SQRD4T20 CHARGING SYSTEM

GENERAL INFORMATION

Components

Description

1 - Alternator Assembly	2 - ECU
3 - Battery Assembly	4 - Engine Compartment Fuse and Relay Box

Alternator is a key component of the charging system. It is a device that converts mechanical energy into electrical energy and generates DC voltage through a rectifying circuit, as one of main power sources of the vehicle. The alternator operates as a complete assembly. If alternator fails for any reason, the entire unit must be replaced.

Operation

- Alternator is a silicon rectifying alternator, which mainly consists of rotor, stator and rectifier.
- When direct current flows to rotor winding, rotor claws energize magnetic field to produce alternating induced electromotive force. When direct current flows to rotor winding, rotor claws energize magnetic field to produce alternating induced electromotive force. The stator is installed on the outside of rotor, which is secured together with the front and rear end covers of alternator. Three-phase alternating current generated by alternator is converted to direct current from alternating current by rectifier, and direct current is transmitted to the vehicle electrical system and battery.

Specifications

Torque Specifications

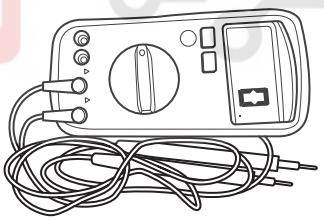
Description	Torque (N·m)
Battery Pressure Plate Fixing Bolt	7 ± 1
Battery Tray Fixing Bolt	25 ± 4
Alternator Output Cable Fixing Nut	13 ± 2
Alternator Fixing Bolt	20 ± 5
Tensioner Fixing Bolt	50 ± 5
Idler Gear Fixing Bolt	50 ± 5

Battery Specification

Engine Type	Type	Specifications
SQRD4T20	L2 400	12v, 70Ah, 560A

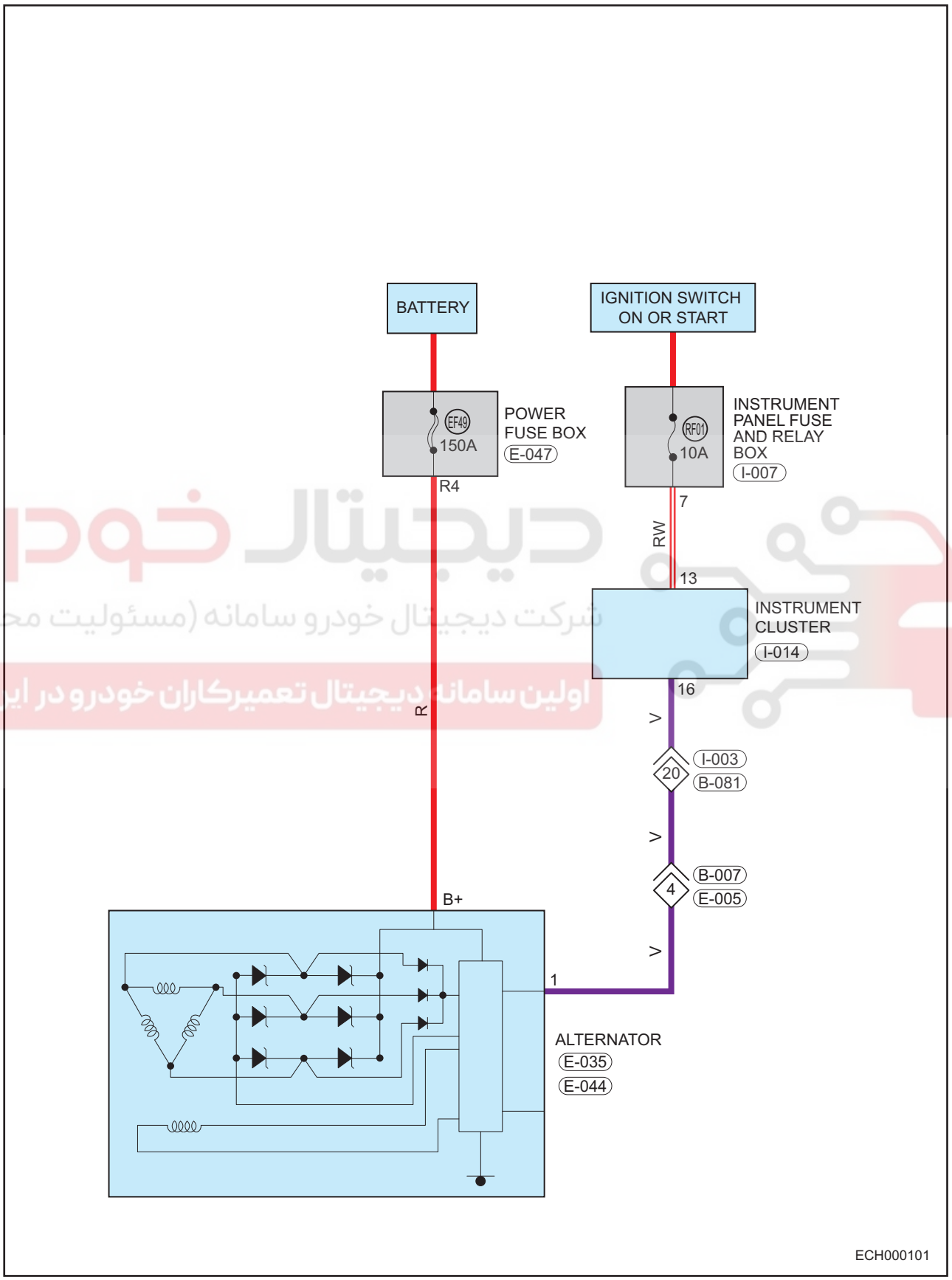
Tools

General Tool

Digital Multimeter	 002

Circuit Diagram

Charging System (Page 1 of 1)



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.

Operating Contents	Operating Instructions
Appearance inspection: check for signs of adhesion of washer fluid, coolant, oil, sludge, etc.	If washer fluid, coolant or oil enters rotor collector ring or brush holder, it will cause alternator rotor collector ring to oxidize and poor contact with brush, so that the charging light remains on or blinks.
Turn over the center of alternator belt by hand, observe whether the maximum angle of turnover is greater than 90°.	Loose belt will cause low speed of alternator, resulting in low power generation or no power; if it is greater than 90°, please adjust the belt tension.
Measure battery voltage with a multimeter.	Check if the battery power is depleted (more than 12 V), if it is depleted, unplug the alternator field wire harness connector, measure the battery voltage (more than 12 V) again, if it is still depleted, recharge the battery.
Check the alternator B+, field end, battery junction terminal and ground wire for looseness, short circuit, dirty, and if the connector is connected firmly.	Confirm if the wire harness is connected normally, and poor contact of wire harness will cause the high generation voltage of generator, indicator light does not come on, remains on or blinks. If it is loose, tighten it.

Common Battery External Failure

1. Cracked or Damaged Housing
   (a) Housing crack or damage is one of the most serious destructive malfunction, the strong vibration of vehicle while driving, lead-acid battery overheat, excess pressure or electrolyte freezing expansion may crack or damage the lead-acid battery housing. Only replace the battery for this malfunction.
2. Loose Post
   (a) The reason for loose post is that it is caused by excessive force when removing and installing the cable and checking contact condition. Replace the battery assembly.
3. Corroded or burned connection post
   (a) The reason is that preservative is not applied to connection post when installing battery, it can be cleaned and coated with petroleum jelly, when the post part is serious corroded or burned, it should be replaced.
4. Battery Bulges
   (a) Check if the power generation is normal, and if the charging voltage is too high.
   (b) It is caused by battery aging and too high internal resistance, the battery should be replaced.

INSPECTION

Charging System Charging Voltage Inspection

1. Leave vehicle under no load test condition and idle the engine. Measure battery voltage with a digital multimeter. Standard voltage: 13.5 V - 14.8 V

   If result is not as specified, replace the alternator.
2. Leave vehicle under load test condition and idle the engine. Measure battery voltage with a digital multimeter.

   Load test condition:
   - Set headlight to high beam;
   - Turn on blower and adjust blower speed to the highest;
   - Turn on the "A/C" switch.

   Standard voltage: 13.5 V - 14.8 V

   If result is not as specified, replace the alternator.

   Caution:
   - If charging system warning light comes on after starting, charging system may have a malfunction.
   - If noises are heard from alternator or generating capacity is extremely high or low, repair or replace the alternator.

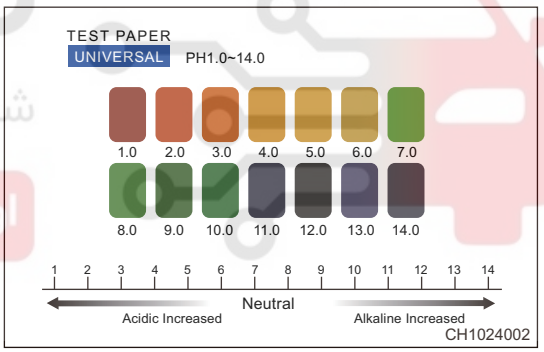
Battery Leakage Test

1. Inspection Method

   (a) Use PH test paper to determine.

   Test paper type definition:

   PH 1 - 14



2. Determination method

   (a) Take a piece of PH test paper (avoid contact with other liquids before testing), and wipe it in the leakage area, smear the liquid on PH test paper, and then compare with the color bar of test paper to determine the PH value.

   (b) The PH value of less than 7 is acidic liquid, it determines that the battery electrolyte leakage.

   (c) The PH value of not less than 7 is non-acidic liquid (neutral or alkaline), it determines that the liquid on battery surface is "petroleum jelly" or other liquids.

ON-VEHICLE SERVICE

Battery

On-vehicle Inspection

1. Check that battery terminals are not loose or corroded. If battery terminals are corroded, clean them.
2. Check battery for damage, deformation or leakage. If damage, deformation or leakage is found, replaced the battery.

   Check the battery voltage.

   (a) Turn ignition switch to on, and turn it off 20 to 30 seconds after turning on headlights. Release the surface charge on battery. Measure battery voltage with a digital multimeter.

   Rated voltage

   12 V - 13 V

Battery Handling\Warning Instruction and Safety Regulation

1. Follow the related instructions on electrical equipment of the battery, repair manual and operation manual.
2. There is a risk of corrosion (burns).
   Battery acid has a strong corrosive, so protective gloves and glasses must be worn during operating.
   Do not pour the battery because the acid may spill out of the vent.
3. No open flames, sparks, lighting without protective measures and smoking.
   Spark should not be generated when operating cables, wires and electrical equipment.
   Avoid the battery short circuit.
4. Wear the protective glasses.
5. Do not allow children near the acid or battery.
6. Recovery.
   Dispose of used battery at designated disposal sites.
7. Never dispose the used battery in domestic waste.
8. There is a danger of explosion.

Removal

Warning\Caution\Hint

Caution:

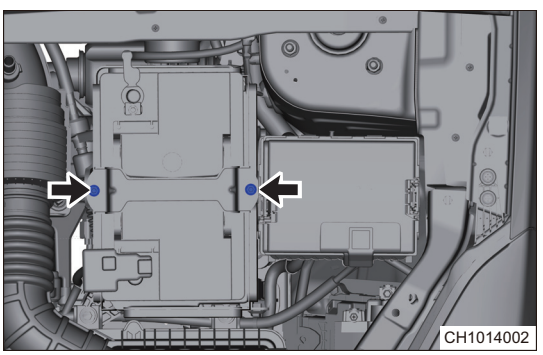
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Remove the battery assembly.

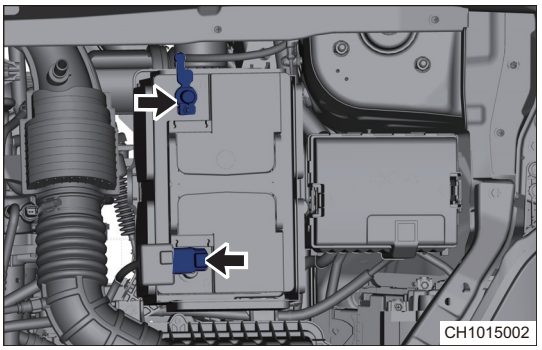
   (a) Loosen 2 fixing bolts (arrow) and remove battery pressure plate assembly.

   Tightening torque

   5 ± 1 N·m



(b) Loosen the positive and negative battery cable locking nuts, and remove the positive (+) and negative (-) battery terminal cables (arrow).



Tightening torque
7 ± 1 N·m

Hint:
When removing positive battery cable, be careful that loosen locking nut and do not completely remove it, to prevent stud bottom "T" type part from deformation when tightening locking nut.

(c) Remove the battery assembly.
Caution:
- Please be careful to prevent metal tools from contacting both electrodes of battery at the same time or touching the positive electrode and vehicle body when removing.

Installation

Warning/Caution/Hint

Caution:
- Replace battery with a new one which conforms to the specifications.
- Used battery contains sulfuric acid and lead, so never discard it at will. Please dispose of it at a qualified local waste treatment station.

1. Installation is in the reverse order of removal.

Battery Tray

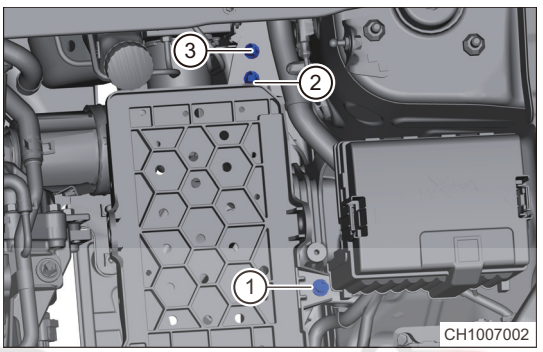
Removal

Warning/Caution/Hint

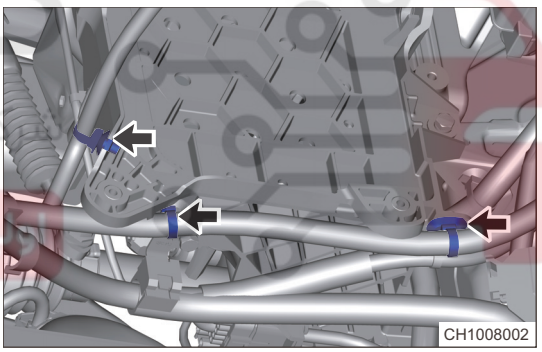
Caution:

- 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.

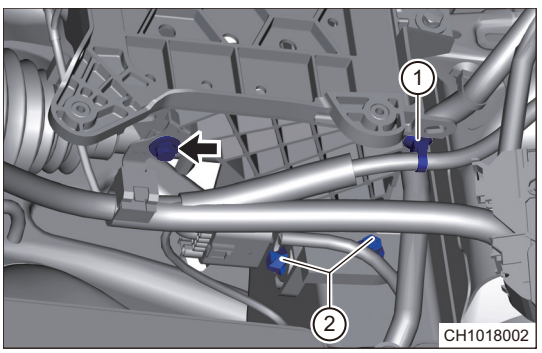
1. Turn off all electrical equipment and the ignition switch.
2. Remove the battery assembly (See page 14-8).
3. Remove the air filter assembly (See page 08-9).
4. Remove the battery tray.
   (a) Remove the battery tray fixing bolt (1).
   Tightening torque
   9 ± 1 N·m
   (b) Remove the battery tray fixing bolts (2), (3).
   Tightening torque
   25 ± 4 N·m



   (c) Remove each wiring harness fixing clips (arrow) from battery tray.



   (d) Remove 1 fixing bolt (arrow) from engine wire harness, fixing clips (1) and tray fixing bolt (2).



   (e) Remove the battery tray.

Installation

Installation is in the reverse order of removal.

Alternator Assembly and Mounting Bracket

Removal

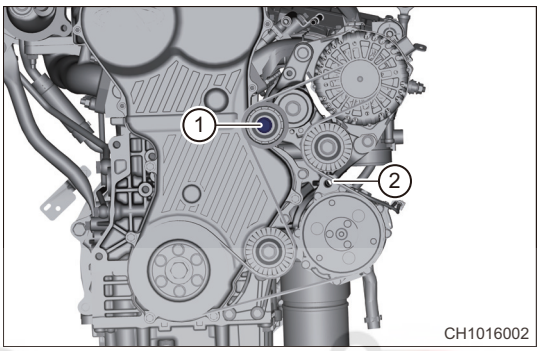
Warning/Caution/Hint

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 engine trim cover.
4. Move away the accessory drive belt.

   (a) Use an appropriate wrench, tight tensioner pulley bolt (1), raise it upward forcefully, and remove accessory drive belt (2) until the belt is loose.

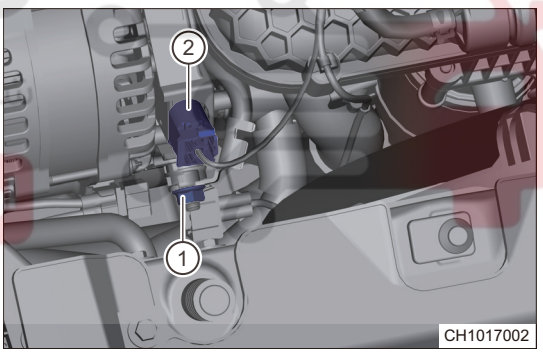


5. Remove the alternator assembly.

   (a) Disconnect the alternator connector (2).

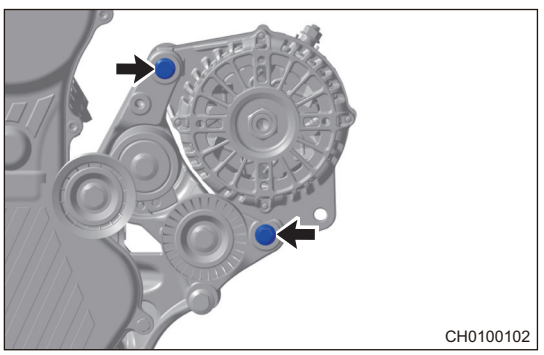
   (b) Open the output end cap, remove the fixing nut (1), and disconnect the output cable connection.

   Tightening torque
   13 ± 2 N·m



   (c) Remove 2 fixing bolts from alternator assembly.

   Tightening torque
   20 + 5 N·m



   (d) Remove the alternator assembly.

6. Remove the alternator mounting bracket.

   (a) Remove the A/C compressor assembly (See page 25-89).

   Caution:

   - When removing the compressor assembly, it is necessary to remove alternator mounting bracket at the same time, and remove the A/C compressor assembly from alternator bracket.

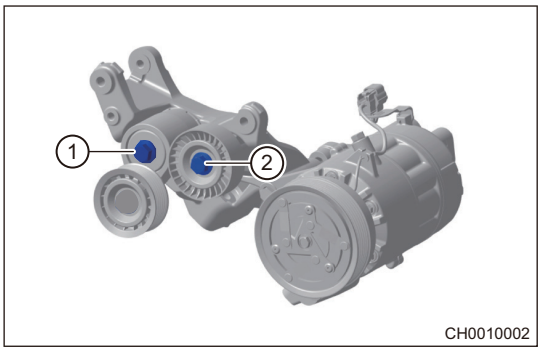
(b) It is necessary to remove tensioner assembly and idler pulley assembly after removing alternator mounting bracket.

(1) Remove the tensioner assembly fixing bolt (1).

Tightening torque
50 ± 5 N·m

(c) Remove the idler pulley assembly fixing bolt (2).

Tightening torque
50 ± 5 N·m



Installation

1. Installation is in the reverse order of removal.
2. Inspection
   (a) Start engine.
   Caution:
   • If battery warning light comes on, charging system may have a malfunction.
   (b) Check alternator output voltage with a digital multimeter, and record the voltage when engine is running.
   (c) If the voltage is between 13.5 and 14.8 V, the alternator is normal.