General Information

SPECIFICATION

IGNITION SYSTEM

Items			Specification
Ignition coil	Primary resistance		0.58 ± 10 % (Ω)
	Secondary resistance		8.8 ± 15 % (kΩ)
Spark plugs	Leaded	NGK	BKR5ES
		CHAMPION	RC10YC
		Gap	0.7 ~ 0.8 mm (0.0276 ~ 0.0315 in.)
	Unleaded	NGK	BKR5ES-11
		CHAMPION	RC10YC4
		Gap	1.0 ~ 1.1 mm (0.0394 ~ 0.0433 in.)

STARTING SYSTEM

Items			Specification
Starter	Rated voltage		12 V, 1.2 kW
	No. of pinion teeth		8
	No-load characteristic-s	Voltage	11 V
		Ampere	90A, MAX
		Speed	2,800 rpm, MIN

CHARGING SYSTEM

Items		Specification
Alternator	Rate voltage	13.5 V, 90A
	Speed in use	1,000 ~ 18,000 rpm
	Regulator setting voltage	14.55 ± 0.2 V
	Temperature compensation	-7 ± 3 mV / ˚C
Battery	Type	CMF 60AH
	Cold cranking amperage [at -18˚C(-0.4˚F)]	550 A
	Reserve capacity	92 min
	Specific gravity [at 20˚C(68˚F)]	1.280 ± 0.01

CAUTION

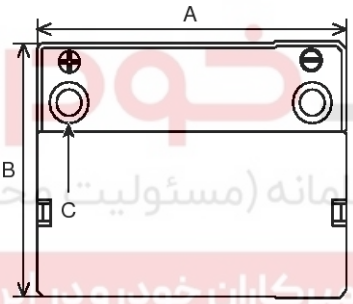
- **COLD CRANKING AMPERAGE is the amperage a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2V or greater at a specified temperature.**
- **RESERVE CAPACITY RATING is amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5V at 26.7°C(80.1°F).**

NOTICE

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

① : 5HR capacity
② : Battery length (A)
③ : Battery width (B)
④ : Terminal location (C)

SXMEE9102L



SXMEE9103L

AUTO CRUISE CONTROL SYSTEM

Items	Specification
Actuator	
Rated voltage range	DC 12V
Operating voltage range	DC 11 ~ 16V
Operation temperature rnage	-30 ~ 100°C (22 ~ 212°F)
Cruise main switch	
Reted voltage	DC 5V
Operating temperature range	-30 ~80 °C (-22 ~ 176°F)

TIGHTENING TORQUE

Items	Nm	kgf.m	lb-ft
Ignition coil monnting	18.6 ~ 26.5	1.9 ~ 2.7	13.7 ~ 19.5
Stater terminal mounting	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Stater mounting	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Alternator mounting A	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Alternator mounting B	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1

TROUBLESHOOTING

IGNITION SYSTEM

Trouble condition	Probable cause	Remedy
Engine cranks, but will not start or is hard to start.	Ignition coil faulty High tension cable faulty Spark plugs faulty Incorrect immobilizer system Ignition wiring disconnected or broken	Replace ignition coil Replace high tension cable Replace plugs Adjust Inspect and replace
Rough idle or stalling	Spark plugs faulty Ignition wiring faulty Ingition coil faulty High gension cord faulty	Replace plugs Replace wiring Replace ignition coil Relpace high tension cord
Engine hesitates/poor acceleration	Spark plugs faulty Ignition wiring faulty	Replace plugs Replace wiring
Poor fuel	Spark plugs faulty	Replace plugs

CHARGING SYSTEM

Trouble condition	Probable cause	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off	Fues blown Light burnde out Wiring connection loose Electronic voltage regulator faulty	Check fuses Replace light Tighten loose connections Replace voltage regulator
Charging warning indicator does not go out with engine runing. (Battery requires fequent recharging)	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown Electronic voltage regulator or alternator faulty Wiring faulty	Adjust tension or replace cables Repair or replace cables Check fuses Replace fusible link Test alternator Repair wiring
Discharged battery	Drive belt loose or worn Wiring connection loose or open circuit Fusible link blown Warning indicator and pre-excitation resistor faulty Poor grounding Electronic voltage regulator or alternator faulty Battery life	Adjust tension or replace drive belt Tighten loose connection or repair wiring Replace fusible link Replace components Repair Test alternator Replace battery
Overcharging	Electronic voltage regulator faulty Voltage sensing wire faulty	Replace voltage regulator Repair wire

STARTING SYSTEM

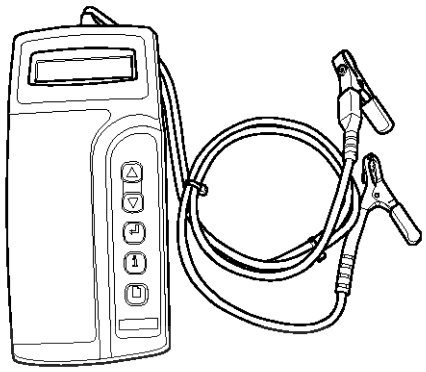
Trouble condition	Probable cause	Remedya
Engine will not crank	Battery charge low Battery cables loose, corroded or worn Transaxle range switch faulty (Vehicle with automatic transaxle only) Fusible link blown Starter motor faulty Ignition switch faulty	Charge or replace battery Repair or replace cables Adjust or replace switch Replace fusible link Repair starter motor Replace ignition switch
Engine cranks slowly	Battery charge low Battery cables loose, corroded or worn Starter motor faulty	Charge or replace battery Inspect wiring and fix Repair starter motor
Starter keeps running	Starter motor faulty Ignition wiring faulty	Repair starter motor Repair or replace
Starter spins but engine will not crank	Short in wiring Pinion gear teeth broken or starter motor faulty Ring gear teeth broken	Repair wiring Repair starter motor Replace flywheel ring gear or torque converter

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

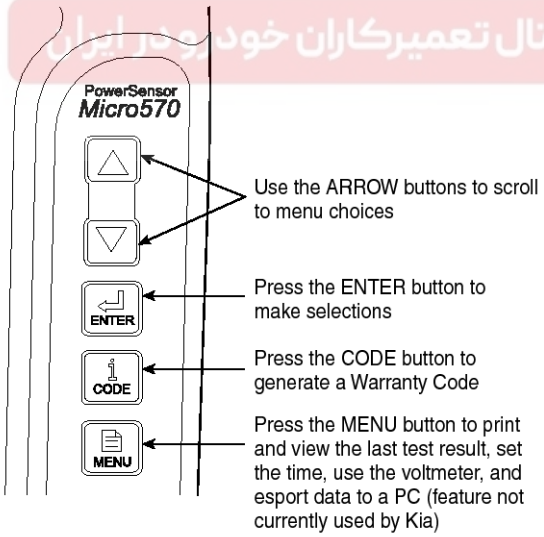
Because of the possibility of personal injury, always use extreme caution and appropriate eye protection when working with batteries.



EBKD001A

Keypad

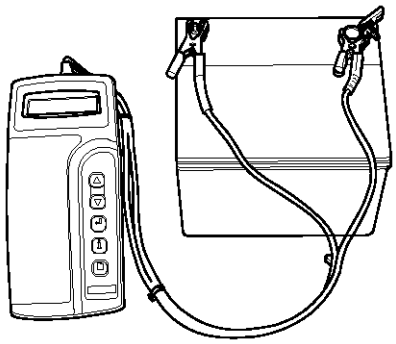
The Micro 570 button on the key pad provide the following functions :



LBGE012A

Battery Test Procedure

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

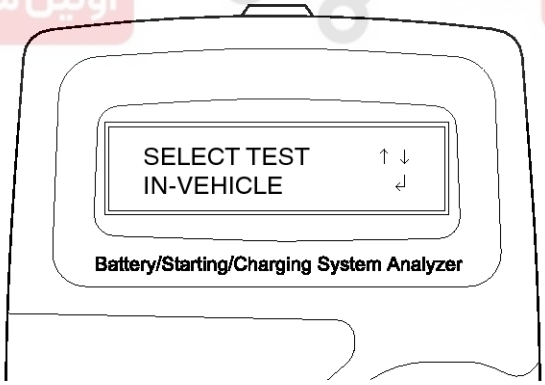


EBKD001C

⚠CAUTION

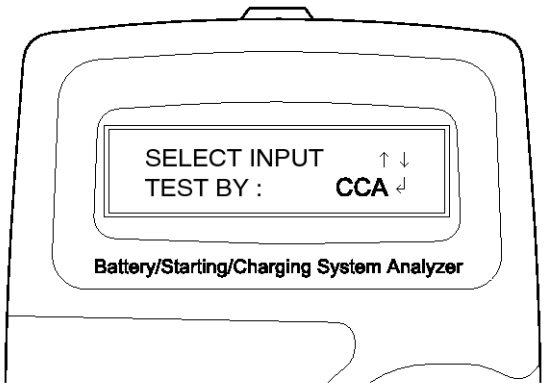
Connect clamps securely. If "CHECK CONNECTION" message is displayed on the screen, reconnect clamps securely.

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.



SXMEE9129D

3. Select CCA and press the ENTER button.

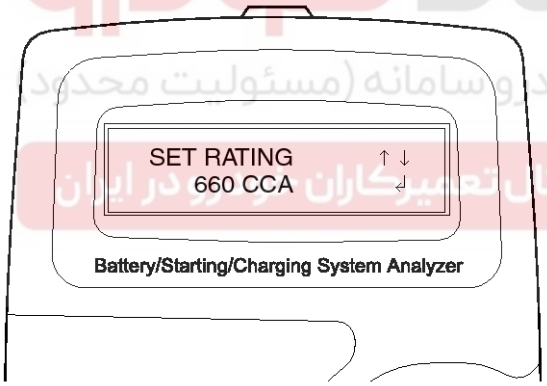


SXMEE9130D

NOTICE

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

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

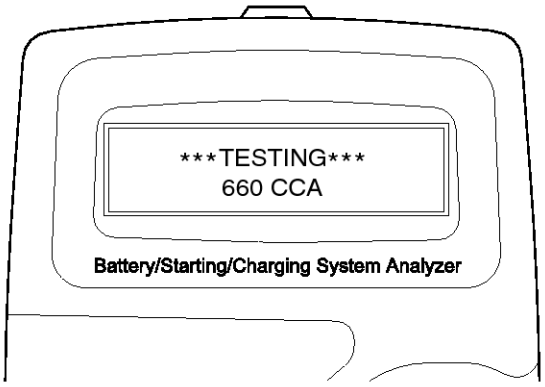


EBKD001F

NOTICE

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

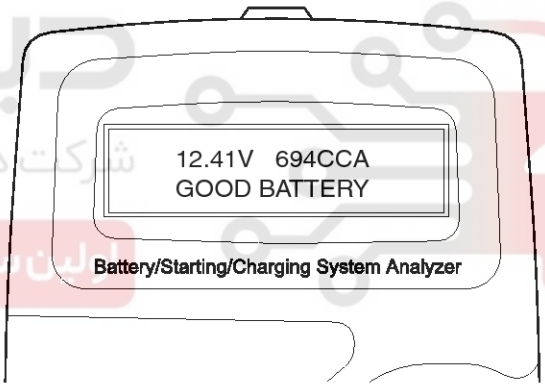
5. The tester will conduct battery test.



SXMEE9131D

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.



SXMEE9132D

Battery Test Results

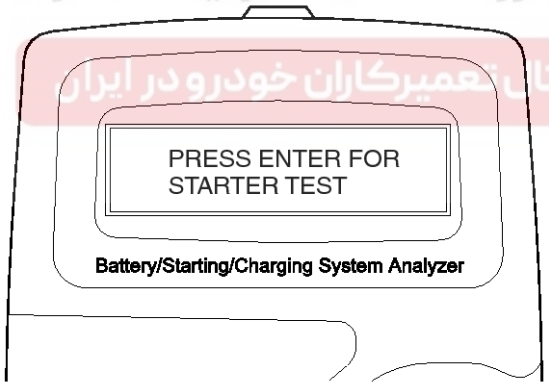
Result On Printer	Remedy
GOOD BATTERY	No action is required.
GOOD RECHARGE	Battery is in a good state. Recharge the battery and use.
CHARGE & RETEST	Battery is not charged properly. - Charge and test the battery again. (Failure to charge the battery fully may read incorrect measurement value.)
REPLACE BATTERY	Replace battery and recheck the charging system. - Improper connection between battery 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.

WARNING

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

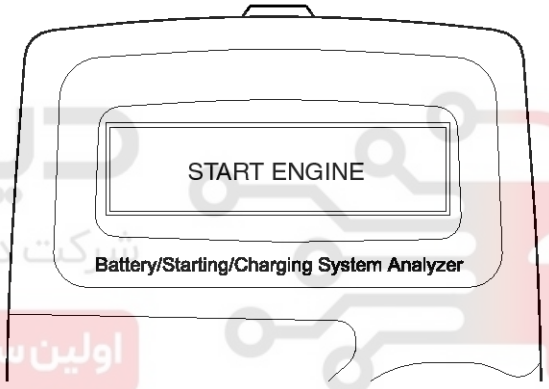
Starter Test Procedure

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



EBKD001H

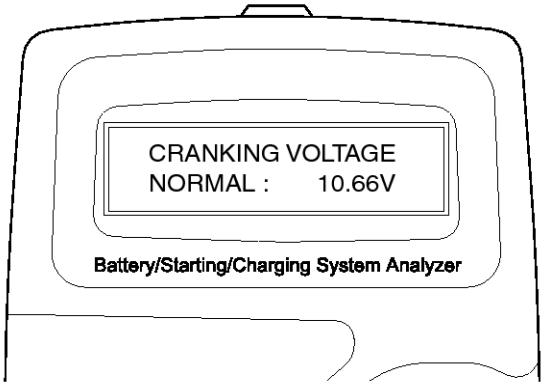
8. Start the engine.



EBKD001I

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.



SXMEE9133D

Starter Test Results

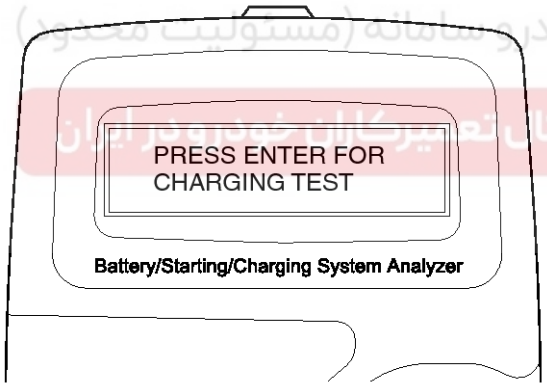
Result On Printer	Remedy
CRANKING VOLTAGE NORM-AL	System shows a normal starter draw.
CRANKING VOLTAGE LOW	Cranking voltage is lower than normal level. - Check starter.
CHARGE BATTERY	The state of battery charge is too low to test. - Charge the battery and retest.
REPLACE BATTERY	Replace battery. - If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

NOTICE

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

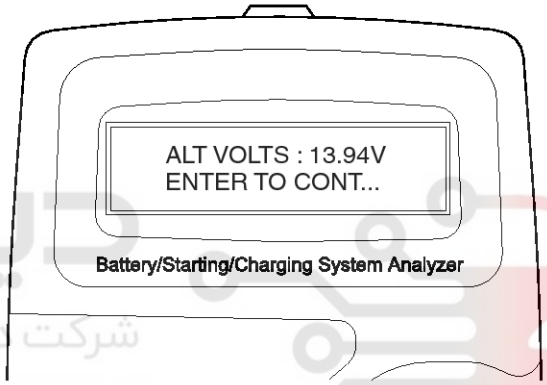
Charging System Test Procedure

10. Press ENTER to begin charging system test.



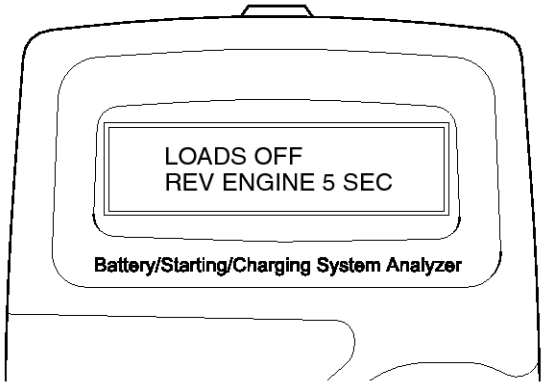
EBKD001K

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

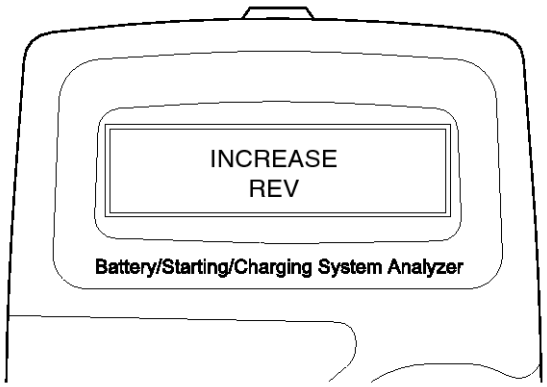


EBKD001L

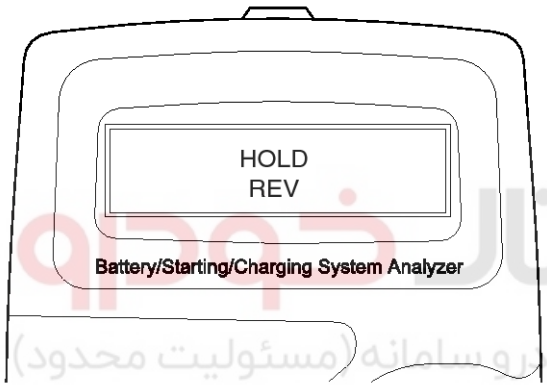
12. Turn off all electrical load and rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)



EBKD001M

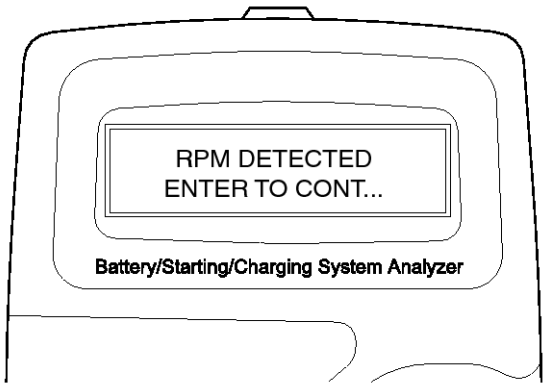


SXMEE9134D



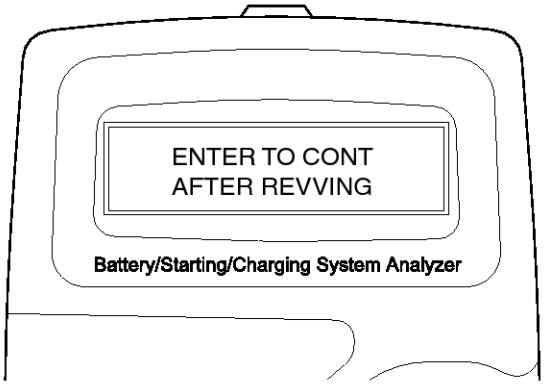
SXMEE9135D

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



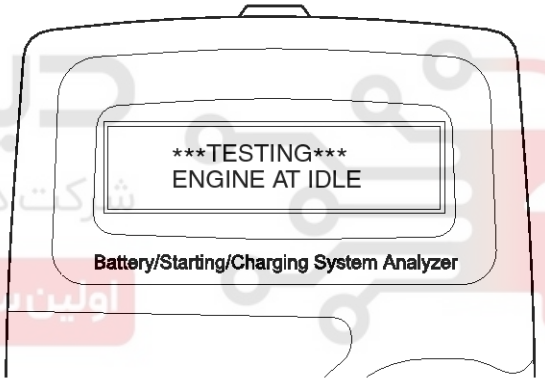
SXMEE9136D

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

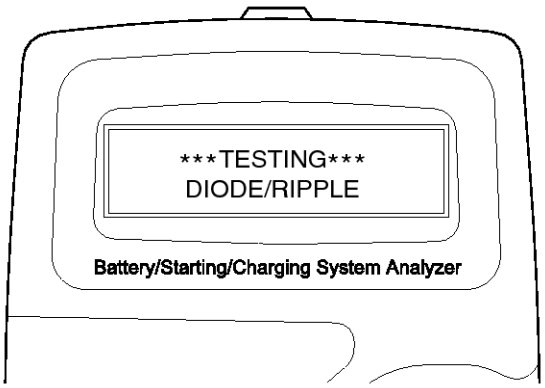


SXMEE9137D

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

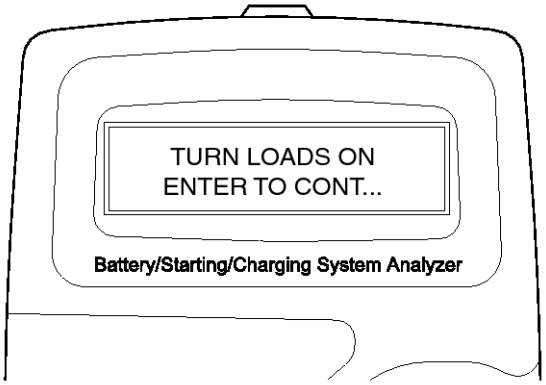


EBKD001O



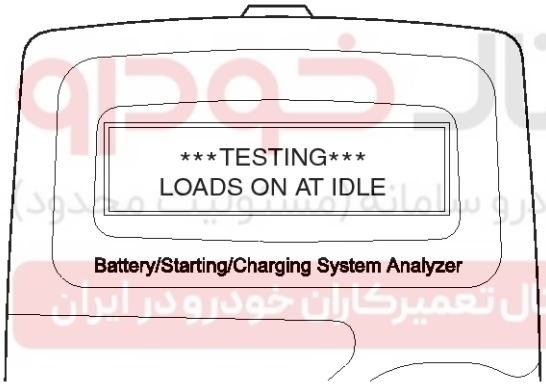
SXMEE9138D

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



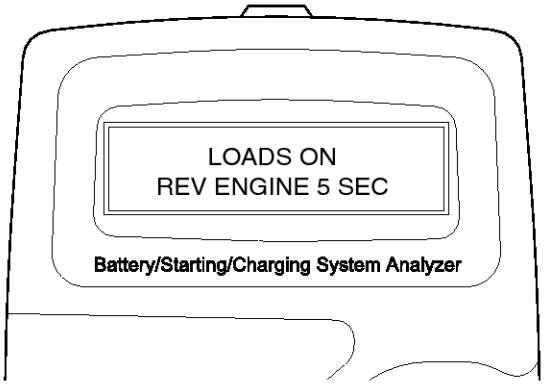
SXMEE9139D

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

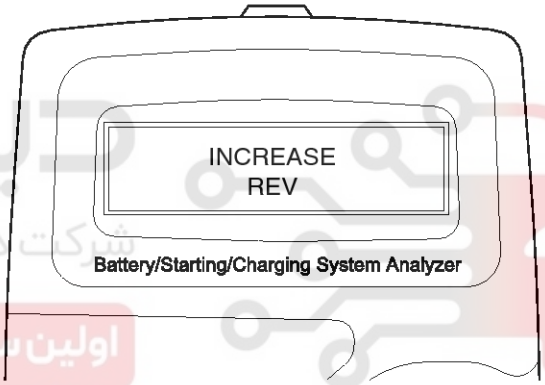


SXMEE9140D

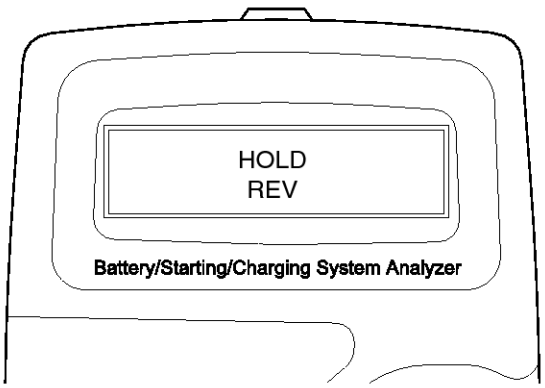
18. Rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)



SXMEE9141D

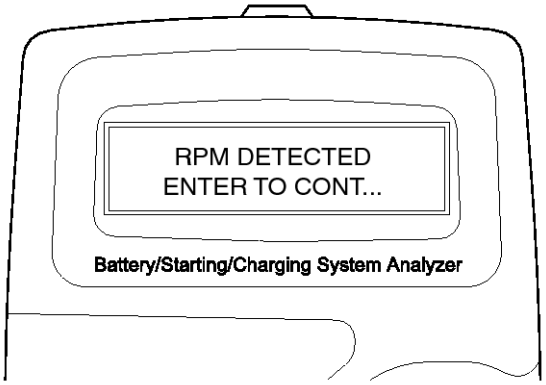


SXMEE9142D



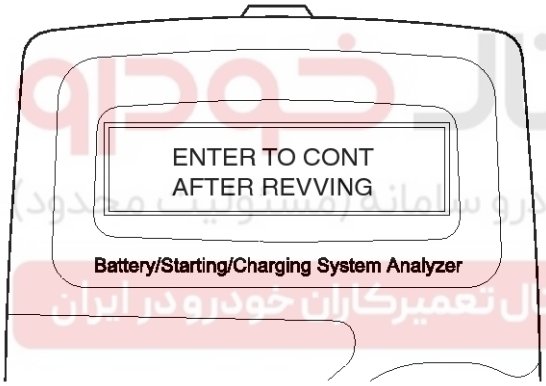
SXMEE9143D

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



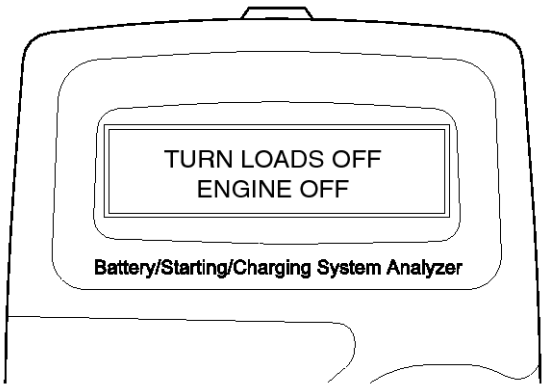
SXMEE9144D

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



SXMEE9145D

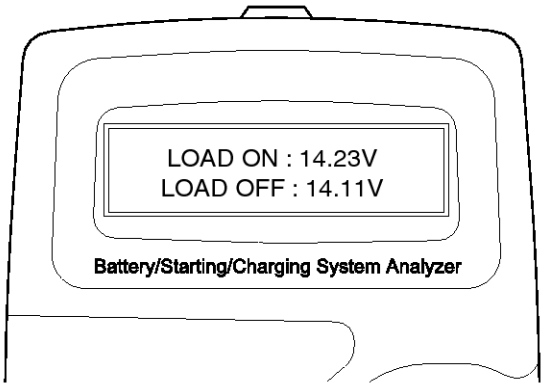
21. Turn off electrical loads (air conditioner, lamps, audio and etc). Turn the engine off.



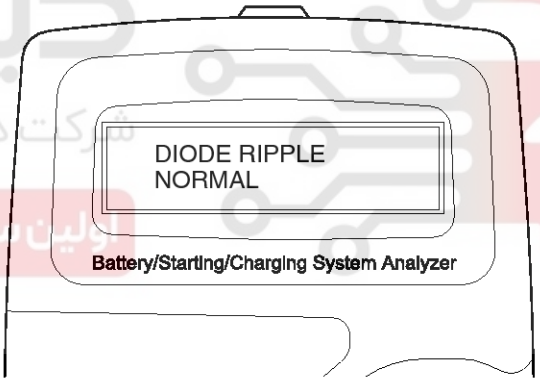
SXMEE9146D

22. Charging voltage and charging system test results will be displayed on the screen.

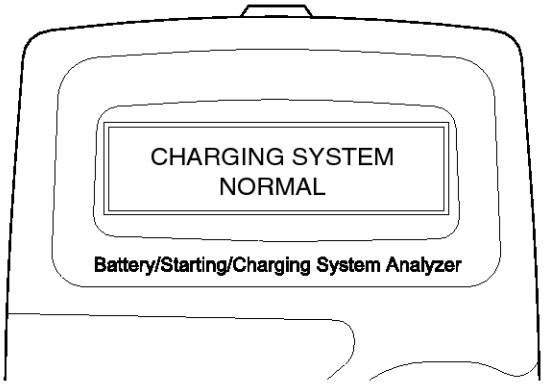
Shut off engine end disconnect the tester clamps from the battery. Refer to the following table and take the appropriate action as recommended by the Micro 570.



SXMEE9147D



EBKD001P



SXMEE9148D

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.

Ignition 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.

Ignition Coil

INSPECTION

1. Measure the primary ciol resistance between terminals 1 and 2.

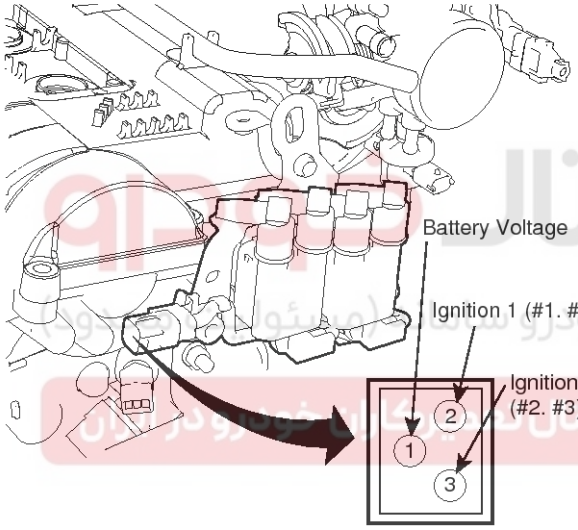
Standard value : 0.58 ± 10% (Ω)

2. Measure the secondary ciol resistance between the high-voltage terminal for the No.1 and No.4 cylinders, and between the high-voltage terminals for the No.2 and No.3 cylinders.

Standard value : 8.8 ± 15% (KΩ)

⚠CAUTION

When measuring the resistance of the secondary coil, be sure to disconnect the ignition coil connector.



SHDEA6013D

Spark Plug

INSPECTION

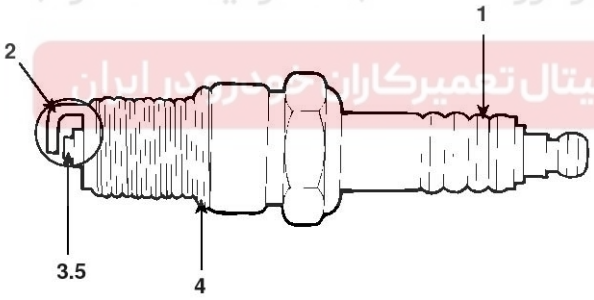
1. Disconnect the spark plug cables from the spark plugs.

   NOTICE
   When removing the spark plug cable, pull on the spark plug cable boot (not the cable), as it may be damaged.

2. Using a spark plug socket, remove all spark plugs from the cylinder head.

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

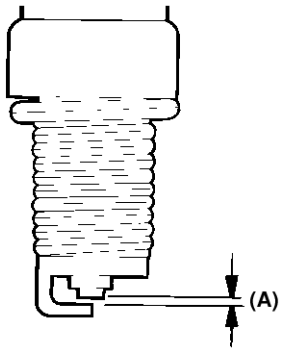
3. Check the spark plugs for the following :
   1. Broken insulator
   2. Worn electrode
   3. Carbon deposits
   4. Damaged or broken gasket
   5. Condition of the porcelain insulator at the tip of the spark plug



SHDEA6009L

4. Check the spark plug gap using a wire gap(A) gauge, and adjust if necessary.

Standard value : 1.0-1.1 mm (0.039-0.043 in)



EBKD002L

5. Re-insert the spark plug and tighten to the specified torque.

   If it is over torqued, damage to the threads of the cylinder head may result.

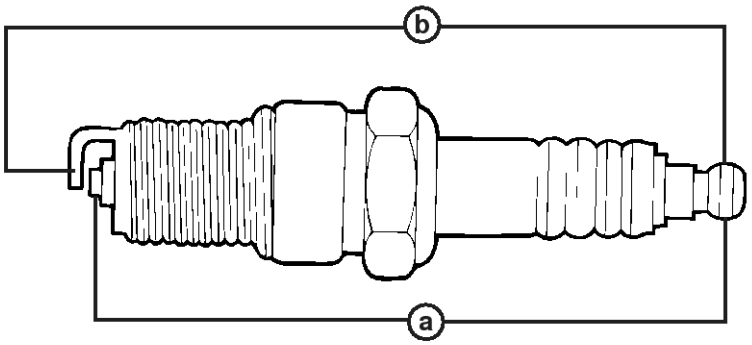
Tightening torque : 20-30 Nm (2.0-3.0 kgf.m, 15-21 lb-ft)

ANALYZING SPARK PLUGS

Engine conditions can be analyzed by examining the tip deposits near the electrode.

Condition	Dark deposits	White deposits
Description	• Fuel mixture too rich7 • Low air intake	• Fuel misture too lean • Advanced ignition timing • Insufficient plug tightening

RESISTANCE INSPECTION



1) Open/Short resistance -ⓐ

Result	Specification		Remedy	Probable cause and state
	Champion	NGK		
Normal	∞		-	-
Not OK	NOT∞		Relpace	· Cause : Open in spark plugs · State : Misfire→engine skipping or hesitation

2) Insulation resistance (with 500~1000V voltmeter)-ⓑ

Result	Specification		Remedy	Probable cause and state
	Champion	NGK		
Normal	50 MΩ above		-	-
Not OK	50 MΩ below		Relpace	· Cause : Carbon or insulator crack · State : Engine skipping or hesitation

SHDEA6010L

Charging System

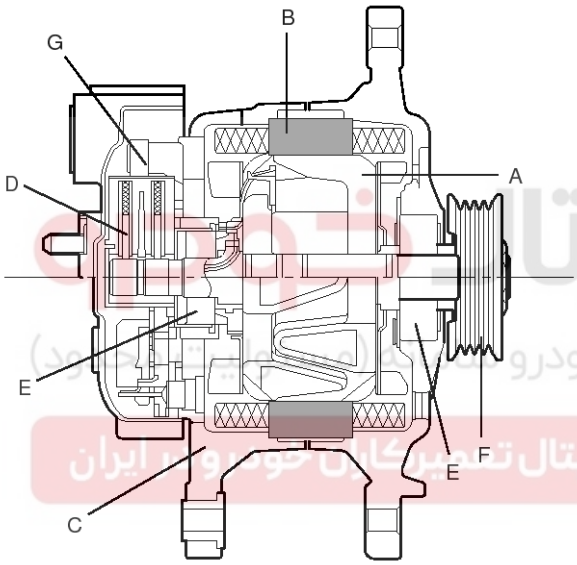
DESCRIPTION

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

The alternator has six built-in diodes (three positive and three negtive), each rectifying AC current to DC current.

Therefore, DC curent appears at alternator "B" terminal.

In addition, the charging voltage of the alternator is regulated by the battery voltage detection system. The main components of the alternator are the rotor(A), stator(B), rectifier(C), brushes(D), bearings(E) V-ribbed belt pulley(F). The brush holder contains a built-in electronic voltage regulator(G).



SEDEA7001L

INSPECTION

VOLTAGE DROP TEST

This test determines if the wiring between the alternator "B" terminal and the battery (+) terminal is good by the voltage drop method.

PREPARATION

1. Turn the ignition switch to "OFF."

   NOTICE

   To identify connection problems, be sure not to disturb either of the two terminals or their connections during this test.

2. Connect a digital voltmeter between the alternator "B" terminal and battery (+) terminal. Connect the (+) lead wire of the voltmeter to the"B" terminal and the (-) lead wire to the battery (+) terminal.

CONDITIONS FOR TESTING

With the engine running and headlamps, blower motor etc. ON, check the reading on the voltmeter.

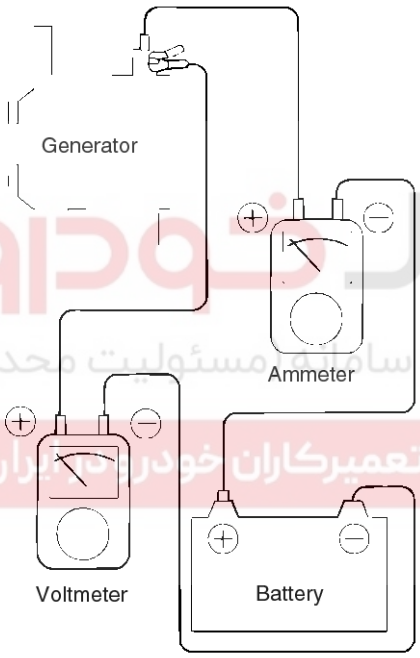
RESULT

1. The voltmeter should read a standard 0.2V.
2. If the reading is above 0.2V, poor wiring should be suspected.

   Check wiring from alternator 'B' terminal through the fusible link to the battery (+) terminal.

   Check for loose wiring or color change from an overheated harness. Correct and check again.
3. On completion of the test, set the engine at idle.

   Then turn off the headlamps, blower motor etc., and ignition.



EBBB013A

OUTPUT CURRENT TEST

This test determines if the alternator gives an output current that is equivalent to the nominal output.

PREPARATION

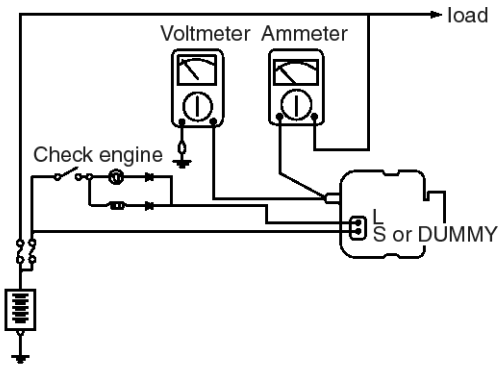
1. Prior to the test, check the following items and correct as necessary.
   1) Check if that the battery installed in the vehicle is in good condition. For details, see "BATTERY".

      NOTICE

      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.
   2) Check the tension of the alternator drive belt. See "COOLING".
2. Turn the ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Disconnect the alternator output wire from the alternator "B" terminal.
5. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire ofthe ammeter to the disconnected output wire.

   NOTICE

   Tighten each connection securely, as a heavy current will flow. Do not rely on clips.
6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the alternator "B" terminal and (-) lead wireto a good ground.
7. Attach an engine tachometer and connect the battery ground cable.
8. Leave the engine hood open.



EBKD013H

TEST

1. Check to see that the voltmeter reads the same value as the battery voltage. If the voltmeter reads 0V, an open circuit in the wire between the alternator "B" terminal and battery (+) terminal, a blown fusible link or poorground is suspected.
2. Start the engine and turn the headlights on.
3. Set the headlights to high beam and the heater blower switch to HIGH, quickly increase the engine speed to 2,500 rpm and read the maximumoutput current value indicated by the ammeter.

NOTICE

After the engine starts, the charging current quickly drops. Therefore, the above operation must be done quickly to readthe maximum current value correctly.

RESULT

1. The ammeter reading must be higher than the limit value. If it is lower but the alternator output wire is in good condition, remove the alternator from the vehicle and test it.

Limit value : 45A

NOTICE

1. *The nominal output current value is shown on the nameplate affixed to the alternator body.*
2. *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. In such case, keep the headlights on to discharge the battery, or use the lights of another vehicle to increase the electrical load.*

   The nominal output current may not be obtained if the temperature of the alternator itself or ambient temperature is too high.

   In such a case, reduce the temperature before testing again.

2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the ammeter and voltmeter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

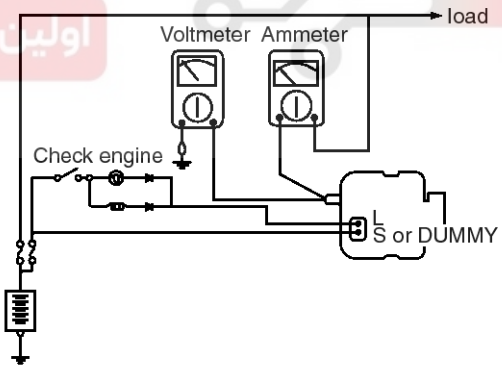
REGULATED VOLTAGE TEST

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

PREPARATION

1. Prior to the test, check the following items and correct if necessary.
   1) Check that the battery installed in the vehicle is fully charged. For battery checking method, see the "BATTERY" section.
   2) Check the alternator drive belt tension.
2. Turn ignition switch to "OFF."
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the "S(L)" terminal of the alternator and ground.

   Connect the (+) lead of the voltmeter to the "S(L)" terminal of the alternator. Connect the (-) lead to a good ground or the battery (-) terminal.
5. Disconnect the alternator output wire from the alternator "B" terminal.
6. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Connect the (-) lead wire of the ammeterto the disconnected output wire.
7. Attach the engine tachometer and connect the battery ground cable.



EBKD013H

TEST

1. Turn on the ignition switch and check to see that the voltmeter indicates the following value.

   Voltage : Battery voltage

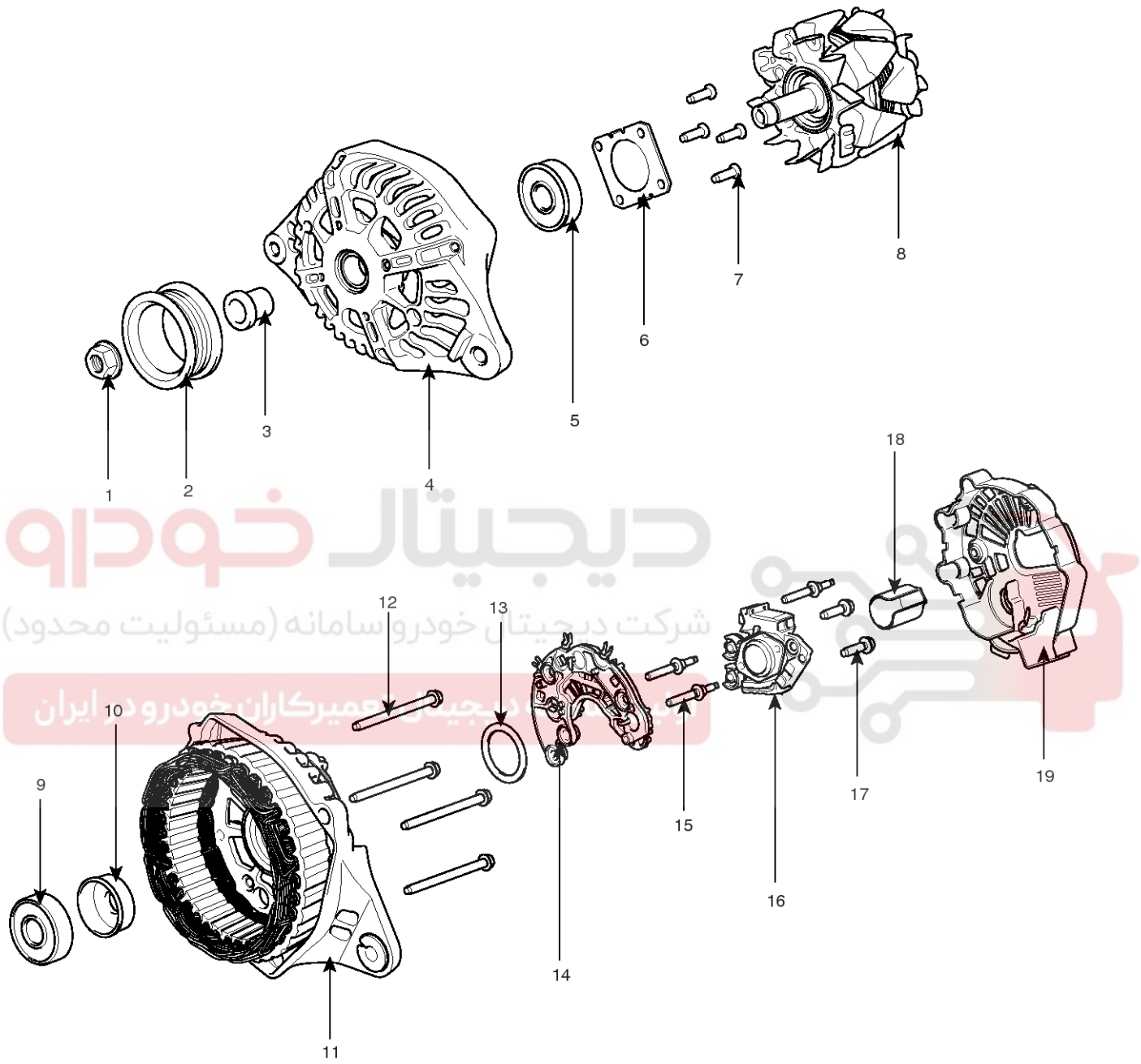
   If it reads 0V, there is an open circuit in the wire between the alternator "S(L)" terminal and the battery and the battery (-), or the fusible link isblown.
2. Start the engine. Keep all lights and accessories off.
3. Run the engine at a speed of about 2,500 rpm and read the voltmeter when the alternator output current drops to 10A or less.

RESULT

1. If the voltmeter reading agrees with the value, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the alternatoris faulty.
2. Upon completion of the test, reduce the engine speed to idle, and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the voltmeter, ammeter, and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Reconnect the battery ground cable.

Alternator

COMPONENTS

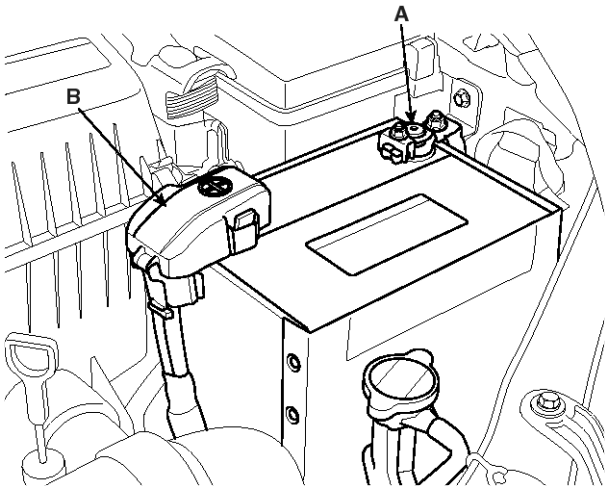


1. Nut
2. Pulley
3. Spacer
4. Front cover assembly
5. Front bearing
6. Bearing cover
7. Bearing cover bolts
8. Rotor coil
9. Rear bearing
10. Bearing cover
11. Rear cover
12. Bolts
13. Seal
14. Rectifier assembly
15. Stud bolts
16. Brush bolder assembly
17. Brush holder bolts
18. Slipring guide
19. Cover

SHDEA6005L

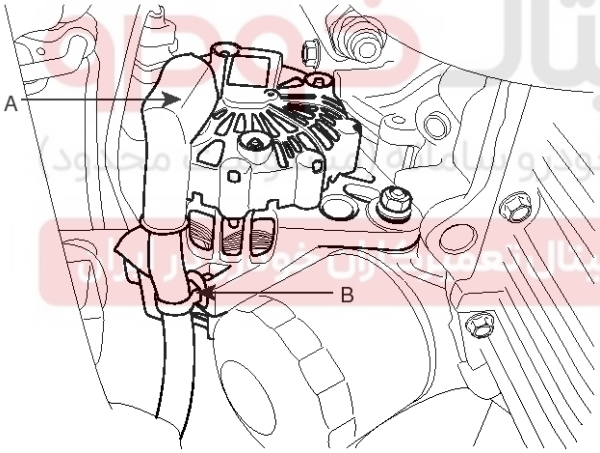
REMOVAL

1. Disconnect the battery negative terminal(A) first, then the positive terminal(B).



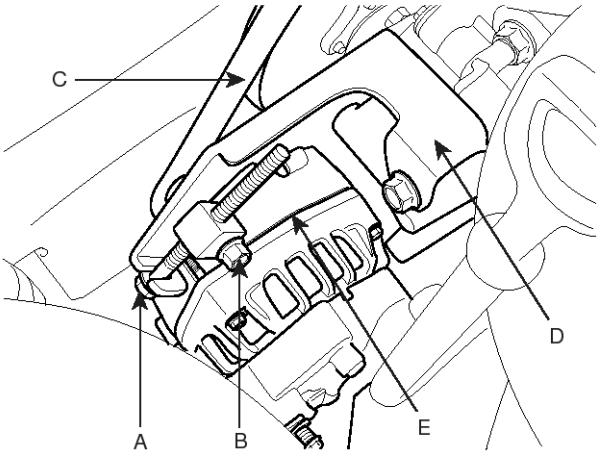
SFDE18003L

2. Deisconnect the alternator connector(A) and "B" terminal cable from the alternator. Losen the cpip(B).



SHDE16002L

3. Remove the adjusting bolt(A), mounting bolt(B), the alternator belt(C) and the alternator mounting bracket(D).
4. Pull out the through bolt, then remove the alternator(E).

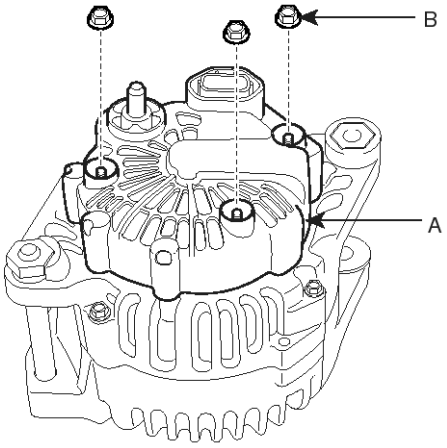


SHDEA6012L

5. Installation is the reverse of removal.
6. Adjust the alternator belt tension after installation.

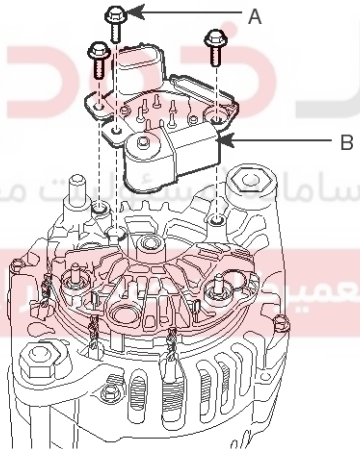
DISASSEMBLY

1. Remove the alternator cover(A) after removing three nuts(B).



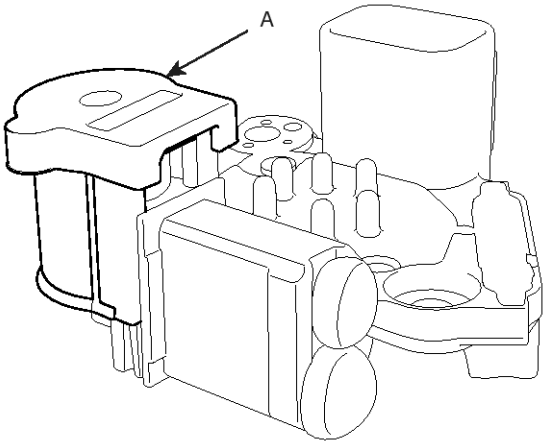
SUNE16001D

2. Loosen the mounting bolts(A) and disconnect the brush holder assembly(B).



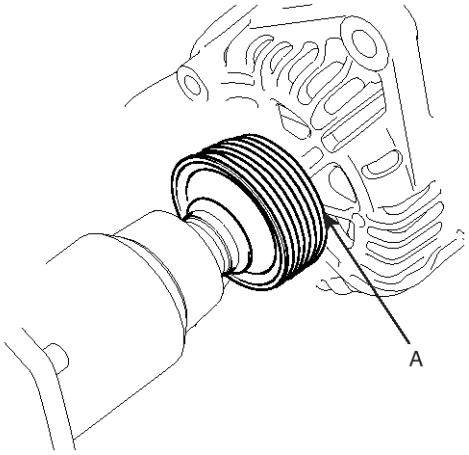
SUNE16002D

3. Remove the slip ring guide(A).



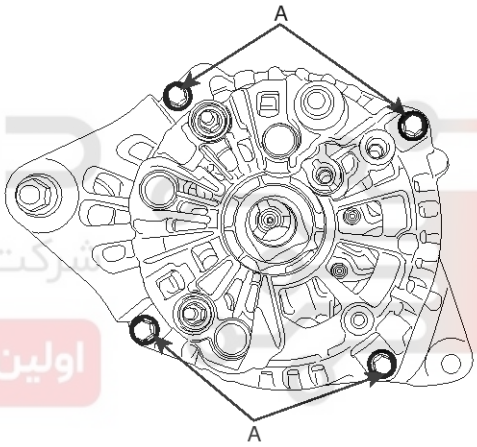
SHDEA6006L

4. Remvoe the nut, pully(A) and spacer.



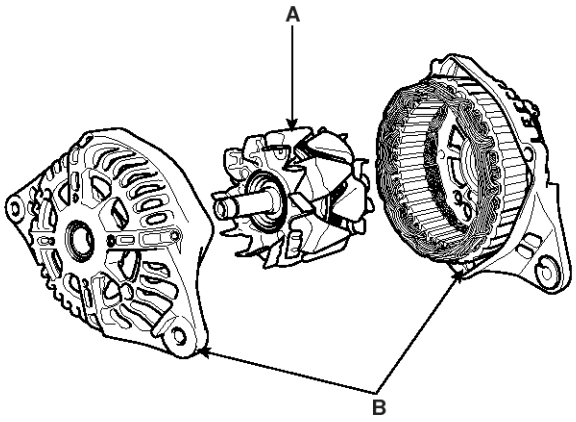
SUNEE6004D

5. Loosen the 4 through bolts(A).



SUNEE6005D

6. Disconnect the rotor(A) and cover(B).



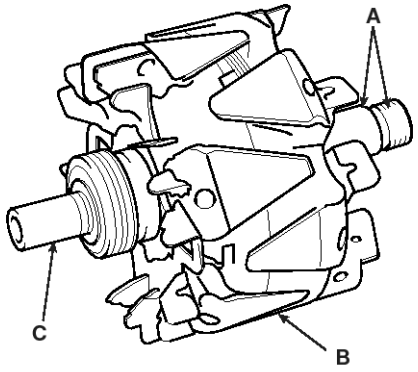
SUNEE6006D

7. Reassembly is the reverse of disassembly.

INSPECTION

ROTOR

1. Check that there is continuity between the slip rings(A).

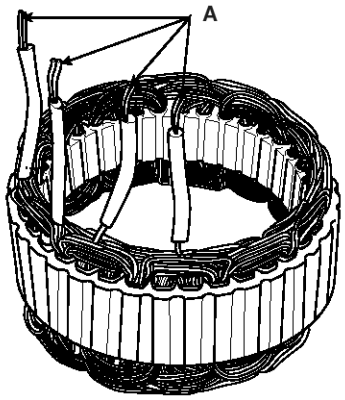


EBKD008A

2. Check that there is no continuity between the slip rings and the rotor(B) or rotor shaft(C).
3. If the rotor fails either continuity check, replace the alternator.

STATOR

1. Check that there is continuity between each pair of leads(A).



EBKD008B

2. Check that there is no continuity between each lead and the coil core.
3. If the coil fails either continuity check, replace the alternator.

ALTERNATOR BELT INSPECTION AND ADJUSTMENT

NOTICE

When using a new belt, first adjust the deflection or tension to the values for the new belt, then readjust the deflection or tension to the values for the used belt after running engine for five minutes.

Deflection method :

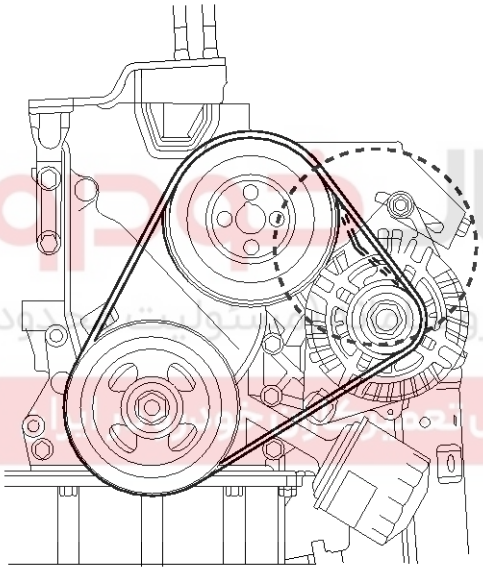
Apply a force of 98N (10 kgf, 22 lbf), and measure the deflection between the alternator and water pump pulley.

Deflection

Used Belt : 5.1 ~ 6.0 mm (0.20 ~ 0.236 in)
New Belt : 4.0 ~ 4.4 mm (0.15 ~ 0.173 in)

NOTICE

If the belt is worn or damaged, replace it.



SFDE18004L

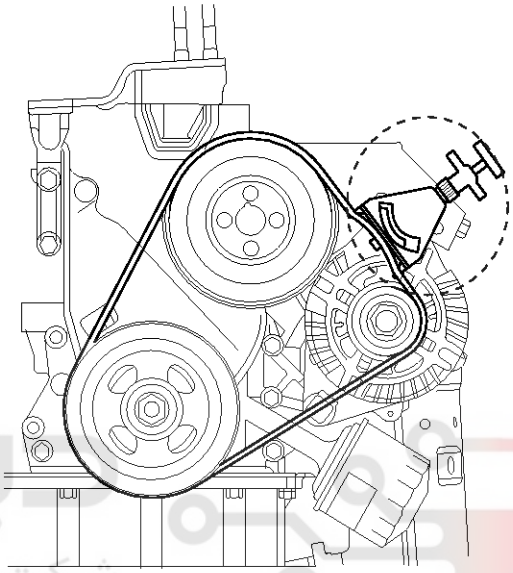
Belt tension gauge method :

Follow the gauge manufacturer's instructions, install the beil tension gange. (Measurement may be done at any spans of pullys)

New Belt : 686 ± 49 N (70 ± 5 kgf, 154 ± 11 lbf)
Used Belt : 441 ± 49 N (45 ± 5 kgf, 99 ± 11 lbf)

NOTICE

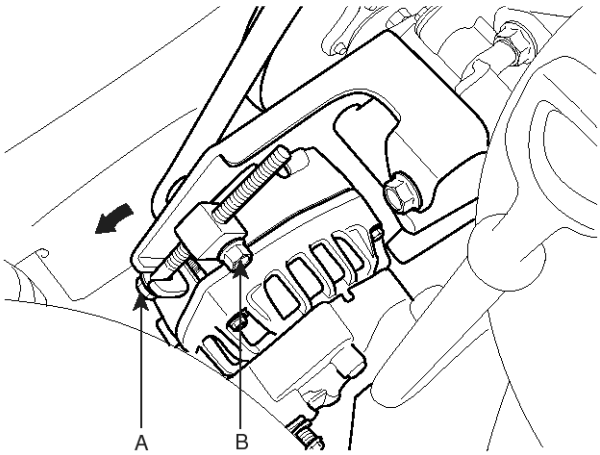
If the belt is worn or damaged, replace it.



SFDE18005L

If adjustment is necessary :

1. Loosen the adjusting bolt(A) and the lock bolt(B).
2. Move the alternator to obtain the proper belt tension, then retighten the nuts.

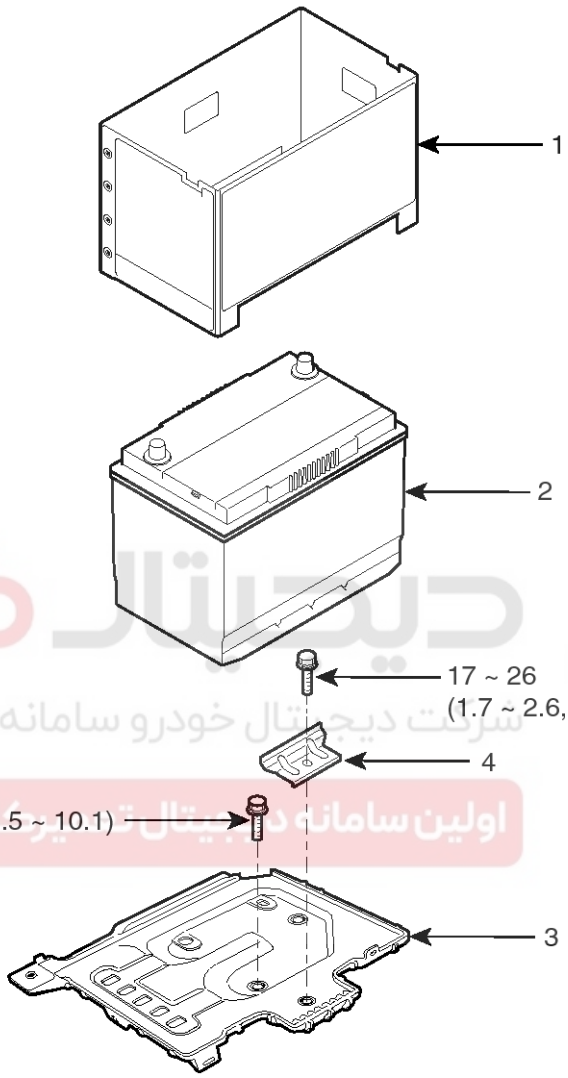


SHDEA6013L

3. Recheck the deflection or tension of the belt.

Battery

COMPONENTS



Tightening torque
N.m (kgf.m, lb-ft)

1. Battery insulation pad
2. Battery
3. Battery tray
4. Battery mounting braket

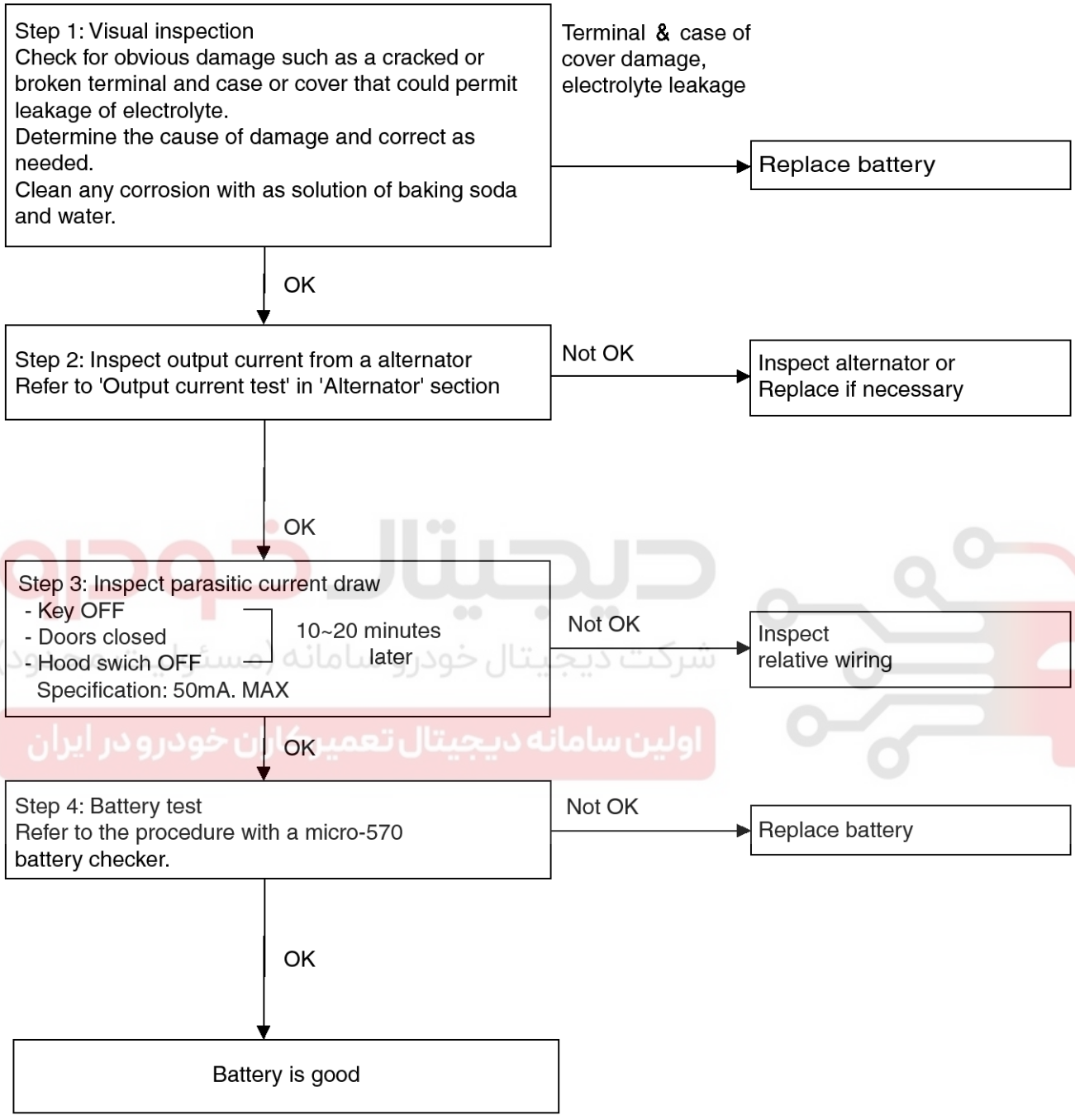
SFDEE8002L

DESCRIPTION

1. A 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 a maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.

Inspection

Battery Diagnostic Flow



SXMEE9150L

Vehicle parasitic current inspection

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

   NOTICE

   For an accurate measurement of a vehicle parasitic current, all electriacl systems should go to sleep mode. (It takes at least one hour or at most one day.) However, an approximate vehicle parasitic current can be measured after 10~20 minutes.
4. Connect an ammeter in series between the battery (-) terminal and the ground cable, and then disconnect the clamp from the battery (-) terminal slowly.

   CAUTION

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

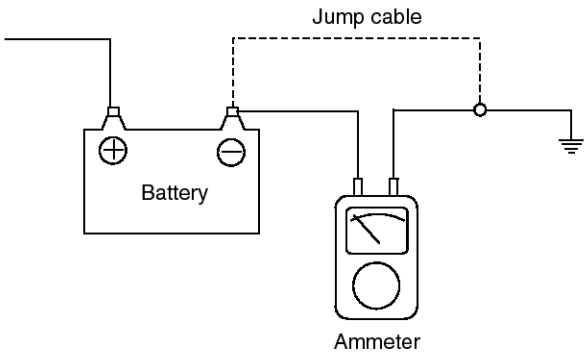
   To prevent the battery from being reset during the inspection,

   a. Connect a jump cable between the battery (-) terminal and the ground cable.

   b. Disconnect the ground cable from the battery (-) terminal.

   c. Connect an ammeter between the battery (-) terminal and the ground cable.

   d. After disconnecting the jump cable, read the current value of the ammeter.



SVQEE0002L

5. Read the current value of the ammeter.
   - If the parasitic current is over the limit value, search for abnormal circuit by removing a fuse one by one and checking the parasitic current.
   - Check the parasitic current again, and search for suspected unit by removing a unit connected with the abnormal circuit one by one.

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

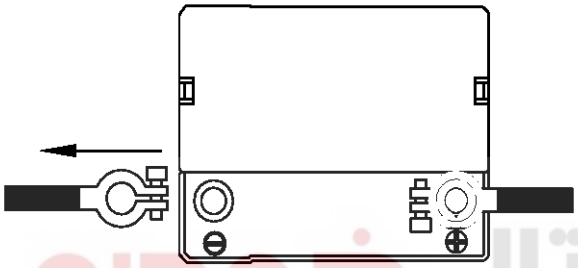
Cleaning

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

⚠CAUTION

Care should be taken in the event the battery case is cracked or leaking, to protect your skin from the electrolyte.

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



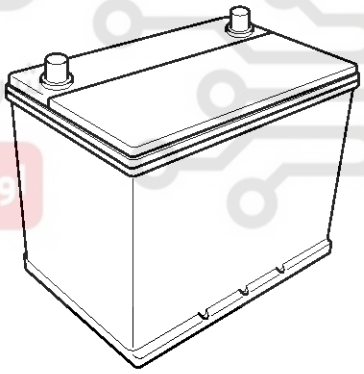
EBJD008B

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.



EBJD008A

Starting System

DESCRIPTION

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

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

The solenoid plunger and clutch shift lever are activated, and the clutch pinion engages the ring gear and the starter motor cranks. In order to prevent damage caused by excessive rotation of the starter armature when the engine starts, the clutch pinion gear overruns.

INSPECTION

START TEST

NOTICE

The air temperature must be between 59 and 100˚F (15 and 38˚C) before testing.

Recommended procedure :

- Use a starter system tester.
- Connect and operate the equipment in accordance with the manufacturer's instructions.
- Test and troubleshoot as described.

Alternate Procedure :

- Use the following equipment :
  - Ammeter, 0~400A
  - Voltmeter, 0~20V (accurate within 0.1 volt)
  - Tachometer, 0~1,200 rpm
- Hook up a voltmeter and ammeter as shown.

NOTICE

After this test, or any subsequent repair, reset the ECM/PCM to clear any codes.

Check the Starter Engagement :

1. Remove the No.8(10A) fuse from the fuse/relay box.
2. Turn the ignition switch to START (III) with the shift lever in or position (A/T) or with the clutch pedal depressed (M/T). The starter should crank the engine.
   - If the starter does not crank the engine, go to step 3.
   - If it cranks the engine erratically or too slowly, go to "Check for Wear and Damage" on the next page.
3. Check the battery, battery positive cable, ground, starter cut relay, and the wire connections for looseness and corrosion. Test again.

   If the starter still does not crank the engine, go to step 4.
4. Unplug the connector from the starter.
5. Connect a jumper wire from the battery positive (+) terminal to the solenoid terminal.

   The starter should crank the engine.
   - If the starter still does not crank the engine, remove it, and diagnose its internal problem.
   - If the starter cranks the engine, go to step 6.
6. Check the ignition switch.
7. Check the starter relay.
8. Check the A/T gear position switch (A/T) or the clutch interlock switch (M/T).
9. Check for an open in the wire between the ignition switch and starter.

Check for wear and Damage

The starter should crank the engine smoothly and steadily. If the starter engages, but cranks the engine erratically, remove it, and inspect he starter drive gear and torque converter ring gear for damage.

Check the drive gear overrunning clutch for binding or slipping when the armature is rotated with the drive gear held. If damaged, replace the gears.

Check Cranking Voltage and Current Draw

Cranking voltage should be no less than 8.7 volts on A/T models, and 8.0 volts on M/T models.

Current draw should be no more than 230 amperes on A/T models, and 200 amperes on M/T models.

If cranking voltage is too low, or current draw too high, check for :

- dead or low battery.
- open circuit in starter armature commutator segments.
- starter armature dragging.
- shorted armature winding.
- excessive drag in engine.

Check Cranking rpm

Engine speed during cranking should be above 100 rpm.

If speed is too low, check for :

- loose battery or starter terminals.
- excessively worn starter brushes.
- open circuit in commutator segments.
- dirty or damaged helical splines or drive gear.
- defective drive gear overrunning clutch.

Check starter disengagement

With the shift lever in N or P position (A/T) or with the clutch pedal depressed (M/T), turn the ignition switch to START(III), and release to ON(II).

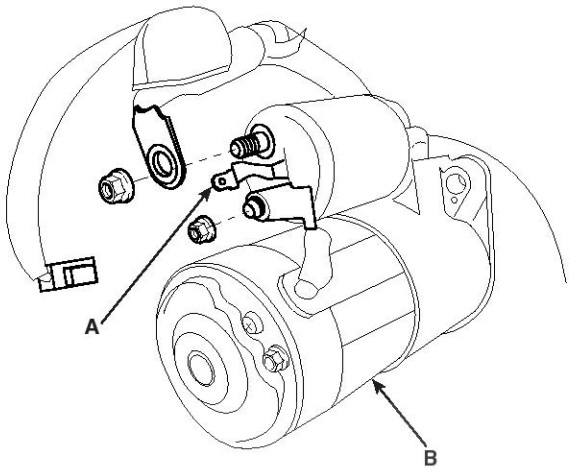
The starter drive gear should disengage from the torque converter ring gear or flywheel ring gear when you release the key.

If the drive gear hangs up on the torque converter ring gear or flywheel ring gear, check for :

- solenoid plunger and switch malfunction.
- dirty drive gear assembly or damaged overrunning clutch.

STARTER SOLENOID TEST

1. Check the hold-in coil for continuity between the S terminal(A) and the armature housing(B) (ground). The coil is OK if there is continuity.



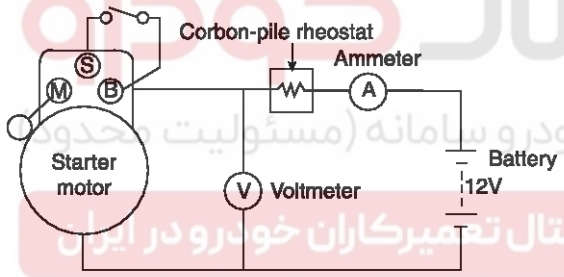
EBKD010C

2. Check the pull-in coil for continuity between the S and M terminals. The coil is OK if there is continuity.

FREE RUNNING TEST

1. Place the starter motor in a vise equipped with soft jaws and connecta fully-charged 12-volt battery to starter motor as follows :
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostatas shown is the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.
4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the startermotor body.
6. Adjust until battery voltage shown on the voltmeter reads 11 volts.
7. Confirm that the maximum amperage is within the specifications andthat the starter motor turns smoothly and freely :

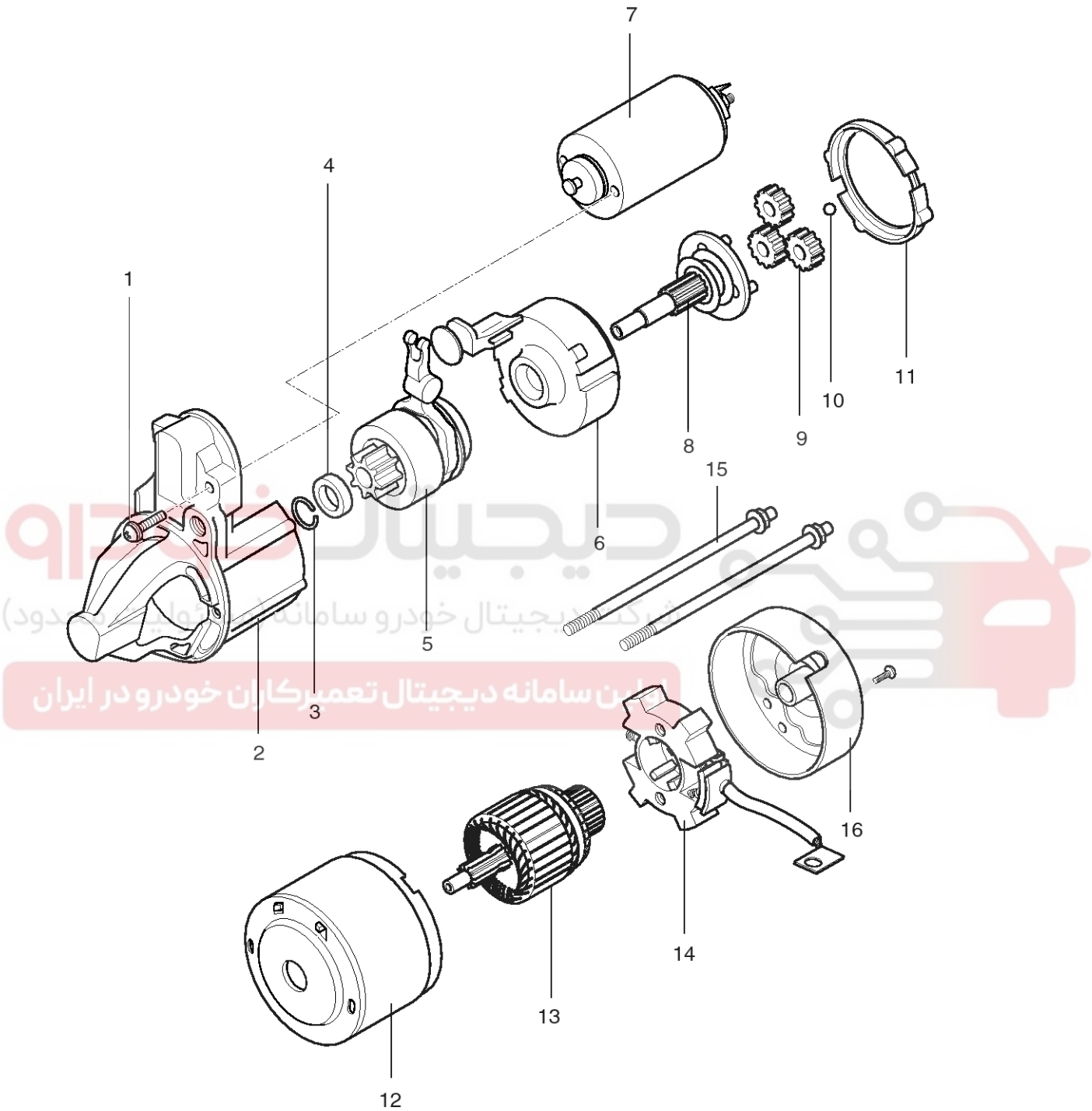
Current : Max. 90 Amps
Speed : Min. 2,800 rpm



BBGE005A

Starter

COMPONENTS



1. Screw
2. Front bracket
3. Stop ring
4. Snap ring
5. Overrun clutch
6. Ring gear
7. Solenoid
8. Sun gear
9. Planetary gear
10. Ball
11. Packing A
12. Yoke assembly
13. Armature
14. Brush holder
15. Planetary gear holder screws
16. Rear bracket

SHDEA6007L

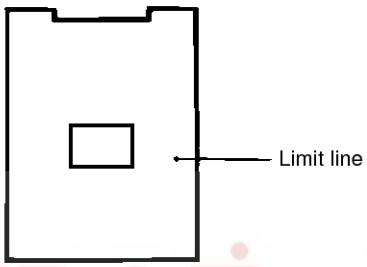
REMOVAL

1. Disconnect the battery ground cable.
2. Remove the speedometer cavble and the shift cable.
3. Disconnect the starter motor connector and terminal.
4. Remove the starter motor assembly.
5. Installation is the reverse order of removal.

INSPECTION

BRUSH

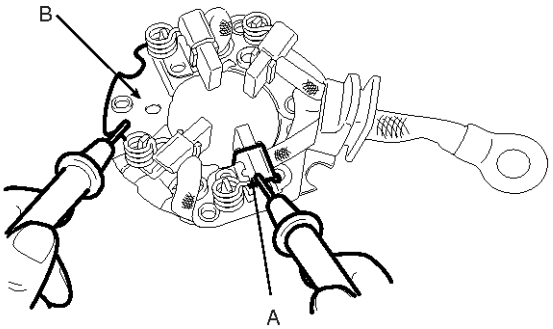
A brush worn down to the wear limit line should be replaced.



EBDA065F

BRUSH HOLDER

Check for continuity between the (+) side brush holder and brush holder base. If there is continuity, replace the holder assembly.

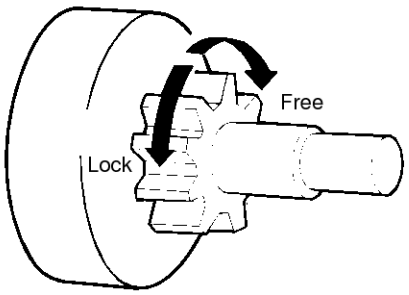


EBBD330A

OVERRUNNING CLUTCH

Inspect the pinion and spline teeth for wear or damage. Replace if damaged. Also inspect the flywheel ring gear for damage.

Rotate the pinion. It should turn freely in a clockwise direction, and lock when turned counterclockwise.



EBDA065H

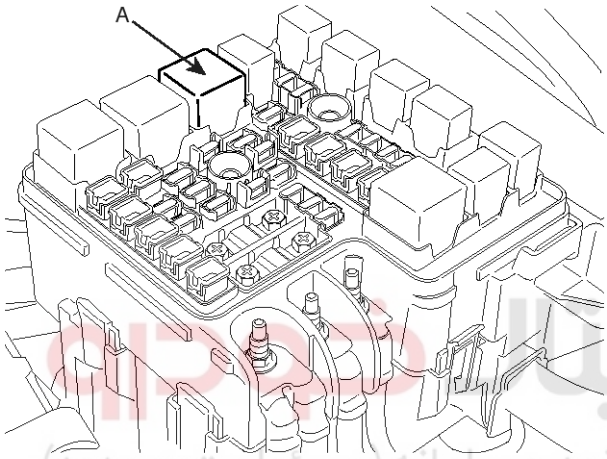
Starter Relay

INSPECTION

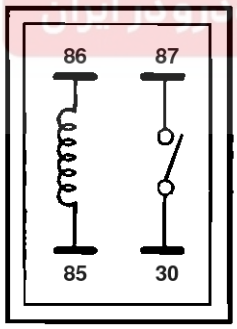
Remove the starter relay(A) and check continuity between the terminals. If the continuity is not as specified, replace the relay.

Terminal / Condition	85	86	87	30
When de-energized	○	○		
When energized	○	○	○	○

SHDEA6008L



SHDE26001D



SHDEA6011L

Cruise Control System

TROUBLESHOOTING

Before starting troubleshooting, inspect each of the following sections, and if there is an abnormality, carry out a repair.

1. Check that the actuator and pulley assembly are all normal.
2. Check if the pulley assembly and the movement of cables are working smoothly.
3. Check if there is no excessive play or tension in each cable.

TROUBLESHOOTING PROCEDURES

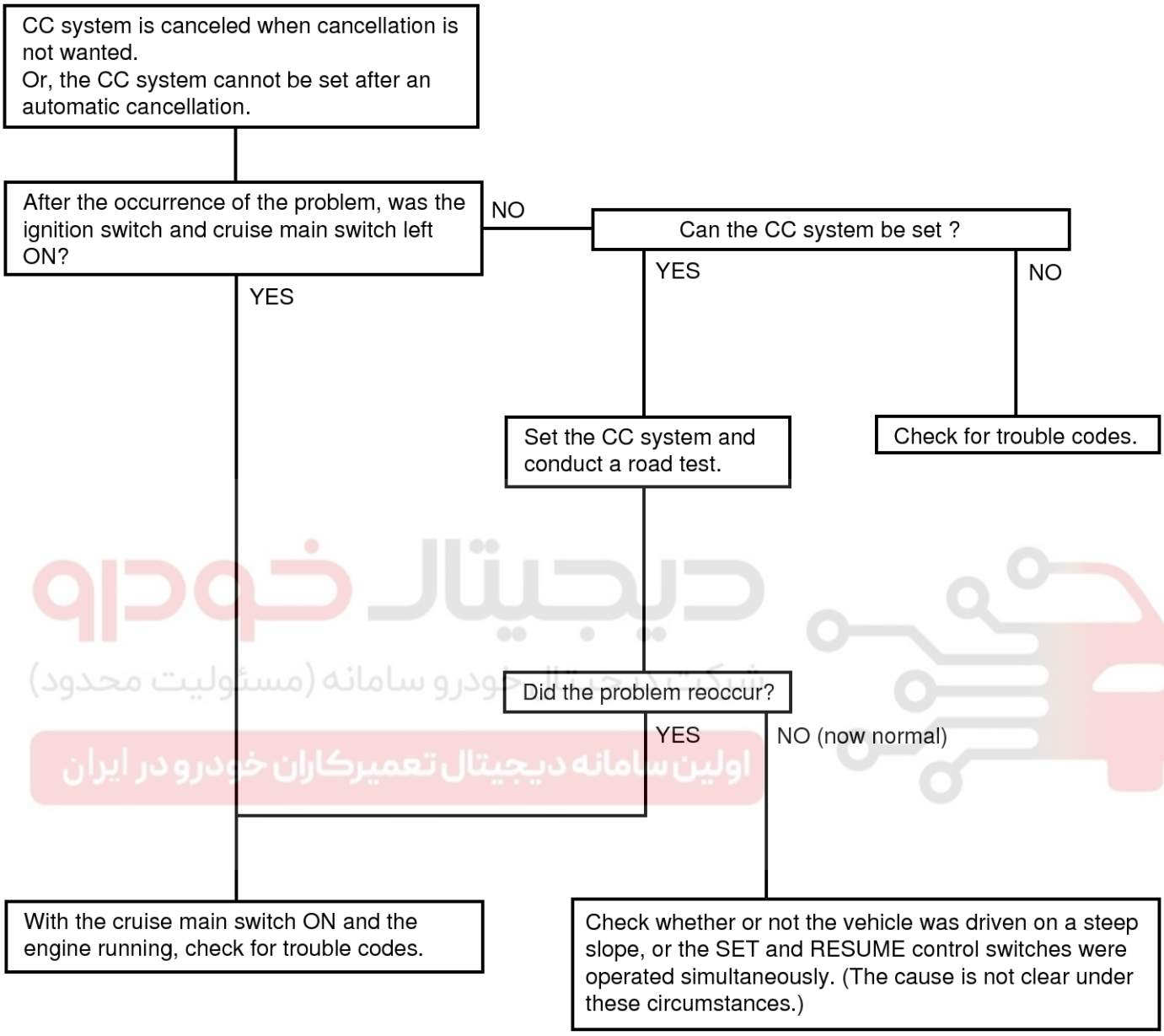
First, select the applicable malfunction symptom from the "TROUBLE SYMPTOM CHARTS" shown on nest pages.

Determine the condition of all function circuits.

1. Make the following preliminary inspections.
   - Check that the installation of the actuator, accelerator cable are correct, and that the cables and links are securely connected.
   - Check that the accelerator pedal moves smootyly.
   - Adjust the cable so there is not excessive tension or excessive play on the accelerator cable.
   - Check that the actuator and unit assembly, cruise main, control switch and the connector of each cancel switch are connected securely.
2. Check in the sequence indicated in the "TROUBLE SYMPTOM CHARTS".
3. If a normal condition is indicated, replace the cruise control module.

TROUBLE SYMPTOM CHARTS

TROUBLE SYMPTOM 1



CC : Cruise Control

EBA9003A

TROUBLE SYMPTOM 2

Trouble symptom	Probable cause	Remedy
The set vehicle speed varies greatly upward or downwqrd "Surging" (repeated alternating acceleration and deceleration) occurs after setting	Malfunction of the vehicle speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the speedometer cable or speedometer drive gear	
	Malfunction of the actuator and unit	Replace the actuator and unit

TROUBLE SYMPTOM 3

Trouble symptom	Probable cause	Remedy
The CC system is not canceled when the brake pedal is deprssed	Damaged or disconnected wiring of the stop lamp switch	Repair the harness or replace the stop lamp switch
	Malfunction of the actuator and unit	Replace the actuator and unit

TROUBLE SYMPTOM 4

Trouble symptom	Probable cause	Remedy
The CC system is not canceled when the shift lever is moved to the "N" position (It is canceled, however, when the brake pedal is depressed	Damaged or disconnected wiring of inhibitor switch input circuit	Repair the harness or repair or replace the ingibitor switch
	Improper adjustment of inhibitor switch	
	Malfunction of the actuator and unit	Replace the actuator and unit

TROUBLE SYMPTOM 5

Trouble symptom	Probable cause	Remedy
Cannot decelerate (coast) by using the SET switch	Temporary damaged or disconnected wiring of SET switch input circuit	Repair the harness or replace the SET switch
	Actuator circuit poor contact	Repair the harness or replace the actuator
	Malfunction of the actuator	
	Malfunction of the actuator and unit	Replace the actuator and unit

TROUBLE SYMPTOM 6

Trouble symptom	Probable cause	Remedy
Cannot accelerate or resume speed by using the RESUME switch	Damaged or disconnected wiring, or short circuit, or RESUME switch input circuit	Repair the harness or RESUME switch
	Actuator circuit poor contact	Repair the harness or replace the actuator
	Malfunction of the actuator	
	Malfunction of the actuator and unit	Replace the actuator and unit

TROUBLE SYMPTOM 7

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

TROUBLE SYMPTOM 8

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

TROUBLE SYMPTOM 9

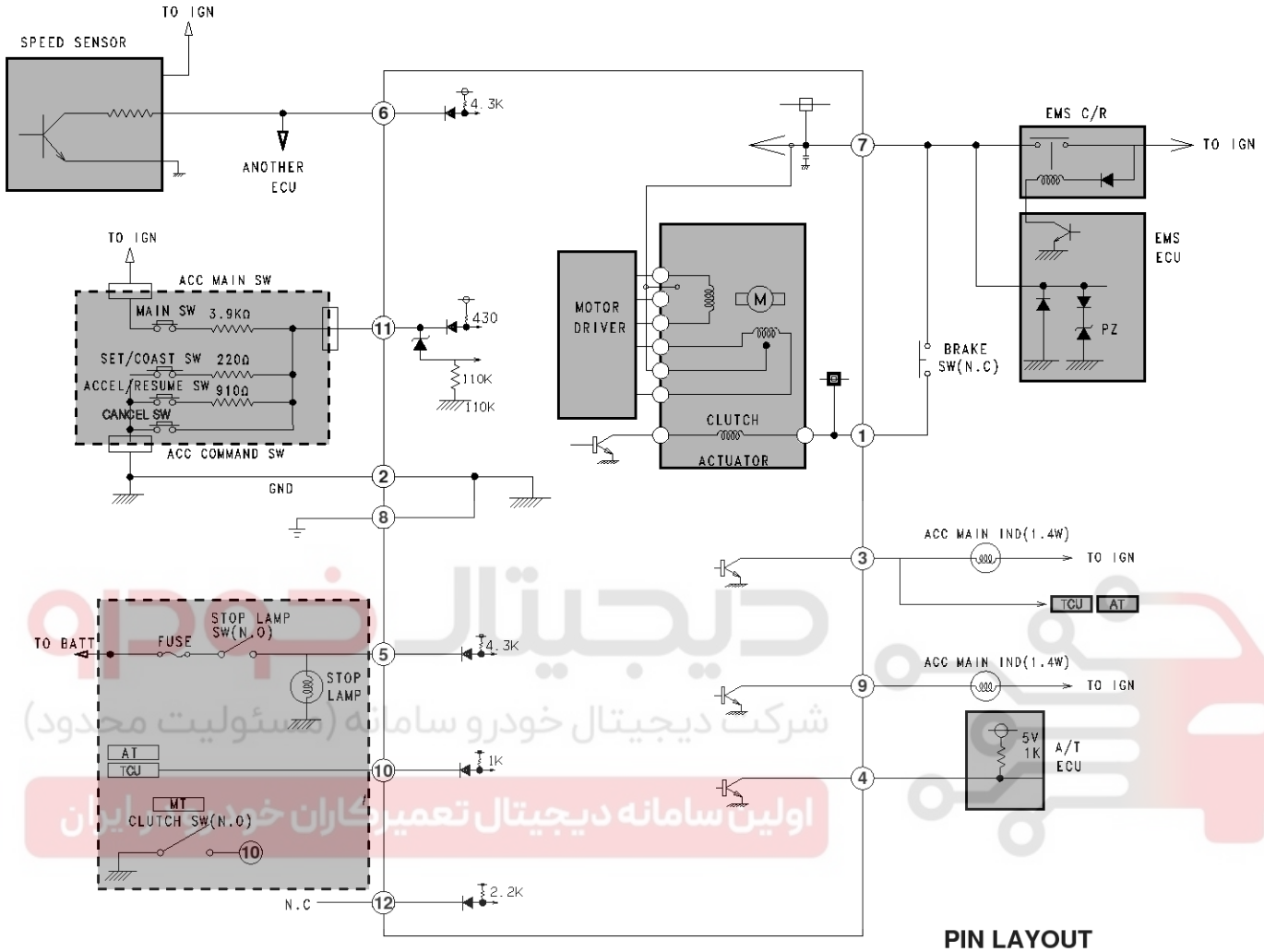
Trouble symptom	Probable cause	Remedy
Malfunction of control function by ON/OFF switching of idle switch	Malfunction of circuit related to idle switch function	Repair the narness or replace the part
	Malfunction of the actuator and unit	

TROUBLE SYMPTOM 10

Trouble symptom	Probable cause	Remedy
Overdrive is not canceled during fixed speed driving	Malfunction of circuit related to overdrive cancellation, or malfunction of actuator and unit	Repair the harness or replace the part
No shift to overdrive during manual driving		

Cruise Control Actuator

CIRCUIT DIAGRAM



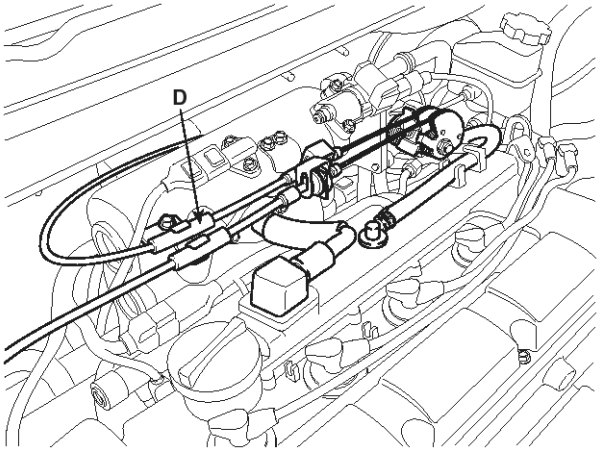
PIN LAYOUT

No	Name	Note
1	BRK	AUTUATOR CLUTCH
2	GND	GND
3	SET	SET INDICATOR
4	AT	OD CONTROL
5	STOP	STOP LAMP SW
6	SPD	SPEED SENSOR
7	IGN1	POWER SOURCE
8	GND	GND
9	MAIN	MAIN INDICATOR
10	CLU	INH./CLUTCH SW
11	COM	MAIN/COMMAND SW
12	NC	NO CONNECTION

SHDEA6001L

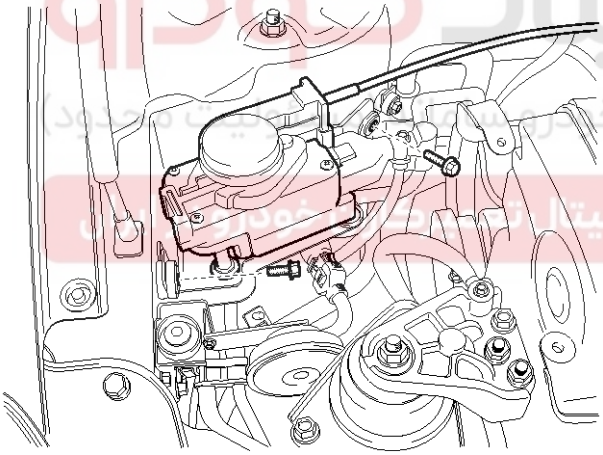
REMOVAL

1. Remove the battery negative and the cruise control cable from the throttle assembly by turning the throttle lever to the full-open position.
2. Remove the auto-cruise control cable(D).



SEDM17001L

3. Remove the actuator and unit assembly(A) mounting bolt.



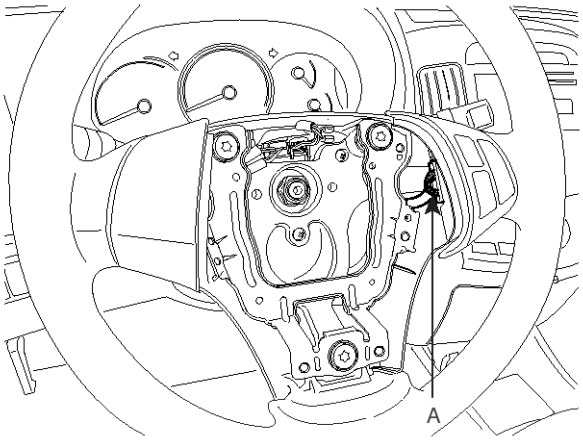
SEDE17001L

4. Installation is the reverse order of removal.

Cruise Control Switch

REMOVAL

1. Remove the air bag module assembly. (Refer to 'RT','ST' group)
2. Disconnect the auto cruise control main switch connector.



SHDE16001D

3. Remove the auto cruise control main switch assembly.
4. To install, reverse the removal procedure.

INSPECTION

1. Operate the switchs and check for continuity between the terminals.
2. If continuity is not as specified, replace the switch.

Switches	State	Terminals							
		1	2	3	4	5	6	7	8
Main	ON							○—○	
Set/ Coast							○—○		
Aocel/ Resume							○—○		
Cancel							○—○		

SHDEA6003L