



**海格客车**

# **Service Manual**

**Yili ATS**

**3906\_11020**

**Higer Bus Company Limited**

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# 1 Overview

ATS is the acronym of auto temperature-control cooling system which consists of the sensor, the controller and the actuator. The sensor transmits the temperature signals to the controller, which controls the rotation speed of the actuator, namely the electronic cooling fan to control the engine coolant temperature and air intake temperature within the proper range as required.



## Two weaknesses of traditional cooling system

1. Passively controlled heat transferring medium outlet temperature: the cooling intensity of the cooling fan is subject to the engine rotation speed, rather than controlled precisely according to difference between the heat exchanger outlet temperature and the best engine working condition requirements. Therefore it is very common that the engine coolant temperature of the same vehicle is easy to get overheated in South China but it will get too low in North China.
2. Tandem layout of the heat exchanger: as two heat exchangers with different cooling requirements share the same cooling fan, one's function will be affected by the other

and the outlet temperature cannot meet the bench working condition requirements.

## Strength of ATS

1. ECU precise calculation, active and real-time control on the cooling intensity (save 6% fuel).
2. Split-type layout and independent heat-exchanger control (increase the engine effective output by more than 8 %.).
3. Independent air compartment and low-noise electric fan (reduce the external acceleration noise by 5dB·A).
4. Modularization product supply without any specification requirement for key control (shorten the installation time by more than 50%).

## 2 Primary structure and working principle

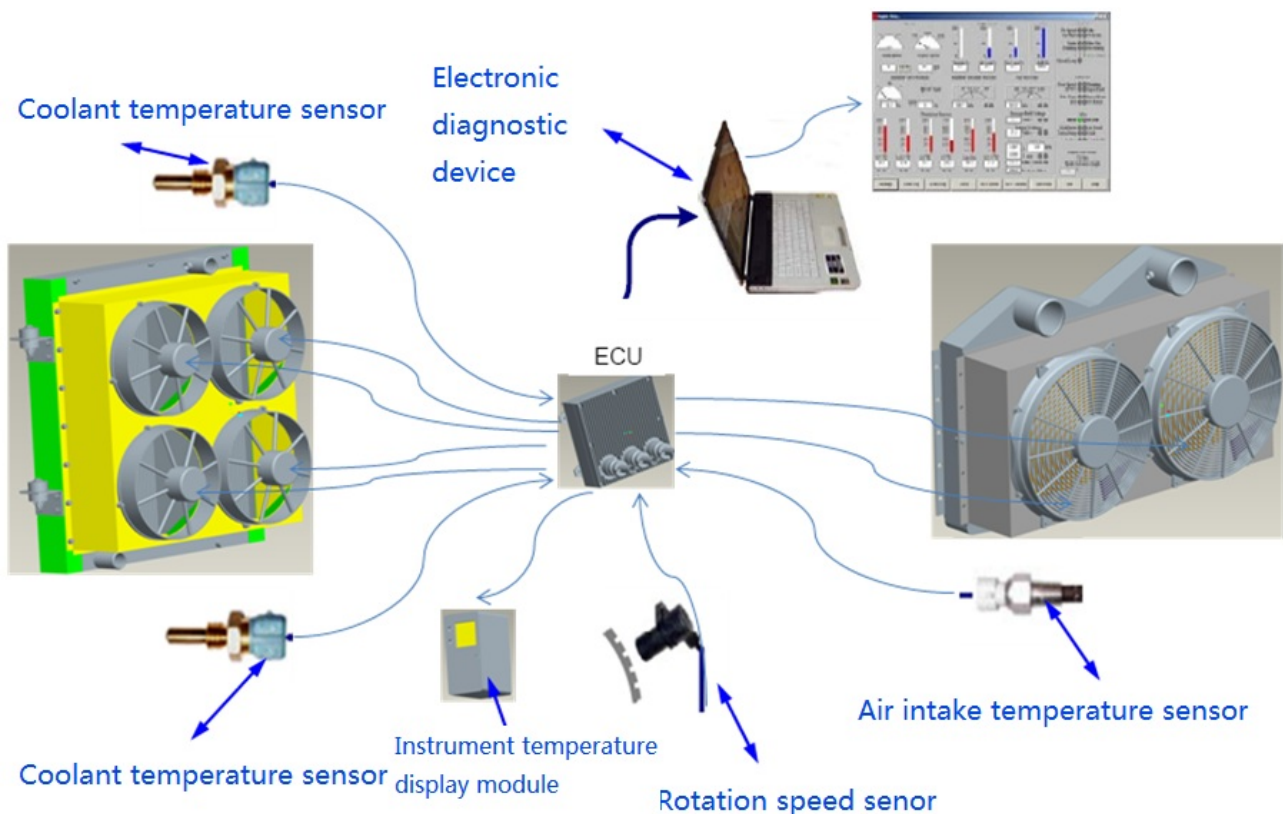


Fig 2-1 ATS schematic diagram

## Heat-sensitive sensor

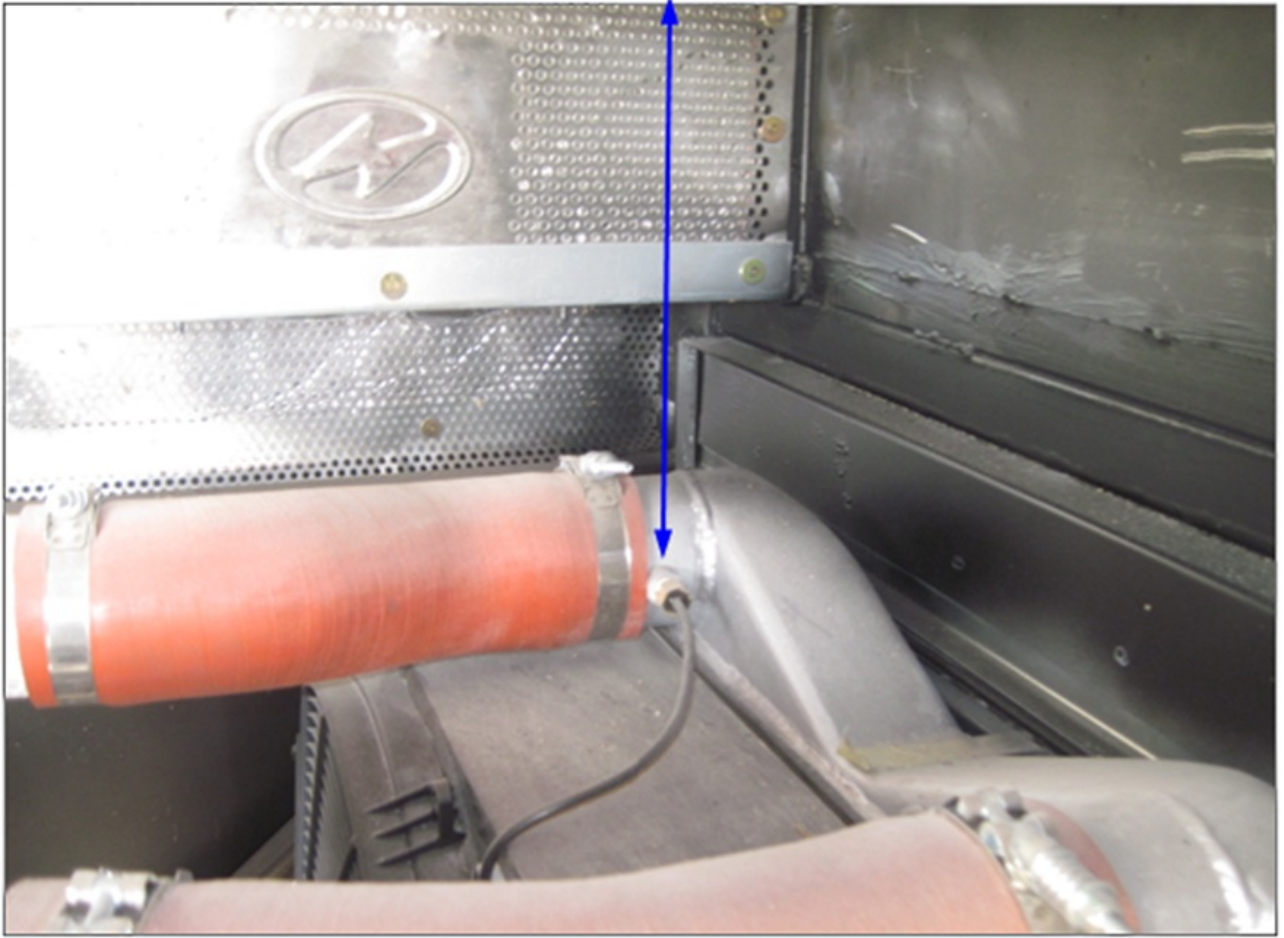


Fig 2-2 sensor

## Electronic fan controller

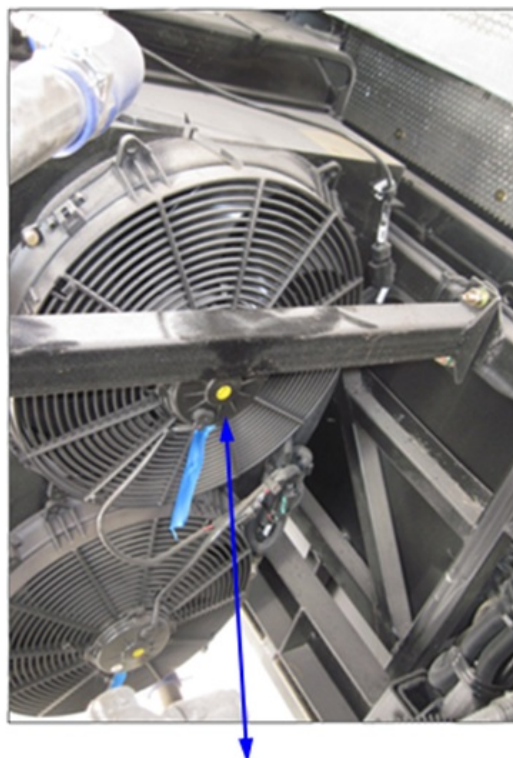


Fig 2-3 controller





Inter cooler  
electronic fan



Engine radiator electronic fan

Fig 2-4 Electronic fan

## 3 Trouble shooting

### 3.1 Production tune-up and check step

#### 3.1.1 System initial check

After the whole circuit is well connected, then turn on the battery main switch and switch on the ignition, ATS will come into the stand-by state, and then check the following items:

1. Check ECU: three inceptors shall be lightened.
2. Check the display module: whether the temperature is displayed.
3. Check the fan: (keep the engine shut and disconnect the ECU signal wire if necessary)

Press the red self-check button on the upper side of ECU, the following parts will be started and functioning for 10 seconds (5 second for the new products) in sequence: inter cooler fan and radiator fan.

Note: any inconformity with the above means the fault of the system and carry out the trouble shooting accordingly.



Fig 3-1brsh ECU



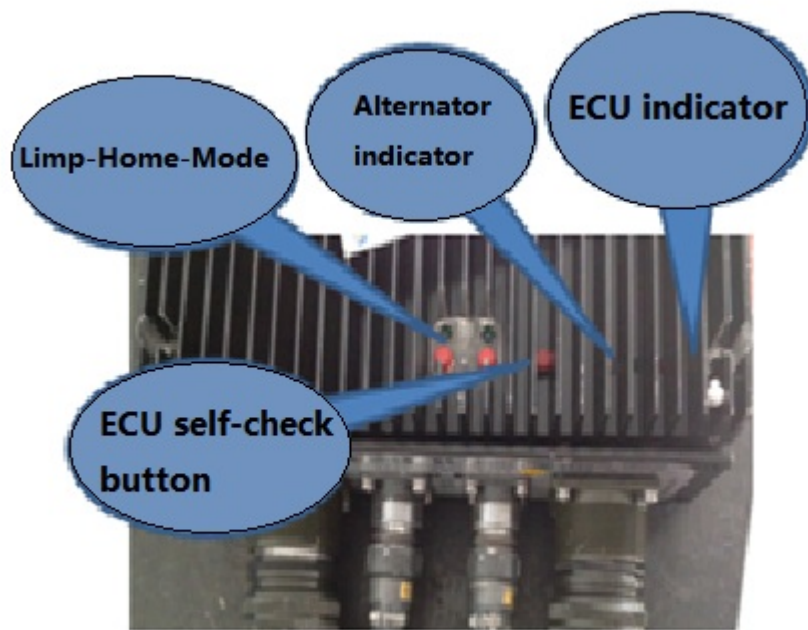


Fig 3-2 brushless ECU

### 3.1.2 ATS test

The blue indicator of ECU will be lightened (which means the alternator is working well). Meanwhile and the display module shall display the information properly.

1. If the starting is the first one, the temperature displayed will be very similar with each other and close to the ambient temperature.
2. When the engine is idling, the inter cooler temperature displayed is usually below 43°C and that of the radiator outlet is below 83°C.
3. Once the inter cooler temperature gets 40~45°C and the radiator coolant temperature get 85~90°C, ECU will trigger the cooling fan. Once the fan starts working, the temperature displayed on the module should stay in a specific range.

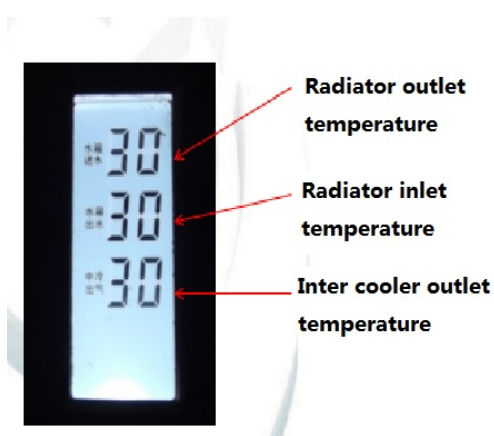


Fig 3-3 LCD (3 digits)

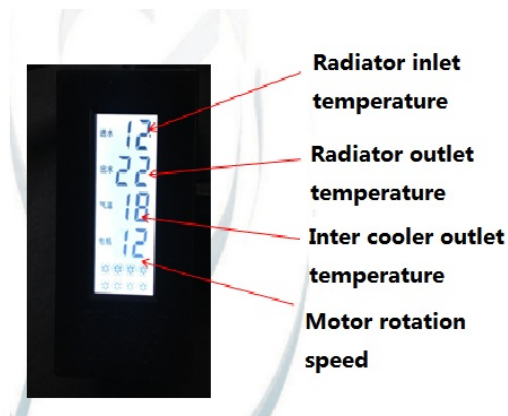


Fig 3-4 LCD (4 digits)

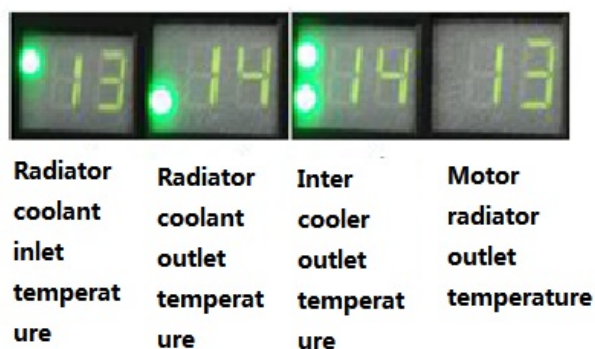


Fig 3-5 digital screen

## 3.2 Abnormity and trouble shooting

### 3.2.1 Abnormal display

#### 3.2.1.1 LCD

1. “EE” displayed on LCD indicated the fault in the sensor connection. Check the sensor harness and the connectors. If the connectors are in good condition, it means the

sensor might be with fault.

- “EE ” or “00” accidentally displayed on LCD generally indicated the fault in connectors.  
Replace the connector or clean it with alcohol.

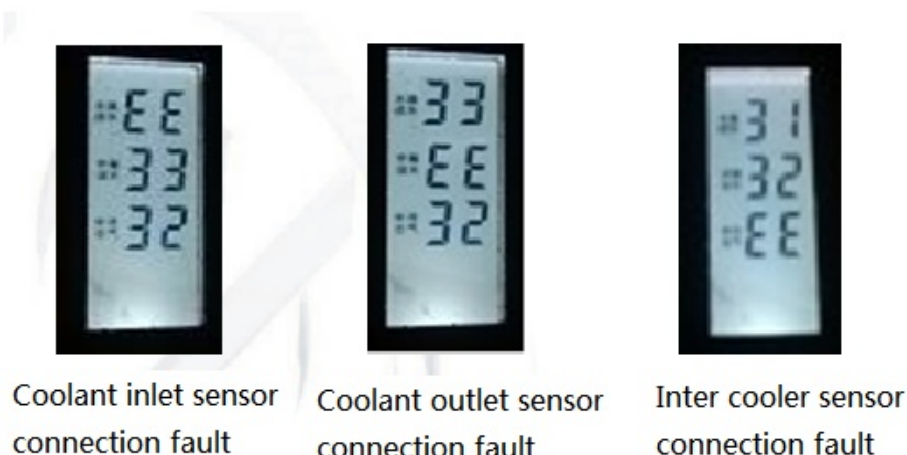


Fig 3-6 LCD (3 digits)

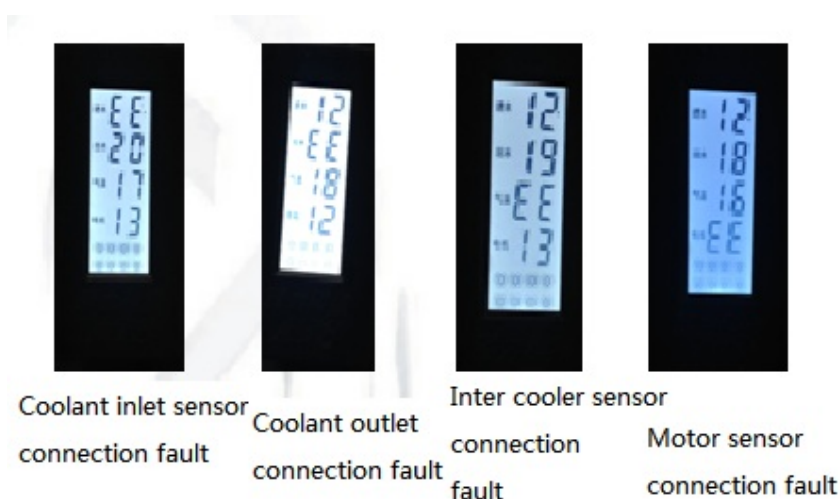


Fig 3-7 LCD (4 digits)

### 3.2.1.2 Digital display

- “E1, E2, E3” displayed in sequence indicates the sensor connection fault. Check the sensor harness and connector. If only E1, E2 or E3 is displayed, it indicates one sensor and harness needs to be checked.

E1: Radiator coolant outlet sensor

E2: Inter cooler air outlet sensor

E3: Radiator coolant inlet sensor

2. If the reading is “00” or “99”: check the status of the display module indicator to confirm the actual fault sensor and replace it accordingly.

Upper indicating lamp: Radiator coolant inlet sensor

Lower indicating lamp: Radiator coolant outlet sensor

Double lamps: Coolant air outlet sensor

No indicating lamp: Motor radiator coolant outlet sensor.

### 3.2.2 Cooling fan shut-off failure

1. One cooling fan or all of them keep working after the engine is shut off. It is the self-protection triggered by ECU itself and the ECU needs to be replaced. (If only one fan keeps working, you can also ignore it.).
2. Is the display normal? Is the temperature gets the working requirement? Is there any fault code?

Annotation: ATS fault codes are EE, C7, 85, 00 and 99. The related fault symptom and troubleshooting method is as follows:

Fault code	Fault symptom	Troubleshooting method
EE	Half of the heat-exchangers keep working (display of coolant outlet or inlet sensor is “EE”, 2 out of 3 or 3 out of 5 fans keep working) after the engine is shut off. The number equals half of the total number and rounds to the nearest.	<ol style="list-style-type: none"> <li>1 Replace the fault sensor.</li> <li>2 Check the fault sensor signal wire (blue one) to check whether it is in open circuit.</li> <li>3 Check the fault sensor grounding wire (black one) to check whether it is in open circuit. Do not confuse the shield wire, which is wrapped by shrinkable tube with the grounding wire which is smooth in the surface.</li> <li>4 Check the fault sensor signal wire (blue) or grounding wire (black) is in short</li> </ol>

		circuit.
C7	The related heat-exchanger fans keep working at the highest speed.	1 Replace the fault sensor accordingly
85	All the related heat-exchanger fans keep working at the highest speed.	1 Replace the fault sensor 2 Check the fault sensor battery wire (brown) to confirm whether it is in open circuit.
00	None of the heat-exchanger fans keep working, which will result in the overheat.	1 Replace the fault sensor 2 Power off the vehicle and restart it.
99	All the related heat-exchanger fans keep working at the highest speed.	1 Replace the fault sensor 2 Power off the vehicle and restart it. 3 Check the fault sensor signal and confirm whether there is short circuit in the circuit between the battery and grounding wire.

3. Check the signal wire (violet, 1mm<sup>2</sup>) of fan harness and confirm whether it is in short circuit with the battery wire (2.5 mm<sup>2</sup>, red)

### 3.2.3 Overheat and radiator boils

If the coolant temperature indicator is lightened and the buzzer sounds, you must pull over and check the engine according to the above procedure (except the water pipeline

blockage and the thermostat opening failure):

1. Is the “charging failure indicator” on the instrument panel lightened while the engine is running? If it does, replace the alternator.
2. Is the alternator indicator lightened when the engine is temporarily started? If it is not, check whether the alternator signal wire is in open circuit.
3. Are all the three ECU indicators lightened? If any of them are not, replace the ECU immediately.
4. Shut off the engine, press the ECU self-checking button for once (when all the ECU indicators are lightened) to confirm whether the fans are working well in the self-checking mode. If it is not, check the fuse of related fan.



## 4 Maintenance

### 4.1 ATS daily maintenance

1. Carry the casual inspection on the radiator, inter cooler external appearance and the pipe to confirm whether the pipe is with leakage resulted from damage and the radiator fin is with deformation. Repair the leakage and the deformation accordingly.
2. Use the air gun to blow away the deposited dust, catkins, leaves and other matter from the radiator core if there is any. Do not wash it with water.
3. Before the welding, disconnect the ECU and reconnect it after the welding is finished.
4. All the connectors in this system are water-proof and the ECU is also water and dust resistant to some extent. Keep the system from water to avoid the fault in the daily maintenance.

### 4.2 Instructions on ATS emergency connectors

Apply this connector(s) if there is the overheat but it is not clear whether the cooling system has the fault.

1. Turn off the engine and the main power switch.
2. Screw off all the aviation connectors that connect the ATS wire and ECU, and then screw the two emergency connectors into the related socket and make sure they are well connected.
3. Turn on the main power switch and the ignition switch to start the vehicle.
4. The ATS can be remove and carried by the vehicle after the check and repair is finished.

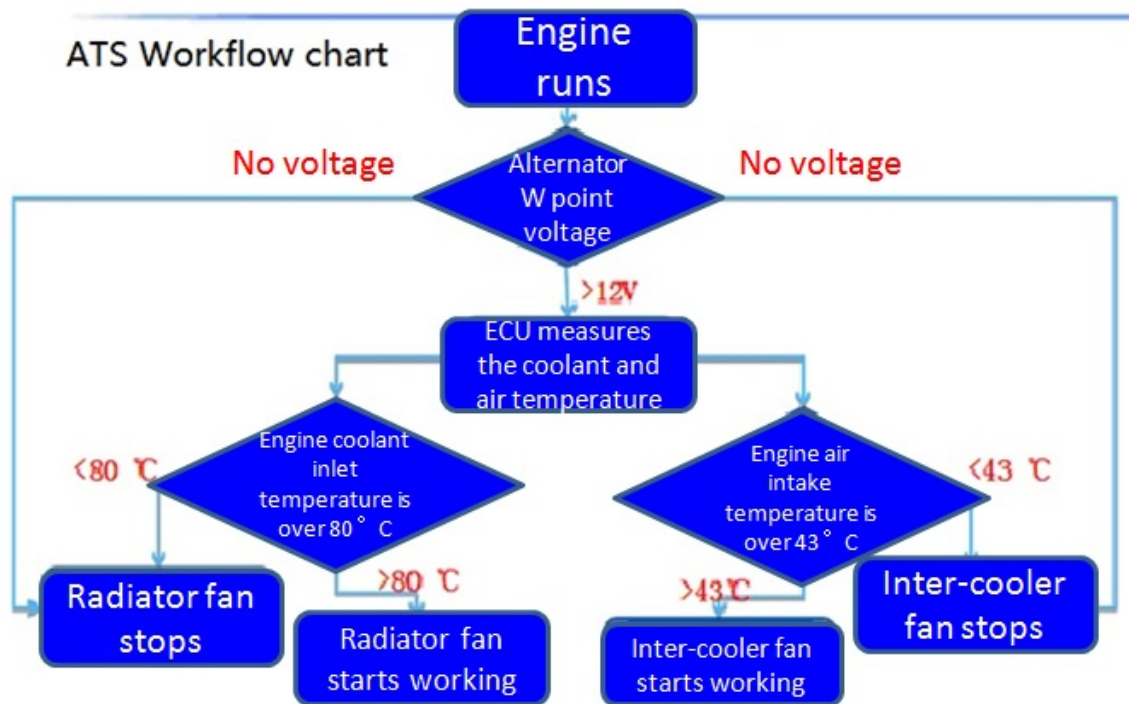
Note: while the ATS is removed from the vehicle, the cooling capacity of the cooling system will be reduced by a half. As long as the vehicle keeps in a medium speed and coolant is not too hot, you keep it running in the emergency status.



## 4.3 Notes

1. Keep the fan rear free of barriers to avoid the air decrease resulted from the back pressure increase and keeps the cooling efficiency.
2. For the aluminum radiator, apply the special coolant only (PH: 7.0~9.0) ONLY! Otherwise the failure will not be covered by warranty.
3. Never turn off the battery main switch when the ECU is in power-up state and the alternator is functioning.
4. Keep the ECU away from the electromagnetic environment in which the electric power is over 50W.
5. Ensure the wires are well wrapped and prevent them from fray with other parts.
6. The inter-cooler sensor must be located at the outlet of the inter cooler. Adjust it if it is not.
7. Connect the wires as the specified sequence and any change on the harness is not allowed!
8. Ensure the system is well connected and the grounding wires are well connected if a temporary start up needed. Prevent the system from the rain if it is parked in the opening.
9. Ensure to open the heating and defrost air drainage valve and completely expel the air when you are adding the coolant.
10. Prevent the welding spark from the radiator core when there is a welding operation.
11. For the brushless blower, it will rotate counterclockwise as the ECU programmed when it is connected to the power. Therefore, the brushless blower will keep rotating counterclockwise for a while. Please be well informed and keep away the danger.

# Appendix



ATS workflow chart