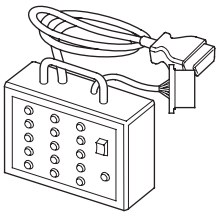
04

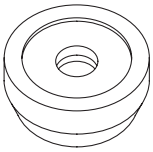
Engine Electrical

Special Tools

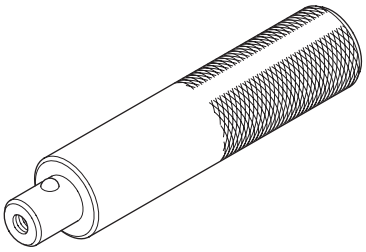
Ref. No.	Tool Number	Description	Qty
1	07WAJ-0010100	DLC Pin Box	1
2	07746-0010400	Driver Attachment, 52 x 55 mm	1
3	07749-0010000	Handle Driver	1



1



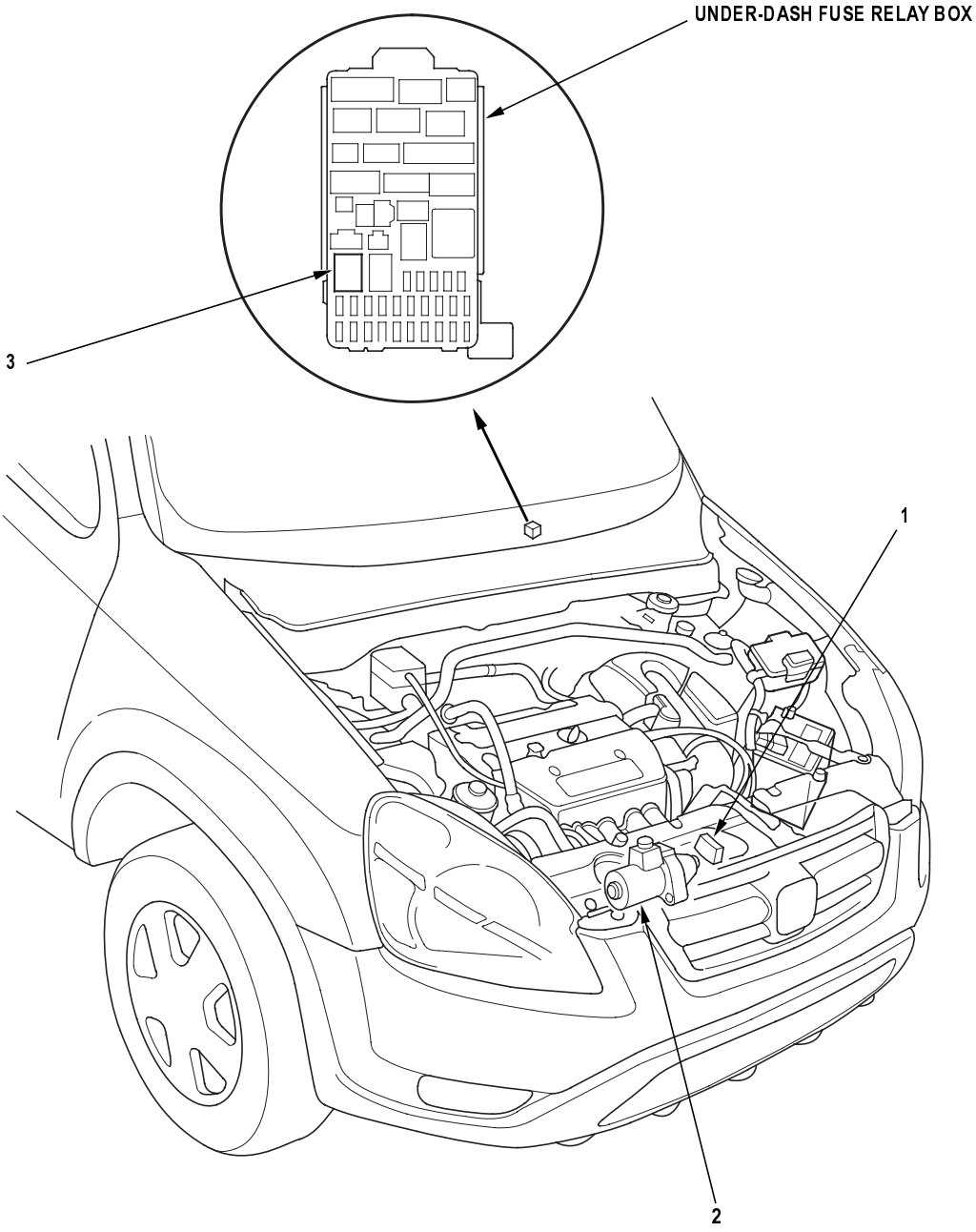
2



3

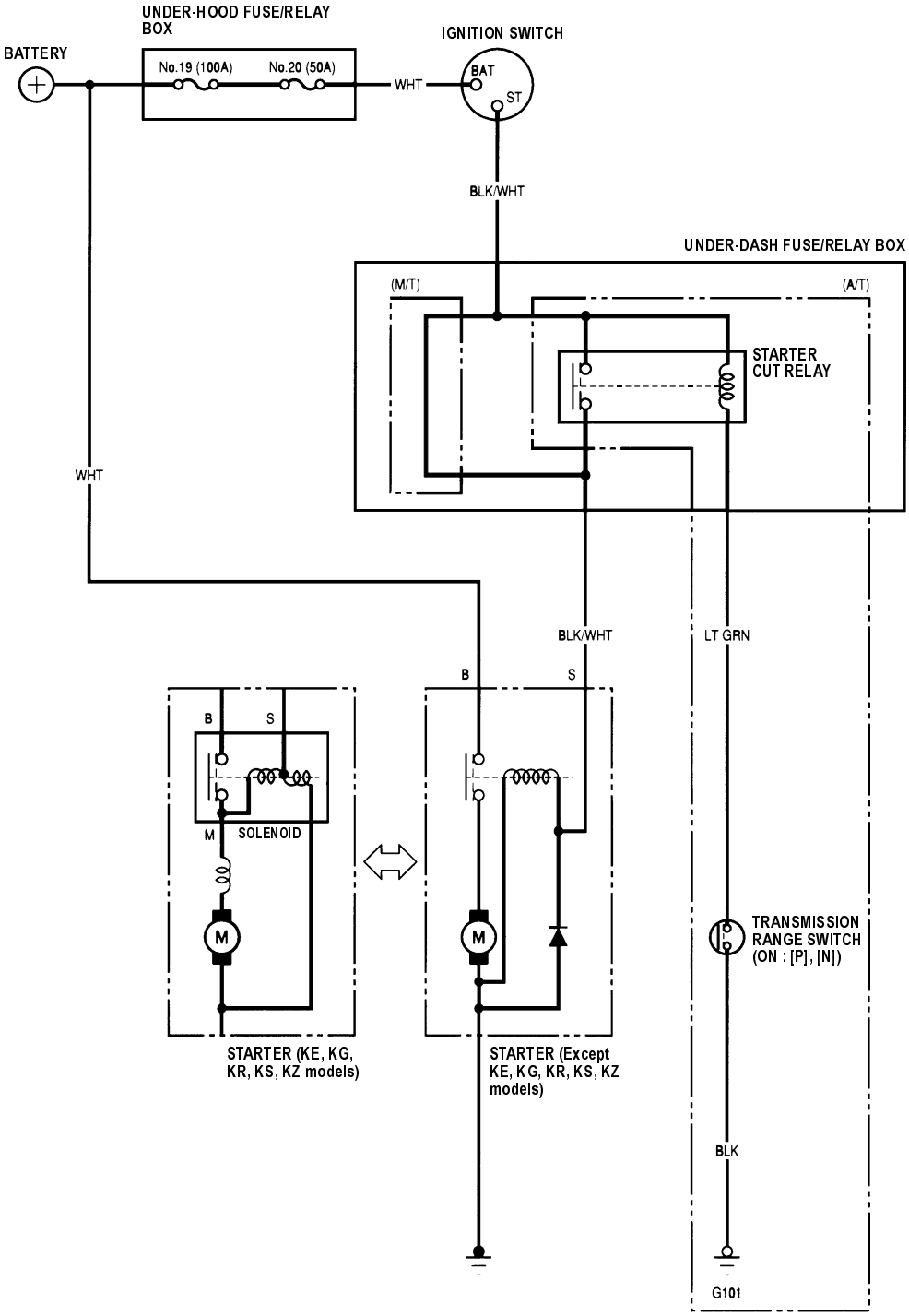
Starting System

Component Location Index



1	TRANSMISSION RANGE SWITCH (A/T)	Test, page 14-168; Replacement, page 14-169
2	STARTER	Starter Circuit Troubleshooting, page 04-5; Solenoid Test, page 04-6; Performance, page 04-7; Replacement, page 04-9; Overhaul, page 04-10
3	STARTER CUT RELAY (A/T)	Test, page 22A-60

Circuit Diagram



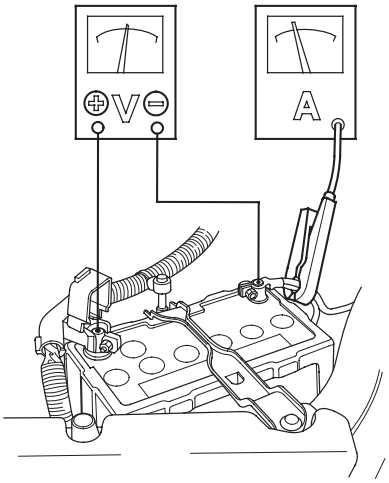
Starter Circuit Troubleshooting

NOTE:
- Air temperature must be between 15° and 38°C (59° and 100°F) during this procedure.
- After this test, or any subsequent repair, reset the Engine Control Module (ECM)/Powertrain Control Module (PCM) to clear any Diagnostic Trouble Codes (DTCs) (see page 11-4).
- The battery must be in good condition and full charged (see page 22A-59).

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 volt)
- Tachometer, 0 - 1200 rpm (min^{-1})



2. Remove the No. 6 (15A) fuse from the under-hood fuse/relay box.

3. With the shift lever in [N] or [P] (A/T), turn the ignition switch to start (III).

Did the starter crank the engine normally?

Yes The starting system is OK.■

No If starter will not crank the engine at all, go to step 4. If it cranks the engine erratically or too slowly, go to step 7. If it won't disengage from the flywheel or torque converter ring gear when you release the key, check for the following until you find the cause.
- Solenoid plunger and switch malfunction
- Dirty drive gear or damaged overrunning clutch

4. 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.

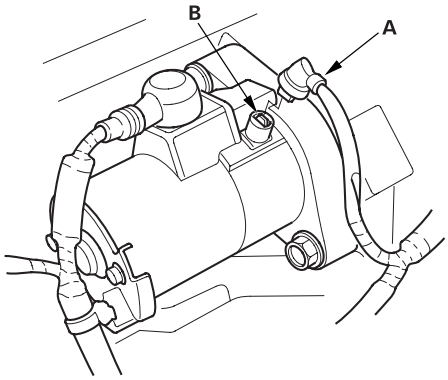
Did the starter crank the engine?

Yes Repairing the loose connection repaired the problem. The starting system is OK.■

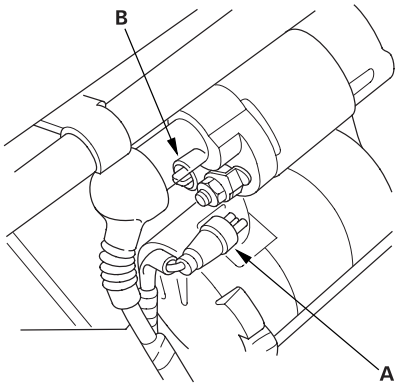
No Go to step 5.

5. Make sure the transmission is in neutral, then disconnect the BLK/WHT wire (A) from the starter solenoid (B). Connect a jumper wire from the battery positive terminal to the solenoid terminal.

Except KE, KG, KR, KS, KZ models:



KE, KG, KR, KS, KZ models:



Did the starter crank the engine?

Yes Go to step 6.

No Remove the starter, and repair or replace as necessary.

(cont'd)

Starter Circuit Troubleshooting (cont'd)

Alternate Procedure (cont'd)

6. Check the following items in the order listed until you find the open circuit.
- Check the BLK/WHT wire and connectors between the under-dash fuse/relay box and the ignition switch, and between the under-dash fuse/relay box and the starter.
- Check the ignition switch (see page 11-3).
- Check the transmission range switch and connector (A/T).
- Check the starter cut relay (A/T).

7. Check the engine speed while cranking the engine.

Is the engine speed above 100 rpm (min^{-1})?

Yes Go to step 8.

No Replace the starter, or remove and disassemble it, and check for the following until you find the cause.
- Excessively worn starter brushes
- Open circuit in commutator brushes
- Dirty or damaged helical splines or drive gear
- Faulty drive gear clutch

8. Check the cranking voltage and current draw.

Is cranking voltage greater than or equal to 8.5 V (Except KE, KG, KR, KS, KZ models) /8.7 V (KE, KG, KR, KS, KZ models) and current draw less than or equal to 350 A (K20A4 (Except KE, KG, KR, KS, KZ models), K20A5 engines) /380 A (K24A1 engine) /230 A (K20A4 (KE, KG, KR, KS, KZ models) engine) ?

Yes Go to step 9.

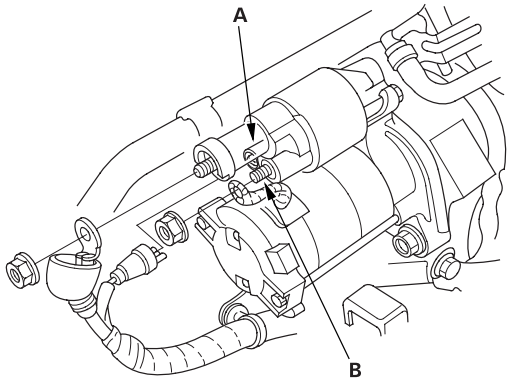
No Replace the starter, or remove and disassemble it, and check for the following until you find the cause.
- Open circuit in starter armature commutator segments
- Starter armature dragging
- Shorted armature winding
- Excessive drag in engine

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

Starter Solenoid Test

KE, KG, KR, KS, KZ models

1. Check the hold-in coil for continuity between the S terminal (A) and the armature housing (ground). There should be continuity.
- If there is continuity, go to step 2.
- If there is no continuity, replace the solenoid.

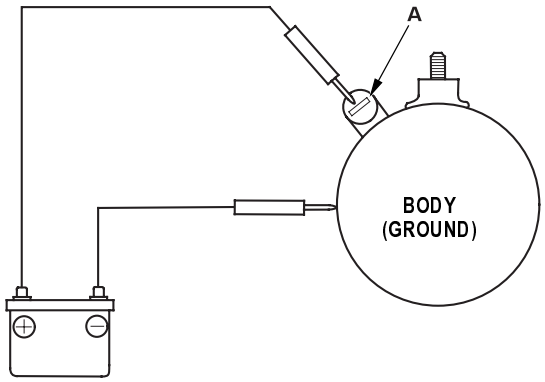


2. Check the pull-in coil for continuity between the S terminal (A) and M terminal (B). There should be continuity.
- If there is continuity, the solenoid is OK.
- If there is no continuity, replace the solenoid.

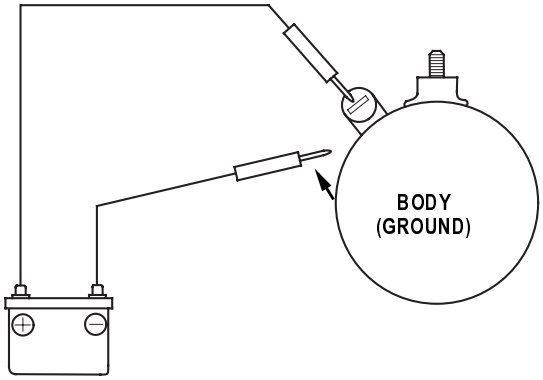
Starter Performance Test

Except KE, KG, KR, KS, KZ models

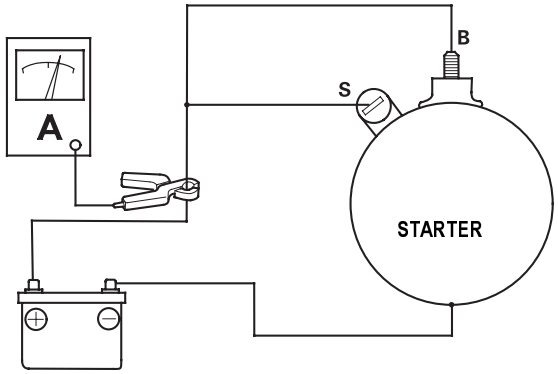
1. Disconnect the wire from the S terminal (A).
2. Make the connections as described below using as heavy a wire as possible (preferably equivalent to the wire used for the vehicle). To avoid damaging the starter, never leave the battery connected for more than 10 seconds.
3. Connect the battery as shown. If the starter pinion moves out, it is working properly.



4. Disconnect the battery from the body. If the pinion retracts immediately, it is working properly.



5. Clamp the starter firmly in a vise.
6. Connect the starter to the battery as described in the diagram below, and confirm that the motor starts and keeps rotating.



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:

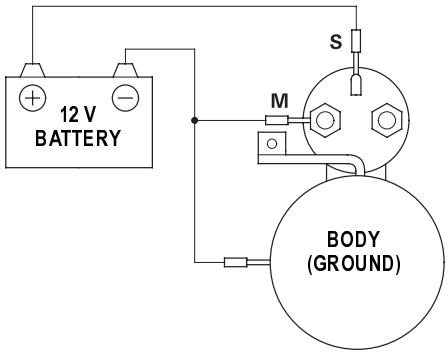
Electric current:	**80 A or less**
Motor speed:	
K20A4, K20A5 engines:	**2,600 rpm (min^{-1}) or more**
K24A1 engine:	**2,300 rpm (min^{-1}) or more**

(cont'd)

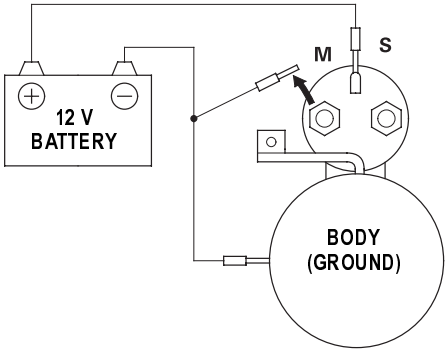
Starter Performance Test (cont'd)

KE, KG, KR, KS, KZ models

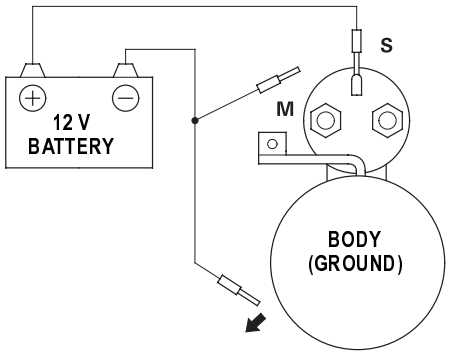
1. Disconnect the wires from the S terminal and the M terminal.
2. Make the connections as described below using as heavy a wire as possible (preferably equivalent to the wire used for the vehicle). To avoid damaging the starter, never leave the battery connected for more than 10 seconds.
3. Connect the battery as shown. If the starter pinion moves out, it is working properly.



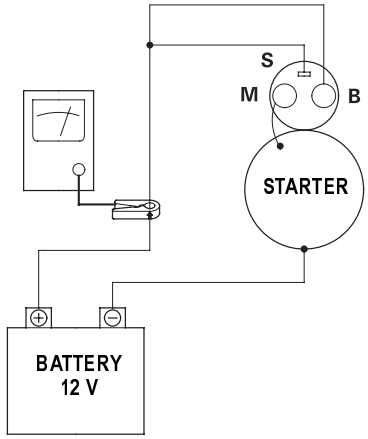
4. Disconnect the battery from the M terminal. If the pinion does not retract, the hold-in coil is working properly.



5. Disconnect the battery from the body. If the pinion retracts immediately, it is working properly.



6. Clamp the starter firmly in a vise.
7. Connect the starter to the battery as described in the diagram below, and confirm that the motor starts and keeps rotating.

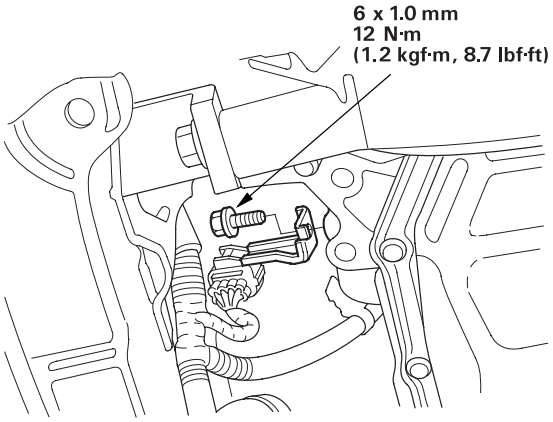


8. If the electric current and motor speed meet the specifications when the battery voltage is at 11.5 V, the starter is working properly.

Specifications:
Electric current: 90 A or less
Motor speed: 3,000 rpm (min^{-1}) or more

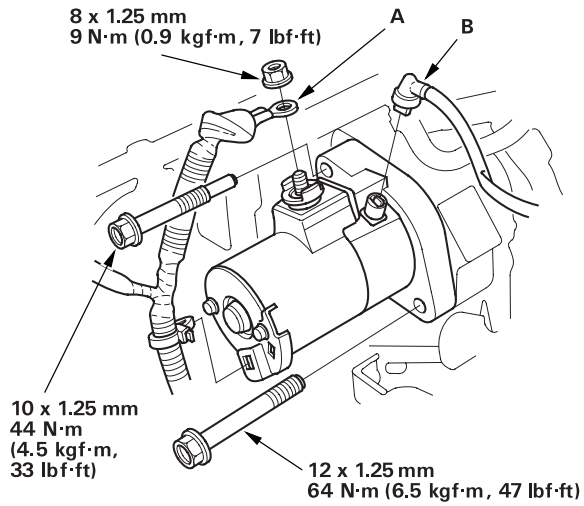
Starter Replacement

1. Disconnect the battery negative cable, then disconnect the positive cable.
2. Disconnect the knock sensor connector.
3. Disconnect the bolt securing the harness bracket.

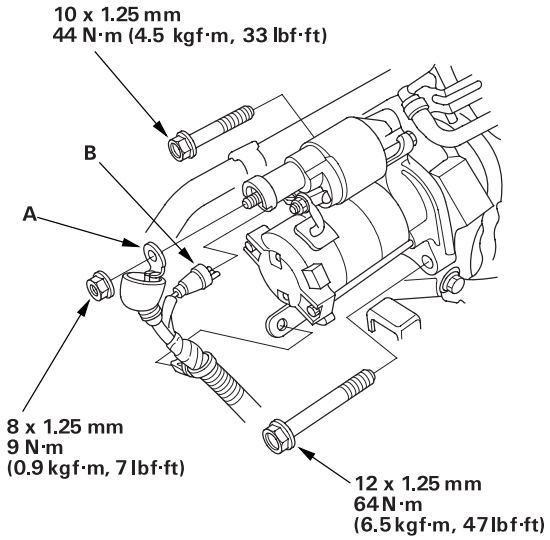


4. Disconnect the starter cable (A) from the B terminal on the solenoid, then disconnect the BLK/WHT wire (B) from the S terminal.

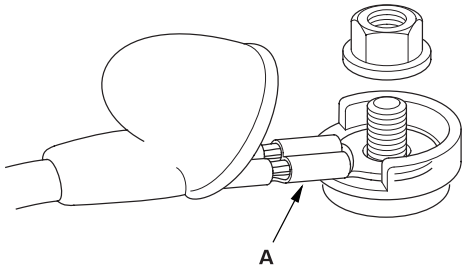
Except KE, KG, KR, KS, KZ models:



KE, KG, KR, KS, KZ models:



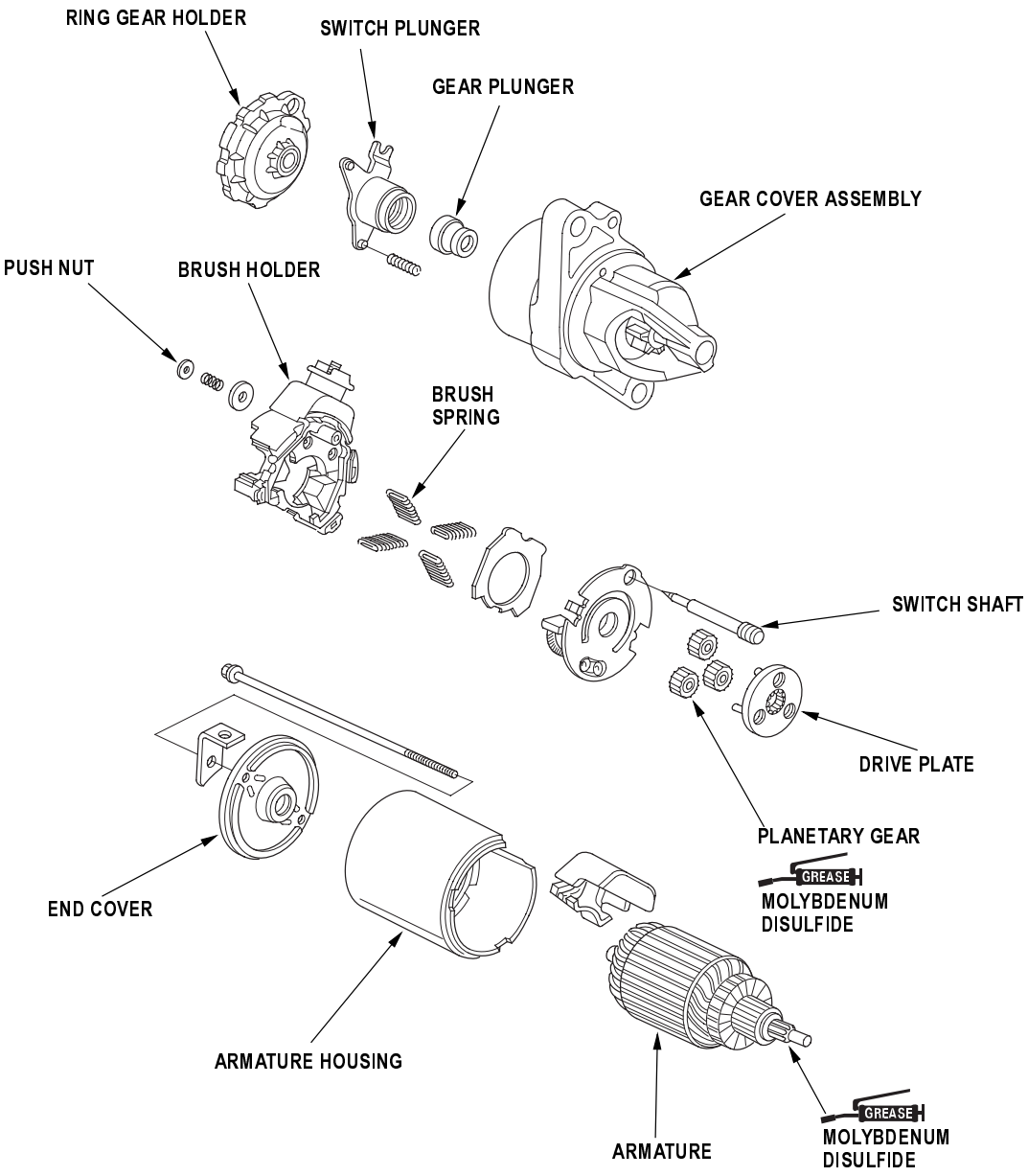
5. Remove the two bolts holding the starter, then remove the starter.
6. Install the starter in the reverse order of removal. Make sure the crimped side of the ring terminal (A) is facing out.



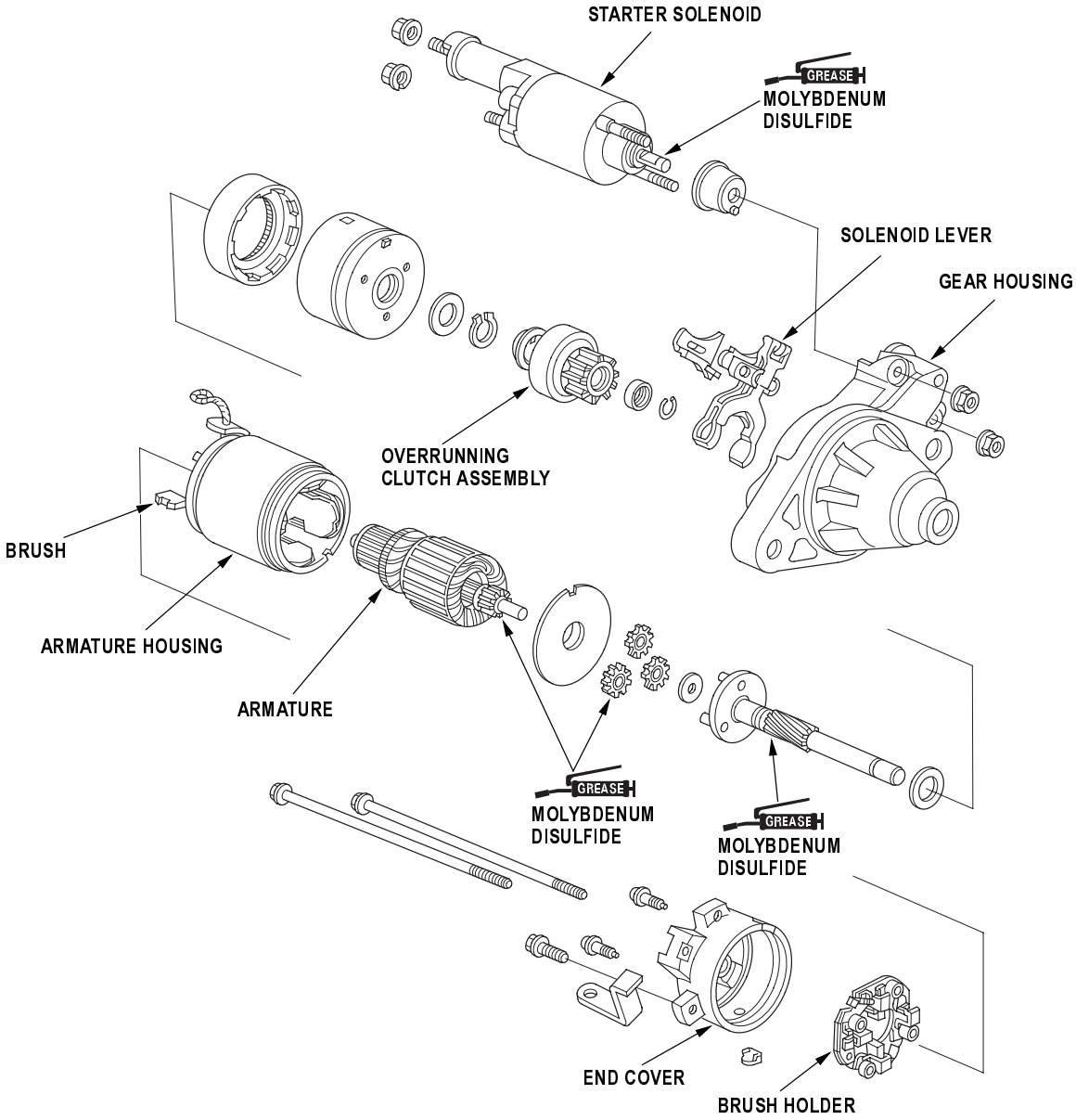
7. Connect the battery positive cable and negative cable to the battery.
8. Start the engine to make sure the starter operates properly.

Starter Overhaul

Disassembly/Reassembly-Except KE, KG, KR, KS, KZ models



Disassembly/Reassembly-KE, KG, KR, KS, KZ models

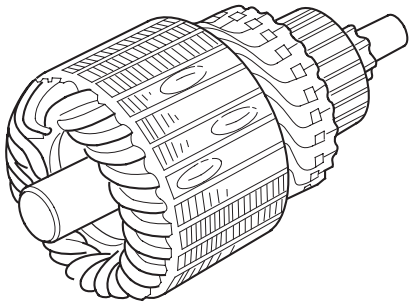


(cont'd)

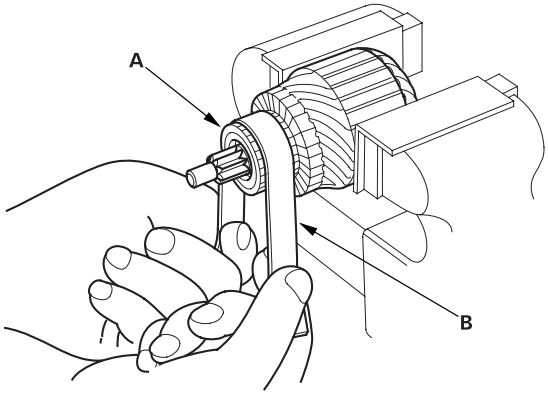
Starter Overhaul (cont'd)

Armature Inspection and Test

1. Remove the starter (see page 04-9).
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.

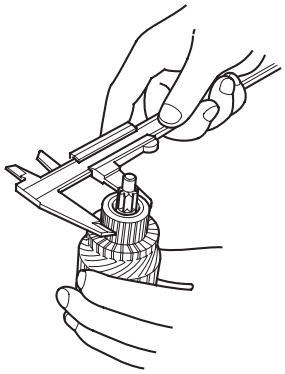


4. Check the commutator (A) surface. If the surface is dirty or burnt, resurface with emery cloth or a lathe within the following specifications, or recondition with #500 or #600 sandpaper (B).



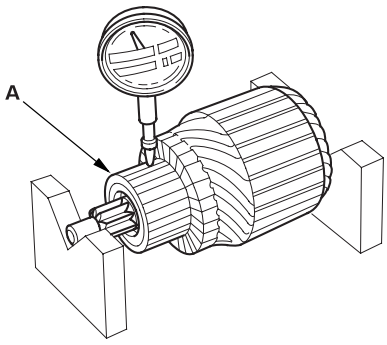
5. Check the commutator diameter. If the diameter is below the service limit, replace the armature.

Commutator Diameter:
Except KE, KG, KR, KS, KZ models:
Standard (New): 28. 0 - 28.1 mm (1.102 - 1.106 in.)
Service Limit: 27.5 mm (1.083 in.)
KE, KG, KR, KS, KZ models:
Standard (New): 28.0 mm (1.10 in.)
Service Limit: 27.0 mm (1.06 in.)



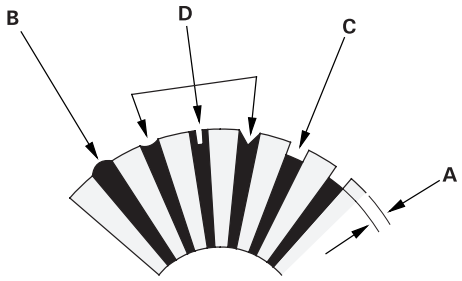
6. Measure the commutator (A) runout.
   - If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   - If the commutator runout is not within the service limit, replace the armature.

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

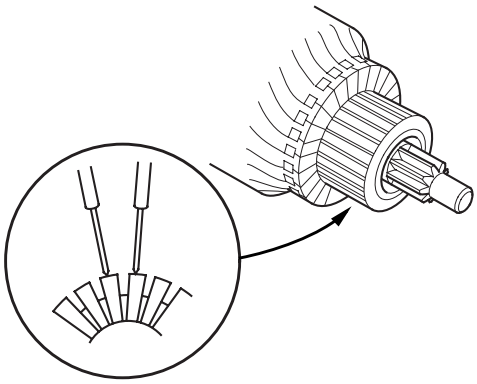


7. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or V-shaped (D).

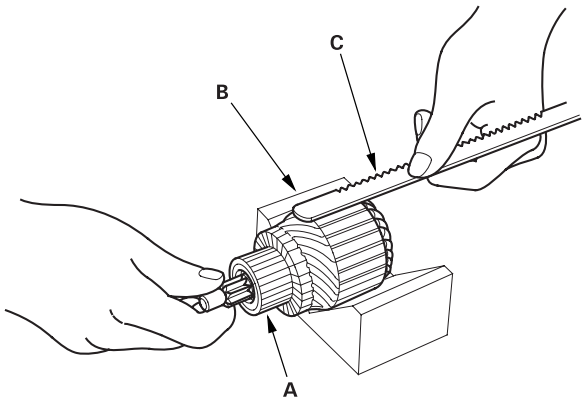
Commutator Mica Depth:
Except KE, KG, KR, KS, KZ models:
Standard (New): 0.40 - 0.50 mm (0.016 - 0.020 in.)
Service Limit: 0.15 mm (0.006 in.)
KE, KG, KR, KS, KZ models:
Standard (New): 0.50 - 0.80 mm (0.020 - 0.031 in.)
Service Limit: 0.20 mm (0.008 in.)



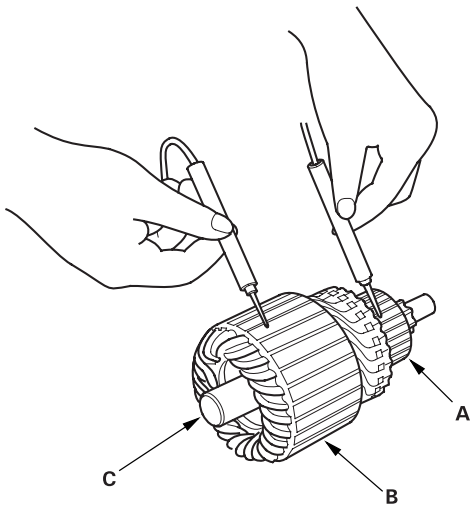
8. Check for continuity between the segments of the commutator. If an open circuit exists between any segments, replace the armature.



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.



10. 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.



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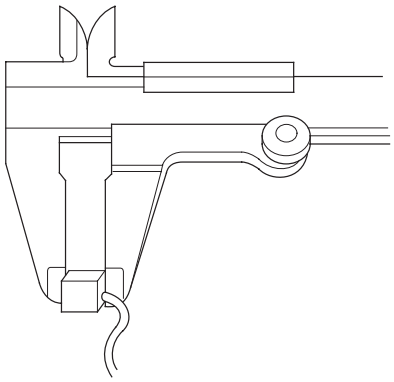
Starter Overhaul (cont'd)

Starter Brush Inspection

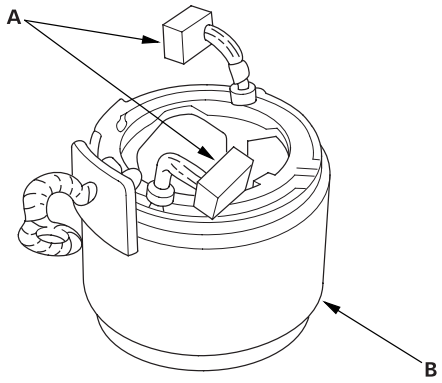
11. Measure the brush length. If it is not within the service limit, replace the brush holder assembly.

Brush Length
Except KE, KG, KR, KS, KZ models:
Standard (New): 11.1 - 11.5 mm (0.44 - 0.45 in.)
Service Limit: 4.3 mm (0.17 in.)
KE, KG, KR, KS, KZ models:
Standard (New): 14.0 - 14.5 mm (0.55 - 0.57 in.)
Service Limit: 9.0 mm (0.35 in.)



Starter Field Winding Test (KE, KG, KR, KS, KZ models)

12. Check for continuity between the brushes (A). If there is no continuity, replace the armature housing (B).

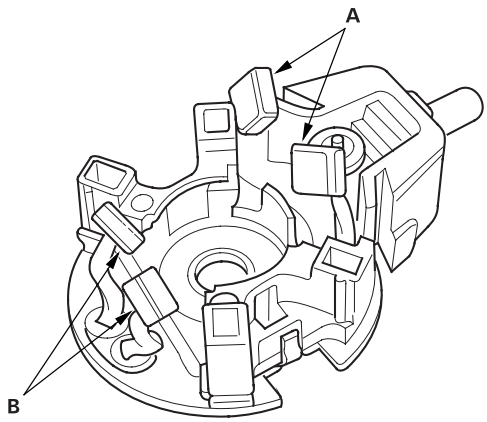


13. Check for continuity between each brush (A) and the armature housing (B). If there is continuity, replace the armature housing.

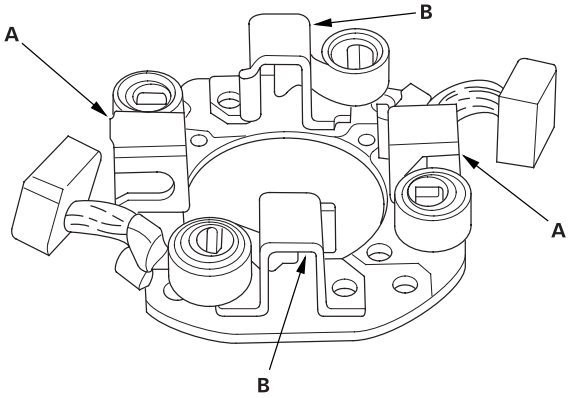
Starter Brush Holder Test

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

Excpet KE, KG, KR, KS, KZ models:



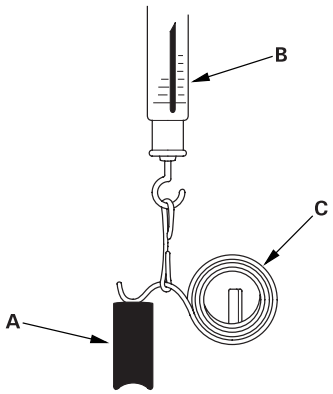
KE, KG, KR, KS, KZ models:



Brush Spring Inspection (KE, KG, KR, KS, KZ models)

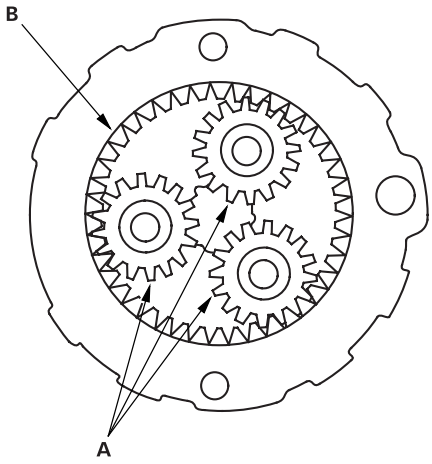
15. Insert the brush (A) into the brush holder, and bring the brush into contact with the commutator, then attach a spring scale (B) to the spring (C). Measure the spring tension at the moment the spring lifts off the brush. If the spring tension is not within specification, replace the spring.

Spring Tension: 13.7 - 17.7 N (1.40 - 1.80 kgf, 3.09 - 3.97 lbf)



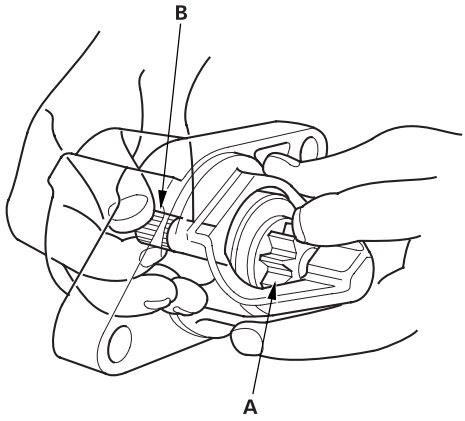
Planetary Gear Inspection

16. Check the planetary gears (A) and ring gear (B). Replace them if they are worn or damaged.



Overrunning Clutch Inspection (Except KE, KG, KR, KS, KZ models)

17. 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.



18. 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.

19. 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. Replace it if the starter drive gear teeth are damaged.

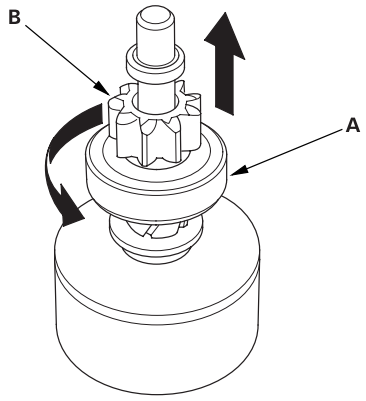
(cont'd)

Starter Overhaul (cont'd)

Overrunning Clutch Inspection (KE, KG, KR, KS, KZ models)

20. Slide the overrunning clutch along the shaft. Replace it, if it does not slide smoothly.

21. Rotate the overrunning clutch (A) both ways. Does it lock in one direction and rotate smoothly in reverse? If it does not lock in either direction or it locks in both directions, replace it.

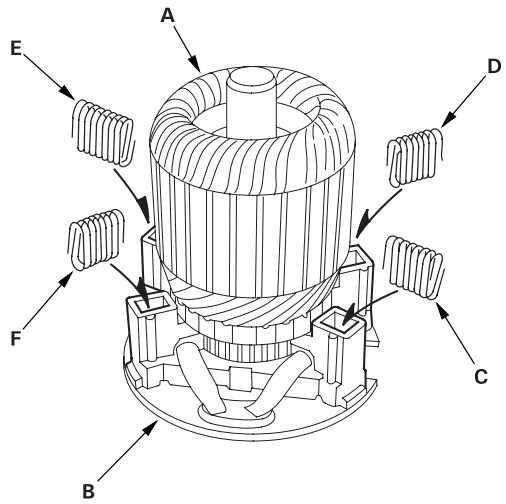


22. If the starter drive gear (B) is worn or damaged, replace the overrunning clutch assembly; the gear is not available separately.
Check the condition of the flywheel ring gear. Replace it if the starter drive gear teeth are damaged.

Starter Reassembly (Except KE, KG, KR, KS, KZ models)

23. 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.



24. 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).

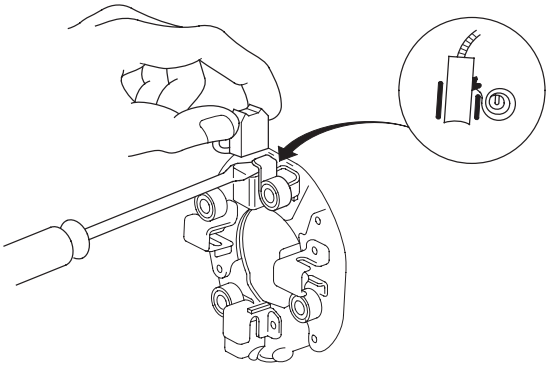
25. Install the armature and brush holder assembly into the housing.

NOTE: Make sure the armature stays in the holder.

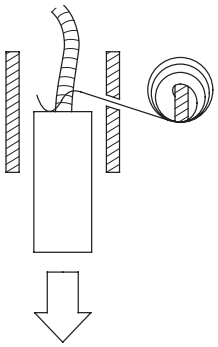
Starter Reassembly (KE, KG, KR, KS, KZ models)

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

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.



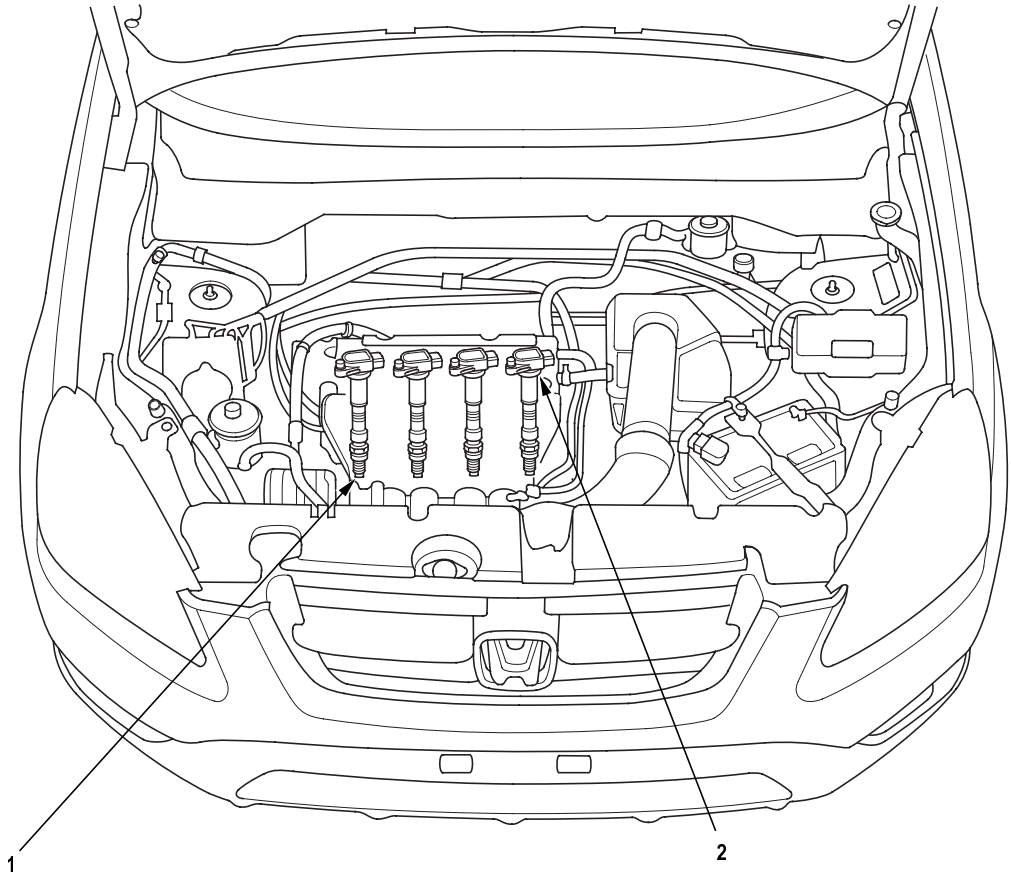
27. Install the armature in the housing, and install the brush holder. Next, pry back each brush spring again, and push the brush down until it seats against the commutator, then release the spring against the end of the brush.



28. Install the starter end cover to retain the brush holder.

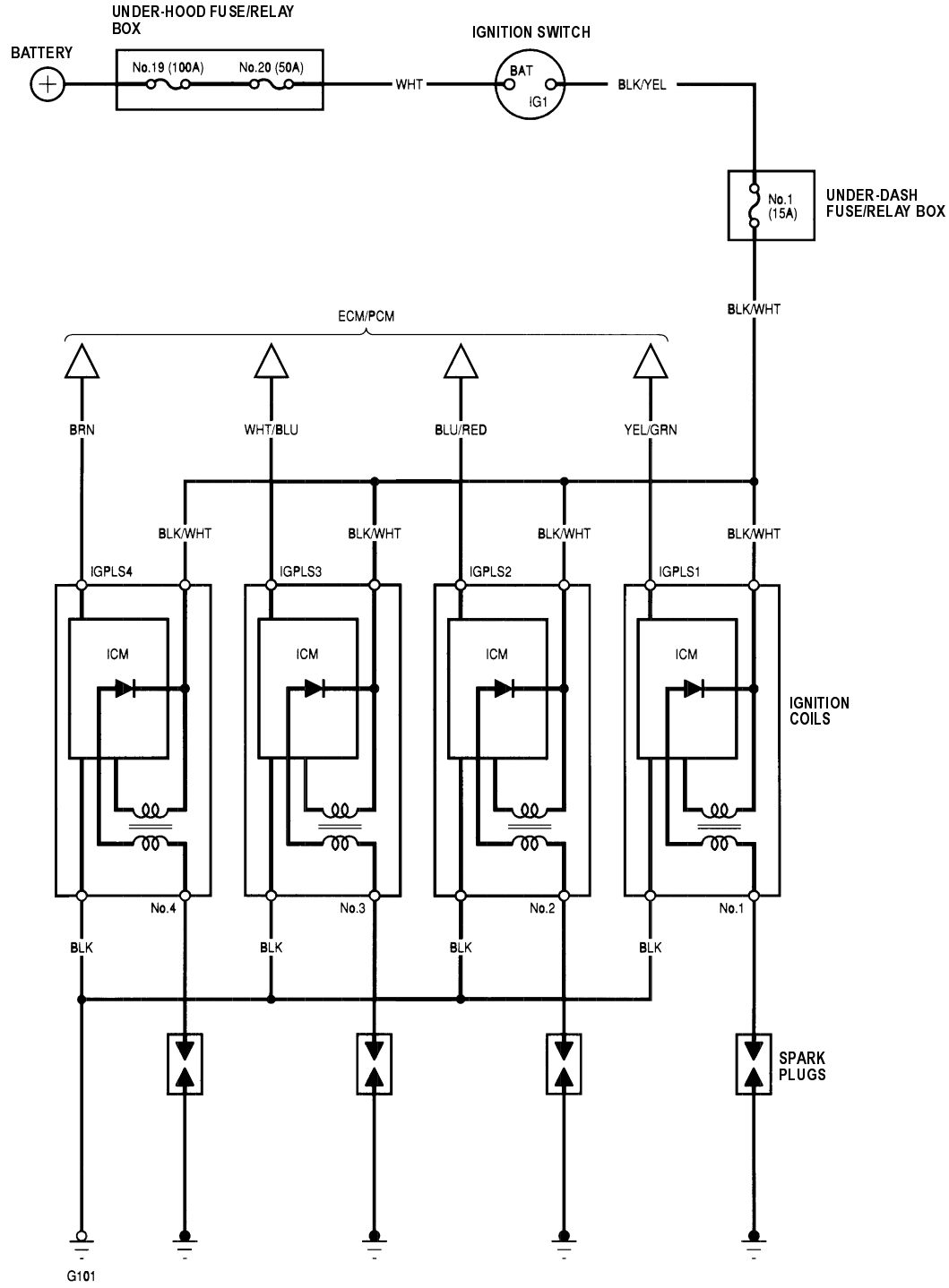
Ignition System

Component Location Index



1	SPARK PLUG	Inspection, page 04-23
2	IGNITION COIL	Ignition Timing Inspection, page 04-20 Removal/Installation, page 04-21 Troubleshooting, page 04-21

Circuit Diagram

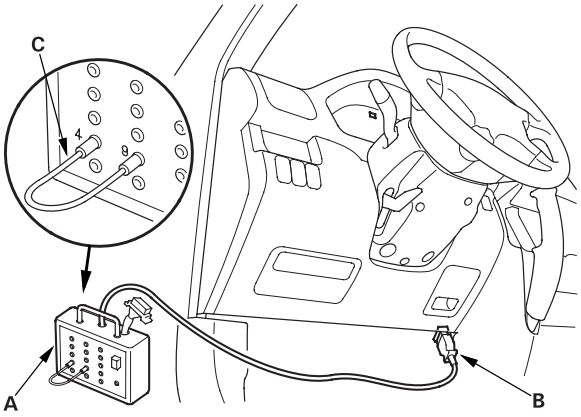


ICM: Ignition Control Module

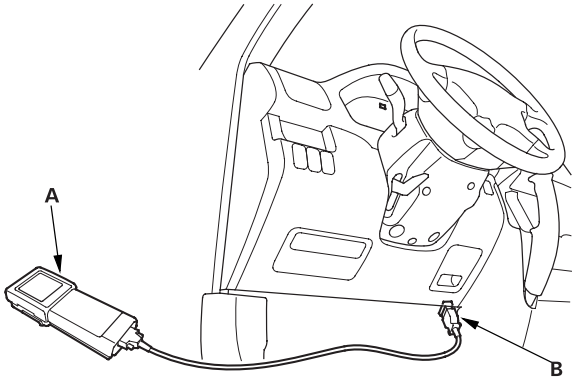
Ignition Timing Inspection

Special Tools Required
DLC pin box 07WAJ-0010100

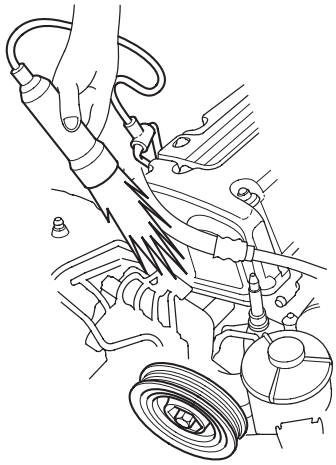
1. Start the engine. Hold the engine at 3,000 rpm (min^{-1}) with no load (in Park or Neutral) until the radiator fan comes on, then let it idle.
2. Check the idle speed (see page 11-148).
3. Short the SCS terminal to ground by using the DLC pin box: Connect the DLC pin box (A) to the Data Link Connector (DLC) (16P) (B), then connect the No. 4 and No. 9 terminals on the DLC pin box with a jamper wire (C), and push the switch.



4. Short the SCS terminal to ground by using the Honda PGM Tester: Connect the Honda PGM tester (A) to the data link connector (16P) (B).

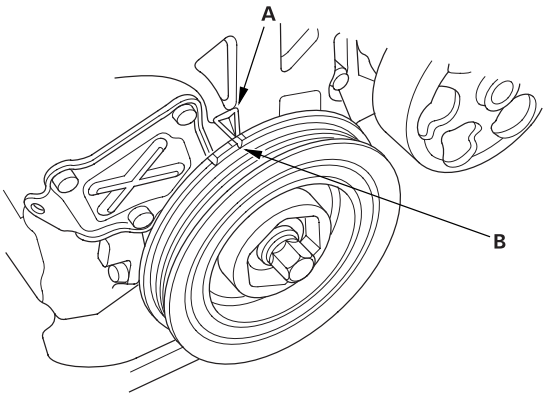


5. Connect the timing light to the service loop.



6. Point the light toward the pointers (A) on the chain case. Check the ignition timing under no load conditions: headlights, blower fan, rear window defogger, and air conditioner are not operating.

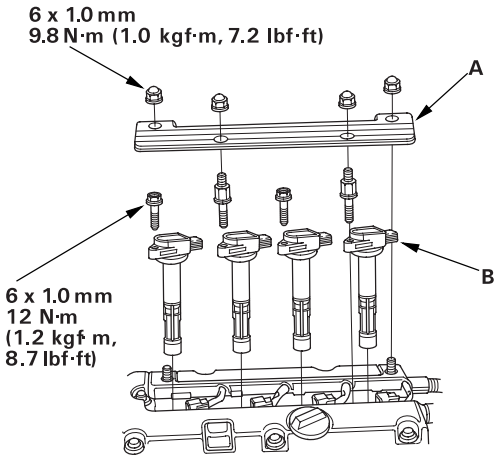
Ignition Timing:
M/T: 8° ± 2° BTDC (RED mark (B)) during idling in neutral
A/T: 8° ± 2° BTDC (RED mark (B)) during idling in [P] or [N]



7. If the ignition timing differs from the specification, replace the Engine Control Module (ECM)/ Powertrain Control Module (PCM) (see page 11-4).
8. Disconnect the special tool/Honda PGM Tester and the timing light.

Ignition Coil Removal/Installation

1. Remove the ignition coil cover (A), then remove the ignition coils (B).



2. Install the ignition coils in the reverse order of removal.

Ignition Coil Troubleshooting

1. Remove the four ignition coils (see page 04-21).
2. Remove the spark plugs from the cylinder head, and inspect the spark plug (see page 04-23).

   Is the spark plug OK?

   Yes Go to step 3.

   No Replace the spark plug.■
3. Disconnect the four injector connectors (see page 11-117).
4. Install the spark plugs on the ignition coils.
5. Connect the ignition coil connector, and connect the spark plug on the ground.
6. With the shift lever in [N] or [P] (A/T), turn the ignition switch to start (III), and check the spark.

   Does the plug spark?

   Yes Ignition coil is OK.■

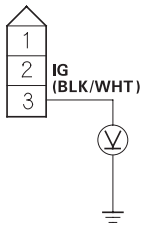
   No Go to step 7.
7. Substitute a known-good ignition coil, and recheck the spark.

   Does the plug spark?

   Yes Replace the original ignition coil.■

   No Go to step 8.
8. Disconnect the ignition coil 3P connector.
9. Turn the ignition switch ON (II).
10. Measure voltage between the ignition coil 3P connector terminal No. 3 and body ground.

IGNITION COIL 3P CONNECTOR



Wire side of female terminals

Is there battery voltage?

Yes Go to step 11.

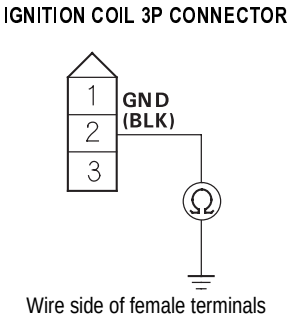
No Repair open in the wire between ignition coil and No. 1 (15A) fuse in the under-dash fuse/relay box.■

(cont'd)

Ignition Coil Troubleshooting (cont'd)

11. Turn the ignition switch OFF.

12. Check for continuity between the ignition coil 3P connector terminal No. 2 and body ground.



Is there continuity?

Yes Go to step 13.

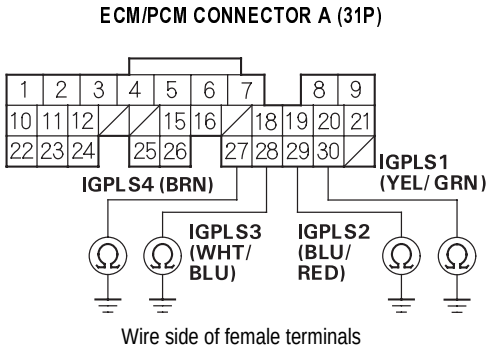
No Repair open in the wire between the ignition coil and G101.■

13. Disconnect the negative cable from the battery.

14. Disconnect Engine Control Module (ECM)/ Powertrain Control Module (PCM) connector A (31P).

15. Check for continuity between body ground and following ECM/PCM connector terminal.

- A27 (No. 4 ignition coil)
- A28 (No. 3 ignition coil)
- A29 (No. 2 ignition coil)
- A30 (No. 1 ignition coil)

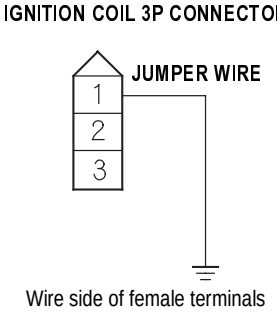


Is there continuity?

Yes Repair short in the wire between the ECM/ PCM and the ignition coil.■

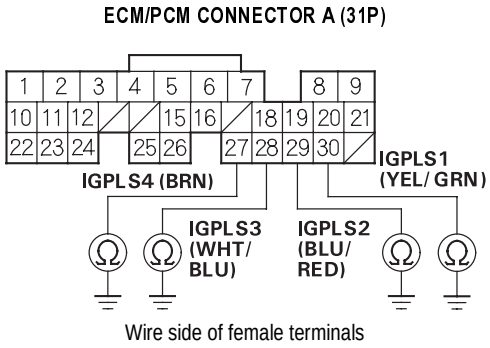
No Go to step 16.

16. Connect the ignition coil 3P connector terminal No. 1 and body ground with a jumper wire.



17. Check for continuity between body ground and following ECM/PCM connector terminal.

- A27 (No. 4 ignition coil)
- A28 (No. 3 ignition coil)
- A29 (No. 2 ignition coil)
- A30 (No. 1 ignition coil)



Is there continuity?

Yes Substitute a known-good ECM/PCM, and recheck (see page 11-5).■

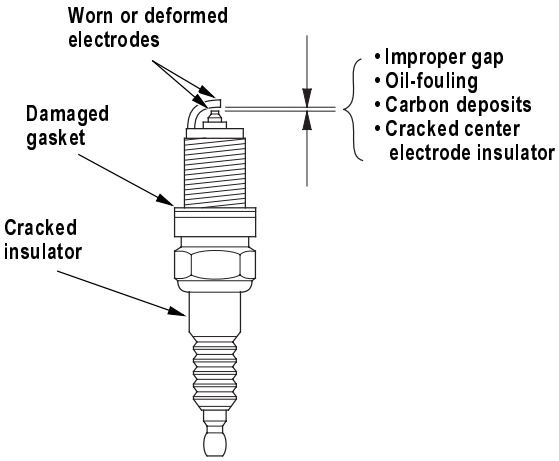
No Repair open in the wire between the ECM/ PCM and the ignition coil.■

Spark Plug Inspection

1. Inspect the electrodes and ceramic insulator.

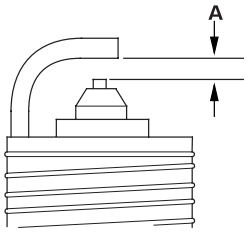
Burned or worn electrodes may be caused by:
- Advanced ignition timing
- Loose spark plug
- Plug heat range too hot
- Insufficient cooling

Fouled plug may be caused by:
- Retarded ignition timing
- Oil in combustion chamber
- Incorrect spark plug gap
- Plug heat range too cold
- Excessive idling/low speed running
- Clogged air cleaner element
- Deteriorated ignition coils



2. Check the electrode gap (A). If the gap is over the standard, adjust the gap with suitable gapping tool.

Electrode Gap:
Standard (New): 1.0 - 1.1 mm (0.039 - 0.043 in.)

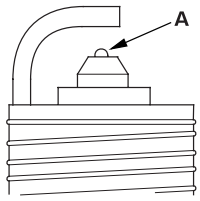


3. Replace the plug at the specified interval, or if the center electrode is rounded (A). Use only the spark plugs listed below.

Spark Plugs:

ZFR6K-11 (NGK)

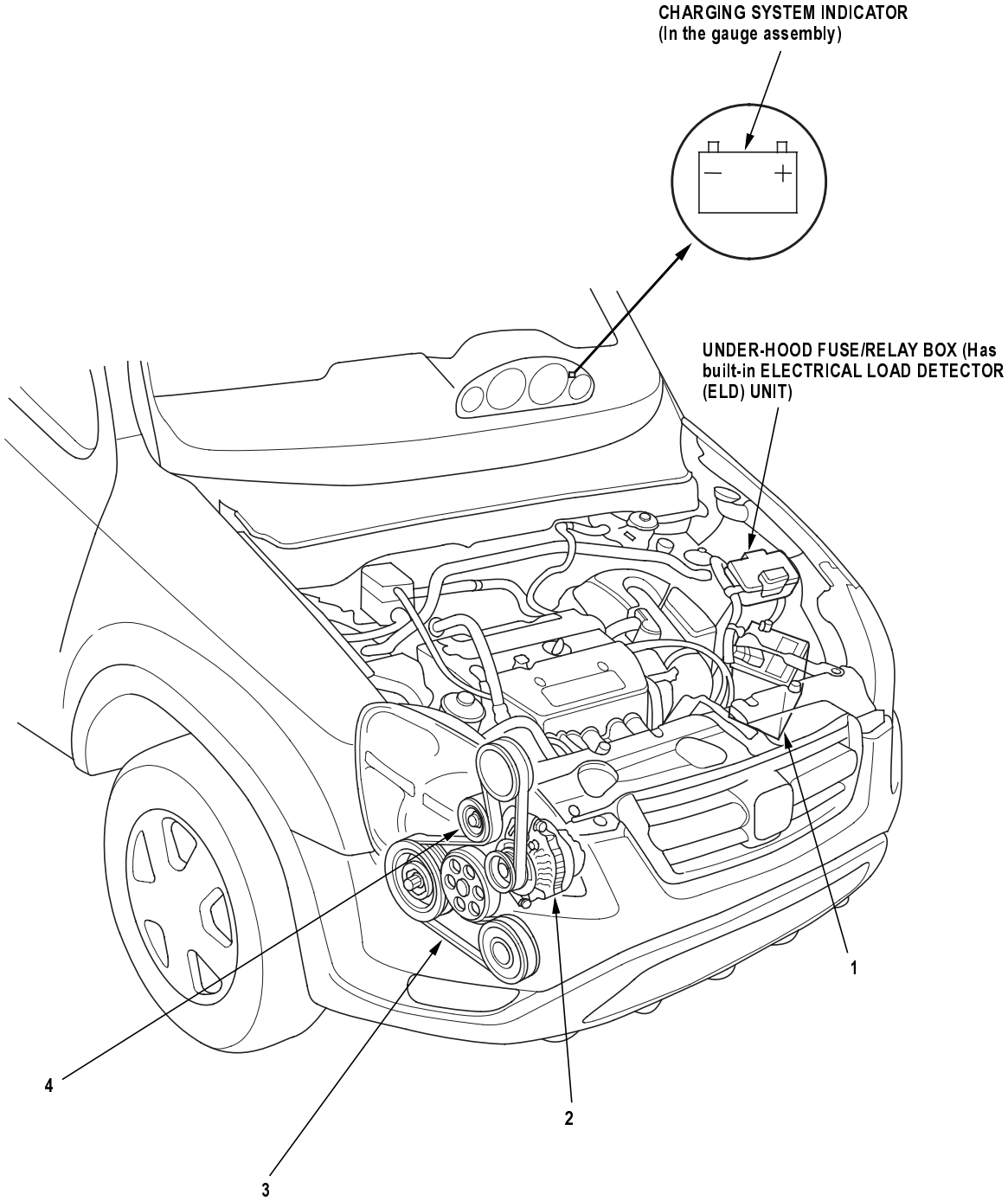
KJ20DR-M11 (DENSO)



4. Apply a small quantity of anti-seize compound to the plug threads, and screw the plugs into the cylinder head finger-tight. Then torque them to 18 N·m (1.8 kgf·m, 13 lbf·ft).

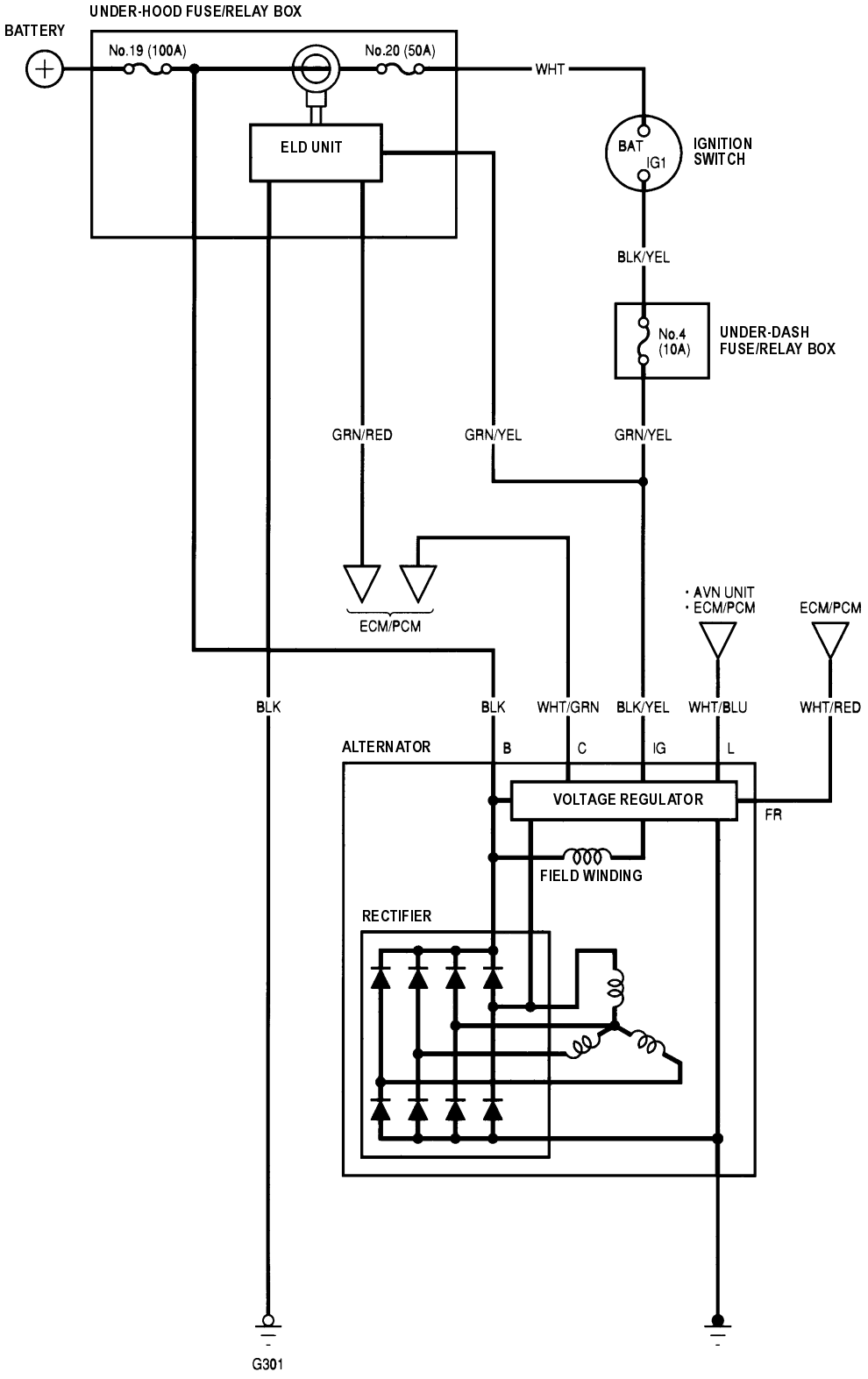
Charging System

Component Location Index



1	BATTERY	Test, page 22A-59
2	ALTERNATOR	Troubleshooting, page 04-26; Replacement, page 04-32; Overhaul, page 04-34
3	DRIVE BELT	Inspection, page 04-29; Replacement, page 04-30
4	AUTO-TENSIONER	Inspection, page 04-30; Replacement, page 04-31

Circuit Diagram

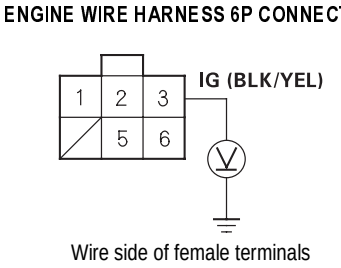


Charging Circuit Troubleshooting

If the charging system indicator does not come on or does not go off, or the battery is dead or low, test the following items in the order listed below:
Battery (see page 22A-59)
Charging system indicator
Alternator and regulator circuit
Alternator control system

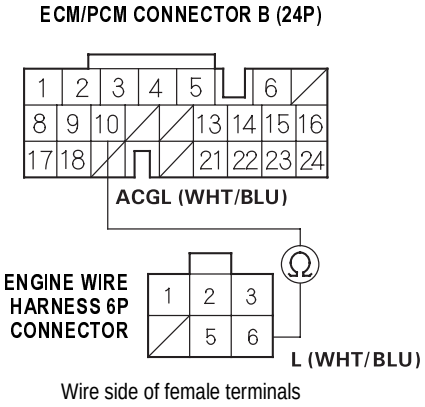
Charging System Indicator Test

1. Turn the ignition switch ON (II).
   Does the charging system indicator come on?
   Yes Go to step 2.
   No Go to step 3.
2. Start the engine.
   Does the charging system indicator go off?
   Yes Charging system indicator circuit is OK.■
   No Go to step 3.
3. Turn the ignition switch OFF.
4. Troubleshoot the multiplex control system (see page 22A-231).
   Is the multiplex control system OK?
   Yes Without navigation system. Go to step 7.
   Yes With navigation system. Go to step 5.
   No Check the multiplex control system as indicated by the Diagnostic Trouble Code (DTC) (see step 8 on page 22A-232).■
5. Disconnect the 12P connector from the AVN unit.
6. Start the engine.
   Does the charging system indicator go off?
   Yes Check that the terminals are firmly seated at the connectors. If OK, substitute a known-good AVN unit and recheck.■
   No Go to step 7.
7. Disconnect the engine wire harness 6P connector from the starter sub-harness 6P connector.
8. Measure the voltage at the No. 3 terminal of the engine wire harness 6P connector with the ignition switch ON (II).



   Is there battery voltage?
   Yes Go to step 9.
   No Check for a blown No.4 (10A) fuse in the under-dash fuse/relay box. If the fuse is OK, repair open in the wire between the alternator and the under-dash fuse/relay box.■
9. Turn the ignition switch OFF.
10. Disconnect the negative cable from the battery.
11. Disconnect Engine Control Module (ECM)/ Powertrain Control Module (PCM) connector B (24P).

12. Check continuity between the ECM/PCM connector terminal B10 and engine wire harness 6P connector terminal No. 6.



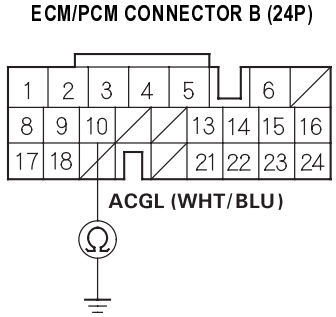
Wire side of female terminals

Is there continuity?

Yes Go to step 13.

No Repair open in the wire between the alternator and the ECM/PCM.■

13. Check continuity between the ECM/PCM connector terminal B10 and body ground.



Wire side of female terminals

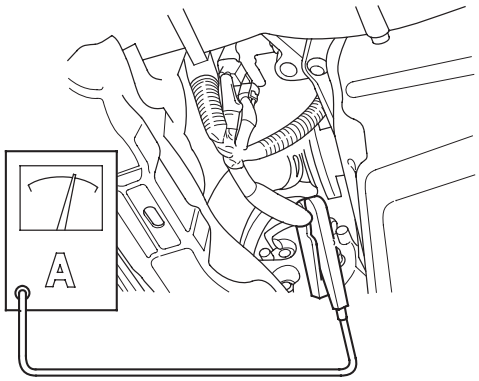
Is there continuity?

Yes Repair short in the wire between the alternator and the ECM/PCM.■

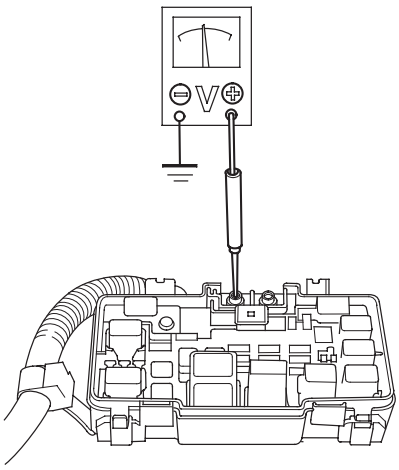
No Reconnect the negative cable to the battery, and go to alternator and regulator test.

Alternator and Regulator Circuit Test

1. Be sure the battery is sufficiently charged and in good condition (see page 22A-59).
2. Raise the hoist to full height.
3. Hook up the ammeter, 0 - 400 A, to the starter sub-harness.



4. Lower the hoist.
5. Hook up the voltmeter, 0 - 20 V (accurate within 0.1 V), to T101.



(cont'd)

Charging Circuit Troubleshooting (cont'd)

Alternator and Regulator Circuit Test (cont'd)

6. Start the engine. Hold the engine at 3,000 rpm (min^{-1}) with no load (in Park or Neutral) until the radiator fan comes on then let it idle.
7. Raise the engine speed to 2,000 rpm (min^{-1}) and hold it there.
8. Turn the headlights (high beam) on, and measure voltage at the under-hood fuse/relay box terminal.

   Is the voltage between 13.9 and 15.1 V?

   Yes Go to step 9.

   No Repair or replace the alternator (see page 04-34).■
9. Read the amperage at 13.5 V.

   NOTE: Adjust the voltage by turning the blower motor, rear window defogger, brake lights, etc. ON.

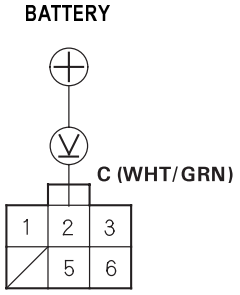
   Is the amperage 60A or more?

   Yes Alternator/regulator operation is OK.■

   No Repair or replace the alternator (see page 04-34).■

Alternator Control System Test

1. Check for proper operation of the Electrical Load Detector (ELD) by checking the Malfunction Indicator Lamp (MIL) (see page 11-3).
2. Disconnect the engine wire harness 6P connector from the starter sub-harness 6P connector.
3. Start the engine, and turn the headlights (high beam) ON.
4. Measure voltage between the engine wire harness 6P connector terminal No. 2 and the positive terminal of the battery.



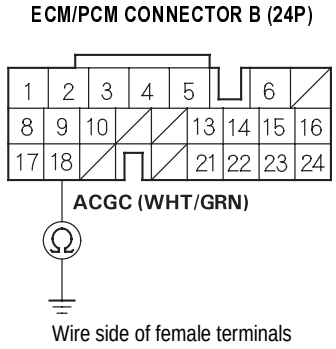
ENGINE WIRE HARNESS 6P CONNECTOR
Wire side of female terminals

   Is there 1 V or less?

   Yes Go to step 9.

   No Go to step 5.
5. Turn the headlights and ignition switch OFF.
6. Disconnect the negative cable from the battery.
7. Disconnect ECM/PCM connector B (24P).

8. Check for continuity between ECM/PCM connector terminal B18 and body ground.

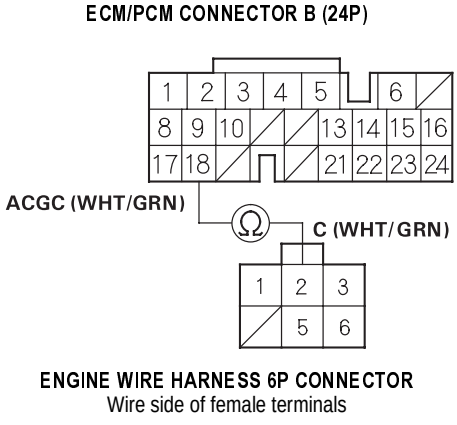


Is there continuity?

Yes Repair short in the wire between the alternator and the ECM/PCM.■

No Check that the terminals are firmly seated at the connector. If OK, substitute a known-good ECM/PCM, and recheck (see page 11-5). If the prescribed voltage is now available, replace the original ECM/PCM.■

9. Turn the headlights and ignition switch OFF.
10. Disconnect the negative cable from the battery.
11. Disconnect ECM/PCM connector B (24P).
12. Check for continuity between ECM/PCM connector terminal B18 and engine wire harness 6P connector terminal No. 2.



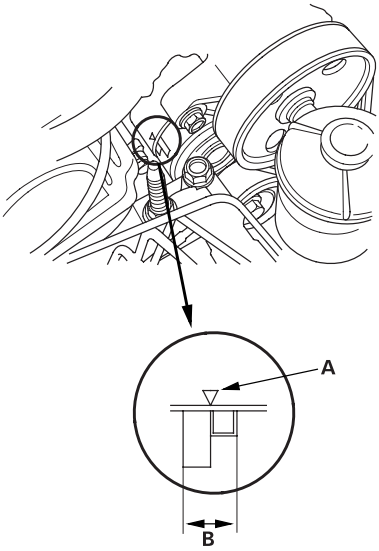
Is there continuity?

Yes Repair or replace the alternator (see page 04-34).■

No Repair open in the wire between the alternator and the ECM/PCM.■

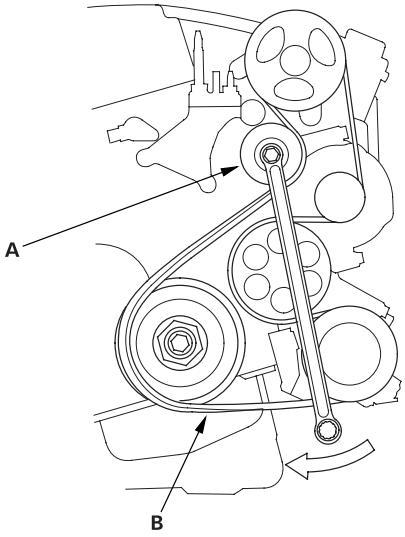
Drive Belt Inspection

Check that the auto-tensioner indicator (A) is within the standard range (B) as shown. If it is out of the standard range, replace the drive belt (see page 04-30).



Drive Belt Replacement

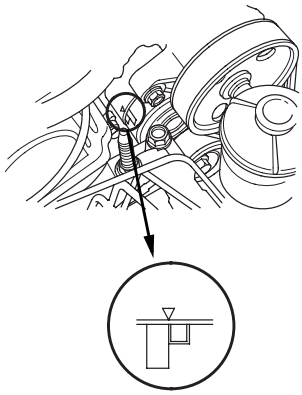
1. Remove the splash shield (see step 21 on page 05-6).
2. Move the auto-tensioner (A) to relieve tension from the drive belt (B), and remove the drive belt.



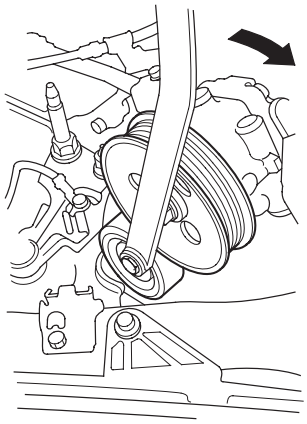
3. Install the new belt in the reverse order of removal.

Drive Belt Auto-tensioner Inspection

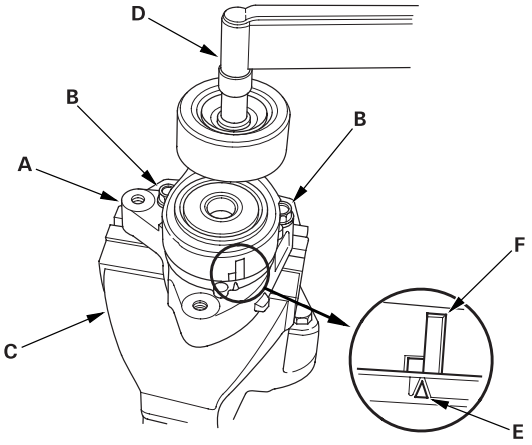
1. Check whether there is a change in the position of the auto-tensioner indicator before starting the engine and after starting the engine. If there is a change in the position, replace the auto-tensioner.



2. Check for abnormal noise from the tensioner pulley. If abnormal noise is heard, replace the tensioner pulley.
3. Remove the drive belt (see page 04-30).
4. Move the auto-tensioner within its limit with the belt tension release tool in the direction shown. Check that the tensioner moves smoothly and without any abnormal noise. If the tensioner does not move smoothly or there is abnormal noise, replace the auto-tensioner.



5. Remove the auto-tensioner (see page 04-31).
6. Install the tensioner pulley.
7. Clamp the auto-tensioner (A) by using two 8 mm bolts (B) and a vise (C) as shown. Do not clamp the auto-tensioner itself.



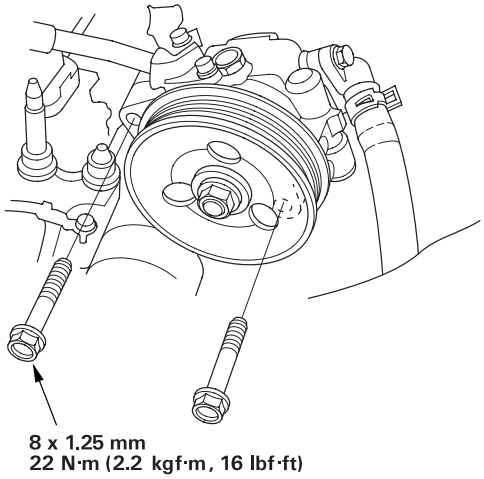
8. Set the torque wrench (D) on the pulley bolt.
9. Align the indicator (E) on the tensioner base with center mark (F) on the tensioner arm by using the torque wrench, and measure the torque. If the torque value is out of specification, replace the auto-tensioner.

   NOTE: If the indicator exceeds the center mark, recheck the torque.

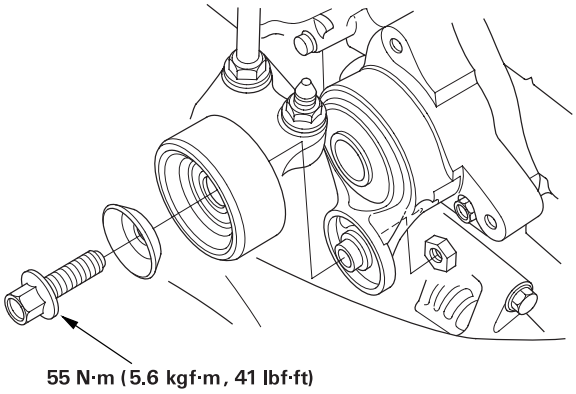
   Auto-tensioner spring torque:
   26.5 - 36.3 N·m (2.7 - 3.7 kg·m, 19.5 - 26.8 lbf·ft)

Drive Belt Auto-tensioner Replacement

1. Remove the drive belt (see page 04-30).
2. Remove the Power Steering (P/S) pump without disconnecting the P/S hoses.



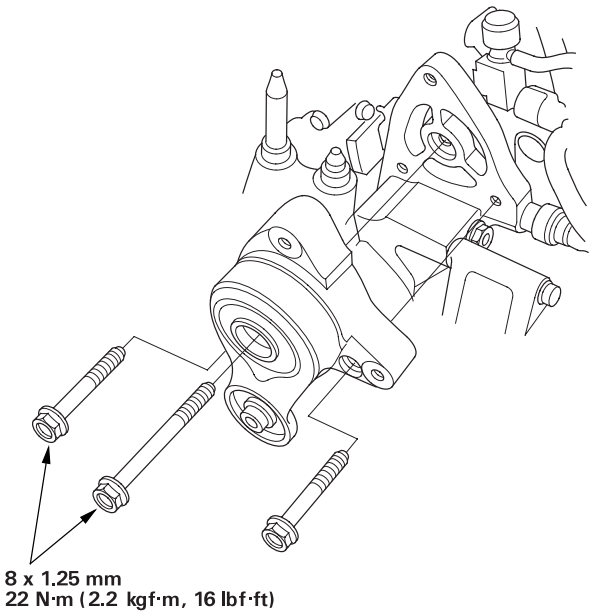
3. Remove the tensioner pulley.



(cont'd)

Drive Belt Auto-tensioner Replacement (cont'd)

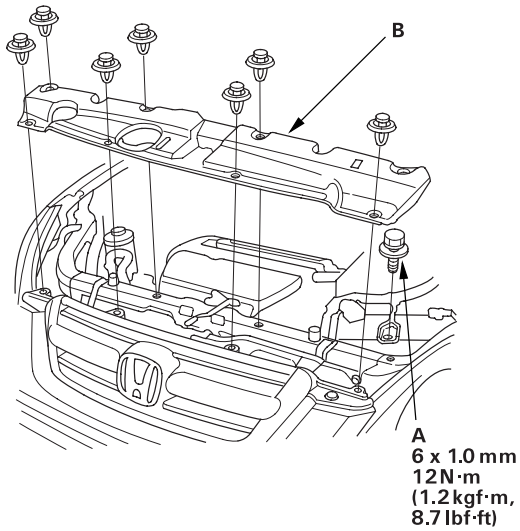
4. Remove the auto-tensioner.



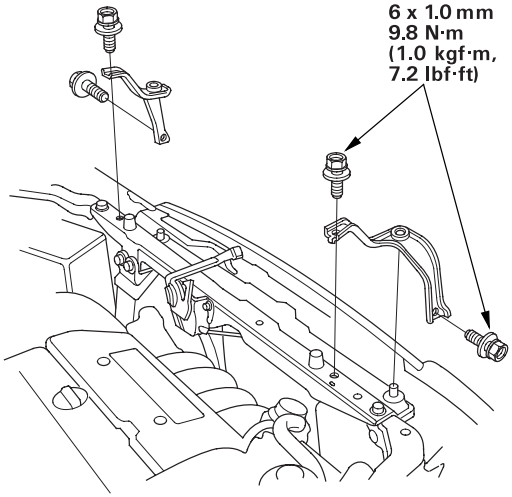
5. Install in the reverse order of removal.

Alternator Replacement

1. Disconnect the battery negative cable, then disconnect the positive cable.
2. Remove the bolt (A) securing the battery clamp, then remove the bulkhead cover (B).

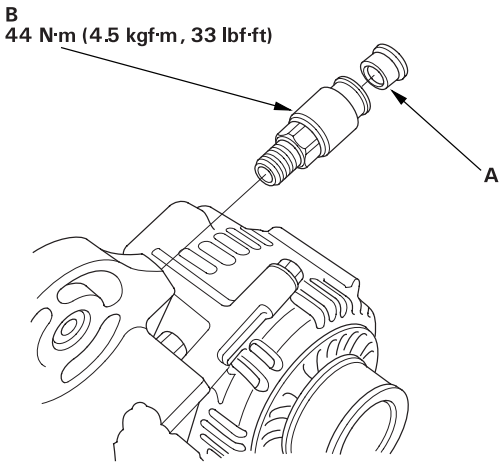


3. Remove the upper bracket and cushion.

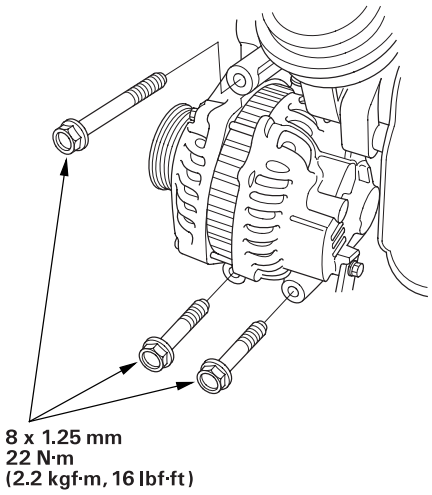


4. Remove the drive belt (see page 04-30).
5. Remove the auto-tensioner (see page 04-31).

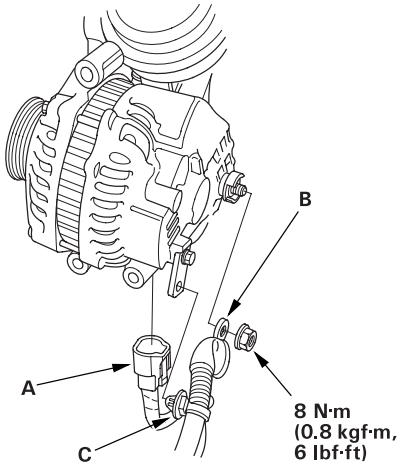
6. Remove the gasket (A), then remove the Positive Crankcase Ventilation (PCV) valve holder (B) with a hex wrench.



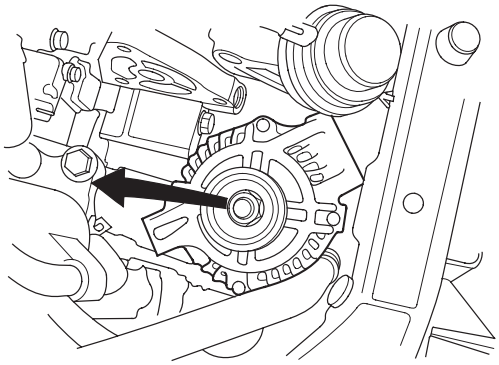
7. Remove the three bolts securing the alternator.



8. Disconnect the alternator connector (A), BLK wire (B) and harness clamp (C) from the alternator.



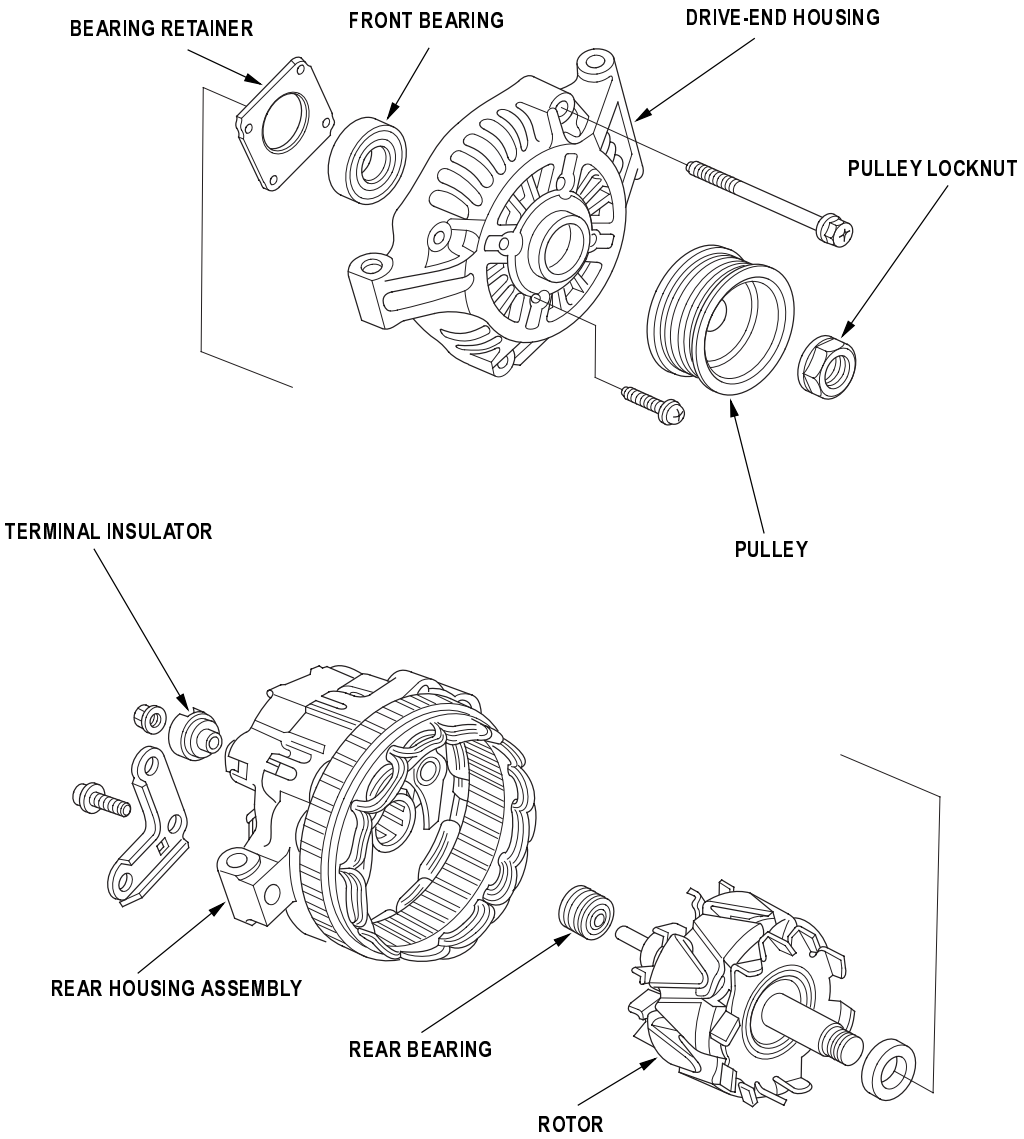
9. Remove the alternator.



10. Install the alternator and drive belt in the reverse order of removal.
11. Apply liquid gasket to the PCV valve holder threads, then install the PCV valve holder.
12. Install the upper bracket and cushion. Make sure they are set securely.
13. Connect the battery positive cable and negative cable to the battery.

Alternator Overhaul

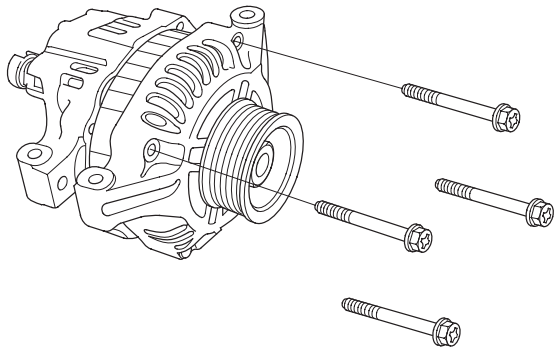
Exploded View



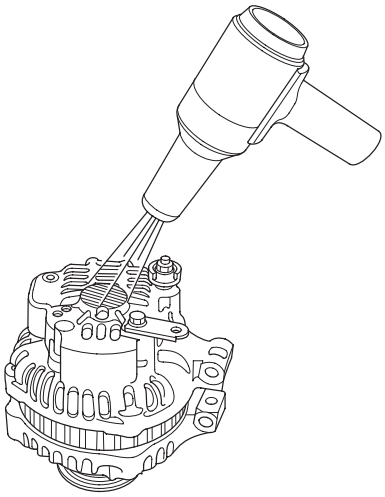
Special Tools Required
- Handle driver 07749-0010000
- Driver attachment, 52 x 55 mm 07746-0010400

NOTE: Refer to the Exploded View as needed during this procedure.

1. Test the alternator and regulator before you remove them (see page 04-26).
2. Remove the alternator (see page 04-32).
3. Remove the four through bolts.

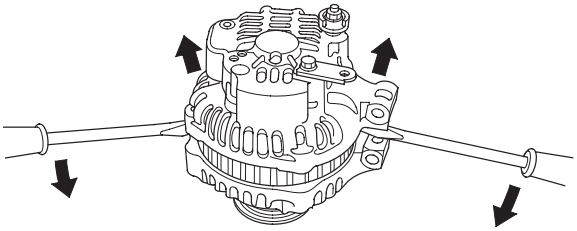


4. Heat the rear bearing seat with a 1,000 W hair drier for about 5 minutes (50 - 60°C, 129 - 140°F).

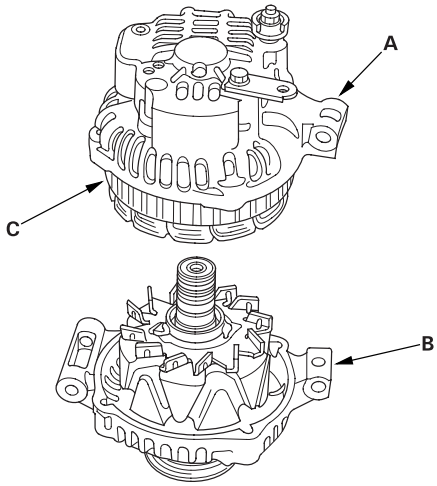


5. Separate the rear housing from the drive-end housing by inserting a flat tip screwdriver into the openings and prying them apart.

   NOTE: Be careful not to damage the stator with the tip of the screwdriver.



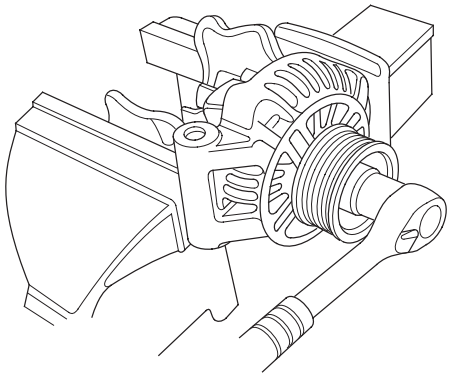
6. Separate the rear housing (A) and drive-end housing (B) with the stator (C) attached to the rear housing.



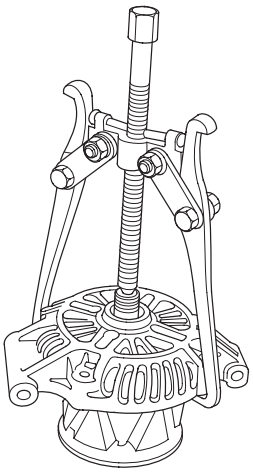
(cont'd)

Alternator Overhaul (cont'd)

7. If you are not replacing the front bearing and/or rear bearing, go to step 15. Clamp the rotor in a soft-jawed vise, then remove the pulley locknut.



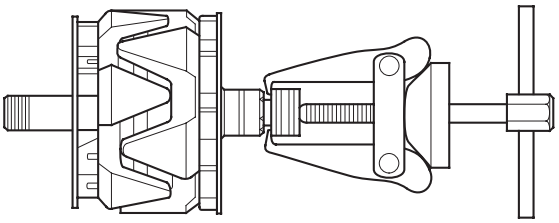
8. Remove the rotor using a puller as shown.



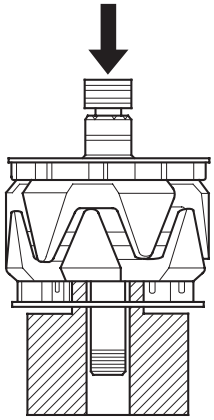
9. Inspect the rotor shaft for scoring, and inspect the bearing journal surface in the drive-end housing for seizure marks.

- If either the rotor or drive-end housing is damaged, replace the alternator.
- If both the rotor and the drive-end housing are OK, go to step 10.

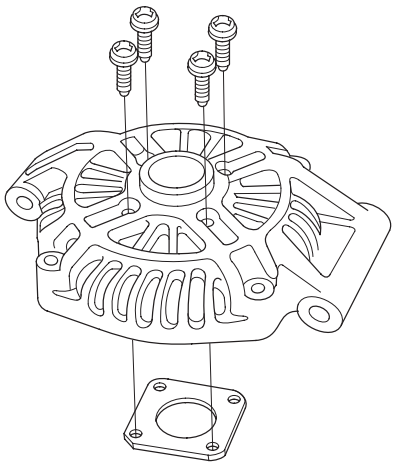
10. Remove the rear bearing using the puller as shown.



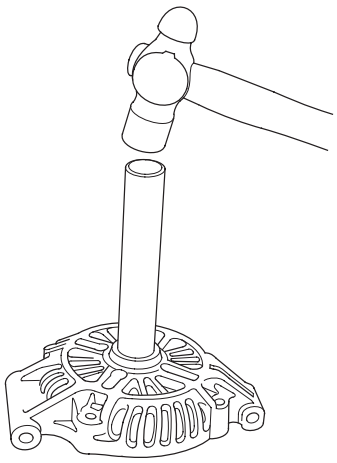
11. Use a hand press to install the new rear bearing. Apply pressure only on the inner race to avoid damaging the bearing.



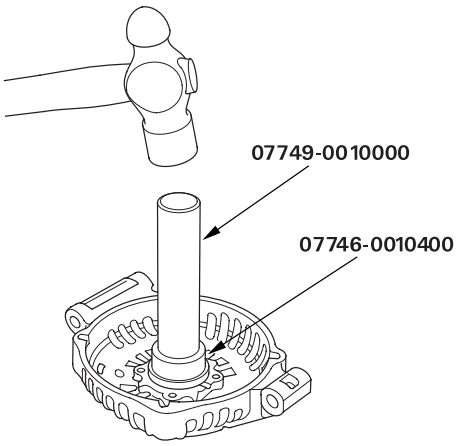
12. Remove the front bearing retainer plate.



13. Support the drive-end housing in a vise, and drive out the front bearing with a brass drift and hammer.



14. With a hammer and the special tools, install a new front bearing in the drive-end housing.

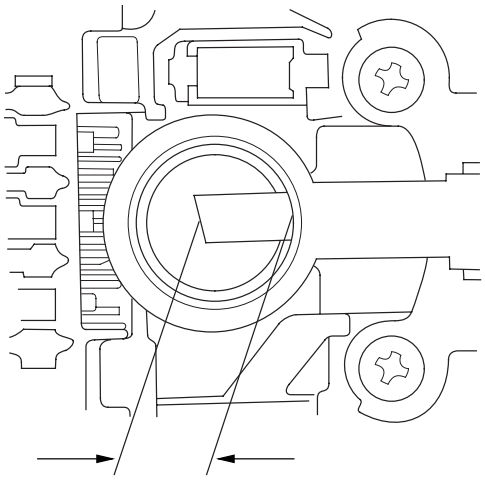


Alternator Brush Inspection

15. Measure the length of both brushes with a vernier caliper.

- If either brush is shorter than the service limit, replace the rear housing assembly.
- If brush length is OK, go to step 16.

Alternator Brush Length:
Standard (New): 19.0 mm (0.75 in.)
Service Limit: 5.0 mm (0.2 in.)

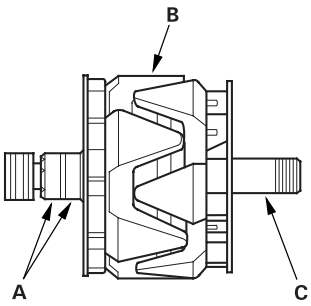


(cont'd)

Alternator Overhaul (cont'd)

Rotor Slip Ring Test

16. Check that there is continuity between the slip rings (A).
- If there is continuity, go to step 17.
- If there is no continuity, replace the rotor assembly.



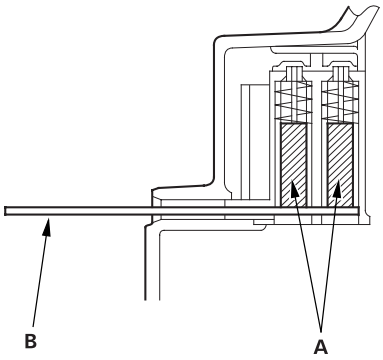
17. Check that there is no continuity between each slip ring (A) and the rotor (B) and the rotor shaft (C).
- If there is no continuity, replace the rear housing assembly, go to step 18.
- If there is continuity, replace the rotor assembly.

Alternator Reassembly

18. If you removed the pulley, put the rotor in the drive-end housing, then tighten its locknut to 111 N·m (11.3 kgf·m, 81.7 lbf·ft).

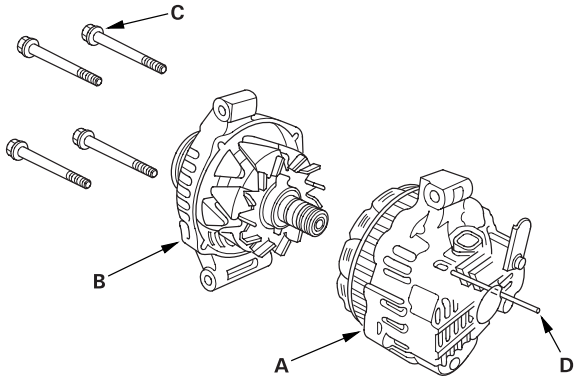
19. Remove any grease or any oil from the slip rings.

20. Push the brushes (A) in, then insert a pin or drill bit (B) (about 1.8 mm (0.77 in.) diameter) to hold them there.



21. Heat the rear bearing seat with a 1,000 W hair drier for about 5 minutes (50 - 60°C, 129 - 140°F).

22. Put the rear housing assembly (A) and drive-end housing/rotor assembly (B) together, tighten the four through bolts (C) and pull out the pin (D).

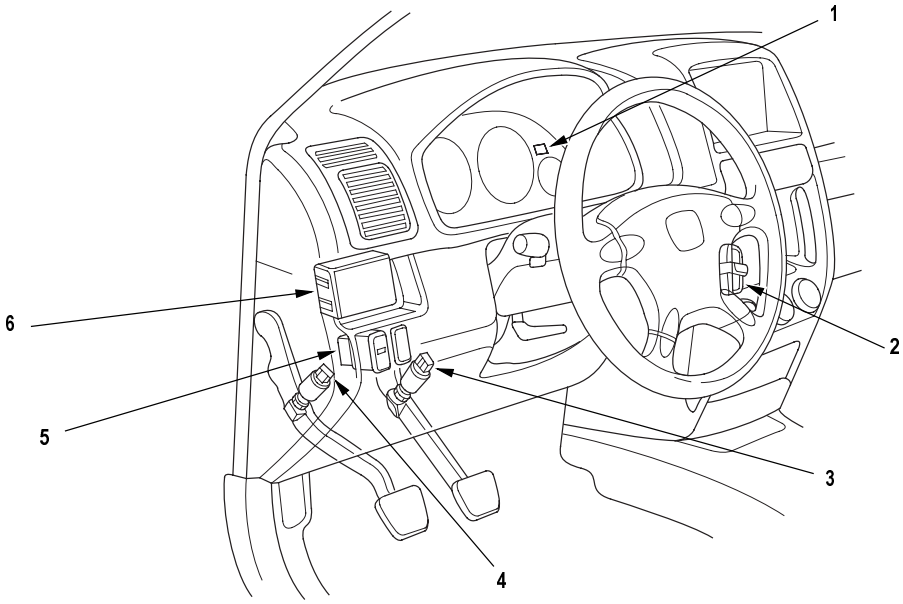


23. After assembling the alternator, turn the pulley by hand to make sure the rotor rotates smoothly and without noise.

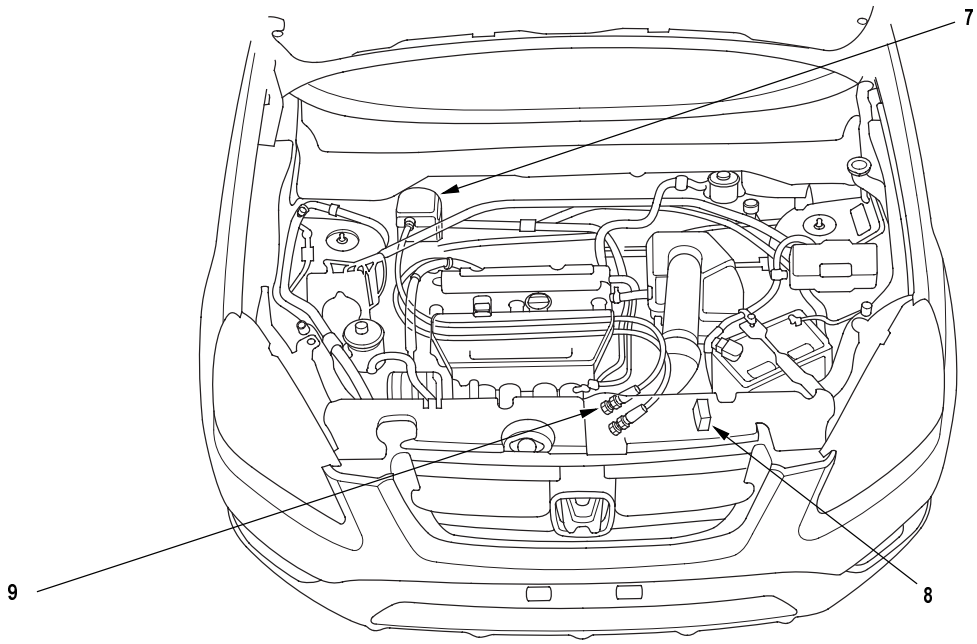
24. Install the alternator and drive belt (see page 04-32).

Cruise Control

Component Location Index

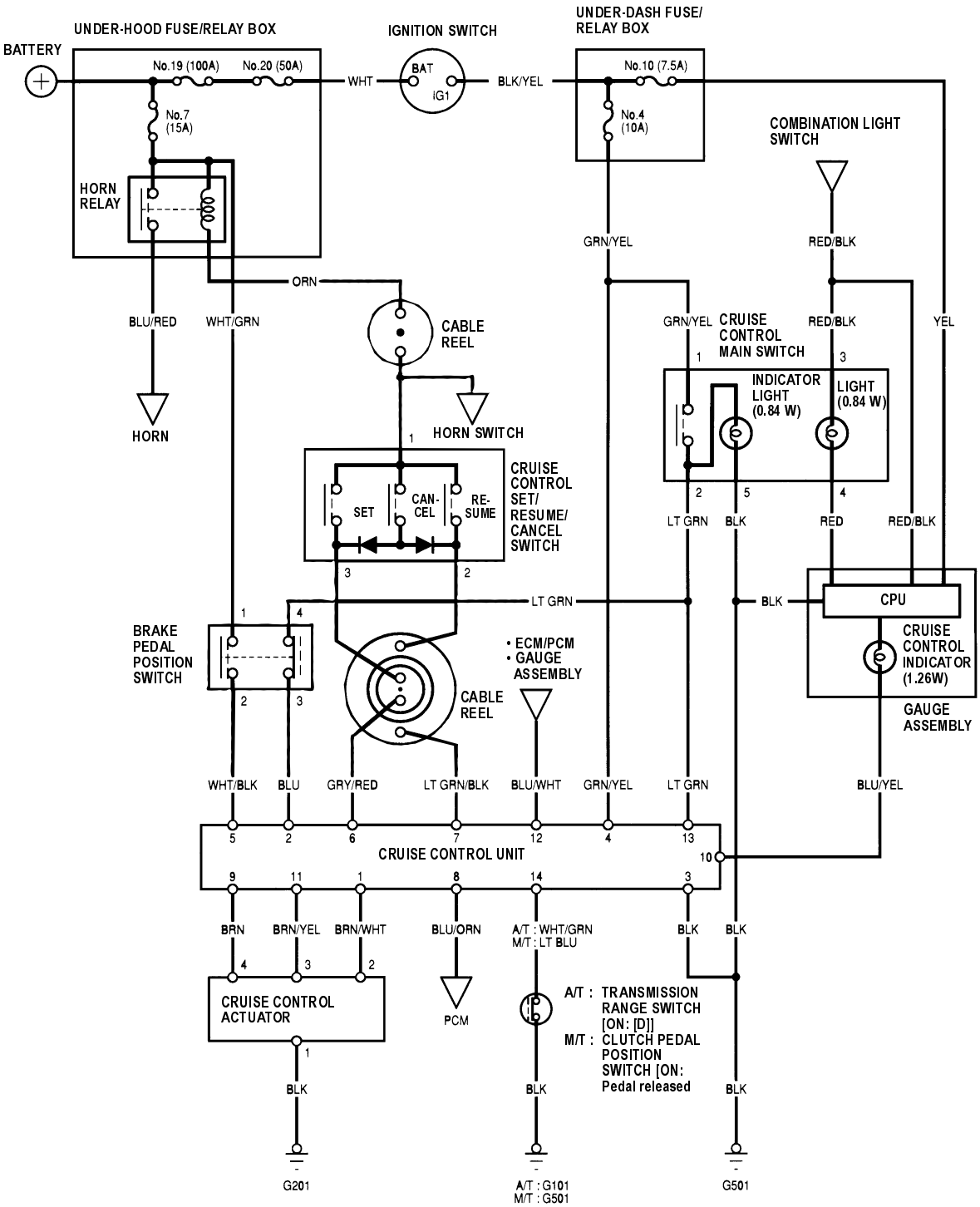


1	CRUISE CONTROL INDICATOR (Built into gauge assembly)	
2	CRUISE CONTROL SET/RESUME/CANCEL SWITCH	Test/Replacement, page 04-46
3	BRAKE PEDAL POSITION SWITCH	Test, page 22A-99; Pedal Height Adjustment, page 19A-5
4	CLUTCH PEDAL POSITION SWITCH (M/T)	Test, page 04-49; Clutch Pedal Adjustment, page 12-4
5	CRUISE CONTROL MAIN SWITCH	Test/Replacement, page 04-46
6	CRUISE CONTROL UNIT	Input Test, page 04-44



7	CRUISE CONTROL ACTUATOR	Test, page 04-47; Replacement, page 04-48
8	TRANSMISSION RANGE SWITCH (A/T)	Test, page 14-168
9	ACTUATOR CABLE	Adjustment, page 04-49

Circuit Diagram



Symptom Troubleshooting Index

NOTE:
- The numbers in the table show the troubleshooting sequence.
- Before troubleshooting.
  - check the No. 10 (7.5A) and No. 4 (10A) fuses in the under-dash fuse/relay box, and the No. 7 (15A) fuse in the under-hood fuse/relay box.
  - check that the horn sounds.
  - check the tachometer to see if it works properly.

Symptom	Diagnostic procedure	Also check for
Cruise control cannot be set	1. Check main switch (see page 04-46) 2. Check SET/RESUME/CANCEL switch (see page 04-46) 3. Test brake pedal position switch (see page 22A-99) and check its adjustment (see page 19A-5) 4. Test clutch pedal position switch (see page 04-49) and check its adjustment (M/T) (see page 12-4) 5. Check transmission range switch (A/T) (see page 14-168) 6. Check control unit (see page 04-44)	• Poor ground: G101 (A/T), G501 (M/T) • Open circuit, loose or disconnected terminals: LT GRN, GRN/YEL, GRY/RED, BLU, WHT/GRN (A/T), LT BLU (M/T), BLU/WHT
Cruise control can be set but indicator light does not go on	1. Check cruise control indicator bulb in gauge assembly (see page 22A-73) 2. Check control unit (see page 04-44)	• Poor ground: G501 • Open circuit, loose or disconnected terminals: YEL, BLU/YEL
Cruise speed is noticeably higher or lower than what was set	1. Check Vehicle Speed Sensor (VSS) (see page 22A-75) 2. Check actuator (see page 04-47) 3. Check control unit (see page 04-44)	
Excessive overshooting or undershooting when trying to set speed	1. Check actuator (see page 04-47) 2. Check Vehicle Speed Sensor (VSS) (see page 22A-75) 3. Check control unit (see page 04-44)	
Speed fluctuation on a flat road with cruise control set	1. Check Vehicle Speed Sensor (VSS) (see page 22A-75) 2. Check actuator (see page 04-47) 3. Check control unit (see page 04-44)	
Vehicle does not decelerate or accelerate accordingly when SET/RESUME/CANCEL button is pushed	1. Check SET/RESUME/CANCEL switch (see page 04-46) 2. Check control unit (see page 04-44)	Open circuit, loose or disconnected terminals: GRY/RED, LT GRN/BLK
Set speed not cancelled (engine rpm stays high) when clutch pedal is pushed (M/T)	1. Test clutch pedal position switch (see page 04-49) and check its adjustment (see page 12-4) 2. Check control unit (see page 04-44)	Short to ground in the LT BLU wire
Set speed not cancelled when shift lever is moved to Neutral position (A/T)	1. Check transmission range switch (see page 14-168) 2. Check control unit (see page 04-44)	Short to ground in the WHT/GRN wire
Set speed not cancelled when brake pedal is pushed	1. Test brake pedal position switch (see page 22A-99) and check its adjustment (see page 19A-5) 2. Check control unit (see page 04-44)	Open circuit, loose or disconnected terminals: WHT/BLK

(cont'd)

Symptom Troubleshooting Index (cont'd)

Symptom	Diagnostic procedure	Also check for
Set speed, does not cancel when main switch is pushed OFF	1. Check main switch (see page 04-46) 2. Check control unit (see page 04-44)	Short to power in the LT GRN wire.
Set speed, does not cancel when CANCEL button is pushed	1. Check SET/RESUME/CANCEL switch (see page 04-46) 2. Check control unit (see page 04-44)	Open circuit, loose or disconnected terminals: GRY/RED, LT GRN/BLK
Set speed will not resume when RESUME button is pushed (with main switch on, when set speed is temporarily cancelled by pressing the brake pedal)	1. Check SET/RESUME/CANCEL switch (see page 04-46) 2. Check control unit (see page 04-44)	Open circuit, loose or disconnected terminals: LT GRN/BLK
The transmission shifts down slower than normal when going up a hill with the cruise control on (A/T)	1. Troubleshoot the cruise control communication circuit (see page 04-43)	Open circuit, loose or disconnected terminals: BLU/ORN

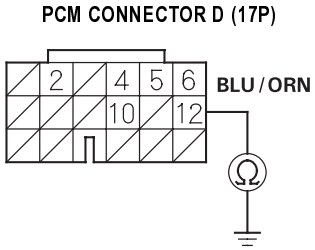
Cruise Control Communication Circuit Troubleshooting

1. Start the engine.
2. Turn on the cruise control main switch, then drive the vehicle to speeds over 25 mph (40 km/h) with the cruise control.

   Does the cruise control operate?

   Yes Go to step 3.

   No Check the cruise control unit (see page 04-44) or cruise control actuator.■
3. Turn the ignition switch OFF.
4. Disconnect the negative cable from the battery.
5. Disconnect Powertrain Control Module (PCM) connector D (17P) and cruise control unit 14P connector.
6. Check for continuity between PCM connector terminal D12 and body ground.

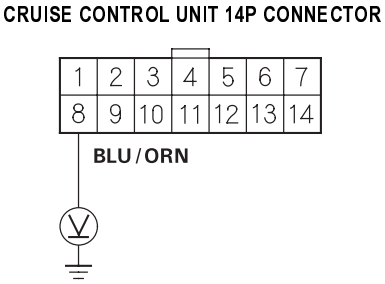


Wire side of female terminals

   Is there continuity?

   Yes Repair short to ground in the wire between PCM connector terminal D12 and the cruise control unit 14P connector terminal No. 8.■

   No Go to step 7.
7. Reconnect PCM connector D (17P) and the cruise control unit 14P connector.
8. Connect the negative cable to the battery.
9. Connect a voltmeter between cruise control unit 14P connector terminal No. 8 and body ground. Test-drive the vehicle at speeds over 25 mph (40 km/h) with the cruise control set, and watch the voltmeter.

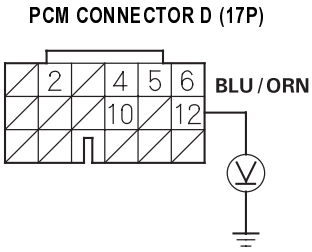


Wire side of female terminals

   Is there about 1 V?

   Yes Go to step 10.

   No Substitute a known-good cruise control unit. If the system works properly, replace the cruise control unit.■
10. Connect a voltmeter between PCM connector terminal D12 and body ground. Drive the vehicle at speeds over 25 mph (40 km/h) with the cruise control set, and watch the voltmeter.



Wire side of female terminals

   Is there about 1 V?

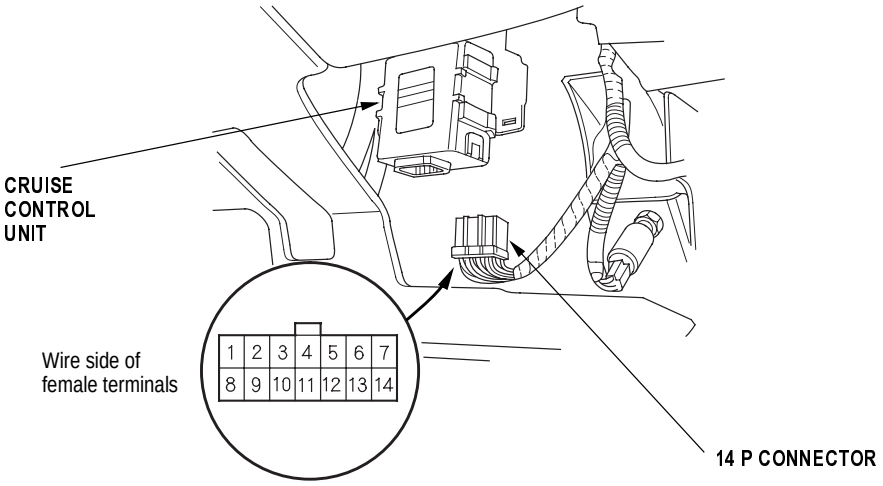
   Yes Check for loose connectors of the BLU/ORN wire between the cruise control unit and the PCM. If necessary replace the PCM and recheck (see page 11-4).■

   No Repair open in the wire between PCM connector terminal D12 and the control unit 14P connector terminal No. 8.■

Control Unit Input Test

SRS components are located in this area. Review the SRS component locations (see page 23-14) and precautions and procedures (see page 23-16) in the SRS section before performing repairs or service.

1. Disconnect the 14P connector from the control unit.
2. Inspect the connector and socket terminals to be sure they are all making good contact.
   - If the terminals are bent, loose, or corroded, repair them as necessary, and recheck the system.
   - If the terminals look OK, go to step 3.



3. With the 14P connector disconnected, make these input tests.

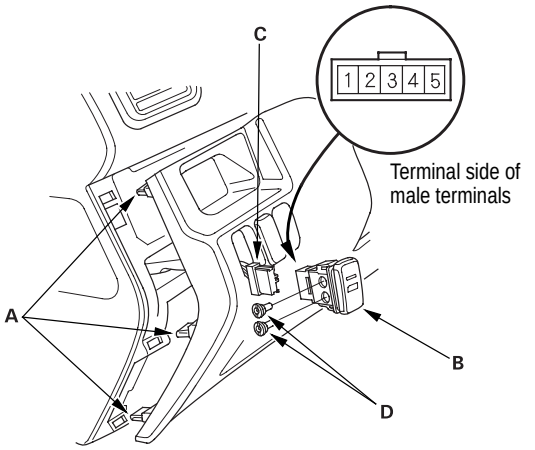
Cavity	Wire	Test Condition	Test: Desired Result	Possible cause if result is not obtained
1	BRN/WHT	Connect battery power	Check the operation of the magnetic clutch: Clutch should click and output link should be locked.	• Faulty actuator • Poor ground (G201) • An open in the wire • Short to ground
2	BLU	Ignition switch ON (II), main switch ON and brake pedal pressed, then released	Check for voltage to ground: There should be 0 V with the pedal pressed and battery voltage with the pedal released.	• Faulty brake pedal position switch • An open in the wire • Open in cruise control main switch • Blown No. 4 (10A) fuse in the under-dash fuse/relay box
3	BLK	Under all conditions	Check for continuity to ground: There should be continuity.	• Poor ground (G501) • An open in the wire
4	GRN/YEL	Ignition switch ON (II)	Check for voltage to ground: There should be battery voltage.	• Blown No. 4 (10A) fuse in the under-dash fuse/relay box • An open in the wire
5	WHT/BLK	Brake pedal pressed, then released	Check for voltage to ground: There should be battery voltage with the pedal pressed, and 0 V with the pedal released.	• Blown No. 7 (15A) fuse in the under-hood fuse/relay box • Faulty brake pedal position switch • An open in the wire

Cavity	Wire	Test Condition	Test: Desired Result	Possible cause if result is not obtained
6	GRY/RED	Set button pushed	Check for voltage to ground: There should be battery voltage. When testing terminal No. 6, there should be no voltage on terminal No. 7.	• Blown No. 7 (15A) fuse in the under-hood fuse/relay box • Faulty horn relay • Faulty set/resume/cancel switch • Faulty cable reel • An open in the wire
7	LT GRN/BLK	Resume button pushed	Check for voltage to ground: There should be battery voltage. When testing terminal No. 7, there should be no voltage on terminal No. 6.	
9	BRN	Connect battery power to the BRN terminal and ground to the BRN/YEL terminal	Check the operation of the actuator motor: You should be able to hear the motor.	• Faulty actuator • An open in the wire
11	BRN/YEL			
10	BLU/YEL	Ignition switch ON (II)	Attach to ground: Cruise indicator light in the gauge assembly should comes on.	• Blown No. 10 (7.5A) fuse in the under-dash fuse/relay box • Faulty gauge assembly • An open in the wire
12	BLU/WHT	Ignition switch ON (II) and main switch ON; raise the front of the vehicle, and rotate one wheel slowly while holding the other wheel	Check for voltage between the BLU/WHT (+) and BLK (-) terminals: There should be 0 - 5 V or more repeatedly.	• Faulty ECM/PCM • An open in the wire • Short to ground
13	LT GRN	Ignition switch ON (II) and main switch ON	Check for voltage to ground: There should be battery voltage.	• Blown No. 4 (10A) fuse in the under-dash fuse/relay box • Faulty main switch • An open in the wire
14	WHT/GRN (A/T) LT BLU (M/T)	A/T: Shift lever in [D] or [D_3] M/T: Clutch pedal released	Check for continuity to ground: There should be continuity. NOTE: There should be no continuity when the clutch pedal is pressed or when the shift lever is in other positions.	• Faulty transmission range switch • Faulty clutch pedal position switch • Poor ground (M/T: G501, A/T: G101) • An open in the wire
8	BLU/ORN	Reconnect the cruise control unit 14P connector, start the engine, turn the main switch ON and drive the vehicle to speeds over 25 mph (40 km/h) with the cruise control set.	Check for voltage to ground: There should be about 1V	• Loose connection at the PCM • Faulty cruise control unit • Short to ground

4. If any test indicates a problem, find and correct the cause, then recheck the system. If all the input tests prove OK, the control unit may be faulty. Substitute a known-good control unit and retest. If the system works properly, replace the control unit.

Main Switch Test/Replacement

1. Detach the three clips (A), to create clearance between the dashboard and dashboard panel.

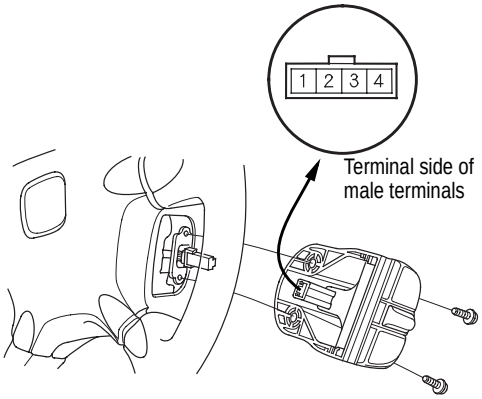


2. Release the clips of the main switch, and push the main switch (B) out of the panel, then disconnect the 5P connector (C) from the main switch.
3. Check for continuity between the terminals in each switch position according to the table. If there is no continuity, replace the illumination bulbs (D) or the switch.

Terminal / Position	2		5	1	3		4
OFF	○	⌇	○		○	⌇	○
ON	○	⌇	○	○	○	⌇	○

Set/Resume/Cancel Switch Test/ Replacement

1. Remove the two screws, then remove the switch.

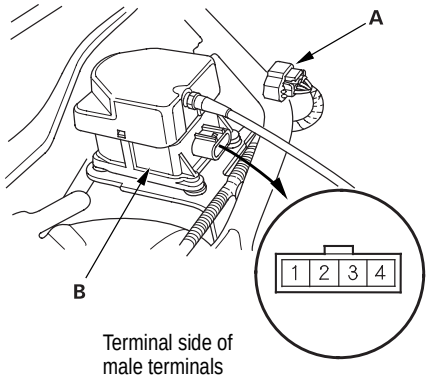


2. Check for continuity between the terminals in each switch position according to the table.
   - If there is continuity, and it matches the table, but switch failure occurred on the cruise control unit input test, check and repair the wire harness on the switch circuit.
   - If there is no continuity in one or both positions, replace the switch.

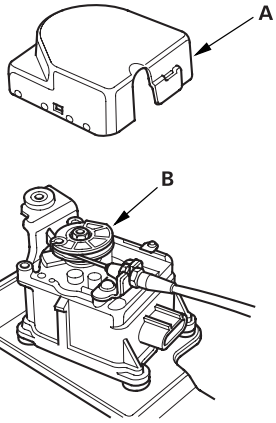
Terminal / Position	1		2	3
SET (ON)	○			○
RESUME (ON)	○		○	
CANCEL (ON)	○	▷	▷ ○	○

Actuator Test

1. Disconnect the 4P connector (A) from the actuator (B).



2. Remove the cover (A), and check the output linkage (B) for smooth movement.



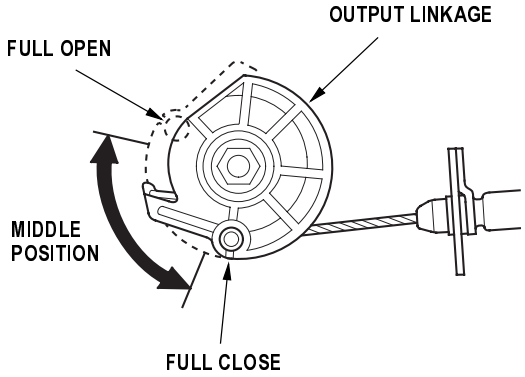
3. Connect battery power to the No. 2 terminal and ground to the No. 1 terminal.

4. Check for a clicking sound from the magnetic clutch. The output linkage should be locked.

5. If the output linkage is not locked, replace the actuator assembly.

6. Check the operation of the actuator motor in each output linkage position according to the table. You should be able to hear the motor.

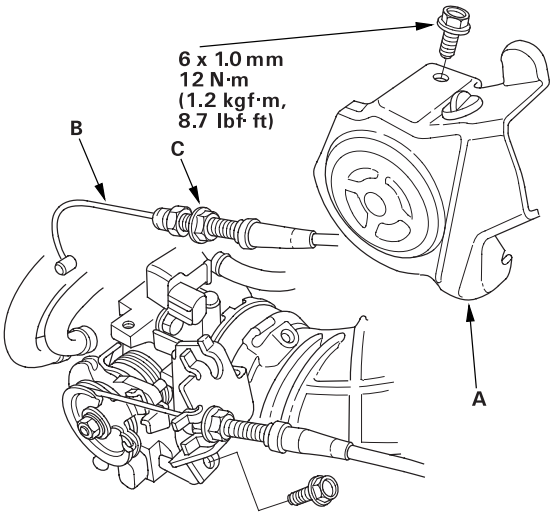
Battery power polarities		Output linkage position		
(+)	(-)	FULL CLOSE	MIDDLE POSITION	FULL OPEN
No. 4 Terminal	No. 3 Terminal	The motor runs.	The motor runs.	The motor stops.
No. 3 Terminal	No. 4 Terminal	The motor stops.	The motor runs.	The motor runs.



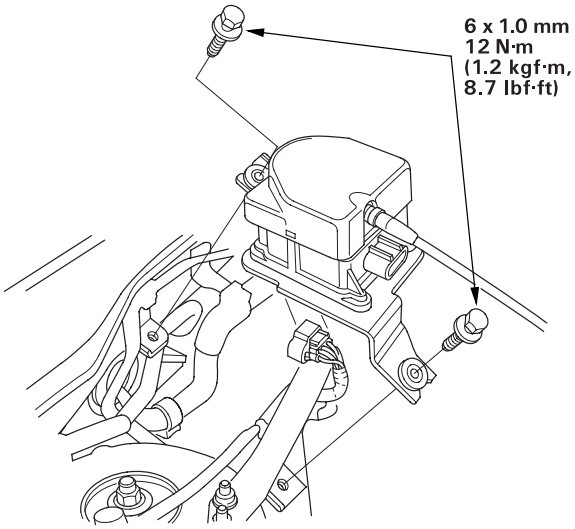
7. If the actuator motor does not operate as specified, replace the actuator assembly.

Actuator/Cable Replacement

1. Remove the throttle cable cover (A), fully open the cruise control link by hand, then remove the cruise control cable (B) from link. Loosen the locknut (C), and remove the cable from the bracket.

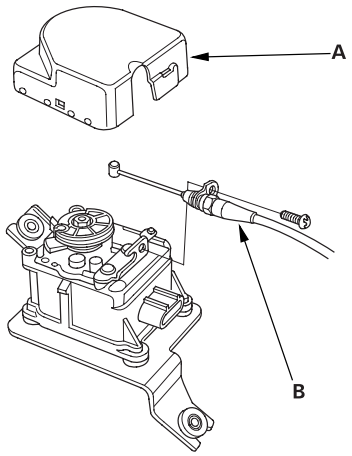


2. Disconnect the 4P connector, and remove the two bolts securing the actuator.

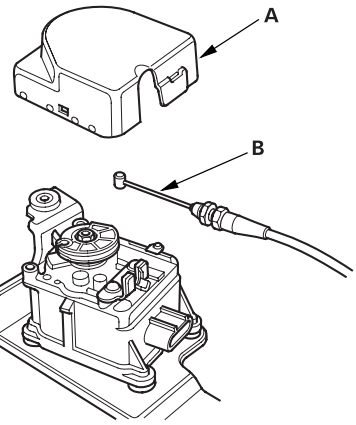


3. Remove the actuator cover (A), then remove the actuator cable (B) from the actuator.

LHD models:



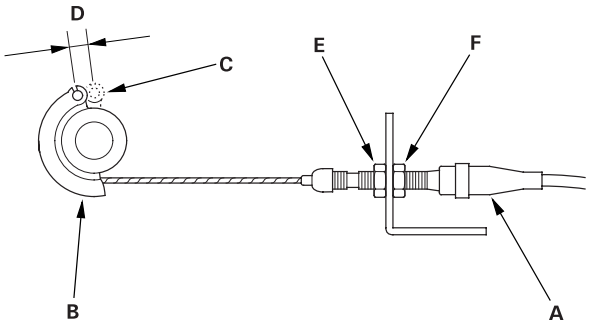
RHD models:



4. Install in the reverse order of removal, and adjust the free play at the throttle linkage after connecting the actuator cable.

Actuator Cable Adjustment

1. Check that the actuator cable (A) moves smoothly with no binding or sticking.

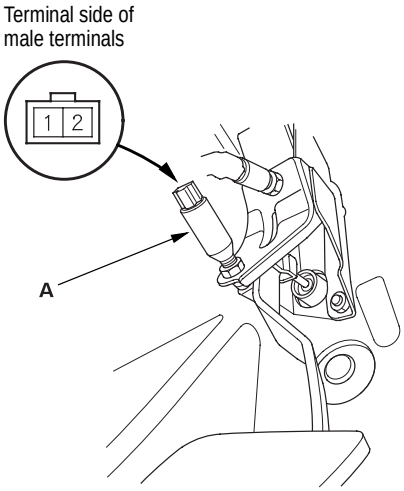


2. Measure the amount of movement of the output linkage (B) until the engine speed starts to increase. At first, the output linkage should be located at the fully closed position (C). The free play (D) should be 3.75 ± 0.5 mm (0.15 ± 0.02 in.).
3. If the free play is not within specs, loosen the locknut (E), and turn the adjusting nut (F) until the free play is as specified, then retighten the locknut.

Clutch Pedal Position Switch Test

1. Disconnect the 2P connector from the clutch pedal position switch (A).

CLUTCH PEDAL POSITION SWITCH 2P CONNECTOR



2. Remove the clutch pedal position switch.
3. Check for continuity between the terminals according to the table.
   - If the continuity is not as specified, replace the clutch pedal position switch.
   - If OK, install the clutch pedal position switch and adjust the pedal height (see page 12-4).

Terminal / Clutch Pedal Postion Switch	1	2
PRESSED		
RELEASED	○	○