SUBARU

SVX

1992

M MECHANISM AND FUNCTION

1. Outline

1. The outlet air temperature, outlet air flow, intake port mode and outlet port mode are automatically selectable so as to provide comfortable air conditioning at all times of the year.
2. In addition to the AUTO switch, a manual switch is provided for selecting the outlet air flow (3 steps), outlet mode (VENT and DEF), intake port (RECIRC for 10 minutes) and economy mode (Compressor OFF).
3. The compressor is a wobble, variable delivery type. It is electronically controlled by way of communication between the MPFI unit and the A/C auto amplifier to increase driving ability as well as power-saving, cool-down and dehumidifying performance.
4. The push-button type control panel features improved ergonomic design.
5. The side defroster outlet port is located in the door trim area. This arrangement reduces dust from entering the door window, and improves side mirror visibility.
6. A large, specialized air outlet is provided on the rear side of the rear bumper to improve ventilation efficiency.
7. The auto amplifier has a self-diagnosis function, which allows easy trouble-diagnosis. An air outlet temperature correcting function is added which corrects for external temperature, depending on the temperature requirements of the passengers.
8. An electric cooling fan is used with three settings (LOW, MEDIUM, HIGH), which reduces noise and energy.
9. To improve the accelerating performance of the vehicle, the compressor stops when the accelerator is moved to the full throttle position.
10. The sunload sensor features high sensitivity to sunlight from both vertical and horizontal directions.
11. All A/C system components are designed to increase efficiency, and delivery- and refrigerant-saving performance, as well as to reduce weight.

2. Switch Functions

A: PUSH SWITCH

1. OFF SWITCH

When the OFF switch is pressed, the set temperature display and switch LED will be turned off, and the following operation pattern established.

Intake door control	Mode door control	Air mix door control	Fan speed control	Compressor
FRESH	HEAT	AUTO	OFF	OFF

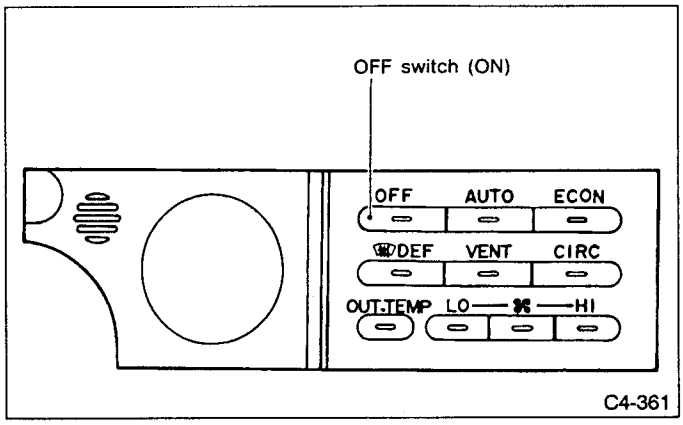


Fig. 1

2. AUTO SWITCH

When the AUTO switch is pressed, the set temperature display and AUTO switch LED (umber) will illuminate. **At the same time, the air conditioner automatic control mode will start.**

Intake door control	Mode door control	Air mix door control	Fan speed control	Compressor
AUTO	AUTO	AUTO	AUTO	AUTO

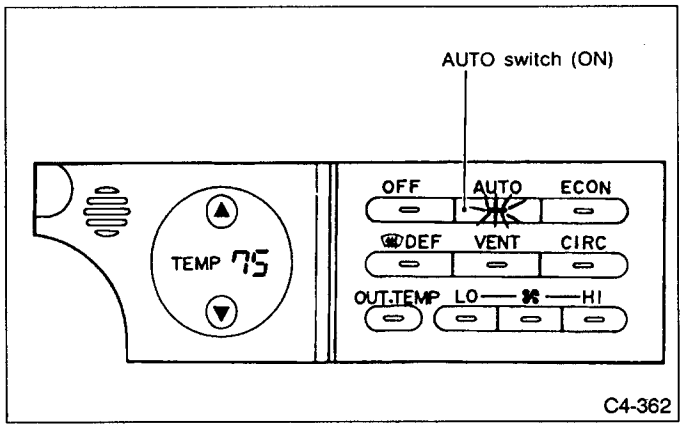


Fig. 2

3. ECON SWITCH

When the ECON switch is pressed, the set temperature display and ECON switch LED (umber) will illuminate, and the following operation pattern established.

At the same time, the heater automatic control mode (Compressor OFF) will start.

Intake door control	Mode door control	Air mix door control	Fan speed control	Compressor
FRESH	AUTO	AUTO	AUTO	OFF

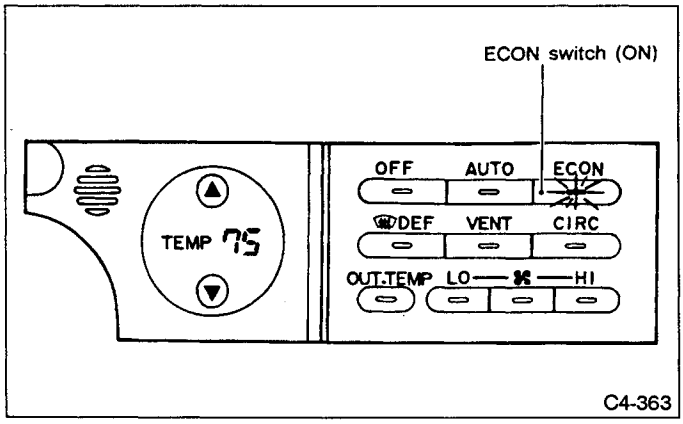


Fig. 3

4. DEF SWITCH

When the DEF switch is pressed, the set temperature display and DEF switch LED (umber) will illuminate, and the following operation pattern established.

Intake door control	Mode door control	Air mix door control	Fan speed control	Compressor
FRESH	DEF	AUTO	Approx. 8V or more	ON

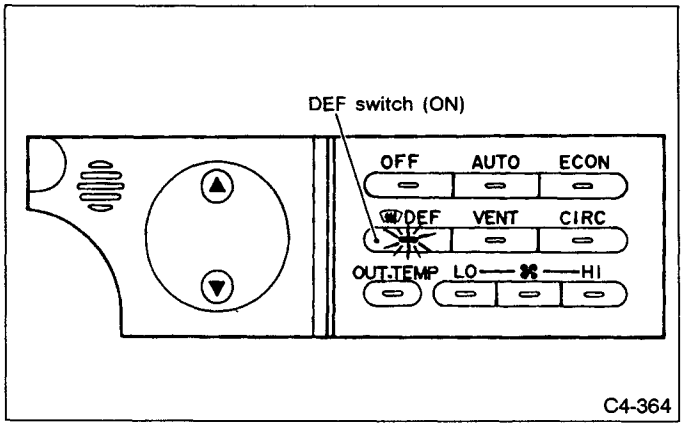


Fig. 4

5. VENT SWITCH

When the VENT switch is pressed, the set temperature display will be turned off and the VENT switch LED (umber) turned on, and the following operation pattern established.

If VENT switch is pressed when the AUTO switch or ECON switch is ON, the set temperature display will be turned OFF. If the VENT switch is pressed when the AUTO or ECON switch is OFF, the display will remain OFF. The VENT switch also allows the VENT outlets to discharge fresh outside air into the passenger compartment.

Intake door control	Mode door control	Air mix door control	Fan speed control	Compressor
FRESH	VENT	FULL COLD	Med Approx. 7V	OFF

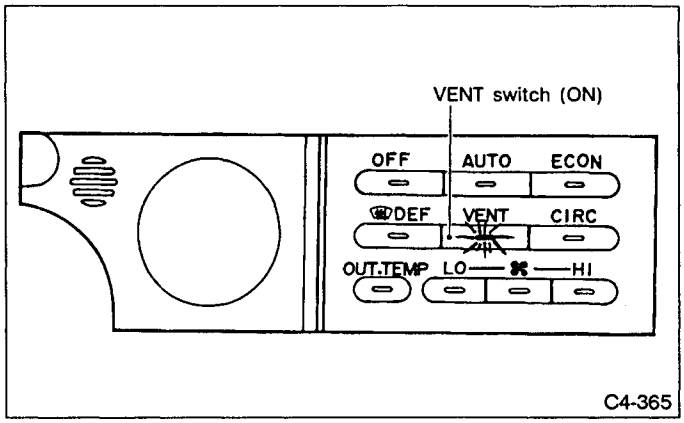


Fig. 5

6. CIRC SWITCH

When the CIRC switch is pressed, the suction port is fixed in the internal air recirculation position for 10 minutes. All other positions remain with the CIRC switch LED (umber) illuminated.

The automatic control mode and internal air recirculation mode alternate when the CIRC switch is pressed.

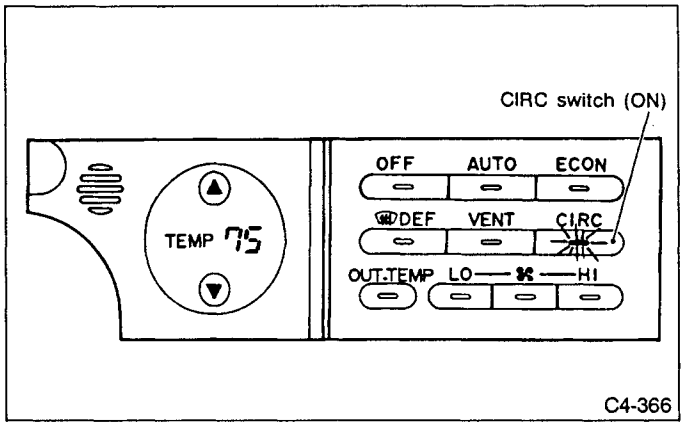


Fig. 6

7. OUT. TEMP SWITCH

When the OUT.TEMP switch is pressed, the external temperature will be displayed by blinking for five seconds.

During this period, the TEMP control switch (▲, ▼) remain OFF.

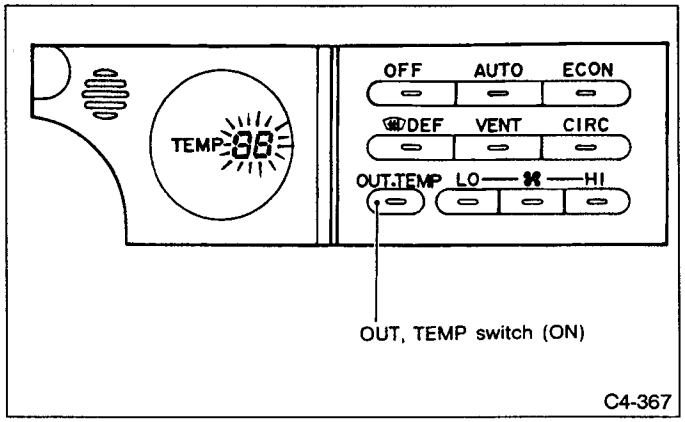


Fig. 7

8. LO (LOW) SWITCH

When the LO switch is pressed when any of the AUTO, ECON, DEF and VENT switches are ON, the LO switch LED (umber) will illuminate, and the fan speed fixed in the LOW (approx. 4 V) position. All other previous conditions are maintained.

When the LO switch is pressed, the AUTO switch and LO switch LEDS (umber) will illuminate, and operation will start with the AUTO mode.

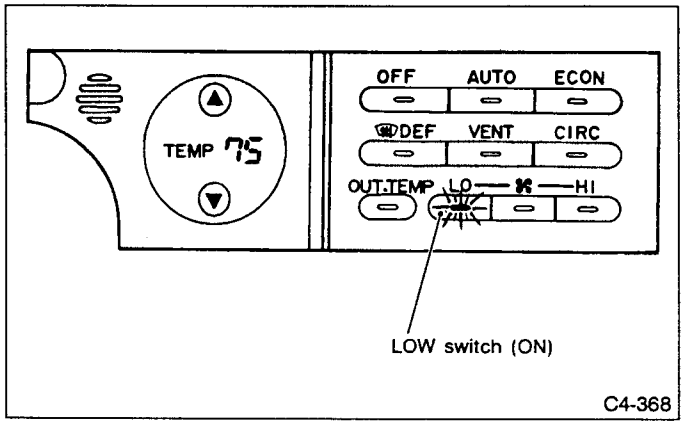


Fig. 8

9. MED (MEDIUM) SWITCH

The operation is the same as the LO switch, except the fan will operate at Medium (approx. 7.5V) speed.

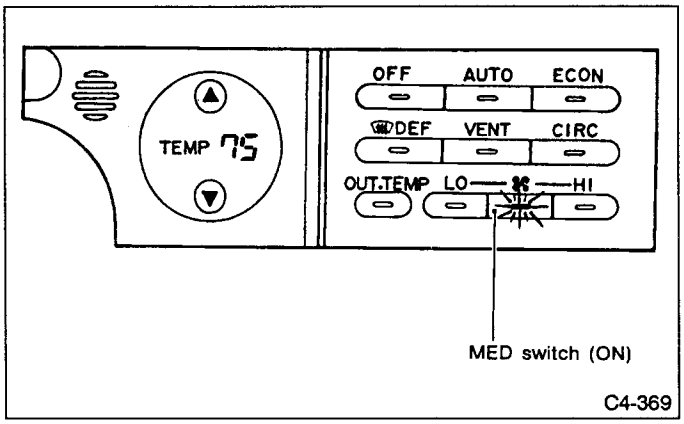


Fig. 9

10. HI (HIGH) SWITCH

The operation is the same as the LO switch, except the fan will operate at High (approx. 12V) speed.

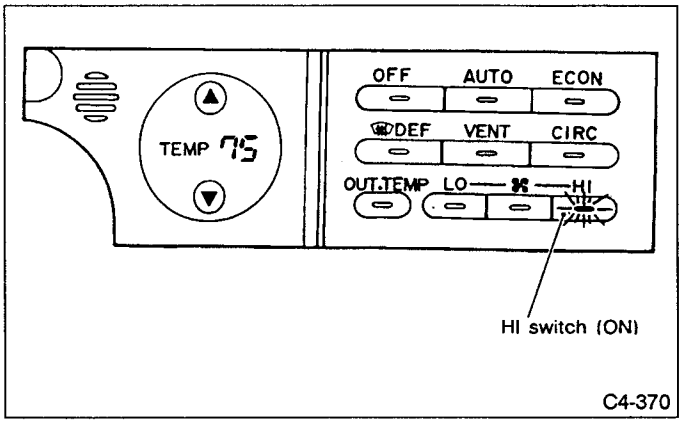


Fig. 10

11. TEMP CONTROL SWITCH

This switch is used to control the set temperature in the display within the range from 18°C to 32°C (65°F to 85°F).
Each press of the "△" switch will increase the temperature 1°C (1°F).
Each press of the "▽" switch will decrease the temperature 1°C (1°F).
When the set temperature is 18°C (65°F), the air mix door is fixed at the max cold position.
When the set temperature is 32°C (85°F), the air mix door is fixed at the max hot position.

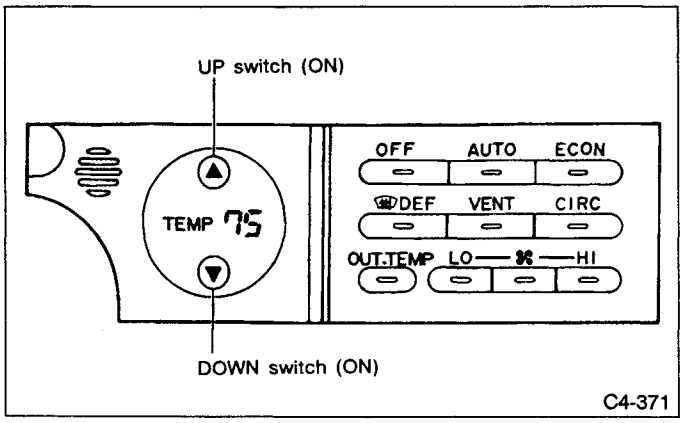


Fig. 11

B: OPERATION CHART

Operation	Display ON status	Switch (LED) ON status									Intake door control	Air flow control	Air mix door control	Mode door control	Compressor control	Starting air flow control	Remarks
Switch	Temp	AUTO	ECON	LO	MED	HI	DEF	VENT	Temp CONT.	CIRC							
AUTO	○	○							○		Automatic control	Automatic control	Automatic control	Automatic control	Automatic control	Yes	
ECON	○		○						○		Set at ambient air	Automatic control	Automatic control	Automatic control	OFF	Yes	
LO	○			○					○			Set at LO	Automatic control			No	If operation is started from the OFF state, the same status as starting with pressing the AUTO switch will be established.
MED	○				○				○			Set at MED	Automatic control			No	
HI	○					○			○			Set at HIGH	Automatic control			No	
DEF	○						○		○		Set at ambient air	Automatic control at DEF	Automatic control	Set at DEF	ON	No	Air flow is automatically controlled when voltage is higher than approx. 8V.
VENT								○			Set at ambient air	Set at MED	Set at max cold	Set at VENT	OFF	No	
Temp cont. °C (°F) 18 (65)													Set at max cold				
Temp cont. °C (°F) 32 (85)													Set at max hot				
CIRC										○	Set at in-vehicle air						In-vehicle fixed mode is canceled after 10 minutes.
OFF											Set at ambient air	Stop	Automatic control	Set at HEAT	OFF	No	
OUT.TEMP	○																Ambient temperature is displayed for 5 sec.

Note: The mark "○" indicates the lit (ON) status. The ON status is determined by switch position.

3. Air Flow

A: AIR FLOW

1. VENT

VENT position can be selected by the following switches:
AUTO switch
ECON switch
VENT switch
If AUTO switch is ON and ambient temperature is high and the set temperature is MAX COLD 18°C (65°F), then the intake door will be set in the RECIRC position.

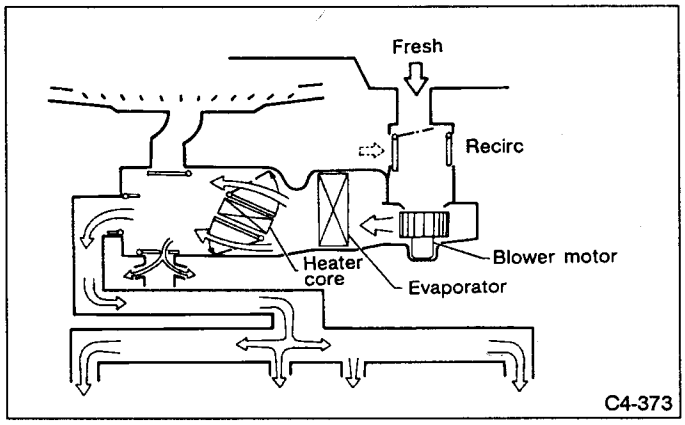


Fig. 12

2. BI-LEVEL

BI-LEVEL position can be selected by the following switches:
AUTO switch
ECON switch

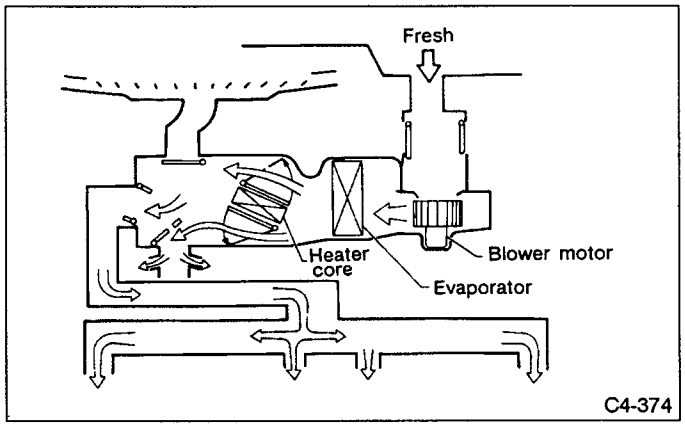


Fig. 13

3. HEAT

HEAT position can be selected by the following switches:
AUTO switch
ECON switch

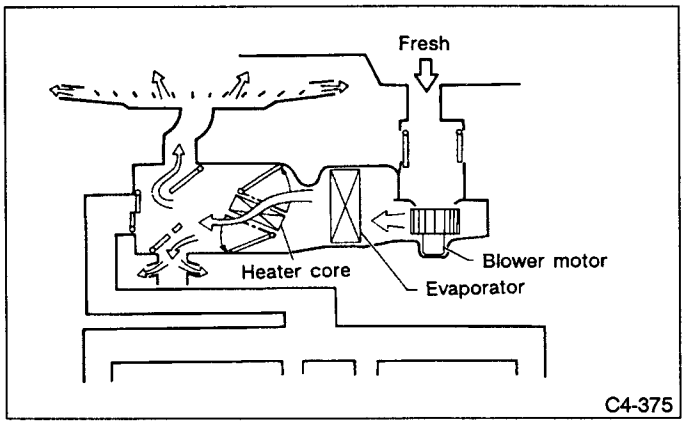


Fig. 14

4. DEF

DEF position can be selected by the following switch:
DEF switch

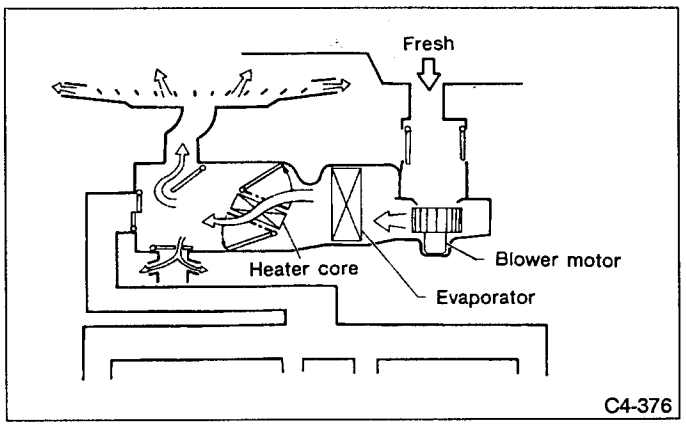


Fig. 15

B: AIR FLOW AND OPERATION OF EACH DOOR

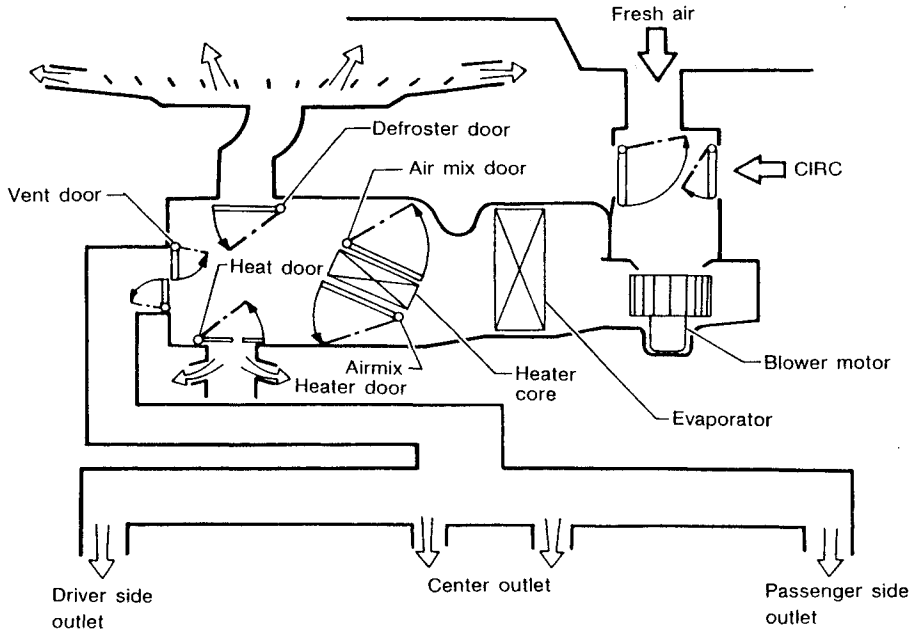


Fig. 16

C: AIR DISTRIBUTION RATIO

The diagram shows the distribution ratio of air in each outlet mode. The BILEVEL and HEAT positions permit AUTO mode operation only, and cannot be operated manually. The DEF/HEAT mode is set only in the heater start control mode.

A cut-off is provided in the heat door so that small amounts of air can flow out heat outlet even in the VENT and DEF modes.

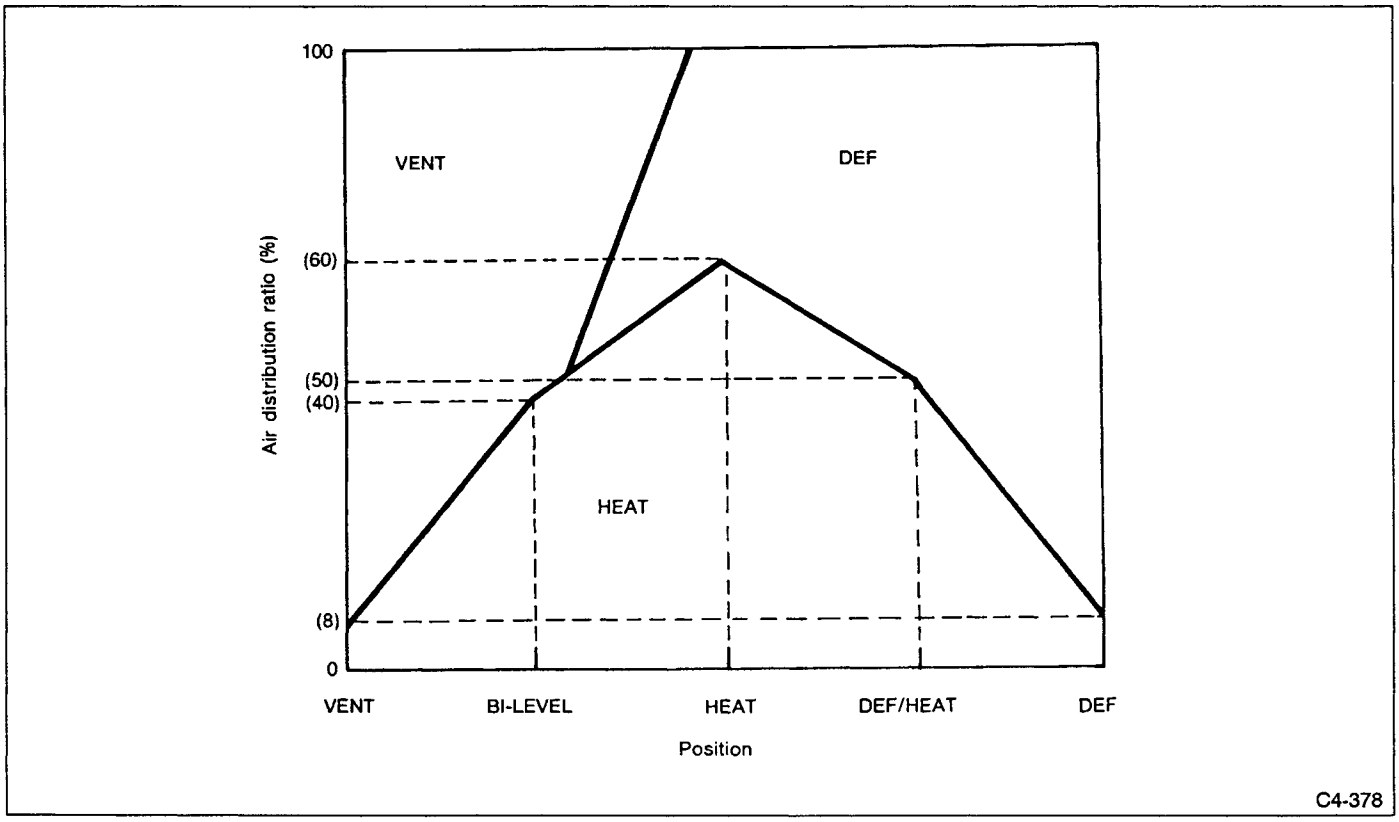


Fig. 17

M MECHANISM AND FUNCTION

4. Air Conditioning System

1. COMPRESSOR

1) General

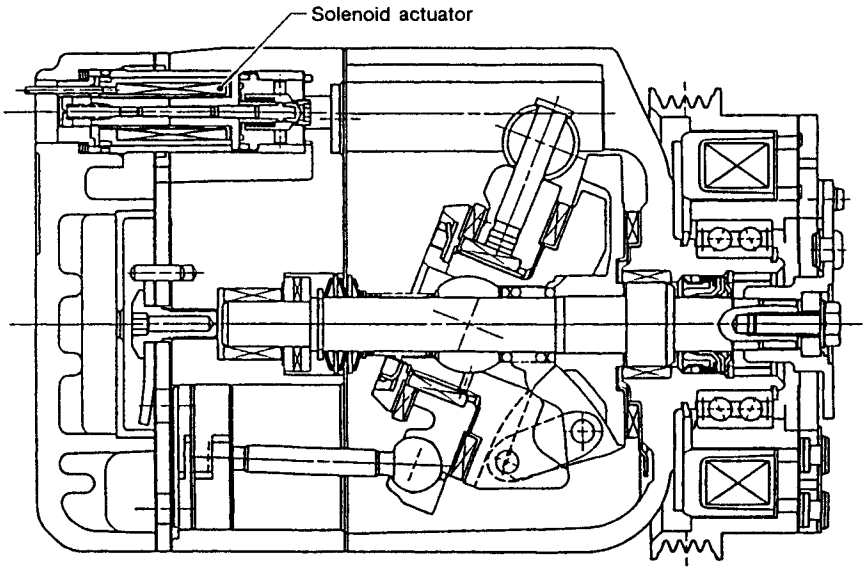
A wobble plate type electronically controlled variable delivery compressor is used. The solenoid actuator built in the compressor is controlled by the auto control unit. This ensures optimum compressor delivery with less power and less fuel, as well as smooth driving feel since compressor ON-OFF is eliminated.

In addition, the quick cool-down capability and defrosting capability during low temperatures are improved as well.

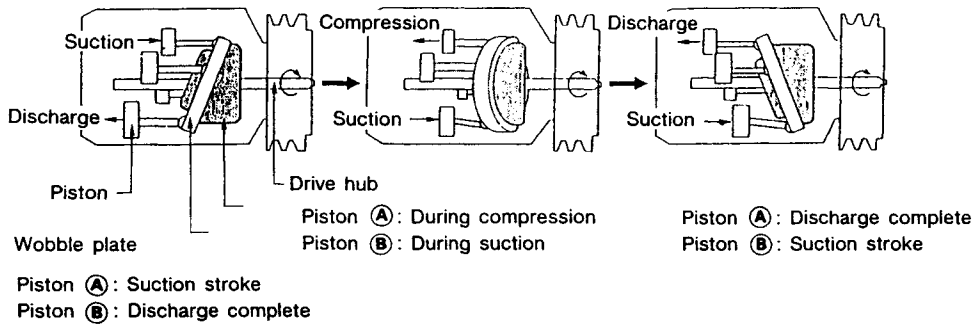
2) Mechanism

Five cylinders and pistons are axially arranged around the drive shaft with equal separation of 72°. These pistons perform the suction, compression and discharge strokes.

The piston operating in the cylinder is driven by a wobble plate, hence this construction is called the wobble plate type. The compressor delivery is changed by changing the piston stroke, and the piston stroke is changed by changing the inclination angle of the wobble plate.



Operation of wobble plate type compressor



C4-1012

Fig. 1

(1) Variable delivery mechanism

The piston delivery is changed when the hinge ball slides on the drive shaft. As the hinge ball slides, the inclination angle "α" of the wobble plate changes. That is, as the wobble plate tilts down, the effective piston stroke increases, and this results in increased piston delivery. Contrary, as the wobble plate rises, the effective piston stroke decreases, and this results in reduced piston delivery.

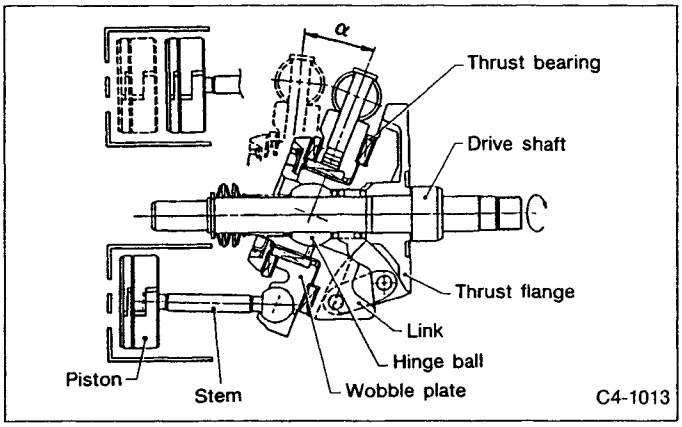


Fig. 2

(2) Operating principle

The wobble plate inclination angle is determined by the equilibrium of the force caused by the discharge and suction pressure acting on the piston top and the force caused by the wobble chamber pressure acting on the underside of the piston.

The wobble chamber pressure is determined by the opening of the solenoid valve in the cylinder (valve stroke).

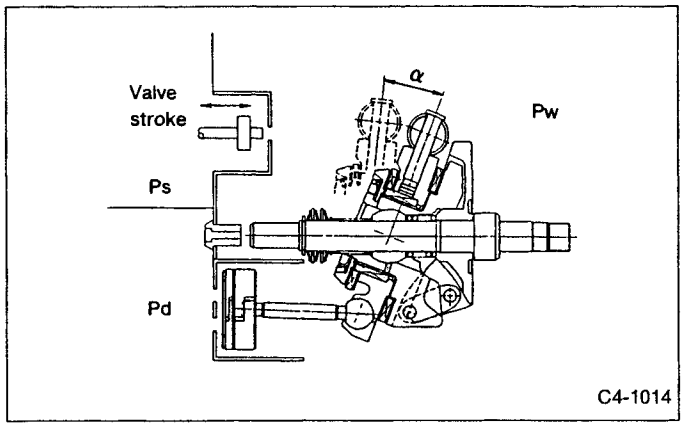


Fig. 3

Pd: Discharge pressure
Ps: Suction pressure
Pw: Wobble chamber pressure (Blow by from discharge pressure + pressure from orifice)

(3) Control of solenoid valve

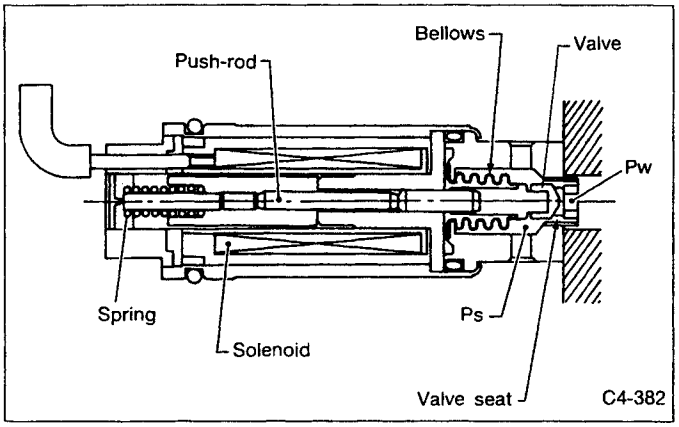


Fig. 4

The valve opening force is created by the suction pressure (Ps) while the valve closing force originates from the spring and solenoid activating current. The spring set force is constant. The pressure (Pw) in the wobble chamber is varied by changing the amount of solenoid valve input current.

As the solenoid valve input current is increased, the valve opening decreases. As a result, the pressure (Pw) in the wobble chamber increases, and the wobble plate tilt angle decreases, which in turn decreases the compressor delivery.

Contrary, if the solenoid valve input current is reduced, the valve opening increases, and the wobble chamber pressure (Pw) decreases. This results in a reduced wobble plate tilt angle and increased compressor delivery.

The solenoid valve input current is continuously controlled by the auto control unit.

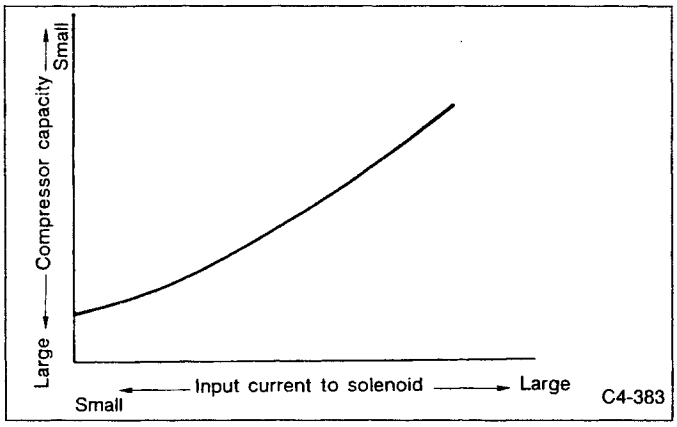


Fig. 5

(4) Relief valve

The relief valve is installed on the rear part of the compressor. This valve opens to release refrigerant if the high-pressure inside the compressor rises abnormally, thereby protecting the compressor against damage. If the high pressure lowers below the spring force, the seat rubber closes to stop release of refrigerant.

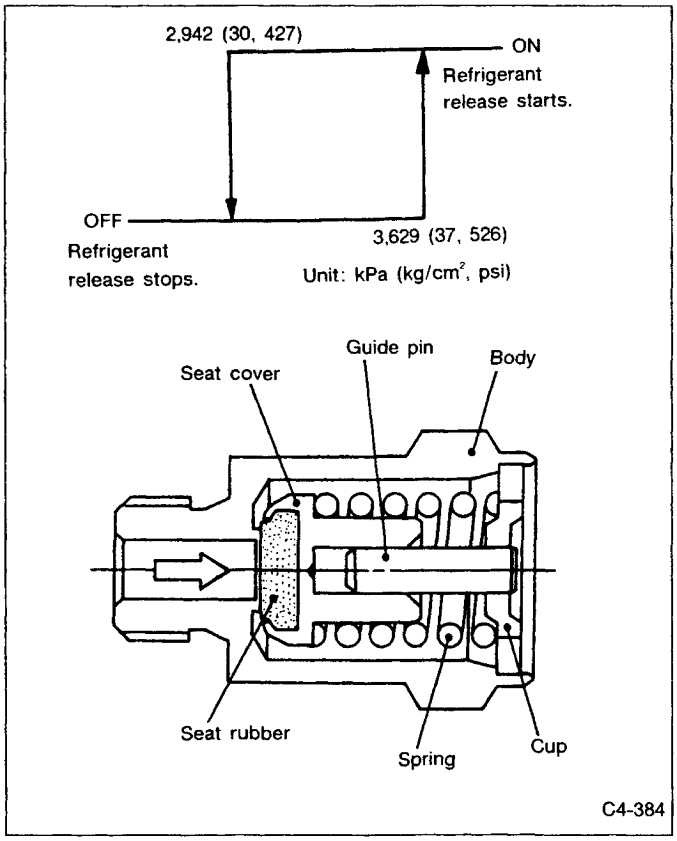


Fig. 6

(5) Magnet clutch

The magnet clutch serve to transmit engine power to the compressor unit. It is built into the compressor shaft. When current flow through the magnet clutch coil, the drive plate is attracted so that the pulley and compressor shaft rotate as a unit. When the compressor is not in use, the pulley alone rotates freely.

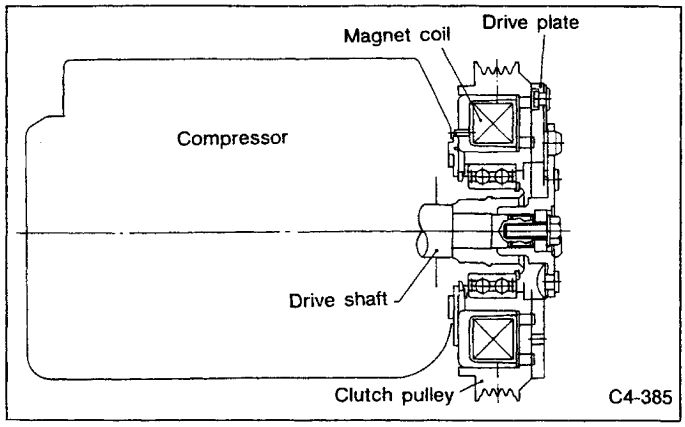


Fig. 7

2. CONDENSER

The high temperature and high pressure gaseous refrigerant discharged from the compressor is cooled down and turned into the liquid state in the condenser which is cooled by the ambient air delivered by the cooling fan.

The condenser is composed of tubes and radiating fins. The heat from hot refrigerant radiates to the ambient air when high temperature gaseous refrigerant passes through the condenser tubes.

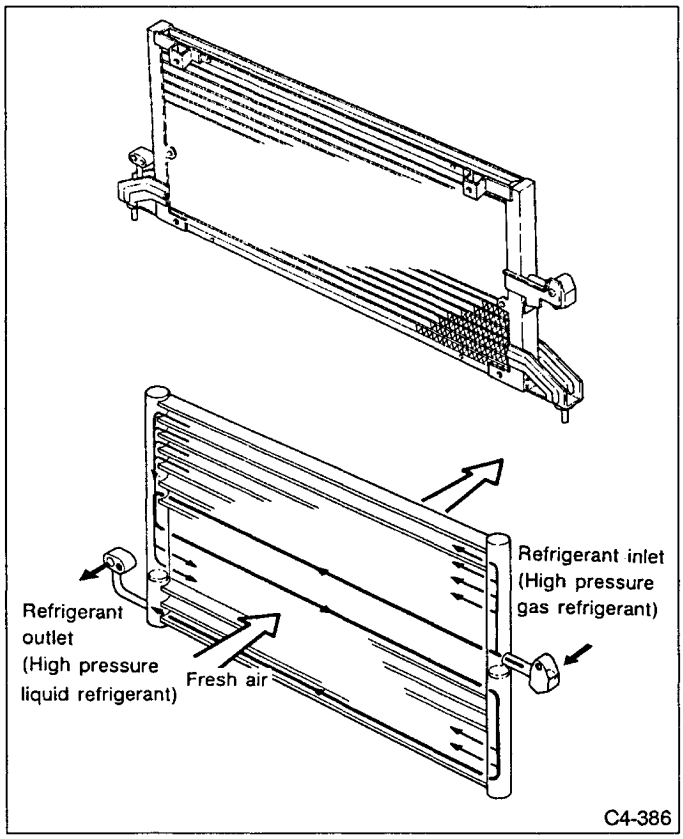


Fig. 25

3. RECEIVER DRIER

The amount of refrigerant circulating varies with the heat load changes. The receiver driver supplies the amount of refrigerant necessary for the cycle according to such changes.

1) It removes bubbles from the condensed refrigerant so that only liquid refrigerant may be delivered to the expansion valve. (If bubbles are present, the refrigerant passing through the expansion valve varies in quantity, temperature, and pressure, resulting in insufficient cooling.)
2) It removes moisture from the refrigerant.
3) It removes foreign substance from the refrigerant.
4) It permits a visual observation of the amount of refrigerant through the sight glass. *

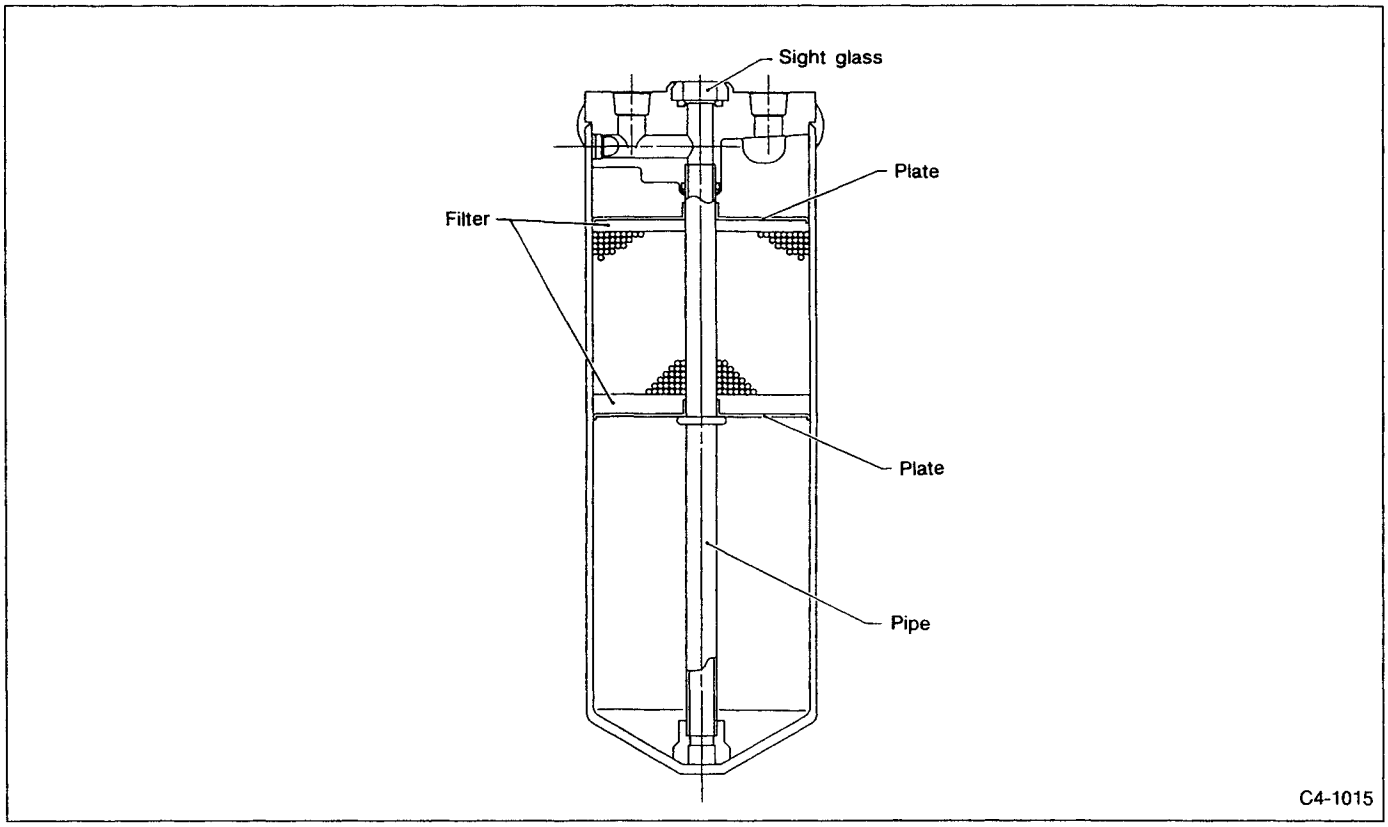


Fig. 8

The receiver drier consists of a strainer to remove foreign substance, desiccant to absorb moisture from refrigerant, a sight glass to check the amount of refrigerant.

*** Use of sight glass for determining refrigerant charge level on R-134a Systems is not recommended.**

4. TRINARY SWITCH

The trinary switch is located in the high-pressure line of the refrigeration cycle. It consists of a diaphragm which receives pressure, diaphragm springs, pin and contact points. Two types of contact points are used. One type activates when the internal pressure is low or when it is too high while the other type controls the operation of the condenser fan.

1) Prevention of operation when there is no gases in the line due to absence of refrigerant — (during low-pressure operation).
2) Protection of refrigeration cycle from abnormal refrigerant pressure rise — (during high-pressure operation).
3) 3-speed control to provide a quiet condenser fan operation — (during intermediate-pressure operation).

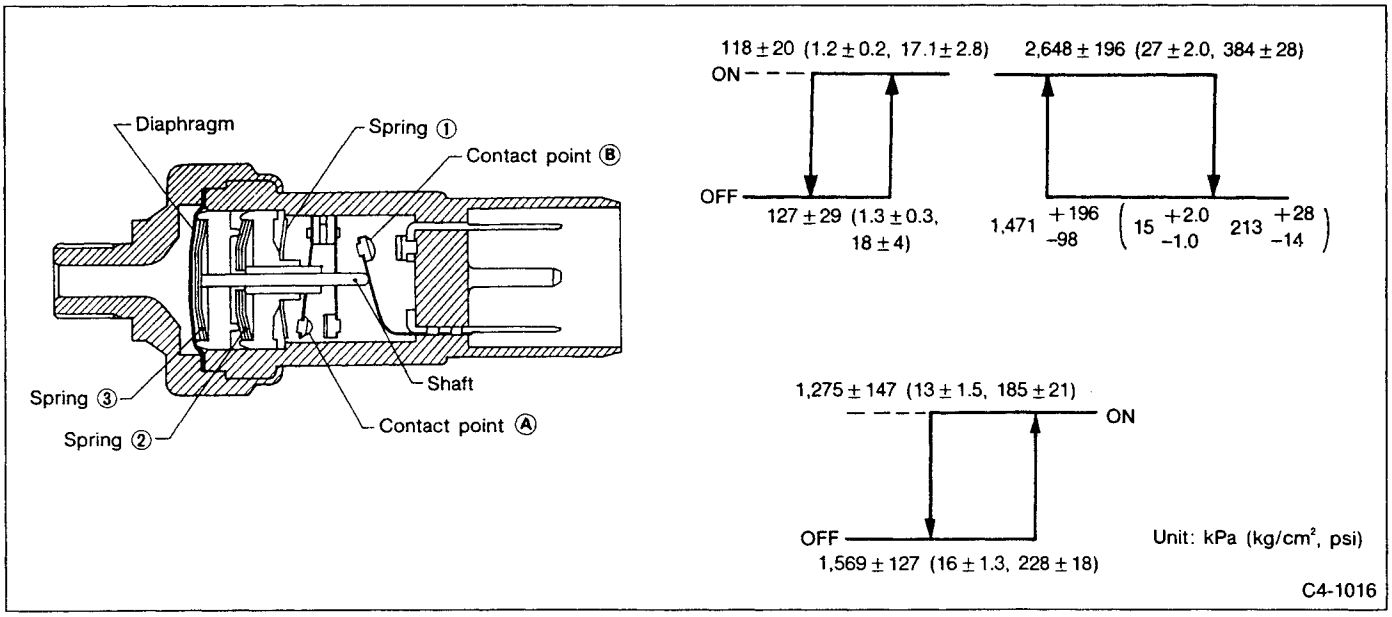


Fig. 9

4) High-low pressure switch

(1) When pressure is abnormally low
[P < Approx. 118 kPa (1.2 kg/cm², 17 psi)]
The tension of springs ①, ② and ③ is greater than the refrigerant pressure, and the contact Ⓐ opens to turn the switch OFF.

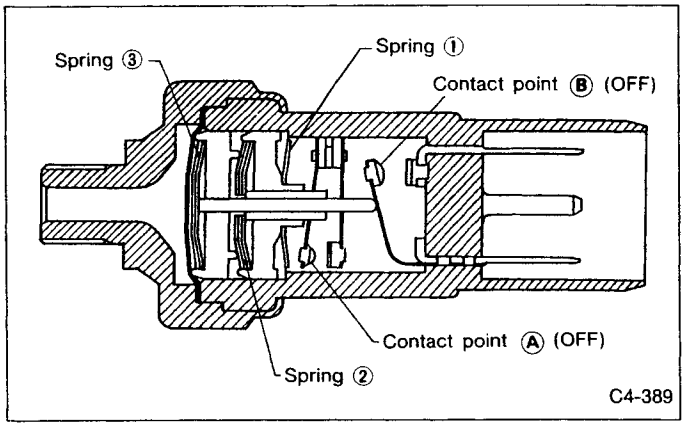


Fig. 10

(2) When pressure is normal.
[Approx. 127 kPa (1.3 kg/cm², 18 psi) < P < Approx. 2,648 kPa (27 kg/cm², 384 psi)]
When the refrigerant pressure rises above 127 kPa (1.3 kg/cm², 18 psi), the spring ① reverses, and the contact closes to turn the switch ON.

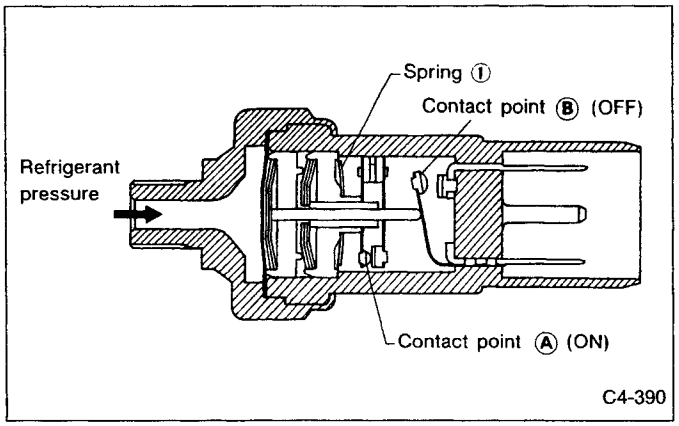


Fig. 11

(3) When pressure is abnormally high.
[P < Approx. 2,648 kPa (27 kg/cm^2, 384 psi)]
If the refrigerant pressure exceeds approx. 2,648 kPa (27 kg/cm^2, 384 psi), the spring ② reverses, and the contact Ⓐ opens to turn the switch OFF.
If the refrigerant pressure lowers to approx. 1,471 kPa (15 kg/cm^2, 213 psi), the spring ② recovers, and the contact closes to turn the switch ON.

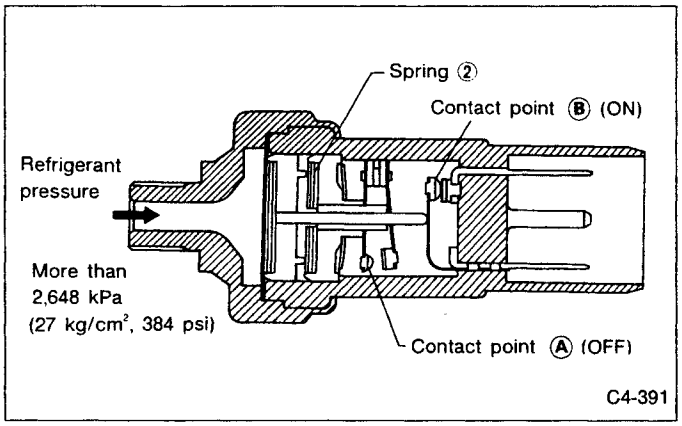


Fig. 12

5) Intermediate-pressure switch
[P < Approx. 1,275 kPa (13 kg/cm^2, 185 psi)]
When the refrigerant pressure is below 1,275 kPa (13 kg/cm^2, 185 psi), the tension of spring ③ exceeds the refrigerant pressure, and pushes the shaft down to open the contact, turning the switch OFF.

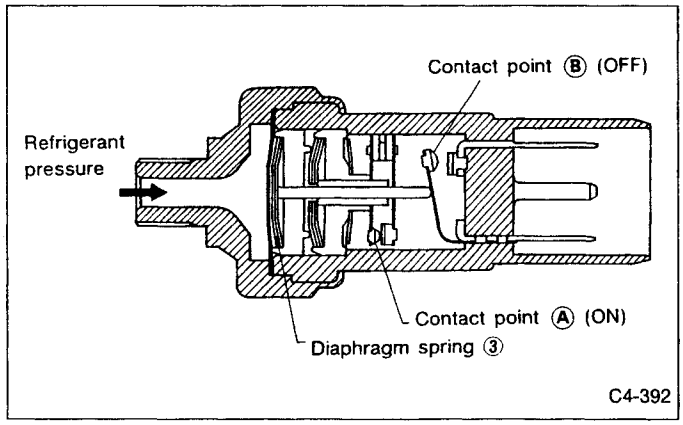


Fig. 13

[P > Approx. 1,569 kPa (16 kg/cm^2, 228 psi)]
When the refrigerant pressure is higher than approx. 1,569 kPa (16 kg/cm^2, 228 psi), it surpasses the tension of spring ③, and pushes the shaft up. As a result, the contact is closed and the switch is turned ON.

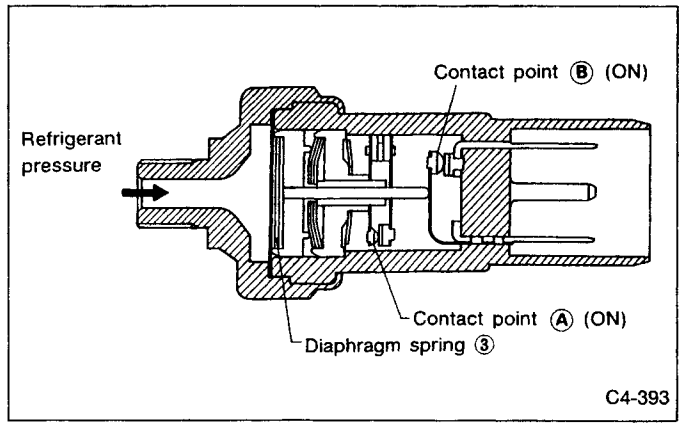


Fig. 14

5. EVAPORATOR ASSEMBLY

The evaporator assembly is mainly composed of an evaporator, expansion valve, and casing.

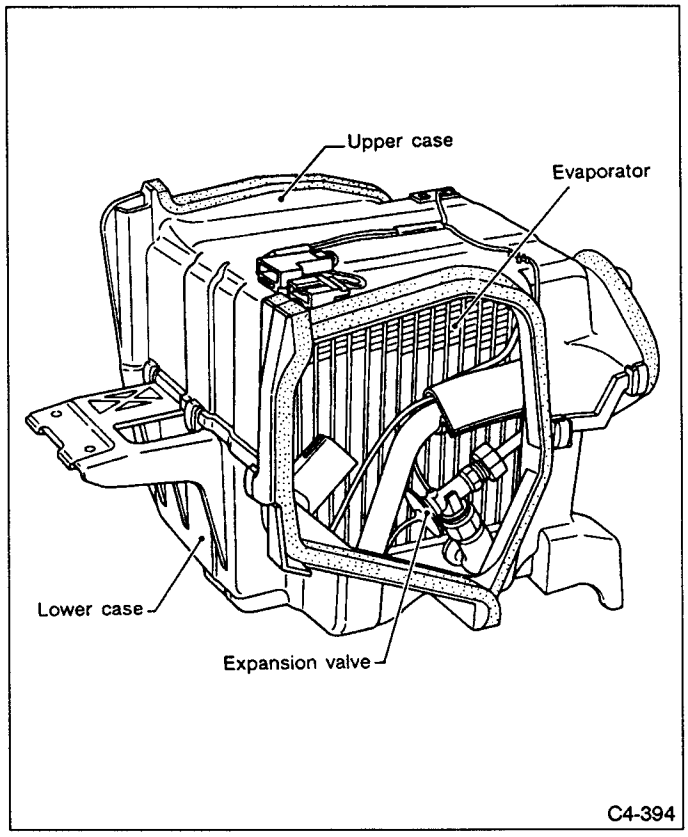


Fig. 33

1) Evaporator

The low pressure and low temperature refrigerant changed into mist in the expansion valve is evaporated in the evaporator, and this evaporation causes the evaporator temperature to drop. The air is delivered by the blower fan, and cooled down as it flows through the evaporator fins. The cool air then blows out of the grille after passing through the heater unit.

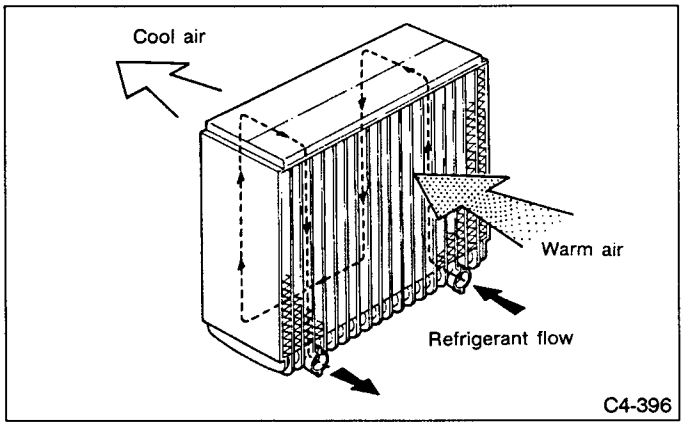


Fig. 34

6. EXPANSION VALVE

The expansion valve is attached to the evaporator inlet. It converts high pressure liquid refrigerant which comes from the liquid tank to misty, low pressure refrigerant, and delivers to the evaporator. Being at low pressure and low temperature, the liquid refrigerant evaporates in the evaporator removing heat from the compartment. It automatically controls the flow rate of refrigerant to obtain the necessary cooling ability required by the fluctuating heat load.

The expansion valve is composed of a sensing bulb with a capillary tube that senses the temperature at the evaporator outlet, an equalizer that transmits the pressure of the refrigerant in the evaporator to the diaphragm and other parts such as the spring, ball and diaphragm.

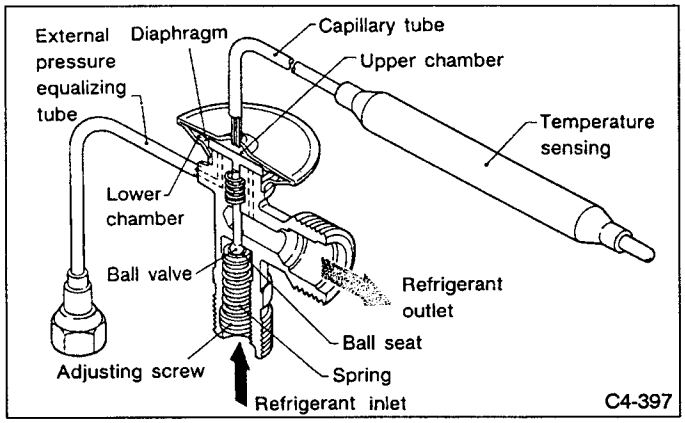


Fig. 35

The operation of the external equalizer type is as follows.

The expansion valve opening is automatically controlled by the functions of three force: the pressure of the temperature-sensing bulb (P_1) containing a liquid or vapor, the pressure at the evaporator outlet (P_2), and the force of the spring (F).

Temperature-sensing bulb pressure (P_1)

..... Forces the diaphragm downward (opens the valve).

Pressure at the evaporator outlet (P_2)

. Forces the diaphragm upward (closes the valve).

Force of the spring (F)

..... Forces the ball upward (closes the valve).

A: Condition of the valve with the compressor in off.

Since the temperature around the evaporator is constant, the pressure in the evaporator is equal to that of the temperature-sensing bulb. Therefore, the force of the spring is greater than these pressures and the pressures are in the following condition:

$P_1 = P_2$

$P_1 < P_2 + F$

That means, the valve is closed with the ball pushed upward.

B: Operation of the valve with the sensing bulb at low temperatures

(When the temperature is low at evaporator outlet)

As the temperature of the compartment decreases, the heat load applied to the evaporator becomes less, and the temperatures at the evaporator outlet, and the sensing bulb drop. Accordingly, the valve tends to close, reducing the amount of refrigerant.

$P_1 < P_2 + F$

The amount of refrigerant is reduced.

C: Operation of valve with the sensing bulb at high temperatures

(When the temperature is high at evaporator outlet)

As the temperature of the compartment rises, the heat load applied to the evaporator becomes greater, and the temperatures at the evaporator outlet, and the sensing bulb increase. Therefore, the valve tends to open, allowing more refrigerant to flow.

$P_1 > P_2 + F$

The amount of refrigerant is increased.

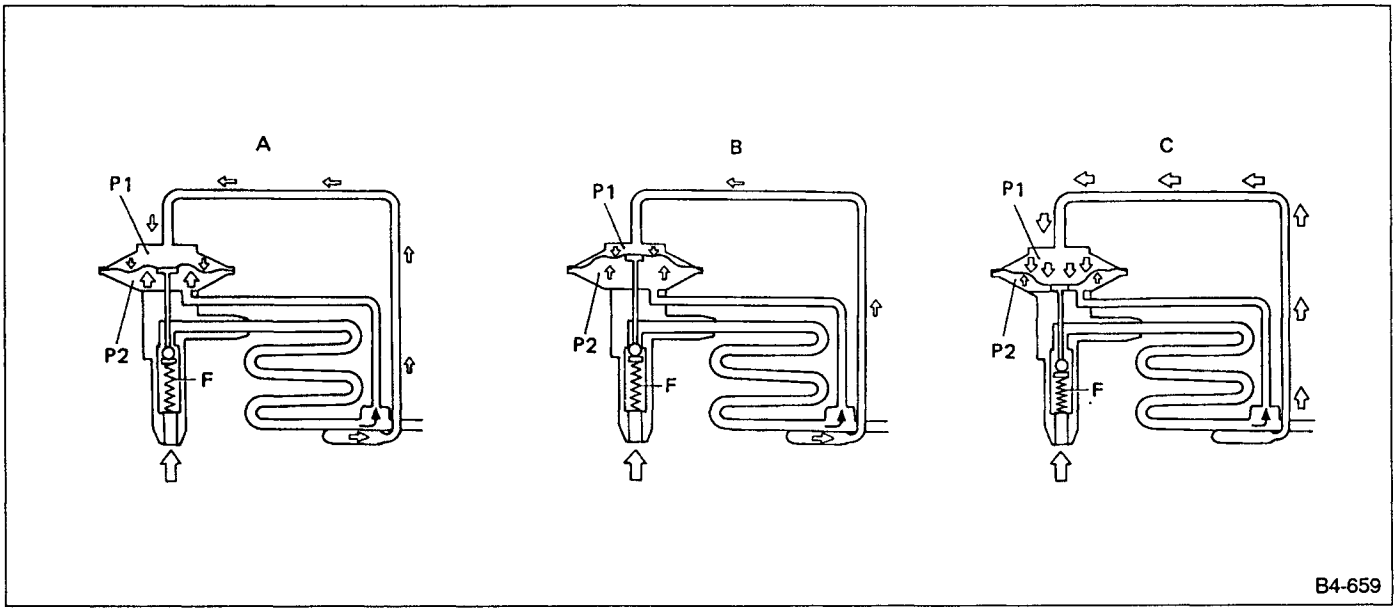


Fig. 36

7. AUTO A/C CONTROL UNIT

The auto A/C control unit is composed of a control panel and auto amplifier.

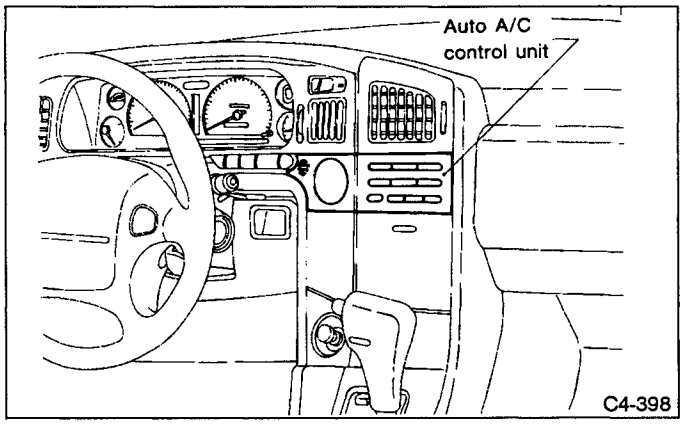


Fig. 37

1) Control panel

The control panel is composed of push-button type switches and a display. An electric signal is sent from an operated switch to the auto amplifier, which is indicated by the switch LED illuminating.

Switch	Operation	Illumination	
		OFF	ON
AUTO, ECON, DEF, VENT, LO, HI, CIRC	OFF	—	Green
	ON	Amber	Amber
OFF, OUT. TEMP	—	—	Green

2) Auto amplifier

The auto amplifier performs computation based on the signals sent from each switch, sensor and engine control unit. It compares the computed results and **P.B.R.** signal, and issues signals to the door motor, fan control amplifier, and compressor solenoid actuator. This method automatically controls the air outlet position, air suction position, air outlet temperature, outlet air quantity and compressor delivery.

In addition, the self-diagnosis function is provided for facilitating trouble diagnosis.

P.B.R. (Potentiometric balance resistor) is a variable resistor which converts air mix door and mode door opening to a voltage.

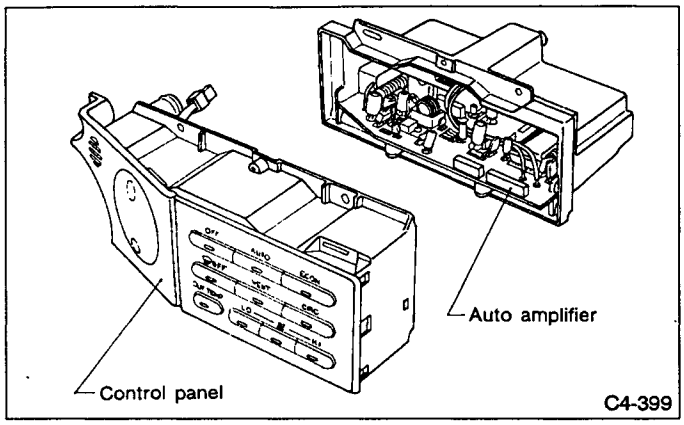


Fig. 38

8. IN-VEHICLE SENSOR

This sensor is installed on the left side of the control panel. It detects the temperature of interior air drawn in by the aspirator and converts the temperature into a resistance value which is then sent to the auto amplifier.

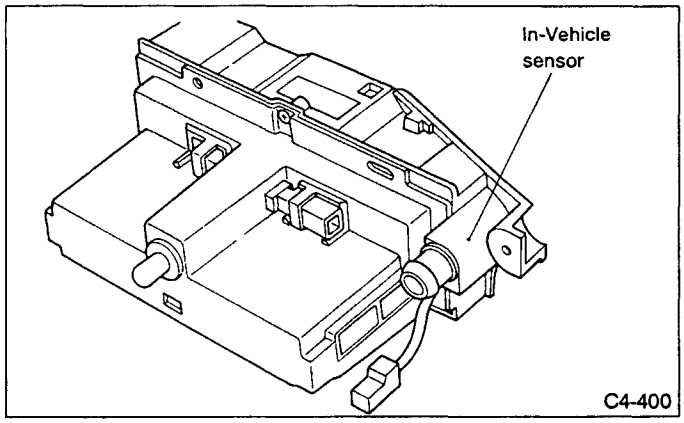


Fig. 39

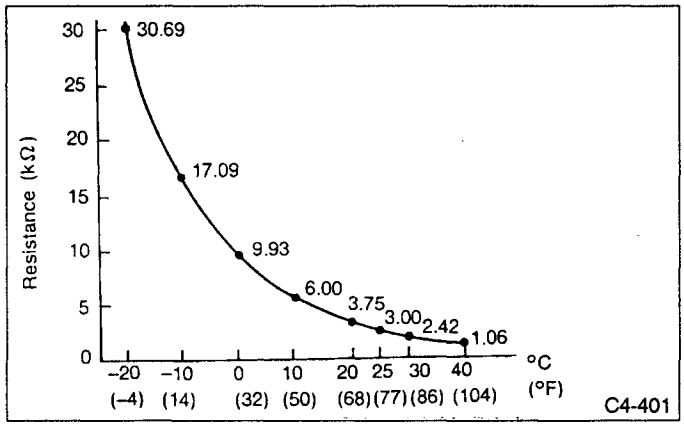


Fig. 40

9. ASPIRATOR

The aspirator continuously draws the vehicle's interior air through the duct and sends the air to the in-vehicle sensor.

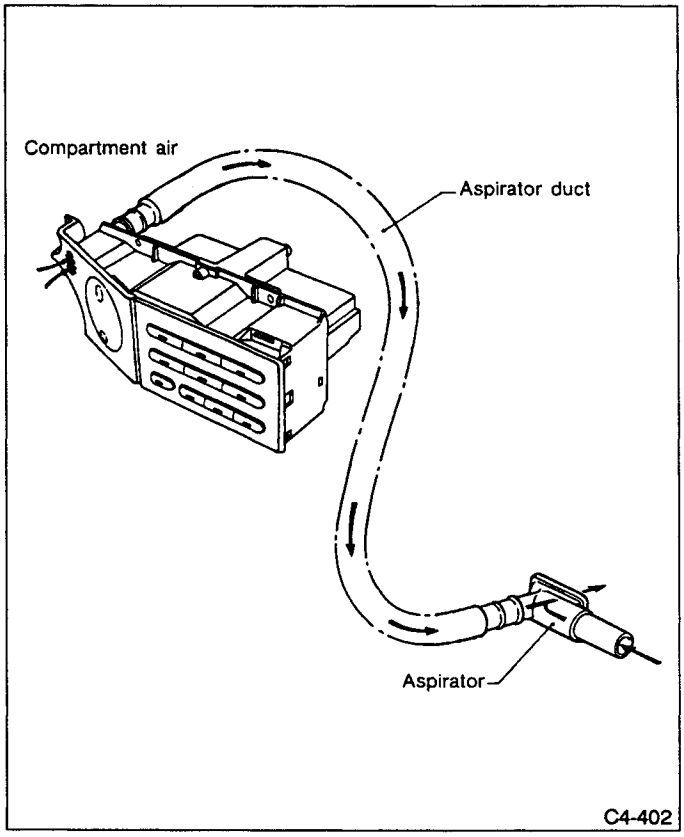


Fig. 41

10. AMBIENT SENSOR

The ambient sensor is installed on the hood lock stay. It detects the temperature of ambient air, and converts the temperature to a resistance value which is sent to the auto amplifier.

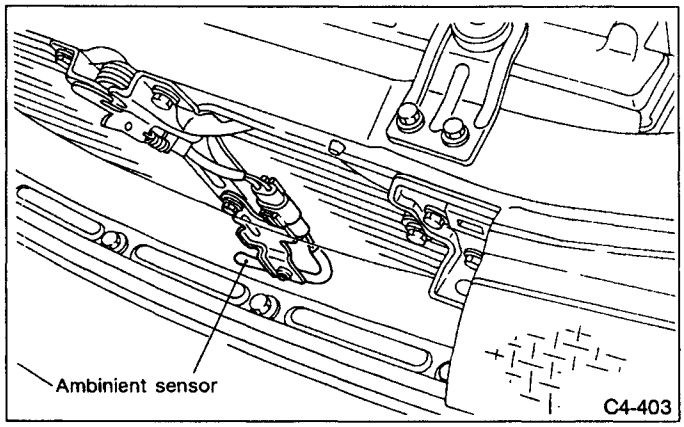


Fig. 42

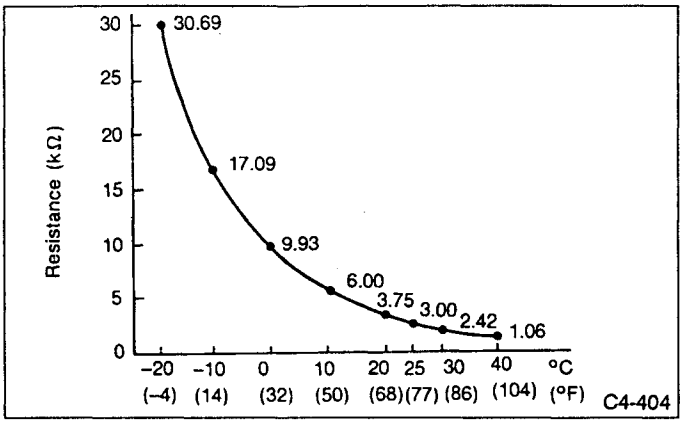


Fig. 43

11. SUNLOAD SENSOR

The sunload sensor detects the amount of solar radiation, and is installed on the upper left side of the instrument panel. The diode converts the solar radiation amount into a current value, which is sent as a voltage signal to the auto amplifier.

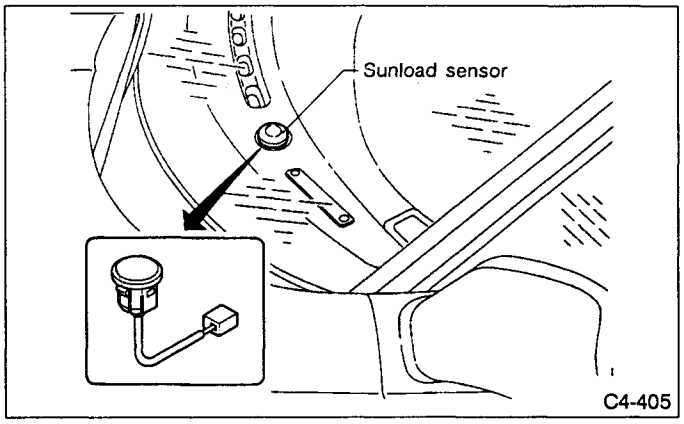


Fig. 44

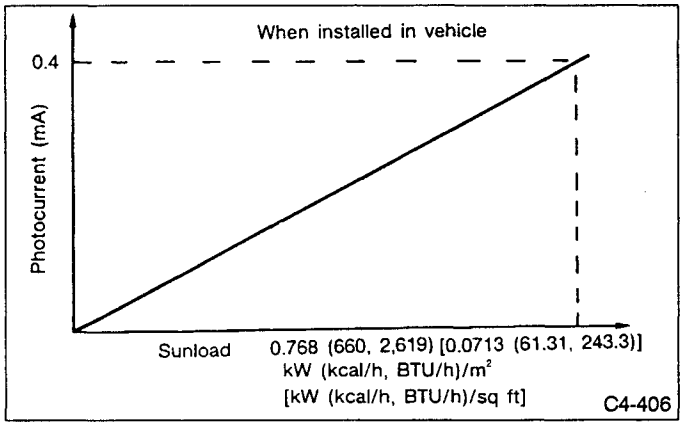


Fig. 45

12. REFRIGERANT TEMPERATURE SENSOR

The refrigerant temperature sensor is installed on the evaporator. It converts the refrigerant temperature into a resistance value which is sent to the auto amplifier.

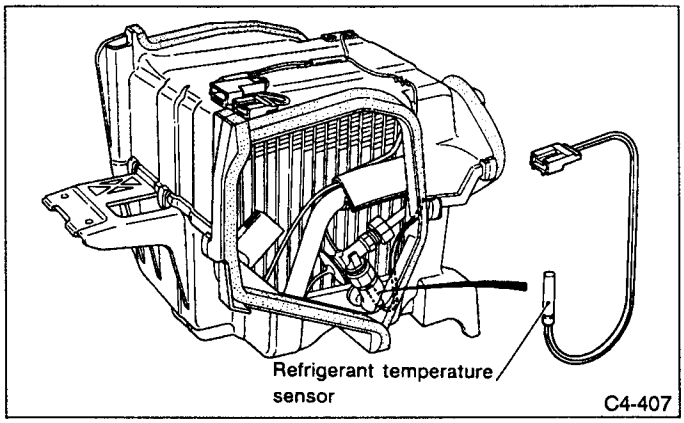


Fig. 46

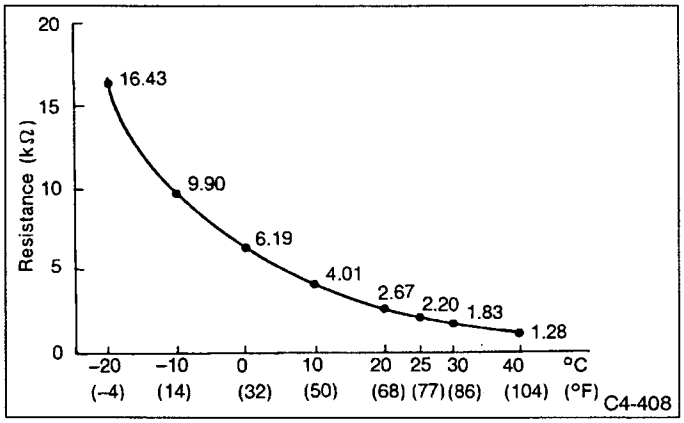


Fig. 47

13. EVAPORATOR SENSOR

The evaporator sensor is installed on the evaporator assembly case (heater unit side). It converts the temperature of air flowing to the heater unit into a resistance value after passing through the evaporator and sends it to the auto amplifier.

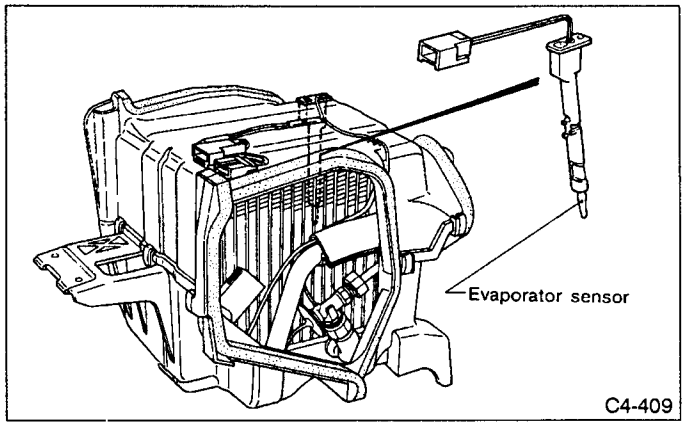


Fig. 48

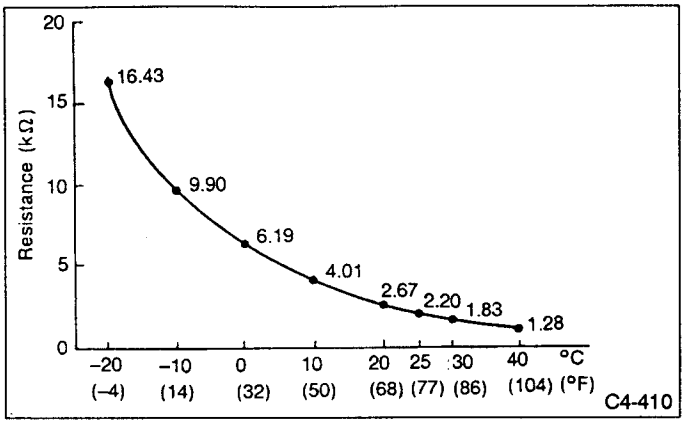


Fig. 49

14. WATER TEMPERATURE SENSOR

The water temperature is installed on the heater core section of the heater unit. It detects the temperature of water flowing to the heater core, and converts the temperature into a resistance value which is sent to the auto amplifier.

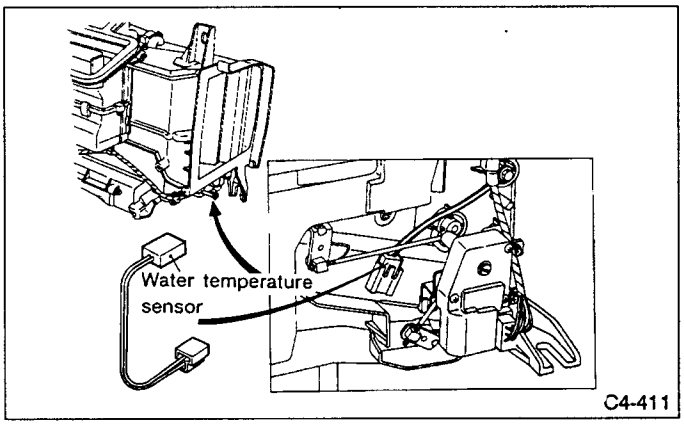


Fig. 50

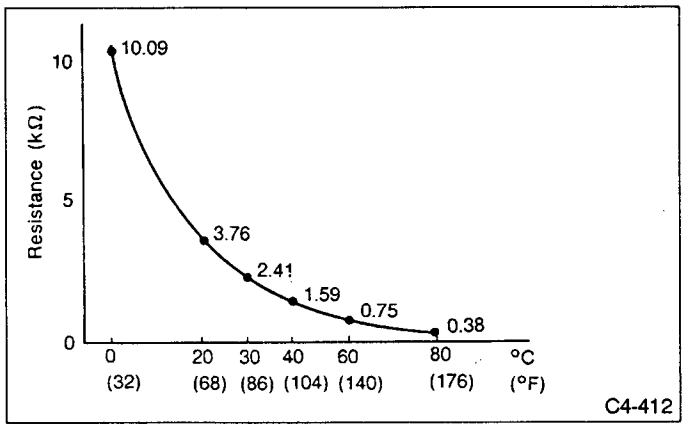


Fig. 51

15. FAN CONTROL AMPLIFIER

The fan control amplifier is installed on the cooling unit. It receives the base current from the auto amplifier, and controls the voltage applied to the fan motor.

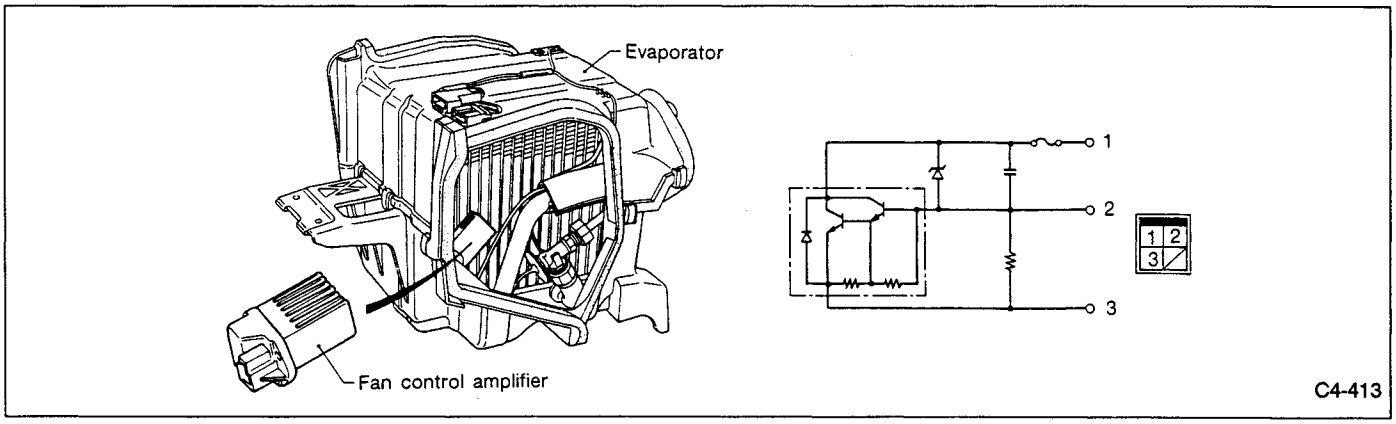


Fig. 52

16. RELAYS

1) Max. HI relay

The MAX HI relay is installed on the blower unit case. It is turned ON and OFF by the signal sent from the auto amplifier. When the MAX. HI relay is turned ON, the fan motor generates maximum air flow.

Normally, the air flow is controlled by the fan control amplifier. Because the fan control amplifier itself causes a small amount of voltage drop, the MAX HI relay is turned ON when generating maximum air flow.

2) OFF relay

The OFF relay is installed on the blower unit. This relay turns ON by the signal sent from the auto amplifier when the control panel switch is pressed. When the OFF relay is ON, the fan motor power supply is connected. When OFF relay is OFF, the fan motor power supply is disconnected.

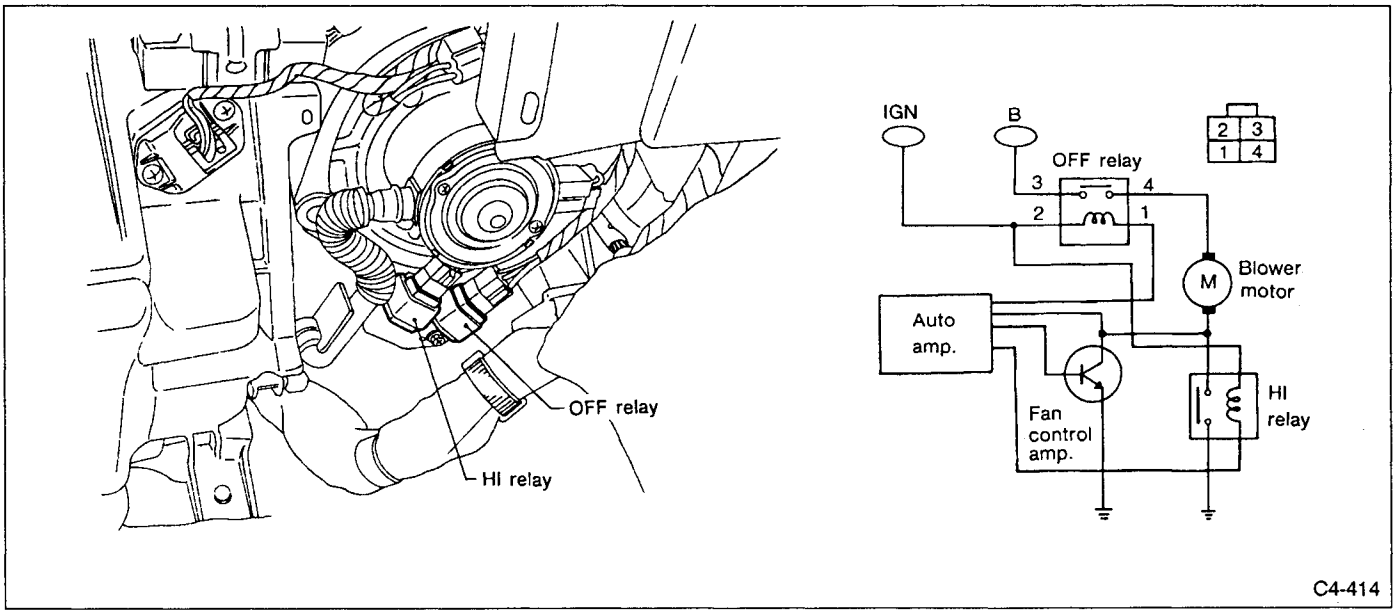


Fig. 53

3) A/C relay
The A/C relay is built into the relay box on the left side of the engine compartment. It connects and disconnects the compressor magnet clutch.
Although this compressor magnet clutch is normally controlled by the AUTO and DEF switches, it is also controlled by abnormal evaporator temperature or refrigerant pressure.

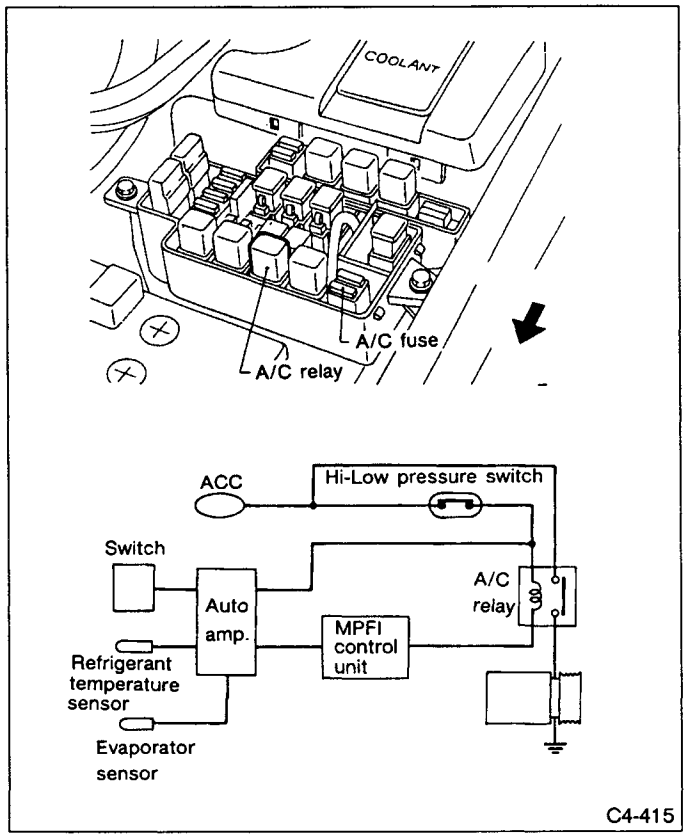


Fig. 54

17. INTAKE DOOR MOTOR

The intake door motor is installed on the right upper part of the blower unit. Operation of this motor is controlled by the signal sent from the auto amplifier. The motor opens and closes the intake door via a rod and link mechanism, thereby controlling the air suction port.

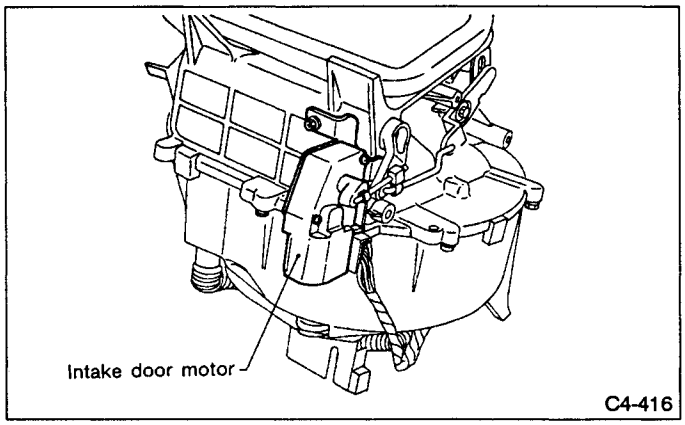


Fig. 55

1) Operation of intake door motor
When the objective intake door position is determined by the auto amplifier, the transistor in the drive section turns ON to operate the motor. The motor can rotate only in one direction, and actuates the intake door via a link mechanism.
The motor continues running until the position detecting contact corresponding to the objective door position is isolated from the ground due to the cut-out of the disc (conductor) linked to the motor.

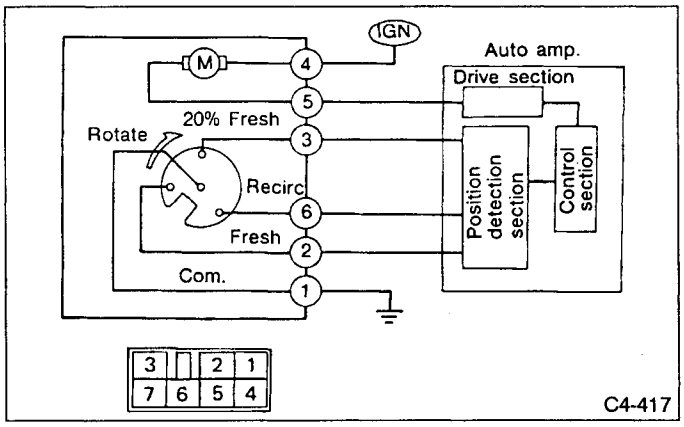


Fig. 56

18. AIR MIX DOOR MOTOR

The air mix door motor is installed on the bottom surface of the heater unit. When it receives a signal from the auto amplifier, it changes the opening of the air mix door via a link and the air mix door lever.
The door motor detects the air mix door position. P.B.R. is built into the motor, and its signal is fed back to the auto amplifier.

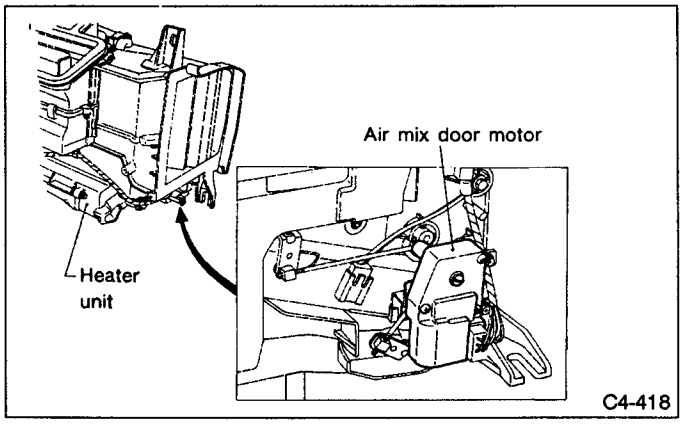


Fig. 57

1) Operation of air mix door motor
The auto amplifier determines the air mix door position. The air mix door motor rotates normally or in reverse direction corresponding to the auto amplifier signal as shown below.
The output shaft and sliding contact are made integral. If the sliding contact exceeds the position of terminal plate Ⓐ or Ⓑ (MAX-HOT or MAX-COLD position), the current is cut off and the motor stops rotating.
If the auto amplifier output signal turns OFF, the motor operation stops irrespective of the position of the sliding contact.

Energizing terminal		Direction of rotation	Remarks
Positive ⊕	Negative ⊖		
①	②	CCW	MAX HOT → MAX COLD
②	①	CW	MAX COLD → MAX HOT

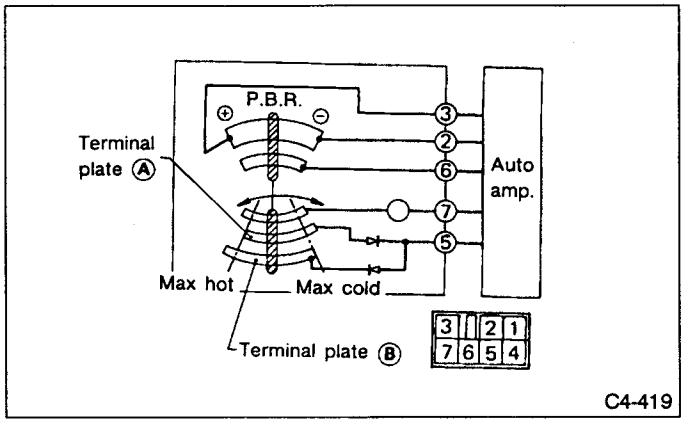


Fig. 58

2) P.B.R. (Potentiometric Balance Resister)
The potentiometric balance resister is built into the printed board in the air mix door motor. This resister detects the air mix door position corresponding to the output shaft rotation as a ratio of variable terminal voltage VM to reference voltage VDD, and feeds the signal back to the auto amplifier.

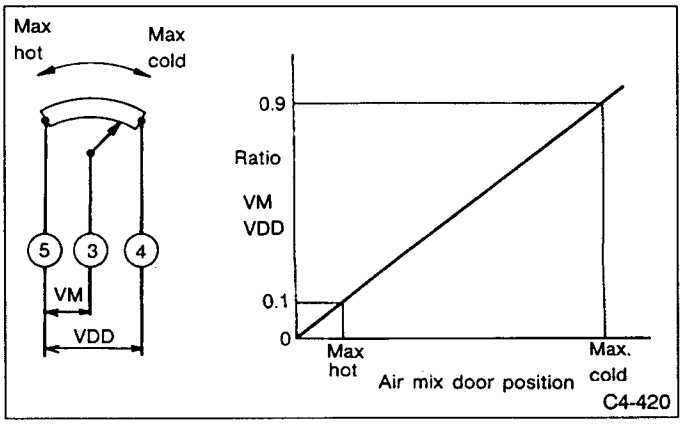


Fig. 59

19. MODE DOOR MOTOR

The mode door motor is installed on the left side of the heater unit, and is controlled by the signal sent from the auto amplifier. This motor actuates the defroster door, vent door and heat door via linkage mechanisms so as to provide optimum air circulation.

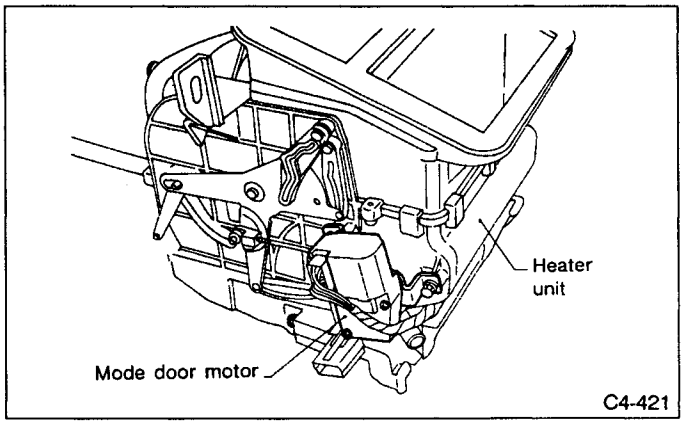


Fig. 60

1) Operation of mode door motor

The auto amplifier determines the mode door position. The mode door motor rotates normally or in reverse direction corresponding to the auto amplifier signal as shown below.

The output shaft and sliding contact are made integral. If the sliding contact exceeds the position of terminal plate Ⓐ or Ⓑ (DEF or VENT position), the current is cut off and the motor stops rotating.

If the auto amplifier output signal turns OFF, the motor operation stops irrespective of the position of the sliding contact.

Energizing terminal		Direction of rotation	Remarks
Positive ⊕	Negative ⊖		
①	②	CCW	VENT → DEF
②	①	CW	DEF → VENT

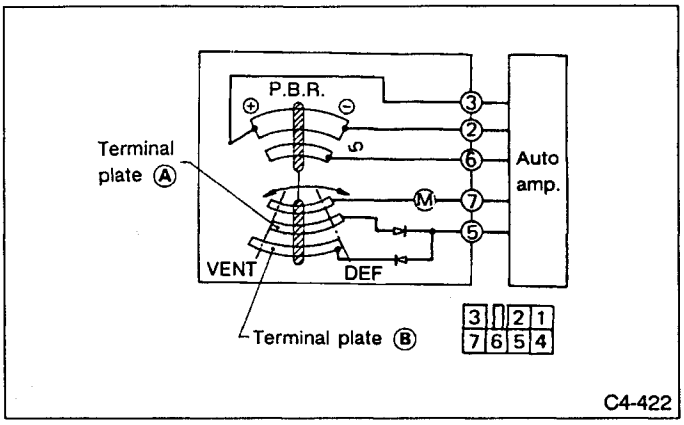


Fig. 61

2) P.B.R. (Potentiometric Balance Resister)

The potentiometric balance resister is built into the printed board in the mode door motor. This resister detects the mode door position corresponding to the output shaft rotation as a ratio of variable terminal voltage VM to reference voltage V_{DD}, and feeds the signal back to the auto amplifier.

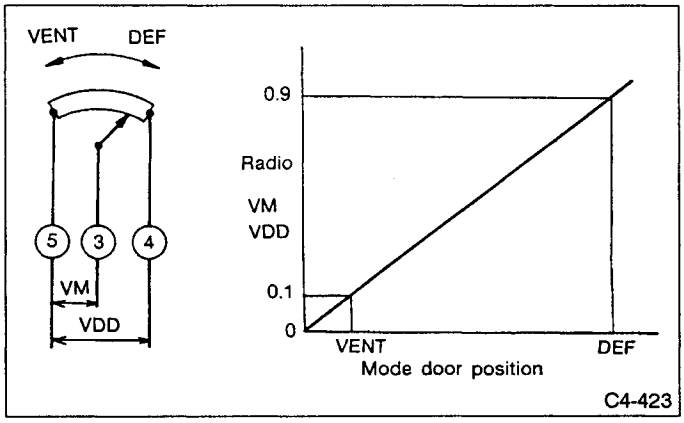


Fig. 62

5. Automatic Climate Control System

A: FEATURES

1. ELECTRONICALLY CONTROLLED VARIABLE DELIVERY COMPRESSOR

1) During the initial "cool-down" stage, air conditioning is maximized to quickly bring the compartment to a comfortable range.
2) During low ambient temperatures, compressor delivery is electronically controlled to effectively dehumidify the compartment.
3) Compressor delivery is controlled to provide power-saving when air conditioning is not required.
4) To maintain smooth engine operation when the A/C switch is turned OFF, the compressor clutch is turned OFF after compressor delivery is minimized.
5) When the engine coolant temperature is high, compressor delivery is decreased with the A/C system in operation to decrease the coolant temperature and thus protect the engine.

2. AUTOMATIC COMPARTMENT TEMPERATURE CONTROL

The air mix door is automatically controlled to maintain an optimum compartment temperature regardless of the ambient temperature, sunload or the number of occupants.

3. AUTOMATIC SELECTION OF AIR OUTLET

The VENT, BILEVEL and HEAT mode doors are automatically selected corresponding to the outlet air temperature. Natural compartment ventilation can be achieved by simply pressing the new VENT switch.

4. HEATER START CONTROL

To prevent cool air from discharging into the passenger compartment during starts in cold weather, the air flow rate is controlled between OFF and AUTO until the heater water temperature increases. In this case, the air outlet is controlled to change from DEF to AUTO through DEF/HEAT in the AUTO mode.

5. COOLER START CONTROL

The cooler start control function controls the outlet air quantity between OFF and AUTO levels until the evaporator cools down. This prevents blowing warm air into the compartment when starting the air conditioner during hot weather. (In AUTO mode operation)

6. SUN LOAD CORRECTION

The photo diode is adopted in the sun load sensor. This provides accurate detection of sun load and ensures proper correction of interior temperatures.

B: SYSTEM CONTROL

Type of automatic control	Input unit	Output unit
Room temperature control	AUTO switch, ECON switch, temperature adjustment switch, in-vehicle sensor, ambient sensor, sun load sensor, evaporator sensor	Air mix door actuating motor
Air flow rate control	AUTO switch, ECON switch, temperature adjustment switch, DEF switch, in-vehicle sensor, ambient sensor, sun load sensor, water temperature sensor, evaporator sensor, fan switch	Blower fan motor, fan control amplifier, HI relay
Mode door control	AUTO switch, ECON switch, temperature adjustment switch, DEF switch, in-vehicle sensor, ambient sensor, sun load sensor, evaporator sensor, water temperature sensor	Mode door actuating motor
Intake door control	AUTO switch, ECON switch, temperature adjustment switch, DEF switch, CIRC switch, in-vehicle sensor, evaporator sensor, ambient sensor, sun load sensor, VENT switch	Intake door actuating motor
Compressor control	AUTO switch, ECON switch, temperature adjustment switch, DEF switch, CIRC switch, in-vehicle sensor, ambient sensor, sun load sensor, evaporator sensor, refrigerant temperature sensor, VENT switch, ECU signal (Engine unit)	Solenoid actuator, compressor ON signal (output to engine control unit)

C: SYSTEM LAYOUT

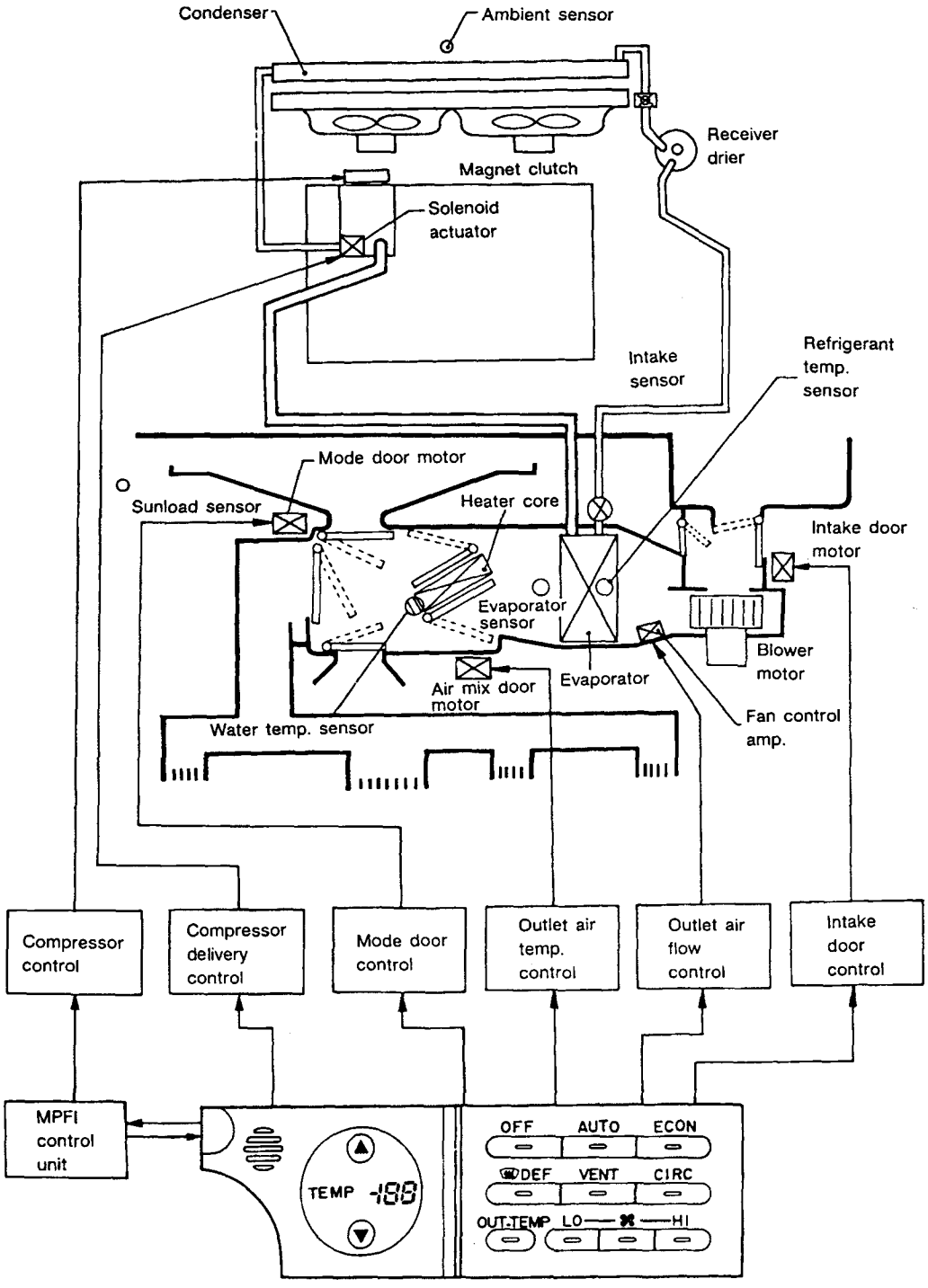
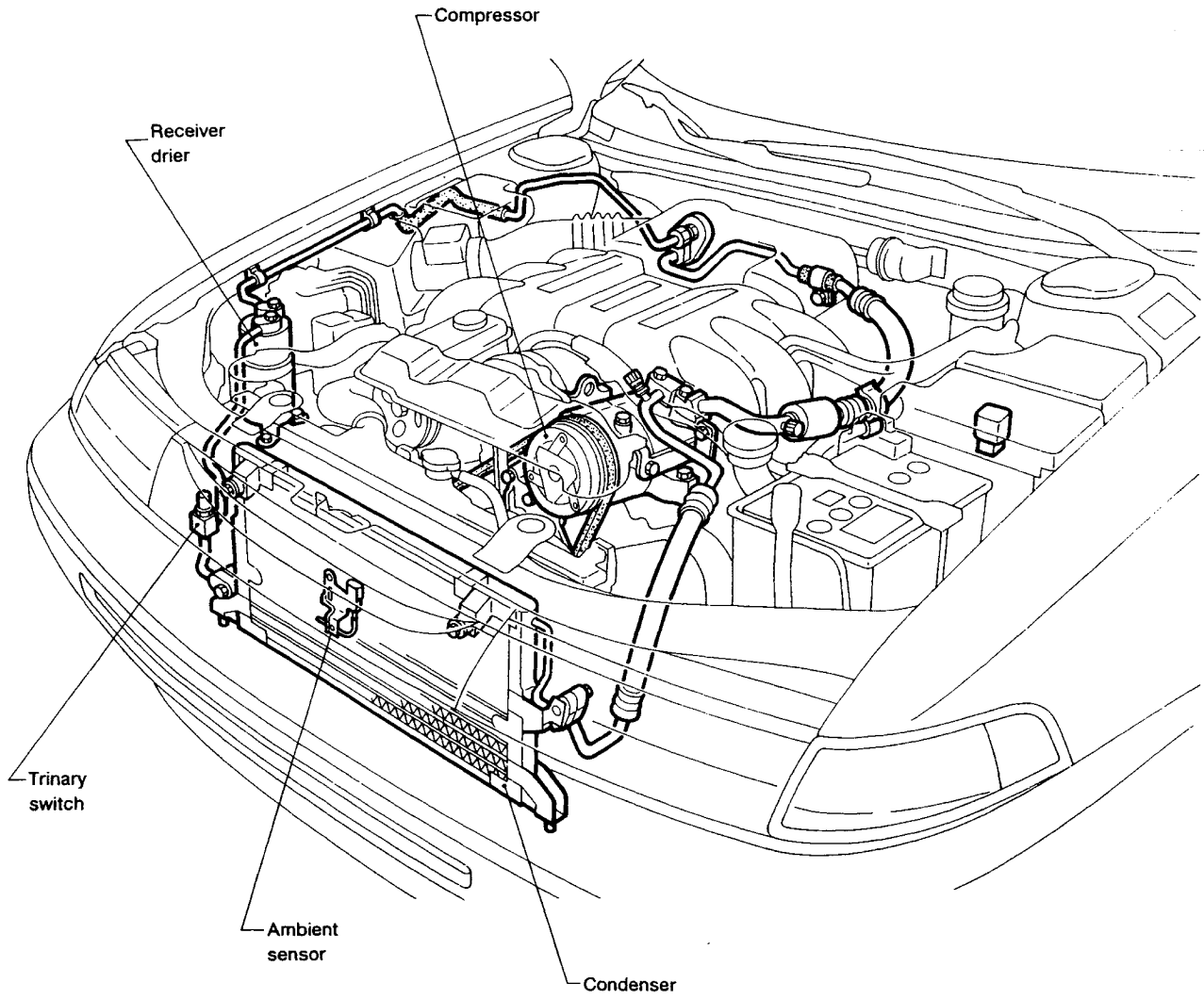


Fig. 63

C4-424

D: COMPONENT LAYOUT

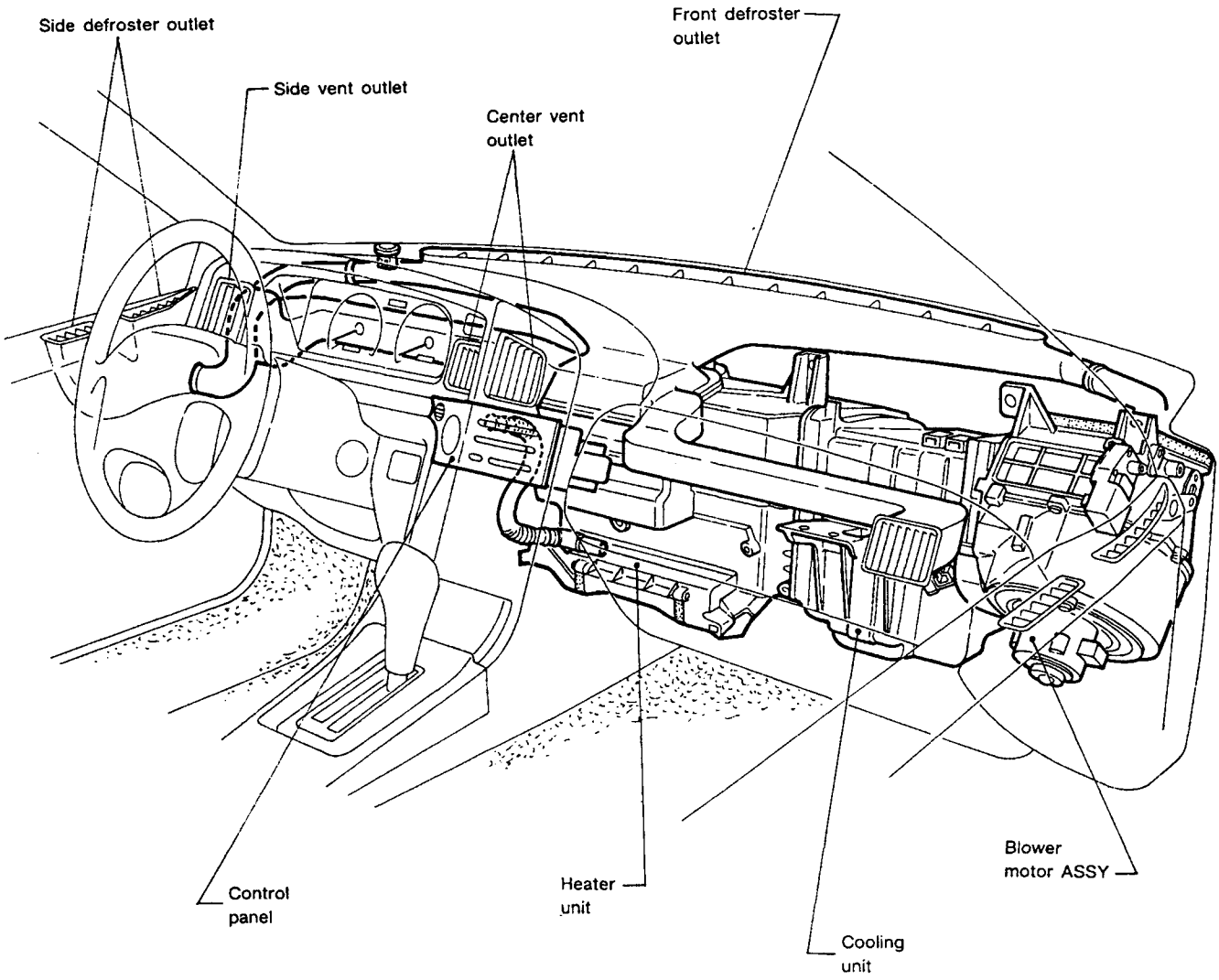
1. ENGINE COMPARTMENT



C4-1017

Fig. 15

2. PASSENGER COMPARTMENT



C4-426

Fig. 65

E: SYSTEM FLOW

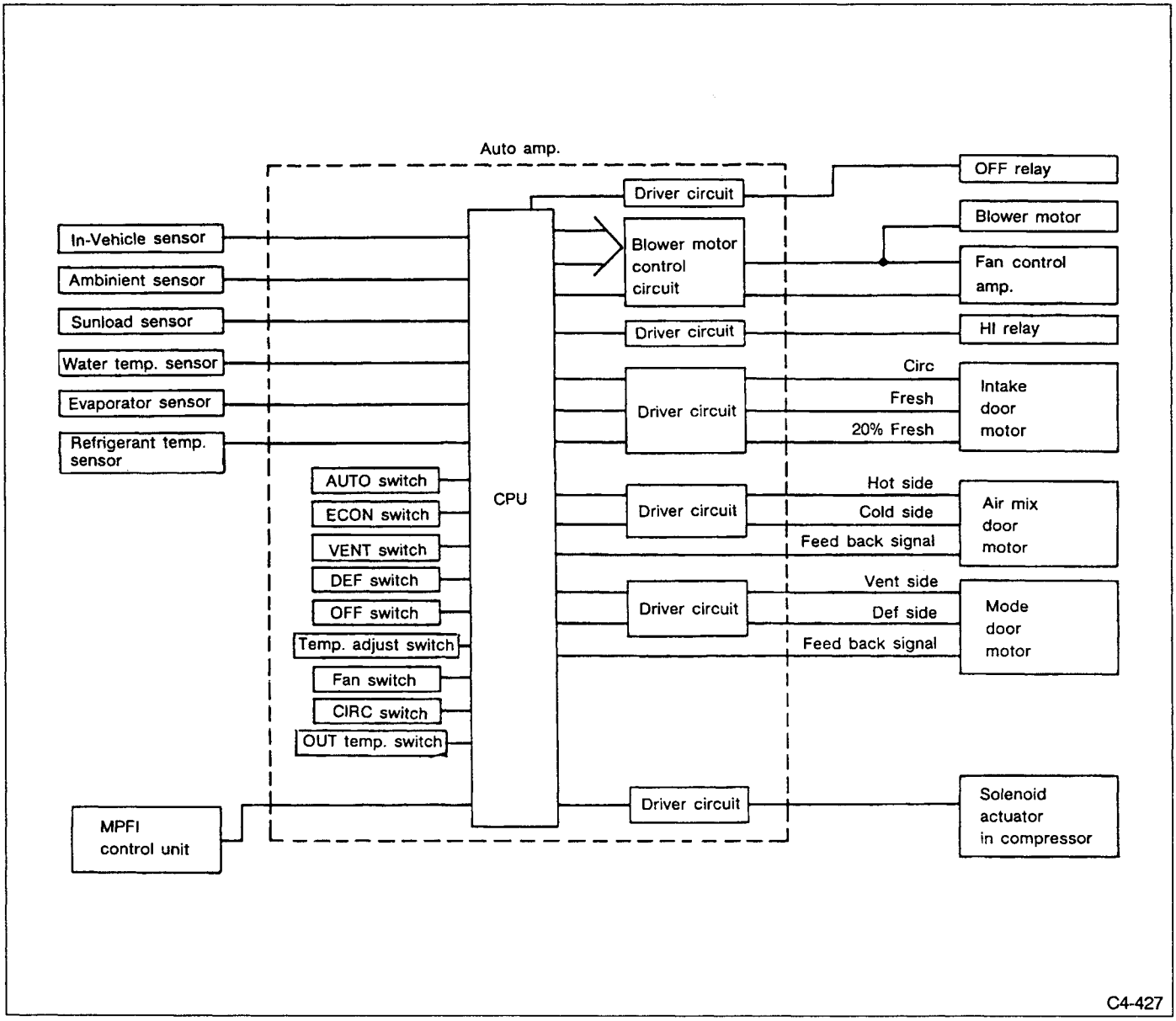


Fig. 66

F: CONTROL SYSTEM

1. AIR MIX DOOR CONTROL (Automatic temperature control)

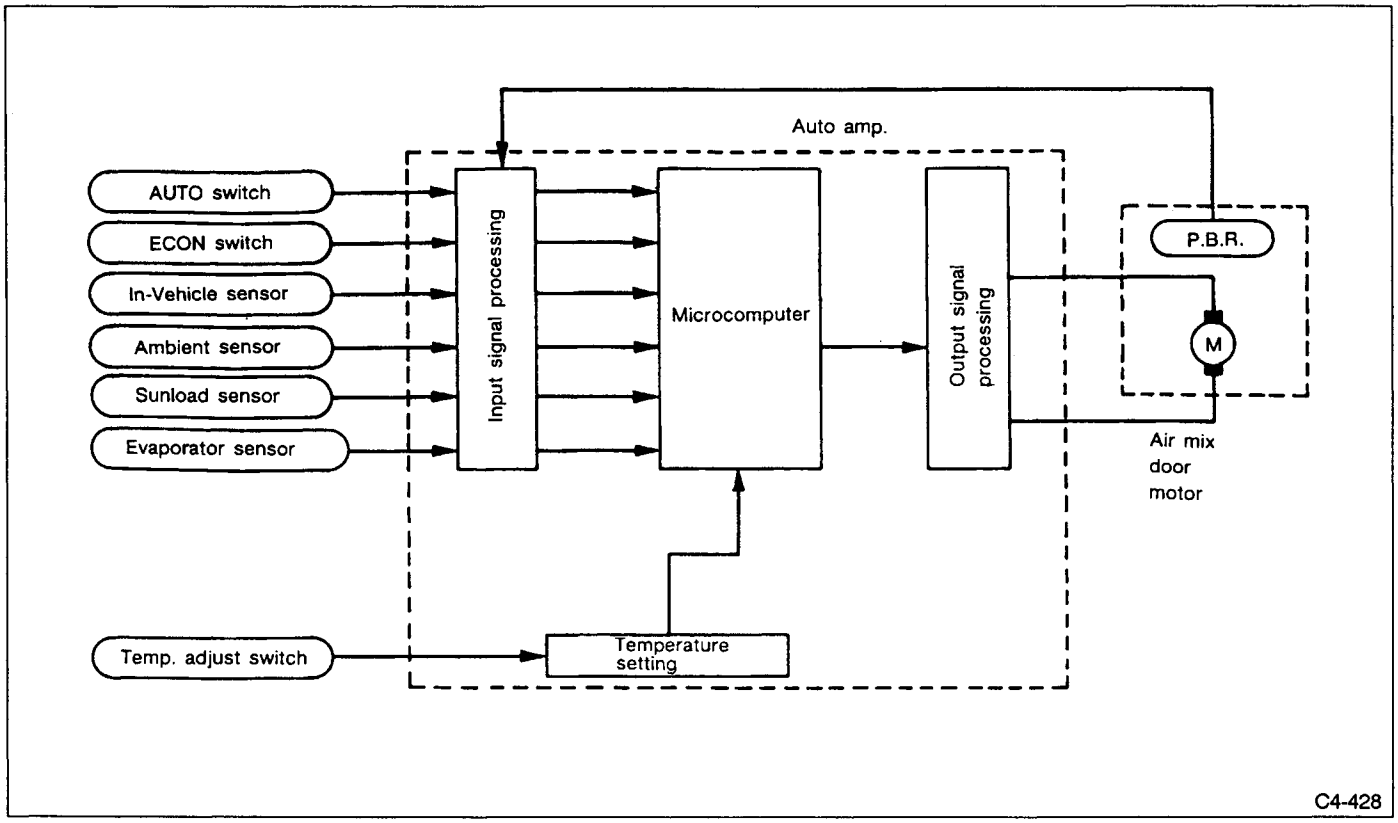


Fig. 67

When the temperature adjustment switch on the control panel is pressed to set a specific temperature, the auto amplifier performs computation based on various input sensor signals, and obtains the overall signal T. Further, it compares the predetermined air mix door opening and P.B.R. signal with respect to this overall signal T, and determines whether the air mix door opening is appropriate.
If the air mix door opening is not appropriate, the air mix door moves toward the heat or cool side so that the appropriate door opening can be obtained.

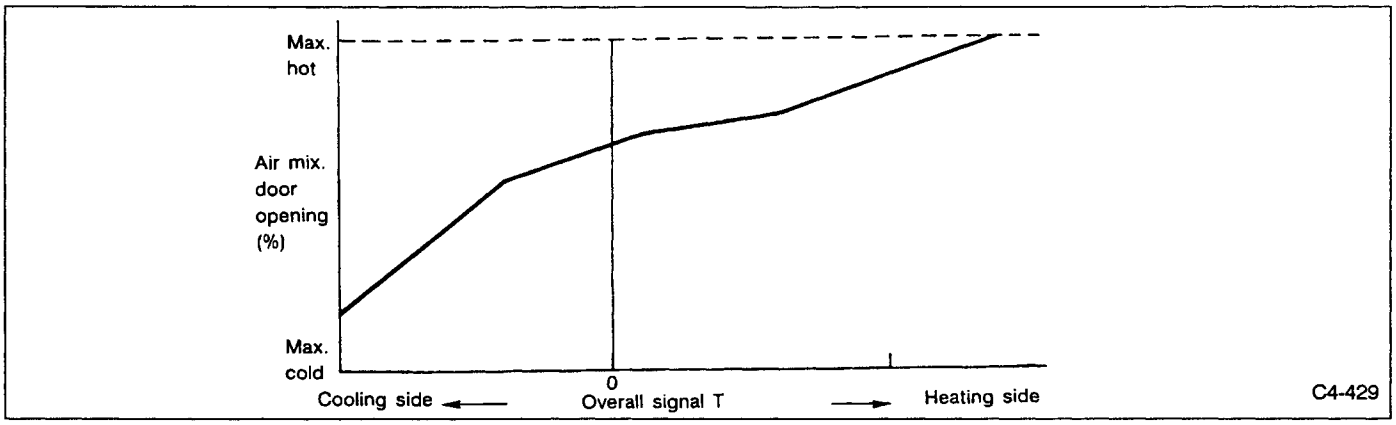

Max.
hot
Air mix.
door
opening
(%)
Max.
cold
0
Cooling side
Overall signal T
Heating side
C4-429

Fig. 68

2. FAN SPEED CONTROL

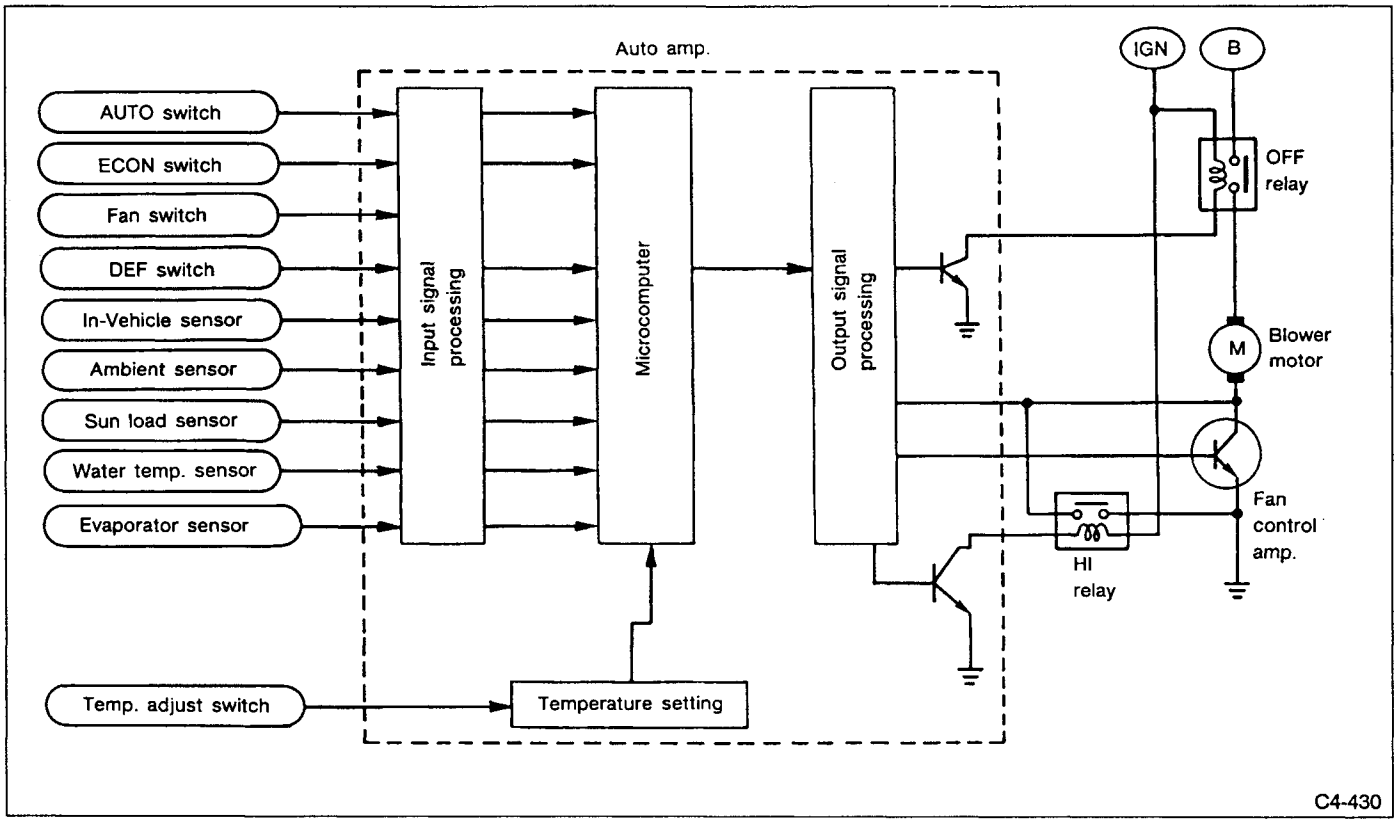


Fig. 69

1) Ordinary automatic air flow rate control
The auto amplifier varies the base voltage of the fan control amplifier corresponding to the overall signal T, thus steplessly controlling the fan motor speed.
The LO voltage varies with the air outlet position as shown below.

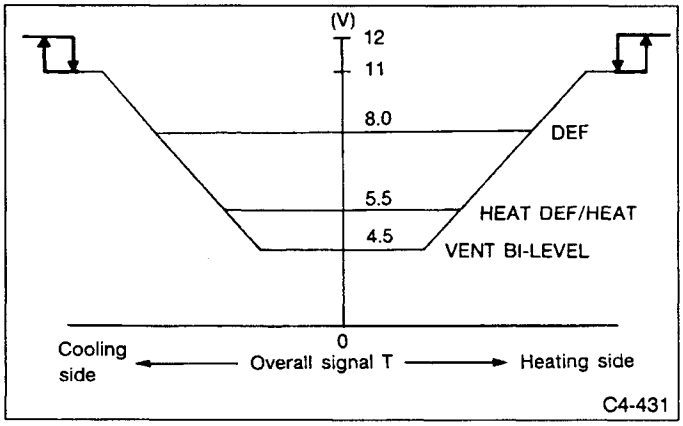


Fig. 70

Air outlet position	Air flow LO voltage
VENT, BI-LEVEL	4.5V
HEAT, DEF/HEAT	5.5V
DEF	8.0V

2) Heater start control
(1) The heater start control is performed corresponding to the air outlet position. (This control is not performed when VENT switch or DEF switch is selected.)
The heater start control changes the air outlet and warm-up air flow rate.
(2) If the water temperature is below 30°C (86°F), DEF position and zero air flow are selected.
(3) If the water temperature is greater than 30°C (86°F), DEF/HEAT position is selected and the air flow rate is linearly increased from LO to AUTO level.
If the blower motor voltage is greater than 7 volts, the air outlet will change to the HEAT position.

AUTO switch	ON		
Water temperature	Less than 30°C (86°F)	Over 30°C (86°F)	
Blower motor voltage	0V	Below 7V	Over 7V
Air outlet	DEF	DEF/HEAT	HEAT

The DEF/HEAT mode door position is only set in case of heater start control.

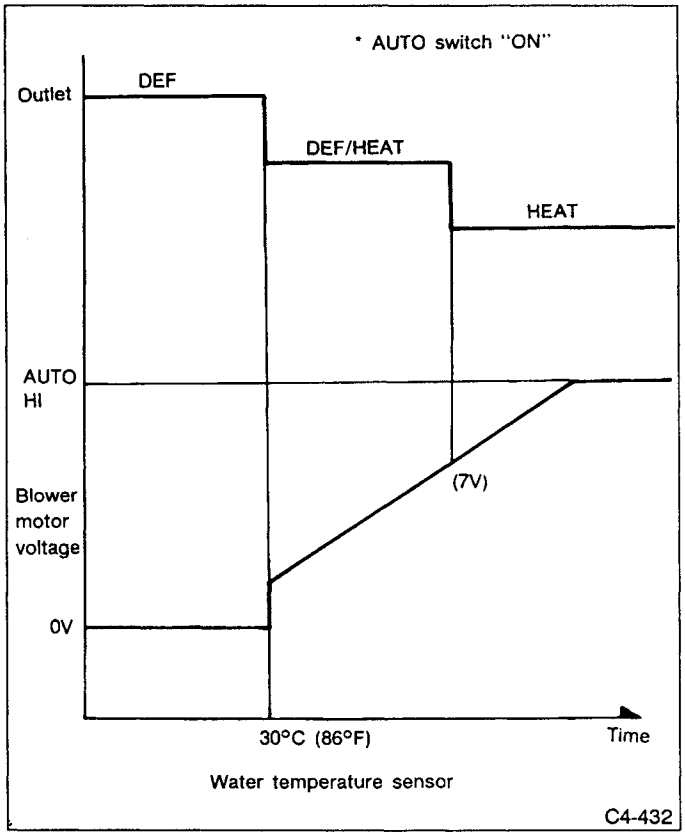


Fig. 71

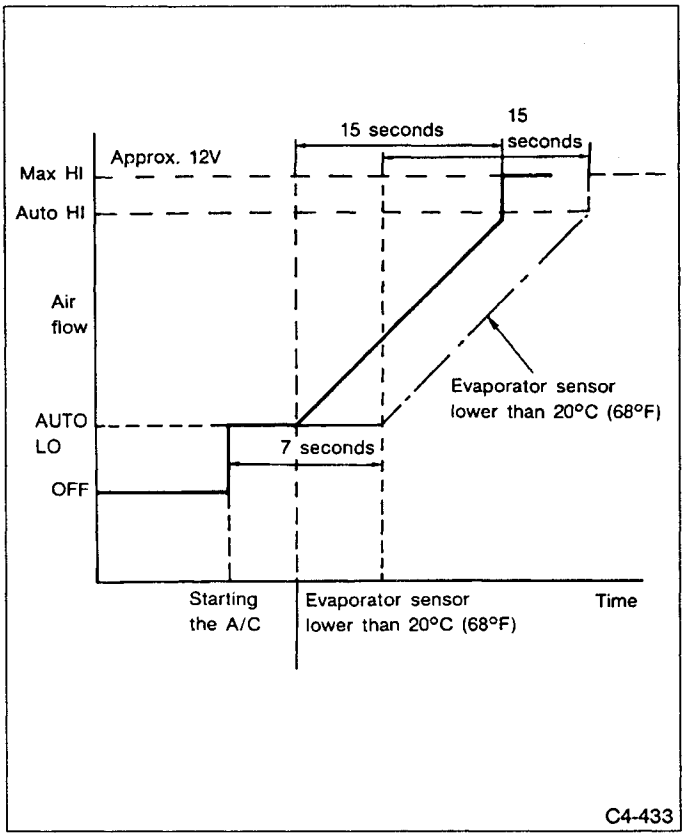


Fig. 72

3) Cooler start control

If the temperature detected by the intake sensor is greater than 20°C (68°F) when starting the air conditioner, the auto amplifier performs cooler start control. The air flow is set at AUTO LO level when the intake sensor detected temperature is higher than 20°C (68°F). If the temperature is lower than 20°C (68°F), the air flow is increased to AUTO HI level from AUTO LO in 15 seconds.

Even if the intake sensor detected temperature is now lower than 20°C (68°F), setting air flow at the AUTO LO level is canceled seven seconds after the air conditioner starts, and it turns AUTO HI level in the subsequent 15 seconds.

This control is performed when the fan is turned ON irrespective of the compressor magnet clutch being ON or OFF.

3. MODE DOOR CONTROL

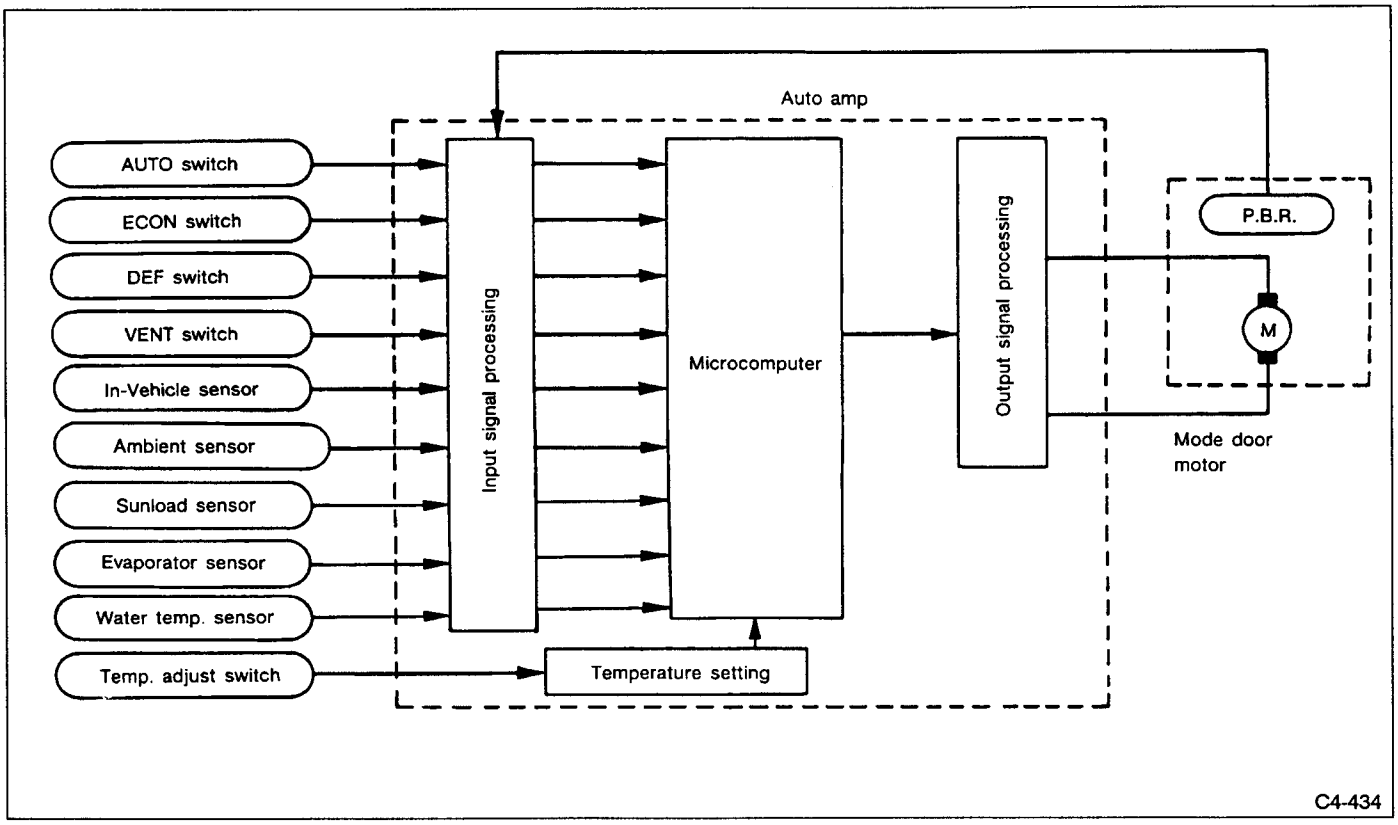


Fig. 73

When the AUTO switch on the control panel is pressed, the switch signal is sent into the auto amplifier. The auto amplifier microcomputer computes the outlet air temperature based on the evaporator sensor signal and air mix door opening signal (computed from the temperature setting signal and various sensor signals). It also compares the computed result with the outlet port selection criterion, and drives the mode door actuating motor to select the air outlet from among the VENT, BI-LEVEL and HEAT modes.

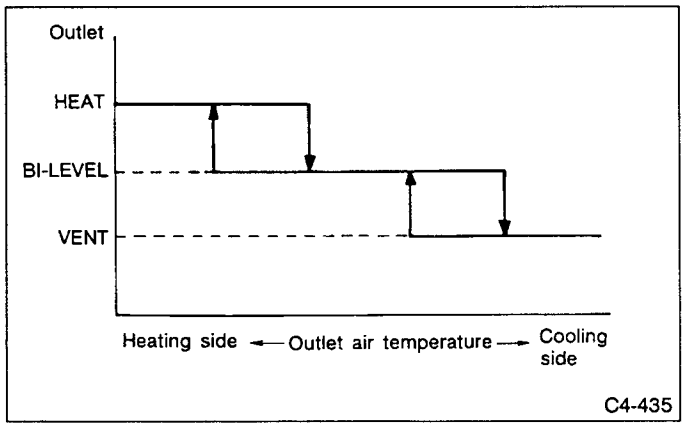


Fig. 74

4. INTAKE DOOR CONTROL
(Automatic suction port control)

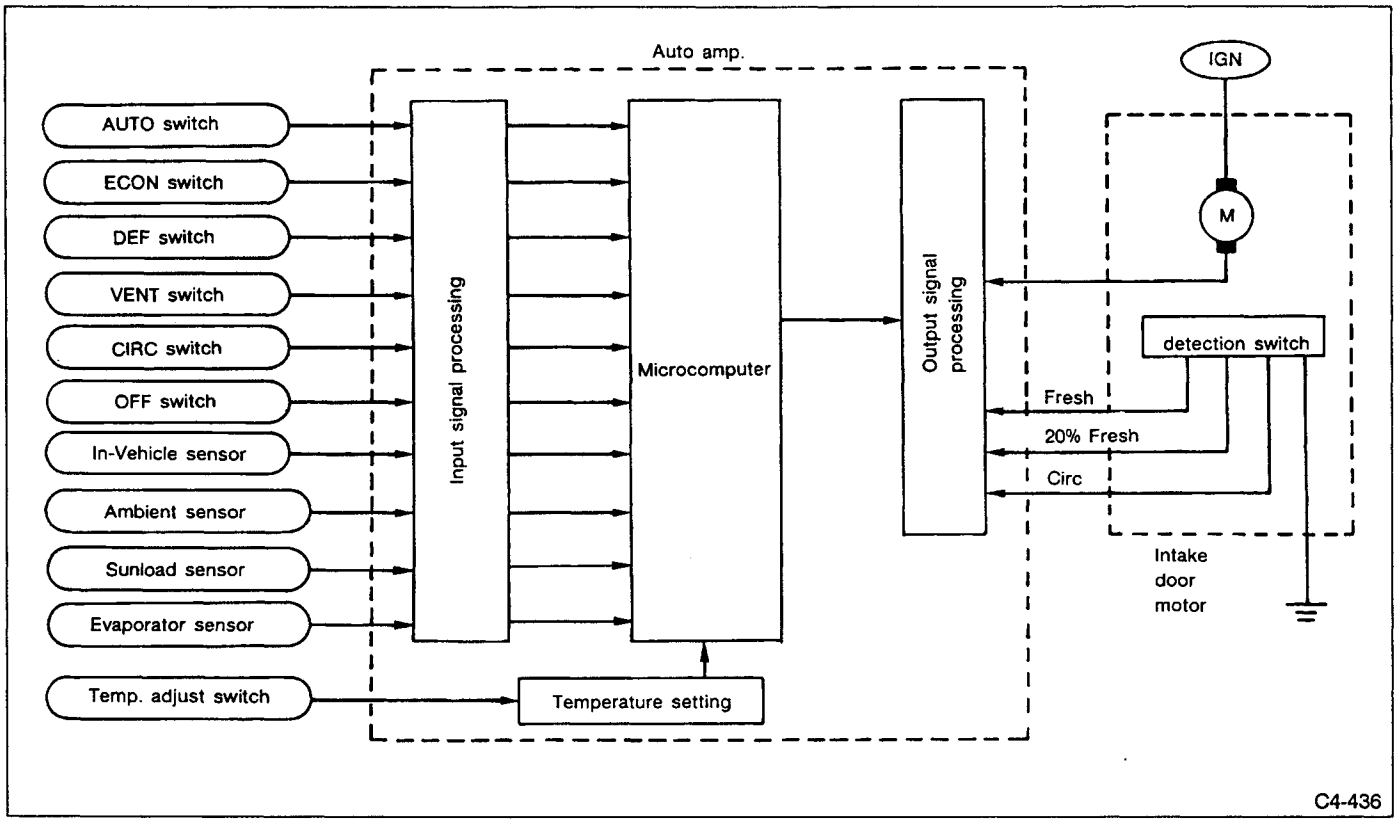


Fig. 75

When the CIRC switch is OFF (LED OFF) and the compressor magnet clutch is OFF, the intake door is normally set in the FRESH position. When the compressor magnet clutch is ON, the intake door is selected among FRESH, 20% FRESH, and RECIRC positions corresponding to the overall signal T and ambient temperature.

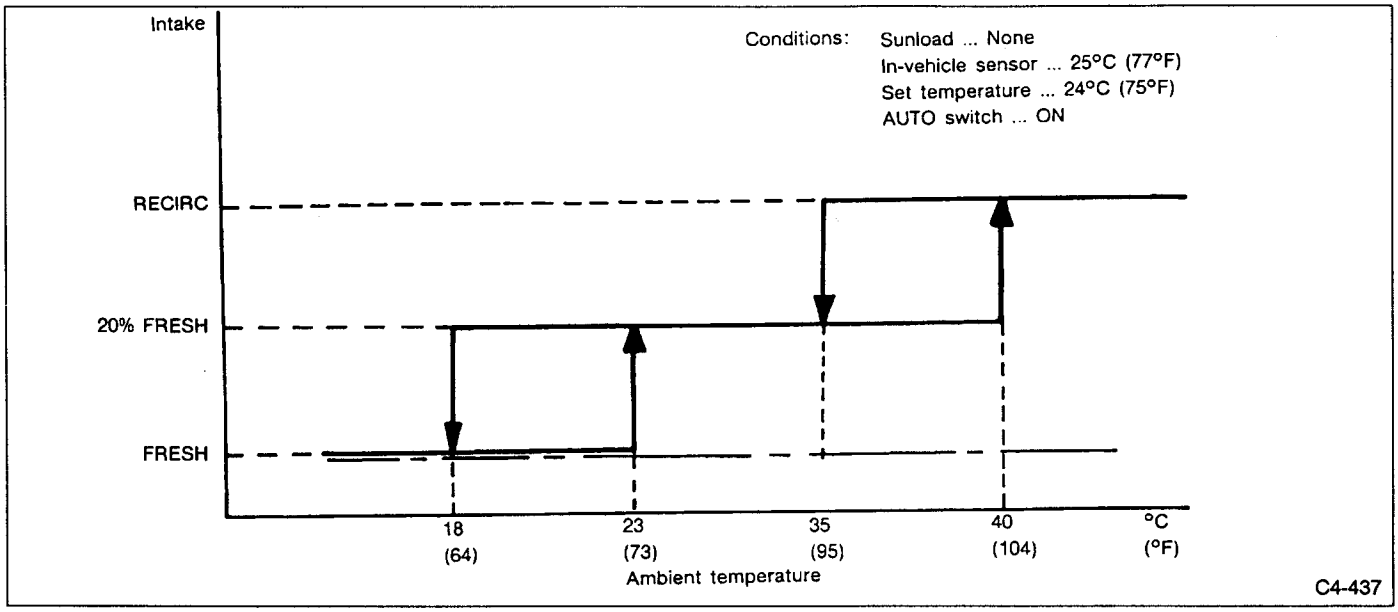

Intake
Conditions: Sunload ... None
In-vehicle sensor ... 25°C (77°F)
Set temperature ... 24°C (75°F)
AUTO switch ... ON
RECIRC
20% FRESH
FRESH
18
(64)
23
(73)
35
(95)
40
(104)
°C
(°F)
Ambient temperature
C4-437

Fig. 76

5. COMPRESSOR CONTROL

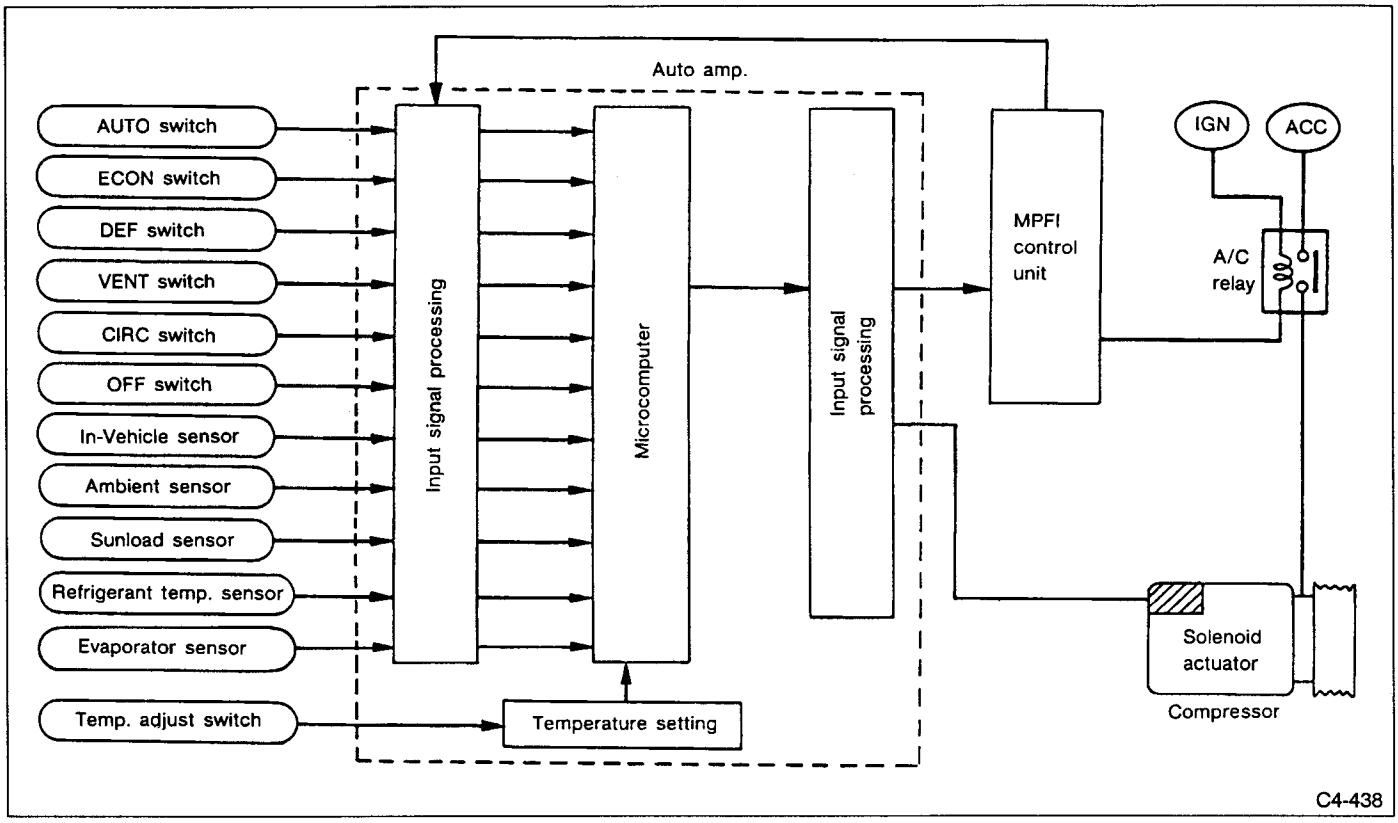


Fig. 77

1) Automatic control of compressor

The compressor operation mode is controlled as shown below corresponding to the control panel switches and ambient temperature levels.

Switch \ Ambient temperature	Zone A	Zone B	Zone C
AUTO switch	• Ordinary control • Quick cool down control	Low temperature defrosting control	OFF
ECON switch	OFF	OFF	OFF
DEF switch	Ordinary control	Low temperature defrosting control	OFF

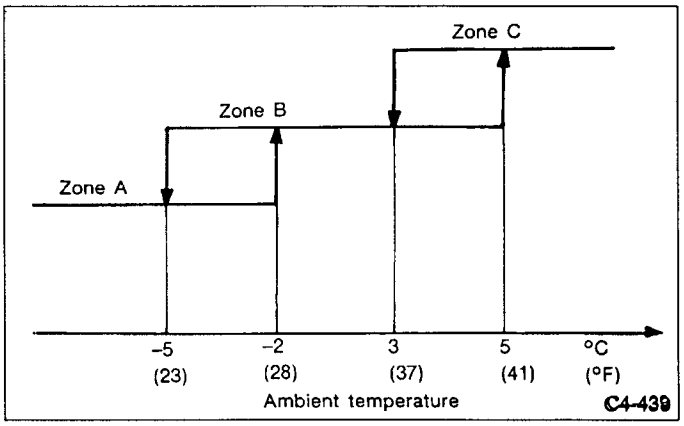


Fig. 78

2) Ordinary control
(When AUTO switch or DEF switch is ON)
The compressor delivery is changed so that the evaporator blow-out air temperature is maintained at 3°C (37°F).

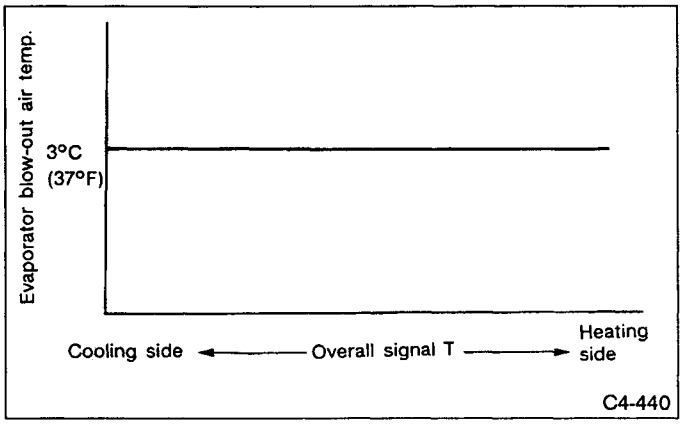


Fig. 79

Evaporator protection against freezing
The compressor magnet clutch is turned OFF depending on the air temperature detected by the evaporator intake sensor.

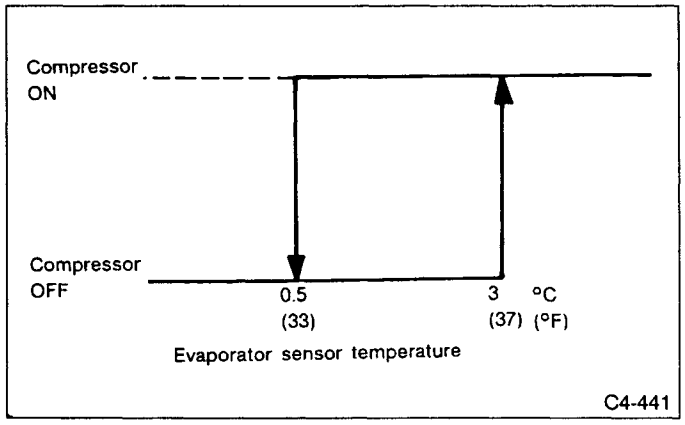


Fig. 80

3) Quick cool-down control [When AUTO switch is ON]
If the auto amplifier decides from the overall signal T that maximum cooling capacity is required, it then maximizes the compressor delivery up to a certain moment.
If the auto amplifier decides that maximum cooling capacity is not needed, it then changes the compressor delivery to the variable control zone.

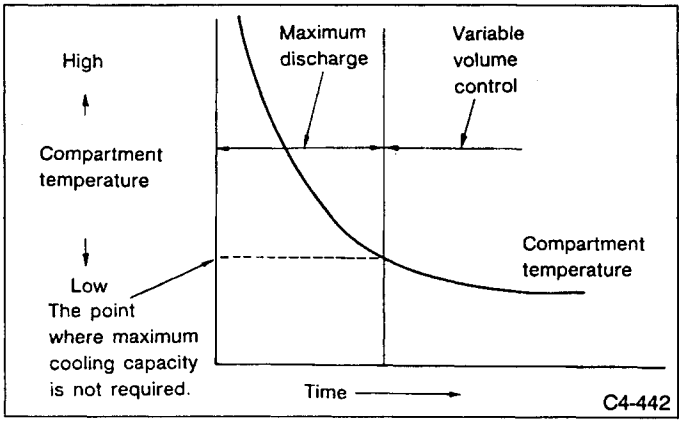


Fig. 81

If the evaporator outlet air temperature is lower than 3°C (37°F) for more than five minutes, the compressor changes from maximum delivery mode to variable delivery mode.

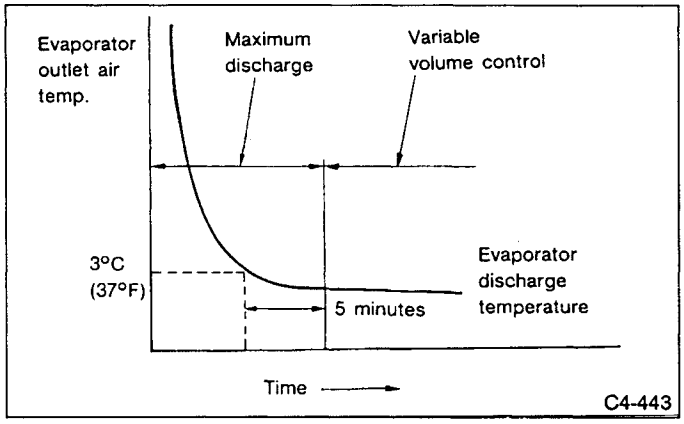


Fig. 82

4) Low temperature defrosting control
[When AUTO switch or DEF switch is ON]
The compressor delivery is varied corresponding to the ambient temperature so that the evaporator outlet air temperature can be kept within the range of 1 — 3°C (34 — 37°F). When the CIRC switch is OFF, the temperature is detected by the refrigerant temperature sensor.

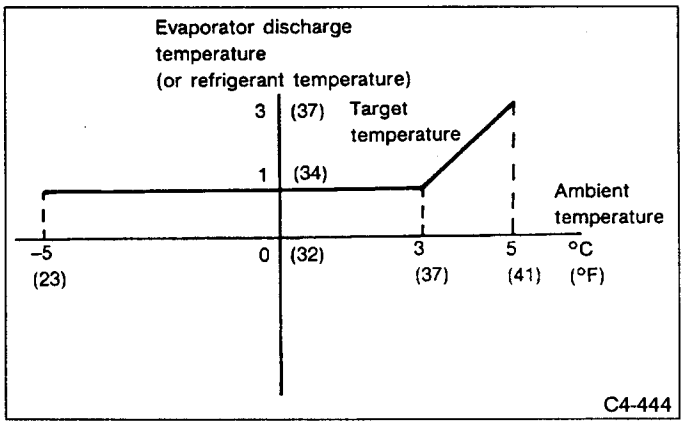


Fig. 83

Evaporator protection against freezing
[When AUTO switch or DEF switch is ON and CIRC switch is ON (RECIRC)]
The compressor magnet clutch is turned OFF depending on the temperature detected by the evaporator sensor.

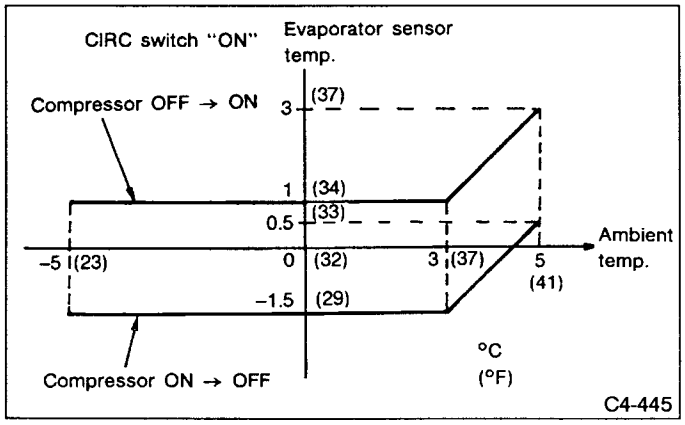


Fig. 84

[When AUTO switch or DEF switch is ON and CIRC switch is OFF (AUTO)]
The compressor is turned OFF depending on the temperature detected by the refrigerant temperature sensor.

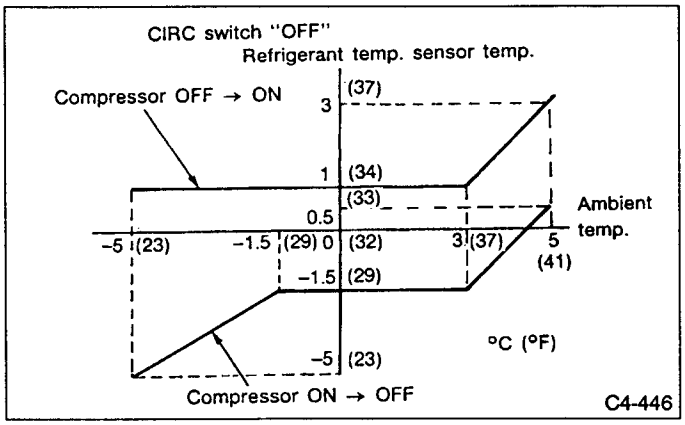


Fig. 85

5) Control by engine control unit (MPFI unit) signal
The engine control unit issues a compressor delivery reduction demanding signal (MPFI unit signal) to the auto amplifier. The auto amplifier, when receiving this signal, controls the solenoid actuator current as shown below.

MPFI signal	Solenoid actuator current
A	Ordinary temperature control
B	0.3(A)
C	0.45(A)
D	0.6(A)
E (Compressor OFF signal)	0(A)
Fault	0.6(A)

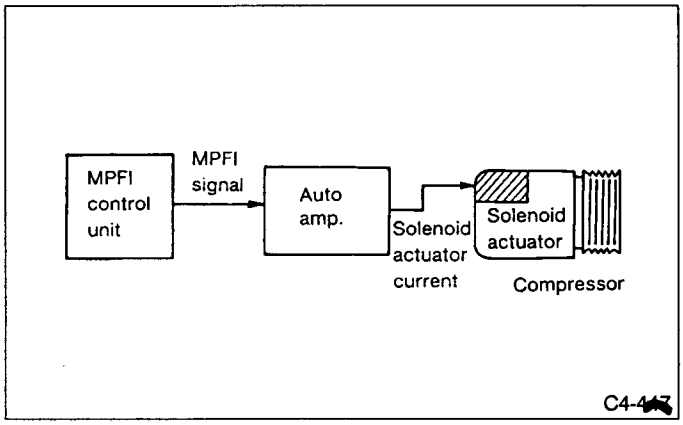


Fig. 86

The engine control unit (MPFI unit) issues the MPFI signal as mentioned above to the auto amplifier.

(1) When engine water temperature is abnormally high
If the engine water temperature rises abnormally, the MPFI unit issues signal A, B, C, D, or E depending on the engine water temperature.
(2) When compressor is turned OFF
When the compressor is turned OFF by the switch operation, the MPFI unit issues signal D (solenoid actuator current 0.6A) for approx. seven seconds before turning OFF.

These control items (1) and (2) are not performed by the auto amplifier.

6) Compressor protection in case of air conditioner trouble
If a trouble occurs in the air conditioner system and if, for example, no air blow is generated, then, the compressor is turned OFF depending on the temperature detected by the refrigerant temperature sensor.

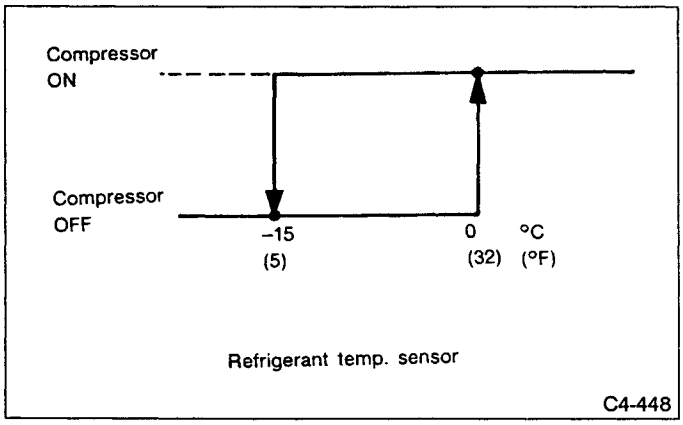


Fig. 87

7) Full-throttle control
When the throttle opening is maximum, the engine control unit (MPFI unit) turns the air conditioner relay OFF for a period of up to twenty seconds, thereby turning OFF the compressor.

This control is not performed by the auto amplifier.

6. AUTOMATIC CONTROL OF AMBIENT TEMPERATURE CORRECTION

The temperature data obtained by the ambient sensor is sent to the auto amplifier as the ambient temperature. Even if the ambient sensor measurement is influenced by the radiator heat and a sudden abnormal rise in temperature is measured, the auto amplifier will not directly respond to such a temperature rise; it only responds slowly owing to this correction function.

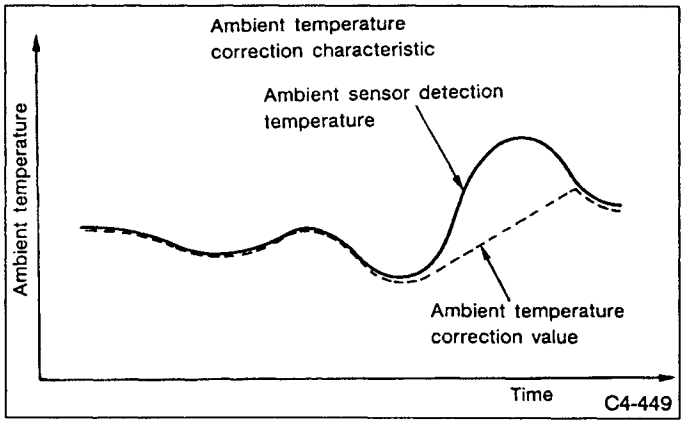


Fig. 88

7. COOLING FAN CONTROL

Electric cooling fans are adopted for cooling the radiator and condenser, and fan speed is controlled in three steps, HI, MED, and LO to reduce fan noise.

Fan speed	Power consumed
LO : 1,600 rpm	115W
MED : 1,950 rpm	145W
HI : 2,300 rpm	175W

This control is not performed by the auto amplifier.

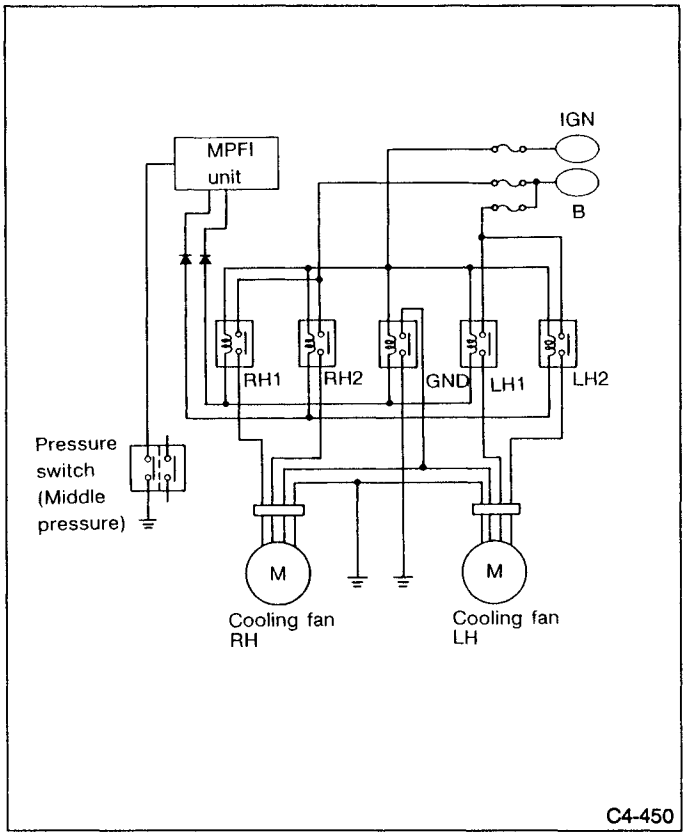


Fig. 89

	Input signal				Output signal		Cooling fan operation status	
	Compressor signal	Vehicle speed X: 6 (10) 12 (20) MPH (km/h)	Engine water temperature X: 192 (89) 203 (95) °F (°C)	Air conditioner intermediate pressure switch X: 1,275 ± 147 (13 ± 1.5) 1,569 ± 127 (16 ± 1.3) kPa (kg/cm²)	MPFI unit signal Terminal ①	 Terminal ②	Main (RH)	Sub. (LH)
1	ON	X	X	X	ON	—	Low	Low
2				O	—	ON	Medium	Medium
3			O	X	—	ON	Medium	Medium
4				O	ON	ON	High	High
5		O	X	X	ON	—	Low	Low
6				O	ON	ON	High	HIgh
7			O	X	ON	ON	High	High
8				O	ON	ON	High	High
9	OFF	X	X		—	—	Off	Off
10			O		ON	—	Low	Low
11		O	X		—	—	Off	Off
12			O		—	ON	Medium	Medium

8. SET TEMPERATURE CORRECTION

When heating or cooling the compartment, and if the occupant does not feel comfortable at the preset temperature, he can then adjust the compartment temperature in three steps depending on the ambient temperature measured by the ambient sensor.

(1) Set to step 4 in the self-diagnosis mode. (Ref. to T400.)

(2) Press the UP or DOWN switch to change the correction.

Switch operation	Display	Ambient temperature correction
Press UP switch	10	• When ambient temperature is low, compartment temperature is increased above the standard level. • When ambient temperature is high, compartment temperature is decreased below the standard level.
—	05	Standard (No correction is made)
Press DOWN switch	00	• When ambient temperature is low, compartment temperature is decreased below the standard level. • When ambient temperature is high, compartment temperature is increased above the standard level.

When the battery is removed, the correction is set at the standard status with a display of "05". Verify the previous correction in advance with the display showing step 4 in the self-diagnosis mode.

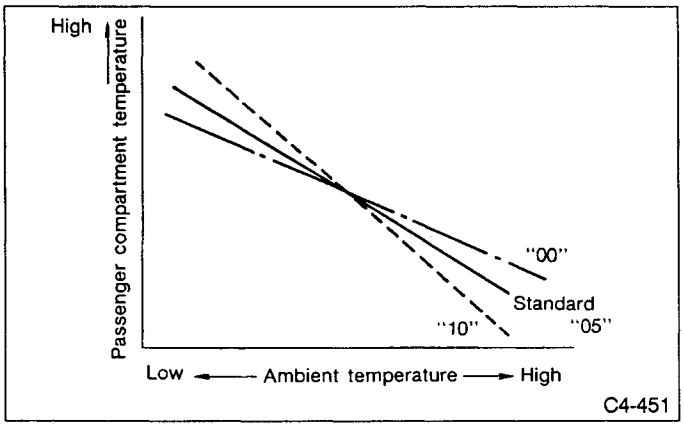


Fig. 90

9. SWITCHING BETWEEN °C AND °F

Switching is made by connecting or disconnecting a connector.

(Under A pillar lower trim driver side: B33)

- connecting — °F
- disconnecting — °C

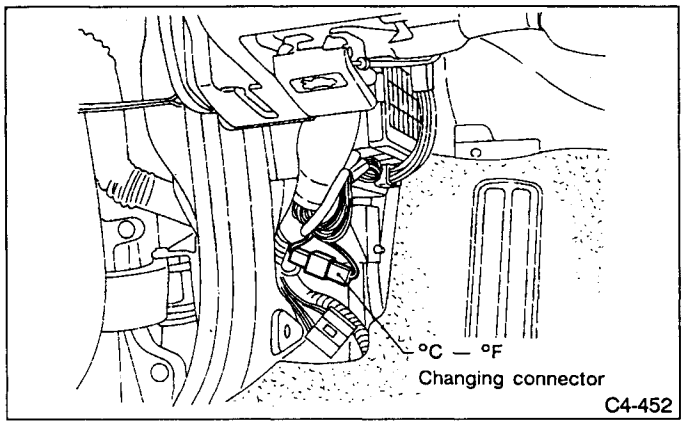


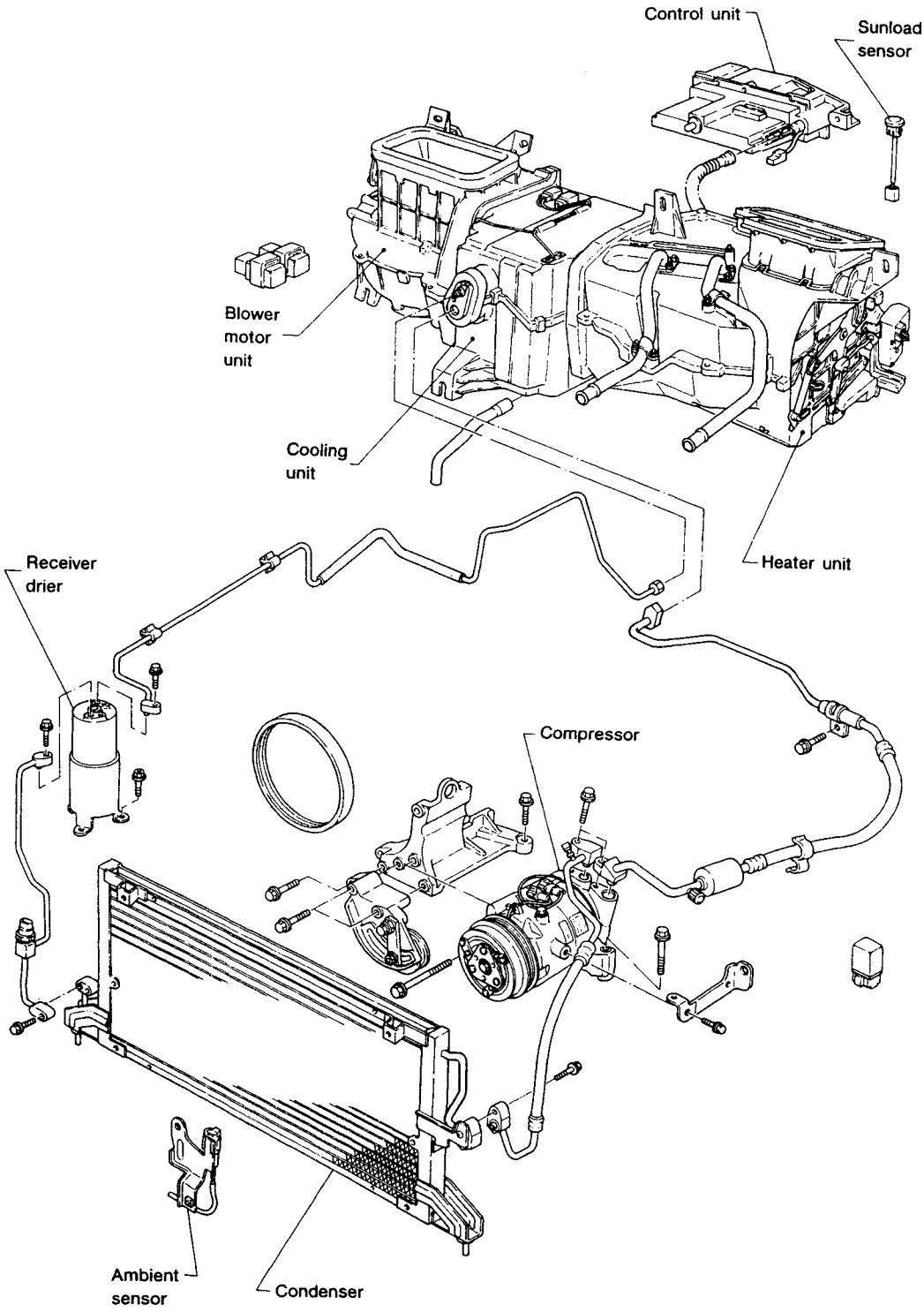
Fig. 91

S SPECIFICATIONS

Item			Specifications
Type of air conditioning			Reheat air-mix. type
Cooling capacity (IMACA)			5.117 kW (4,400 kcal/h, 17,459 BTU/h)
Mass air flow rate			460 m^3/h (16,243 cu ft/h)
Refrigerant			R134a (CH_2FCF_3) 0.65 kg (1.43 lb)
Compressor		Type	Variable displacement wobble plate
		Discharge	Max. 167 cm^3 (10.19 cu in)/rev
		Max. permissible speed	8,400 rpm
		Compressor oil	ZXL100PG 150 cm^3 (9.15 cu in)
Magnet clutch		Type	Dry single-disc type
		Power consumption	Less than 45W
		Type of belt	V-Ribed 4PK
		Pulley dia. (effective dia.)	120 mm (4.72 in)
		Pulley ratio	1.11
Condenser		Type	Multi-flow (Corrugated fin)
		Core face area	0.161 m^2 (1.73 sq ft)
		Core thickness	18.7 mm (0.736 in)
Receiver drier		Effective inner capacity	290 cm^3 (17.70 cu in)
		Desiccant	Zeolite 100 g (3.53 oz)
Expansion valve		Type	External equalizing
Evaporator		Type	Laminated
		Dimensions (W x H x T)	224 x 235 x 74 mm (8.82 x 9.25 x 2.91 in)
Heater unit		Heating capacity	4.768 kW (4,100 kcal/h, 16,269 BTU/h)
		Heater core size (Height x Length x Width x Thickness)	192.4 x 152.0 x 25.0 x 1.8 mm (7.57 x 5.98 x 0.984 x 0.071 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter x width	150 x 65 mm (5.91 x 2.56 in)
		Power consumption	250W at 12.5V
Fan control (Main fan)		Motor type	Magnet
		Power consumption	175W at 12V
		Fan outer diameter x blade	320 mm (12.60 in) x 4
Fan control (Sub fan)		Motor type	Magnet
		Power consumption	175W at 12V
		Fan outer diameter x blade	320 mm (12.60 in) x 5
Compressor relief valve operating pressure		kPa (kg/cm^2, psi)	3,629 ± 363 (37 ± 3.7, 526 ± 53)
Trinary switch (Pressure switch)	Low-pressure operating pressure kPa (kg/cm^2, psi)	ON → OFF	118 ± 20 (1.2 ± 0.2, 17.1 ± 2.8)
		OFF → ON	127 ± 29 (1.3 ± 0.3, 18 ± 4)
	High-pressure operating pressure kPa (kg/cm^2, psi)	ON → OFF	2,648 ± 196 (27 ± 2, 384 ± 28)
		OFF → ON	$1,471^{+196}_{-98}$ ($15^{+2.0}_{-1.0}$, 213^{+28}_{-14})
	Intermediate-pressure switch operating pressure (fan control) kPa (kg/cm^2, psi)	OFF → ON	1,569 ± 127 (16 ± 1.3, 228 ± 18)
		ON → OFF	1,275 ± 147 (13 ± 1.5, 185 ± 21)
Sensors	In-vehicle sensor	Resistance	3 kΩ at 25°C (77°F)
	Ambient sensor	Resistance	3 kΩ at 25°C (77°F)
	Water temperature sensor	Resistance	3 kΩ at 25°C (77°F)
	Evaporator sensor	Resistance	6.194 kΩ at 0°C (32°F)
	Refrigerant temperature sensor	Resistance	6.194 kΩ at 0°C (32°F)
	Sunload sensor	Current measuring type	Photo diode; 0.4 mA at 660 kcal/m^2h
Control components	Auto amplifier		With microcomputer incorporated
	Air mix door motor	Power consumption	1.2W at 12V
	Mode door motor	Power consumption	1.2W at 12V
	Intake door motor	Power consumption	1.2W at 12V

C COMPONENT PARTS

1. Air Conditioning System



C4-1018

Fig. 16

W SERVICE PROCEDURE

1. Safety Precautions

1. R134a AIR CONDITIONING SYSTEM

Component parts of the cooling system, refrigerant, compressor oil, and other parts are not the same for the R134a system and the older R12 system. Do not interchange parts or liquid.

Vehicles with R134a air conditioning systems, use only R134a parts that are indicated on a label attached to the vehicle. Before performing any maintenance, verify the type of air conditioning system installed in the vehicle.

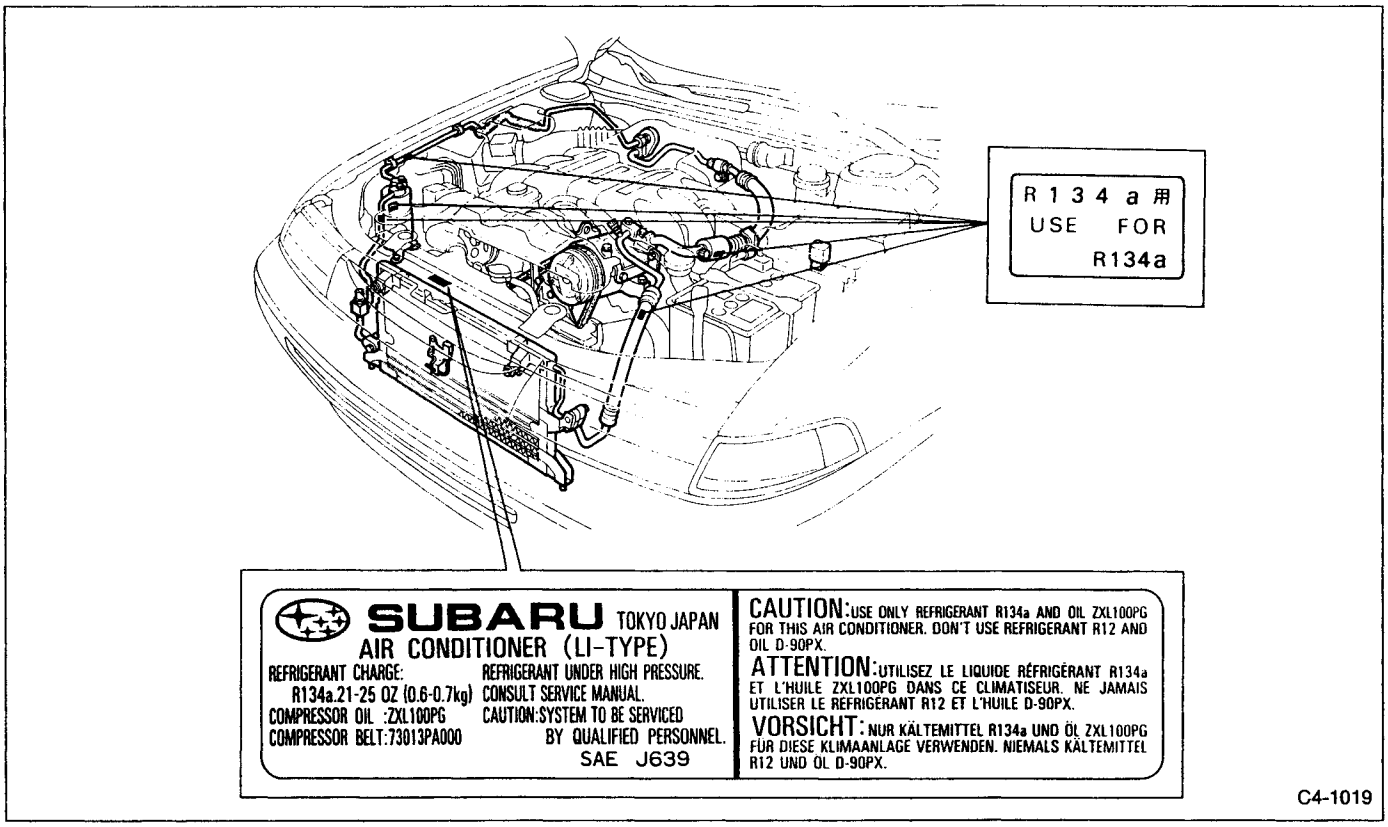


Fig. 17

2. COMPRESSOR OIL

Do not use any compressor oil that is not specifically designated for the R134a air conditioning system; only use ZXL100PG. Also, do not use R134a compressor oil in the R12 air conditioning system. If compression oils are mixed, poor lubrication will result and the compressor itself may be damaged.

Because R134a compressor oil is very hygroscopic (easily absorbs moisture), when parts of the air conditioning system are being removed, quickly install a blind plug to prevent contact with the outside air. Also, always make sure that the service container for compressor oil is tightly closed except when in use. Store compressor oil in a tightly closed container.

3. REFRIGERANT

Do not put R12 refrigerant into a R134a air conditioning system. Also, do not put R134a refrigerant into a R12 air conditioning system. If the wrong refrigerant is used, poor lubrication will result and the compressor itself may be destroyed.

4. HANDLING OF REFRIGERANT

Because refrigerant boils at approx. –30°C (–22°F) at sea level, it is cold enough to give you severe frostbite. Always wear goggles to protect your eyes and gloves to protect your hands. Also, even under the pressures normally found in R-12 containers, refrigerant will boil with the addition of heat. This could raise the pressure inside the container to a dangerous level.

Never expose a can of R134a to direct sunlight, or to temperatures over 40°C (104°F). One more thing to remember about R134a is that when it is exposed to an open flame or to hot metal, it forms phosgene, a deadly gas. Do not discharge R134a into the atmosphere on purpose. Always read and follow the precautions on the R134a bottle.

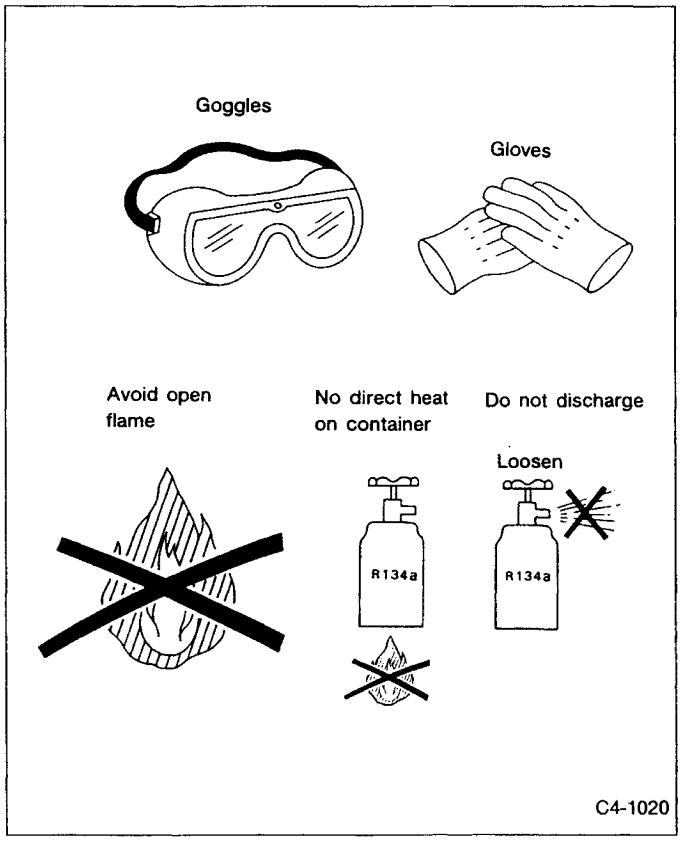


Fig. 18

2. Basic Information

1) The combination of moisture and refrigerant forms acid, therefore, moisture should not be allowed to enter the refrigerant.

2) Refrigerant oil readily absorbs moisture, therefore, keep refrigerant oil containers tightly capped.

3) The process of evacuating the system is performed to remove small amounts of moisture. This is accomplished by lowering the pressure inside the system, which allows the moisture to boil off, in much the same way that a pot of water will boil away to nothing given enough time. The evacuation process does not suck the moisture out of the system.

4) A minimum level of vacuum must be reached to satisfactorily evacuate the system. This minimum level of vacuum depends on the temperature inside the system. The chart below shows the level of vacuum required to boil water at various temperatures.

Additionally, the vacuum level shown on a gauge will read approx. 4 kPa (25 mmHg, 1 inHg) less for each 1000 ft. above sea level, due to the decrease in atmospheric pressure at altitude.

Vacuum level required to boil water (at sea level)

Temperature °C (°F)	Vacuum kPa (mmHg, inHg)
1.7 (35)	100.9 (757, 29.8)
7.2 (45)	100.6 (754, 29.7)
12.8 (55)	99.9 (749, 29.5)
18.3 (65)	99.2 (744, 29.3)
23.9 (75)	98.5 (739, 29.1)
29.4 (85)	97.2 (729, 28.7)
35 (95)	95.8 (719, 28.3)

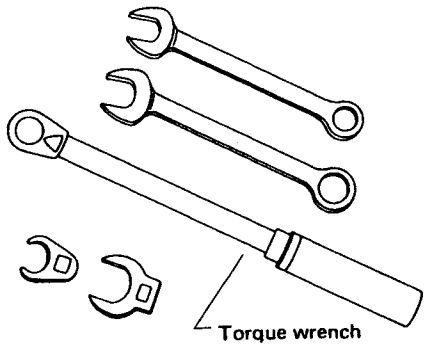
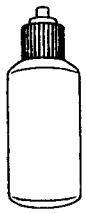
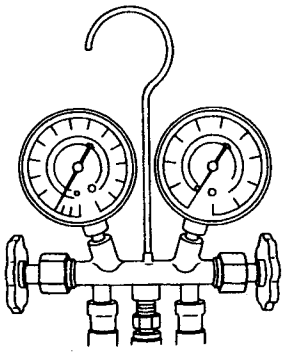
3. Tools and Equipment

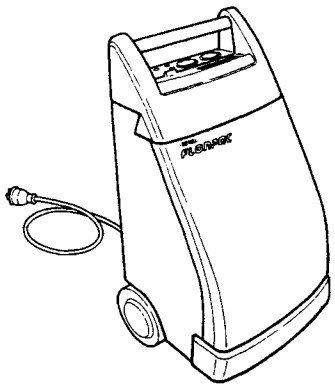
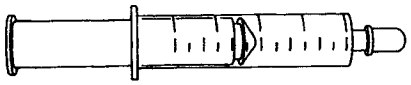
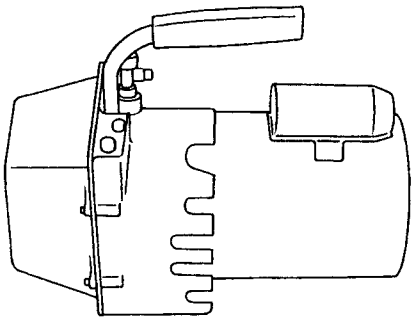
The following section provides information about the tools and equipment that will be necessary to properly service the air conditioning system.
Since equipment may vary slightly depending on the manufacturer, it is important to always read and follow the manufacturer's instructions.

When working on vehicles with the R134a system, only use R134a specified tools and parts. Do not mix with R12 tools and parts. If R134a and R12 refrigerant or compressor oil is mixed, poor lubrication will result and the compressor itself may be destroyed.

In order to help prevent mixing R134a and R12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the R134a and R12 systems must also not be interchanged.

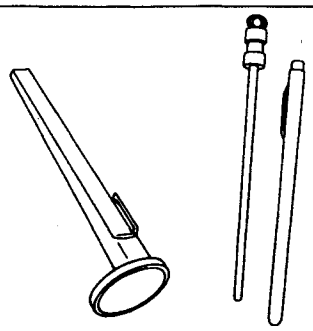
	R134a	R12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

Tools and Equipment	Description
WRENCHES Various **WRENCHES** will be required to service any air conditioning system. A 7 to 40 N·m (0.7 to 4.1 kg-m, 5 to 30 ft-lb) torque wrench with various crowfoot wrenches will be needed. Open end or flare nut wrenches will be needed for back-up on the tube and hose fittings.	 B4-669-1 *Fig. 19*
APPLICATOR BOTTLE A small **APPLICATOR BOTTLE** is recommended to apply refrigerant oil to the various parts. They can be obtained at a hardware or drug store.	 B4-669-2 *Fig. 20*
MANIFOLD GAUGE SET A **MANIFOLD GAUGE SET** (with hoses) can be obtained from either a commercial refrigeration supply house or from an auto shop equipment supplier.	 B4-669-3 *Fig. 21*

Tools and Equipment	Description
REFRIGERANT RECOVERY SYSTEM **REFRIGERANT RECOVERY SYSTEM** recycles refrigerant rather than discharging it into atmosphere. Must be U.L. Approved. Kent Moore ACR-4 or equivalent is recommended.	 C4-617 *Fig. 22*
SYRINGE A graduated plastic **SYRINGE** will be needed to add oil back into the system. The syringe can be found at a pharmacy or drug store.	 B4-669-6 *Fig. 23*
VACUUM PUMP A **VACUUM PUMP** (in good working condition) is necessary, and may be obtained from either a commercial refrigeration supply house or an automotive equipment supplier. Included with Kent Moore ACR-4.	 B4-670-1 *Fig. 24*

THERMOMETERS

Pocket **THERMOMETERS** are available from either industrial hardware store or commercial refrigeration supply houses.



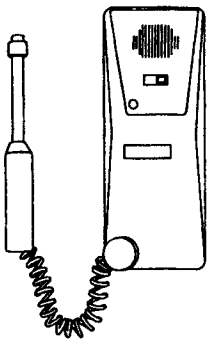
B4-670-3

Fig. 26

ELECTRONIC LEAK DETECTOR

An **ELECTRONIC LEAK DETECTOR** can be obtained from either a specialty tool supply or an air conditioning equipment supplier.

Must be capable of detecting R-134a Refrigerant.



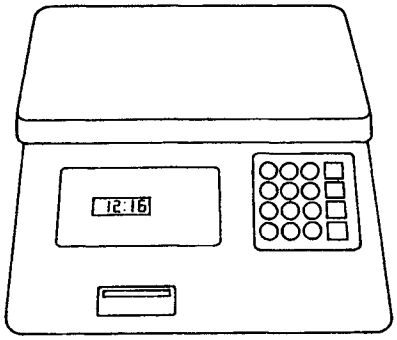
B4-670-4

Fig. 27

WEIGHT SCALE

A **WEIGHT SCALE** such as an electronic charging scale or a bathroom scale with digital display will be needed if a 13.6 kg (30 lb) refrigerant container is used.

Included with Kent Moore ACR-4.



B4-670-5

Fig. 28

4. O-ring Connections

1. GENERAL

The following points should be kept in mind when assembling O-ring connections:

1) Avoid unnecessary handling and contact of O-rings with your hands, since even clean fingers contain body acids, which can contaminate the O-ring surface.

2) Do not handle O-rings with gloves, shop towels, etc., since lint particles may cling to the O-ring, possibly causing a leak upon assembly.

3) Always lubricate O-rings before assembly to allow the O-ring to seat itself properly.

4) Be certain to use torque wrenches when tightening O-ring fittings, because overtightening can not only damage the O-ring, but it can distort the tube end as well.

2. REMOVE PROTECTIVE SEALS

Just prior to making the connection, remove the protective seals.

If for any reason you have to stop before making a connection, recap the tube, component or fitting.

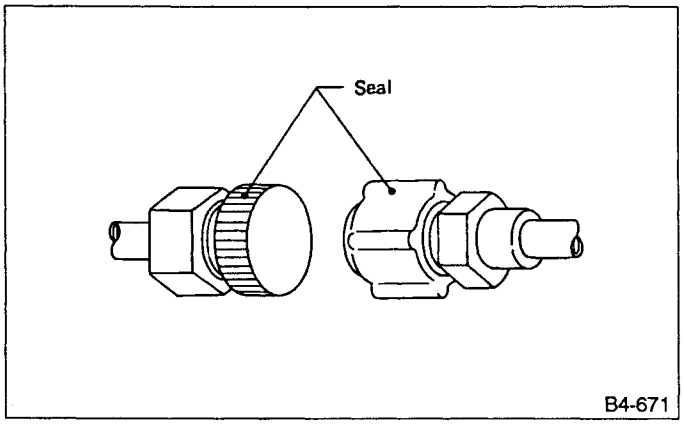


Fig. 104

Visually inspect the O-ring surface, the O-ring mating surface, the threads and the connection points. If a defective part is found, replace it.

The O-ring must sit square against the tube bead. If necessary, slide the O-ring into proper position **with clean hands.**

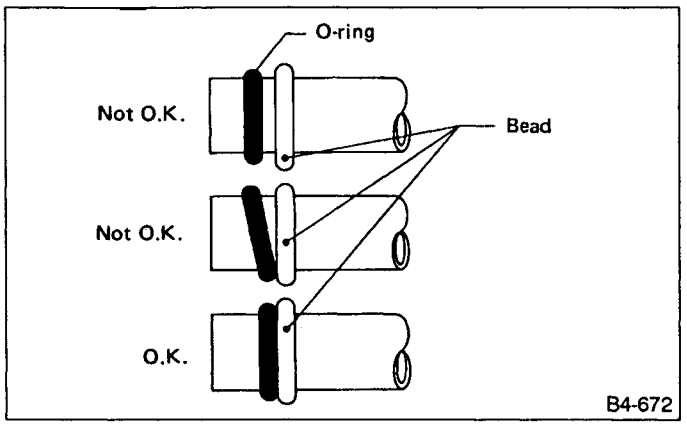


Fig. 105

3. LUBRICATE THE COMPONENTS

For lubrication of the components, use only refrigerant oil as described in the appropriate service manual. Apply oil from an oil squirt gun or other closed container. Do not use your finger to spread the oil over the O-ring.

Apply a small amount of refrigerant oil to the top and sides of the O-ring. The area covered by oil should include the O-ring and the tube bead.

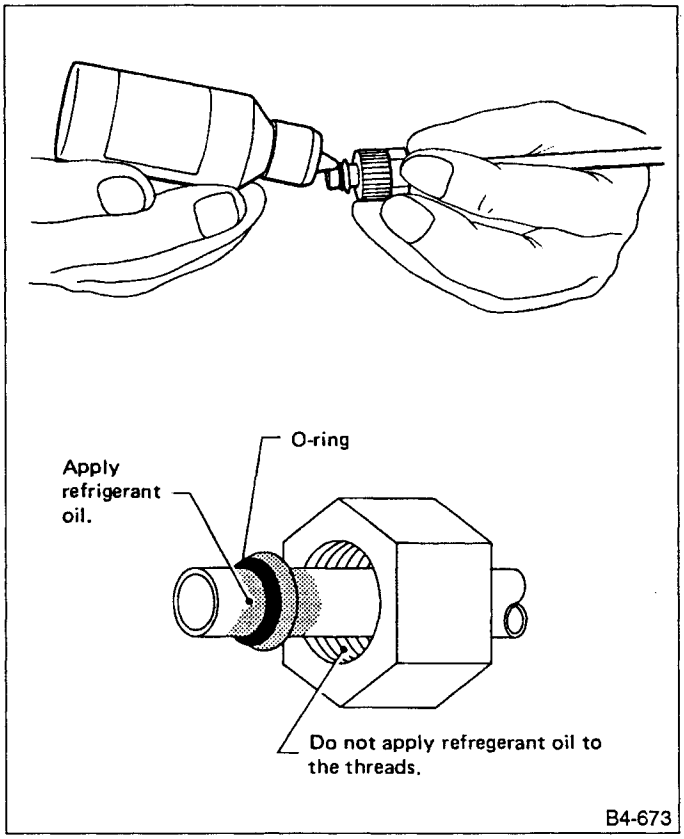


Fig. 106

4. MAKE THE CONNECTION

Carefully align the tube/O-ring assembly with the mating component.

Insert the tube/O-ring into the receiving component until the O-ring is fully seated.

Once the O-ring is fully seated, start the nut **by hand** and tighten **by hand** until snug.

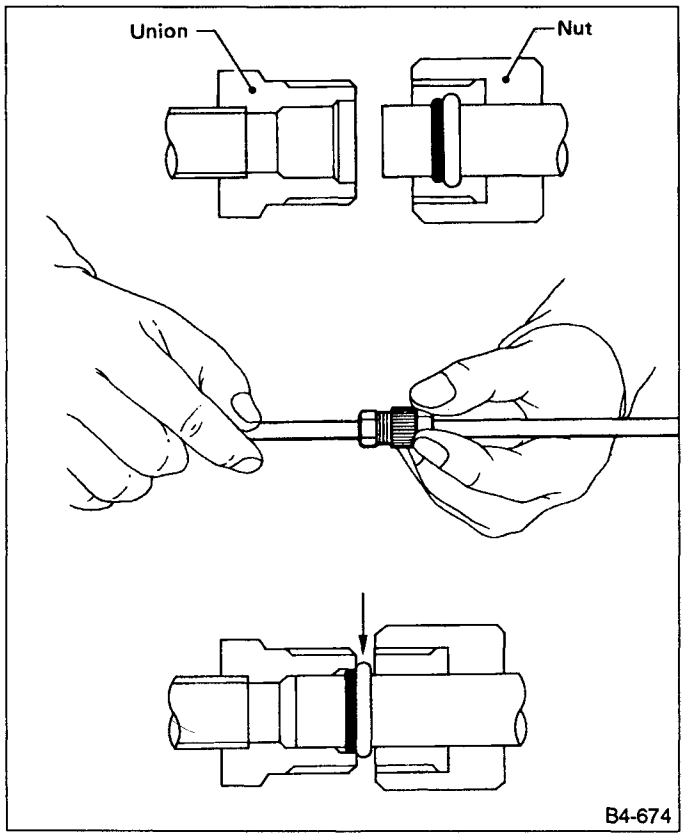


Fig. 107

5. TORQUE THE FITTING

Using a back-up wrench in conjunction with a calibrated torque wrench, torque the connection to the midrange of the specification.

After completion of torquing, use a clean shop towel to remove any excess oil from the connection or any oil that may have dripped on the vehicle body or other parts.

If a leak is suspected after torquing, do not retighten or retorque the connection. Instead, disassemble the connection, remove the O-ring, and inspect the O-ring, threads, joints and seating surfaces.

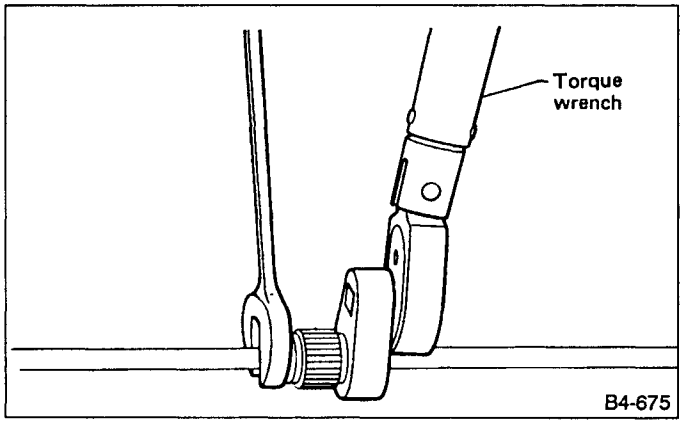
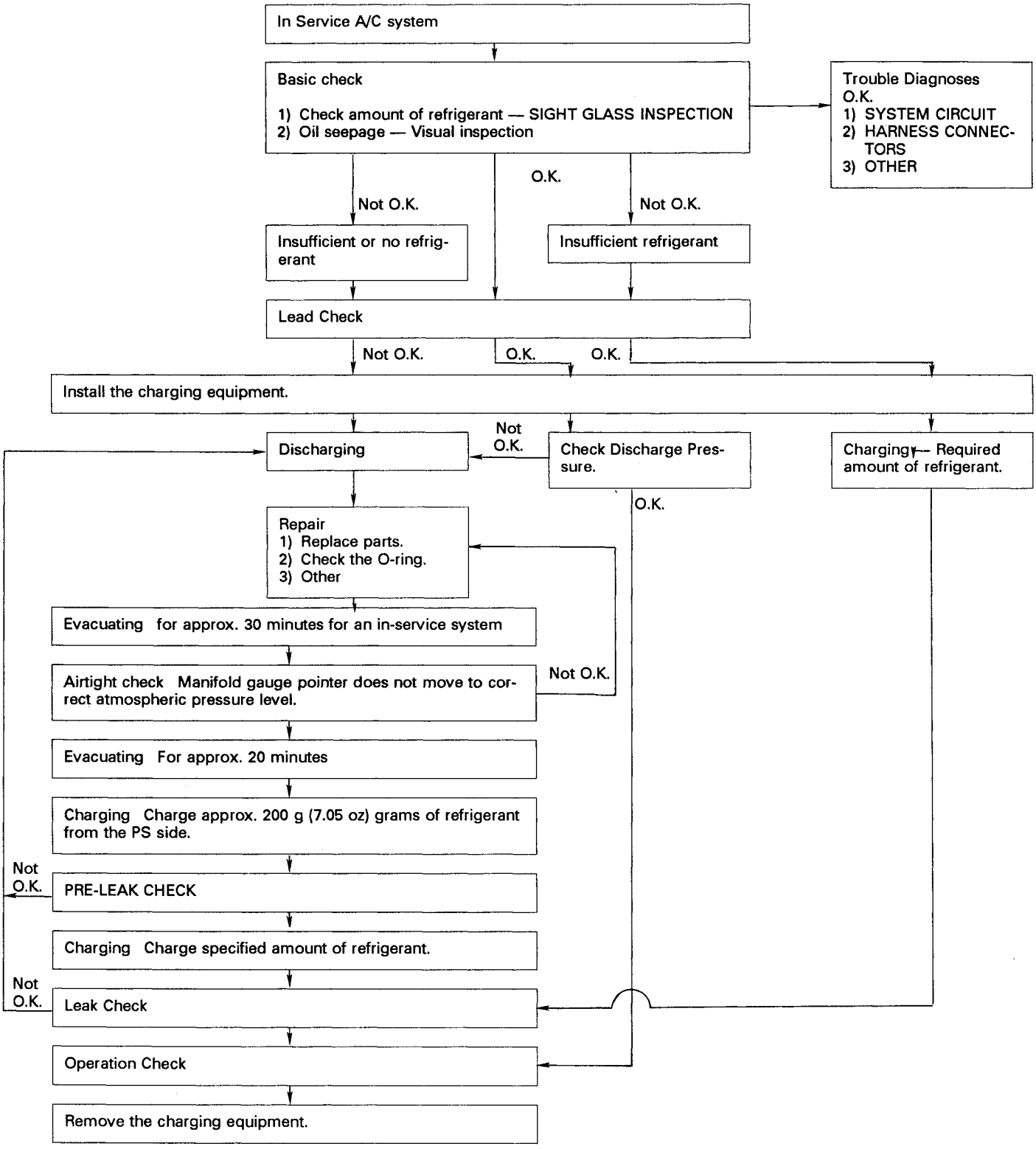


Fig. 108

5. Refrigerant Service Procedure

1. WORK FLOW



6. Discharge the System

The following points should be kept in mind when discharging the system.

1) Be certain that goggles and gloves are worn.

2) Connect refrigerant recovery system to gauge manifold to recycle refrigerant from the system.

1. CONNECTING THE MANIFOLD GAUGE SET

1) Close the high and low side manifold valves

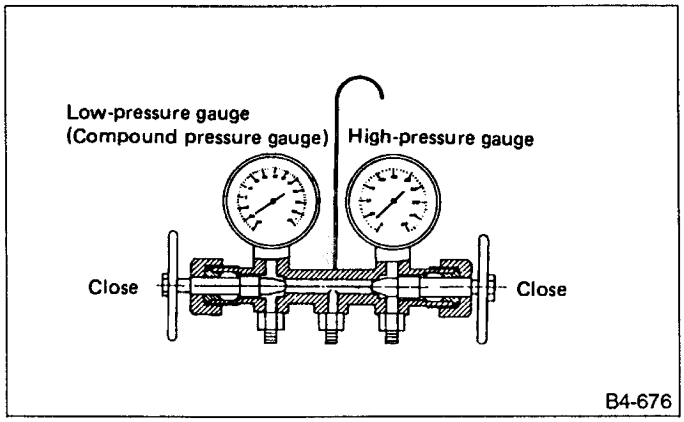


Fig. 109

2) Attach the high- and low-pressure manifolds to the high and low services port on the vehicle.

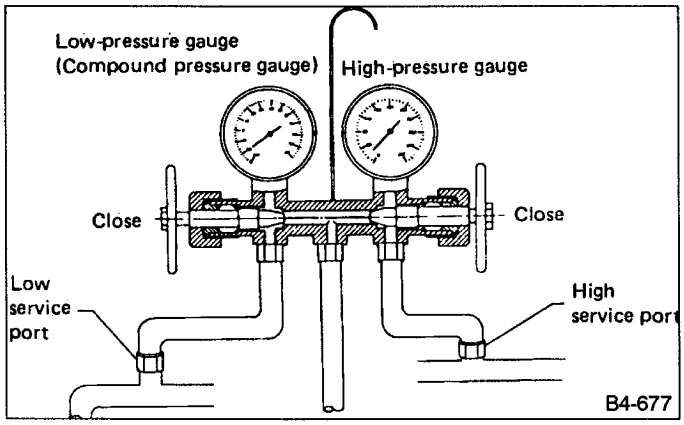


Fig. 110

2. PREPARE FOR DISCHARGING

Connect center manifold hose to refrigerant recovery system to recycle refrigerant.

7. Evacuating and Charging

The following points should be kept in mind when evacuating and charging with a manifold gauge set:
1) Be certain that goggles and gloves are worn.
2) If bulk refrigerant [13.6 kg (30 lb) canister] is used, be certain to weigh the charge amount carefully, using the correct equipment, to avoid overcharging the system.
3) The charging procedure described in this section begins by charging **liquid refrigerant into the high- pressure side of the system with the engine off.** The procedure is completed by charging refrigerant **vapor** into the low-pressure side of the system with the engine running.

Never open the high-pressure manifold valve when the engine is running.

1. CONNECT THE GAUGE SET

1) Close the high- and low-pressure manifold valves

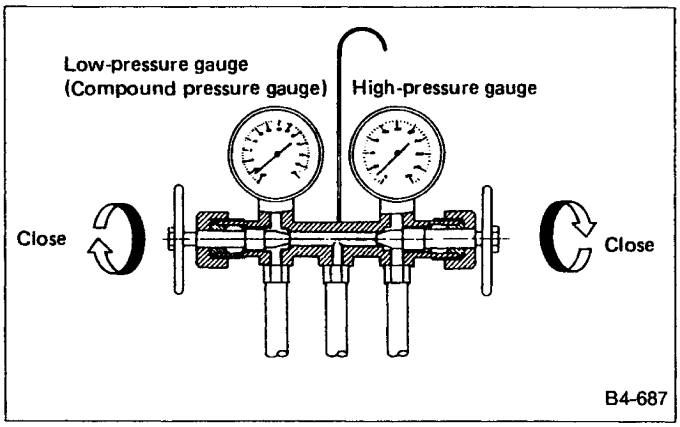


Fig. 29

2) Attach the low-pressure manifold hose to the low- pressure service port on the vehicle. Check the low- pressure gauge. If more than 68.6 kPa (0.70 kg / cm^2, 10.0 psi) is indicated, discharge the system prior to charging.
3) Attach the high-pressure manifold hose to the high-pressure service port on the vehicle.
4) Connect the center hose from the manifold to the vacuum pump.
5) Turn on the vacuum pump.
6) Slowly open the low-pressure manifold valve.
7) When the low-pressure gauge reaches approximately 66.43 kPa (498.3 mmHg, 19.62 inHg), slowly open the high-pressure manifold valve.

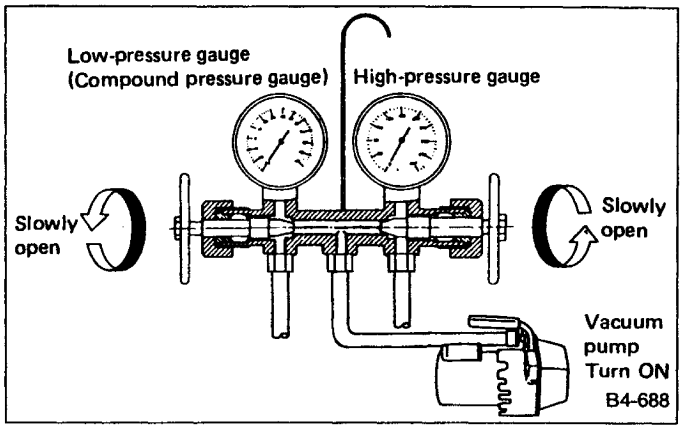


Fig. 30

8) Maintain a minimum vacuum level of 100.56 kPa (754.4 mmHg, 29.70 inHg) for a minimum of 15 minutes on a new system or 30 minutes for an in-service system.

The gauge will read 4 kPa (25 mmHg, 1 inHg) less for every 304.8 m (1,000 ft) above sea level.

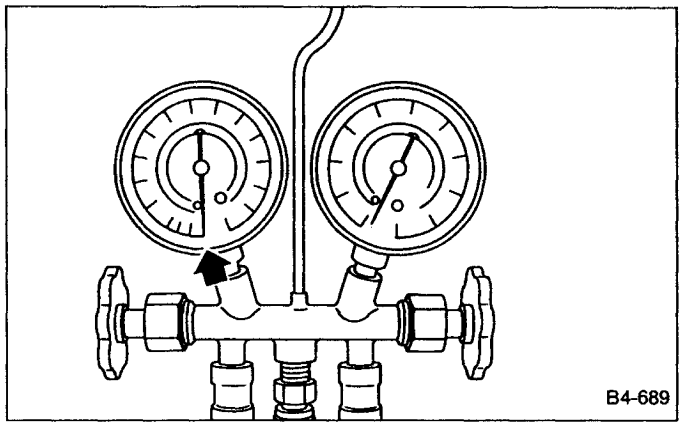


Fig. 31

2. PERFORM A VACUUM LEAK TEST

1) After 15 minutes (or more) of evacuation, close the high-pressure manifold valve.
2) Close the low-pressure manifold valve.
3) Turn off the vacuum pump.
IF the vacuum level has changed more than 4 kPa (25 mmHg, 1 inHg), perform an R134a leak test.
IF the vacuum reading is about the same as noted in step 2-4), continue on to step 2-6).

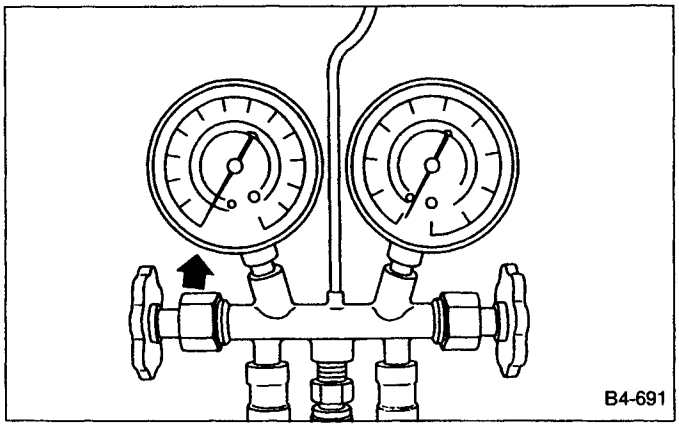


Fig. 32

6) Carefully attach the can tap to the refrigerant can by following the can tap manufacturer's instructions.
7) Disconnect the center manifold hose from the vacuum pump and connect the hose to the tap valve.

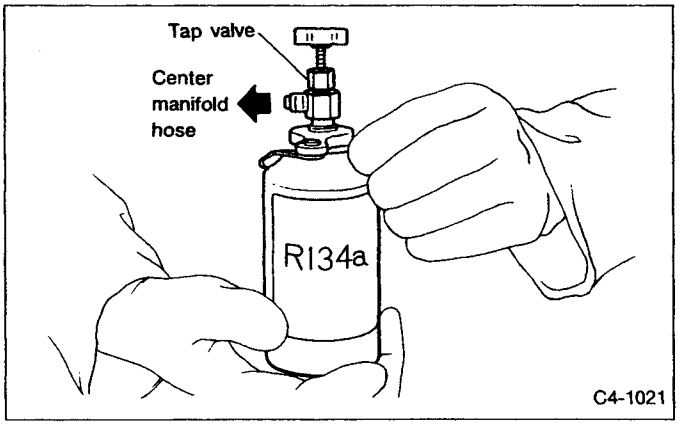


Fig. 33

8) If a 13.6 kg (30 lb) container of refrigerant is used a weight scale will be needed. This scale is to determine the amount of refrigerant that is used.
Connect the center hose from the manifold to the valve. Place the 13.6 kg (30 lb) container on the scale, valve end down.

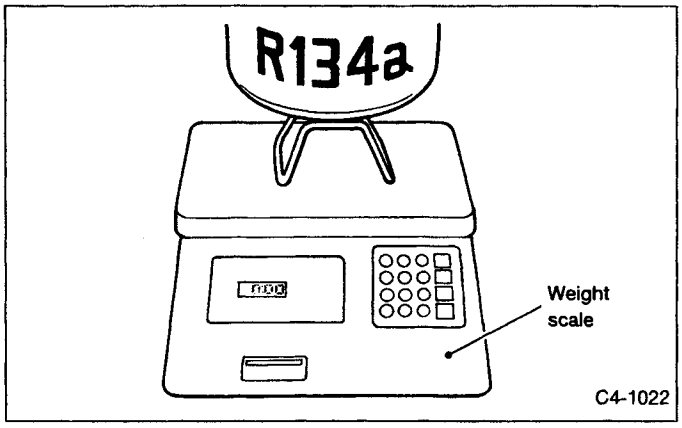


Fig. 34

3. PURGE THE CENTER HOSE

1) Verify that all three hose connections are tight at the manifold gauge set.
2) Open the valve on the R134a source.

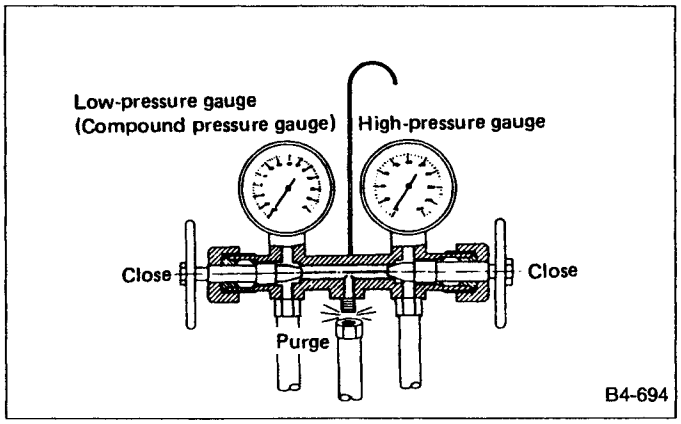


Fig. 35

4. INITIAL CHARGING THROUGH THE HIGH SIDE

1) Connect a tachometer to the engine.
2) **With the engine off**, start charging by slowly opening the high-pressure manifold valve.

The initial charge rate can be increased by immersing the can in lukewarm [below 38°C (100°F)] water for a short time.

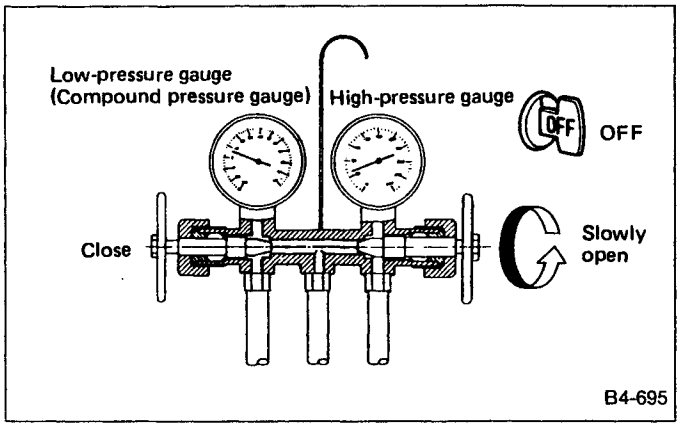


Fig. 36

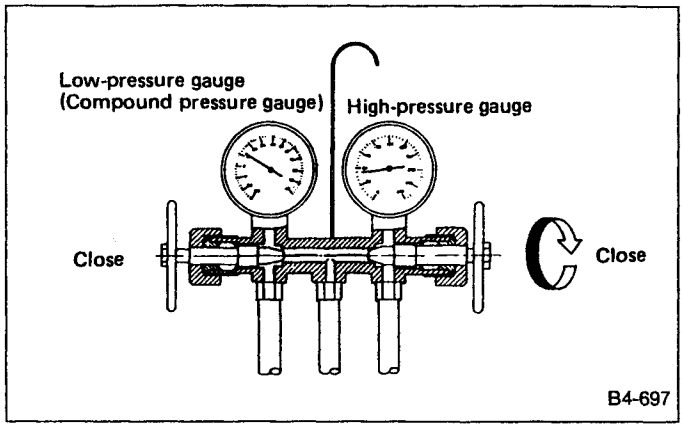


Fig. 38

5. CHECK THE GAUGE READINGS

When both the high- and low-pressure gauge readings are about equal, or the R134a source is empty, or the system has been filled to specifications, close the high- pressure manifold valve.

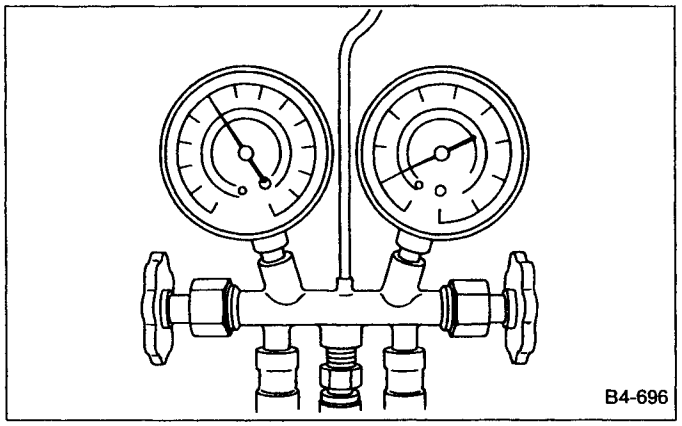


Fig. 37

6. ADD ADDITIONAL CANS

If the R134a source is exhausted, first close the high- pressure manifold valve, second, close the can tap valve, then slowly purge the refrigerant from the service hose by loosening the fitting at the can tap.

7. COMPLETE CHARGING THROUGH THE LOW SIDE

1) Verify that the high-pressure manifold valve is closed (should have already been closed).
2) Verify that the low-pressure manifold valve is closed (should have already been closed).
3) With the OFF switch on and the windows rolled down, start the engine and run at engine speed.
4) Set the temperature controls on max cold and set the blower speed on the highest setting.
5) Alternately press the AUTO and ECON switches several times at intervals of more than 10 seconds to prevent initial compressor damage due to "load shock." Finish this operation with the AUTO switch in the ON position.
6) Raise engine speed to approximately 1,500 rpm.

8. CHARGE THE SYSTEM

1) With the refrigerant source connected and the service hose purged, slowly open the low-pressure manifold valve, while checking the low-pressure gauge reading.

The refrigerant source must be positioned for vapor (valve up).

2) Keep the low side pressure below 276 kPa (2.81 kg/cm^2, 40 psi) by using the low-pressure manifold valve to regulate the flow of refrigerant into the system.

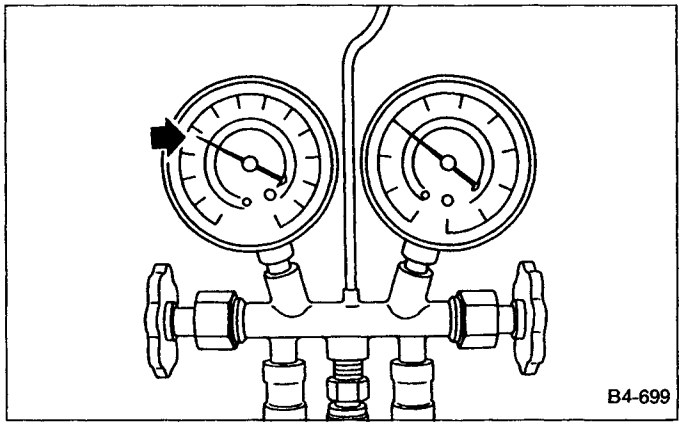


Fig. 39

3) When the system is fully charged, close the low- pressure manifold valve.
4) Close the valve at the refrigerant source.

Refrigerant capacity Unit: kg (lb)

Refrigerant	Minimum	Maximum
R134a	0.6 (1.3)	0.7 (1.5)

9. COMPLETE ALL SYSTEM CHECKS

1) Evaluate the system performance (refer to performance testing section).
2) Perform leak detection test.

Always perform leak checking in an environment free of refrigerant pollution.
Do not disconnect the high- or low-pressure hoses from the vehicle before leak checking.

10. DISCONNECT THE MANIFOLD GAUGE SET

1) Remove the high- or low-pressure hoses from the service ports and install the service port caps.

8. Leak Testing

The following points should be kept in mind when conducting a refrigerant leak test.
1) The air conditioning system to be tested must have an adequate refrigerant charge to begin with.
2) The area where the leak test is conducted must be free of wind and drafts, with still air being the ideal condition.
3) The atmosphere where the leak test is conducted must be free of refrigerant contamination.
4) Operate the air conditioning system for approx. 10 minutes, then turn the engine off an begin the leak test.
5) Refrigerant gas is heavier than air, therefore always hold the probe below the connection being tested.
6) When checking for a leak along a length of hose or tube, the leak detector probe must be moved slowly, approx. 25 mm (1 in) per second making sure probe does not come in contact with the component being tested.
7) When checking for a leak at a certain point, the leak detector probe must be held at that point for at least 5 seconds.

1. CHECK THE SYSTEM PRESSURE

1) With gauges connected to the air conditioning system, operate the air conditioning and confirm that the high side pressure is above 690 kPa (7.03 kg/cm^2, 100 psi). If not, evacuate and charge the system before leak checking (refer to evacuation and charging sections).

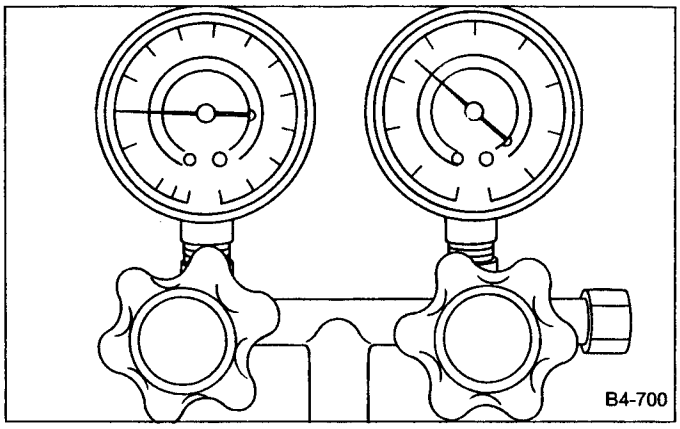


Fig. 40

2. CLEAN CONNECTIONS BEFORE TESTING

Before testing, use a clean shop towel to wipe off refrigerant oil, dirt, or foreign material from all of the connections and components to be tested.

Since refrigerant oil absorbs refrigerant, excess oil on or near a connection may falsely signal a leak.

3. CALIBRATE LEAK DETECTOR

Refer to the manufacturer's instructions for the particular type of detector used and calibrate the instrument.

Always make sure that the probe tip filter is clean and free of contamination.

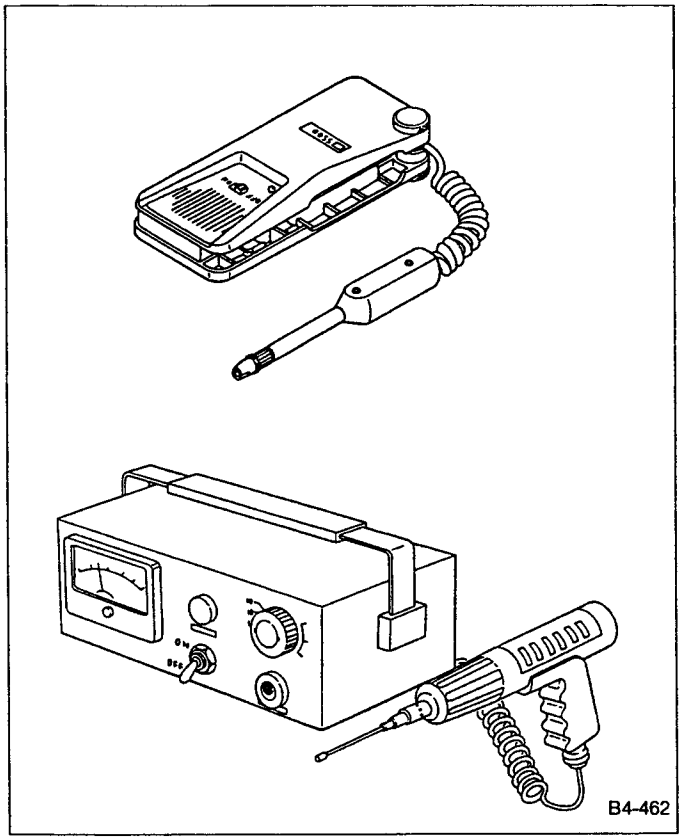


Fig. 41

9. Compressor Oil

1. COMPRESSOR OIL

1) Replenish compressor oil if any of the following arise:
   (1) Excessive refrigerant leaks
   (2) Compressor replacement
   (3) Evaporator replacement

Compressor oil replenishment quantity

Unit: mℓ (US fl oz, Imp fl oz)

Item		Replenishment amount	Remarks
Compressor replacement		70 (2.4, 2.5)	Drain oil completely from new compressor and replenish compressor oil by amount indicated at left.
Evaporator replacement		70 (2.4, 2.5)	
Receiver dryer replacement		—	Replenishment is not necessary.
Condenser replacement	Oil does not appear to leak.	—	Replenishment is not necessary.
	Oil leaks from condenser in large quantities.	50 (1.7, 1.8)	
Flexible hose/ pipe replacement	Oil does not appear to leak.	—	Replenishment is not necessary.
	Oil leaks in large quantities.	50 (1.7, 1.8)	
Refrigerant leaks	Oil does not appear to leak.	—	Replenishment is not necessary.
	Oil leaks in large quantities.	50 (1.7, 1.8)	

2) Compressor oil replenishment procedures
   (1) Measure required amount of compressor oil using volumetric cylinder.
   (2) Remove plug from upper side of compressor and pour compressor oil into plug hole.
   (3) Tighten plug.

Processes that require the containers or systems holding compressor oil to remain open should be completed quickly because R134a compressor oil easily absorbs moisture.

Tightening torque: N·m (kg-m, ft-lb)
Plug
8 — 12 (0.8 — 1.2, 5.8 — 8.7)

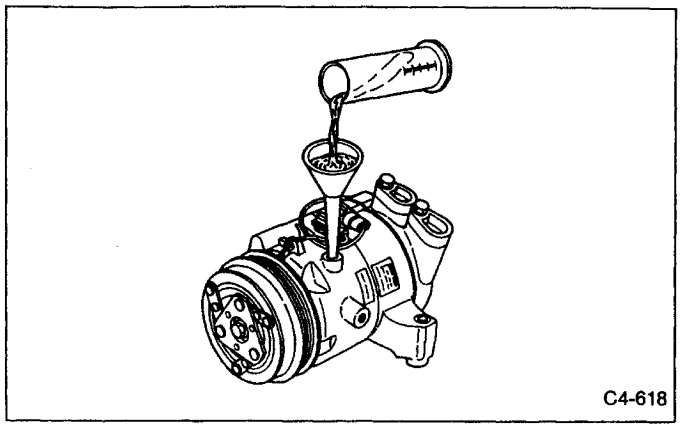


Fig. 42

2. COMPRESSOR REPLACEMENT

1) Before replacing compressor, return compressor oil that circulates along with refrigerant through the cycle to compressor.
(Compressor "oil-return" operation)
   (1) Open all doors.
   (2) Start and run engine at 800 — 1,500 rpm.
   (3) Set TEMP switch to 18°C (65°F) [max cold].
   (4) Turn DEF switch "ON".
   (5) Set FAN switch to "HI".
   After setting all switches as outlined above, continue to run engine for approximately 20 minutes.
2) If "oil-return" operation cannot be completed (due to seized or broken compressor), replace old compressor with new one, perform "oil-return" operation. Then, remove new compressor and drain excess oil.
To drain compressor oil, remove plug from upper side of compressor and turn compressor upside down to drain oil completely. Measure specified amount of oil using volumetric cylinder and pour into compressor through plug hole. Tighten plug.

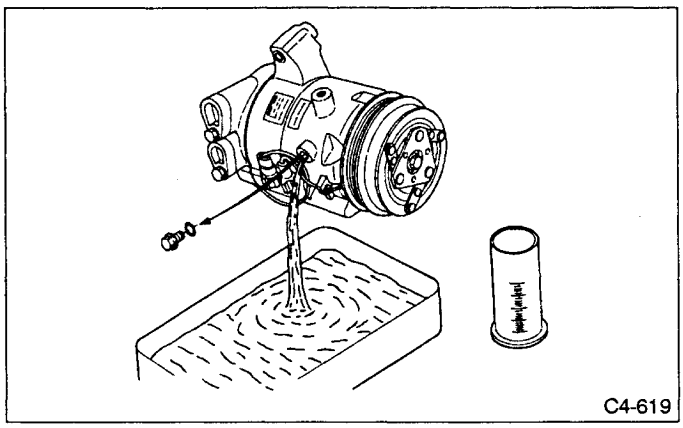


Fig. 127

10. Cooling Unit

A: REMOVAL

1) Recover refrigerant.
2) Disconnect high- and low-pressure hoses.

Plug high- and low-pressure hoses and evaporator connections immediately after disconnecting piping to prevent entry of dirt, dust, water, etc.

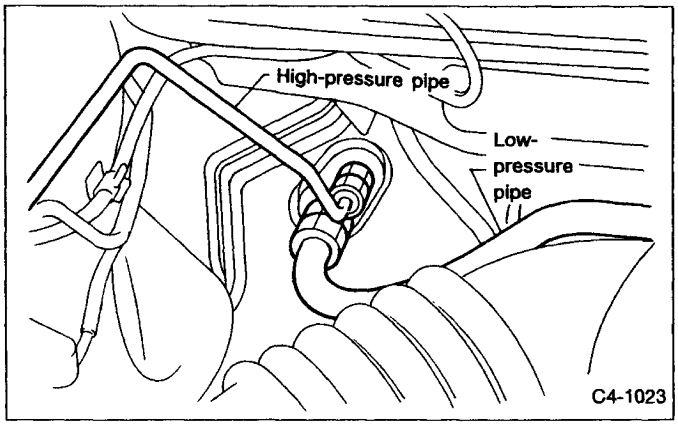


Fig. 43

3) Remove glove box.
4) Remove time control unit from instrument member.
5) Disconnect fan control amplifier connector.

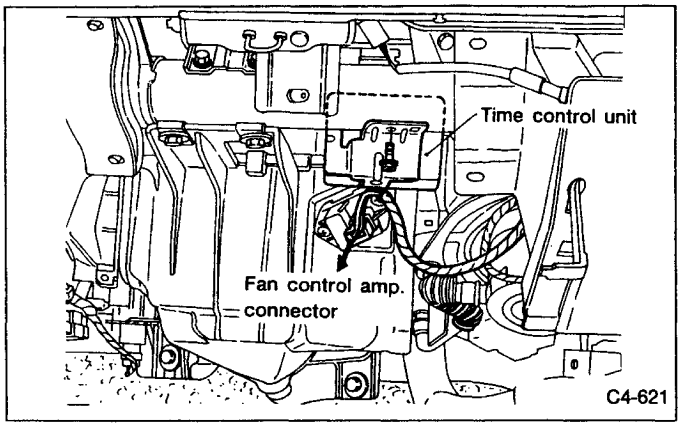


Fig. 44

6) Disconnect drain hose.
7) Remove cooling unit attaching bolts.
8) Extract cooling unit.
9) Disconnect sensor harness connector.

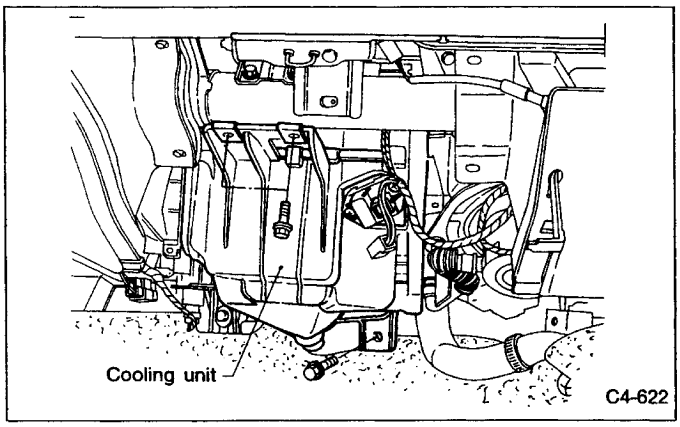


Fig. 45

B: INSTALLATION

1) To install, reverse removal procedures.

Replace O-ring (used with piping) with new one, and apply a coat of compressor oil before installing.

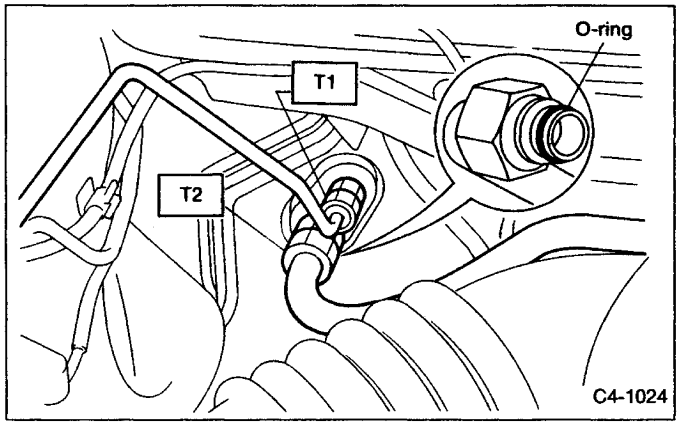


Fig. 46

Tightening torque: N·m (kg-m, ft-lb)
T1: 10 — 20 (1.0 — 2.0, 7 — 14)
T2: 25 — 34 (2.5 — 3.5, 18 — 25)

C: DISASSEMBLY

1) Remove refrigerant temperature and evaporator sensors.
2) Unfasten clamps, and separate upper and lower cases.

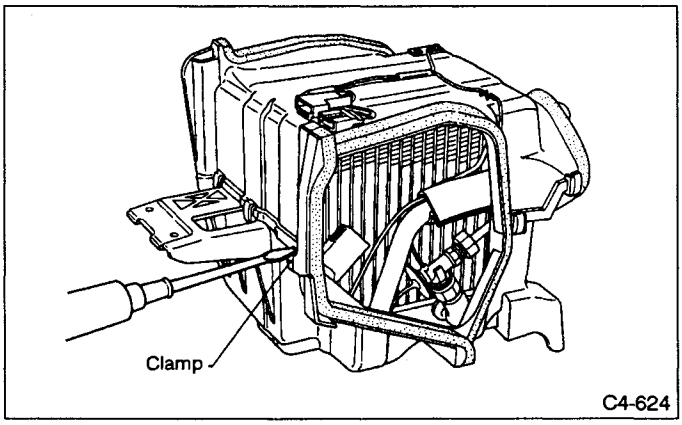


Fig. 132

Check whether the evaporator fins are clogged. If they are, clean them with compressed air. Check parts that have been removed for cracks or scratches and if necessary, repair or replace them.

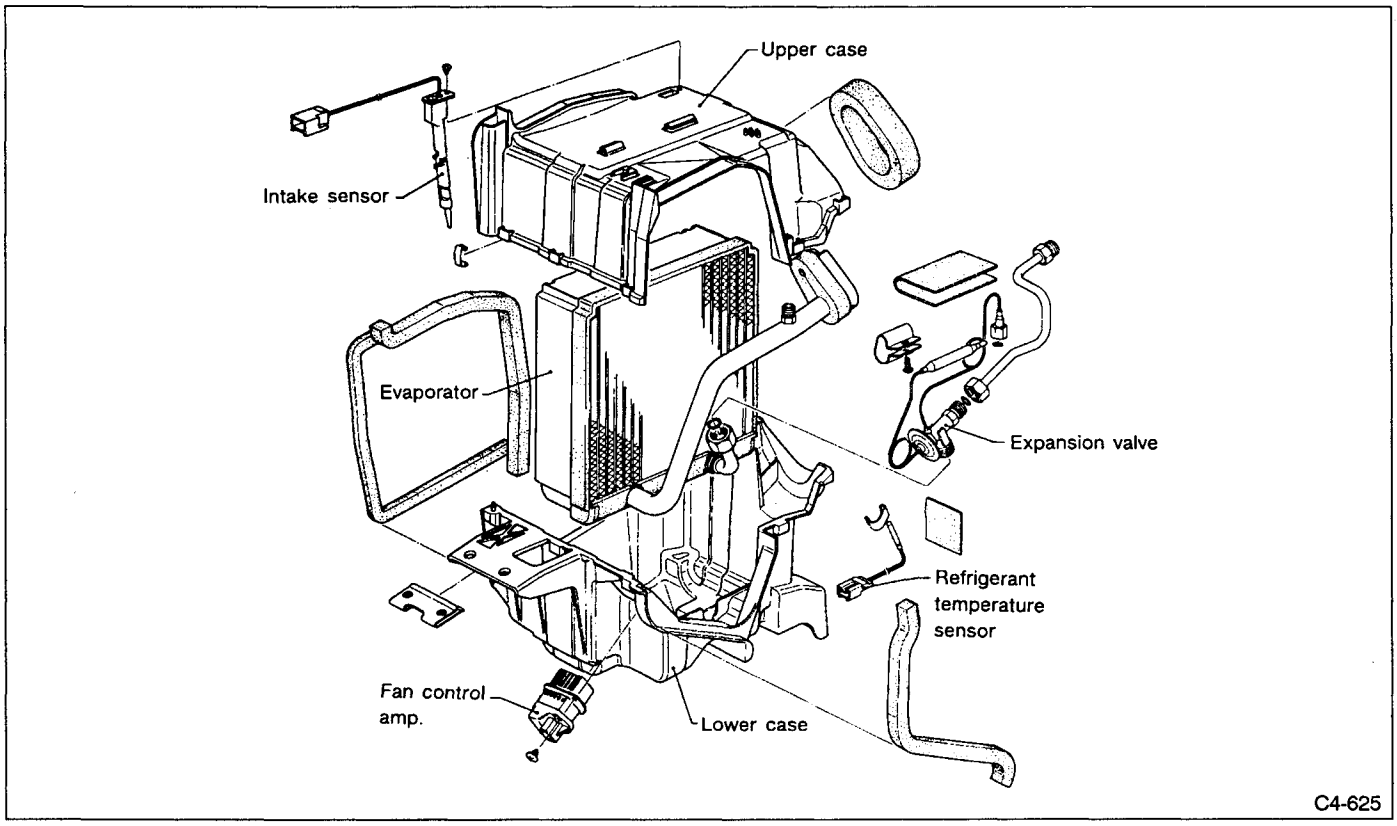


Fig. 133

D: ASSEMBLY

1) Install expansion valve on evaporator.
2) Connect hose to expansion valve.
Replace old O-ring with new one, and apply a coat of compressor oil to it before installing.
3) Secure expansion valve temperature-sensing tube to evaporator hose.

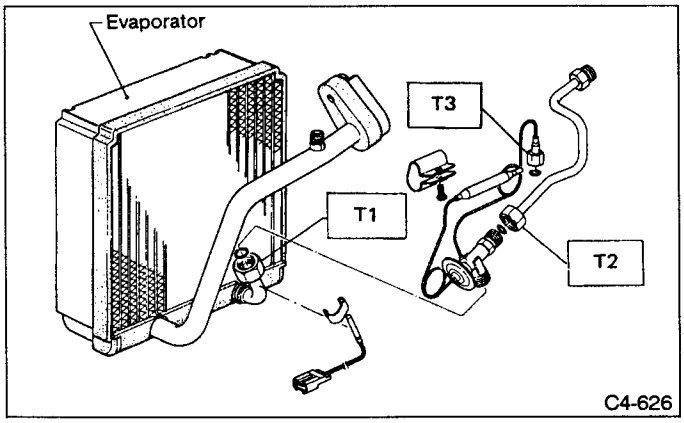


Fig. 134

Tightening torque: N•m (kg-m, ft-lb)
T1: 15 — 25 (1.5 — 2.5, 11 — 18)
T2: 10 — 20 (1.0 — 2.0, 7 — 14)
T3: 7 — 13 (0.7 — 1.3, 5.1 — 9.4)

4) Wrap insulator around expansion valve temperature-sensing tube.
5) Install upper and lower cases on evaporator.
6) Set refrigerant temperature sensor in position, and wrap insulator around sensor.

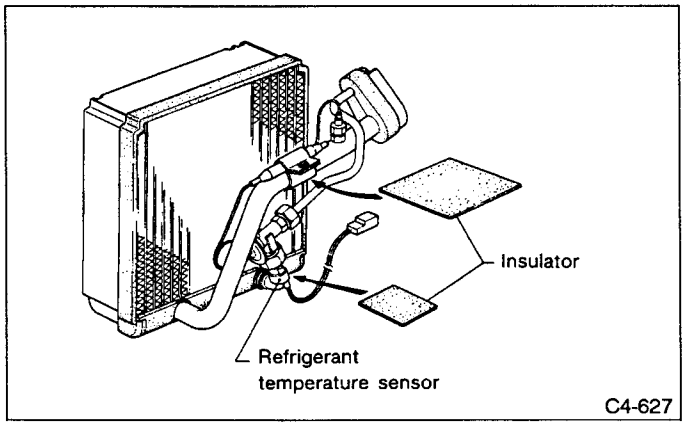


Fig. 135

7) Install evaporator sensor.

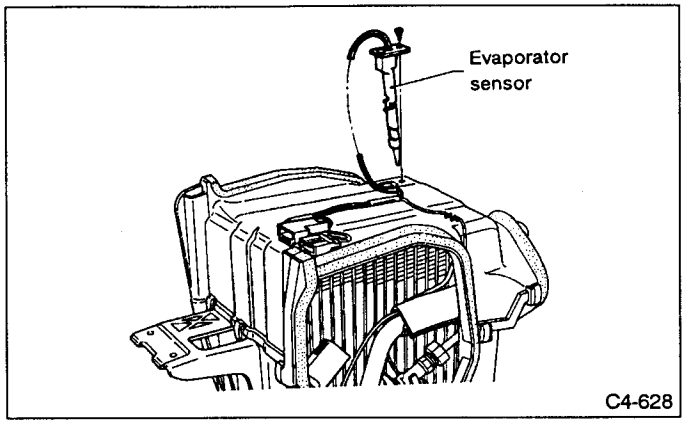


Fig. 136

11. Heater Unit

A: REMOVAL

1) Remove heater hoses (inlet, outlet) in engine compartment.
Drain as much coolant from heater unit as possible, and plug disconnected hose with cloth.
2) Remove instrument panel from body.
3) Remove steering support beam.
4) Disconnect door motor joint connectors (mode, air mix door, sensor) from heater unit.
5) Remove aspirator hose.
6) Remove evaporator.
7) Remove heater unit.

B: INSTALLATION

Installation is in the reverse order of removal.

12. Blower Motor Assembly

A: REMOVAL

1) Remove glove box.
2) Remove glove box support bracket.
3) Disconnect blower motor harness connector.
4) Remove motor cool hose.
5) Remove blower motor mounting screw.
6) Remove blower motor assembly.

B: INSTALLATION

Installation is in the reverse order of removal.

13. Control Unit

A: REMOVAL AND INSTALLATION

1) Remove meter visor. [Ref. to 6-2.]
2) Remove center grille.

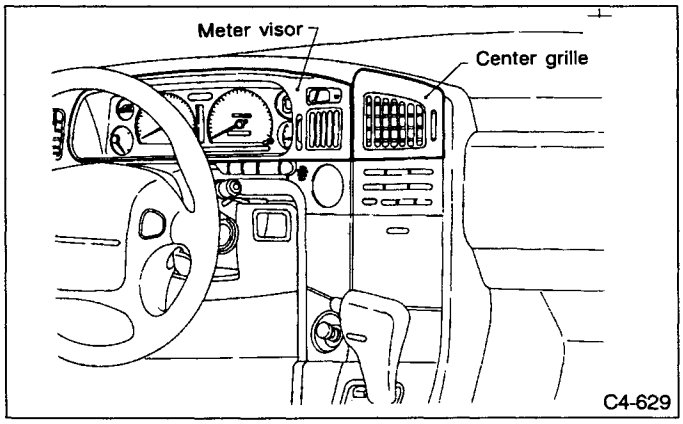


Fig. 137

3) Remove control unit attaching screws.
4) Remove aspirator duct.
5) Disconnect control unit harness connector.
6) Remove control unit.

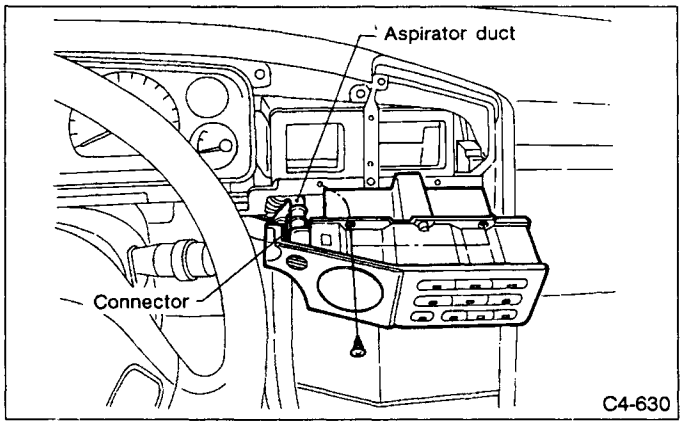


Fig. 138

7) To install, reverse removal procedures.

B: DISASSEMBLY AND ASSEMBLY

1) Remove screws.
2) Disconnect harness connector.

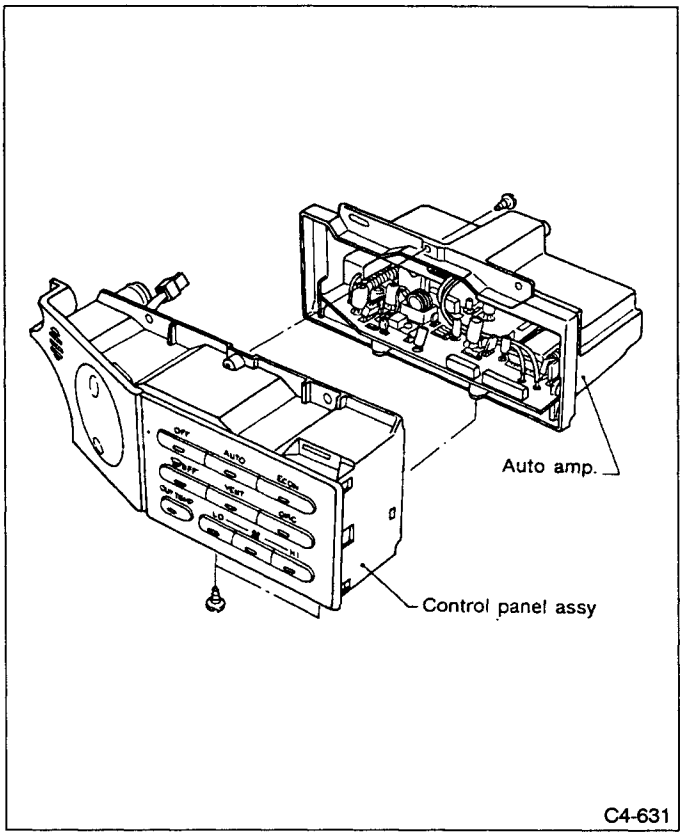


Fig. 139

3) To reassemble, reverse disassembly procedures.

14. Compressor

A: REMOVAL

1) Recover refrigerant.
2) Remove belt cover.

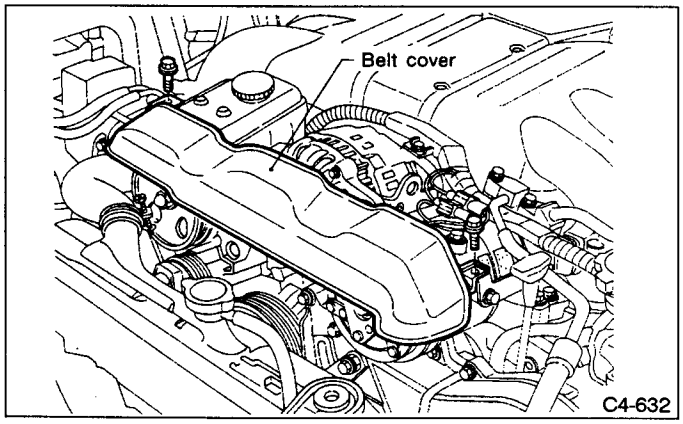


Fig. 140

3) Remove alternator belt.
4) Remove compressor belt.

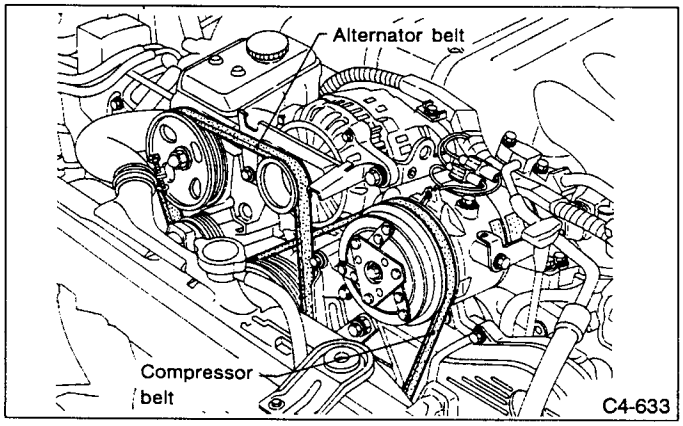


Fig. 141

5) Disconnect low- and high-pressure hoses from compressor.

Plug low- and high-pressure hoses and compressor connections immediately after disconnecting piping to prevent entry of dirt, dust, water, etc.

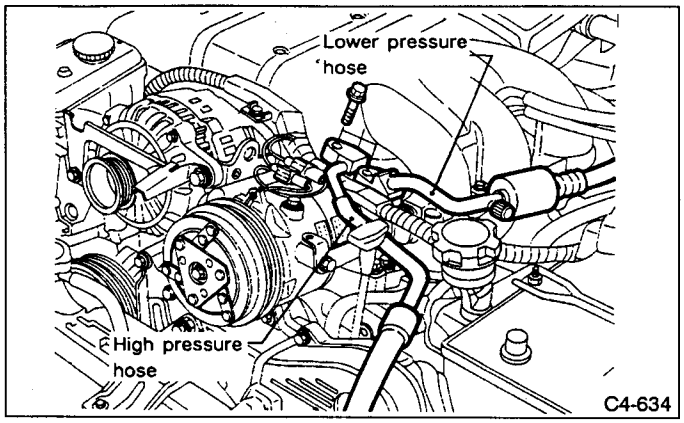


Fig. 142

6) Disconnect alternator harness connector.
7) Remove belt cover bracket and alternator.
8) Disconnect compressor harness connector.

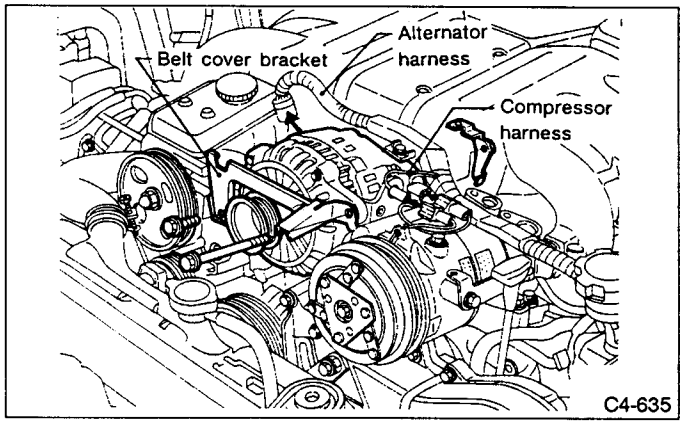


Fig. 143

9) Remove idler pulley assembly.

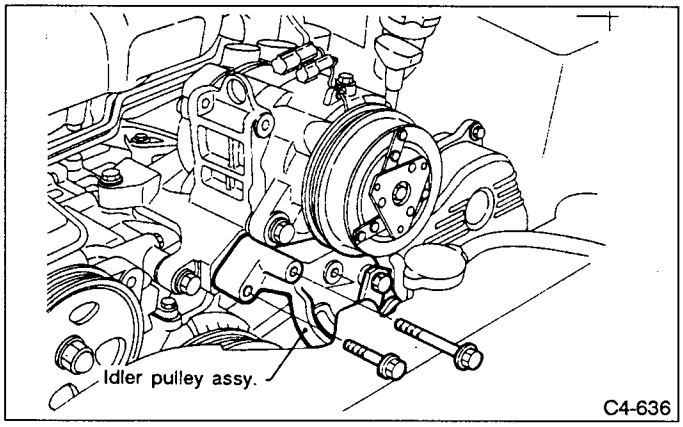


Fig. 144

10) Remove compressor sub-bracket.
11) Remove compressor attaching bolts.

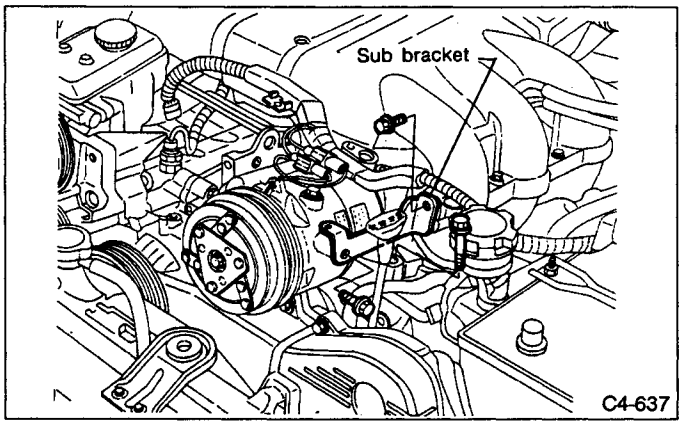


Fig. 145

12) Remove compressor bracket attaching bolts.

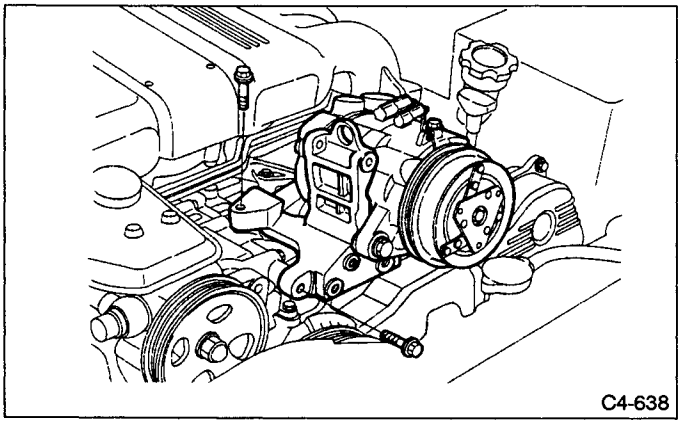


Fig. 146

13) Remove compressor from bracket.

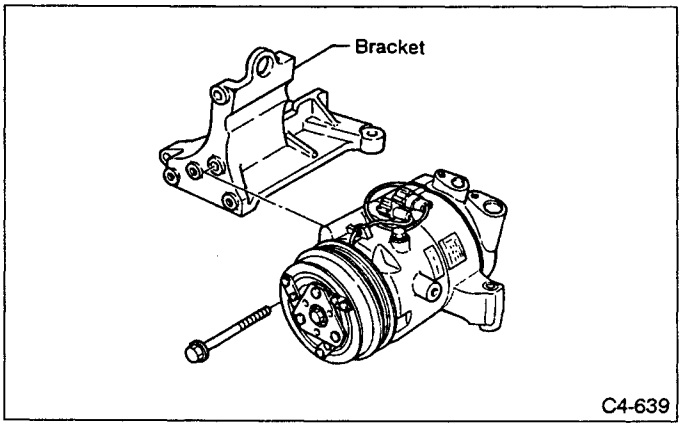


Fig. 147

B: INSTALLATION

1) To install, reverse removal procedures.

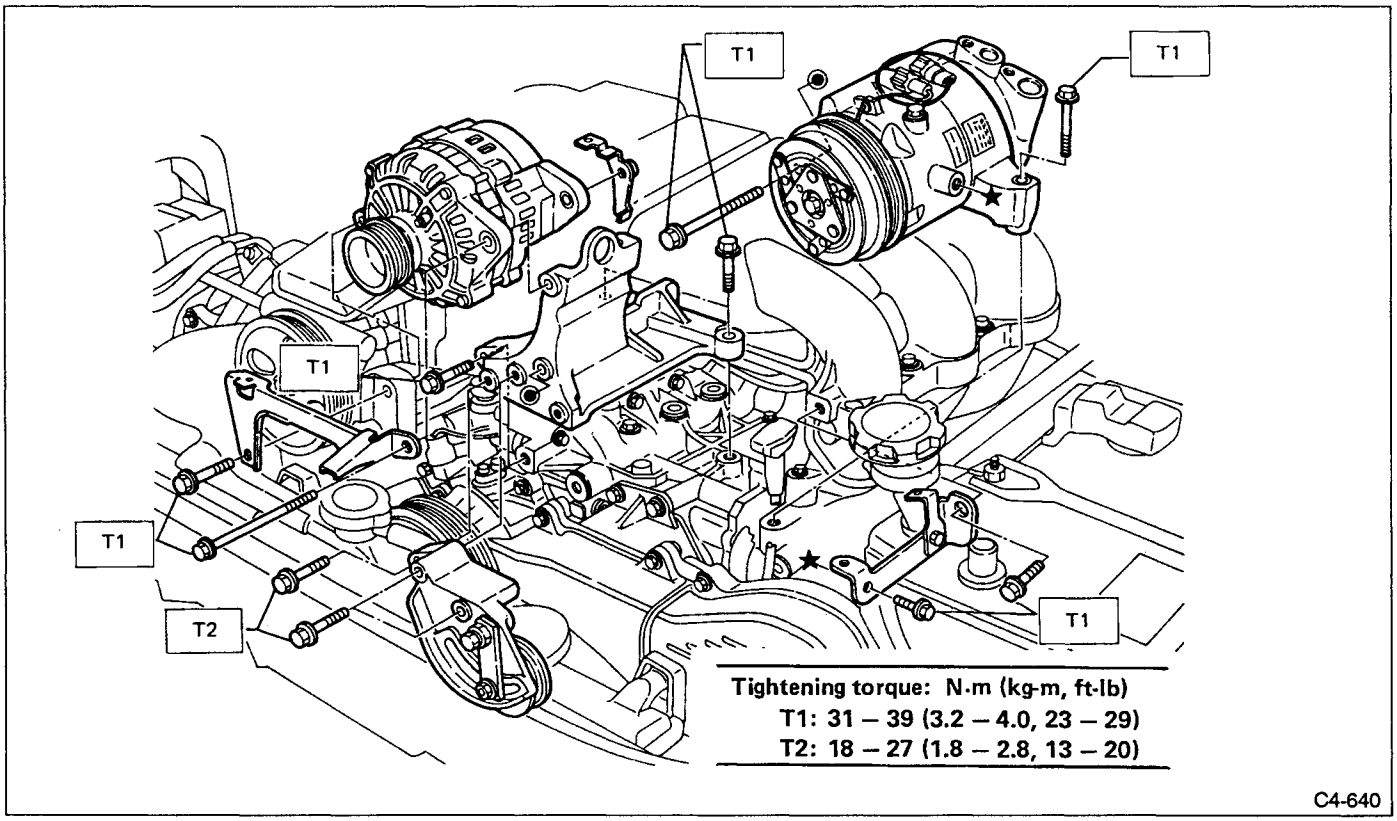


Fig. 148

2) Connect low- and high-pressure hoses to compressor.

Replace O-rings with new ones, and apply a coat of compressor oil to them before installing.

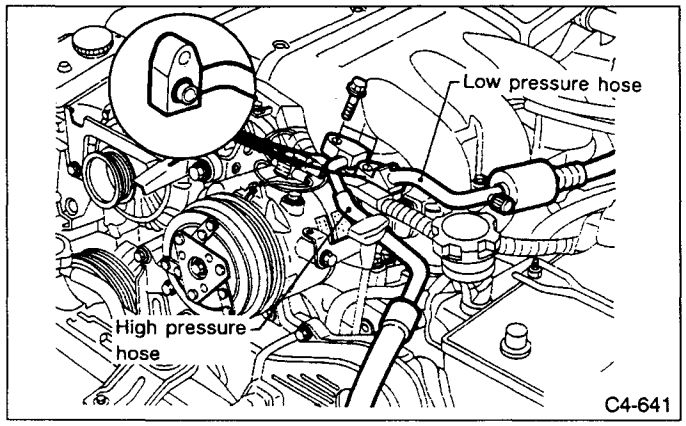


Fig. 149

Tightening torque: N·m (kg-m, ft-lb)
Hose attaching bolts
10 — 20 (1.0 — 2.0, 7 — 14)

3) After adjusting compressor belt tension, tighten lock bolt and lock nut securely.

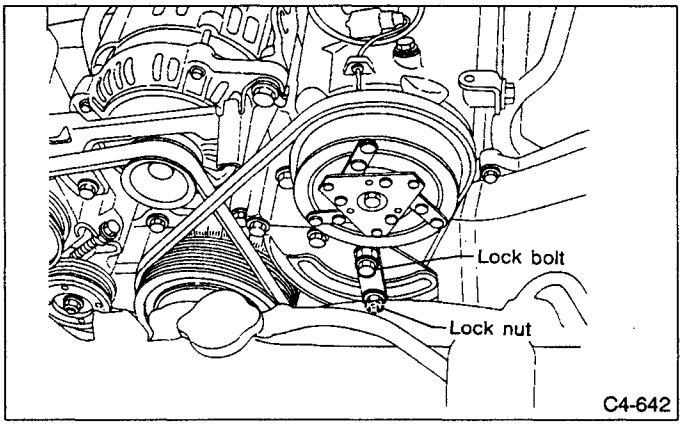


Fig. 150

Tightening torque: N·m (kg-m, ft-lb)
Lock bolt and lock nut
18 — 27 (1.8 — 2.8, 13 — 20)

4) After adjusting alternator belt tension, tighten idler pulley lock nut securely.

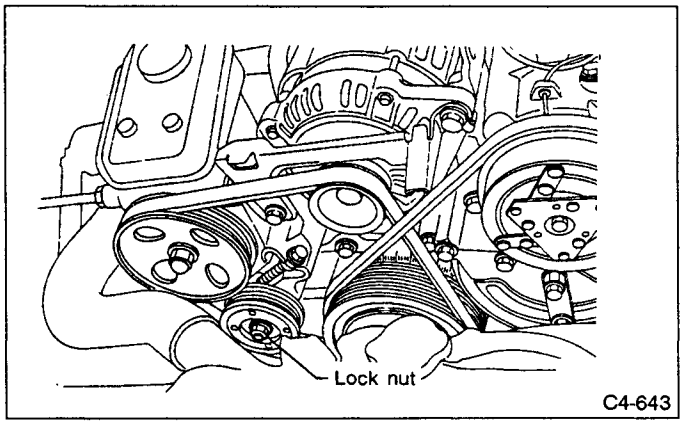


Fig. 151

Tightening torque: N•m (kg-m, ft-lb)
Lock nut:
18 — 27 (1.8 — 2.8, 13 — 20)

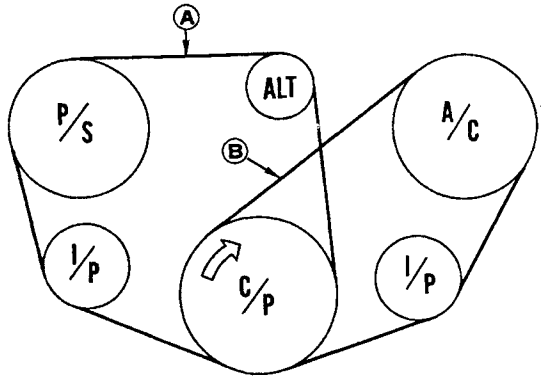
Pulley arrangement	Belt tension			
	Gauge		Belt tension [with 98 N (10 kg, 22 lb) force]	
	A	B	A	B
 C1-037				
New belt	637 — 785 N (65 — 80 kg, 143 — 176 lb)	637 — 736 N (65 — 75 kg, 143 — 165 lb)	4.0 — 5.0 mm (0.157 — 0.197 in)	6.0 — 7.0 mm (0.236 — 0.276 in)
Existing belt	392 — 588 N (40 — 60 kg, 88 — 132 lb)	343 — 441 N (35 — 45 kg, 77 — 99 lb)	5.0 — 6.0 mm (0.197 — 0.236 in)	7.0 — 8.0 mm (0.276 — 0.315 in)

Fig. 152

C/P : Crankshaft pulley
ALT : Alternator pulley
P/S : Power steering oil pump pulley
A/C : Air conditioner compressor pulley
I/P : Idler pulley
When replacing belts with new ones, adjust tensions to specification and then readjust to the same specification after running engine for 5 minutes.

15. Condenser

A: REMOVAL

1) Remove front grille.
2) Remove belt cover.
3) Disconnect radiator fan harness connectors (main and sub).
4) Remove upper radiator bracket.

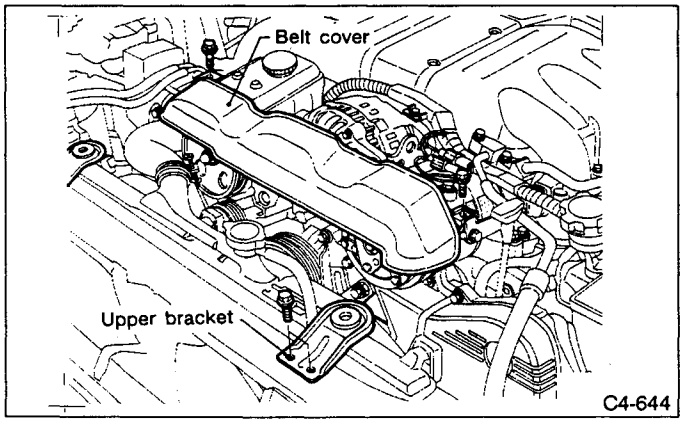


Fig. 153

5) Disconnect high-pressure hose from condenser.
Plug high-pressure hose and condenser connections immediately after disconnecting piping to prevent dirt, dust, water, etc.

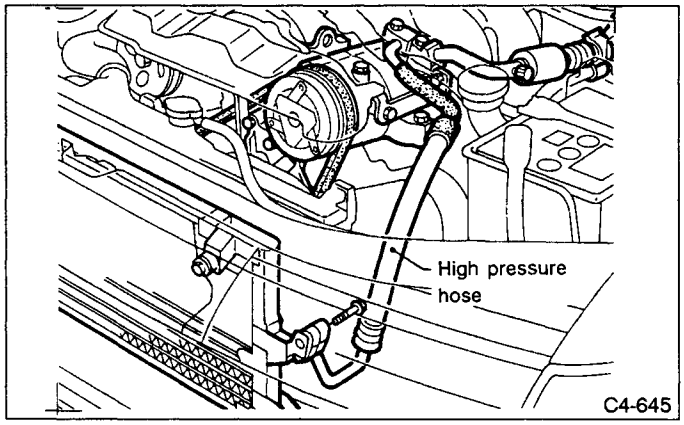


Fig. 154

6) Remove main and sub radiator fans. Remove water hose located under radiator fan shroud.

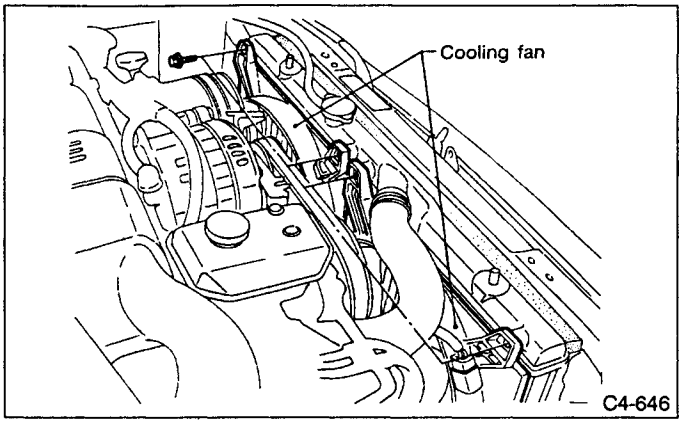


Fig. 155

7) Move canister aside.
8) Disconnect trinary switch harness connector.
9) Disconnect receiver dryer-to-condenser high pressure hose.
Plug high-pressure hose, receiver dryer and condenser connections immediately after disconnecting hoses to prevent entry of dirt, dust, water, etc.

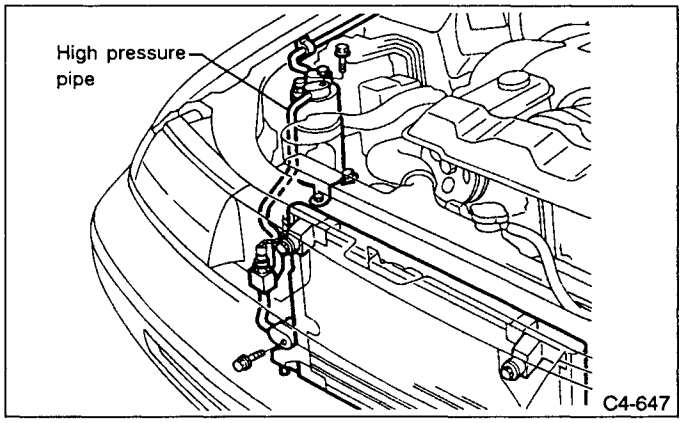


Fig. 156

10) Lift up vehicle.
11) Remove under cover.
12) Remove both side bolts securing oil cooler with condenser.

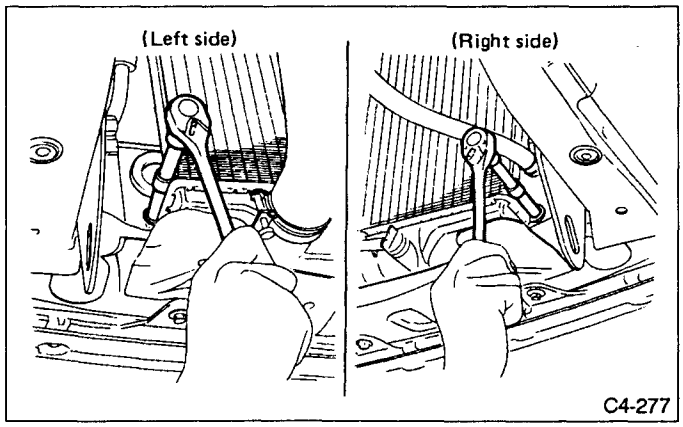


Fig. 157

13) Let down vehicle.
14) Move radiator toward engine, and remove condenser from gap between radiator and radiator panel.

B: INSTALLATION

1) To install, reverse removal procedures.
a. Make sure guide pin on upper condenser bracket is securely inserted into hole in radiator panel.
b. Replace old O-ring (used with piping) with new one, and apply a coat of compressor oil to it before installing.

C: INSPECTION

1) Make sure the condenser fins are free from dust and insects. If the fins are clogged, clean by blowing air or water through them.
To prevent dust and water from getting into the condenser, this work must be done when the condenser is installed in an actual vehicle.
2) Check the condenser to see if it shows any sign of oil seepage. Should oil ooze or gas leak from the condenser replace it with a new one.

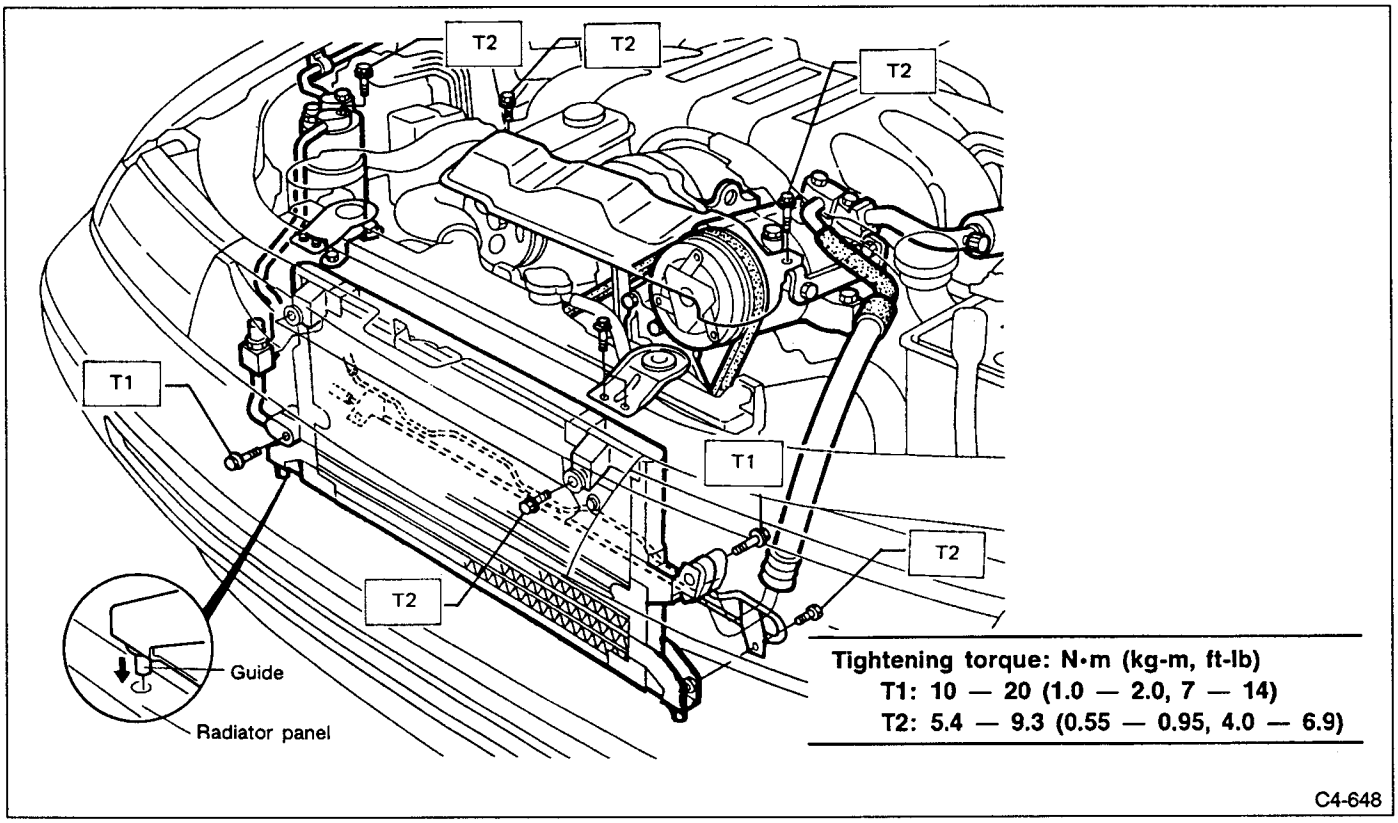


Fig. 158

16. Receiver Drier

A: REMOVAL AND INSTALLATION

1) Recover refrigerant.
2) Remove high-pressure hose attaching bolts.

Plug high-pressure hose and receiver drier connections immediately after disconnecting piping to prevent entry of dirt, dust, water, etc.

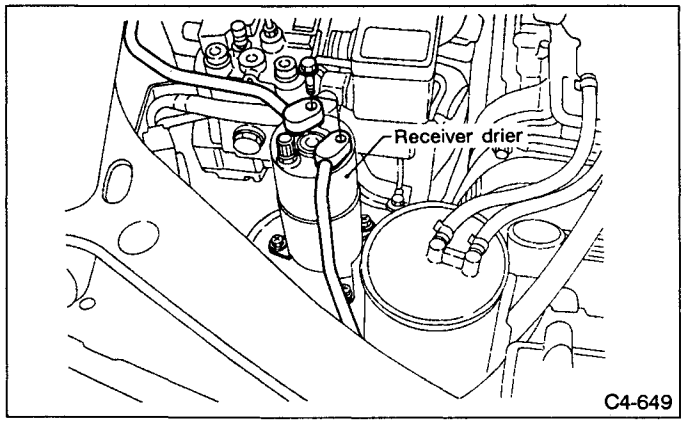


Fig. 159

3) Remove receiver drier bracket attaching bolts.

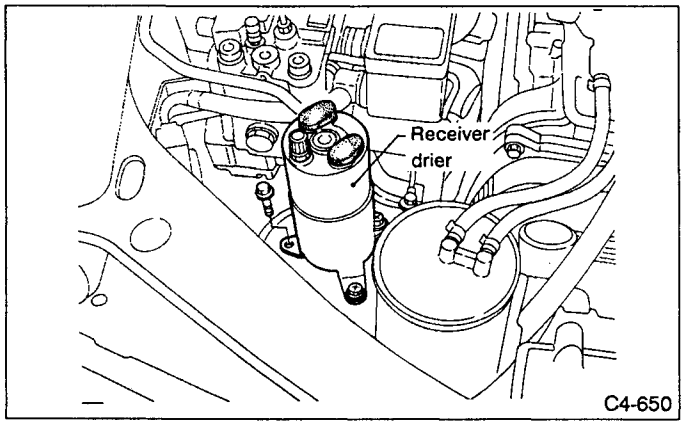


Fig. 160

4) Separate bracket from receiver dryer.

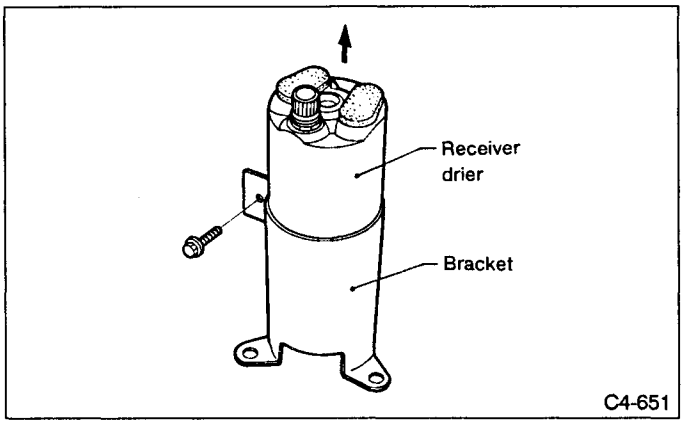


Fig. 161

5) To install, reverse removal procedures.

Replace old O-ring (used with piping) with new one, and apply a coat of compressor oil to it before installing.

Tightening torque: N•m (kg-m, ft-lb)
Pipe attaching bolts
5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)
Mounting bolts
5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)

17. Trinary Switch

A: REMOVAL AND INSTALLATION

1) Recover refrigerant.
2) Move canister.
3) Disconnect trinary switch.
4) Disconnect receiver dryer-to-condenser high- pressure hose.

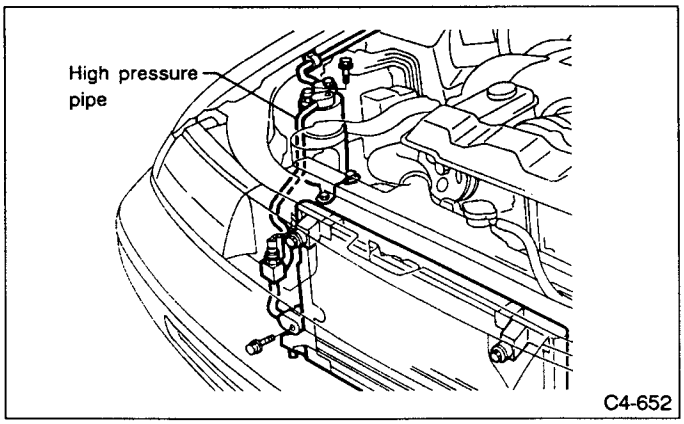


Fig. 162

5) Remove trinary switch from high-pressure hose.

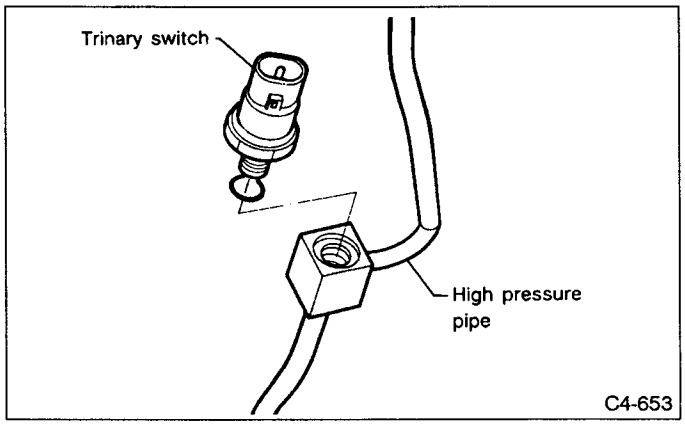


Fig. 163

6) To install, reverse removal procedures.
Replace old trinary switch and O-ring (used with piping) with new ones, and apply a coat of engine to them before installing.

Tightening torque: N·m (kg-m, ft-lb)
Trinary switch
11 — 14 (1.1 — 1.4, 8 — 10)
Pipe attaching bolt
5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)

B: INSPECTION

1) Remove cap from high-pressure line service valve, and connect gauge manifold to service valve.
2) Disconnect pressure switch harness connector, and check pressure switch for proper ON-OFF operation. Use a circuit tester.

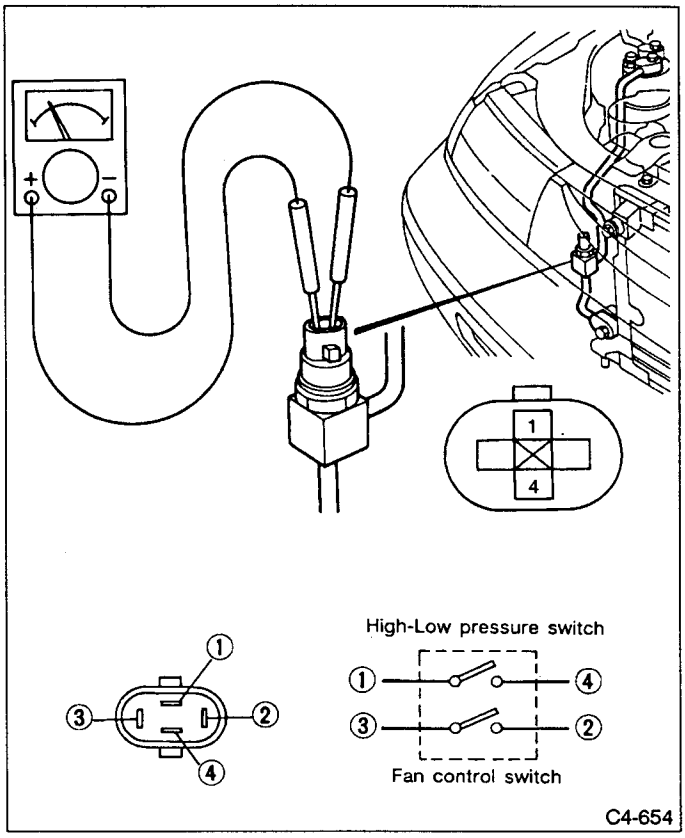


Fig. 164

1. High and low pressure switch

Terminal	Operation	High pressure side line-pressure kPa (kg/cm², psi)
③ — ④	Turns OFF	Increasing to 2,648± 196 (27± 2, 384± 28)
		Decreasing to 137± 20 (1.4± 0.2, 20± 2.8)
	Turns ON	Increasing to 147± 29 (1.5± 0.3, 21± 4)
		Decreasing to $1,471^{+196}_{-98}$ ($15^{+2.0}_{-1.0}$, 213^{+28}_{-14})

2. Fan control switch

Terminal	Operation	High pressure side line-pressure kPa (kg/cm², psi)
① — ②	Turns ON	Increasing to 1,569± 127 (16± 1.3, 228± 18)
	Turns OFF	Decreasing to 1,275± 147 (13± 1.5, 185± 21)

C: REMOVAL AND INSTALLATION

1. HIGH-PRESSURE HOSE

1) Recover refrigerant.
2) Remove high-pressure hose attaching bolts on compressor and condenser sides.

Plug high-pressure hose, compressor and condenser connections immediately after disconnecting piping to prevent entry of dirt, dust, water, etc.

3) To install, reverse removal procedures.

Replace old O-ring (used with piping) with new one, and apply a coat of compressor oil to it before installing.

2. LOW-PRESSURE HOSE

1) Recover refrigerant.
2) Remove throttle body cover.
3) Remove air intake duct.
4) Remove ignition harness clip.
5) Remove low-pressure hose clip attaching screw.
6) Remove low-pressure hose attaching bolts on compressor and evaporator sides.

Plug low-pressure hose, compressor and evaporator hose connections immediately after disconnecting piping to prevent entry of dirt, dust, water, etc.

18. Pipe and Hose

A: REMOVAL AND INSTALLATION

1. HIGH-PRESSURE HOSE

1) Recover refrigerant.
2) Remove high-pressure hose attaching bolts on compressor and condenser sides.

Plug high-pressure hose, compressor and condenser connections immediately after disconnecting piping to prevent entry of dirt, dust, water, etc.

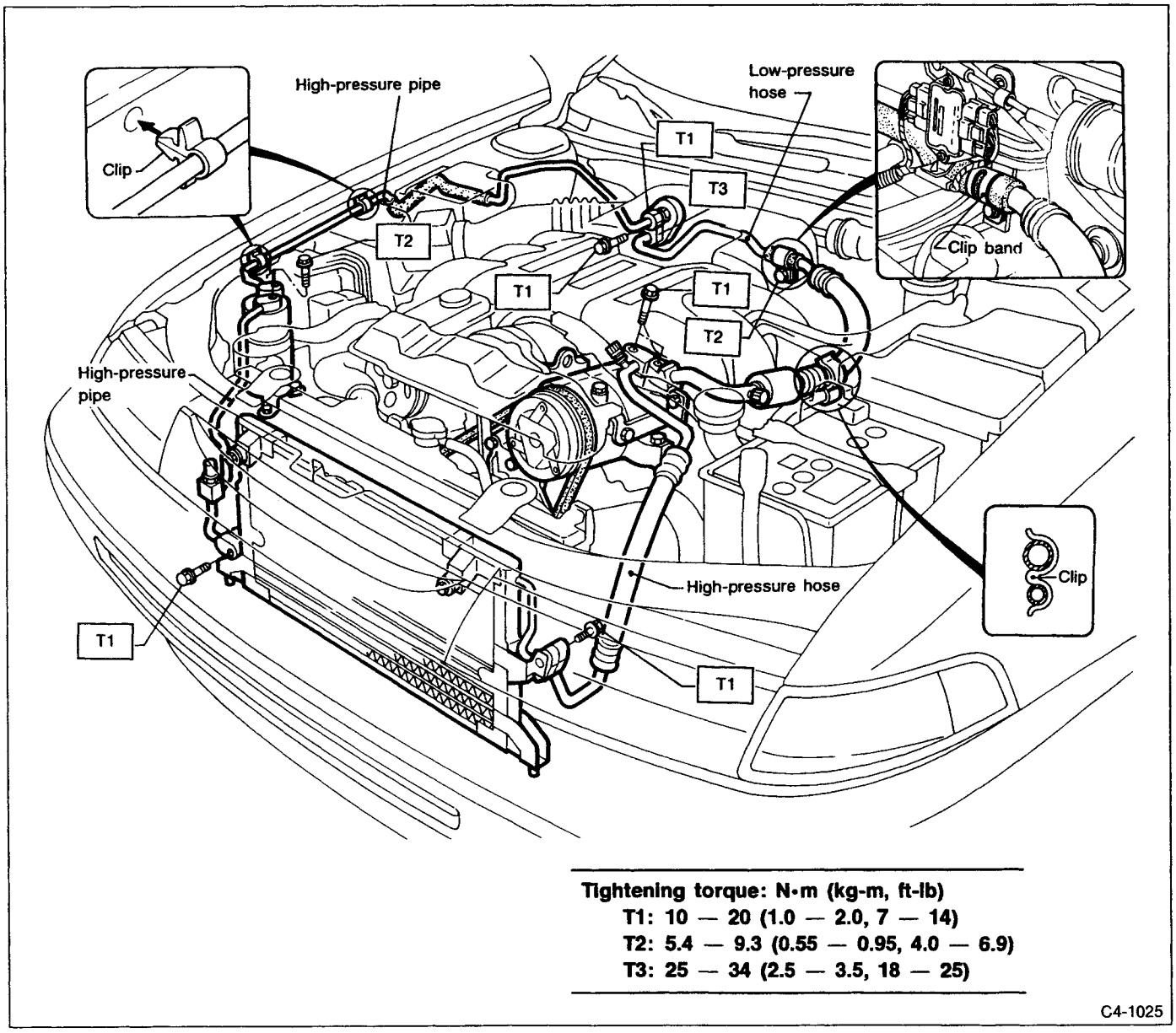
3) To install, reverse removal procedures.

Replace old O-ring (used with piping) with new one, and apply a coat of compressor oil to it before installing.

2. LOW-PRESSURE HOSE

1) Recover refrigerant.
2) Remove throttle body cover.
3) Remove air intake duct.
4) Remove ignition harness clip.
5) Remove low-pressure hose clip attaching screw.
6) Remove low-pressure hose attaching bolts on compressor and evaporator sides.

Plug low-pressure hose, compressor and evaporator hose connections immediately after disconnecting piping to prevent entry of dirt, dust, water, etc.



Tightening torque: N·m (kg-m, ft-lb)
T1: 10 — 20 (1.0 — 2.0, 7 — 14)
T2: 5.4 — 9.3 (0.55 — 0.95, 4.0 — 6.9)
T3: 25 — 34 (2.5 — 3.5, 18 — 25)

C4-1025

Fig. 47

19. Relay and Fuse

Relays used with A/C system are located as shown in figure below.

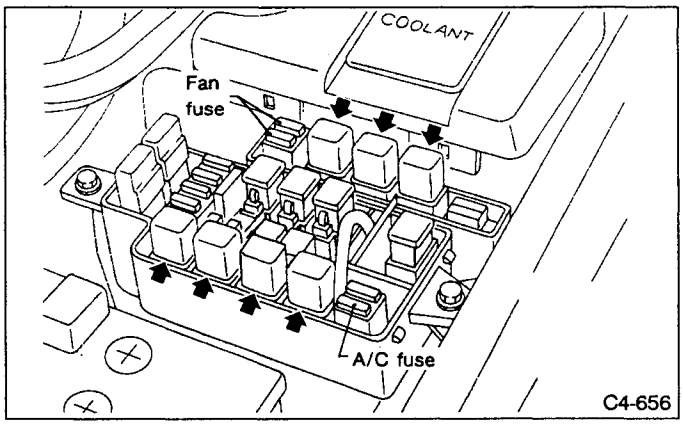


Fig. 166

6) OFF relay and Hi relay.

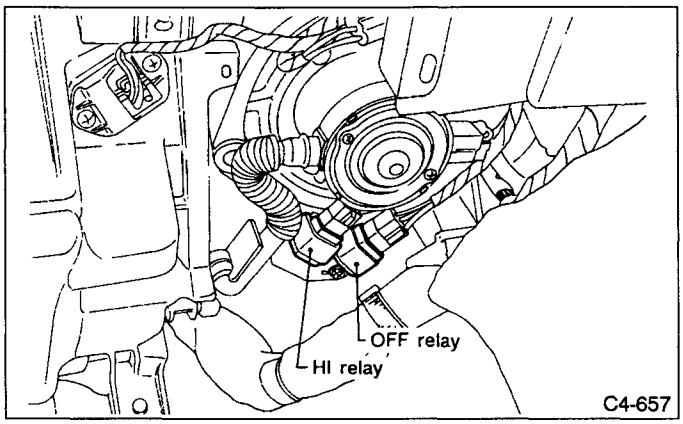


Fig. 167

A: INSPECTION

Check conduction with a circuit tester (ohm range) according to the following table.

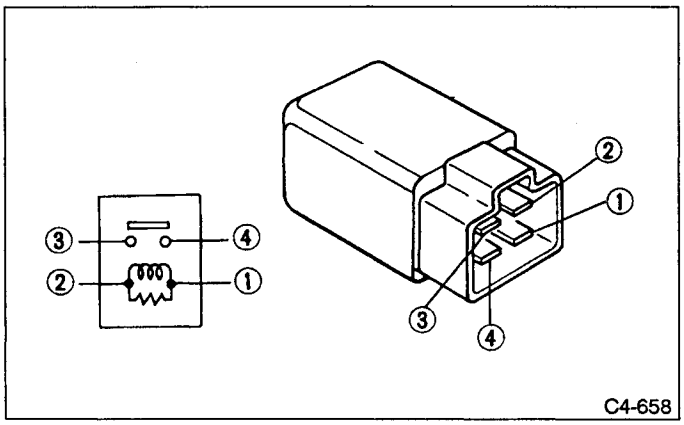


Fig. 168

Specified resistance:
No. 1 — No. 2/100Ω
No. 3 — No. 4/1MΩ min.

Replace relays which do not meet above specifications.

T TROUBLESHOOTING

1. Precautions

1) Never connect the battery in reverse polarity.
- The Auto A/C control unit will be destroyed instantly.

2) Do not disconnect the battery terminals while the engine is running.
- A large counter electro motive force will be generated in the alternator, and this voltage may damage electronic parts such as Auto amp. (Auto A/C control unit)

3) Before disconnecting the connectors of each sensor and the Auto amp., be sure to turn off the ignition switch.
- Otherwise, the Auto amp. may be damaged.

4) Every Auto A/C-related part is a precision part. Do not drop them.

2. Pre-inspection

Before troubleshooting check the following items.

1. POWER SUPPLY

1) Measure battery voltage and specific gravity of electrolyte.

Standard voltage: 12V
Specific gravity: Above 1.260

2) Check the condition of the fuses for A/C. heater and other fuses.
3) Check the condition of the harnesses and harness connectors connection.

2. REFRIGERANT LINE

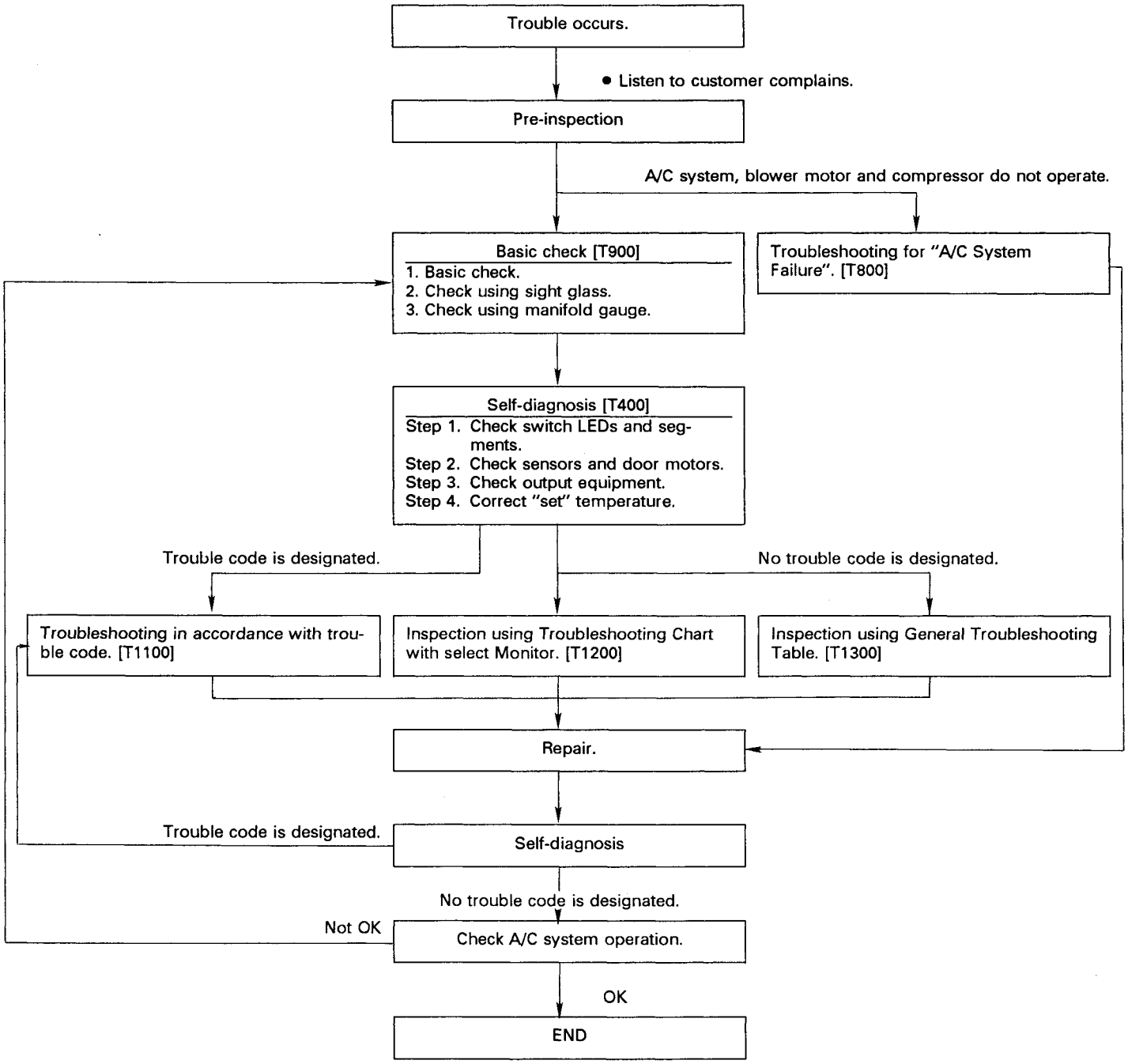
1) Check contact for refrigerant line.
2) Check amount of refrigerant.
Refer to the Sight Glass Inspection.

3. CONTROL LINKAGE

1) Check state of mode door control rod and linkage.
2) Check state of air mix door control rod and linkage.
3) Check state of intake door control rod and linkage.

3. Troubleshooting Chart for Self-diagnosis System

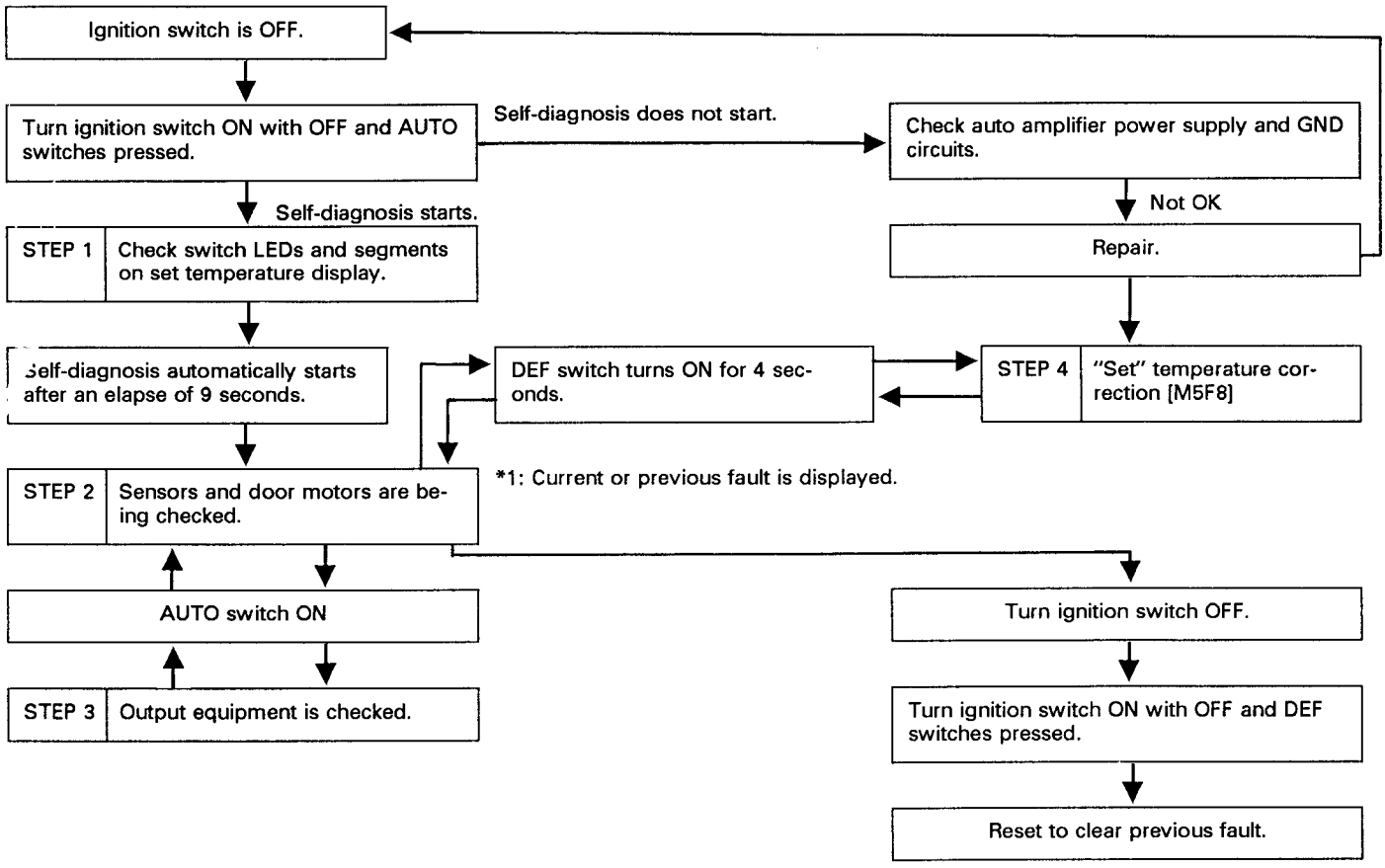
A: BASIC TROUBLESHOOTING PROCEDURE



4. Self-diagnosis System

A: GENERAL

1. The self-diagnosis system checks the condition of various switch LEDs, set-temperature display segments (STEP 1), sensors (STEP 2) and output equipment (STEP 3). It also sends predetermined control output signals to check the operation of the blower fan motor and mode door motors.
2. The compartment set temperature can be corrected in 3 steps to meet passenger's preference while the air conditioning system or heating unit is operating. (STEP 4)



*1: Current fault ... A problem which is currently occurring
*2: Previous fault ... Stored in auto amplifier memory.
(Auto amplifier stores in memory up to 16 previous faults (such as poor connector contact, etc.).

B: FUNCTION

1. HOW TO START THE SELF-DIAGNOSIS

Start engine.

↓

Warm up engine.

↓

- Ignition switch is OFF.
- Engine water temperature is 40°C (104°F) or more.
- Direct 100W light to sunload sensor.

↓

- START

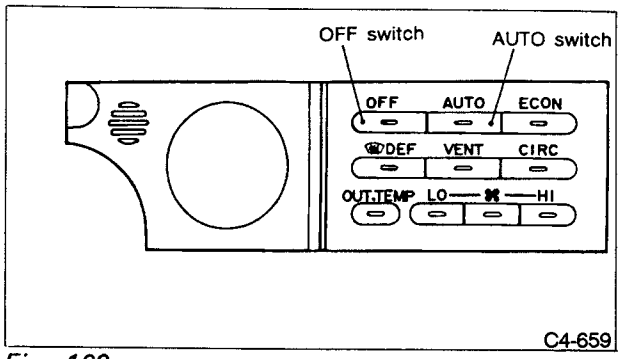


Fig. 169

START

With ON with OFF and AUTO switches pressed, turn ignition switch ON.

→ Self-diagnosis does not start.

→ Check auto amplifier power supply and GND circuits.

↓

- STEP-1

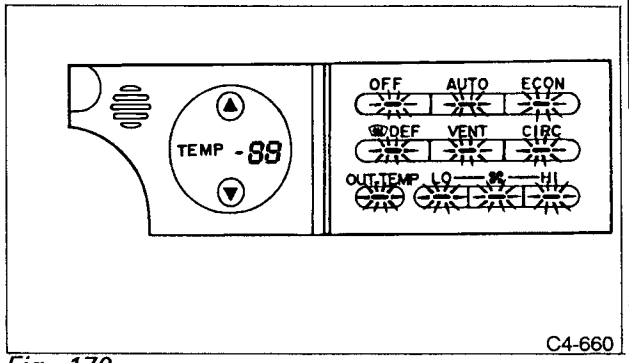


Fig. 170

STEP 1

- Check whether all switch LEDs turn ON.*1
- Check whether all segments on set temperature display turn ON.

→ Not OK

→ Faulty control panel (incl. auto amplifier)

↓ OK

Elapse of 9 seconds

*1: Amber LED turns ON first, then after approx. 4 seconds, green LED turns ON.

↓

To be continued.

↓

With OFF and OUT. TEMP switches, only green LED turns ON.

• STEP-2

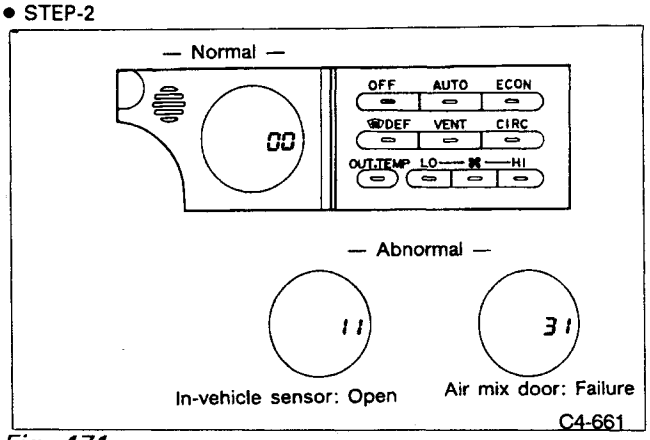


Fig. 171

STEP 2
Check segments "00" in set temperature display.

"00" does not appear.

Display presentation	Fault	Remarks
11.21	In-vehicle sensor	Open or shorted
12.22	Ambient sensor	Open or shorted
⑬.23*2	Sunload sensor	Open or shorted
14.24	Evaporator sensor	Open or shorted
15.25	Refrigerant temperature sensor	Open or shorted
16.26	Water temperature sensor	Open or shorted
31	Air mix door (PBR)	Faulty
32	Mode door (PBR)	Faulty
㉝	Mix door motor	Faulty engine
㉞	Mode door motor	Faulty engine
㉟	Intake door motor	Faulty engine

*2: Judged as "open" if light is not directed to sunload sensor.
*3: Circled figures refer to a fault which is currently occurring.

"00" appears.

AUTO SWITCH ON.

STEP 3
Check output equipment operation.

Each time DEF switch is pressed, operation step advances.

Operation step	①	②	③	④	⑤
"Set" temperature display	41	42	43	44	45
Outlet port	Defroster	Heat	Bi-level	Vent	Vent
Suction port	Fresh/ Recirc	Fresh	Fresh	Fresh	Recirc
Air mix door	Max. hot	Max. hot	50%	Max. cold	Max. cold
Blower motor (V)	5	7	11	12 (Max. Hi)	12 (Max. Hi)
Compressor	ON	ON	OFF	OFF	ON
Compressor solenoid current (A)	0	0.65	0	0	0

OK

Turn ignition switch OFF.

Not OK

Repair.

Set DEF switch ON more than 4 seconds.

STEP 4
"Set" temperature correction

Press UP or DOWN switch.

Display presentation	Ambient temperature correction
10	• Compartment temperature is set toward hot side with respect to standard position when ambient temperatures are low. • Compartment temperature is set toward cold side with respect to standard position when ambient temperatures are high.
05	• Standard position
00	• Compartment temperature is set toward cold side in relation to standard position when ambient temperatures are low. • Compartment temperature is set toward hot side in relation to standard position when ambient temperatures are high.

Turn ignition switch OFF.

2. CLEAR MEMORY

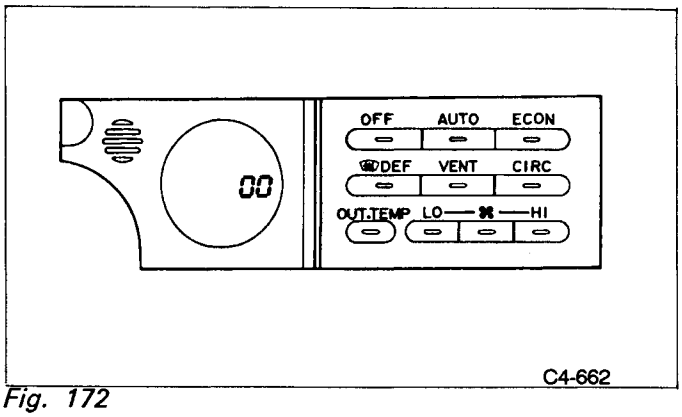


Fig. 172

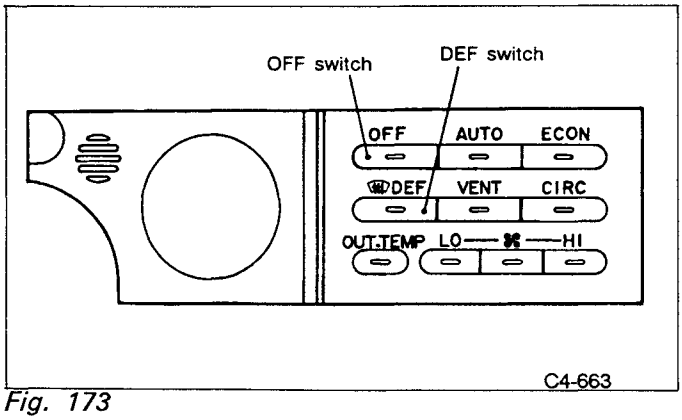


Fig. 173

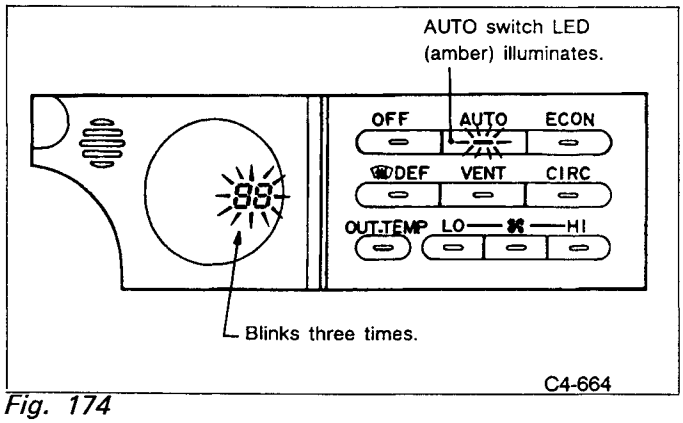


Fig. 174

Set system to "STEP 2" in self-diagnosis mode.

↓

Turn ignition switch OFF.

↓

Turn ignition switch ON with OFF and DEF switches pressed.

↓

AUTO switch LED (amber) and "88" ("set" temperature display) flashes three times.

↓

Previous faults stored in memory are cleared and system returns to initial state.

↓

Turn ignition switch OFF.

5. Output Modes of Select Monitor

1. FUNCTION MODE

Applicable cartridge of select monitor: No. 498348500

MODE	Abbr.	Contents	Unit	Contents of display
F00	—	System identification	—	—
F01	Tset	"Set" temperature	deg °C (°F)	Monitors "Set" temperature
F02	To	Total signal	deg °C (°F)	Monitors total signal determined by auto amplifier in relation to "set" temperature and signals sent from in-vehicle sensor, ambient sensor, evaporator sensor, and sunload sensor.
F03	Troom	Compartment temperature	deg °C (°F)	Monitors compartment temperature determined by auto amplifier in relation to in-vehicle sensor.
F04	Tamb	Ambient temperature	deg °C (°F)	Monitors ambient temperature determined by auto amplifier in relation to signal sent from ambient sensor.
F05	Tevp	Rear-of-evaporator temperature	deg °C (°F)	Monitors cool air temperature determined by auto amplifier in relation to signal sent from evaporator sensor.
F06	Qsun	Sunload	kcal	Monitors sunload determined by auto amplifier in relation to signal sent from sunload sensor.
F07	Tsun	Sunload sensor correction temperature	deg °C (°F)	Monitors total signal correction value in relation to sunlight received.
F08	Tref	Refrigerant temperature	deg °C (°F)	Monitors refrigerant temperature determined by auto amplifier in relation to signal sent from refrigerant temperature sensor.
F09	Tw	Heater core temperature	deg °C (°F)	Monitors water temperature at lower section of heater core which is determined by auto amplifier in relation to signal sent from water temperature sensor.
F10	AMRset	Air mix door target value	%	Monitors air mix door target opening determined by total signal (T).
F11	AMRpot	Actual air mix door opening	%	Monitors actual air mix door opening controlled by its motor P.B.R. in relation to target opening.
F12	MODEset	Target outlet value	%	Monitors target outlet value determined from both air mix door target value and temperature at rear of evaporator.
F13	MODEpot	Actual outlet opening	%	Monitors actual outlet opening.
F14	BLW	Blower level (V)	V	Monitors blower air discharge controlled by auto amplifier.
F15	Intak	Intake position	—	Monitors air suction port position.
F16	Isol	Solenoid current output	A	Monitors solenoid current output which is sent from auto amplifier to control variable compressor.
F17	EGI to A/C	Variable compressor control signal	%	Monitors "duty" signal which is sent from MPFI unit to control variable compressor.
FA0	SW	Switch input	—	Monitors switch input.
FB0	DIAG.	Faulty input-output	—	Monitors sensor and door operation.

2. ON-OFF SIGNAL LIST

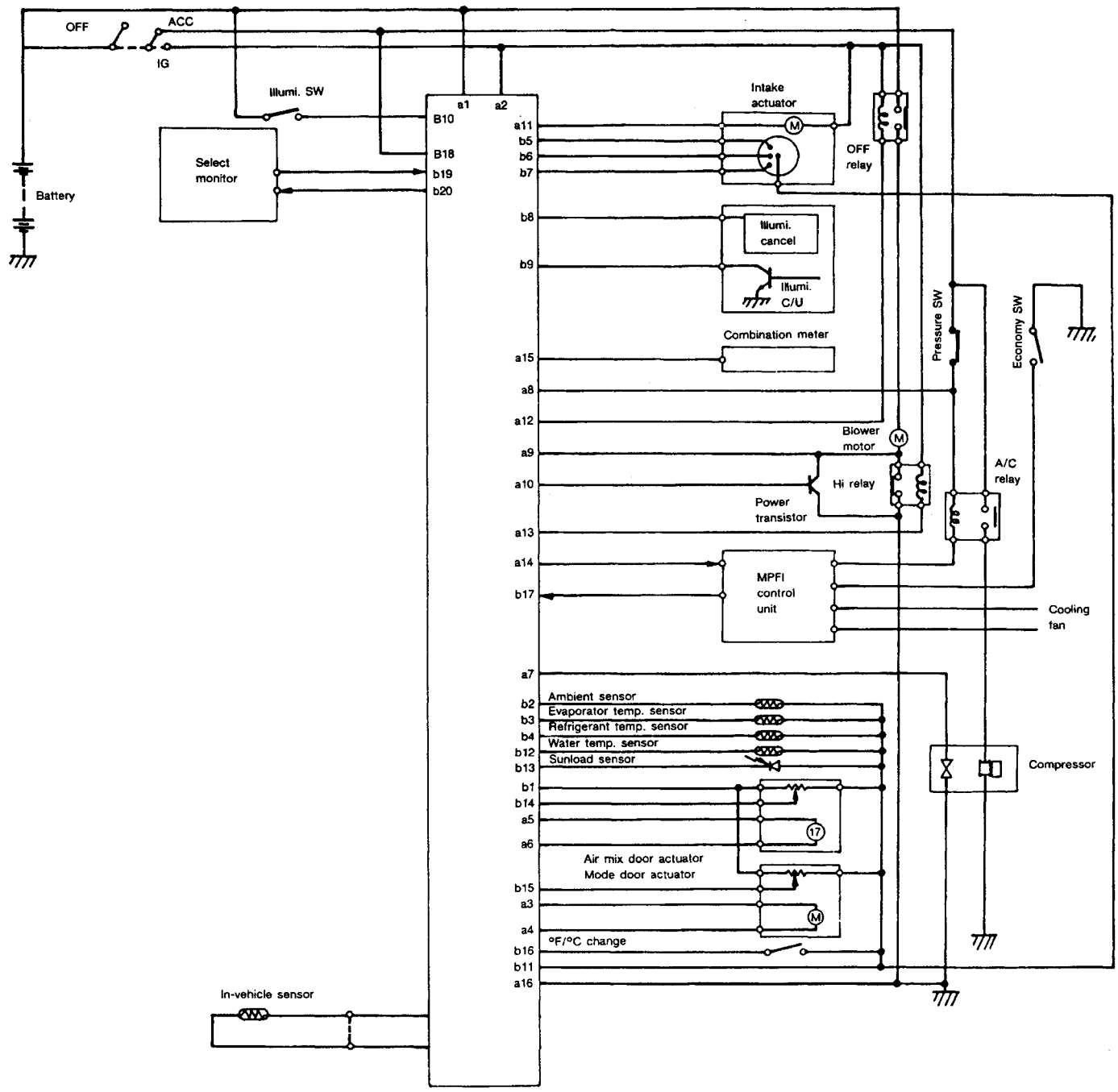
MODE	LED No.	Display	LED "ON" requirement
FA0	1	UP	UP switch ON
	3	OFF	OFF switch ON
	3	DEF	DEF switch ON
	4	VENT	VENT switch ON
	4	AUTO	AUTO switch ON
	5	REC	CIRC switch ON
	5	ECON	ECON switch ON
	6	DOWN	DOWN switch ON
	7	OUT.TEMP	OUT.TEMP switch ON
	8	LOW	FAN (LOW) switch ON
	9	MED	FAN (MED) switch ON
	10	HI	FAN (HI) switch ON
	OFF	SWITCH OFF	No switch operation required.

While switch is pressed, the corresponding display and LED flash.

3. INPUT-OUTPUT FAULT DATA

Mode	Display Cord	Display	Content	
FB0	00	—	Normal	
	11	ROM.S O	IN-VEHICLE SENSOR	OPEN
	21	ROM.S S		SHORT
	12	AMB.S O	AMBIENT SENSOR	OPEN
	22	AMB.S S		SHORT
	13	SUN.S O	SUNLOAD SENSOR	OPEN
	23	SUN.S S		SHORT
	14	EVP.S O	EVAPORATOR SENSOR	OPEN
	24	EVP.S S		SHORT
	15	REF.S O	REFRIGERANT TEMPERATURE SENSOR	OPEN
	25	REF.S S		SHORT
	16	WTR.S O	WATER TEMPERATURE SENSOR	OPEN
	26	WTR.S S		SHORT
	31	AM.PO F	AIR MIX DOOR P.B.R.	FAULT
	32	MD.PO F	MODE DOOR P.B.R.	FAULT
	33	AM.AC F	AIR MIX DOOR MOTOR	FAULT
	34	MD.AC F	MODE DOOR MOTOR	FAULT
	35	FD.AC F	INTAKE DOOR MOTOR	FAULT

6. Schematic



C4-665

Fig. 175

7. Control Unit (Auto Amp.) I/O Signal

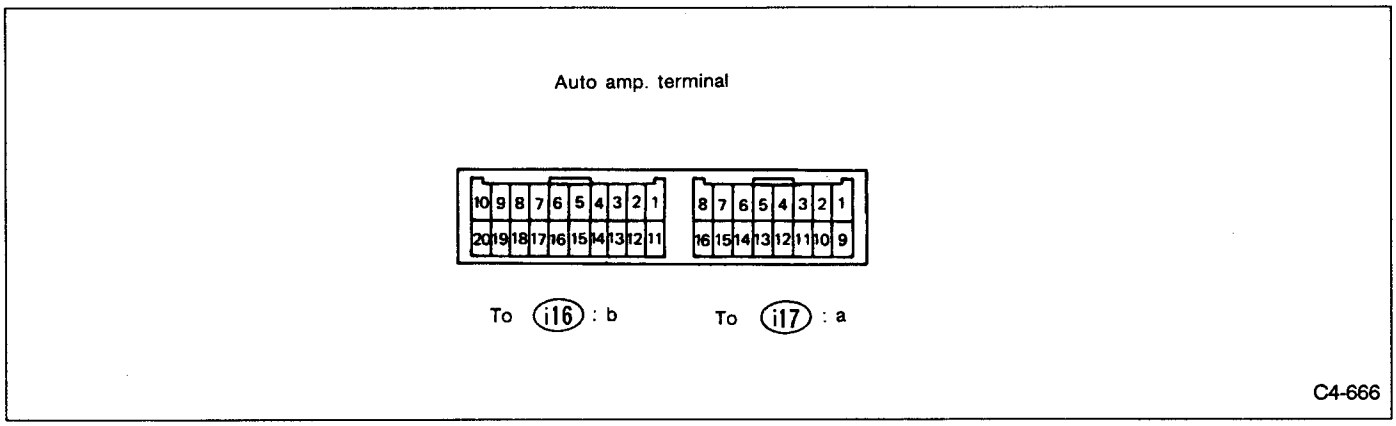


Fig. 176

Content	Connector No.	Terminal No.	Signal (V)
BATT voltage (Memory back-up)	i17	a1-body	BATT voltage 13 — 14 (engine running)
IGN power supply	i17	a2-body	Battery voltage (ignition switch ON) 13 — 14 (engine running)
ACC power supply (OFF: ignition in START or diagnosis system reset)	i16	b18-body	BATT voltage 0 (engine cranking); BATT voltage during engine starts
Sensor standard voltage	i16	b1-body	0 (ignition switch ON) — 5V
Auto amplifier ground circuit	i17	a16-body	0 (ignition switch ON) — circuit constantly grounded
Sensor ground circuit	i16	b11-body	0 (ignition switch ON) — continuity exists
In-vehicle sensor	—	—	Approx. 5 (ignition switch ON and sensors disconnected)
Ambient sensor	i16	b2-b11	
Evaporator sensor	i16	b3-b11	
Refrigerant temperature	i16	b4-b11	
Water temperature sensor	i16	b12-b11	
Sunload sensor	i16	b13-b11	
Air mix door motor	i17	a5-a6	BATT voltage (AUTO mode) positive ⊕ at terminal "a5" and negative ⊖ at "a6" [temperature set at 18°C (65°F)]; negative ⊖ at terminal "a5" and positive ⊕ at "a6" [temperature set at 32°C (85°F)]
Air mix door motor P.B.R.	i16	b14-b11	Approx. 0.5 [temperature set at 18°C (85°F) in AUTO mode] Approx. 4.5 [temperature set at 32°C (85°F)]
Mode door motor	i17	a3-a4	BATT voltage (ignition switch ON in MANUAL mode); positive ⊕ at terminal "a3" and negative ⊖ at "a4" (VENT); negative ⊖ at "a3" and positive ⊕ at "a4" (DEF)
Mode door motor P.B.R.	i16	b15-b11	BATT voltage (ignition switch ON in MANUAL mode) Approx. 4.5 (VENT); approx. 0.5 (DEF)
Mode door FRS voltage	i16	b7-b11	BATT voltage (DEF switch ON)
Mode door REC voltage	i16	b5-b11	BATT voltage (CIRC switch ON)
OFF relay	i17	a12-body	BATT voltage (ignition switch ON)
HI relay	i17	a13-body	
A/C relay	i17	a14-body	BATT voltage (ignition and A/C switches ON) 0 (A/C switch OFF)
Illumination control signal	i16	b10-body	BATT voltage (ignition and lighting switches ON)
°F/°C select signal	i16	b16-b11	°C is shown (select switch ON) °F is shown (select switch SHORT)

8. Troubleshooting for A/C System Failure

A: A/C AND/OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE.

CONTENTS OF DIAGNOSIS:
- Faulty auto amplifier
- Faulty harness connector
- Faulty connector

TROUBLE SYMPTOM:
- "Set" temperature is not indicated on display, switch LEDs are faulty and switches do not operate.
- Self-diagnosis system does not operate.

1 Check auto amplifier power circuit. — Not OK → Faulty fuse or harness

↓ OK

2 Check auto amplifier ground circuit. — Not OK → Faulty harness

↓ OK

Faulty auto amplifier (replace and recheck)

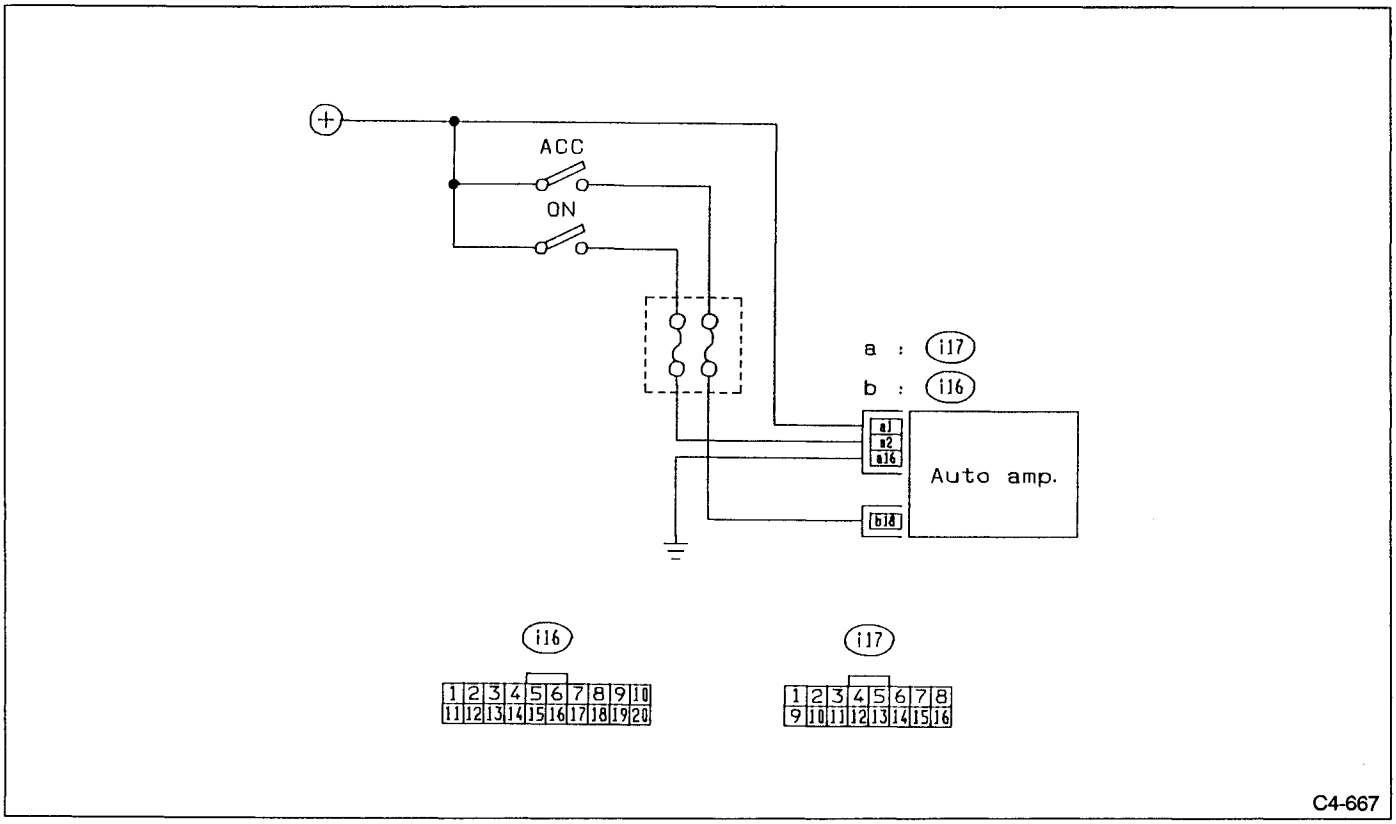


Fig. 177

1. CHECK VOLTAGE BETWEEN AUTO AMP. AND BODY

1) Measure voltage between Auto amp. connector terminals and body.

Connector & Terminal/Specified voltage:
Ignition switch
OFF (i17) No. 1 ⊕ — Body/Approx. 12 V
ACC (i17) No. 18 ⊕ — Body/Approx. 12 V
ON (i16) No. 2 ⊕ — Body/Approx. 12 V

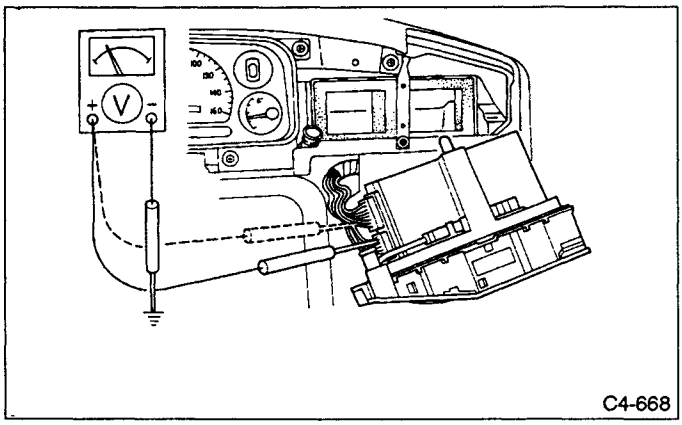


Fig. 178

2. CHECK GROUNDING CIRCUIT

1) Disconnect Auto amp. connector.
2) Check continuity between Auto amp. connector terminal and body.

Connector & Terminal/Specified resistance:
(i16) No. 16 — Body/0 Ω

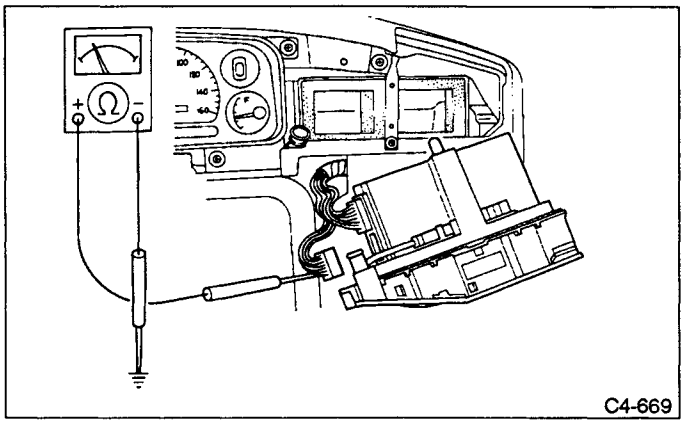
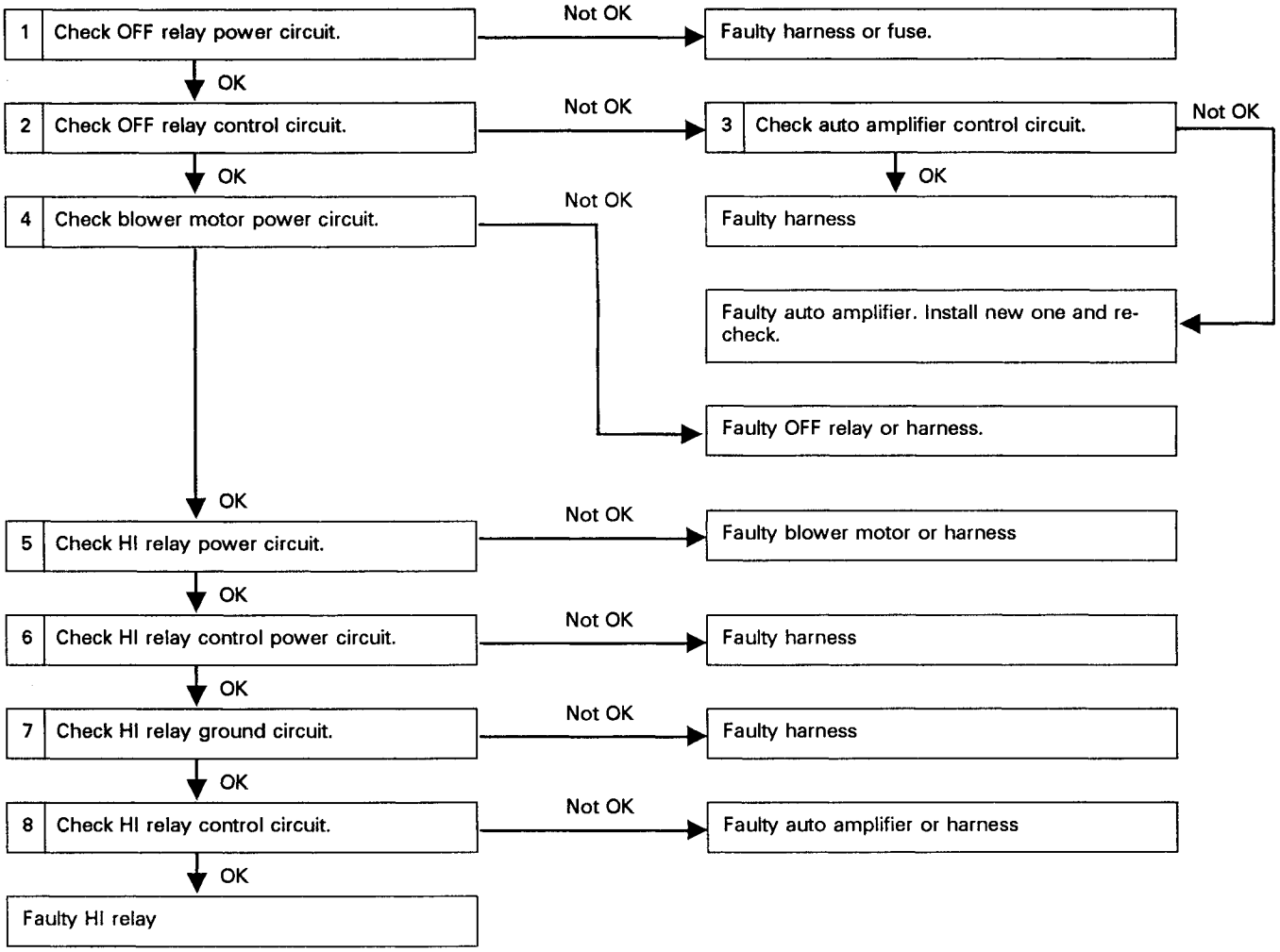


Fig. 179

B: BLOWER MOTOR DOES NOT ROTATE IN "HI" ONLY OR AT ALL.

CONTENTS OF DIAGNOSIS:
Burned-out fuse, or faulty harness, OFF relay, blower motor, auto amplifier or HI relay

TROUBLE SYMPTOM:
- Blower motor does not rotate.
- Blower motor does not rotate in "HI".



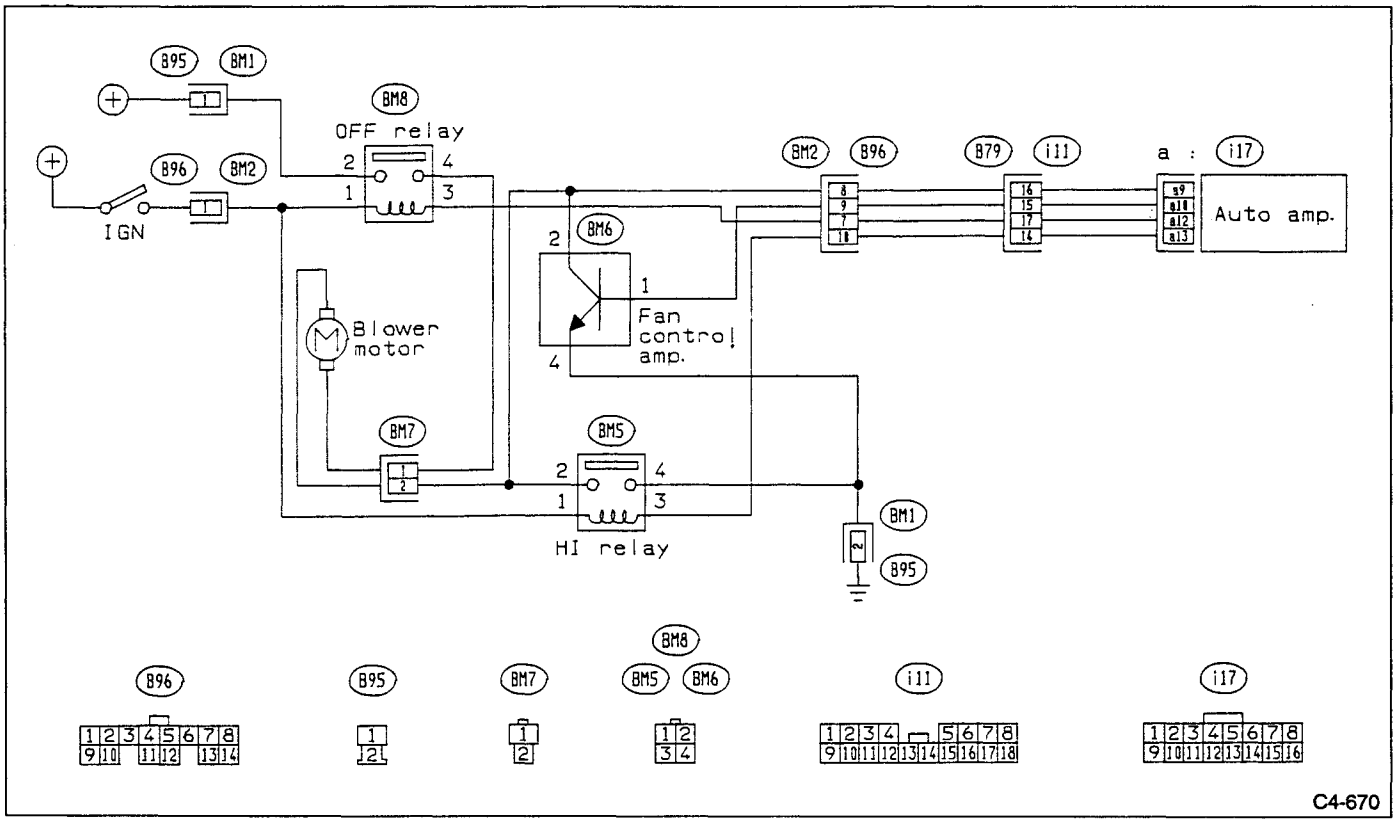

B95
BM1
BM8
OFF relay
B96
BM2
IGN
Blower motor
BM7
BM6
Fan control amp.
BM5
HI relay
BM1
B95
BM2
B96
B79
i11
a :
i17
Auto amp.
B96
B95
BM7
BM8
BM5
BM6
i11
i17
C4-670

Fig. 180

1. CHECK OFF RELAY POWER CIRCUIT.

1) Measure voltage between OFF relay connector terminals and body.

Connector & Terminal/Specified voltage:
Ignition switch OFF (BM8) No. 2 — Body/Approx. 12 V
ON (BM8) No. 1 — Body/Approx. 12 V

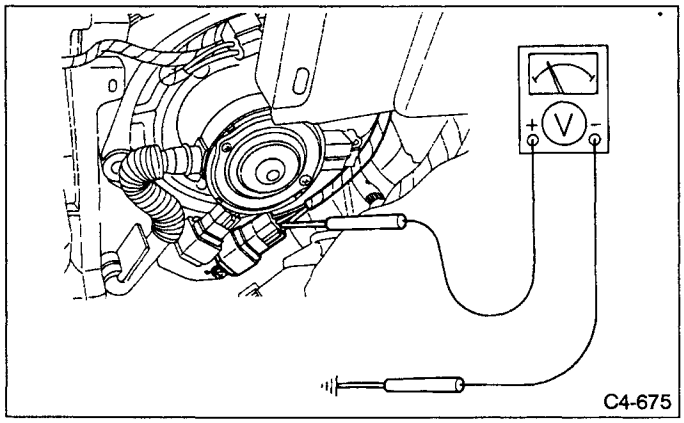


Fig. 181

2. CHECK OFF RELAY CONTROL CIRCUIT.

1) Turn the ignition switch to "ON".
2) Measure voltage between OFF relay connector terminals and body.

Connector & Terminal/Specified voltage:
OFF switch ON
(BM8) No. 3 — Body/Approx. 12 V
AUTO switch ON
FAN switch HI
(BM8) No. 3 — Body/Approx. 1 V max.

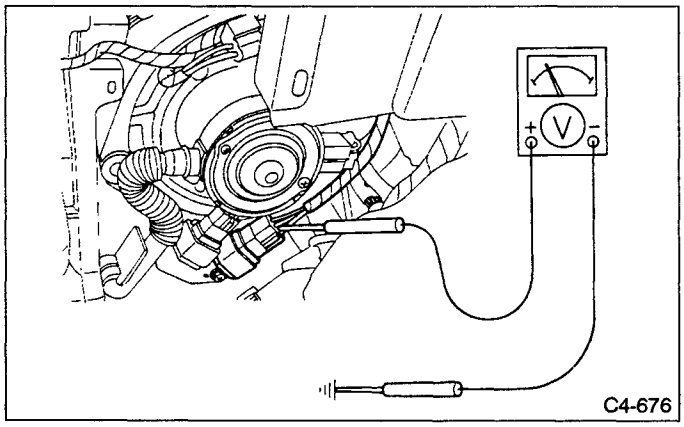


Fig. 182

3. CHECK AUTO AMPLIFIER CONTROL CIRCUIT.

1) Turn the ignition switch to "ON".
2) Measure voltage between AUTO amp. connector terminals and body.

Connector & Terminal/Specified voltage:
OFF switch ON
(i17) No. 12 — Body/Approx. 12 V
AUTO switch ON
FAN switch HI
(i17) No. 12 — Body/Approx. 1 V max.

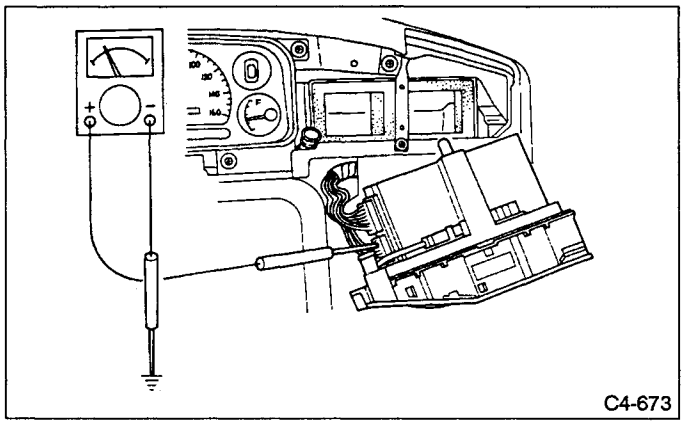


Fig. 183

4. CHECK BLOWER MOTOR POWER CIRCUIT.

1) Disconnect blower motor connector.
2) Turn the ignition switch to "ON".
3) Measure voltage between blower motor connector terminal and body.

Connector & Terminal/Specified voltage:
AUTO switch ON
FAN switch HI
(BM7) No. 1 — Body/Approx. 12 V

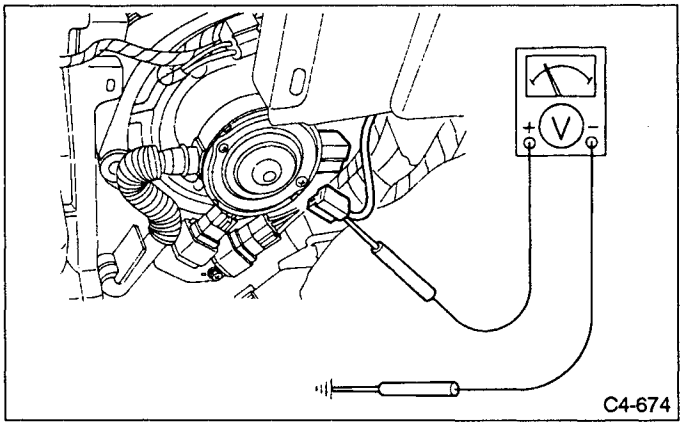


Fig. 184

5. CHECK HI RELAY POWER CIRCUIT.

1) Disconnect fan control amp. connector.
2) Turn the ignition switch to "ON".
3) Measure voltage between HI relay connector terminal and body.

Connector & Terminal/Specified voltage:
AUTO switch ON
FAN switch Low or Med
(BM5) No. 2 — Body/Approx. 12 V

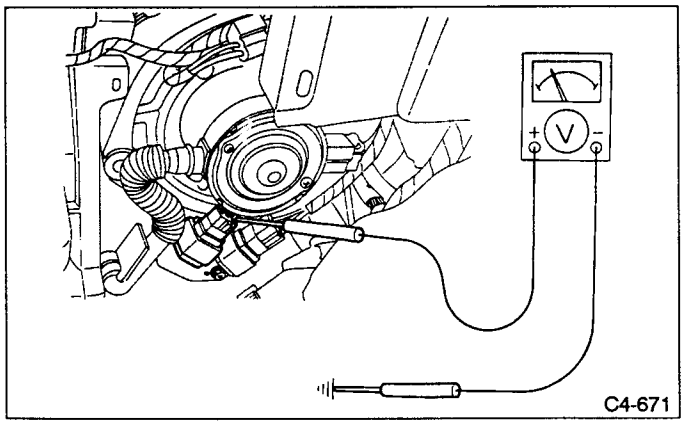


Fig. 185

6. CHECK HI RELAY CONTROL POWER CIRCUIT.

1) Turn the ignition switch to "ON".
2) Measure voltage between HI relay connector terminal and body.

Connector & Terminal/Specified voltage:
(BM5) No. 1 — Body/Approx. 12 V

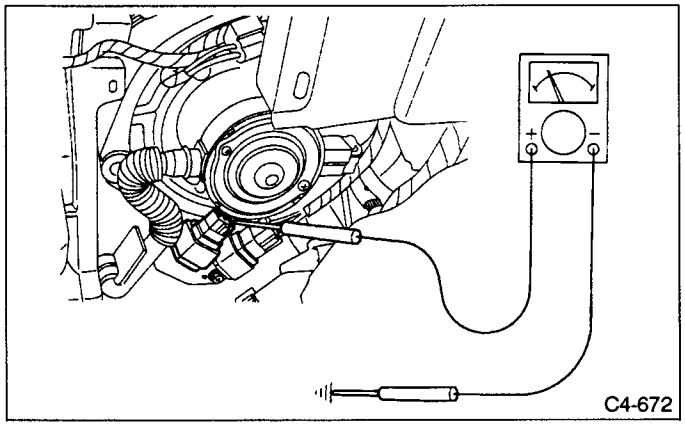


Fig. 186

7. CHECK HI RELAY GROUND CIRCUIT.

1) Disconnect HI relay connector.
2) Measure resistance between HI relay connector and body.

Connector & Terminal/Specified resistance:
(BM5) No. 4 — Body/0 Ω

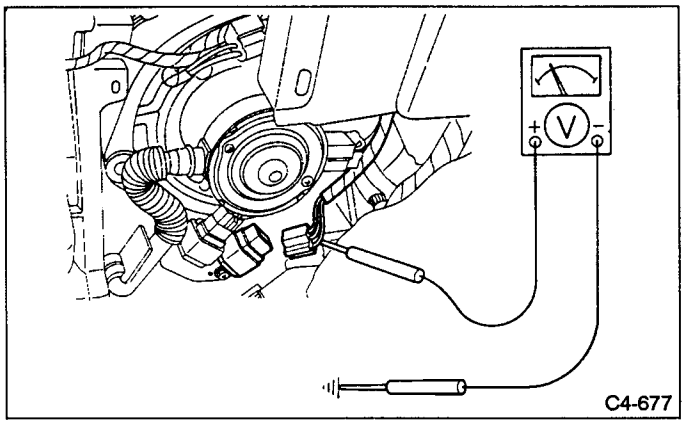


Fig. 187

8. CHECK HI RELAY CONTROL CIRCUIT.

1) Connect HI relay connector.
2) Turn the ignition switch to "ON".
3) Measure voltage between HI relay connector terminal and body.

Connector & Terminal/Specified voltage:
AUTO switch ON
FAN switch HI
(BM5) No. 3 — Body/1 V max.
FAN switch Lo•Med
(BM5) No. 3 — Body/Approx. 12 V

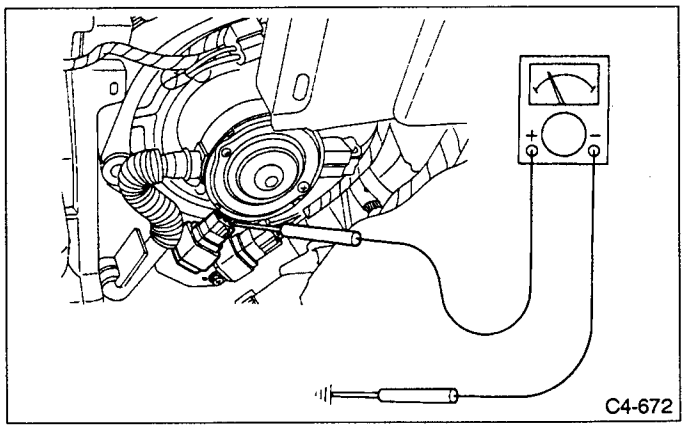


Fig. 188

C: BLOWER MOTOR ROTATES IN "HI" ONLY.

CONTENTS OF DIAGNOSIS:
Faulty harness, fan control amplifier or auto amplifier

TROUBLE SYMPTOM:
Blower motor rotates in "HI" but not in "LO" and "MED".

1	Check fan control amplifier power circuit.	Not OK	Faulty harness
	↓ OK		
2	Check fan control amplifier control voltage.	Not OK	Faulty auto amplifier or harness
	↓ OK		
3	Check fan control amplifier ground circuit.	Not OK	Faulty harness
	↓ OK		
	Faulty fan control amplifier		

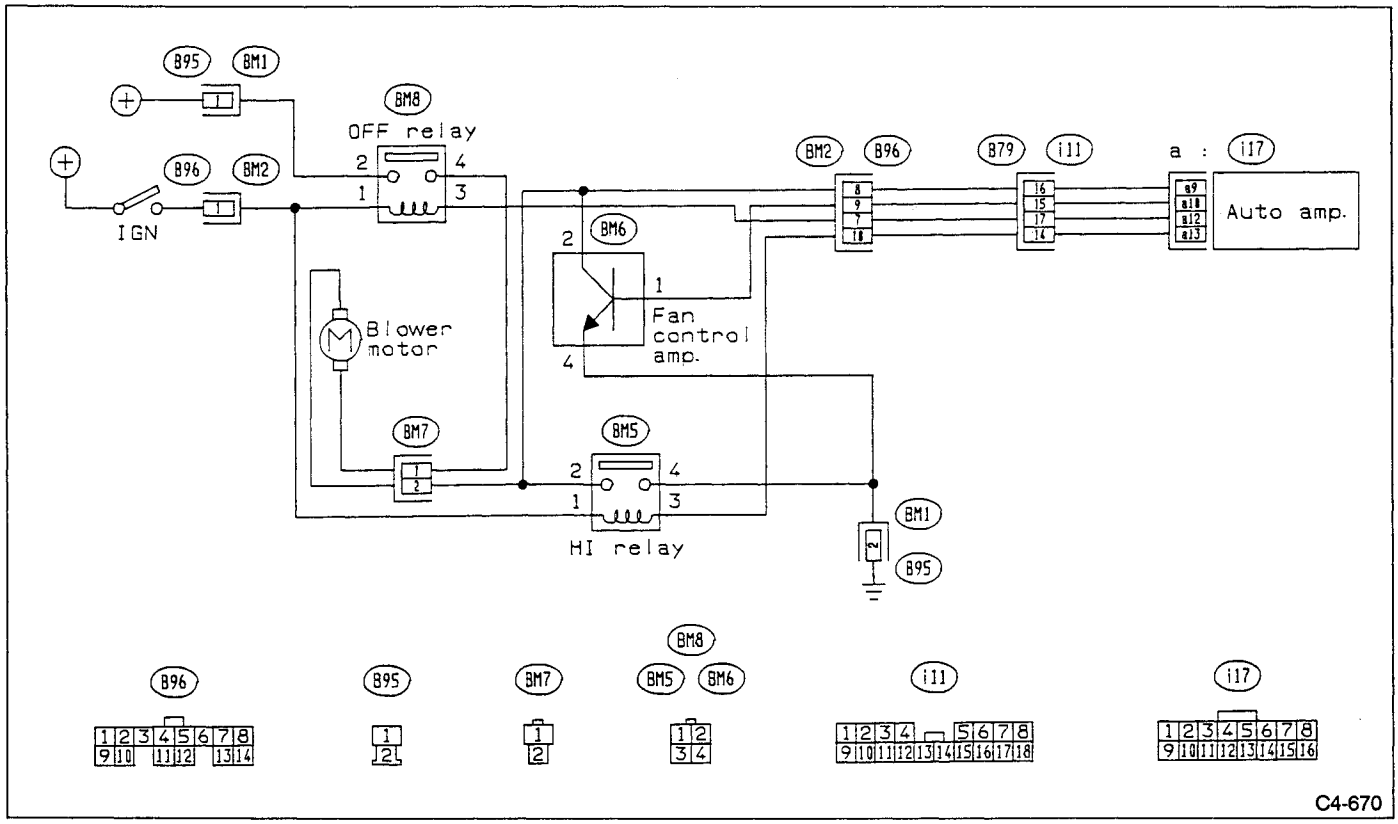


Fig. 189

1. CHECK FAN CONTROL AMPLIFIER POWER CIRCUIT.

1) Remove the glove box.
2) Disconnect fan control amp. connector.
3) Turn the ignition switch to "ON".
4) Measure voltage between fan control amp. connector and body.

Connector & Terminal/Specified voltage:
AUTO switch ON
FAN switch HI
(BM6) No. 2 — Body/1 V max.
FAN switch Low•Med
(BM6) No. 2 — Body/Approx. 12 V

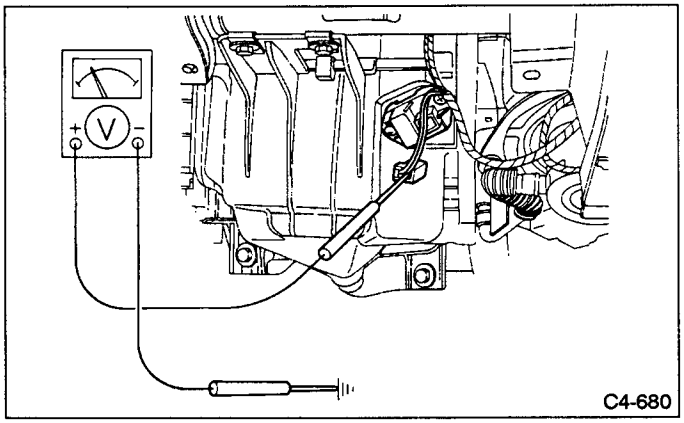


Fig. 190

2. CHECK FAN CONTROL AMPLIFIER CONTROL VOLTAGE.

1) Connect fan control amp. connector.
2) Turn the ignition switch to "ON".
3) Measure voltage between fan control amp. connector terminal and body.

Connector & Terminal/Specified voltage:
AUTO switch ON
FAN switch HI
(BM6) No. 1 — Body/Approx. 0 V
FAN switch Low•Med
(BM6) No. 1 — Body/Approx. 1.0 — 2.0 V

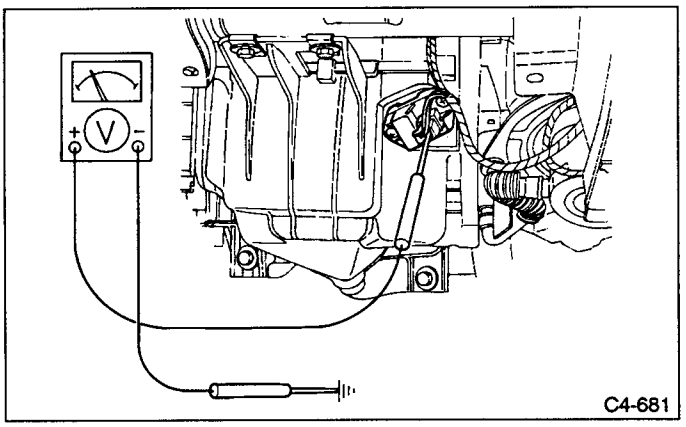


Fig. 191

3. CHECK FAN CONTROL AMPLIFIER GROUND CIRCUIT.

1) Disconnect fan control amp. connector.
2) Measure resistance between fan control amp. connector terminal and body.

Connector & Terminal/Specified resistance:
(BM6) No. 4 — Body/0 Ω

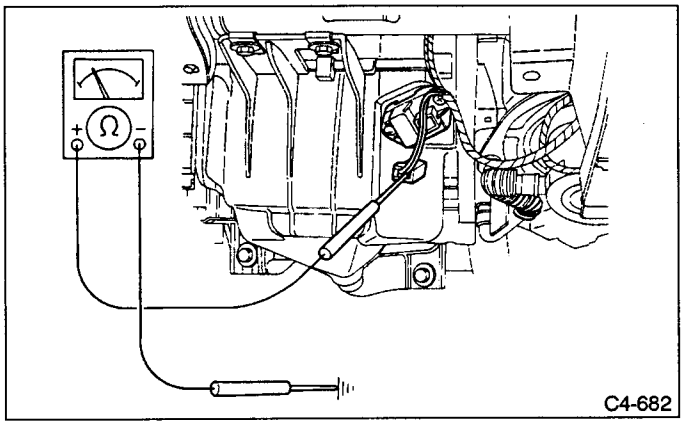
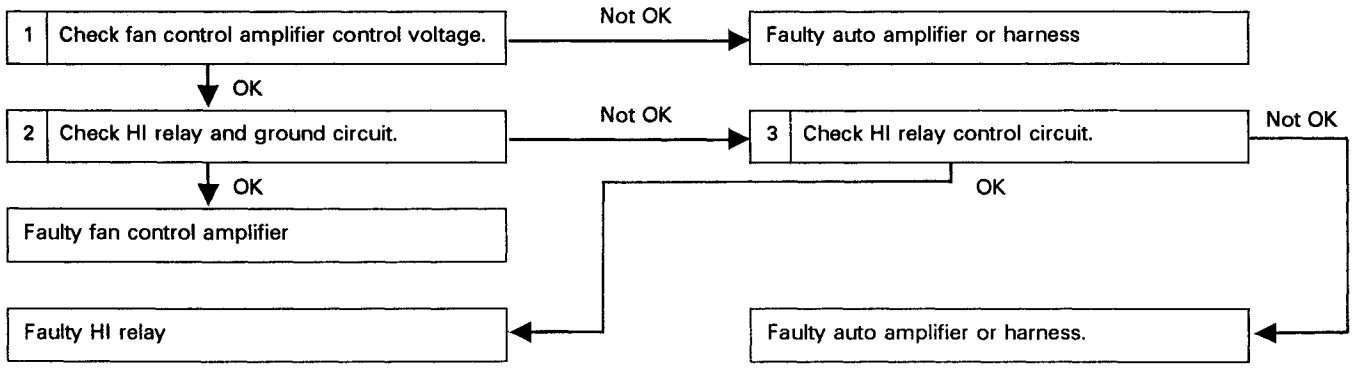


Fig. 192

D: BLOWER MOTOR SPEED DOES NOT CHANGE.

CONTENTS OF DIAGNOSIS:
Faulty auto amplifier, fan control amplifier or HI relay

TROUBLE SYMPTOM:
Blower motor speed does not change but is constant.



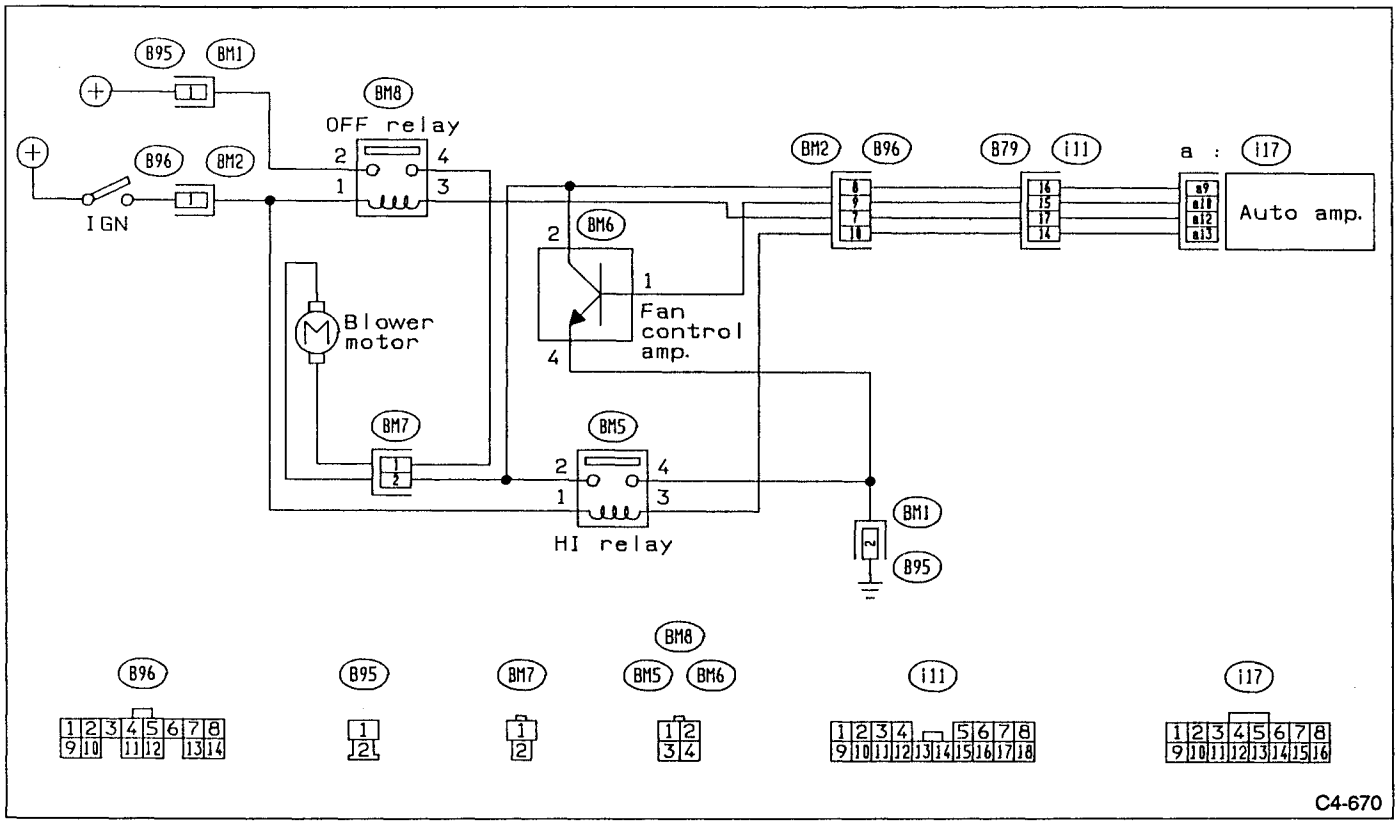


Fig. 193

1. CHECK FAN CONTROL AMPLIFIER CONTROL VOLTAGE.

1) Remove the glove box.
2) Turn the ignition switch to "ON".
3) Measure voltage between fan control amp. connector terminal and body.

Connector & Terminal/Specified voltage:
AUTO switch ON
FAN switch Low•Med
(BM6) No. 1 — Body/Approx. 1.0 — 2.0 V

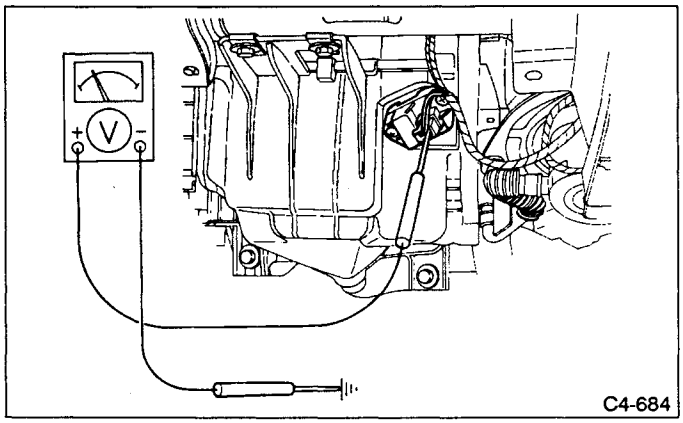


Fig. 194

2. CHECK HI RELAY OPERATION AND GROUND CIRCUIT.

1) Disconnect fan control amp. connector.
2) Turn the ignition switch to "ON".
3) Measure voltage between HI relay connector terminal and body.

Connector & Terminal/Specified voltage:
AUTO switch ON
FAN switch HI
(BM5) No. 2 — Body/Approx. 0 V
FAN switch Low•Med
(BM5) No. 2 — Body/Approx. 12 V

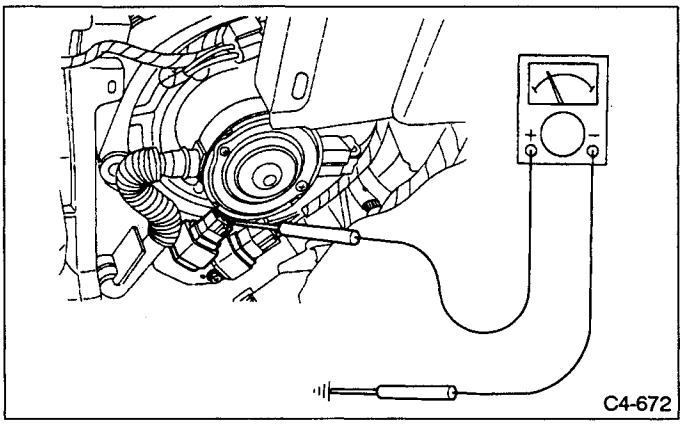


Fig. 195

3. CHECK HI RELAY CONTROL CIRCUIT.

1) Turn the ignition switch to "ON".
2) Measure voltage between HI relay connector terminal and body.

Connector & Terminal/Specified voltage:
AUTO switch ON
FAN switch HI
(BM5) No. 3 — Body/Approx. 1 V max.
FAN switch Low•Med
(BM5) No. 3 — Body/Approx. 12 V

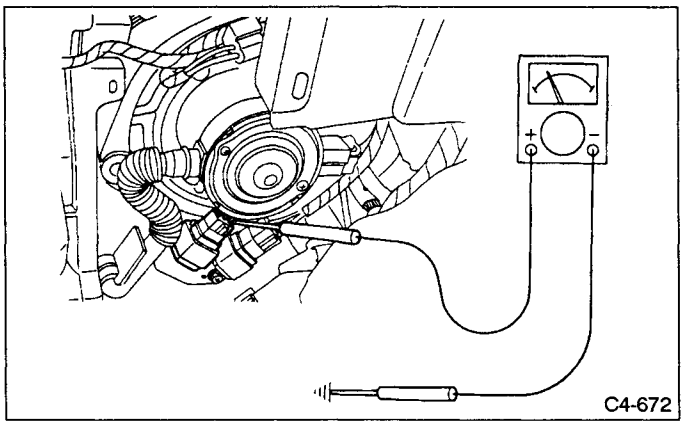
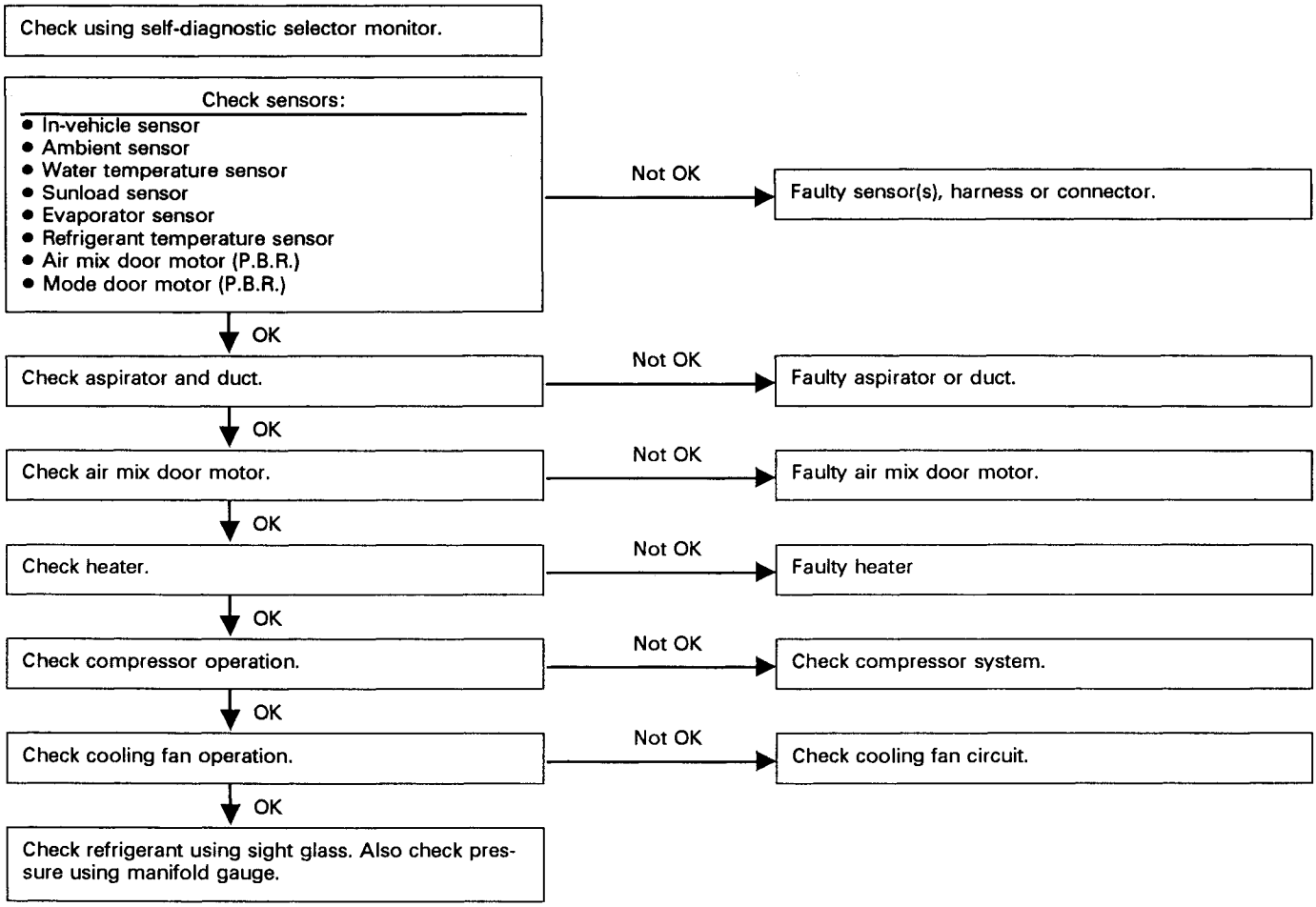


Fig. 196

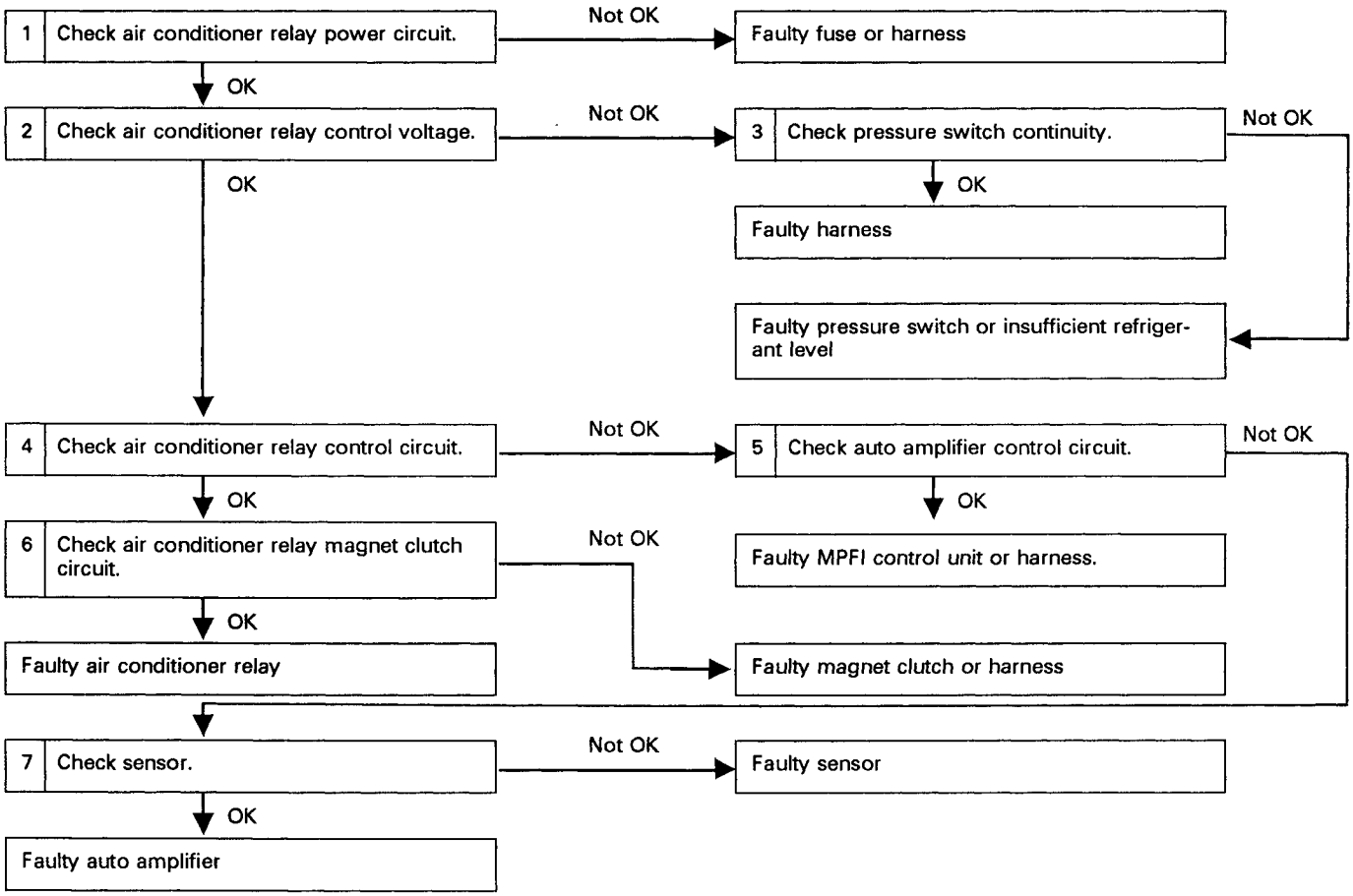
E: COMPARTMENT TEMPERATURE DOES NOT CHANGE FROM "SET" TEMPERATURE OR AIR CONDITIONING SYSTEM DOES NOT RESPOND QUICKLY.



F: MAGNET CLUTCH DOES NOT TURN ON OR OFF.

CONTENTS OF DIAGNOSIS:
Faulty fuse, harness, pressure switch, air conditioner relay, sensor or MPFI unit, or insufficient refrigerant level

TROUBLE SYMPTOM:
- Magnet clutch does not engage.
- Magnet clutch does not disengage.



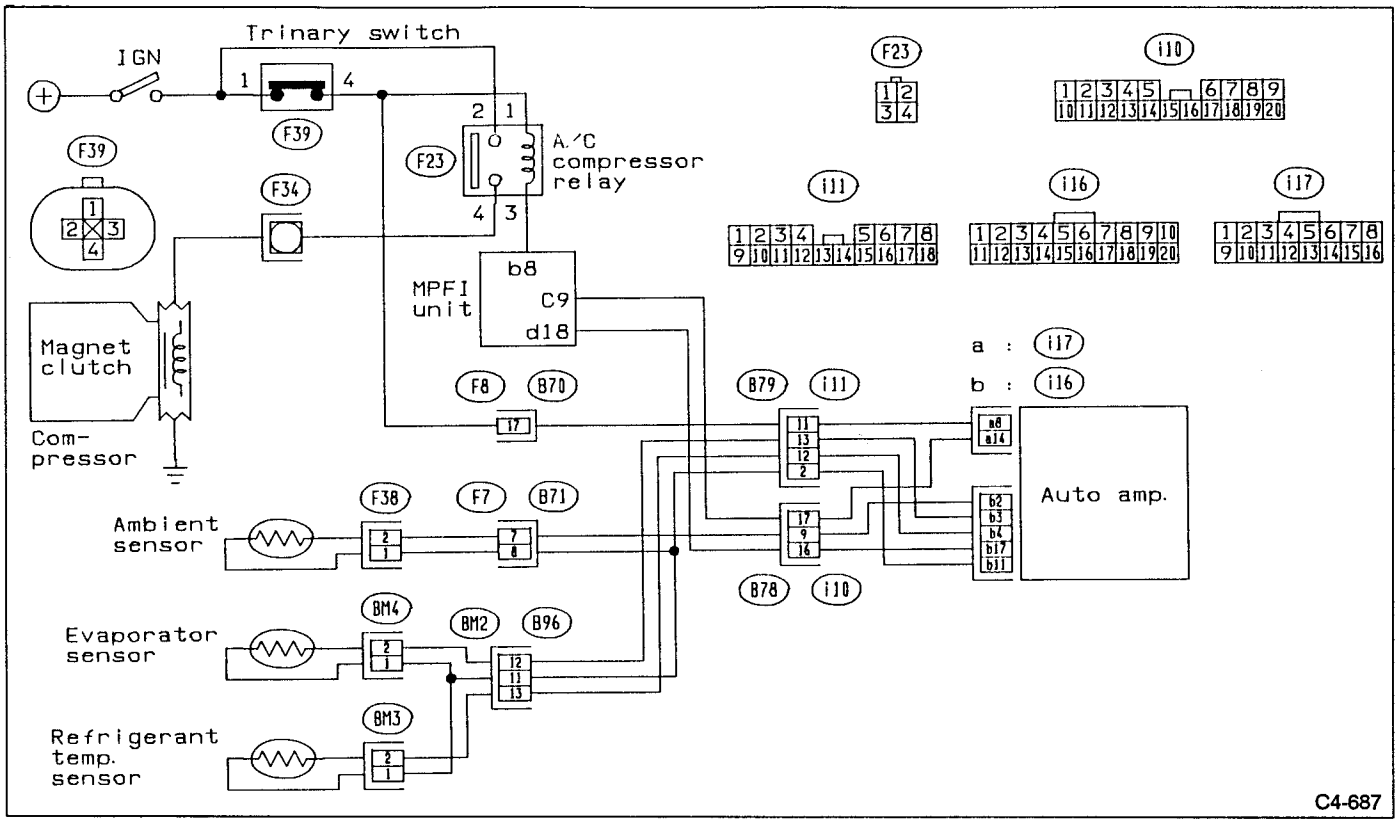

Trinary switch
IGN
F39
F23
A/C compressor relay
F34
MPFI unit
b8
C9
d18
Magnet clutch
Com-pressor
F8
B70
i17
B79
i11
a : i17
b : i16
Auto amp.
F38
F7
B71
Ambient sensor
B78
i10
BM4
BM2
B96
Evaporator sensor
BM3
Refrigerant temp. sensor
i10
i11
i16
i17
C4-687

Fig. 197

1. CHECK AIR CONDITIONER RELAY POWER CIRCUIT.

1) Remove A/C relay.
2) Turn the ignition switch to "ON".
3) Measure voltage between A/C relay connector terminal and body.

Connector & Terminal/Specified voltage:
(F23) No. 2 — Body/Approx. 12 V

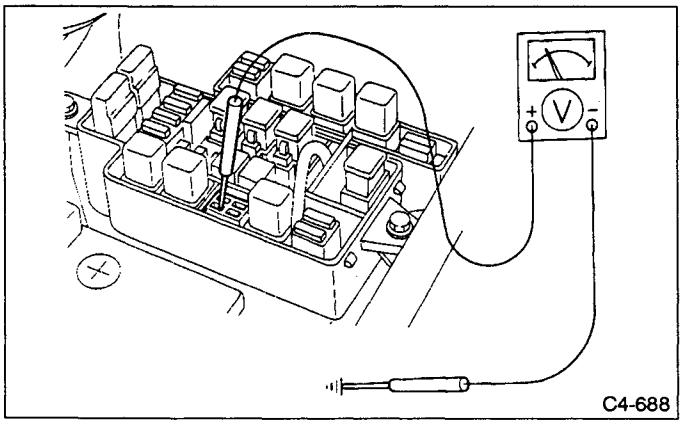


Fig. 198

2. CHECK AIR CONDITIONER RELAY CONTROL VOLTAGE.

1) Turn the ignition switch to "ON".
2) Measure voltage between A/C relay connector terminal and body.

Connector & Terminal/Specified voltage:
(F23) No. 1 — Body/Approx. 12 V

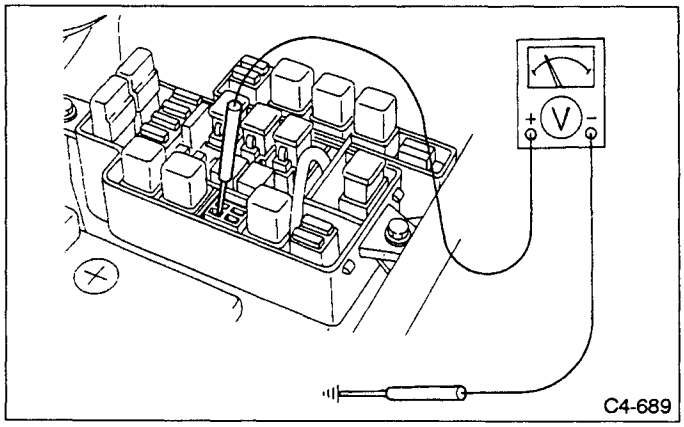


Fig. 199

3. CHECK PRESSURE SWITCH CONTINUITY.

1) Disconnect pressure switch connector.
2) Measure resistance between pressure switch terminals.

Connector & Terminal/Specified resistance:
No. 1 — No. 4/0 Ω

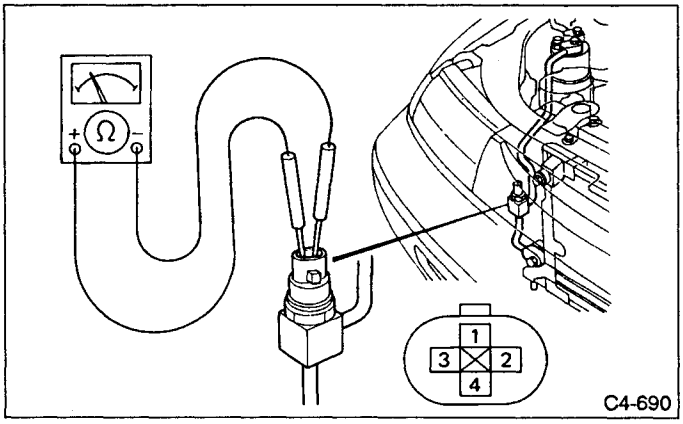


Fig. 200

4. CHECK AIR CONDITIONER RELAY CONTROL CIRCUIT.

1) Turn the ignition switch to "ON".
2) Measure voltage between A/C relay connector terminal and body.

Connector & Terminal/Specified voltage:
OFF switch ON
(F23) No. 3 — Body/Approx. 12 V
DEF switch ON
(F23) No. 3 — Body/1 V max.

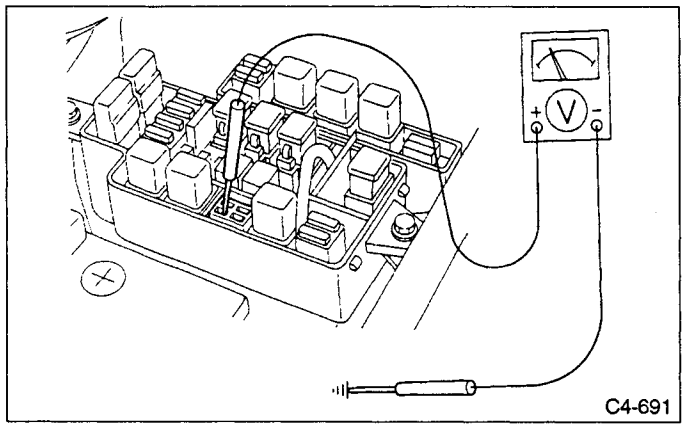


Fig. 201

5. CHECK AUTO AMPLIFIER CONTROL CIRCUIT.

1) Turn the ignition switch to "ON".
2) Measure voltage between and body.

Connector & Terminal/Specified voltage:
OFF switch ON
(i17) No. 14 — Body/Approx. 0 V
DEF switch ON
(i17) No. 14 — Body/Approx. 12 V

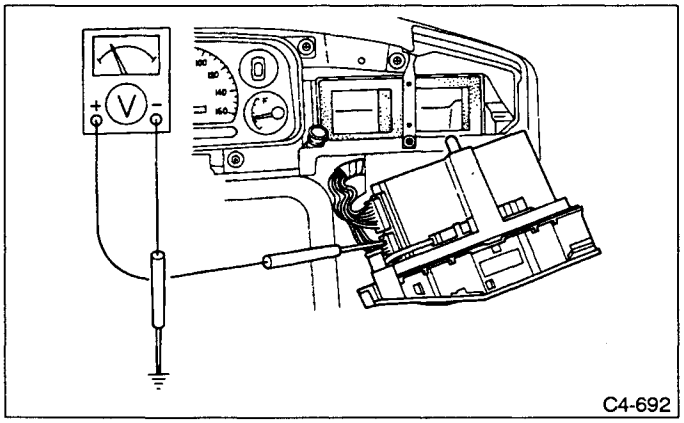


Fig. 202

6. CHECK AIR CONDITIONER RELAY MAGNET CLUTCH.

1) Remove A/C relay.
2) Measure resistance between A/C relay connector terminal and body.

Connector & Terminal/Specified resistance:
(F23) No. 4 — Body/Approx. 7.3 Ω

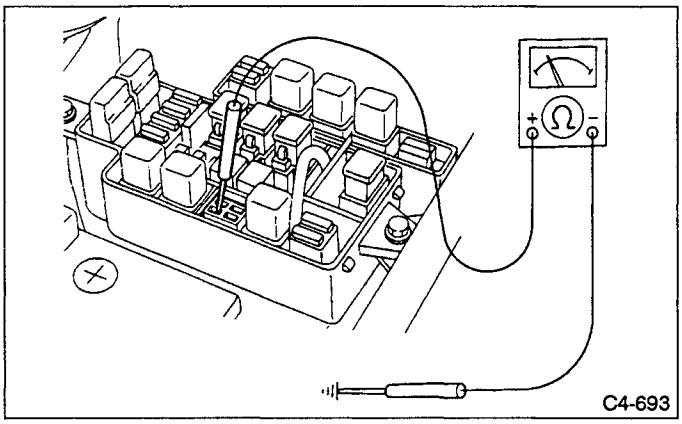


Fig. 203

7. CHECK SENSOR.

• Check sensor using self-diagnosis function "STEP [2]".

Sensors to check	Standard value
Ambient sensor	Ensure sensors and related circuits operate properly.
Evaporator sensor	
Refrigerant temperature	

G: COMPARTMENT IS NOT COOL (MAGNET CLUTCH ON).

CONTENTS OF DIAGNOSIS:
Faulty harness, solenoid actuator, auto amplifier or air mix door system.

TROUBLE SYMPTOM:
Compartment does not become cool.

1 Check solenoid actuator control current.
- Not OK → Check pressure using manifold gauge.
- OK ↓

2 Check air mix door.
- Not OK → Faulty air mix door system or auto amplifier
- OK ↓

Check pressure using manifold gauge.

3 Check solenoid actuator resistance.
- Not OK → Faulty solenoid actuator
- OK ↓

Faulty auto amplifier or harness

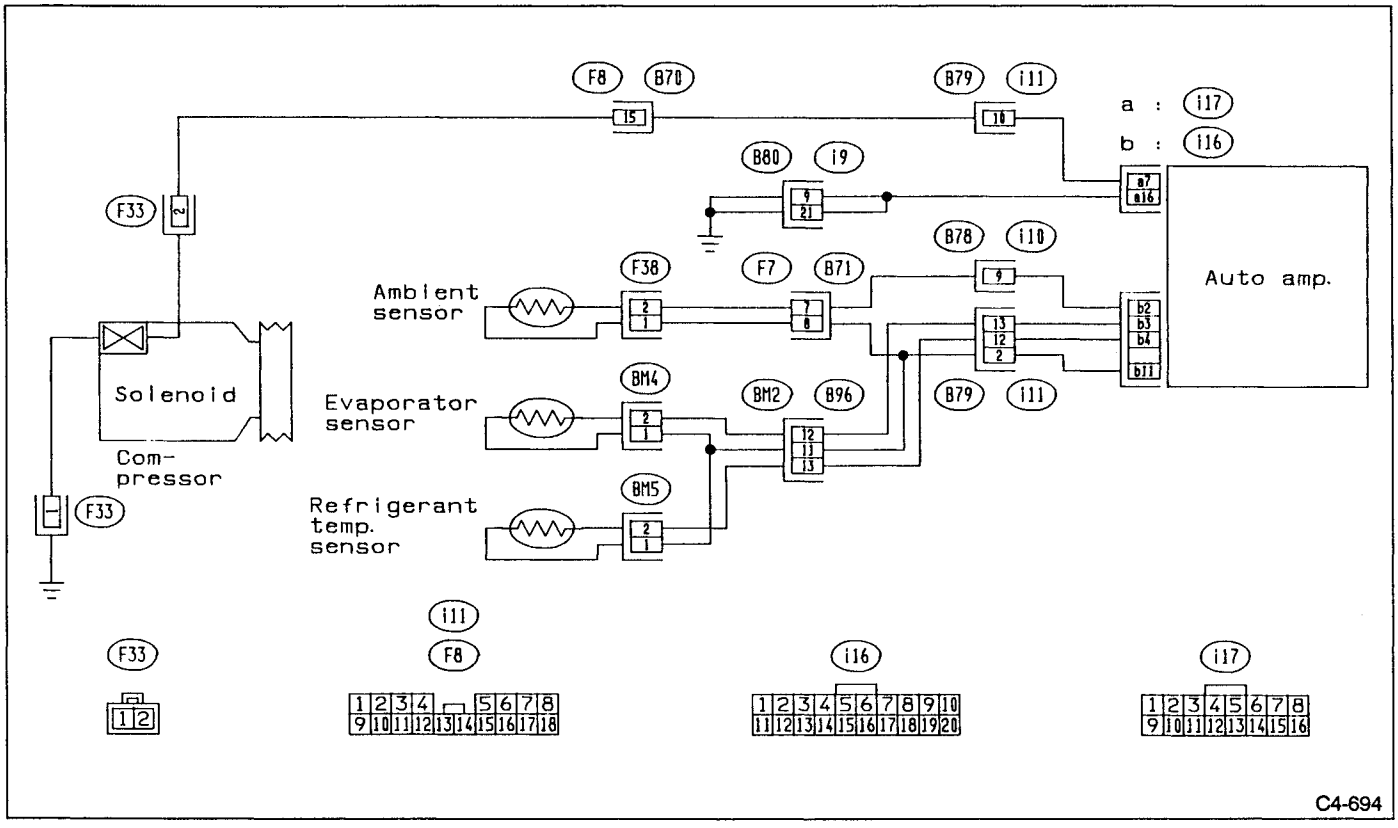


Fig. 204

1. CHECK SOLENOID VALVE CONTROL CURRENT.

1) Set to self-diagnostic function "STEP [3]".
2) Disconnect solenoid actuator.
3) Measure ampere between solenoid actuator connector terminal and body harness connector.

Connector & Terminal/Specified ampere:
(F23) No. 2 ⊕ (Body harness) — No. 2 ⊖ (Solenoid)/
Display 41 0 A
Display 42 0.65 A

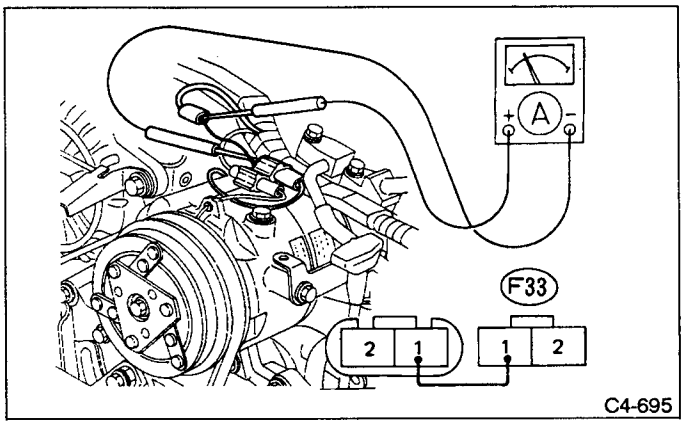


Fig. 205

2. CHECK AIR MIX DOOR.

1) Set to self-diagnosis function "STEP [3]".
2) Visually inspect link movement to check air mix door position.

Specified position:
Display 42 Max. hot
Display 43 50%
Display 44 Max. cold

3. CHECK SOLENOID ACTUATOR RESISTANCE.

1) Remove solenoid actuator connector.
2) Measure resistance between solenoid actuator connector terminals.

Connector & Terminal/Specified resistance:
No. 2 — No. 1/Approx. 6 — 11 Ω

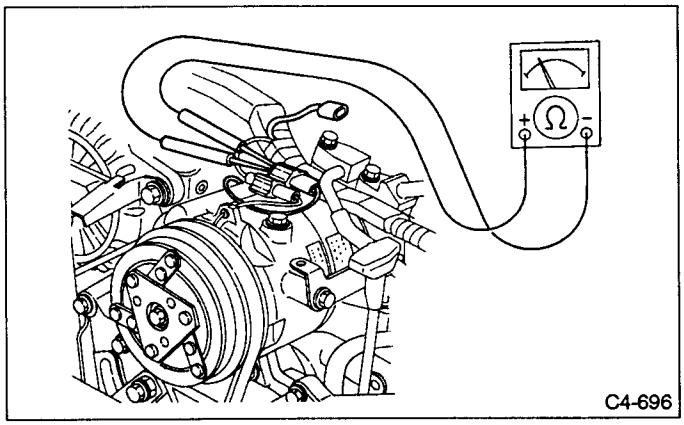


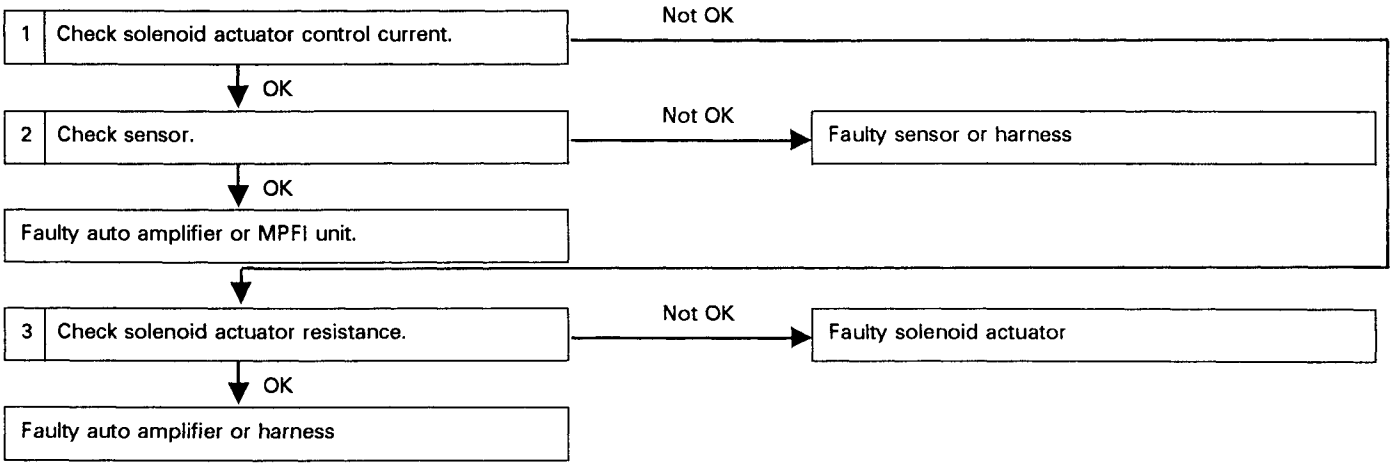
Fig. 206

H: MAGNET CLUTCH CYCLES ON AND OFF CONTINUALLY.

CONTENTS OF DIAGNOSIS:
Faulty solenoid actuator, sensor, harness or auto amplifier

TROUBLE SYMPTOM:
Magnet clutch cycles ON and OFF when ambient temperatures are higher than 10°C (50°F).

Magnet clutch can sometimes turn ON and OFF even when ambient temperatures are lower than approximately 10°C (50°F). This indicates that freeze- protection function is operating and is not a problem.



1. CHECK SOLENOID VALVE CONTROL CURRENT.

1) Set to self-diagnosis function "STEP [3]".
2) Disconnect solenoid actuator.
3) Measure ampere between solenoid actuator connector terminal and body harness connector.

Specified ampere:
(F33) No. 2 ⊕ (Body harness) — No. 2 (Solenoid actuator)/Display 41 0 A
Display 42 0.65 A

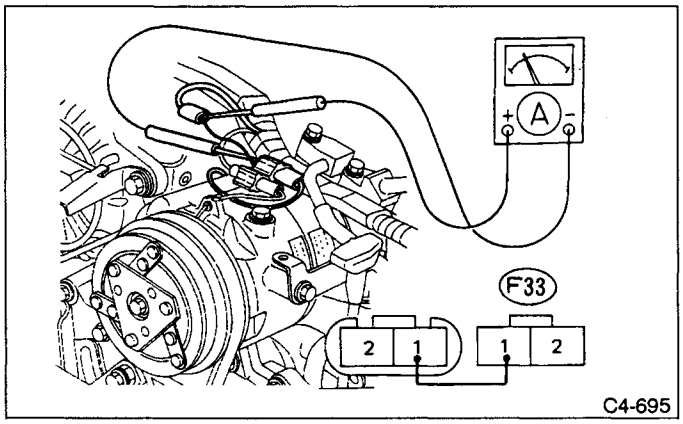


Fig. 207

2. CHECK SENSORS.

- Use self-diagnosis function "STEP [2]".

Sensors to check	Standard value
Ambient sensor	Ensure sensors and their circuits are in good condition.
Evaporator sensor	
Refrigerant temperature sensor	

3. CHECK SOLENOID VALVE ACTUATOR RESISTANCE.

1) Disconnect solenoid valve actuator connector.
2) Measure resistance between solenoid valve connector terminals.

Connector & Terminal/Specified resistance:
No. 2 — No. 1/Approx. 6 — 11 Ω

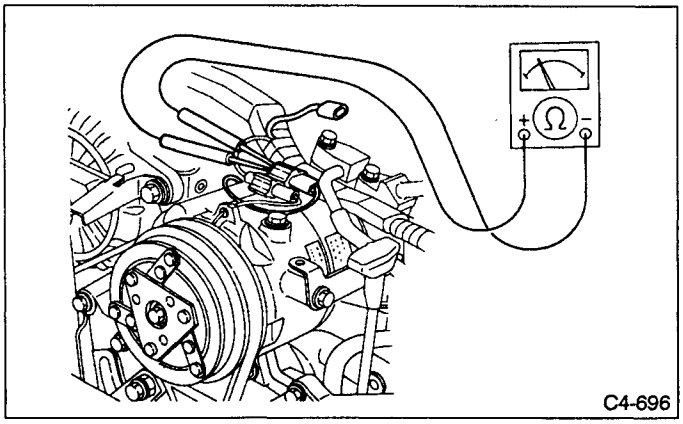


Fig. 208

9. Basic Check

Start and warm up engine completely.

1. BASIC CHECK

1) Inspection using switches.

No.	Point to check	Switch operation	Judgement standard
1	OFF switch	① OFF switch "ON"	① LED on panel and "set" temperature display go out. • Air flow → OFF • Outlet → HEAT • Inlet → FRESH • Compressor → OFF
2	AUTO switch	① AUTO switch "ON" ② Temp. control switch 18°C (65°F) (Max. Cold)	① AUTO switch LED illuminates. ② • Outlet air → Cool • Air flow → HI (AUTO) • Outlet → VENT • Inlet → AUTO • Compressor → AUTO
		TEMP control switch is gradually set from 18°C (65°F) to 32°C (85°F).	③ Air and air outlet mode change as follows: • Outlet air: cool → hot • Air flow: AUTO • Outlet: VENT → BILEVEL → HEAT • Inlet: AUTO
		④ Temp. control switch 32°C (85°F) (Max. Hot)	④ Outlet air → Hot • Air flow → HI (AUTO) • Outlet → HEAT • Inlet → FRESH (AUTO) • Compressor → AUTO
3	ECON switch	① ECON switch "ON" ② Temp. control switch 18 — 32°C (65 — 85°F)	① ECON switch LED illuminates. ② • Outlet air temperature • Air flow AUTO control • Outlet • Inlet → FRESH • Compressor OFF
4	DEF switch	① DEF switch "ON" ② Temp. control switch 18 — 32°C (65 — 85°F)	① DEF switch LED illuminates. ② • Outlet air temperature AUTO control • Air flow • Outlet → DEF • Inlet → FRESH • Compressor → ON
5	VENT switch	① VENT switch "ON"	① VENT switch LED illuminates and "set" temperature display goes out. • Outlet air → Ambient temperature • Air flow → ME (7.5 V) • Outlet → VENT • Inlet → FRESH • Compressor → OFF
6	CIRC switch	① CIRC switch "ON"	① CIRC switch LED illuminates. • Inlet: Set to "RECIRC" for 10 minutes, then to "FRESH". (CIRC switch lamp goes out.)
7	FAN switch	① FAN switch "ON" ② LO switch "ON" ③ MED switch "ON" ④ HI switch "ON"	① LED corresponding to switch pressed illuminates. ② Air flow → LO ③ Air flow → ME ④ Air flow → HI
8	OUT-TEMP switch	① OUT-TEMP switch "ON"	① Ambient temperature flashes on "set" temperature display, and "set" temperature appears.

2) Compressor operation inspection

No.	Point to check	Switch operation	Judgement standard	Remarks
1	Compressor	① DEF switch "ON" ② ECON switch "ON" ③ DEF switch "ON"	① Compressor ON ② Compressor OFF ③ Compressor ON	Compressor turns OFF several seconds after ECON switch is turned ON.

3) Illumination control inspection

No.	Point to check	Switch operation	Judgement standard	Remarks
1	Illumination switch	Lighting switch "ON"	① Illumination lamp illuminates and both switch lamp and "set" temperature display dim. • Switch lamps: OFF → Green lamp illuminates. ON → Amber lamp illuminates.	Green lamps remain on although OFF and OUT-TEMP switches are ON.

2. INSPECTION USING SIGHT GLASS

When high-pressure line is greater than 588 kPa (6 kg/cm², 85 psi) observe sight glass to check refrigerant amount.

Correct amount of refrigerant cannot be judged if the line pressure is less than 588 kPa (6 kg/cm², 85 psi) since air bubbles flow through system.

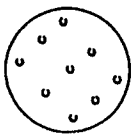
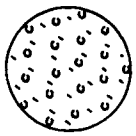
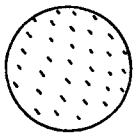
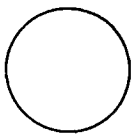
Item to check	Adequate	Insufficient	Almost in refrigerant	Too much refrigerant
State in sight glass	CLEAR Air bubbles sometimes appear when engine speed is increased or decreased 	FOAMY Or BUBBLY Air bubbles always appear. 	FROSTY Frost-like appears. 	NO FOAM NO air bubbles appear. 
Temperature of high and low pressure lines	High-pressure side is hot while low-pressure side is cold. (A big temperature difference between high and low-pressure side.)	High-pressure side is warm and low-pressure side is slightly cold. (Not so big temperature difference between high and low-pressure side.)	There is almost no temperature difference between high and low- pressure side.	High-pressure side is hot and low-pressure side is slightly warm. (Slight temperature difference between and low pressure side.)
Pressure of system	Both pressures on high and low-pressure sides are normal.	Both pressures on high and low-pressure sides are slightly low.	High-pressure side is abnormally low.	Both pressures on high and low-pressure sides are abnormally high.

Fig. 209 B4-712

3. INSPECTION USING MANIFOLD GAUGE

Standard pressure:
High-pressure side
Approx. 1,275 — 1,471 kPa (13 — 15 kg/cm², 185 — 213 psi)
Low-pressure side
Approx. 196 kPa (2 kg/cm², 28 psi)

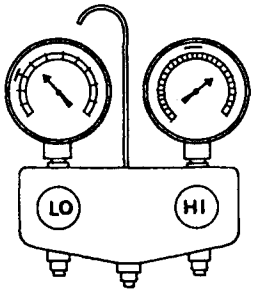
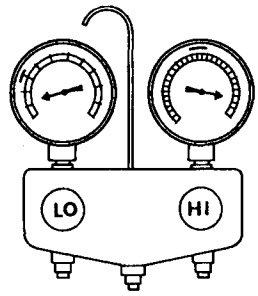
Connect manifold gauge and read pressure gauge indication.

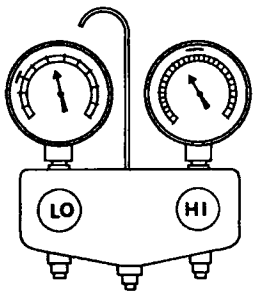
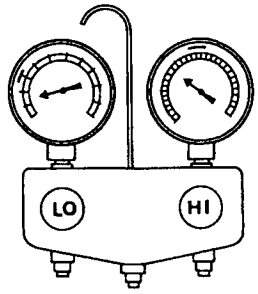
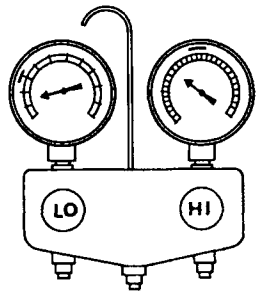
Vehicle conditions:

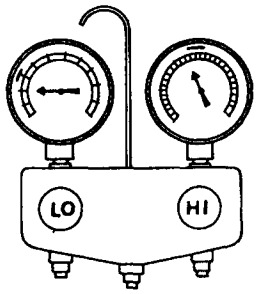
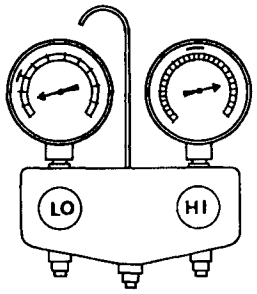
Windows ..... Open
Engine speed ..... 1,500 — 1,700 rpm
Blower fan speed ..... HI
Inlet ..... FRESH
"Set" temperature display ..... 18°C (65°F)

10. Trouble Diagnosis for Abnormal Pressure

Whenever abnormal pressure in the high and/or low sides of the system is noted. Diagnosis must be conducted by using a gauge manifold. The thick-line zone on the gauge scale (see illustrations) shown in the following table refers to the standard (normal) pressure.

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high- and low-pressure sides are too high.  B4-713 *Fig. 210*	Pressure is reduced soon after water is splashed on condenser. No air bubbles appear in sight glass when pressure is reduced.	Excessive refrigerant charge in refrigeration cycle	Reduce refrigerant until specified pressure is obtained.
	Air suction by radiator or condenser fan is insufficient.	Insufficient condenser cooling performance ↓ 1) Condenser fin is clogged. 2) Improper rotation of radiator fan or condenser fan	• Clean condenser. • Check and repair cooling fan as necessary.
	• Low-pressure pipe is not cold. • When compressor is stopped, high-pressure value quickly drops by approximately 196 kPa (2 kg/cm^2, 28 psi). It will then decrease gradually thereafter.	Poor heat exchange in condenser (After compressor operation stops, high pressure decreases too slowly.) ↓ Air in refrigeration cycle	Evacuate repeatedly and recharge system.
	Engine tends to overheat.	Engine cooling systems malfunction.	Check and repair each engine cooling system.
	• Area near low-pressure pipe connection and service valves are considerably cold as compared with area near expansion valve outlet or evaporator. • Parts are sometimes covered with frost.	• Excessive liquid refrigerant on low-pressure side • Excessive refrigerant discharge flow • Expansion valve is open a little compared with the specification. ↓ 1)Improper thermal valve installation 2)Improper expansion valve adjustment	Replace expansion valve.
High-pressure side is too high and low-pressure side is too low.  B4-714 *Fig. 211*	Upper side of condenser and high-pressure side are hot, however, receiver drier is not so hot.	High-pressure hose or parts located between compressor and condenser are clogged or crushed.	• Check and repair or replace malfunctioning parts. • Check compressor oil for contamination.

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
High-pressure side is too low and low-pressure side is too high.  B4-715 *Fig. 212*	High- and low-pressure sides become equal soon after compressor operation stops.	Compressor pressure operation is improper. ↓ Damaged inside packings for compressor	Replace compressor.
	No temperature difference between high and low- pressure sides	Compressor discharge capacity does not change. (Compressor stroke is set at maximum.)	Replace compressor.
Both high- and low-pressure sides are too low.  B4-716 *Fig. 213*	• There is a big temperature difference between receiver drier outlet and inlet. Outlet temperature is extremely low. • Receiver drier inlet and expansion valve are frosted.	Receiver drier inside is clogged a little.	• Replace receiver drier • Check compressor oil for contamination.
	• Temperature of expansion valve inlet is extremely low as compared with areas near receiver drier. • Expansion valve inlet may be frosted. • Temperature difference occurs somewhere in high-pressure side.	High-pressure pipe located between receiver drier and expansion valve is clogged.	• Check and repair malfunctioning parts. • Check compressor oil for contamination.
Both high and low-pressure sides are too low.  B4-716 *Fig. 214*	There is a big temperature difference between expansion valve inlet and outlet while the valve itself is frosted.	Expansion valve becomes closed a little compared with the specification. ↓ 1) Improper expansion valve adjustment 2) Malfunctioning thermal valve 3) Outlet and inlet may be clogged	• Remove foreign particles by using compressed air. • Check compressor oil for contamination.
	Area near low-pressure pipe connection and service valve are extremely cold as compared with area near expansion valve outlet and evaporator.	Low-pressure hose is clogged or crushed.	• Check and repair malfunctioning parts. • Check compressor oil for contamination.
	Air flow volume is not enough or low.	Evaporator is frozen ↓ Compressor discharge capacity does not change. (Compressor stroke is set at maximum length.)	Replace compressor.

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side sometimes becomes negative.  B4-718 *Fig. 215*	• Air conditioning system does not function and does not cyclically cool the compartment air. • The system constantly function for a certain period of time after compressor is stopped and restarted.	Refrigerant does not discharge cyclically. ↓ Moisture is frozen at expansion valve outlet and inlet. ↓ Water is mixed in refrigeration cycle.	• Drain water from refrigerant cycle or replace refrigerant. • Replace receiver drier.
Low-pressure side becomes negative.  B4-719 *Fig. 216*	Receiver drier or front/rear side of expansion valve's pipe is frosted or dewed.	High-pressure side is closed and refrigerant does not flow. ↓ Expansion valve or receiver drier is frosted.	After the system is left at rest, start again in order to confirm whether or not problem is caused by water or foreign particles. • If the problem is due to water, drain water from refrigeration cycle or replace refrigerant. • If it is due to foreign particles, remove expansion valve and remove it with dry and compressed air. • If either oil the above method cannot correct the problem, replace expansion valve. • Replace receiver drier. • Check compressor oil for contamination.

11. Troubleshooting Chart with Trouble Cord

A: TROUBLE CODE (11/21) — Check in-vehicle sensor circuit.

CONTENT OF DIAGNOSIS:
11: Open circuit
21: Short circuit

TROUBLE SYMPTOM:
Fan speed, outlet and inlet ports do not change when AUTO or ECON switch is ON.

1 Check in-vehicle sensor.
- Not OK → Replace in-vehicle sensor.
- OK ↓

2 Check input signals for in-vehicle sensor.
- Not OK → Repair harness. (Replace auto amplifier.)
- OK ↓

Repair Auto amplifier terminal poor contact. (Replace auto amplifier.)

• Replace and recheck.

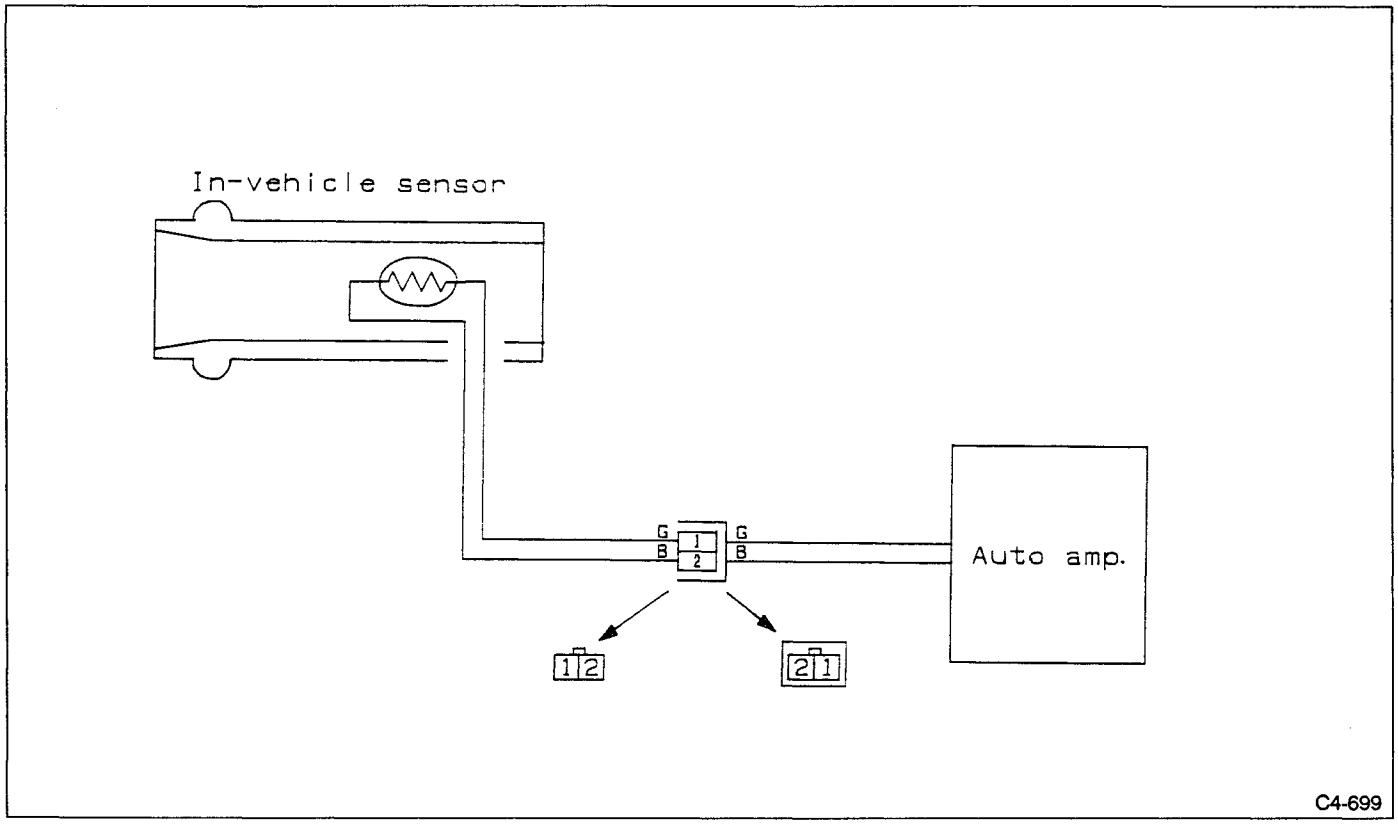


Fig. 217

1. CHECK IN-VEHICLE SENSOR.

1) Remove auto amplifier.
2) Disconnect in-vehicle sensor connector.
3) Check circuit continuity for in-vehicle sensor.
4) Measure resistance using the table below.

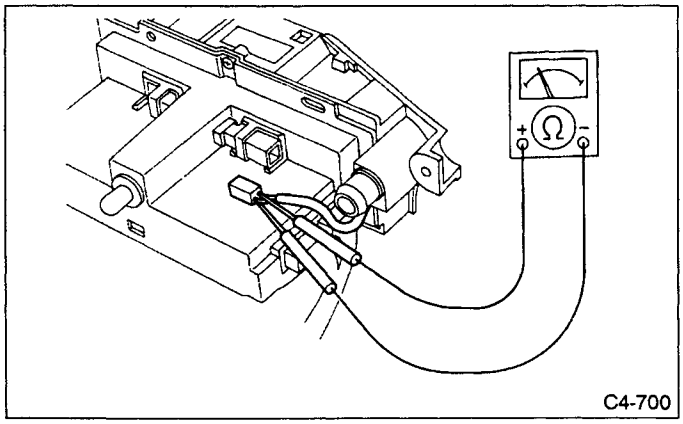


Fig. 218

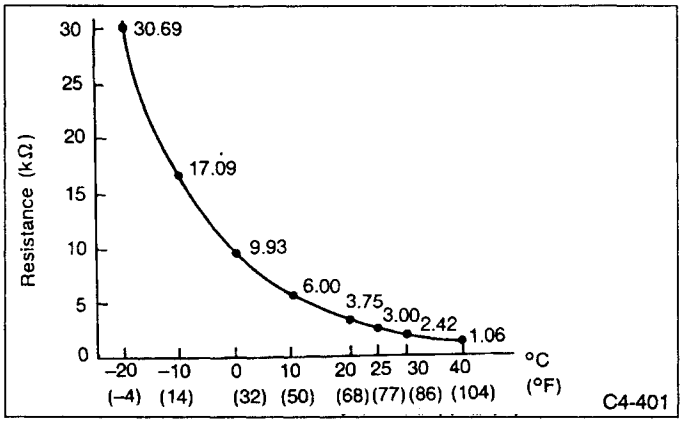


Fig. 219

2. CHECK INPUT SIGNALS FOR IN-VEHICLE SENSOR.

1) Remove auto amplifier.
2) Turn ignition switch ON.
3) Measure voltage between in-vehicle sensor connector and body.

Connector & Terminal/Specified voltage:
No. 1 — Body/Approx. 5 V

4) Measure voltage between in-vehicle sensor connector.

Connector & Terminal/Specified voltage:
No. 1 — No. 2/Approx. 5 V

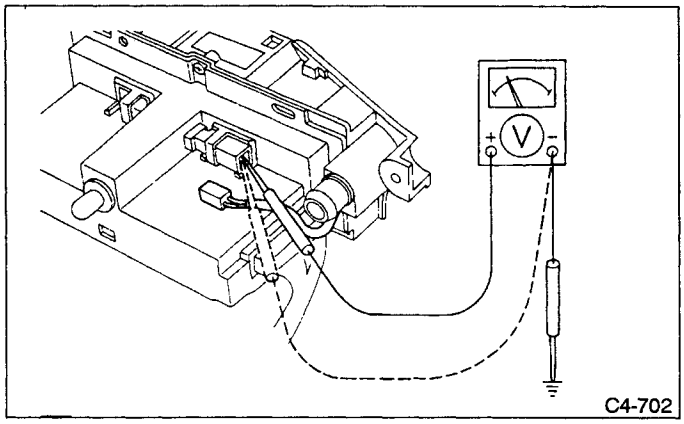


Fig. 220

B: TROUBLE CODE (12/22) — Check ambient sensor circuit.

CONTENT OF DIAGNOSIS:
12: Open circuit
22: Short circuit

TROUBLE SYMPTOM:
Fan speed, outlets and inlets are not switched when AUTO or ECON switch is ON.

1 Check ambient sensor.
- Not OK → Replace ambient sensor.
- OK ↓

2 Check input signals for ambient sensor.
- OK → Repair auto amplifier terminal poor contact. (Replace auto amplifier.)
- Not OK ↓

3 Check output signals for auto amplifier.
- Not OK → Replace and recheck.
- OK ↓

Repair harness.

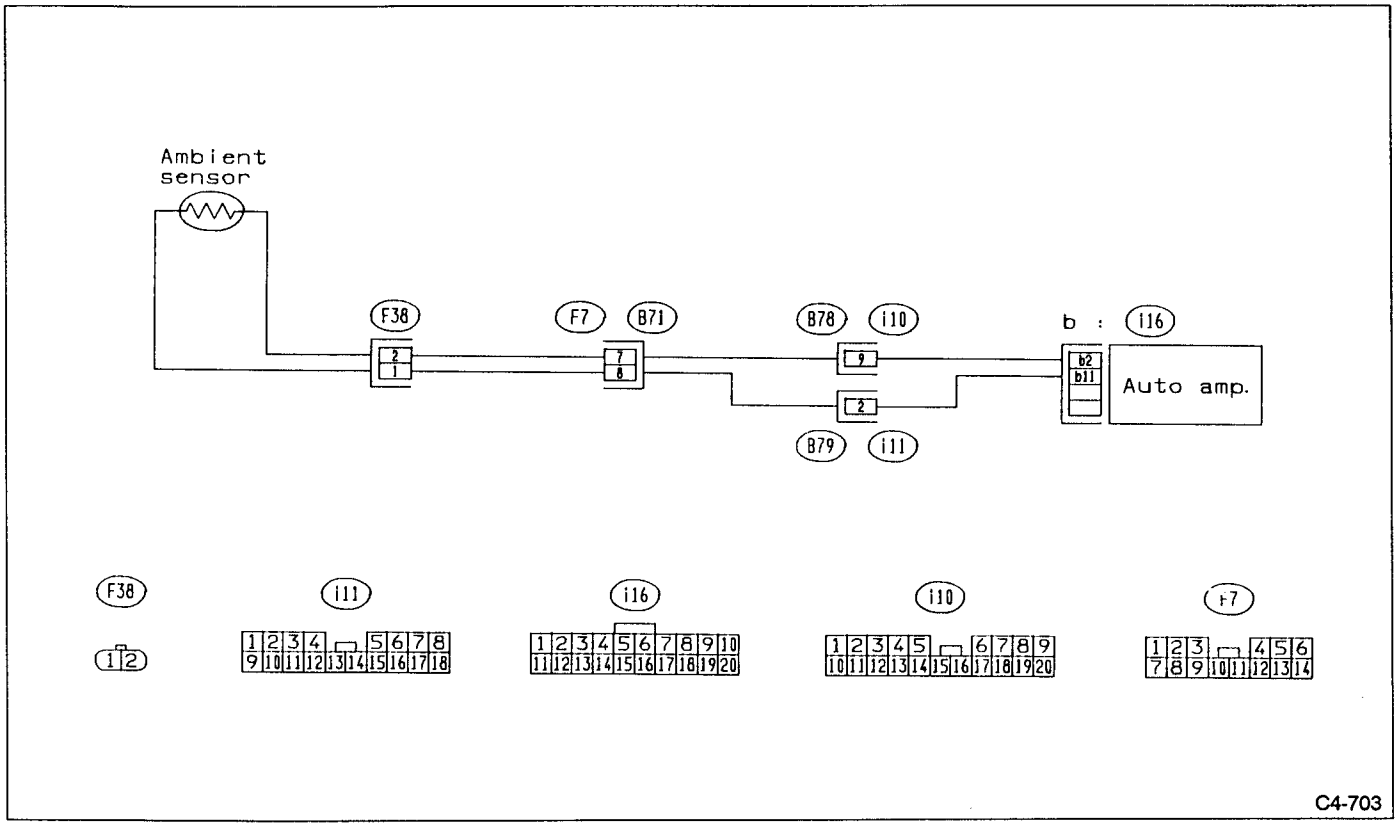


Fig. 221

1. CHECK AMBIENT SENSOR.

1) Disconnect ambient sensor connector.
2) Measure resistance using the table below.

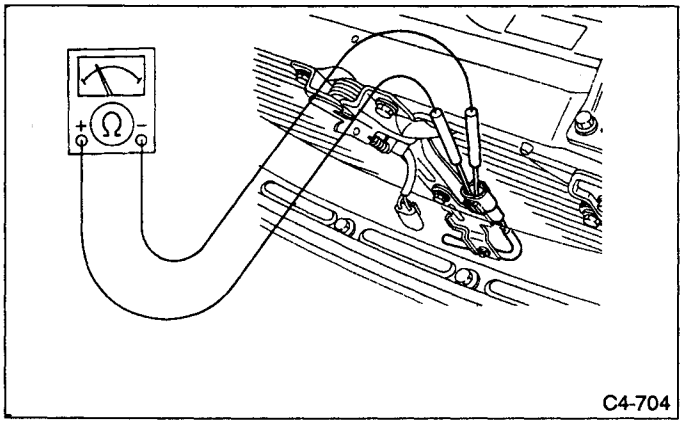


Fig. 222

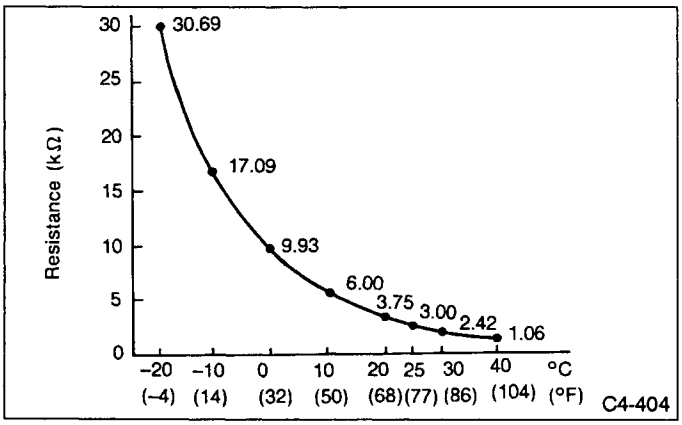


Fig. 223

2. CHECK INPUT SIGNALS FOR AUTO AMPLIFIER.

1) Turn ignition ON.
2) Measure voltage between ambient sensor connector and body.

Connector & Terminal/Specified voltage:
(F38) No. 2 — Body/Approx. 5 V

3) Measure voltage between ambient sensor connector.

Connector & Terminal/Specified voltage:
(F38) No. 1 — 2/Approx. 5 V

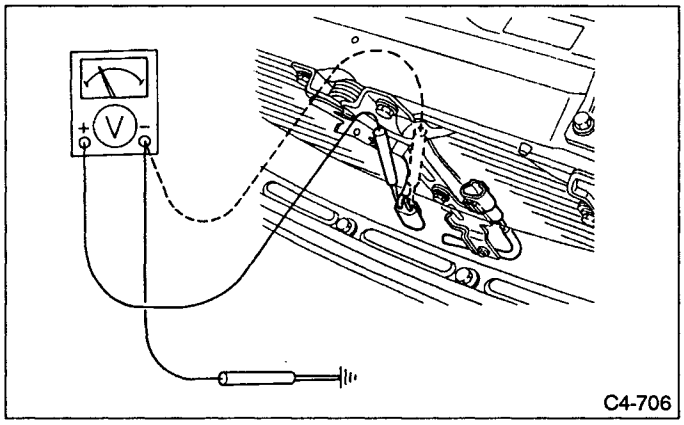


Fig. 224

3. CHECK OUTPUT SIGNALS FOR AUTO AMPLIFIER.

1) Remove auto amplifier.
2) Disconnect ambient sensor connector.
3) Turn ignition switch ON.
4) Measure voltage for auto amplifier.

Connector & Terminal/Specified voltage:
(i16) No. 2 — No. 11/Approx. 5 V

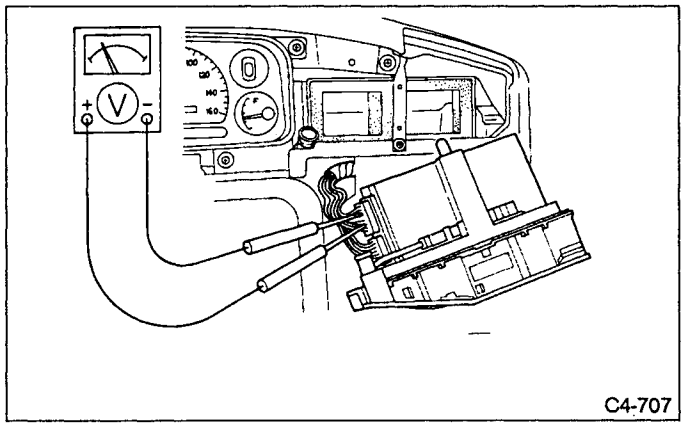


Fig. 225

C: TROUBLE CODE (13/23) — Check sunload sensor circuit.

CONTENT OF DIAGNOSIS:
13: Open circuit
23: Short circuit

TROUBLE SYMPTOM:
No sunlight is identified to control system toward "HEAT" side.

1	Check output signals for auto amplifier.	Not OK	Repair auto amplifier terminal poor contact. (Replace auto amplifier.)
	▼ OK		
2	Check input signals for auto amplifier.	Not OK	• Replace and recheck. Repair harness or replace sunload sensor.

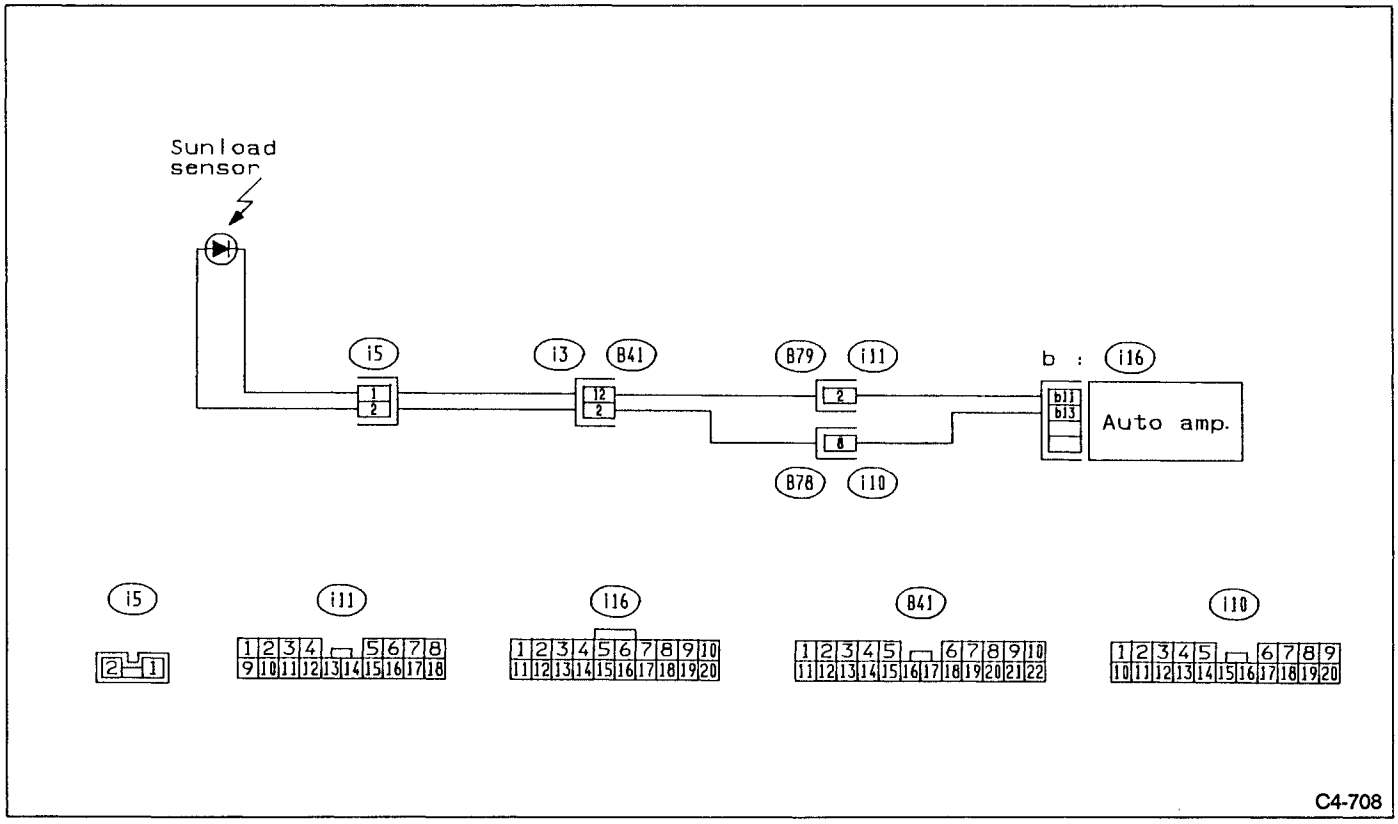


Fig. 226

1. CHECK OUTPUT SIGNALS FOR AUTO AMPLIFIER.

1) Remove auto amplifier.
2) Place cover on sunload sensor to block sunlight.
3) Turn ignition switch ON.
4) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) 13 — 11/Approx. 5 V

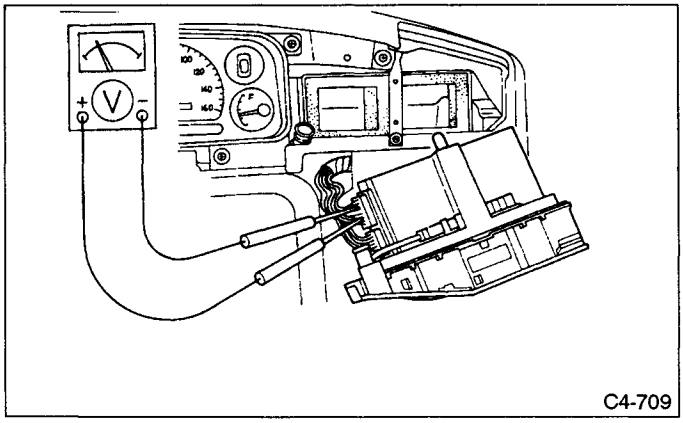


Fig. 227

2. CHECK INPUT SIGNALS FOR AUTO AMPLIFIER.

1) Remove cover from sunload sensor, allowing sunlight to hit sunload sensor.
2) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) 13 — 11/Approx. 2.94 V

If sunlight is slight, move lit 100 watt electric bulb toward sunload sensor to ensure voltage changes.

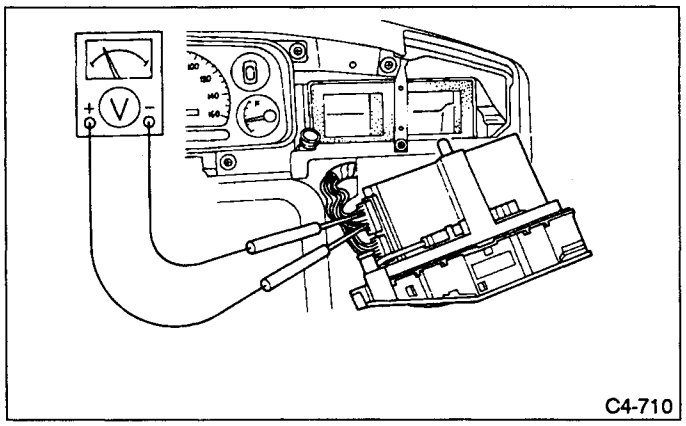


Fig. 228

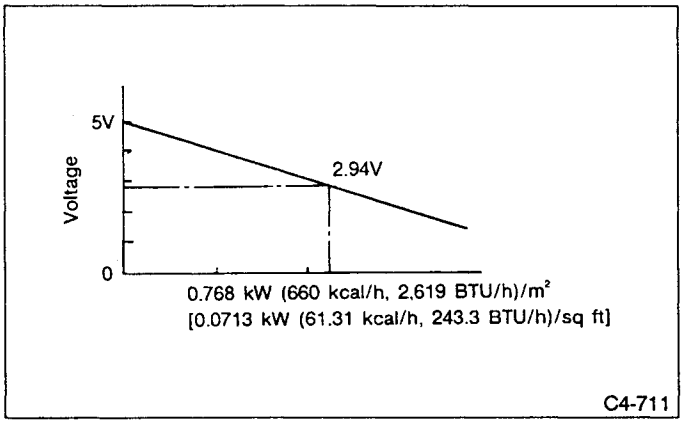
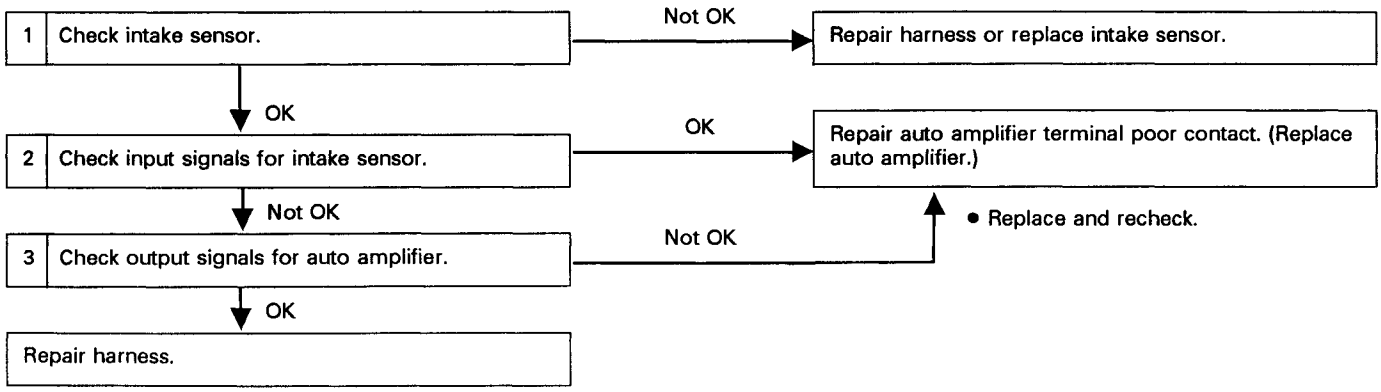


Fig. 229

D: TROUBLE CODE (14/24) — Check intake sensor circuit.

CONTENT OF DIAGNOSIS:
14: Open circuit
24: Short circuit



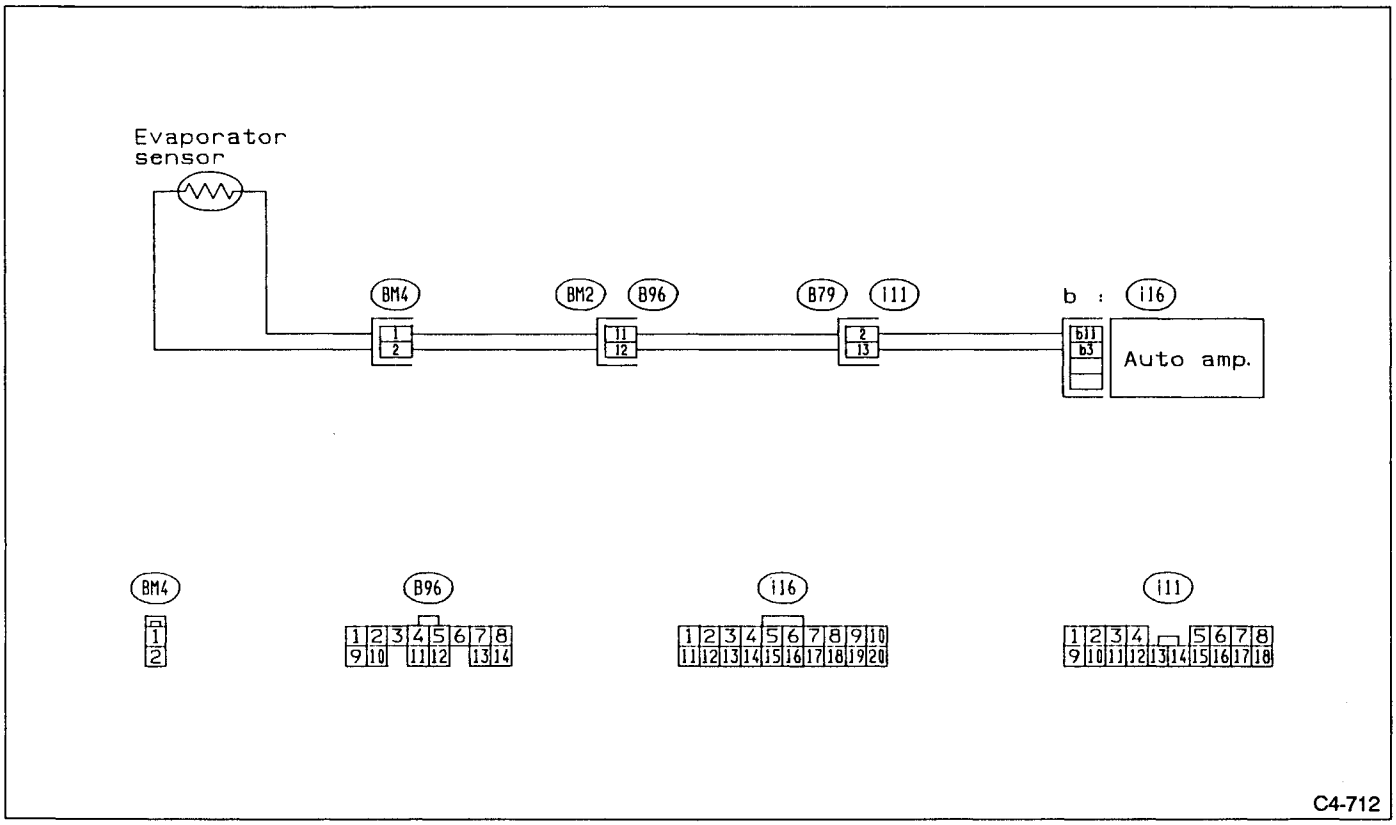


Fig. 230

1. CHECK EVAPORATOR SENSOR.

1) Remove glove box.
2) Disconnect connector (BM2).
3) Measure resistance using the table below.

Connector & Terminal:
(BM2) No. 11 — No. 12

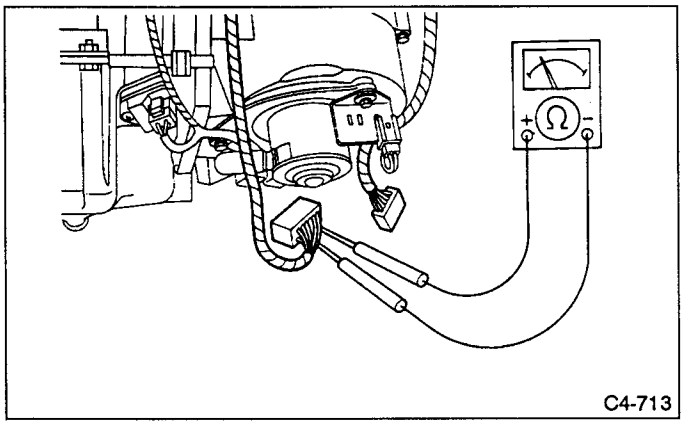


Fig. 231

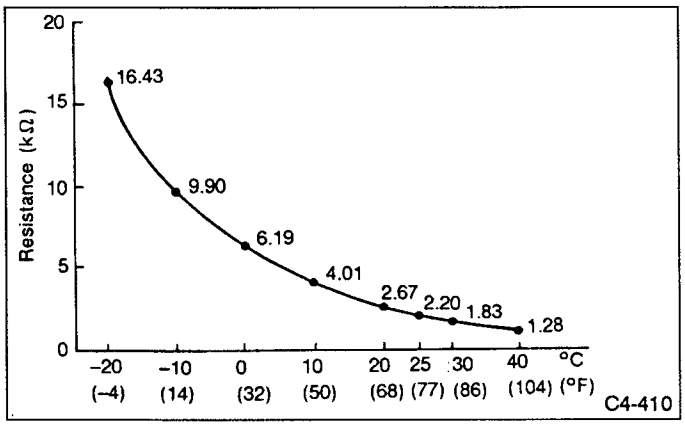


Fig. 232

2. CHECK INPUT SIGNALS FOR INTAKE SENSOR.

1) Turn ignition switch to "ON".
2) Measure voltage between connector (B96) and body.

Connector & Terminal/Specified voltage:
(B96) No. 12 — Body/Approx. 5 V

3) Measure voltage between connector (B96).

Connector & Terminal/Specified voltage:
(B96) No. 12 — 11/Approx. 5 V

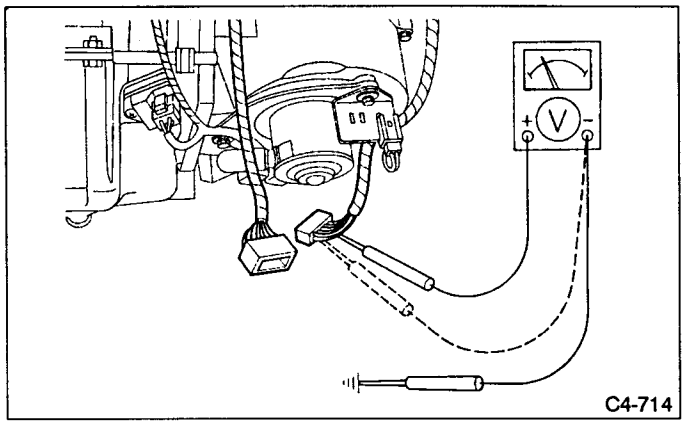


Fig. 233

3. CHECK OUTPUT SIGNALS FOR AUTO AMPLIFIER.

1) Remove auto amplifier.
2) Turn ignition switch to "ON".
3) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) No. 3 — 11/Approx. 5 V

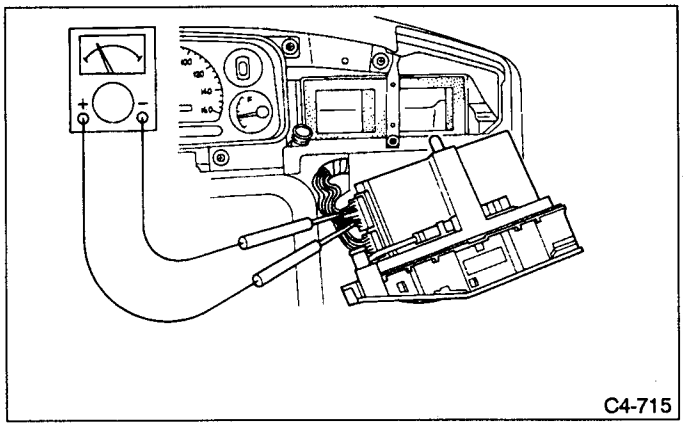
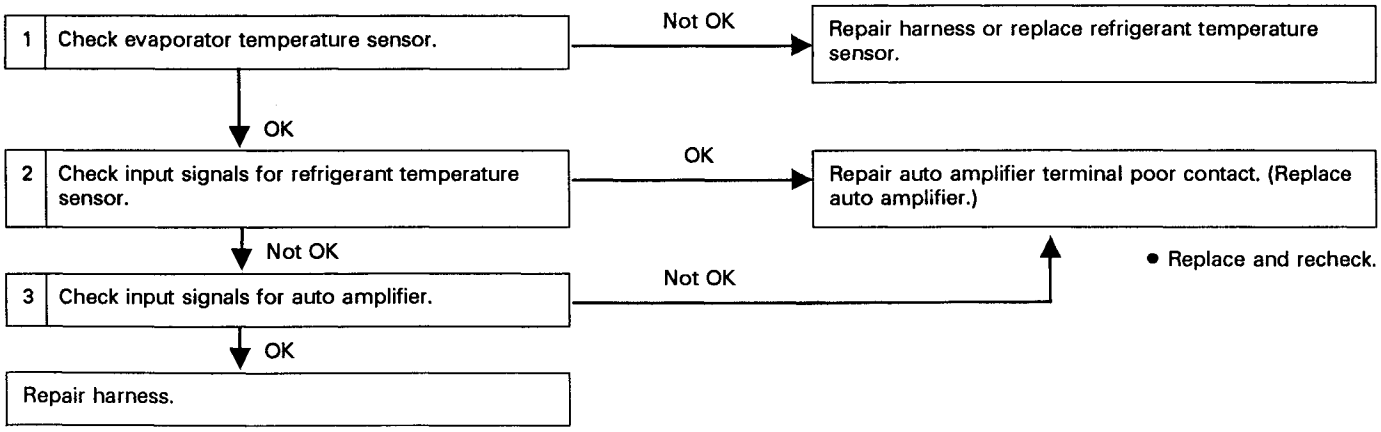


Fig. 234

E: TROUBLE CODE (15/25) — Check evaporator temperature sensor circuit.

CONTENT OF DIAGNOSIS:
15: Open circuit
25: Short circuit



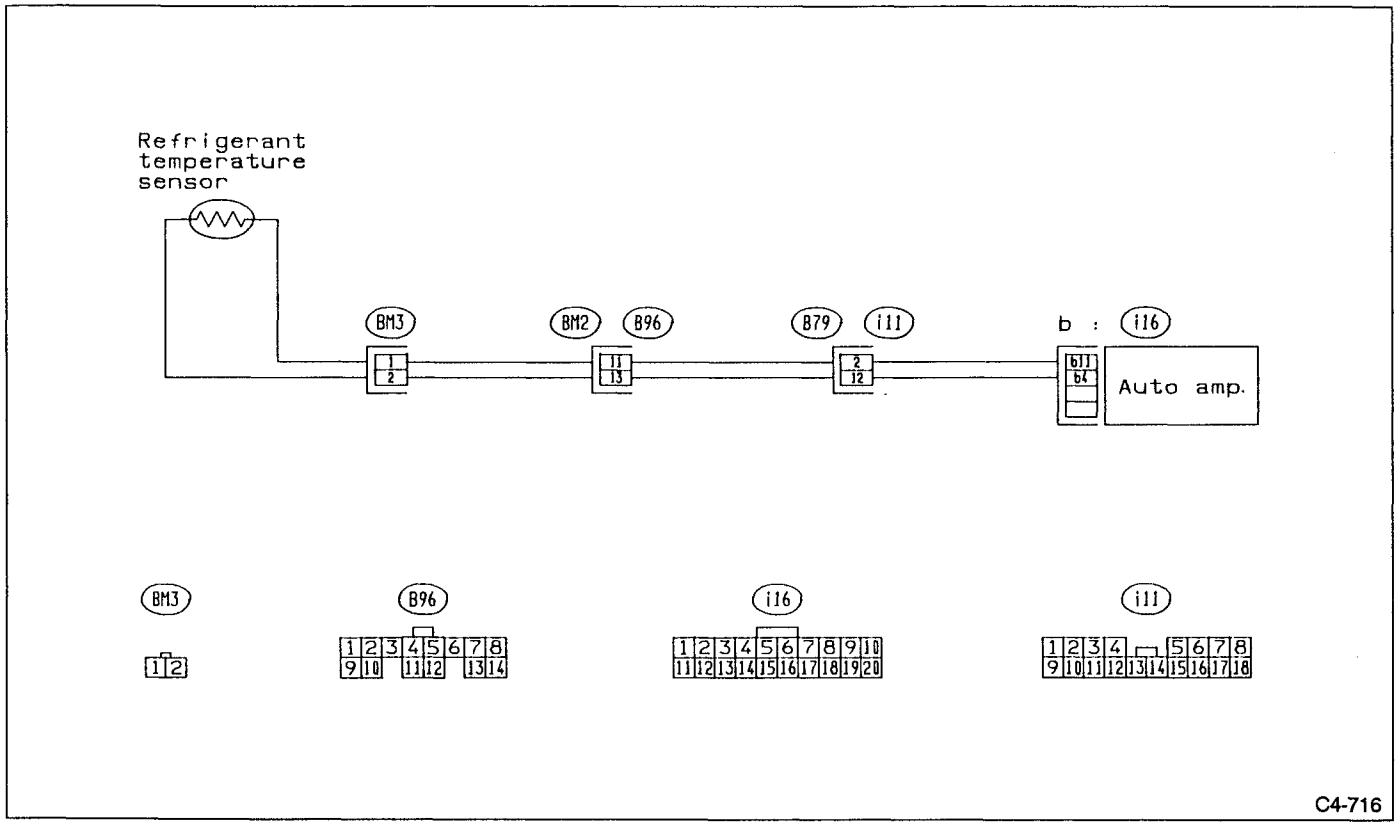


Fig. 235

1. CHECK EVAPORATOR TEMPERATURE SENSOR.

1) Remove glove box.
2) Disconnect connector (BM2).
3) Turn ignition switch to "ON".
4) Measure resistance using the table below.

Connector & Terminal:
(BM2) No. 11 — No. 13

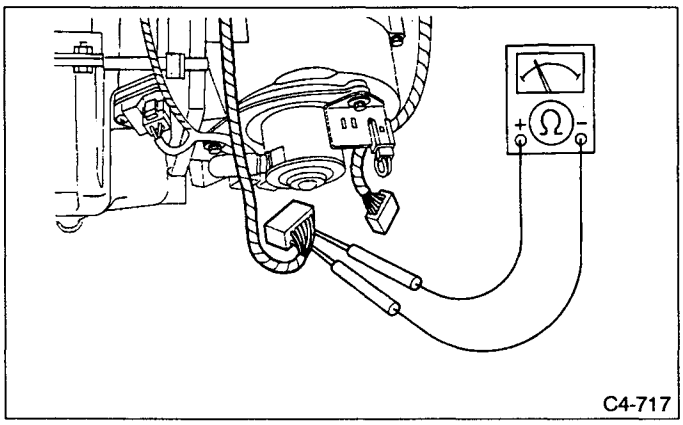


Fig. 236

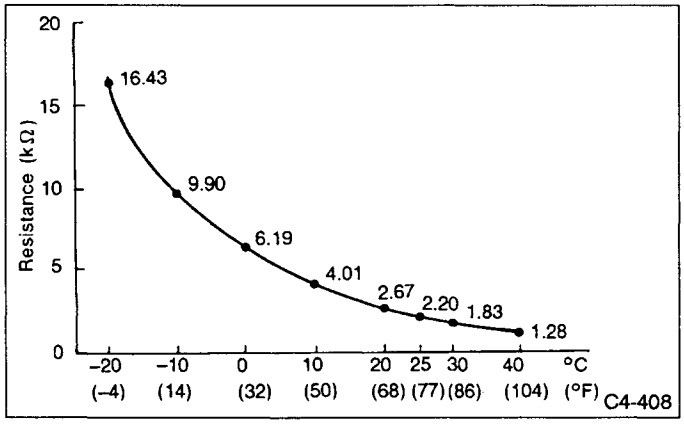


Fig. 237

2. CHECK INPUT SIGNALS FOR EVAPORATOR SENSOR.

1) Turn ignition switch to "ON".
2) Measure voltage between connector (B96) and body.

Connector & Terminal/Specified voltage:
(B96) No. 13 — Body/Approx. 5 V

3) Measure voltage between connector (B96).

Connector & Terminal/Specified voltage:
(B96) No. 13 — No. 11/Approx. 5 V

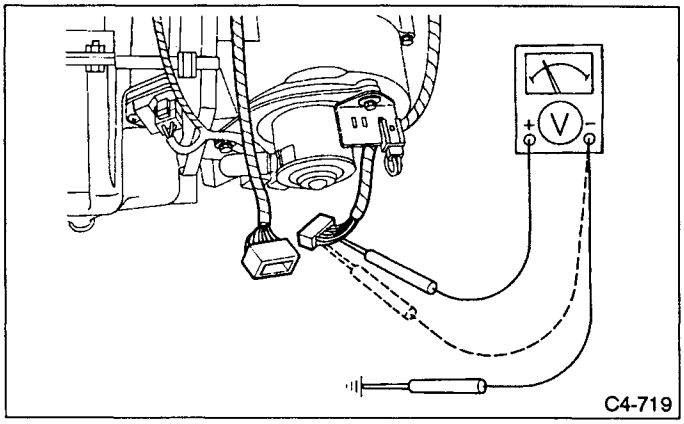


Fig. 238

3. CHECK INPUT SIGNALS FOR AUTO AMPLIFIER.

1) Remove auto amplifier.
2) Turn ignition switch to "ON".
3) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) No. 4 — 11/Approx. 5 V

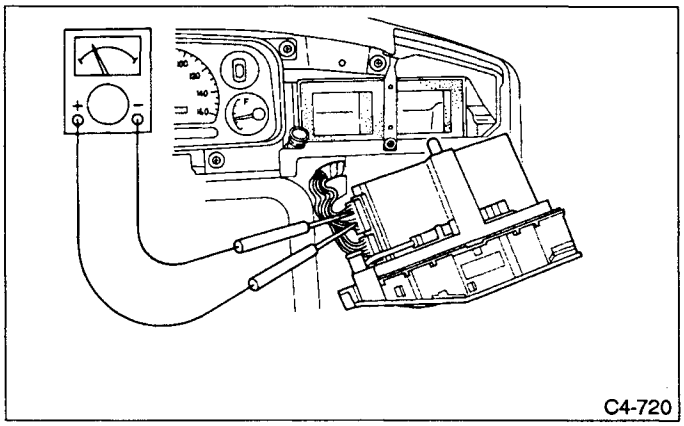


Fig. 239

F: TROUBLE CODE (16/26) — Check water temperature sensor circuit.

CONTENT OF DIAGNOSIS:
16: Open circuit
26: Short circuit

1 Check water temperature sensor.
→ Not OK → Replace water temperature sensor.
↓ OK

2 Check input signals for water temperature sensor.
→ OK → Repair auto amplifier terminal poor contact. (Replace auto amplifier.)
↓ Not OK

3 Check output signals for auto amplifier.
→ Not OK → • Replace and recheck.
↓ OK

Repair harness.

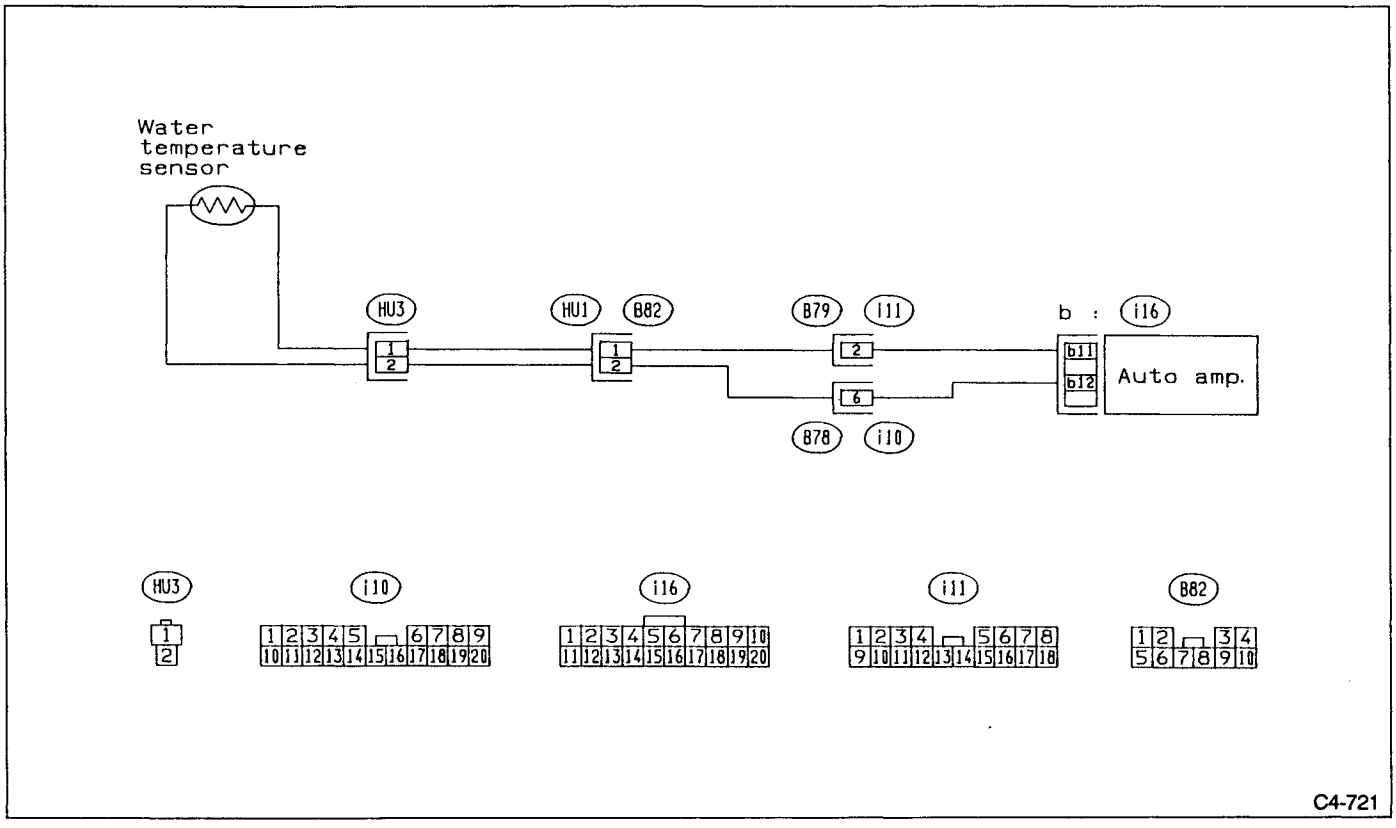


Fig. 240

1. CHECK WATER TEMPERATURE SENSOR.

1) Remove glove box.
2) Disconnect water temperature sensor connector (HU3).
3) Measure resistance using the table below.

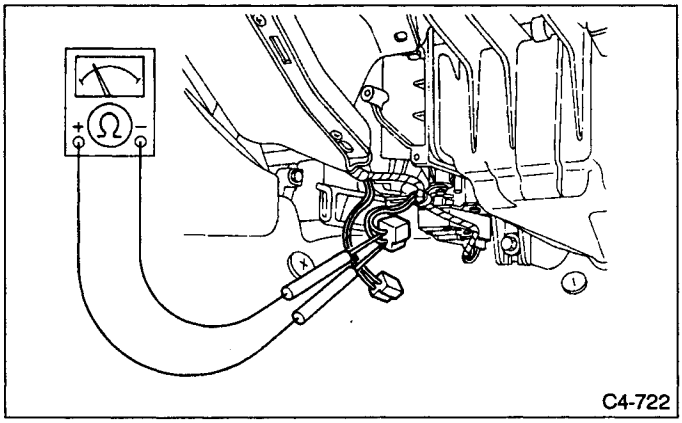


Fig. 241

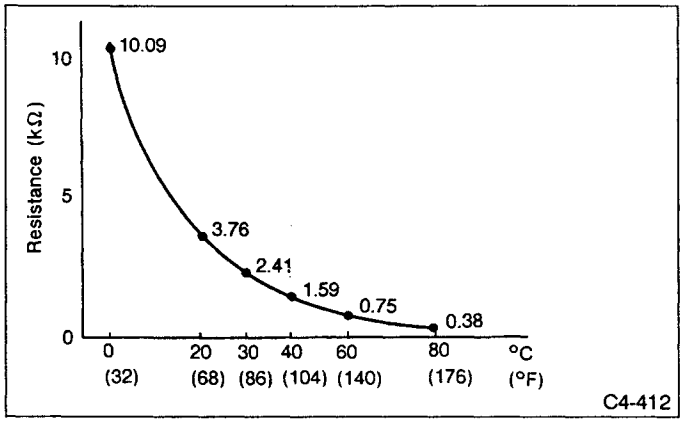


Fig. 242

2. CHECK INPUT SIGNALS FOR WATER TEMPERATURE SENSOR.

1) Turn ignition switch to "ON".
2) Measure voltage between connector (HU3) and body.

Connector & Terminal/Specified voltage:
(HU3) No. 2 — Body/Approx. 5 V

3) Measure voltage between water temperature connector.

Connector & Terminal/Specified voltage:
(HU3) No. 1 — 2/Approx. 5 V

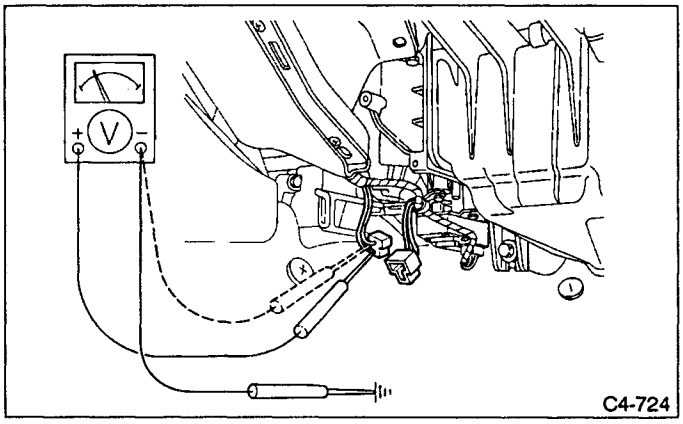


Fig. 243

3. CHECK OUTPUT SIGNALS FOR AUTO AMPLIFIER.

1) Remove auto amplifier.
2) Disconnect water temperature sensor connector.
3) Turn ignition switch to "ON".
4) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) No. 12 — No. 11/Approx. 5 V

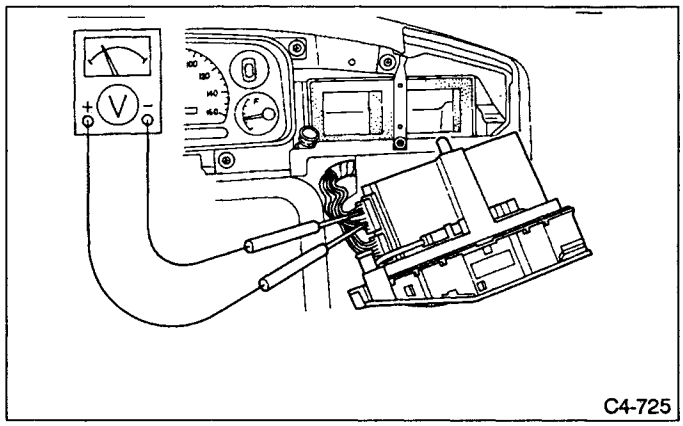


Fig. 244

G: TROUBLE CODE (31) — Check air mix door circuit.

CONTENT OF DIAGNOSIS:
31: Shorted P.B.R. circuit

TROUBLE SYMPTOM:
Outlet air temperature does not change. (Compartment temperature cannot be controlled to "set" value.

(P.B.R.: Potentio Balance Resistor)

1 Check P.B.R. circuit.
- OK → Check trouble cord 33.
- Not OK ↓

2 Check output signals for auto amplifier.
- Not OK → Repair auto amplifier terminal poor contact. (Replace auto amplifier.)
- OK ↓

3 Check harness connector between auto amplifier and air mix door.
- Not OK → Repair harness.
- OK ↓

Replace air mix door motor.

• Replace and recheck.

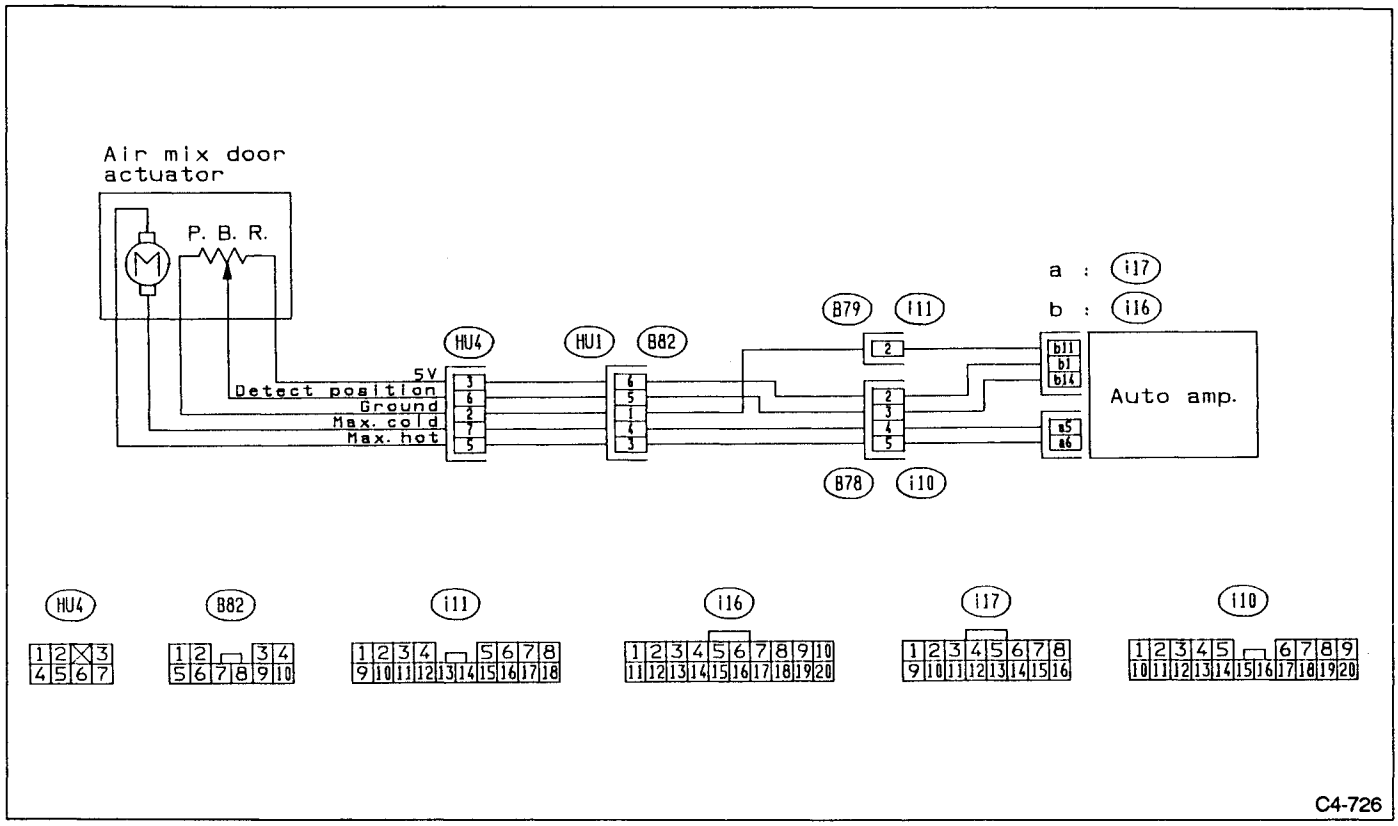


Fig. 245

1. CHECK P.B.R. CIRCUIT.

1) Remove auto amplifier.
2) Set to self-diagnosis mode "step [3]".
3) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) No. 14 — No. 11/
Display shows 44•45 (Full cold) Approx. 0.5 V
41•42 (Full hot) Approx. 4.5 V
43 (50%) Approx. 2.5 V

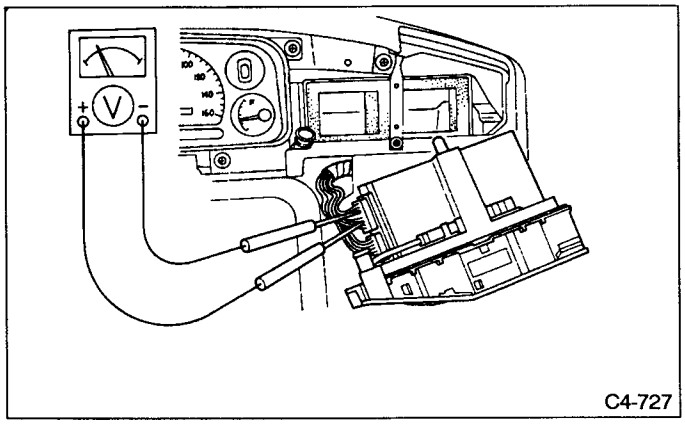


Fig. 246

2. CHECK OUTPUT SIGNALS FOR AUTO AMPLIFIER.

1) Disconnect air mix door connector.
2) Turn ignition switch to "ON".
3) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) No. 1 — No. 11/Approx. 5 V

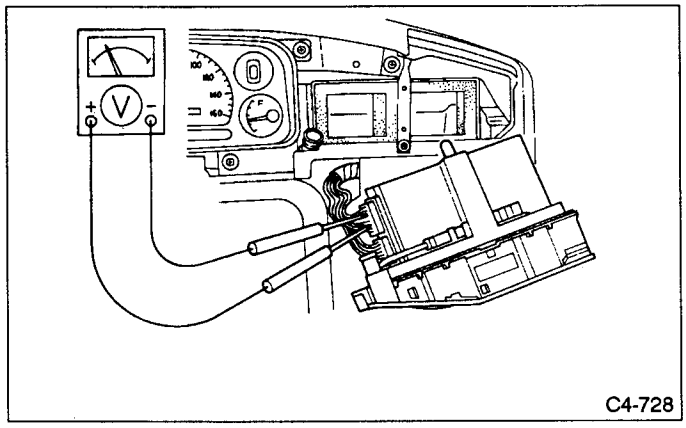


Fig. 247

3. CHECK HARNESS CONNECTOR BETWEEN AUTO AMPLIFIER AND AIR MIX DOOR.

1) Disconnect auto amplifier and air mix door motor connector.
2) Measure resistance between auto amplifier and air mix door motor connector.

Connector & Terminal/Specified resistance:
(i16) No. 1 — (HU4) No. 3/0 Ω
(i16) No. 14 — (HU4) No. 6/0 Ω
(i16) No. 11 — (HU4) No. 2/0 Ω

3) Measure resistance between auto amplifier connector and body.

Connector & Terminal/Specified resistance:
(i16) No. 1 — Body/1 MΩ min.
(i16) No. 11 — Body/1 MΩ min.
(i16) No. 14 — Body/1 MΩ min.

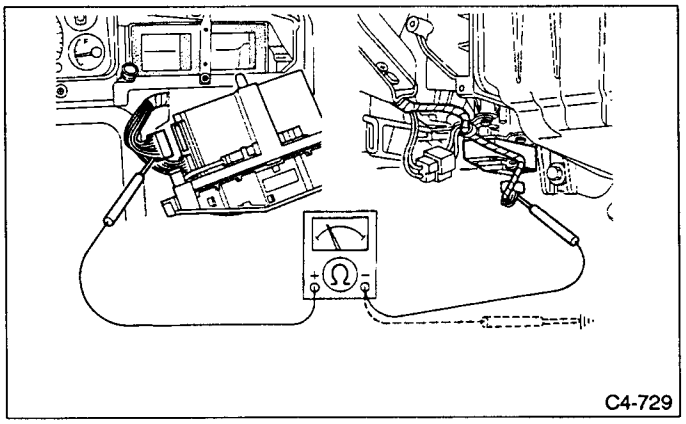


Fig. 248

H: TROUBLE CODE (33) — Check air mix door circuit.

CONTENT OF DIAGNOSIS:
33: Faulty air mix door motor

TROUBLE SYMPTOM:
Outlet air temperature does not change. (Compartment temperature cannot be controlled to "set" value.)

1 Check output signals for auto amplifier.
- Not OK → Repair auto amplifier connector poor contact. (Replace auto amplifier.)
  - • Replace and recheck.
- OK ↓

2 Check harness connector between auto amplifier and air mix door motor.
- Not OK → Repair harness.
- OK ↓

Replace air mix door motor.

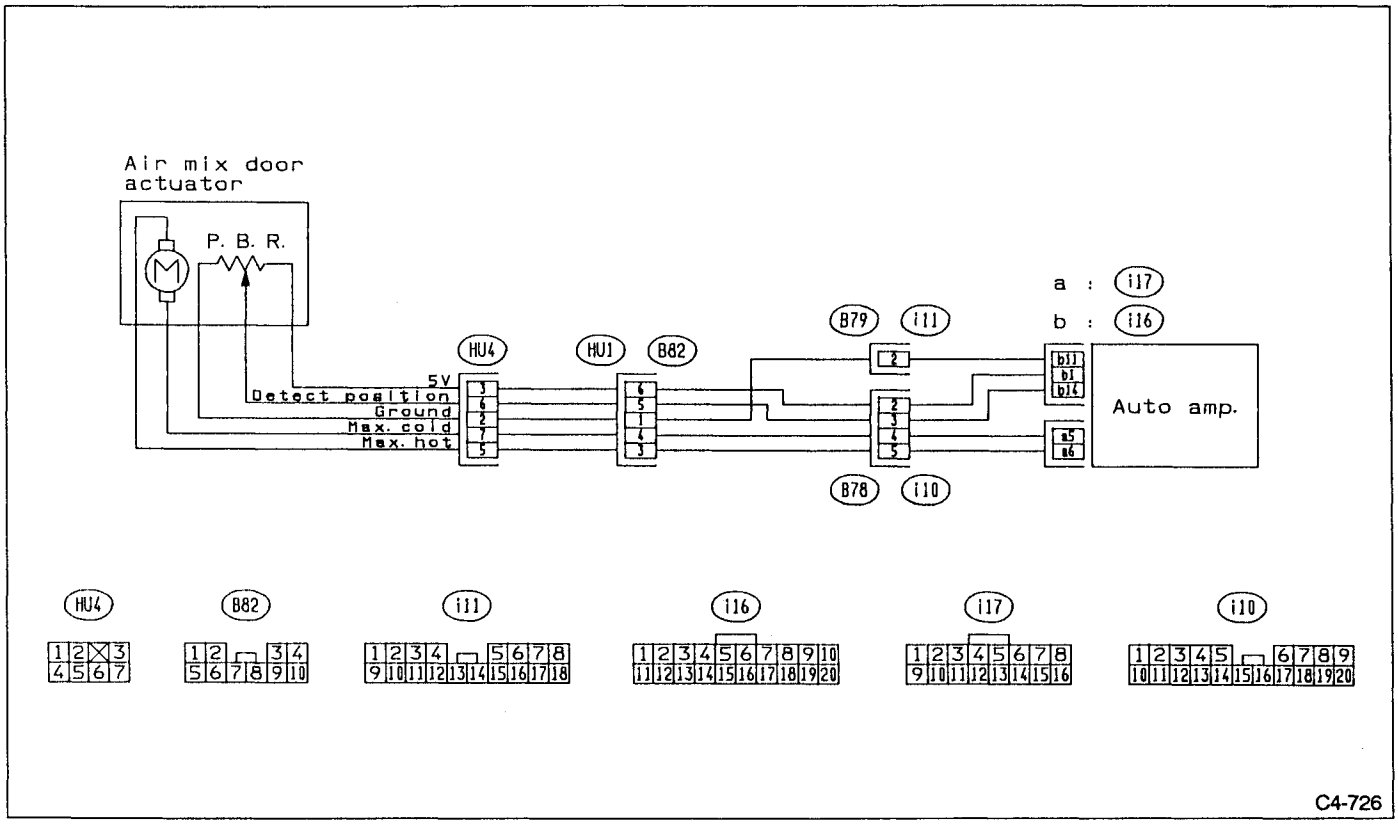


Fig. 249

1. CHECK OUTPUT SIGNALS FOR AUTO AMPLIFIER.

1) Remove auto amplifier.
2) Set to self-diagnosis mode "STEP [3]".
3) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i17) No. 6 ⊕ — No. 5 ⊖
Display shows 45 → 41/Approx. 10 V
(i17) No. 5 ⊕ — No. 6 ⊖
Display shows 42 → 44/Approx. 10 V

a. Voltage is produced only when air mix door is operating.
b. Since auto amplifier cyclically produces an output of approximately 10 volts, analog circuit tester pointer deflects between 0 and 5 volts.

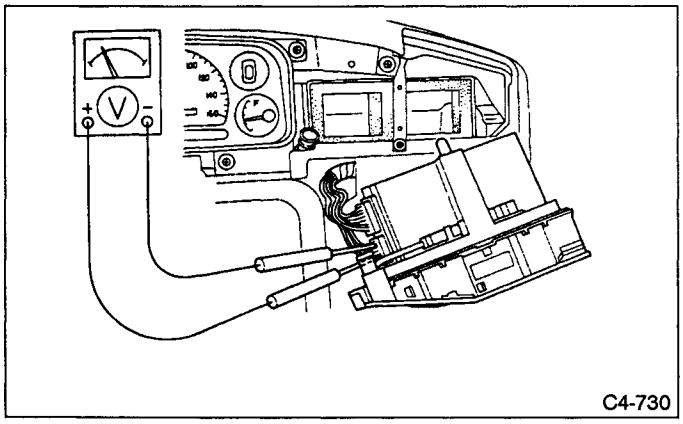


Fig. 250

2. CHECK HARNESS CONNECTOR BETWEEN AUTO AMPLIFIER AND AIR MIX DOOR MOTOR.

1) Disconnect auto amplifier and air mix door connector.
2) Measure resistance between auto amplifier and air mix door connector.

Connector & Terminal/Specified resistance:
(i17) No. 6 — (HU4) No. 5/0 Ω
(i17) No. 5 — (HU4) No. 7/0 Ω

3) Measure resistance between auto amplifier connector and body.

Connector & Terminal/Specified resistance:
(i17) No. 6 — Body/1 MΩ min.
(i17) No. 5 — Body/1 MΩ min.

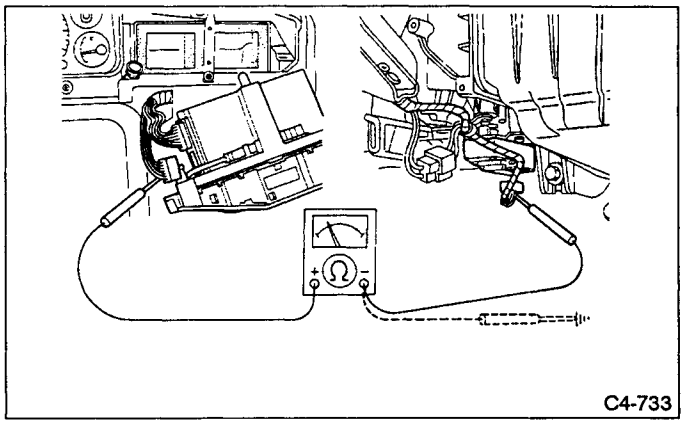


Fig. 251

I: TROUBLE CODE (32) — Check mode door motor circuit.

CONTENT OF DIAGNOSIS:
32: Open or shorted P.B.R. circuit

TROUBLE SYMPTOM:
Mode door does not change.

(P.B.R.: Potentio Balance Resistor)

1 Check P.B.R. circuit in mode door motor.
- OK → Check trouble cord 34.
- Not OK ↓

2 Check output signals for auto amplifier.
- Not OK → Repair auto amplifier terminal poor contact. (Replace auto amplifier.)
- OK ↓

3 Check harness connector between auto amplifier and mode door motor.
- Not OK → Repair harness.
- OK ↓

Replace mode door motor.

• Replace and recheck.

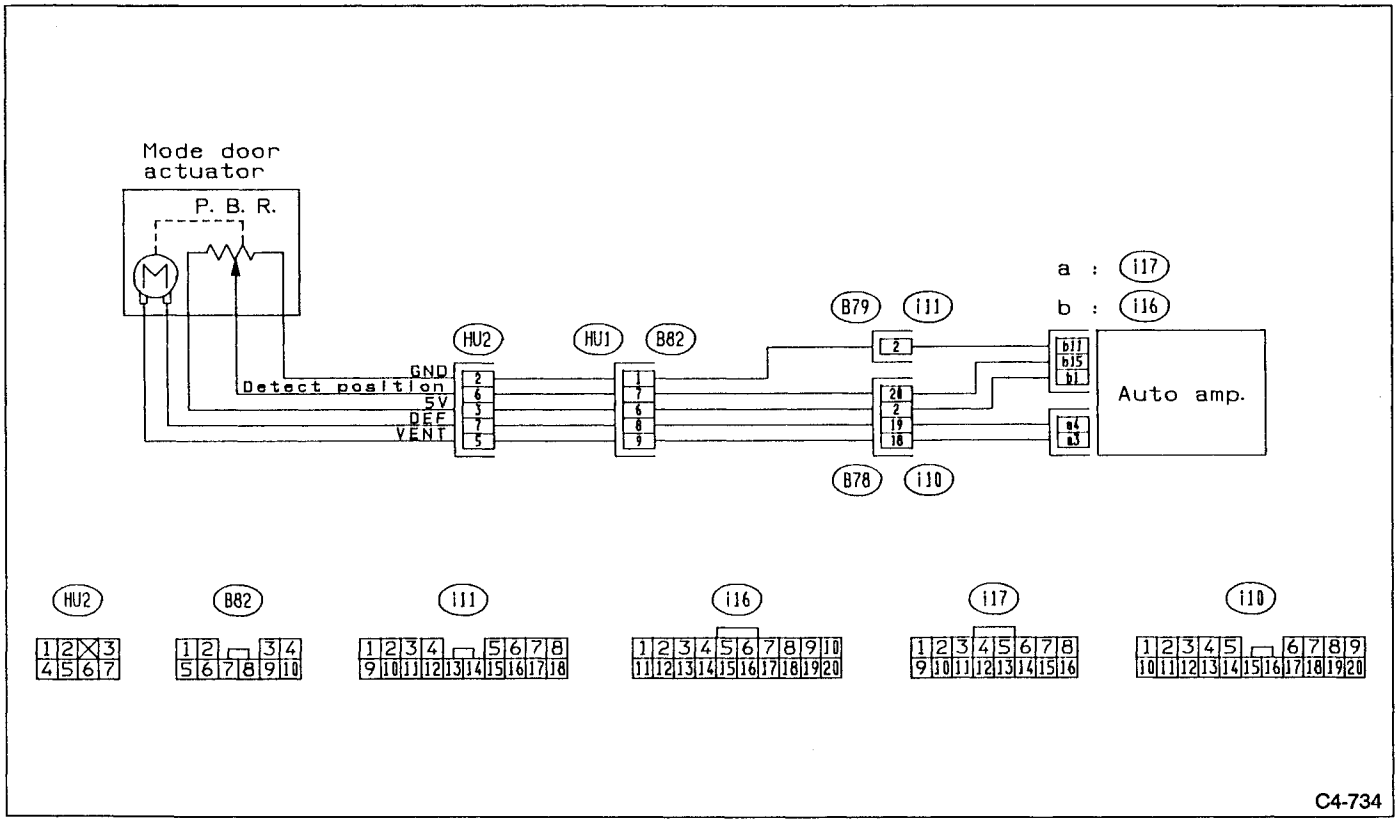


Fig. 252

1. CHECK P.B.R. CIRCUIT.

1) Remove auto amplifier.
2) Set to self-diagnosis mode "STEP [3]".
3) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) No. 15 — No. 11/
Display shows 41 (DEF) Approx. 0.5 V
44 (VENT) Approx. 4.5 V

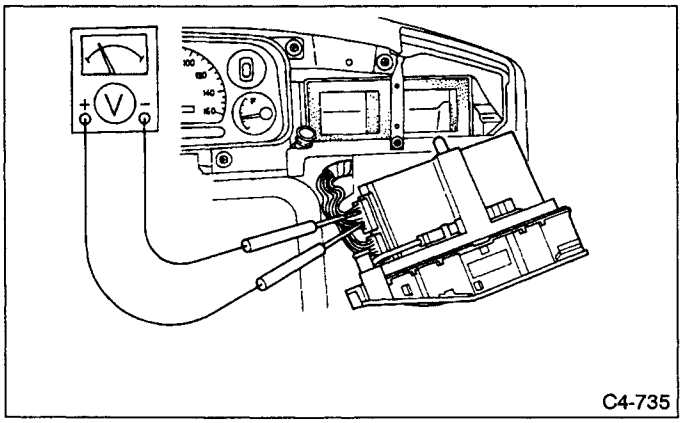


Fig. 253

2. CHECK OUTPUT SIGNALS FOR AUTO AMPLIFIER.

1) Disconnect mode door motor connector.
2) Turn ignition switch to "ON".
3) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i16) No. 1 — No. 11/Approx. 5 V

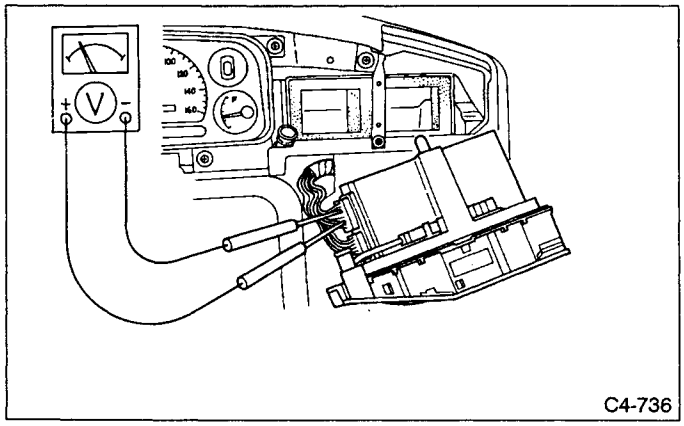


Fig. 254

3. CHECK HARNESS CONNECTOR BETWEEN AUTO AMPLIFIER AND MODE DOOR MOTOR.

1) Disconnect auto amplifier and mode door motor connector.
2) Measure resistance between auto amplifier and mode door motor connector.

Connector & Terminal/Specified resistance:
(i16) No. 1 — (HU2) No. 3/0 Ω
(i16) No. 15 — (HU2) No. 6/0 Ω
(i16) No. 11 — (HU2) No. 2/0 Ω

3) Measure resistance between auto amplifier connector and body.

Connector & Terminal/Specified resistance:
(i16) No. B1 — Body/1 MΩ min.
(i16) No. B15 — Body/1 MΩ min.
(i16) No. B11 — Body/1 MΩ min.

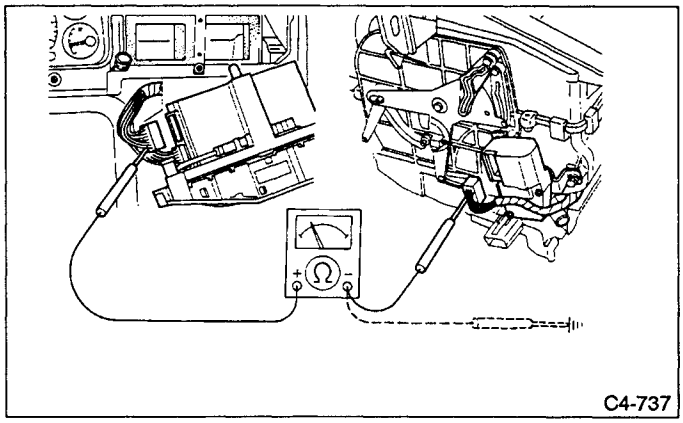


Fig. 255

J: TROUBLE CODE (34) — Check mode door motor circuit.

CONTENT OF DIAGNOSIS:
34: Faulty mode door motor

TROUBLE SYMPTOM:
Mode door does not change.

1 Check output signals for auto amplifier.
- Not OK → Repair auto amplifier terminal poor contact. (Replace auto amplifier.)
- OK ↓

2 Check harness connector between auto amplifier and mode door motor.
- Not OK → Repair harness.
- OK ↓

Replace mode door motor.

• Replace and recheck.

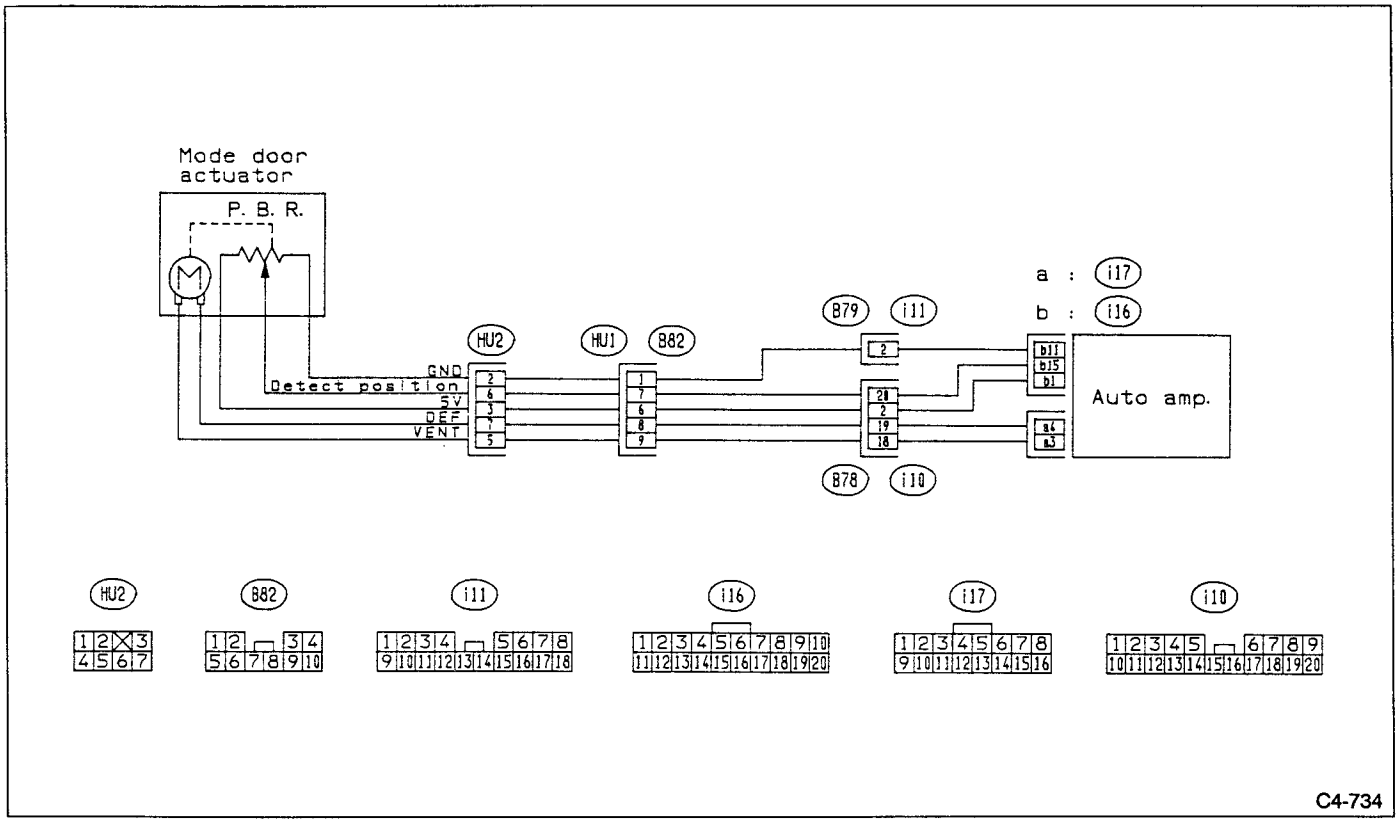


Fig. 256

1. CHECK OUTPUT SIGNALS FOR AUTO AMPLIFIER.

1) Remove auto amplifier.
2) Set to self-diagnosis mode "STEP [3]".
3) Measure voltage between auto amplifier connector.

Connector & Terminal/Specified voltage:
(i17) No. 3 ⊕ — No. 4 ⊖
Display shows 41 → 44/Approx. 10 V
(i17) No. 4 ⊕ — No. 3 ⊖
Display shows 45 → 41/Approx. 10 V

a. Output voltage is produced only when mode door motor is operating.
b. Since auto amplifier cyclically produces an output of approximately 10 volts, analog circuit tester pointer deflects between 0 and 5 volts.

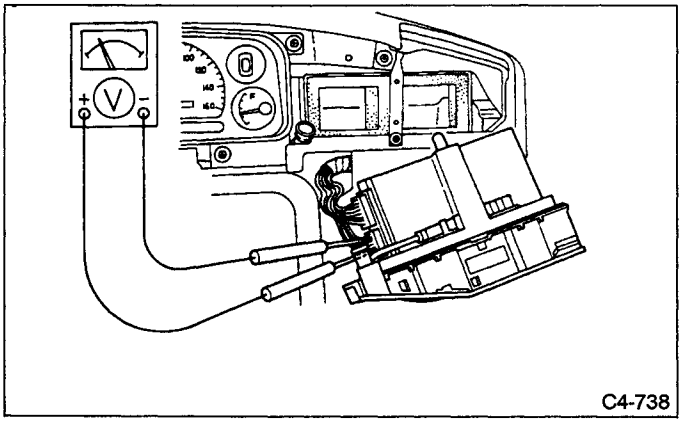


Fig. 257

2. CHECK HARNESS CONNECTOR BETWEEN AUTO AMPLIFIER AND MODE DOOR MOTOR.

1) Disconnect auto amplifier and mode door motor connector.
2) Measure resistance between auto amplifier and mode door motor connector.

Connector & Terminal/Specified resistance:
(i17) No. 3 — (HU2) No. 5/0 Ω
(i17) No. 4 — (HU2) No. 7/0 Ω

3) Measure resistance between auto amplifier connector and body.

Connector & Terminal/Specified resistance:
(i17) No. 3 — Body/1 MΩ min.
(i17) No. 4 — Body/1 MΩ min.

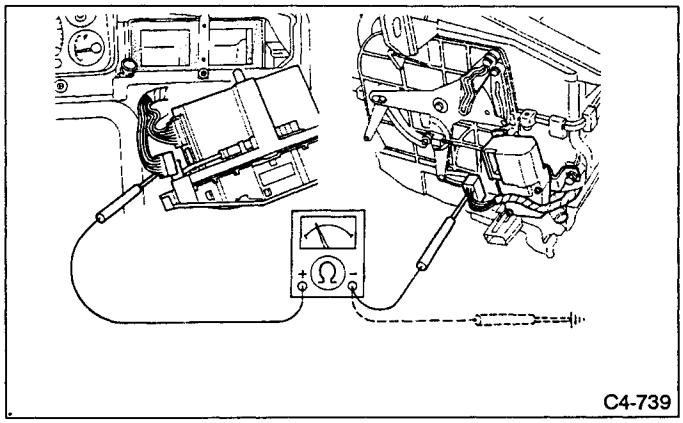


Fig. 258

K: TROUBLE CODE (35) — Check intake door motor circuit.

CONTENT OF DIAGNOSIS:
35: Open or short circuit

TROUBLE SYMPTOM:
Inlet is not switched among FRESH, 20% FRESH and RECIRC.

1	Check voltage at intake door motor's power terminal.	Not OK	Replace fuse or repair harness.
2	Check intake door motor.	Not OK	Repair auto amplifier terminal poor contact. (Replace auto amplifier.)
3	Check harness connector between auto amplifier and intake door motor.	Not OK	Repair harness.

OK

Replace intake door motor.

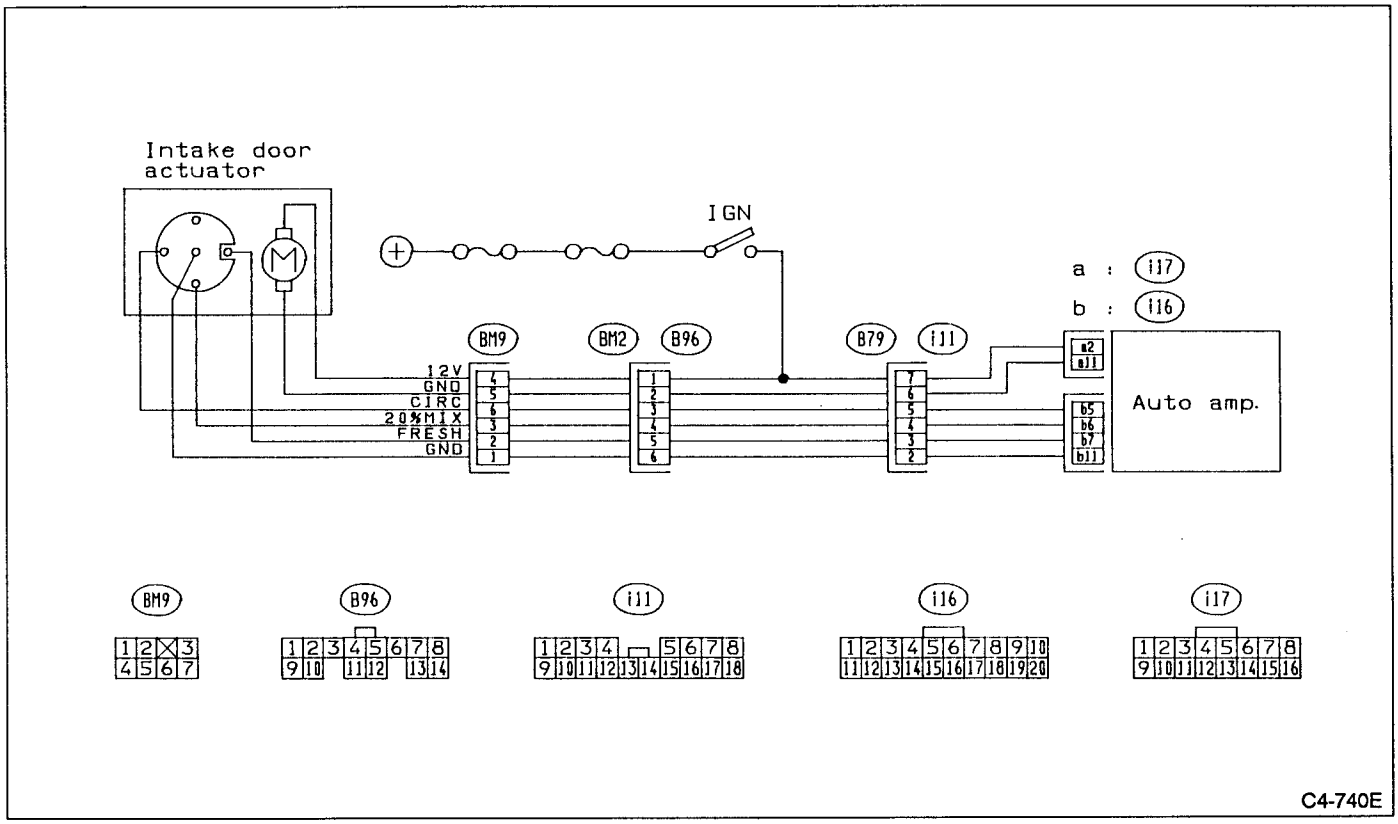


Fig. 259

1. CHECK VOLTAGE AT INTAKE DOOR MOTOR'S POWER TERMINAL.

1) Remove glove box.
2) Disconnect intake door motor connector.
3) Turn ignition switch to "ON".
4) Measure voltage between intake door motor connector and body.

Connector & Terminal/Specified voltage:
(BM9) No. 4 — Body/Battery voltage

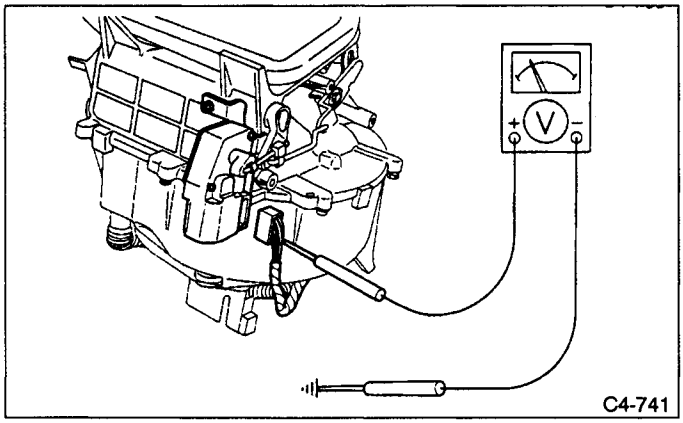


Fig. 260

2. CHECK INTAKE DOOR MOTOR.

1) Remove auto amplifier.
2) Set to self-diagnosis mode "STEP [3]".
3) Measure voltage between auto amplifier and body.

Connector & Terminal/Specified voltage:
(i16) No. 5 — Body/
Display shows 45 (RECIRC) Approx. 5 V
EXCEPT 45 Approx. 0 V
(i16) No. 6 — Body/
Display shows 41 (20% FRESH) Approx. 5 V
EXCEPT 41 Approx. 0 V
(i16) No. 7 — Body/
Display shows 42•43•44 (FRESH) Approx. 5 V
EXCEPT 42•43•44 Approx. 0 V

Measure voltage 10 seconds after setting system to "STEP [3]".

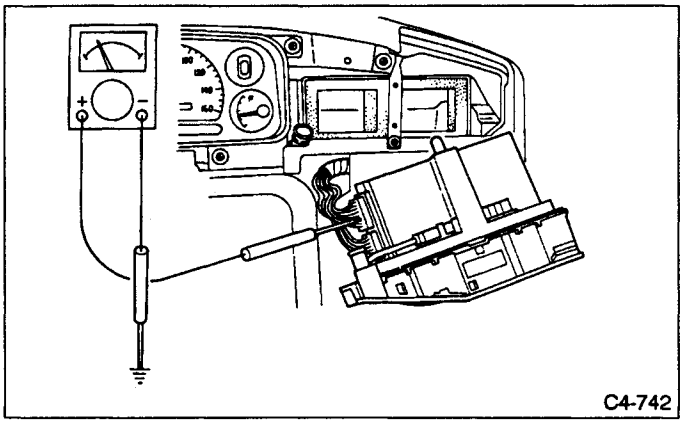


Fig. 261

3. CHECK HARNESS CONNECTOR BETWEEN AUTO AMPLIFIER.

1) Disconnect auto amplifier and intake door motor connector.
2) Measure resistance between auto amplifier and intake door motor connector.

Connector & Terminal/Specified voltage:
(i16) 5 — (BM9) 6/0 Ω
(i16) 6 — (BM9) 3/0 Ω
(i16) 7 — (BM9) 2/0 Ω
(i16) 11 — (BM9) 1/0 Ω

3) Measure resistance between auto amplifier connector and body.

Connector & Terminal/Specified resistance:
(i16) 5 — Body/1 MΩ min.
(i16) 6 — Body/1 MΩ min.
(i16) 7 — Body/1 MΩ min.
(i16) 11 — Body/1 MΩ min.

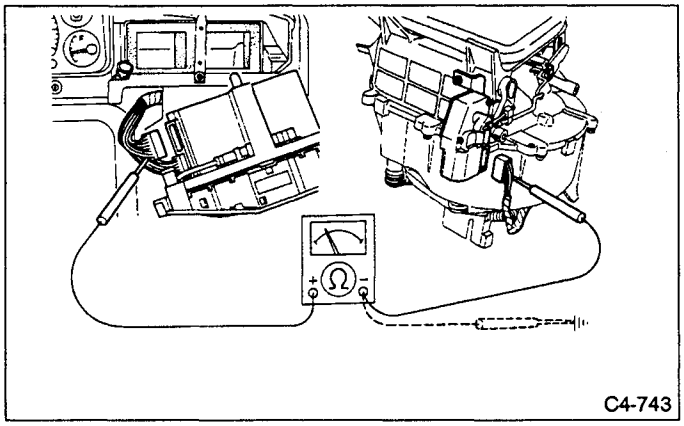


Fig. 262

12. Troubleshooting Chart with Select Monitor

BASIC TROUBLESHOOTING CHART

1. PROCEDURE FOR SELECT MONITOR

Connect select monitor to connector (B35).

Applicable cartridge of select monitor: No. 498348500

1) Turn ignition switch to "ON".
2) Turn select monitor power to "ON".

SELECT ERS: 0	SYSTEM A/C: 1

Pressing "1" and "ENT" will convert display to reed.

YEAR	(F00) 1991

Pressing "↑" will convert display to reed.

T set	(F01) 75 deg F

A: MODE 00 — AUTO AIR CONDITIONER —

- Probable cause (item outside "specified date")

Error 1	Failure to communicate. (Communication method cannot be verified after power is ON.)	• Check for poor connector contact, open circuit, etc. • Use of improper cartridge
Error 2	Failure of auto amplifier to identify communication	Improper cartridge selection

B: MODE 01 — "Set" temperature (T set) —

CONDITION:
- Engine warming up after starting
- "Set" temperature continually switching from 18 to 32°C (65°F to 85°F) after operating A/C system in AUTO mode.

SPECIFICATION DATA:
Value determined by auto amplifier is indicated on monitor display.

- Probable cause (item outside "specified date")

1	"Set" temperature is not displayed.	→ Faulty auto amplifier → Replace.

C: MODE 02 — Total signal (To) —

CONDITION:
- Engine warming up completely after starting
- A/C system operating in AUTO mode.

SPECIFICATION DATA:
Check displayed values to ensure air flow, inlet and outlet are controlled as indicated on "To" control graph.

- "To" refers to apparently controlled value.
  "Set" temperature 18°C (65°F) (MAX COLD) → 68 deg F is indicated.
  "Set" temperature 32°C (85°F) (MAX HOT) → 69 deg F is indicated.

Improper blower air discharge	→ Check fan control amplifier. → Check auto amplifier.
Improper inlet setting FRESH/RECIRC	→ Check intake door motor and linkage. → Check auto amplifier.
Improper outlet setting • VENT BI/LEVEL • HEAT	→ Check air mix door motor and linkage. → Check auto amplifier.

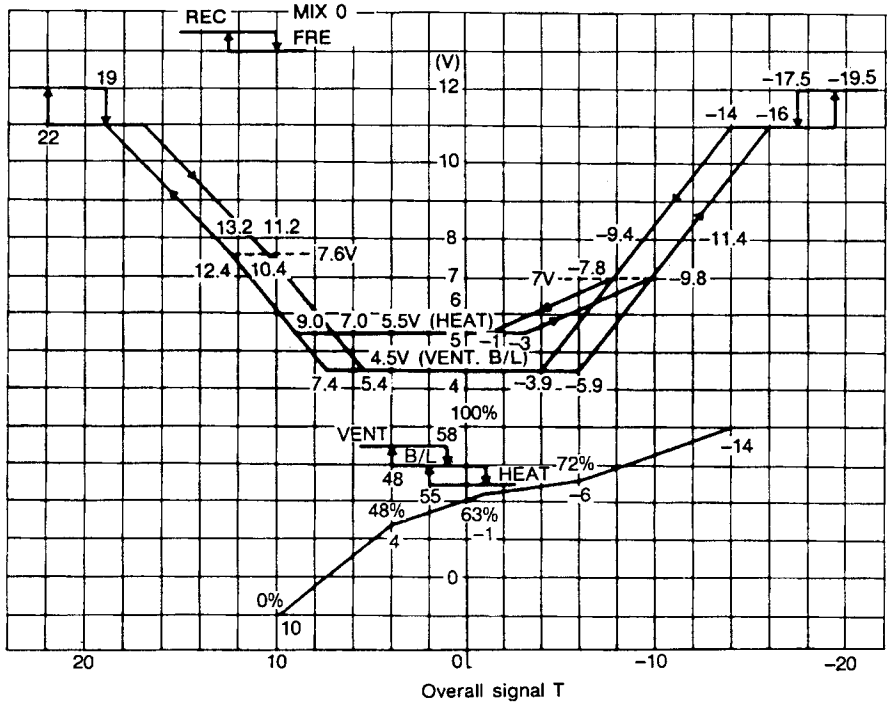

REC
MIX 0
FRE
(V)
12
10
8
7
6
5
4
0
19
22
13.2 11.2
7.6V
12.4 10.4
9.0 7.0 5.5V (HEAT)
4.5V (VENT. B/L)
7.4 5.4
-17.5 -19.5
-14 -16
-9.4
-11.4
7V -7.8
-9.8
-1 -3
-3.9 -5.9
100%
VENT
58
B/L
48
HEAT
72%
-14
55
-6
48%
63%
-1
4
0%
10
20
10
0
-10
-20
Overall signal T
C4-744

Fig. 263

D: MODE 03 — In-vehicle sensor (T room) —

CONDITION:
- Engine warmed up completely
- System operating in AUTO mode

SPECIFICATION DATA:
Temperature close to areas around in-vehicle sensor should be indicated.

- Probable cause (item outside "specified date")

Indication: Open circuit — 20 deg F
Shorted circuit 117 deg F

Check duct between aspirator and in-vehicle sensor. → OK → Check as per trouble codes 11 and 21.

E: MODE 04 — Ambient sensor (T amb) —

CONDITION:
- Engine warmed up completely
- System operating in AUTO mode

SPECIFICATION DATA:
Temperature close to front bumper at ambient sensor should be indicated.

- Probable cause (item outside "specified date")

Indication: — 20 deg F (open circuit)
117 deg F (shorted circuit)

Check ambient sensor for accumulation of mud, snow, etc. → OK → Check as per trouble codes 12 and 22.

F: MODE 05 — Evaporator sensor (T evp) —

CONDITION:
- Engine warmed up completely after starting
- A/C system operating in AUTO mode and compartment temperature set to 18°C (65°F) [FULL COOL]
- Press OFF switch.

SPECIFICATION DATA:
When A/C system is OFF, evaporator sensor temperature close to ambient temperature should be indicated.

- Probable cause (item outside "specified date")

1	Check compressor operation.	Not OK →	Check magnet clutch circuit.
↓ OK			
2	Check refrigerant gas amount.	Not OK →	Repair leaks and replenish refrigerant.
↓ OK			
3	Check as per trouble codes 14 and 24.		

Indication: – 20 deg F (open circuit)
117 deg F (shorted circuit)

G: MODE 06 — Sunload sensor (Q sun) —

CONDITION:
- Engine warmed up completely after starting
- After operating A/C system in AUTO mode, place vehicle in the sun.

SPECIFICATION DATA:
Sensor operation differs according to weather and the season.

- Probable cause (item outside "specified date")

Check as per trouble codes 13 and 23.

Indication: 0 kcal (open circuit)
1,262 kcal (shorted circuit)
- **If sunload sensor is checked indoors or in dark places, "0" kcal will be indicated. To check sunload sensor in such adverse conditions, use a lighted 100 watt bulb and move it close to the sensor.**

H: MODE 07 — Sunload sensor correction temperature (T sun) --

CONDITION:
- Engine warmed up completely after starts.
- After operating A/C system in AUTO mode, move vehicle to place in direct sunlight.
- Turn ignition switch from OFF to ON.
- Monitor trouble codes F06 and F07.

SPECIFICATION DATA:
"F06" value multiplied by 0.0083 is indicated.

T sun (F07)
(F06 x 0.0083) deg F

- Probable cause (item outside "specified date")

Check as per trouble codes 13 and 23.

Indication: 0 deg F (open circuit)
13.77 deg F (short circuit)

I: MODE 08 — Refrigerant temperature sensor (T ref) —

CONDITION:
- Engine warmed up completely after starting
- After operating A/C system in AUTO mode, set compartment temperature to 18°C (65°F) (MAX COLD) on display.

SPECIFICATION DATA:
Approximately 2.8°C (37°F) is indicated in MAX COLD (with intake sensor circuit open).

Indication: – 20 deg F (open circuit)
117 deg F (shorted circuit)

- Probable cause (item outside "specified date")

1	Check compressor operation.	Not OK →	Check magnet clutch circuit.
↓ OK			
2	Check refrigerant amount.	Not OK →	Repair leaks.
↓ OK			
3	Check as per trouble codes 15 and 25.		

J: MODE 09 — Water temperature sensor (TW) —

CONDITION:
- Engine warmed up completely after starting
- A/C system operating in AUTO mode

SPECIFICATION DATA:
Value slightly lower than engine coolant temperature is indicated as temperature is measured at lower section of heater core.

Indication: – 18 deg F (open circuit)
216 deg F (shorted circuit)

- Probable cause (item outside "specified date")

Check as per trouble codes 16 and 26.

K: MODE 10 — Air mix door target position (AMR set) —

CONDITION:
- Engine warmed up completely after starting
- After operating A/C system in AUTO mode, switch compartment "set" temperature from 18 to 32°C (65 to 85°F).

SPECIFICATION DATA:
Indication changes correspondingly with compartment temperature setting from 18°C (65°F) (0%) to 32°C (85°F) (100%).

⟨Reference⟩
- Air mix door target position is apparent value determined by target outlet air temperature.
- Determine mix door target position, taking into account actual air mix door data "F11".

- Probable cause (item outside "specified date")

Data at 18°C (65°F) (MAX COLD) and/or 32°C (85°F) (MAX HOT) are faulty.	→ Check sensors using self-diagnosis function.

L: MODE 11 — Actual air mix door position (AMR P) —

CONDITION:
- Engine warmed up completely after starting
- After operating A/C system in AUTO mode, switch compartment "set" temperature from 18 to 32°C (65 to 85°F).

SPECIFICATION DATA:
Indication changes correspondingly with compartment temperature setting from 0% to 100%.

- Probable cause (item outside "specified date")

1	Check air mix door motor linkage.	Not OK →	Repair.
	↓ OK		
2	Check as per trouble codes 31 and 33.	Not OK →	Repair or replace.

M: MODE 12 — Mode door target value (MODE set) —

CONDITION:
- Start engine.
- Press VENT switch.
- Press DEF switch.

SPECIFICATION DATA:
- MODE set: 100% (mode door in VENT)
- MODE set: 0% (mode door in DEF)

- Probable cause (item outside "specified date")

Check actual mode door "F13" and outlet positions.

(Reference
- Check to determine mode door target value in relation to actual mode door position using mode function "F13". If target value is outside specification data, auto amplifier may be faulty.

N: MODE 13 — Actual mode door position (MODE pot) —

CONDITION:
- Start engine.
- Press VENT switch.
- Press DEF switch.

SPECIFICATION DATA:
- MODE pot: 100% (mode door in VENT)
- MODE pot: 0% (mode door in DEF)

- Probable cause (item outside "specified date")

1	Check as per trouble codes 32 and 34.	→ Repair harness/connector or replace mode door motor.

↓ OK

Check and repair mode door motor linkage.

O: MODE 14 — Blower motor level (BLW) —

CONDITION:
- Engine warmed up sufficiently
- While A/C system is in AUTO mode, manually change blower fan speed from LO to ME and then to HI using FAN switch.

SPECIFICATION DATA:
- BLW: 4.0 V (FAN switch in LO)
- BLW: 7.5 V (FAN switch in ME)
- BLW: 12.5 V (FAN switch in HI)

- Probable cause (item outside "specified date")

1	Measure voltage between blower motor terminals at blower motor. LO: approx. 4 V ME: approx. 7.5 V HI: approx. 12 V	→ See "Blower Motor Diagnosis" under "Troubleshooting Guide by Fault".

↓ OK

Faulty auto amplifier or control panel switch

P: MODE 15 — Intake door position (Intake) —

CONDITION:
- Self-diagnosis mode "STEP [3]" set to check output equipment.
- Temperature set to 41 - 45 on control panel display using DEF switch.

SPECIFICATION DATA:

Control panel display	Select monitor display
41	20% FRESH
42, 43, 44	FRESH
45	RECIRC

- Probable cause (item outside "specified date")

Check as per trouble code 35.

Q: MODE 16 — Solenoid actuator current output (I sol) —

CONDITION:
- Self-diagnosis mode "STEP [3]" set to check output equipment.
- Temperature set to 41 - 45 on control panel display using DEF switch.

SPECIFICATION DATA:

Control panel display	Select monitor display
41, 43, 44, 45	0.00 A
42	0.65 A

- Probable cause (item outside "specified date")

Install new auto amplifier and recheck.
→ Not OK → Faulty solenoid actuator or harness.
↓ OK
Faulty auto amplifier

R: MODE 17 — Variable compressor control signal (EGI to A/C) —

CONDITION:
- Engine warmed up completely
- A/C system operating in AUTO mode

SPECIFICATION DATA:
Value outside 225% should be indicated.

- Probable cause (item outside "specified date")

"255%" is indicated.
↓
Install new auto amplifier and recheck.
→ Not OK → Install new MPFI unit and recheck.
→ Not OK → Faulty harness
↓ OK
Faulty auto amplifier
OK ↓
Faulty MPFI unit

13. Troubleshooting Guide by Fault

	1	2	3	4	5	6	7	8	9	10	11	12	13
	A/C system does not operate when ignition switch is ON.	Fuse blows very soon.	Mode before preset is not stored in memory.	Indication is not displayed.	Illumination does not dim.	Blower motor rotates erroneously or does not rotate.	Intake-recirc is not switched.	Outlets are not switched.	Compartment temperature does not increase. (Hot air is not discharged)	Compartment temperature does not decrease. (Cool air is not discharged)	Compartment temperature is not controlled to set value.	System responds to temperature setting too slow.	Condenser fan does not rotate when air conditioner is ON.
Fuse	○	○	○	○	○	○							
Harness and connector	○	○	○	○	○	○	○	○	○	○			
GND (ground)	○		○	○		○							
Auto amplifier	○		○	○	○	○	○	○	○	○	○		
Air mix door motor (including P.B.R.)									○	○	○	○	
Mode door motor (including P.B.R. and linkage)								○					
Intake door motor (including linkage)							○						
Blower motor						○							
Fan control amplifier						○							
HI relay						○							
OFF relay						○							
A/C relay										○			
Magnet clutch										○			
Cooling fan motors (main and sub)													○
Fan relays (main and sub)													○
Sensors (in-vehicle, ambient, water temperature, refrigerant, intake and sunload)											○	○	
In-vehicle sensor duct (aspirator)											○		