

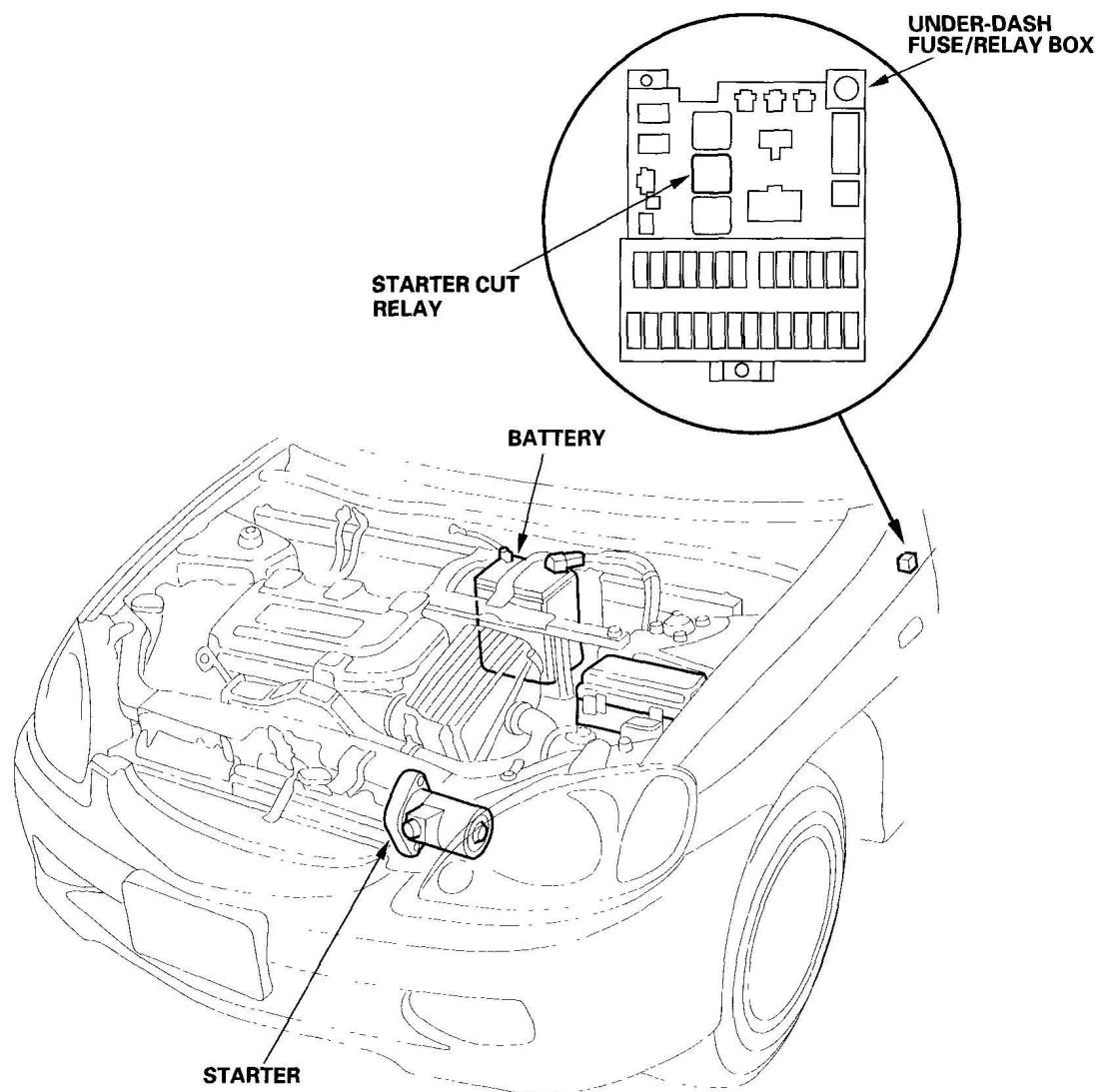
## 2006 Honda Insight

2000-06 ENGINE Starting System - Insight

### 2000-06 ENGINE

#### Starting System - Insight

## COMPONENT LOCATION INDEX



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**Fig. 1: Identifying Starting System Component Locations**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## SYMPTOM TROUBLESHOOTING INDEX

## TROUBLESHOOTING CHART

Symptom	Diagnostic procedure	Also check for
Engine does not start (does not crank)	<ol style="list-style-type: none"> <li>1. Check for loose battery terminals or connections.</li> <li>2. Test the battery for a low charge (see <b><u>12 VOLT BATTERY TEST</u></b> ).</li> <li>3. Check the starter (see <b><u>STARTER CIRCUIT TROUBLESHOOTING</u></b> ).</li> <li>4. Check the starter cut relay (see <b><u>POWER RELAY TEST</u></b> ).</li> <li>5. Check the transmission range switch (CVT) (see <b><u>TRANSMISSION RANGE SWITCH TEST</u></b> ).</li> <li>6. Check the clutch pedal position switch (M/T) (see <b><u>FUEL LINE INSPECTION</u></b> ).</li> <li>7. Check the ignition switch or wire (see <b><u>IGNITION KEY SWITCH TEST</u></b> ).</li> </ol>	
Engine cranks, but does not start	<ol style="list-style-type: none"> <li>1. Check for PGM-FI DTCs.</li> <li>2. Check the fuel pressure: <ul style="list-style-type: none"> <li>• 2000-2003 M/T models (see <b><u>2000-2003 M/T MODELS</u></b> )</li> <li>• 2001-2003 CVT models (see <b><u>2001-</u></b></li> </ul> </li> </ol>	

**2003 CVT  
MODELS )**

- 2004-2005 M/T models (see **2001-2003 CVT MODELS )**)

- 2004-2005 CVT models (see **2004-2005 CVT MODELS )** 2006 model (see **2006 MODEL )**)

3. Check for a plugged or damaged fuel line (see **FUEL LINE INSPECTION )**).

4. Check for a plugged fuel filter (see **FUEL FILTER REPLACEMENT )**).

5. Check the throttle body (see **THROTTLE BODY TEST )**).

6. Check for low engine compression (see **ENGINE COMPRESSION INSPECTION )**).

7. Check for a damaged or broken cam chain.

Engine is hard to start

1. Check for PGM-FI DTCs.

2. Check the fuel pressure:

- 2000-2003 M/T models (see **2000-2003 M/T**)

	<p><b><u>MODELS</u></b> )</p> <ul style="list-style-type: none"><li>• 2001-2003 CVT models (see <b><u>2001-2003 CVT MODELS</u></b> )</li><li>• 2004-2005 M/T models (see <b><u>2001-2003 CVT MODELS</u></b> )</li><li>• 2004-2005 CVT models (see <b><u>2004-2005 CVT MODELS</u></b> )</li><li>• 2006 model (see <b><u>2006 MODEL</u></b> )</li></ul> <p>3. Check for a plugged or damaged fuel line (see <b><u>FUEL LINE INSPECTION</u></b> ).</p> <p>4. Check for a plugged fuel filter (see <b><u>FUEL FILTER REPLACEMENT</u></b> ).</p>
Engine cranks slowly	<ol style="list-style-type: none"><li>1. Check for loose battery terminals or connections.</li><li>2. Test the battery for a low charge (see <b><u>12 VOLT BATTERY TEST</u></b> ).</li><li>3. Check the starter for binding (see <b><u>STARTER OVERHAUL</u></b> ).</li><li>4. Check for excessive drag in the engine.</li><li>5. Check for excessive drag in</li></ol>

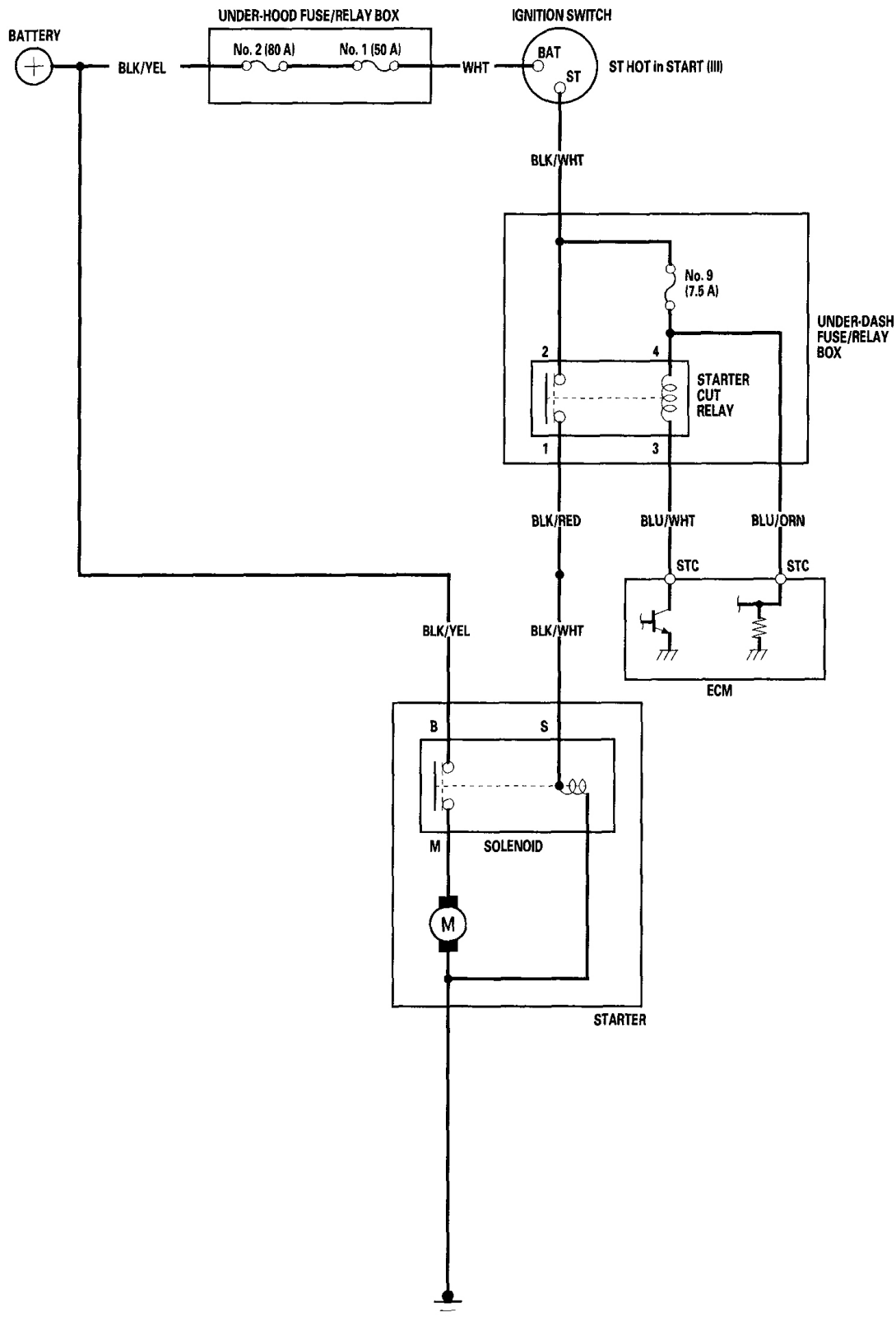
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	the transmission (CVT).	
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CIRCUIT DIAGRAM

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**Fig. 2: Circuit Diagram**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

**STARTER CIRCUIT TROUBLESHOOTING**

**NOTE:**

- Air temperature must be between 59 and 100°F (15 and 38°C) during this procedure.
- After this test, or any subsequent repair, reset the engine control module (ECM) to clear any DTCs (see HDS CLEAR COMMAND ).
- The battery must be in good condition and fully charged.

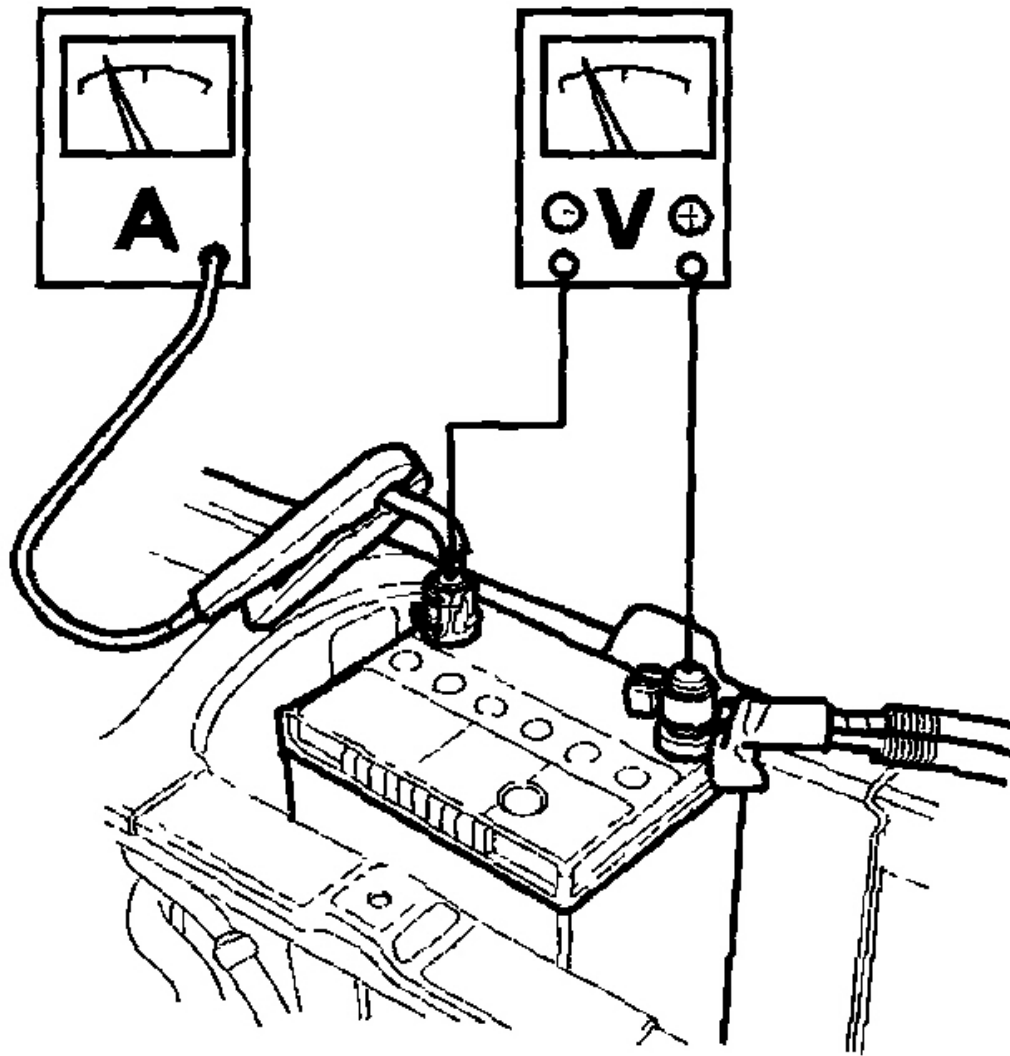
**Recommended Procedure**

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

**ALTERNATE PROCEDURE**

1. Hook up the following equipment:

- Ammeter, 0-400 A
- Voltmeter, 0-20 V (accurate within 0.1 V)
- Tachometer, 0-1,200 RPM



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**Fig. 3: Checking Battery Voltage**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

2. Disconnect the three fuel injector connectors.
3. Turn the battery module switch OFF, and measure the voltage (see **TURNING OFF POWER TO THE HIGH VOLTAGE CIRCUIT** ).



4. With the shift lever in P or N position (CVT) or the clutch pedal pressed (M/T), turn the ignition switch to START (III).

*Does the starter crank the engine normally?*

**YES** -The starting system is OK, go to step 10 .

**NO** -Go to step 5.

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

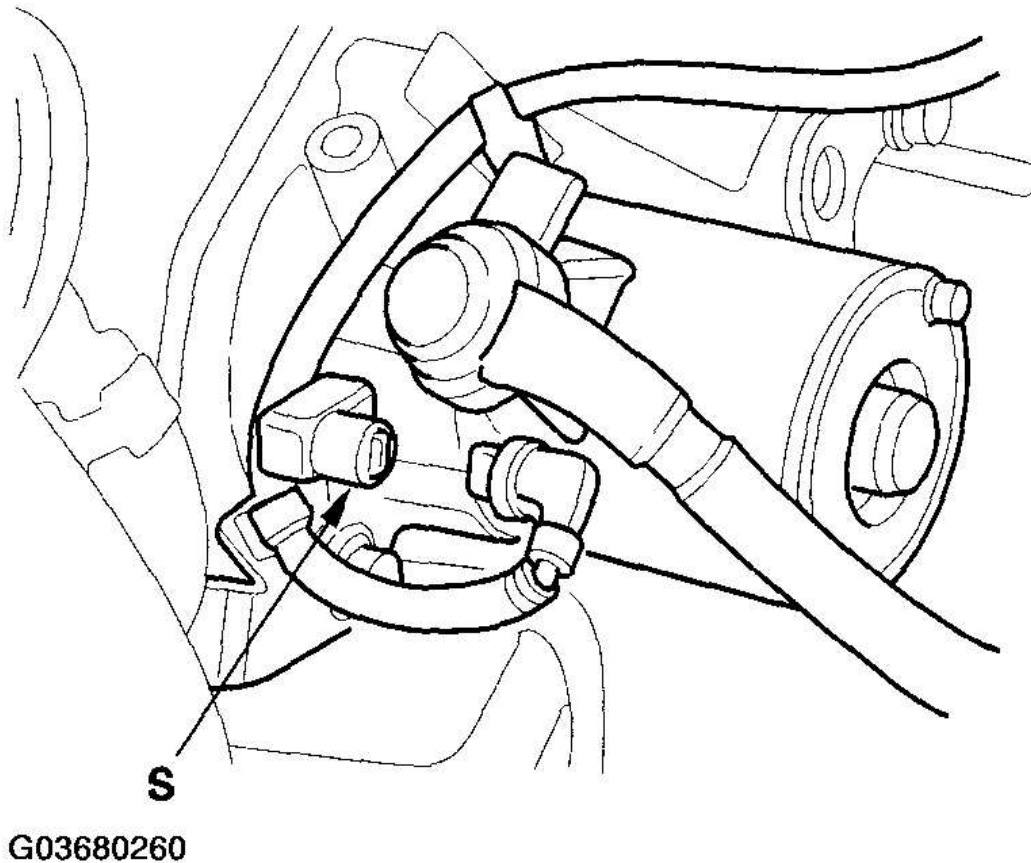
*Does the starter crank the engine?*

**YES** -Repairing the loose connection corrected the problem. The starting system is OK, go to step 10 .

**NO** -Check the following:

- If the starter will not crank the engine at all, go to step 6.
- If it cranks the engine erratically or too slowly, go to step 7 .
- If it won't disengage from the flywheel ring gear when you release the key, check the following:
  - Solenoid plunger and switch malfunction
  - Dirty drive gear damaged overrunning clutch

6. Make sure the transmission is in Neutral, then disconnect the BLK/WHT wire from the starter solenoid S terminal. Connect a jumper wire from the battery positive terminal to the solenoid terminal.



**Fig. 4: Disconnecting BLK/WHT Wire From Starter Solenoid S Terminal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

*Does the starter crank the engine?*

**YES** -Check the following items in the order listed until you find the open circuit:

- Check for an open circuit or loose connections in the BLK/WHT wire and connectors between the starter cut relay and the ignition switch, and between the starter cut relay and the starter.
- Check the ignition switch (see **IGNITION KEY SWITCH TEST** ).

**NO** -Remove the starter, and repair or replace as necessary.

7. While cranking the engine, check the cranking voltage and the current draw.

*Is the cranking voltage greater than or equal to 8.5 V and the current draw less than or equal to 350 A?*

**YES** -Go to step 8.

**NO** -Replace the starter, or remove and disassemble it, and check the following:

- Drag in the starter armature
- Shorted armature winding
- Excessive drag in the engine
- Excessive drag in the transmission (CVT)

8. Check the engine speed while cranking the engine.

*Is the engine speed above 100 RPM?*

**YES** -Go to step 9.

**NO** -Replace the starter, or remove and disassemble it, and check the following:

- Open circuit in starter armature commutator segments
- Excessively worn starter brushes
- Open circuit in commutator brushes
- Dirty or damaged helical spline or drive gear
- Faulty drive gear clutch.

9. Remove the starter, and inspect its drive gear and the flywheel ring gear for damage. Replace any damaged parts.

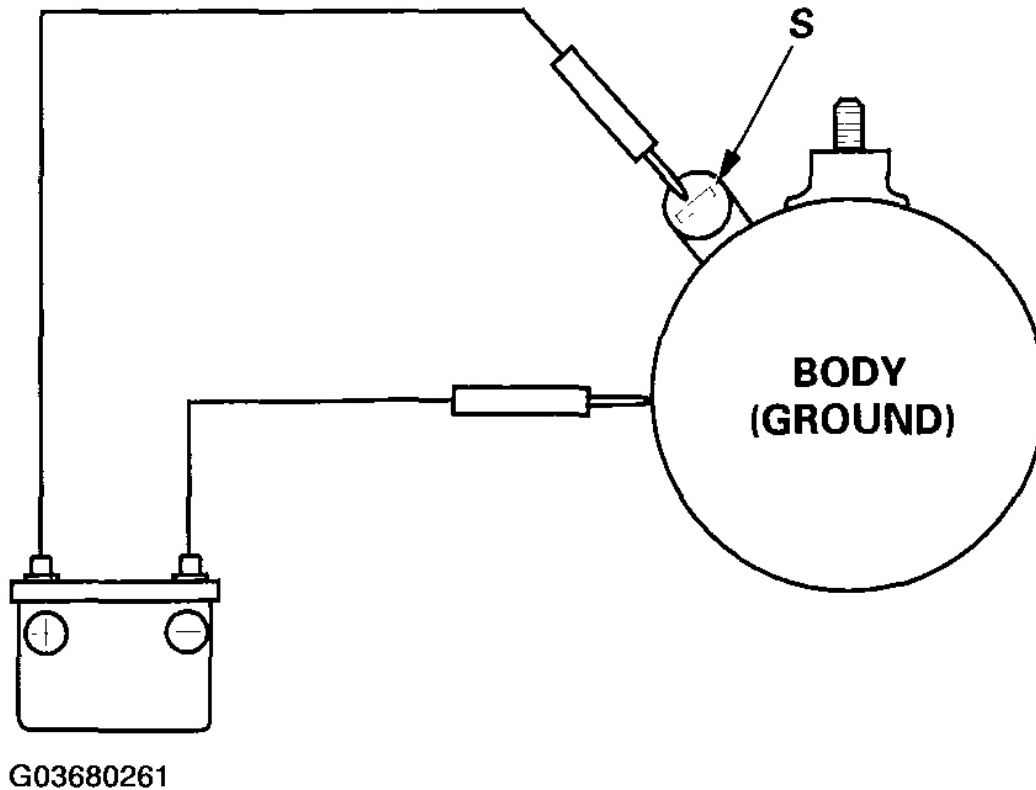
10. Reset the ECM using the HDS (see **HDS CLEAR COMMAND** ).

11. Do the ECM idle learn procedure (see **ECM IDLE LEARN PROCEDURE** ).

## **STARTER PERFORMANCE TEST**

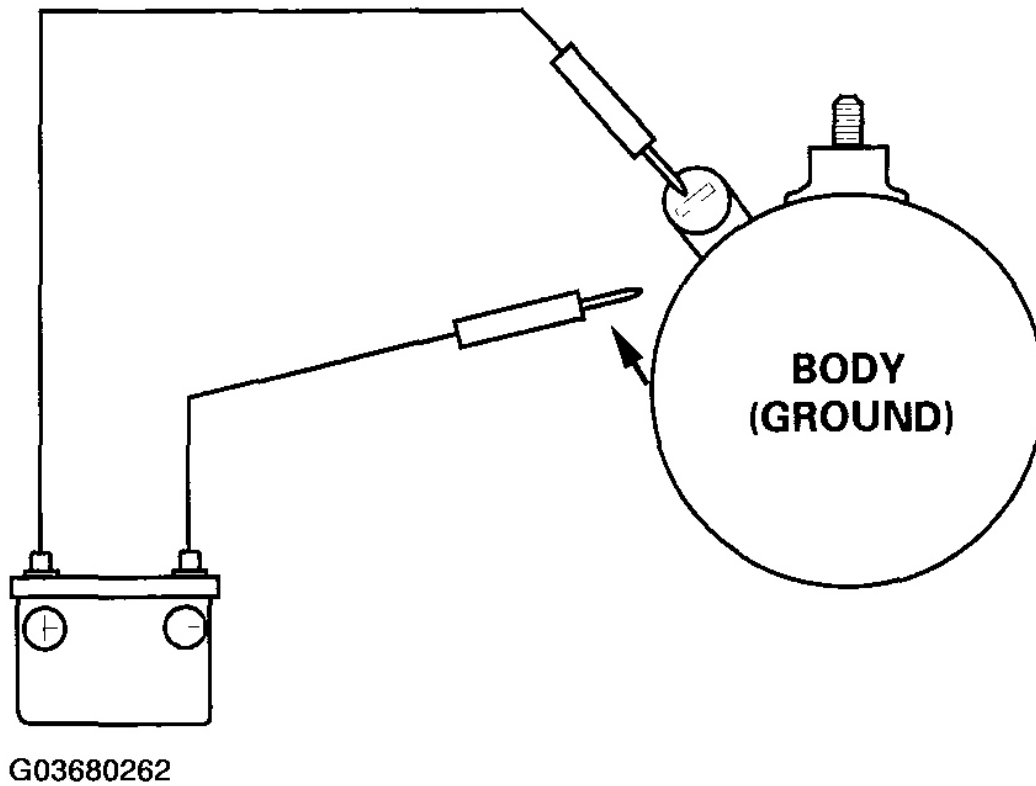
1. Disconnect the wire from the S terminal.
2. Make the connections as shown using as heavy a wire as possible (preferably equivalent to the wire used for the vehicle). To avoid damaging the starter, never leave the battery connected for more than 10 seconds.

3. Connect the battery as shown. If the starter pinion moves out, it is working properly.



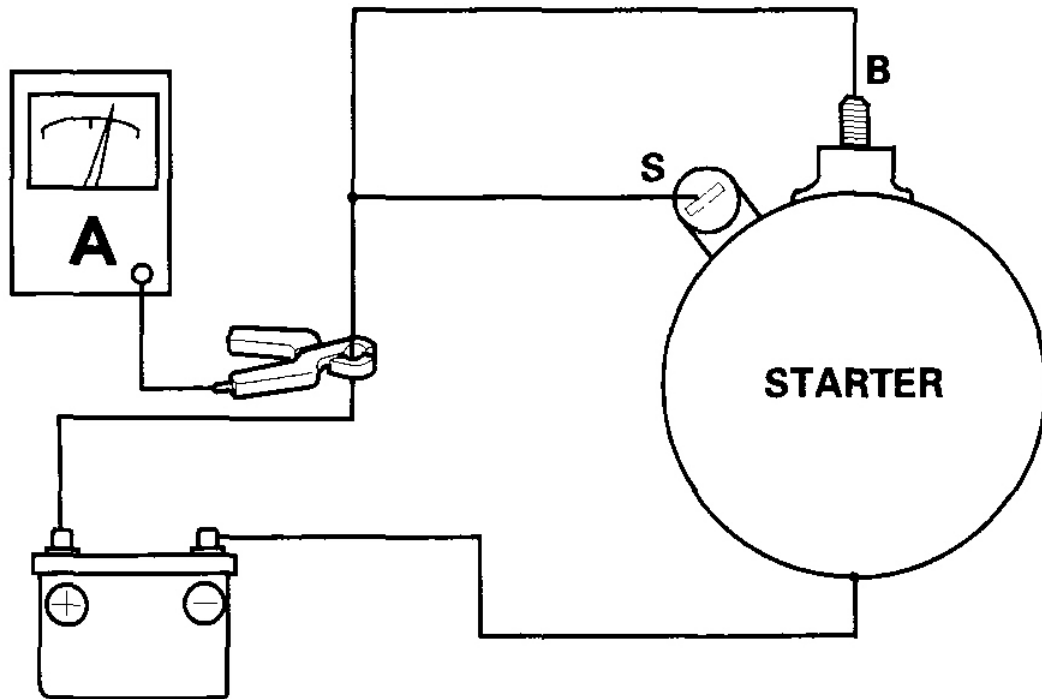
**Fig. 5: Connecting Battery Terminal To Starter**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Disconnect the negative battery terminal from the starter as shown. If the pinion retracts immediately, it is working properly.



**Fig. 6: Disconnecting Negative Battery Terminal From Starter**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Clamp the starter firmly in a vise.
6. Connect the starter to the battery as shown, and check that the motor turns and keeps rotating.



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**Fig. 7: Connecting Starter To Battery**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. If the electric current and motor speed meet the specifications when the battery voltage is at 11.5 V, the starter is working properly.

### **Specifications**

**Electric Current: 80 A or less**

**Motor Speed: 2,600 RPM or more**

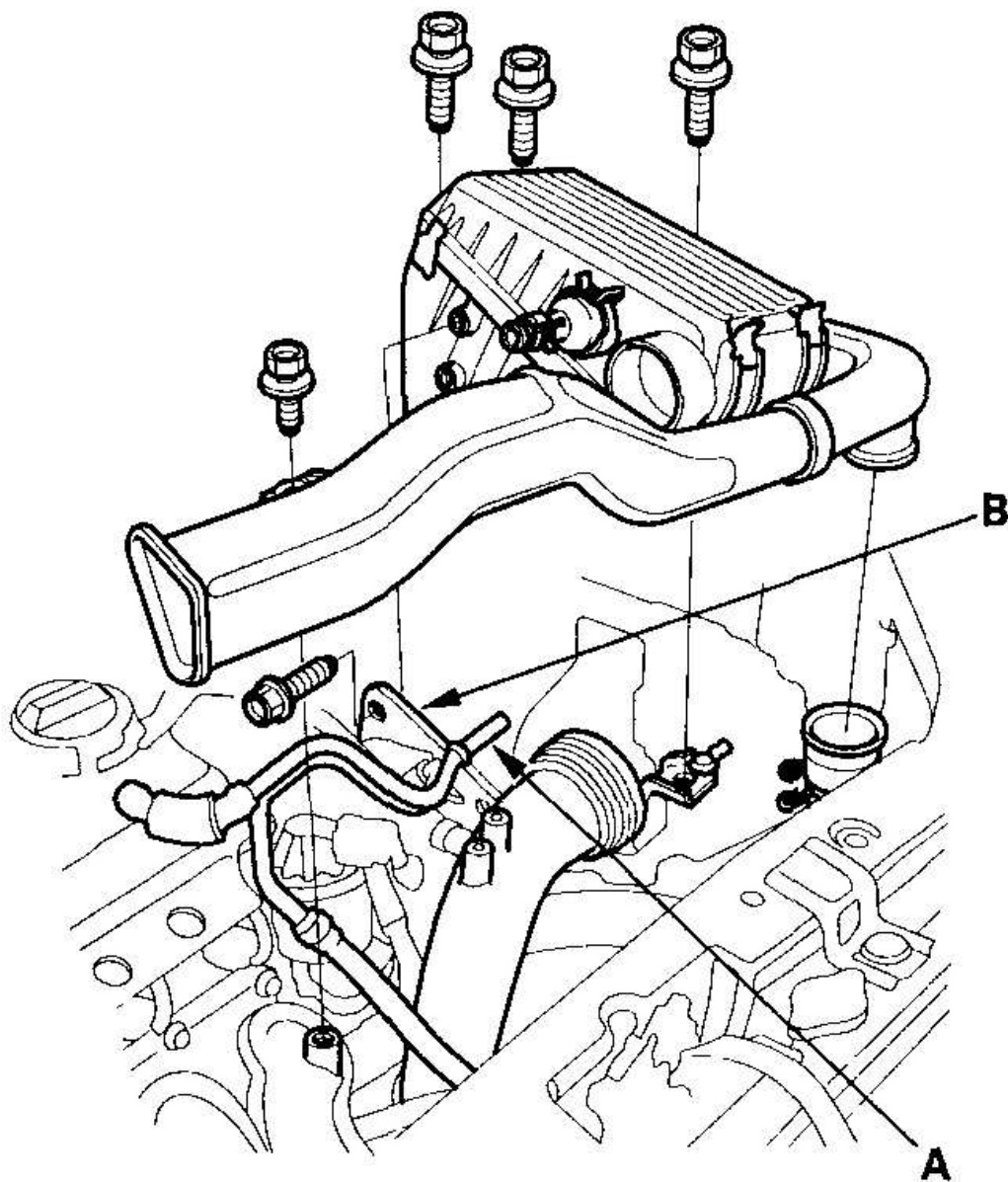
## **STARTER REMOVAL AND INSTALLATION**

### **REMOVAL**

1. Make sure you have the anti-theft code for the radio, then write down the audio presets.

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2. Disconnect the negative cable from the battery first, then disconnect the positive cable.
3. Remove the breather pipe (A) and brake booster vacuum hose bracket (B) from the air cleaner housing, then remove the air cleaner housing/intake air duct assembly.



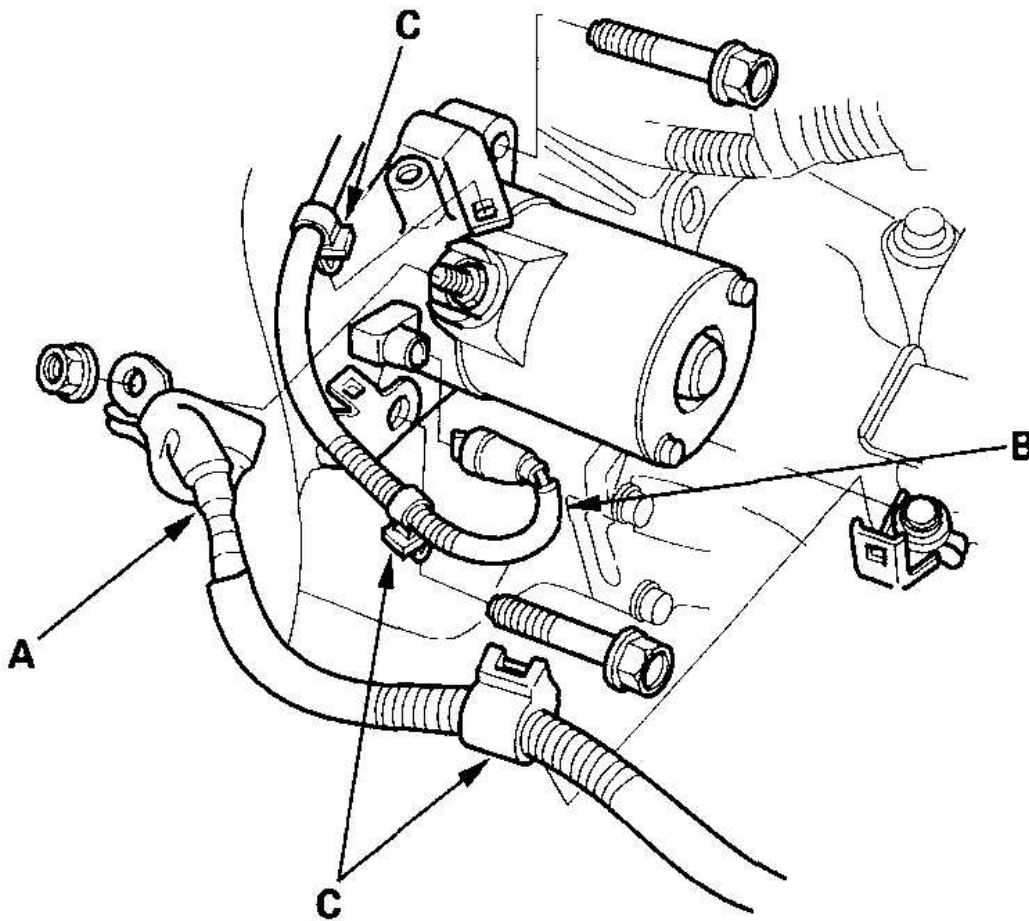
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**Fig. 8: Removing Breather Pipe And Brake Booster Vacuum Hose Bracket From Air Cleaner Housing**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**



4. Disconnect the starter cable (A) and BLK/WHT wire (B), then remove the wire harness clamps (C).



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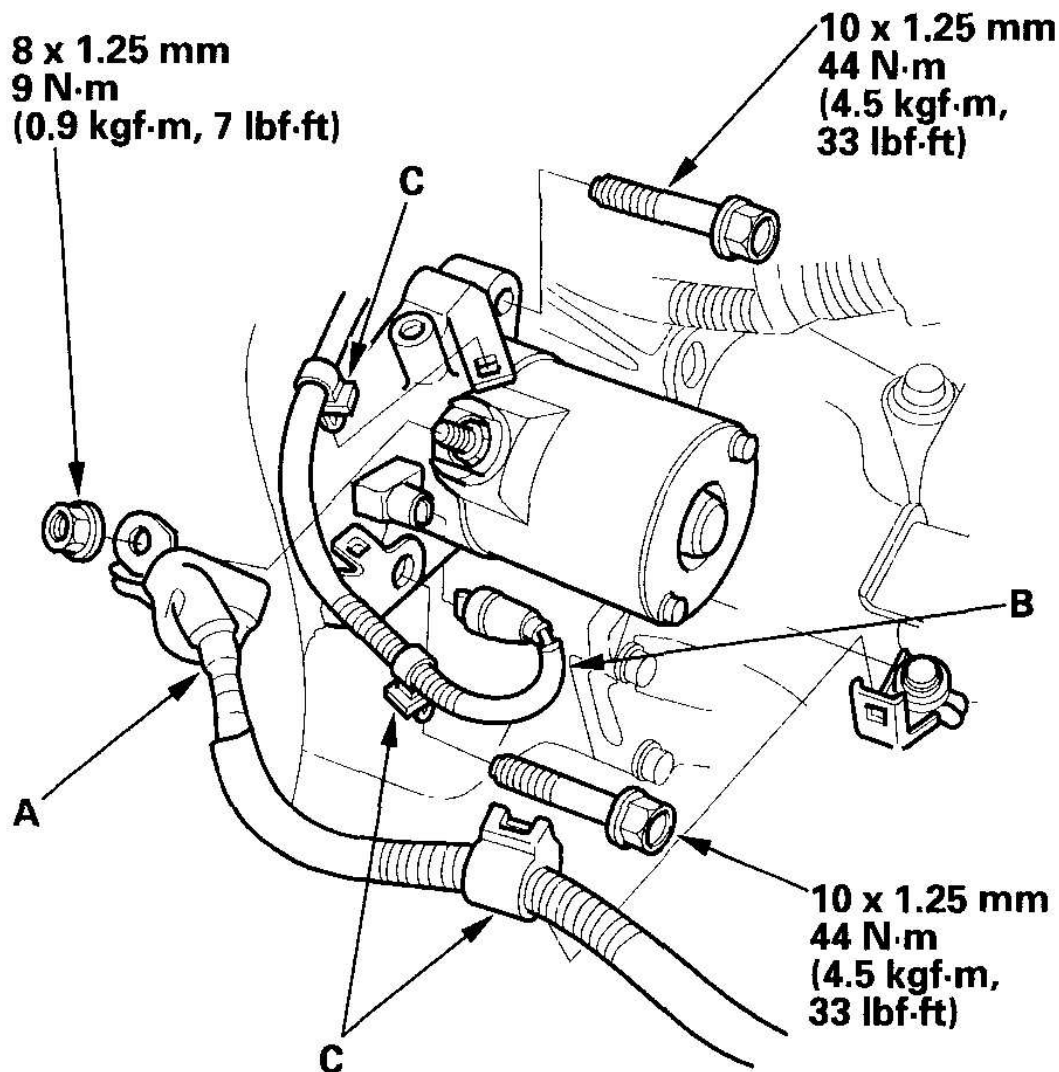
**Fig. 9: Disconnecting Starter Cable And BLK/WHT Wire And Removing Wire Harness Clamps**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Remove the two bolts holding the starter, then remove the starter.

## INSTALLATION

1. Install the two bolts holding the starter.
2. Connect the starter cable (A) and BLK/WHT wire (B), then remove the wire harness clamps (C). Make sure the crimped side of the ring terminal is facing out.



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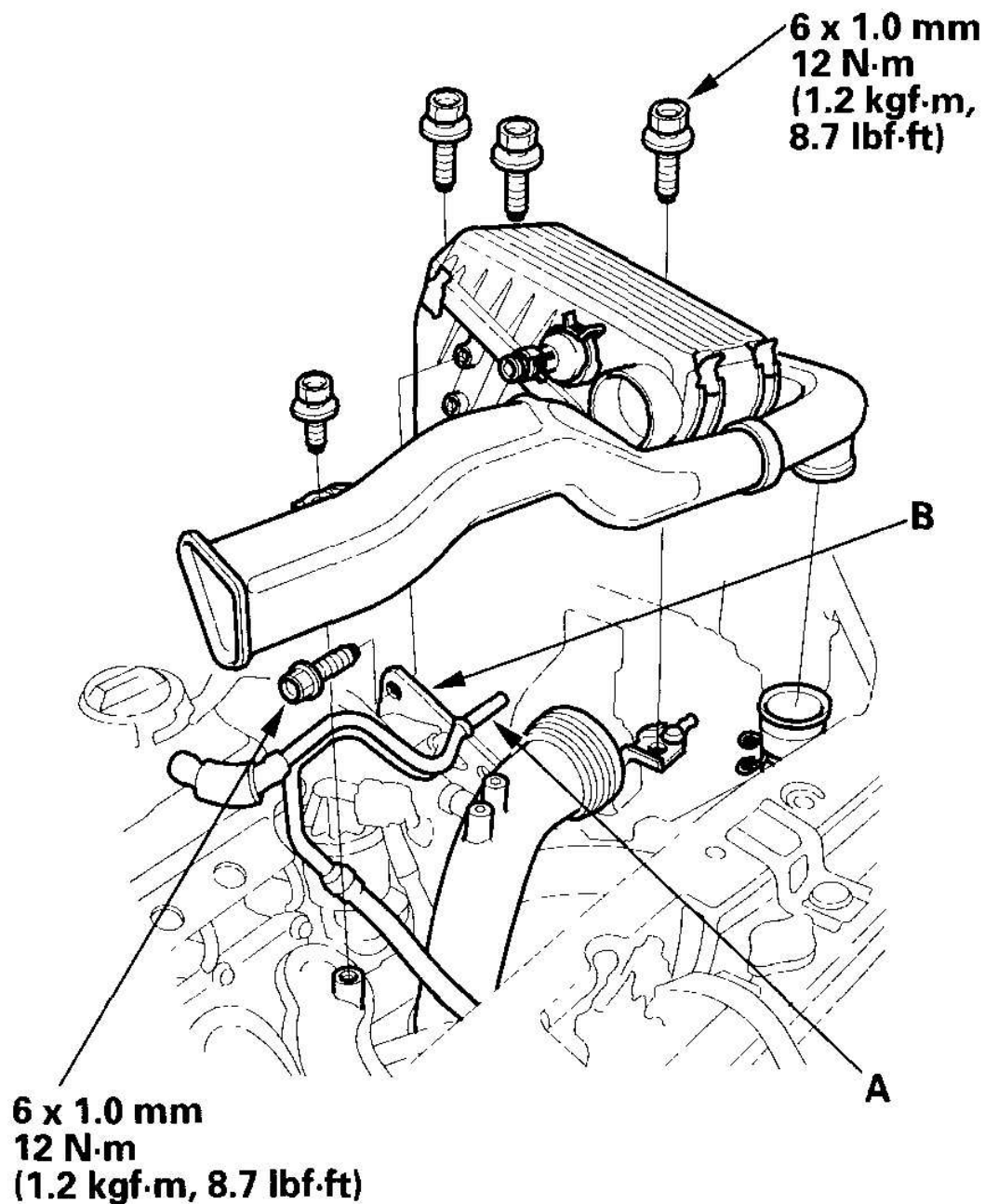
**Fig. 10: Connecting Starter Cable And BLK/WHT Wire With Torque Specifications**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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3. Install the air cleaner housing/intake air duct assembly, then install the breather pipe (A) and brake booster vacuum hose bracket (B) to the air cleaner housing.



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**Fig. 11: Installing Air Cleaner Housing/Intake Air Duct Assembly And Torque Specifications**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

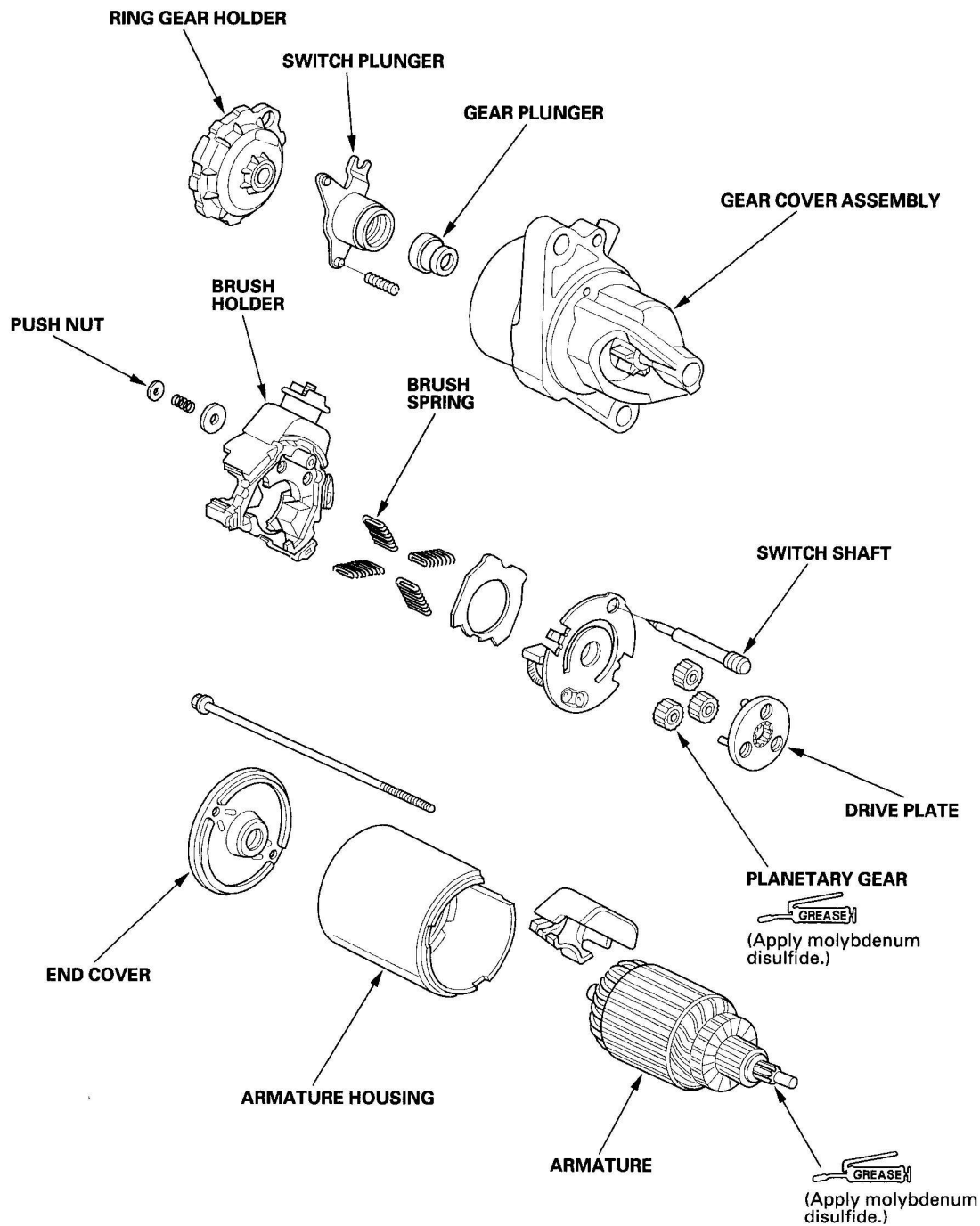
4. Connect the positive cable to the battery first, then connect the negative cable.
5. Remove the No. 15 (40 A) fuse from the under-hood fuse/relay box.
6. Start the engine to make sure the starter works properly.
7. If the IMA battery level gauge (BAT) displays no segments, hold the engine speed between 3,500 RPM and 4,000 RPM without load (in Park or neutral) until the BAT displays at least three segments.
8. Reinstall the No. 15 (40 A) fuse in the under-hood fuse/relay box.
9. Reset the ECM with the HDS (see **HDS CLEAR COMMAND** ).
10. Do the engine control module (ECM) idle learn procedure (see **ECM IDLE LEARN PROCEDURE** ).
11. Enter the anti-theft code for the radio, then enter the audio presets.
12. Set the clock.

**STARTER OVERHAUL**

**DISASSEMBLY/REASSEMBLY**

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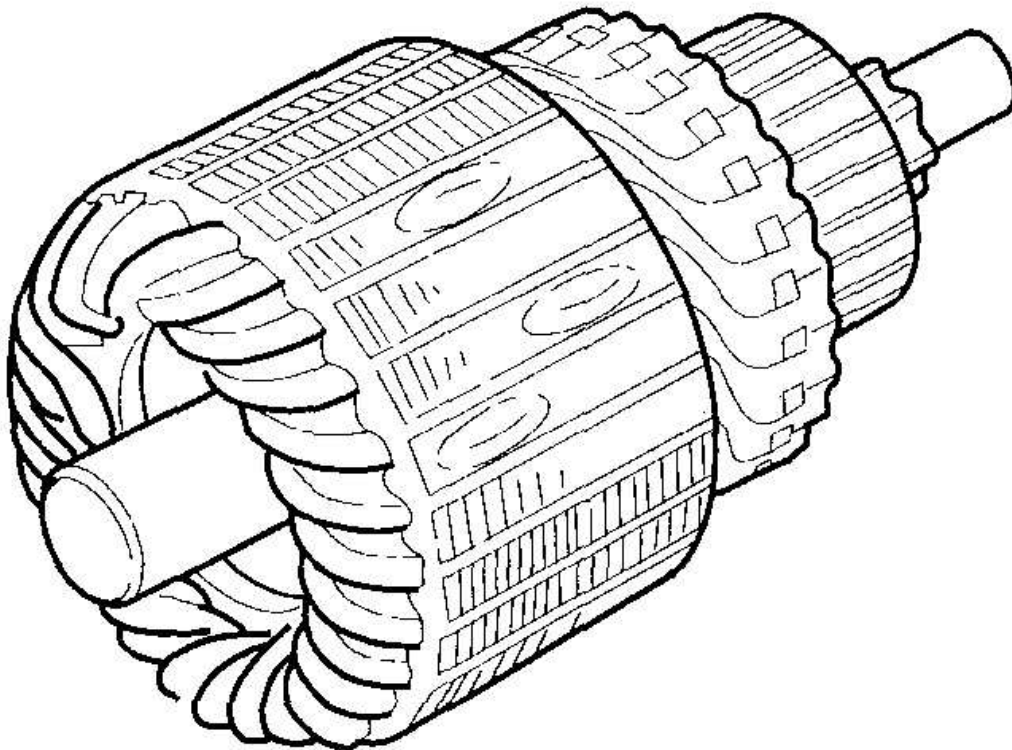
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**Fig. 12: Exploded View Of Starter**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ARMATURE INSPECTION AND TEST



1. Remove the starter (see **STARTER REMOVAL AND INSTALLATION** ).
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.

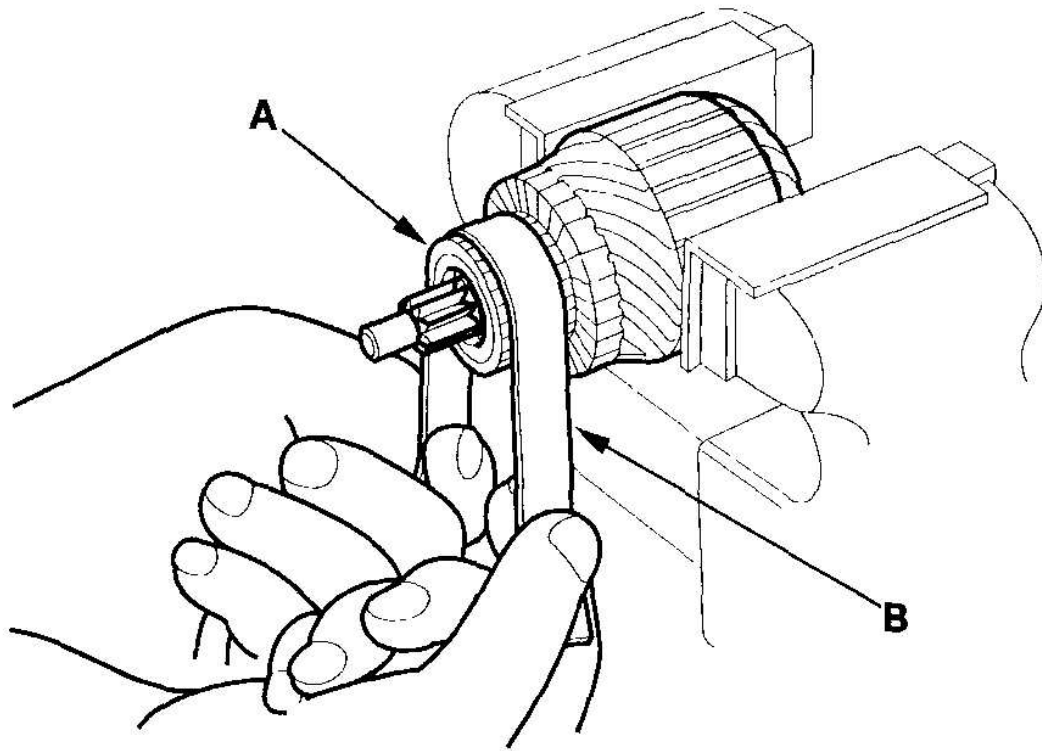


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**Fig. 13: Identifying Armature**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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).



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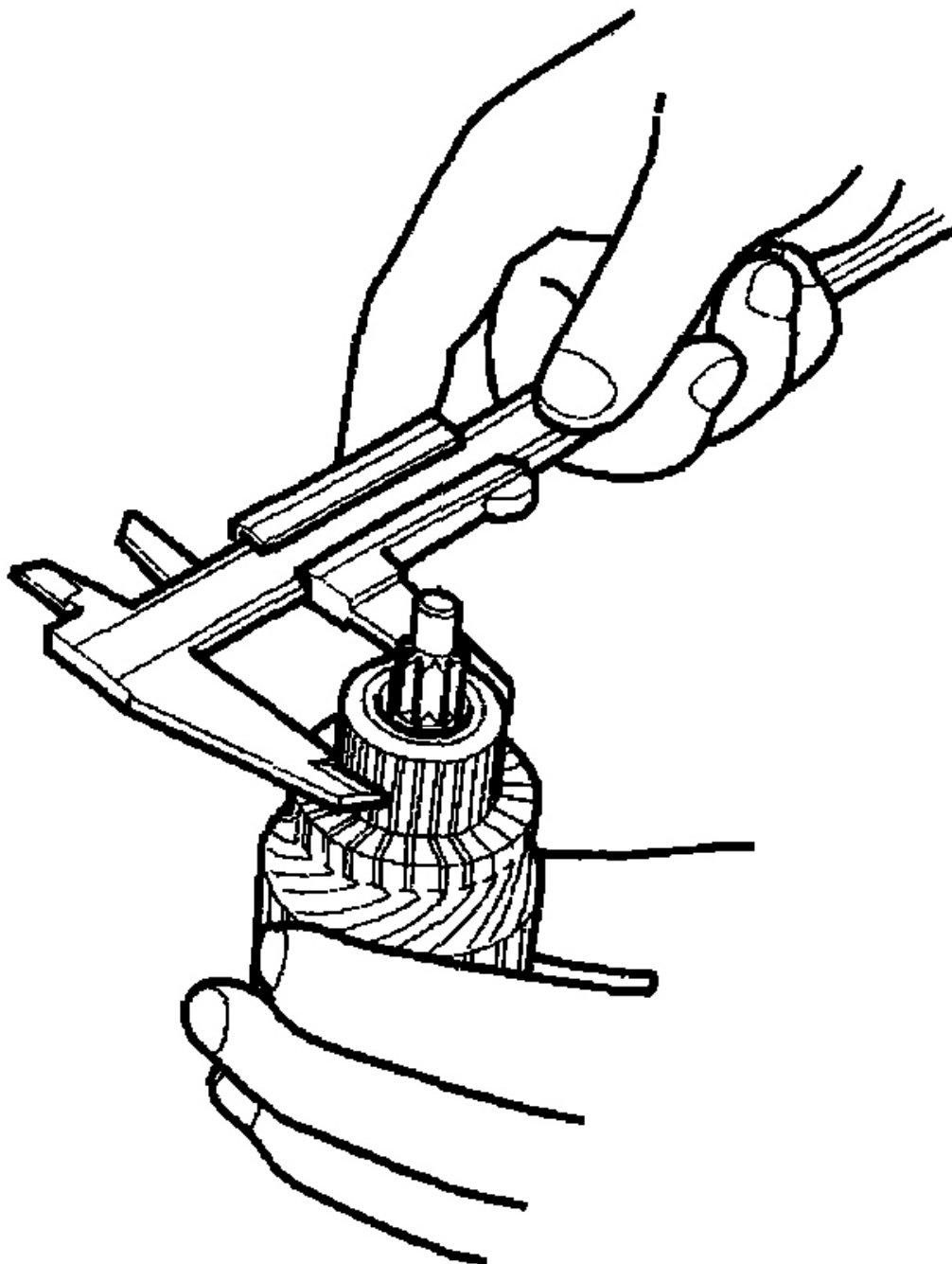
**Fig. 14: Checking Commutator Surface**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

### **Commutator Diameter**

**Standard (New): 28.0-28.1 mm (1.102-1.106 in.)**

**Service Limit: 27.5 mm (1.083 in.)**



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**Fig. 15: Checking Commutator Diameter**



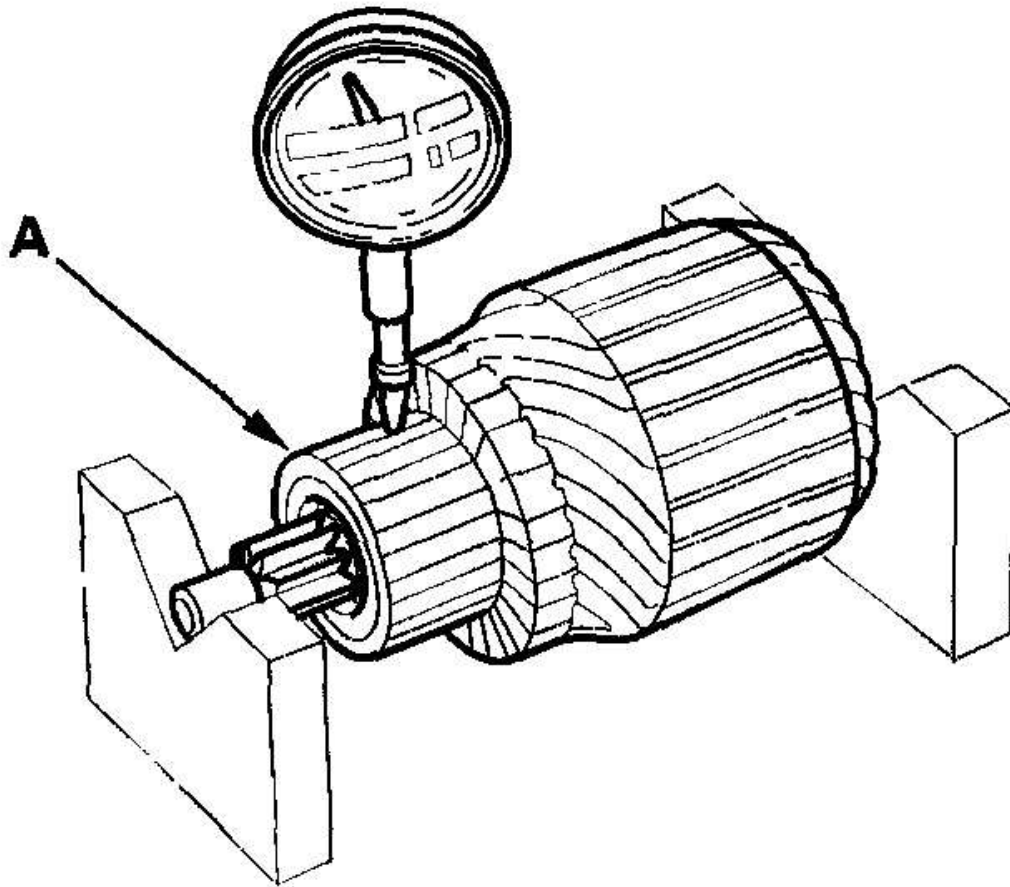
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

**Commutator Runout**

**Standard (New): 0.02 mm (0.001 in.) max.**

**Service Limit: 0.05 mm (0.002 in.)**



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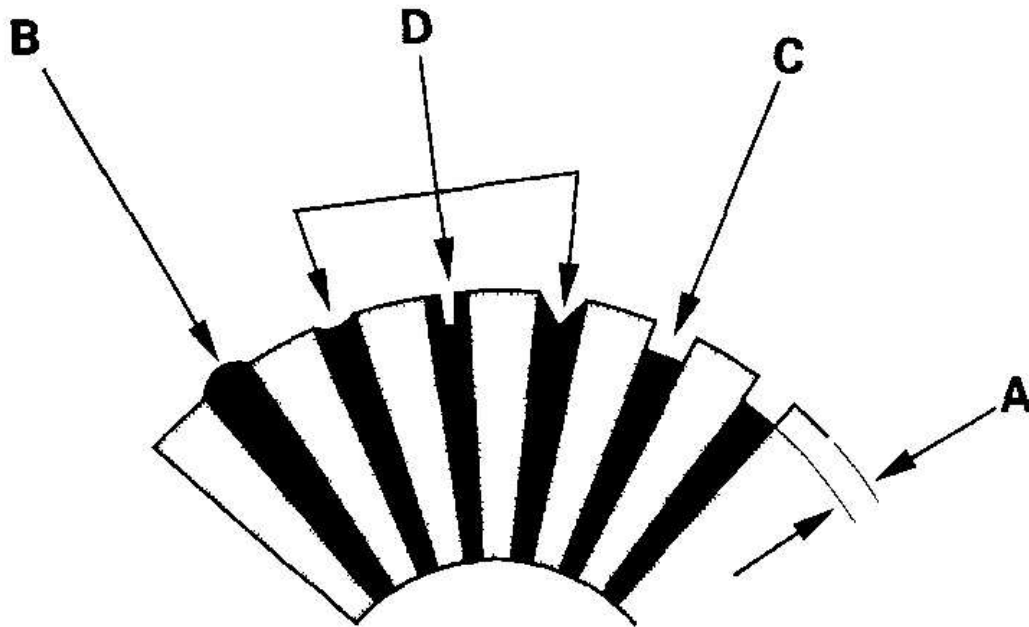
**Fig. 16: Measuring Commutator Runout**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. 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).

### **Commutator Mica Depth**

**Standard (New): 0.4-0.5 mm (0.016-0.020 in.)**

**Service Limit: 0.15 mm (0.006 in.)**

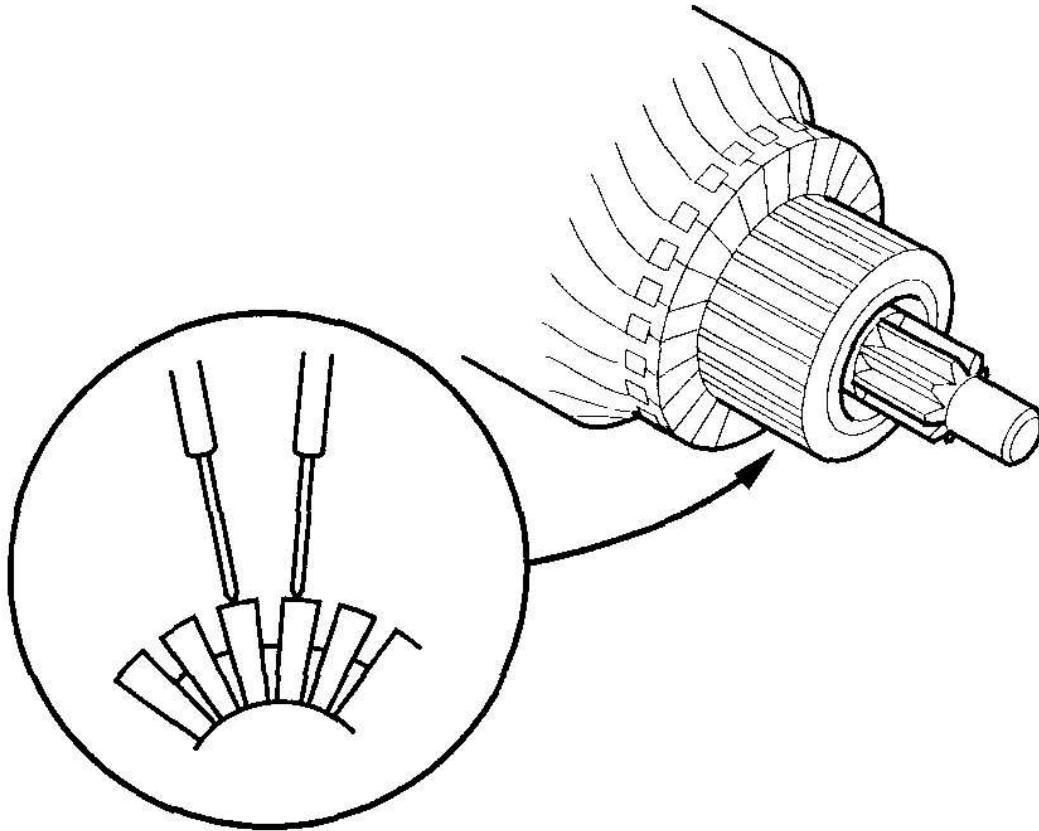


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**Fig. 17: Checking Mica Depth**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

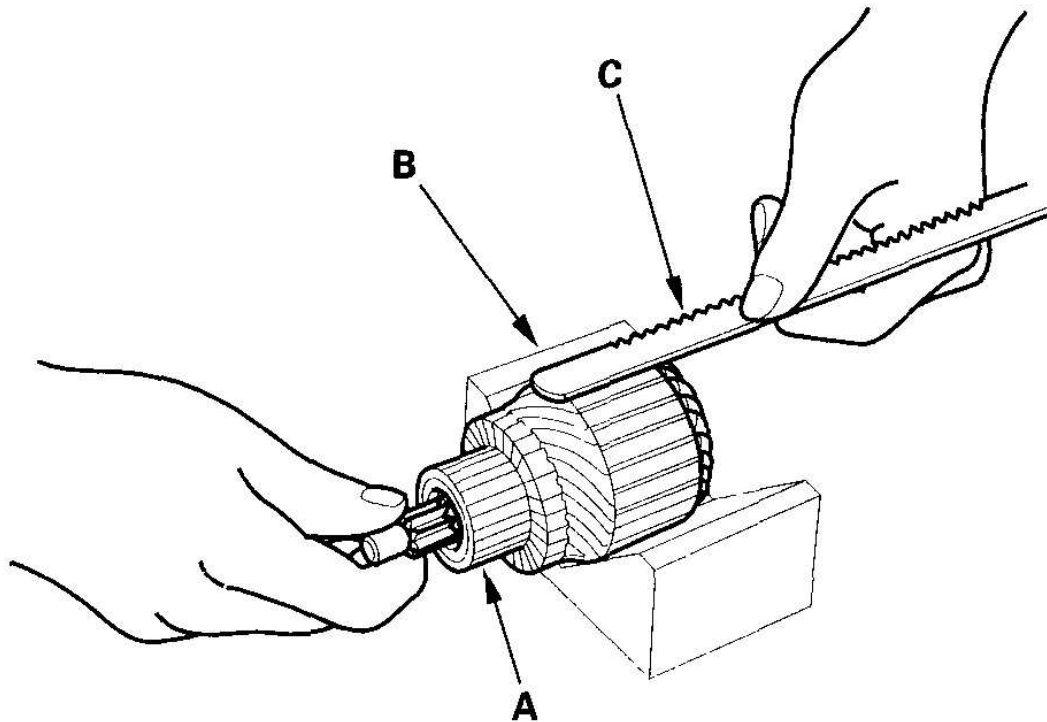
8. Check for continuity between the segments of the commutator. If there is an open circuit between any segments, replace the armature.



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**Fig. 18: Checking Continuity Between Segments Of Commutator**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

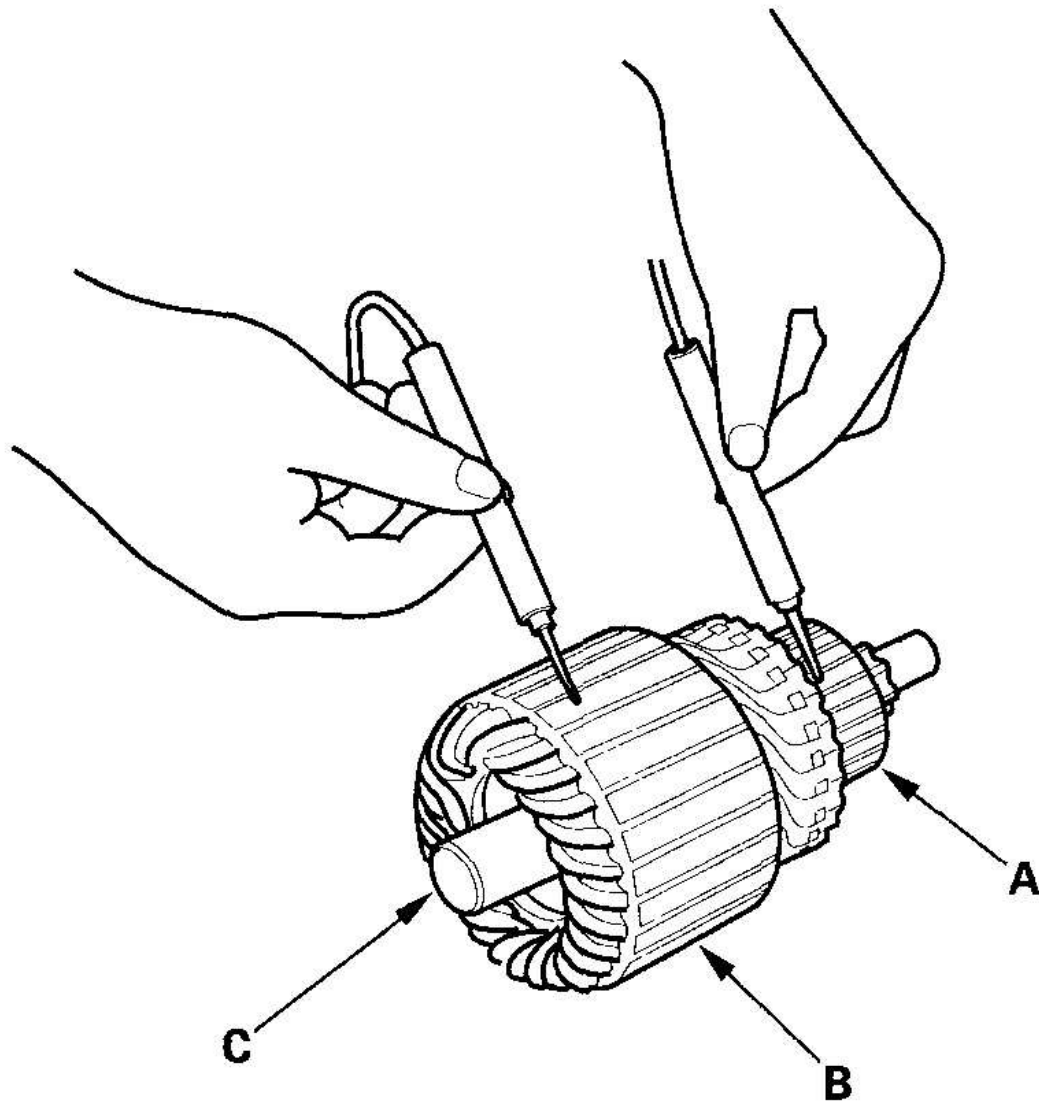
9. Place the armature (A) on an armature tester (B). Hold a hacksaw blade (C) on the armature core. If the blade is attracted to the core or vibrates while the core is turned, the armature is shorted. Replace the armature.



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**Fig. 19: Holding Hacksaw Blade On Armature Core**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

10. Check for continuity between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If there is continuity, replace the armature.



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**Fig. 20: Checking Continuity Between Commutator And Armature Coil Core**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

#### **STARTER BRUSH INSPECTION**

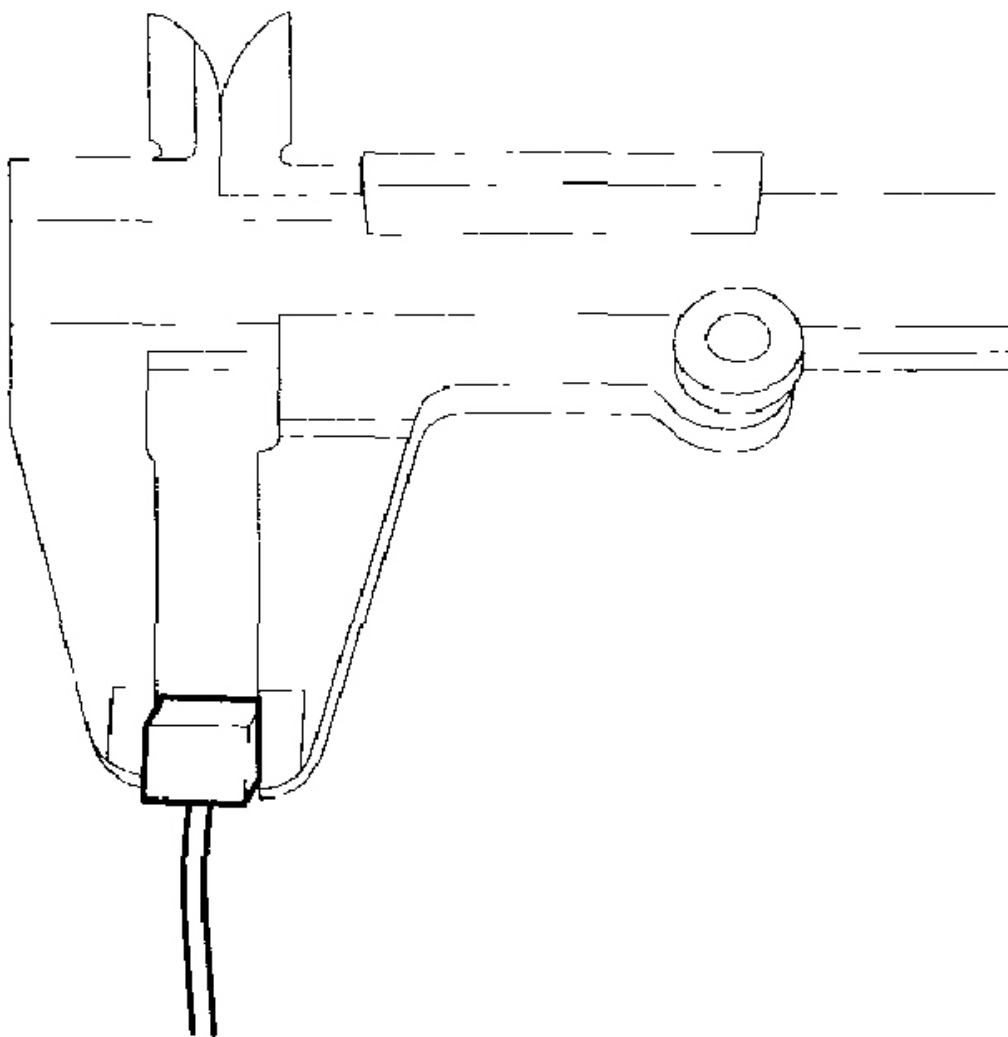
11. Measure the brush length. If it is shorter than the service limit, replace the

brush holder assembly.

### **Brush Length**

**Standard (New): 11.1 - 11.5 mm (0.44-0.45 in.)**

**Service Limit: 4.3 mm (0.17 in.)**



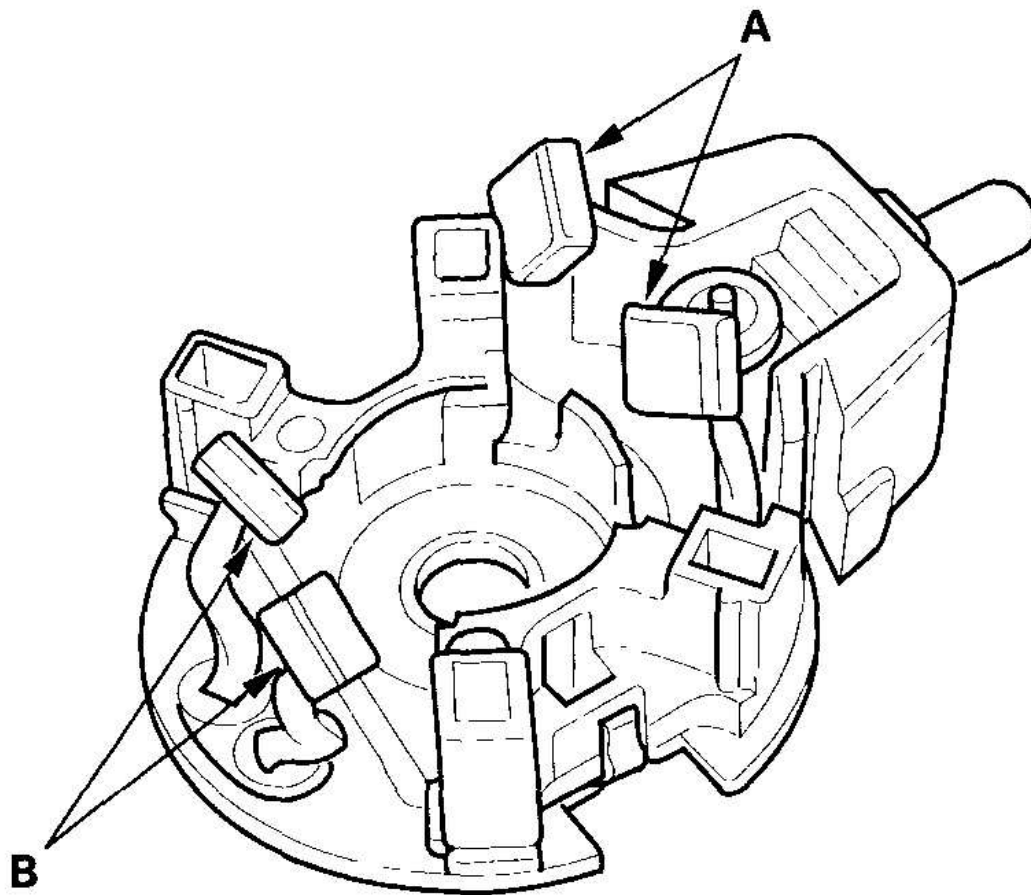
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**Fig. 21: Measuring Brush Length**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**STARTER BRUSH HOLDER TEST**

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



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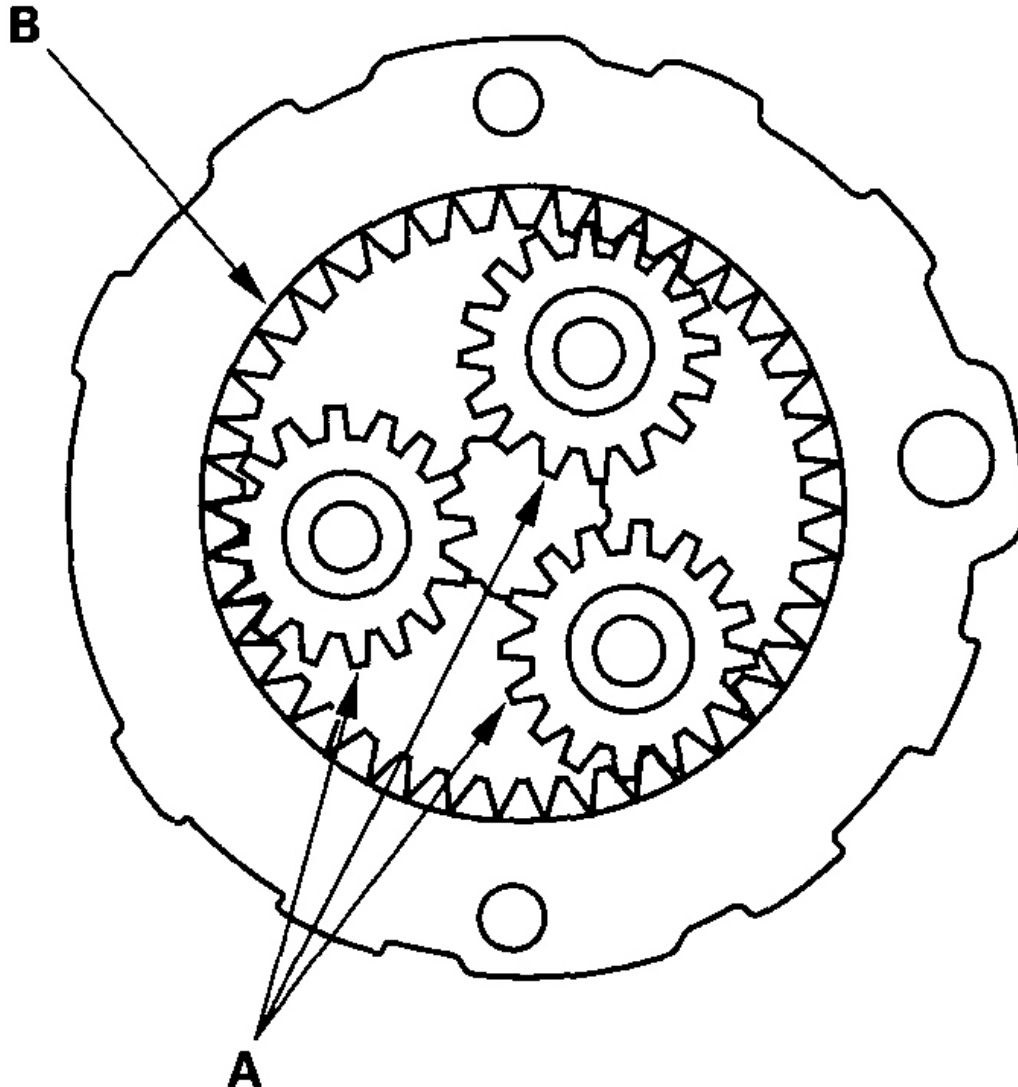
**Fig. 22: Checking Continuity Between (+) Brush (A) And (-) Brush (B)**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**PLANETARY GEAR INSPECTION**



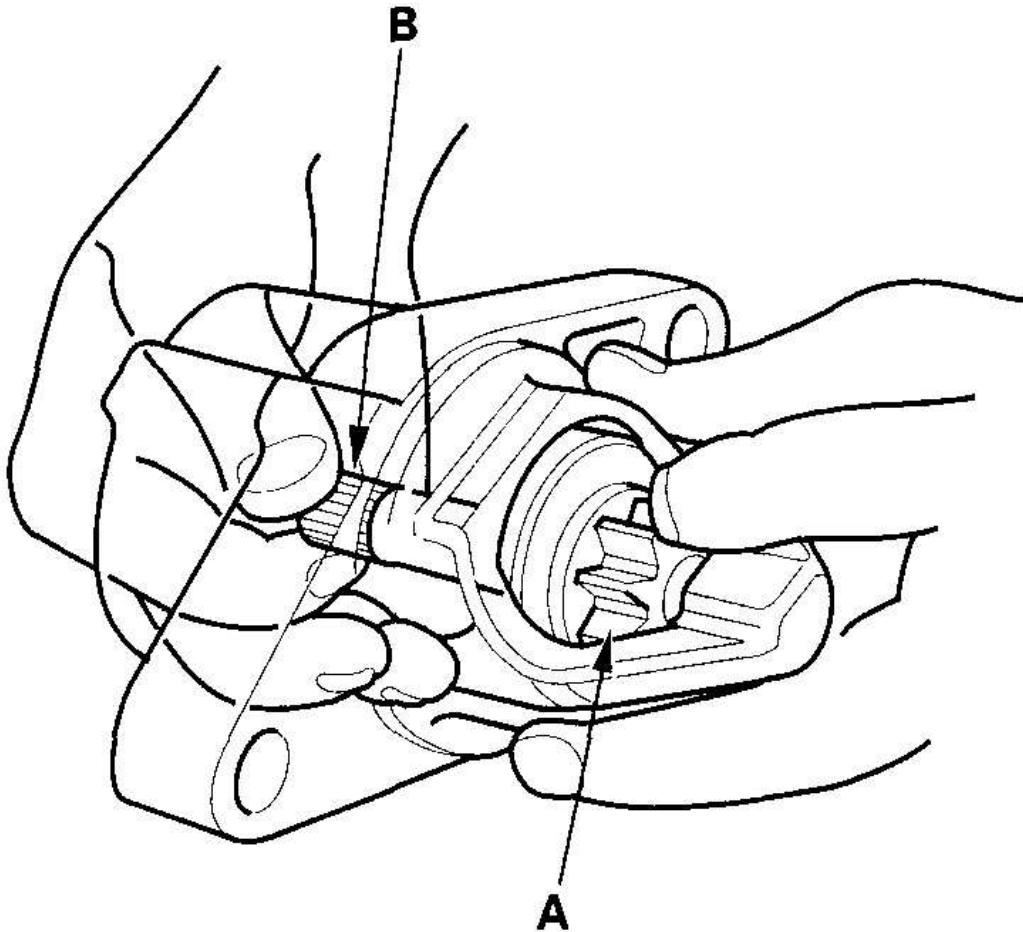
13. Check the planetary gears (A) and ring gear (B) for wear or damage. If they are worn or damaged, replace the planetary gears and ring gear.



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**Fig. 23: Checking Planetary Gears And Ring Gear**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. While holding the drive gear (A), turn the gear shaft (B) clockwise. Check that the drive gear comes out to the other end. If the drive gear does not move smoothly, replace the gear cover assembly.



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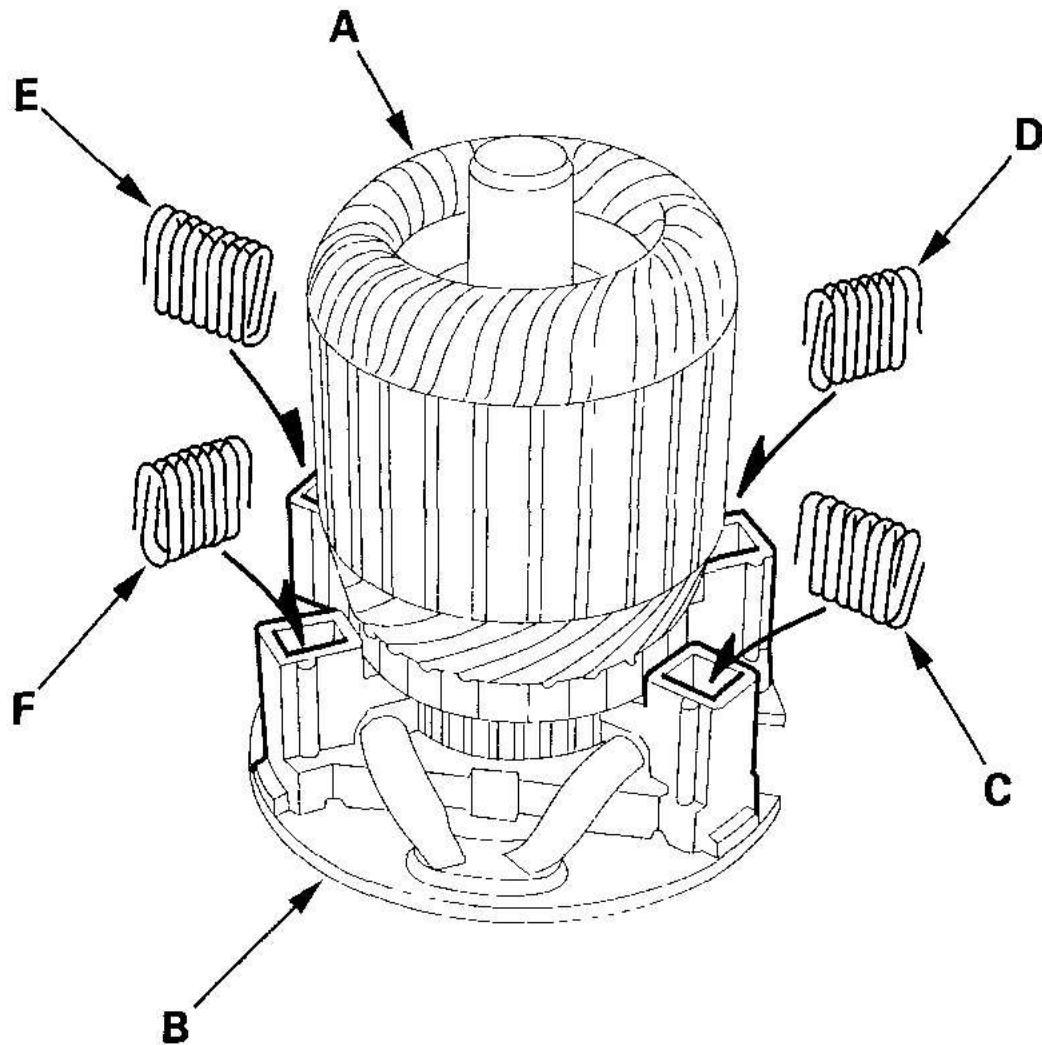
**Fig. 24: Holding Drive Gear And Turning Gear Shaft**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

15. While holding the drive gear, turn the gear shaft counterclockwise. The gear shaft should rotate freely. If the gear shaft does not rotate smoothly, replace the gear cover assembly.

16. If the starter drive gear is worn or damaged, replace the gear cover assembly. Check the condition of the flywheel ring gear if the drive gear teeth are damaged.

17. Install the brush into the brush holder, and set the armature (A) in the brush holder (B).

**NOTE:** To seat the 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.



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**Fig. 25: Setting Armature In Brush Holder**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

18. While squeezing a spring (C), insert it in the hole on the brush holder and push it until it bottoms. Repeat this for the other three springs (D, E, and F).
19. Install the armature and brush holder assembly in the housing.

**NOTE:     Make sure the armature stays in the holder.**

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20. Reassemble the starter in the reverse order of disassembly.