General Information

SPECIFICATION

STARTING SYSTEM

Item			Specifications
Starter	Type		Reduction drive (with planetary gear)
	Rated voltage		12V, 2.2KW
	No. of pinion teeth		10
	No-load charasteristics	Voltage	11V
		Amperage	130A, MAX
		Speed	4,500rpm, MIN

CHARGING SYSTEM

Item		Specifications
Alternator	Type	Battery voltage sensing
	Rated voltage	13.5V, 110A
	Voltage regulator	I.C regulator built-in type
	Regulator setting voltage	14.4 ± 0.3V
	Temperrature compensation	-10 ± 3mV/°C
Battery	Type	MF 100 AH
	Cold cranking amperage at-18°C (0°F)	850A
	Reserve capacity	182min
	Specific gravity at 20°C (77°F)	1.280 ± 0.01

NOTICE

- *COLD CRANKING AMPERAGE is the amperage a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2V or greater at a specified temperature.*
- *REVERSE CAPACITY RATING is amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5V at 26.7°C(80°F)*

PREHEATING SYSTEM

Item		Specifications
Glow plug	Rated voltage	DC 12V
	Current	250MΩ
Glow plug relay	Rated voltage	DC 12V
	Operating voltage range	DC 9V ~ DC 16V
	Operating temperature range	-40°C ~ 120°C
	Rated load current	DC 12V, 70A

TROUBLESHOOTING

CHARGING SYSTEM

Symptom	Suspect Area	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off	Fuse blown Light burned out Wiring connection loose Electronic voltage regulator	Check fuses Replace light Tighten loose connections Replace voltage regulator
Charging warning indicator does not go out with engine running (Battery requires frequent recharging)	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown Electronic voltage regulator or generator Wiring	Adjust tension or replace drive belt Repair or replace cavles Check fuses Replace fusible link Test generator Repair wiring
Engine hesitates/poor acceleration Overcharge	Drive belt loose or worn Wiring connection loose or open circuit Fusible link blown Poor grounding Electronic voltage regulator or generator Worn battery Electronic voltage regulator Voltage sensing wire	Adjust tension or replace drive belt Tighten loose connection or repair wiring Replace fusible link Repair Test generator, if faulty, repair or replace Replace battery Replace voltage regulator Repair wire

STARTING SYSTEM

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

CRUISE CONTROL SYSTEM

NOTICE

Before troubleshooting :

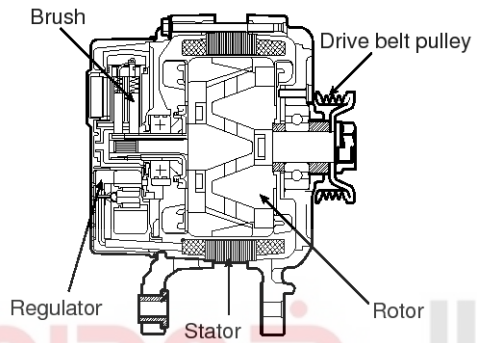
- *Check the ECM(10A), Horn(10A), ECU #3(10A) and ECU B+(15A) fuse in the under - hood fuse/relay box.*
- *Check that the horn sounds.*
- *Check the tachometer to see if it works properly.*

Symptom	Suspect Area	See Page
Cruise control cannot be set	Remocon switch Brake switch A/T gear position switch Cruise control unit	See page EE-34 See page EE-35 See page TR group-automatic transaxle See page EE-6
Cruise control cannot be set but indicator light does not go on	Dimming circuit in gauge Cruise control unit	See page EE-6 See page EE-6
Cruise speed is noticeably higher or lower than what was set	Vehicle speed sensor Cruise control unit and actuator cable deflection Cruise control unit	See page TR group-automatic transaxle See page EE-35 See page EE-6
Excessive overshooting or undershooting when trying to set speed	Cruise control unit and actuator cable deflection Vehicle speed sensor Cruise control unit	See page EE-35 See page TR group-automatic transaxle See page EE-6
Speed fluctuation on a flat road with cruise control set	Vehicle speed sensor Cruise control unit and actuator cable deflection Cruise control unit	See page TR group-automatic tranxaxle See page EE-35 See page EE-8
Vehicle does not decelerate or accelerate accordingly when SET/RESUME/CANCEL button is pushed	Remocon switch Cruise control unit	See page EE-57 See page EE-6
Cruise control does not cancel when shift lever is moved to N position (A/T)	A/T gear position switch Cruise control unit	See page TR group-automatic tranxaxle See page EE-6
Set speed is not cancelled when brake pedal is pushed	Brake switch Cruise control unit	See page EE-35 See page EE-6
Cruise control will not cancel when main switch is pushed OFF	Remocon switch Cruise control unit	See page EE-34 See page EE-6
Cruise control will not cancel when CANCEL button is pushed	Remocon switch Cruise control unit	See page EE-34 See page EE-6
Set speed will not resume when RESUME button (with main switch on, when set speed is temporarily cancelled)	Remocon switch Cruise control unit	See page EE-34 See page EE-6
The transmission shifts down slower than normal when going up a hill with the cruise control on (A/T)	Troubleshooting the cruise control communication circuit	See page EE-6

Charging System

DESCRIPTION

The conventional internal voltage detection type alternator controls the charging voltage regardless of the battery condition and according to the external load change so that it sometimes causes battery under or over charging or causes flickering of meters and lamps due to ripples of generated voltage resulting from load fluctuation. The figure below show the internal circuits of the alternator and voltage regulator.



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ON-VEHICLE INSPECTION

⚠CAUTION

- **Check that the battery cables are connected to the correct terminals.**
- **Disconnect the battery cables when the battery is given a quick charge.**
- **Do not perform tests with a high voltage insulation resistance tester.**
- **Never disconnect the battery while the engine is running.**

CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

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

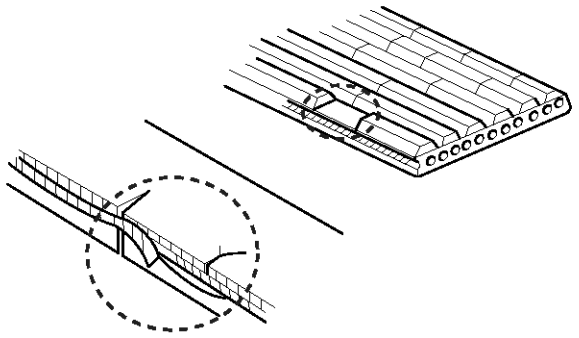
INSPECT DRIVE BELT

1. Visually check the belt for excessive wear, frayed cords etc.

   If any defect has been found, replace the drive belt.

   NOTICE

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



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2. Using a belt tension gauge, measure the drive belt tension.

VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

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

CHECK DISCHARGE WARNING LIGHT CIRCUIT

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

INSPECT CHARGING SYSTEM

VOLTAGE DROP TEST OF ALTERNATOR OUTPUT WIRE

This test determines whether or not the wiring between the alternator "B" terminal and the battery (+) terminal is good by the voltage drop method.

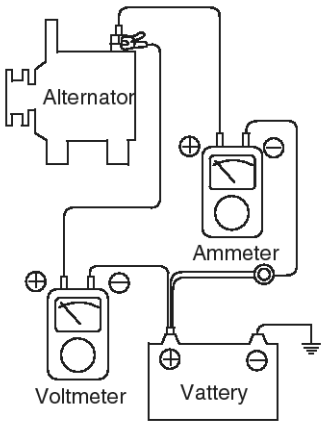
PREPARATION

1. Turn the ignition switch to "OFF".

   NOTICE

   To find abnormal conditions of the connection, actions should not be taken on the two terminals and each connection during the test.

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



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CONDITIONS FOR THE TEST

1. Start the engine.
2. Switch on the headlamps, blower motor and so on. And then, read the voltmeter under this condition.

RESULT

1. The voltmeter may indicate the standard value.

0.2V max.

2. If the value of the voltmeter is higher than expected (above 0.2V max.), poor wiring is suspected. In this case check the wiring from the alternator "B" terminal to the fusible link to the battery (+) terminal. Check for loose connections, color change due to an overheated harness, etc. Correct them before testing again.
3. Upon completion of the test, set the engine speed at idle. Turn off the head lamps, blower motor and the ignition switch.

OUTPUT CURRENT TEST

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

PREPARATION

1. Prior to the test, check the following items and correct as necessary.

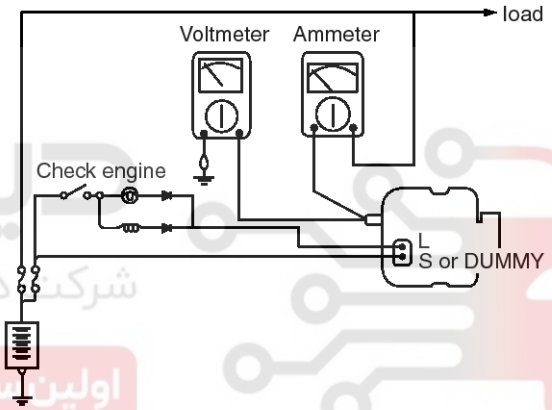
   Check the battery installed in the vehicle to ensure that it is in good condition. The battery checking method is described in "BATTERY".

   The battery that is used to test the output current should be one that has been partially discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.

   Check the tension of the alternator drive belt.
2. Turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Disconnect the alternator output wire from the alternator "B" terminal.
5. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the ammeter to the disconnected output wire.

   NOTICE

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



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TEST

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

   NOTICE

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

RESULT

1. The ammeter reading must be higher than the limit

value. If it is lower but the alternator output wire is in good condition, remove the alternator from the vehicle and test it.

Limit value : 50% of the reated currend.

NOTICE

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

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

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

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

REGULATED VOLTAGE TEST

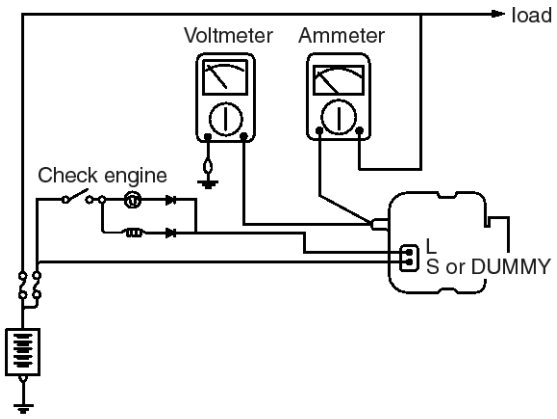
The purpose of this test is to check that the electronic voltage regulator controls voltage correctly.

PREPARATION

1. Prior to the test, check the following items and correct if necessary.

   Check that the battery installed on the vehicle is fully charged. For battery checking method, see "BATTERY".

   Check the alternator drive belt tension.
2. Turn ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the "B" terminal of the alternator and ground. Connect the (+) lead of the voltmeter to the "B" terminal of the alternator. Connect the (-) lead to good ground or the battery (-) terminal.
5. Disconnect the alternator output wire from the alternator "B" terminal.
6. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Connect the (-) lead wire of the ammeter to the disconnected output wire.
7. Attach the engine tachometer and connect the battery ground cable.



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TEST

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

Battery voltage

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

RESULT

1. If the voltmeter reading agrees with the value listed in the Regulating Voltage Table below, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the alternator is faulty.

REGULATING VOLTAGE TABLE

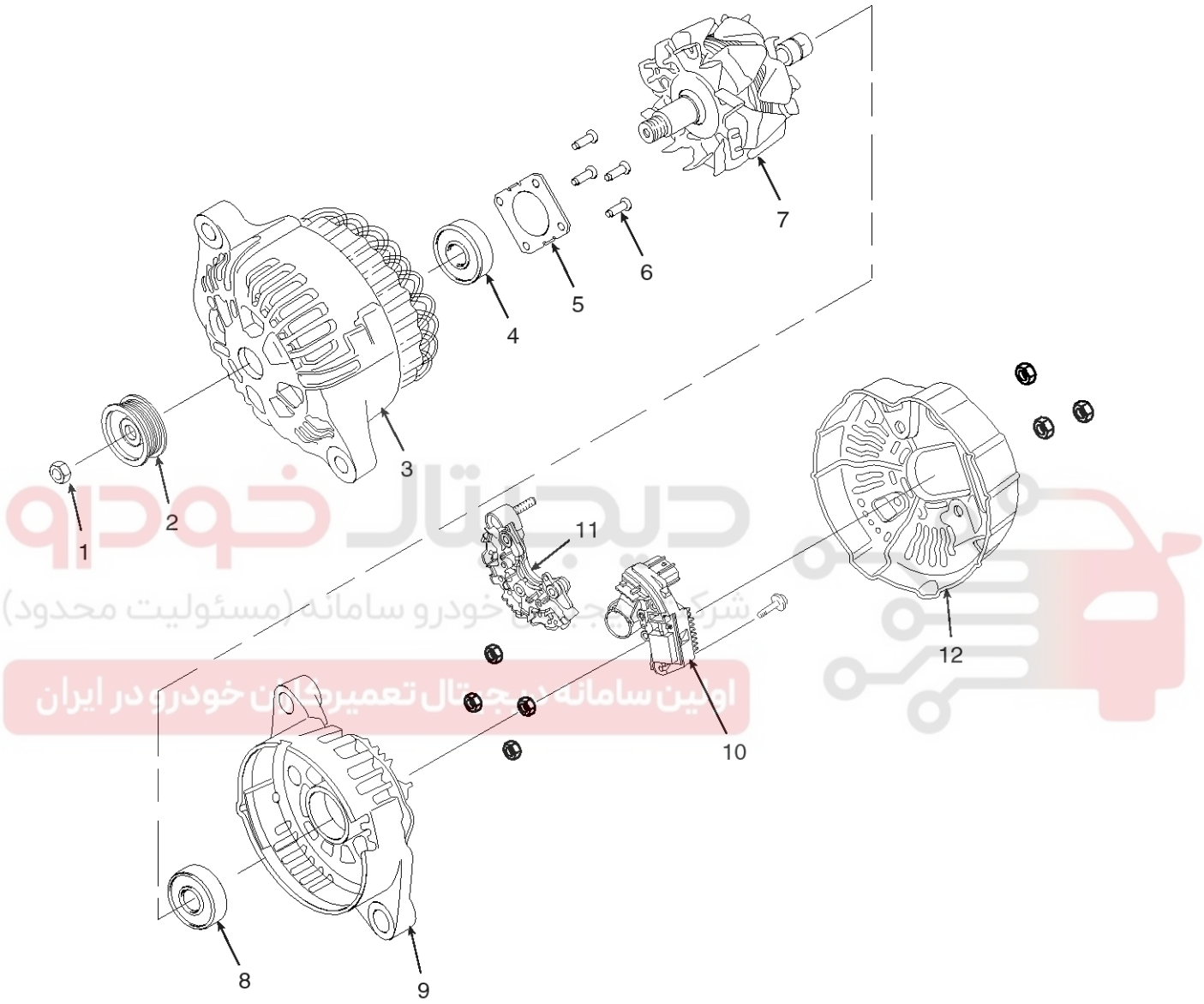
Voltage regulator ambie-nt temperature °C (°F)	Regulating voltage (V)
-30 (-22)	14.2 ~ 15.3
25 (77)	14.2 ~ 14.8
135 (275)	13.3 ~ 14.8

2. Upon completion of the test, reduce the engine speed to idle, and turn off the ignition switch.
3. Disconnect the battery ground cable.

4. Remove the voltmeter and ammeter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

Alternator

COMPONENTS



1. Nut
2. Pulley
3. Pront bracket
4. Pront bearing
5. Bearing cover
6. Bearing cover bolts
7. Rotor
8. Rear bearing
9. Rear bracket
10. Brush holder assembly
11. Regulator
12. Rear cover

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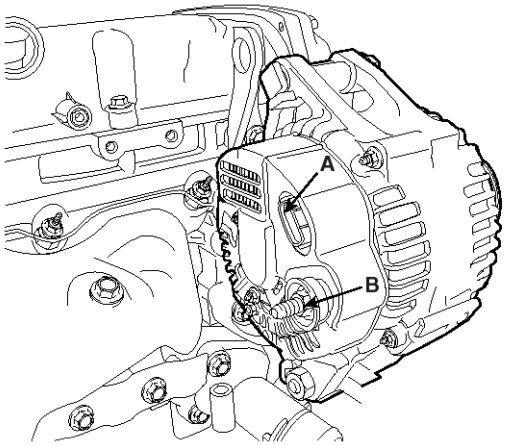
REPLACEMENT

1. Disconnect the battery negative terminal frist, then the positive terminal.
2. Disconnect the alternator connector(A) and "B" terminal cable(B) from the alternator.
3. Remove the drive belt.



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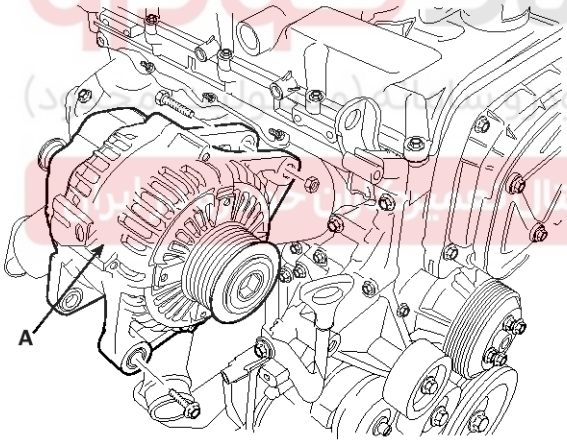
4. Remove the through bolt and the alternator(A).

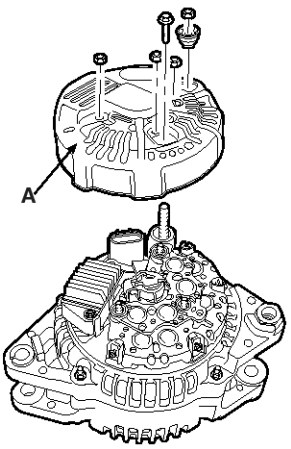


ACAF018A

5. Installation is the reverse of removal.

DISASSEMBLY

1. Remove the nuts and bolts frist, and cover(A).



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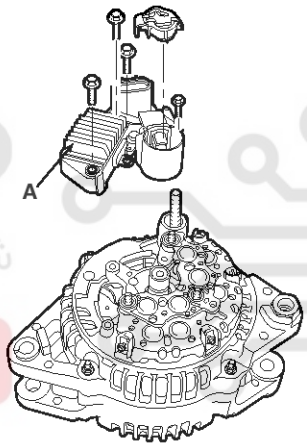
2. Remve the brush holder assembly(A).



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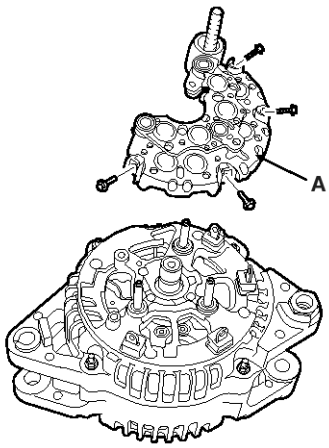
3. Remove the regulator(A).



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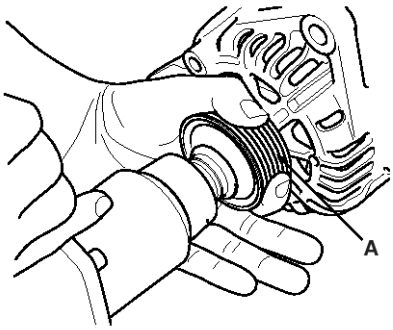
4. Remove the alternator pulley(A).



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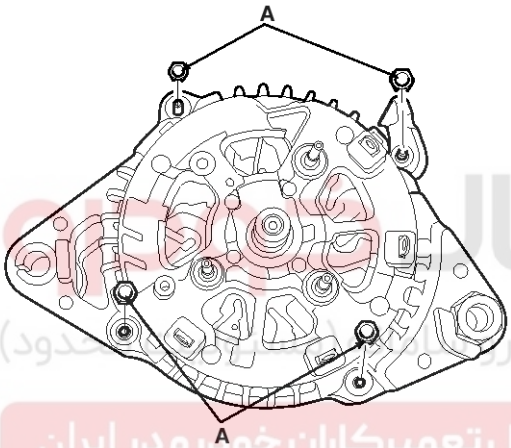
5. Remove the rear bracket nuts(A).



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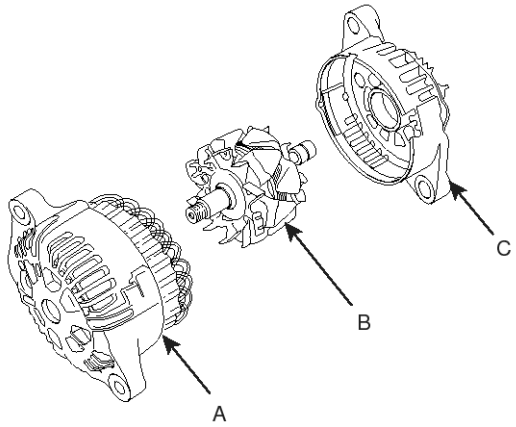
6. Separate the front bracket(A), rotor(B) rear bracket(C).



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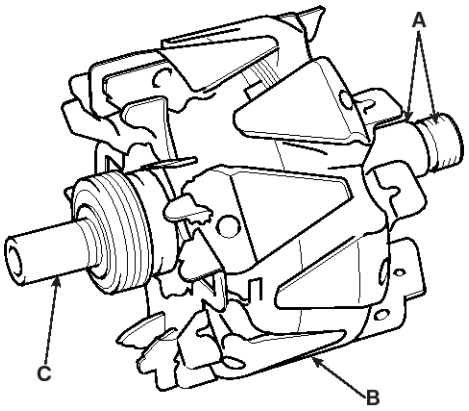
7. Installation is the reverse of removal.

INSPECTION

INSPECT ROTOR

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



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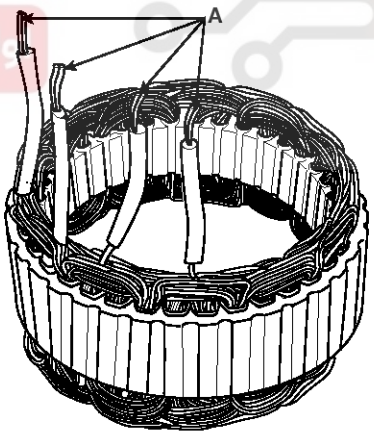
2. Check that there is no continuity between the slip rings and the rotor(B) or rotor shaft(C).
3. If the rotor fails either continuity check, replace the alternator.

INSPECT STATOR

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



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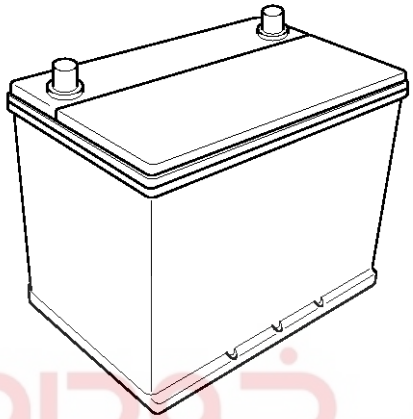
2. Check that there is no continuity between each lead and the coil core.
3. If the coil fails either continuity check, replace the generator.

Battery

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.



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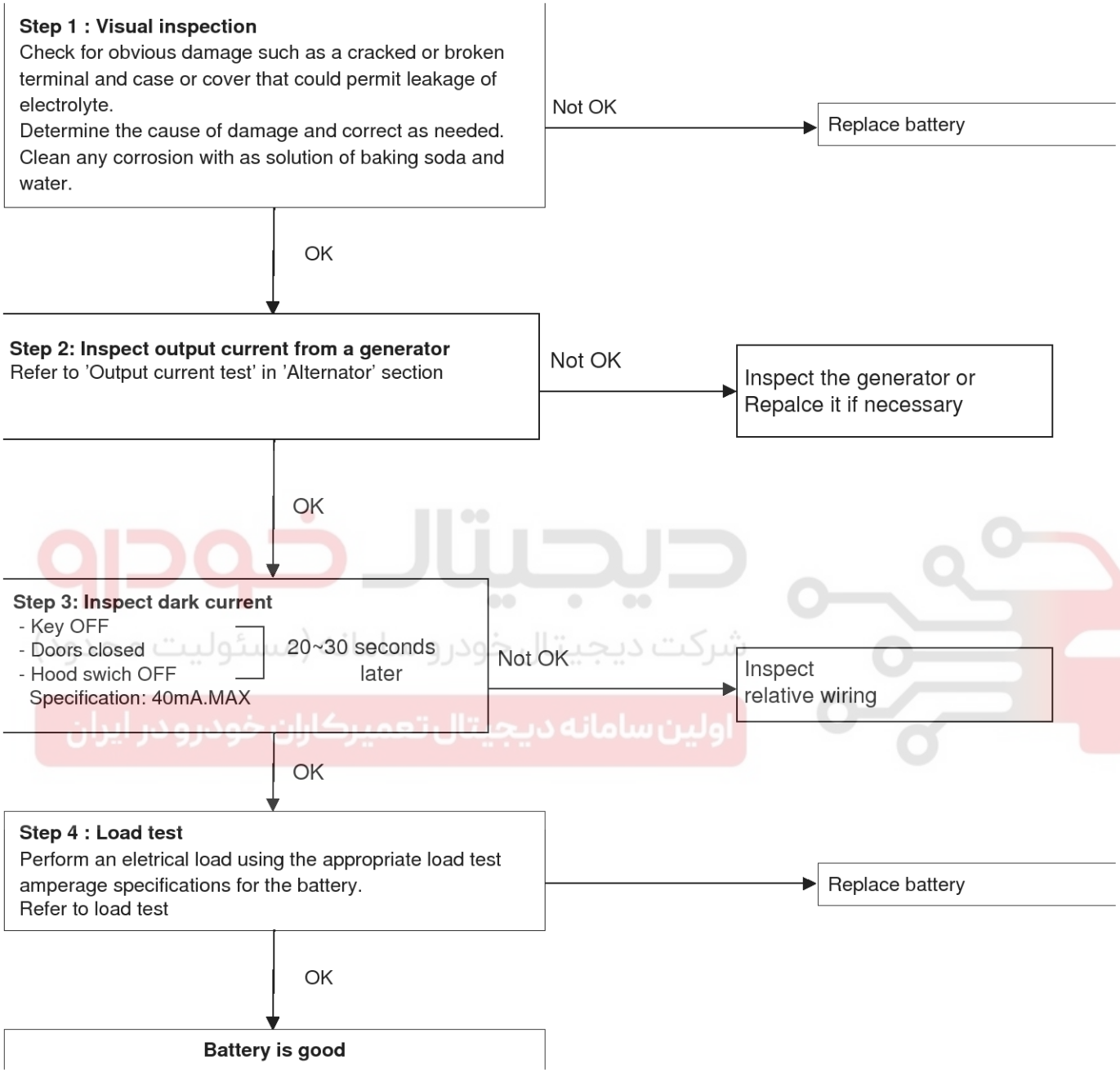
INSPECTION

BATTERY DIAGNOSTIC TEST(1)

CHECKING FLOW



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LOAD TEST

1. Perform the following steps to complete the load test procedure for maintenance free batteries.
2. Connect the load tester clamps to the terminals and proceed with the test as follow :
   a. If the battery has been on charge, remove the surface charge by connect a 300 ampere load for 15 seconds.
   b. Connect the voltmeter and apply the specified load.
   c. Read the voltage after the load has been applied for 15 seconds.
   d. Disconnect the load.
   e. Compare the voltage reading with the minimum and replace the battery if battery test voltage is below that shown in the voltage table.

Voltage	Temperature
9.6	20˚C (70˚F) and above
9.5	16 ˚C (60 ˚F)
9.4	10 ˚C (50 ˚F)
9.3	4 ˚C (40 ˚F)
9.1	-1 ˚C (30 ˚F)
8.9	-7 ˚C (20 ˚F)
8.7	-12 ˚C (10 ˚F)
8.5	-18 ˚C (0 ˚F)

NOTICE

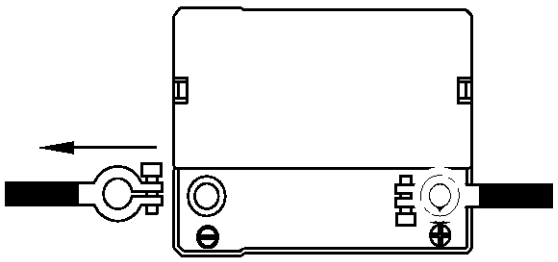
- *If the voltage is less than shown in the table, the battery is good.*
- *If the voltage is greater than shown in the table, replace the battery.*

BATTERY DIAGNOSTIC TEST

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.



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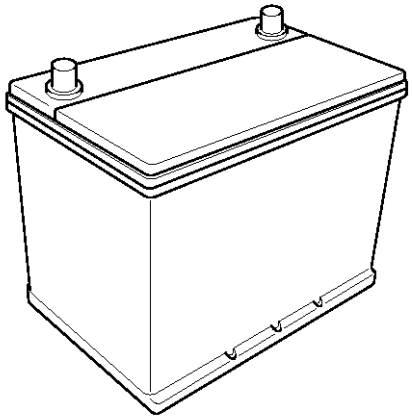
4. Inspect the battery carrier for damage caused by the loss of electrolyte. If acid damage is present, it will be necessary to clean the area with a solution of clean warm water and baking soda. Scrub the area with a stiff brush and wipe off with a cloth moistened with baking soda and water.
5. Clean the top of the battery with the same solution as described in Step(3).
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 the 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 circuits at the terminals of batteries being charged. A spark will occur when the circuit is broken. Keep open flames away from the battery.



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Starting System

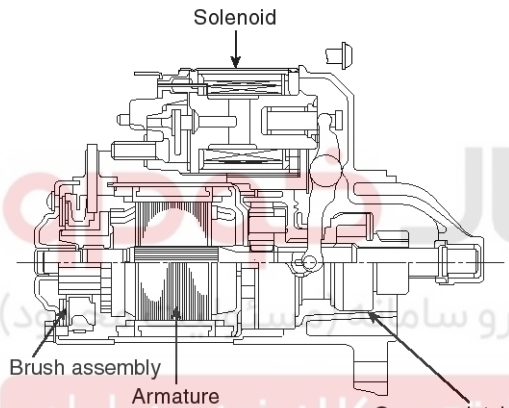
DESCRIPTION

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.

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.



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INSPECTION

STARTER 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 :

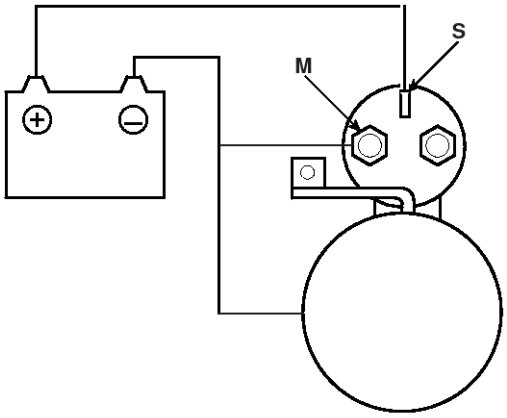
1. Remove the ECM(B+) fuse from the fuse/relay box.
2. Turn the ignition switch to START (III) with the shift lever in N or P position (A/T) or with the clutch pedal depressed (M/T). The starter should crank the engine.
   - If the starter does not crank the engine, go to step 3.
   - If it cranks the 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.

STARTER SOLENOID TEST

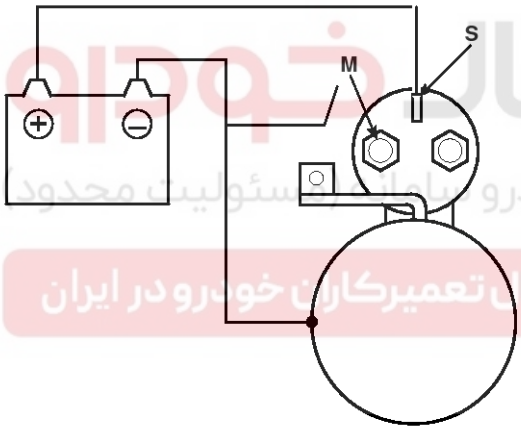
1. Disconnect the wires from the Sterminal and the M terminal.
2. Connect the battery as shown. If the starter pinion pops out, it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



LBIF065A

3. Disconnect the battery from the M terminal.

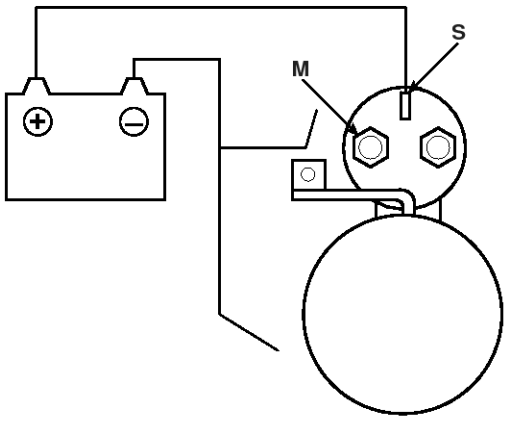
   If the pinion does not retract, the hold-in coil is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



LBIF066A

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.

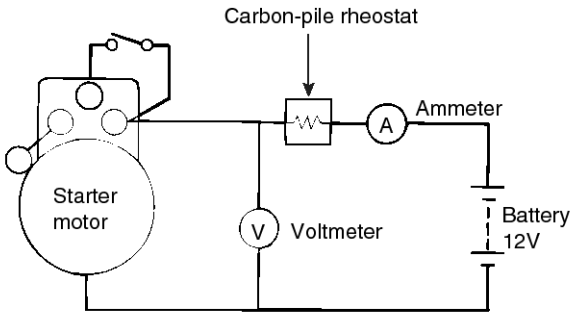


LBIF067A

FREE RUNNING TEST

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

: Max. 120 Amps	
: Min. 4,000 rpm	



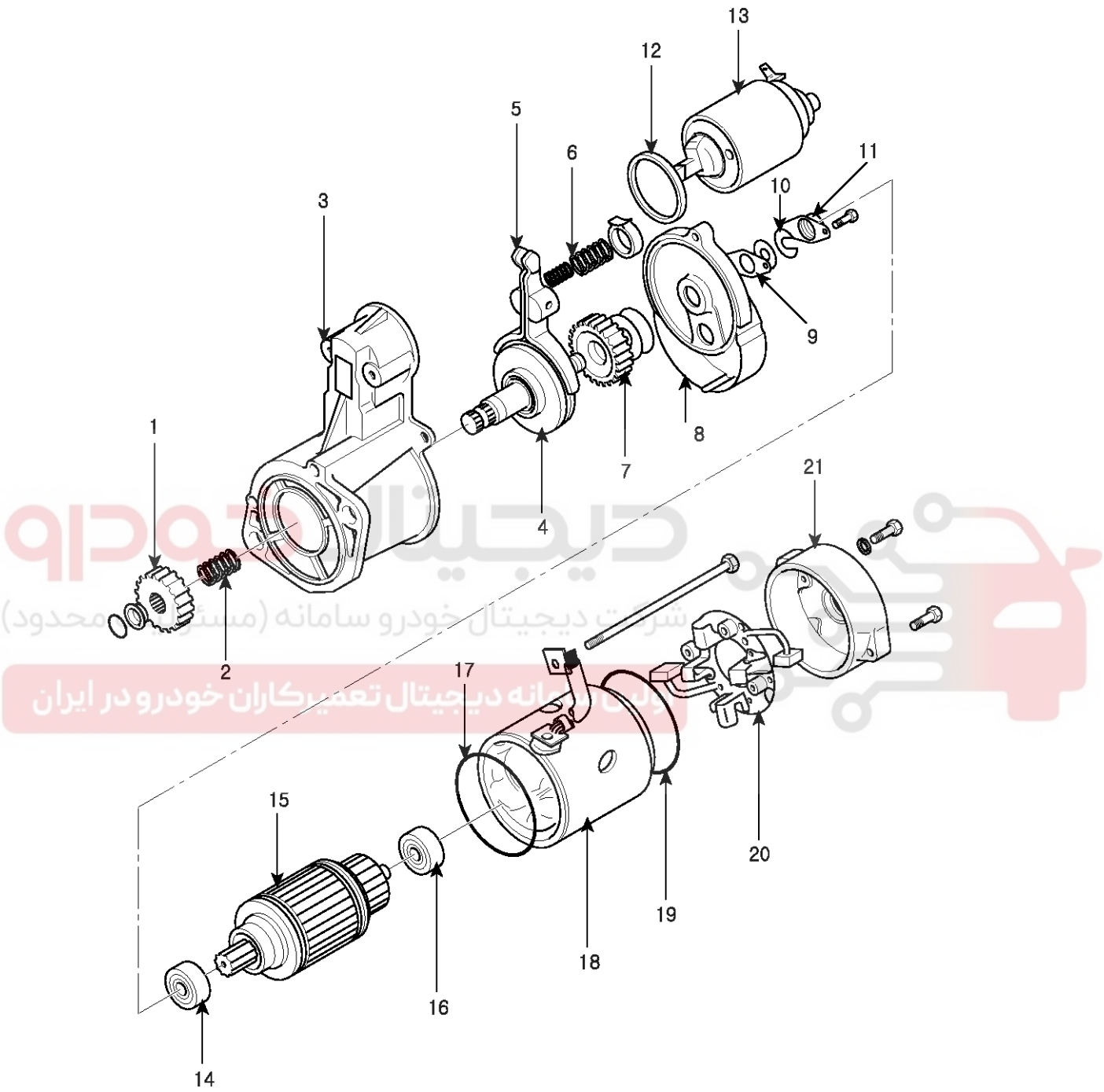
LBIF068A

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.

Starter

COMPONENTS



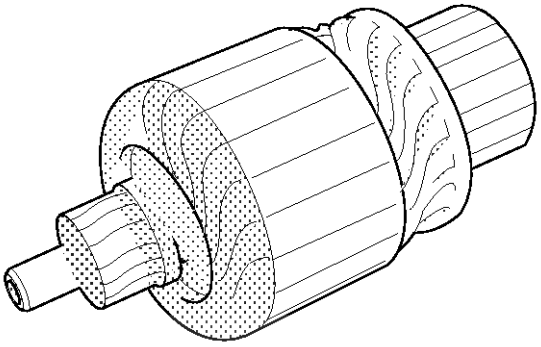
1. Pinion gear
2. Spring
3. Front bracket
4. Pinion shaft
5. Lever
6. Spring
7. Gear
8. Center bracket
9. Plate
10. Stopring
11. Cover
12. Washer
13. Magnetic swich
14. Bearing
15. Armature
16. Bearing
17. O-ring
18. Yoke assembly
19. O-ring
20. Brush holder
21. Rear bracket

SBLEE6004L

INSPECTION

ARMATURE INSPECTION AND TEST

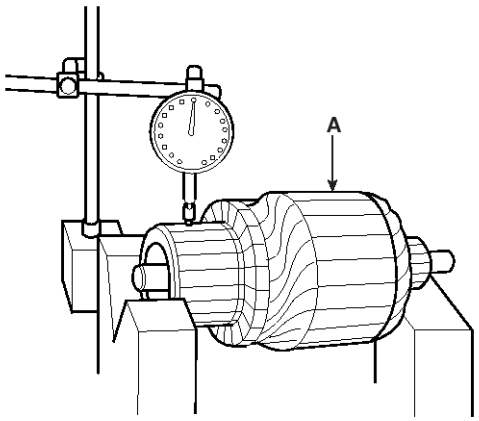
1. Remove the starter.
2. Disassemble the starter as shown at the beginning of this procedure.
3. Inspect the armature for wear or damage from contact with the permanent magnet. If there is wear or damage, replace the armature.



LBIF093A

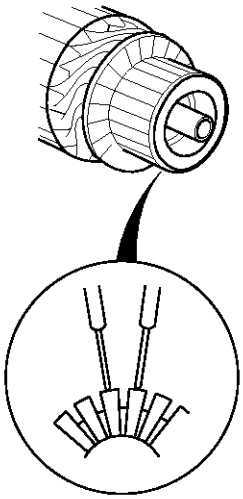
4. Measure the commutator (A) runout.
   - If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   - If the commutator runout is not within the service limit, replace the armature.

Commutator Runout
Standard (New) : 0.02mm (0.001 in.) max.
Service limit : 0.05mm (0.002 in.)



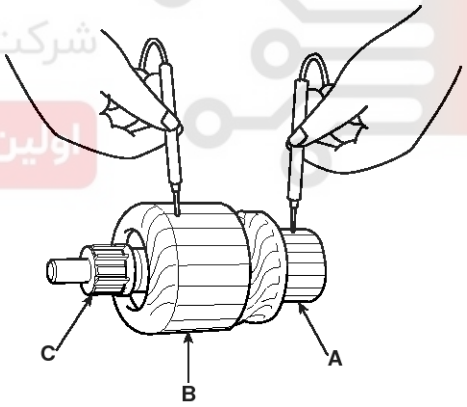
LBIF094A

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



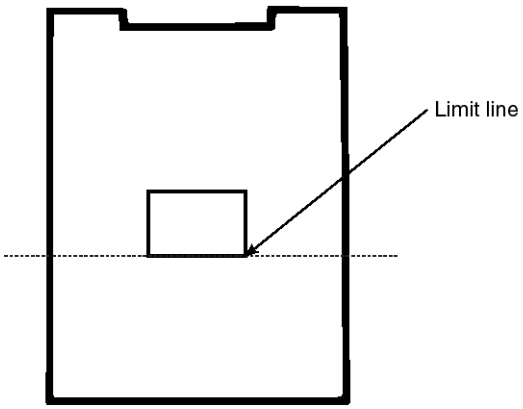
LBIF095A

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



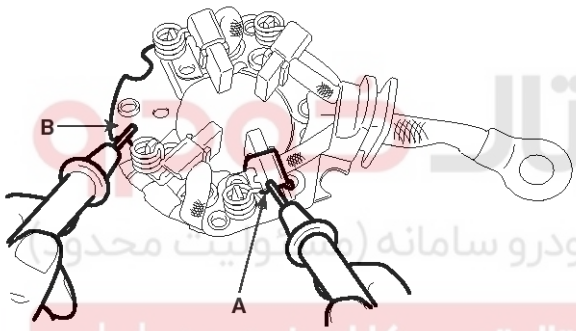
LBIF096A

INSPECT STARTER BRUSH



LBIF097A

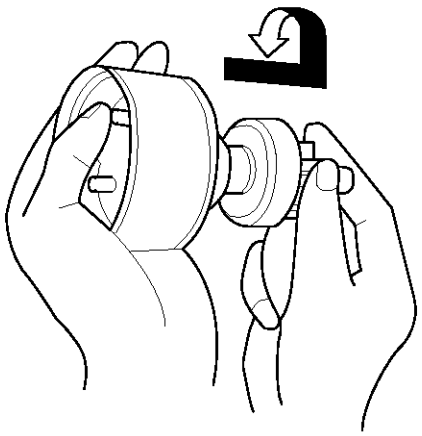
STARTER BRUSH HOLDER TEST



LBIF098A

INSPECT OVERRUNNING CLUTCH

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

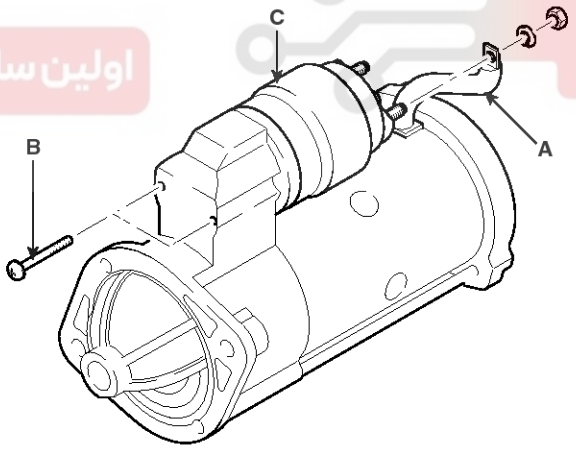


LBIF099A

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

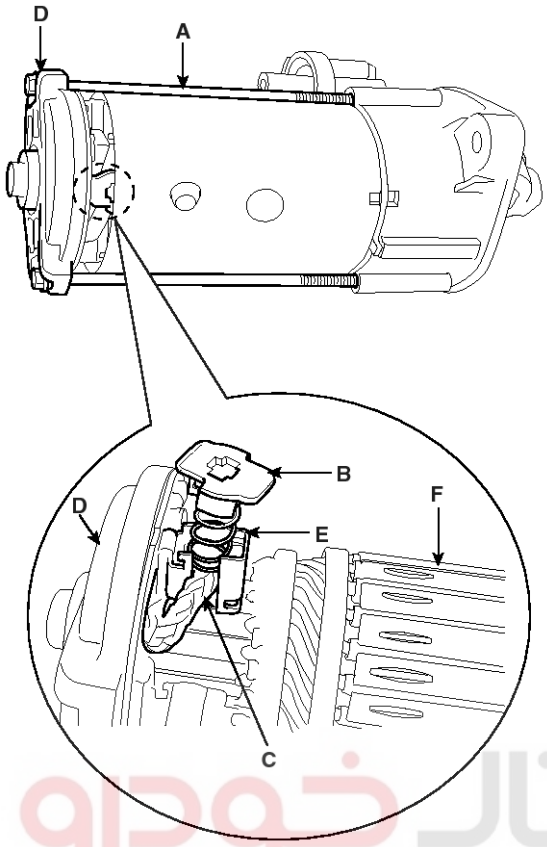
DISASSEMBLY

1. Remove the magnetic swich "M" terminal(A) and magnetic swich(C).



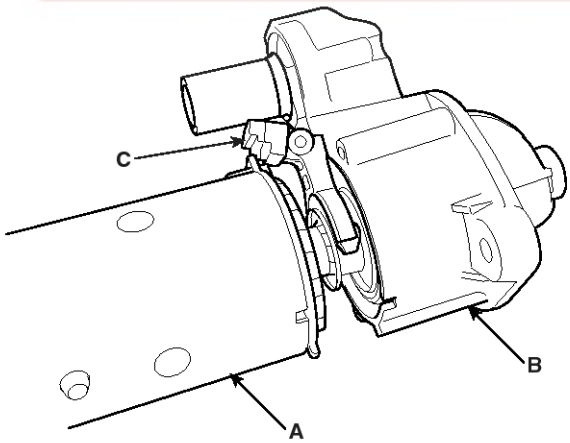
KBSD201A

2. Remove the brusth spring by(B) using screw driver, the disconnect the brush(C) from the brush holder.
   Disconnect the rear bracket(D), brush holder(E) and armature(F).



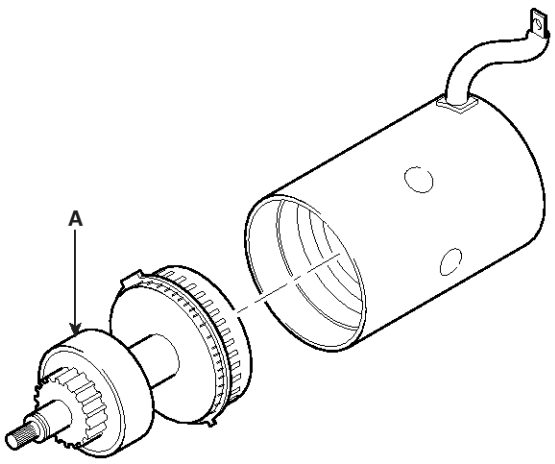
KBSD201D

3. Remove the yoke assembly with the front bracket(B) and pinion shift lever assembly(C).



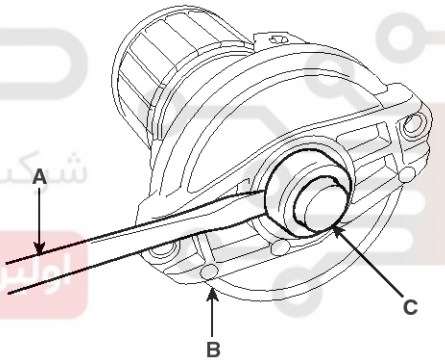
KBSD201E

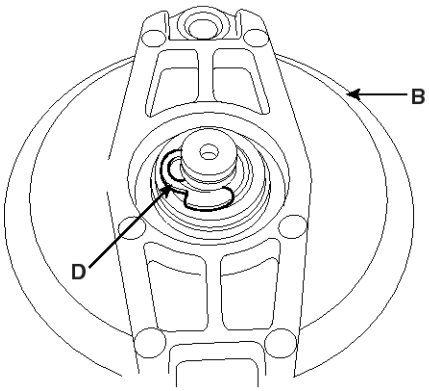
4. Remove the over running clutch assembly(A).



KBSD201F

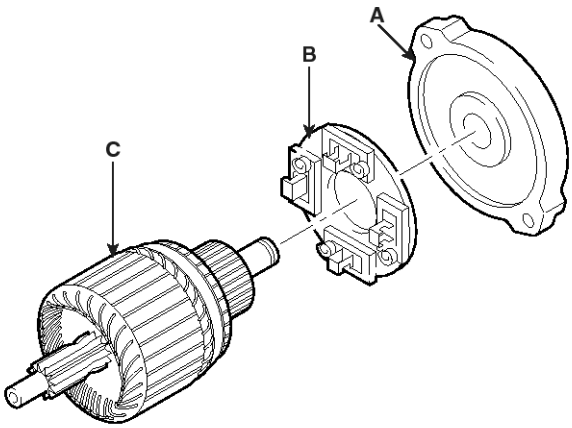
5. Using a screw driver(A), remove the rear bracket packing(C) and key(D).





KBSD201I

6. Separat the rear bracket(A), brush holder(B), armature(C).

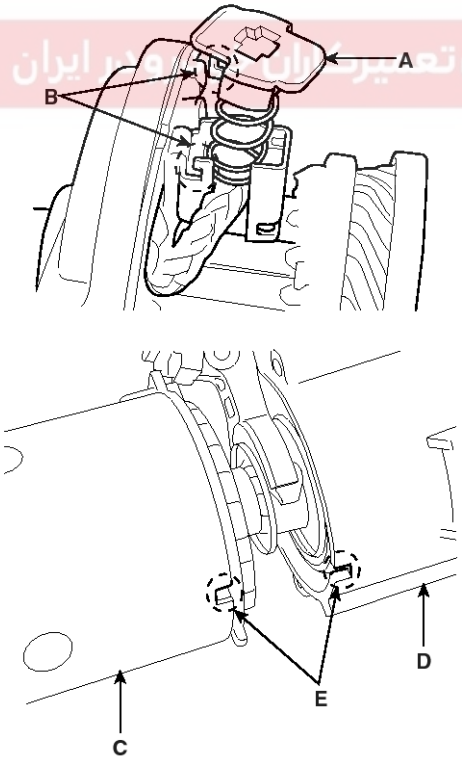


KBSD201J

7. Reassembly is the reverse of disassembly

NOTICE

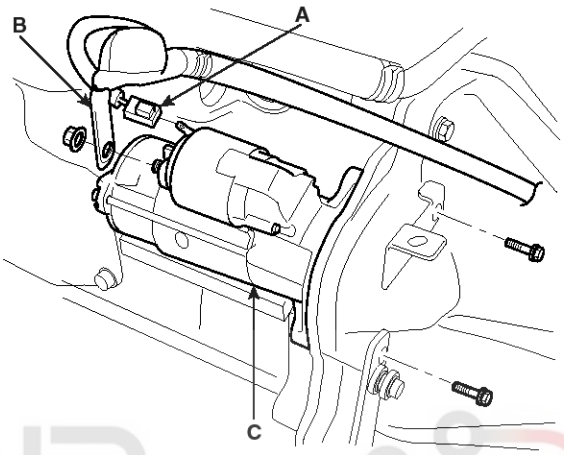
- *When installing the brush spring(A), take care not to break the brush edge part(B).*
- *When installing the yoke(C) and front bracket(D), align the mark(E) on the yoke to mark the range of the front bracket.*



KBSD201M

REPLACMENT

1. Disconnect the negative cable.
2. Disconnect the stater cable from the "B" teminal(B) on the solenoid then disconnect the "S" teminal connector(A).
3. Remove the 2bolts holding the stater, then remove the stater(C).

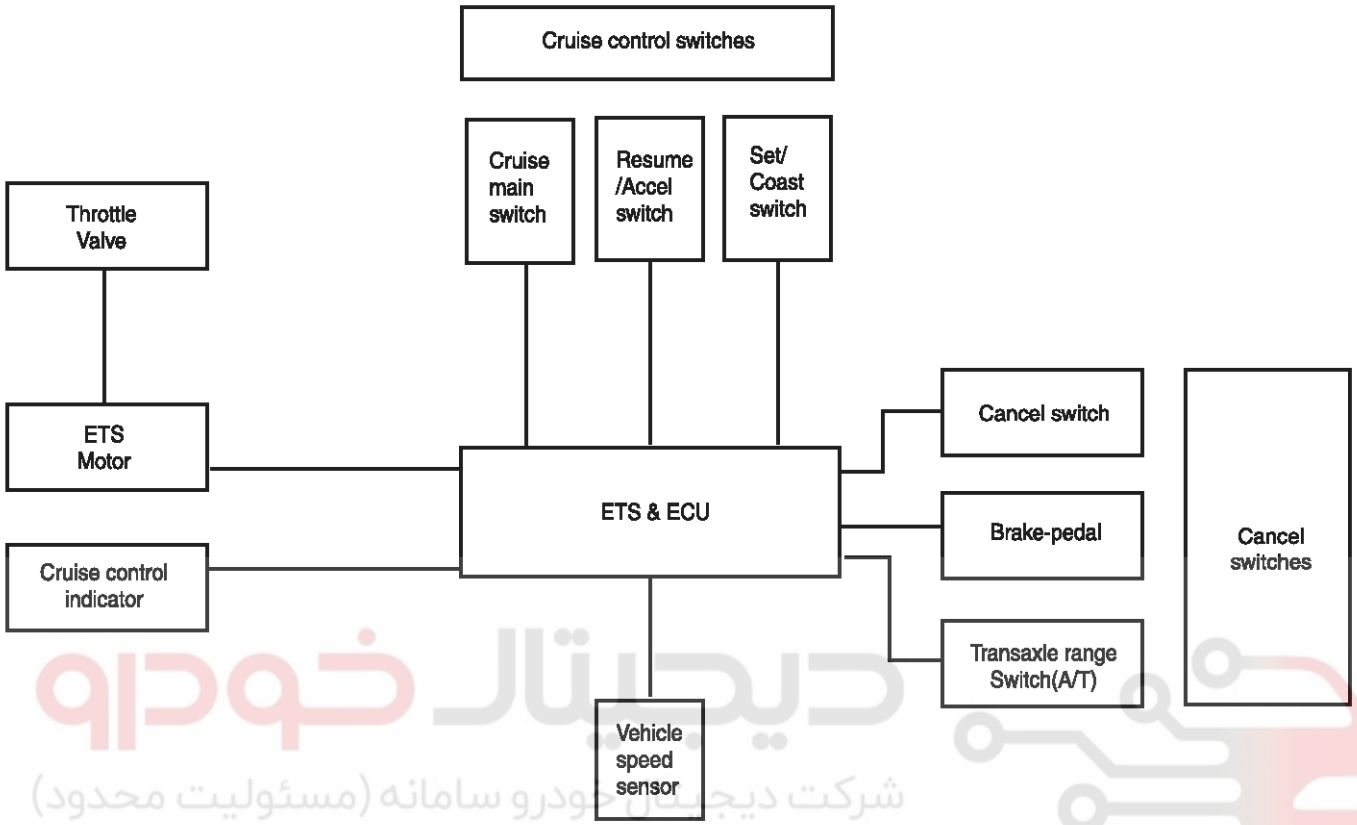


KBSD200C

4. Installation is the reverse of removal.

Cruise Control System

SYSTEM BLOCK DIAGRAM



COMPONENT PARTS AND FUNCTION OUTLINE

Component part		Function
Vehicle-speed sensor		Converts vehicle speed to pulse.
Engine control module (ECM)		Receives signals from sensor and control switches;
Cruise control indicator		Illuminate when CRUISE main switch is ON (Built into cluster)
Cruise Control switches	CRUISE main 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) Clutch switch (M/T)	
ETS motor		Regulates the throttle valve to the set opening by ECM.

* ETS : Electronic Throttle System

CRUISE CONTROL

Cruise control system is engaged by "ON/OFF" main switch located on right of steering wheel column. 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.

ECM is a speed control system that maintains a required vehicle speed at normal driving conditions.

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.

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. The switches are on brake pedal bracket and transaxle. 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 "ON/OFF" push button. Releasing "ON/OFF" push button 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 speed 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 which will cause the cruise control 's speed of vehicle to 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).

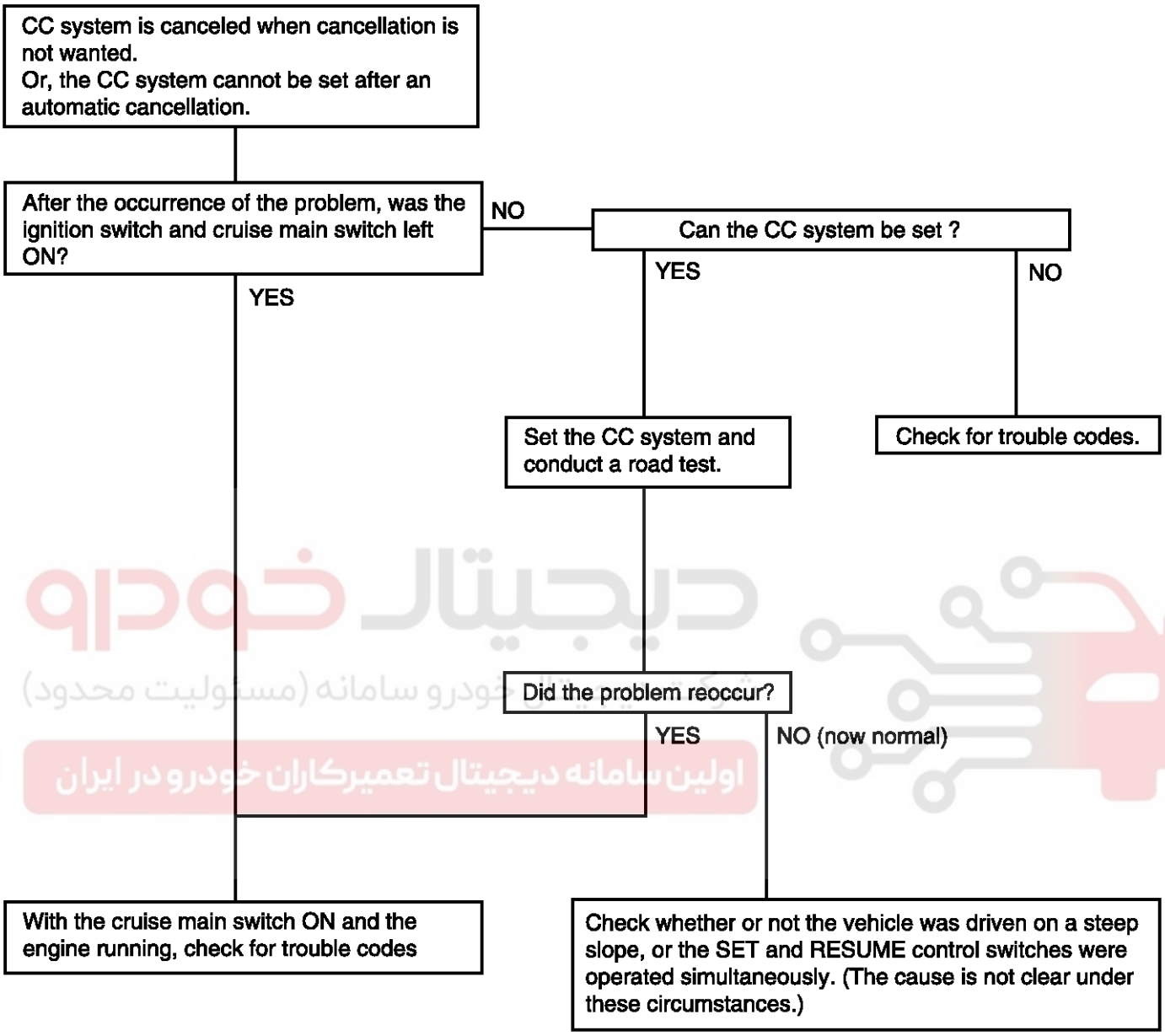
Cancel switch

Cruise control system is temporarily disengaged by pressing "CANCEL" switch.

Cruise speed canceled by this switch will be recovered by RES/ACCEL switch

TROUBLE SYMPTOM CHARTS

TROUBLE SYMPTOM 1



CC : Cruise Control
ECU : Engine Control Unit

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TROUBLE SYMPTOM 2

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

TROUBLE SYMPTOM 3

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

TROUBLE SYMPTOM 4

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

TROUBLE SYMPTOM 5

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

TROUBLE SYMPTOM 6

Trouble symptom	Probable cause	Remedy
Cannot accelerate or resume speed by using the 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

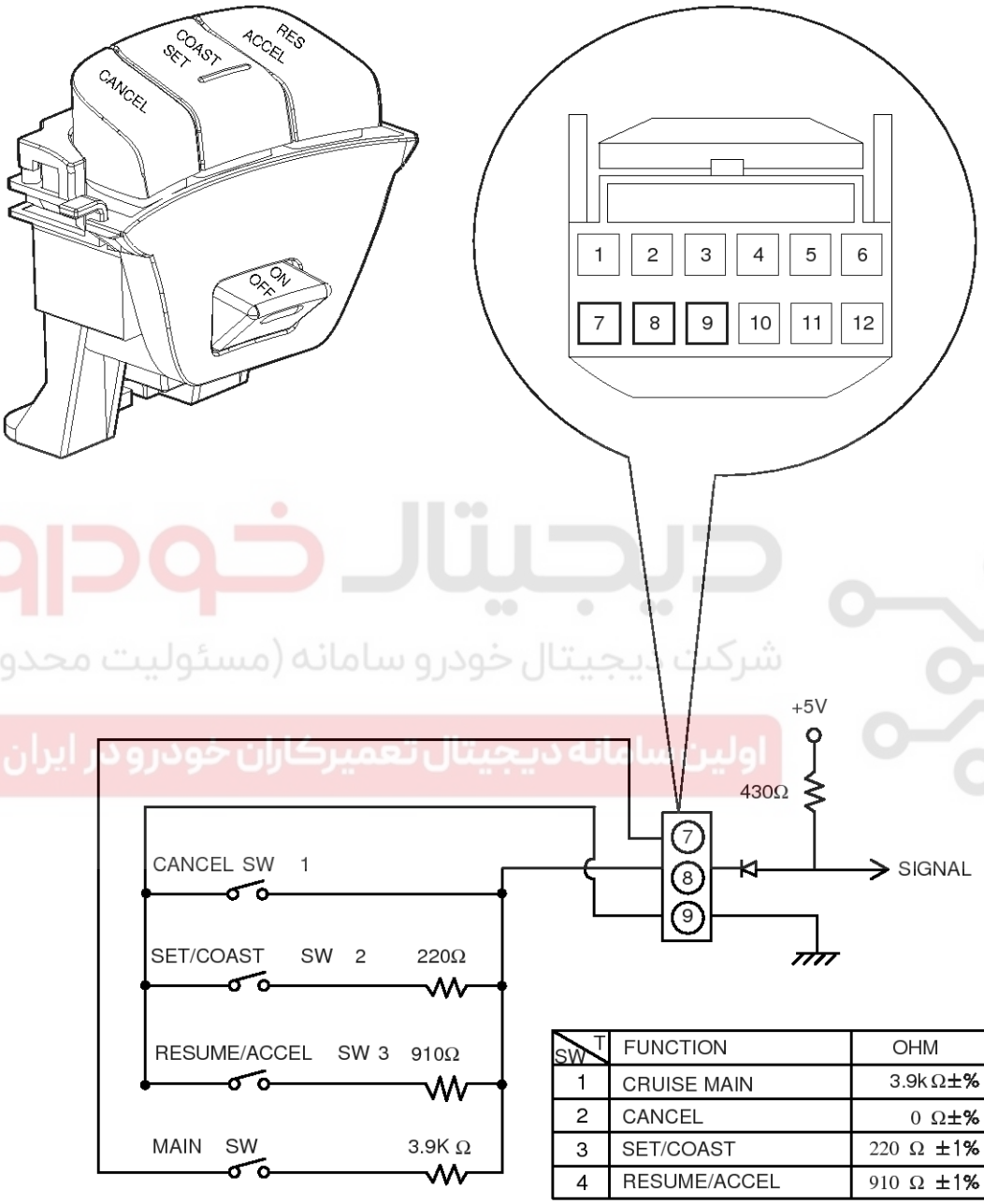
Trouble symptom	Probable cause	Remedy
CC system can be set while driving at a vehicle speed of less than 40km/h (25mph), or there is no automatic cancellation at that speed	Malfunction of the vehicle-speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the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

Cruise Control Switch

CIRCUIT DIAGRAM

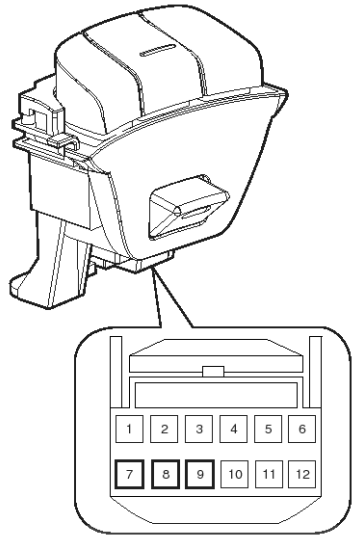


SW / T	FUNCTION	OHM	OUT PUT VOLTAGE
1	CRUISE MAIN	3.9kΩ±%	–
2	CANCEL	0 Ω±%	0V ±0.25V
3	SET/COAST	220 Ω ±1%	1.5V ±0.25V
4	RESUME/ACCEL	910 Ω ±1%	3.0V ±0.25V

SBLEA6004L

MEASURING RESISTANCE

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



SBLEA6007L

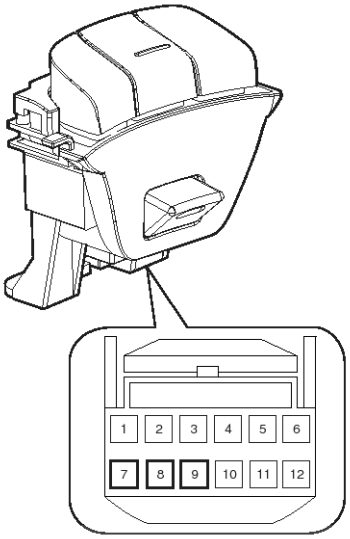
2. Measure resistance between terminals on the control switch when each function switch is ON (switch is depressed).

Function switch	Terminal	Resistance
Cruise Main	7-9	3.9kΩ ± 1%
Cancel	8-9	0Ω ± 1%
Set/Coast	8-9	220Ω ± 1%
Resume/Accel	8-9	910Ω ± 1%

3. If not within specification, replace switch.

MEASURING VOLTAGE

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



SBLEA6007L

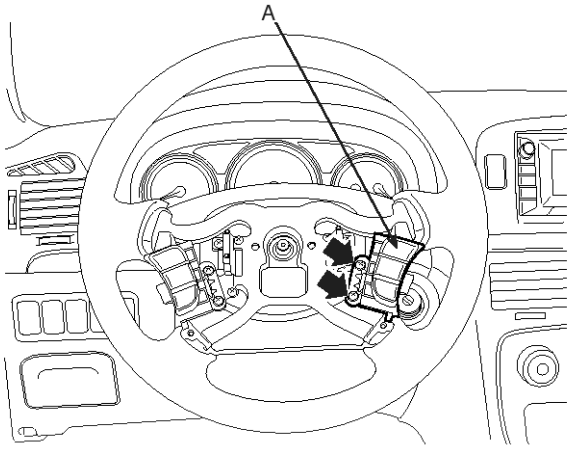
2. Measure voltage between terminals on the harness side connector when each function switch is ON (switch is depressed).

Function switch	Terminal	Voltage
Cruise Main	7-9	-
Cancel	8-9	0.0V ± 0.25V
Set/Coast	8-9	1.5V ± 0.25V
Resume/Accel	8-9	3.0V ± 0.25V

3. If not within specification, replace switch.

REMOVAL

1. Disconnect the battery (-) terminal.
2. Remove the driver side air bag module. (Refer to RT GR.)
3. Disconnect the cruise control switch connector and then remove the cruise control switch(A) with two screws.

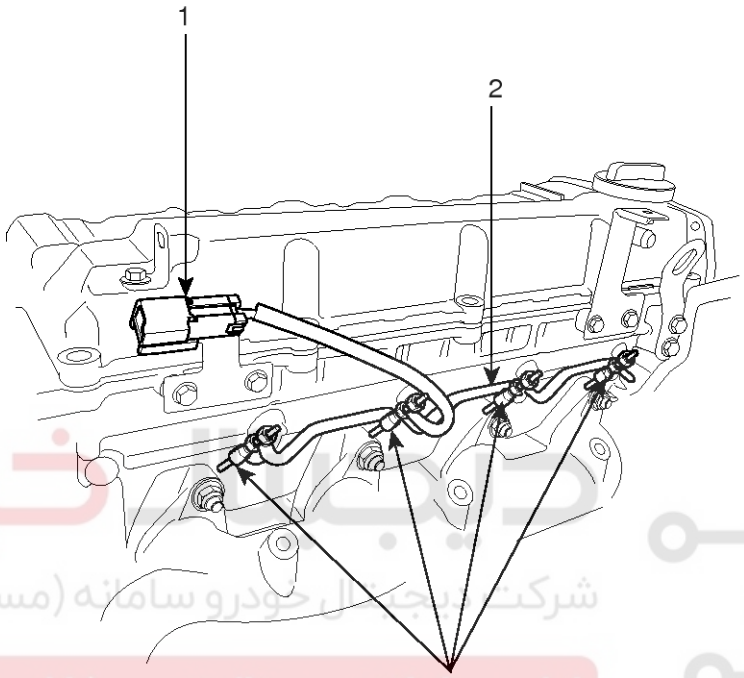


SBLEA6006L

4. Installation is the reverse of removal.

Preheating System

COMPONENTS



1. Glow plug connector
2. Plate
3. Glow plug

SBLEE6003L

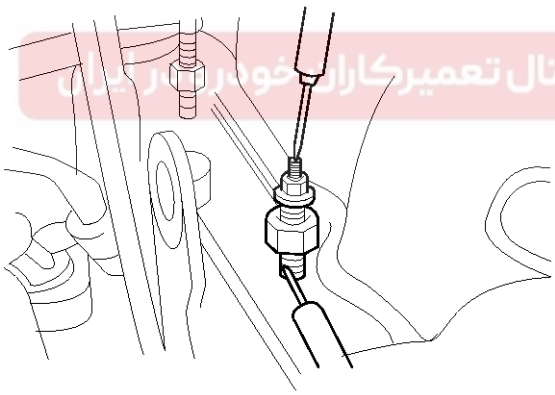
INSPECT PREHEATING SYSTEM

Conditions before inspection :

Battery voltage : 12V

1. Connect voltmeter between glow plug plate and plug body (ground).
2. Check indicated value on voltmeter with ignition switch ON.
3. Check that preheat indication lamp lights for about 6 seconds and indicates battery voltage (about 9V or over) for about 36 seconds immediately afterignitionswitch is turned on. [At cooling water temperature 20˚C (68˚F)]

   NOTICE
   Continuity time varies depending upon cooling water temperature.
4. After checking 3, set ignition switch at START position.
5. The system is normal if battery voltage (about 9V or over) is generatedforabout 6 seconds during engine cranking and after start operation. [at coolingwater temperature 20˚C (68˚F)]
6. When the voltage or continuity time is not normal, check the terminal voltage in glow control unit, and single parts.



LBIF117A

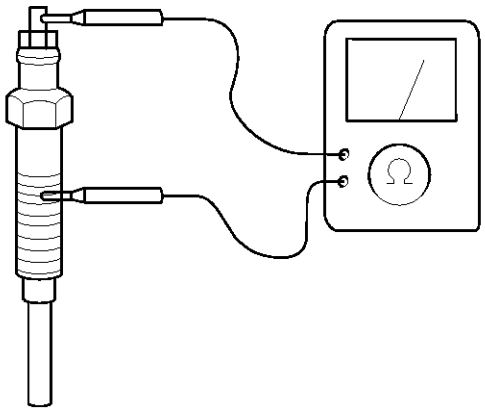
INSPECT GLOW PLUS

1. Check the continuity between the terminal and body as illustrated. Replaceif discontinuity or with large resistance.

Standard value : 0.25Ω

CAUTION
Remove oil from plug before measuring as glow plug resistance is verysmall.

2. Check for rust on glow plug plate.
3. Check glow plug for damage.



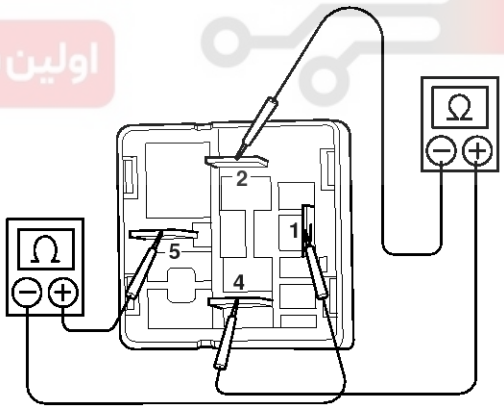
LBIF118A

INSPECT GLOW PLUG RELAY

1. Remove the glow plug relay.
2. Inspect the relay continuity.
   - Using an ohmmeter, check that there is continuity between terminals 2 and 4.

     If there is no continuity, replace the relay.
   - Check that there is no continuity between terminals 1 and 5.

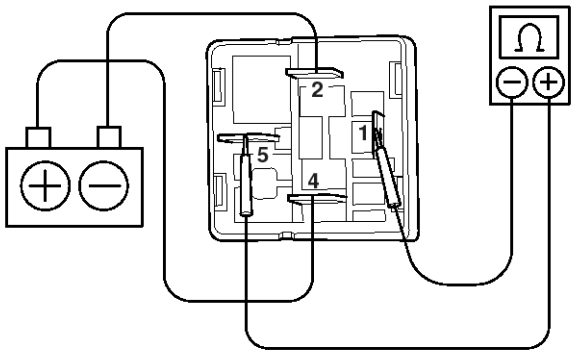
     If there is continuity, replace the relay.



LBIF119A

3. Inspect the relay operation.
   - Apply battery positive voltage across terminals 2 and 4.
   - Using an ohmmeter, check that there is continuity between terminals 1 and 5.

     If there is no continuity, replace the relay.



LBIF120A

4. Install the glow plug relay.-