GENESIS(BH) > 2012 > G 4.6 DOHC > Engine Electrical System

Engine Electrical System > General Information > Specifications

Specifications

Ignition System

Items			Specification
Ignition coil	Primary resistance		0.62 ± 10 %
	Secondary resistance		7.0kΩ ± 15 %
Spark plugs	Unleaded	Type	T40246P
		Gap	1.0 ~ 1.1 mm (0.0394 ~ 0.0433 in.)
Condensor	Capacity (1kHz)		0.47 MF

Starting System

Items			Specification
Starter	Rated voltage		12 V, 1.7 kW
	No. of pinion teeth		8
	No-load characteristics	Voltage	11.5 V
		Ampere	85A, MAX
		Speed	2,660 rpm, MIN

Charging System

Items		Specification
Alternator	Rate voltage	13.5 V, 180A
	Speed in use	1,000 ~ 18,000 rpm
	Voltage regulator	IC regulator built-in type
	Regulator setting voltage	11.7 ~ 12.3 V
Battery	Type	80 - 35 FL
	Cold cranking amperage [at -18° C(-0.4° F)]	780 A
	Reserve capacity	190 min
	Specific gravity [at 25° C(77° F)]	1.280 ± 0.01

NOTE

- COLD CRANKING AMPERAGE is the amperage a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2V or greater at a specified temperature.
- RESERVE CAPACITY RATING is amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5V at 26.7° C(80.1° F).

Battery type notation: MF 48 - 23 G L
① ② ③ ④ ⑤

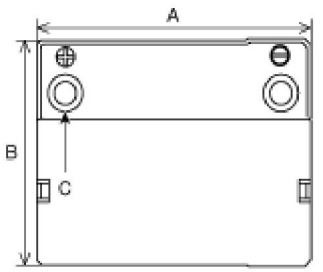
① : Battery type
- MF: Maintenance Free

② : Battery capacity (5HR)
- 48: 48 AH

③ : Battery length (A)
- 23: 230 mm (9.06 in.)

④ : Battery width (B)
- A: 127 mm (5.00 in.)
- B: 129 mm (5.08 in.)
- C: 132 mm (5.20 in.)
- D: 135 mm (5.31 in.)
- E: 154 mm (6.06 in.)
- F: 173 mm (6.81 in.)
- G: 175 mm (6.89 in.)
- H: 176 mm (6.93 in.) or above

⑤ : Terminal location (C)
- L: Positive terminal is left
- R: Positive terminal is right



Engine Electrical System > General Information > Troubleshooting

Troubleshooting

Ignition System

Symptom	Suspect area	Remedy
Engine will not start or is hard to start (Cranks OK)	Ignition lock switch	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	Disconnect the voltage regulator to see if light turns off. 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	Disconnect the voltage regulator or alternator to see if light turns off. If light turns off, replace voltage regulator.
	Wiring	Repair or replace wiring
Overcharge	Electronic voltage regulator	Disconnect the voltage regulator to see if light turns off. 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	Disconnect the voltage regulator or alternator to see if light turns off. If light turns off, replace voltage regulator.
	Poor grounding	Inspect ground or repair
	Worn battery	Replace battery

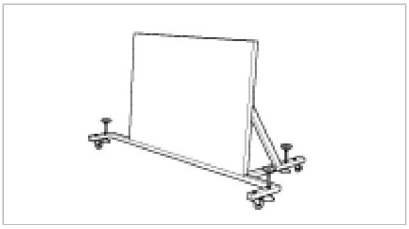
Starting System

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 TR group-automatic transaxle
	Fuse blown	
	Starter motor faulty	Replace fuse
	Ignition switch faulty	Replace
		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	Replace
	Ignition switch	Replace
Starter spins but engine will not crank	Short in wiring	Repair wiring
	Pinion gear teeth broken or starter motor	Replace
	Ring gear teeth broken	Replace fly wheel or torque converter

Engine Electrical System > General Information > Special Service Tools

Special Service Tools

Tool (Number and name)	Illustration	Use
SCC reflector (09964-3N200)		Reflector (metal plate) to align the SCC sensor

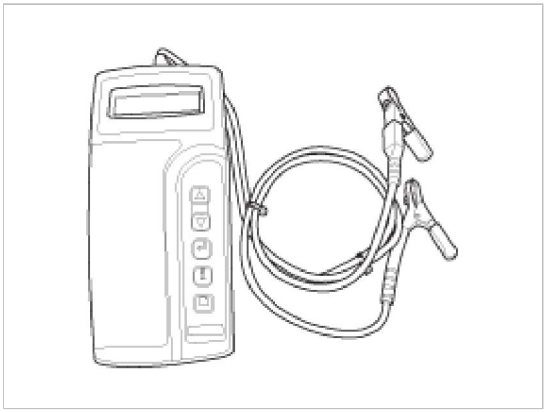
Engine Electrical System > General Information > General Information

The Micro 570 Analyzer

The Micro 570 Analyzer provides the ability to test the charging and starting systems, including the battery, starter and alternator.

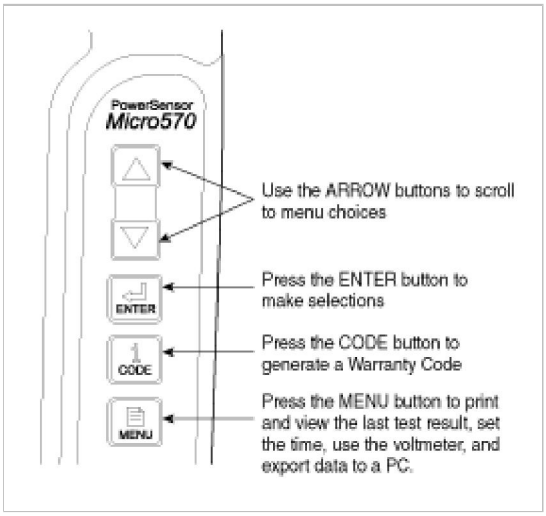
CAUTION

※ Because of the possibility of personal injury, always use extreme caution and appropriate eye protection when working with batteries.
※ When charging battery by test result, Battery must be fully charged.
To get accurate test result, battery surface voltage must have subsided ahead before test when you test battery after charged. (See following Battery Test Results)



Keypad

The Micro 570 button on the key pad provide the following functions :

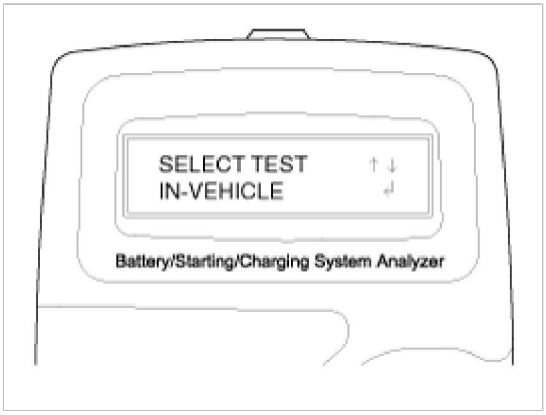


Battery Test Procedure

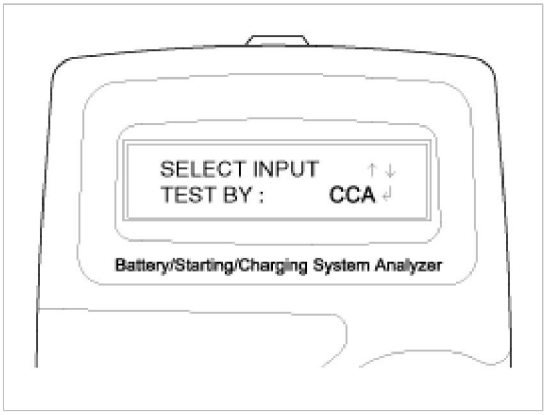
1. Connect the tester to the battery.
   A. Red clamp to battery positive (+) terminal.
   B. Black clamp to battery negative (-) terminal.

> CAUTION
>
> Connect clamps securely. If "CHECK CONNECTION" message is displayed on the screen, reconnect clamps securely.

2. The tester will ask if the battery is connected "IN-VEHICLE" or "OUT-OF-VEHICLE". Make your selection by pressing the arrow buttons; then press ENTER.

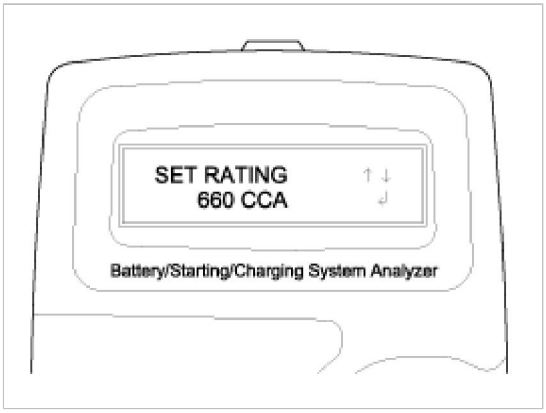


3. Select CCA and press the ENTER button.



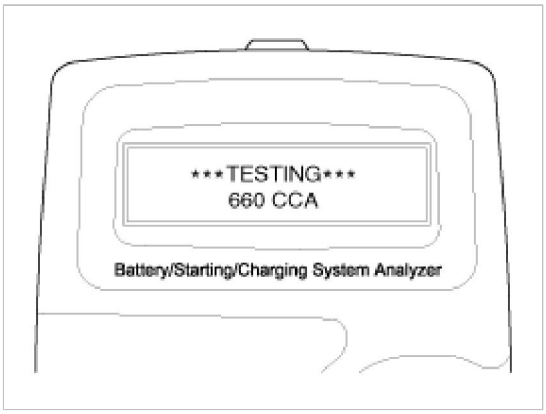
> NOTE
>
> CCA : Cold cranking amps, is an SAE specification for cranking batteried at -0.4° F (-18° C).

4. Set the CCA value displayed on the screen to the CCA value marked on the battery label by pressing up and down buttons and press ENTER.

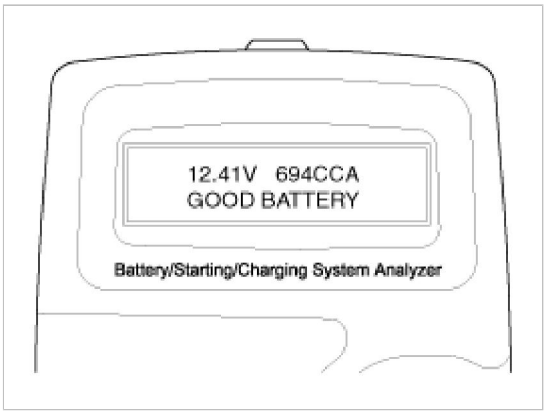


> NOTE
>
> The battery ratings(CCA) displayed on the tester must be identical to the ratings marked on battery label.

5. The tester will conduct battery test.



6. The tester displays battery test results including voltage and battery ratings.
   Refer to the following table and take the appropriate action as recommended by the Micro 570.



Battery Test Results

Result On Printer	**Remedy**
GOOD BATTERY	No action is required.
GOOD RECHARGE	Battery is in a good state. Recharge the battery and use. ※ You have to follow instruction below when you charge battery and retest, otherwise test result can be inaccurate. (See ‘Charge and Retest method after battery charge’ below.)
CHARGE & RETEST	Battery is not charged properly. - Charge and test the battery again. ※ You have to follow instruction below when you charge battery and retest, otherwise test result can be inaccurate. (See ‘Charge and Retest method after battery charge’ below.)
REPLACE BATTERY	Replace battery and recheck the charging system. - Improper connection between battery and vehicle cables may cause "REPLACE BATTERY". Retest the battery after removing cables and connecting the tester to the battery terminal directly prior to replacing the battery.
BAD CELL-REPLACE	Charge and retest the battery. - If the Micro 570 recommends "REPLACE BATTERY", replace the battery and recheck the charging system.

[Charge and Retest method after battery charge]

Battery charge

Set battery charger to ‘Auto Mode’ (The Mode that charging current drops as the battery charges.) and charge battery until charging current down close to zero or the charger alerts you with an alarm when charge is complete.

(Minimum charging time recommended: More than 3 hours with Auto Mode that explained above)

A. If battery is not fully charged, battery surface voltage will be high while the amount of current charged (CCA) in battery is low. If you measure the battery under this condition, tester may misjudge that battery sulfation occurred because the amount of current in battery is too low in comparison with battery voltage.
   * Surface voltage: When battery is charged electrolyte temperature increases and chemical reaction become active resulting in an excessive increase of battery voltage.
   It is known that it takes approximate one day to subside this increased surface voltage completely.

Battery Test after charge

Do not test battery right after the charge. Test battery after battery surface voltage has subsided as instructed in the following procedure.

(1) When battery charge is complete, install the battery in the vehicle.

(2) Put IG key to ON position and turn on head lamp with low beam, and wait 5 minutes. (Discharge for 5 minutes)

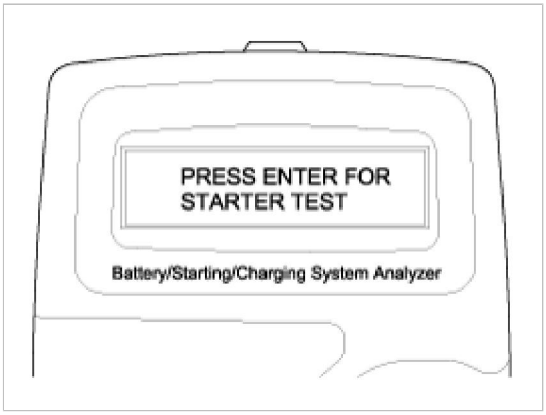
(3) Turn off the head lamp and IG key, and wait 5 minutes. (Waiting for 5 minutes)

(4) Remove +, - cable from the battery and test battery.

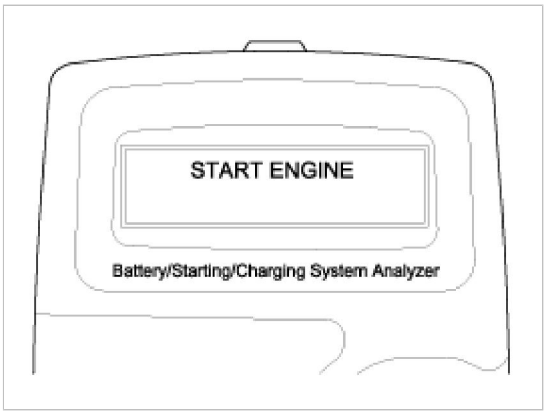
> WARNING
>
> Whenever filing a claim for battery, the print out of the battery test results must be attached.

Starter Test Procedure

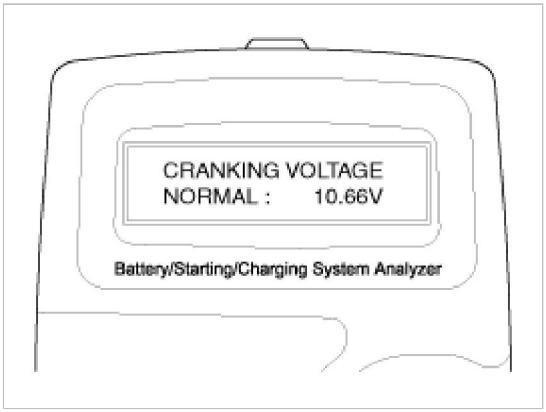
7. After the battery test, press ENTER immediately for the starter test.



8. Start the engine.



9. Cranking voltage and starter test results will be displayed on the screen.
   Refer to the following table and take the appropriate action as recommended by the Micro 570.



Starter Test Results

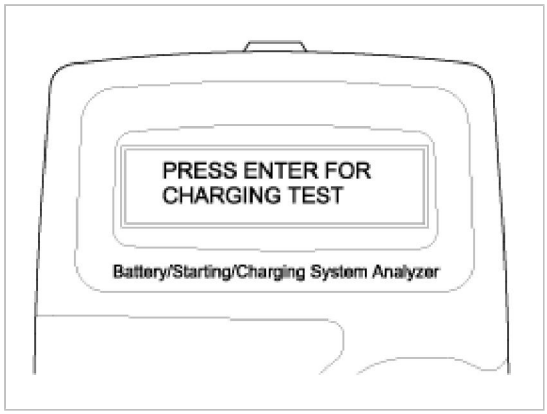
Result On Printer	Remedy
CRANKING VOLTAGE NORMAL	System shows a normal starter draw.
CRANKING VOLTAGE LOW	Cranking voltage is lower than normal level. - Check starter.
CHARGE BATTERY	The state of battery charge is too low to test. - Charge the battery and retest.
REPLACE BATTERY	Replace battery. - If the vehicle is not started though the battery condition of "GOOD BATTERY" is displayed, check wiring for open circuit, battery cable connection, starter and repair or replace as necessary. - If the engine does crank, check fuel system.

NOTE

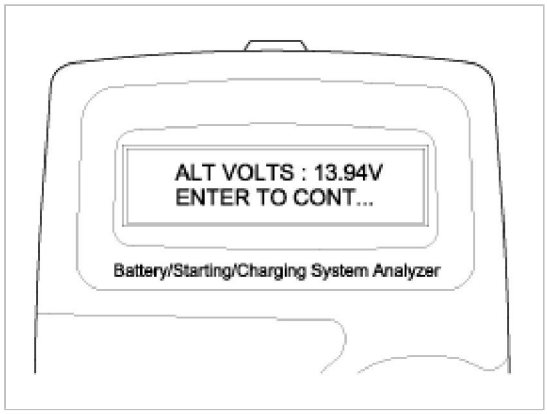
When testing the vehicle with old diesel engines, the test result will not be favorable if the glow plug is not heated. Conduct the test after warming up the engine for 5 minutes.

Charging System Test Procedure

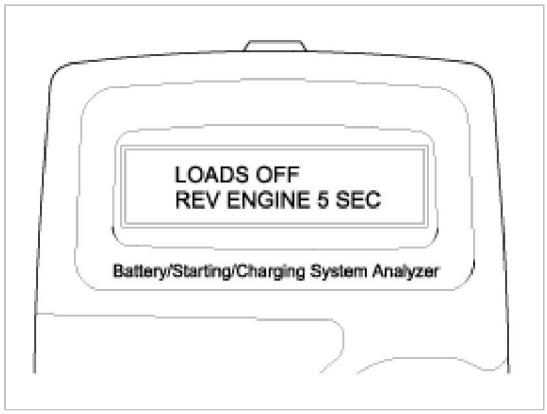
10. Press ENTER to begin charging system test.

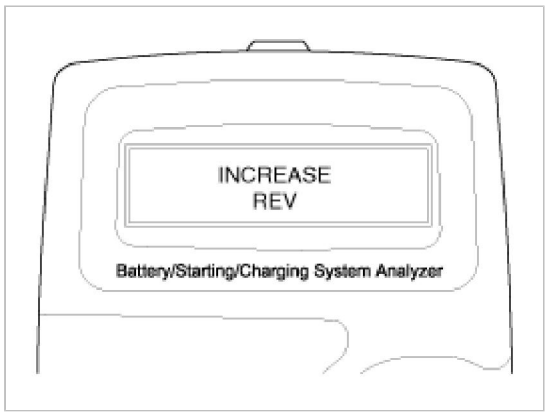


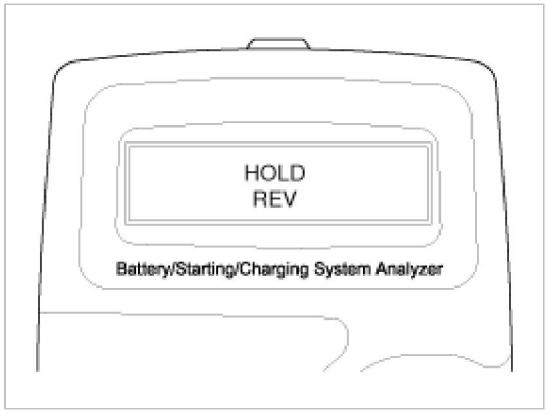
11. The tester displays the actual voltage of alternator.
    Press ENTER to continue.



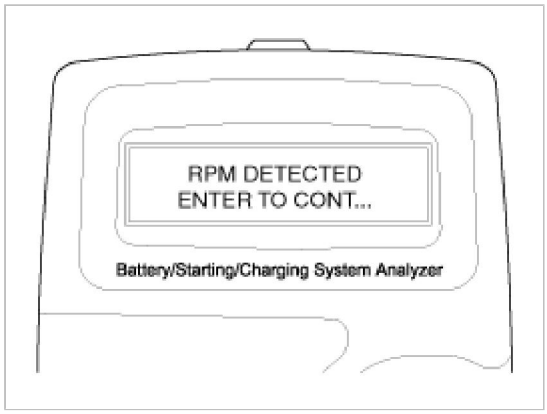
12. Turn off all electrical load and rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)



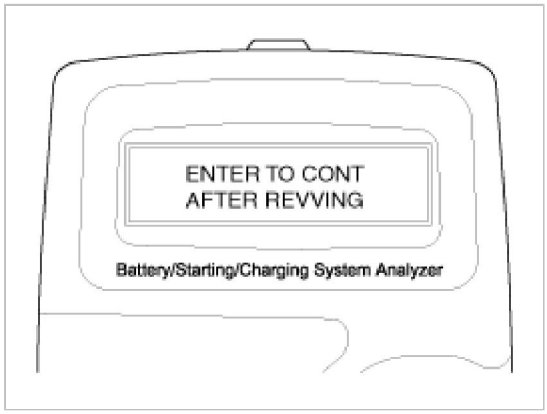




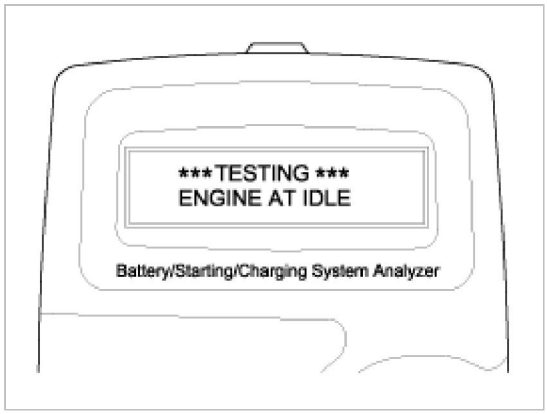
13. The message that engine RPM is detected will be displayed on the screen. Press ENTER to continue.

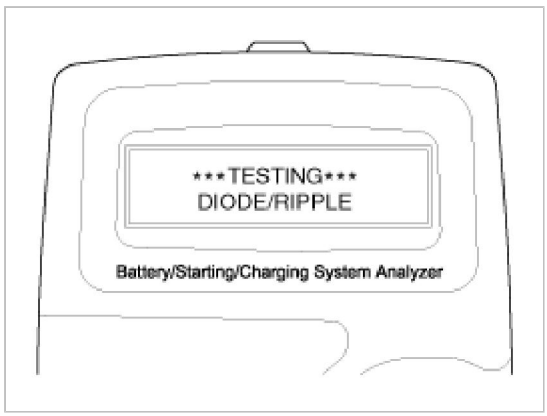


14. If the engine RPM is not detected, press ENTER after revving engine.

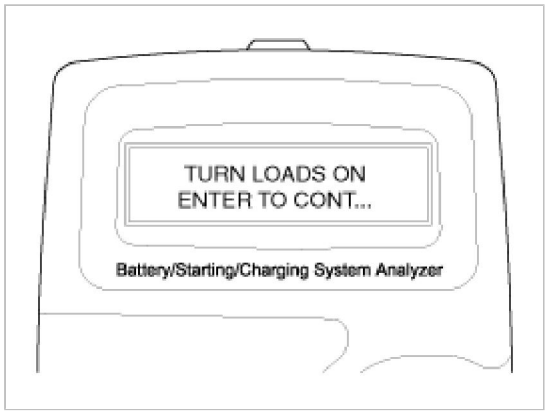


15. The tester will conduct charging system test during loads off.

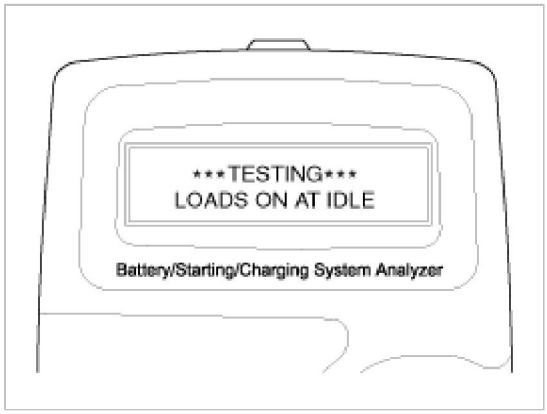




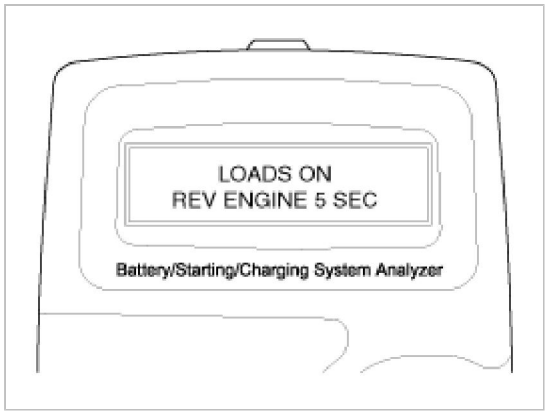
16. Turn on electrical loads (air conditioner, lamps, audio and etc). Press ENTER to continue.

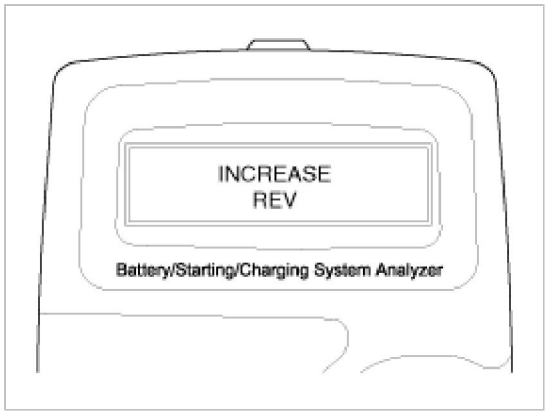


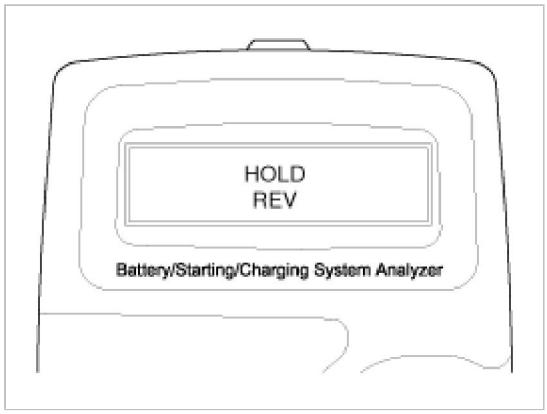
17. The tester will conduct charging system test during loads on.



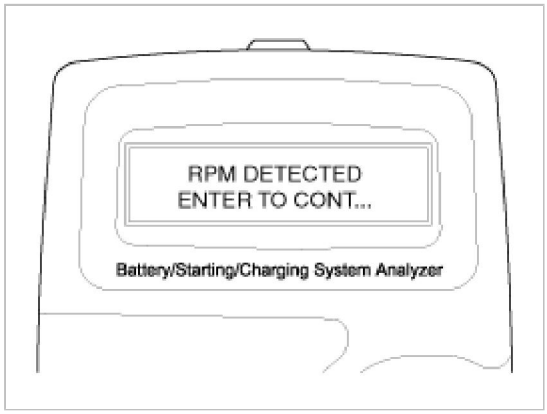
18. Rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)



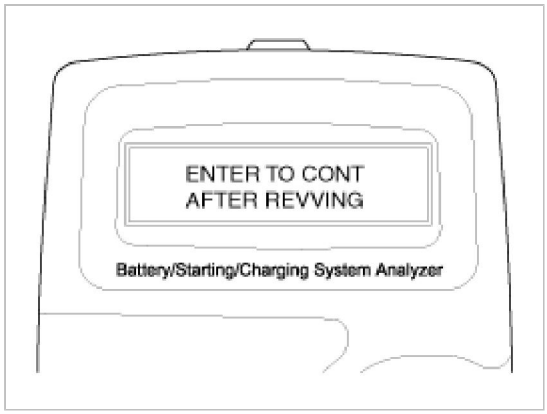




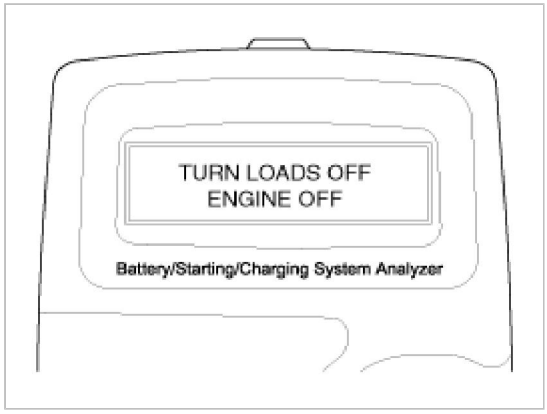
19. The message that engine RPM is detected will be displayed on the screen. Press ENTER to continue.



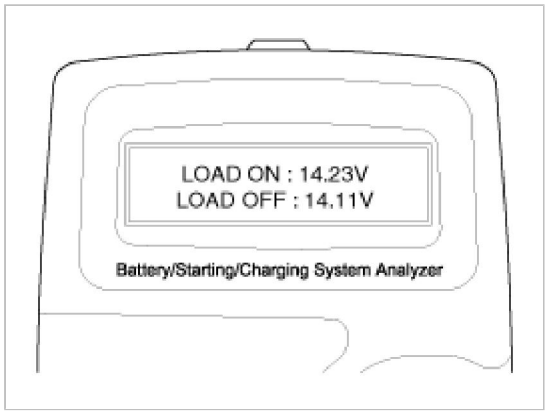
20. If the engine RPM is not detected, press ENTER after revving engine.

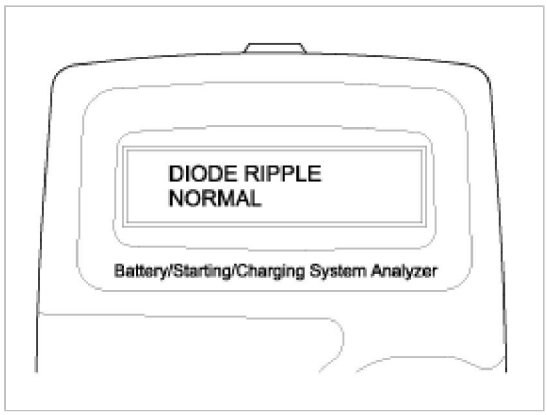


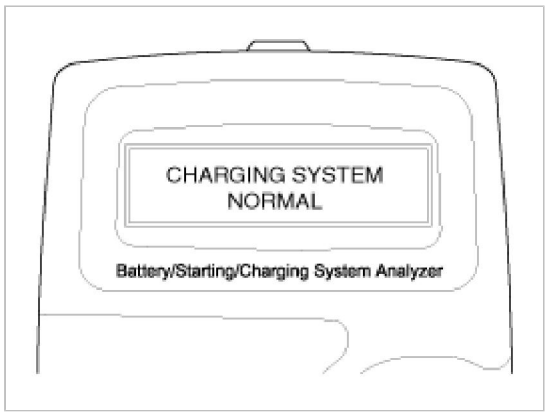
21. Turn off electrical loads (air conditioner, lamps, audio and etc). Turn the engine off.



22. Charging voltage and charging system test results will be displayed on the screen.
    Shut off engine end disconnect the tester clamps from the battery. Refer to the following table and take the appropriate action as recommended by the Micro 570.







Charging System Test Results

Result On Printer	Remedy
CHARGING SYSTEM NORMAL / DIODE RIPPLE NORMAL	Charging system is normal.
NO CHARGING VOLTAGE	Alternator does not supply charging current to battery. - Check belts, connection between alternator and battery and replace belts or cable or alternator as necessary.
LOW CHARGING VOLTAGE	Alternator does not supply charging current to battery and electrical load to system fully. - Check belts and alternator and replace as necessary.
HIGH CHARGING VOLTAGE	The voltage from alternator to battery is higher than normal limit during voltage regulating. - Check connection and ground and replace regulator as necessary. - Check electrolyte level in the battery.
EXCESS RIPPLE DETECTED	One or more diodes in the alternator is not functioning properly. - Check alternator mounting and belts and replace as necessary.

Engine Electrical System > Ignition System > Description and Operation

Description

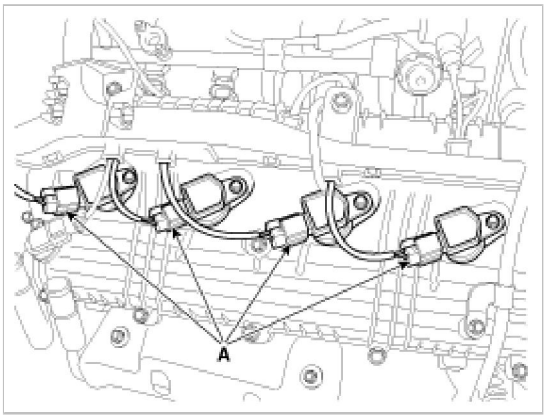
Ignition timing is controlled by the electronic control ignition timing system. The standard reference ignition timing data for the engine operating conditions are preprogrammed in the memory of the ECM (Engine Control Module). The engine operating conditions (speed, load, warm-up condition, etc.) are detected by the various sensors. Based on these sensor signals and the ignition timing data, signals to interrupt the primary current are sent to the ECM. The ignition coil is activated, and timing is controlled.

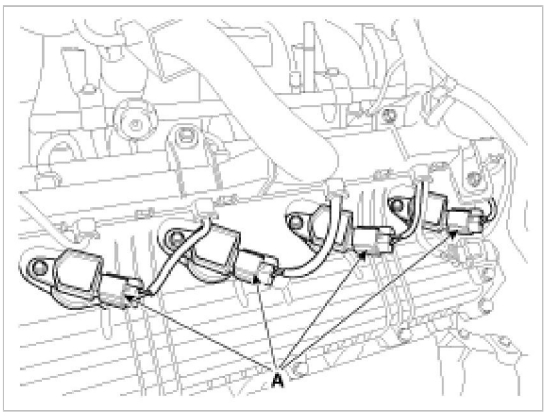
Engine Electrical System > Ignition System > Repair procedures

On-vehicle Inspection

Spark test

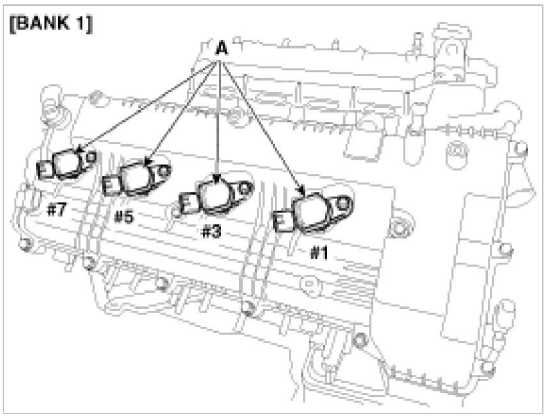
1. Disconnect the ignition coil connectors (A).

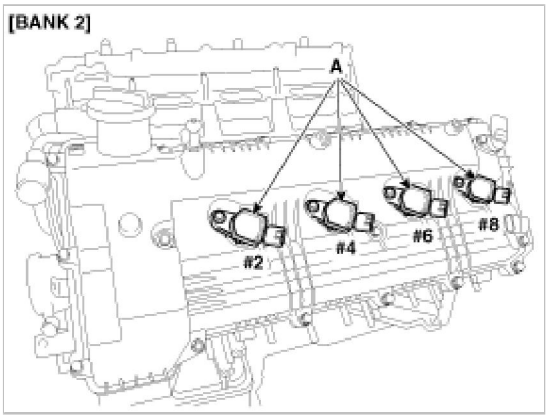




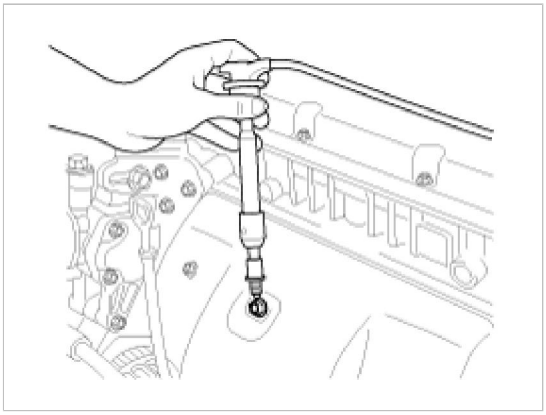
2. Remove the ignition coils (A).

Tightening torque :
9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)





3. Using a spark plug socket, remove the spark plug.
4. Install the spark plug to the ignition coil.
5. Ground the spark plug to the engine.



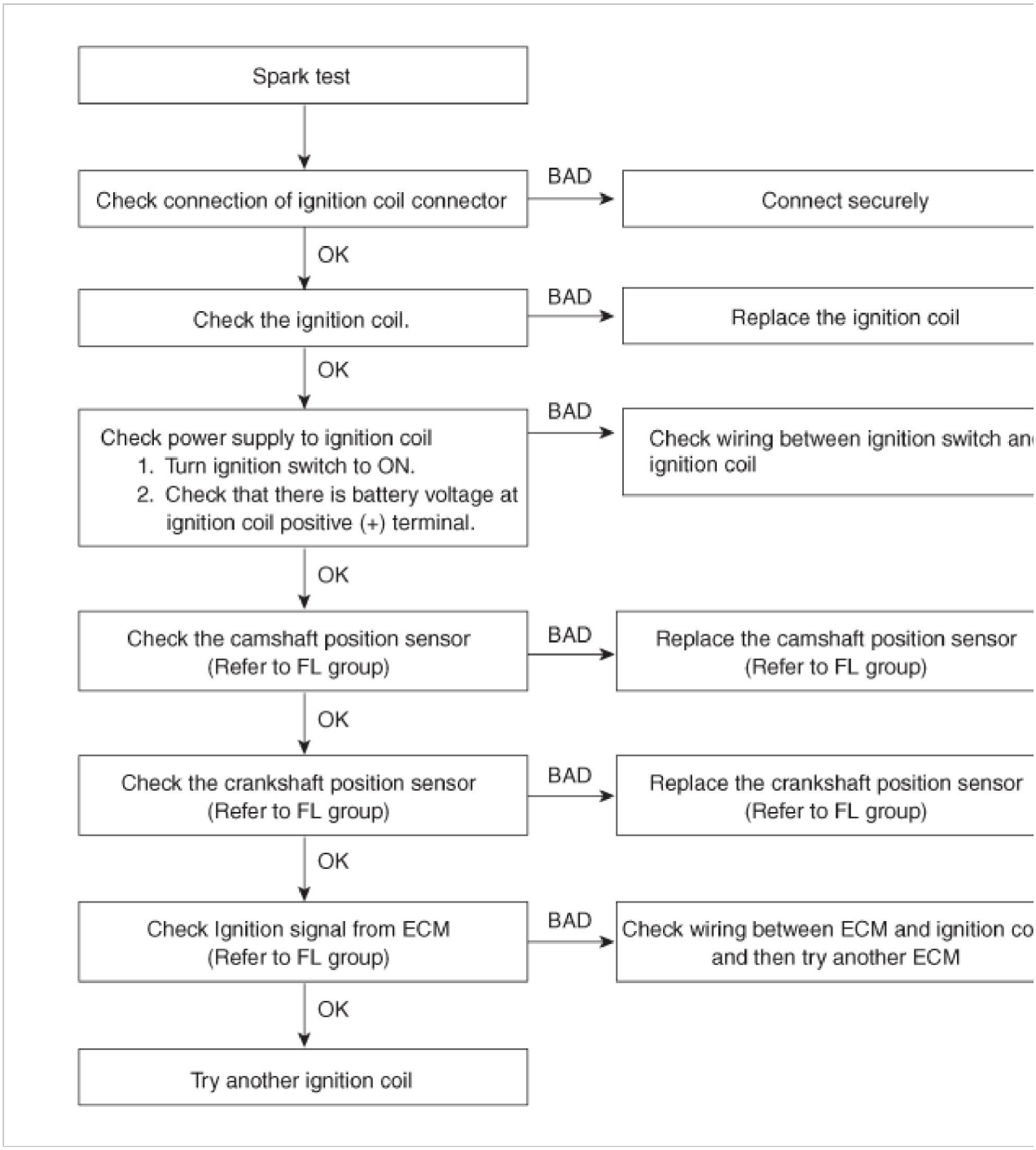
NOTE

To prevent fuel being injected from injectors while the engine is being cranked, disconnect the injector connector.
Crank the engine for no more than 5 ~ 10 seconds.

6. Inspect all the spark plugs.
7. Using a spark plug socket, install the spark plug.

Tightening torque :
24.5 ~ 29.4 N.m (2.5 ~ 3.0 kgf.m, 18.1 ~ 21.7 lb-ft)

8. Install the ignition coil.
9. Reconnect the ignition coil connector.

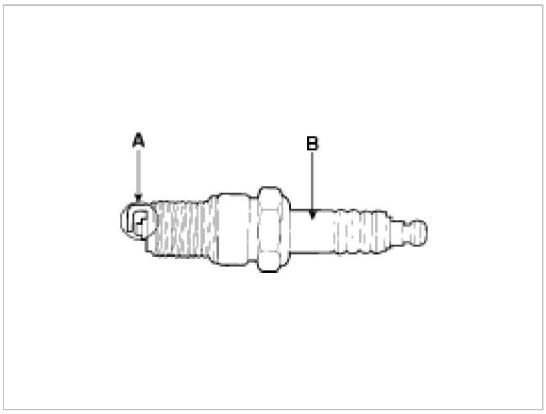


Inspect Spark Plug

1. Using a spark plug socket, remove the spark plug.

> CAUTION
>
> Be careful that no contaminants enter through the spark plug holes.

2. Inspect the electrodes (A) and ceramic insulator (B).

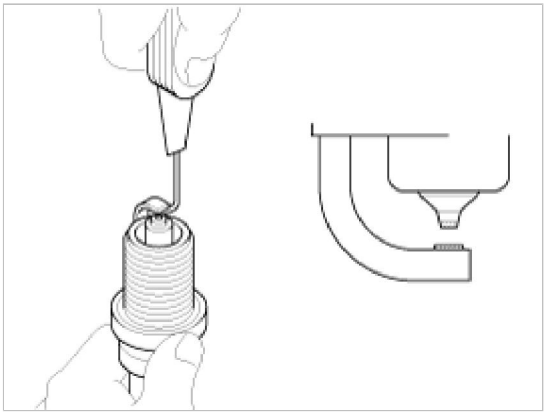


Inspection Of Electrodes

Condition	Dark deposits	White deposits
Description	- Fuel mixture too rich - Low air intake	- Fuel mixture too lean - Advanced ignition timing - Insufficient plug tightening torque

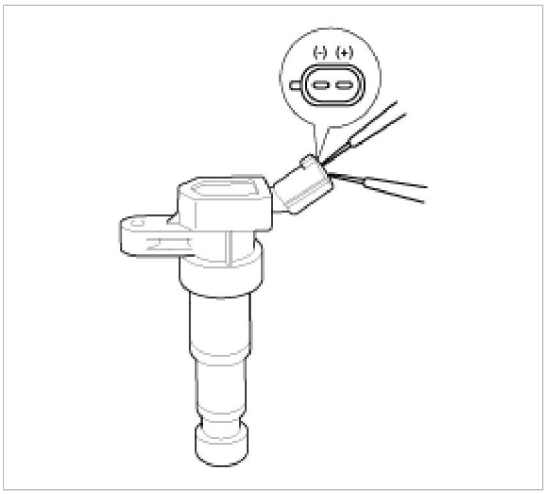
3. Check the electrode gap (A).

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



Inspect Ignition Coil

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

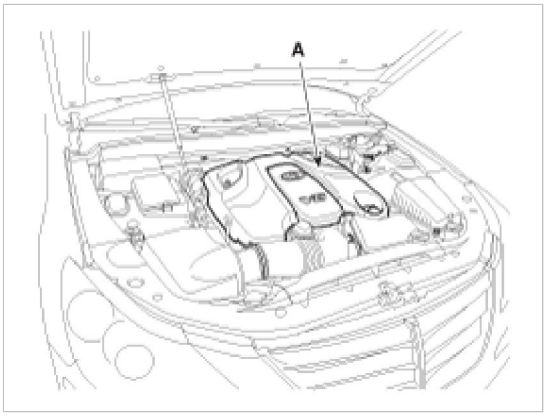


Standard value: 0.62Ω ± 10%

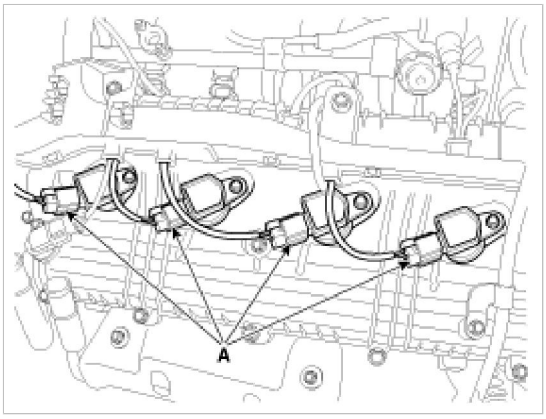
Replacement

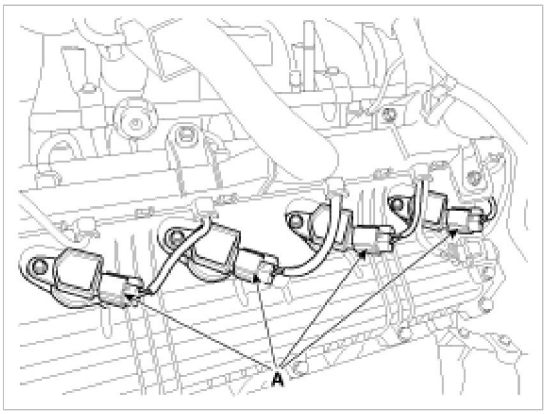
Ignition coil

1. Remove the engine cover (A).



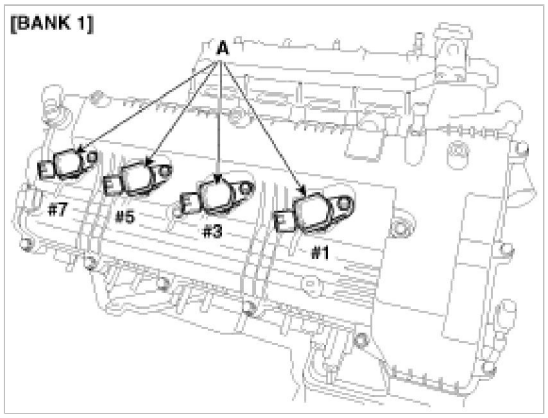
2. Disconnect the ignition coil connectors (A).

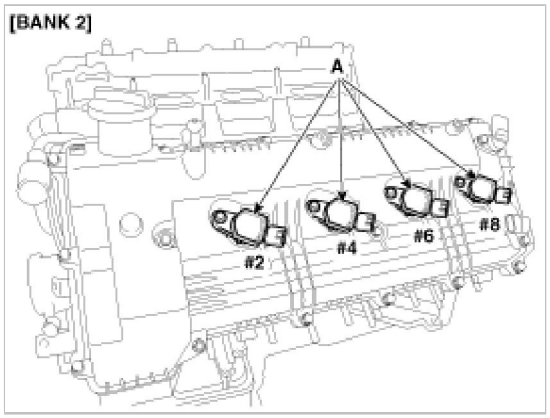




3. Remove the ignition coils (A).

Tightening torque : 9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)



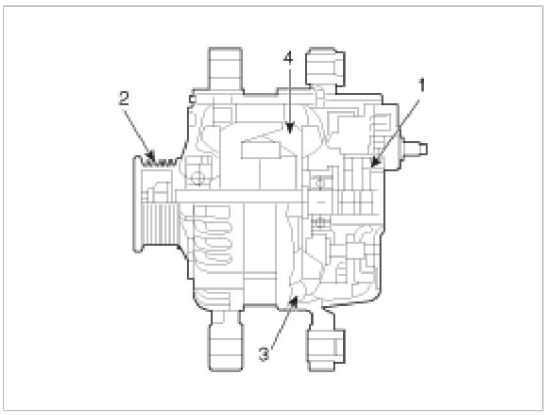


4. Installation is reverse order of removal.

Engine Electrical System > Charging System > Description and Operation

Description

The charging system includes a battery, an alternator with a built-in regulator, and the charging indicator light and wire.
The Alternator has built-in diodes, each rectifying AC current to DC current.
DC current appears at alternator "B" terminal.
The charging voltage of this alternator is regulated by the ECM.
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. Stator
4. Rotor

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 > Charging System > Repair procedures

On-vehicle Inspection

CAUTION

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

Check The Battery Terminals And Fuses

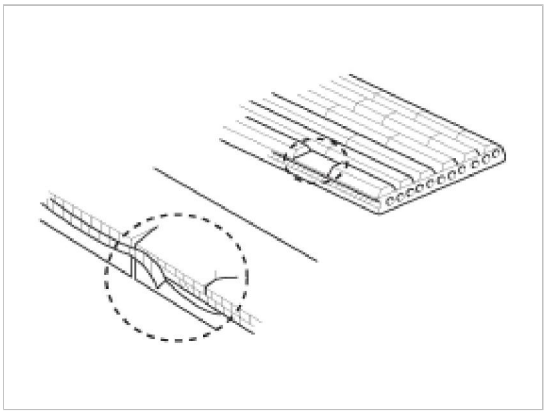
1. Check that the battery terminals are not loose or corroded.
2. Check the fuses for continuity.

Inspect Drive Belt

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

NOTE

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



Visually Check Alternator Wiring And Listen For Abnormal Noises

1. Check that the wiring is in good condition.
2. Check that there is no abnormal noise from the alternator while the engine is running.

Check Discharge Warning Light Circuit

1. Warm up the engine and then turn it off.
2. Turn off all accessories.
3. Turn the ignition switch "ON". Check that the discharge warning light is lit.

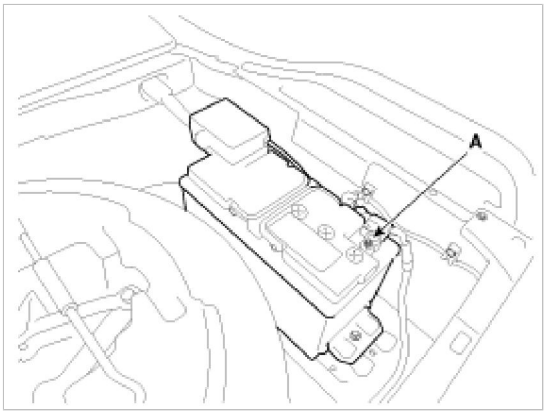
4. Start the engine. Check that the light is lit.
   If the light does not go off as specified, troubleshoot the discharge light circuit.

Engine Electrical System > Charging System > Alternator > Repair procedures

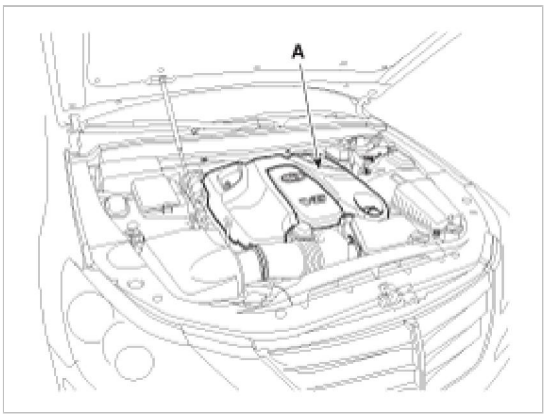
Replacement

1. Disconnect the negative cable from the battery.

Tightening torque :
4.0 ~ 6.0N.m (0.4 ~ 0.6kgf.m, 3.0 ~ 4.4lb-ft)

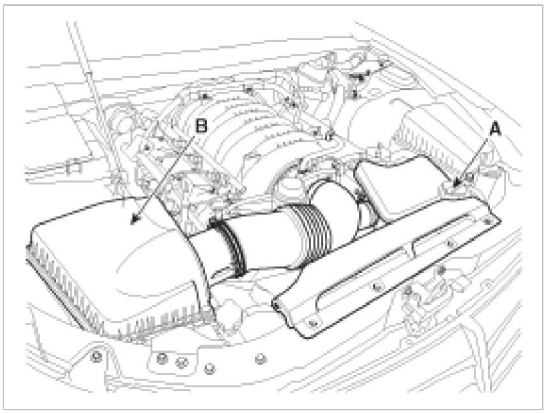


2. Remove the engine cover (A).

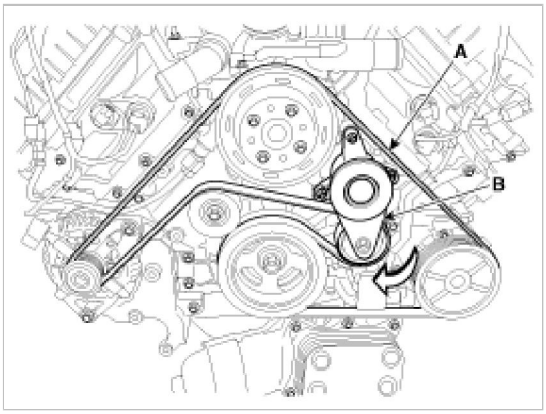


3. Remove the air duct (A) and the air cleaner assembly (B).

Tightening torque
Hose clamp bolt :
2.9 ~ 4.9N.m (0.3 ~ 0.5kgf.m, 2.2 ~ 3.6lb-ft)
Air cleaner assembly bolts :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

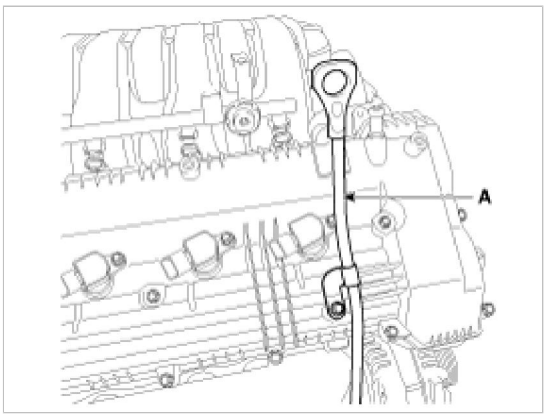


4. Using the wrench turn the tensioner countorclockwise and loosen. Then remove the drive belt (A).

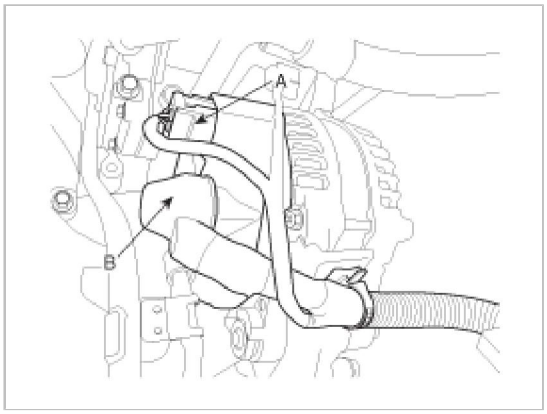


5. Remove the oil level gauge (A).

Tightening torque :
9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

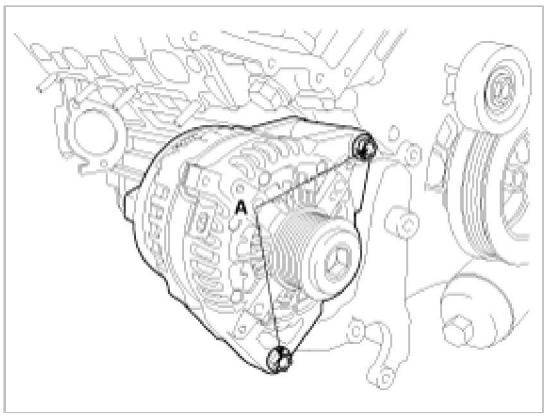


6. Remove the alternator.
   (1) Disconnect the alternator connector (A) and cable (B) from the ‘B’ terminal.



(2) Loosen the alternator mounting bolts (A) and then remove alternator from the vehicle.

Tightening torque :
29.4 ~ 41.2 N.m (3.0 ~ 4.2 kgf.m, 21.7 ~ 30.4 lb-ft)



7. Installation is reverse order of removal.

Engine Electrical System > Charging System > Battery > Description and Operation

Description

1. The maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
2. Water never needs to be added to the maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.

NOTE

After disconnecting then reconnecting the batterynegative cable, reset some parts that require thereset procedures. (Refer to BE group - General information)

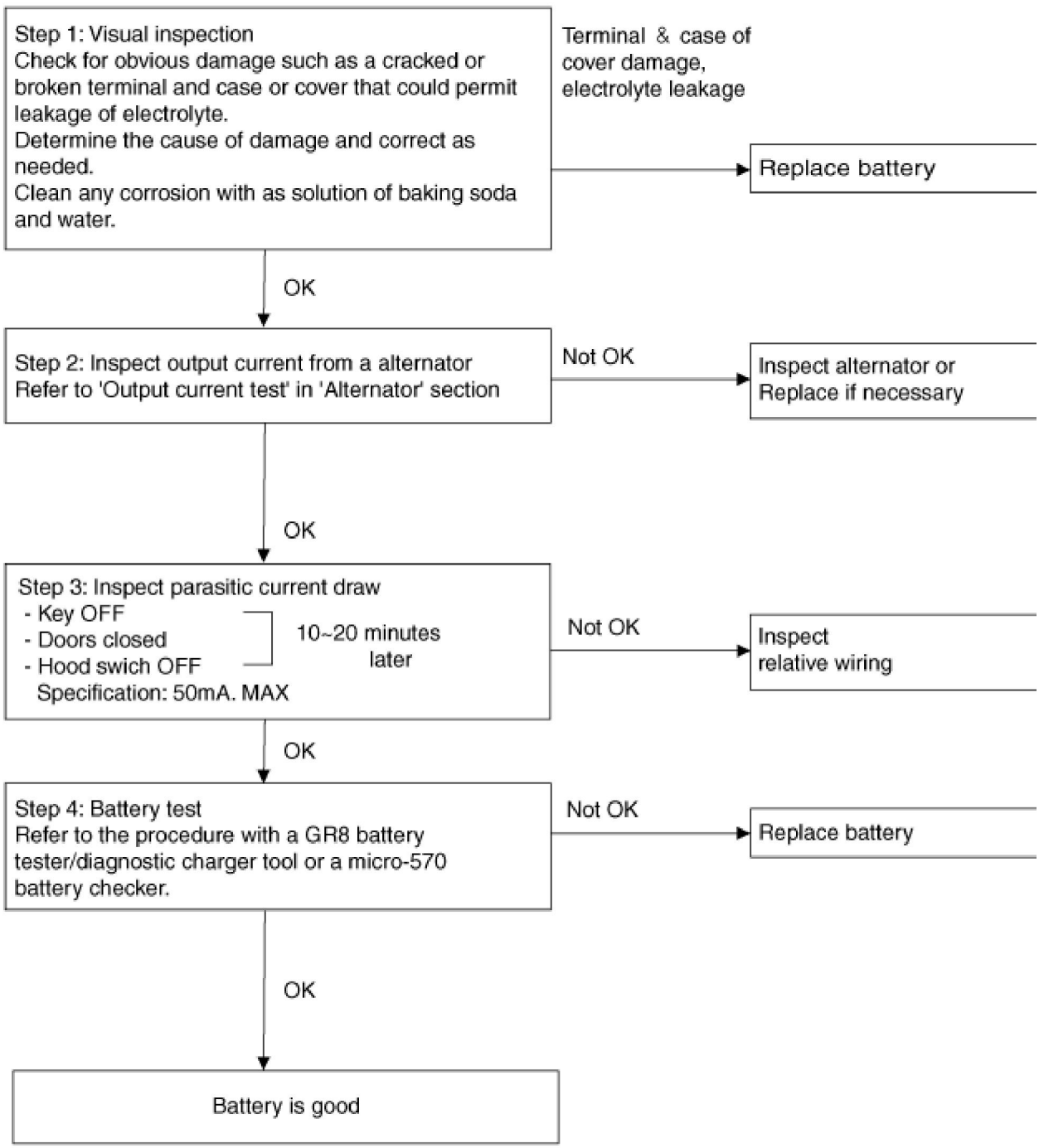
CAUTION

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.If the battery is charged directly at the battery (+),(-) terminals on vehicles with battery sensor, please battery sensor be re-installed and re-calibration.

Engine Electrical System > Charging System > Battery > Repair procedures

Inspection

Battery Diagnostic Flow



Vehicle parasitic current inspection

1. Turn the all electric devices OFF, and then turn the ignition switch OFF.
2. Close all doors except the engine hood, and then lock all doors.
   (1) Disconnect the hood switch connector.

(2) Close the trunk lid.

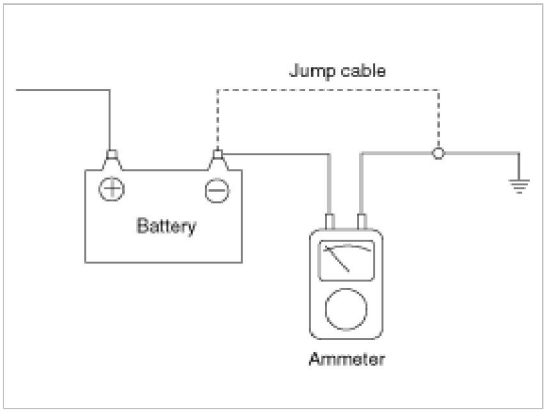
(3) Close the doors.

3. Wait a few minutes until the vehicle’s electrical systems go to sleep mode.

> **NOTE**
>
> For an accurate measurement of a vehicle parasitic current, all 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.

> **CAUTION**
>
> Be careful that the lead wires of an ammeter do not come off from the battery (-) terminal and the ground cable to prevent the battery from being reset. In case the battery is reset, connect the battery cable again, and then start the engine or turn the ignition switch ON for more than 10 sec. Repeat the procedure from No. 1.
>
> To prevent the battery from being reset during the inspection,
>
> 1) Connect a jump cable between the battery (-) terminal and the ground cable.
> 2) Disconnect the ground cable from the battery (-) terminal.
> 3) Connect an ammeter between the battery (-) terminal and the ground cable.
> 4) After disconnecting the jump cable, read the current value of the ammeter.



5. Read the current value of the ammeter.
   A. If the parasitic current is over the limit value, search for abnormal circuit by removing a fuse one by one and checking the parasitic current.
   B. 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

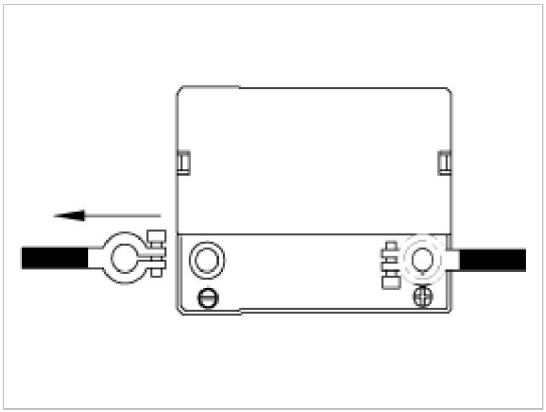
Limit value (after 10~20 min.) : Below 50mA

Cleaning

1. Make sure the ignition switch and all accessories are in the OFF position.
2. Disconnect the battery cables (negative first).
3. Remove the battery from the vehicle.

> **CAUTION**
>
> Care should be taken in the event the battery case is cracked or leaking, to protect your skin from the

electrolyte.
Heavy rubber gloves (not the household type) should be worn when removing the battery.



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

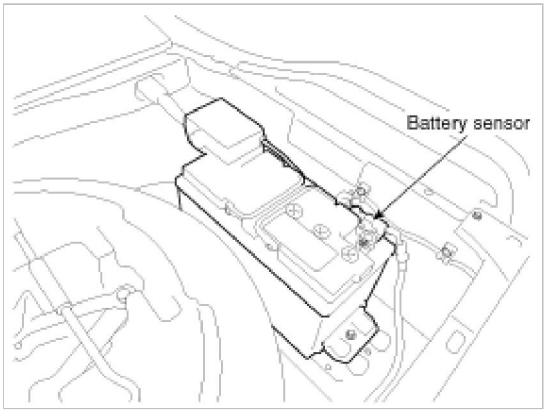
CAUTION

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

Engine Electrical System > Charging System > Battery Sensor > Description and Operation

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.



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)

NOTE

Perform the following process after replace the battery sensor.

- Ignition switch ON/OFF.
- Park the vehicle about 4 hours.
- After 4 hours later, check the SOC (State of charge) of battery using GDS.
- After engine start ON/OFF 2 times or more, check the SOF (State of function) of battery using GDS.

CAUTION

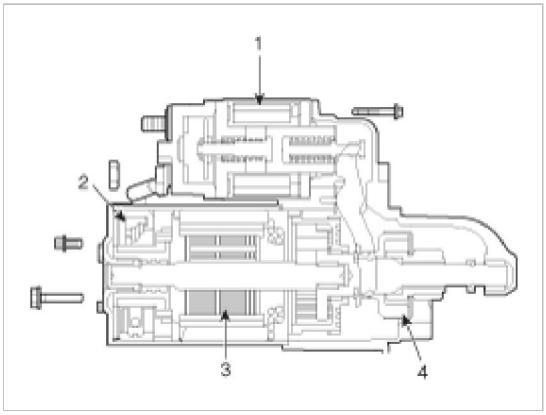
For the vehicle equipped with a battery sensor, be careful not to damage the battery sensor when the battery is replaced or recharged.

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 of 4.0~6.0N.m (0.4~0.6kgf.m, 3.0~4.4lb-ft). 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.

Engine Electrical System > Starting System > Description and Operation

Description

The starting system includes the battery, starter, solenoid switch, ignition switch, inhibitor switch (A/T), ignition lock switch, connection wires and the battery cable.
When the ignition key is turned to the start position, current flows and energizes the starter motor's solenoid coil. The solenoid plunger and clutch shift lever are activated, and the clutch pinion engages the ring gear.
The contacts close and the starter motor cranks. In order to prevent damage caused by excessive rotation of the starter armature when the engine starts, the clutch pinion gear overruns.



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

Engine Electrical System > Starting System > Repair procedures

Troubleshooting Starter Circuit

NOTE

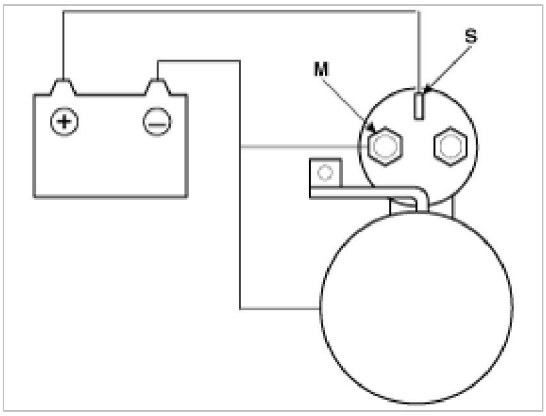
The battery must be in good condition and fully charged.

1. Disconnect the fuel pump connector
2. With the shift lever in N or P (A/T) or clutch pedal pressed (M/T), turn the ignition switch to "START"
   If the starter normally cranks the engine, starting system is OK. If the starter will not crank the engine at all, go to next step.
   If it won't disengage from the ring gear when you release key, check for the following until you find the cause.
   A. Solenoid plunger and switch malfunction.
   B. Dirty pinion gear or damaged overrunning clutch.
3. Check the battery condition. Check electrical connections at the battery, battery negative cable connected to the body, engine ground cables, and the starter for looseness and corrosion. Then try starting the engine again.
   If the starter cranks the engine normally, repairing the loose connection repaired the problem. The starting system is now OK.
   If the starter still does not crank the engine, go to next step.
4. Disconnect the connector from the S-terminal of solenoid. Connect a jumper wire from the B-terminal of solenoid to the S-terminal of solenoid.
   If the starter cranks the engine, go to next step.
   If the starter still does not crank the engine, remove the starter, and repair or replace as necessary.
5. Check the following items in the order listed until you find the open circuit.
   A. Check the wire and connectors between the driver's under-dash fuse/relay box and the ignition switch, and between the driver's under-dash fuse/relay box and the starter.
   B. Check the ignition switch (Refer to ignition system in BE Group).
   C. Check the transaxle range switch connector or ignition lock switch connector.
   D. Inspect the starter relay.

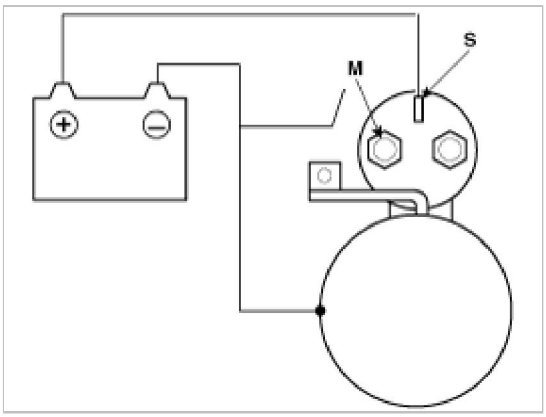
Starter Solenoid Test

1. Disconnect the field coil wire from the M-terminal of solenoid switch.

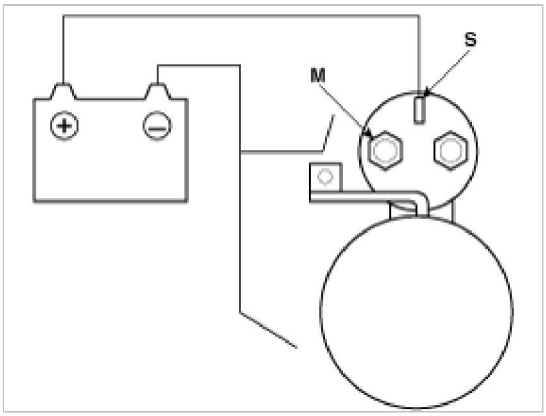
2. Connect the battery as shown. If the starter pinion pops out (engages), it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



3. Disconnect the battery from the M terminal.
   If the pinion does not retract, the hold-in coil is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.

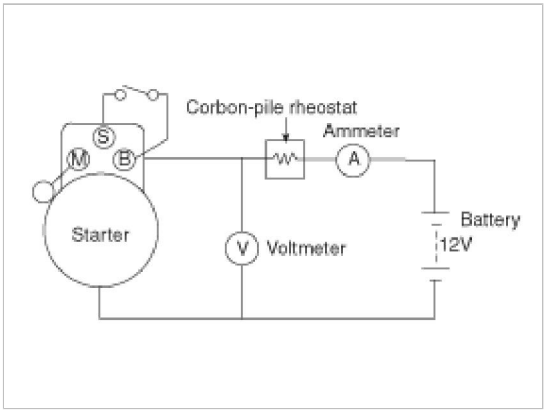


4. Disconnect the battery also from the body. If the pinion retracts immediately, it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



Free Running Test

1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows.
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostats as shown in the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.

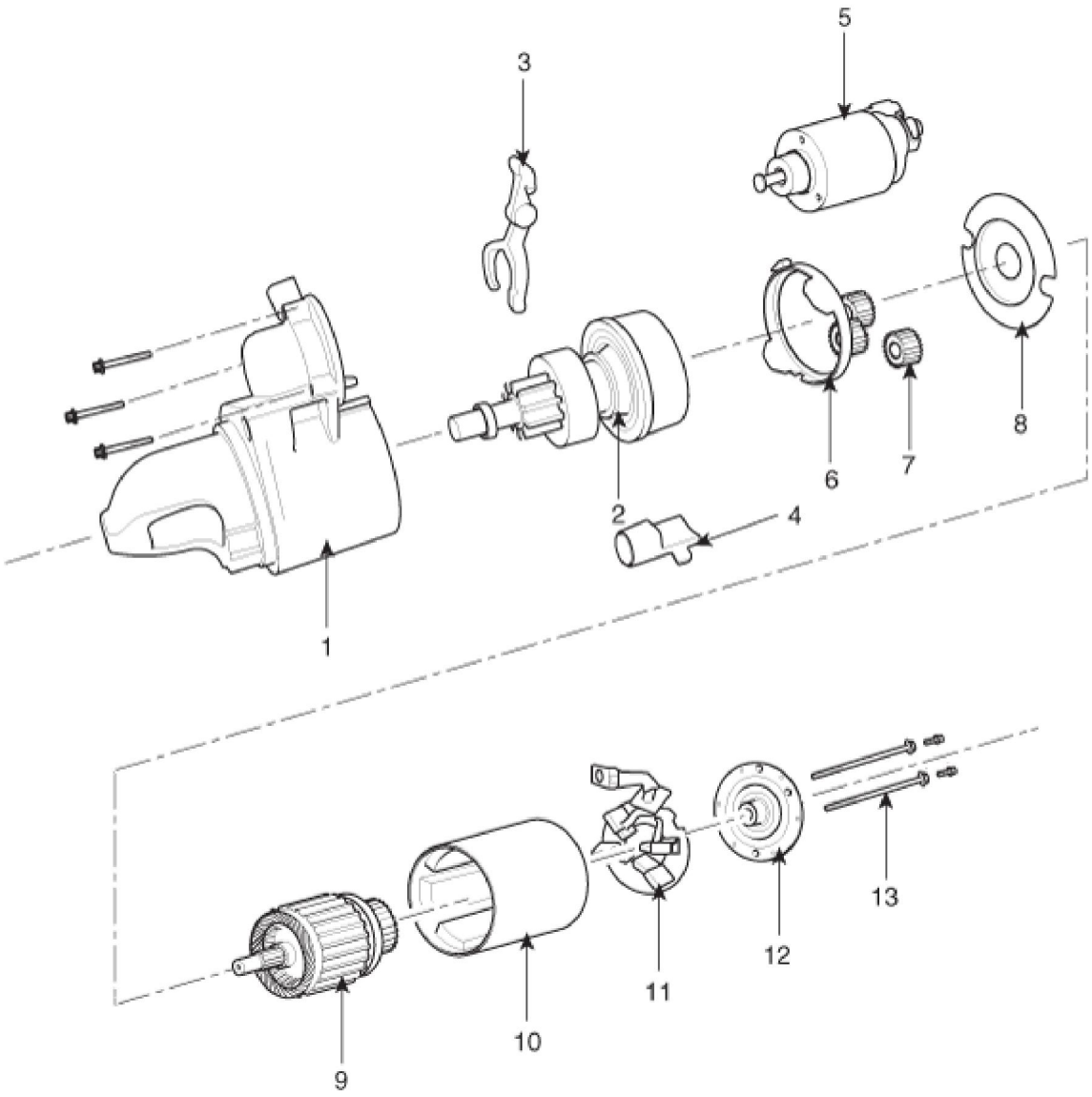


4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the starter motor body.
6. Adjust until battery voltage shown on the voltmeter reads 11volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly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

Current : 85A MAX
Speed : 2,660 rpm MIN

Engine Electrical System > Starting System > Starter > Components and Components Location

Components



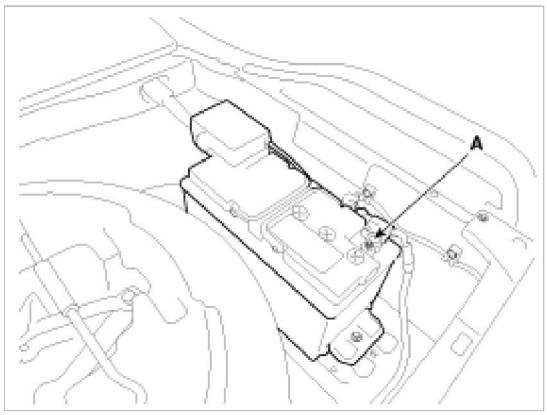
1 . Front housing	8 . Shield
2. Planet gear shaft assembly	9 . Armature assembly
3 . Lever	10 . York assembly
4 . Lever packing	11 . Brush holder assembly
5 . Starter solenoid assembly	12 . Rear housing
6 . Packing	13 . Through bolt
7 . Planet gear	

Engine Electrical System > Starting System > Starter > Repair procedures

Replacement

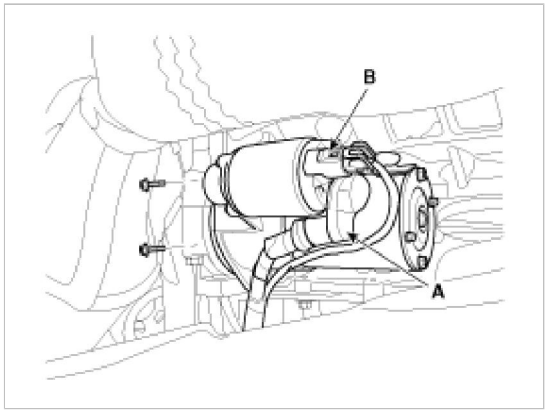
1. Disconnect the negative terminal from the battery.

Tightening torque :
4.0 ~ 6.0N.m (0.4 ~ 0.6kgf.m, 3.0 ~ 4.4lb-ft)



2. Disconnect the starter cable (A) from the B terminal on the solenoid, and the connector (B) from the S terminal.
3. Loosen the starter mounting bolts and then remove the starter.

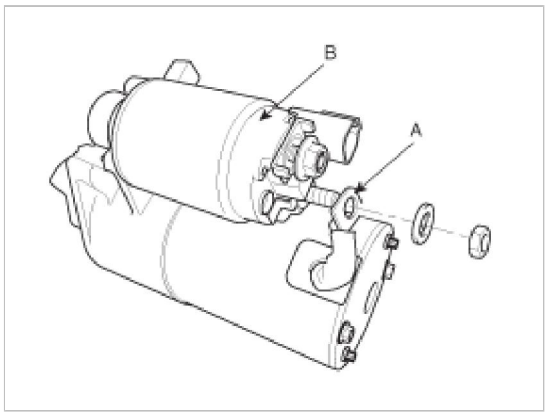
Tightening torque :
49.0 ~ 63.7 N.m (5.0 ~ 6.5 kgf.m, 36.2 ~ 47.0 lb-ft)



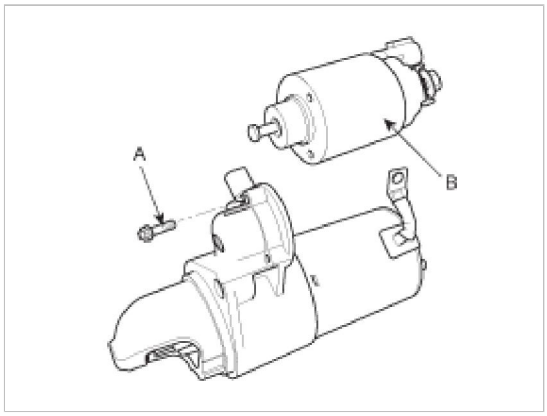
4. Installation is reverse order of removal.

Disassembly

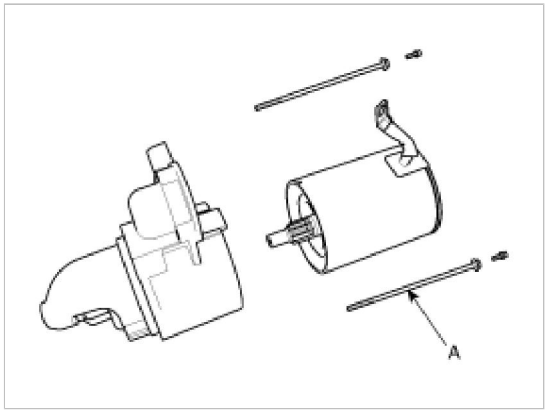
1. Disconnect the M-terminal on the starter solenoid assembly.



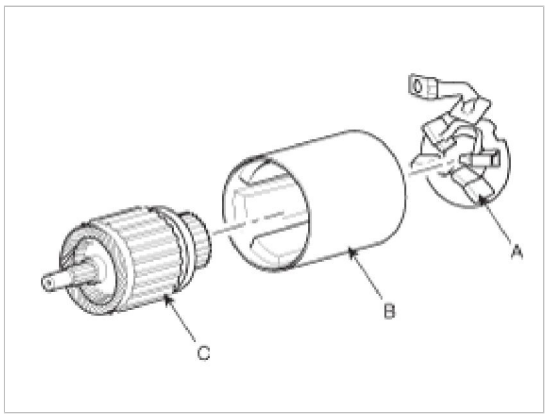
2. After loosening the 3 screws (A), detach the starter solenoid assembly (B).



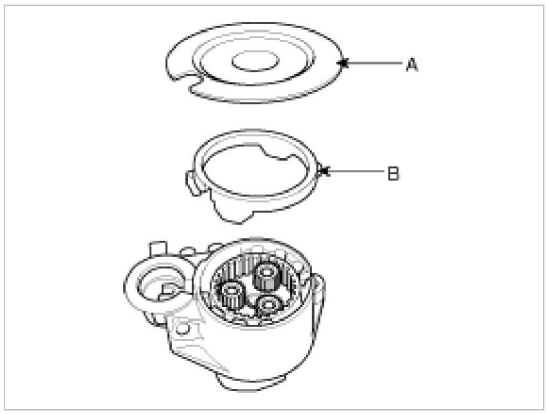
3. Loosen the through bolts (A).



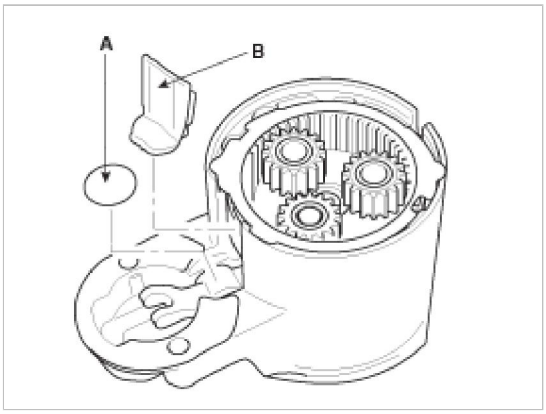
4. Remove the brush holder assembly (A), yoke (B) and armature (C).



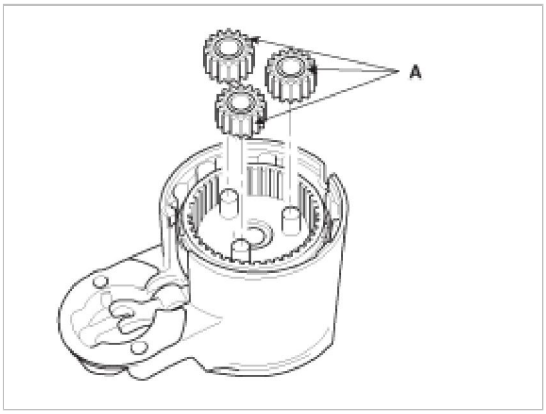
5. Remove the shield (A) and packing (B).



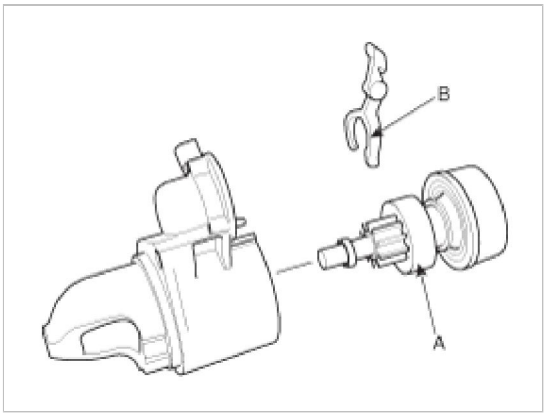
6. Remove the lever plate (A) and lever packing (B).



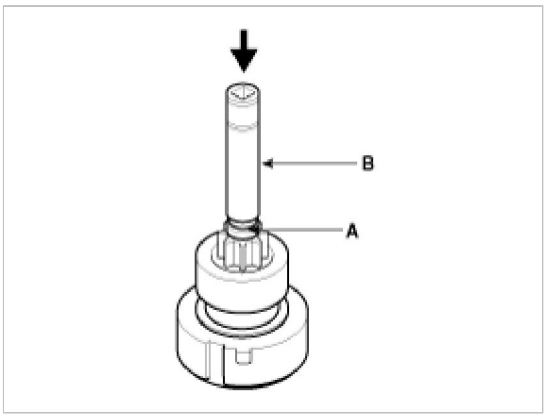
7. Disconnect the planet gear (A).



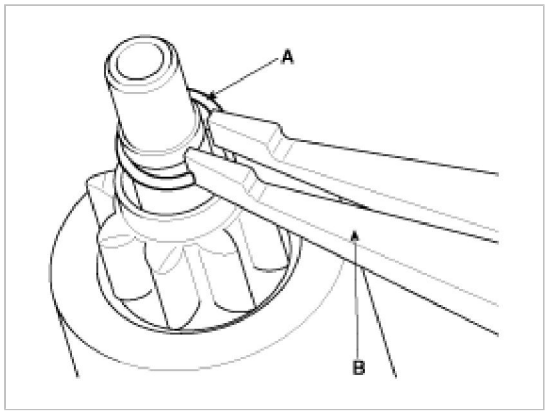
8. Disconnect the planet shaft assembly (A) and lever (B).



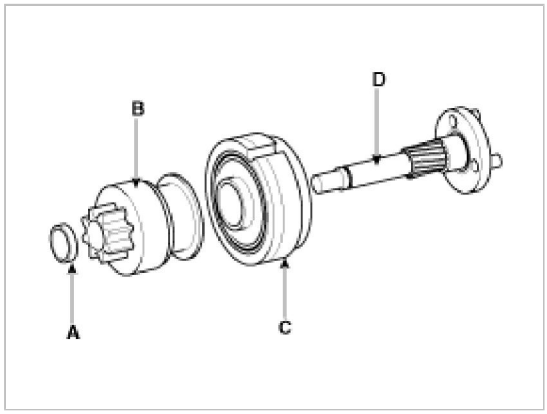
9. Press the stopper (A) using a socket (B).



10. Remopve the stop ring (A) using stop ring pliers (B).

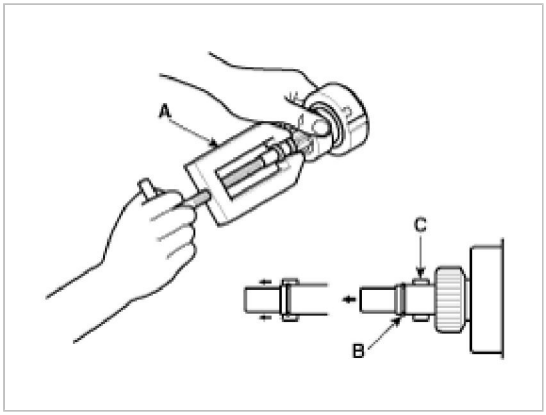


11. Disconnect the stopper (A), overrunning clutch (B), internal gear (C) and planet shaft (D).



NOTE

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

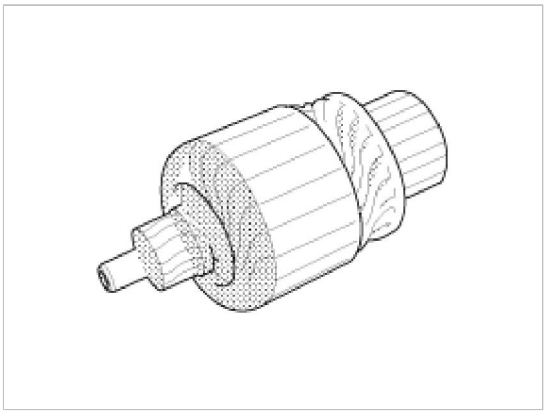


12. Reassembly is the reverse order of disassembly.

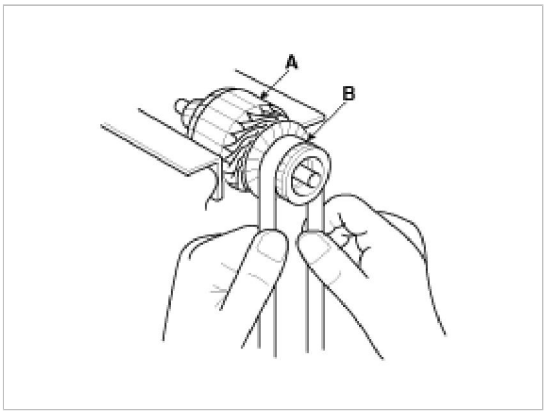
Inspection

Armature Inspection And Test

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

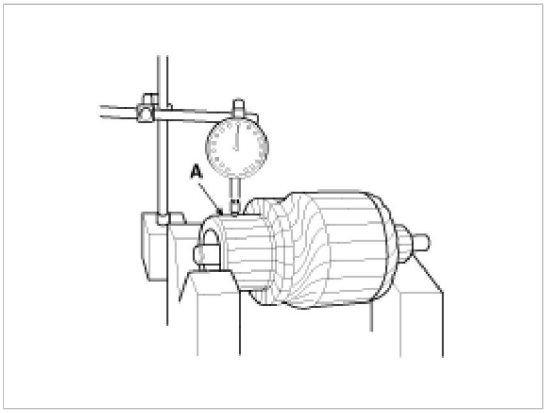


4. Check the commutator (A) surface. If the surface is dirty or burnt, resurface with emery cloth or a lathe within the following specifications, or recondition with #500 or #600 sandpaper (B).



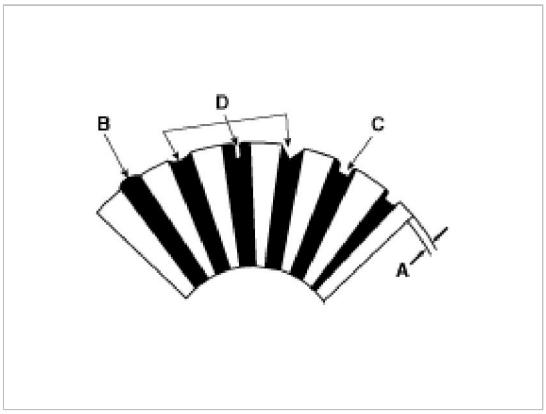
5. Measure the commutator (A) runout.
   A. If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   B. If the commutator run out is not within the service limit, replace the armature.

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

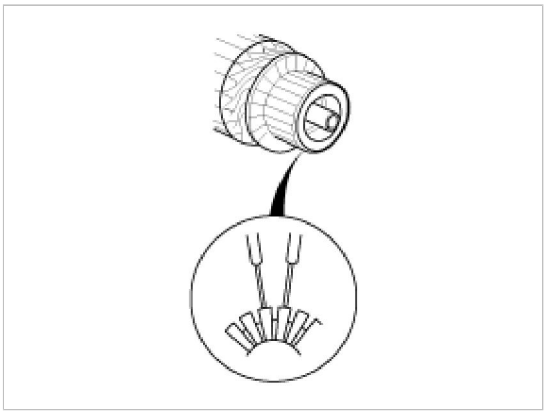


6. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or v-shaped (D).

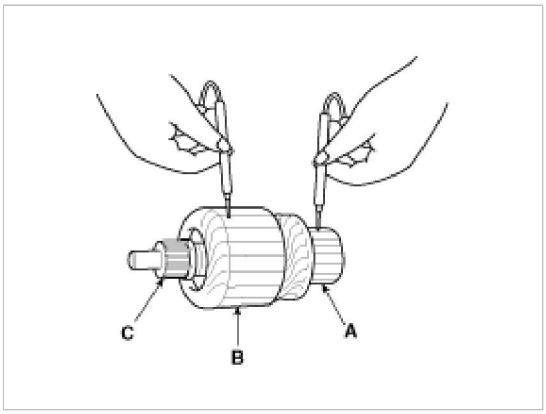
Commutator mica depth
Standard (New) : 0.7 mm (0.0275in.)
Limit : 0.2mm (0.0079 in.)



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

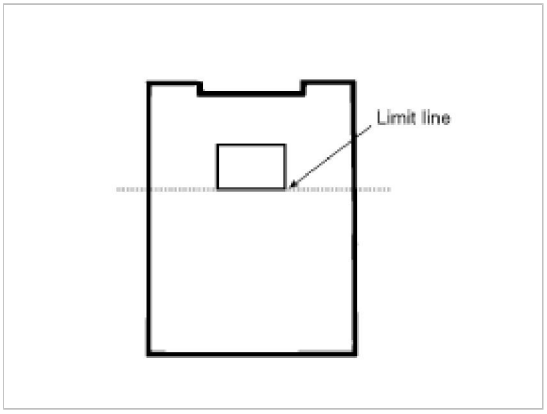


8. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.



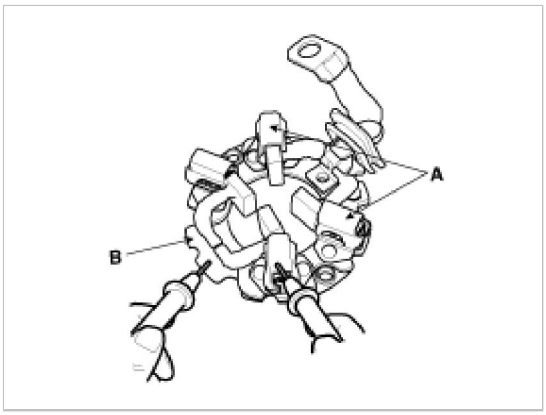
Inspect Starter Brush

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



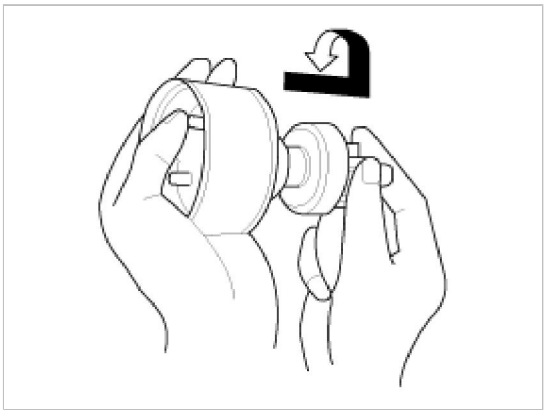
Starter Brush Holder Test

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



Overrunning Clutch

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



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

Cleaning

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

Engine Electrical System > Starting System > Starter Relay > Repair procedures

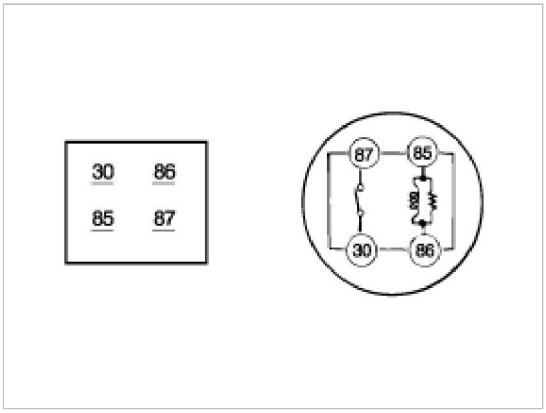
Inspection

1. Remove the fuse box cover.
2. Remove the starter relay.

3. Using an ohmmeter, check that there is continuity between each terminal.

Terminal	Continuity
30 - 87	NO
85 - 86	YES

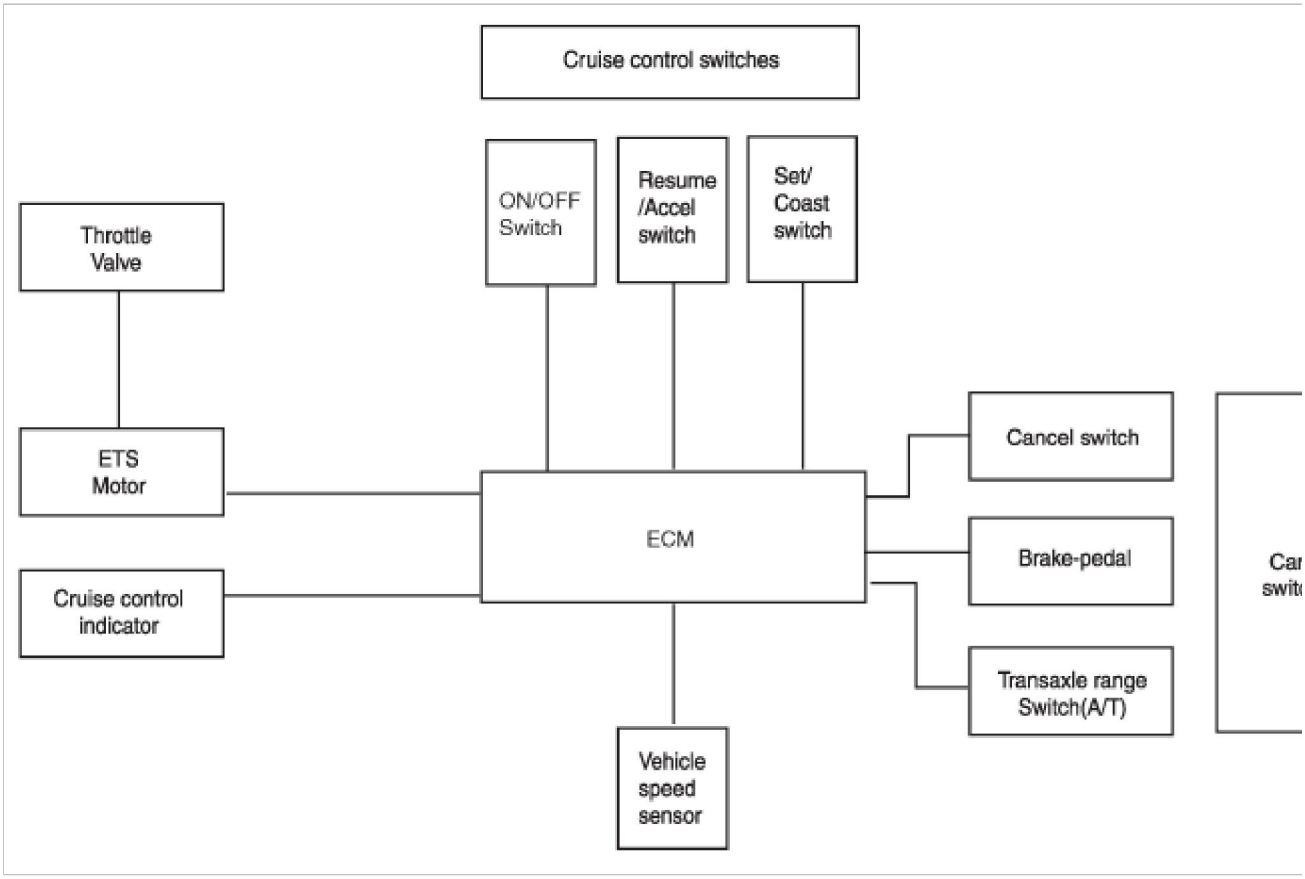
4. Apply 12V to terminal 85 and ground to terminal 86.
   Check for continuity between terminals 30 and 87.



5. If there is no continuity, replace the starter relay.
6. Install the starter relay.
7. Install the fuse box cover.

Engine Electrical System > Cruise Control System > Schematic Diagrams

System Block Diagram



Component Parts And Function Outline

Component part		Function
Vehicle-speed sensor		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	ON/OFF switch	Switch for automatic speed control power supply.
	Resume/Accel switch	Controls automatic speed control functions by Resume/Accel switch (Set/Coast switch)
	Set/Coast switch	
Cancel switch	Cancel switch	Sends cancel signals to ECM.
	Brake-pedal switch	
	Transaxle range switch (A/T)	
ETS motor		Regulates the throttle valve to the set opening by ECM.

* ETS : Electronic Throttle System

Engine Electrical System > Cruise Control System > Description and Operation

Cruise Control

Cruise control system is engaged by the "ON/OFF" main switch located on right of steering wheel column. The system has the capability to cruise, coast, resume speed, and accelerate, and raise "tab-up" or lower "tab-down" set speed.
It also has a safety interrupt, engaged upon depressing brake or shifting select lever.
The ECM is the control module for this system.
The main components of cruise control system are mode control switches, transaxle range switch, brake switch, vehicle speed sensor, ECM and ETS motor that connect throttle body.
The ECM contains a low speed limit which will prevent system engagement below a minimum speed of 40km/h (25mph).
The operation of the controller is controlled by mode control switches located on steering wheel.
Transaxle range switch and brake switch are provided to disengage the cruise control system. When the brake pedal is depressed or select lever shifted, the cruise control system is electrically disengaged and the throttle is returned to the idle position.

Cruise main switch

Cruise control system is engaged by pressing the "ON/OFF" push button. Releasing the "ON/OFF" push button will release throttle, clears cruise memory speed, and puts vehicle in a non-cruise mode.

Coast/Set switch

COAST/SET switch located on right of steering wheel column has two positions - "Normal" and "Depressed". The set position - With COAST/SET switch depressed and then released the cruise speed will be set at the speed the vehicle was going when COAST/SET switch was released. The coast position - With COAST/SET switch fully depressed, driver can lower cruise speed. To decrease cruise speed, COAST/SET switch is held in, disengaging cruise control system. When vehicle has slowed to required cruise speed, releasing COAST/SET switch will re-engage system at new selected speed.
The tab down - To lower vehicle speed, cruise must be engaged and operating. Tab down is done by quickly pressing and releasing COAST/SET switch. Do not hold COAST/SET switch in depressed position.
Tab down is a function in which vehicle speed is decrease by 1 mph (1.6km/h)

Resume/Accel switch

RES/ACCEL switch located on right of steering wheel column has two positions - "Normal" and "Depressed".
The resume position - With RES/ACCEL switch depressed and then release, this switch also returns cruise control operation to last speed (Which is temporarily disengaged by Cancel switch or Brake pedal), setting when

momentarily operating RES/ACCEL switch by constant acceleration.
The accel position - With RES/ACCEL switch depressed and held in, disengaging cruise control system, when vehicle has accelerated to required cruise speed, releasing RES/ACCEL switch will re-engage speed at new selected speed.
The tab up - To increase vehicle speed, the cruise must be engaged and operating.
Tab up is done by quickly pressing and releasing RES/ACCEL switch less than 0.5 second. Do not hold RES/ACCEL switch in depressed position. Tab up is a function in which cruise speed can be increased by 1mph (1.6km/h).

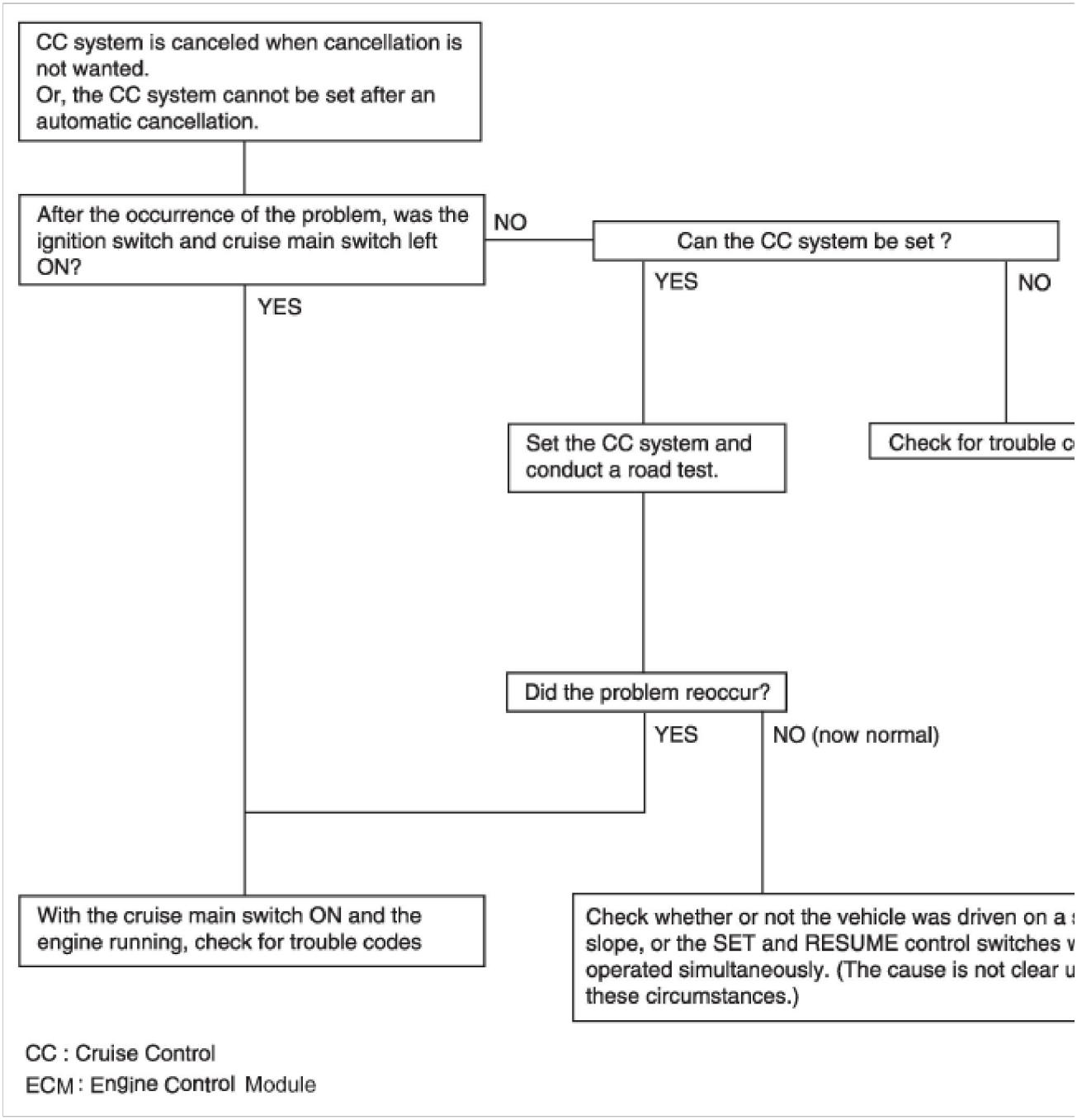
Cancel switch

Cruise control system is temporarily disengaged by pressing "CANCEL" switch.
Cruise speed canceled by this switch will be recovered by RES/ACCEL switch

Engine Electrical System > Cruise Control System > Troubleshooting

Trouble Symptom Charts

Trouble Symptom 1



Trouble Symptom 2

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

Trouble Symptom 7

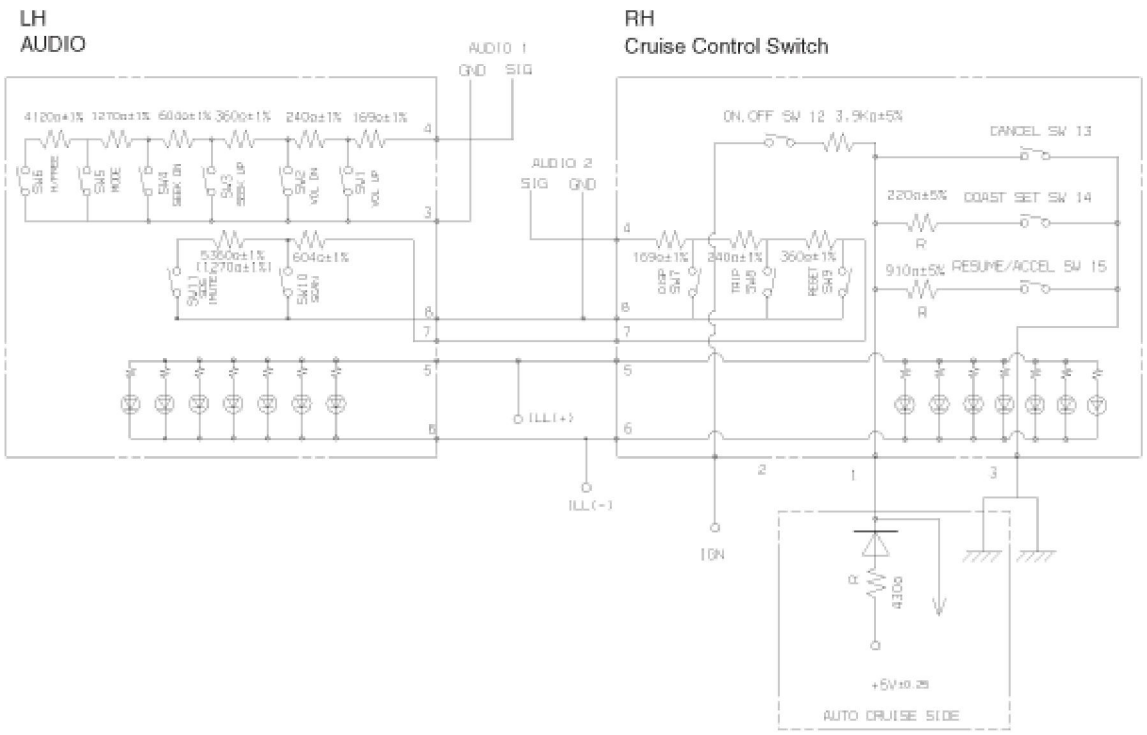
Trouble symptom	Probable cause	Remedy
CC system can be set while driving at a vehicle speed of less than 40km/h (25mph), or there is no automatic cancellation at that speed	Malfunction of the vehicle-speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the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

Engine Electrical System > Cruise Control System > Cruise Control Switch > Schematic Diagrams

Circuit Diagram



LH

NO	CONNECTOR(LH)
1	NC
2	NC
3	AUDIO1 GND
4	AUDIO1 SIG
5	ILL(+)
6	ILL(-)
7	COMM
8	AUDIO2 GND

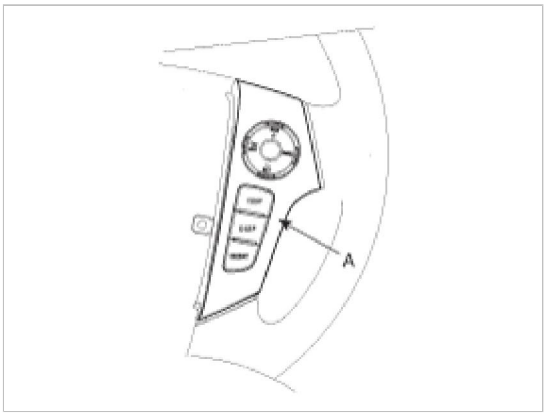
RH

NO	CONNECTOR(RH)
1	CRUISE SW(SIG IN)
2	CRUISE SW(IGN)
3	CRUISE SW(SIG OUT)
4	AUDIO2 SIG
5	ILL(+)
6	ILL(-)
7	COMM
8	AUDIO2 GND

Engine Electrical System > Cruise Control System > Cruise Control Switch > Repair procedures

Removal

1. Disconnect the battery (-) terminal.
2. Remove the air-bag module from the steering wheel. (Refer to RT group)
3. Disconnect the cruise control main switch connector and then remove the cruise control switch (C) with three screws .

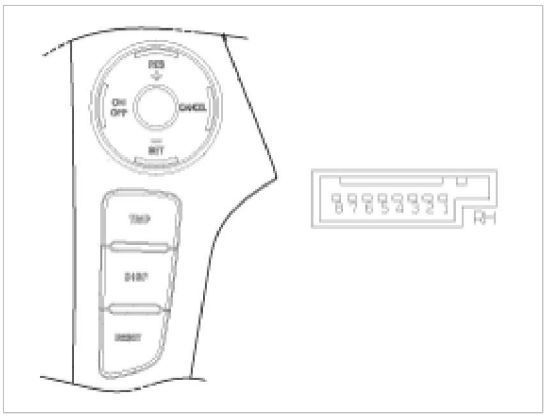


4. Installation is the reverse of removal.

Inspection

Measuring Resistance

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



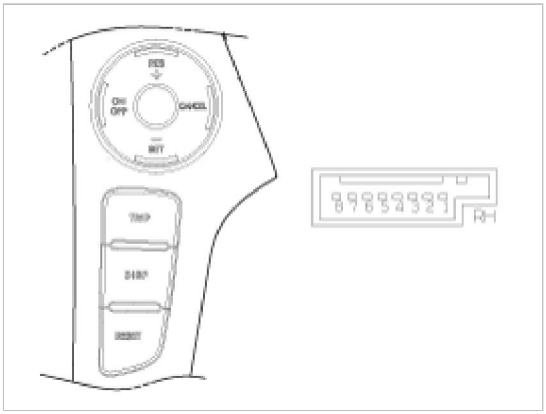
2. Measure resistance between terminals on the control switch when each function switch is ON (switch is depressed).

Function switch	Terminal	Resistance
CANCEL	1-3	0Ω
SET -	1-3	220Ω
RES +	1-3	910Ω
ON / OFF	1-2	3900Ω

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
CANCEL	1-3	0.83V
SET -	1-3	2.5V
RES +	1-3	3.33V
ON / OFF	1-2	4.17V

3. If not within specification, replace switch.

Engine Electrical System > Smart Cruise Control System > General Safety Information and Caution

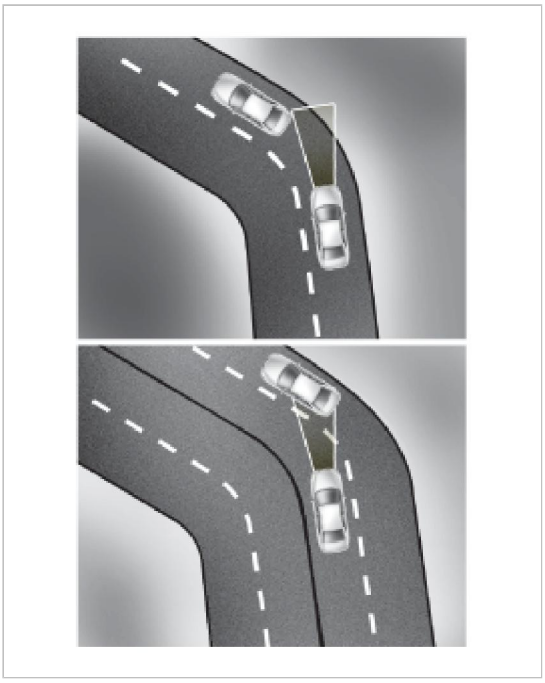
Smart Cruise Control

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

CAUTION

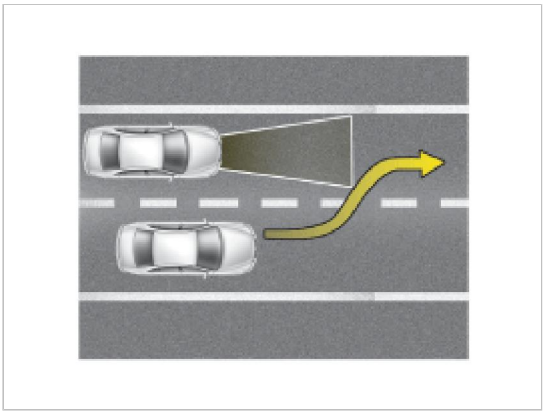
- The smart cruise control system may have limits to detect distance to the vehicle ahead due to road and traffic conditions.
- On curves or inclines/declines

- 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.
- 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.



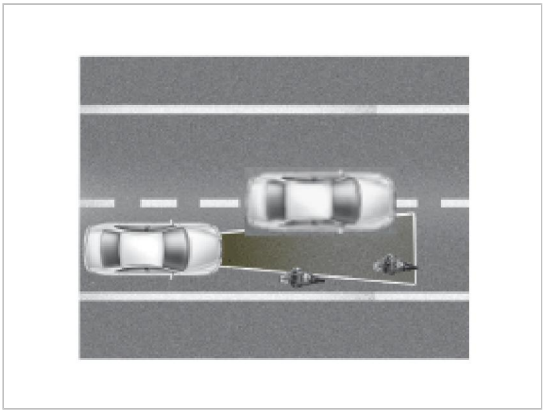
• Lane changing

- 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.
- 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.



• Vehicle recognition

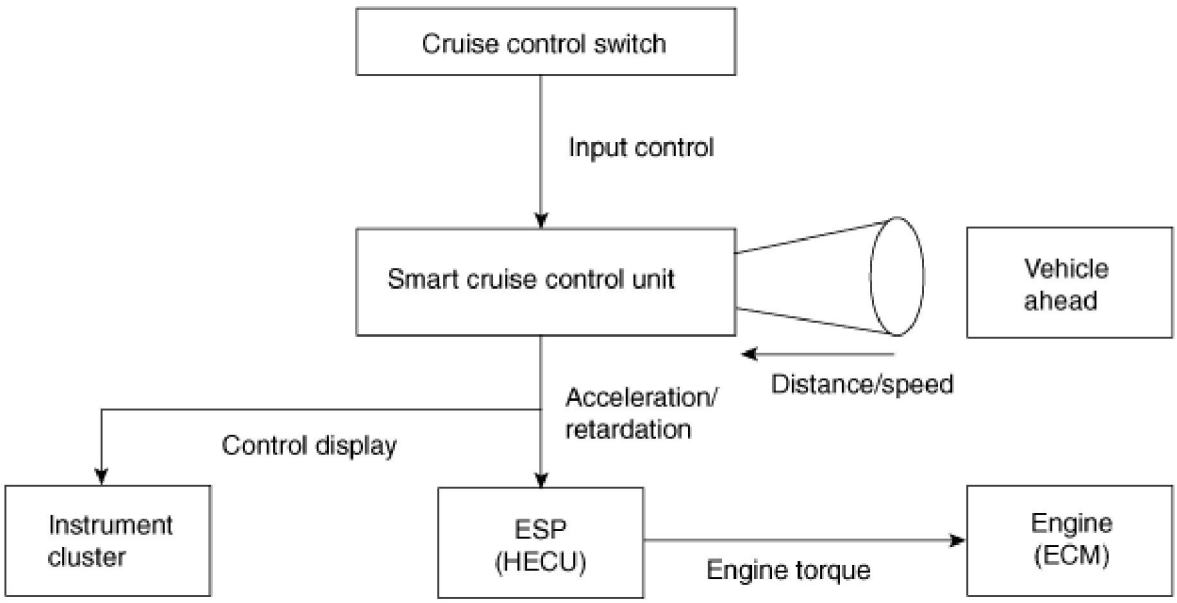
- Small vehicles, such as motorcycles or bicycles, ahead in your lane may not be recognized by the sensor as the vehicles are out the detection of range of the sensor. Vehicles offset to one side also may not be recognized by the sensor.



- 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.

Engine Electrical System > Smart Cruise Control System > Schematic Diagrams

System Block Diagram



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

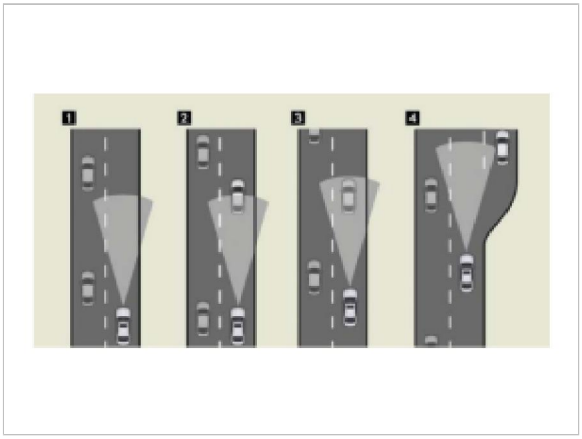
	Request the acceleration and retardation to ESP
ESP (HECU)	Automatic braking Request the engine torque control to the engine (ECM)
Engine (ECM)	Control the engine torque

Engine Electrical System > Smart Cruise Control System > Description and Operation

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. 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.)
6. 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 – 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.)
7. 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.

NOTE

- Smart cruise control operating conditions
- Vehicle speed at more than approximately 10km/h (6.2mph) or less than approximately 180km/h (111.8mph)
- Transmssion in D or Sports mode.
- "ESC OFF" switch OFF
- Parking brake released
- "ON/OFF" switch ON (CRUISE indicator ON)
  Under the above conditions, activate the cruise system using the "SET/ – " or "RES/+" switch.
- Smart cruise control disabling conditions
- "ON/OFF" switch OFF
- "CANCLE" switch ON
- Brake pedal applied
- Vehicle speed at less than approximately 10km/h (6.2mph) when there is a vehicle ahead in the lane. (The warning buzzer will sound and indicator in the cluster will display.)
- Vehicle speed at less than approximately 30km/h (18.6mph) when there is not a vehicle ahead in the lane. (The warning buzzer will sound and indicator in the cluster will display.)
- Vehicle speed at more than approximately 180km/h (111.8mph)
- Transmission in N or R
- ESC / TCS / ABS operating (The warning buzzer will sound and indicator in the cluster will display.)
- "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)

Cruise main switch (ON/OFF)

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.
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.

NOTE

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.

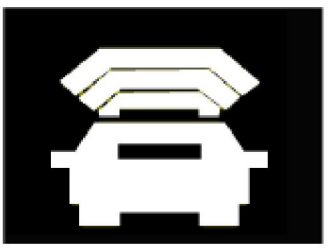
Cancel switch (CANCEL)

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 3 → Distance 2 → Distance 1→ Distance 3
If you drive at 80 km/h (49.7mph), the distance maintain as follows;
Distance 3 - approximately 55m (180.4ft)
Distance 2 - approximately 40m (131.2ft)
Distance 1 - approximately 26m (85.3ft)
The following distance of each stage is changed according to the speed of the vehicle ahead.

Display in the cluster

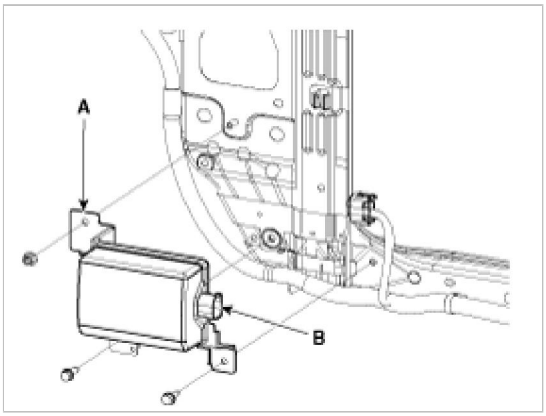
Display	Description	Display	Description
	Distance 1 - without a vehicle ahead		Distance 3 - with a vehicle ahead
	Distance 2 - without a vehicle ahead		SCC cancelled
	Distance 3 - without a vehicle ahead		SCC system malfunction
	Distance 1 - with a vehicle ahead		SCC sensor malfunction
	Distance 2 - with a vehicle ahead		

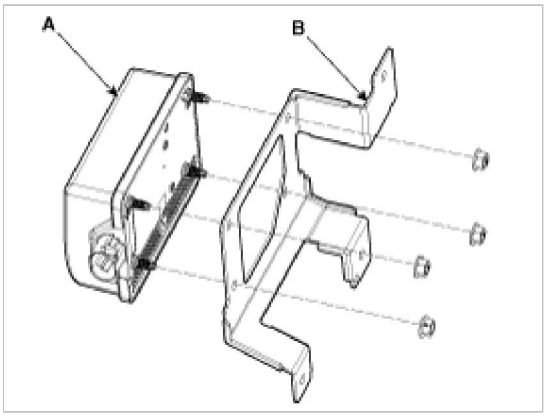
Engine Electrical System > Smart Cruise Control System > Smart Cruise Control Unit > Repair procedures

Removal

1. Remove the bumper. (Refer to “BD” group)
2. Disconnect the smart cruise control unit connector (A).
3. Loosen the bolts and then remove the smart cruise control unit bracket (B).

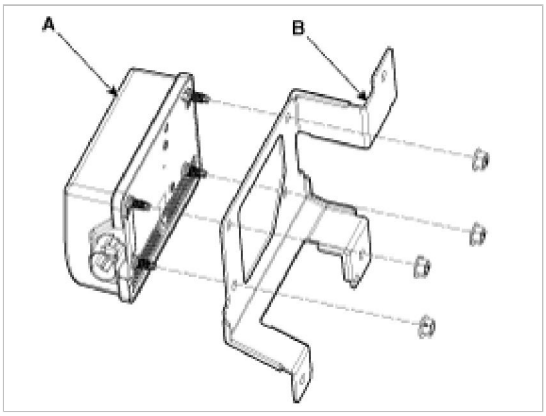


4. Loosen the nuts and then disassemble the smart cruise control unit (A) from the bracket (B).

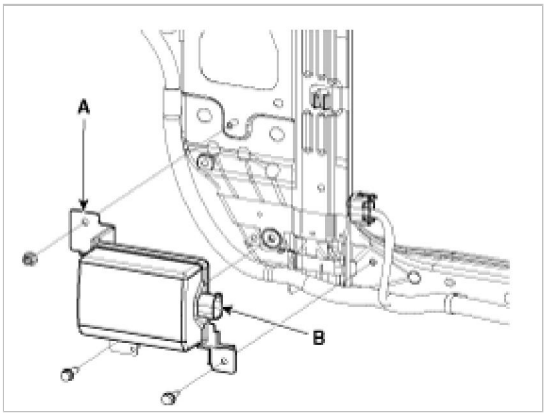


Installation

1. Assemble the smart cruise control unit (A) to the bracket (B) correctly.



2. Install the smart cruise control unit bracket (B) on the vehicle.
3. Connect the smart cruise control connector (A) to the unit.



4. Align the smart cruise control sensor. (Refer to the Alignment in this group)
5. Install the bumper. (Refer to BD group)

Smart Cruise Control(SCC) Sensor Alignment

The objective of the alignment is to ensure correct SCC performance. In order for the sensor to perform correctly, the sensor must be aligned correctly. The sensor alignment has major impact on road estimation, lane prediction, and target processing. When the sensor is misaligned, the performance of SCC cannot be guaranteed.
Therefore, when the sensor is reinstalled or a new sensor is installed on a vehicle, the sensor shall be aligned by service personnel.

NOTE

The sensor must be aligned when;
- The sensor is reinstalled after removing.
- A new sensor is installed on a vehicle.
- The sensor or nearby parts are impacted in a collision.
- The sensor can not recognize a vehicle ahead.

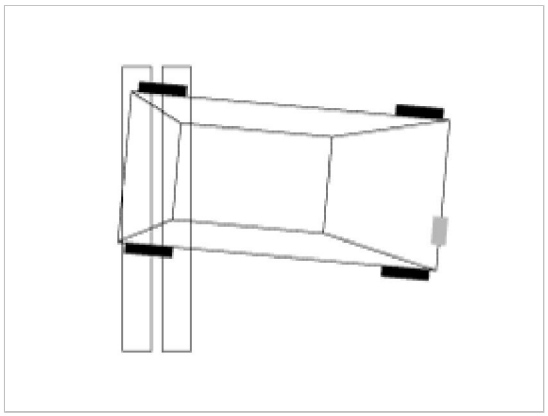
CAUTION

Preparation for sensor alignment:
- Remove heavy objects, such as luggage in the trunk, from the vehicle.
- Adjust the tire pressure properly.
- Check wheel alignment.
- If possible, adjust the vehicle’s height to the normal position.

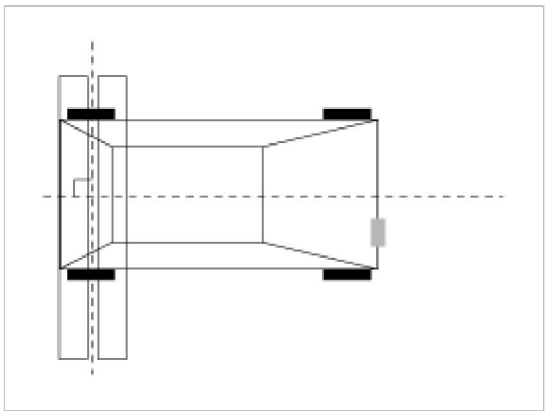
Sensor Alignment Procedure (Parking Mode)

The SCC sensor can be aligned using a metal plate reflector.
The ignition switch should be ON for the alignment procedure.

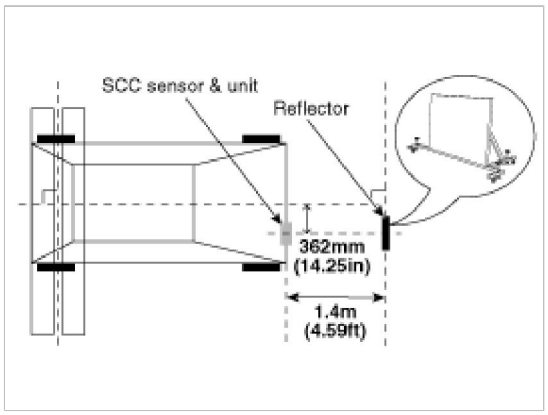
1. Put the rear wheel of the vehicle on the dynamometer roll.



2. Rotate the rear wheel (approximately three revolutions) to make the rear axis be parallel to dynamometer axis. Make sure the steering wheel is straight ahead to align the front wheels to the vehicle motion vector.



3. Put the metal plate reflector (09964-3N200) on the front of the sensor so the reflector is perpendicular to the vehicle motion vector.



NOTE

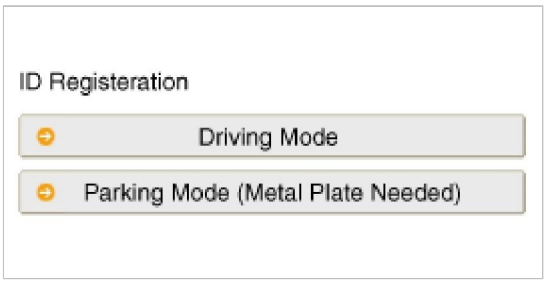
- The reflector should be perpendicular to the floor. Use the bubble level on the reflector.
- Make sure that there is no other material except the reflector in a space around the reflector.
- Between the vehicle and reflector
- Within 1.0m (3.28ft) from the back of the reflector
- Within 0.5m (1.64ft) from the left of right side of the reflector
- Within 1.0m (3.28ft) from the top of the reflector

4. Connect the GDS to the vehicle. Select the model and the system and click the “Vehicle S/W Management”.

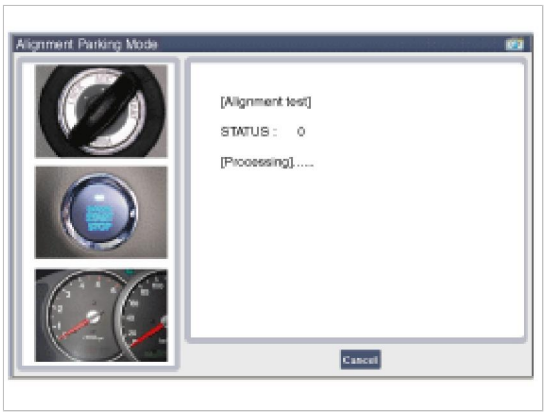
NOTE

Erase the DTC code (C1620) before the sensor alignment procedure.

5. Select “Parking Mode” to start sensor alignment.



6. Check the alignment (0%) start on the GDS. The progress of the alignment is displayed on the GDS.



7. Make sure that the sensor alignment is completed (100%).

8. If the sensor alignment fails, delete the DTC code (C1620) and then repeat the above procedure.

Sensor Alignment Procedure (Driving Mode)

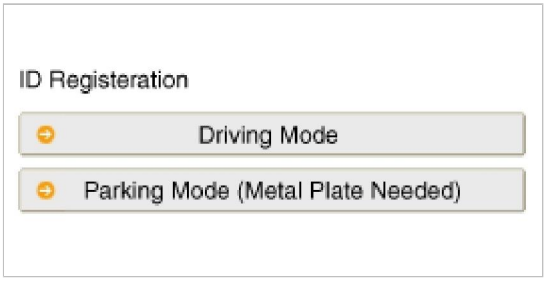
The SCC sensor can be aligned by driving the vehicle. The alignment is based on moving and stationary targets in front of the sensor.

1. Connect the GDS to the vehicle. Select the model and the system and click the “Vehicle S/W Management”.

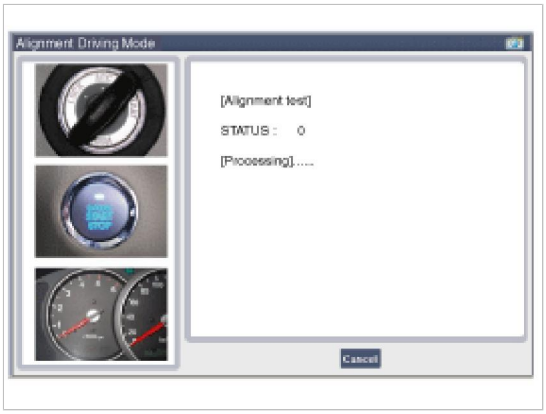
NOTE

Erase the DTC code (C1620) before the sensor alignment procedure.

2. Select “Driving Mode” to start sensor alignment.



3. Drive the vehicle after checking the alignment (0%) start on the GDS. The progress of the alignment is displayed on the GDS.



NOTE

The sensor alignment will last about 10~15 minutes. Depending on the traffic situation or road condition, the duration of the procedure can shorten or extend.
To complete the alignment in minimum time, if it is possible, drive the vehicle considering the driving/road conditions as follows.

- To shorten the duration of the alignment;
  - Drive at more than 50km/h (31.1mph).
  - Drive on a straight road without any curve and incline.
  - Drive on a thick and wide asphalt road.
  - Drive on a road with repetitive static targets.
  - Drive behind a passenger car (not SUV, bus or truck) at a distance of about 30~90m (98.4~295.2ft).
  - Drive on a dry and good road without rain and snow.
- The alignment process can be interrupted when the following condition exists;
  - When the vehicle encounter curves with a radius smaller than 100m (328.0ft).
  - When the vehicle accelerates/decelerates more than 2m/s² (6.6ft/s²).
  - When the vehicle speed is lower than 10km/h (6.2mph).
  - When the vehicle is in a tunnel or under pass.
  - When there are excessive steering wheel actions such as turning to the right or left and sudden lane change.

CAUTION

Be careful when driving the vehicle for sensor alignment as follows;

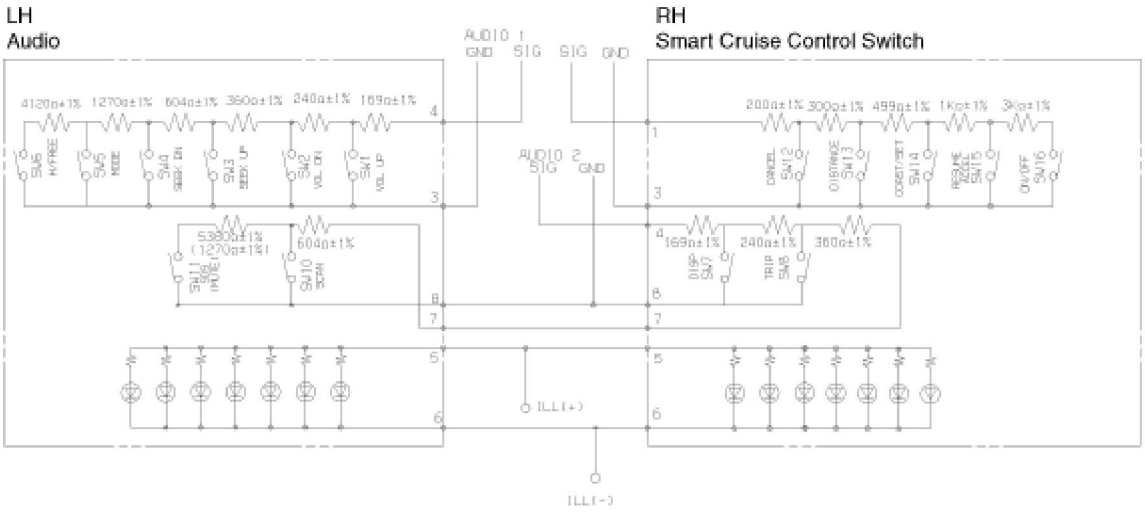
- Observe a regulation speed on the road.
- Do not stick to the previous driving/road conditions excessively to shorten the duration of the alignment and drive the vehicle safely considering traffic situations.
- When driving the vehicle, do not operate the GDS and look at the GDS display for a long time. You can lose your steering control.
- Operate the GDS only when the vehicle stops.

4. Make sure that the sensor alignment is completed (100%).

5. If the sensor alignment fails, delete the DTC code (C1620) and then repeat the above procedure.

Engine Electrical System > Smart Cruise Control System > Smart Cruise Control Switch > Schematic Diagrams

Circuit Diagram



LH

NO	CONNECTOR (LH)
1	NC
2	NC
3	AUDIO1 GND
4	AUDIO1 SIG
5	ILL(+)
6	ILL(-)
7	COMM
8	AUDIO2 GND

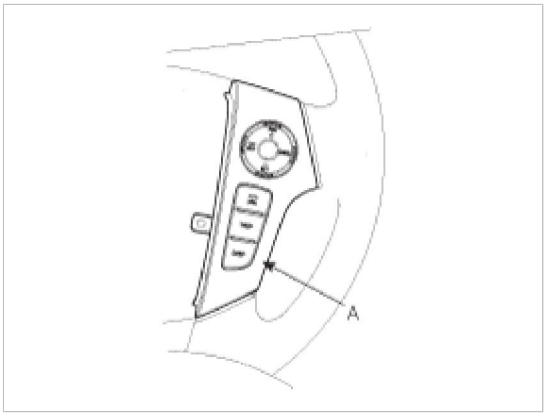
RH

NO	CONNECTOR (RH)
1	CRUISE SIG
2	NC
3	CRUISE GND
4	AUDIO2 SIG
5	ILL(+)
6	ILL(-)
7	COMM
8	AUDIO2 GND

Engine Electrical System > Smart Cruise Control System > Smart Cruise Control Switch > Repair procedures

Removal

1. Disconnect the battery (-) terminal.
2. Remove the air-bag module from the steering wheel. (Refer to RT group)
3. Disconnect the smart cruise control main switch connect.
4. Remove the smart cruise control switch (A) with three screws.

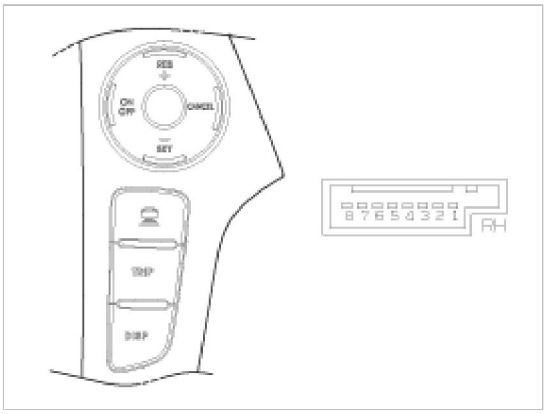


5. Installation is the reverse order of removal.

Inspection

Measuring Resistance

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



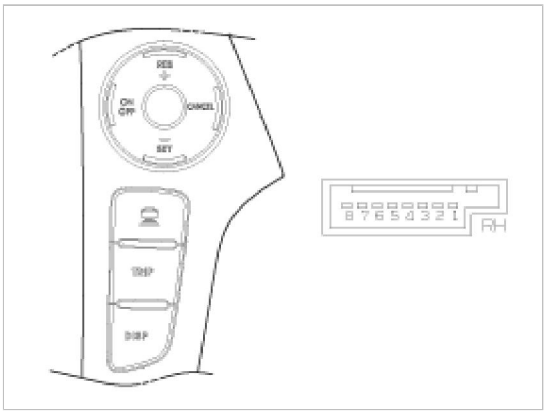
2. Measure resistance between terminals on the control switch when each function switch is ON (switch is depressed).

Function switch	Terminal	Resistance
CANCEL	1 - 3	200Ω
DISTANT	1 - 3	500Ω
SET/－	1 - 3	999Ω
RES/＋	1 - 3	1999Ω
ON/OFF	1 - 3	4999Ω

3. If not within specification, replace the switch.

Measuring Voltage

1. Connect the smart 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
CANCEL	1 - 3	0.83V
DISTANT	1 - 3	1.66V
SET/－	1 - 3	2.5V
RES/＋	1 - 3	3.33V
ON/OFF	1 - 3	4.17V

3. If not within specification, replace the switch.