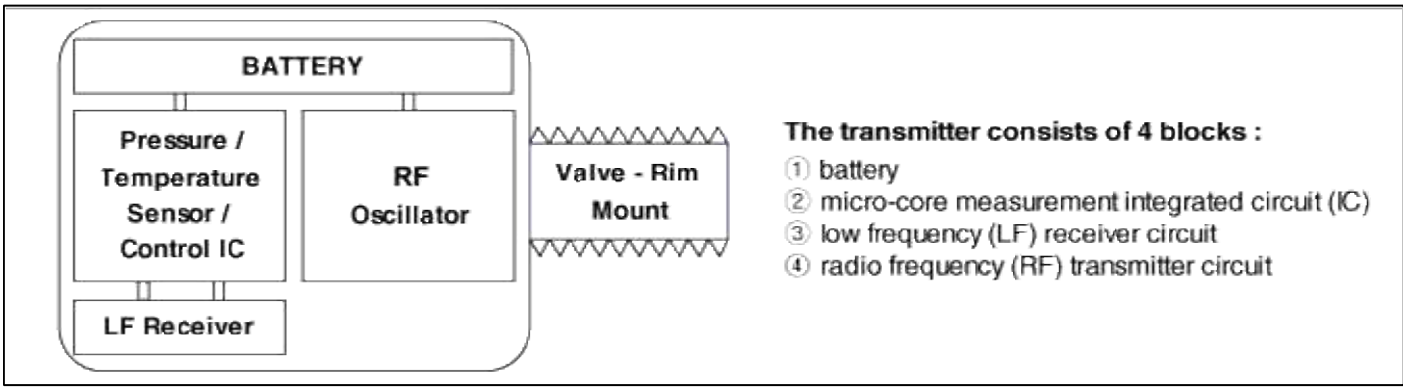
System performing to specification at this time.

Suspension System > Troubleshooting > C1124

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 °F (-5/7 °C) at this temperature, therefore the actual temperature may be 244.4 °F (118 °C). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

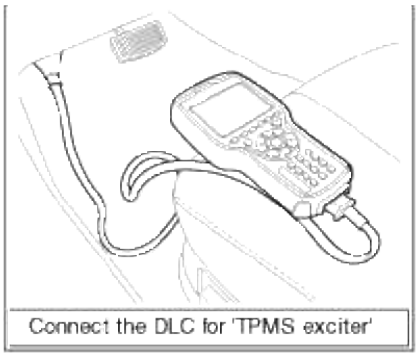
This DTC indicates that the sensor battery voltage level is Low. The most likely cause is battery passing it's expected life / excessively Low temperatures / sensor failure.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Sensor battery check	• Sensor temperature low • Sensor battery low • Faulty TPMS sensor
Enable conditions	• Latest Lowest sensor Temp. > -4 °F(-20 °C) • Distance travelled during 12 min. > 4 km	
Threshold value	• Sensor voltage <2.2 V	
Diagnosis time	• 12 ~13 minutes	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).


Connect the DLC for 'TPMS exciter'

3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mod of "CURRENT DATA" function.
5. Monitor the parameter of SENSOR 1 on the 'TPMS exciter' or scantool after 13 minutes.

Specification : 'Sensor Temp.' is more than -4 °F(-20 °C)and 'Sensor battery value' is 'Normal'.

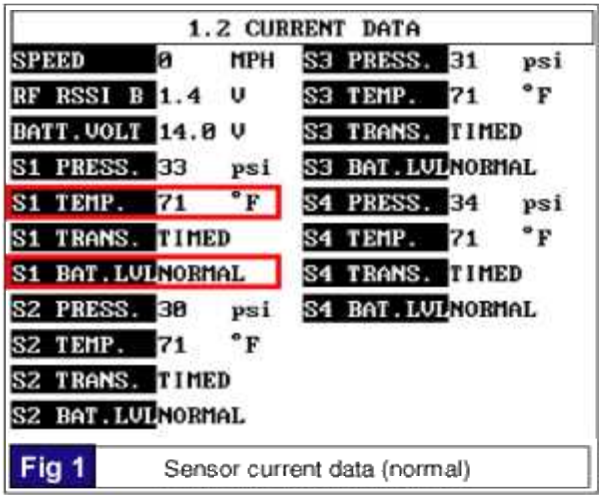


Fig 1 Sensor current data (normal)

6. Is parameter within specifications?

YES

Fault is intermittent. It might have been caused by low temperature.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.

Specification : 'Sensor battery value' is 'Normal' and 'Sensor Temp.' is more than -4 °F(-20 °C).

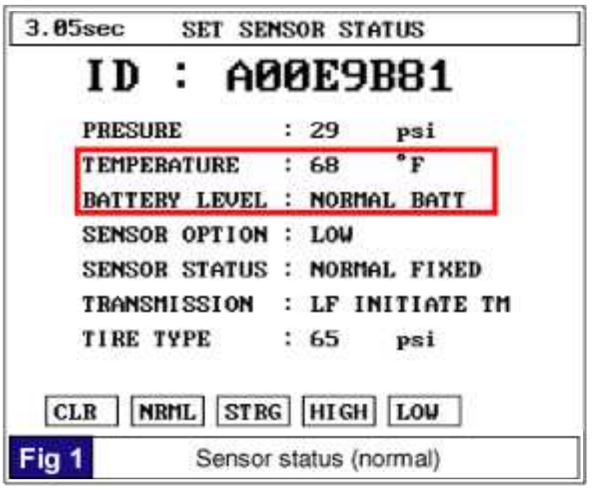
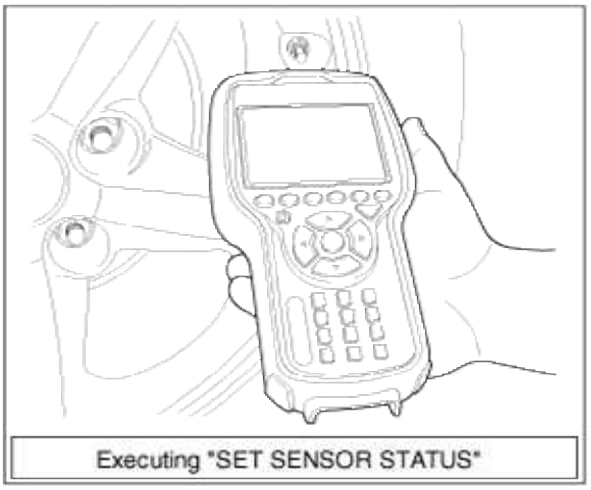


Fig 1 Sensor status (normal)



Executing "SET SENSOR STATUS"

4. Is any sensor data outside specification?

YES

Check wheel / tire where abnormal sensor data was detected. Check for tire / wheel damage and overheated brake condition.
Repair or replace if necessary and go to "Verification of Vehicle Repair" procedure.
If it is OK, go to "Check wheel / tire" as follows.

NO

Check for sensor if unable to retrieve data with 'TPMS exciter'.
Replace TPMS sensor if necessary and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

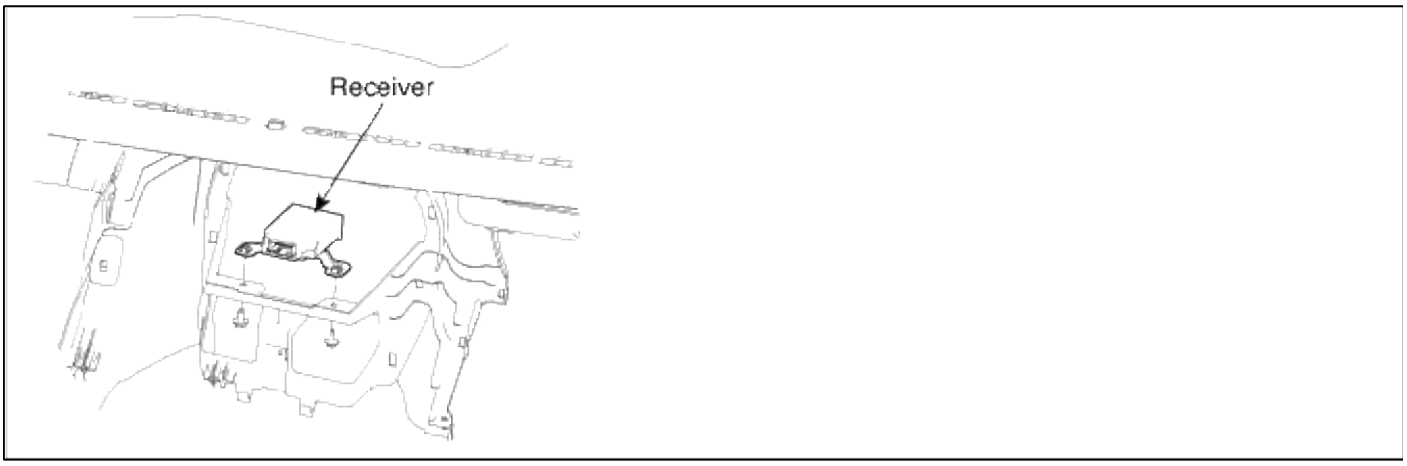
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C1126

Component Location



General Description

TPM Receiver is integrated with the TPM module installed behind the center facia. The operating battery of TPM module is supplied from the vehicle battery. Data such as Tire pressure, Tire Temperature, TPM sensor battery status and TPM sensor valve ID from TPM sensors are transmitted to TPM receiver in the form of RF signal. TPM module accomplishes Tire Monitoring and Warning Logic with received data.

DTC Description

This indicates that the receiver battery level is Low. The most likely cause is battery / harness / receiver input / A-D failure.

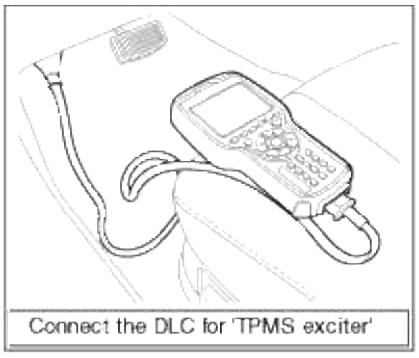
DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Battery level check	• Faulty charging system • Vehicle battery low • Faulty TPMS Receiver
Enable conditions	• Battery voltage level low	
Threshold value	• Battery voltage < 9V • Latest measured speed >= 12.43mph(20kph)	
Diagnosis time	• 2 sec.	

Monitor Scantool Data

1. Start engine and turn headight and rear defroster.

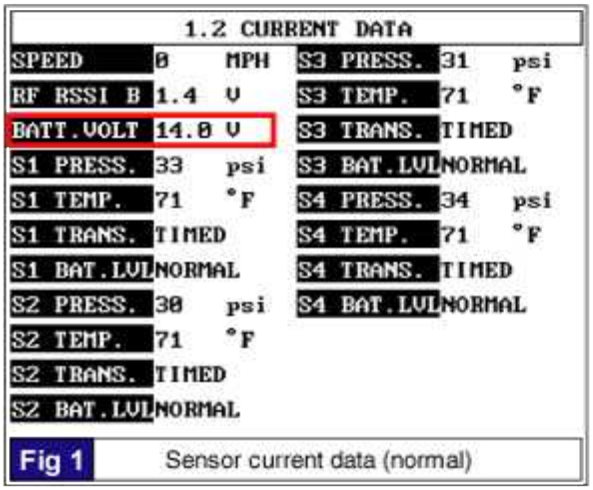
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



Connect the DLC for 'TPMS exciter'

3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Maintaining ENG. RPM at 2,500RPM(idle) over 2 minutes.
6. Monitor the parameter of BATT. VOLT on the 'TPMS exciter' or scantool

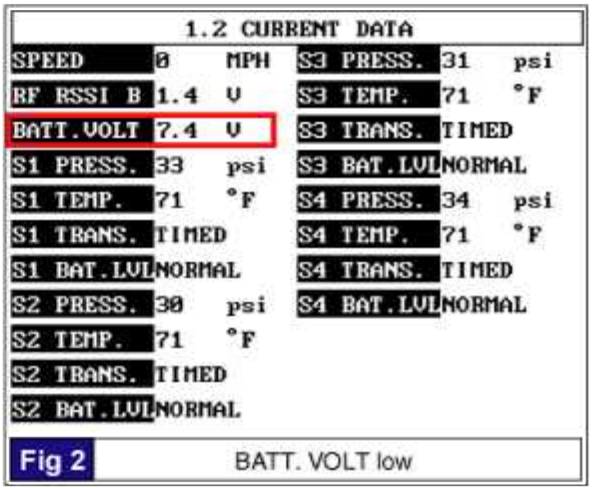
Specification : 'BATT. VOLT' is more than 11 V



1.2 CURRENT DATA

SPEED	0	MPH	S3 PRESS.	31	psi
RF RSSI B	1.4	V	S3 TEMP.	71	°F
BATT.VOLT	14.0	V	S3 TRANS.	TIMED	
S1 PRESS.	33	psi	S3 BAT.LVL	NORMAL	
S1 TEMP.	71	°F	S4 PRESS.	34	psi
S1 TRANS.	TIMED		S4 TEMP.	71	°F
S1 BAT.LVL	NORMAL		S4 TRANS.	TIMED	
S2 PRESS.	30	psi	S4 BAT.LVL	NORMAL	
S2 TEMP.	71	°F			
S2 TRANS.	TIMED				
S2 BAT.LVL	NORMAL				

Fig 1 Sensor current data (normal)



1.2 CURRENT DATA

SPEED	0	MPH	S3 PRESS.	31	psi
RF RSSI B	1.4	V	S3 TEMP.	71	°F
BATT.VOLT	7.4	V	S3 TRANS.	TIMED	
S1 PRESS.	33	psi	S3 BAT.LVL	NORMAL	
S1 TEMP.	71	°F	S4 PRESS.	34	psi
S1 TRANS.	TIMED		S4 TEMP.	71	°F
S1 BAT.LVL	NORMAL		S4 TRANS.	TIMED	
S2 PRESS.	30	psi	S4 BAT.LVL	NORMAL	
S2 TEMP.	71	°F			
S2 TRANS.	TIMED				
S2 BAT.LVL	NORMAL				

Fig 2 BATT. VOLT low

7. Is parameter normal?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection/Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
3. Has a problem been found?

YES

Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

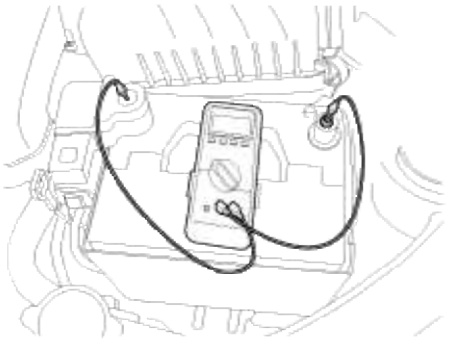
NO

Go to "Charging System Inspection" procedure.

Charging System Inspection

1. Engine "ON".
2. headight and rear defroster "ON".
3. Measure voltage between terminal (+) and (-) of battery maintaining ENG. RPM at 2,500 RPM(idle) over 2 minutes.

Specification : more than 11 V



4. Is the measured voltage within specifications?

YES

Substitute with a known-good TPM receiver and check for proper operation.
If the problem is corrected, replace TPM receiver and then go to "Verification of Vehicle Repair" procedure.

NO

Check for fault in charging system and check for tension of generator drive belt, ENG.idle rpm or open/short in harness from battery to generator.
Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

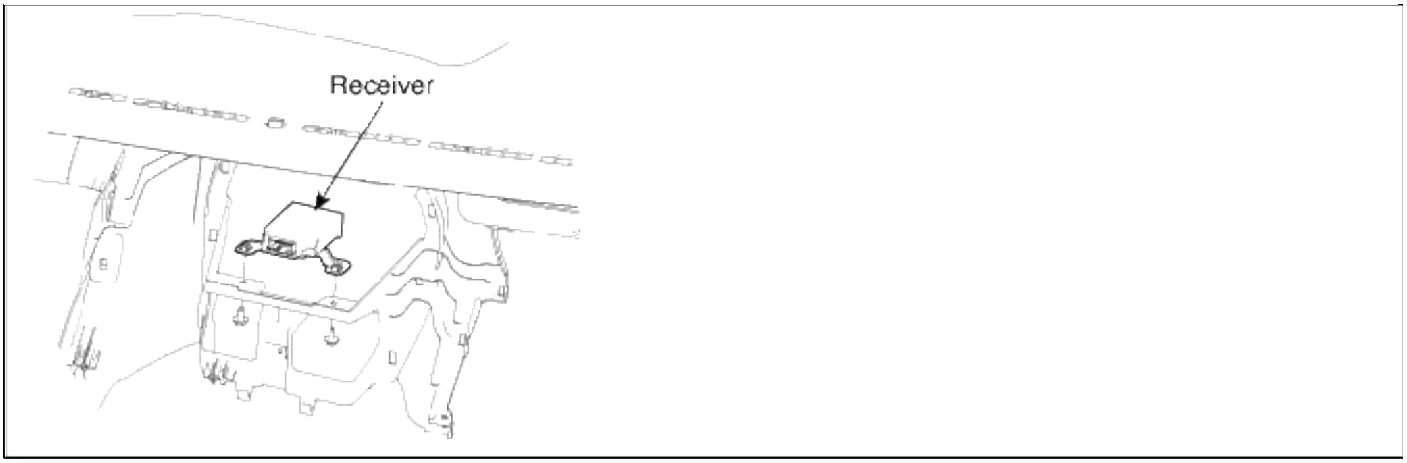
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C1127

Component Location



General Description

TPM Receiver is integrated with the TPM module installed behind the center facia. The operating battery of TPM module is supplied from the vehicle battery. Data such as Tire pressure, Tire Temperature, TPM sensor battery status and TPM sensor valve ID from TPM sensors are transmitted to TPM receiver in the form of RF signal. TPM module accomplishes Tire Monitoring and Warning Logic with received data.

DTC Description

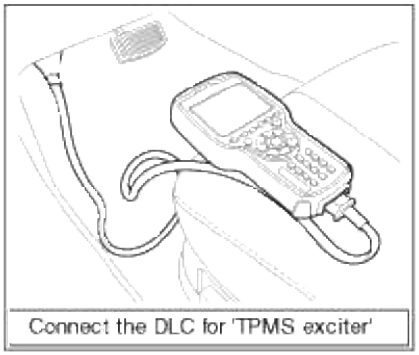
This indicates that the receiver battery level is High. The most likely cause is receiver input / A-D failure.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Battery level check	• Faulty charging system • Vehicle battery high • Faulty TPMS Receiver
Enable conditions	• Battery voltage level high	
Threshold value	• Battery voltage > 17.5 V	
Diagnosis time	• 2 sec.	

Monitor Scantool Data

1. Start engine and turn headight and heatwire on.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



3. Select "TPMS DIAGNOSIS" mode.

4. Select the "FULL" mode of "CURRENT DATA" function.
5. Maintaining ENG. RPM at 2,500RPM(idle) over 2 minutes.
6. Monitor the parameter of BATT. VOLT on the 'TPMS exciter' or scantool.

Specification : 'BATT. VOLT' is less than 16.5 V

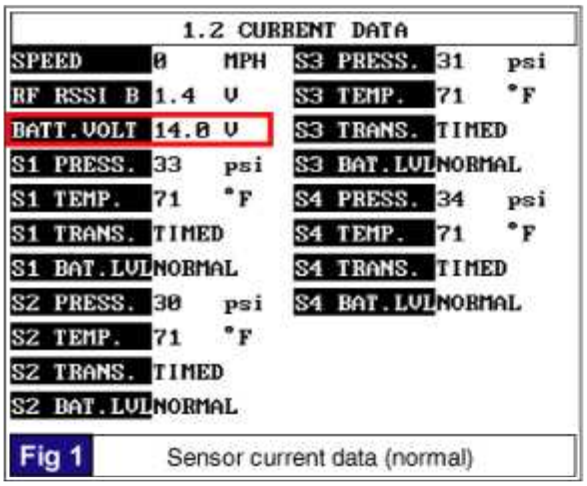


Fig 1 Sensor current data (normal)

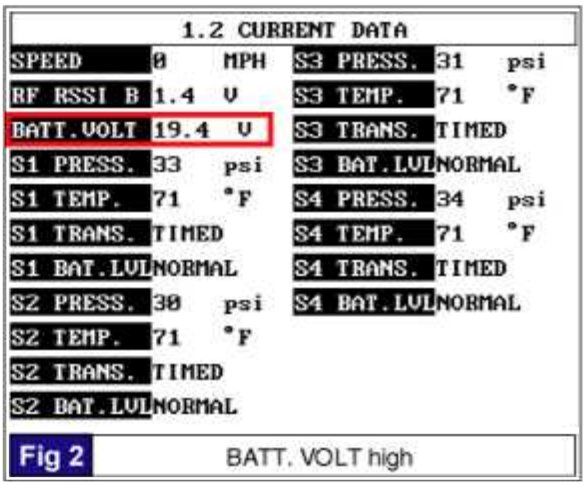


Fig 2 BATT. VOLT high

7. Is parameter normal?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Inspection/Repair" procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
3. Has a problem been found?

YES

Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

NO

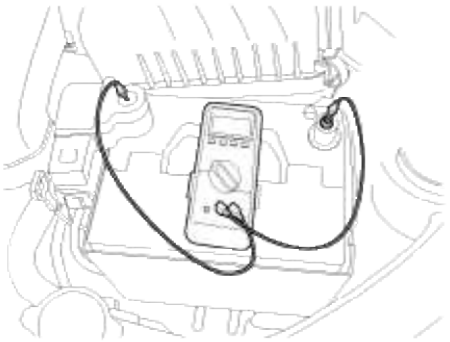
Go to "Charging System Inspection" procedure.

Charging System Inspection

1. Engine "ON".
2. headight and rear defroster "ON".

3. Measure voltage between terminal (+) and (-) of battery maintaining ENG. RPM at 2,500 RPM(idle) over 2 minutes.

Specification : less than 16.5 V



4. Is the measured voltage within specifications?

YES

Substitute with a known-good TPM receiver and check for proper operation.
If the problem is corrected, replace TPM receiver and then go to "Verification of Vehicle Repair" procedure.

NO

Check for fault in charging system and thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
Repair or replace if necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

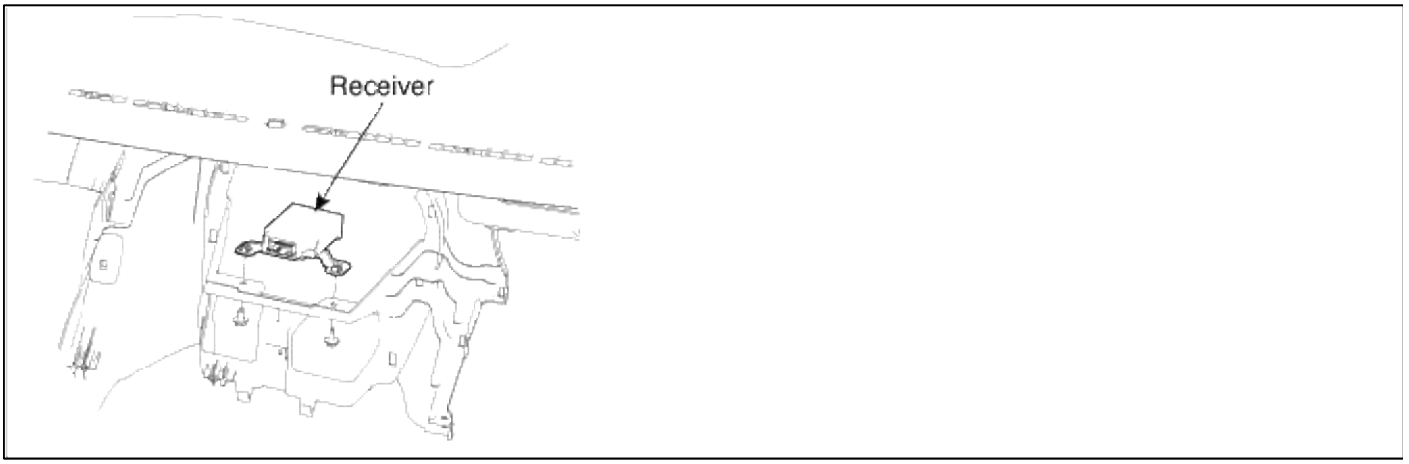
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C1300

Component Location



General Description

TPM Receiver is integrated with the TPM module installed behind the center facia. The operating battery of TPM module is supplied from the vehicle battery. Data such as Tire pressure, Tire Temperature, TPM sensor battery status and TPM sensor valve ID from TPM sensors are transmitted to TPM receiver in the form of RF signal. TPM module accomplishes Tire Monitoring and Warning Logic with received data.

DTC Description

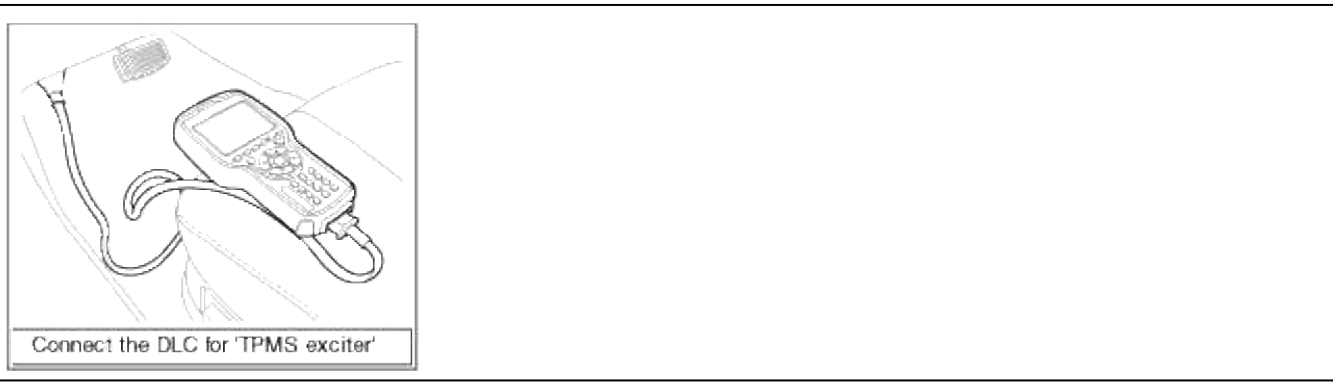
This DTC indicates that system is not functioning due to High interference levels from external sources.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• LF/RF check	• LF/RF Interference from external sources(unless C1306 also exists as historic. If this is the case then interference source is likely to be internal to the vehicle)
Enable conditions	• System not functioning due to High RF interference levels	
Threshold value	• No valid RF data for 8 min from any sensor • Distance travelled during 8 minutes ≤ 1.68 mile(2.7 km)	
Diagnosis time	• 8 - 9 minutes	

Monitor Scantool Data

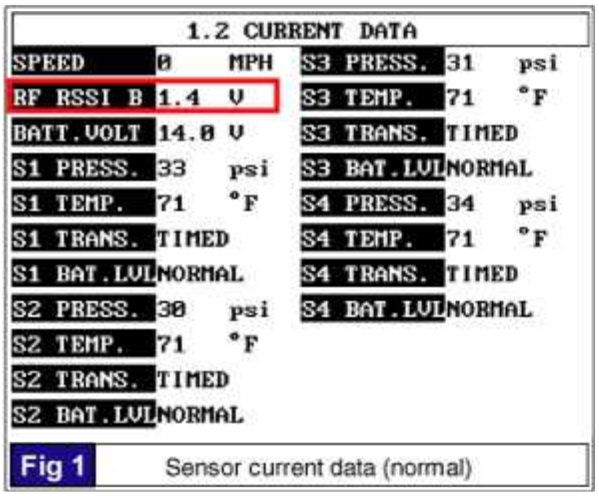
1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.

5. Monitor the parameter of RF RSSI background on the 'TPMS exciter' or scantool after 9 minutes.

Specification : "RSSI background" is less than 1.5 V



6. Is parameter within specifications?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

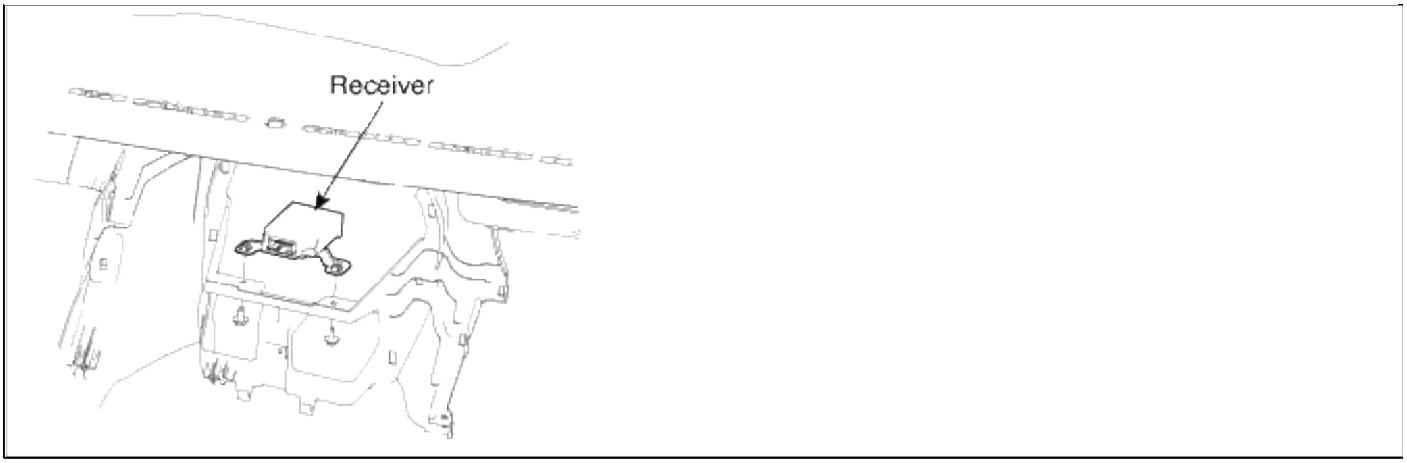
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C1306

Component Location



General Description

TPM Receiver is integrated with the TPM module installed behind the center facia. The operating battery of TPM module is supplied from the vehicle battery. Data such as Tire pressure, Tire Temperature, TPM sensor battery status and TPM sensor valve ID from TPM sensors are transmitted to TPM receiver in the form of RF signal. TPM module accomplishes Tire Monitoring and Warning Logic with received data.

DTC Description

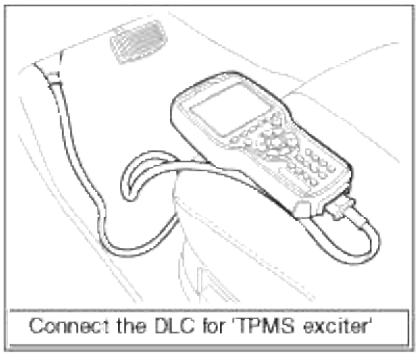
This DTC indicates that system is not functioning due to High interference levels, which are most likely being generated in the vehicle.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• LF/RF check	• Internal vehicle noise source
Enable conditions	• System not functioning due to High RF interference (Internal) levels	
Threshold value	• No valid RF data for 8 min from any sensor • 16.57 mile (26.67 km) > Distance travelled during 8 minutes > 1.68 mile(2.7 km)	
Diagnosis time	• 8 - 9 minutes	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Monitor the parameter of RF RSSI background on the 'TPMS exciter' or scantool after 9 minutes..

Specification : "RSSI background" is less than 1.5V

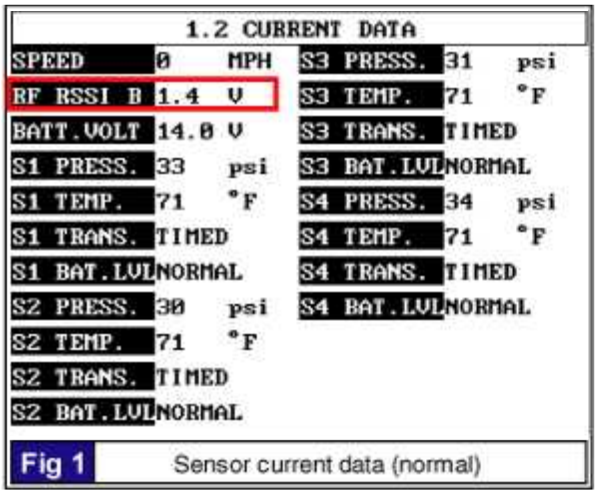


Fig 1 Sensor current data (normal)

6. Is parameter within specifications?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

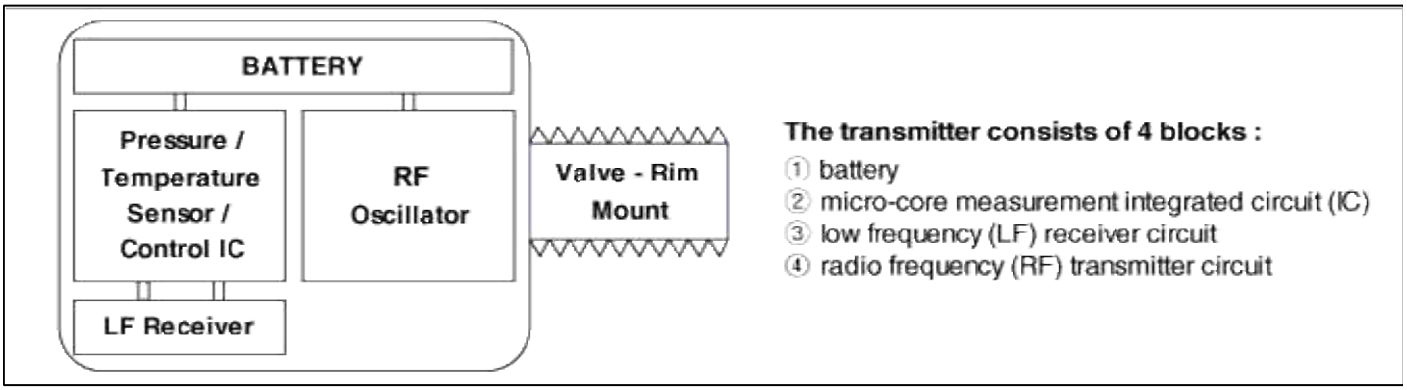
System performing to specification at this time.

Suspension System > Troubleshooting > C1312

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

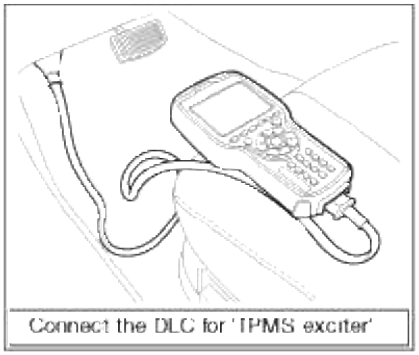
This DTC indicates that the sensor has either failed to learn OR has successfully learned and the receiver did not receive messages from the learned sensor for 12 minutes.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• RF message from sensor check	• Incorrectly configured TPMS sensor e.g.Low Line vehicle with High Line sensors. • Low Line vehicle sensors in storage state. • Wrong receiver type fitted e.g. Low Line receiver to a High Line vehicle. • Shielding in vehicle. • Un-approved wheels/tires i.e. a vehicle set up that has not been approved for good RF performance. • Incorrectly fitted sensor / receiver. • When a wheel is detected as stationary during driving. • Faulty TPMS sensor
Enable conditions	• 2.48 mile < Distance travelled during 12 min. < 24.85 mile	
Threshold value	• Failure to Learn Sensors Correctly. • No RF message received from sensor1 over 12 min.	
Diagnosis time	• 12 ~ 20 minutes.	

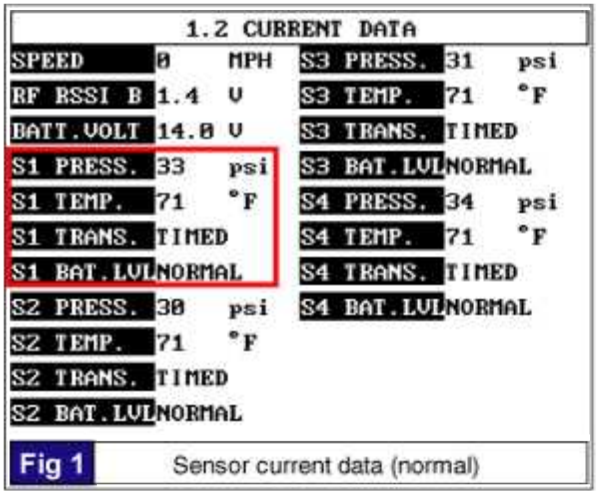
Monitor Scantool Data

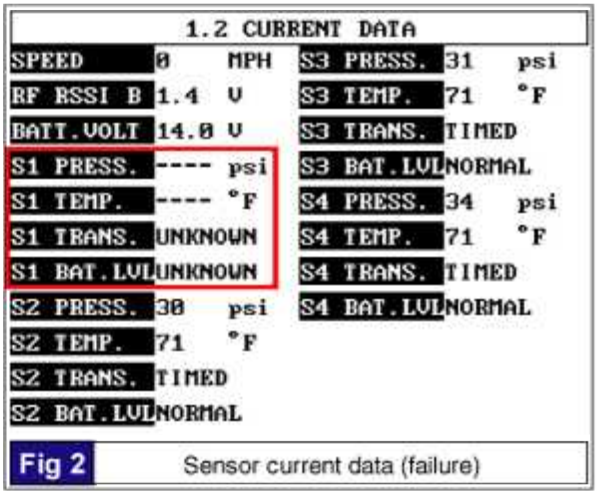
1. Connect "TPMS exciter' or scantool to Data Link Connector(DLC).



2. Select "TPMS DIAGNOSIS" mode.
3. Select the "FULL" mode of "CURRENT DATA" function.

4. Monitor the parameter of SENSOR 1 on the 'TPMS exciter' or scantool after 20 minutes.





5. Is parameter normal?

YES

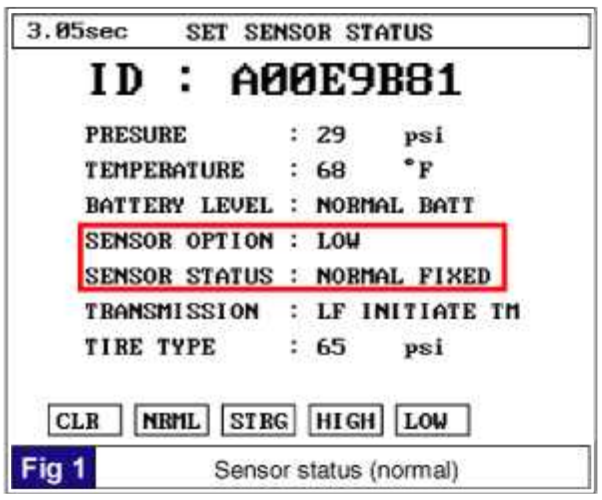
Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

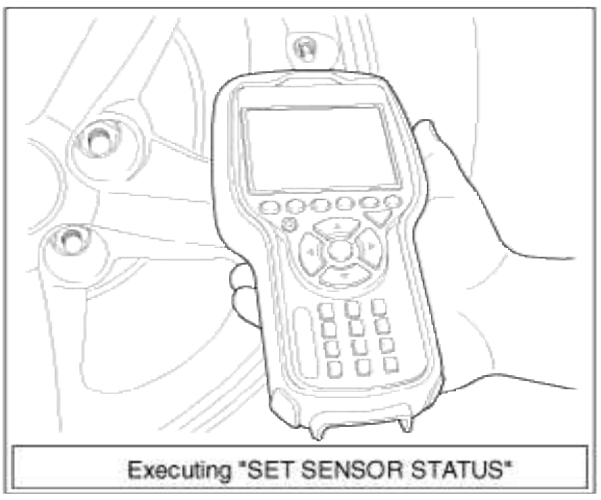
NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.





4. Is data unable to be retrieved for any sensor?

YES

Replace affected TPM sensor and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode

2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

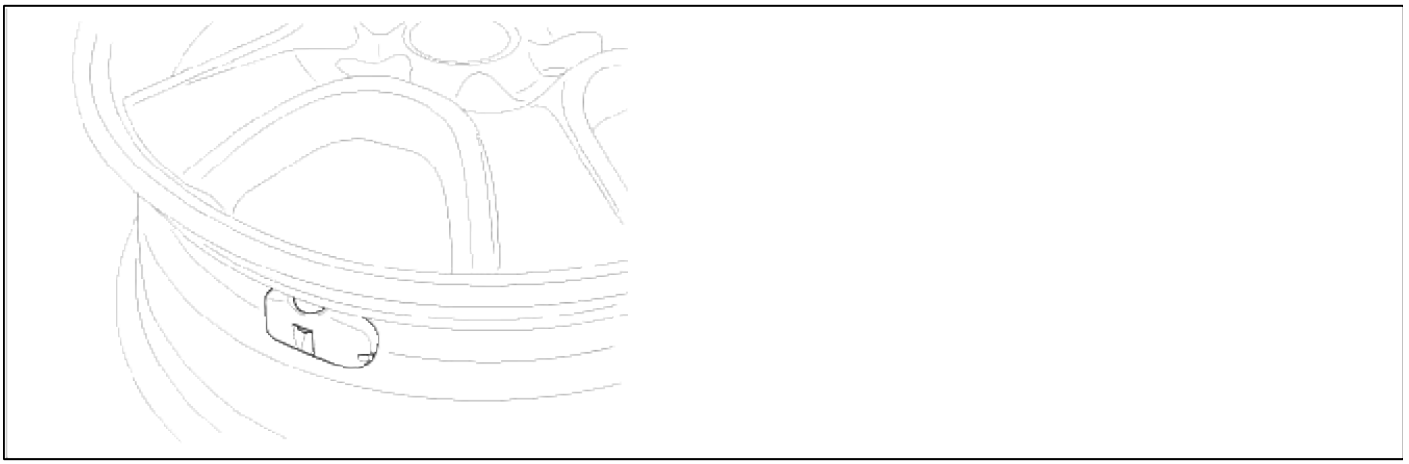
Go to the applicable troubleshooting procedure.

NO

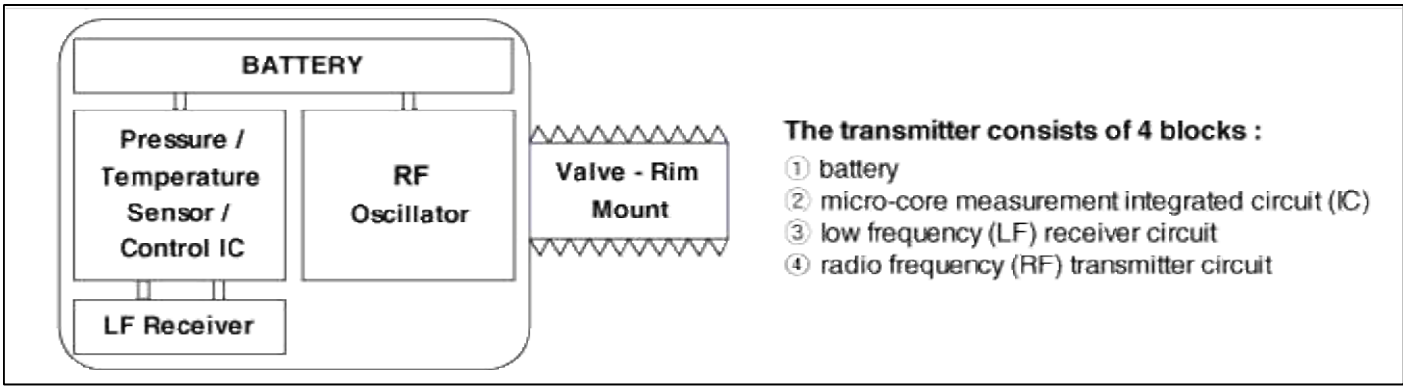
System performing to specification at this time.

Suspension System > Troubleshooting > C1313

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

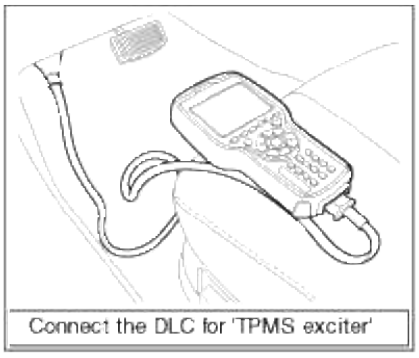
This DTC indicates that the sensor has either failed to learn OR has successfully learned and the receiver did not receive messages from the learned sensor for 12 minutes.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• RF message from sensor check	• Incorrectly configured TPMS sensor e.g.Low Line vehicle with High Line sensors. • Low Line vehicle sensors in storage state. • Wrong receiver type fitted e.g. Low Line receiver to a High Line vehicle. • Shielding in vehicle. • Un-approved wheels/tires i.e. a vehicle set up that has not been approved for good RF performance. • Incorrectly fitted sensor / receiver. • When a wheel is detected as stationary during driving. • Faulty TPMS sensor
Enable conditions	• 2.48 mile < Distance travelled during 12 min. < 24.85 mile	
Threshold value	• Failure to Learn Sensors Correctly. • No RF message received from sensor1 over 12 min.	
Diagnosis time	• 12 ~ 20 minutes.	

Monitor Scantool Data

1. Connect "TPMS exciter' or scantool to Data Link Connector(DLC).


Connect the DLC for 'TPMS exciter'

2. Select "TPMS DIAGNOSIS" mode.
3. Select the "FULL" mode of "CURRENT DATA" function.
4. Monitor the parameter of SENSOR 1 on the 'TPMS exciter' or scantool after 20 minutes.

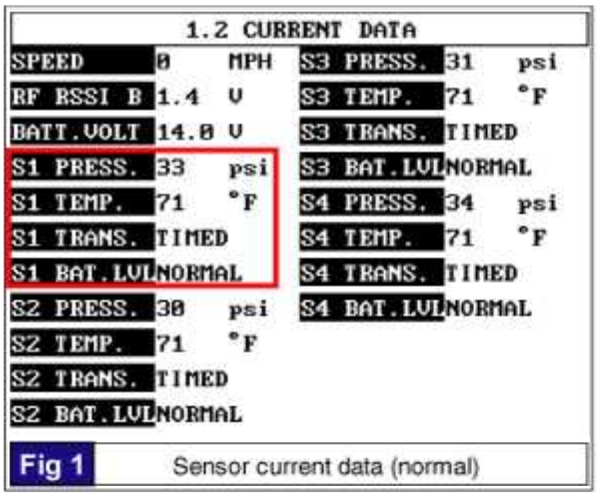


Fig 1 Sensor current data (normal)

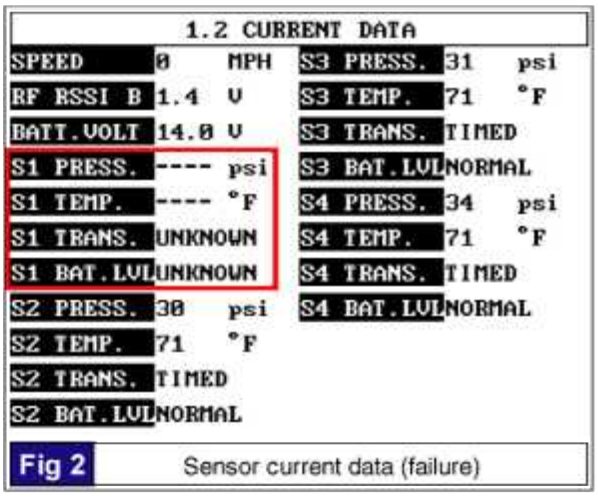


Fig 2 Sensor current data (failure)

5. Is parameter normal?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.

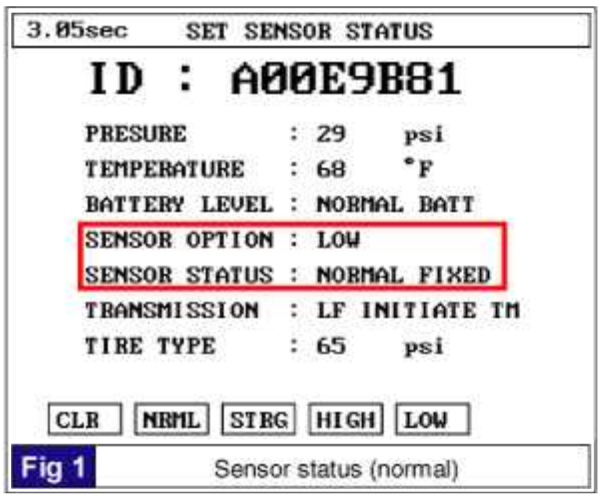
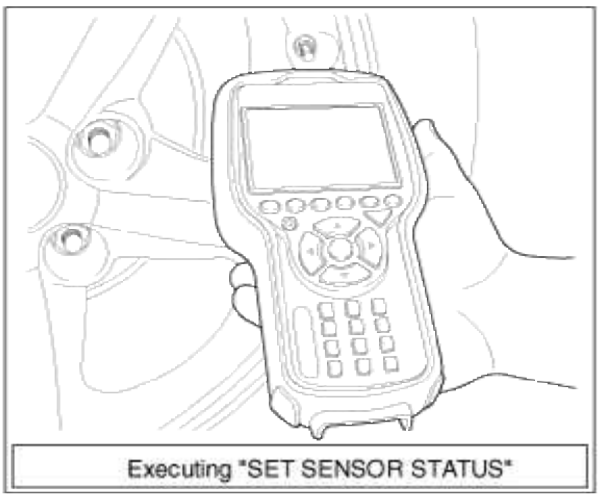


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

4. Is data unable to be retrieved for any sensor?

YES

Replace affected TPM sensor and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

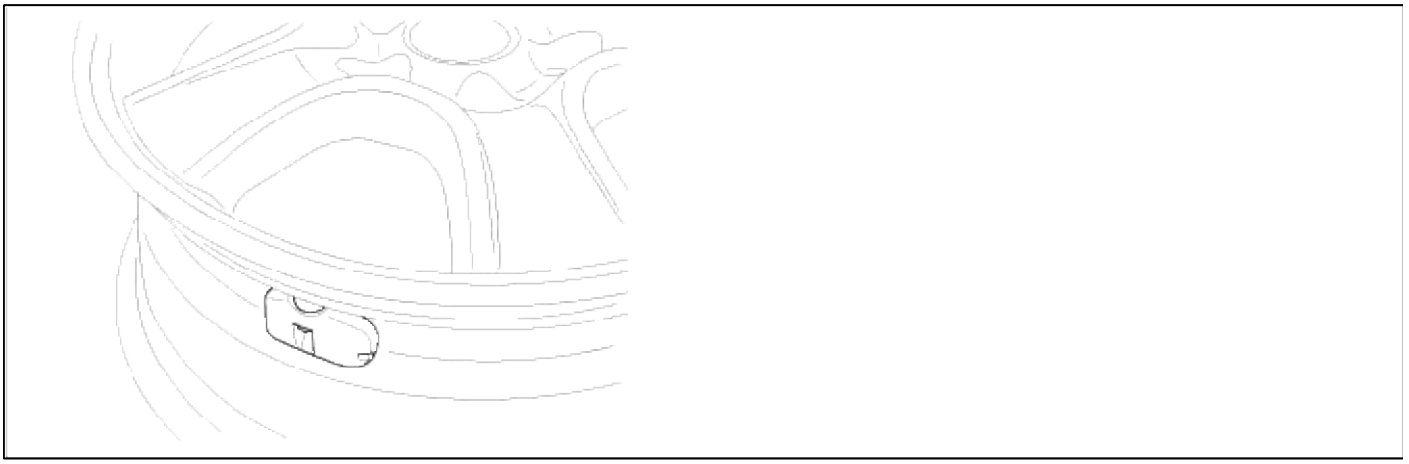
Go to the applicable troubleshooting procedure.

NO

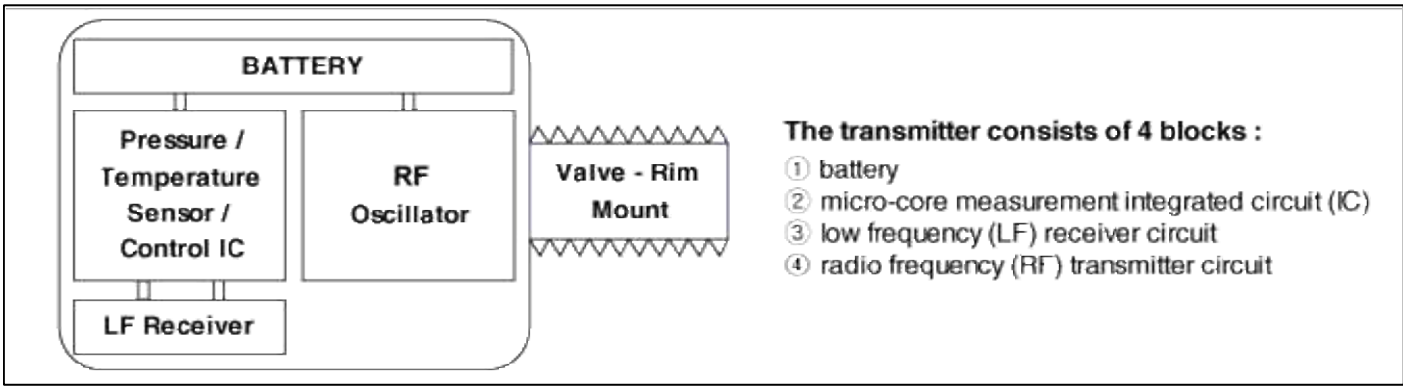
System performing to specification at this time.

Suspension System > Troubleshooting > C1314

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and

transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

This DTC indicates that the sensor has either failed to learn OR has successfully learned and the receiver did not receive messages from the learned sensor for 12 minutes.

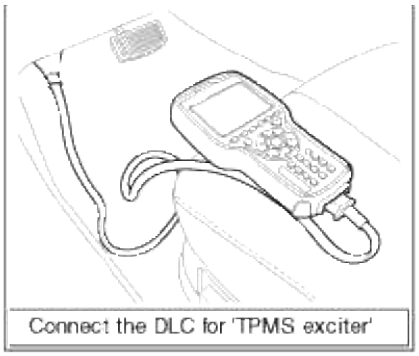
DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• RF message from sensor check	• Incorrectly configured TPMS sensor e.g.Low Line vehicle with High Line sensors. • Low Line vehicle sensors in storage state. • Wrong receiver type fitted e.g. Low Line receiver to a High Line vehicle. • Shielding in vehicle. • Un-approved wheels/tires i.e. a vehicle set up that has not been approved for good RF performance. • Incorrectly fitted sensor / receiver.
Enable conditions	• 2.48 mile < Distance travelled during 12 min. < 24.85 mile	
Threshold value	• Failure to Learn Sensors Correctly. • No RF message received from sensor1 over 12 min.	

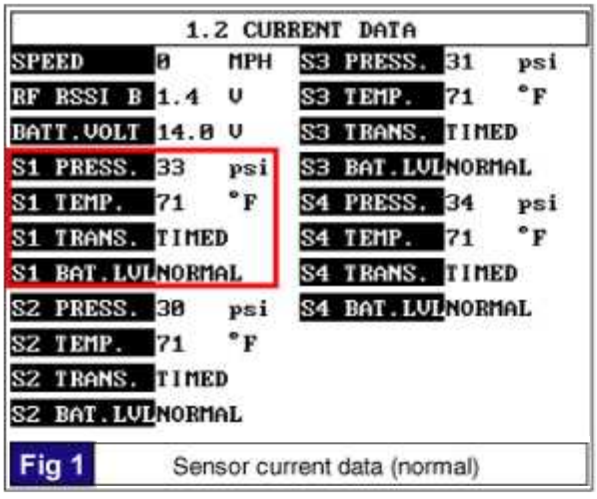
Diagnosis time	• 12 ~ 20 minutes.	• When a wheel is detected as stationary during driving. • Faulty TPMS sensor

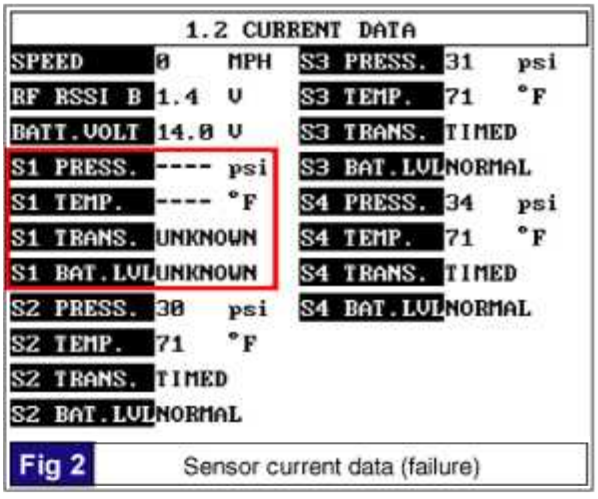
Monitor Scantool Data

1. Connect "TPMS exciter' or scantool to Data Link Connector(DLC).



2. Select "TPMS DIAGNOSIS" mode.
3. Select the "FULL" mode of "CURRENT DATA" function.
4. Monitor the parameter of SENSOR 1 on the 'TPMS exciter' or scantool after 20 minutes.





5. Is parameter normal?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.

3. Execute "SET SENSOR STATUS" of each wheel.

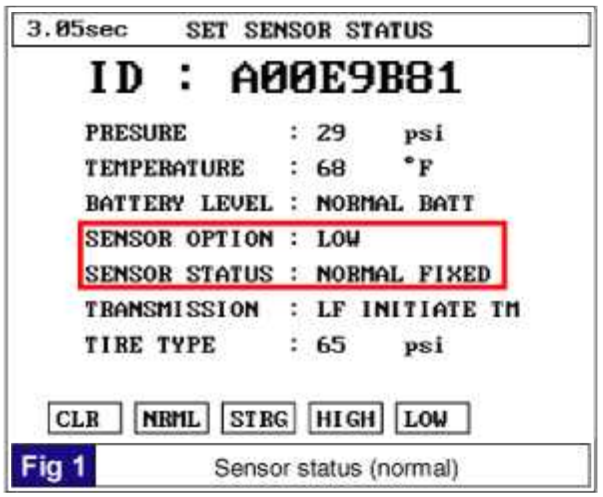
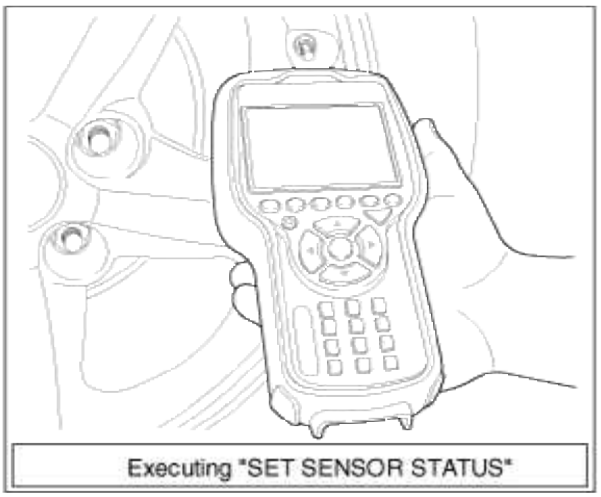


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

4. Is data unable to be retrieved for any sensor?

YES

Replace affected TPM sensor and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

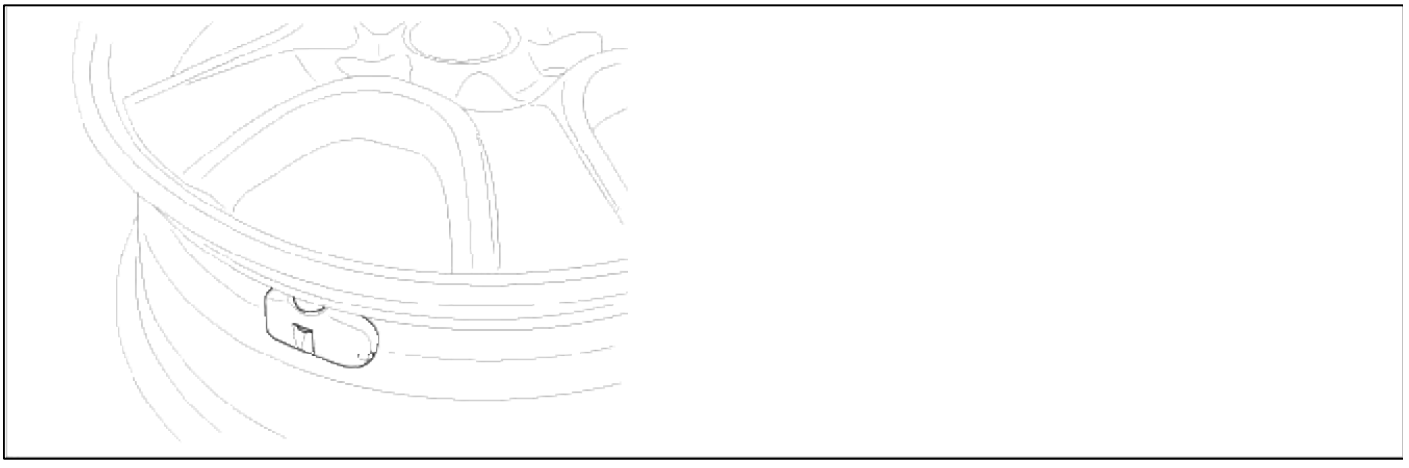
Go to the applicable troubleshooting procedure.

NO

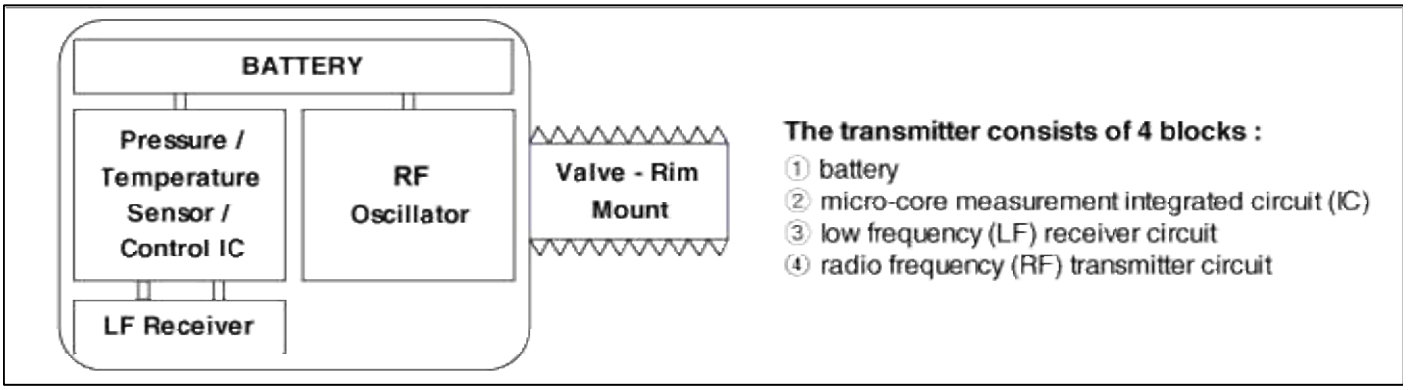
System performing to specification at this time.

Suspension System > Troubleshooting > C1315

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

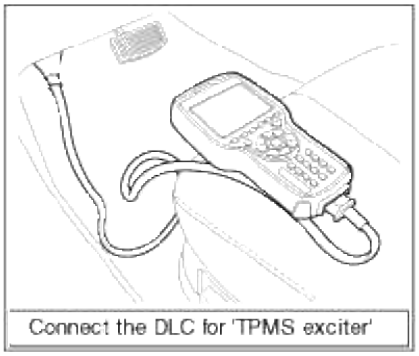
This DTC indicates that the sensor has either failed to learn OR has successfully learned and the receiver did not receive messages from the learned sensor for 12 minutes.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• RF message from sensor check	• Incorrectly configured TPMS sensor e.g.Low Line vehicle with High Line sensors. • Low Line vehicle sensors in storage state. • Wrong receiver type fitted e.g. Low Line receiver to a High Line vehicle. • Shielding in vehicle. • Un-approved wheels/tires i.e. a vehicle set up that has not been approved for good RF performance. • Incorrectly fitted sensor / receiver. • When a wheel is detected as stationary during driving. • Faulty TPMS sensor
Enable conditions	• 2.48 mile < Distance travelled during 12 min. < 24.85 mile	
Threshold value	• Failure to Learn Sensors Correctly. • No RF message received from sensor1 over 12 min.	
Diagnosis time	• 12 ~ 20 minutes.	

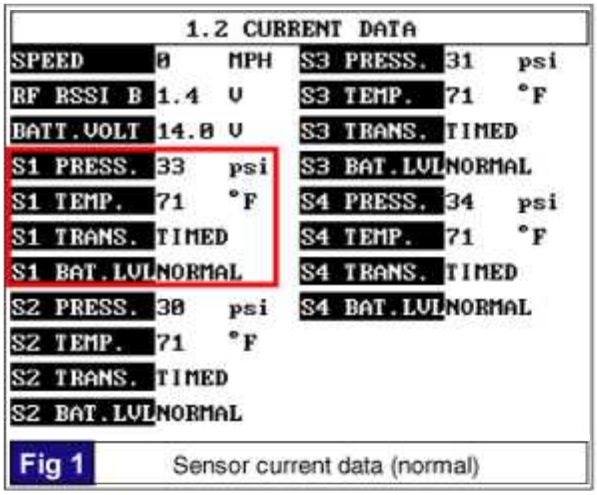
Monitor Scantool Data

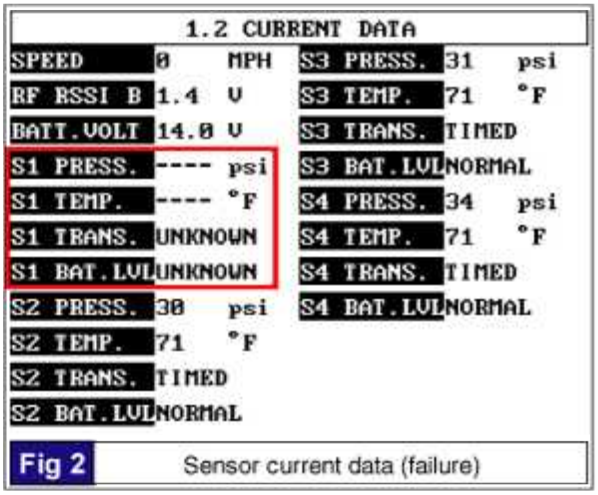
1. Connect "TPMS exciter' or scantool to Data Link Connector(DLC).



2. Select "TPMS DIAGNOSIS" mode.
3. Select the "FULL" mode of "CURRENT DATA" function.

4. Monitor the parameter of SENSOR 1 on the 'TPMS exciter' or scantool after 20 minutes.





5. Is parameter normal?

YES

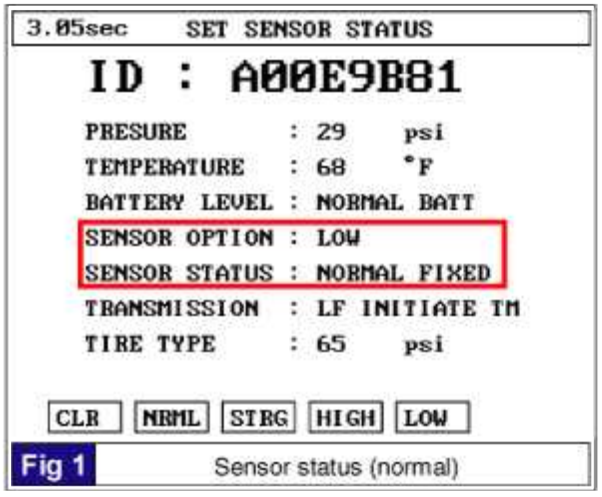
Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

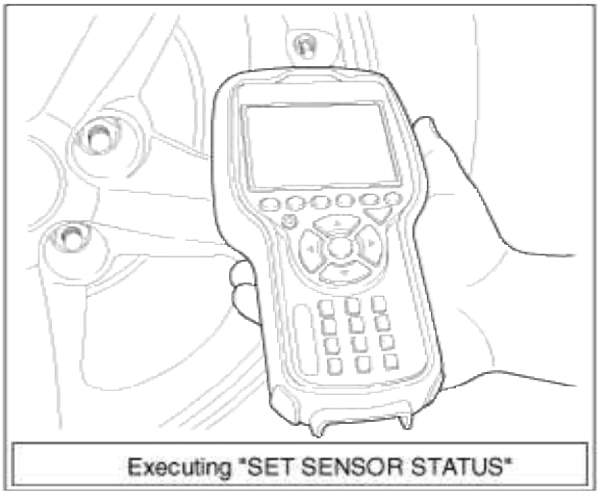
NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.





4. Is data unable to be retrieved for any sensor?

YES

Replace affected TPM sensor and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode

2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

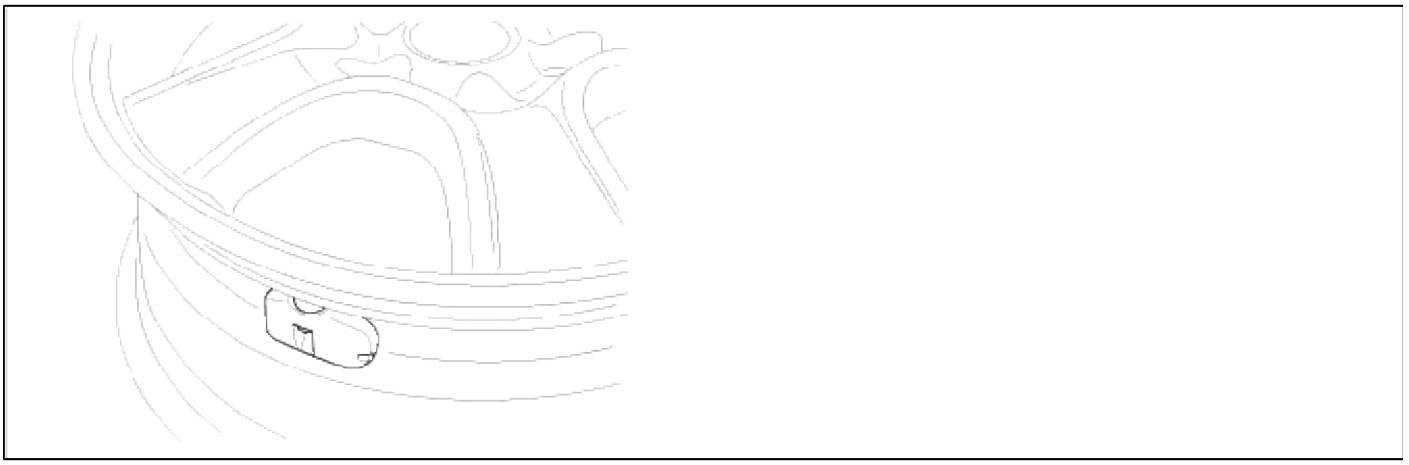
Go to the applicable troubleshooting procedure.

NO

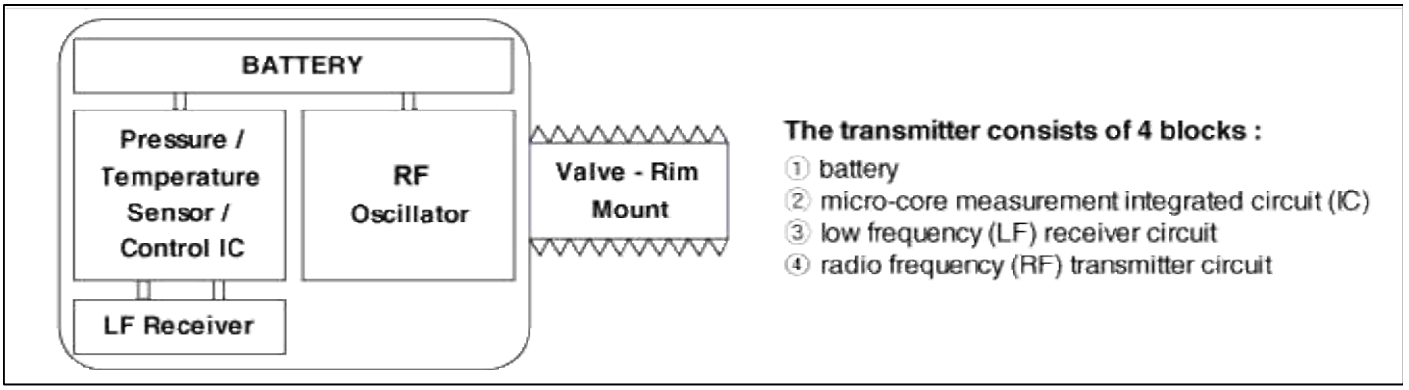
System performing to specification at this time.

Suspension System > Troubleshooting > C1322

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

This DTC indicates that the sensor has seen a temperature in excess of 110°C. At 125°C, the sensor will shut down and the warning is therefore so that the driver knows that there is a problem with the vehicle that may affect tire performance.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Temperature of sensor check	• Damaged tire • Excessive braking • Driving while the parking brake is on.
Enable conditions	• 2 consecutive Alert State temperature > 230°F(110°C)	
Threshold value	• Sensor temperature > 230°F(110°C)	
Diagnosis time	• < 10 sec.	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).
3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Monitor the parameter of SENSOR 1 temperature on the 'TPMS exciter' or scantool after 4 minutes.

Specification : Less than 230 °F(110 °C)

NOTE

DTC will be demoted at temperature < 140°F(60°C)

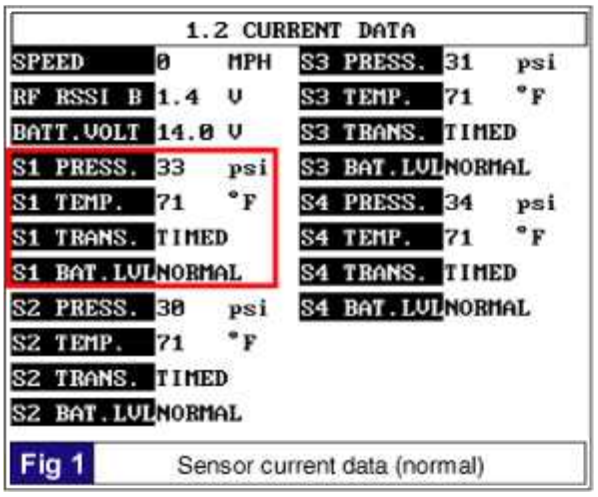
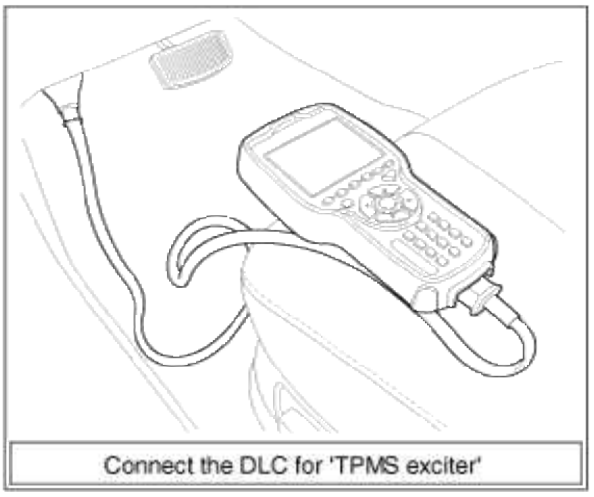


Fig 1 Sensor current data (normal)


Connect the DLC for 'TPMS exciter'

6. Is parameter within specifications?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

Check TPM SENSOR

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
   Execute "SET SENSOR STATUS" of each wheel.
3. Monitor the parameter of each sensor temperature on the 'TPMS exciter'.

Specification : Less than 230 °F(110 °C)

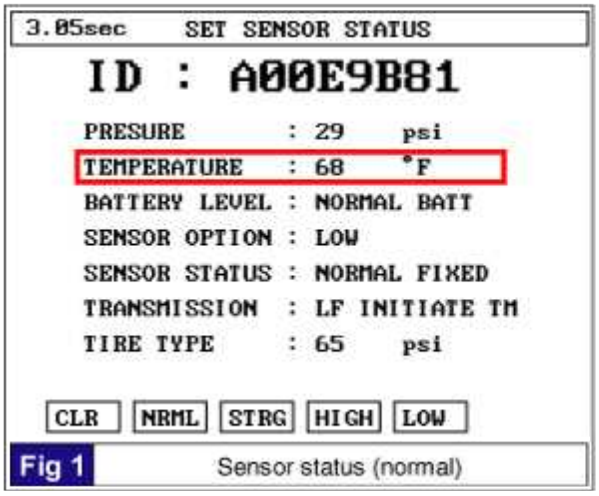
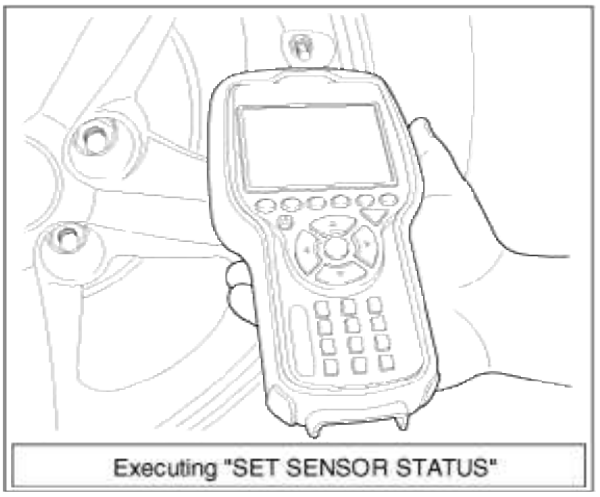


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

4. Is any sensor data outside specification?

YES

Check wheel / tire for if Damaged tire, Excessive braking, Driving while the parking brake is on is detected.
Repair or replace if necessary and go to "Verification of Vehicle Repair" procedure.
If it is OK, go to "Check wheel / tire" as follows.

NO

Substitute with a known-good TPMS receiver module and check proper operation.
If the problem is corrected, replace TPMS receiver module and go to "Verification of Vehicle Repair" procedure.

Check wheel / tire

1. Cool the heat of the SENSOR
2. IG OFF & IG ON.
3. Monitor the sensor temperature on the 'TPMS exciter' or scantool after 4 minutes.

Specification : Less than 230 °F(110 °C)

YES

Fault can be because of temporary overheating.
Go to "Verification of vehicle Repair" procedure.

NO

Replace TPMS sensor and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

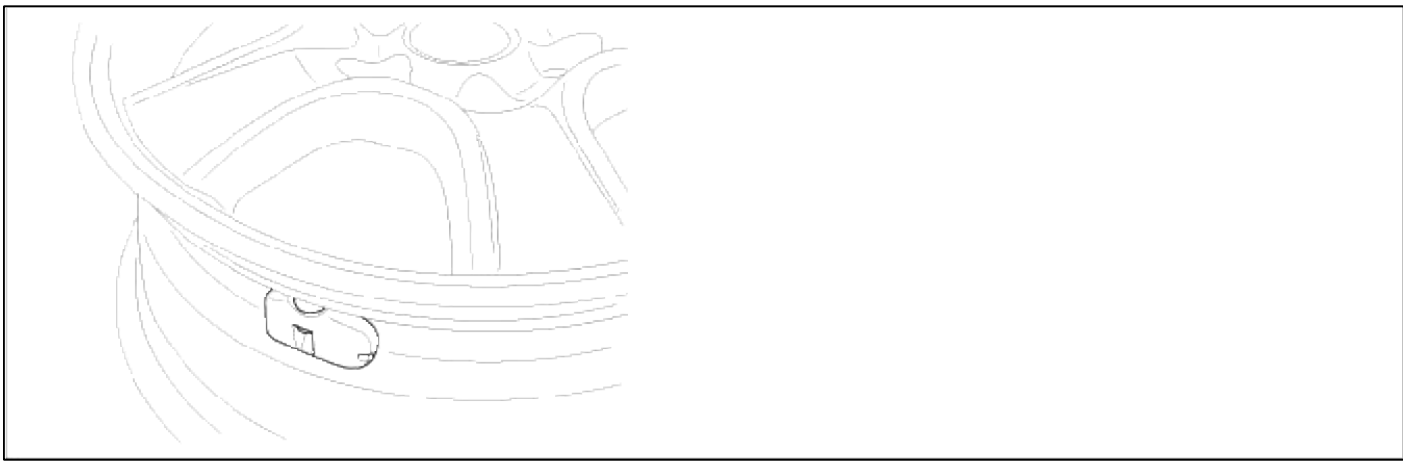
Go to the applicable troubleshooting procedure.

NO

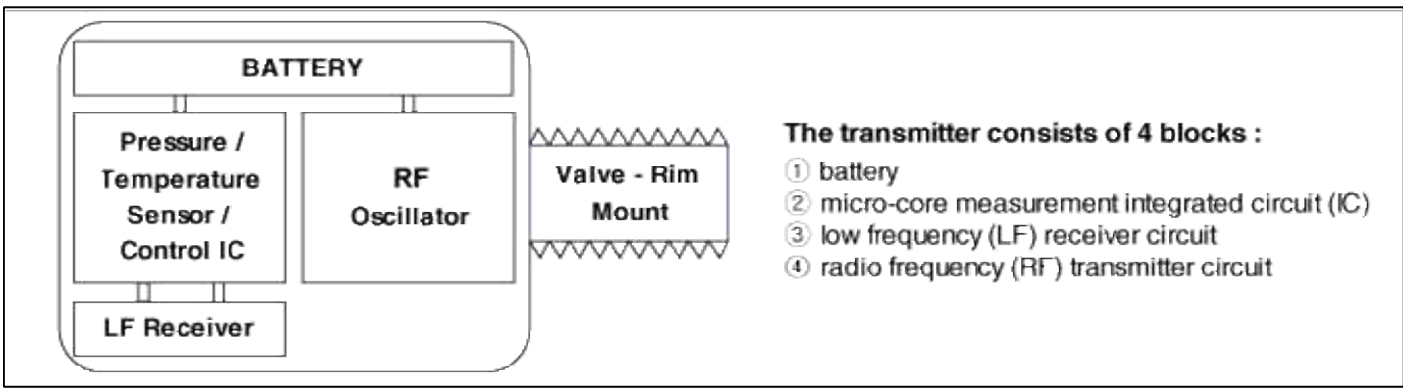
System performing to specification at this time.

Suspension System > Troubleshooting > C1323

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

This DTC indicates that the sensor has seen a temperature in excess of 110°C. At 125°C, the sensor will shut down and the warning is therefore so that the driver knows that there is a problem with the vehicle that may affect tire performance.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Temperature of sensor check	• Damaged tire • Excessive braking • Driving while the parking brake is on.
Enable conditions	• 2 consecutive Alert State temperature > 230°F(110°C)	
Threshold value	• Sensor temperature > 230°F(110°C)	
Diagnosis time	• < 10 sec.	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).
3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Monitor the parameter of SENSOR 1 temperature on the 'TPMS exciter' or scantool after 4 minutes.

Specification : Less than 230 °F(110 °C)

NOTE

DTC will be demoted at temperature < 140°F(60°C)

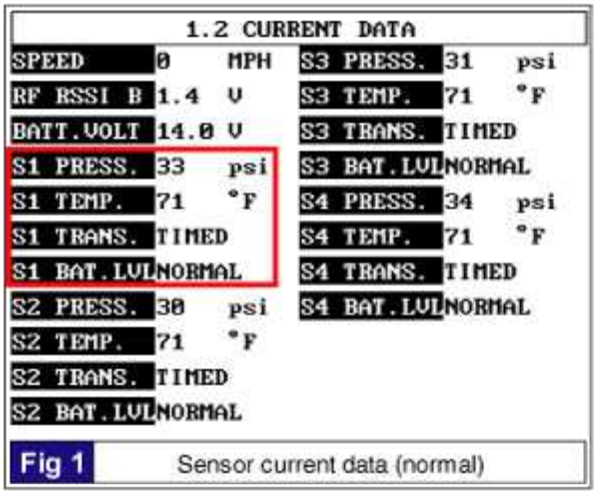
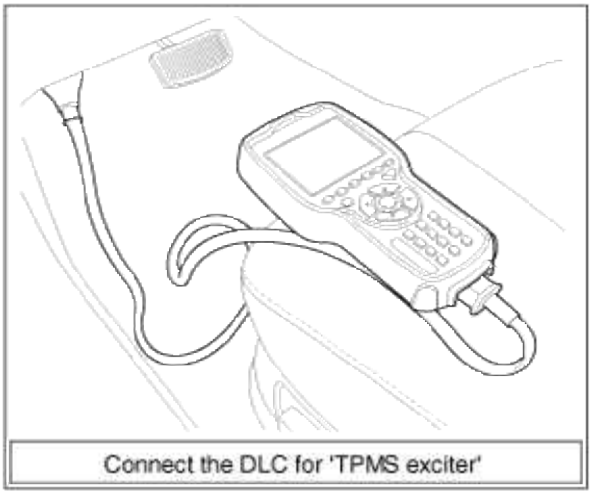


Fig 1 Sensor current data (normal)



Connect the DLC for 'TPMS exciter'

6. Is parameter within specifications?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

Check TPM SENSOR

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
   Execute "SET SENSOR STATUS" of each wheel.

3. Monitor the parameter of each sensor temperature on the 'TPMS exciter'.

Specification : Less than 230 °F(110 °C)

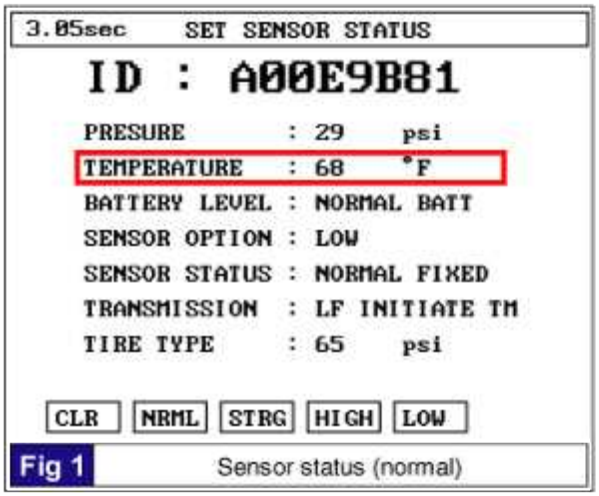
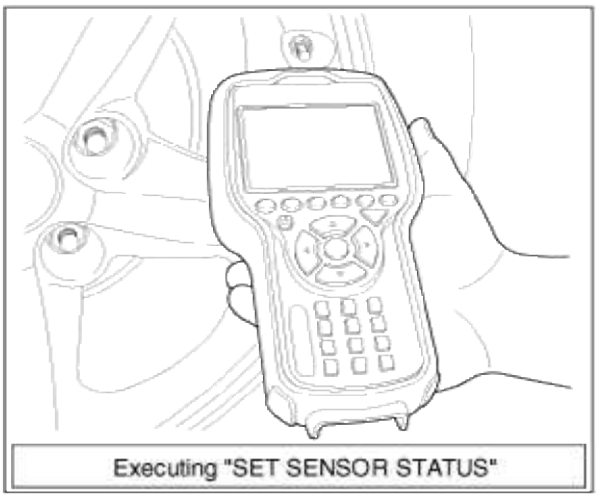


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

4. Is any sensor data outside specification?

YES

Check wheel / tire for if Damaged tire, Excessive braking, Driving while the parking brake is on is detected.
Repair or replace if necessary and go to "Verification of Vehicle Repair" procedure.
If it is OK, go to "Check wheel / tire" as follows.

NO

Substitute with a known-good TPMS receiver module and check proper operation.
If the problem is corrected, replace TPMS receiver module and go to "Verification of Vehicle Repair" procedure.

Check wheel / tire

1. Cool the heat of the SENSOR
2. IG OFF & IG ON.
3. Monitor the sensor temperature on the 'TPMS exciter' or scantool after 4 minutes.

Specification : Less than 230 °F(110 °C)

YES

Fault can be because of temporary overheating.
Go to "Verification of vehicle Repair" procedure.

NO

Replace TPMS sensor and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

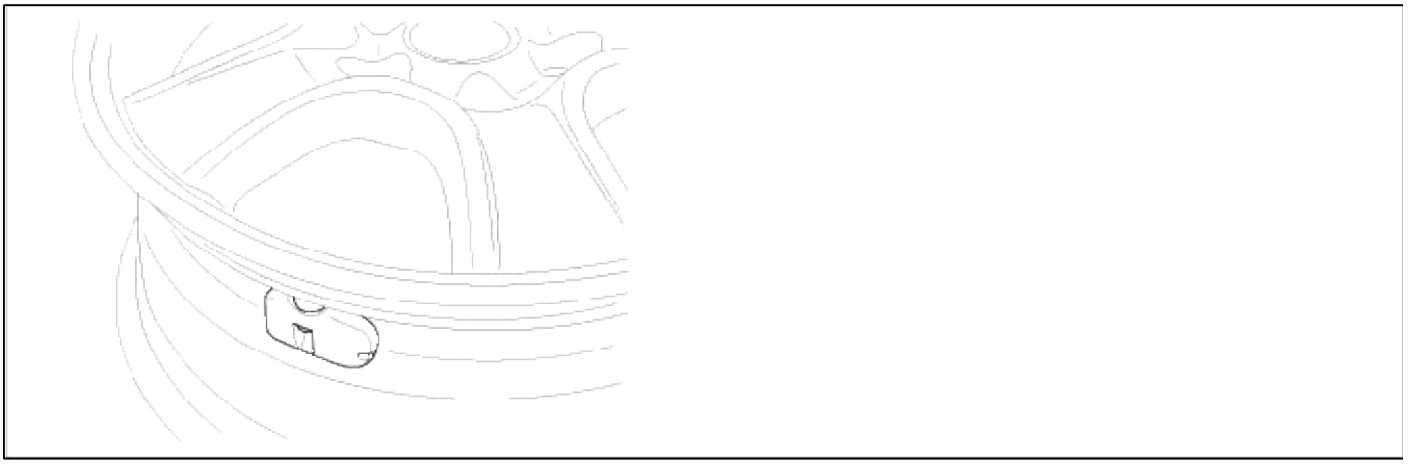
Go to the applicable troubleshooting procedure.

NO

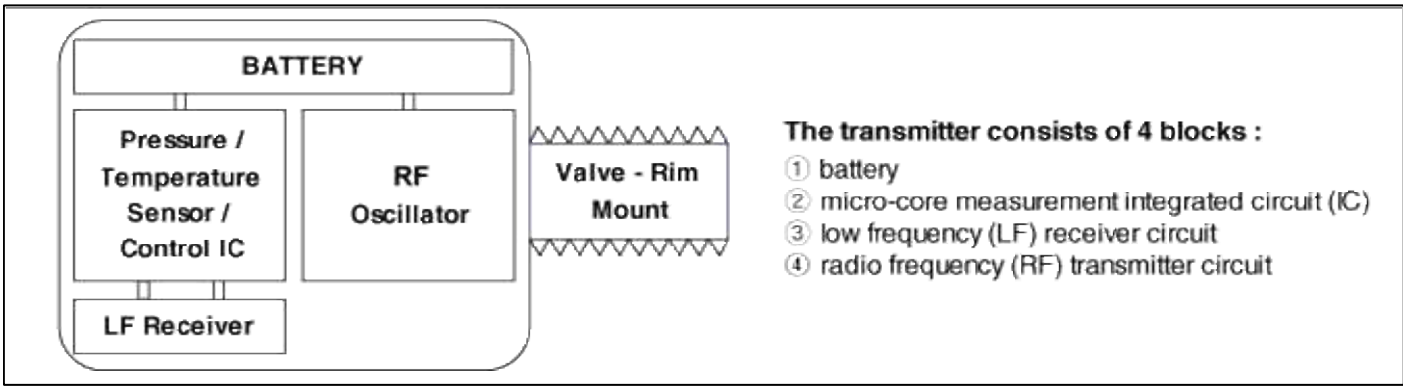
System performing to specification at this time.

Suspension System > Troubleshooting > C1324

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature

measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

This DTC indicates that the sensor has seen a temperature in excess of 110°C. At 125°C, the sensor will shut down and the warning is therefore so that the driver knows that there is a problem with the vehicle that may affect tire performance.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Temperature of sensor check	• Damaged tire • Excessive braking • Driving while the parking brake is on.
Enable conditions	• 2 consecutive Alert State temperature > 230°F(110°C)	
Threshold value	• Sensor temperature > 230°F(110°C)	
Diagnosis time	• < 10 sec.	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).
3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Monitor the parameter of SENSOR 1 temperature on the 'TPMS exciter' or scantool after 4 minutes.

Specification : Less than 230 °F(110 °C)

NOTE

DTC will be demoted at temperature < 140°F(60°C)

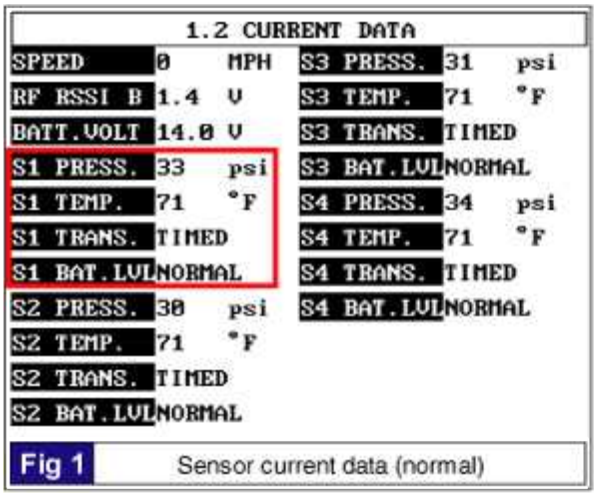
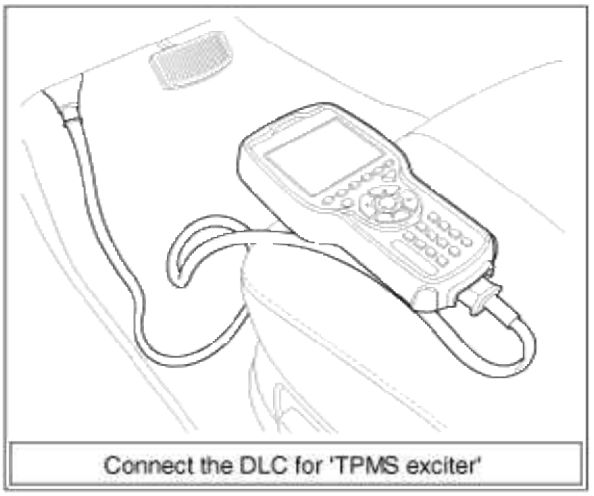


Fig 1 Sensor current data (normal)



Connect the DLC for 'TPMS exciter'

6. Is parameter within specifications?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

Check TPM SENSOR

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
   Execute "SET SENSOR STATUS" of each wheel.
3. Monitor the parameter of each sensor temperature on the 'TPMS exciter'.

Specification : Less than 230 °F(110 °C)

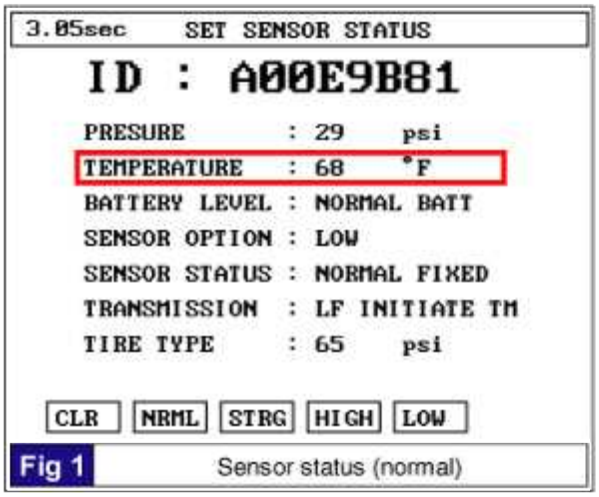
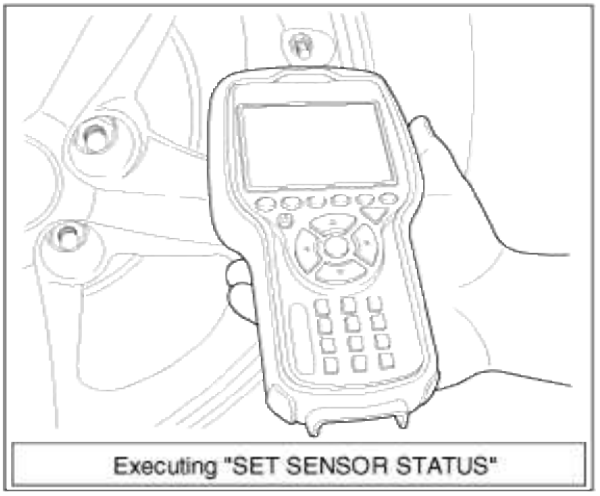


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

4. Is any sensor data outside specification?

YES

Check wheel / tire for if Damaged tire, Excessive braking, Driving while the parking brake is on is detected.
Repair or replace if necessary and go to "Verification of Vehicle Repair" procedure.
If it is OK, go to "Check wheel / tire" as follows.

NO

Substitute with a known-good TPMS receiver module and check proper operation.
If the problem is corrected, replace TPMS receiver module and go to "Verification of Vehicle Repair" procedure.

Check wheel / tire

1. Cool the heat of the SENSOR
2. IG OFF & IG ON.

3. Monitor the sensor temperature on the 'TPMS exciter' or scantool after 4 minutes.

Specification : Less than 230 °F(110 °C)

YES

Fault can be because of temporary overheating.
Go to "Verification of vehicle Repair" procedure.

NO

Replace TPMS sensor and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

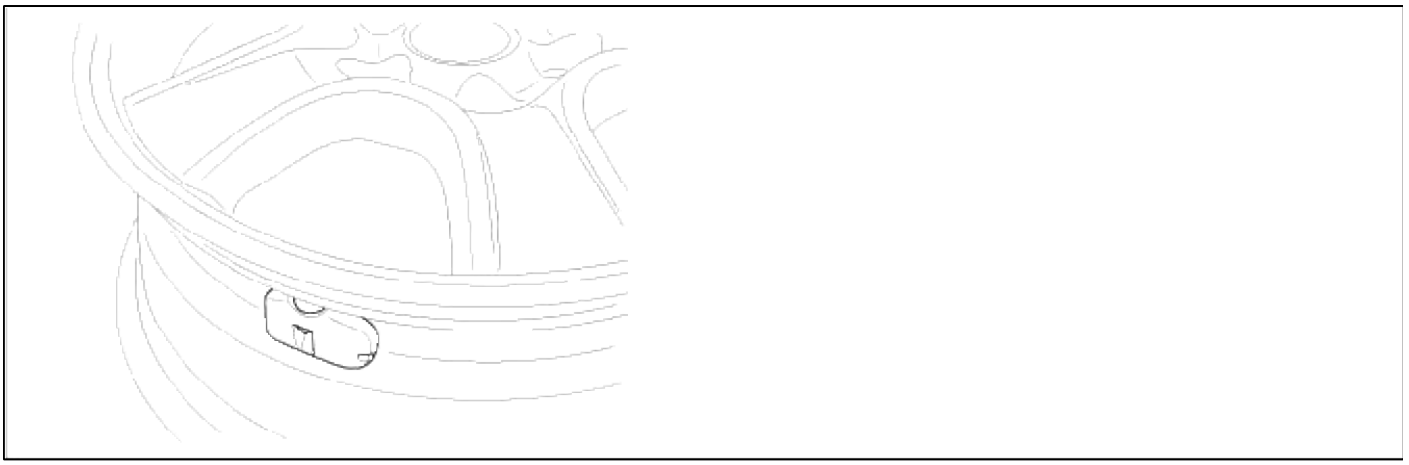
Go to the applicable troubleshooting procedure.

NO

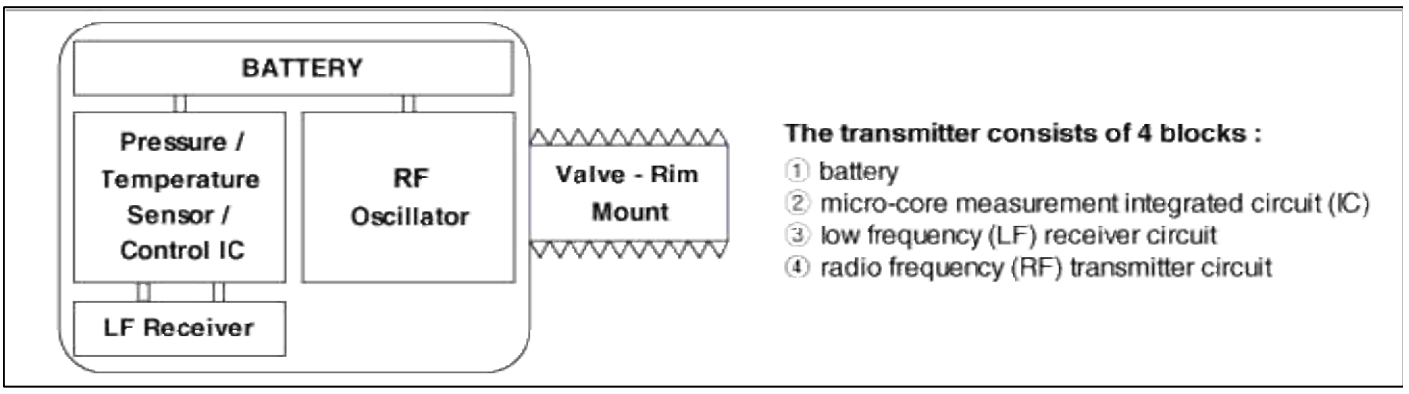
System performing to specification at this time.

Suspension System > Troubleshooting > C1325

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

This DTC indicates that the sensor has seen a temperature in excess of 110°C. At 125°C, the sensor will shut down and the warning is therefore so that the driver knows that there is a problem with the vehicle that may affect tire performance.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Temperature of sensor check	• Damaged tire • Excessive braking • Driving while the parking brake is on.
Enable conditions	• 2 consecutive Alert State temperature > 230°F(110°C)	
Threshold value	• Sensor temperature > 230°F(110°C)	
Diagnosis time	• < 10 sec.	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).
3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.

5. Monitor the parameter of SENSOR 1 temperature on the 'TPMS exciter' or scantool after 4 minutes.

Specification : Less than 230 °F(110 °C)

NOTE

DTC will be demoted at temperature < 140°F(60°C)

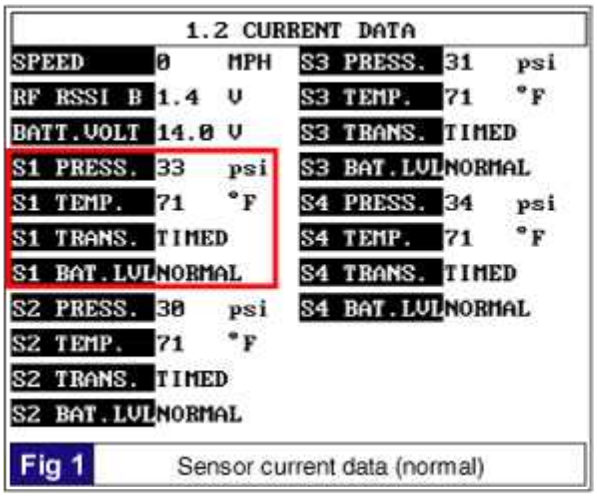
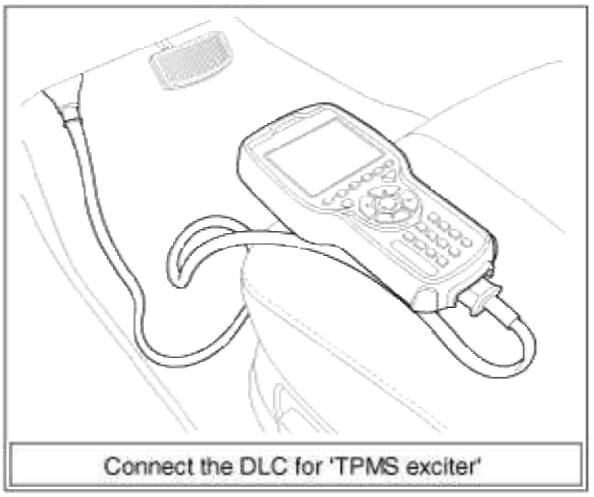


Fig 1 Sensor current data (normal)


Connect the DLC for 'TPMS exciter'

6. Is parameter within specifications?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

Check TPM SENSOR

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
   Execute "SET SENSOR STATUS" of each wheel.
3. Monitor the parameter of each sensor temperature on the 'TPMS exciter'.

Specification : Less than 230 °F(110 °C)

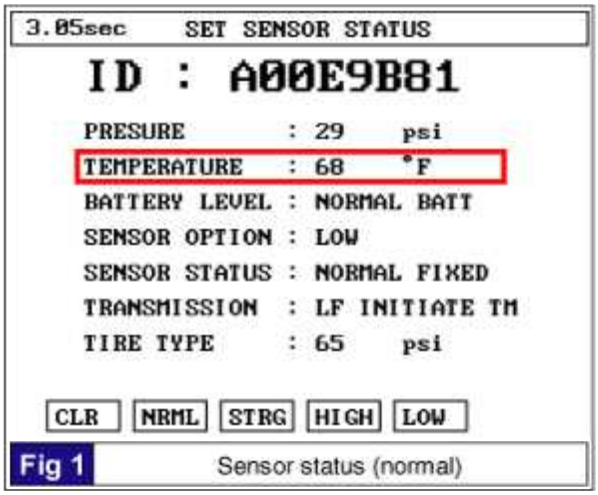
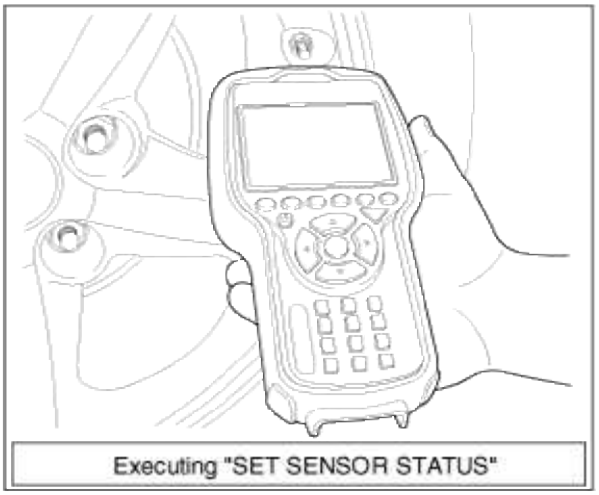


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

4. Is any sensor data outside specification?

YES

Check wheel / tire for if Damaged tire, Excessive braking, Driving while the parking brake is on is detected.
Repair or replace if necessary and go to "Verification of Vehicle Repair" procedure.
If it is OK, go to "Check wheel / tire" as follows.

NO

Substitute with a known-good TPMS receiver module and check proper operation.
If the problem is corrected, replace TPMS receiver module and go to "Verification of Vehicle Repair" procedure.

Check wheel / tire

1. Cool the heat of the SENSOR
2. IG OFF & IG ON.
3. Monitor the sensor temperature on the 'TPMS exciter' or scantool after 4 minutes.

Specification : Less than 230 °F(110 °C)

YES

Fault can be because of temporary overheating.
Go to "Verification of vehicle Repair" procedure.

NO

Replace TPMS sensor and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

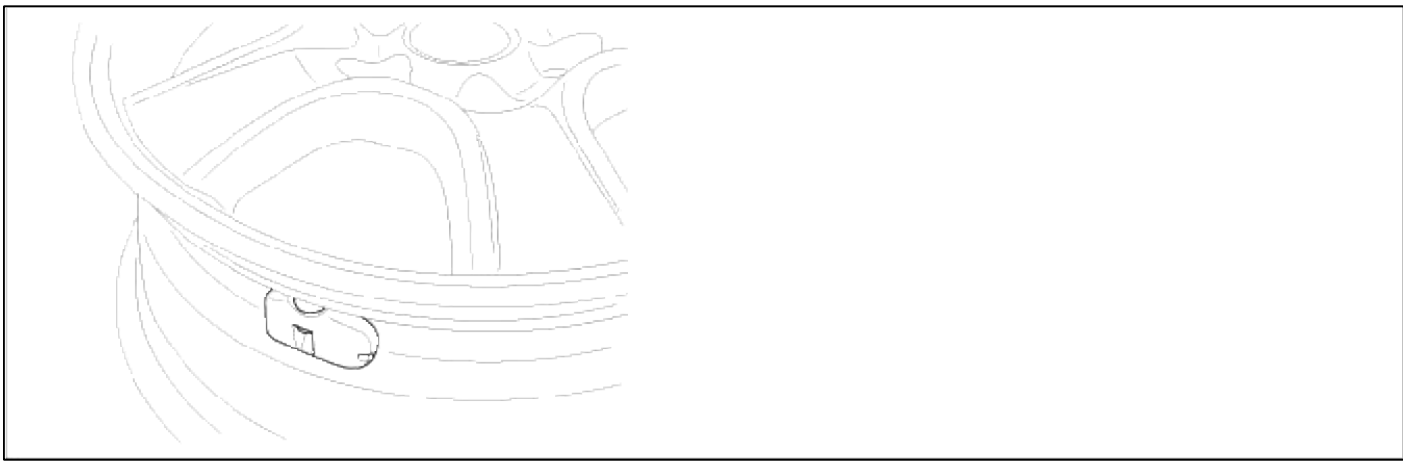
Go to the applicable troubleshooting procedure.

NO

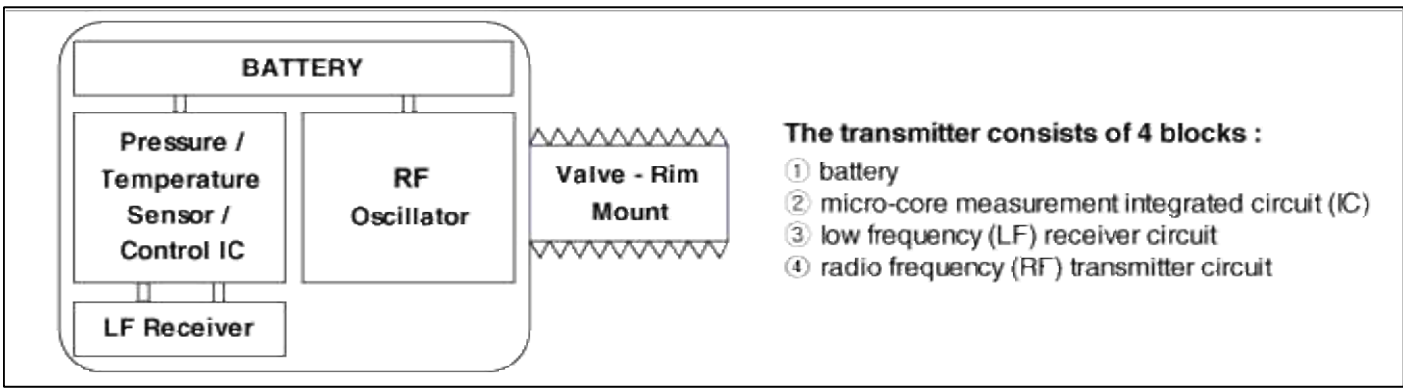
System performing to specification at this time.

Suspension System > Troubleshooting > C1332

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

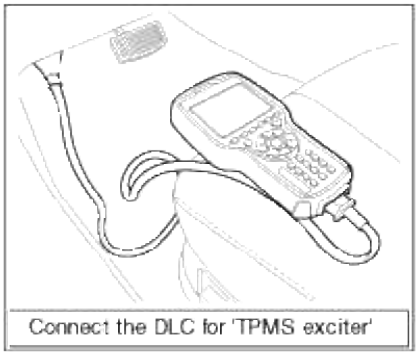
This DTC indicates that the sensor has detected that it has an internal fault. The most likely cause is sensor failure.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Sensor check	• Damage to sensor • Faulty TPMS sensor
Enable conditions	• An internal fault in the TPMS sensor	
Threshold value	• TPMS sensor fault	
Diagnosis time	• < 9 minutes	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).


Connect the DLC for 'TPMS exciter'

3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Monitor each sensor's temperature parameter on the 'TPMS exciter' or scantool after 9 minutes.

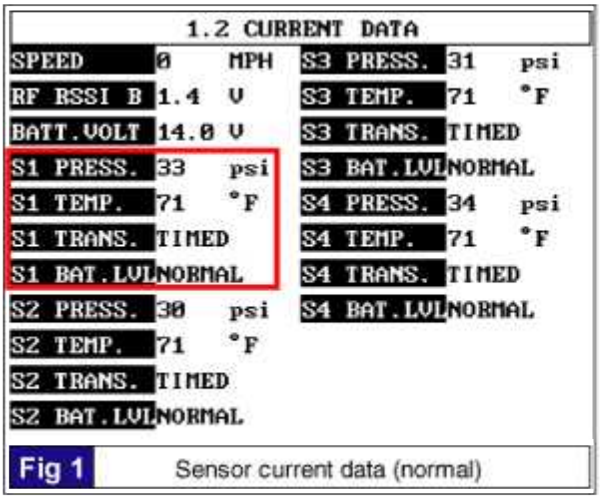


Fig 1 Sensor current data (normal)

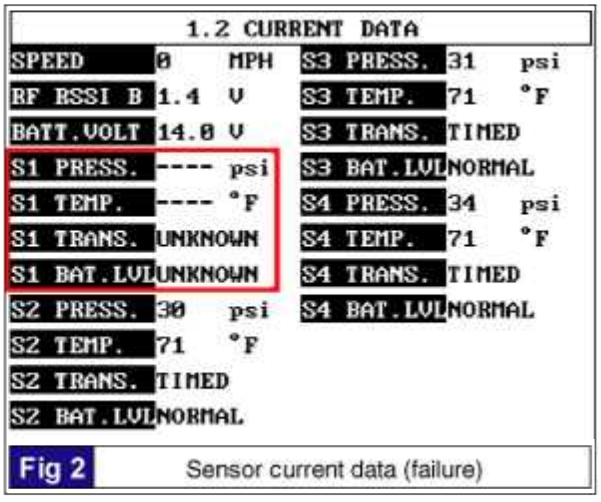


Fig 2 Sensor current data (failure)

6. Is parameter normal?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.

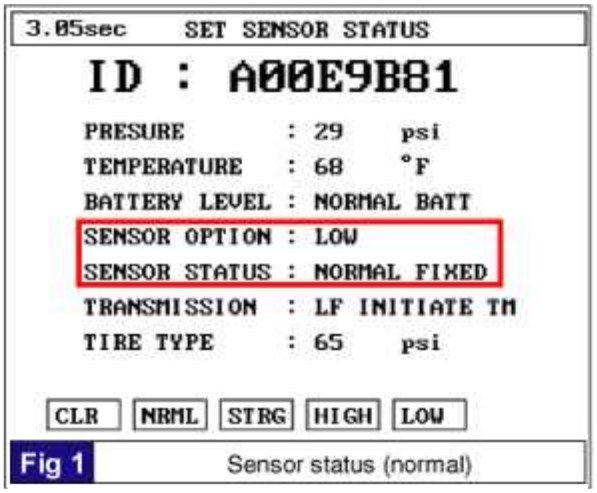
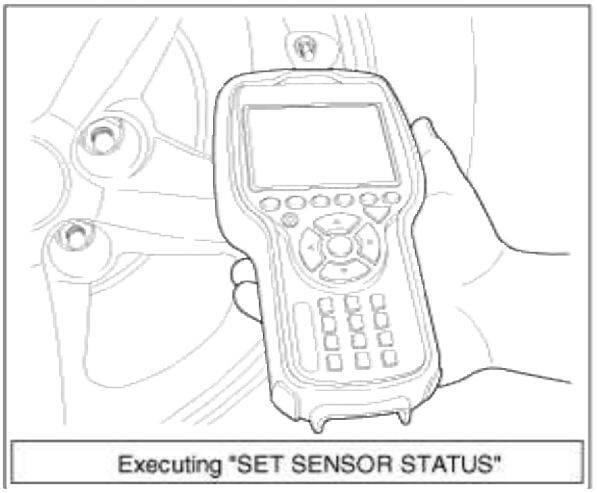


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

4. Is data unable to be retrieved for any sensor?

YES

Check for damaged of TPMS sensor on affected wheel.
Replace TPMS sensor if necessary and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

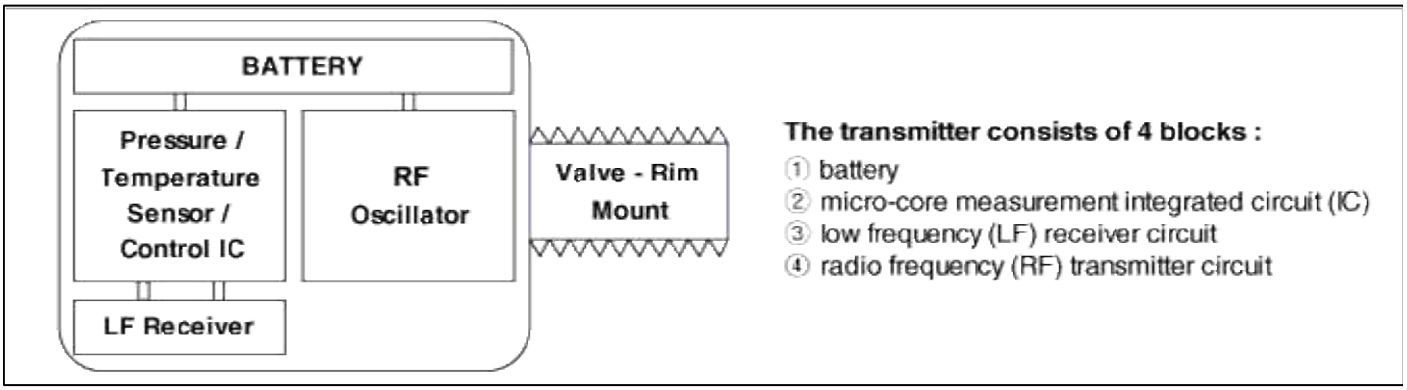
System performing to specification at this time.

Suspension System > Troubleshooting > C1333

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

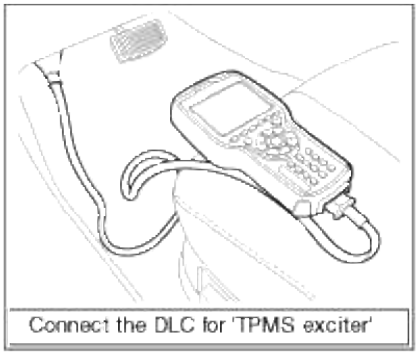
This DTC indicates that the sensor has detected that it has an internal fault. The most likely cause is sensor failure.

DTC Detecting Condition

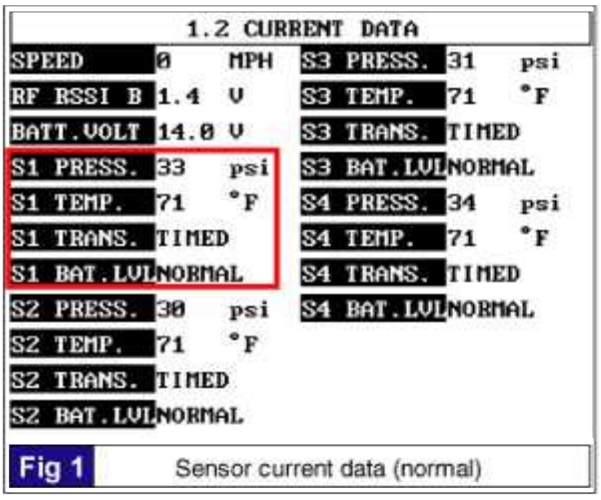
Item	Detecting Condition	Possible cause
DTC strategy	• Sensor check	• Damage to sensor • Faulty TPMS sensor
Enable conditions	• An internal fault in the TPMS sensor	
Threshold value	• TPMS sensor fault	
Diagnosis time	• < 9 minutes	

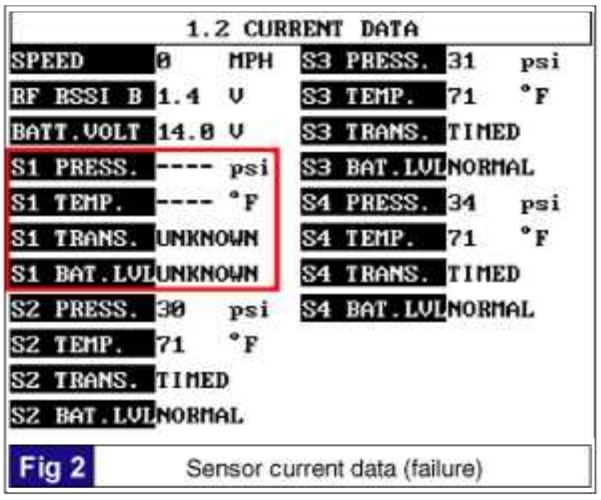
Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Monitor each sensor's temperature parameter on the 'TPMS exciter' or scantool after 9 minutes.





6. Is parameter normal?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.

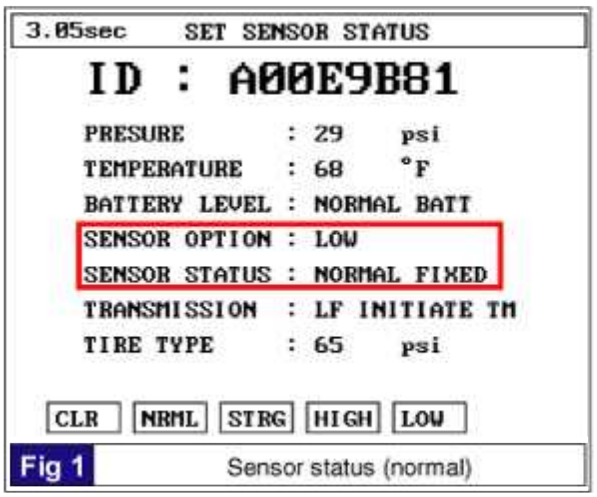
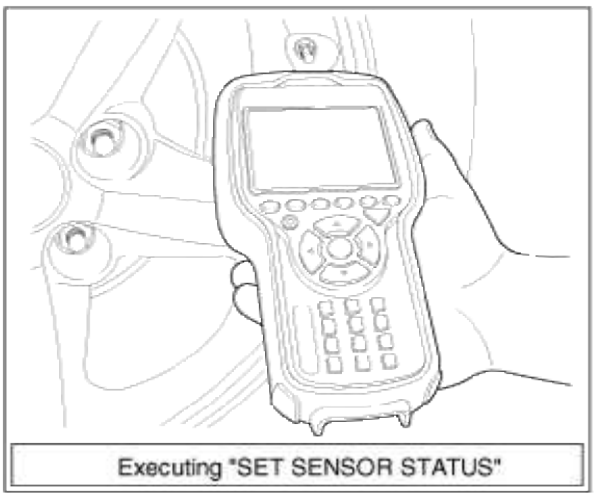


Fig 1 Sensor status (normal)



Executing "SET SENSOR STATUS"

4. Is data unable to be retrieved for any sensor?

YES

Check for damaged of TPMS sensor on affected wheel.
Replace TPMS sensor if necessary and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

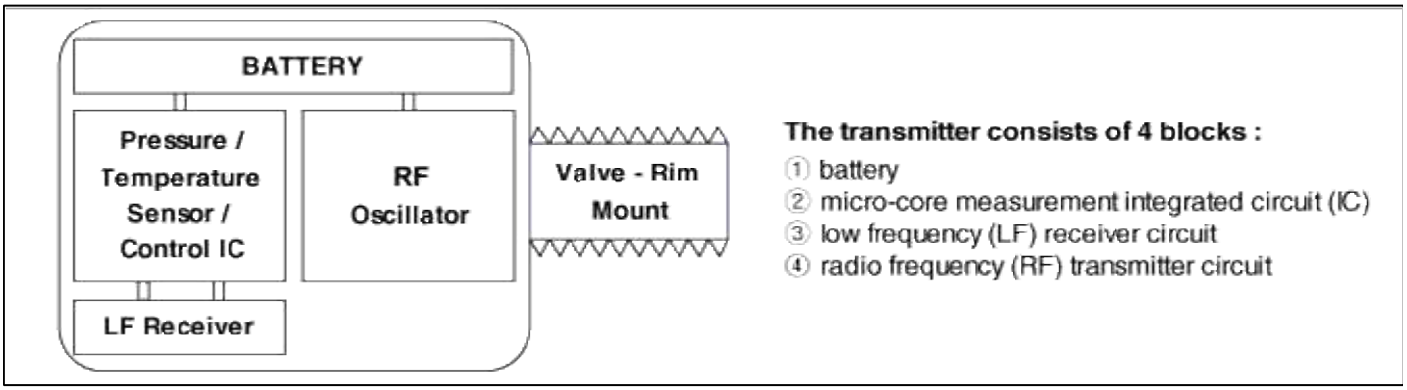
System performing to specification at this time.

Suspension System > Troubleshooting > C1334

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

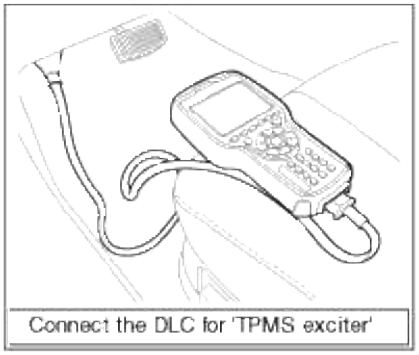
This DTC indicates that the sensor has detected that it has an internal fault. The most likely cause is sensor failure.

DTC Detecting Condition

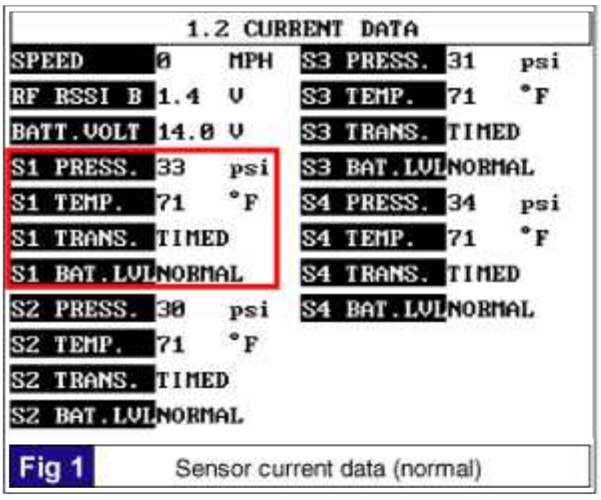
Item	Detecting Condition	Possible cause
DTC strategy	• Sensor check	• Damage to sensor • Faulty TPMS sensor
Enable conditions	• An internal fault in the TPMS sensor	
Threshold value	• TPMS sensor fault	
Diagnosis time	• < 9 minutes	

Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).

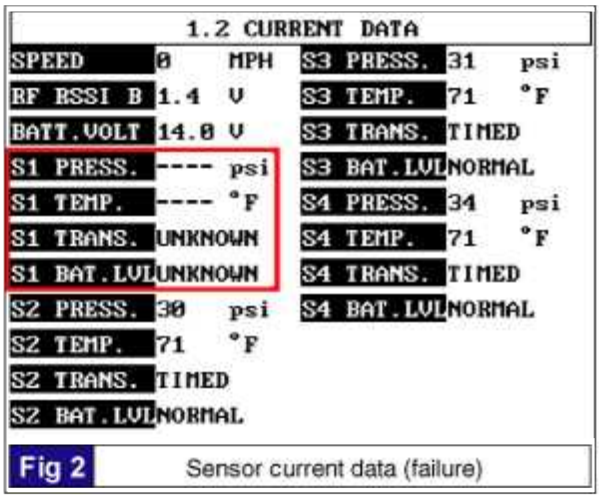

Connect the DLC for 'TPMS exciter'

3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Monitor each sensor's temperature parameter on the 'TPMS exciter' or scantool after 9 minutes.


1.2 CURRENT DATA

SPEED	0	MPH	S3 PRESS.	31	psi
RF RSSI B	1.4	V	S3 TEMP.	71	°F
BATT.VOLT	14.0	V	S3 TRANS.	TIMED	
S1 PRESS.	33	psi	S3 BAT.LVL	NORMAL	
S1 TEMP.	71	°F	S4 PRESS.	34	psi
S1 TRANS.	TIMED		S4 TEMP.	71	°F
S1 BAT.LVL	NORMAL		S4 TRANS.	TIMED	
S2 PRESS.	30	psi	S4 BAT.LVL	NORMAL	
S2 TEMP.	71	°F			
S2 TRANS.	TIMED				
S2 BAT.LVL	NORMAL				

Fig 1 Sensor current data (normal)


1.2 CURRENT DATA

SPEED	0	MPH	S3 PRESS.	31	psi
RF RSSI B	1.4	V	S3 TEMP.	71	°F
BATT.VOLT	14.0	V	S3 TRANS.	TIMED	
S1 PRESS.	----	psi	S3 BAT.LVL	NORMAL	
S1 TEMP.	----	°F	S4 PRESS.	34	psi
S1 TRANS.	UNKNOWN		S4 TEMP.	71	°F
S1 BAT.LVL	UNKNOWN		S4 TRANS.	TIMED	
S2 PRESS.	30	psi	S4 BAT.LVL	NORMAL	
S2 TEMP.	71	°F			
S2 TRANS.	TIMED				
S2 BAT.LVL	NORMAL				

Fig 2 Sensor current data (failure)

6. Is parameter normal?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.

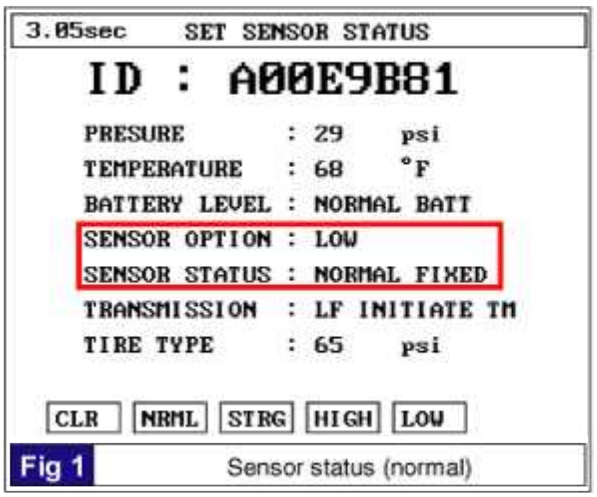
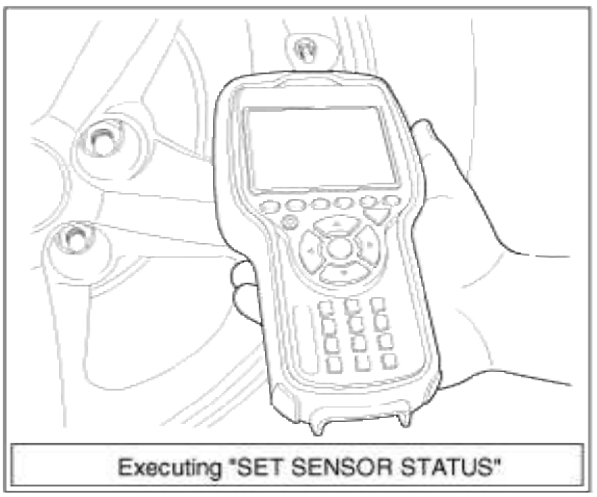


Fig 1 Sensor status (normal)



Executing "SET SENSOR STATUS"

4. Is data unable to be retrieved for any sensor?

YES

Check for damaged of TPMS sensor on affected wheel.
Replace TPMS sensor if necessary and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

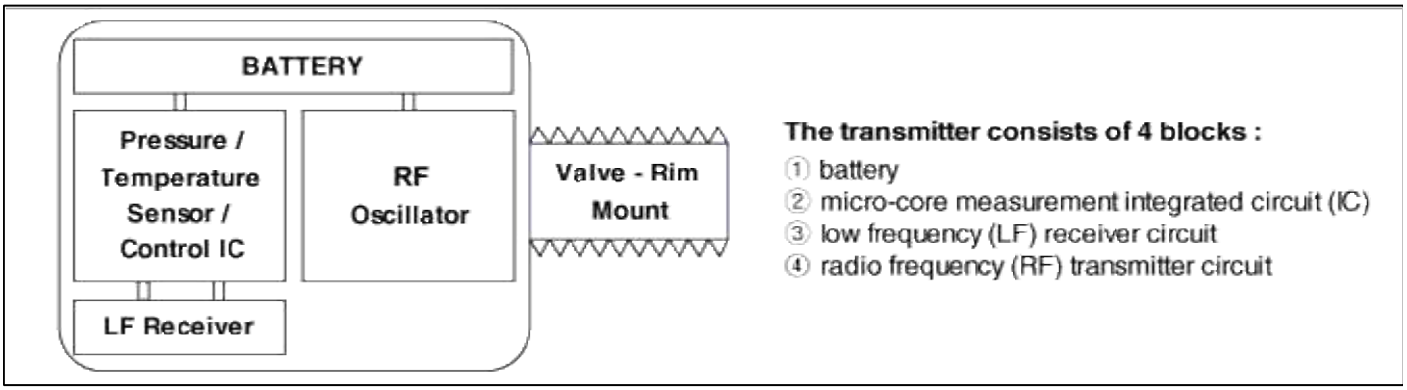
System performing to specification at this time.

Suspension System > Troubleshooting > C1335

Component Location



General Description



This transmitter is a transmitter device with tire valve, which is mounted in the valve hole of the wheel rim and transmits the pressure and temperature inside the tire, the battery voltage of the transmitter, and the tire identification code (ID) at normal and abnormal condition with the radio wave (RF) that conforms to the used area. Also this device has a countermeasure function such as the random delay of transmission time so that the RF signal from each tire will not interfere due to transmission. Wheel sensors shall support usage on steel or aluminum rims.
Sensor transmissions continue when sensor status is 'Normal Fixed State'. Sensor transmissions stop when sensor status is 'Storage State' or the sensor battery runs out. The transmitter should transmit data at vehicle speeds between 0 mph (0 kph) and 186 mph (300 kph). Operating Temperature Range is -40 to 248 °F(-40 to 120 °C). Transmitter shall enter thermal shutdown once the measured temperature is greater than or equal to 257 °F(125 °C). The accuracy of the sensor is -9/12.6 degree Fahrenheit (-5/7 degree Celsius) at this temperature, therefore the actual temperature may be 244.4 degree Fahrenheit (118 degree Celsius). The sensor shall exit thermal shutdown once the temperature is less than or equal to 212 °F(100 °C). The transmitter shall have the capability to measure the internal battery voltage as an indicator of the end of life of the sensor. Since the unit is sealed, this parameter cannot be verified with a production unit..

Tire Pressure Monitoring

When 4 sensors have been learned as road wheels, it shall not be possible to learn new road wheel sensors on the same Ignition cycle. In normal mode low line, tire pressure and temperature shall be transmitted every 3 minutes 20 s nominally independent of vehicle operation. Monitoring shall be every 20 s. If sensor detects rapid deflation, then RF messages will be transmitted every 4 s for 1 minute duration. Communication from wheel sensors shall be via RF at a frequency of 315 MHz, 5 kBaud. Tire pressure measurement tolerance shall be ±7 kPa from 32 to 122 °F(0 to 50 °C) and ±17.5 kPa from -40 to 248 °F(-40 to 120°C) with a range of 100 to 450 kPa. Tire temperature measurement tolerance shall be ±37.4 °F(±3 °C) from -4 to 158 °F(-20 to 70 °C) and ±9 °F(±5 °C) from -40 to 194 °F(40 to 90 °C) and -9/12.6 degree Fahrenheit (-5/7 degree Celsius) from -40 to 248 degree Fahrenheit (-40 to 120 degree Fahrenheit).

DTC Description

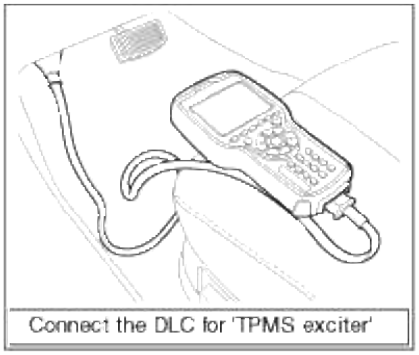
This DTC indicates that the sensor has detected that it has an internal fault. The most likely cause is sensor failure.

DTC Detecting Condition

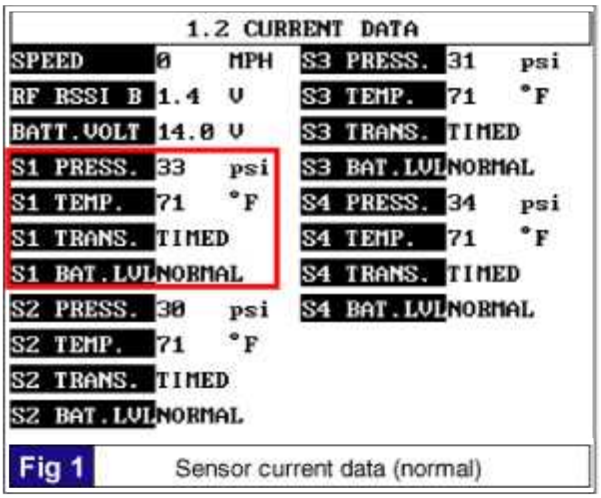
Item	Detecting Condition	Possible cause
DTC strategy	• Sensor check	• Damage to sensor • Faulty TPMS sensor
Enable conditions	• An internal fault in the TPMS sensor	
Threshold value	• TPMS sensor fault	
Diagnosis time	• < 9 minutes	

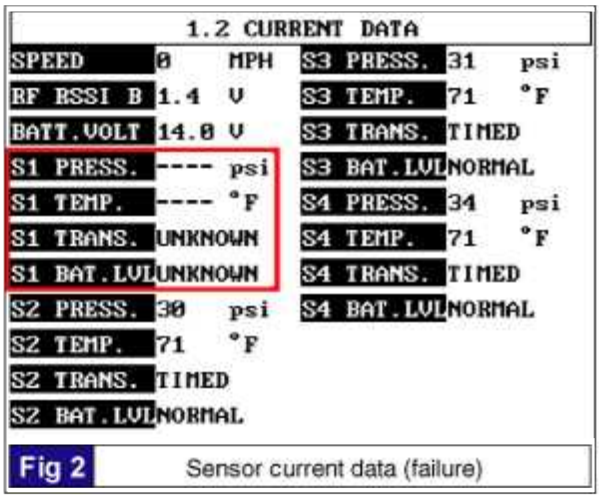
Monitor Scantool Data

1. Park the vehicle on a level surface.
2. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



3. Select "TPMS DIAGNOSIS" mode.
4. Select the "FULL" mode of "CURRENT DATA" function.
5. Monitor each sensor's temperature parameter on the 'TPMS exciter' or scantool after 9 minutes.





6. Is parameter normal?

YES

Fault is intermittent. It has been repaired and TPM receiver module memory is not cleared yet.
Go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

Component Inspection

1. Turn ON 'TPMS exciter'.
2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
3. Execute "SET SENSOR STATUS" of each wheel.

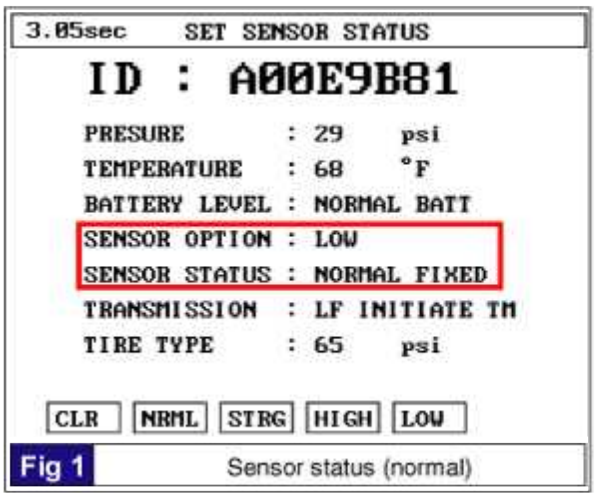
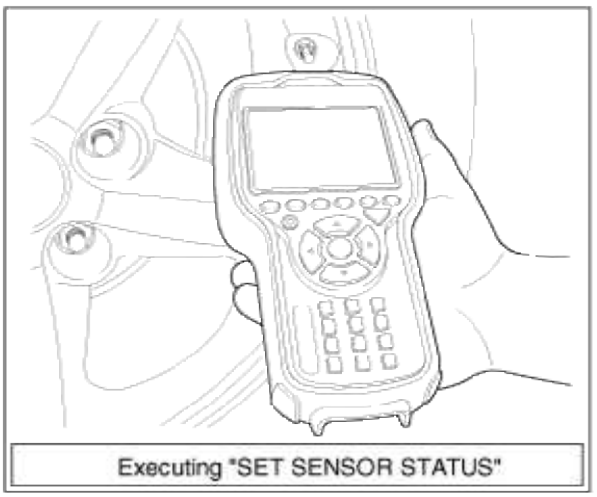


Fig 1 Sensor status (normal)



Executing "SET SENSOR STATUS"

4. Is data unable to be retrieved for any sensor?

YES

Check for damaged of TPMS sensor on affected wheel.
Replace TPMS sensor if necessary and register sensor ID with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good TPM receiver module and check for proper operation.
If the problem is corrected, replace TPM receiver module and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

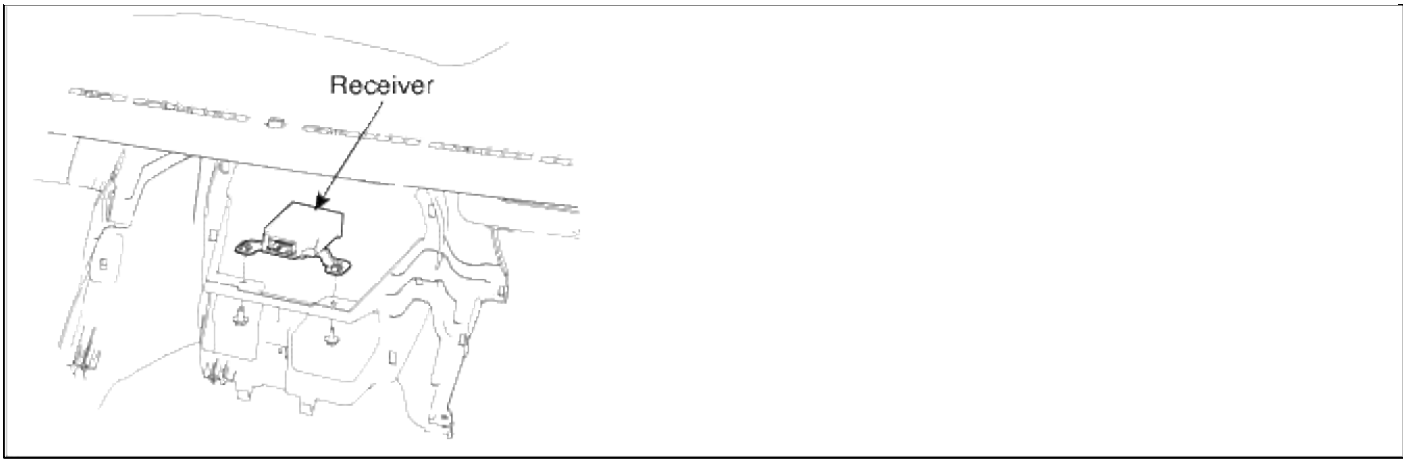
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C1660

Component Location



General Description

TPM Receiver is integrated with the TPM module installed behind the center facia. The operating battery of TPM module is supplied from the vehicle battery. Data such as Tire pressure, Tire Temperature, TPM sensor battery status and TPM sensor valve ID from TPM sensors are transmitted to TPM receiver in the form of RF signal. TPM module accomplishes Tire Monitoring and Warning Logic with received data.

DTC Description

This DTC indicates that the receiver has not received any RF messages. The most likely cause is receiver RF circuit failure / RF screening.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Internal RF circuit check of Receiver module	• Low Line - all sensors in storage state and no other RF transmissions received • Low Line - receiver RF shielding • Faulty TPMS Receiver module
Enable conditions	• No valid RF data for 12 min from any sensor • RF messages not received	
Threshold value	• Internal RF circuit fault	
Diagnosis time	• 2.49 mile < Distance travelled during 12 min < 24.85 mile	

Component Inspection

Check status of all TPM sensor

1. Turn ON 'TPMS exciter'.

2. Select "TIRE SNSR CONFIG(EXCITER)" mode.
   Execute "SET SENSOR STATUS" of each wheel.

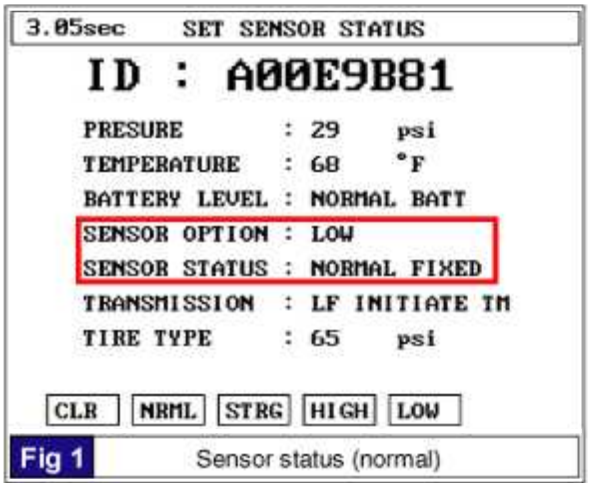
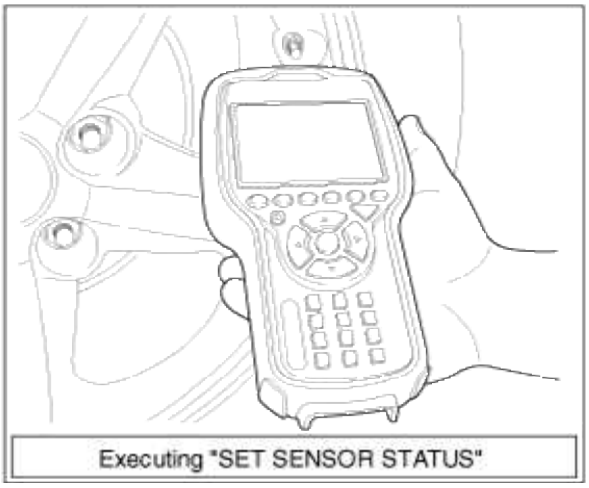


Fig 1 Sensor status (normal)


Executing "SET SENSOR STATUS"

3. Are status of all sensors "normal"?

YES

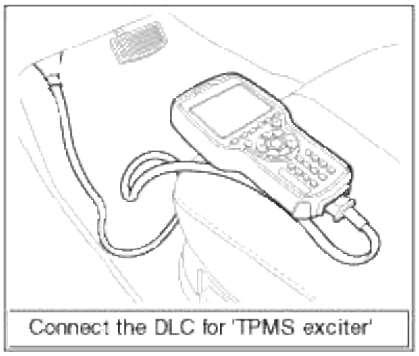
Check TPM receiver RF shielding.
If it is OK, go to "Check TPM receiver" as fellows.
Repair if necessary and go to "Verification of Vehicle Repair" procedure.

NO

Change status of all TPM sensors into "normal" status with 'TPMS exciter'.
Go to "Verification of Vehicle Repair" procedure.

Check TPM receiver

1. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).


Connect the DLC for 'TPMS exciter'

2. Clear DTC.
3. IG OFF & IG ON. Wait 4 minutes.
4. Execute "Diagnostic Trouble Codes(DTCs)".
5. Is 'C1660' present ?

YES

Substitute with a known-good TPM Receiver module and check for proper operation.
If the problem is corrected, replace TPM Receiver module and go to "Verification of vehicle Repair" procedure.

NO

System is OK.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.

4. Are any DTCs present ?

YES

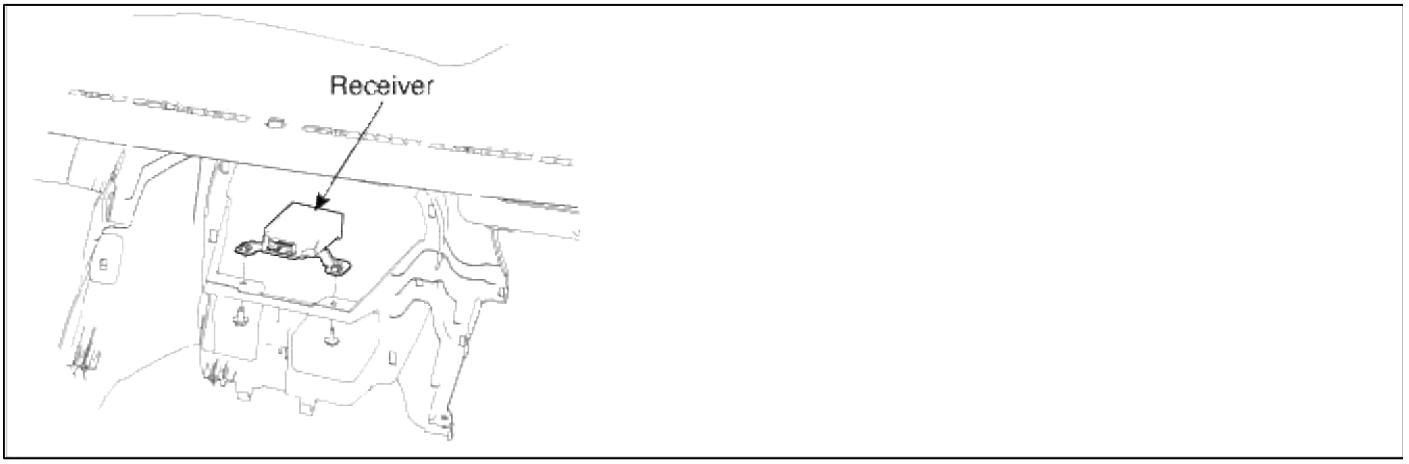
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C1661

Component Location



General Description

TPM Receiver is integrated with the TPM module installed behind the center facia. The operating battery of TPM module is supplied from the vehicle battery. Data such as Tire pressure, Tire Temperature, TPM sensor battery status and TPM sensor valve ID from TPM sensors are transmitted to TPM receiver in the form of RF signal. TPM module accomplishes Tire Monitoring and Warning Logic with received data.

DTC Description

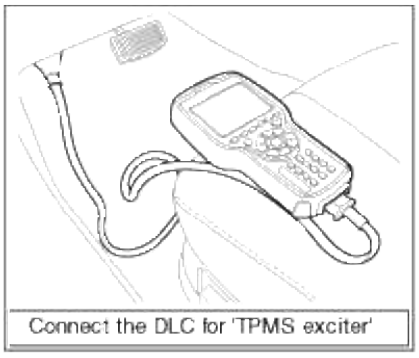
This DTC indicates that the receiver has a problem reading or writing to EEPROM.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Receiver module check	• Transient over voltage due to vehicle fault (fault would typically recover) • Faulty TPMS Receiver
Enable conditions	• Reading or writing problem to EEPROM	
Threshold value	• EEPROM in the receiver module fault	
Diagnosis time	• < 10 sec.	

Component Inspection

1. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



2. Clear DTC.
3. IG OFF & IG ON. Wait 4 minutes.
4. Execute "Diagnostic Trouble Codes(DTCs)".
5. Is 'C1661' present ?

YES

Substitute with a known-good TPM Receiver module and check for proper operation.
If the problem is corrected, replace TPM Receiver module and go to "Verification of vehicle Repair" procedure.

NO

System is OK.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

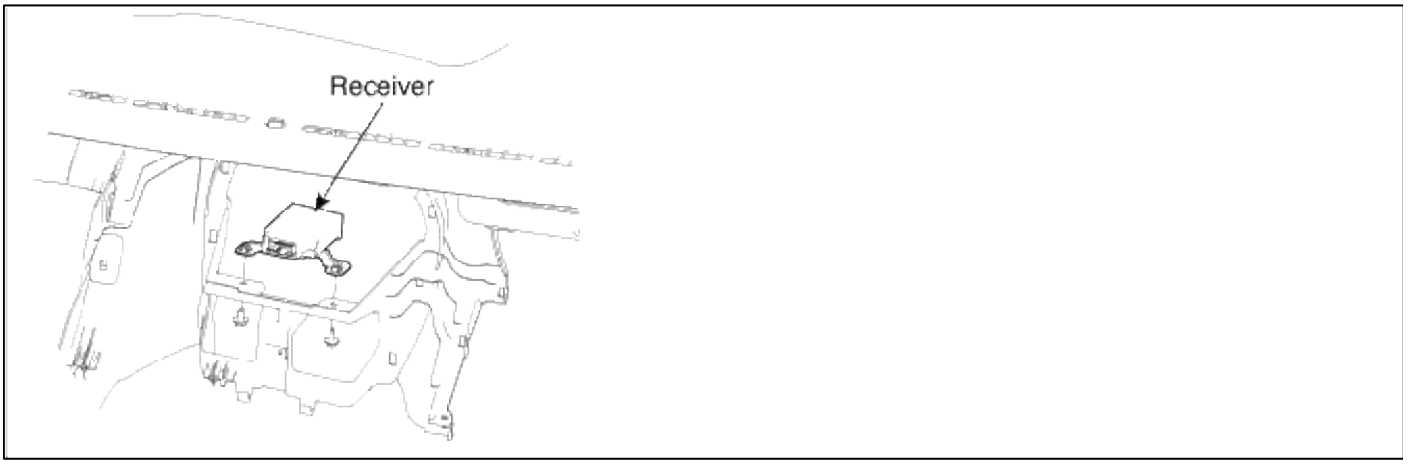
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C1668

Component Location



General Description

TPM Receiver is integrated with the TPM module installed behind the center facia. The operating battery of TPM module is supplied from the vehicle battery. Data such as Tire pressure, Tire Temperature, TPM sensor battery status and TPM sensor valve ID from TPM sensors are transmitted to TPM receiver in the form of RF signal. TPM module accomplishes Tire Monitoring and Warning Logic with received data.

DTC Description

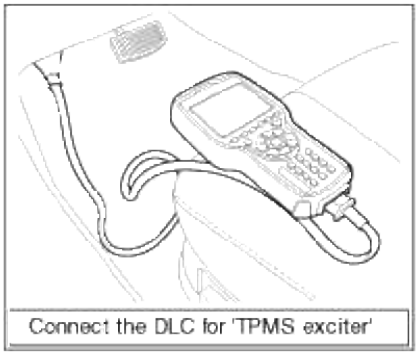
This DTC indicates that the receiver has detected an internal error.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Receiver module check	• Transient over voltage due to vehicle fault (fault would typically recover) • Faulty TPMS Receiver • Software is incorrectly programed to the receiver micro controller
Enable conditions	• An Internal error	
Threshold value	• TPMS Receiver module fault	
Diagnosis time	• < 3 sec. - Carried out once at Ignition ON	

Component Inspection

1. Connect 'TPMS exciter' or scantool to Data Link Connector(DLC).



2. Clear DTC.
3. IG OFF & IG ON. Wait 4 minutes.
4. Execute "Diagnostic Trouble Codes(DTCs)".
5. Is 'C1668' present ?

YES

Substitute with a known-good TPM Receiver module and check for proper operation.

If the problem is corrected, replace TPM Receiver module and go to "Verification of vehicle Repair" procedure.

NO

System is OK.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.

4. Are any DTCs present ?

YES

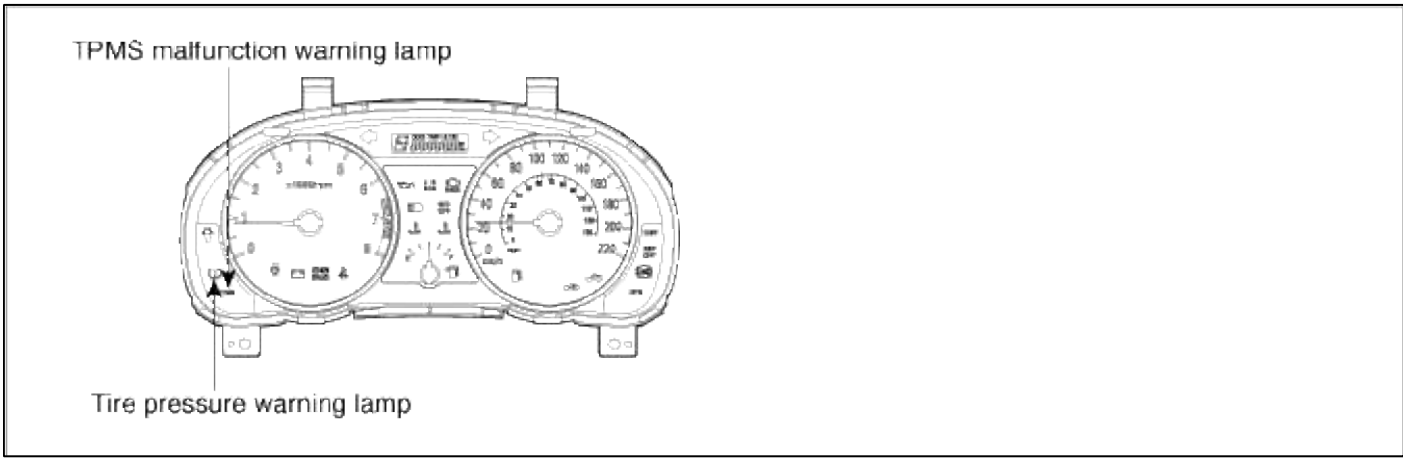
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C2510

Component Location



General Description

The TPMS receiver unit must provide two outputs continuously to drive the indicator lamps. One of the output turn the TREAD indicator lamp on when pressure in one or more tires associated with the TPMS receiver unit have reported a pressure below the warning level threshold. The other output turn the TPMS Warning indicator bulb on when the TPMS receiver unit has detected a system fault.

Turn the TREAD indicator lamp on

1. When tire pressure is below allowed threshold.
2. When rapid leak is detected by the sensor.
3. Indicates that tire needs to be re-inflated to placard pressure / repaired.

Turn the TREAD indicator lamp off

1. Under-inflation : When tire pressure is above (warning threshold + hysteresis).
2. Leak : When tire pressure is above (leak warning threshold) OR on Ignition cycle off to on.

DTC Description

This DTC indicates that the TREAD(Tire Under Inflation / Leak Warning) / DTC Warning lamp is short circuit and therefore cannot be turned on. The most likely failure is harness / instrument cluster / connector / receiver short circuit.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Input lamp current check	• Short circuit to 12 V between lamp and TPMS receiver
Enable conditions	• TREAD / Diagnostic lamp circuit short to 12 V	
Threshold value	• TREAD / Diagnostic lamp - 200 mA allowed each (after in rush time). 50 mA margin built in.	
Diagnosis time	• < 3s	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
3. Has a problem been found?

YES

Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

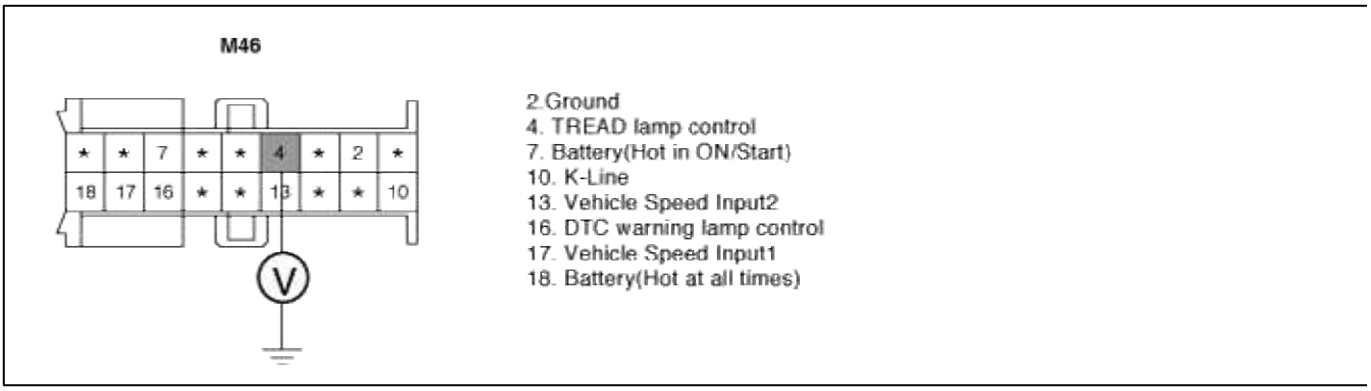
NO

Go to "Control Circuit Inspection" procedure.

Control Circuit Inspection

1. Engine "OFF".
2. Disconnect instrument cluster connector and TPM receiver connector.
3. Engine "ON".
4. Measure voltage between terminal "4" of TPMS receiver harness connector and chassis ground.

Specification : 0 V



5. Is the measured voltage within specifications?

YES

Substitute with a known-good TPM receiver and check for proper operation.
If the problem is corrected, replace TPM receiver and then go to "Verification of Vehicle Repair" procedure.

NO

Check for short to power in control harness.
Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

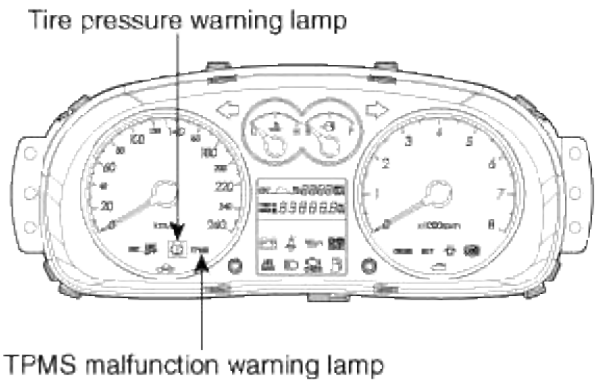
Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

Suspension System > Troubleshooting > C2511

Component Location



General Description

The TPMS receiver unit must provide two outputs continuously to drive the indicator lamps. One of the output turn the TREAD indicator lamp on when pressure in one or more tires associated with the TPMS receiver unit have reported a pressure below the warning level threshold. The other output turn the TPMS Warning indicator bulb on when the TPMS receiver unit has detected a system fault.

Turn the TPMS DTC Warning indicator lamp on

1. When the system detects a fault that is external to the receiver / sensor.
2. When the system detects a receiver fault.
3. When the system detects a sensor fault.

Turn the TPMS DTC Warning indicator lamp off

1. If the fault is considered as 'critical', then the lamp is held on throughout the current Ignition cycle (even if the DTC has been demoted). This is because it is important to bring the problem to the drivers attention. On the following Ignition cycle, the demotion conditions will be re-checked. If the demotion conditions occur, the lamp will be turned off. It will be held on until DTC demotion checking is completed.
2. 'Non critical' faults are those that can occur temporarily e.g. vehicle battery under voltage. The lamp is therefore turned off when the DTC demotion condition occurs.

DTC Description

This DTC indicates that the TREAD(Tire Under Inflation / Leak Warning) / DTC Warning lamp is short circuit and therefore cannot be turned on. The most likely failure is harness / instrument cluster / connector / receiver short circuit.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC strategy	• Input lamp current check	• Short circuit to 12 V between lamp and TPMS receiver
Enable conditions	• TREAD / Diagnostic lamp circuit short to 12 V	
Threshold value	• TREAD / Diagnostic lamp - 200 mA allowed each (after in rush time). 50 mA margin built in.	
Diagnosis time	• < 3s	

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminal condition. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check all connectors (and connections) for looseness, bending, corrosion, contamination, deterioration, and/or damage.
3. Has a problem been found?

YES

Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Control Circuit Inspection" procedure.

Control Circuit Inspection

1. Engine "OFF".
2. Disconnect instrument cluster connector and TPM receiver connector.
3. Engine "ON".
4. Measure voltage between terminal "17" of TPMS receiver harness connector and chassis ground.

Specification : 0 V



5. Is the measured voltage within specifications?

YES

Substitute with a known-good TPM receiver and check for proper operation.
If the problem is corrected, replace TPM receiver and then go to "Verification of Vehicle Repair" procedure.

NO

Check for short to power in control harness.
Repair if necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect TPMS exciter or scantool and select "Diagnostic Trouble Codes(DTCs)" mode
2. Using a TPMS exciter or scantool, Clear DTC.
3. Operate the vehicle within DTC Enable conditions in General information.
4. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

System performing to specification at this time.

ACCENT(MC) > 2008 > G 1.6 DOHC > Suspension System

Suspension System > General Information > Specifications

SPCIFICATIONS

FRONT SUSPENSION SYSTEM

Items			Specifications
Type			Macpherson strut type
Shock absorber	Type		Gas
	Stroke mm(in)		163 (6.42)
	Expansion mm(in)		492 ± 3 (19.37 ± 0.12)
	Compression mm(in)		329 + 3, -free (12.95 + 0.12, -free)
	Damping force (0.3m/s)	Expansion N(kfg)	657 ± 107 (67 ± 11)
		Compression N(kfg)	304 ± 68 (31 ± 7)
Spring	1.4 GSL MT 1.6 GSL MT	Free height mm(in)	347.5 (13.68)
		I.D color	YELLOW - RED
	1.4 GSL AT 1.6 GSL AT	Free height mm(in)	352.9 (13.89)
		I.D color	YELLOW - RED

REAR SUSPENSION SYSTEM

Items			Specifications
Type			Torsion beam axle
Shock absorber	Type		Gas
	Stroke mm(in)		213 (8.38)
	Expansion mm(in)		606 ± 3 (23.85 ± 0.11)
	Compression mm(in)		393 + 3, -free (15.47 + 0.11, -free)
	Damping force (0.3m/s)	Expansion N(kfg)	470 ± 78 (48 ± 8)
		Compression N(kfg)	156 ± 49 (16 ± 5)
Spring	Free height mm(in)		330.5 (13)
	I.D color		WHITE - WHITE

WHEELS AND TIRES

Items		Specifications
Tire size		195/55 R15
		185/65 R14
		175/70 R14
Wheel size	Steel	5.5J X 14 offset = 46
		5J X 14 offset = 39
	Aluminium	5.5J X 15 offset = 46
		5.5J X 14 offset = 46
	PCD (mm)	100
Tire pressure kPa(kg/cm², PSI)	Gasoline	210 (2.1, 30)

WHEEL ALIGNMENT

Items		Front		Rear
		Power Steering	Manual Steering	
Camber		0° ± 0.5°	0° ± 0.5°	-1° ± 0.5°
Caster		4° ± 0.5°	0°.58° ± 0.5°	-
Toe-in	Total	0° ± 0.2°	0° ± 0.2°	0.2° ~ 0.6°
	Individual	0° ± 0.1°	0° ± 0.1°	0.1° ~ 0.3°
King pin angle		13° ± 0.5°	13° ± 0.5°	-
Tread mm(in)	185, 195 Tire	1470 (57.87)	-	1460 (57.48)
	175 Tire	1484 (58.42)	1484 (58.42)	1474 (58.03)

TIGHTENING TORQUES

Items	Nm	Kgf·m	lb-ft
Wheel nut	90 ~ 110	9 ~ 11	65 ~ 79
Driveshaft nut	200 ~ 260	20 ~ 26	144 ~ 188
Front strut upper mounting nut	20 ~ 30	2 ~ 3	14.4 ~ 21.6
Front strut lower mounting nut	100 ~ 120	10 ~ 12	72 ~ 86
Front strut mounting self-locking nut	50 ~ 70	5 ~ 7	36 ~ 50
Subframe mounting bolt	95 ~ 120	9.5 ~ 12	68 ~ 86
Wheel speed sensor mouning bolt	13 ~ 17	1.3 ~ 1.7	9.4 ~ 12
Front lower arm ball joint mounting bolt	100 ~ 120	10 ~ 12	72 ~ 86
Front lower arm bush(A) mounting bolt	100 ~ 120	10 ~ 12	72 ~ 86

Front lower arm bush(G) mounting bolt	120 ~ 140	12 ~ 14	86 ~ 101
Engine mounting bolt	50 ~ 65	5 ~ 6.5	36 ~ 47
Stabilizer bracket mounting bolt	45 ~ 55	4.5 ~ 5.5	32 ~ 39
Tie rod end ball joint self-locking nut	16 ~ 34	1.6 ~ 3.4	11 ~ 24
Tie rod toe adjustment nut	50 ~ 55	5 ~ 5.5	36 ~ 39
Stabilizer bar link mounting nut	35 ~ 45	3.5 ~ 4.5	25 ~ 32
Rear shock absorber upper mounting nut	40 ~ 60	4 ~ 6	28 ~ 43
Rear shock absorber lower mounting nut	100 ~ 120	10 ~ 12	72 ~ 86
Rear torsion alxe beam mounting bolt	100 ~ 120	10 ~ 12	72 ~ 86
Rear shock absorber self-locking nut	22 ~ 32	2.2 ~ 3.2	15 ~ 23
Rear brake caliper to knuckle bolt	65 ~ 75	6.5 ~ 7.5	47 ~ 54
Rear hub unit bearing	50 ~ 60	5 ~ 6	36 ~ 43
Brake hose mounting bolt	9 ~ 14	0.9 ~ 1.4	6 ~ 10
Wheel speed sensor wire mounting bolt	7 ~ 11	0.7 ~ 1.1	5 ~ 7

CAUTION

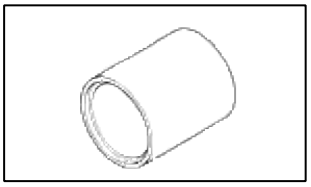
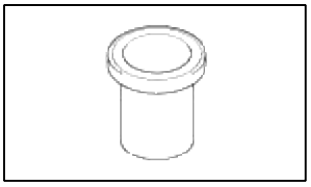
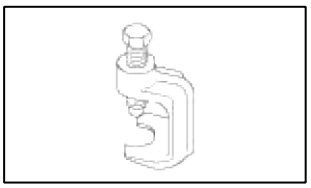
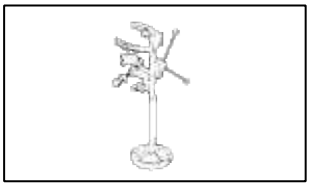
Replace the self-locking nuts with new ones after removal.

LUBRICANTS

Item	The recommended	Quantity
Lower arm ball joint	Ball : CGMS01 (CMS-H006)	0.5g ~ 1g
	Dust cober : CGMS03 (CMS-H006)	4g ~ 5g
Strut insulator bearing	GLE	3.9g ± 1g
Stabilizer bar link ball joint	Ball : LUBCHEM	0.2g ~ 1.7g
	Dust cover : LUBCHEM	1.2g ~ 1.7g

Suspension System > General Information > Special Service Tools

SPECIAL SERVICE TOOLS

Tool(Number and Name)	Illustration	Use
09216-21100 Mount bushing remover and installer		Removal & installation of lower arm bushing(G)
09214-32000 Mount bushing remover and installer		Removal & installation of lower arm bushing(G)
09568-4A000 Ball joint remover		Removal of the front lower arm and tie rod end ball joint
09546-26000 Strut spring compressor		Compression of the coil spring

Suspension System > General Information > Troubleshooting

TROUBLESHOOTING

Vehicle inspection

WHEEL/TIRE/CHECK :

Balance Check **Yes / No**

Maximum Runout Allowed :

Wheel : Radial _____ Lateral _____

Tire : Radial _____ Lateral _____

Measured Runout :

Tire/Wheel Radial : LF _____ LR _____ RF _____ RR _____

Lateral : LF _____ LR _____ RF _____ RR _____

Wheel Only Radial : LF _____ LR _____ RF _____ RR _____

Lateral : LF _____ LR _____ RF _____ RR _____

SUSPENSION INSPECTION :

Can Cause Shimmy ☐ Clunk ☐ Squeak ☐ Harshness ☐

Suspension Bushing : Loose ☐ Worn ☐ Missing ☐ OK ☐

Front stabilizer ☐ Rear stabilizer (sway bar) ☐ Rear trailing arm ☐

Front lower arm ☐ Rear suspension front ☐ Rear suspension rear arm ☐

Other _____

Suspension/Components : Loose Worm Missing OK

Ball Joint ☐ Shock absorbers F/R ☐ Springs F/R ☐ The rod ends/sleeve ☐

SYMPTOM CHART

Symptom	Suspect Area	Remedy (See page)
Squeak or grunt-noise from the front suspension, occurs more in cold ambient temperatures-more noticeable over rough roads or when turning	Front stabilizer bar	Under these conditions, the noise is acceptable.
Clunk-noise from the front suspension, occurs in and out of turns	Loose front struts or shocks	Inspect for loose nuts or bolts. Tighten to specifications.
Clunk-noise from the rear suspension, occurs when shifting from reverse to drive	Loose rear suspension components	Inspect for loose or damaged rear suspension components. Repair or install new components as necessary.
Click or pop-noise from the front suspension-more noticeable over rough roads or over bumps	Worn or damaged ball joints	Install new lower arm as necessary.
Click or pop-noise occurs when vehicle is turning	Worn or damaged ball joints	Install new lower arm as necessary.
Click or snap-occurs when accelerating around a corner	Damaged or worn Birfield joint	Repair or install a new Birfied joint as necessary. See DS group - driveshaft.
Front suspension noise-a squeak, creak or rattle noise-occurs mostly	Steering components Loose or bent front struts or	Go to detailed test A.

over bumps or rough roads	shock absorbers Damaged spring or spring mounts Damaged or worn arm bushings Worn or damaged stabilizer bar bushing or links	
Groaning or grinding-noise from the front strut, occurs when driving on bumpy roads or turning the vehicle	Uneven seating surface between the insulator and panel by the burrs around the strut insulator mounting bolts and the insulator boltes mounting holes	Repair or install a new parts as necessary.
Rear suspension noise - a squeak, creak or rattle noise - occurs mostly over bumps or rough roads	Loose or bent rear shock absorbers Damaged spring or spring mounts Damaged or worn control arm bushings	Go to detailed test B.
Shudder-occurs during acceleration from a slow speed or stop	Rear axle assembly mispositioned Damaged or worn front suspension components	Check the axle mounts and Rear suspension the rear suspension for damage or wear. Repair as necessary. Check for a loose stabilizer bar, damaged or loose strut/strut bushings or loose or worn ball joints. Inspect the steering linkage for wear or damage. Repair or Install new components as necessary.
Shimmy-most noticeable on coast/deceleration-also hard steering condition	Excessive positive caster	Check the caster alignment angle. Correct as necessary.
Tire noise-hum/moan at constant speeds	Abnormal wear patterns	Spin the tire and Check for tire wear. Install a new tire as necessary. Inspect for damaged/worn suspension components. Carry out wheel alignment.
Tire noise-noise tone lowers as the vehicle speed is lowered	Out-of-balance tire	Balance the tire and road test. Install a new tire as necessary.
Tire noise - ticking noise, change with speed	Nail puncture or stone in tire tread	Inspect the tire. Repair as necessary.
Wheel and tire-vibration and noise concern is directly related to vehicle speed and is not affected by acceleration, coasting or decelerating	Damaged or worn tire	Go to detailed test C.
Tire wobble or shudder - occurs at lower speeds	Damaged wheel bearings	Spin the tire and check for abnormal wheel bearing play or roughness. Adjust or Install new wheel bearings as necessary. See DS group - front/rear axle.

	Damaged wheel	Inspect the wheel for damage. Install a new wheel as necessary.
	Damaged or worn suspension components	Inspect the suspension components for wear or damage. Repair as necessary.
	Loosen wheel nuts	Check the wheel nuts. Tighten to specification.
	Damaged or uneven tire wear	Spin the tire and Check for abnormal tire wear or damage. Install a new tire as necessary.
Tire shimmy or shake - occurs at lower speeds	Wheel/tire out of balance	
	Uneven tire wear	Check for abnormal tire wear. Install a new tire as necessary.
	Excessive radial runout of wheel or tire	Carry out a radial runout test of the wheel and tire. Install a new tire as necessary.
	Worn or damaged wheel studs or elongate stud holes	Inspect the wheel studs and wheels. Install new components as necessary.
	Excessive lateral runout of the wheel or tire	Carry out a lateral runout test of the wheel and tire. Check the wheel, tire and hub. Repair or Install new components as necessary.
	Foreign materal between the brake disc and hub.	Clean the mounting surfaces of the brake disc and hub. See DS group - front/rear axle.
High speed shake or shimmy-occurs at high speeds	Excessive wheel hub runout Damaged or worn tires Damaged or worn wheel bearings Worn or damaged suspension or steering linkage Brake disc or drum imbalance	Go to detailed test D.
Drift left or right	Tires Steering linkage Alignment Base brake system	Go to detailed test E.
Steering wheel	Alignment Steering linkage Front lower arm ball joint	Go to detailed test F.
Tracks incorrectly	Rear suspension Caster	Go to detailed test G.
Rough ride	Front strut and spring assembly Rear shock absor and spring assembly	Go to detailed test H.
Excessive noise	Front or rear stabilizer bar components	Go to detailed test I.

	Springs Suspension components Shock absorbers	
Incorrect tire wear	Tire or unbalanced wheels Tire inflation Strut Alignment	Go to detailed test J.
Vibration	Wheel/tire Front wheel drivshaft(s) Steering system Strut and spring assembly Spring and strut mounting Front lower arm ball joint Front lower arm mounting bolt bushing Stabilizer bar bushings Wheel hubs and bearing Rear suspension arms and bushings	Go to detailed test K.
Vehicle leans	Tire/wheel Vehicle load Suspension components Incorrect ride height	Inflate tires to specification. Redistribute the load as necessary. Visually inspect the suspention system. Correct the ride height as necessary.
Poor returnability	High knuckle rotating torque Alignment	Go to detailed test E.

DETAILED TEST A : FRONT SUSPENSION NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
ROAD TEST THE VEHICLE	
	1. Test drive the vehicle. 2. During the road test, drive the vehicle over a rough road. Determine from which area/component the noise is originating. ● Is there a squeak, creak or rattle noise ? → **YES** Go to → **NO** The suspension system is OK. Conduct a diagnosis on other suspect systems.
INSPECT THE STEERING SYSTEM	

	1. Check the steering system for wear or damage. Carry out a steering linkage test. Inspect the tire wear pattern. ● Are the steering components worn or damaged ? → **YES** Repair the steering system. Install new components as necessary. Test the system for normal operation. → **NO** Go to
FRONT SHOCK ABSORBER/STRUT CHECK	
	1. Check the front shock absorbers/strut mounts for loose bolts or nuts. 2. Check the front shock absorbers/struts for damage. Carry out a shock absorber check. ● Are the front shock absorbers/struts loose or damaged ? → **YES** Tighten to specifications if loose. Install new front shock absorbers/struts if damaged. Test the system for normal operation. → **NO** Go to
CHECK THE FRONT SPRINGS	
	Check the front spring and front spring mounts/brackets for wear or damage ● Are the front springs or spring mounts/brackets worn or damaged ? → **YES** Repair or Install new components as necessary. Test the system for normal operation. → **NO** Go to**A5.**
CHECK THE STABILIZER BAR	
	1. Check the stabilizer bar bushing and links for damage or wear. 2. Check the stabilizer bar for damage. 3. Check for loose or damaged stabilizer brackets. ● Are the stabilizer bar/track bar components loose, worn or damaged ? → **YES** Repair or Install new components as necessary. Test the system for normal operation. → **NO** Suspension system is OK. Conduct diagnosis on other suspect systems.

DETAILED TEST B : REAR SUSPENSION NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
ROAD TEST THE VEHICLE	
	1. Test drive the vehicle. 2. During the road test, drive the vehicle over a rough road. Determine from which area/component the noise is originating. ● Is there a squeak, creak or rattle noise ? → **YES** Go to → **NO** The suspension system is OK. Conduct a diagnosis on other suspect systems.
REAR SHOCK ABSORBER/STRUT CHECK	
	1. Raise and support the vehicle. See GI group - lift support point. 2. Check the rear shock absorber/strut mounts for loose bolts or nuts. 3. Check the rear shock absorbers/strut for damage. Carry out a shock absorber check. ● Are the rear shock absorbers/struts loose or damaged ? → **YES** Tighten to specifications if loose. Install new rear shock absorbers/struts if damaged. Test the system for normal operation. → **NO** Go to
CHECK THE REAR SPRINGS	
	Check the rear springs and rear spring mounts/brackets for wear or damage. ● Are the rear springs or spring mounts/brackets worn or damaged ? → **YES** Repair or Install new components as necessary. Test the system for normal operation. → **NO** Go to**B4.**
CHECK THE TRAILING ARMS	
	1. Inspect the trailing arm bushings for wear or damage. Check for loose trailing arm bolts. 2. Inspect for twisted or bent trailing arms. ● Are the trailing arms loose, damaged or worn ? → **YES** Repair or Install new components as necessary. Test the system for normal operation. → **NO** Suspension system is OK. Conduct diagnosis on other suspect systems.

DETAILED TEST C : WHEEL AND TIRE

CONDITIONS	DETAILS/RESULTS/ACTIONS
ROAD TEST THE VEHICLE	
	NOTE Wheel or tire vibrations felt in the steering wheel are most likely related to the front wheel or tire. Vibration felt through the seat are most likely related to the rear wheel or tire. This may not always be true, but it can help to isolate the problem to the front or rear of the vehicle. Test drive the vehicle at different speed ranges. During the road test, if the vibration can be eliminated by placing the vehicle in neutral or is affected by the speed of the engine, the cause is not the wheels or tires. ● Is there a vibration and noise ? → **YES** Go to**C2.** → **NO** The wheel and tires are OK. Conduct a diagnosis on other suspect systems.
CHECK THE FRONT WHEEL BEARINGS	
	Check the front wheel bearings. Refer to Wheel Bearing Check (See DS group - front axle). ● Are the wheel bearing OK ? → **YES** Go to**C3.** → **NO** Inspect the wheel bearings. Adjust or Repair as necessary. Test the system for normal operation.
INSPECT THE TIRES	
	1. Check the tires for missing weights. 2. Check the wheels for damage. 3. Inspect the tire wear pattern. ● Do the tires have an abnormal wear pattern ? → **YES** Correct the condition that caused the abnormal wear. Install new tire(s). Test the system for normal operation. → **NO** Go to

TIRE ROTATION DIAGNOSIS	
	1. Spin the tires slowly and watch for signs of lateral runout. 2. Spin the tires slowly and watch for signs of radial runout. ● Are there signs of visual runout ? → **YES** Go to → **NO** Check the wheel and tire balance. Correct as necessary. Test the system for normal operation.
RADIAL RUNOUT CHECK ON THE TIRE	
	Measure the radial runout of the wheel and tire assembly. A typical specification for total radial runout is 1.15mm (0.059 inch). ● Is the radial runout within specifications ? → **YES** Go to**C8.** → **NO** Go to**C6.**
RADIAL RUNOUT CHECK ON THE WHEEL	
	Measure the radial runout of the wheel. A typical specification for total radial runout is 1.14mm (0.045 inch). ● Is the radial runout within specifications ? → **YES** Install a new tire. Test the system for normal operation. → **NO** Go to**C7.**
CHECK THE HUB/BRAKE DISC OR DRUM PILOT RUNOUT OR BOLT CIRCLE RUNOUT	
	Measure the pilot or bolt circle runout. A typical specification for radial runout is : ● pilot runout - less than 0.15mm (0.006 inch). ● bolt circle runout - less than 0.38 mm (0.015 inch). ● Is the radial runout within specification ? → **YES** Install a new wheel. Test the system for normal operation. → **NO** Repair or Install new components as necessary.
LATERAL RUNOUT CHECK ON THE TIRE	
	Measure the lateral runout of the wheel and tire assembly. A typical specification for total lateral runout is 2.5mm (0.098 inch).

	● Is the lateral runout within specifications ? → **YES** Wheel and tires are OK. Conduct diagnosis on other suspect systems. → **NO** Go to**C9.**
LATERAL RUNOUT CHECK ON THE WHEEL	
	Measure the lateral runout of the wheel. A typical specification for total radial runout is 1.2mm (0.047 inch). ● Is the lateral runout within specifications ? → **YES** Install a new tire. Test the system for normal operation. → **NO** Go to**C10.**
CHECK THE FLANGE FACE LATERAL RUNOUT	
	Measure the flange face lateral runout. A typical specification for lateral runout is : ● hub/brake disc - less than 0.13mm (0.005 inch). ● Is the lateral runout within specifications ? → **YES** Install a new wheel. Test the system for normal operation. → **NO** Repair or Install new components as necessary.

DETAILED TEST D :

CONDITIONS	DETAILS/RESULTS/ACTIONS
CHECK FOR FRONT WHEEL BEARING ROUGHNESS	
	1. Raise and support the front end of the vehicle so that the front wheel and tire assemblies can spin. See GI group - lift support point. 2. Spin the front tires by hand. ● Do the wheel bearings feel rough ? → **YES** Inspect the wheel bearings. Repair as necessary. Test the system for normal operation. → **NO** Go to
CHECK THE END PLAY OF THE FRONT WHEEL BEARINGS	

	Check the end play of the front wheel bearings. ● Is the end play OK ? → **YES** Go to**D3.** → **NO** Adjust or Repair as necessary. Test the system for normal operation.
MEASURE THE LATERAL RUNOUT AND THE RADIAL RUNOUT OF THE FRONT WHEELS ON THE VEHICLE	
	Measure the lateral runout and the radial runout of the front wheels on the vehicle. Go to detailed test C. ● Are the measurements within specifications ? → **YES** Go to**D4.** → **NO** Install new wheels as necessary and Balance the assembly. Test the system for normal operation.
MEASURE THE LATERAL RUNOUT OF THE FRONT TIRES ON THE VEHICLE	
	Measure the lateral runout of the front tires on the vehicle. Go to detailed test C. ● Is the runout within specifications ? → **YES** Go to**D5.** → **NO** Install new tires as necessary and Balance the assembly. Test the system for normal operation.
MEASURE THE RADIAL RUNOUT OF THE FRONT TIRES ON THE VEHICLE	
	Measure the radial runout of the front tires on the vehicle. Go to detailed test C. ● Is the runout within specifications ? → **YES** Balance the front wheel and tire assemblies. If any tire cannot be balanced, Install a new tire. Test the system for normal operation. → **NO** Go to**D6.**
MATCH MOUNT THE TIRE AND WHEEL ASSEMBLY	
	Mark the high runout location on the tire and also on the wheel. Break the

	assembly down and rotate the tire 180 degrees (halfway around) on the wheel. Inflate the tire and measure the radial runout. ● Is the runout within specifications ? → **YES** Balance the assembly. Test the system for normal operation. → **NO** If the high spot is not within 101.6mm (4 inches) of the first high spot on the tire, Go to**D7.**
MEASURE THE WHEEL FLANGE RUNOUT	
	Dismount the tire and mount the wheel on a wheel balancer. Measure the runout on both wheel flanges. Go to detailed test C ● Is the runout within specifications ? → **YES** Locate and Mark the low spot on the wheel. Install the tire, matching the high spot on the tire with the low spot on the wheel. Balance the assembly. Test the system for normal operation. If the condition persists, Go to**D8.** → **NO** Install a new wheel. Check the runout on the new wheel. If the new wheel is within limits, locate and Mark the low spot. Install the tire, matching the high spot on the tire with the low spot on the wheel. Balance the assembly. Test the system for normal operation. If the condition persists, Go to**D8.**
CHECK FOR VIBRATION FROM THE FRONT OF THE VEHICLE	
	Spin the front wheel and tire assemblies with a wheel balancer while the vehicle is raised on a hoist. Feel for vibration in the front fender or while seated in the vehicle. ● Is the vibration persent ? → **YES** Substitute known good wheel and tire assemblies as necessary. Test the system for normal operation. → **NO** Check the driveline components. Test the system for normal operation.

DETAILED TEST E : DRIFT LEFT OR RIGHT

CONDITIONS	DETAILS/RESULTS/ACTIONS
CHECK THE TIRES	
	Inspect the tires for excessive wear or damage. ● Are the tires excessively worn or damaged ? → **YES** Install new tires. → **NO** Go to**E2.**
CHECK THE STEERING LINKAGE	
	1. Raise and support the vehicle. 2. Check the steering components for indications of excessive wear or damage. See ST group - specification. ● Is there an indication of excessive wear or damage ? → **YES** Repair or Install new components as necessary. → **NO** Go to
CHECK THE VEHICLE ALIGNMENT	
	1. Place the vehicle on an alignment rack. Check the vehicle alignmnt. ● Is the alignment within specification ? → **YES** Go to → **NO** Adjust the alignment as necessary.
BRAKE DRAG DIAGNOSIS	
	Apply the brakes while driving. ● Does drift or pull occur when the brakes are applied ? → **YES** See BR group - specification. → **NO** If the steering wheel is in the center, the vehicle is OK. If the steering wheel is off-center, Go to Detailed Test**F.**

DETAILED TEST F : STEERING WHEEL OFF-CENTER

CONDITIONS	DETAILS/RESULTS/ACTIONS
CHECK THE CLEAR VISION	
	Place the vehicle on an alignment rack. ● Is the clear vision within specification ? → **YES** Go to**F2.** → **NO** Adjust the clear vision to specification.
INSPECT THE STEERING COMPONENTS	
	1. Raise and support the vehicle. 2. Inspect the steering components for excessive wear or damage. See ST group - specification. ● Are the steering components excessively worn or damaged ? → **YES** Repair or Install new components as necessary. → **NO** If it tracks corectly, vehicle is OK. If it tracks incorrectly, Go to Detailed Test

DETAILED TEST G : TRACKS INCORRECTLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
CHECK THE CASTER	
	Place the vehicle on an alignment rack. ● Are the caster within specification ? → **YES** Go to**G2.** →**NO** Replace bent or damaged parts.
CHECK THE REAR SUSPENSION	
	1. Measure the vehicle wheel base for LH and RH. 2. Compare the measurements. ● Are the measurements the same ? → **YES** If the ride is smooth, vehicle is OK. If the ride is rough, Go to Detailed Test → **NO** Inspect the rear suspension components for wear or damage. Repair or Install new components as necessary.

DETAILED TEST H : ROUGH RIDE

CONDITIONS	DETAILS/RESULTS/ACTIONS
CHECK THE FRONT SHOCK ABSORBER	
	1. Raise support the vehicle. 2. Inspect the front shock absorber for oil leaks or damage. ● Are the tires excessively worn or damaged ? → **YES** Install new front shock absorbers. → **NO** Go to
CHECK THE REAR SHOCK ABSORBERS	
	Inspect the rear shock absorbers for oil leaks or damage. ● Are the rear shock absorbers leaking ? → **YES** Install new rear shock absorbers. → **NO** The vehicle is OK. Go to**TROUBLESHOOTING.**

DETAILED TEST I : EXCESSIVE NOISE

CONDITIONS	DETAILS/RESULTS/ACTIONS
INSPECT THE SUSPENSION	
	1. Raise and support the vehicle. 2. Inspect the shock absorber mounting bolts. ● Are the mounting bolts loose or broken ? → **YES** Tighten or Install new shock absorber mounting bolts. → **NO** Go to
INSPECT THE SPRING AND TORSION BARS	
	Inspect the springs and stabilizer bars for damage. ● Are the spring or stabilizer bars damaged ? → **YES** Install new spring and/or stabilizer bars. → **NO** Go to**I3.**
INSPECT THE FRONT SUSPENSION	

	Inspect the front suspension components for excessive wear or damage. ● Are the front suspension components worn or damaged ? → **YES** Install new front suspension components. → **NO** The vehicle is OK. Go to**TROUBLESHOOTING.**

DETAILED TEST J : INCORRECT TIRE WEAR

CONDITIONS	DETAILS/RESULTS/ACTIONS
INSPECT THE TIRES	
	1. Raise and support the vehicle. 2. Inspect the tires for uneven wear on the inner or outer shoulder. ● Is there uneven tire wear ? → **YES** Align the vehicle. Install new tires if badly worn. → **NO** Go to
UNEVEN TIRE WEAR	
	Inspect the tires for a feathering pattern. ● Do the tires have a feahering pattern ? → **YES** Align the vehicle. Install new tires if badly worn. → **NO** Go to**J3.**
CHECK FOR CUPPED TIRE	
	Inspect the tires for cupping or dishing. ● Are the tires cupped or dished ? → **YES** Balance and Rotate the tires. → **NO** The vehicle is OK. Go to**TROUBLESHOOTING.**

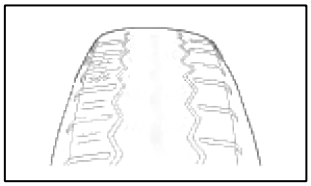
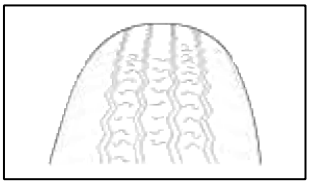
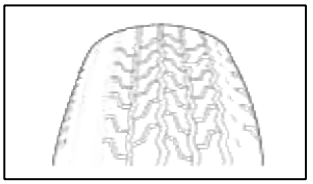
DETAILED TEST K : VIBRATION

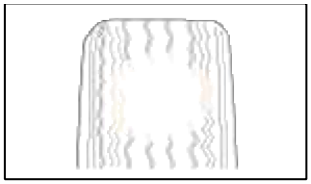
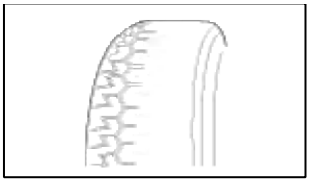
CONDITIONS	DETAILS/RESULTS/ACTIONS
ROAD TEST	

	Accelerate the vehicle to the speed at which the customer indicated the vibration occured. ● Is the vibration present ? → **YES** Go to**K2.** → **NO** The vehicle is OK. Go to**TROUBLESHOOTING.**
INSPECT THE TIRES	
	1. Raise and support the vehicle with a frame contact hoist. 2. Inspect the tires for extreme wear or damage, cupping, or flat spots. ● Are the tires OK ? → **YES** Go to → **NO** Check the suspension components for misalignment, abnormal wear, or damage that may have contributed to the tire wear. Correct the suspension concerns and Install new tires.
INSPECT THE WHEEL BEARINGS	
	Spin the tires by hand to check for wheel bearing rougness. ● Is the front wheel bearing OK ? → **YES** Go to**K4.** → **NO** Install new front wheel bearings as necessary. See Ds group - front axle.
TIRE/WHEEL BALANCE	
	Check the tire/wheel balance. ● Are the tires balanced ? → **YES** Go to**K5.** → **NO** Balance the tires and wheels as necessary.
MEASURE THE RUNOUTS	
	For each wheel position measure, locate and mark the following items. - High point of the tire/wheel assembly total radial runout - High point of the wheel radial runout - High point of the wheel lateral runout

	● Are the runouts as specified ? → **YES** Go to**K7.** → **NO** Go to**K6.**
SUBSTITUTE THE WHEELS AND TIRE	
	1. Substitute a known good set of wheels and tires. 2. Carry out a road test. 3. If the vehicle still exhibits a shake or vibration, note the vehicle speed and/or engine rpm which it occurs. ● Is the vibration felt ? → **YES** Engine/transmission imbalance. See the specification of TR group, EM group, FL group and EC group. → **NO** Install the original tire/wheel assemblies one by one, Road testing at each step until the damaged tire(s)/wheel(s) as necessary. Test the system for normal operation.

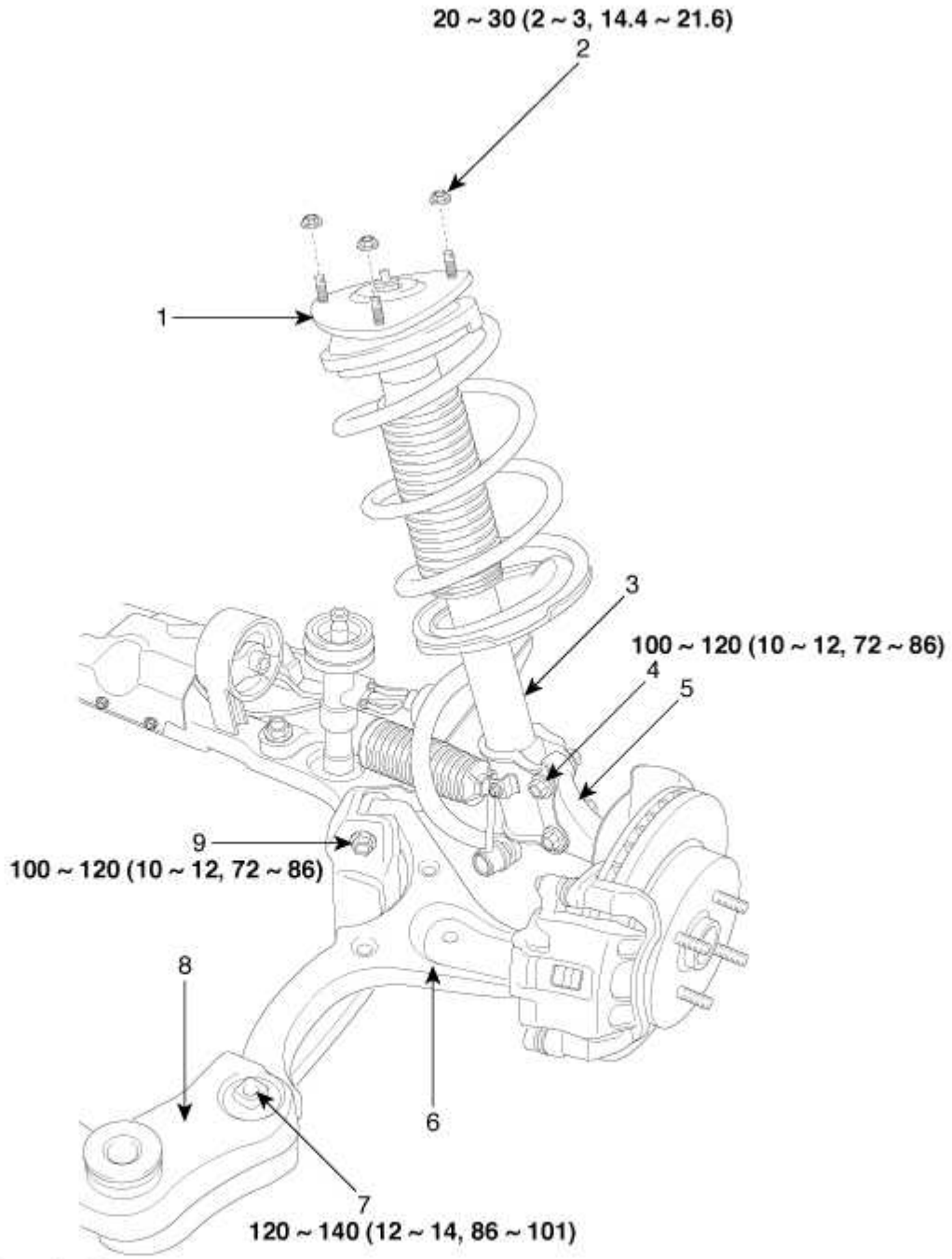
Wheel /tire noise, vibration and harshness concerns are directly related to vehicle speed and are not generally affected by acceleration, coasting or decelerating. Also, out-of-balance wheel and tires can vibrate at more than one speed. A vibration that is affected by the engine rpm, or is eliminated 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. Carry out 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
		
• 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

Suspension System > Front Suspension System > Front Strut Assembly > Components and Components Location

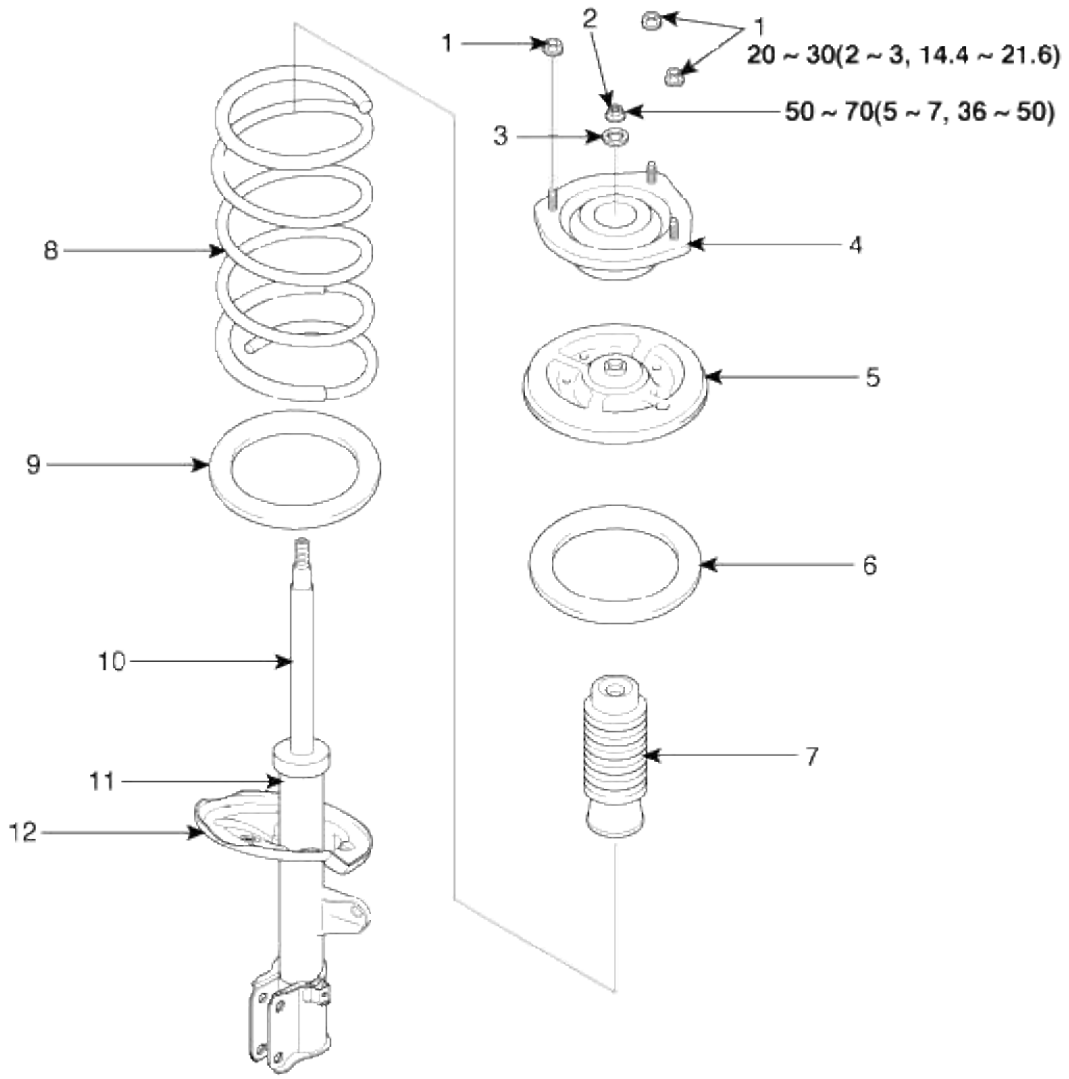
COMPONENTS



TORQUE : Nm (kgf·m, lb-ft)

1. Strut insulator
2. Upper mounting nut
3. Front strut assembly
4. Front strut lower mounting bolt
5. Knuckle assembly
6. Lower arm
7. Lower arm bush(G) mounting bolt
8. Subframe
9. Lower arm bush(A) mounting bolt

COMPONENTS



TORQUE : Nm (kgf·m, lb-ft)

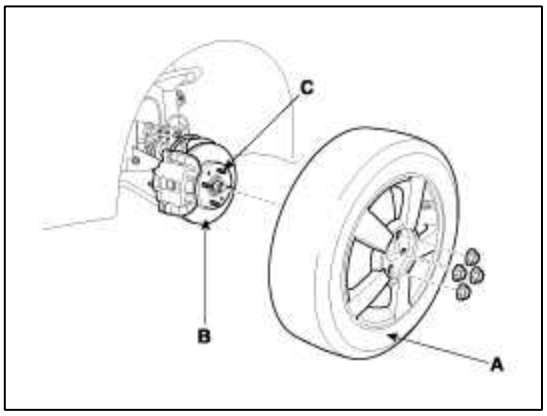
1. Upper mounting nuts
2. Self-locking nut
3. Spacer
4. Insulator
5. Spring upper seat
6. Spring upper pad
7. Strut dust cover & bumper rubber
8. Coil spring
9. Spring lower pad
10. Piston rod
11. Strut assembly
12. Spring lower seat

Suspension System > Front Suspension System > Front Strut Assembly > Repair procedures

REMOVAL

1. Loosen the wheel nuts slightly.
   Raise the front of the vehicle, and make sure it is securely supported.

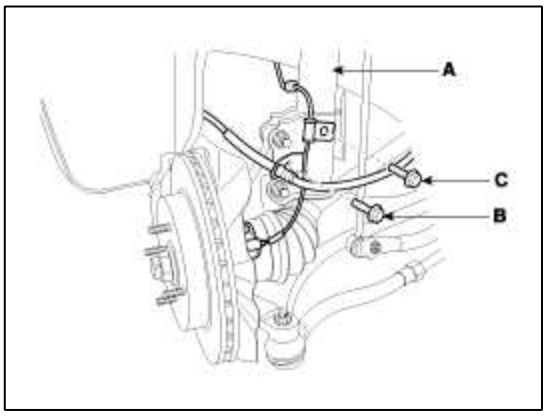
2. Remove the front wheel and tire (A) from front hub (B).



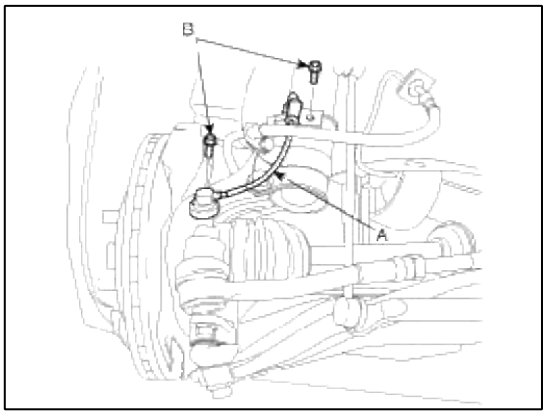
CAUTION

Be careful not to damage the hub bolts (C) then remove the front wheel and tire (A).

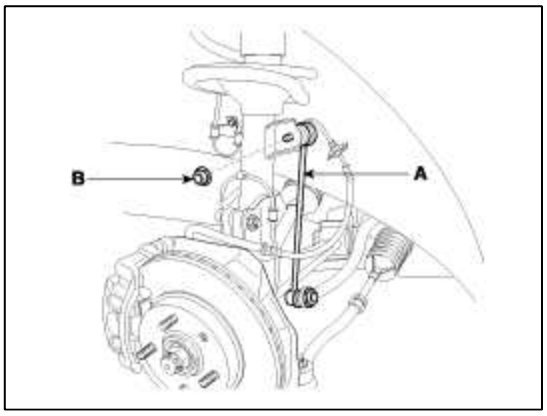
3. Remove the brake hose bracket (B) and speed sensor wire mounting bolt (C) from the strut assembly (A).



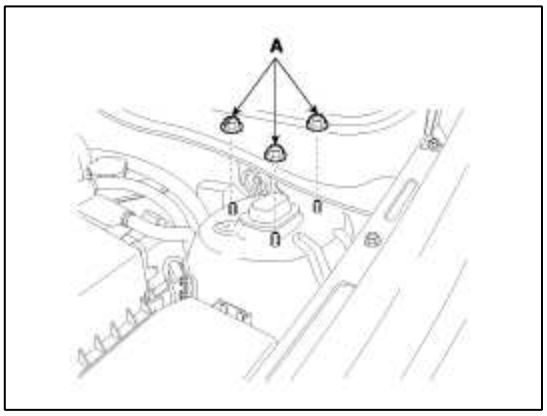
4. Remove the speed sensor wire mounting bolt (B) and speed sensor (A).



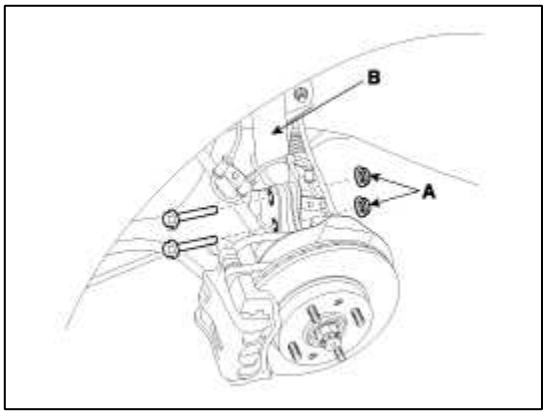
5. Remove the nut (B) from the stabilizer bar link (A).



6. Remove the strut upper mounting nuts (A).



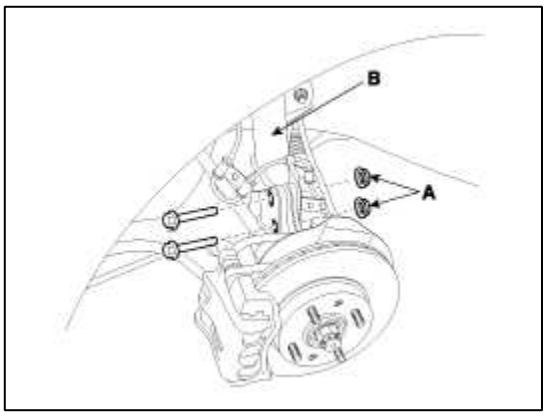
7. Remove the strut lower mounting bolts (A) and then remove the strut assembly (B).



INSTALLATION

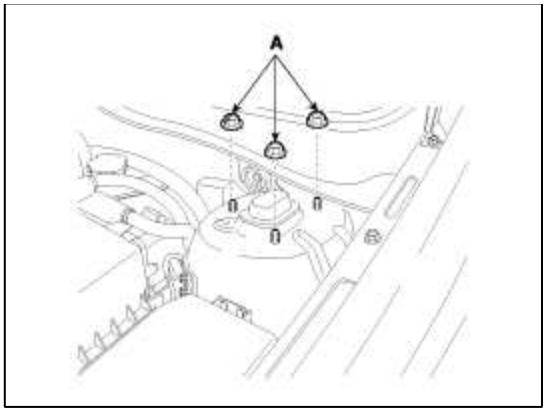
1. Install the strut assembly (B) and then install the strut lower mounting bolts (A).

Tightening torque :
100 ~ 120 Nm (10 ~ 12 Kgf·m, 72 ~ 86 lb-ft)



2. Install the strut upper mounting nuts (A).

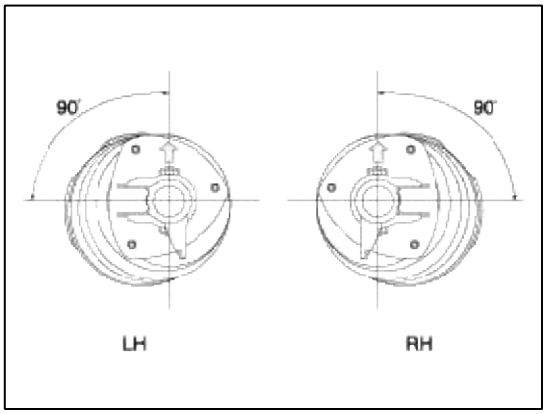
Tightening torque :
20 ~ 30 Nm (2 ~ 3 Kgf·m, 14.4 ~ 21.6 lb-ft)



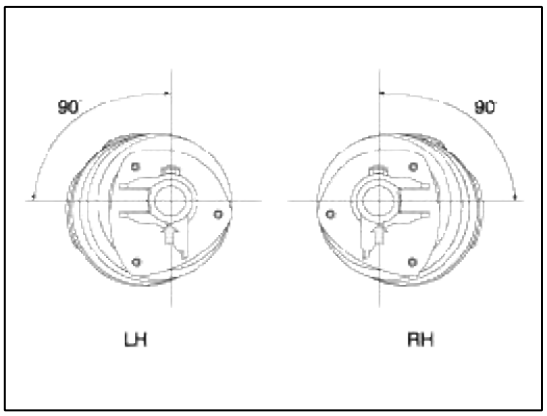
NOTE

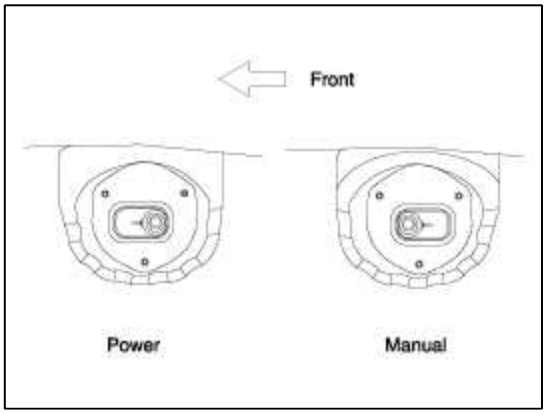
When installing the strut assembly mounting nuts, check if the self-locking nut is in the right direction as shown in the illustration.

Power steering



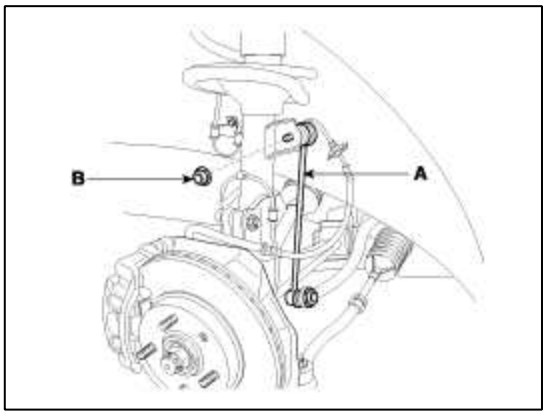
Manual steering





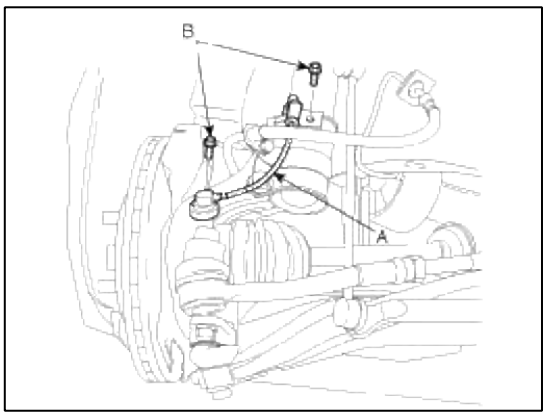
3. Install the nut (B) on the stabilizer bar link (A).

Tightening torque :
35 ~ 45 Nm (3.5 ~4.5 Kgf·m, 25 ~ 32 lb-ft)



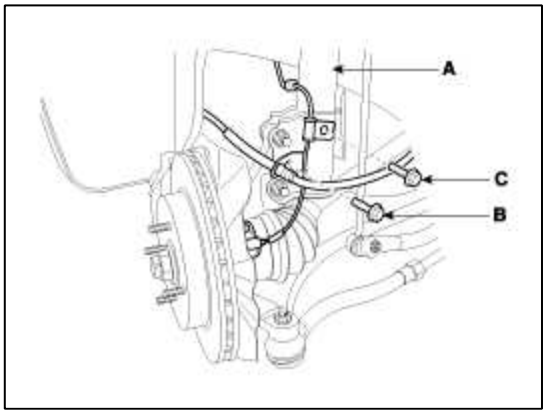
4. Install the speed sensor wire mounting bolt (B) and speed sensor (A).

Tightening torque :
13 ~ 17 Nm (1.3 ~ 1.7 Kgf·m, 9.4 ~ 12 lb-ft)



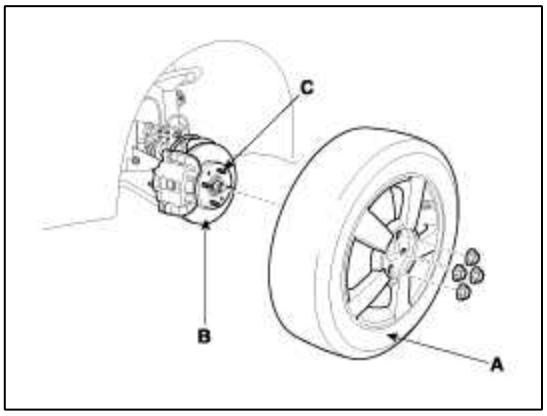
5. Install the brake hose bracket (B) and speed sensor wire mounting bolt (C) on the strut assembly (A).

Tightening torque :
Brake hose mounting bolt ;
9 ~14 Nm (0.9 ~ 1.4 Kgf·m, 6 ~ 10 lb-ft)



6. Install the front wheel and tire (A) on the front hub (B).

Tightening torque :
90 ~ 110 Nm (9 ~ 11 Kgf·m, 65 ~ 79 lb-ft)

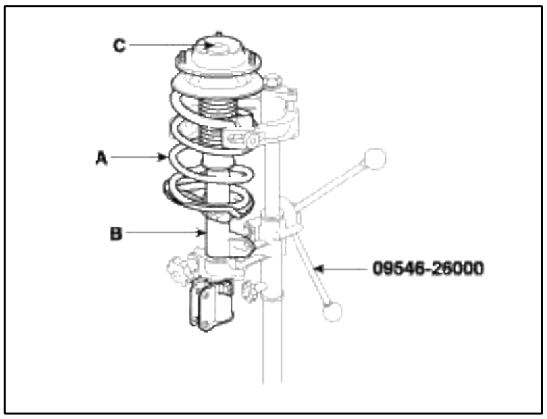


CAUTION

Be careful not to damage the hub bolts (C) then install the front wheel and tire (A).

DISASSEMBLY

1. Using the special tool (09546-26000), compress the coil spring (A) until there is only a little tension of the spring on the strut.

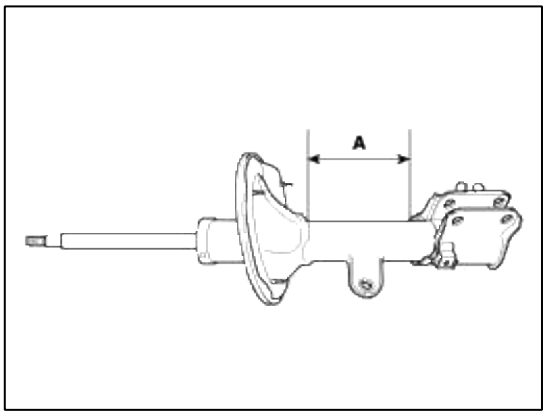


2. Remove the self-locking nut (C) from the strut assembly (B).
3. Remove the insulator, spring seat, coil spring and dust cover from the strut assembly.

DISPOSAL

1. Fully extend the piston rod.

2. Drill a hole on the A section to remove gas from the cylinder.

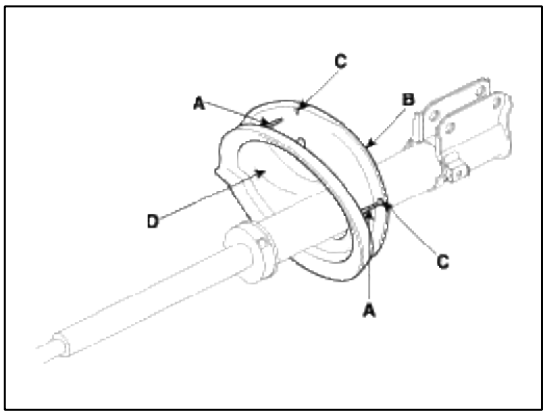


CAUTION

The gas coming out is harmless, but be careful of chips that may fly when drilling.

REASSEMBLY

1. Install the spring lower pad (D) so that the protrusions (A) fit in the holes (C) in the spring lower seat (B).



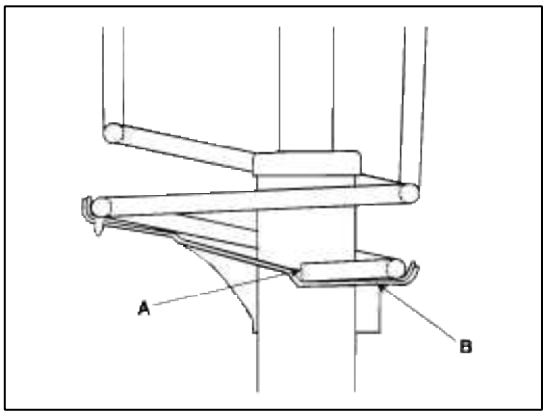
2. Compress coil spring using special tool (09546-26000).
   Install compressed coil spring into shock absorber.

NOTE

1) Indicated two identification color marks on the coil spring one follows model option the other follows load classification according to the below.
   Pay attention to distiuguish between the two marks and then install them.
2) Install the coil spring wth the idemtification mark directed toward the knuckle.

3. After fully extending the piston rod, install the spring upper seat and insulator assembly.

4. After seating the upper and lower ends of the coil spring (A) in the upper and lower spring seat grooves (B) correctly, tighten new self-locking nut temporarily.

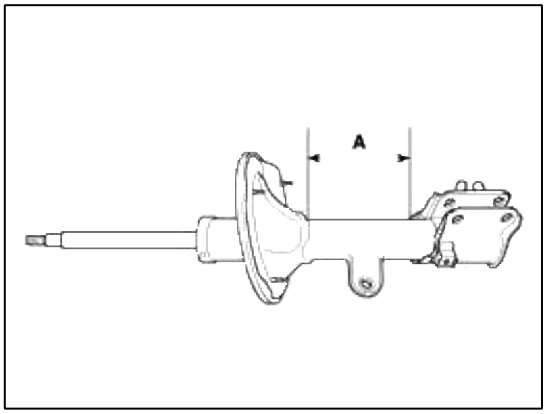


5. Remove the special tool (09546-26000).
6. Tighten the self-locking nut to the specified torque.

Tightening torque :
50 ~ 70 Nm (5 ~7 kgf·m, 36 ~ 50 lb-ft)

DISPOSAL

1. Fully extend the piston rod.
2. Drill a hole on the A section to remove gas from the cylinder.

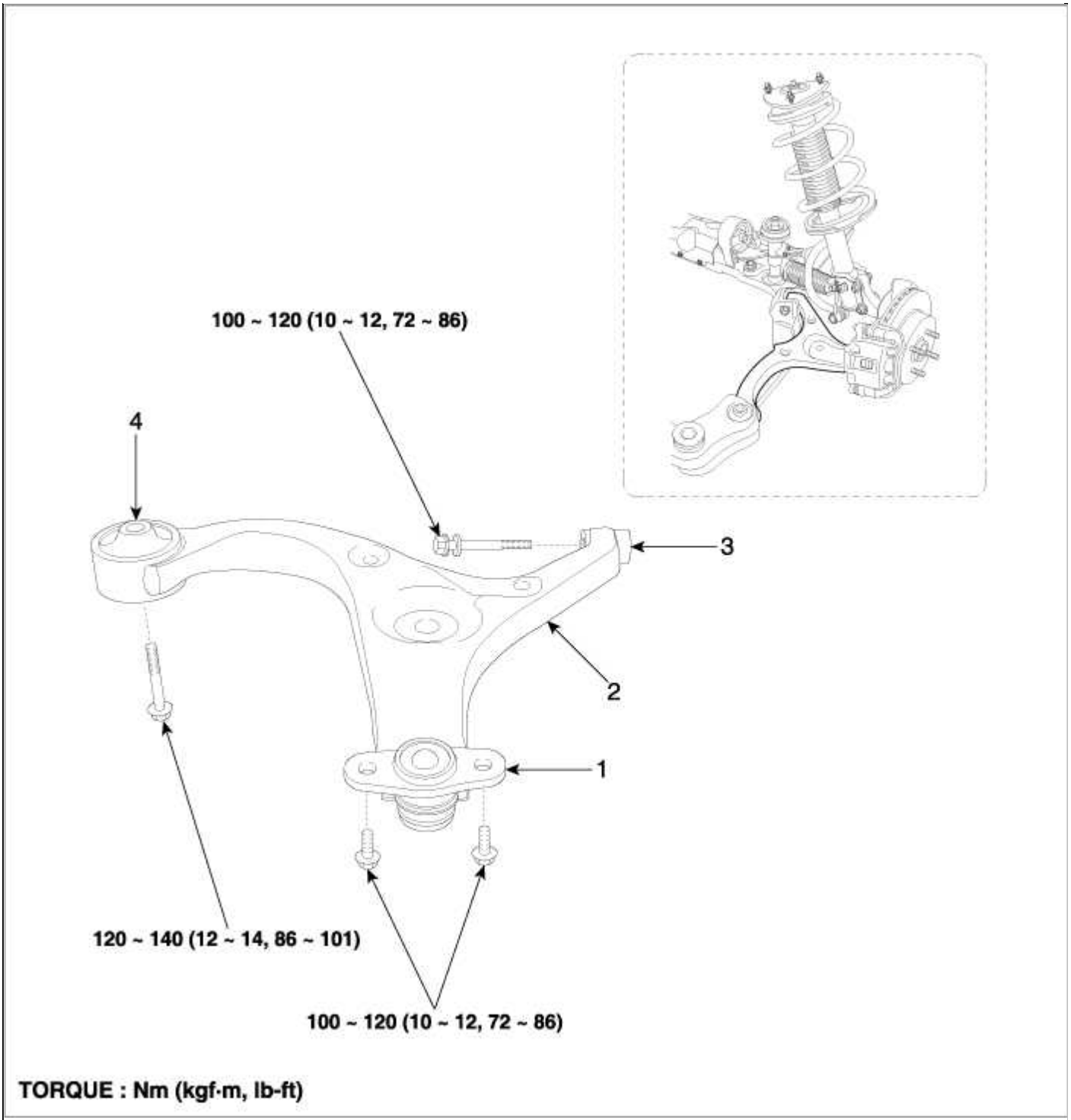


CAUTION

The gas coming out is harmless, but be careful of chips that may fly when drilling.

Suspension System > Front Suspension System > Front Lower Arm > Components and Components Location

COMPONENTS



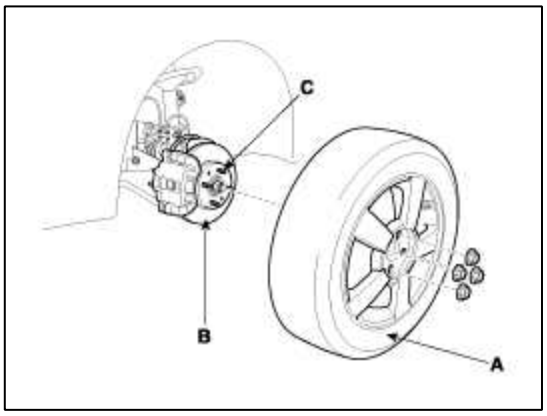
1. Front lower arm ball joint
2. Lower arm
3. A bushing
4. G bushing

Suspension System > Front Suspension System > Front Lower Arm > Repair procedures

REMOVAL

1. Loosen the wheel nuts slightly.
   Raise the front of the vehicle, and make sure it is securely supported.

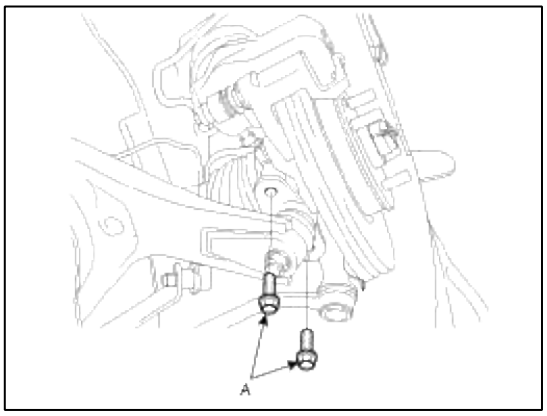
2. Remove the front wheel and tire (A) from front hub (B).



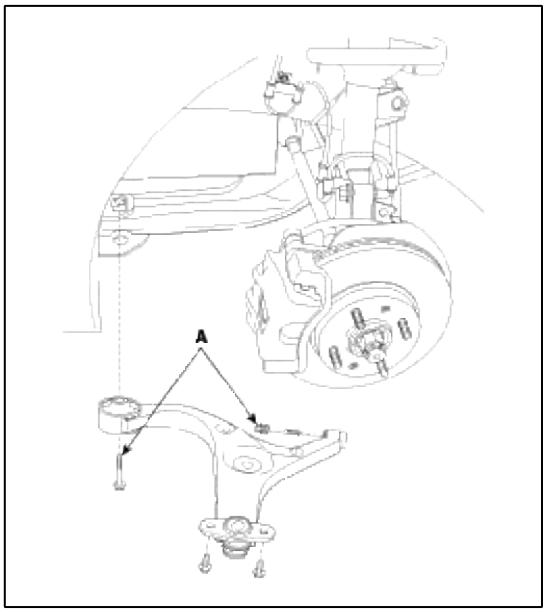
CAUTION

Be careful not to damage the hub bolts (C) then remove the front wheel and tire (A).

3. Remove the lower arm ball joint mounting bolts (A).

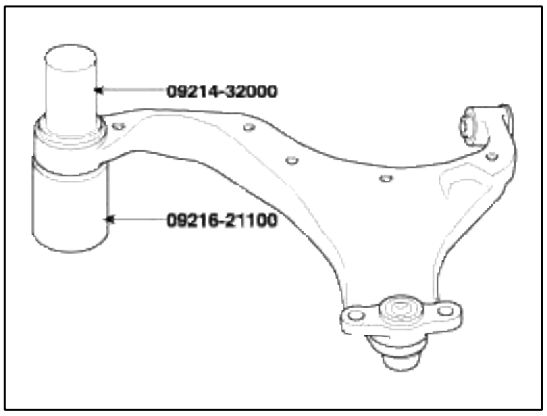


4. Remove the lower arm mounting bolts (A).

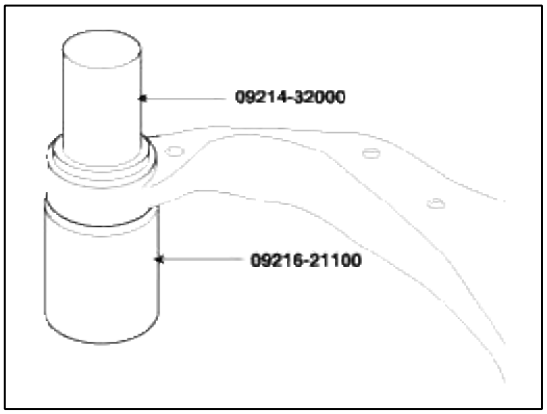


REPLACEMENT

1. Using the special tools (09214-32000 & 09216-211000), remove the bushing from the lower arm.



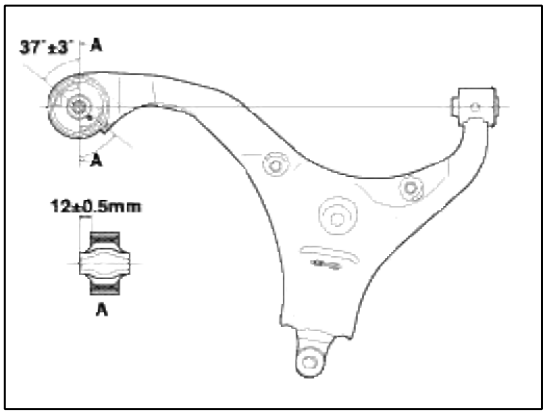
2. Apply soap solution to the following parts.
   A. Outer surface of the bushing.
   B. Inner surface of the lower bushing mounting part.
3. Using the special tools (09214-32000 & 09216-21100), install the busing on the lower arm.



CAUTION

Insert bush as to arrow direct toward this dir shown.

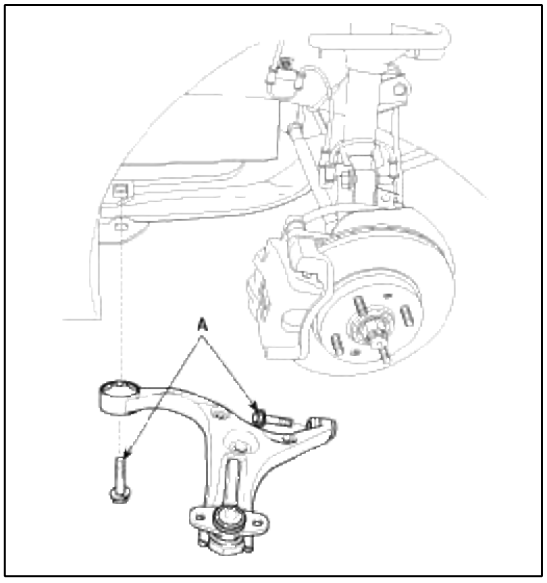
Separation force is over 800Kg



INSTALLATION

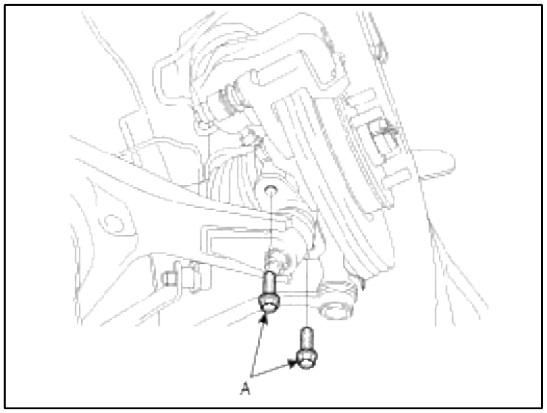
1. Install the lower arm mounting bolts (A).

Tightening torque :
A bushing :
100 ~ 120 Nm (10 ~ 12 Kgf·m, 72 ~ 86 lb-ft)
G bushing :
100~140 Nm (10 ~ 14 Kgf·m, 72 ~ 101 lb-ft)



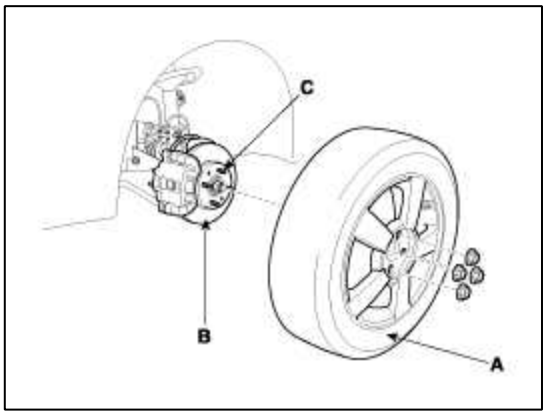
2. Install the lower arm ball joint mounting bolts (A).

Tightening torque :
100 ~ 120 Nm (10 ~ 12 Kgf·m, 72 ~ 86 lb-ft)



3. Install the front wheel and tire (A) on the front hub (B).

Tightening torque :
90 ~ 110 Nm (9 ~ 11 Kgf·m, 65 ~ 79 lb-ft)

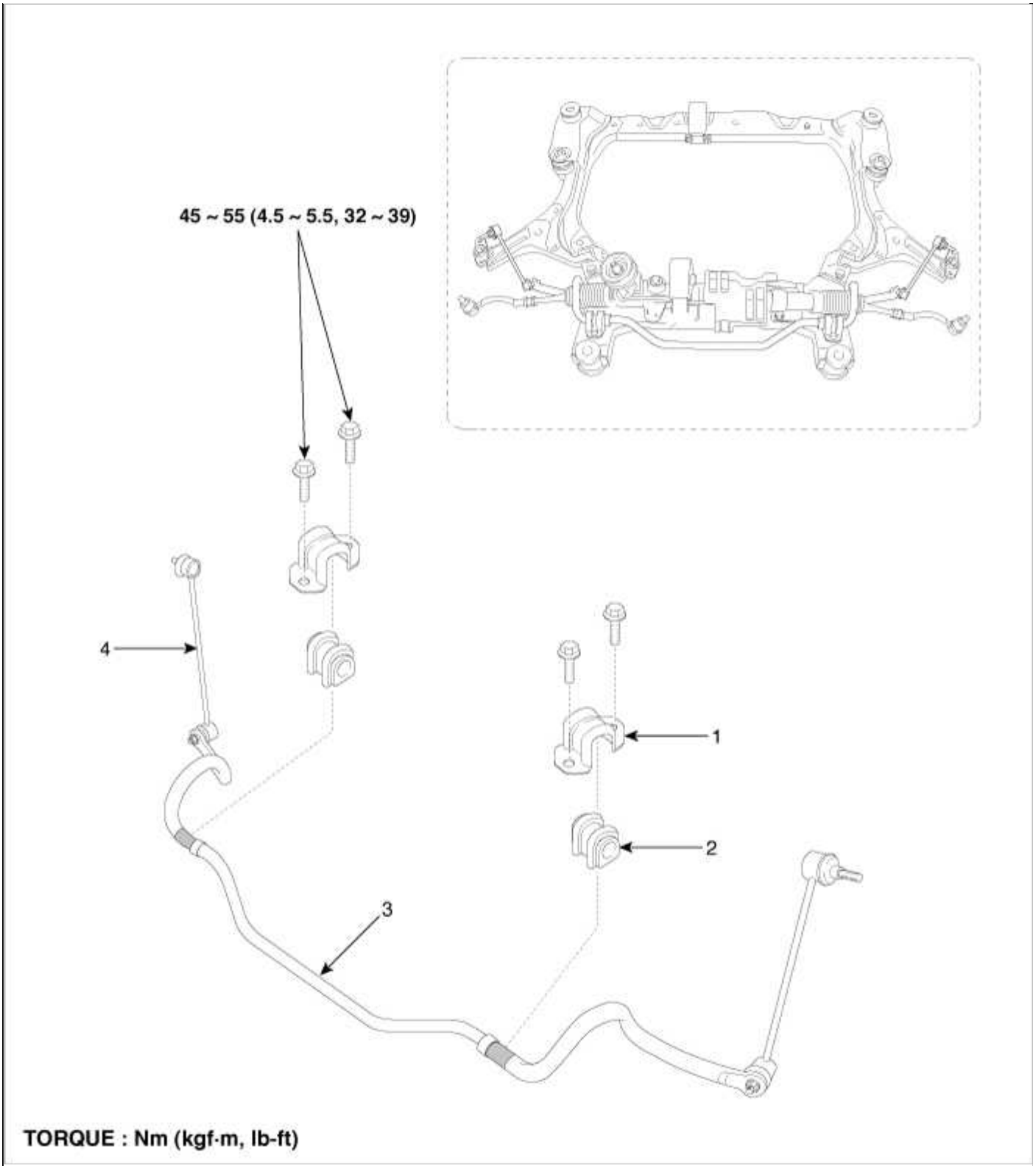


CAUTION

Be careful not to damage the hub bolts (C) then install the front wheel and tire (A).

Suspension System > Front Suspension System > Front Stabilizer Bar > Components and Components Location

COMPONENTS



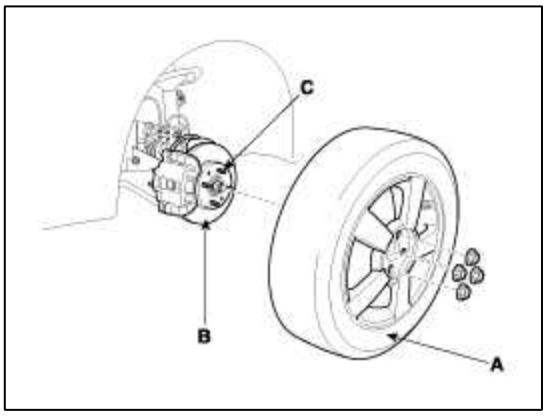
1. Stabilizer bracket
2. Stabilizer bushing
3. Stabilizer bar
4. Stabilizer bar link

Suspension System > Front Suspension System > Front Stabilizer Bar > Repair procedures

REMOVAL

1. Loosen the wheel nuts slightly.
   Raise the front of the vehicle, and make sure it is securely supported.

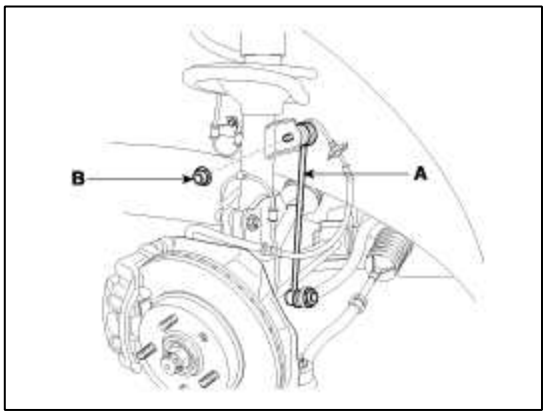
2. Remove the front wheel and tire (A) from front hub (B).



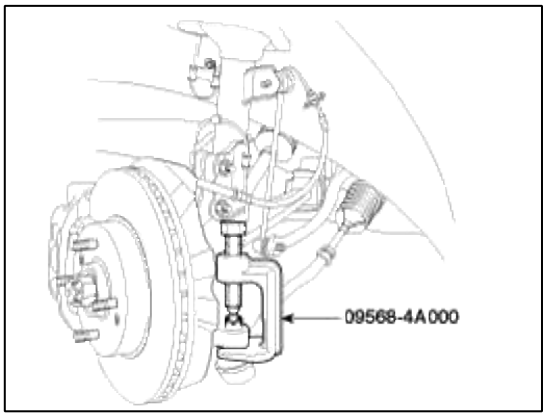
CAUTION

Be careful not to damage the hub bolts (C) then remove the front wheel and tire (A).

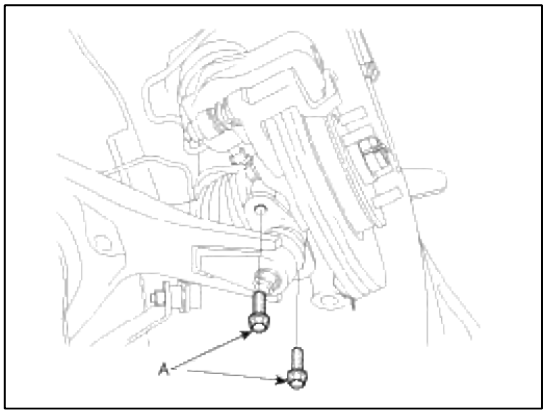
3. Remove the stabilizer bar link (B) from the strut assmembly (A).



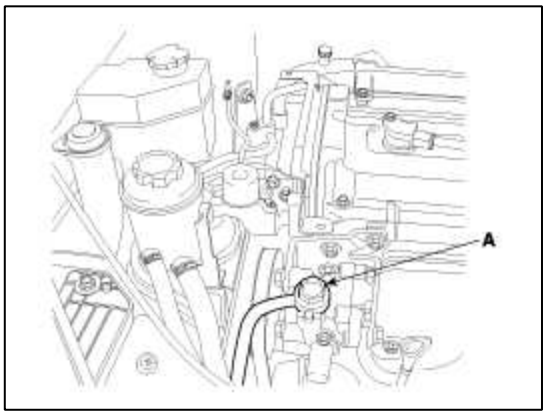
4. Remove the tie rod end (A) from the knuckle by using the special tool (09568-4A000).



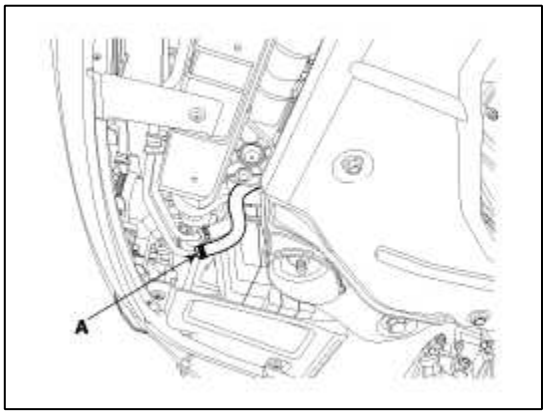
5. Remove the two bolts (A) for lower arm ball joint.



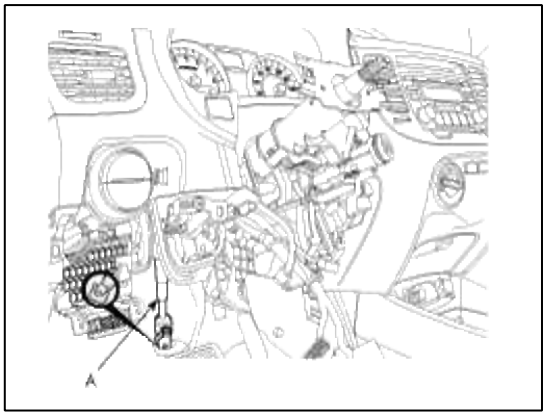
6. Drain power steering oil. (Power steering only)
7. Remove the pressure pipe mounting bolt (A). (Power steering only)



8. Disconnect between the return hose and tube (A). (Power steering only)



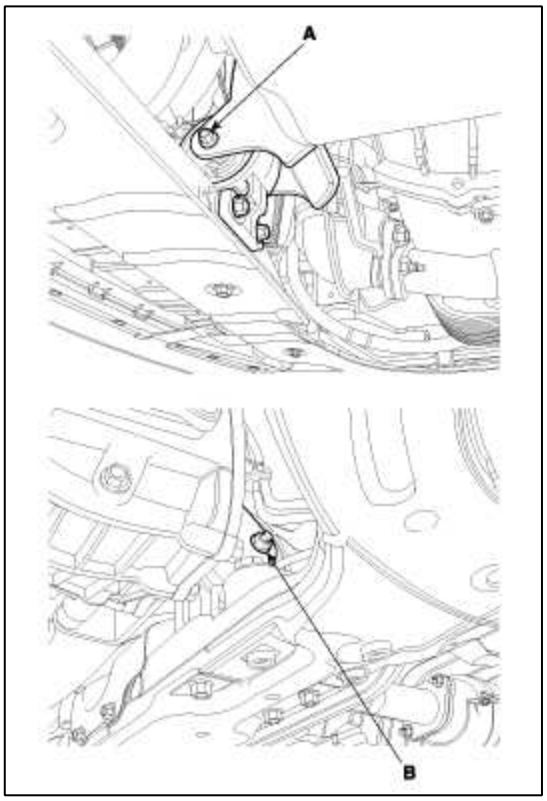
9. Remove the connecting bolt (A) between the steering universal joint assembly and the pinion assembly.

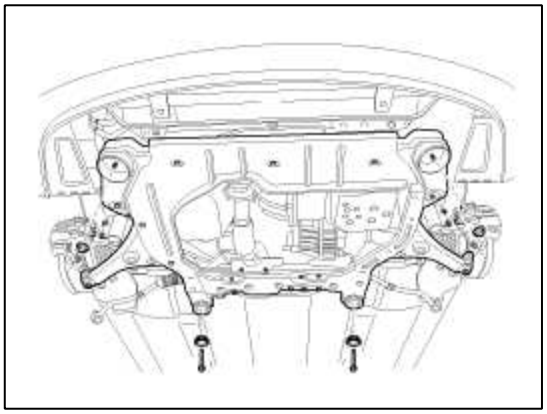


CAUTION

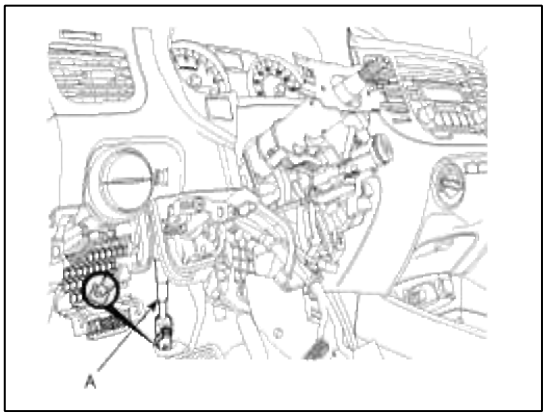
Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

10. Remove two engline mounting bolts (A,B) and six subframe mounting bolts in order to remove the subframe.

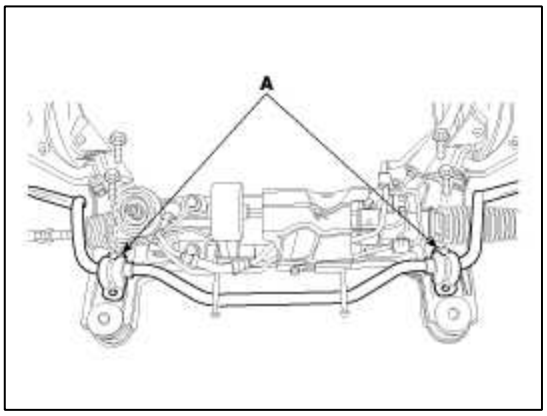




11. Install the connecting bolt (A) between the steering universal joint assembly and the pinion assembly.



12. Remove both two stabilizer brackets (A) and two bushes respcetively.



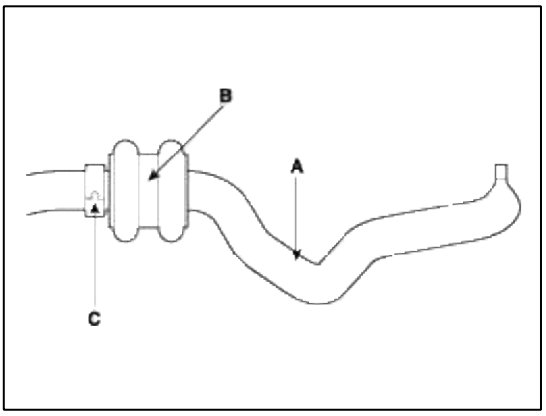
13. Remove the stabilizer bar.

CAUTION

Be careful not to do damage to pressure tubes.

INSTALLATION

1. Install the bushing (B) on the stabilizer bar (A).



NOTE

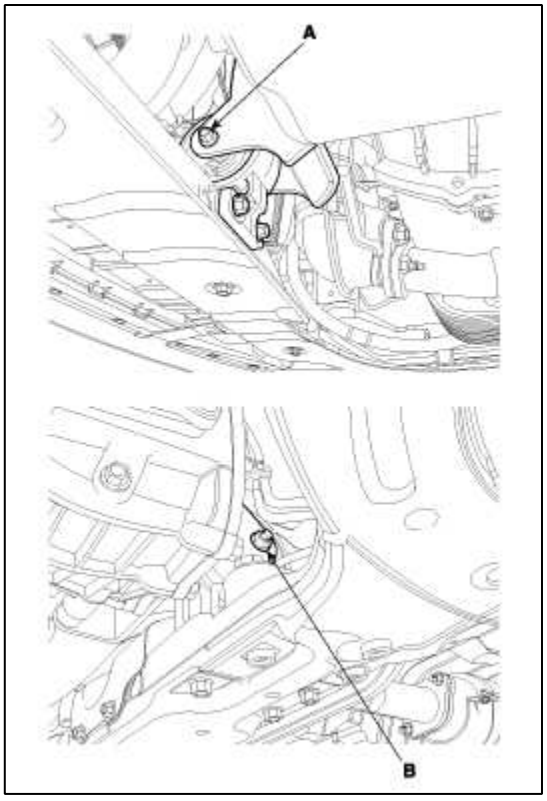
Bring clamp (C) of stabilizer bar (A) into contact with bushing (B).

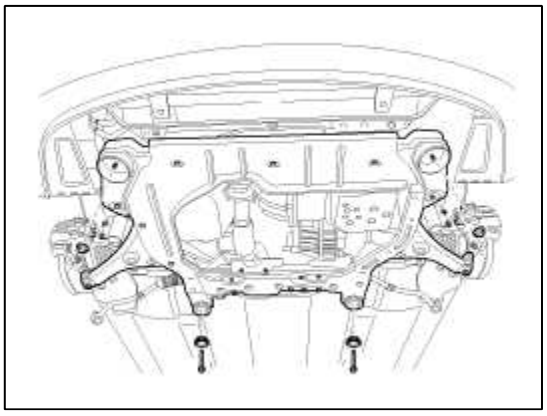
2. Install the bracket on the bushing (B).
3. After tightening the bolts of the bushing bracket temporarily, install the bushing bracket on the opposite side.

Tightening torque :
45 ~ 55 Nm (4.5 ~ 5.5 Kgf·m, 32 ~ 39 lb-ft)

4. Install the six subframe mounting bolts, then the two engine mounting bolts (A,B).

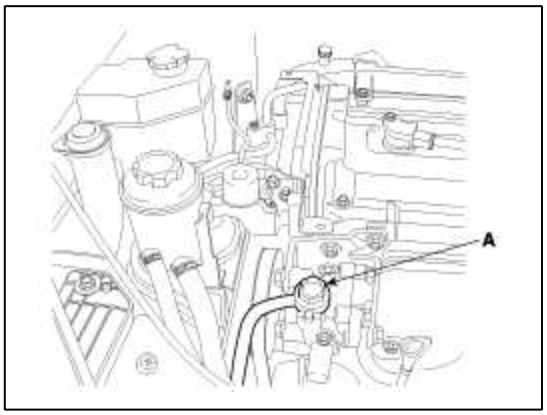
Tightening torque :
Engine mounting ;
50 ~ 65 Nm (5 ~ 6.5 Kgf·m, 36 ~ 47 lb-ft)
Subframe mounting ;
95 ~ 120 Nm (9.5 ~ 12 Kgf·m, 68 ~ 86 lb-ft)



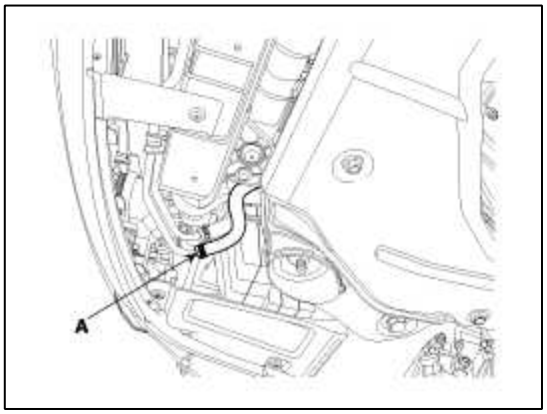


5. Install the pressure pipe mounting bolt (A).

Tightening torque :
55 ~ 65 Nm (5.5 ~ 6.5 Kgf·m, 39 ~ 47 lb-ft)

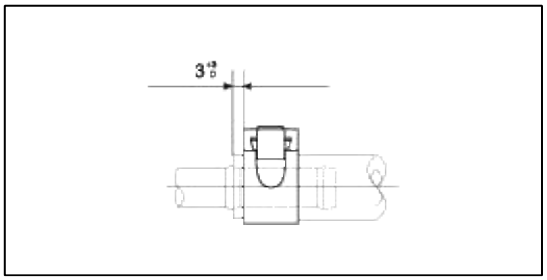


6. Connect between the return tube and hose (A).



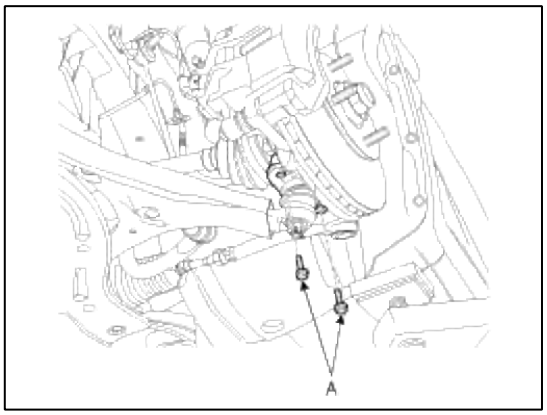
CAUTION

Be sure to connect between a tube and a hose as shown in the illustration.



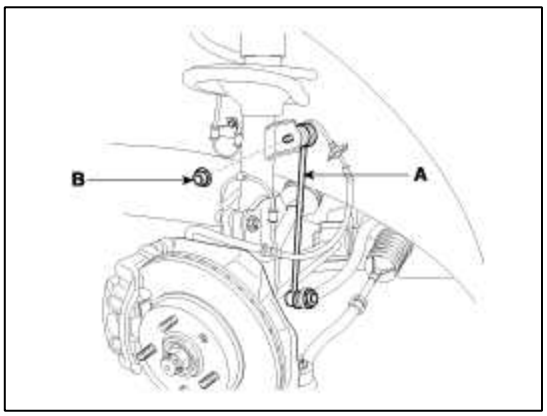
7. Install the two bolts (A) for the lower arm ball joint.

Tightening torque :
100 ~ 120 Nm (10 ~ 12 Kgf·m, 72 ~ 86 lb-ft)



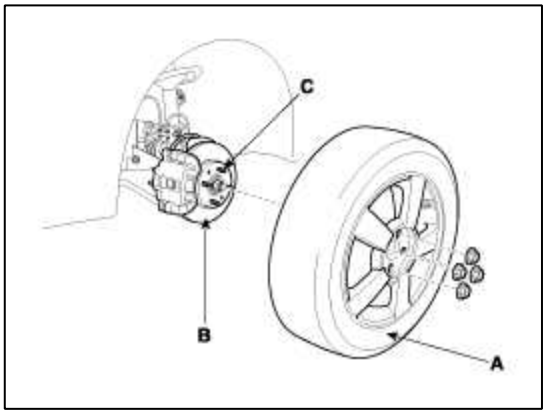
8. Install the nut (B) on the stabilizer bar link (A).

Tightening torque :
35 ~ 45 Nm (3.5 ~ 4.5 Kgf·m, 25 ~ 32 lb-ft)



9. Install the tie rod end on the knuckle.
10. Install the front wheel and tire (A) on thr front hub (B).

Tightening torque :
90 ~ 110 Nm (9 ~ 11 Kgf·m, 65 ~ 79 lb-ft)



CAUTION

Be careful not to do damage the hub bolts (C) then install the front wheel and tire (A).

11. Refill the power steering fluid (PSF-3).

CAUTION

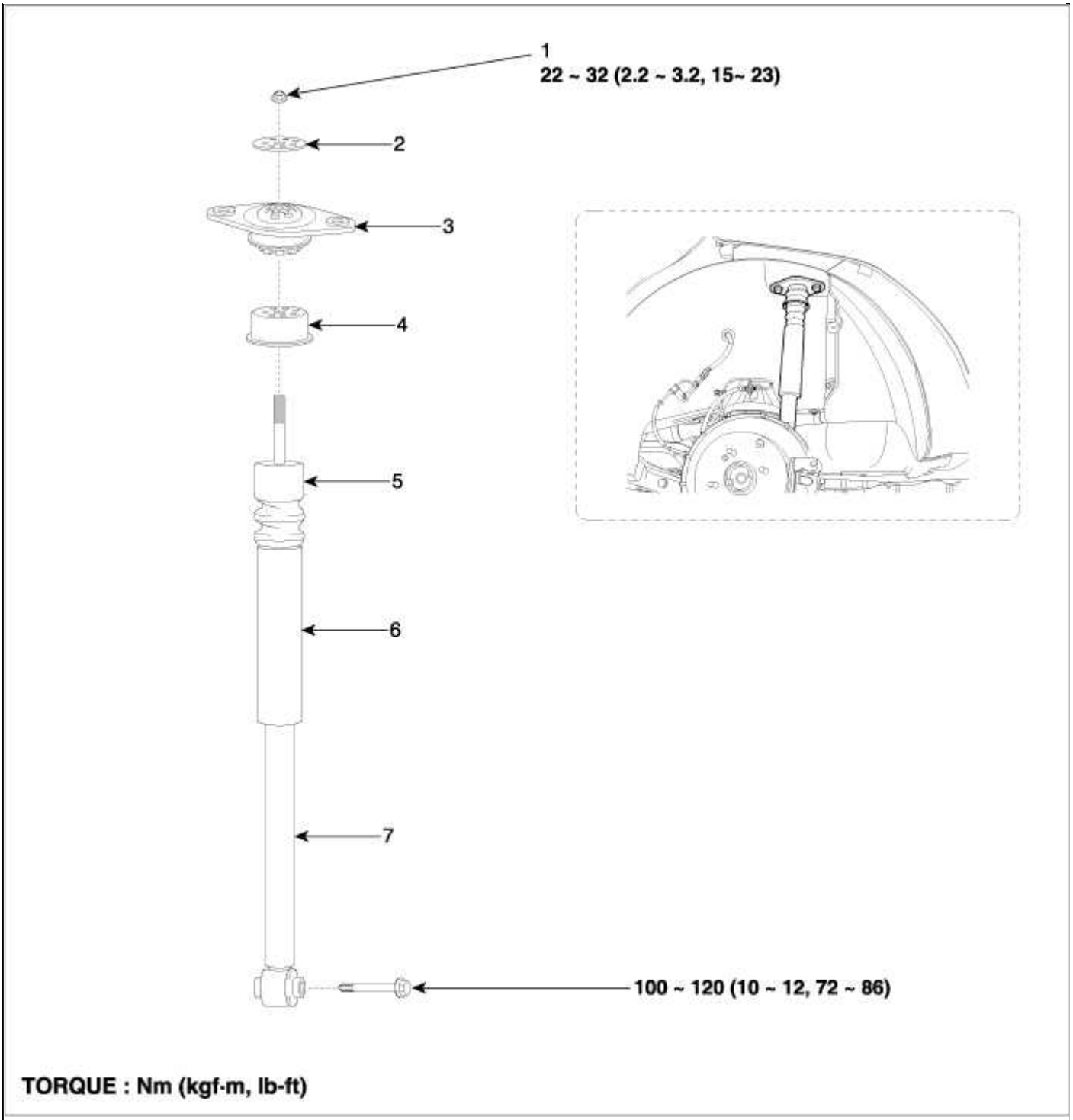
After installation, bleed the air in the power steering system. (refer to ST-10)

INSPECTION

1. Check the stabilizer bar for deterioration and damage.
2. Check all bolts for damage and deformation.
3. Check the stabilizer link dust cover for cracks or damage.

Suspension System > Rear Suspension System > Rear Shock Absorber > Components and Components Location

COMPONENTS

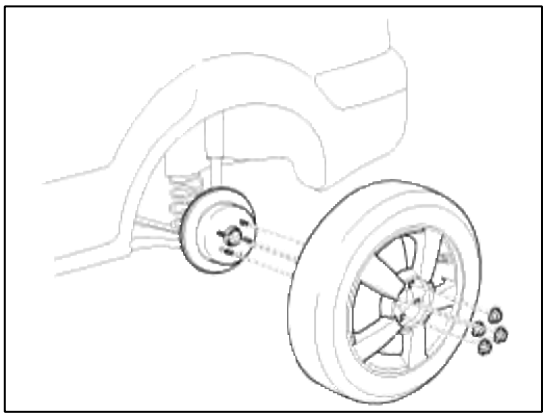


1. Self locking nut
2. Retainer
3. Insulater
4. Upper cup
5. Bumper stopper
6. Dust cover
7. Rear shock absober assembly

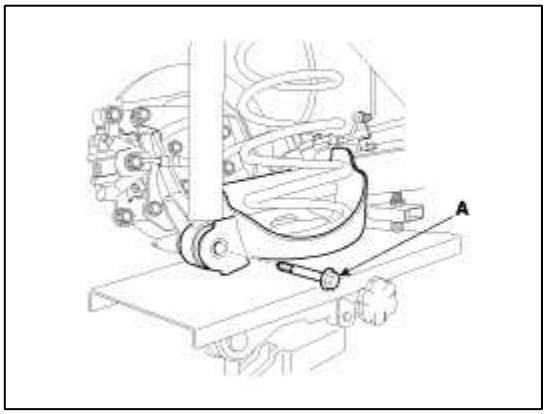
Suspension System > Rear Suspension System > Rear Shock Absorber > Repair procedures

REMOVAL

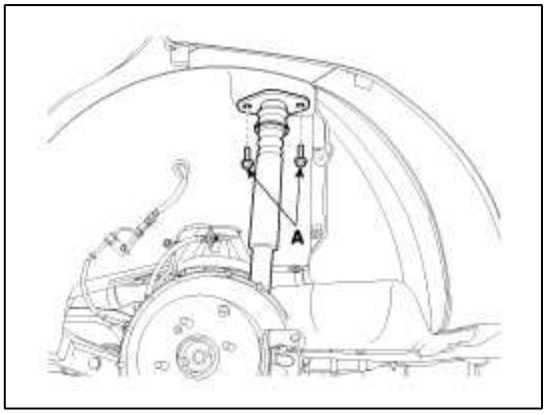
1. Remove the wheel and tire.



2. After supporting the rear torsion axle beam with a jack, remove the rear shock absorber lower mounting bolt. Remove the rear shock absorber.



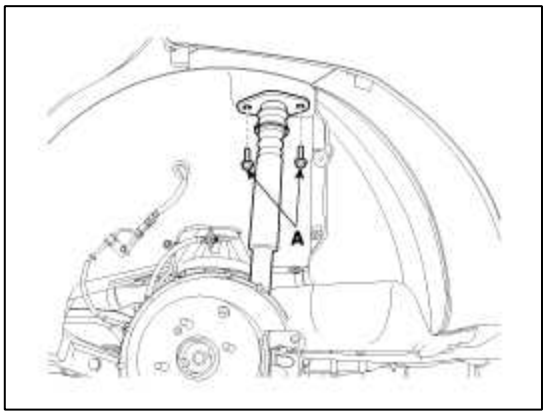
3. Remove the rear shock absorber mounting bolts (A).



INSTALLATION

1. Tighten the rear shock absorber upper mounting bolt to the specified torque as follows.

Specified torque :
40 ~ 60 Nm (4 ~6 kgf·m, 28 ~ 43 lb-ft)

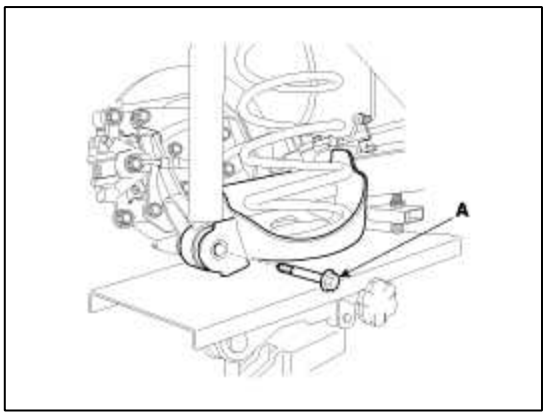


2. After placing a jack at the bottom of the rear torsion axle beam and jacking up the vehicle to the proper location, tighten the rear shock absorber lower mounting bolt (A).

Specified torque :
100 ~ 120 Nm (10 ~ 12 kgf·m, 72 ~ 86 lb-ft)

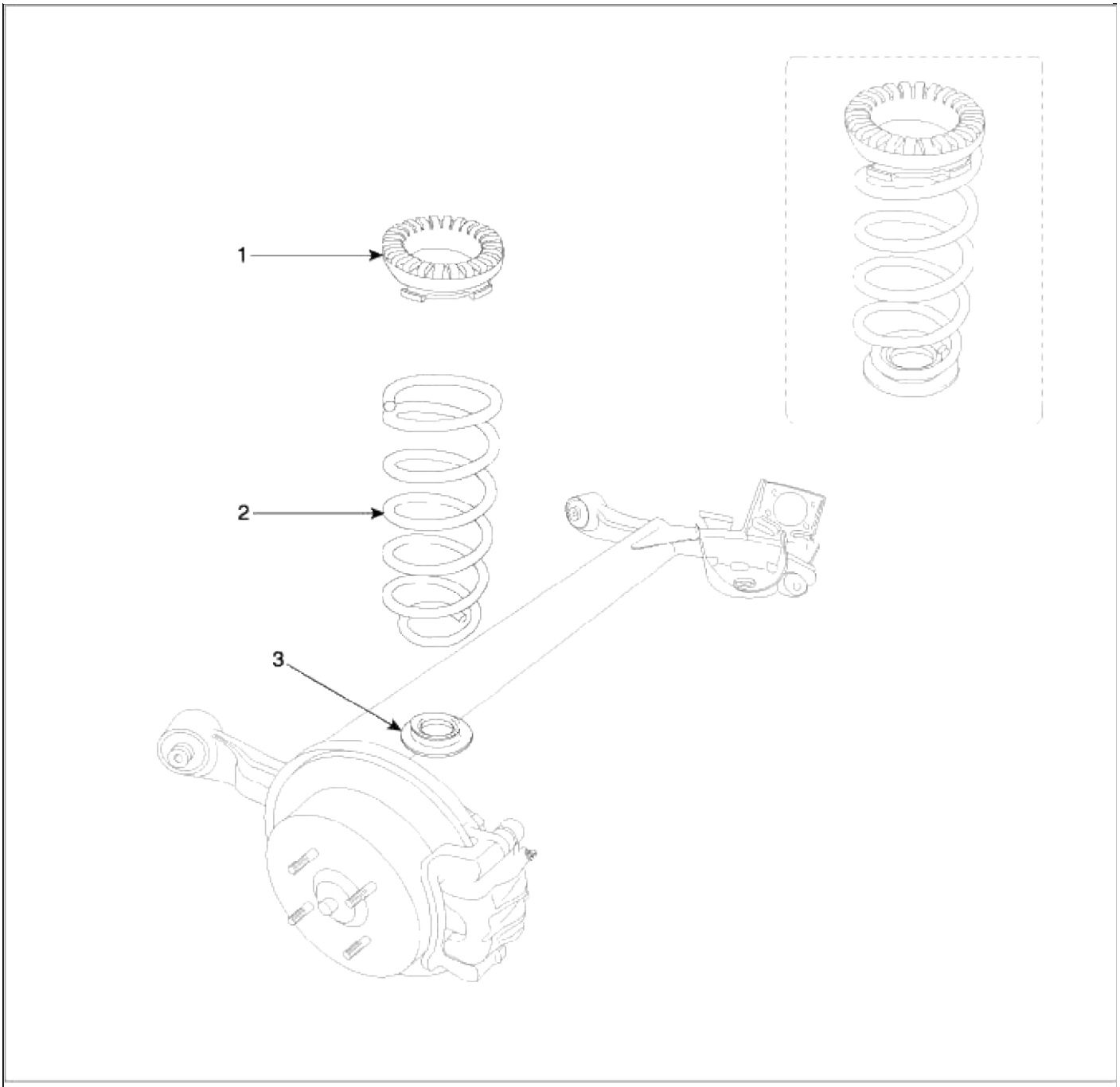
CAUTION

Check that the rear coil spring is located in the proper position.



Suspension System > Rear Suspension System > Rear Coil Spring > Components and Components Location

COMPONENTS

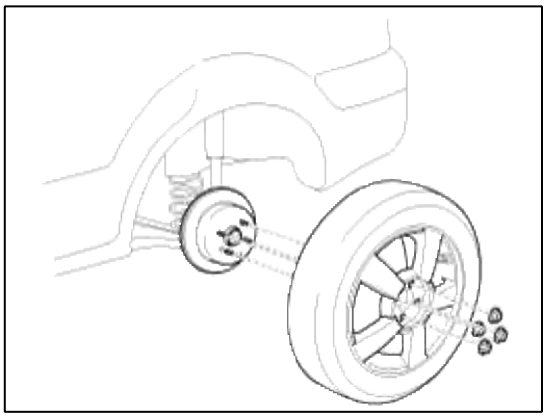


1. Spring upper pad
2. Spring
3. Spring lower pad

Suspension System > Rear Suspension System > Rear Coil Spring > Repair procedures

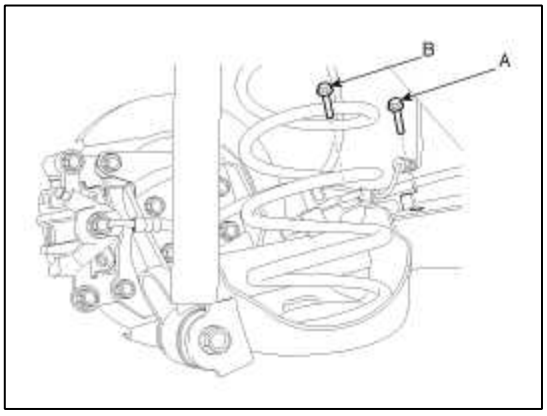
REMOVAL

1. Remove the wheel and tire.

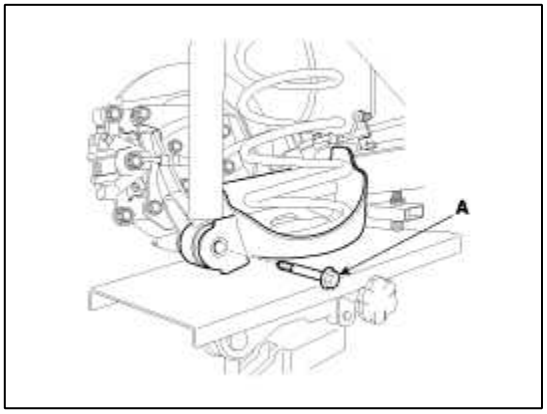


2. Remove the brake hose bracket (B) and the wheel speed sensor wire bracket (A).

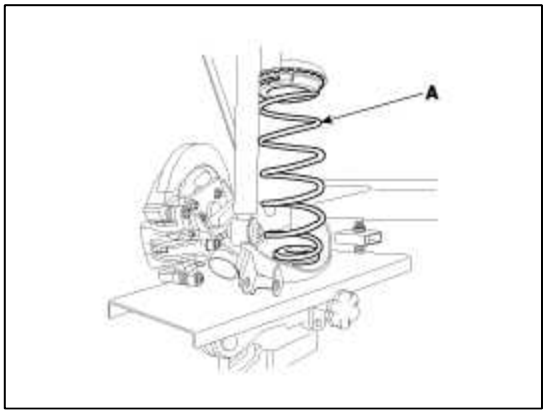
> **CAUTION**
>
> The brake hose should not expand when the rear torsion axle beam is hanged down from the body.



3. After placing a jack at the bottom of the rear torsion axle beam, remove the rear shock absorber lower mounting bolt (A).

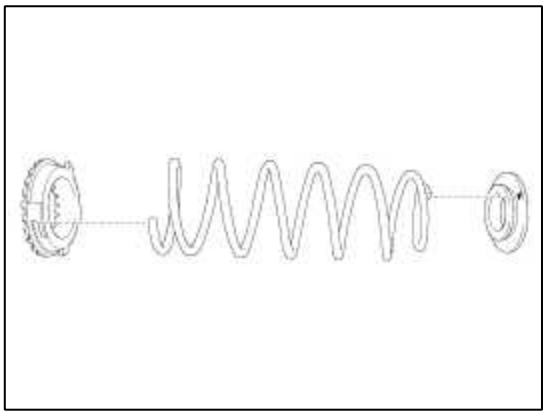


4. Remove the rear coil spring (A).

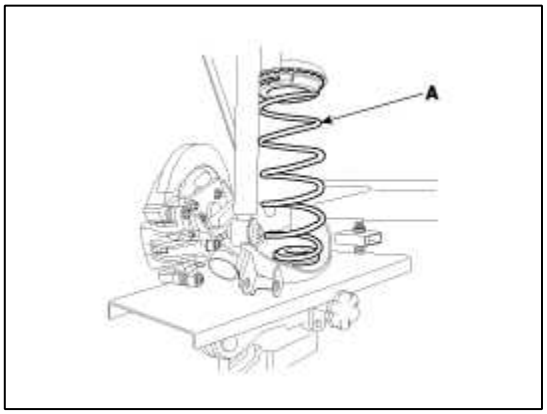


INSTALLATION

1. Install the upper and lower pads on the coil spring by aligning the grooves on the pads.

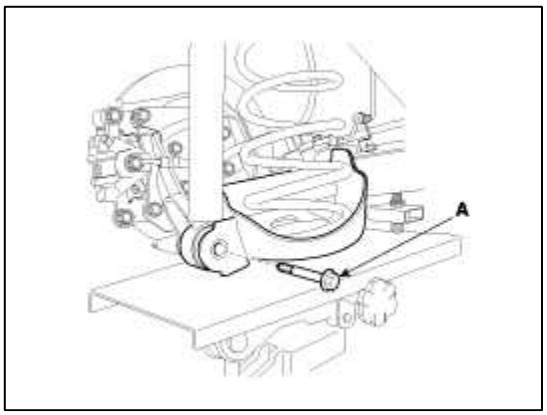


2. Place the coil spring (A) with the pads on the torsion axle beam and support it with a jack.



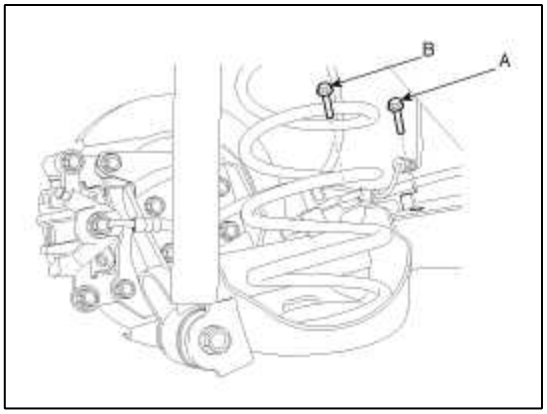
3. Install the rear shock absorber mounting bolt (A) by lifting the rear torsion axle beam.

Tightening torque Nm(kgf·m,lb-ft) :
100 ~ 120 Nm (10 ~12 kgf·m, 72 ~ 86 lb-ft)



4. Install the wheel speed sensor wire bracket bolt (A) and the brake pressure hose bracket bolt (B).

Tightening torque Nm(kgf·m,lb-ft) :
Brake pressure hose bracket ;
9 ~ 14 Nm (0.9 ~1.4 kgf·m, 6 ~ 10 lb-ft)
Speed sensor wire bracket ;
7 ~ 11 Nm (0.7 ~1.1 kgf·m, 5 ~ 7 lb-ft)

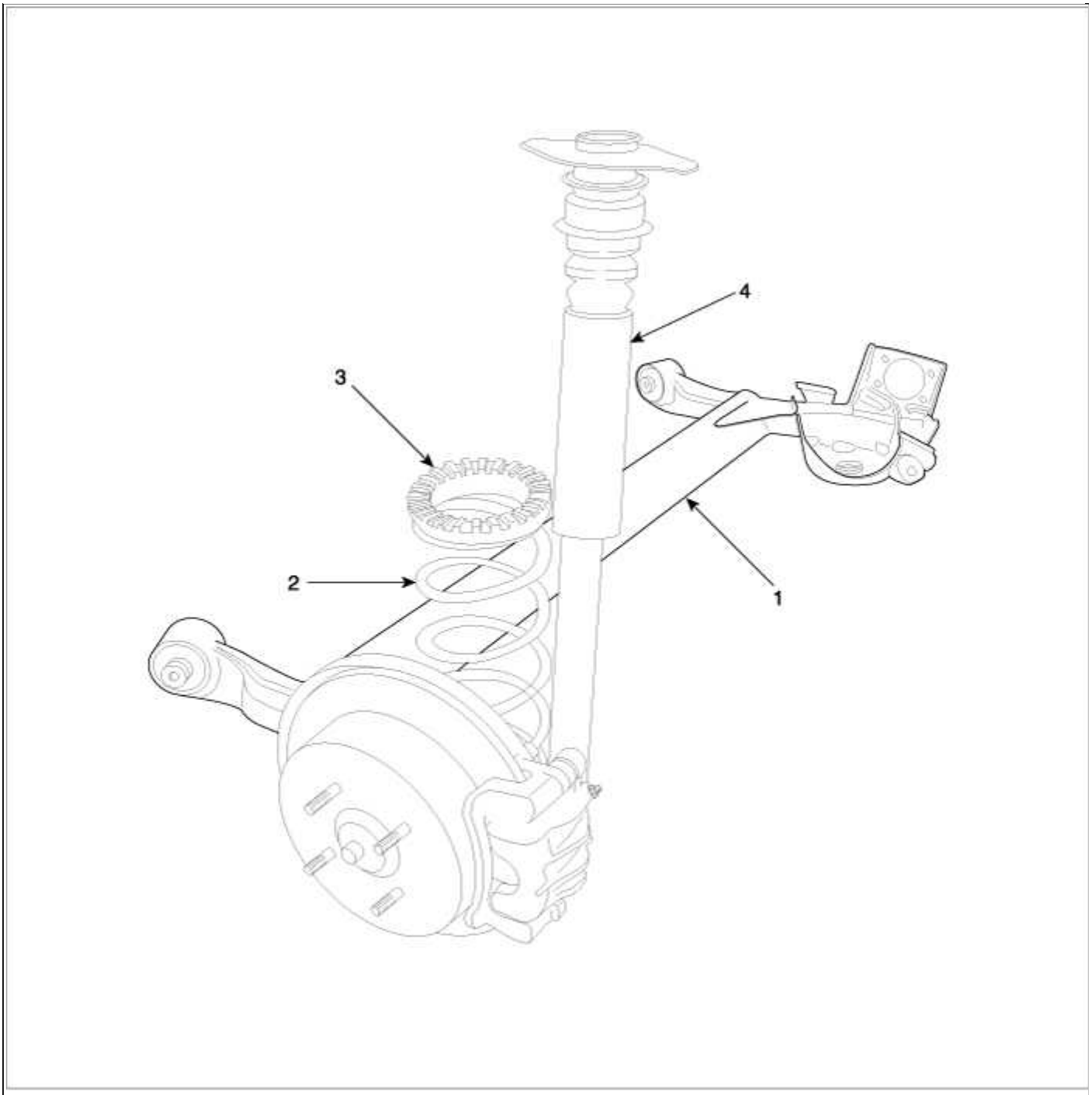


INSPECTION

1. Check the coil spring for crack and deformation.
2. Check the coil spring pad for damage and deformation.

Suspension System > Rear Suspension System > Rear torsion axle beam > Components and Components Location

COMPONENTS

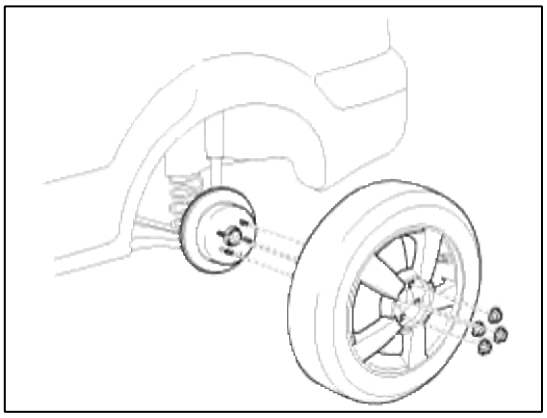


1. Rear torsion beam axle
2. Rear coil spring
3. Uppper pad
4. Rear shock absorber

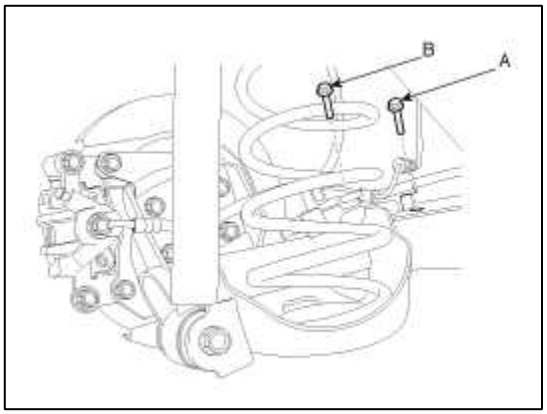
Suspension System > Rear Suspension System > Rear torsion axle beam > Repair procedures

REMOVAL

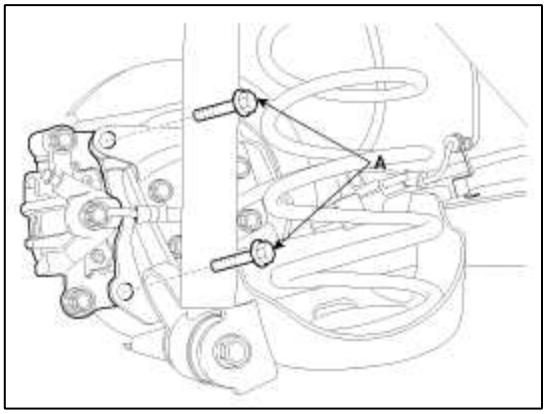
1. Remove the rear tire and wheel.



2. Remove the wheel speed sensor wire bracket bolt (A) and the brake pressure hose bracket bolt (B).

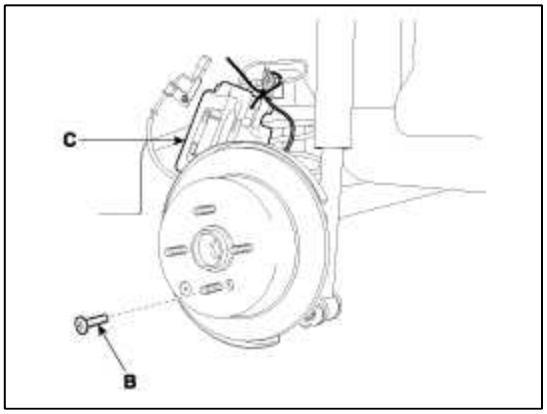


3. Remove the brake caliper assembly bolt (A) and the brake disk mounting screw (B).

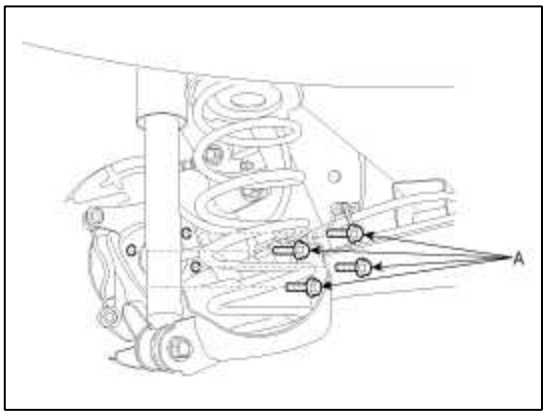


NOTE

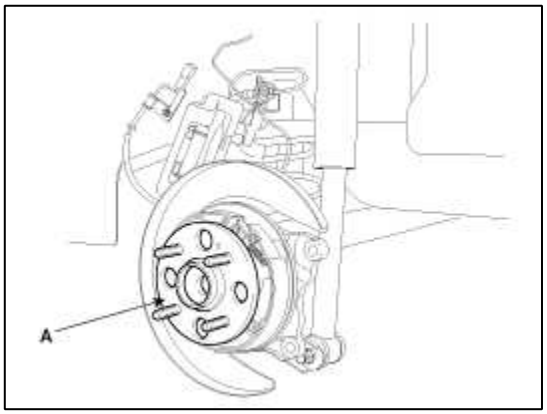
Hang the brake caliper assembly (C) tightly on a proper place with wire.



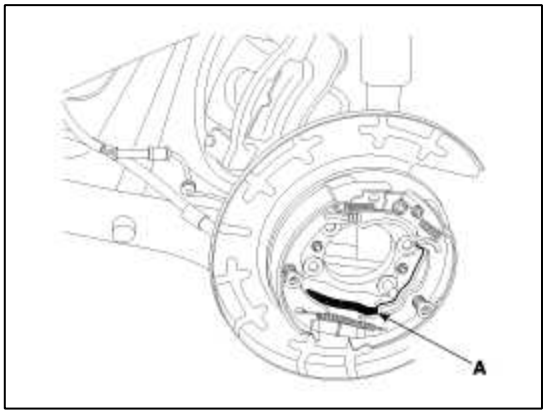
4. Remove the rear hub bearing assembly bolts (A).



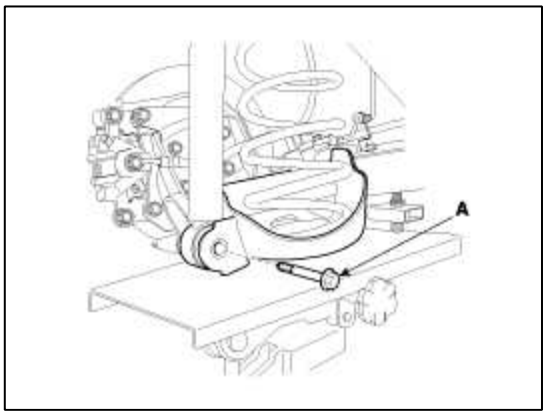
5. Remove the rear hub bearing assembly (A).



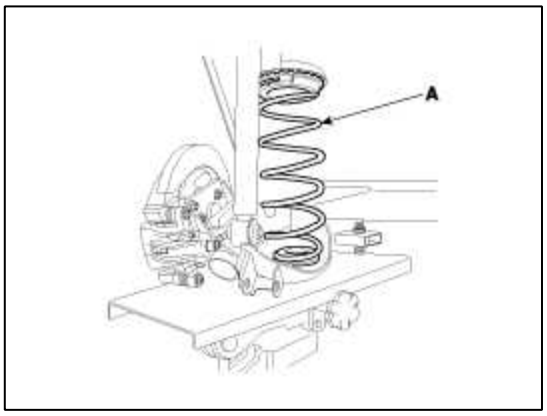
6. Remove the parking brake wire (A).



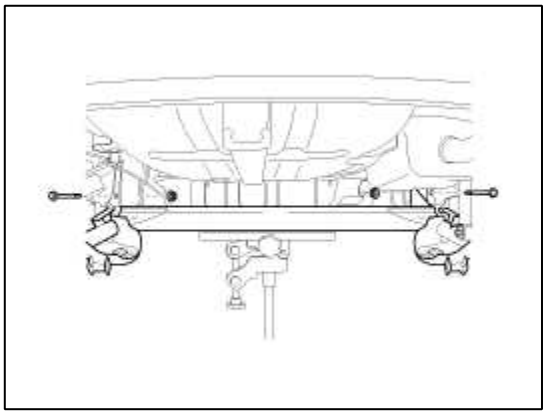
7. Remove the rear shock absorber mounting bolt (A) from the rear torsion axle beam which is supported by a jack.



8. Release the rear coil spring tension by lowering the jack and remove the rear coil spring.



9. Remove the rear torsion axle beam mounting bolts.



INSTALLATION

1. Installation is reverse of removal.
2. Install the following parts with the specified torque.

Items	Tightening Torque Nm(kgf·m,lb-ft)
Rear hub unit bearing mounting bolt	50 ~ 60 (5 ~ 6, 36 ~ 43)
Rear shock absober lower mounting	100 ~ 120 (10 ~ 12, 72 ~ 86)
Rear torsion axle beam mounting bolt	100 ~ 120 (10 ~ 12, 72 ~ 86)
Rear caliper mounting bolt	65 ~ 75 (6.5 ~ 7.5, 47 ~ 54)
Wheel speed sensor wire bracket bolt	7 ~ 11 (0.7 ~ 1.1, 5 ~ 7)
Brake pressure hose bracket bolt	9 ~ 14 (0.9 ~ 1.4, 6 ~ 10)

Suspension System > Tires/Wheels > Tire > Repair procedures

TIRE WEAR

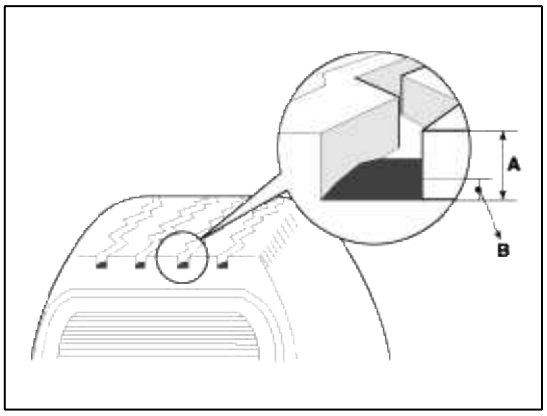
1. Measure the tread depth of the tires.

Tread depth of tire [Limit] : 1.6 mm (0.06 in)

2. If the remaining tread (A) depth is less than the limit, replace the tire.

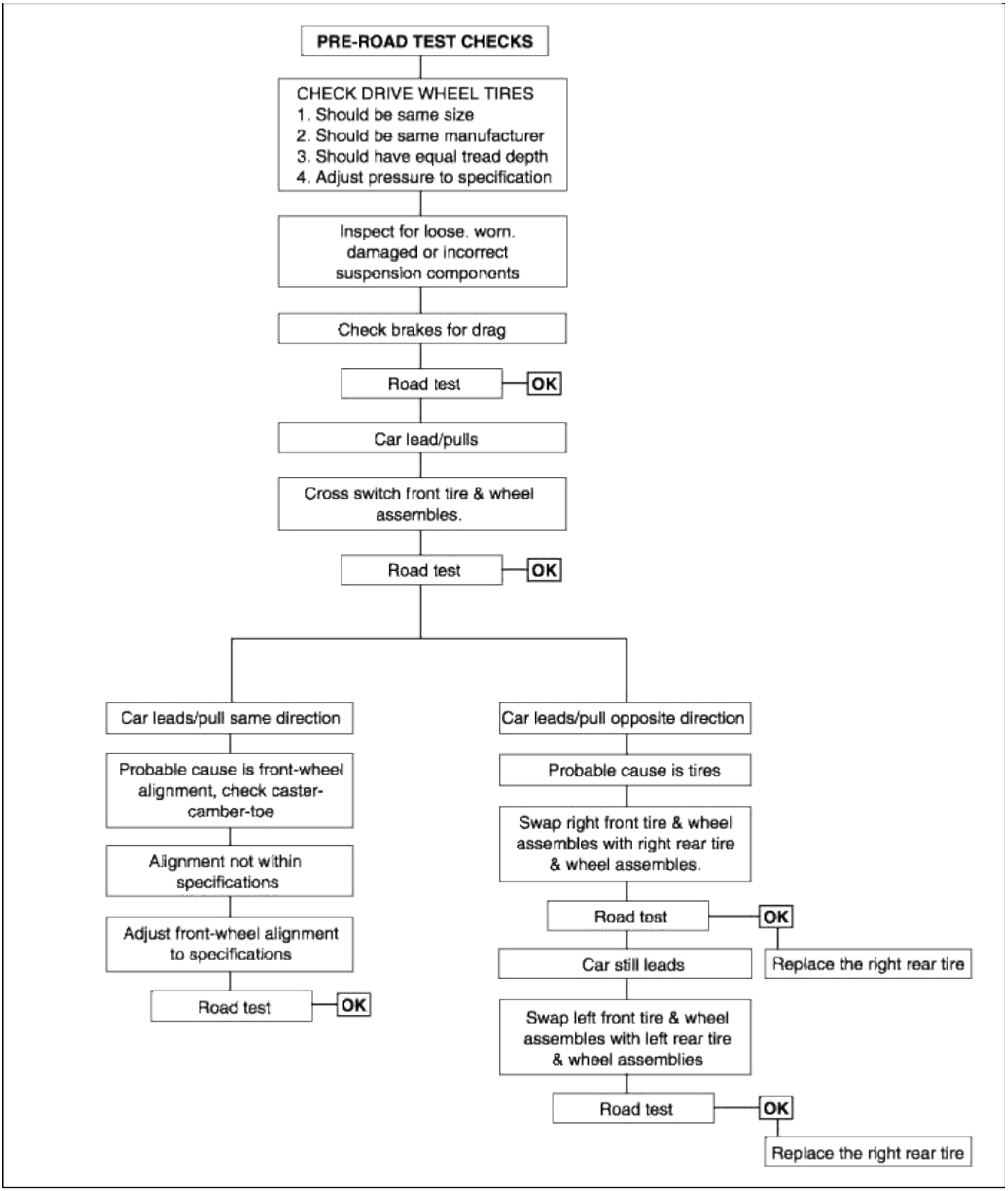
NOTE

When the tread depth of the tires is less than 1.6 mm (0.06 in.), the wear indicators (B) will appear.



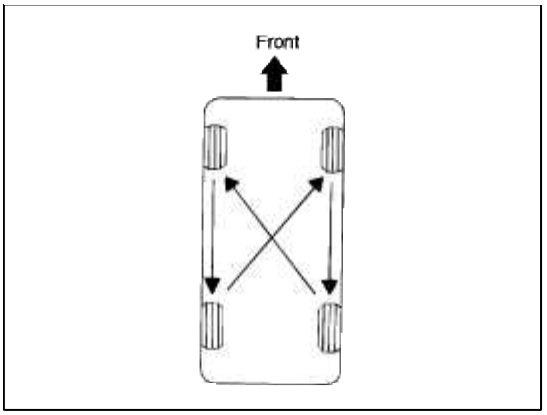
TIRE ROTATION

LEAD/PULL CORRECTION CHART



ROTATION

Rotate the tires in the pattern illustrated.



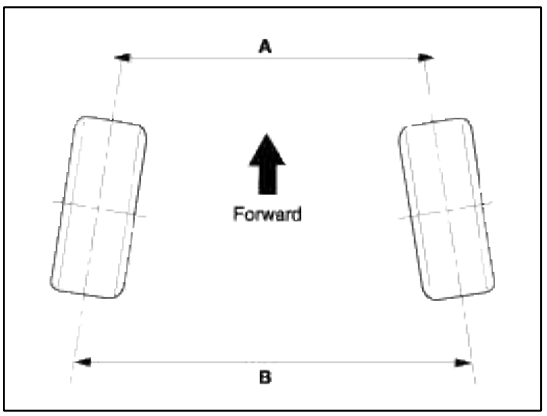
Suspension System > Tires/Wheels > Wheel > Repair procedures

Front Wheel Alignment

When using a commercially-available computerized four wheel alignment equipment (caster, camber, toe) to inspect the front wheel alignment, always position the car on a level surface with the front wheels facing straight ahead. Prior to inspection, make sure that the front suspension and steering system are in normal operating condition and that the wheels and tires facestraight ahead and the tires are inflated to the specified pressure.

Toe

Toe is a measurement of how much the front of the wheels are turned in or out from the straight-ahead position.



ITEM	Description
A-B<0	Positive (+) toe (toe in)
A-B>0	Negative (-) toe (toe out)

When the wheels aree turned in toward the front of the vehicle, toe is positive (+) (toe in). When the wheels are turned out toward the front of the vehicle, toe is negative (-) (toe out). Toe is measured in degrees, from side to side, and totaled.

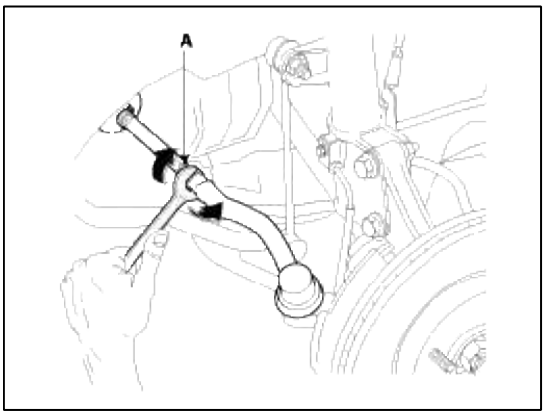
Toe-in(B-A or angle a+b) is adjusted by turning the tie rod turnbuckles. Toe-in on the left front wheel can be reduced by turning the tie rod toward the rear of the car. Toe- in change is adjusted by turning the tie rods for the right and left wheelss simultaneously at the same amount as follows.

Standard value
Toe- in
Total : 0° ± 0.2°
Individual : 0° ± 0.1°

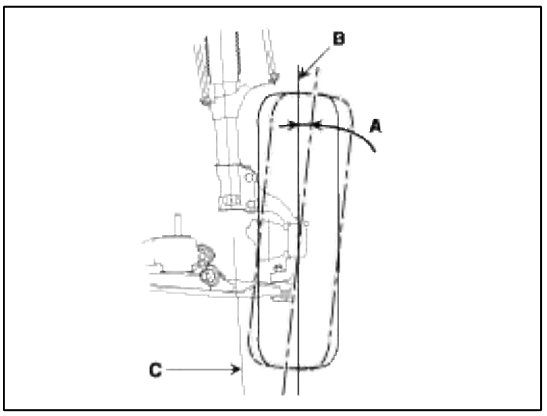
NOTE

- Toe-in adjustment should be made by turning the right and left tie rods at the same amount.
- When adjusting toe-in, loosen the outer bellows clip to prevent twisting the bellows.
- After the adjustment, tighten the tie rod end lock nuts firmly and reinstall the bellows clip.
- Adjust each toe-in to be the range of ±1°.

Tie rod end lock nuts(A) tightening torque :
50 ~ 55 N.m (5 ~ 5.5 kgf.m, 36 ~ 39 lb-ft)



Camber
Camber is the inward or outward tilting of the wheels at the top.



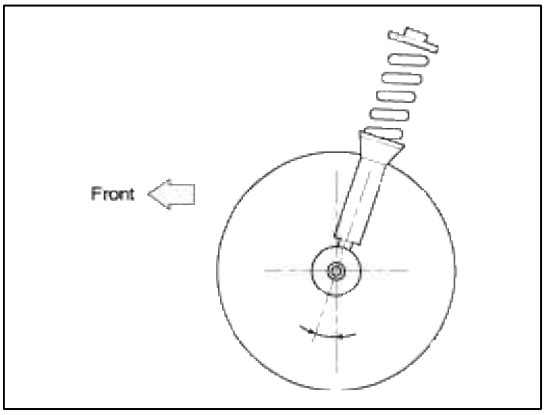
ITEM	Description
A	Positive camber angle
B	True vertical
C	Strut centerline

When the wheel tilts out at the top, then the camber is positive (+).
When the wheel tilts in at the top, then the camber is negative (-).
The stering knuckle which is installed with the strut assembly is pre-set to the specified camber at the factory and doesn't need to be adjusted.

Camber : 0° ± 0.5 °

Caster
Caster is the tilting of the strut axis either forward or backward from vertical. A backward tilt is positive (+) and a forward tilt is negative (-).
Caster is pre-set at the factory and doesn't need to be adjusted. If the caster is not within the standard value, replace the bent or damaged parts.

Caster : 4°±0.5 °



NOTE

- The worn loose or damaged parts of the front suspension assembly must be replaced prior to measuring front wheel alignment.
- Camber and caster are pre-set to the specified value at the factory and don't need to be adjusted.
- If the camber and caster are not within specifications, replace bent or damaged parts.
- The difference of left and right wheels about the camber and the caster must be within the range of 0° ± 0.5°.

Rear Wheel Alignment
Toe-in

Standard value
Toe- in
Total : 0.2° ~ 0.6 °
Individual : 0.1° ~ 0.3°

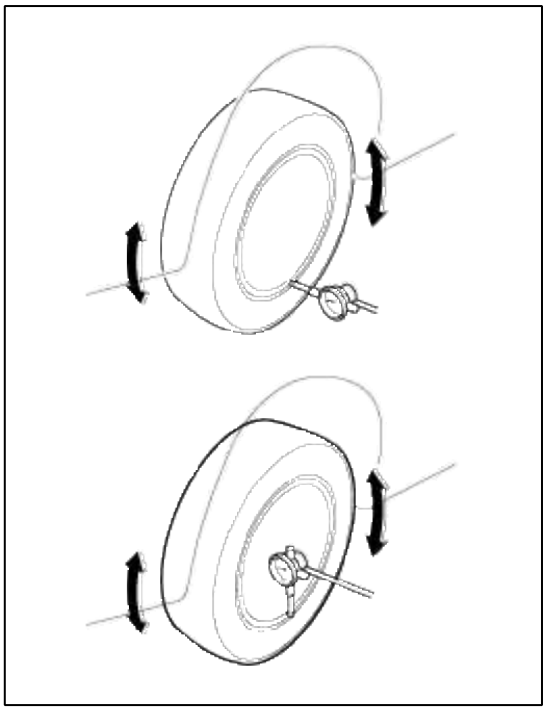
Camber

Standard value
-1° ± 0.5 °

Wheel Runout
1. Jack up the vehicle and support it with jack stands.

2. Measure the wheel runout with a dial indicator as illustrated.
3. Replace the wheel if the wheel runout exceeds the limit.

Limit		Radial	Axial
Runout mm(in)	Aluminium	0.3(0.012)	0.3(0.012)
	Steel	0.9(0.035)	1.4(0.055)



Wheel Nut Tightening

1. Tightening torque.

Tightening torque :
90 ~ 110 N.m (9 ~ 11 kgf.m, 65 ~ 79 lb-ft)

CAUTION

When using an impact gun, final tightening torque should be checked using a torque wrench.

2. Tightening order.
   Check the torque again after tightening the wheel nuts diagonally.

