Automotive Training Manual

HEATER AND AIR CONDITIONER SYSTEMS

STEP 2

mazda

FOREWORD

Because the field of automotive service is an ever-advancing and demanding profession, Mazda Motor Corporation has prepared this Automotive Training Manual (ATM) series to help its technicians, new and experienced, attain a higher degree of technical skills.
Thus, as you progress through the three-step, use these textbooks and related materials to their fullest for your advancement, Mazda's advancement, and improved customer satisfaction.

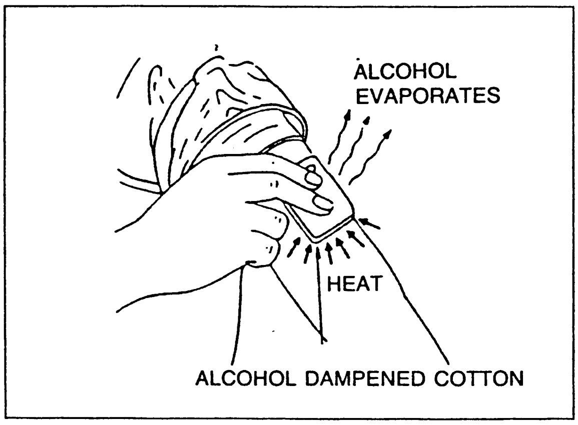
The objectives and points of training set out in this ATM are as shown below.

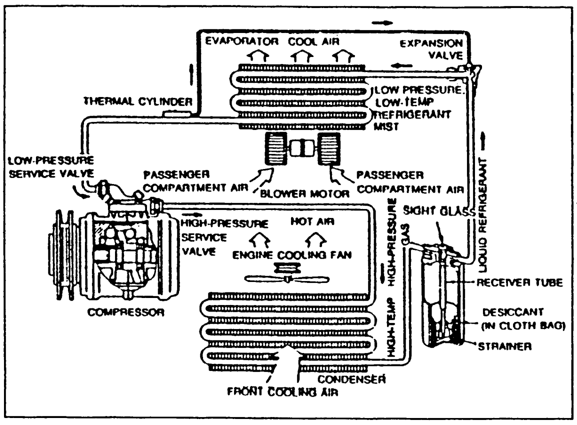
Objective
To teach the basic construction and operation of the heater and air conditioner system.

Points of training
After studying this textbook, the trainee should have a full understanding of the following. He should also be able to perform related inspections and repairs based on this understanding when the appropriate workshop manual is used.

Air conditioning principles
Types of air conditioners
Components
Air purging and gas charging
Troubleshooting

CONTENTS





AIR CONDITIONER

AIR CONDITIONING PRINCIPLES

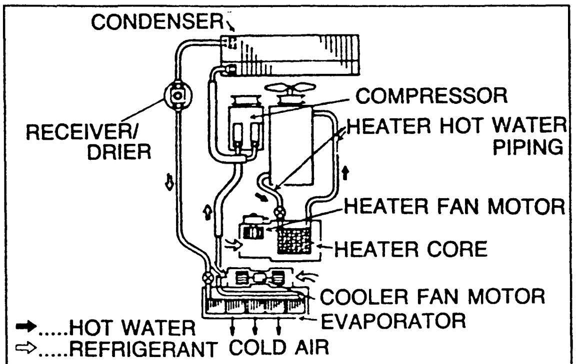
After swimming on a midsummer day when the humidity is low, you have probably felt a bit chilly, despite the heat, a few moments after coming out of the water.
The reason is that the drops of moisture on your body have taken heat from your body as they evaporated.
When alcohol is put on the skin it feels cold. This is because it takes heat from the skin as it evaporates.
These phenomena illustrate the principle of cooling.
A vehicle's air conditioner uses the same principle: when liquid evaporates it takes the heat necessary for evaporation from the adjacent object.

THE COOLING SYSTEM

The cooling system of a vehicle air conditioner, as shown, consists of the compressor, condenser, expansion valve, and evaporator. Refrigerant is circulated through this airtight circuit (cooling cycle). Heat is transferred from the low heat source (vehicle interior air) to a high heat source (outside air) to cool. This is called the evaporation compressor type of cooling system and is the most commonly used cooling system for vehicle coolers, room air conditioners, and small refrigerators.

- Cooling system operation

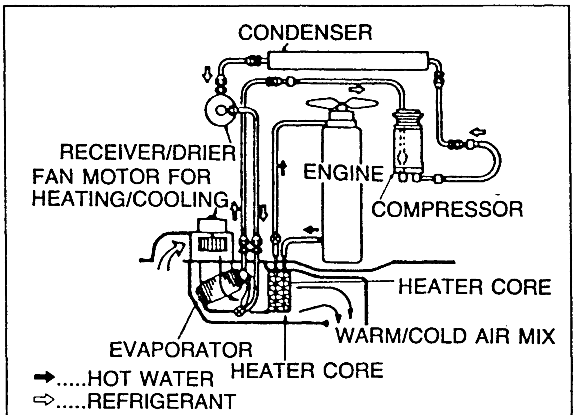
When a special type of gas called refrigerant (freon gas) is compressed at the compressor, to approximately 15 times the air pressure, the temperature increases (approx. 70°C {160°F}) when outside air temperature is about 30°C {86°F}. When this high-temperature refrigerant comes in contact with and is cooled by outside air at the heat exchanger (condenser), located near the radiator, it liquefies at about 60°C {140°F}.
The liquefied refrigerant is led into the passenger compartment and is sprayed from a small hole (expansion valve) to a low-pressure place (at the compressor intake side). Because the refrigerant is low pressure, it boils at about 0°C {32°F}, absorbing surrounding heat and changing back to its original gas form. Because the refrigerant passes through the heat exchanger (evaporator), the evaporator temperature becomes very low, and as a result of blower-circulated passenger compartment air, the interior air is cooled when the refrigerant is becoming a gas.
The refrigerant that has passed through the heat exchanger (evaporator) is warmed by the air in the vehicle, becomes a gas, and is taken into the compressor again. Thus the interior heat is absorbed and discharged outside the vehicle, thereby cooling the inside.



COOLER AND HEATER INSTALLED SEPARATELY FOR INDEPENDENT FUNCTION

AIR CONDITIONER

The air conditioner adjusts the cabin's air and humidity, thus the name air conditioner.



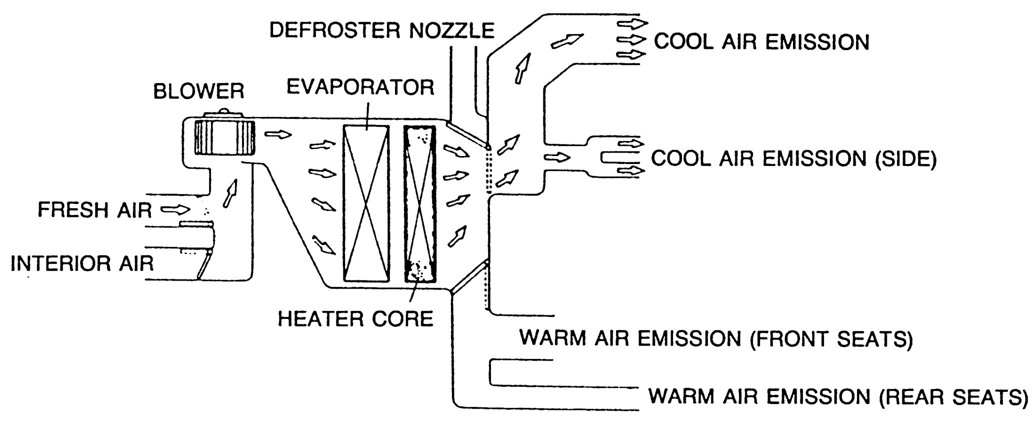
Mazda air conditioners blend warm and cool air for heating and cooling. One control can thus be used for actuation.

TYPES OF AIR CONDITIONERS

There are two basic vehicle air conditioner systems. In one, air passes through the heater core and air conditioner evaporator separately, after which cool air and hot air are mixed and adjusted to the suitable temperature and then conveyed to the passenger compartment. In the second system, air that has passed through the evaporator is passed again through the heater unit to adjust to the suitable temperature.
There are also two methods of temperature control: one in which the amount of air flowing at the core is varied and one in which the amount of hot water flowing in the heater core is varied. The systems most used are described below.

Reheat air conditioner system

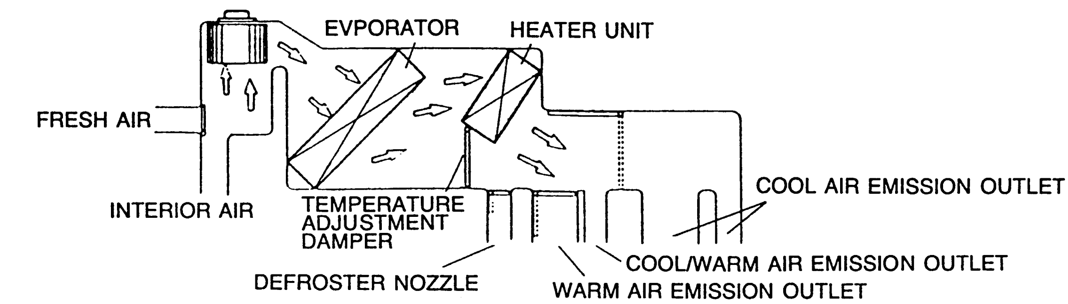
A reheat air conditioner system example is illustrated. In this system, air that has passed through the evaporator and has been cooled and dehumidified passes again through the heater core and maintains the passenger compartment temperature at a comfortable level.
When the interior temperature is set, only the evaporator is activated if it's midsummer, or if it's winter, mainly the heater operates. During other seasons, especially rainy seasons, both the heater and evaporator operate to provide dehumidified heating.



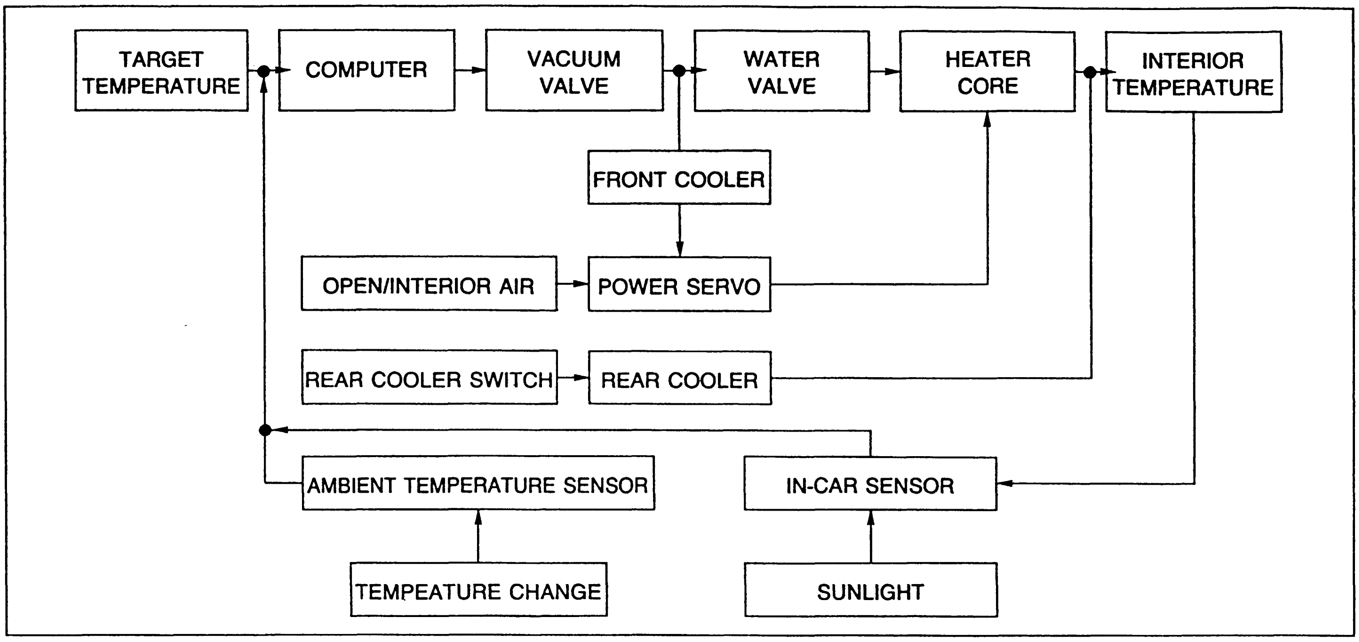
REHEAT AIR CONDITIONER SYSTEM

Air-mix air conditioner system

When the interior temperature is set, the temperature adjustment damper moves, as shown, according to that setting, adjusting both the air that passes through the evaporator and that enters the heater core and the air that does not, mixing both airs (shaded area in illustration) so that a comfortable air temperature is obtained. The flow of air is shown.
A system based on this method is called an automatic air conditioner.
Automatic air conditioner
When the interior temperature is set, the outside and inside air temperatures are constantly detected and the heater or evaporator is then activated. Because the interior temperature is maintained at the set level, the interior is very comfortable.
The block diagram of the control mechanisms used for the automatic air conditioner is shown on the next page.

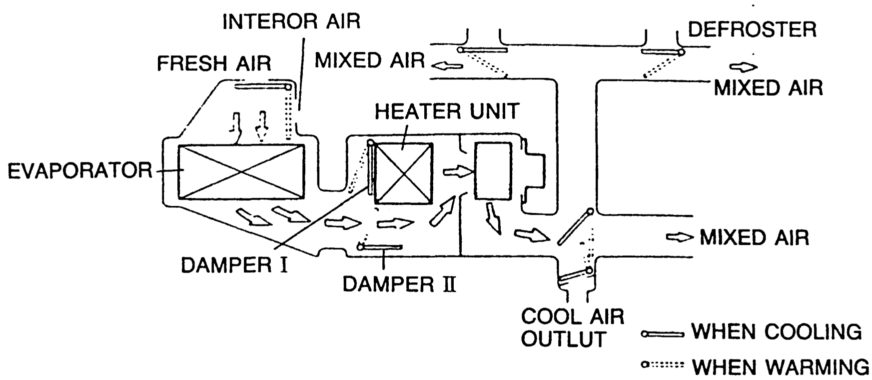


AIR-MIX AIR CONDITIONER SYSTEM



The interior temperature and amount of sunlight are detected by an in-car sensor and the outside temperature by an ambient temperature sensor. Both data are sent to the computer as signals, where they are converted to signals that activate the transducer.
Signals from the computer produce a vacuum corresponding to the difference between the set temperature and the temperature set by the transducer, thus activating the water valve that controls the amount of hot-water flow in the heater core and the power servo that activates the damper, thereby maintaining the interior temperature to the set level.

Semi-air-mix air conditioner system
When the interior temperature is set, dampers I and II move accordingly and adjust the amount of air entering the heater core. Then the air that passed through the heater core and the air that did not are mixed, and the mixed air is blown out from the air outlets. The airflow pattern is shown below.
In summer, the air outlet temperature is detected by the thermistor, controlling the temperature by turning the compressor on and off.



SEMI-AIR-MIX AIR CONDITIONER SYSTEM

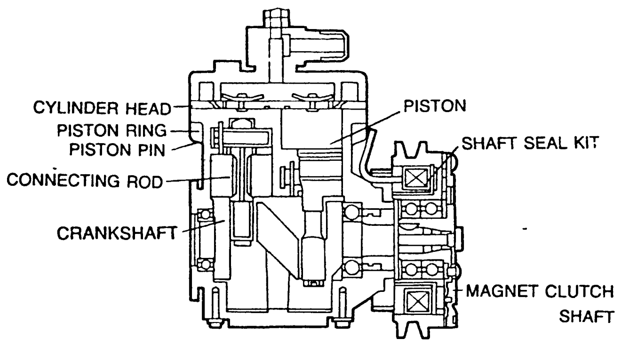
COMPONENTS

An automobile air conditioner consists of the cooling system, which is composed of a compressor, condenser, receiver, expansion valve, and evaporator. These components are placed by function not to interfere with the other functions of the vehicle.

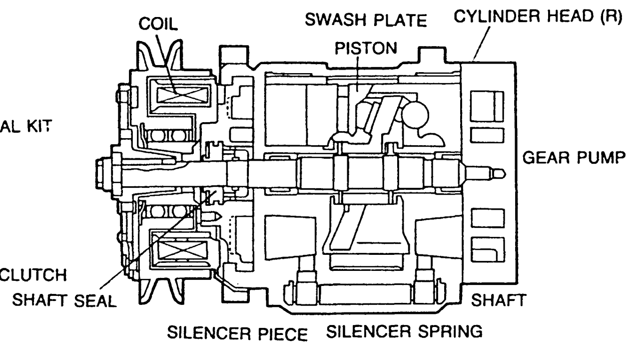
Compressor

The reason that a compressor is used in air conditioners is that the refrigerant in the cooling system is circulated and reused many times, and it can be easily compressed and liquefied.
The role of the compressor in the cooling system is to compress refrigerant (to raise its temperature and pressure to high levels) so that refrigerant gas from which heat was taken at the evaporator can easily discard its heat in a place of relatively high temperature (such as a place where the ambient temperature is 35°C {95°F}) and be liquefied.

- Compressor configuration
  Two types of compressors are often used in vehicles: the vertical reciprocal operation type (which has a crankshaft at the drive shaft), and the swash plate type, which has a double-end piston that moves reciprocally in the axial direction. They are described below.



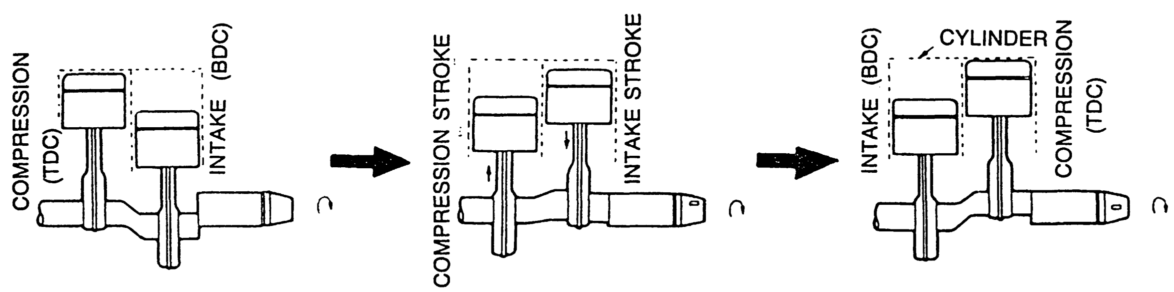
SWASH PLATE COMPRESSOR



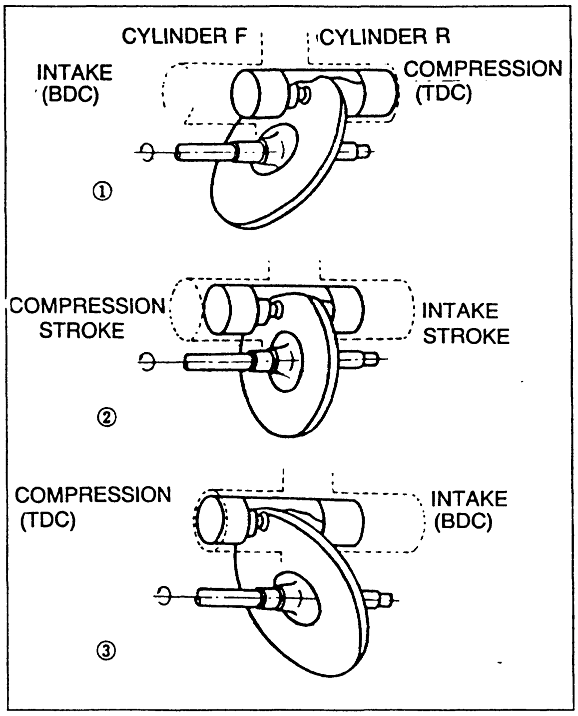
VERTICAL RECIPROCAL OPERATION TYPE

Operation principles

- Vertical reciprocal operation type (in-line)
  As shown, the vertical reciprocal operation type of compressor combines the connecting rod with the crankshaft, and by turning the crankshaft, it activates reciprocal motion of the piston, thereby compressing the refrigerant.



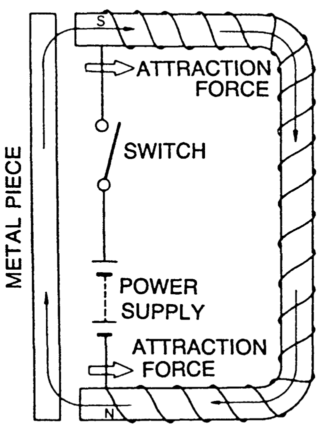
- Swash plate type
  The swash plate type of compressor, as shown (page 7), combines the piston with the swash plate, and by turning the swash plate, it activates reciprocal motion of the piston in the shaft direction, thus compressing the refrigerant.



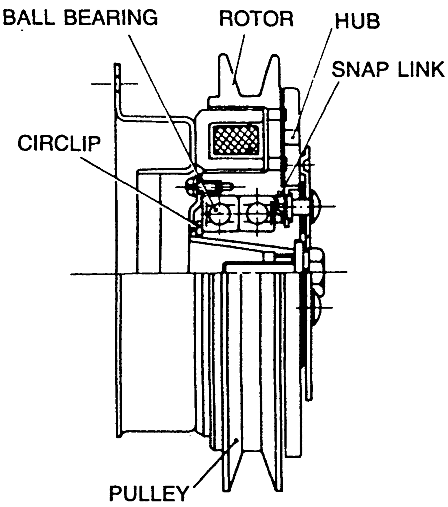
In other words, in the condition shown ①, the right side of the piston is in the compression TDC condition; the left side is in the intake BDC condition.
In part ②, the condition is shown when, from ①, the swash plate is turned 90°. Thus the piston is midway through movement at the left side. As a result, the piston right side is midway through intake and the left side is midway through compression.
When the swash plate is turned another 90° from ②, the condition becomes as in ③; the piston is midway through changing direction from the left side to the right side, and the piston right side has finished intake and the left side has finished compression.

When the swash plate is turned in this way, the piston moves reciprocally and the refrigerant is compressed. Note that for an actual compressor, the swash plate has three pistons (six cylinders), and each piston makes one reciprocal motion for one turn of the swash plate.

Magnetic clutch
When the engine is running and the interior temperature has reached the set level or when the air conditioner is not needed in cold weather or at other times, there is no need for the compressor to operate.
The magnetic clutch is a control mechanism that activates the compressor only when the air conditioner is needed; otherwise it stops operation.



MAGNETIC CLUTCH OPERATION PRINCIPLE

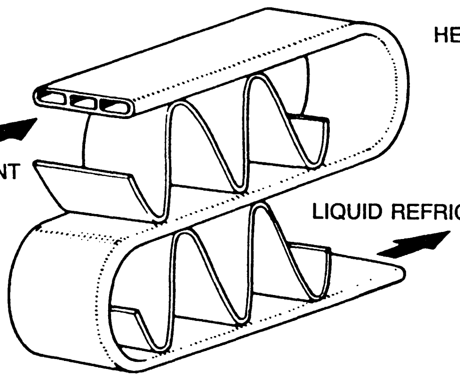


MAGNETIC CLUTCH CONSTRUCTION

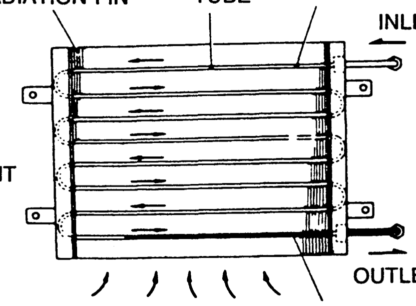
The operation principle and construction of the magnetic clutch are shown (page 7). The rotor is installed to the compressor crankshaft. When the air conditioner is not needed, only the rotor's pulley turns and the compressor doesn't operate. When the air conditioner is turned on, current flows to the coil in the stator, making the stator a strong magnet that attracts the rotor's hub and turns it with the pulley, thus starting compressor operation.
The service life of the magnetic clutch is determined by the amount of work consumed when the clutch is coupled and by the wear-resistance of the clutch friction surface.

Condenser

The condenser is used during the cooling cycle to cool the refrigerant (which was compressed at the compressor and became high temperature, high pressure) to its heat and convert the high-temperature, high-pressure gas refrigerant to liquid refrigerant.
At the condenser, the amount of heat the gas refrigerant releases is the total of the amount of heat absorbed at the evaporator plus the amount of heat necessary to compress the refrigerant at the compressor. Conversely, the greater the amount of heat radiation at the condenser, the greater the cooling effect obtained at the evaporator. Consequently the condenser is installed at the very front of the body so that it will be force-cooled by the engine's cooling fan and the airflow produced by vehicle movement.
Because the condenser is usually installed at the front of the radiator and to dispel any problems about engine overheating, the location of components is carefully planned in consideration of such factors as cooling fan replacement, fan shroud replacement, and fan rpm change.



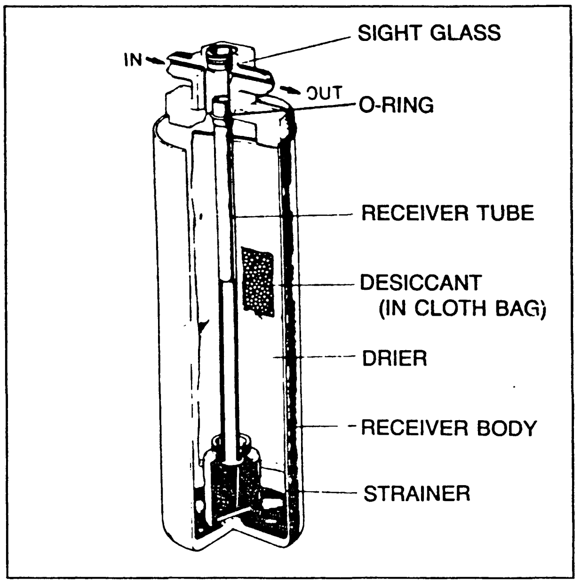
CONDENSER FUNCTION



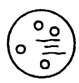
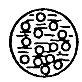
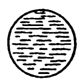
REFRIGERANT CHANGE AT CONDENSER

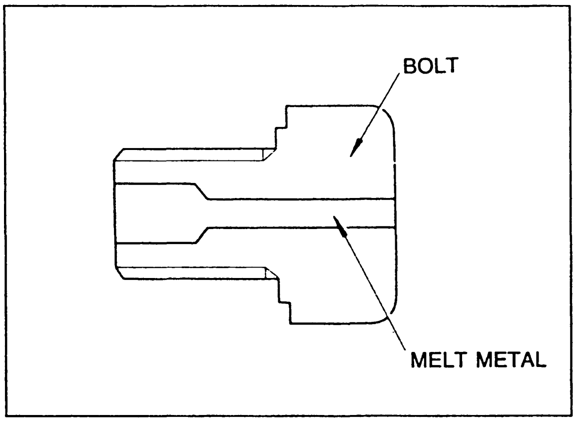
Receiver/drier

The receiver/drier tank temporarily stores refrigerant (liquefied at the condenser) for supply to the evaporator as needed, and it also removes contaminants from the cycle. This tank consists of a receiver tank, drier, strainer, check port, and fusible plug integrated in one unit. The functions are described on the next page.



1. Receiver tank
   The tank temporarily stores the liquid refrigerant sent from the condenser and thereafter supplies liquid refrigerant.
2. Drier
   If the refrigerant has moisture in it during cooling in the cooling system, it condenses and separates, then freezes at the expansion valve outlet. It also causes sludge that corrodes metal. For these reasons, the drier is necessary to keep the refrigerant always free of moisture.
   The drier uses silica as desiccant that is mainly silicic acid anhydride. With a globule shape, the inside has an infinite number of capillary tubes. The strong drying performance of the silica is the result of the activated surfaces of the capillary holes.
3. Strainer
   The strainer uses a metal screen to remove contaminants from the cooling system. This prevents the expansion valve from clogging.
4. Sight glass
   The check port is used to inspect the amount of refrigerant in the cooling system. It's installed at the upper part of the liquid tank outlet, and its glass permits visual checking of the refrigerant condition.

Sight glass condition	Almost transparent; foam disappears when engine rpm increased/decreased 	Foam always visible; transparent, some foam 	Very slight "mist" visible 
Overall condition judgment	Normal; refrigerant amount OK	Possible leakage somewhere	Most refrigerant has leaked out

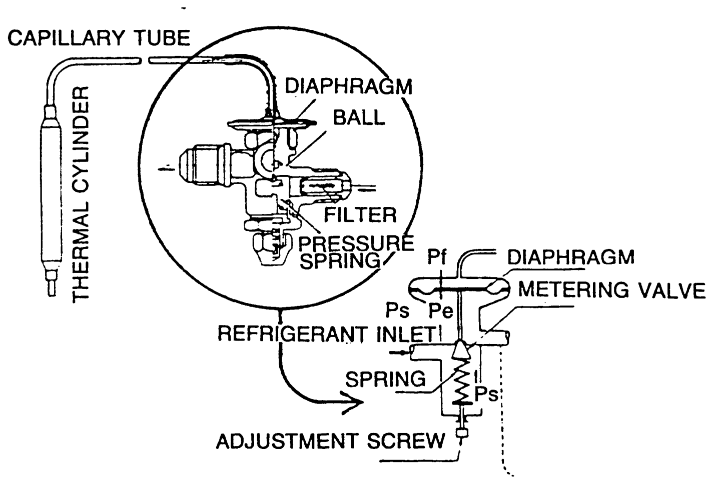


5. Fusible plug
   In the event, the gas in the system becomes abnormally high, it is allowed to escape.
   The activation temperature is about 95°—100°C {200°—212°F} (2,900 kPa {30 kgf/cm^2, 430 psi}). The material is an alloy of lead and tin that melts at high temperature, releasing the gas.

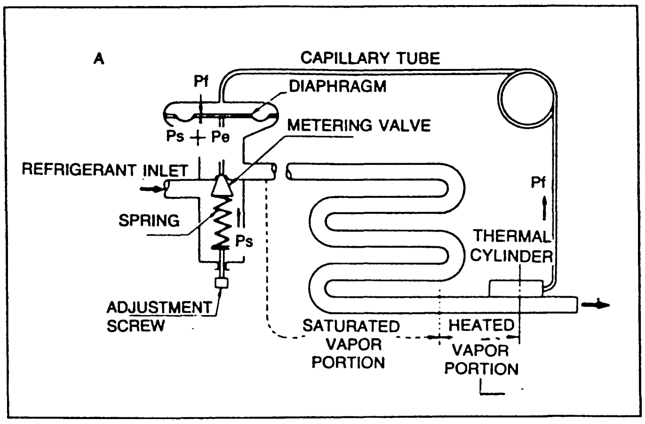
Expansion valve

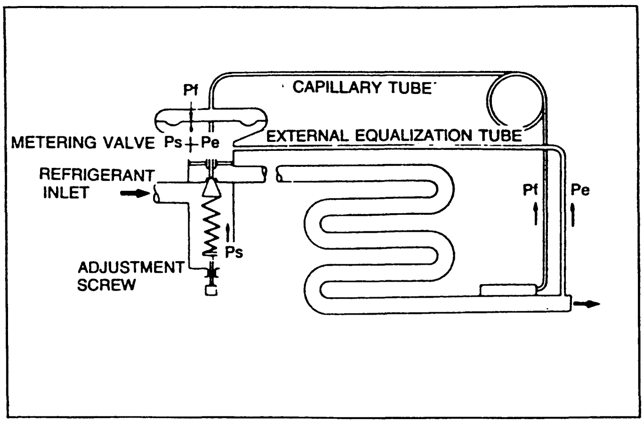
The expansion valve functions by spraying the liquid refrigerant (which has passed through the receiver/drier) from the small hole, changing the refrigerant to low-temperature, low-pressure refrigerant.
The expansion valve can be classified into the following types.
Constant-pressure type expansion valve
Thermal-activated expansion valve
Float valve

Unless conditions are maintained so that, regardless of the load at the evaporator, the liquid refrigerant is evaporated at the outlet and latent heat is taken from the surrounding air, the full capacity of the circulating refrigerant cannot be attained.
The thermal-activated type of expansion valve adjusts the amount of refrigerant flow to make the temperature difference constant between saturated gas and refrigerant gas from the evaporator.
Thus by using this type of expansion valve, exactly the same amount of refrigerant as the amount evaporated at the evaporator can be sent to the evaporator, so that the evaporator is fully used, the overall cooling mechanism operates smoothly, and efficiency is improved.
The needle valve moves up and down according to the difference between the sum Ps (pressure spring pressure) + Pe (evaporating pressure in the evaporator) and Pf (gas pressure in the thermal cylinder), and that result determines the amount of liquefied (at the condenser) refrigerant flow into the thermal-activated expansion valves.
When the cooling load is high, the temperature of the refrigerant gas at the evaporator outlet is also high; thus the temperature and pressure in the thermal cylinder become high and the force exerted on the diaphragm in the thermal cylinder also increases. This results in the ball being pushed down to try and circulate more refrigerant. When, conversely, the cooling load is low, the operation is completely the opposite, reducing the amount of circulating refrigerant.
There are two types of thermal-activated expansion valves (depending on how the saturated vapor pressure in the evaporator is taken out): the internal pressure-equalization type and the external pressure-equalization type. Their principles of operation are exactly the same.



1. Internal pressure-equalization expansion valve
   In figure above: Pf = thermal cylinder internal gas pressure
   Ps = spring pressure
   Pe = evaporator internal evaporation pressure
   When during operation the evaporation pressure of the refrigerant mechanism is stable, Pf = Pd + Ps is achieved and restraint is accomplished by the degree of opening of the needle valve, thus maintaining a constant flow amount of refrigerant.
   For evaporators that use this expansion valve, the refrigerant is always heated vapor for a certain portion (L in the figure) at the outlet. If the amount of refrigerant in the evaporator becomes low, the refrigerant evaporates quickly, the L portion becomes longer, and the degree of heating becomes greater.
   Consequently, the pressure in the thermal cylinder rises, the needle valve opens farther, and the amount of refrigerant flowing into the evaporator increases. When the amount of refrigerant in the evaporator is high however, the L portion becomes shorter and the pressure in the thermal cylinder drops; thus the needle valve opening becomes smaller.



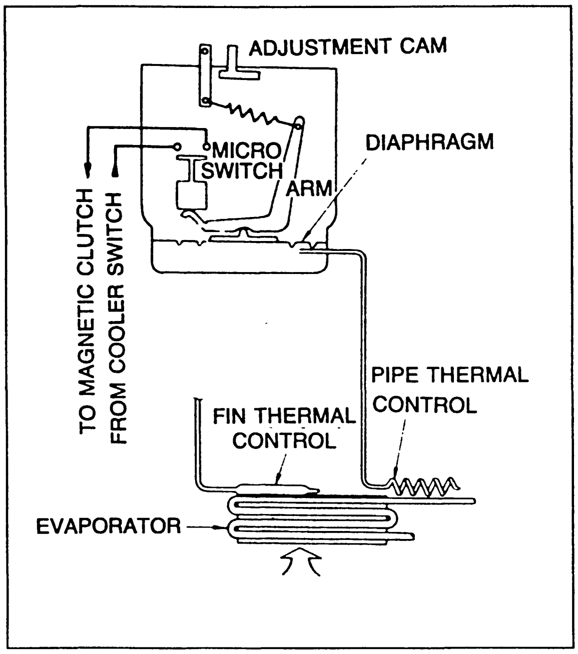


2. External equalization type expansion valve
   As a result of passage resistance, a pressure drop occurs from the inlet to the outlet of the evaporator. If it's great, a large degree of heating is necessary to open the valve for the type of valve in which, like the internal equalization type, the evaporator inlet pressure is applied directly to the diaphragm. This results in the L part (illustration) becoming longer and evaporator efficiency decreasing.
   For that reason, the pressure applied to the lower side of the diaphragm is not the expansion valve outlet pressure; instead, the pressure near the end of the evaporator is used, thus activating the expansion valve. The external equalization type, as shown, thus overcomes the disadvantage of the internal equalization type.

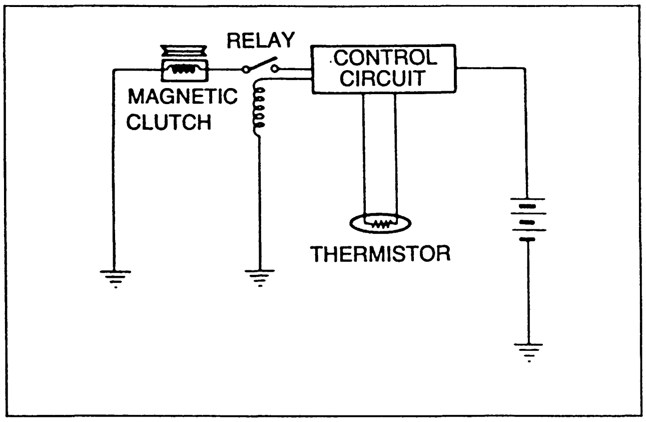
Thermal control

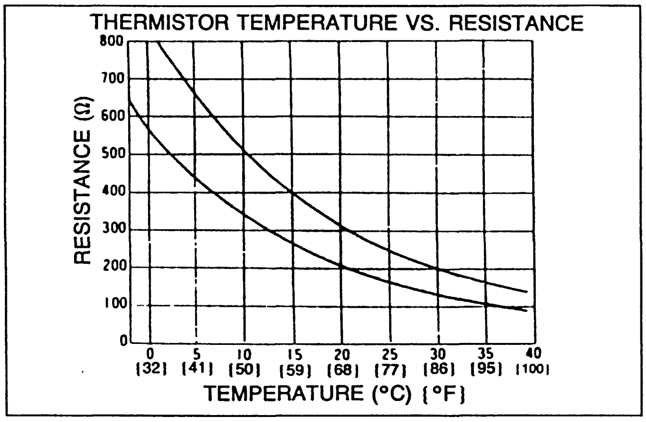
If the evaporator fin temperature (that is, the refrigerant evaporation temperature) becomes 0°C {32°F} or less, frost forms on the fins, which reduces airflow and cooling capacity. To prevent this and thus be able to control the interior temperature to the desired level, the thermal control is used. There are two types: gas and thermistor. There are two gas types, both exactly the same except for location: the fin thermal control, installed on the evaporator fins, and the pipe thermal control, installed on the pipe.
In the gas-type thermal control, the air outlet temperature, fin surface temperature, or pipe surface temperature is detected so that the evaporator fin surface temperature does not fall below a certain level, and the compressor's magnetic clutch operates intermittently for control.

- Gas-type thermal control
  The gas enclosed in the thermal cylinder is extremely sensitive to temperature changes; it has a high expansion coefficient.



When the air outlet temperature is higher than the set temperature (which means the evaporator's refrigerant evaporation temperature is too high), the gas in the thermal control's thermal cylinder expands, causing the pressure to rise and pushing the diaphragm up. When this happens, the microswitch is turned on, the magnet clutch is activated, the compressor operates, the refrigerant is circulated again, and the air outlet temperature decreases.
Conversely, when the air outlet temperature is too low, the gas in the thermal cylinder contracts, the pressure falls, the diaphragm is pulled down, the magnet clutch is stopped, and the compressor stops.
This method of mechanical control of the temperature is called the gas type. The method by which electricity is used is called the thermistor type.





By this method, temperature is controlled by intermittent operation of the magnetic clutch, which is installed at the compressor. As shown, when the temperature rises the thermistor resistance becomes smaller. Changes of the air outlet temperature are detected by changes of this resistance.

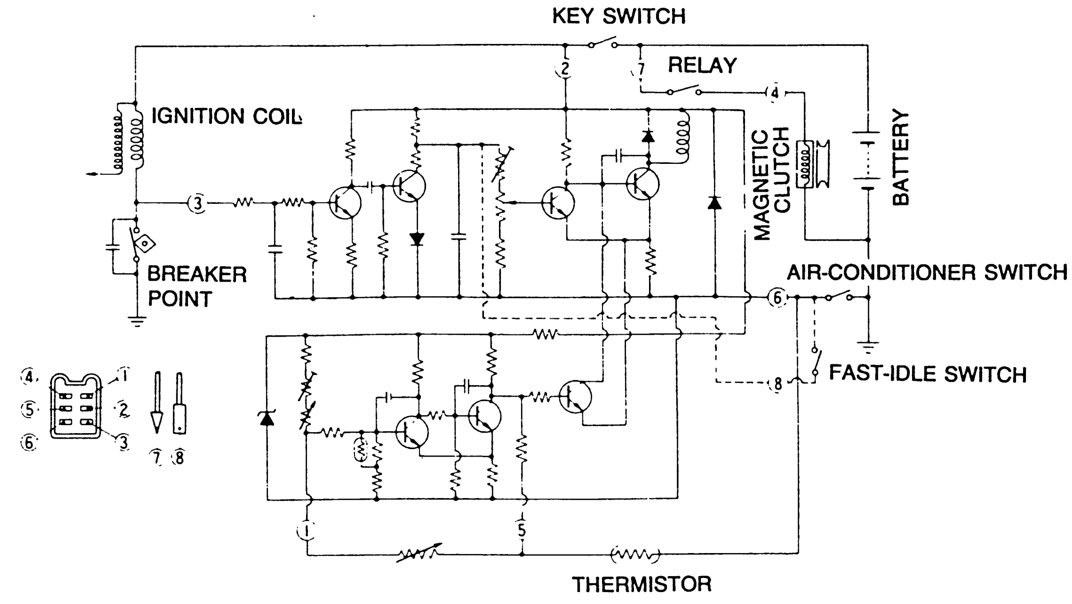
Amp stabilizer relay

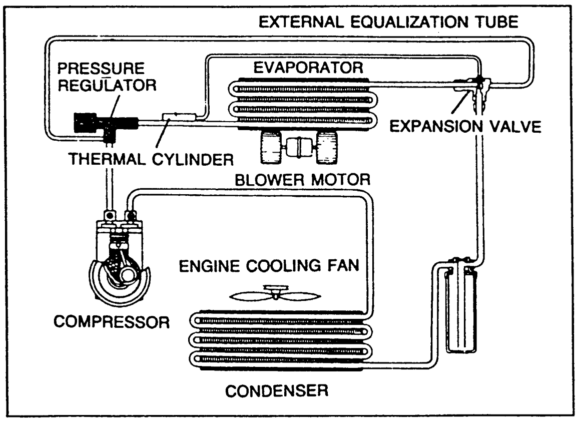
There are two types of circuit in the stabilizer relay: one that operates the magnetic clutch intermittently by detecting the engine rpm, and one that operates the clutch intermittently by detecting the interior temperature. The amp stabilizer relay is a combination of a circuit (thermo control) that uses a thermistor to convert the interior temperature to signals for control by a thermistor circuit and a transistor circuit (idle stabilizer) that is controlled by detecting the engine rpm. There are also systems using the idle stabilizer itself and the thermal control itself.

The amp stabilizer relay can be divided into three sections by function: interior temperature detection/amplification, engine rpm amplification, and relay. Signals from interior temperature and engine rpm are combined at the relay, which is activated when it satisfies both signals at the same time, causing current to flow to the magnetic clutch and the compressor to run.
When the interior temperature is lower than the set temperature, the air conditioner is not activated.
When the engine rpm is very low and the compressor is activated, the compressor applies a load to the engine, causing overheating and stalling.

Note

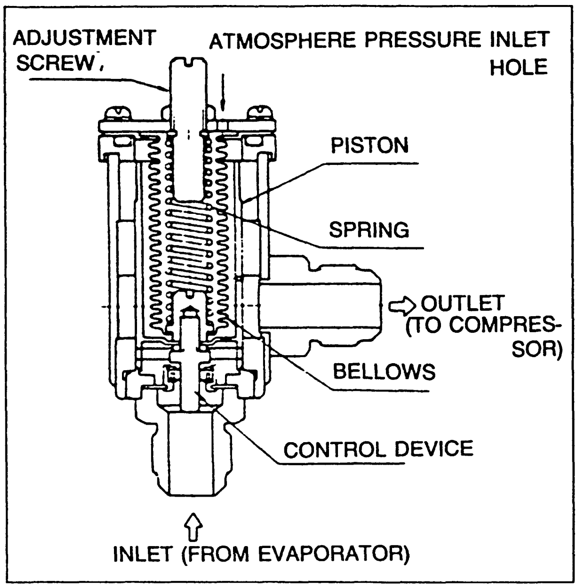
- **The air conditioner can be used effectively on Mazda vehicles during idling because of the adoption of the fast-idle device; so only the thermal control circuit is used in the amp stabilizer.**



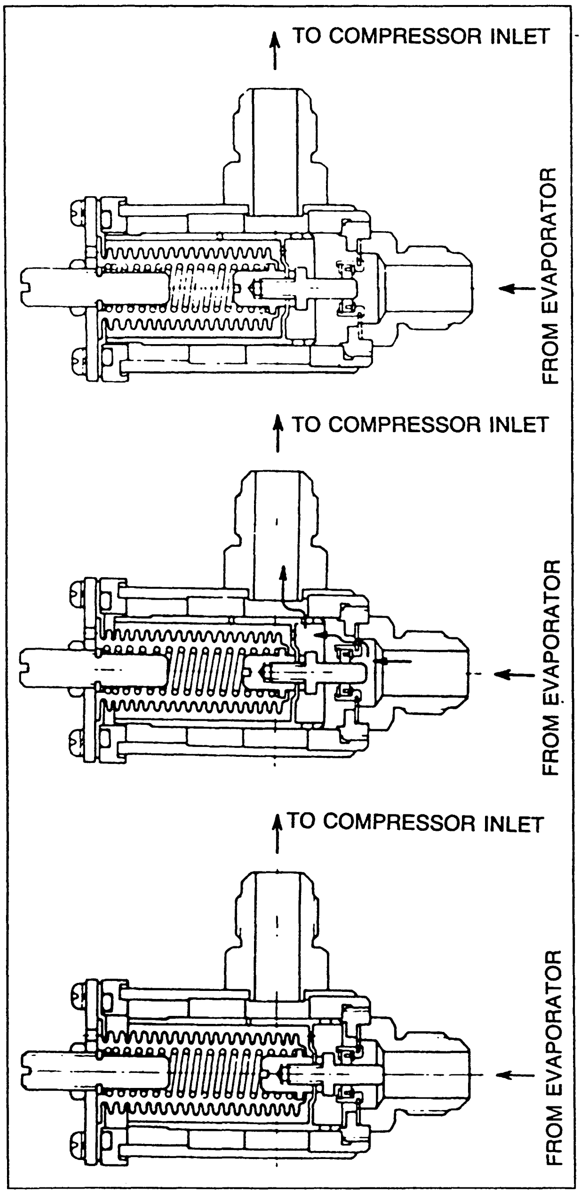


EPR (evaporator pressure regulator)

The EPR is between the evaporator outlet and the compressor inlet. It is an evaporation pressure regulator valve that restricts the suction line and thus regulates the evaporation pressure within the evaporator.
It functions to maintain the evaporation pressure at a certain level or higher so that the refrigerant temperature doesn't fall to 0°C {32°F} or below to prevent a drop in cooling capacity because of the freezing of moisture on the evaporator's external surface. Refrigerant temperature is 0°C {32°F} when the refrigerant evaporation pressure in the evaporator is 210 kPa {2.1 kgf/cm^2, 30 psi}.

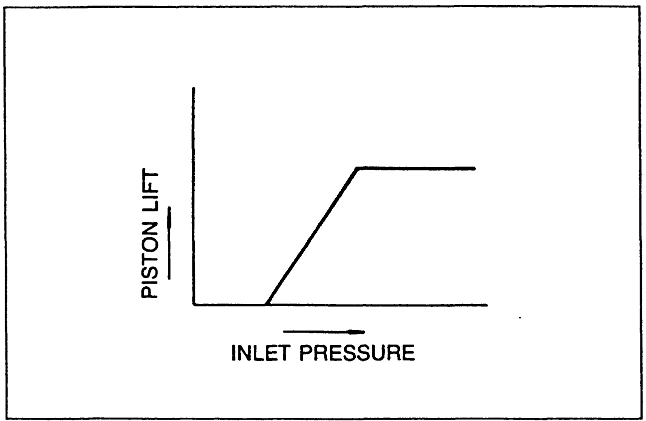


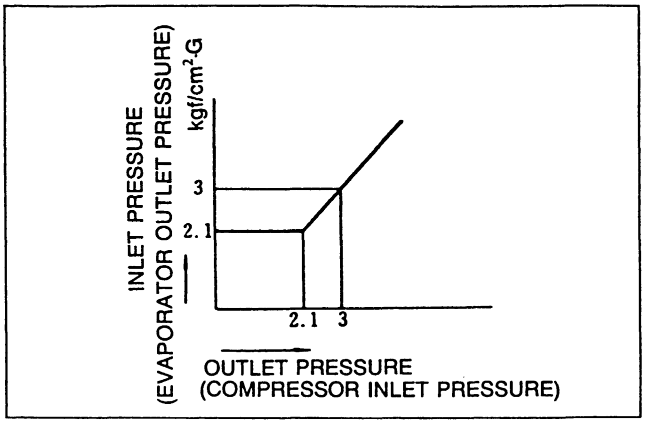
1. EPR structure
   Two forces act on the piston: one (spring force + bellows pushing force + air pressure) trying to close the passage and another (evaporator outlet pressure) trying to open it. The balance of these forces maintains the evaporator outlet pressure at a certain pressure or higher. To absorb the piston vibrations caused by the pulsating action of refrigerant, a control mechanism is provided and abnormal noise is prevented.



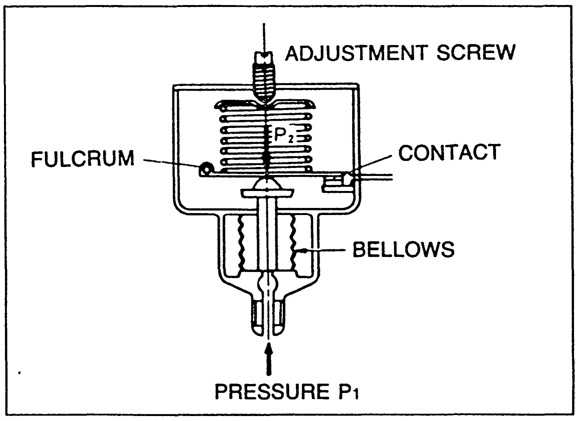
2. EPR operation
   (a) Because the evaporator internal pressure is higher than the EPR set pressure before system operation, the spring contracts, the piston is pushed back, and the refrigerant passage opens.
   (b) During pressure control
   To maintain the EPR set pressure within the evaporator, that pressure and the combination of force resulting from spring contraction + the bellows pushing force + atmospheric pressure are balanced, thus regulating refrigerant flow.
   (c) When evaporator internal pressure falls
   When the pressure on the piston by the refrigerant falls, the spring expands and the piston moves in the closing direction so that the evaporator internal pressure becomes the set pressure.

- The relationship between EPR inlet pressure and piston lift and the relationship between outlet pressure and inlet pressure are shown.



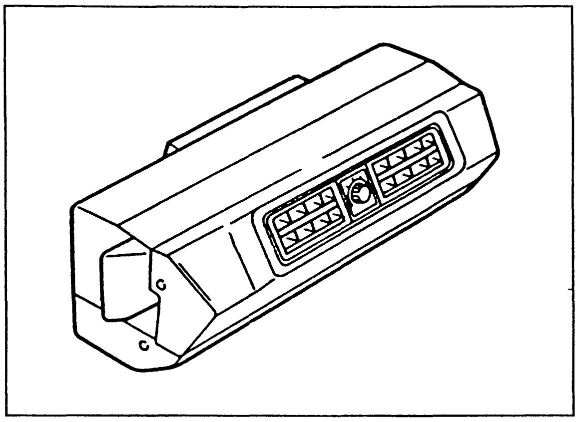


3. Handling notes
   (a) The evaporator outlet pressure cannot be measured; so don't move the adjustment screw. This could result in a change of the evaporation pressure and a cooling malfunction. If it is unavoidably moved, the following is a guide: one turn inward increases the evaporation pressure by about 5.9 kPa {0.06 kgf/cm^2, 0.85 psi}, or about 0.5°C {33°F}.
   (b) Frost may appear on the surface of the suction line between the EPR outlet and the compressor inlet, but this is not abnormal. It's because of the great decrease in pressure resulting from restriction of the suction line at the EPR, causing the suction line temperature to fall to 0°C {32°F} or less.
   (c) It was formerly possible to judge whether the refrigerant system was good or not by installing a gauge manifold at the compressor inlet and outlet and measuring high and low pressures, but judgment by gauge cannot be done when the suction line is restricted (suction line frosted) because of the EPR.
   (d) In former air conditioners, the compressor's magnetic clutch was turned off when the outlet air temperature fell, but with EPR, it's not turned off, because of freezing prevention by the EPR.
   If, however, the temperature of the evaporator suction air falls to 8°C {50°F} or less, the intake-air sensor (thermal control) is activated, turning off the clutch.

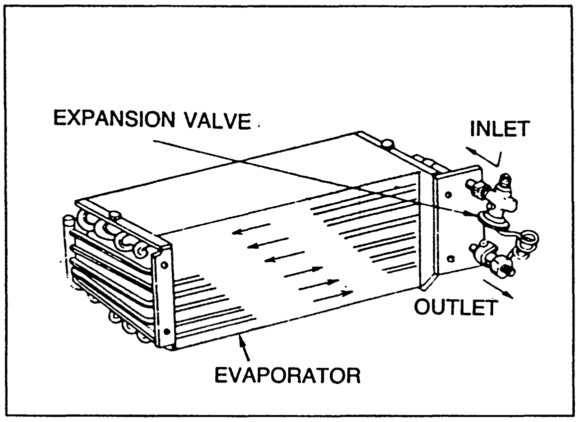


- Pressure switch
  The pressure switch prevents condenser damage if the pressure at the high-pressure side in the cooling system (that is, the refrigerant's condensation pressure) becomes abnormally high. A bellows is incorporated in this switch to convert pressure changes to position displacements.

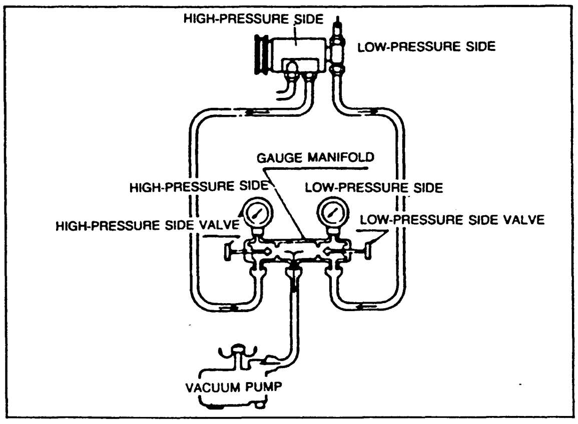
The bellows detects the high-pressure side pressure, and if that pressure is high (P1 > P2), it overcomes the spring force and the microswitch and magnetic clutch are turned off, thus protecting the cooling system. This pressure switch is also used for control in a system using a fan exclusively for cooling the condenser.
To prevent poor circulation at the compressor because of an abnormal decrease of the refrigerant in the cooling system, another type detects the pressure at the compressor's low-pressure side (SUC) and turns off the magnetic clutch.
To prevent a liquid backup in the compressor (because all refrigerant in the evaporator did not evaporate as a result of low evaporator inlet-air temperature) and damage to the suction valve, the compressor's magnetic clutch is turned off by the intake-air sensor when the outside air temperature becomes low.



Air conditioner unit
The air conditioner unit, installed in the passenger compartment, consists of the evaporator, blower motor and fan, and the above-mentioned expansion valve and drain pan.
For some types of air conditioners, the fan and blower motor are common.
The drain pan also serves as the air conditioner unit's case. It collects the moisture from the evaporator fins and discharges it to the outside. It is formed in such a way that water doesn't leak into the passenger compartment.



- Evaporator
  As shown, the evaporator, like the condenser, has a very simple structure, but it's the most important cooling component.
  The formation of frost mainly occurs on the evaporator fins. When warm air strikes the fins and is cooled to a temperature below the dew point, moisture in the air is condensed and water droplets form on the fins. If the fins' temperature is 0°C {32°F} or below, those droplets change to ice or frost. When that happens, the evaporator's heat exchange efficiency drops, the amount of air passing through it also decreases, and the coefficient of operation of the cooling device drops.



AIR PURGING AND GAS CHARGING

Air purging

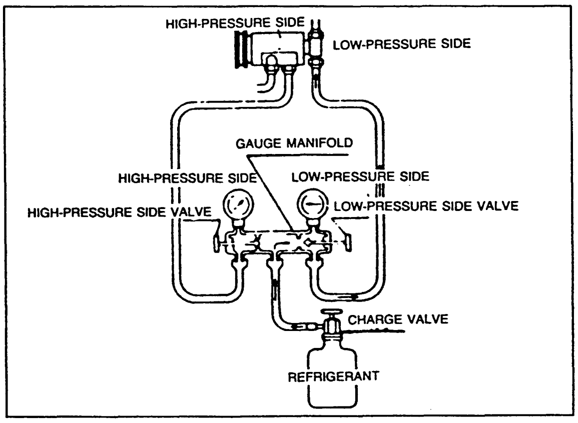
Air must be purged from the system before gas charging. If air remains, the efficiency would drop after refrigerant charging; so purging must be done carefully.

1. Remove the high- and low-pressure connector caps and connect the charging hose, with one end connected to the high- and low-pressure sides of the gauge manifold. (The compressor and gauge manifold connections must be high to high pressure and low to low pressure.)
2. Connect the charging hose to the central port of the gauge manifold, and the other end to a vacuum pump.

Note
- **Inspect the compressor high- and low-pressure connections and the gauge manifold high- and low-pressure connections to be sure they're correct.**

3. To open the gauge manifold high- and low-pressure valves, turn them to the left.
4. Start the vacuum pump and suck out air in the system.
5. When the vacuum gauge indicates about 98.7 kPa {740 mmHg, 29.1 inHg}, close the gauge manifold high- and low-pressure valves by turning them to the right; then stop the vacuum pump.
6. If under these conditions the vacuum doesn't change after 10 minutes or more, operate the vacuum pump again and open the gauge manifold high- and low-pressure valves by turning them to the left to get 101 kPa {760 mmHg, 29.9 inHg}. If the humidity is especially high, air purging should be done with special care for 20—30 minutes.
7. After that, close the gauge manifold high- and low-pressure valves by turning them to the right and stop the vacuum pump.
8. Disconnect the charging hose from the vacuum pump.

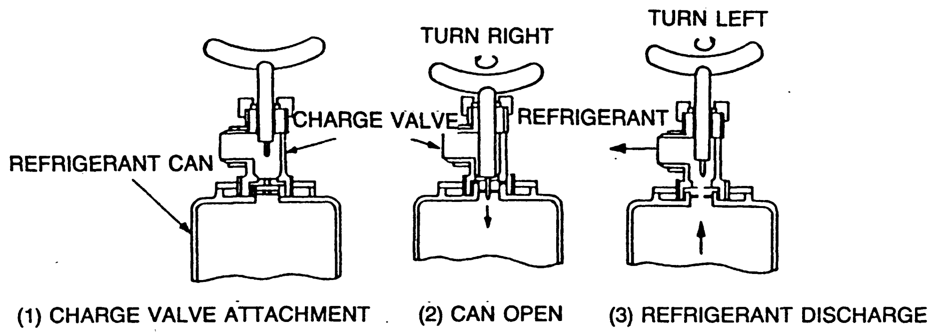
Note
- **Disconnect the hose only after the vacuum pump stops, not before. If the pump is not stopped, dirt and moisture will be sucked in and cause trouble.**



Gas charging

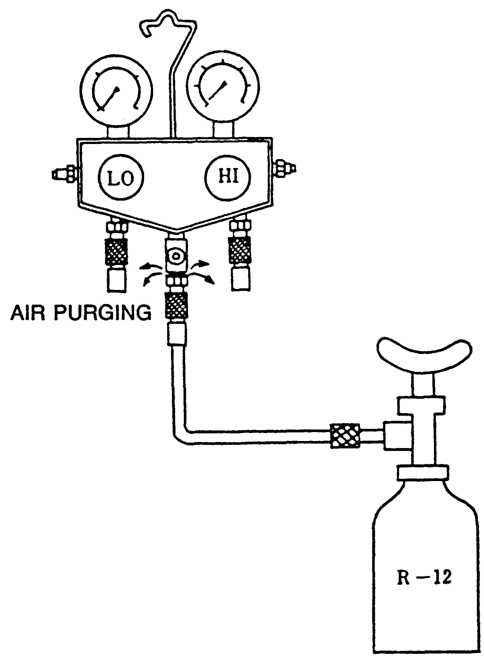
Charge with gas after purging the air.

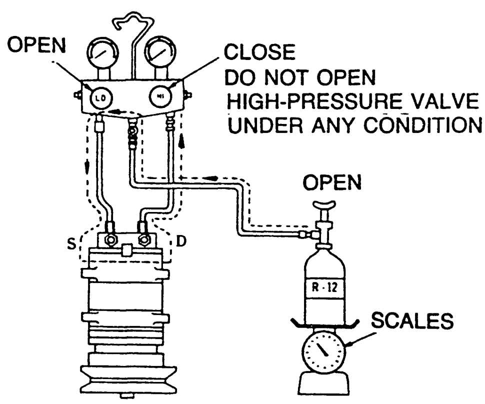
1. Completely return the charge valve handle and securely attach the can. Connect it to the charging hose at the center of the gauge manifold.
2. Turn the charge valve handle all the way inward and break the can seal.
3. When the handle is returned, refrigerant will enter the center charging hose. Loosen the joint slightly at the gauge manifold to purge air from the hose. Then securely connect the joint to the manifold.

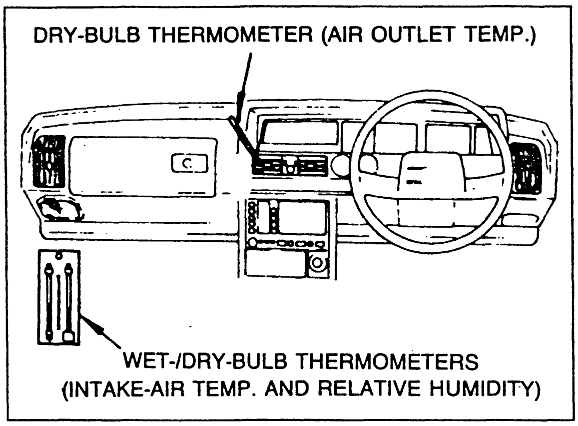


(1) CHARGE VALVE ATTACHMENT (2) CAN OPEN (3) REFRIGERANT DISCHARGE

4. To open, turn only the low-pressure valve of the gauge manifold to the left and charge the refrigerant to the cycle. To close, turn it to the right.
5. Test for gas leaks of the entire system.
6. If no leaks are found, turn only the low-pressure valve again to the left (to open) and fill the system with canned refrigerant.
7. If the refrigerant will not enter, start the engine, run it at about 1,000 rpm, and start the air conditioner.
8. When the can feels light and is no longer cold, close the low-pressure valve by turning it to the right.
9. Remove the can from the charge valve and replace it with a new can.
10. Repeat Steps 1—8.
11. When the proper amount has been charged, close the low-pressure valve by turning it to the right and turn the charge valve handle all the way in.
12. Stop the air conditioner and the engine.
13. Disconnect the charging hose from the compressor's high- and low-pressure connectors and cap the connectors.







Refrigerant gas charging notes

1. Don't fail to close the high-pressure valve when charging with the engine running.
2. When the charging valve is removed while cans are being exchanged, be careful of the momentary outgush of gas remaining in the used can.
3. Don't turn the can upside down during charging because liquid will enter the compressor and damage the valve.
4. Gas evaporation is poor when the air temperature is low, thus requiring more time. Heat the can in warm water if necessary, but never exceed 40°C {100°F}.
5. Watch the bubbles in the sight glass and charge to the specified level. (A scale can also be used.)

PERFORMANCE TESTS

It's necessary to know to what extent the air conditioner is cooling.
Cooling performance tests are therefore conducted and measured results compared with a standard performance table in order to judge performance.

Performance inspection equipment

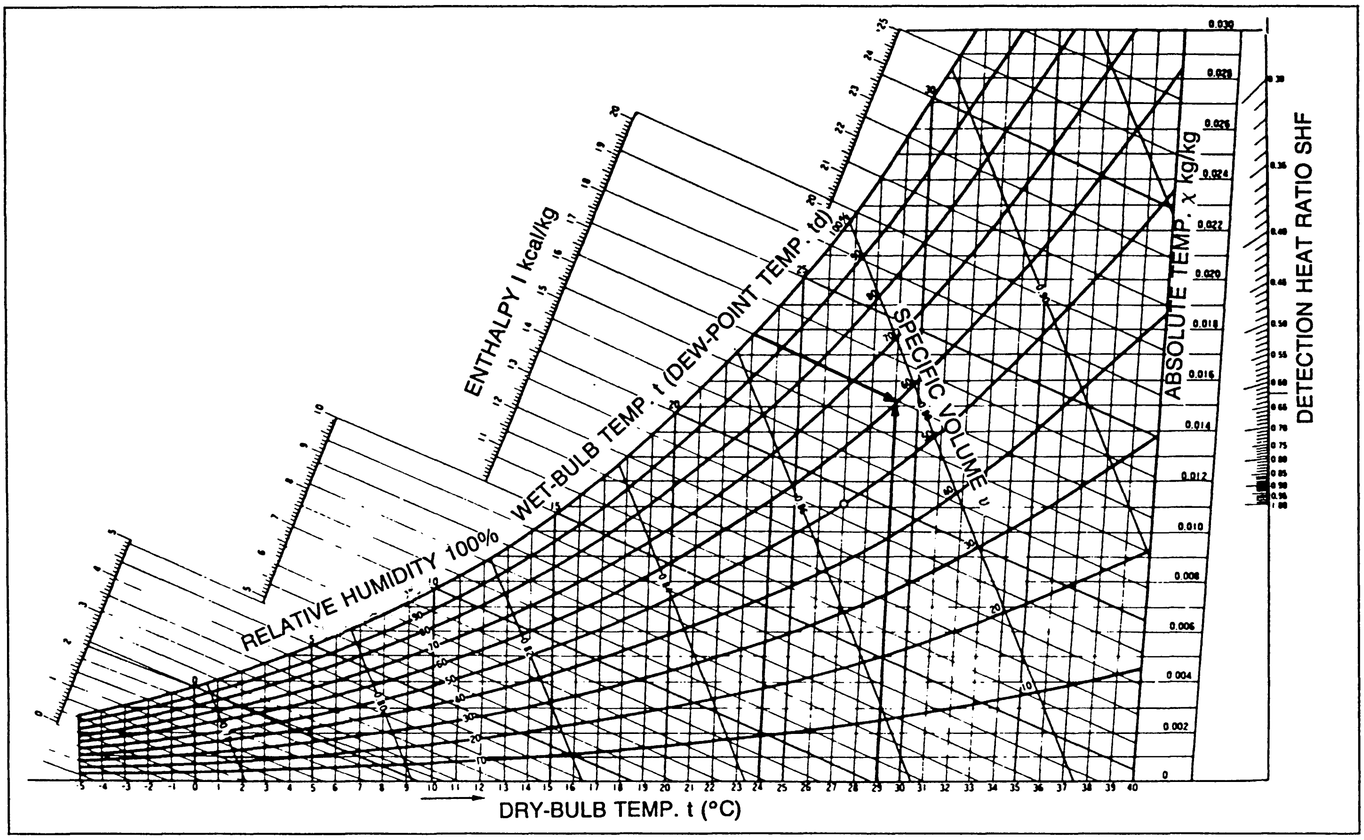
- Dry-bulb thermometers 2
- Gauge manifold 1
- Wet-bulb thermometer 1
- Engine tachometer 1

Measurement conditions

1. Park the vehicle in a shaded, well-ventilated place.
2. Open the hood.
3. Close the doors and open the windows.
4. Attach a dry-bulb and a wet-bulb thermometer at the air conditioner's air intake port and a dry-bulb thermometer at the center air outlet.
5. Increase and hold the engine rpm to a speed that corresponds to 40 km/h {25 MPH} (top gear).
6. Set the air conditioner blower speed at high.
7. Set the mode lever at recirculate (inside air cooling) and the temperature lever at cold.
8. Hold the compressor delivery pressure to about 1500 kPa {15 kgf/cm^2, 210 psi} G.
   Monitor the intake and outlet air for 5 minutes or more; measure when they appear to be stable.

How to use isometric graph

The standard performance table's relative humidity is determined from the isometric graph (page 20).
Example: When the cooling unit intake air wet-bulb temperature is 23°C {73°F} and the dry-bulb temperature is 29°C {84°F}, the intersection of these lines indicates a relative humidity of 60%.

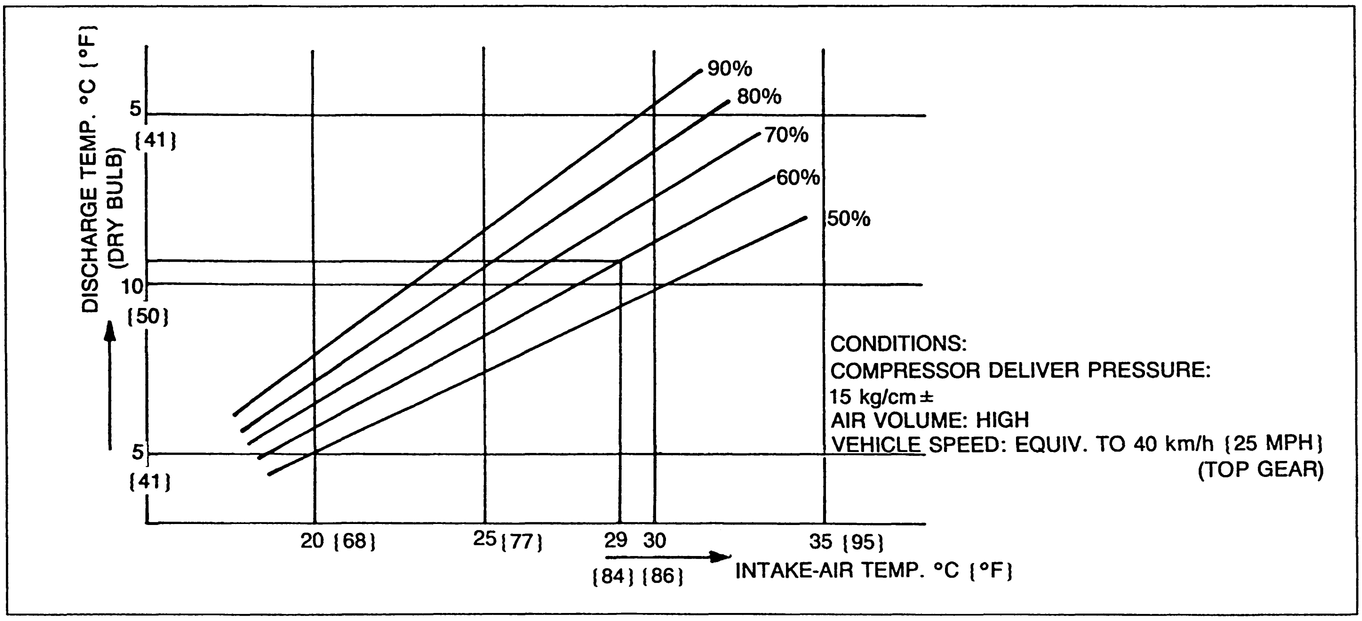


Compression with standard performance table

After taking measurements, compare them with the standard performance table. The temperature obtained at the air outlet should be approximately the discharge temperature at the intersection of the lines indicating the relative humidity and the dry-bulb temperature of intake air.

How to use standard performance table

If, for example, the intake-air temperature is 29°C {84°F} and the relative humidity 60%, the discharge temperature at the air outlet should be 10.5°C {50.9°F}.



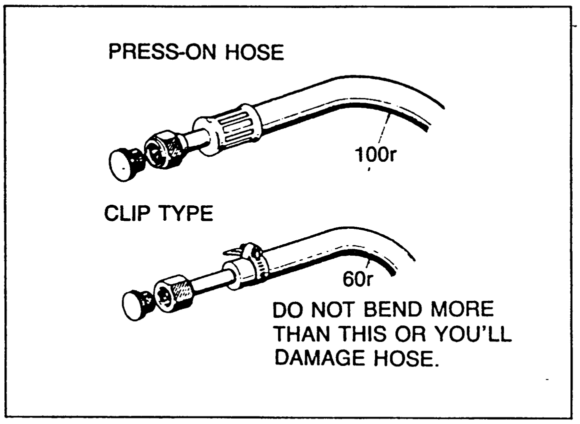
Note

- **If the measured values differ by 2° or 3°C {36° or 37°F} or more from the standard performance table, measurements should be taken again because changed conditions may be causing the difference.**
- **If the compressor delivery pressure exceeds 1,700 kPa {17 kgf/cm^2, 240 psi} some way should be devised so that airflow contacts the condenser and maintains a pressure of about 1,500 kPa {15 kgf/cm^2, 210 psi}.**
- **Be cautious of the outdoor air and the wet-bulb temperatures because they easily affect intake-air set value.**

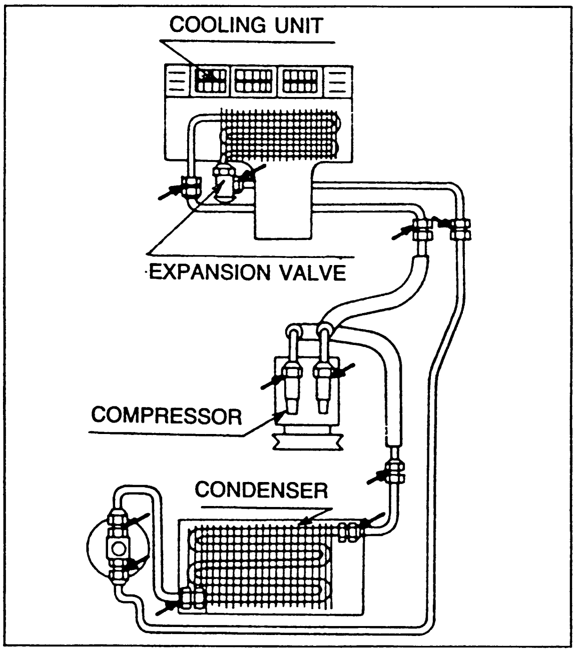
TROUBLESHOOTING

When air conditioner won't cool effectively
Inspect for normal compressor and fan motor operation.
If it's not normal, inspect for fuse failure, wiring disconnection, poor switch contact, and belt slipping.
If the compressor and fan motor operate normally, inspect the refrigerant flow; add refrigerant if necessary, and inspect for refrigerant leakage with a leak tester at the hose and pipe connections.

Gas leakage
Gas leakage is the most common cause of trouble. When there is insufficient refrigerant because of the leakage of a refrigerant gas from the system, there will be a decrease in the amount of liquid refrigerant supplied to the expansion valve, resulting in too little evaporating liquid in the evaporator and therefore not enough heat absorption.
This causes a reduced cooling effect and thus insufficient cooling. Causes of gas leaks can be divided into leaks resulting from hose damage and poor pipe connections and leaks of main parts of the system, but most are the former.
Although possible, leaks of the compressor (seals), condenser, receiver/drier, and evaporator are unlikely to occur.

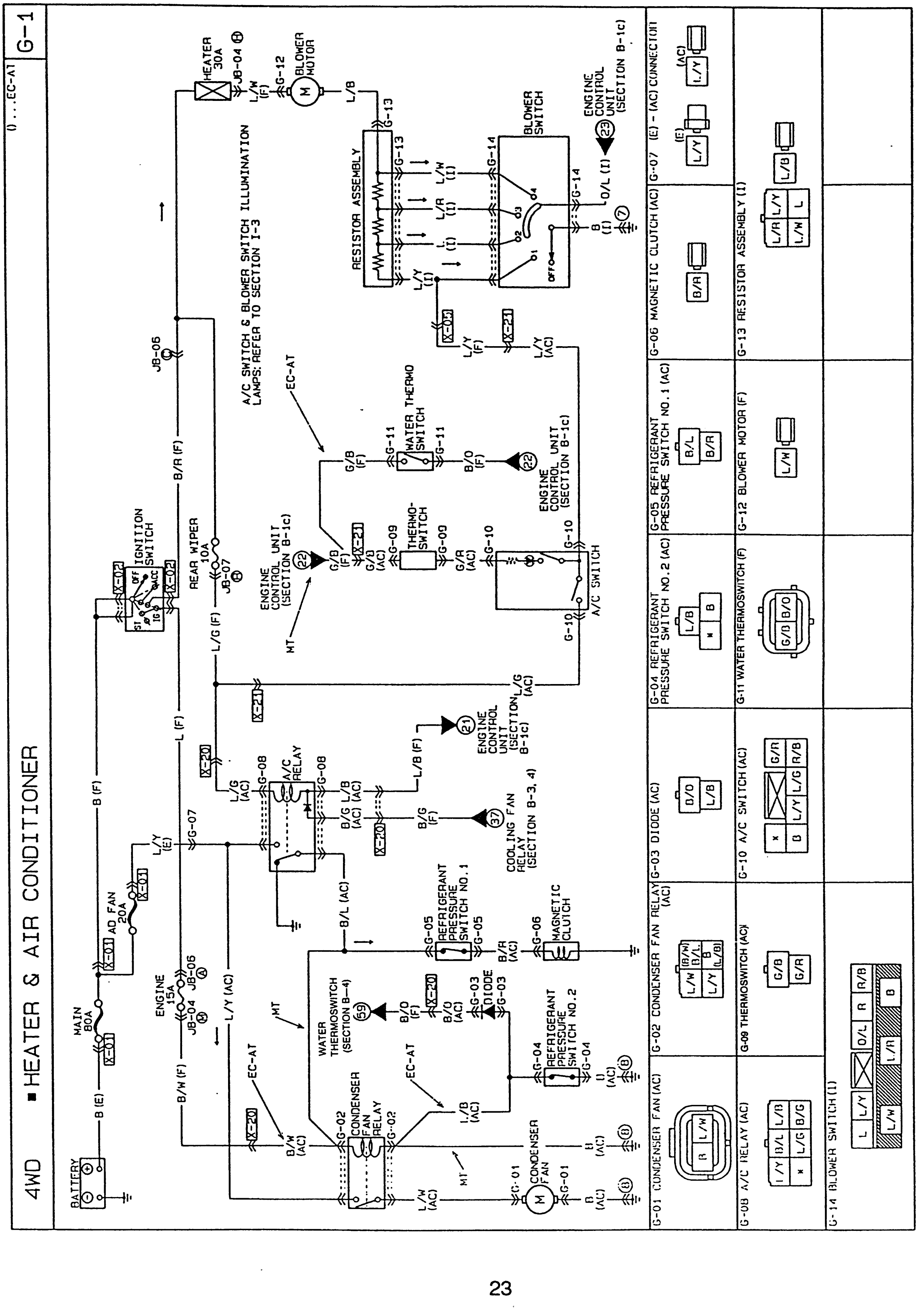


1. Hose damage
   Most problems are caused by improper assembly of the hose at the time of installation. As shown, the angle of the flare fitting should be so that excessive pressure is not applied to the hose tubing.
   When piping is installed, the hose part should be held so that the angle of the flare fitting is not changed.
   You must use hose clips to hold the hose.



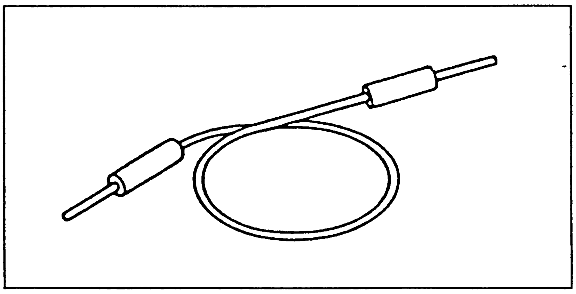
2. Gas leaks at pipe connections
   These leaks can be classified as either poor connections at the pipe flares or because of turning together with the aluminum pipe. The former is an elementary error, but the latter is a more difficult problem: tightening is difficult without damaging the pipe because the pipe also turns.
   - Note the following in regard to flare nut tightening.
     Apply compressor oil at the flare and use a two wrenches to prevent turning it when tightening.
     The pipe should be positioned at an angle where the flare nut is not adversely affected; first tighten by hand.

TROUBLESHOOTING GUIDE
CIRCUIT DIAGRAM



Symptom
Blower motor doesn't operate.
Condenser fan doesn't operate. (magnetic clutch operates normally.)
Magnetic clutch doesn't operate. (condenser fan operates normally.)
Condenser fan and magnetic clutch don't operate.
Insufficient cooling. No cooling. Intermittent cooling.

Note
- **The follow inspections are for general explanation only, refer to the proper workshop manual.**

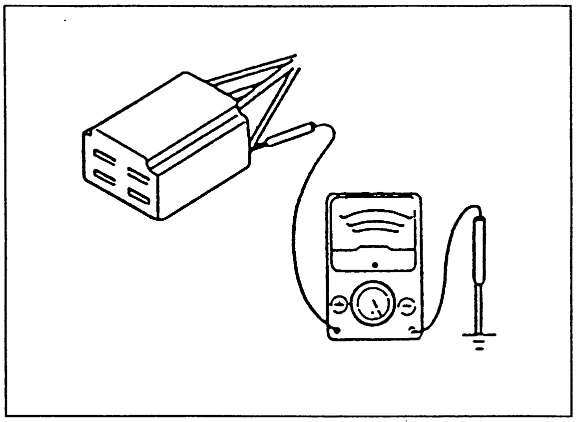


ELECTRICAL TROUBLESHOOTING TOOLS

Jumper Wire

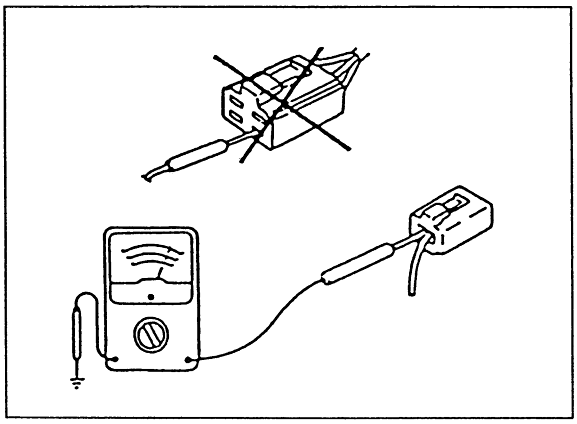
The jumper wire is used for testing by short-circuiting the switch terminals and to verify the condition of the ground connections.

Caution
- **Don't connect the jumper wire between a power source and a body ground. This may cause burning and other damage to harnesses and electronic components.**



Voltmeter

The DC voltmeter is used to measure circuit voltage. A voltmeter with a range of 15V or more must be used. It's used by connecting the positive (+) probe (red lead) to the point where voltage is to be measured and by connecting the negative (–) probe (black lead) to a body ground.



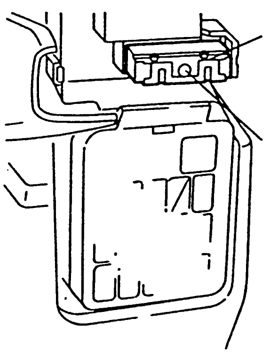
Ohmmeter

The ohmmeter is used to measure the resistance between two points in a circuit, to check for continuity, and to diagnose short circuits.

Caution
- **Never connect the ohmmeter to any circuit to which voltage is applied. You may burn or otherwise damage the ohmmeter.**

Symptom: Blower motor doesn't operate.

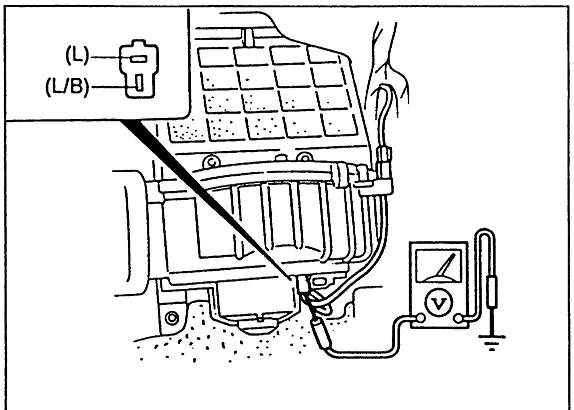
Normal operation of blower motor
Blower motor speed is controlled by the blower switch and a resistor assembly in the blower unit. When the blower switch is in the OFF position, the motor ground circuit is open and the blower motor doesn't operate. When the switch is in the first (low) position, current flow from the motor is restricted by the three resistors in the resistor assembly and the motor turns at low speed.
Changing the blower switch to the second (mid), third (high), or fourth (superhigh) positions causes the circuit resistance to decrease and the blower motor speed to become correspondingly faster.



Step 1. Inspect circuit breaker
1. Inspect the circuit breaker.

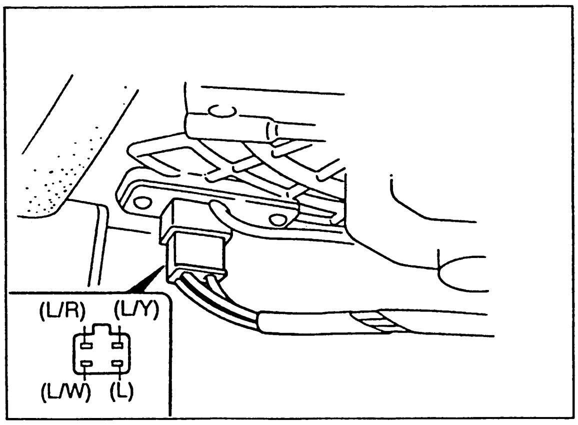
Circuit breaker	Amperage	Location
HEATER	30A	Fuse box

2. If the reset button is not out, go to Step 2.
3. If the reset button is out, inspect for a short circuit in the harness. Repair as necessary; then depress the reset button to reset the circuit breaker.



Step 2. Measure voltage at blower motor
1. Turn on the ignition switch.
2. Turn the blower switch to the fourth position.
3. Measure voltage at the terminal wires of the blower motor connector.

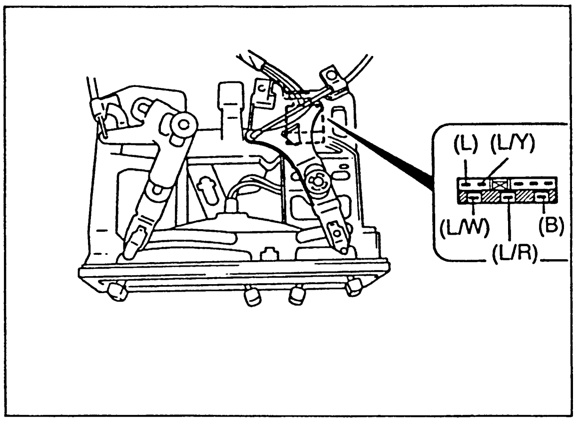
Wire	Voltage	Action
(L)	12V	Next, inspect wire (L/B)
	0V	Repair wiring harness (Circuit breaker—Blower motor)
(L/B)	12V	Go to Step 3
	0V	Replace blower motor



Step 3. Measure voltage at resistor assembly

1. Turn on the ignition switch.
2. Turn off the blower switch and make sure the A/C switch is off.
3. Measure voltage at the following terminal wires of the resistor assembly.

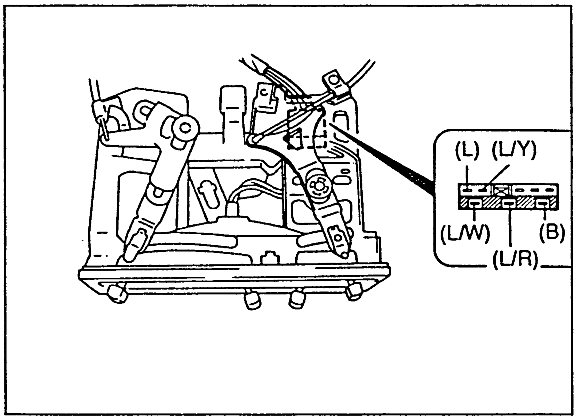
Wire	Voltage	Action
(L/W)	12V	Next, inspect wire (L/R)
	0V	Replace resistor assembly
(L/R)	12V	Next, inspect wire (L)
	0V	Replace resistor assembly
(L)	12V	Next, inspect wire (L/Y)
	0V	Replace resistor assembly
(L/Y)	12V	Go to Step 4
	0V	Replace resistor assembly



Step 4. Measure voltage at blower switch

1. Turn on the ignition switch.
2. Turn the blower switch to the fourth position.
3. Measure voltage at the following terminal wire of the blower switch connector.

Wire	Voltage	Action
(B)	0V	Go to Step 5
	12V	Repair wiring harness (Blower switch—Body ground)

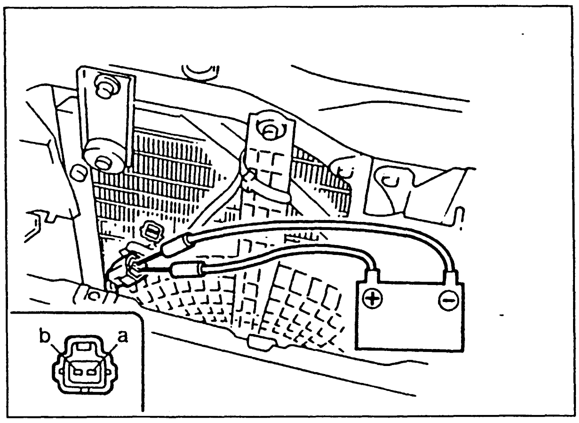


Step 5. Measure voltage at blower switch

1. Turn on the ignition switch.
2. Turn off the blower switch and the A/C switch.
3. Measure voltage at the following terminal wires of the blower switch connector.

Wire	Voltage	Action
(L/W)	0V	Repair wiring harness (Resistor assembly—Blower switch)
	12V	Next, inspect wire (L/R)
(L/R)	0V	Repair wiring harness (Resistor assembly—Blower switch)
	12V	Next, inspect wire (L)
(L)	0V	Repair wiring harness (Resistor assembly—Blower switch)
	12V	Next, inspect wire (L/Y)
(L/Y)	0V	Repair wiring harness (Resistor assembly—Blower switch)
	12V	Replace blower switch

Symptom: Condenser fan doesn't operate. (Magnetic clutch operates normally.)



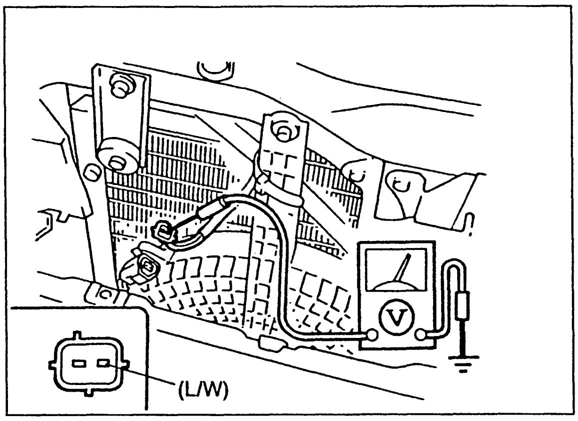
Step 1. Inspect condenser fan operation

1. Disconnect the condenser fan connector.
2. Apply 12V to terminal a and ground terminal b; verify that the condenser fan operates.
3. If it doesn't, replace it.
4. If it does, go to Step 2.

Step 2. Measure voltage at condenser fan

1. Disconnect the condenser fan connector.
2. Run the engine at idle.
3. Turn on the A/C and blower switches.
4. Measure voltage at the following terminal wire of the condenser fan connector.

Wire	Voltage	Action
(L/W)	12V	Replace condenser fan
	0V	Go to Step 2

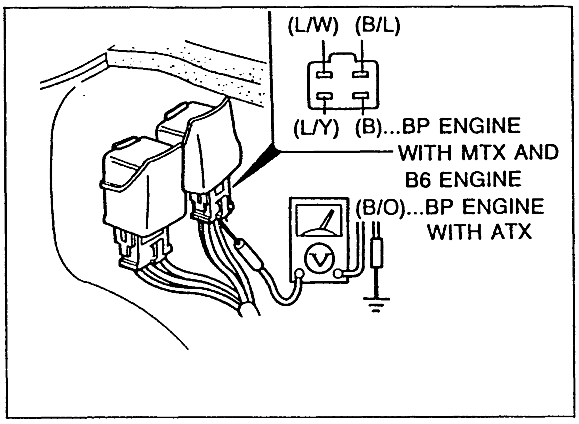


Step 3. Measure voltage at condenser fan relay

Measure voltage at the following terminal wires of the condenser fan relay connector.

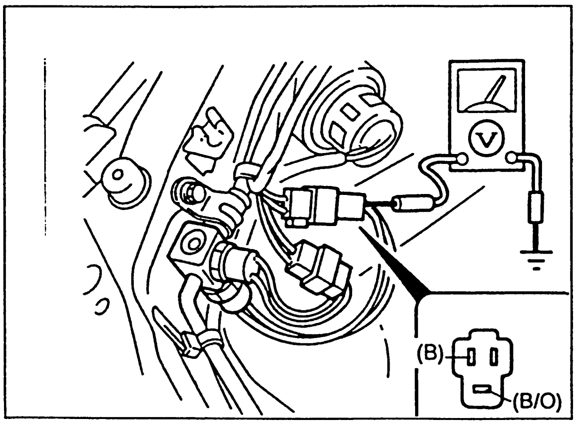
(BP engine with ATX)

Wire	Voltage	Action
(L/W)	12V	Repair wire (L/W)
	0V	Next, inspect wire (L/Y)
(L/Y)	12V	Next, inspect wire (B/L)
	0V	Repair wire (L/Y)
(B/L)	12V	Next, inspect wire (B/O)
	0V	Repair wire (B/L)
(B/O)	12V	Go to Step 4
	0V	Replace condenser fan relay



(BP engine with MTX and B6 engine)

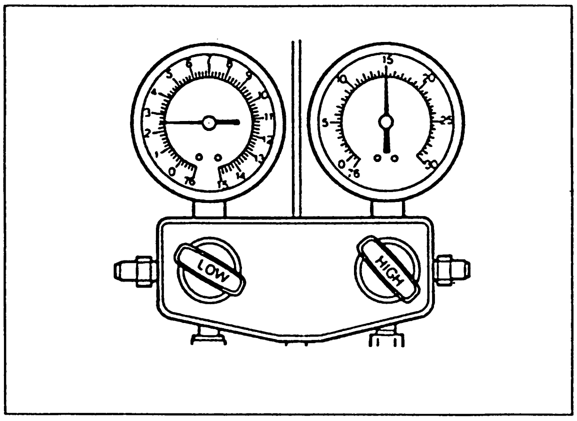
Wire	Voltage	Action
(L/W)	12V	Repair wire (L/W)
	0V	Next, inspect wire (L/Y)
(L/Y)	12V	Repair wire (L/Y)
	0V	Next, inspect wire (B/L)
(B/L)	12V	Repair wire (B/L)
	0V	Next, inspect wire (B)
(B)	12V	Repair wire (B)
	0V	Replace condenser fan relay



Step 4. Measure voltage at refrigerant pressure switch No. 2

Measure voltage at the following terminal wires of the refrigerant pressure switch No. 2 connector.

Wire	Voltage	Action
(B/O)	12V	Next, inspect wire (B)
	0V	Repair wire (B/O)
(B)	12V	Repair wire (B)
	0V	Go to Step 5

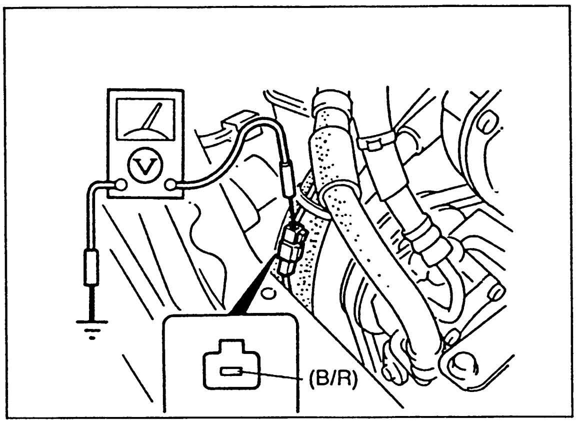


Step 5. Measure refrigerant pressure

1. Connect the A/C manifold gauge set.
2. Operate the engine at 2,000 rpm and set the air conditioner at maximum cooling.
3. Measure the high-pressure side refrigerant pressure.

Refrigerant pressure	Action
Below 1,200 kPa {12 kgf/cm^2, 170 psi}	Normal operation
Above 1,200 kPa {12 kgf/cm^2, 170 psi}	Replace refrigerant pressure switch No. 2

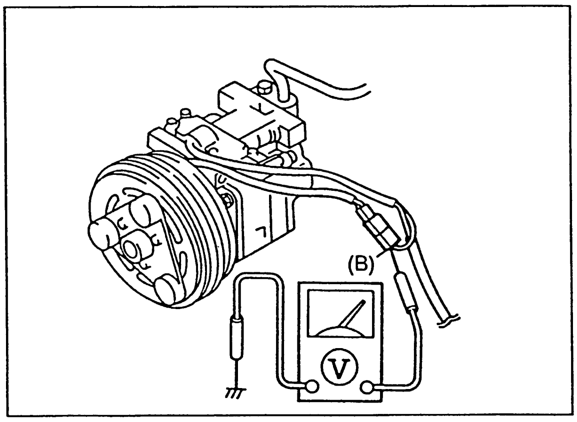
Symptom: Magnetic clutch doesn't operate. (Condenser fan operates normally.)



Step 1. Measure voltage at compressor connector

1. Run the engine at idle.
2. Turn on the A/C and blower switches.
3. Measure voltage at the following terminal wire of the compressor connector.

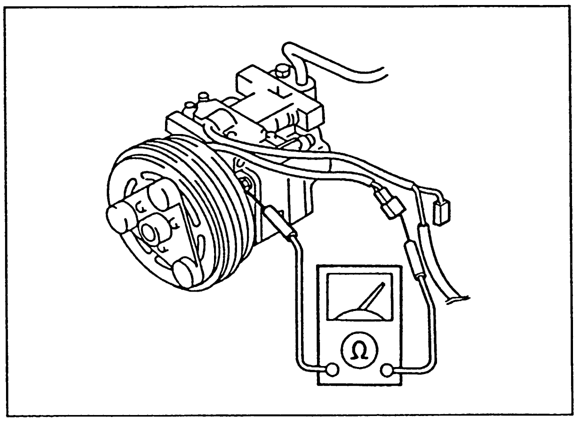
Wire	Voltage	Action
(B/R)	12V	Go to Step 2
	0V	Go to Step 5



Step 2. Measure voltage at magnetic clutch connector

Measure voltage at the following terminal wire of the magnetic clutch connector.

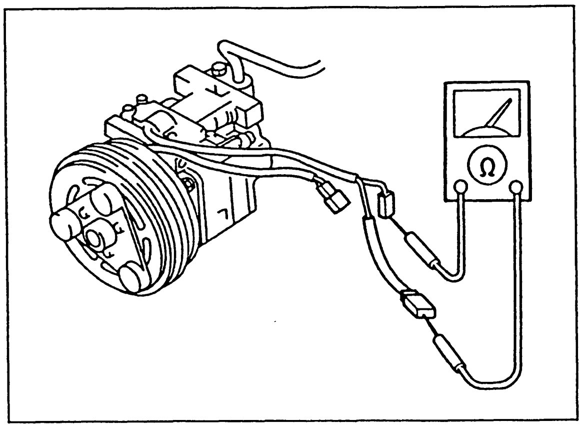
Wire	Voltage	Action
(B)	12V	Go to Step 3
	0V	Go to Step 4



Step 3. Inspect magnetic clutch

1. Disconnect the magnetic clutch connector.
2. Inspect for continuity between the magnetic clutch and a body ground.

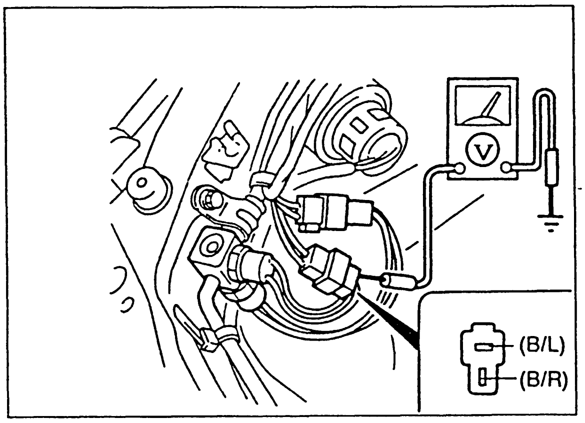
Continuity	Action
Yes	Adjust magnetic clutch clearance or inspect for compressor internal trouble
No	Inspect ground wire If ground wire is OK, replace magnetic clutch



Step 4. Inspect thermal protector

1. Turn off the air conditioner for about 10 minutes.
2. Inspect for continuity of the thermal protector.

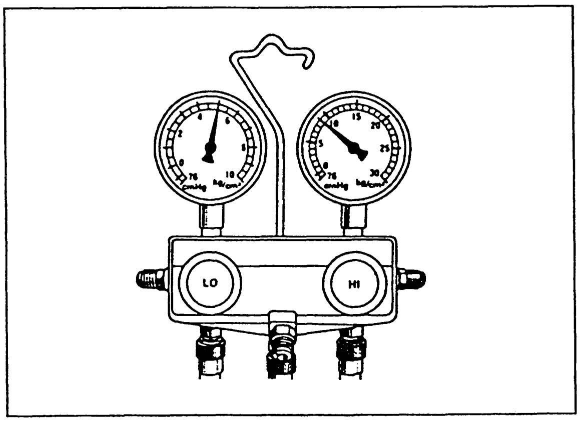
Continuity	Action
Yes	Normal operation
No	Replace thermal protector



Step 5. Measure voltage at refrigerant pressure switch No. 1

Measure voltage at the following terminal wires of the refrigerant pressure switch No. 1 connector.

Wire	Voltage	Action
(B/R)	12V	Repair wire (B/R)
	0V	Next, inspect wire (B/L)
(B/L)	12V	Go to Step 6
	0V	Repair wire (B/L)



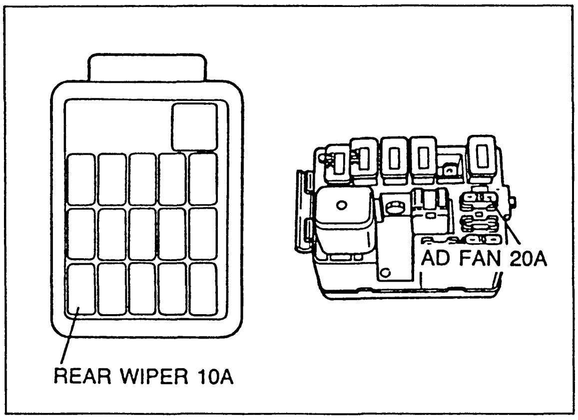
Step 6. Measure refrigerant pressure

1. Turn off the ignition switch.
2. Connect the high-pressure hose of the manifold gauge to the high-pressure gauge fitting.
3. Measure refrigerant pressure at the high-pressure side.

High-pressure side:
Above 450 kPa {4.6 kgf/cm^2, 65 psi}

4. If not as specified, inspect the refrigerant system by referring to the troubleshooting information on page **34**.
5. If the pressure is OK, replace refrigerant pressure switch No. 2 with cooler pipe No. 2.

Symptom: Condenser fan and magnetic clutch don't operate.

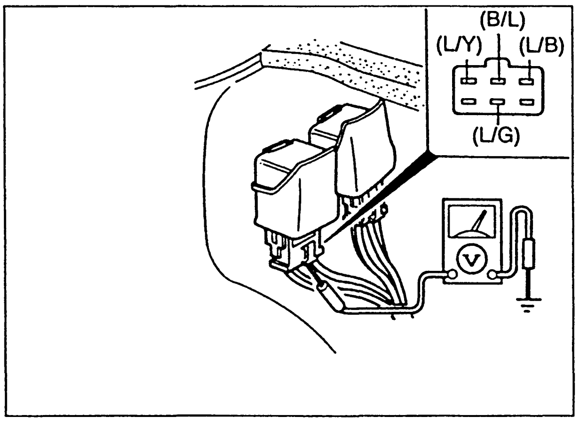


Step 1. Inspect fuses

1. Inspect these fuses:

Fuse	Amperage	Location
AD FAN	20A	In main fuse box
REAR WIPER	10A	In fuse box

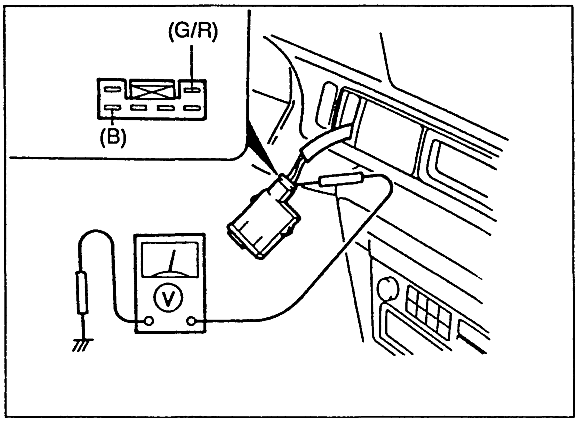
2. If the fuse is burned, look for a short-circuit in the wiring harness before replacing it.
3. If the fuses are OK, go to Step 2.



Step 2. Measure voltage at A/C relay connector

1. Run the engine at idle.
2. Turn on the A/C and blower switches.
3. Measure voltage at the following terminal wires of the A/C relay connector:

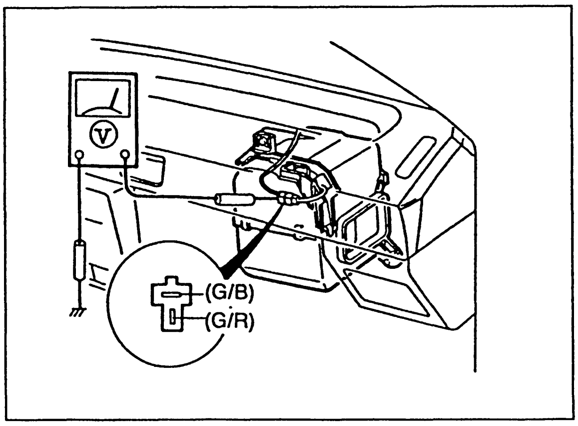
Wire	Voltage	Action
(L/G)	12V	Next, inspect wire (L/Y)
	0V	Repair wire (L/G)
(L/Y)	12V	Next, inspect wire (B/L)
	0V	Repair wire (L/Y)
(B/L)	12V	Repair wire (B/L)
	0V	Next, inspect wire (L/B)
(L/B)	12V	Go to Step 3
	0V	Replace A/C relay



Step 3. Measure voltage at A/C switch

Measure voltage at the following terminal wires of the A/C switch connectors:

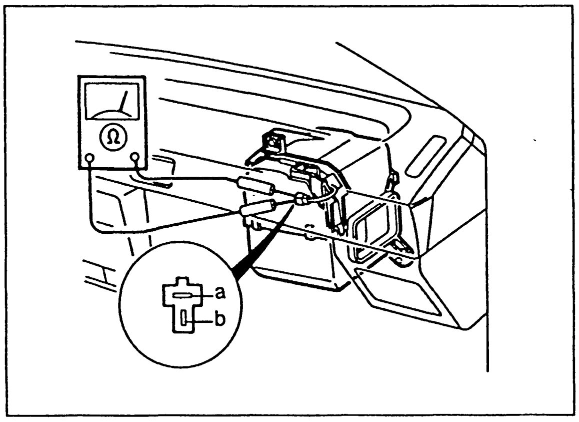
Wire	Voltage	Action
(B)	12V	Repair wire (B)
	0V	Next, inspect wire (G/R)
(G/R)	12V	Replace A/C switch
	0V	Go to Step 4



Step 4. Measure voltage at thermoswitch

Measure voltage at the terminal wires of the thermoswitch connector.

Wire	Voltage	Action
(G/R)	12V	Repair wire (G/R)
	0V	Next, inspect wire (G/B)
(G/B)	12V	Go to Step 5
	0V	Inspect ECU operation

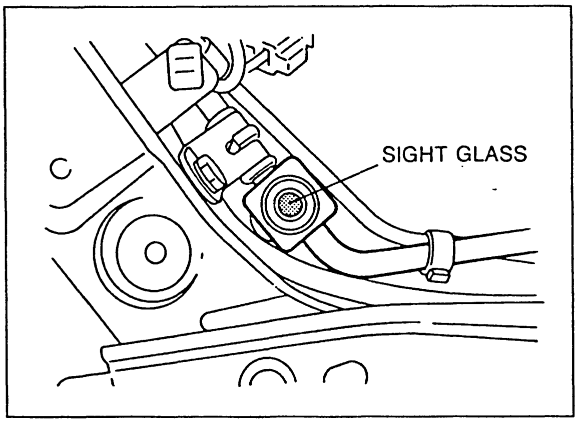


Step 5. Inspect thermoswitch

1. Turn off the A/C switch and set the blower switch at the fourth position to operate the blower fan for a few minutes.
2. After a few minutes, turn off the blower switch and stop the engine.
3. Disconnect the thermoswitch connector and inspect for continuity of the thermoswitch.

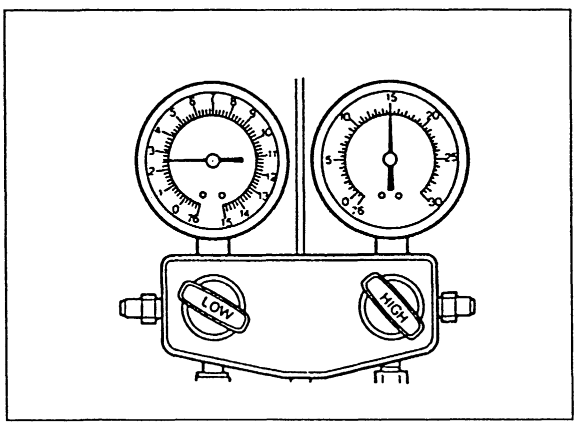
Terminals	Continuity	Action
a — b	Yes	Normal operation; no action necessary
	No	Replace thermoswitch

Symptom: Insufficient cooling.
No cooling.
Intermittent cooling.



Step 1. Inspecting refrigerant charge
1. Run the engine at fast idle.
2. Operate the air conditioner at maximum cooling for a few minutes.
3. Observe the sight glass to determine the amount of refrigerant and the related action as shown below.

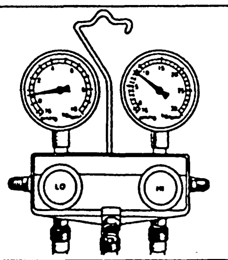
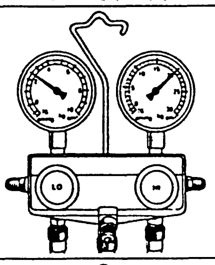
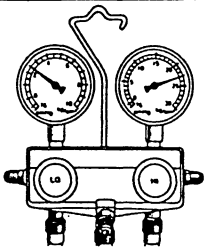
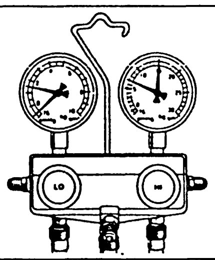
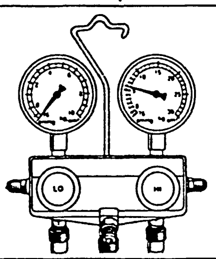
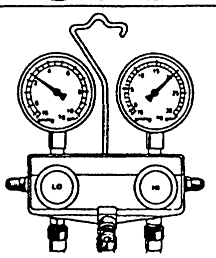
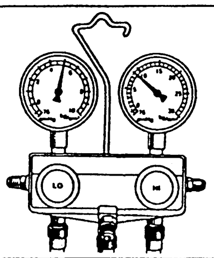
Item	Symptom	Amount of refrigerant	Action
1	Bubbles present in sight glass	Insufficient	Inspect refrigerant pressure; go to Step 2
2	No bubbles present in sight glass	Too much or proper amount	Turn off air conditioner and watch bubbles (Refer to items 3 and 4)
3	Immediately after air conditioner is turned off, refrigerant in sight glass stays clear	Too much	Inspect refrigerant pressure; go to Step 2
4	When air conditioner is turned off, refriger-ant foams and sight glass clears	Proper amount	Refrigerant amount normal



Step 2. Inspecting refrigerant pressure
1. Connect the A/C manifold gauge set.
2. Operate the engine at 2,000 rpm and set the air conditioner at maximum cooling.
3. Measure the low- and high-pressure sides.

Normal pressure
Low-pressure side:
150—290 kPa {1.5—3.0 kgf/cm^2, 21—43 psi}
High-pressure side: 1,180—1,610 kPa {12.0—16.5 kgf/cm^2, 171—234 psi}

4. If the pressures are not as specified, refer to the chart on the next page and inspect the system.

Measured pressure		Possible cause	Action
	Low side: Below 78 kPa {0.8 kgf/cm², 11 psi} High side: 790—880 kPa {8—9 kgf/cm², 114—127 psi}	Insufficient refrigerant	Case 1 (Refer to page **35**)
	Low side: Above 250 kPa {2.5 kgf/cm², 36 psi} High side: Above 2,000 kPa {20 kgf/cm², 280 psi}	Excessive refrigerant or insufficient condenser cooling	Case 2 (Refer to page **36**)
	Low side: Above 250 kPa {2.5 kgf/cm², 36 psi} High side: Above 2,300 kPa {23 kgf/cm², 330 psi}	Air in system	Case 3 (Refer to page **36**)
	Low side: 50 cmHg {2.0 inHg} of vacuum—150 kPa {1.5 kgf/cm², 21 psi} High side: 690—1,400 kPa {7—15 kgf/cm², 100—210 psi}	Moisture in system	Case 4 (Refer to page **37**)
	Low side: 76 cmHg {3.0 inHg} of vacuum High side: Below 590 kPa {6 kgf/cm², 85 psi}	No refrigerant circulation	Case 5 (Refer to page **37**)
	Low side: Above 250 kPa {2.5 kgf/cm², 36 psi} High side: 1,900—2,000 kPa {19—20 kgf/cm², 280—280 psi}	Expansion valve stuck open	Case 6 (Refer to **38**)
	Low side: 400—580 kPa {4—6 kgf/cm², 57—85 psi} High side: 690—980 kPa {7—10 kgf/cm², 100—140 psi}	Faulty compressor	Case 7 (Refer to page **38**)

Case 1: Insufficient refrigerant

Measured pressure

Low-pressure side: Less than 78 kPa {0.8 kgf/cm^2, 11 psi}

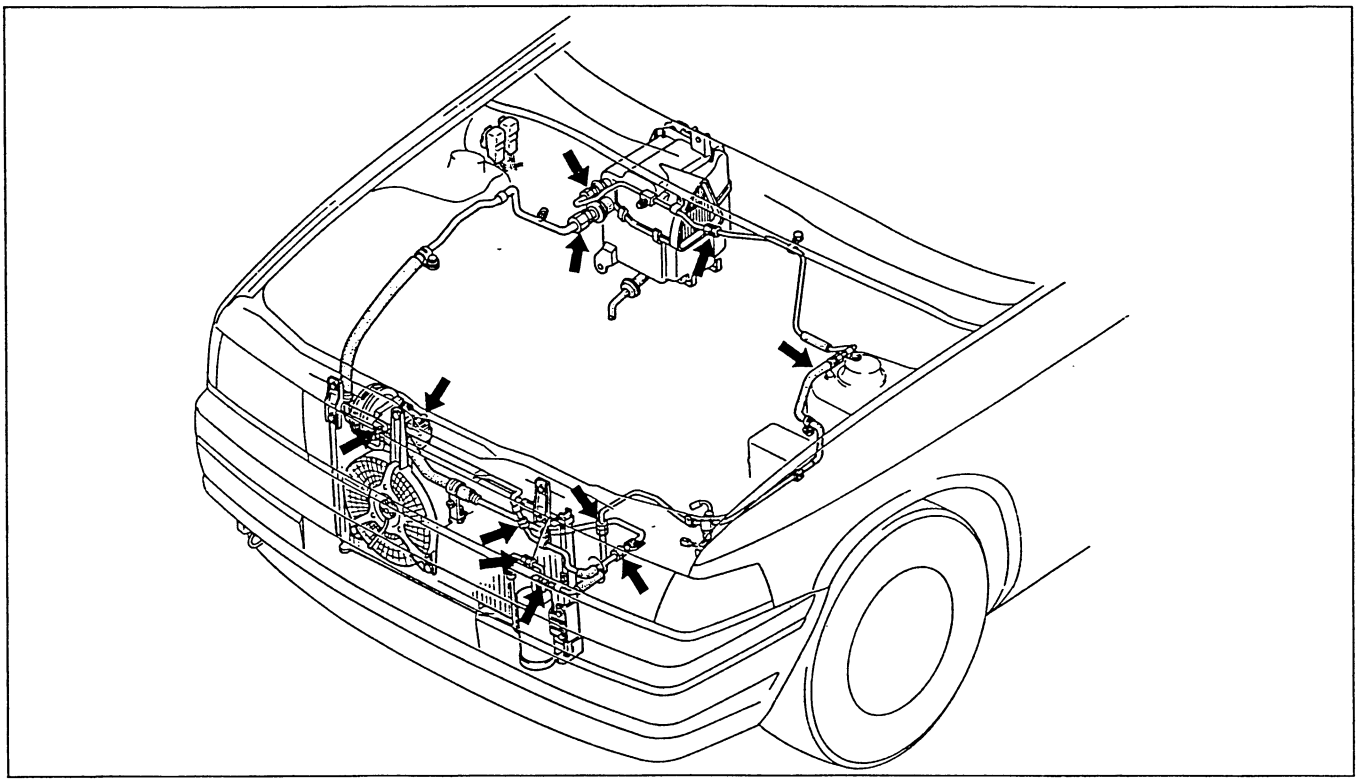
High-pressure side: 790—880 kPa {8.0—9.0 kgf/cm^2, 120 psi}

Condition

- **Outlet air from vents is not cold.**
- **Bubbles are seen in sight glass.**

Step 1

1. Inspect for oil stains on the pipes, hoses, and other parts. (Refer to illustration below.)
2. If oil staining is found at the connections of pipes and hoses, replace the O-ring; then evacuate, charge, and test the system.
3. If no oil staining is found, go to Step 2.



Step 2

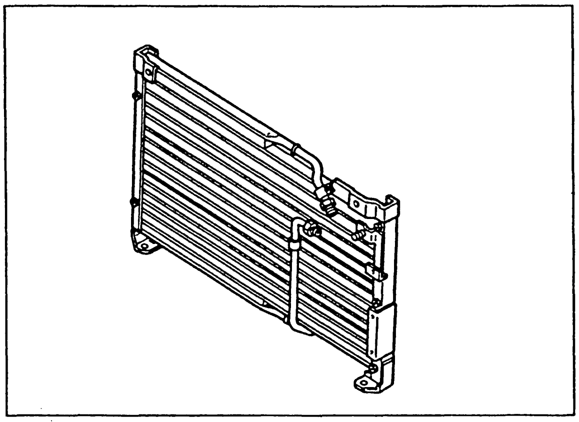
1. Inspect for leakage from the following connections with a gas leak tester:
   - Inlet and outlet of condenser
   - Inlet and outlet of receiver/drier
   - Inlet and outlet of compressor
   - Sight glass
   - Inlet and outlet of cooling unit
2. If leakage is evident, go to Step 3.
3. If no leakage is found, evacuate, charge, and test the system. (System is OK, but refrigerant leaked gradually over time.)

Step 3

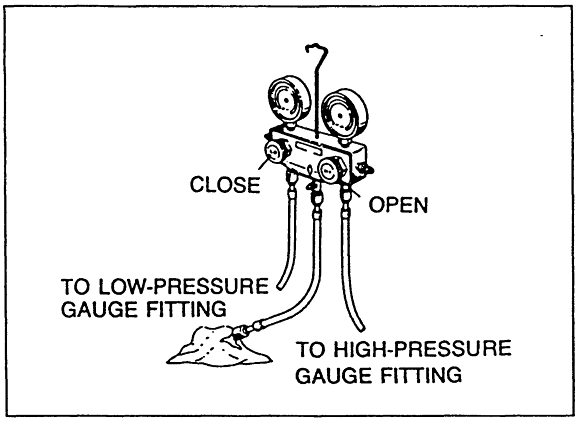
1. Inspect the tightening torque of the connection where the leak was detected.
2. If the connection is loose, tighten the connection to the specified torque; then evacuate, charge, and test the system.
3. If the connection was properly tightened, replace the O-ring; then evacuate, charge, and test the system.

Case 2: Excessive refrigerant or insufficient condenser cooling
Measured pressure
Low-pressure side: Above 250 kPa {2.5 kgf/cm^2, 36 psi}
High-pressure side: Above 2,000 kPa {20 kgf/cm^2, 280 psi}
Condition
Insufficient cooling

Note
- **If the condenser fan doesn't operate when the air conditioner is operating, see "Condenser fan doesn't operate," page 48, before proceeding.**



Step 1
1. Inspect the condenser for bent fins and damage. Repair or replace as necessary.
2. If the condenser is OK, go to Step 2.

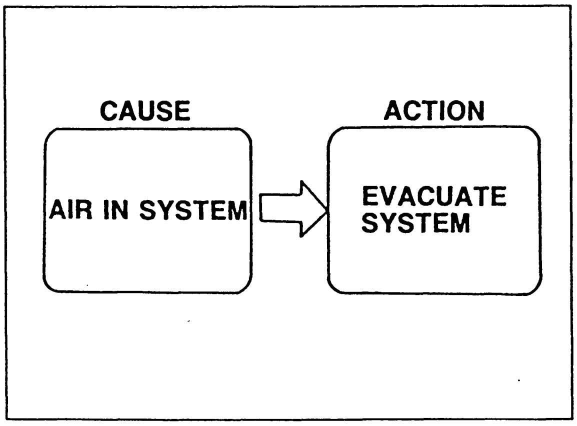


Step 2
1. Discharge the excess refrigerant into a recovery system if available.

Warning
- **Always wear gloves and eye protection when discharging the refrigerant.**

2. Make sure the refrigerant pressure is normal.

Case 3: Air in system
Measured pressure
Low-pressure: Above 250 kPa {2.5 kgf/cm^2, 36 psi}
High-pressure: Above 2,300 kPa {23 kgf/cm^2, 330 psi}
Condition
Insufficient cooling



Step 1
Discharge the refrigeration system into a recovery system if available.
Step 2
Evacuate the system to remove all air from it.
Step 3
Charge the system with refrigerant.
Step 4
After charging, measure the refrigerant pressure.
Step 5
If the low- and high-pressure sides are still too high, replace the receiver/drier.

Case 4: Moisture in system

Measured pressure

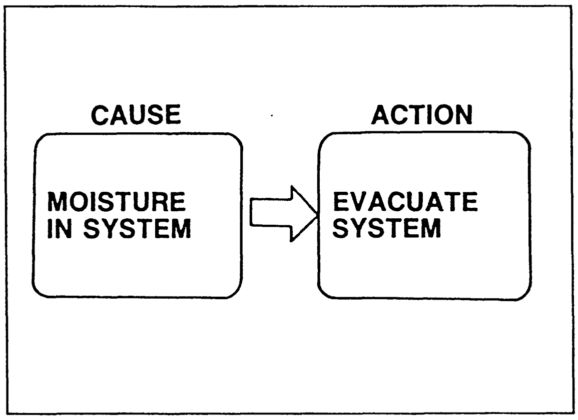
Low-pressure: 6.8 kPa {50 mmHg, 2.0 inHg}: (Vacuum)

High-pressure: 690—1,400 kPa {7.0—15 kgf/cm^2, 100—210 psi}

Condition

Intermittent cooling

(Moisture in the refrigeration system is freezing in the expansion valve and causing temporary blocking. After time, the ice melts and conditions return to normal.)



Step 1
Discharge the refrigeration system into a recovery system if available.
Step 2
Evacuate the system to remove all air and moisture from it.
Step 3
Charge the system with refrigerant.
Step 4
After charging, measure the refrigerant pressure.
Step 5
If the low- and high-pressure sides are still too high, replace the receiver/drier.

Case 5: No refrigerant circulation

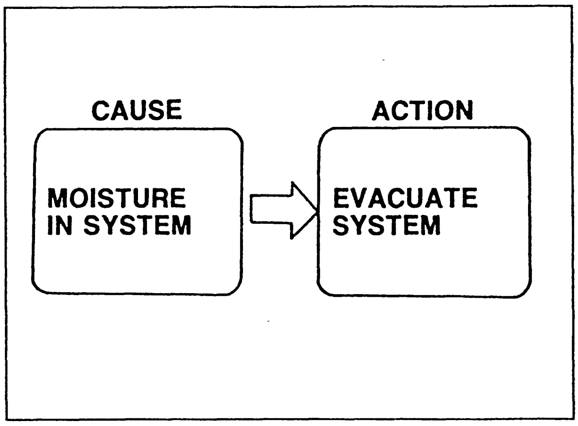
Measurement pressure

Low-pressure: 10 kPa {76 mmHg, 3.0 inHg} (Vacuum)

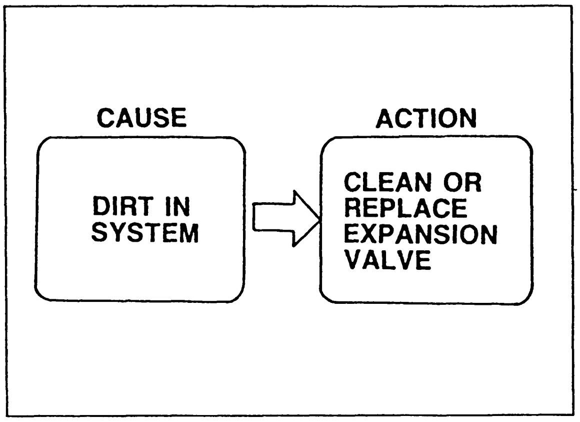
High-pressure: Below 590 kPa {6.0 kgf/cm^2, 85 psi}

Condition

Refrigerant flow obstructed by moisture or dirt, causing freezing or blockage of expansion valve

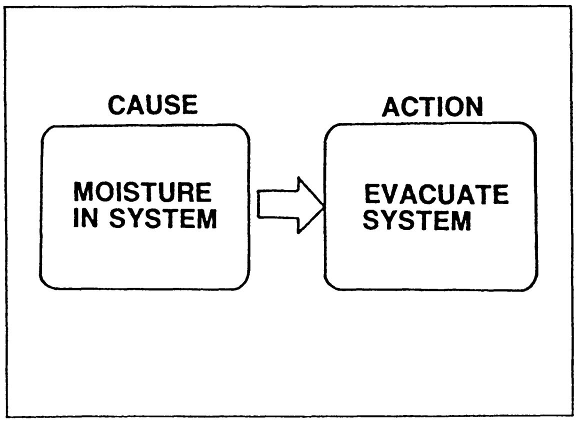


Step 1
Turn off the air conditioner for about 10 minutes. Turn it on to determine whether the blockage is due to moisture or dirt.
a) If caused by moisture:
System will operate normally after being off for 10 minutes. (Ice melts and relieves blockage.)
Refer to "Moisture in system."
b) If caused by dirt
System remains abnormal after being off 10 minutes.
Go to Step 2.



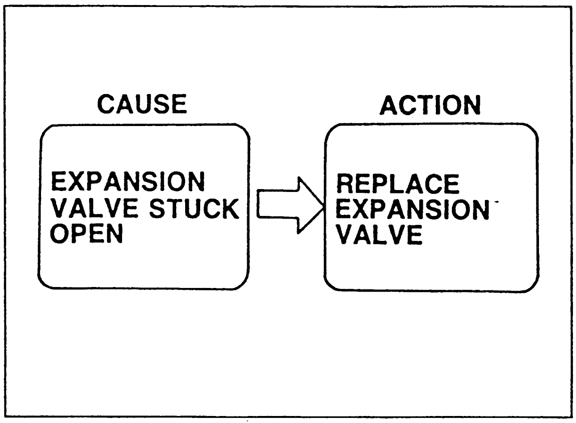
Step 2
1. Remove the expansion valve.
2. Blow out the dirt with compressed air.
3. If unable to remove the dirt, replace the valve.
4. Evacuate, charge, and test the system.

Case 6: Expansion valve stuck open
Measured pressure
Low-pressure: Above 250 kPa {2.5 kgf/cm^2, 36 psi}
High-pressure: 1,900 kPa {19—20 kgf/cm^2, 270—280 psi}
Condition
Insufficient cooling



1. Inspect whether frost or heavy dew is on the suction pipe (between the cooling unit and the compressor).
2. If neither is found, refer to "Excessive refrigerant or insufficient condenser cooling."
3. If either is found, replace the expansion valve.

Case 7: Faulty compressor
Measured pressure
Low-pressure: 400—580 kPa {4.0—6.0 kgf/cm², 57—85 psi}
High-pressure: 690—980 kPa {7.0—10 kgf/cm², 100—140 psi}
Condition
No cooling



1. Run the engine at a fast idle.
2. Make sure the magnetic clutch is on when the A/C switch and blower switch are on.
3. If the magnetic clutch remains off, refer to "Magnetic clutch doesn't operate."

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N O T E

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