

# Engine Electrical System

**GENERAL**

**CHARGING SYSTEM**

ALTERNATOR  
BATTERY

**STARTING SYSTEM**

STARTER  
STARTER RELAY

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# GENERAL

## SPECIFICATION E63F15E2

### STARTING SYSTEM

Items		Specification	
Starter	Rated voltage	12 V, 1.7 kW	
	No. of pinion teeth	8	
	No -load characteristics	Voltage	11V
		Ampere	90A, MAX
		Speed	2,600 r pm, MIN
	Commutator diameter	Standard	29.4 mm (1.1575in.)
		Limit	28.8 mm (1.1339in.)
	Under cut depth	Standard	0.5 mm (0.0197in.)
		Limit	0.2 mm (0.0079in.)

### CHARGING SYSTEM

Items		Specification
Alternator	Type	Battery voltage sensing
	Rate voltage	12 V, 120A
	Speed in use	1,000 ~ 18,000 rpm
	Voltage regulator	Electronic built-in type
	Regulator setting voltage	14.55 ± 0.2V
	Temperature compensation	-7 ± 3mV/ °C
Battery	Type	MF 68AH
	Cold cranking amperage [at -18 C(-0.4 F)]	60 0A
	Reserve capacity	110 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).

**TROUBLE SHOOTING**

E81C5D80

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

**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 connection Replace voltage regulator
Charging warning indicator does not go out with engine running. (Battery requires frequent recharging)	Drive belt loose or worn Battery cable loose, corroded or worn  Fuse blown Electronic voltage regulator or alternator Wiring	Adjust belt tension or replace belt Inspect cable connection, repair or replace cable Check fuses Replace voltage regulator or alternator Repair or replace wiring
Overcharge	Electronic voltage regulator Voltage sensing wire	Replace voltage regulator Repair or replace wiring
Discharge	Drive belt loose or worn Wiring connection loose or short circuit  Fuse blown Electronic voltage regulator or alternator Poor grounding Worn battery	Adjust belt tension or replace belt Inspect wiring connection, repair or replace wiring Check fuses Replace voltage regulator or alternator Inspect ground or repair Replace battery

## CHARGING SYSTEM

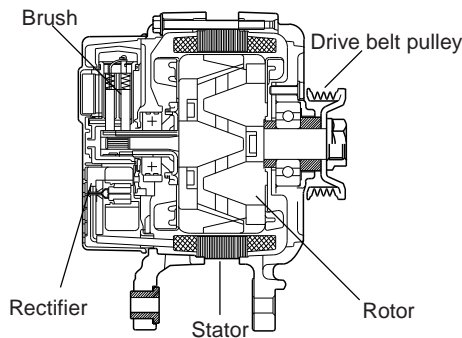
### DESCRIPTION ECD 624A6

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

The Alternator has eight built-in diodes, each rectifying AC current to DC current.

Therefore, DC current appears at alternator "B" terminal. In addition, the charging voltage of this alternator is regulated by the battery voltage detection system.

The alternator is regulated by the battery voltage detection system. The main components of the alternator are the rotor, stator, rectifier, capacitor brushes, bearings and V-ribbed belt pulley. The brush holder contains a built-in electronic voltage regulator.



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### ON-VEHICLE INSPECTION E52DA296

#### CAUTION

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

#### CHECK BATTERY VOLTAGE

1. If 20 minutes have not passed since the engine was stopped, turn the ignition switch on and turn on the electrical system(headlamp, Blower motor, Rear defogger etc.) For 60 seconds to remove the surface charge.
2. Turn the ignition switch OFF and turn off the electrical systems.
3. Measure the battery voltage between the negative(-) And positive(+) terminals of the battery.

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Standard voltage: 12.5~12.9Vat20C(68F)

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If The voltage is less than specification, charge the battery.

#### CHECK THE BATTERY TERMINALS AND FUSES

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

#### VISUALLY CHECK ALTERNATOR WIRING AND LISTEN FOR ABNORMAL NOISES

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

#### CHECK DISCHARGE WARNING LIGHT CIRCUIT

1. Warm up the engine and then turn it off.
2. Turn off all accessories.
3. Turn the ignition switch "ON". Check that the discharge warning light is lit.
4. Start the engine. Check that the light is lit. If the light does not go off as specified, troubleshoot The discharge light circuit.

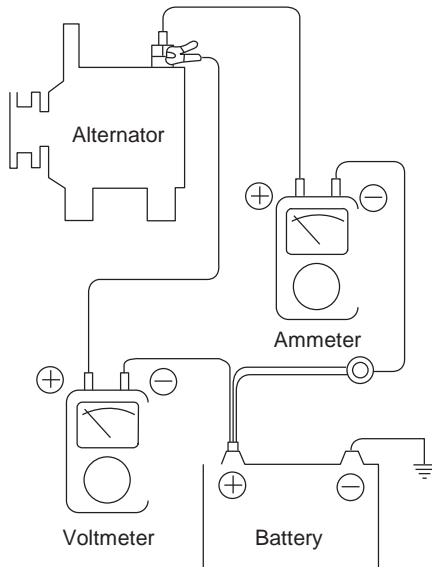
**INSPECT CHARGING SYSTEM**

**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".
2. Disconnect the output wire from the alternator "B" terminal. Connect the (+) lead wire of Am meter to the "B" terminal of alternator and the (-) lead wire of ammeter to the output wire. Connect the (+) lead wire of voltmeter to the "B" terminal Of alternator and the (-) lead wire of volt meter to the (+) terminal of battery.



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**TEST**

1. Start the engine.
2. Turn on the headlamps and blower motor, and set the engine speed until the ammeter indicates 20A. And then, read the volt meter at this time.

**RESULT**

1. The voltmeter may indicate the standard value.

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Standard value: 0.2Vmax

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2. If the value of the volt meter is higher than expected (above 0.2V max.), Poor wiring is suspected. In this case check the wiring from the alternator "B" terminal to the battery (+) terminal. Check for loose connections, color change due to an over-heated harness, etc. Correct them before testing again.
3. Upon completion of the test, set the engine speed at idle. Turn off the headlamps, 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 normal output.

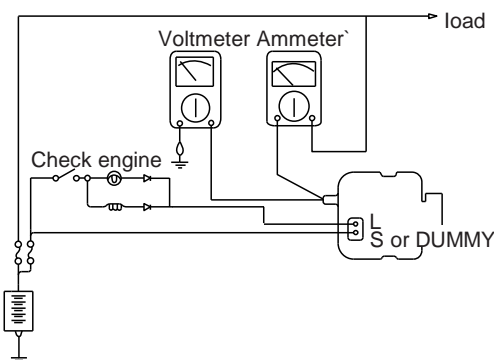
### PREPARATION

1. Prior to the test, check the following items and correct as necessary.  
Check the battery in stalled in the vehicle to ensure that it is good condition. The battery checking method is described in the section "Battery".  
The battery that is used to test the output current should be one that has been partially discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.  
Check the tension of the alternator drive belt. The belt tension check method is described in the section "Inspect drive belt".
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 (0to150A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the am meter 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 (0to20V) 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.



## TEST

1. Check to see that the volt meter reads as the same value as the battery voltage. If the volt meter reads 0V, and the open circuit in the wire between alternator "B" terminal and battery (-) terminal or poor grounding is suspected.
2. Start the engine and turn on the headlamps.
3. Set the head lamps 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 am meter.

### NOTE

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

## RESULT

1. The am meter 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.

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Limit value( 120A alternator): 84Amin.

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### NOTE

- The nominal output current value is shown on the name plate affixed to the alternator body.
- The output current value change with the electrical load and the temperature of the alternator itself.

*Therefore, the nominal output current may not be obtained. If such is the case, keep the headlamps on the cause discharge of the battery, or use the lights of another vehicle to increase the electrical load.*

*The nominal output current may not be obtained if the temperature of the alternator it self or ambient temperature is too high. In such a case, reduce the temperature before testing again.*

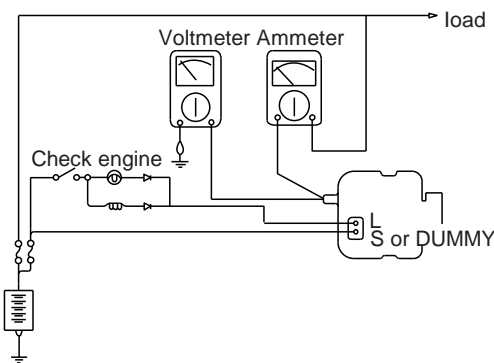
2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the am meter and volt meter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the 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. The battery checking method is described in the section "Battery".  
Check the alternator drive belt tension. The belt tension check method is described in the section "Inspect drive belt".
2. Turn ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Connect a digital volt meter between the "B" terminal of the alternator and ground. Connect the (+) lead of the volt meter 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 am meter (0to150A) in series between the "B" terminal and the disconnected out put wire. Connect the (-) lead wire of the am meter to the disconnected out put 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 volt meter indicates the following value.

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Voltage: Battery voltage

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If it reads 0V, there is an open circuit in the wire between the alternator "B" terminal and the battery and the battery (-) terminal.

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 volt meter when the alternator output current drops to 10 A or less

**RESULT**

1. If the volt meter 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**

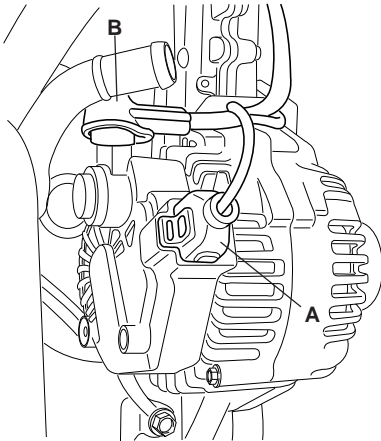
Voltage regulator ambient temperature °C(F)	Regulating voltage(V)
-20(-4)	14.2~15.4
20(68)	14.0~15.0
60(140)	13.7~14.9
80(176)	13.5~14.7

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 am meter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

## ALTERNATOR

### REPLACEMENT E32558EE

1. Disconnect the battery negative terminal first, then the positive terminal.
2. Disconnect the alternator connector (A), and remove the cable (B) from alternator "B" terminal.



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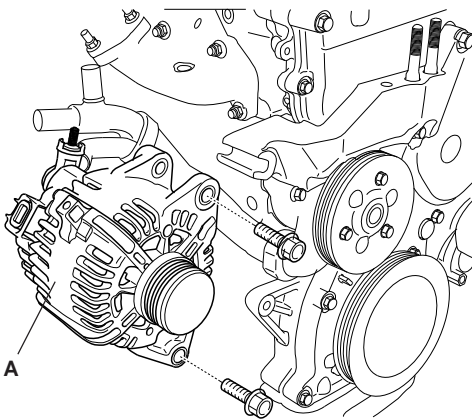
3. Remove the alternator (A).

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Tightening torque:

38.2~58.8N.m (3.9~6.0kgf.m, 28.2~43.4lbf.ft)

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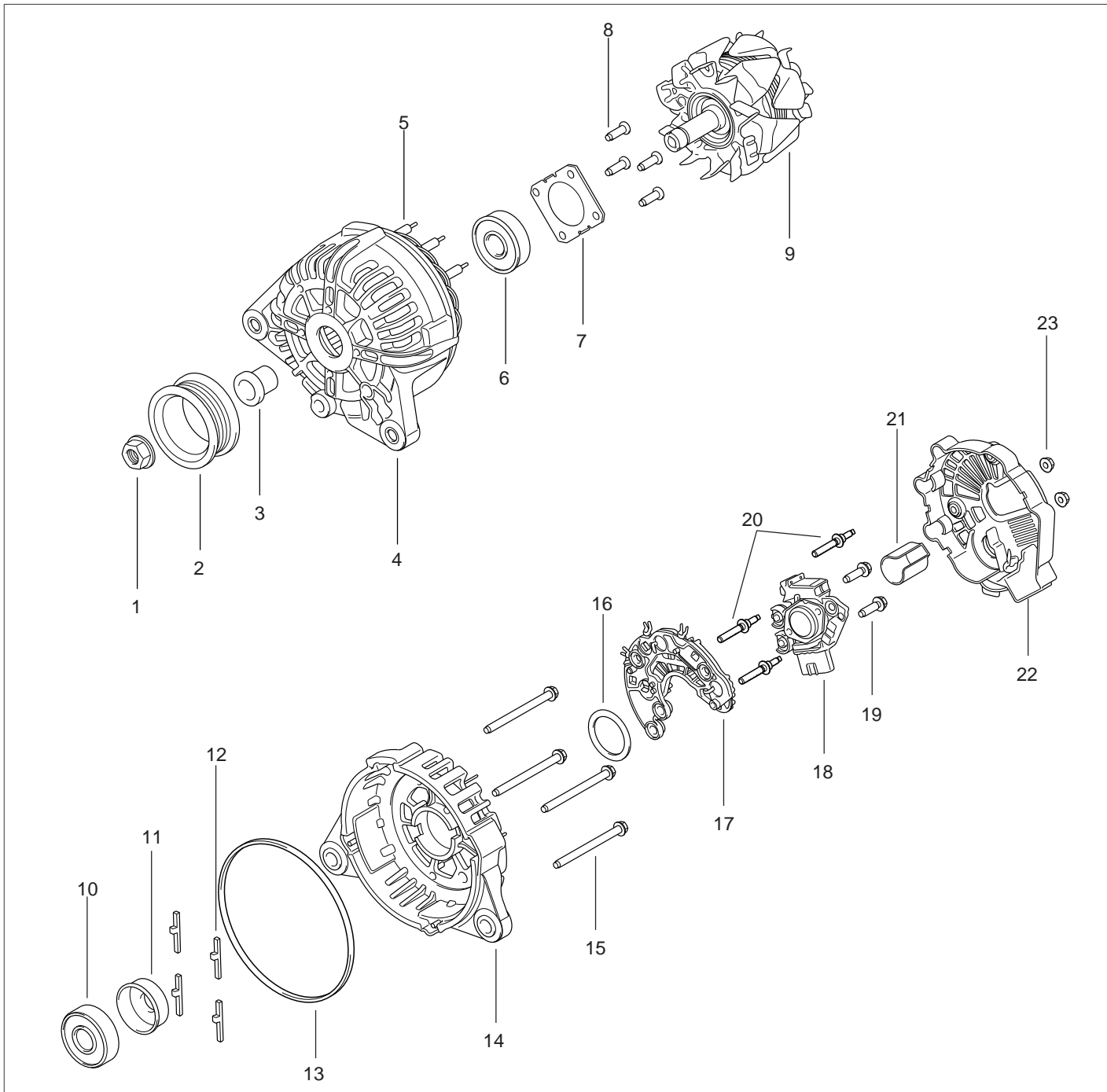


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4. Installation is the reverse order of removal.



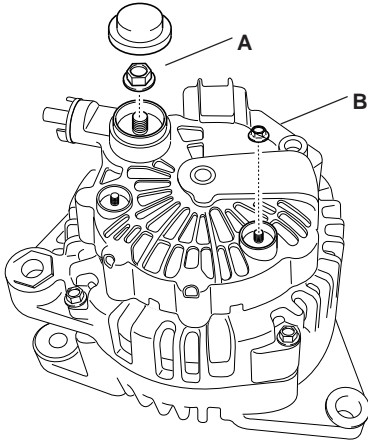
COMPONENT EBE188A8



- |                             |                        |                           |
|-----------------------------|------------------------|---------------------------|
| 1. Nut                      | 9. Rotor coil          | 17. Rectifier assembly    |
| 2. Pulley                   | 10. Rear bearing       | 18. Brush holder assembly |
| 3. Bushing                  | 11. Rear bearing cover | 19. Brush holder bolt     |
| 4. Front cover assembly     | 12. Damper             | 20. Stud bolt             |
| 5. Stator coil              | 13. Packing            | 21. Guard                 |
| 6. Front bearing            | 14. Rear cover         | 22. Cover                 |
| 7. Front bearing cover      | 15. Through bolt       | 23. Cover nut             |
| 8. Front bearing cover bolt | 16. Seal               |                           |

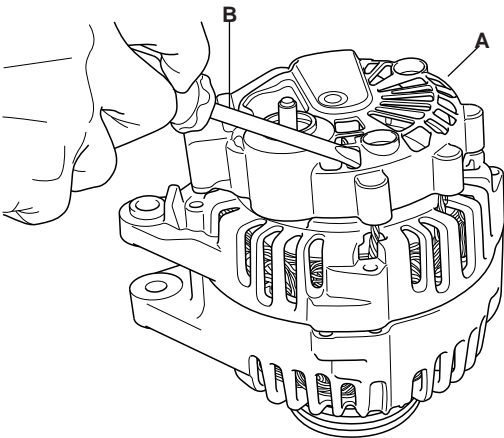
**DISASSEMBLY** EE5DAE6A

1. Remove the B terminal mounting nut (A) and rear cover nut (B).



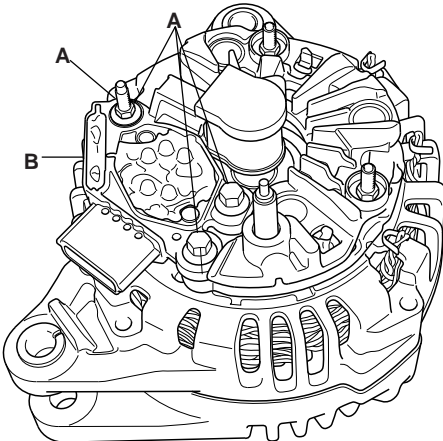
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2. Remove the alternator cover(A) using a screw driver (B).



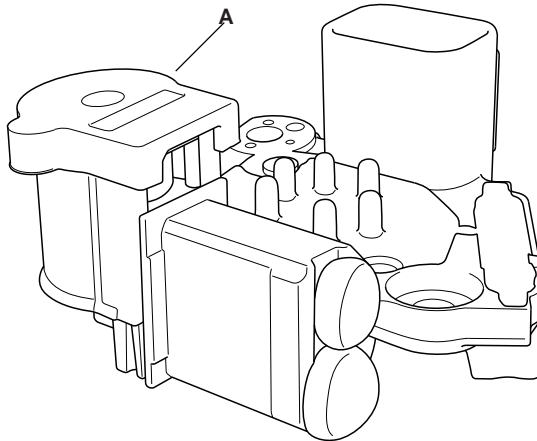
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3. Loosen the mounting bolts (A) and disconnect the brush holder assembly (B).



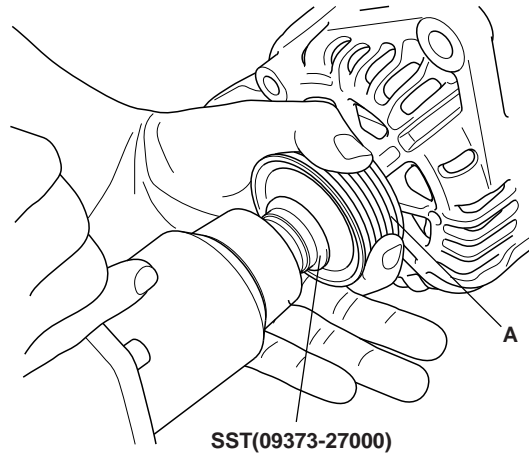
LBGF004A

4. Remove the slip ring guide (A).



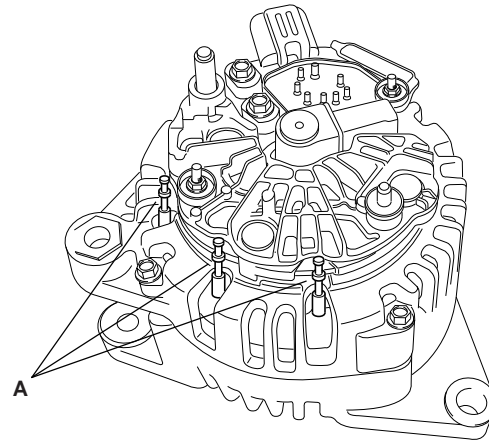
LBGF005A

5. Remove the pulley (A) using the special tool.



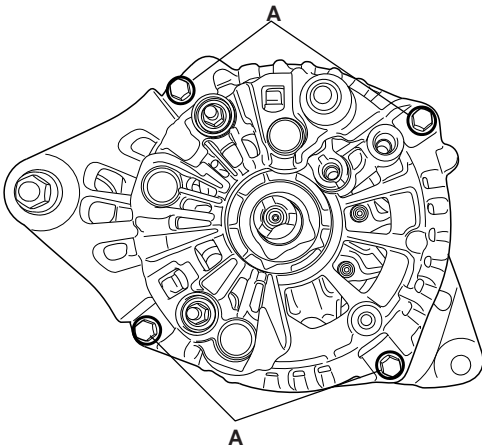
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6. Unsolder the 3 stator leads (A).



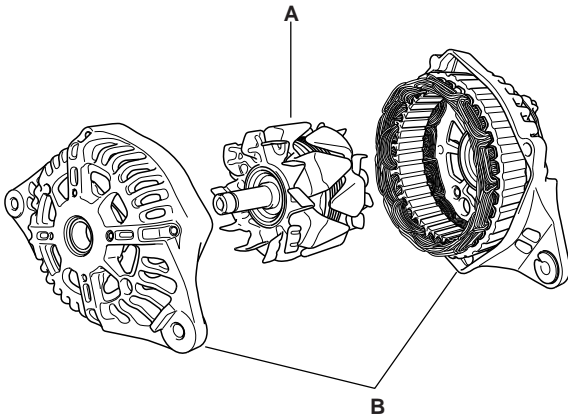
LCGF121A

- Loosen the 4 through bolts (A).



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



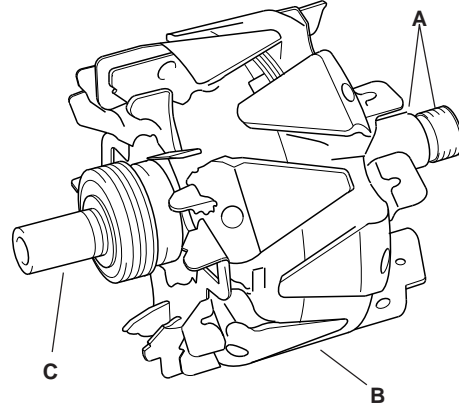
LBGF008A

- Reassembly is the reverse order of disassembly.

**INSPECTION** E1D4E7FD

**INSPECT ROTOR**

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

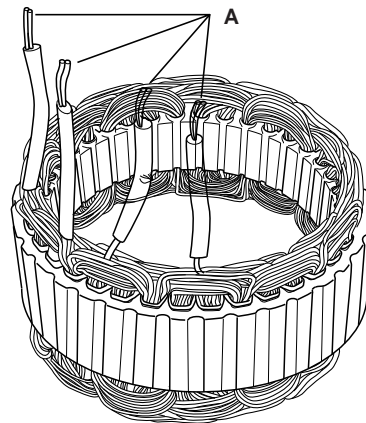


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- Check that there is no continuity between the slip rings and the rotor (B) or rotor shaft (C).
- If the rotor fails either continuity check, replace the alternator.

**INSPECT STATOR**

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



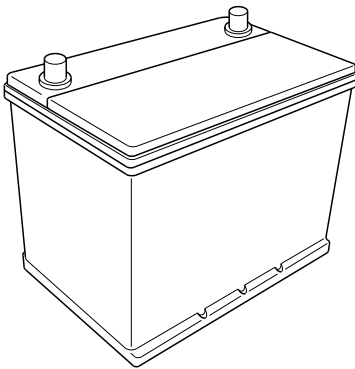
LBGF010A

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

## BATTERY

### DESCRIPTION EF8FBD2E

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.

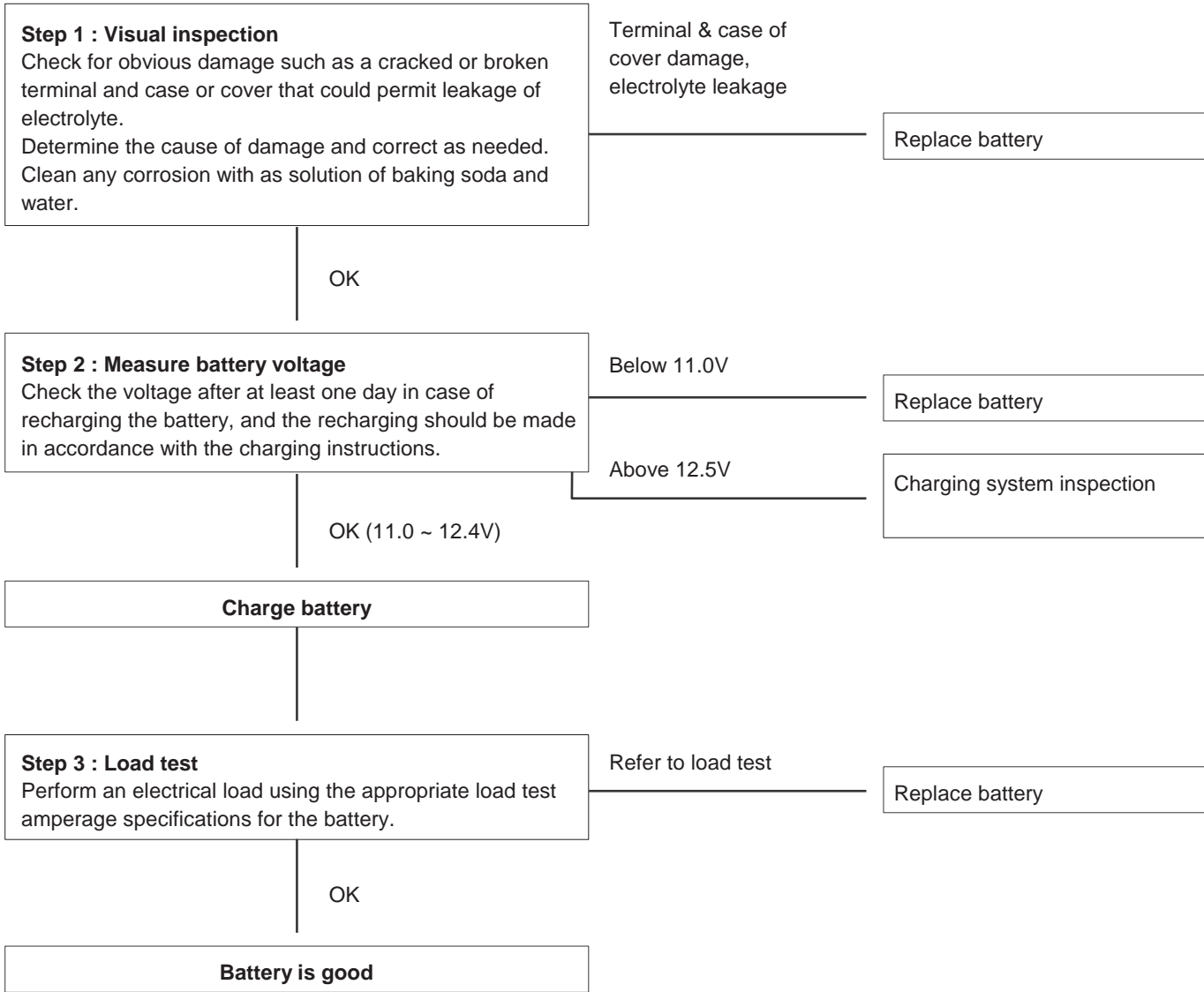


EBJD008A

**INSPECTION** EC7F1CDF

**BATTERY DIAGNOSTIC TEST (1)**

**CHECKING FLOW**



## LOADTEST

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 300 ampere 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.

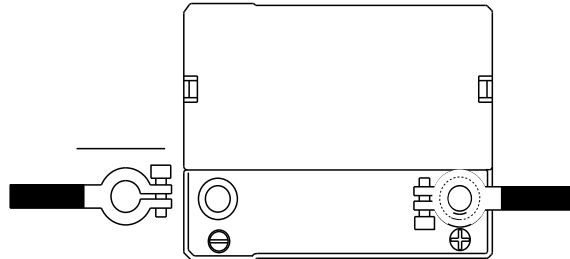
## BATTERY DIAGNOSTIC TEST (2)

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 house hold type) should be wore when removing the battery.**



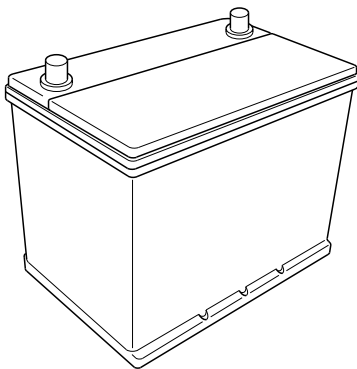
EBJD008B

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 in side surface of the terminal clamps with a suitable battery cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
9. Install the battery in the vehicle.
10. Connect the cable terminals to the battery post, making sure tops of the terminals are flush with the tops of the posts.

11. Tighten the terminal nuts securely.
12. Coat all connections with light mineral grease after tightening.

 **CAUTION**

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

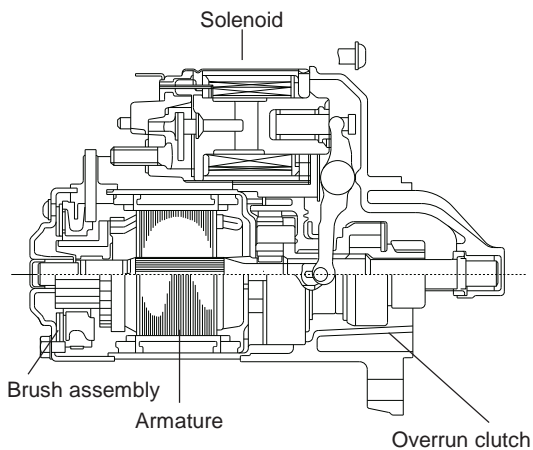


EBJD008A

# STARTING SYSTEM

## DESCRIPTION E6CD00C1

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



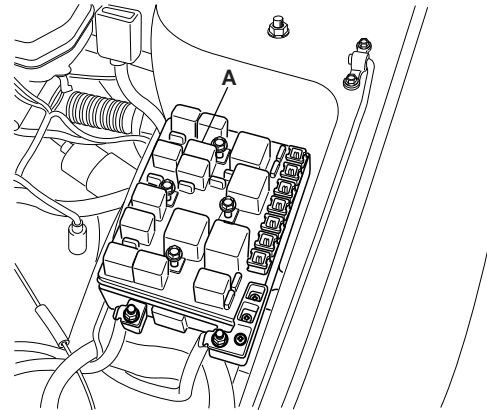
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## STARTER CIRCUIT TROUBLE SHOOTING E9CCB56A

### NOTE

*The battery must be in good condition and fully charged.*

1. Remove the fuel pump relay from the fuse box.



ABGE002A

2. With the shift lever in Nor P(A/T) or clutch pedal pressed (M/T), turn the ignition switch to "START"

If the starter normally cranks the engine, starting system is OK. If the starter will not crank the engine at all, go to next step.

If it won't disengage from the ring gear when you release key, check for the following until you find the cause.

- Solenoid plunger and switch malfunction.
- Dirty pinion gear or damaged over running clutch.

3. Check the battery condition. Check electrical connections at the battery, battery negative cable connected to the body, engine ground cables, and the starter for looseness and corrosion. Then try starting the engine again.

If the starter cranks normally the engine, repairing the loose connection repaired the problem. The starting system is now OK.

If the starter still does not crank the engine, go to next step.

4. Disconnect the connector from the S-terminal of solenoid. Connect a jumper wire from the B-terminal of solenoid to the S-terminal of solenoid.

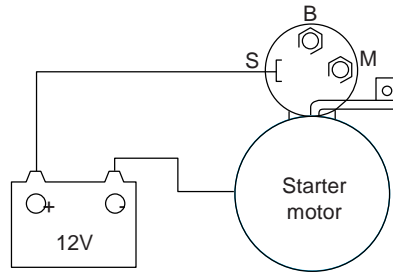
If the starter cranks the engine, go to next step. If the starter still does not crank the engine, remove the starter, and repair or replace as necessary.



5. Check the following items in the order listed until you find the open circuit.
  - Check the wire and connectors between the driver's under-dash fuse/relay box and the ignition switch, and between the driver's under-dash fuse/relay box and the starter.
  - Check the ignition switch (Refer to BE group-ignition system)
  - Check the trans axle range switch connector or ignition lock switch connector.
  - Inspect the starter relay.

**STATER SOLENOID TEST**

1. Disconnect the field coil wire from the M-terminal of solenoid switch.
2. Connect a 12V battery between S-terminal and the starter body.



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3. Connect the field coil wire to the M-terminal.

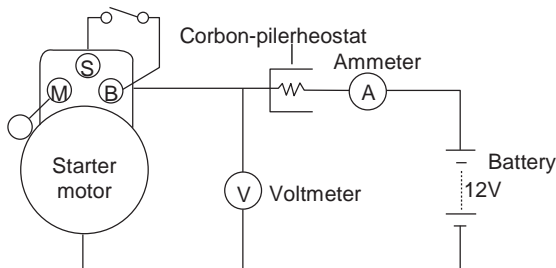
**⚠ CAUTION**

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

4. If the pinion moves out, the pull-incoil of solenoid is working properly.  
If the pinion does not move, replace the solenoid.
5. Diconnect the field coil wire from the M-terminal.
6. If the pinion has moved out, the hold-incoil of the solenoid is working properly.  
If the pinion moves in, replace the solenoid.

## FREE RUNNING TEST

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



BBGE005A

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.

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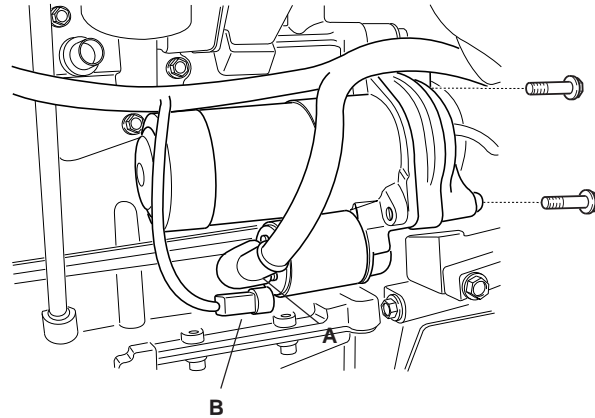
Current : 90Amax  
Speed: 2,600rpm

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## STARTER

## REPLACEMENT EFC90D5C

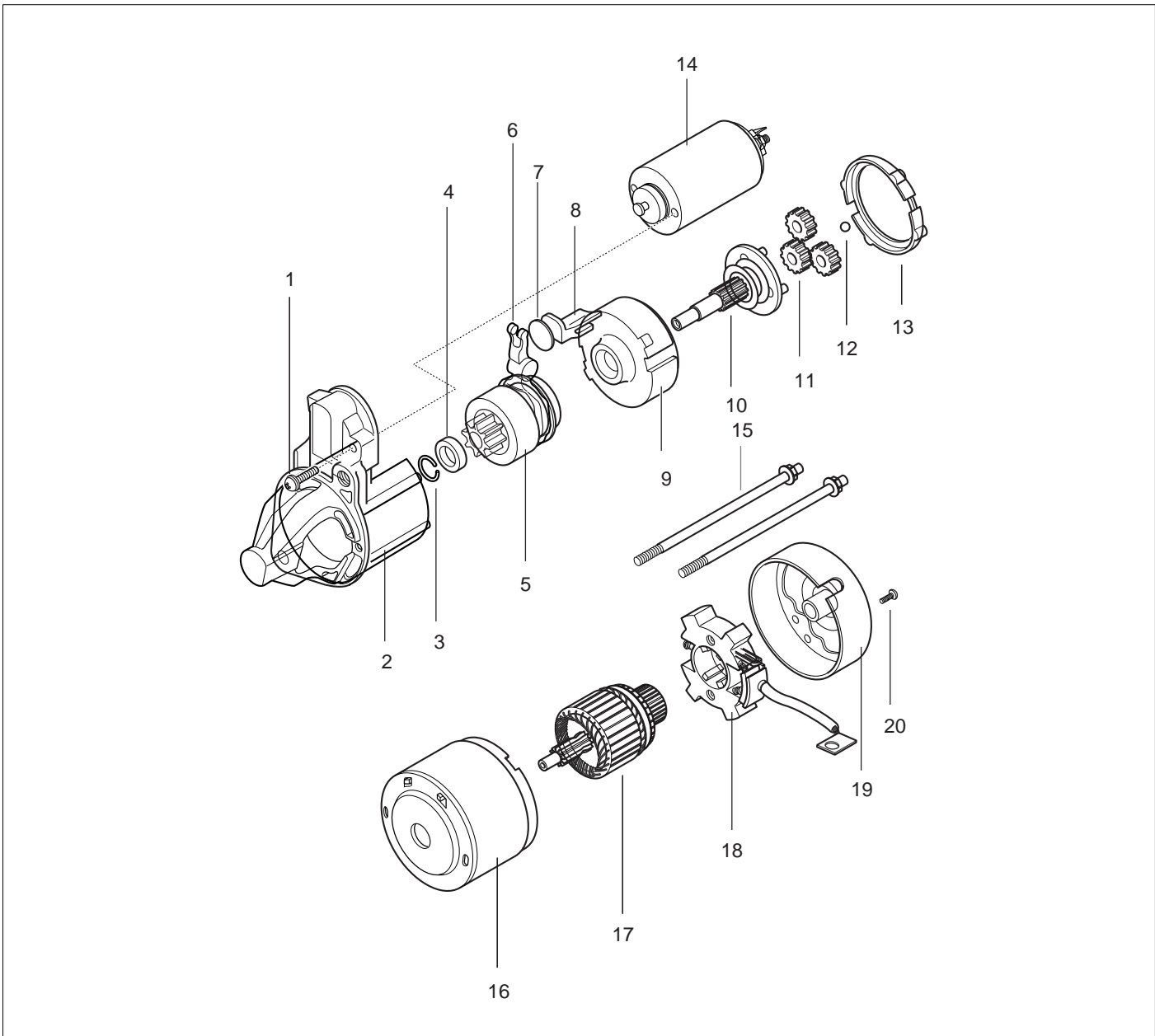
1. Disconnect the battery negative cable.
2. Disconnect the starter cable (A) from the B terminal on the solenoid then disconnect the connector (B) from the S terminal.



LCGF122A

3. Remove the 2 bolts holding the starter, then remove the starter.
4. Installation is the reverse of removal.
5. Connect the battery negative cable to the battery.

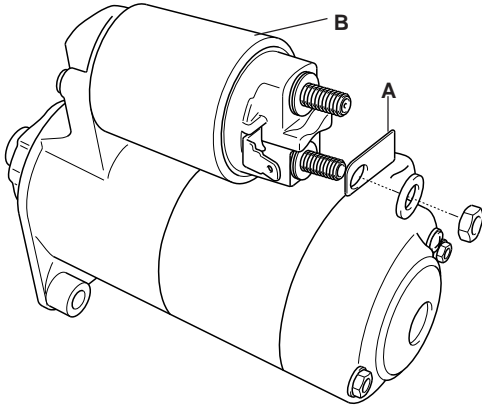
COMPONENT E9B18E5C



- |                            |                             |
|----------------------------|-----------------------------|
| 1. Screw                   | 11. Planetary gear assembly |
| 2. Front bracket assembly  | 12. Steel ball              |
| 3. Stop ring               | 13. Packing                 |
| 4. Stopper                 | 14. Magnet switch assembly  |
| 5. Overrun clutch assembly | 15. Through bolt            |
| 6. Lever                   | 16. Yoke assembly           |
| 7. Plate                   | 17. Armature assembly       |
| 8. Lever packing           | 18. Brush holder assembly   |
| 9. Internal gear assembly  | 19. Rear bracket            |
| 10. Planet shaft assembly  | 20. Screw                   |

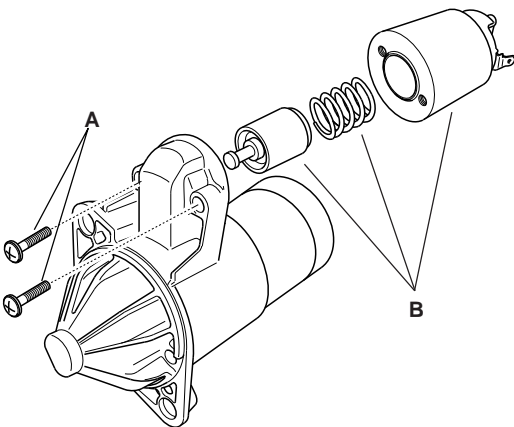
**DISASSEMBLY** E3BDCF91

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



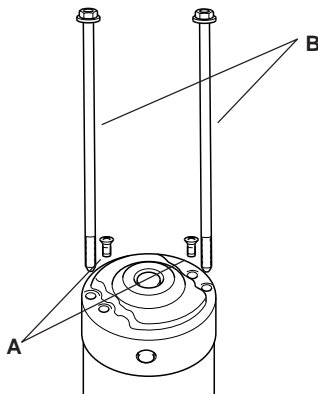
LBGF014A

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



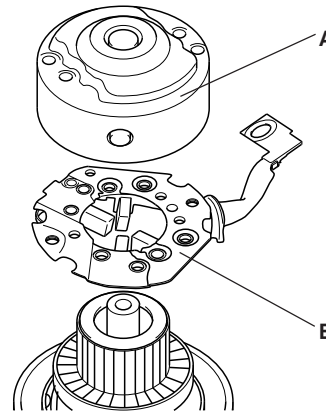
LBGF015A

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



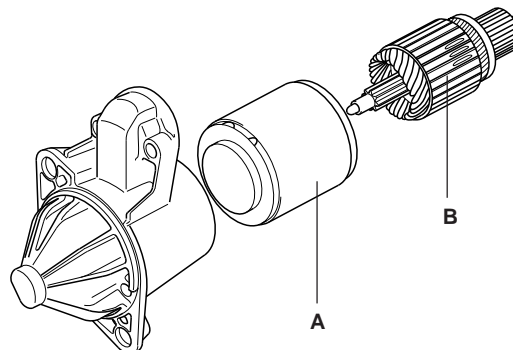
LBGF016A

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



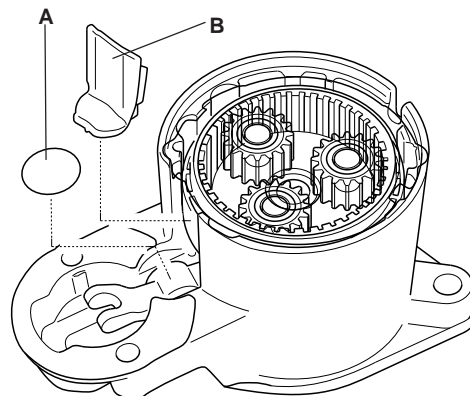
LBGF017A

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



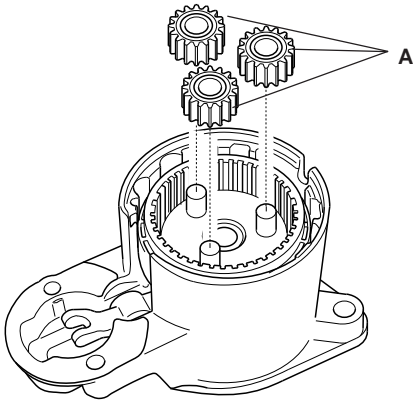
LBGF018A

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



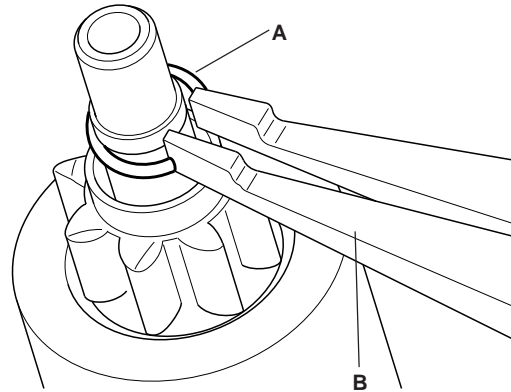
LBGF019A

7. Disconnect the planet gear (A).



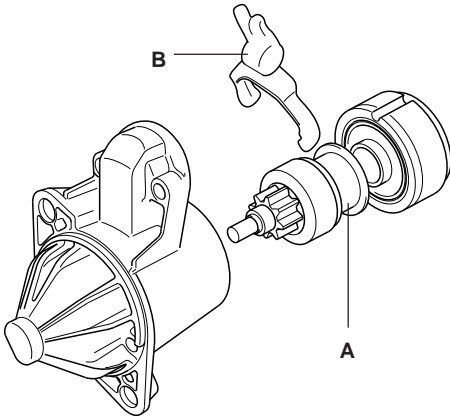
LBGF020A

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



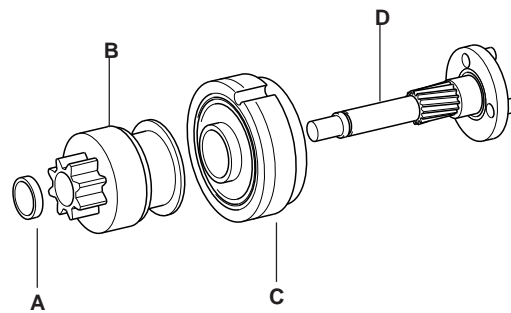
LBGF023A

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



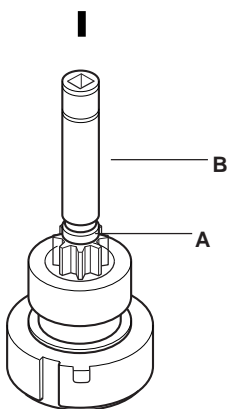
LBGF021A

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



LBGF024A

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

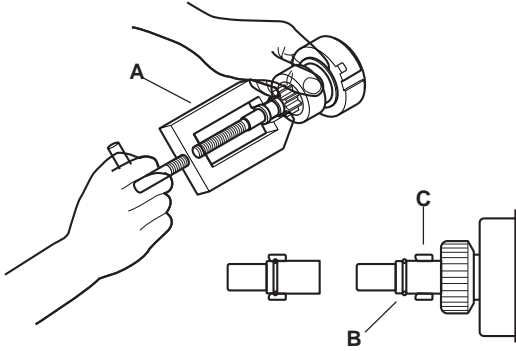


LBGF022A

12. Re assembly is the reverse of dis assembly.

**NOTE**

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

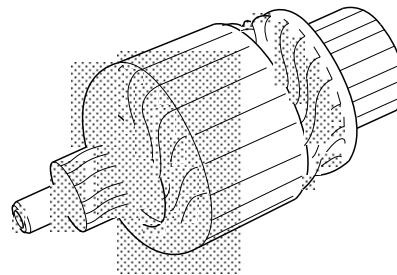


LBGF025A

**INSPECTION** EB74B9B5

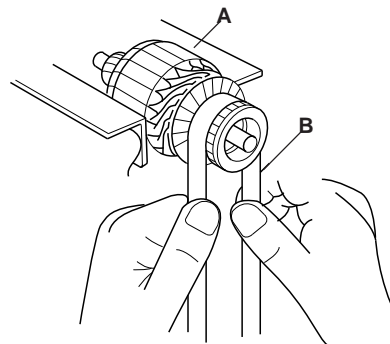
**ARMATURE IN SPECTION AND TEST**

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.



LBGF026A

4. Check the commutator (A) surface. If the surface is dirty or burnt, re surface with emery cloth or a lathe with in the following specifications, or recondition with #500 or #600 sand paper (B).



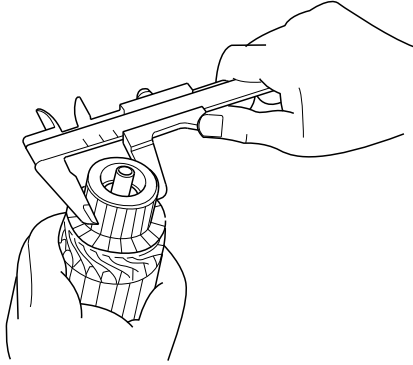
LBGF027A

5. Check the commutator diameter. If the diameter is below the service limit, replace the armature.

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Commutator diameter  
 Standard (New): 29.4mm (1.1575in)  
 Service limit: 28.8mm (1.1339in)

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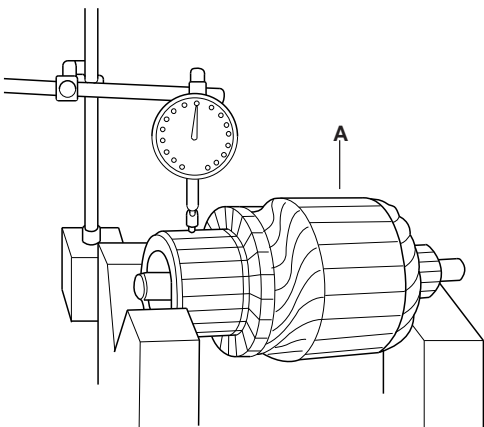
LBGF028A

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

---

Commutator run out  
 Standard (New): 0.02mm (0.0008in.) max  
 Service limit: 0.05mm(0.0020in.)

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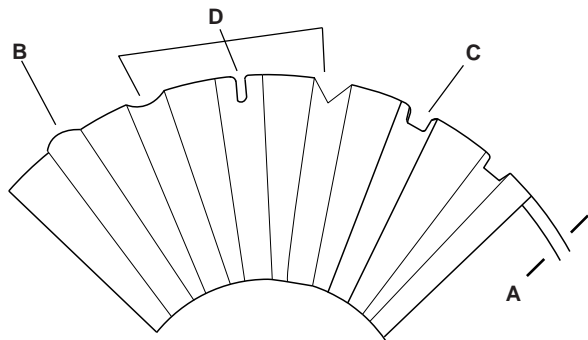
LBGF029A

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

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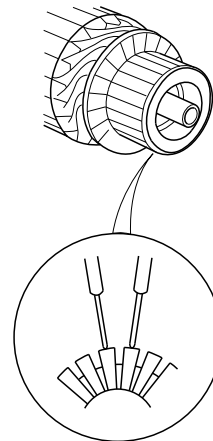
Commutator mica depth  
 Standard (New): 0.5mm (0.0197in.)  
 Limit : 0.2mm (0.0079in.)

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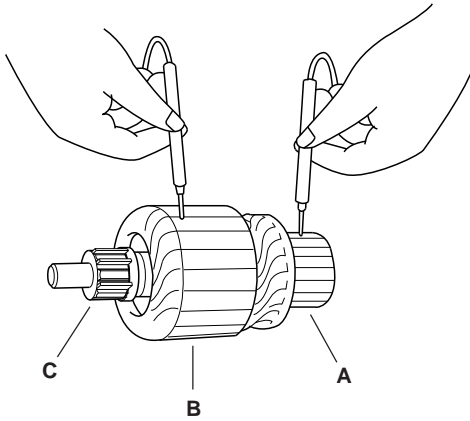
LBGF030A

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



LBGF031A

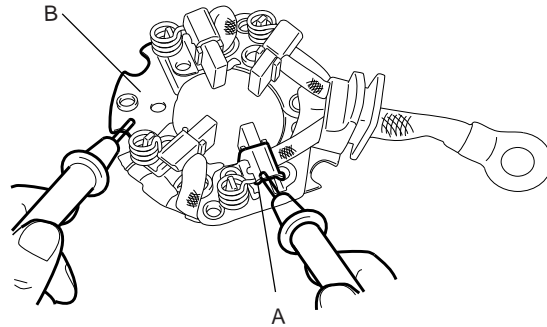
9. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.



LBGF032A

**STARTER BRUSH HOLDER TEST**

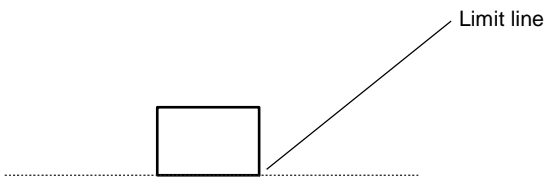
Check that there is no continuity between the (+) brush holder (A) and (-) brush holder (B). If there is no continuity, replace the brush holder assembly.



EBBD330A

**INSPECT STARTER BRUSH**

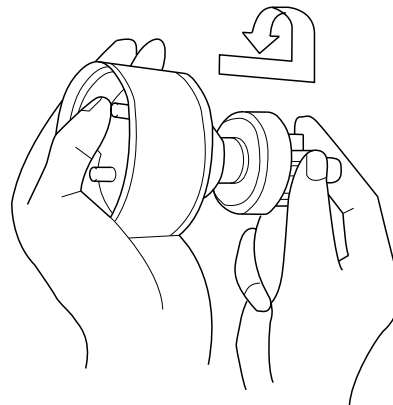
Brushes that are worn out, or oil-soaked, should be replaced.



LBGF033A

**INSPECT OVER RUNNING CLUTCH**

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



LBGF034A

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