SQRE4T15C STARTING SYSTEM

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GENERAL INFORMATION

Component

Description

1 - Ignition Starting Switch	2 - Engine Compartment Fuse and Relay Box
3 - Battery	4 - Starter

Starting system consists of battery, ENGINE START STOP switch and starter, etc. Starting system converts electrical energy from battery into mechanical energy, allowing engine to crank initially, and disconnects power transmission between starter and engine when engine runs normally.

Operation

Starter consists of three parts: control mechanism, drive train mechanism and DC motor.

1. Control mechanism (solenoid switch): Controls engagement and disengagement between starter drive gear and engine flywheel gear and switches on/off the DC circuit; Also the solenoid switch has function of additional resistance of short circuit ignition coil when starting.
2. Drive train mechanism: When engine starts, it engages starter drive gear with flywheel gear ring and transmits starter torque to the engine crankshaft; after engine starts, drive gear will automatically disengage from the flywheel gear, so that engine cannot drive starter at high speed, avoiding damage to the starter.
3. DC motor: Converts electrical energy from battery into electromagnetic moment.

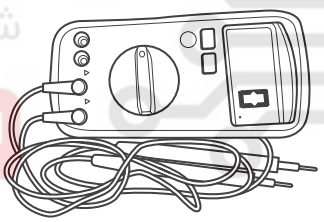
Specifications

Torque Specifications

Description	Torque (N·m)
Starter Power Cable Nut	13 ± 2
Starter Fixing Bolt	45 ± 5

Tool

General Tool

Digital Multimeter	 RCH0002006

DIAGNOSIS & TESTING

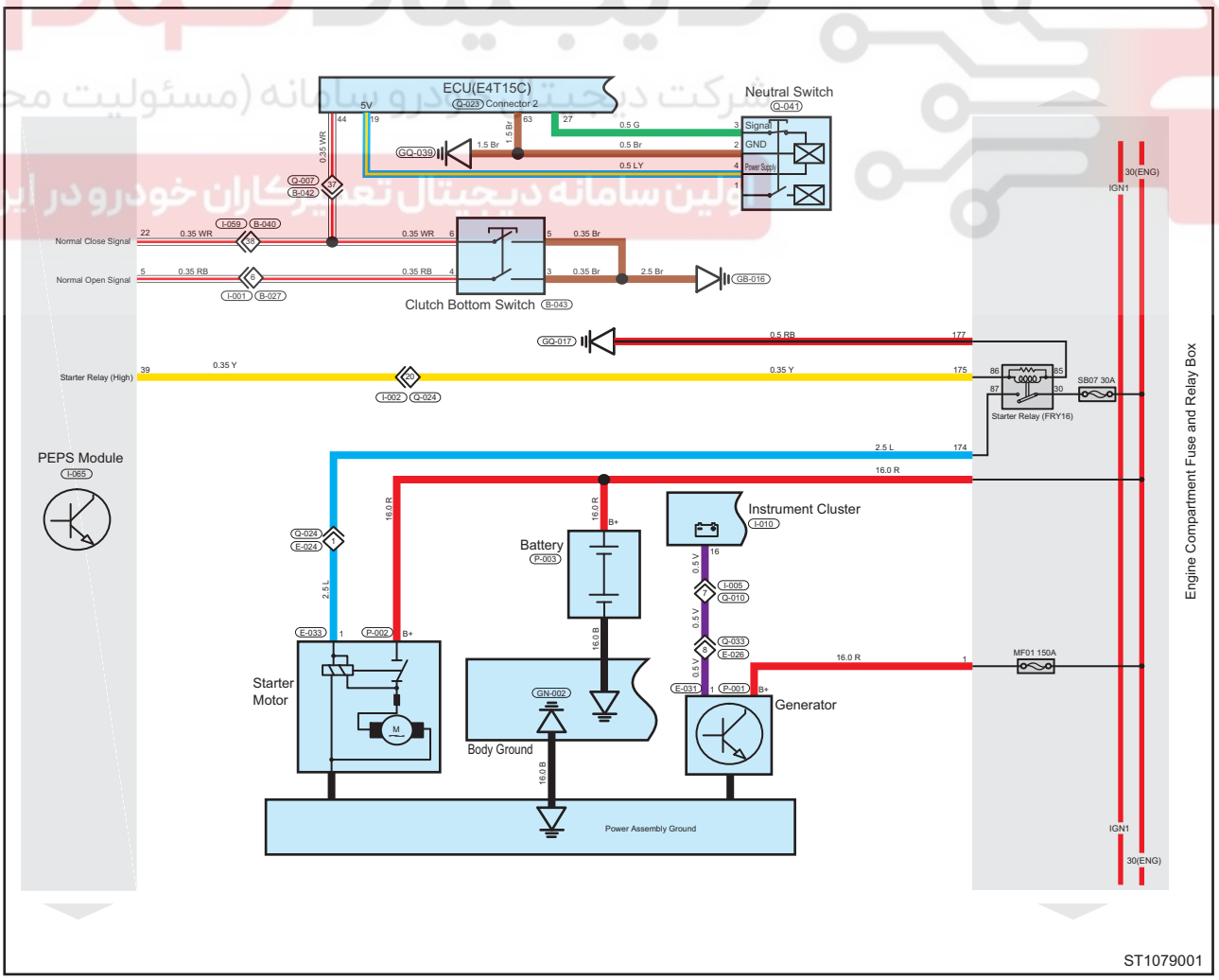
Problem Symptoms Table

Hint:

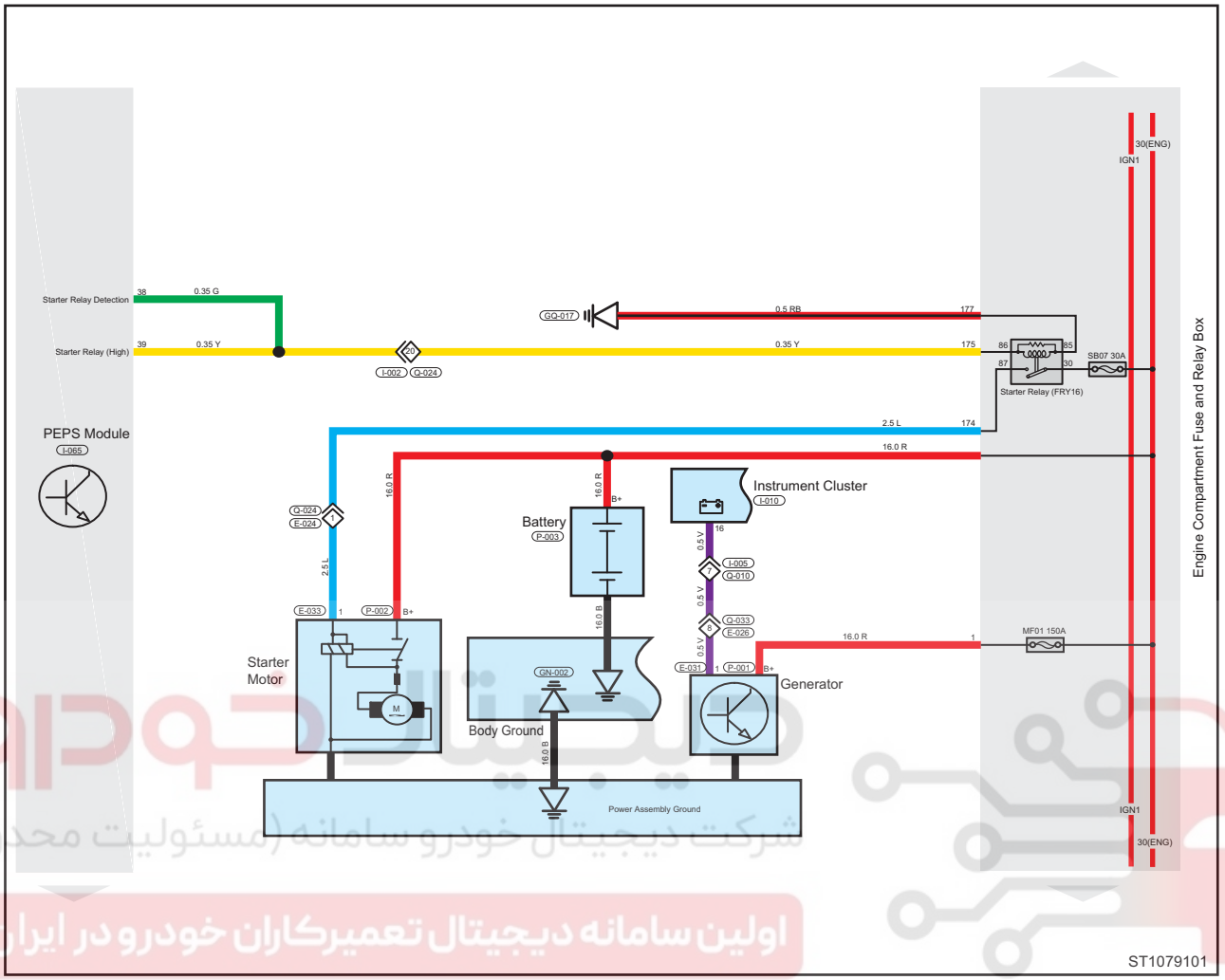
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
When ENGINE START STOP switch is turned to START, solenoid switch makes a "clanking" sound and engine cannot start	Battery (depleted)
	Starter (solenoid switch)
Starter does not run	Battery (depleted)
	Fuse
	Relay
	Starting system wire harness
	Starting switch
	Starter
	ECU
Starter runs weakly	Battery (depleted)
	Starter
Starter is racing	Starter (incorrect installation, internal fault)
	Flywheel ring gear (gear teeth broken)

Starting Circuit Diagram (MT)



Starting Circuit Diagram (CVT)

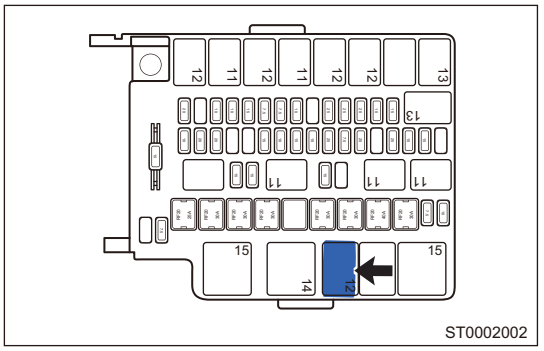


On-vehicle Inspection

Starter Relay

1. Check the starter relay.

   (a) Remove the starter relay from engine compartment fuse and relay box.



   (b) According to value in the table, using a digital multimeter, measure starter relay resistance.

Multimeter Connection	Specified Condition
30 - 87	No continuity
30 - 87	Continuity (battery voltage is applied between terminals 85 and 86)

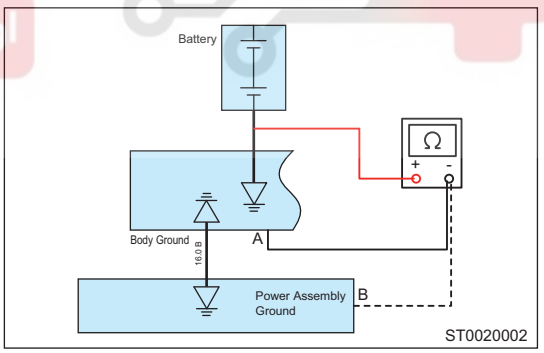
Hint:
If result is not as specified, replace the starter relay.

Ground Inspection

1. Power assembly ground and body ground inspection.

   (a) Check the power and body ground wire fixing bolts for looseness, and the ground parts should be in good contact with no heat or burnt smell.

   (b) Using ohm band of digital multimeter, one test lead is connected to the negative cable, and the other test lead is connected to the body ground or power assembly ground. The resistance measured at A is $\leqslant 0.3\Omega$, and the resistance measured at B is $\leqslant 1\Omega$, the values at A and B cannot differ greatly. If it does not meet the requirements, check the body ground and power assembly ground cable.



Precautions for Starting System

1. Before starting engine, shift transmission to P/N, neutral position (MT), and apply parking brake while depressing brake/clutch pedal.
2. Make sure that battery is fully charged to reduce repeat operating time of starter.
3. Do not start engine for more than 5 seconds each time, repeated starting interval should not be less than 10 - 15 seconds, and consecutive starting is not allowed for more than 3 times.
4. If starter cannot stop, turn off ENGINE START STOP switch immediately, or remove the negative battery cable to find the problem.
5. Check the starter circuit frequently to make sure that each wire of starting system is connected securely and in good insulation.
6. Generally, perform maintainable service for starter when servicing the vehicle. Also, maintenance interval can be shortened or extended depending on actual conditions.
7. Remove the negative battery cable before removing starter.

Starter Assembly (CVT Model)

Removal

Warning/Caution/Hint

Caution:

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the air filter assembly.
4. Remove the electric water pump assembly.

   Hint:

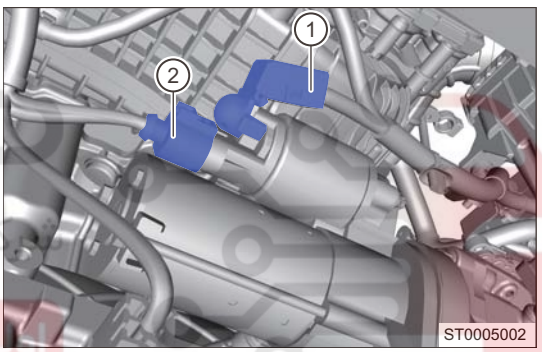
   Remove the electric water pump set bolt without having to remove water pipe. Move electric water pump aside after removal so that starter assembly can be taken out easily.
5. Remove starter assembly.

   (a) Remove positive cable fixing nut rubber protector (1) from starter. Remove the set bolt.

   Tightening torque

   13 ± 2 N·m

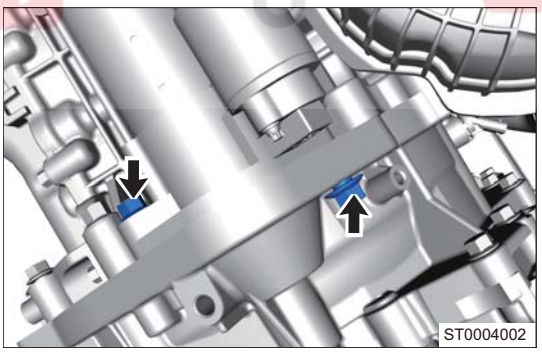
   (b) Disconnect the starter assembly connector (2).



   (c) Remove 2 set bolts between starter assembly and transmission assembly (arrow).

   Tightening torque

   45 ± 5 N·m

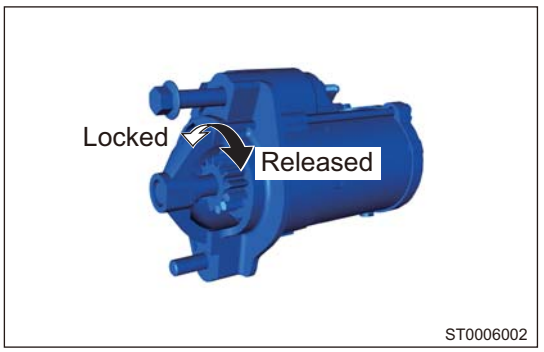


   (d) Remove starter assembly.

22 Inspection

1. Check the starter clutch.

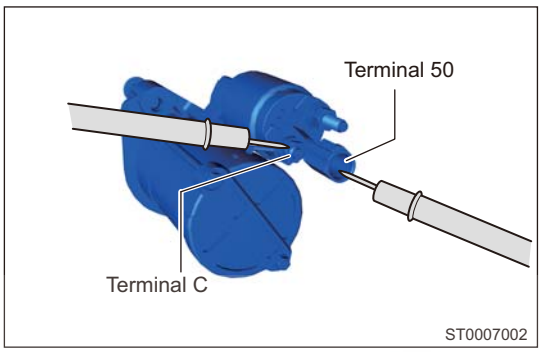
(a) Rotate the clutch pinion gear clockwise to check that it can turn freely. Rotate the clutch pinion gear counterclockwise to check that it locks. If result is not as specified, replace the starter.



2. Check the starter solenoid switch.

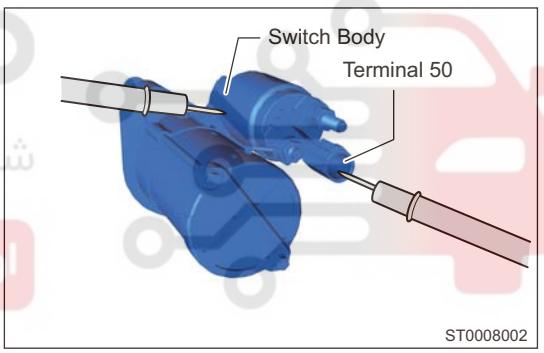
(a) Check the pull-in coil.

- Measure the resistance between terminal 50 and terminal C.
- Standard resistance should be below 2 Ω.
  If the resistance is abnormal, replace the starter assembly.



(b) Check the hold-in coil.

- Measure the resistance between terminal 50 and starter solenoid switch body.
- Standard resistance should be below 2 Ω.
  If the resistance is abnormal, replace the starter assembly.



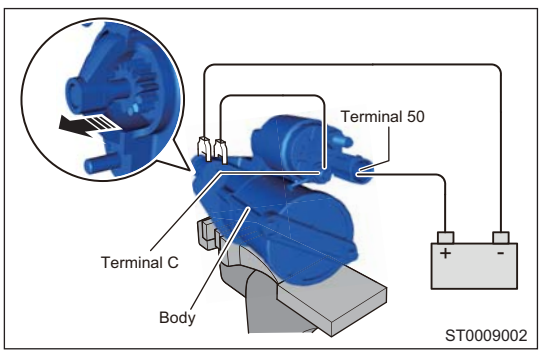
3. Check the starter assembly.

Caution:

- These measurements must be performed within 3 to 5 seconds to avoid coil burnout.
- Place the starter assembly onto a vise. The jaws of vise should be covered by aluminum sheet or brass plate; otherwise, the starter assembly will be easily damaged when clamping it.

(a) Perform pull-in test.

- Remove the nut and disconnect the field coil lead from terminal C.
- As shown in illustration, connect battery to solenoid switch, and check that starter clutch pinion sticks out normally.

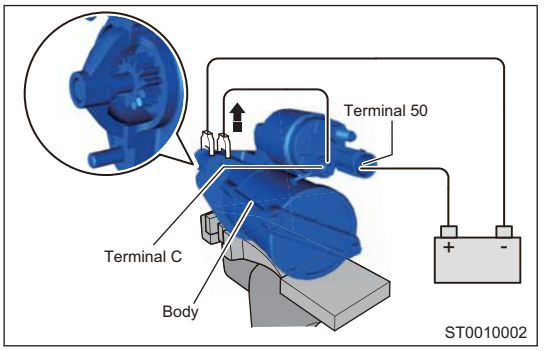


If starter clutch pinion does not move, replace the starter assembly.

(b) Perform hold-in test.

- Keep the starter clutch pinion sticking out and the connection condition of battery mentioned above, and disconnect the negative battery cable from terminal C.

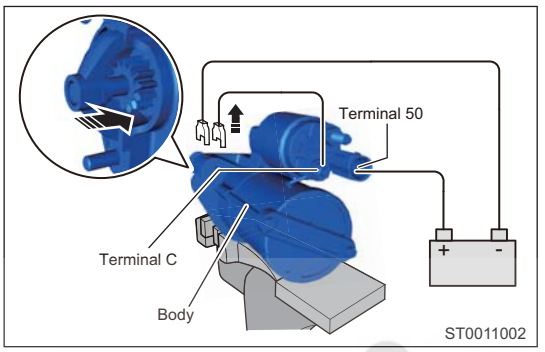
  Check if starter clutch pinion keeps sticking out. If starter clutch pinion moves inward, replace the starter assembly.



(c) Check if starter clutch pinion returns back.

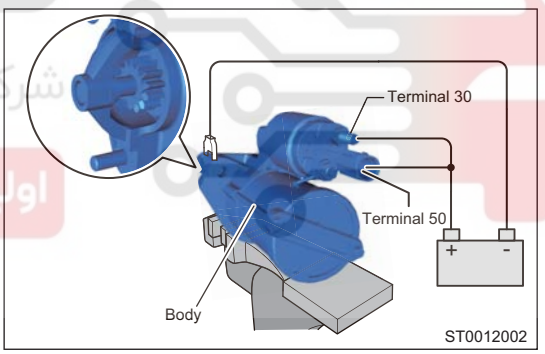
- Disconnect the negative battery cable from starter body. Check that starter clutch pinion returns back.

  If starter clutch pinion does not return back, replace the starter assembly.



(d) Check if starter rotates smoothly.

- Connect the field coil lead to terminal C, and tighten it with a nut.
- As shown in illustration, connect battery to starter. Check that starter rotates smoothly when the starter clutch pinion moves outward.



Caution:

- The lead to be connected should avoid the pinion side to prevent lead stuck as pinion rotates.

If result is not as specified, replace the starter assembly.

Installation

1. Installation is in the reverse order of removal.

Starter Assembly (MT Model)

Removal

Warning/Caution/Hint

Caution:

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the air filter assembly.
4. Remove the electric water pump assembly.

   Hint:

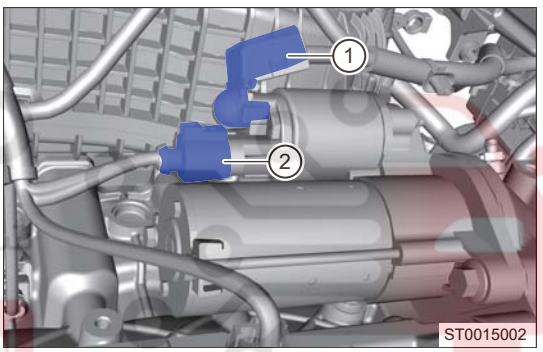
   Remove the electric water pump set bolt without having to remove water pipe. Move electric water pump aside after removal so that starter assembly can be taken out easily.
5. Remove starter assembly.

   (a) Remove positive cable rubber protector (1) from starter. Remove the set bolt.

   Tightening torque

   13 ± 2 N·m

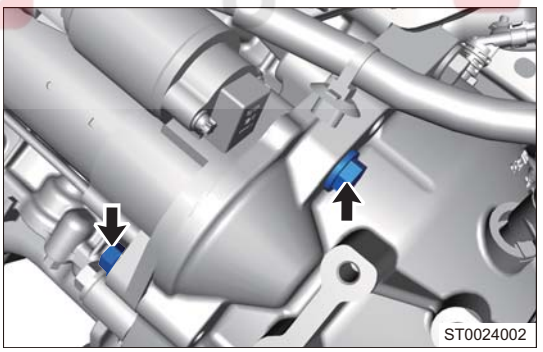
   (b) Disconnect the starter assembly connector (2).



   (c) Remove 2 set bolts (arrow) between starter assembly and clutch case assembly.

   Tightening torque

   45 ± 5 N·m

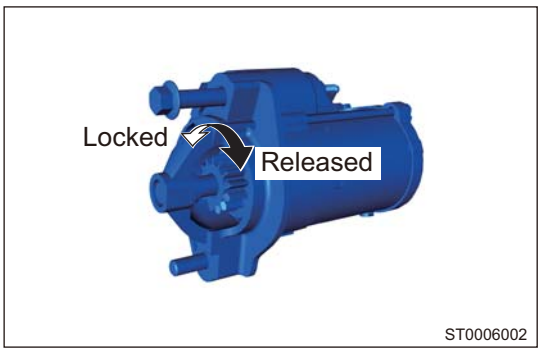


   (d) Remove starter assembly.

Inspection

1. Check the starter clutch.

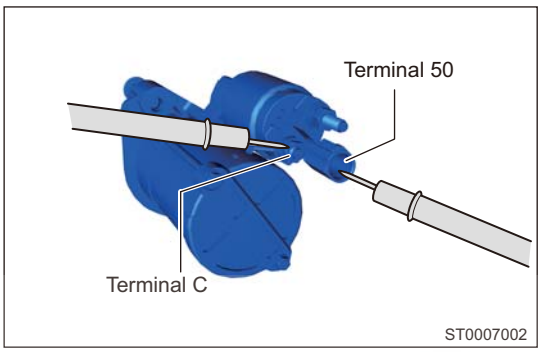
(a) Rotate the clutch pinion gear clockwise to check that it can turn freely. Rotate the clutch pinion gear counterclockwise to check that it locks. If result is not as specified, replace the starter.



2. Check the starter solenoid switch.

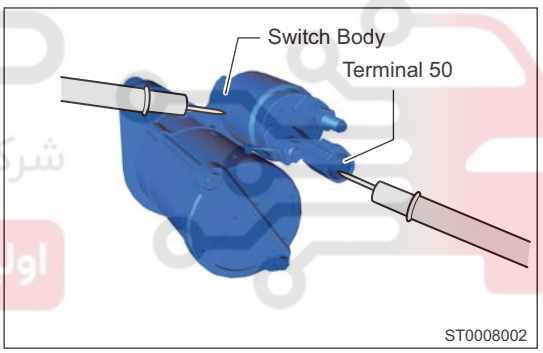
(a) Check the pull-in coil.

- Measure the resistance between terminal 50 and terminal C.
- Standard resistance should be below 2 Ω.
  If the resistance is abnormal, replace the starter assembly.



(b) Check the hold-in coil.

- Measure the resistance between terminal 50 and starter solenoid switch body.
- Standard resistance should be below 2 Ω.
  If the resistance is abnormal, replace the starter assembly.



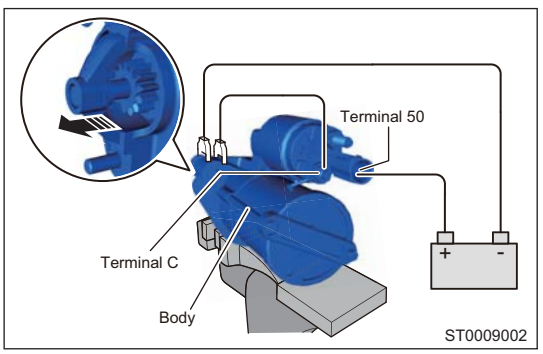
3. Check the starter assembly.

Caution:

- These measurements must be performed within 3 to 5 seconds to avoid coil burnout.
- Place the starter assembly onto a vise. The jaws of vise should be covered by aluminum sheet or brass plate; otherwise, the starter assembly will be easily damaged when clamping it.

(a) Perform pull-in test.

- Remove the nut and disconnect the field coil lead from terminal C.
- As shown in illustration, connect battery to solenoid switch, and check that starter clutch pinion sticks out normally.

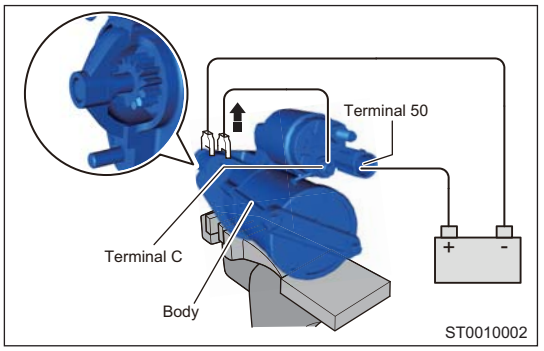


If starter clutch pinion does not move, replace the starter assembly.

(b) Perform hold-in test.

- Keep the starter clutch pinion sticking out and the connection condition of battery mentioned above, and disconnect the negative battery cable from terminal C.

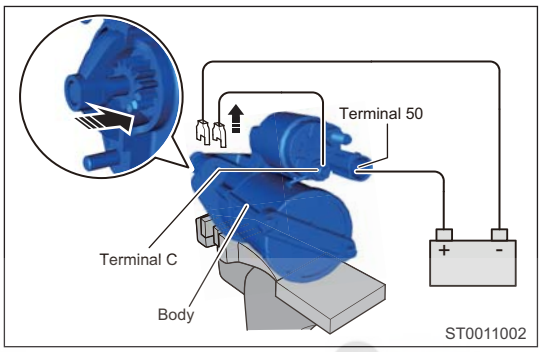
  Check if starter clutch pinion keeps sticking out. If starter clutch pinion moves inward, replace the starter assembly.



(c) Check if starter clutch pinion returns back.

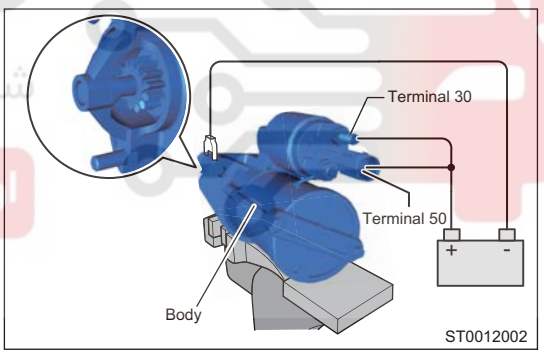
- Disconnect the negative battery cable from starter body. Check that starter clutch pinion returns back.

  If starter clutch pinion does not return back, replace the starter assembly.



(d) Check if starter rotates smoothly.

- Connect the field coil lead to terminal C, and tighten it with a nut.
- As shown in illustration, connect battery to starter. Check that starter rotates smoothly when the starter clutch pinion moves outward.



Caution:

- The lead to be connected should avoid the pinion side to prevent lead stuck as pinion rotates.

If result is not as specified, replace the starter assembly.

Installation

1. Installation is in the reverse order of removal.

ENGINE START STOP Switch

Removal

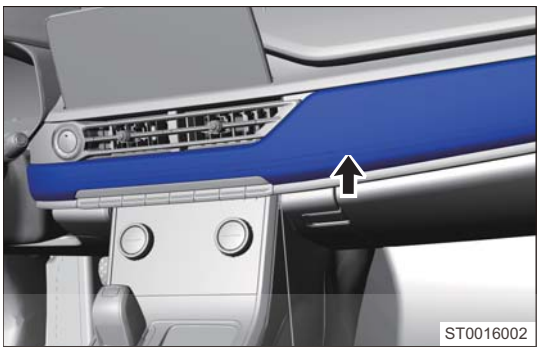
Warning/Caution/Hint

Caution:

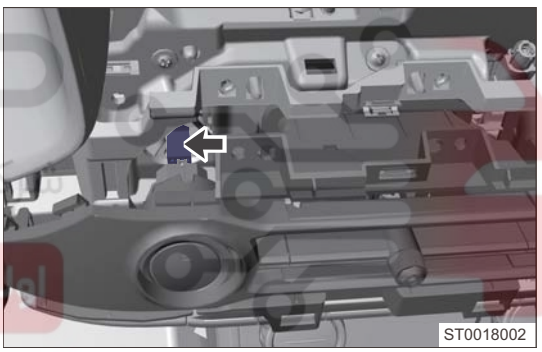
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent interior from being scratched during removal and installation.

1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable.
3. Remove the ENGINE START STOP switch

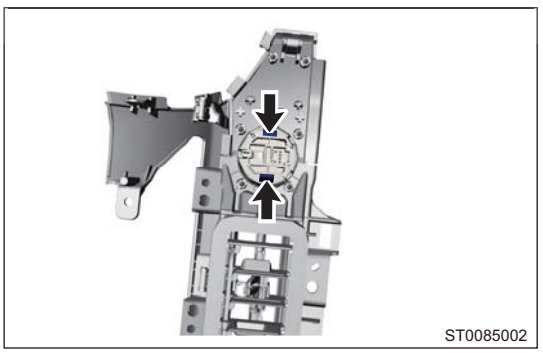
(a) Using an interior crow plate, remove the center control panel (arrow).



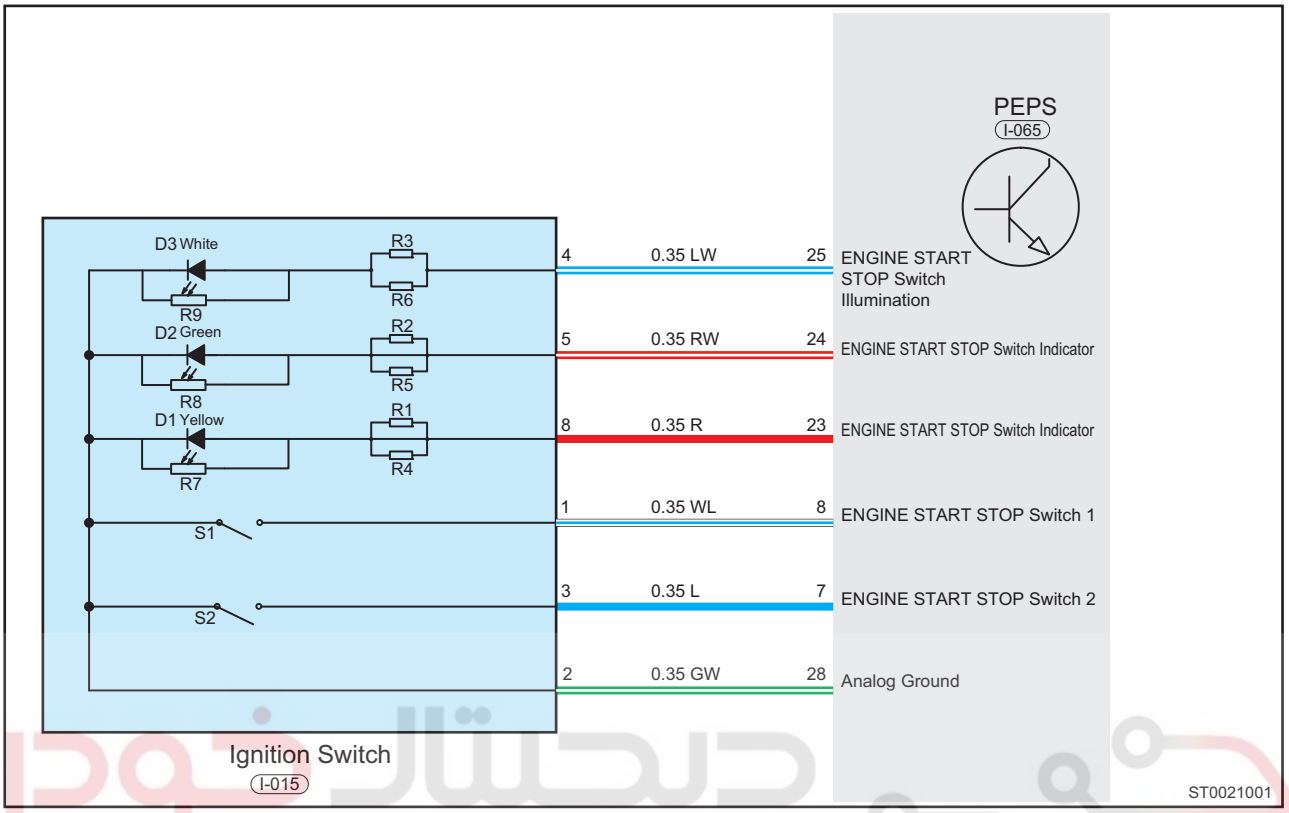
(b) Remove middle A/C air outlet and disconnect the ENGINE START STOP switch connector (arrow).



(c) Push fixing clips on both sides of ENGINE START STOP switch and ENGINE START STOP switch.



ENGINE START STOP Switch Circuit Diagram



Inspection

1. Check the ENGINE START STOP switch continuity

   (a) Using a digital multimeter, check the continuity of ENGINE START STOP switch according to the table below.

Multimeter Connection	Switch Condition	Specified Condition
Terminal 1 - Terminal 2	Not pressed	No continuity
Terminal 3 - Terminal 2	Not pressed	No continuity
Terminal 1 - Terminal 2	Pushed	Continuity
Terminal 3 - Terminal 2	Pushed	Continuity

If measure result is not as specified, replace the ENGINE START STOP switch.

2. Check the ENGINE START STOP switch indicator

   (a) Press the ENGINE START STOP switch, observe if indicator illuminates normally.

   Hint:

   - If the positive (+) lead and negative (-) lead are incorrectly connected, the ENGINE START STOP switch indicator will not illuminate.
   - If the battery voltage is too low, the ENGINE START STOP switch indicator will not illuminate.

Multimeter Connection	Specified Condition
Battery positive (+) → Terminal 4 Battery negative (-) → Terminal 2	White (not illuminate)
Battery positive (+) → Terminal 5 Battery negative (-) → Terminal 2	Green
Battery positive (+) → Terminal 8 Battery negative (-) → Terminal 2	Yellow

If measure result is not as specified, replace the ENGINE START STOP switch.

Installation

1. Installation is in the reverse order of removal.