

COOLING SYSTEM

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COOLING SYSTEM

DESCRIPTION OF COOLING SYSTEM

COMPONENTS OF 480 ENGINE COOLING SYSTEM

Engine cooling system is used to cool engine to prevent the engine from overheating, ensuring the normal operation of engine. It is composed of the timing belt-driven water pump, transverse radiator, water tank, water pipe, thermostat, temperature control switch of electrically-driven fan and water temperature sensor.

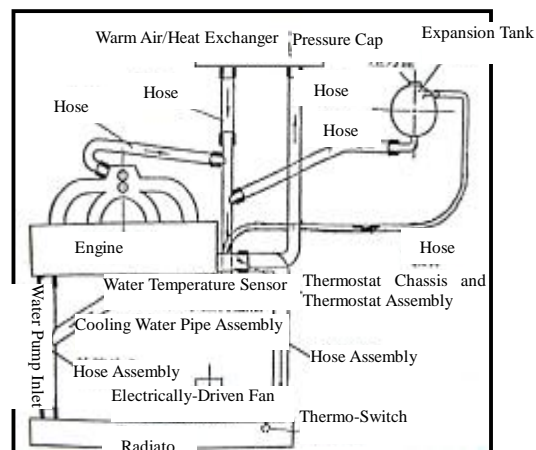
WORKING PRINCIPLE OF COOLING SYSTEM

When the temperature of engine coolant is relatively low, the thermostat shall turn it off, and the coolant shall circulate and flow among the cylinder block, water pump and warm air exchanger. This kind of circulation is called small circulation.

When the temperature of engine coolant is relatively high, the thermostat shall turn it on, the coolant shall flow into the radiator, the electrically-driven fan shall operate to lower down the temperature of coolant. And then the coolant shall flow back to the engine cylinder block. This kind of circulation is called big circulation. As the big circulation operates, the small circulation shall also play its role.

As the engine works under normal work temperature the engine coolant shall expand. Under this circumstance, the overflow valve installed on the thermostat chassis shall turn it on, the coolant shall flow into the expansion water tank through the overflow pipe; and as the system cools down, the coolant shall flow back to the water pump inlet from the expansion reservoir.

The operation of electrically-driven fan is controlled by the thermo-switch installed on the right water chamber of radiator. When the contact points of thermo-switch meet together, the electrically-driven fan shall run. The water temperature sensor is fitted on the back of cylinder head lying at the side of exhaust pipe.



PARAMETER OF COOLING SYSTEM

| Cooling system | Parameter |
|------------------|---|
| Coolant capacity | Total system capacity (L) 8 |
| | Engine capacity (L) 3.3 |
| | Radiator capacity (L) 2.1 |
| | Expansion reservoir capacity (L) 0.4 |
| Fan | Diameter: 280mm |
| | Number of blades: 6 |
| | Operating voltage: 9-15V |
| | Rotating speed I gear: high-speed engine 2000±200 low-speed engine 1800±200 |
| | Rotating speed II gear: high-speed engine 2800±200 low-speed engine 2600±200 |
| Water pump | Diameter of impeller: $\phi 72\text{mm}$ |
| | Transmission rate: 1.053:1 |
| | Opening pressure of the pressure cap: 160kPa |
| Radiator | Front face area: 0.202m ² |
| | Heat abstraction area: 8.93m ² |
| Thermostat | Opening temperature: 85°-89° |
| | Full opening temperature: 99°-102° |
| Thermo-switch | Switch-on temperature I gear 95 C° II gear 102 C° |
| | Switch-off temperature I gear ≤ 84 C° II gear ≤ 91 C° |
| | Operating voltage: 12V |

ENGINE COOLANT

Coolant Discharge:

- To demount the pressure cap of expansion reservoir;
- To install a vessel under the radiator, demount the radiator outlet hose under the radiator and discharge the coolant.

Cooling System Cleaning:

- To discharge coolant, mount the radiator outlet hose;
- To inject clean water up to the position of the largest water surface of the expansion reservoir from the expansion reservoir filler, and then close the pressure cap;
- To start up engine to make it operate at idle speed,



preheat up to normal operating temperature, shut down and cool down;

——To discharge coolant;

——To repeat the above-mentioned steps until the discharged water is the same as the clean water;

——To clean the cooling system according to the following methods if the coolant is not correctly used and replaced to meet the requirements in the former utilization:

- a. To discharge coolant;
- b. To demount the radiator inlet hose, insert the main water hose into the radiator filler until the outlet water becomes clean;
- c. In order to flush out the engine, you should connect the main water hose with the water outlet of the thermostat to clean the engine until the discharged water flowing from the water pump inlet becomes clean;
- d. To repeat cleaning operations if the radiator is very dirty, and connect the main water hose with the radiator water outlet until the water flowing from the radiator water outlet becomes clean.

Coolant Filling:

——To check whether the pipeline is well connected and fastened before injecting coolant;

——To open the pressure cap; fill up coolant into the expansion reservoir filler slowly. Since the expansion reservoir is at the highest position in the cooling system. Therefore, as the coolant level rises, the air in the system shall be discharged into the expansion reservoir and shall be discharged out of the expansion reservoir by injecting coolant slowly.

——To continuously inject coolant up to the highest coolant level. And then close the filler to prevent coolant from spilling.

——To start up the engine to make it operate at idle speed and preheat up to normal operating temperature. And until the fan begins to run, observe water thermometer and check if the engine is at overheating condition. If the coolant level in



the expansion reservoir descends quickly, coolant should be injected up to the highest position to cut down the air circulation in the system.

- To shut the engine down to have it fully cooled (if possible, leave the engine alone for one night.) ;
- To open the pressure cap to check the coolant level, and inject coolant up to the highest position.

Cooling System Checkup:

- To check the coolant level, start up the engine and preheat it. Put the engine under idle speed circumstance until the cooling fan runs, and check if coolant leakage exists at various pipe joints. Shut down the engine and wait for engine cooling. And then check if the coolant level in the expansion reservoir is at normal condition.
- To try best to prevent the coolant spilling from scalding operator during checkup.
- To timely check if water flows into the engine oil pan (the lubricating oil shall become milk white after water flows) when no pipe leakage is found and the expansion reservoir is short of coolant, and timely stop water from flowing in when finding it.

COOLING SYSTEM MAINTENANCE WARNING

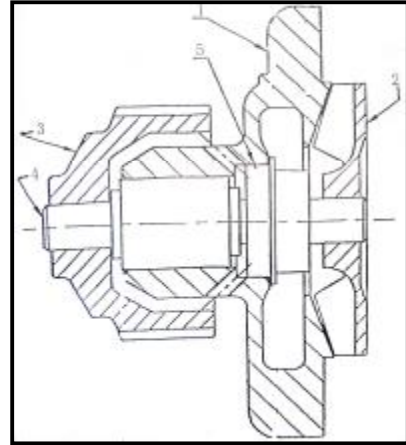
Warning:

- To try best not to move radiator cap or loose the radiator discharging plug when the engine is under operation or the engine and radiator are at a very high temperature. Scorching coolant may spill out, hurting the people and damaging the engine and cooling system.**
- To shut down the engine until it cools down, and then carefully demount the radiator cap. Meanwhile, wrap a large thick cloth onto the radiator cap, rotate it slowly to the position of the first clip along the counter-clockwise direction and then release the pressure slowly.**
- To use a cloth to push down the radiator cap, rotate and remove the radiator cap after the operator ensures all the intensity of pressure has been released.**

WATER PUMP

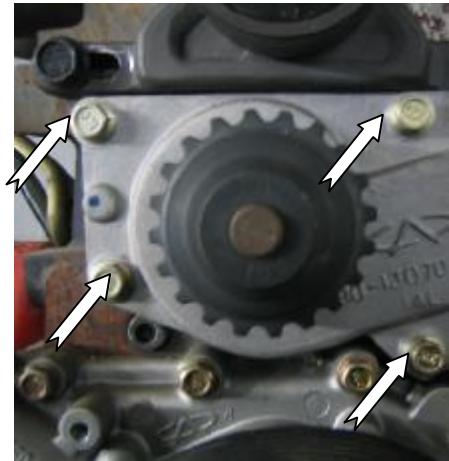
Structure:

- 1—Water pump housing
- 2—Water pump impeller
- 3—Water pump gear
- 4—Water pump shaft bearing
- 5—Water pump seal (ceramics-lead)



Disassembly:

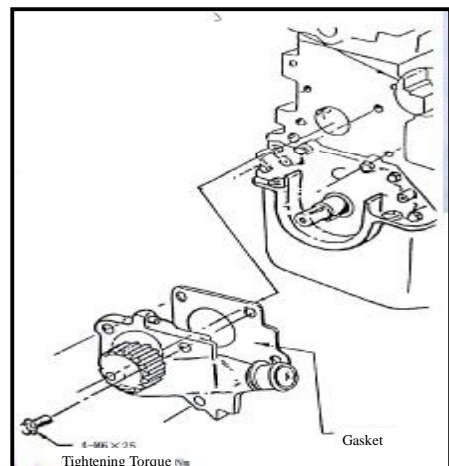
- To disconnect the negative terminal of battery;
- To discharge engine coolant (refer to the coolant discharge process);
- To disconnect poly V-belt and power pump belt;
- To demount timing shield;
- To unscrew and take 4 bolts out of the front side of cylinder block.
- To demount the water pump assembly;
- To demount the water pump gasket.



Assembly:

- To install the new gasket on the water pump;
- To install the water pump assembly in the cylinder block and screw up 4 fixing bolts by hand, and then screw up to 7.0—10.0Nm;
- The water pump impeller installed in the cylinder block should be able to rotate freely;
- To refill engine coolant;
- To check leakage occurrences of engine coolant.

Note: Because water pump assembly can not be repaired, it should be replaced when seal ring or bearing is worn and torn.



THERMOSTAT

Disassembly:

- To unscrew 3 M6×40 bolts and then demount the bolts;
- To demount thermostat chassis and thermostat assembly.



- To pry out the spring clamps by using chisel or screwdriver.



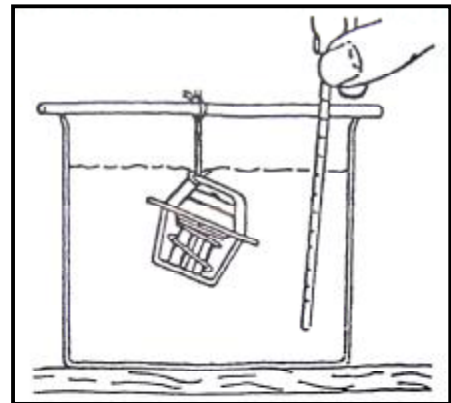
- To take the thermostat out;
- To clean up the thermostat;



- To take the seal ring out, and replace it if it being worn and torn.
- To demount the gasket from the thermostat chassis.
(To replace with new gasket if it is worn and torn, and allow no repeated use.)



- To measure the thermostat opening temperature under hot water.



Assembly:

- To clamp the thermostat and then put the gasket into the thermostat aperture.
- To install thermostat (the side with spring facing outward).
- To embed spring clamp to ensure the clip within the thermostat chassis slot;
- To mount new gasket onto thermostat chassis;
- To mount the thermostat chassis and thermostat assembly into the aperture at the rear side of engine cylinder head, and screw up the bolt by hand to 9—12N.m.

WATER TEMPERATURE SENSOR

Disassembly:

—To demount water temperature sensor (at the exhaust pipe flank and under the lifting eye).

Assembly:

—To apply Letai 243 glue on the screw thread, screw up the bolt to 7.0—10.0Nm before installation.



Checking:

Water temperature sensor is a negative temperature coefficient sensor, which is composed of a thermal resistor. The resistance value of the resistor shall decrease as the engine temperature rises. The variation is detailed in the following table:

| Temperature (°C) | Resistance Value (Ω) |
|------------------|-------------------------------|
| -20 | 29,125 |
| -10 | 16,660 |
| 0 | 9,790 |
| +20 | 3,748 |
| +25 | 3,000 |
| +60 | 747 |
| +80 | 377 |
| +100 | 204 |
| +120 | 117 |

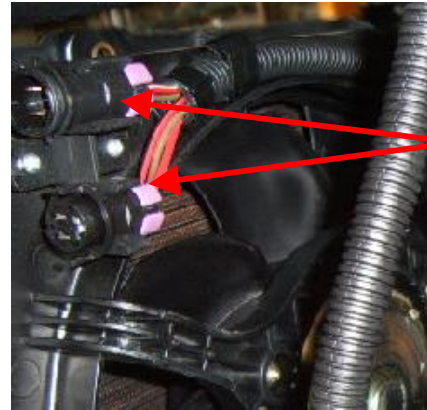
COOLING FAN

Disassembly:

—To disconnect the negative terminal of battery;



——To demount the matching plug of the cooling fan.



——To remove the fastening self-tapping screw from the cooling fan.



——To take the cooling fan out.

Assembly:

——To assemble the cooling fan according to the disassembly order (the tightening torque of self-tapping screw is 1.8~2.2Nm)

——To start up the engine and check if the cooling fan is under normal operation.

Guideline For Disassembly:

——During the disassembly process, you should pay more attention not to pull A/C pipe to a large extent, otherwise the A/C pipe shall crack and deform.

EXPANSION RESERVOIR

Disassembly:

—To demount the water pipe connecting with the expansion reservoir.



—To pry out the protecting hood of expansion reservoir by using a screw driver.



—To demount the fastening bolts of the expansion reservoir by using M10 sleeve.



—To pull out the plug of liquid level sensor.

—To take the expansion reservoir out.

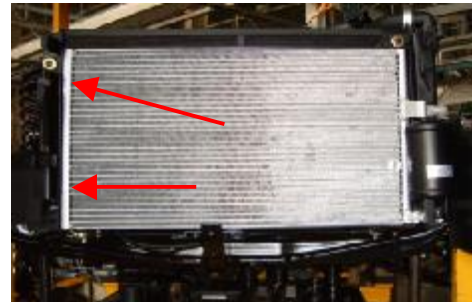
Assembly:

- To assemble the expansion reservoir according to the order opposite to the disassembly order (the tightening torque of self-tapping screw is 4.0~5.0Nm) .
- To refill coolant.

ASSEMBLY OF RADIATOR

Disassembly:

- To discharge coolant (refer to the coolant discharge process)
- To demount the cooling fan (refer to the disassembly process of the cooling fan).
- To demount the left and right wind boards by M10 sleeve.



- To take out the radiator.

——To take out the radiator



Assembly:

——To assemble the radiator according to the order opposite of the disassembly order.

——To install the 2 wind boards onto the radiator by using self-tapping screws with their tightening torque of 6~7Nm.



——To install the radiator onto the front transom and put it straightly towards the positioning hole.

——To install the left and right tensioned plates of the radiator, and tighten the bolts of the plates with tightening torque of 5 ± 1 Nm.