

GROUP

3

# Powertrain

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## 3.1 Engine - 1.6L

3.1.4 Cooling System..... 3.1.4-1

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



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**Specifications****Component Specifications**

Description	Specification
Thermostat type	Waxtype
Thermostat opening temperature	86 ~ 90 °C
Thermostat full opening temperature	93 ~ 97 °C
Water pump type	Centrifugal impeller pump
Number of leaves of water pump	6

**General Specifications**

Application	Specification
Cooling type	Water cooling
Coolant capacity (including reservoir)	6.5 L
Low-speed opening temperature of the electronic fan	97 °C
Low-speed closing temperature of the electronic fan	94 °C
High-speed opening temperature of the electronic fan	102 °C
High-speed closing temperature of the electronic fan	99 °C

**Torque Specifications**

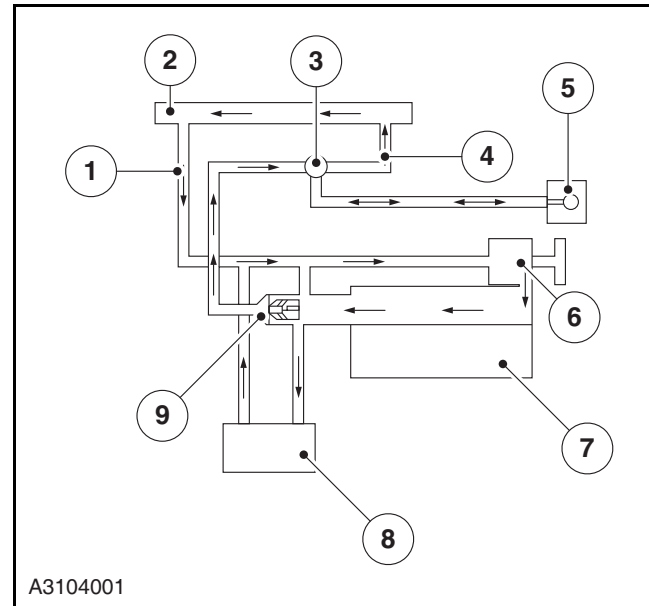
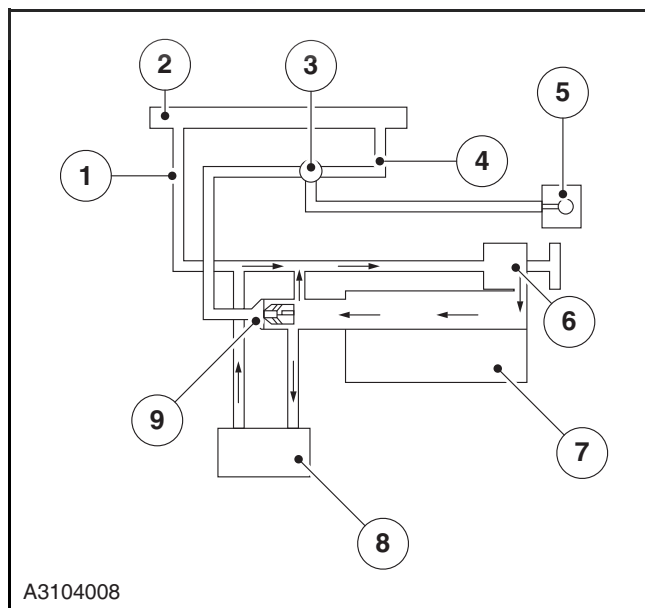
Description	Nm	lb-ft	lb-in
Coolant temperature sensor	20	15	-
Pump M8 retaining bolt	23	17	-
Pump M6 retaining bolt	10	-	89
Water pump belt pulley retaining bolt	23	17	-
Thermostat cap retaining bolt	23	17	-
Cooling fan retaining bolt	10	-	89
Cooling fan bracket retaining bolt	10	-	89
Radiator retaining bolt	23	17	-
Radiator drain plug	-	-	-

**Description and Operation**  
**System Overview**

The cooling system consists of a radiator, a coolant reservoir, hoses, a water pump, cooling fans and a thermostat. The radiator is the gilled tube type. Engine at cold state: the normal working temperature of the engine is around 95 °C ( 203 °F ). Within such a range, all components of an engine work best with each other. The mechanical wear of the engine would be even if the engine cannot reach the ideal working temperature in a long period. Due to the low temperature, the mixed gas burns inadequately in the combustion chamber, which leads to serious carbon deposit. Therefore, the engine is required to run at low temperatures.

The normal working temperature should be reached as soon as possible. The heat produced by the engine should be kept from exchanging with the outside as possible. At this moment, the thermostat controls the coolant in the engine to recycle in the engine only. It may carry the heat produced by the cylinder wall to other components of the engine to heat them rapidly. The water pump makes the coolant flow in a cycle and then the coolant cycles through the water jacket, the throttle body assembly and the cylinder head. Such state is called a minor cycle.

jacket, the intake manifold, the cylinder head and the radiator. Such state is called a major cycle.



Item	Description
1	Radiator water outlet pipe
2	Radiator
3	Filling port
4	Radiator water inlet pipe
5	Water storage bottle
6	Water pump
7	Engine
8	Heater water tank
9	Thermostat

When the temperature is 88 °C ( 179.6 °F ), the coolant is pumped by the water pump to the water

## Component Description

### Coolant

When the engine reaches the normal working temperature: the coolant in the engine gets warm rapidly as the engine is running. The system reaching the thermostat large cooling cycle system is the standard system. The coolant in radiator begins to swell as it is heated and the overflow is collected in the reservoir. The coolant flows back to the radiator when the engine cools down. This cooling system has been filled with high-quality antifreeze composed of water and glycol in a proportion of 45/55 before the delivery. The antifreeze mixed in a proportion of 45/55 can prevent freezing at a temperature as far as  $-40\text{ }^{\circ}\text{C}$  ( $-37\text{ }^{\circ}\text{F}$ ).

Keep the cooling system antifreeze temperature at  $-40\text{ }^{\circ}\text{C}$  ( $-37\text{ }^{\circ}\text{F}$ ) to guarantee rust prevention and prevent the loss of the coolant because of boil. Such antifreeze should be used even though the ambient temperature is not below the icing temperature.

The glycol coolant should be added to prevent the antifreezing temperature being below  $-40\text{ }^{\circ}\text{C}$  ( $-37\text{ }^{\circ}\text{F}$ ).

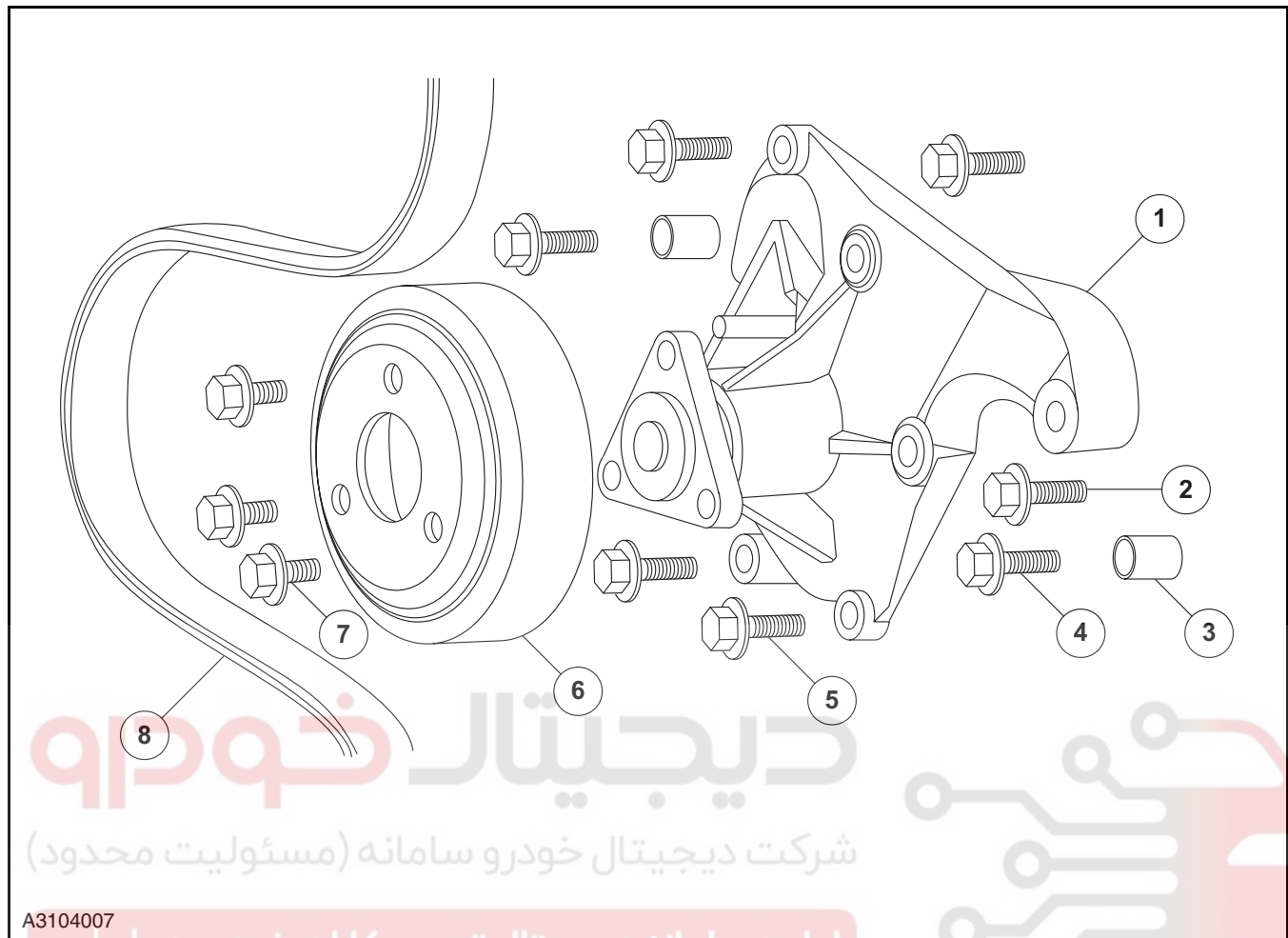
**⚠ CAUTION: Coolant such as alcohol, methanol or water alone can not be used for the cooling system. Otherwise, the cooling system may fail.**

**⚠ CAUTION: Even though the ambient temperature can not be expected to reach the freezing point, an antifreeze (antifreeze and rust prevention coolant) mixed with water and glycol in a proportion of 45 to 55 should be used as the coolant.**

**Coolant Proportion Table**

Antifreeze proportion table	Freezing point temperature	$^{\circ}\text{C}$	-40
		$^{\circ}\text{F}$	-37
	Antifreeze/Rust prevention coolant concentration	%	55
	Coolant mixing proportion	ltr	3.5/3.5
		USpt	7.39/7.39
Imp pt		6.16/6.16	
Coolant capacity	Engine radiator and heater water tank		About 2.9 L (6.12/5.1 US/Imp.pt.)
	Water storage bottle		About 1.2 L (4.22/3.52 US/Imp.pt.)
	Others		About 2.1 L (4.43/3.70 US/Imp.pt.)
	Total capacity		About 6.5 L (14.77/12.32 US/Imp.pt.)

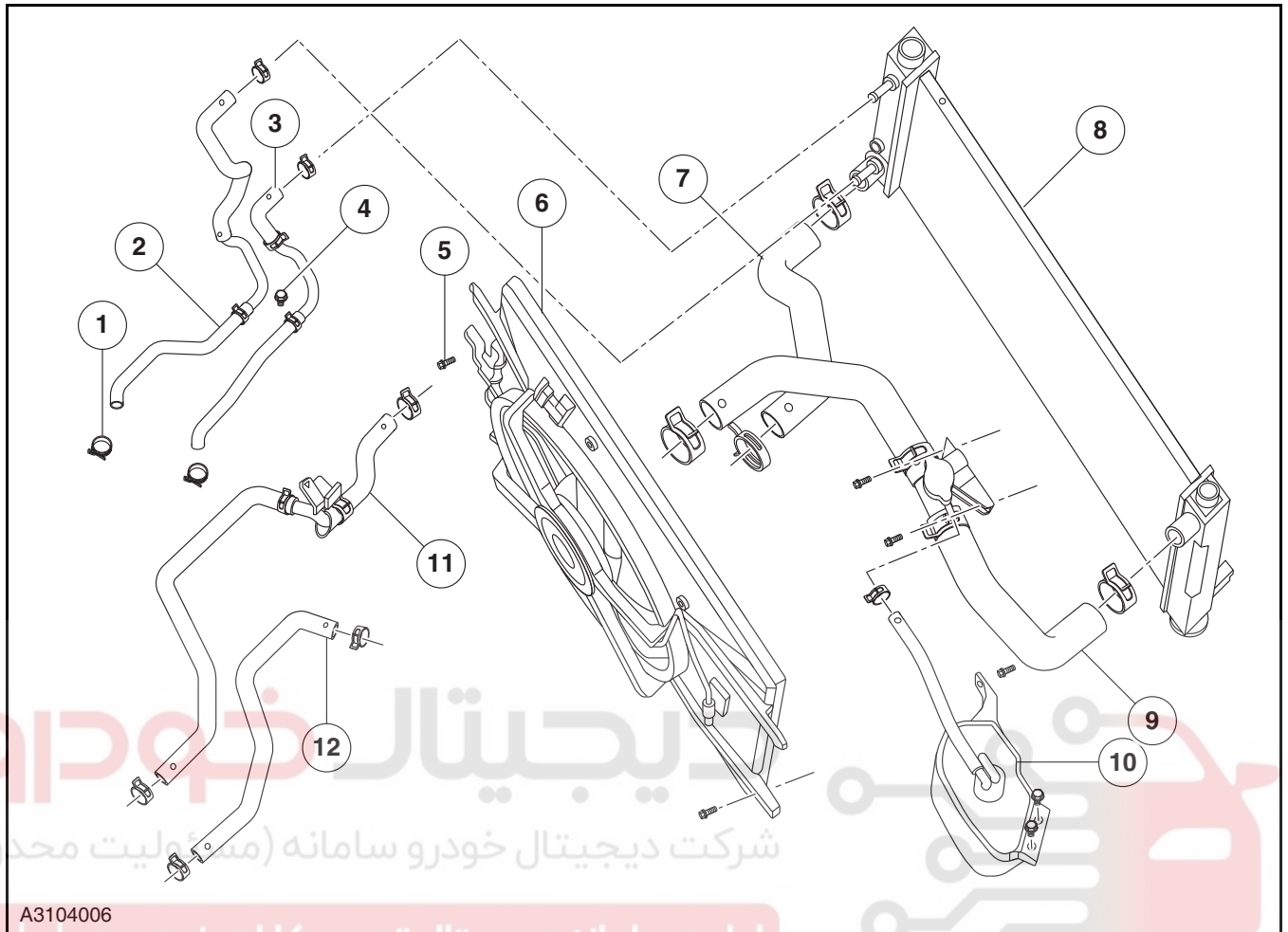
Location View



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Item	Description	Item	Description
1	Water pump assembly	5	Hexagon flange bolt Q1840625
2	Hydraulic tensioner and water pump connection bolt	6	Water pump belt pulley
3	Water pump alignment pin	7	Hexagon flange bolt Q1840812
4	Hexagon flange bolt Q1840835	8	Front pulley belt









Exploded View





A3104006


Item	Description	Item	Description
1	Elastic circlip	7	Lower coolant hose
2	Oil cooler inlet pipe assembly	8	Radiator
3	Oil cooler outlet pipe assembly	9	Upper coolant hose with filler assembly
4	Cross recessed hexagon screw	10	Water reservoir with accessory assembly
5	Hexagon flange bolt	11	Heating ventilation water outlet pipe
6	Cooling fan assembly	12	Heating ventilation water inlet pipe

### General Procedures


-  **CAUTION:** Coolant such as alcohol, methanol or water alone can not be used for the cooling system. Otherwise, the cooling system may fail.
-  **CAUTION:** The poor quality antifreeze will corrode the cooling system, so please add the Changan specified brands of anti-freeze at the Changan designated station.
-  **CAUTION:** Even though the ambient temperature can not be expected to reach the freezing point, an antifreeze (antifreeze and rust prevention coolant) mixed with 45% water and 55% glycol should be used as the coolant.
-  **WARNING:** Hands, tools and clothing shall be away from the engine cooling fan to avoid people injured. This fan is an electrical fan, and regardless of whether the engine runs, it can run. When the ignition switch is in the "ON" position, the fan automatic operation depends on ECU (and the ECT sensor).
-  **WARNING:** Remove all the components when the engine is at cold state. Otherwise, they would lead to serious scalding or injury.
-  **WARNING:** Turn off the engine and wait until it cools down. It takes much care to remove the reservoir cap even if the engine has cooled down. Wrap it with a thick rag and turn it anticlockwise for 2.5 turns. Step back before releasing the pressure.
-  **WARNING:** Turn the cap with the rag wrapping it and remove it after making sure that all pressure has been released.
-  **WARNING:** Use a coolant with concentration suitable for the driving ambient conditions. Otherwise, the engine may be damaged.


 **WARNING:** The engine has some components made of aluminium which shall need the protection from the coolant based on the glycol to prevent them from being eroded and frozen.


 **WARNING:** Only use soft water or demineralized water in the coolant mixture. Water containing mineral reduces the effectiveness of the coolant.

 **WARNING:** Engine coolant does damage to the paintwork. Wash the affected area immediately after it reaches the surface of the paintwork.

### Coolant Level Inspection

 **WARNING:** To avoid the danger of being scalded, do not open the reservoir cap when the coolant is boiling.

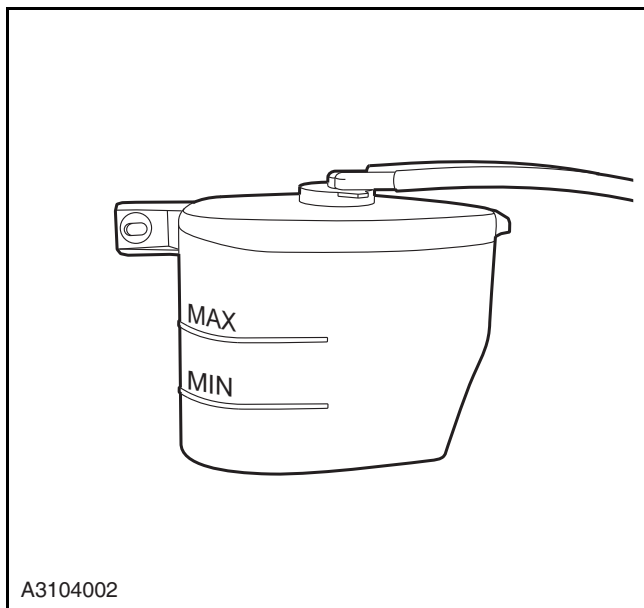
 **WARNING:** To avoid the danger of being scalded, do not open the reservoir cap when the engine and the radiator remain hot.

 **WARNING:** The boiling liquid and steams may spurt out under the pressure since the reservoir cap opens earlier.

Inspect the coolant level in the reservoir when the engine cools down. The normal coolant level should be located between Max and Min on the reservoir.

Open the reservoir and add a moderate amount of coolant to make the level reach Max when the coolant level is below Min. And install the cap again.



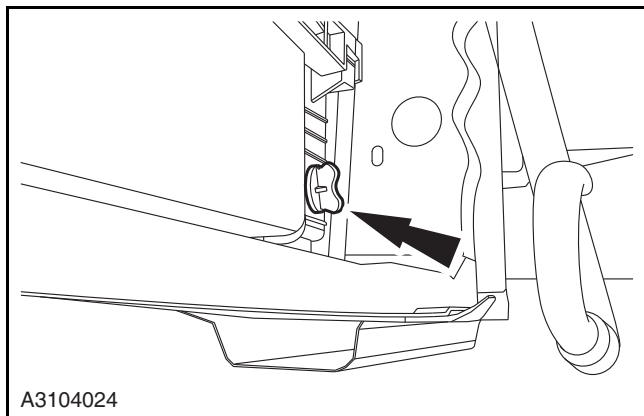


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### Coolant Drainage and Filling

**⚠ WARNING:** To avoid the danger of being scalded, do not remove the reservoir cap when the engine and radiator remain hot. The boiling liquid and steams may spurt out under the pressure since the reservoir cap opens earlier.

1. Remove the coolant filler cap after the engine cools down. Turn the cap anticlockwise until the pressure has been released, and press it down and continue to turn it anticlockwise.
2. After opening the cap, run the engine until the upper hose of the radiator gets warm, which shows that the thermostat has been opened and the coolant has begun to flow through the system.
3. Turn off the engine and drain the coolant.



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4. Tighten the drain plug. Fill the system with water until it is full and run the engine until the upper hose of the radiator gets warm again.
5. Repeat the step 3 and 4 for times until the liquid drained from the cooling system is getting transparent.
6. Drain the cooling system and tighten the radiator drain plug.
7. Remove the reservoir and unscrew the reservoir cap, and take the reservoir away and pour the liquid from it. Use soap water to clean the bottom of it and wash it with clean water and drain it before installing the reservoir and hoses again.
8. A coolant mixed with high-quality glycol and water in a proportion of 45/55 is added to the reservoir and the radiator.
9. Keep the idle engine until the cooling fan starts and observe the coolant level. Fill the coolant when the level decreases. Tighten the coolant filler cap. Start the engine at 2,500 rpm to 3,000 rpm for 5 minutes and back to the idle speed. Open the coolant filler cap and check the coolant level. If the level decreases, repeat the process above until the radiator coolant level does not decrease any longer. Turn off the engine after starting in the idle state for 1 minute.
10. Fill the coolant into the reservoir to the Max after the engine cools down. Run the engine at idle speed until the cooling fan is running, and observe whether the reservoir coolant level decreases after the engine cools down, fill the coolant into the reservoir to the Max if it decreases.
11. Repeat the step 10 if the air remains in the cooling system.

## Coolant Leak Inspection

1. Visually inspect the cooling system for leaks or damage.
2. When the engine is cooling, remove the filler cap, and clean the cap and filler port with clean water.
3. Install the testing instrument on the filler of the radiator.
4. Apply some pressure with the testing instrument and make the pressure reach 110 kPa.

**⚠ CAUTION:** Be aware that the pressure in the radiator cannot exceed 115 kpa, otherwise, it may cause damage.

5. Observe the testing instrument for pressure changes.

Standard: keep the pressure the same for 2 minutes when it reaches 110 kPa.

It shows that there may be leaks of water if the pressure gauge needle points to begins to drop. Repair them or install some new related components.

## Coolant Filler Cap Inspection

1. Clean the coolant filler cap and sealing part.
2. Inspect the coolant filler cap for any cracks or any sealant facing outward. If there is any fault, replace the coolant filler cap.
3. Connect the coolant filler cap to the coolant filler cap testing instrument.
4. Apply some pressure to the water reservoir through the testing instrument and increase the pressure to 110 kPa. Make sure that the pressure can be maintained for 10 seconds.

Replace a new coolant filler cap if the pressure can not keep stable within the specified range.

**Coolant Filler Cap Standard Pressure: 110 kPa**

## Accessory Drive Belt Tension Inspection

**⚠ WARNING:** Disconnect the battery negative cable before inspecting and adjusting the belt tension.

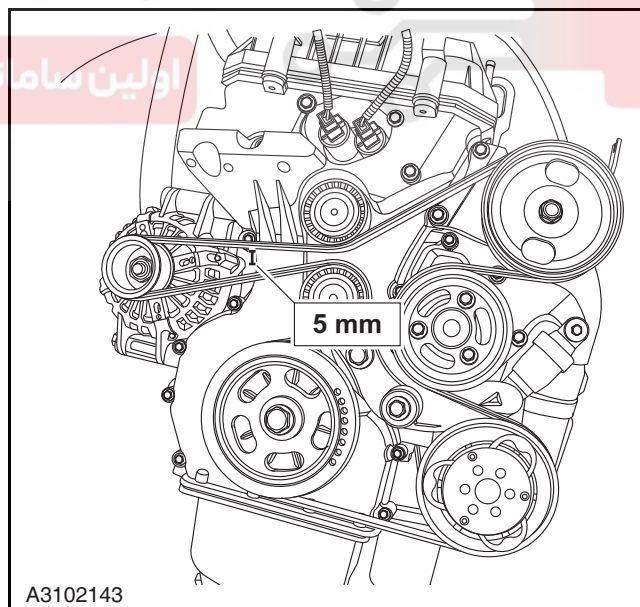
**⚠ WARNING:** Read the "WARNING" content in 3.1.4 Cooling System.

1. Inspect the belt for any cracks, cuts, deformation, wear and dirt. Install a new belt if necessary.

Refer to: Accessory Drive Belt (3.1.2 Mechanical System, Removal and Installation).

2. Inspect the belt tension. The loosened accessory belt will have an impact on the motor voltage, which leads to the over heating and early wear of the belt. The belt is supposed to have a dent as deep as 5 ~ 6 mm when a pressure of 100 N is applied to the middle of the belt during the inspection.

3. Connect the negative cable to the battery terminal.



## Thermostat Test

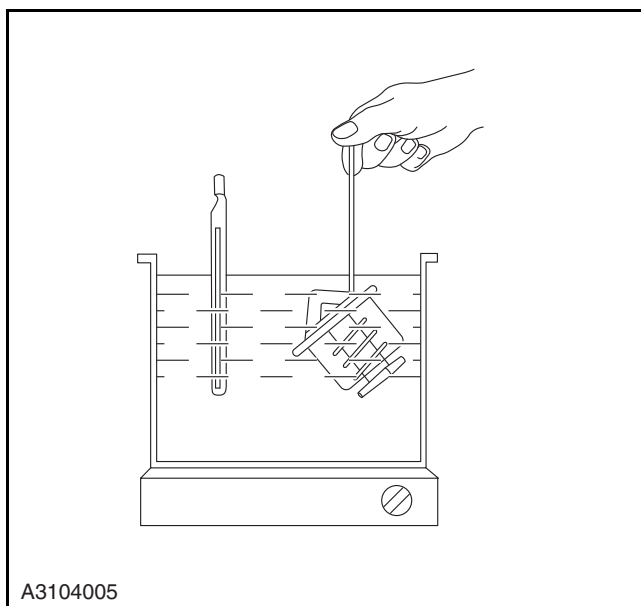
1. Inspect whether all the air is exhausted by the thermostat exhaust valve. If the exhaust valve is blocked, it will lead to the engine overheating.
2. Inspect the valve seat for foreigners, which leads to the valve installed loosen.
3. Inspect the thermostat seals for crack, distortion or damage.
4. Inspect the thermostatic actions of the wax ball as followings:
  - Remove the thermostat.

**Refer to: Thermostat (3.1.4 Cooling System, Removal and Installation).**

- Soak the thermostat in the heated water.
- Place a thermometer in the water.
- Heat the water, observe the thermometer state and inspect whether the temperature when opening the valve is the specified value.

**Refer to: Component Specifications (3.1.4 Cooling System, Specifications).**

- If the temperature is lower or higher than the specified value obviously when opening the valve, install a new thermometer. Unspecified thermometer may lead to the over cold or over heat tendency.



## Symptom Diagnosis and Testing

### General Equipment

Digital Multimeter
Changan Auto Special Diagnostic Tool

## Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical damage or electric damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause before proceeding to the next step.
4. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart.

### Visual Inspection Chart

Mechanical	Electrical
<ul style="list-style-type: none"> <li>• Coolant leak(s)</li> <li>• Liner or seal</li> <li>• Hose or hose connector</li> <li>• Coolant filler cap and sealing</li> <li>• Water reservoir</li> <li>• Radiator</li> <li>• Water pump</li> <li>• Thermostat housing</li> <li>• Heater water tank</li> <li>• Accessory drive belt</li> <li>• Coolant output connector</li> </ul>	<ul style="list-style-type: none"> <li>• Fuse</li> <li>• Wiring harness</li> <li>• Electrical plug</li> <li>• Engine coolant temperature (ECT) sensor</li> <li>• Cooling fan</li> <li>• Engine control unit ECM</li> </ul>



## Symptom Chart

If the fault occurs, but there is no DTC stored in the ECM for this fault, and can not confirm the cause, then follow the procedure to diagnose the fault and eliminate it.

Symptom	Possible Sources	Solutions
Loss of coolant	• Hose or hose connector	• Inspect the hose for aging and the hose connector for leakage.
	• Radiator	• Inspect the radiator for leakage.
	• Water pump	• Inspect the water pump for any possible leaks. Carry out the component testing, pressure testing, 3.1.4 Cooling System. Install a new set of water pump or water pump cushion if necessary.  <b>Refer to: Water Pump (3.1.4 Cooling System, Removal and Installation).</b>
	• Thermostat housing	• Inspect the thermostat housing for any possible leaks. Carry out the component testing, pressure testing, 3.1.4 Cooling System. Install a new set of thermostat housing and housing cushion if necessary.  <b>Refer to: Thermostat (3.1.4 Cooling System, Removal and Installation).</b>
	• Coolant filler cap or sealing	• Inspect the coolant filler pressure cap for lock and damage. Install a new set of coolant filler cap if necessary.
	• Water reservoir	• Inspect the reservoir for any possible damages. Install a new set of reservoir if necessary.
	• Heater water tank	• Inspect the heater water tank for any possible leaks.
	• Engine	• Inspect the engine, cylinder head, cylinder block and cylinder liner.

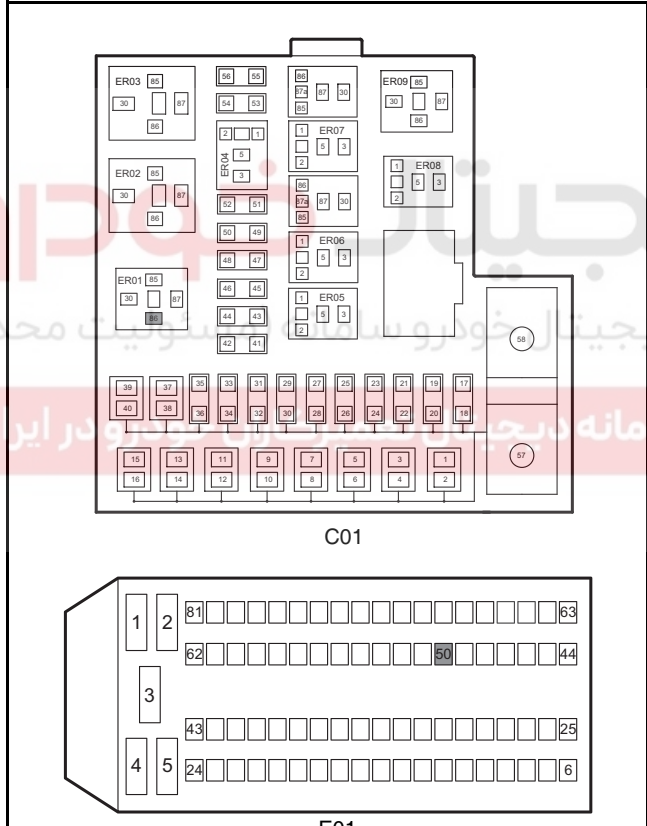
Symptom	Possible Sources	Solutions
Engine overheating (traces of boiling coolant)	<ul style="list-style-type: none"> <li>The cooling system can not maintain the pressure</li> </ul>	<ul style="list-style-type: none"> <li>Inspect the water pump or water pump gasket for any possible damage. Install a new set of water pump or water pump cushion if necessary.</li> <li><b>Refer to: Water Pump (3.1.4 Cooling System, Removal and Installation).</b></li> <li>Inspect the engine, cylinder head, cylinder block and cylinder liner.</li> </ul>
	<ul style="list-style-type: none"> <li>Air exists in the brake system</li> </ul>	<ul style="list-style-type: none"> <li>Bleed the cooling system.</li> </ul>
	<ul style="list-style-type: none"> <li>Coolant filler pressure cap or sealing</li> </ul>	<ul style="list-style-type: none"> <li>Inspect if the coolant filler pressure cap has been locked or damaged. Install a new set of coolant filler pressure cap if necessary.</li> </ul>
	<ul style="list-style-type: none"> <li>Water reservoir</li> </ul>	<ul style="list-style-type: none"> <li>Inspect the reservoir for any possible damages. Install a new set of reservoir if necessary.</li> </ul>
	<ul style="list-style-type: none"> <li>Coolant level or state</li> </ul>	<ul style="list-style-type: none"> <li>Inspect the coolant level. Add more coolant if necessary.</li> <li><b>Refer to: Coolant Draining and Filling (3.1.4 Cooling System, General Procedures).</b></li> <li>Inspect the state of the coolant. Drain the old coolant and add new coolant if the old coolant is abnormal.</li> <li><b>Refer to: Coolant Draining and Filling (3.1.4 Cooling System, General Procedures).</b></li> </ul>
	<ul style="list-style-type: none"> <li>Contaminated coolant</li> </ul>	<ul style="list-style-type: none"> <li>Replace the coolant.</li> </ul>

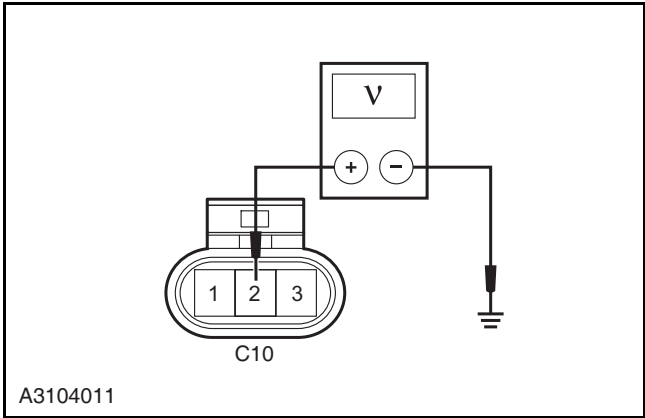
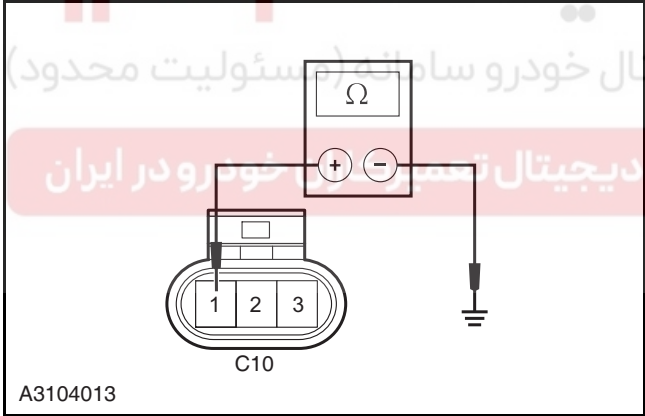
Symptom	Possible Sources	Solutions
Engine overheating (traces of boiling coolant)	• Water tank grille	• Inspect the water tank grille for air blocking or any possible damages. Repair it or install new components if necessary.
	• Water pump	• Carry out the component testing, pressure testing, 3.1.4 Cooling System. Inspect the water pump for any possible leaks. Install a new set of water pump or water pump cushion if necessary.  <b>Refer to: Water Pump (3.1.4 Cooling System, Removal and Installation).</b>
	• Thermostat	• Carry out the component testing, pressure testing, 3.1.4 Cooling System. Install a new set of thermostat housing and housing cushion if necessary.  <b>Refer to: Thermostat (3.1.4 Cooling System, Removal and Installation).</b>
	• Accessory drive belt	• Inspect the state of the accessory drive belt.  <b>Refer to: Accessory Drive Belt (3.1.2 Mechanical System, General Procedures).</b>
	• Cooling fan	• Cooling Fan Not Work Diagnosis.
The engine can not reach the normal working temperature	• Engine	• Inspect the engine, cylinder head, cylinder block and cylinder liner.
	• Thermostat	• Carry out the component testing, pressure testing, 3.1.4 Cooling System. Install a new set of thermostat housing and housing cushion if necessary.  <b>Refer to: Thermostat (3.1.4 Cooling System, Removal and Installation).</b>
	• Cooling fan	• Low-speed Fan Constant Work Diagnosis.  • High-speed Fan Constant Work Diagnosis.

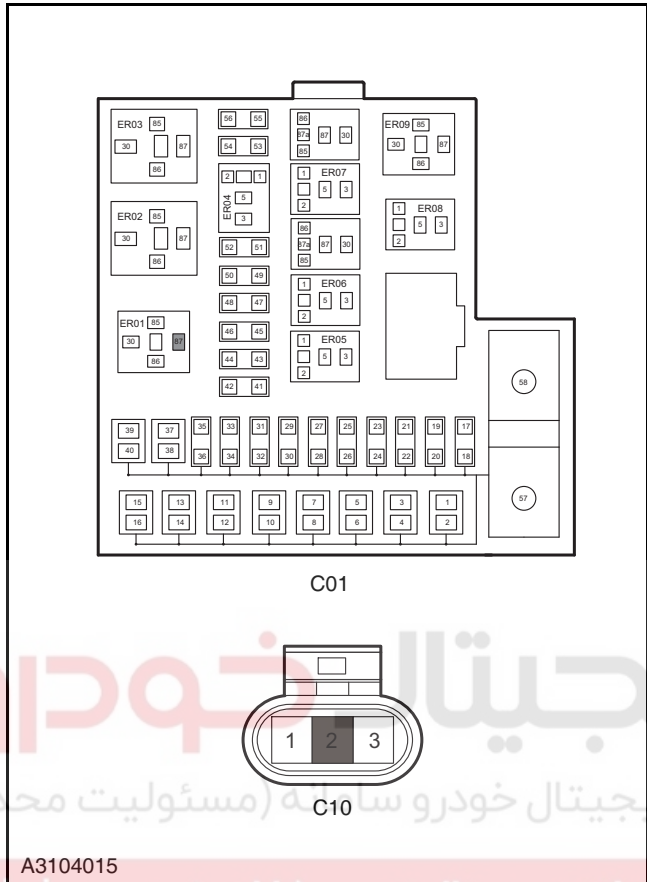
## Low-speed Electronic Fan Not Work Diagnosis

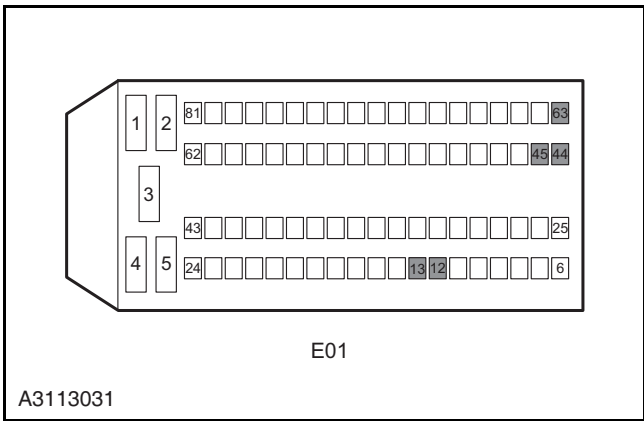
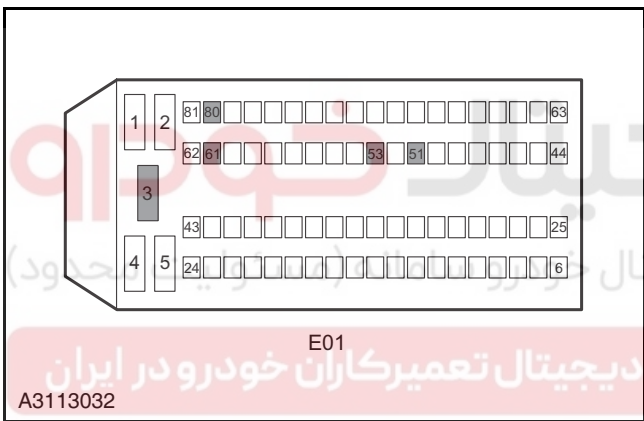
Test Conditions	Details/Results/Solutions
1. Inspect the DTC	<p>A. Connect the diagnostic tool and turn the ignition switch to position "ON".</p> <p>B. Diagnose the engine system.</p> <p>Is there any cooling system DTC?</p> <p><b>Y</b></p> <p>Carry out the DTC diagnosis.</p> <p><b>Refer to: DTC Diagnostic Procedure Index (3.1.13 Electrical Control System - ME7, DTC Diagnosis and Testing).</b></p> <p><b>N</b></p> <p>Go to step 2.</p>
2. Carry out the low-speed fan drive test	<p>A. Connect the diagnostic tool.</p> <p>B. Turn the ignition switch to "ON" position. Carry out an active test on the low-speed cooling fan use the diagnostic tool.</p> <p>Does the fan rotate at a low speed?</p> <p><b>Y</b></p> <p>Inspect the coolant temperature sensor.</p> <p><b>Refer to: DTC P0117, P0118 Diagnosis (3.1.13 Electronic Control System - ME7, DTC Diagnosis and Testing).</b></p> <p><b>N</b></p> <p>Go to step 3.</p>
3. Inspect the fuse	<p>A. Inspect the state of the fuse EF02 and EF25.</p> <p>Is the fuse normal?</p> <p><b>Y</b></p> <p>Go to step 4.</p> <p><b>N</b></p> <p>Inspect and repair the fuse circuits and install new fuses.</p>



Test Conditions	Details/Results/Solutions
<p>4. Inspect the low-speed relay control circuit</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Disconnect the terminal 50 of the ECM wiring harness connector E01 with the special tool.</p> <p>C. Turn the ignition switch to "ON" position.</p> <p>D. Make the terminal 50 of the ECM wiring harness connector E01 and the reliable ground short circuit.</p> <p>Is the cooling fan at the low-speed?</p> <p><b>Y</b></p> <p>Go to step 10.</p> <p><b>N</b></p> <p>Go to step 5.</p>
<p>5. Inspect the low-speed circuit from the engine compartment fuse and relay box to ECM</p>  <p>A3104009</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Disconnect the battery negative cable.</p> <p>C. Disconnect the engine compartment fuse and relay box ER01.</p> <p>D. Measure the resistance value between the terminal 85 of the relay ER01 in the engine compartment fuse and relay box C01 and the terminal 50 of the ECM wiring harness connector E01.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Go to step 6.</p> <p><b>N</b></p> <p>Inspect and repair the open circuit fault between the terminal 85 of the relay ER01 in the engine compartment fuse and relay box C01 and the terminal 50 of the ECM wiring harness connector E01. Replace the engine compartment fuse and relay box C01 as necessary.</p>

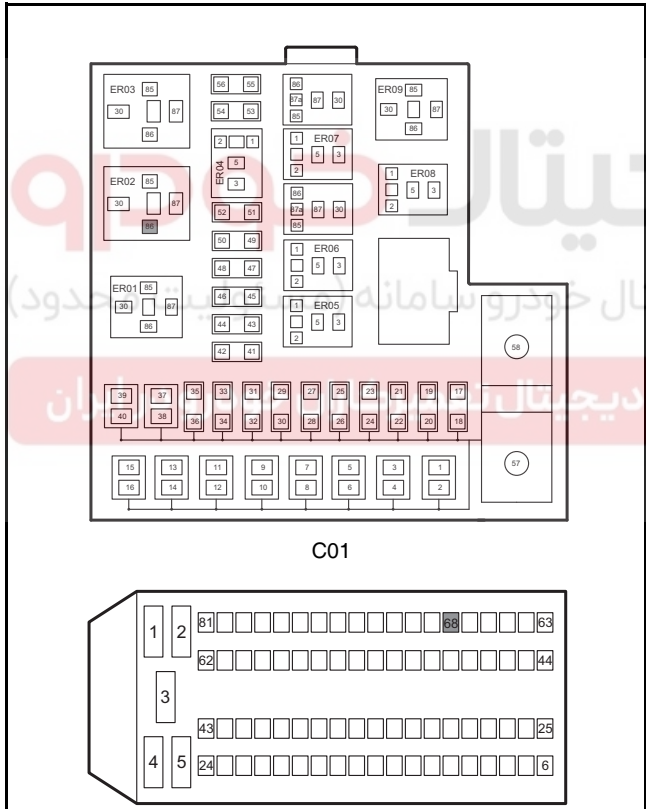
Test Conditions	Details/Results/Solutions
<p>6. Inspect the low-speed cooling fan power supply</p>  <p>A3104011</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Install the engine compartment fuse and relay box relay ER01.</p> <p>C. Disconnect the radiator fan motor wiring harness connector C10.</p> <p>D. Turn the ignition switch to position "ON".</p> <p>E. Make the terminal 50 of the ECM wiring harness connector E01 and the reliable ground point grounded.</p> <p>F. Measure the voltage value between the terminal 2 of the radiator fan motor wiring harness connector C10 and the reliable ground point.</p> <p><b>Standard Voltage Value: 11 ~ 14 V</b></p> <p>Is the voltage normal?</p> <p><b>Y</b></p> <p>Go to step 7.</p> <p><b>N</b></p> <p>Go to step 8.</p>
<p>7. Inspect the fan motor ground circuit</p>  <p>A3104013</p>	<p>A. Measure the resistance value between the terminal 1 of the radiator fan motor wiring harness connector C10 and the reliable ground point.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Install a new fan motor.</p> <p>Verify the system is normal.</p> <p><b>N</b></p> <p>Inspect and repair the open circuit fault between the terminal 1 of the radiator fan wiring harness connector C10 to the ground point G301.</p>

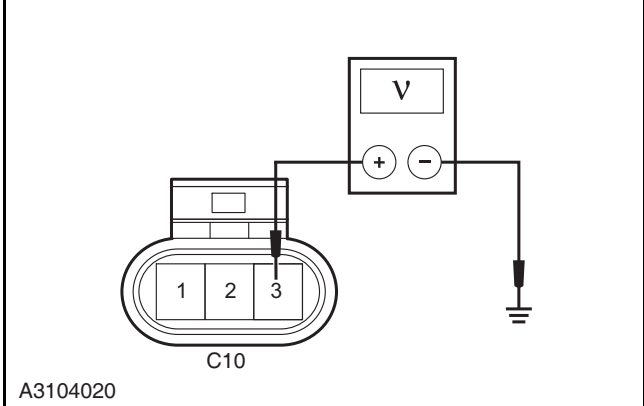
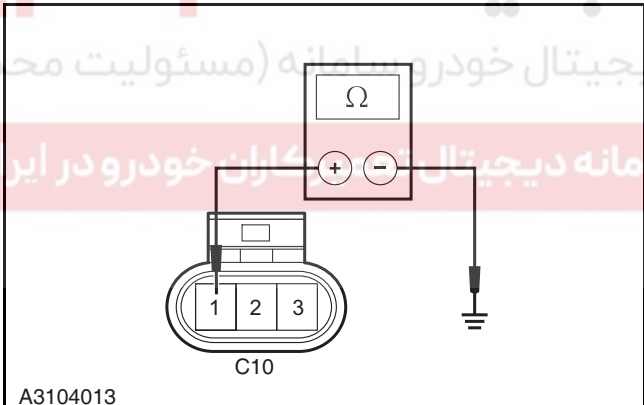
Test Conditions	Details/Results/Solutions
<p>8. Inspect the fan motor power supply circuit</p>  <p>A3104015</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Disconnect the engine compartment fuse and relay box ER01.</p> <p>C. Measure the resistance value between the terminal 87 of the relay ER01 in the engine compartment fuse and relay box C01 and the terminal 2 of the fan motor wiring harness connector C10.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Go to step 9.</p> <p><b>N</b></p> <p>Inspect and repair the open circuit fault between the terminal 87 of the relay ER01 in the engine compartment fuse and relay box C01 and the terminal 2 of the fan motor wiring harness connector C10.</p>
<p>9. Inspect the low-speed fan relay</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Exchange the low-speed fan relay ER01 with the normal vehicle of the same model.</p> <p>Is the fan normal?</p> <p><b>Y</b></p> <p>Replace the relay ER01 of the fault vehicle. Verify the system is normal.</p> <p><b>N</b></p> <p>Inspect and repair the engine compartment fuse and relay box C01 and replace it if necessary.</p>

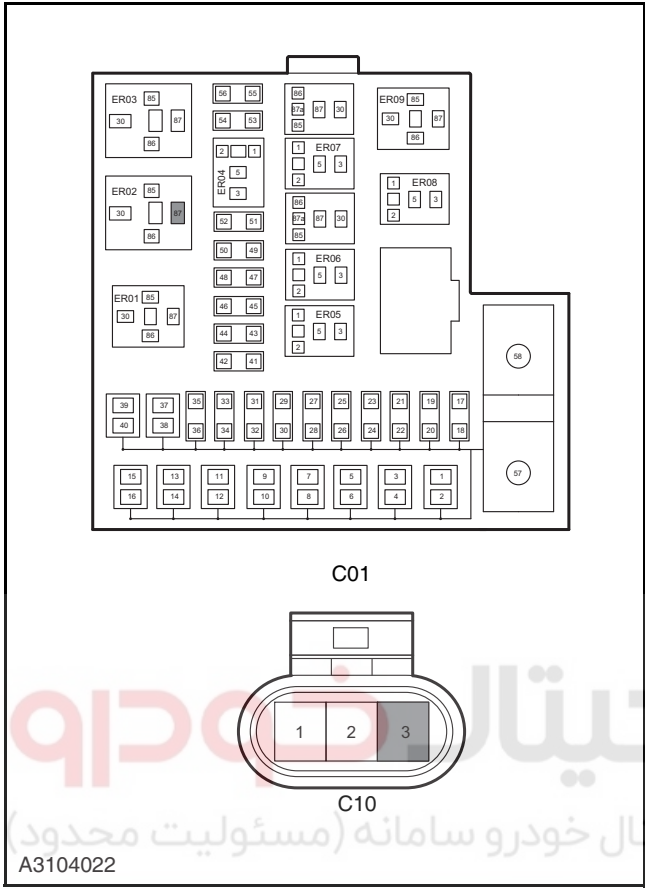
Test Conditions	Details/Results/Solutions
<p>10. Inspect the ECM power supply circuit</p>  <p>A3113031</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Measure from the back of the ECM wiring harness connector E01.</p> <p>C. Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 12, 13, 44, 45 and 63 of the ECM wiring harness connector E01 and the power supply.</p> <p><b>Standard Voltage Value: 11 ~ 14 V</b></p> <p>Is the voltage normal?</p> <p><b>Y</b></p> <p>GO to step 11.</p> <p><b>N</b></p> <p>Repair and inspect the ECM power supply circuit.</p>
<p>11. Inspect the ECM ground circuit</p>  <p>A3113032</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Measure from the back of the ECM wiring harness connector E01.</p> <p>C. Measure the resistance between the terminal 3, 51, 53, 61 and 80 of the ECM wiring harness connector E01 and the reliable ground with a multimeter.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Replace the engine control module.</p> <p><b>Refer to: Engine Control Module (3.1.13 Electronic Control System - ME7, Removal and Installation).</b></p> <p><b>N</b></p> <p>Inspect and repair the ECM ground circuit.</p>

## Electronic Fan Stop at High - speed Diagnosis

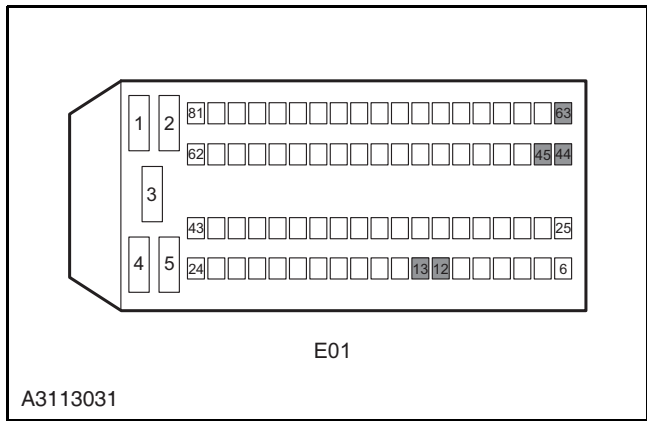
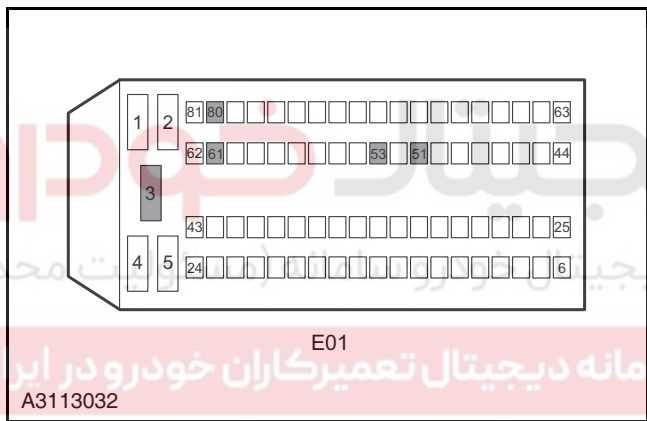
Test Conditions	Details/Results/Solutions
1. Inspect the DTC	<p>A. Connect the diagnostic tool and turn the ignition switch to position "ON".</p> <p>B. Diagnose the engine system.</p> <p>Is there any cooling system trouble code?</p> <p><b>Y</b></p> <p><b>Refer to: DTC Diagnostic Procedure Index (3.1.13 Electrical Control System - ME7, DTC Diagnosis and Testing).</b></p> <p><b>N</b></p> <p>Go to step 2.</p>
2. Carry out the electronic fan high-speed drive test	<p>A. Connect the diagnostic tool.</p> <p>B. Turn the ignition switch to "ON" position. Carry out an active test on the high-speed cooling fan with a diagnostic tool.</p> <p>Does the fan rotate at the high speed?</p> <p><b>Y</b></p> <p>Inspect the coolant temperature sensor.</p> <p><b>Refer to: DTC P0117, P0118 Diagnosis (3.1.13 Electronic Control System - ME7, DTC Diagnosis and Testing).</b></p> <p><b>N</b></p> <p>Go to step 3.</p>
3. Inspect the fuse	<p>A. Inspect the state of the fuse EF02 and EF25.</p> <p>Is the fuse normal?</p> <p><b>Y</b></p> <p>Go to step 4.</p> <p><b>N</b></p> <p>Inspect and repair the fuse circuit and install new fuses.</p>

Test Conditions	Details/Results/Solutions
<p>4. Inspect the high-speed relay control circuit</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Disconnect the terminal 68 of the ECM wiring harness connector E01 with the special tool.</p> <p>C. Turn the ignition switch to "ON" position.</p> <p>D. Make the terminal 68 of the ECM wiring harness connector E01 and the reliable ground point grounded.</p> <p>Is the cooling fan at the high-speed?</p> <p><b>Y</b></p> <p>Go to step 10.</p> <p><b>N</b></p> <p>Go to step 5.</p>
<p>5. Inspect the high-speed circuit from the engine compartment fuse and relay box to ECM</p>  <p>A3104018</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Disconnect the battery negative cable.</p> <p>C. Disconnect the engine compartment fuse and relay box ER02.</p> <p>D. Disconnect the ECM wiring harness connector E01.</p> <p>E. Measure the resistance value between the terminal 86 of the relay ER02 in the engine compartment fuse and relay box C01 and the terminal 68 of the ECM wiring harness connector E01.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Go to step 6.</p> <p><b>N</b></p> <p>Inspect and repair the open circuit fault between the terminal 86 of the relay ER02 in the engine compartment fuse and relay box C01 and the terminal 68 of the ECM wiring harness connector E01.</p>

Test Conditions	Details/Results/Solutions
<p>6. Inspect the high-speed fan power supply</p>  <p>A3104020</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Install the engine compartment fuse and relay box relay ER02.</p> <p>C. Disconnect the radiator fan motor wiring harness connector C10.</p> <p>D. Turn the ignition switch to position "ON".</p> <p>E. Make the terminal 68 of the ECM wiring harness connector E01 and the reliable ground point grounded.</p> <p>F. Measure the voltage value between the terminal 3 of the radiator fan motor wiring harness connector C10 and the reliable ground point.</p> <p><b>Standard Voltage Value: 11 ~ 14 V</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Go to step 7.</p> <p><b>N</b></p> <p>Go to step 8.</p>
<p>7. Inspect the fan motor ground circuit</p>  <p>A3104013</p>	<p>A. Measure the resistance value between the terminal 1 of the radiator fan motor wiring harness connector C10 and the reliable ground point.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Install a new fan motor.</p> <p>Verify the system is normal.</p> <p><b>N</b></p> <p>Inspect and repair the open circuit fault between the terminal 1 of the radiator fan wiring harness connector C10 and the ground point G301.</p>

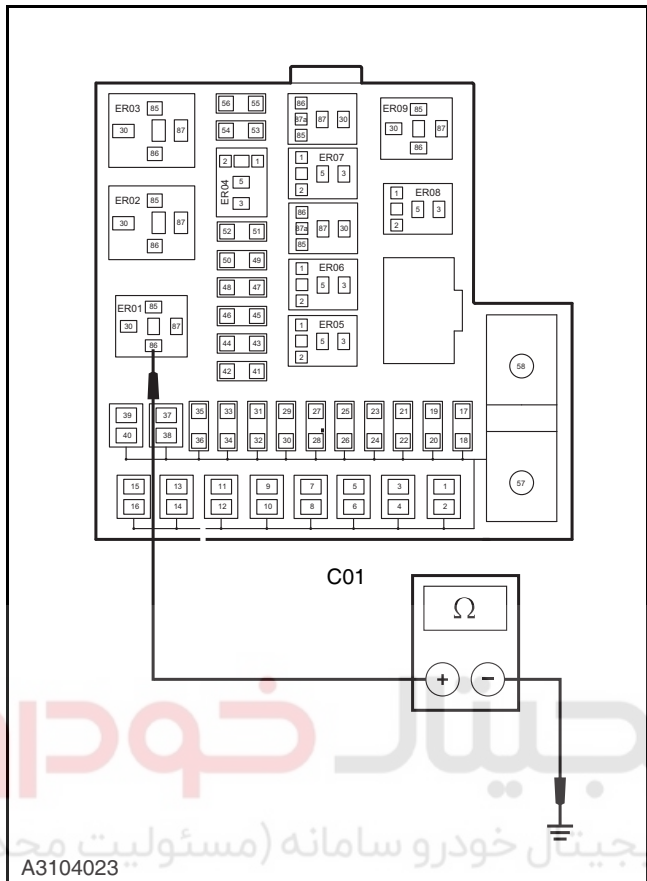
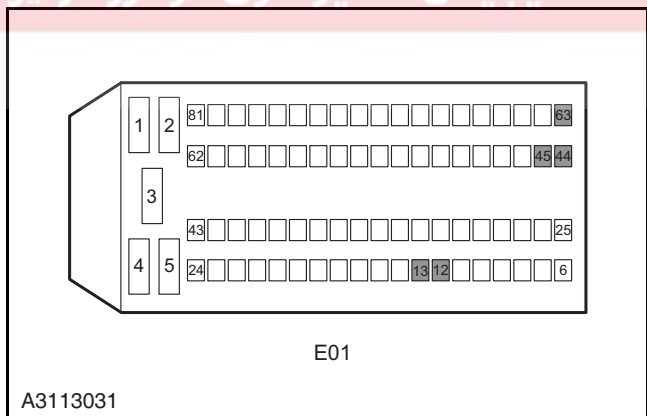
Test Conditions	Details/Results/Solutions
<p>8. Inspect the high-speed fan motor power supply circuit</p>  <p>A3104022</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Disconnect the engine compartment fuse and relay box ER02.</p> <p>C. Disconnect the fan motor wiring harness connector C10.</p> <p>D. Measure the resistance value between the terminal 87 of the relay ER02 in the engine compartment electric center wiring harness connector C01 and the terminal 3 of the fan motor wiring harness connector C10.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Go to step 9.</p> <p><b>N</b></p> <p>Inspect and repair the open circuit fault between the terminal 87 of the relay ER02 in the engine compartment fuse and relay box C01 to the terminal 3 of the fan motor wiring harness connector C10.</p>
<p>9. Inspect the high-speed fan relay</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Exchange the high-speed fan relay ER02 with the normal vehicle of the same model.</p> <p>Is the fan normal?</p> <p><b>Y</b></p> <p>Replace the relay ER02 of the fault vehicle.</p> <p>Verify the system is normal.</p> <p><b>N</b></p> <p>Inspect and repair the engine compartment fuse and relay box C01 and replace it if necessary.</p>

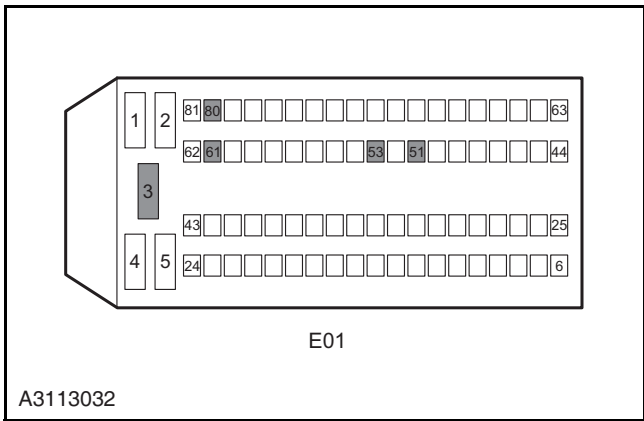


Test Conditions	Details/Results/Solutions
<p>10. Inspect the ECM power supply circuit</p>  <p>A3113031</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Measure from the back of the ECM wiring harness connector E01.</p> <p>C. Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 12, 13, 44, 45 and 63 of the ECM wiring harness connector E01 and the power supply.</p> <p><b>Standard Voltage Value: 11 ~ 14 V</b></p> <p>Is the voltage normal?</p> <p><b>Y</b></p> <p>GO to step 11.</p> <p><b>N</b></p> <p>Repair and inspect the ECM power supply circuit.</p>
<p>11. Inspect the ECM ground circuit</p>  <p>A3113032</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Measure from the back of the ECM wiring harness connector E01.</p> <p>C. Measure the resistance between the terminal 3, 51, 53, 61 and 80 of the ECM wiring harness connector E01 and the reliable ground with a multimeter.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Replace the engine control module.</p> <p><b>Refer to: Engine Control Module (3.1.13 Electronic Control System - ME7, Removal and Installation).</b></p> <p><b>N</b></p> <p>Inspect and repair the ECM ground circuit.</p>

## Electronic Fan Cannot Stop at Low-speed Diagnosis

Test Conditions	Details/Results/Solutions
1. Inspect the DTC	<p>A. Connect the diagnostic tool and turn the ignition switch to position "ON".</p> <p>B. Diagnose the engine system.</p> <p>Is there any cooling system trouble code?</p> <p><b>Y</b></p> <p>Carry out the DTC diagnosis.</p> <p><b>Refer to: DTC Diagnostic Procedure Index (3.1.13 Electronic Control System - ME7, DTC Diagnosis and Testing).</b></p> <p><b>N</b></p> <p>Go to step 2.</p>
2. Remove the low-speed fan relay	<p>A. Remove the low-speed fan relay ER01.</p> <p>Is the fan still working?</p> <p><b>Y</b></p> <p>Inspect and repair the short circuit to positive power supply fault between the terminal 87 of the relay ER01 in the engine compartment fuse and relay box C01 and the terminal 2 of the fan motor wiring harness connector C10. Replace the engine compartment fuse and relay box C01 if necessary.</p> <p><b>N</b></p> <p>Go to step 3.</p>
3. Inspect the ER01 relay	<p>A. Exchange the relay ER01 with the normal vehicle of the same model.</p> <p>Is the fan still working?</p> <p><b>Y</b></p> <p>Go to step 4.</p> <p><b>N</b></p> <p>Replace the relay ER01 of the fault vehicle.</p> <p>Verify the system is normal.</p>

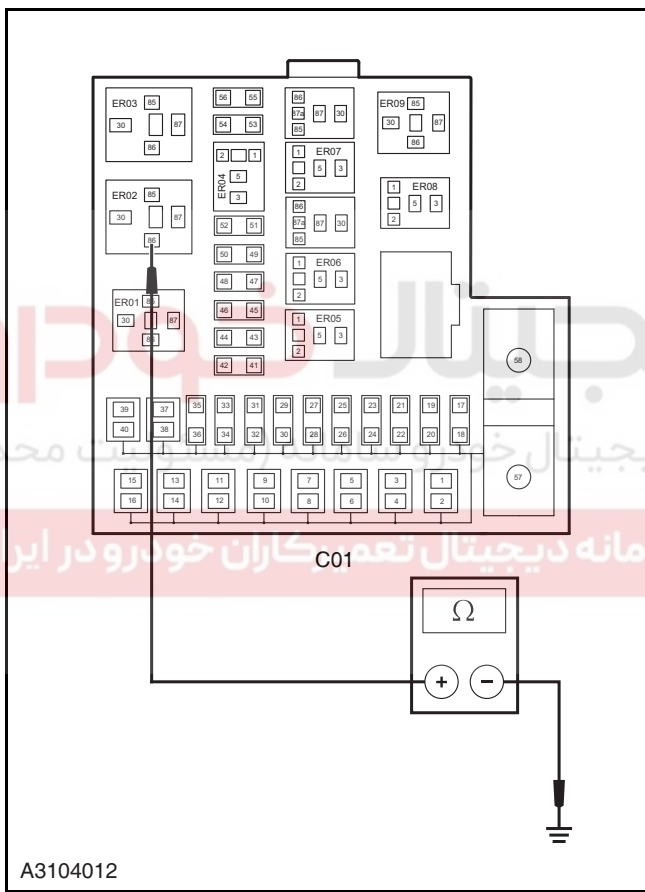
Test Conditions	Details/Results/Solutions
<p data-bbox="172 230 1329 259">4. Inspect the low-speed circuit from the engine compartment fuse and relay box to ECM</p>  <p data-bbox="188 1137 292 1160">A3104023</p>	<p data-bbox="853 280 1492 492">A. Turn the ignition switch to position "LOCK". B. Remove the low-speed fan relay ER01. C. Measure the resistance between the terminal 86 of the relay ER01 in the engine compartment electric center wiring harness connector C01 and the reliable ground.</p> <p data-bbox="885 504 1428 533"><b>Standard Resistance Value: 10 MΩ or more</b></p> <p data-bbox="885 548 1252 577">Is the resistance value normal?</p> <p data-bbox="885 593 901 622"><b>Y</b></p> <p data-bbox="885 638 1037 667">Go to step 5.</p> <p data-bbox="885 683 901 712"><b>N</b></p> <p data-bbox="885 728 1492 884">Inspect and repair the circuit between the terminal 86 of the relay ER01 in the engine compartment electric center C01 and the terminal 50 of the ECM wiring harness connector E01 for short circuit to ground.</p>
<p data-bbox="172 1187 675 1216">5. Inspect the ECM power supply circuit</p>  <p data-bbox="188 1630 292 1653">A3113031</p>	<p data-bbox="853 1243 1492 1478">A. Turn the ignition switch to position "LOCK". B. Measure from the back of the ECM wiring harness connector E01. C. Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 12, 13, 44, 45 and 63 of the ECM wiring harness connector E01 and the power supply.</p> <p data-bbox="885 1489 1316 1518"><b>Standard Voltage Value: 11 ~ 14 V</b></p> <p data-bbox="885 1534 1157 1563">Is the voltage normal?</p> <p data-bbox="885 1579 901 1608"><b>Y</b></p> <p data-bbox="885 1624 1053 1653">GO to step 6.</p> <p data-bbox="885 1668 901 1697"><b>N</b></p> <p data-bbox="885 1713 1476 1742">Repair and inspect the ECM power supply circuit.</p>

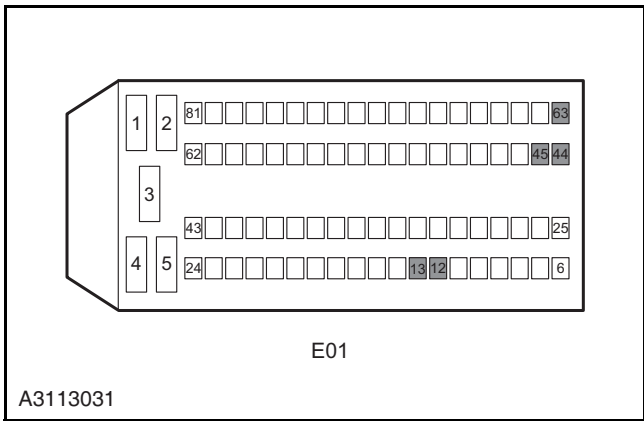
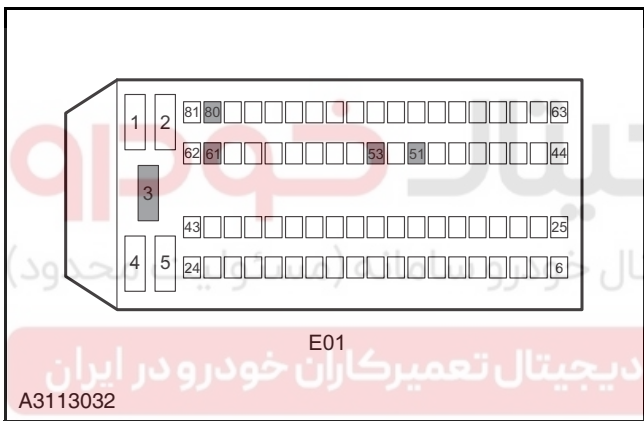
Test Conditions	Details/Results/Solutions
<p>6. Inspect the ECM ground circuit</p> 	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Measure from the back of the ECM wiring harness connector E01.</p> <p>C. Measure the resistance between the terminal 3, 51, 53, 61 and 80 of the ECM wiring harness connector E01 and the reliable ground with a multimeter.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Replace the engine control module.</p> <p><b>Refer to: Engine Control Module (3.1.13 Electronic Control System - ME7, Removal and Installation).</b></p> <p><b>N</b></p> <p>Inspect and repair the ECM ground circuit.</p>

### Electronic Fan Cannot Stop at High - speed Diagnosis

Test Conditions	Details/Results/Solutions
<p>1. Inspect the DTC</p>	<p>A. Connect the diagnostic tool and turn the ignition switch to position "ON".</p> <p>B. Diagnose the engine system.</p> <p>Is there any cooling system trouble code?</p> <p><b>Y</b></p> <p>Carry out the DTC diagnosis.</p> <p><b>Refer to: DTC Diagnostic Procedure Index (3.1.13 Electrical Control System - ME7, DTC Diagnosis and Testing).</b></p> <p><b>N</b></p> <p>Go to step 2.</p>
<p>2. Remove the high - speed fan relay ER02</p>	<p>A. Remove the high - speed fan relay ER02.</p> <p>Is the fan still working at the high - speed?</p> <p><b>Y</b></p> <p>Inspect and repair the short circuit to positive power supply fault between the terminal 87 of the relay ER02 in the engine compartment fuse and relay box C01 and the terminal 3 of the fan motor wiring harness connector C10. Replace the engine compartment fuse and relay box C01 if necessary.</p> <p><b>N</b></p> <p>Go to step 3.</p>

Test Conditions	Details/Results/Solutions
3. Inspect the relay ER02	<p>A. Exchange the relay ER02 with the normal vehicle of the same model.</p> <p>Is the fan still working at the high-speed?</p> <p><b>Y</b></p> <p>Go to step 4.</p> <p><b>N</b></p> <p>Replace the relay of the fault vehicle.</p> <p>Verify the system is normal.</p>
4. Inspect the circuit from the engine compartment fuse and relay box to ECM	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Remove the low-speed fan relay ER02.</p> <p>C. Measure the resistance between the terminal 86 of the relay ER02 in the engine compartment electric center wiring harness connector C01 and the reliable ground.</p> <p><b>Standard Resistance Value: 10 MΩ or more</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Go to step 5.</p> <p><b>N</b></p> <p>Inspect and repair the short circuit to ground fault between the terminal 86 of the relay ER02 in the engine compartment electric center wiring harness connector C01 and the terminal 68 of the ECM wiring harness connector E01.</p>



Test Conditions	Details/Results/Solutions
<p>5. Inspect the ECM power supply circuit</p>  <p>A3113031</p>	<p>A. Turn the ignition switch to position "LOCK".</p> <p>B. Measure from the back of the ECM wiring harness connector E01.</p> <p>C. Turn the ignition switch to "ON" position and use a multimeter to measure the voltage between the terminal 12, 13, 44, 45 and 63 of the ECM wiring harness connector E01 and the power supply.</p> <p><b>Standard Voltage Value: 11 ~ 14 V</b></p> <p>Is the voltage normal?</p> <p><b>Y</b></p> <p>GO to step 6.</p> <p><b>N</b></p> <p>Repair and inspect the ECM power supply circuit.</p>
<p>6. ECM ground circuit</p>  <p>A3113032</p>	<p>A. Turn the ignition switch to "LOCK" position.</p> <p>B. Measure from the back of the ECM wiring harness connector E01.</p> <p>C. Measure the resistance between the terminal 3, 51, 53, 61 and 80 of the ECM wiring harness connector E01 and the reliable ground with a multimeter.</p> <p><b>Standard Resistance Value: less than 5 Ω</b></p> <p>Is the resistance value normal?</p> <p><b>Y</b></p> <p>Replace the engine control module.</p> <p><b>Refer to: Engine Control Module (3.1.13 Electronic Control System - ME7, Removal and Installation).</b></p> <p><b>N</b></p> <p>Inspect and repair the ECM ground circuit.</p>

## Removal and Installation

### Upper Coolant Hose With Filler Assembly

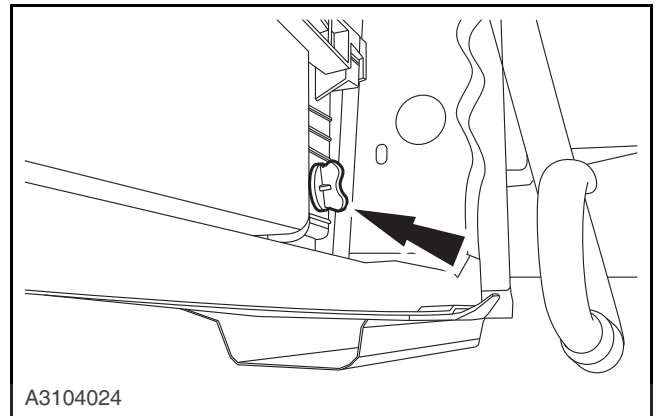
#### Removal

1. Disconnect the battery negative cable.

Refer to: [Battery Inspection \(3.1.10 Charging System, General Procedures\)](#).

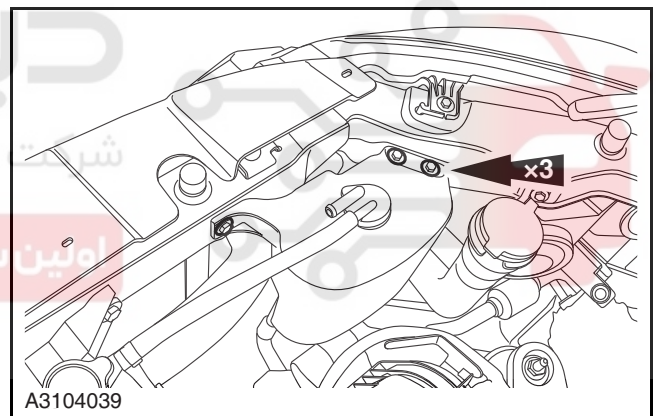
2. Loosen the radiator drain plug to drain the cooling system.

Refer to: [Coolant Draining and Filling \(3.1.4 Cooling System, General Procedures\)](#).

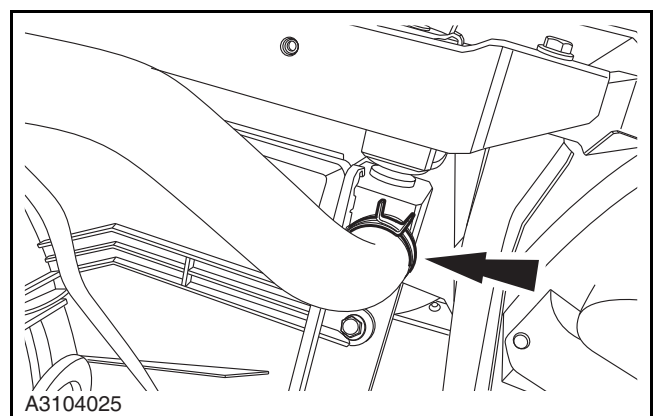


3. Remove the reservoir retaining bolt and take out the reservoir.

Torque: 10 Nm

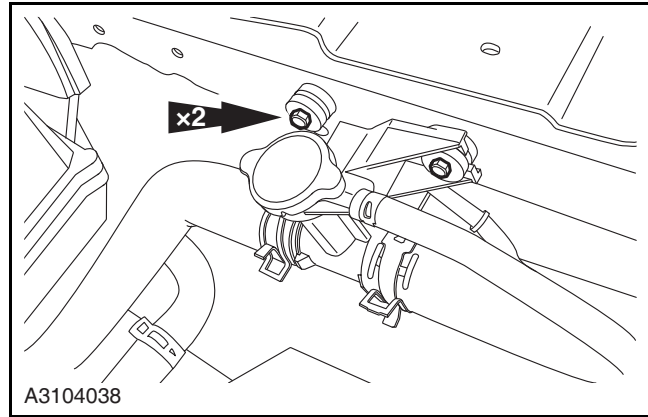


4. Loosen the upper coolant hose fixing clamp from the water tank.



5. Remove the upper coolant hose with filler assembly retaining bolt.

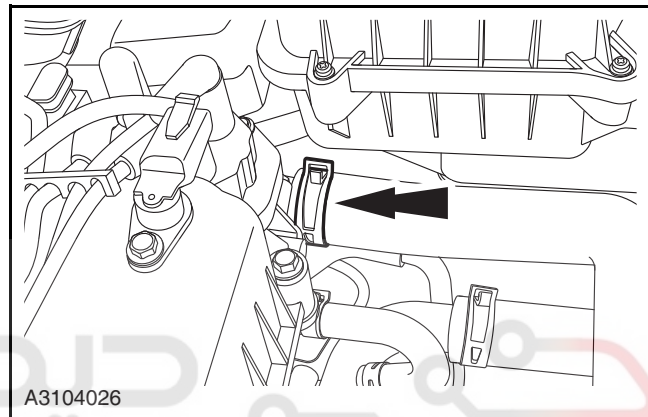
Torque: 10 Nm



6. Remove the upper coolant hose with filler assembly.

1. Loosen the upper coolant hose and the engine connection end fixing clamp.

2. Take out the upper coolant hose with filler assembly.



### Installation

1. To install, reverse the removal procedure.
2. Refill the coolant.
3. Start the engine and inspect the cooling system for any leaks.



## Lower Coolant Hose

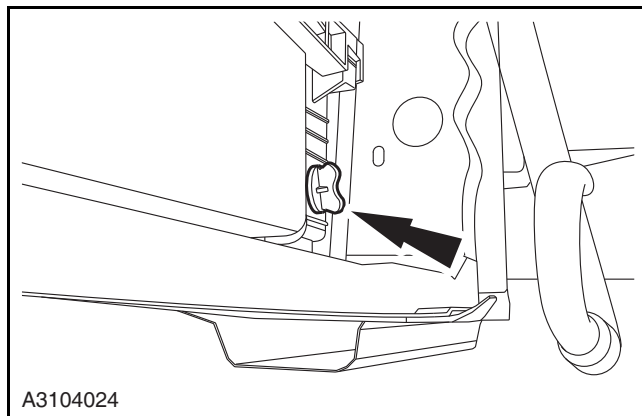
### Removal

1. Disconnect the battery negative cable.

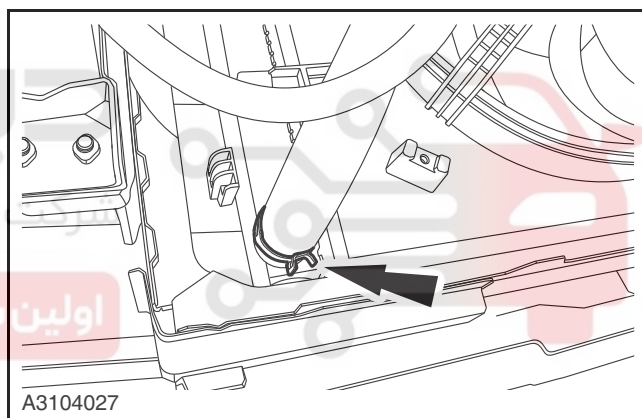
Refer to: [Battery Inspection \(3.1.10 Charging System, General Procedures\)](#).

2. Loosen the radiator drain plug to drain the cooling system.

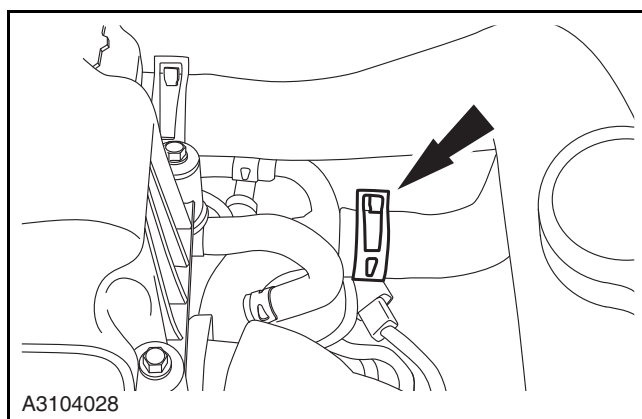
Refer to: [Coolant Draining and Filling \(3.1.4 Cooling System, General Procedures\)](#).



3. Loosen the lower coolant hose fixing clamp from the water tank.



4. Loosen the lower coolant hose and the engine connection end fixing clamp, and take out the lower coolant hose.



### Installation

1. To install, reverse the removal procedure.
2. Refill the coolant.
3. Start the engine and inspect the cooling system for any leaks.

## Thermostat

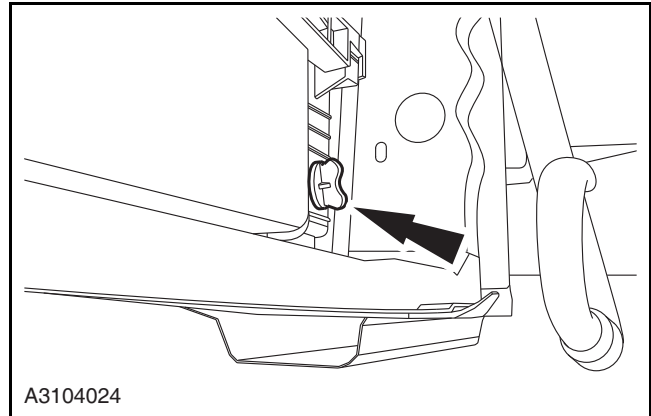
### Removal

1. Disconnect the battery negative cable.

Refer to: [Battery Inspection \(3.1.10 Charging System, General Procedures\)](#).

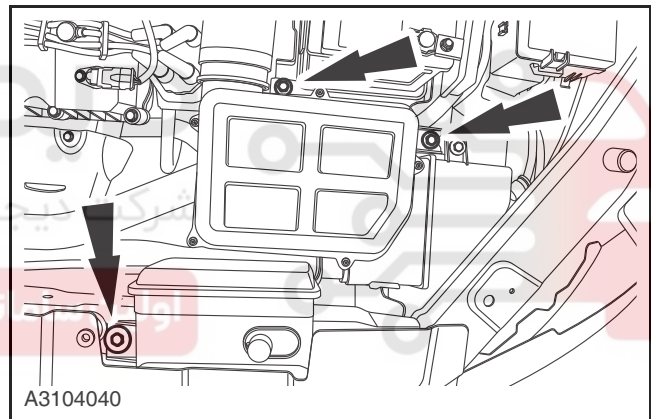
2. Loosen the radiator drain plug to drain the cooling system.

Refer to: [Coolant Draining and Filling \(3.1.4 Cooling System, General Procedures\)](#).

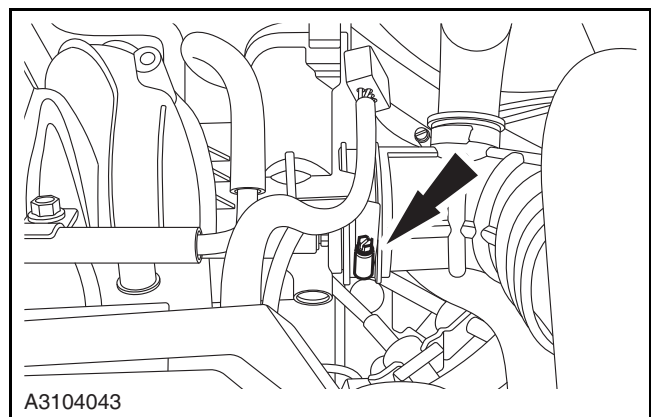


3. Remove the air filter assembly retaining bolt.

Torque: 10 Nm

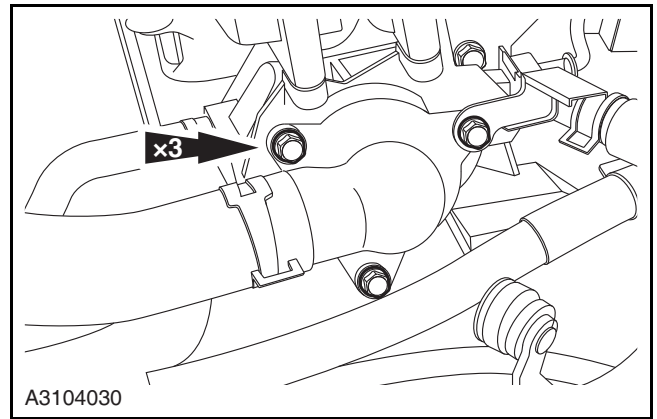


4. Remove the air intake hose clamp, and detach the air filter assembly.

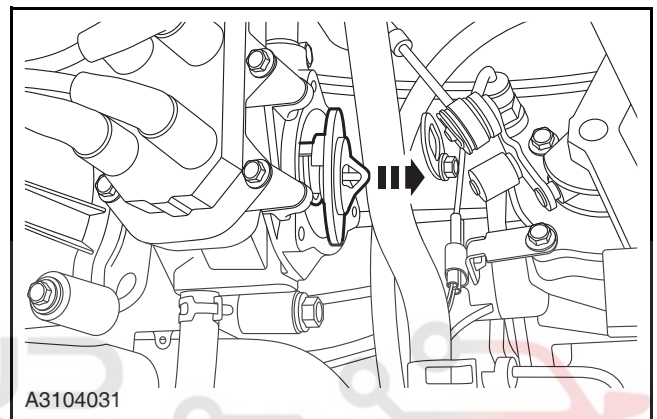


5. Remove the retaining bolts on the thermostat cap.

Torque: 23 Nm



6. Take out the thermostat.



#### Installation

1. To install, reverse the removal procedure.
2. Refill the coolant.
3. Start the engine and inspect the cooling system for any leaks.

## Radiator Fan

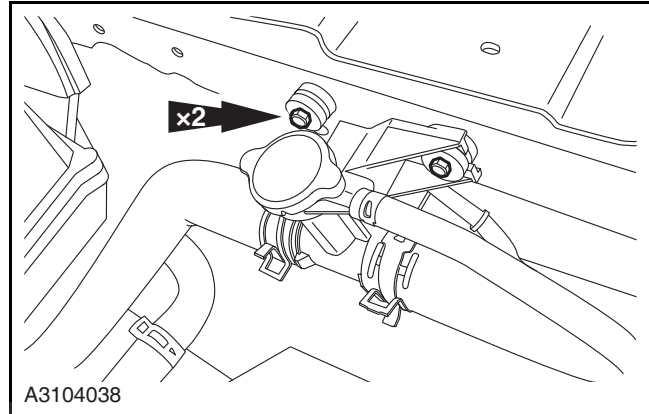
### Removal

1. Disconnect the battery negative cable.

Refer to: [Battery Inspection \(3.1.10 Charging System, General Procedures\)](#).

2. Remove the filler retaining bolt.

Torque: 10 Nm



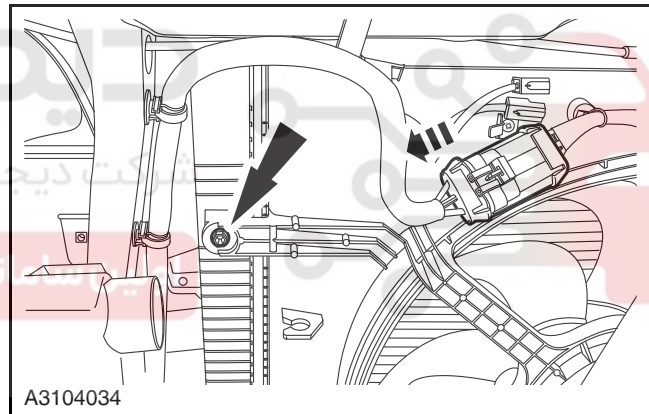
3. Disconnect the radiator fan wiring harness connector.

4. Remove the radiator fan retaining bolts.

Torque: 10 Nm

5. **CAUTION: The left and right sides are two in total.**

5. Take out the radiator fan.



### Installation

1. To install, reverse the removal procedure.

## Radiator

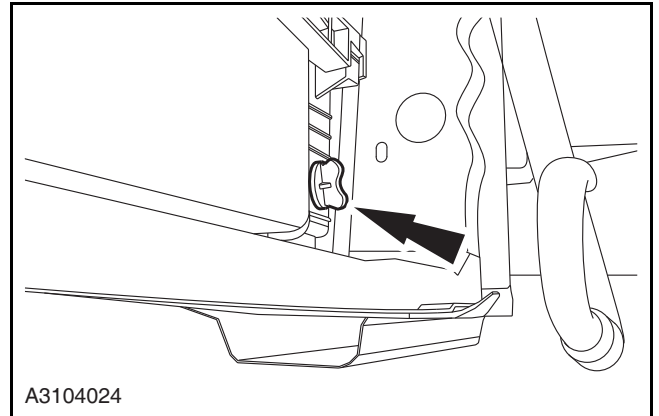
### Removal

1. Disconnect the battery negative cable.

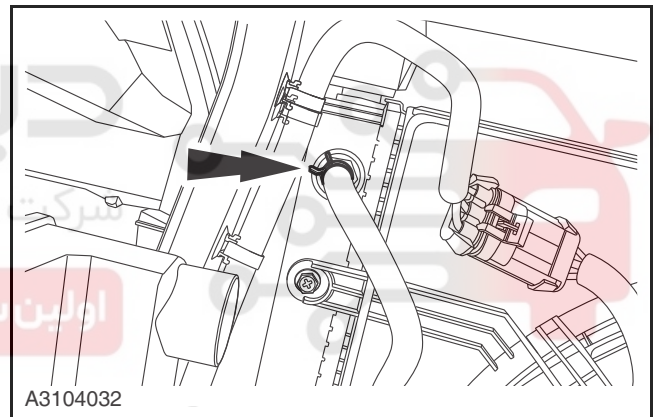
Refer to: [Battery Inspection \(3.1.10 Charging System, General Procedures\)](#).

2. Loosen the radiator drain plug to drain the cooling system.

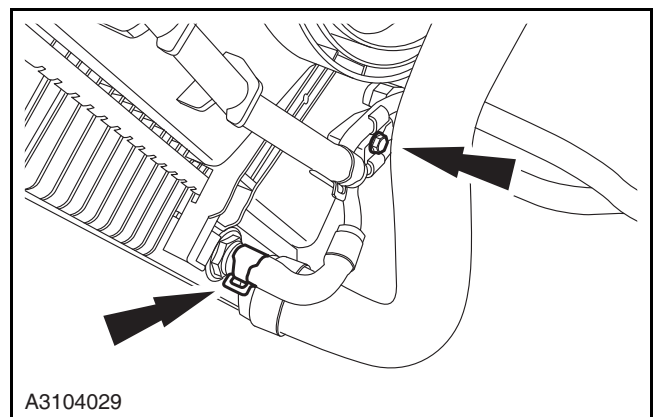
Refer to: [Coolant Draining and Filling \(3.1.4 Cooling System, General Procedures\)](#).



3. Loosen the oil cooler hose retaining clamp from the upper water tank, and take out the oil cooler hose.



4. Loosen the oil cooler hose retaining clamp from the lower water tank, and remove the oil cooler hose retaining bolt.



5. Detach the upper coolant hose from the water tank.

Refer to: **Upper Coolant Hose With Filler Assembly (3.1.4 Cooling System, Removal and Installation).**

6. Detach the lower coolant hose from the water tank.

Refer to: **Lower Coolant Hose (3.1.4 Cooling System, Removal and Installation).**

7. Remove the radiator fan.

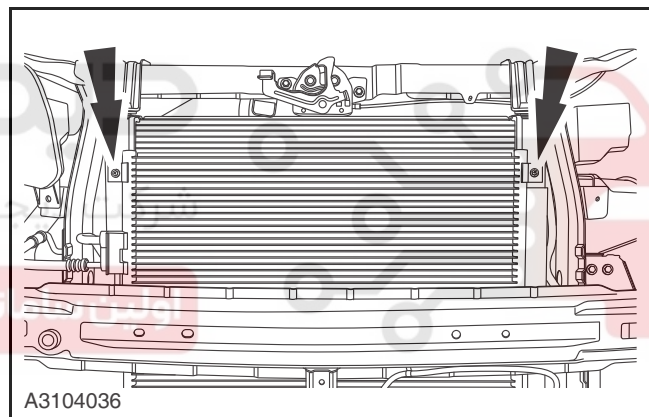
Refer to: **Radiator Fan (3.1.4 Cooling System, Removal and Installation).**

8. Remove the front bumper.

Refer to: **Front Bumper (5.1.7 Bumper, Removal and Installation).**

9. Remove the mounting bolt of the condenser on the radiator, detach the condenser.

Torque: 23 Nm



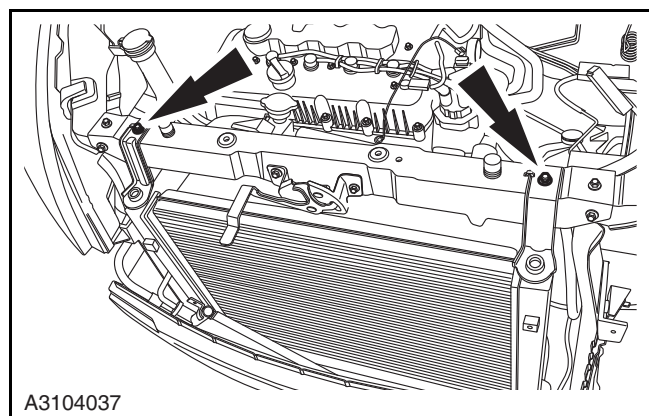
10. Remove the radiator mounting bracket.

1. Remove the 2 bolts on the lower bracket.

Torque: 23 Nm

2. Detach the radiator mounting bracket.

11. Take out the radiator.



### Installation

1. To install, reverse the removal procedure.
2. Fill the new coolant.

Refer to: [Coolant Draining and Filling \(3.1.4 Cooling System, General Procedures\)](#).

3. Inspect the system for any leaks.

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



## Water Pump

### Removal

1. Disconnect the battery negative cable.

Refer to: [Battery Inspection \(3.1.10 Charging System, General Procedures\)](#).

2. Loosen the radiator drain plug to drain the cooling system.

Refer to: [Coolant Draining and Filling \(3.1.4 Cooling System, General Procedures\)](#).

3. Remove the accessory drive belt.

Refer to: [Accessory Drive Belt \(3.1.2 Mechanical System, Removal and Installation\)](#).

4. Remove the accessory drive belt tensioning gear and the water pump pulley.

Refer to: [Accessory Drive Belt Tensioning Gear \(3.1.2 Mechanical System, Removal and Installation\)](#).

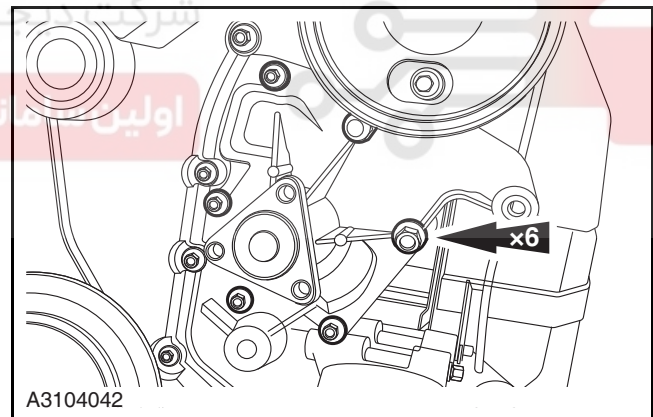
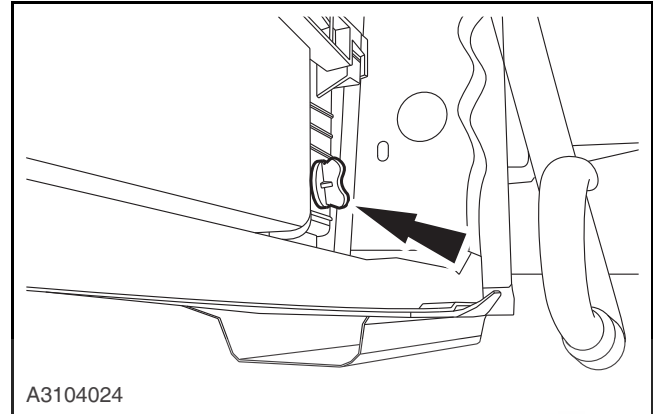
5. Remove the retaining bolts, water pump.

1. Remove the 8 retaining bolts, water pump.

Torque: 23 Nm

2. Remove the M6 retaining bolts, water pump.

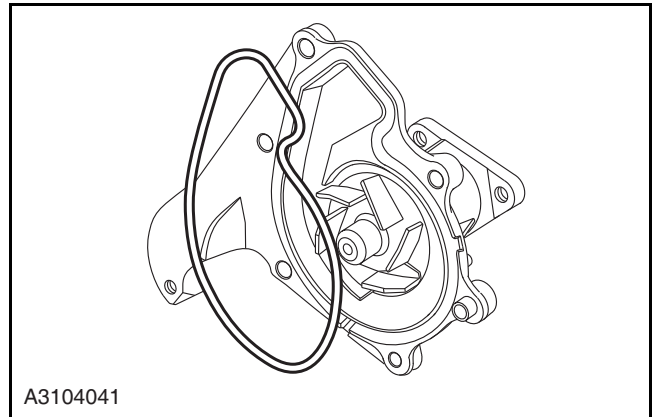
Torque: 10 Nm





### Inspection

1. Inspect if the water pump gasket has been damaged or not. If so, a new gasket must be installed.
2. Rotate the water pump with hands for flexible operation. If the water pump rotation is not flexible or noise, replace it.
3. Inspect the water pump impeller for any damage and replace it in time.
4. Clean the mating face between the engine block and the water pump.



### Installation

1. Install a new water pump gasket.
2. To install, reverse the removal procedure.
3. Refill the coolant.
4. Start the engine and inspect the cooling system for any leaks.

دیجیتال خودرو

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