

AIR CONDITIONING SYSTEM

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Precautions

This chapter mainly introduces operating principle and maintenance and repair of refrigerant R134a air conditioner. Some of automobiles of our company adopt rear air conditioning system. In maintenance of rear air conditioning system, faults in front air conditioning system must be removed first. As rear air conditioning system is composed of electric motor and evaporator, rear air conditioning system can be maintained and repaired in the same maintenance and repair method adopted for the electric motor and evaporator assembly front air conditioning system.

General

Electrical parts

Before moving and check electrical parts, set ignition switch at "LOCK" position, and disconnect the negative wire from the battery (if necessary).

Refrigerating system

(1) The following precautions should be taken when handling R134a refrigerant.

- ① Do not handle refrigerant in an enclosed room or near fire.
- ② Operators must wear goggles in operation.
- ③ Care should be taken not let liquid refrigerant enter your eyes or splash on your skin. If such things happen, following measures should be taken:
 - ▲ Do not rub eyes or skin.
 - ▲ Use large quantity of water to flush eyes or skin.
 - ▲ Apply clean Vaseline on the skin.
 - ▲ Go to hospital to seek treatment immediately.
 - ▲ Do not attempt to treat it by yourself.

(2) Care should be taken when replace parts:

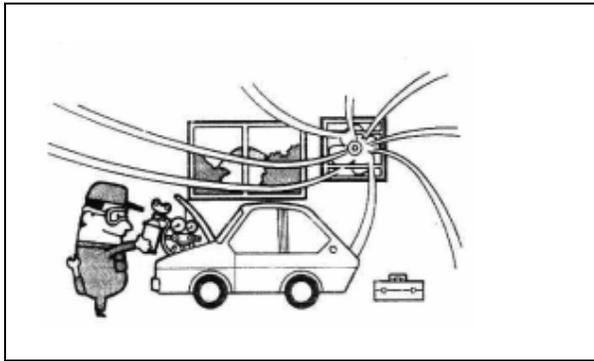
- ① Before replacing parts, slowly drain out refrigerant.
- ② Immediately seal the parts removed, so as to prevent moisture and dust from entering into the system.
- ③ Do not heat the pipes with high temperature when bending or stretching them.

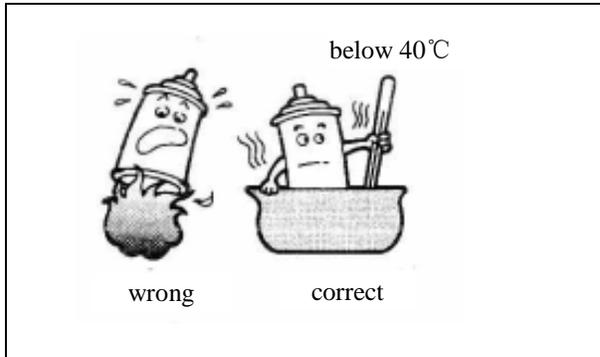
(3) Care should be taken when tightening parts:

- ① Slightly coat O-rings with compressor lubricating oil.
- ② Use two wrenches to tighten nuts to their specified torque.

(4) Care should be taken when vacuuming the system:

Vacuum the product for 5 minutes approximately, and check the system for leakage. Then, further vacuum the system for at least 25 minutes, so as to ensure that all air and moisture are removed.





(5) Care should be taken when filling refrigerant:

- ① Refrigerant must filled in gas state.
- ② when handling refrigerant maintenance tank, temperature must kept below 40°C .
- ③ When heating maintenance tank, make sure that the valve at the top of the maintenance tank is not immersed into water.
- ④ Empty maintenance tank can not be re-used.
- ⑤ Filling should be made under low pressure.
- ⑥ Do not fill too much refrigerant, as this will decrease the efficiency of cooling, lower the economy of the fuel, and overheat the engine.

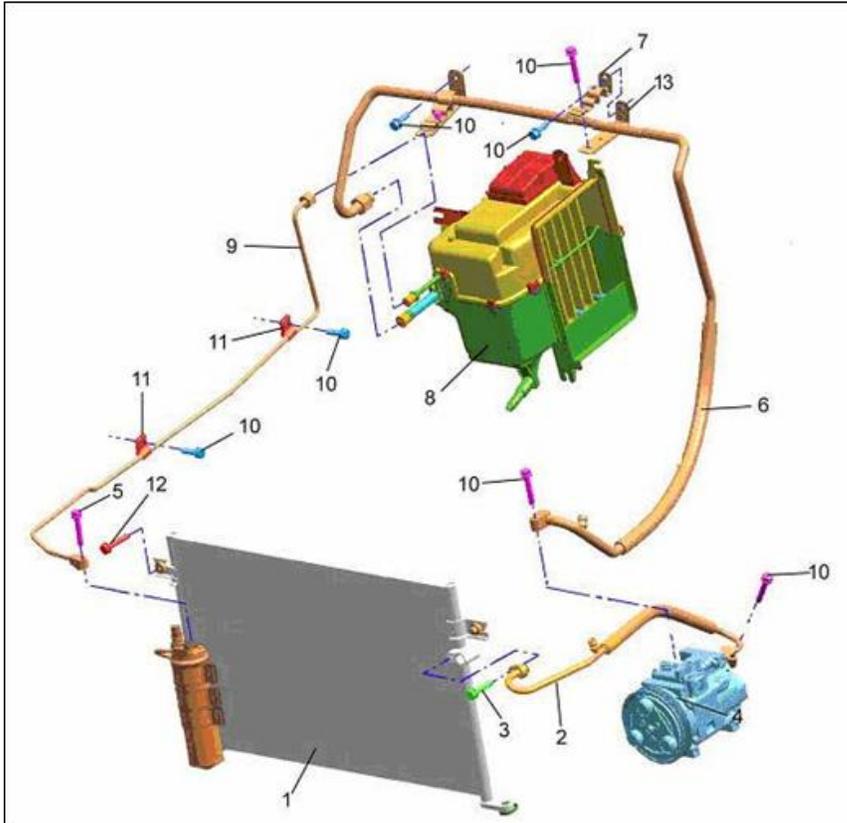
(6) Recovery of refrigerant:

Use air conditioner refrigerator recovery, regenerating and refill (ACR4) system to recover refrigerant.

Installation and Removal of Air Conditioner

1 Air conditioner assemblies in the cabin

Schematic Diagram of Air Conditioner Assemblies Installed in the Cabin:



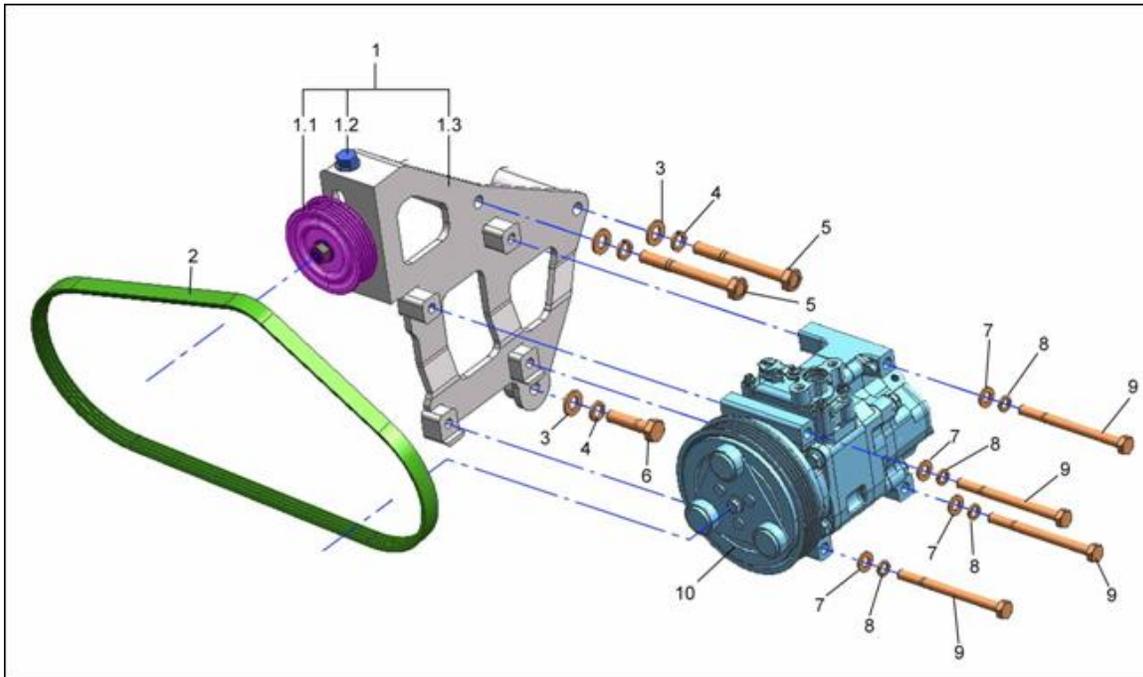
S/N Descriptions

1	Condenser assembly	8	Evaporator assembly
2	High pressure hose assembly	9	Fluid reservoir exhaust pipe
3	Hex-head bolt, spring washer and flat washer assembly	10	Hex-head bolt, spring washer and flat washer assembly
4	Compressor assembly	11	Fluid reservoir exhaust pipe clamp
5	Hex-head bolt, spring washer and flat washer assembly	12	Hex-head bolt, spring washer and flat washer assembly
6	Lower pressure hose assembly	13	Lower body of fixed pipe clamp
7	Upper body of fixed pipe clamp		

Engine chamber mainly includes compressor, compressor bracket assembly, belt, condenser assembly, fluid reservoir and connecting pipeline, and water valve and hot water pipe.

- 2 Removal and installation of air conditioner assemblies in the cabin
 - (1) Removal of air conditioner pipeline
 - Recover air conditioner refrigerant.
 - Remove air conditioner pipe clamp and bolt (when removing 9, it is necessary to remove air conditioner pipe clamp).
 - Remove nut or bolt of air conditioner pipeline fitting (when removing 2 and 9, it is necessary to remove intermediate strainer).
 - Remove air conditioner pipeline.
 - (2) Installation of air conditioner pipeline.
 - Position air conditioner pipeline.
 - Install nut or bolt of air conditioner pipeline fitting.
 - Install air conditioner pipe clamp (when installing 9, it is necessary to install air conditioner pipe clamp).
 - Vacuum the system. Fill air conditioner refrigerant.
 - Install intermediate strainer.
 - (3) Remove of condenser:
 - Recover air conditioner refrigerant.
 - Remove intermediate strainer, and hood lock bracket.
 - Remove air conditioner pipeline.
 - Remove installation bolt of condenser.
 - Take out air conditioner condenser.
 - (4) Installation of condenser:
 - Position air conditioner condenser, and place air conditioner lower bracket into fixing pillar.
 - Install condenser bolt.
 - Vacuum the system. Fill air conditioner refrigerant.
 - Install air conditioner pipeline.
 - Vacuum the system. Fill air conditioner refrigerant.
 - Install hood lock bracket and intermediate strainer.
 - (5) Remove of fluid reservoir assembly and three-state cock.
 - Remove air conditioner condenser assembly (as for detail, refer to removal of condenser).
 - Loosen bolt on fluid reservoir assembly bracket.
 - Remove fluid reservoir assembly.
 - Remove air conditioner three-state cock.
 - (6) Installation of fluid reservoir assembly and three-state cock
 - Install air conditioner three-state cock.
 - Install fluid reservoir assembly.
 - Tighten bolt on fluid reservoir assembly bracket.
 - Install air conditioner condenser assembly (as for detail, refer to installation of condenser).

- (7) Installation and removal of compressor and compressor bracket and tensioner assembly, belt.



S/N	Description	S/N	Description
1	Compressor bracket and tensioner assembly	4	Spring washer
1.1	Compressor bracket	5	Hex-head bolt
1.2	Hex-head bolt	6	Hex-head bolt
1.3	Tensioner assembly	7	Flat washer
2	Compressor belt	8	Spring washer
3	Flat washer	9	Hex-head bolt
		10	Compressor assembly

- (8) Removal of compressor belt.
 Loosen 1.1 fastening bolt.
 Loosen 1.2 installation bolt of compressor tensioner assembly, and adjust tensioner to move it to the inside of belt.
 Remove compressor belt.
- (9) Installation of compressor belt
 Install compressor belt. The belt should be aligned with the wheel groove.
 Adjust 1.2 installation bolt of compressor tensioner assembly to move tensioner upward and tighten compressor belt.
 Adjust tightness of compressor belt, and tighten 1.1 fastening bolt.
 Check tightness of compressor belt.
- (10) Removal of compressor assembly
 Recover air conditioner refrigerant.
 Remove compressor belt (Item 2).
 Remove air conditioner pipeline in connection with compressor assembly.
 Remove fastening bolt of compressor assembly (Item 9).
 Remove compressor assembly (Item 10).

(11) Installation of compressor assembly

Install compressor belt. The belt should be aligned with the wheel groove.

Adjust installation bolt (Item 1.2) of compressor tensioner assembly to move tensioner upward and tighten compressor belt.

Adjust tightness of compressor belt, and tighten fastening bolt (Item 1.1).

Adjust tightness of compressor belt.

(12) Removal of compressor bracket and tensioner assembly

Remove compressor belt and compressor assembly (refer to Removal of Compressor Assembly and Removal of Compressor Belt).

Remove of installation bolts (Items 5 and 6) of compressor bracket.

Remove compressor bracket.

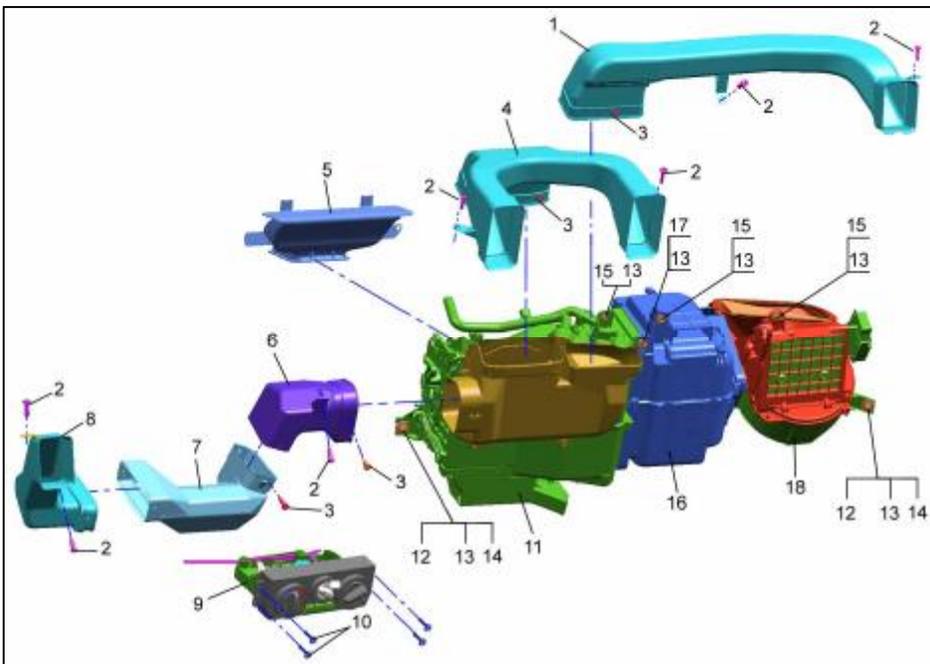
(13) Installation of compressor bracket and tensioner assembly

Install compressor bracket and tensioner assembly, aligning the installation space of the compressor bracket with bolt hole on engine.

Tightening installation bolt.

Install compressor.

Install compressor belt.



S/N Description of Parts

- 1 Codriver side air passage
- 2 Philips pan-head self-tapping screw +large flat washer
- 3 Philips pan-head self-tapping screw
- 4 Center air passage
- 5 Defrost air passage
- 6 Driver's right side air passage
- 7 Air passage 3
- 8 Driver's left side air passage
- 9 Air conditioner controller assembly (with cable)

- 10 Philips pan-head self-tapping screw
- 11 Air heater assembly
- 12 Philips pan-head self-tapping screw
- 13 Large washer
- 14 Large washer
- 15 Hex nut
- 16 Evaporator assembly
- 17 Philips pan-head self-tapping screw
- 18 Blower assembly

X Air Conditioning System

- a) Removal of air conditioner air passages (Items 1, 4, 5, 6, 7 and 8)
 - Remove instrument panel assembly
 - Remove self-tapping screw of air passage.
 - Remove air conditioner air passage.
 - b) Installation of air conditioner air passages (Items 1, 4, 5, 6, 7 and 8)
 - Install air conditioner air passage.
 - Install self-tapping screw of upper air passage.
 - Install instrument panel assembly.
 - c) Removal of air conditioner controller (Item 9)
 - Remove instrument panel cover.
 - Disconnect switch connector from instrument panel cover.
 - Remove self-tapping screw (Item 10).
 - Pull out air conditioner controller.
 - Disconnect wire bundle of air conditioner controller assembly.
 - Remove air conditioner cable.
 - d) Installation of air conditioner controller (Item 9)
 - Install air conditioner cable, and set controller in air conditioner mode.
 - Install wire bundle of air conditioner controller assembly.
 - Install air conditioner controller.
 - Install switch connecting wire.
 - Install self-tapping screw (Item 10).
 - Connect switch connector of instrument panel cover.
 - Install instrument panel cover.
 - e) Installation of evaporator assembly
 - Recover air conditioner refrigerant.
 - Remove plugs of air conditioner low pressure hose assembly and fluid reservoir exhaust pipe to evaporator assembly.
 - Remove instrument panel assembly (as for detail, refer to Removal of Instrument Panel Assembly).
 - Unplug the connecting plug of evaporator and wire bundle.
 - Remove nut and screw fixing evaporator assembly.
 - Pull out evaporator assembly.
 - f) Removal of evaporator assembly
 - Install evaporator assembly, allow upper bolt catch evaporator, and align evaporator hole with holes of blower assembly and air heater assembly.
 - Install nut and screw fixing evaporator assembly.
 - Connect the connecting plug of evaporator and wire bundle.
 - Install instrument panel assembly (as for detail, refer to Removal of Instrument Panel Assembly).
 - Connect plugs of air conditioner low pressure hose assembly and fluid reservoir exhaust pipe to evaporator assembly.
 - Vacuum the system, and fill air conditioner refrigerant.
- 3 Removal and installation of air conditioner assemblies in the cabin

- g) Removal of air heater assembly
Remove warn air water inlet pipe (—) connected to air heater, and air conditioner warn air water outlet pipe.
Remove instrument panel assembly (as for detail, refer to Removal of Instrument Panel Assembly).
Remove codriver side air conditioner air passage, air passage 6,air passage 3, and defrost air passage.
Unplug the connecting plug of evaporator and wire bundle.
Remove nut and screw fixing evaporator assembly.
Pull out evaporator assembly about 20mm.
Remove air heater mode wire and cold/hot air choker cables.
Remove nut and screw fixing air heater assembly.
Pull out Air heater assembly.
- h) Installation of air heater assembly
Install air heater assembly.
Install nut and screw fixing air heater assembly.
Install evaporator assembly.
Install nut and screw fixing evaporator assembly.
Install mode wire: When installing, put controller assembly and air heater assembly mode knobs at Defrost position, and clamp wire in wire clip.
Install cold/hot choke cables: When installing, put controller assembly and air heater assembly temperature knobs at hottest position, and clamp cable in cable clip.
Install codriver side air conditioner air passage, air passage 6,air passage 3, and defrost air passage.
Install instrument panel assembly (as for detail, refer to Installation of Instrument Panel Assembly).
Install warn air water inlet pipe (—) connected to air heater, and air conditioner warn air water outlet pipe.
- i) Removal of blower assembly
Remove instrument panel assembly (as for detail, refer to Removal of Instrument Panel Assembly).
Unplug the connecting plug of blower and wire bundle.
Remove nut and screw fixing evaporator assembly and wire connector.
Pull out evaporator assembly about 20mm.
Remove nut and screw fixing blower assembly.
Pull out blower assembly.
- j) Installation of blower assembly
Install air heater assembly.
Install nut and screw fixing blower assembly.
Plug in two connecting plugs of blower and wire bundle (one is blower motor connector, and another is servo motor connector).
Install evaporator assembly.
Install nut and screw fixing evaporator assembly and wire connector.
Install instrument panel assembly (as for detail, refer to Installation of Instrument Panel Assembly).
Install warn air water inlet pipe (—) connected to blower, and air conditioner warn air water outlet pipe.

Refrigerant

Refrigerant used in our automobiles is R-134a.

Safety Precautions:

Following precautions should be taken when handling R134a refrigerant.

- (1) When carrying out refrigerating system maintenance, operators must wear goggles.

Under the conditions of normal temperature and normal pressure, R-134a vaporizes very fast and possesses a tendency to freeze any substances coming into contact with it. Hence, operators must handle refrigerant carefully, so as to prevent refrigerant from splashing on skin or into eyes. When carrying out maintenance on refrigeration parts of air conditioning system, operators must wear goggles. When handling refrigerating system, get a bottle of sterile mineral oil ready for. If liquid refrigerant is splashed into your eyes, you can squeeze several drops of mineral oil into your eyes flush off refrigerant. R-134a can be absorbed within a short time. You can immediately use large quantity of cold water to flush your eyes, and then seek for medical assistance.

- (2) Do not heat R-134a to a temperature higher than 40°C.

Under normal circumstances, when filling or replenishing refrigerant, refrigerant is required to be heated to a certain temperature, so as to make the pressure of refrigerant in the container higher than the pressure in the system. For this purpose, you can use big tank or pan filled with warm water at a temperature not exceeding 40°C to fully warm the refrigerant container. Do not use blowtorch or any other methods heat refrigerant container to increase its temperature and pressure, so as prevent temperature from exceeding its specified value. Do not carry out operations such as welding or vapor cleaning at locations near parts of refrigerating system or refrigeration pipeline.

- (3) When filling the system, R-134a container must be kept in vertical state.

When filling the system, R-134a container must be kept in vertical state and refrigerant should be kept in gas state. If refrigerant container is positioned sideway or upside down, liquid refrigerant might flow into the system, causing compressor to suffer from liquid shock and damage.

Warning: At low pressure side, refrigerant must be filled in gas state.

- (4) Use leak detector specially designed for R-134a to check refrigerant leakage.
- (5) Good ventilation must be guaranteed.
- (6) Do not let liquid refrigerant come into contact with bright metal surface.

Refrigerant would make bright metal and chrome-steel surface lose brightness and seriously corrode all metal surfaces when integrated with moisture.

Refrigeration oil

When filling or replenishing refrigeration oil, care must be taken to the following two points:

- (1) Refrigeration oil used must be of the brand specified for compressor or equivalent having the same features, do not use any substitutes, or compressor might be damaged.
- (2) Refrigeration oil is apt to absorb moisture, so, do not open the cap of the oil tank before everything is ready for filling. Upon completion of filling, close and seal the cap of the tank immediately.

Condenser

Its structure is in the form of parallel stream. when installing, following precautions must be taken:

- (1) Before pipe fittings are installed, do not remove protective caps from pipe openings, as moisture would enter the system through these openings.
- (2) High temperature, high pressure refrigerant out of compressor must enter from pipe opening at the top of condenser, and refrigerant condensed into liquid must flow out through lower pipe opening into fluid reservoir. Do not connect them incorrectly, otherwise, refrigerating system pressure would increase, causing condenser to expand and damage.

Evaporator

Precautions for installation of evaporator:

1. Check and make sure that the cooling fins of the evaporator are not clogged.
If cooling fins are clogged, use compressed air to blow them clean.
2. Check and make sure that fittings are free from cracks or scratches.
3. Carry out repair as necessary.

Fluid reservoir

There is a glass window at the upper outlet of the fluid reservoir used for observing the flowing of refrigerant during operation in order to determine the filling amount of refrigerant and the operating condition of the refrigerating system.

Vertical fluid reservoir must be installed vertically with tilting angle of not exceeding 15 degrees. Do not remove the blanking caps of openings of inlet and outlet pipes too early before installation, so as to prevent damp air from entering the system, resulting in loss of moisture absorbing function. Correctly identify the inlet and outlet ports of the fluid reservoir. Markings are usually made for the inlet and outlet ports of the fluid reservoir. The inlet port is marked with IN, and outlet with OUT, or both of them are marked directly with arrows. (These markings are different for different configurations of automobiles.)

Installation of expansion valve

Care should be taken when installing expansion valve:

Check and make sure that expansion valve is in good condition and temperature sensitive device is free from leakage.

Expansion valve is normally installed vertically.

Temperature-sensitive capsule should be installed at the upper part of the air outlet pipe of the evaporator, closely leaning against the pipe wall. It is wrapped with heat insulating material.

The balancing pipe of the external balancing expansion valve should be installed on the air return pipe located 10cm downstream the temperature-sensitive capsule, and be led out from the top of the pipe, so as to prevent refrigeration oil from entering the valve.

Function of temperature controller

Most ZXAUTO automobile air conditioners adopt thermistor semi-conductor temperature sensor equipped with electronic temperature controller composed of electronic amplifier or ECU. Thermistor possesses negative temperature coefficient. Namely, when the temperature of the thermistor increases, its resistance value decreases, and vice versa. Through change of temperature of the thermistor within a certain range, and by using amplifier or ECU to control the operation of the refrigerating system, the interior temperature can be maintained within a set range.

Pressure switch

ZXAUTO automobiles adopt three-state switch. The three-state switch is a switch integrating high pressure, low pressure and intermediate pressure switches.

When abnormal high pressure occurs at the high pressure side of the refrigerating system, high pressure switch can automatically cutoff the electromagnetic clutch circuit, stopping the compressor, in order to prevent the compressor from being overloaded and the high pressure system from being expanded (not exceeding 3.14MPa).

Low pressure switch is also called refrigerant leak Inspection switch. If the compressor is operating when refrigerant is insufficient or emptied refrigerating system due to leakage or any other reasons, wear would be aggravated because of poor circulation of lubricating oil, or the compressor might be burnt. When refrigerant in refrigerating system is extremely insufficient, the low pressure switch can stop the rotation of the compressor, so as to protect the compressor from being damaged (not lower than 0.196MPa).

The intermediate pressure switch is used to detect the pressure of the refrigerant. When the pressure of the refrigerant exceeds its specified value, the fan of the radiator of the water tank is activated to run at high speed to cool the condenser by force, so as to keep the pressure of the refrigerant within its normal range.

Commonly-used leak Inspection method:

R134a refrigerant is colorless and odorless. Without proper leak Inspection means, it is difficult to find the leakage locations. At the present, the following methods are used commonly:

- (1) Visual leak Inspection: Because refrigeration oil and refrigerant used in automobile air conditioner are mutual soluble, we can determine if there is any refrigerant leakage by traces of oil on the surface of the air conditioner and its connecting hoses and other parts.
- (2) Soap water leak Inspection: Apply soap water of proper density at the locations to be checked, and if there appear bubbles, it means that there exists leakage.
- (3) Leak Inspection by using electronic leak detector: The detector is highly sensitive, fast and accurate, but expensive.
- (4) Leak Inspection by tracer technique: It is applicable to locations difficult to be checked by other methods (better for minor leakage). The tracer technique is also high in cost. Fill suitable dye into refrigerating system, and after operating the air conditioning system for some time, if there is any leakage, traces of dye can be seen.
- (5) Leak Inspection by pressurization: If leaking locations can not be found by using methods mentioned above, fill a small quantity of refrigerant and nitrogen at a given pressure into the refrigerating system, maintain the pressure for several hours, and observe if the pressure drops or not.
- (6) Vacuum leak Inspection: Evacuate the refrigerating system, maintain it for several hours, and observe if the pointer of the vacuum meter drops or not.

Automobile air conditioner common troubles and their remedy

1 Common troubles and their remedy

- (1) Abnormal noise or vibration.
- (2) Intermittent cooling, i.e. the air conditioner supplies cool air for a while and stops for a while.
- (3) Cooling ability is decreased, and cool air is not cool enough.
- (4) It does not supply cool air at all.

The reasons of the above troubles can be summarized as leakage, clogging, breakage, jamming, damage, etc.

Leakage: including leaks of refrigerant and refrigeration oil.

Blocking: including dirt block and ice block of expansion valve, dehydrator and pipeline, and dust deposit and blocking of condenser and evaporator.

Break: melting of heat fuse, opening of protecting switch, opening and poor contact of air conditioning system circuit, etc.

Seizure: compressor is seized, moving or control parts are unable to move.

Damage: Some parts of air conditioner are damaged.

2 Test of air conditioner refrigerating system

Troubles of air conditioning system mainly include:

- (1) System pipeline leakage.
- (2) Refrigerant is too much or too less.
- (3) Refrigerant circulating passage is blocked.
- (4) There is air, moisture, impurities in the system, or parts such as compressor and expansion valve are damaged or failed.

Check and locate troubles of refrigerating system by hearing, feeling, observing and measuring:

Hearing: Hear the opinion of the user, and hear abnormal sound and noise

while air conditioner is operating.

Feel: After the air conditioner has been operating for several minutes, feel by hand the case of the compressor and its air inlet and outlet pipes and condenser and dehydrator and their air inlet and outlet pipes to determine if temperature is normal.

Observing: Visually inspect and make sure that: various cooling pipes are not damaged or crushed; Fittings are connected reliably; there is oil leakage; and connecting pipes, dehydrator and expansion valve are not frosted or dewed. Use fluid viewing glass to inspect and make sure that: the flow of refrigerant is normal. Visually inspect and make sure that: condenser cooling fin is not blocked by dirt; and air inlet strainer is not blocked by impurities.

Measuring: Use manifold pressure gage to measure and make sure that: the pressure at the high-pressure and low-pressure sides of the refrigerating system is normal, or locate troubles of the system according to values indicated by the pressure gage. When the compressor is operating at 1800r/min approx at the ambient temperature of 30-35°C, the pressure at its high-pressure side is 1.40-1.70MPa, and the pressure at its low-pressure side is 0.15-0.25MPa.

3 Automobile air conditioner running noise includes:

- (1) Electromagnetic clutch noise: electromagnetic clutch bearing is worn or damaged, or electromagnetic clutch slips.
- (2) Compressor driving belt noise: V-belt is loose and slips or V- belt wheel is not properly located.
- (3) Compressor noise: Air inlet and outlet valve plates are broken or moving parts such as compressor bearing are damaged.
- (4) Blower noise: blades vibrate or blower installation is loose and vibrates.
- (5) Pipeline noise: pipes are not secured firmly and vibrate, or other mechanical parts collide against each other..
- (6) Noise as the result of looseness of compressor bracket, condenser and other mechanical parts.

4 Test of air conditioner circuit

Automobile air conditioner circuit troubles mainly include two categories of control element troubles and circuit troubles.

Control element troubles mainly include: electromagnetic clutch coil damage, blower motor damage; blower speed regulating resistor damage; control relay defective; pressure switch defective; air conditioner temperature controller damage; and failure of various control switches.

Trouble of control elements can be checked visually or by method of substitution, i.e. use good element of the same specifications to substitute the element in doubt. If trouble is removed, it indicates that the trouble lies in the element substituted, which should be repaired or replaced.

Troubles in air conditioner temperature controller (different for different configurations of automobiles), pressure switch and some other parts can be located by method of short-circuiting, i.e. to short-circuit the element in doubt. If the trouble is removed after an element is short-circuited, it indicates that the element has failed.

As for check of electromagnetic clutch, blower and motor, disconnect power supply line from the circuit, then, use a section of wire to connect it directly to the positive pole of the battery, and observe that electromagnetic clutch should be activated and motor should be running.

Besides visual inspection, circuit can be checked section by section with the help of tools such as test lamps and multimeter.

5 Determination and removal of dirt block in automobile air conditioner refrigerating system

Dirt block of automobile air conditioner refrigeration frequently occurs in passages of refrigerating system with small cross-sections. Dirt goes with refrigerant flow and stops at those places (mainly expansion valve) and creates block. This kind of block is called dirt block. This kind of block is different from ice block. Ice block usually occurs at specific locations in the refrigerating system and is easy to determine. When dirt block occurs, the refrigerating ability decreases or even the system stops refrigeration. The pressure is lower than normal value at both high- and low-pressure sides. The temperature at some locations in the refrigerating system will decrease, or ice is formed occasionally.

Dirt blocks mostly occur at the high-pressure side of refrigerating system. For example: high-pressure hose and aluminum pipe connected to both ends of the condenser, and the elbow-shaped valve on the fluid reservoir. In operation, the temperatures of these parts are higher than the ambient temperature, and are hot when felt by hand. When dirt block occurs at a certain place, the phenomenon of flow restriction would happen at this place, and the temperature will decrease rapidly and feels cold when touched by hand. This shows that there exists dirt block at this location.

Let see how to determine dirt block of expansion valve. In normal operation, low, continuous and uniform flow sound can be heard from expansion valve. There is frost within the area of from 45-degree line towards half of the outlet port with the flow restricting orifice in the valve body as boundary, and there is no frost at the strainer at the inlet end. If there is frost at the inlet strainer of expansion valve and the sound of flow is interrupted, use a small wrench to gently tap the body of the expansion valve and the sound of flow changes slightly, and the frost at the flow restricting orifice in the expansion valve gradually melts at the same time. It can be determined that the strainer at the inlet of the expansion valve is blocked.

Troubles can be removed by the following method:

Drain refrigerant from refrigerating system.

Remove, and clean or replace blocked parts of refrigerating system.

When blockage is serious, disassemble the refrigerating system, and wash them section by section by using industrial gasoline or carbon tetrachloride. Condenser or evaporator must be cleaned by using special cleaning equipment. After washing, use nitrogen gas to blow parts dry and then bake them. Assemble cleaned refrigerating system, and re-evacuate R134a.

6 Determination and removal of ice block in automobile air conditioner refrigerating system

Ice block usually refers to blockage by ice at the expansion valve while air conditioner refrigerating system is operating. Ice block is the result of refrigerating system containing moisture. Therefore, ice block only occurs at specific locations in the refrigerating system, i.e. at the location of flow restricting orifice of the expansion valve. As R134a is not soluble with water, when R134a flows through the flow restricting orifice, temperature drops abruptly. The moisture in the refrigerant would form into small ice particles around the orifice or valve needle hole. When ice particles are accumulated to a certain amount, flow restricting passage will be blocked. Ice block is thus formed.

When water content in liquid refrigerant is low, minor ice block would occur. When water content in liquid refrigerant is higher, the restricting orifice could be blocked entirely, resulting in serious decrease of refrigerating ability and complete failure of refrigeration. As air conditioning system is fit with high- and low-pressure protecting switches, under the action of these pressure switches, the compressor would operate intermittently. As ice block occurs when refrigerating system is operating normally, liquid refrigerant is restricted by expansion valve, evaporates and absorbs heat, causing moisture to freeze into ice. With ice block, the refrigerating system is unable to operate normally. After the refrigerating efficiency is decreased or the system stops refrigeration, the temperature at the location of ice block rises, ice particles melt, ice block disappears, and the system resumes normal operation. After refrigerating system operates for some time, ice block would occur again, and the refrigerating system is unable to operate normally. Under the action of high- and low-pressure protection switches, compressor electromagnetic clutch activates and deactivates intermittently, making refrigerating system unable to operate normally. This phenomenon can be judged by checking the center vent in the instrument panel. After the air conditioner refrigerating system is turned on, there would be cool air from the center vent. After operating for some time, the temperature of cool air from the center vent will increase, and compressor electromagnetic clutch activates and deactivates intermittently. Now, if you turn off A/C switch for some time and turn it on again, normal operation will be resumed. The process will be repeated in this way.

Ice block of refrigerating system is similar to the phenomenon of dirt block mentioned above. The difference between ice block and dirt block is that in ice block can disappear when you heat the body of expansion valve; otherwise, it is the dirt block. When dirt block is serious, normal operation of the system can not be resumed by re-turning on A/C switch.

Method to remove moisture in refrigerating system:

Drain out refrigerant.

Replace dehydrator.

Bake or use hot air to directly blow the inside of the refrigerating system, allowing moisture to evaporate.

Fill fresh refrigerator oil of the same brand. Before filling, and heat refrigerator oil to 130°C and let moisture in the oil to evaporate.

Evacuate the system for not less than 30 minutes, and then, fill qualified refrigerant.

7 Frost block of automobile air conditioning system

When air conditioning system is operating, moisture in the air is condensed into water on the surface of the evaporator. When temperature is below 0°C, water forms into frost. When frost layer reaches a certain thickness, the air passage in the evaporator would be blocked. In this case, even though the blower is running, cool air can not come out through vent.

The main feature of frost block is: compressor is unable to stop automatically. This means that the temperature control system is out of function, making refrigerating system operating unceasingly. When evaporator surface is below 0°C, condensed water becomes frost on the surface, the frost layer blocks air passage in the evaporator, causing cool air flow to reduce and resulting in insufficient cool air inside the automobile. At the same time, frost forms on the surface of the low pressure hose, and there is moisture or water drops on the vent of instrument panel.

The main reason of frost block is the failure of temperature control system. Normal temperature control is accomplished by a thermistor installed on evaporator (at the air outlet side of the evaporator 1.0~1.5cm away from its surface) detecting the change of the temperature of air from the outlet of the evaporator, and converting the temperature change into electrical signal and feeding it into air conditioner temperature control circuit. The air conditioner temperature control circuit controls the activation and deactivation of compressor electromagnetic clutch. When temperature drops to 2°C, the air conditioner temperature control circuit deactivates compressor electromagnetic clutch, and compressor stops operating.. The refrigerating system is thus stopped. As blower is still operating, there is still cool air coming out from the vent, and evaporator surface temperature rises. When temperature drops to 6°C, the air conditioner temperature control circuit activates compressor electromagnetic clutch, and compressor resumes operation. (It can be understood that the system stops at 2°C and operates at 6°C). The process is repeated in this way and keeps the inside of the driving cab at desired temperature.

The method to remove frost block is as follows:

Check and make sure that thermistor is not separated from evaporator.

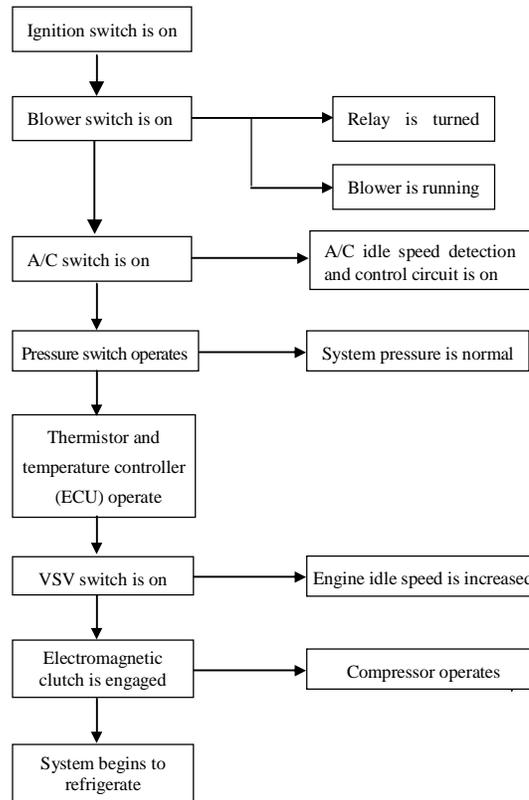
Check and make sure that the resistance of thermistor is not reduced and should be 1.5KΩ at 25°C.

Repair air conditioner temperature control circuit.

Difference between ice block and frost is given in the following Table:

Trouble	Ice block	Frost block
Difference	Ice block is the result of moisture inside the refrigerating system.	Frost block is the result of evaporator surface frost due to failure of air conditioner temperature control circuit.
	Cool air temperature at the vent increases, but air flow is unchanged.	Air flow at the vent becomes smaller no cool air comes out even though blower runs normally, and there is moisture or water drops at the vent.
	After ice block, there would be no frost on low pressure hose.	After frost block, there would be frost on low pressure hose.
	After ice block, compressor electromagnetic clutch might operate intermittently.	After frost block, compressor electromagnetic clutch would not operate intermittently, but there might exist the phenomenon of liquid shock.
	When removing ice block, it is necessary to dry the system and refill it with refrigerant.	When removing frost block, it is only necessary to check and repair thermistor and air conditioner temperature control circuit.

Initiation Sequence of Refrigerating System



Main Technical Parameters of Air Conditioning system

- (1) System refrigerating capacity at rated operating mode: 4000W
- (2) Rear A/C refrigerating capacity: 1500W
- (3) System heat release at rated operating mode: 6200W
- (4) Refrigerant: R134a
- (5) Filling amount of refrigerant:
 - Single air conditioner automobiles: 650±20g (R134a)
 - Double air conditioner automobiles: 750±20g (R134a)
- (6) Voltage used: DC12V
- (7) Compressor and lubricating oil type:

Compressor	Panasonic H12A0 (R134a)
Compressor	ZEXEL DKS-17S

Specifications of compressor assembly:

- (1) Type: DKS-17S
- (2) Max. rotating speed: 7000r/min
- (3) Rotating direction: clockwise when looking from the clutch side

Specifications of compressor:

- (1) Number of cylinders-inner diameter X travel: 6-Φ38X24.7
- (2) Theoretical displacement: 167cm³/r
- (3) Volumetric efficiency: over 60% at compression of 1000r/min
- (4) Annual leakage of cold medium ≤20g
- (5) Cold medium: HFC-134a

(6) Oil quantity: ZXL100PG 180cm³

(7) Weight: 4.8kg

Specifications of electromagnetic clutch:

(1) Nominal voltage: DC12V

(2) Belt used: 4PK

(3) Static torque: over 49N·m

(4) Power consumption: 38W(DC12V 25\U+2103)

(5) Min. attracting voltage: DC10.5V(90\U+2103)

(6) Weight: 2.2kg

Panasonic H12A0 (R134a)

Cold medium used: HFC-134a

Displacement: 120cm /rev

Lubricating oil ATMOS GU10 150 cm³

Weight 5.9 Kg

Rated voltage A.C.12V

Rotating direction clockwise

Installation condition inside automobile (allowable angle) 20

Max. allowable rotating speed 7200r/min

Max. allowable vibration MAX 30 G

Static frictional torque MIN 31.4 N.m

Operation temperature protection ON/OFF=120/140

Installation and Commissioning of Air Conditioner

Automobile air conditioner must be installed and operated properly as per Process Specifications, and should be free from leakage, dirt and water.

1 Installation of evaporator, condenser, liquid container, warm air heat exchanger, rear air conditioner, blower and air passage:

Various units must be mounted and secured at designed positions. All fittings of evaporator, blower and warm air heat exchanger and air passage must be connected reliably and mated properly with air vents.

2 Installation of compressor assembly

Connect compressor to the engine firmly by using bracket. After belt is installed, ensure that engine belt groove is on the same plane as compressor belt groove. The tightness of belt should be appropriate, and the deflection of a new belt should be 8-10mm when a force of 98N is applied.

3 Installation of pipelines and their fittings

After various parts are installed and secured, remove sealing plugs at pipe ends of these parts. In the process of installation, attention should be paid to keep part clean and avoid any dirt entering the system. Slightly coat O-rings with compressor lubricating oil, so as to prevent gaseous refrigerant from leaking. Use torque wrench to tighten nuts and fittings to their specified torque. Do not twist and deform the pipes. Use hot water pipes to connect warm air water valve to engine water inlet and outlet pipes, and then, use clamp and other fasteners to secure the pipelines, so as to prevent them from looseness or damage due to vibration.

First type: locking nut and fittings

Locations	Locking nut size	Std. torque range N·m (kgf·m)
Expansion valve and inlet pipe	19	11.76~14.7 (1.2~1.5)
High pressure pipe and high pressure pipe		
Expansion valve and its body inlet pipe	24	15.68~19.6 (1.6~2.0)
Pressure switch and inlet pipe	17	6.86~8.82 (0.7~0.9)
Expansion valve external balance pipe and outlet pipe	14	6.86~8.82 (0.7~0.9)
Evaporator outlet pipe and low pressure pipe	27	29.4~34.3 (3~3.5)
Low pressure pipe and low pressure pipe		

Second type: specified torque of fastening bolts

Bolt diameter	Std. torque range N.m (kg.cm)
M4	196.1±19.6N.cm (20±2kg.cm)
M5	2.5±0.5N.m
M 6	4.9~6.9 (0.5~0.7)
M 8	13.7~17.7 (1.4~1.8)
M 1 0	25.5~35.3 (2.6~3.6)

4 Commissioning of air conditioning System

Evacuate the system for 20 minutes until the indicated pressure is below -0.095MPa, and maintain it for 1-2 hours. If there is no rise in pressure, freon can be charged. When charging freon, precautions should be taken to prevent refrigerant from sprayed out and hurt the operator. Fill specified quantity of R 134 a refrigerant.

Use and Maintenance

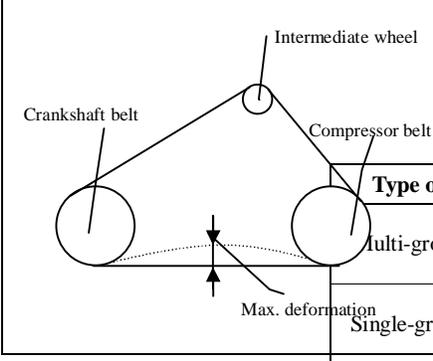
1 Maintenance

(1) Check and repair of dehydrator

Run air conditioning system, check the temperature of pipelines by feeling the inlet and outlet of the dehydrator by hand. If there exists temperature difference between the inlet and the outlet, it indicates that the dehydrator is clogged. It is necessary to replace the dehydrator.

(2) Check and adjustment of compressor belt

The max deformation of the belt is as listed in the following Table when a 10kg force is applied at the locations as shown in the diagram:



Type of belts	Max. deformation (mm)	
Multi-groove belt	New belt	9-11
	Used belt	11-16
Single-groove belt	New belt	8-10
	Used belt	10-14

Note: Used belts refer to those having been operated for 15 min.

If deformation of belt is found to exceed the specified value, it is necessary to adjust the position of the intermediate wheel.

When belt is to be replaced, the replacement belt must be of the same specification and type.

(3) Check of filling quantity of refrigerant by fluid viewing glass

Fluid viewing glass is an indicator of filling quantity of refrigerant. Wipe the fluid viewing glass clean, and check the filling quantity of refrigerant as follows:

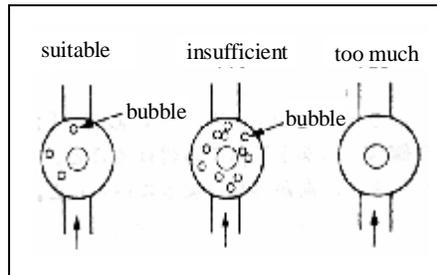
Start the engine.

Set blower switch at Max. position, turn on A/C switch, and set temperature at minimum.

Stabilize engine rotating speed at 1500r/min.

Observe air bubbles in refrigerant through fluid viewing glass.

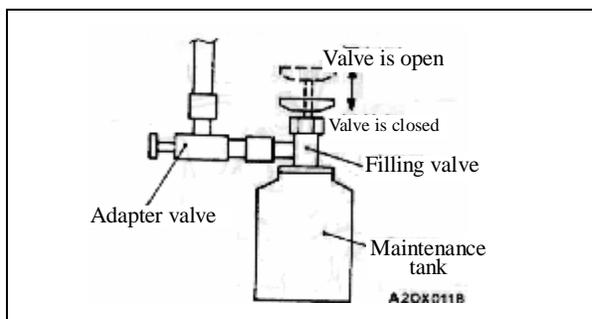
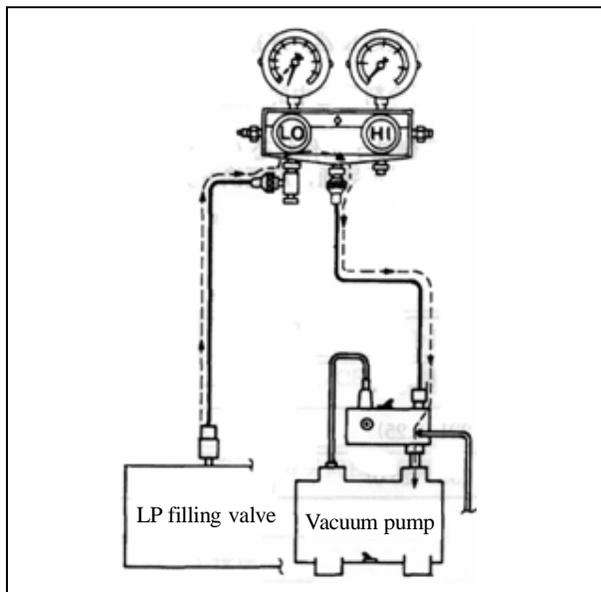
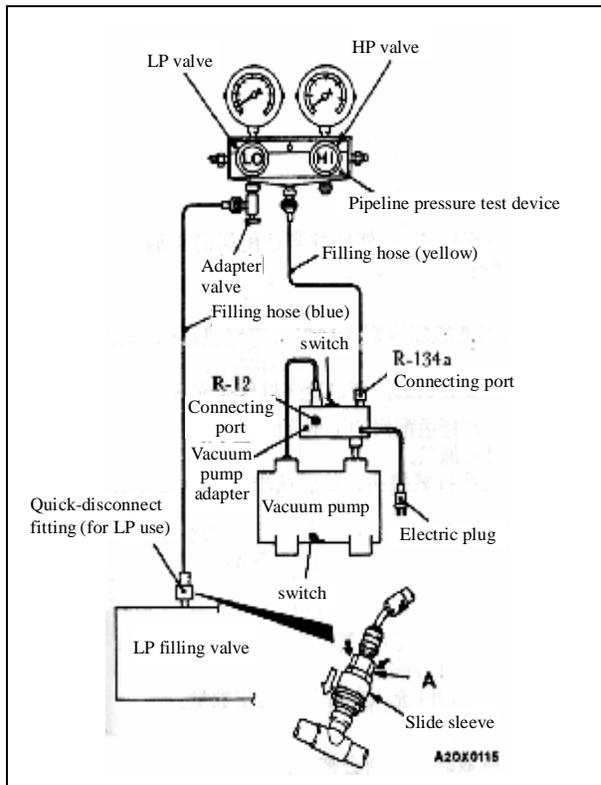
Refer to diagramd.



State	Phenomenon
Appropriate	Bubbles can be seen when switching on and off A/C system, and disappear or can be seen occasionally while A/C is operating. (It can in the form of mist. It shows that the refrigerating oil and refrigerant are not sufficiently mixed)
Insufficient	A lot of bubbles. Or in the form of white foam if extremely insufficient.
Too much	No bubbles can be seen when switching on and off A/C system.

If insufficient, replenish refrigerant, and if too much, drain refrigerant as appropriate.

Caution: Operate by using standby valve at the low pressure side.



(4) Filling of refrigerant

- ① Turn the handle fully out (valve is closed), and install the adapter valve at the low pressure side of the pipeline pressure test device.
- ② Connect the filling hose (blue) to the adapter valve.
- ③ Connect the quick-disconnect fitting (for low pressure use) to the filling hose (blue).
- ④ Connect the other end of the quick-disconnect fitting (for low pressure use) to the low-pressure filling valve.

Note: Connect the low-pressure filling valve to the inlet hose.

Caution: • All tools should be suitable for R-134a.

• When installing the quick-disconnect fitting, push Part "A" by force towards the filling valve until a "click" is heard. When making the connection, move it along the hose, so as to make sure that the hose is not bent after the connection.

- ⑤ Close high pressure valve and low pressure valve of pipeline pressure test device.
- ⑥ Install the adapter of the vacuum pump on the pump.
- ⑦ Connect the plug of the vacuum pump to the adapter.
- ⑧ Connect the filling hose (yellow) to the R-134a fitting of the vacuum pump adapter.
- ⑨ Turn the adapter valve handle fully in (valve is open).
- ⑩ Open low pressure valve of pipeline pressure test device.
- ⑪ Set the power switch of the vacuum pump at ON position.

Note: Even though the power switch of the vacuum pump is set at ON position, the vacuum pump is not operating, as power supply has been connected in Step (7).

- ⑫ Set vacuum pump adapter switch at R-134a side to start the vacuum pump.

Caution: do not operate the compressor to vacuum the system.

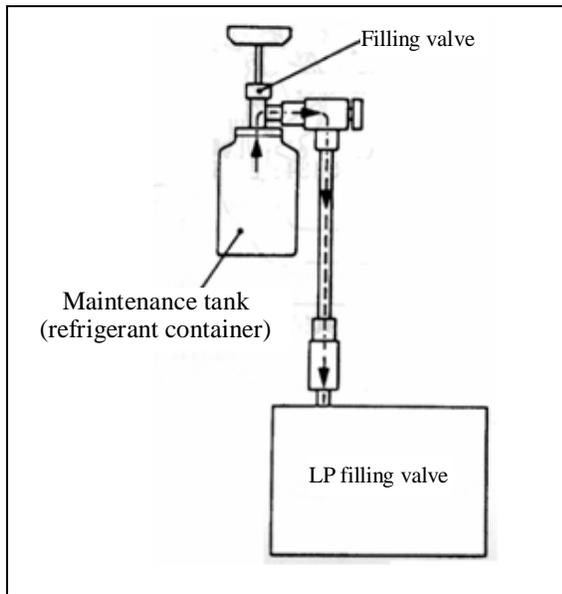
- ⑬ Evacuate the system until the vacuum reading is above 100kPa (1.0kgf/cm²) (10 minutes approx.).
- ⑭ Set vacuum pump adapter switch at OFF position, and maintain it for 5 minutes.

Caution: Do not let the compressor operate in vacuum state, or damage would be resulted.

- ⑮ Carry out leak test. (It is normal if negative pressure does not decrease)

Caution: If negative pressure decreases, tighten the fitting further, and evacuate the system starting from Step (12).

- ⑯ Turn the handle fully out (valve is open), and install the filling valve on the maintenance tank.
- ⑰ Turn the handle of the adapter valve fully out (valve is closed), remove it from pipeline pressure test device, and install it on the maintenance tank.
- ⑱ Tighten the handle of the filling valve (valve is closed), so as to puncture the maintenance tank.



- ⑰ Turn out the handle of the filling valve (valve is open), and then, tighten the handle of the adapter valve (valve is open) to fill the system with refrigerant.

Caution: • Do not position maintenance tank upside down, or liquid refrigerant would be sucked into the compressor, compress the liquid inside the compressor and damage the compressor.

- The maintenance tank must be kept upright, so as to allow refrigerant to be filled into the system in liquid state.
- ⑱ If refrigerant can not be sucked out, fully turn out the handle of the adapter valve (valve is closed).
- ⑲ Use leak detector to check if there is leakage.
- Caution:** • If leak is found, re-tighten fittings, and then, repeat the filling procedures from Step (12).
- ⑳ Tighten the handle of the adapter valve (valve is open), and fill refrigerant.

Caution: • Do not position maintenance tank upside down, or liquid refrigerant would be sucked into the compressor, compress the liquid inside the compressor and damage the compressor. The maintenance tank must be kept upright, so as to allow refrigerant to be filled into the system in liquid state.

- ㉑ After filling, fully turn out the handle of the adapter valve (valve is closed).

- ㉒ Tighten the filling valve handle (valve is closed).

Remove quick-disconnect fitting from low pressure filling valve (for low pressure use).

Note: If refrigerant in maintenance tank is not finished, tightly close filling valve and adapter valve. The remaining refrigerant can be used next time.

- (5) If refrigerant is insufficient, use maintenance tank to replenish.

- ① With the handle of the filling valve turned fully out (valve is open), install the filling valve on the maintenance tank.

- ② With the handle of the adapter valve fully tightened (valve is closed), connect it to the filling valve.

- ③ Connect the filling hose (blue) to the adapter valve.

- ④ Connect the filling hose (blue) to the quick-disconnect fitting (for low pressure use).

- ⑤ Tighten the handle of the filling valve (valve is closed), so as to puncture the maintenance tank.

- ⑥ Rotate the handle of the adapter valve to discharge air.

- ⑦ Install the quick-disconnect fitting (for low pressure use) on low-pressure auxiliary valve.

- ⑧ Start the engine.

- ⑨ Run the air conditioner and adjust to the lowest temperature.

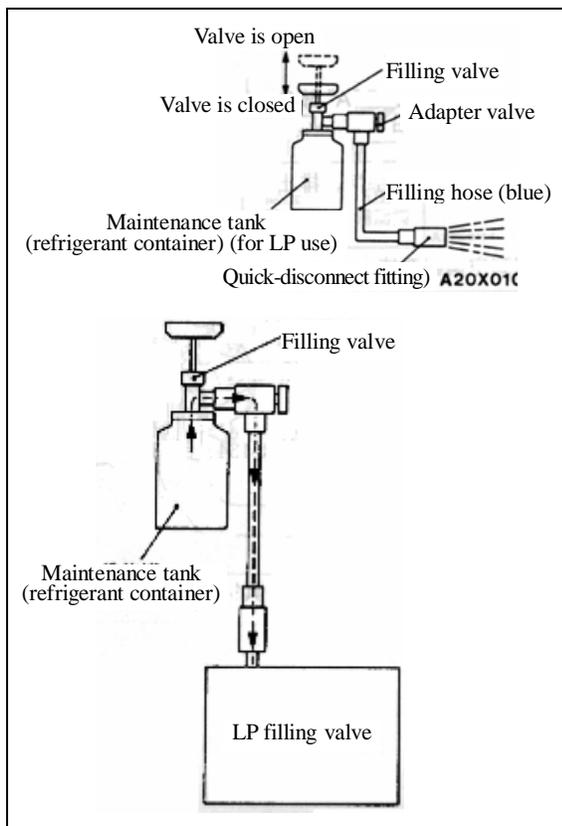
- ⑩ Stabilize engine rotating speed at 1500r/min.

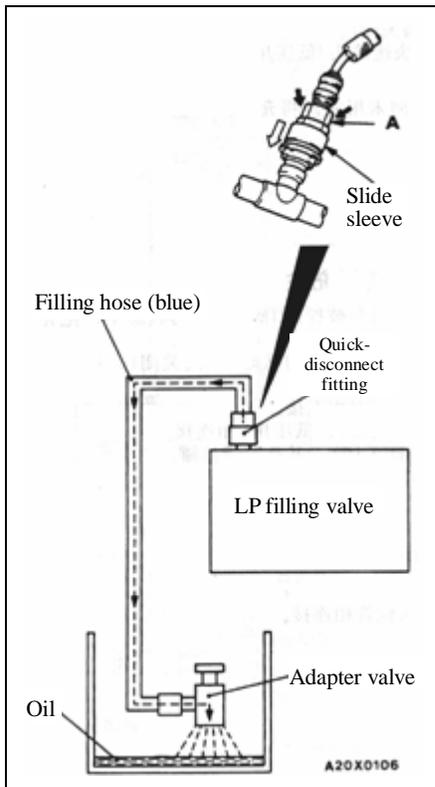
- ⑪ Tighten the handle of the adapter valve (valve is open), fill refrigerant, and check its quantity through liquid viewing glass.

Caution: Do not position maintenance tank upside down, or liquid refrigerant would be sucked into the compressor, compress the liquid inside the compressor and damage the compressor. The maintenance tank must be kept upright, so as to allow refrigerant to be filled into the system in liquid state.

- ⑫ After filling, turn the handle of the adapter valve fully out (valve is closed), and remove the quick-disconnect fitting.

Note: If refrigerant in maintenance tank is not finished, tightly close filling valve and adapter valve. The remaining refrigerant can be used next time





(6) Drain out refrigerant.

- ① With air conditioner operating, let engine run at 1200~1500r/min for about 5 minutes to allow lubricating oil to be fully dissolved into refrigerant.

Note: It is easier to dissolve lubricating oil while automobile is running.

- ② Stop the engine.
- ③ With the handle of the adapter valve fully turned out (valve is closed), connect filling hose (blue) to the adapter valve.
- ④ Connect the quick-disconnect joint (for low pressure use) to the filling hose (blue).
- ⑤ Connect the quick-disconnect fitting to the low pressure filling valve.

Note: Connect the low-pressure filling valve to the inlet hose.

Caution: When installing the quick-disconnect fitting, push Part “A” by force towards the filling valve until a “click” is heard. When making the connection, move it along the hose, so as to make sure that the hose is not bent after the connection.

- ⑥ Put the adapter valve into a container, and then, gradually open the handle and drain out refrigerant. No not let oil spray out.

Note: Put lubricating oil in container back into the air conditioning system.

(7) Performance test

- ① Automobile under test must park at a place free from direct sunshine.
- ② Close high pressure valve and low pressure valve of pipeline pressure test device.
- ③ Connect filling hose (blue) and low pressure valve, and at the same time, connect high pressure valve and filling hose (red) of pipeline pressure test device.
- ④ Install quick-disconnect fitting (for low pressure use) on filling hose (blue), and connect quick-disconnect fitting (for high pressure use) and filling hose (red).
- ⑤ Connect quick-disconnect fitting (for low pressure use) and low pressure filling valve, and quick-disconnect fitting (for high pressure use) and high pressure filling valve.

Note: The high pressure filling valve is on compressor exhaust pipe, and low pressure filling valve is on compressor air inlet hose.

Caution: When installing the quick-disconnect fitting, push Part “A” by force towards the filling valve until a “click” is heard. When making the connection, move it along the hose, so as to make sure that the hose is not bent after the connection.

- ⑥ Start the engine.

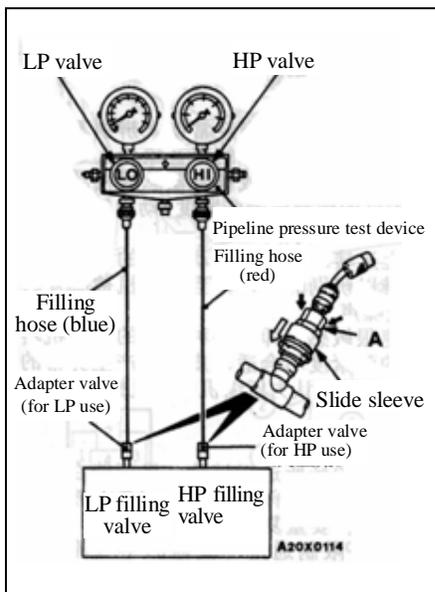
- ⑦ Set switches and control mechanism to put air conditioner in the following modes:

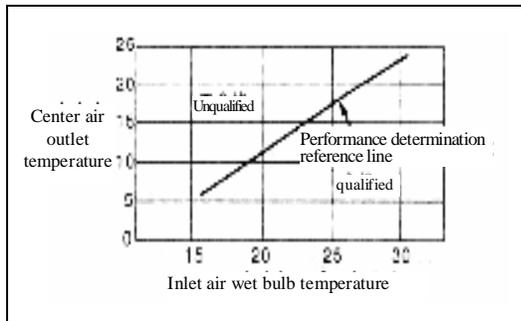
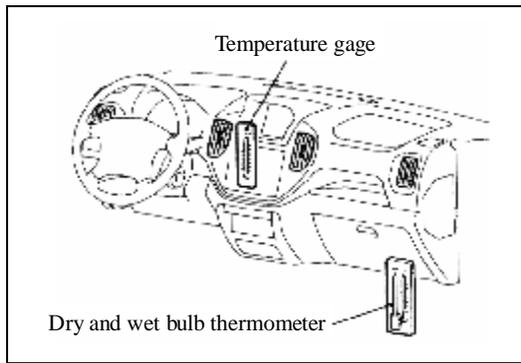
Air conditioner switch: A/C-ON position Mode selection: Face position

Temperature control: Coldest position Air select: Internal Circulation position

Blower switch: HI (high speed) position

- ⑧ With compressor clutch engaged, stabilize engine rotating speed at 1,500r/min.





- ⑨ Put temperature gage at the center air outlet of instrument panel, and install a dry and wet bulb thermometer at the air inlet. As shown in the diagram.

Caution: · Cool air must directly blow at the sensing part of temperature gage.

- The dry and wet bulb thermometer is installed at a location where is not directly blown by cool air.

- ⑩ After air from the outlet is stabilized (10~15 minutes after air conditioner is started), measure air temperature at the outlet and air temperature at the inlet.

- ⑪ Find the cross point of the two values obtained in Step (10) on the diagram. It is qualified if the point is below the reference line.

(8) Oil replenishment of air conditioning system

Insufficient lubricating oil can not satisfy the need of lubrication of the compressor and might result in failure of the compressor. Too much lubricating oil would decrease the refrigerating effect. The compressor is provided with lubricating oil when it is delivered from the factory. When air conditioning system is operating, lubricating oil is brought through the entire system together with refrigerant. After refrigerant is drained, part of dissolved lubricating oil is stays on some parts of the system.

After replacing the following parts of the system, lubricating oil must be added into the system to replenish that part of lubricating oil taken away by these parts.

Condenser: 40~50cc

Evaporator: 40~50cc

Pipeline: 10cc

Dehydrator: 10~20cc

Item	Brand	Volume (cc)
DKS-17 compressor oil cm ³ {cc}	ZXL100PG	180
10B15 compressor oil cm ³ {cc}	Oil-300001202 (PAG)	150
Pipeline joints cm ³ {cc}	Oil-300001201(PAG)	0.1
Refrigerant g	R134a (HFC-134a)	650
	R134a (with rear air conditioner)	750±20

(9) Precautions

Dirt, air and moisture forbidden substances in refrigerating system. If the system is not maintained properly, these substances might enter the system, resulting in pipeline blockage, corrosion, decrease of refrigerating capability and other consequences. In maintenance and repair of automobile air conditioner refrigerating system, attention should be paid to the following points:

- ① Maintenance and repair should be carried out in clean, dry and well-ventilated site.
- ② All maintenance and repair tools must be clean and dry.

- ③ If disassembly is required for maintenance and repair, first drain refrigerant, and clean all fittings before removing them.
- ④ Seal all openings immediately after pipes and parts are removed, so as to prevent oil, moisture and other impurities from entering the inside of the parts.
- ⑤ If the inside of parts is dirty and cleaning is needed, use refrigerant or dry nitrogen to flush them. Do not use water.
- ⑥ Before filling refrigerant, fully evacuate the system, so as to remove all air and moisture from the system.
- ⑦ When filling refrigeration oil at service station, make sure that the refrigeration oil is the brand as specified in the Instruction Manual. Filling quantity should also meet the requirement. Do not use substitutes.
- ⑧ Except pure refrigerant and compressor oil, do not fill the system with any other substances.

R134a refrigerant is not soluble in water. When refrigerating system contains moisture, it would bring the following hazards to the air conditioner refrigerating system:

- ① As the temperature at expansion valve flow restriction port is low and passage is narrow, moisture is liable to freeze into ice and creates ice block here. Light ice block may cause the expansion valve unable to supply fluid properly. Serious ice block can cause the valve to clog and the system unable to refrigerate.
- ② Water and refrigerant interact mutually and produce acid material. Acid material can corrode mechanical parts and produces mechanical impurities which would clog the strainer.
- ③ Moisture can also deteriorate the refrigeration oil, decrease the lubrication of the system, and accelerate the wear of the compressor.

Therefore, in order to guarantee normal operation of the system, the user must ensure that there is no moisture in the system. The concrete method is as follows:

- ① Water content in refrigerant must not exceed 0.025% (JB453—64).
 - ② Before filling refrigerant, the system must be fully evacuated.
 - ③ Refrigeration oil must be stored under sealed conditions, so as to prevent it from absorbing moisture from air.
- (10) In order to obtain better effect of usage and safe operation, and prolong service life, carry out periodic maintenance as per Table below:

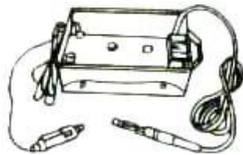
Items of check	Contents	Period of check
Filling quantity of refrigerant	Observe through fluid viewing glass, bubbles can be seen when switching on and off A/C system, and disappear when operation is stabilized.	Every week
Adapter pipe fitting	Check if it is loose or there is oil stain. Oil stain indicates there is leakage, and repair is needed.	Every month
Condenser	Check and make sure that cooling fin is free from dust and dirt. Use water to clean if there is.	Every week
Evaporator core	Check and clean dirt, and use nitrogen to blow.	Every year
Compressor oil seal	Check for leakage	Every 3 months
Electromagnetic clutch bearing	Check its operation, and replace the bearing if it can not rotate smoothly.	Every 3 months
Pressure at high and low pressure ends	Check pressure at high and low pressure ends.	Every 3 months
Electrical units	Check and adjust if necessary.	Every 3 months
Driving belt	Check tightness and wear. When 98N force is applied, the deflection is 10-13mm.	Every month
Assembly accessories	Check and make sure that assembly bolts are not loose. Tighten screws.	Beginning of every 3 months

2 Removal of troubles

If it is found that the air conditioner does not refrigerate or cool air is insufficient, check and remove troubles as per Table below. Maintenance and repair must be conducted by special personnel.

Items of check	Contents	Remedy
No cool air	<p><i>Electromagnetic clutch does not engage</i></p> <p>a Ignition switch fuse is burnt</p> <p>b Electromagnetic clutch is faulty.</p> <p>c A/C switch is faulty.</p> <p>d Wire or grounding is faulty.</p> <p>e No refrigerant.</p> <p>f Pressure switch is faulty.</p> <p><i>Compressor does not operate normally</i></p> <p>a Driving belt is loose or broken.</p> <p>b Compressor is faulty.</p> <p><i>Expansion valve is faulty</i></p> <p><i>System does not leak</i></p> <p><i>Strainer is clogged</i></p> <p><i>Blower does not work</i></p> <p>a A/C switch is faulty or burnt.</p> <p>b Blower motor is faulty.</p> <p>c Wires are faulty</p>	<p>Replace fuse and check if there is short-circuit.</p> <p>Check electromagnetic clutch</p> <p>Check switch.</p> <p>Repair as required.</p> <p>Check refrigerant pressure.</p> <p>Check pressure switch.</p> <p>Adjust or replace driving belt.</p> <p>Check compressor.</p> <p>Check expansion valve.</p> <p>Carry out leak test for the system.</p> <p>Check fluid tank.</p> <p>Check A/C switch.</p> <p>Check blower motor.</p> <p>Repair as required.</p>
Cool air is being provided intermittently	<p>Electromagnetic clutch slips.</p> <p>Expansion valve is faulty.</p> <p>Wire connection is faulty.</p> <p>There is too much moisture in the system.</p>	<p>Check electromagnetic clutch.</p> <p>Check expansion valve.</p> <p>Repair as required.</p> <p>Evacuate the system, and fill it with refrigerant.</p>
There is cool air only at high speed	<p>Condenser is clogged.</p> <p>Driving belt slips.</p> <p>Compressor is faulty.</p> <p>Refrigerant is insufficient or too much.</p> <p>There is air in the system.</p>	<p>Check condenser.</p> <p>Check or replace driving belt.</p> <p>Check compressor.</p> <p>Check the quantity of refrigerant.</p> <p>Evacuate the system, and fill it with refrigerant.</p>
Cool air is insufficient	<p>Condenser is clogged.</p> <p>Driving belt slips.</p> <p>Electromagnetic clutch is faulty.</p> <p>Compressor is faulty.</p> <p>Refrigerant is insufficient or compressor lubricating oil is too much.</p> <p>Fluid reservoir is clogged.</p>	<p>Check condenser.</p> <p>Check or replace driving belt.</p> <p>Check electromagnetic clutch.</p> <p>Check compressor.</p> <p>Replenish refrigerant, drain out extra compressor lubricating oil.</p> <p>Check fluid reservoir.</p>
Cool air speed is low.	<p>Evaporator is clogged or frosted.</p> <p>Condenser or air pipeline leaks air.</p> <p>Air inlet is blocked.</p> <p>Blower motor is faulty.</p>	<p>Clean evaporator cooling fin, maintain and repair temperature control components.</p> <p>Repair as required.</p> <p>Replace blower motor.</p>

Special tools

Tools	Part No.	Description	Function
		R134A manifold tester assembly	
		22.7kg (501b) refillable bottle	
		Halogen leak detector	
		A/C refrigerant recovery and refilling system (ACR4)	
		Digital multimeter	