

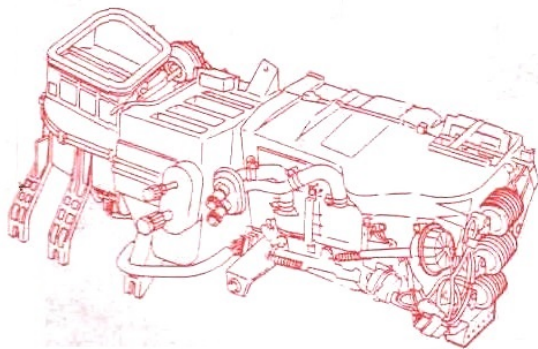
# 1984 NISSAN 300ZX



## AUTO AIR CONDITIONER

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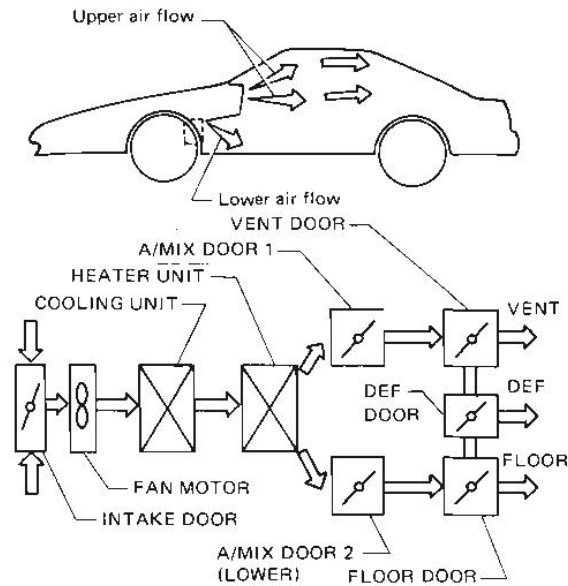


**SERVICE MANUAL  
SUPPLEMENT**

# DESCRIPTION—Auto Air Conditioner

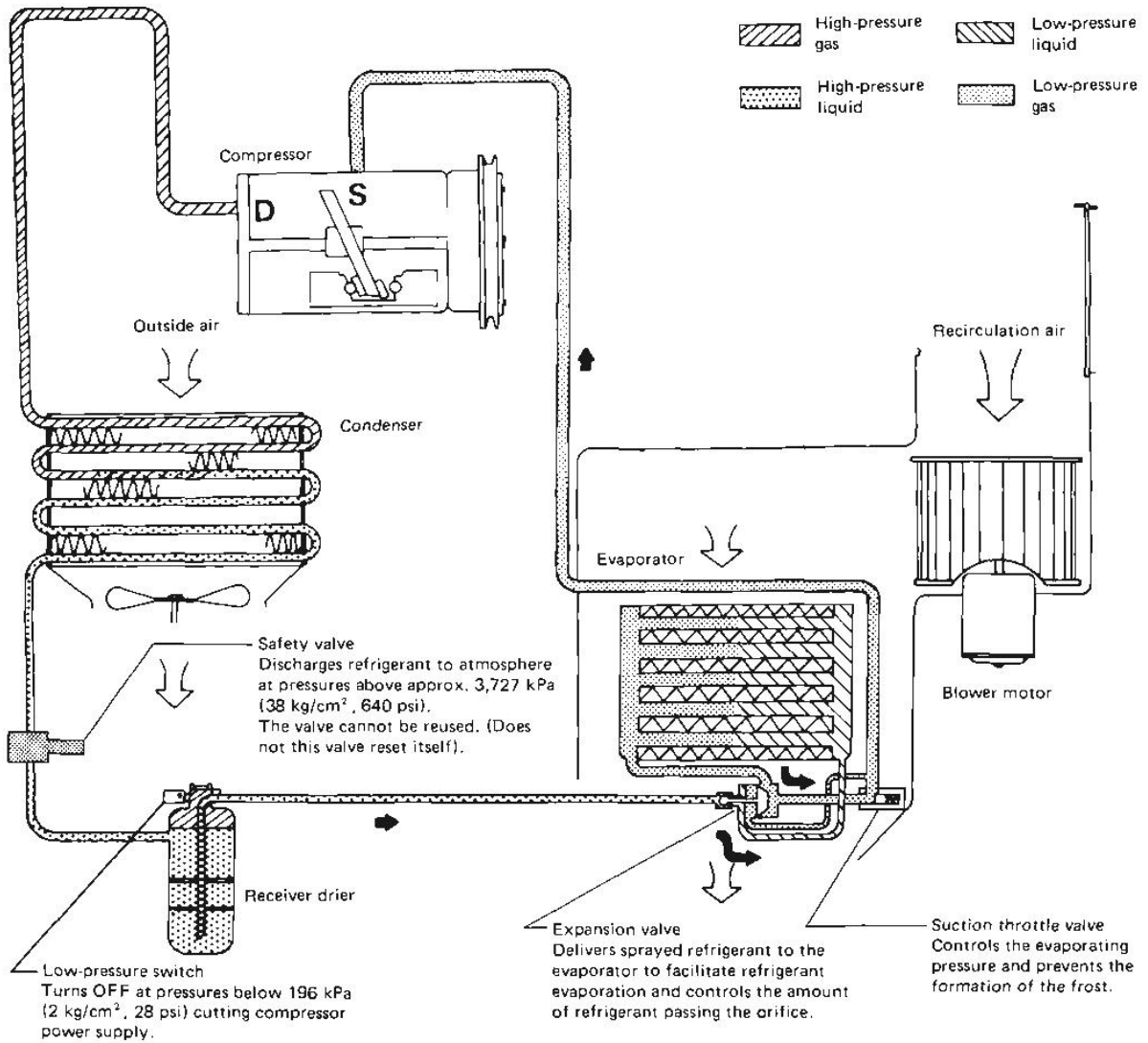
## Features

- The vehicle sensors are installed at head level and foot level, in order to maintain the temperatures of both positions at the optimum levels.
- When starting the engine in cold season, the system immediately operates in the defroster mode until the coolant temperature rises, thereby preventing fogging on the windshield.
- As the coolant temperature rises high enough to use the heater, the outlet door is automatically switched to the foot level for starting the heating operation. The system begins to control the air flow automatically as the outlet air temperature reaches the optimum level.
- When the DEF switch is ON, the air flow is automatically set to the "HI" position. However, the air flow can also be switched to "LO" by setting the manual switch to "LO" position.
- The objective temperature fine control switch (Set temp. adjuster) has been adopted. This switch permits adjustment of the upper objective temperature and the lower objective temperature within the range of  $\pm 2^{\circ}\text{C}$  ( $\pm 3.6^{\circ}\text{F}$ ).
- The manual DEF switch has been adopted so that the system can be fixed in the available mode for driving (DEF mode) even when trouble occurs in the control function.
- The control unit display section (digital display and air flow indicator) is utilized for self-diagnosing each sensor and actuator.
- The proportional integral control system newly adopted in the temperature control system provides quick and accurate response without generation of steady-state error during stabilized operation.



# DESCRIPTION—Auto Air Conditioner

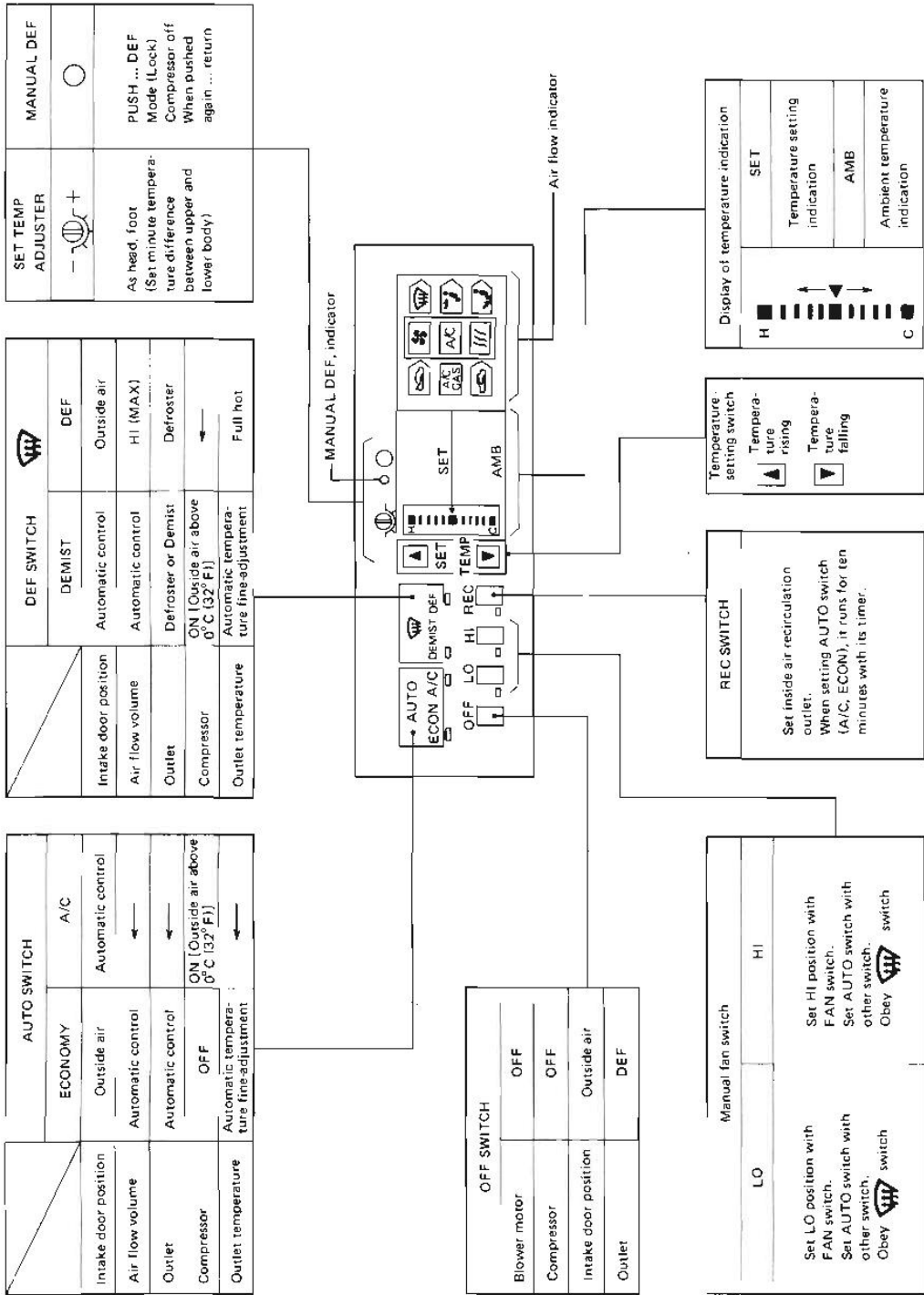
## Refrigeration Cycle



SHA276B

# DESCRIPTION—Auto Air Conditioner

## Function of the Switches on Control Unit



SHA282B



# DESCRIPTION—Auto Air Conditioner

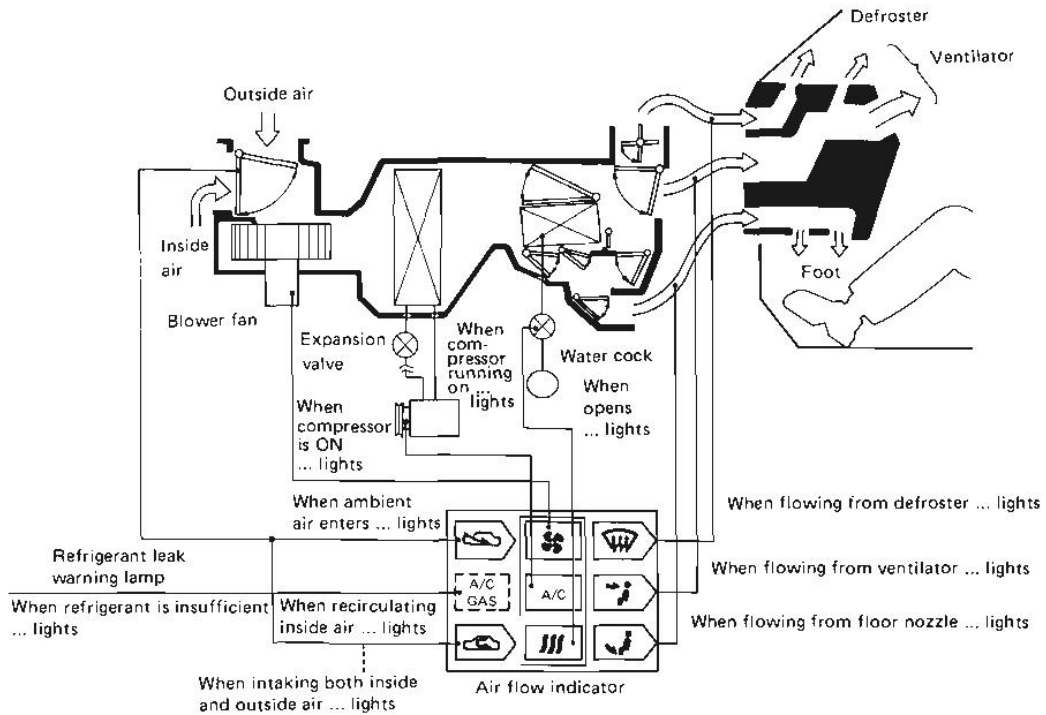
## Basic Control Function and Control Switches

(3) SWITCHES AND THEIR CONTROL FUNCTIONS

| Item to be controlled            | Air flow | A/M door | Compressor                           | Water cock (W/C) | Intake air               | Air outlet    | Control When starting | Remarks  |
|----------------------------------|----------|----------|--------------------------------------|------------------|--------------------------|---------------|-----------------------|--|
| Switch                           |          |          |                                      |                  |                          |               |                       |  |
| OFF                              | OFF      | Auto     | OFF                                  | Auto             | Outside air              | DEF           |                       | Display (SETY)(AMB) is ON with ignition switch set to ACC. A/M door and W/C control air temperature obtained by ram pressure.                                |
| AUTO SW                          | Auto     | Auto     | ON [OFF below 0°C (32°F) amb. temp.] | Auto             | Auto                     | Auto          | Operated              | A/C — ECON momentary switch (A/C has priority over ECON.)  |
| SW                               | Auto     | Auto     | OFF                                  | Auto             | Auto                     | DEF or DEMIST | Operated              | DEF — DEMIST momentary switch (DEF has priority over DEMIST.)  |
|                                  | Auto     | Auto     | ON [OFF below 0°C (32°F) amb. temp.] | Auto             | Auto                     | DEF or DEMIST | Operated              |  |
| DEF                              | HI       | Full-Hot | ON [OFF below 0°C (32°F) amb. temp.] | Open             | Outside air              | DEF           | Not operated          | HI indicator comes on. Selection of air flow at Lo is available.   |
| Lo                               | Lo       | —        | —                                    | —                | —                        | —             |                       | Only air flow in Lo mode. All others are as determined by AUTO and "HI" switches. When manual switch is pushed again, control function is cancelled.         |
| HI                               | HI       | —        | —                                    | —                | —                        | —             |                       | Only air flow in HI mode. All others are as determined by AUTO and "HI" switches. When manual switch is pushed again, control function is cancelled.         |
| REC                              | —        | —        | —                                    | —                | Inside air recirculation | —             |                       | REC function is activated only by AUTO switch (A/C or ECON). REC switch is provided with timer which cancels REC function 10 minutes after it has turned on. |
| MANUAL DEF                       | HI       | Full-Hot | OFF                                  | Open             | Outside air              | DEF           |                       | Pushing this switch again returns to previous condition.   |
| Target temp. fine-adjustment SW. | —        | —        | —                                    | —                | —                        | —             |                       | Air temperatures at head and foot levels are adjustable to ±2°C, regardless of operation of any other switch.  |

# DESCRIPTION—Auto Air Conditioner

## Display of the Air Flow Indicator



SHA283B

## Display of Temperature Setting

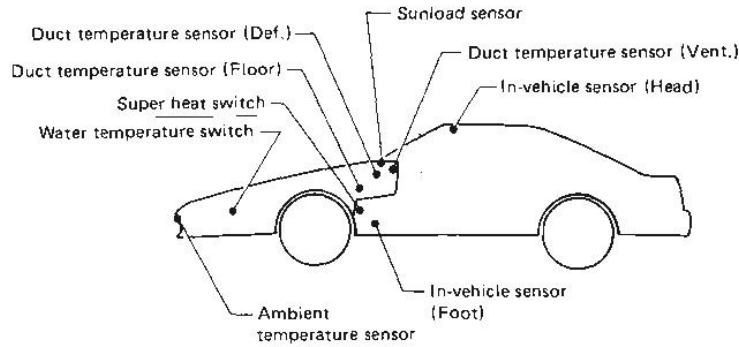
| Analogue display | Display              |                                |
|------------------|----------------------|--------------------------------|
|                  | Digital display (°F) | Fixed control temperature (°F) |
|                  | 90                   | 104                            |
|                  | 85                   | 90                             |
|                  | 84                   | 88.5                           |
|                  | 83                   | 87                             |
|                  | 82                   | 85.5                           |
|                  | 81                   | 84                             |
|                  | 80                   | 82.5                           |
|                  | 79                   | 81.0                           |
|                  | 78                   | 79.5                           |
|                  | 77                   | 78                             |
|                  | 76                   | 76.5                           |
|                  | 75                   | 75                             |
|                  | 74                   | 73.5                           |
|                  | 73                   | 72                             |
|                  | 72                   | 70.5                           |
|                  | 71                   | 69                             |
|                  | 70                   | 67.5                           |
|                  | 69                   | 66                             |
|                  | 68                   | 64.5                           |
|                  | 67                   | 63                             |
|                  | 66                   | 61.5                           |
|                  | 65                   | 60                             |
|                  | 60                   | 50                             |

SHA284B

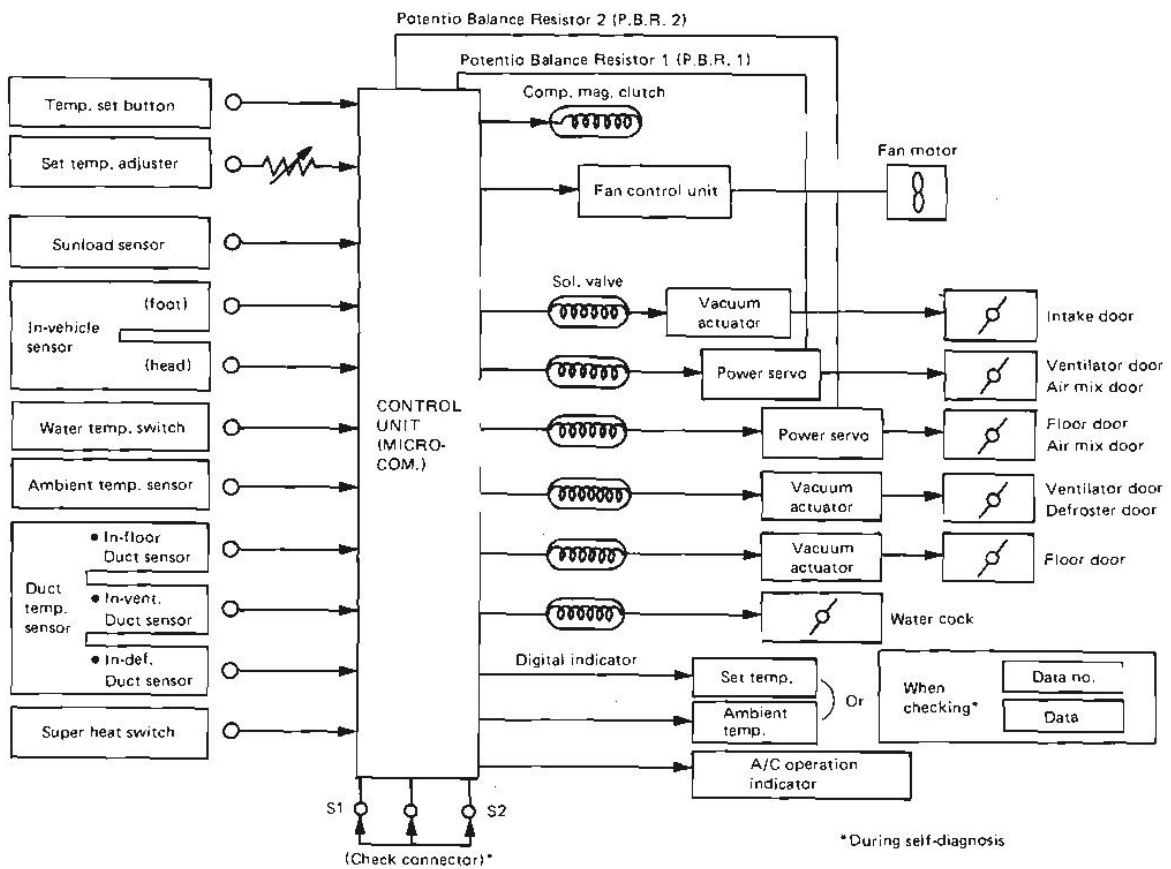
# DESCRIPTION—Auto Air Conditioner

## Control System

### SENSOR & SWITCH LOCATION



SHA337B



SHA338B

# DESCRIPTION—Auto Air Conditioner

## System Operation (Air mix door control)

### AIR MIX DOOR CONTROL (Automatic temperature control)

#### 1. Component parts

Air mix door control system consists of the parts shown below.

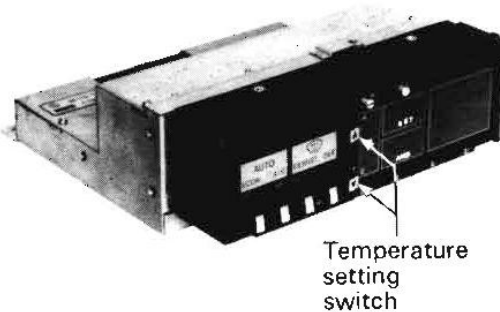
- 1) Automatic amplifier (with microcomputer)
- 2) Temperature setting switch
- 3) Two in vehicle sensors (head/foot)
- 4) Ambient temperature sensor
- 5) Three duct temperature sensors (defroster duct, ventilator duct, floor duct)
- 6) Sunload sensor
- 7) Power servo 1 and Power servo 2
- 8) PBR1 and PBR2  
(P.B.R.: Potentio Balance Resistor)
- 9) D.S.V.V. 1 and D.S.V.V. 2  
(D.S.V.V.: Double Solenoid Vacuum Valve)

#### • Automatic amplifier

This amplifier has a built-in microcomputer enabling it to deal with data and to provide precise control, which is necessary for driving the auto air conditioner system. In addition to the auto air conditioner mode, this microcomputer has the self-diagnosis mode program.

\* For functioning of system for self-diagnosis of trouble, refer to "SELF-DIAGNOSING SYSTEM OF TROUBLE".

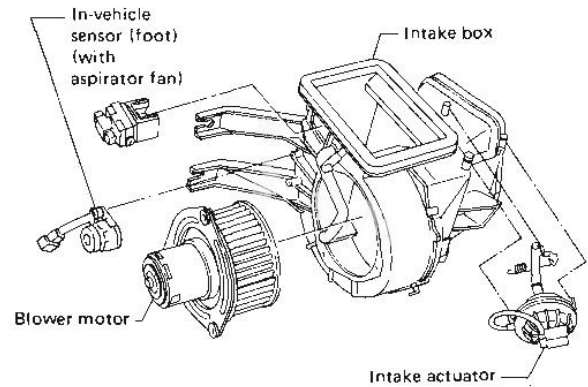
#### • Temperature setting switch



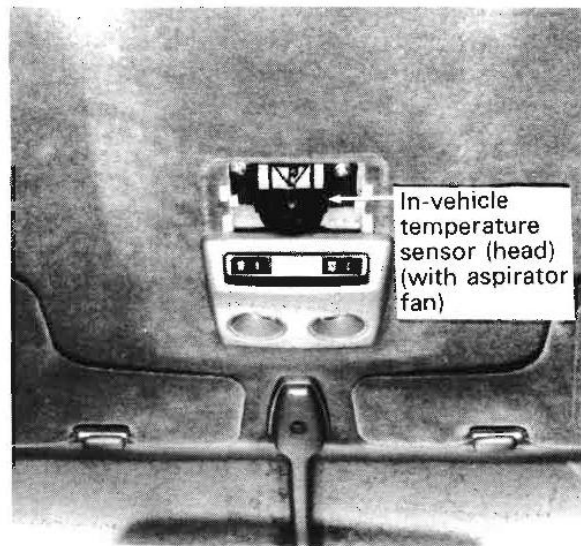
This switch is used for setting the in-vehicle temperature. Temperature set by temperature setting switch is electrically memorized by the microcomputer in automatic amplifier.

#### • In-vehicle sensor (Head, foot)

The in-vehicle sensor converts the temperature value of the inside air which is drawn through (by low pressure) the aspirator fan into resistance value, which is then input into the auto amplifier. The sensor placed at head level detects the typical temperature at the upper half body level. The sensor placed at foot level detects the foot level temperature.

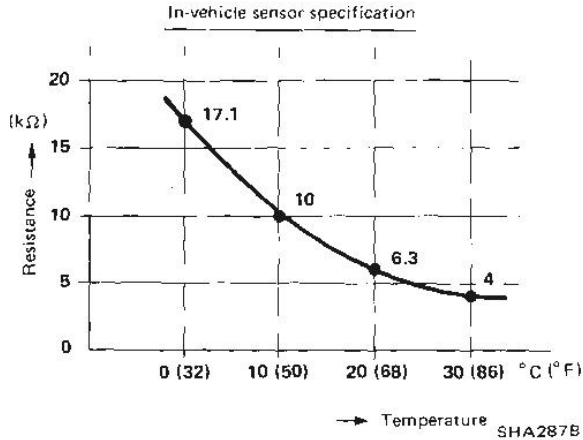


SHA318B



## DESCRIPTION—Auto Air Conditioner

### System Operation (Air mix door control) (Cont'd)



- **Ambient temperature sensor**

This sensor transforms the value of ambient temperature into a resistance value, which is put into automatic amplifier.

(The specification of this sensor is the same as for in-vehicle sensor.)

- **Defroster duct temp. sensor, ventilator duct temp. sensor, floor duct temp. sensor**

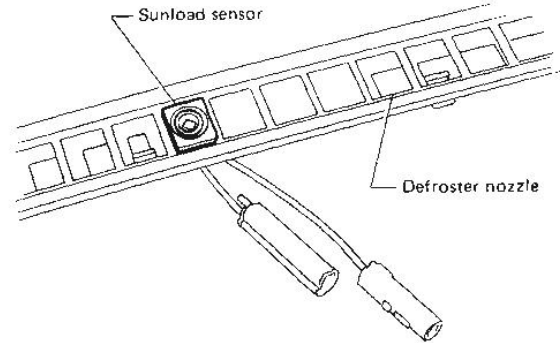
Each sensor transforms the value of outlet air temperature from each duct into a resistance value, which is put into automatic amplifier.

(The specification of these sensors is the same as for in-vehicle sensor.)

\* For the location of these sensors, refer to AIR FLOW AND COMPONENT LAYOUT — Auto A/C (Component Layout).

- **Sunload sensor (Photo diode)**

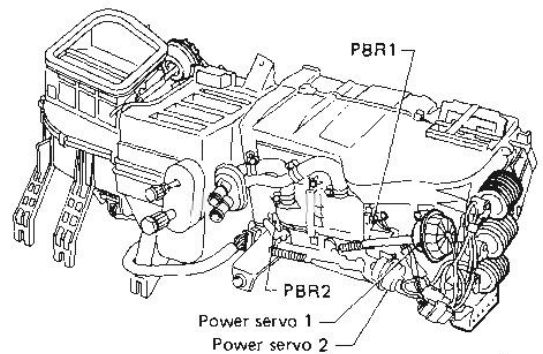
This sensor transforms sunload into current value, which is put into the automatic amplifier. This sensor is located in defroster grille.



SHA299B

- **Power servo 1, 2 P.B.R. 1, 2 (P.B.R.: Potentio Balance Resistor)**

The power servo varies its stroke depending on the vacuum or atmospheric pressure led through D.S.V.V. for controlling the air mix door. The P.B.R. is a variable resistor interlinked to the power servo, and the air mix door position (opening) information is input into the auto amplifier in terms of resistance value.

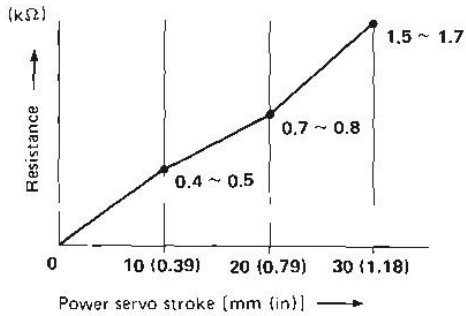


SHA319B

# DESCRIPTION—Auto Air Conditioner

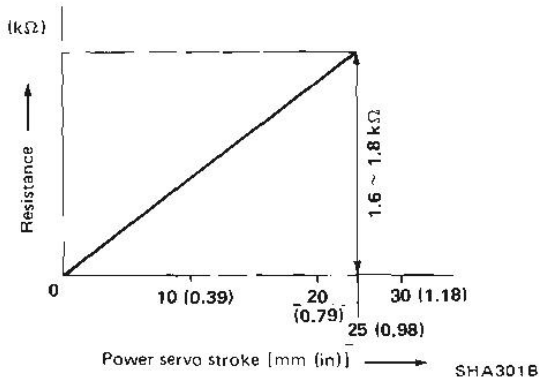
## System Operation (Air mix door control) (Cont'd)

### P.B.R. 1



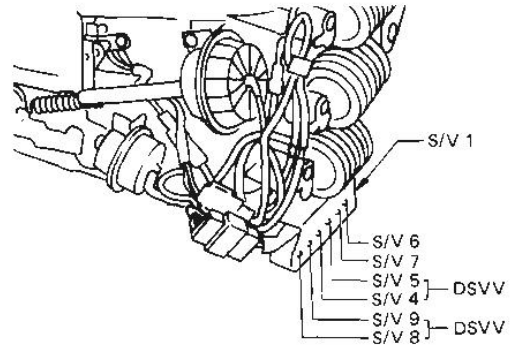
SHA300B

### P.B.R. 2



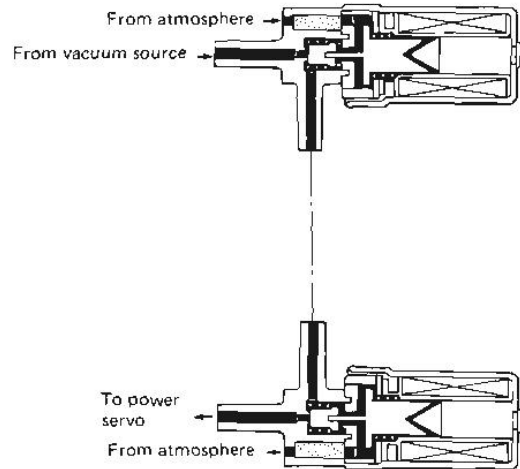
SHA301B

- **D.S.V.V. (Double Solenoid Vacuum Valve)**  
D.S.V.V. can drive the power servo, because it transforms the electric signal from automatic amplifier into vacuum pressure or atmospheric pressure.



SHA339B

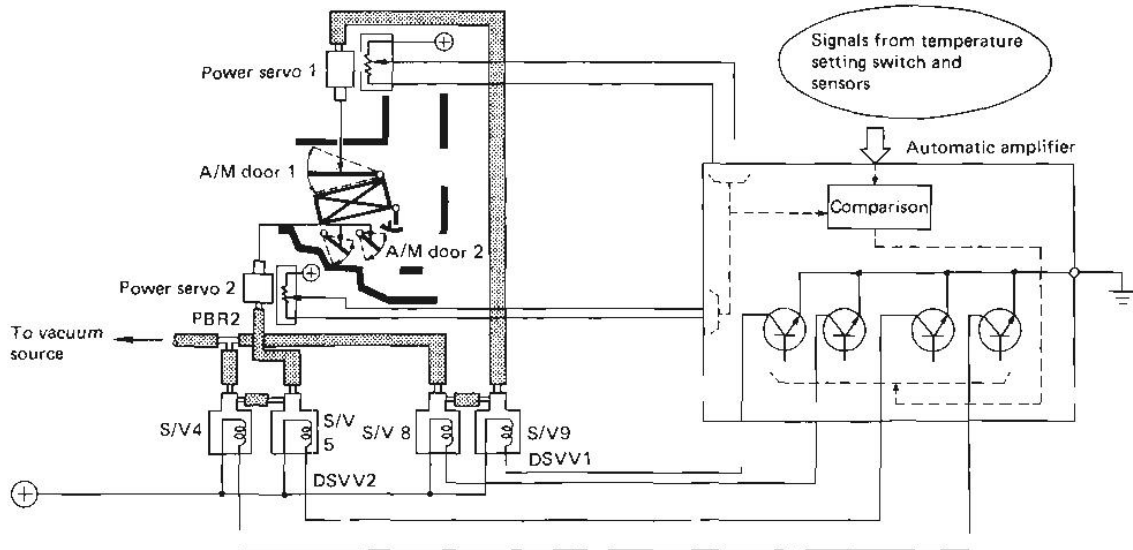
Inner structure of D.S.V.V.



SHA289B

# DESCRIPTION—Auto Air Conditioner

## System Operation (Air mix door control) (Cont'd)



SHA288B

The objective air mix door opening calculated in the auto amplifier and the actual door opening input from P.B.R. are compared in the auto amplifier. A signal, as shown in the list is sent to D.S.V.V. according to the results of comparison.

CL: Solenoid valve is closed  
OP: Solenoid valve is open

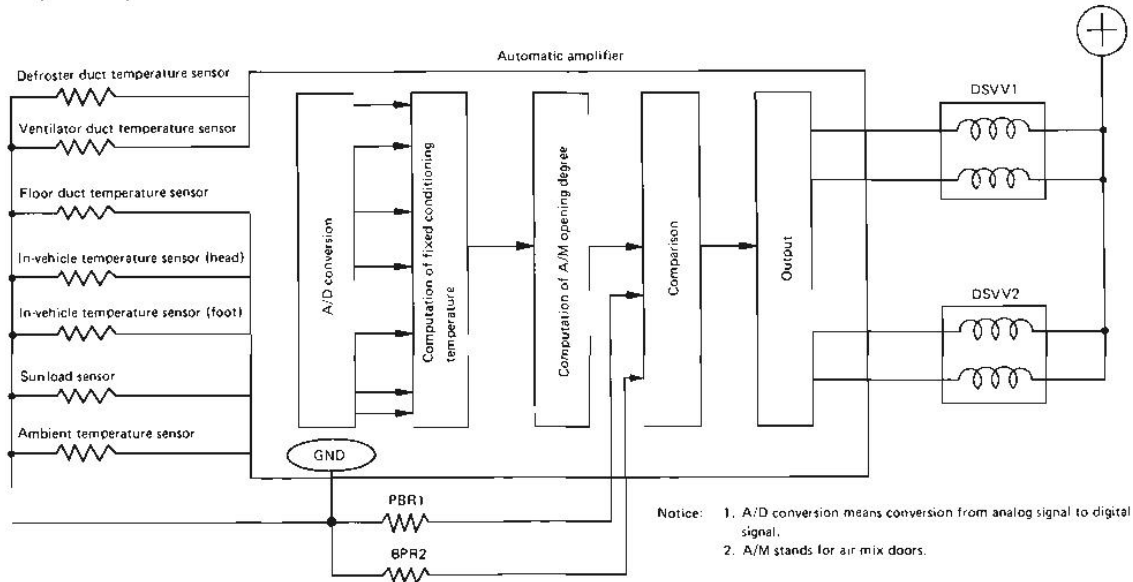
|                |                             | AIR MIX DOOR CONTROL |      |           |    |
|----------------|-----------------------------|----------------------|------|-----------|----|
|                |                             | HOT side             | HOLD | COLD side |    |
| Air mix door 1 | Operation of solenoid valve | S/V8                 | CL   | CL        | OP |
|                |                             | S/V9                 | OP   | CL        | OP |
| Air mix door 2 | Operation of solenoid valve | S/V4                 | CL   | CL        | OP |
|                |                             | S/V5                 | OP   | CL        | OP |



# DESCRIPTION—Auto Air Conditioner

## System Operation (Air mix door control) (Cont'd)

### 2. System operation of air mix door control



SHA290B

The temperature setting switch in this control system inputs the setting temperature signal to the auto amplifier.

The in-vehicle sensor, sunload sensor, ambient air temperature sensor, and duct temperature sensor also input the resistance value signals respectively to the auto amplifier corresponding to their conditions.

Receiving these input signals, the auto amplifier calculates the desirable air mix door position and causes the air mix door to move to the calculated position from its actual position detected by P.B.R. 1.

This movement of the air mix door is done by the power servo activated by the signal sent from the auto amplifier to the atmosphere side or vacuum side of the D.S.V.V.

The position of the air mix door is confirmed by the P.B.R. when converting the stroke of the power servo into voltage signal, and then by inputting the signal to the auto amplifier. The D.S.V.V. then continues operation until the air mix door position detected in this way coincides with the position determined by the control unit. The D.S.V.V. and the power servo stops operation once coincidence is attained.

# DESCRIPTION—Auto Air Conditioner

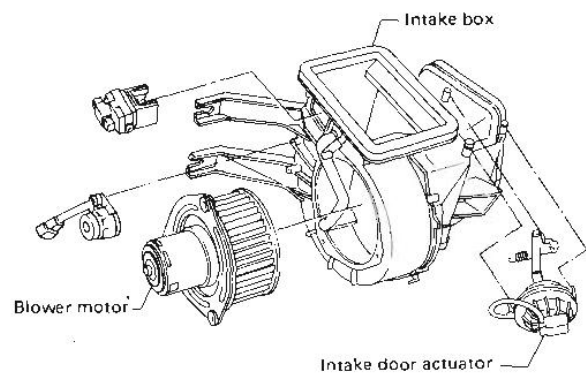
## System Operation (Intake door control)

### INTAKE DOOR CONTROL

#### 1. Component parts

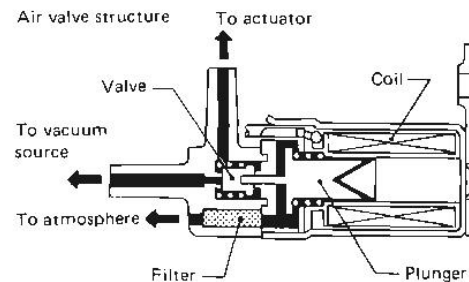
The next parts are added to the component parts of air mix door control system.

- Intake door actuator



SHA318B

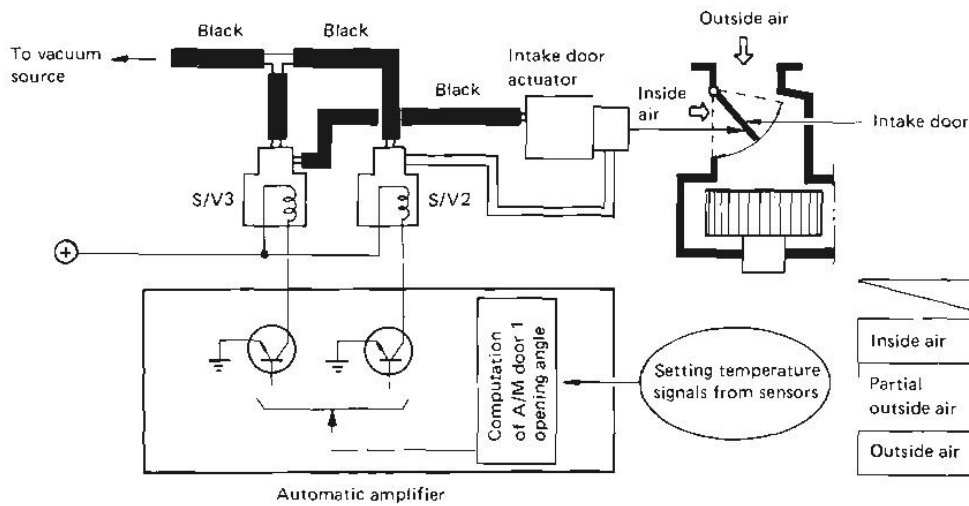
- Solenoid valve (Air valve type)



| SW  | Vacuum source | Actuator side | Atmosphere side |
|-----|---------------|---------------|-----------------|
| ON  | ○             | ○             |                 |
| OFF |               | ○             | ○               |

SHA302B

#### 2. System operation of intake door control



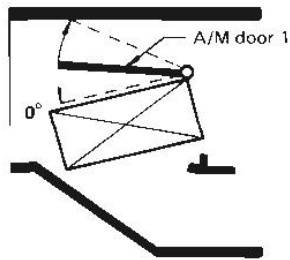
|                     | S/V3   | S/V2   |
|---------------------|--------|--------|
| Inside air          | OPEN   | OPEN   |
| Partial outside air | CLOSED | CLOSED |
| Outside air         | CLOSED | CLOSED |

SHA303B

# DESCRIPTION—Auto Air Conditioner

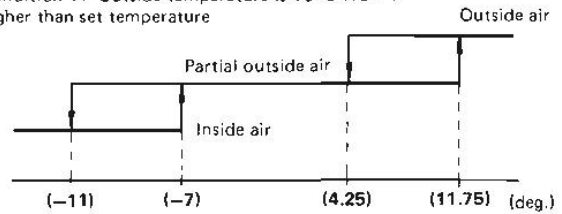
## System Operation (Intake door control) (Cont'd)

The intake door is switched in order to introduce the inside air, partial outside air, or outside air at the positions already memorized in the auto amplifier corresponding to the angle (opening) of the air mix door 1 which is automatically temperature controlled. The relationship between the angle (opening) of the air mix door and the intake door position is as shown below.



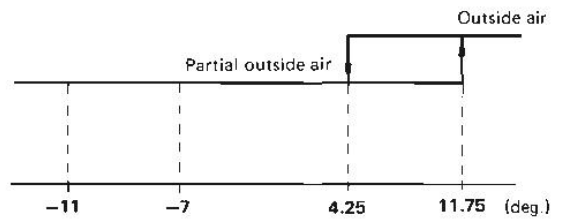
SHA304B

Condition 1: Outside temperature is 10°C (18°F) higher than set temperature



A/M door 1 angle (Opening angle): setting value

Condition 2: Except for Condition 1



A/M door 1 angle (Opening angle): setting value. SHA305B

## System Operation (Outlet door control)

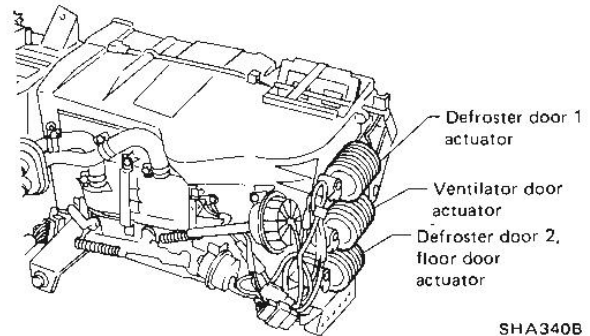
### OUTLET DOOR CONTROL

#### 1. Component parts

Outlet door control system consists of the parts shown below.

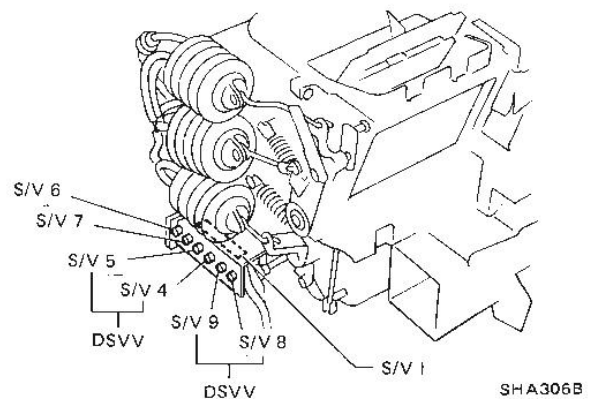
- 1) Defroster door actuator
- 2) Ventilator door actuator
- 3) Defroster and floor door actuator
- 4) Solenoid valve 6, 7
- 5) Sunload sensor
- 6) Ambient temperature sensor
- 7) Automatic amplifier

#### • Actuators



SHA340B

#### • Solenoid valve 6, 7

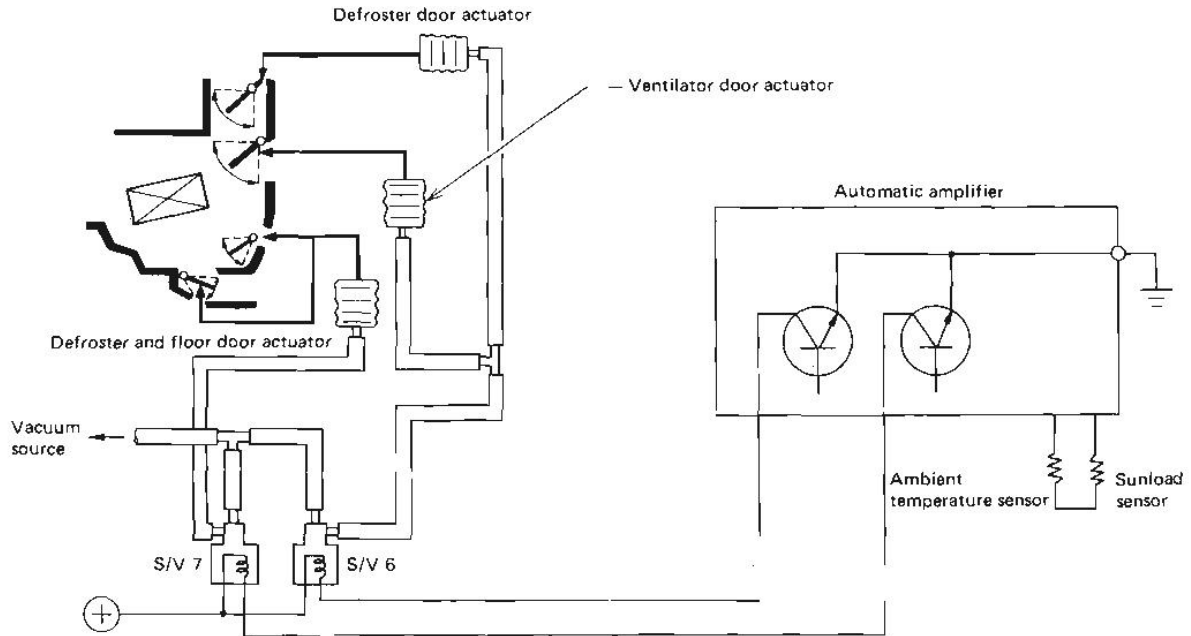


SHA306B

# DESCRIPTION—Auto Air Conditioner

## System Operation (Outlet door control) (Cont'd)

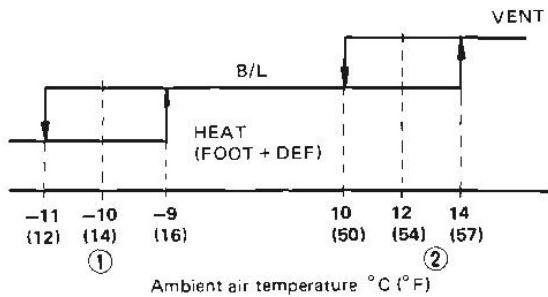
### 2. System operation of outlet door control



SHA291B

The outlet door is switched to HEAT, B/L, or VENT at the positions already memorized in the auto amplifier, corresponding to the ambient air temperature and sunload.

Condition: Very fine in midsummer  
 ( Sunload: Approximately 0.768 kW  
 (660 kcal/h, 2,619 BTU/h)/m<sup>2</sup>  
 (0.0713 kW (61.3 kcal/h, 243.2 BTU/h)/sq ft) )

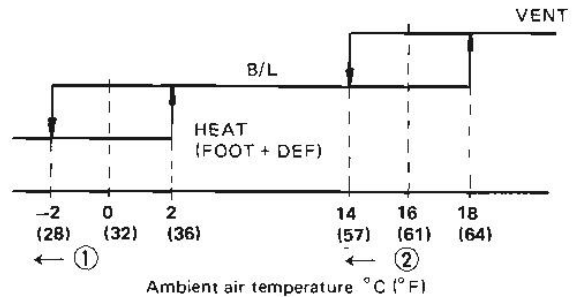


SHA307B

The relationship between the ambient air temperature and outlet door is as shown below.

If the sunload increases, points ① and ② are moved in parallel direction to the arrow by the distance corresponding to the increase in sunload.

Condition: No sunload



SHA308B

# DESCRIPTION—Auto Air Conditioner

## System Operation (Air flow volume control)

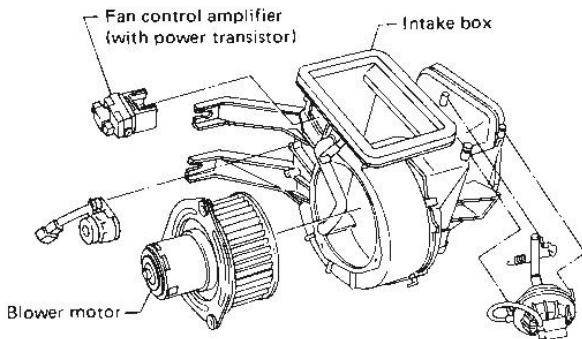
### AIR FLOW VOLUME CONTROL

#### 1. Component parts

Power transistor is added to the component parts of air mix door control system.

- **Power transistor**

Power transistor varies blower speed automatically according to the signal from automatic amplifier.

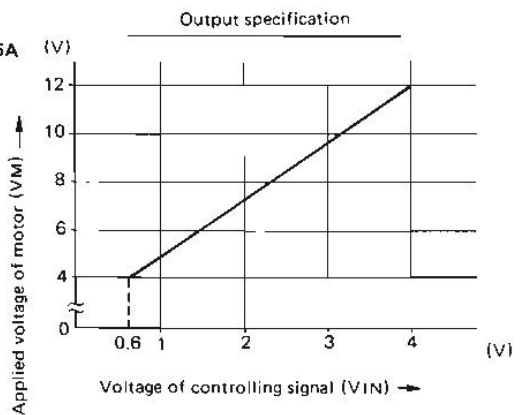
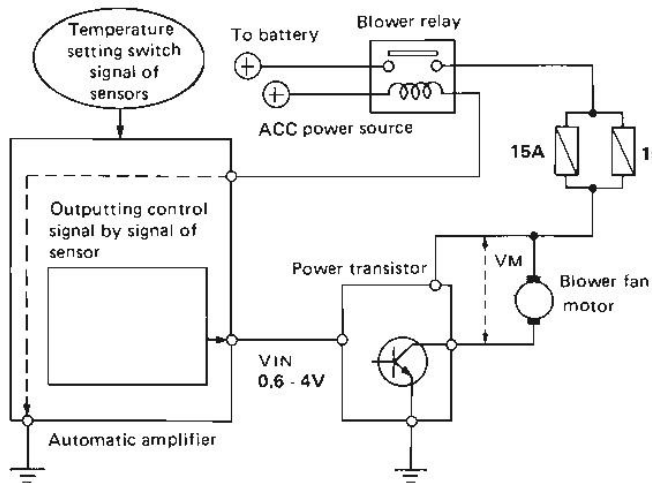


SHA318B

#### 2. System operation of air flow volume control

The auto amplifier computes signals from the setting temperature switch and sensors that compose the air mix door control, and sends the control signal voltage ( $V_{IN}$ : 0.6 to 4 V) to the power transistor.

The power transistor amplifies this control signal voltage to change the voltage ( $V_M$ ) fed to the motor terminals. Accordingly, the air flow is controlled automatically. With the manual fan switch, the voltage is fixed at 5.5V for LO, and at 12V for HI position.



SHA309B

# DESCRIPTION—Auto Air Conditioner

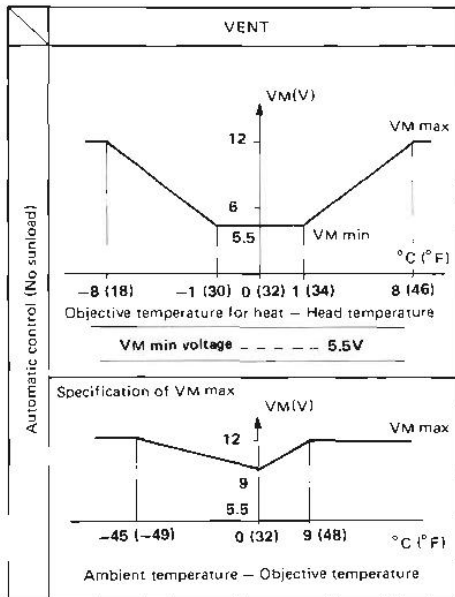
## System Operation (Air flow volume control) (Cont'd)

3. Specification of air flow volume control (Automatic control)
  - When "AUTO" switch is ON:

### VENT mode

The air flow volume control voltage is determined according to the difference between the objective temperature at head level and the actual room temperature at head level. This voltage varies within the range of 5.5V to 12V.

The  $V_M$  max is determined according to the difference between the ambient temperature and objective temperature, and this voltage varies within the range of from 9V to 12V.

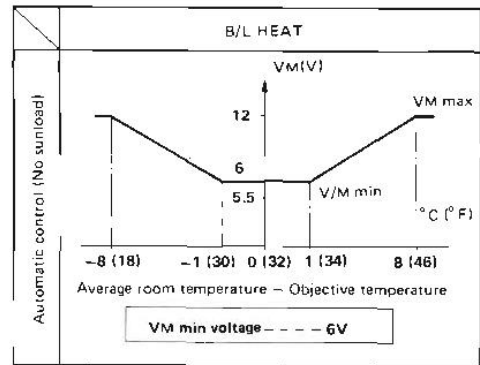


SHA310B

### B/L, HEAT mode

The air flow volume control voltage is determined according to the difference between the average room temperature and the objective temperature. This voltage varies within the range of 6V to 12V. The  $V_M$  max varies within the range of 9V to 12V, just like in the case of VENT.

When the DEMIST switch on the DEF switch is ON, the  $V_M$  min voltage is fixed at 8V. Accordingly, the control voltage varies within the range of 8V to 12V.



SHA311B

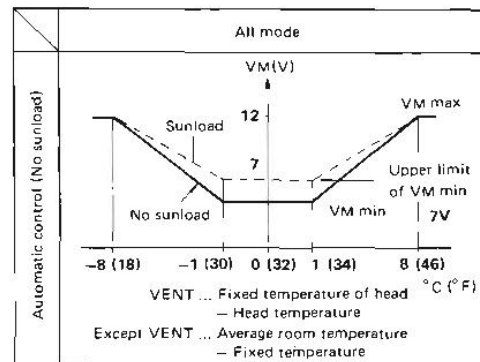
4. Compensation of air flow volume when sunload exists

In order to compensate for a change in room temperature depending on whether or not the sunload exists, the air flow volume is corrected according to the following diagram.

In VENT . . . . .  $V_M$  min: 5.5 to 7 V  
 Except VENT . . . . .  $V_M$  min: 6 to 7 V  
 (In both cases, the upper limit of compensation is 7V.)

$V_M$  max is the same as when no sunload exists.

If the DEMIST switch is ON, compensation of air flow volume by sunload does not occur.



SHA292B

# DESCRIPTION—Auto Air Conditioner

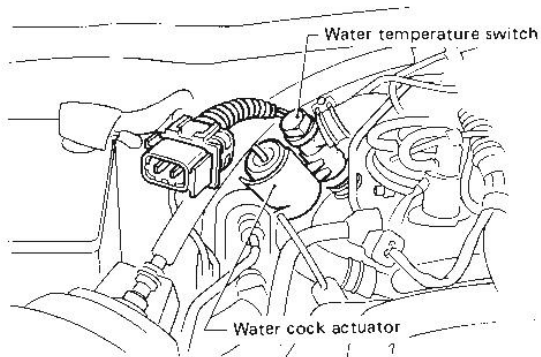
## System Operation (Control at starting)

### CONTROL AT STARTING

#### 1. Component parts

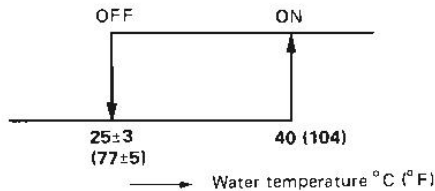
Water temperature switch is added to the component parts of air mix door control system.

- Water temperature switch



SHA312B

Specification

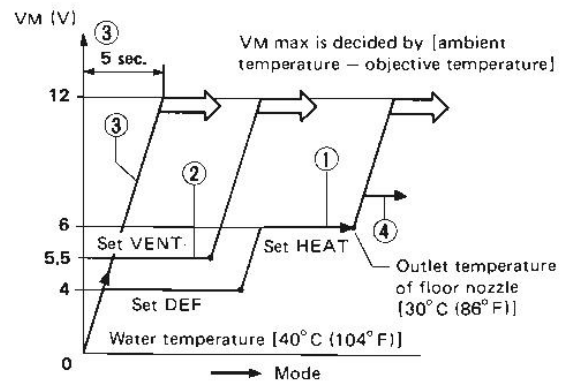


SHA293B

#### 2. System operation of control at starting

- Curve ① means that the coolant temperature is below 40°C (104°F) and the room temperature at head level is lower than the objective temperature by more than 5°C (9°F). (Example: When sunload does not exist in winter)
- Curve ② means that the coolant temperature is below 40°C (104°F) and the room temperature at foot level is only lower than the objective temperature. (Example: When sunload exists in winter)
- Curve ③ means that the room temperature at head level is higher than the objective temperature by more than 5°C (9°F) and the room temperature at foot level is also higher than the objective temperature. (The outlet door is controlled by the outlet door control signal.)
- Curve ④ means that the difference between the objective temperature and actual room temperature is less than 8°C (14°F).

In cases ① and ② when the voltage is higher than 6V, the outlet door is determined by the outlet door control signal.



SHA313B



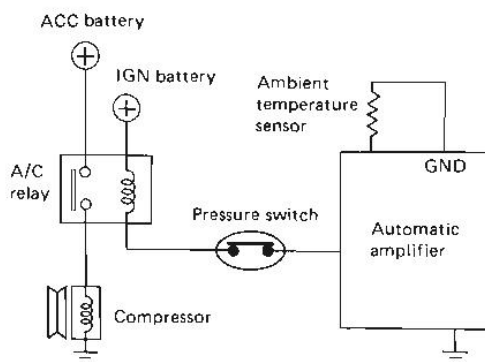
# DESCRIPTION—Auto Air Conditioner

## System Operation (Compressor, water cock control and compensation for ambient temperature)

### COMPRESSOR CONTROL

- "ECON" mode: OFF
- Except for "ECON" mode:

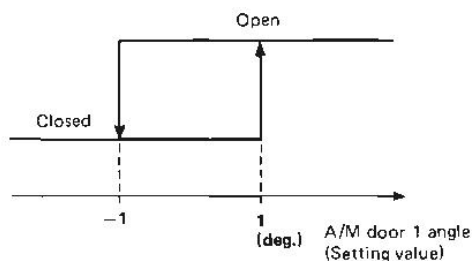
| Ambient temperature  | Control |
|----------------------|---------|
| More than 0°C (32°F) | ON      |
| Less than 0°C (32°F) | OFF     |



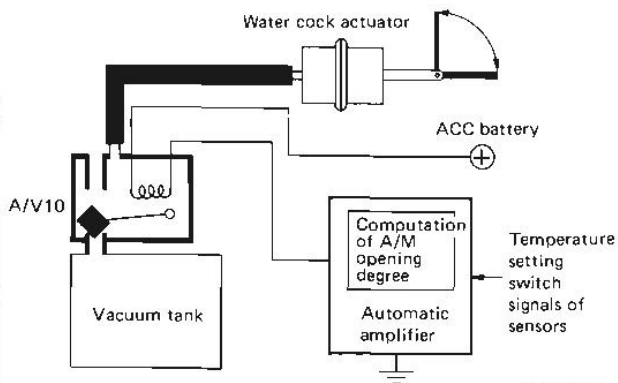
SHA294B

### WATER COCK CONTROL

When the ambient temperature is lower than the objective temperature, the water cock is kept open. In other cases, the water cock is opened or closed at the position already memorized in the auto amplifier corresponding to the opening angle of the air mix door 1.



SHA314B



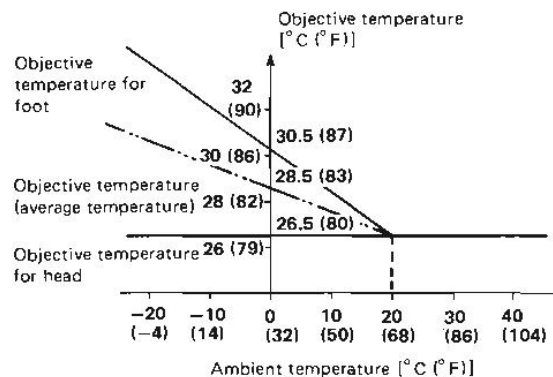
SHA295B

### COMPENSATION FOR AMBIENT TEMPERATURE

In the temperature control system, the head-level and foot-level objective temperatures are compensated for a change in the ambient temperature.

For example, when the setting temperature is 25°C (77°F), and if the ambient temperature is 0°C (32°F), the foot-level objective temperature is compensated to 30.5°C (87°F) and the head-level objective temperature to 26.5°C (80°F). If the ambient temperature is higher than 20°C (68°F), the objective temperature at both levels is 26.5°C (80°F).

Specification of objective temperature  
[When the setting temperature is 25°C (77°F)]



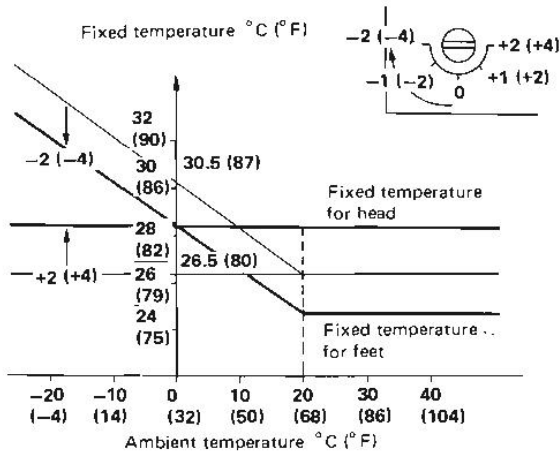
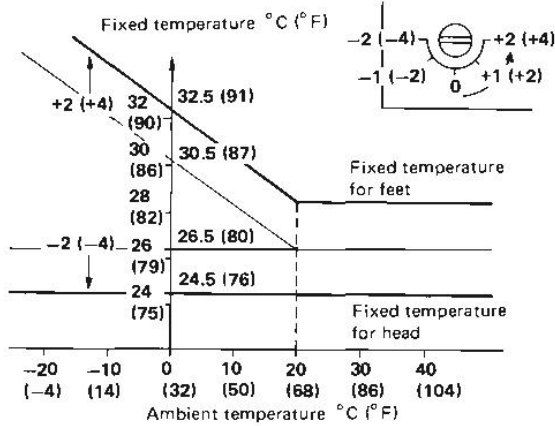
SHA315B

# DESCRIPTION—Auto Air Conditioner

## System Operation (Function of set TEMP. adjuster)

### FUNCTION OF SET TEMP. ADJUSTER

TEMP. SET ADJUSTER changes the value of the objective controlling temperature shown above, according to the ambient temperature, to the next value shown below.

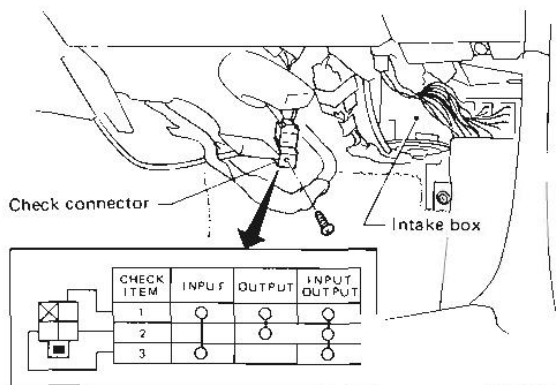


# DESCRIPTION—Auto Air Conditioner

## Function of Self-Diagnosis of Trouble

The self-diagnosis program is used to locate trouble and is composed of the following two steps:

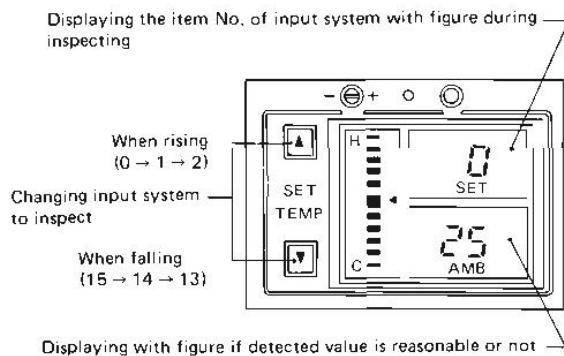
- Step 1 . . . . . Inspection of input system
- Step 2 . . . . . Inspection of output system
- Diagnosing check terminal  
To change the system to the diagnosis mode, short the check terminal located at the lower portion of the cooling unit.



SHA316B

### STEP 1 INSPECTION OF INPUT SYSTEM

The number of the part being checked and the value detected by that part (whether that part is disconnected or shorted) is displayed on the temperature display section by the setting temperature switch.



SHA317B

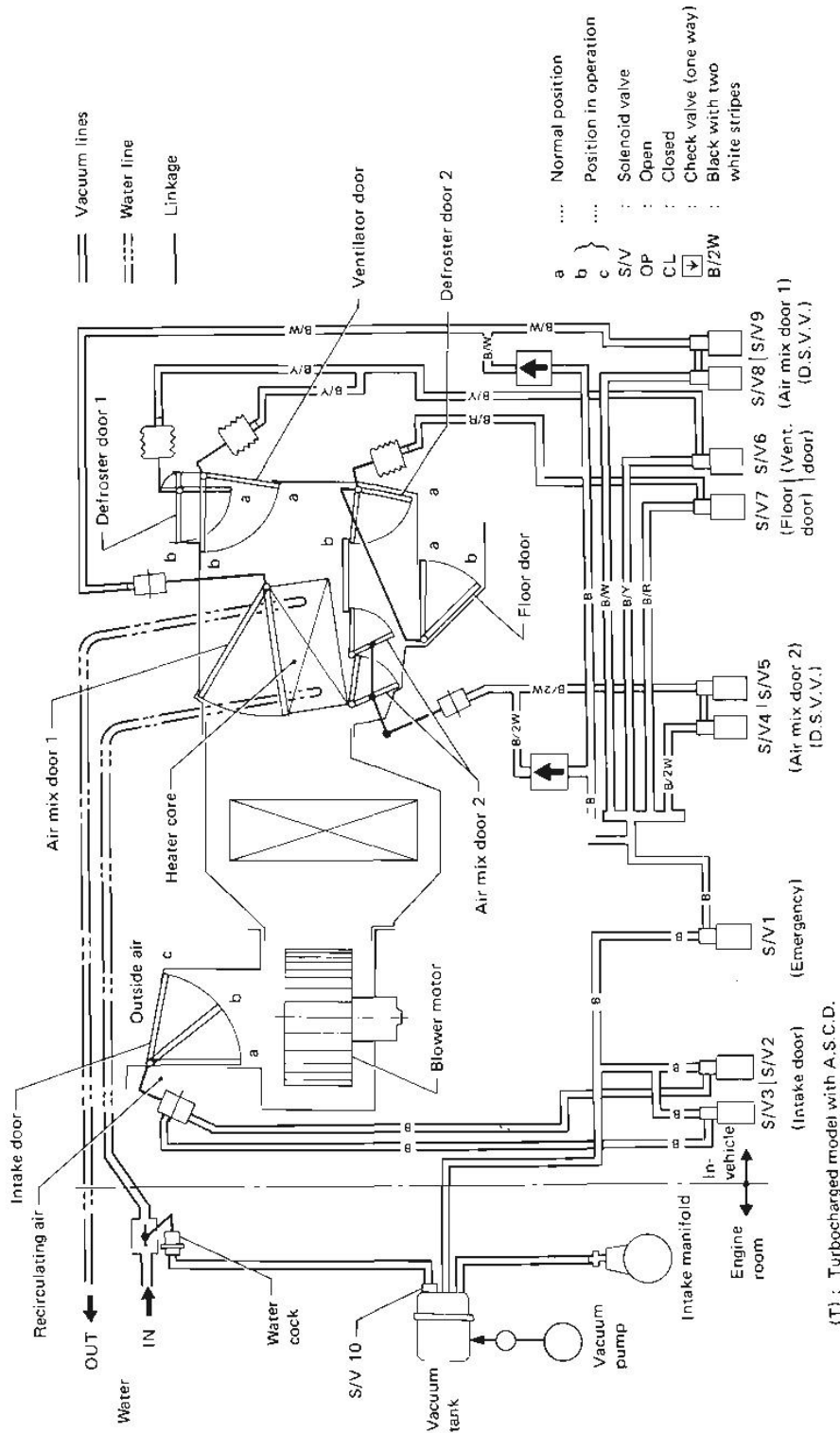
| Display No. | Item of input signal                                | Parts name                         |
|-------------|---|------------------------------------|
| 0           | Temperature of inside air temperature sensor (foot) | In-vehicle sensor (foot)           |
| 1           | Temperature of in-vehicle sensor (head)             | In-vehicle sensor (head)           |
| 2           | Temperature of floor outlet                         | Floor duct temperature sensor      |
| 3           | Temperature of ventilator outlet                    | Ventilator duct temperature sensor |
| 4           | Temperature of defroster outlet                     | Defroster duct temperature sensor  |
| 5           | Water temperature SW, display ON-OFF                | Water temperature SW.              |
| 6           | Sunload   | Sunload sensor                     |
| 7           | Width of objective temperature                      | Set temp. adjuster                 |
| 8           | Position of A/M door 2                              | P.B.R. 2                           |
| 9           | Position of A/M door 1                              | P.B.R. 1                           |
| 10~15       | No meaning  | No meaning                         |

### STEP 2 INSPECTION OF OUTPUT SYSTEM

- Whether the parts of the output system are operating normally according to the predetermined pattern can be checked by applying a hand to the outlet door, observing the air flow indicator, listening to the operating noise, or by measuring the applied voltage.
- Once the step 2 program starts, the following six parts begin their operation sequentially, moving between stroke ends or changing all positions.
- **Operating parts**
  1. Air mix door 1 and air mix door 2 (same motion)
  2. Outlet doors (All mode)
  3. Intake door
  4. Water cock
  5. Compressor magnet clutch
  6. Blower motor

# AIR FLOW AND COMPONENT LAYOUT — Auto A/C

## Air Flow



| OUTLET CONTROL |      |     |              |
|----------------|------|-----|--------------|
| MODE           | VENT | B/L | HEAT/DEHUMID |
| DEF. DOOR 1    | b    | b   | a            |
| VENT. DOOR     | b    | b   | a            |
| FLOOR, DOOR    | a    | b   | b            |
| DEF. DOOR 1    | a    | b   | a            |
| S/V 6          | OP   | OP  | CL           |
| S/V 7          | CL   | OP  | OP           |

| AIR MIX DOOR CONTROL |          |       |           |       |
|----------------------|----------|-------|-----------|-------|
| OPERATION            | HOT side |       | COLD side |       |
|                      | S/V 8    | S/V 9 | S/V 8     | S/V 9 |
| Air mix door 1       | OP       | OP    | CL        | OP    |
| Air mix door 2       | CL       | CL    | CL        | OP    |

| WATER COCK CONTROL          |        |       |        |    |
|-----------------------------|--------|-------|--------|----|
| OPERATION OF SOLENOID VALVE | OPEN   |       | CLOSED |    |
|                             | S/V 10 | CL    | CL     | OP |
| EMERGENCY SWITCH            | ON     | OFF   | CL     | OP |
| OPERATION OF SOLENOID VALVE | S/V 1  | S/V 1 | CL     | OP |

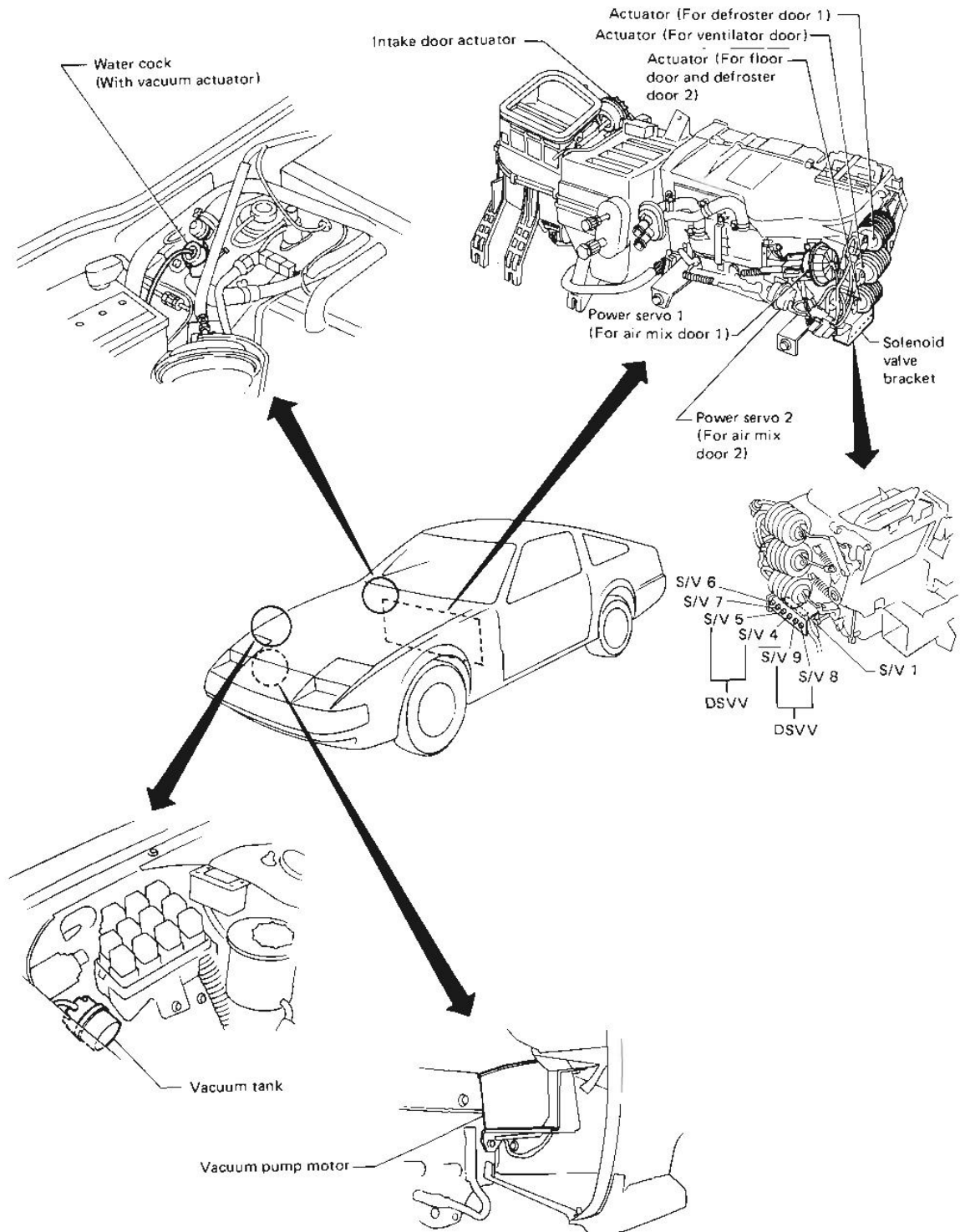
  

| INTAKE CONTROL              |        |       |                 |    |
|-----------------------------|--------|-------|-----------------|----|
| INTAKE AIR                  | RECIRC |       | PARTIAL OUTSIDE |    |
|                             | S/V 2  | S/V 1 | a               | b  |
| OPERATION OF SOLENOID VALVE | OP     | OP    | OP              | CL |
|                             | S/V 1  | S/V 1 | CL              | CL |

SHA277B



# LOCATION OF VACUUM COMPONENTS — Auto A/C



SHA341B

# A/C PERFORMANCE TEST (Auto)

## Performance Chart

### TEST CONDITION

Testing must be performed as follows:

|  |  |
|--|--|
| Vehicle location:  | Indoors or in the shade (in a well ventilated place) |
| Ambient temperature  | More than 14°C (57° F)                               |
| Doors:   | Closed   |
| Door window:   | Open   |
| Hood:  | Open   |
| SET TEMP. switch position:   | Max. COLD  |
| Auto switch position:  | A/C (Ventilation mode)                               |
| Recirculation switch position:   | RECIRC. ON   |
| FAN switch position  | HI. ON   |
| Engine speed:  | 1,500 rpm  |
| Time required before starting testing after<br>air conditioner starts operating: | More than 10 minutes                                 |

### TEST READING

Recirculating-to-discharge air temperature table

| Inside air (Recirculating air) at blower assembly inlet |                           | Discharge air temperature at center ventilator<br>°C (°F) |
|---|---------------------------|---|
| Relative humidity<br>%                                  | At temperature<br>°C (°F) |   |
| 50 - 70   | 20 (68)                   | 3.0 - 5.0 (37 - 41)                                       |
|   | 25 (77)                   | 5.5 - 8.5 (42 - 47)                                       |
|   | 30 (86)                   | 10.0 - 13.5 (50 - 56)                                     |
|   | 35 (95)                   | 14.7 - 18.4 (58 - 65)                                     |
|   | 40 (104)                  | 19.5 - 23.2 (67 - 74)                                     |
| 70 - 90   | 20 (68)                   | 5.0 - 7.0 (41 - 45)                                       |
|   | 25 (77)                   | 8.5 - 11.5 (47 - 53)                                      |
|   | 30 (86)                   | 13.5 - 17.0 (56 - 63)                                     |
|   | 35 (95)                   | 18.4 - 21.8 (65 - 71)                                     |
|   | 40 (104)                  | 23.2 - 26.8 (74 - 80)                                     |



# A/C PERFORMANCE TEST (Auto)/PIPING —Auto A/C

## Performance Chart

Ambient air temperature to compressor pressure table

| Ambient air            |                            | Low pressure (Suction side)<br>kPa (kg/cm <sup>2</sup> , psi) | High pressure (Discharge side)<br>kPa (kg/cm <sup>2</sup> , psi) |
|------------------------|----------------------------|---|--|
| Relative humidity<br>% | Air temperature<br>°C (°F) |   |  |
| 50 - 70                | 20 (68)                    | 59 - 98 (0.6 - 1.0, 9 - 14)                                   | 755 - 892 (7.7 - 9.1, 109 - 129)                                 |
|                        | 25 (77)                    | 78 - 127 (0.8 - 1.3, 11 - 18)                                 | 883 - 1,030 (9.0 - 10.5, 128 - 149)                              |
|                        | 30 (86)                    | 98 - 157 (1.0 - 1.6, 14 - 23)                                 | 1,010 - 1,187 (10.3 - 12.1, 146 - 172)                           |
|                        | 35 (95)                    | 118 - 186 (1.2 - 1.9, 17 - 27)                                | 1,138 - 1,334 (11.6 - 13.6, 165 - 193)                           |
|                        | 40 (104)                   | 137 - 216 (1.4 - 2.2, 20 - 31)                                | 1,295 - 1,510 (13.2 - 15.4, 188 - 219)                           |
| 70 - 90                | 20 (68)                    | 98 - 137 (1.0 - 1.4, 14 - 20)                                 | 883 - 1,020 (9.0 - 10.4, 128 - 148)                              |
|                        | 25 (77)                    | 127 - 177 (1.3 - 1.8, 18 - 26)                                | 1,030 - 1,177 (10.5 - 12.0, 149 - 171)                           |
|                        | 30 (86)                    | 157 - 216 (1.6 - 2.2, 23 - 31)                                | 1,187 - 1,344 (12.1 - 13.7, 172 - 195)                           |
|                        | 35 (95)                    | 186 - 255 (1.9 - 2.6, 27 - 37)                                | 1,334 - 1,530 (13.6 - 15.6, 193 - 222)                           |
|                        | 40 (104)                   | 216 - 304 (2.2 - 3.1, 31 - 44)                                | 1,510 - 1,736 (15.4 - 17.7, 219 - 252)                           |

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

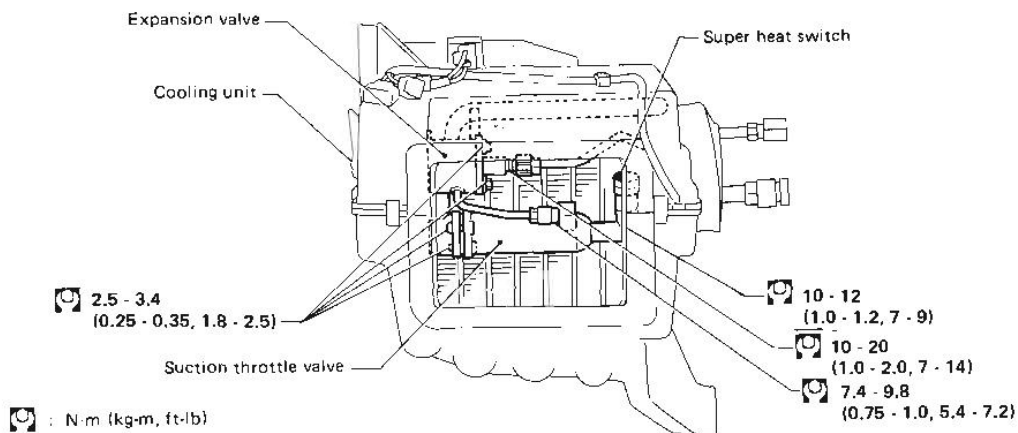
- When blower speed is low, discharge pressure will drop.
- When the relative humidity of intake air is low, discharge pressure will drop.

b. The temperature will change in the following manner with changes in conditions:

When the ambient air temperature is low, the outlet air temperature will become low.

## Refrigerant Lines—Cooling Unit

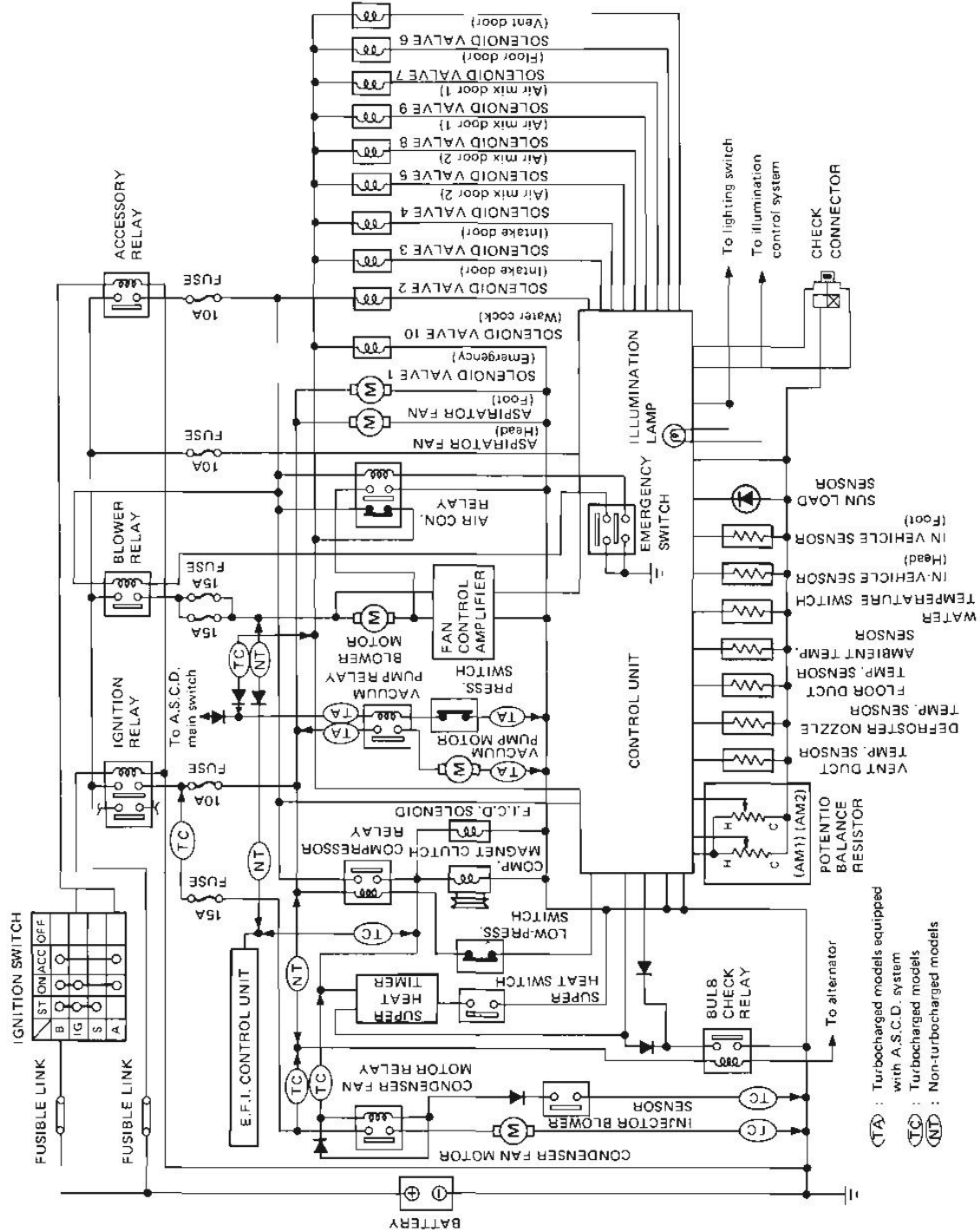
- Refrigerant lines for auto A/C are the same as for manual A/C.



SHA281B

# A/C ELECTRICAL CIRCUIT (Auto)

## Schematic

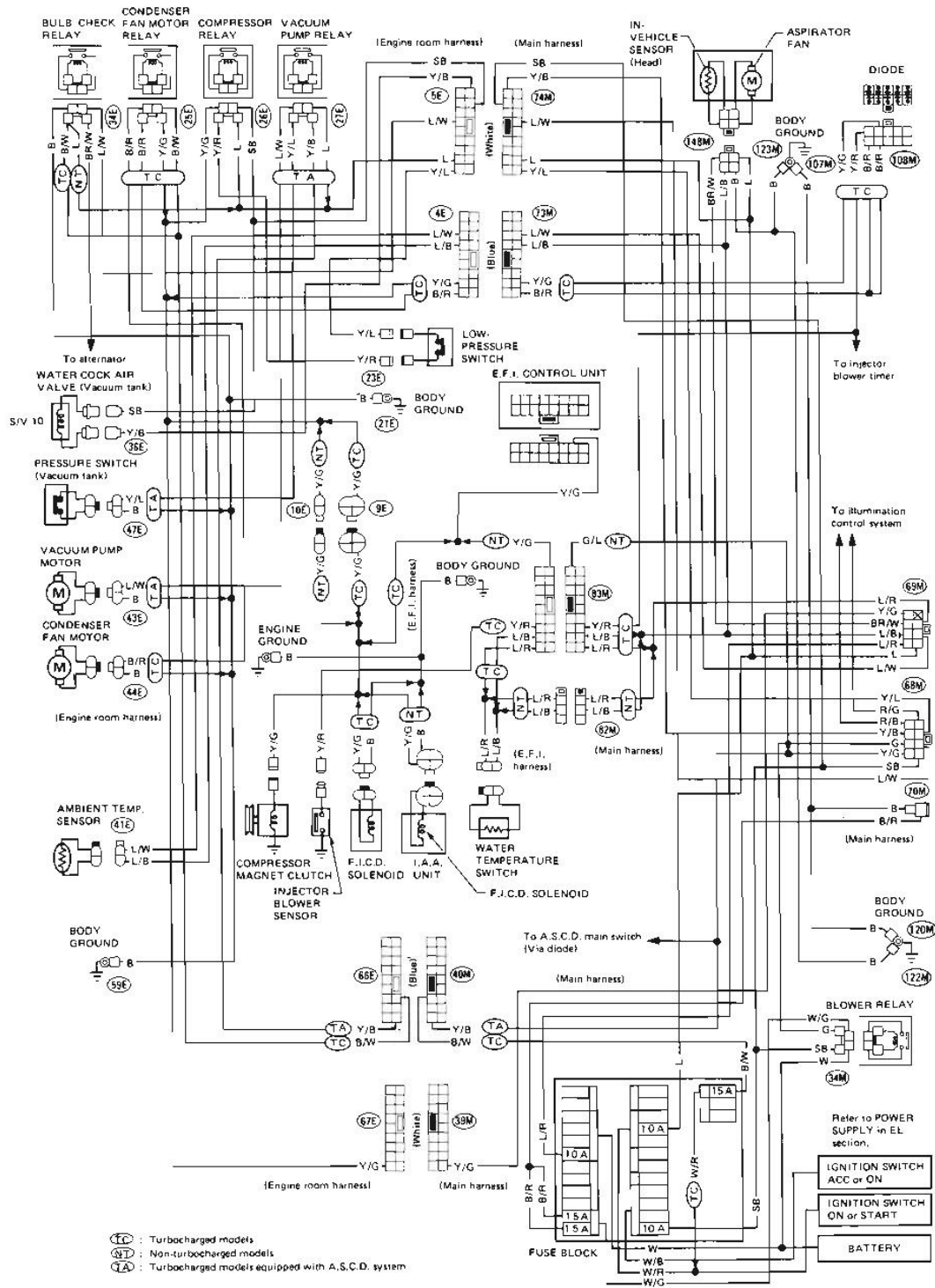


(TA) : Turbocharged models equipped with A.S.C.D. system  
 (TC) : Turbocharged models  
 (NT) : Non-turbocharged models

SHA279B

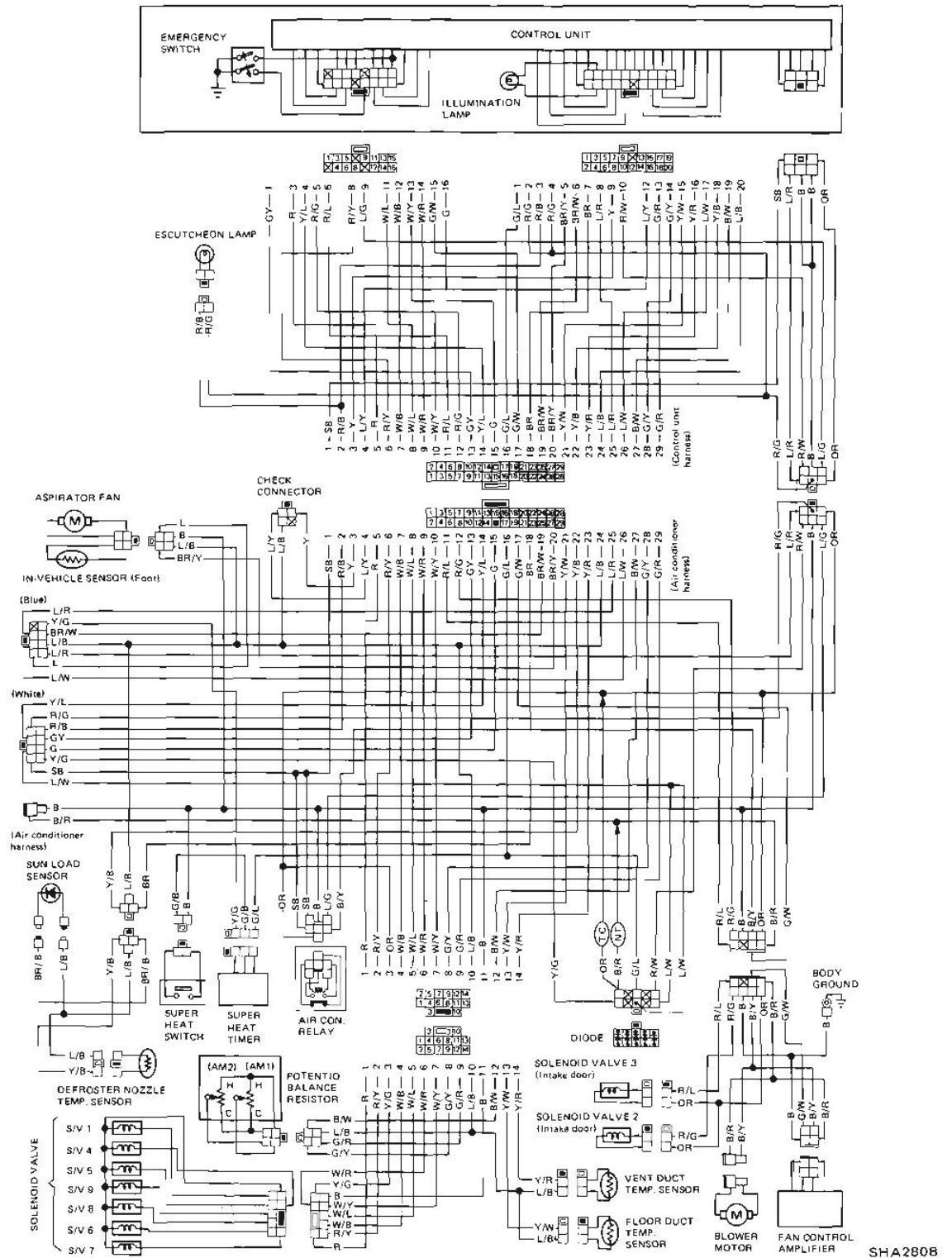
# A/C ELECTRICAL CIRCUIT (Auto)

## Wiring Diagram



# A/C ELECTRICAL CIRCUIT (Auto)

## Wiring Diagram (Cont'd)



SHA2808

## A/C ELECTRICAL COMPONENTS (Auto)

### Inspection

#### IN-VEHICLE SENSOR AT HEAD OR FOOT (with aspirator fan)

- For aspirator fan, check the air flow when applying the voltage.
- For thermistor detecting temperature, refer to "SELF - DIAGNOSING SYSTEM OF TROUBLE" and "DESCRIPTION - AUTO A/C". [System Operation (Air mix door control)].

#### WATER TEMPERATURE SWITCH

1. Disconnect vacuum hose and two heater hoses and harness connector.
2. Dip the water cock assembly in a container filled with cold water and increase the temperature of the water. The switch should turn "ON".

Refer to DESCRIPTION - AUTO "A/C"  
[System operation (Control at starting)].

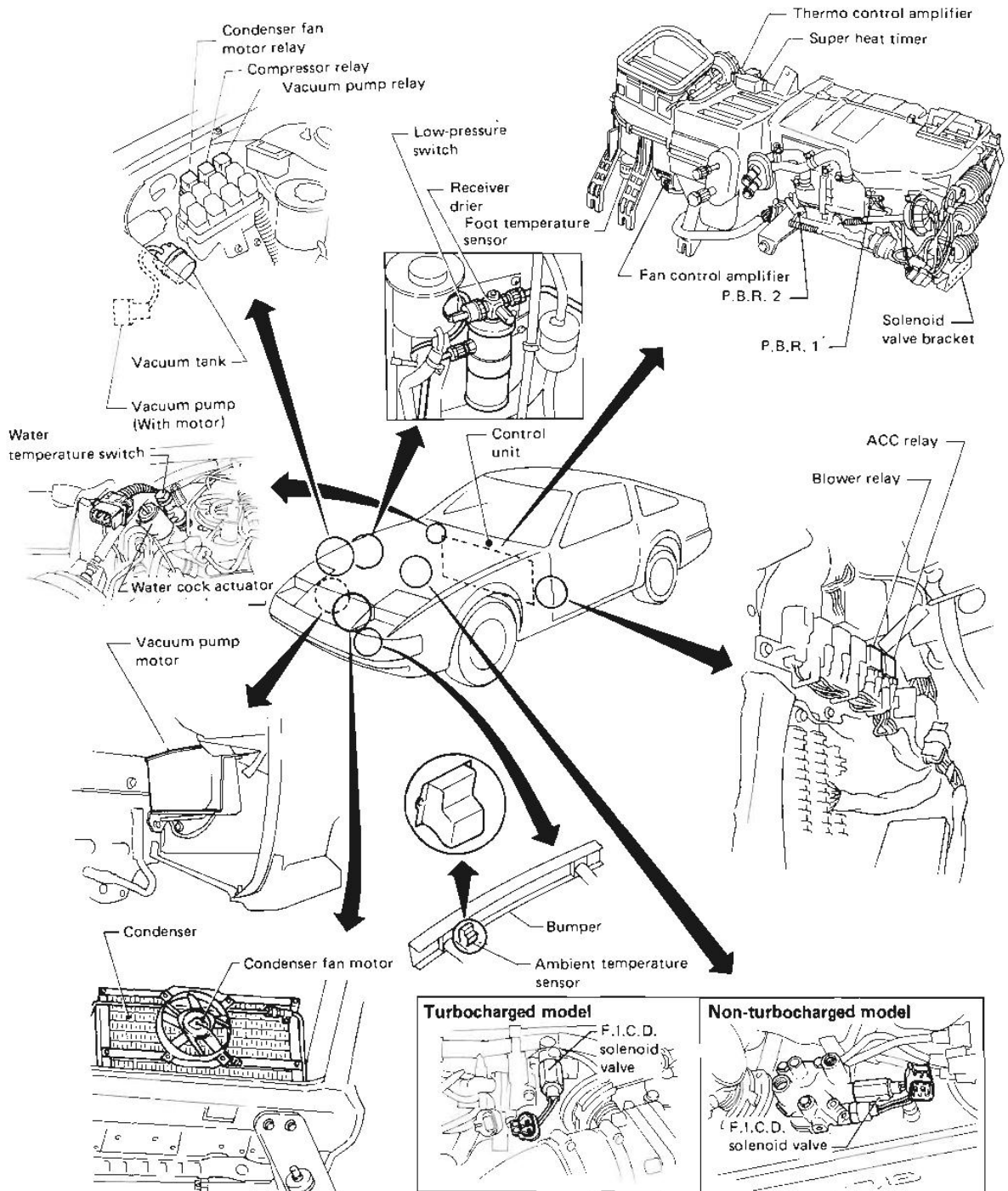
#### NOTICE

- Do not separate the switch from the water cock assembly.

#### SUNLOAD SENSOR

- Check the operation of the pointer of the micro-ammeter when pointing the flashlight toward the sensor and turning it off and on. Refer to DESCRIPTION - AUTO "A/C" [System operation (Air mix door control)].

# LOCATION OF A/C ELECTRICAL COMPONENTS (Auto)



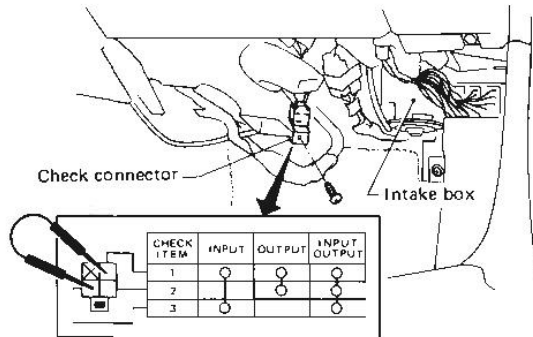
SHA342B

# SELF-DIAGNOSING SYSTEM OF TROUBLE

## Inspection of Input System

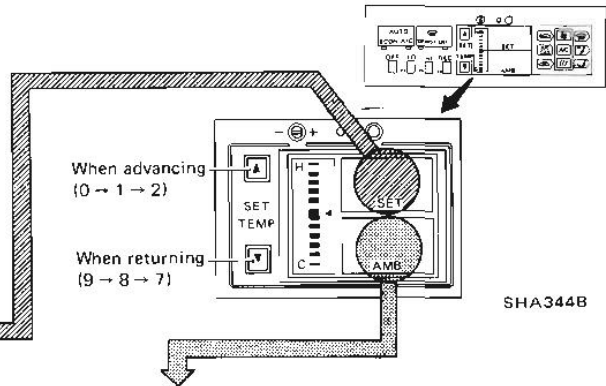
### CHECKING PROCEDURES FOR INPUT SIGNALS

- Short-circuit terminals No. 1 and No. 3 (Terminals are located under the cooling unit.)



SHA343B

- Turn the ignition to "ACC" position and press the "ECON/AC" button once.
- Set data number by tuning set temp. button. Read figures indicated on "AMB" indicator.



SHA344B

| Step No. | Checking item                                  | "SET"   | Display "AMB"  |
|----------|--|---------|--|
| I-0      | FOOT TEMP. SENSOR                              | 0       | Foot temp.<br>OK — If close to actual inside vehicle temperature   |
| I-1      | HEAD TEMP. SENSOR                              | 1       | Head temp.   |
| I-2      | Floor duct temp. sensor                        | 2       | Floor duct temp.   |
| I-3      | Vent duct temp. sensor                         | 3       | Vent. duct temp.   |
| I-4      | DEF. duct temp. sensor                         | 4       | DEF duct temp.   |
| I-5      | Water temp. switch                             | 5       | Water temp. level<br>2 (−17)*: If the water temperature is less than 104°F (40°C).<br>181 (83)*: If the water temperature is greater than 104°F (40°C)   |
| I-6      | Sunload sensor                                 | 6       | Sunload level (Zc/16, kcal/m <sup>2</sup> hr)<br>Receives sunshine and numbers change, it is O.K. Varies [32 to 104 (0 to 40)]   |
| I-7      | Setting temp. difference between Foot and Head | 7       | —<br>32 (0): Indicates there is 0°F (0°C) difference between upper and lower sensors.<br>90 (32): Indicates there is 3.5°F (2°C) difference between upper and lower sensors.<br>147 (64): Indicates there is 7.0°F (4°C) difference between upper and lower sensors. |
| I-8      | Feedback potentiometer (lower)                 | 8       | Position of air mix door (2)<br>Difference between full cool - full hot: More than 40°F (10°C) [Standard value 68°F (20°C)]  |
| I-9      | Feedback potentiometer (Upper)                 | 9       | Position of air mix door (1)<br>Refer to Inspection of Output System (Step No. O.1)  |
|          |  | 10 ~ 15 | Meaningless  |

\* Figures in ( ) indicate degrees centigrade.



# SELF-DIAGNOSING SYSTEM OF TROUBLE

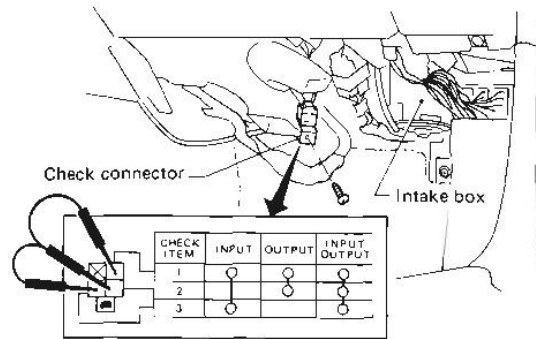
## Inspection of Ambient Temperature Sensor

1. Turn the ignition to "ACC" position.
  2. Read figures indicated on "ABM" indicator.
    - OK – Reasonable ambient temperature
    - 56 (–49)\* : Open sensor
    - 181 (83) : Shorted sensor
- \*Figures in ( ) indicate degrees centigrade.

## Inspection of Output System

### CHECKING PROCEDURES FOR OPERATION OF ACTUATORS

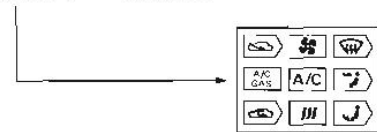
1. Short-circuit terminals No. 1, No. 2 and No. 3.



SHA345B

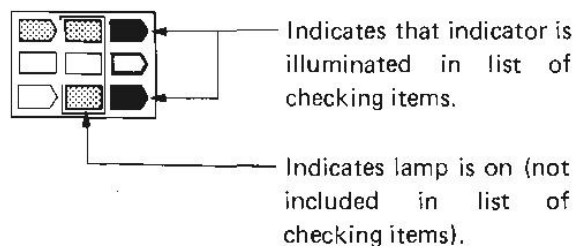
2. Start the engine and press the "ECON/AC" button.
3. Check that output parts operate smoothly using the following table.
  - The way to make sure of the operation of actuators.
    - 1) By digital indicator 

|          |      |
|----------|------|
| DATA No. | DATA |
|----------|------|
    - 2) By A/CON operation indicator.



SHA346B

- How to read display in inspection chart.



- 3) By feeling. (air velocity or temperature at ventilator grilles.)

# SELF-DIAGNOSING SYSTEM OF TROUBLE

## Inspection of Output System (Cont'd)

| Step No. | Checking item           | Procedures of confirming operation  | Time (SEC)   |             |             |    |    |
|----------|-------------------------|---|--------------|-------------|-------------|----|----|
|          |                         |   | 0            | 4           | 8           | 12 | 16 |
| O-1      | Air mix door 1 (Upper)  | <ul style="list-style-type: none"> <li>Read the position of feedback potentiometer (1-9 steps)</li> </ul>   |              |             |             |    |    |
|          | Objective display value |   | 104*<br>(40) | 88*<br>(30) | 68*<br>(20) |    |    |
| O-1      | Air mix door 2 (Lower)  | <ul style="list-style-type: none"> <li>Read the position of feedback potentiometer (1-8 steps)</li> </ul>   |              |             |             |    |    |
|          | Objective display value |   | 104*<br>(40) | 86*<br>(30) | 68*<br>(20) |    |    |
| O-2      | Outlet                  | <ul style="list-style-type: none"> <li>Air conditioner operation indicator</li> <li>Touch with each outlet by hand.</li> </ul>  |              |             |             |    |    |
|          | Display                 |   |              |             |             |    |    |
| O-3      | Intake door             | <ul style="list-style-type: none"> <li>Air conditioner operation indicator</li> <li>Look at the intake door spring</li> </ul>   |              |             |             |    |    |
|          | Display                 |   |              |             |             |    |    |
| O-4      | Water cock              | <ul style="list-style-type: none"> <li>Air conditioner operation indicator</li> <li>Look at the water cock and touch with the diaphragm of cock.</li> </ul>                   |              |             |             |    |    |
|          | Display                 |   |              |             |             |    |    |
| O-5      | Compressor clutch       | <ul style="list-style-type: none"> <li>Air conditioner operation indicator</li> <li>Look at the magnet clutch.</li> </ul>   |              |             |             |    |    |
|          | Display ("REC" "DEF")   |   |              |             |             |    |    |
| O-6      | Blower motor            | <ul style="list-style-type: none"> <li>Air conditioner operation indicator</li> <li>Touch with each outlet by hand.</li> <li>Measure the applied voltage of motor.</li> </ul> |              |             |             |    |    |
|          | Display                 |   |              |             |             |    |    |

\*Figures in ( ) indicate degrees centigrade

SHA347B

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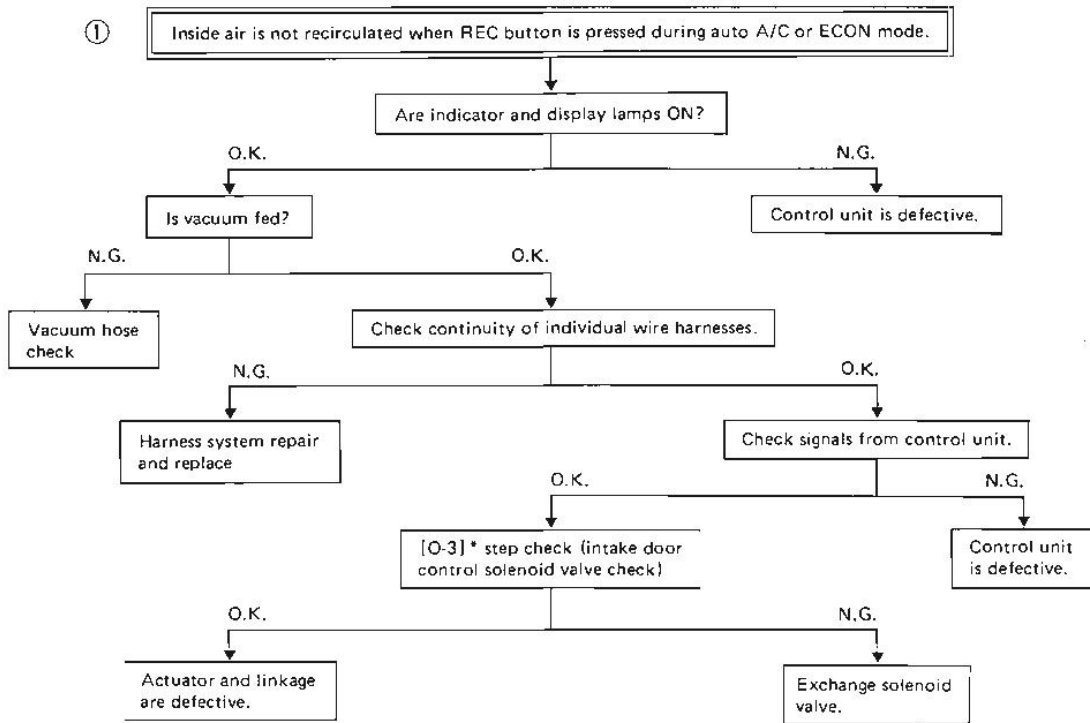
## TROUBLE DIAGNOSES—Auto Air Conditioner

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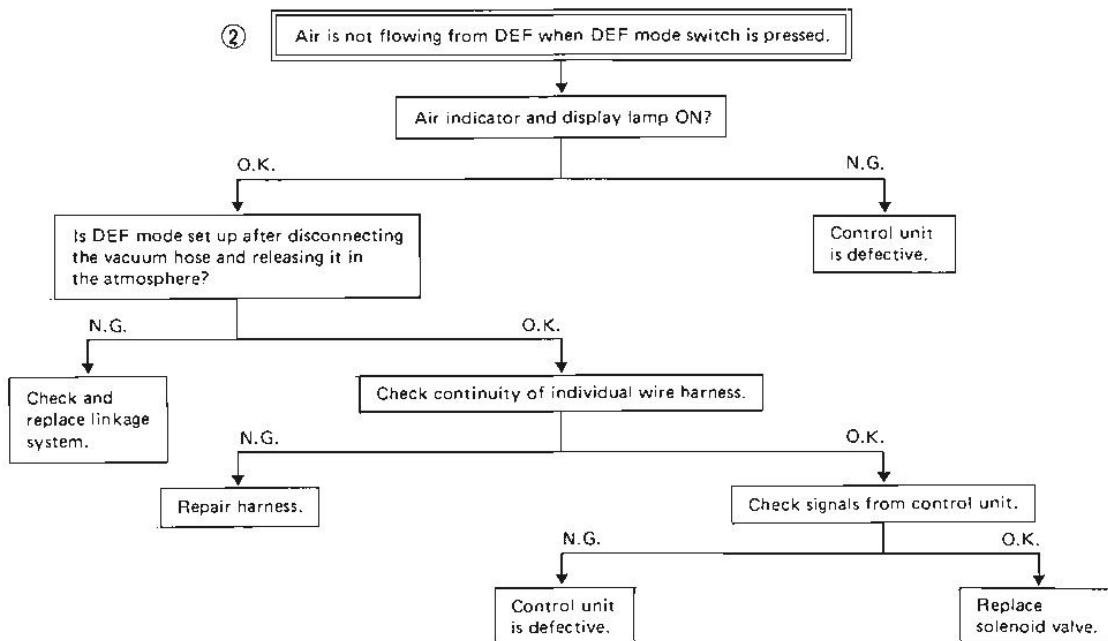
### CONTENTS

|   |  |       |
|---|--|-------|
| ① | Inside air is not recirculated when REC button is pressed during auto A/C or ECON mode . . . . .   | HA-36 |
| ② | Air is not flowing from DEF when DEF mode switch is pressed . . . . .  | HA-36 |
| ③ | Outside air is not drawn in when DEF mode switch is pressed . . . . .  | HA-37 |
| ④ | Air discharge from DEF and foot position does not occur simultaneously when DEMIST mode switch is pressed . . . . .  | HA-37 |
| ⑤ | Discharging air flow outlet and display do not coincide . . . . .  | HA-38 |
| ⑥ | Inside air recirculation is continued for more than 10 minutes when REC button is pressed once during AUTO A/C mode . . . . .  | HA-39 |
| ⑦ | EMERGENCY mode is not set up even when EMERGENCY button is pressed . . . . .   | HA-40 |
| ⑧ | Full hot is not attained even when EMERGENCY button is pressed . . . . .   | HA-40 |
| ⑨ | Does not blow out in DEF mode, but blows out in other mode when cooling water temperature is low and interior temperature is lower than set temperature . . . . .  | HA-41 |
| ⑩ | When the SET TEMP. lever is moved from F/COOL to F/HOT, air temperature from outlets does not change, or else it becomes either FULL HOT or FULL COOL in the AUTO A/C mode or ECON mode . . . . .  | HA-42 |
| ⑪ | Does not control when fan is designated HI or LO . . . . .   | HA-43 |
| ⑫ | Temperature difference between the upper and lower sections of the vehicle interior does not change even when SET TEMP ADJUSTER knob is rotated in the AUTO mode . . . . .   | HA-44 |
| ⑬ | Indicator lamp for refrigerant gas shortage is ON during rapid acceleration, or when changing air conditioner mode from AUTO air or Indicator lamp for refrigerant gas shortage is ON even though amount of refrigerant gas is appropriate . . . . .   | HA-45 |
| ⑭ | A long time is needed before air conditioner reaches a steady state when in the AUTO A/C mode as fan speed is slow even when temperature difference between set and interior temperatures is large<br>Fan speed does not reduce even when interior temperature approaches set temperature in AUTO A/C mode . . . . . | HA-46 |
| ⑮ | Discharging air temperature changes, but indicator set temperature value does not change when the set temperature is varied . . . . .  | HA-46 |
| ⑯ | Discharging air flow does not change under low air flow level even when sunload on the sunload sensor is greatly changed . . . . .   | HA-47 |
| ⑰ | Cooling is insufficient during auto air conditioning . . . . .   | HA-48 |
| ⑱ | Air is not discharged, or its volume is insufficient . . . . .   | HA-49 |

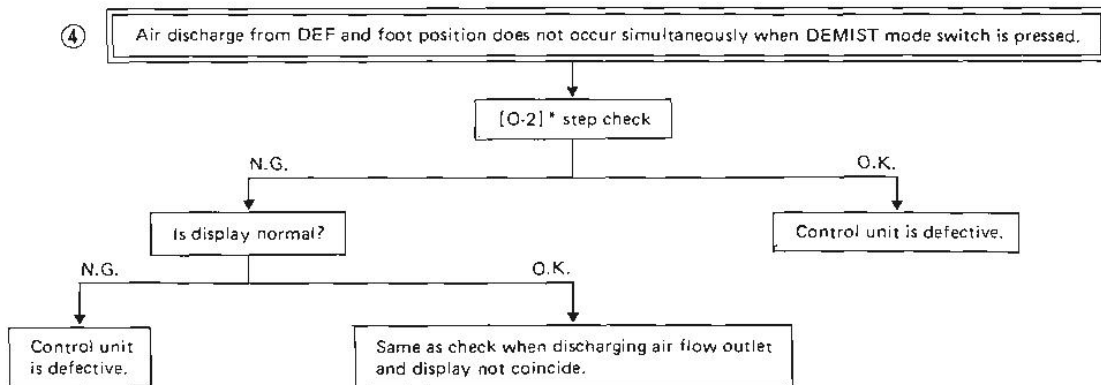
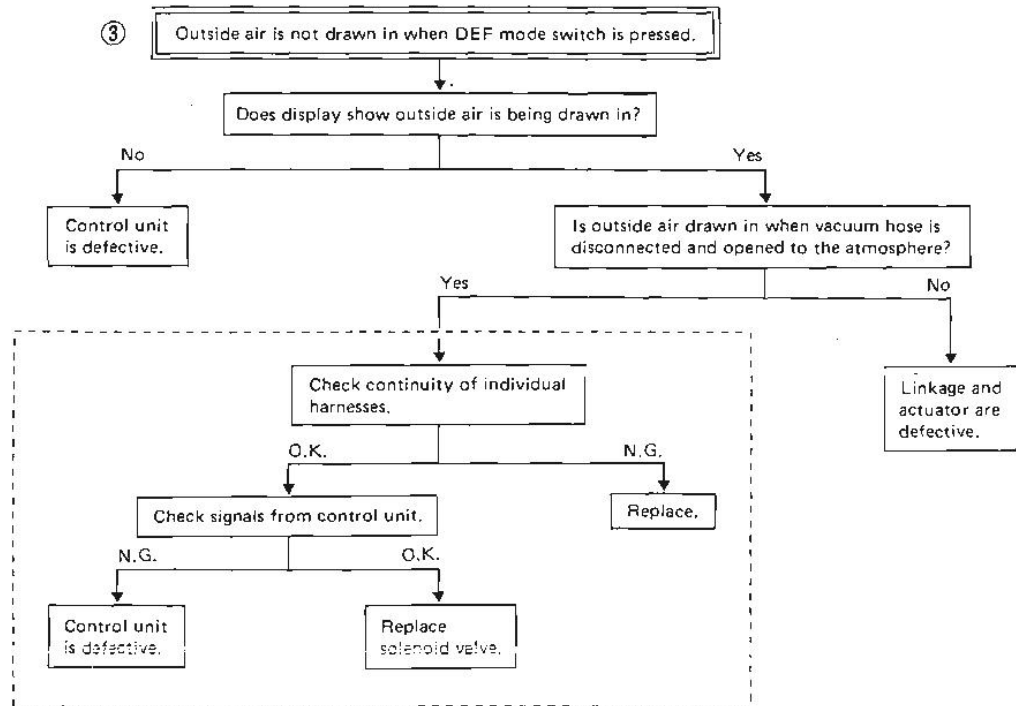
# TROUBLE DIAGNOSES—Auto Air Conditioner



\*Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Output system).

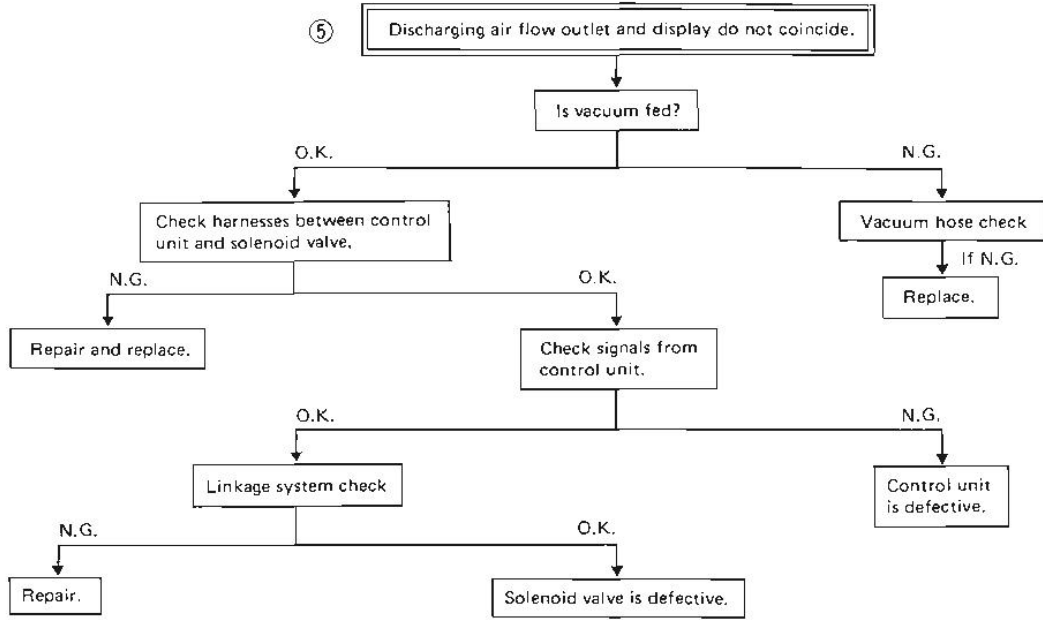


## TROUBLE DIAGNOSES—Auto Air Conditioner

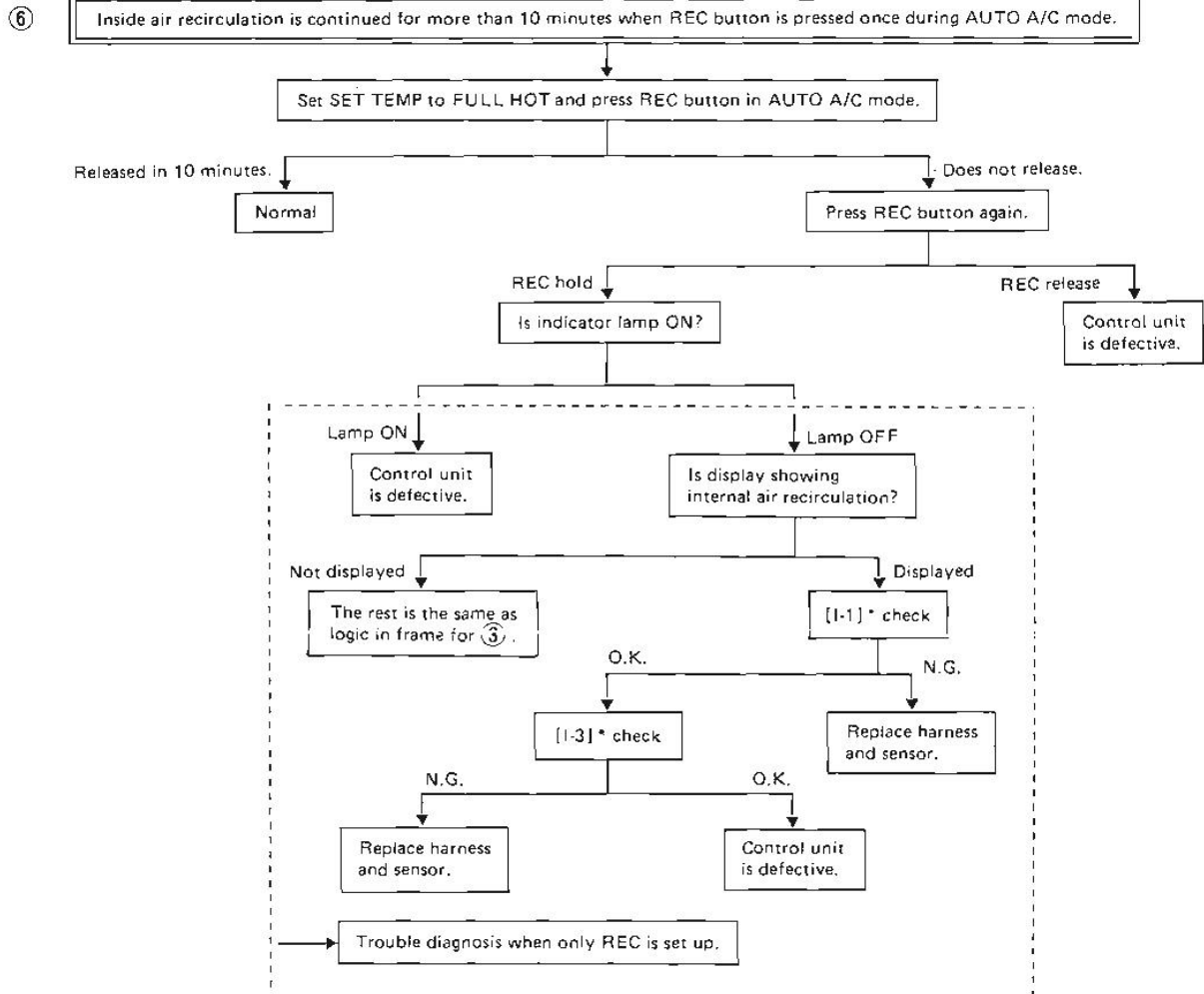


\*Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Output system).

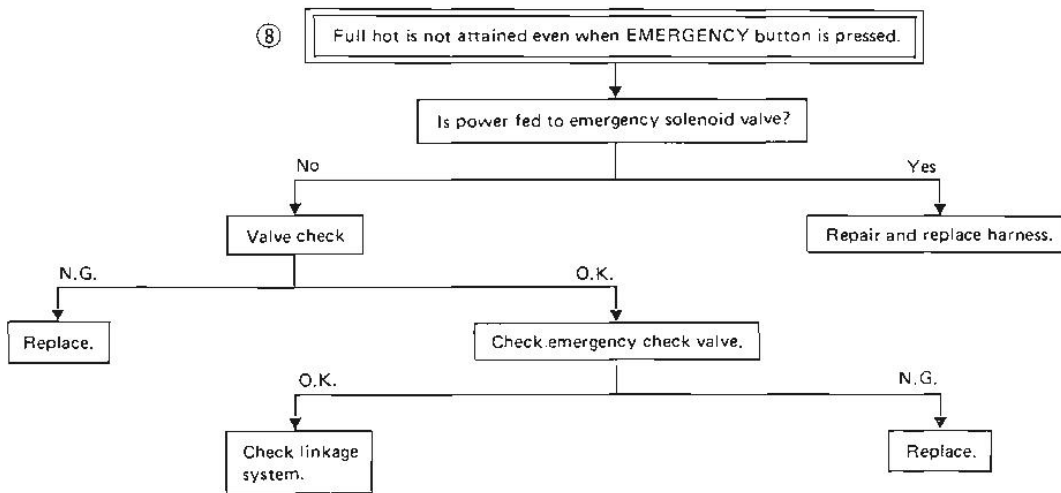
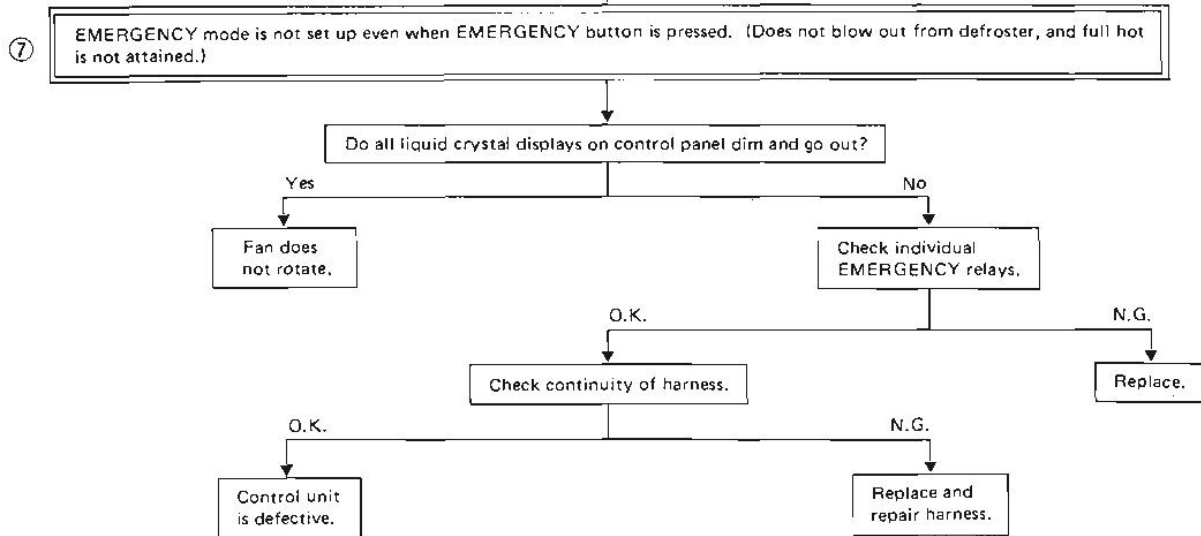
# TROUBLE DIAGNOSES—Auto Air Conditioner



# TROUBLE DIAGNOSES—Auto Air Conditioner

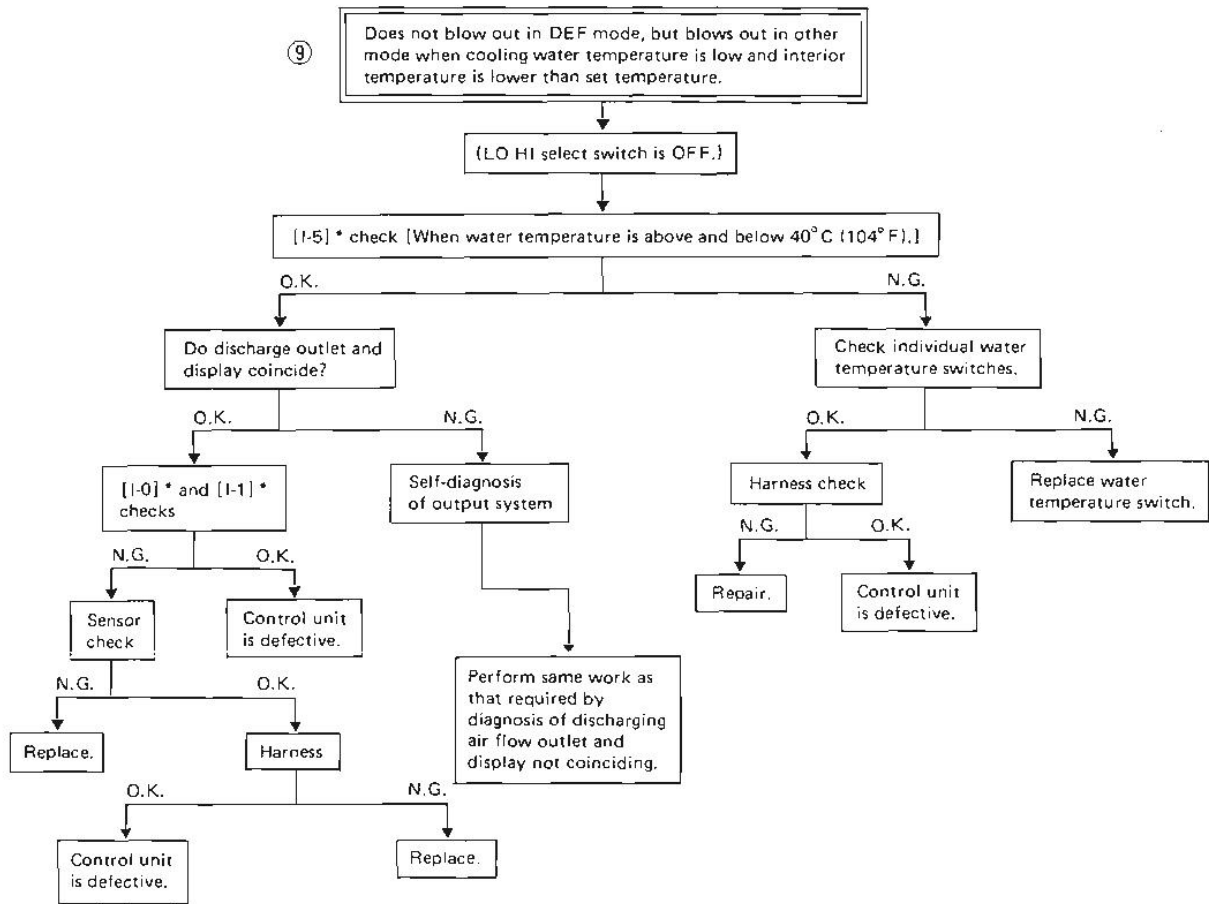


## TROUBLE DIAGNOSES—Auto Air Conditioner





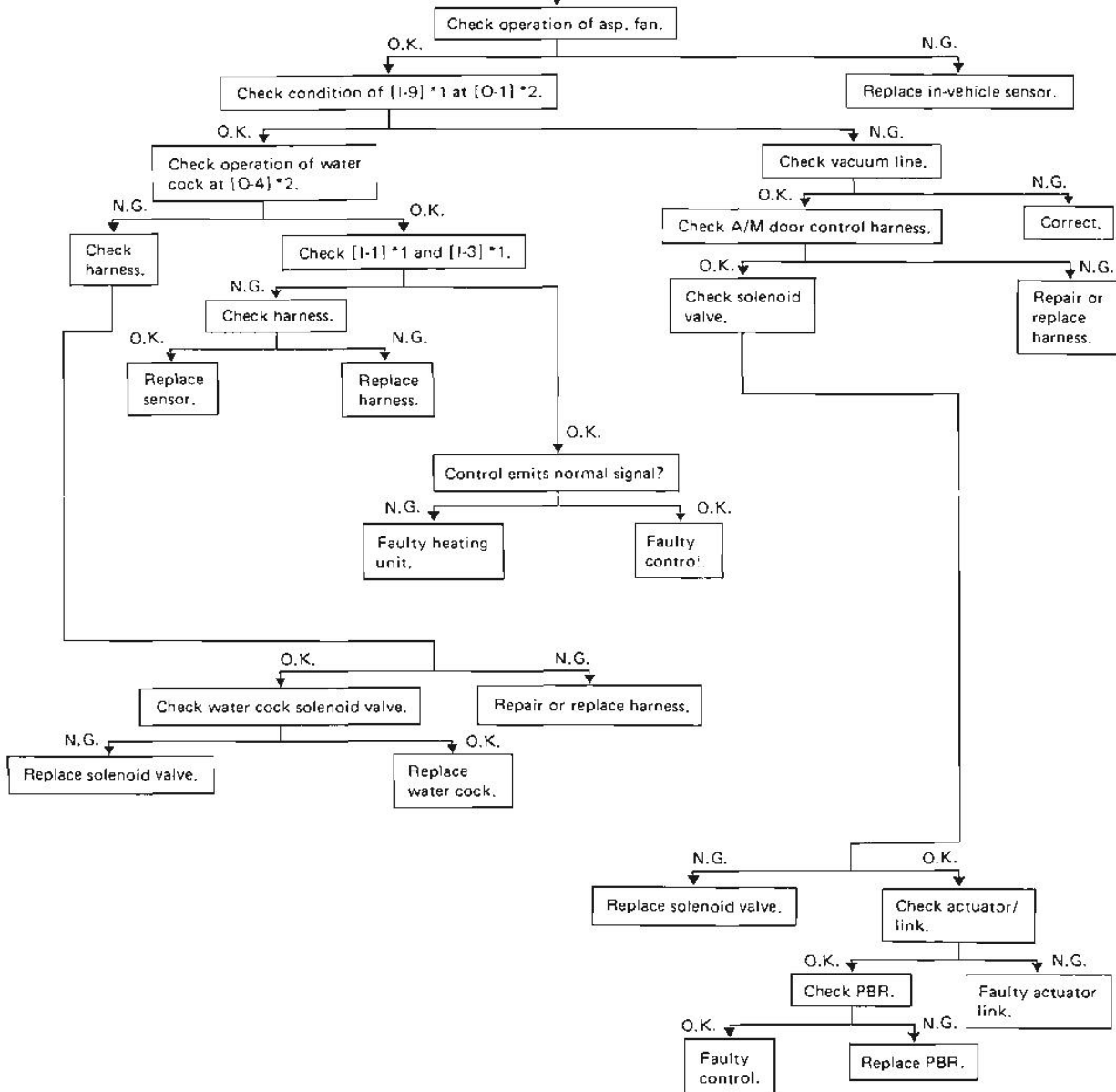
# TROUBLE DIAGNOSES—Auto Air Conditioner



\* Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Input system).

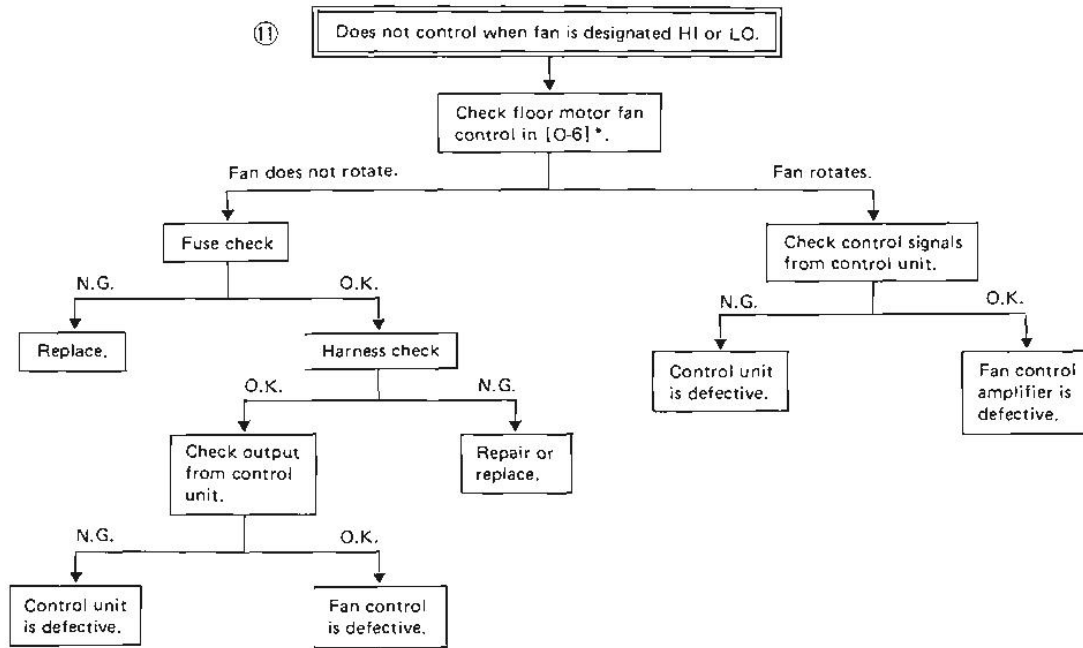
# TROUBLE DIAGNOSES—Auto Air Conditioner

⑩ When the SET TEMP. lever is moved from F/COOL to F/HOT, air temperature from outlets does not change, or else it becomes either FULL HOT or FULL COOL in the AUTO A/C mode or ECON mode.



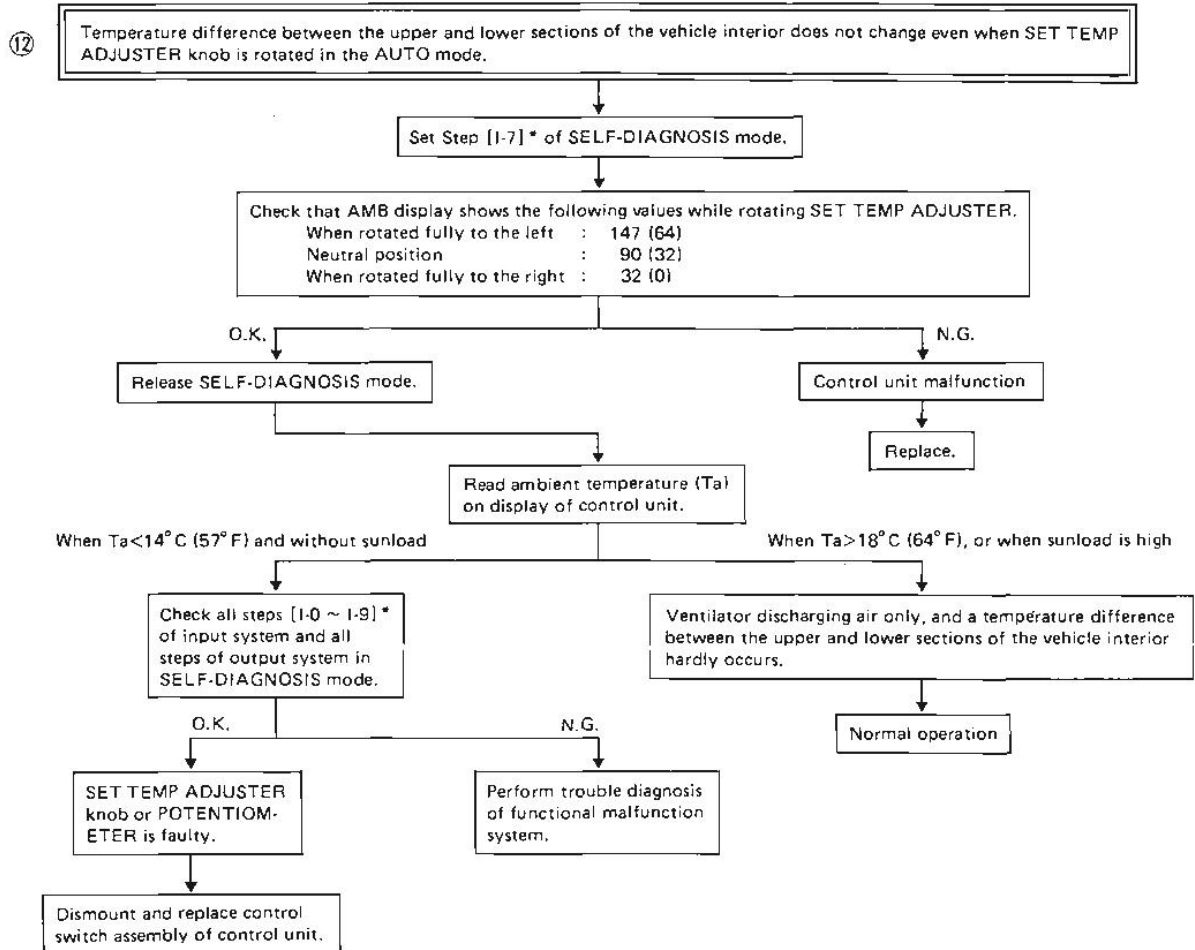
\*1 Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Input system).  
 \*2 Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Output system).

# TROUBLE DIAGNOSES—Auto Air Conditioner



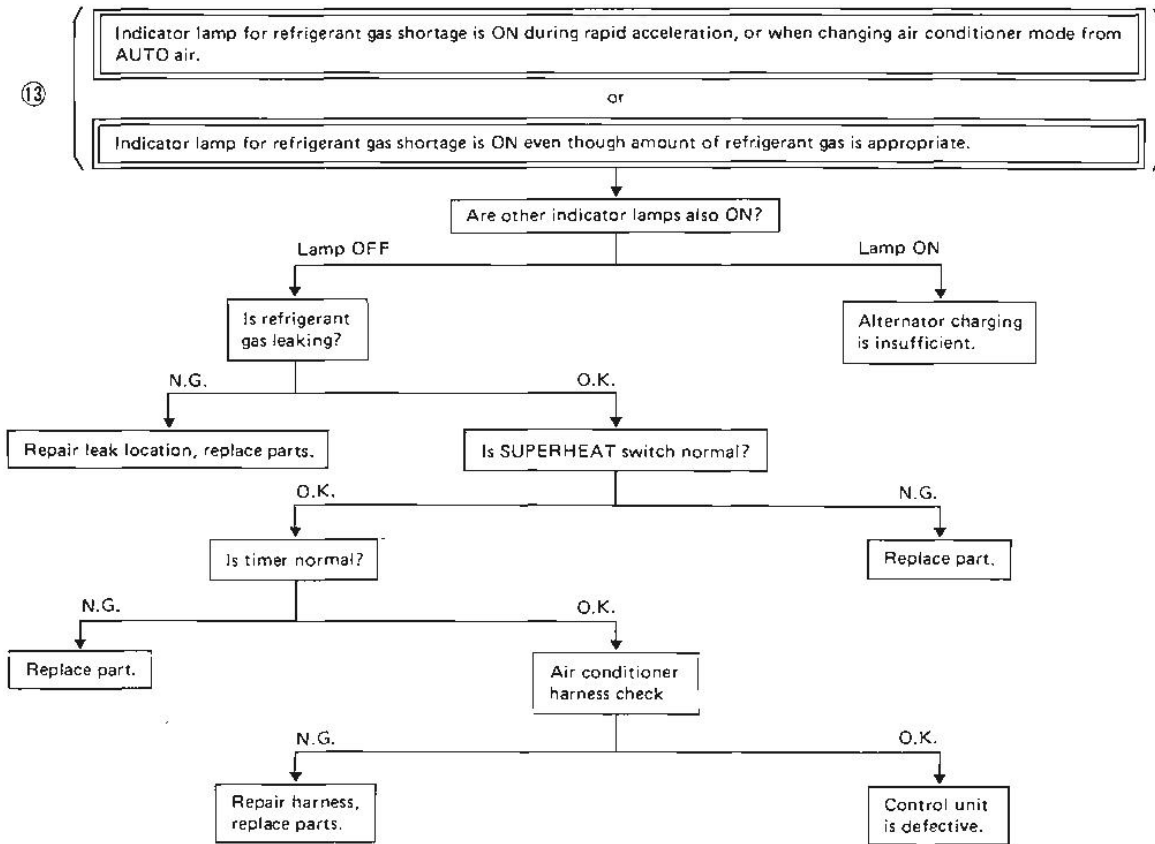
\*Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Output system).

## TROUBLE DIAGNOSES—Auto Air Conditioner



\*Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Input system).

# TROUBLE DIAGNOSES—Auto Air Conditioner

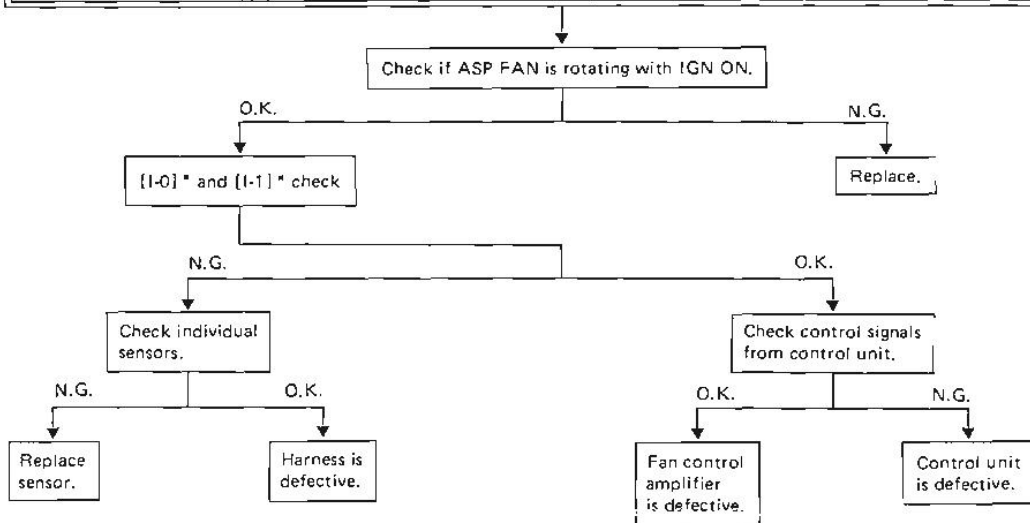


## TROUBLE DIAGNOSES—Auto Air Conditioner

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A long time is needed before air conditioner reaches a steady state when in the AUTO A/C mode as fan speed is slow even when temperature difference between set and interior temperatures is large.

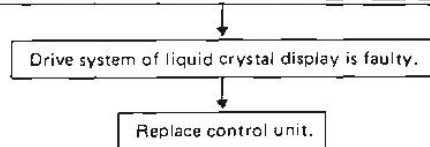
Fan speed does not reduce even when interior temperature approaches set temperature in AUTO A/C mode.



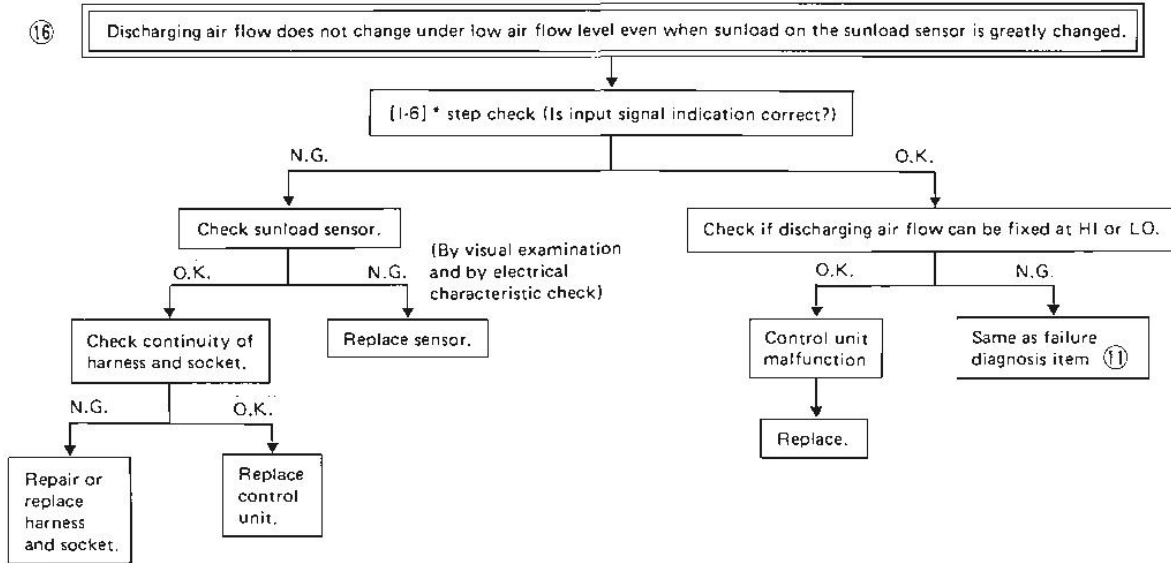
\* Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Input system).

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Discharging air temperature changes, but indicator set temperature value does not change when the set temperature is varied.

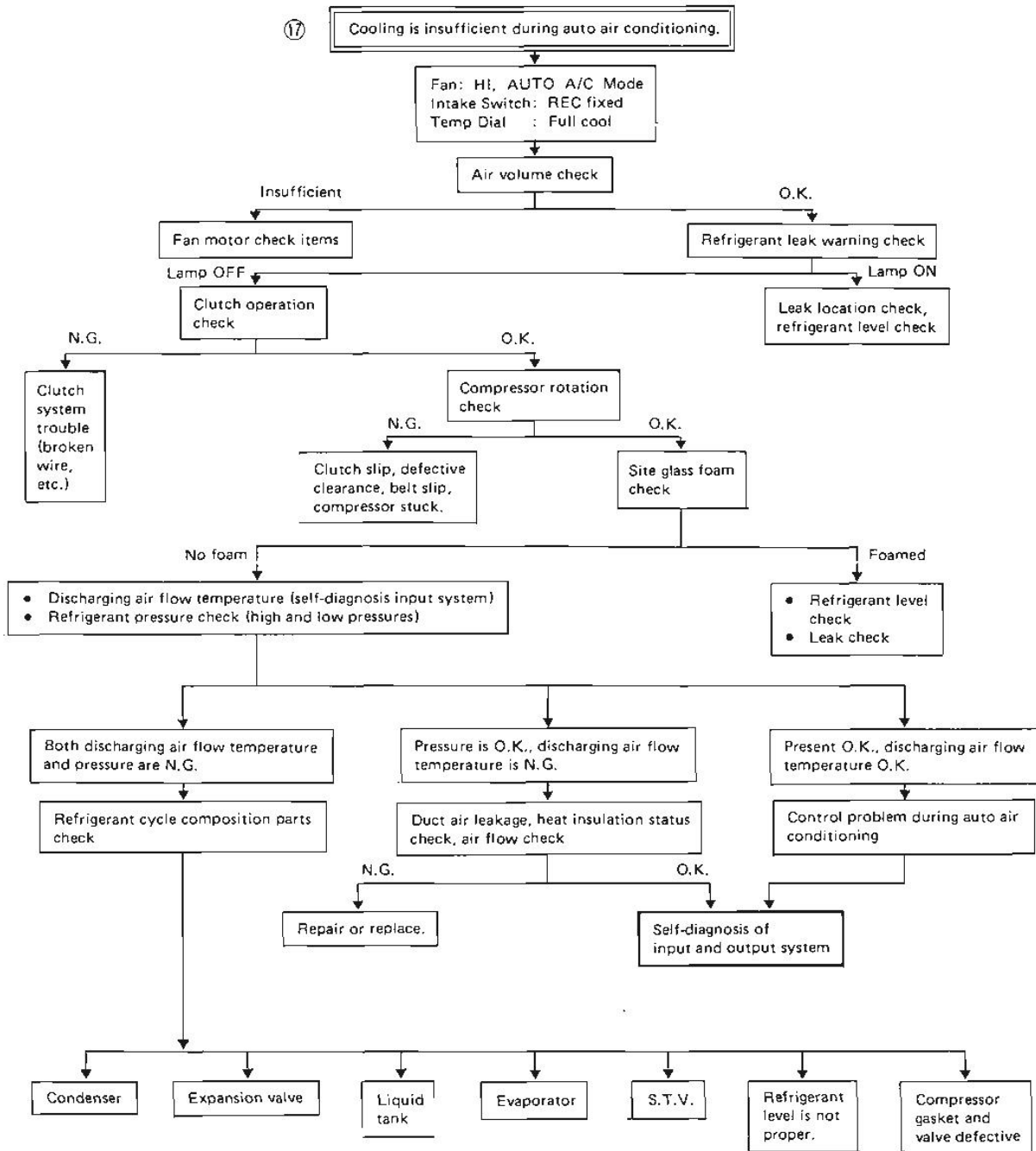


## TROUBLE DIAGNOSES—Auto Air Conditioner



\*Refer to SELF-DIAGNOSING SYSTEM OF TROUBLE (Input system).

# TROUBLE DIAGNOSES—Auto Air Conditioner





## TROUBLE DIAGNOSES—Auto Air Conditioner

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