

SQRD4T20 STARTING SYSTEM

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دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



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GENERAL INFORMATION

Components

Description



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.
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	40 ± 5

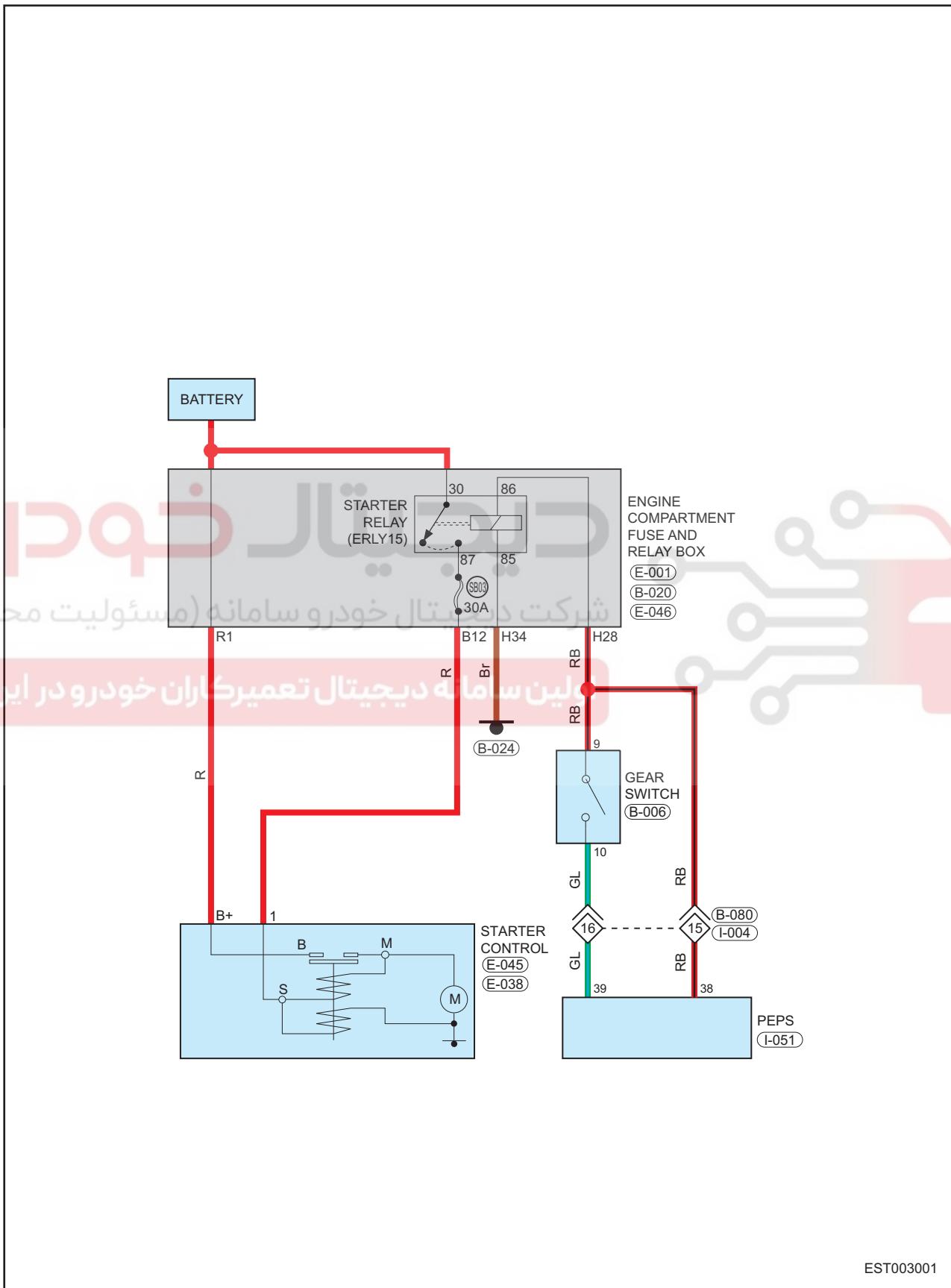
Tools

General Tool



Circuit Diagram

Starting System Circuit Diagram



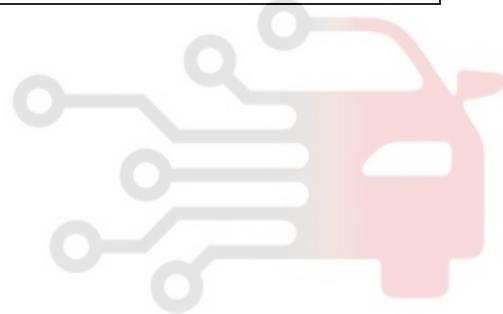
DIAGNOSIS & TESTING

Problem Symptoms Table

Hint:

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

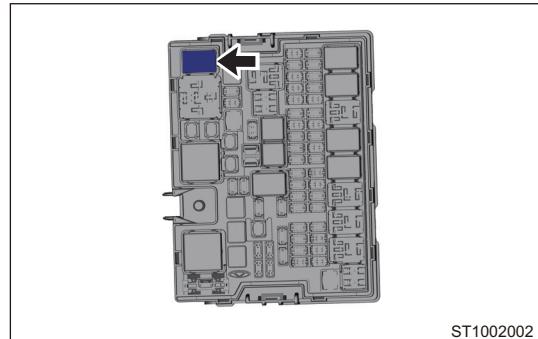
Symptom	Suspected Area
When ignition switch is turned to START, solenoid switch makes a "clanking" sound and engine cannot start	Battery (depleted) Starter (solenoid switch)
Starter does not run	Battery (depleted) Fuse Relay Starting system wire harness Starting switch Starter ECM
Starter runs weakly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



ON-VEHICLE INSPECTION

Starter Relay

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

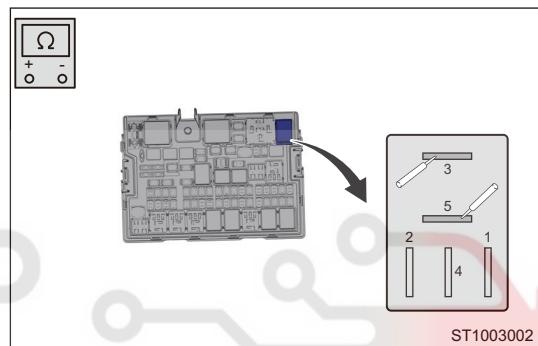


- (b) Using a digital multimeter, measure resistance according to table below.

Multimeter Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (apply battery voltage between terminal 1 and terminal 2)

Hint:

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



Precautions for Starting System

1. Before starting engine, shift transmission to P/N, neutral position, and apply parking brake while depressing 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 ignition 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.

ON-VEHICLE SERVICE

Starter Assembly

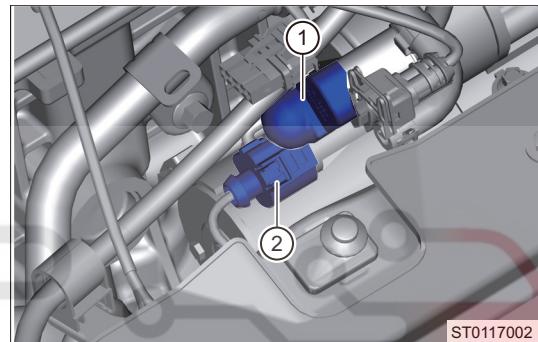
Removal

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 the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the air filter assembly (See page 08-9).
4. Remove the intercooler inlet pipe assembly II (arrow).
5. Remove starter assembly.
 - (a) Turn over protective cap, and remove positive cable fixing nut (1) from starter.
 - (b) Disconnect the starter connector (2).



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- (c) Remove 2 fixing bolts (1) from starter.

Tightening torque

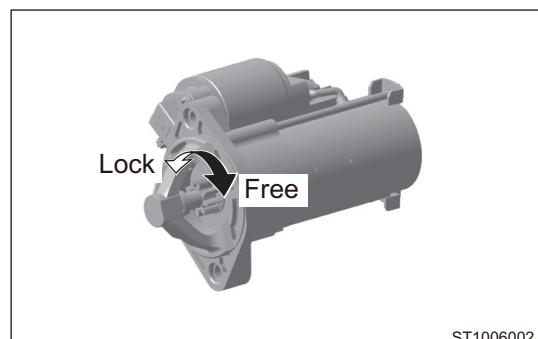
 $40 \pm 5 \text{ N}\cdot\text{m}$


ST1018002

- (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.

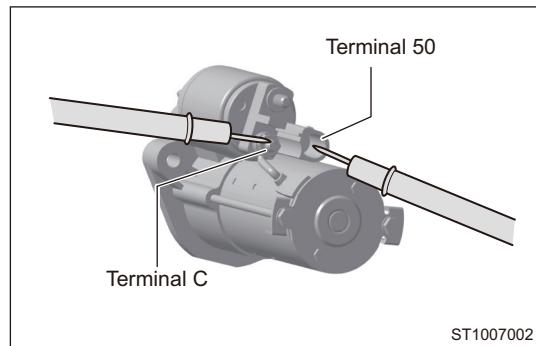


ST1006002

2. Check the starter solenoid switch.

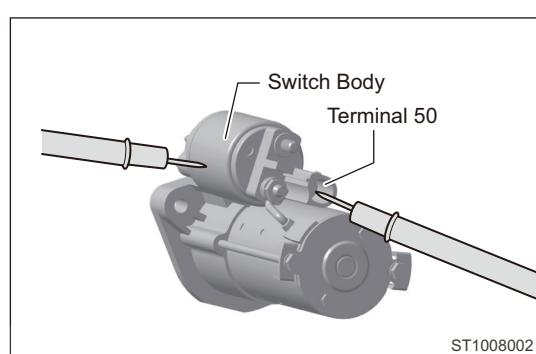
(a) Check the pull-in coil.

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



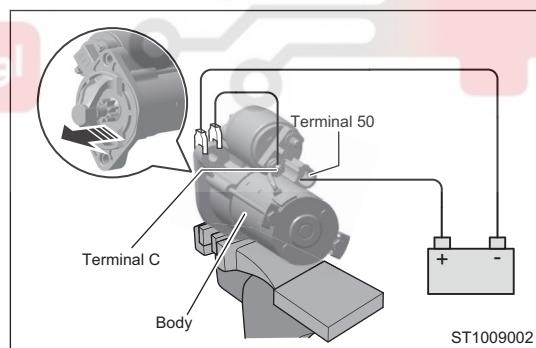
3. Check the starter assembly.

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.

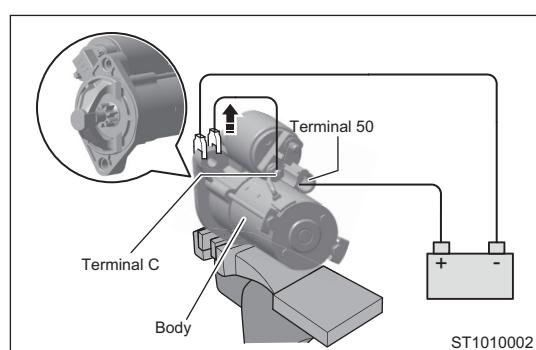
- Remove the nut and disconnect the field coil lead from terminal C.
- As shown in illustration, connect battery to solenoid switch, and check that starter clutch pinion sticks out normally.



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

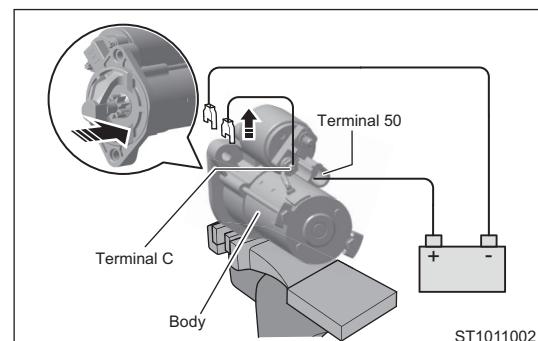
(b) Perform hold-in test.

- 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.

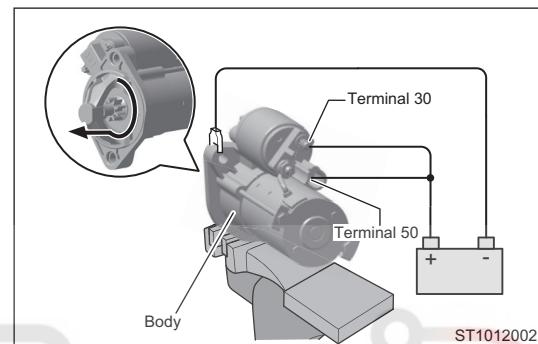
- Disconnect the negative battery cable from starter body. Check that starter clutch pinion returns back.
- If starter clutch pinion does not return back, replace the starter assembly.



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(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.



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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.

13 Installation

1. Installation is in the reverse order of removal.

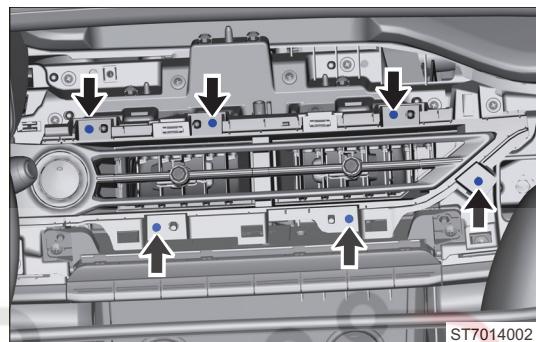
Ignition Starting Switch Removal

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.

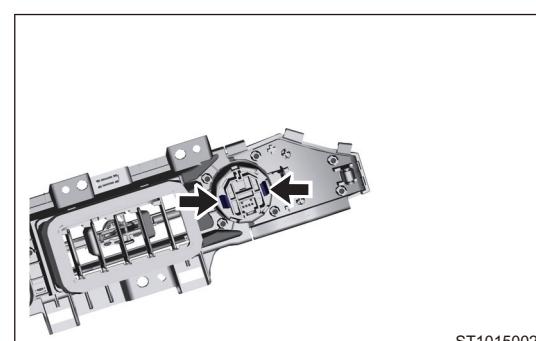
1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the center control panel assembly (See page 25-54).
4. Remove the audio head unit assembly.
5. Remove auxiliary fascia console switch assembly.
 - (a) Remove 6 fixing screws (arrow) from center A/C outlet and move them away.



- (b) Disconnect the one-button start button connector (arrow).



- (c) Push fixing clips on both sides of ignition starting switch in direction of arrows and remove ignition starting switch assembly.



- (d) Remove auxiliary fascia console switch assembly.

Inspection

1. Check for continuity of ignition starting switch.
 - (a) Using a digital multimeter, check the continuity of ignition starting switch according to the table below.

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

If measure result is not as specified, replace the ignition starting switch.

2. Check the ignition starting switch indicator.

- (a) Press the ignition starting switch, observe if switch indicator illuminates normally.

Hint:

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

If measure result is not as specified, replace the ignition starting switch.

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Installation

1. Installation is in the reverse order of removal.