FOREWORD

This manual has been published for guidance of servicemen on repairing the automotive air conditioner and maintaining it in best performance.

It contains the general description and construction with all up-to-date informations at the time of this publication.

As for compressor repair, please refer to the booklet "AIR CONDITIONING COMPRESSOR REPAIR MANUAL : TYPE CC2M & CC6DA" we issued.

It is recommended that this repair manual should be kept readily available for reference at all times. Also this may be used for the training of your servicemen in regards to the special features, function, operation and maintenance of the air conditioner for TOYOTA LAND CRUISER (FJ55L, FJ55) Series.

We reserve the right to change the specifications and data without further notice.

TABLE OF CONTENTS

1. THE PRINCIPLE OF THE AIR CONDITIONER

1. THE PURPOSE OF THE AIR CONDITIONER

The purpose of automative air conditioner is to maintain the passenger compartment more comfortable for driver and passengers. Well, what is comfortable circumstances for men? The main factors that affect human body heat are temperature, humidity and air movement. The automotive air conditioner make it possible to change the condition of the air in the car by controlling above factors.

2. EVAPORATION AND LIQUEFACTION

It is well known that liquid changes into gas when it is heated. Conversely, gas changes into liquid when it is cooled down. Therefore, we can change the phase of material by means of controlling the temperature. This evaporation or liquefaction is also affected by pressure.

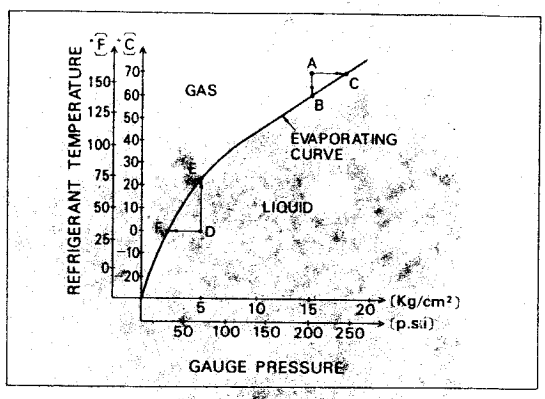


Fig. 1

Fig. 1 shows the saturating vapor pressure curve of R-12 which expresses the relation between temperature and pressure, when R-12 exists in both liquid and gaseous state in the air tight container. R-12 is the refrigerant which is generally used for automotive air conditioner.

The graph enable to determine the state of the refrigerant with temperature and pressure of R-12. In the graph, the upper part of the curve shows R-12 in gaseous state and the lower part in liquid state. The curve itself indicates the boiling point of R-12.

Gaseous R-12 can be converted to liquid by increasing pressure at constant temperature, or by lowering temperature at constant pressure.

(In the graph, point "A" to "B", or "A" to "C".)

Conversely, liquid R-12 can be converted to gas by descreasing pressure at constant temperature, or by raising temperature at constant pressure.

(In the graph, point "D" to "E", or "D" to "F")

3. LATENT HEAT

We feel cool when we wet our skin with alcohol. This is caused that alcohl absorbs body heat from our skin when it evaporates.

When material changes into gas from liquid, it absorbs heat from surroundings. This heat is called latent heat.

Latent heat is the term applied to heat that is needed to cause a change of material state.

Every materials have three states—solid, liquid and gas.

When material state is changed, large heat is absorbed from surroundings or released to surroundings. For example, water at an atmospheric pressure boils at 212°F (100°C).

In this case when 1 lb (1kg) water changes into steam, 970 BTU (539Kcal) of heat is absorbed from surrounding air. This is refered to as the latent heat of vaporization.

Conversely, steam at 212°F (100°C) will give up 970 BTU (539 Kcal) of heat per 1 lb (1kg) at it condenses into water. The heat released in this process is refered to as the latent heat of condensation.

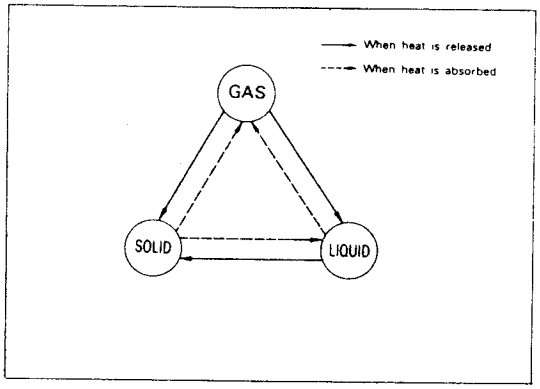


Fig. 2

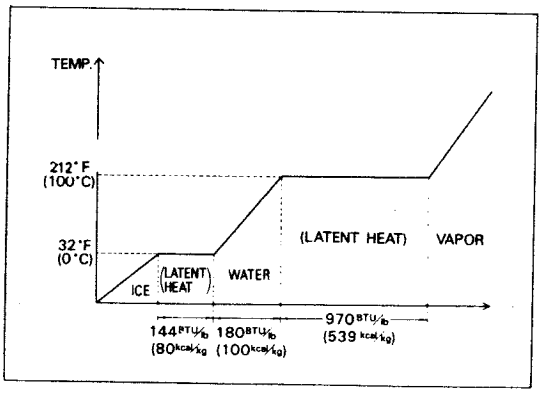


Fig. 3

4. REFRIGERATION CYCLE

The basic chart of air conditioning system is shown in Fig. 4.

The compressor makes gaseous refrigerant high pressure, high temperature, and compressed gaseous refrigerant changes into liquid by being cooled down till point of liquefaction in the condenser. At this time, large heat is released to the outside. Then, high pressure liquefied refrigerant suddenly expands into the evaporator tube from the expansion valve.

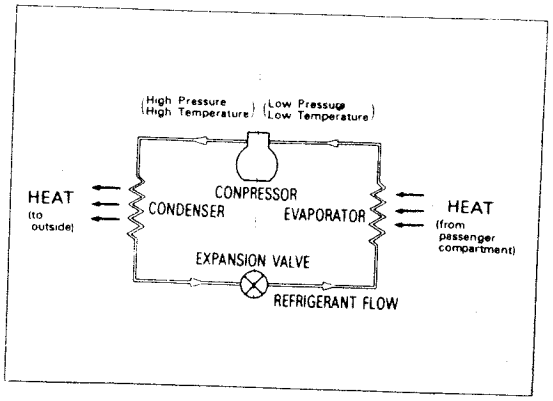


Fig. 4

By this expansion, refrigerant evaporates and it absorbs large heat through the evaporator fins from outside. Above description is the basic principle of general air conditioner.

Now, let's see the automotive air conditioner.

The schematic chart of automotive refrigeration cycle is shown in Fig. 5. The compressor pumps heat-laden gaseous from the evaporator. It compresses the gaseous refrigerant and send it under high pressure to the condenser.

Since the high pressure vapor delivered to the condenser is much hotter than the surrounding air, it gives up its heat to the outside through the condenser fins. As the refrigerant vapor dissipates its heat, it changes into liquid. The condensed liquid refrigerant is filtered, dried stored under high pressure in the receiver until it is needed by the evaporator.

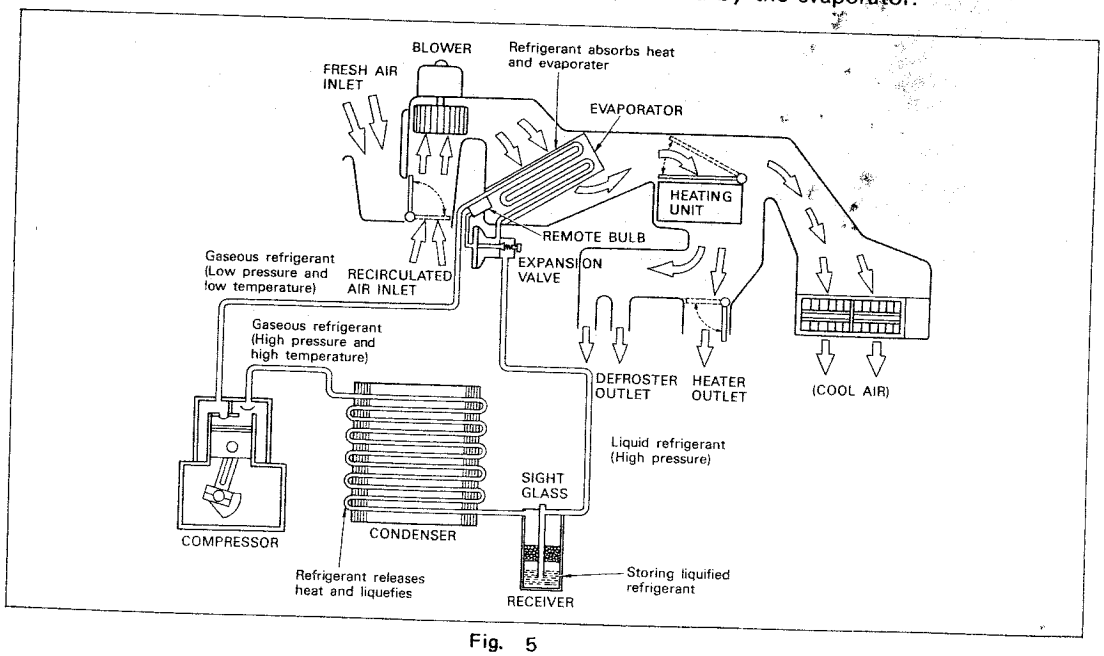


Fig. 5

Liquid refrigerant is metered from receiver into the evaporator by the thermostatic expansion valve which controls the flow of refrigerant in system. The pressure of the refrigerant is lowered by the expansion valve and begins to boil, or change to a vapor.

In so doing refrigerant absorbs heat from warm air in the passenger compartment passing through the evaporator fins.

This heat will be transmitted, via compressor, to the condenser for dissipation.

5. REFRIGERANT (R-12)

In refrigeration system, the substance that absorbs and releases heat is called refrigerant. In automotive air conditioner, R-12 (CCl_2F_2) is used as refrigerant because of following merits.

1) Large latent heat of evaporation and easy liquefaction.
2) Chemical stability
3) Non-corrosive
4) Imcombustible and non-explosive
5) Non-poisonous
6) Scentless
7) Harmless to clothing and food

Now, let's see the saturating vapor pressure curve of R-12 again. (See Fig. 6)

R-12 boils at -29.8°C (-21.6°F) in an atmospheric pressure, and under a pressure of 2 kg/cm² (28.4 p.s.i.), it boils at 0°C (32°F) which is evaporation temperature in the air conditioner. Gaseous R-12 can be converted to liquid by increasing pressure without changing temperature, or by lowering it to boiling point, in other words, dew point.

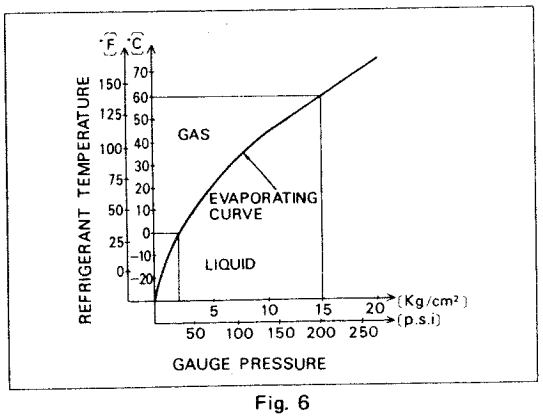


Fig. 6

In case of automotive air conditioner, the liquefaction of the refrigerant is carried out by raising the pressure and also by lowering the temperature, which are performed within the compressor and condenser, respectively.

For example, 15 kg/cm² (213 p.s.i.), 70°C (158°F) gas refrigerant compressed by the compressor can be liquified by lowering the temperature about 10°C (18°F).

※ SAFETY PRECAUTION

** If liquid refrigerant strikes your eye or skin, it can cause blindness or frostbite.*

** If a refrigerant container is heated, there is a danger of container explosion due to the build-up of refrigerant pressure.*

** If refrigerant is in direct contact with an open flame or heated metal, a poisonous gas will be created.*

6. REFRIGERATION OIL

Refrigeration oil is needed to lubricate the seals, bearings and other moving parts of the compressor.

A small amount of oil is circulated through the system with the refrigerant and is an aid in keeping the expansion valve in proper operating condition.

Refrigeration oil is highly refind mineral oil. Do not use allow the oil container to remain uncapped when not in use. Always be sure that the cap is in place and is tight.

Approved refrigeration oil ····· SUNISO NO. 4G or equivalent.

MEMO :

II. THE FUNCTION OF MAIN COMPONENTS

1. COMPRESSOR

The compressor is a pump designed to raise the pressure of the refrigerant. It is necessary that the compressor is of sufficient capacity to control the movement of refrigerant from the evaporator to the condenser. The compressor primarily circulates the refrigerant arround the system, but it must also increase the pressure of the refrigerant for a more efficient condensation process later in the cycle. The compressors which are used for LAND CRUISER (FJ55L, 55) are CC6DA type compressor (swash plate type) and CC2M type compressor (reciprocating type). Construction and functional parts of CC6DA and CC2M types compressors are shown in Fig. 7 and Fig. 8.

FJ55L MODEL **CC6DA TYPE**

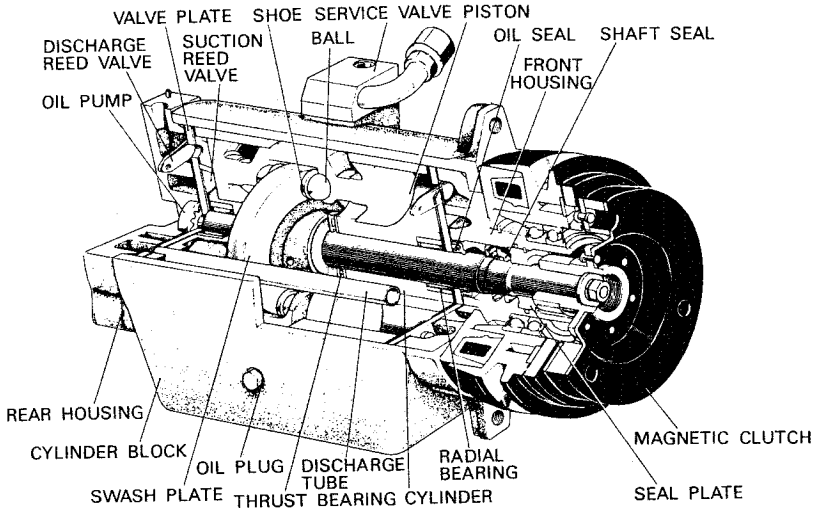


Fig. 7

FJ55 MODEL **CC2M TYPE**

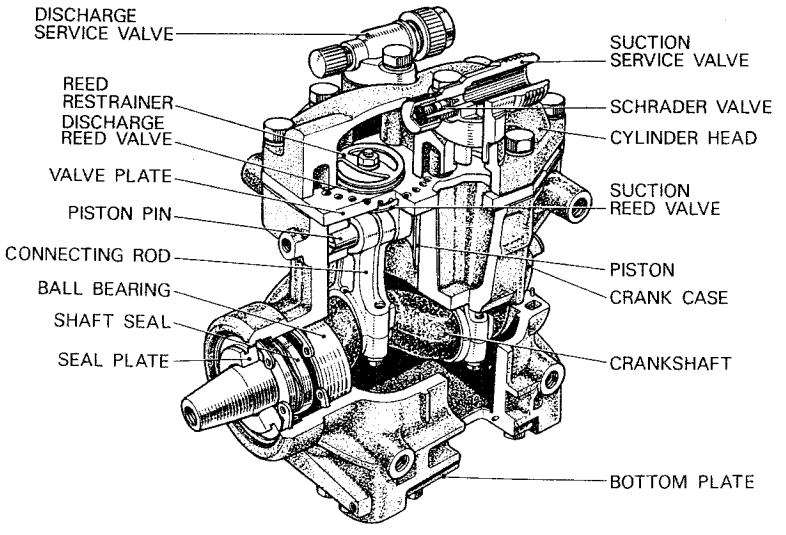


Fig. 8

CC2M type compressor consists of two cylinders. Each cylinder has two valves: a discharge service valve and a suction service valve.

On the down stroke, vaporized refrigerant is drawn into the empty cylinder and on the upward stroke, vapor is pressurized and directed to the high pressure line.

See Fig. 9.

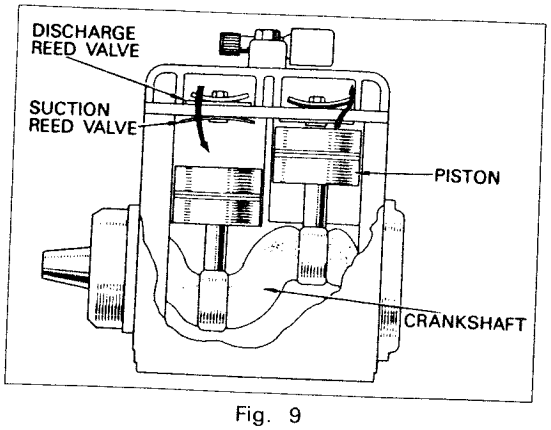


Fig. 9

Fig. 10. shows lubricant flow in the compressor.

The oil lubricate bearings, connecting rod, shaft seal, piston, cylinder and other inner parts of compressor.

This oil is pumped out compulsorily by oil pump.

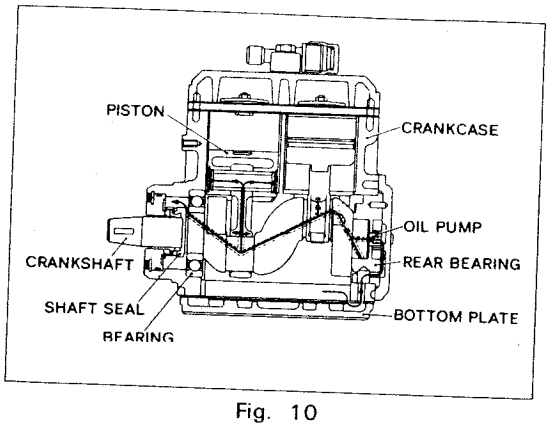


Fig. 10

CC6DA type compressor consists of six cylinders. Each cylinder has two valves: a discharge service valve and a service valve.

Fig. 11 shows lubricant flow in the compressor.

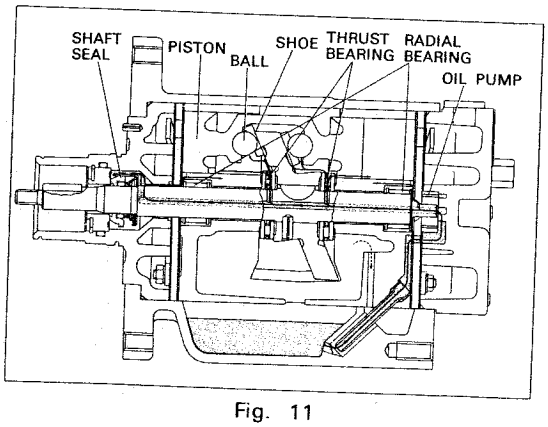


Fig. 11

2. MAGNETIC CLUTCH

The function of magnetic clutch is to engage and disengage the compressor as system demands. Basically, all magnetic clutches operate on the same principle, that of magnetic attraction. The magnetic clutch which is used for LAND CRUISER (FJ55, 55L) are "F" type clutch (CC2M) and "R" type clutch (CC6DA).

The construction of "F" type magnetic clutch is shown in Fig. 13 and R type magnetic clutch is shown in Fig. 14. The magnetic clutch consists of stator, rotor and center piece. When no current is fed to the stator coil, there is no magnetic force applied to the clutch and compressor disengages. When current is fed to the coil, magnetic force is set up between the stator and center piece (pressure plate).

When the center piece (pressure plate) becomes engaged with the rotor, it becomes as one piece and complete unit turns while the field remains stationary.

This causes the compressor crankshaft to turn, starting the refrigeration cycle.

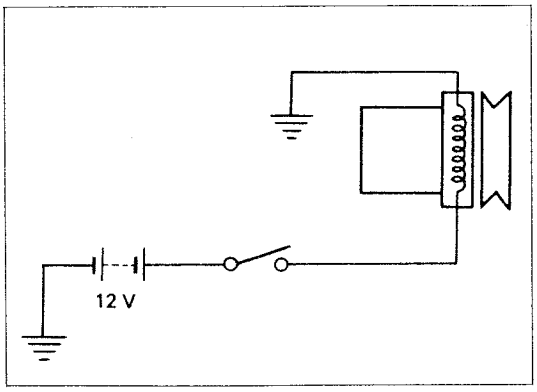


Fig. 12

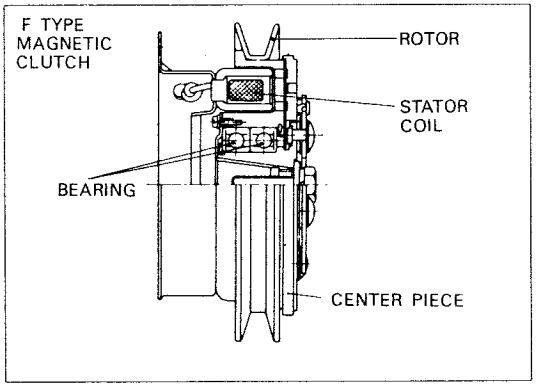


Fig. 13

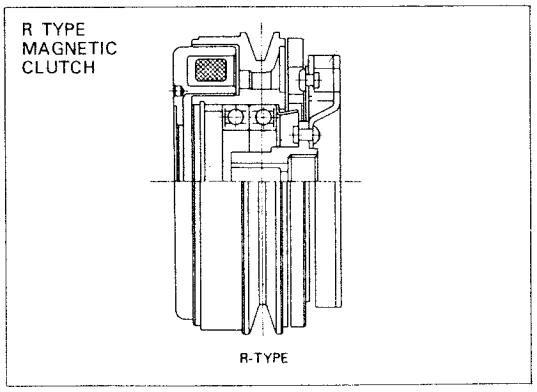


Fig. 14

3. CONDENSER

The function of the condenser is just opposite to that of the evaporator. High pressure refrigerant, laden with heat, enters the condenser in the form of a gas and giving up its heat to the air, the gas changes to a liquid. This heat is transferred from the passenger compartment. In other words, this heat which is removed to cause a change of state from a gas to a liquid is the same heat that was absorbed in the evaporator to cause a change of state from liquid to a gas. If the liquefaction of refrigerant is done insufficiently in the condenser, air conditioner will reduce its performance.

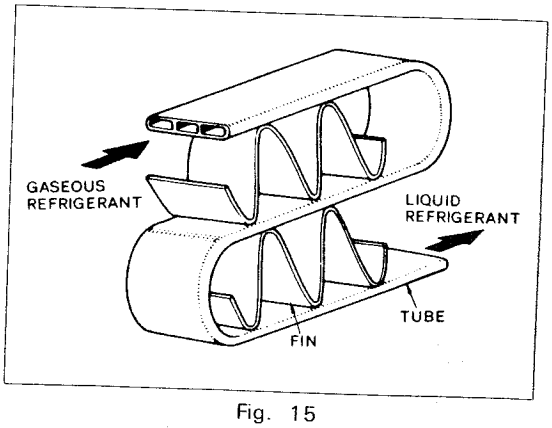


Fig. 15

The efficiency of the condensing action is dependent on the motion of the vehicle to force air against the condenser fins combined with the cooling action of the belt driven cooling fan.

4. RECEIVER

The construction of receiver is shown in Fig. 16. The receiver has important functions as follows.

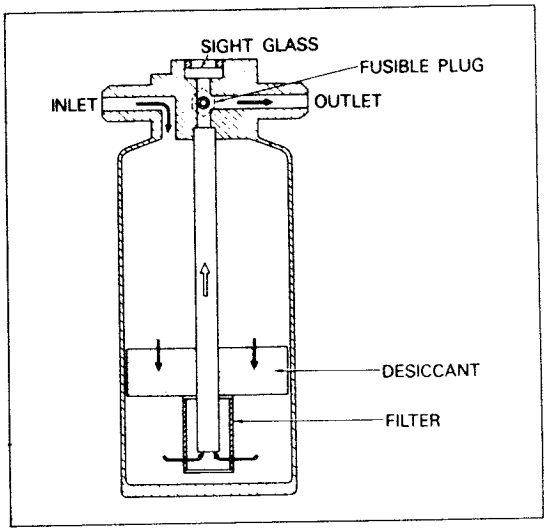


Fig. 16

1) In case that the load on the evaporator varies because of refrigerant loss which occurs through small leaks and so on, receiver supplies the extra refrigerant which is stored until needed by the evaporator.

   As above description, one of receiver functions is a tank that is designed to supply or receive the refrigerant according to the load on evaporator.

2) The receiver has drier and filter in the tank. A desiccant is a solid substance which can remove moisture from gas or liquid. By this desiccant, moisture in the refrigeration cycle which causes corrosion of metal and deteriorate the refrigeration oil is removed.

   The refrigerant must pass through the filter before it leaves the tank. The purpose of filter is to prevent the desiccant, dust and other solids carried with the refrigerant.

3) The receiver is equipped with fusible plug as a safety device.

   The structure is simple. A small hole is made through the center of a bolt and where solder has been poured in. When the temperature and the pressure inside the condenser or receiver go up abnormally due to poor liquefaction of the refrigerant and so on, the solder of fusible plug melts (at the temperature of about 95°C–100°C (203°F–212°F)) and springs out, thus, preventing the damage to other parts.

4) The receiver is equipped with sight glass on the top. Amount of refrigerant to be charged is very important for the efficiency of air conditioner.

   Sight glass is used to check the amount of refrigerant. On checking the amount of refrigerant, refer on Page 5.

5. EXPANSION VALVE

The main function of thermostatic expansion valve is to control the amount of refrigerant entering the evaporator core. At the expansion valve, the high pressure liquid refrigerant from the receiver is sprayed out with a sudden drop in pressure. The structure of the expansion valve is shown in Fig. 17.

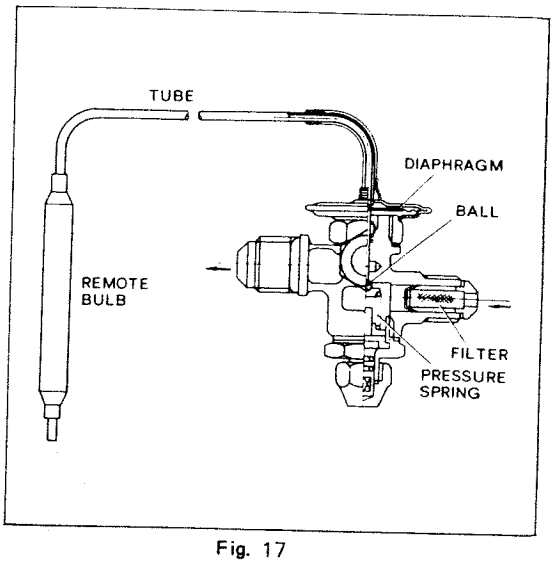


Fig. 17

The remote bulb is fastened to the evaporator outlet. The remote bulb senses the temperature of evaporator outlet, and activiates the diaphragm in the expansion valve through the capillary tube and causes the proper amount of refrigerant to flow into the evaporator. When remote bulb senses high temperature, in other words, the evaporator is starved of refrigerant, this heat causes pressure to be increased on the diaphragm by the expanding gas in the remote bulb through the capillary tube. And the valve is opened more widely. Conversely, when remote bulb senses low temperature, in other words, the amount of refrigerant is excessive in the evaporator, the valve is opened more narrowly. Thus, the amount of refrigerant in the evaporator is controlled by the expansion valve.

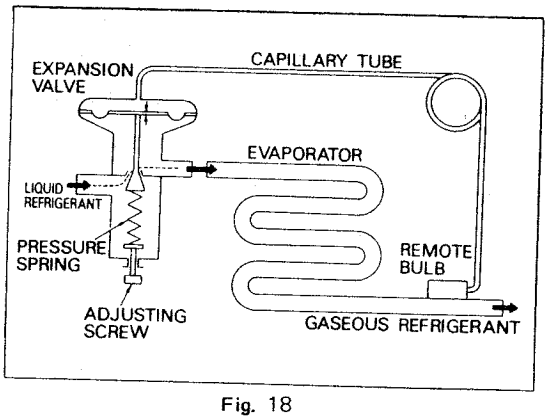


Fig. 18

6. EVAPORATOR

The purpose of the evaporator is just opposite to that of the condenser.

The state of the refrigerant immediately after the expansion valve is 100 % liquid.
It is not all liquid, long, however.
As soon as the liquid pressure is dropped, it starts to boil, and in so doing must absorb or take on heat.
This is heat removed from the air passing over the cooling fins of the evaporator and causes the air to feel cool.

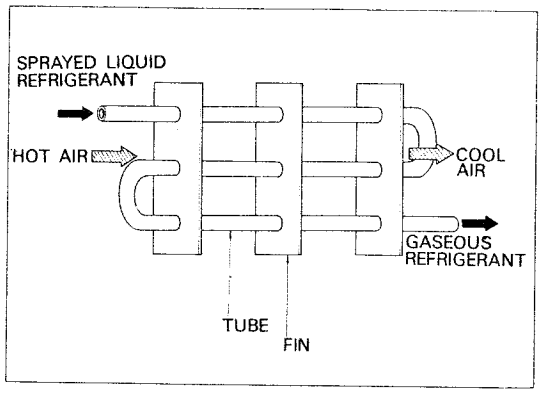


Fig. 19

If too much refrigerant is sent into the evaporator, it will not cool because the pressure of refrigerant will be higher and it will not boil away so easily.
Also, the evaporator filled with liquid refrigerant eliminates a place for the refrigerant to properly vaporize which is necessary in order for it to take on heat.
A flooding condition of the evaporator will allow an excess of liquid refrigerant to leave the evaporator and may cause serious damage to the compressor.

If too little refrigerant is sent into the evaporator, we refer to the system as being starved.
Again the evaporator will not cool because the refrigerant will vaporize, or boil off, long before it passes through the evaporator.

Refrigerant properly metered into the evaporator should allow for 100 % liquid just after the expansion valve, and 100 % gas at the outlet.

7. ELECTRICAL SYSTEM

The function of electrical circuits in the air conditioner system is, in short, controlling the air cooling action. The most important electrical circuit is the idling stabilizer circuit. Schematic chart of idling stabilizer circuit comprises an outlet air temperature detecting circuit and an engine speed sensing circuit.

They are thermistor, temperature control resistor and idling stabilizer amplifier with relay.

The idling stabilizer amplifier amplifies and synthesizes both electric signals from the distributor and thermistor. When these signals are simulataneously satisfied with specified condition, the amplifier actuates the relay and the magnetic clutch engages. Then the compressor is driven by the engine. The temperature control resistor varies in resistance as it is adjusted by the driver to suit his comfort requirement.

The thermistor is located in front of the evaporator core so as to sense the cool air temperature. The resistance of thermistor varies according to surrounding air temperature. As the temperature rises, the resistance decreases and as the temperature lowers, the resistance increases.

This change of resistance is converted into electrical signal to the idling stabilizer amplifier.

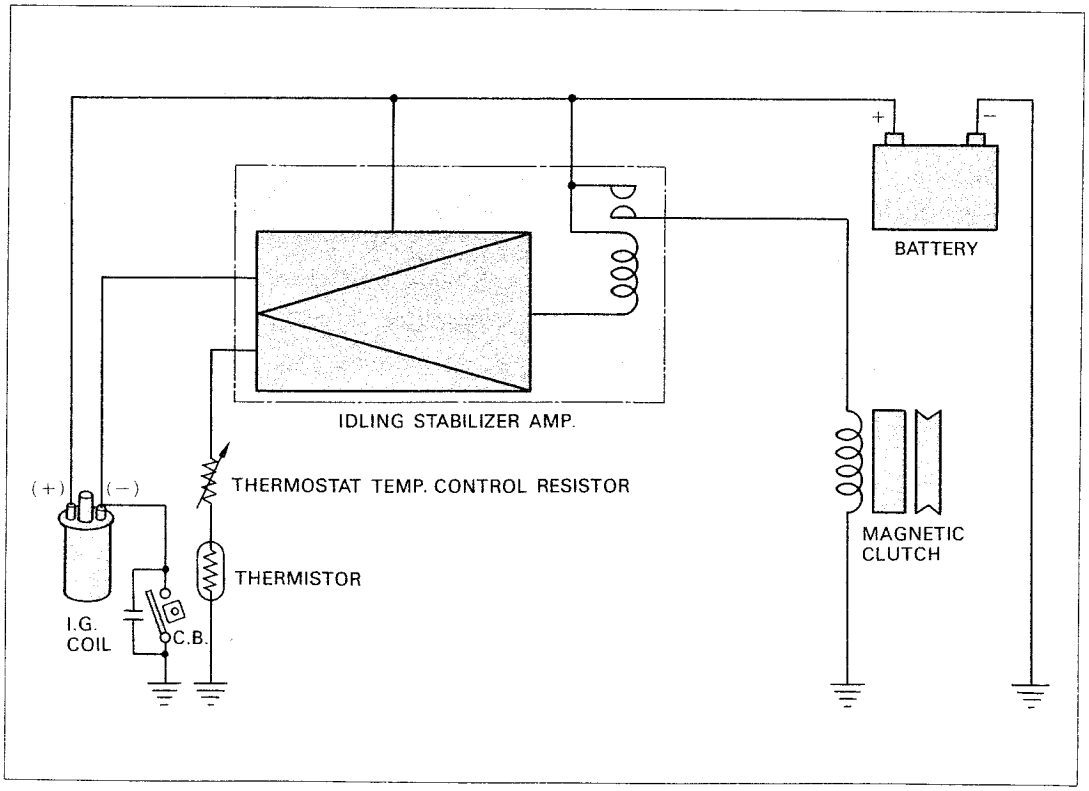


Fig. 20

III. AIR CONDITIONING CONTROLS

III-1 GENERAL DESCRIPTION

Cooling unit and heating unit are mounted on the dash panel of passenger compartment. Blower is equipped in heating unit originally and other component parts of air conditioner are installed in the engine compartment.

The recirculated air (or fresh air) is forced through the evaporator by blower, or through and around the heater core then mixed, and is delivered to the rectangular center outlet, heater outlet and defroster outlet, according to the setting position of each control lever on the control panel.

Direction of conditioned air is controlled by moving the grille of rectangular center outlet.

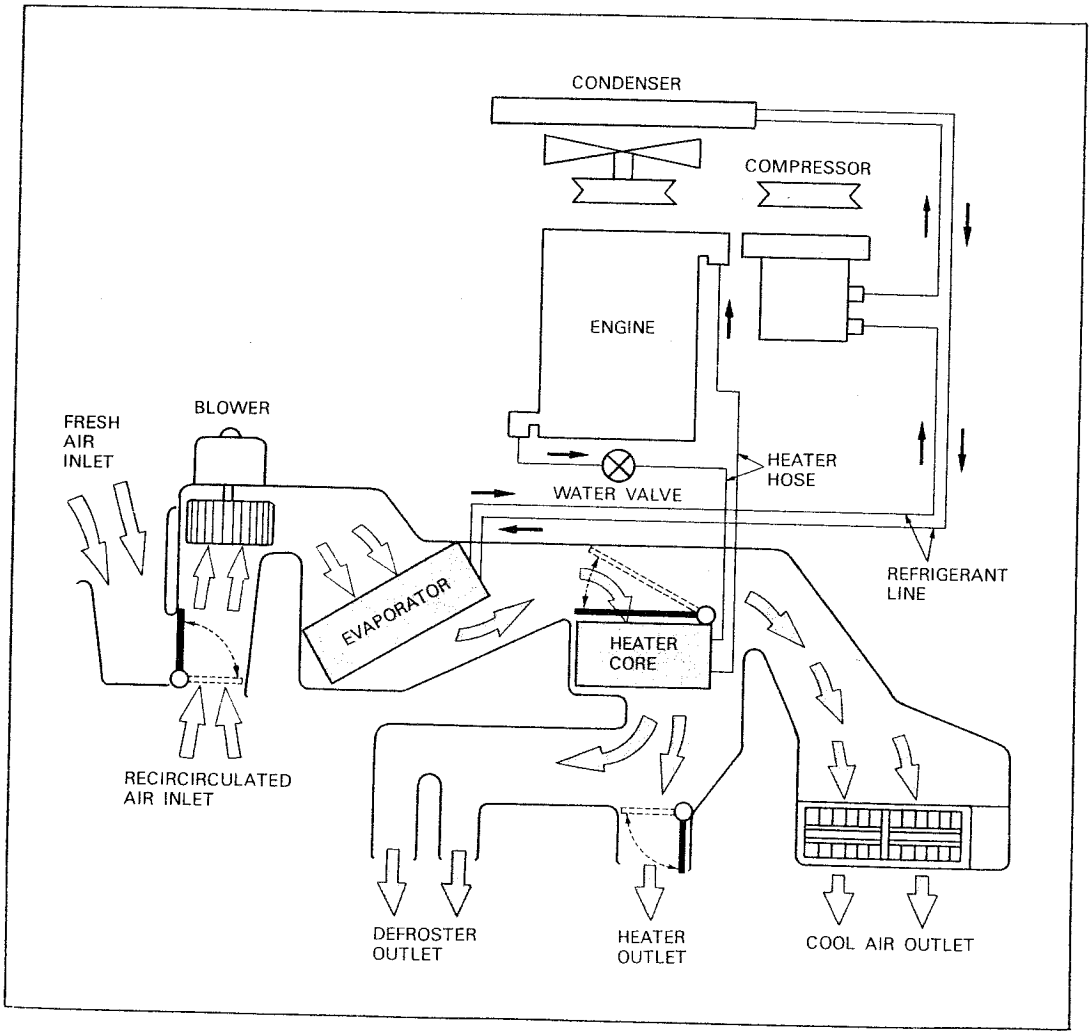


Fig. 21

III-2 OPERATION OF CONTROL PANEL

The air conditioning system is maintained through the use of three levers, thermostat dial and water valve knob shown in Fig. 22.

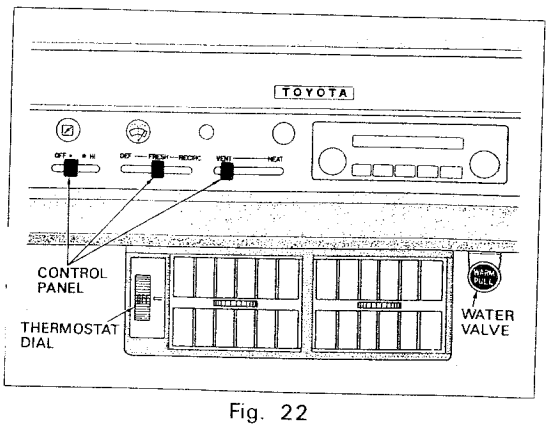


Fig. 22

1) DEF-FRESH-RECIRC CONTROL LEVER

This lever controls the defroster damper and fresh-recirc damper as follows.

a) When lever position is at "RECIRC", sucked air is recirculated.

b) When lever position is at "FRESH", sucked air is fresh.

c) When lever position is at "DEF", sucked air is fresh and heater outlet is close.

2) HEAT-VENT CONTROL LEVER

This lever controls air distribution damper.

a) When lever position is at "VENT", heater inlet is close.
Air only comes from the cool air outlet. This air can be either cool or fresh.

b) When lever position is at "HEAT", heater inlet is open.
Air is directed through the heater core. It can be blown from either the defroster or the heater outlet.

3) BLOWER SPEED CONTROL LEVER

This lever controls blower motor speed at cooling or heating.
Blower motor speed can be controlled at three speed — low speed, medium speed and high speed.
When lever is at "OFF" position, air conditioner system does not operate.

4) HOT WATER VALVE

This knob controls that water valve opens or closes.
a) When the knob is pushed, the hot water does not flow to the heater core.
The water valve is off.

d) When the knob is pulled, the hot water flows to the heater core. The water valve is on.

5) THERMOSTAT DIAL (Thumb Wheel)

This dial may be regulated to control the degree of cooling.
Maximum cooling is determined at "10" position of this dial.
When dial position is at "OFF", air conditioner does not operate.

III-3 AIR CONDITIONING CONTROLS

1. COOLING

Set the three control levers, thermostat dial and water valve knob shown in Fig. 23.

When placing the heat-vent control lever at "VENT" position, cool air will be delivered from rectangular center outlet.

At this mode, the water valve is closed to preventing hot water flow into heater core.

Recirculated or fresh air can be selected as sucked air at cooling operation.

Temperature of inside passenger compartment is determined by setting position of thermostat dial and blower speed control lever. See Fig. 24.

Never operate the air conditioner with thermostat dial at max. position and blower speed at low position, for this combination may sometimes causes frost on the evaporator.

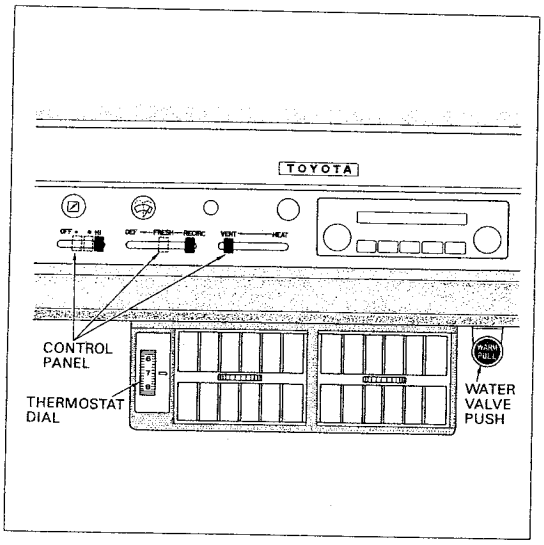


Fig. 23

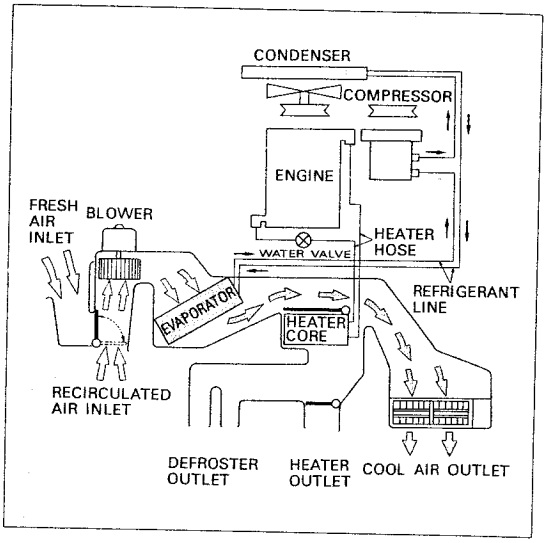
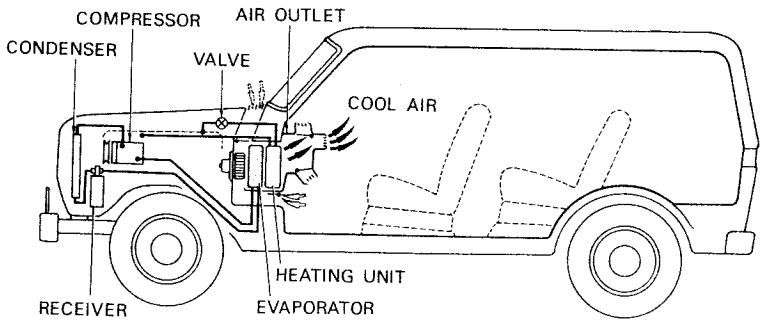


Fig. 24



2. HEATING

When setting three control levers, thermostat dial and water valve knob as shown in Fig. 25, each damper is placed as shown in Fig. 26, directing almost all heated air flow out of the heater outlet.

> ***Note:*** *Always keep the thermostat dial in "OFF" position when using the system as a heater.*

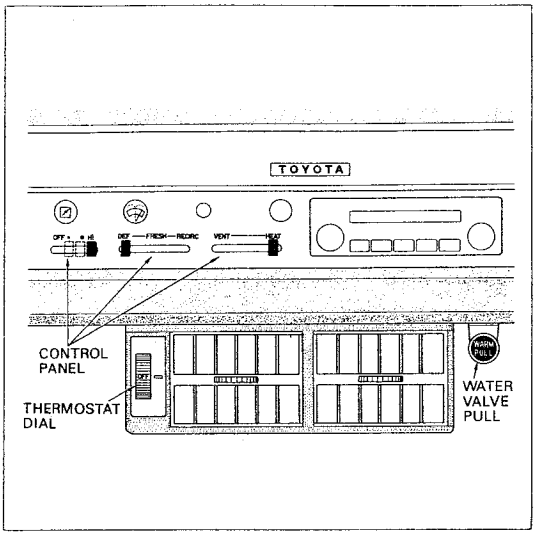


Fig. 25

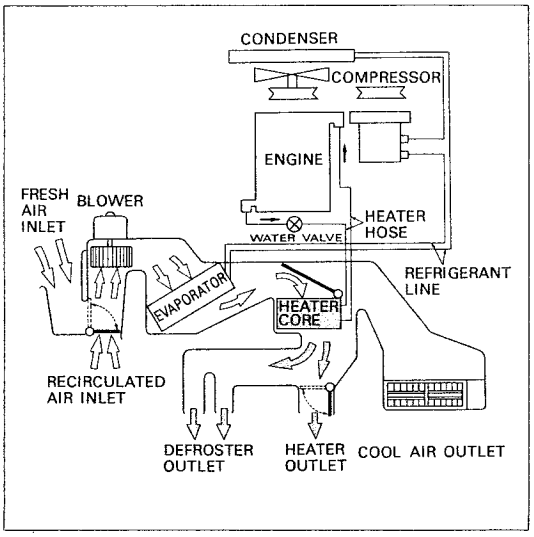
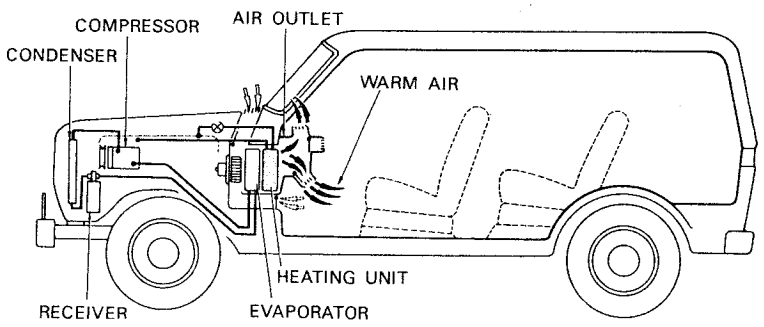


Fig. 26



3. DEFROSTING

When placing the DEF—FRESH—RECIRC control lever only at "DEF" position, defroster damper shuts the heater outlets.

The air flow is allowed to flow out of the defroster outlet.

See Fig. 27 and Fig. 28.

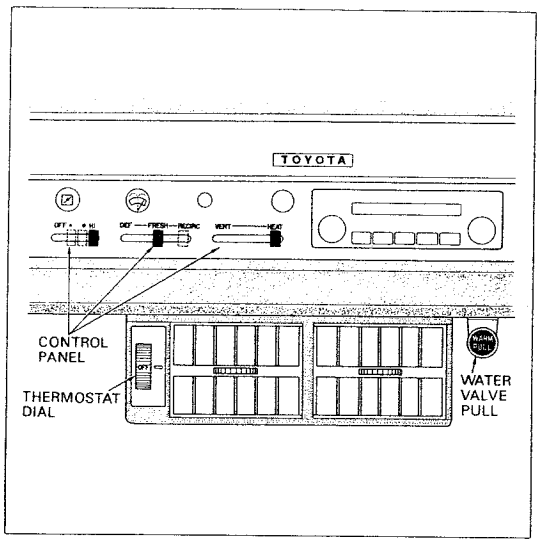


Fig. 27

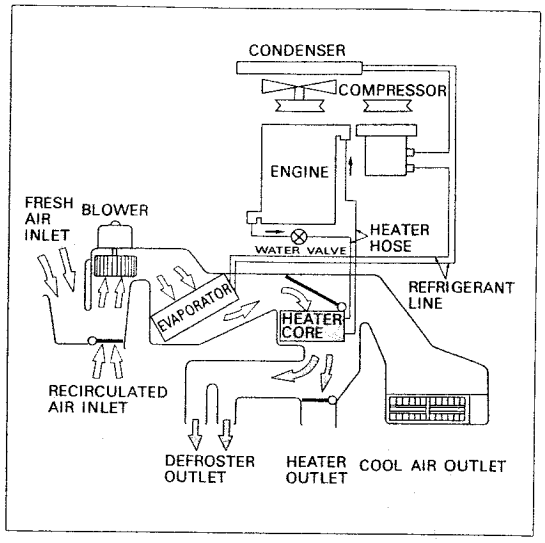
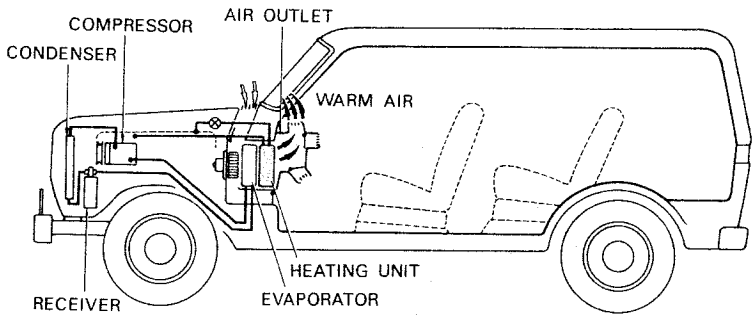


Fig. 28



4. DEHUMIDIFYING

When setting the three control levers, thermostat dial and water valve knob as shown in Fig. 29 and Fig. 30, both cooling system and heating system operates.

Recirculated or fresh air is cooled and dehumidified at the evaporator. Then cooled and dehumidified air flow through the heater core and is delivered to the heater outlet and defroster outlet.

The conditioned air temperature is determined by setting position of thermostat dial and water valve knob.

Dehumidifying and heating action is made at the same time, therefore it is effective in the humid weather and also has defrosting effect.

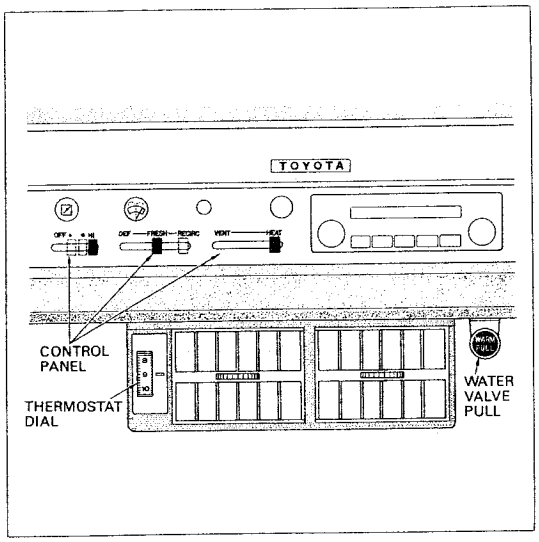


Fig. 29

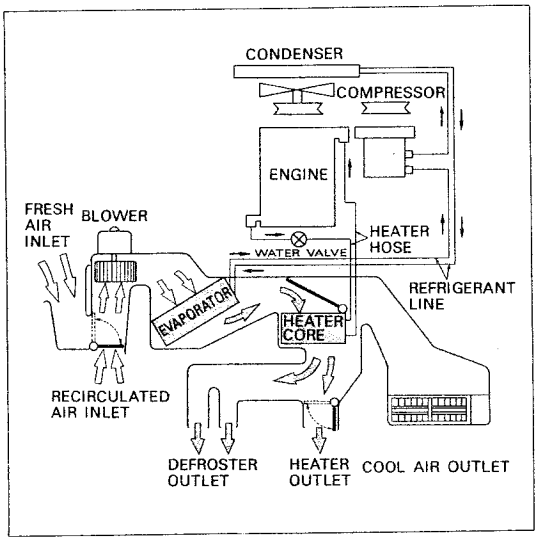
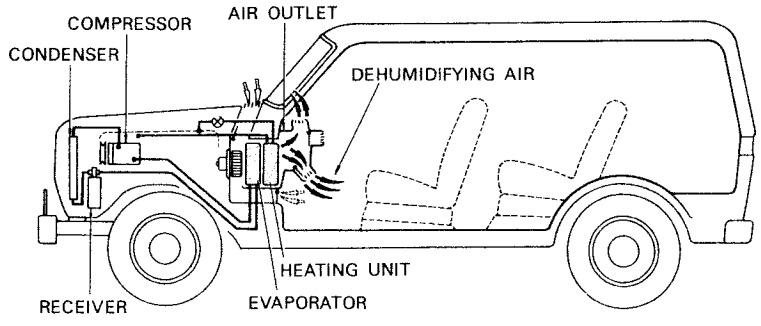


Fig. 30



III-4 AIR CONDITIONING CONTROLS (WITH BOOST VENTILATOR)

1. COOLING

Set the three control levers and thermostat dial shown in Fig. 31.

When placing the DEF—VENT control lever at "VENT" position, cool air will be delivered from rectangular center outlet.

Temperature of inside passenger compartment is determined by setting position of thermostat dial and blower speed control lever. See Fig. 32.

Never operate the air conditioner with thermostat dial at max. position and blower speed at low position, for this combination may sometimes cause frost on the evaporator.

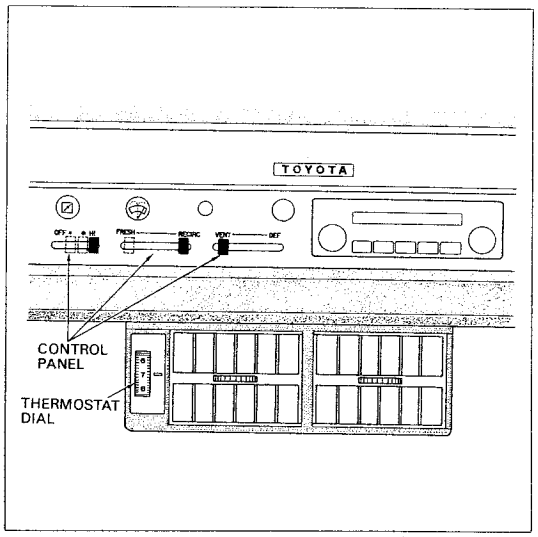


Fig. 31

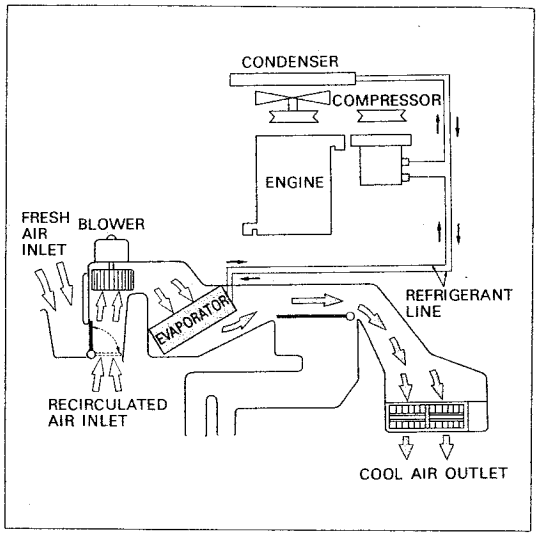
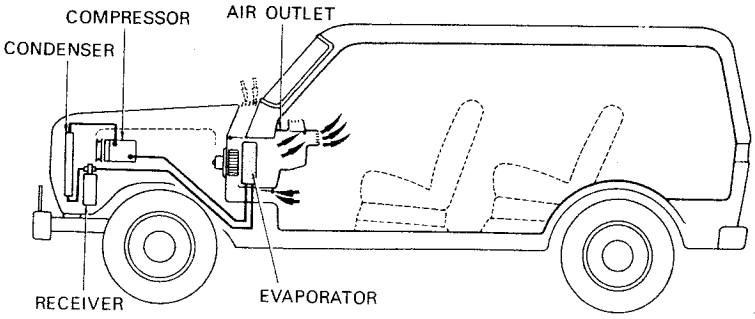


Fig. 32



2. DEFROSTING

When placing the DEF—VENT control lever at "DEF" position, fresh or recirculated air will be delivered from defroster outlet. See Fig. 33 and Fig. 34.

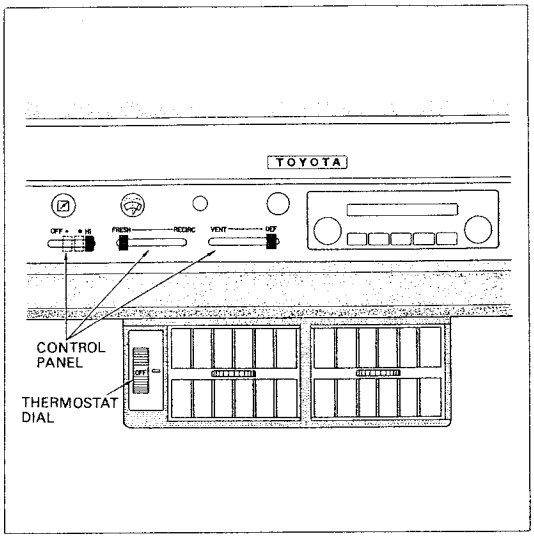


Fig. 33

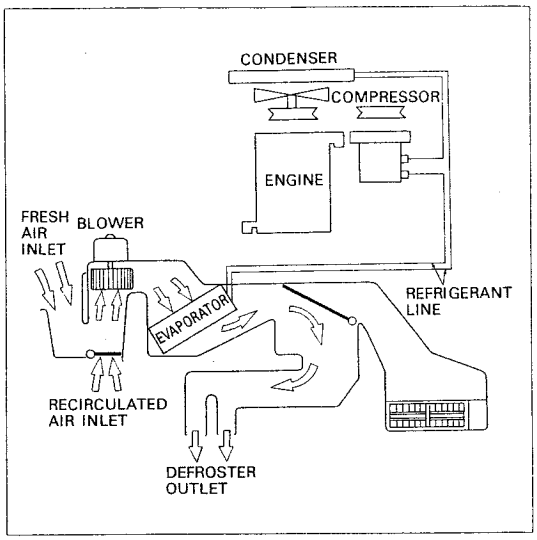
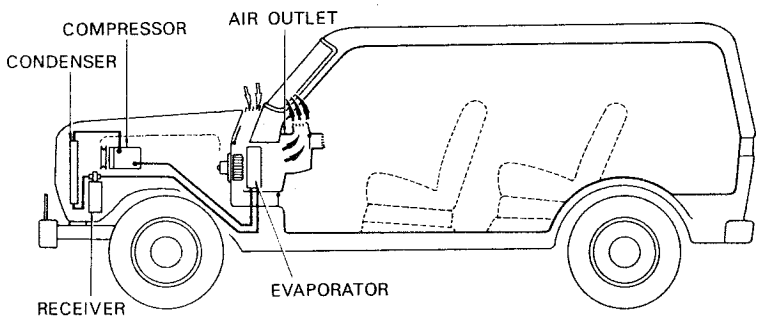


Fig. 34



IV. EXPLODED VIEW

1. FJ55L

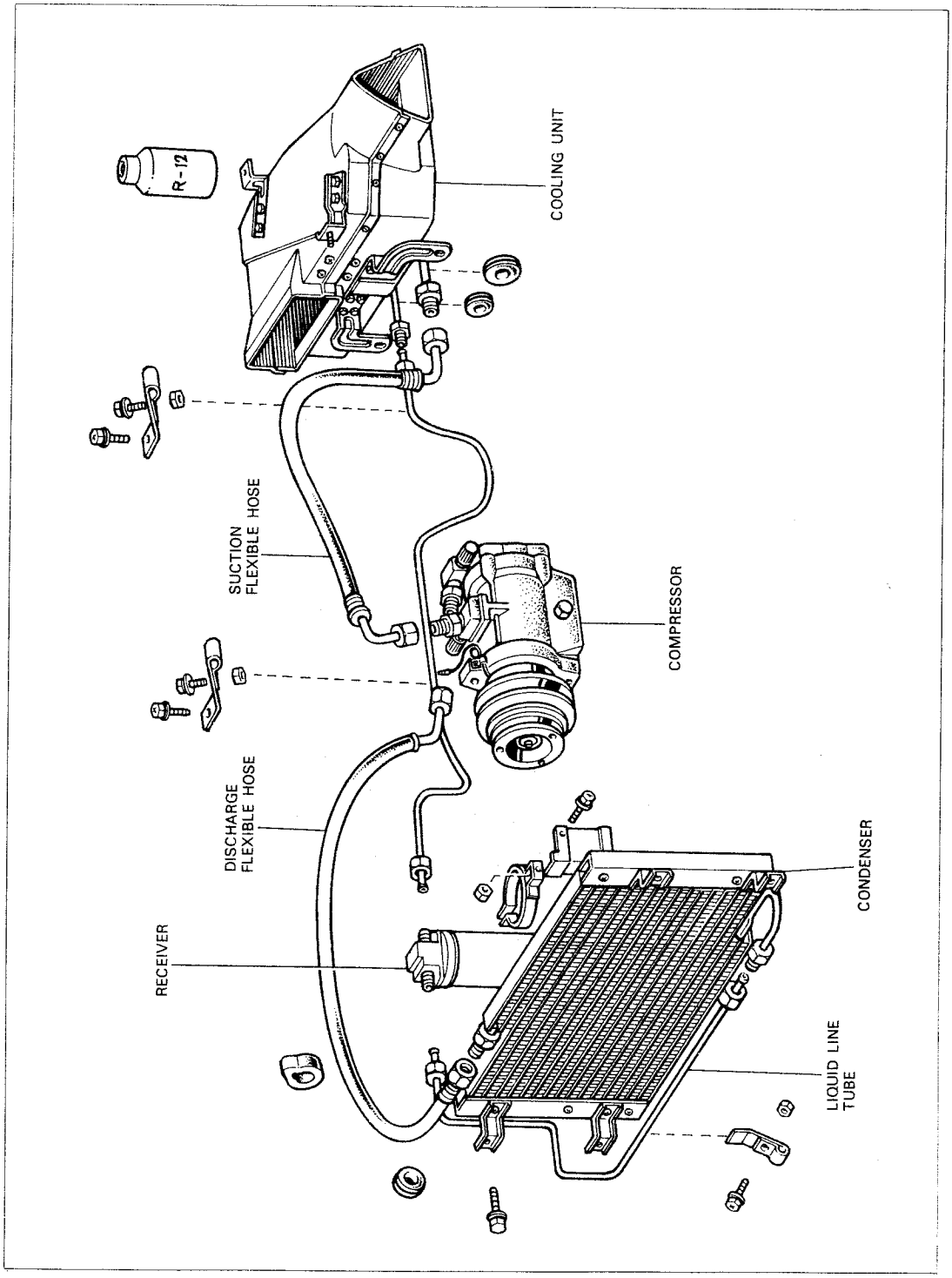


Fig. 35

2. FJ55

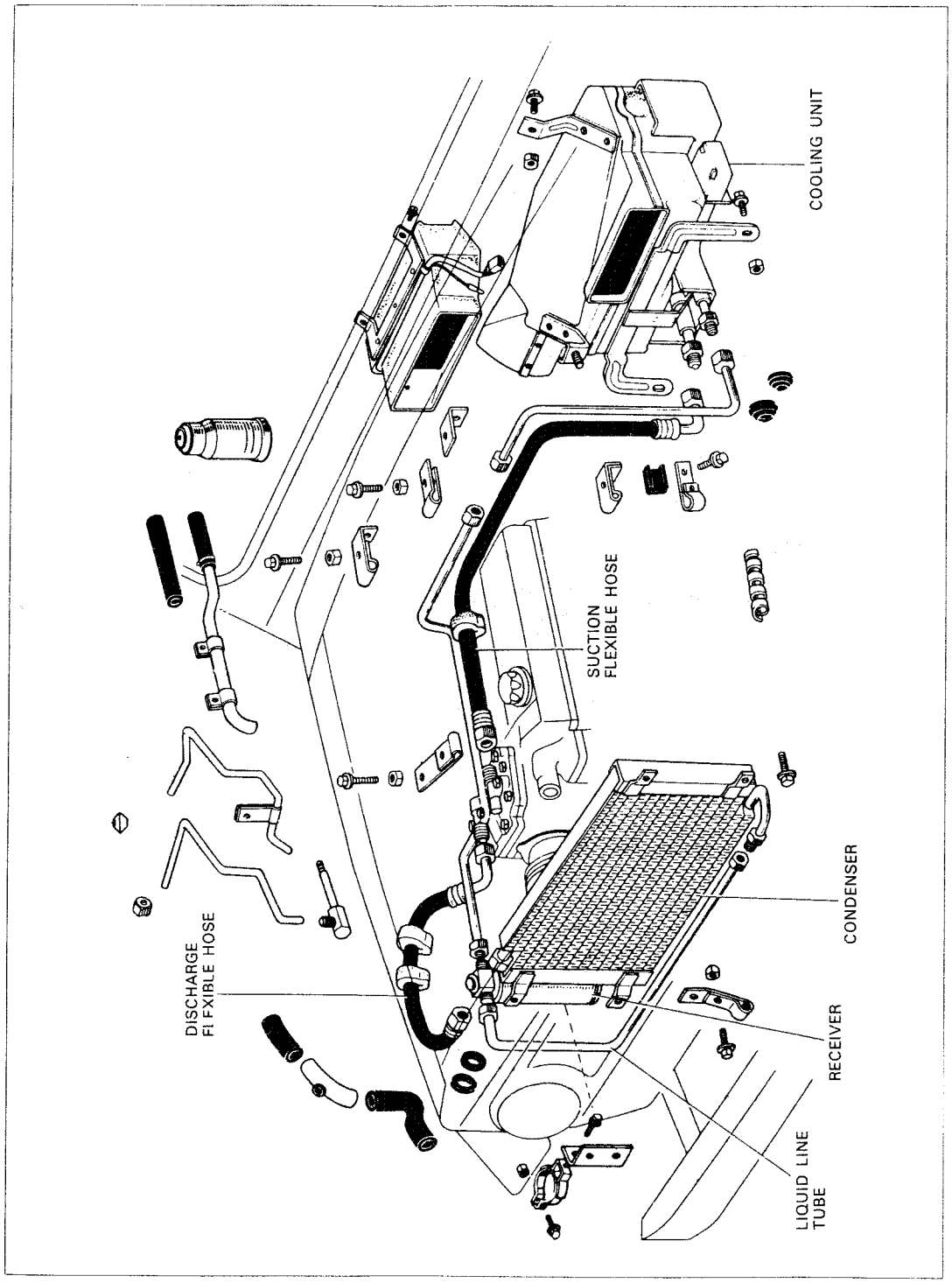

COOLING UNIT
SUCTION FLEXIBLE HOSE
CONDENSER
DISCHARGE FLEXIBLE HOSE
RECEIVER
LIQUID LINE TUBE

Fig. 36

V CONNECTION AND WIRING

1. CONECTION DIAGRAM

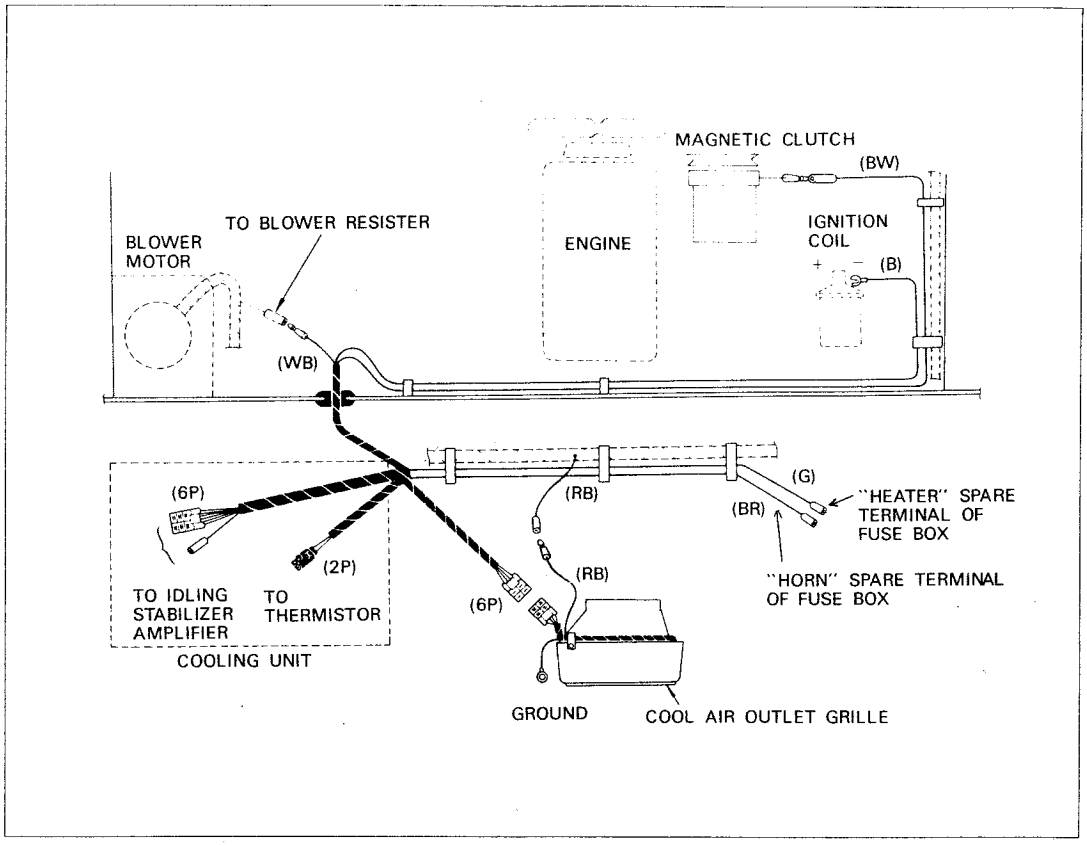


Fig. 37

Connection to fuse box is shown in Fig. 38.

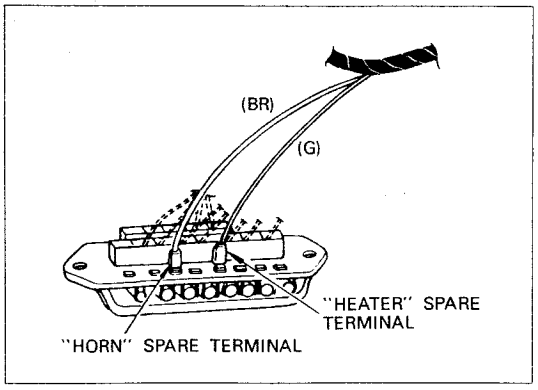


Fig. 38

2. WIRING DIAGRAM

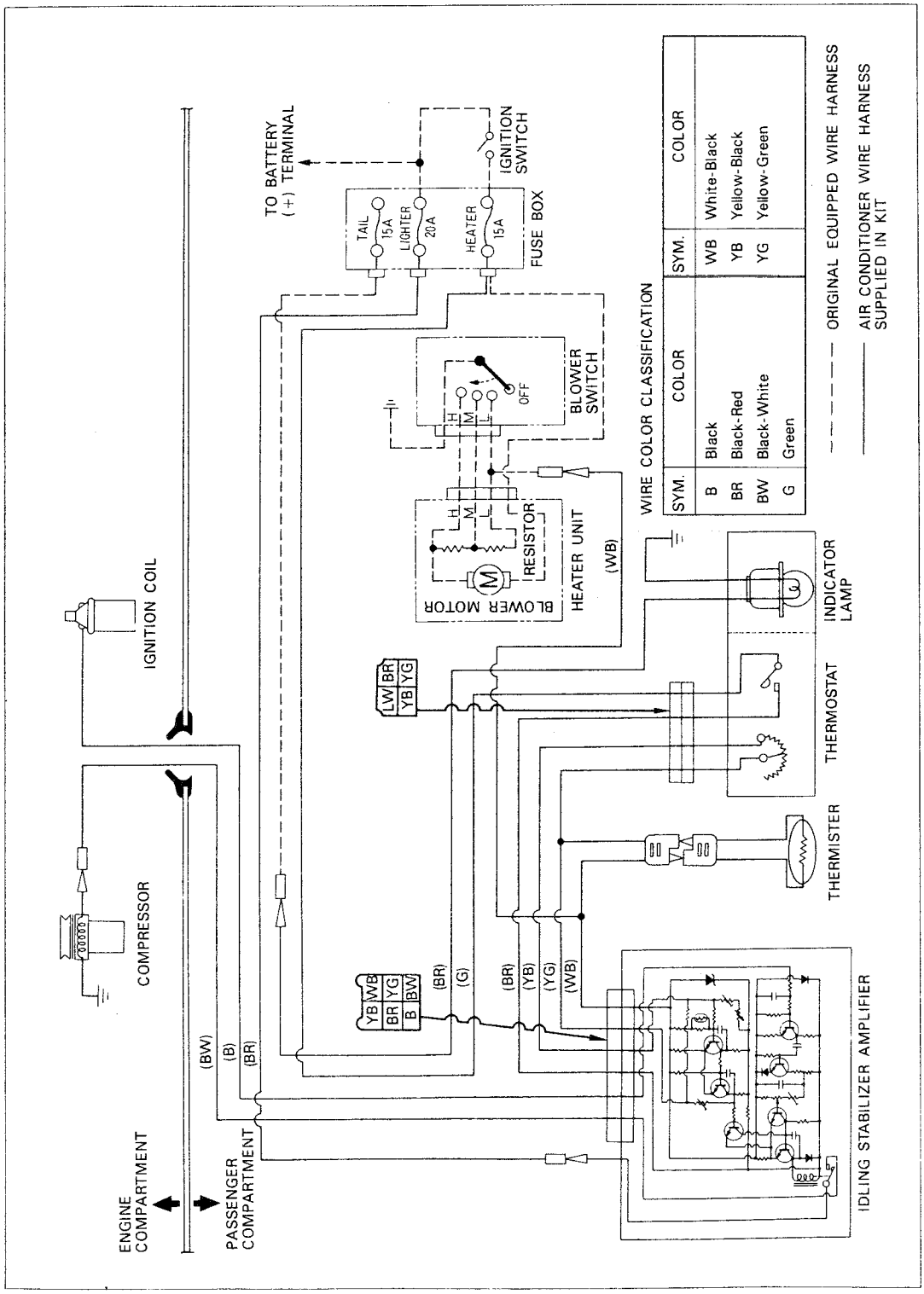


Fig. 39

VI SERVICE TOOLS FOR REPAIRING

VI-1 SERVICE TOOL KIT

ILL. NO.	TOOL NAME
1	Gauge, refrigerant charging (Incl. 2 to 4)
2	Gauge, low pressure
3	Gauge, high pressure
4	Body, gauge
5	Tester, gas leak
6	Reactor, gas leak tester
7	Nozzle, gas leak tester
8	Tube, gas leak tester inlet
9	Wrench, gas leak tester bomb valve
10	Wrench, gas leak tester valve
11	Cleaner, gas leak tester nozzle
12	Packing, refrigerant charging hose
13	Adapter, charging hose
14	Case, air conditioner service tool
15	Hose, refrigerant charging, No. 3 (red color)
16	Hose, refrigerant charging, No. 1 (green color)
17	Hose, refrigerant charging, No. 2 (yellow color)
18	Bomb, gas leak tester
19	Holder, refrigerant pipe (For 1/2", 7/16", 5/16", 1/4", 3/16", 3/8", 5/8")
20	Cutter, refrigerant pipe
21	Tool, refrigerant pipe flare
22	Wrench, compressor service valve
23	Valve, refrigerant drum service
24	Remover, magnetic clutch (For removing clutch fixed with swash plate type compressor)
25	Remover, magnetic clutch (For removing clutch fixed with reciprocating type compressor)

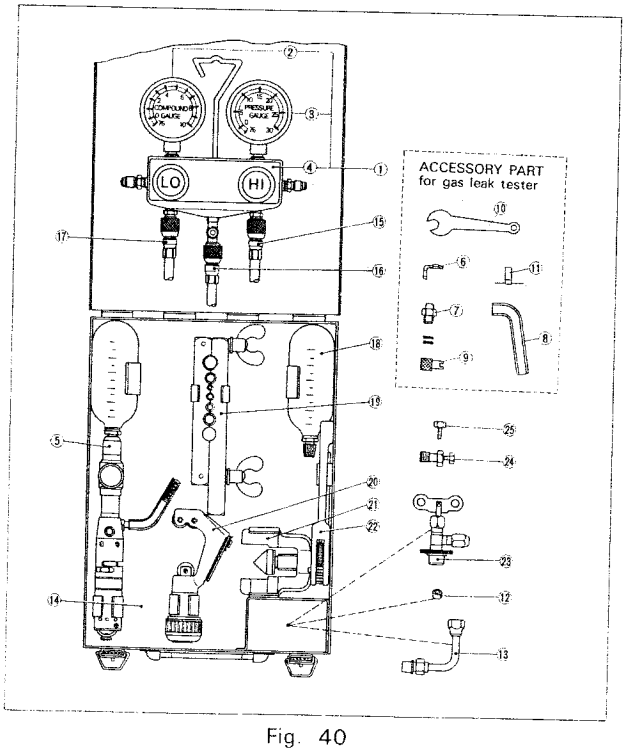


Fig. 40

VII HANDLING OF SERVICE TOOLS

1. REFRIGERANT PIPE CUTTER

A) Refrigerant pipe cutter is used when cutting the copper tube. See Fig. 41.

B) After cutting the pipe, always finish the internal surface of the pipe ends using the blade equipped with pipe cutter. See Fig. 42.

Note: *Take care not to let dust and chips get inside the tube while cutting and finishing.*

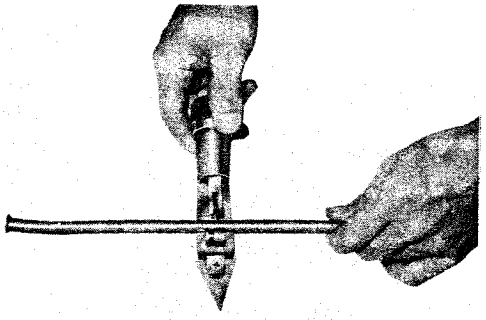


Fig. 41

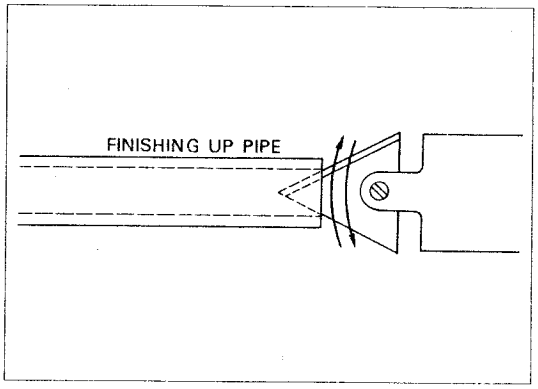


Fig. 42

2. REFRIGERANT PIPE HOLDER AND FLARE TOOL

A) Hold the copper pipe with the pipe holder at specified tube size position, and clamp it evenly.

B) The tip of the copper pipe should stick out of the holder as shown in Fig. 43.

C) Flare the tip of pipe with the flare tool. See Fig. 44.

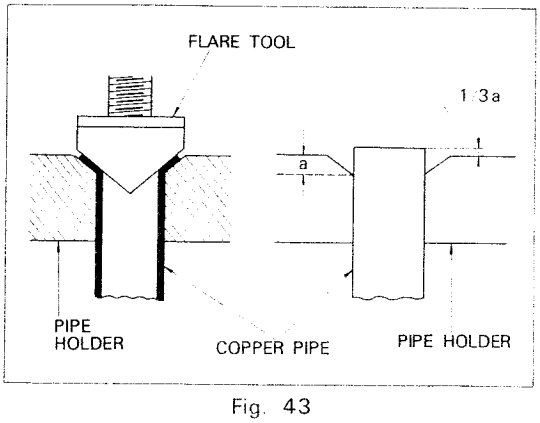


Fig. 43

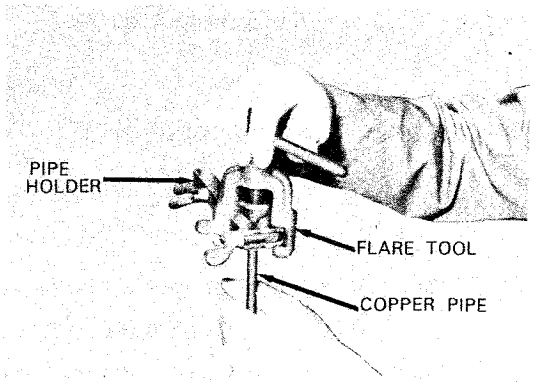


Fig. 44

3. REFRIGERANT CHARGING GAUGE

The hand valves ("LO" and "HI") on the front of the refrigerant charging gauge are used to open and close the valve.

The hand valve inscribed "LO" is for the low pressure side valve and "HI" is for the high pressure side valve.

One complete turn of the knob opens or closes the respective valve.

By opening or closing the high and low pressure hand valves, the following circuits are established. See Fig. 45.

A) When low pressure side valve ("LO") is opened and high pressure side valve ("HI") is closed.

Two circuits are established:

※ ③ → ② → low pressure gauge
※ ③ → ④ (schrader valve must be opened.)
※ ① → high pressure gauge

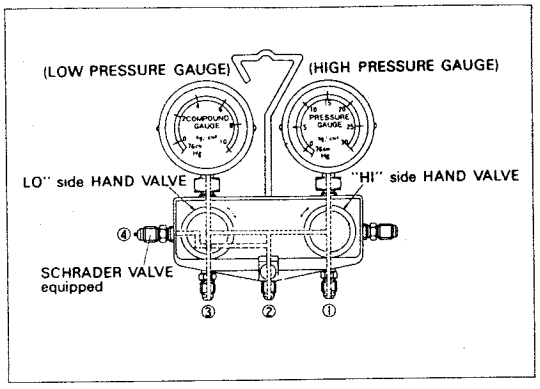


Fig. 45

B) When low pressure side valve ("LO") is closed and high pressure side valve ("HI") is opened.

Two circuits are established:

※ ① → ② → high pressure gauge
※ ① → ④ (schrader valve must be opened.)
※ ③ → low pressure gauge

C) When low and high pressure gauges are closed.

Two circuits are established:

※ ③ → low pressure gauge
※ ① → high pressure gauge

4. REFRIGERANT CHARGING HOSE

The charging hoses are classified in three colors.

The each charging hoses must be handled as described belows.

A) The air conditioner manufacturer recommend that yellow hose is used for low pressure side (suction side), the green hose for refrigeration side (center connecting port) and the red hose for high pressure side (discharge side).

B) The 45 degree swivel fitting of charging hose is equipped with special pin to opening the charging hose connecting port on compressor service valve, and straight fitting of charging hose is always connected to the port of refrigerant charging gauge. See Fig. 46.

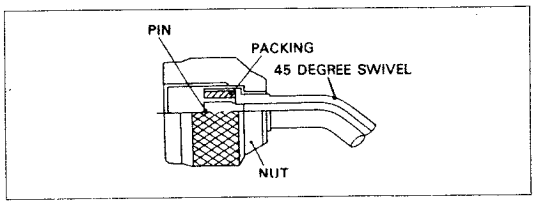


Fig. 46

C) The nut at the end of charging hose can be tightened by hand, never use the plier.

D) When the refrigerant charging gauge is not in use, connect the end of the hose to spare fitting of refrigerant charging hose. See Fig. 47.

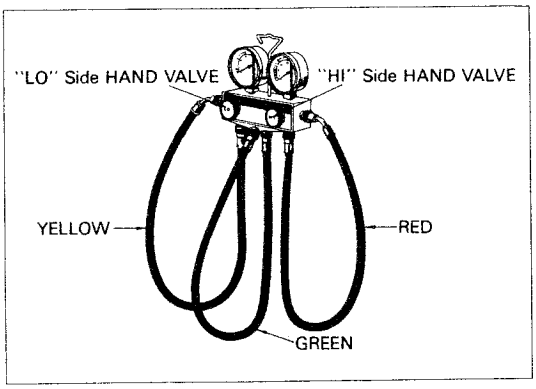


Fig. 47

5. REFRIGERANT DRUM SERVICE VALVE

Refrigerant drum service valve that is handled to charge the refrigerant into the air conditioning system, follow the procedure described belows.

A) Before putting the refrigerant drum service valve on the refrigerant drum, turn the handle counterclockwise till the valve needle is fully retracted.

B) Turn the plate nut (disk) counterclockwise till it reaches its highest position, then screw down the refrigerant drum service valve onto the sealed tap.

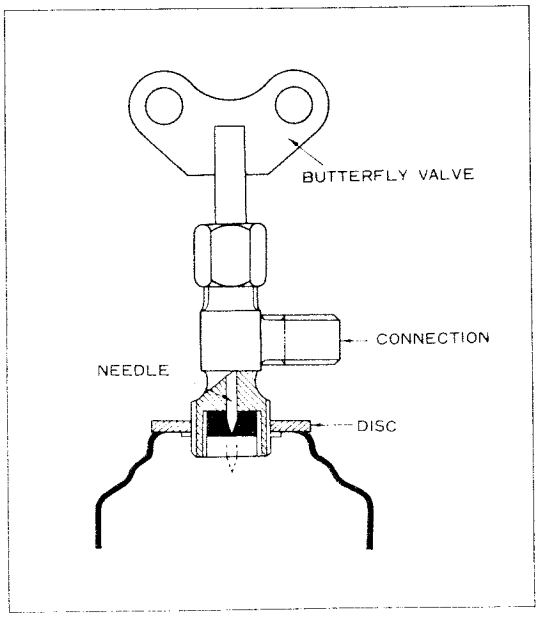


Fig. 48

C) Turn the plate nut (disk) clockwise fully, and fix the center charging hose to the valve.

D) The plate nut can be sufficiently tightened by hand.

E) Turn the handle clockwise, thus making a hole in the sealed tap.

F) To charge the refrigerant into the system, turn the handle counterclockwise. To stop the charging, turn it clockwise.

6. GAS LEAK TESTER

Check all connection, and the compressor shaft seal for leaks carefully, whenever the air conditioning system is replaced or repaired.

Use the gas leak tester to inspect the system.

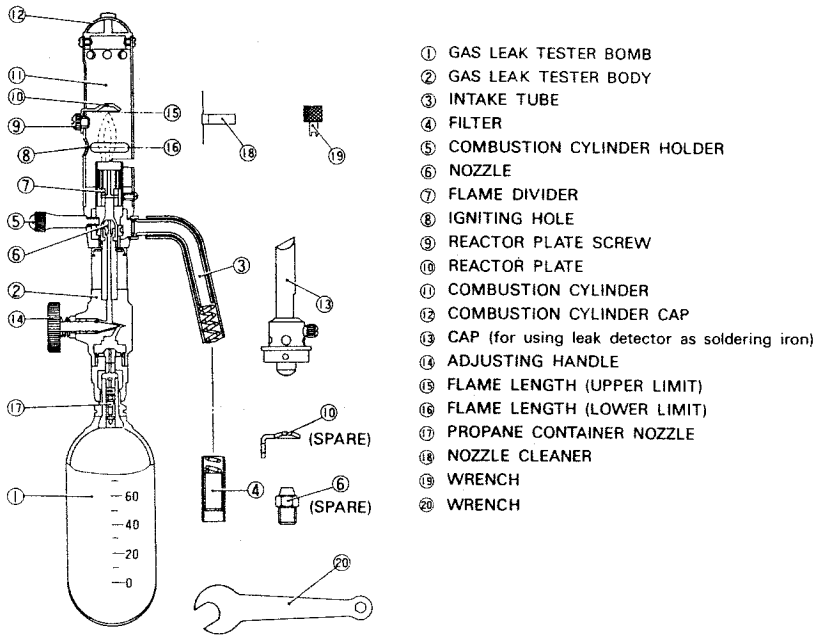


Fig. 49

Gas leak tester is used in the following method.

A) Check the amount of propane liquid.

B) Install the bomb (propane container) to the gas leak tester body by turning it clockwise fully.

C) When lighting the tester, insert the flame of match or cigarette lighter into the igniting hole of the tester and turn the adjusting handle slowly counterclockwise. This will ignite the gas leak tester.

D) The reactor (copper ring) must be red hot, but the flame must be kept as small as possible.

The smaller the flame the more sensitive it is to leak.

E) Hold the tip of sensing tube at each suspected leak portion.

F) Watch for the change in the flame color.

If it is no leak, the flame will be almost colorless.

The slightest leak will be indicate by a bright color to the flame.

Color of flame :

When leak is very small ..... Color of flame is light green.

When leak is large ..... Color of flame is bright blue.

When leak is very large ..... Color of flame is purple.

Note:

a) Always hold the tester vertically when detecting a leak.

b) Never use the tester in an area having explosive gas.

c) Do not inhale the burned gas, it is poisonous gas.

VIII. TROUBLESHOOTING

TROUBLE	SYMPTOM	POSSIBLE CAUSE	CHECK & REMEDY
System produces no/hardly cooling.	**I. Magnetic clutch does not engage.**	**I. (Electrical)**	
		1) Blown fuse	1) Page 45
		2) Defective magnetic clutch stator coil	2) Page 51
		3) Defective blower control switch	3) Page 45
		4) Defective thermostat	4) Page 49
		5) Defective idling stabilizer amplifier	5) Page 48
		6) Defective thermistor	6) Page 49
		7) Defective wiring connection	7) Page 25
	II. Compressor does not rotate properly.	**II. (Mechanical)**	
		1) Loose or worn compressor drive belt	1) Page 58
		2) Defective compressor	2) Page 37
	III. Blower does not rotate properly.	**III. (Electrical)**	
		1) Blown fuse	1) Page 45
		2) Defective blower control switch	2) Page 45
		3) Defective thermostat	3) Page 49
		4) Defective blower motor	4) Page 47
		5) Defective wiring connection	5) Page 25
	IV. Item I, II & III are normal.	**IV. (Mechanical)**	
		1) No or insufficient refrigerant in system	1) Page 64
		2) Defective expansion valve	2) Page 40
		3) Defective compressor	3) Page 37
		4) Clogged receiver	4) Page 39

TROUBLE	SYMPTOM	POSSIBLE CAUSE	CHECK & REMEDY
System produces insufficient cooling.	**I. Cool air comes out intermittently.**	**I. (Mechanical)**	
		1) Defective expansion valve	1) Page 40
		2) Defective compressor	2) Page 37
		(Electrical)	
		3) Defective idling stabilizer amplifier	3) Page 48
		4) Defective wiring connection	4) Page 25
	II. Running at only high speed, cool air comes out.	**II. (Mechanical)**	
		1) Condenser fins are clogged partially with dust or dirt.	1) Page 38
		2) Compressor drive belt is slipping	2) Page 58
		3) Magnetic clutch is slipping	3) Page 51
		4) Defective compressor	4) Page 37
		5) Insufficient or too much refrigerant in system.	5) Page 64
		6) Air in system	6) Page 61
		(Electrical)	
		7) Defective idling stabilizer amplifier	7) Page 48
	III. Running at high speed, cool air is not enough.	**III. (Electrical)**	
		1) Frosted evaporator by defective thermistor	1) Page 49
		2) Frosted evaporator by defective idling stabilizer amplifier.	2) Page 48

TROUBLE	SYMPTOM	POSSIBLE CAUSE	CHECK & REMEDY
System produces insufficient cooling.	**IV. Insufficiently cooled air comes out.**	**IV. (Mechanical)**	
		1) Improper refrigerant amount	1) Page 64
		2) Air in system	2) Page 61
		3) Excessive moisture in system.	3) Page 39
		4) Clogged condenser	4) Page 38
		5) Compressor drive belt is slipping	5) Page 58
		6) Magnetic clutch is slipping	6) Page 51
		7) Defective compressor	7) Page 37
		8) Defective expansion valve	8) Page 40
		(Electrical)	
		10) Dfective thermistor	10) Page 49
		11) Defective idling stabilizer amplifier	11) Page 48
		12) Defective wiring connection	12) Page 25
	V. Insufficient velocity of cool air.	**V. (Mechanical)**	
		1) Clogged evaporator	1) Page 42
		2) Frosted evaporator	2) Page 42
		3) Air leakage from cooling unit or air duct	3) Page 42
		(Electrical)	
		4) Defective blower motor	4) Page 47
		5) Defective wiring connection	5) Page 25
Abnormal noise in system.	**I. Noise from piping clamp**	**I. (Mechanical)**	
		1) Piping clamp is loosen.	

TROUBLE	SYMPTOM	POSSIBLE CAUSE	CHECK & REMEDY
Abnormal noise in system.	**II. Noise from blower or blower motor**	**II. (Mechanical)**	
		1) Blower touches case.	1) Page 47
		2) Bearing of blower motor shaft lacks oil.	2) Page 47
	III. Noise from compressor	**III. (Mechanical)**	
		1) Compressor mount fixing bolt is loosen.	1) Page 37
		2) Defective compressor.	2) Page 37
		3) Amount of compressor lubricant is not proper.	3) Page 59
	IV. Noise from magnetic clutch.	**IV. (Mechanical)**	
		1) Bearings are worn out.	1) Page 52, 53
	V. Noise from compressor drive belt or fan belt.	**V. (Mechanical)**	
		1) Compressor drive belt or fan belt is loosen.	1) Page 58
	VI. Noise from idle pulley.	**VI. (Mechanical)**	
		1) Idle pulley bearing is worn out.	
Car performance shows a fall.	**I. Engine tends to overheat.**	**I. (Mechanical)**	
		1) Loose or broken fan belt.	1) Page 58
		2) Condenser fins are clogged.	2) Page 38
		3) Radiator fins are clogged.	
		4) Defective radiator cap.	
		5) Defective water pump.	

IX INSPECTION AND REPAIRING

IX-1. REFRIGERATION SYSTEM

1. COMPRESSOR

A) Inspection before removal

1) After closing both hand valves ("LO" and "HI") on the refrigerant charging gauge, install it in such a manner to connect red charging hose (discharge side) to the discharge service valve of discharge tube (FJ55L model) or compressor (FJ55 model) and yellow charging hose (suction side) to the suction service valve of compressor. See Fig. 50.

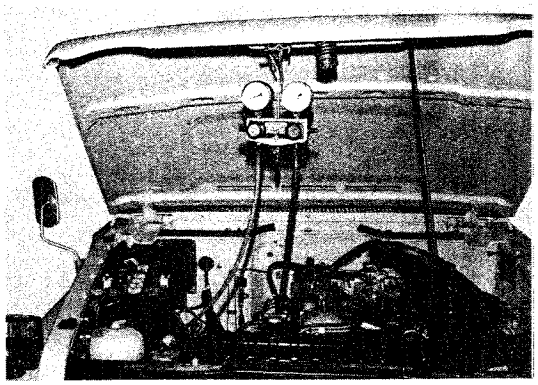


Fig. 50

2) Rotate the compressor at any speed, and check the following items.
Check if :
   a) high pressure gauge reading is fully higher than low pressure one.
   b) a metallic sound is not heard from compressor inside.
   c) gas or oil leaking is nothing from compressor shaft seal.
      (A slight amount of compressor oil leakage at the compressor front seal is considered normal.)

If defective, replace or repair the compressor.

B) Removal

1) Disconnect the battery negative cord from the battery terminal.
2) Isolate the clutch stator lead wire from the air conditioner wire harness.
3) Discharge the refrigerant very slowly from the refrigeration system. See Fig. 51.
   (Refer to "SAFETY PRECAUTIONS" on page 5.)
4) Remove the suction and discharge flexible hoses from the compressor service valves.

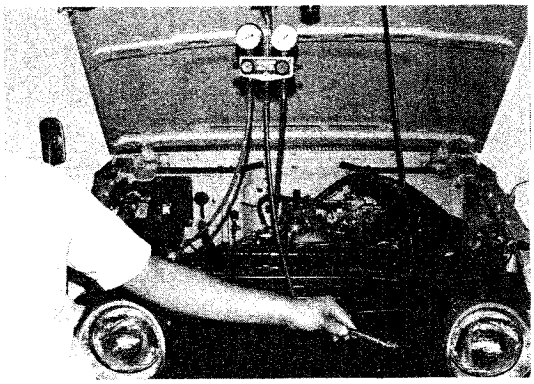


Fig. 51

Note: *Cap the open fittings as soon as they are disconnected to keep the moisture out of the system.*

5) Loose the compressor drive belt, then remove the compressor w/clutch assy from the engine.

6) Remove the magnetic clutch from the compressor.
(Refer to "9. MAGNETIC CLUTCH" on page 51.)

C) Inspection and Repairing

Refer to "REPAIR MANUAL FOR AIR CONDITIONING COMPRESSOR."

D) Installation

1) Follow the removal procedures in reverse order.

Note: *1) Stretch the compressor drive belt as specified.*
(Refer to "1. DRIVE BELTS" on page 58.)
2) Check the refrigerant oil, charge the refrigerant and carry out the performance test of the air conditioning system.
(Refer to "XI FINISH" on page 59.)

2. CONDENSER

A) Inspection

Check if :

a) condenser fins are clogged with dirt or bugs.

b) gas leaking is nothing from the condenser fitting or tube.

c) condenser fins are damaged.

Clogged condenser fins should be washed with water.

Note: *Take care not to damage condenser fins.*

If condenser fins are damaged, correct them using screw-driver or plier.

If leakage of fitting or tube is found, repair or replace the condenser.

B) Removal

1) Discharge the refrigerant very slowly from the refrigeration system. See Fig. 53.
(Refer to "SAFETY PRECAUTIONS" on page 5.)

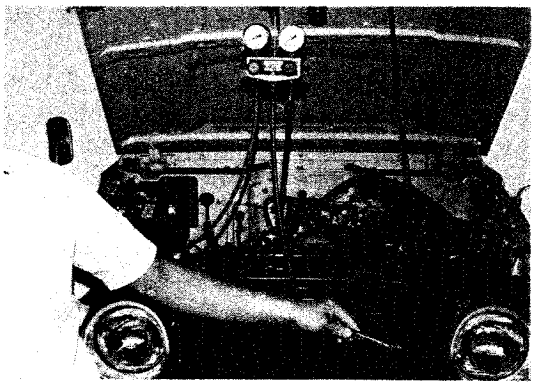


Fig. 52

2) Remove the hood lock.

3) Disconnect the discharge tube from condenser inlet fitting.

4) Disconnect the liquid line tube from receiver outlet fitting.

Note: *Cap the open fittings as soon as they are disconnected to keep the moisture out of the system.*

5) Remove the condenser from the vehicle.

C) Installation

1) Follow the removal procedures in reverse order.

Note: *Add the additional refrigerant oil about 1 fluid ounce (30 cc) to compressor when condenser is replaced.*

2) Charge the refrigerant and carry out the performance test of the air conditioning system. (Refer to "XI FINISH" on page 59.)

3. RECEIVER

A) Inspection

a) Check the sight-glass, fusible plug and welding portion for gas leakage using gas leak tester. If abnormal, replace the receiver.

B) Removal

1) Discharge the refrigerant very slowly from the refrigeration system. See Fig. 53. (Refer to "SAFETY PRECAUTIONS" on page 5.)

2) Disconnect the liquid line tubes from receiver inlet and outlet fittings.

Note: *Cap the open fittings as soon as they are disconnected to keep the moisture out of the system.*

3) Remove the receiver from the receiver holder.

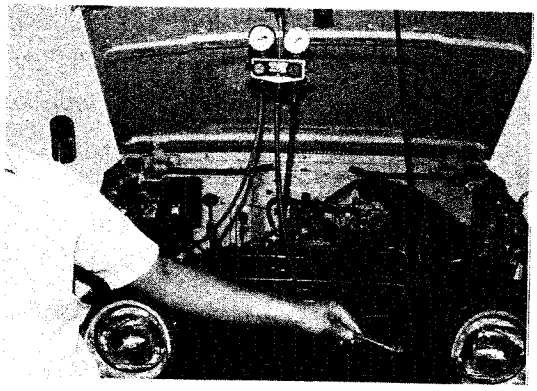


Fig. 53

C) Installation

1) Follow the removal procedures in reverse order.

Note: *1) Add the additional refrigerant oil about 3 fluid once (90 cc) to compressor when the receiver is replaced.*

2) Do not remove the blind plugs till ready for connection.

2) Charge the refrigerant and carry out the performance test of the air conditioning system. (Refer to "XI FINISH" on page 59.)

4. EXPANSION VALVE

A) Inspection before removal

1) Connect the refrigerant charging gauge to the air conditioning system.

2) Rotate the compressor, and check the low pressure gauge reading.

a) When low pressure gauge shows too low.
This is caused by sticking freezed moisture on spray hole of expansion valve or by leaking gas in the remote bulb.
If so, check and replace the expansion valve and receiver.

b) When low pressure gauge shows too high.
This is caused by opening widely spray hole of expansion valve due to loosen remote bulb holder or due to stick it at open position.
If so, replace or tighten remote bulb holder.

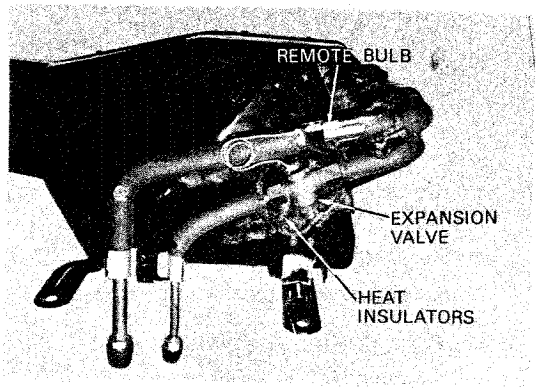


Fig. 54

3) Remove the under cover and heat insulator, then check the gas leakage from tube fittings and equalizer pipe of expansion valve using gas leak tester.

c) If gas leakage is found, retighten or replace the expansion valve.

B) Removal

1) Discharge the refrigerant very slowly from the refrigeration system. See Fig. 55. (Refer to "SAFETY PRECAUTIONS" on page 5.)

2) Remove the under cover from the cooling unit. See Fig. 56.

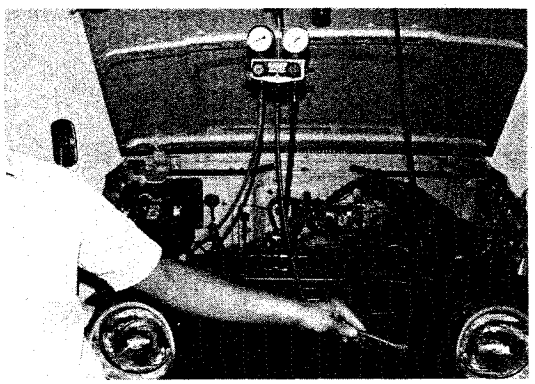


Fig. 55

Fig. 56

3) After removing the heat insulators from the expansion valve, remove the expansion valve in such a manner to disconnect equalizer pipe fitting and remote bulb from the suction return tube, and inlet and outlet fittings of expansion valve from the liquid line tubes.

Note: *Cap the open fittings as soon as they are disconnected to keep the moisture out of the system.*

C) Inspection

1) Connect the refrigerant charging gauge, expansion valve, orifice and refrigerant drum with the charging hoses as shown in Fig. 57.

2) Dip the remote bulb of expansion valve in the pan filled with various temperature water.

3) Keep the both hand valves of refrigerant charging gauge closed.

4) Pierce the refrigerant drum to release the pressure.

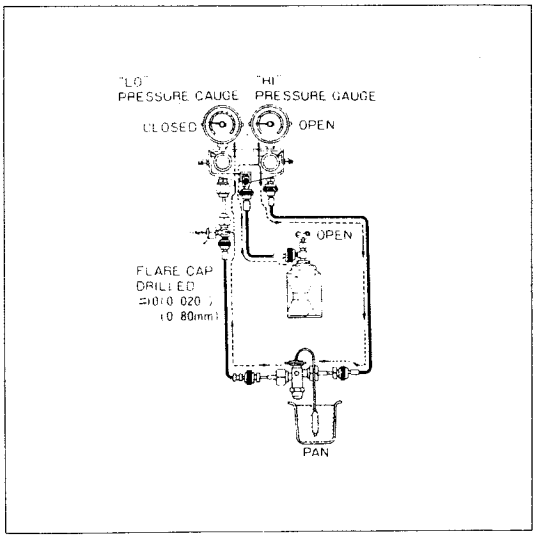


Fig. 57

5) Open the high pressure hand valve and adjust the high side pressure to approximate 70 psi (5 kg/cm²) by turning the high pressure hand valve.

6) Read the indication of the low pressure gauge, at the same time measure the water temperature using the thermometer.

7) Relate two readings on the following chart. See Fig. 58.
If the crossing point is within the area outlined by diagonal lines, the expansion valve is normal.
If not so, replace it.

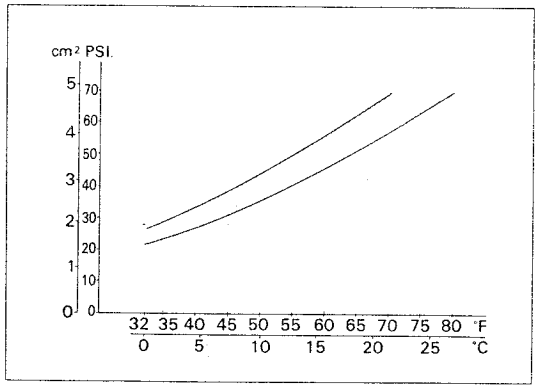


Fig. 58

D) Installation

1) Follow the removal procedures in reverse order.
Note: *After checking the gas leakage, wrap the expansion valve body, remote bulb, evaporator inlet and outlet tubes using heat insulator.*

2) Charge the refrigerant and carry out the performance test of the air conditioning system. (Refer to "XI FINISH" on page 59.)

5. EVAPORATOR

A) Removal

1) Disconnect the battery negative cord from the battery terminal.

2) Discharge the refrigerant very slowly from the refrigeration system. See Fig. 59.
(Refer to "SAFETY PRECAUTIONS" on page 5.)

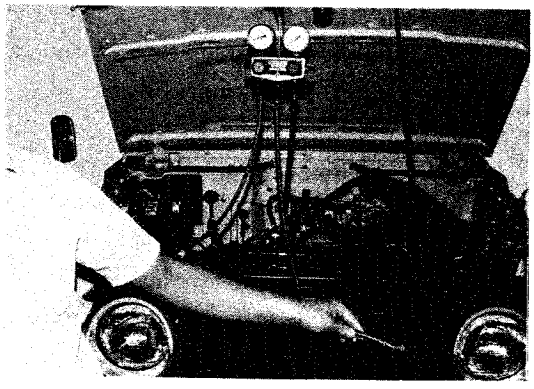


Fig. 59

3) Remove the instrument panel under tray, lower garnish, ash receptacle, glove compartment door, right side air duct and glove compartment from the instrument panel.

4) Disconnect the connectors of vacuum switch and thermostat from the air conditioner wire harness.

5) Disconnect the liquid line tube and suction flexible hose from the inlet and outlet fittings of cooling unit.

Note: *Cap removed all fittings as soon as they are disconnected.*

6) Remove the cooling unit from under the dashboard.

7) Disconnect the inlet and outlet fittings of evaporator from the suction return and inlet tubes. See Fig. 60.

Note: *Cap the inlet and outlet fittings of evaporator at once.*

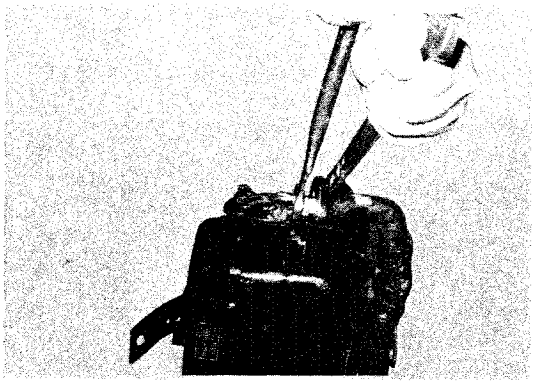


Fig. 60

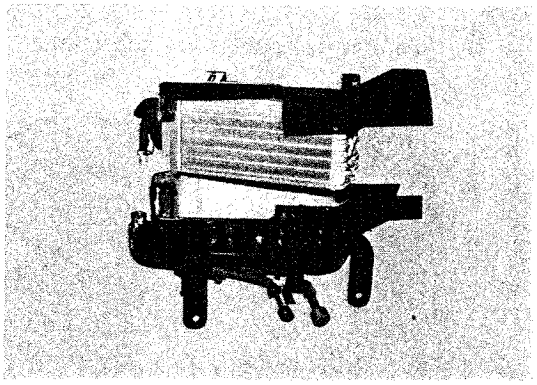


Fig. 61

8) Remove the upper case w/evaporator from the lower case. See Fig. 61.

9) Remove the evaporator from the upper case.

B) Inspection

a) Check if the evaporator fins are clogged with dirt or dust.

b) Check both evaporator fittings for cracks or scratches and the evaporator for gas leak with gas leak tester.

Clogged evaporator fins should be cleaned with high pressure air.

Note: *Never use water.*

If leakage of fitting or tube is found, repair or replace the evaporator.

C) Installation

1) Follow the removal procedure in reverse order.

Note: *1) At installing the cooling unit, be careful not to bite the wire harness with cooling unit bracket.*

2) Add the additional refrigerant oil about 1 fluid ounce (30 cc) to inside compressor when evaporator is replaced.

2) Charge the refrigerant and carry out the performance test of the air conditioning system. (Refer to "XI FINISH" on page 59.)

6. REFRIGERANT LINE

A) Inspection

a) Inspect the hose or tube for gas leak using the gas leak tester.

b) Check the hose holders and pipe clips for looseness.
If abnormal, retighten or replace it.

B) Removal

1) Discharge the refrigerant very slowly from the refrigeration system. See Fig. 62.
(Refer to "SAFETY PRECAUTIONS" on page 5.)

2) Remove defective tube or hose from the air conditioning system.

Note: *Cap the open fittings as soon as they are disconnected to keep the moisture out of the system.*

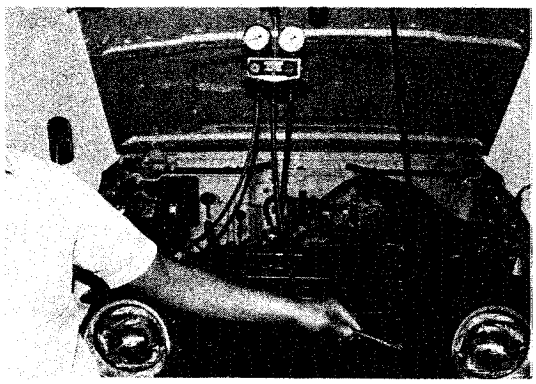


Fig. 62

C) Installation

1) Follow the removal procedure in reverse order.

2) Charge the refrigerant and carry out the performance test of the air conditioning system. (Refer to "XI FINISH" on page 59.)

IX-2 ELECTRICAL SYSTEM

1. FUSE

A) Inspection

Check "TAIL", "LIGHTER"

If the fuse is blown, check and repair the air conditioner wire harness or electrical parts, and replace the blown fuse.

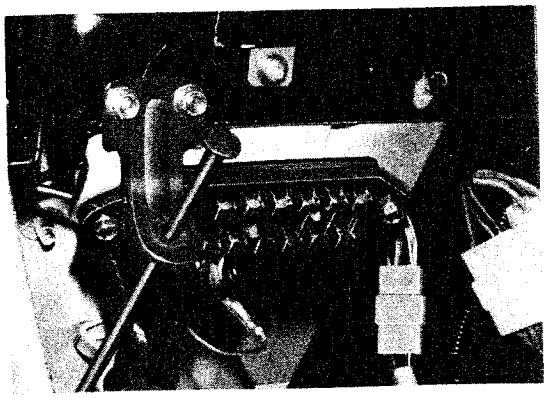


Fig. 63

2. BLOWER CONTROL SWITCH

A) Removal

1) Disconnect the battery negative cord from the battery terminal.
2) Remove the blower control switch.

B) Inspection

a) Using a circuit tester, check the continuity between the terminals.

Switch Position	Terminal Continuity
OFF	3 – 6
1st Stage (Low Speed)	1 – 3 – 5 – 6
2nd Stage (Medium Speed)	1 – 3 – 4 – 6
3rd Stage (High Speed)	1 – 2 – 3 – 6

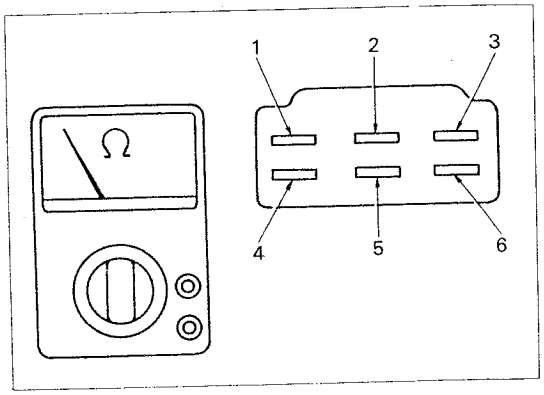


Fig. 64

3. BLOWER CONTROL RESISTOR

A) Removal

1) Remove the heater blower. See Fig. 65.
2) Remove the blower control resistor. See Fig. 66.
3) Using a circuit tester, measure the resistance between the terminals. See Fig. 68.

Standard

Hi — Me ..... 1.1 ohm
Me — Lo ..... 1.0 ohm
Hi — Lo ..... 2.1 ohm

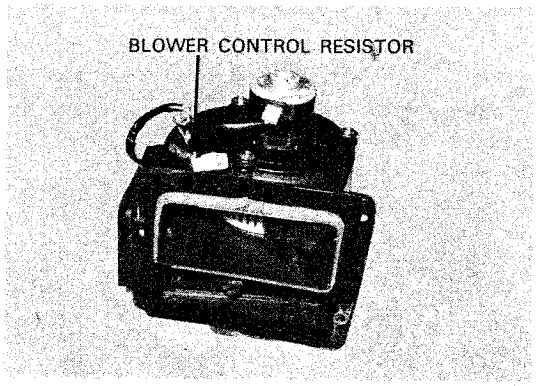


Fig. 65

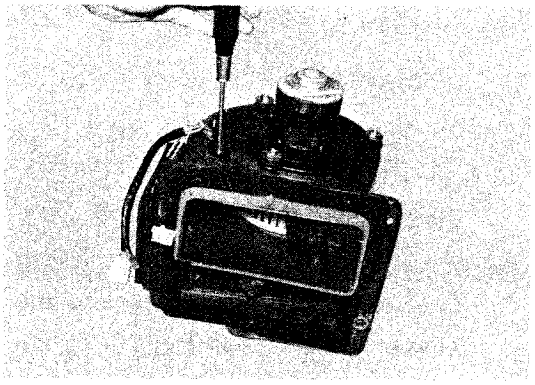


Fig. 66

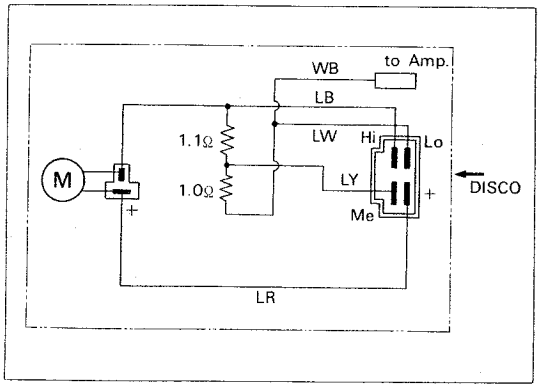


Fig. 67

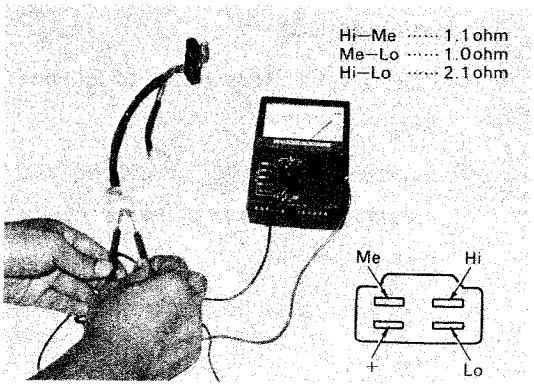


Fig. 68

4. BLOWER MOTOR AND FAN

A) Removal

1) Remove the booster assy.
2) Remove the blower motor w/fan from the booster case.
3) Remove the blower fan from the blower motor. See Fig. 69.

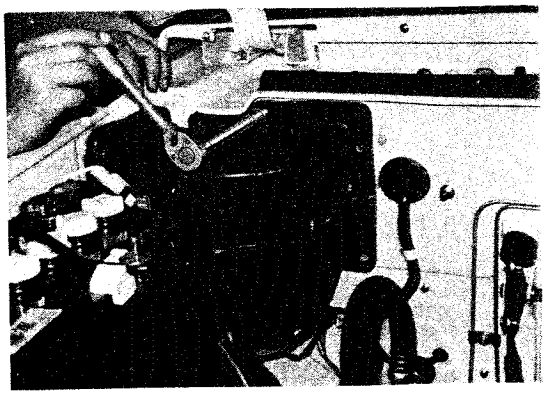


Fig. 69

B) Inspection (1)

1) Disconnect 2-pole connector.
   a) Connect the circuit tester to "Plus" and "Minus" terminals, and check the continuity.

   If the circuit tester indicates infinity (∞), or zero (0) ohm, replace the blower motor. See Fig. 70.

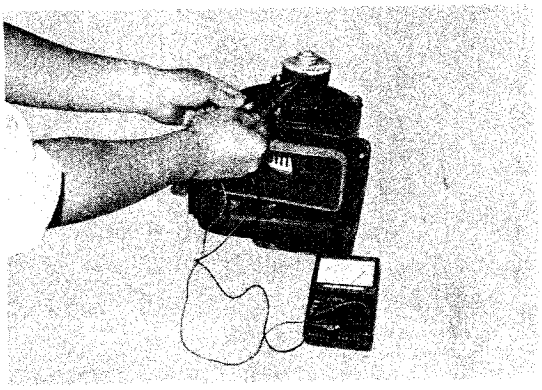


Fig. 70

C) Inspection (2)

1) Check for deformation of blower fan.
2) Check for melting or cutting the solder connections of inside blower motor.

If abnormal, repair or replace it.

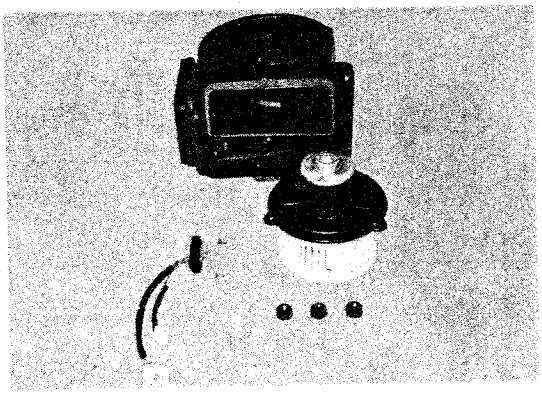


Fig. 71

5. IDLING STABILIZER AMPLIFIER

A) Inspection

1) Run the engine and turn on the air conditioner, then measure cut-in and cut-off engine rpm.

   a) If cut-in and cut-off engine rpm is too low or high, adjust or replace the idling stabilizer amplifier that is installed under the cooling unit to get specified cut-in and cut-off engine rpm.

B) Adjustment

Standard

Cut-in rpm ·····800—900 rpm
Cut-off rpm ·····600—700 rpm

1) If operating point is too high :
   Turn the knob of cut-in rpm setting resistor clockwise.

2) If operating point is too low :
   Turn it counterclockwise.

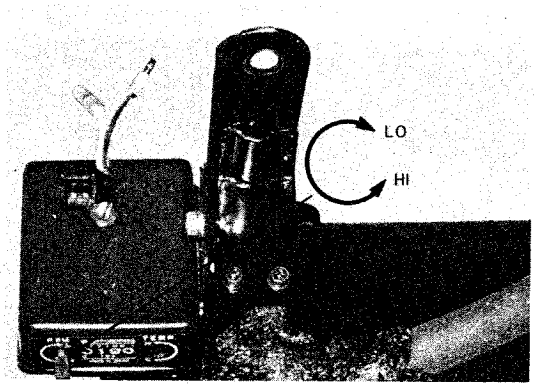


Fig. 72

6. THERMISTOR

A) Removal

1) Disconnect the battery negative cord from the battery.

2) Disconnect 2-pole connector of thermistor from the air conditioner wire harness.

3) Measure the resistance of the thermistor, at the same time measure the surrounding air temperature. See Fig. 73.

   a) Relate two readings (resistance and temperature) on the following chart. If the crossing point is with-in area outlined by diagonal lines, the thermistor is normal. If not so, replace it. See Fig. 74.

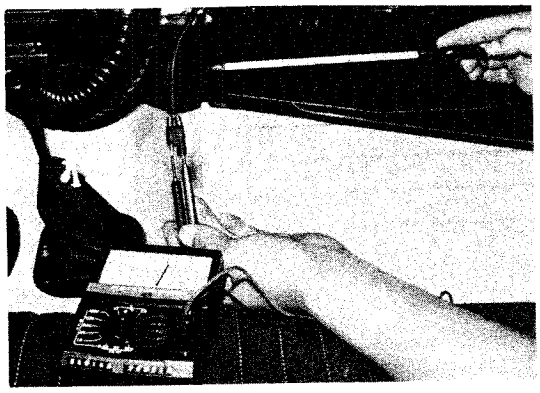


Fig. 73

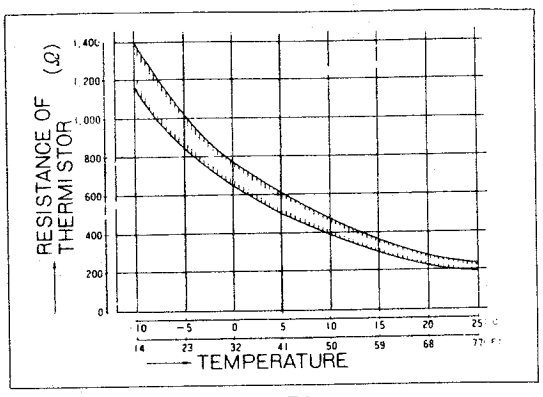


Fig. 74

7. THERMOSTAT DIAL

A) Inspection

a) When placing the THERMOSTAT dial at "OFF" position, circuit tester indicates infinity (∞).
See Fig. 75.

If abnormal, replace it.

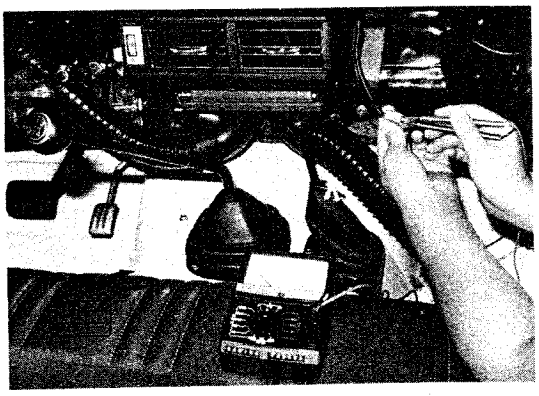


Fig. 75

b) Measure the resistance of thermostat while turning the control lever from "1" position to "10" position using circuit tester.
See Fig. 76 and Fig. 77.

○ If the circuit tester reading increases smoothly from 500 to 0 ohms, the thermostat is normal.

If abnormal, replace it.

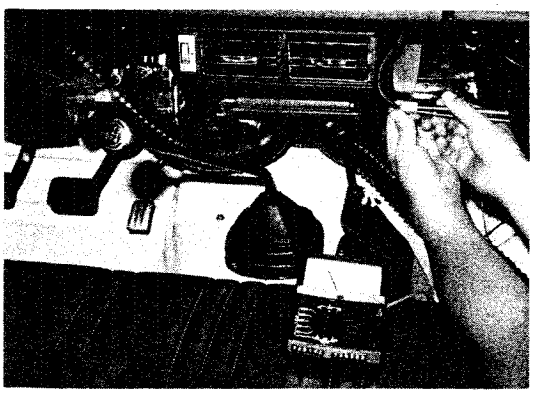


Fig. 76

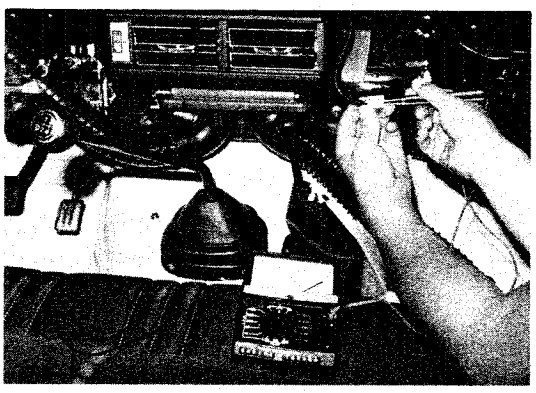


Fig. 77

8. BULB

A) Inspection

a) Remove the cool air outlet grille.

b) Disconnect the plug terminal.

c) Using a circuit tester, check the continuity between the terminals.
See Fig. 78.

If the circuit tester indicates infinity (∞), replace the bulb.

Fig. 78

9. MAGNETIC CLUTCH

A) Inspection

a) Inspect the pressure plate surface of the rotor and the pulley for wear, score and oil soaked condition.
If necessary, replace them.

b) Check the clutch bearings for wear. If necessary, replace them.

c) Connect an ammeter (0—10 ampere scale) in series with 12 volts battery and the stator coil lead wire to test the stator coil for open or short circuit.
Standard Current (at 68°F (20°C))
R-type magnetic clutch (for MS model) : 2.9 — 3.3 A
G-type magnetic clutch (for RS model) : 2.5 — 3.0 A

B) Removal

R-type (for FJ55L)

1) Isolate the clutch stator lead wire from the air conditioner wire harness.
2) Loose the compressor drive belt.
3) Remove a fixing nut from the compressor shaft and then remove the pressure plate using the clutch remover (SST No. 24 on page 27). See Fig. 79.
4) Remove the rotor and the stator from the compressor housing.

Note: *Never scratch on the outer surface of the front housing boss when removing the clutch rotor and stator.*

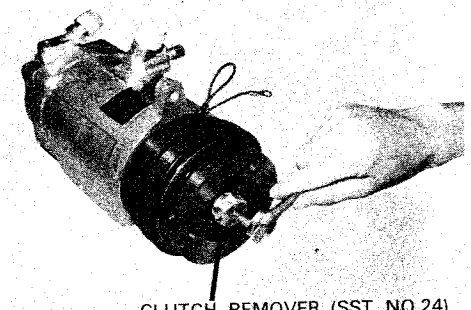


Fig. 79

G-type (for FJ55 model)

1) Isolate the clutch stator lead wire from the air conditioner wire harness.
2) Loose the compressor drive belt.
3) Unscrew the center bolt from the crankshaft of the compressor.
4) Remove the rotor w/pulley assy from the crankshaft using the clutch remover (SST No. 25 on page 27). See Fig. 80.
5) Remove the stator from the compressor housing.

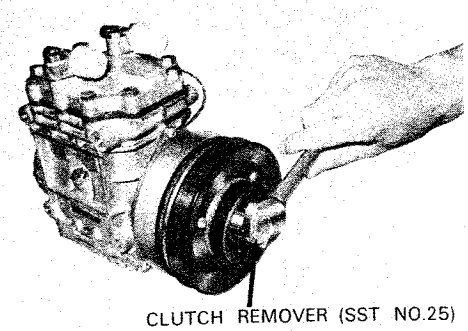


Fig. 80

C) Disassembly

R-type

1) Remove the snap ring from the rotor groove.
2) Place the rotor on the support stand with pulley side down, and press two bearings from the rotor boss. See Fig. 81.

R-type

1) Remove the snap ring from the rotor groove.
2) Place the rotor on the support stand with pulley side up, and press a collar, two bearings and a shield ring from the rotor boss. See Fig. 82.

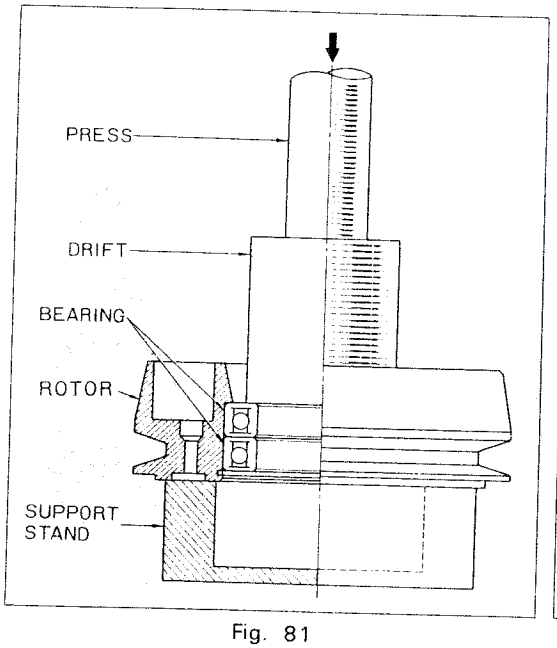


Fig. 81

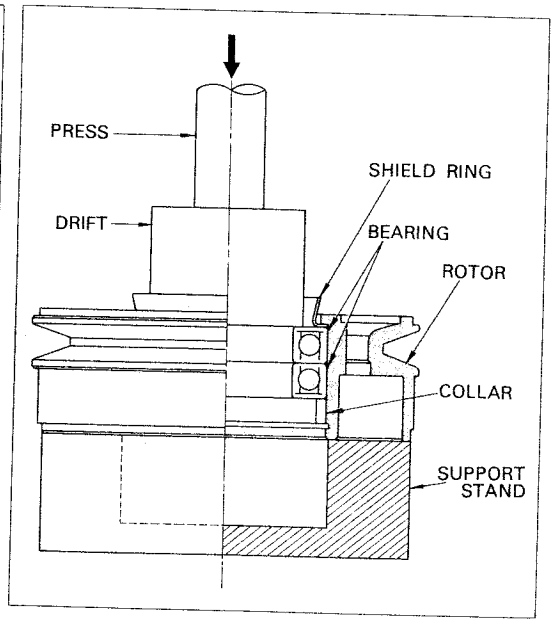


Fig. 82

G-type

1) Divide the rotor w/pulley assy into the rotor and the pulley.
2) Remove the snap ring from the pulley groove.
3) Place the pulley on the support stand with pulley side down, and press two bearings from the pulley boss. See Fig. 83.

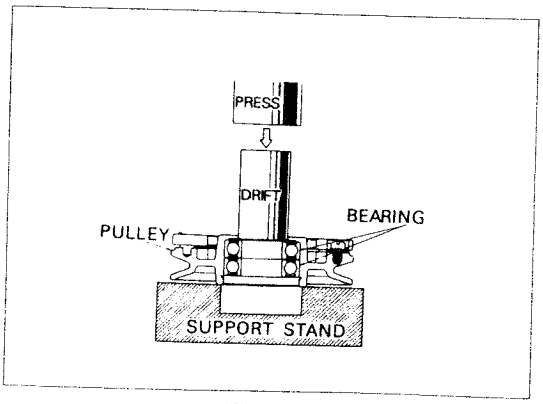


Fig. 83

D) Assembly

Note: *New bearing must be installed every time the magnetic clutch is disassembled.*

R-type

1) Place the rotor with pulley side up on the support stand.
2) Insert two pieces of new bearing into the rotor boss till fully seated. See Fig. 84.
3) Install the snap ring to the rotor groove.

R-type

1) Place the rotor with pulley side down on the support stand.
2) Insert a shield ring, two pieces of new bearing and a collar into the rotor boss till fully seated. See Fig. 85.
3) Install the snap ring to the rotor groove.

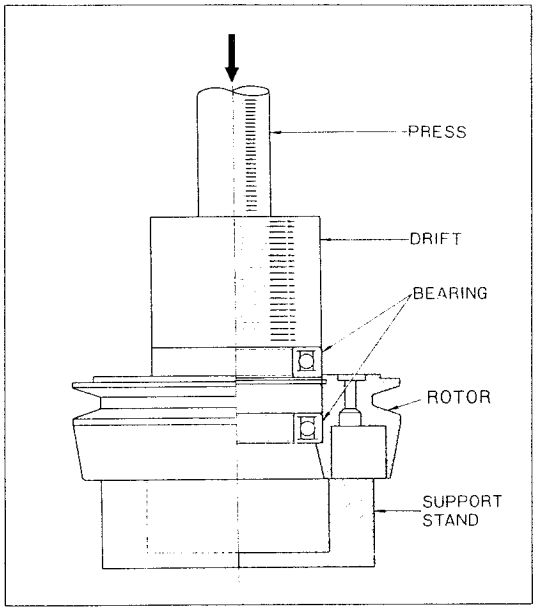


Fig. 84

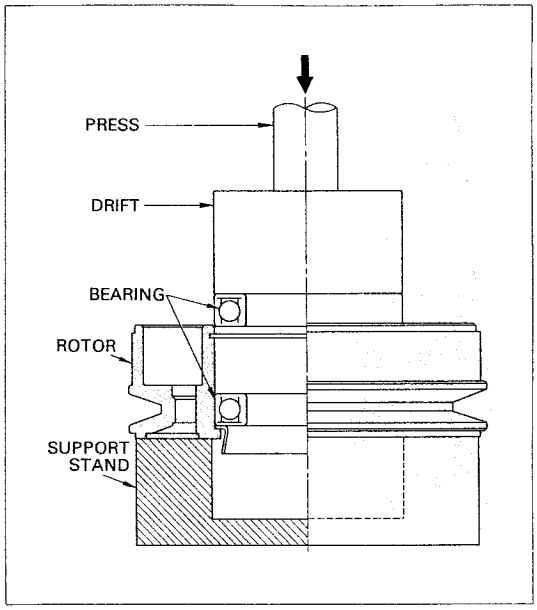


Fig. 85

G-type

1) Place the pulley with pulley side up on the support stand.
2) Insert two pieces of new bearing into the pulley boss till fully seated. See Fig. 86.
3) Install the snap ring to the pulley groove.
4) Assemble the pulley to the rotor.

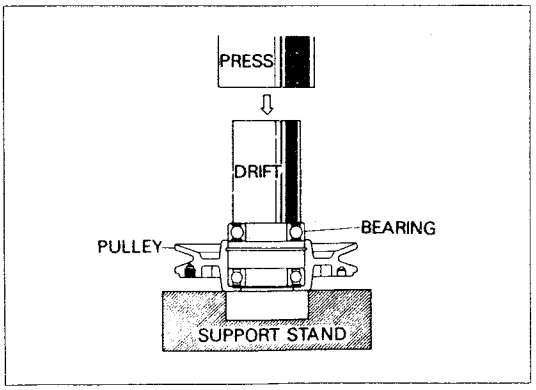


Fig. 86

Note: *When assembling the pulley to the rotor, adjust the gap between rotor and pressure plate of pulley by putting the thrust washer on the rotor boss.*

Standard gap: 0.4 — 0.7 mm (0.016 — 0.028 in.)

E) Installation

1) Follow the removal procedures in reverse order.

Fixing torque:

Center bolt of G-type clutch ..... 1.7 — 2.4 kg-m (12.3—17.4 ft-lb)

Center nut of R-type clutch ..... 1.75—2.0 kg-m (12.7—14.5 ft-lb)

Note: *When assembling the R-type magnetic clutch onto the compressor shaft, adjust the gap between rotor and pressure plate by putting the thrust washers on the tip of compressor shaft.*

Standard gap: 0.7 — 1.3 mm (0.028 — 0.051 in.)

IX-3 HEATING SYSTEM AND AIR DISTRIBUTION

1. WATER VALVE

A) Removal

1) Drain the engine coolant.

2) Disconnect two heater hoses and heater control cable from the water valve fittings, then remove the water valve.

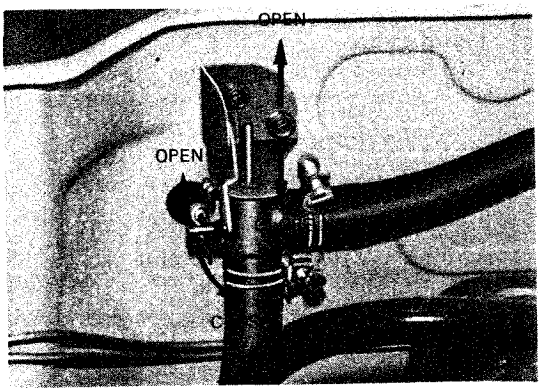


Fig. 87

B) Inspection

a) When the lever of the water valve move to fully closed direction, check if the water valve is fully closed.

b) When the lever of the water valve move to fully opened direction, check if the water valve is fully opened.

c) check the water valve for water leakage.

C) Installation

1) Follow the removal procedures in reverse order.

2. HEATER CORE

A) Removal

1) Remove the heating unit.

2) Disassemble the heating unit case, and remove the heater core from the case. See Fig. 88, Fig. 89, Fig. 90 and Fig. 91.

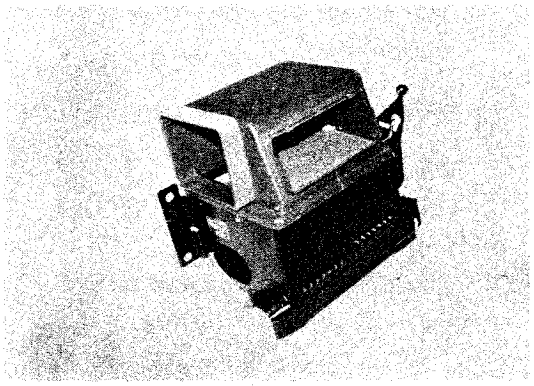


Fig. 88

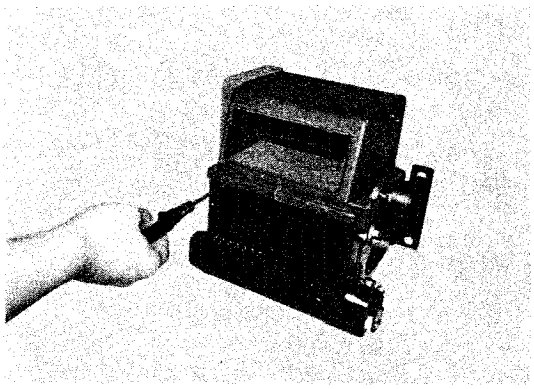


Fig. 89

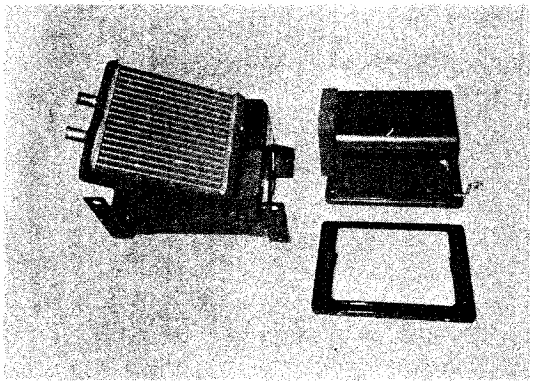


Fig. 90

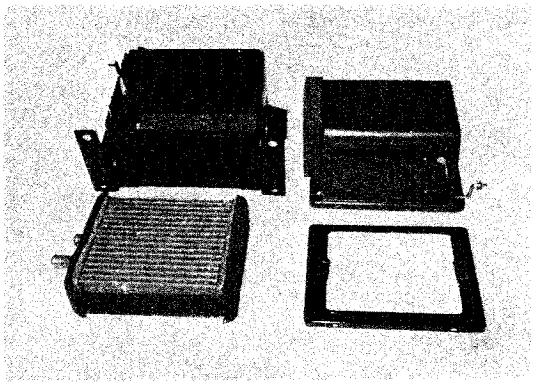


Fig. 91

B) Inspection

a) Check if the fins of heater core are clogged with dirt or dust.

b) Check the water tubes of heater core for water leaking.

If the fins are clogged, wash them with water or high pressure air.

If there is water leaking, replace the heater core.

C) Installation

1) Follow the removal procedures in reverse order.

Note: *At installing the heating unit, be carefull not to bite the wire harness with heating unit brackets.*

3. AIR DUCTS

A) Inspection

a) Check the air ducts for disconnection or air leaking.

If air leaks from the joints, stick the packing or the vinyl tape around them.

X OTHERS

1. DRIVE BELTS

A) Inspection

a) Check the belt tension.

b) Check if the belt is worn.

If abnormal, restretch or replace it.

(Specified belt tension)

Deviating distance when pushed with 22 lb (10 kg) force :

Fan belt .....
0.28~0.40 in. (7~10 mm)

Compressor drive belt .....
0.60~0.72 in. (15~18 mm)

Air pump drive belt.....
0.75~0.94 in. (20~25 mm)

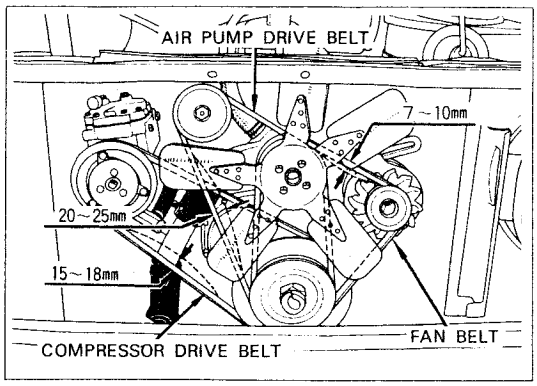


Fig. 92

Note: *When replacing the belt to new one, restretch the belt with specified tension after finishing the break-in running.*

XI FINISH

1. CHECKING THE REFRIGERANT OIL

Generally, when the air conditioning system is operating normally, the compressor oil level does not need checking.

But compressor oil level should be checked only where there is evidence of a major loss of refrigerant oil such as caused by:

a) a excessive hose or tube fitting leak.
b) a broken flexible hose.
c) collision damage to the air conditioner component part.
d) a excessive leaking from the compressor shaft seal.
(A slight amount of compressor oil leaking at the compressor front shaft seal is considered normal.)

A) Filling or Drawing the Refrigerant Oil

Swash plate type compressor (FJ55L model)

To check the refrigeration oil amount, it is necessary to remove the compressor assy from the engine, drain and measure the oil as described below.

a) Put the compressor assy horizontally on the clean working stand and incline the compressor in such a manner as to lift up the housing surface screwed plug. See Fig. 93.

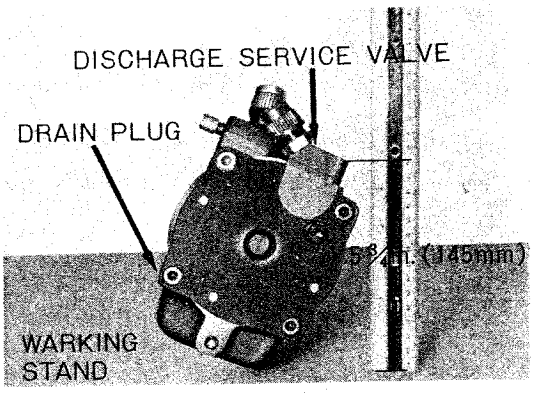


Fig. 93

b) Remove the drain plug slightly from the compressor housing with keeping compressor assy as shown in Fig. 93.
1) If the oil comes out of drain hole, the oil amount is proper.
The compressor contained about 10—11 fluid ounce (300—330 cc) of oil.
2) If the oil does not come out of drain hole, even though compressor is inclined as shown in Fig. 93. The oil amount is insufficient.
Add the clean specified oil till the oil comes out of drain hole.

Note: *a) If additional oil is required, add clean DENSOIL 6, SUNISO NO. 5GS or equivalent.*
b) Draw out the excessive oil until proper quantity is indicated.
※ If more oil than specified is indicated.
※ If new compressor is installed on system which has been operated.
c) After checking the refrigerant oil level, tighten the drain plug to 10—12 ft-lb (1.4—1.7 kg-m).
d) Evacuate and charge the system and check the drain plug for gas leak.

Reciprocating type compressor (FJ55 model)

To check the refrigeration oil level using the oil level gauge (SST NO. 07115—82010), remove the oil filler plug from the compressor housing and insert the gauge into the hole to measure the oil level.
See Fig. 94.

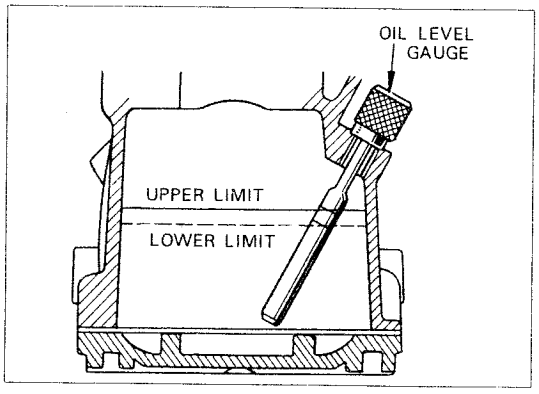


Fig. 94

Note: *a) Discharge the refrigerant from the air conditioning system before refrigerant oil level is checked.*

b) If additional oil is required, add clean SUNISO No. 4G oil or equivalent.

c) Draw out the excessive oil until proper quautity is indicated.
※ If more oil than specified is indicated.
※ If new compressor is installed on the system which has been operated.

d) After checking the refrigerant oil level, tighten the drain plug to 23—25 ft-lb (3.2—3.5 kg-m).

e) Evacuate and charge the system and check the drain plug for gas leak.

B) Add Additional Refrigerant Oil to Inside Compressor When System Component is Repaired.

Evaporator ..... 1 fluid ounce (30cc)
Condenser ..... 1 fluid ounce (30cc)
Receiver ..... 3 fluid ounce (90cc)

Note: *When adding or drawing the refrigerant oil, oil container should not be opened ready for use, and it should be capped immediately after using.*
Because, compressor oil will absorb quickly any moisture.

2. EVACUATING AND CHARGING METHOD

Before doing evacuating and charging works, refer to and "VII HANDLING OF SERVICE TOOLS" on page 27.

A) Installing the Gauge Manifold Set

1) The fittings for attaching the refrigerant charging gauge are located on the compressor service valves.
   These service valves have schrader type valve shown in Fig. 95, so charging hose which is connected to the service valve fittings should be a pin at the end of charging hose.

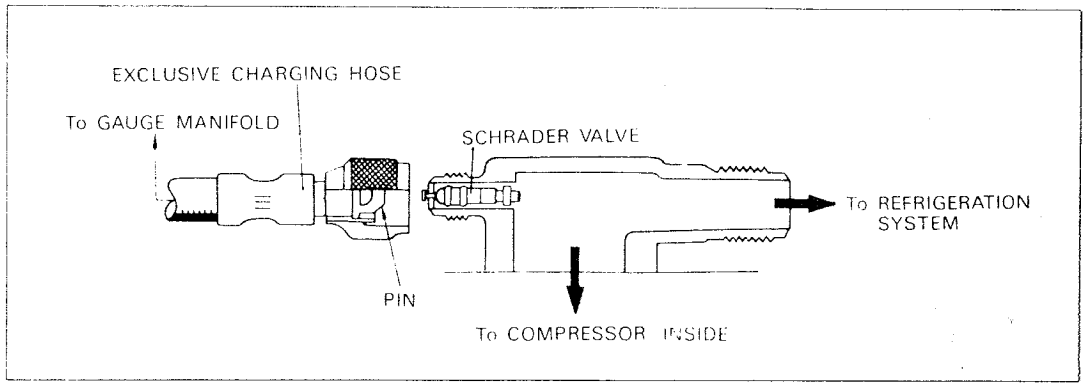


Fig. 95

2) After stopping the engine, remove the cap nuts from the service valve fittings.
3) Be certain of the both hand valves of refrigerant charging gauge are closed.
4) Install the charging hoses of refrigerant charging gauge onto the suction and discharge service valves respectively.

B) Evacuating the System

1) Connect the high and low charging hoses of refrigerant charging gauge to the hose fittings of the compressor and discharge tube.
2) Install the center charging hose of the refrigerant charging gauge to the vacuum pump inlet. See Fig. 96 or Fig. 97.
3) Close the both hand valves of refrigerant charging gauge tightly.
4) Run the vacuum pump, then open the both hand valves.
5) After about 10 minutes, the low pressure gauge should be less than 24–27 in. Hg (60–70 cm-Hg) vacuum, if there is no leak.

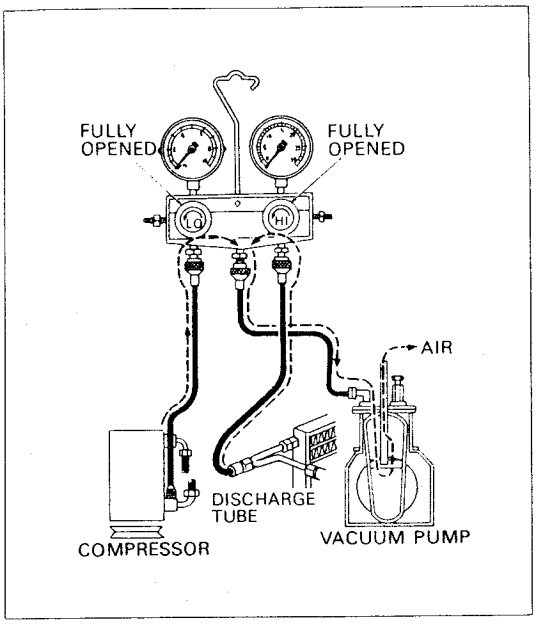


Fig. 96

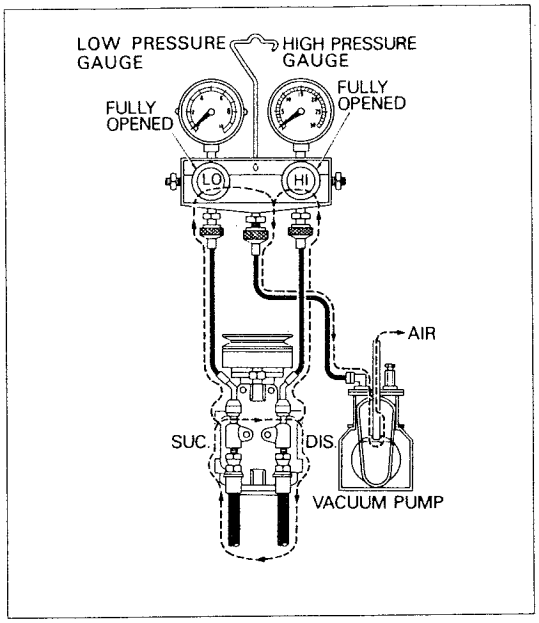


Fig. 97

Note: *a) If the system is not down to 24—27 in. Hg (60—70 cm-Hg) vacuum, close the high and low hand valves, and stop the vacuum pump.*
Observe the low pressure gauge of refrigerant charging gauge.
b) If the low pressure gauge indication increases, there is a leak which must be repaired before continuing with evacuation.
c) If no leak is evident, continue pumping down.

6) After evacuating the system until low pressure gauge indicates below 27 in. Hg (70 cm-Hg) vacuum, close the both hand valves.

7) Stop the vacuum pump, then disconnect the center charging hose from the vacuum pump inlet.
The system is now ready for charging after it is evacuated as above.

C) Leak Testing the System

After finishing the evacuation of the system, check the system for gas leak using gas leak detector as described below.

1) Attach the service valve to the refrigerant drum.

2) Install the center charging hose of the refrigerant charging gauge to the service valve, then pierce the refrigerant drum by screwing the service valve handle in clockwise.

3) Unscrew the service valve handle counterclockwise fully. Now the center charging hose is filled with vapor. Do not open the high and low hand valves.

4) Loosen the center charging hose nut connected to the center fitting of refrigerant charging gauge until a hiss can be heard.
   Allow the vapor to escape for a few seconds, and then tighten nut.

5) Open the high pressure hand valve to charge the refrigerant vapor into the system. See Fig. 98 or Fig. 99.

6) After indicating 14 psi (1 kg/cm^2) of low pressure gauge, close the high side hand valve.
   Under this condition, check the system for gas leak using a gas leak tester.

7) If gas leak is found, the defective components or connected portions should be repaired.

8) After checking and repairing the system for gas leak, evacuate the system again outlined below.
   a) Turn the service valve handle in clockwise fully to close the valve.
   b) Disconnect the center charging hose from the service valve fitting.
   c) Connect the center charging hose to the vacuum pump inlet, and then continue pumping down as described in Section B).

If possible, continue to run the vacuum pump for 30 minutes after the system reaches 24—27 in. Hg (60—70 cm-Hg) vacuum.

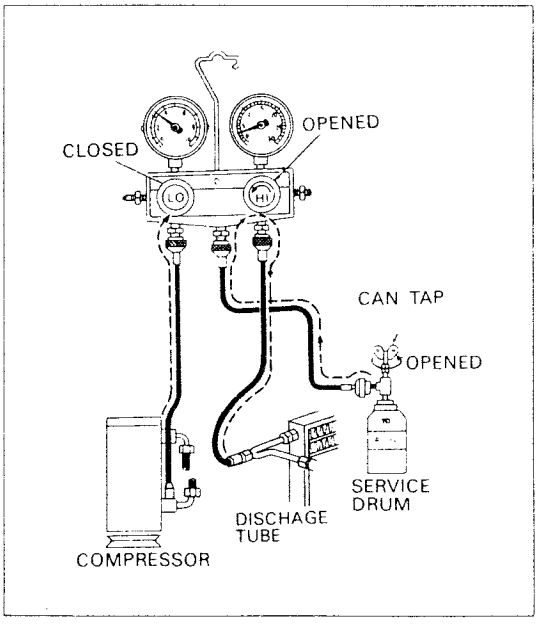


Fig. 98

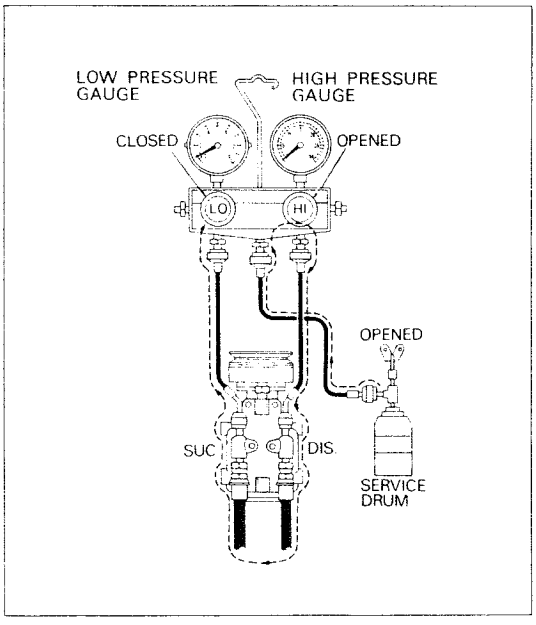


Fig. 99

D) Charging the System

1) Close the high and low hand valves of refrigerant charging gauge after the system is evacuated completely.

2) Connect the center charging hose to the service valve fitting, and then loosen the center charging hose at the center fitting of refrigerant charging gauge until a hiss can be heard.

3) Open the high pressure hand valve fully, and keeping the refrigerant drum up side down to charge the refrigerant in liquid state from the high pressure line (Never open the low hand valve of refrigerant charging gauge.).
See Fig. 100 or Fig. 101.

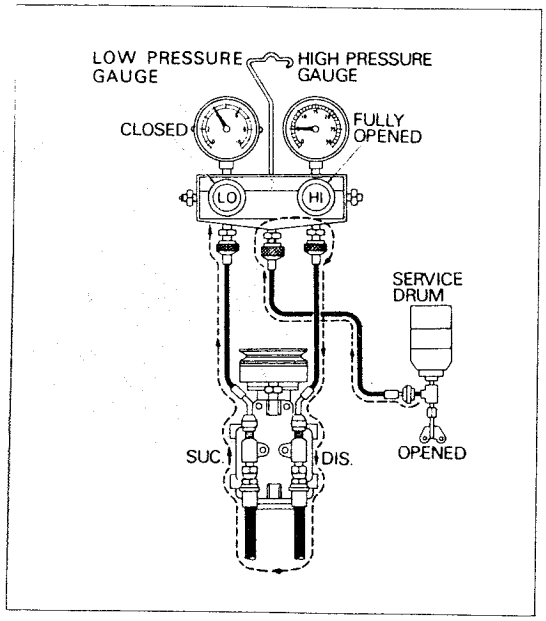


Fig. 100

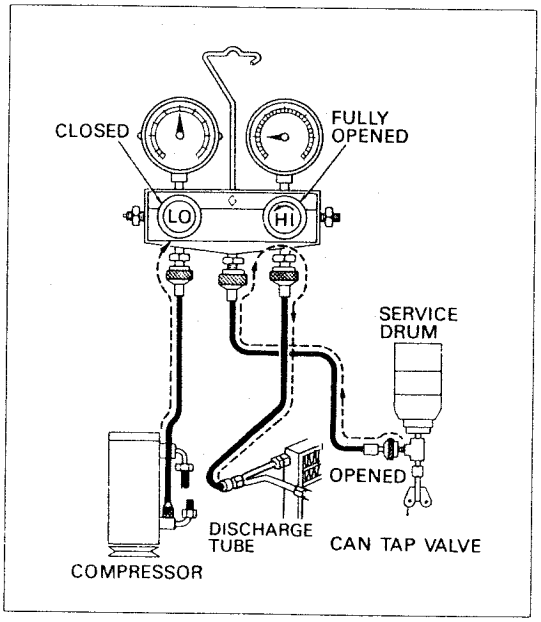


Fig. 101

4) Under the above state, charge the refrigerant completely to specified amount.
Standard Amount of Refrigerant : 1.6 lbs (800 g)

Note: *If liquid refrigerant does not allow into the system smoothly.*

① *Put the refrigerant drum in warm water of less than 105° F (40° C). or*

② *Charge the refrigerant in vapor from the low pressure line as described below.*

a) Charge the refrigerant in liquid state at least more than one can (0.8 lb, 400g) from the high pressure line.

b) Close the high hand valve of refrigerant charging gauge tightly, and then open low hand valve.

c) Run the engine at first idle, and operate the air conditioner to get maximum cooling ("HI" blower speed, "COOL" posion of temperature control lever).

d) Charge the refrigerant in vapor into the air conditioning system.
Be sure to keep the refrigerant drum in upright position in this charging method. This is to prevent the liquid from the system through the suction service port of compressor.
Liquid refrigerant entering suction chamber of the compressor may cause serious damage to internal component parts.

e) After charging the specified amount of refrigerant into the system, close the low hand valve.

5) When the refrigerant drum becomes empty, close the high hand valve of refrigerant charging gauge, and remove the service valve from the refrigerant drum.
Attach the service valve to a new refrigerant drum, purge the air in the center charging hose shown in Fig. 102.

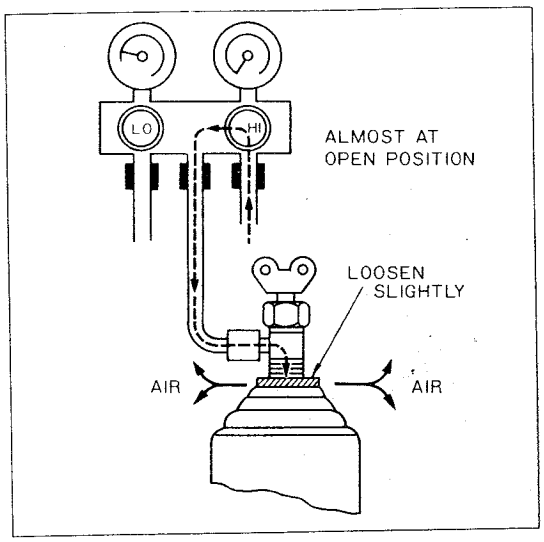


Fig. 102

6) Pierce the sealed tap of the refrigerant drum, and charge the refrigerant into the system continuously.

7) Close the high hand valve of refrigerant charging gauge after the specified amount of refrigerant is charged into the system.

8) Remove the high and low hand valves of refrigerant charging gauge quickly from the high and low service valves of compressor.

9) Put the cap nuts on the both service valve fittings of compressor.

3. PERFORMANCE TEST

After finishing all repairing works, make sure to carry out the performance test of the air conditioning system as follows.

A) Procedure

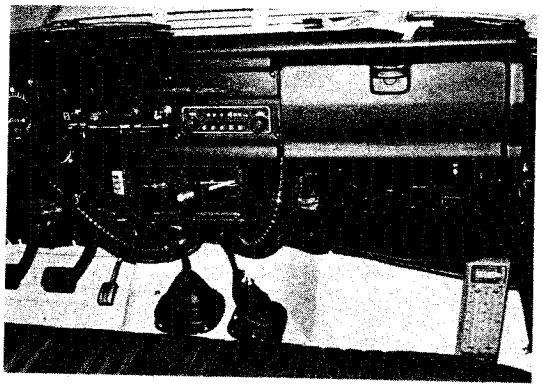


Fig. 103

1) Connect the high and low side charging hose of refrigerant charging gauge to the hose fittings of compressor and discharge tube.
2) Run the engine, and keep the compressor revolution at 2,000 rpm.
3) Operate the air conditioner, and set the blower control switch at "HI", the temperature control lever at "COOL" and the fresh-recirc control lever at "RECIRC" (MAXIMUM COOLING).
4) Keep the all windows and doors open.
5) Insert the dry bulb thermometer in the cool air outlet, and place the psychrometer (dry and wet bulb thermometer) close to the inlet of cooling unit. See Fig. 103.
6) The high pressure gauge of refrigerant charging gauge indication should be within the specified pressure range, 200—220 psi (14.0—15.5 kg/cm²).

Note: *If the gauge indicates too high, pour the water on the condenser or if it is too low, cover the front surface of condenser.*

7) The dry bulb thermometer at the air inlet should be within 77—95°F(25—35°C). If not so, postpone the performance test.

On the above conditions, operate the air conditioning system until a stabilized condition on high and low pressure gauges and the thermometers have been established.

B) How to Read the Standard Performance Curve

1) Read the indications of psychrometer at the inlet, and get the relative humidity from psychrometric chart. See Fig. 105.
2) Measure the dry bulb temperature at the cool air outlet, then find out the difference between the inlet and outlet temperatures.
3) For example, the difference is

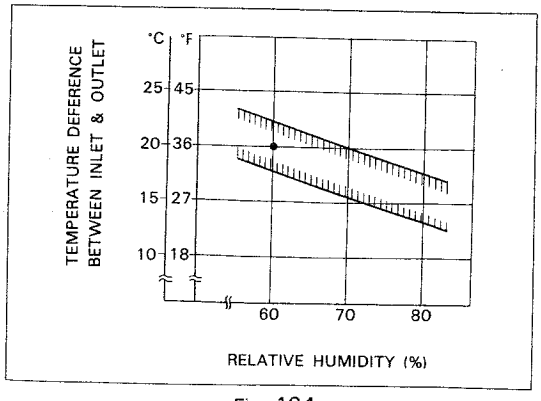


Fig. 104

36°F (20°C) and the relative humidity is 60%. Relate two points on Fig. 104. If the crossing point is within the diagonal lines area, the cooling performance is satisfactory and proper.

HOW TO GET RELATIVE HUMIDITY:

Measure temperatures of dry- and wet-bulb thermometers at air inlet (evaporator in let), then dring them into mutual relation on the chart and find out the intersection which is relative humidity.
For example, if dry-bulb temperature is 90°F, and wet-bulb temperature is 78°F, the relative humidity is 60%.

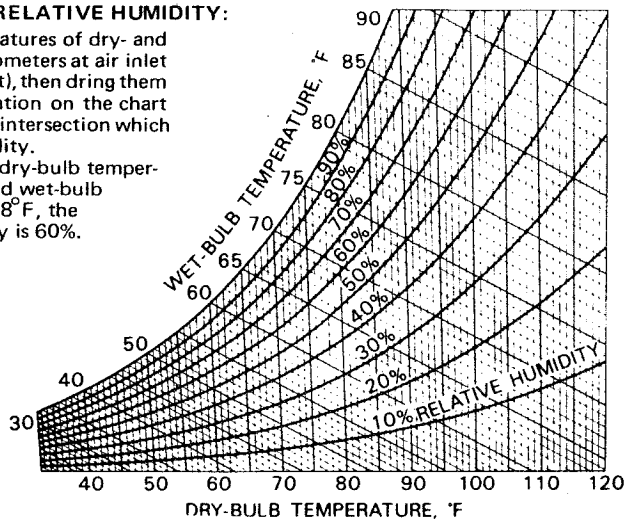


Fig. 105

MEMO :

November, 1975

No. : MAC—227

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