Specification

Ignition System

Ignition Coil

Item	Specification
Primary Coil Resistance (Ω)	0.62 ± 10% [20°C (68°F)]
Secondary Coil Resistance (kΩ)	7.0 ± 15% [20°C (68°F)]

Spark Plug

Item	Specification
Type	DILKR7A11
Gap	1.0 ~ 1.1 mm (0.0394 ~ 0.0433 in.)

Condenser

Item	Specification
Capacitance (uF)	0.47 [1KHz]
Insulation resistance (MΩ)	1,000 [DC 500 V/1 Min]

Charging System

Alternator

Item	Specification
Rated voltage	13.5V , 150A
Speed in use	1,500 ~ 18,000rpm
Voltage regulator	IC Regulator built in type
Regulator reform mode voltage (V) [COM terminal]	14.0 ~ 15.5 [-35°C(-31°F)]
	14.0 ~ 15.0 [25°C(77°F)]
	13.1 ~ 15.0 [140°C(284°F)]
Regulator Setting Voltage (V) [COM terminal]	11.6 ~ 15.4

Battery

▷ AGM 105L-DIN

Item	Specification
Capacity [20HR/5HR] (AH)	105/84
Cold Cranking Amperage (A)	950 (SAE) /640 (EN)
Reserve Capacity (Min)	190

Information

- Model type description

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- Battery type notation : □□□ □□ □ - □□□
  ① ② ③ ④

  ① : Battery specification
  - CMF : Closed Maintenance Free
  - MF : Maintenance Free
  - AGM : Absorbent Glass Mat

  ② : Battery capacity (20HR)
  - 68 : 68AH

  ③ : Terminal location
  - L : Positive terminal is left
  - R : Positive terminal is right

  ④ : Battery type
  - DIN: Deutsche Industric Normen
  - BCI: Battery Council International

- Cold Cranking Ampere (CCA): Cold Cranking Amps is a rating used in the battery industry to define a battery's ability to start an engine in cold temperatures.
- The rating is the number of amps a new, fully charged battery can deliver at -18 °C(-0.4 °F) for 30 seconds, while maintaining a voltage of at least 7.2 volts for a 12 volt battery.
- The higher the CCA rating, the greater the starting power of the battery.
- RESERVE CAPACITY (RC) : Reserve Capacity is a battery industry rating, defining a battery's ability to power a vehicle with an inoperative alternator or fan belt.
- The rating is the number of minutes a battery at 26.7 °C(80 °F) can be discharged at 25 amps and maintain a voltage of 10.5 volts for a 12 volt battery.
- The higher the reserve rating, the longer your vehicle can operate should your alternator or fan belt fail.

Starting System

Starter

Item		Specification
Rated voltage		12 V, 1.7 kW
The number of pinion teeth		13
Performance [No-load, 11.5 V]	Ampere	Max. 85 A
	Speed	Min. 2,550 rpm

Smart Cruise Control System

Smart Cruise Control Unit

Item	Specification
Power supply (V)	12
Operation voltage (V)	9 ~ 16

Tightening Torques

Item	N.m	kgf.m	lb-ft
Ignition coil mounting bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Spark plug	14.7 ~ 24.5	1.5 ~ 2.5	10.9 ~ 18.1
Condenser & Hanger bracket mounting bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Alternator B-terminal cable nut	9.8 ~ 14.7	1.0 ~ 1.5	7.2 ~ 10.8
Alternator mounting bolt	26.5 ~ 33.3	2.7 ~ 3.4	19.5 ~ 24.6
Battery (+) terminal tightening nut	7.8 ~ 9.8	0.8 ~ 1.0	5.2~ 8.7
Battery (-) terminal tightening nut	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Battery mounting bracket bolt	8.8 ~13.7	0.9 ~1.4	6.5 ~10.1
Battery tray mounting bolt	8.8 ~13.7	0.9 ~1.4	6.5 ~10.1
Battery sensor cable mounting bolt	10.8 ~13.7	1.1 ~ 1.4	8.0 ~10.1
Starter mounting bolt	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Starter cover mounting bolt	8.8 ~ 13.7	0.9 ~ 1.4	6.5 ~ 10.1

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Special Service Tools

Tool Name / Number	Illustration	Description
Digital Level [SCC Setting JIG] 0K964-3T000		Smart Cruise Control (SCC) Unit radar sensor alignment

Engine Electrical System

Troubleshooting

Ignition System

Symptom	Suspect Area	Remedy
Engine will not start or is hard to start (Cranks OK)	Ignition lock switch	Inspect ignition lock switch, or replace as required
	Ignition coil	Inspect ignition coil, or replace as required
	Spark plugs	Inspect spark plugs, or replace as required
	Ignition wiring disconnected or broken	Repair wiring, or replace as required
Rough idle or stalls	Ignition wiring	Repair wiring, or replace as required
	Ignition coil	Inspect ignition coil, or replace as required
Engine hesitates/poor acceleration	Spark plugs and spark plug cables	Inspect spark plugs / cable, or replace as required
	Ignition wiring	Repair wiring, or replace as required
Poor mileage	Spark plugs and spark plug cables	Inspect spark plugs / cable, or replace as required

Charging System

Symptom	Suspect Area	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off.	Fuse blown	Check fuses
	Light burned out	Replace light
	Wiring connection loose	Tighten loose connection
	Electronic voltage regulator	If light turns off, replace voltage regulator.
Charging warning indicator does not go out with engine running. (Battery requires frequent recharging)	Drive belt loose or worn	Adjust belt tension or replace belt
	Battery cable loose, corroded or worn	Inspect cable connection, repair or replace cable
	Electronic voltage regulator or alternator	If light turns off, replace voltage regulator or alternator
	Wiring	Repair or replace wiring
Overcharge	Electronic voltage regulator	If light turns off, replace voltage regulator.
	Voltage sensing wire	Repair or replace wiring
Discharge	Drive belt loose or worn	Adjust belt tension or replace belt
	Wiring connection loose or short circuit	Inspect wiring connection, repair or replace wiring
	Electronic voltage regulator or alternator	If light turns off, replace voltage regulator or alternator
	Poor grounding	Inspect ground or repair
	Worn battery	Replace battery

Starting System

Symptom	Suspect Area	Remedy
Engine will not crank	Battery charge low	Charge or replace battery

	Battery cables loose, corroded or worn out	Repair or replace cables
	Transaxle range switch (Vehicle with automatic transaxle only)	Refer to AT group-automatic transaxle
	Fuse blown	Replace fuse
	Starter motor faulty	Replace
	Ignition switch faulty	Replace
Engine cranks slowly	Battery charge low	Charge or replace battery
	Battery cables loose, corroded or worn out	Repair or replace cables
	Starter motor faulty	Replace
Starter keeps running	Starter motor faulty	Replace
	Ignition switch	Replace
Starter spins but engine will not crank	Short in wiring	Repair or replace wiring
	Pinion gear teeth broken or starter motor	Replace
	Ring gear teeth broken	Replace fly wheel or torque converter

Engine Electrical System

Description

The charging system included a battery, an alternator with a built-in regulator, and the charging indicator light and wire.

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.

Alternator Management System

Alternator management system controls the charging voltage set point in order to improve fuel economy, manage alternator load under various operating conditions, keep the battery charged, and protect the battery from over-charging. ECM controls generating voltage by duty cycle (charging control, discharging control, normal control) based on the battery conditions and vehicle operating conditions.

The system conducts discharging control when accelerating a vehicle. Vehicle reduces an alternator load and consumes an electric power form a battery.

The system conducts charging control when decelerating a vehicle. Vehicle increases an alternator load and charges a battery.

Engine Electrical System

On-vehicle Inpection

Information

- First of all, check for DTCs. If a DTC is present, perform troubleshooting in accordance with the procedure for that DTC. (Refer to DTC guide)

CAUTION

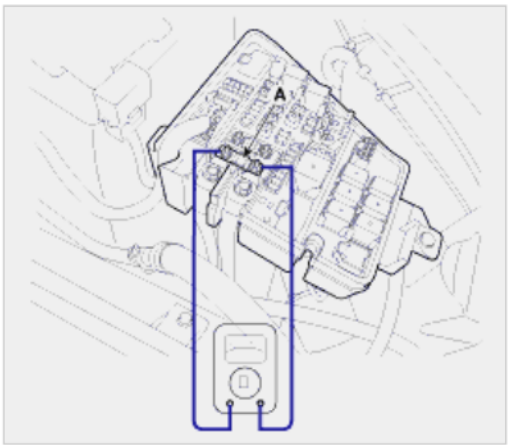
- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Never disconnect the battery while the engine is running.

[General Inspection]

1. Check that the battery terminals are not loose or corroded. (Refer to Charging System - "Battery")
2. Check the fuses for continuity.

Alternator Fuse

(1) Check the alternator fuse for continuity (A).

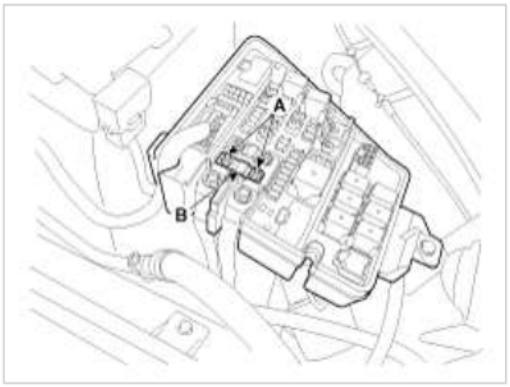


(2) If the alternator fuse blown, below replace the alternator fuse.

A. Turn ignition switch OFF and disconnect the battery negative (-) terminal.

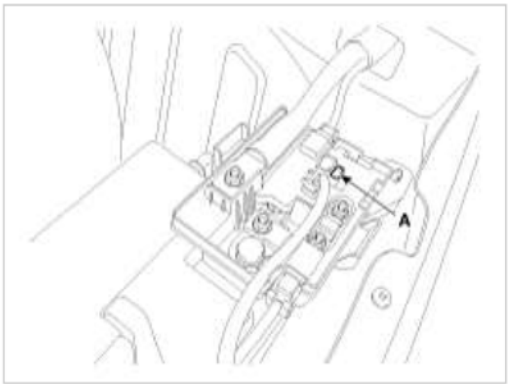
B. Remove the battery positive (+) cable mounting nuts (A).

C. Replace the norminal alternator fuse (B).



Battery Sensor Fuse

(1) Check the battery sensor fuse for continuity (A).



(2) If the alternator fuse blown, replace the battery sensor fuse.

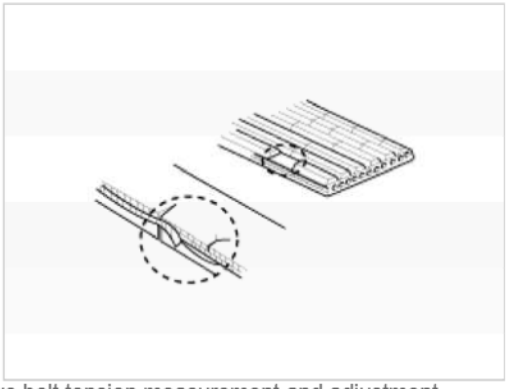
3. Inspect Drive Belt

(1) Visually check the belt for excessive wear, frayed cords etc.
If any defect has been found, replace the drive belt.

NOTICE

- Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.

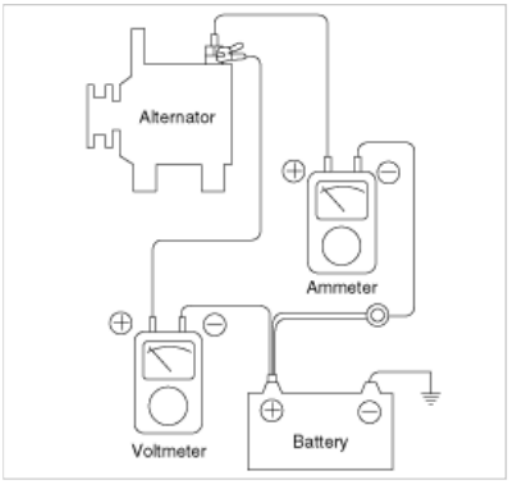
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4. Drive belt tension measurement and adjustment.
   (Refer to Engine Mechanical System - "Drive Belt")
5. Visually Check Alternator Wiring And Listen For Abnormal Noises
   (1) Check that the wiring is in good condition.
   (2) Check that there is no abnormal noise from the alternator while the engine is running.
6. 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.

[Electrical Specified Value Inspection]

1. 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.
   (1) Preparation
      A. Turn the ignition switch to "OFF".
      B. 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.



   (2) Test
      A. Start the engine.
      B. 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.
   (3) Result
      A. The voltmeter may indicate the standard value.

Standard value : 0.2V max

      B.

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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.

C. Upon completion of the test, set the engine speed at idle.
Turn off the headlamps, blower motor and the ignition switch.

2. Output Current Test

This test determines whether or not the alternator gives an output current that is equivalent to the normal output.

(1) Preparation

A. 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".

B. Turn off the ignition switch.

C. Disconnect the battery ground cable.

D. Disconnect the alternator output wire from the alternator "B" terminal.

E. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the ammeter to the disconnected output wire.

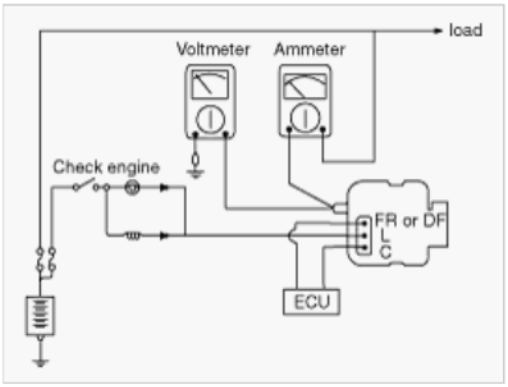
NOTICE

- Tighten each connection securely, as a heavy current will flow. Do not rely on clips.

F. 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.

G. Attach an engine tachometer and connect the battery ground cable.

H. Leave the engine hood open.



(2) Test

A. 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.

B. Start the engine and turn on the headlamps.

C. 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.

NOTICE

- 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.

(3) Result

A. 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 :60% of the voltage rate

NOTICE

- The nominal output current value is shown on the nameplate affixed to the alternator body.
- The output current value changes with the electrical load and the temperature of the alternator itself.
Therefore, the nominal output current may not be obtained. If such is the case, keep the headlamps on the cause discharge of the battery, or use the lights of another vehicle to increase the electrical load.
-

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> 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.

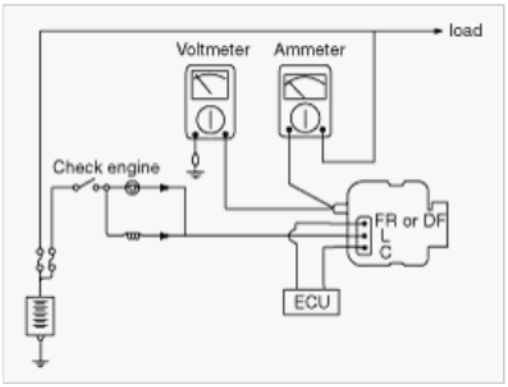
B. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
C. Disconnect the battery ground cable.
D. Remove the ammeter and voltmeter and the engine tachometer.
E. Connect the alternator output wire to the alternator "B" terminal.
F. Connect the battery ground cable.

3. Regulated Voltage Test

The purpose of this test is to check that the electronic voltage regulator controls voltage correctly.

(1) Preparation

A. 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".
B. Turn ignition switch to "OFF".
C. Disconnect the battery ground cable.
D. 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.
E. Disconnect the alternator output wire from the alternator "B" terminal.
F. 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.
G. Attach the engine tachometer and connect the battery ground cable.



(2) Test

A. 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.
B. Start the engine. Keep all lights and accessories off.
C. 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

(3) Result

A. If the voltmeter reading dosen't agree with the standard value, the voltage regulator or the alternator is faulty.
B. Upon completion of the test, reduce the engine speed to idle, and turn off the ignition switch.
C. Disconnect the battery ground cable.
D. Remove the voltmeter and ammeter and the engine tachometer.
E. Connect the alternator output wire to the alternator "B" terminal.
F. Connect the battery ground cable.

Engine Electrical System

Specification

Item	Specification
Rated voltage	13.5V , 150A
Speed in use	1,500 ~ 18,000rpm

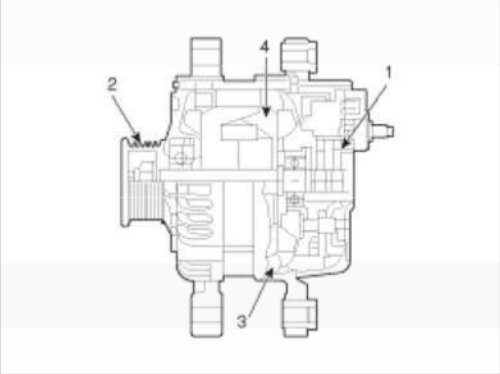
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Voltage regulator	IC Regulator built in type
Regulator reform mode voltage (V) [COM terminal]	14.0 ~ 15.5 [-35°C(-31°F)] 14.0 ~ 15.0 [25°C(77°F)] 13.1 ~ 15.0 [140°C(284°F)]
Regulator Setting Voltage (V) [COM terminal]	11.6 ~ 15.4

Engine Electrical System

Description

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.

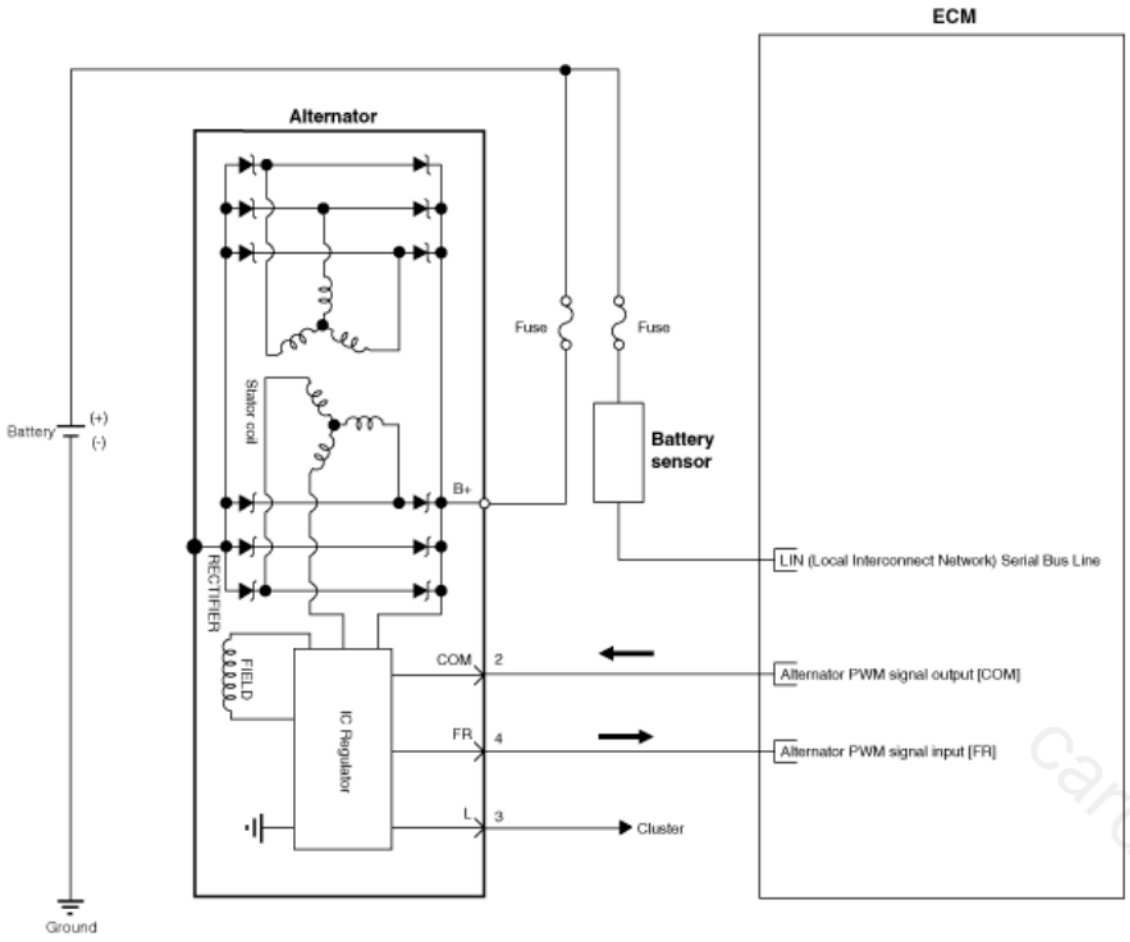


1. Brush
2. Drive belt pulley
3. Rotor
4. Stator

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Engine Electrical System

Circuit Diagram



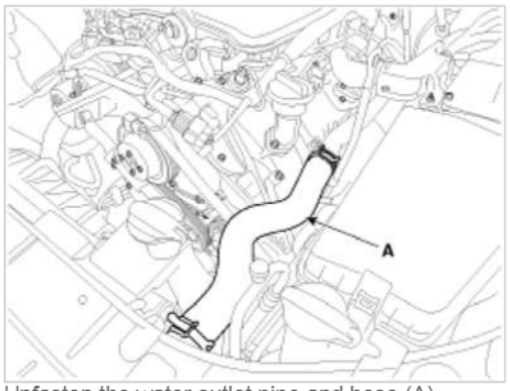
Information

- **COM signal**
  - When controlling the voltage generated, the ECM sends the target voltage data to the alternator via a PWM signal.(High voltage: 4V or higher, low voltage: 2V or lower)
- **FR signal -**
  The transistor activation signal inside thealternator monitors the voltage generated by thealternator to control the field current before itsends the FR signal to the ECM. (At certain RPM/electric loads, the FR duty can remain static. However, more often, the RPM, electric load, target voltage, etc. are always changing in the vehicle, so the FR must also change constantly)
- **L signal -**
  Turns on the battery warning lamp on the dashboard when the battery charging system malfunctions. (Conditions for turning on the lamp - overcharge, over discharge, a field coil blown inside the alternator)
- **B+ terminal -**The output voltage from the generator travels to the battery via the B+ terminal.

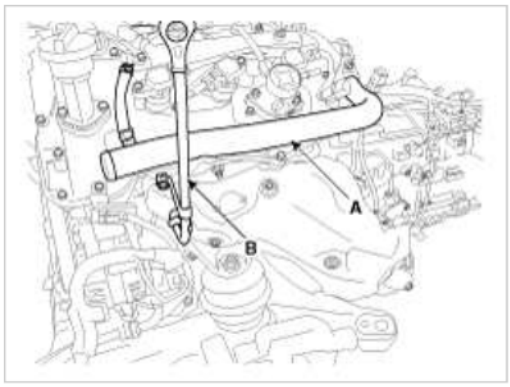
Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the engine cover.
3. Disconnect the radiator upper hose (A).

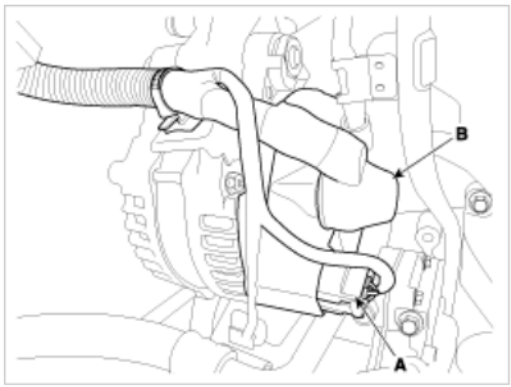
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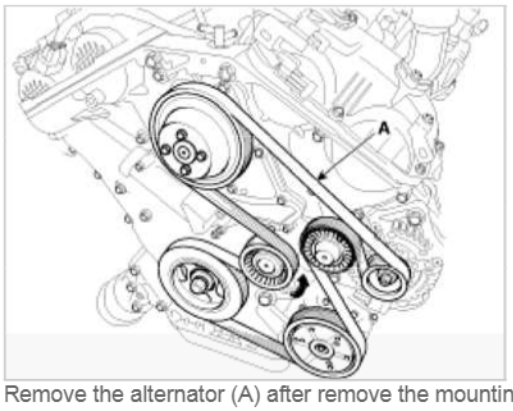
4. Unfasten the water outlet pipe and hose (A).
5. Remove the oil level gage pipe (B).



6. Disconnect the alternator connector (A) and cable (B) from the 'B' terminal.

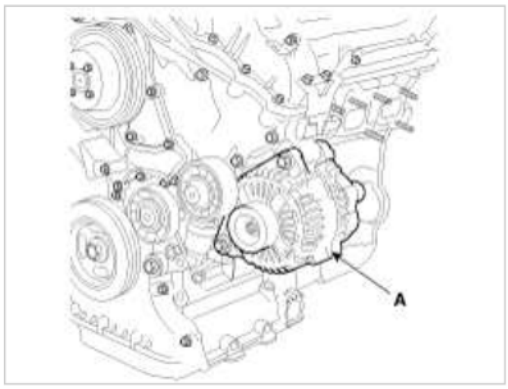


7. To release the tension, turn the drive belt tensioner counterclockwise then remove the drive belt (A).



8. Remove the alternator (A) after remove the mounting bolts.

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Installation

1. Install in the reverse order of removal.
2. Adjust the alternator belt tension after installation.
   (Refer to Engine Mechanical System - "Drive Belt")

Alternator installation bolt:
26.5 ~ 33.3 Nm (2.7 ~ 3.4 kgf.m, 19.5 ~ 24.6 lb-ft)

3. Fill the coolant.

Engine Electrical System

Specifications

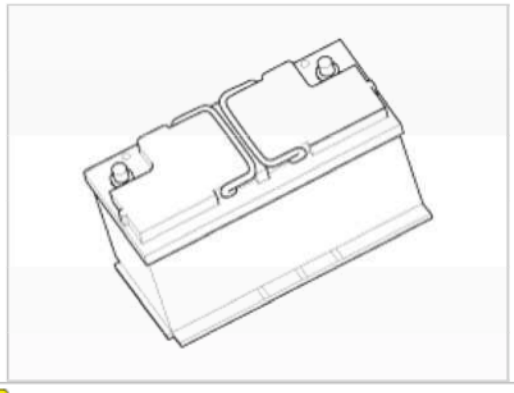
▷ AGM105L-DIN

Item	Specification
Capacity [20HR/5HR] (AH)	105/84
Cold Cranking Amperage (A)	950 (SAE) /640 (EN)
Reserve Capacity (Min)	190

Engine Electrical System

Description

1. The CMF(Closed Maintenance Free) battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
2. The CMF(Closed Maintenance Free) battery does not require water replenishment for the repair.
3. The battery is completely sealed, except for small vent holes in the cover.



Information

- After disconnecting then reconnecting the battery negative cable, reset some parts that require the reset procedures.
  (Refer to Body Electrical System - "General Information")

[AGM Battery]

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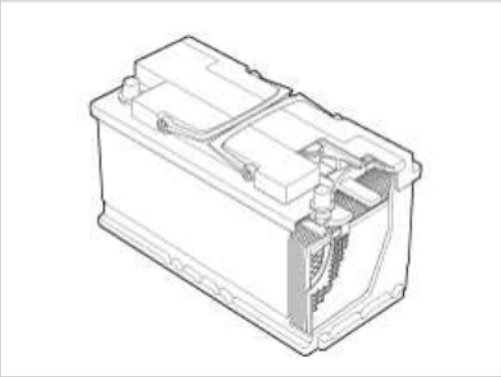
AGM battery is used for especially heavy load on the vehicle network depending on equipment and requirements. AGM stands for Absorbent Glass Material Battery; that is absorbent glass fibre fleece. AGM batteries are fitted in models with electrical loads/consumers which have a high energy demand.

The constantly increasing energy demand of modern vehicle electrical systems calls for ever more powerful battery solutions.

The power consumption is considerable even when the vehicle is parked.

The somewhat higher price compared with a battery of similar size is fully balanced by the following benefits:

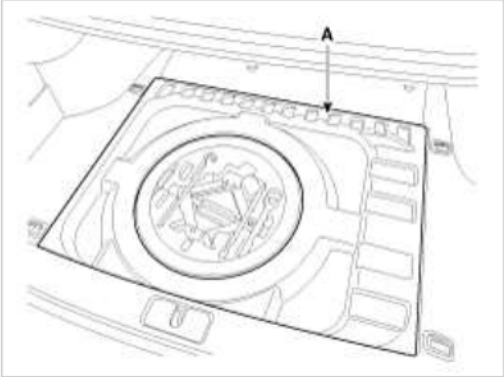
- Significantly longer service life
- Increased starting reliability at low temperatures
- 100 % freedom from maintenance
- Low risk in event of an accident (reduced risk to the environment)



Engine Electrical System

Removal

1. Open the trunk.
2. Remove the luggage under cover (A).



3. Turn ignition switch OFF.
4. Disconnect the battery sensor connector (A) and disconnect the negative (-) battery terminal.

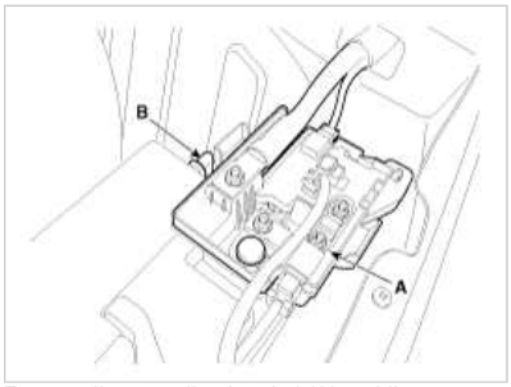


5. Open the battery positive (+) terminal cover (A).

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6. Disconnect the battery positive (+) terminal (A).
7. Disconnect the vent hose connector (B) from the battery air vent hole.



8. Remove the mounting bracket (A) and then remove the battery (B).



Installation

1. Install in the reverse order of removal.

Battery negative (-)terminal tightening nut:
4.0 ~ 6.0 N.m (0.4 ~ 0.6 kgf.m, 3.0 ~ 4.4 lb-ft)
Battery positive (+)terminal tightening nut:
7.8 ~ 9.8 N.m (0.8 ~ 1.0 kgf.m, 5.8 ~ 7.2 lb-ft)
Battery mounting bracket bolt:
8.8 ~ 13.7 N.m (0.9 ~ 1.4 kgf.m, 6.5 ~ 10.1 lb-ft)

NOTICE

- When installing the battery, fix the mounting bracket on the tray correctly.

Adjustment

Battery Charging

In general, vehicle battery charging system has three forms.

1.

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Constant current charge: The battery voltage gradually rises by charging with setting a constant current. If charging current and time are not managed correctly, the battery is over-charged, therefore charging should be stopped after confirming the completion of charging.

A. General charge: Charging the battery for a long time with low current

B. Quick charge: Charging the battery for a short time with high current

2. Constant voltage charge: The battery charge current is gradually reduced by charging with setting a constant voltage.
3. Constant current-Constant voltage charge: Charging with constant current and voltage to protect the battery damage
   (1) Initial Stage: Charging with constant current
   (2) Last Stage: Charging with constant voltage

> **⚠ CAUTION**
> Refer to the instruction manual provided by the battery charger equipment manufacturers for detailed charging procedures and precautions.

[AGM Battery Charging]

AGM battery should be charged with constant voltage or constant current-constant voltage in order to minimize performance degradation due to the charging.

If charging the battery with constant current, overcharging may occur. It can cause damage to the internal battery and will give an adverse effect on battery life.

> ***NOTICE***
> Do not charge with more than 14.8V or quick charge mode.

[Constant Voltage Charge Conditions]

Charging voltage / time:14.7V [68°F ~ 86°F (20°C ~ 30°C)] / approximately 24 hours

The minimum charge voltage:14.4V [68°F ~ 86°F (20°C ~ 30°C)]

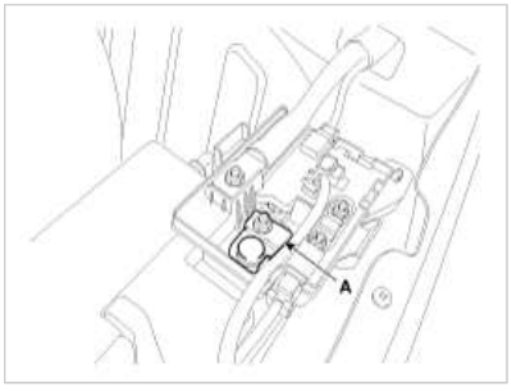
The maximum charging voltage:14.8V [68°F ~ 86°F (20°C ~ 30°C)]

> **Information**
> Battery temperature should be maintained at about 68°F ~ 86°F (20°C ~ 30°C) during charging of the battery.

> **⚠ CAUTION**
> If the battery is charged directly at the battery terminals on vehicles with battery sensor, misinterpretations of battery condition and under certain circumstances also unwanted Check Control messages or fault memory entire can occur.
> After recharging finished, let the battery stand for over 10 hours with normal temperature for battery stabilization.

Battery Terminal

1. Move back and forth to check that the battery terminals (A) are loose or corroded.If the terminals are corroded, clean them.



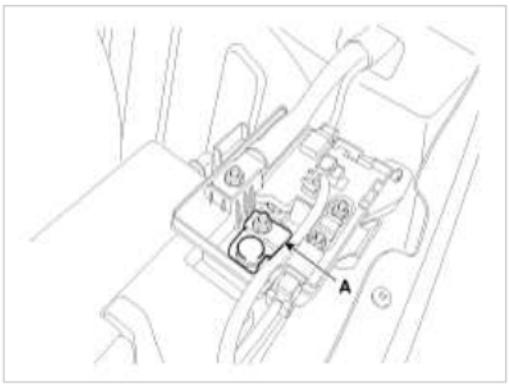
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If battery positive connection is loose, disconnect ground(GND) cable first before attempting to remove or tighten plus connection, to prevent personal injury.

2. If the battery clamp on battery positive (+) terminal is not seated securely:
   (1) Turn ignition switch OFF and disconnect the battery negative (-) terminal.
   (2) Tighten battery clamp (A) on battery positive (+) terminal

   Battery positive (+) terminal:
   7.8 ~ 9.8 N.m (0.8 ~ 1.0 kgf.m, 5.8 ~ 7.2 lb-ft)



3. If the battery clamp on battery negative (-) terminal is not seated securely:
   (1) Tighten battery clamp (A) on battery negative (-) terminal.

   Battery negative (-) terminal:
   4.0 ~ 6.0 N.m (0.4 ~ 0.6 kgf.m, 3.0 ~ 4.4 lb-ft)



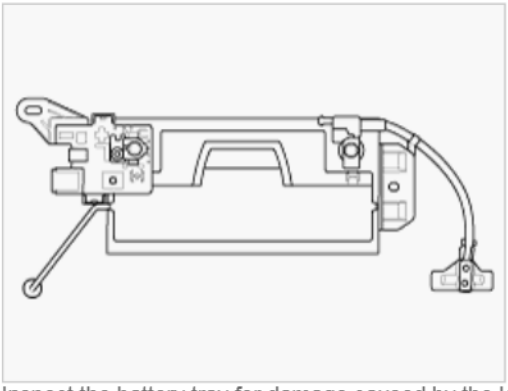
Cleaning

1. Make sure the ignition switch and all accessories are in the OFF position.
2. Remove the battery from the vehicle.
   (Refer to Charging System - "Battery")

⚠ 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 worn when removing the battery.

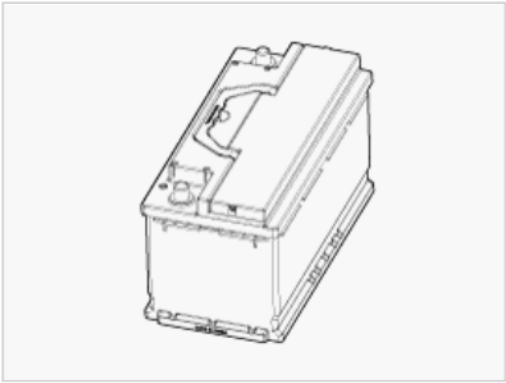
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3. Inspect the battery tray for damage caused by the loss of electrolyte. If acid damage is present, it will be necessary to clean the area with a solution of clean warm water and baking soda. Scrub the area with a stiff brush and wipe off with a cloth moistened with baking soda and water.
4. Clean the top of the battery with the same solution as described above.
5. Inspect the battery case and cover for cracks. If cracks are present, the battery must be replaced.
6. Clean the battery posts with a suitable battery post tool.
7. Clean the inside surface of the terminal clamps with a suitable battery cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
8. Install the battery in the vehicle.
9. Connect the cable terminals to the battery post, making sure tops of the terminals are flush with the tops of the posts.
10. Tighten the terminal nuts securely.
11. Coat all connections with light mineral grease after tightening.

⚠ CAUTION

When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries being charged or which have recently been charged. Do not break live circuit at the terminals of batteries being charged.
A spark will occur when the circuit is broken. Keep open flames away from battery.



Vehicle Parasitic Current Inspection

1. Turn the all electric devices OFF, and then turn the ignition switch OFF.
2. Close all doors except the engine hood, and then lock all doors.
   (1) Disconnect the hood switch connector.
   (2) Close the trunk lid.
   (3) Close the doors or remove the door switches.
3. Wait a few minutes until the vehicle's electrical systems go to sleep mode.

NOTICE

- For an accurate measurement of a vehicle parasitic current, all electrical systems should go to sleep mode. (It takes at least one hour or at most one day.) However, an approximate vehicle parasitic current can be measured after 10~20 minutes.

4. Connect an ammeter in series between the battery (-) terminal and the ground cable, and then disconnect the clamp from the battery (-) terminal slowly.

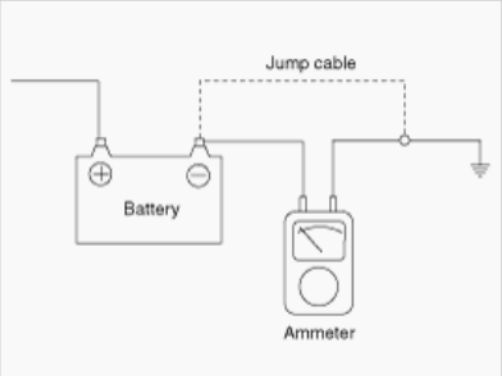
NOTICE

- Be careful that the lead wires of an ammeter do not come off from the battery (-) terminal and the ground cable to prevent the battery from being reset. In case the battery is reset, connect the battery cable again, and then start the engine or turn the ignition switch ON for more than 10 sec. Repeat the procedure from No. 1.

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To prevent the battery from being reset during the inspection,

1) Connect a jump cable between the battery (-) terminal and the ground cable.
2) Disconnect the ground cable from the battery (-) terminal.
3) Connect an ammeter between the battery (-) terminal and the ground cable.
4) After disconnecting the jump cable, read the current value of the ammeter.



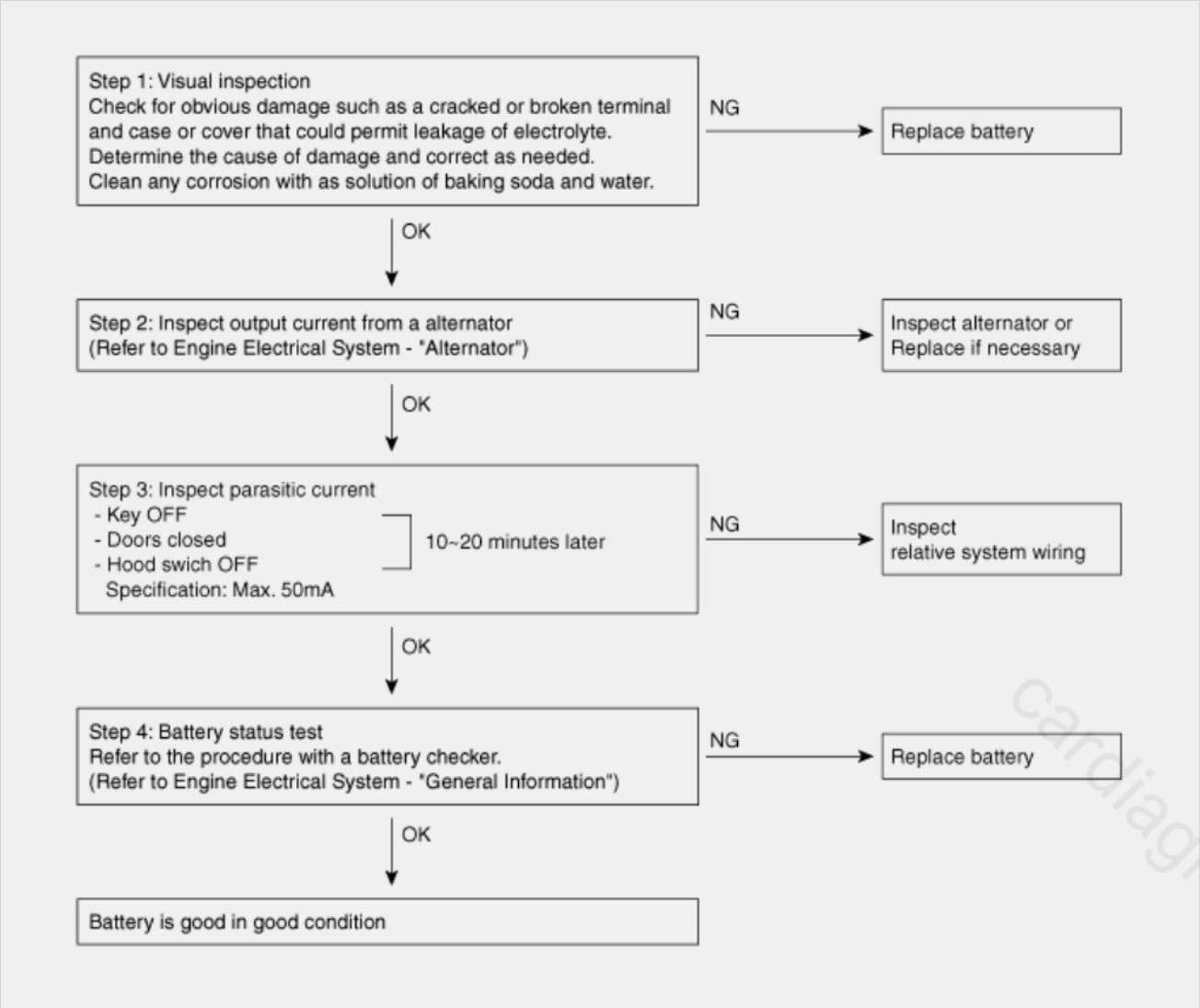
5. Read the current value of the ammeter.
   A. If the parasitic current is over the limit value, search for abnormal circuit by removing a fuse one by one and checking the parasitic current.
   B. Reconnect the suspected parasitic current draw circuit fuse only and search for suspected unit by removing a component connected with the circuit one by one until the parasitic draw drops below limit value.

Limit value (after 10~20 min.) : Below 50mA

Engine Electrical System

Troubleshooting

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Engine Electrical System

Description

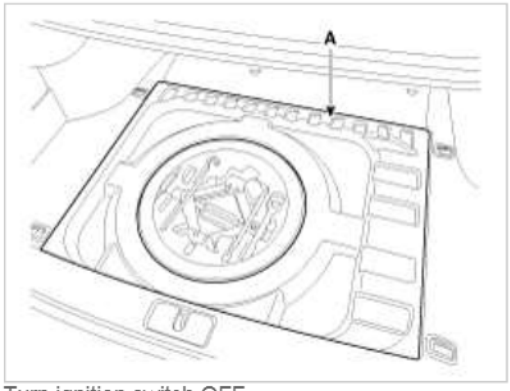
Vehicles have many control units that use more electricity. These units control their own system based on information from diverse sensors. It is important to have a stable power supply as there diverse sensors giving a variety of information. Battery sensor is mounted on battery (-) terminal. It transmits battery voltage, current, temperature information to ECM. ECM controls generating voltage by duty cycle based on these signals.



Engine Electrical System

Removal

1. Open the trunk.
2. Remove the luggage under cover (A).



3. Turn ignition switch OFF.
4. Disconnect the battery negative (-) terminal.
5. Disconnect the battery sensor connector (A).
6. Remove the battery negative (-) cable after removing the bolts (B).



Installation

1. Install in the reverse order of removal.

Battery sensor cable mounting bolt:
10.8 ~ 13.7 N.m (1.1 ~ 1.4 kgf.m, 8.0 ~10.1 lb-ft)
Battery negative (-) terminal tightening nut:
3.9 ~ 5.9 N.m (0.4 ~ 0.6 kgf.m, 2.9 ~ 4.3 lb-ft)

⚠ CAUTION

When battery sensor signal fault occurs, inspect the vehicle parasitic draw in advance after inspecting the sensor because the sensor will behave abnormally when the parasitic draw is more than 100mA. (Refer to vehicle parasitic current inspection)

NOTICE

- For the vehicle equipped with a battery sensor, be careful not to damage the battery sensor when the battery is replaced or recharged.

1. When replacing the battery, it should be same one (type, capacity and brand) that is originally installed on your vehicle. If a battery of a different type is replaced, the battery sensor may recognize the battery to be abnormal.
2. When installing the ground cable on the negative post of battery, tighten the clamp with specified torque. An excessive tightening torque can damage the PCB internal circuit and the battery terminal .
3. When recharging the battery, ground the negative terminal of the booster battery to the vehicle body.

Adjustment

Battery Sensor Recalibration Procedure

After reconnecting the battery negative cable, AMS function does not operates until the system is stabilized, about 4 hours. If disconnecting the negative (-) battery cable from the battery during repair work for the vehicle equipped with AMS function, Battery sensor recalibration procedure should be performed after finishing the repair work.

1. Turn the Iginition switch ON and OFF.

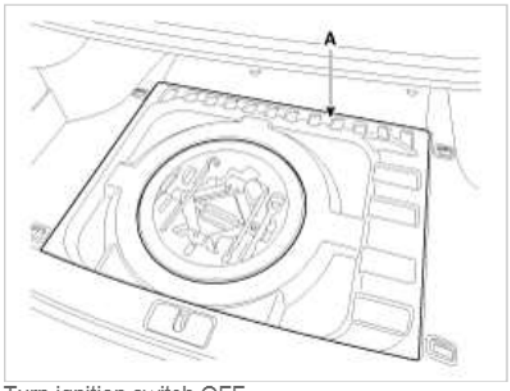
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2. Park the vehicle for about 4 hours with the hood and all doors closed.

Engine Electrical System

Removal

1. Open the trunk.
2. Remove the luggage under cover (A).



3. Turn ignition switch OFF.
4. Disconnect the battery sensor connector (A) and disconnect the negative (-) battery terminal.

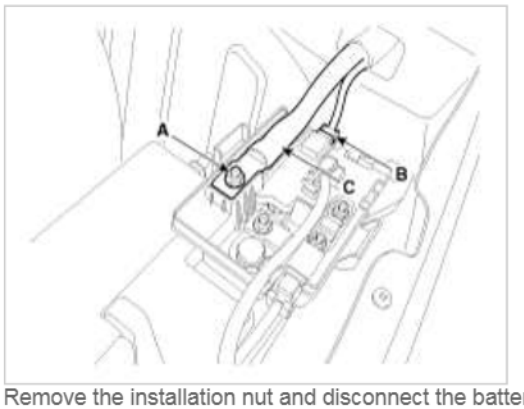


5. Open the battery positive (+) terminal cover (A).



6. Remove the mounting nut (A) and disconnect the starting signal connector (B).
7. Dissconnect the battery positive (+) cable (C).

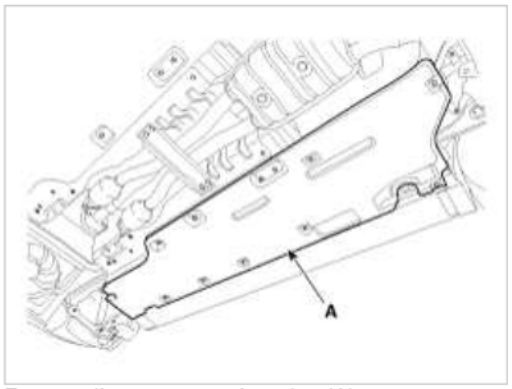
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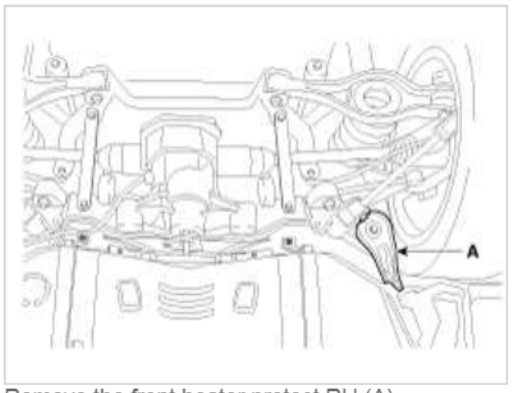
8. Remove the installation nut and disconnect the battery positive (+) cable (A) from the engine room RH box.
9. Disconnect the battery positive (+) cable connection with front harness (B).



10. Lift the vehicle.
11. Remove the under cover (A).

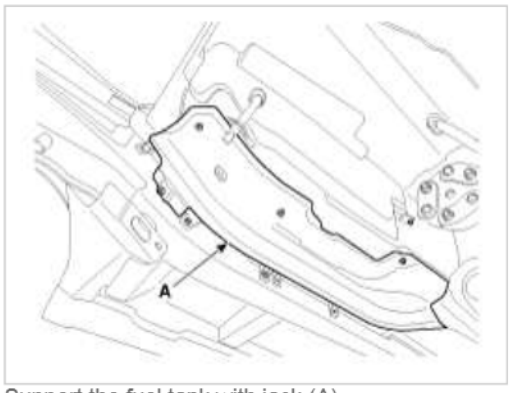


12. Remove the cross member stay (A).

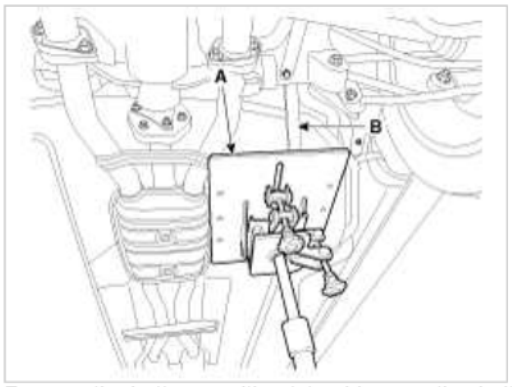


13. Remove the front heater protect RH (A).

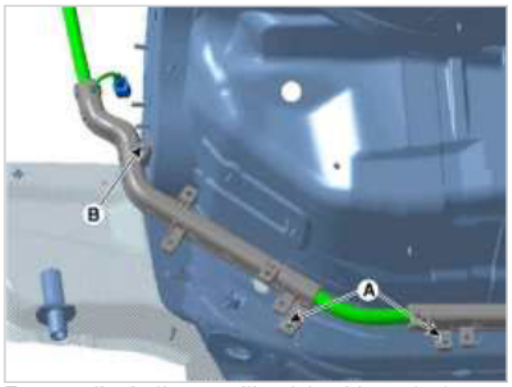
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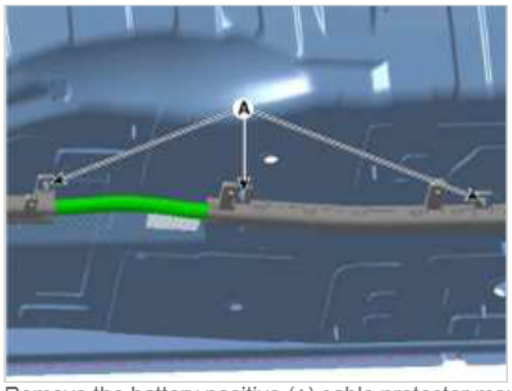
14. Support the fuel tank with jack (A).
15. Remove the fuel tank band RH (B).



16. Remove the battery positive (+) cable mounting bolts (A) and nut (B).

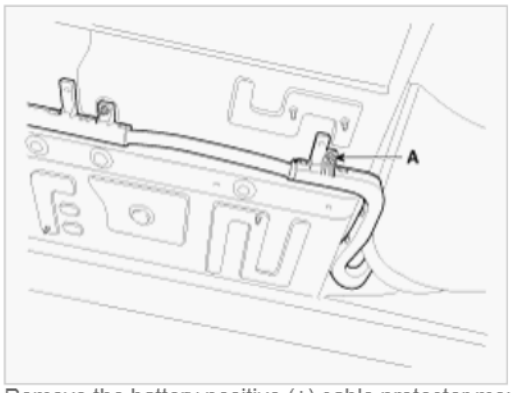


17. Remove the battery positive (+) cable protector mounting nuts (A).

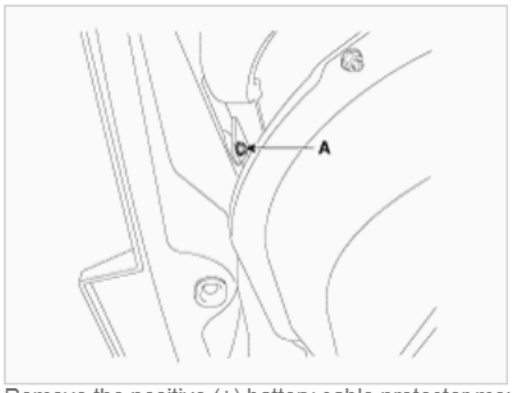


18. Remove the battery positive (+) cable protector mounting nut (A).

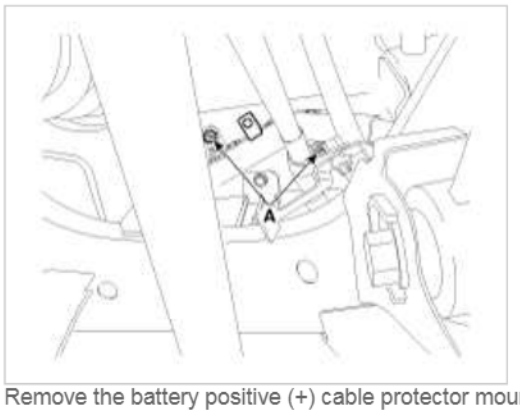
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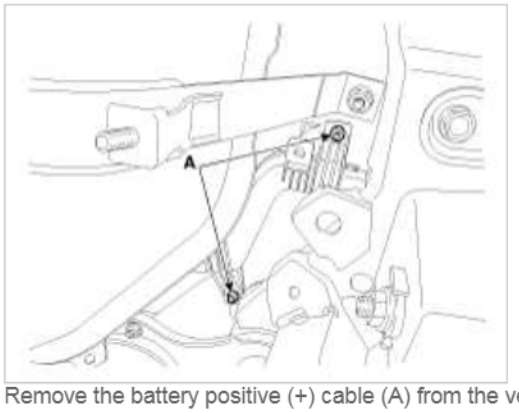
19. Remove the battery positive (+) cable protector mounting bolt (A).



20. Remove the positive (+) battery cable protector mounting nuts (A).

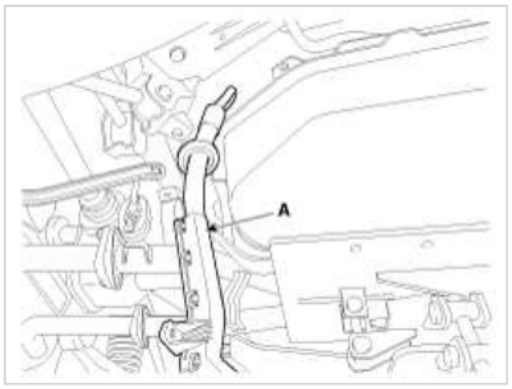


21. Remove the battery positive (+) cable protector mounting nuts (A).



22. Remove the battery positive (+) cable (A) from the vehicle.

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Installation

1. Install in the reverse order of removal.

Engine Electrical System

Cruise Control

The cruise control system is engaged by the cruise "ON/OFF" main switch located on right of steering wheel column. The system has the capability to cruise, coast, accelerate and resume speed.

It also has a safety interrupt, engaged upon depressing brake or shifting select lever.

The ECM is the control module for this system. The main components of cruise control system are mode control switches, transmission range switch, brake switch, vehicle speed sensor, ECM and ETS motor that connect throttle body.

The ECM contains a low speed limit which will prevent system engagement below a minimum speed of 40km/h (25mph).

The operation of the controller is controlled by mode control switches located on steering wheel.

Transmission range switch and brake switch are provided to disengage the cruise control system. The switches are on brake pedal bracket and transmission. When the brake pedal is depressed or select lever shifted, the cruise control system is electrically disengaged and the throttle is returned to the idle position.

Cruise main switch (CRUISE)

The cruise control system is engaged by pressing the cruise "ON/OFF" main switch. Pressing the cruise "ON/OFF" main switch again releases throttle, clears cruise memory speed, and puts vehicle in a non-cruise mode.

Set/Coast switch (SET/–)

The "SET/–" switch located on right of steering wheel column has two functions.

The set function - Push the "SET/–" switch and release it at the desired speed. The SET indicator light in the instrument cluster will illuminate. Release the accelerator pedal. The desired speed will automatically be maintained.

The coast function - Push the "SET/–" switch and hold it when the cruise control is on. The vehicle will gradually slow down. Release the switch at the desired speed. The desired speed will be maintained.

Push the "SET/–" switch and release it quickly. The cruising speed will decrease by 2km/h or 1mph.

Resume/Accel switch (RES/+)

The "RES/+" switch located on right of steering wheel column has two functions.

The resume function - If any method other than the cruise “ON/OFF” main switch was used to cancel cruising speed temporarily and the system is still activated, the most recent set speed will automatically resume when the "RES/+" switch is pushed. It will not resume, however, if the vehicle speed has dropped below approximately 40km/h (25mph).

The accel function - Push the "RES/+" switch and hold it when the cruise control is on. The vehicle will gradually accelerate. Release the switch at the desired speed. The desired speed will be maintained.

Push the "RES/+" switch and release it quickly. The cruising speed will increase by 2km/h or 1mph.

Cancel switch (CANCEL)

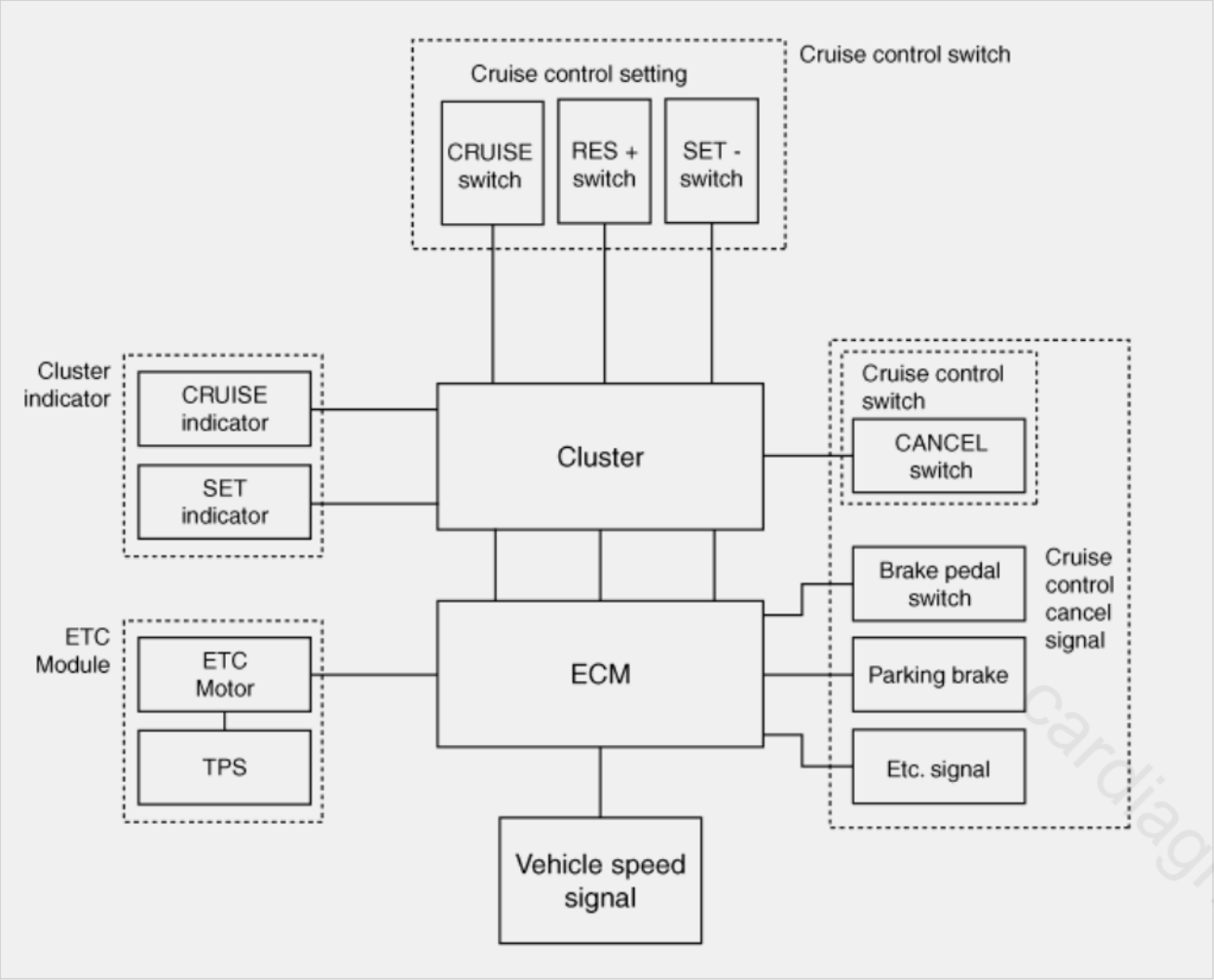
The cruise control system is temporarily disengaged by pushing the "CANCEL" switch.

Cruise speed canceled by this switch can be recovered by pushing the "RES/+" switch.

Engine Electrical System

System Block Diagram

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Component Parts And Function Outline

Component part		Function
Vehicle-speed sensor, ESP/ABS Control Module		Converts vehicle speed to pulse.
ECM		Receives signals from sensor and control switches.
Cruise control indicator		Illuminate when CRUISE main switch is ON (Built into cluster)
Cruise Control switches	CRUISE switch	Switch for automatic speed control power supply.
	Resume/Accel switch (RES +)	Controls automatic speed control functions by Resume/Accel switch (Set/Coast switch)
	Set/Coast switch (RES -)	
Cancel switches	Cancel switch	Sends cancel signals to ECM.
	Brake-pedal switch	
	Transaxle range switch (A/T)	
ETC Motor		Regulates the throttle valve to the set opening by ECM.

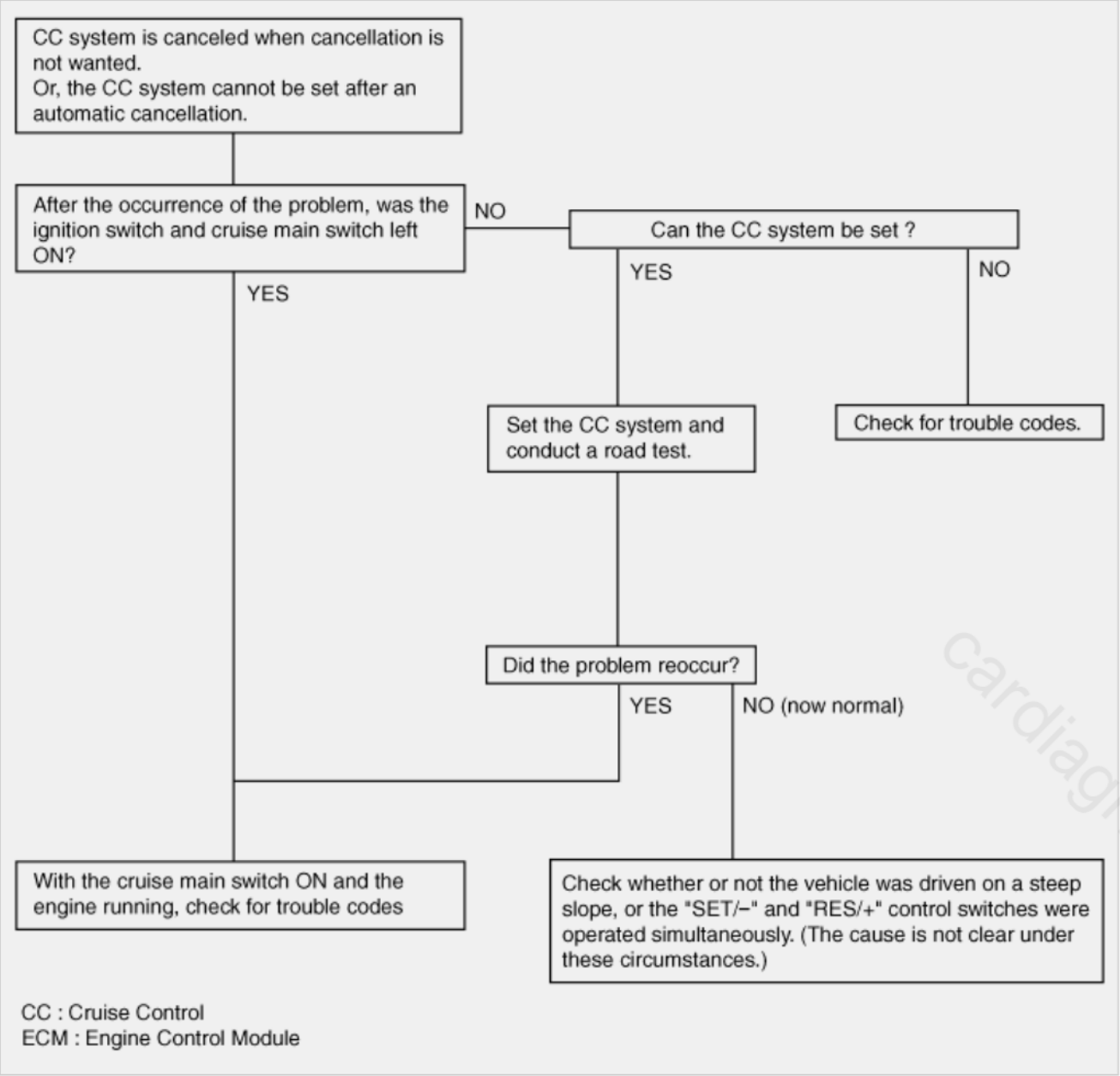
* ETC Motor : Electronic Throttle Control Motor

Engine Electrical System

Trouble Symptom Charts

Trouble Symptom 1

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Trouble Symptom 2

Trouble symptom	Probable cause	Remedy
The set vehicle speed varies greatly upward or downward "Surging" (repeated alternating acceleration and deceleration) occurs after setting	Malfunction of the vehicle speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of ECM	Check input and output signals at ECM

Trouble Symptom 3

Trouble symptom	Probable cause	Remedy
The CC system is not canceled when the brake pedal is depressed	Damaged or disconnected wiring of the brake pedal switch	Repair the harness or replace the brake pedal switch
	Malfunction of the ECM signals	Check input and output signals at ECM

Trouble Symptom 4

Trouble symptom	Probable cause	Remedy

The CC system is not canceled when the shift lever is moved to the "N" position (It is canceled, however, when the brake pedal is depressed)	Damaged or disconnected wiring of inhibitor switch input circuit	Repair the harness or repair or replace the inhibitor switch
	Improper adjustment of inhibitor switch	
	Malfunction of the ECM signals	Check input and output signals at ECM

Trouble Symptom 5

Trouble symptom	Probable cause	Remedy
Cannot decelerate (coast) by using the "SET/–" switch	Temporary damaged or disconnected wiring of "SET/–" switch input circuit	Repair the harness or replace the "SET/–" switch
	Malfunction of the ECM signals	Check input and output signals at ECM

Trouble Symptom 6

Trouble symptom	Probable cause	Remedy
Cannot accelerate or resume speed by using the "RES/+" switch	Damaged or disconnected wiring, or short circuit, or "RES/+" switch input circuit	Repair the harness or replace the "RES/+" switch
	Malfunction of the ECM signals	Check input and output signals at ECM

Trouble Symptom 7

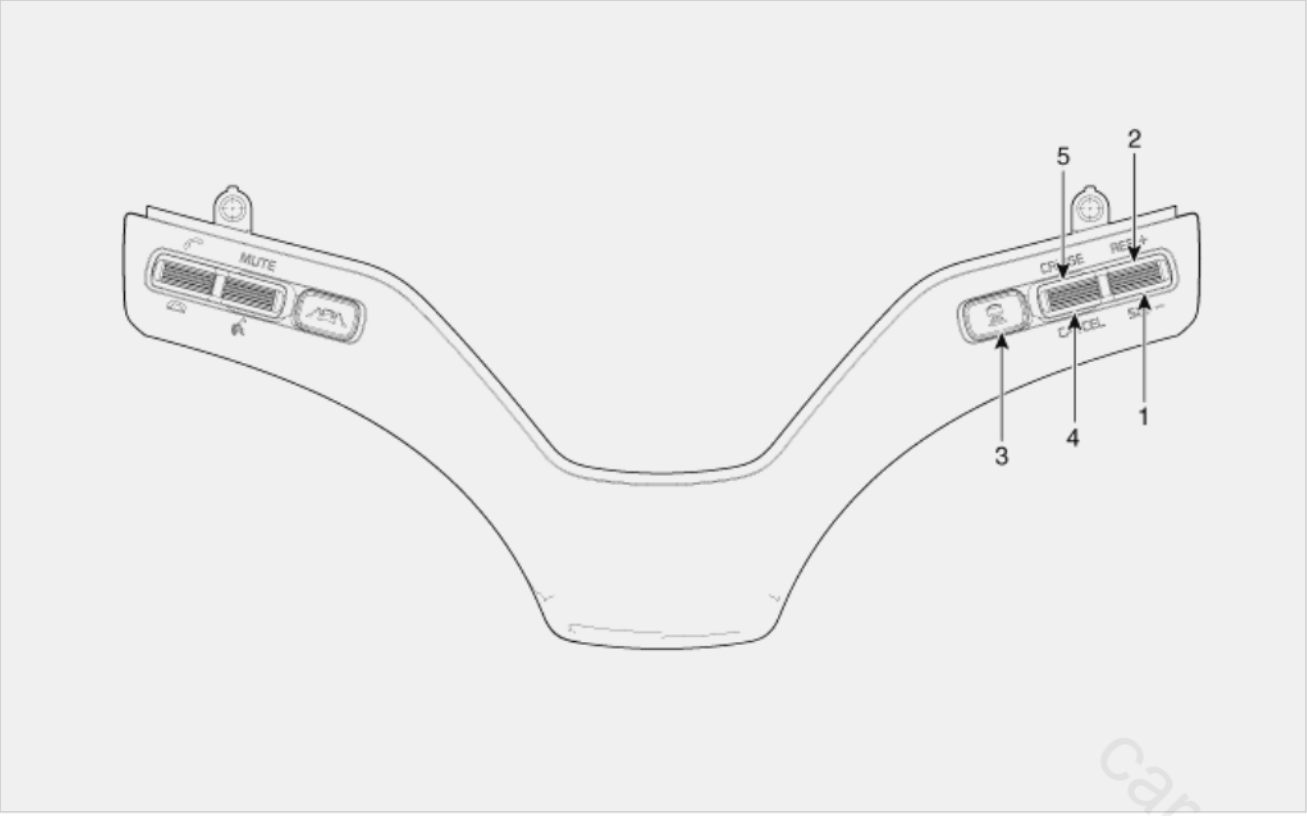
Trouble symptom	Probable cause	Remedy
CC system can be set while driving at a vehicle speed of less than 40km/h (25mph), or there is no automatic cancellation at that speed	Malfunction of the vehicle-speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the ECM signals	Check input and output signals at ECM

Trouble Symptom 8

Trouble symptom	Probable cause	Remedy
The cruise main switch indicator lamp does not illuminate (But CC system is normal)	Damaged or disconnected bulb of cruise main switch indicator lamp	Repair the harness or replace the part.
	Harness damaged or disconnected	

Components

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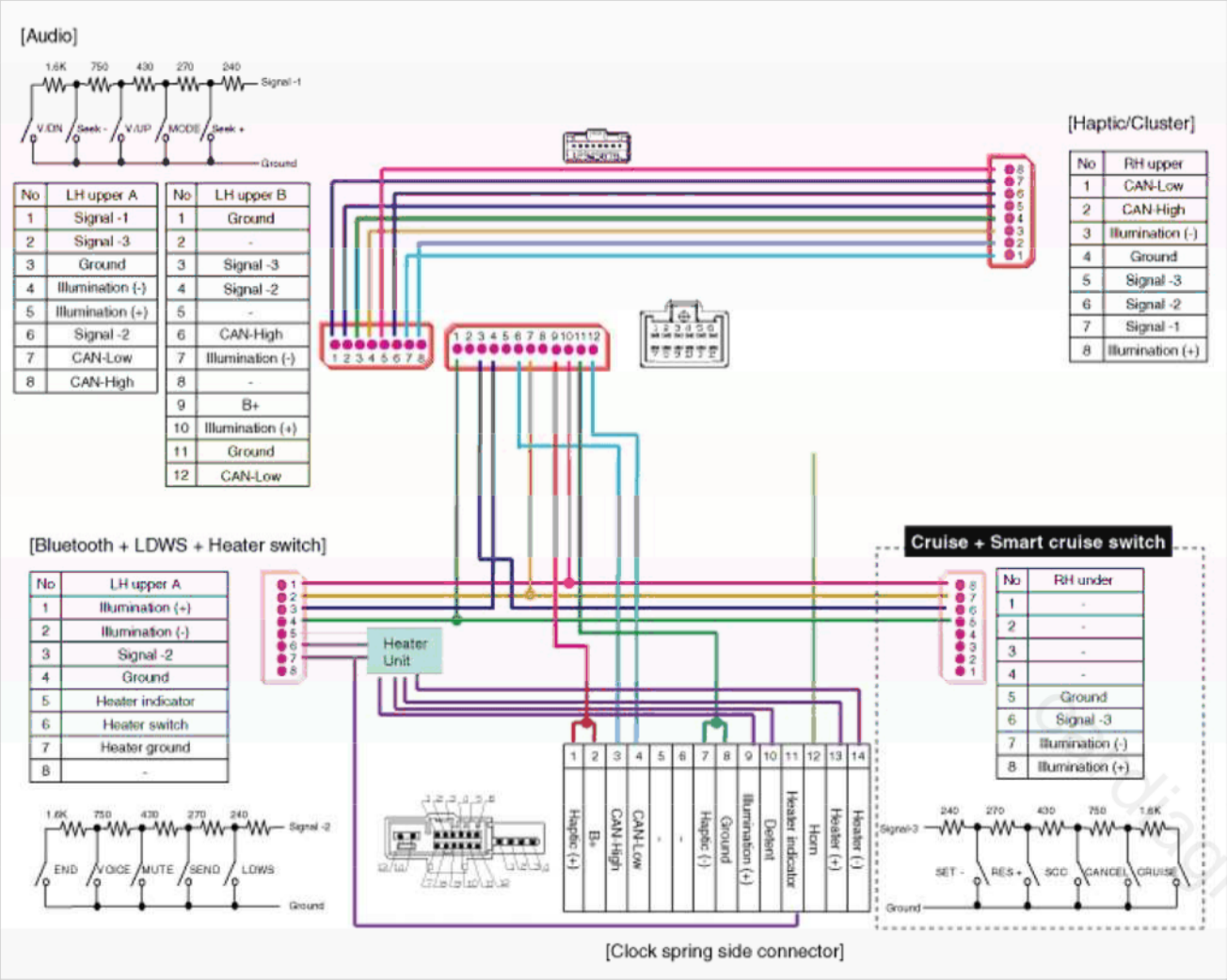


1. SET - switch 2. RES + switch 3. SCC switch	4. CANCEL switch 5. CRUISE switch

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Engine Electrical System

Circuit Diagram

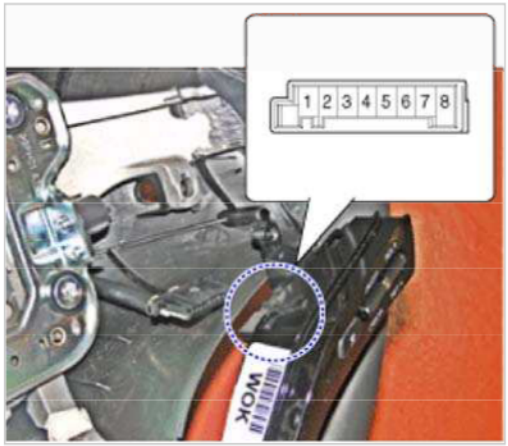


Engine Electrical System

Inspection

[Measuring Resistance]

1. Disconnect the cruise control switch connector from the control switch.



2. Measure resistance between terminals on the control switch when each function switch is ON (switch is depressed).

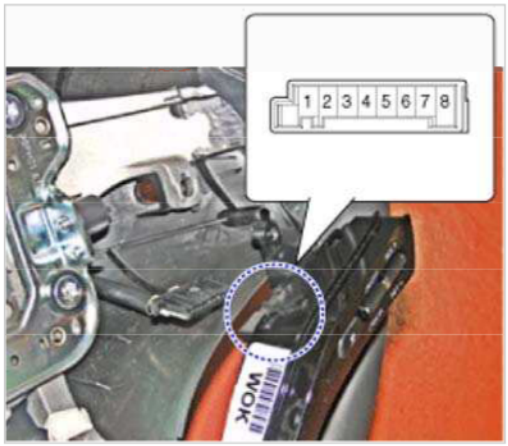
Function switch	Terminal	Resistance (kΩ)
SET -	5 - 6	0.24
RES +	5 - 6	0.51

SCC	5 - 6	0.94
CANCEL	5 - 6	1.69
CRUISE	5 - 6	3.29

3. If not within specification, replace switch.

[Measuring Voltage]

1. Connect the cruise control switch connector to the control switch.



2. Measure voltage between terminals on the harness side connector when each function switch is ON (switch is depressed).

Function switch	Terminal	Voltage (V)
SET -	5 - 6	0.95
RES +	5 - 6	1.68
SCC	5 - 6	2.44
CANCEL	5 - 6	3.10
CRUISE	5 - 6	3.80

3. If not within specification, inspect the control switch resistance.
   The measuring resistance value is not within specification, replace the switch and measure the voltage again.
4. If resistance is OK but, measuring voltage is not within specification, inspect the wiring harness and connectors between the switch and the ECM.

Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the air-bag module from the steering wheel.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
3. Release the under remote switch assembly (B) after loosening the screws (A).



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4. Disconnect the under remote switch connector (A).





5. Remove the under remote switch assembly (A) from the steering.



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Installation

1. Install in the reverse order of removal.

Engine Electrical System

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

On-vehicle Inspection

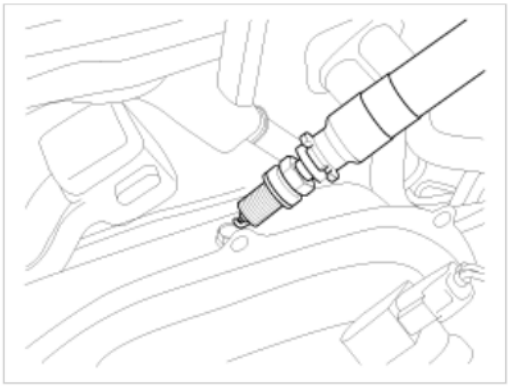
Inspect ignition coil assembly and Perform spark test

1. Check for DTCs.

NOTICE

- If a DTC is present, perform troubleshooting in accordance with the procedure for that DTC. (Refer to DTC guide)

2. Check if sparks occur.
   (1) Remove the engine cover.
   (2) Remove the ignition coils.
   (3) Using a spark plug wrench, remove the spark plugs.
   (4) Disconnect the injector extension connectors.
   (5) Ground the spark plug to the engine.



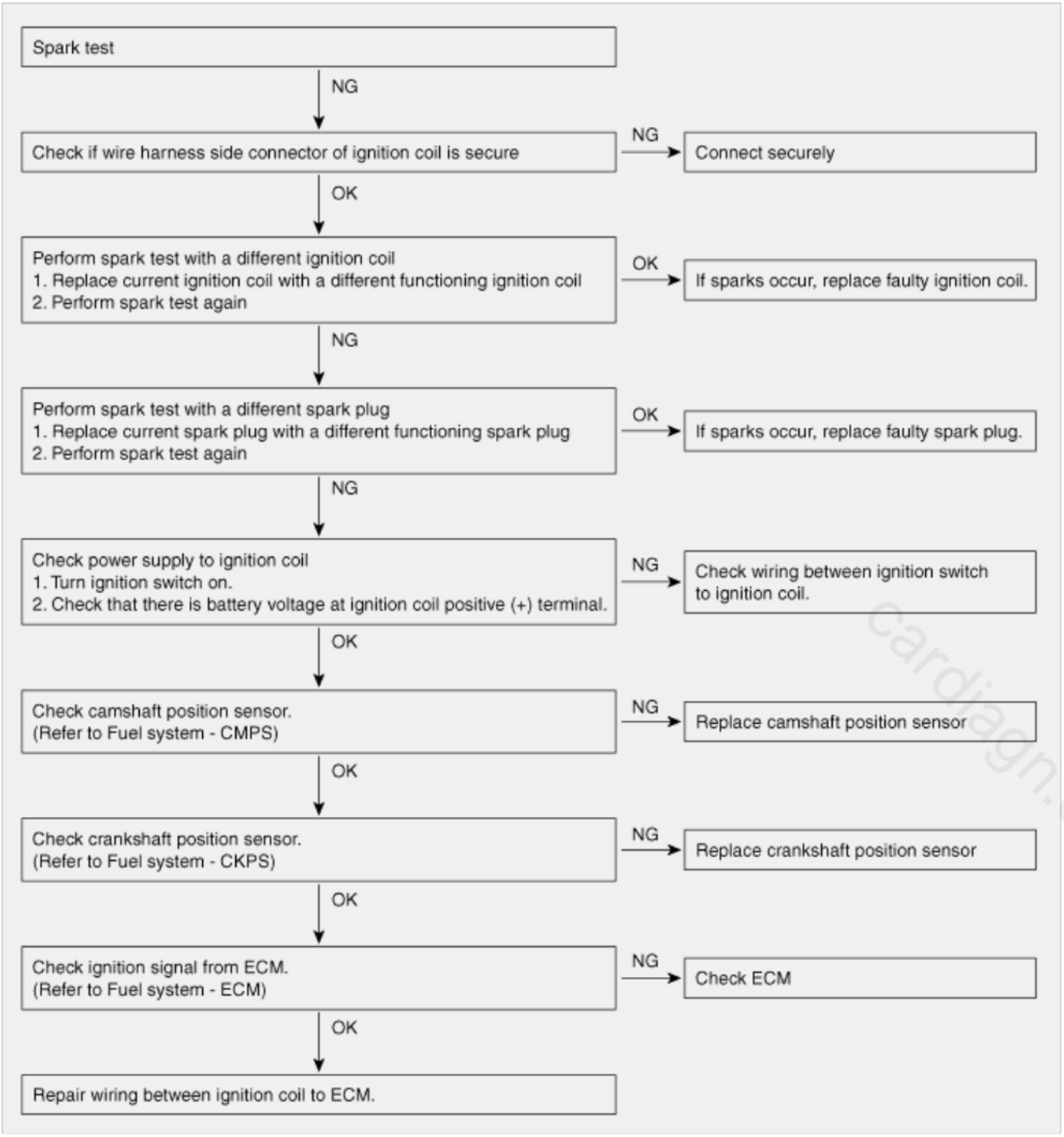
   (6) Check if sparks occur at each spark plug while engine is being cranked.

NOTICE

- Do not crank the engine for more then 5 seonds.

3. If sparks do not occur, perform the following test.

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4. Using a spark plug wrench, install spark plugs.
5. Install the ignition coils.
6. Install the engine cover.

Engine Electrical System

Specification

Item	Specification
Primary Coil Resistance (Ω)	0.62 ± 10% [20°C (68°F)]
Secondary Coil Resistance (kΩ)	7.0 ± 15% [20°C (68°F)]

Engine Electrical System

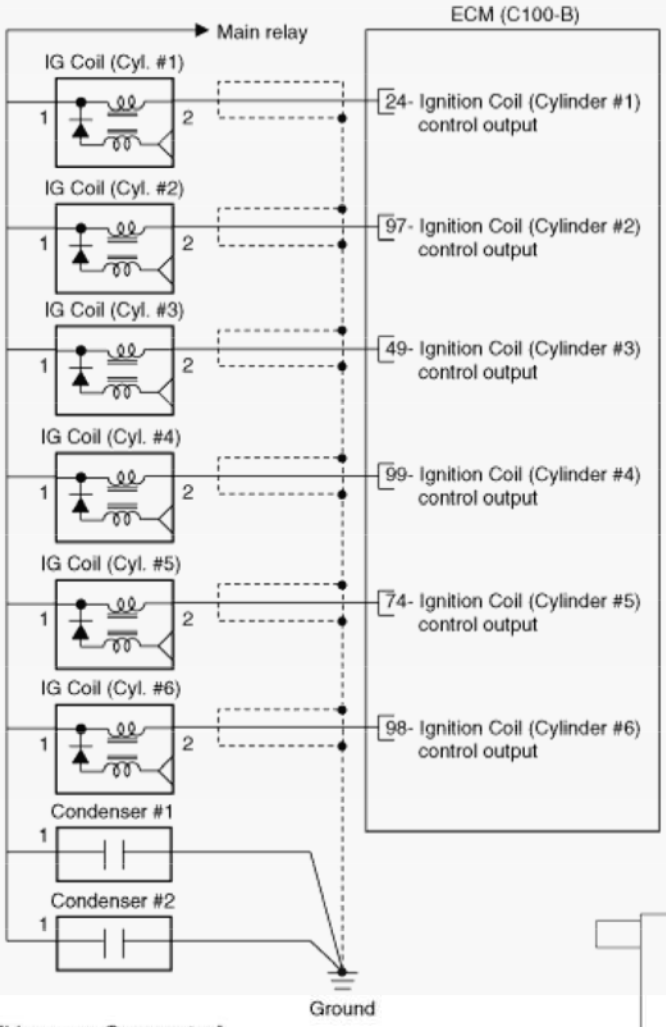
Description

An ignition coil is an induction coil in an engine's ignition system which transforms the battery's low voltage to the high voltage needed to create an electric spark in the spark plugs to ignite the fuel. Coils have an internal resistor while others rely on a resistor wire or an external resistor to limit the current flowing into the coil from the battery 12 V supply.

Engine Electrical System

Circuit Diagram

[Circuit Diagram]



[Connection Information]

Ignition Coil (Cylinder #1)

Terminal	Connected to	Function
1	Main relay	Battery power (B+)
2	ECM C100-B (24)	Ignition Coil #1 control output

Ignition Coil (Cylinder #2)

Terminal	Connected to	Function
1	Main relay	Battery power (B+)
2	ECM C100-B (97)	Ignition Coil #2 control output

Ignition Coil (Cylinder #3)

Terminal	Connected to	Function
1	Main relay	Battery power (B+)
2	ECM C100-B (49)	Ignition Coil #3 control output

Ignition Coil (Cylinder #4)

Terminal	Connected to	Function
1	Main relay	Battery power (B+)
2	ECM C100-B (99)	Ignition Coil #4 control output

Ignition Coil (Cylinder #5)

Terminal	Connected to	Function
1	Main relay	Battery power (B+)
2	ECM C100-B (74)	Ignition Coil #5 control output

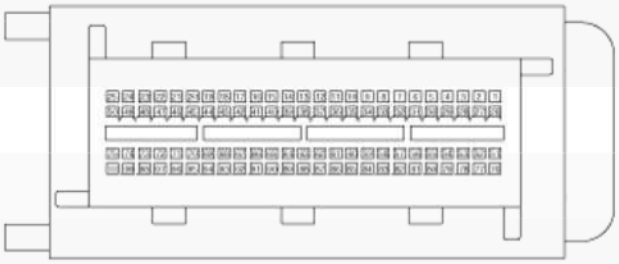
Ignition Coil (Cylinder #6)

Terminal	Connected to	Function
1	Main relay	Battery power (B+)
2	ECM C100-B (98)	Ignition Coil #6 control output

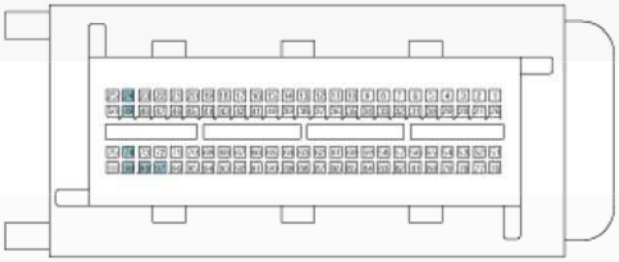
[Harness Connector]



IG Coil #1,2,3,4,5,6



E100-A



C100-B
ECM

Removal

Ignition Coil #1

1. Remove the surge tank assembly.
   (Refer to Engine Mechanical System - "Surge Tank")
2. Disconnect the ignition coil connector (A).
3. Remove the igniton coil (B) after loosening the bolts.



Ignition Coil #2

1. Disconnect the battery nagative terminal.
2. Disconnect the ignition coil connector (A).
3. Remove the igniton coil (B) after loosening the bolts.



Ignition Coil #3

1. Remove the surge tank assembly.
   (Refer to Engine Mechanical System - "Surge Tank")
2. Disconnect the ignition coil connector (A).
3. Remove the igniton coil (B) after loosening the bolts.



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Ignition Coil #4

1. Disconnect the battery nagative terminal.
2. Disconnect the ignition coil connector (A).
3. Remove the igniton coil (B) after loosening the bolts.



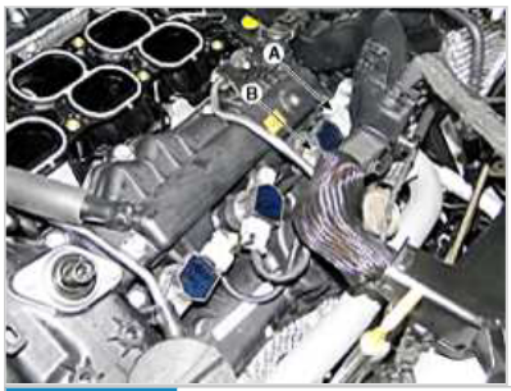
Ignition Coil #5

1. Disconnect the battery nagative terminal.
2. Disconnect the ignition coil connector (A).
3. Remove the igniton coil (B) after loosening the bolts.



Ignition Coil #6

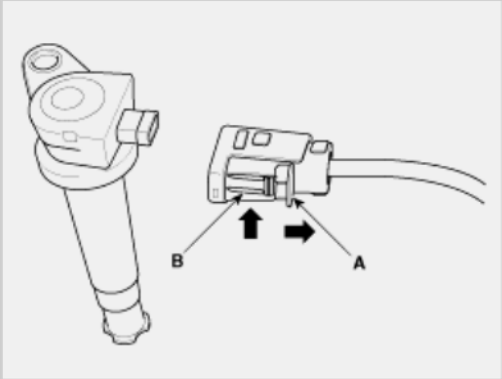
1. Remove the surge tank assembly.
   (Refer to Engine Mechanical System - "Surge Tank")
2. Disconnect the ignition coil connector (A).
3. Remove the igniton coil (B) after loosening the bolts.



NOTICE

- When removing the ignition coil connector, pull the lock pin (A) and push the clip (B).

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Installation

⚠ CAUTION

- Do not accidentally switch the ignition coil #2 and #4 connections.
  Doing so may cause the engine to stall due to incomplete ignition. And, since unburned fuel flows into the catalyst, this can overheat and damage the catalyst.
  A yellow tag (A) is attached to ignition coil #4. Use this tag for reference when connecting the ignition coils.

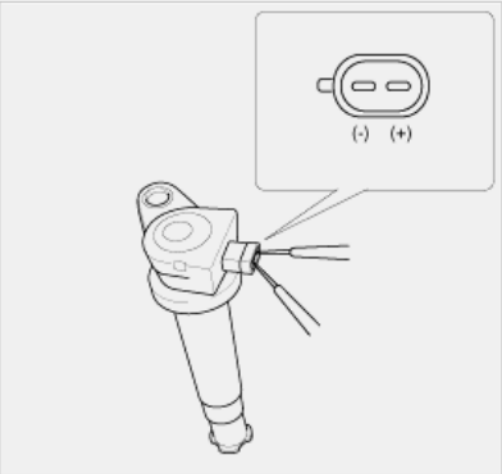


1. Install in the reverse order of removal.

Ignition coil mounting bolts:
9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

Inspection

1. Measure the primary coil resistance between terminals (+) and (-).



Standard value:0.62Ω ± 10%

Specification

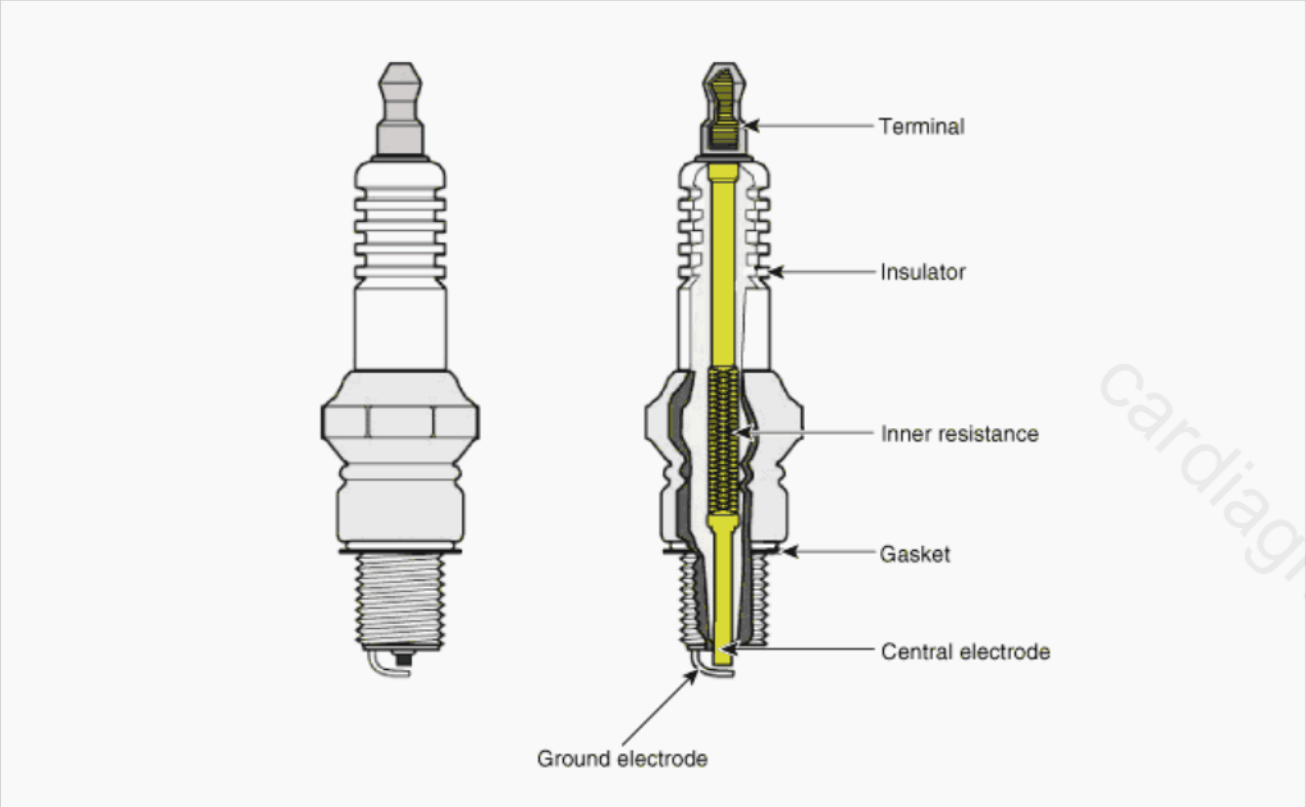
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Item	Specification
Type	DILKR7A11
Gap	1.0 ~ 1.1 mm (0.0394 ~ 0.0433 in.)

Engine Electrical System

Description

A spark plug is a device for delivering electric current from an ignition system to the combustion chamber of a spark-ignition engine to ignite the compressed fuel/air mixture therein by means of an electric spark, while containing combustion pressure within the engine. A spark plug has a metal threaded shell, electrically isolated from a central electrode by a porcelain insulator.



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Engine Electrical System

Inspection

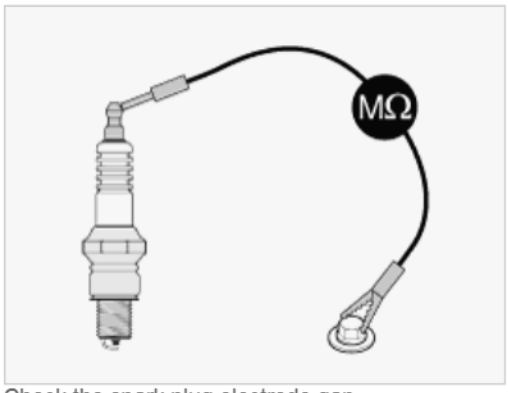
[On vehicle inspection]

1. Accelerate the engine to about 3,000 rpm 3 times or more.
2. Remove the spark plug.
3. Check the spark plug visually.
   If the electrode is dry, the spark plug is normal.
   If the electrode is wet, check the damage and electrode gap as below.

[Component Inspection]

1. Check the spark plug for any damage on its thread and insulator.
   If there is damage, replace the spark plug.
2. Check the electrode. Measure the insulation resistance with an ohmmeter.
   If the resistance is less than the specified value, adjust the electrode gap.

Specification:10 MΩ or more

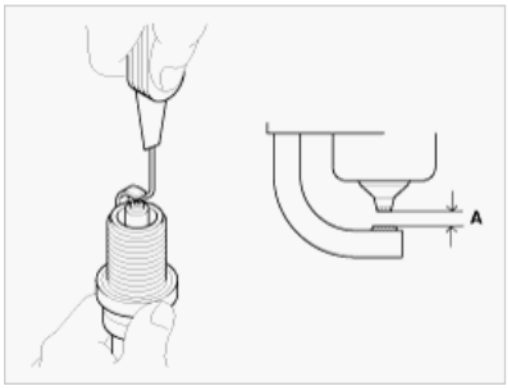


3. Check the spark plug electrode gap.
   If the gap is greater than the maximum, replace the spark plug.

Specification:1.0 ~ 1.1 mm (0.0394 ~ 0.0433 in.)

NOTICE

- If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on a used plug.

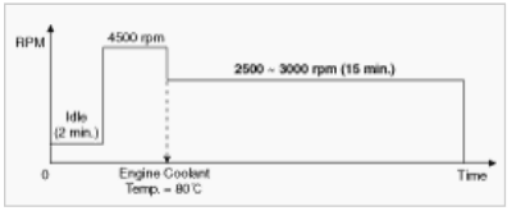


Cleaning

The combustion temporarily becomes unstable, due to the aged fuel and the carbon deposits accumulated on the spark plug(s) after long-term storage.

[1st Method]

1. Start the engine and keep the engine running at idle for 2 minutes.
2. Step on the accelerator pedal and hold it steady at 4500 rpm with the shift lever in N position to warm up the engine until the temperature of the engine coolant reaches 80°C.
3. Keep the engine running at 2500~3000 rpm in the N position for 15 minutes.



[2nd Method]

NOTICE

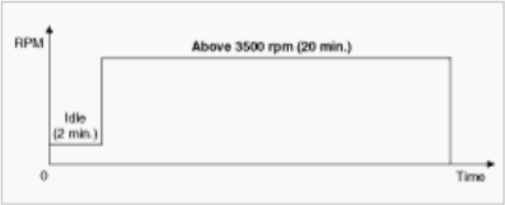
- The 2nd method should be performed only if the 1st method fails (the misfire-related codes return).

1. Start the engine and keep the engine running at idle for 2 minutes.
2. Drive the vehicle for over 20 minutes, keeping the engine speed above 3500 rpm.

NOTICE

- If equipped with manual transaxle, shift the gear properly for keeping the engine speed above 3500 rpm.

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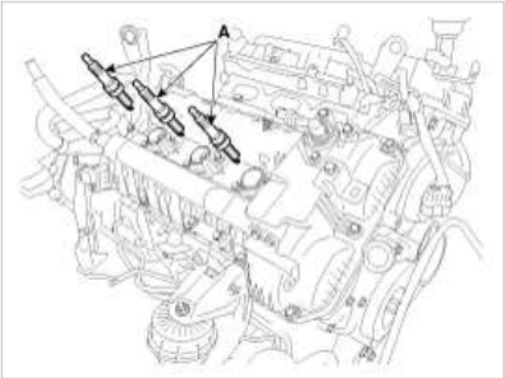
Removal

1. Remove the ignition coil.
   (Refer to Ignition System - "Ignition Coil")
2. Using a spark plug wrench, remove the spark plug (A).

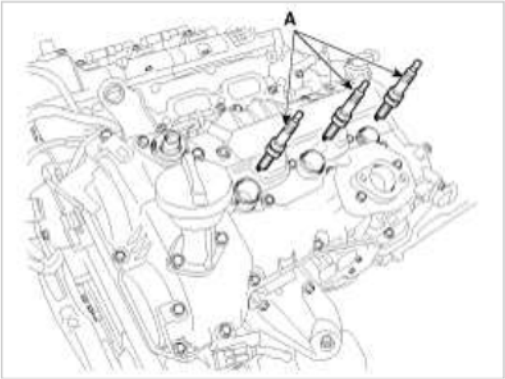
NOTICE

- Be careful that no contaminates enter into spark plug holes.

[Bank 1]



[Bank 2]



Installation

1. Install in the reverse order of removal.

Tightening torque:
14.7 ~ 24.5 N.m (1.5 ~ 2.5 kgf.m, 10.9 ~ 18.0 lb-ft)

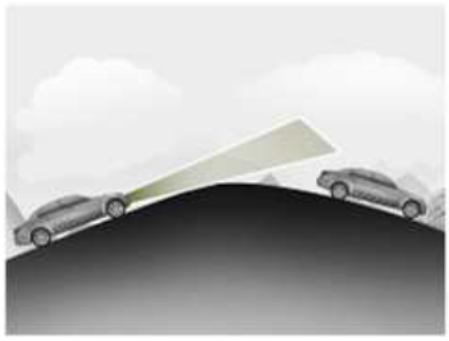
Smart Cruise Control

Be careful when driving the vehicle using the smart cruise control system as follows.

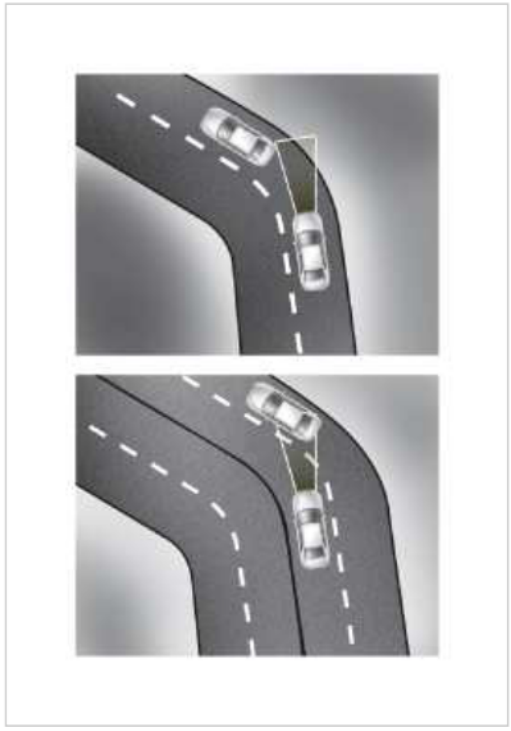
⚠ CAUTION

- The smart cruise control system may have limits to detect distance to the vehicle ahead due to road and traffic conditions.
- On curves or inclines/declines
- On curves or inclines/declines, the smart cruise control system may not detect a moving vehicle in your lane, and then your vehicle may accelerate to the set speed directly. Also, the vehicle speed may slow down abruptly when the vehicle ahead is recognized. Select the appropriate set speed on curves or inclines/declines and control the vehicle speed by applying the brake pedal if necessary.

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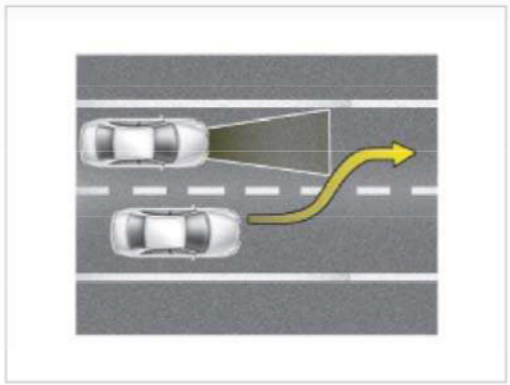


- Your vehicle speed can be reduced due to a vehicle in the adjacent lane. Apply the accelerator pedal and select the appropriate set speed. Check to be sure that the road conditions permit.



• Lane changing

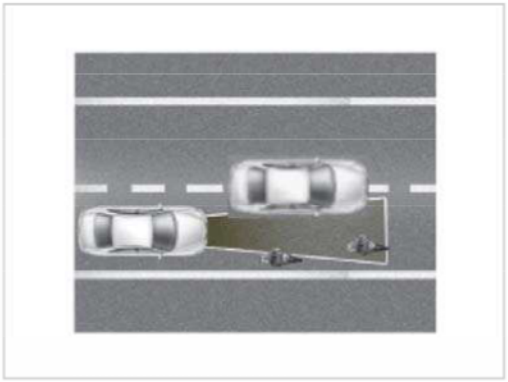
- A vehicle which moves into your lane from an adjacent lane cannot be recognized by the sensor until it is in the sensor's detection range.
- Be always cautious because a vehicle which suddenly moves into your lane can be recognized late by the sensor.
- If the vehicle which moves into your lane is slower than your vehicle, the speed may decrease to maintain the distance to the vehicle ahead.
- If the vehicle which moves into your lane is faster than your vehicle, your vehicle will maintain the selected speed even the vehicle is in the sensor's detection range.



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• Vehicle recognition

- Even though a vehicle is in the same lane, a vehicle which is out of the sensor's detection range cannot be recognized by the sensor.
  1) Small vehicle such as motorcycle, bicycle and cultivator
  2) A vehicle offset to one side
  3) A slow-moving vehicle or sudden-decelerating vehicle
  4) A stopped vehicle
  5) A vehicle with small rear profile such as trailer with no loads



- In this following situation, the front vehicle can't be recognized correctly so control the vehicle speed by applying the brake pedal or accelerator pedal if necessary.
  1) When the vehicle is pointing upwards due to overloading in the trunk
  2) While making turns by steering
  3) When driving to one side of the lane
  4) When driving on narrow lanes or on curves

• If the smart cruise control is left on (CRUISE indicator light ON), the smart cruise control can be switched on accidentally. Keep the smart cruise control system off (CRUISE indicator light OFF) when the smart cruise control is not in use, to avoid inadvertently setting a speed.

• Observe a regulation speed on road when setting the cruise speed.

• Use the smart cruise control system only when traveling on open highways in good weather. Do not use the smart cruise control when it may not be safe to keep the car at a constant speed, for instance, driving in heavy or varying traffic, or on slippery (rainy, icy or snow-covered) or winding roads or over 6% up-hill or down-hill roads.

• Pay particular attention to the driving conditions whenever using the smart cruise control system.

• The vehicle cannot be stopped by using the smart cruise control system. If emergency stop is necessary, you should apply the brakes.

• Keep the safety distance according to road conditions and vehicle speed. If the following distance is too close at a high speed driving, it is dangerous.

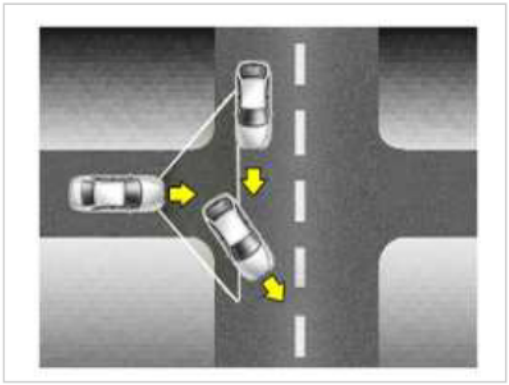
• The smart cruise control system can not recognize a stopped vehicle, pedestrians or an oncoming vehicle. Always look ahead cautiously to prevent unexpected and sudden situations from occurring.

• The smart cruise control system is not a substitute for safe driving practices but a supplementary function only. It is the responsibility of the driver to always check the speed and the distance to the vehicle ahead.

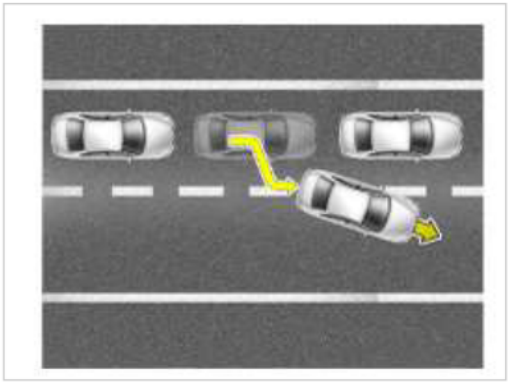
• In front of you, vehicles moving with a frequent lane change may cause a delay in the system's reaction or may cause the system to react to a vehicle actually in adjacent lane. Always look ahead cautiously to prevent unexpected and sudden situations from occurring.

• Your vehicle may accelerate when a vehicle ahead of you disappears. When you are warned that the vehicle ahead of you is not detected, drive with caution.

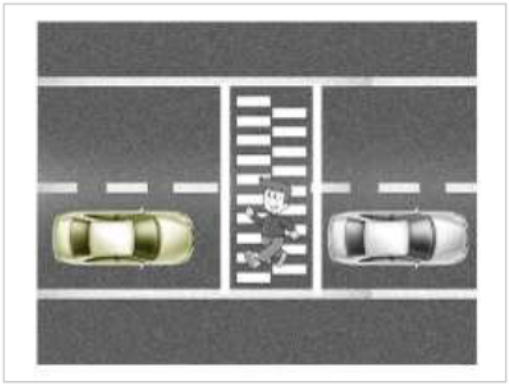
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- When vehicles are at a standstill and the vehicle in front of you changes to the next lane, be careful when your vehicle starts to move because it may not recognize the stopped vehicle in front of you.



- Always look out for pedestrians when your vehicle is maintaining a distance with the vehicle ahead.



- Always be cautious for vehicles with higher height or vehicles carrying loads that sticks out to the back of the vehicle.

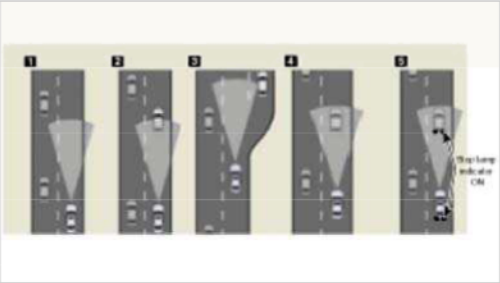


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Description

The smart cruise control system allows a driver to program the vehicle to control the speed and following distance detecting the vehicle ahead without depressing the brake pedal and the accelerator pedal.

1. Cruise speed control: The vehicle maintains the selected speed if there are not vehicles ahead.
2. Retardation control: The vehicle decelerates if a vehicle ahead is detected.
3. Following distance control: The vehicle maintains the selected following distance.
4. Acceleration control: The vehicle accelerates to the selected speed if a vehicle ahead is not detected.
5. Congested area control : In traffic, your vehicle will stop if the vehicle ahead of you stops. Also, if the vehicle ahead of you starts moving, your vehicle will start as well. However, if the vehicle stops for more than 3 seconds, you must depress the accelerator pedal or push the RES+ switch to start driving.



6. Control on curves
   (1) The sensor may not detect a vehicle ahead or may detect a vehicle on other lanes because the detection range of the sensor is limited.
   (2) On curves, if the vehicle equipped the SCC is driving at high speed, the vehicle can slip outside. Therefore reduce the speed on curves even there is not a vehicle ahead. (There is no brake control by SCC.)
   (3) While the vehicle follows a vehicle ahead on straight road, if the vehicle ahead enters on curve, the vehicle equipped the SCC may accelerate to follow the vehicle ahead.
   (4) On curves, if a vehicle ahead followed is out of range, the vehicle does not accelerate to the set speed and maintain the following speed to prevent from accelerating and decelerating repeatedly. (If the vehicle equipped the SCC changes the lane or apply the accelerator pedal, the vehicle will accelerate.)
7. Warning alarm
   If the vehicle equipped the SCC decelerates because a vehicle ahead decelerates or moves into your lane, the warning will operate.
   (1) In case that the vehicle equipped with SCC is able to decelerate properly by the system – No warning
   (2) In case that the vehicle equipped with SCC is not able to decelerate properly by the system
      A. Indicator in the cluster will blink and the warning buzzer will sound. (The warning and deceleration by the system will go on until the brake pedal is applied.)
   (3) If the vehicle ahead (vehicle speed: less than 30km/h) disappears to the next lane during following distance control, the warning chime will sound and a message will appear. Adjust your vehicle speed for vehicles or objects that can suddenly appear in front of you.
8. Accelerating by driver
   Even the vehicle is being decelerated by the SCC system, the vehicle can be accelerated by applying the accelerator pedal. If the vehicle is accelerated above the set speed, the indicator in the cluster will blink.

NOTICE

• Smart cruise control operating conditions
- Vehicle speed at approximately 0 ~ 180km/h (0 ~ 110mph)
- Transmission in D or Sports mode
- "ESC OFF" switch OFF
- "CRUISE" switch ON (CRUISE indicator ON)

Under the above conditions, activate the cruise system using the "SET/–" or "RES/+" switch.

• Smart cruise control disabling conditions
- "CRUISE" switch OFF
- "CANCEL" switch ON
- Brake pedal applied
- Driver's door opened
- Vehicle speed at more than approximately 180km/h (110mph)
- Stopped at steep slope
- Continued SCC stop for more than 5 min
- Repetitive SCC stop & go for long time
- When you try to start the vehicle after a vehicle ahead stops far away ahead of your vehicle during SCC auto stop
-

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Transmission in N or P or R
- ESC/ TCS / ABS operating
- An accelerator pedal applied for more than 60 sec
- ESC OFF" switch ON (ESC OFF indicator ON)
- Parking brake applied
- System failure (The warning indicator ON)
- Crack, damage or wrong installation of smart cruise control unit cover (The warning indicator ON)

9. Function of cruise control
   The driver may choose to only use the cruise control mode (speed control function) by doing as follows:
   With the smart cruise control system on (the cruise indicator light will be on but the system will not be activated), push the distance to distance switch for more than 2 seconds. "Smart cruise control (SCC) mode" and "Cruise control (CC) mode" can be selected.The speed control of the cruise control mode is the same as that of the smart cruise control mode.
   When using the cruise control mode, the driver must manually access the distance to other vehicles as the system will not automatically brake to slow down for other vehicles.

Cruise main switch (CRUISE)

The smart cruise control system is engaged by pressing the cruise "ON/OFF" main switch. When the smart cruise control system is engaged, the CRUISE indicator in the cluster illuminates.

Set/Coast switch (SET/–)

The "SET/–" switch located on right of steering wheel column has two functions.

The set function - Push the "SET/–" switch and release it at the desired speed. The SET indicator light in the instrument cluster will illuminate. Release the accelerator pedal. The desired speed will automatically be maintained.

At low speed of 0 ~ 30 km/h (0 ~ 20mph), there should be a vehicle in front of driver's vehicle with a distance of 2 ~ 15 m (6.6 ~ 49.2 ft). The target speed is set to 30km/h (20mph).

The coast function - Push the "SET/–" switch and hold it when the smart cruise control is on. The vehicle will gradually slow down. Release the switch at the desired speed.

The desired speed will be maintained.Push the "SET/–" switch and release it quickly.

The cruising speed will decrease by 1.0km/h or 1.0mph.

NOTICE

If the vehicle speed is above the set speed by applying the accelerator pedal, the vehicle speed will be the set speed.

Resume/Accel switch (RES/+)

The "RES/+" switch located on right of steering wheel column has two functions.

The resume function - If any method other than the cruise "ON/OFF" main switch was used to cancel cruising speed temporarily and the system is still activated, the most recent set speed will automatically resume when the "RES/+" switch is pushed.

The accel function - Push the "RES/+" switch and hold it when the smart cruise control is on. The vehicle will gradually accelerate. Release the switch at the desired speed. The desired speed will be maintained.

Push the "RES/+" switch and release it quickly. The cruising speed will increase by 1.0km/h or 1.0mph.

Cancel switch (CANCEL)

The cruise control system is temporarily disengaged by pushing the "CANCEL" switch.

Following distance control switch

This system assists you can set the distance from the vehicle ahead and maintain the selected distance even if you did not push the accelerator or the brake pedal.

Select the appropriate following distance according to road conditions and vehicle speed.

Each time the button is pressed, the following distance changes as follows:

Ex) Distance 4 → Distance 3 → Distance 2 → Distance 1→ Distance 4

If you drive at 90 km/h (55.9mph), the distance maintain as follows;

Distance 4 - approximately 52.5m (172.2ft)

Distance 3 - approximately 40m (131.2ft)

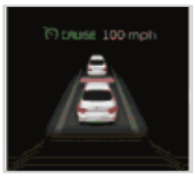
Distance 2 - approximately 30m (98.4ft)

Distance 1 - approximately 25m (82.0ft)

The following distance of each stage is changed according to the speed of the vehicle ahead.

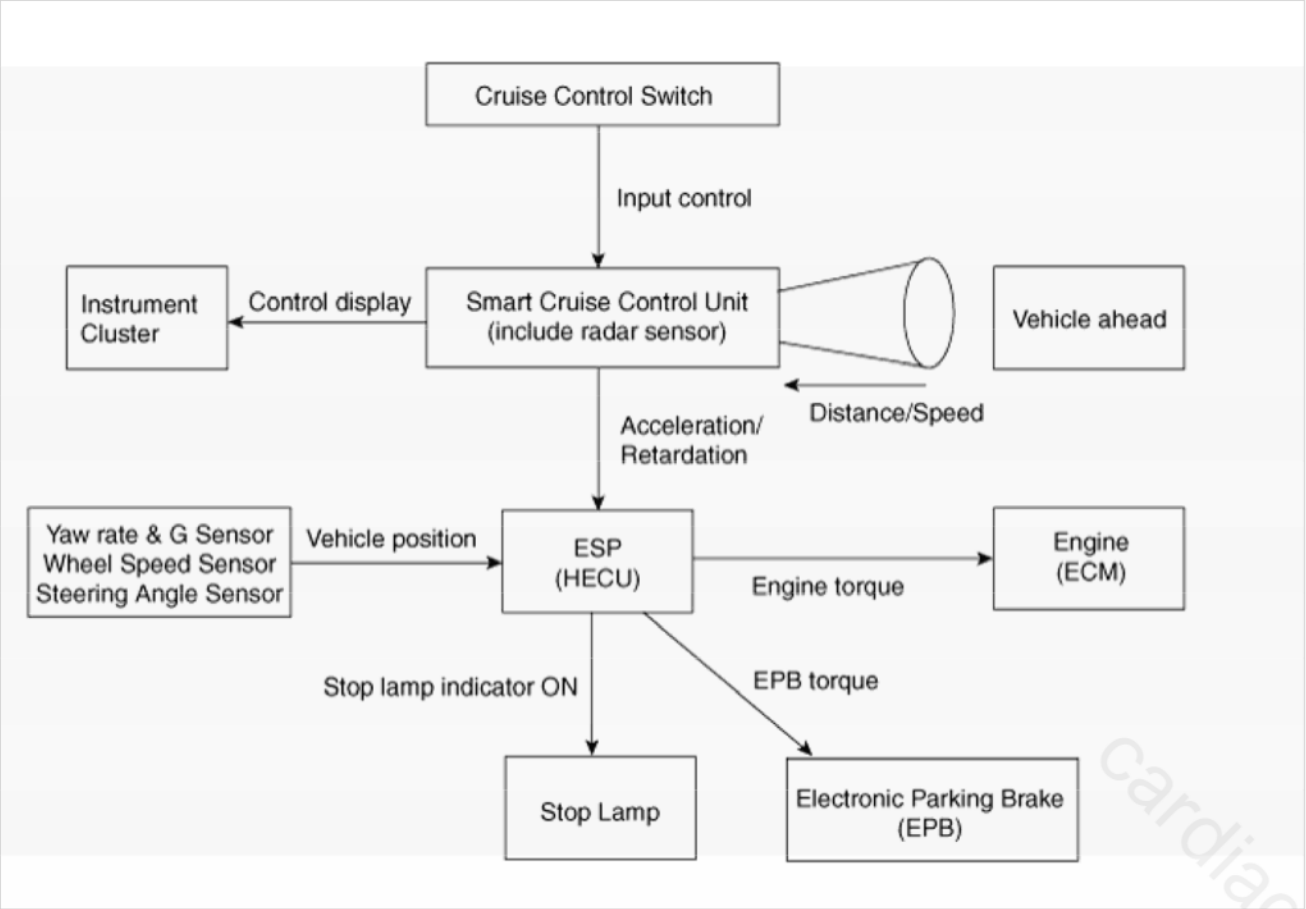
Display in the cluster

carsdiagn.com

Display		Description	Display		Description
A Type	B Type		A Type	B Type	
		Distance 1			Distance 3
		Distance 2			Distance 4
		SCC sensor malfunction			SCC system malfunction

Trouble Symptom Charts

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Component Parts And Function Outline

Component part	Function
Cruise Control Switch	Input the set speed and distance to the SCC ECU.
Instrument Cluster	Display various information inputted from SCC.
Smart Cruise Control Unit	Recognize and track the vehicle ahead. Calculate the target speed and distance Request the acceleration and retardation to ESP
ESP (HECU)	Automatic braking and request the engine torque control to the engine (ECM) Request the EPB torque control to the Electronic Parking Brake (EPB) Request the stop lamp indicator ON
Engine (ECM)	Control the engine torque
Electronic Parking Brake (EPB)	Control the EPB torque
Stop lamp	Stop lamp indicator ON

Engine Electrical System

Specification

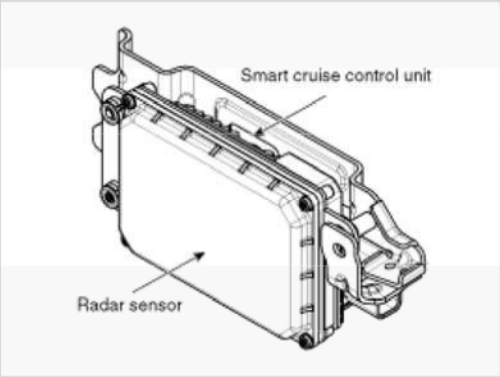
Item	Specification
Power supply(V)	12
Operation voltage (V)	9 ~ 16

Engine Electrical System

Description

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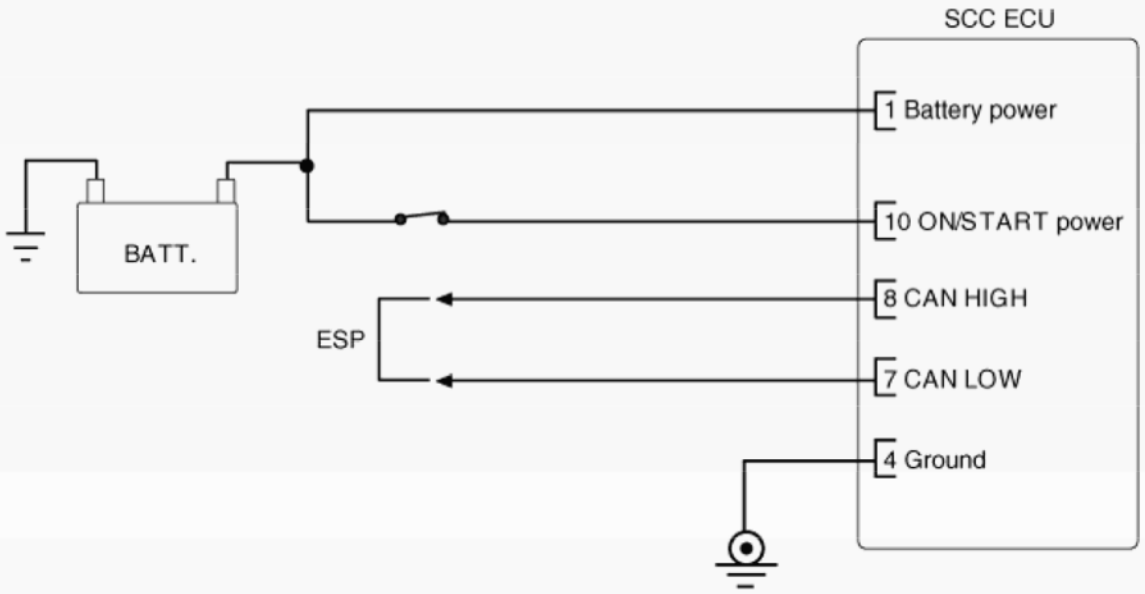
The smart cruise control unit is installed on the front right side of the chassis.A radar sensor is embedded in the front section of the unit. This sensor detects vehicles and objects in front of the vehicle.The radar sensor can detect up to 64 objects ahead of a vehicle. The alarm goes off when the vehicle deviates from the horizontal and vertical alignment reference points during operation. This sensor communicates with the dashboard, warning buzzer, smart cruise control switch, Electronic Stability Program (ESP), ECM, and TCM via CAN communication.The sensor controls vehicle speed through CAN communication between the Electronic Stability Program (ESP) system and the ECM and TCM.



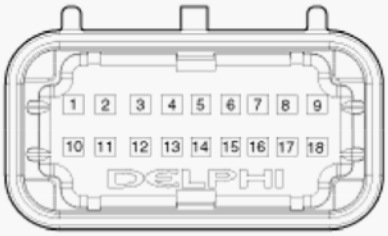
Circuit Diagram

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[Circuit Diagram]



[Connector]



NO	Item	NO	Item
1	Battery	10	-
2	Power (B+)	11	IG 1 Power
3	-	12	-
4	Ground	13	-
5	-	14	-
6	-	15	-
7	Low	16	-
8	High	17	-
9	-	18	-

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Engine Electrical System

Removal

1. Turn the ignition switch OFF and disconnect the battery negative (-) cable.
2. Remove the front bumper.
   (Refer to Body - "Front Bumper Cover")
3. Disconnect the smart cruise control unit connector (A).
4. Loosen the nuts (B) and then remove the smart cruise control unit assembly (C) from the vehicle.



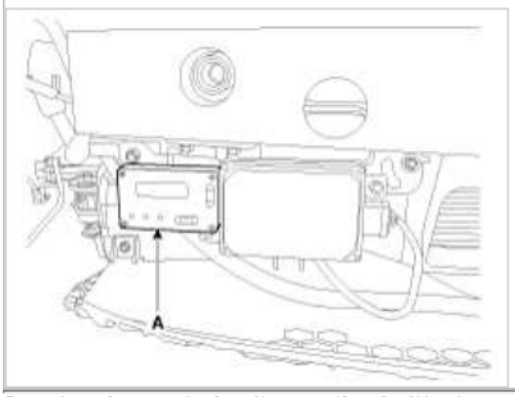


Installation

1. Install in the reverse order of removal.

NOTICE

Ensure that the side surface of the smart cruise control (SCC) unit is perpendicular to the level ground using the SST 0K964-3T000 (A).



Smart cruise control unit mounting bolt/nut:

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

2. Perform the smart cruise control radar sensor alignment procedure.
   (Refer to "Smart Cruise Control Sensor Alignment")
3. Install the front bumper.
   (Refer to Body - "Front Bumper Cover")

Smart Cruise Control (SCC) Radar Sensor Alignment

Smart Cruise Control (SCC) unit detects a forward vehicle and then recognizes the distance to the forward vehicle and the relative speed using the built-in radar sensor. In order for the radar sensor to operate correctly, it must be properly aligned parallel to the driving direction of the vehicle. So, the radar sensor alignment procedure must be carried out after the sensor is reinstalled or replaced with new one. If not performing the sensor alignment in the conditions mentioned above, the smart cruise control system may not operate correctly.

Information

The SCC radar sensor alignment is required when:

- The SCC unit is reinstalled or replaced with a new one.
- The radar sensor or the surrounding parts are impacted by a collision.
- The sensor does not recognize a forward vehicle.
- The Steering Angle Sensor (SAS) is replaced or adjusted.

NOTICE

Preparation before the SCC radar sensor alignment:

- Put the vehicle on the level ground.
- Take out heavy luggage from the vehicles' seats or trunk.
- Set all tires according to the specified pressure.
- Check wheel alignment.
-

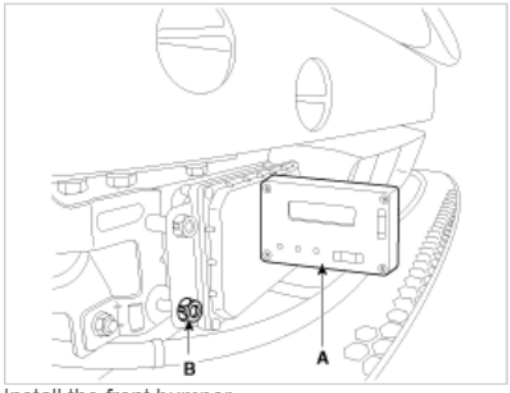
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Check that the front surface of the SCC unit is clean.

Radar sensor should be aligned in both vertical and lateral direction. Vertical alignment can performed by using the SST (0K964-3T000) and lateral alignment can be performed automatically by driving on a road.

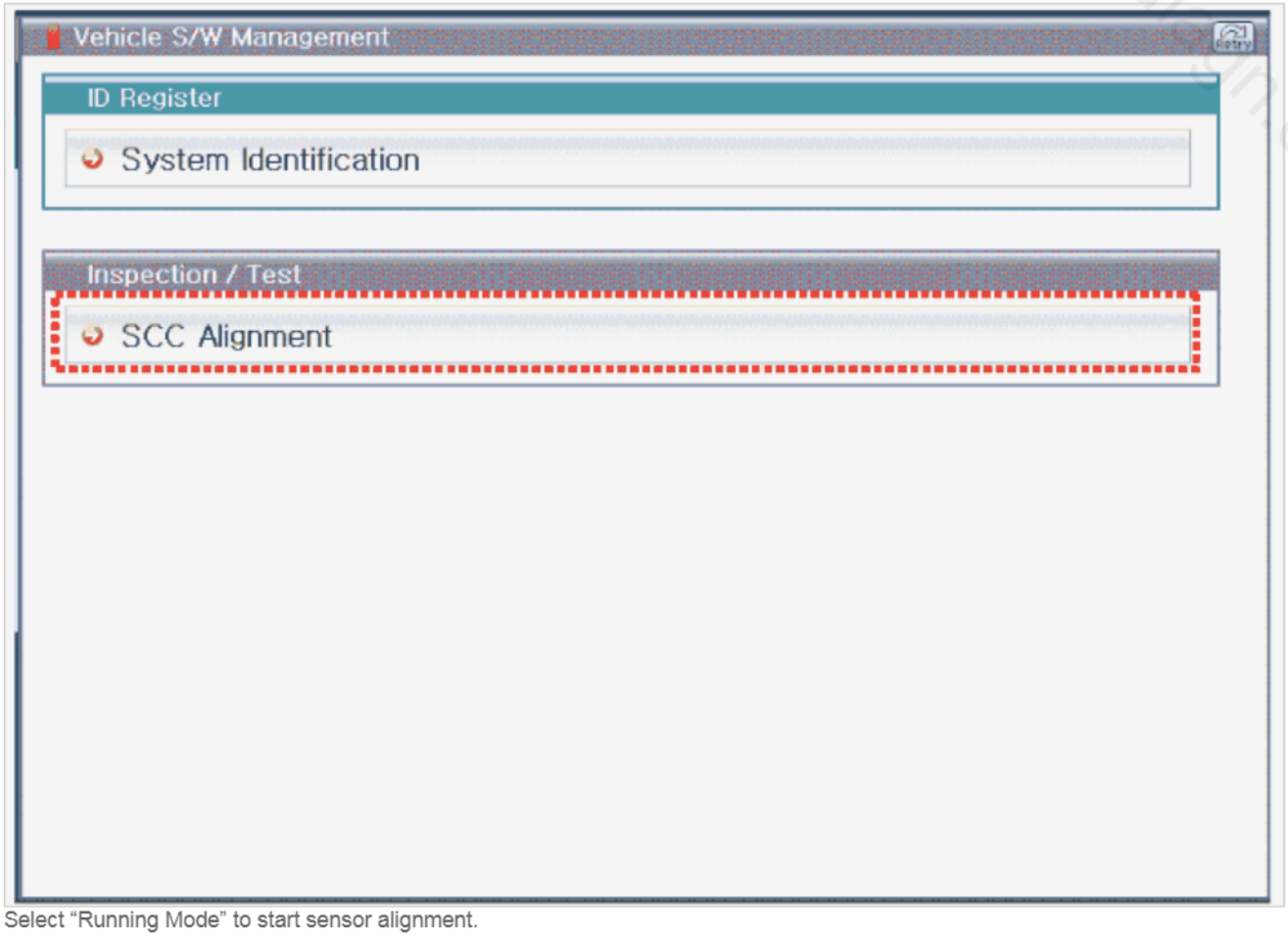
1. Park the vehicle on a level ground.
2. Remove the front bumper.
   (Refer to Body - "Front Bumper Cover")
3. Check the vertical alignment of the radar sensor using the SST 0K964-3T000 (A).
   If the vertical alignment is out of the the tolerance, turn the adjustment screw (B) until the alignment is within the tolerance.

   Tolerance:±1.25° or less

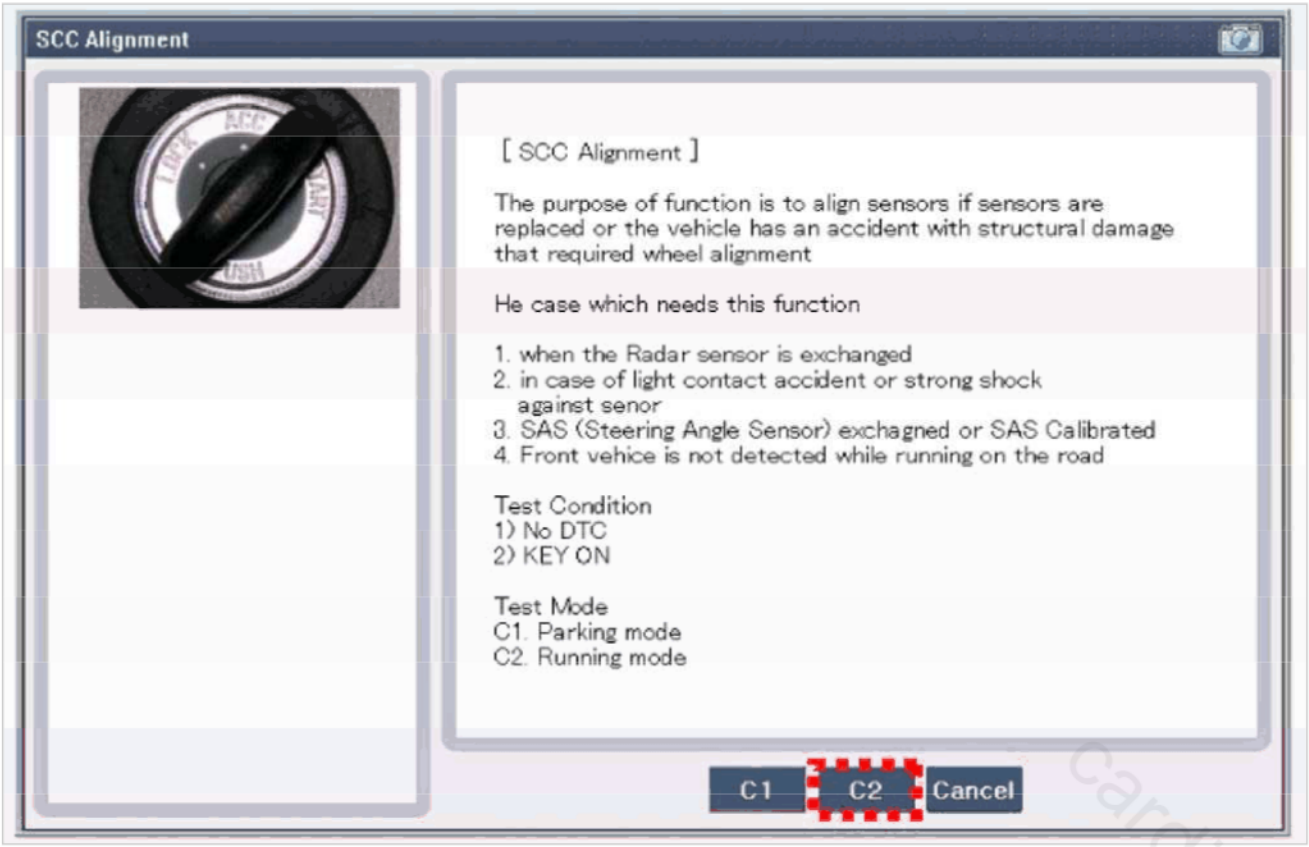


4. Install the front bumper.
   (Refer to Body - "Front Bumper Cover")
5. To perform the lateral alignment, connect the GDS with the engine started and select the “SCC Alignment”.

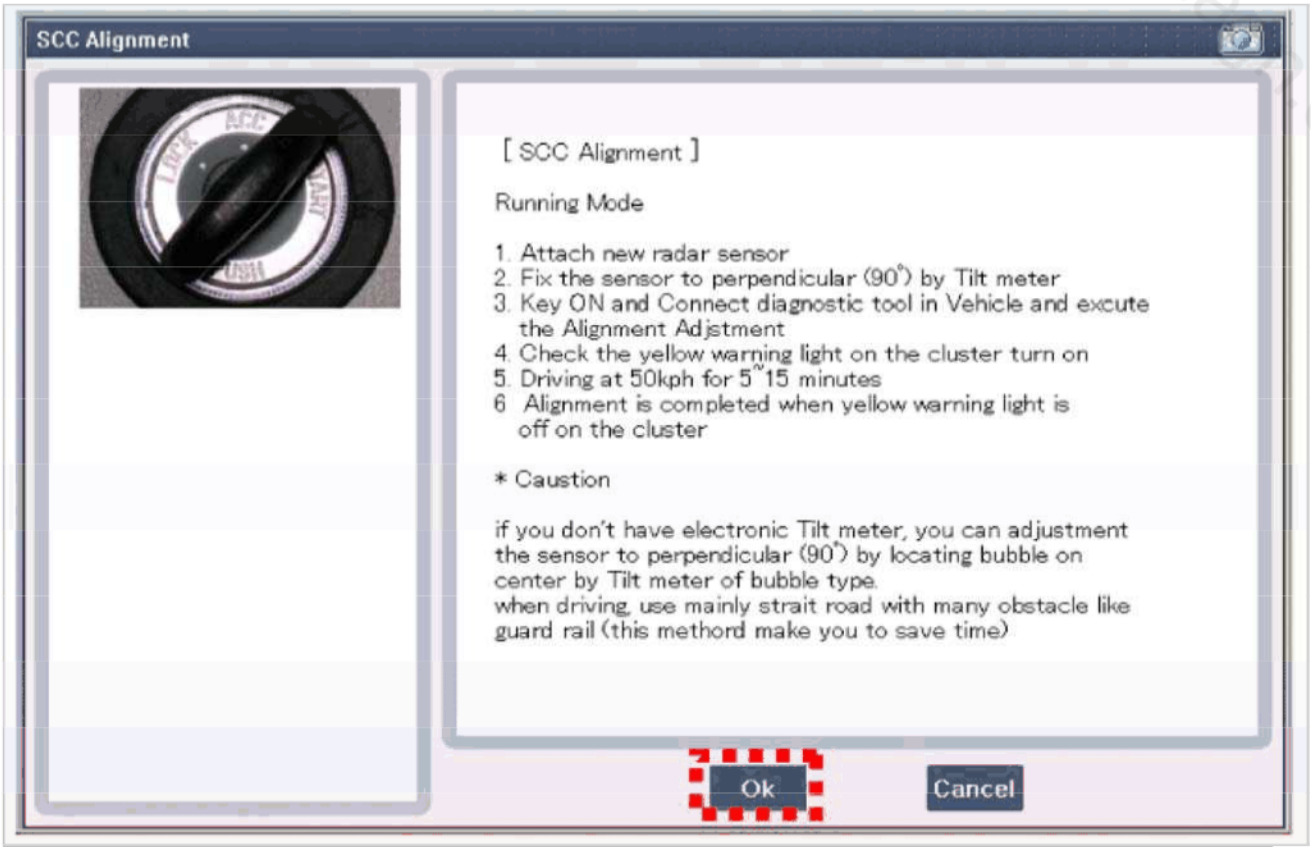
   Information
   Be sure to erase DTC before performing the lateral alignment.



6. Select “Running Mode” to start sensor alignment.



7. Drive the vehicle and check that the yellow warning light on the cluster is turned ON and then OFF.



NOTICE

The lateral alignment takes about 5 to 15 minutes generally but it can be shorten or extended depending on the road condition or driving condition.

- Road or driving conditions for shortening the alignment :
- Driving at more than 65 km/h (40.4 mph)
- Driving on a road without curve and slope
- Driving on a thick and wide paved road
- Driving on a road where there are repetitive and fixed targets (metal materials such as street lights or guard rails)
- Driving on a dry road without rain or snow
- Road or driving conditions that can interrupt the alignment process
- Driving a road with the sharp curve where the radius is within 100m (328.0ft)
- Driving at a lower speed than suggested above or during a stop due to a red light
- Driving in a tunnel or under an overpass
- Turning the steering wheel excessively to the left or right or changing the lane suddenly

⚠ CAUTION

Be sure to follow the below safety guidelines while driving the vehicle for the lateral alignment :

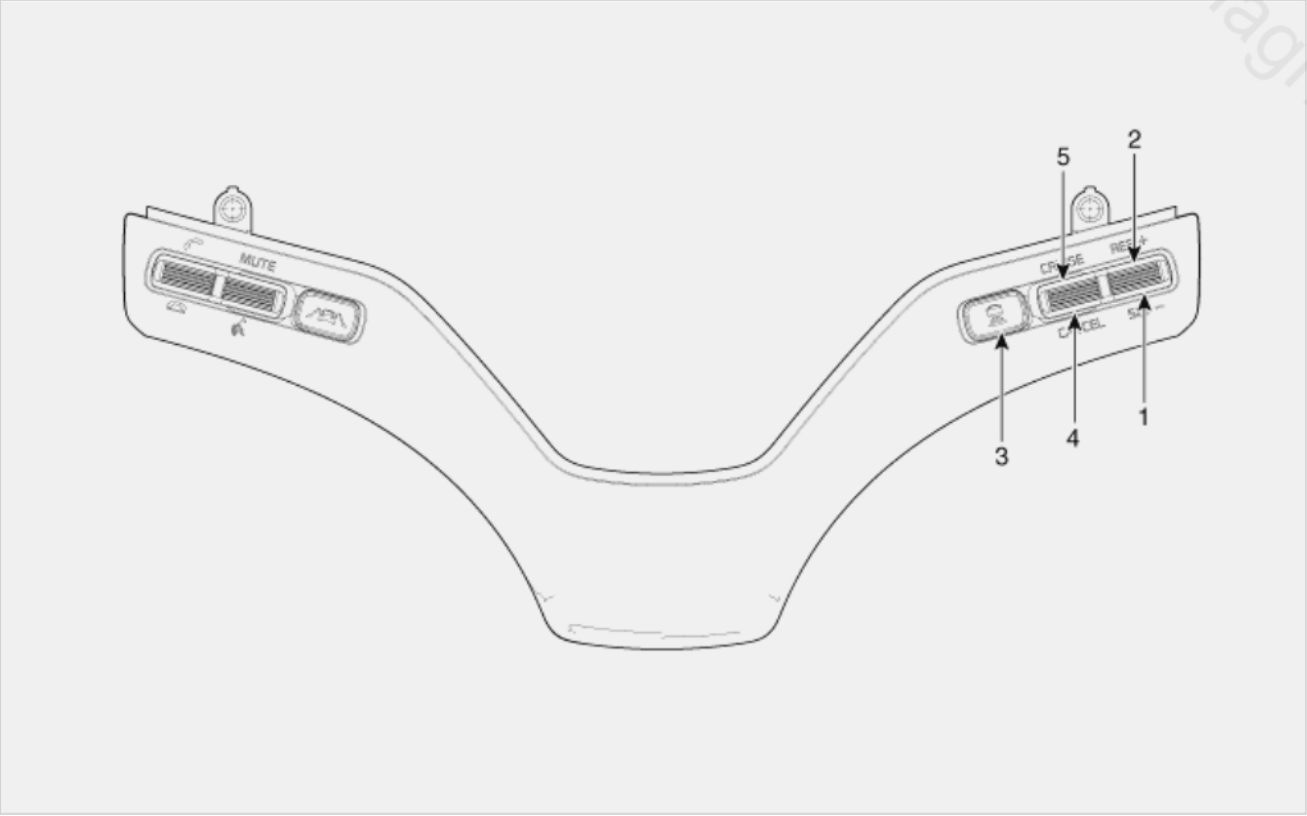
- Observe a regulation speed
- Do not drive too fast for shortening the sensor alignment. Drive safely considering the road condition and traffic situation.
- Do not stare the GDS screen or operate the GDS while driving. Only while stopping, the GDS should be operated.

NOTICE

If the lateral alignment is not completed successfully, check the alignment using the GDS. If the value is out of ±3°, check that the back beam or bracket where the SCC unit is mounted are in a good condition and then if there is no problems, replace the SCC unit with new one. After replacing the SCC unit, repeat the alignment procedure described above.

Engine Electrical System

Components

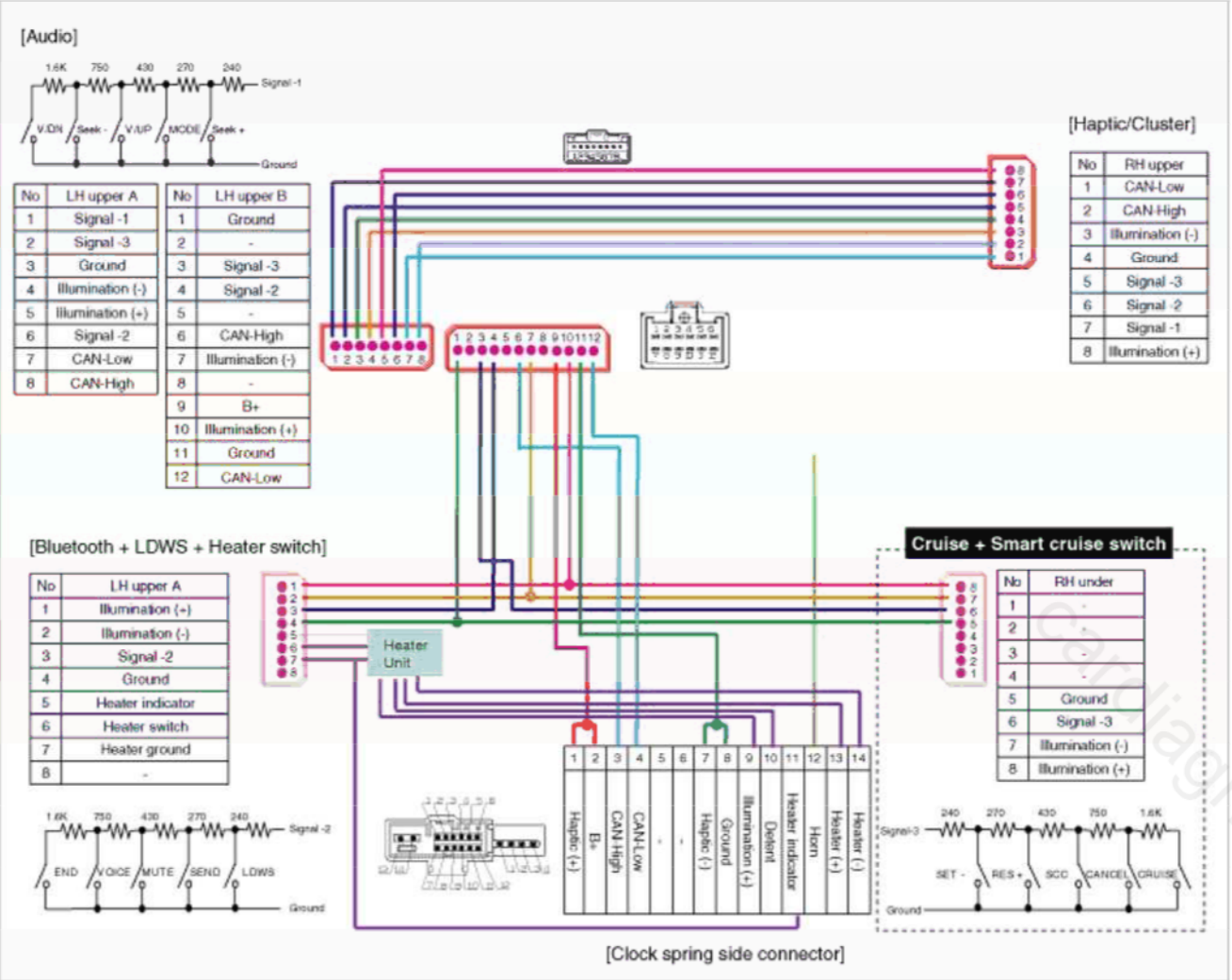


1. SET - switch	4. CANCEL switch
2. RES + switch	5. CRUISE switch
3. SCC switch	

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Engine Electrical System

Circuit Diagram

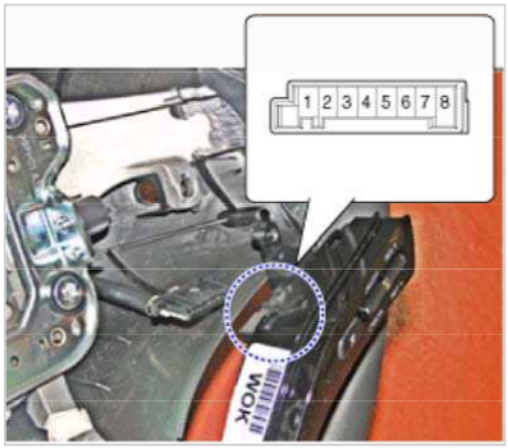


Engine Electrical System

Inspection

[Measuring Resistance]

1. Disconnect the cruise control switch connector from the control switch.



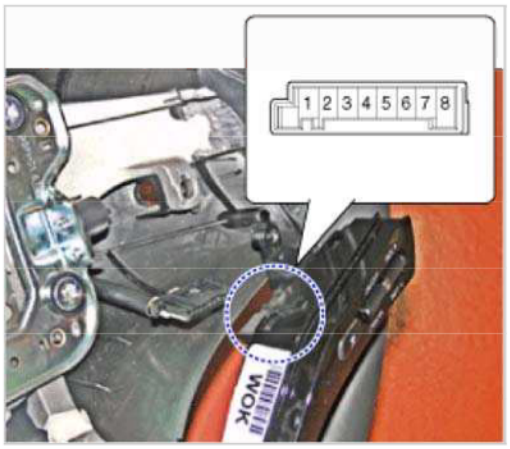
2. Measure resistance between terminals on the control switch when each function switch is ON (switch is depressed).

Function switch	Terminal	Resistance (kΩ)
SET -	5 - 6	0.24
RES +	5 - 6	0.51
SCC	5 - 6	0.94
CANCEL	5 - 6	1.69
CRUISE	5 - 6	3.29

3. If not within specification, replace switch.

[Measuring Voltage]

1. Connect the cruise control switch connector to the control switch.



2. Measure voltage between terminals on the harness side connector when each function switch is ON (switch is depressed).

Function switch	Terminal	Voltage (V)
SET -	5 - 6	0.95
RES +	5 - 6	1.68
SCC	5 - 6	2.44
CANCEL	5 - 6	3.10
CRUISE	5 - 6	3.80

3. If not within specification, inspect the control switch resistance.
   The measuring resistance value is not within specification, replace the switch and measure the voltage again.
4. If resistance is OK but, measuring voltage is not within specification, inspect the wiring harness and connectors between the switch and the ECM.

Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the air-bag module from the steering wheel.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")
3. Release the under remote switch assembly (B) after loosening the screws (A).



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4. Disconnect the under remote switch connector (A).





5. Remove the under remote switch assembly (A) from the steering.



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Installation

1. Install in the reverse order of removal.

Engine Electrical System

Description

The starting system includes the battery, starter, solenoid switch, ignition switch, inhibitor switch (A/T), clutch pedal switch (M/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.

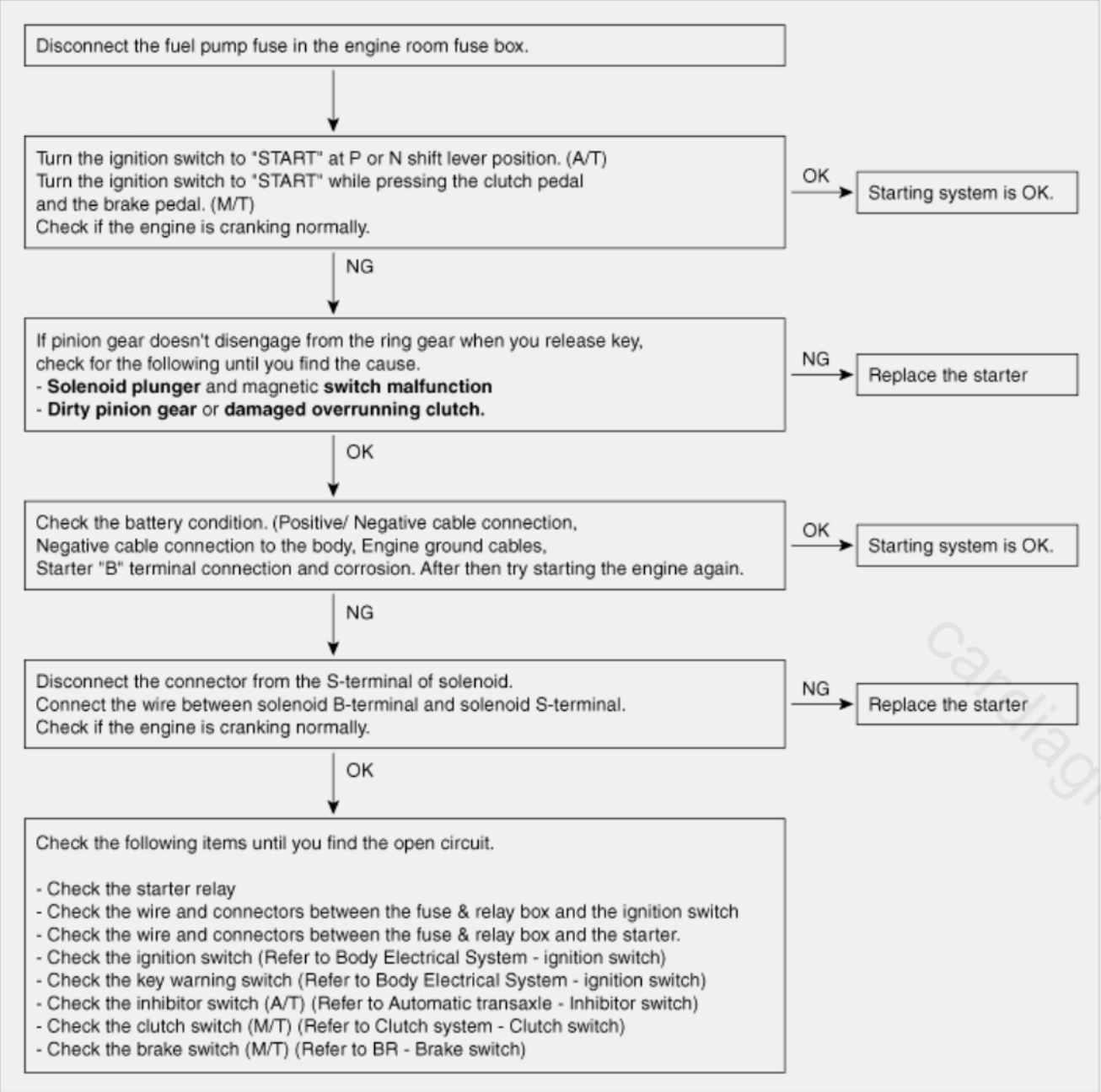
Engine Electrical System

Troubleshooting

NOTICE

- The battery must be in good condition and fully charged for this troubleshooting.

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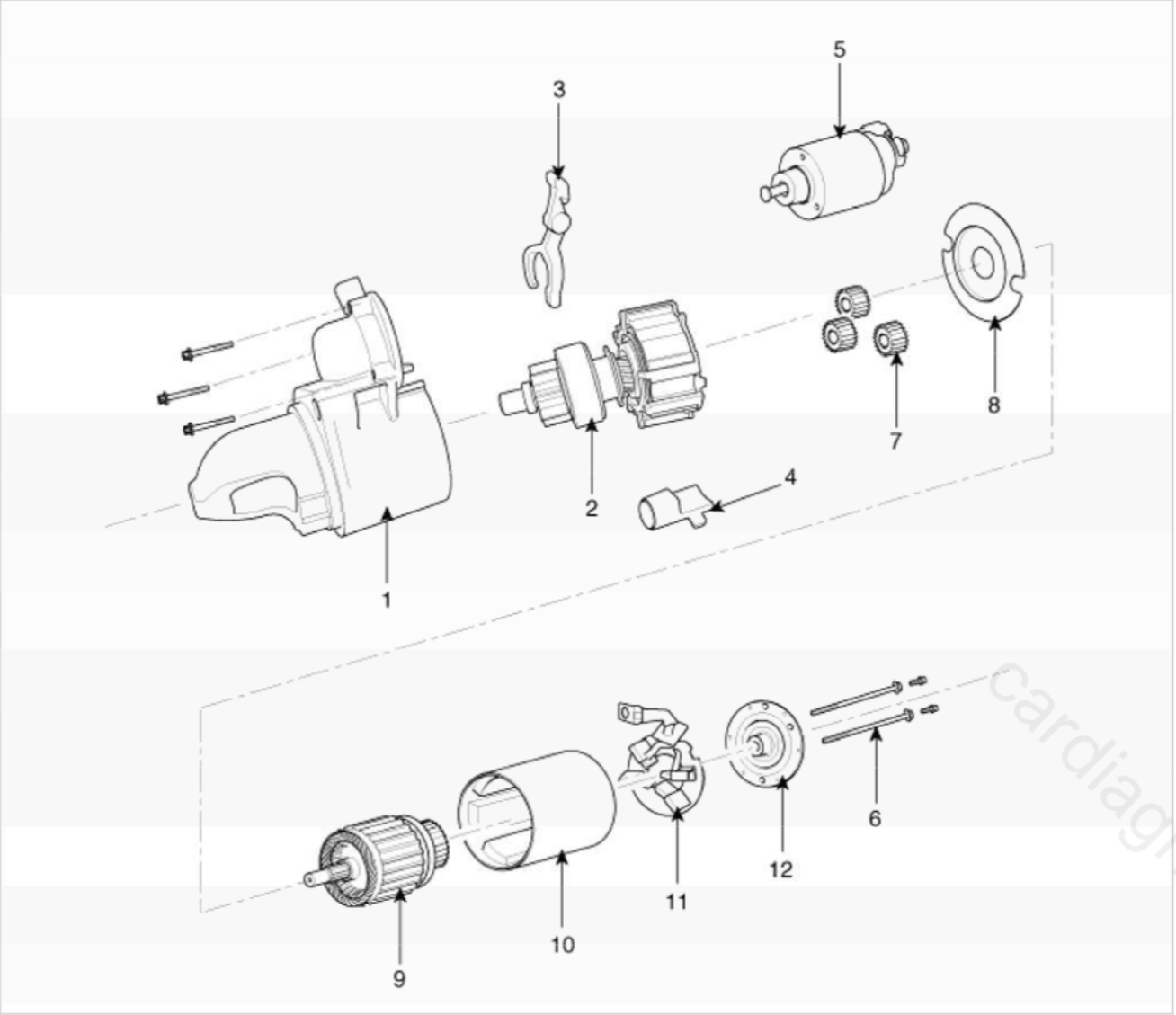


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Specification

Item		Specification
Rated voltage		12 V, 1.7 kW
The number of pinion teeth		13
Performance [No-load, 11.5 V]	Ampere	Max. 85 A
	Speed	Min. 2,550 rpm

Components



1. Front bracket	7. Planet gear
2. Planet gear shaft assembly	8. Shield
3. Lever	9. Armature assembly
4. Lever packing	10. York assembly
5. Magnet switch	11. Brush holder assembly
6. Through bolt	12. Rear bracket

Engine Electrical System

Description

The starting system includes the battery, starter, solenoid switch, ignition switch, inhibitor switch (A/T), clutch pedal switch (M/T), ignition lock switch, connection wires and the battery cable.

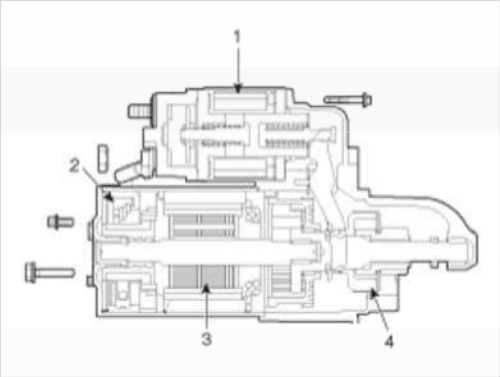
When the ignition key is turned to the start position, current flows and energizes the starter motor's solenoid coil.

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.

In conjunction with the ISG function, the starter motor must do a great deal more work. Therefore, the starter motor is configured for a significantly higher number of start cycles. The components of the starter motor have been adapted to the higher requirements.

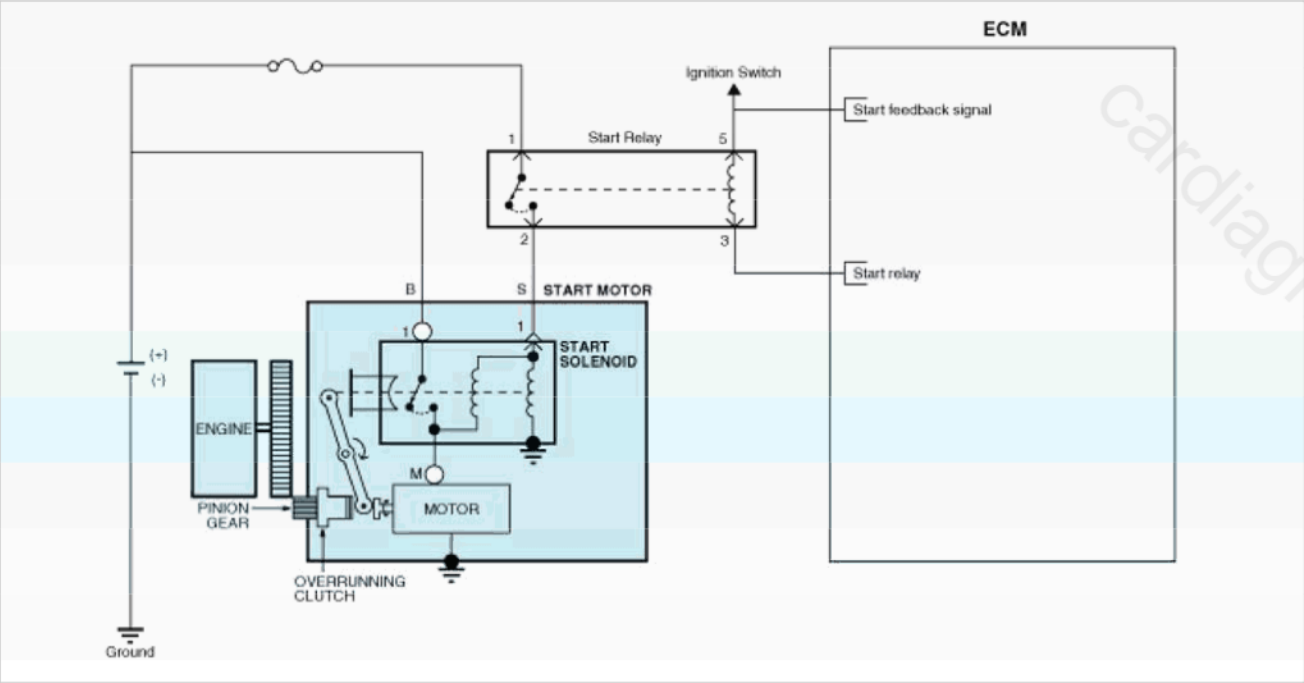
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1. Solenoid
2. Brush
3. Armature
4. Overrun clutch

Engine Electrical System

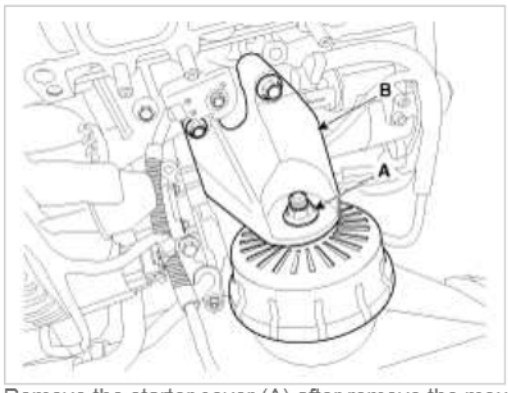
Circuit Diagram



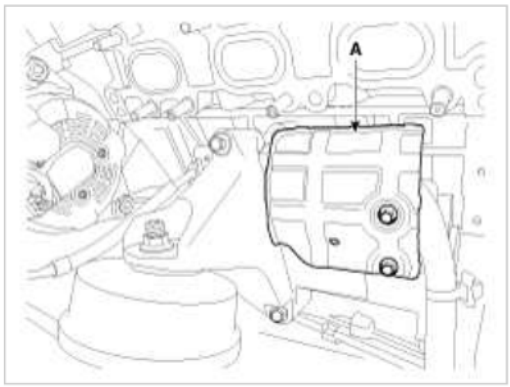
Engine Electrical System

Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the alternator.
   (Refer to Charging System - "Alternator")
3. Loosen the engine mounting nut and bolts, and then remove the engine mounting bracket (A).



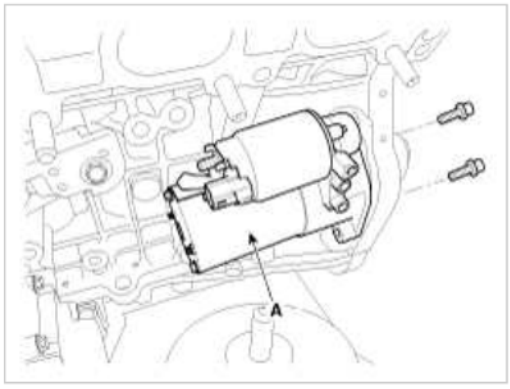
4. Remove the starter cover (A) after remove the mounting bolts.



5. Disconnect the startor connector (A) and cable (B) from the 'B' terminal.



6. Remove the starter (A) after remove the mounting bolts.



Installation

1. Install in the reverse order of removal.

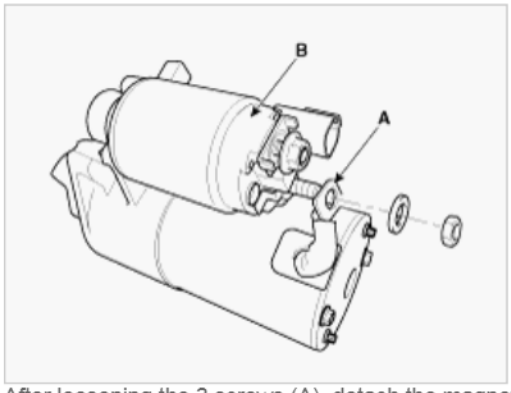
Starter mounting bolt:
49.0 ~ 63.7 N.m (5.0 ~ 6.5 kgf.m, 36.2 ~ 47.0 lb-ft)

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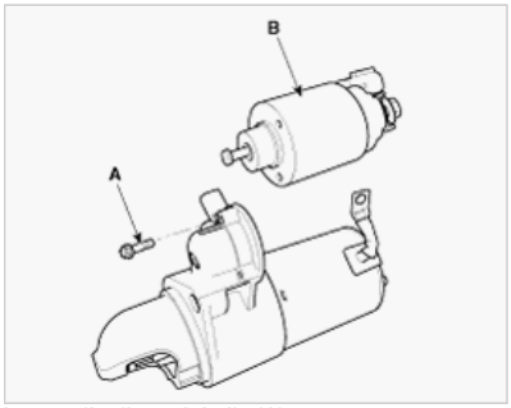
Starter cover mounting bolt:
8.8 ~ 13.7 N.m (0.9 ~ 1.4 kgf.m, 6.5 ~ 10.1 lb-ft)

Disassembly

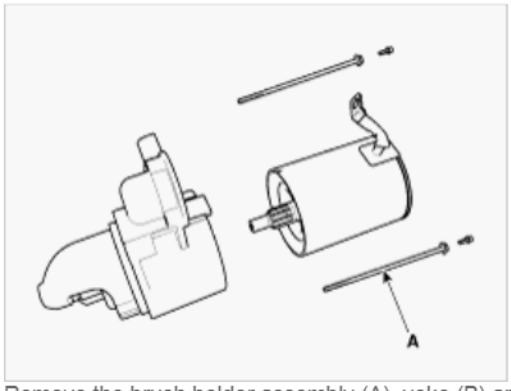
1. Disconnect the M-terminal on the magnet switch assembly.



2. After loosening the 3 screws (A), detach the magnet switch assembly (B).

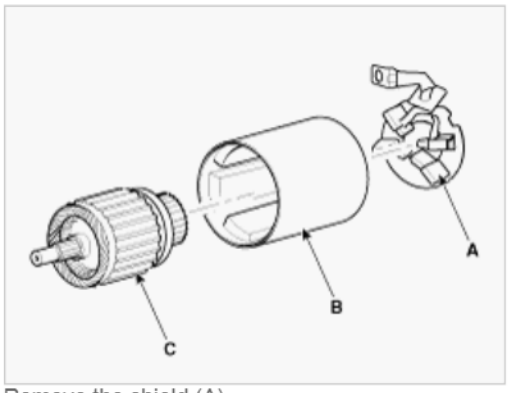


3. Loosen the through bolts (A).

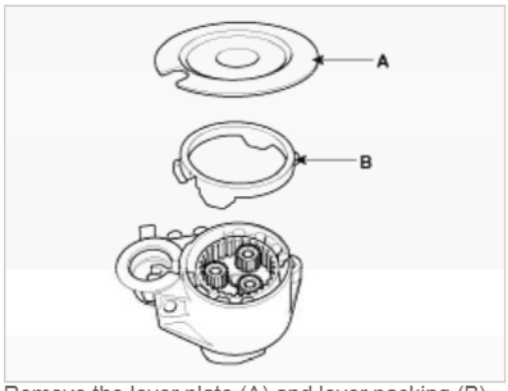


4. Remove the brush holder assembly (A), yoke (B) and armature (C).

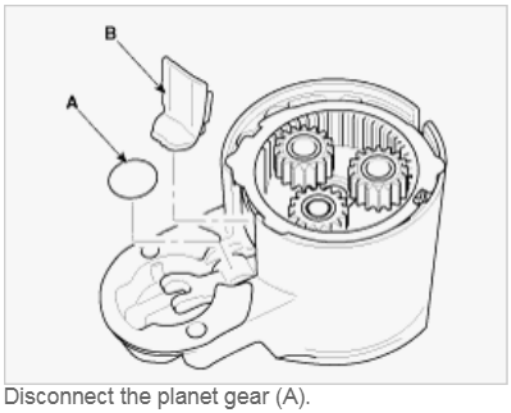
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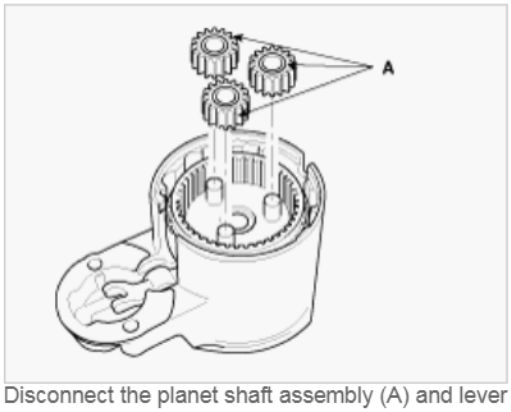
5. Remove the shield (A).



6. Remove the lever plate (A) and lever packing (B).

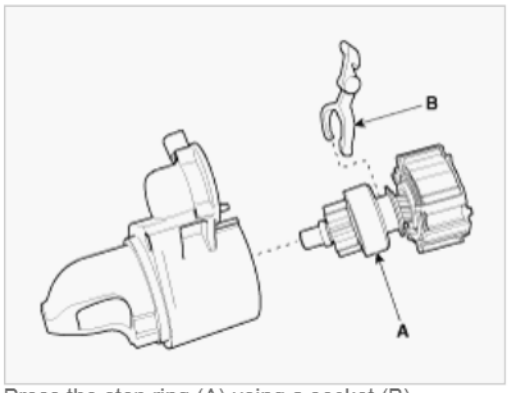


7. Disconnect the planet gear (A).

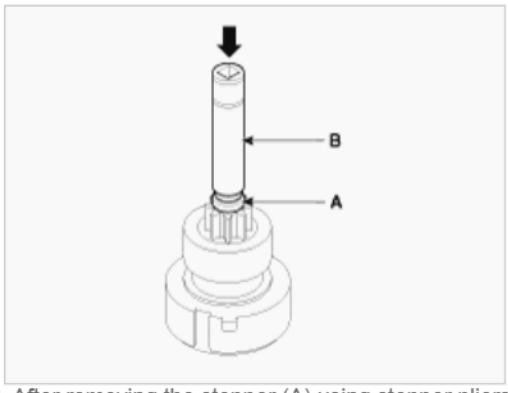


8. Disconnect the planet shaft assembly (A) and lever (B).

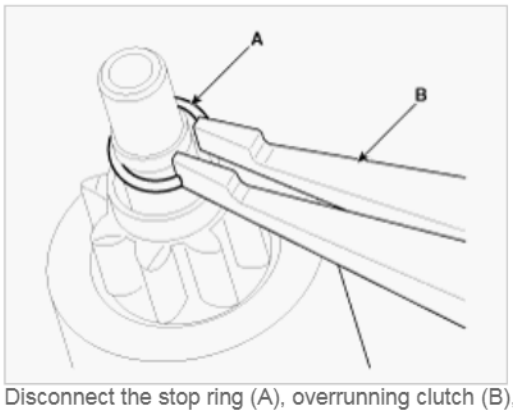
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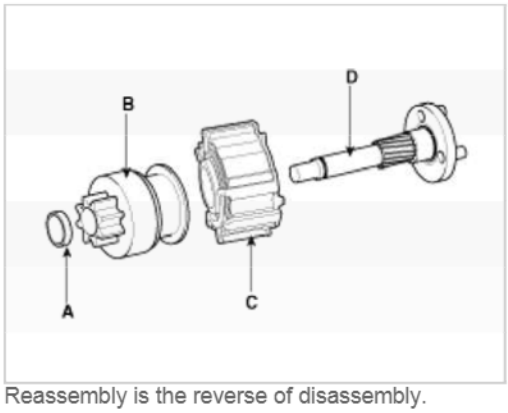
9. Press the stop ring (A) using a socket (B).



10. After removing the stopper (A) using stopper pliers (B).



11. Disconnect the stop ring (A), overrunning clutch (B), internal gear (C) and planet shaft (D).

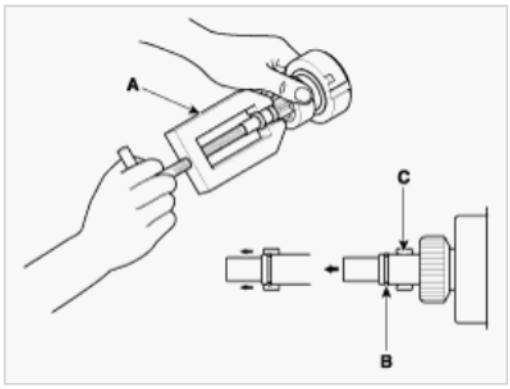


12. Reassembly is the reverse of disassembly.

NOTICE

Using a suitable pulling tool (A), pull the overrunning clutch stop ring (B) over the stopper (C).

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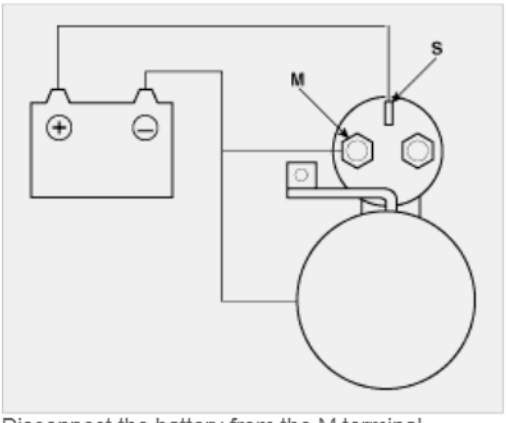
Inspection

Starter Solenoid Inspection

1. Disconnect the lead wire from the M-terminal of solenoid switch.
2. Connect the battery as shown. If the starter pinion pops out, it is working properly.

NOTICE

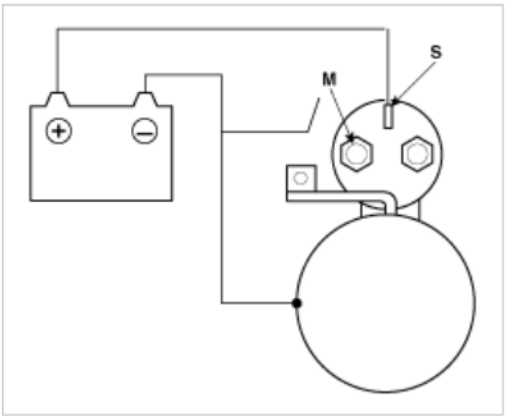
- To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



3. Disconnect the battery from the M terminal.
   If the pinion does not retract, the hold-in coil is working properly.

NOTICE

- To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.

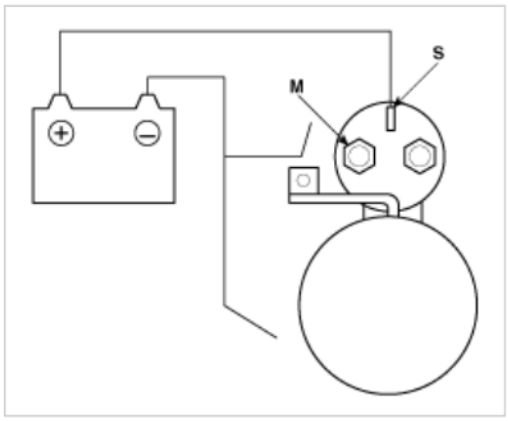


4. Disconnect the battery also from the body. If the pinion retracts immediately, it is working properly.

NOTICE

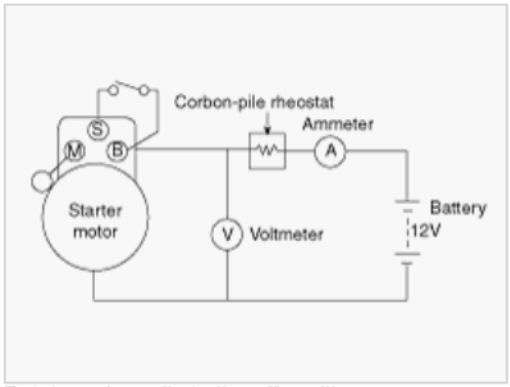
- To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.

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Free Running Inspection

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 (150-ampere scale) and carbon pile rheostats shown is the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.

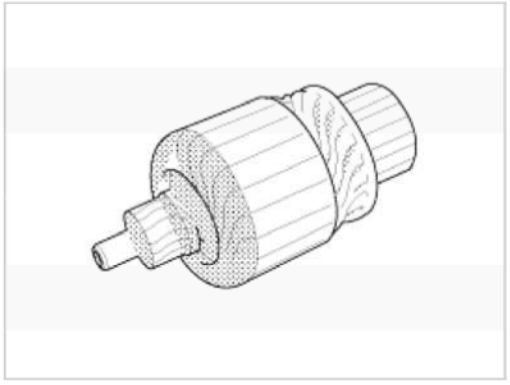


4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the starter motor body.
6. Adjust until battery voltage shown on the voltmeter reads 11volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Items	Specification
Current (Max.)	85 A
Speed (Min.)	2550 rpm

Armature Inspection And Test

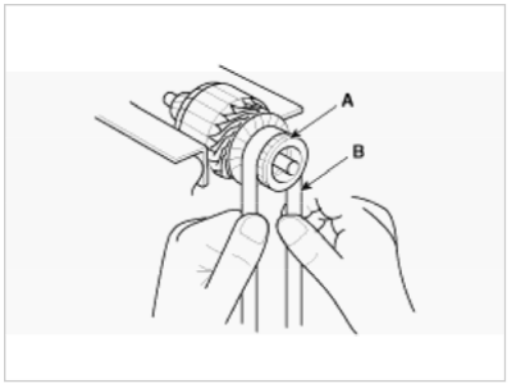
1. Remove the starter.
2. Disassemble the starter as shown at the beginning of this procedure.
3. Inspect the armature for wear or damage from contact with the permanent magnet. If there is wear or damage, replace the armature.



4.

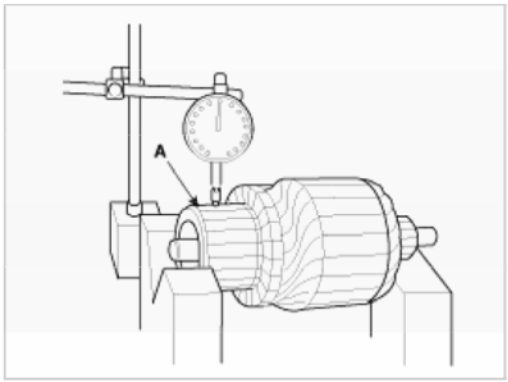
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Check the commutator (A) surface. If the surface is dirty or burnt, resurface with emery cloth or a lathe within the following specifications, or recondition with #500 or #600 sandpaper (B).



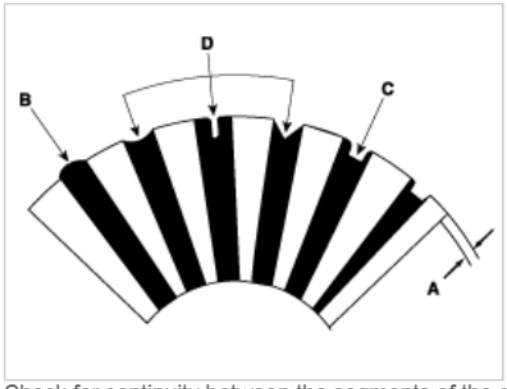
5. Measure the commutator (A) runout.
   A. If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   B. If the commutator run out is not within the service limit, replace the armature.

Commutator runout
Standard (New): 0.05mm (0.0019in.) max
Service limit: 0.08mm (0.0031in.)



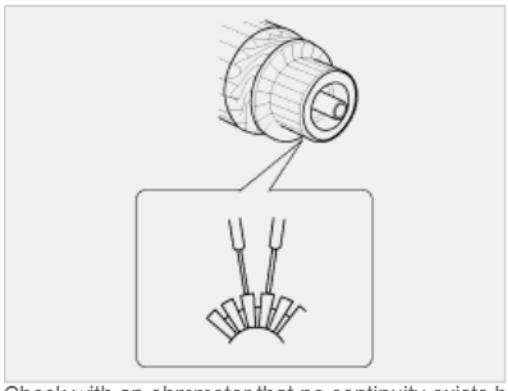
6. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or v-shaped (D).

Commutator mica depth
Standard (New) : 0.7 mm (0.0275in.)
Limit : 0.2mm (0.0079 in.)

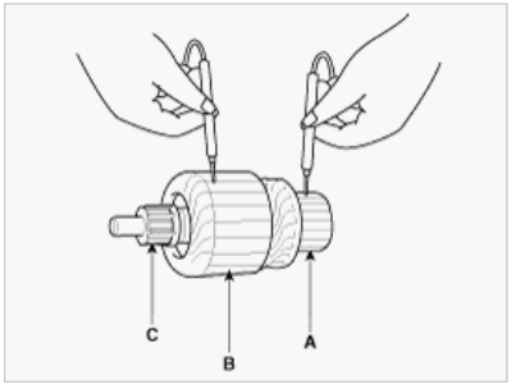


7. Check for continuity between the segments of the commutator. If an open circuit exists between any segments, replace the armature.

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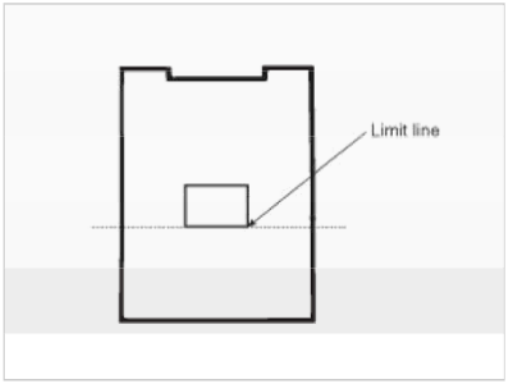


8. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.



Inspect Starter Brush

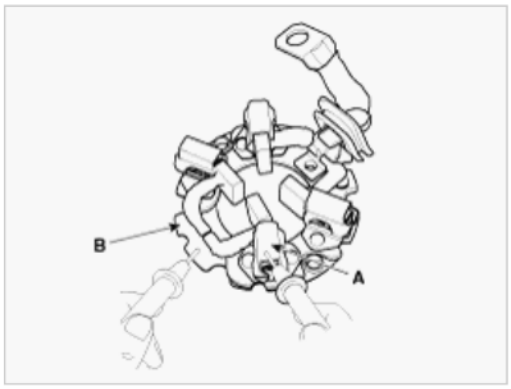
Brushes that are worm out, or oil-soaked, should be replaced.



Starter Brush Holder Test

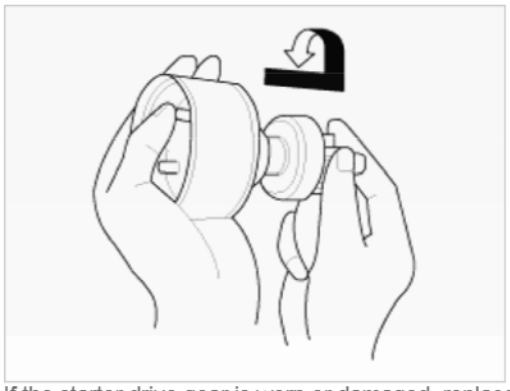
1. Make sure there is no continuity between the (+) brush holder (A) and (-) plate (B). If there is continuity, replace the brush holder assembly.

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Overrunning Clutch

1. Slide the overrunning clutch along the shaft.
   Replace it if does not slide smoothly.
2. Rotate the overrunning clutch both ways.
   Does it lock in one direction and rotate smoothly in reverse? If it does not lock in either direction or it locks in both directions, replace it.



3. If the starter drive gear is worn or damaged, replace the overrunning clutch assembly. (the gear is not available separately).
   Check the condition of the flywheel or torque converter ring gear if the starter drive gear teeth are damaged.

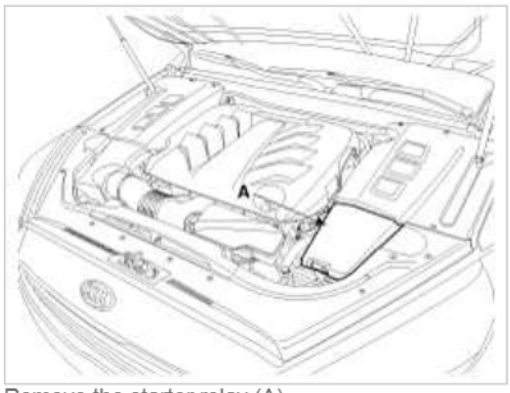
Cleaning

1. Do not immerse parts in cleaning solvent. Immersing the yoke assembly and/or armature will damage the insulation. Wipe these parts with a cloth only.
2. Do not immerse the drive unit in cleaning solvent. The overrun clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

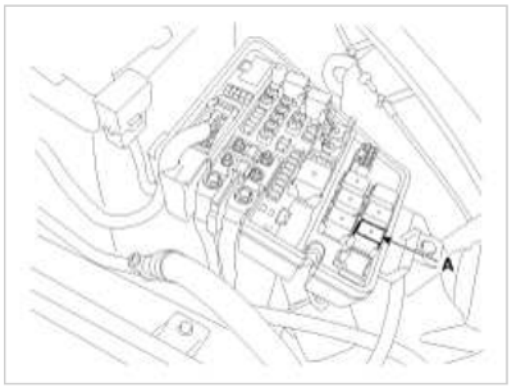
Inspection

1. Turn ignition switch OFF and disconnect the negative (-) battery terminal.
2. Remove the fuse box cover (A).

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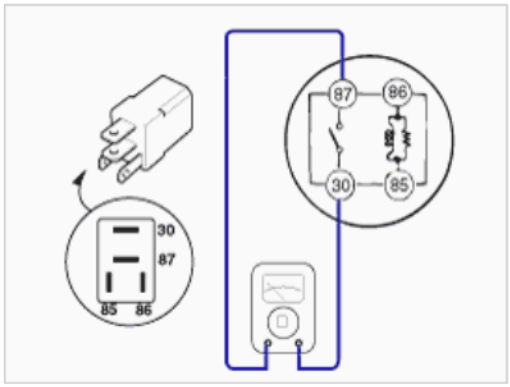


3. Remove the starter relay (A).



4. Check for continuity between the terminals (30 and 87) using an ohmmeter.

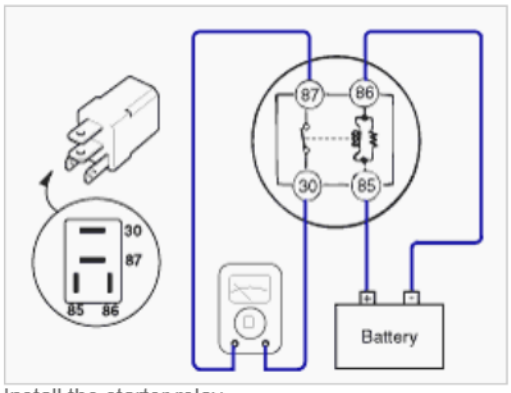
Terminal	Resistance	Measure
30 - 87	1MΩ or higher	If there is continuity between the terminals, replace the relay.



5. Apply 12V to the terminal 85 and ground to the terminal 86 and then check for continuity between the terminals (30 and 87).

Terminal	Resistance	Measure
30 - 87	1Ω or less	If there is no continuity between the terminals, replace the relay.

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6. Install the starter relay.
7. Install the fuse box cover.

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