Engine Electrical System

GENERAL

SPECIFICATION EEA41EF0

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	0.8 ~ 0.9 mm (0.0315 ~ 0.0354 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 characteristics	Voltage	11 V
		Ampere	90A, MAX
		Speed	3,000 rpm, MIN

CHARGING SYSTEM

Items		Specification	
Arternator	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 45AH	CMF 60AH
	Cold cranking amperage [at -18°C(-0.4°F)]	410A	550 A
	Reserve capacity	80 min	92 min
	Specific gravity [at 20°C(68°F)]	→	1.280 ± 0.01

NOTE

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

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
Generator mounting A	11.8 ~ 14.7	1.2 ~ 1.5	8.7 ~ 10.8
Generator mounting B	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1

TROUBLESHOOTING EFE40DF7

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 generator faulty Wiring faulty	Adjust tension or replace cables Repair or replace cables Check fuses Replace fusible link Test generator 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 generator faulty Battery life	Adjust tension or replace drive belt Tighten loose connection or repair wiring Replace fusible link Replace components Repair Test generator 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

IGNITION SYSTEM

DESCRIPTION E6DFFB0C

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 E5CF12C8

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

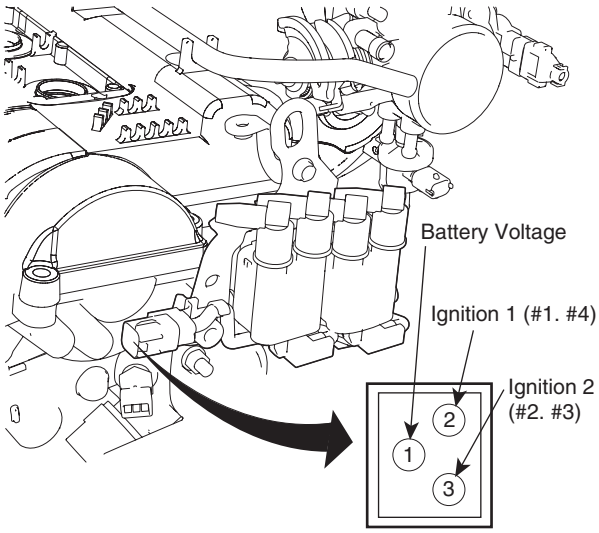
Standard value : 0.58 ± 10% (Ω)

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.

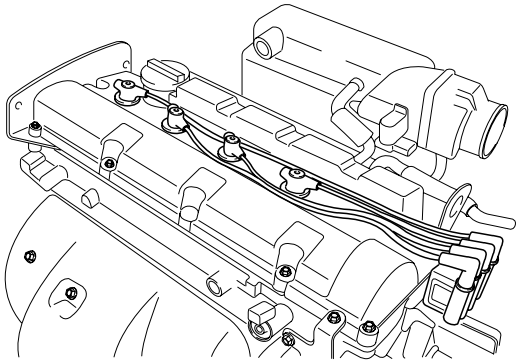


SHDEA6013D

SPARK PLUG

INSPECTION E09ACA39

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



ACGE002A

NOTE

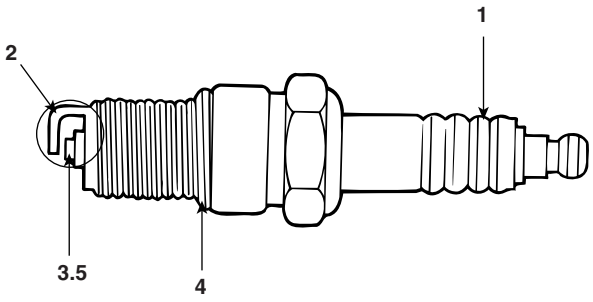
When removing the spark plug cable, pull on the spark plug cable boot (not the cable), as it may be damaged.

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.

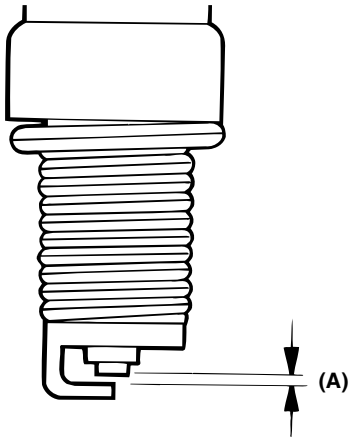
3. Check the spark plugs for the following :
   1. Broken insulator
   2. Worn electrode
   3. Carbon deposits
   4. Damaged or broken gasket
   5. Condition of the porcelain insulator at the tip of the spark plug



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.

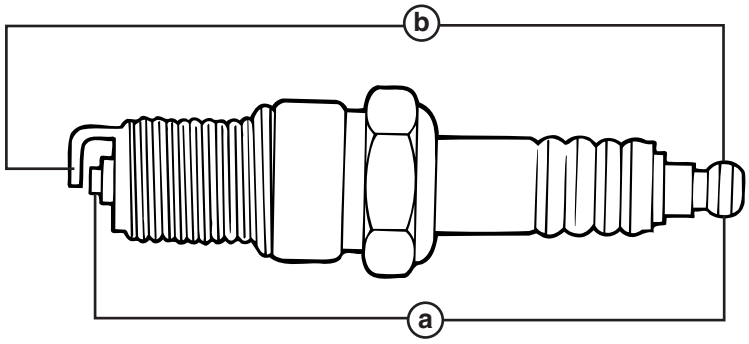
Tightening torque :
20 ~ 30 Nm (2.0 ~ 3.0 kgf.m, 15-21 Ib-ft)

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 rich • 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)-ⓑ

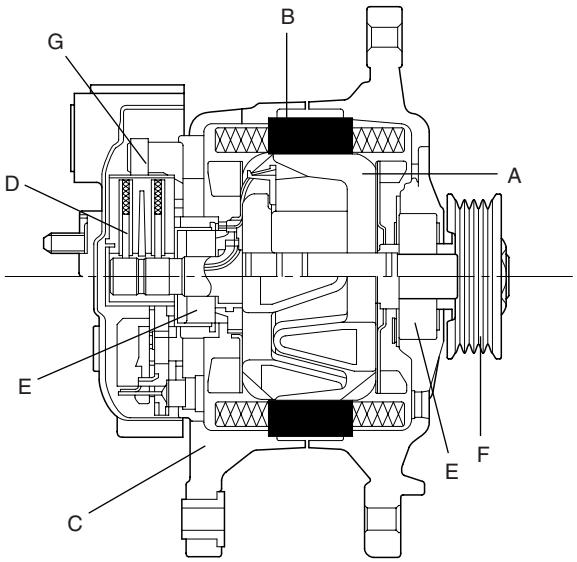
Result	Specification		Remedy	Probable cause and state
	Champion	NGK		
Normal	50 MΩ above		-	-
Not OK	50 MΩ below		Relpace	· Cause : Carbon or insulator crack · State : Engine skipping or hesitation

SHDEA6010L

CHARGING SYSTEM

DESCRIPTION E280D528

The charging system includes a battery, an generator with a built-in regulator, and the charging indicator light and wire.
The generator has six built-in diodes (three positive and three negtive), each rectifying AC current to DC current.
Therefore, DC curent appears at generator "B" terminal.
In addition, the charging voltage of the generator is regulated by the battery voltage detection system. The main components of the generator 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).



SHDEA6004L

INSPECTION EDB6DBB1

VOLTAGE DROP TEST

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

PREPARATION

1. Turn the ignition switch to "OFF."

   NOTE

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

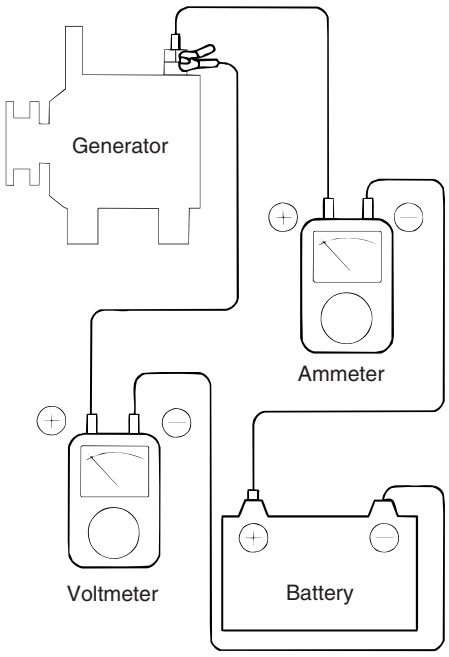
2. Connect a digital voltmeter between the generator "B" terminal and battery (+) terminal. Connect the (+) lead wire of the voltmeter to the"B" terminal and the (-) lead wire to the battery (+) terminal.

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 generator '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 generator 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".

   NOTE

   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.

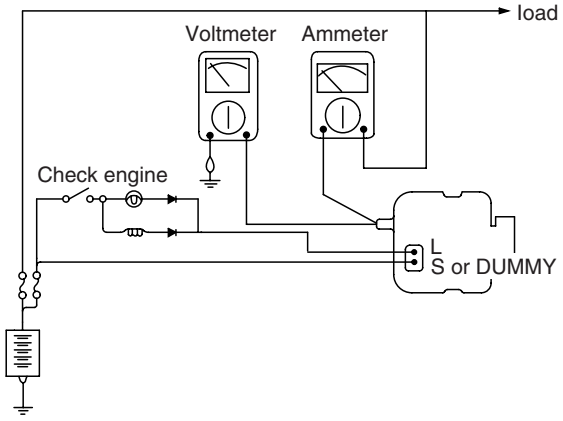
   2) Check the tension of the generator drive belt. See "COOLING".

2. Turn the ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Disconnect the generator output wire from the generator "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.

   NOTE

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

6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the generator "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 generator "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.

NOTE

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 generator output wire is in good condition, remove the generatorfrom the vehicle and test it.

Limit value : 45A

NOTE

1. *The nominal output current value is shown on the nameplate affixed to the generator body.*
2. *The output current value changes with the electrical load and the temperature of the generator 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 generator itself or ambient temperature is too high.*
   In such a case, reduce the temperature before testing again.

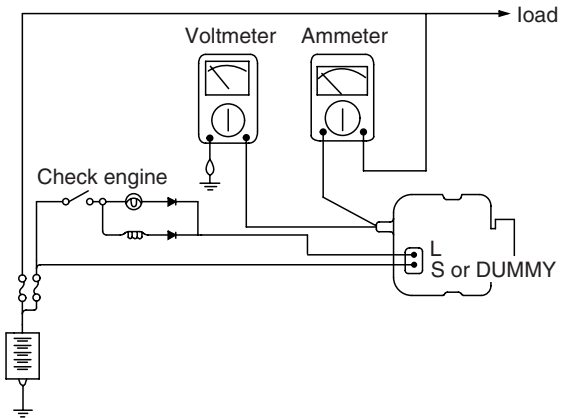
2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the ammeter and voltmeter and the engine tachometer.
5. Connect the generator output wire to the generator "B" terminal.
6. Connect the battery 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 generator drive belt tension. For belt tension check, see section, "COOLING."
2. Turn ignition switch to "OFF."
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the "S(L)" terminal of the generator and ground.
   Connect the (+) lead of the voltmeter to the "S(L)" terminal of the generator. Connect the (-) lead to a good ground or the battery (-) terminal.
5. Disconnect the generator output wire from the generator "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 generator "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 generator 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 generatoris 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.

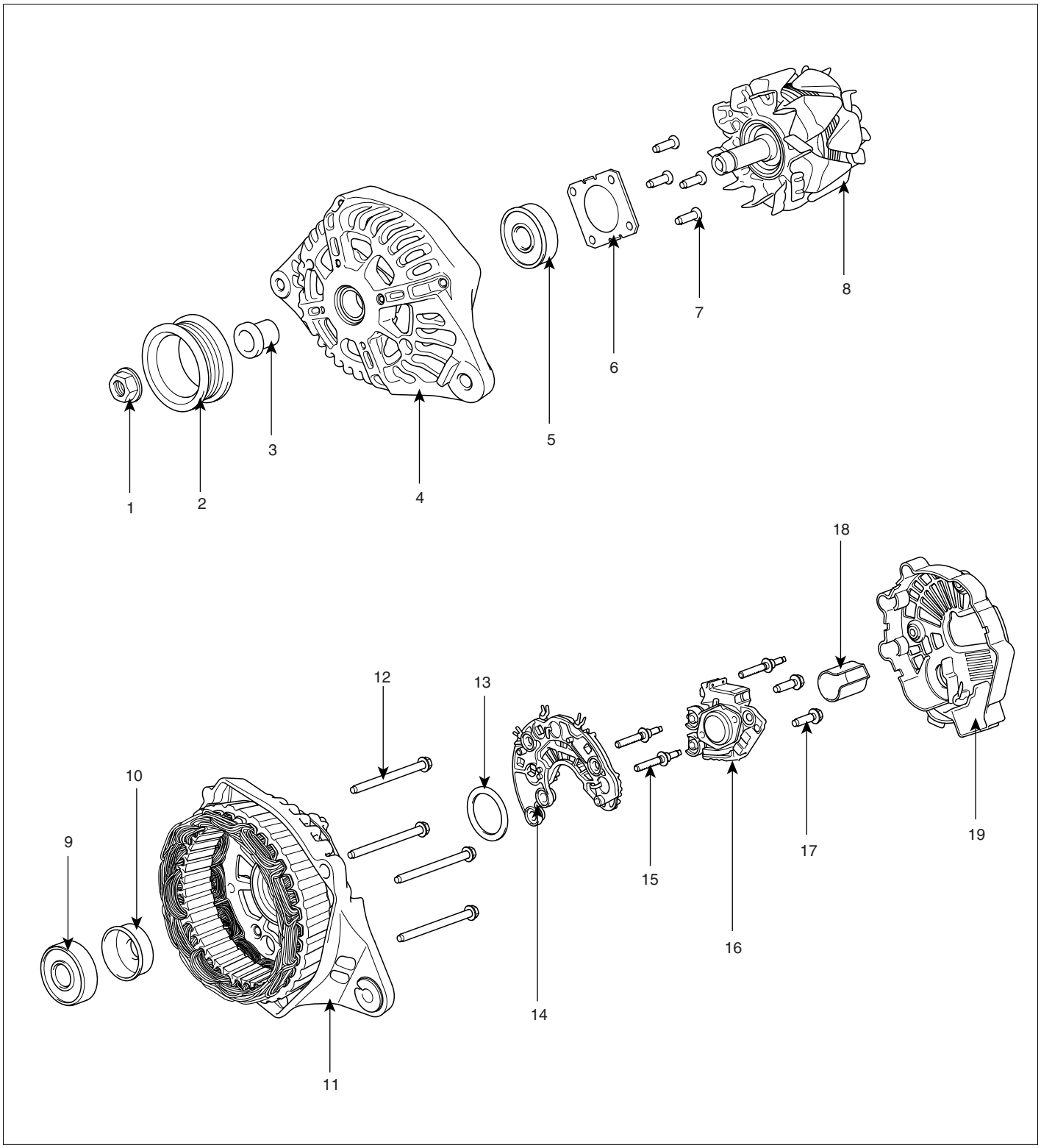
4. Remove the voltmeter, ammeter, and the engine tachometer.

5. Connect the generator output wire to the generator "B" terminal.

6. Reconnect the battery ground cable.

ALTERNATOR

COMPONENTS E4E04EC4

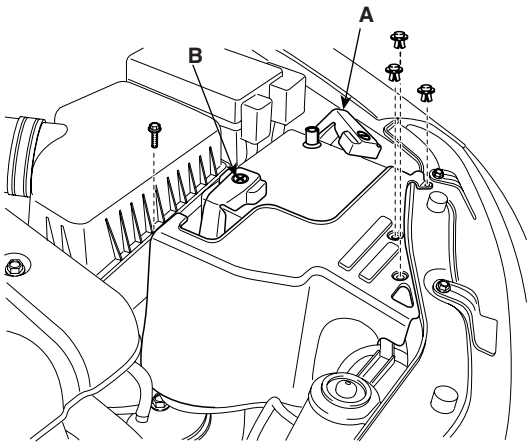


1. Nut
2. Pulley
3. Spacer
4. Front cover assembly
5. Front bearing
6. Bearing cover
7. Bearing cover bolts
8. Rotor coil
9. Rear bearing
10. Bearing cover
11. Rear cover
12. Bolts
13. Seal
14. Rectifier assembly
15. Stud bolts
16. Brush bolder assembly
17. Brush holder bolts
18. Slipring guide
19. Cover

SHDEA6005L

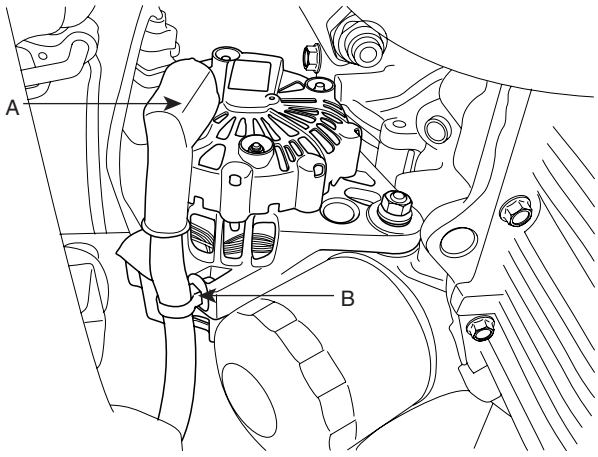
REMOVAL E9D090B0

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



SLDM17201L

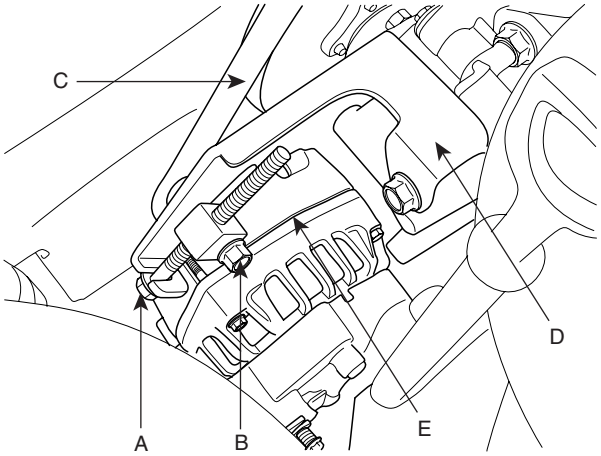
2. Deisconnect the generator connector(A) and "B" terminal cable from the generator. Losen the cpip(B).



SHDE16002L

3. Remove the adjusting bolt(A), mounting bolt(B), the generator belt(C) and the generator mounting bracket(D).

4. Pull out the through bolt, then remove the generatorE).



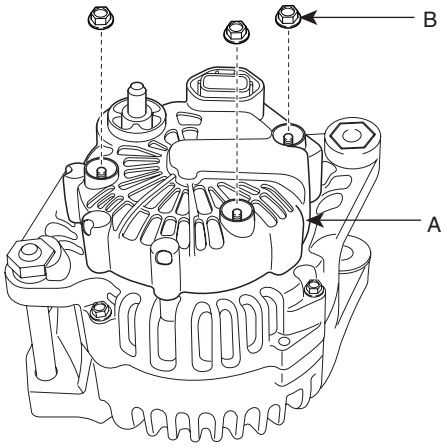
SHDEA6012L

5. Installation is the reverse of removal.

6. Adjust the generator belt tension after installation.

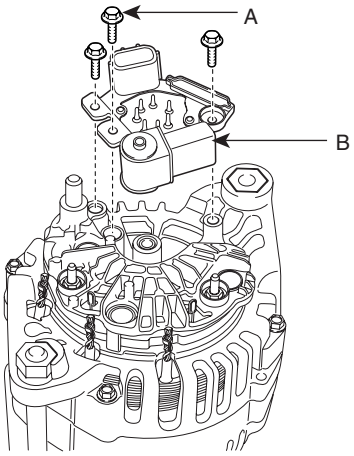
DISASSEMBLY EAEE15CD

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



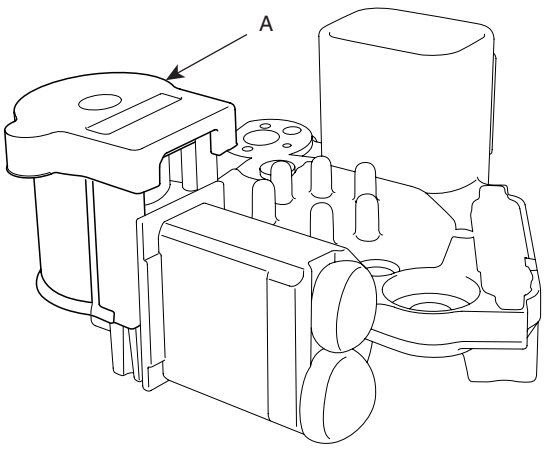
SUNE16001D

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



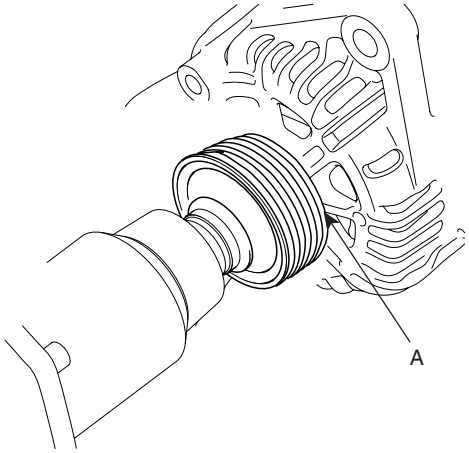
SUNE16002D

3. Remove the slip ring guide(A).



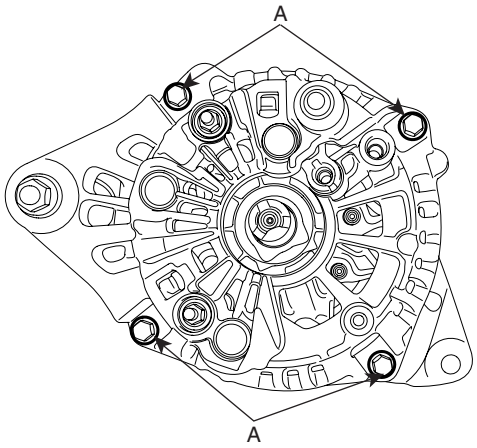
SHDEA6006L

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



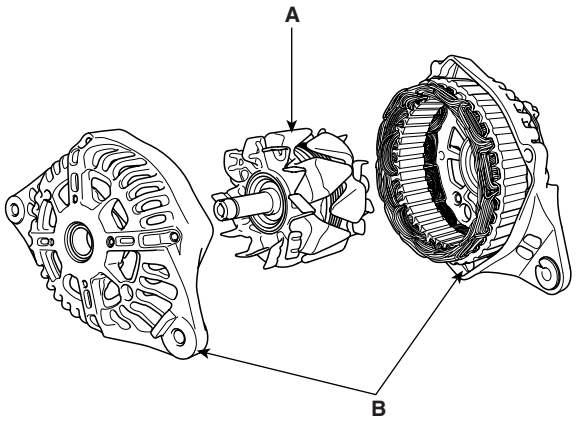
SUNEE6004D

5. Loosen the 4 through bolts(A).



SUNEE6005D

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



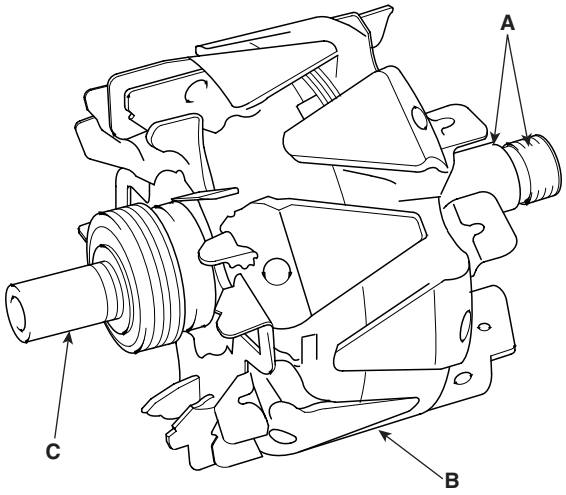
SUNEE6006D

7. Reassembly is the reverse of disassembly.

INSPECTION E742A251

ROTOR

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

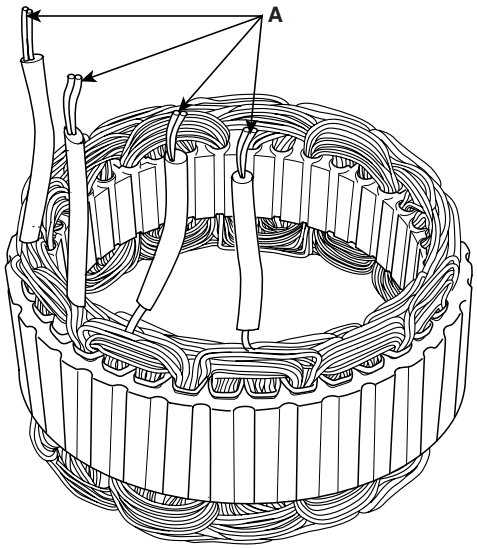


EBKD008A

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 generator.

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 generator.

ALTERNATOR BELT INSPECTION AND ADJUSTMENT

NOTE

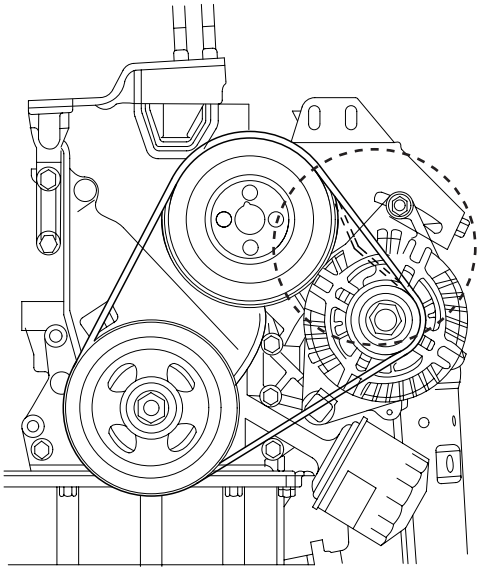
When using a new belt, first adjust the deflection or tension to the values for the new belt, then readjust the deflection or tension to the values for the used belt after running engine for five minutes.

Deflection method :
Apply a force of 98N (10 kgf, 22 lbf), and measure the deflection between the alternator and crankshaft pulley.

Deflection
Used Belt : 8.5 ~ 11.5 mm (0.33 ~ 0345 in)
New Belt : 5.5 ~ 8.0 mm (0.22 ~ 0361 in)

NOTE

If the belt is worn or damaged, replace it.



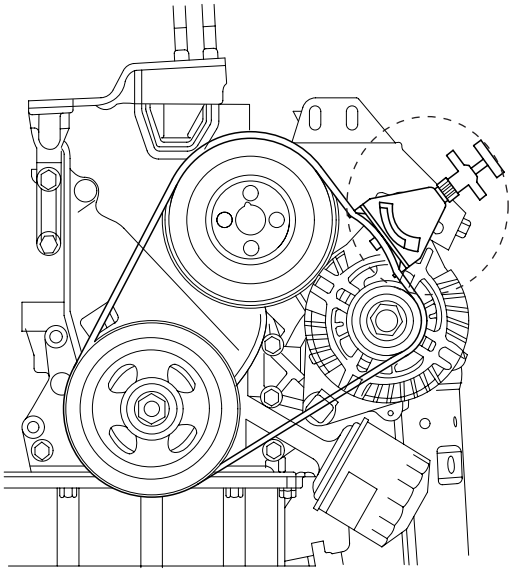
EBKD008C

Belt tension gauge method :
Attach the belt tension gauge to the belt and measure the tension. Follow the gauge manufacturer's instructions.

Tension
Used Belt : 340~490 N (35~50 kgf, 77~110 lbf)
New Belt : 690~880 N (70~90 kgf, 150~200 lbf)

NOTE

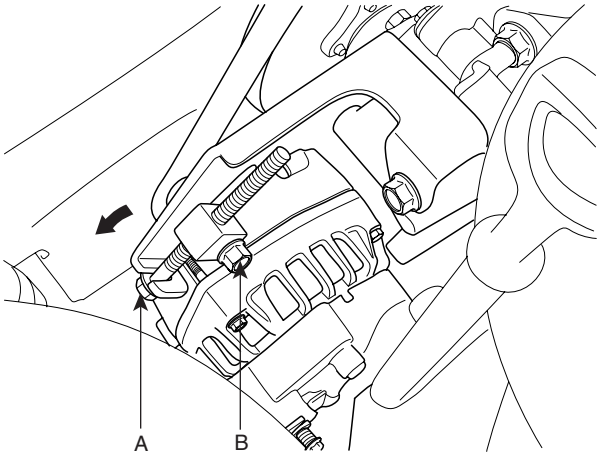
If the belt is worn or damaged, replace it.



EBKD008D

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

DESCRIPTION EA753A50

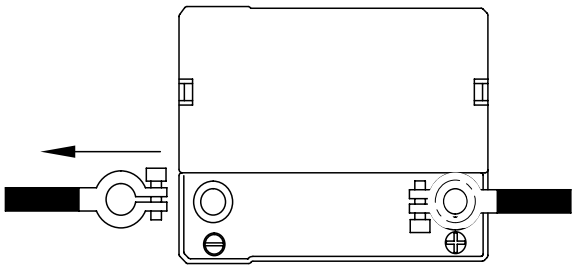
1. A maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
2. Water never needs to be added to a maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.

CLEANING E825E9A9

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.



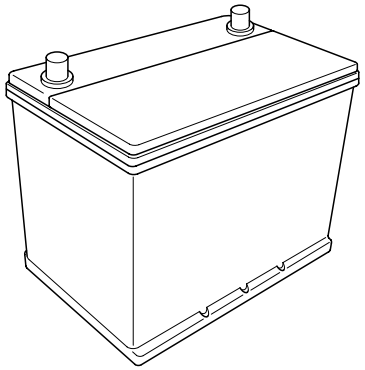
EBJD008B

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

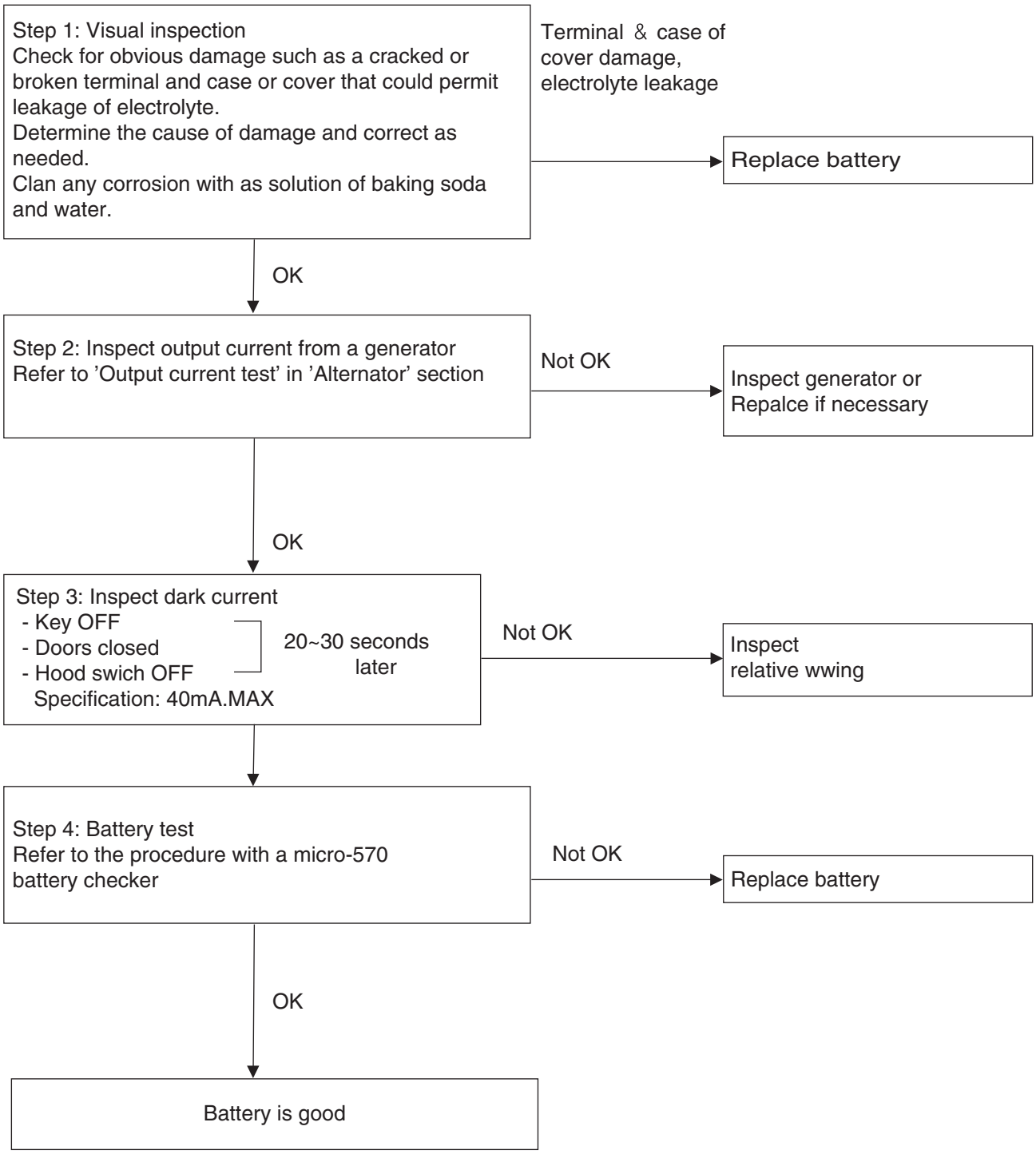
When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries being charged or which have recently been charged. Do not break live circuit at the terminals of batteries being charged. A spark will occur when the circuit is broken. Keep open flames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



EBJD008A

INSPECTION E54CF1ED

BATTERY DIAGNOSTIC FLOW



SLDEA7004L

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:

   1) If the battery has been on charge, remove the surface charge by connect a 300ampere load for 15 seconds.

   2) Connect the voltmeter and apply the specified load.

   3) Read the voltage after the load has been applied for 15 seconds.

   4) Disconnect the load.

   5) 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
9.6V	20°C (68.0°F) and above
9.5V	16°C (60.8°F)
9.4V	10°C (50.0°F)
9.3V	4°C (39.2°F)
9.1V	-1°C (30.2°F)
8.9V	-7°C (19.4°F)
8.7V	-12°C (10.4°F)
8.5V	-18°C (-0.4°F)

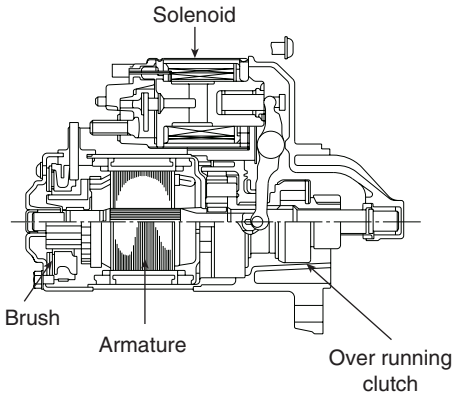
NOTE

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

STARTING SYSTEM

DESCRIPTION EB67C1D0

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.



SHDEE6005L

INSPECTION EFDC0AEE

START TEST

NOTE

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 :

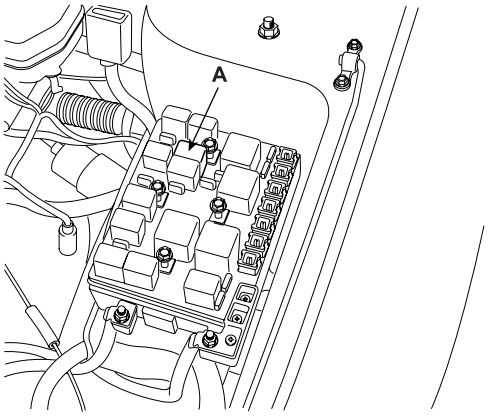
- Use the following equipment :
  - Ammeter, 0~400A
  - Voltmeter, 0~20V (accurate within 0.1 volt)
  - Tachometer, 0~1,200 rpm
- Hook up a voltmeter and ammeter as shown.

NOTE

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

Check the Starter Engagement :

1. Remove the fuel pump relay (A) from the fuse/relay box.



SLDEA6007D

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.

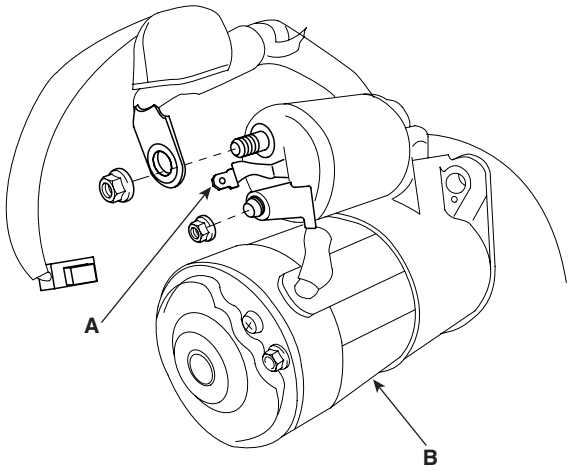
If cranking voltage is too low, or current draw too high, check for :
- dead or low battery.
- open circuit in starter armature commutator segments.
- starter armature dragging.
- shorted armature winding.
- excessive drag in engine.

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.



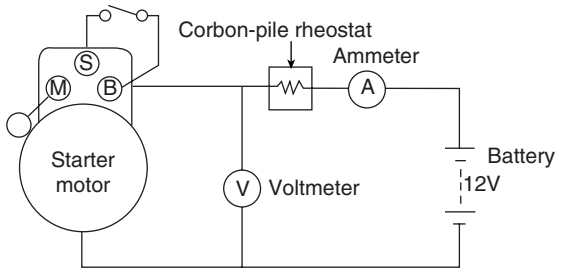
EBKD010C

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 :

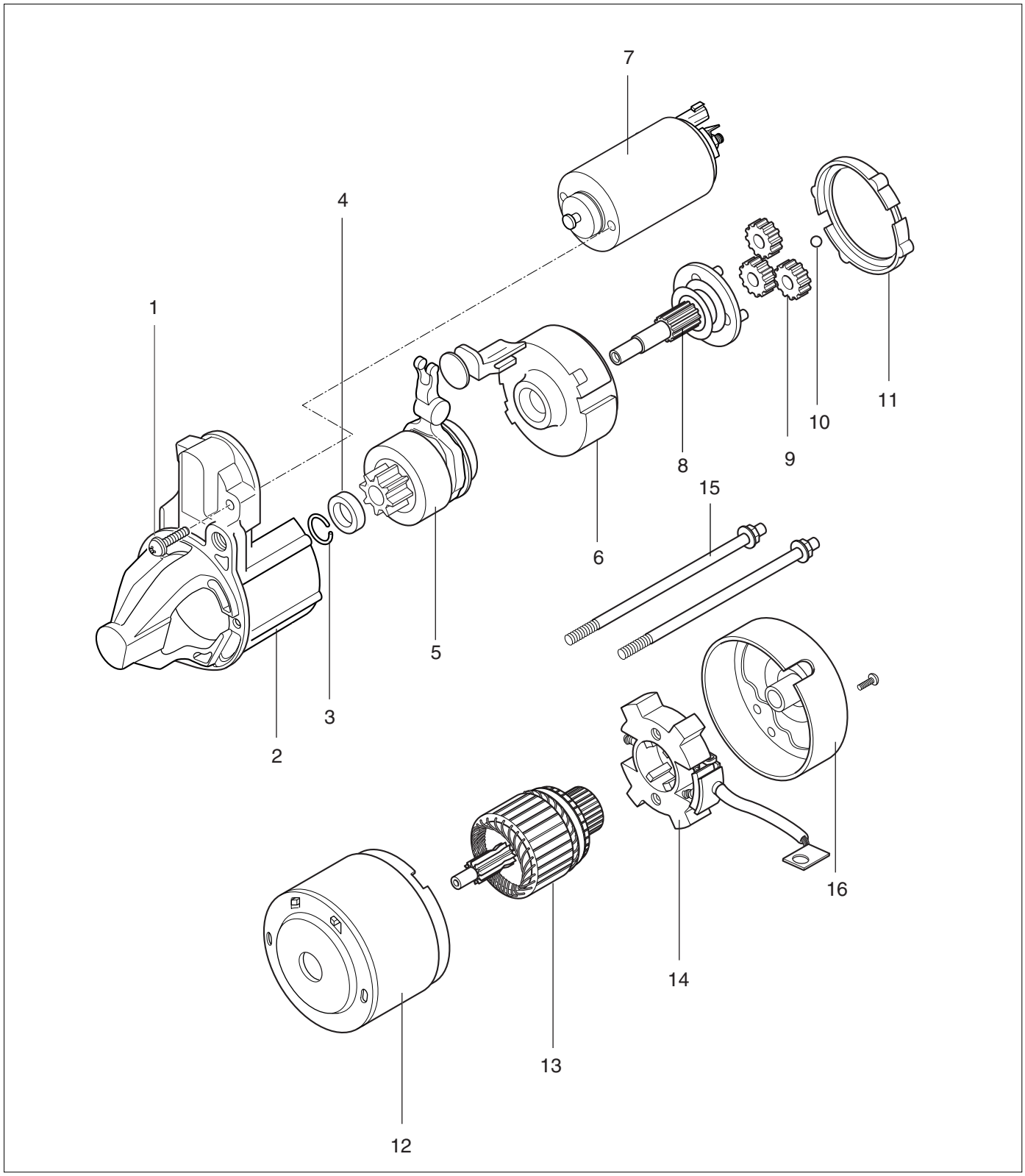
Current: Max. 90 Amps **Speed**: Min. 2,800 rpm



BBGE005A

STARTER

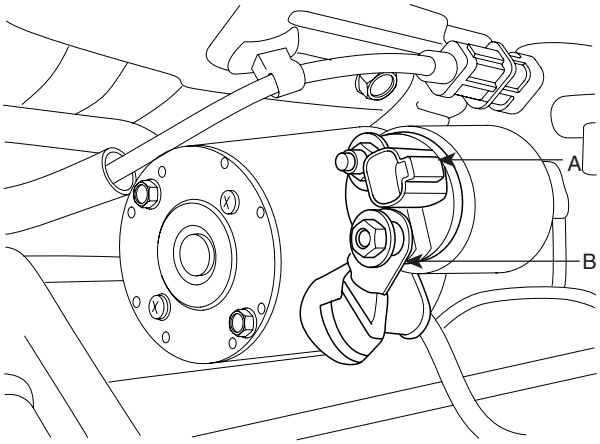
COMPONENTS E0512593



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

REMOVAL E45FA7EA

1. Disconnect the battery ground cable.
2. Disconnect the solenoid "S" terminal and "B" terminal cable (B).

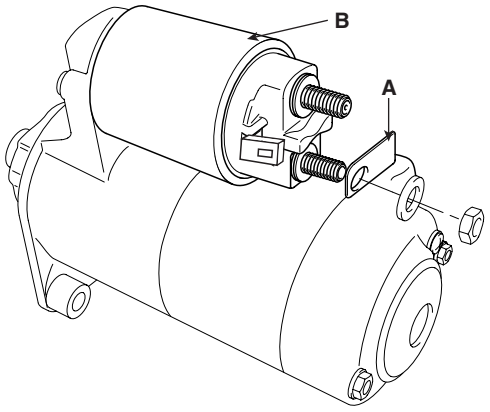


SHDEE6010D

3. Remove the starter motor mounting bolt and the starter motor.
4. Installation is the reverse order of removal.

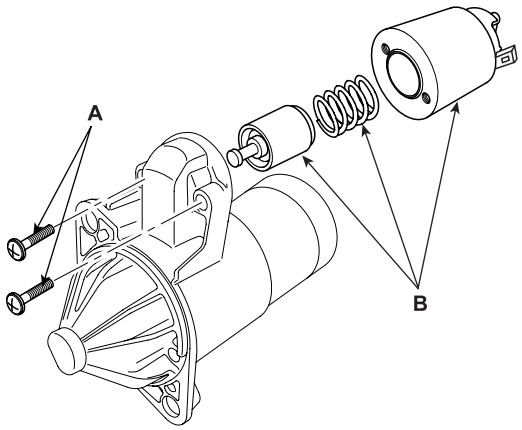
DISASSEMBLY E60DC19E

1. Disconnect the M-terminal (A) on the magner switch assembly (B).



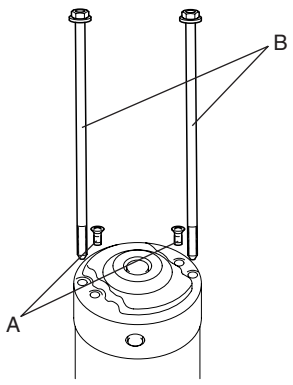
SLDEA6004D

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



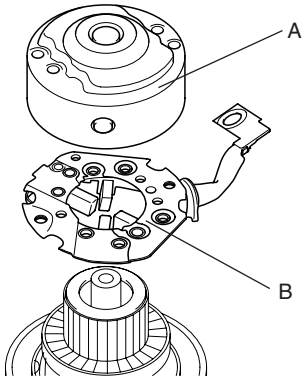
SLDEA6005D

3. Loosen the brush holder mounting screw (A) and through bolts (B).



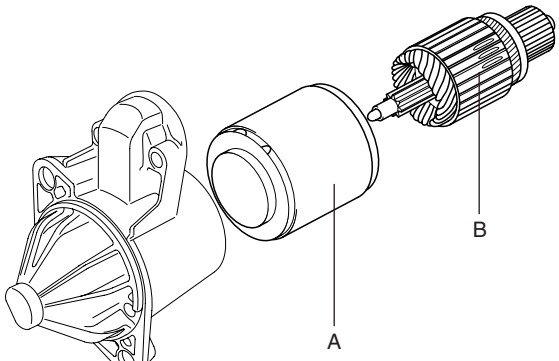
SHDEA6020D

4. Remove the rear bracket (A) and brush holder assembly (B).



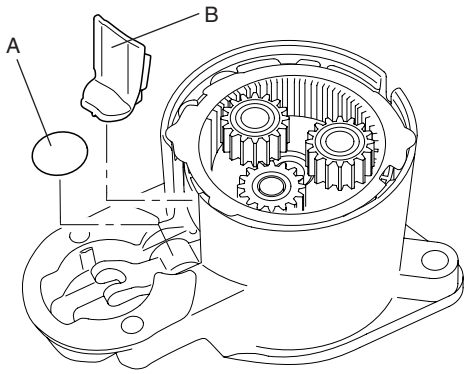
SHDEA6021D

5. Remove the yoke (A) and armature (B).



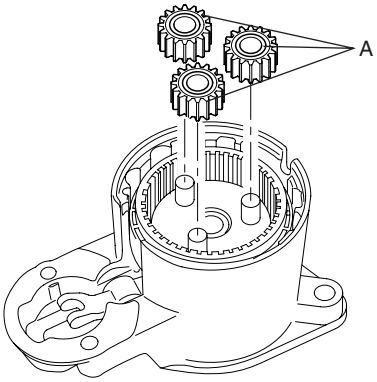
SHDEA6022D

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



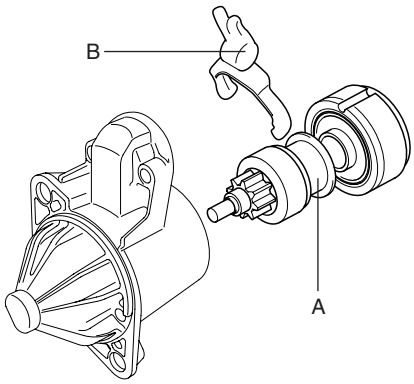
SHDEA6023D

7. Disconnect the planetary gear (A).



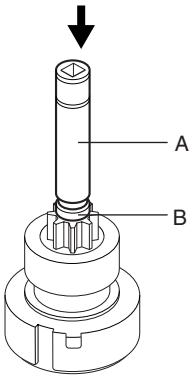
SHDEA6024D

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



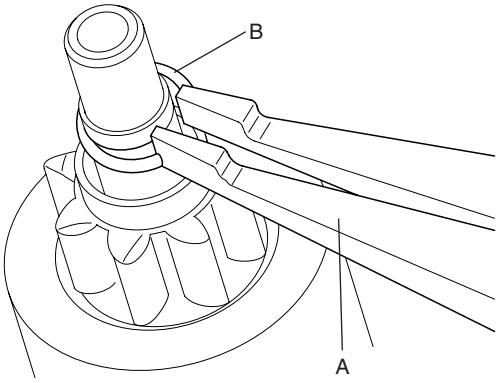
SHDEA6025D

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



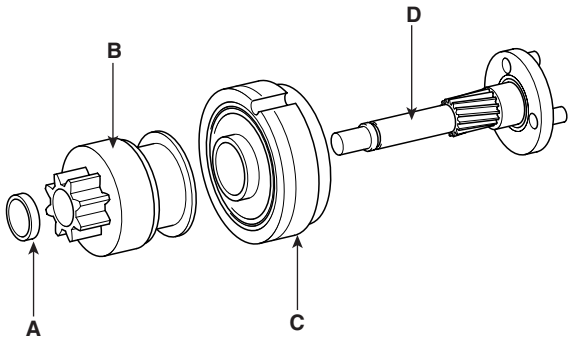
SHDEA6026D

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



SHDEA6027D

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

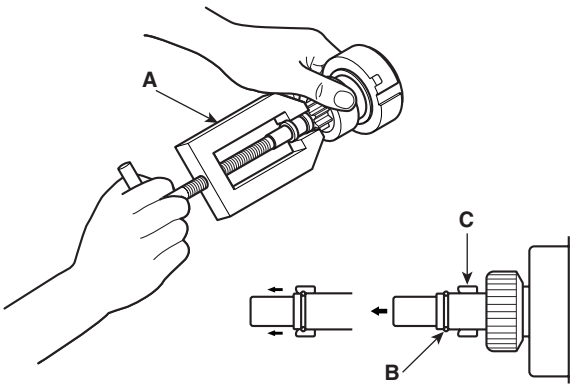


EBKD011M

12. Reassembly is the reverse of disassembly.

NOTE

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

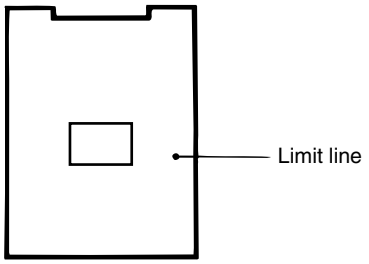


EBKD011O

INSPECTION EDDB59AF

BRUSH

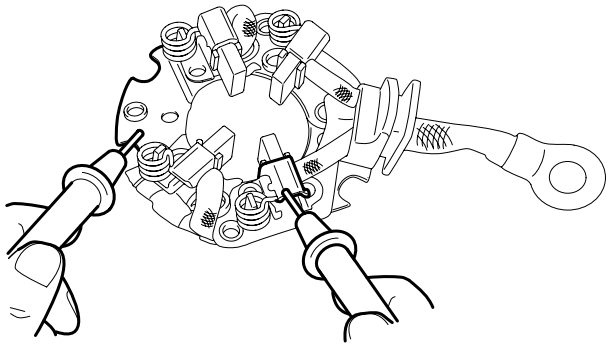
A brush worn down to the wear limit line should be replaced.



EBDA065F

BRUSH HOLDER

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

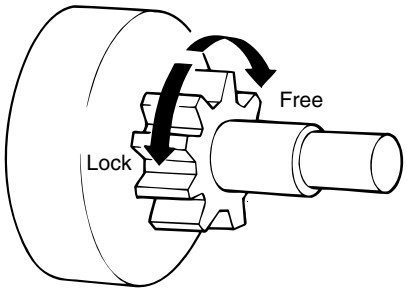


EBBD330A

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.



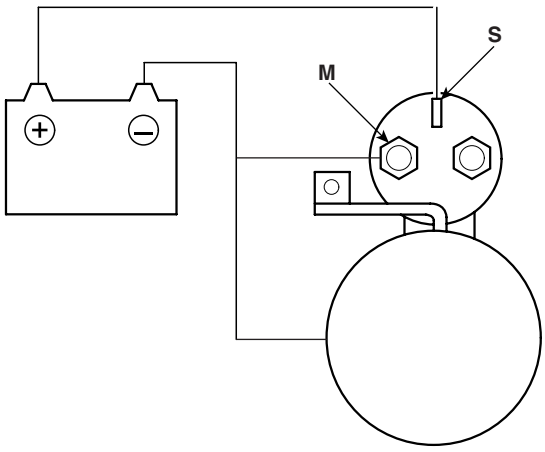
EBDA065H

PINION GAP ADJUSTMENT

1. Disconnect the wire from the M-terminal.
2. Connect a 12V battery between the S-terminal and the M-terminal.
3. Set the switch to "ON", and the pinion will move out.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.



KBSE203D

4. Check the pinion to stopper clearance (pinion gap) with a feeler gauge. If the pinion gap is out of specification, adjust by adding or removingwashers between the solenoid and the front bracket.

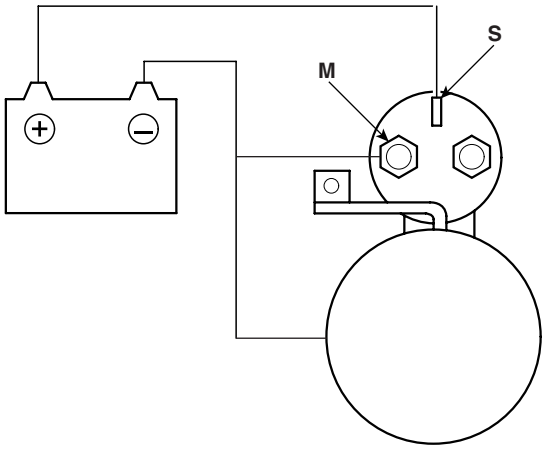
SOLENOID PULL-IN TEST

1. Disconnect the connector from the M-terminal.
2. Connect a 12V battery between the S-terminal and M-terminal.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. If the pinion moves out, the pull-in coil is good. If it doesn't, replace the solenoid.



KBSE203D

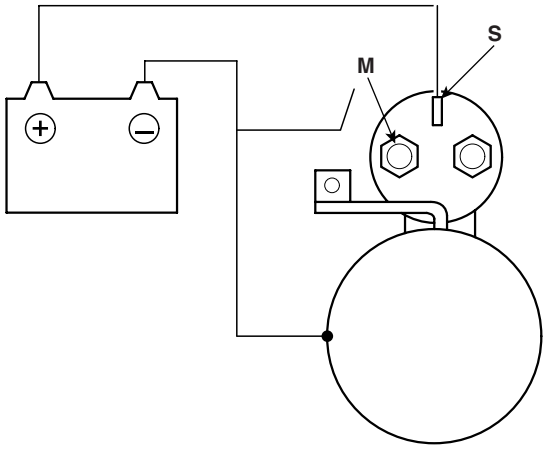
SOLENOID HOLD-IN TEST

1. Disconnect the connector from the M-terminal.
2. Connect a 12V battery between the S-terminal and the body.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

3. If the pinion remains out, everything is in order. If the pinion moves in, the hold-in circuit is open. Replace the magnetic switch.



KBSE203E

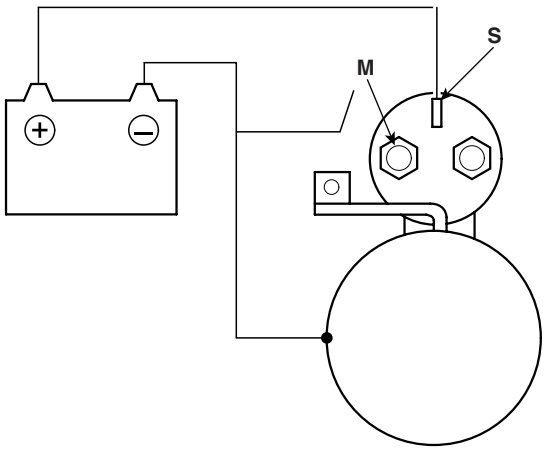
SOLENOID RETURN TEST

1. Disconnect the connector from the M-terminal.
2. Connect a 12V battery between the M-terminal and the body.

CAUTION

This test must be performed quickly (in less than 10 seconds) to prevent the coil from burning.

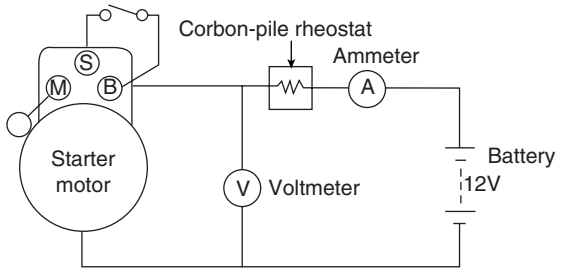
3. Pull out the pinion and then release it. If the pinion returns quickly to its original position, everything is in order. If it doesn't, replace thesolenoid



KBSE203E

PERFORMANCE TEST (NO-LOAD)

1. Make the no-load circuit test as shown.
2. After adjusting the rheostat until the battery voltage shown on the voltmeter reads 11.5 volts, confirm that the maximum amperage draw is within the specifications and that the starter motor turns smoothly and freely.



BBGE005A

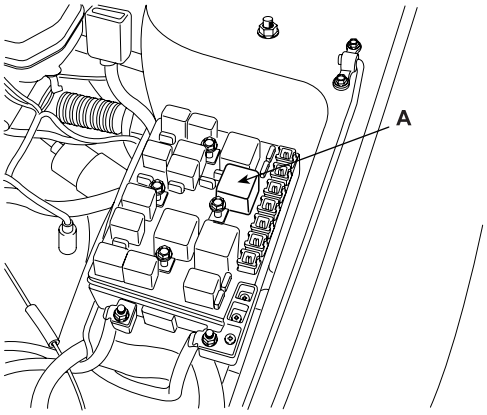
STARTER RELAY

INSPECTION EFFD524E

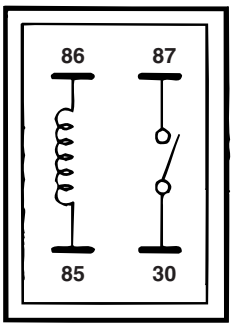
Remove the starter relay(A) and check continuity between the terminals. If the continuity is not as specified, replace the relay.

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

SHDEA6008L



SLDEE7001D



SHDEA6011L

CRUISE CONTROL SYSTEM

TROUBLESHOOTING E268CA73

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

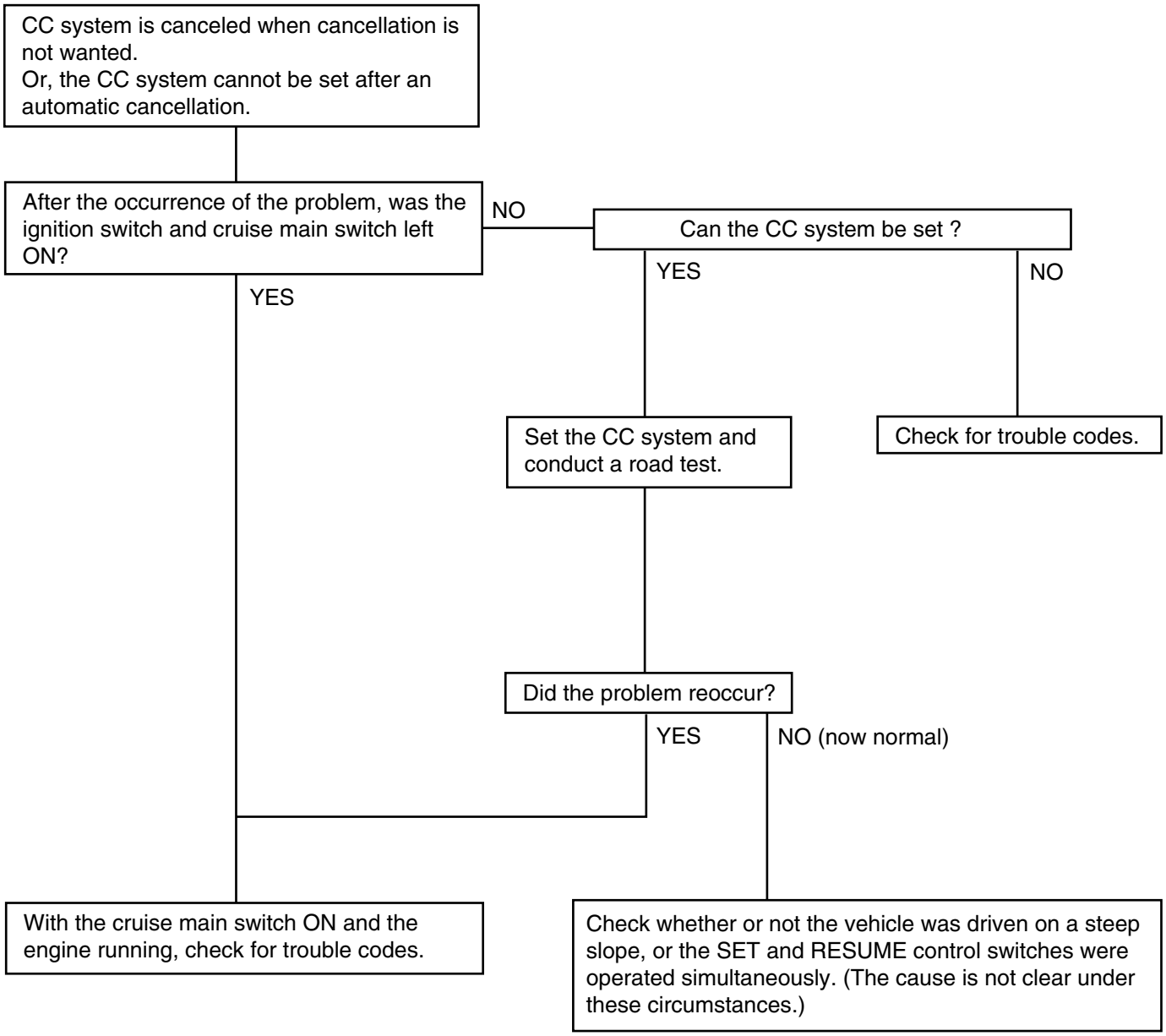
First, select the applicable malfunction symptom from the "TROUBLE SYMPTOM CHARTS" shown on nest pages.

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

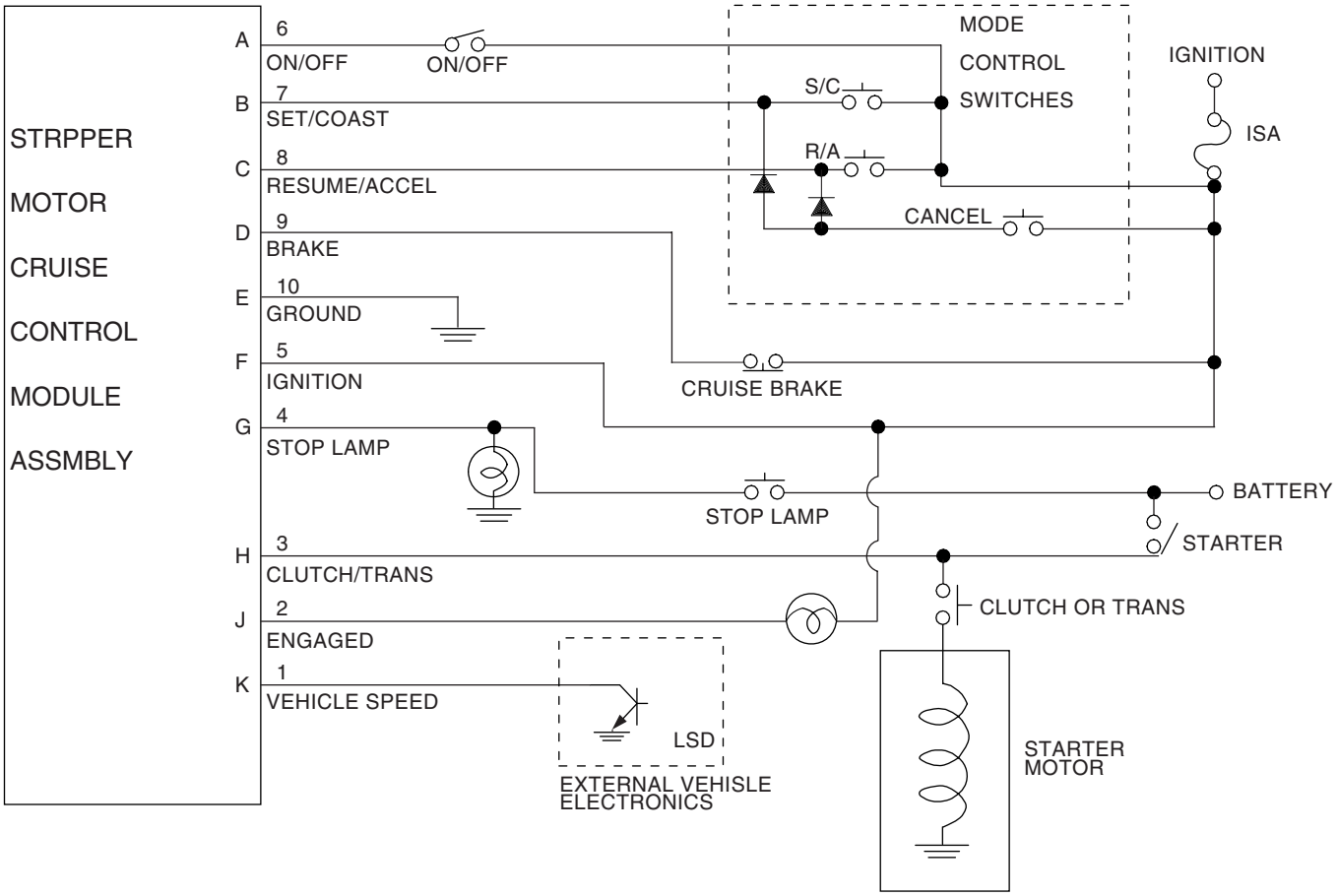
Trouble symptom	Probable cause	Remedy
Malfunction of control function by ON/OFF switching of idle switch	Malfunction of circuit related to idle switch function	Repair the narness or replace the part
	Malfunction of the actuator and unit	

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 E83C405C



PIN LAYOUT	
ON/OFF	A
SET/COAST	B
TESUME/ACCLE	C
BRAKE	D
GROUND	E
IGNITION	F
STOP LAMPS	G
INHIBIT	H
ENGAGED	J
VSS	K

SLDEA7002L

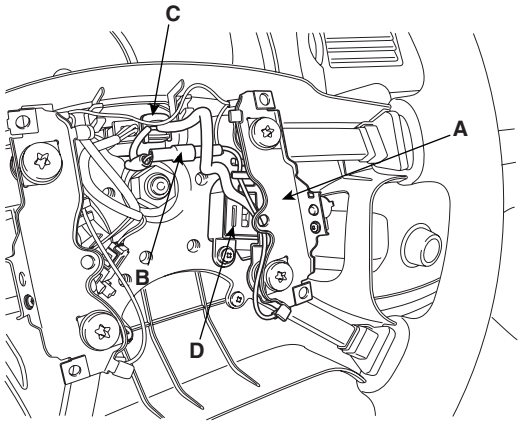
REPLACEMENT E234DBA8

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 accelerator cable from accelerator pedal connection.
3. Remove the accelerator cable counting bolts.
4. Remove the actuator and unit assembly mounting bolt.
5. Installation is the reverse order of removal.

CRUISE CONTROL MAIN SWITCH

REPLACEMENT EAE71ACC

1. Remove the air bag module assembly. (Refer to 'RT','ST' group)
2. Remove the horn pad (A) and the ground line (B).
3. Disconnect the auto cruise control switch conetor (C) and remove the auto cruise main switch (D).

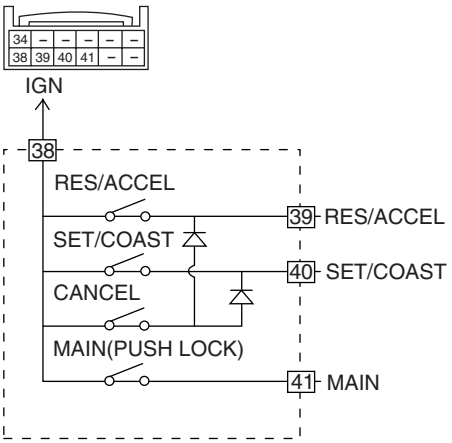


SLDEA7005L

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

INSPECTION EE139CBF

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



SLDEA7003L