SERVICE MANUAL

DATSUN 280Z
MODEL S30 SERIES

# SECTION AC

# AIR CONDITIONING


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AC

NISSAN


NISSAN MOTOR CO., LTD.
TOKYO, JAPAN

# DESCRIPTION

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## OUTLINE OF AIR CONDITIONER

The air conditioner is a combined unit of an evaporator, heater and blower and provides heating and cooling functions. In addition, it has bi-level and ventilation functions, enabling comfortable air conditioning at all seasons. Its control system consists of a mechanical system using cables and engine vacuum and electric system.

All units are housed in the dash panel, 'thereby assuring driving comfort.

The functional principle of this system is as shown in Figure AC-1.

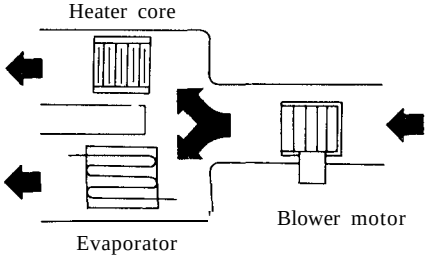



*Fig. AC-1 Principle of air flow*

The component units of the air conditioner are installed in the engine room and passenger compartment; the compressor and condenser in the former and the unit comprising the evaporator, heater and blower and its control in the latter. The units in the passenger compartment are summarized as below:

### Air intake housing

This housing is internally provided with an air intake door that takes in outside air.

### Blower housing

The housing contains a blower motor, by which the air is blown to the heater and evaporator.

### Evaporator housing

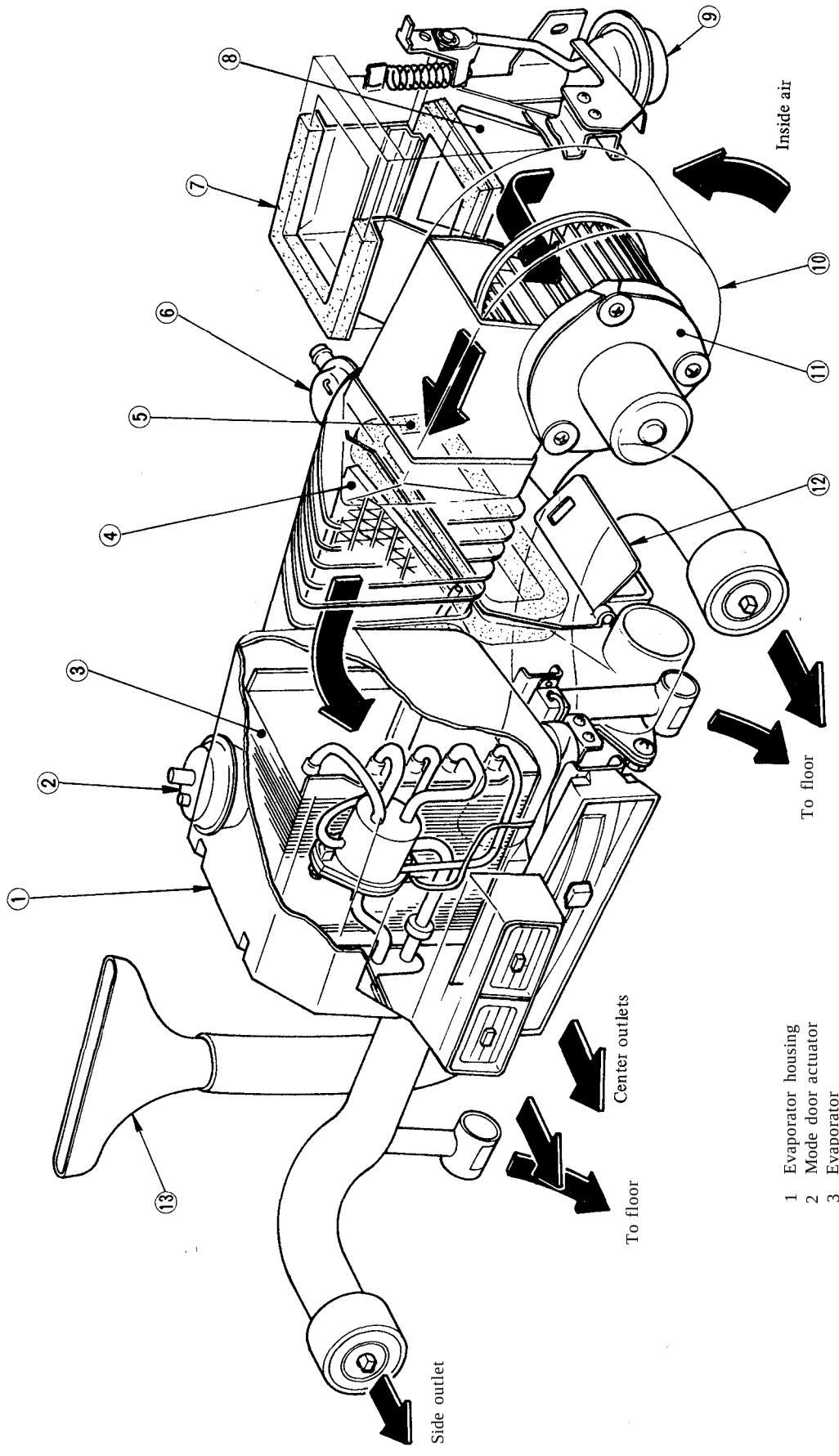
An evaporator is contained in this housing, which cools air passing through the fins with refrigerant circulating in the system.

### Heater unit

A heater core is housed in this unit, in which hot water from the engine runs to warm the air passing through the fins.

#### FEATURES

1. When the AIR lever is set in BI-LEVEL position, the mode door is set halfway between the full open and full close positions. Fresh air is blown out from the outlets in the instrument panel and warm air from underfoot, thus providing ventilation and heating functions at the same time.
2. The mode door to divert air flow and the air intake door are opened and closed by means of the vacuum actuator.
3. The control of hot water flowing to the heater is carried out by the vacuum-operating water cock and the water cock that controls the amount of hot water.
4. When the air conditioner is in A/C, the temperature is adjusted by automatically switching the compressor on or off by means of the thermostat.
5. The air conditioner can be operated with the fast idle control device during idling.




AO228

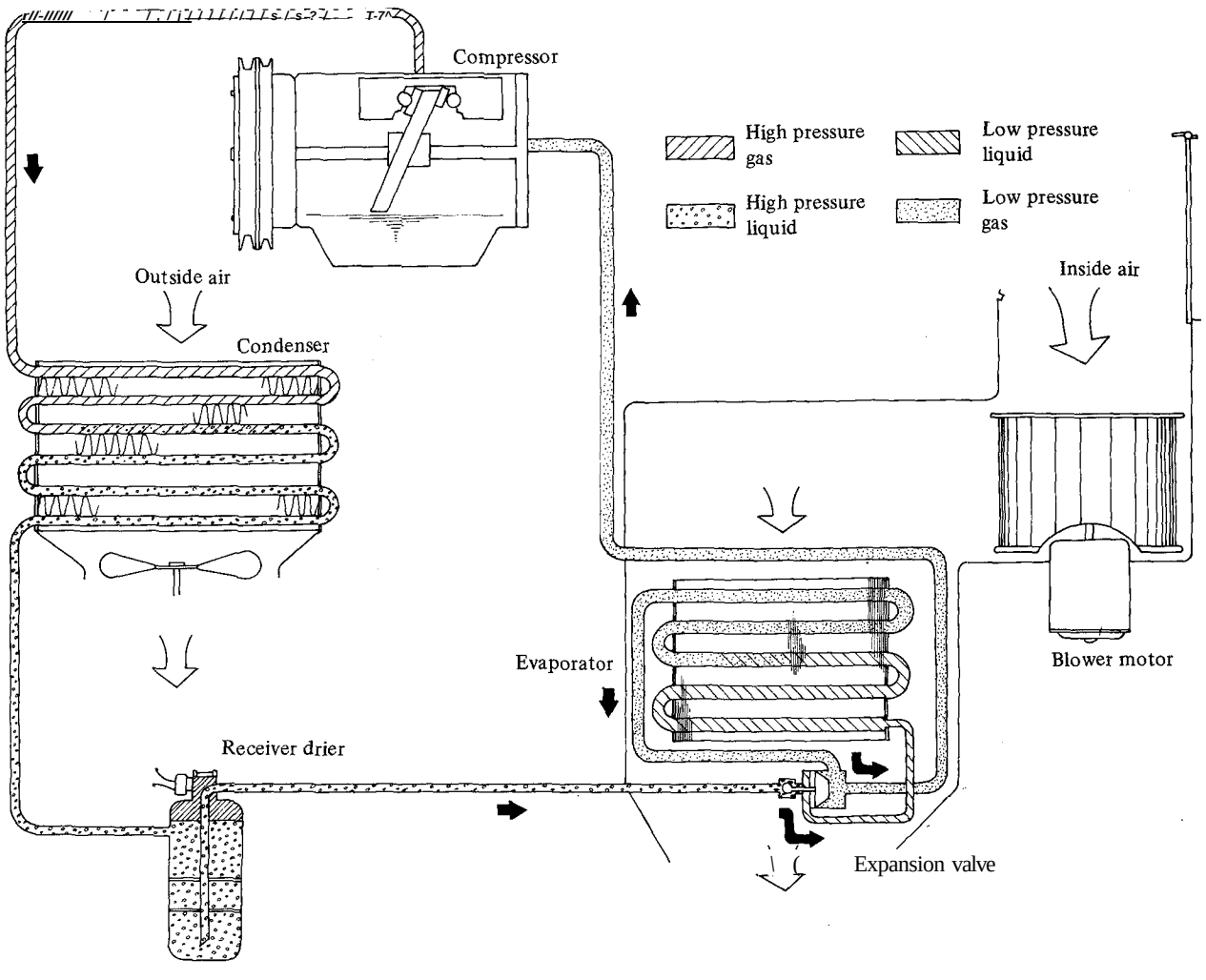
*Fig. AO-2 Sectional view of air conditioner*

# REFRIGERATION SYSTEM

If you were to paint your finger with alcohol, your finger would feel cold. This is because the liquid alcohol takes heat away from your finger while it evaporates. If an quickly evaporating liquid such as alcohol is placed in a container inside a box, the temperature inside the box will drop. This is because the alcohol is evaporated absorbing the heat from the air inside the box. If the gaseous alcohol is collected and cooled with cold water, it will be changed back into a liquid by absorption of its heat by the cold water.

The cooler operates on this principle. The liquid used is the refrigerant R-12. The heat inside the passenger compartment is absorbed by changing the refrigerant from a liquid to a gas and then dissipated to the outside by changing the refrigerant from a gas back to a liquid.

The refrigeration system is shown in Figure AC-3.




AC229

*Fig.AC-3 Refrigeration cycle*

The operation of the five devices of the refrigeration system are described below.

## EVAPORATOR

The heat of the inside air which is force-circulated by the blower motor is absorbed by vaporizing the liquid refrigerant passed through the evaporator. This cools the air.

## COMPRESSOR

The compressor is installed to the side of the engine and is driven by crank pulley through a belt. The refrigerant gas leaving the evaporator is forced out to the condenser by compressor and the low pressure refrigerant gas is compressed to a high pressure and high temperature.

## CONDENSER

The condenser is installed to the front of the radiator. The heated and compressed refrigerant gas from the compressor condenses to a liquid by being cooled by air passing between the fins of the condenser.

## RECEIVER DRIER

The receiver drier serves the purpose of storing the liquid refrigerant. The amount of the liquid refrigerant flowing through the system varies with the operating condition of the air conditioner. To be accurate, the receiver drier stores excess amount of refrigerant when the heat load is lowered. It also releases stored refrigerant when additional cooling is needed, thus maintaining the optimum flow of refrigerant within the system.

The receiver drier includes a strain^ er and desiccant. They have the job of removing moisture and foreign particles as the refrigerant circulates within the system.

The pressure switch is installed beside sight glass of receiver drier. The purpose of the switch is to stop the compressor operation in the event an excessive system pressure builds up on the high pressure lines.

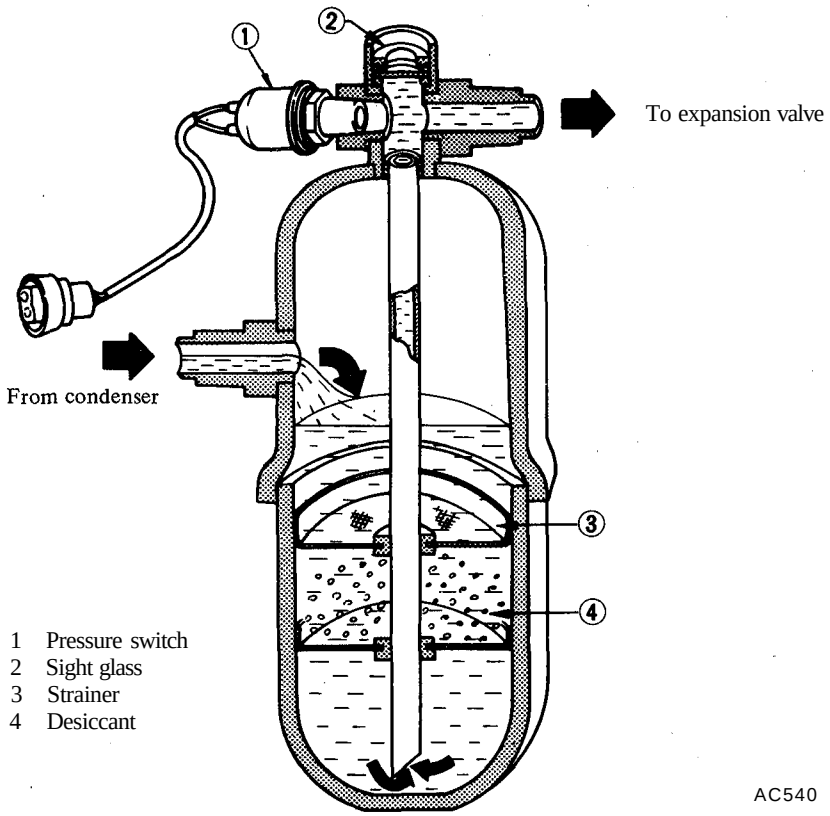



*Fig.AC-4 Receiver drier*

## EXPANSION VALVE

The expansion valve restricts the flow of liquid refrigerant as it passes through it and delivers sprayed refrigerant to the evaporator for facilitating refrigerant evaporation.

The refrigerant within the thermo bulb changes in pressure through the super heat condition of vaporized refrigerant gas which comes out of the evaporator, causing the deflection of the diaphragm. The lift of the ball valve attached to the diaphragm is changed by the deflection of the diaphragm, thus controlling the amount of refrigerant passing the orifice.

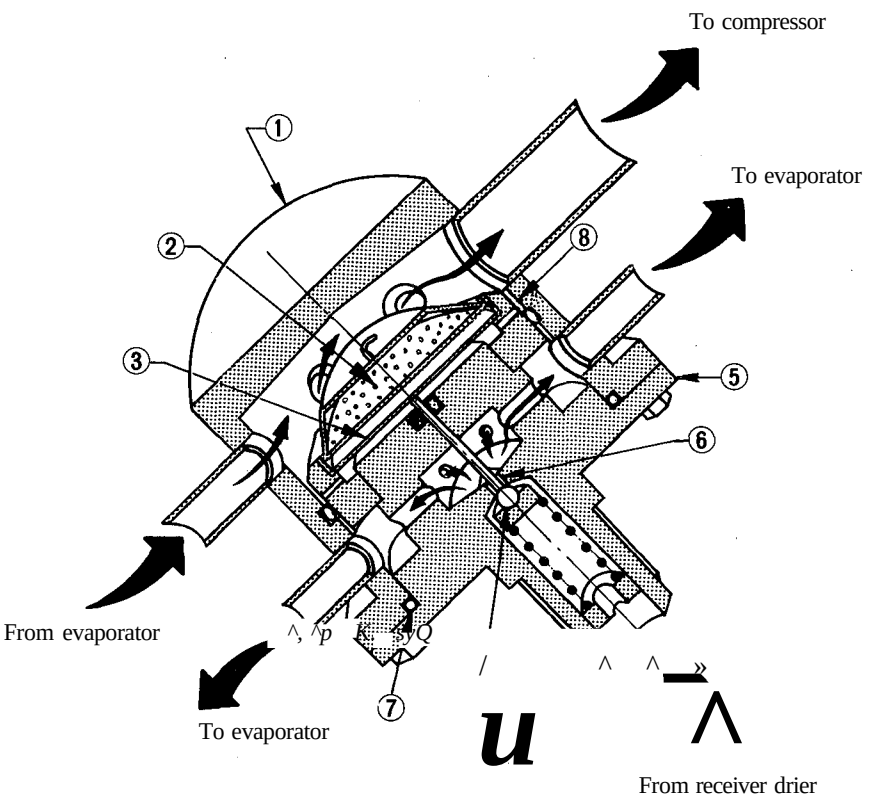
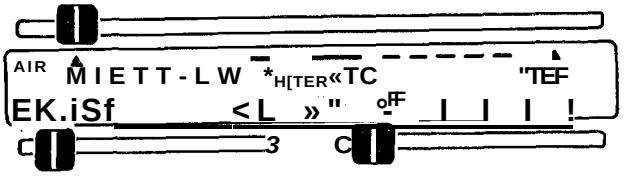



*Fig. ACS Expansion valve*

# AIR FLOW AND VACUUM SYSTEM

## AIR FLOW

### OFF position

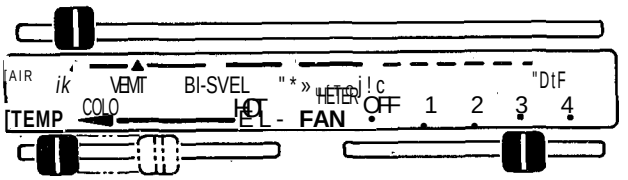



AIR lever: In any position
FAN lever: OFF position
TEMP lever: In any position

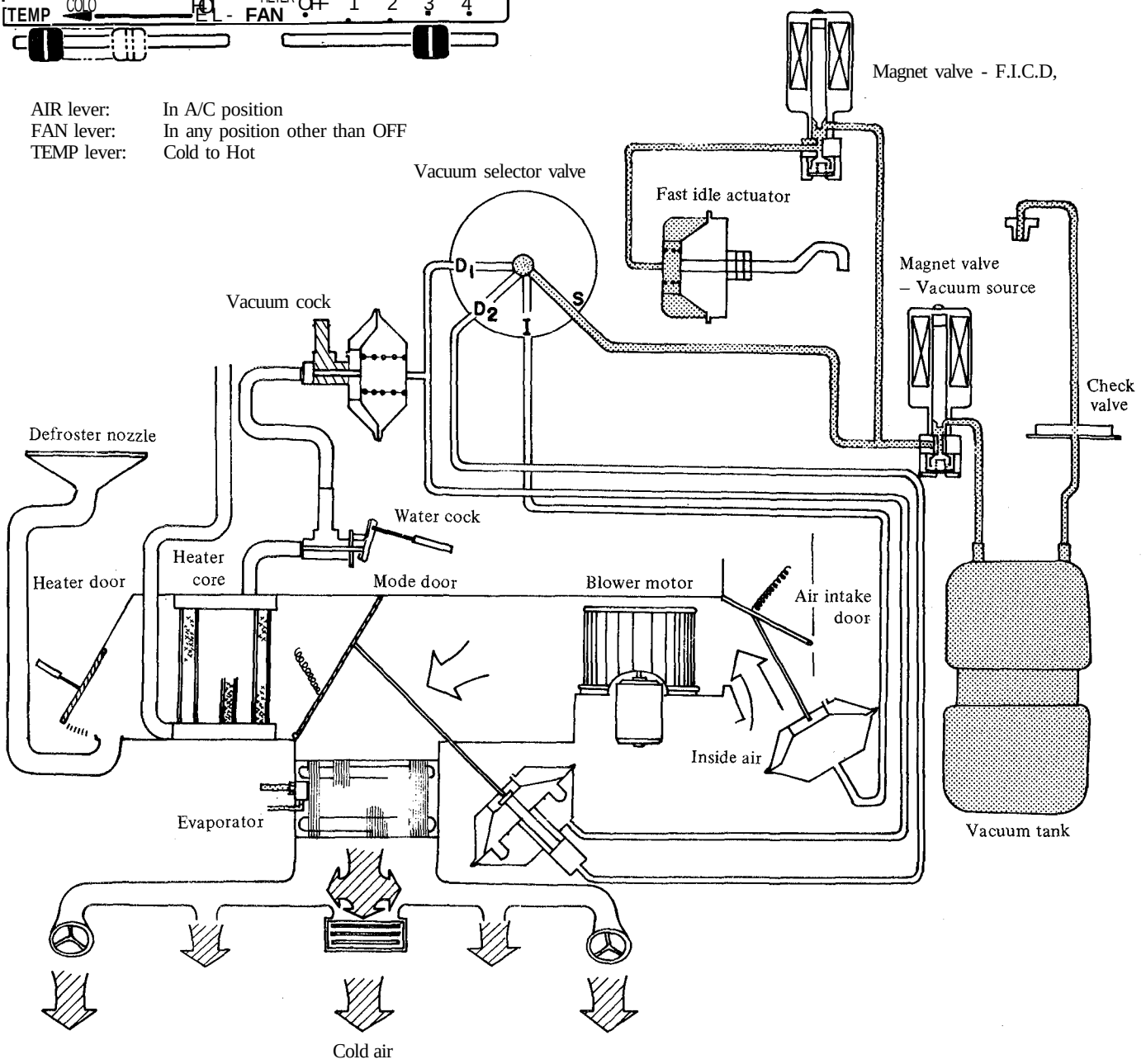



*Fig. AC-6 Air flow - OFF position*

## A/C **(Air conditioner) position**




AIR lever: In A/C position
FAN lever: In any position other than OFF
TEMP lever: Cold to Hot



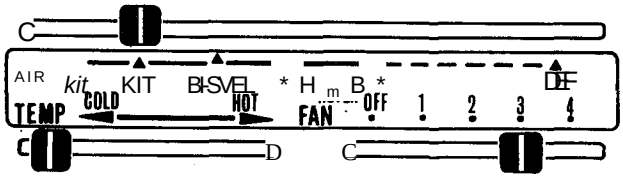

AC542

*Fig. AC-7 Air flow - A/C (Air Conditioner) position*

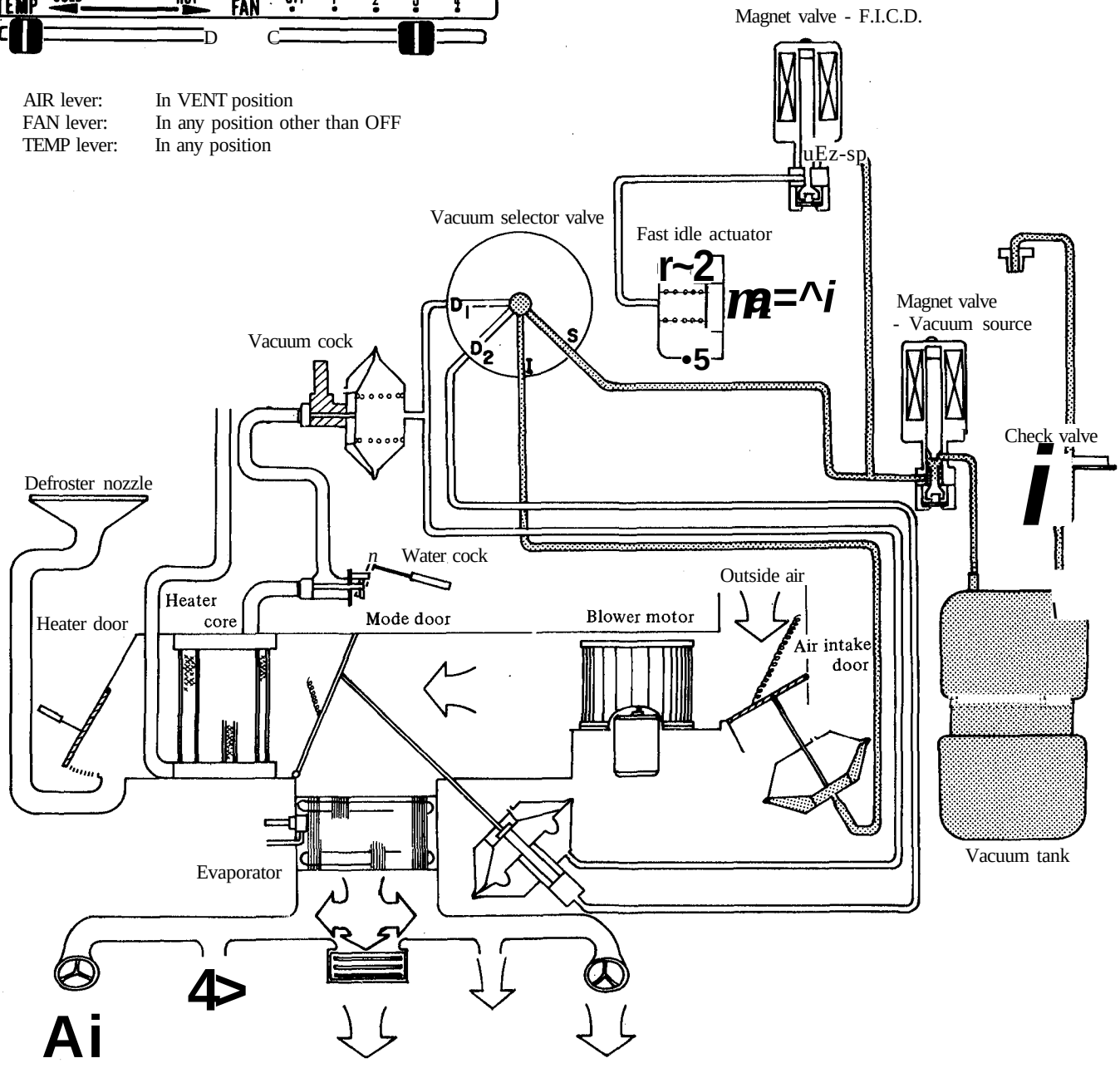
When the AIR lever is set to the A/C position, vacuum and air flows are as shown in the schematic layout above.

1. Air intake door... The air intake door is in the closed position, shutting off outside air. Air is circulating inside the passenger compartment.
2. Mode door . . . The mode door is in the closed position. All the air introduced from the air intake is cooled in the evaporator and then directed to the outlets located on the instrument panel.
3. Heater door ... The heater door, connected by a control cable from the AIR lever, is in the open position.
4. Vacuum cock .. . The vacuum cock is in the shut position.
5. Fast idle actuator.. . With passage to the magnet valve open, the vacuum introduced down to the fast idle actuator moves the actuator diaphragm to pull its operating lever. As a result, the throttle valve is moved to open a little wider, thus increasing the idling rpm.

**VENT** (Ventilation) position




AIR lever: In VENT position
FAN lever: In any position other than OFF
TEMP lever: In any position




AC543

*Fig. AC-8 Air flow - VENT (Ventilation) position*

1. Air intake door. .. Vacuum is introduced to the actuator of the air intake door and causes an actuator movement to open the door.

Thus it admits outside air into the air conditioner unit.

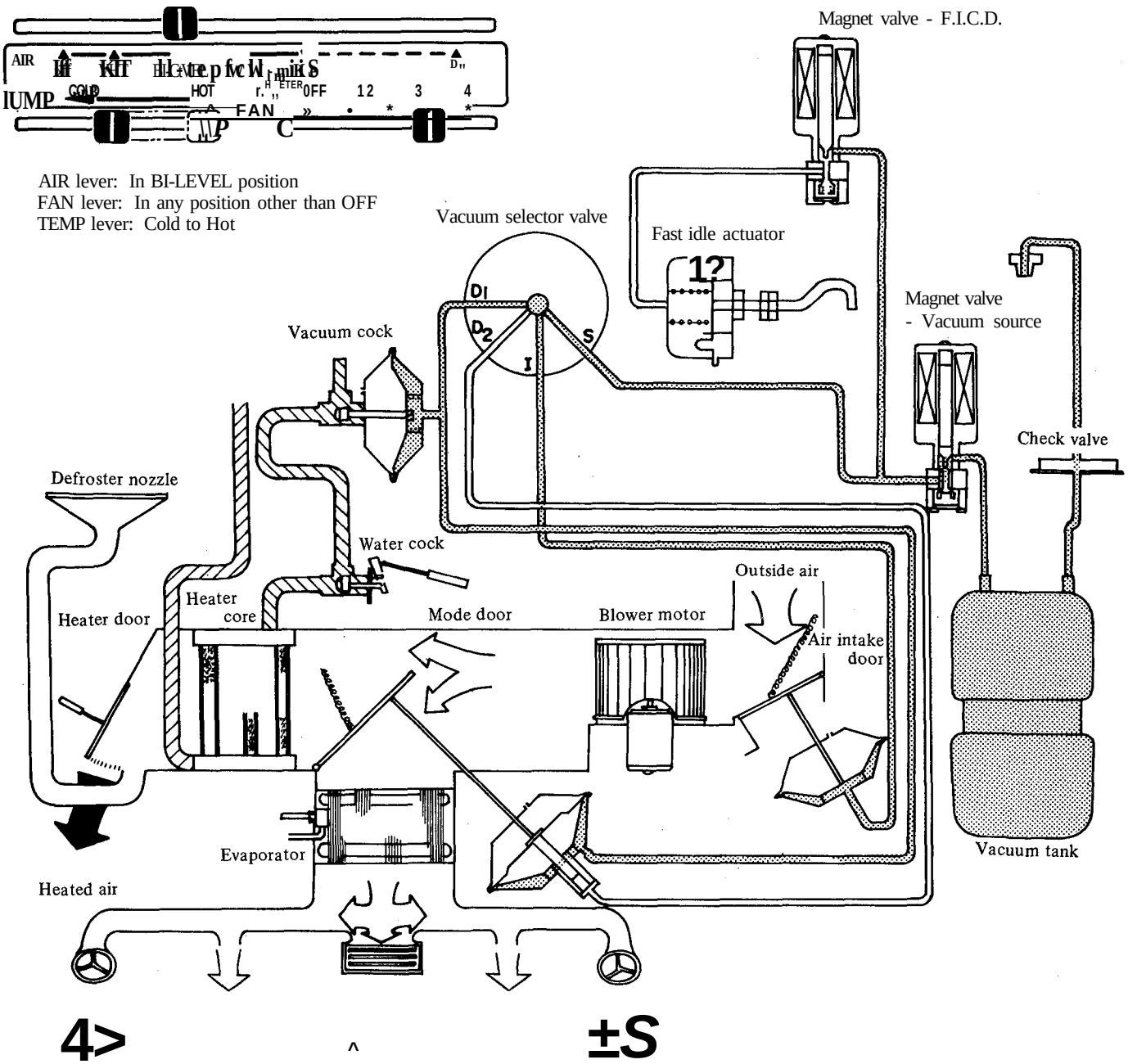
2. Mode door. .. The mode door is in the closed position. Outside air is directed to the outlets located on the instrument panel.

3. Heater door ... The heater door is in the open position.

4. Vacuum cock ... The vacuum cock is in the closed position, shutting off the hot water at the cock.

5. Fast idle actuator.. . The vacuum flowing into the fast idle actuator is interrupted by the magnet valve. The actuator then stops its operation and the operating lever returns to its original position.

**BI-LEVEL position**



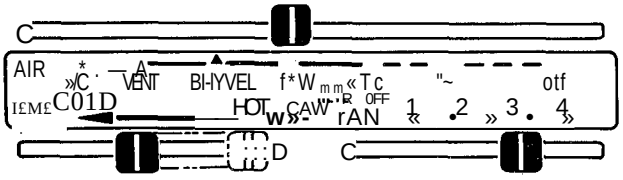

AC544

*Fig. AC-9 Air flow - BI-LEVEL position*

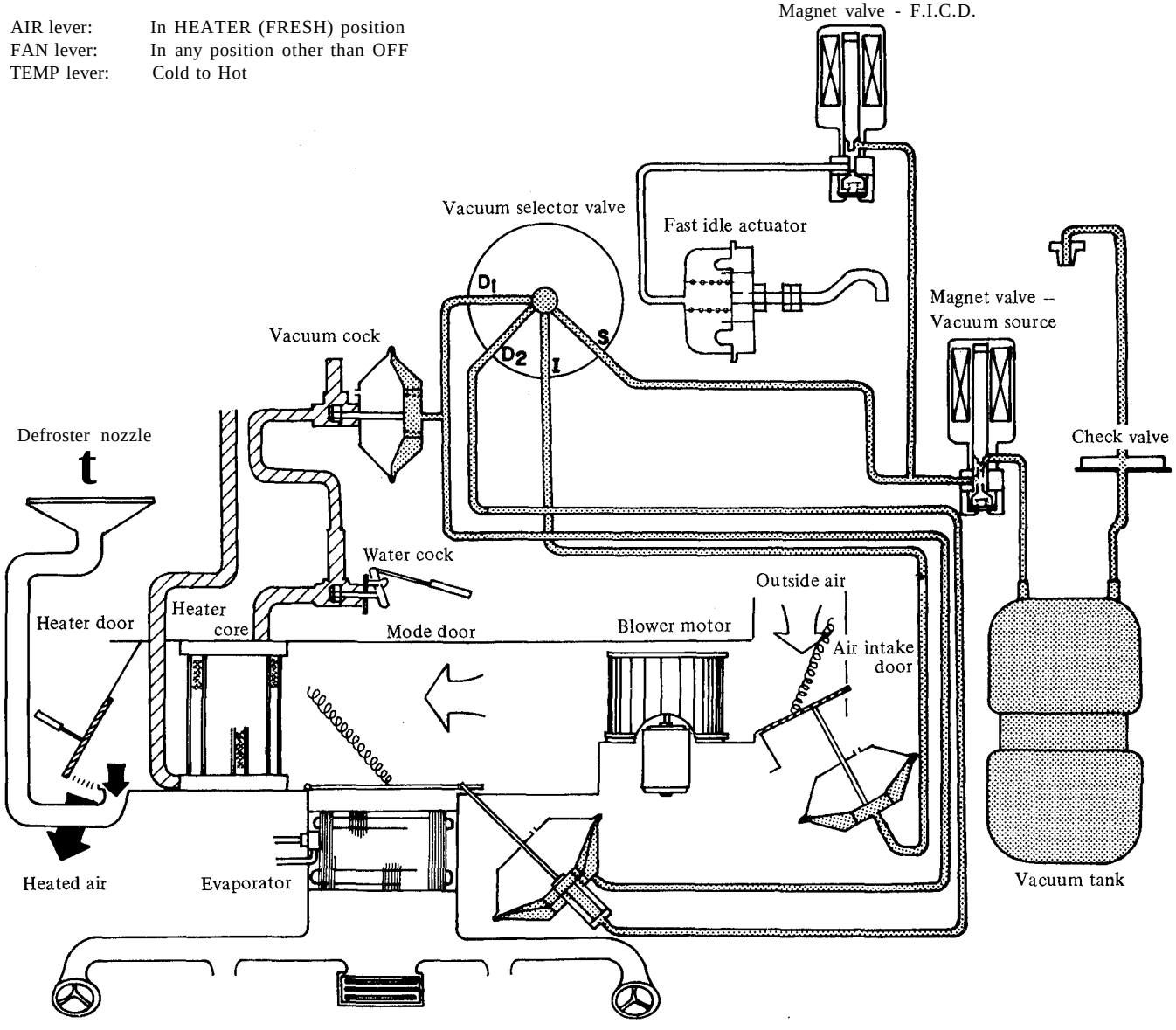
1. Air intake door ... Vacuum is imposed on the actuator of the air intake door and the door is in the open position.
2. Mode door . .. Vacuum is introduced only to $D_x$ of the double-action actuator and the door is allowed to open in its first-stage position. Outside air admitted from the air intake door thus flows both into the heater core and the evaporator.
3. Heater door .. . The heater door is in the open position. Warm air heated by the core is directed toward occupant's feet in the passenger compartment.
4. Vacuum cock . .. Vacuum is imposed on the actuator, causing the cock to open. Hot water now circulates in the heater core.
5. Fast idle actuator... The actuator is not in operation.

Under the BI-LEVEL position, fresh outside air is discharged from the instrument air outlets while, from the heater outlets on the floor, warm air is produced.

**HEATER (FRESH)** position




AIR lever: In HEATER (FRESH) position
FAN lever: In any position other than OFF
TEMP lever: Cold to Hot



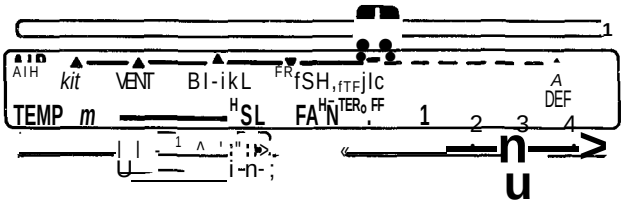

AC545

*Fig. AC-10 Air flow - HEATER (FRESH) position*

1. Air intake door ... Vacuum is imposed on the actuator of the air intake door and the door is in the open position.
2. Mode door. . . Vacuum is introduced both to Dj and $D_2$ of the double-action actuator and the mode door is in its fully open position. All the outside air thus flows into the heater core.
3. Heater door.. . The heater door is in the open position. Warm air heated by the core is discharged from the opening located above occupant's feet. A small portion of it goes to the defroster nozzles.
4. Vacuum cock . .. Vacuum is imposed on the actuator, causing the vacuum cock to open.
5. Fast idle actuator... The actuator is not in operation.

Temperature of the discharge air varies with the amount of water flowing into the heater core via the water cock. The water cock is controlled by a control cable from the TEMP lever.

**HEATER (REC) position**




AIR lever: In HEATER (REC) position
FAN lever: In any position other than OFF
TEMP lever: Cold to Hot

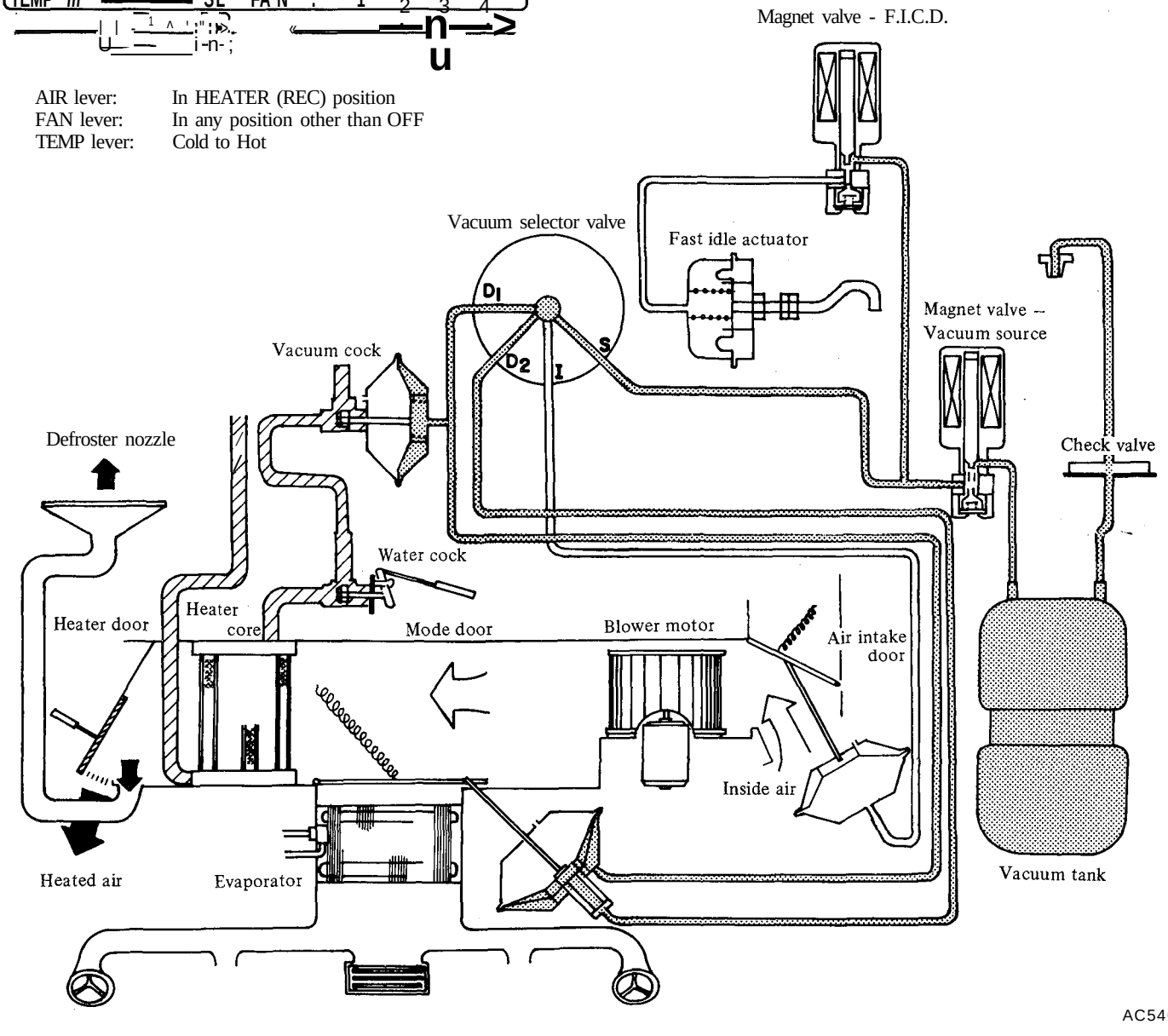



*Fig. AC-11 Air flow - HEATER (REC) position*

1. Air intake door... The air intake door is in the closed position, shutting off outside air. Air is circulating inside the passenger compartment.
2. Mode door... Vacuum is introduced both to $D_1$ and $D_2$ of the double-action actuator and the mode door is in its fully open position. All the outside air thus flows into the heater core.
3. Heater door ... The heater door is in the open position. Warm air heated by the core is discharged from the opening located above occupant's feet. A small portion of it goes to the defroster nozzles.
4. Vacuum cock . . . Vacuum is imposed on the actuator, causing the vacuum cock to open.
5. Fast idle actuator . . . The actuator is not in operation.

Temperature of the discharge air varies with the amount of water flowing into the heater core via the water cock. The water cock is controlled by a control cable from the TEMP lever.

**DEF (Defrost) position**

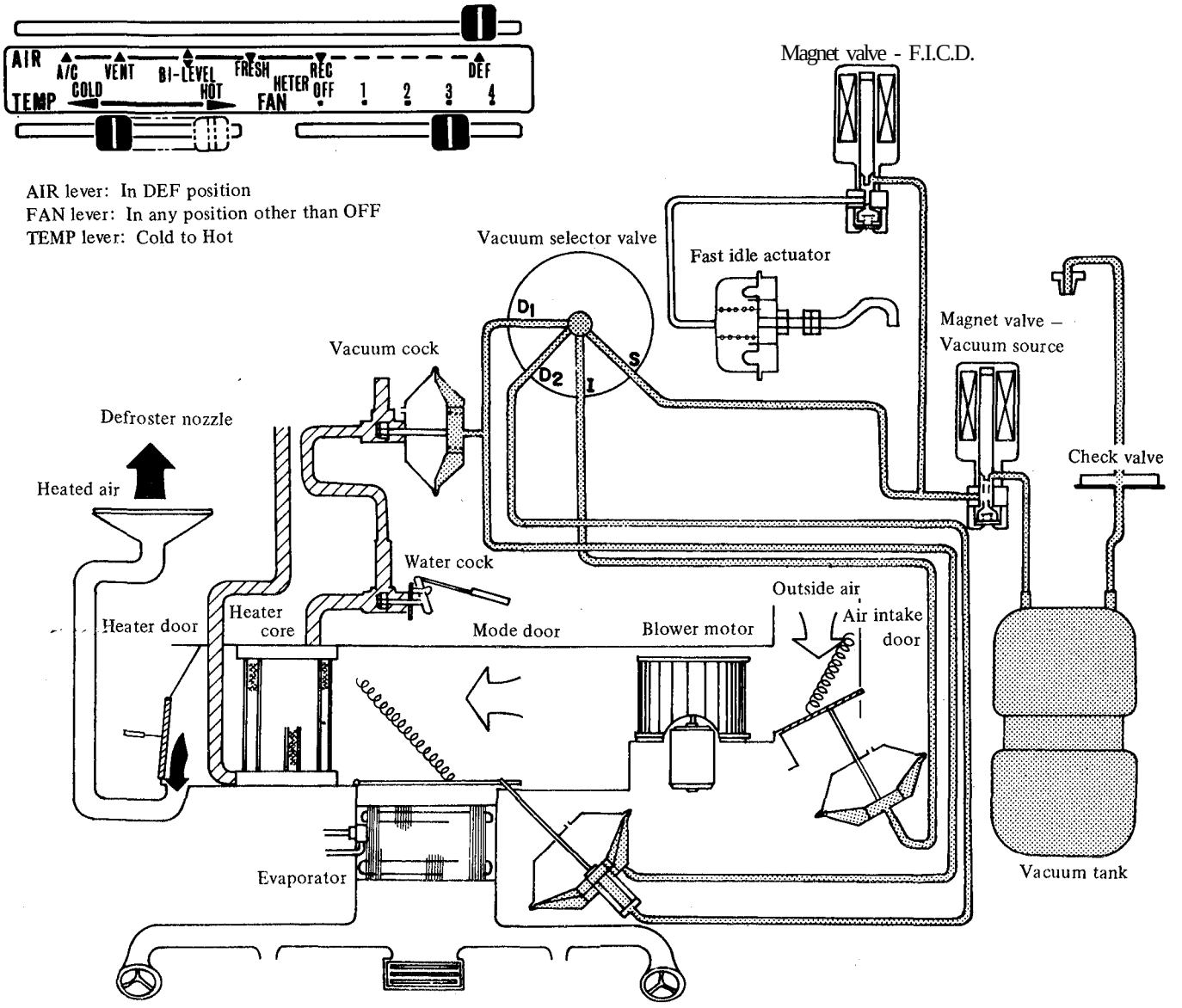



*Fig. AC-12 Air flow - DEF (Defrost) position*

1. Air intake door . .. Vacuum is imposed on the actuator of the air intake door and the door is in the open position.
2. Mode door ... Vacuum is introduced both to $D_x$ and $D_2$ of the double-action actuator and the mode door is in its fully open position.
3. Heater door... The control cable of the heater door is connected to the AIR lever and holds the door in the closed position.

Warm air heated by the core goes to the defroster nozzles.

4. Vacuum cock ... Vacuum is imposed on the actuator of the vacuum cock and the cock is in the open position.
5. Fast idle actuator ... The actuator is not in operation.

## VACUUM SYSTEM

### Vacuum tank

It is necessary to control the amount of vacuum that the engine intake manifold produces. This is important since the amount of vacuum varies with speed and load of the engine. The vacuum tank stores the vacuum to help maintain a constant supply of vacuum to the system.

### Check valve

The check valve is located between the engine intake manifold and the vacuum tank. Its valve opens at a negative pressure on the engine side 20 mm Hg (4/5 in Hg) higher than that on the vacuum tank side.

The valve closes when the manifold pressure is higher than that in the vacuum tank to prevent the flow of pressure from the manifold to the tank.

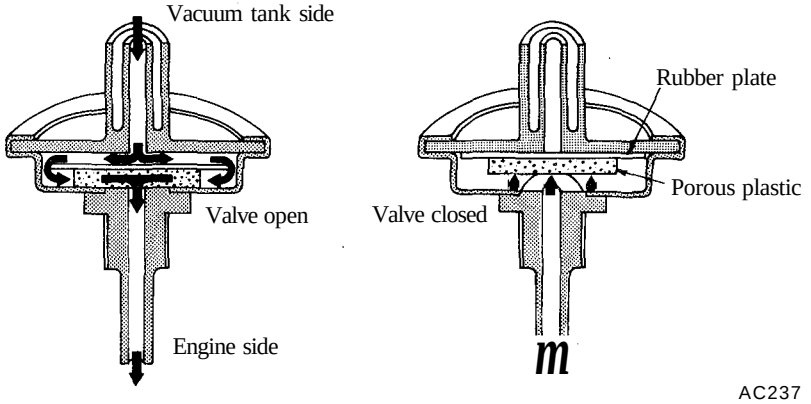



*Fig. AC-13 Check valve*

### Vacuum selector valve

Vacuum distribution is controlled by the vacuum selector valve. The AIR lever directly actuates the vacuum selector valve. This valve consists of two plates which are facing each other. The plates have their mating faces grooved for the transmission of vacuum to the individual vacuum actuators. Moving the AIR lever changes the relative position between these grooves, causing the vacuum actuators to operate depending on the AIR lever setting.

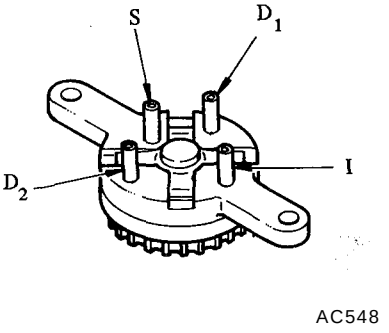



*Fig. AC-15 Vacuum selector valve*

### Magnet valve

While the magnet valve's coil is energized by an electric current, it holds the valve needle in the raised position and vacuum is imposed on the selector side.

When current to the coil is interrupted, passage on the vacuum tank side closes, leaving the selector side line open to the atmosphere.

There are two magnet valves in the system. One is located between the vacuum tank and the vacuum selector valve. The other is provided for the fast idle actuator.

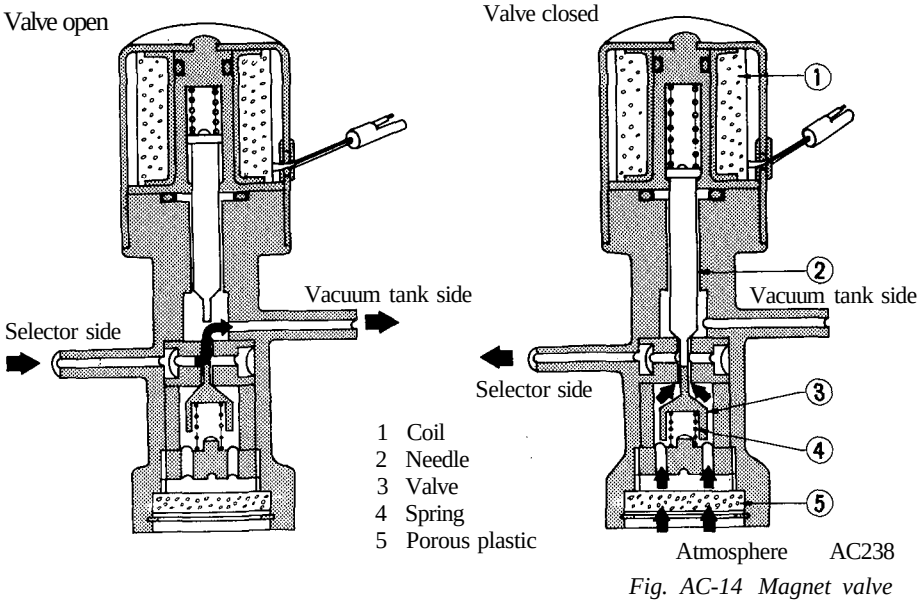



*Fig. AC-14 Magnet valve*

### Vacuum actuator

Single-action and double-action actuators are used. Operation is the same. When vacuum is imposed on the diaphragm, it deflects moving the operating lever connected to it. The actuators operate at a vacuum of 200 mm Hg (8 in Hg).

### Fast idle control device (F.I. CD.)

The fast idle control device increases engine idle speed so that the air conditioner continues to cool the passenger compartment even when the car is at a stand still.

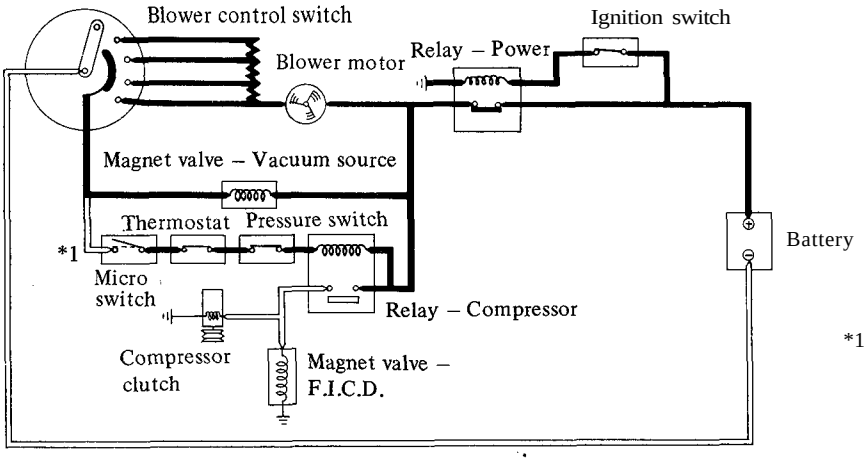
### Vacuum water cock

This cock, too, has a vacuum actuator, by which two-stage operations of opening and closing the cock are performed. This cock opens and closes the passage of the cooling water which flows into the heater core.

OFF POSITION

AIR lever: In any position
FAN lever: In OFF position

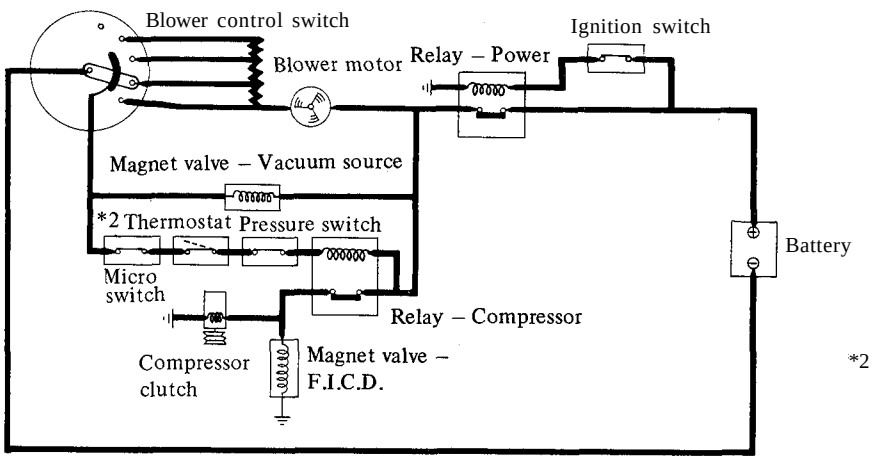





*1 - (When AIR lever is in A/C position, micro switch is ON.)

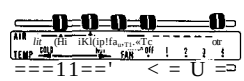
A/C POSITION

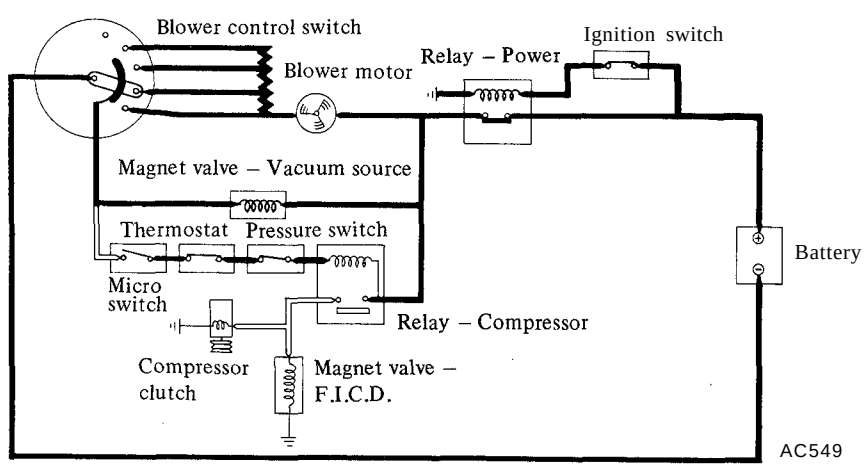





*2 - (May be on or off by switching thermostat on or off)

VENT
BI-LEVEL
HEATER (FRESH) POSITION
HEATER (REC)
DEF






AC549

*Fig. AC-16 Electrical circuit*

# ELECTRICAL CIRCUIT

The electrical system of the air conditioner is designed to control the ground circuit. In the following paragraphs are described the operations of the blower motor, compressor and magnet valves.

## BLOWER MOTOR OPERATION

As the ignition switch is turned on, a power relay for the air conditioner closes, allowing the current from the battery to the blower motor, resistor and blower speed switch. When the blower speed switch is turned on, a ground circuit is completed and thus the blower motor begins to rotate.

## COMPRESSOR OPERATION

The compressor circuit contains a compressor relay. The solenoid energizing circuit of the relay includes the blower speed switch, a micro switch, the thermostat and a pressure switch, all connected in series. On-off operations in these devices control current to the compressor clutch. This circuit also controls the magnet valve for the fast idle actuator.

## MAGNET VALVE (VACUUM SOURCE) OPERATION

The vacuum source magnet valve is operated in conjunction with the on-off of the blower speed switch. This valve controls vacuum supply to the vacuum-operated system.

### Relay

Two relays are used. One is in the line between the blower motor and the battery. When the ignition switch is set at ON, the current flows through the solenoid to the ground, that is, the relay solenoid is energized so that the relay contacts are closed and the current flows to the blower motor.

The other relay is located in the line on the way to compressor clutch. The pressure switch, thermostat, micro switch and blower speed switch are in series connection in the line where the solenoid branches off. The current passes through the blower speed switch to the same ground circuit as the blower motor.

### Blower speed switch

The blower speed switch is directly actuated by the FAN lever. The current passes through the resistor to the blower motor; then it passes through the blower speed switch to the ground. The speed of the blower motor is changed to four speeds with the FAN lever's position.

### Magnet valve

This valve is opened and closed electrically by its electric solenoid.

### Pressure switch

Installed in the receiver drier, the pressure switch interrupts current to the compressor clutch and stops the compressor operation whenever system pressure on the high pressure lines builds up abnormally. See Figure AC-4.

### Micro switch

The micro switch is actuated by the **AIR** lever. This switch is on only when the AIR lever is set at A/C position.

### Thermostat

The thermostat has one sensor, which is located in the center of the evaporator core of the evaporator housing and which senses the temperature of air forced out of the evaporator. In the thermostat, the contact is switched to ON and OFF according to the change in the temperature sensed by the sensor; in other words, the current which is sent to the compressor clutch is cut so as to stop the compressor's operation and to maintain steady the temperature of air forced out. One of the control cables from the TEMP lever changes the temperature setting for operation of the thermostat.

### Compressor clutch

The compressor clutch engages and disengages the clutch disc electrically by the electric solenoid, and transmits the engine speed to the shaft of the compressor.

# GENERAL SERVICE

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## REFRIGERANT R-12

The refrigerant used in the air conditioner is generally called "Refrigerant-12 (R-12)". No other refrigerant than the above refrigerant should be used.

This refrigerant is usually available in a small can or a cylinder. In either case, it is liquefied under high pressure in the container.

Refrigerant evaporates easily (has a low evaporation point) and, moreover, since the latent heat of the refrigerant is large, it can absorb a large amount of heat when evaporating. Extreme care must be exercised when handling the refrigerant.

## COMPRESSOR OIL

The "SUNISO 5GS" refrigeration lubricant should be used to assure the successful compressor operation. Use of oils other than recommended or mixing of the oil with other oils would cause chemical reaction or lead to lowered viscosity or deficient lubrication.

The oil absorbs moisture as it contacts the air. This points out the need for care not to expose it to atmosphere for an extended period of time.

## MAINTENANCE

### PERIODICAL MAINTENANCE AND SEASON-IN INSPECTION

Both periodical maintenance and season-in inspection are most essential to enable the air conditioner to give full performance.

Perform the following checks.

1. Start engine and check refrigerant level through sight glass on receiver drier. For details, refer to relative topics under "Refrigerant Level Check".
2. Check the entire system for sign of refrigerant leaks. Refer to relative topics under "Checking for Leaks" and "Refrigerant Leaks".

If any trace of oil is noted at and around connection fittings, it is a sure indication that refrigerant is leaking. This condition can be corrected easily by retightening the joints. If any joint on line is suspected of small amount of leakage, use a leak detector to locate leaking points.

3. Check compressor drive belts for proper deflection.

#### Season-off

Observe the following maintenance tips to allow the air conditioner to operate normally in the next season.

1. Keep the entire system free from refrigerant leakage by periodically checking for refrigerant gas leak even out of season.
2. Turn the compressor for 10 minutes at least once a month by running the engine at 1,500 rpm.

## GENERAL SERVICE INSTRUCTIONS

The servicing of the air conditioner should be carried out only by well-trained servicemen. This chapter describes essential points of servicing.

- If a large amount of dirt and sand enter the system, they will be carried with refrigerant and may clog the system or scratch rotating parts. This points out the need for care in servicing the system. That is, disconnecting joints should be carried out in a clean place.
- Water should not be allowed to get inside the system. The refrigerant does not readily mix with water. However, the presence of even a minute amount of water will cause a chemical reaction at high temperature which will in turn produce hydrochloric acid (HC1). Since hydrochloric acid is highly corrosive to metals, the aluminum and copper piping, etc. will become corroded and the refrigeration system will become clogged.

- Water in the system will ice the orifice when the high pressure refrigerant is changed to low pressure refrigerant by expansion valve, etc., and will obstruct the refrigerant flow.

The following are general instructions to be closely observed in servicing the system.

1. When a system line is disconnected, plug the opening immediately. This is especially necessary to prevent moisture condensation from forming in the line and to keep out dirt and dust. It is also necessary to keep the line at and above surrounding air temperatures at all times. When connecting system lines, do not attempt to remove the plug from the opening until ready for immediate use.
2. Always keep the working place clean and dry and free from dirt and dust. Wipe clean water that comes into contact with the pipe joint before disconnecting.
3. Have all necessary tools in preparation beforehand and have tools clean and dry.
4. The compressor oil will easily absorb moisture when exposed to air. Immediately close the opening of the container after use. It is also necessary to observe the following notes:

**Notes:**

**a. The oil should not be transfused from a container into another, as the failure will possibly cause moisture to mix with the oil.**
**b. The used oil should not be returned into a container.**
**c. The oil should not be used if its state of preservation is not clear enough.**

5. When connecting or disconnecting pipes from the refrigeration system, use two wrenches. One wrench is used for holding the fixing nut in place while the other for turning the mating flare nut. Failure to do so may result in a twisted tube or may damage connection.

6. Also use care not to give scratches to the seating surface at connections. A small scratch on the seating surface may be the cause of gas leakage. Before connecting pipes, be sure to give coating of compressor oil to the seating surfaces.

## SAFETY PRECAUTIONS

1. Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. **Wear gloves or wrap a piece of cloth around service valve to protect your fingers against frostbite by refrigerant.** If any of the refrigerant should get into your eyes when charging the refrigerant, splash your eyes with cool water to raise the temperature gradually. Apply a protective film to the eye to avoid infection. Do not rub your eyes. Consult an eye specialist. **Always wear goggles or glasses *to* protect your eyes when working around the system. Should refrigerant strikes your body, splash on cool water and apply a protective film.**
2. The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, **always follow the instructions on the label. In particular, never store it in a hot location [above 52°C (125°F)] or drop it from a high height.**
3. The refrigerant gas is odorless and colorless and breathing may become difficult due to the lack of oxygen. Since the refrigerant gas is heavier than air and will lay close to the floor, be especially careful when handling it in small, confined spaces.
4. The refrigerant itself is nonflammable . **However, a toxic gas (phosgene gas) is produced when it contacts fire and special care is therefore required when checking for leaks in the system with a halide torch.**
5. Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.

**The above precautions are essential in handling of Refrigerant-12, and their strict observation requires sufficient training. Therefore, it is of first importance that any other personnel than a well-trained serviceman should not be allowed to handle the refrigerant.**

## EVACUATING AND CHARGING SYSTEM

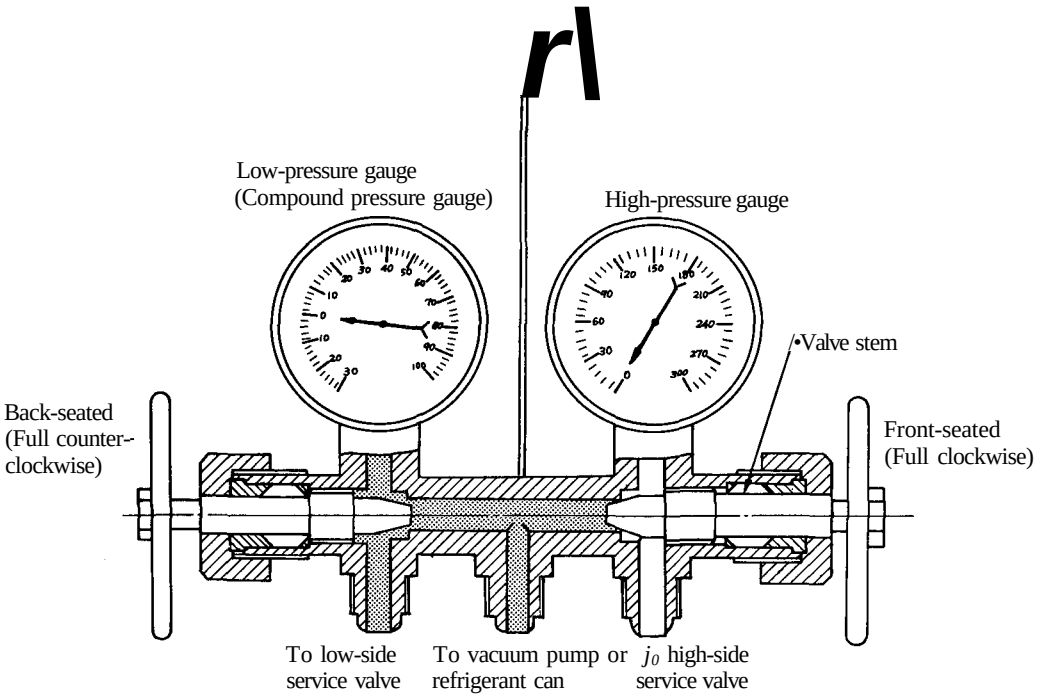
During servicing, use caution to keep air from getting into refrigerant. When air enters the system, all refrigerant must be evacuated from system prior to charging new refrigerant. Air in refrigerant has the following deleterious effects:

1. Since the condensation temperature of the air is extremely low, the air will not be condensed when refrigerant gas is condensed in the condenser, and the air will thus remain in gaseous form. Consequently, the effective thermal transmission area of condenser for refrigerant gas will be reduced and refrigerant gas to be condensed will be reduced. The pressure rise will become proportional to the volume of the air in system.
2. When air and refrigerant are mixed in system, a chemical reaction will be produced and hydrochloric acid which will adversely affect the aluminum, copper, iron, and other materials in system may be generated.

### HANDLING MANIFOLD GAUGE

The pressure at the high- and low-sides of system should be measured when evacuating and charging refrigerant and when diagnosing trouble in the system. The manifold gauge is used for these purposes. A manifold gauge has two pressure gauges; a low pressure gauge and a high pressure gauge. These gauges are connected to the high- and low-side service valves of system through flexible charging hoses. The construction of manifold gauge is shown in Figure AC-17.

When valve stem is fully screwed, the valve is front-seated and valve path and the center path are blocked. When valve stem is backed off, the paths are opened.




AC243

*Fig. AC-17 Manifold gauge*

### Connection to service valve

1. Fully close both valves of manifold gauge. Connect high- and low-pressure charging hoses to manifold gauge.
2. Remove caps from service valves. Connect high- and low-pressure charging hoses to service valves in system. The refrigerant gas will be discharged since check valve is open when pressing charging hose onto service valve.
3. Next, loosen the connection fitting of charging hose at manifold gauge side for 2 to 3 seconds to purge any air inside charging hose by the pressurized gas in system.

## HANDLING SERVICE VALVE

An automatic check valve is built into service valve. When this valve presses against the connection fitting, that is, when charging hose is connected to service valve, the valve is open. When charging hose is disconnected, the valve is closed automatically. Always observe the following usage precautions:

1. Always install valve cap after using service valve.

When high speed operation is performed without valve cap, a negative pressure will gradually build up at the low pressure side of system and air may be sucked in. In addition, dirt and dust will easily enter the valve resulting in foreign matter entering the system.

2. Check valve will be half opened during connection and disconnection of charging hoses and refrigerant will be forcefully discharged. Therefore, connect and disconnect charging hoses quickly while pressing flare nut of charging hose against service valve.

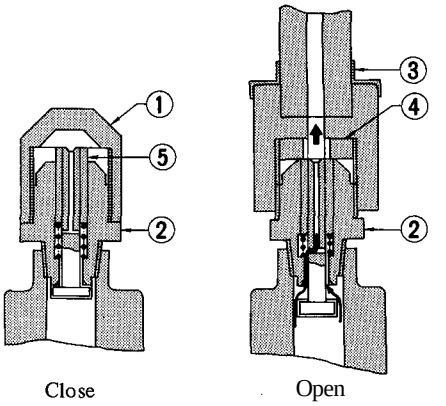
Caution: Work with fingers protected with cloth against frostbite by refrigerant.

3. Since close contact between the thread of valve cap and the thread of service valve will prevent gas leakage, keep these sections clean and free of scratches and damage.
4. Since packing of charging hose will be lost during long use, always check packing prior to installing charging hose.

### Disconnection from service valve

1. Fully close both valves of manifold gauge.
2. Disconnect two charging hoses from service valves. At this time, the gas will be discharged until check valve is closed. Therefore, disconnect hose quickly.

Caution: Work with fingers protected with cloth against frostbite by refrigerant.




AC244

Close Open

1 Cap
2 Service valve
3 Charging hose
4 Packing
5 Check valve

*Fig. AC-18 Service valve*

## HANDLING CAN TAP

A wide variety of can taps are available. The following procedures apply to conventional can taps.

For the correct usage, refer to the manufacturer's instructions.

**Caution: Use can tap of good quality.**

**1.** Connect charging hose to the center fitting of manifold gauge. At this time, confirm that both stems are fully turned in (front-seated).

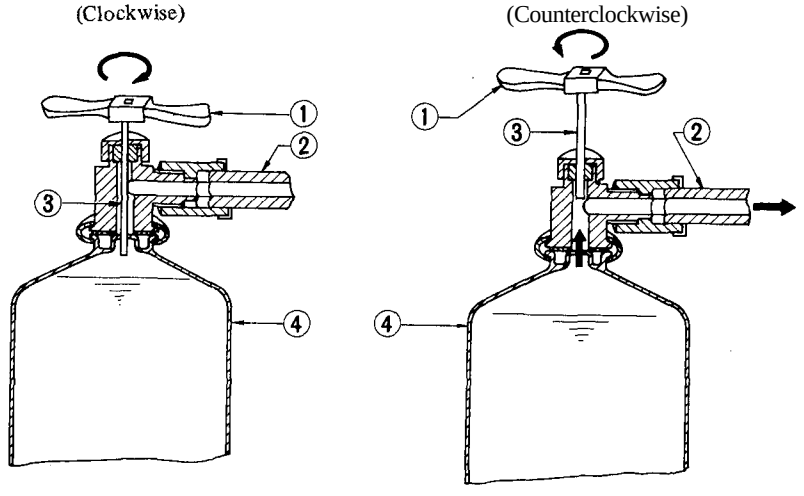
2. Turn can tap handle fully counterclockwise so that the needle is pulled up.

3. Attach can tap to refrigerant can firmly.

4. Turn can tap handle fully clockwise to make a hole in refrigerant can.

5. Turn the handle fully counterclockwise to raise the needle. Refrigerant gas will flow up to the center fitting of manifold gauge.

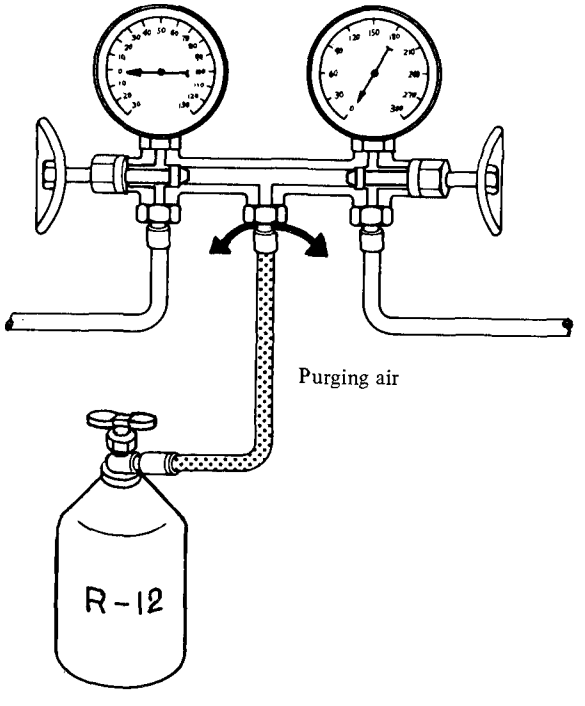
6. Loosen the connection at the center fitting of manifold gauge for a few seconds to purge air inside charging hose. See Figure AC-20.




1 Can tap handle
2 Charging hose
3 Needle
4 Refrigerant can

AC246

*Fig. AC-19 Can tap*




AC247

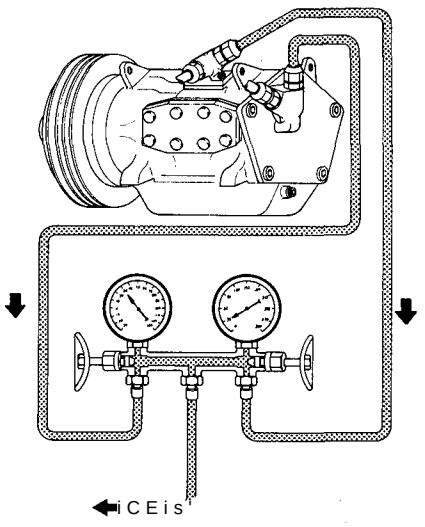
*Fig. AC-20 Purging air*

## DISCHARGING SYSTEM

The pressurized refrigerant gas inside system must be discharged to a pressure approaching atmospheric pressure prior to evacuating refrigerant inside system. This operation should be made to permit safe removal when replacing system components.

1. Close high- and low-pressure valves of manifold gauge fully.
2. Connect two charging hoses of manifold gauge to their respective service valves.
3. Open both manifold gauge valves slightly and slowly discharge refrigerant from system. See Figure AC-21.

**Note: Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.**




AC248

*Fig. AC-21 Discharging system*

**Caution: Protect fingers with cloth against frostbite by refrigerant when connecting the charging hose to the service valve or disconnecting it therefrom.**

## EVACUATING SYSTEM

1. Connect high- and low-pressure charging hoses of manifold gauge to their respective service valves of system and discharge refrigerant from system. Refer to "Discharge System".
2. When refrigerant has been discharged to a pressure approaching atmospheric pressure, connect center charging hose to a vacuum pump.
3. Close both valves of manifold gauge fully. Then start vacuum pump.
4. Open low-pressure valve and suck old refrigerant from system. See Figure AC-22.
5. When low-pressure gauge reading has reached to approximately 500 mm Hg (20 in Hg), slowly open high-pressure valve. See Figure AC-23.
6. When pressure inside system has dropped to 710 mmHg (28 inHg), fully close both of valves of manifold gauge and stop vacuum pump. Let stand it for 5 to 10 minutes in this state and confirm that the reading does not rise.

**Notes:**

**a. The low-pressure gauge reads lower by 25 mm Hg (1 in Hg) per a 300 m (1,000 ft) elevation. Perform evacuation according to the following table.**

| Elevation m(ft) | Vacuum of system mm Hg (in Hg) |
|---|---|
| 0 (0) | 710 (28) |
| 300(1,000) | 685 (27) |
| 600(2,000) | 660(26) |
| 900(3,000) | 635 (25) |

**Note: Values show readings of the low-pressure gauge.**

**b. The rate of ascension of the low-pressure gauge should be less than 25 mm Hg (1 in Hg) in five minutes.**

If the pressure rises or the specified negative pressure can not be obtained, there is a leak in the system. In this case, immediately charge system with refrigerant and repair the leak described in the folio wings.

(1) Confirm that both valves of manifold gauge are fully closed and then disconnect center charging hose from vacuum pump.

(2) Connect center hose to can tap in place of vacuum pump. Attach refrigerant can to can tap and pass refrigerant to manifold gauge.

(3) Loosen the connection of center fitting of manifold gauge to purge air from center hose.

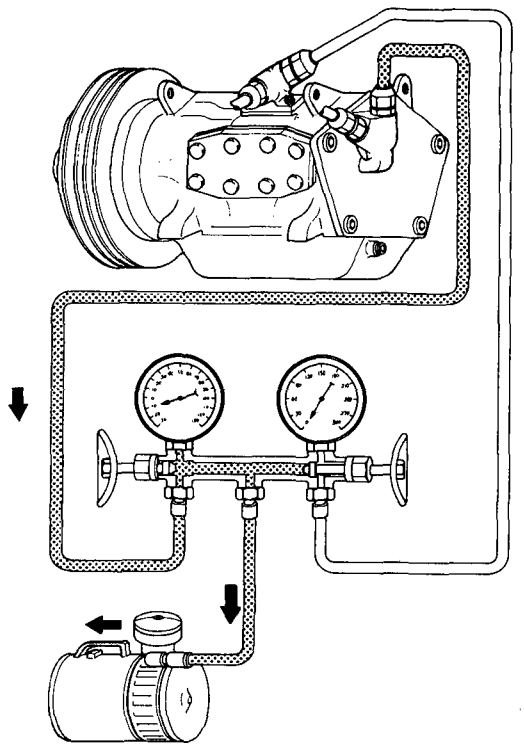
(4) Open low-pressure valve of manifold gauge and charge refrigerant into system. After one can [about 0.4 kg (1 lb)] of refrigerant has been charged into system, close low-pressure valve.

(5) Check for refrigerant leakage with a leak detector. Repair any leakages found. Refer to "Checking for Leaks" and "Refrigerant Leaks".

(6) Confirm that both valves of manifold gauge are fully closed and then change center charging hose from can tap to vacuum pump.

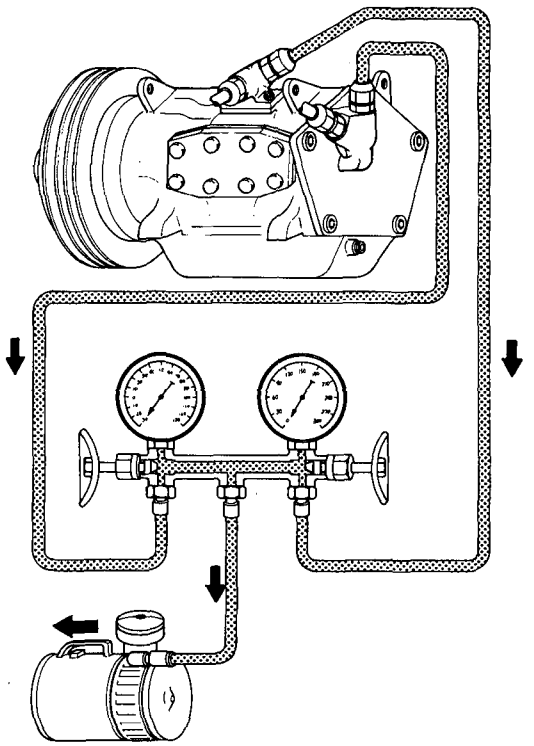
(7) Open high- and low-pressure valves and operate vacuum pump to such refrigerant from system. When the pressure in system has dropped to 710 mmHg (28 inHg), fully close both valves of manifold gauge.

7. The above operation completes evacuation of system. Next, charge refrigerant. Refer to "Charging Refrigerant".



AC249

*Fig. AC-22 Evacuating system - First step*



AC250

*Fig. AC-23 Evacuating system - Second step*

## CHARGING REFRIGERANT

1. Install manifold gauge to system. Refer to "Handling Manifold Gauge".

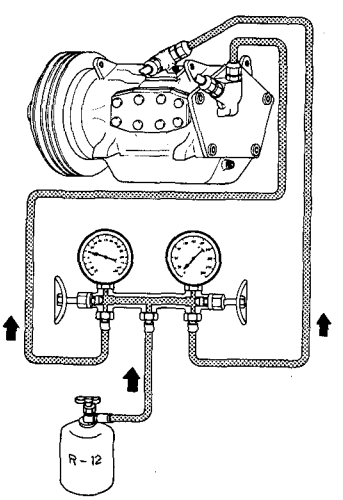
**Notes:**

**a. Be sure to purge air from the high- and low-pressure charging hoses.**

**b. If air is mixed with refrigerant gas in system, evacuation of system should be performed. Refer to "Evacuating System".**

2. Attach center charging hose of manifold gauge to refrigerant can through can tap. Break seal of refrigerant can to allow refrigerant to enter manifold gauge. Loosen charging hose at the center fitting of manifold gauge and purge air from inside charging hose. Refer to "Handling Can Tap".

3. Open high- and low-pressure valves of manifold gauge and charge refrigerant into system. See Figure AC-24.




AC251

*Fig. AC-24 Charging refrigerant*

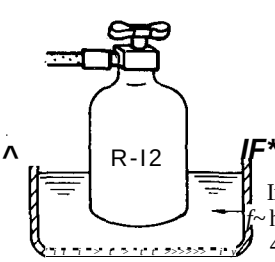
**Notes:**

**a. When refrigerant charging speed is slow, immerse refrigerant can in water heated to a temperature of about 40°C (104°F). However, note that this is dangerous when water is hot. See Figure AC-25.**

**Cautions:**

**a. Under any circumstances the refrigerant can must not be warmed in water heated to a temperature of over 52°C (125°F).**

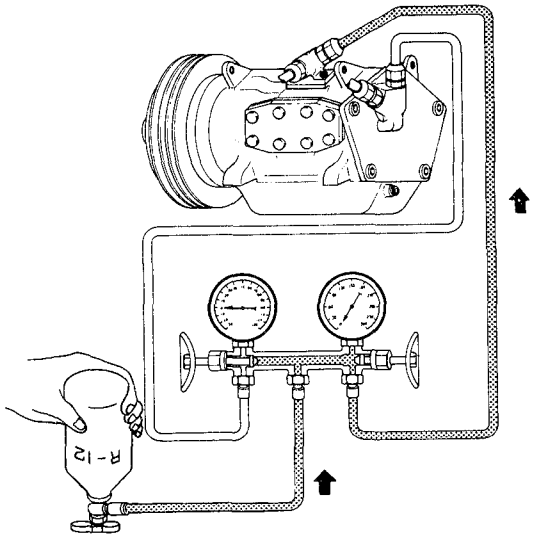
**b. A blow torch or stove must never be used to warm up the can.**




AC252

*Fig. AC-25 Charging refrigerant*

**b. When charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge it only through high pressure valve, but not through low-pressure valve.**
**After completion of charging, the compressor should always be turned several times manually. See Figure AC-26.**

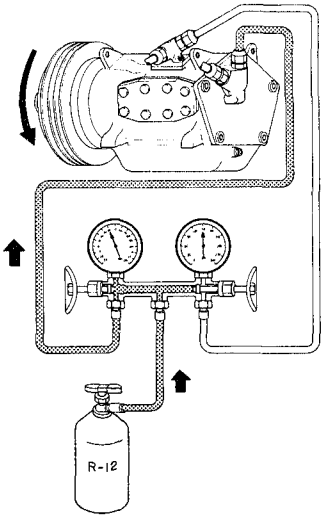



AC253
*Fig. AC-26 Charging refrigerant*

**4. If** refrigerant charging speed slows down, charge it while running the compressor for ease of charging. After having taken the steps up to (3) above, proceed with charging in the following order.
(1) Shut off high pressure valve of manifold gauge.

**Caution: Never charge refrigerant through high pressure side of system since this will force refrigerant back into refrigerant can and can may explode.**

(2) Run the engine at idling speeds below 1,500 rpm.
(3) Set the TEMP lever and FAN switch at maximum cool and maximum speed respectively.
(4) Charge refrigerant while controlling low-pressure gauge reading at 2.8 kg/cm$^2$ (40 psi) or less by turning in or out low-pressure valve of manifold gauge. See Figure AC-27.

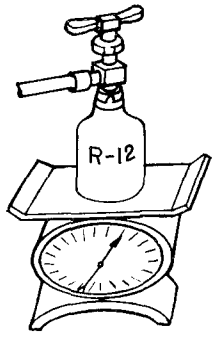



AC254
*Fig. AC-27 Charging refrigerant*

5. When refrigerant can is empty, fully close both valves of manifold gauge and replace refrigerant can **with** a new one.

Before opening manifold gauge valve to charge refrigerant from new can, be sure to purge air from inside charging hose.

6. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise. See Figure AC-28.




Measure the amount of charged refrigerant with a scale.
Make a note of the amount charged from can.

AC255
*Fig. AC-28 Charging refrigerant*

Refrigerant capacity

Unit: kg (lb)

| Refrigerant | Minimum | Maximum |
|---|---|---|
| R-12 | 0.6(1.3) | 0.9 (2.0) |

**Note: The presence of bubbles in sight glass of receiver drier is an unsuitable method of checking the amount of refrigerant charged in system. The state of the bubbles in sight glass should only be used for checking whether the amount of charged refrigerant is small or not. The amount of charged refrigerant can be correctly judged by means of discharge pressure. Refer to "Refrigerant Level Check".**

7. After the specified amount of refrigerant has been charged into system, close manifold gauge valves. Then detach charging hoses from service valves of system. Be sure to install valve cap to service valve.

8. Confirm that there are no leaks in system by checking with a leak detector.

Refer to "Checking for Leaks".

**Note: Conducting a performance test prior to removing manifold gauge is a good service operation. Refer to "Performance Test".**

## CHECKING FOR LEAKS

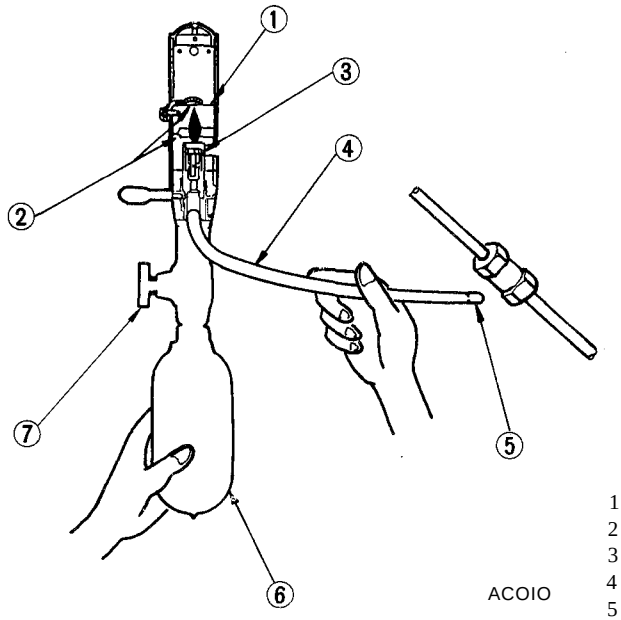
Conduct a leak test whenever leakage of refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening of connection fittings.

Refrigerant is a colorless, odorless gas and leakage from system is difficult to detect. Accordingly, the use of a leak detector facilitates check for leaks. Two methods of checking are available; one employs a halide leak detector which burns propane gas or butane gas and the other is an electric type leak detector.

### HALIDE LEAK DETECTOR

Since the propane leak detector and butane leak detector are the same in respect to their operation, this section describes the operation of the propane leak detector.

The copper screen is heated by the burning of propane. Refrigerant gas decomposes to color the flame when it contacts the heated screen. The gas to be checked is drawn into the sampling tube and sent out to the burner. A refrigerant leak can clearly be detected by variations in the color of the flame.




1 Copper reaction plate
2 Flame adjusting lines
3 Burner
4 Sampling tube
5 Strainer
6 Gas bomb
7 Flame adjuster

*Fig. AC-29 Checking for leaks*

| | Propane type | Butane type |
|---|---|---|
| NO LEAK | Greenish blue | Pale blue |
| SMALL LEAK | Yellow | Bright blue |
| LARGE LEAK | Purple | Vivid green |

1. Discharge refrigerant in one or two seconds to ascertain that system has a sufficient pressure needed for leak detection. Charge with 0.4 kg (1 lb) of refrigerant, if necessary.

2. Light leak detector. Adjust the height of the flame between flame adjusting lines at the top and bottom of combustion tube. A reaction plate will immediately become red hot.

3. Place the end of sampling tube near the point of the suspected leak in system.

**Notes:**

**a. Since refrigerant gas is heavier than air, small leaks can be easily detected by placing sampling tube directly below the check point.**

**b. Suitable ventilation is required. If refrigerant gas is mixed with the surrounding air, leak detector will always indicate a response and detection of the actual leak will be difficult.**

**c. Never hold leak detector at an angle.**

**Cautions:**

**a. Never inhale the fumes produced by combustion of refrigerant gas since they are toxic.**

**b. Never use halide torch in a place where combustible or explosive gas is present.**

4. The flame will be almost colorless when there is no refrigerant gas being burned. When there is a small refrigerant gas leak, the flame will be green or yellowgreen. When refrigerant gas leakage is large, the flame will be brilliant blue or purple. Since the color of the flame will be yellow when dust is being burned or there is aging scale on copper reaction plate, always keep the strainer of sampling tube and reaction plate clean.

5. Major check points

(1) Compressor

- Compressor shaft seal (rotate the compressor by hand)
- Oil filler plug
- Flexible hose connections
- Rear cover and side cover gaskets.
- Service valve

(2) Condenser

- Condenser pipe fitting
- Condenser inlet and outlet pipe connections

(3) Piping
- Flared section of high pressure and low pressure flexible hose.
- Pipe connections
- Service valve

(4) Evaporator housing
- Inlet and outlet pipe connections
- Expansion valve

## ELECTRIC LEAK DETECTOR

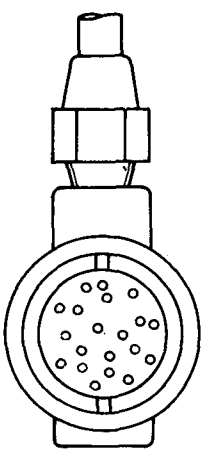
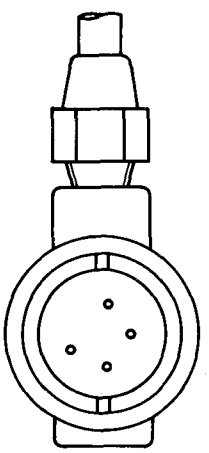
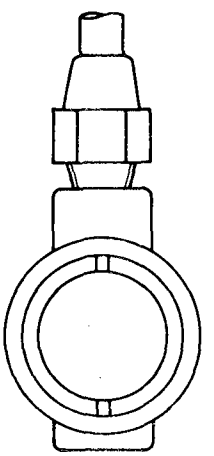
For the operational procedures, refer to the instructions furnished with each electric leak detector.

# REFRIGERANT LEVEL CHECK

## SIGHT GLASS

Sight glass is provided at the top of receiver drier. One guide for whether there is enough refrigerant in system is given by observing refrigerant flow through sight glass. However, this method is unsuitable for judging the amount of refrigerant. The correct refrigerant level can be judged by measuring the system pressures in accordance with the procedures as described "Performance Test".

1. Start the engine and hold engine speed at 1,500 rpm.
2. Set AIR lever to A/C position.
3. Set blower to maximum speed.
4. Check sight glass after the lapse of about five minutes. Judge according to the following table.

| Amount of refrigerant / Check item | Almost no refrigerant | Insufficient | Suitable | Too much refrigerant |
|---|---|---|---|---|
| Temperature of high pressure and low pressure pipes. | Almost no difference between high pressure and low pressure side temperature. | High pressure side is warm and low pressure side is fairly cold. | High pressure side is hot and low pressure side is cold. | High pressure side is abnormally hot. |
| State in sight glass. | Bubbles flow continuously. **Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.**  AC256 | The bubbles are seen at intervals of 1 - 2 seconds.  AC257 | Almost transparent. Bubbles may appear when engine speed is raised and lowered. **No clear difference exists between these two conditions.**  AC258 | No bubbles can be seen. |
| Pressure of system. | High pressure side is abnormally low. | Both pressures on high and low pressure sides are slightly low. | Both pressures on high and low pressure sides are normal. | Both pressures on high and low pressure sides are abnormally high. |
| Repair. | **Stop compressor** and conduct an overall check. | Check for gas leakage, repair as required, replenish and charge system. | | Discharge refrigerant from service valve of low pressure side. |

**Notes:**

**a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68° F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Be sure to recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy to show up.**

**b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount of refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.**

### PERFORMANCE TEST

Check for the amount of refrigerant in the system can be made by measuring pressure on discharge side.

The correct amount of refrigerant is in the system, if pressure on the discharge side is within the specified range. For details, refer to "Performance Test" described later.

Overcharging will show up in higher pressure on discharge side.

## COMPRESSOR OIL LEVEL CHECK

The oil used to lubricate compressor circulates into system from the oil sump while compressor is operating. Therefore, to correctly measure compressor oil, the amount of oil flowing to system must be considered. If a considerable amount of leakage of refrigerant gas happens, the leakage of compressor oil is also considered. There will be no compressor oil leakage from a completely sealed system. When system operates under satisfying condition, the compressor oil level check is unnecessary.

When checking the level of compressor oil or when replacing any component part of the system, use the following service procedure. This facilitates to return oil to compressor.

1. Operate compressor at engine idling speed (1,000 rpm or below) with controls set for maximum cooling and high blower speed for 10 to 15 minutes in order to return compressor oil to compressor.
2. Stop the engine and discharge refrigerant of system and then remove compressor from the car.
3. Remove compressor drain plug. Drain compressor oil from compressor oil sump and measure the amount.
4. Compressor oil is satisfactory if the following amount of oil remains in the compressor.

   Residual oil:
   85 to 128 gr (3 to 4 % oz)

5. Check the cleanliness of the oil. If the oil contains chips or other foreign material, clean oil sump with new oil.
6. Discard the used oil and fill with the same amount of new oil. Add oil if found less than above amount.

If compressor is inoperative due to defective compressor or heavy loss of refrigerant, remove compressor and repair as necessary. Then pour oil up to correct level and install on engine. After above steps have been completed, recheck oil level; drain oil to correct level if level is excessively high.

## PERFORMANCE TEST

The cooling performance of the air conditioner changes considerably with changes in surrounding conditions. Testing must be performed using the correct method. This test is used to judge whether system is operating correctly and can also be used as a guide in checking for problems.

1. Park the car indoors or in the shade.
2. Open all the windows of the car fully. However, close the doors.
3. Open the hood.
4. Connect manifold gauge to high- and low-side service valves of the system. Refer to "Handling Manifold Gauge".
5. Set AIR lever to A/C position.
6. Set TEMP lever to max. cool position.
7. Set blower to its highest speed.
8. Start the engine and hold engine speed at 1,500 rpm.
9. After the air conditioner has been operated for about 10 minutes, measure system pressures at high-pressure (discharge) side and low-pressure (suction) side.
10. Measure the temperature of discharge air at outlet grille.
11. Measure the temperature and humidity of the ambient air at a point 1 m (3.3 ft) front of condenser. However, a dry bulb and wet bulb must not be placed in direct sunlight.
12. Check for any abnormalities by comparing the test results with standard pressure in "Performance Chart".

Notes:

**a. The pressure will change in the following manner with changes in conditions:**

- **When blower speed is low, discharge pressure will drop.**
- **When the relative humidity of intake air is low, discharge pressure will drop.**

**b. The temperature will change in the following manner with changes in conditions:**
**When the ambient air temperature is low, the outlet air temperature will become low.**

**If** the test reveals that there is any abnormality in system pressure, isolate the cause and. repair by reference to the "Trouble Diagnoses and Corrections".

## REFRIGERANT LEAKS

If leaks are noticeable, leaky parts should be repaired. Then system should be filled with refrigerant. **Do not operate compressor with refrigerant level excessively low.**

If this caution is neglected, a burnt compressor will result since heavy loss of refrigerant usually indicates heavy loss of compressor oil.

If system has been exposed to atmosphere for an extended period of time, receiver drier must be replaced. If leaks are slight and no air is present in system, add refrigerant as necessary.

To detect leaks, refer to relative topics under "Checking for Leaks". Here is how leaks are stopped.

1. Check torque on the connection fitting and, if too loose, tighten to the proper torque. Check for gas leakage with a leak detector.
2. If leakage continues even after the fitting has been retightened, discharge refrigerant from system, disconnect the fittings, and check its seating face for damage. Always replace even if damage is slight.
3. Check compressor oil and add oil if required.
4. Charge refrigerant and recheck for gas leaks. If no leaks are found, evacuate and charge system.

# REMOVAL AND INSTALLATION

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## COMPRESSOR

### REMOVAL

1. Disconnect battery ground cable.
2. Remove air flow meter with air ducts.
3. Remove under cover.
4. Remove rediator shroud and radiator.
5. Loosen tension adjust bolt of idler pulley and remove compressor drive belt.
6. Disconnect compressor clutch wire at connector.
7. Discharge system. Refer to Section of "General Service" for "Discharging System".
8. Remove high and low flexible hoses from compressor.

**Notes:**

**a. Use wrench to fix joint nut on compressor side, and then loosen flare nut of flexible hose with another wrench.**

**b. Be sure to immediately put plugs in flexible hose opening and in compressor connection.**

9. Jack up front of car, and remove bolts mounting compressor's lower side.
10. Lower car, and remove two bolts mounting compressor's top side. While doing this, hold compressor by hand to prevent it from falling down.
11. Take compressor out of car, holding it with both hands, with compressor clutch's front side turned upward.
12. In the same manner as described in "Compressor Oil Level Check" of "General Service", check amount and quality of oil in compressor.

**Notes:**

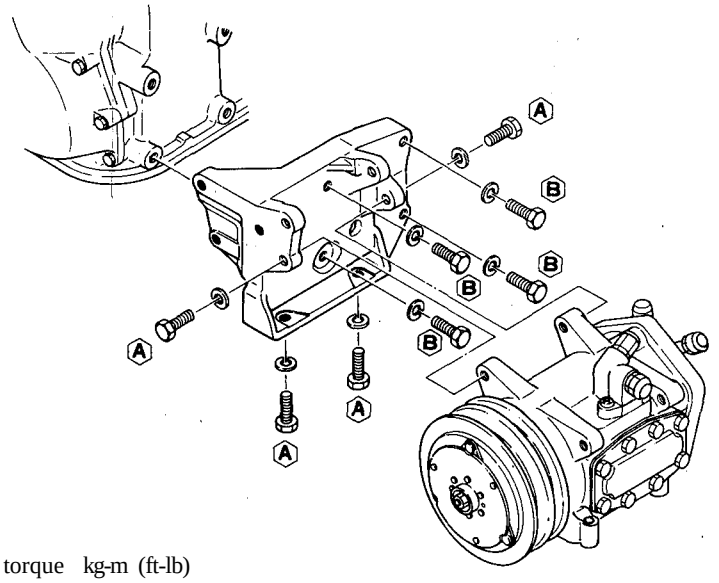
**a. Do not attempt to operate the compressor on its side or upside down for more than 10 minutes, as the compressor oil will enter the low pressure chambers. If, under that condition, compressor should be operated suddenly, internal damages would result. To expel oil from chambers, hand-crank compressor several times in its installed condition.**

**b. When storing a compressor, be sure to fill it with refrigerant through low pressure service valve and purge air from high pressure side service valve.**

### INSTALLATION

Installation of compressor is to be done in reverse sequence of removal, with attention paid to the following points:

1. Oil in compressor to be installed should be equal in amount to what remained in compressor removed. New compressor contains prescribed amount of oil; before its installation, drain the excessive amount of oil.
2. Check tightening torque of bolt holding compressor bracket. Retighten bolt if necessary. See Figure AC-30.
3. Compressor plugs and flexible hose plugs should be kept in place until preparation of piping is completed.
4. Upon installation of compressor, turn compressor by hand a few turns.
5. As to tightening torque on piping connection, refer to "Piping".
6. As to compressor drive belt tension, refer to "Idler Pulley and Compressor Drive Belt". Make sure that air pump drive belt and cooling fan belt have the specified deflection.
7. Evacuate and recharge system. Refer to "General Service" for "Evacuating and Charging System".



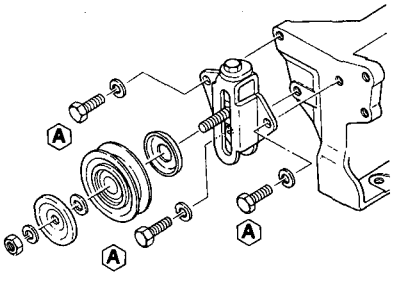

Tightening torque kg-m (ft-lb)
®: 2.7 to 3.7 (19.5 to 26.7)
Cg): 4.5 to 5.5 (33 to 40)

AC550

*Fig. AC-30 Compressor*

8. Conduct leak test and make sure that there is no leak from connection.
9. Check air pump for operation. Make sure that hose piping of air pump is correctly connected.
10. Check engine idle speed.
11. Check "CO" percent at idle speed.

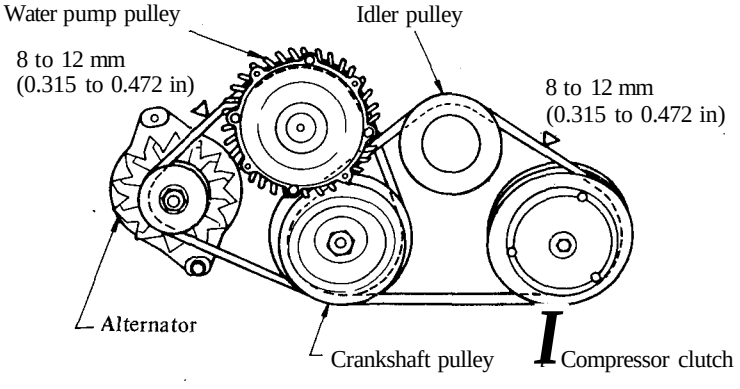
## IDLER PULLEY AND COMPRESSOR DRIVE BELT




AC551

Tightening torque
® : 2.5 to 3.5 kg-m
(18.1 to 25.3 ft-lb)

*Fig.AC-31 Idler pulley*




AC552

*Fig. AC-32 Belt tension*

**ADJUSTMENT OF BELT TENSION**

Normal compressor drive belt deflection is 8 to 12 mm (0.315 to 0.472 in) when moderate thumb pressure is applied midway between pulleys. Move idler pulley up or down by turning adjusting bolt to correct belt deflection.

## CONDENSER

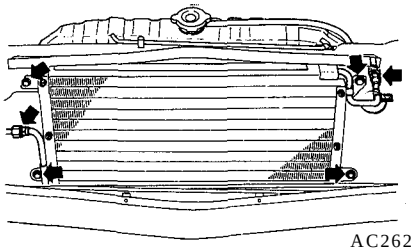
### REMOVAL

1. Disconnect battery ground cable.
2. Remove engine hood.
3. Discharge system.
4. Disconnect inlet and outlet refrigerant lines from condenser.

**Note: Plug up all pipe openings to prevent entrance of dirt and moisture.**

5. Remove four mounting bolts, then remove condenser from the car.

Radiator, which is bolted together with condenser, is also removed in this work process. See Figure AC-33.



AC262

*Fig. AC-33 Removing condenser*

### INSPECTION

Inspect joints of inlet and outlet pipes for cracks and scratches. Upon finding any problem which may cause gas to leak, repair or replace condenser.

Condenser fins or air passages clogged with dirt, insects or leaves will reduce cooling efficiency of condenser. In such a case, clean fins or air passages with compressed air.

**Note: Condenser of the system completed should not be cleaned with steam for fear that system should burst by excessively high pressure created therein. Be sure to use cold water or compressed air.**

### INSTALLATION

Installation of condenser is to be

done in reverse sequence of removal, with notice paid to the following points:

1. When new condenser is used as replacement, be sure to add 28 g (1 oz) of new oil thereto.
2. Keep piping plug in place until immediately before piping work is started.
3. As to tightening torque on piping connection, refer to "Piping".
4. As to evacuating and charging system, refer to "General Service".
5. Conduct leak test and make sure that there is no leak from connection.

## RECEIVER DRIER

### REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Discharge system. Refer to Section "General Service for Discharging System".
3. Disconnect pressure switch wires at connector.
4. Disconnect refrigerant lines from receiver drier.

**Note: Plug all pipe openings to prevent entrance of dirt and moisture.**

5. Remove receiver drier mounting screws and then remove receiver drier.
6. When replacing receiver drier with a new one, charge system with 28 g (1 oz) of compressor oil.
7. Installation is to be done in reverse order of removal. With plugs taken off immediately before piping work is started, connect piping and receiver drier. As to tightening torque on piping, refer to "Piping".
8. As to evacuating and charging system, refer to "General Service".
9. Conduct leak test, and make sure that there is no leak from connection.

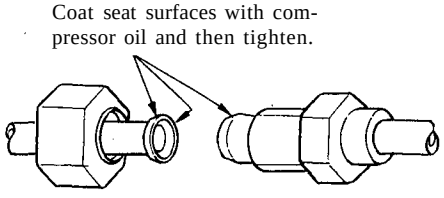
## PIPING

Refrigerant system piping is as shown in Figure AC-35.

In replacing flexible hose and tube, be attentive to following points:

1. Before starting work, be sure to discharge system.
2. In disconnecting tubes, be sure to use two wrenches on both tubes.
3. Upon disconnecting tubes, plug all pipe openings immediately to prevent entrance of dirt and moisture.
4. Compressed air must never be used to clean dirty piping. Clean with refrigerant gas.
5. In connecting tubes, be sure to apply compressor oil to seating surface and then tighten tubes by prescribed tightening torque. See Figure AC-34.

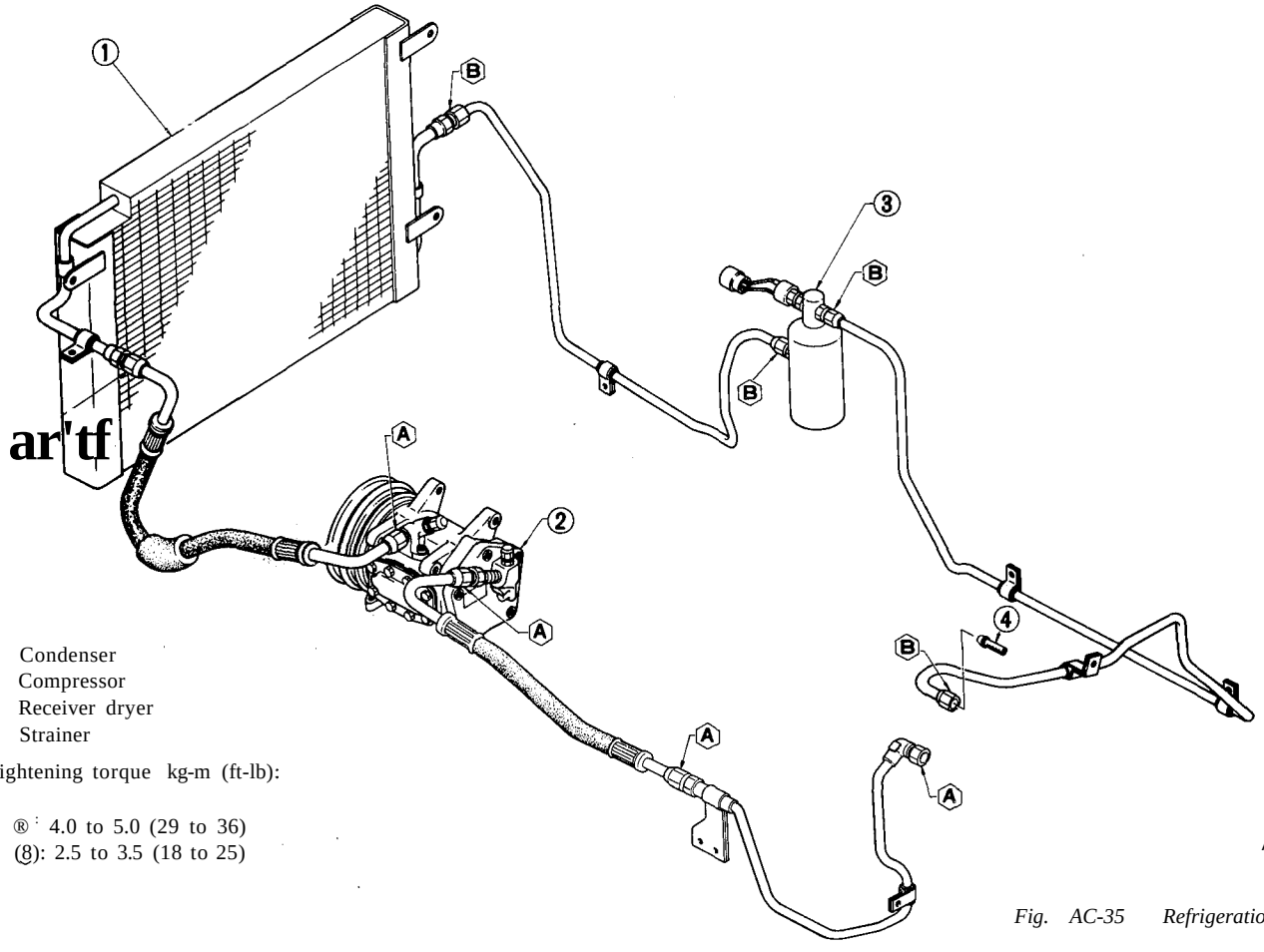
Be sure to use two wrenches when tightening a flare nut of tube.




AC263

*Fig. AC-34 Pipe connection*

6. Make sure of proper clamping. Start engine and raise engine speed to inspect if there is vibration or unusuai noise.
7. Conduct leak test and make sure that there is no leak from connection.
8. As to evacuating and charging system, refer to "General Service" for "Evacuating and Charging System".




1 Condenser
2 Compressor
3 Receiver dryer
4 Strainer

Tightening torque kg-m (ft-lb):

® : 4.0 to 5.0 (29 to 36)
(8): 2.5 to 3.5 (18 to 25)

AC553

*Fig. AC-35 Refrigeration line*

# FAST IDLE ACTUATOR

## ADJUSTMENT OF IDLE SPEED

| Engine model | Transmission | When A/C is OFF | WhenF.I.C.D. is actuated |
|---|---|---|---|
| L28 | Manual | 800 rpm | 800 rpm |
| | Automatic | 700 rpm at "D" range | 800 rpm at "N" range |

The fast idle control device is used on car equipped with air conditioner to raise the idle speed automatically.

Use the following procedures when adjusting.

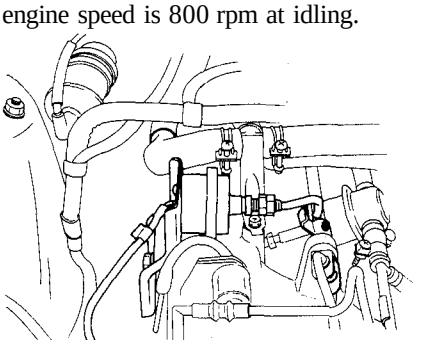
1. Run the engine until it reaches operating temperature.
2. With air conditioner in OFF (when compressor is not operated), make sure that engine is at correct idle speed.
3. With air conditioner in ON (when F.I.C.D. is actuated), set the engine speed to 800 rpm using the following procedures as a guide.

(1) Adjust the F.I.C.D. lever stroke by means of length of lever until engine speed is 800 rpm.

On cars equipped with automatic transmission, make this adjustment with the shift control lever in the "N" position.

(2) Depress and release the accelerator pedal several times, and make sure that the engine speed reduces to 800 rpm as the pedal is released.

If correct adjustment is not made, repeat steps (1) and (2) above until the engine speed is 800 rpm at idling.



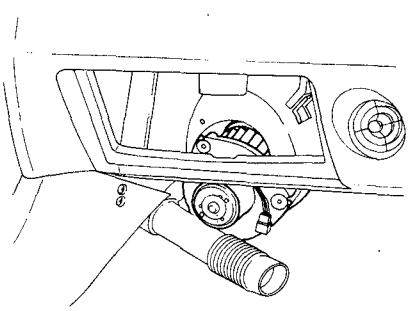
AC554

*Fig. AC-36 Fast idle actuator*

# BLOWER MOTOR

## REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove glove box.
3. Remove defroster duct on the side of assistant's seat.
4. Remove wiring connector of blower motor.
5. Remove three screws mounting blower motor, and take out motor from blower housing.



AC266

*Fig. AC-37 Removing blower motor*

**Notes:**

a. **Between blower motor and blower housing are three** spacers **inserted. Be careful not to lose them.**

**b. In removing blower motor, remember its direction carefully so that it is reinstalled properly.**

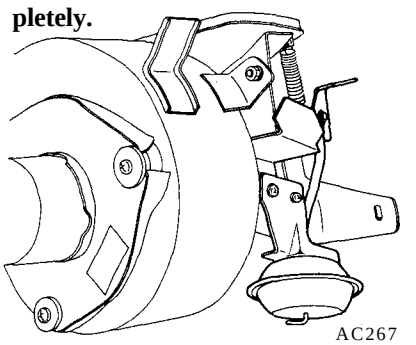
6. Installation is to be done in reverse sequence of removal.

# AIR INTAKE DOOR ACTUATOR

## REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove snap ring from top of actuator lever.
3. Remove two mounting screws and actuator from air intake housing.
4. Disconnect vacuum hose from actuator, and remove actuator.
5. Installation is to be done in reverse order of removal.

**Note: Make sure that air intake door shuts off the outside air completely.**



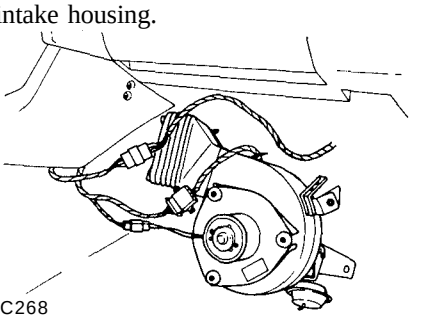
AC267

*Fig. AC-38 Air intake door actuator*

# BLOWER HOUSING

## REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Disconnect vacuum hose from air intake door actuator.
3. Remove defroster duct located on the side of assistant's seat.
4. Remove two wiring connectors (one for blower motor, and the other for resistor).
5. Remove three bolts mounting housing assembly, one installed on upper side and two on lower side.
6. Remove blower housing with air intake housing.



AC268

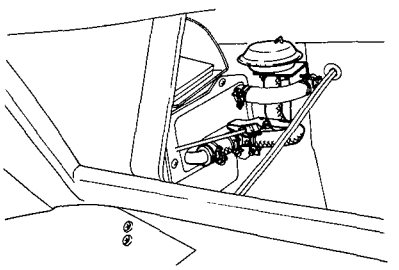
*Fig. AC-39 Removing blower housing*

7. Installation is to be done in reverse sequence of removal.

# VACUUM WATER COCK

## REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Drain engine coolant.
3. On inside of the engine compartment, remove heater hoses on both inlet and outlet sides by loosening hose clamps.
4. Remove glove box.
5. Remove blower housing as described in "Blower Housing".
6. Remove two hoses on room side by loosening hose clamps.



AC269

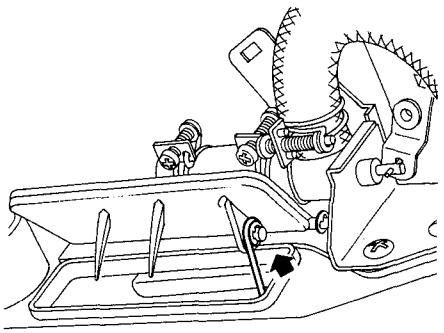
*Fig. AC-40 Removing vacuum water cock*

7. Remove two mounting screws of vacuum water cock.
8. Take off vacuum hose, and remove vacuum water cock from heater unit.
9. Installation is to be done in reverse order of removal.

# HEATER CORE AND WATER COCK

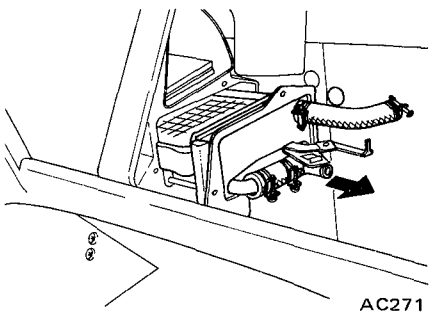
## REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Drain engine coolant.
3. On inside of the engine compartment, remove heater hoses for heater inlet and outlet.
4. Remove glove box.
5. Remove blower housing as described in "Blower Housing".
6. Remove vacuum water cock as described in "Vacuum Water Cock".
7. Remove control cable from water cock.
8. Remove control cable from heater door and then disconnect heater door rod from heater door by removing snap ring. See Figure AC-41.



AC270

*Fig. AC-41 Removing heater door rod*



AC271

*Fig. AC-42 Removing heater core*

9. Remove two mounting screws of water cock and two mounting screws of heater core cover, and pull out water cock and heater core assembly. See Figure AC-42.

**Note: In removing or installing core, keep heater door open; otherwise core will be damaged.**

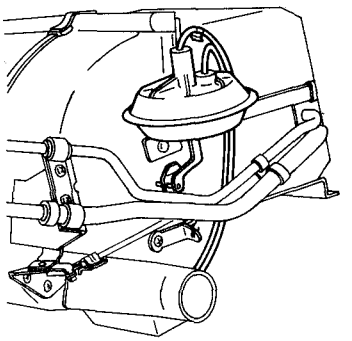
10. Unfasten hose clamps, and disassemble core and cock.
11. Installation is to be done in reverse sequence of removal.

**Note: As to adjustment of water cock control cable and heater door control cable, refer to "Control Assembly".**

# MODE DOOR ACTUATOR

## REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove two vacuum hoses from mode door actuator.
3. Remove snap ring from tip of actuator lever.
4. Remove two actuator mounting screws, and take out actuator.
5. Installation is done in reverse sequence of removal.



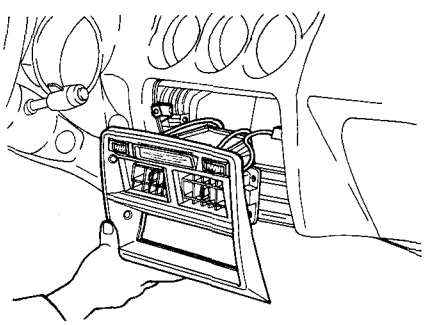
AC272

*Fig. AC-43 Mode door actuator*

# CONTROL ASSEMBLY

## REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove console box.
3. Remove four screws retaining finisher, and pull out finisher forward. Disconnect wires at three connectors, then remove finisher from instrument panel. See Figure AC-44.



AC273

*Fig. AC-44 Removing finisher*

4. Remove control cables from heater door and water cock.
5. Remove thermostat control rod from thermostat.
6. Remove four vacuum hoses from vacuum selector valve.
7. Remove three wire connectors of control assembly. (These connectors are for control panel illumination lamp, micro switch and fan speed switch.)
8. Remove two screws that retain control assembly to instrument panel reinforcement.
9. Remove screws and instrument panel reinforcement from instrument panel.
10. Remove control assembly by removing two screws (upper side), "E"-ring and pin (lower side). See Figure AC-45.

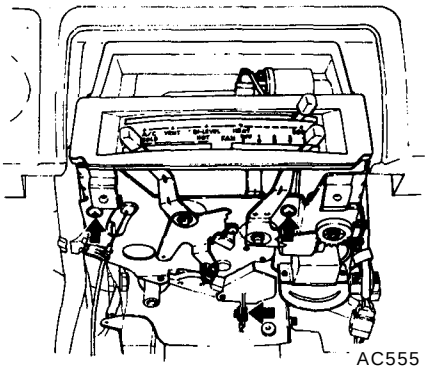



*Fig. AC-45 Removing control assembly*

11. In the reverse sequence of removal, reinstall control assembly.

As to adjustment of cable, refer to "Adjustment of Control Cable".

- As to connection of wiring harness, refer to "Wiring Harness Diagram".
- As to connection of vacuum hose, refer to "Vacuum Hose Diagram".

Note: Capillary tube should not be bent too sharp.

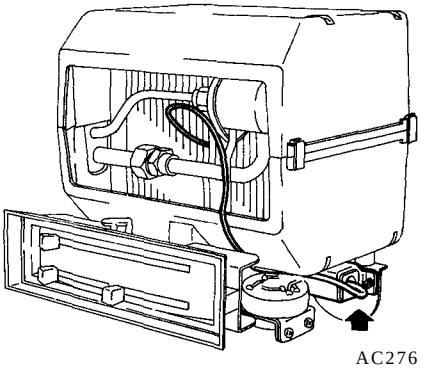



*Fig. AC-47 Thermostat*

### DISASSEMBLY AND ASSEMBLY

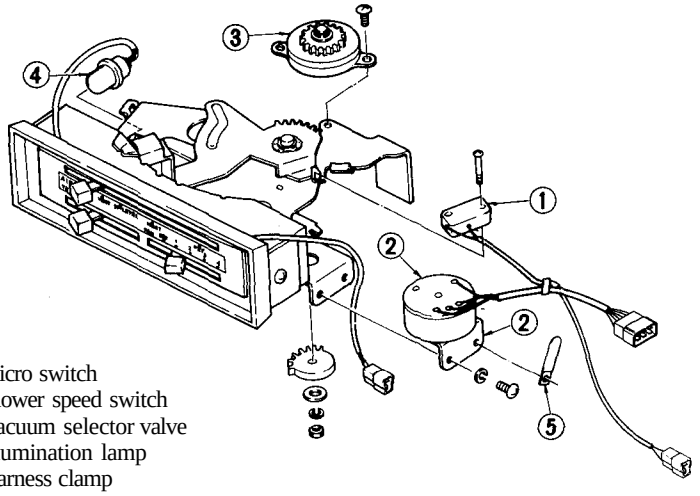



*Fig. AC-46 Exploded view of control assembly*

### ADJUSTMENT OF CONTROL CABLE

#### Heater door

Set AIR lever in DEF position. Hook control cable on heater door and fix cable with clamp so as to close heater door perfectly.

#### Water cock

Set TEMP lever in COLD position. Hook control cable on water cock and fix cable with clamp so as to get water cock closed completely.

#### Thermostat

Set TEMP lever in COLD position. Install thermostat control rod so that thermostat is in full cold position.

## THERMOSTAT

### REMOVAL AND INSTALLATION

1. Disconnect battery ground cable.
2. Remove console box.
3. Remove finisher. See Figure AC-44.
4. Remove finisher brackets and 3-way air duct.
5. Remove control rod of thermostat.
6. From evaporator housing, remove thermostat together with bracket by taking off two mounting screws.
7. Remove thermostat wiring at connector.
8. Pull out capillary tube from evaporator core and then take out thermostat.
9. Installation is to be done in reverse order of removal.

Capillary tube should be inserted by prescribed length in original position. Length to be inserted is 50 to 70 mm (1.97 to 2.76 in).

## EXPANSION VALVE

### REMOVAL

1. Disconnect battery ground cable.
2. Discharge system.
3. Remove finisher. See Figure AC-44.
4. Remove finisher brackets and 3-way air duct.
5. Remove tube from expansion valve by removing flare nut.
6. Remove two mounting nuts, and pull out valve from expansion valve case. See Figure AC-48.

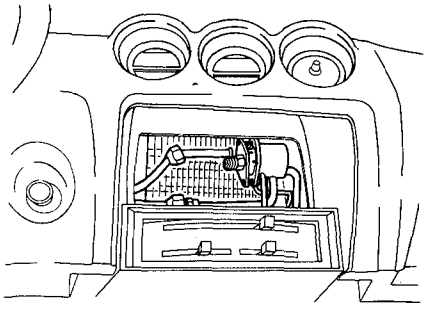
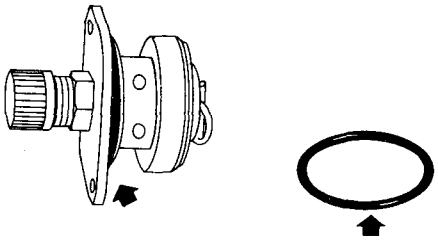



*Fig. AC-48 Removing expansion valve*



AC278

*Fig. AC-49 O-ring*

### INSTALLATION

1. Replace two O-rings with new ones.
2. Apply adequate compressor oil to new O-rings, and install them on expansion valve.
3. Fit expansion valve to case, and install bolts and nuts thereon.

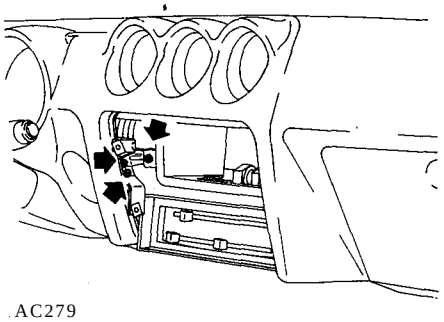
**Note: In inserting valve into case, be sure to insert it parallelly to** case **without turning it. Never twist valve in the case, otherwise O-ring will be caused to twist.**

4. Tighten two mounting nuts horizontally.
5. Connect tube to expansion valve.
6. Work that follows is to be done in reverse sequence of removal.
7. Lastly, evacuate and recharge system. As to evacuating and charging system, refer to "Evacuating and Charging System".
8. Conduct leak test and insure that there is no leak from connection.

## EVAPORATOR HOUSING

### REMOVAL

1. Disconnect battery ground cable.
2. Discharge system.
3. Remove console box.
4. Remove finisher. See Figure AC-43.
5. Remove retaining screw of 3-way air duct.
6. Remove instrument panel reinforcement, and remove finisher brackets. See Figure AC-50.



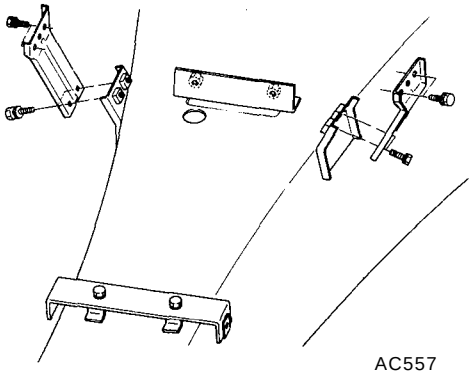
AC279

*Fig. AC-50 Removing finisher brackets*

7. From 3-way air duct, remove air duct on assistant's seat side, then pull out 3-way air duct.
8. Disconnect both inlet and outlet tubes of evaporator.

**Note: Upon disconnection of tubes, put plugs in their openings to keep dust and moisture out.**

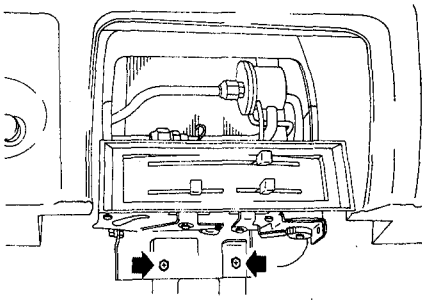
9. Remove retaining screw, grommet cover and grommet from tubes of evaporator.
10. Remove defroster ducts.
11. Remove instrument panel center stays. See Figure AC-51.



AC557

*Fig. AC-51 Removing instrument panel center stays*

12. Remove drain hose.
13. Remove brackets, installed on heater unit, of evaporator inlet and outlet tubes by removing two attaching screws.
14. Remove control cables from heater door and water cock.
15. Remove four vacuum hoses from vacuum selector valve.
16. Remove four wiring connectors (for control panel illumination lamp, micro switch, fan speed switch and thermostat respectively).
17. Remove two attaching bolts installed on lower side of evaporator housing, and let evaporator housing fall down. See Figure AC-52.
18. Pull out evaporator housing when it has come off bracket installed on heater unit.

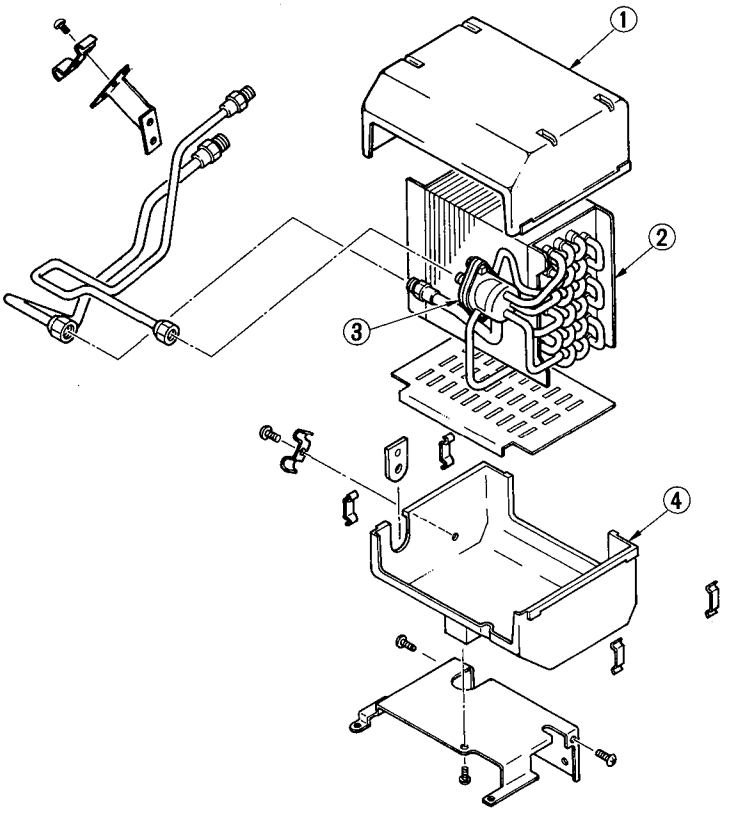


AC281

*Fig. AC-52 Removing evaporator housing*

### DISASSEMBLY AND ASSEMBLY

1. Remove four fixing clips of upper and lower cases.
2. Pull up upper case and separate it from lower case.
3. Cut off sealing packing with knife at the conjunction of cases.
4. Pull out thermostat capillary tube from evaporator core.
5. Pull out evaporator core from lower case.




AC282

1 Upper case
2 Evaporator core
3 Expansion valve
4 Lower case

*Fig. AC-53 Exploded view of evaporator housing*

### INSPECTION

In case evaporator core or expansion valve have gas leaking, repair or replace it with a new one as necessary.

Dirt and nicotine accumulation on evaporator housing will go bad and smell. This means that you have to remove them from time to time to assure healthful fresh air inside car.

### INSTALLATION

Installation should be done in reverse order of removal, with attention paid to following points:

1. When replacing evaporator with a new one, add 28 g (1 oz) of new compressor oil to new evaporator.
2. As to adjustment of cable, refer to "Adjustment of Control Cable" in "Control Assembly".
3. As to wiring harness connection, refer to "Wiring Harness Diagram".
4. As to vacuum hose connection, refer to "Vacuum Hose Diagram".
5. As to evacuating and charging system, refer to section concerned in "General Service".
6. Conduct leak test and insure that there is no gas leak from connection.

## HEATER UNIT

### REMOVAL

1. Disconnect battery ground cable.
2. Drain engine coolant.
3. Discharge system.
4. Remove hose clamp and disconnect heater hose from inlet and outlet tubes of heater unit.
5. Remove screw, grommet cover and grommet from tubes of heater unit.
6. Disconnect evaporator's inlet and outlet tubes.
7. Remove retaining screw, grommet cover, and grommet from tubes of evaporator.
8. Remove console box.
9. Remove finisher. See Figure AC-44.
10. Remove instrument panel reinforcement and finisher brackets.
11. Remove 3-way air duct. See Figure AC-50.
12. Remove glove box.
13. Remove blower housing as described in "Blower Housing".
14. Remove evaporator housing as described in "Evaporator Housing".
15. In engine compartment, remove two mounting nuts of heater unit.
16. In passenger compartment, remove heater unit mounting bolts (two each on upper and lower sides). See Figure AC-54.
17. Remove brackets on upper side of heater unit, and remove heater unit by pulling it out towards assistant's seat side.

### INSTALLATION

1. Place heater unit without upper bracket into instrument panel through assistant's seat side.

2. Tilting heater unit, fix upper bracket on side of driver's seat, and then that on side of assistant's seat.
3. Insert two vacuum hoses in mode door actuator.
4. Insert heater unit mounting bolts in dash panel, and temporarily put nuts on them from side of engine compartment.
5. On side of passenger compartment temporarily tighten two upper attaching bolts.
6. Tighten two lower attaching bolts. Then tighten up other bolts and nuts which have been temporarily installed.
7. Install evaporator housing with control assembly.
8. Install blower housing.
9. Remaining work is to be done in reverse sequence of removal.
10. As to adjustment of cable, refer to "Adjustment of Control Cable" in "Control Assembly".
11. As to wiring harness connection, refer to "Wiring Harness Diagram".
12. As to vacuum hose connection, refer to "Vacuum Hose Diagram".
13. As to evacuating and charging system, refer to section concerned in "General Service".
14. Conduct leak test and insure that there is no gas leak from connection.

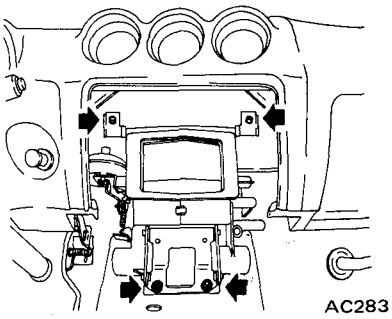
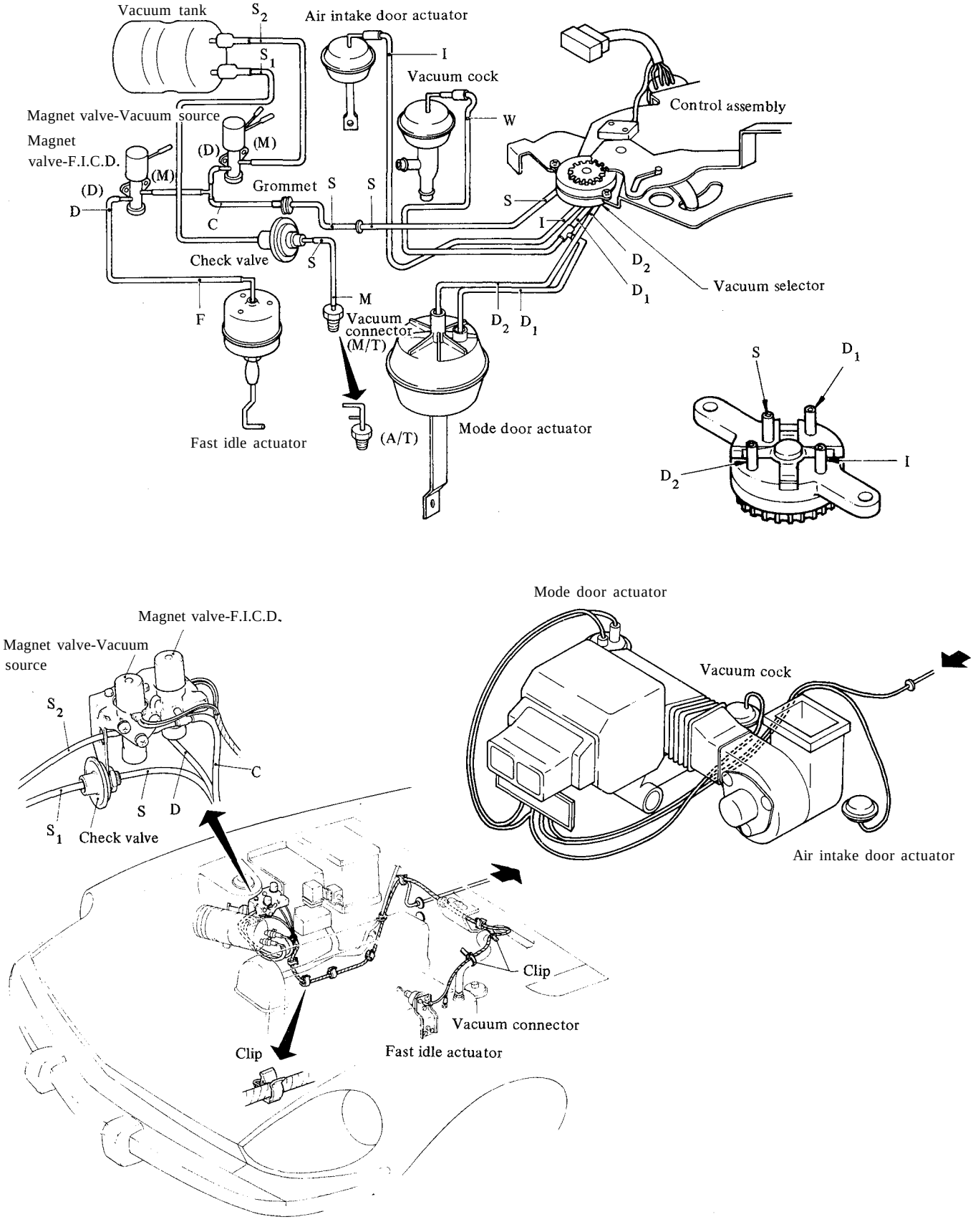


*Fig. AC-54 Removing heater unit*

# VACUUM HOSE DIAGRAM




AC558

*Fig. AC-55 Vacuum hose diagram*

# WIRING HARNESS DIAGRAM

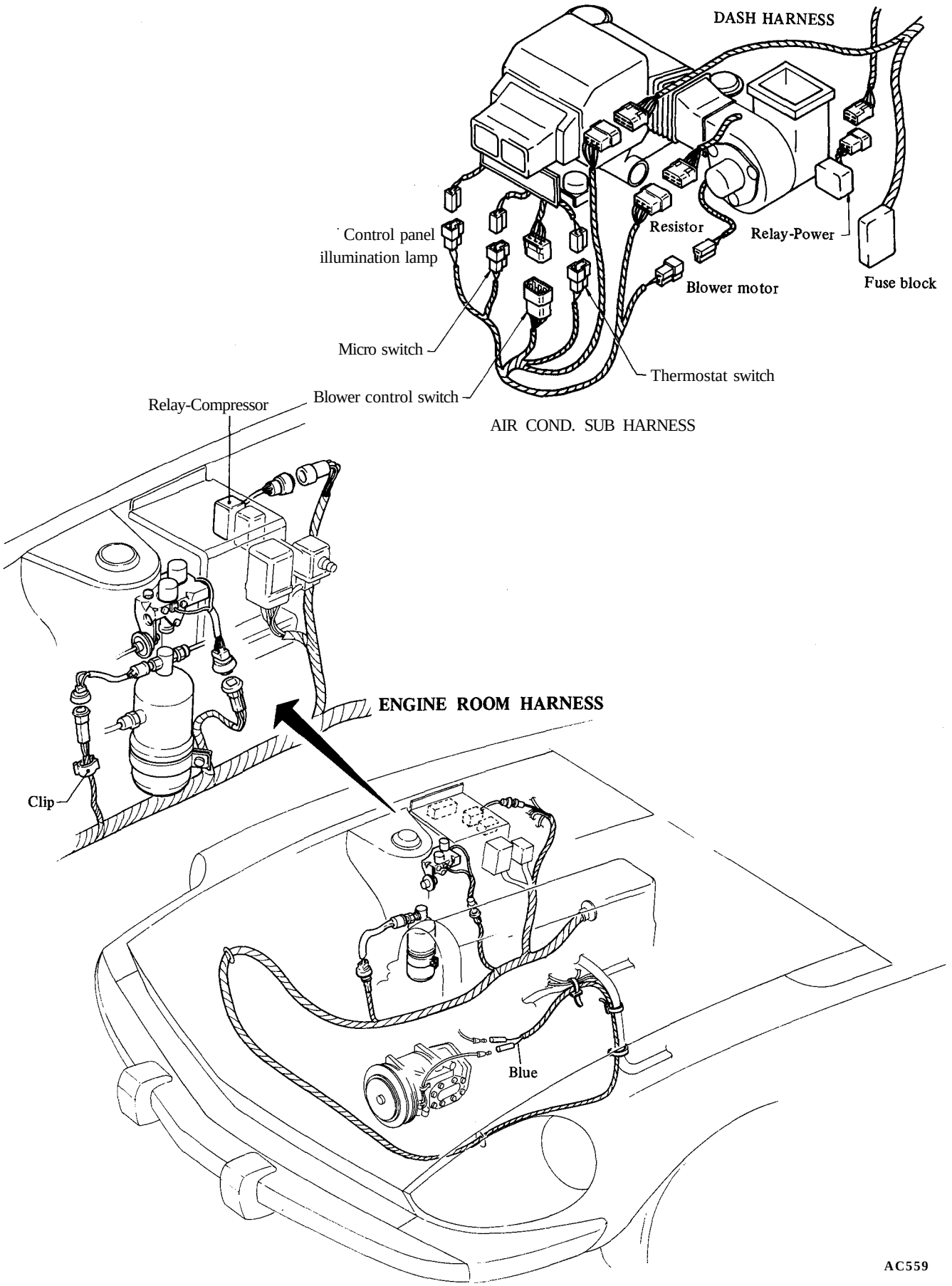
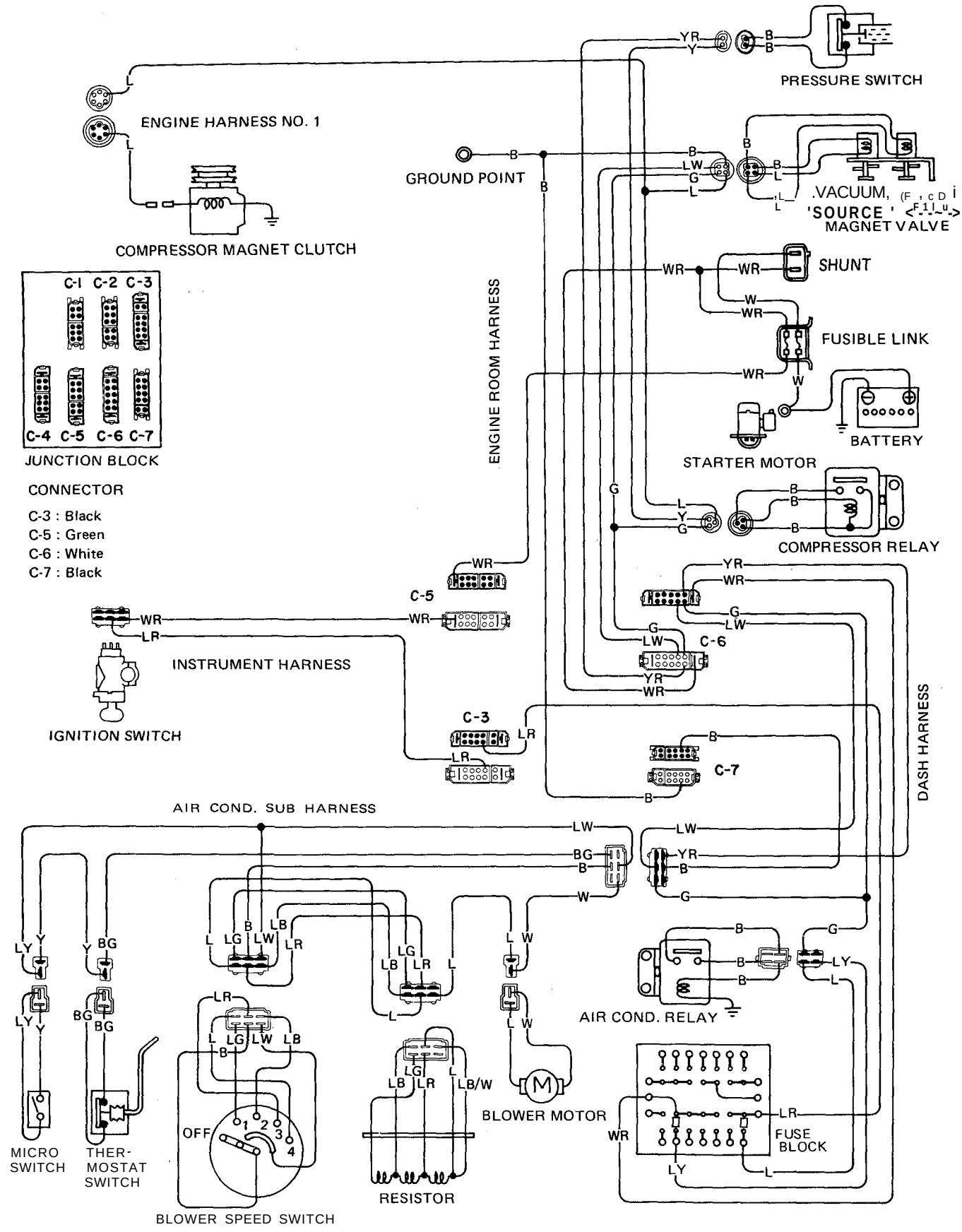



*Fig. AC-56 Wiring harness diagram*

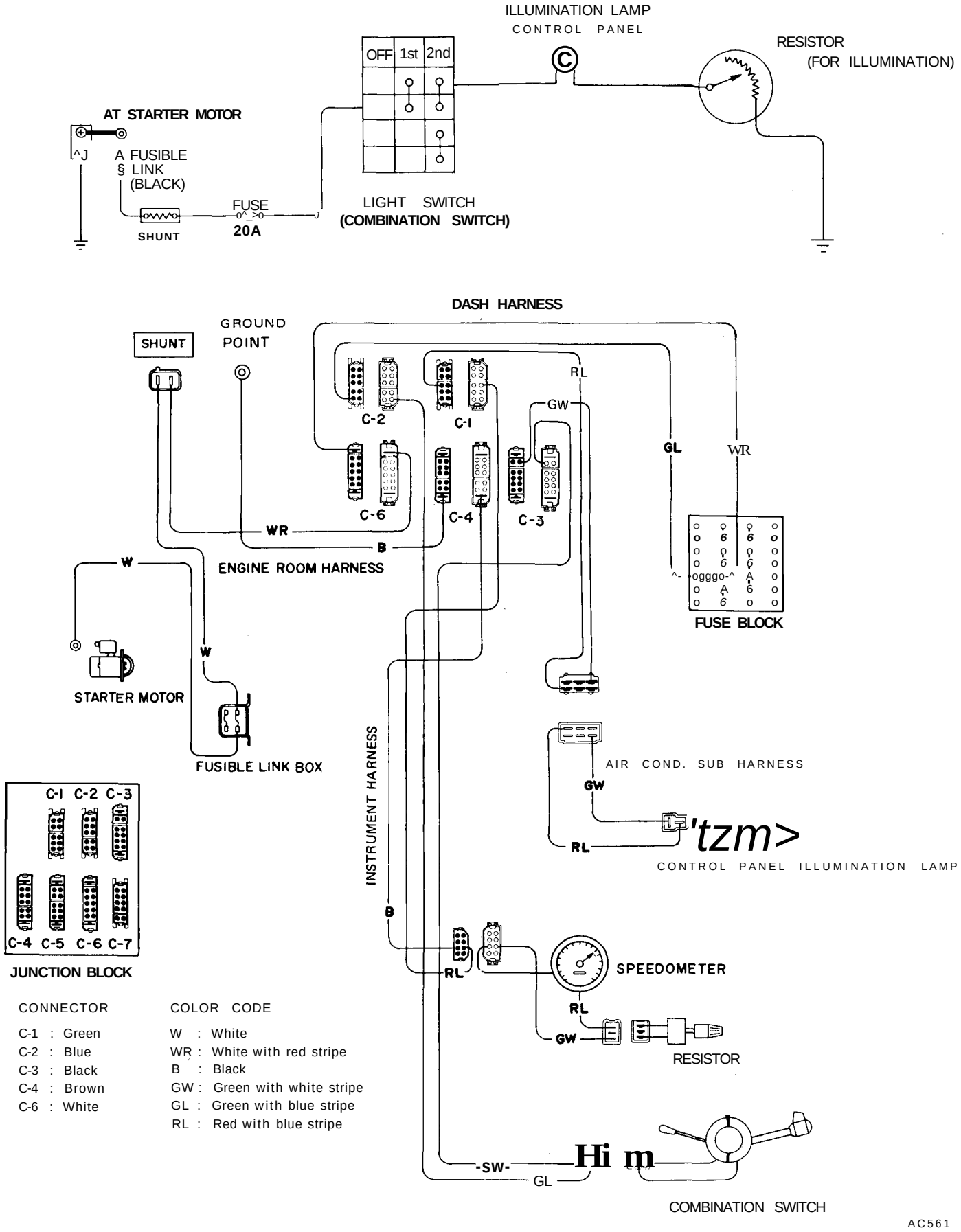
## CIRCUIT DIAGRAM FOR AIR CONDITIONER




AC560

*Fig. AC-57 Circuit diagram for air conditioner*

## CIRCUIT DIAGRAM FOR ILLUMINATION LAMP



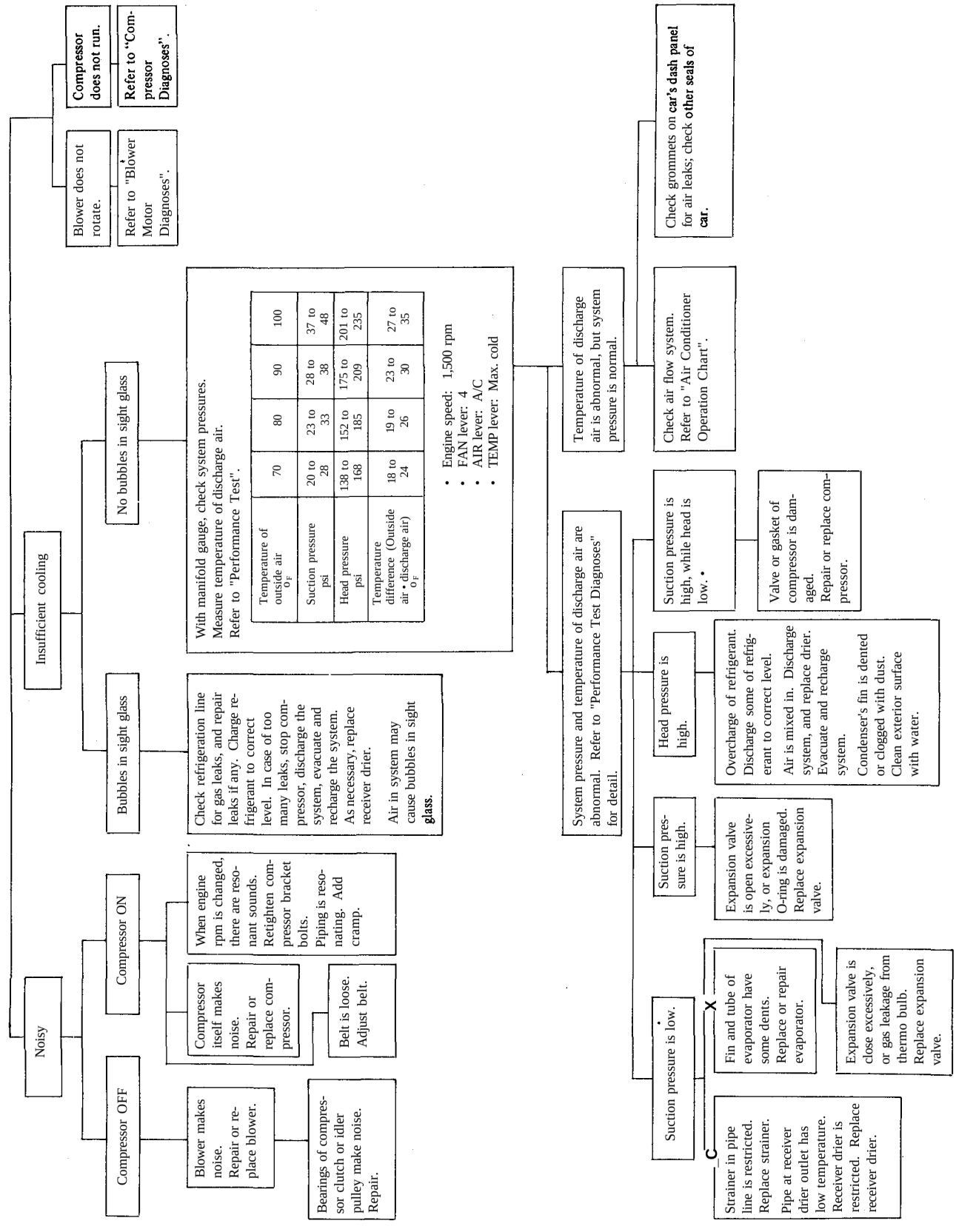

| CONNECTOR | | COLOR CODE | |
|---|---|---|---|
| C-1 | : Green | W | : White |
| C-2 | : Blue | WR | : White with red stripe |
| C-3 | : Black | B | : Black |
| C-4 | : Brown | GW | : Green with white stripe |
| C-6 | : White | GL | : Green with blue stripe |
| | | RL | : Red with blue stripe |

AC561

*Fig. AC-58 Circuit diagram for illumination lamp*

# TROUBLE DIAGNOSES AND CORRECTIONS

## AIR CONDITIONER DIAGNOSES

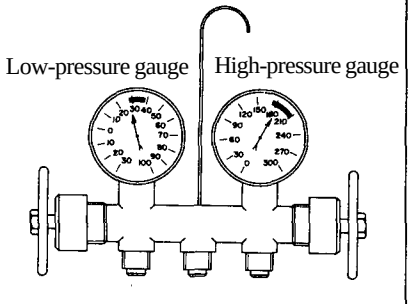
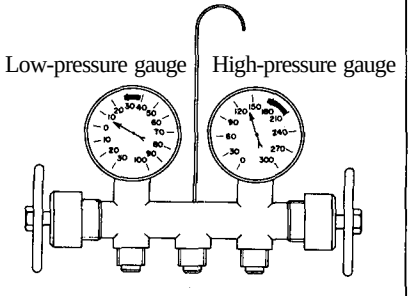
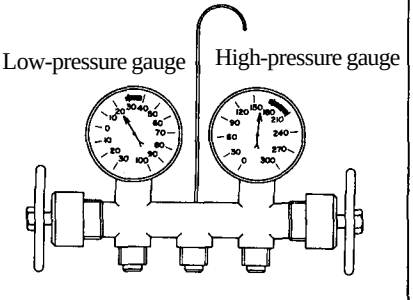


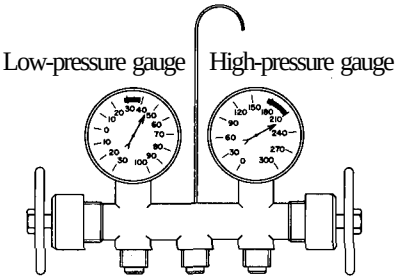
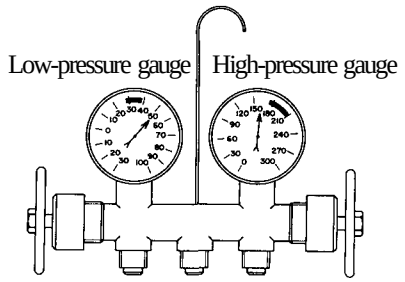
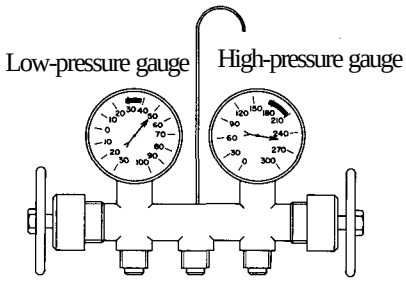
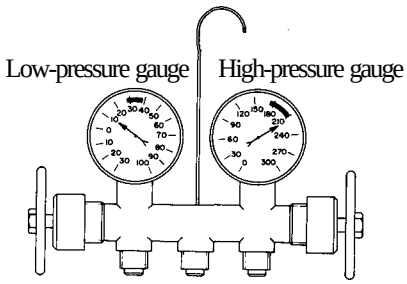
# PERFORMANCE TEST DIAGNOSES

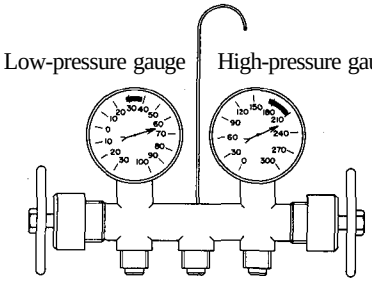
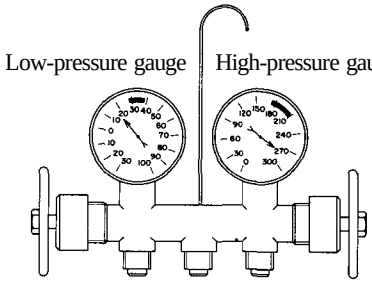
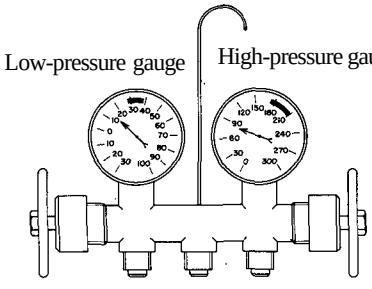
Of various conditions caused to the air conditioning system, the characteristics revealed on manifold gauge reading are shown in the following.

As to the method of a performance test, refer to the item of "Performance Test".

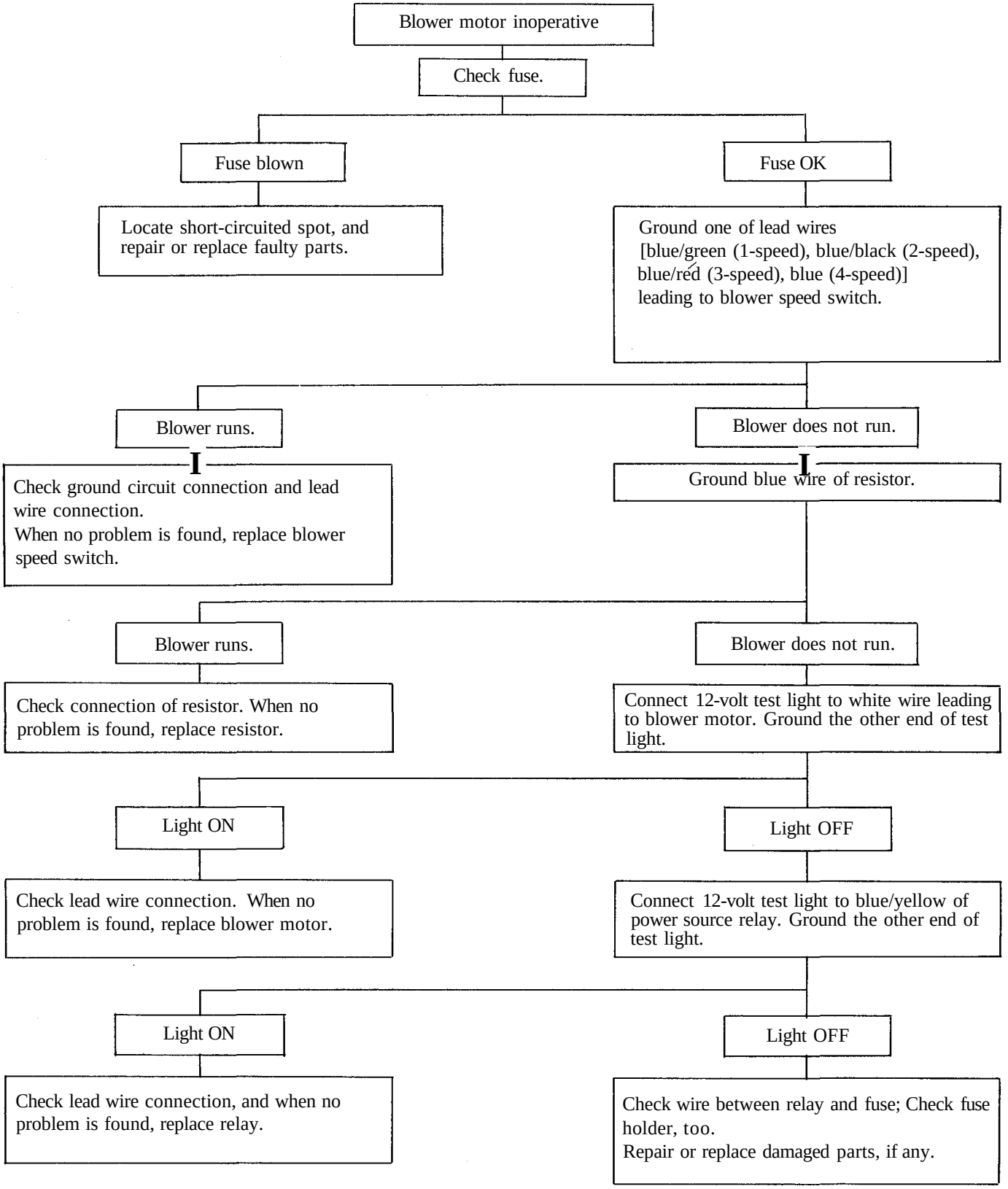
Each shaded area on the following tables indicates a reading of the normal system when the temperature of outside air is 32.5°C(90°F).

| Condition | Probable cause | Corrective action |
|---|---|---|
| **INSUFFICIENT REFRIGERANT CHARGE**<br><br><br>AC287<br>Insufficient cooling.<br>Bubbles appear in sight glass. | Refrigerant is small, or leaking a little. | 1. Leak test.<br>2. Repair leak.<br>3. Charge system.<br>**Note: Evacuate, as necessary, and recharge system.** |
| **ALMOST NO REFRIGERANT**<br><br><br>AC288<br>No cooling action.<br>In sight glass appear a lot of bubbles or something like mist. | Serious refrigerant leak. | **Stop compressor immediately.**<br>**1.** Leak test.<br>2. Discharge system.<br>3. Repair leak(s).<br>4. Replace receiver drier if necessary.<br>5. Check oil level.<br>6. Evacuate and recharge system. |
| **FAULTY EXPANSION VALVE**<br><br><br>AC289<br>Slight cooling.<br>Sweating or frosted expansion valve inlet. | Expansion valve restricts refrigerant flow.<br>• Expansion valve is clogged.<br>• Expansion valve is inoperative.<br>Valve stuck closed. Thermal bulb has lost charge. | If valve inlet reveals sweat or frost:<br>1. Discharge system.<br>2. Remove valve and clean it. Replace it if necessary.<br>3. Evacuate system.<br>4. Charge system.<br>If valve does not operate:<br>1. Discharge system.<br>2. Replace valve.<br>3. Evacuate and charge system. |

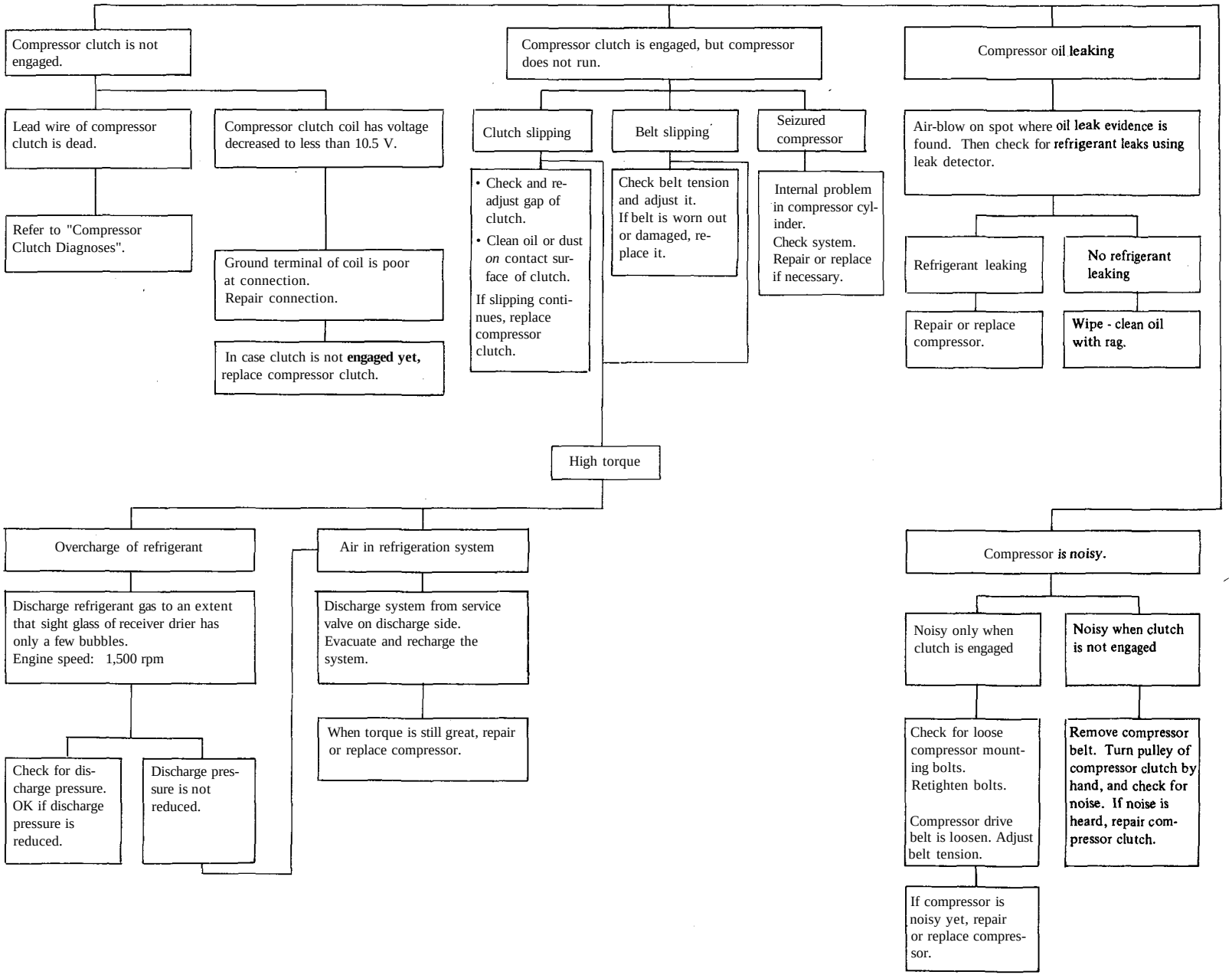
| Condition | | Probable cause | Corrective action |
|---|---|---|---|
|  AC290 | Insufficient cooling.<br>Sweated suction line. | Expansion valve allows too much refrigerant through evaporator. | Check valve for operation. If suction side does not show a pressure decrease, replace valve. |
|  AC291 | No cooling.<br>Sweating or frosted suction line. | Faulty seal of O-ring in expansion valve. | 1. Discharge system.<br>2. Remove expansion valve and replace 0-ring.<br>3. Evacuate and replace system. |
| **AIR IN SYSTEM**<br> AC292 | Insufficient cooling.<br>Sight glass shows occasional bubbles. | Air mixed with refrigerant in system. | 1. Discharge system.<br>2. Replace receiver drier.<br>3. Evacuate and charge system. |
| **MOISTURE IN SYSTEM**<br> AC293 | After operation for a while, pressure on suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As warning of this, reading shows 0.4 kg/cm* (5 lb/in2) vibration. | Drier is saturated with moisture. Moisture has frozen at expansion valve. Refrigerant flow is restricted. | 1. Discharge system.<br>2. Replace receiver drier (twice if necessary).<br>3. Evacuate system completely. (Repeat 30-minute evacuating three times.)<br>4. Recharge system. |

| Condition | Probable cause | Corrective action |
|---|---|---|
| **FAULTY CONDENSER**<br><br><br>AC294<br>No cooling action: engine may overheat.<br>Bubbles appear in sight glass of drier.<br>Suction line is very hot. | Condenser is often found not functioning well. | • Check fan belt and fluid coupling.<br>• Check condenser for dirt accumulation.<br>• Check engine cooling system for overheat.<br>• Check for refrigerant overcharge.<br>**Note: If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.** |
| **HIGH PRESSURE LINE BLOCKED**<br><br><br>AC295<br>Insufficient cooling.<br>Frosted high pressure liquid line. | Drier clogged, or restriction in high pressure line. | 1. Discharge system.<br>2. Remove receiver drier or strainer and replace it.<br>3. Evacuate and charge system. |
| **FAULTY COMPRESSOR**<br><br><br>AC296<br>Insufficient cooling. | Internal problem in compressor, or damaged gasket and valve. | 1. Discharge system.<br>2. Remove and check compressor.<br>3. Repair or replace compressor.<br>4. Check oil level.<br>5. Replace receiver drier.<br>6. Evacuate and charge system. |

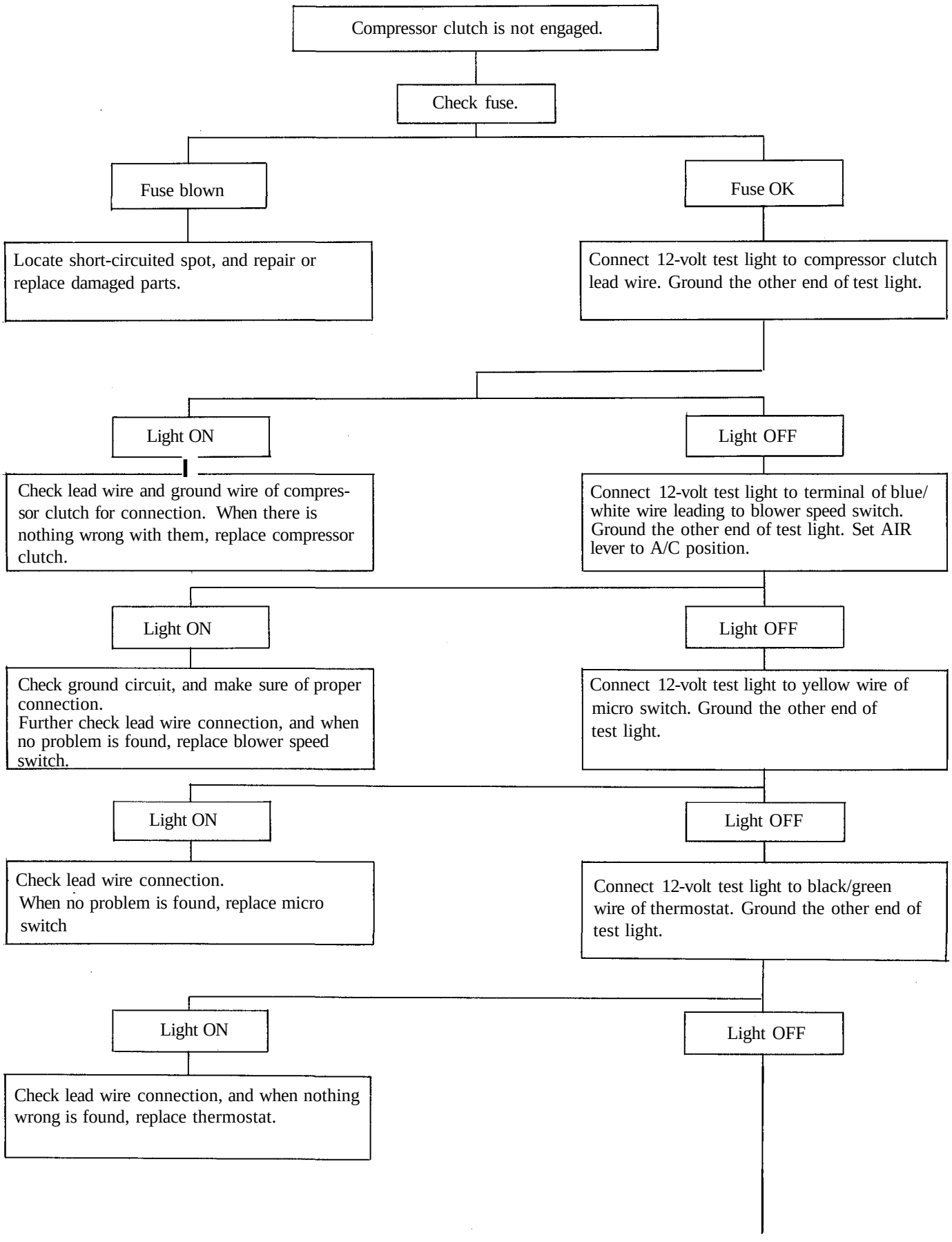
## BLOWER MOTOR DIAGNOSES

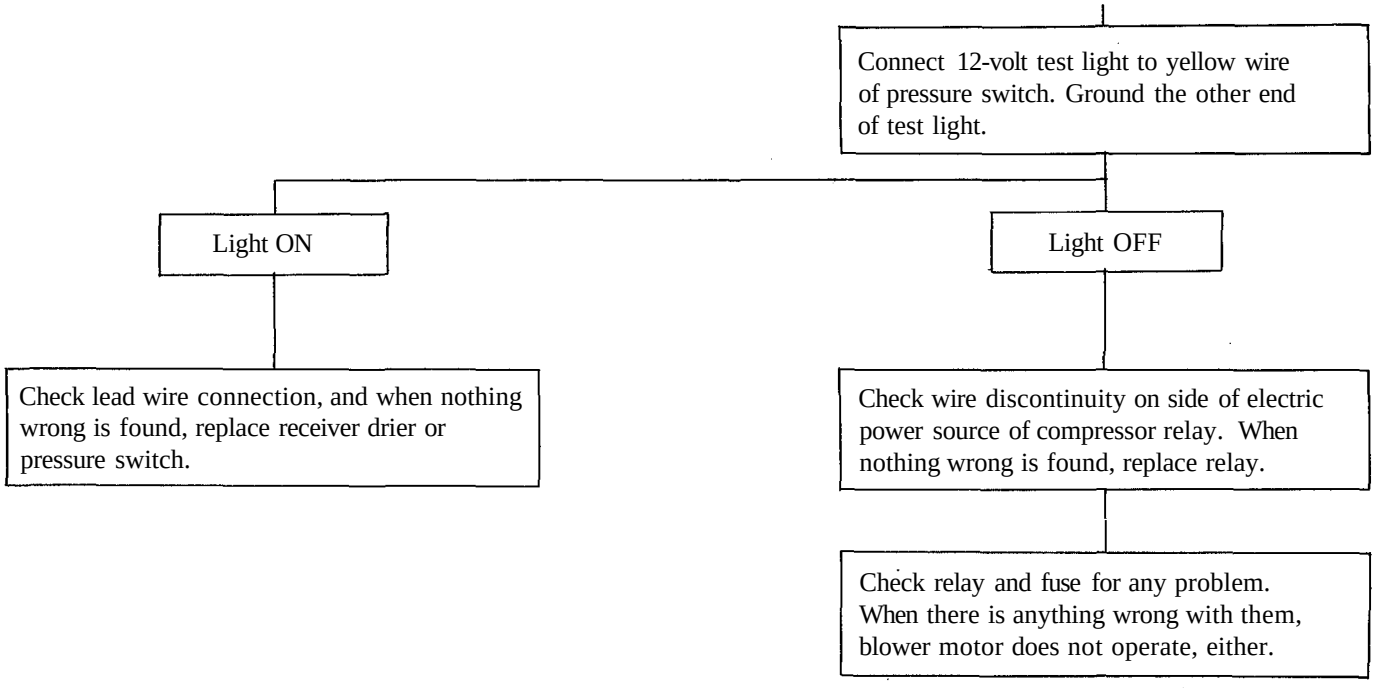


# COMPRESSOR DIAGNOSES



## COMPRESSOR CLUTCH DIAGNOSES




Connect 12-volt test light to yellow wire of pressure switch. Ground the other end of test light.
Light ON
Light OFF
Check lead wire connection, and when nothing wrong is found, replace receiver drier or pressure switch.
Check wire discontinuity on side of electric power source of compressor relay. When nothing wrong is found, replace relay.
Check relay and fuse for any problem. When there is anything wrong with them, blower motor does not operate, either.

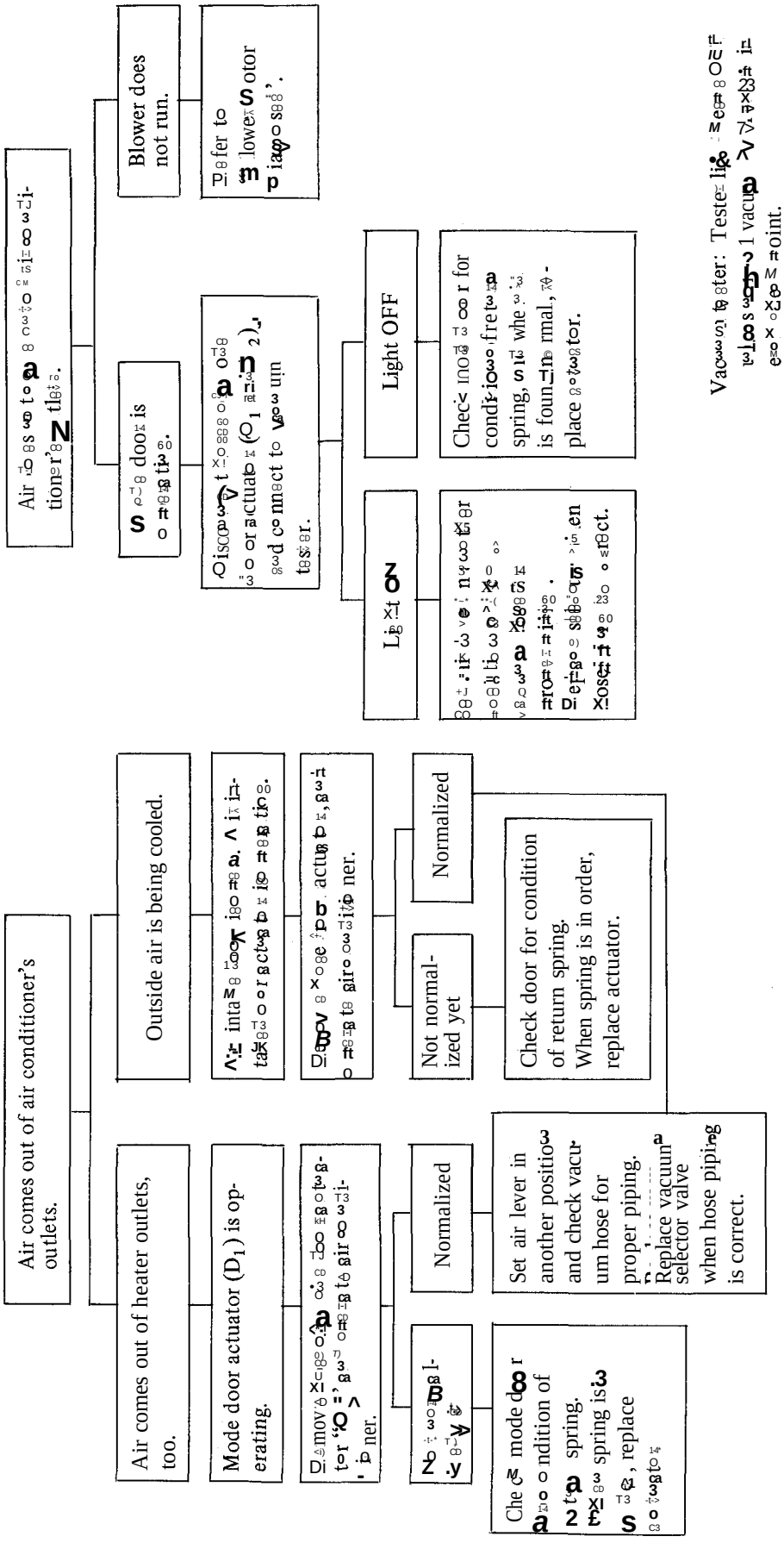
# AIR CONDITIONER OPERATION CHART

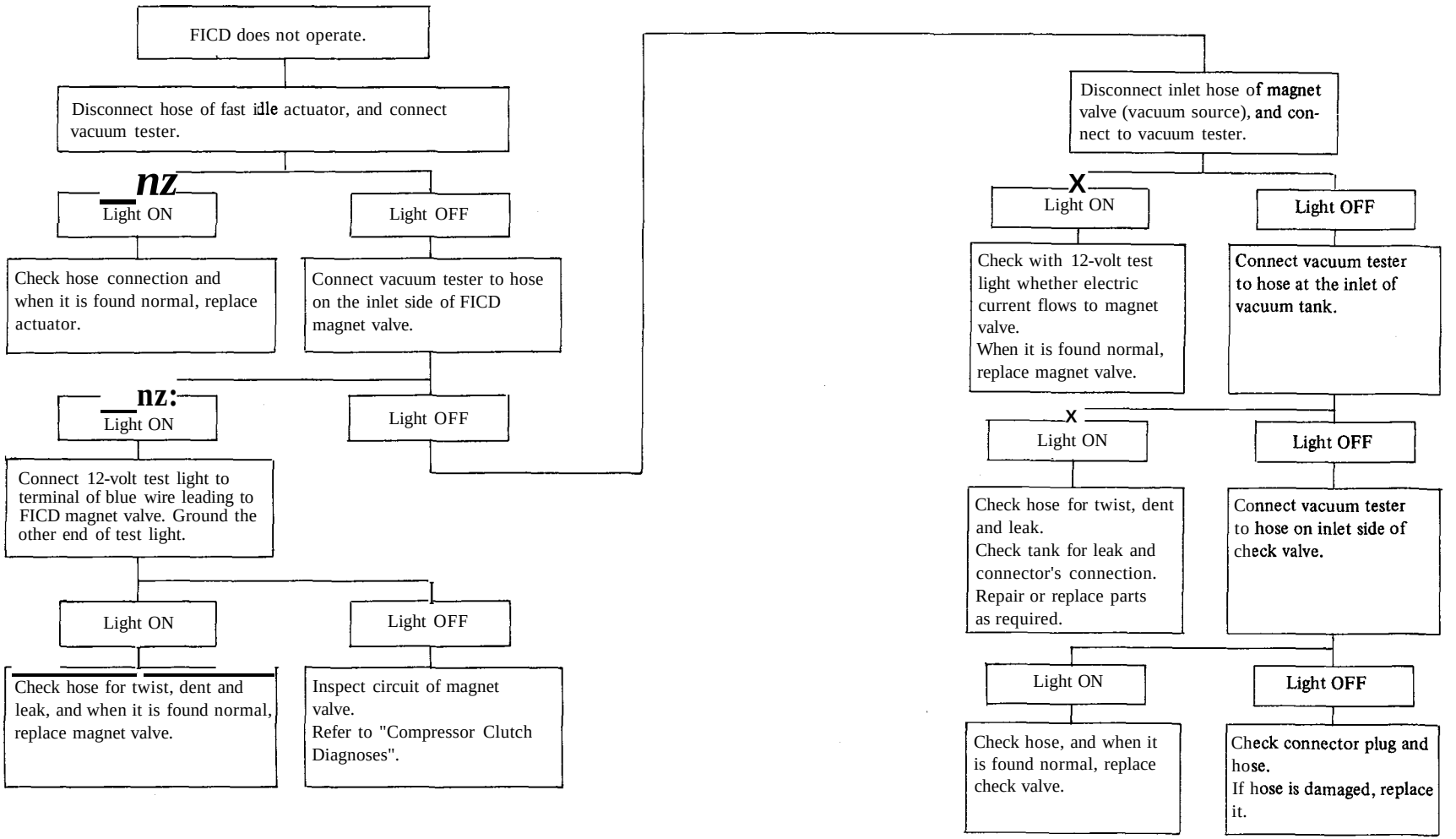
| Control lever position | | | Operation | |
|---|---|---|---|---|
| AIR lever | FAN lever | TEMP lever | Item | Correct action |
| A/C<br>Engine at idle | 1 to 4 | Cold | Discharge air<br>Air intake door<br>Mode door<br>Air temperature<br>Vacuum cock<br>FICD<br>Magnet valve<br>Compressor<br>Magnet clutch | Instrument - 100%<br>Vacuum — OFF (Position of isolating outside air)<br>Vacuum — OFF<br>Cold<br>Vacuum - OFF<br>Vacuum — ON *1<br>Current - ON *1<br>ON*1<br>Current-ON *1<br>*1 — (May be on or off by switching thermostat on or off) |
| | OFF | Cold | Blower motor<br>FICD<br>Magnet valve<br>Compressor<br>Magnet clutch | OFF<br>Vacuum - OFF<br>Current - OFF<br>OFF<br>Current — OFF |
| VENT<br>Engine at idle | 1 to 4 | At any position | Discharge air<br>Air intake door<br>Mode door<br>Air temperature<br>Vacuum cock<br>Magnet valve | Instrument - 100%<br>Vacuum — ON (Position of admitting outside air)<br>Vacuum — OFF<br>Same as outside air<br>Vacuum — OFF<br>Current - ON |
| BI-LEVEL<br>Engine at idle | 1 to 4 | Hot<br>1<br>Cold | Discharge air<br>Air intake door<br>Mode door<br>Air temperature<br>Vacuum cock<br>Water cock<br>Magnet valve | Floor & Instrument<br>Vacuum — ON (Position of admitting outside air)<br>Vacuum — ON (1 step)<br>Floor — warm-> cool<br>Instrument — same as outside air<br>Vacuum — ON<br>Open—> closed<br>Current - ON |

| Control lever position | | | Operation | |
|---|---|---|---|---|
| AIR lever | FAN lever | TEMP lever | Item | Correct action |
| HEATER (FRESH)<br><br>Engine at idle | 1 to 4 | Hot<br>1<br>Cold | Discharge air<br>Air intake door<br><br>Mode door<br><br>Air temperature<br>Vacuum cock<br>Water cock<br><br>Magnet valve | Floor & defroster nozzle<br>Vacuum - ON (Position of admitting outside air)<br>Vacuum — ON (2 steps)<br><br>Warm —> cool<br>Vacuum - ON<br>Open —> closed<br><br>Current - ON |
| HEATER (REC)<br><br>Engine at idle | 1 to 4 | Hot<br>1<br>Cold | Discharge air<br>Air intake door<br><br>Mode door<br><br>Air temperature<br>Vacuum cock<br>Water cock<br><br>Magnet valve | Floor & defroster nozzle<br>Vacuum - OFF (Position of isolating outside air)<br>Vacuum - ON (2 steps)<br><br>Warm —> cool<br>Vacuum - ON<br>Open —> closed<br><br>Current - ON |
| DEF<br><br>Engine at idle | 1 to 4 | Hot<br>1<br>Cold | Discharge air<br>Air intake door<br><br>Mode door<br>Heater door<br><br>Air temperature<br>Vacuum cock<br>Water cock<br><br>Magnet valve | Defroster nozzle<br>Vacuum - ON (Position of admitting outside air)<br>Vacuum - ON (2 steps)<br>Open<br><br>Warm<br>Vacuum - ON<br>Open —> closed<br><br>Current - ON |

# VACUUM SYSTEM DIAGNOSES

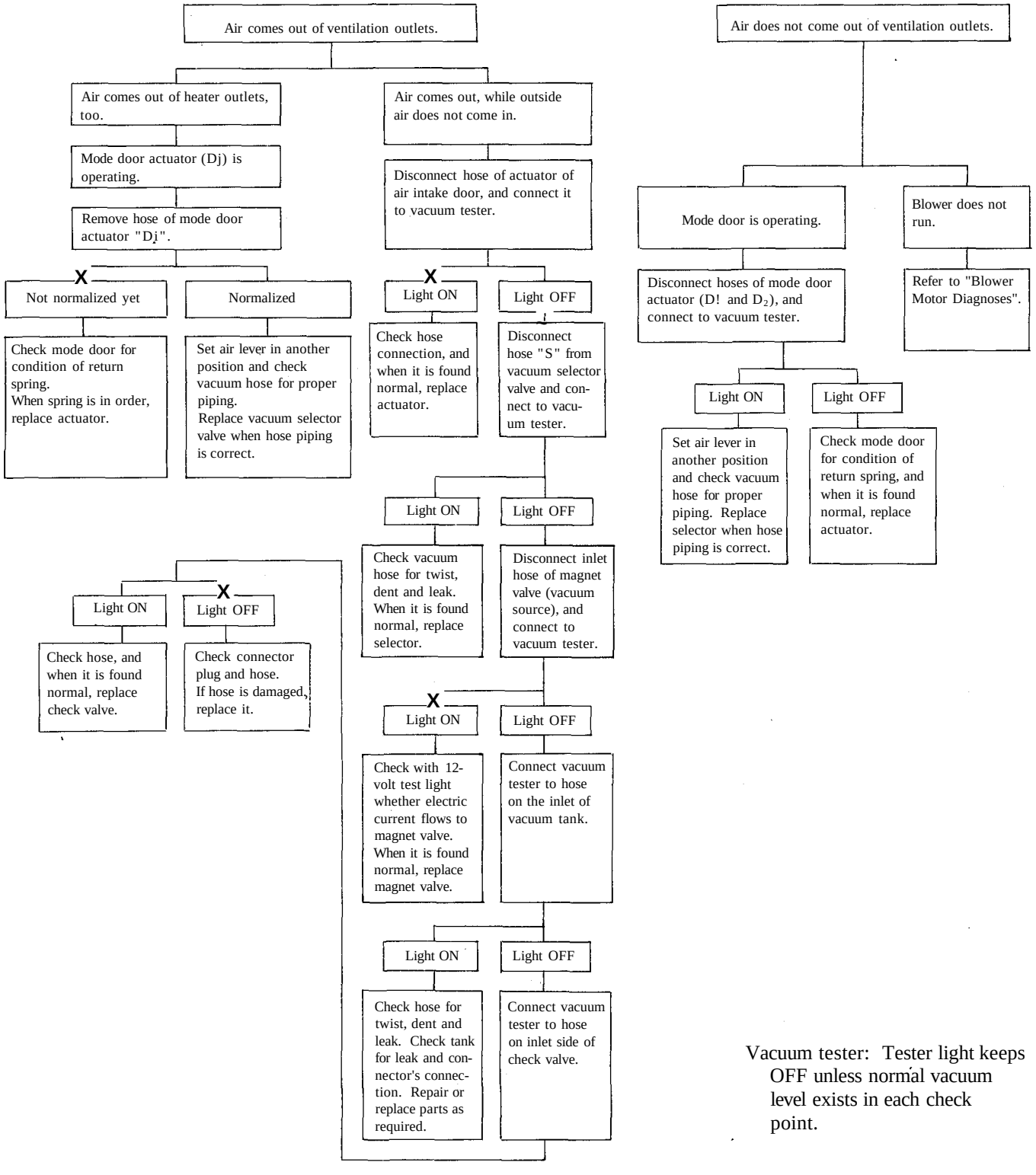
## VACUUM SYSTEM DIAGNOSES -A/C POSITION





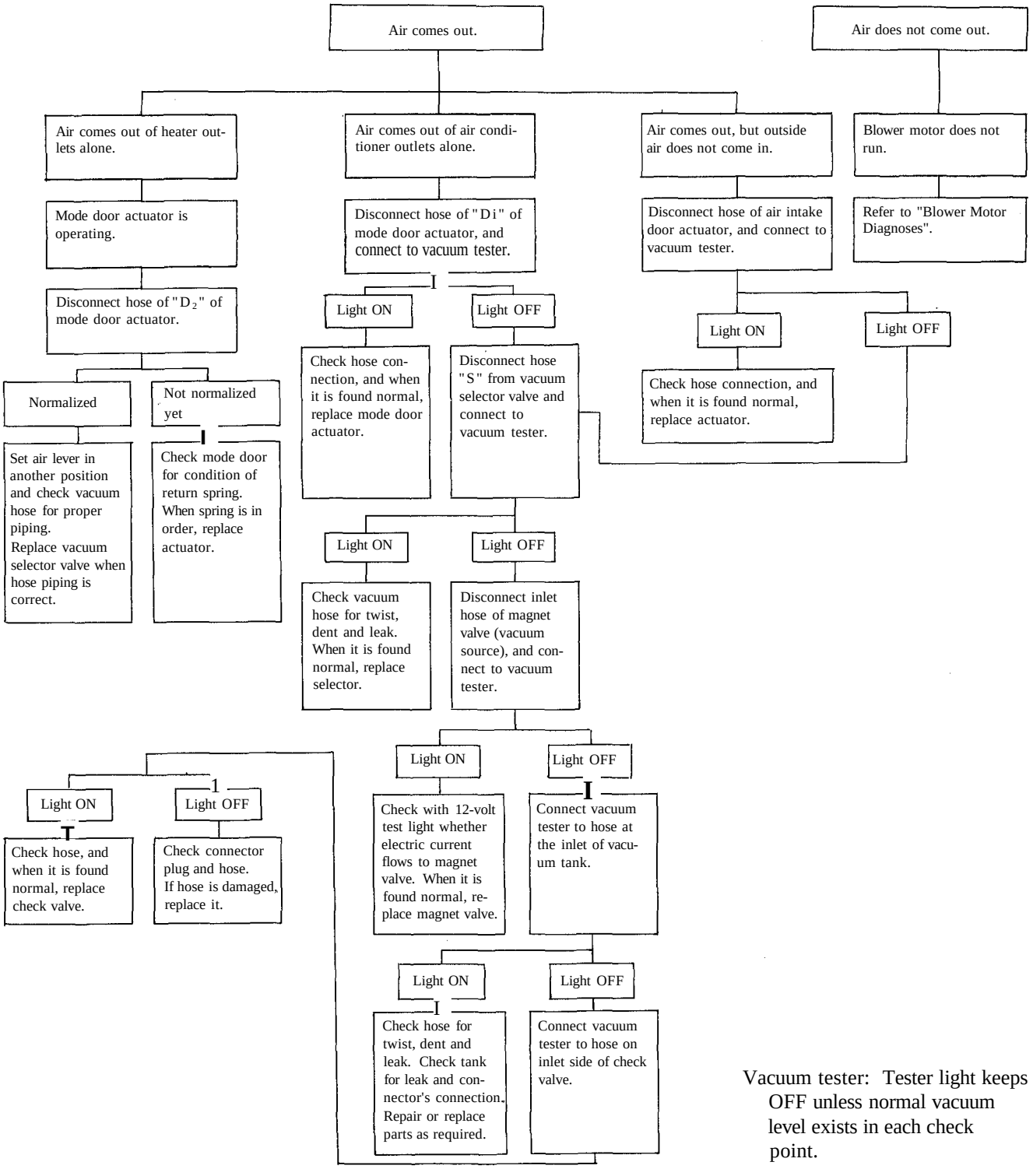

Vacuum tester: Tester light keeps OFF unless normal vacuum level exists in each check point.

## VACUUM SYSTEM DIAGNOSES-VENT POSITION



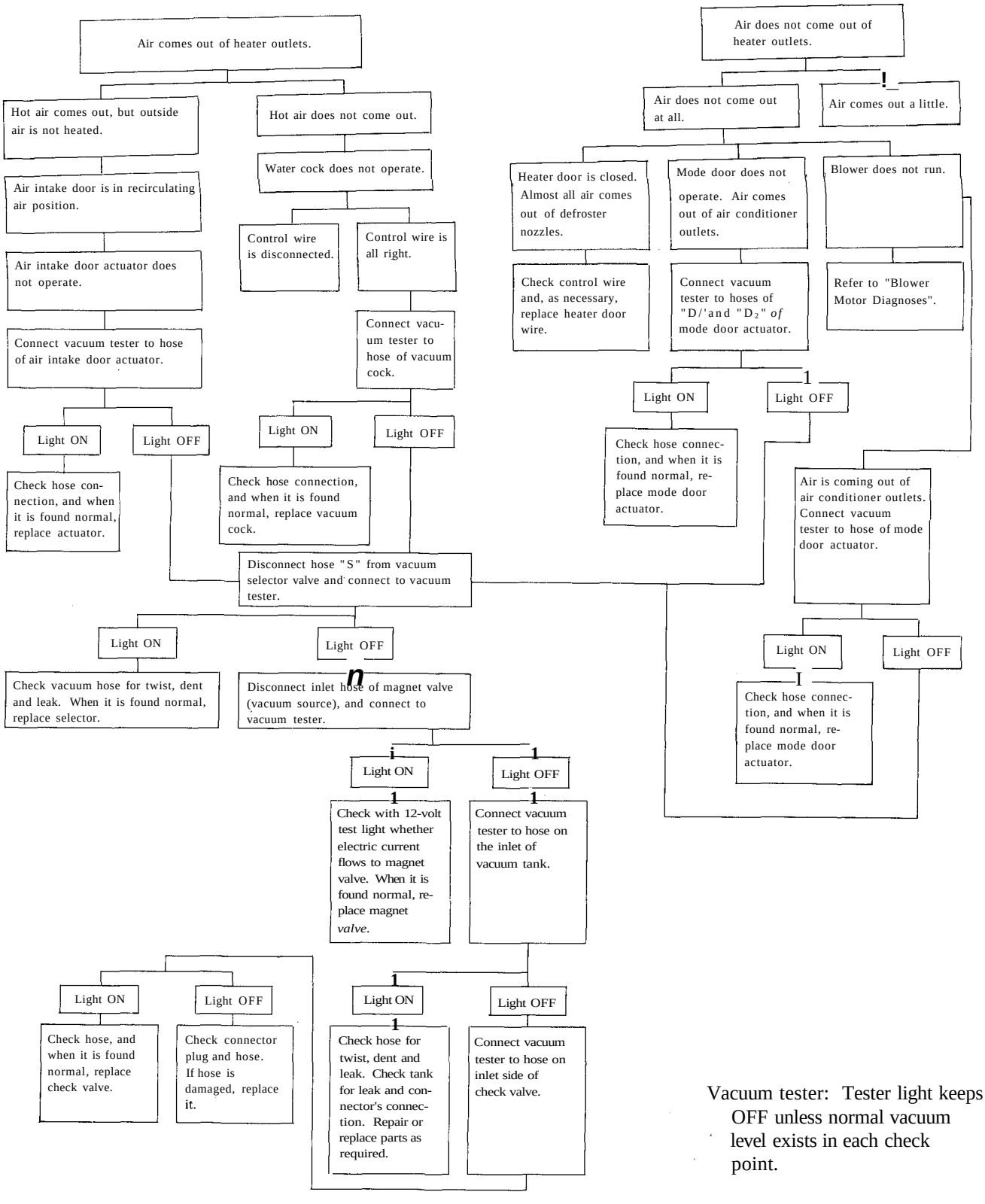

Vacuum tester: Tester light keeps OFF unless normal vacuum level exists in each check point.

## VACUUM SYSTEM DIAGNOSES-BI-LEVEL POSITION



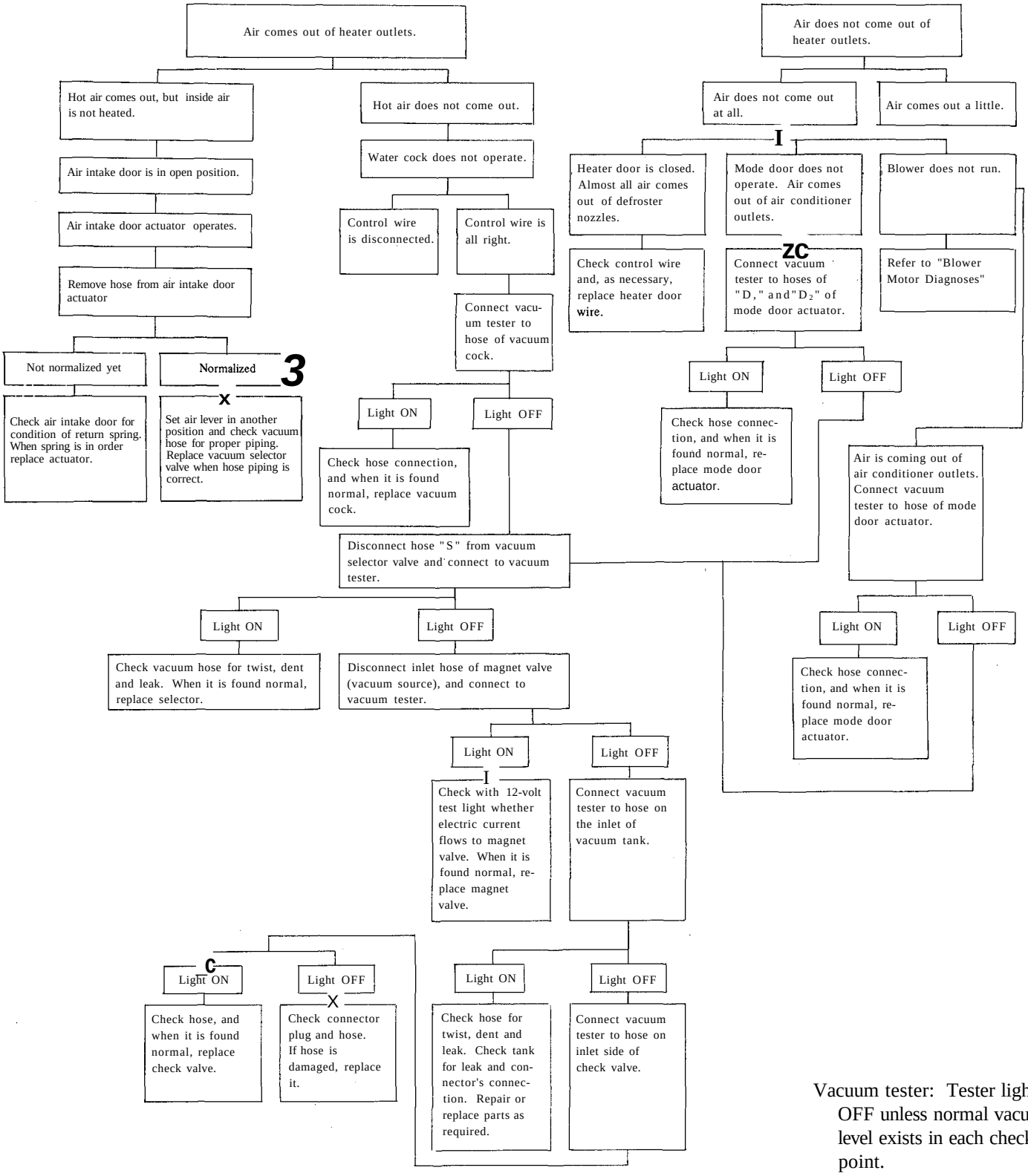

Vacuum tester: Tester light keeps OFF unless normal vacuum level exists in each check point.

## VACUUM SYSTEM DIAGNOSES - HEATER (FRESH) POSITION



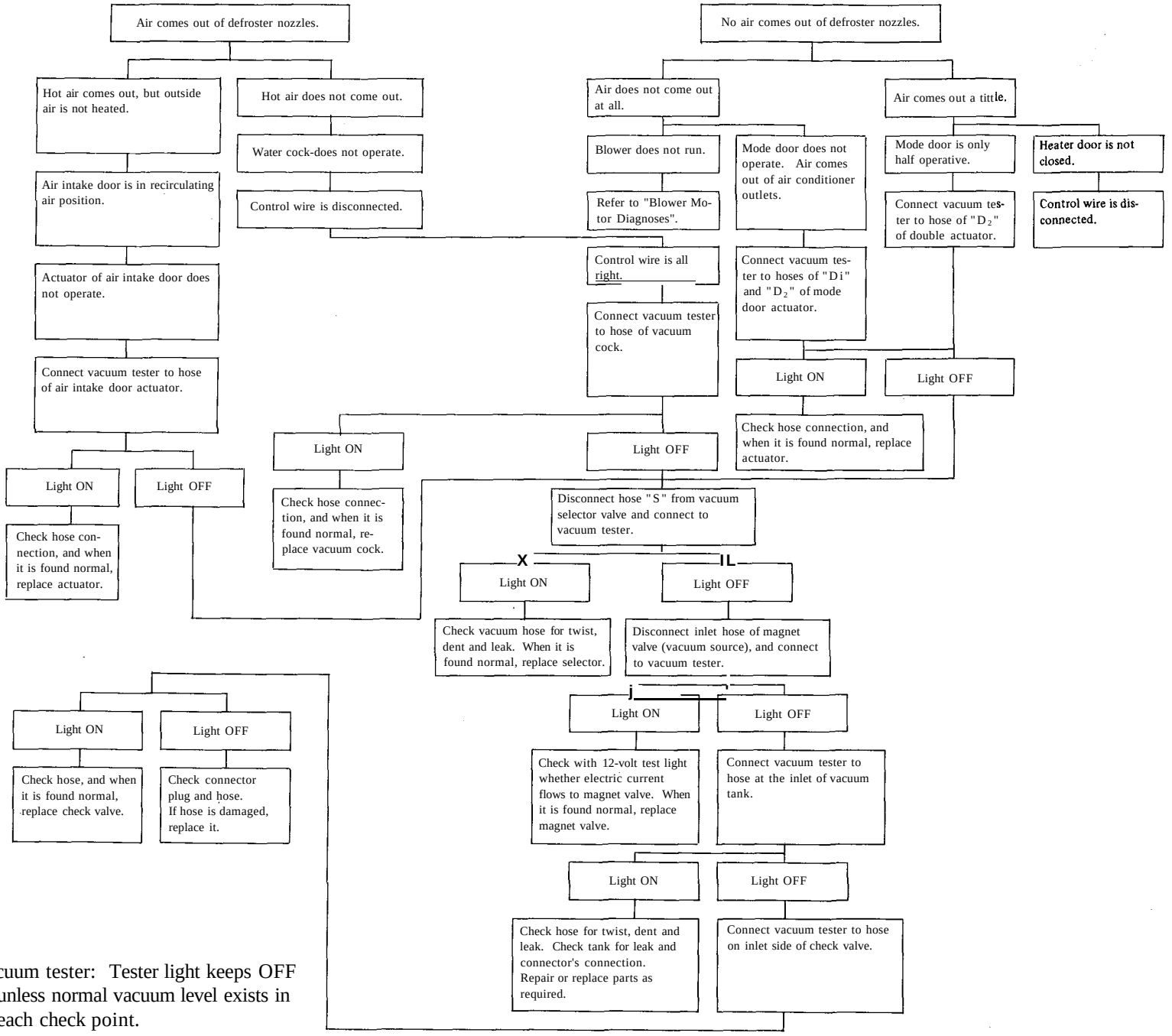

Vacuum tester: Tester light keeps OFF unless normal vacuum level exists in each check point.

## VACUUM SYSTEM DIAGNOSES - HEATER (REC) POSITION




Vacuum tester: Tester light keeps OFF unless normal vacuum level exists in each check point.

## VACUUM SYSTEM DIAGNOSES -DEFROST POSITION




Vacuum tester: Tester light keeps OFF unless normal vacuum level exists in each check point.

## RERFORMANCE CHART

Engine speed : 1,500 rpm
FAN lever : 4
AIR lever : A/C
TEMP lever : Max. cold

| Ambient air | | Discharge air temperature °F(°C) | Pressure High (Discharge side) psi (kg/cm²) | Pressure Low (Suction side) psi (kg/cm²) |
|---|---|---|---|---|
| Relative humidity | Air temperature °F(°C) | | | |
| 80 | 70 (21.0) | 52.0 to 57.0 (11.0 to 14.0) | 168 to 198 (11.8 to 13.9) | 28 to 36 (2.0 to 2.5) |
| | 80 (26.5) | 61.0 to 68.0 (16.0 to 20.0) | 185 to 218 (13.0 to 15.3) | 33 to 40 (2.3 to 2.8) |
| | 90 (32.5) | 67.0 to 76.0 (19.5 to 24.5) | 208 to 246 (14.6 to 17.3) | 38 to 48 (2.7 to 3.4) |
| | 100 (38.0) | 73.0 to 82.5 (23.0 to 27.5) | 235 to 273 (16.5 to 19.2) | 48 to 55 (3.4 to 3.9) |
| | 110(43.5) | 79.0 to 90.0 (26.0 to 32.0) | 266 to 303 (18.7 to 21.3) | 61 to 68 (4.3 to 4.8) |
| 70 | 70 (21.0) | 49.0 to 55.0 (9.5 to 13.0) | 154 to 182 (10.8 to 12.8) | 24 to 33 (1.7 to 2.3) |
| | 80 (26.5) | 57.0 to 64.0 (14.0 to 18.0) | 168 to 202 (11.8 to 14.2) | 28 to 37 (2.0 to 2.6) |
| | 90 (32.5) | 63.5 to 71.5 (17.5 to 22.0) | 192 to 228 (13.5 to 16.0) | 34 to 43 (2.4 to 3.0) |
| | 100 (38.0) | 70.0 to 78.0 (21.0 to 25.5) | 219 to 255 (15.4 to 17.9) | 43 to 51 (3.0 to 3.6) |
| | 110(43.5) | 75.0 to 84.0 (24.0 to 29.0) | 249 to 285 (17.5 to 20.0) | 55 to 64 (3.9 to 4.5) |
| 60 | 70(21.0) | 46.0 to 52.0 (7.5 to 11.0) | 138 to 168 (9.7 to 11.8) | 20 to 28 (1.4 to 2.0) |
| | 80 (26.5) | 54.0 to 61.0 (12.0 to 16.0) | 152 to 185 (10.7 to 13.0) | 23 to 33 (1.6 to 2.3) |
| | 90 (32.5) | 60.0 to 67.0 (15.5 to 19.5) | 175 to 209 (12.3 to 14.7) | 28 to 38 (2.0 to 2.7) |
| | 100 (38.0) | 65.0 to 73.0 (18.5 to 23.0) | 201 to 235 (14.1 to 16.5) | 37 to 48 (2.6 to 3.4) |
| | 110(43.5) | 70.5 to 79.0 (21.5 to 26.0) | 230 to 267 (16.2 to 18.8) | 48 to 61 (3.4 to 4.3) |
| 50 | 70 (21.0) | 43.0 to 49.0 (6.0 to 9.5) | 124 to 154 (8.7 to 10.8) | 16 to 24 (1.1 to 1.7) |
| | 80 (26.5) | 50.0 to 57.0 (10.0 to 14.0) | 137 to 168 (9.6 to 11.8) | 18 to 28 (1.3 to 2.0) |
| | 90 (32.5) | 56.0 to 63.5 (13.5 to 17.5) | 156 to 192 (11.0 to 13.5) | 23 to 34 (1.6 to 2.4) |
| | 100 (38.0) | 61.0 to 70.0 (16.0 to 21.0) | 182 to 219 (12.8 to 15.4) | 31 to 43 (2.2 to 3.0) |
| | 110(43.5) | 66.0 to 75.0 (19.0 to 24.0) | 213 to 249 (15.0 to 17.5) | 44 to 55 (3.1 to 3.9) |
| 40 | 70 (21.0) | 39.0 to 45.5 (4.0 to 7.5) | 108 to 137 (7.6 to 9.7) | 11 to 20 (0.8 to 1.4) |
| | 80 (26.5) | 46.0 to 54.0 (8.0 to 12.0) | 119 to 152 (8.4 to 10.7) | 14 to 23 (1.0 to 1.6) |
| | 90 (32.5) | 53.0 to 60.0 (11.5 to 15.5) | 139 to 175 (9.8 to 12.3) | 18 to 28 (1.3 to 2.0) |
| | 100 (38.0) | 57.0 to 65.0(14.0 to 18.5) | 162 to 201 (11.4 to 14.1) | 27 to 37 (1.9 to 2.6) |
| | 110 (43.5) | 62.0 to 71.0 (16.5 to 21.5) | 195 to 230 (13.7 to 16.2) | 40 to 48 (2.8 to 3.4) |
| 30 | 70 (21.0) | 36.5 to 43.0 (2.5 to 6.0) | 94 to 124 (6.6 to 8.7) | 7 to 16 (0.5 to 1.1) |
| | 80 (26.5) | 43.0 to 50.0 (6.0 to 10.0) | 102 to 137 (7.2 to 9.6) | 10 to 18 (0.7 to 1.3) |
| | 90 (32.5) | 48.0 to 56.0 (9.0 to 13.5) | 121 to 156 (8.5 to 11.0) | 14 to 23 (1.0 to 1.6) |
| | 100 (38.0) | 54.0 to 61.0 (12.0 to 16.0) | 147 to 182 (10.3 to 12.8) | 23 to 31 (1.6 to 2.2) |
| | 110 (43.5) | 58.0 to 66.0 (14.5 to 19.0) | 176 to 213 (12.4 to 15.0) | 37 to 44 (2.6 to 3.1) |

**Note: These data are based on the results when air conditioner has been in operation approximately for 10 minutes.**

# HOW TO INSTALL AIR CONDITIONER

I. First, remove the heater unit from the passenger compartment side. Prior to removal prepare the engine compartment by:

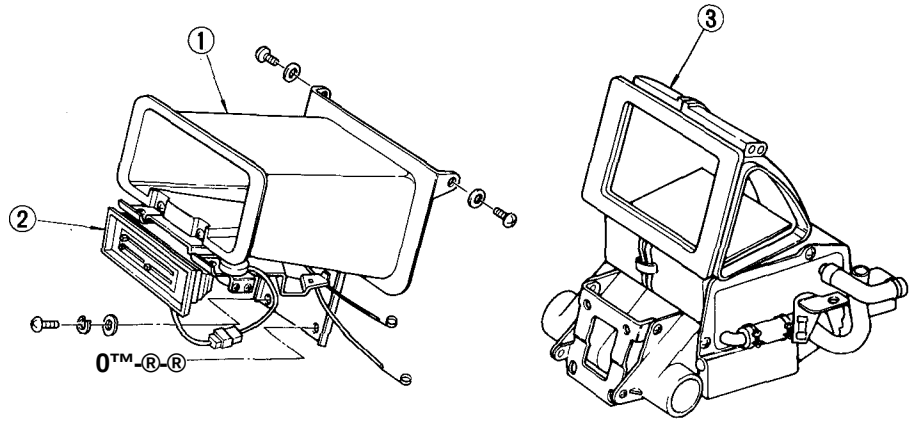
1) Removing battery negative cable
2) Draining engine coolant
3) Removing engine hood
4) Disconnecting inlet and outlet heater hoses and removing grommet that seals the clearance between tube and dash panel

**Note: Take care not to damage the heater unit during removal because, once removed the heater unit can be used, after suitable modifications, as a component of the air conditioner.**

**1.** Remove console box and glove box.
2. Remove instrument finisher from the center of the instrument panel. See Figure AC-44.
3. Remove defroster ducts.
4. Remove two finisher brackets.
5. Remove 3-way air duct. See Figure AC-50.
6. Remove blower housing by removing three mounting bolts. In removing blower housing, disconnect control cable for air intake door and two wiring connectors for blower motor and resistor.
7. Remove three control cables from the heater unit.
8. Disconnect wiring connectors of heater sub harness from heater control assembly and dash harness. Discard heater sub harness.
9. Remove heater air duct with heater control assembly as an assembly from the heater unit by removing four attaching screws. See Figure AC-59.

Since it is useless as a component of air conditioner, discard the removed assembly.

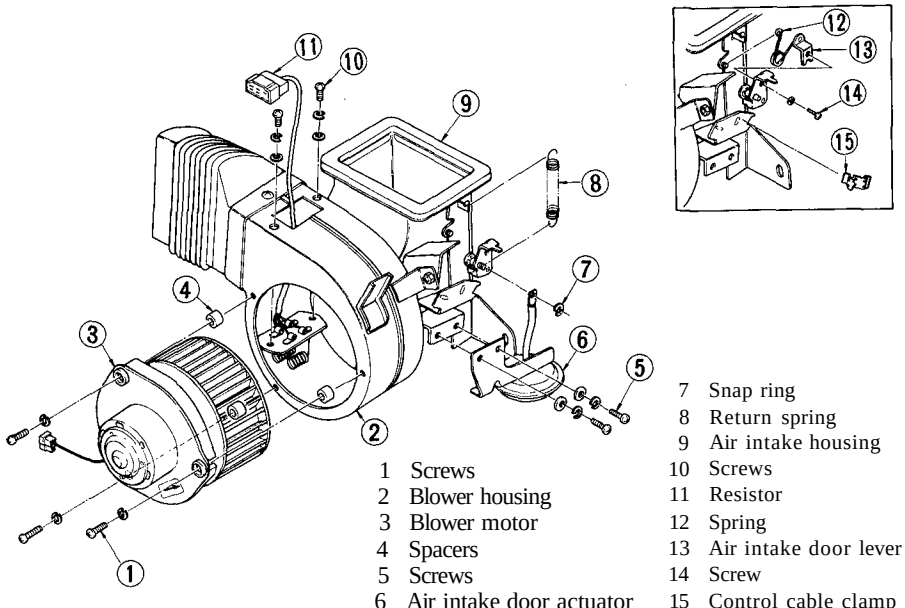
10. Remove two instrument panel center stays. See Figure AC-51.
11. Remove heater unit by removing two nuts from the engine compartment side and then two bolts from the passenger compartment side.



1 Heater air duct
2 Heater control assembly
3 Heater unit

AC316

*Fig. AC-59 Removing heater air duct*



1 Screws
2 Blower housing
3 Blower motor
4 Spacers
5 Screws
6 Air intake door actuator
7 Snap ring
8 Return spring
9 Air intake housing
10 Screws
11 Resistor
12 Spring
13 Air intake door lever
14 Screw
15 Control cable clamp

AC317

*Fig. AC-60 Air intake housing and blower motor*

II. Modify the heater component parts for use as the component parts of the air conditioner according to the following procedure

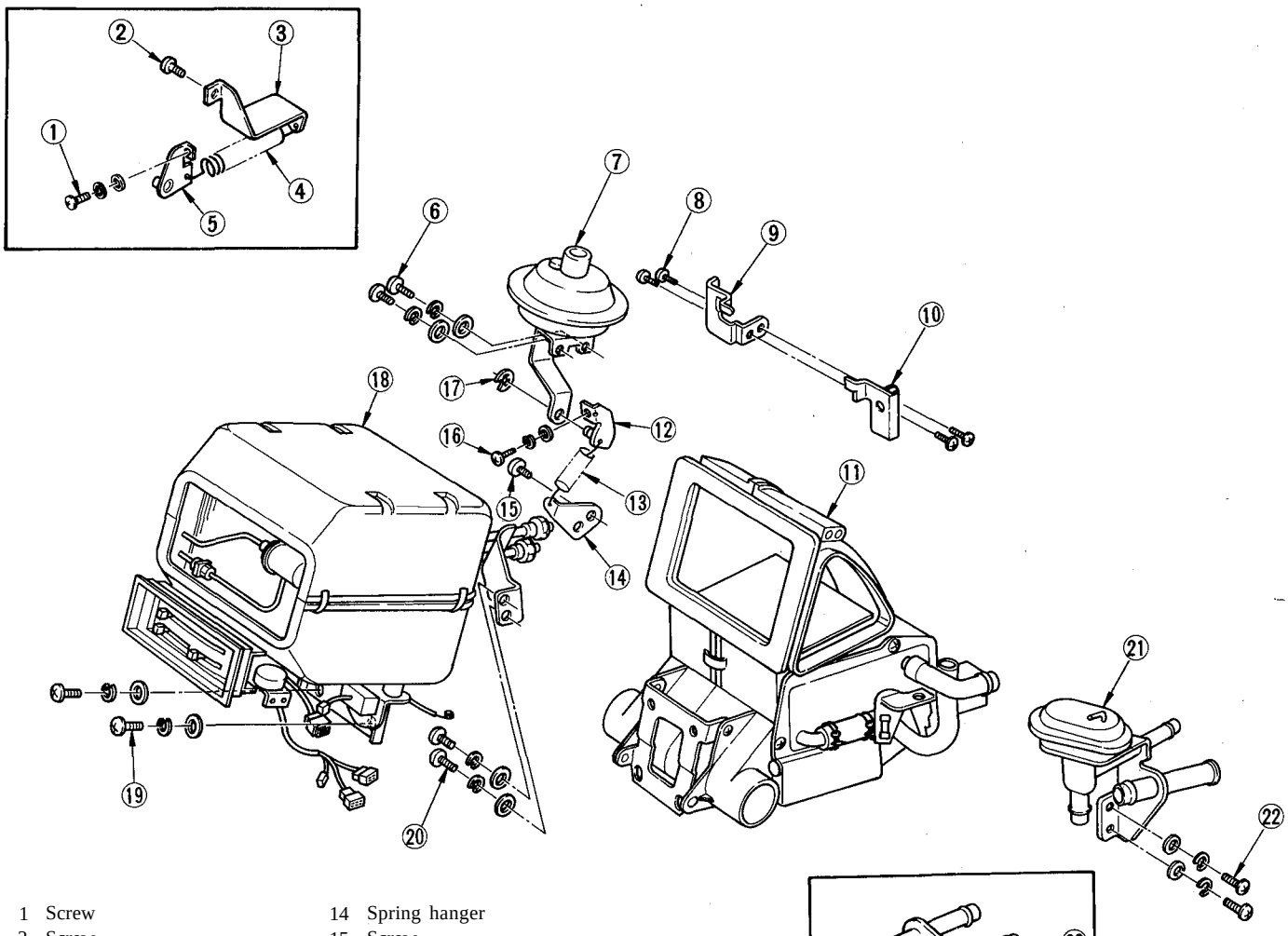
### AIR INTAKE HOUSING AND BLOWER MOTOR

See Figure AC-60.

1. Remove two screws (fj) attaching resistor to blower housing, and take out resistor (jj). Replace resistor with a new one for air conditioner.

2. Remove air intake door lever © and spring @. Newly assemble vacuum actuator (6), using two screws ® and snap ring (7). Replace return spring with one *(§)* designed for air conditioner.

## HEATER UNIT



1 Screw
2 Screw
3 Spring hanger
4 Spring
5 Mode door lever
6 Screws
7 Mode door actuator
8 Screws
9 Heater unit bracket
10 Heater unit bracket
11 Heater unit
12 Mode door lever
13 Spring return
14 Spring hanger
15 Screw
16 Screw
17 Snap ring
18 Evaporator housing and control assembly
19 Screws
20 Screws
21 Vacuum water cock
22 Screws
23 Hose connector
24 Screw

AC318

*Fig. AC-SI Heater unit*

1. Loosen two water hose clamps, take off two screws @> , then remove hose connector @) from heater unit @. Newly install vacuum water cock (21).

2. Remove spring (4) and spring hanger (3) , then remove mode door lever (5) .

Install mode door lever © , spring hanger ® and spring @ .

Then assemble mode door actuator (7) using two screws (6) and snap ring ©•

3. Temporarily install heater unit brackets (9) and @ to the heater unit body.

4. Install two vacuum hoses to mode door actuator referring to Figure AC-55.

III. Install air conditioner component parts in the passenger compartment in the following manner:

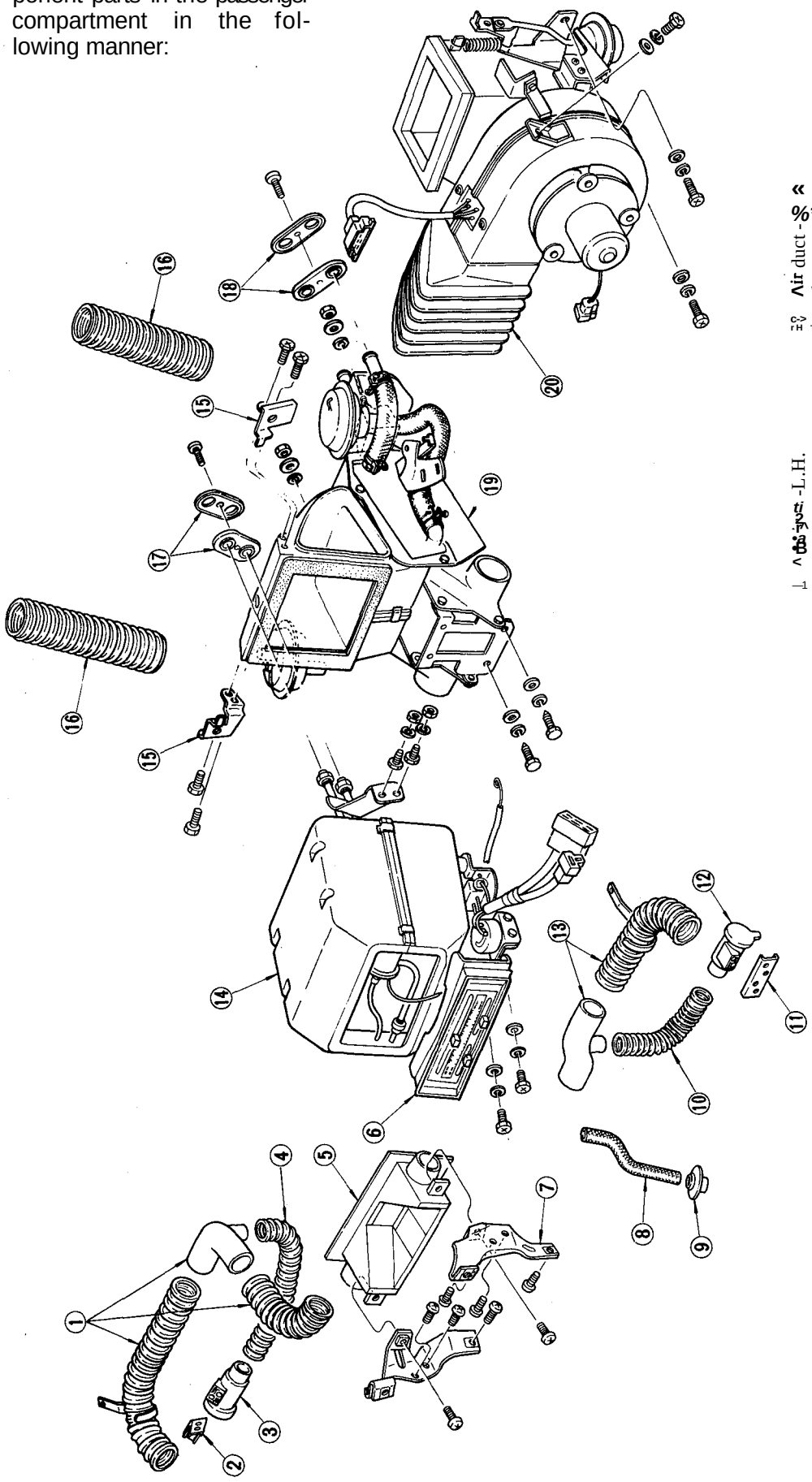


*Fig. AC-62 Air conditioner components and parts in the passenger compartment*

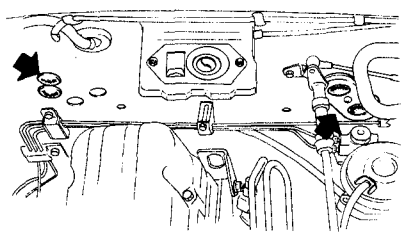
AC326

1. Drill holes in dash panel for hoses and tubes.

(1) Remove grommet cover and grommet for refrigeration piping. See Figure AC-63.

Discard grommet, saving grommet cover for future use.

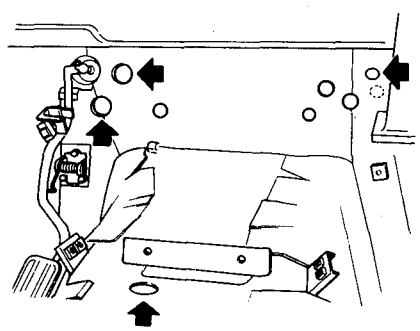
Remove blind grommet for vacuum hose. See Figure AC-63.



AC562

*Fig. AC-63 Grommet*

(2) Drill holes in dash panel insulator from the passenger compartment side. Remove the round cutout from the insulator. See Figure AC-64.



AC563

*Fig. AC-64 Dash insulator*

(3) Remove blind grommet for drain hose.

2. Installation of heater unit

(1) From passenger seat side set heater unit modified for use with air conditioner in place below instrument panel. Fit it securely in place by tightening two nuts from the engine compartment side and four bolts from the passenger compartment side. See Figure AC-54.

(2) From the engine compartment side seal the pass-through holes using grommet and grommet cover. Connect two heater hoses to the connectors protruding inside the engine room.

3. Installation of evaporator housing

(1) Install evaporator housing and control assembly, which have been previously assembled in a unit, onto the heater unit. To do this, hook a heater unit upper bracket to the dimple in evaporator housing and securely tighten the two bolts at the lower side of evaporator housing. See Figure AC-52.

(2) Connect wiring connectors of air conditioner sub harness to those of control assembly (4 connectors), and to dash harness at one connector. Two connectors, one for blower motor and the other for resistor, may be left unconnected. See Figure AC-56.

(3) Connect control cables (heater door cable and water cock cable) to the respective levers on heater unit. Refer to "Adjustment of Control Cable" in "Control Assembly".

(4) Arrange vacuum hose piping

Install all hoses leading to vacuum water cock, on heater unit and to vacuum selector on control assembly, referring to Figure AC-55.

Also install a hose leading from vacuum source into engine compartment through panel.

Secure vacuum hoses and air conditioner sub-harness to water cock control cable with clip.

(5) Install a fixture bracket to fix two tubes leading to the inlet and outlet of evaporator onto the side of heater unit, and secure it with two bolts. Seal the clearance between tube and dash panel using grommet and grommet cover.

**Note: Do not remove the blind plug from the opening of evaporator tube until ready for piping in the engine compartment.**

(6) Install drain hose on the bottom of evaporator housing and direct its end under the car through floor panel. Seal the clearance between hose and floor panel with grommet.

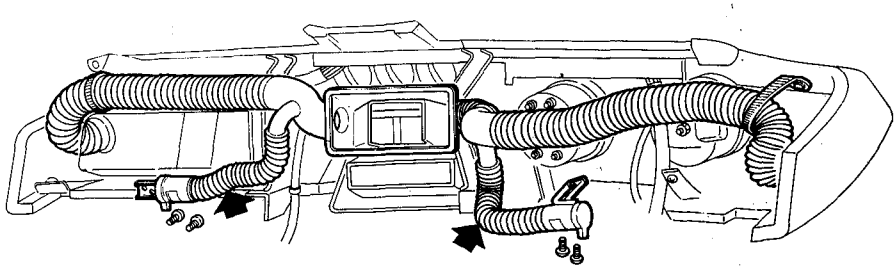
(7) Install two instrument panel center stays.

4. Installation of blower housing

(1) Install blower housing previously modified for use with air conditioner onto dash panel with three bolts.

(2) Install vacuum hose to air intake door actuator. See Figure AC-55.

(3) Connect two wiring connectors, one for blower motor and the other for resistor, with those on air conditioner sub harness. See Figure AC-56.

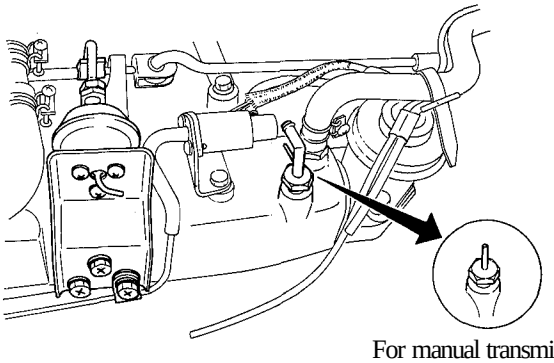


AC321

*Fig. AC-65 Floor grille and duct*

5. Installation of air duct

(1) Install floor grille brackets on both sides of instrument panel, and install the respective floor grilles.
(2) Remove plug- from air duct leading to side ventilator. Install a special air duct for delivering the air to the floor. See Figure AC-64.
(3) Install air duct to floor grille.
(4) Install 3-way ventilator duct at the center of instrument panel and then install instrument finisher.



AC564

For manual transmission

*Fig. AC-66 Vacuum hose connector and F.LCD.*

IV. Succeeding works should be conducted in the engine compartment to make necessary modification of engine.

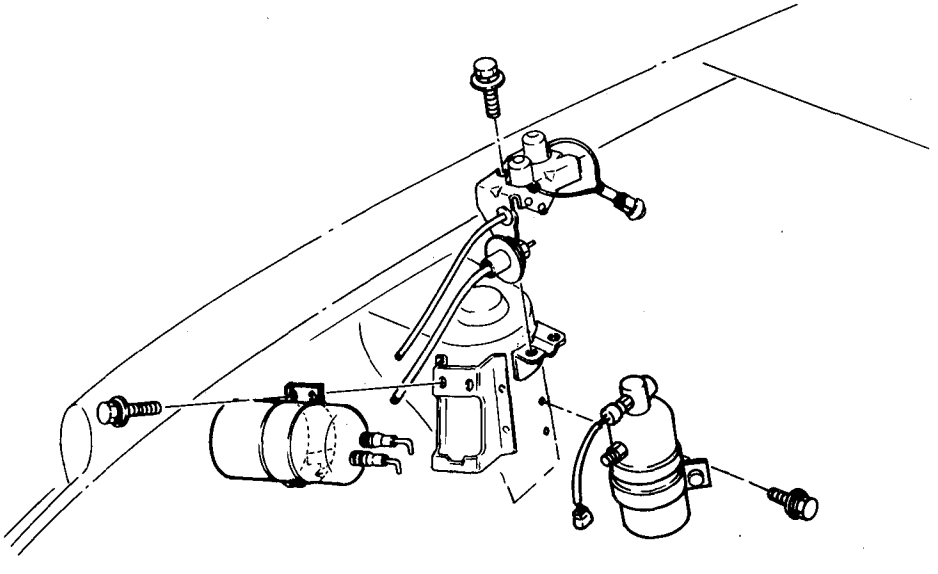
1. Remove air flow meter with air ducts.
2. Remove engine under cover.
3. Remove radiator.
4. Remove air cleaner.
5. Newly install compressor bracket to cylinder block. See Figure AC-30.
6. Assemble idler pulley to idler pulley bracket.

Then, install the assembly to compressor bracket. See Figure AC-31.

7. Install compressor to compressor bracket. See Figure AC-30. Install adjusting shims between bracket and compressor if necessary.
8. Reinstall fan belt and adjust its tension. See Figure AC-32.
9. Newly install compressor drive belt and adjust its tension. See Figure AC-31.
10. Replace vacuum hose connector on intake manifold with one provided with air conditioner. See Figure AC-66.
11. Newly install F.I.C.D. actuator to intake manifold. See Figure AC-66.

V. After completion of engine modification, install all the necessary component parts in the engine compartment according to the following procedure:

1. Set down radiator and condenser onto the rear and front sides, respectively, of radiator core support. Install them in place by tightening together with four bolts.
2. Newly install upper and lower radiator shrouds.
3. Reinstall radiator upper and lower hoses.
4. Newly install receiver drier. See Figure AC-67.



AC566

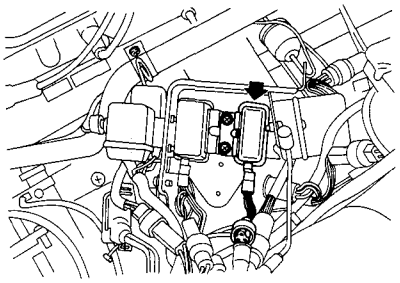
*Fig. AC-67 Receiver drier, vacuum tank and valve assembly*

5. Arrange piping of refrigeration tubes. See Figure AC-35.

**Notes:**

**a. When connecting system lines, do not attempt to remove the blind plug from the opening until ready for immediate use.**
**b. *h.* connecting tubes, be sure to apply compressor oil to seating surface and then tighten tubes to prescribed tightening torque.**
**Be sure to use two wrenches when tightening a flare nut of tube.**
**c. Use care not to give scratches to the seating surface at connections.**
**d. Connect refrigeration tubes to receiver drier after all other connections have been made.**
**e. Take care to tighten securely piping clamps so unusual noise or vibration can be prevented.**

6. Newly install vacuum tank and valve assembly with bracket to the hood ledge panel. See Figure AC-67.
7. Arrange vacuum hose piping. See Figure AC-55.
8. Remove relay bracket from the hood ledge panel. Newly install compressor relay to relay bracket. See Figure AC-68.



AC565

*Fig. AC-68 Compressor relay*

Reinstall relay bracket.

9. Arrange wiring harness. See Figure AC-56.

VI. After completion of all the previous works, fill the system with refrigerant and check for the proper functioning as follows:

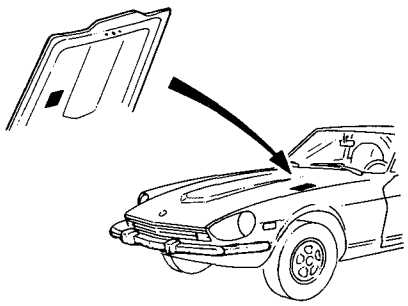
1. Pour in engine coolant and connect battery ground cable.
2. Evacuate system completely.
3. Charge the specified amount of refrigerant into system.

Refrigerant capacity:
0.6 to 0.9 kg (1.3 to 2.0 lb)

4. Conduct leak test and insure that there is no gas leak from connection.
5. Start up engine and check electric system and vacuum system in the air conditioner for their proper functioning, referring to "AIR CONDITIONER OPERATION CHART".
6. Install all the parts listed below. Then, conduct the performance test of air conditioner system to check for proper functioning of the system.

(1) Air cleaner.
(2) Air flow meter.
(3) Under cover.
(4) Engine hood
(5) Glove box
(6) Console box

7. Adjust F.I.C.D. stroke, referring to "Fast Idle Actuator".
8. Check ignition timing.
9. Check engine idle speed and "CO" percent at idle speed.
10. Check the height of front bumper and, if necessary, adjust. Refer to Section BF.
11. After completion of all the previous steps, conduct the followings:
(1) Attach caution label in place as illustrated.
(2) Attach kit number at the specified position.



AC325

*Fig. AC-69 Caution label*

# COMPRESSOR

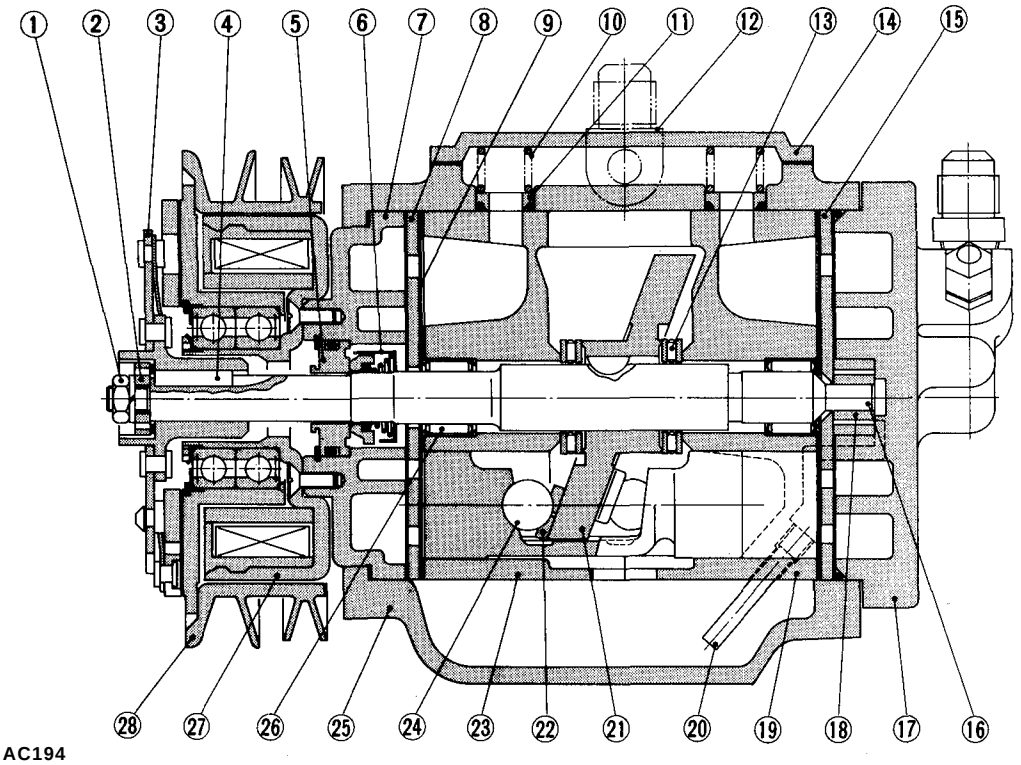
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## DESCRIPTION

Model SWP123 is a swash plate type compressor. As with conventional crank type compressors, reciprocating pistons compress incoming gas. The principal difference between these two types of compressors lies in the way in which the piston is driven, by crankshaft rotation on the one hand and by swash plate rotation on the other. When the swash plate compressor is used in air conditioning system, the following advantages are obtained. tained.

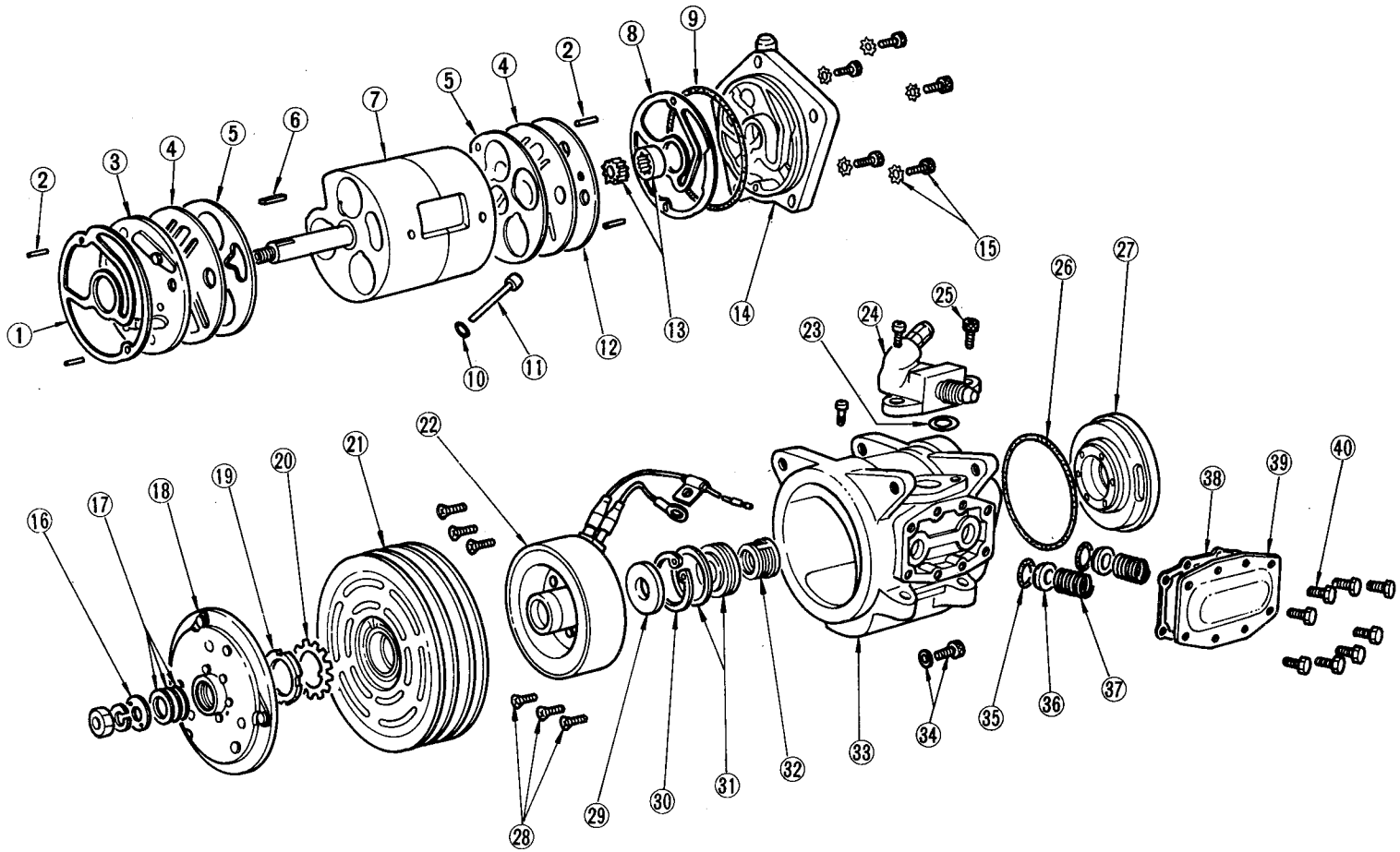
1. The shape is cylindrical, facilitating installation.
2. Torque changes are minimal since a number of cylinders are used.
3. Complete mechanical balance is possible, limiting vibration and noise and allowing high-speed operation.
4. Discharge per unit of compressor volume is quite high, resulting in high cooling capacity and superb cooling characteristics.




AC194

1 Shaft nut
2 Clutch hub nut
3 Clutch hub
4 Key
5 Shaft seal seat
6 Shaft seal
7 Front end cover
8 Front cylinder head
9 Suction valve plate
10 Silencer spring
11 Silencer piece
12 Discharge valve
13 Thrust bearing
14 Side cover
15 Rear cylinder head
16 Compressor shaft
17 Rear en4 cover
18 Oil pump
19 Rear cylinder
20 Oil pipe
21 Swash plate
22 Shoe disc
23 Front cylinder
24 Drive ball
25 Shell
26 Needle bearing
27 Clutch coil
28 Pulley and bearing assembly

*Fig, AC-70 Sectional view*



1 Gasket
2 Knock pin
3 Front cylinder head
4 Suction valve plate
5 Gasket
6 Key
7 Compressor cylinder assembly
8 Gasket
9 Rear end cover O-ring
10 Oil pipe O-ring
11 Oil pipe
12 Rear cylinder head
13 Gear pump assembly
14 Rear end cover
15 Rear end cover fixing bolt and washer
16 Hub nut
17 Spacer
18 Clutch hub
19 Lock nut
20 Lock washer
21 Pulley and bearing assembly
22 Coil assembly
23 Discharge valve O-ring
24 Discharge valve assembly
25 Discharge valve fixing bolt
26 Gasket
27 Front end cover
28 Coil mounting screw
"9 Felt
30 Retainer ring
31 Shaft seal seat and O-ring
32 Shaft seal
33 Compressor shell
34 Drain plug and gasket
35 Silencer piece O-ring
36 Silencer piece
37 Silencer spring
38 Gasket
39 Side cover
40 Side cover fixing bolt

AC222

*Fig. AC-71 Exploded view*

# COMPRESSOR CLUTCH

The most likely source of problem is clutch slippage. Factors are listed here. Exercise ample'care.

1. Clearance between clutch hub and pulley should be 0.5 to 0.8 mm (0.020 to 0.031 in) at all peripheral points.
2. Make sure that there is no oil or dirt on friction surfaces of clutch disc (clutch hub) and pulley. Remove any oil or dirt with a dry rag.
3. Make sure that terminal voltage at magnetic coil is above 10.5V.

## REMOVAL

1. Using Clutch Hub Wrench KV99412302, hold clutch hub. With suitable socket wrench, remove shaft nut from shaft.
2. Then, using Hub Nut Socket KV99412305, remove clutch hub nut. Remove spacers.

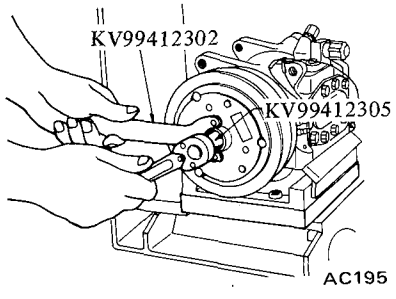



*Fig. AC-72 Removing clutch hub nut*

3. Using Clutch Hub Puller KV99412306, remove clutch hub. Thread tool into the bore of clutch hub, hold tool with wrench, and then thread in center bolt.

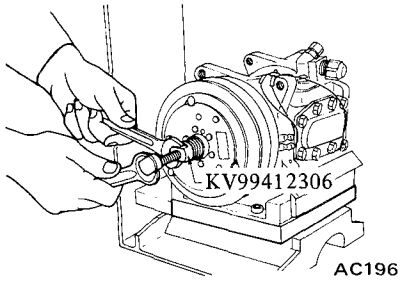



*Fig. AC-73 Removing clutch hub*

4. With an ordinary screwdriver, flatten lock washer tab.

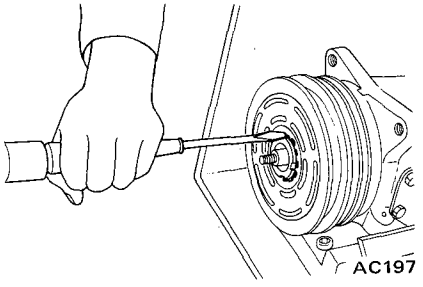



*Fig. AC-74 Flattening lock washer tab*

5. Using Lock Nut Socket KV99412310, loosen lock nut. Remove lock nut and lock washer.

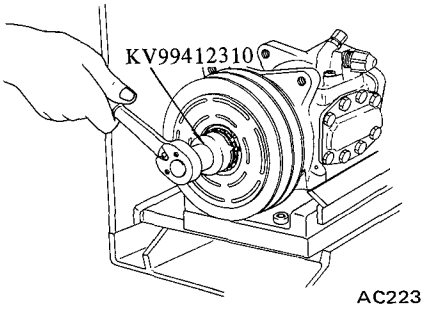



*Fig. AC-75 Removing lock nut*

6. Remove pulley and bearing assembly. When the assembly can not be removed by hand, use a puller, Puller Adapter KV99412313 and Puller Pilot KV99412312.

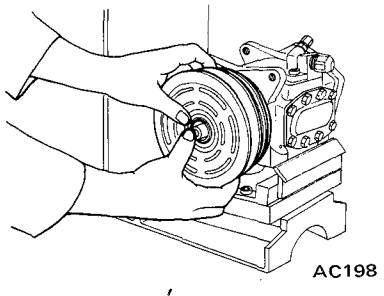



*Fig. AC-76 Removing pulley*

7. Using an impact tool, loosen six coil mounting screws. Use of the impact tool is advisable as screws have been calked.

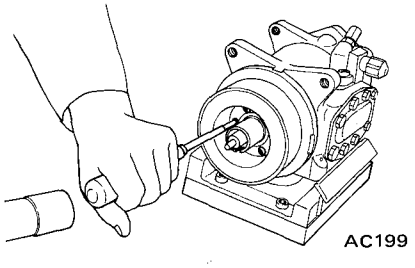



*Fig. AC-77 Loosening coil mounting screw*

8. Remove coil mounting screws and separate coil assembly.

## INSPECTION

1. Check the friction surfaces of the clutch for damage due to excessive heat, or excessive grooving due to slippage. If necessary, replace coil, pulley and bearing assembly, and clutch hub as a set.
2. Oil or dirt on the friction surfaces should be cleaned with a suitable solvent and a dry rag.
3. Check coil for shorted or opened binding leads.
4. When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch some thirty times. Break-in operation raises the level of transmitted torque.

## INSTALLATION

1. Using a Phillips screwdriver, tighten coil assembly mounting screws in an alternating pattern. After screws have been firmly tightened, punch-lock each at one location to prevent loosening. Correct tightening torque is 0.28 to 0.35 kg-m (2.0 to 2.5 ft-lb).

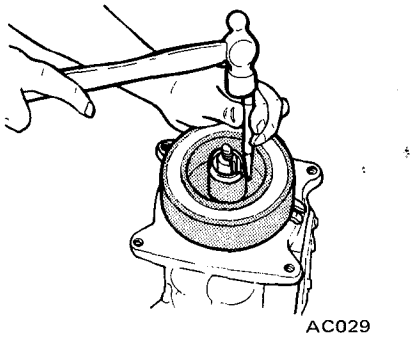



*Fig. AC-78 Punch-locking*

2. Using a plastic mallet, drive pulley and bearing assembly onto the neck of the installed coil assembly. Turn the pulley, making sure that there is no noise and that rotation is free. Also make sure that there is no pulley play.
3. Position lock washer and lock nut in place. Using Lock Nut Socket KV99412310, tighten lock nut firmly. With lock washer tab and lock nut cutouts matched, bend the tab with the screwdriver. Proceed carefully to avoid bearing cage damage. Correct

tightening torque is 2.5 to 2.8 kg-m (18.1 to 20.2 ft-lb).

4. Fit key and clutch hub to the shaft. Select adjusting spacer which gives Aecoml clearance between the pulley and clutch hub.

Tighten hub nut to 1.8 to 2.1 kg-m (13 to 15 ft-lb)

5. Tighten shaft nut with spring washer in place.

Tightening torque:
1.6 to 1.7 kg-m
(11.5 to 12.3 ft-lb)

6. Using a thickness gauge, measure the clutch hub-to-pulley gap. If the gap is 0.5 to 0.8 mm (0.020 to 0.031 in), adjustment is correct.

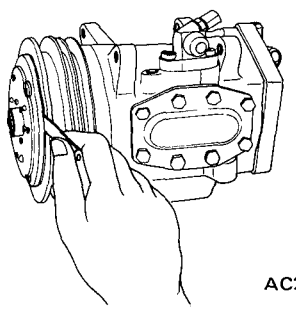



*Fig. AC-79 Checking clutch hub-to-pulley clearance*

**Note: If the specified gap is not obtained, replace adjusting spacer and readjust.**

## SHAFT SEAL

To prevent refrigerant leakage at the cylinder shaft exit point, tightness must be maintained at friction surfaces between shaft seal and shaft seal seat and at contact surfaces between shaft seal seat and front end cover. Use extreme care in removing or assembling seals not to damage the sealing surfaces. Discard the old seals. Do not re-use them.

### REMOVAL

The system must be discharged beforehand. When compressor is removed, do not turn it on its side or upside down without first draining the oil. Remove dirt from the exterior. Clean the workbench to be used, tools and your hands.

1. Remove drain plug, thereby draining the oil.

1 Remove clutch hub, pulley and bearing assembly, and coil assembly. Proceed according to information under "Compressor Clutch".

3. Using snap ring pliers, compress and remove retainer ring.

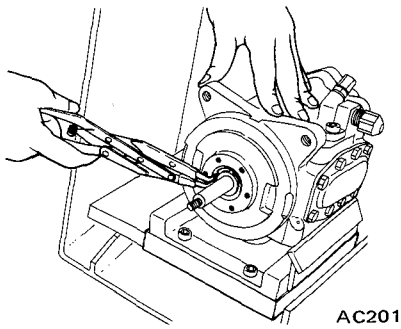



*Fig. AC-80 Removing retainer ring*

4. Using Shaft Seal Seat Puller KV99412320, remove shaft seal seat.

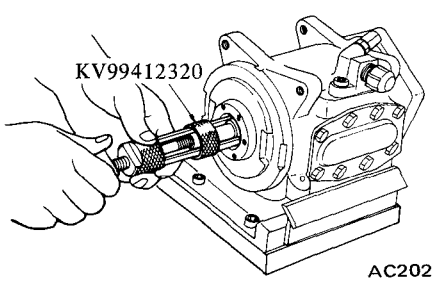



*Fig. AC-81 Removing shaft seal seat*

5. Insert Shaft Seal Remover & Installer KV99412321 through the open end of front end cover. Depress the carbon seal and hook the tool at the case projection of shaft seal. Slowly pull out the tool, thereby removing shaft seal.

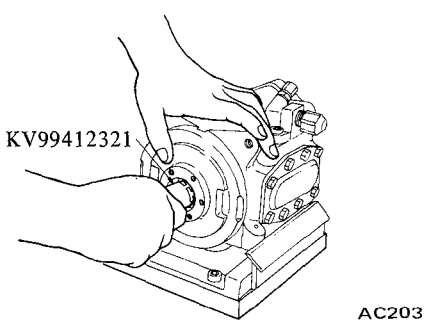



*Fig. AC-82 Inserting special tool*

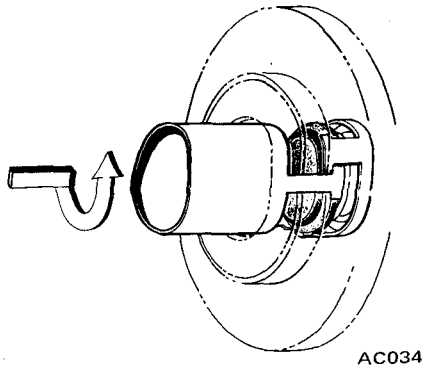
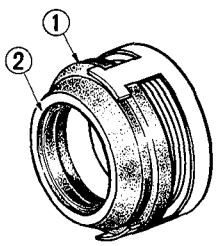



*Fig.AC-83 Removing shaft seal*

### INSPECTION

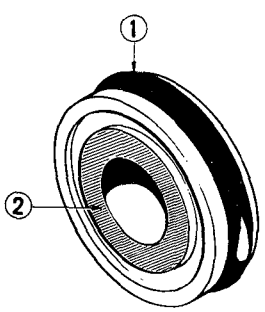
1. Check the carbon seal surface of shaft seal for damage.




1 Carbon seal
2 Contact surface AC036

*Fig. AC-84 Checking shaft seal*

2. Check O-ring and the carbon seal contact surface of shaft seal seat for damage. Make sure that O-ring contact surface at front end cover is not damaged.




1 O-ring
2 Contact surface AC036

*Fig. AC-8S Checking shaft seal seat*

Notes:

a. Do **not** re-use shaft seal **seat and shaft seal.**

**b. In placing a** new seal **on the workbench,** make sure that the **contact surface** faces **upward.** Take necessary steps to avoid damage.

## INSTALLATION

1. Make sure that the shaft seal contact surface is free of dirt and amply lubricated with oil.
2. Cap Shaft Seal Pilot KV99412322 to the top end of compressor shaft.
3. Using Shaft Seal Remover & Installer KV99412321, insert shaft seal with shaft seal case and shaft cutout aligned.

Apply force to turn the seal somewhat to the left and right. Insure that shaft seal seats properly in the shaft cutout.

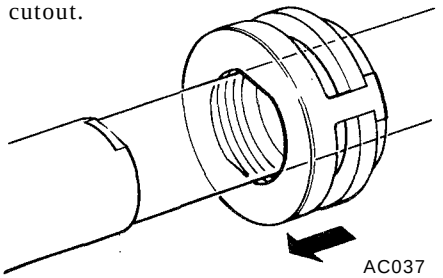



*Fig. AC-86 Inserting shaft seal*

4. Fit O-ring to the outside groove of shaft seal seat, making sure that it seats properly.
5. Coat seal contact surface and periphery of shaft seal seat with an ample amount of oil, so that shaft seat is easy to slip on the inside surface of front end cover. Following this, push in shaft seal seat so that it seats properly at the land of front end cover.
6. Using snap ring pliers, compress retainer ring and fit it into front end cover. Seat retainer ring firmly in the groove.
7. Then, check for gas leakage as follows:

(1) Plug high- and low-pressure joints on compressor with blind caps.
(2) Connect charging hoses in the lines between manifold gauge and high- and low-pressure service valves.
Connect refrigerant can to the middle hose of manifold gauge.
(3) Open valve of can tap, and charge refrigerant. Loosen oil plug on compressor to purge air out of compressor.
(4) Install Shaft Handle Socket KV99412329 to the shaft of compressor, and turn the shaft 5 to 6 turns in the clockwise direction. Then, confirm that pressure does not decrease on the low pressure gauge. If the gauge indicates a pressure decrease, there is a leak. Conduct a leak test. Under such a condition, remove and then install parts again.

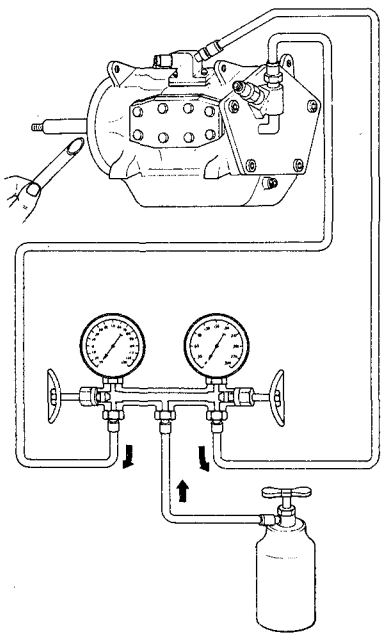



*Fig. AC-87 Checking for gas leaks*

(5) Install compressor clutch assembly according to information under "Installation" of "Compressor Clutch".
(6) Fill with oil.

# DISCHARGE VALVE

## REMOVAL

1. Using Allen Socket KV99412324, remove two hex. socket head bolts.

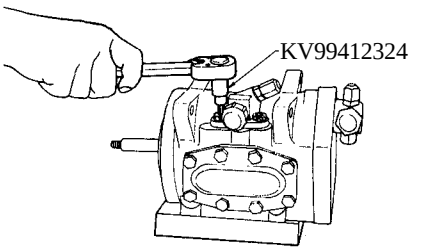



*Fig. AC-88 Removing bolts*

2. Remove discharge valve.'
3. Discard the old O-ring.

## INSPECTION

1. Check for scratched seating surface of discharge valve and of shell. Do not re-use the old O-ring.
2. Replace discharge valve which is scratched.
3. If a scratch is found on the groove of shell O-ring, replace shell.

## INSTALLATION

1. Apply a coating of compressor oil to the groove of discharge valve and O-ring, and install these parts in their proper positions on shell.
2. Using Allen Socket KV99412324, secure discharge valve to shell with two hex. socket head bolts.

Tightening torque:
1.8to2.0kg-m
(13 to 14.5 ft-lb)

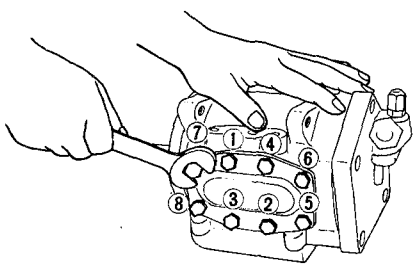
3. Conduct a gas leak test by referring to the topic "Installation" of "Shaft Seal".

# SIDE COVER

## REMOVAL

Discharge the system before beginning work. Work may be carried out with compressor mounted. If compressor is to be removed, first drain oil. Unless oil has been drained, do not turn compressor on its side or upside down.

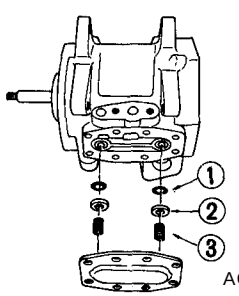
1. Drain oil.
2. Loosen and remove eight side cover mounting bolts in an alternate pattern as shown in Figure AC-89. Note that two silencer springs inside the cover will force up side cover.




AC206

*Fig. AC-89 Loosening cover mounting bolt*

3. Remove side cover and side cover gasket. Discard the gasket.
4. Remove silencer springs, pieces, and O-rings. Do not damage O-ring surface of silencer piece during this process. Discard used O-rings.




AC207

1 O-ring
2 Piece
3 Silencer spring

*Fig. AC-90 Exploded view of silencer spring, pieces and O-ring*

## INSPECTION

1. Make sure that side cover gasket surface and shell gasket surface are not damaged.
2. Make sure that silencer pieces and shell contact surfaces in contact with O-ring are not damaged.
3. Do not reuse old gasket and O-rings.

## INSTALLATION

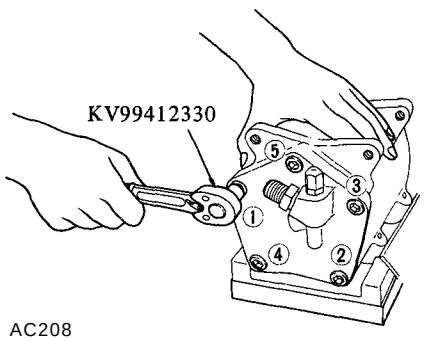
1. Place the mounting surface of side cover upward.
2. Make sure that holes of cylinder and shell are aligned and install O-rings.
3. Coat O-ring and the area around shell hole with an ample amount of oil. Using O-ring Installer KV99412328, install O-ring into the shell hole. Then install silencer piece with Silencer Piece Installer KV99412327.
4. Coat the gasket surface of shell with oil and position gasket and side cover.
5. Hold side cover in place by hand and thread in eight mounting bolts. Tighten these bolts evenly in an alternating pattern as shown in Figure AC-89. Tightening torque is 1.8 to 2.0 kg-m(13tol4.5ft-lb).
6. Fill with oil.
7. Upon completion of the above operations, conduct a gas leak test by referring to the item "Installation" under the topic "Shaft Seal".

# REAR END COVER AND REAR CYLINDER HEAD

Before beginning work, remove dirt from the exterior of the detached compressor. Clean the workbench to be used, tools, and your hands.

## DISASSEMBLY

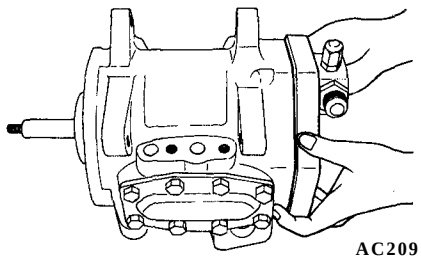
1. Drain oil.
2. Using Allen Socket KV99412330, remove five rear end cover mounting bolts. Starting at the top, loosen all bolts one turn in an alternating pattern. Then remove bolts in turn.




AC208

*Fig. AC-91 Loosening holts*

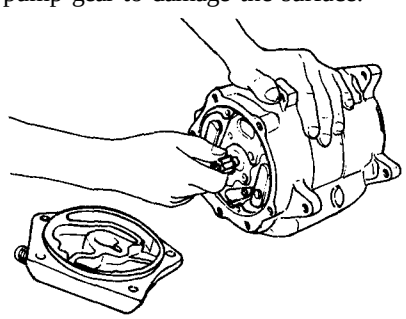
3. Grasp rear end cover and carefully separate it from compressor. Tap the flange lightly and alternately as required with a plastic mallet. Do not tap on the compressor shaft.



AC209

*Fig. AC-92 Removing rear end cover*

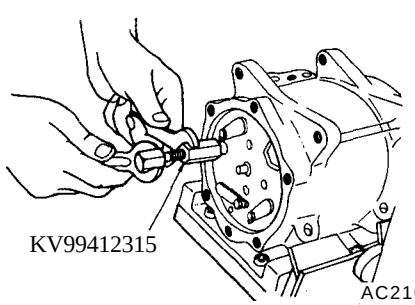
4. Remove pump gear. Do not allow pump gear to damage the surface.



AC042

*Fig. AC-93 Removing pump gear*

5. Remove O-ring, gasket and two pins. Discard the O-ring and gasket.
6. Remove rear cylinder head, suction valve plate and gasket. Discard the gasket. Carefully remove suction valve plate, avoiding deformation.
7. When removal proves difficult, use Cylinder Head Remover KV99412315. Insert this tool into hole in cylinder head as shown in Figure AC-94. With the nut in firm contact with the back side of cylinder head, tighten the bolt slowly to break loose the head.




AC210

*Fig. AC-94 Removing rear cylinder head*

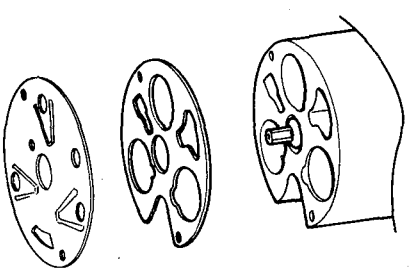
### INSPECTION

1. Do not reuse old gasket and O-ring.
2. Make sure that the gasket contact surface is free of damage.
3. If replacement of rear end cover connector and check valve is necessary, replace rear end cover with a new one.
4. Check suction valve plate and cylinder head for broken valves.
5. Check pump gear for wear and damage.

### ASSEMBLY

Using clean oil, remove dirt and other matter from end cover, cylinder head and suction valve plate. Clean the workbench.

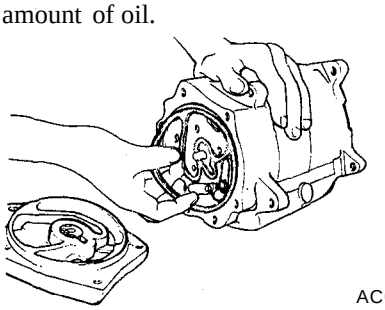
1. Using suitable blocks, position compressor with the front face downward and the rear upward.
2. Insert two pins in the rear of cylinder.
3. Coat both surfaces of cylinder head gasket with oil and align gasket with cylinder.
4. Install suction valve plate, making sure that the three valves properly align with cylinders and gasket cutouts.



AC224

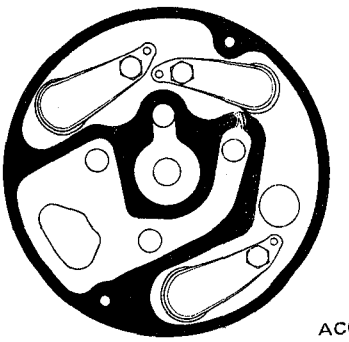
*Fig. AC-96 Cutouts of cylinder and gasket*

5. Install cylinder head, gasket, and O-ring in the order listed. Coat gasket and O-ring beforehand with an ample amount of oil.



AC045

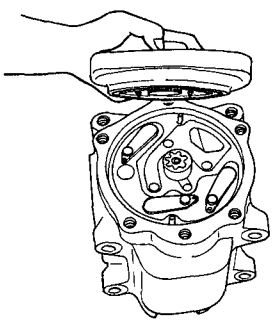
*Fig. AC-96 Installing gasket*



AC046

*Fig. AC-97 Cylinder head and gasket*

6. Fit pump gear to rear end cover.
7. Carefully fit rear end cover to the rear of compressor.



AC211

*Fig. AC-98 Installing rear end cover*

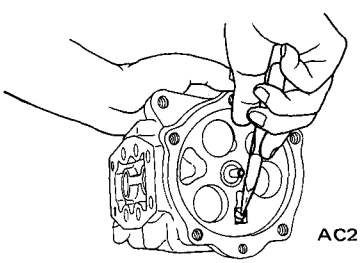
8. Using Allen Socket KV99412330, tighten up five bolts in an alternating pattern, starting at the top. Do not forget lock washers. Then, using torque wrench, tighten these bolts to 3.0 to 3.5 kg-m (21.5 to 25.5 ft-lb) in the same sequence.
9. Fill with oil.
10. Upon completion of the above operation, conduct a leak test by referring to the topic under "Shaft Seal".

## REPLACEMENT OF CYLINDER

Before proceeding, remove all dirt and other matter from the detached compressor. Clean the workbench, tools, and your hands. Lay out parts in the order in which they were removed, in space set aside for this purpose. This procedure facilitates reassembly.

### REMOVAL

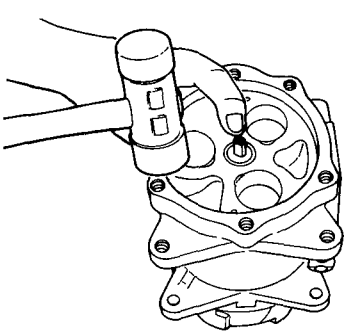
1. Drain oil.
2. Remove compressor clutch assembly. Refer to "Compressor Clutch".
3. Using snap ring pliers, remove shaft seal retainer ring. Then remove shaft seal seat. Refer to "Shaft Seal". Removal of shaft seal is not absolutely necessary. It may be removed when cylinder assembly is removed from front end cover. In fact, this approach facilitates work.
4. Remove side cover. Refer to "Side Cover".
5. Remove rear end cover. Refer to "Rear End Cover and Rear Cylinder Head". Remove O-ring, gasket, two pins, cylinder head, suction valve plate, and gasket in the order listed. This exposes the rear part of cylinder.
6. Using long nose pliers or other suitable tool, pull out oil pipe. Proceed carefully as oil pipe is easily bent. **UNLESS OIL PIPE HAS BEEN REMOVED, DO NOT ATTEMPT THE FOLLOWING STEPS.**



AC212

*Fig. AC-99 Pulling out oil pipe*

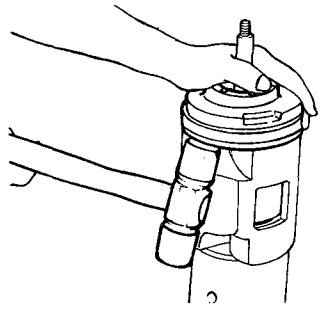
7. With the front facing downward support compressor shell. Using a plastic mallet, tap at the rear end of the shell flange, driving shell straight downward. Discard front end cover gasket.



AC213

*Fig. AC-100 Removing shell*

8. Detach front end cover from cylinder assembly. Using a plastic mallet, drive end cover upward. Refrain from excessive force to avoid cover damage.



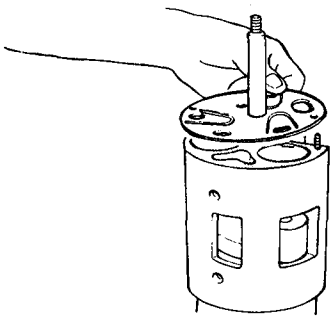
AC050

*Fig. AC-101 Removing front end cover*

9. Remove shaft seal from the shaft.
10. Remove two pins, gasket, cylinder head, suction valve plate, and gasket. In removing two pins, proceed carefully to avoid cylinder head damage. Do not deform suction valve plate in removing suction valve plate. Discard old gasket.

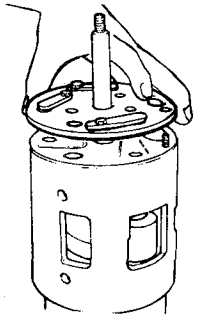
## INSTALLATION

1. Using suitable blocks, face cylinder assembly upward. Insert two pins. Position gasket and suction valve plate in the order listed while making sure that three valves of suction valve plate are aligned with the cylinder and gasket cutouts. Coat gasket with oil prior to assembly. Gaskets and suction valve plates are the same for front and rear. The cylinder head with the smaller numbers of holes goes to the front. Do not mix front and rear parts.



AC051

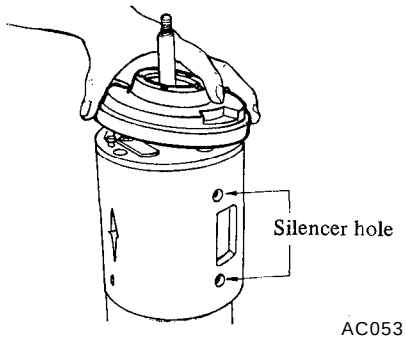
*Fig. AC-102 Installing suction valve plate*



AC052

*Fig. AC-103 Installing cylinder head*

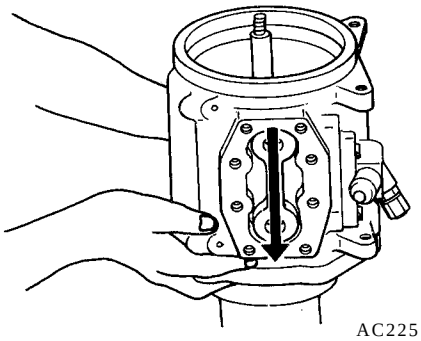
2. Align shaft seal with the shaft cutaway. Firmly seat shaft seal at the shaft land. Attempt to turn shaft seal to the left and right, confirming that it is seated properly.
3. Place gasket on cylinder head and install front end cover. Coat gasket with oil beforehand. Gasket differs for the front and rear. Make sure that the correct gasket is used. After completing this work, gasket protruding from front end cover and cylinder head should be adjusted by hand.




AC053

*Fig. AC-104 Installing front end cover*

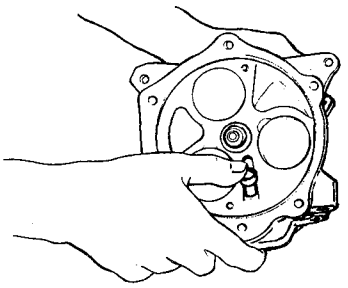
4. Fit gasket to front end cover. Then bring the shell into place over the cylinder assembly. At this time, make sure that the two holes of side cover and the cylinder holes are matched. Note that later adjustment will no longer be possible, as inside and outside diameters of these are not perfectly round. Note that moving the shell up and down may cause the gasket to slip out of place.



AC225

*Fig. AC-105 Installing shell*

5. Turn over the assembled shell and cylinder assembly, that is, fape the front downward.
6. Coat oil pipe and O-ring with an ample amount of oil. Insert oil pipe at the rear of the cylinder. After making sure that the hole lines are matched as specified in step (4), continue with step (6) work.



AC226

*Fig. AC-106 Installing oil pipe*

7. Continue with work up to installation of rear end cover, according to "Installation" under "Rear End Cover and Rear Cylinder Head".
8. Continue with work up to installation of side cover, according to "Installation" under "Side Cover".
9. Install shaft seal seat according to instructions in "Installation" under "Shaft Seal".
10. Install and adjust compressor clutch according to instructions in "Installation" under "Compressor Clutch".
11. Charge compressor oil 270 g (9.5 oz), and tighten oil plug with copper gasket in place.

Tightening torque:
1.8 to2.0kg-m
(13 to 14.5 ft-lb)

12. Conduct a leak test by referring to the topic under "Shaft Seal".

# SERVICE DATA AND SPECIFICATIONS

## Specifications

| | | |
|---|---|---|
| Type | | Swash plate |
| Model | | SWP123 |
| Displacement | cc (cu in) | 123 (7.6) |
| Cylinder bore x stroke | mm (in) | 32 x 25.4(1.26 x 1) |
| Direction of rotation | | Clockwise (viewed from drive end) |
| Lubricating oil type | g(oz) | SUNISO 5GS 270(9.5) |
| Refrigerant | | R-12 |
| Weight with compressor clutch | approx. kg (lb) | 11.6 (25.5) |

## Tightening torque

| | kg-m (ft-lb) |
|---|---|
| Rear end cover bolt | 3.0 to 3.5 (21.5 to 25.5) |
| Side cover bolt | 1.8 to 2.0 (13 to 14.5) |
| Coil screw | 0.28 to 0.35 (2.0 to 2.5) |
| Clutch hub nut | 1.8 to 2.1 (13 to 15) |
| Shaft nut | 1.6 to 1.7(11.5 to 12.3) |
| Oil plug | 1.8 to 2.0 (13 to 14.5) |
| Discharge valve assembly bolt | 1.8 to 2.0 (13 to 14.5) |

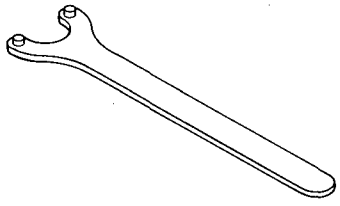
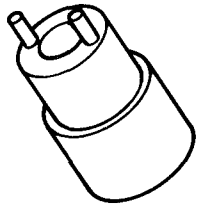
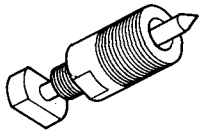
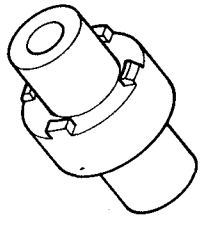
## Adjustment specifications

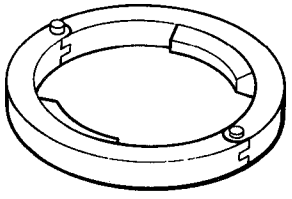
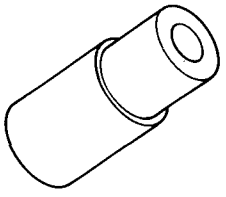
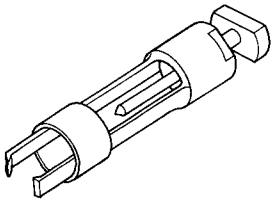
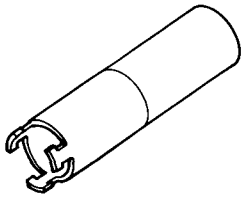
| | | |
|---|---|---|
| Clutch hub to pulley clearance | mm (in) | 0.5 to 0.8 (0.0020 to 0.031) |
| Shaft end play | mm (in) | 0 to 0.02 (0 to 0.0008) |

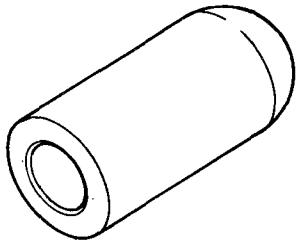
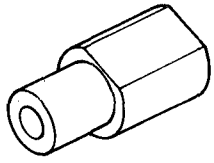
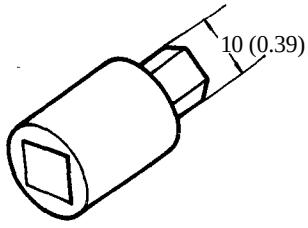
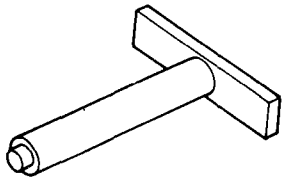
# TROUBLE DIAGNOSES AND CORRECTIONS

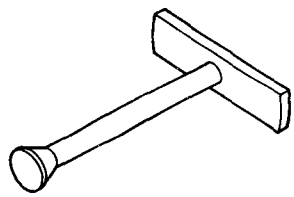
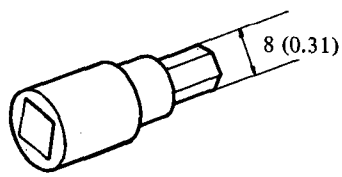
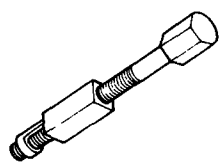
| Condition | Probable cause | Corrective action |
|---|---|---|
| Noise from compressor | Broken delivery valve. | Replace cylinder head. |
| | Broken suction valve. | Replace suction valve plate. |
| | Worn shoe disc. | Replace cylinder assembly. |
| | Oil level high. | Adjust oil level. |
| | Broken radial bearing. | Replace cylinder assembly. |
| | Broken thrust bearing. | Replace cylinder assembly. |
| | Contact between pulley and clutch hub. | Adjust clearance. |
| | Loose bracket bolt, cracked or broken bracket. | Tighten bolt or replace bracket. |
| Rough rotation. (can be sensed by hand) | | |
| Roughness. | Broken radial bearing. | Replace cylinder assembly. |
| Seizure | Worn shaft, bearing fault. | Replace cylinder assembly. |
| Erratic operation | Lack of lubrication. | Check and add oil or replace cylinder assembly. |
| Compressor locked. | Broken piston. | Replace cylinder assembly. |
| | Burned shoe disc. | Replace cylinder assembly. |
| Hot compressor. | Ruptured oil pipe O-ring, | Replace O-ring. |
| | Broken delivery valve. | Replace cylinder head. |
| | Ruptured gasket. | Replace. |
| Compressor gas leakage. | Gas leaking from magnetic clutch mounting. | Replace shaft seal and shaft seal seat. |
| | Gas leaking from check valve. | Replace discharge valve or rear end cover. |
| | Gas leaking between end cover (R) and shell. | Replace O-ring. |
| | Gas leaking between end cover (F) and shell. | Replace front end cover gasket. |
| Compressor clutch does not operate. | Open coil or leads. | Replace compressor clutch or leads. |
| | Poor terminal contact. | Clean dirt from terminals, etc. |

# SPECIAL SERVICE TOOLS

| No. | Tool number & tool name | Description | For use on | Reference page or Figure No. |
|---|---|---|---|---|
| 1. | KV99412302<br>Clutch hub wrench | This tool is used to hold clutch hub.<br><br>SE353 | S30<br>610<br>710 | Fig. AC-72 |
| 2. | KV99412305<br>Hub nut socket | This tool is used to remove clutch hub nut.<br><br>SE354 | S30<br>610<br>710 | Fig. AC-72 |
| 3. | KV99412306<br>Clutch hub puller | This tool is used to remove clutch hub.<br><br>SE355 | S30<br>610<br>710 | Fig. AC-73 |
| 4. | KV99412310<br>Lock nut socket | This tool is used to loosen lock nut.<br><br>SE356 | S30<br>610<br>710 | Fig. AC-75 |

| No. | Tool number & tool name | Description | For use on | Reference page or Figure No. |
|---|---|---|---|---|
| 5. | KV99412313<br>Puller adapter | These tools are used when removing pulley and bearing assembly.<br><br>SE357 | S30<br>610<br>710 | Page AC-66 |
| 6. | KV99412312<br>Puller pilot | <br>SE358 | S30<br>610<br>710 | |
| 7. | KV99412320<br>Shaft seal seat puller | This tool is used to remove shaft seal seat.<br><br>SE359 | S30<br>610<br>710 | Fig. AC-81 |
| 8. | KV99412321<br>Shaft seal remover and installer | This tool is used to remove or to install shaft seal.<br><br>SE360 | S30<br>610<br>710 | Fig. AC-82 |

| No. | Tool number & tool name | Description Unit: mm (in) | For use on | Reference page or Figure No. |
|---|---|---|---|---|
| 9. | **KV99412322**<br>**Shaft seal pilot** | **This tool is used when installing shaft seal so as not to damage it.**<br><br>SE361 | **S30**<br>610<br>**710** | Page AC-68 |
| 10. | **KV99412329**<br>**Shaft handle socket** | **This tool is used to turn the shaft of compressor.**<br><br>SE362 | S30<br>610<br>**710** | Page AC-68 |
| 11. | **KV99412324**<br>**Allen socket** | **This tool is used to remove discharge valve.**<br><br>SE363 | **S30**<br>610<br>**710** | **Fig. AC-88** |
| 12. | **KV99412327**<br>**Silencer piece installer** | This tool is used to install silencer piece.<br><br>**SE364** | S30<br>610<br>710 | Page AC-69 |

| No. | Tool number & tool name | Description<br>Unit: mm (in) | For use on | Reference page or Figure No. |
|---|---|---|---|---|
| 13. | **KV99412328**<br>**O-ring installer** | This tool is used to install silencer piece O-ring.<br><br>SE365 | **S30**<br>**610**<br>**710** | Page AC-69 |
| 14. | **KV99412330**<br>**Allen socket** | **This tool is used to remove rear end cover.**<br><br>SE366 | **S30**<br>**610**<br>**710** | Fig. AC-91 |
| 15. | **KV99412315**<br>**Cylinder head remover** | **This tool is used to remove cylinder head.**<br><br>SE367 | **S30**<br>**610**<br>710 | Fig. AC-94 |