08- Electric air conditioning system

Electric air conditioning system

Technical specifications

Torque Specifications

Name	Torque range	
	Metric (Nm)	British (lb-ft)
Air conditioning compressor mounting bolts	25	18

Components

Compressor model		WXH-106-AP
Condenser assembly	Type	Parallel-flow
	Specification D×H× W mm	625×397×16mm
	Heat exchanging capacity	≥ 4.5m / s Surface wind speed 13.1kW
Evaporator core	Type	Stack-up type
	Specification D×H× W mm	58×255×255
	Refrigeration capacity	Inlet air volume 423 m³/h, refrigerating capacity ≥ 4.2KW
Heater element	Type	Stack-up type
	Specification D×H× W mm	27×220×180
	Heat capacity	6L/h flow, with 350 m³/h air volume, the collected volume ≥ 4.5kW
Air flow adjustment		8 gear
Max air flow		Face cooling ≥ 423m³/h
		Feet heating ≥ 300 m³/h
Refrigerant	Type	R134a
	Filling volume	540g±20g
Lubricating oil	Type	PAG56
	Filling volume	120ml
A/C system	Max cooling power	At the compressure speed of 1800 rpm ≥ 4.8kW
	Temperature adjustment range	18℃ ~32

Precautions

Note:

Following precautions must be observed during inspection and repair of A/C system, otherwise may cause vehicle damaged and personal injury.

1. Special gloves and glasses must be used, because the refrigerant has extremely low freezing point and strong volatile, it can cause chilblain or blind if touch skin or eyes.
2. If the refrigerant is spilled onto skin or eyes, wash with clean water immediately, then seek medical treatment from hospital. Never touch hurt skin or eye with your hand or tissue.
3. Working related to refrigerant must be conducted in areas with good ventilation. Released refrigerant may cause oxygen deficit phenomena.
4. Working related to refrigerant must be conducted in clean atmosphere without damp and/or dust, which may flow into A/C system causing damage.
5. A leak detector should be prepared during working related to refrigerant. Leaking should be prevent, because leaked R134a may set off reaction with hot items causing noxious gas.
6. Only R134a should be used as refrigerant for this vehicle. Any other refrigerant has adverse effects on system components.
7. R134a refrigerant and R12 refrigerant are not compatible, so they can not be mixed even with very few amount
8. No kindling or flammable items should be exist in areas of working related to refrigerant. Spacial care must be taken to avoid the refrigerant container exposed in heat sources because this may cause explosion.
9. The R134a is stored with high pressure, thus the container should never be exposed in high temperature conditions. If necessary, c heck to ensure temperature of storage areas is below 52℃ .
10. Caps should be used to prevent water, dust etc. getting into components of A/C system. The caps should be removed before work, and reinstalled after work.
11. It is advisable to avoid any work related to A/C system in rainy days because moisture has extremely adverse impact on system.
12. After the air conditioner system is disassembled, the O-ring seal must be coated with refrigerant oil, especially on the bolt-type connection parts, and manual installation at first and then fixed with a special tool
13. In assembly of flanged connection, the nuts and bolts should be tightened with pipes pushed gently.
14. Operation requirement should be adhered to install A/C, any torque above specification or excessive force on O seals may cause leaking of refrigerant.
15. No hose may be twist.
16. Any components should be removed before the refrigerant is totally recovered. If not, internal pressure of system may push out refrigerant and oil, causing environmental pollution.
17. After replacement of A/C component, refrigeration oil should be added along with refrigerant .
18. Refrigerant R134a must be used for this vehicle.

- R134a refrigerants that all indicators such as ingredients, moisture content, impurities, and non-condensable gases are qualified must be used.
- The filling amount of refrigerant must strictly comply with the provisions of the vehicle factory, too much or too little will have bad influence on the cooling effect of air conditioner.
- Before filling the refrigerant, thoroughly check that if the sealing seals of each pipe joint are intact and the parts are leaked.
- Before the compressor can operate, it can be filled from the low pressure side and the high pressure side. After the compressor is running, it can only be filled slowly from the low pressure side.
- After the R134a refrigerant is added, it shall be checked for leak carefully with electronic leak detector.

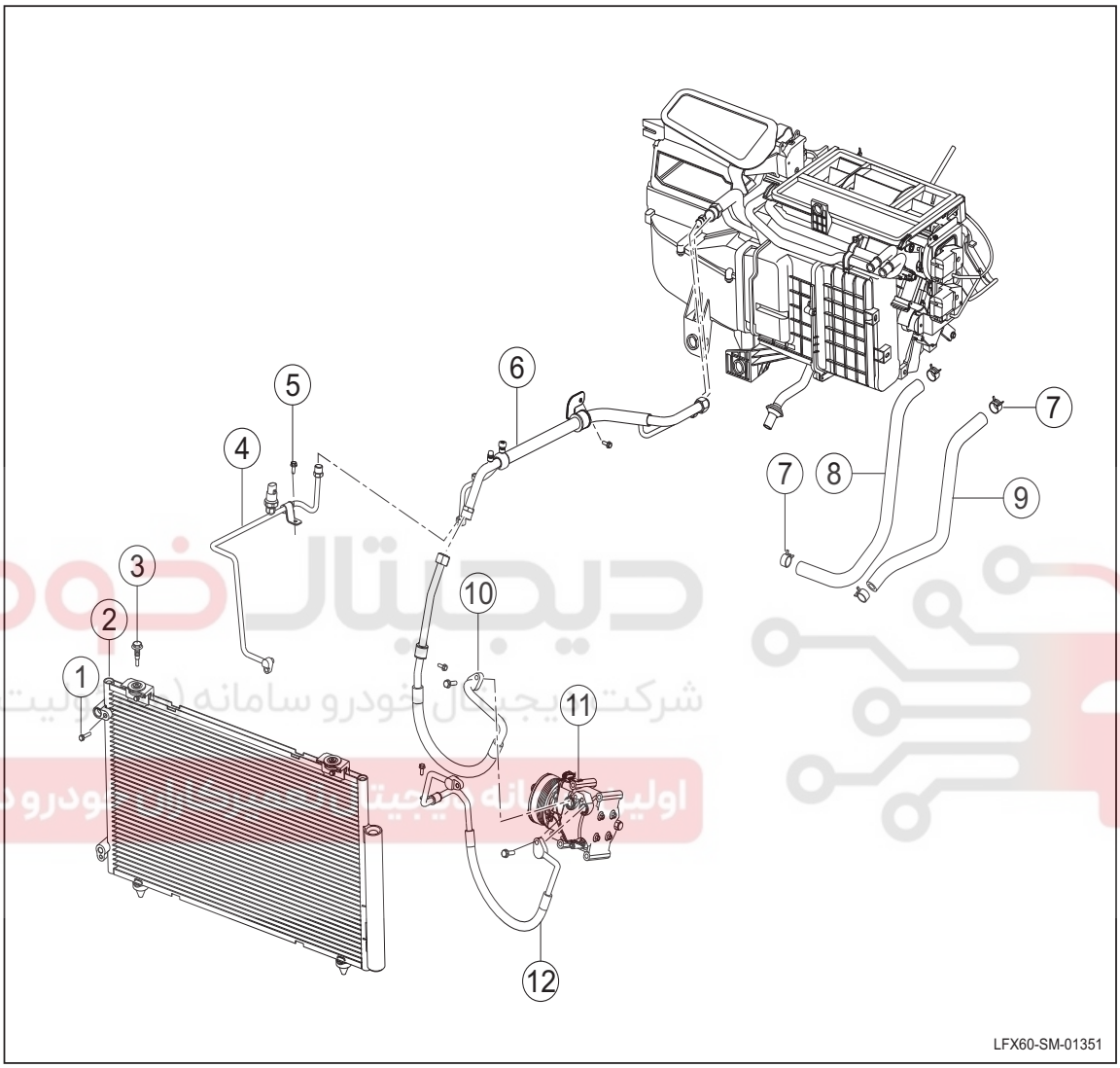
19. Add refrigerant oil properly.

- The type and grade of refrigerant oil of specified by the manufacturer must be used and different types and grades of refrigerant oil can not be mixed, otherwise the compressor will be damaged.
- Filling shall in strict accordance with the provisions of the amount, note that the refrigerant oil hinders heat transfer, excessive filling will seriously reduce the air conditioner effect; generally no need to fill refrigerant oil, for refrigerant oil has been filled by the manufacturers; when replacing parts (except for compressors), the same type of refrigerant oil shall be added properly.
- Since the refrigeration oil is highly easy to absorb water, shorten the air contact time so long as possible.
- The refrigerant oil should be filled from the compressor exhaust port before vacuumize.

Structure and installation location

Part exploded view

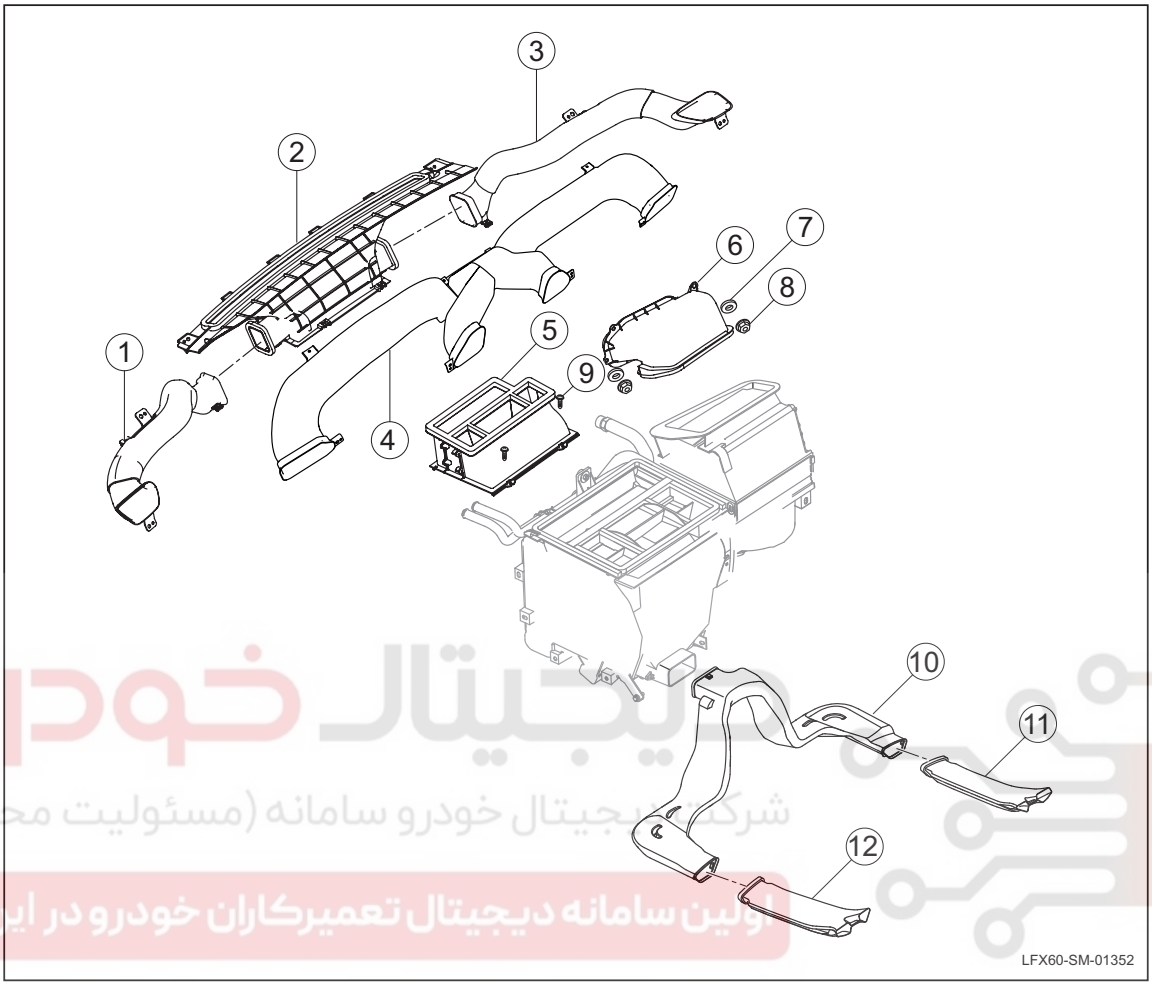
Air conditioner piping system



No.	Part name
1	Hexagon head bolt and taper elastic washer assembly
2	Condenser assembly
3	Condenser mounting bolts
4	High pressure pipe of A/C
5	Hexagonal bolts
6	High and low pressure coaxial tube

No.	Part name
7	Steel strip elastic clamp
8	Heater inlet pipe
9	Heater outlet pipe
10	Low pressure pipe of A/C
11	Compressor
12	Compressor exhaust pipe

Ventilation device



No.	Part name
1	Left defrost duct
2	Central defrost duct components
3	Right blowing face air duct assembly
4	Central blowing duct assembly
5	Central transition duct assembly
6	New air duct assembly
7	Plain washer

No.	Part name
8	Hexagon nuts M6
9	Cross recessed pan head tapping screws, large washer assembly
10	Rear feet blowing middle air duct
11	Rear feet blowing right wind fairing assembly
12	Rear feet blowing left wind fairing assembly

General Inspection

General equipment

Name
Digital multimeter
Refrigerant recovery and filling machine
Pressure gage
Thermometer
Electronic leak detector
UV leak detector
Sprayer

⚠Warning:

- **Before servicing the electrical system, disconnect the negative terminal of the battery, and welding or steam cleaning operations on or near the vehicle with air conditioner piping or components are prohibited.**
- **Do not use water, corrosive solvents or flammable and explosive solvents to clean the air conditioner system. It is recommended to use R-141b, heptane and other cleaning agents.**

The operating efficiency and service life of the air conditioner system depends on the chemical stability of the refrigeration system. Contaminants can change the stability of refrigerant and refrigerant oil when the refrigeration system is contaminated by foreign matter such as dust, air or moisture. And also affect the relationship between pressure and temperature, reduce efficiency, and may lead to corrosion and abnormal wear and tear of the system parts and components. Please check the air conditioner system as described below:

- Before disconnecting the plug, clean the plug and the oil around the plug to reduce the possibility of oil entering the system.
- Immediately after the pipe is disconnected, tighten the ends of the plug with a cap, stopper or tape to prevent oil, foreign matter and moisture from entering.
- Keep all tools clean and dry, including pressure gauge components and all parts for replacement.
- Add refrigerant oil with clean and dry conveyors and containers to ensure that the refrigerant oil is not contaminated.
- Operate as quickly as possible to shorten the time that the air conditioner system is exposed to the air.
- The air conditioner system must be re-emptied and refilled after exposure to air. All parts are dry and sealed before leaving the factory, and these sealed parts can only be opened at the time of installation. Before unpacking, all parts should be at room temperature, prevent moisture in the air from condensing into the parts inside the system, and re-seal all parts as soon as possible.

ℹNote:

- **Do not store the refrigerant at sun exposure or next to a heat sour e.**
- **The refrigerant can not be discharged directly into the atmosphere in any case.**
- **Refrigerants such as R-134a (tetrafluoroethane) and R-12 (dichlorodifluoromethane) are not mixable.**
- **The type and grade of refrigerant oil of specified by the compressor manufacturer must be used and different types and grades of refrigerant oil can not be mixed, otherwise the compressor will be damaged.**
- **Since the refrigeration oil is highly easy to absorb water, shorten the air contact time so long as possible.**

Refrigeration system testing

If you suspect a problem with the air conditioner system, check the following:

- Check the outer surface of the radiator and condenser core to ensure that the airflow is not blocked by dust, leaves or other foreign matter.
- Check the surface between the condenser and the radiator as well as all outer surfaces.
- Check that if the condenser core, hose and connecting pipe are blocked or kinked.
- Check the operation of the blower motor.
- Check all air conditioner lines for leak or blocking.
- Check that if the compressor clutch is slipping.
- Check the compressor belt tension.

Quick inspection for Refrigeration piping

⚠Warning:

In some cases, the refrigerant piping and air conditioner components may be extremely hot or extremely cold. When checking the refrigerant piping or air conditioner unit, care should be taken when touching is required. Failure to follow this statement can result in personal injury.

- The air conditioner piping from the compressor to the condenser should be hot.
- The air conditioner piping from the condenser to the expansion valve should be warm, but not as hot as the air conditioner piping described above.
- Determine the temperature difference between the condenser heat and the air outlet by measuring the temperature. Depending on the ambient temperature, the temperature difference should be greater than 20 °C. If

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the temperature difference is less than 20 °C, check the condenser heat sink for foreign matter or damage, and if the radiator fan operation is normal.

- The air conditioner piping between the expansion valve and the evaporator should be cold from the installation point of expansion valve. Depending on the climate, the surface of the air conditioner piping may also freeze.
- The air conditioner piping between the evaporator and the compressor should be cold.
- Test the temperature of evaporator core output piping and prepare the following when measuring:
- Open all windows.
- Set the air distribution to the head outlet and open the air outlet for all vents.
- Turn on external circulation mode.
- Select the lowest blower switch setting.
- Select the lowest temperature setting.

Note:

The temperature measurement can not be performed using a non-contact thermometer because the surface temperature radiation can lead to incorrect measurements.

1. Connect the temperature sensor to the evaporator core output piping. The temperature sensor must be mounted as close as possible to the evaporator core, connecting the temperature sensor to the digital multimeter.
2. Start the engine and allow the engine to run idle for several minutes.
3. Turn on the air conditioner, after 3min, measure the surface temperature of the evaporator core output piping.
4. If the measured temperature is 4 °C or less, the air conditioner system is normal. If the temperature is too high, the cooling of air conditioner system is not enough, continue to the next inspection step.

Frequent failure of the refrigeration system and its causes:

• Poor or no cooling

The air conditioner piping or the drying bottle is blocked or hindered, by comparing the temperature of the air conditioner piping or the surface of the drying bottle to find out the blocked or hindered position. The place with temperature difference is the place blocked or hindered.

Note:

It is normal to have a temperature difference between the piping before and after the expansion valve. When the blocked or hindered place is found, check the relevant parts and replace the parts with new ones if necessary.

- The cooling performance is reduced (the compressor returns to normal after about 6 minutes of stopping)

This is due to the presence of moisture in the system, causing the expansion valve to freeze. In order to ensure that the moisture is completely removed from the refrigerant circuit, the time for evacuation must be extended to 2 to 3 hours and the drying bottle must be replaced with a new one.

Refrigeration system leak test

When you suspect that the system leaks the refrigerant, it should be tested for sure. The leak test should also be performed when the maintenance operation you are performing affects the piping or plugs. Leakage usually occurs at the refrigerant plug or interface. The cause of the leak usually includes the following faults:

- The mounting torque of the parts is not appropriate.
- The seal is damaged.
- Dust or fibers on O-rings.

There shall be appropriate pressure in the air conditioner system for leak detection, at least 340kPa. But compressed air is not allowed in the system; otherwise moisture, dust or other impurities of the air will increase the burden of desiccant or pollute the system. Leak check of refrigeration system uses the following methods.

Electronic leak detection

1. Use the electronic leak detector to inspect the entire piping of the refrigeration system carefully.

Note:

Electronic leak detectors are sensitive to front window glass washings, solvents and cleaning agents and certain vehicle adhesives. The surface must be wiped clean, to avoid incorrect reading. Make sure that all surfaces are dry so as not to damage the electronic leak detector.

1. Move at 25 ~ 50mm / s to detect each connection for one whole circle.
2. Within 6mm from the probe tip to the detection surface.
3. Do not block the air inlet.
4. If a leak is detected, the audible alarm will change from 1 ~ 2 per second to continuous alarm. Adjust the balance control; maintain the alarm sound to 1 to 2 sounds per second.
5. Even if a leak has been detected, all parts of the following must be tested:

• Evaporator inlet and outlet.

- Inlet and outlet of drying bottle.
- Condenser inlet and outlet.
- Brazing and welding parts.
- Damaged parts.
- Front and rear cover of compressor.
- All plugs and connectors.
- Test the high and low pressure service port / service valve.

Leak detection by fluorescent dye

Note:

- **Some vehicles have signs of refrigerant oil and refrigerant at the air conditioner pipe joints, which may be left for ease of installation of air conditioner piping and lubrication of spring lock interface of air conditioner piping. When the connector is suspected to leak, wipe the parts clean and use the R-134a Electronic Leak Detector to check for leaks.**
- **The leaks can be precisely positioned by the yellow-green light of the tracer. Since there may be more than one leak, normally each part should be checked.**

1. Add 7.4mm fluorescent tracer to the air conditioner refrigerant system.
2. After running the air conditioner system for 15min, turns off the engine.
3. Use an ultraviolet lamp to check all parts of the air conditioner system to determine the leak.
4. If a leak is found, recycle the refrigerant with the fluorescent tracer, repair or replace the leaked part, and refill the refrigerant with the fluorescent tracer into the air conditioner system.
5. Use oily solvents to remove traces of any fluorescent tracer on piping or components.
6. Run the air conditioner system for a few minutes and use the UV lamp again to check all parts of the air conditioner system and confirm the troubleshooting.

Leak detection by soap solution

For large leakage in the connection part of refrigerant piping, soapy water can be sprayed around the piping to see whether bubble is generated on the surface. This method is relatively simple and convenient, but the system microleakage can not be detected.

Leak detection by vacuum

1. Recycle the refrigerant and vacuumize the system (approx. 30 min).

Note:

If the air conditioner system is filled with refrigerant, then some of the refrigerant will remain in the refrigeration oil of the compressor. The remaining refrigerant will still evaporate and will cause a slight increase in the reading of the pressure gauge (up to 2 divisions) during the leak test, but this increase in pressure does not mean that the air conditioner system is leaking.

2. Turn off the manual valves for refrigerant on the high and low pressure gauge of the recycling and filling machine.
3. Observe the low pressure gauge on the refrigerant recycling and filling machine.

- If the reading on the gauge is increased by more than 2 kPa, it means that the system is leaked. You need to fill about 300g refrigerant for the leak check.
- If there is no leakage in the system, continue with the filling procedure.

Leak check for evaporator core

Evaporator core leakage is difficult to find, test the evaporator core according to the following procedures:

1. Set the blower speed to the maximum for at least 15 minutes.
2. Turn off the blower.
3. Wait for 10min.
4. Remove the blower speed regulation module.
5. Insert the leak detector probe as close as possible to the evaporator core, and a continuous alarm sound appears when the leak detector detects a leak.

Leak check for compressor shaft seal

1. Use the workshop compressed air to blow the rear and the compressor / front of pulley for at least 15s.
2. Wait for 1~2 min.
3. Detect at the front of the pulley. A continuous alarm sound appears when the leak detector detects a leak.

Refrigerant oil quality inspection

- Contrast method

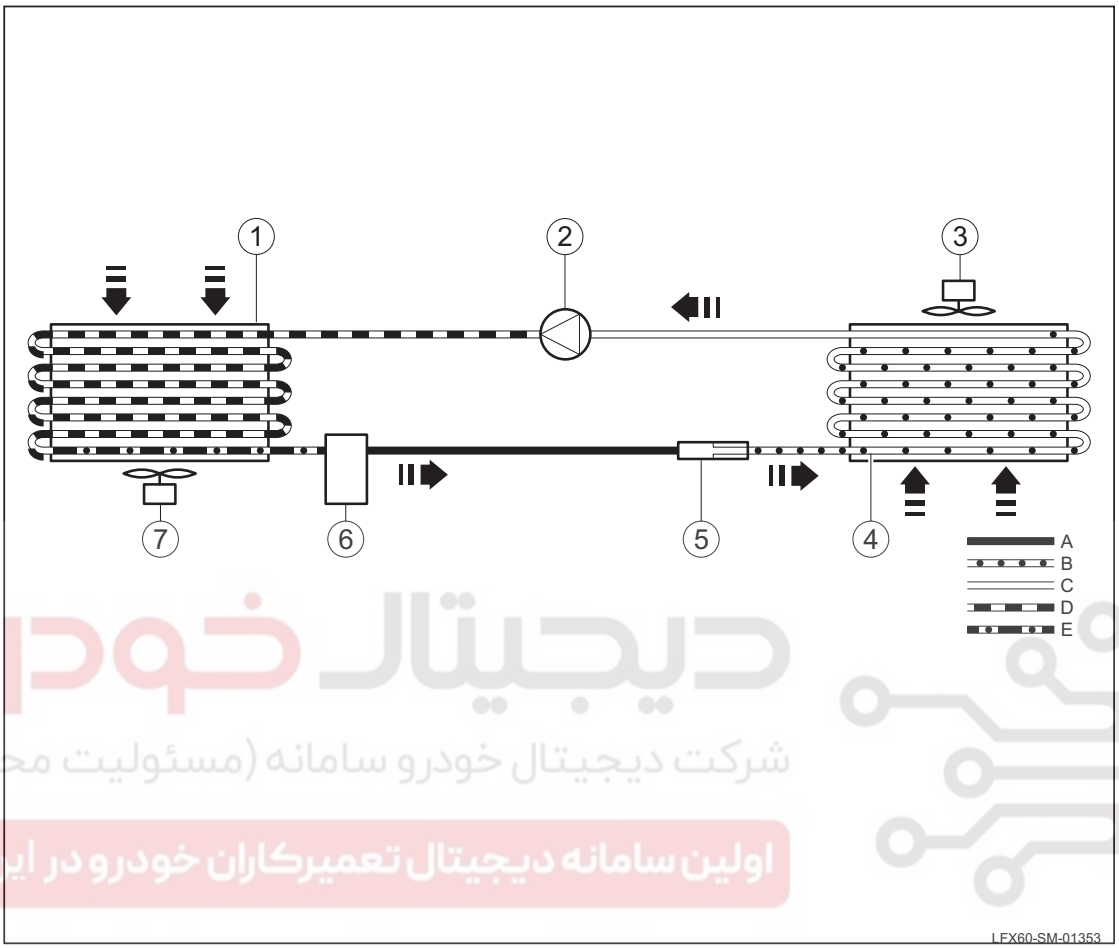
Take the standard refrigerant oil into the test tube as standard oil, and then take the refrigerant oil to be checked into a tube of the same size for comparison. If the color of the refrigerant oil to be checked is light yellow or orange, it can be used; if it has become dirty solution of red brown, it can not be used.

- Dropping method

Remove the refrigerant oil to be checked and drop it on a clean white sheet and observe the color of the oil droplets after a while. If the color is light and in uniform distribution, it means that there are no impurities in the oil, and it can be used; if the central part of the oil droplets has black spots, indicating that the oil has deteriorated, and it can not be used.

Air conditioner schematic

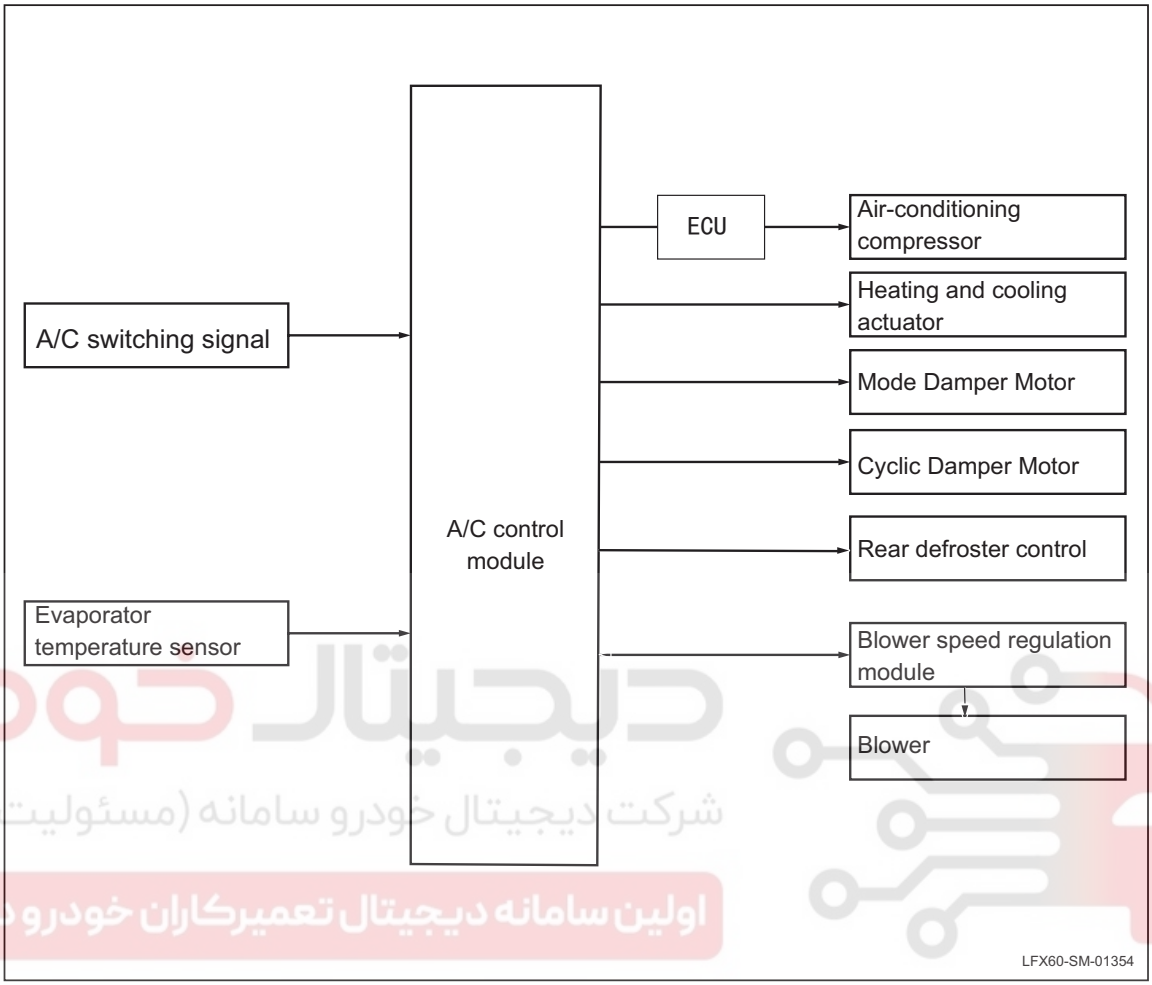
Refrigerating system



No.	Part name
1	Condenser
2	Compressor
3	Blower assembly
4	Evaporator assembly
5	Expansion Valve
6	Drying bottle

No.	Part name
7	Cooling fan
A	High pressure, medium temperature and liquid state
B	Low pressure, low temperature and liquid state
C	Low pressure, low temperature and gas state
D	High pressure, high temperature and gas state
E	High pressure, high temperature and gas-liquid mixing state

Air conditioner control



Operating Principle

System overview

The air conditioner system is designed for the vehicle to provide a comfortable ride environment regardless of the external weather conditions. The system controls the air entering the passenger compartment by performing the following functions:

- Cooling down
- Drying
- Heating
- Circulating

Fresh air from the air conditioner first get into the wind hood, then go through the air conditioner air filter, blower assembly, evaporator box assembly, warm water tank assembly, duct, and then reach the various outlet, into the space inside the vehicle. The air conditioner system consists of the following components:

- Cooling System
- Heater system
- Air distribution system
- Air-conditioning control system

The air conditioner system has the following characteristics:

- Filter the air into the car
- Provide a suitable temperature for the car
- Electricity ventilation
- Front windshield defrost

The driver can adjust the front air conditioner controller to achieve the following functions:

- Adjust the temperature inside the cab
- Blower speed
- Outflow mode
- Front windscreen defrost
- Rear windscreen defrost

Refrigerating system

The purpose of cooling is achieved by the heat absorption during the refrigerant transition from liquid to gas. The cooling process consists of the compression process, the cooling process (exothermic), the throttling process and the evaporation process (endothermic).

1. Compression process

The compressor draws the low temperature and low pressure gas at the outlet of the evaporator, compresses it into gas with high temperature and high pressure, and then feeds it into the condenser.

2. Cooling process (exothermic)

The high temperature and high pressure gas enters the condenser and exchanges heat with the air. The cooling fan blows the heat into the atmosphere and cools the refrigerant into liquid.

3. Throttle process

The liquid refrigerant with medium temperature and high pressure is throttled and depressurized by the expansion valve, to discharge the expansion device in a mist (fine droplets).

4. Evaporation process (endothermic)

The refrigerant mist throttled and depressurized by the expansion valve get into the evaporator to evaporate into a gas. Evaporation process absorbs the heat around and reduces the temperature inside the vehicle.

Compressor

The air conditioner compressor is driven pulley rotated by the compressor clutch, which is transmitted from the belt driven by the engine crankshaft. When the compressor clutch solenoid is not energized, the compressor pulley is free to rotate. The compressor pulley idles at this time, does not drive the compressor shaft. When the clutch coil is energized, the clutch disc and hub are pushed toward the pulley. The magnetic force locks the clutch disc and the pulley as one to drive the compressor shaft, and the compressor starts to operate.

Condenser, liquid storage drying bottle

The high-pressure high-temperature refrigerant vapor from the air-conditioning compressor flows into the condenser. The condenser is made of aluminum tubes and cooling fins which allow rapid heat transfer of the high-pressure high-temperature refrigerant vapor. The cooling fins condense the high-pressure high-temperature refrigerant vapor to high-pressure medium-temperature liquid by heat dissipation. The internal structure of the liquid storage drying bottle can ensure that when the high-pressure high-temperature gas-liquid mixed refrigerant enters, only the high-pressure medium-temperature liquid refrigerant exit the drying bottle. The drying solution has a desiccant that absorbs the moisture in the refrigeration system and the desiccant can not be reused.

Expansion throttle device

The expansion throttle device throttles and decompresses the high pressure liquid refrigerant from the condenser or the liquid storage drying bottle, to adjust and control the amount of the liquid refrigerant entering the evaporator, to accommodate the change in the cooling load. At the same time, to prevent the hydraulic phenomenon and abnormal overheating of the evaporator outlet steam.

Expansion valve is mainly composed of thin film and the valve shell, which is a neck expansion valve, which adjust the refrigerant flow according to the refrigerant pressure and temperature.

When the cooling requirement is low, the valve closes to reduce the amount of refrigerant.

When the cooling requirement is high, the valve will open slightly so that more refrigerant will

pass to the evaporator.

Evaporator

The evaporator is located on the refrigerant piping between the expansion throttle device and the compressor, and is used to vaporize the liquid refrigerant after throttling and depressurization, to absorb the heat of the outside air. The cold wind was blown into the compartment, to achieve the purpose of cooling.

The evaporator cools and dries the air, and its tilted mounting position provides good runoff and reduces condensate and odor residue.

Refrigerant R-134a, refrigerant oil

Vehicles use R-134a refrigerant, refrigerant R-134a is non-toxic, flame retardant, transparent, colorless liquefied gas. Refrigerants have the following effects in air conditioner systems:

- Absorb heat
- Transfer heat
- Release heat

The refrigerating oil acts as a lubricant in the operation of the compressor to reduce the degree of friction and wear during the operation of the compressor, thereby extending the service life of the compressor. The refrigerating oil acts as a sealing between the piston and the cylinder surface of the compressor, and the rotation between the rotating bearings, to prevent the refrigerant from leaking. Refrigerant oil is used for lubrication in the compressor between the moving parts, it can take away the heat generated during the operation, so that the moving parts maintain a low temperature, thereby enhancing the efficiency and the reliability of use of the compressor.

Be sure to follow the instructions and carry out the following repairs:

- Recycle of refrigerants
- Recycle of refrigerant oil
- Filling of refrigerant
- Filling of refrigerant oil

⚠Warning:

- The amount of refrigerant oil should not exceed the maximum amount of filling.
- The filling amount of the refrigerant should not exceed the maximum filling amount.
- In strict accordance with the standard filling procedure, it should be operated by professionals,Otherwise it may cause harm to the person.

AC pressure switch

Air conditioner pressure switch is a three-state pressure switch, for air conditioner pressure signal transmission.

Heating system

The heat generated by the engine is transfered through the warm water pipes into the warm water tank, which can provide the vehicle a suitable temperature in cold weather. When heating is needed, the driver simply adjust the temperature adjustment knob on the air conditioner controller to drive the temperature adjuster motor, which controls the cold / warm air throttle for temperature adjustment.

The heating system is mainly composed of heat exchangers, blowers and corresponding piping, and the heated air is controlled by the throttle to get into the passenger compartment.

Air distribution system

The air distribution system distributes the cold and hot air produced by the cooling and heating system, according to different situations and the requirements of the crew from the different outlet of the wind, so that the passenger compartment temperature and air velocity are kept in a certain range, to form a more comfortable environment. The air distribution system is mainly composed of an intake pipe, an air mixing pipe and a gas distribution pipe. The air conditioner filter is located on the right side of the HVAC assembly on the right side of the cab, to filter the dust in the air circulation.

HVAC assembly

HVAC assembly is located in the dashboard, includes the blower, blower motor speed control module, dust filter, heater core, evaporator, expansion valve, mixed throttle control motor and a variety of air deflection throttle , and ventilation duct.

Diagnostic Information and Procedures

Diagnosis Instructions

Before the diagnose of the electric air conditioner system, familiarize yourself with the working principle of the electric air conditioner system, and then start the electric air conditioner system diagnostics, which helps not only to determine the correct troubleshooting step in the event of a failure, and more importantly

It helps to determine the condition described by the customer is normal or not.

Any troubleshooting of the electric air conditioner system should take the electric air conditioner system check as a starting point and instruct the service personnel to take the next logical step, for troubleshooting. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital multimeter
Diagnostic equipment of vehicle
Thermometer
Electronic leak detector
Pressure gage
Refrigerant recovery and filling machine

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual check table

Mechanical	Electrical
• Attachment belt • Refrigerant • Compressor • Expansion valve • Air conditioner piping • Condenser • Air conditioner filter • Air conditioner outlet pipe	• Fuse • Harness or plug • A/C pressure switch • A/C control panel • Blower speed control module • Blower • Cool and heat throttle motor • Mode throttle motor • New return throttle motor • Compressor

3. If the observed or raised problem is the evident and the cause has been found, ensure to fix this fault before proceeding with the next step.
4. f for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

List of fault symptoms

Symptom	Possible Cause	Recommended Measures
Water from air conditioner leak into the vehicle	• The drain-pipe of evaporator is blocked	• Clean the drain pipe
	• The drain-pipe of evaporator falls off	• Reinstall the evaporator drain pipe
	• The evaporator housing is damaged	• Replace the evaporator housing **Refer to: Replacement of HVAC**
Abnormal air conditioner pressure (both high and low pressure are high)	• The refrigeration system is mixed with air	• Vacuumize, refill the refrigerant
	• Refrigerant overcharged	• Recover the surplus refrigerant
	• Too many refrigerant lubricants	• Re-fill the refrigerant by standard procedure
	• Poor heat dissipation of condenser	• Clean the condenser surface or replace the condenser **Refer to: Replacement of condenser**
	• The cooling fan is operating abnormally	• Check the cooling fan
Abnormal air conditioner pressure (both high and low pressure are low)	• Refrigerant insufficient	• Check for refrigerant failure and refill the refrigerant
Abnormal air conditioner pressure (High pressure is normal, low pressure is high)	• Expansion valve failure	• Check or replace the expansion valve **Refer to: Replacement of expansion valve**
	• Refrigerant overcharged	• Recover the surplus refrigerant
	• Compressor fault	• Check and replace the compressor **Refer to: Replacement of compressor**
Abnormal air conditioner pressure (High pressure is normal, low pressure is low)	• Refrigerant insufficient	• Refill refrigerant
	• Expansion valve blocked by ice	• Replace the liquid storage drying bottle
	• Dirt on evaporator surface or internal blocking	• Clean or replace the evaporator • Refer to: **Replacement of the evaporator**
The evaporator is frozen	• Evaporator temperature sensor failure	• Check and replace the evaporator temperature sensor **Refer to: Replacement of evaporator temperature sensor**
	• The refrigerant is overfilled	• Recover the surplus refrigerant
	• The amount of air passing through the evaporator is insufficient	• Check that if the blower is operating properly and that the air conditioner filter is blocked
	• Expansion valve failure	• Check or replace the expansion valve **Refer to: Replacement of expansion valve.**

Symptom	Possible Cause	Recommended Measures
Air conditioner is not cooling (normal air volume)	• Refrigerant leaks, missing	• Check the refrigerant for leak and refill the refrigerant
	• The compressor belt slips and falls off	• Check the accessory belt
	• The compressor does not operate	**Refer to: Compressor out of operation diagnosis flow**
	• Temperature flap fault	• Check if the temperature throttle is jammed and the hybrid throttle is operating
	• The compressor is damaged	• Replace the compressor **Refer to: Replacement of compressor**
A/C refrigerating output insufficient	• Refrigerant leaks, not enough	**Refer to: A/C refrigerating output insufficient diagnosis flow**
	• A/C filter clogging	
	• The compressor belt slips	
	• Fan fan is operating abnormally	
	• Condenser dissipation abnormal	
	• Air conditioner piping is blocked	
	• Temperature flap fault	
	• Blower fault	
	• Compressor fault	
A/C refrigerating output insufficient	• Air in cooling system	**Refer to: A/C refrigerating output insufficient diagnosis flow**
	• Heater water pipe clogging	
	• Heater radiator surface dirty or inside clogging	
	• Blower fault	
	• Temperature mixing flap fault	
Lack of heating	• Air in cooling system	**Refer to: Diagnostic process for lack of heating**
	• Heater water pipe clogging	
	• Heater radiator surface dirty or inside clogging	
	• Blower fault	
	• Temperature mixing flap fault	
Compressor out of operation	• The refrigerant is completely leaked	**Refer to: Compressor out of operation diagnosis flow**
	• Compressor fuses	
	• Harness and plug	
	• Compressor relay	
	• A/C pressure switch	
	• Evaporator temperature sensor	
	• A/C control panel	
	• Compressor	
	• ECM	

Symptom	Possible Cause	Recommended Measures
Abnormal air volume	• Air duct blocked	• Clean the duct
	• Duct leaks	• Reinstall or replace the duct
	• A/C filter clogging	• Replace the air conditioner filter **Refer to:Replacement of air conditioner filter**
	• Blower fault	• Check or replace the blower **Refer to: Replacement of blower**
	• Air conditioner control panel failure	• Check or replace the air conditioner control panel **Refer to: Replacement of A/C control panel**
Blower out of operation	• Harness and plug	**Refer to:Diagnostic process for blower does not operate**
	• Blower fuses	
	• Blower relay	
	• Blower fault	
	• A/C control panel	

Diagnostic process for lack of cooling

Test condition	Details/results/measures
1. Check the outlet temperature of air conditioner dashboard.	
	A Start the engine at 2,000 rpm and measure the outlet air temperature of the air panel. Is the outlet temperature too high? →**Yes** After completing the following adjustment, measure again and check whether the system is normal. • Switch to internal circulation mode. • Move the vehicle is into the shade. • Adjust the cool and heat throttle to the lowest temperature. →**No** To step 2.
2. Check the air output of the A/C dashboard air outlet	
	A. Adjust the blower speed to the maximum. B. Check whether the air output of the A/C dashboard air outlet is too low. Is the air output too low? →**Yes** After completing the following adjustment, measure again and check whether the system is normal. • Check the A/C filter for clogging and replace it if necessary. • Check the blower. • Check the blower speed regulation module. • Check the air outlet line. →**No** To step 3.

Test condition	Details/results/measures
3. Check the refrigerant pressure.	
	A. Connect the A/C pressure test meter. B. start the engine, turn on the air conditioner. C. With engine speed of 2000rpm, measure the high and low pressure of the air conditioner system. **Standard value:** **High pressure 1.40 ~ 1.75 MPa** **Low pressure 0.25 ~ 0.35 MPa** Is it OK after checking? →**No** To step 4. →**Yes** Carry out the following adjustment or repair and check whether the system is normal. • If both the high and the low pressure of the air conditioner are high, check whether the piping of the refrigeration system is blocked. Check if the refrigerant is too much; drain too much refrigerant and refrigerant oil. Replace the expansion valve. • If the air conditioner pressure is high but the low pressure is low, clean and replace the blocked high pressure pipe; replace the expansion valve. • If the air conditioner pressure is low but the low pressure is high, add the refrigeration oil, repair or replace the compressor. • If both the air conditioner high pressure and low pressure are low, then repair, replace the leaked components of air conditioner system, according to the standard provisions for the filling of air conditioner refrigerant. • If the air conditioner pressure is low but low pressure is vacuum, replace the liquid storage drying bottle, replace the expansion valve, clean or replace the blocked low pressure pipe, extend the system vacuum time, fill the standard air conditioner refrigerant specified by manufacturer.
4. Check the operating status of the compressor.	
	A. Check the compressor belt for slipping. B. Check that if the compressor clutch is normal. C. Check that if the compressor working condition is normal. Is it OK after checking? →**Yes** To step 5. →**No** Carry out the following adjustment or repair and check whether the system is normal. • Check and adjust the compressor belt. • Check the compressor clutch coil. • Check the compressor control circuit. • Check the air conditioner pressure switch. • Check the evaporator temperature sensor. • Check the compressor. • Check the A/C control panel. • Check the ECM.

Test condition	Details/results/measures
5. Check the air conditioner cooling system.	
	A. Check the condenser for serious dirt. Is it OK after checking? →**Yes** To step 6. →**No** Clean the air conditioner condenser.
6. Check the engine cooling system.	
	A. Check the following parts of the engine cooling system. • Is the coolant missing? • Whether the thermostat is operating properly. • Operating status of the cooling fan. • Status of the radiator. • Status of the radiator windshield. Adjust and repair according to the check situation to, and confirm that the system is operating properly.

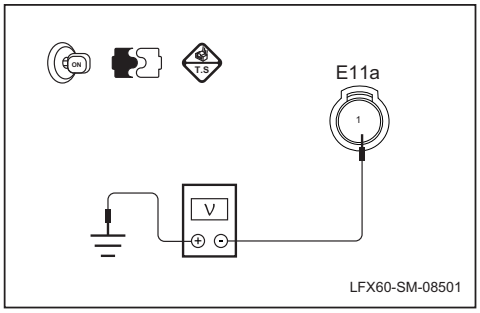
Diagnostic process for lack of heating

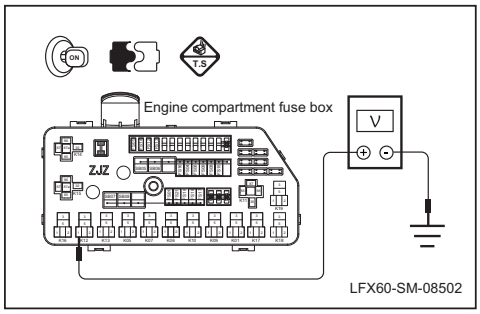
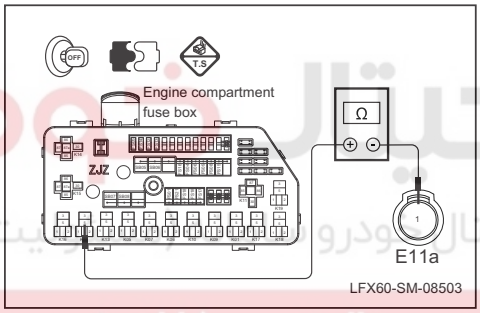
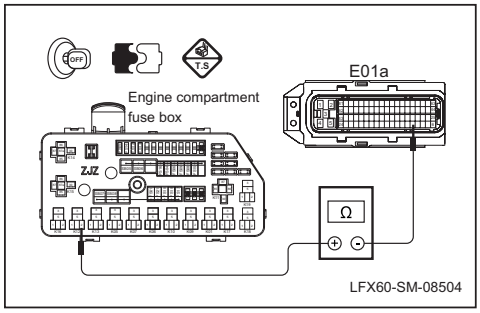
Test condition	Details/results/measures
1. Check the engine cooling system.	
	A. Check the temperature of engine coolant. B. Is the temperature of engine coolant at 82 °C? Is it OK after checking? →**Yes** To step 2. →**No** Make the following adjustments and repairs and confirm that the system is operating properly. • Extend the engine running time. • Check the cooling system for air. • Check that if the thermostat is operating properly. • Check if the warm water pipes are blocked.
2. Check the air output of the A/C dashboard air outlet	
	A. Adjust the blower speed to the maximum. B. Check whether the air output of the A/C dashboard air outlet is too low. Is the air output too low? →**Yes** After completing the following adjustment, measure again and check whether the system is normal. • Check the A/C filter for clogging and replace it if necessary. • Check the blower. • Check the blower speed regulation module. • Check the air outlet line. →**No** To step 3.
3. Check the temperature throttle.	
	A. Adjust the temperature to the highest. B. Check that if the temperature throttle is operating properly. Is it OK after checking? →**Yes** To step 4. →**No** Carry out the following adjustment and repair and check whether the system is normal. • Adjust the temperature throttle mechanism, • Check the temperature throttle mechanical actuator and the cool and heat throttle motor. • Check that if the duct is leaking or blocking. • Check the A/C control panel.

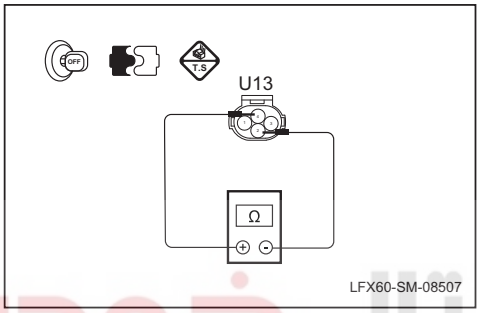
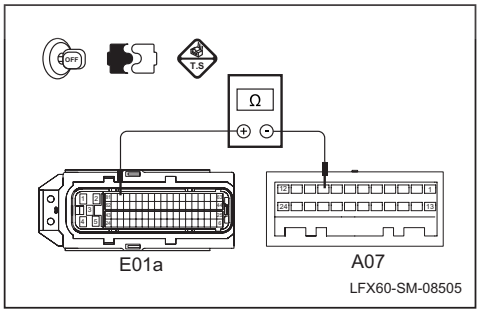
Test condition	Details/results/measures
4. Check the internal and external circulation throttle.	
	A. Adjust to internal circulation mode. B. Check whether the internal and external circulation throttle is operating properly. Is it OK after checking? →**No** To step 5. →**Yes** Carry out the following adjustment and repair and check whether the system is normal. • Adjust the internal and external circulation throttle mechanism, • Check the internal and external circulation throttle mechanical actuators and the internal and external circulation throttle motors.
5. Check the heating water tank.	
	A. Replace the heating water tank. **Refer to: Replacement of heating water tank** Confirm that the fault has been ruled out.

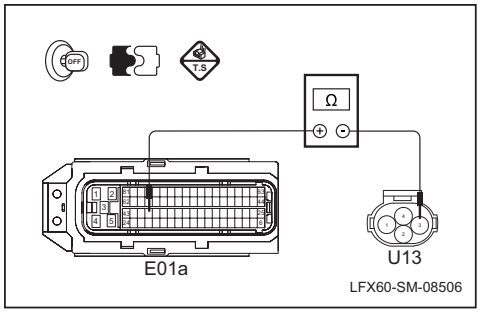
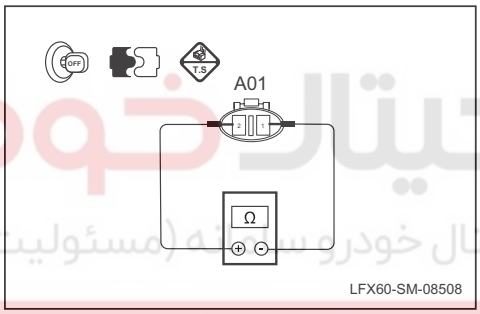
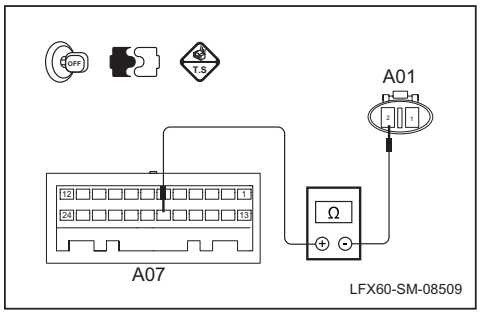
Compressor out of operation diagnosis flow

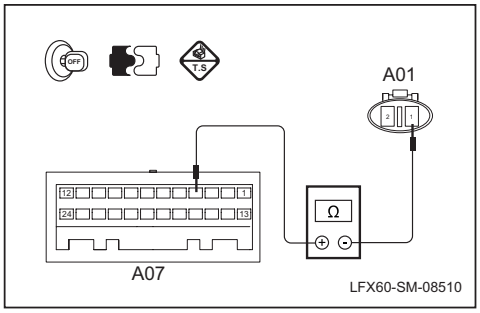
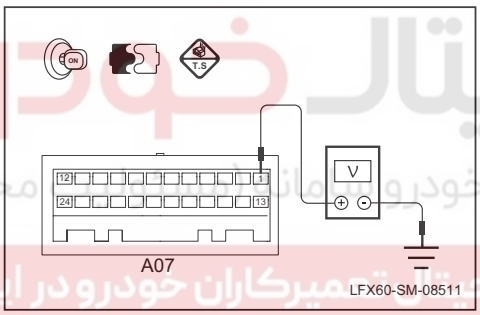
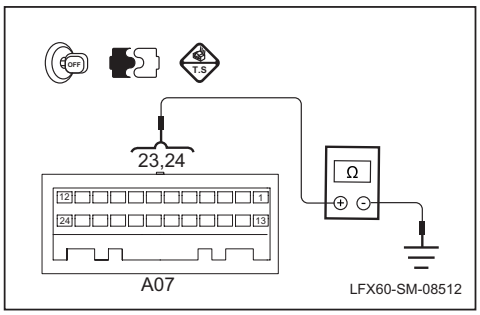
Test condition	Details/results/measures
1. General inspection.	
	A. Check if the compressor belt is off. B. Check the compressor harness plug for aging, shedding, damage and other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the engine DTC.	
	A. Read and see if there is a DTC in the engine control system by using automotive diagnostic equipment. Is there a DTC? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 3.
3. Input and output function test.	
	A. Start the engine. B. Press down the power key of the diagnostic device for the vehicle with a fault. C. Select the following items on the menu:Power System / Engine System (Delphi VVT ETC) / I/O Control Function Unit / Air Conditioner Clutch. Is the compressor operating properly? →**Yes** To step 10. →**No** To step 4.

Test condition	Details/results/measures
4. Check the compressor input voltage.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the harness plug E11a of the compressor. D. Connect the battery negative terminal E. Start the engine. F. Press down the power key of the diagnostic device for the vehicle with a fault. G. Select the following items on the menu:Power System / Engine System (Delphi VVT ETC) / I/O Control Function Unit / Air Conditioner Clutch. H. Measure the voltage between the No. 1 terminal of the harness plug E11a of the compressor and the reliable grounding with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** Replace the compressor. →**No** To step 5.
5. Check the compressor fuses.	
	A. Check the compressor fuses FS16. **Fuse rated capacity: 10 A** Is it OK after checking? →**Yes** To step 6. →**No** Replace the compressor fuse.
6. Check the air conditioning compressor relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Replace the K12 air conditioner compressor relay with a new one. C. Start the engine. D. Turn on the air conditioner and set the air conditioner in the cooling and running state. Check if the compressor is operating properly? →**Yes** Replace the air conditioner compressor relay. →**No** To step 7.

Test condition	Details/results/measures
7. Check the air conditioning compressor relay power supply line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the K12 air conditioner compressor relay. C. Operate the ignition switch to turn the power to ON state. D. Measure the voltage between No. 1, 3 terminals of the K12 air conditioner compressor relay of the front compartment electrical box and the reliable ground point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? **→Yes** To step 8. **→No** Check the air conditioner compressor relay power circuit for failure, and replace the front compartment electrical box as necessary.
8. Check the compressor input voltage circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the K12 A/C compressor relay. D. Disconnect the harness plug E11a of the compressor. E. Measure the resistance between No. 5 terminal of K12 air conditioner compressor relay of the front compartment electrical box and No. 1 terminal of the compressor harness plug E11a with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 9. **→No** Check the compressor input voltage circuit for failure, and replace the front compartment electrical box as necessary.
9. Check the compressor relay control circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the K12 A/C compressor relay. D. Disconnect the ECM harness connector E01a. E. Measure the resistance between the engine compartment fuse box K12 A/C compressor relay terminal 2 and the compressor harness plug E01a terminal 10 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 21. **→No** Check the compressor relay control circuit for failure, and replace the front compartment electrical box as necessary.

Test condition	Details/results/measures
10. Check the refrigerant.	
	A. Connect the A/C pressure test meter. B. Check if the refrigerant leaks or is missing. Is it OK after checking? →**No** To step 11. →**Yes** Check the refrigerant for leak failure, refill the refrigerant. **Refer to: Recycling and filling procedures for air conditioner refrigerants**
11. Check the test pressure switch.	
	A. Fill the refrigerant by standard procedure. B. Operate the ignition switch to switch the power mode to "OFF". C. Disconnect the negative connector of the battery. D. Disconnect the A/C pressure switch harness plug U13. E. Measure the resistance between the No. 2 and No. 4 terminals of the air conditioner pressure switch U13 with a multimeter. **Standard value: Less than 5Ω** F. Measure the resistance between the No. 1 and No. 43 terminals of the air conditioner pressure switch U13 with a multimeter. **Standard value: 10MΩ or higher** Is it OK after checking? →**Yes** To step 12. →**No** Replace the air conditioner pressure switch. **Refer to: Replacement of air conditioner pressure switch**
12. Check the A/C switch feedback signal circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01a. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the No. 79 terminal of the ECM harness plug E01a and the No. 9 terminal of the harness plug A07 of the air conditioner control panel with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 13. →**No** Check the A/C switch feedback signal circuit for open circuit failure and replace the wiring harness if necessary.

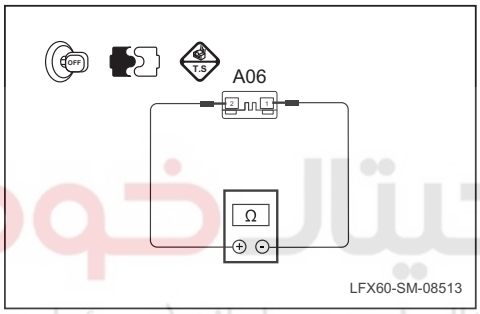
Test condition	Details/results/measures
13. Check the A / C switch signal circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ECM harness connector E01a. D. Disconnect the A/C pressure switch harness plug U13. E. Measure the resistance between the No. 40 terminal of the ECM harness plug E01a and the No. 3 terminal of the harness plug U13 of the air conditioner pressure switch with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 14. →**No** Check the A/C switch signal circuit for open circuit failure and replace the wiring harness if necessary.
14. Check the evaporator temperature sensor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the temperature harness plug A01a of evaporator. D. Measure the resistance between the No. 1 and No. 2 terminal of the evaporator temperature harness plug A01 with a multimeter. Is the resistance normal? →**Yes** To step 15. →**No** Replace the evaporator temperature sensor **Refer to: Replacement of evaporator temperature sensor**
15. Check the evaporator temperature sensor signal circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the evaporator temperature harness plug A01. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the evaporator temperature harness plug A01 terminal 2 and A/C control panel harness plug A07 terminal 18 with the multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 16. →**No** Check and repair the evaporator temperature sensor signal circuit.

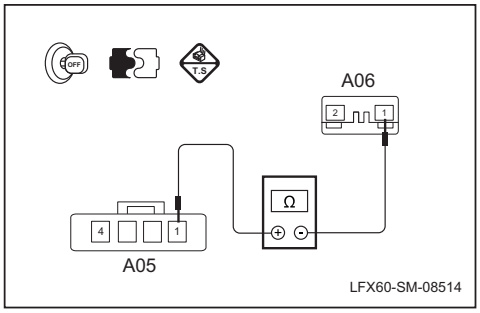
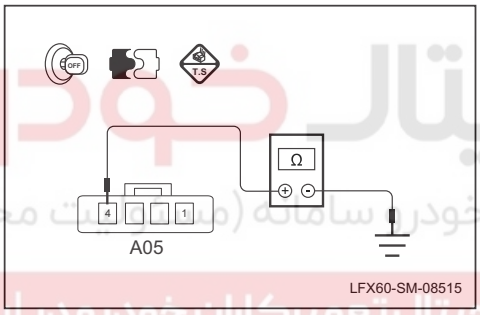
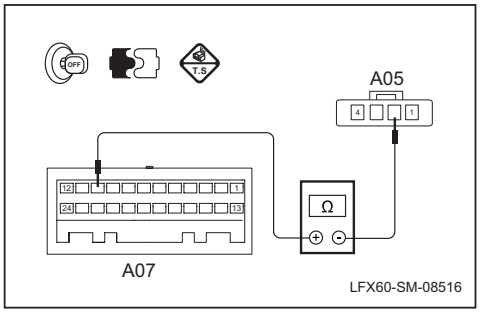
Test condition	Details/results/measures
16. Check the evaporator temperature sensor signal grounding circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the evaporator temperature harness plug A01. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the evaporator temperature harness plug A01 terminal 1 and A/C control panel harness plug A07 terminal 4 with the multimeter. **Standard value: Less than 5Ω** Are the resistance and the voltage normal? →**Yes** To step 17. →**No** Check the evaporator temperature sensor signal grounding circuit for failure, and replace the wiring harness if necessary.
17. Check the air conditioner control panel power supply circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the A/C control panel harness plug A07. D. Connect the battery negative terminal E. Operate the ignition switch to turn the power to ON state. F. Measure the voltage between No. 1 terminal of the harness plug A07 of the air conditioner control panel and the reliable grounding with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 18. →**No** Check the air conditioner control panel power supply circuit for failure and replace the wiring harness if necessary.
18. Check the air conditioner control panel grounding circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the A/C control panel harness plug A07. D. Measure the resistance between No. 23, 24 terminal of the harness plug A07 of the air conditioner control panel and the reliable grounding with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 19. →**No** Check the air conditioner control panel grounding circuit for failure and replace the wiring harness if necessary.

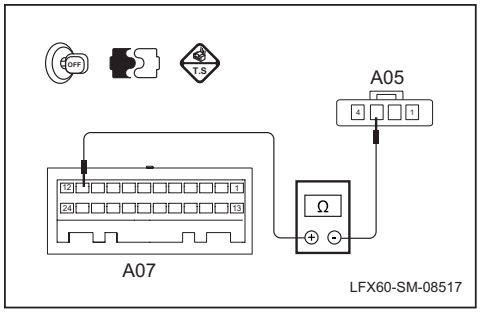
Test condition	Details/results/measures
19. Check the A/C control panel.	
	A. Replace the A/C control panel. **Refer to: Replacement of A/C control panel** Is the troubleshooting successful? →**Yes** Replace the air conditioner control panel. →**No** To step 20.
20. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM** Confirm that the fault has been ruled out.

Blower out of operation diagnosis flow

Test condition	Details/results/measures
1. General inspection.	
	A. Check the blower harness connector for aging, shedding, damage and other abnormalities. Is it OK after checking? →**Yes** To step 2. →**No** Repair the fault position.
2. Check the K18 blower fuses.	
	A. Check the blower fuse SB09. **Fuse rated capacity: 30 A** Is it OK after checking? →**Yes** To step 3. →**No** Replace the blower fuses.
3. Check the blower relay.	
	A. Operate the ignition switch to turn the power to OFF state. B. Replace the K18 blower relay with a new one. C. Operate the ignition switch to turn the power to ON state. D. Turn on the blower and check if the blower is operating properly Is the blower normal? →**Yes** Replace the K18 blower relay. →**No** To step 4.
4. Check the blower relay power supply circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the K18 blower relay. C. Operate the ignition switch to turn the power to ON state. D. Measure the voltage between No. 1 and 3 terminals of the K18 blower relay of the dashboard electrical box and the reliable ground point with a multimeter. **Standard value: 11 ~ 14 V** Is the voltage normal? →**Yes** To step 5. →**No** Check the blower relay power circuit for failure, replace the dashboard electrical box as necessary.

Test condition	Details/results/measures
5. Check the blower relay control circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Remove the K18 blower relay. C. Measure the resistance between No. 2 terminal of the K18 blower relay of the dashboard electrical box and the reliable ground point with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? → **Yes** To step 6. → **No** Check the blower relay control circuit for failure and replace the wiring harness if necessary.
6. Check the blower.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower harness plug A06. D. When measured with a multimeter, the No. 1 and No. 2 terminals of the blower should be conducting. Is it OK after checking? →**Yes** To step 7. →**No** Replace the blower. **Refer to: Replacement of blower**
7. Check the blower input voltage circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the K18 blower relay. D. Disconnect the harness plug A06 of the blower. E. Measure the resistance between the No. 5 terminal of the K18 blower relay of the dashboard electrical box and No. 2 of the harness plug A06 of the blower with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Check the blower input voltage circuit for failure, and replace the dashboard electrical box as necessary.

Test condition	Details/results/measures
8. Check the blower grounding circuit.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower harness plug A06. D. Disconnect the harness plug A05 of blower speed control module. E. Measure the resistance between the No. 1 terminal of the harness plug A06 of blower and No. 1 terminal of the harness plug A05 of the blower speed control module with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 9. **→No** Check the blower input voltage circuit for failure and replace the wiring harness if necessary.
9. Check the grounding circuit of the blower speed control resistor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower speed regulation module harness plug A05. D. Measure the resistance between No. 4 terminal of the harness plug A05 of the blower speed control module and the reliable grounding with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 10. **→No** Check the grounding circuit of the blower speed control resistor for failure and replace the wiring harness if necessary.
10. Check the control signal circuit of the blower speed control resistor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower speed regulation module harness plug A05. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the No. 2 terminal of the harness plug A05 of blower speed control module and the No. 10 terminal of the air conditioner control panel A07 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 11. **→No** Repair the blower speed regulation resistance control signal line fault and replace the harness if necessary.

Test condition	Details/results/measures
11. Check the feedback signal circuit of the blower speed control resistor.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the blower speed regulation module harness plug A05. D. Disconnect the A/C control panel harness plug A07. E. Measure the resistance between the No. 3 terminal of the harness plug A05 of blower speed control module and the No. 11 terminal of the air conditioner control panel A07 with a multimeter. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 12. **→No** Repair the blower speed regulation resistance control signal line fault and replace the harness if necessary.
12. Check the blower speed control resistor.	
	A. Replace the blower speed control resistor. **Refer to: Replacement of blower speed control resistor** Is the troubleshooting successful? **→Yes** Replace the blower speed regulation resistance. **→ No** To step 13.
13. Check the A/C control panel.	
	A. Replace the A/C control panel. **Refer to: Replacement of A/C control panel** Confirm that the fault has been ruled out.

08

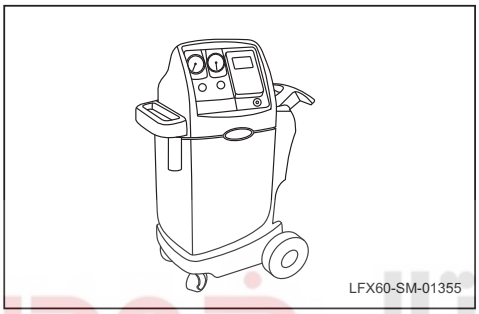
Removal and installation

Recycling and filling procedures for air conditioner refrigerants

Recycle

1. Recycle of the air conditioner refrigerants.

a. Refrigerant recycling and filling machine can complete the recovery, emptying and refilling procedures of air conditioning system with one connection. During recovery and emptying, the refrigerant is filtered to ensure that the refrigerant filled in the air conditioning system is clean and dry.



⚠Warning:

Refrigerant-related operations should be carried out in a well-ventilated environment without inhalation of refrigerant vapor. Avoid inhalation of vapor or mist of air conditioning refrigerant R-134a (tetrafluoroethane) and lubricating oil. Contact them will irritate the eyes, nose and throat. Works should be performed in a well-ventilated area.When removing R-134a from the air conditioning system, use a certified service facility (R-134a Recycling Equipment) that meets the requirements of SAE (American Society of Automotive Engineers) J 2210.If the system is accidentally discharged, the workspace must be ventilated before continuing maintenance..More information about health and safety is available from the refrigerant and lubricating oil manufacturers.

b. Connect the hose of high pressure side with quick connector to the high pressure side connector of the vehicle air conditioning system.

c. Open joint valve on the high pressure side.

d. Connect the hose of low pressure side with quick connector to the low pressure side connector of the vehicle air conditioning system.

e. Open joint valve on the low pressure side..

f. Check the the pressure gauge on the high pressure and low pressure side of the control panel on the refrigerant recycling and filling machine to ensure the air conditioning system pressure. If there is no pressure, there is no recyclable refrigerant in the system.

g. Open valves on the high pressure side and low pressure side.

h. Connect the refrigerant recycling and filling machine to appropriate power socket.

i. Turn on the main power switch.

j. Start the recycling process. Refer to the operation instructions supplied by the manufacturer and further learn about the use of refrigerant recovery and filling machine.

k. Check the low pressure side pressure gauge of control panel. If the air conditioning system pressure is kept at zero, the recovery is completed.

l. If the data indication of the low pressure side pressure gauge is not zero, then the system still has refrigerant in it. Recover the remaining refrigerant. Repeat this step until the system pressure remains at zero for 2 minutes.

Empty the refrigerants.

a. The refrigerant tank of Refrigerant Recycling and Filling Machine must be filled with sufficient amount of R-134a refrigerant for filling. Check the amount of refrigerant in the tank. If the refrigerant is less than 2 kg, add new refrigerant is to the refrigerant tank. Refer to the instructions of the Refrigerant Recycling and filing Machine for how to add the refrigerant. Check that the hoses of high pressure side and low pressure side are connected to the air conditioning system and open the valves of high pressure side and low pressure side on the control panel of the refrigerant recycling and filling machine.

b. Operate according to the operation procedure of the refrigerant recycling and filling machine, start the vacuum pump and start the empty program.

c. Check the system for leaks. Refer to the operation instructions supplied by the manufacturer and further learn about the use of refrigerant recovery and filling machine.

Lubricating oil filling, refilling of refrigeration system

ⓘNote:

It is necessary to replenish the lubricating oil discharged from the air conditioning system during the recovery of the refrigerant.

a. Use the lubricants used exclusively for the R-134a system.
b. Refer to the manufacturer's instruction manual for details on how to use the refrigerant recycling and filling machine and add the specified lubricating oil to the vehicle air conditioning system.
c. When the filled oil reaches the required level, close the valve.

Filling

1. Filling of the air conditioner refrigerants.
a. Open the low pressure side valve on the control panel.
b. Open the high pressure side valve on the control panel.
c. Refer to the manufacturer's instruction manual for details on how to use the refrigerant recycling and filling machine.
d. Fill the air conditioner with the specified amount of refrigerant, make sure that the unit of measurement is correct (ie kilograms, kilograms or pounds).
e. Start filling.
2. After the refrigerant filling is complete, do the following:
a. Close the valves of the high and low pressure side on the control panel of refrigerant recycling and filling machine, both valves should be closed.
b. Start the vehicle air conditioning system.
c. Keep the engine running until the readings of the pressure gauge on the high pressure side and the low pressure side is stable.
d. Compare the readings with the system specifications.
e. Check the outlet temperature of evaporator to ensure that the air conditioning system operates in accordance with system specifications.
f. Turn off the air conditioning system.
g. Disconnect the hoses of the high and low pressure side from the vehicle.
h. Perform the cleaning operation of the air conditioning hose according to the instructions of the refrigerant recycling and filling machine.

Replacement of the air conditioner control panel

Removal

1. **Remove the air conditioner control panel.**

(a). Remove the air conditioner control panel, **refer to the replacement of the dashboard assembly.**

Installation

1. **Install the air conditioner control panel.**

(a). Install the air conditioner control panel, **refer to the replacement of the dashboard assembly.**

Replacement of compressor

Removal

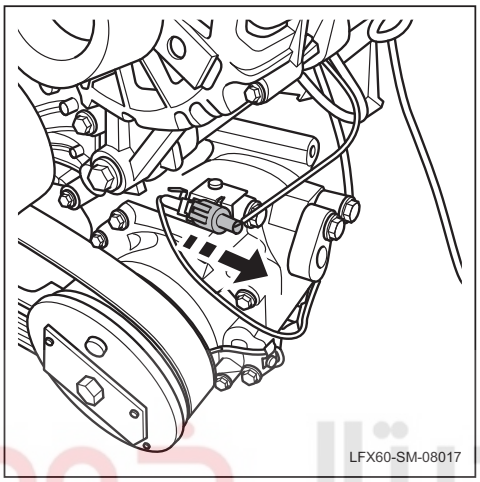
1. **Remove the compressor to evaporator front section line.**

(a). Recycle refrigerant, **refer to the recycling and filling procedures for air conditioner refrigerants**

(b). Disconnect the battery negative terminal .

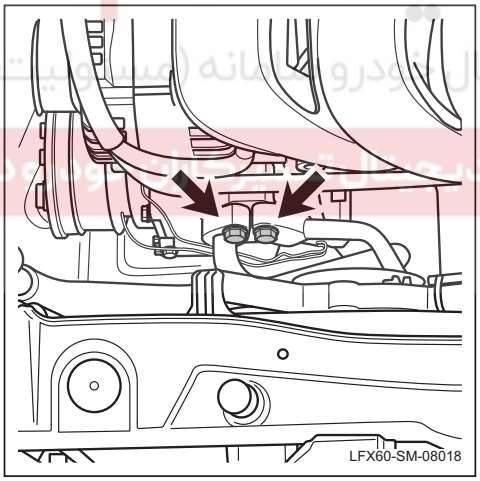
(c). Remove the compressor belt, **refer to the replacement of the compressor belt.**

(d). Lift the vehicle, **refer to:Lifting and support of the vehicle.**

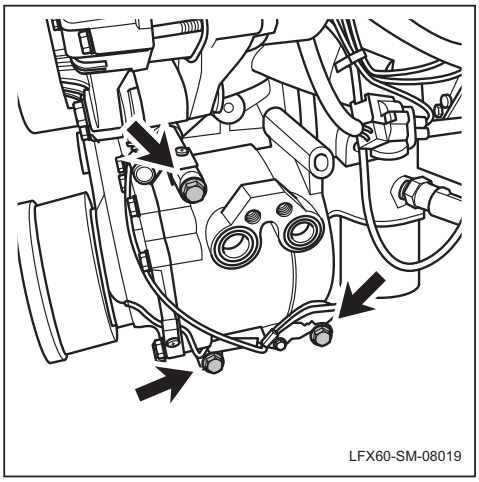


(e). Remove the bottom guard of the engine.

(f). Disconnect the harness plug of the compressor.



(g). Remove the fixing bolts of the air conditioner compressor piping.



(h). Remove the fixing bolts of the compressor.
(i). Take off the compressor.

Installation

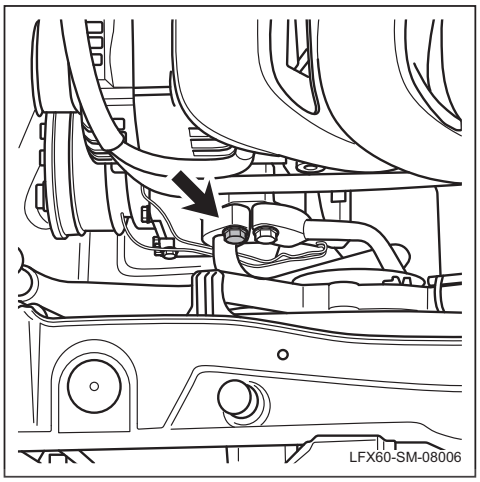
1. Install the compressor.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

Replacement of the front piping from compressor to evaporator

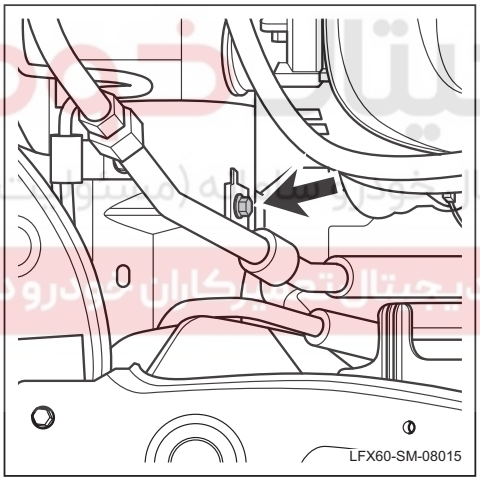
Removal

1. Remove the compressor to evaporator front section line.

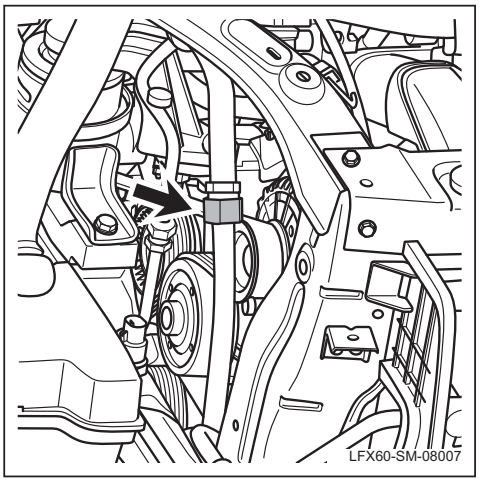
(a). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**



(b). Remove the pipe fixing bolts on the compressor.



(c). Remove the fixing bolts of bracket for the air conditioner piping.



(d). Remove the lock nut of the compressor piping.
(e). Take off the front piping from compressor to evaporator.

Installation

1. Install the front piping from compressor to evaporator.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

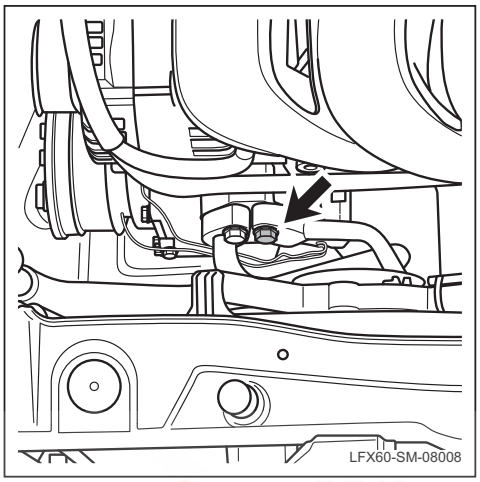
Replacement of the piping from compressor to condenser

Removal

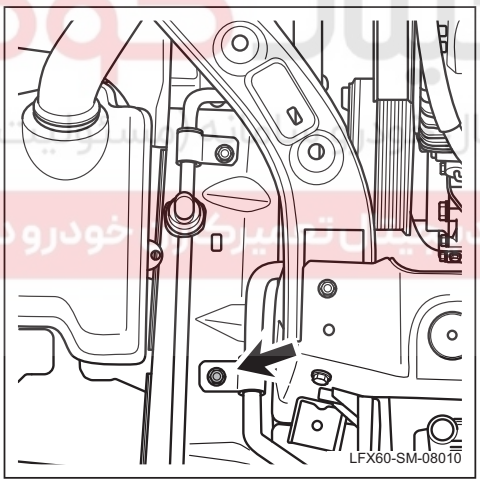
1. Remove the piping from compressor to condenser.

(a). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

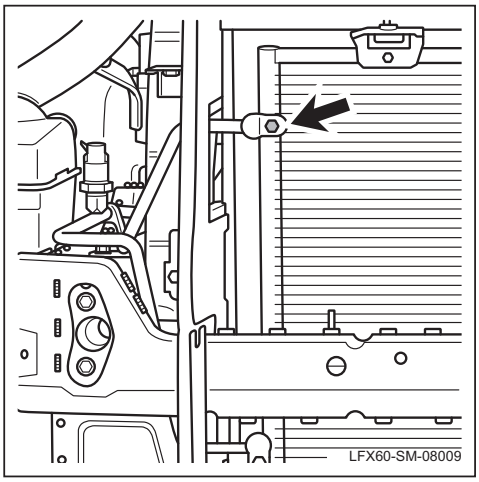
(b). Remove the front bumper and grid assembly. **Refer to the replacement of front bumper assembly.**



(c). Remove the pipe fixing bolts on the compressor.



(d). Remove the fixing bolts of bracket for the air conditioner piping.



(e). Remove the pipe fixing bolts on the condenser.
(f). Take off the piping from compressor to condenser.

Installation

1. Install the piping from compressor to condenser.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

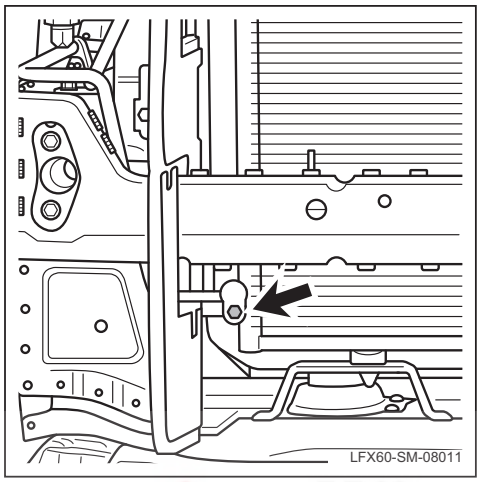
Replacement of the front piping from condenser to evaporator

Removal

1. Remove the front piping from condenser to evaporator

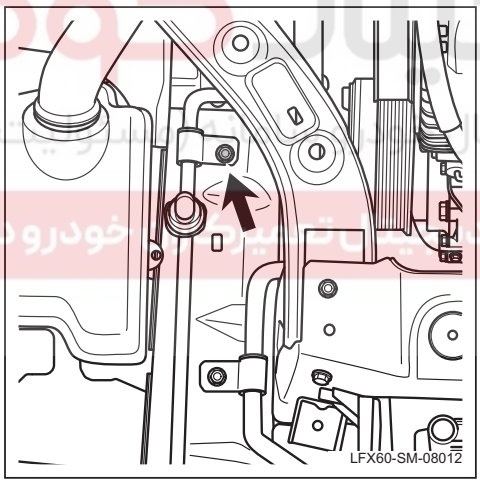
(a). Recover the refrigerant. Refer to the A/C refrigerant recovery and filling procedures.

(b). Remove the front bumper and grid assembly. Refer to the replacement of front bumper assembly.

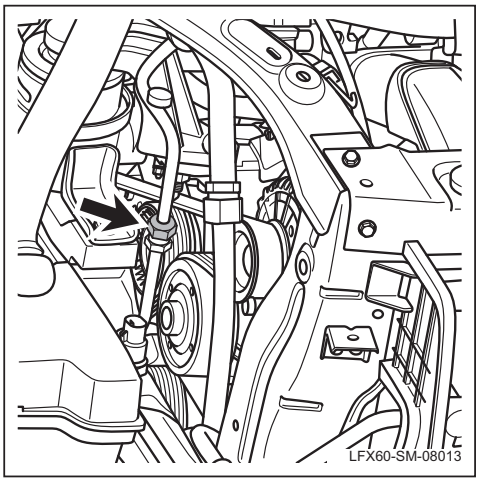


(c). Remove the pipe fixing bolts on the condenser.

(d). Disconnect the harness plug of air conditioner pressure switch.



(e). Remove the fixing bolts of bracket for the air conditioner piping.



(f). Remove the lock nut of air conditioner piping.
(g). Take off the front piping from condenser to evaporator

Installation

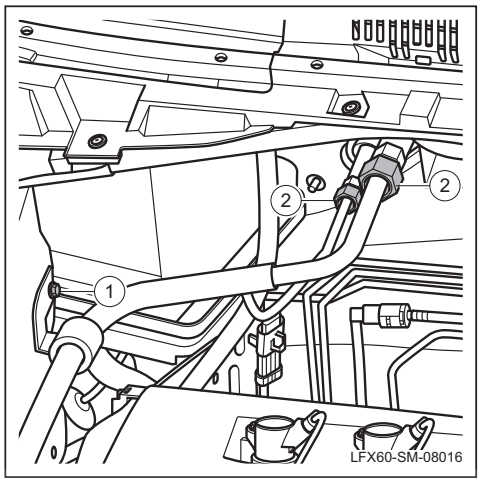
1. Install the condenser to evaporator front section line.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. Refer to the A/C refrigerant recovery and filling procedures.
(c). Check for refrigeration system leak.

Replacement of the front piping of evaporator

Removal

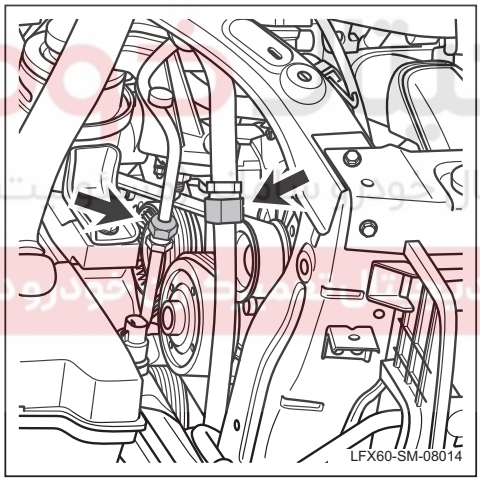
1. Remove the front piping of evaporator

(a). Recover the refrigerant. Refer to the A/C refrigerant recovery and filling procedures.



(b). Remove the fixing bolts 1 of bracket for the air conditioner piping.

(c). Remove the lock nut 2 of the front piping of evaporator



(d). Remove the lock nut of air conditioner piping.

(e). Take off the front piping of evaporator.

Installation

1. Install the condenser to evaporator front section line.

(a). The installation sequence is the reverse of the disassembly order.

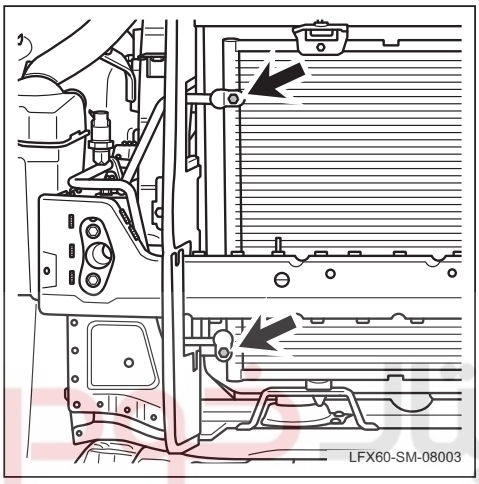
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(c). Check for refrigeration system leak.

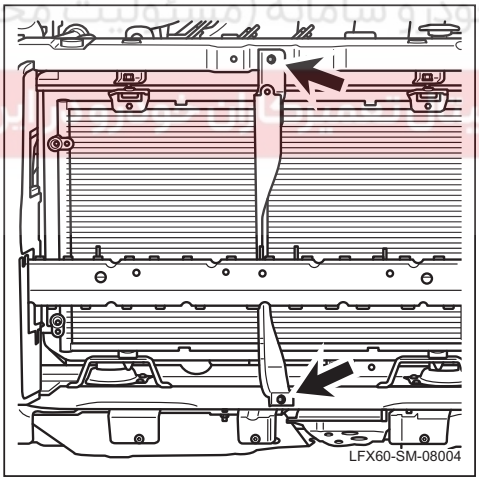
Replacement of condenser

Removal

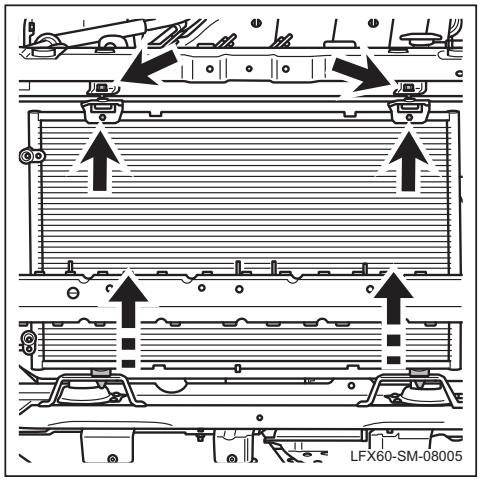
1. Remove the condenser.
(a). Disconnect the battery negative cable.
(b). Remove the front bumper. **Refer to the replacement of front bumper assembly.**
(c). Remove the hood lock, **refer to the replacemen of hood lock.**
(d). Remove the ambient temperature sensor, **refer to the replacement of ambient temperature sensor.**
(e). Recycle the refrigerant, **refer to the recycling and filling procedures for air conditioner refrigerants**



(f). Remove the fixing bolts of the condenser piping.



(g). Remove the lock nut of the front braket.



(h). Remove the fixing bolts of the condenser bracket.
(i). Take off the condenser assembly upwards.

Installation

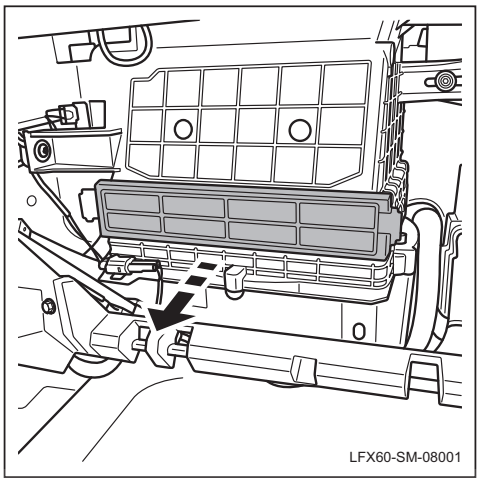
1. The installation sequence is reverse to the removal sequence.
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

Replacement of air conditioner filter

Removal

1. Remove the air conditioner filter

(a). Remove the glovebox, **refer to the replacement of the dashboard assembly.**



(b). Remove the housing of air conditioning filter and take off the air conditioning filter.

Installation

1. Install the air conditioner filter

(a). The installation sequence is the reverse of the disassembly order.

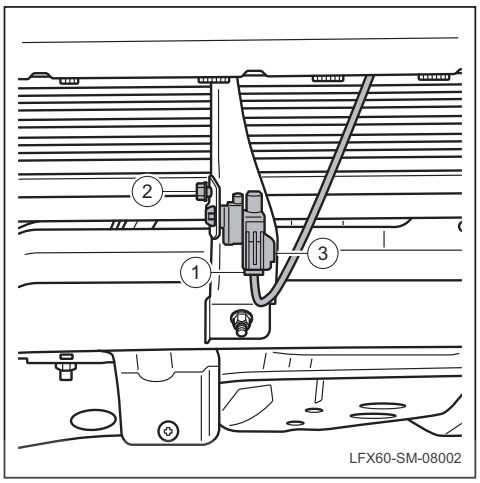
Replacement of ambient temperature sensor

Removal

1. Remove the ambient temperature sensor.

(a). Disconnect the battery negative connector.

(b). Remove the front bumper. Refer to the replacement of front bumper assembly.



(c). Disconnect the harness plug 1 of the ambient temperature sensor.

(d). Remove the fixing bolts 2 of bracket for ambient temperature sensor.

(e). Take off the ambient temperature sensor 3.

Installation

1. Install the ambient temperature sensor.

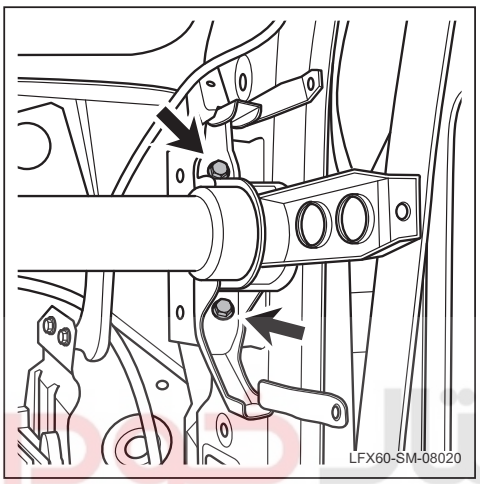
(a). The installation order is the reverse of the disassembly order.

Replacement of HVAC assembly

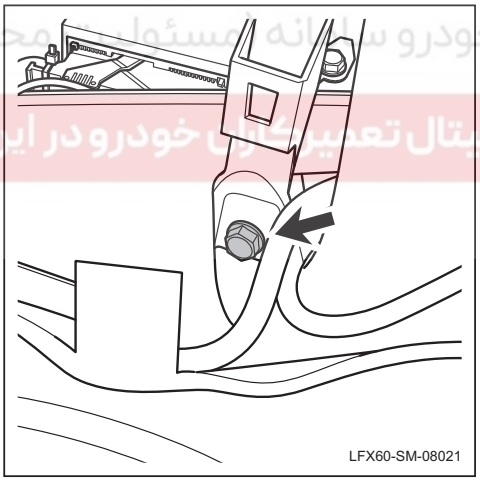
Removal

1. Remove the HVAC assembly.

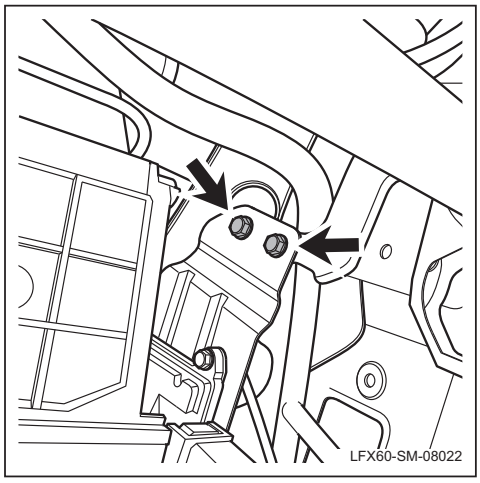
(a). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(b). Recycling of engine coolant, **refer to the recycling and filling procedures for coolant.**
(c). Disconnect the battery negative terminal.
(d). Remove the console, **refer to the replacement of the console assembly.**
(e). Remove the dashboard, **refer to the replacement of the dashboard assembly.**
(f). Remove the front cover, **refer to the replacement of the front ventilation cover assembly.**



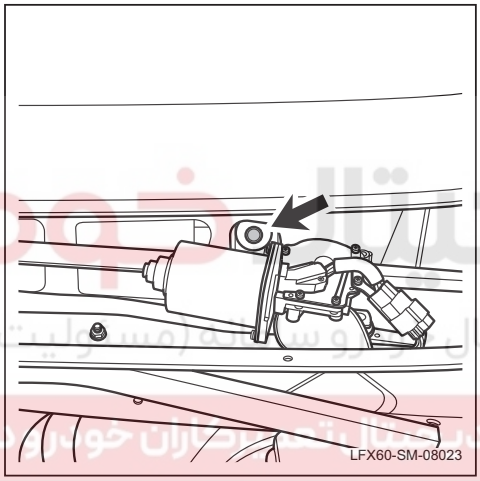
(g). Remove the left and right fixing bolts of dashboard pipe column beam.



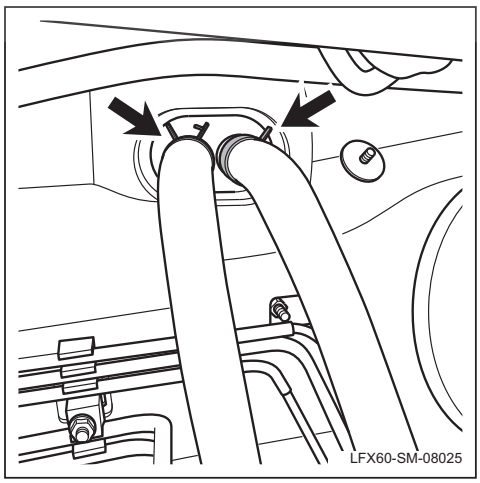
(h). Remove the lower fixing bolts of dashboard pipe column beam.



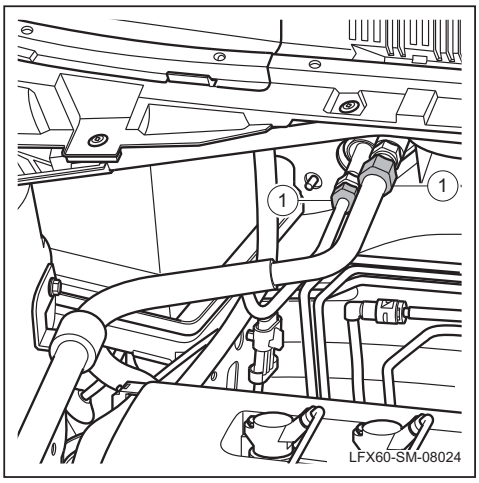
(i). Remove the fixing bolts of the ECU module bracket and the pipe beam.



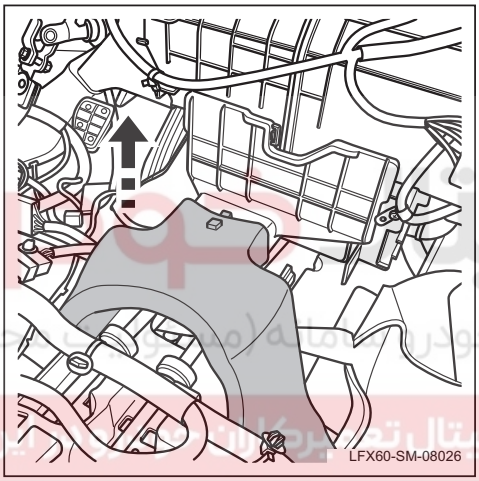
(j). Remove the front fixing bolts of dashboard pipe column beam.
(k). Disconnect the harness clip and harness plug of the dashboard pipe column beam.
(l). Take off the dashboard pipe column beam.



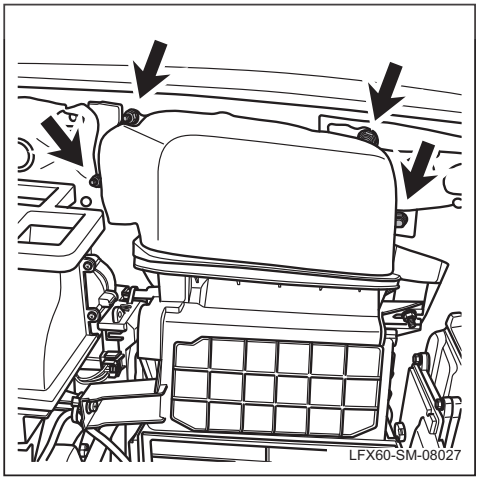
(m). Remove the clamp of heating water pipe.
(n). Remove the heating water pipes.



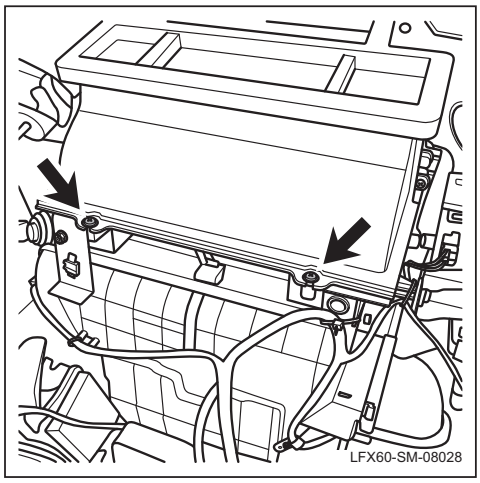
(o). Remove the lock nut 1 of air conditioner piping.
(p). Remove the air conditioner piping.



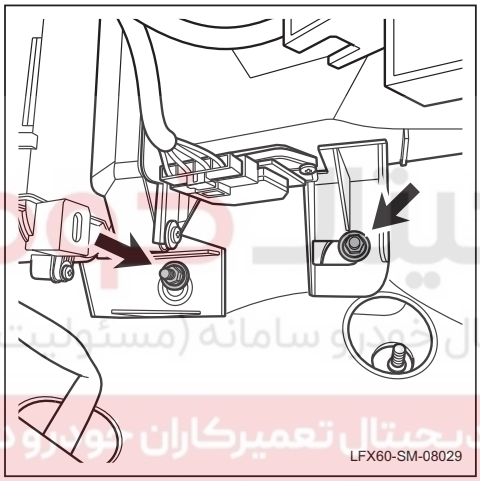
(q). Remove the floor duct.



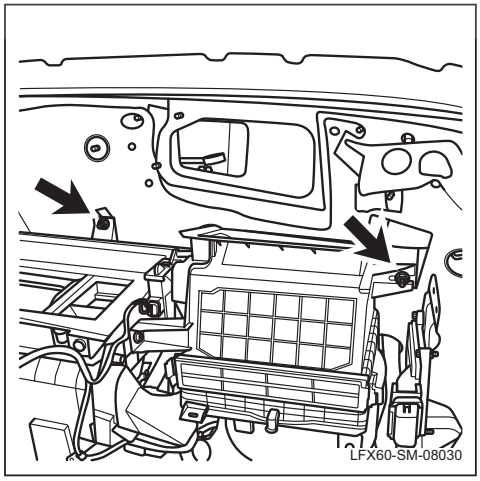
(r). Remove the fixing nut of HVAC assembly.



(s). Remove the fixing screws of the upper outlet of HVAC assembly and take it off.



(t). Remove the lower fixing nut of HVAC assembly.



(u). Remove the fixing nut of HVAC assembly.
(v). Take off the HVAC assembly.

Installation

1. **Install the evaporator assembly.**

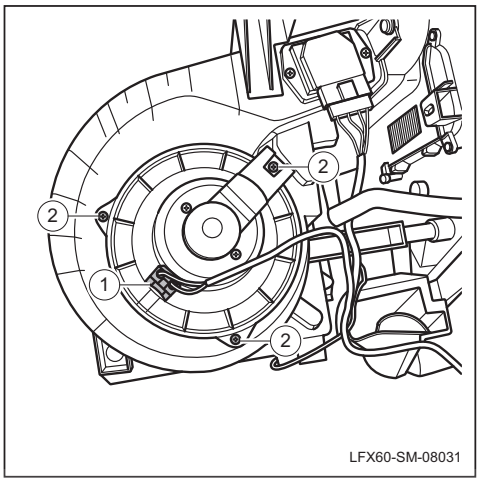
(a). The installation sequence is the reverse of the disassembly order.
(b). Fill the A/C refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Check for refrigeration system leak.

Replacement of blower motor

Removal

1. Remove the blower motor.

(a). Disconnect the battery negative cable.



(b). Disconnect the harness connector 1 of blower motor.

(c). Remove the fixed screw 2 of the blower motor.

(d). Take off the blower motor.

Installation

1. Install the blower motor.

(a). The installation sequence is the reverse of the disassembly order.

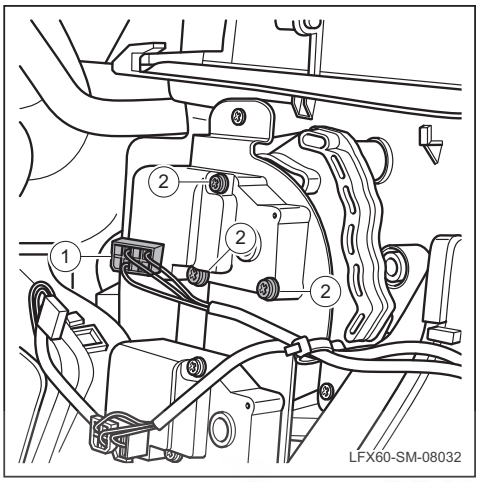
Replacement of mode throttle motor

Removal

1. Remove the mode throttle motor.

(a). Disconnect the battery negative connector.

(b). Remove the dashboard lower left panel assembly. Refer to the replacement of dashboard assembly.



(c). Disconnect the harness connector 1 of mode throttle motor.

(d). Remove the fixing screw 2 of mode throttle motor.

(e). Take off the mode throttle motor.

Installation

1. Install the mode throttle motor.

(a). The installation sequence is the reverse of the disassembly order.

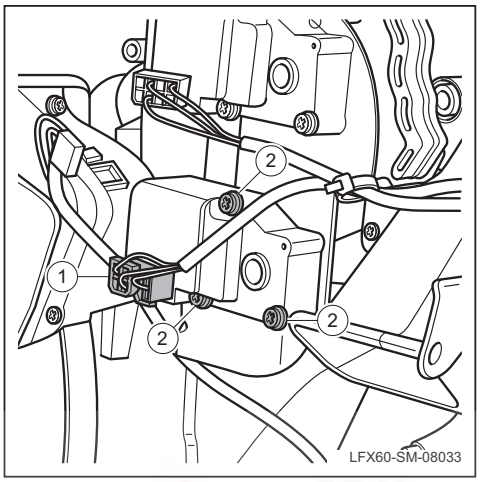
Replacement of cool and heat throttle motor

Removal

1. Remove the cool and heat throttle motor.

(a). Disconnect the battery negative connector.

(b). Remove the dashboard lower left panel assembly. **Refer to the replacement of dashboard assembly.**



(c). Disconnect the harness connector 1 of cool and heat throttle motor.

(d). Remove the fixing screw 2 of cool and heat throttle motor.

(e). Take off the cool and heat throttle motor.

Installation

1. Install the cool and heat throttle motor.

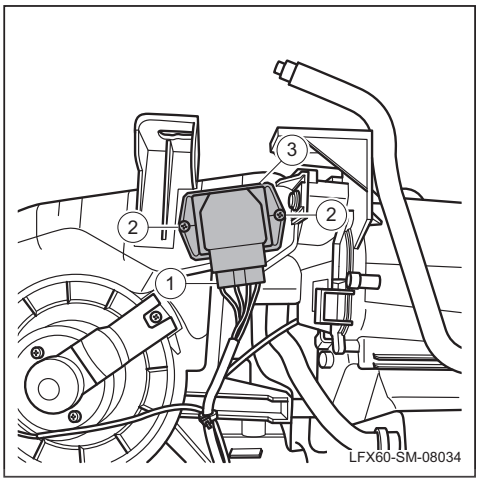
(a). The installation sequence is the reverse of the disassembly order.

Replacement of blower speed control module

Removal

1. Remove the blower speed regulation module.

(a). Disconnect the battery negative cable.



(b). Disconnect the harness plug 1 of blower speed control module.

(c). Remove the fixed screw 2 of the blower speed control module.

(d). Take off the blower speed control module

Installation

1. Install the blower speed control module

(a). The installation sequence is the reverse of the disassembly order.

Replacement of new return throttle motor

Removal

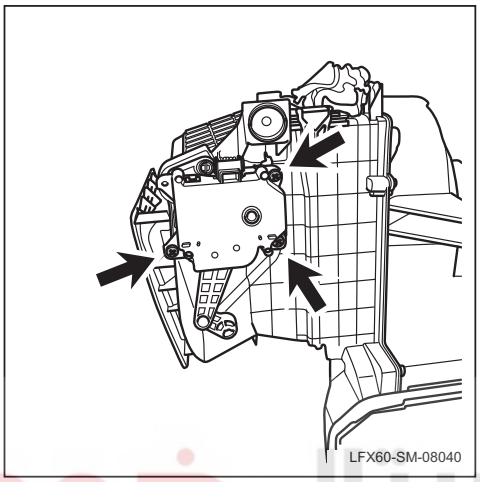
1. Remove the new return throttle motor.

(a). Disconnect the battery negative cable.

(b). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(c). Recover the engine coolant. **Refer to engine coolant draining and filling procedures.**

(d). Remove the HVAC assembly. **Refer to the replacement of HVAC assembly.**



(e). Remove the blower tank and evaporator tank connecting bolt and separate them.

(f). Disconnect the harness connector 1 of new return throttle motor.

(g). Remove the fixing screw of the new return throttle motor.

(h). Take off the new return throttle motor.

08

Installation

1. Install the new return throttle motor.

(a). The installation sequence is the **reverse of the disassembly order.**

(b). Install the HVAC assembly, **refer to the replacement of HVAC.**

(c). Fill the refrigerant, **refer to the A/C refrigerant recovery and filling procedures.**

(d). Fill the engine coolant, **refer to the engine coolant draining and filling procedures.**

(e). Connect the battery negative terminal

Replacement of heating water tank

Removal

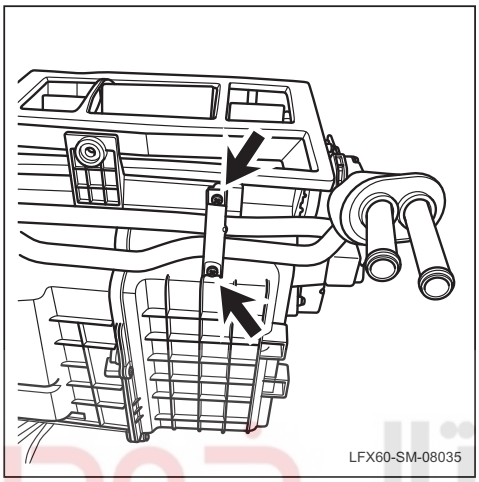
1. Remove the heating water tank

(a). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**

(b). Recycling of engine coolant, **refer to the recycling and filling procedures for engine coolant.**

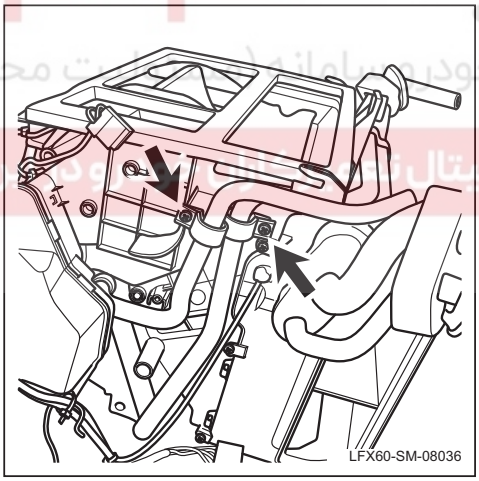
(c). Disconnect the battery negative terminal.

(d). Remove the HVAC assembly. **Refer to the replacement of HVAC assembly.**



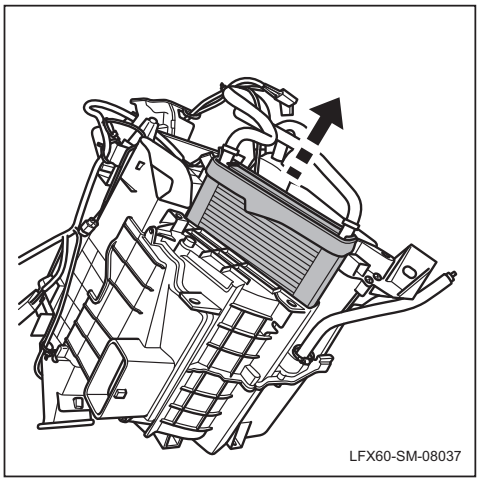
(e). Remove the blower tank and evaporator tank connecting bolt and separate them.

(f). Remove the fixing screw of heating water tank.



(g). Remove the fixing screw of heating water tank.

(h). Disconnect the harness snap and the fixing screw of HVAC assembly.



(i). Take off the heating water tank.

Installation

1. Install the heating water tank.

(a). The installation sequence is the **reverse of the disassembly order.**

(b). Install the HVAC assembly, **refer to the replacement of HVAC.**

(c). Fill the refrigerant, **refer to the A/C refrigerant recovery and filling procedures.**

(d). Fill the engine coolant, **refer to the engine coolant draining and filling procedures.**

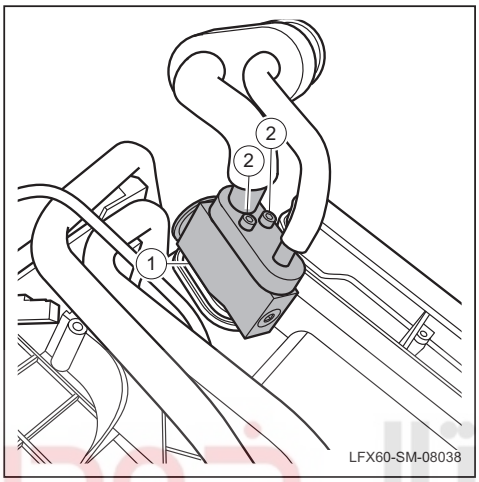
(e). Connect the battery negative terminal

Replacement of expansion valve

Removal

1. Remove the expansion valve.

(a). Disconnect the battery negative connector.
(b). Recover the refrigerant. **Refer to the A/C refrigerant recovery and filling procedures.**
(c). Recycling of engine coolant, **refer to the recycling and filling procedures for engine coolant.**
(d). Remove the HVAC assembly, **refer to the replacement of HVAC assembly.**



(e). Remove the fixing bolt 2 of expansion valve.
(f). Take off the expansion valve 1.

Installation

1. Install the expansion valve.

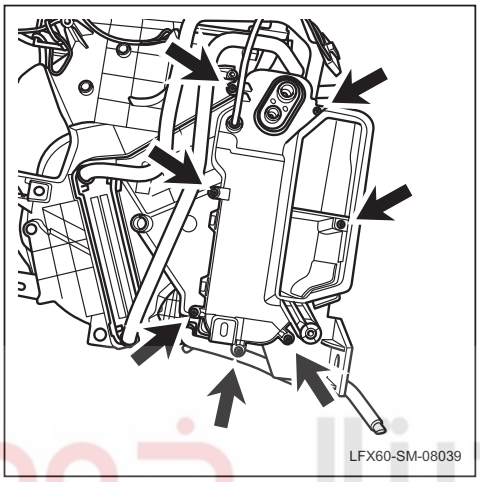
(a). The installation sequence is the reverse of the disassembly order.
(b). Install the HVAC assembly, **refer to the replacement of the HVAC assembly.**
(c). Filling of engine coolant, **refer to the recycling and filling procedures for engine coolant.**
(d). Refill refrigerant, **refer to the recycling and filling procedures for air conditioner refrigerants**
(e). Connect the battery negative terminal

Replacement of the evaporator

Removal

1. **Remove the evaporator.**

(a). Disconnect the battery negative connector.
(b). Recover the refrigerant, **refer to the A/C refrigerant recovery and filling procedures.**
(c). Recover the engine coolant, **refer to engine coolant draining and filling procedures.**
(d). Remove the HVAC assembly, **refer to the replacement of HVAC assembly.**
(e). Remove the expansion valve, **refer to the replacement of expansion valve.**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(f). Remove the connecting bolts of the blower housing and the evaporator housing and separate them.
(g). Remove the fixing screw of evaporator upper cover.
(h). Take off the evaporator.

08

Installation

1. **Install the evaporator.**

(a). The installation sequence is the reverse of the disassembly order.
(b). Install the expansion valve, **refer to the replacement of expansion valve.**
(c). Install HVAC assembly, **refer to the replacement of HVAC assembly.**
(d). Fill the engine coolant,**refer to the engine coolant draining and filling procedures.**
(e). Refill refrigerant, **refer to the recycling and filling procedures for air conditioner refrigerants.**
(f). Connect the negative connector of the battery.