SQRD4G15B STARTING SYSTEM

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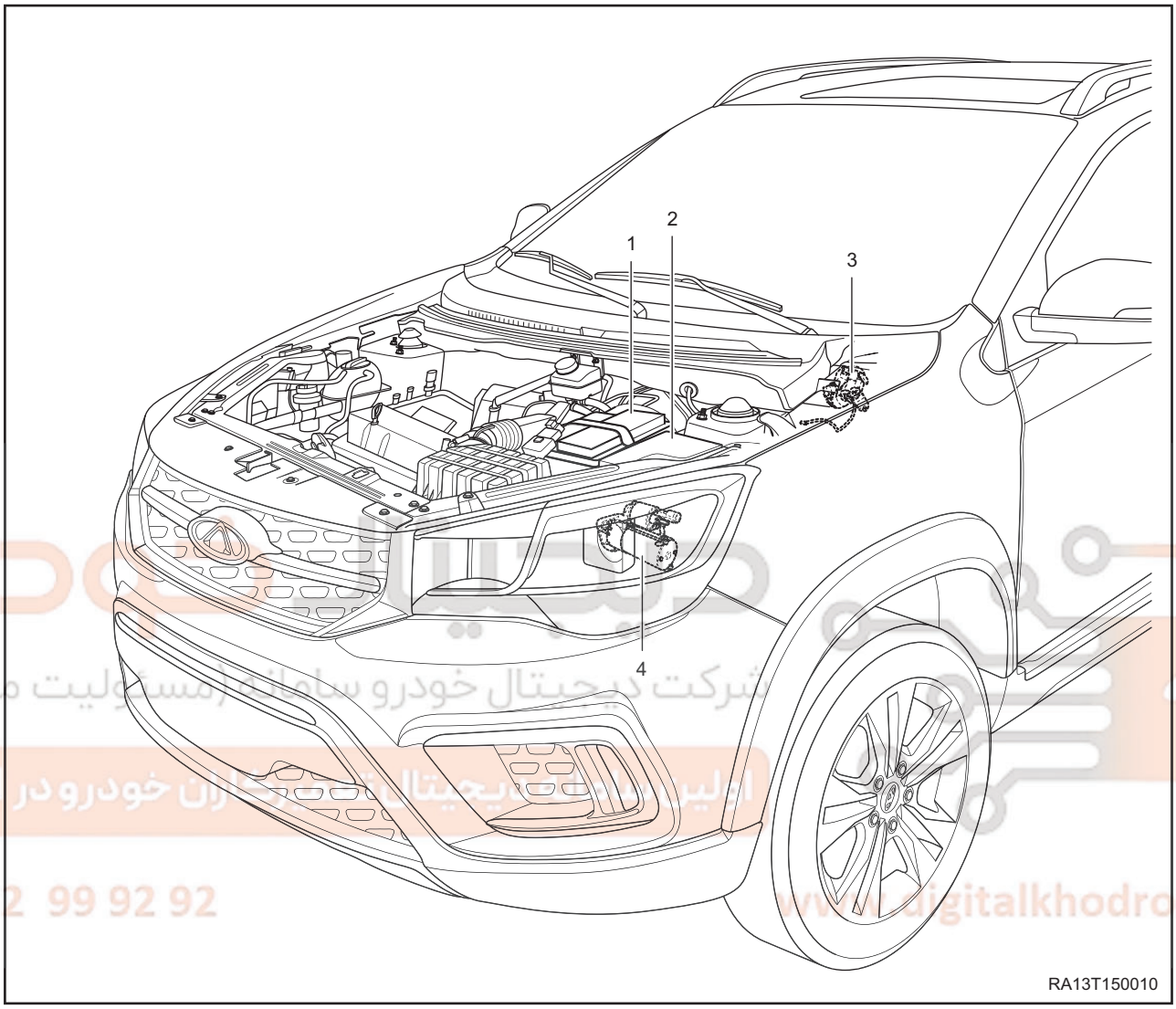
GENERAL INFORMATION

Description



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

Starting system consists of battery, ignition switch and starter etc. It converts electrical energy from battery into mechanical energy by starter, 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.
2. Drive train mechanism: When engine starts, it engages starter drive gear with flywheel gear ring and transmits torque of starter to 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 starter.
3. DC motor: converts electrical energy from battery into electromagnetic moment.

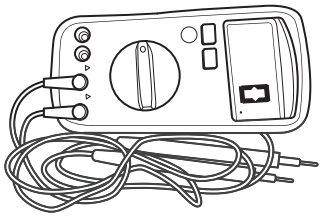
Specifications

Torque Specifications

Description	Torque (N·m)
Starter Power Cable Nut	18 ± 2
Starter Fixing Bolt	40 ± 5
Ignition Starting Switch Fixing Screw	1.5

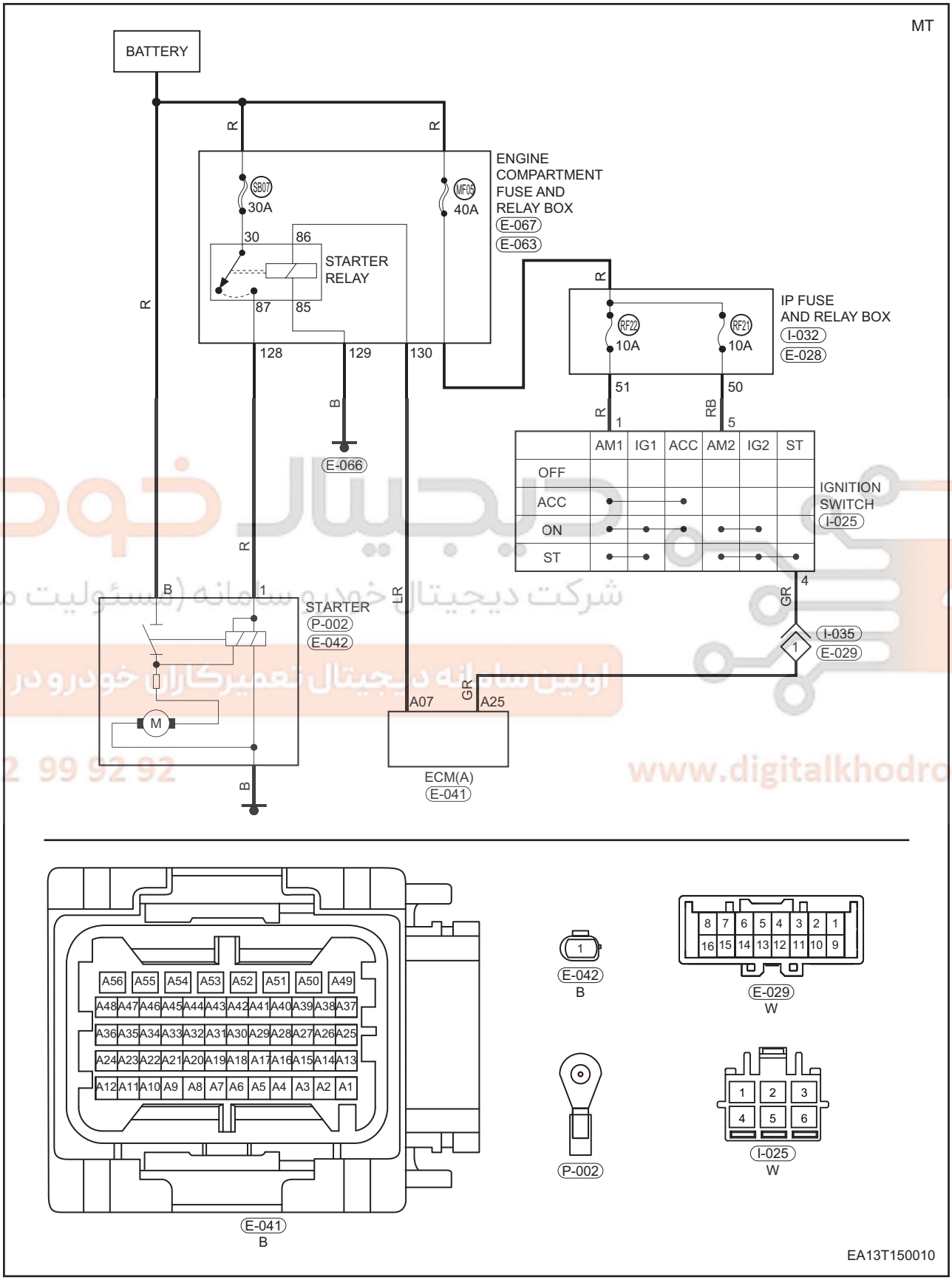
Tool

General Tool

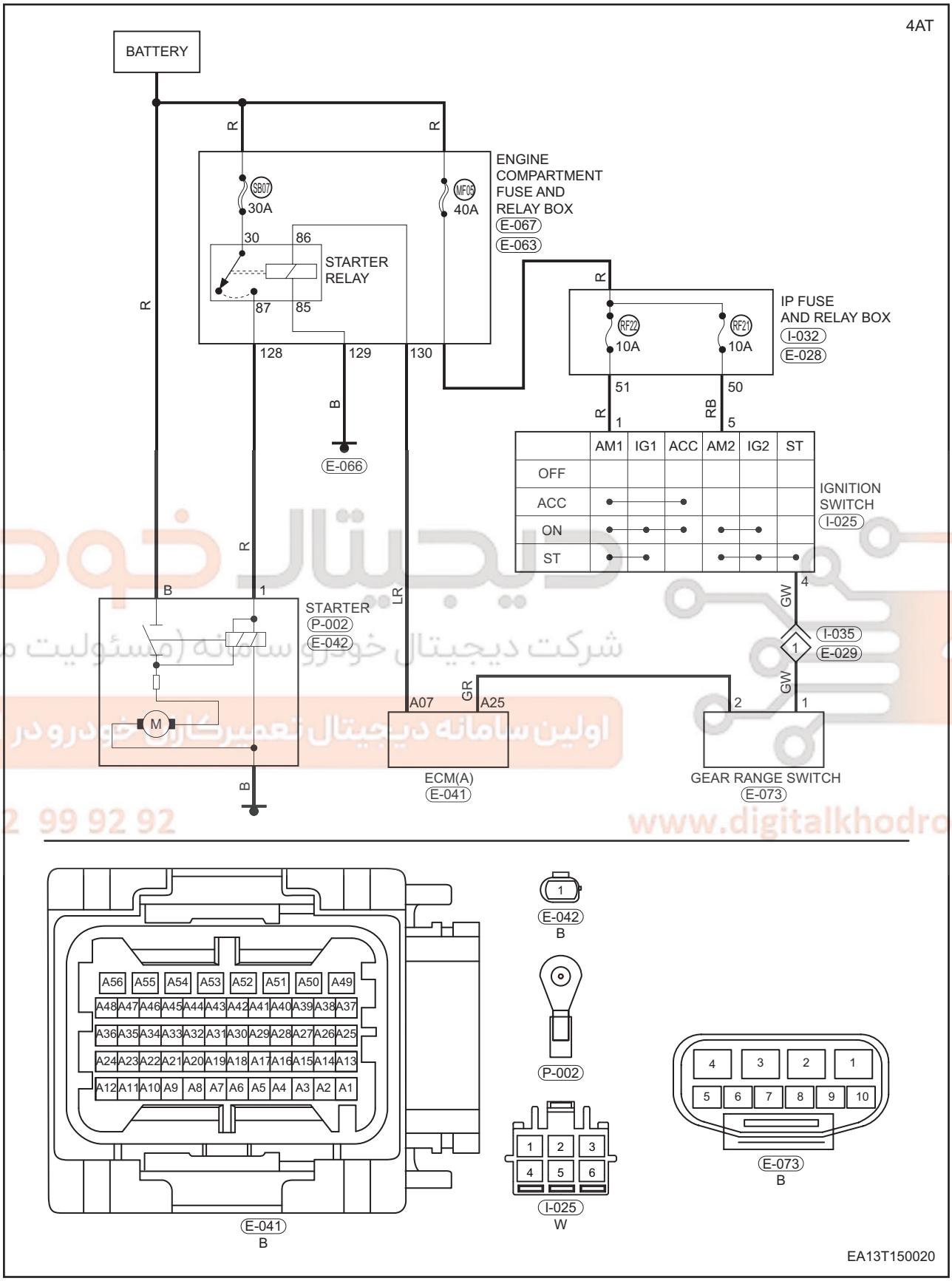
Digital Multimeter	 RCH0000002

Circuit Diagram

Starting System (Page 1 of 2)



Starting System (Page 2 of 2)



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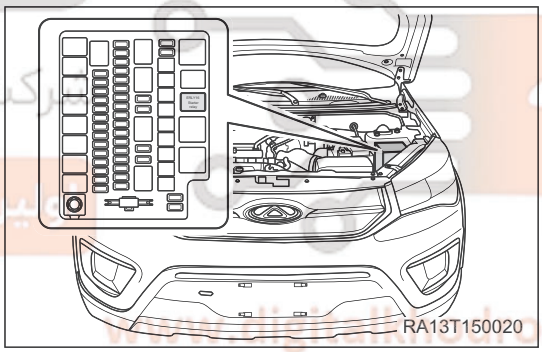
DIAGNOSIS & TESTING

Problem Symptoms Table

Symptom	Suspected Area	See page
When ignition switch is turned to START, solenoid switch makes a "clanking" sound and engine cannot start	Battery (weak battery, poor contact of battery cable)	-
Starter does not run	Battery (depleted)	-
	Starter	15-9
	Ignition switch	15-12
	Starting system wire harness	-
Starter runs weakly	Battery (weak battery, internal fault)	16-7
	Starter	15-9
Starter is racing	Starter (incorrect installation, internal fault)	15-9
	Flywheel ring gear (gear teeth broken)	07-49

Starter Relay Inspection

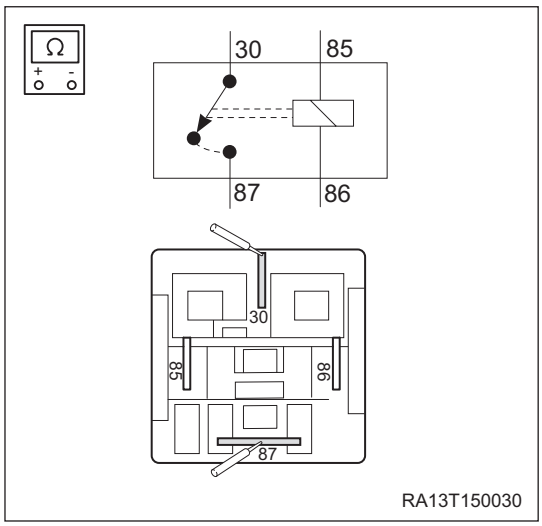
1. Indentify and remove starter relay from engine compartment fuse and relay box.


RA13T150020

2. Starter the relay.
   a. Check the starter relay.
      Using a digital multimeter, measure resistance according to the value(s) in table below.
      Standard Resistance

Multimeter Connection	Specified Condition
30-87	10 kΩ or more
30-87	Below 1 Ω (When battery voltage is applied between terminal 85 and terminal 86)

If result is not as specified, replace starter relay.



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Precautions for Starting System

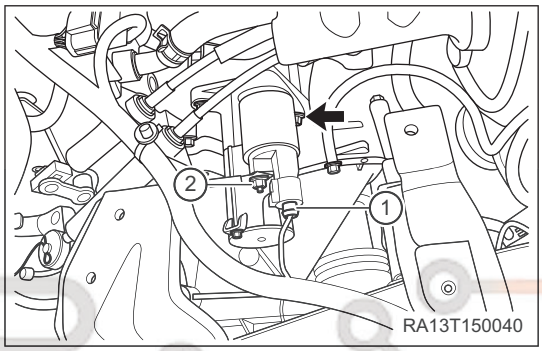
1. Before starting engine, shift transmission to N and apply parking brake while depressing clutch pedal.
2. Make sure that battery is fully charged to reduce repeat operating time of starter.
3. Do not start engine for more than 5 seconds each time, repeated starting interval should not be less than 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

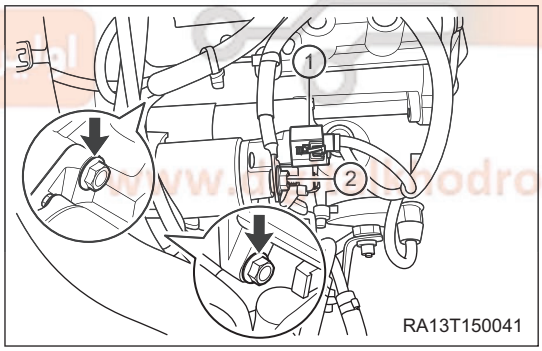
Starter

Removal

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the starter (MT).
   a. Remove the air filter assembly (See page 10-10).
   b. Remove the battery (See page 16-7).
   c. Remove the battery tray (See page 16-9).
   d. Disconnect the starter connector (1).
   e. Move away terminal cap, remove starter power cable nut (2) and disconnect starter power cable.
      (Tightening torque: 18 ± 2 N·m)
   f. Remove 2 fixing bolts (arrow) from starter.
      (Tightening torque: 40 ± 5 N·m)



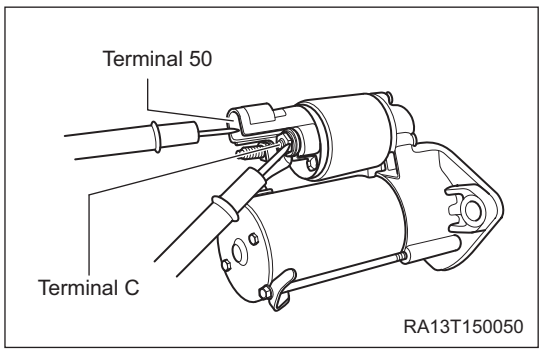
   g. Remove the starter.
4. Remove the starter (AT).
   a. Remove the air filter assembly (See page 10-10).
   b. Disconnect the starter connector (1).
   c. Remove starter power cable nut (2) and disconnect starter power cable.
      (Tightening torque: 18 ± 2 N·m)
   d. Remove 2 fixing bolts (arrow) from starter.
      (Tightening torque: 40 ± 5 N·m)



   e. Remove the starter.

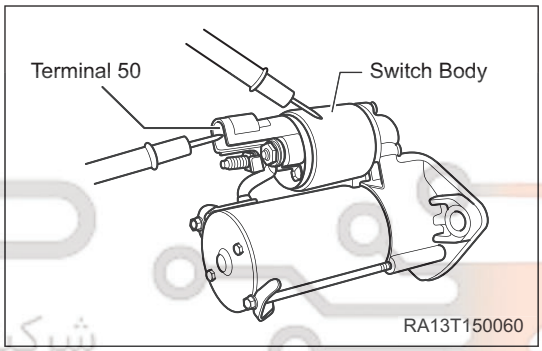
Inspection

1. Check the starter solenoid switch.
   a. Check the pull-in coil.
      - Measure resistance between terminal 50 and terminal C.
      - Standard resistance should be below 2 Ω.



   If result is not as specified, replace starter.

   b. Check the hold-in coil.
      - Measure resistance between terminal 50 and starter solenoid switch body.
      - Standard resistance should be below 2 Ω.



   If result is not as specified, replace starter.

2. Check the starter assembly.

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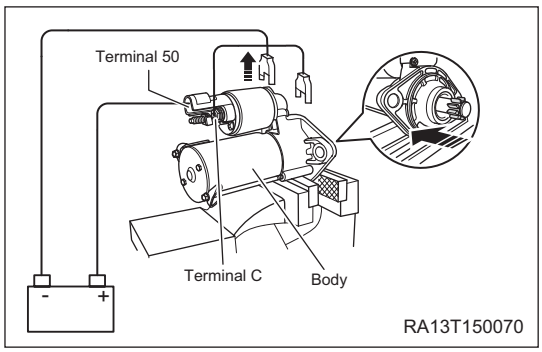
CAUTION

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

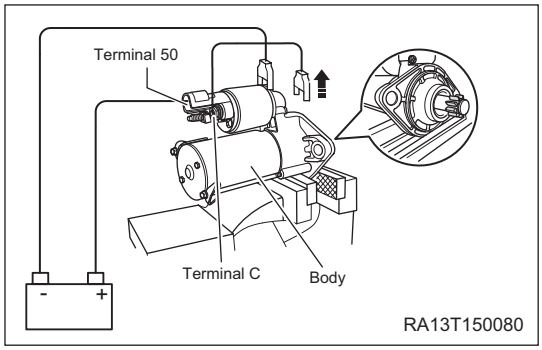


   If starter clutch pinion does not move, replace starter assembly.

b. Perform the hold-in test.

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

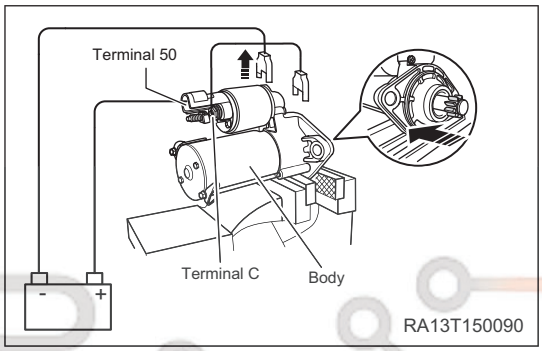
  Check that starter clutch pinion keeps sticking out.



If starter clutch pinion moves inward, replace starter assembly.

c. Check if starter clutch pinion returns back.

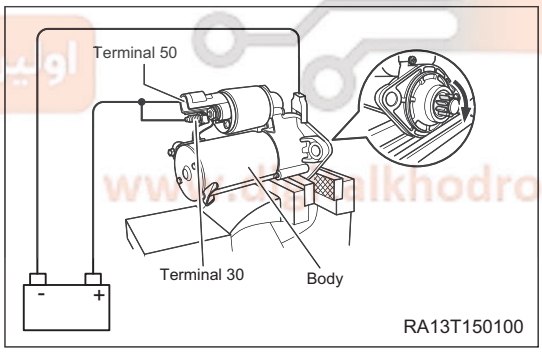
- Disconnect negative battery cable from starter body. Check that starter clutch pinion returns back.



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

d. Check if starter rotates smoothly.

- Connect 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 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 starter assembly.

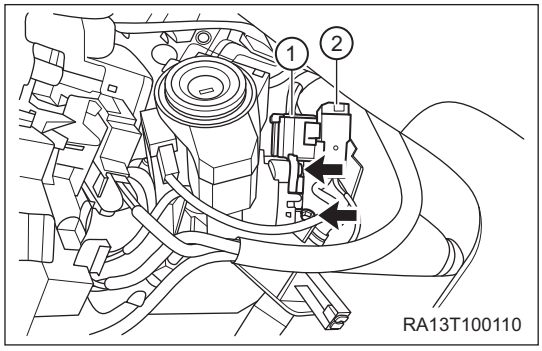
Installation

Installation is in the reverse order of removal.

Ignition Starting Switch

Removal

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the steering column cover assembly (See page 28-11).
4. Remove the ignition starting switch.
   a. Disconnect ignition switch assembly wire harnss connector (1).
   b. Move wire harness connector (2) away from ignition switch.
   c. Remove fixing screw (arrow) from ignition starting switch.
      (Tightening torque: 1.5 N·m)

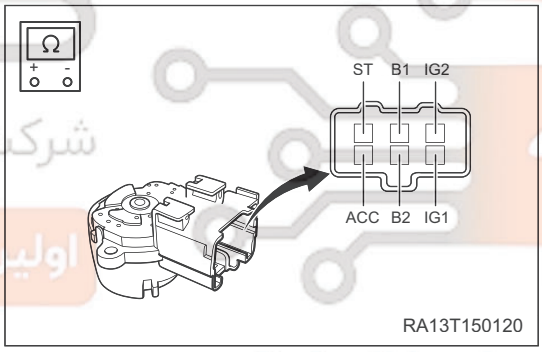


   d. Remove the ignition starting switch.

Inspection

1. Check for continuity of ignition starting switch.

Multimeter Connection	Switch Condition	Specified Condition
All terminals	LOCK	No continuity
Terminal B1 - Terminal ACC	ACC	Continuity
Terminal B1 - Terminal IG1 Terminal B1 - Terminal ACC Terminal IG2 - Terminal B2 Terminal IG1 - Terminal ACC	ON	Continuity
Terminal ST - Terminal B2 Terminal IG1 - Terminal B1	START	Continuity



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

Installation

Installation is in the reverse order of removal.