

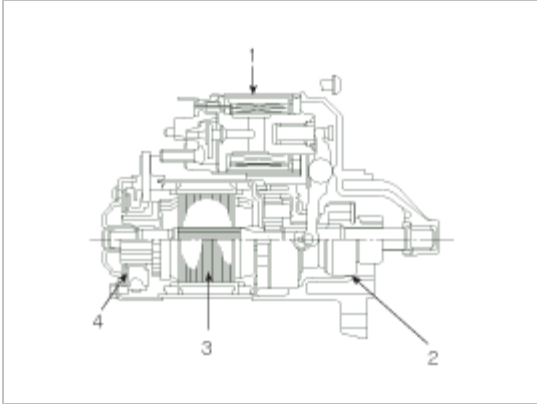
## **Description**

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

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

The solenoid plunger and clutch shift lever are activated, and the clutch pinion engages the ring gear.

The contacts close and the starter motor cranks. In order to prevent damage caused by excessive rotation of the starter armature when the engine starts, the clutch pinion gear overruns.



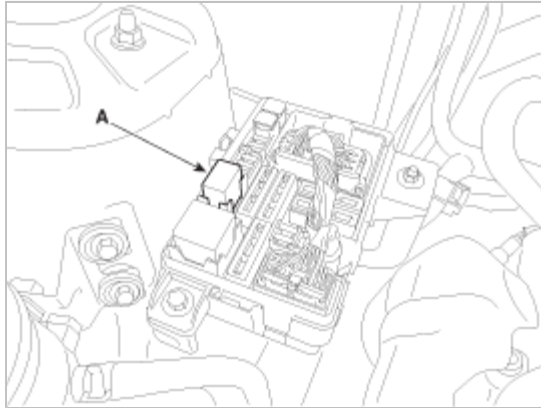
1. Solenoid
2. Overrun clutch
3. Armature
4. Brush assembly

## Starter Circuit Troubleshooting

### NOTE

The battery must be in good condition and fully charged.

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



2. With the shift lever in N or P (A/T) or clutch pedal pressed (M/T), turn the ignition switch to "START"  
If the starter normally cranks the engine, starting system is OK. If the starter will not crank the engine at all, go to next step.  
If it won't disengage from the ring gear when you release key, check for the following until you find the cause.  
A. Solenoid plunger and switch malfunction.  
B. Dirty pinion gear or damaged overrunning clutch.
3. Check the battery condition. Check electrical connections at the battery, battery negative cable connected to the body, engine ground cables, and the starter for looseness and corrosion. Then try starting the engine again.  
If the starter cranks 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.

### NOTE

Ensure that the automatic transmission is in a park or the manual transmission is a neutral in the parking brake is set.

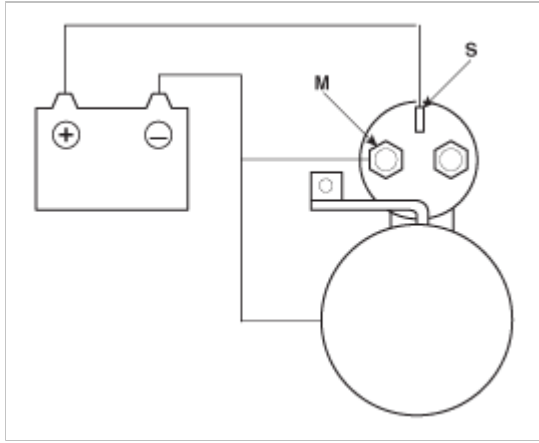
If the starter cranks the engine, go to next step.

If the starter still does not crank the engine, remove the starter, and repair or replace as necessary.

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

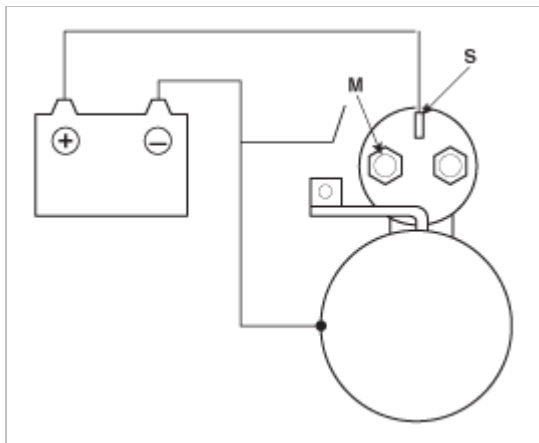
## Starter Solenoid Test

1. Disconnect the field coil wire from the M-terminal of solenoid switch.
2. Connect the battery as shown. If the starter pinion pops out, it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.

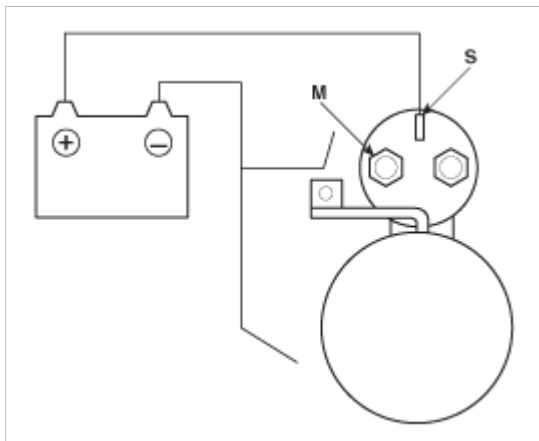


3. Disconnect the battery from the M terminal.

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

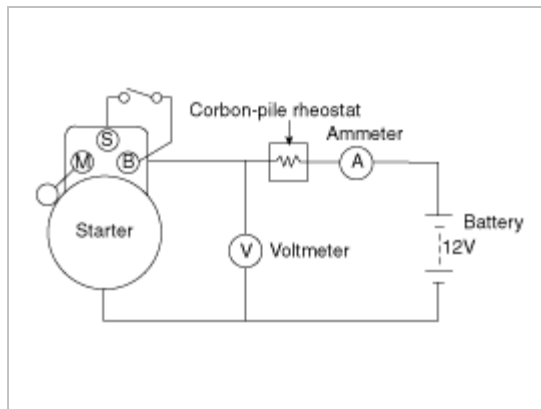


4. Disconnect the battery also from the body. If the pinion retracts immediately, it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



## Free Running Test

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



4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the starter motor body.
6. Adjust until battery voltage shown on the voltmeter reads 11.5volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

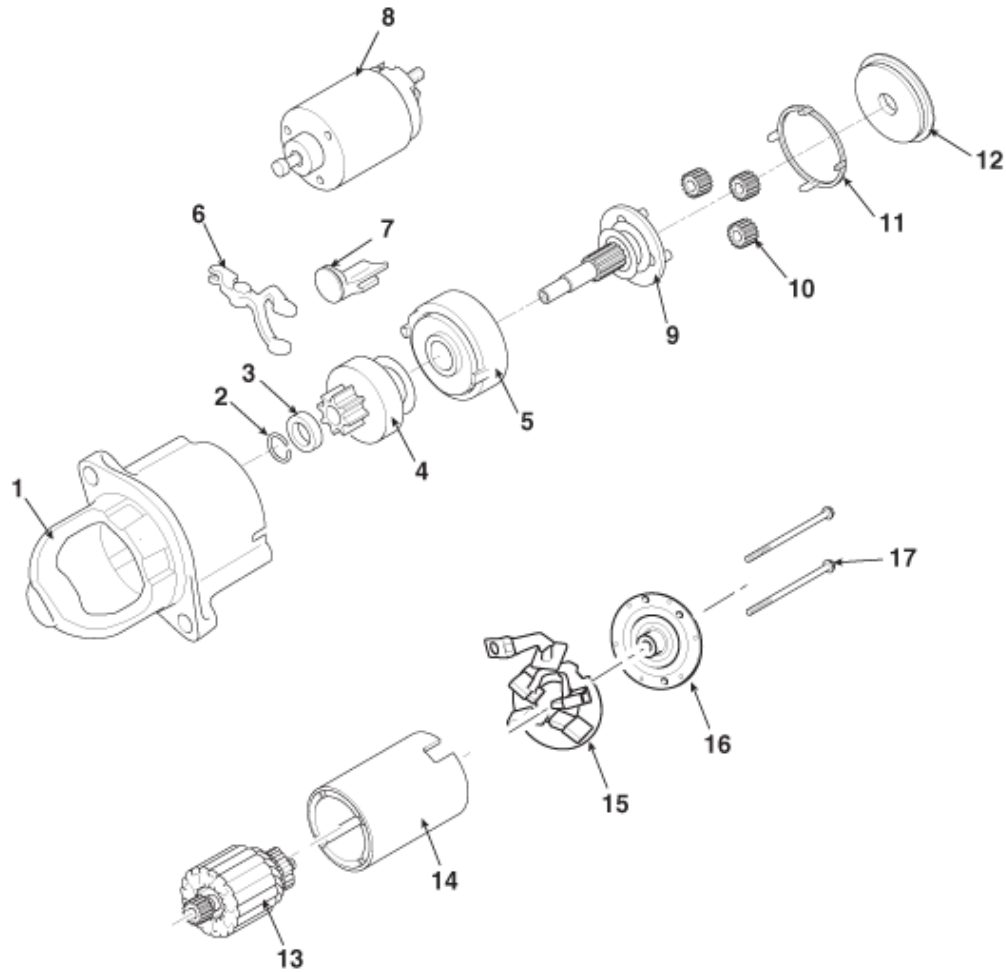
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**Current :** 90A max

**Speed :** 2,600 rpm

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## Component



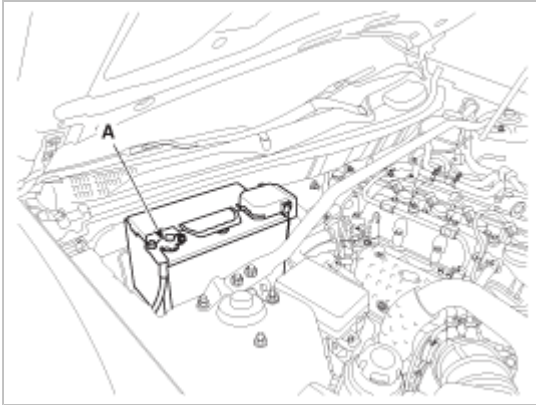
1. Front bracket
2. Stop ring
3. Stopper
4. Overrun clutch assembly
5. Internal gear assembly
6. Lever
7. Lever packing
8. Magnet switch assembly

9. Planet shaft assembly
10. Planetary gear assembly
11. Packing
12. Shield
13. Armature assembly
14. Yoke assembly
15. Brush holder assembly
16. Rear bracket
17. Through bolt

## Starter

### Removal

1. Disconnect the battery negative cable(A).



2. Set the jack under the engine oil pan.

#### NOTE

Insert the rubber block between engine oil pan and jack to prevent the damage of oil pan.

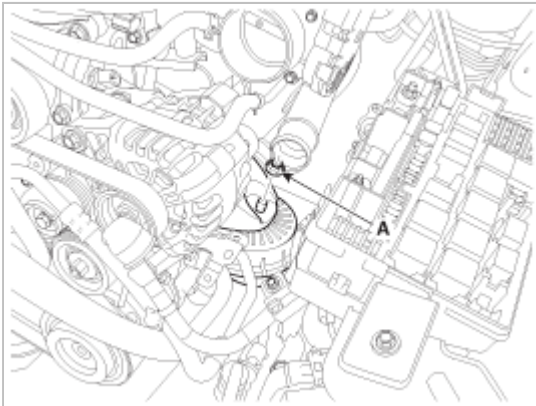
3. Remove the LH engine mounting bracket nut (A).

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#### Tightening torque :

63.7 ~ 83.4 N.m (6.5 ~ 8.5 kgf.m, 47.0 ~ 61.5 lb-ft)

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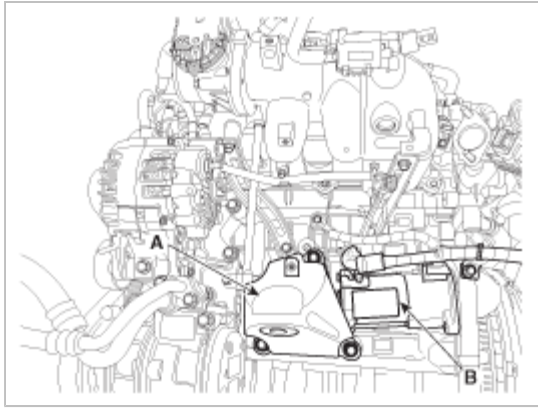
4. Lift up the engine assembly slightly by using a jack to get access to the side of engine.
5. Remove the engine support bracket (A). And then remove cable and connector from starter (B).

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#### Tightening torque :

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

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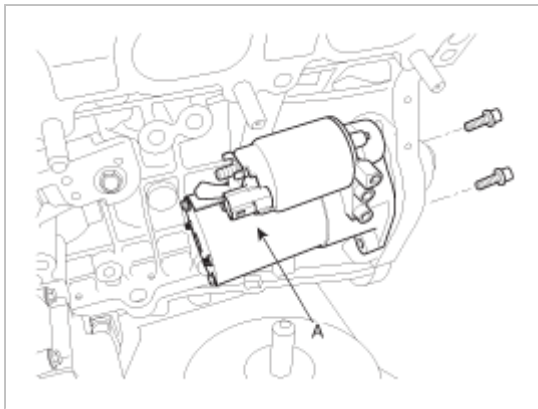
6. Remove the bolts and starter (A).

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**Tightening torque :**

42.1 ~ 53.9 N.m (4.3 ~ 5.5 kgf.m, 31.1 ~ 39.7 lb-ft)

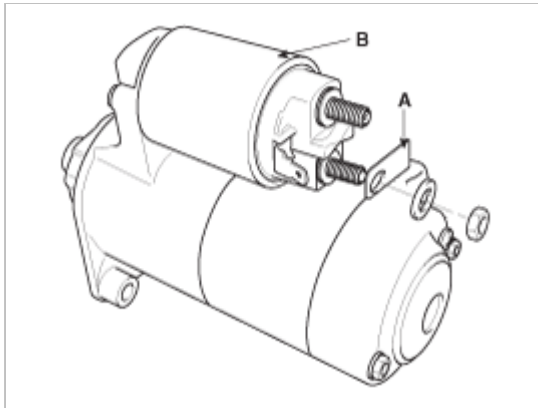
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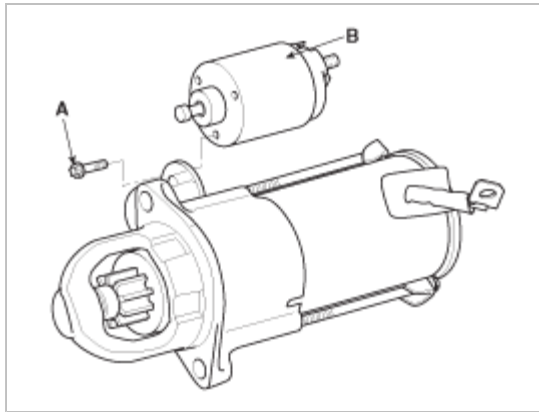
7. Installation is the reverse of removal.

**Disassembly**

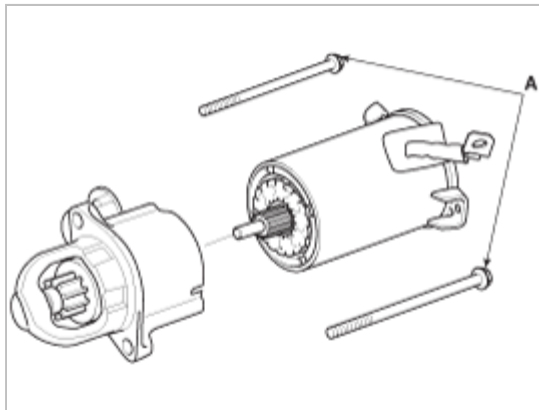
1. Disconnect the M-terminal (A) on the magnet switch assembly (B).



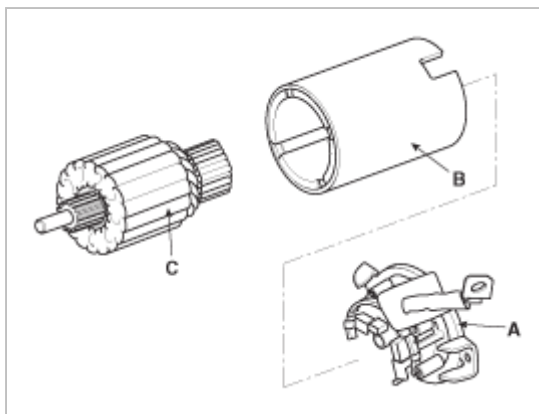
2. After loosening the 3 screws (A), detach the magnet switch assembly (B).



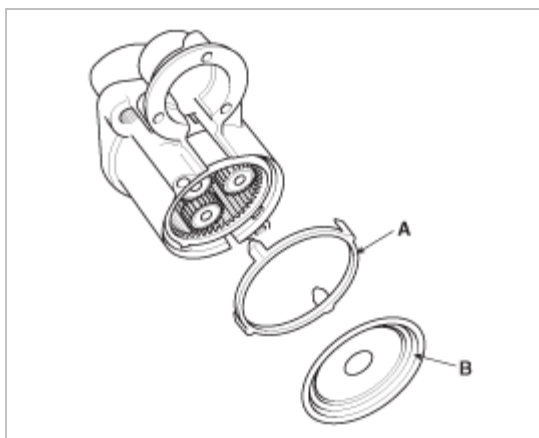
3. Loosen the through bolts (A).



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

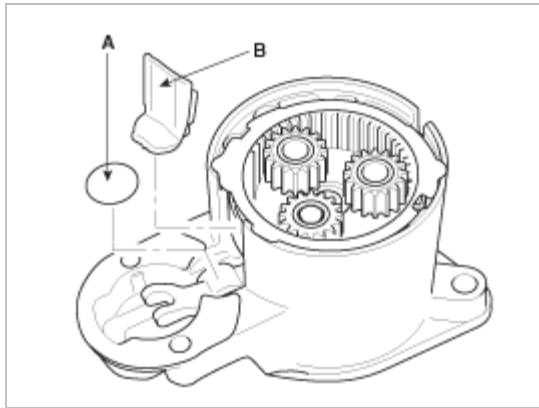


5. Remove the shield (A) and packing (B).

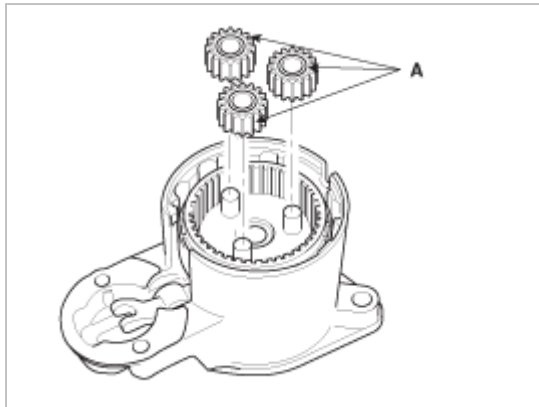


6. Remove the lever plate (A) and lever packing (B).

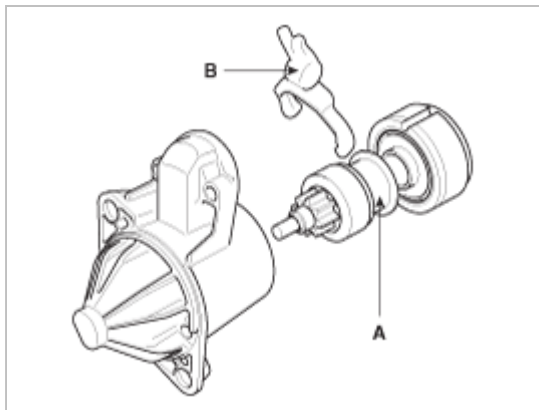




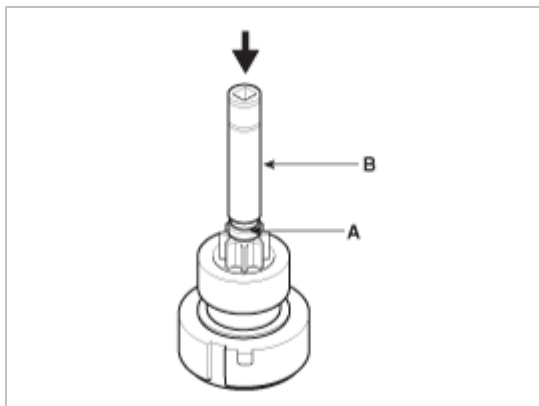
7. Disconnect the planet gear (A).



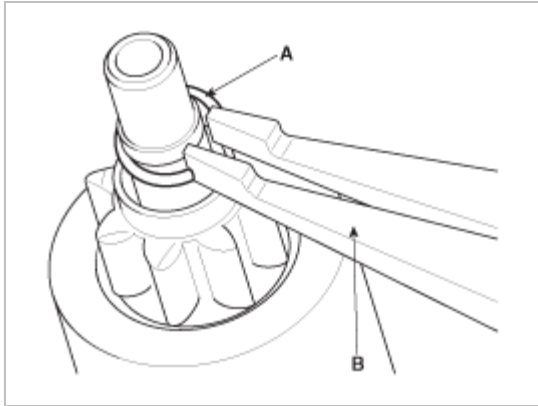
8. Disconnect the planet shaft assembly (A) and lever (B).



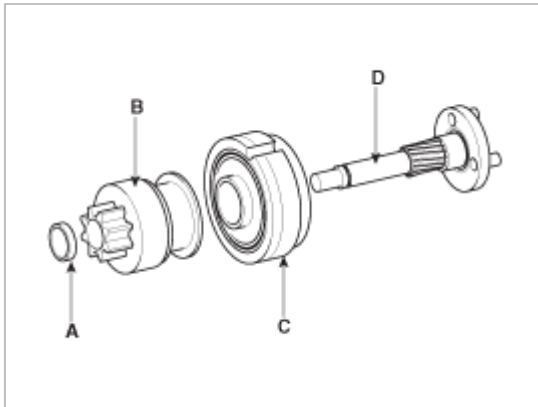
9. Press the stop ring (A) using a socket (B).



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



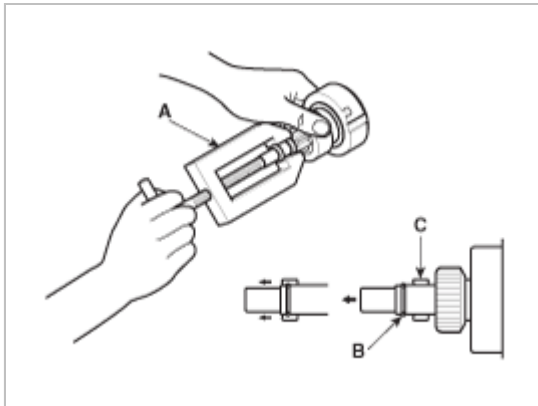
11. Disconnect the stop ring (A), overrunning clutch (B), internal gear (C) and planet shaft (D).



12. Reassembly is the reverse of disassembly.

#### NOTE

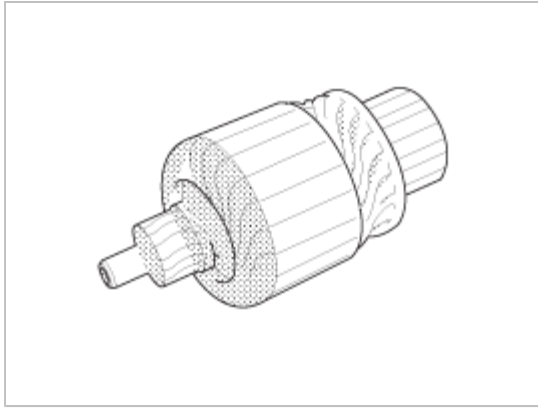
Using a suitable pulling tool (A), pull the overrunning clutch stop ring (B) over the stopper (C).



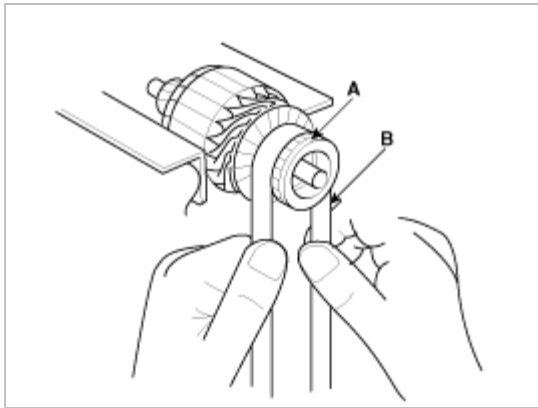
## Inspection

### Armature Inspection And Test

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



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



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

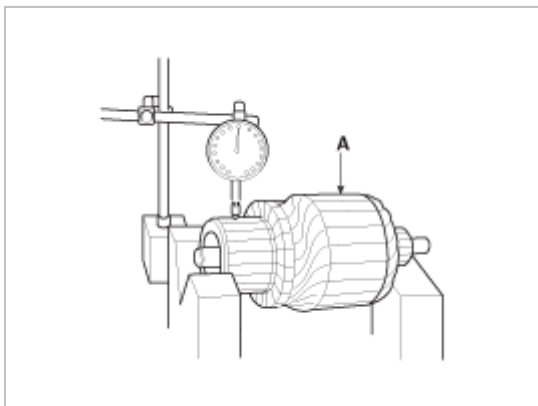
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#### **Commutator runout**

Standard (New): 0.05mm (0.0020in.) max

Service limit: 0.08mm (0.0031in.)

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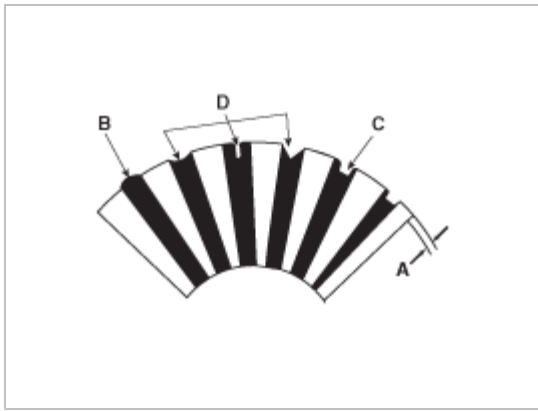
6. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or v-shaped (D).

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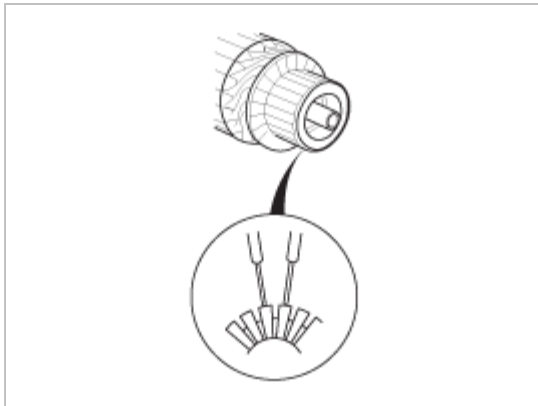
#### **Commutator mica depth**

Standard (New) : 0.8 mm (0.0314 in.)

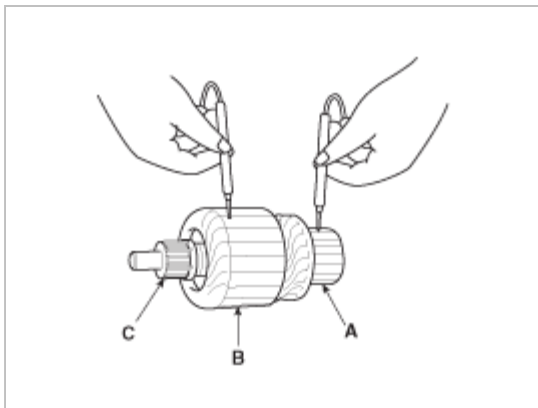
Limit : 0.2mm (0.0079 in.)



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

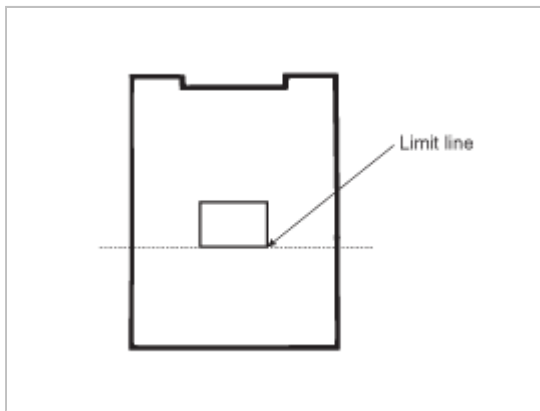


8. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.



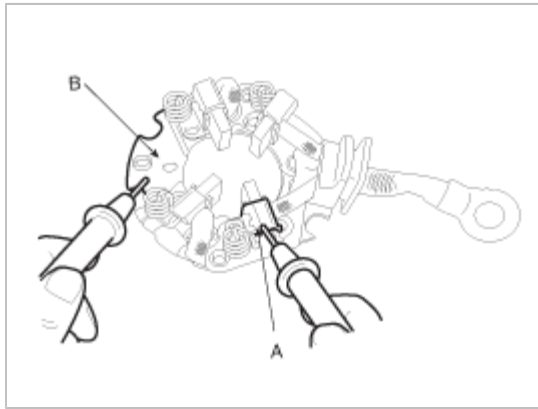
## Inspect Starter Brush

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

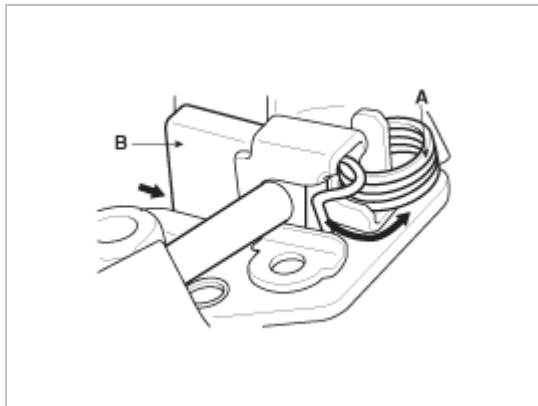


## Starter Brush Holder Test

1. Check that there is continuity between the (+) brush holder (A) and (-) brush plate (B). If there is continuity, replace the brush holder assembly.



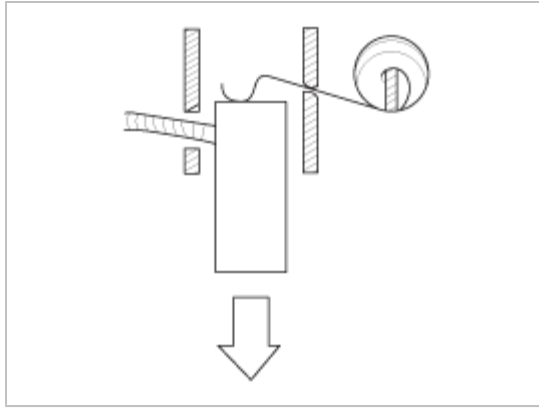
2. Pry back each brush spring (A) with a screwdriver, then position the brush (B) about halfway out of its holder, and release the spring to hold it there.



3. Install the armature in the housing, and install the brush holder. Next, pry back each brush spring again, and push the brush down until it seats against the commutator, then release the spring against the end of the brush.

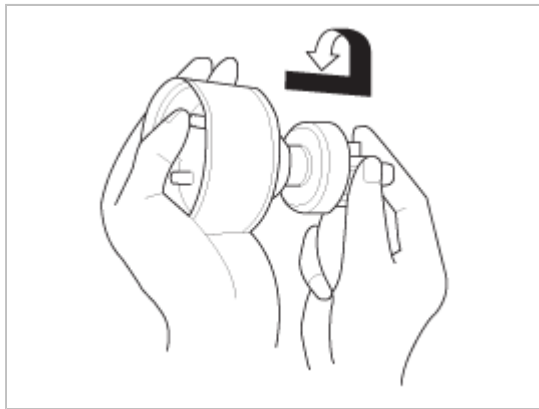
### NOTE

To seat new brushes, slip a strip of #500 or #600 sandpaper, with the grit side up, between the commutator and each brush, and smoothly rotate the armature. The contact surface of the brushes will be sanded to the same contour as the commutator.



## Inspect Overrunning Clutch

1. Slide the overrunning 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 or it locks in both directions, replace it.



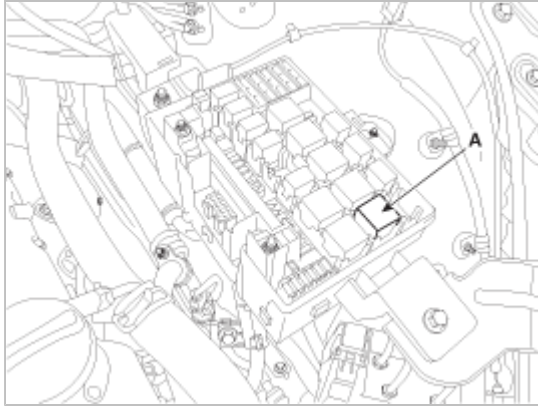
3. If the starter drive gear is worn or damaged, replace the overrunning clutch assembly. (the gear is not available separately).  
Check the condition of the flywheel or torque converter ring gear if the starter drive gear teeth are damaged.

## Cleaning

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

## Inspection

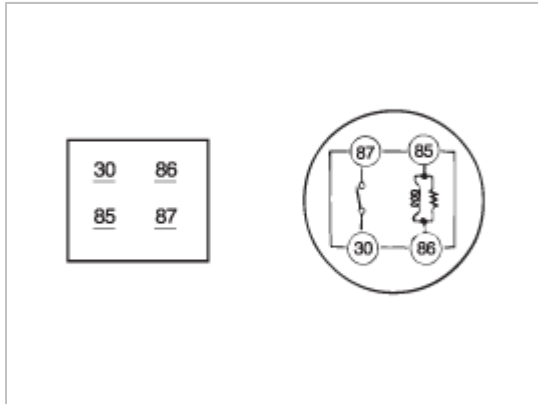
1. Remove the fuse box cover.
2. Remove the starter relay (A).



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

Terminal	Continuity
30 - 87	NO
85 - 86	YES

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



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