

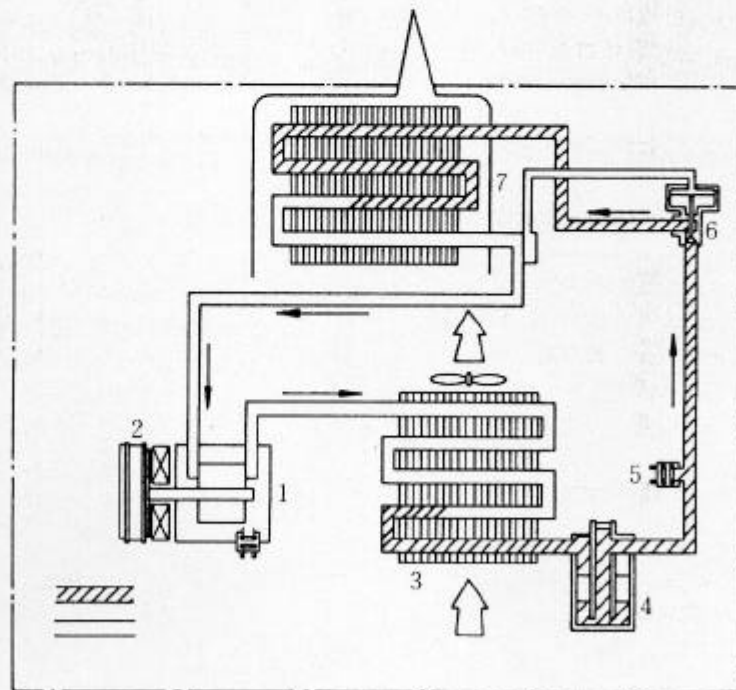
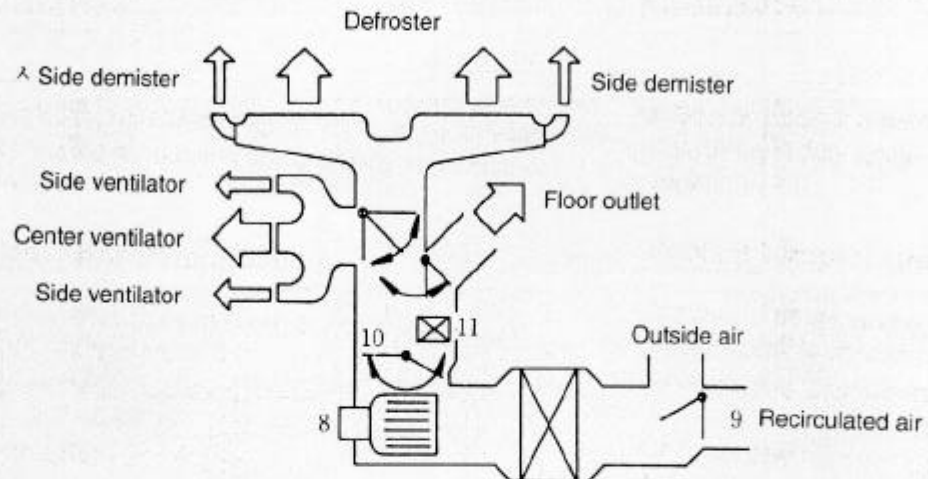
## SECTION 9B

**AIR CONDITIONER**

<b>GENERAL DESCRIPTION .....</b>	<b>9B — 340</b>
Function of Each Control Component .....	9B — 341
Wiring Diagram .....	9B — 343
<b>TROUBLESHOOTING .....</b>	<b>9B — 344</b>
<b>ON-CAR SERVICE .....</b>	<b>9B — 348</b>
Wiring Check .....	9B — 348
Conduit Check .....	9B — 348
Refrigerant Check .....	9B — 349
Checking Through Sight Glass .....	9B — 349
Bleeding Air and Charging Refrigerant .....	9B — 350
Adjustment of Air Conditioner Idle up .....	9B — 353
Cooling Performance Test .....	9B — 353

## GENERAL DESCRIPTION

This section describes the functions of major components of air conditioner equipped on this car.



- |                    |                          |
|--------------------|--------------------------|
| 1. Compressor      | 6. Expansion valve       |
| 2. Magnetic clutch | 7. Evaporator            |
| 3. Condenser       | 8. Blower motor          |
| 4. Receiver dryer  | 9. Mode control damper   |
| 5. Dual cut switch | 10. Temp. control damper |
|                    | 11. Heater core          |

FIG. 9B — 1

## FUNCTION OF EACH CONTROL COMPONENT

### Relay

A relay to operate the cooling fan motor. The motor works continuously as long as the air conditioner (compressor) is under operation.

### Magnetic Clutch

A device, which transmit engine torque to compressor. It is controlled by coolant thermo switch and dual cut switch.

### Coolant Temperature Gauge

The resistance varies with every change of temperature. If the engine coolant temperature exceeds  $110^{\circ}\text{C}$ , the cooling stops (Magnetic clutch is OFF).

### Compressor

Compressor may supply two major functions. One is to change the low pressure refrigerant vaporized gas into high pressure/ high temperature vapour gas by compressing in the evaporator and another is to circulate the refrigerant (or compressor oil) into A/C system.

### Condenser

It is installed at the front of the radiator and consists of refrigerant flow tube and radiated cooling fan. It serves to change the compressor compressed, high-temperature/high pressure-obtained refrigerant gas into liquid refrigerant.

### Receiver Dryer

Receiver dryer has the three roles

- The receiver section serves as a temporary storage tank of condenser-liquefied refrigerant and stores condenser-liquefied refrigerant as the change of the cooling load.
- The dryer serves to remove the dirt and water mixed in the cycling refrigerant by means of the filter and desiccant sealed therein.
- The sight glass, installed on the top of receiver, serves to look at there by the flowing state of the refrigerant.

### Dual Cut Switch

A control switch to stop the compressor operation when the cycling refrigerant is dropped in pressure due to its leakage, lack of refrigerant or has reached too high a level.

### Expansion Valve

This is a device to eject the receiver/dryer-passed liquid refrigerant from fine holes for adiabatic expansion to produce atomized refrigerant of low pressure and low temperature.

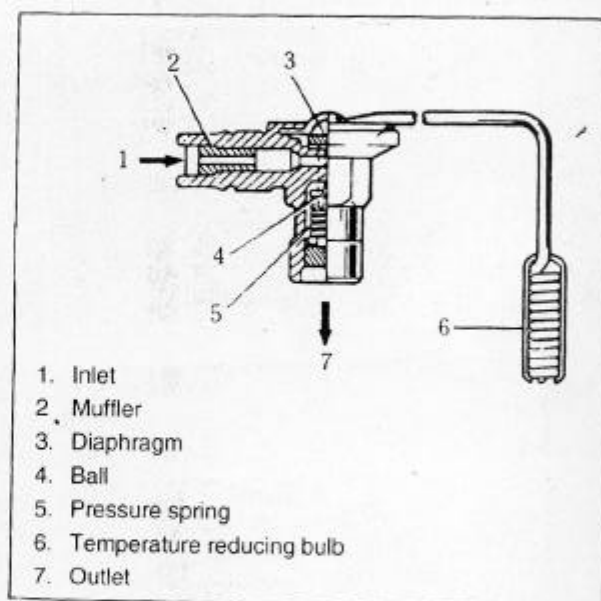


FIG. 9B — 2

### Evaporator

Evaporator is a device which applies the latent heat of vaporization to refrigerant to lower the air temperature. High-pressure liquid refrigerant flows through the expansion valve to evaporator.

Heated air passes through the evaporator core and its temperature is lowered. If the warm air adjacent to the evaporator core is cooled, the water in air is condensed and a bubble is produced on the evaporator core surface.

### **Evaporator Thermistor**

A semiconductor which resistance is remarkably changed as the change of temperature.

When the evaporative temperature of a refrigerant drops to 0℃ and below, the evaporator cores get stuck with frost or ice, reducing the airflow, lowering the cooling capacity.

The thermistor is a sensor which is used to prevent from frosting or icing.

The thermistor is installed on evaporator.

### **Idle up System**

This system is used to prevent engine from stopping when the engine idling speed increase and air conditioner works(at A/C switch and compressor clutch "ON").

## WIRING DIAGRAM

- |                                       |                                     |
|---------------------------------------|-------------------------------------|
| E18. Blower switch light              | S18. Cooling fan temperature switch |
| E19. Air conditioner switch light     | S19. Blower switch                  |
| K3. Radiator motor fan relay          | S20. Dual cut switch                |
| M6. Radiator fan motor                | S21. Air conditioner switch         |
| M7. Blower motor                      | V1. Diode                           |
| P5. Air conditioner temperature gauge | Y4. Compressor                      |
| P6. Evaporator thermistor             | Y5. V.S.V(Vacuum switch valve)      |
| R3. Series resistance                 |                                     |

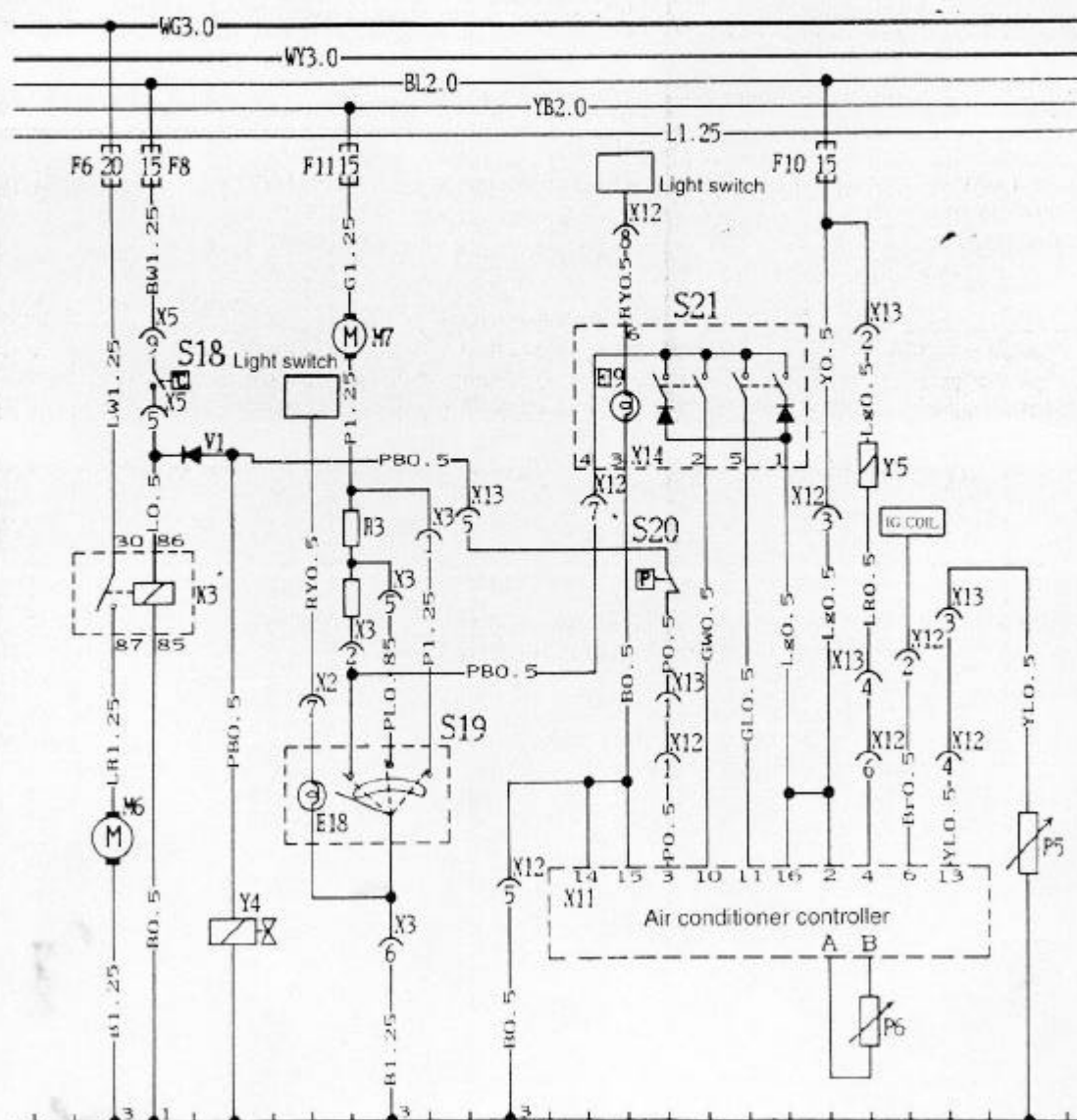
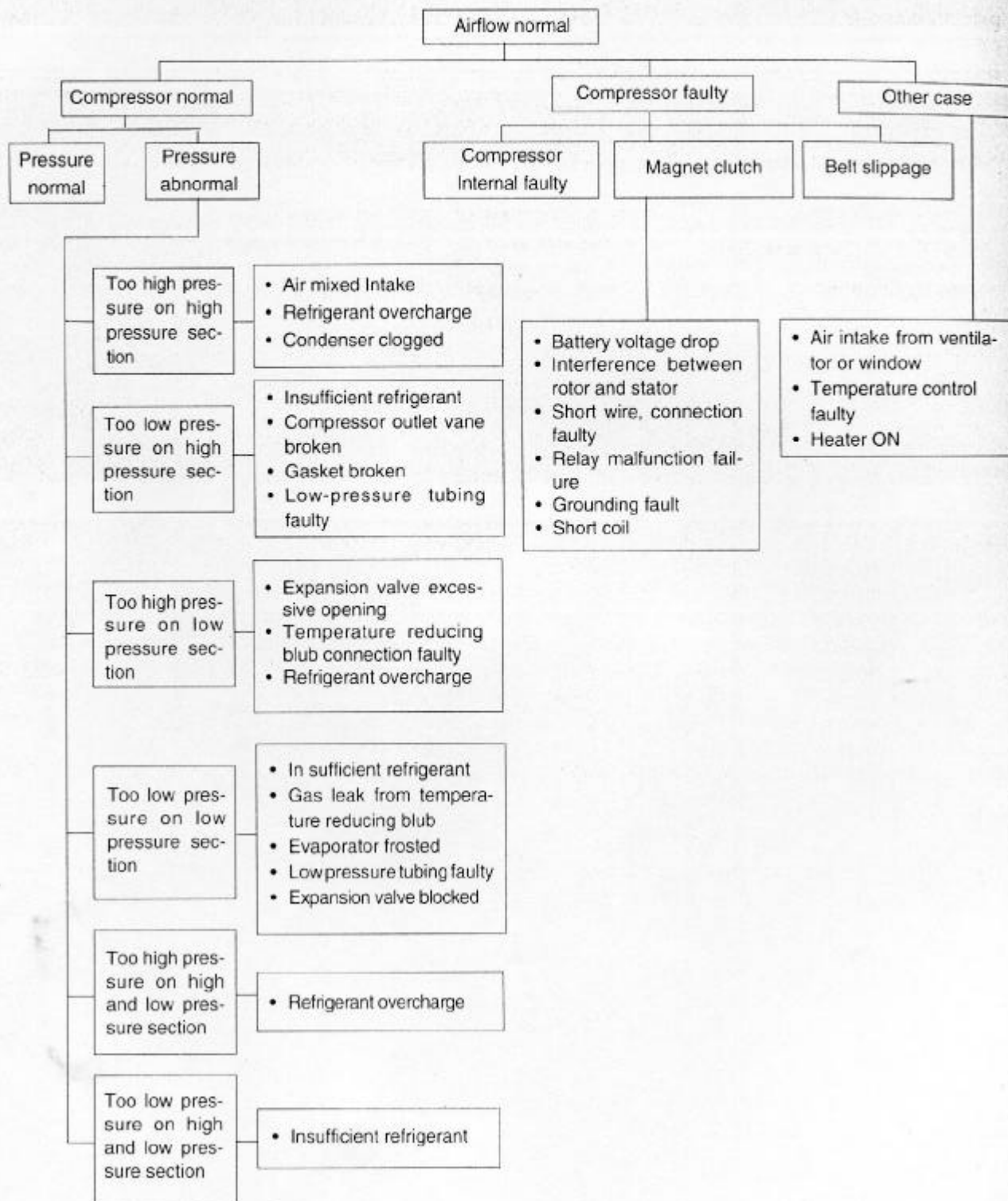


FIG. 9B — 3 AIR CONDITIONER WIRING DIAGRAM

## TROUBLESHOOTING

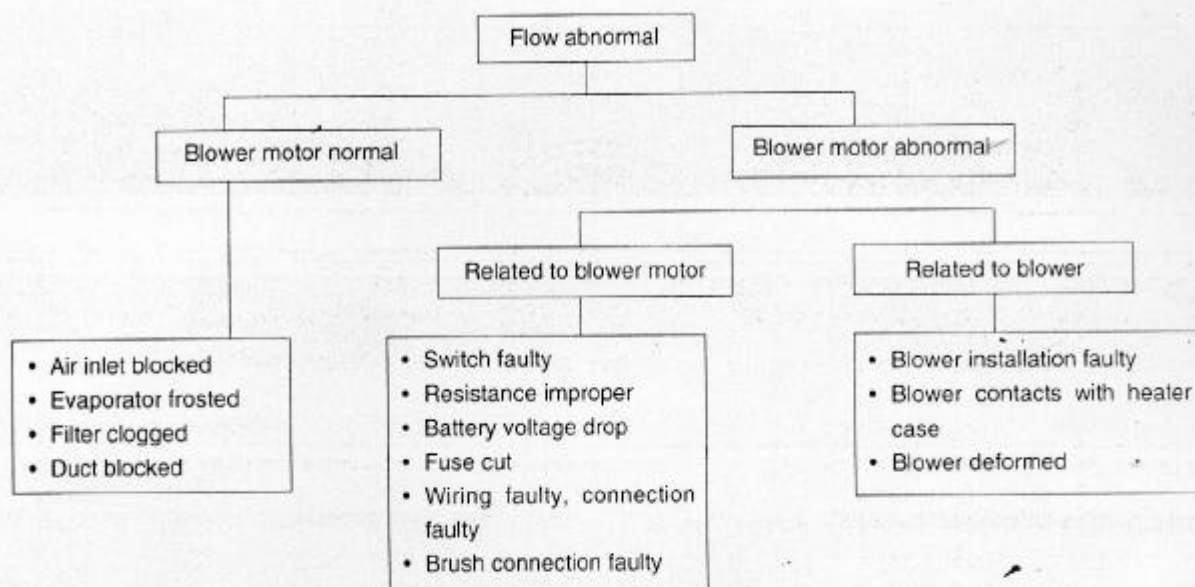
## FLOW CHART(NO COOLING)

## 1. Normal airflow





## 2. Flow Quantity Abnormal



## Troubleshooting Method by Observing Instrument System

### When normal

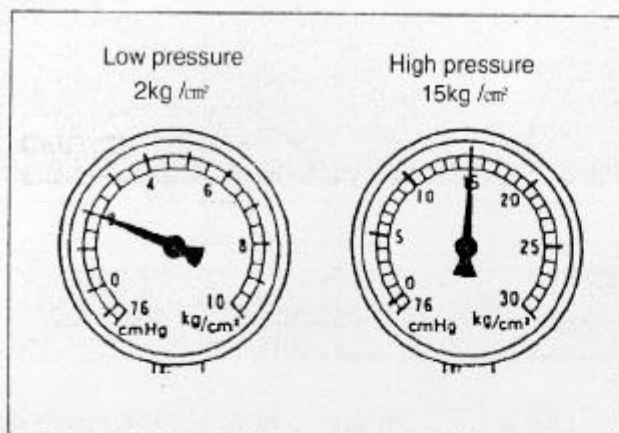


FIG. 9B — 5 WHEN NORMAL

### When insufficient charge of refrigerant

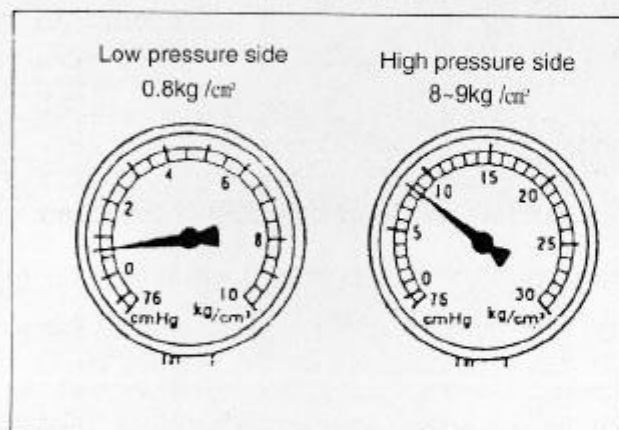
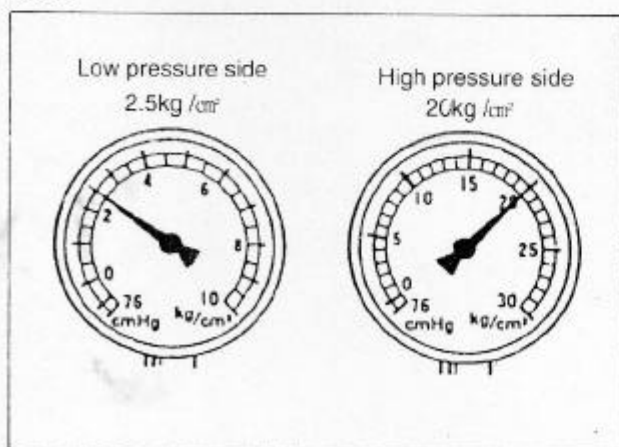


FIG. 9B — 6 WHEN INSUFFICIENT CHARGE

### When refrigerant overcharged, condenser cooling insufficient

FIG. 9B — 7 WHEN REFRIGERANT OVERCHARGED,  
CONDENSER COOLING INSUFFICIENT

When the refrigerant cycle is normal (conditions that the A/C outlet temperature is 25°C~35°C, idle up revolution (1000 rpm), fan switch is on "STRONG" control lever is on "COOL", and the external air temperature is about 30°C) gauge pointer indicates approximately 1.5~2.0 kg/cm<sup>2</sup> at low pressure side, 14.5~15.0 kg/cm<sup>2</sup> at high pressure side.

### CAUTION

A troubleshooting shown in below is a indication in above conditions.

Condition	Probable Cause	Correction
Both low and high pressure side indication are low	<ul style="list-style-type: none"> <li>Gas leakage is in system</li> <li>Bubbles are observed in sight glass</li> <li>Outlet air is cold</li> </ul>	<ul style="list-style-type: none"> <li>Check for leak and repair</li> <li>Fill up refrigerant</li> </ul>

Condition	Probable Cause	Correction
Both low and high pressure side indication are too much high	<ul style="list-style-type: none"> <li>Cooling faulty due to over-charge</li> <li>Condenser cooling faulty</li> <li>Condenser fan malfunction</li> </ul>	<ul style="list-style-type: none"> <li>Adjust refrigerant to a specified amount</li> <li>Clean condenser</li> <li>Repair condenser fan</li> </ul>



Expansion valve failure (too much open), temperature reducing bulb installation faulty, air in cycle.

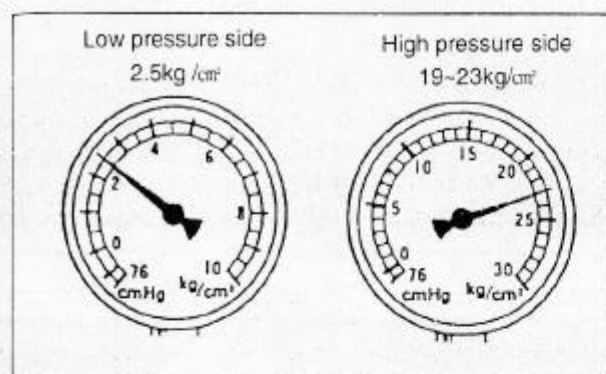


FIG. 9B — 8 WHEN EXPANSION VALVE FAILURE, AIR IN SYSTEM

Moisture in cycle

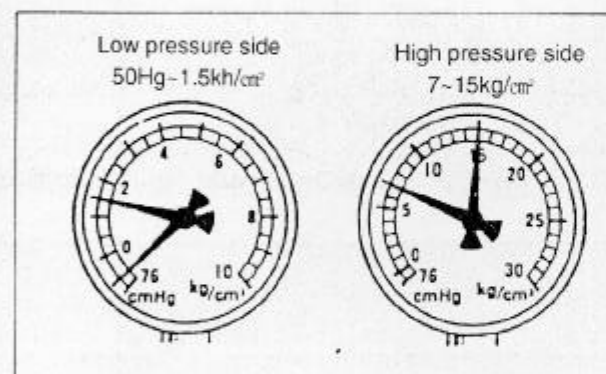


FIG. 9B — 9 MOISTURE IN CYCLE

Refrigerant is not cycling.

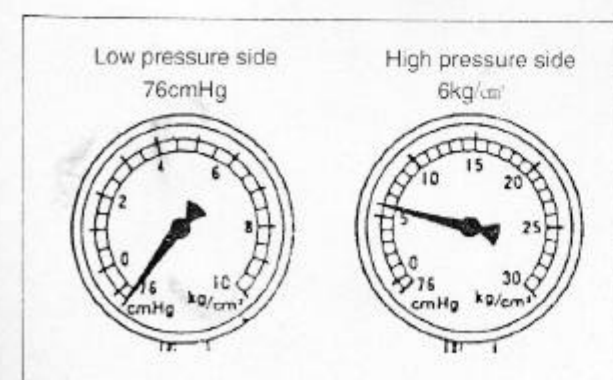


FIG. 9B — 10 WHEN REFRIGERANT IS NOT CYCLING

Condition	Probable Cause	Correction
<ul style="list-style-type: none"> <li>Both low and high pressure side indication is too much high</li> <li>Large amount of frost or dew on low pressure tubing</li> </ul>	<ul style="list-style-type: none"> <li>Expansion valve failure or temp. reducing bulb installation faulty</li> <li>Flow is not controlled</li> </ul>	<ul style="list-style-type: none"> <li>Identify temp. reducing bulb installation</li> </ul>
<ul style="list-style-type: none"> <li>Both low and high pressure side indication is too much High</li> <li>When touch the low pressure tubing with the hand, no cold is felt.</li> </ul>	<ul style="list-style-type: none"> <li>Air in system</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Receiver dryer</li> </ul>

Condition	Probable Cause	Correction
<ul style="list-style-type: none"> <li>During running low pressure side indication is negative or normal</li> </ul>	<ul style="list-style-type: none"> <li>Mixed moisture is frozen in the expansion valve and stopped temporary</li> </ul>	<ul style="list-style-type: none"> <li>Replace the receiver dryer and carry out vacuum procedure exactly</li> </ul>

Condition	Probable Cause	Correction
<ul style="list-style-type: none"> <li>Low side indicates negative and high side indicates low</li> </ul>	<ul style="list-style-type: none"> <li>Dust and moisture is fixed or frozen in the expansion valve to interrupt refrigerant flowing</li> </ul>	<ul style="list-style-type: none"> <li>Replace receiver dryer, and expansion valve</li> </ul>
<ul style="list-style-type: none"> <li>Frost or dew is fixed in the receiver or front and rear tubing of expansion valve</li> </ul>		<ul style="list-style-type: none"> <li>If temp. reducing bulb is in faulty replace the expansion valve</li> </ul>

## ON-CAR SERVICE

## WIRING CHECK

1. Disconnect battery  $\ominus$  terminal.
2. Connect wiring harness connectors securely.
3. When routing a wiring harness through a panel hole, previously insert a rubber bushing into the hole for its protection.
4. Use a vinyl tape or original clamps to connect air conditioner wiring harness to main wiring harness.
5. If original harness has been disconnected or removed while return it to a proper position.
6. During their installation, be careful not to pinch.
7. When adding lead wires to wiring harness by soldering, use those lead wires which share the same diameter and tape each connection.
8. Keep wiring harness way from any components moving or subjected to high temperature.
9. Keep coupler position away from fuel lines.
10. Make sure that wire harness makes no contact to a sharp edge or corner.

## CONDUIT CHECK

1. Never use heat for bending pipes.
2. Keep internal parts of air conditioner free from moisture or dust when disconnecting any line from system, install plug immediately.
3. When connecting hoses or pipes, apply air conditioner oil to O-ring.

4. When tightening or loosening a fastener, use recommended open spanner.
5. Take the best possible care to receiver dryer direction, Initial torque by hand.
6. Torque nuts according to as shown in below.

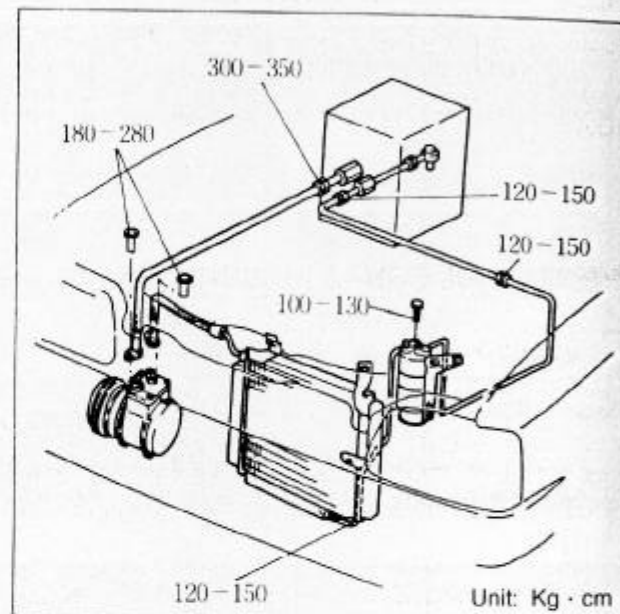


FIG. 9B — 11

7. Install drain hose so that drained water from evaporator does not make any contact to car inside components.

## REFRIGERANT CHECK

Check system if refrigerant is charged properly in the A/C system as followings.

1. Operate engine to idling rpm(1000 rpm) to operate air conditioner for a few minutes.
2. Observe receiver/dryer sight glass.

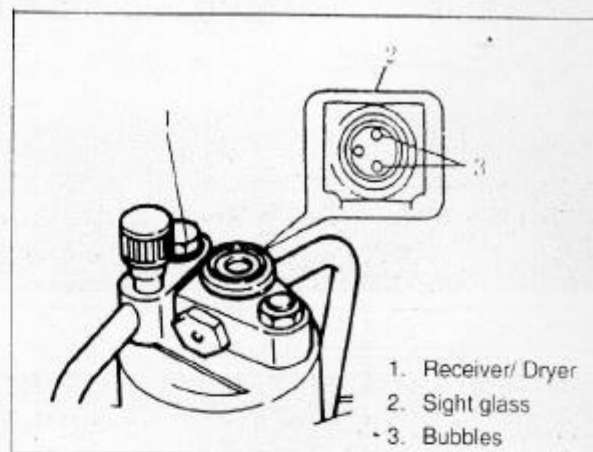
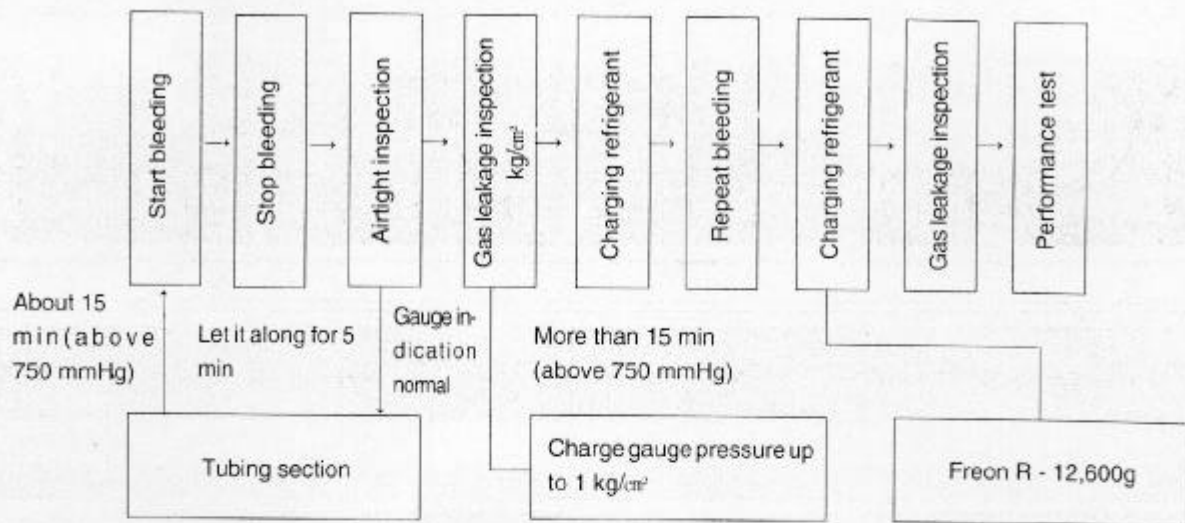


FIG. 9B — 12 SIGHT GLASS

## CHECKING THROUGH SIGHT GLASS

Item No	Condition	Probable Cause	Correction
1	Bubbles observed in sight glass	Insufficient charge of refrigerant	Check system for leaks with a leak
2	No bubbles observed in sight glass	Insufficient charge of refrigerant	Refer to the item 3
3	No temperature difference between compressor inlet and outlet	Empty system	Evacuate and recharge system and then check it for leaks with a leak tester.
4	Noticeable temperature difference between compressor inlet and outlet	Proper or too much charge of refrigerant	Refer to the item 5
5	When air conditioner is turned OFF, refrigerant in sight glass clarifies immediately	Refrigerant overcharge	Discharge excess charge of refrigerant to adjust it to a specified charge
6	When air conditioner is turned OFF, refrigerant in sight glass once produces bubbles and then clarifies	Proper charge of refrigerant	No correction needed

## BLEEDING AIR AND CHARGING REFRIGERANT



1. Bleed air for 15 minutes using vacuum pump.

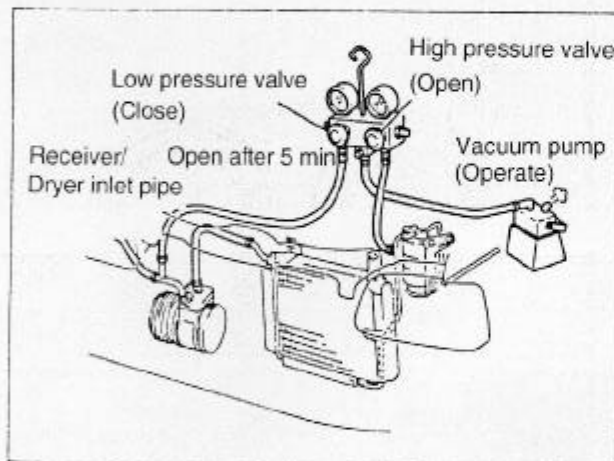


FIG. 9B — 13 BLEEDING AIR

3. Airtight check about five minutes after.

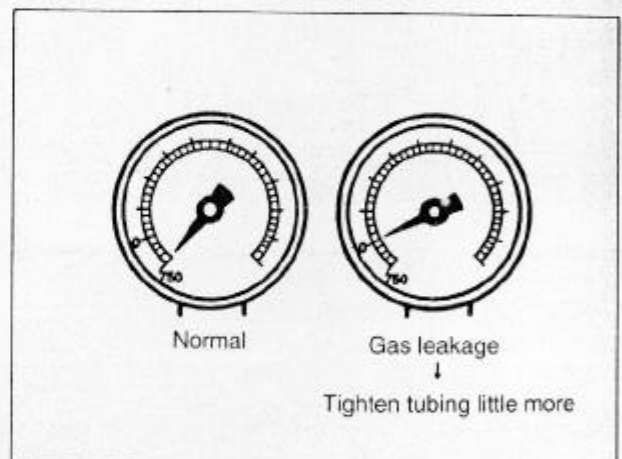


FIG. 9B — 15 TIGHTEN TUBING LITTLE MORE

2. Turn off the low and high valve of instrument system and stop vacuum pump.

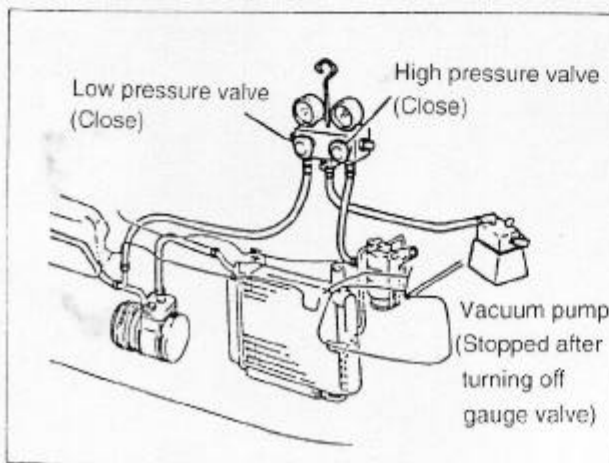


FIG. 9B — 14 STOPPED AFTER TURNING OFF GAUGE VALVE

4. Bleed air charging hose before charging refrigerant.

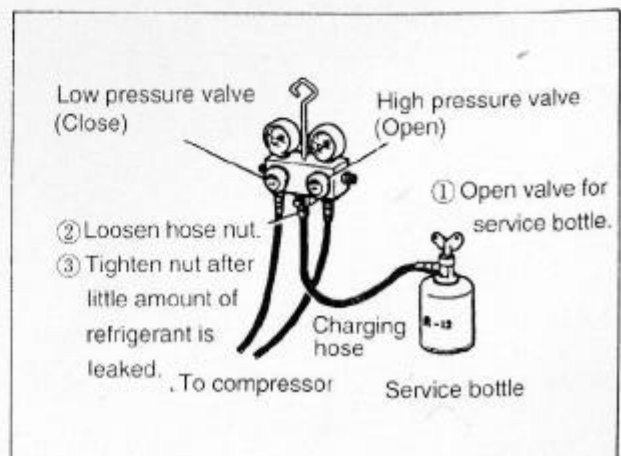


FIG. 9B — 16 BLEEDING CHARGING HOSE



## 5. Temporary charging refrigerant

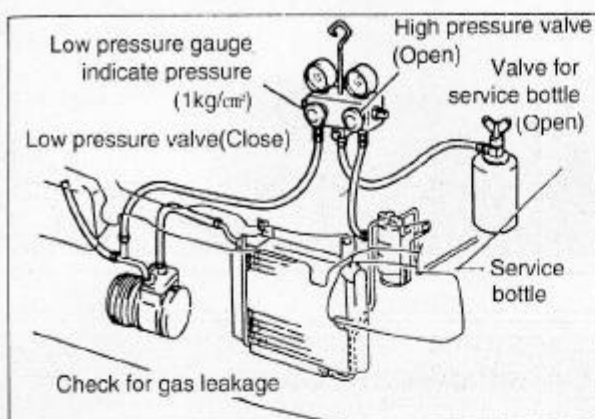


FIG. 9B — 17 TEMPORARY CHARGING

## 8. Begin to real charge from the high pressure-side.

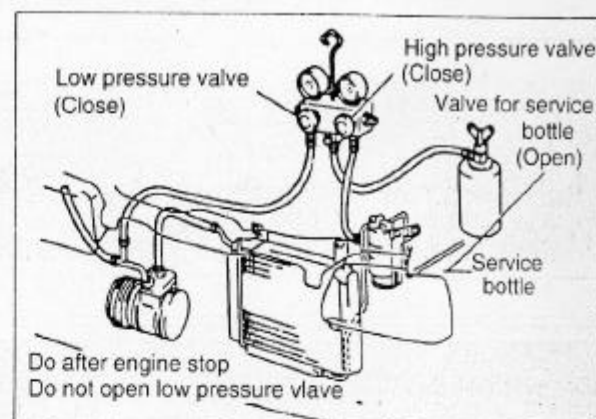


FIG. 9B — 20 CHARGING REFRIGERANT

## 6. Air bleeding for more than 15 minutes.

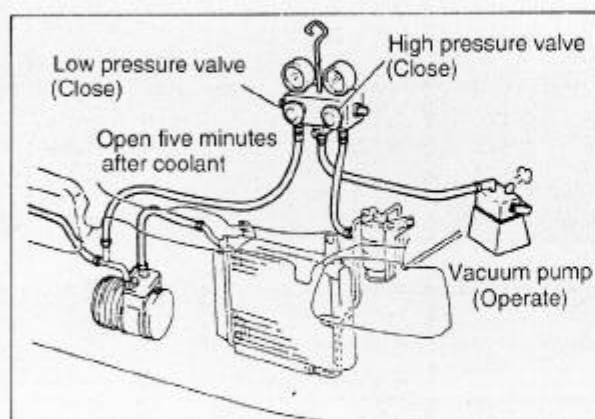


FIG. 9B — 18 REPITATION VACUUMING

## 9. Preparation for refrigerant real charge.

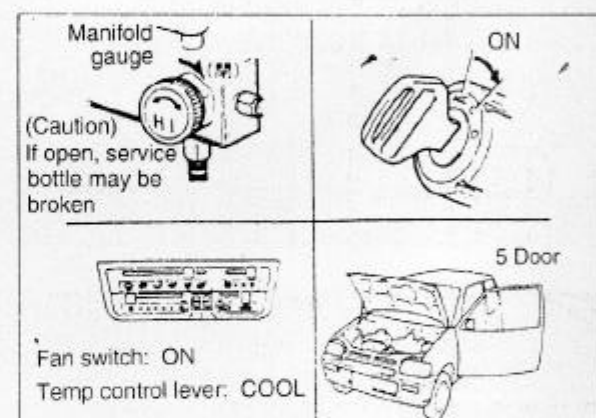


FIG. 9B — 21 REFRIGERANT REAL CHARGE

## 7. Bleed air in charging hose before charging refrigerant.

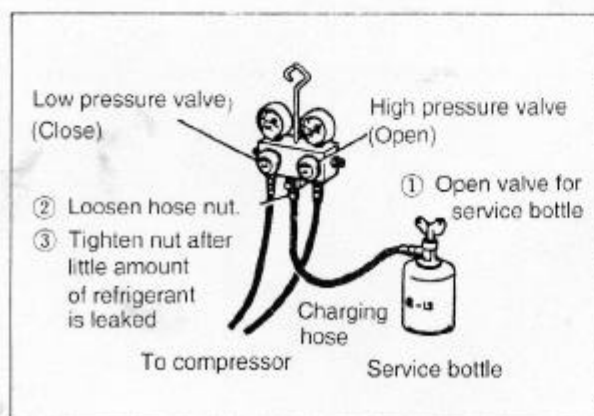


FIG. 9B — 19 BLEEDING CHARGING HOSE

## 10. Begin to real charge from the low pressure-side and operate compressor until about 500g refrigerant is charged and then turn off valve.

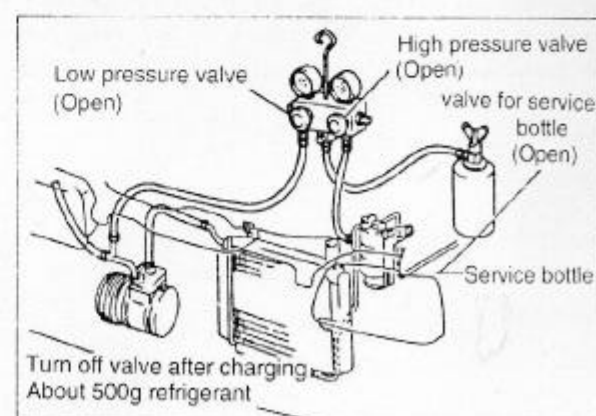


FIG. 9B — 22 REFRIGERANT CHARGING

## 11. Charging level inspection

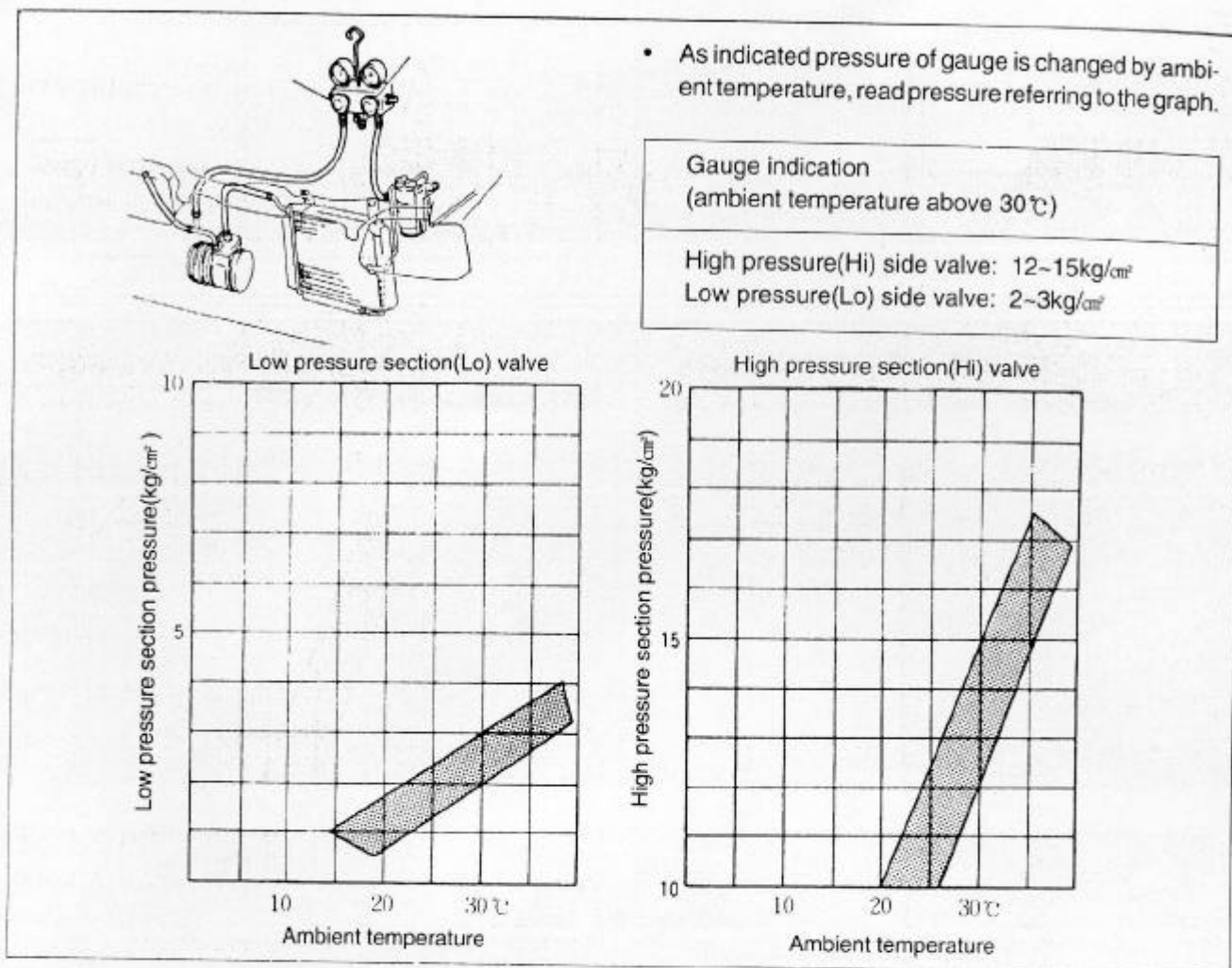


FIG. 9B — 23 RELATIONS BETWEEN AMBIENT TEMPERATURE AND PRESSURE

**Precaution for Charging System with Refrigerant**

1. When new gas is going to be serviced after installing the A/C.
  - Bleed air from high pressure section for five minutes and then from both high and low pressure section.
  - When the gas should be serviced with compressor operating do it from low temperature section.
2. When refilling gas
  - When bleeding gas make sure not to spill oil from the high pressure section.
  - ※ Caution: If large quantity of refrigerant is spilled, compressor may be damaged, therefore extreme care must be paid(use recommended oil when adding refrigerant).
3. Other cautions
  - Because the special liquid is used as a refrigerant, do not use those that are not specified.
  - Abnormal noise "Rattling" is heard for few seconds at the compressor just after refrigerant driving, but it is normal condition(Especially, when insert the refrigerant or when ambient temperature is low).
  - Receiver/dryer sight glass may appear white, but it is normal condition.



## ADJUSTMENT OF AIR CONDITIONER IDLE UP

1. A/C switch : ON, Fan switch : HIGH

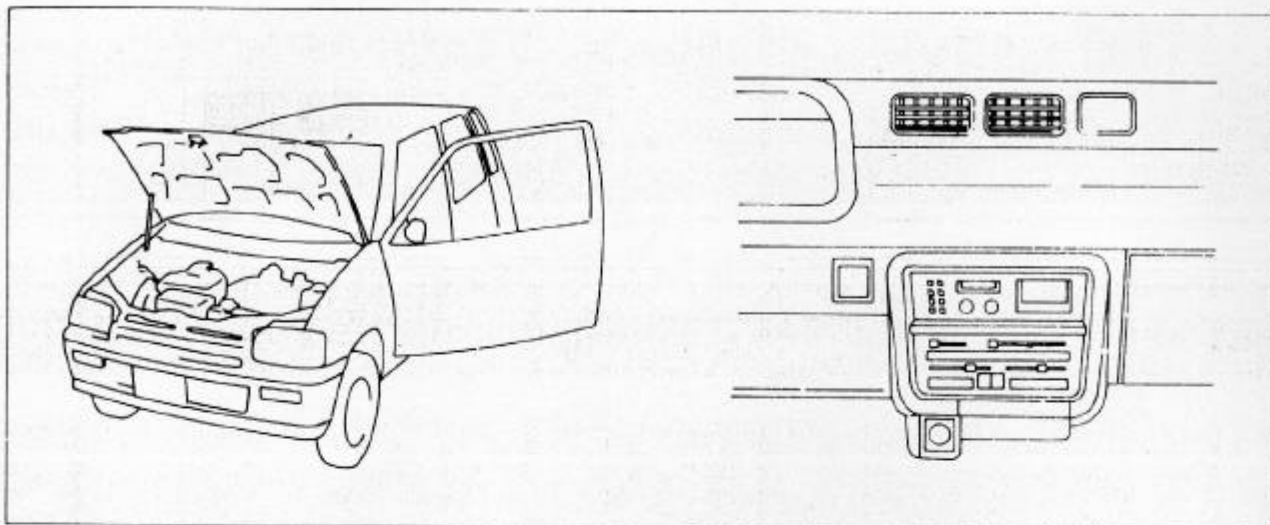


FIG. 9B — 24 IDLE UP ADJUSTMENT

2. Idle screw adjustment

Item	Engine revolution(rpm)
Air conditioner OFF	$950 \pm 50$
Air conditioner ON	$1000 \pm 50$

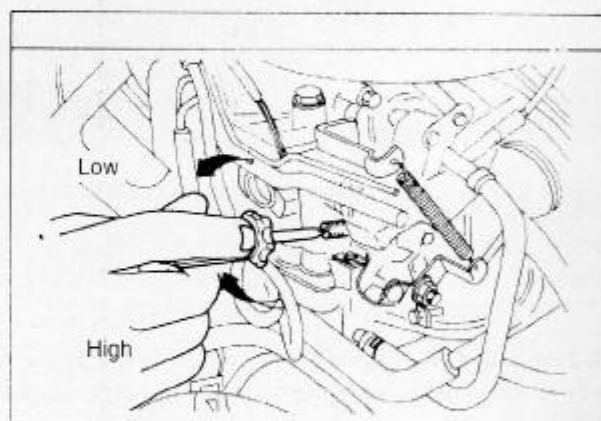


FIG. 9B — 25 IDLE SCREW ADJUSTMENT

## COOLING PERFORMANCE TEST

Performance test preparation, A/C switch : ON, Fan switch : HIGH

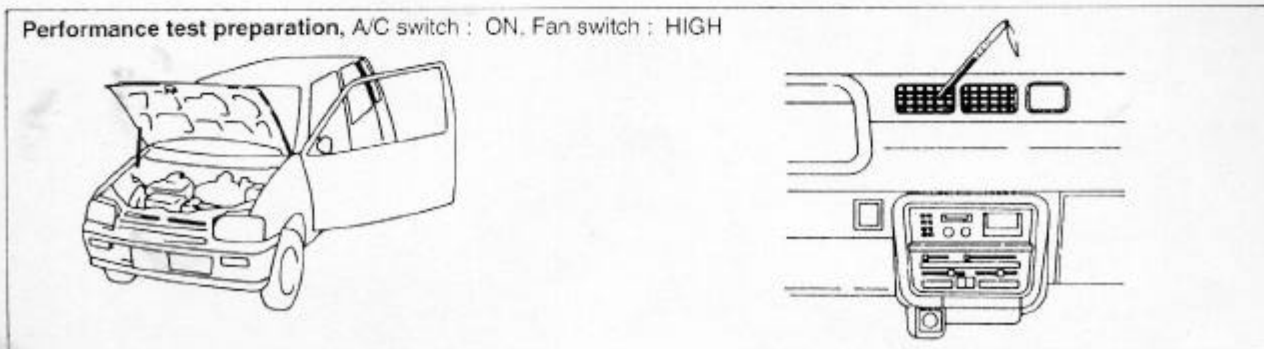


FIG. 9B — 26 COOLING PERFORMANCE TEST

## Center Duct Inlet and Outlet Temperature Range

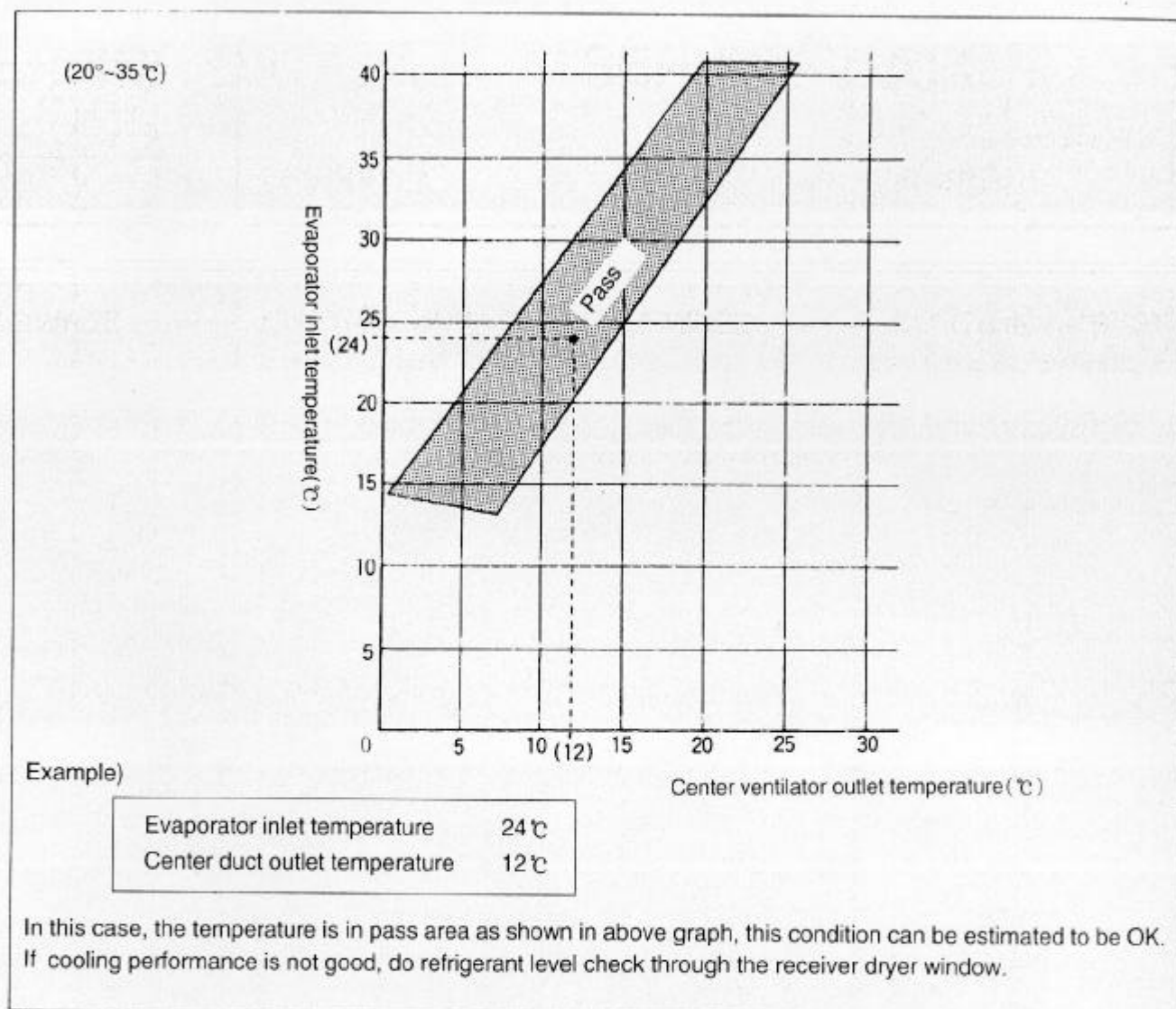


FIG. 9B — 27