HEATER & AIR CONDITIONER

SECTION HA

MODIFICATION NOTICE :

Self-Diagnosing System has been partially changed.

The following systems have been discontinued.

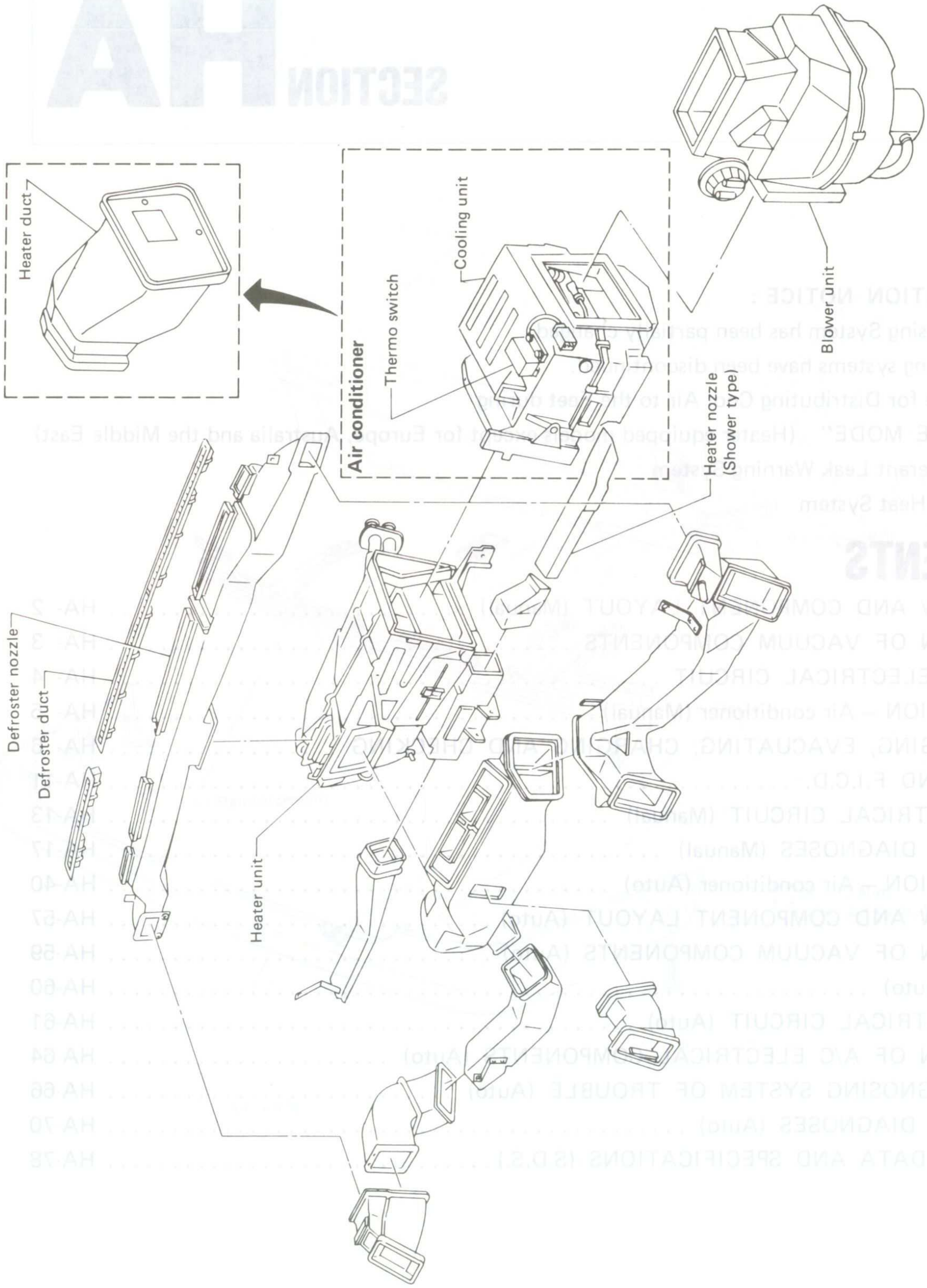
- Device for Distributing Cool Air to the Feet during "FACE MODE" (Heater equipped models except for Europe, Australia and the Middle East)
- Refrigerant Leak Warning System
- Super Heat System

CONTENTS

AIR FLOW AND COMPONENT LAYOUT (Manual) ..... HA- 2
LOCATION OF VACUUM COMPONENTS ..... HA- 3
HEATER ELECTRICAL CIRCUIT ..... HA- 4
DESCRIPTION – Air conditioner (Manual) ..... HA- 5
DISCHARGING, EVACUATING, CHARGING AND CHECKING ..... HA- 6
PIPING AND F.I.C.D. HA-11
A/C ELECTRICAL CIRCUIT (Manual) HA-13
TROUBLE DIAGNOSES (Manual) HA-17
DESCRIPTION – Air conditioner (Auto) HA-40
AIR FLOW AND COMPONENT LAYOUT (Auto) HA-57
LOCATION OF VACUUM COMPONENTS (Auto) HA-59
PIPING (Auto) HA-60
A/C ELECTRICAL CIRCUIT (Auto) HA-61
LOCATION OF A/C ELECTRICAL COMPONENTS (Auto) HA-64
SELF-DIAGNOSING SYSTEM OF TROUBLE (Auto) HA-66
TROUBLE DIAGNOSES (Auto) HA-70
SERVICE DATA AND SPECIFICATIONS (S.D.S.) HA-78

AIR FLOW AND COMPONENT LAYOUT (Manual)

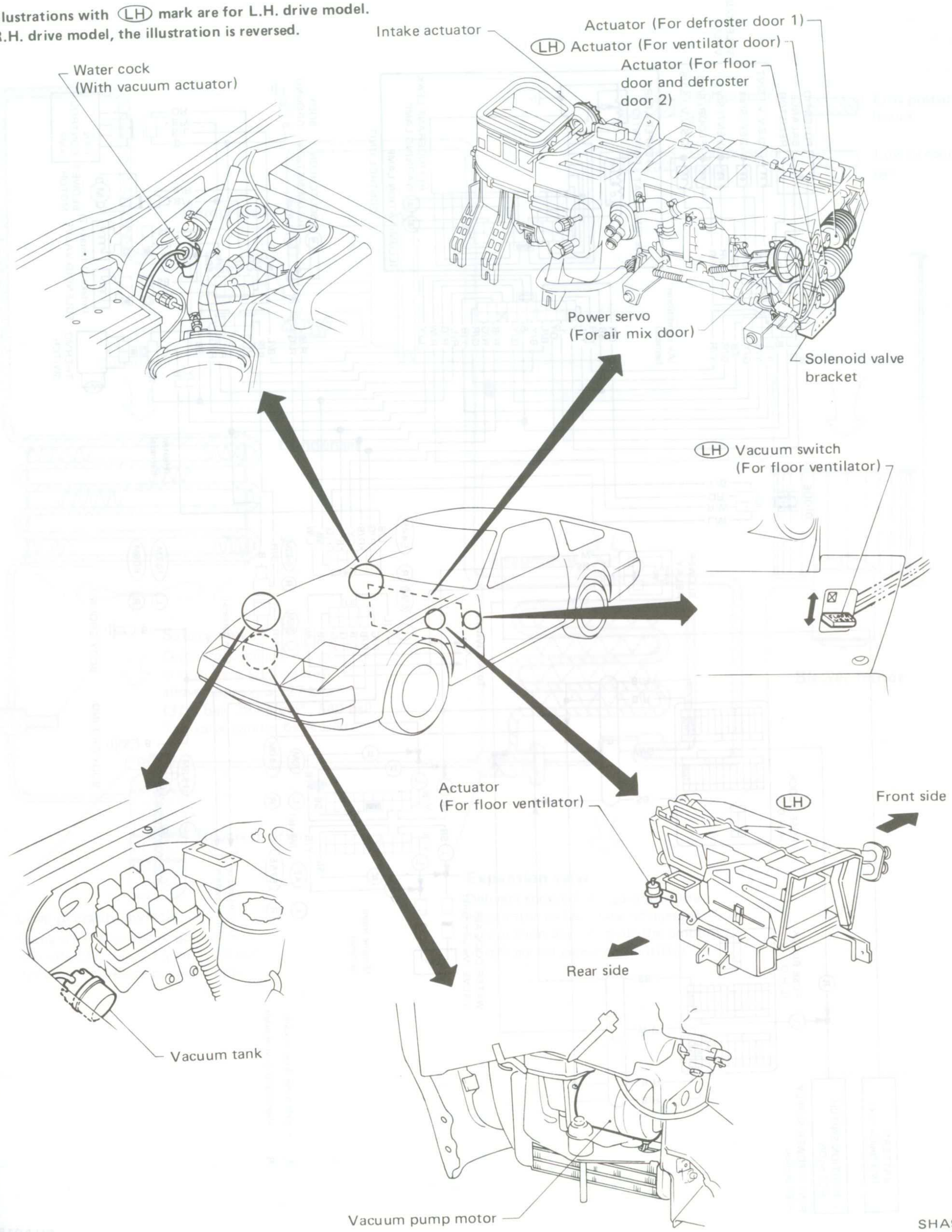
Component Layout



SHA790B

LOCATION OF VACUUM COMPONENTS

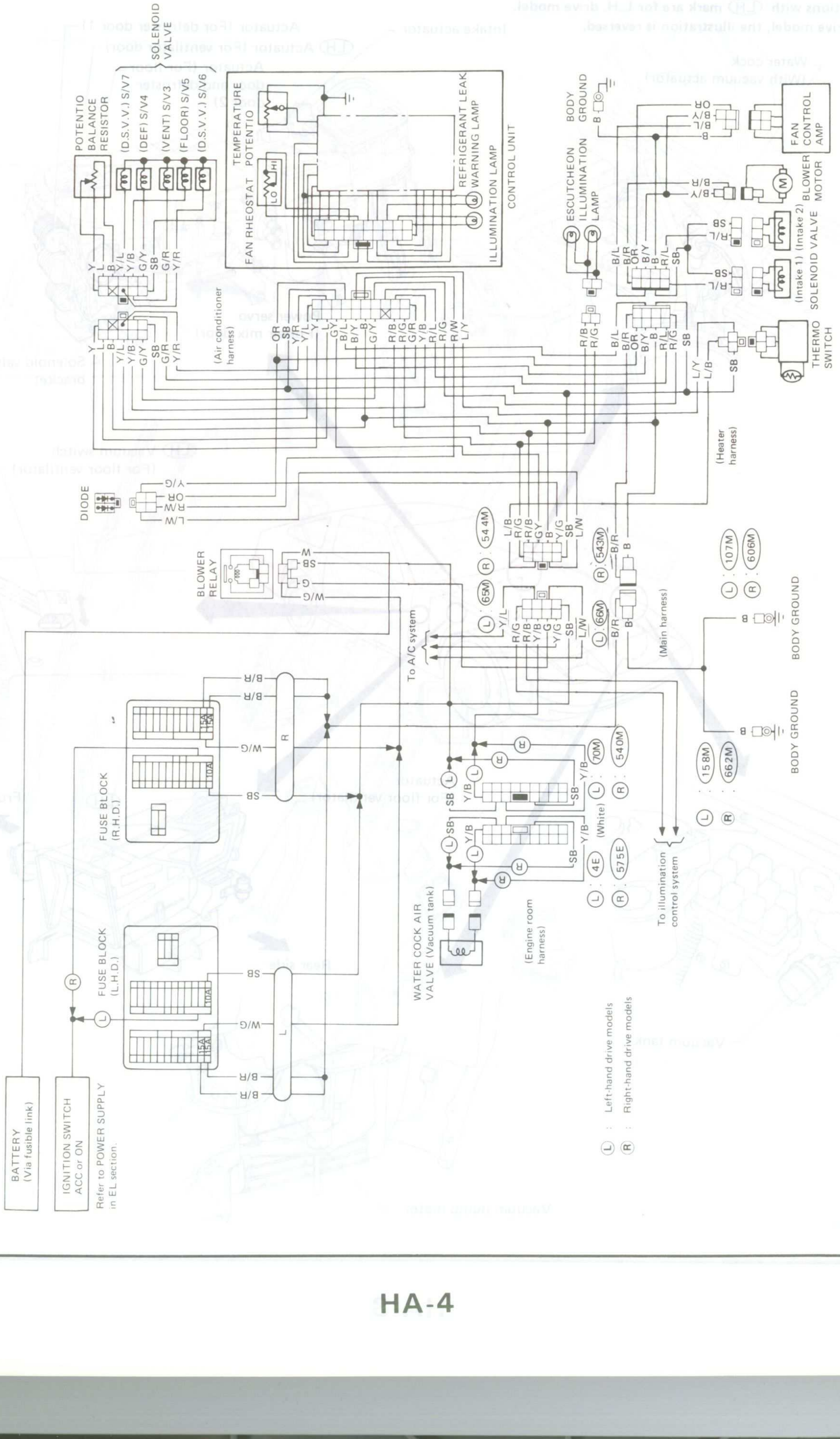
The illustrations with (LH) mark are for L.H. drive model.
For R.H. drive model, the illustration is reversed.



SHA923B

HEATER ELECTRICAL CIRCUIT

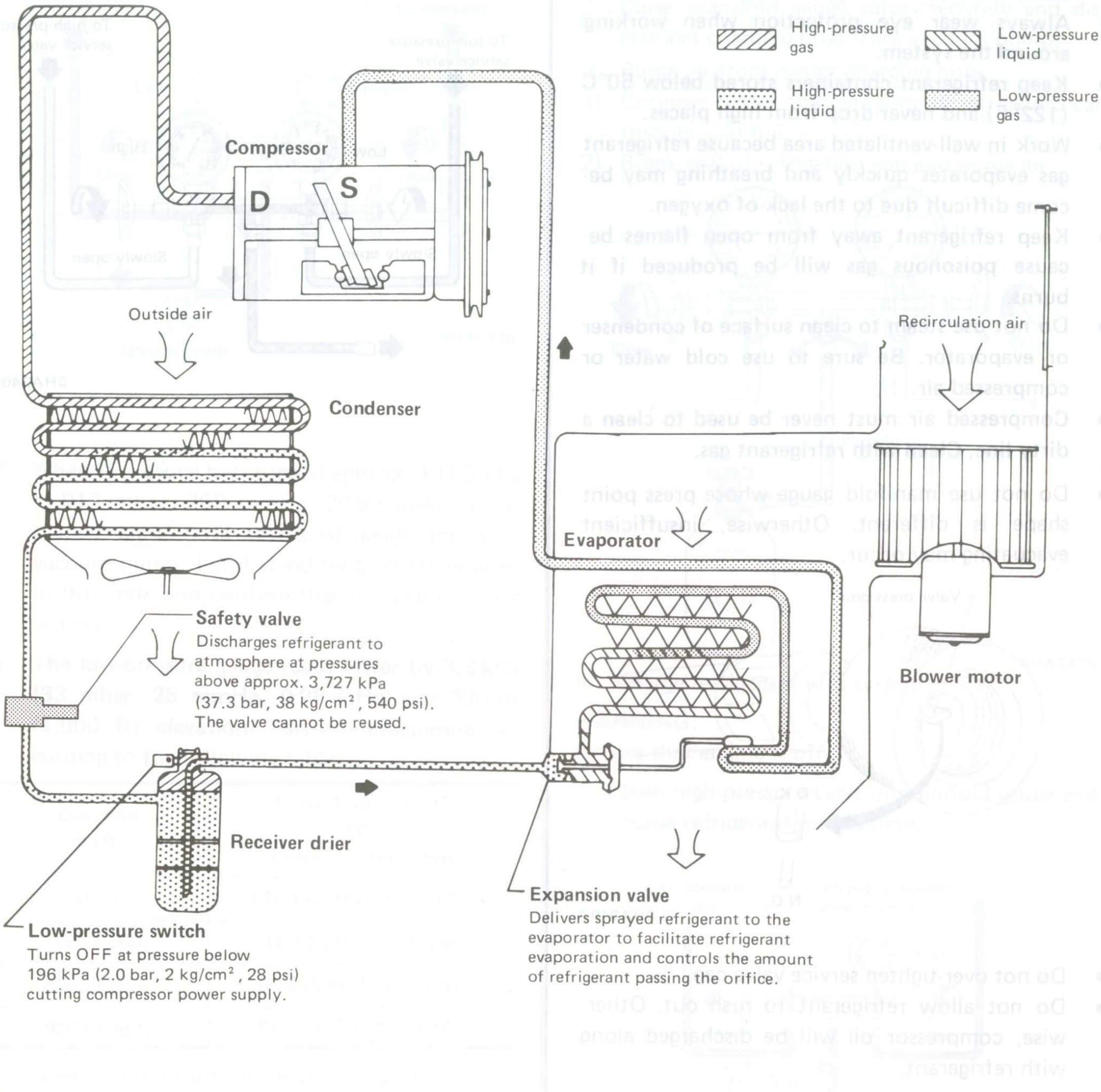
Wiring Diagram



SHA915B

DESCRIPTION—Air Conditioner (Manual)

Refrigeration Cycle



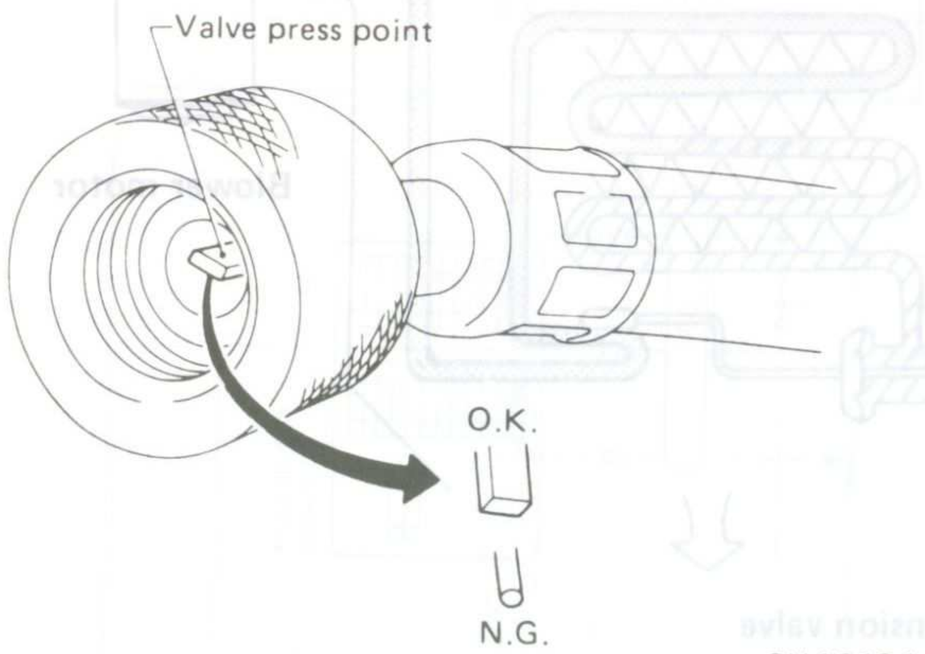
SHA926B

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Precautions

WARNING:

- Always be careful that refrigerant does not come in contact with your skin.
- Always wear eye protection when working around the system.
- Keep refrigerant containers stored below 50°C (122°F) and never drop from high places.
- Work in well-ventilated area because refrigerant gas evaporates quickly and breathing may become difficult due to the lack of oxygen.
- Keep refrigerant away from open flames because poisonous gas will be produced if it burns.
- Do not use steam to clean surface of condenser or evaporator. Be sure to use cold water or compressed air.
- Compressed air must never be used to clean a dirty line. Clean with refrigerant gas.
- Do not use manifold gauge whose press point shape is different. Otherwise, insufficient evacuating may occur.

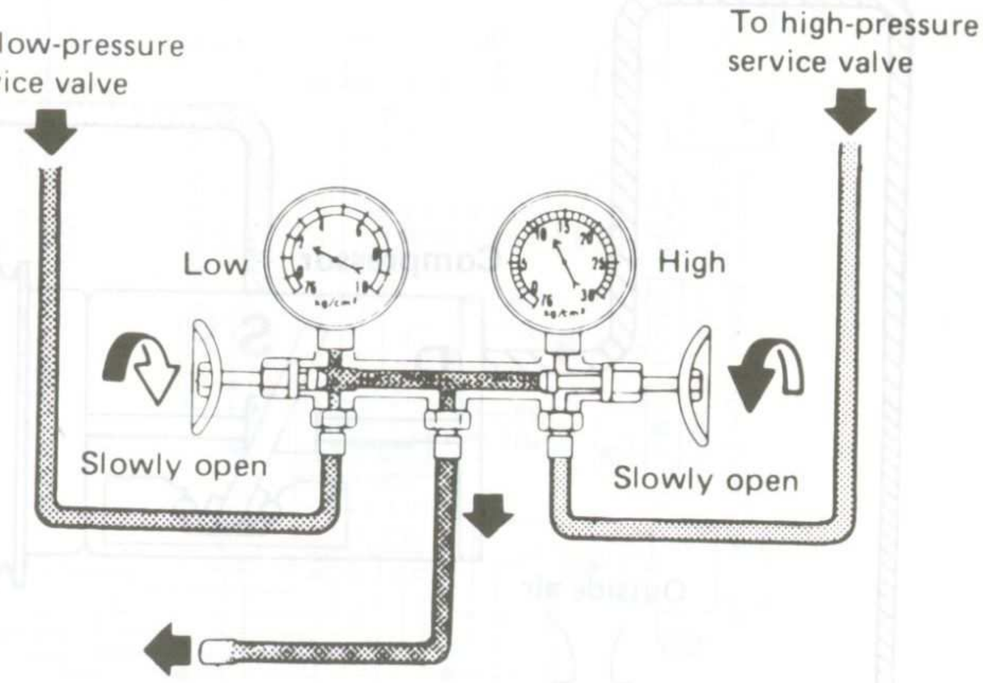


SHA919A

- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

Discharging

Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.

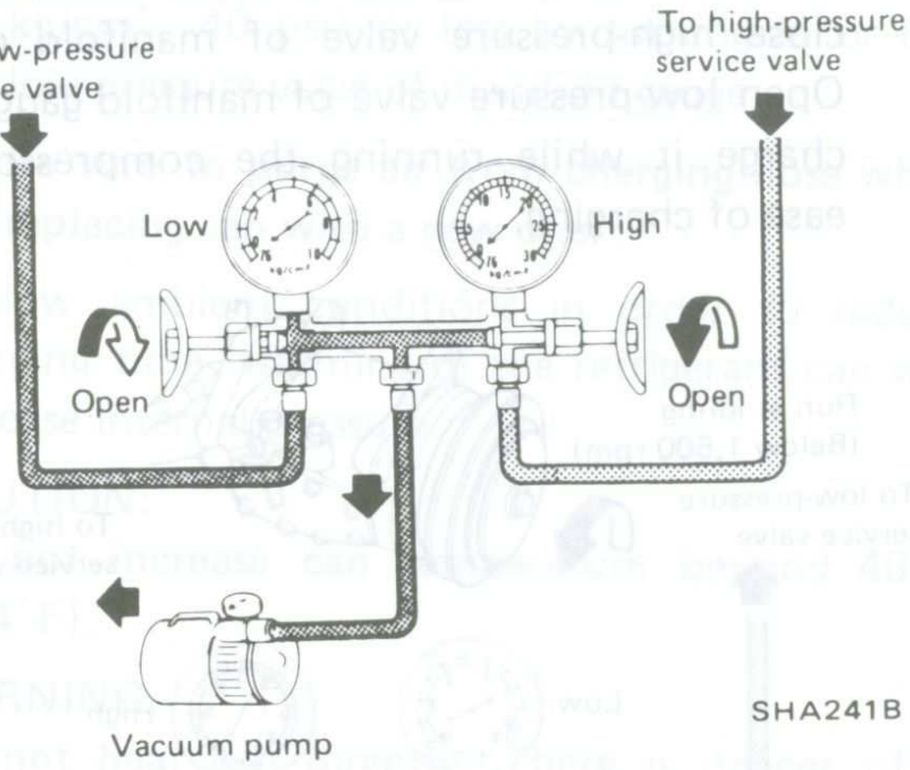


SHA240B

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Evacuating the System—Step one

1. Start pump, then open both valves and run pump for about 5 minutes.



SHA241B

2. When low gauge has reached approx. 101.3 kPa (1,013 mbar, 760 mmHg, 29.92 inHg), completely close both valves of gauge and stop vacuum pump. Let it stand for 5 to 10 minutes in this state and confirm that the reading does not rise.

a. The low-pressure gauge reads lower by 3.3 kPa (33 mbar, 25 mmHg, 0.98 inHg) per 300 m (1,000 ft) elevation. Perform evacuation according to the following table.

Elevation m (ft)	Vacuum of system* kPa (mbar, mmHg, inHg)
0 (0)	101.3 (1,013, 760, 29.92)
300 (1,000)	98.0 (980, 735, 28.94)
600 (2,000)	94.6 (946, 710, 27.95)
900 (3,000)	91.3 (913, 685, 26.97)

*: Values show reading of the low-pressure gauge.

b. The rate of ascension of the low-pressure gauge should be less than 3.3 kPa (33 mbar, 25 mmHg, 0.98 inHg) in five minutes.

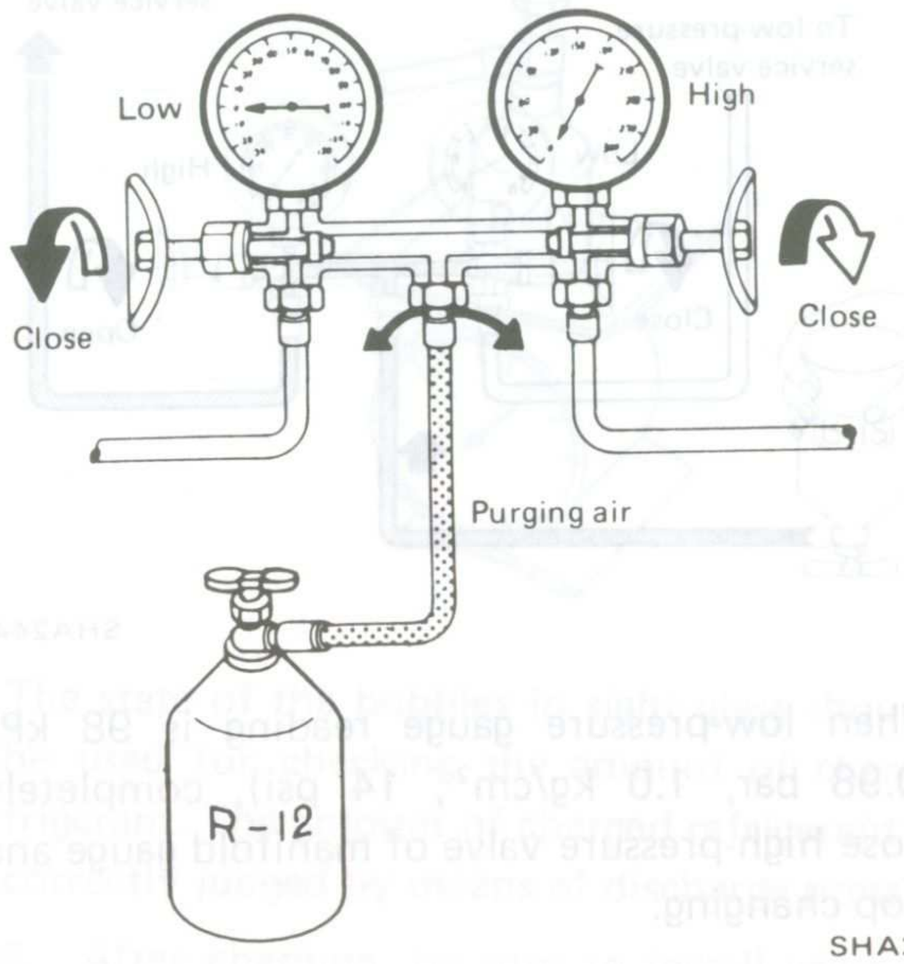
Charging—Step one

1. Evacuate refrigerant system.

Refer to "Evacuating the System-Step One".

2. Close manifold gauge valves securely and disconnect charging hose from vacuum pump.
3. Purge air from center charging hose.

1) Connect center charging hose to refrigerant can through can top.
2) Break seal of refrigerant can and purge air.



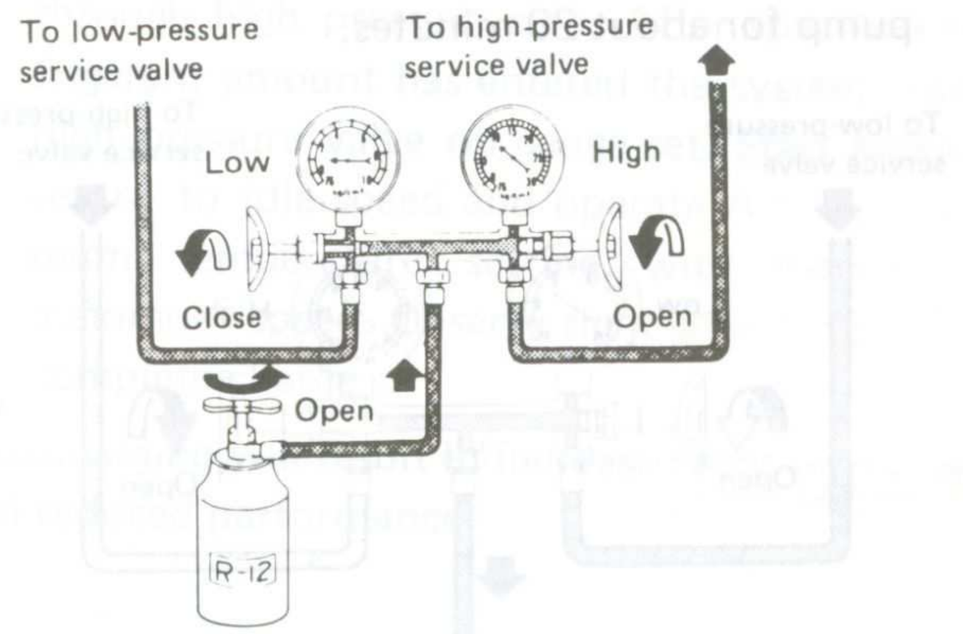
SHA242B

4. Charge refrigerant into system.

WARNING:

Ensure that engine is off.

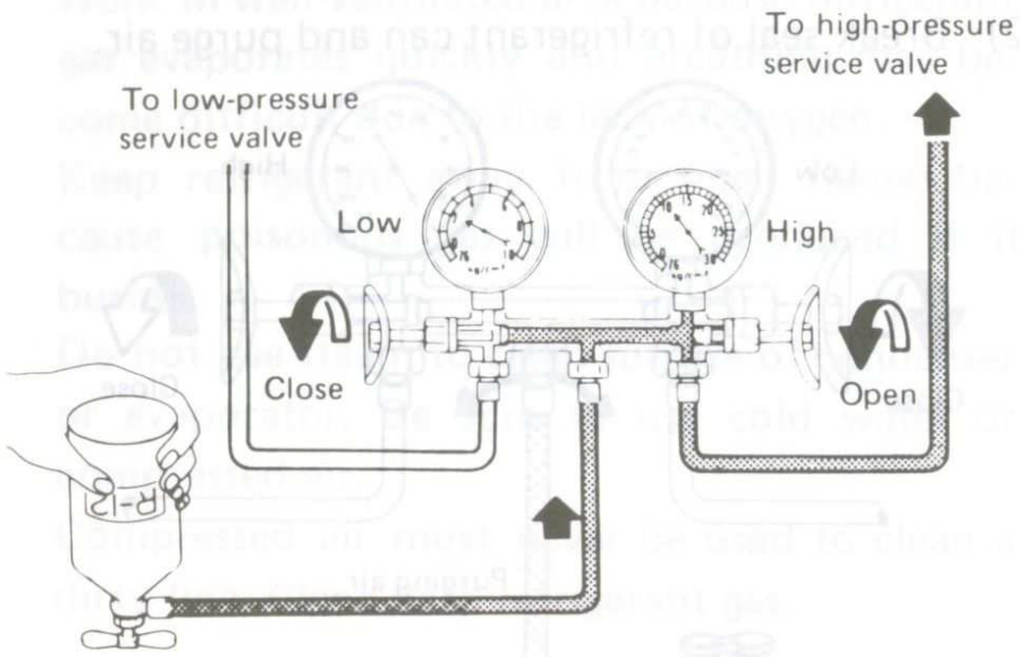
1) Open high-pressure valve of manifold gauge and charge refrigerant into system.



RHA278

Charging—Step one (Cont'd)

CAUTION:
If charging liquefied refrigerant into the system with the can turned upside down to reduce charging time, charge refrigerant only through high-pressure (discharge) service valve. After charging, the compressor should always be turned several times manually.

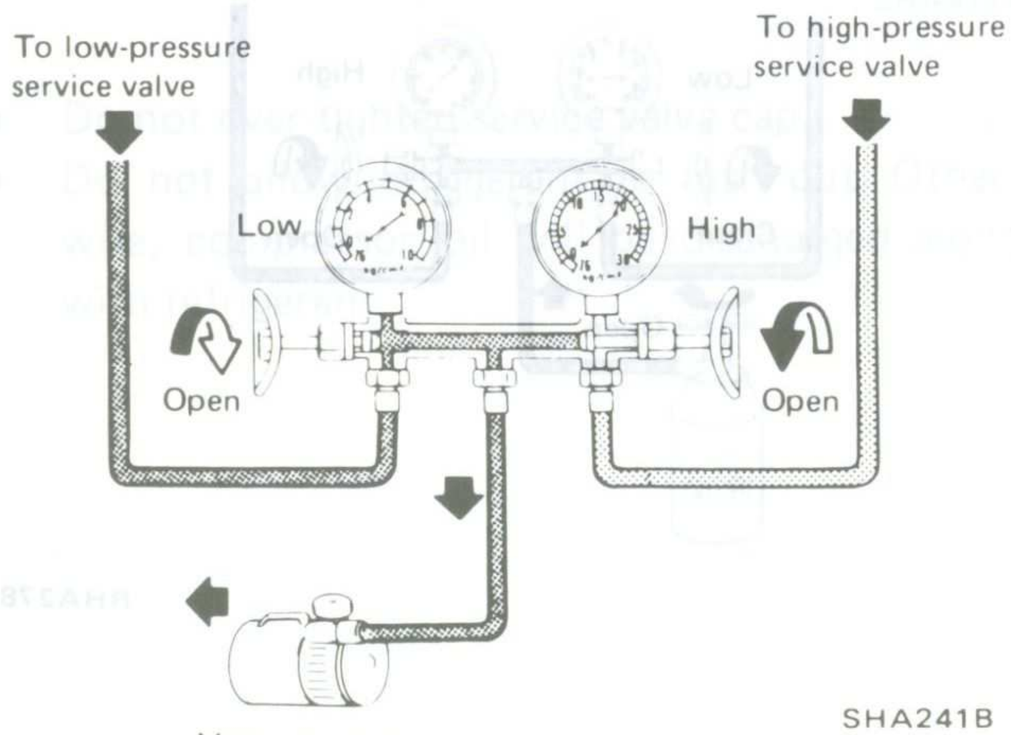


SHA244B

2) When low-pressure gauge reading is 98 kPa (0.98 bar, 1.0 kg/cm², 14 psi), completely close high-pressure valve of manifold gauge and stop changing.

Evacuating the System—Step two

1. Close manifold gauge valve securely and disconnect charging hose from refrigerant can.
2. Connect center charging hose to vacuum pump.
3. Start pump, then open both valves and run pump for about 20 minutes.



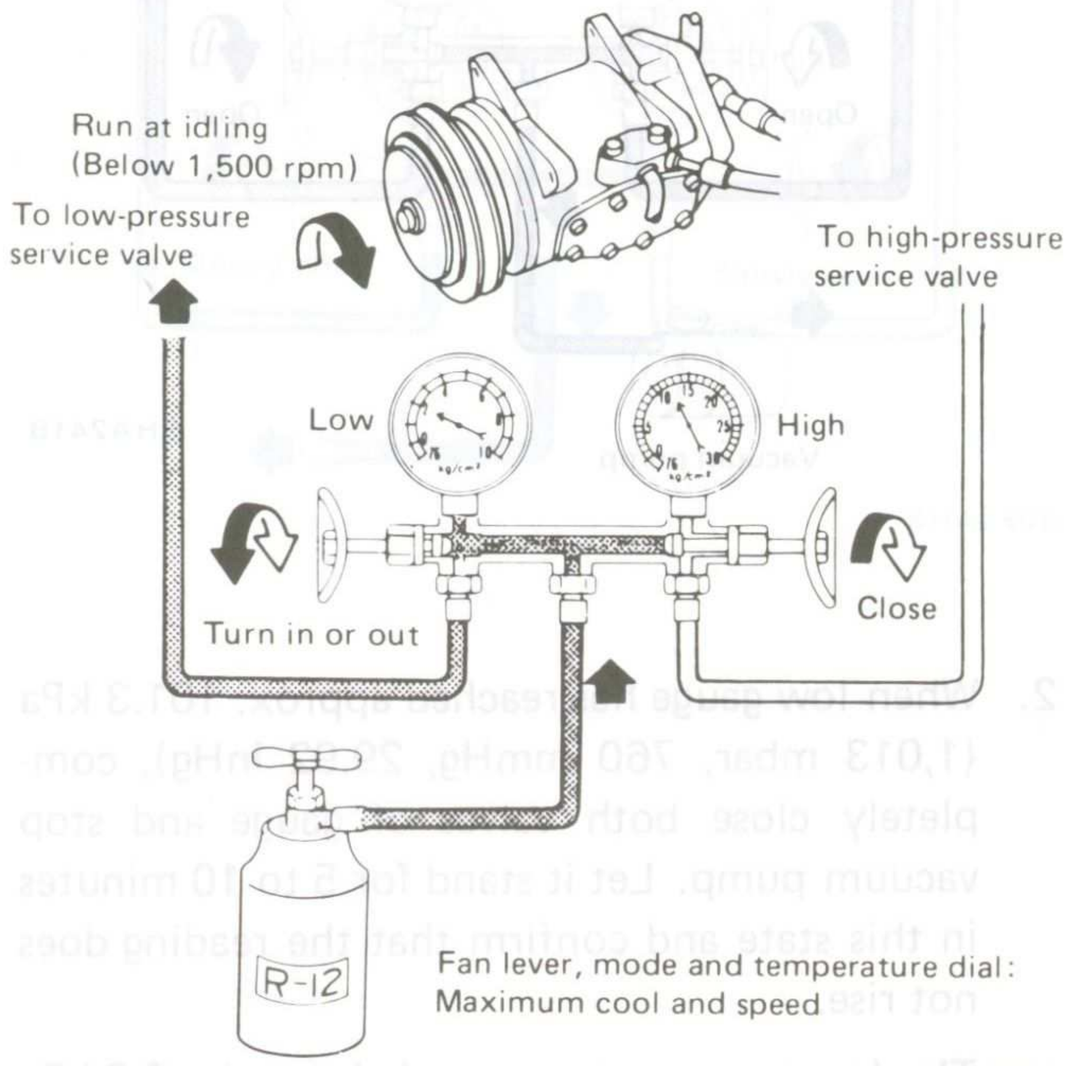
Vacuum pump

SHA241B

Charging—Step two

Refer to "Charging step one" of Nos. 2 through 4.

4. When refrigerant charging speed slows down, close high-pressure valve of manifold gauge. Open low-pressure valve of manifold gauge and charge it while running the compressor for ease of charging.



SHA245B

5. Start Engine — Air conditioning system ON, maximum temperature set, maximum blower speed. Open low-pressure valve on gauge set, with can in upright position, and monitor sight glass. Charge is complete when sight glass is clear.

Cycling clutch systems will produce bubbles in sight glass when clutch engages. Therefore, allow 5 seconds after clutch engages to determine if bubbles continue, and, if so, add refrigerant to clear sight glass.

WARNING:
Never charge refrigerant through high-pressure side (discharge side) of system since this will force refrigerant back into refrigerant can and can may explode.

Charging—Step two (Cont'd)

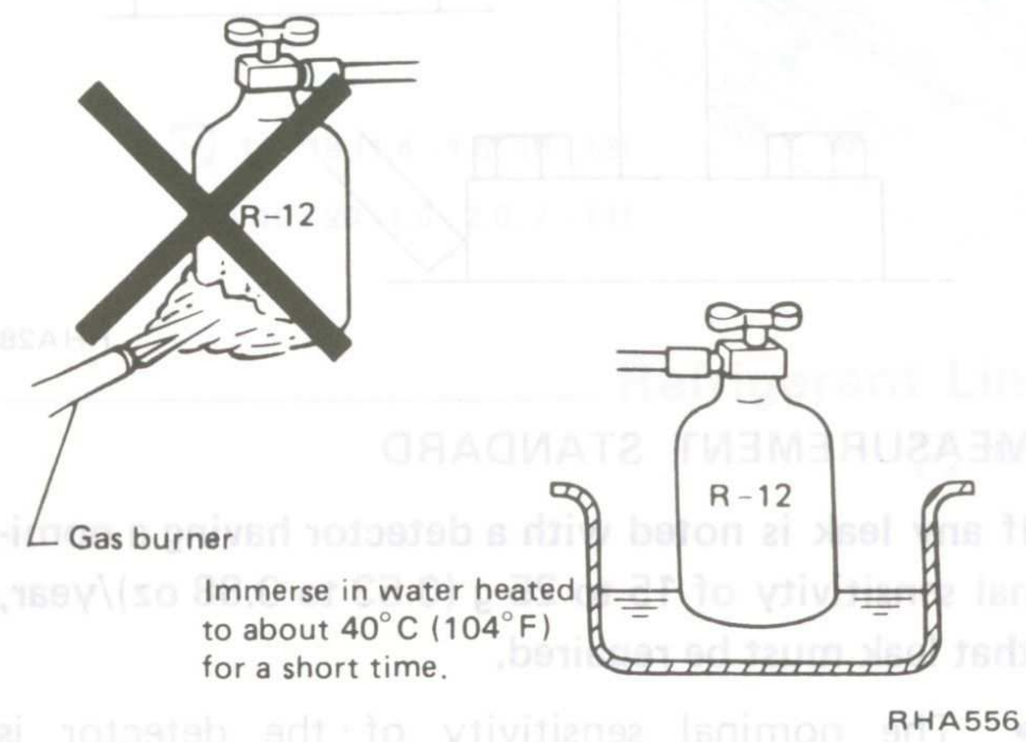
6. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.75 bar, 2.8 kg/cm², 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- **Be sure to purge air from charging hose when replacing can with a new one.**

In low ambient conditions in order to reduce charging time, warming of the refrigerant can will increase internal pressure.

CAUTION:
Do not increase can temperature beyond 40°C (104°F).

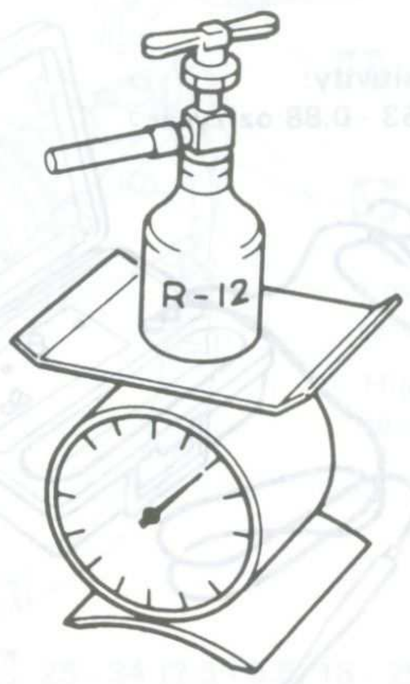
WARNING:
Do not heat can directly. There is danger of it exploding.



RHA556

7. Charge the specified amount of refrigerant into system by weighing charged refrigerant with scale. Overcharging will cause discharge pressure to rise.

Refrigerant amount:
0.9 - 1.1 kg (2.0 - 2.4 lb)



RHA504

The state of the bubbles in sight glass should only be used for checking the amount of charged refrigerant. The amount of charged refrigerant can be correctly judged by means of discharge pressure.

8. After charging, be sure to install valve cap on service valve.
9. Confirm that there are no leaks in system by checking with a leak detector.

- When charging refrigerant with a charging cylinder, charging station, or automatic charging equipment (with engine off), charge only through high pressure side. After specified refrigerant amount has entered the system, close high pressure valve on gauge set. Start engine, return to idle speed and operate A/C at maximum temperature setting with blower at maximum speed. Observe sight glass to confirm complete charge.

Overcharging will result in increased high pressures, and reduced performance.

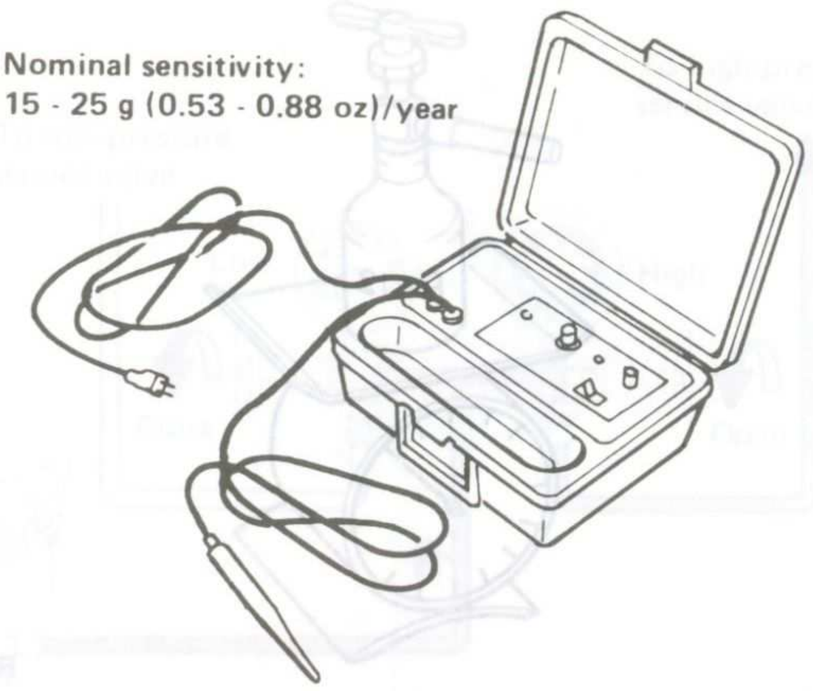
Checking Refrigerant Leaks

ELECTRIC LEAK-DETECTOR

The leak detector is a delicate device that detects small amounts of halogen.

In order to use the device properly, read the manufacturer's manuals and perform the specified maintenance and inspections.

Nominal sensitivity:
15 - 25 g (0.53 - 0.88 oz)/year



SHA733A

GENERAL PRECAUTIONS FOR HANDLING LEAK DETECTOR

Place the probe on connection fitting and wait for 5 seconds or more.

To check cooling unit, wait for 10 seconds or more.

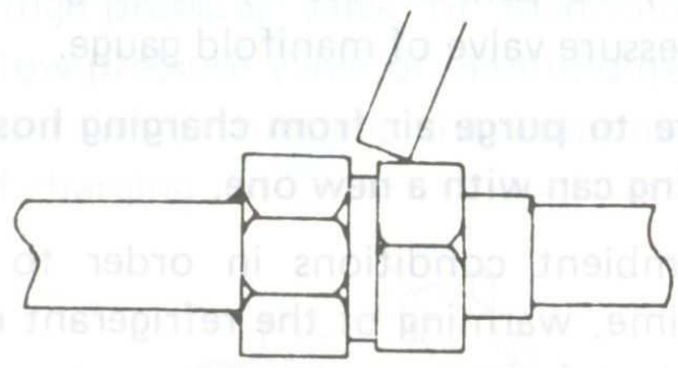
WARNING:

Keep the probe as still as possible for one more minute.

NOTICE:

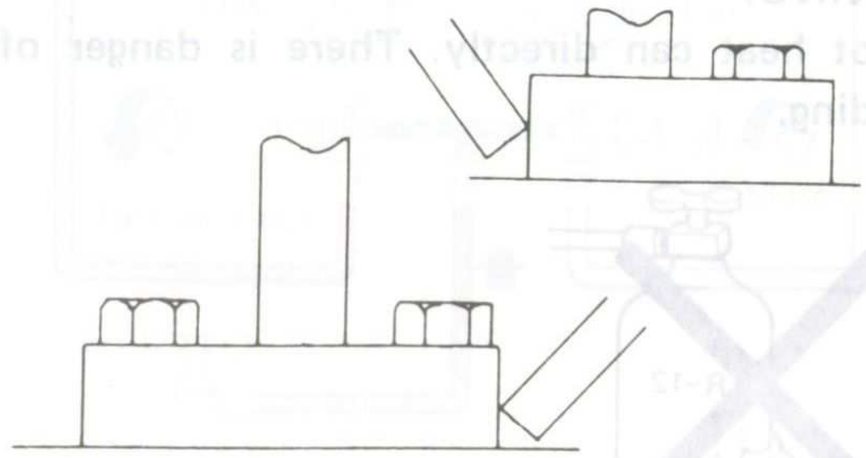
When testing single bolt flange, place the probe on the opposite side of the fitting.

UNION TYPE



RHA279

PLATE TYPE



RHA280

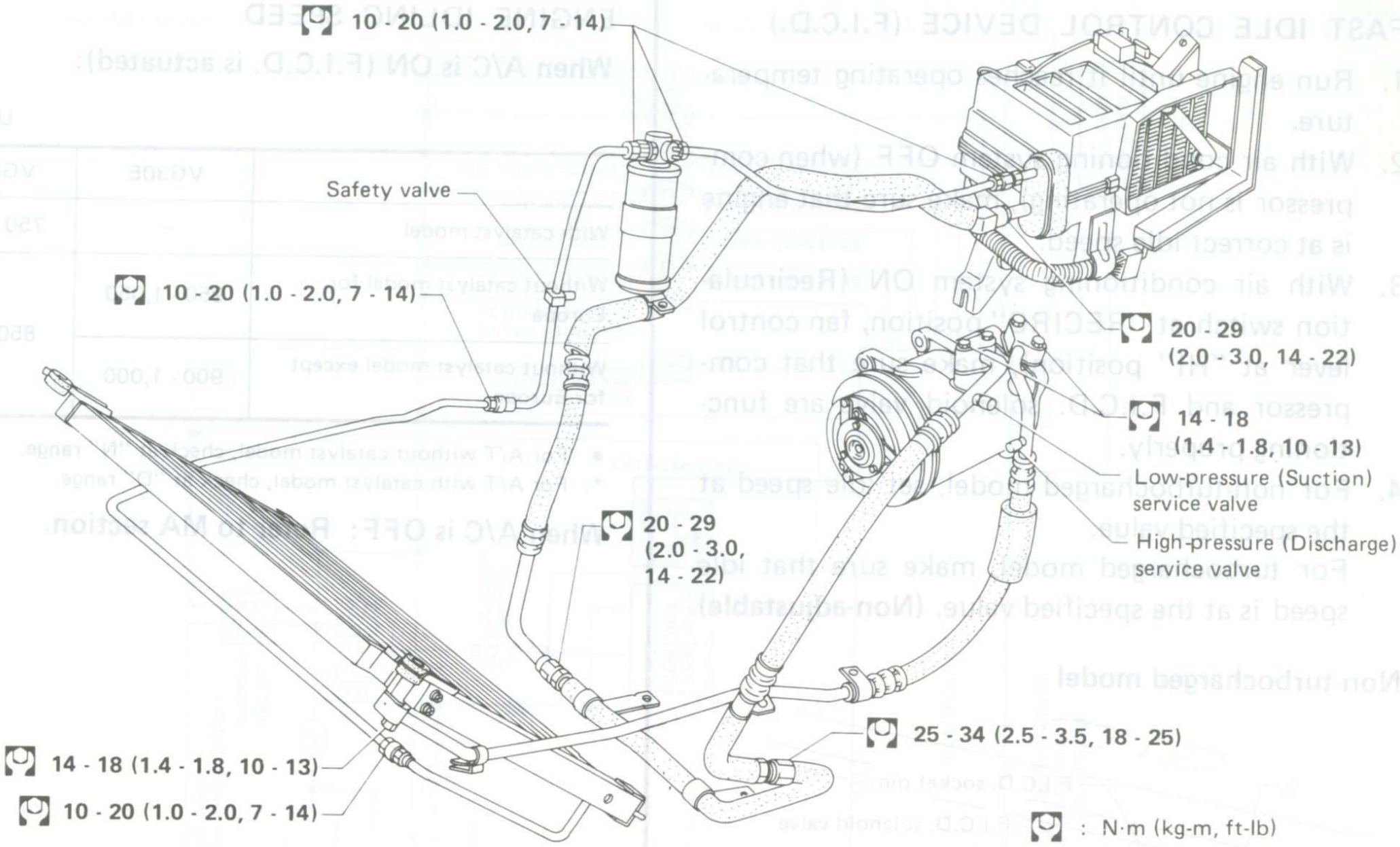
MEASUREMENT STANDARD

If any leak is noted with a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that leak must be repaired.

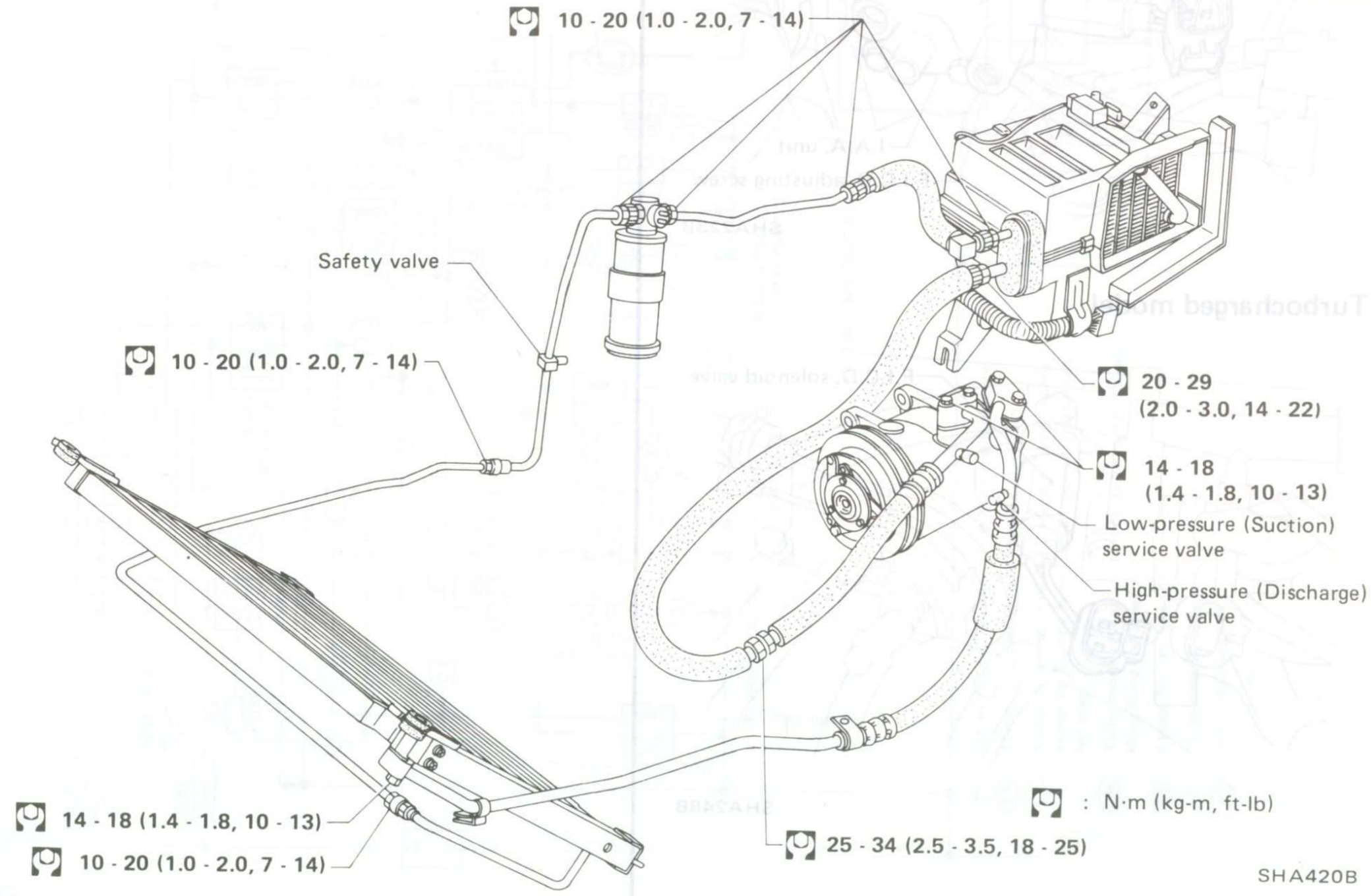
- The nominal sensitivity of the detector is determined under the assumption that all the leaking gas is collected by the detector. Accordingly, the quantity of gas actually leaking can amount to five to ten times the indicated value. Generally speaking, leakage of 150 to 200 g (5.29 to 7.05 oz) of refrigerant can cause insufficient cooling.
- Oil deposited during assembling must be wiped off before inspection. Refrigerant easily dissolves in oil, and the presence of oil can cause an error in measurement.
  This precaution is important when checking a used vehicle for refrigerant leakage.
- If oil is noted at or around connections, it indicates that refrigerant is leaking.

PIPING AND F.I.C.D.

Refrigerant Lines (L.H. drive model)



Refrigerant Lines (R.H. drive model)

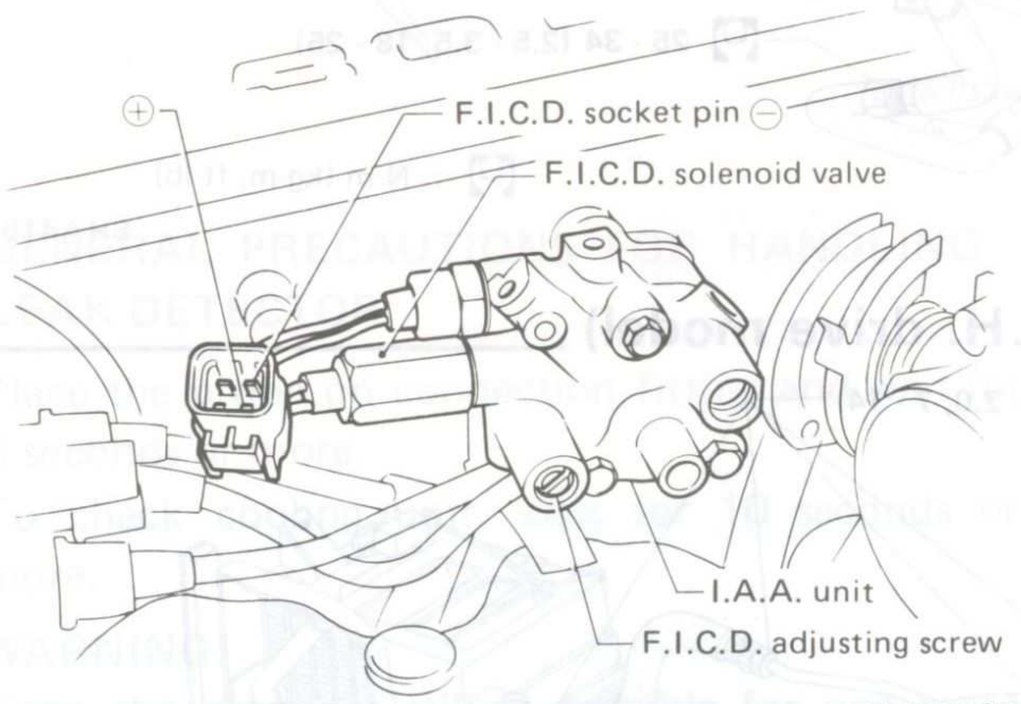


Idle Speed Adjusting and Checking

FAST IDLE CONTROL DEVICE (F.I.C.D.)

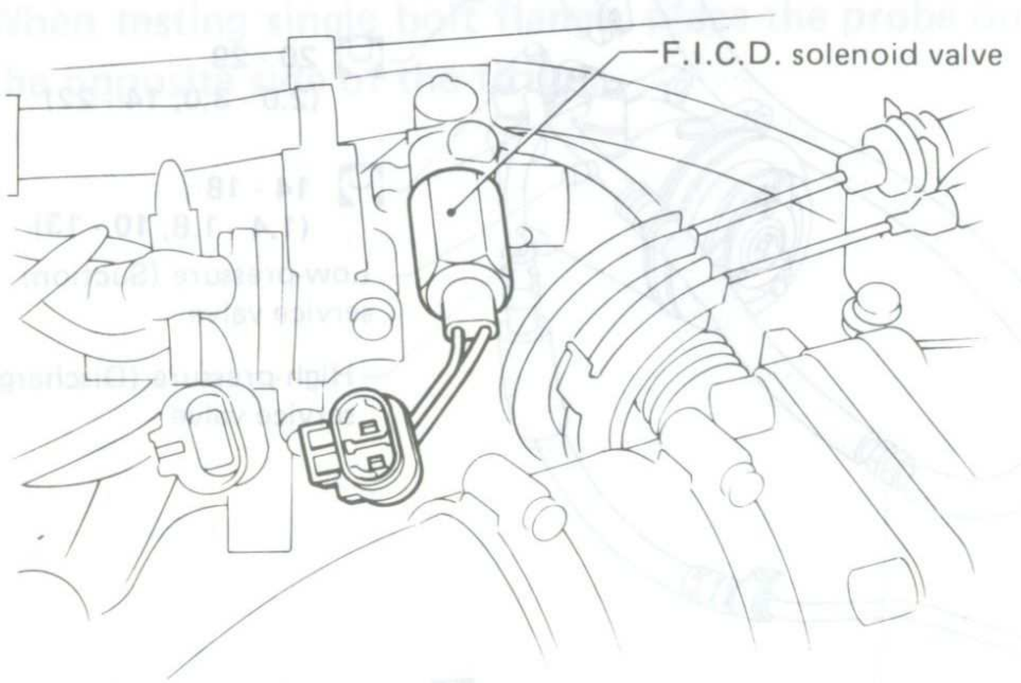
1. Run engine until it reaches operating temperature.
2. With air conditioning system OFF (when compressor is not operating), make sure that engine is at correct idle speed.
3. With air conditioning system ON (Recirculation switch at "RECIRC" position, fan control lever at "HI" position), make sure that compressor and F.I.C.D. solenoid valve are functioning properly.
4. For non-turbocharged model, set idle speed at the specified value.
   For turbocharged model, make sure that idle speed is at the specified value. **(Non-adjustable)**

Non-turbocharged model



SHA223B

Turbocharged model



SHA248B

ENGINE IDLING SPEED

When A/C is ON (F.I.C.D. is actuated):

Unit: rpm

	VG30E	VG30ET
With catalyst model	—	750 - 850*
Without catalyst model for Europe	950 - 1,050	850 - 950
Without catalyst model except for Europe	900 - 1,000	

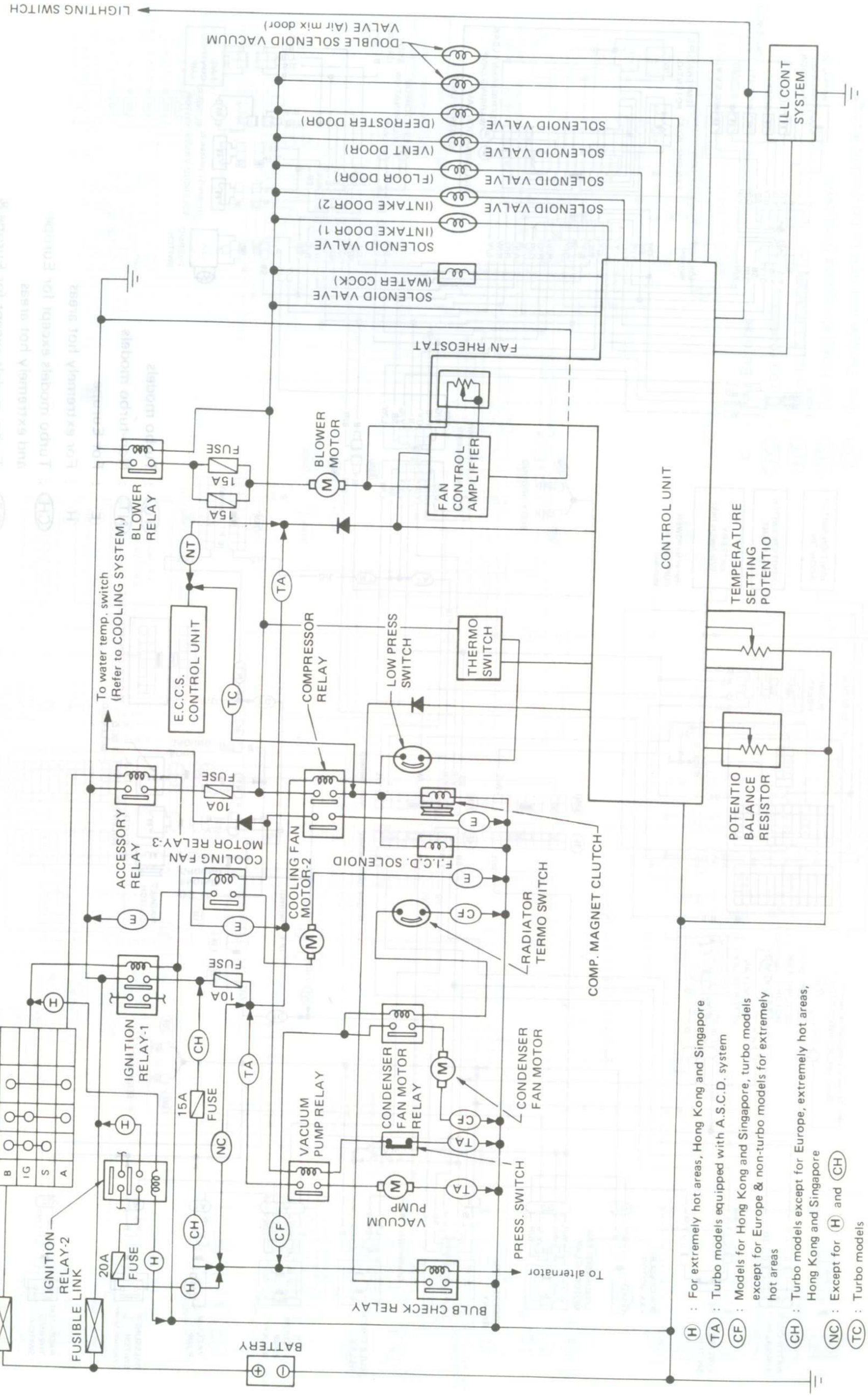
- For A/T without catalyst model, check at "N" range.

*: For A/T with catalyst model, check at "D" range.

When A/C is OFF: Refer to MA section.

A/C ELECTRICAL CIRCUIT (Manual)

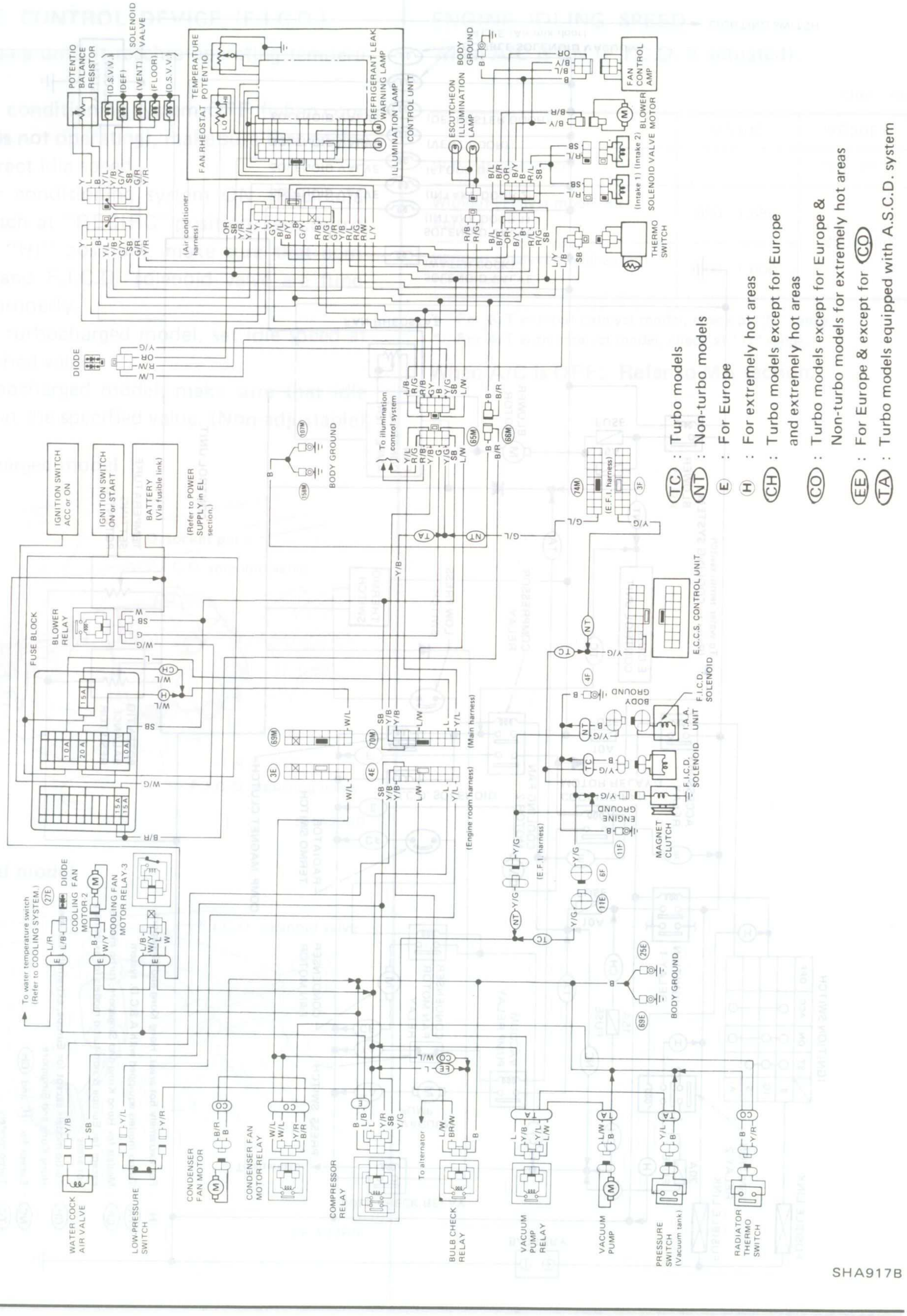
Schematic



SHA916B

A/C ELECTRICAL CIRCUIT (Manual)

Wiring Diagram (L.H. drive model)

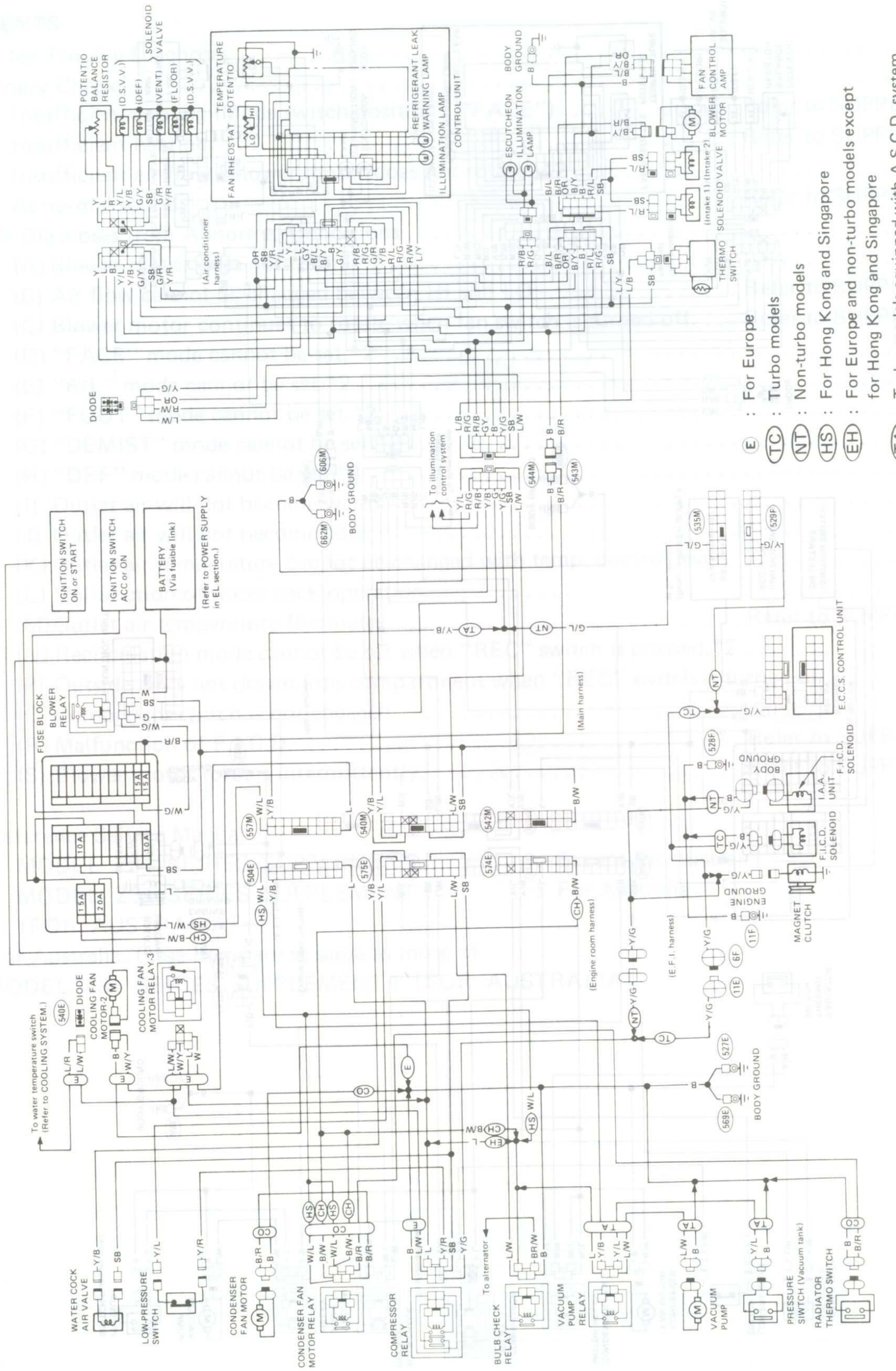


(TC) : Turbo models
(NT) : Non-turbo models
(E) : For Europe
(H) : For extremely hot areas
(CH) : Turbo models except for Europe & and extremely hot areas
(CO) : Turbo models except for Europe & Non-turbo models for extremely hot areas
(EE) : For Europe & except for (CO)
(TA) : Turbo models equipped with A.S.C.D. system

SHA917B

A/C ELECTRICAL CIRCUIT (Manual)

Wiring Diagram (R.H. drive model except for Australia)

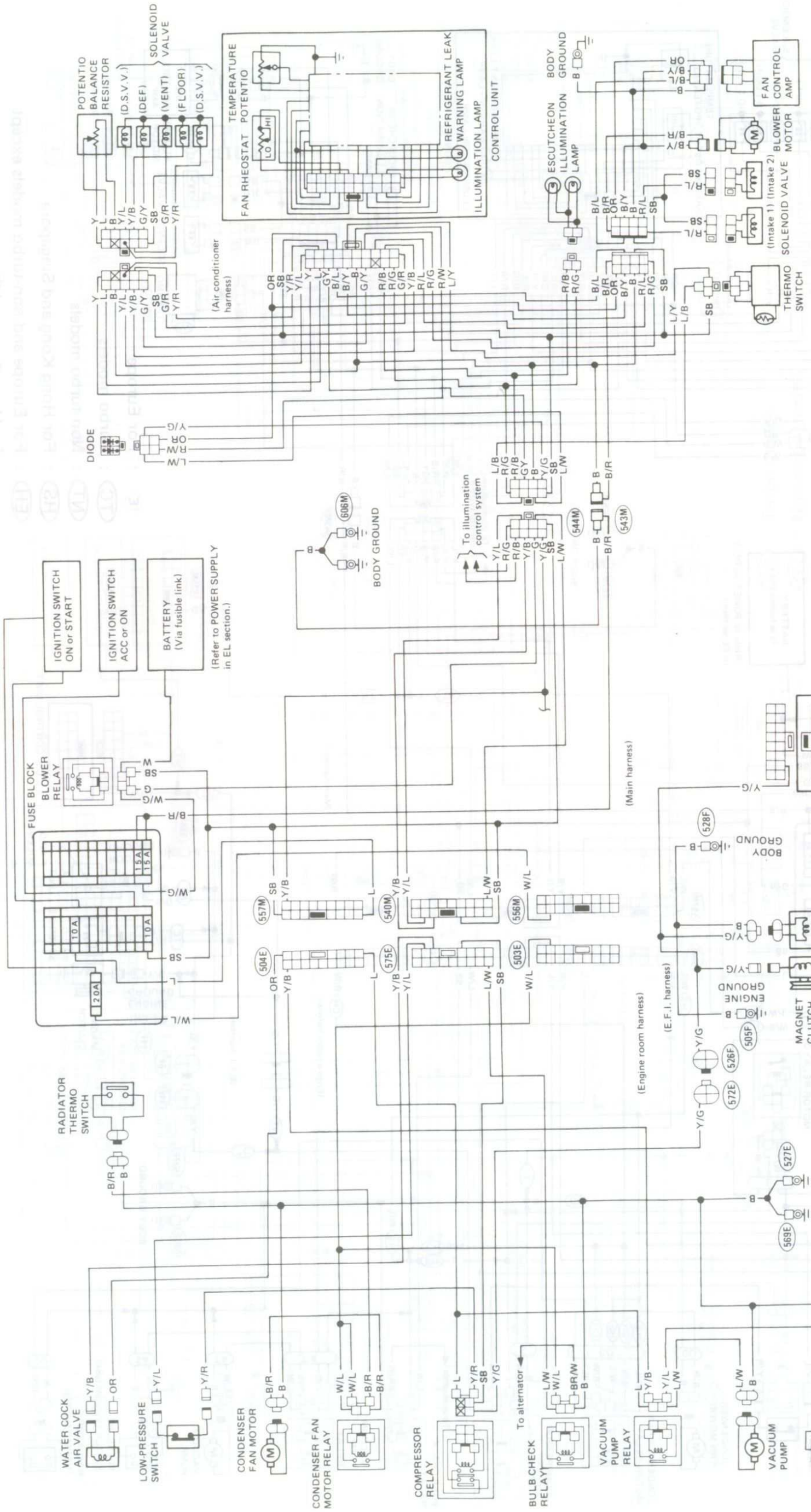


(E) : For Europe
(TC) : Turbo models
(NT) : Non-turbo models
(HS) : For Hong Kong and Singapore
(EH) : For Europe and non-turbo models except for Hong Kong and Singapore
(TA) : Turbo models equipped with A.S.C.D. system
(CO) : Turbo models except for Europe & Non-turbo models for Hong Kong and Singapore
(CH) : Turbo models except for Europe, Hong Kong and Singapore

SHA918B

A/C ELECTRICAL CIRCUIT (Manual)

Wiring Diagram (For Australia)



SHA919B

TROUBLE DIAGNOSES (Manual)

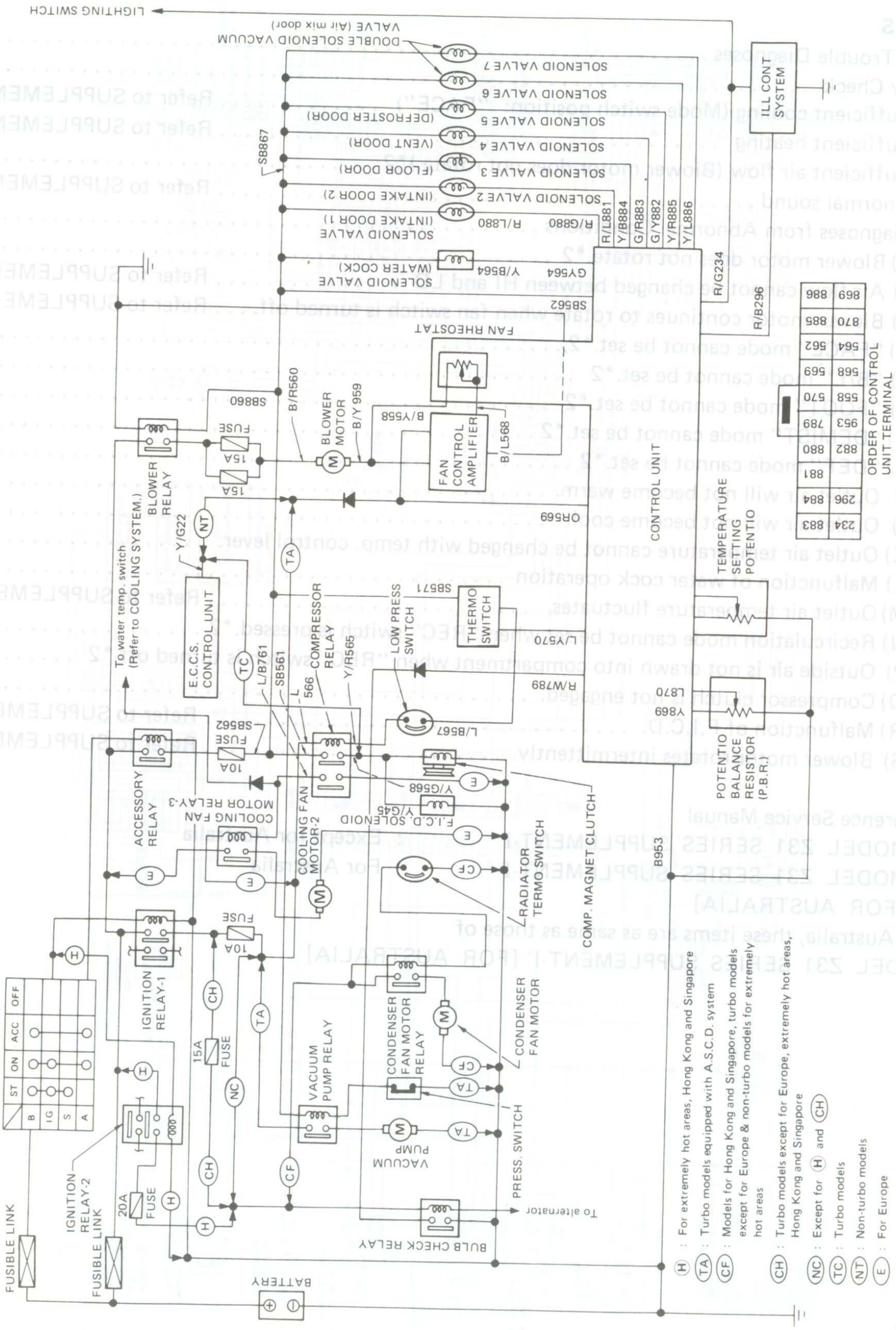
CONTENTS

Circuit for Trouble Diagnoses HA-18
Preliminary Check HA-19
1) Insufficient cooling (Mode switch position: "FACE") . . . . . Refer to SUPPLEMENT-I.*1
2) Insufficient heating . . . . . Refer to SUPPLEMENT-I.*1
3) Insufficient air flow (Blower motor does not rotate.)*2 . . . . . HA-19
4) Abnormal sound . . . . . Refer to SUPPLEMENT-I.*1
Trouble Diagnoses from Abnormal Conditions HA-20
(A) Blower motor does not rotate.*2 . . . . . HA-20
(B) Air flow cannot be changed between HI and LO . . . . . Refer to SUPPLEMENT-I.*1
(C) Blower motor continues to rotate when fan switch is turned off. . . . Refer to SUPPLEMENT-I.*1
(D) "FACE" mode cannot be set.*2 . . . . . HA-21
(E) "B/L" mode cannot be set.*2 . . . . . HA-23
(F) "FOOT" mode cannot be set.*2 . . . . . HA-25
(G) "DEMIST" mode cannot be set.*2 . . . . . HA-27
(H) "DEF" mode cannot be set.*2 . . . . . HA-29
(I) Outlet air will not become warm. HA-30
(J) Outlet air will not become cool. HA-32
(K) Outlet air temperature cannot be changed with temp. control lever. HA-35
(L) Malfunction of water cock operation HA-35
(M) Outlet air temperature fluctuates. . . . . Refer to SUPPLEMENT-I.*1
(N) Recirculation mode cannot be set when "REC" switch is pressed.*2 . . . . . HA-36
(P) Outside air is not drawn into compartment when "REC" switch is turned off.*2 . . . . . HA-36
(Q) Compressor clutch is not engaged. HA-37
(R) Malfunction of F.I.C.D. . . . . Refer to SUPPLEMENT-I.*1
(S) Blower motor rotates intermittently. . . . . Refer to SUPPLEMENT-I.*1

*1: Reference Service Manual
- MODEL Z31 SERIES SUPPLEMENT-I : Except for Australia
- MODEL Z31 SERIES SUPPLEMENT-I [FOR AUSTRALIA] : For Australia

*2: For Australia, these items are as same as those of MODEL Z31 SERIES SUPPLEMENT-I [FOR AUSTRALIA]

Circuit for Trouble Diagnoses



SHA928B

Preliminary Check

3) INSUFFICIENT AIR FLOW (Blower motor does not rotate.)

Does the air flow volume change according to the fan control lever position between LO and HI?

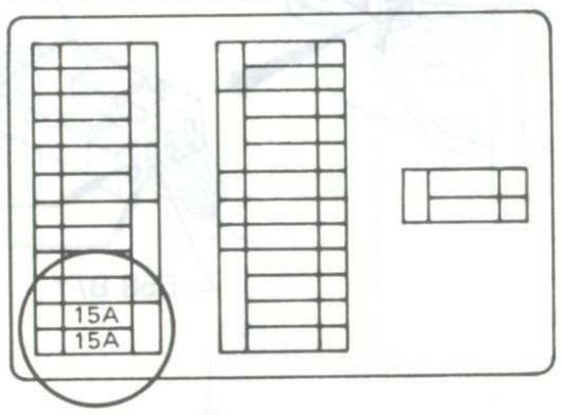
Yes → Fan motor does not operate at some position between fan control lever LO and HI. (Go to items **A, B, C**.)

No → Check the two fuses between blower motor and blower relay.

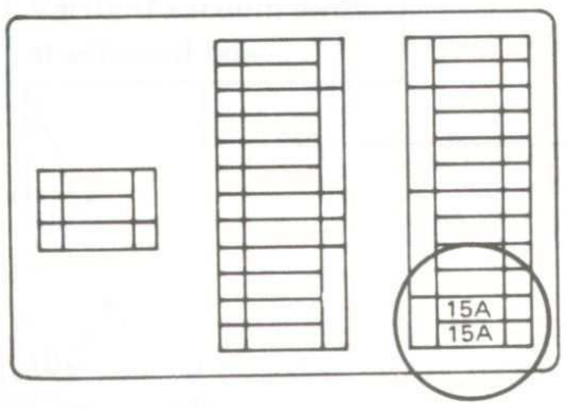
O.K. → Blower motor does not rotate at all. (Go to item **A**.)

N.G. → Replace fuses.

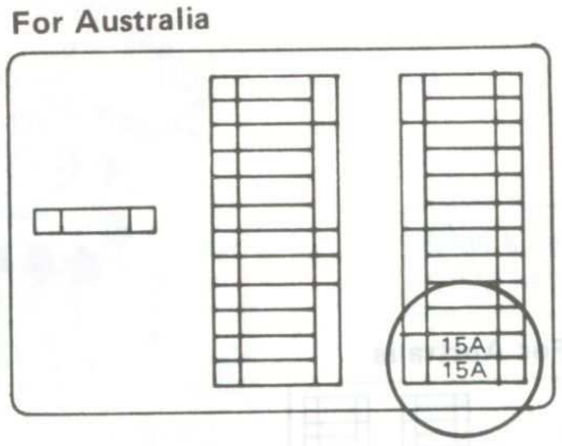
For L.H. drive model



R.H. drive model except for Australia



For Australia



SHA930B

TROUBLE DIAGNOSES (Manual)

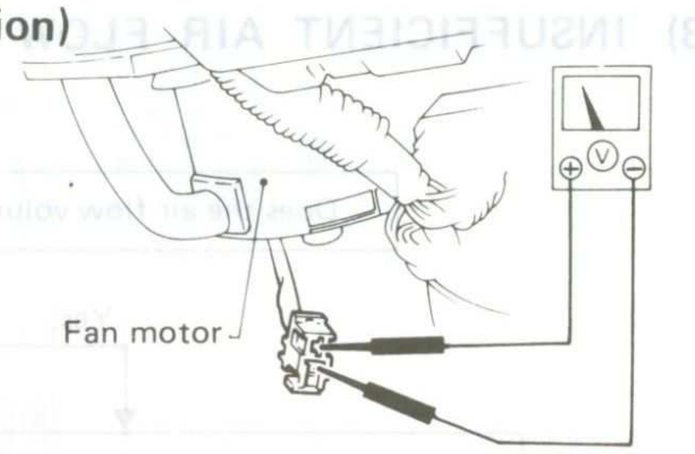
Trouble Diagnoses from Abnormal Conditions

(A) BLOWER MOTOR DOES NOT ROTATE. (Ignition switch on position)

Is motor's terminal voltage approx. 12 volts with FAN switch set to "HI"?
Remove 2-pin connector from motor and measure voltage.

Yes → Faulty motor.

No → Does approx. 12 volts exist between 560 and 558? (HI position)

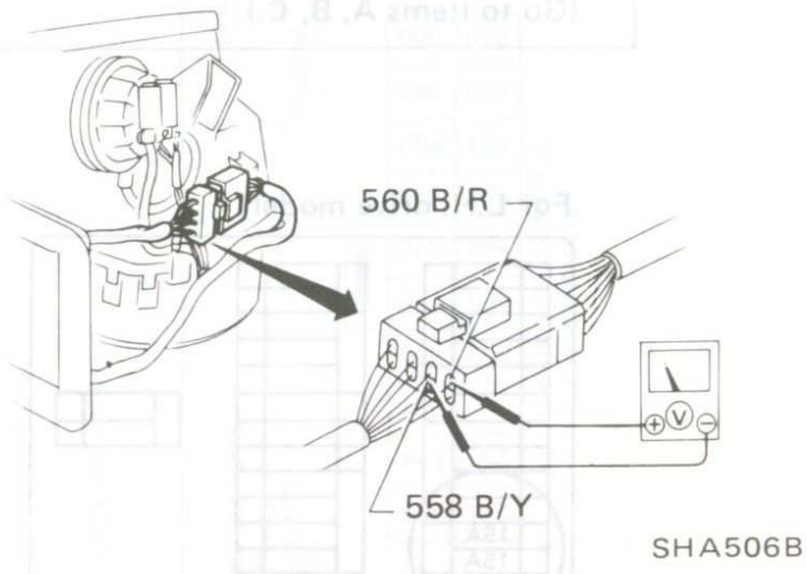


SHA450B

Applied voltage of motor check.

Yes → Go to item B.

No → Is there an open circuit between blower harness and power line, when wires are traced back from blower harness via air conditioner harness?



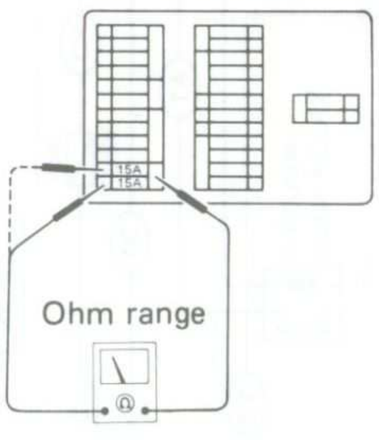
SHA506B

Yes → Repair.

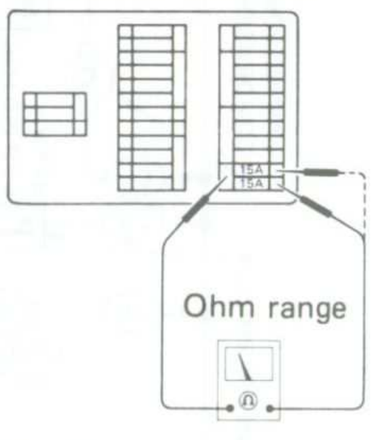
No → Check fuses and blower relay for continuity.

Fuse check
(Ignition switch: OFF position)

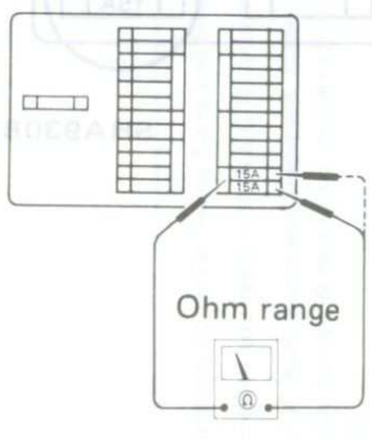
For L.H. drive model

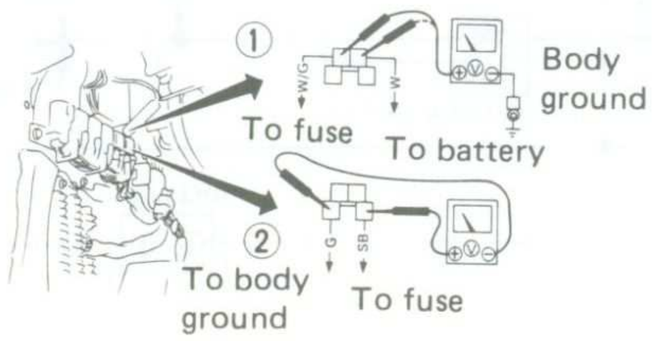


R.H. drive model except for Australia



For Australia





Blower relay check (Fan switch: ON position)

Remove relay bracket and check the relay operation from the back side of the electrical connector.

① Terminal voltage check (Correct voltage: Approx. 12V)
② If item ① is N.G., check applied voltage of relay coil. (Correct voltage: Approx. 12V)

SHA931B

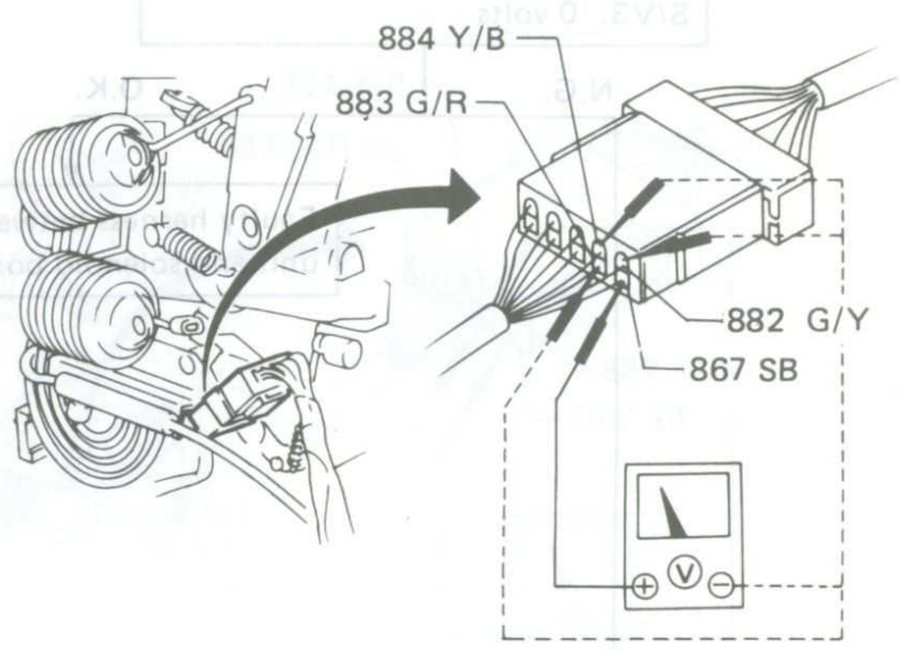
Trouble Diagnoses from Abnormal Conditions (Cont'd)

(D) "FACE" MODE CANNOT BE SET.

Depress FACE switch to "ON".

Remove under cover.

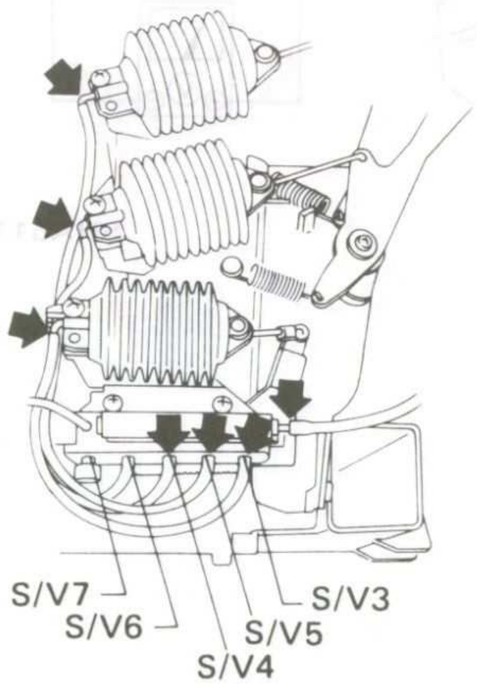
Check voltage at connector solenoid box.
Measure voltage with connector in place.
S/V4 and S/V5: Approx. 12 volts
S/V3: 0 volts



SHA626B

Yes

Verify if vacuum exists at solenoid box.



SHA400B

No

Yes

Check vacuum at outlet of S/V4 and S/V5 and also check S/V3 output port. This should be open to the atmosphere.

No

Malfunction of vacuum hose at the source side. Replace the hose.

Yes

Check vacuum hose between S/V3, 4 and 5.

No

Faulty solenoid valve.

O.K.

Faulty vacuum actuator or linkage.

N.G.

Replace vacuum hose.

A

Trouble Diagnoses from Abnormal Conditions (Cont'd)

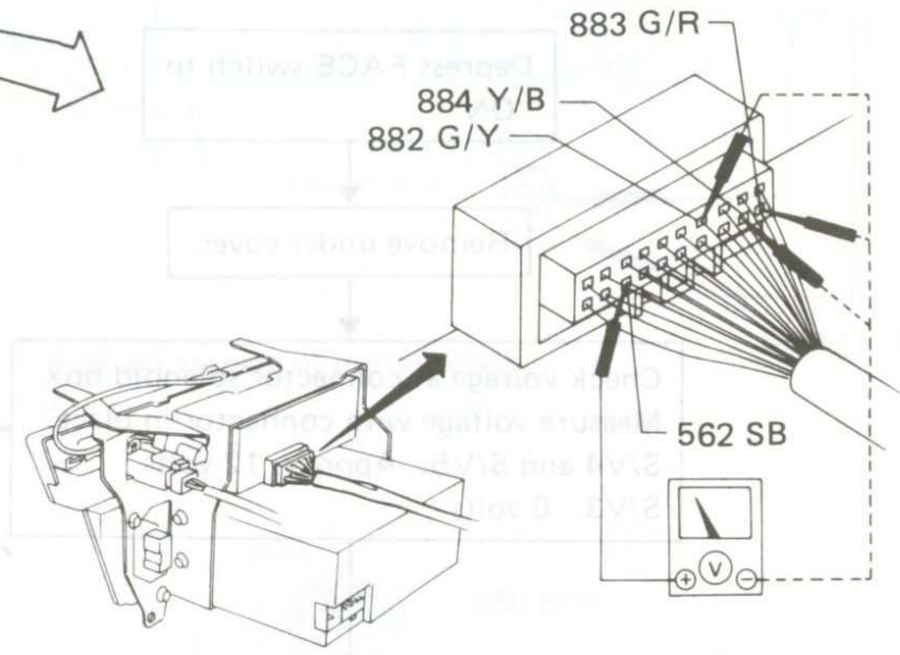
(A)

Check the applied voltages of the solenoid valves.
S/V4 and S/V5: Approx. 12 volts
S/V3: 0 volts

N.G.

O.K.

Faulty harness between control unit and solenoid box.



SHA510B

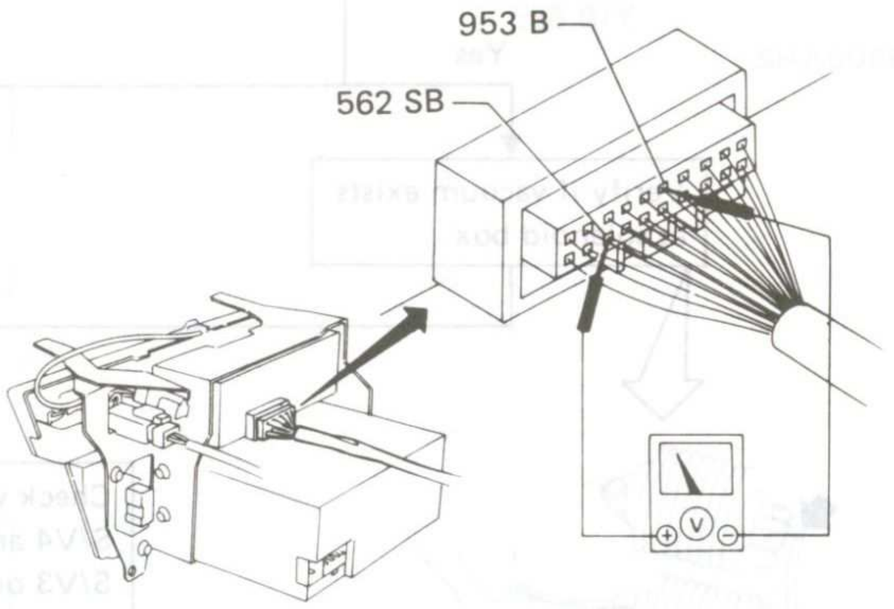
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?

Yes

No

Faulty control unit.

Check air conditioner harness.



SHA511B

(A)

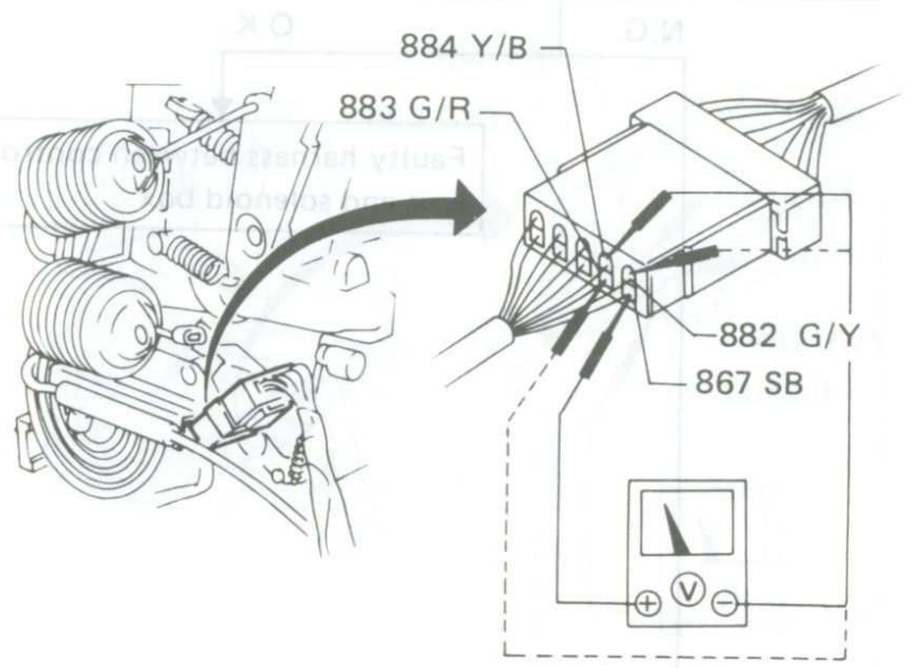
Trouble Diagnoses from Abnormal Conditions (Cont'd)

(E) "B/L" MODE CANNOT BE SET.

Depress B/L switch to "ON".

Remove under-cover.

Check voltage at connector solenoid box. Measure voltage with connectors in place.
All S/Vs: 12 volts

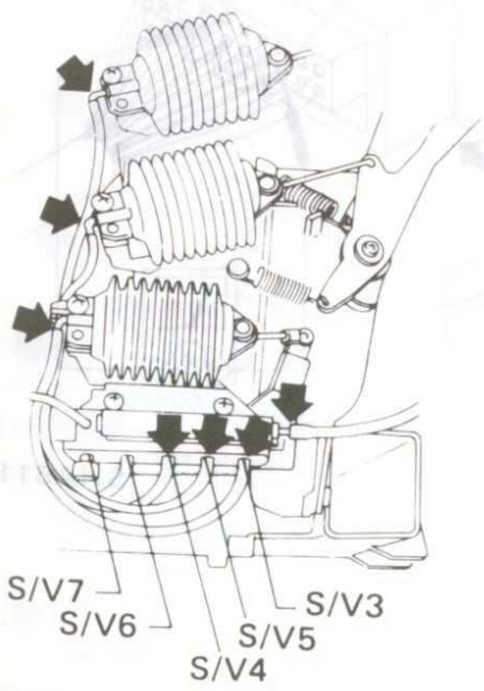


SHA509B

Yes

No

Verify that vacuum exists at solenoid box.



SHA400B

Yes

No

Check vacuum at outlet of S/V3, S/V4 and S/V5.

Malfunction of vacuum hose at source side.

Yes

No

Check vacuum hose between S/V3, 4 and 5.

Faulty solenoid valve.

O.K.

N.G.

Faulty vacuum actuator or linkage.

Replace vacuum hose.

Ⓐ

Trouble Diagnoses from Abnormal Conditions (Cont'd)

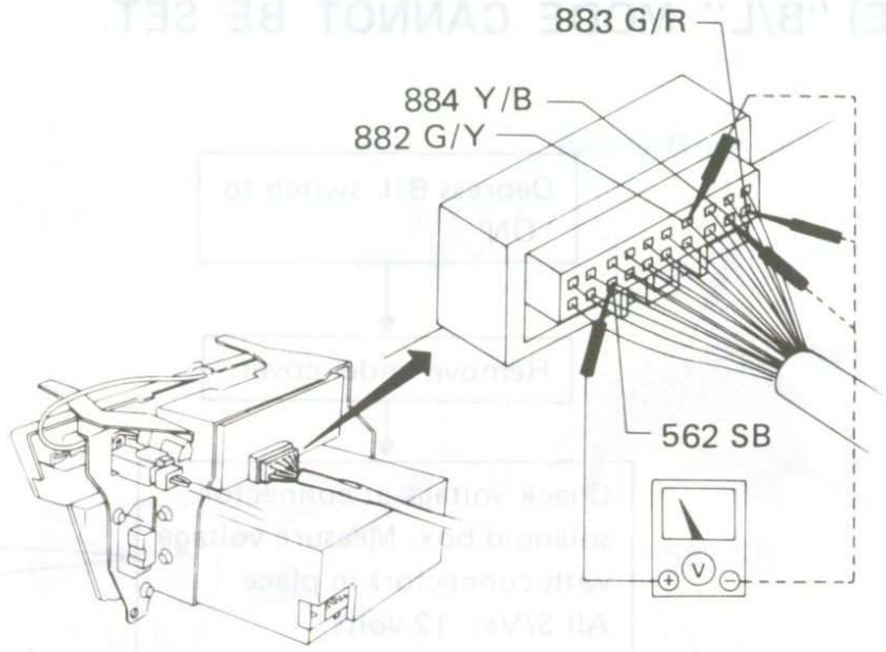
Ⓐ

Check applied voltages of the solenoid valves.
S/V3, 4 and 5: Approx. 12 volts

N.G.

O.K.

Faulty harness between control unit and solenoid box.



SHA510B

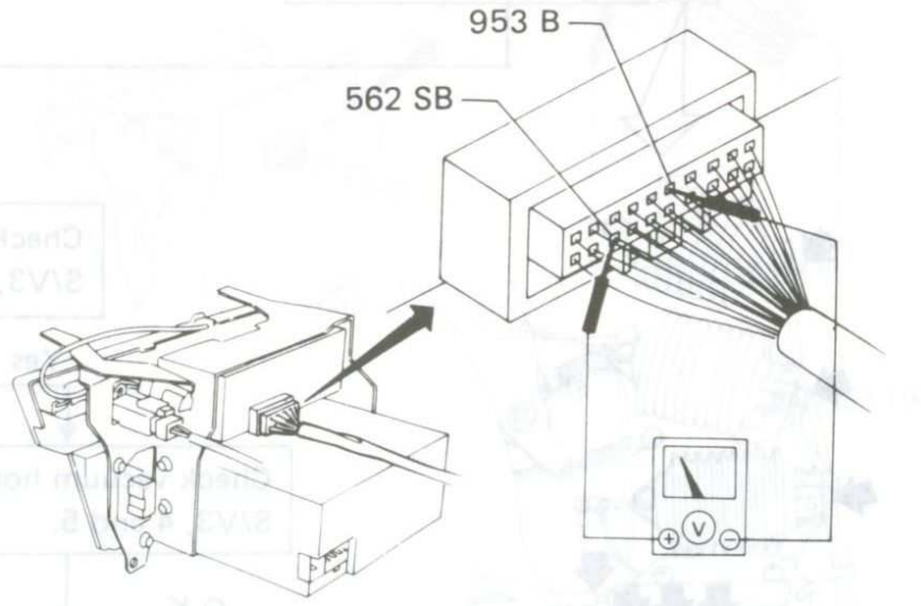
Does 12 volts exist between lines 953 (B) and 562 (SB) of control unit?

Yes

No

Faulty control unit.

Check air conditioner harness.



SHA511B

Ⓐ

Trouble Diagnoses from Abnormal Conditions (Cont'd)

(F) "FOOT" MODE CANNOT BE SET.

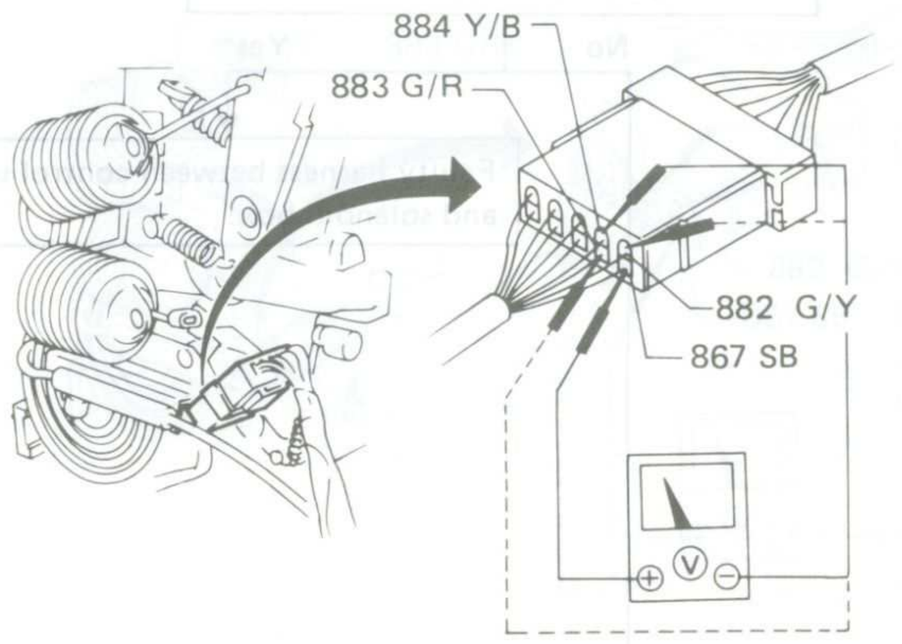
Depress FOOT switch to "ON".

↓

Remove under-cover.

↓

Check voltage at connector solenoid box. Measure voltage with connector in place.
- S/V3 and S/V5: Approx. 12 volts
- S/V4: Approx. 0 volts

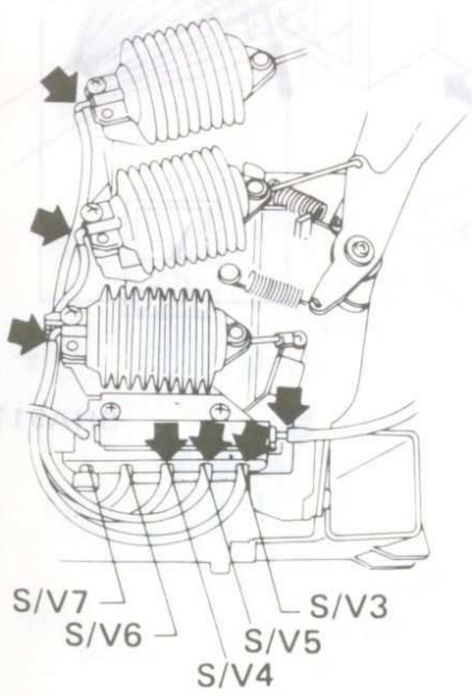


SHA509B

Yes

↓

Check vacuum at the inlet of the solenoid box.



SHA400B

Yes

↓

Check vacuum at the outlets of S/V3 and 5. Check S/V4—this should be opened to atmosphere.

Yes

↓

Check vacuum hose between solenoid valves and vacuum actuator.

O.K.

↓

Faulty vacuum actuator or linkage.

N.G.

↓

Replace vacuum hose.

No

↓

Faulty solenoid valve.

No

↓

Faulty vacuum hose at source side.

No

↓

Ⓐ

Trouble Diagnoses from Abnormal Conditions (Cont'd)

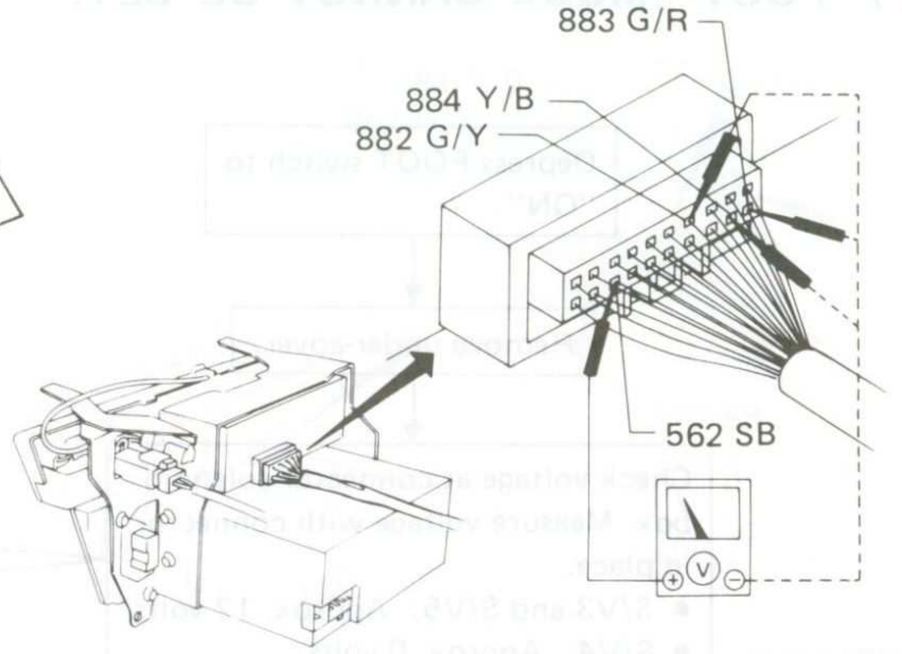
(A)

Check applied voltages of the solenoid valves.
S/V3 and 5: Approx. 12 volts
S/V4: Approx. 0 volts

No

Yes

Faulty harness between control unit and solenoid box.



SHA510B

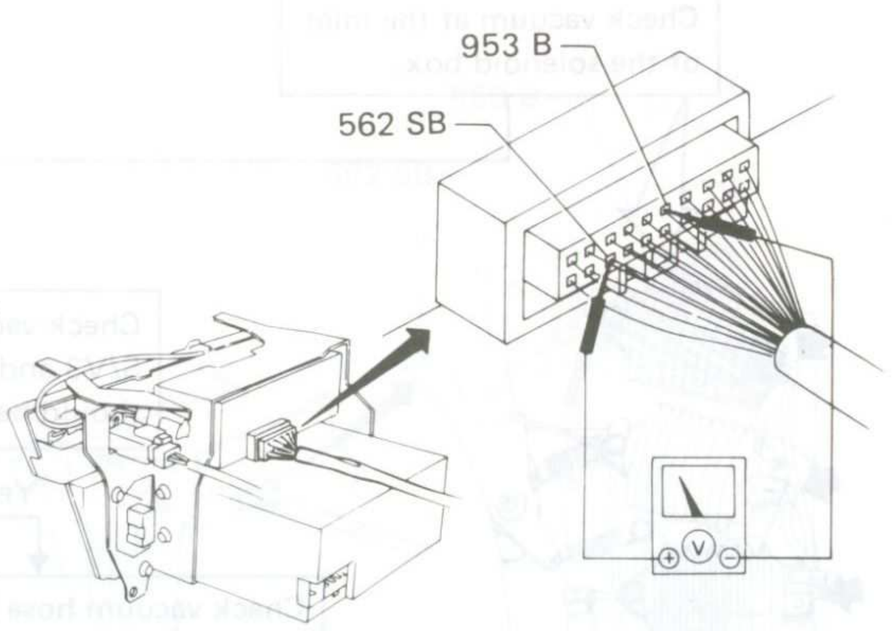
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?

Yes

No

Faulty control unit.

Check air conditioner harness.



SHA511B

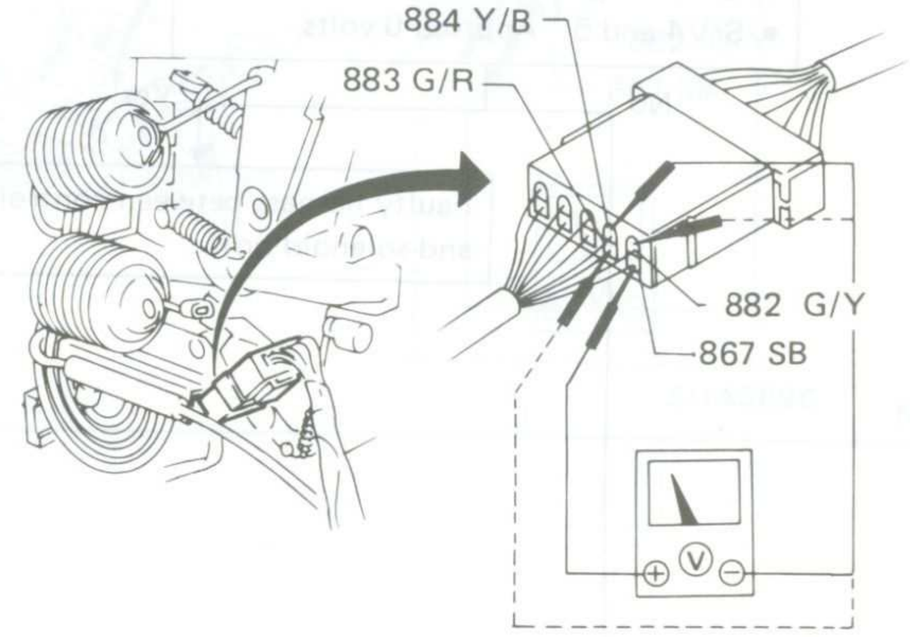
Trouble Diagnoses from Abnormal Conditions (Cont'd)

(G) "DEMIST" MODE CANNOT BE SET.

Depress DEMIST switch to "ON".

Remove under-cover from driver's side.

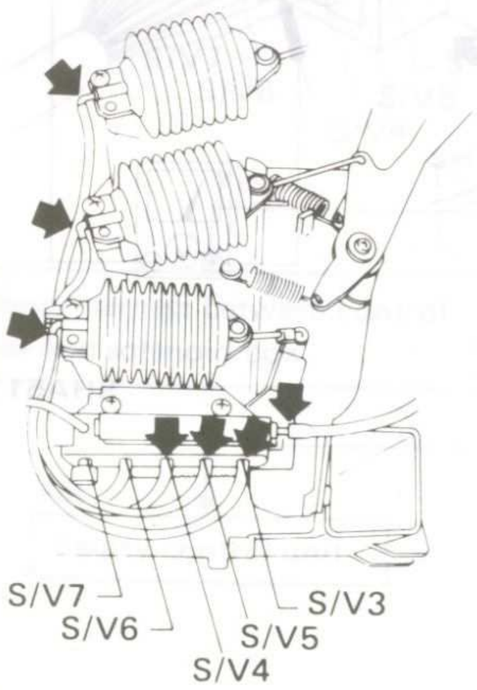
Check voltage at connector solenoid box.
Measure voltage with connector in place.
S/V4 and 5: Approx. 0 volts
S/V3: Approx. 12 volts



SHA509B

Yes

Check vacuum at the inlet of the solenoid box.



SHA400B

Yes

Check vacuum at outlets S/V3.
Check outlet at S/V4 and 5; this should be opened to the atmosphere.

Yes

Check vacuum hose between solenoid valve and vacuum actuator.

O.K.

Faulty vacuum actuator or linkage.

N.G.

Replace vacuum hose.

No

Faulty solenoid valve.

No

Faulty vacuum hose at source side.

No

Ⓐ

Trouble Diagnoses from Abnormal Conditions (Cont'd)

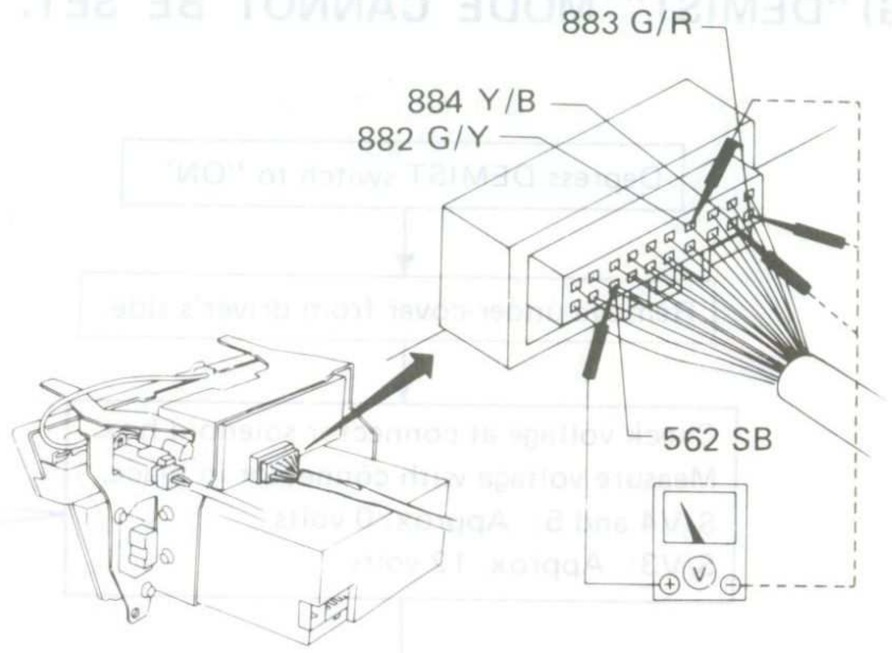
Ⓐ

Check applied voltages of the solenoid valves.
- S/V3: Approx 12 volts
- S/V4 and 5: Approx. 0 volts

No

Yes

Faulty harness between control unit and solenoid box.



SHA510B

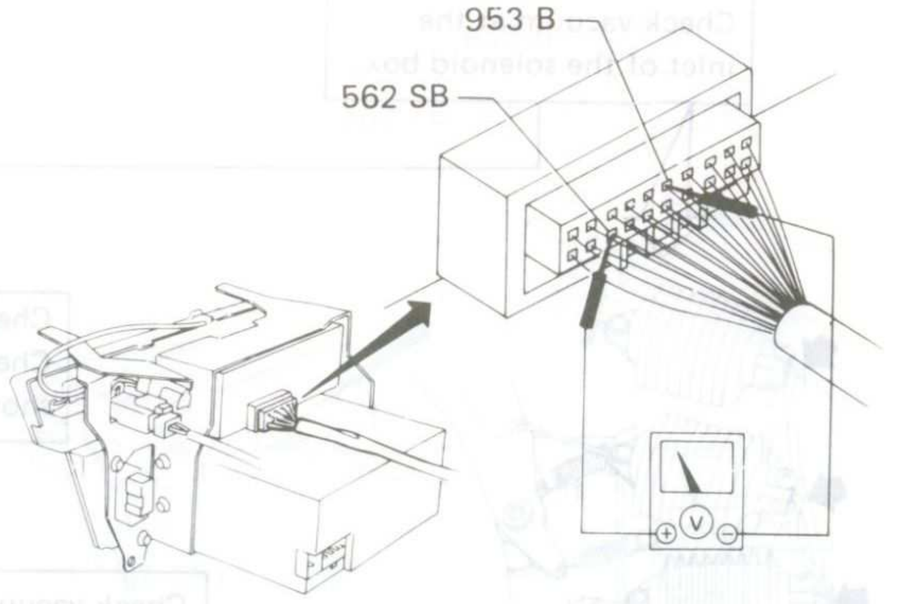
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?

Yes

No

Faulty control unit.

Check air conditioner harness.



SHA511B

Ⓐ

Trouble Diagnoses from Abnormal Conditions (Cont'd)

(H) "DEF" MODE CANNOT BE SET.

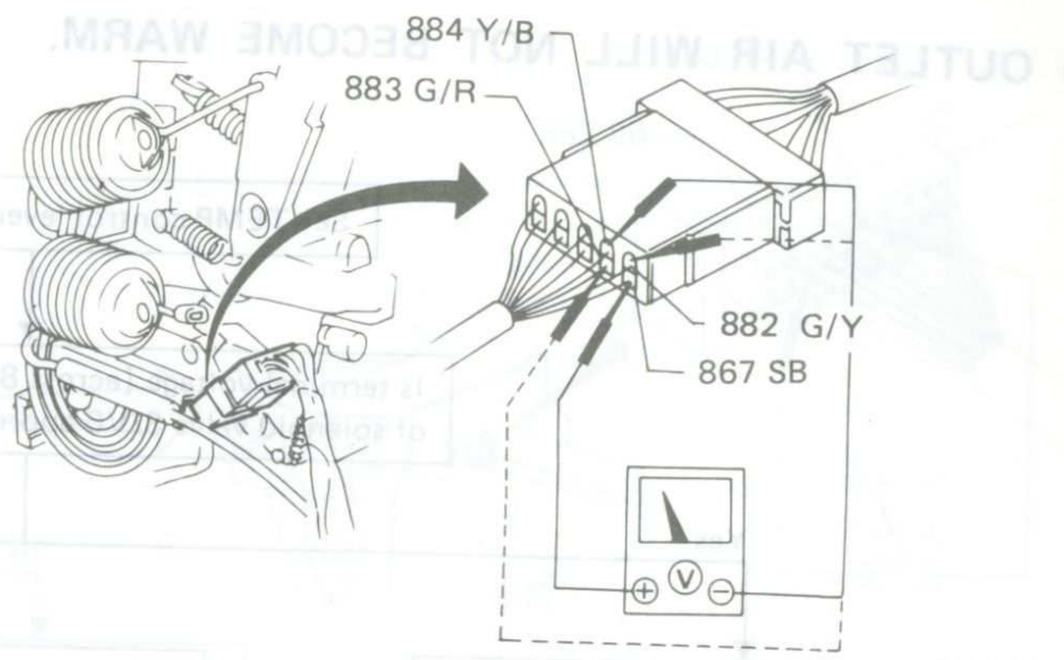
Turn DEF switch to "ON".

↓

Remove under-cover from driver's side.

↓

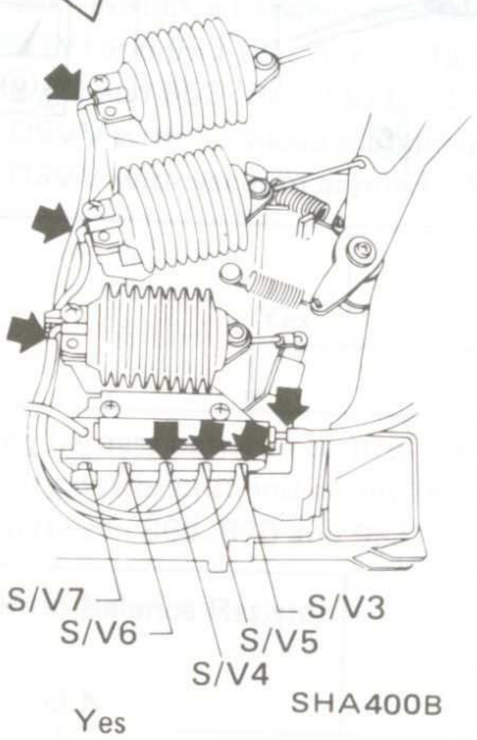
Check voltage at the connector solenoid box. Measure voltage with connector in place.
S/V3, 4 and 5: Approx. 0 volts



SHA509B

Yes

Solenoid valves S/V3, 4 and 5 should be open to the atmosphere.



SHA400B

Yes

Faulty actuator or disconnected linkage.

No

Faulty solenoid valve.

No

Check the applied voltages of solenoid valves.
S/V3, 4 and 5: 0 volts

Yes

Faulty harness between control unit and solenoid box.

No

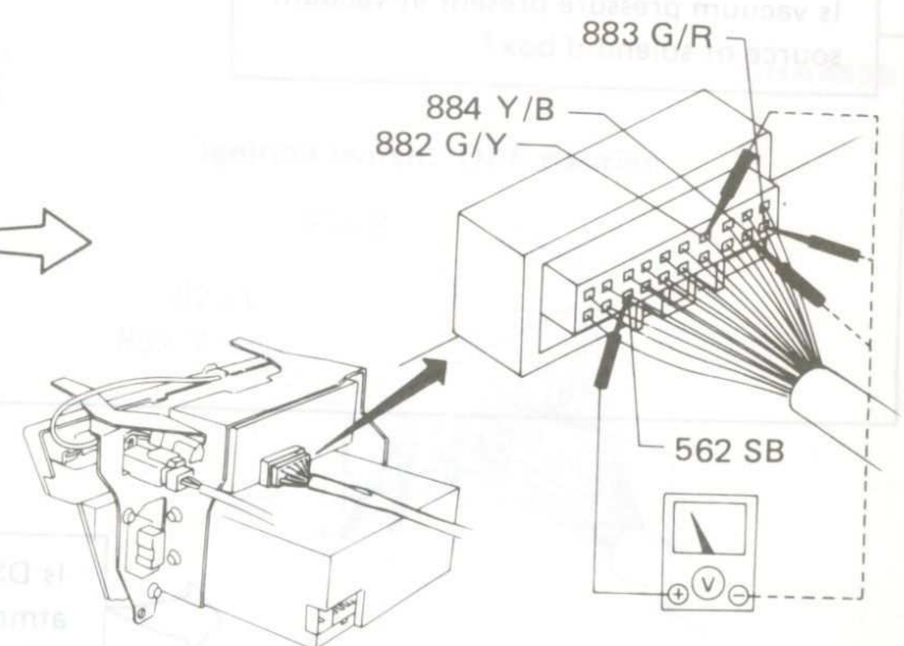
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?

Yes

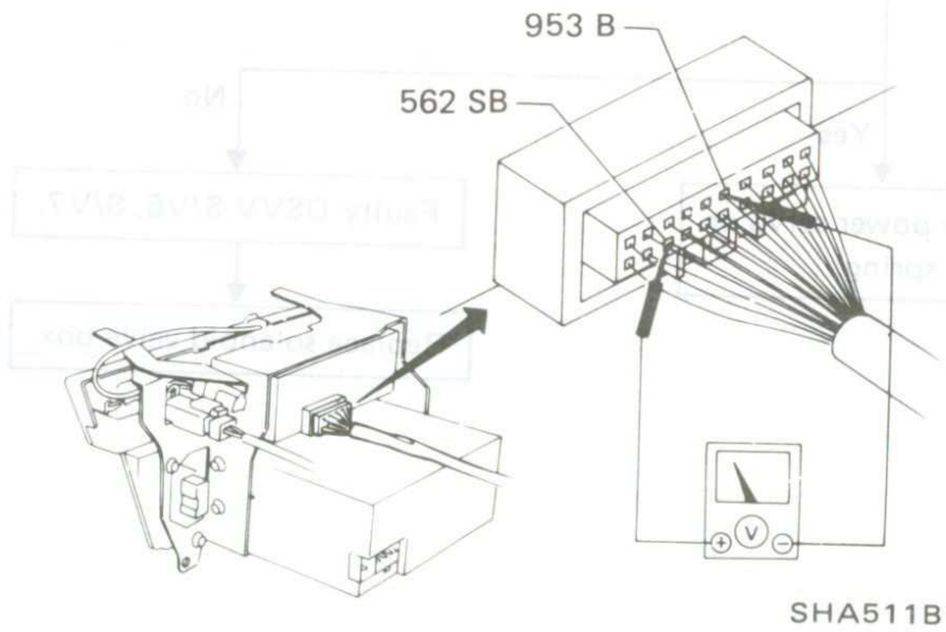
Faulty control unit.

No

Check air conditioner harness.



SHA510B



SHA511B

Trouble Diagnoses from Abnormal Conditions (Cont'd)

(I) OUTLET AIR WILL NOT BECOME WARM.

Set TEMP control lever to "FULL HOT".

Is terminal voltage [across 867 (SB) and 885 (Y/R)] of solenoid valve S/V6 approx. 0 volts?

Yes

Is terminal voltage across 867 (SB) and 886 (Y/L) of solenoid valve S/V7 12 volts?

Yes

Is vacuum pressure present at vacuum source of solenoid box?

Yes

Is DSVV S/V6, S/V7 open to atmospheric pressure?

Yes

Faulty power servo or return spring.

No

Faulty DSVV S/V6, S/V7.

Replace solenoid valve box.

No

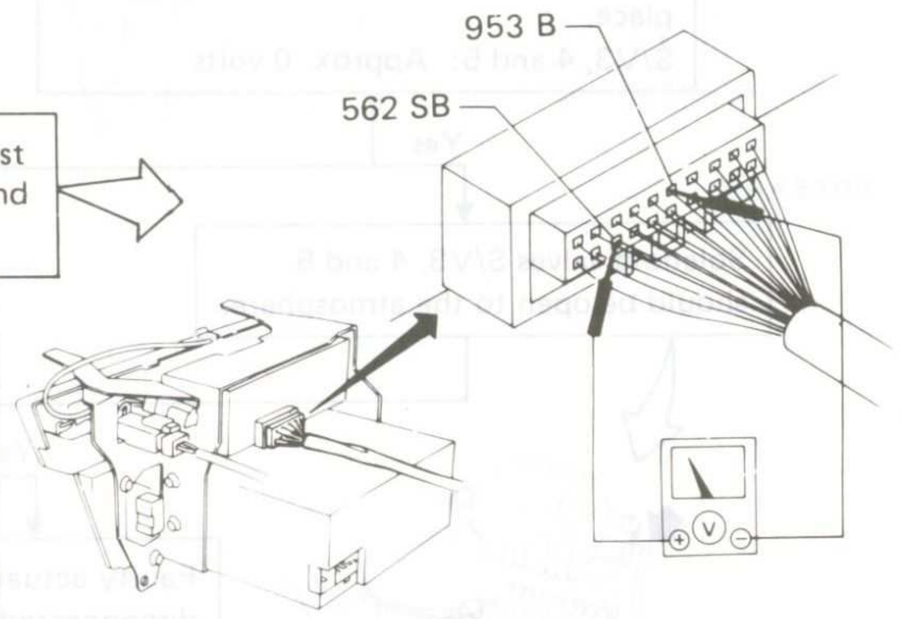
Check vacuum line.

No

Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?

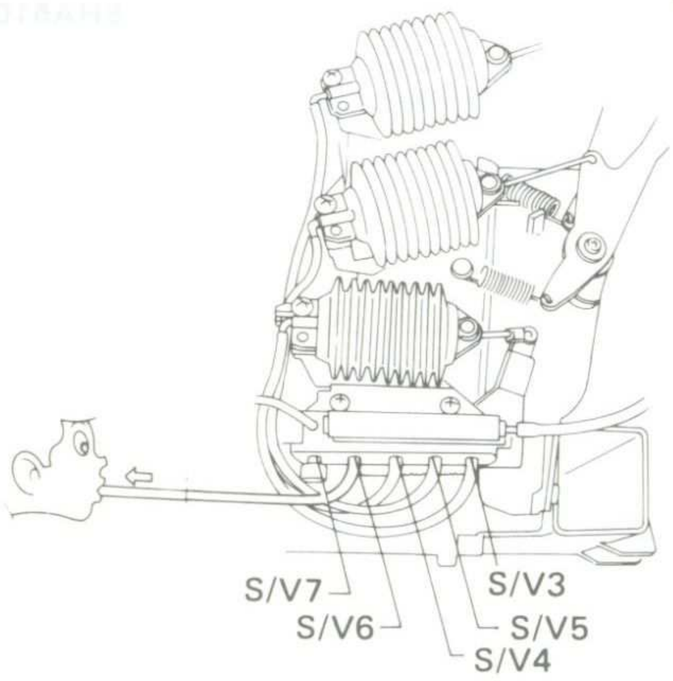
Yes

(A)



SHA511B

No



SHA404B

Trouble Diagnoses from Abnormal Conditions (Cont'd)

Ⓐ

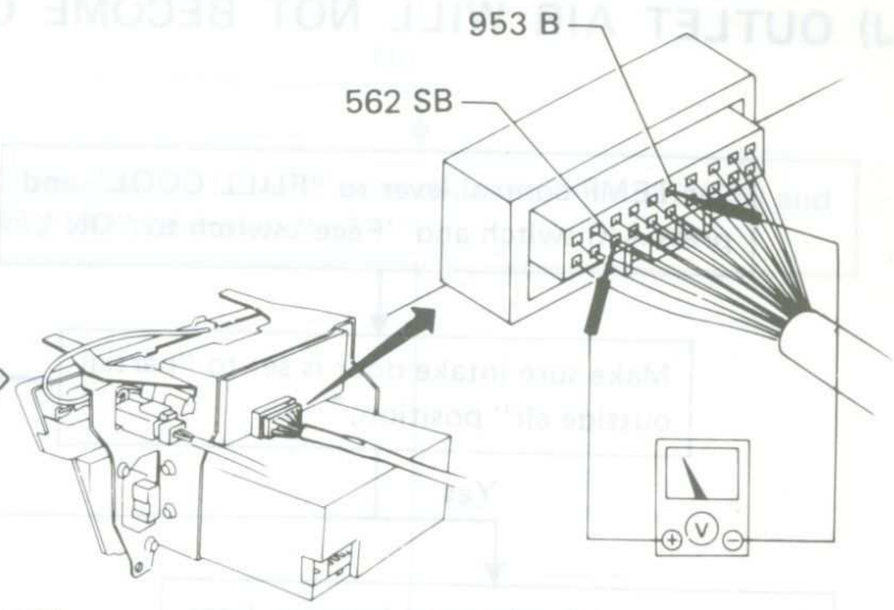
Remove the connector from the control amplifier. Check to see if plug has electrical pins pushed back, or if the electrical pins in the control unit are bent.

Reinsert the connector to the amplifier.
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of the control unit (Ignition switch ON)?

Yes

No

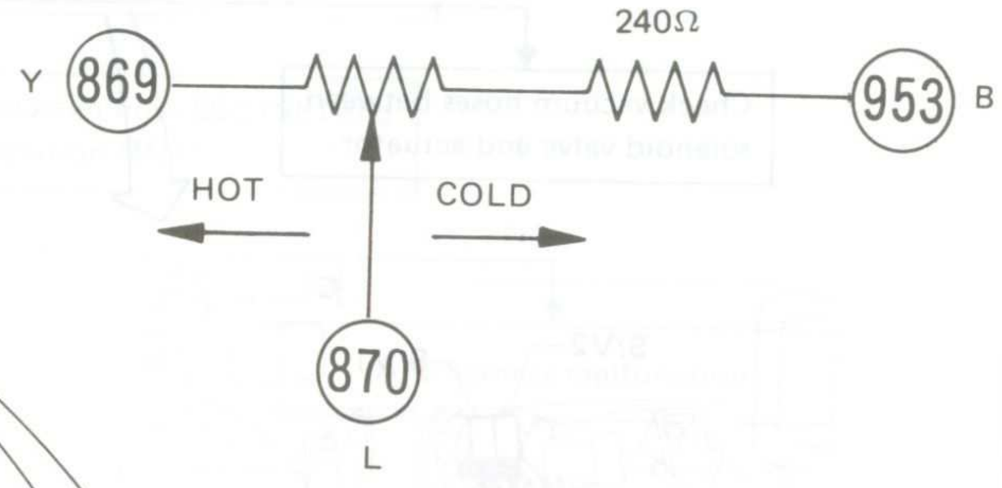
A/C harness malfunction.



SHA511B

Does the potential balance resistor work normally?
Perform either the ohm or voltage output test with the electrical connector hooked up to the control amp.

Check resistance between terminals.
869 (Y) and 953 (B): 1.2 - 1.45 kΩ
870 (L) and 953 (B): 230 Ω - 1.45 kΩ
**DSVV with no vacuum applied 1.2 - 1.45 kΩ
DSVV with vacuum applied 230 - 250 Ω



SHA453B

Yes

No

Check wiring harness between control unit and PBR. Remove connectors at control unit and solenoid valve box. Check continuity between 869, 870 and 953.

P.B.R.: Potentio Balance Resistor

Faulty PBR.

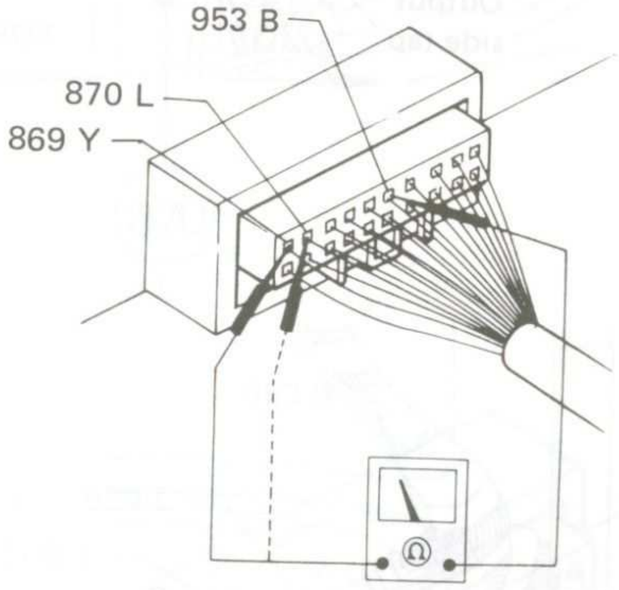
O.K.

N.G.

Malfunction of control unit.

Malfunction of the A/C wiring harness.

Ignition switch: OFF position



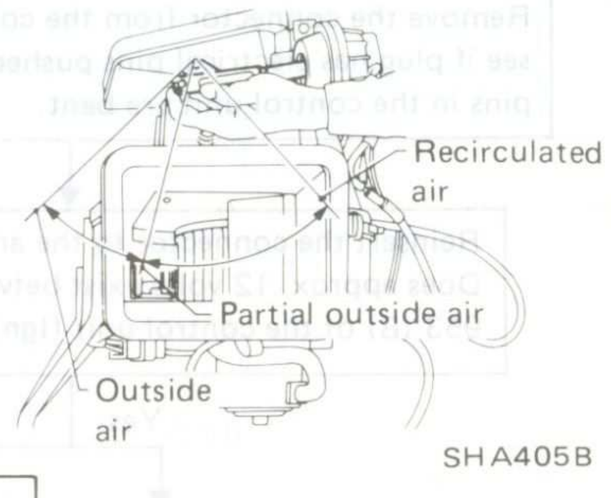
SHA933B

(J) OUTLET AIR WILL NOT BECOME COOL.

Set TEMP control lever to "FULL COOL" and press A/C switch and "Face" switch to "ON".

Make sure intake door is set to "partial outside air" position.*

* Intake door position is always in partial outside air position with A/C switch "ON".



SHA405B

Yes

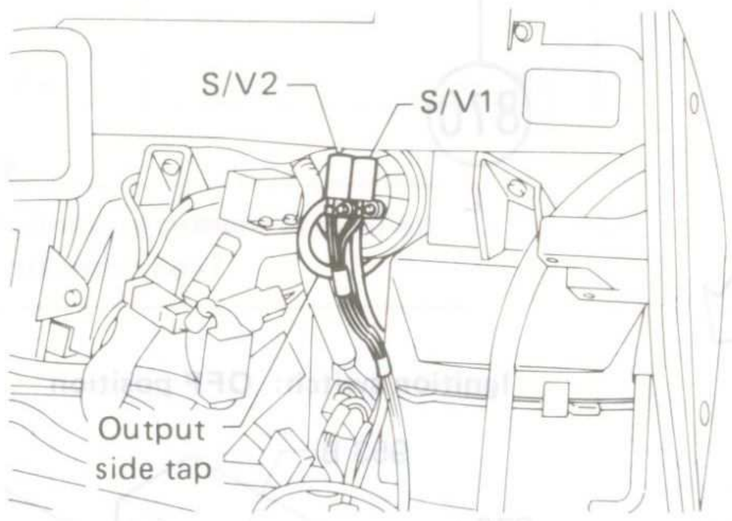
Does approx. 12 volts exist between lines 867 (SB) and 886 (Y/L) of solenoid valve S/V7?

No

Check the operation of the solenoid valve 1 by turning A/C switch to "ON" and "OFF". Is vacuum pressure present at outlet port or solenoid valve S/V2?

Yes

Check vacuum hoses between solenoid valve and actuator.

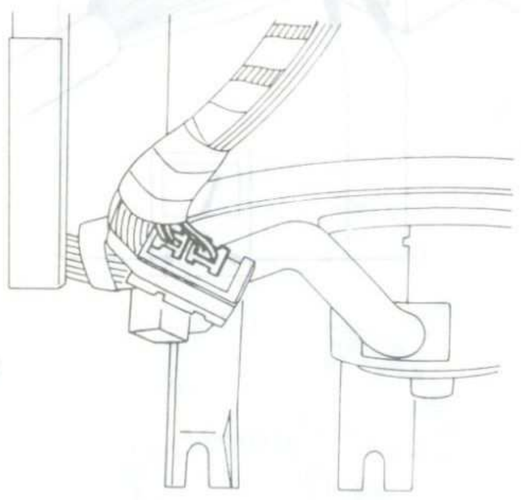


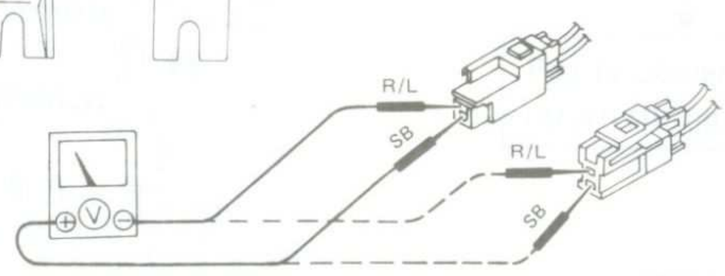
SHA406B

No

Check voltage at solenoid valves 1 and 2 when the recirculation switch is "OFF". The voltage should be at zero volts. When the recirculation switch is on, the voltage should be 12V at both solenoids.

Faulty linkage actuator or linkage.



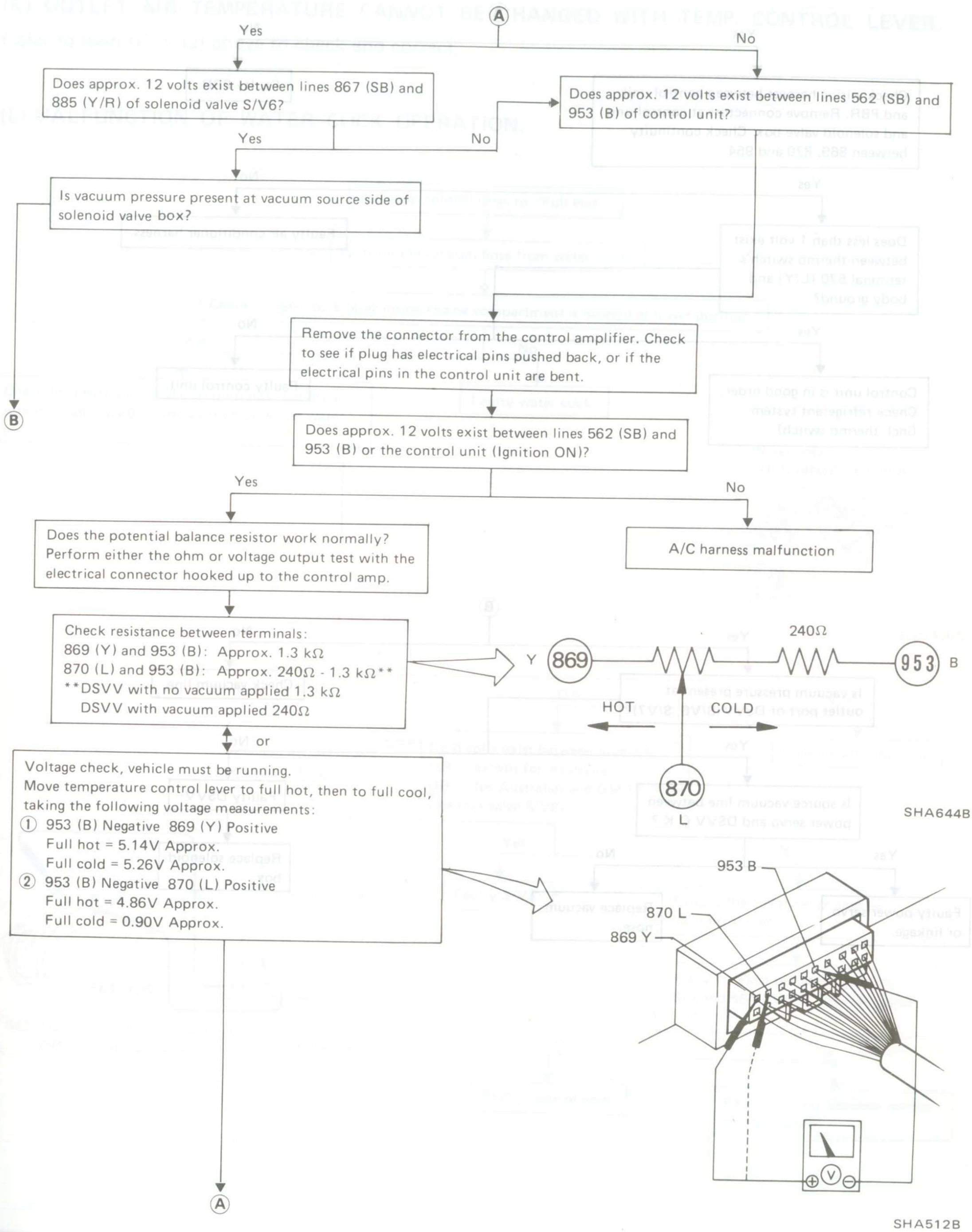


SHA934B

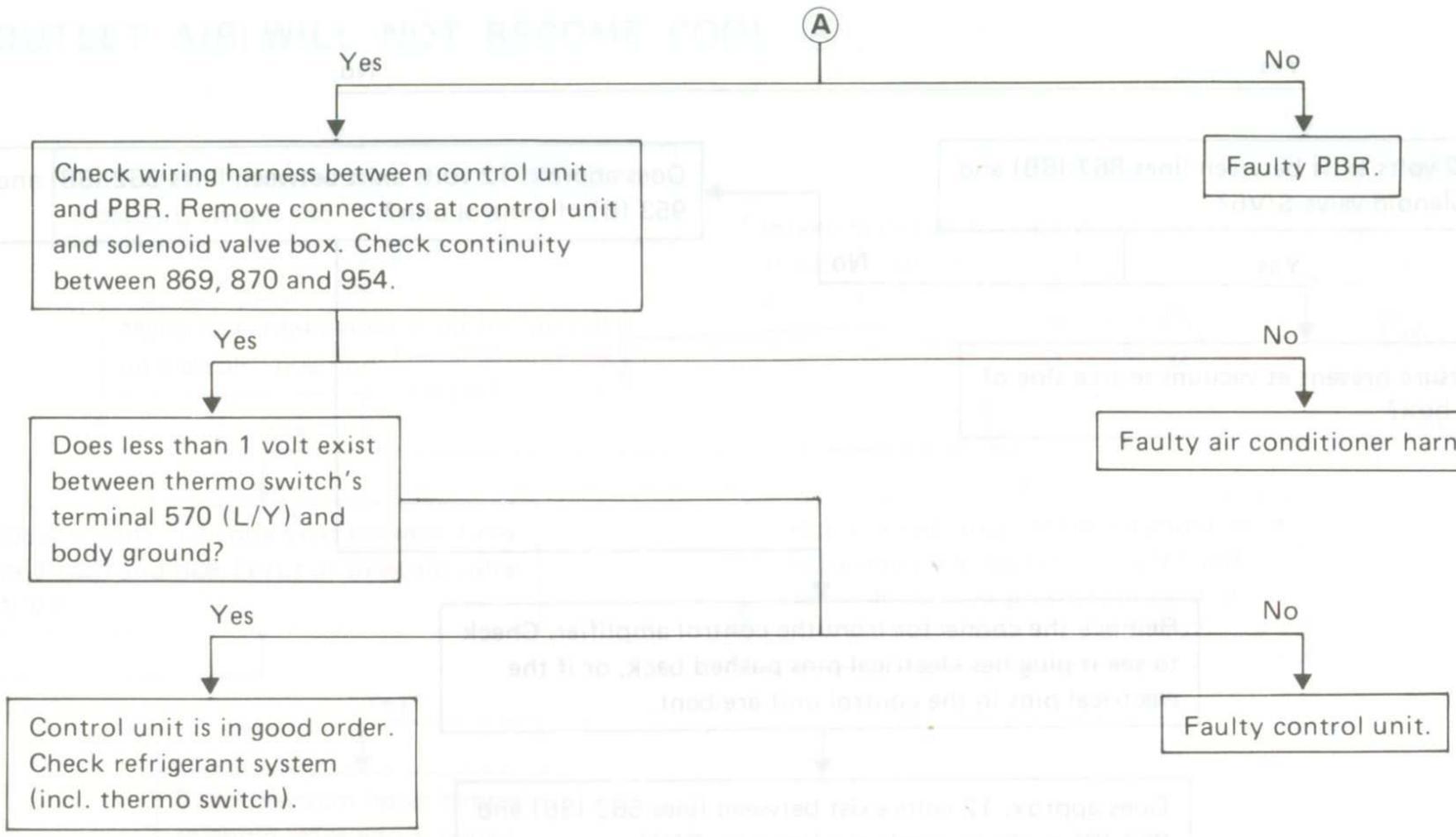
Ⓐ

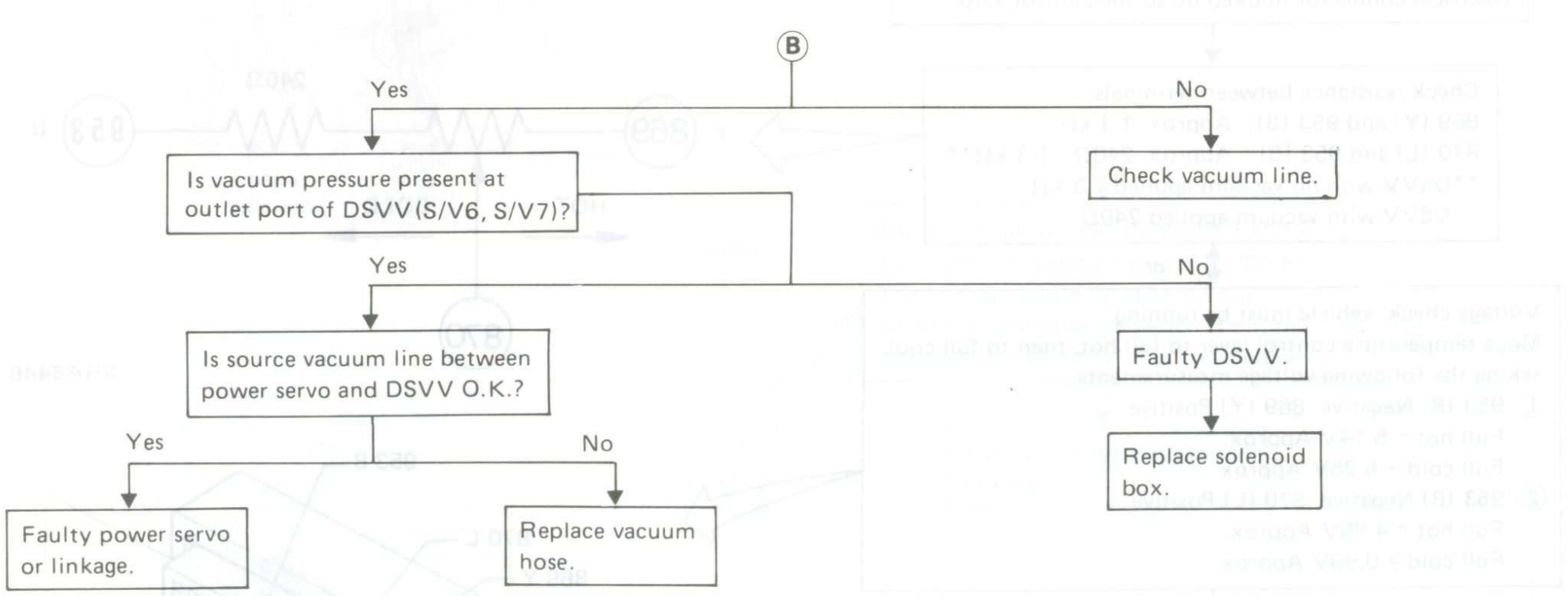
TROUBLE DIAGNOSES (Manual)

Trouble Diagnoses from Abnormal Conditions (Cont'd)



Trouble Diagnoses from Abnormal Conditions (Cont'd)





Trouble Diagnoses from Abnormal Conditions (Cont'd)

(K) OUTLET AIR TEMPERATURE CANNOT BE CHANGED WITH TEMP. CONTROL LEVER.

Refer to item (I) or (J) above to check and correct.

(L) MALFUNCTION OF WATER COCK OPERATION.

Set temp control lever to "Full Hot".

Remove the vacuum hose from water cock.

Check if water cock lever inside engine compartment is located at lower position.

Yes

No

Faulty water cock.

Check for restriction of the vacuum hose between solenoid valve S/V8 on the vacuum tank and water cock.



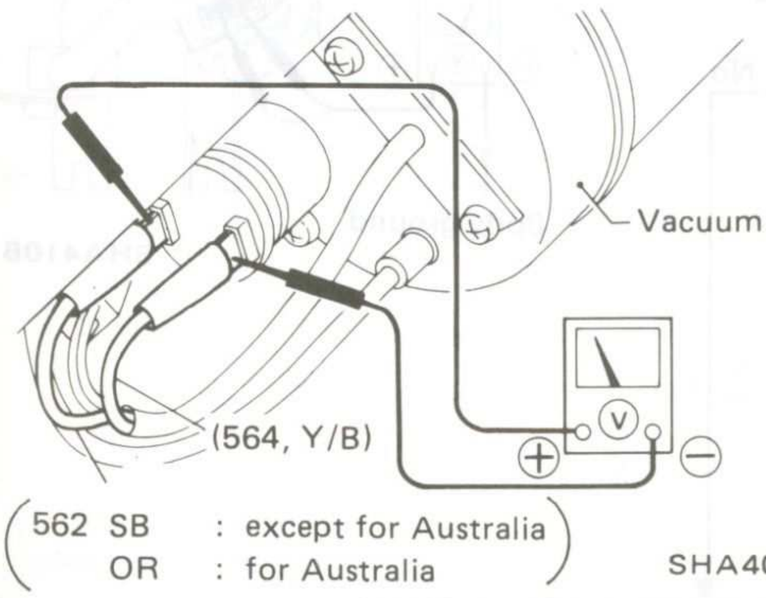
SHA408B

O.K.

N.G.

Replace vacuum hose.

Do 0 volts exist between lines 562 (SB : except for Australia, OR : for Australia) and 564 (Y/B) of solenoid valve S/V8?



(562 SB : except for Australia
OR : for Australia)

SHA409B

Yes

No

Faulty S/V8.

Remove the electrical connection from the control unit.

Do 0 volts exist between lines 562 (SB) and 564 (GY) of solenoid valve S/V8?

Yes

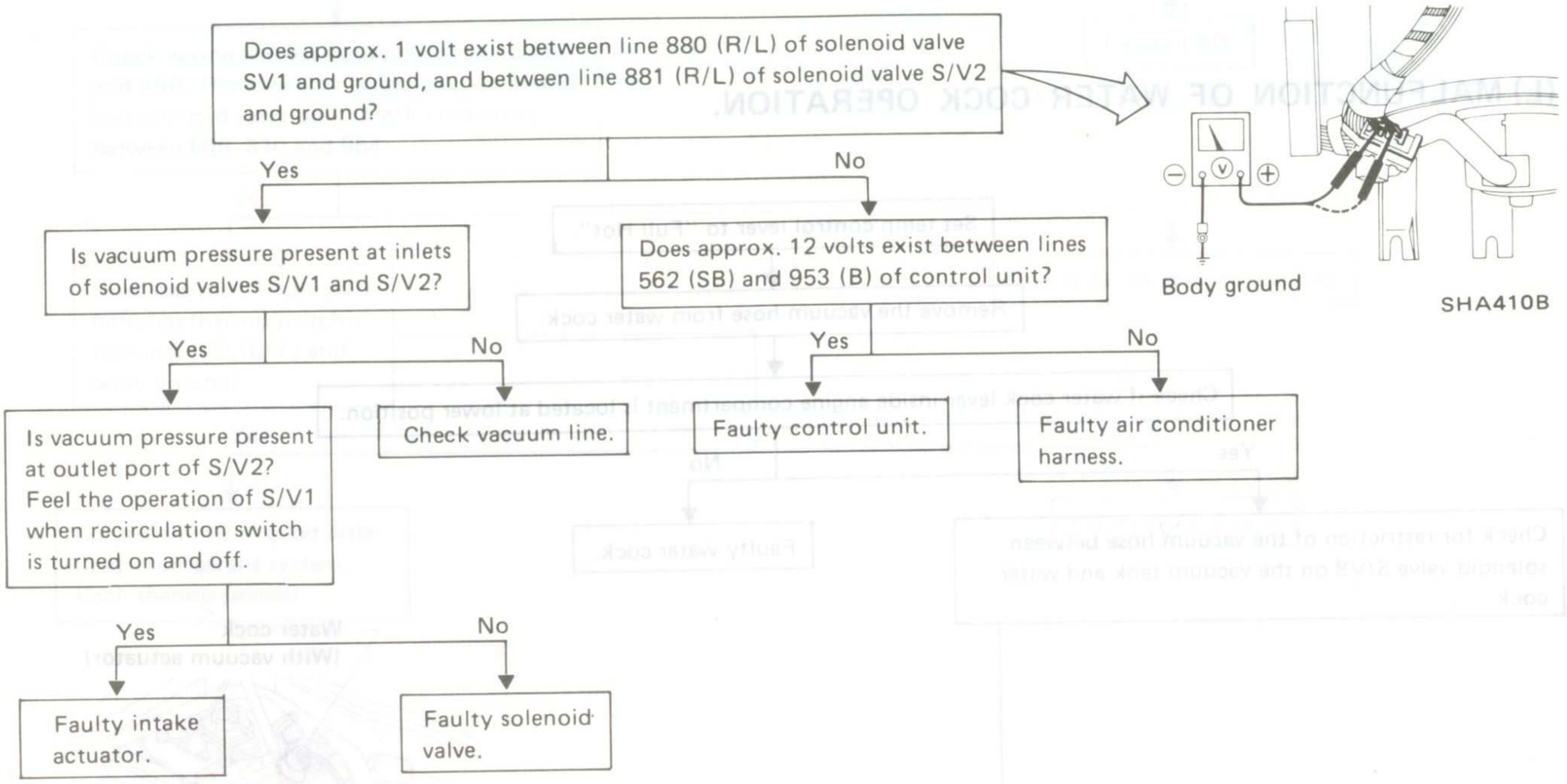
No

Faulty control unit.

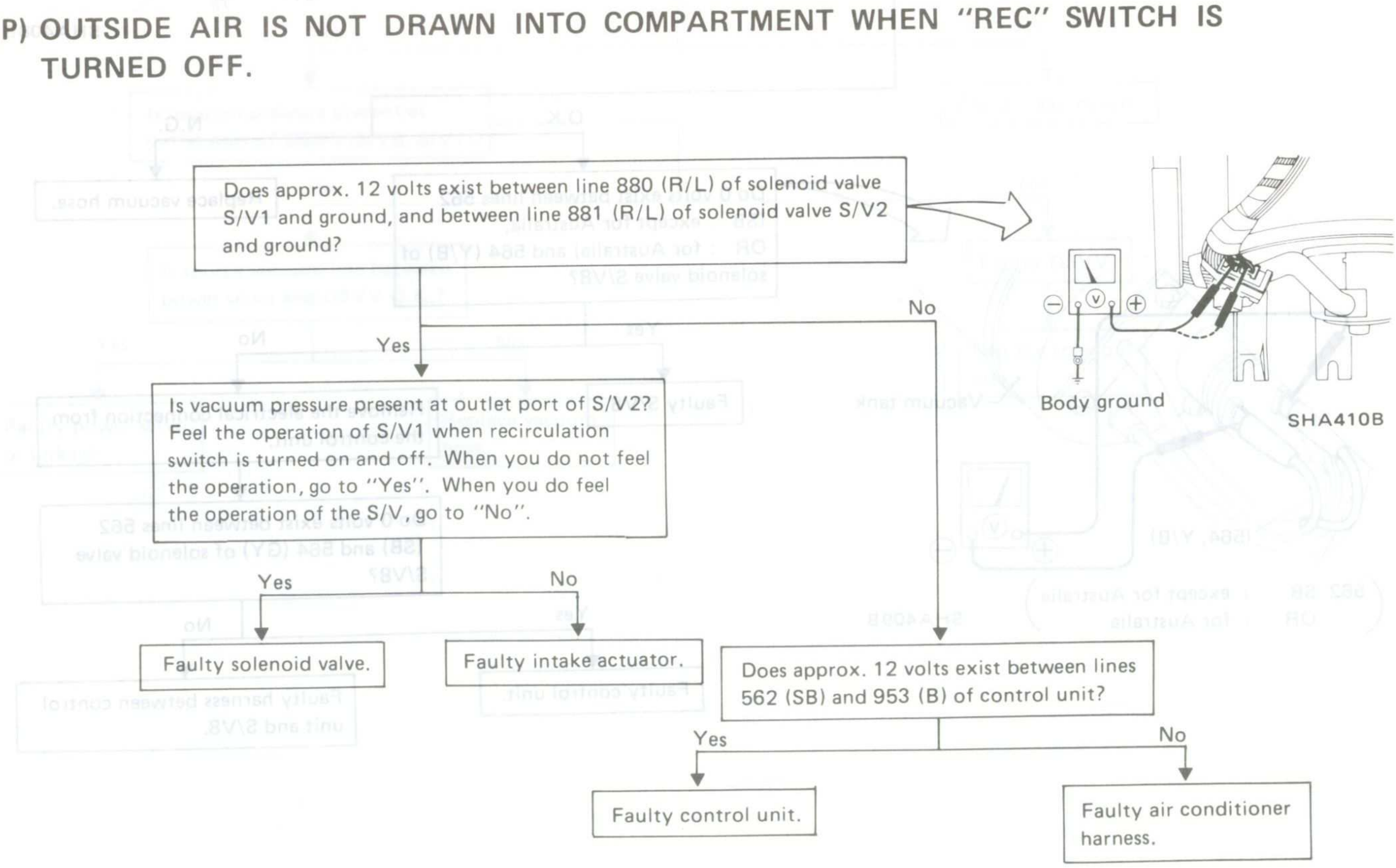
Faulty harness between control unit and S/V8.

Trouble Diagnoses from Abnormal Conditions (Cont'd)

(N) RECIRCULATION MODE CANNOT BE SET WHEN "REC" SWITCH IS PRESSED.

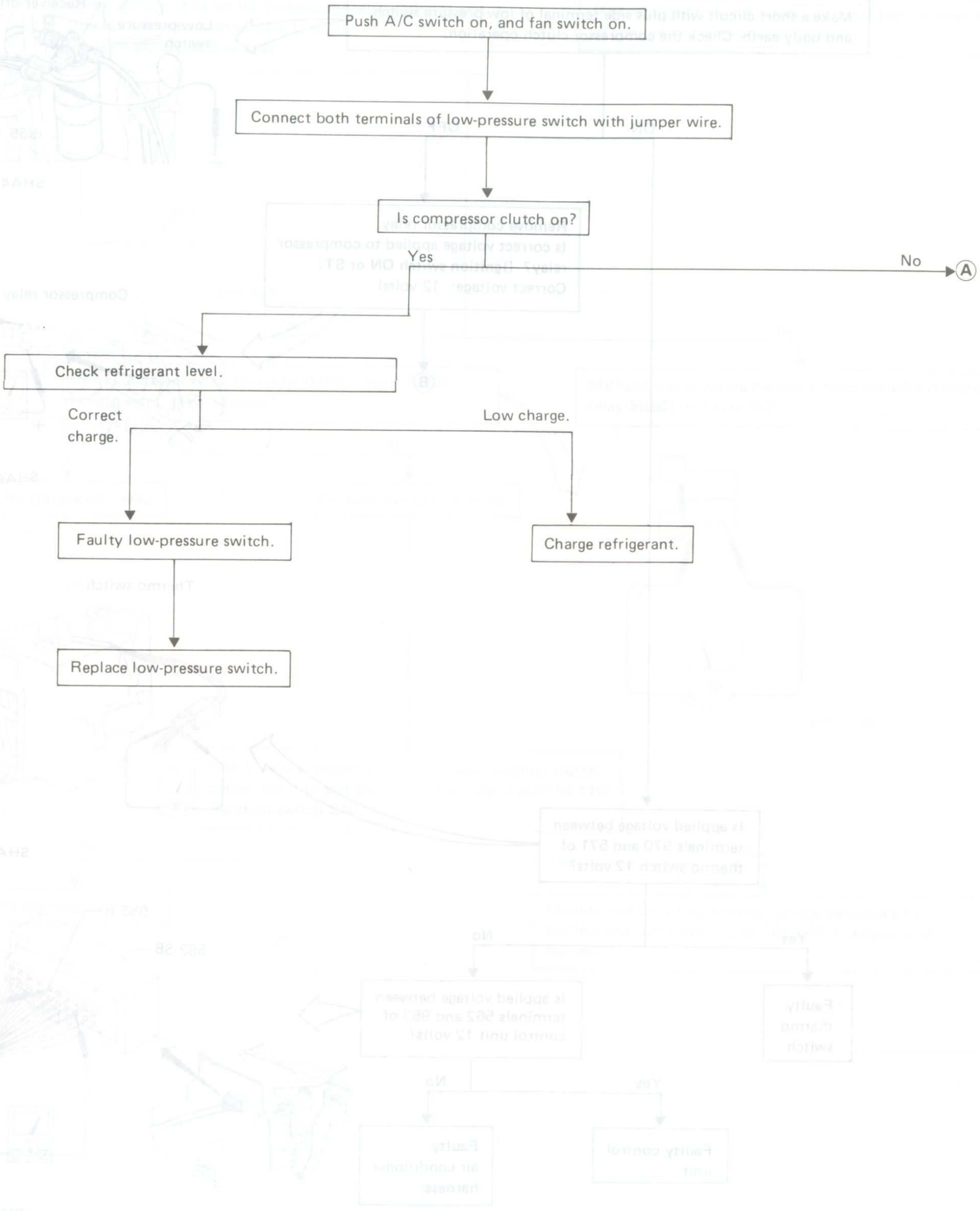


(P) OUTSIDE AIR IS NOT DRAWN INTO COMPARTMENT WHEN "REC" SWITCH IS TURNED OFF.



Trouble Diagnoses from Abnormal Conditions (Cont'd)

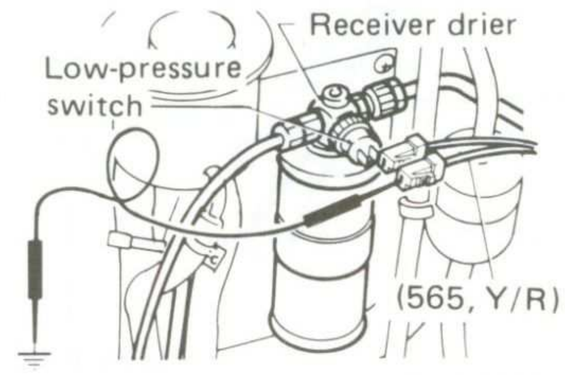
(Q) COMPRESSOR CLUTCH IS NOT ENGAGED.



Trouble Diagnoses from Abnormal Conditions (Cont'd)

(A)

Make a short circuit with plus side terminal of low-pressure switch and body earth. Check the compressor clutch operation.

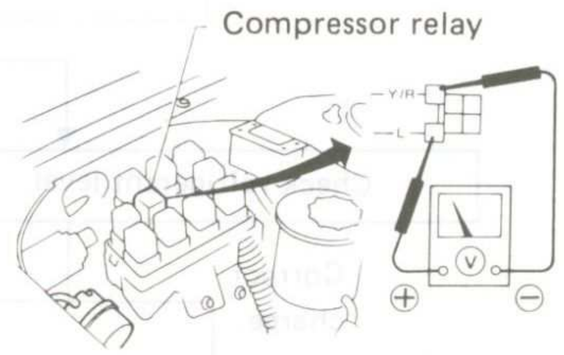


SHA411B

ON / OFF

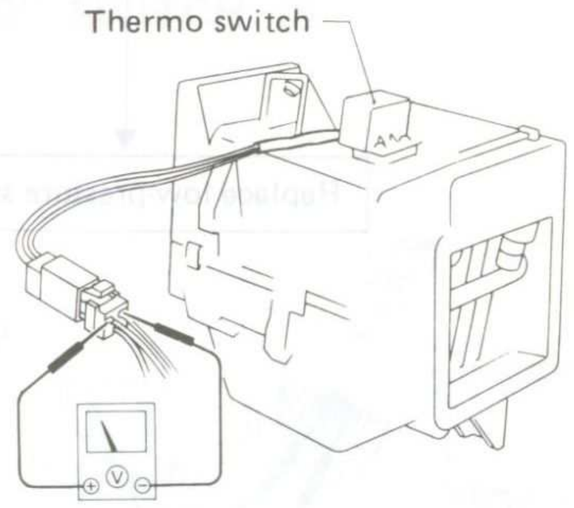
Remove compressor relay.
Is correct voltage applied to compressor relay? (**Ignition switch ON or ST:** Correct voltage: 12 volts)

(B)



SHA935B

Is applied voltage between terminals 570 and 571 of thermo switch 12 volts?

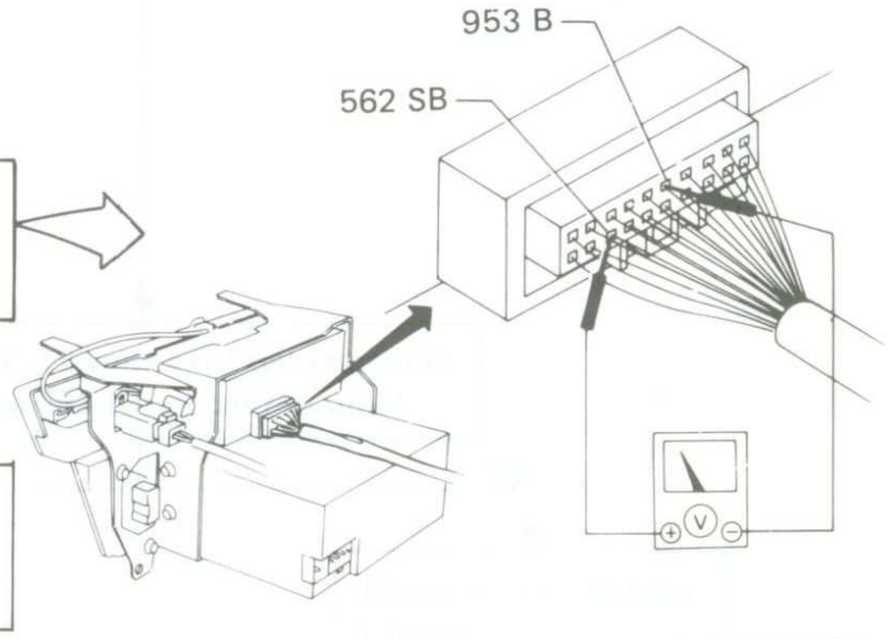


SHA936B

Yes / No

Faulty thermo switch.

Is applied voltage between terminals 562 and 953 of control unit 12 volts?



Yes / No

Faulty control unit.

Faulty air conditioner harness.

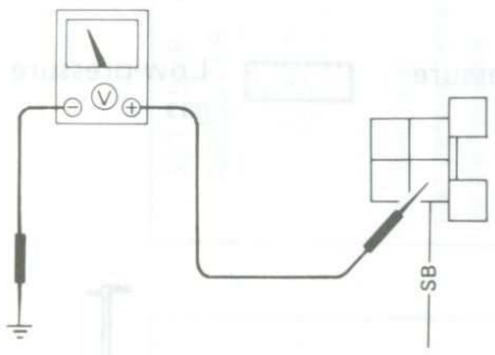
SHA511B

Trouble Diagnoses from Abnormal Conditions (Cont'd)

Ⓑ

Yes

Check voltage between the compressor relay (SB561) and ground. The voltage should be 12 volts.
(Ignition switch ACC or ON)



SHA937B

No

Malfunction of wiring harness or burnt fuse between L566 of compressor relay and ignition relay.

Yes

Is the compressor relay terminals (SB561 and YG568 of compressor relay) shorted?

Yes

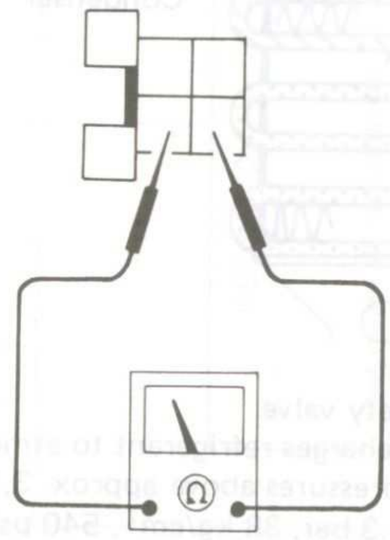
Faulty compressor relay.

No

Reinsert compressor relay.

No

Malfunction of wiring harness (check between compressor relay SB561 and fuse 562).



SHA938B

Check voltage between the compressor magnet clutch connector Y/G and ground. The voltage should be 12V.
(Ignition switch ON)

Yes

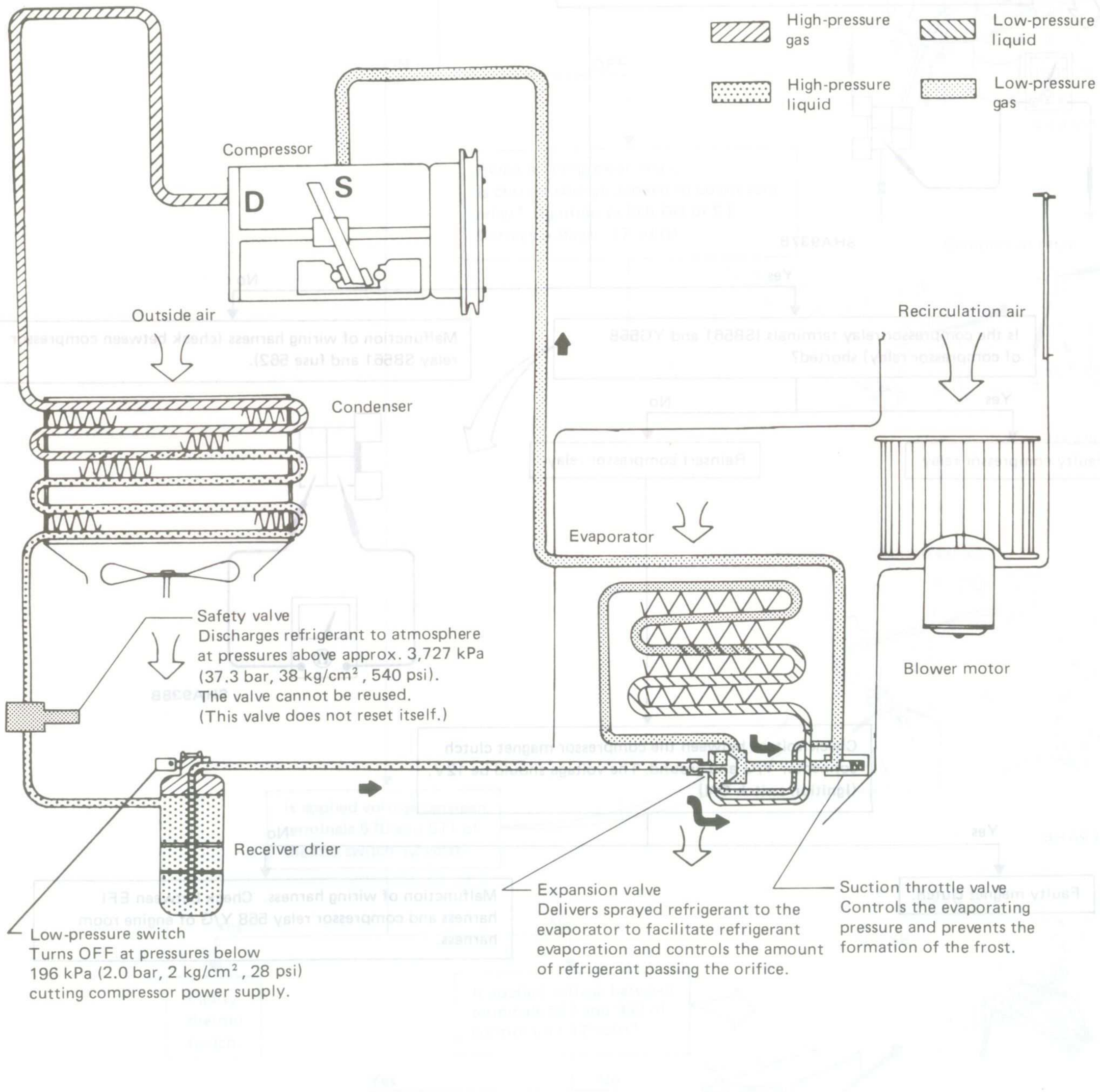
Faulty magnet clutch.

No

Malfunction of wiring harness. Check between EFI harness and compressor relay 568 Y/G of engine room harness.

DESCRIPTION — Air Conditioner (Auto)

Refrigeration Cycle



SHA927B

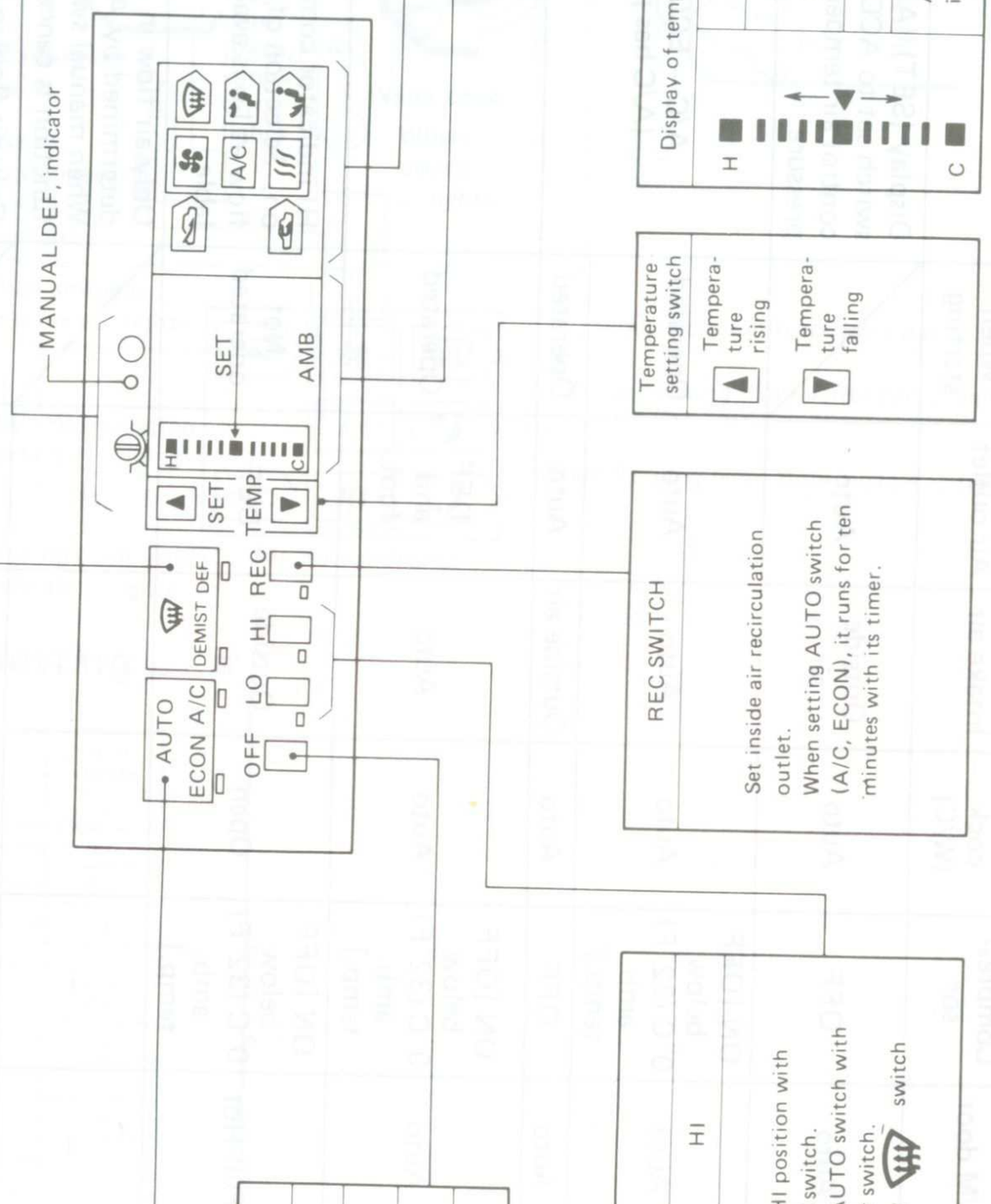
DESCRIPTION — Air Conditioner (Auto)

Function of the Switches on Control Unit

SET TEMP ADJUSTER	MANUAL DEF SWITCH
− +	○
As head, foot (Set minute temperature difference between upper and lower body)	PUSH ... DEF Mode (Lock) Compressor off When pushed again ... return

DEF SWITCH	
DEMIST	DEF
Intake door position	Automatic control
Air flow volume	Automatic control
Outlet	Defroster or Demist
Compressor	ON [Outside air above 0°C (32°F)]
Outlet temperature	Automatic temperature fine-adjustment

AUTO SWITCH	
ECONOMY	A/C
Intake door position	Automatic control
Air flow volume	Automatic control
Outlet	Automatic control
Compressor	ON [Outside air above 0°C (32°F)]
Outlet temperature	Automatic temperature fine-adjustment



OFF SWITCH	
Blower motor	OFF
Compressor	OFF
Intake door position	Outside air
Outlet	DEF

Manual fan switch	
LO	HI
Set LO position with FAN switch. Set AUTO switch with other switch. Obey switch	Set HI position with FAN switch. Set AUTO switch with other switch. Obey switch

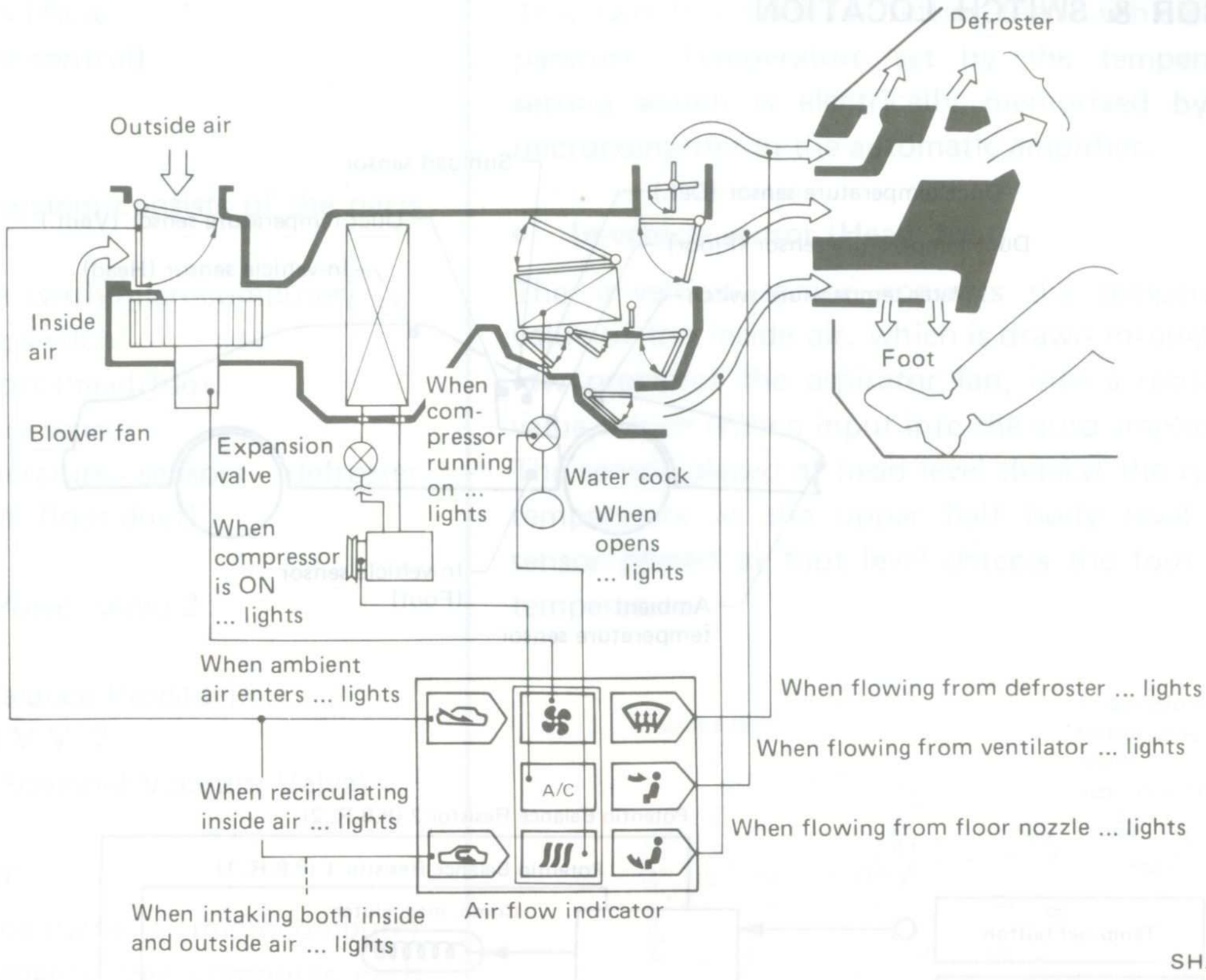
SHA796B

(3) SWITCHES AND THEIR CONTROL FUNCTIONS

Switch \ Item to be controlled		Air flow	A/M door	Compressor	Water cock (W/C)	Intake air	Air outlet	Control When starting	Remarks
OFF		OFF	Auto	OFF	Auto	Outside air	Auto		Display (SET)/(AMB) is ON with ignition switch set to ACC. A/M door and W/C control air temperature obtained by ram pressure.
AUTO SW	A/C	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.)
	ECON	Auto	Auto	OFF	Auto	Outside air	Auto	Operated	
SW	DEMIST	Auto	Auto	ON [OFF below 0°C (32°F) amb. temp.]	Auto	Auto	DEF and foot	Operated	DEF – DEMIST momentary switch (DEF has priority over DEMIST.)
	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.
Manual fan SW	Lo	Lo	–	–	–	–	–		Only air flow in Lo mode. All others are as determined by AUTO and "SW" 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 "SW" switches. When manual switch is pushed again, control function is cancelled.
REC		–	–	–	–	Inside air recirculation	–		REC function is activated by AUTO switch (A/C position) and OFF. 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.
SET TEMP ADJUSTER		–	–	–	–	–	–	–	Air temperatures at head and foot levels are adjustable to ±2°C (±3.6°F), regardless of operation of any other switch.

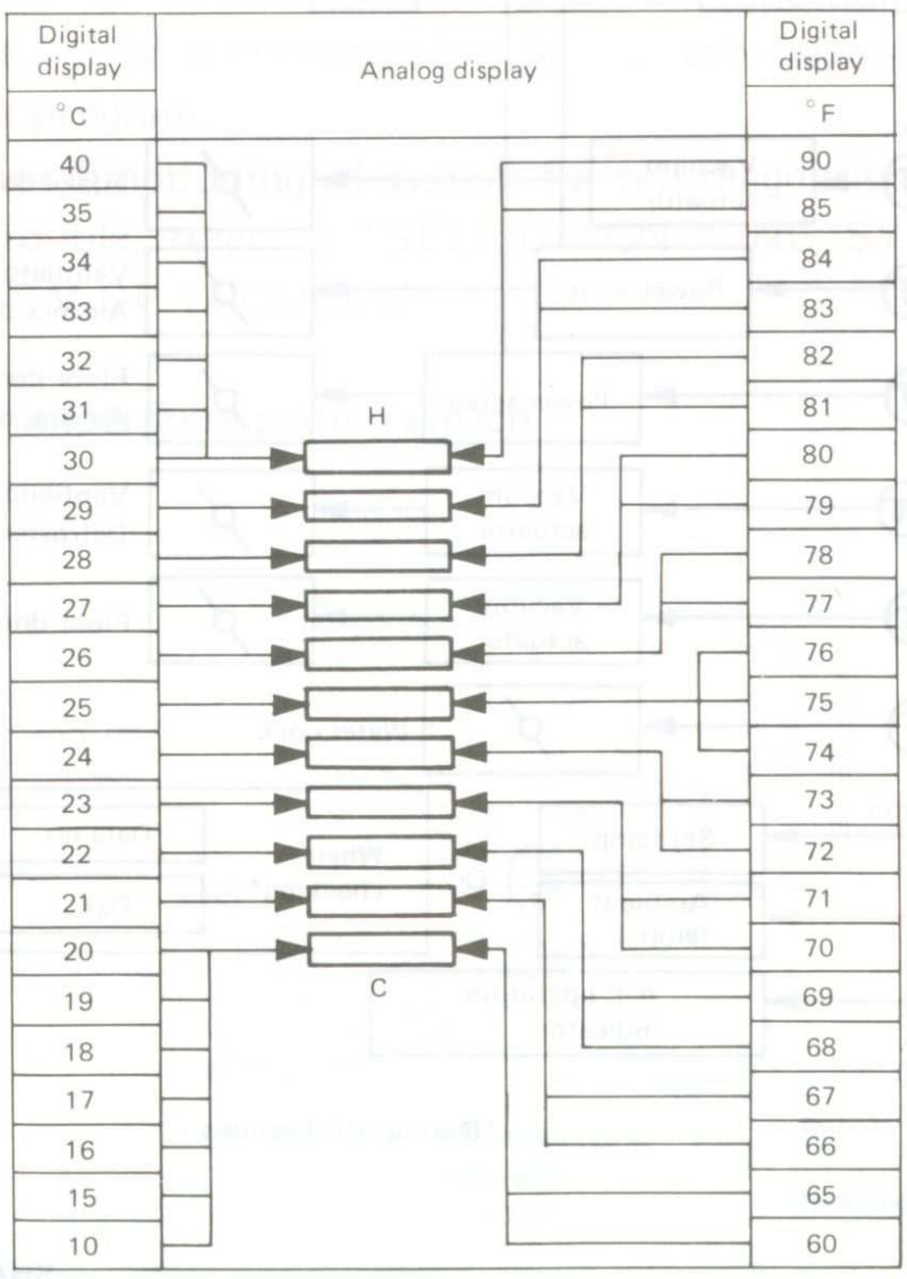
DESCRIPTION — Air Conditioner (Auto)

Display of the Air Flow Indicator



SHA797B

Display of Temperature Setting

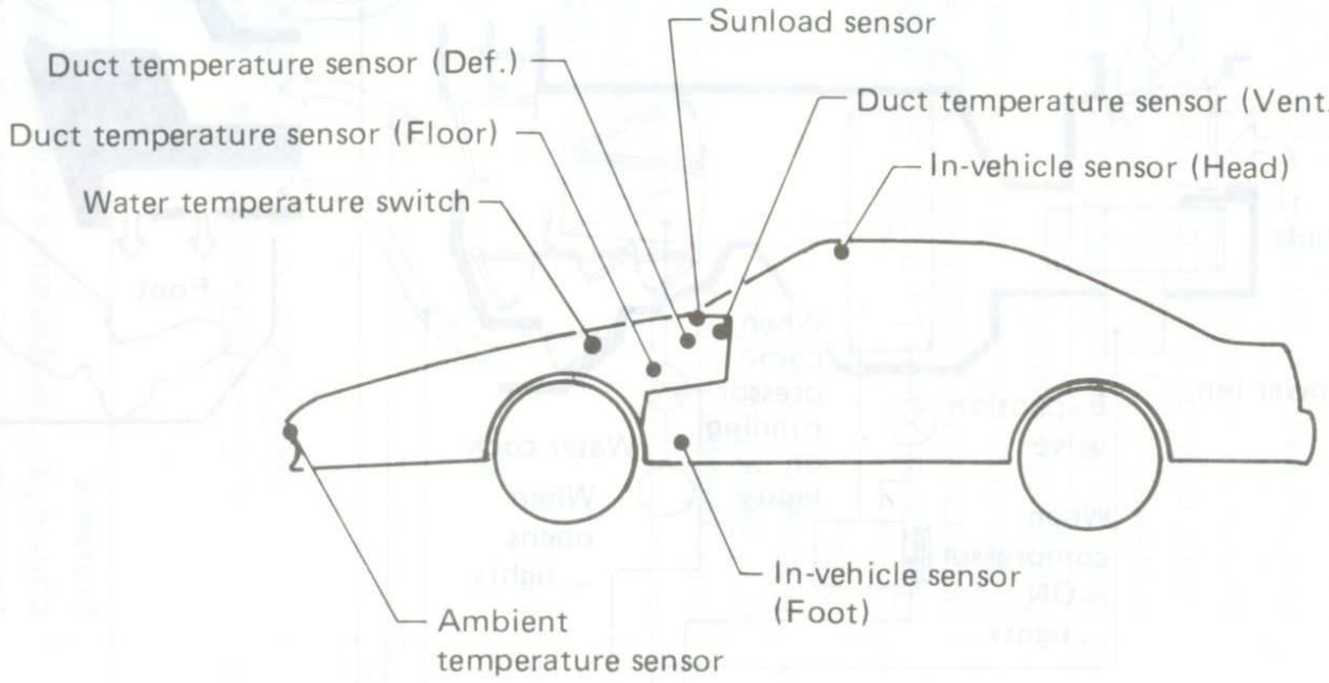


SHA523B

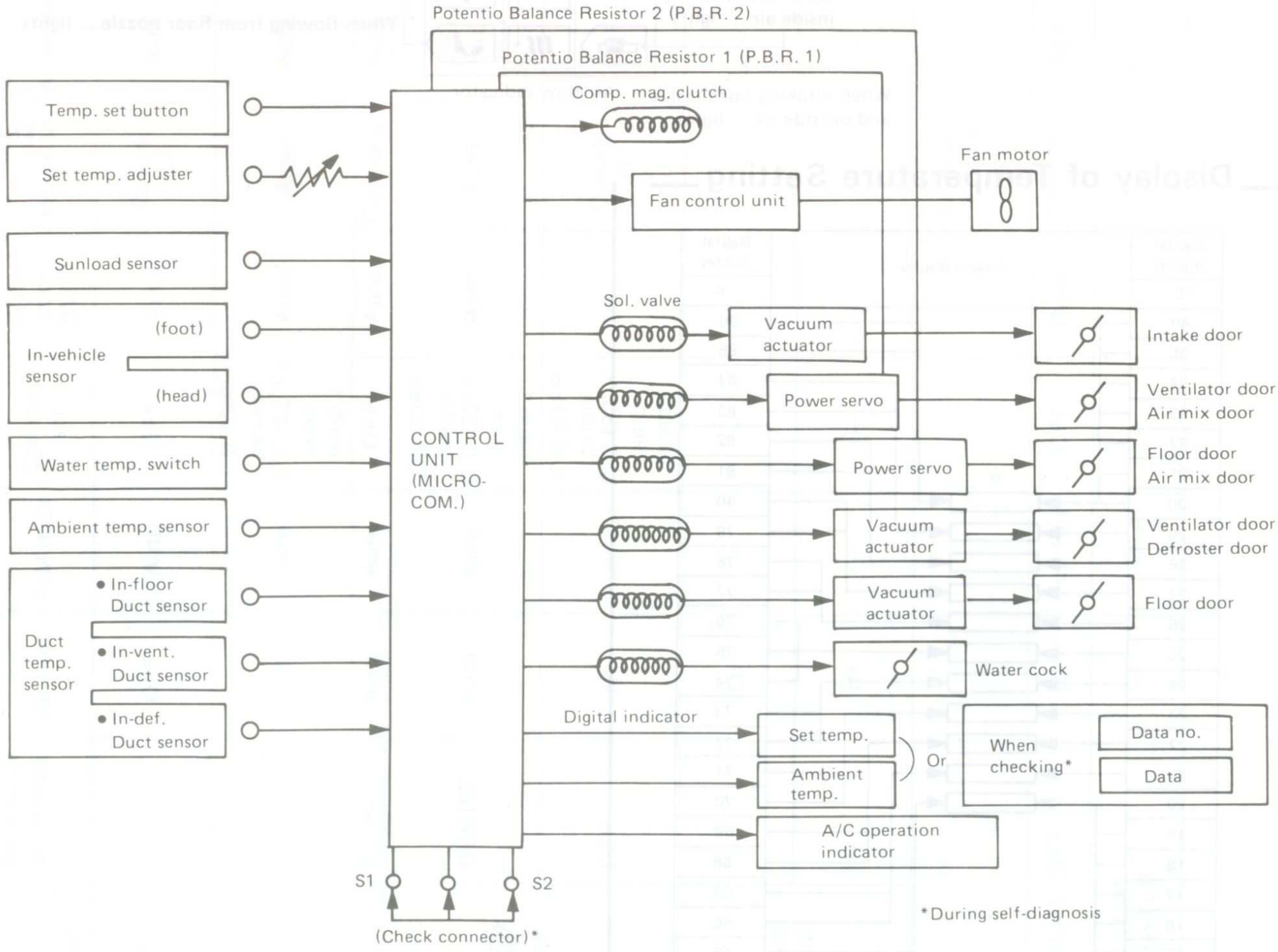
DESCRIPTION — Air Conditioner (Auto)

Control System

SENSOR & SWITCH LOCATION



SHA925B



SHA799B

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.

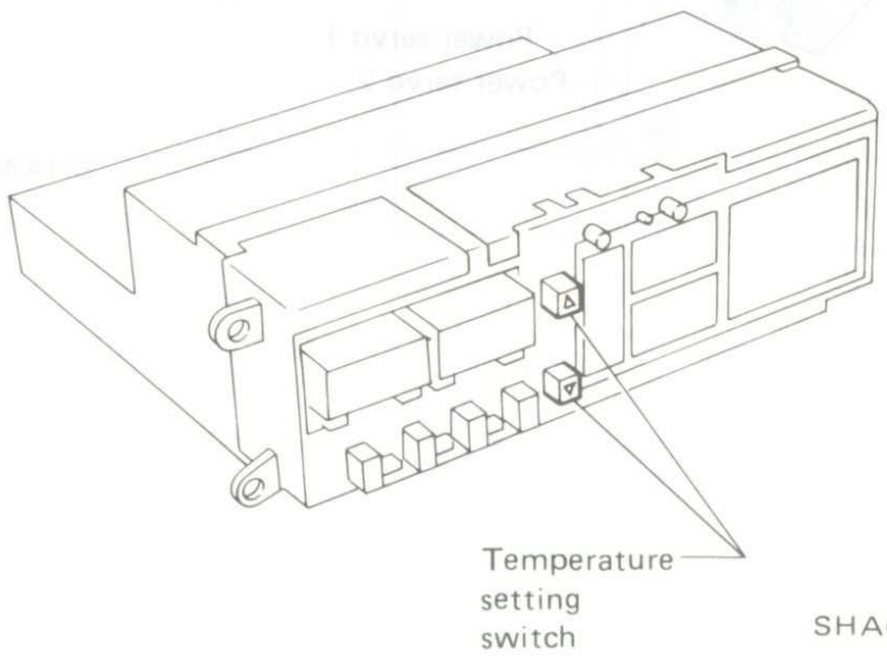
1) Automatic amplifier (with microcomputer)
2) Temperature setting switch
3) Two in vehicle sensors (head/foot)
4) Ambient temperature sensor
5) Three duct temperature sensors (defroster duct, ventilator duct, floor duct)
6) Sunload sensor
7) Power servo 1 and Power servo 2
8) PBR1 and PBR2
   (P.B.R.: 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**

The auto amplifier contains a microcomputer which controls components and computes each signal needed to operate the auto air conditioner system. In addition to the auto air conditioner mode, this microcomputer has a self-diagnosis mode program.

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

- **Temperature setting switch**

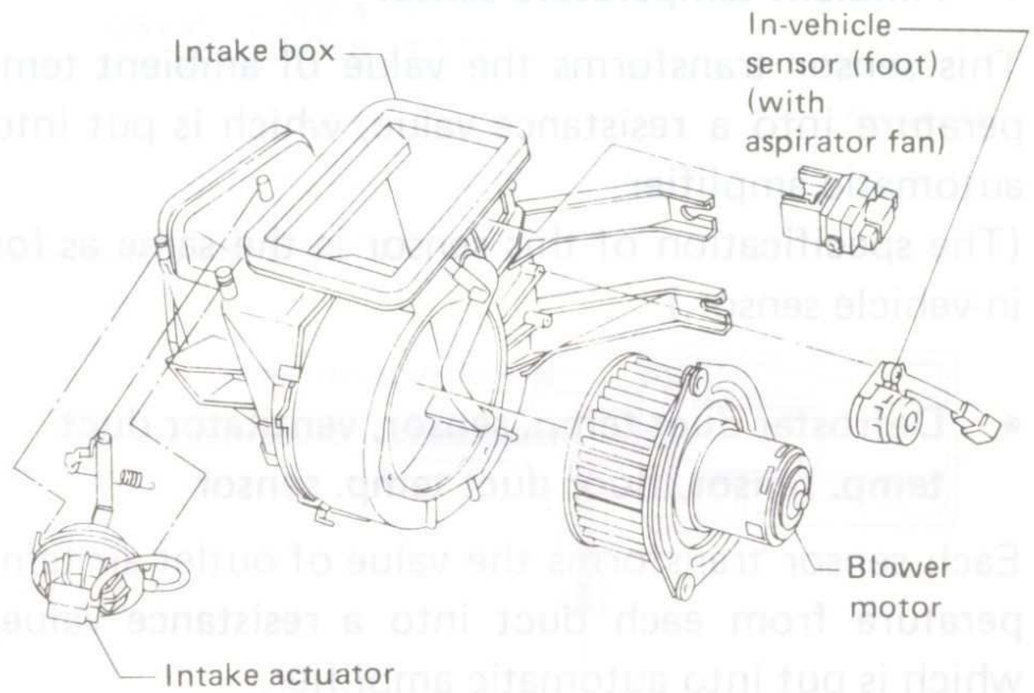


SHA608B

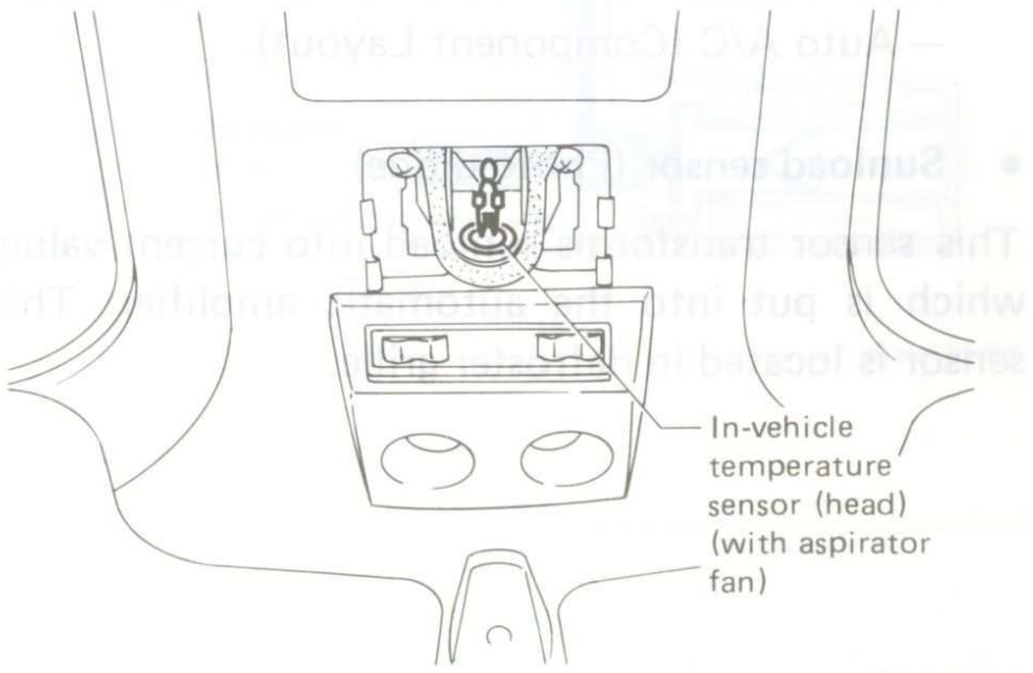
This switch is used for setting the in-vehicle temperature. Temperature set by the temperature setting switch is electrically memorized by the microcomputer in the automatic amplifier.

- **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 a 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.

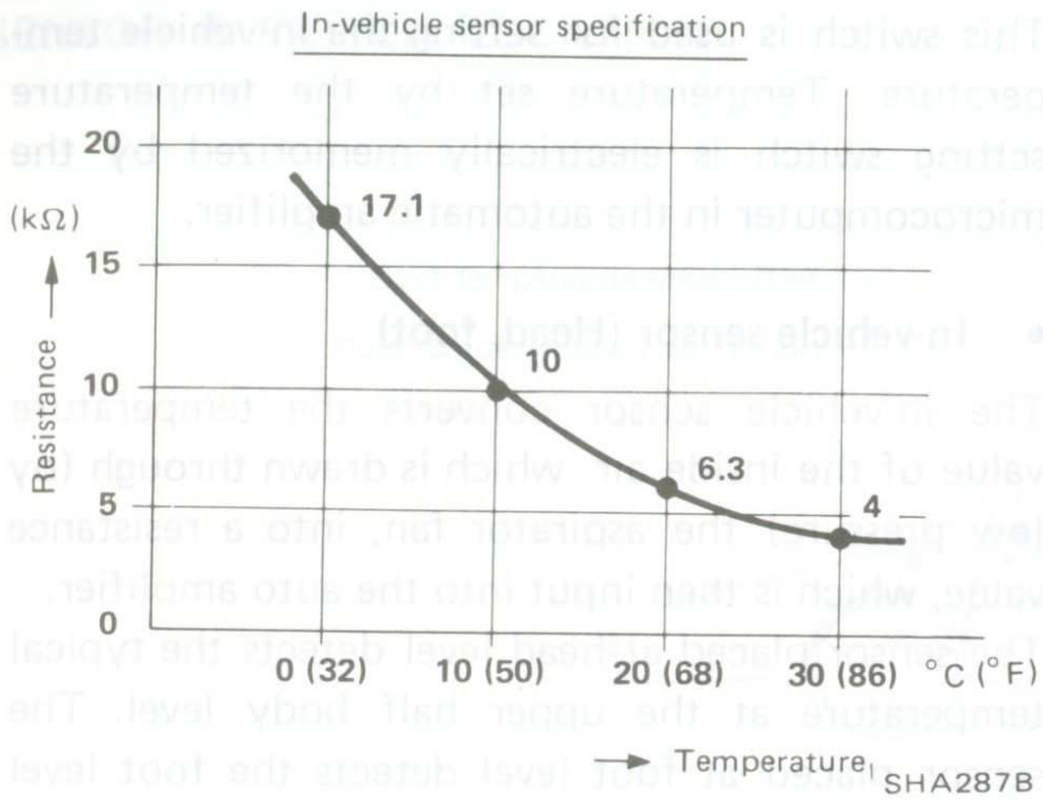


SHA426B



SHA609B

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.)

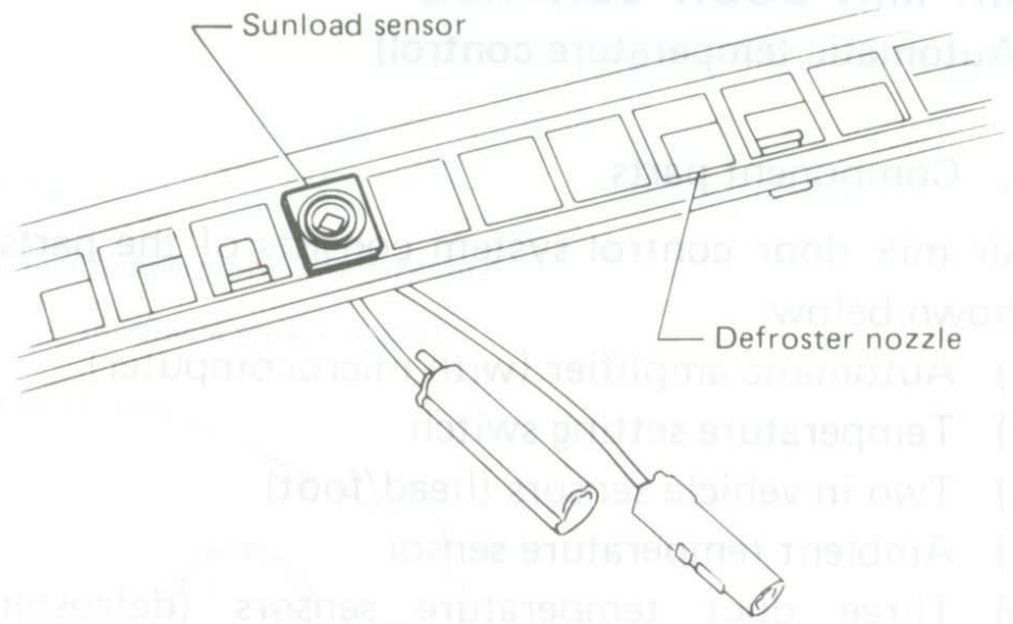
- **Defroster duct temp. sensor, ventilator duct temp. sensor, floor duct temp. sensor**

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).

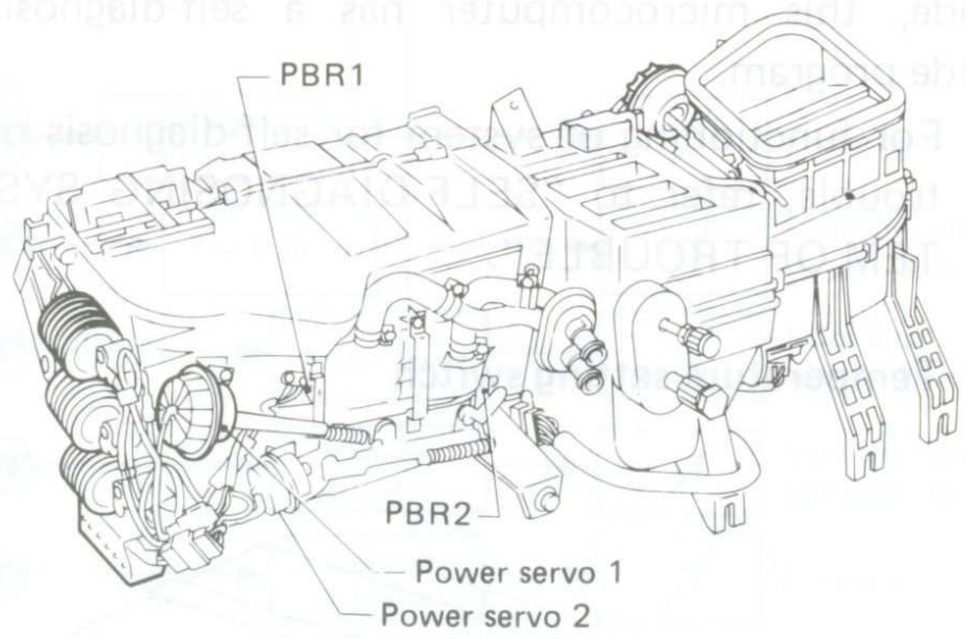
- **Sunload sensor (Photo diode)**

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



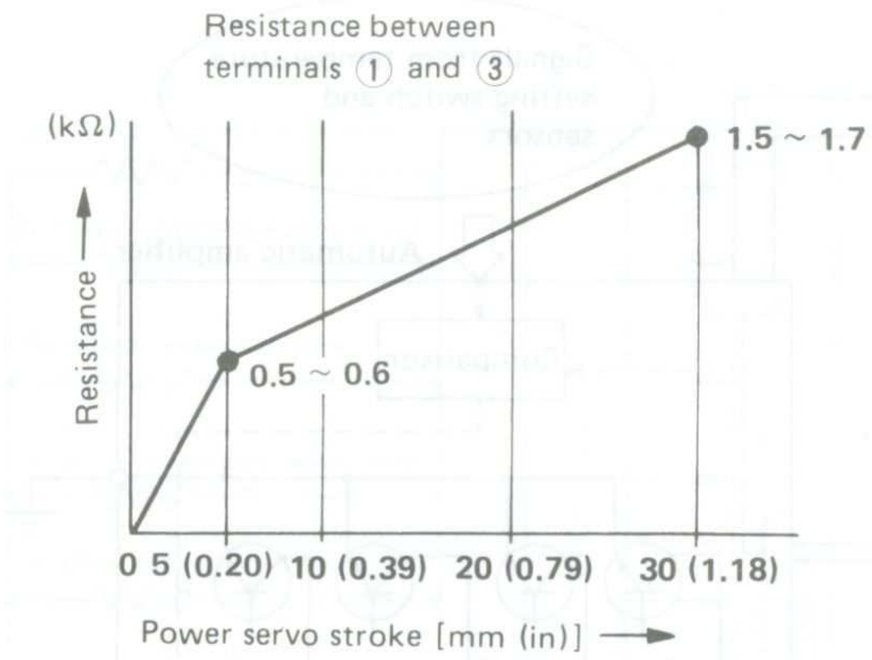
- **Power servo 1, 2 P.B.R. 1, 2**
  (P.B.R.: Potentio Balance Resistor)

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.



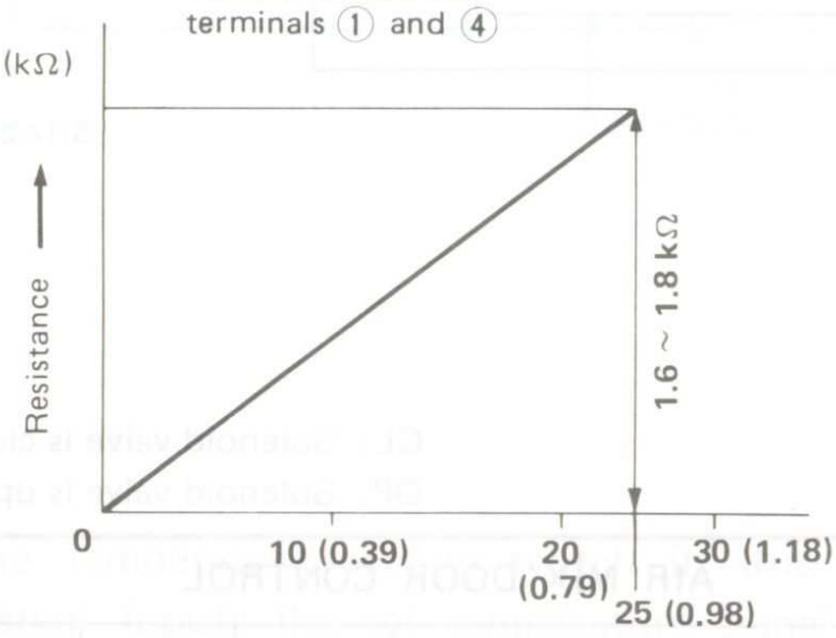
System Operation (Air mix door control) (Cont'd)

P.B.R. 1

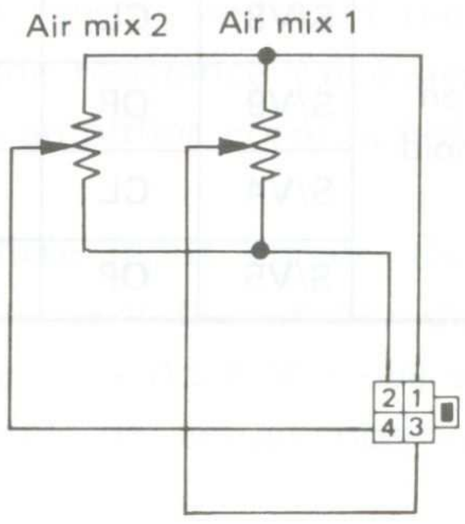


SHA610B

P.B.R. 2

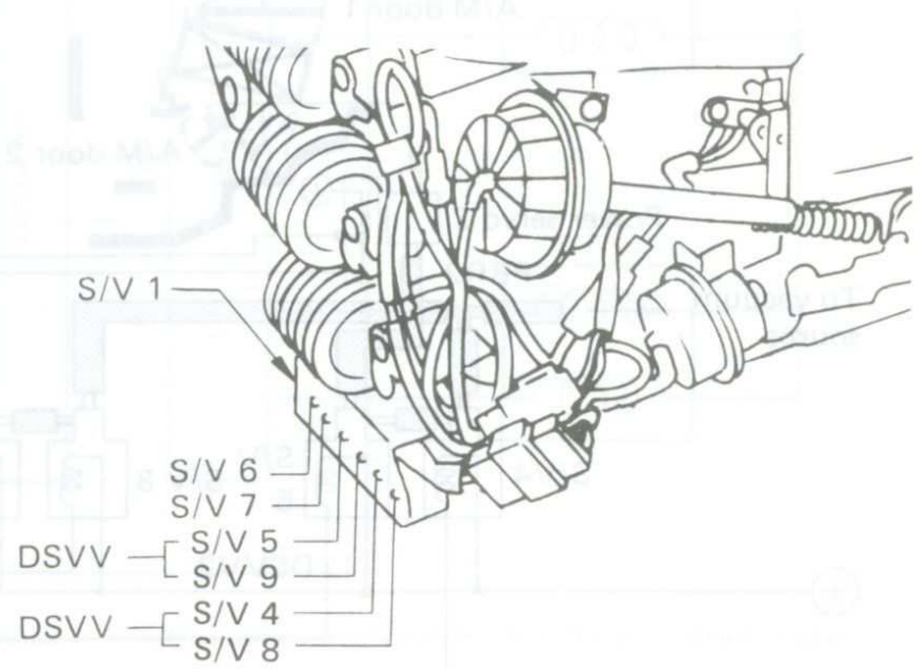


SHA301B



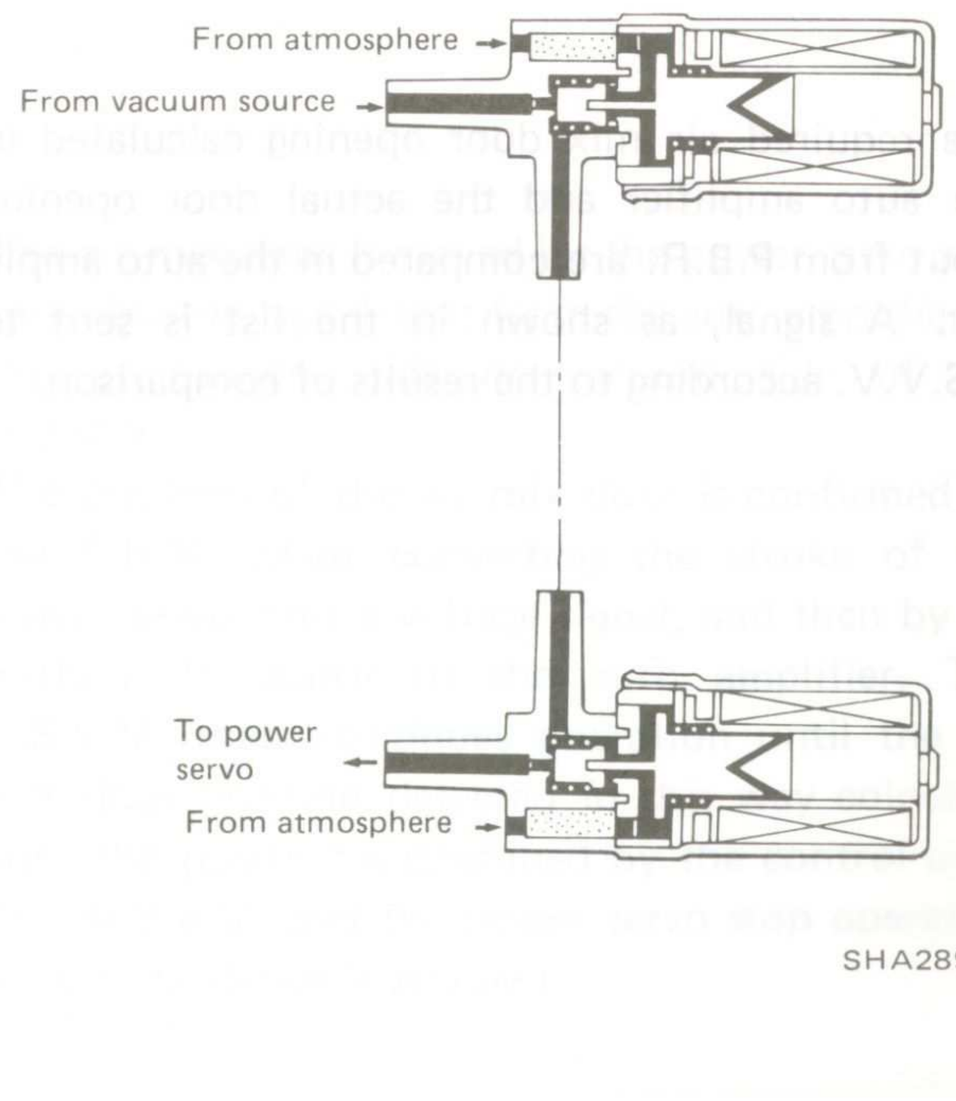
SHA611B

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



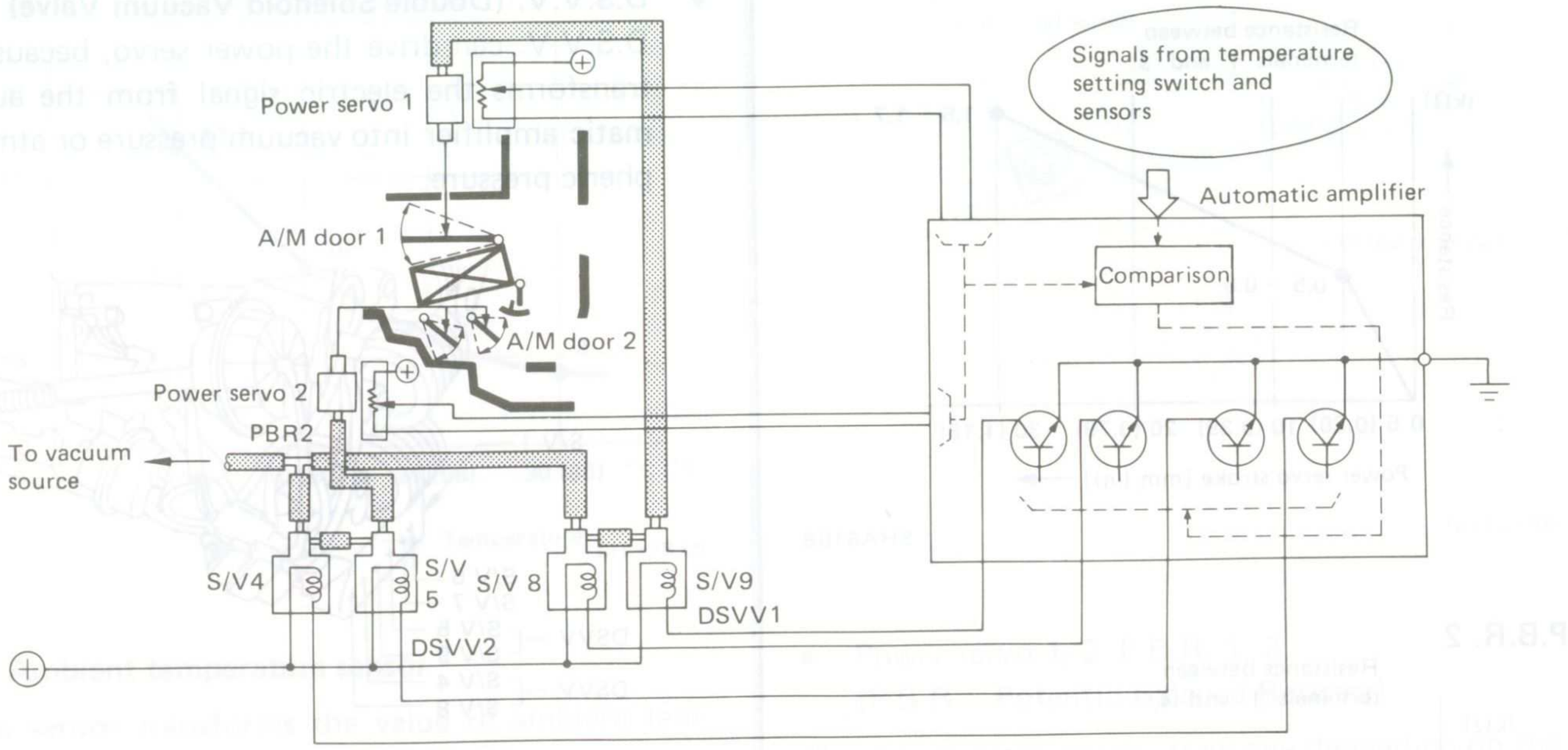
SHA428B

Inner structure of D.S.V.V.



SHA289B

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



SHA288B

The required 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.

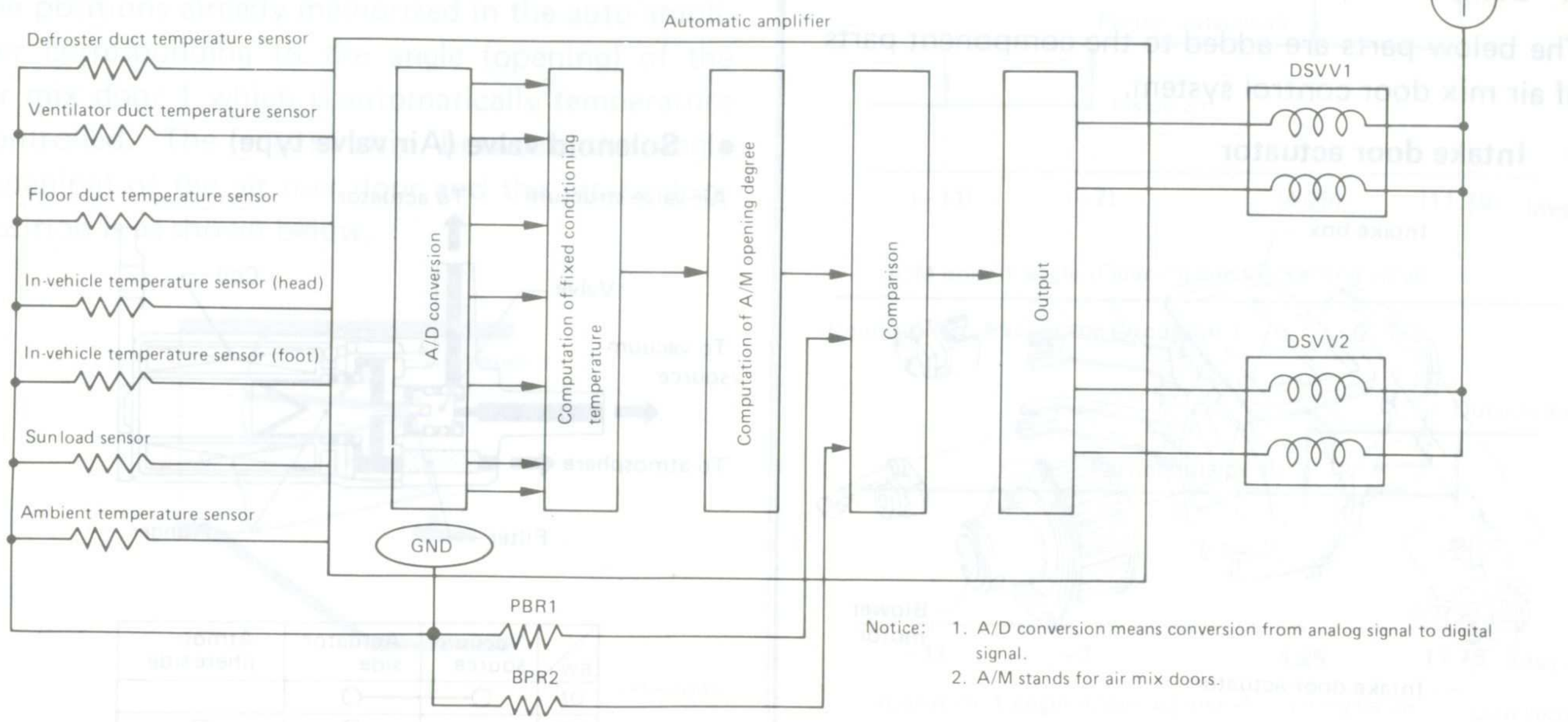
CL: Solenoid valve is closed
OP: Solenoid valve is open

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		S/V4	CL	CL	OP
		S/V5	OP	CL	OP

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

2. System operation of air mix door control



Notice: 1. A/D conversion means conversion from analog signal to digital signal.
2. A/M stands for air mix doors.

SHA290B

The temperature setting switch in this control system inputs the set 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.

The air mix door is moved 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 a 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 stop operating once coincidence is attained.

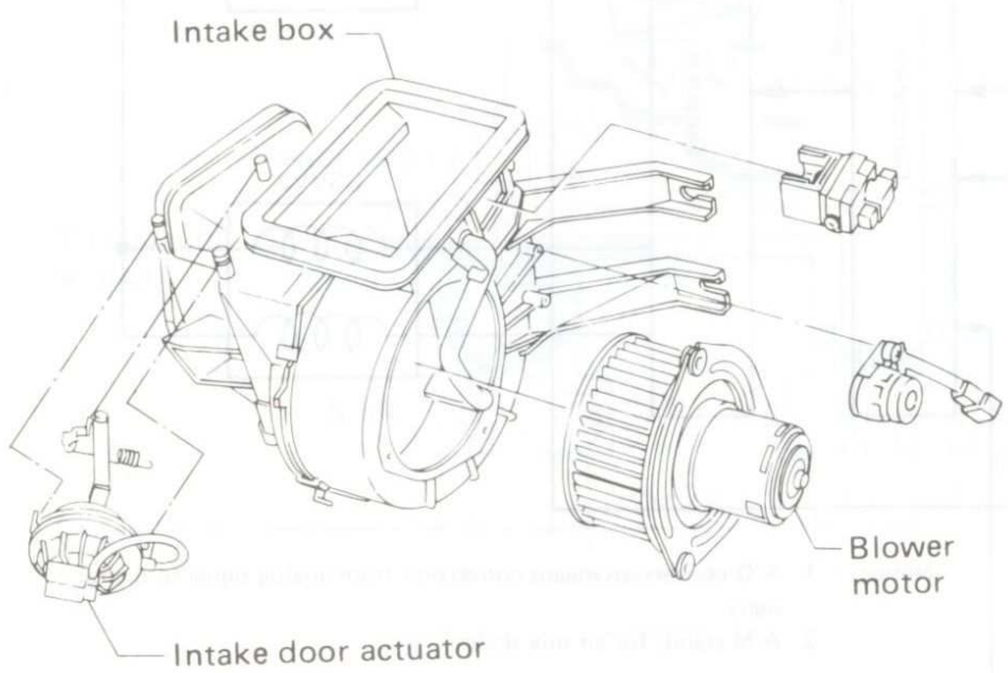
System Operation (Intake door control)

INTAKE DOOR CONTROL

1. Component parts

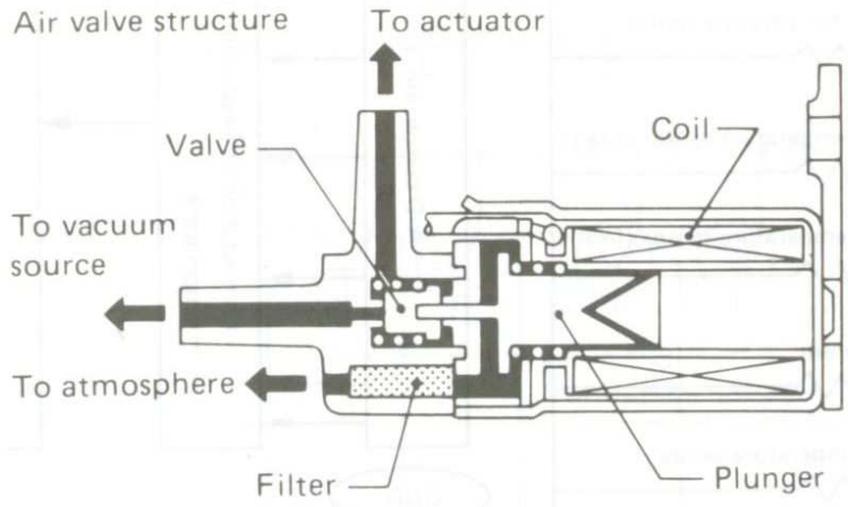
The below parts are added to the component parts of air mix door control system.

- **Intake door actuator**



SHA429B

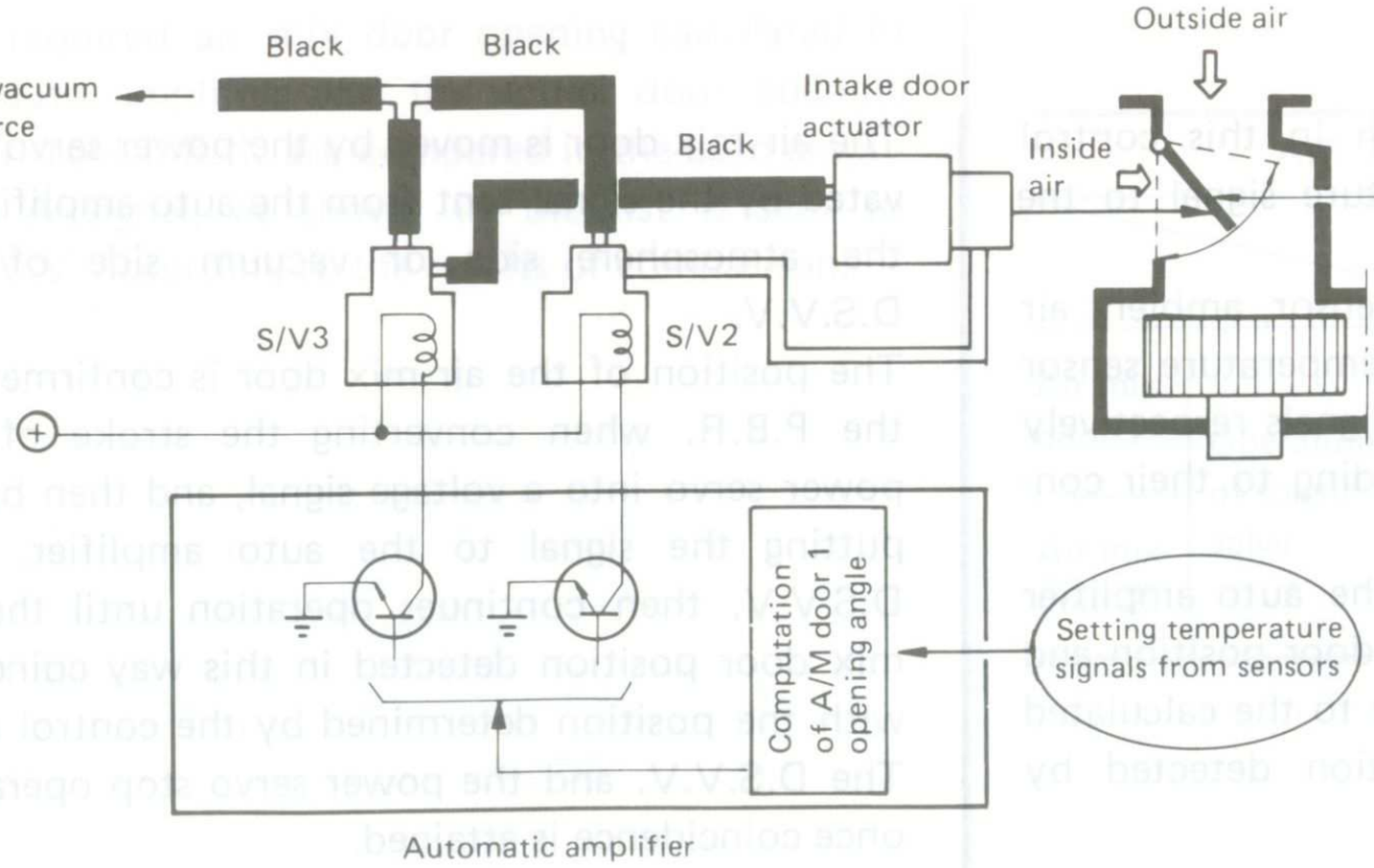
- **Solenoid valve (Air valve type)**



SW	Vacuum source	Actuator side	Atmos-phere side
ON	○	○	
OFF		○	○

SHA302B

2. System operation of intake door control



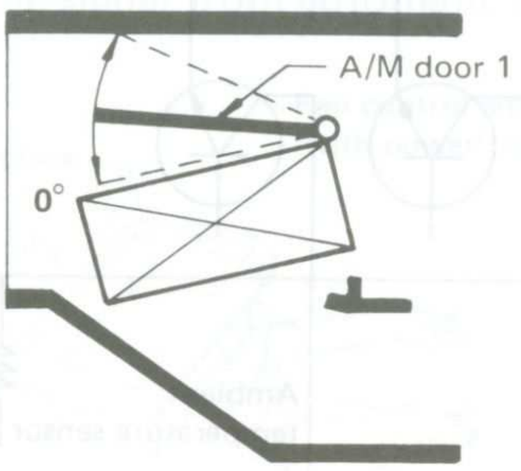
	S/V3	S/V2
Inside air	OPEN	OPEN
Partial outside air	CLOSED	OPEN
Outside air	CLOSED	CLOSED

SHA303B

DESCRIPTION — Air Conditioner (Auto)

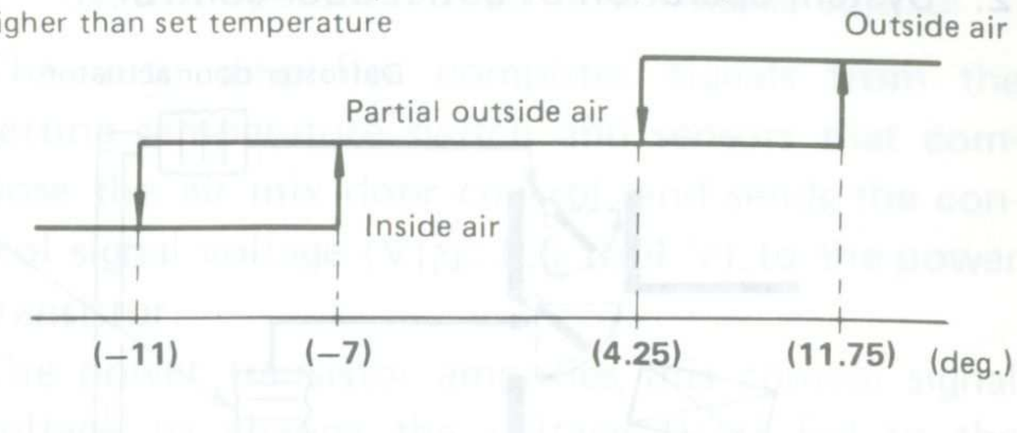
System Operation (Intake door control) (Cont'd)

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.

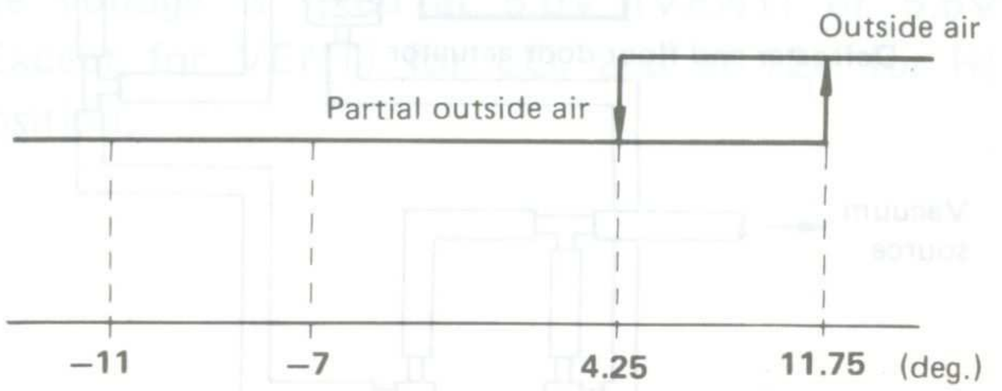


SHA304B

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



Condition 2: Except for Condition 1



SHA305B

System Operation (Outlet door control)

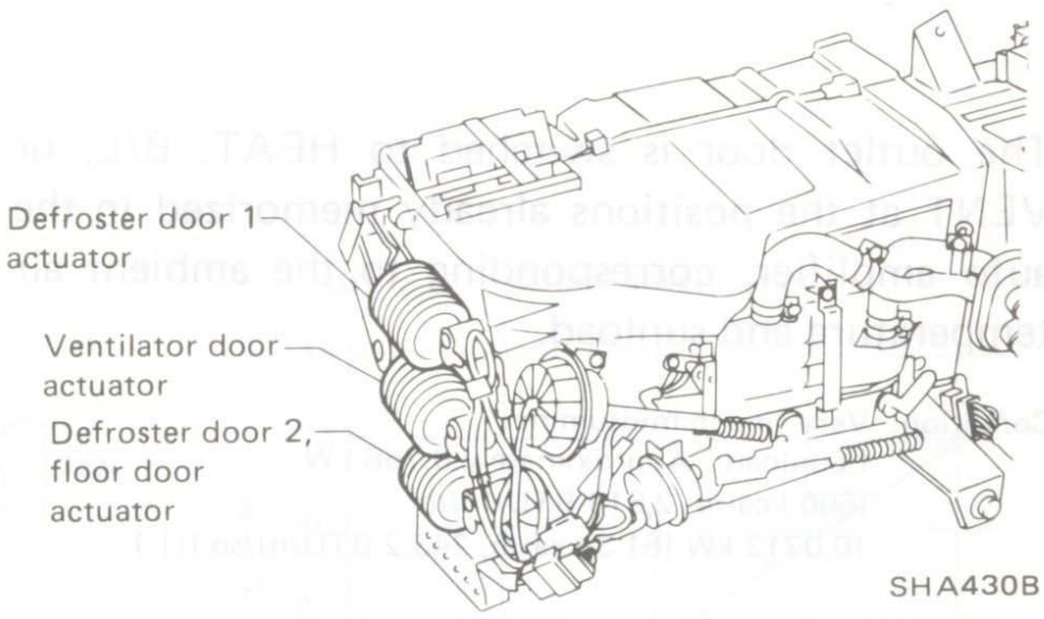
OUTLET DOOR CONTROL

1. Component parts

Outlet door control system consists of the parts shown below.

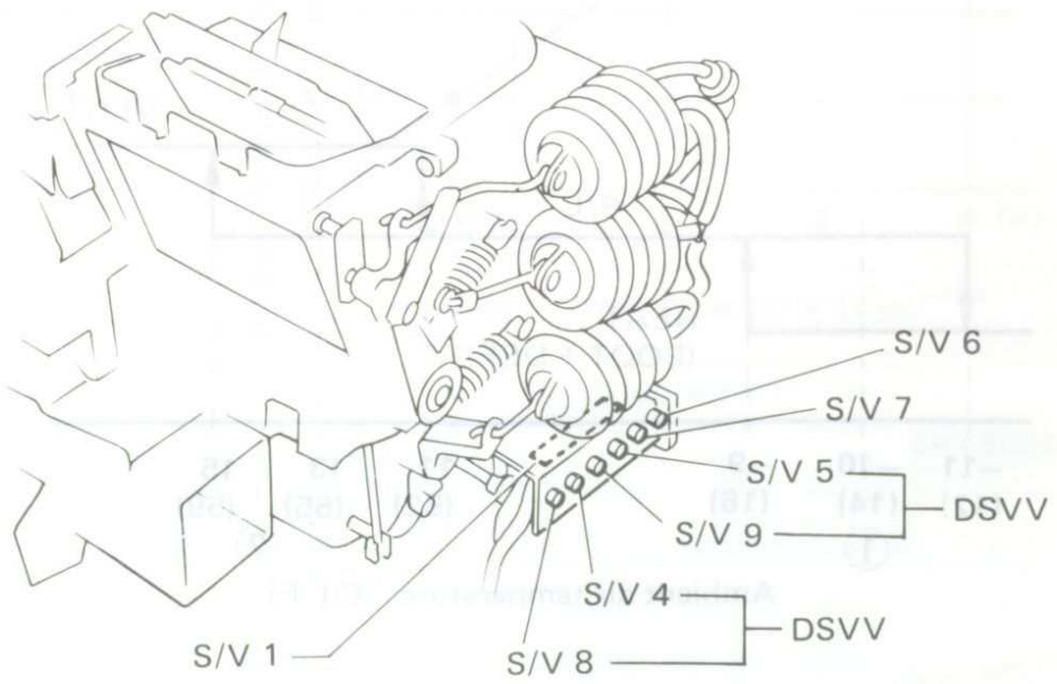
1) Defroster door actuator
2) Ventilator door actuator
3) Defroster and floor door actuator
4) Solenoid valve 6, 7
5) Sunload sensor
6) Ambient temperature sensor
7) Automatic amplifier

- **Actuators**



SHA430B

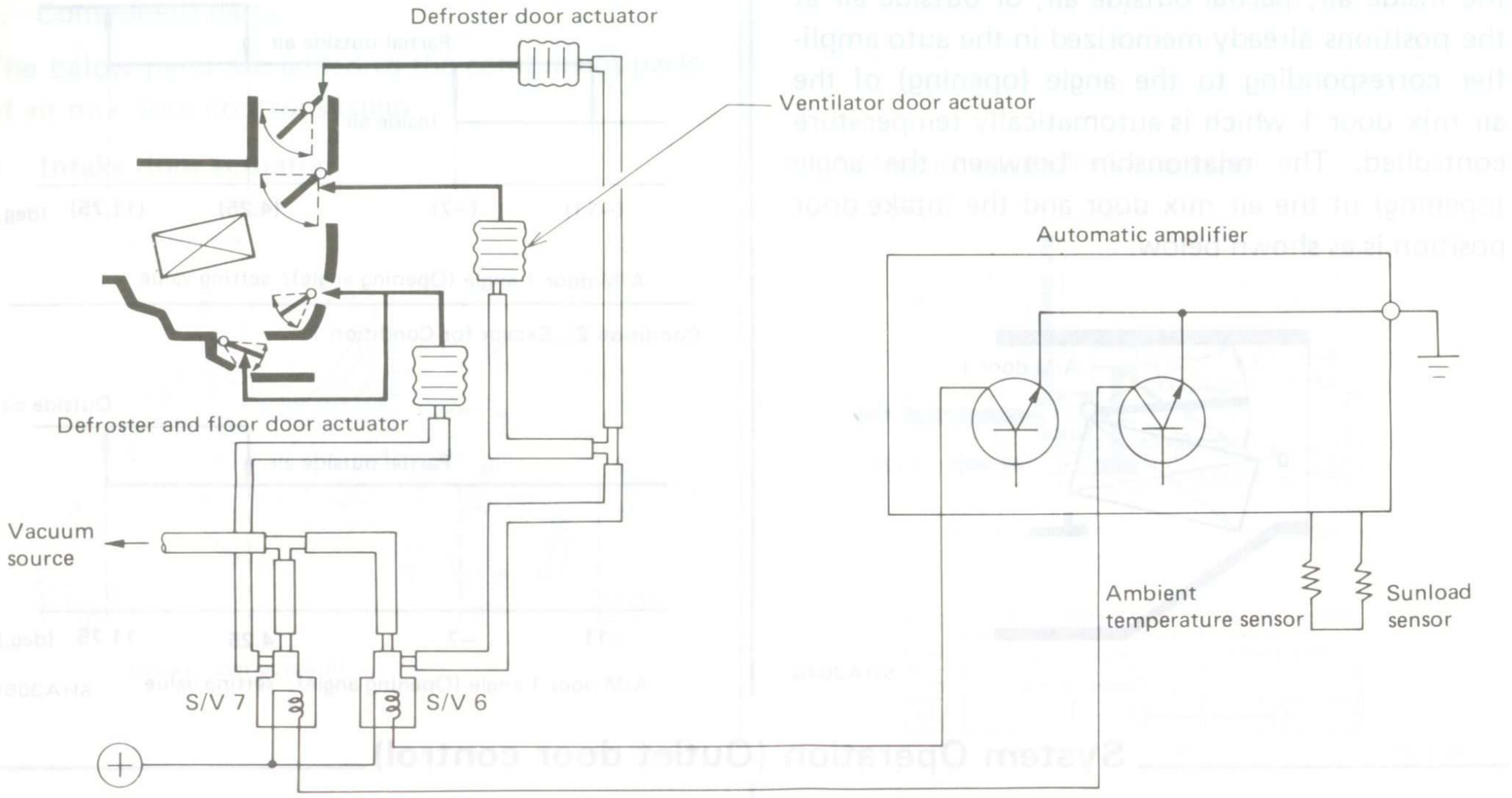
- **Solenoid valve 6, 7**



SHA431B

System Operation (Outlet door control)

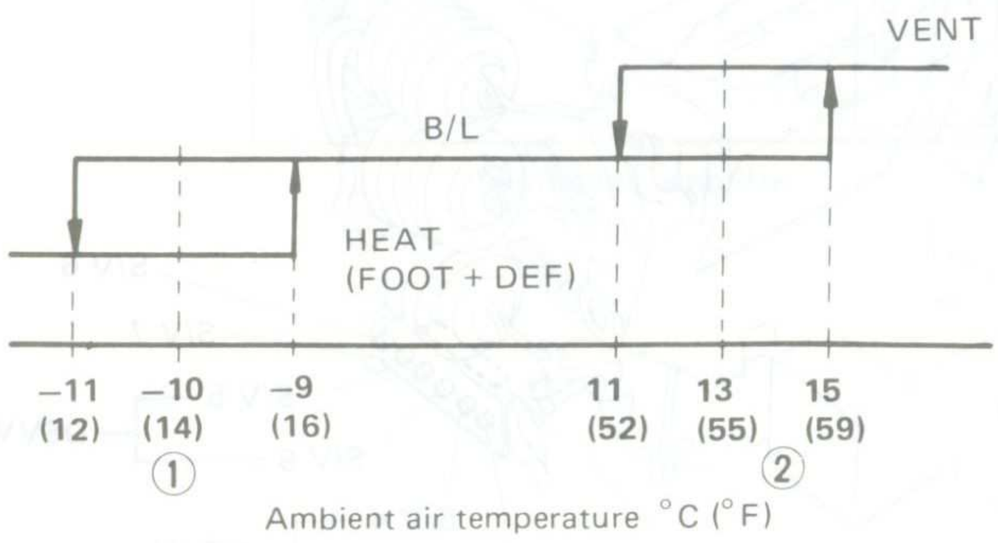
2. System operation of outlet door control



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.

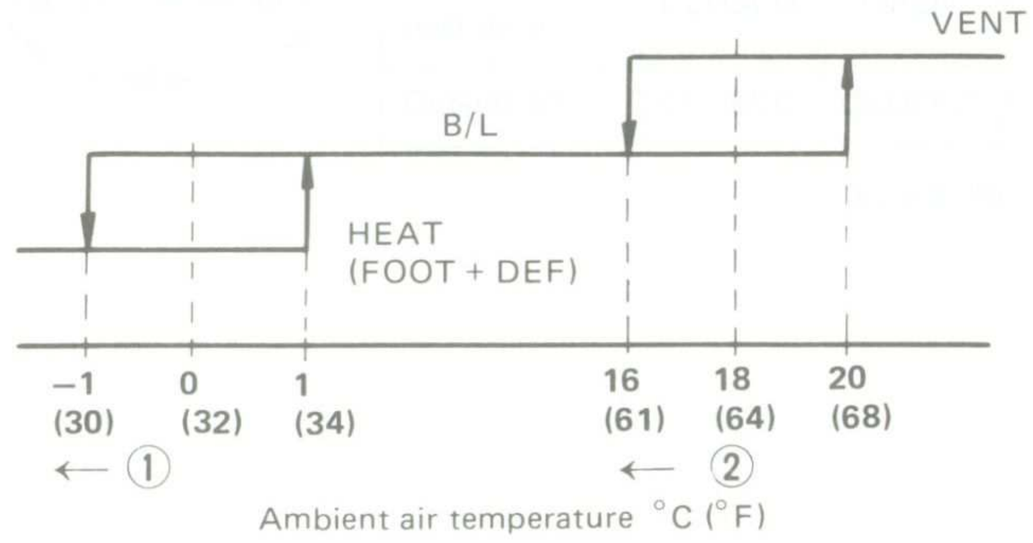
Condition: Very fine in midsummer
(Sunload: Approximately 0.768 kW
(660 kcal/h, 2,619 BTU/h)/m^2
[0.0713 kW (61.3 kcal/h, 243.2 BTU/h)/sq ft])



SHA800B

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



SHA801B

DESCRIPTION — Air Conditioner (Auto)

System Operation (Air flow volume control)

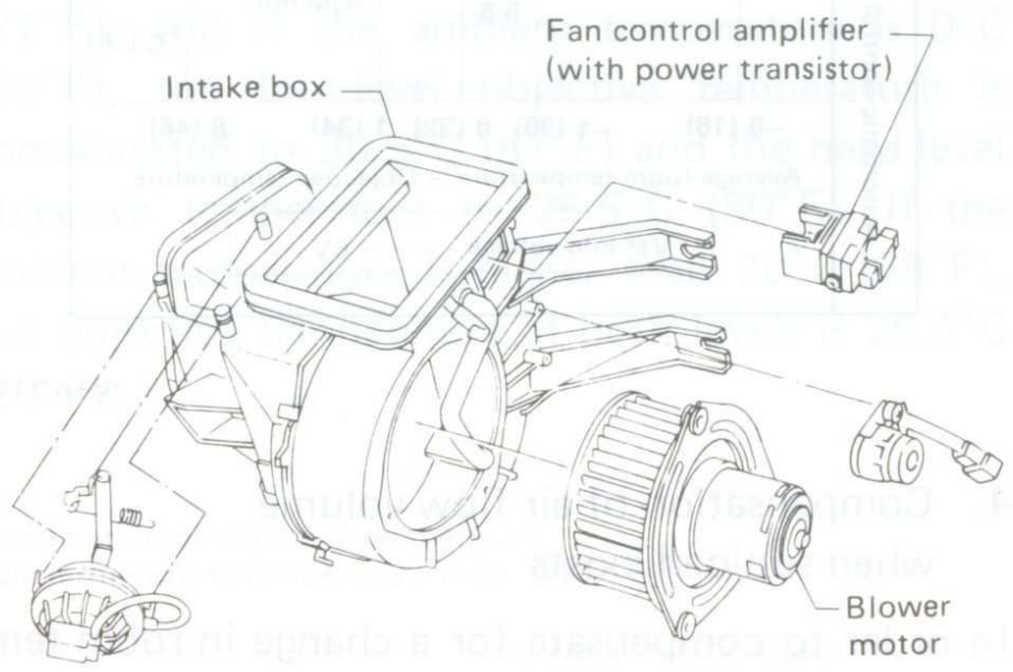
AIR FLOW VOLUME CONTROL

1. Component parts

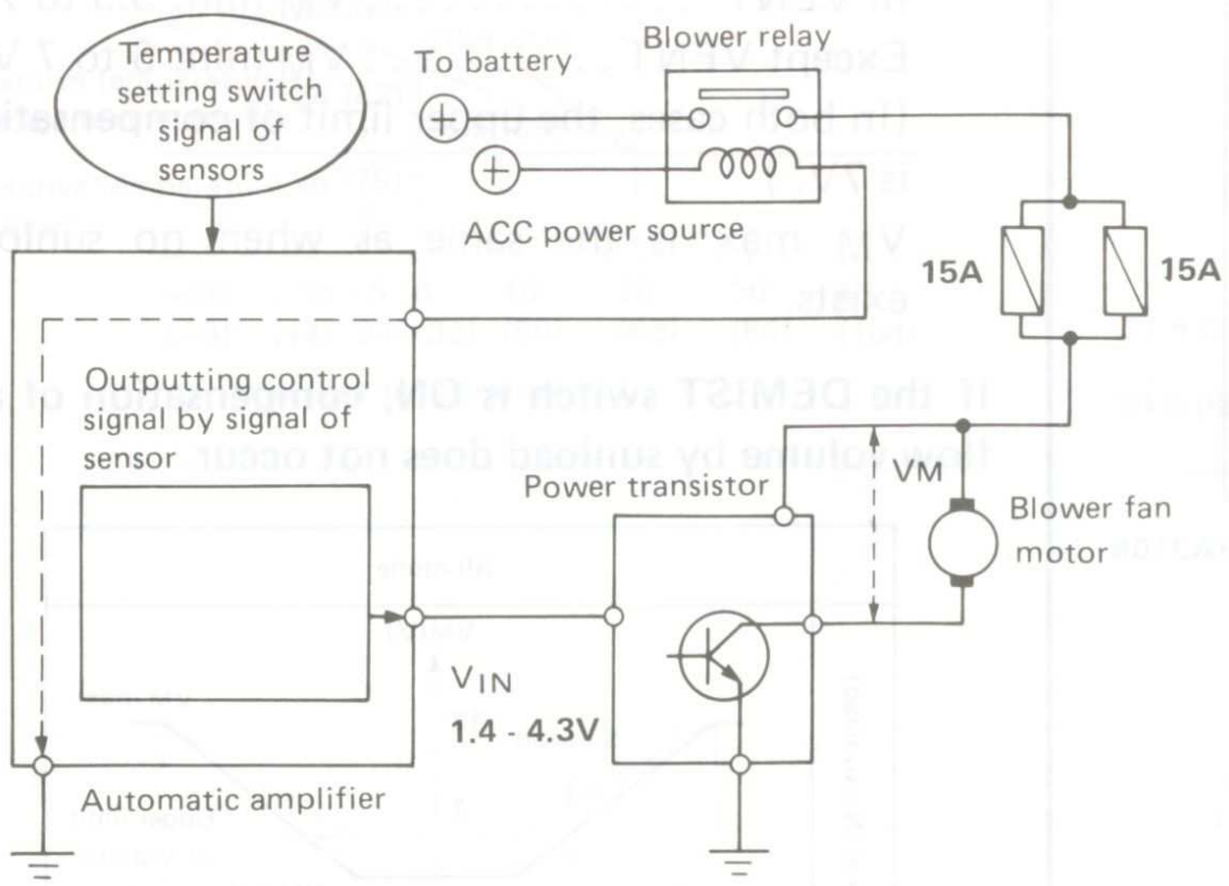
Power transistor is added to the component parts of air mix door control system.

- **Power transistor**

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

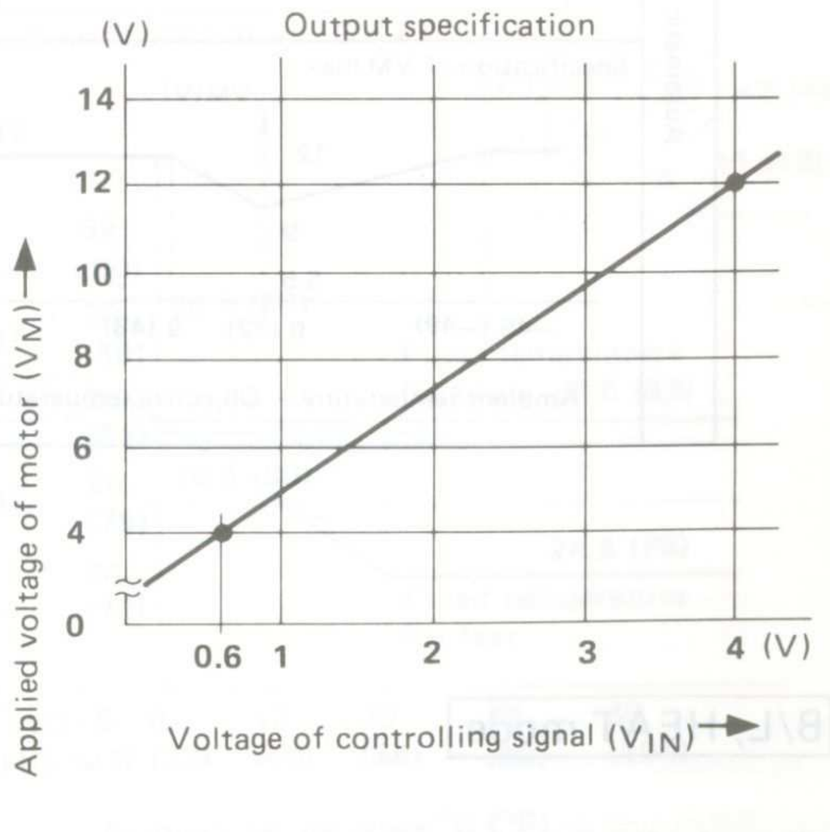


SHA432B



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 5.0V (VENT) or 5.5V (Except for VENT) for LO, and at 12V for HI position.



SHA802B

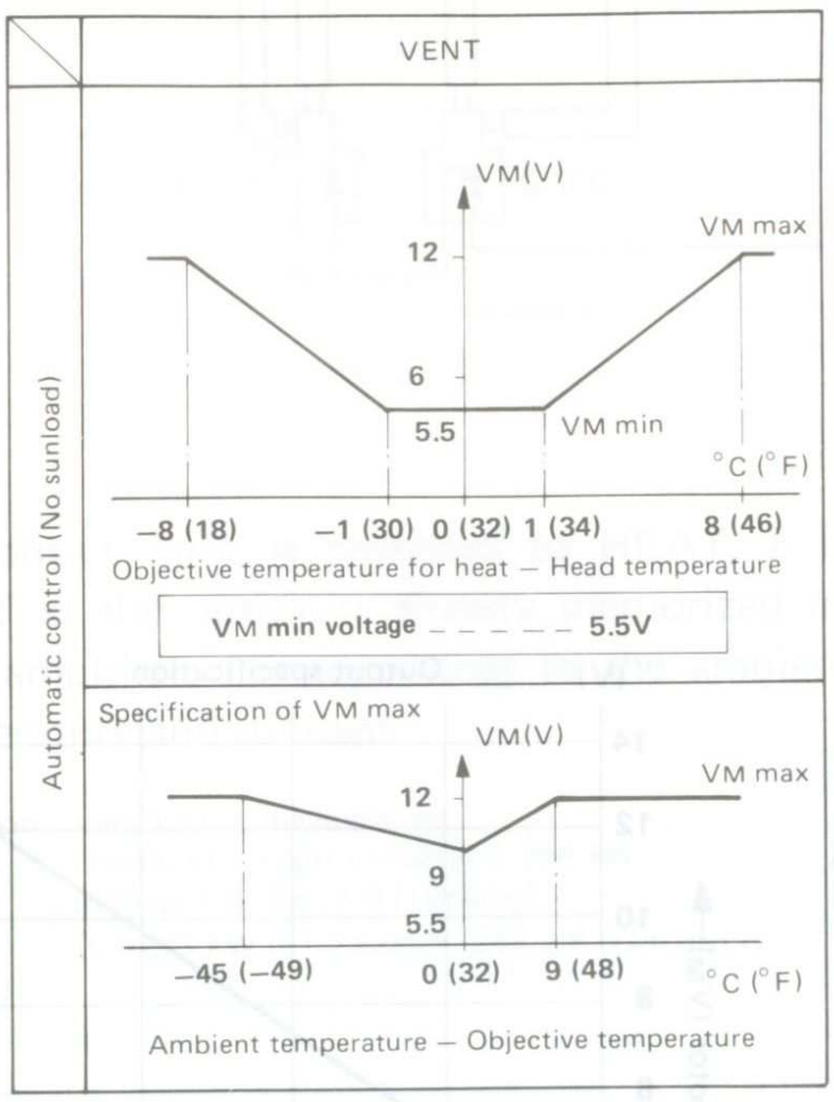
System Operation (Air flow volume control) (Cont'd)

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.

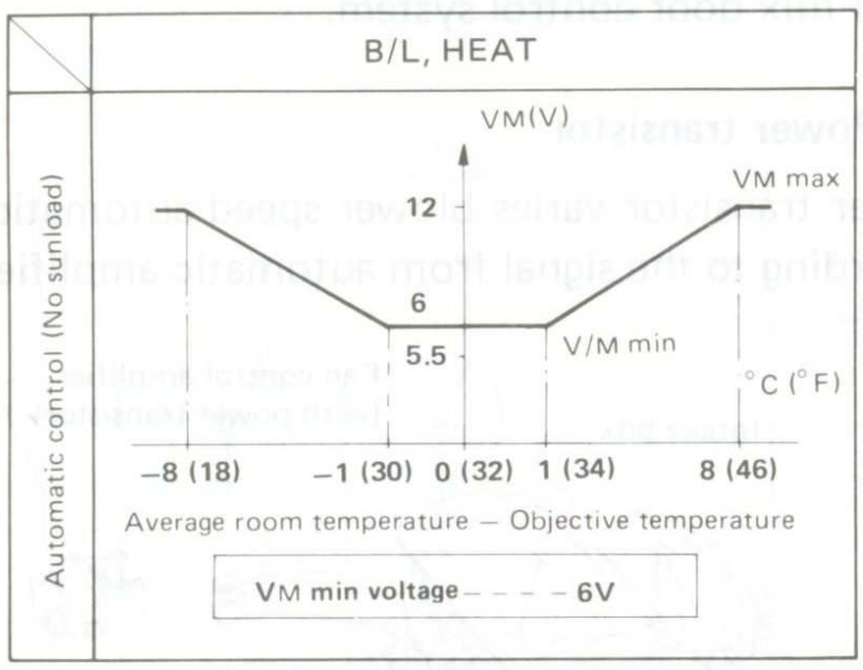


SHA310B

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.



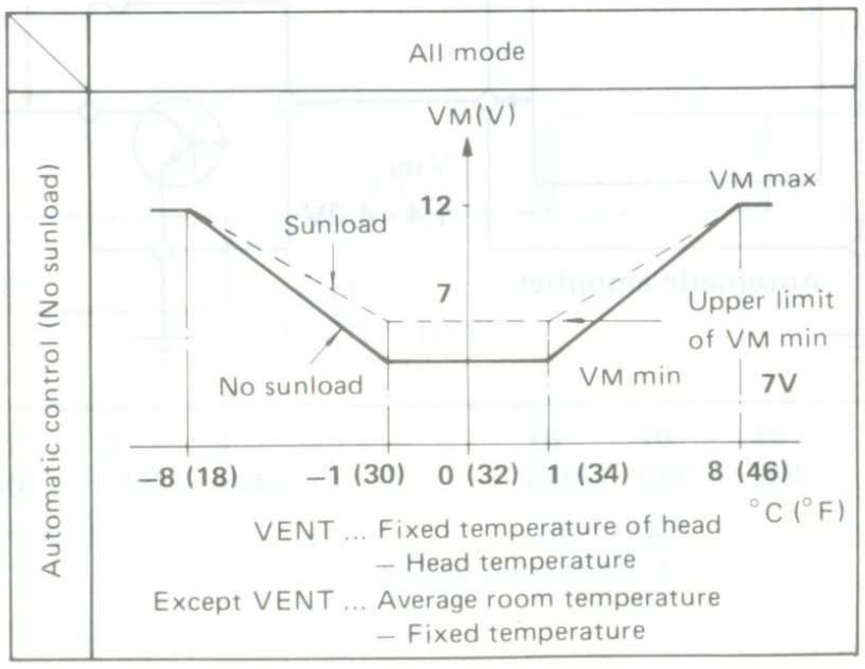
SHA311B

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 — Air Conditioner (Auto)

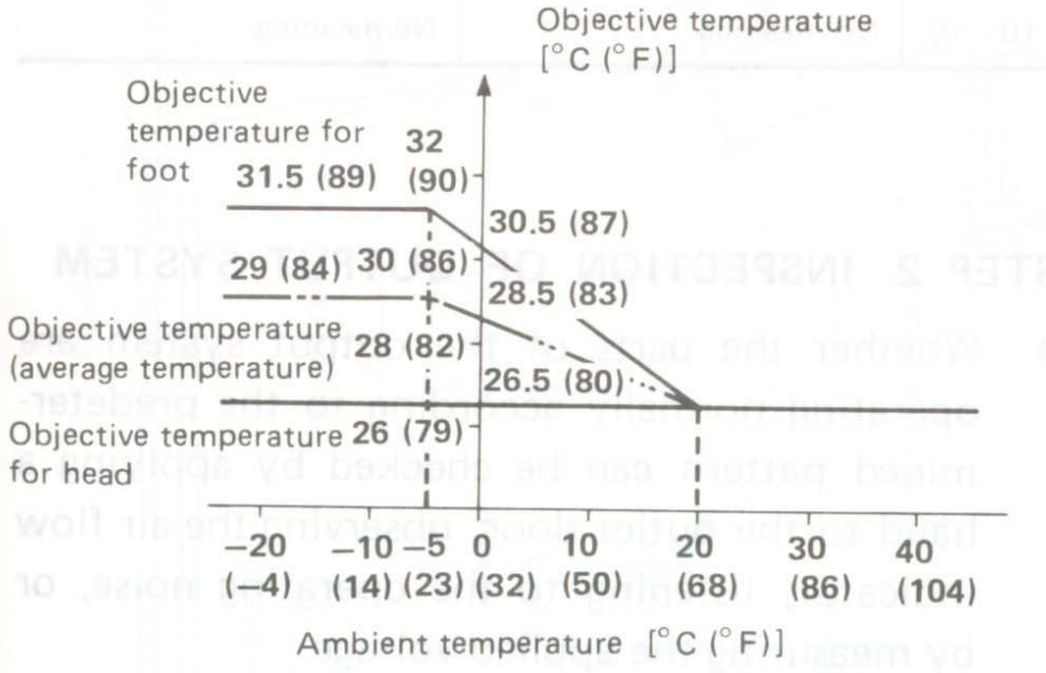
System Operation (Compensation for ambient temperature)

- For **COMPRESSOR CONTROL** and **WATER COCK CONTROL**, refer to Service Manual.

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)]

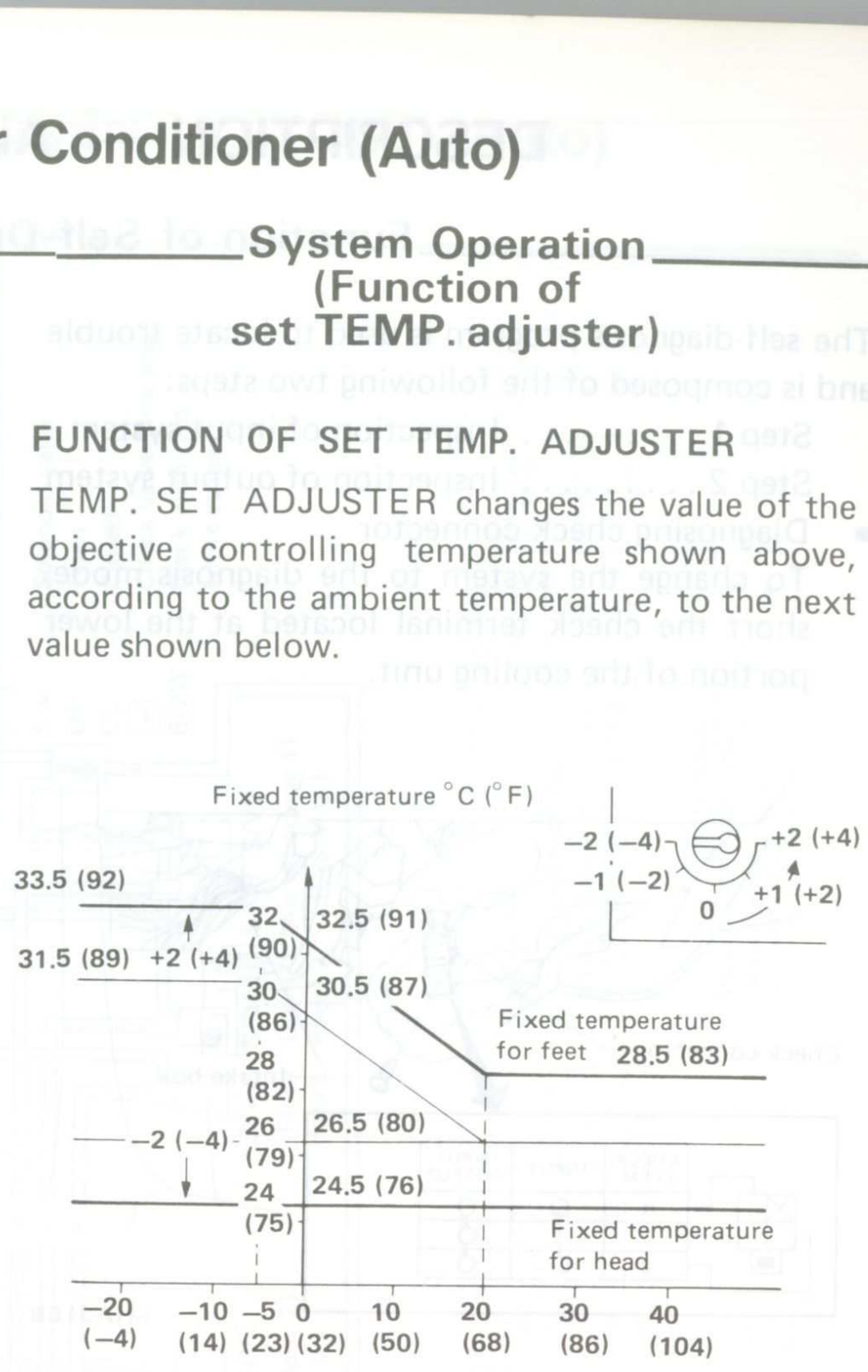


SHA803B

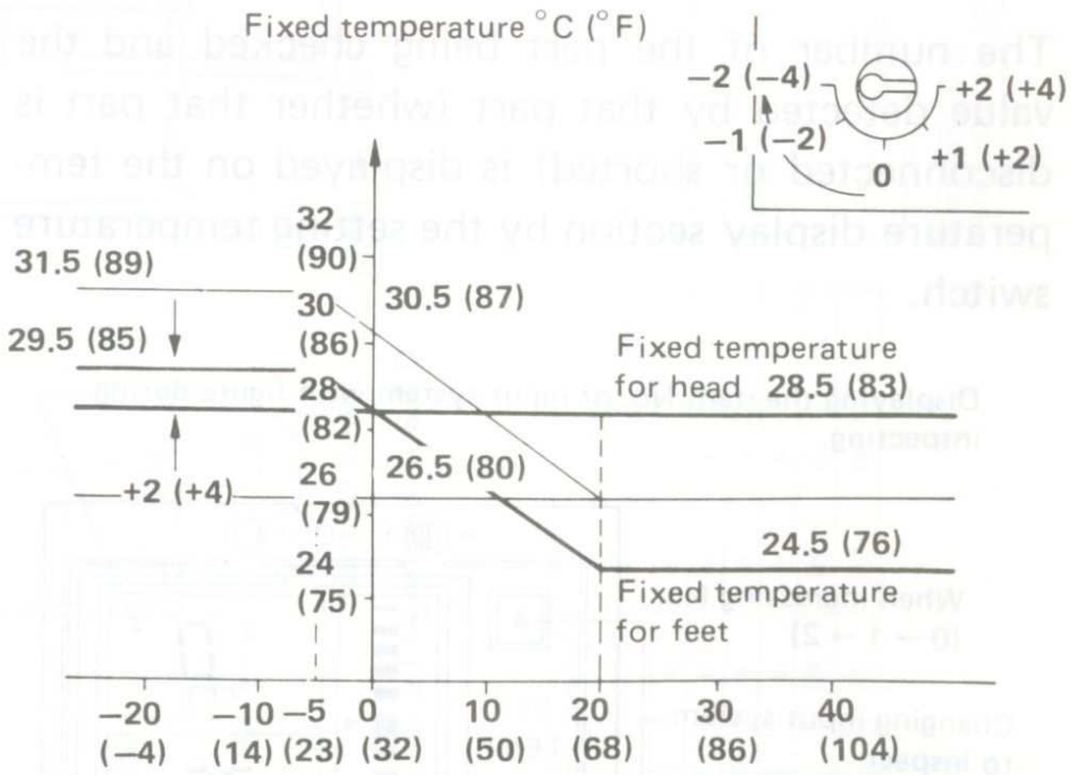
System Operation (Function of set TEMP. adjuster)

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.



SHA804B



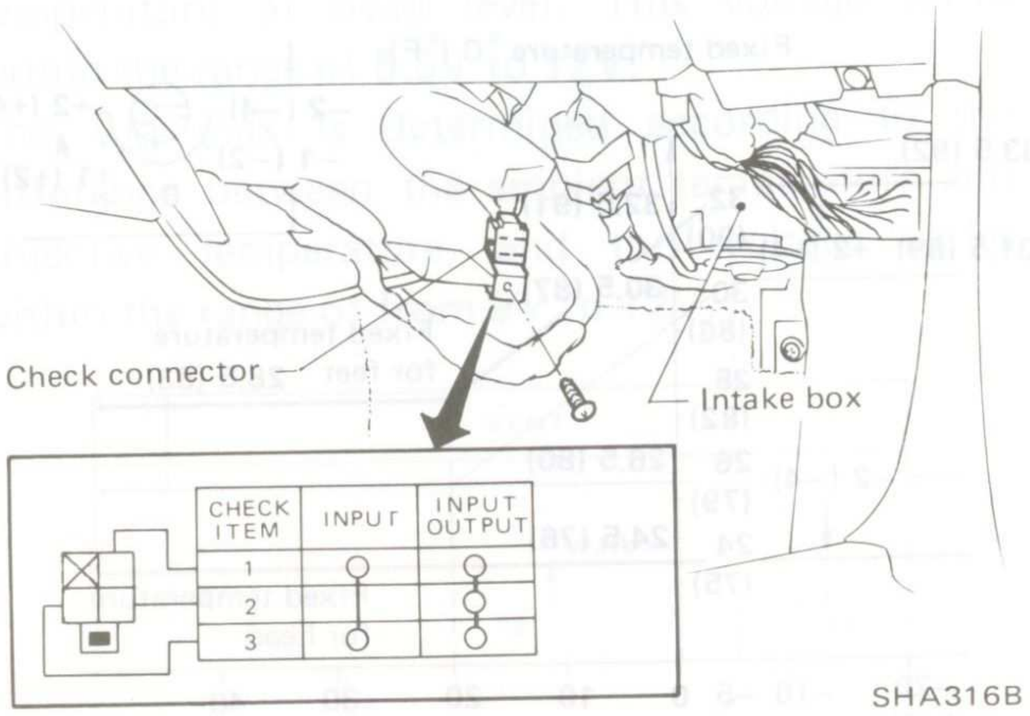
SHA805B

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

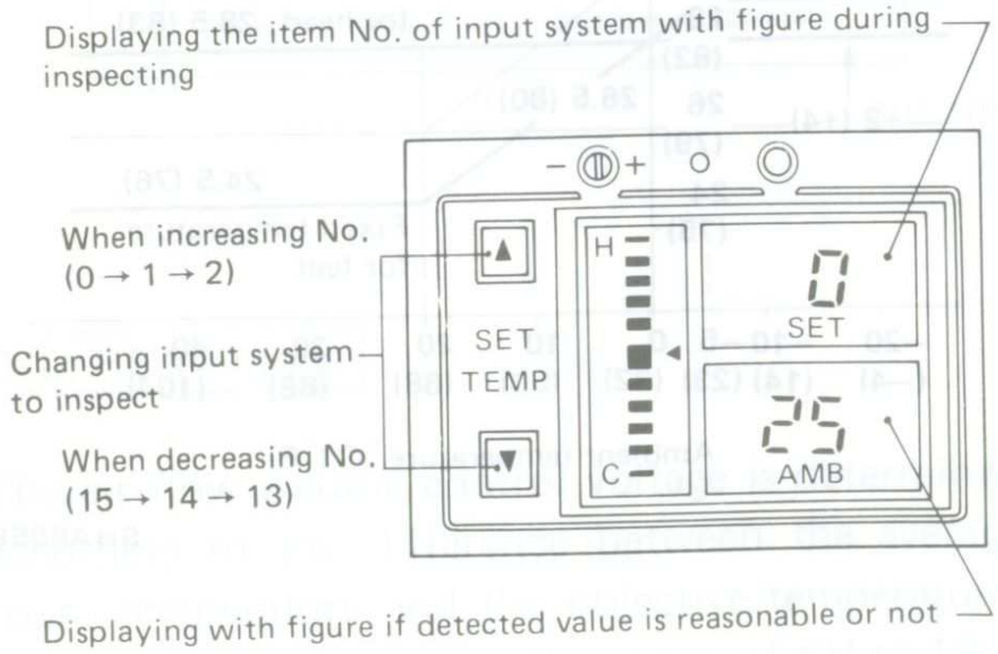
- Diagnosing check connector
  To change the system to the diagnosis mode, short the check terminal located at the lower portion of the cooling unit.



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

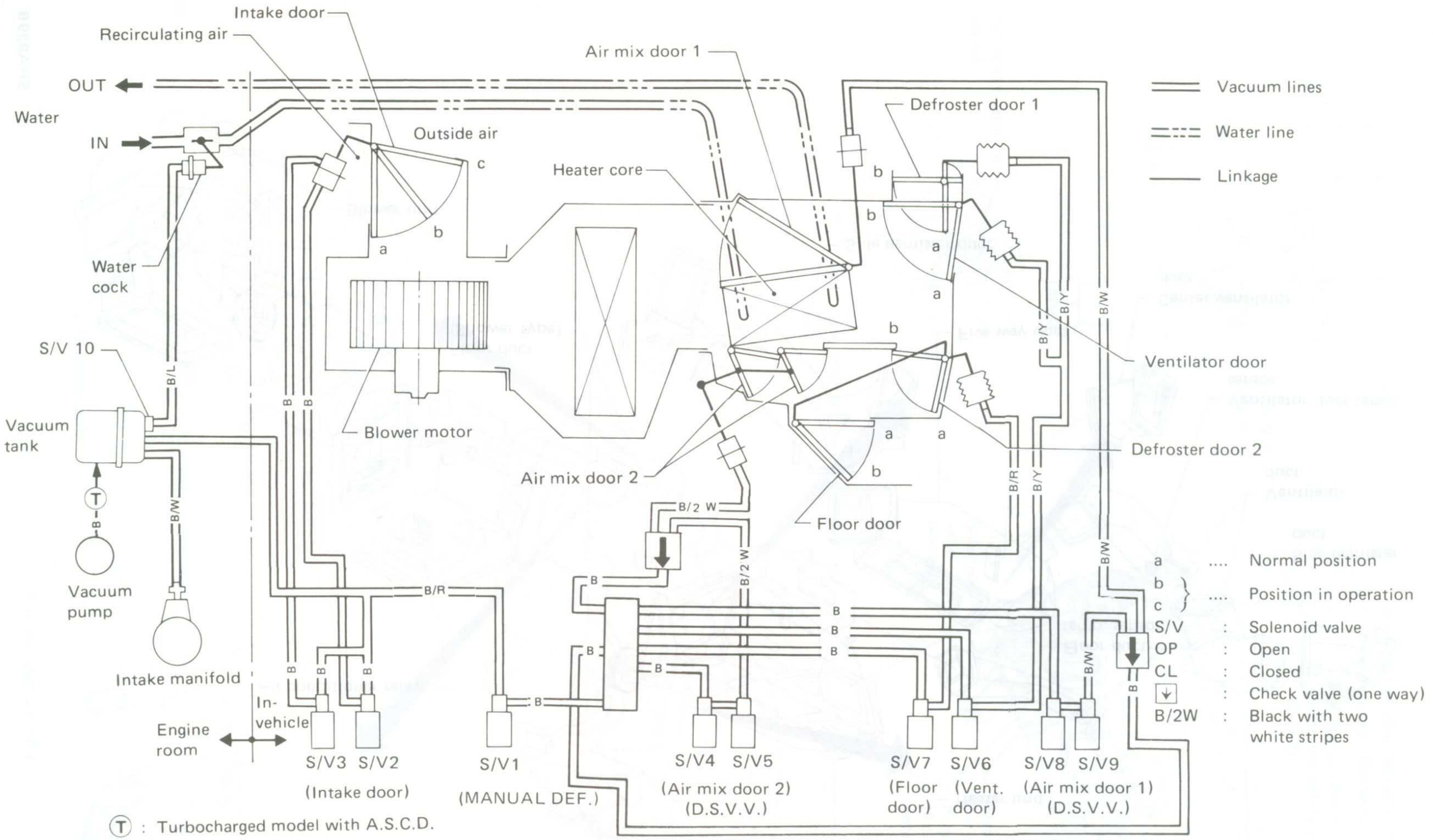
Display No.	Item of input signal	Parts to be checked
0	Temperature of inside air temperature sensor (foot)	In-vehicle sensor (foot)
1	Temperature of in-vehicle sensor (head)	In-vehicle sensor (head)
2	Temperature of floor outlet	Floor duct temperature sensor
3	Temperature of ventilator outlet	Ventilator 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



(T) : Turbocharged model with A.S.C.D.

OUTLET CONTROL					
MODE		VENT	B/L	HEAT/ DEMIST	DEF
DOOR POSITION	DEF, DOOR 1	b	b	a	a
	VENT, DOOR	b	b	a	a
	FLOOR, DOOR	a	b	b	a
	DEF, DOOR 2	a	b	b	a
OPERATION OF SOLENOID VALVE	S/V6	OP	OP	CL	CL
	S/V7	CL	OP	OP	CL

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		S/V4	CL	CL	OP
		S/V5	OP	CL	OP

INTAKE CONTROL				
INTAKE AIR		RECIRC	PARTIAL OUTSIDE	OUTSIDE
INTAKE DOOR POSITION		c	b	a
OPERATION OF SOLENOID VALVE	S/V2	OP	OP	CL
	S/V3	OP	CL	CL

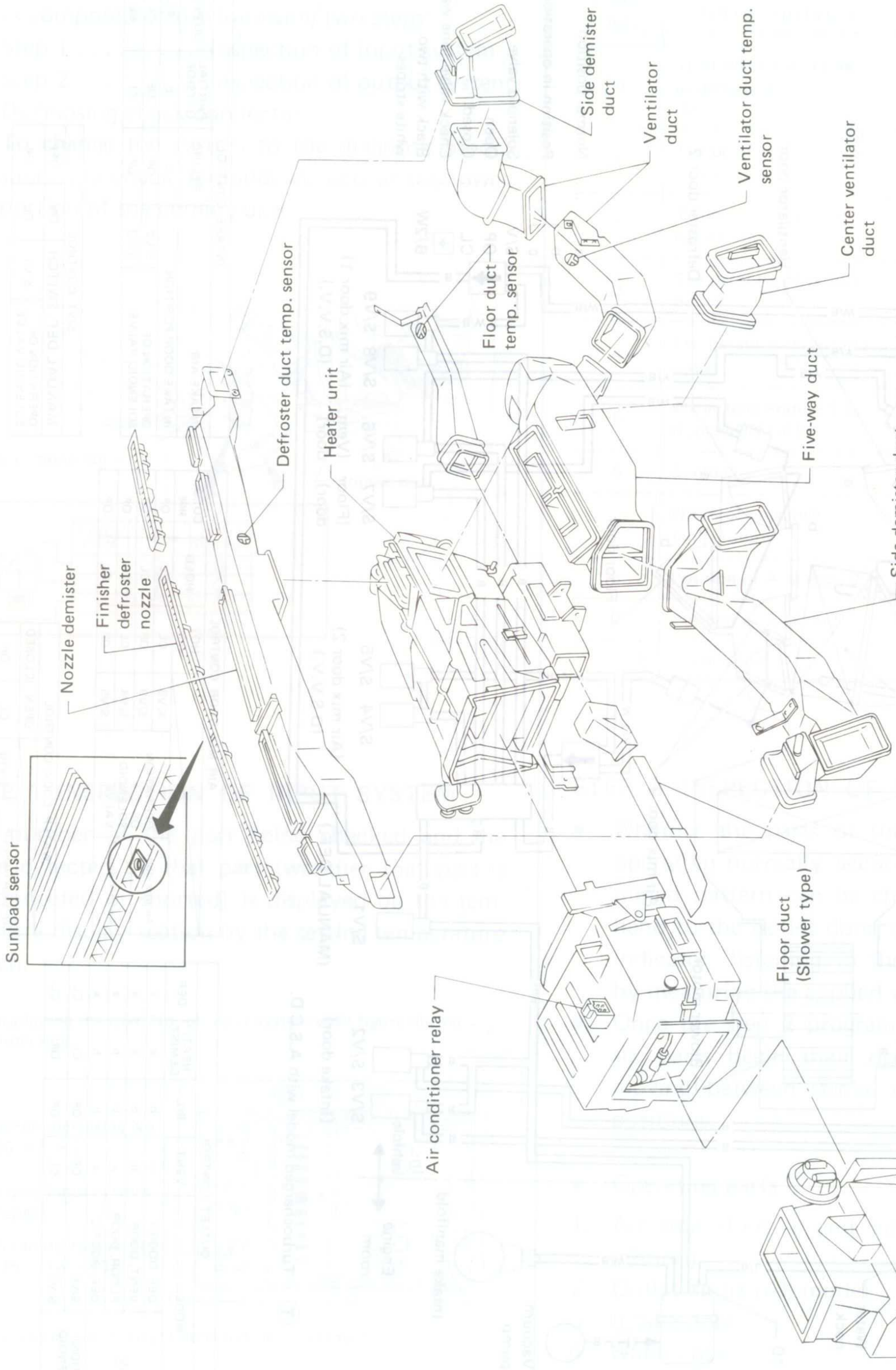
WATER COCK CONTROL			
		OPEN	CLOSED
OPERATION OF SOLENOID VALVE	S/V10	CL	OP

S/V1 CONTROL			
MANUAL DEF. SWITCH		ON	OFF
OPERATION OF SOLENOID VALVE	S/V1	CL	OP

SHA612B

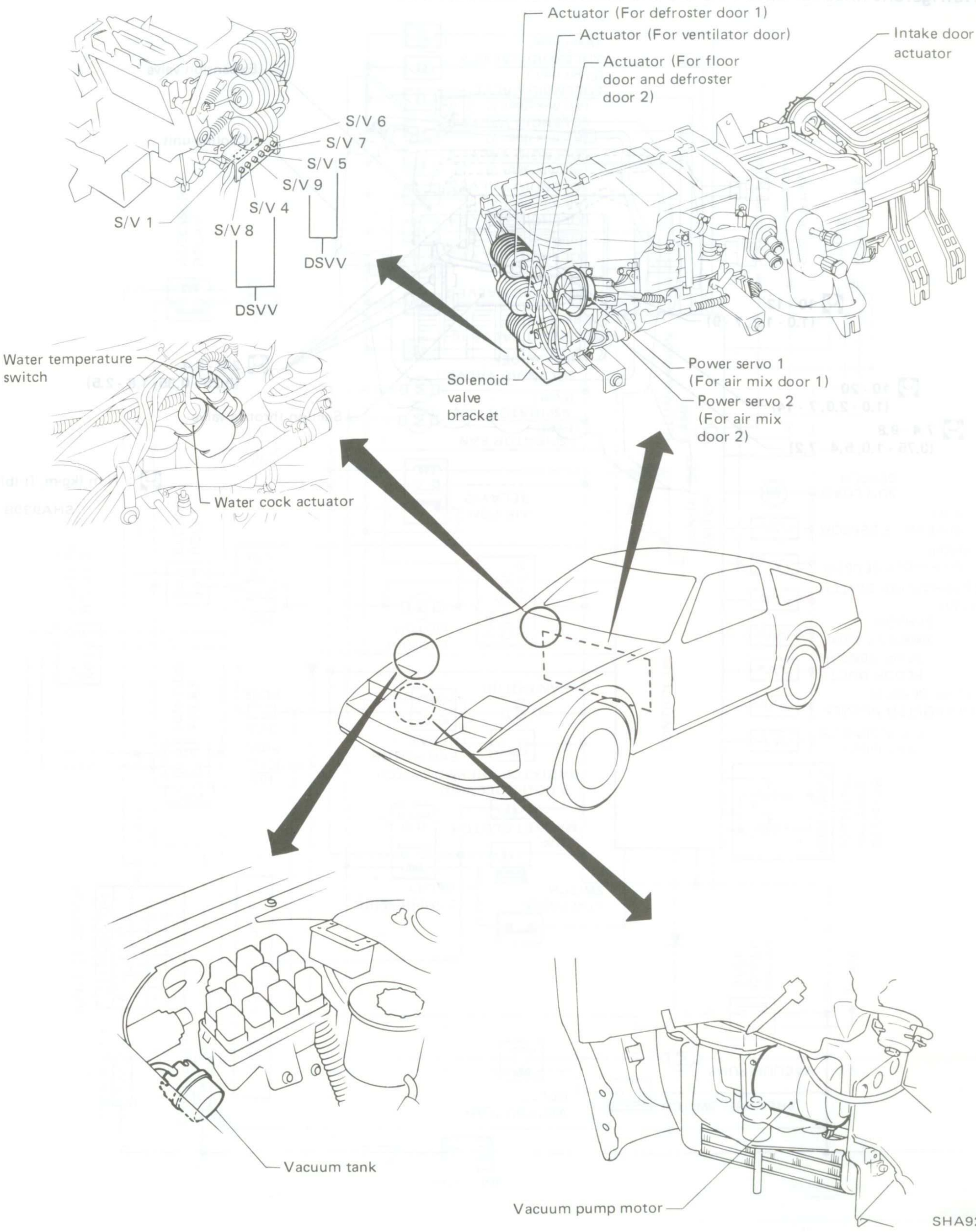
AIR FLOW AND COMPONENT LAYOUT (Auto)

Component Layout



SHA929B

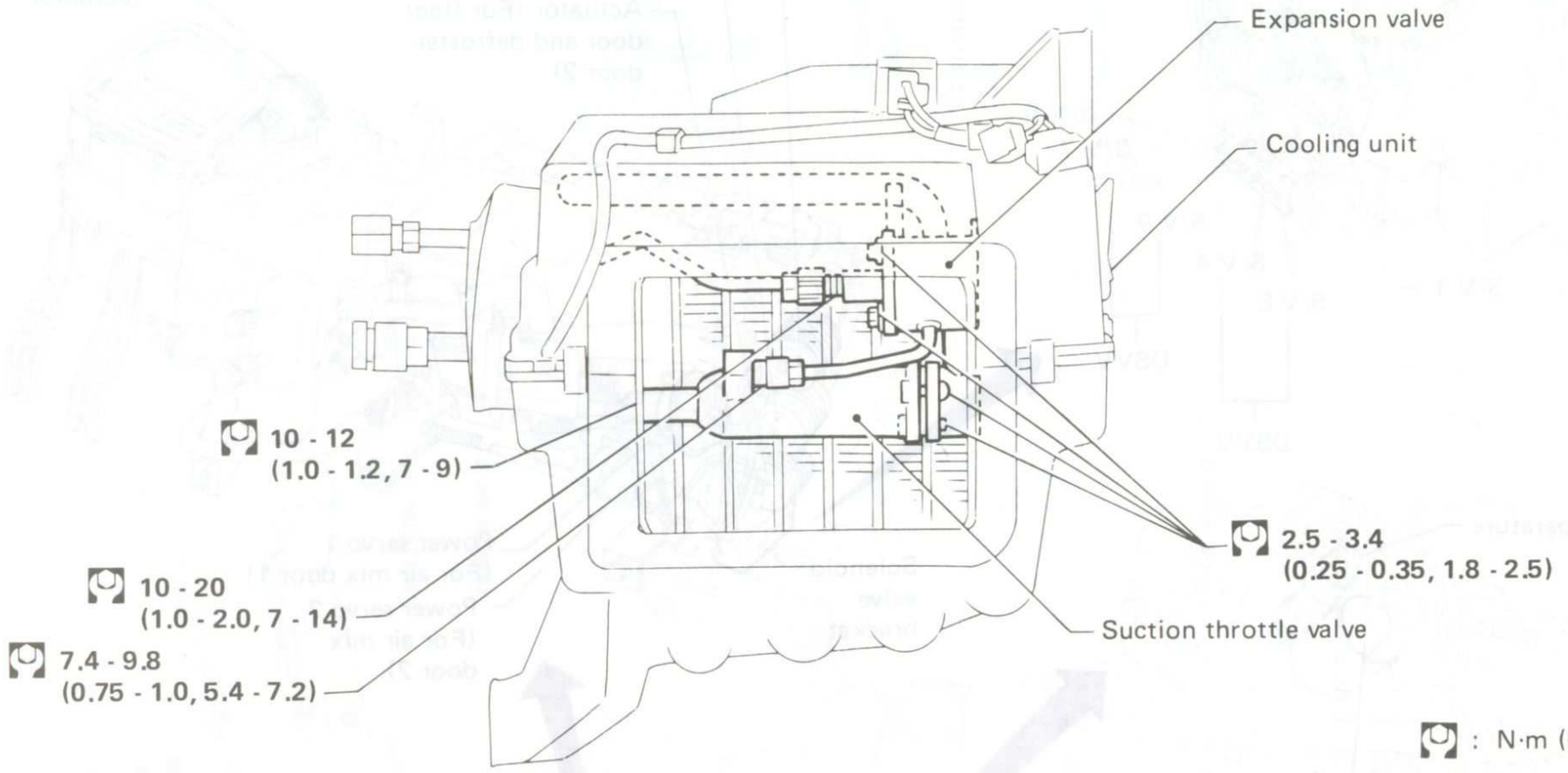
LOCATION OF VACUUM COMPONENTS (Auto)



PIPING (Auto)

Refrigerant Lines—Cooling Unit

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

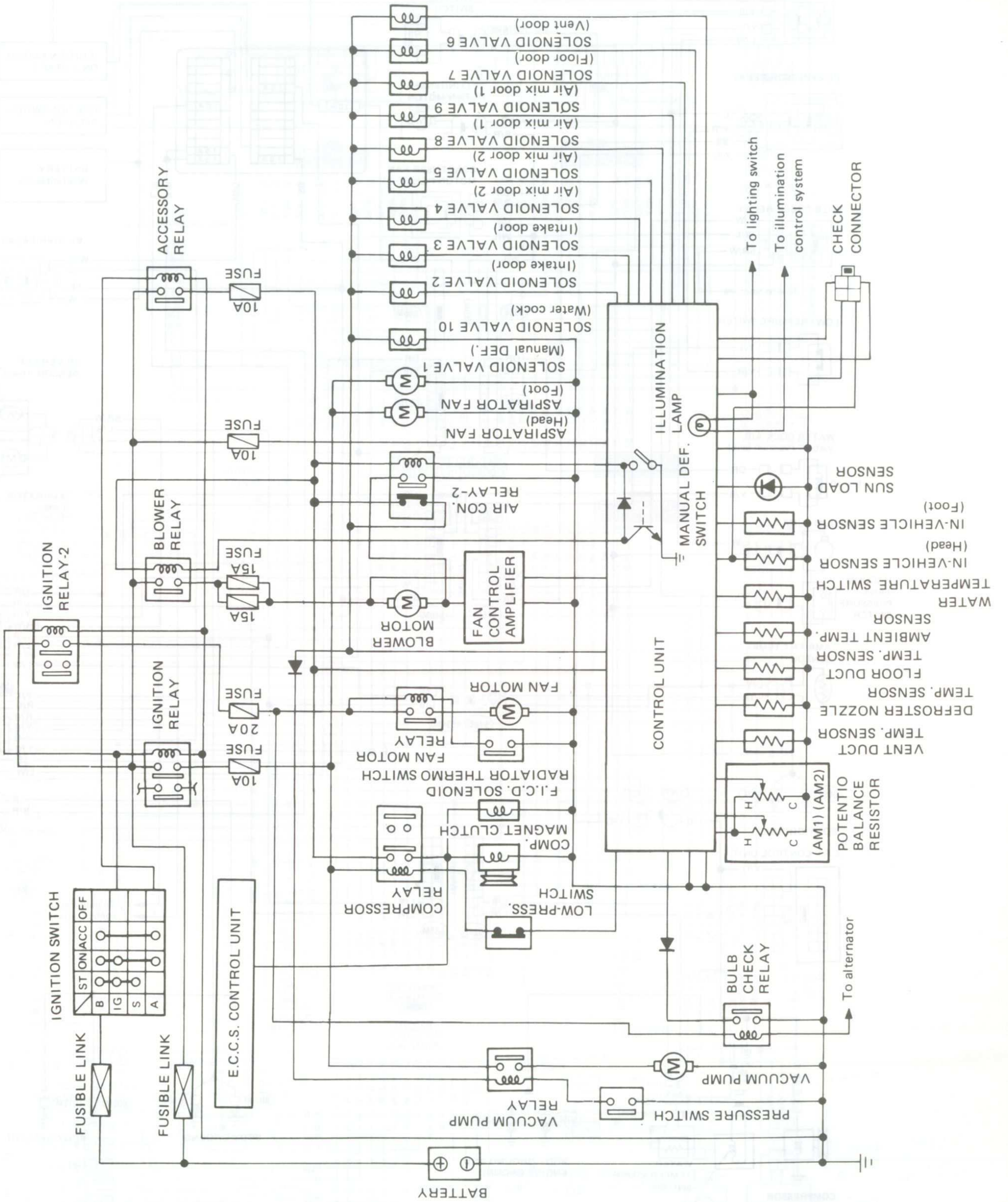


: N·m (kg-m, ft-lb)

SHA930B

A/C ELECTRICAL CIRCUIT (Auto)

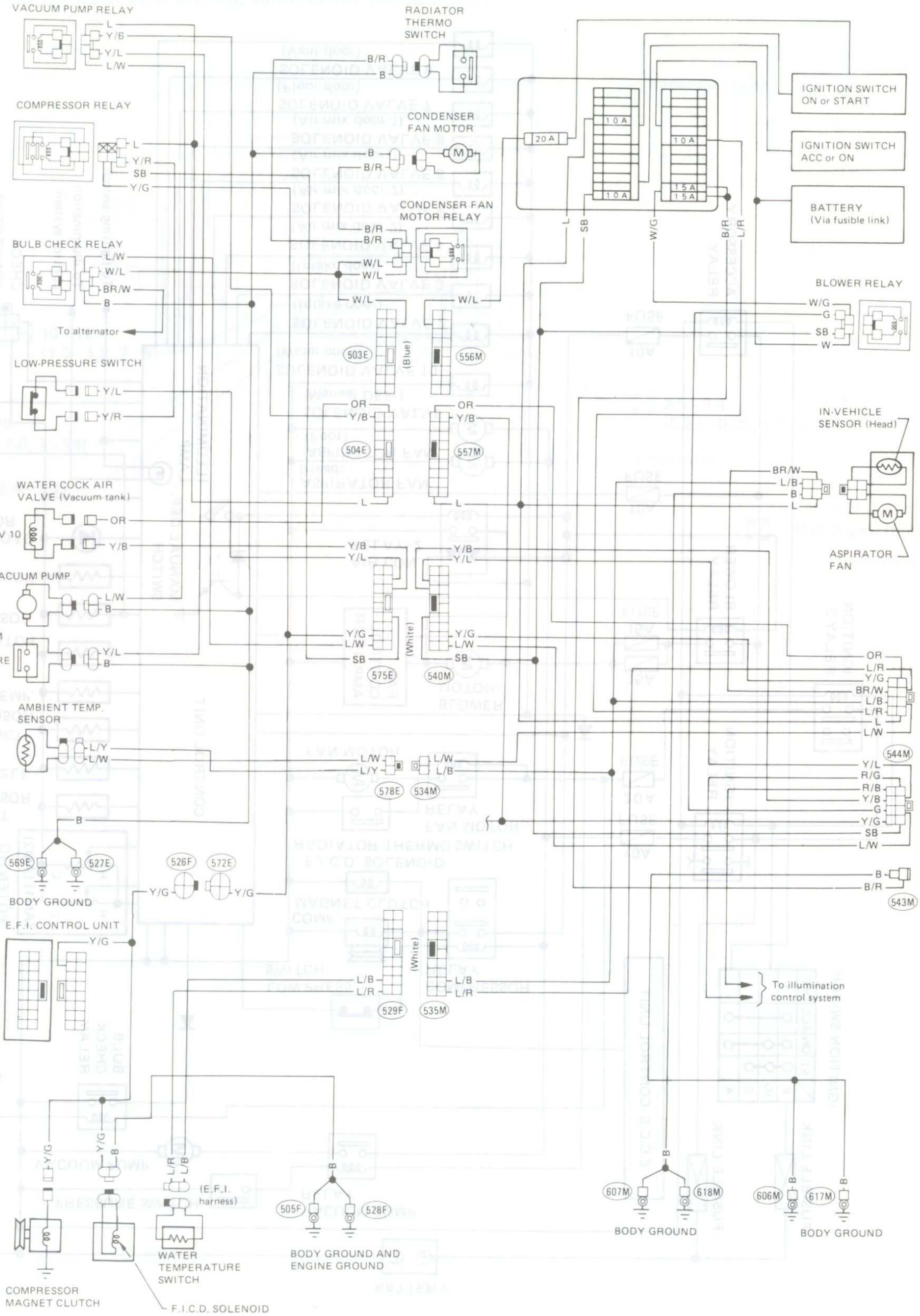
Schematic



SHA920B

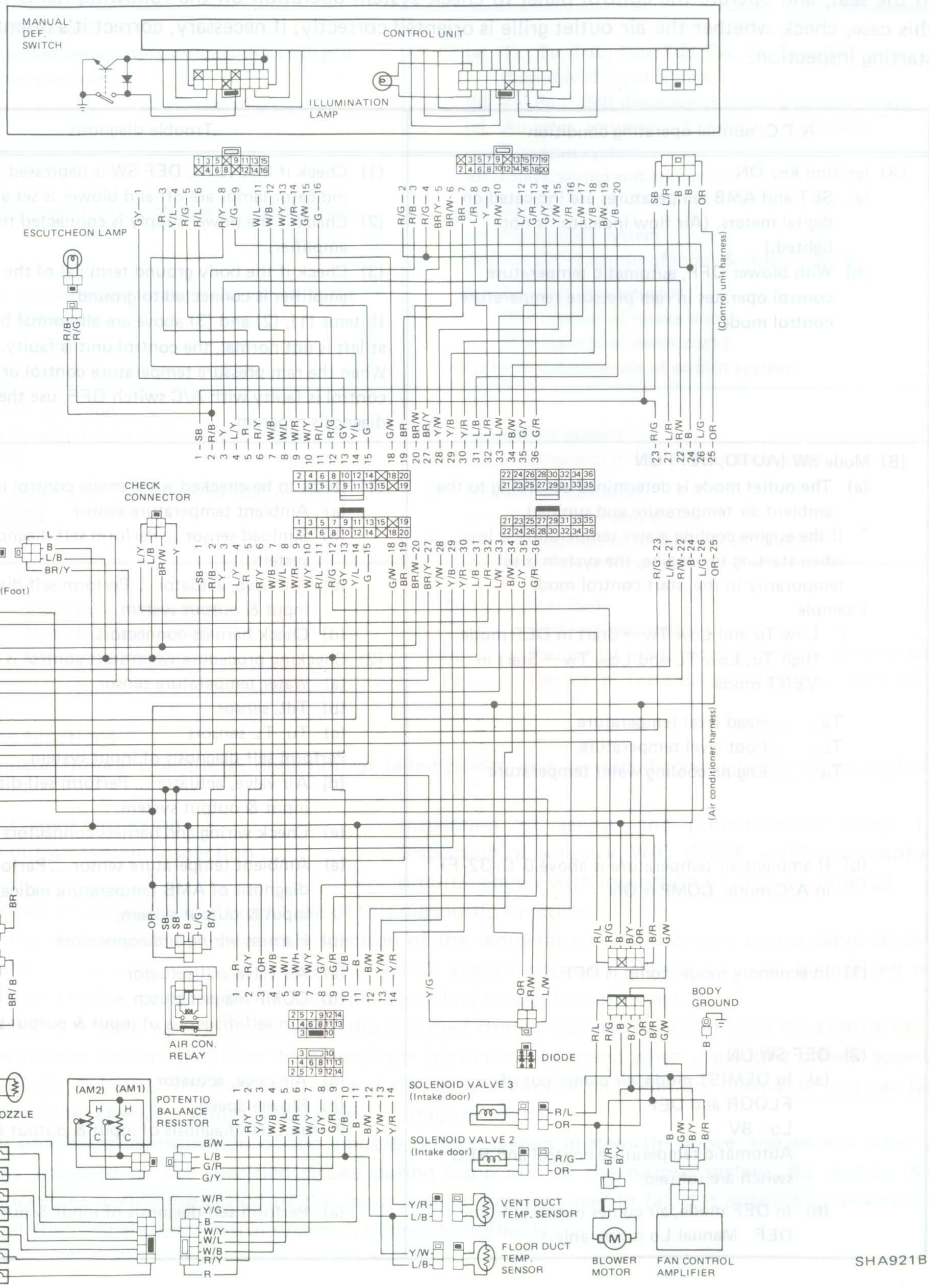
A/C ELECTRICAL CIRCUIT (Auto)

Wiring Diagram



A/C ELECTRICAL CIRCUIT (Auto)

Wiring Diagram (Cont'd)



SHA921B

LOCATION OF A/C ELECTRICAL COMPONENTS (Auto)

Diagnostic Procedure

Listen carefully to the customer's complaint to correctly understand the problem. Then start the engine, sit in the seat, and operate the control panel to check system operation on the following items (A) to (D). In this case, check whether the air outlet grille is oriented correctly; if necessary, correct it's orientation before starting inspection.

A.T.C. normal operating condition	Trouble diagnosis
(A) Ignition key ON (a) SET and AMB temperatures are indicated on digital meters. (Air flow indicator is not lighted.) (b) With blower OFF, automatic temperature control operates in ram pressure temperature control mode.	(1) Check if MANUAL DEF SW is depressed. (when all indicator lamps are off and blower is set at Hi.) (2) Check if the power supply is connected to the control amplifier. (3) Check if the body ground terminal of the control amplifier is connected to ground. If items (1), (2) and (3) above are all normal but item (a) at left is not normal, the control unit is faulty. When the ram pressure temperature control or mode control is faulty with A/C switch OFF, use the self-diagnosis program.
(B) Mode SW (AUTO, DEF) ON (a) The outlet mode is determined according to the ambient air temperature and sunload. * If the engine cooling water temperature is low when starting the engine, the system is set temporarily in the start control mode. Example ○ Low Tu and Low Tw → Start in DEF mode ○ High Tu, Low TL and Low Tw → Start in VENT mode Tu .... Head level temperature TL .... Foot level temperature Tw .... Engine cooling water temperature (b) If ambient air temperature is above 0°C (32°F) in A/C mode, COMP is ON. (1) In economy mode, comp is OFF. (2) DEF SW ON (a) In DEMIST mode, air comes out of FLOOR and DEF. Lo: 8V Automatic temperature control and REC switch are refused. (b) In DEF mode, air comes out only from DEF. Manual Lo is operable.	(1) Items to be checked when mode control is abnormal. (a) Ambient temperature sensor (b) Sunload sensor ... Perform self-diagnosis of input system. (c) Air valve, actuator ... Perform self-diagnosis of input & output system. (d) Check harness connectors. (2) Checking procedure when start control is faulty (a) Water temperature sensor (b) TdL sensor (c) Tu, TL sensors Perform self-diagnosis of input system. (d) Air valve, actuator ... Perform self-diagnosis of input & output system. (e) Check wiring and harness connectors (a) Ambient temperature sensor ... Perform self-diagnosis of AMB temperature indication and input & output system. (b) Harness wiring and connectors (a) Air valve and actuator (b) COMP Magnet clutch Perform self-diagnosis of input & output system. (a) Air valve, actuator (b) Blower speed Perform self-diagnosis of input & output system. (a) Perform self-diagnosis of input & output system.

Diagnostic Procedure (Cont'd)

A.T.C. normal operating condition	Trouble diagnosis
(C) TEMP SW change (1) Air outlet temperature varies with a change in set temperature.	(a) T_L, Tu, TdL, Tdu, Tdd, Tw, Zc, Ta ... Self-diagnosis of input system (b) P_L, Pu ... Self-diagnosis of input & output system (c) Air valve, actuator ... Self-diagnosis of input & output system (d) Check wiring and connectors.
(2) Blower speed varies with the set temperature.	(a) T_L, Tu (b) Fan control system Perform self-diagnosis of input & output system.
(3) W/C operation and intake mode vary with the set temperature.	(a) Air valve and actuator (For control of intake door) (For control of water cock) Perform self-diagnosis of output system.
(D) manual SW operation (1) Blower speed is set at Hi or Lo by blower Hi-Lo switch.	(1) Fan control system Perform self-diagnosis of input & output system.
(2) Air intake mode is changed to REC mode by REC SW.	(2) Air valve and actuator (For control of intake door) Perform self-diagnosis of input & output system.

Note: TdL .... Floor duct temperature
Tdu .... Vent duct temperature
Tdd .... Def. duct temperature
Zc ..... Sun load
Ta ..... Ambient temperature
P_L ..... Position of Feedback potentiometer (floor side)
Pu ..... Position of Feedback potentiometer (vent side)

(1) Diagnosing functions

The diagnostic program facilitates detection of failed points, and permits diagnosis in the following two modes:

(a) Input system inspection ..... Inspection of sensor and potentiometer (Step 1)
(b) Input-output system inspection ..... Inspection of actuator, W/C, COMP, and blower motor simultaneously with inspection of item (a) (Step 2)

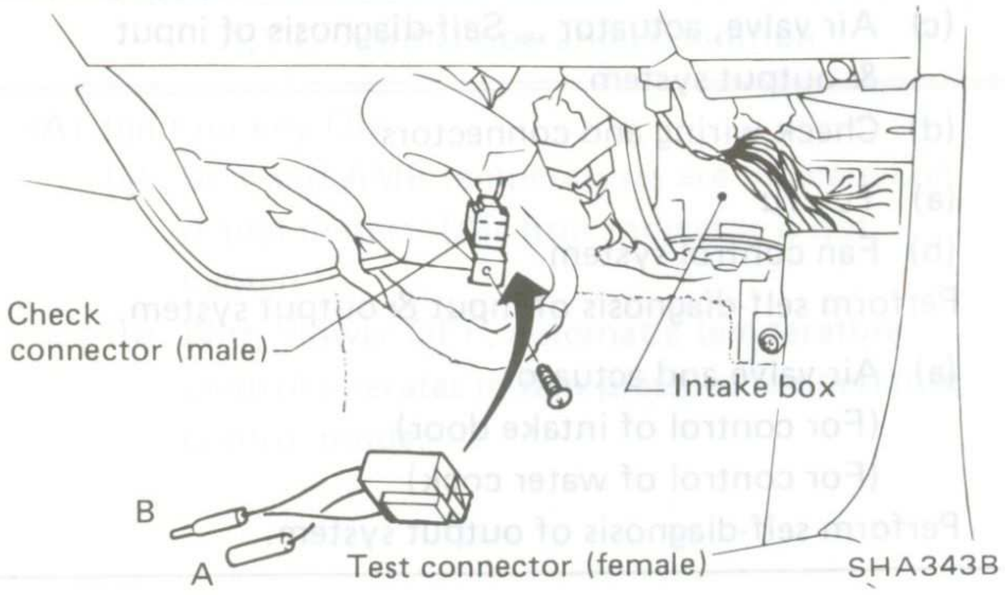
Shown below are examples of efficient use of this diagnostic function.

* "Input system inspection" permits inspection of the temperature of all sensors, power servo stroke and other functions while operating the A.T.C. system normally. Hence, this can be utilized to determine whether or not a device is normal according to the data obtained.
* In "Input & output system inspection", the specified control voltage is applied from the control unit to the blower control amplifier to control the blower motor speed when inspecting blower speed. Accordingly, whether the control unit and the blower control amplifier are normal or not can be determined by checking whether the control voltage is normal.
* In the simultaneous inspection of the input & output system in item (b) above, the air-mix door is forcibly actuated by the specified stroke during inspection of the output system. By reading the potentiometer during inspection of the input system as mentioned in (a), it is possible to determine whether the temperature control system is operating normally.

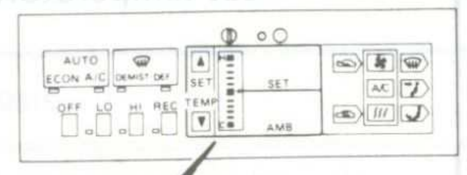
Inspection of Input System

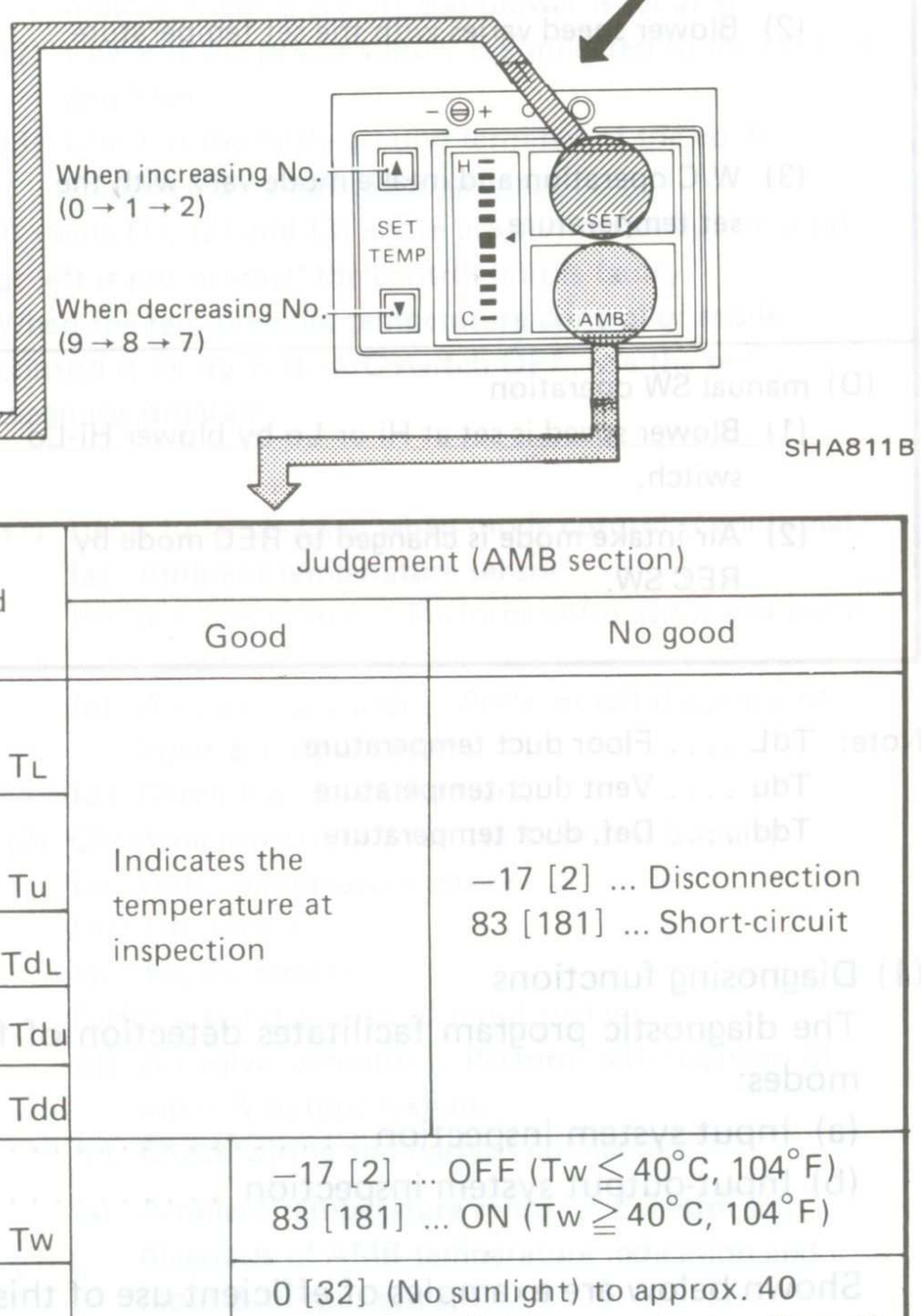
CHECKING PROCEDURES FOR INPUT SIGNALS

1. For Input Test I-0 through I-9, plug the test connector into the check connector. Do not connect the wire leads (A and B) at this time.



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





Abbrev.	Terminal No.	Indicated No.	Unit to be checked	Judgement (AMB section)	
				Good	No good
I–0	857 (BR/Y)	0	In-vehicle sensor (Foot level) TL	Indicates the temperature at inspection	–17 [2] ... Disconnection 83 [181] ... Short-circuit
I–1	863 (BR/W)	1	In-vehicle sensor (Head level) Tu		
I–2	858 (Y/W)	2	Floor duct sensor TdL		
I–3	860 (Y/R)	3	Vent duct sensor Tdu		
I–4	859 (Y/B)	4	Def. duct sensor Tdd		
I–5	862 (L/R)	5	Water temperature switch Tw	Good	–17 [2] ... OFF (Tw ≦ 40°C, 104°F) 83 [181] ... ON (Tw ≧ 40°C, 104°F)
I–6	855 (BR)	6	Sunload sensor Zc		0 [32] (No sunlight) to approx. 40 [approx. 104] (Fine weather) ... Note 1)
I–7	–	7	Object temperature fine adjusting switch HL		0 - 64 [32 - 147] 0 (32) – + 64 (147) 32 (90)
I–8	870 (G/R)	8	FBP2 (Floor side) PL		Varies in the range of approx. 40 to approx. 20 [approx. 104 to approx. 68]
I–9	869 (G/Y)	9	FBP1 (Vent side) Pu		
	—	10 - 15	—	—	

Note 1) The value change gradually.
Note 2) The value in [ ] is for "F" marked items.
The letter in ( ) indicates lead color.

SELF-DIAGNOSING SYSTEM OF TROUBLE (Auto)

Inspection of Ambient Temperature Sensor

1. Turn the ignition to "ACC" position.
2. Read figures indicated on "AMB" indicator.
3. How to judge

   Terminal No. 864 (L/W)

   The letter in ( ) indicates lead color.

   OK – Reasonable ambient temperature

   –49 [–56] * : Open sensor

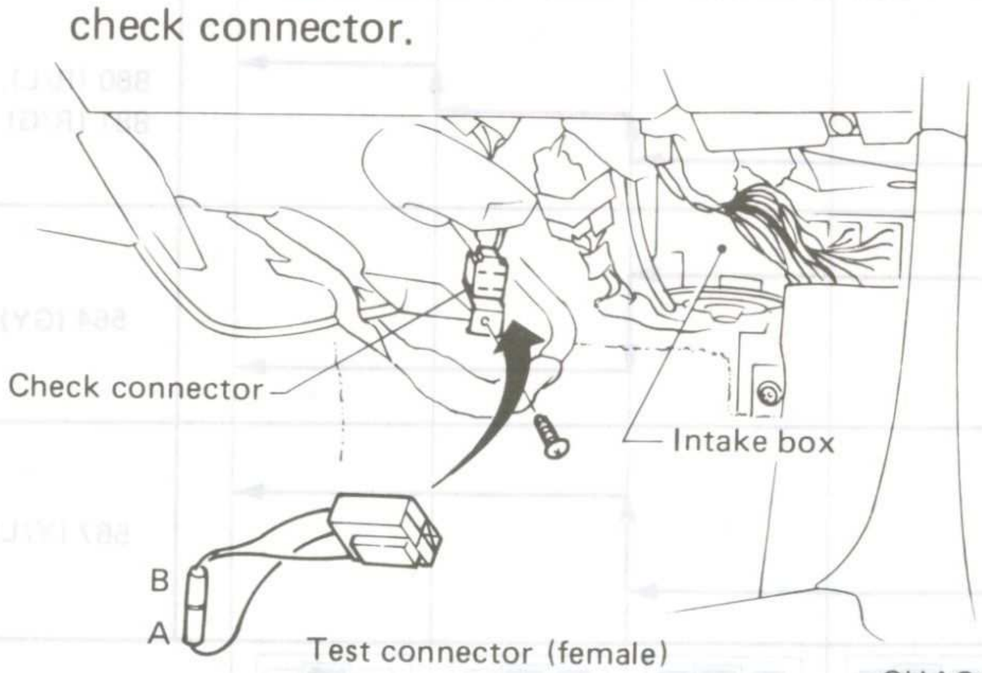
   83 [181] : Shorted sensor

   *Figures in [ ] indicate degrees Fahrenheit.

Inspection of Output System

CHECKING PROCEDURES FOR OPERATION OF ACTUATORS

1. For Input/Output System Test 1 to 4, connect leads A and B, and plug the test connector into check connector.



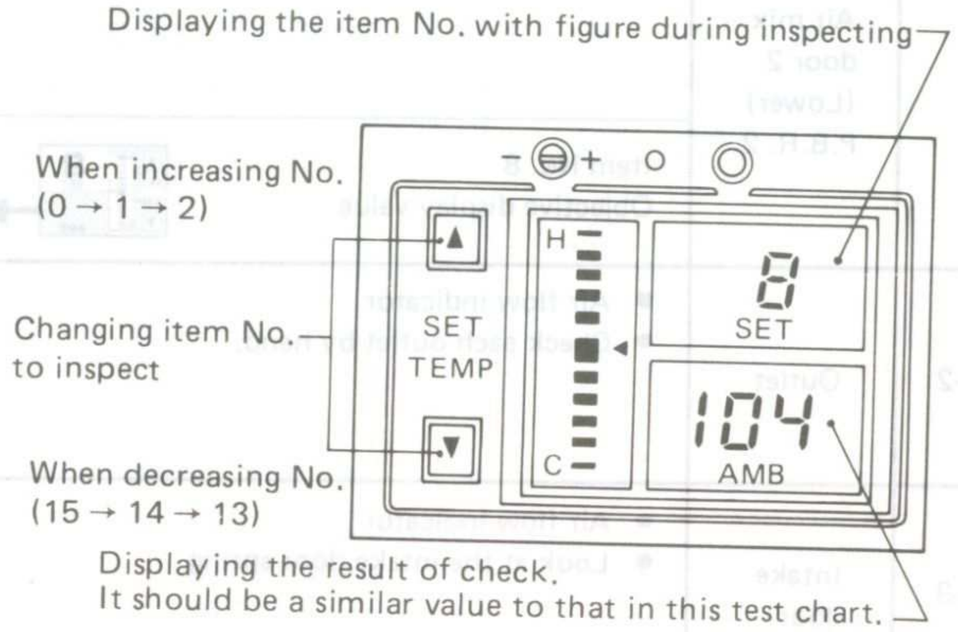
SHA345B

2. Start the engine and press the "ECON/AC" button.
3. Check that output parts operate smoothly using the following chart. (Refer to page HA-68, 69.)

- The way to make sure of the operation of actuators.

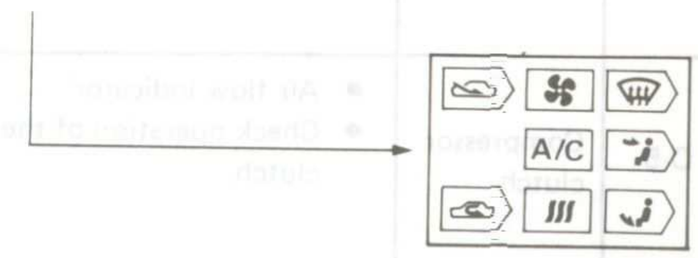
1) By digital indicator

When checking air mix door, set indicated number at 8 or 9 in SET section by pushing SET TEMP. button as shown below and read the displayed value in AMB section.

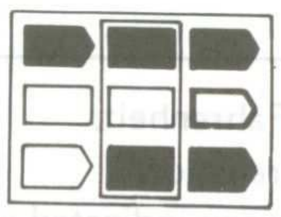


SHA816B

2) By air flow indicator.



SHA812B



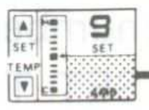
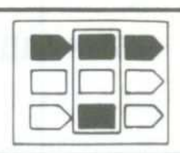
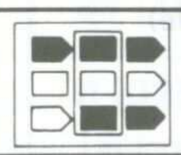
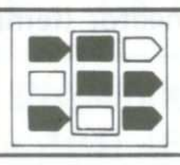
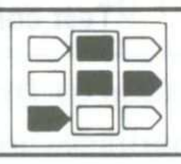
Checking items are displayed in the indicator during inspecting.

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

SELF-DIAGNOSING SYSTEM OF TROUBLE (Auto)

Inspection of Output System (Cont'd)

The following 4 steps can be selected by pushing the OFF Switch.
Step No. increases by pushing the switch (1-push → 2, 2-push → 3, 3-push → 4, 4-push → 1).

Checking item		Procedures of confirming operation		Step No. 1	2	3	4	Terminal No.
O-1	Air mix door 1 (Upper) P.B.R. 1	• Position of air mix door 1	Full Hot / Full Cool	→	→	→	→	882 (W/R), 883 (W/Y)
		Item No. 9 Objective display value 		approx. 40 [104] *	40 [104] *	30 [86] *	20 [68] *	
	Air mix door 2 (Lower) P.B.R. 2	• Position of air mix door 2	Full Hot / Full Cool	→	→	→	→	884 (W/B), 885 (W/L)
		Item No. 8 Objective display value 		approx. 40 [104] *	40 [104] *	30 [86] *	20 [68] *	
O-2	Outlet	• Air flow indicator • Check each outlet by hand.	DEF. / VENT. / B/L / DEMIST	→	→	→	→	DEF/VENT Changeover 887 (R/Y) FOOT Opens/ Closes 886 (R)
O-3	Intake door	• Air flow indicator • Look at the intake door spring	REC. / Partial REC. / Fresh air	→	→	→	→	880 (R/L), 881 (R/G)
O-4	Water cock	• Air flow indicator • Look at the water cock position and check temperature by hand.	ON / OFF	→	→	→	→	564 (GY)
O-5	Compressor clutch	• Air flow indicator • Check operation of the magnet clutch.	ON / OFF	→	→	→	→	567 (Y/L)
Display								

Note:
- Figures in [ ] indicate degrees Fahrenheit.
- The letter in ( ) indicates lead wire color.
- If approx. ±7 difference exists between indicated value and the value in test chart, it is OK.

SHA819B

SELF-DIAGNOSING SYSTEM OF TROUBLE (Auto)

Inspection of Output System (Cont'd)

Blower motor can be checked by the following procedure.
4 steps can be selected by pushing the Lo Switch. Step No. increases by pushing the switch.

Checking item		Procedures of confirming operation	Step No. 1	2	3	4	Terminal No.
O-6	Blower motor	• Air conditioner operation indicator • Touch with each outlet by hand. • Measure the applied voltage of motor.	12 (V) 8.5 6 4				Blower relay 571 (G) Signal for amount of air 568 (G/W)

Note: The letter in ( ) indicates lead wire color.

SHA820B

TROUBLE DIAGNOSES (Auto)

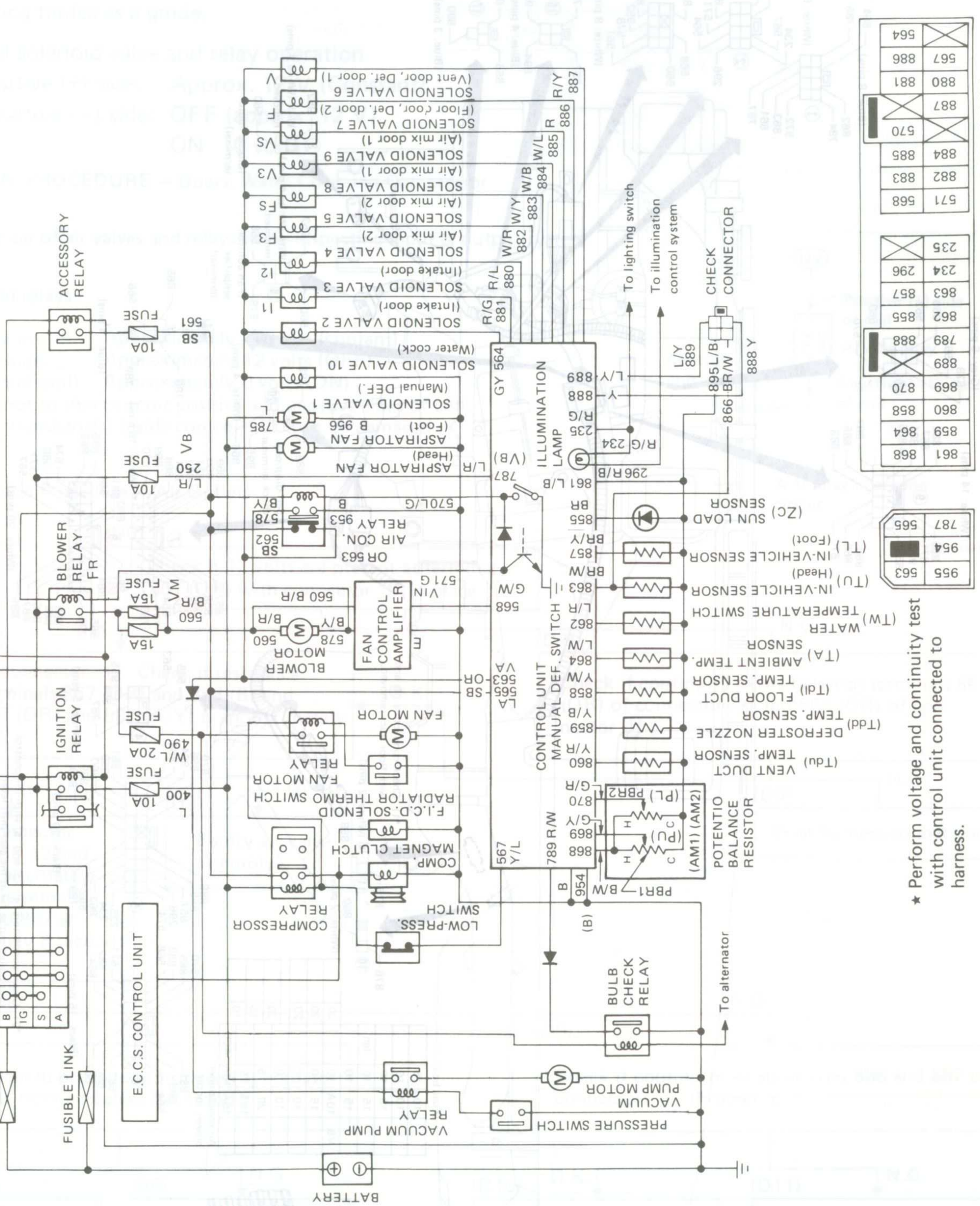
- Except for the following items, refer to MODEL Z31 SERIES SUPPLEMENT-I [FOR AUSTRALIA].

CONTENTS

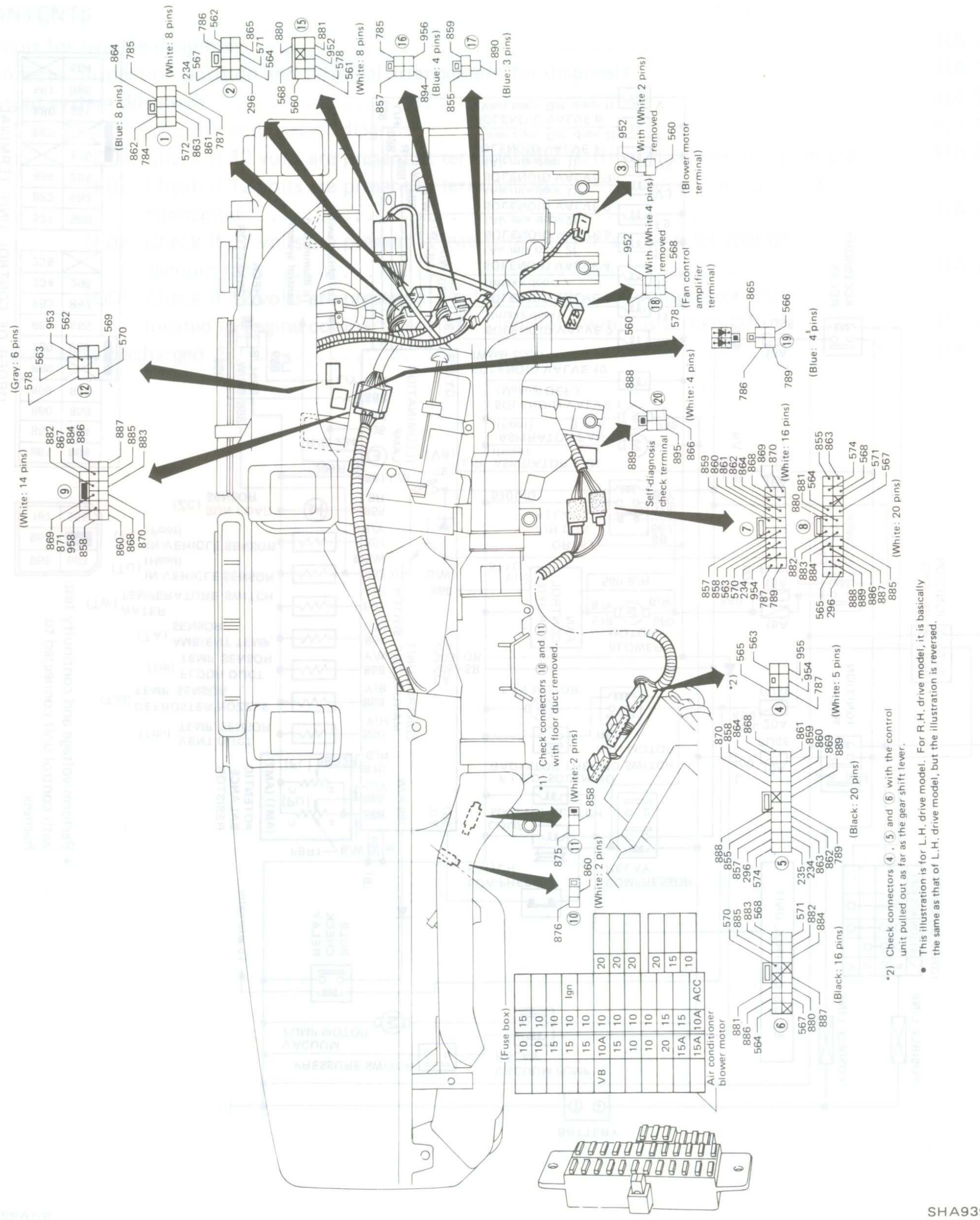
Circuit for trouble diagnoses HA-71
Connector inspection position and terminal arrangement for diagnosis HA-72
Output system diagnosis HA-73
Doors, water cock and compressor diagnosis HA-73
(D0) Check if 12 volts are present at terminal 867 (OR) with connector ⑨ in place HA-73
(E0) Check if 12 volts are present at terminal 561 (OR) when connector ⑮ is connected HA-74
(F0) Check if 12 volts are present at lead wire (OR) of air valve located on vacuum tank HA-75
(G0) Check if 12 volts are present at lead wire (L side) of compressor relay located in engine compartment when ignition switch is turned ON HA-76
No cool air is discharged HA-77

TROUBLE DIAGNOSES (Auto)

Circuit for Trouble Diagnoses



SHA929B



*2) Check connectors ④, ⑤ and ⑥ with the control unit pulled out as far as the gear shift lever.

- This illustration is for L.H. drive model. For R.H. drive model, it is basically the same as that of L.H. drive model, but the illustration is reversed.

SHA939B

1) For inoperative air mix door, refer to MODEL Z31 SERIES SUPPLEMENT-I [FOR AUSTRALIA].
2) Doors, water cock and compressor diagnosis

While checking input, output system, check solenoid valves, relays, vacuum pressure, etc., using the following tables as a guide.

Normal solenoid valve and relay operation

Positive (+) side: Approx. 12 V (Constant)
Negative (−) side: OFF (approx. 12 V)
ON (0 volts)

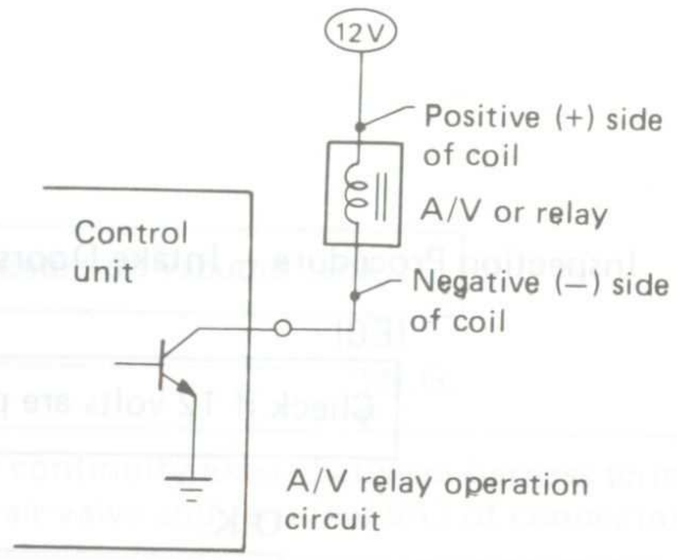
INSPECTION PROCEDURE – Doors, Water Cock and Compressor

Check operation of air valves and relays while inspecting input & output system.

Air valves and relays

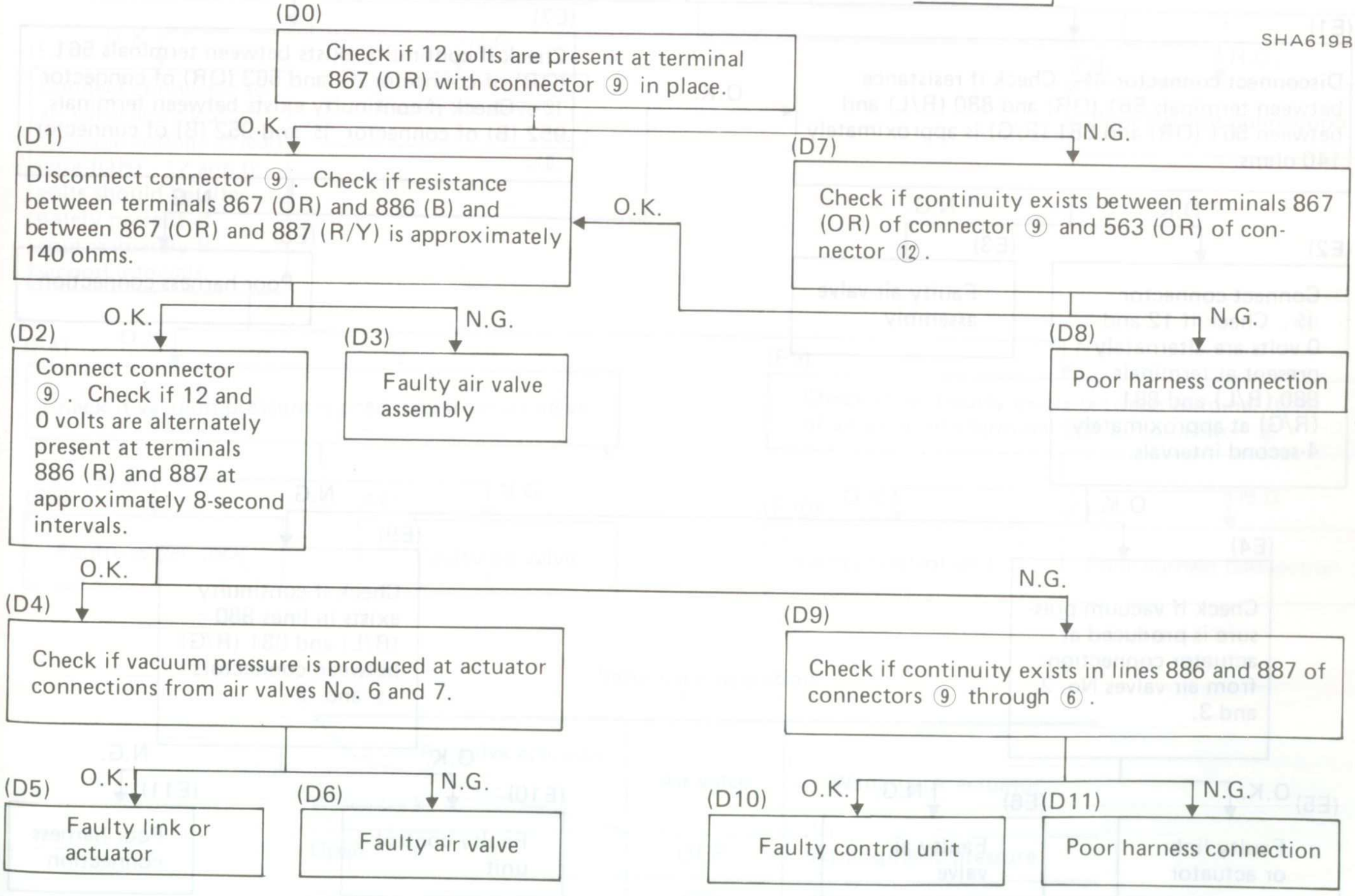
Positive (+) side: Approximately 12 volts (contant)
Negative (−) side: Approximately 12 volts (OFF)
(Downstream of coil): Approximately 0 volts (ON)

★ Be careful not to short-circuit positive and negative sides of coil. Otherwise, transistor(s) inside control unit may be damaged.



SHA619B

2-1 Inspection Procedure – Air Outlets



Mode Door Operation

Mode \ Air valve actuator		Air valve		Actuator		
		No. 6	No. 7	DEF door	VENT door	FLOOR door
Air outlet	DEF	OFF	OFF	Atmospheric pressure		
	VENT	ON	OFF	Vacuum pressure		Atmospheric pressure
	B/L	ON	ON	Vacuum pressure		
	HEAT	OFF	ON	Atmospheric pressure		Vacuum pressure

2-2 Inspection Procedure – Intake Doors

(E0)

Check if 12 volts are present at terminal 561 (OR) when connector ⑮ is connected.

O.K. → (E1)

Disconnect connector ⑮. Check if resistance between terminals 561 (OR) and 880 (R/L) and between 561 (OR) and 881 (R/G) is approximately 140 ohms.

O.K. → (E2)

Connect connector ⑮. Check if 12 and 0 volts are alternately present at terminals 880 (R/L) and 881 (R/G) at approximately 4-second intervals.

O.K. → (E4)

Check if vacuum pressure is produced at actuator connections from air valves No. 2 and 3.

O.K. → (E5) Faulty link or actuator

N.G. → (E6) Faulty air valve

N.G. → (E3) Faulty air valve assembly

N.G. → (E7)

Check if continuity exists between terminals 561 (OR) of connector ⑮ and 563 (OR) of connector ⑫. Check if continuity exists between terminals 952 (B) of connector ⑮ and 952 (B) of connector ③.

O.K. → (E1)

N.G. → (E8) Poor harness connection

N.G. → (E9)

Check if continuity exists in lines 880 (R/L) and 881 (R/G) between connectors ⑮ and ⑥.

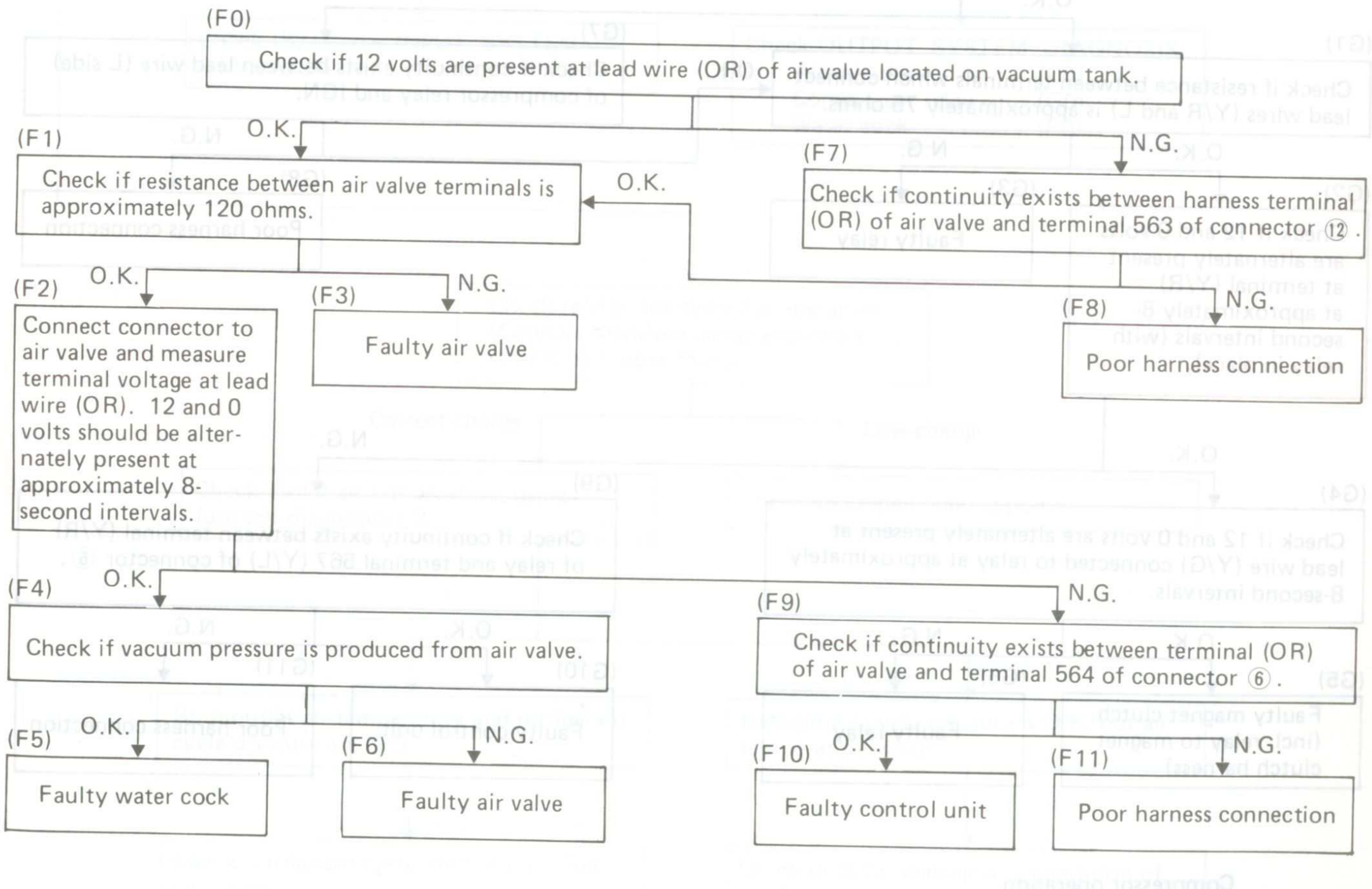
O.K. → (E10) Faulty control unit

N.G. → (E11) Poor harness connection

Intake Door Operation

Mode	Air valve actuator	Air valve No. 3	Air valve No. 2	Double-action actuator (intake door closed)
Air inlet	Inside air	ON	ON	Vacuum pressure (at 1st and 2nd positions)
	Inside-outside air	ON	OFF	Vacuum pressure (at 1st position)
	Outside air	OFF	OFF	Atmospheric pressure

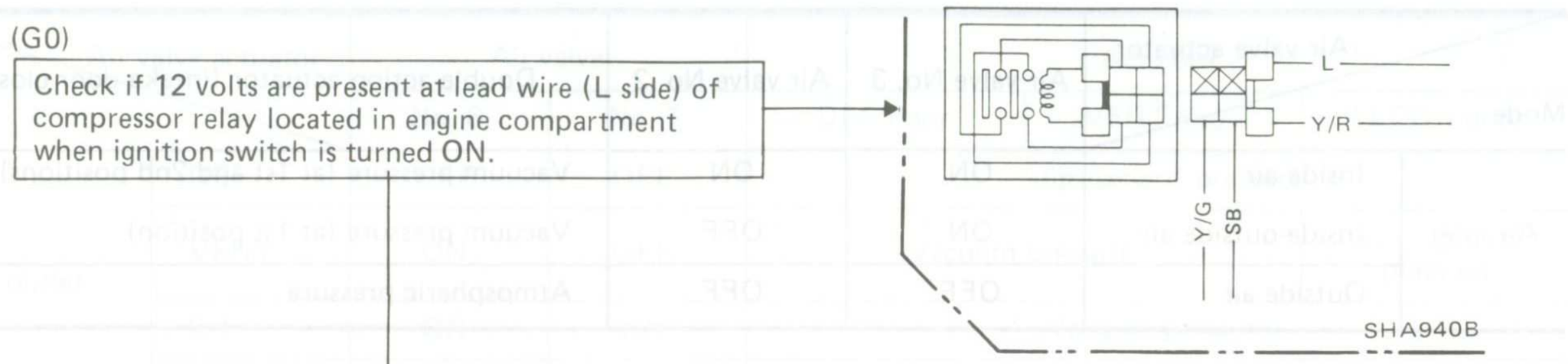
2-3 Inspection Procedure — Water Cock



Water cock operation

Water cock \ Air valve actuator	Air valve	Water cock actuator
Open	OFF	Atmospheric pressure
Close	ON	Vacuum pressure

2-4 Inspection Procedure — Compressor



(G0)

Check if 12 volts are present at lead wire (L side) of compressor relay located in engine compartment when ignition switch is turned ON.

O.K. → (G1)

(G1) Check if resistance between terminals which connect lead wires (Y/R and L) is approximately 75 ohms.

O.K. → (G2)

(G2) Check if 12 and 0 volts are alternately present at terminal (Y/R) at approximately 8-second intervals (with relay in place).

O.K. → (G4)

(G4) Check if 12 and 0 volts are alternately present at lead wire (Y/G) connected to relay at approximately 8-second intervals.

O.K. → (G5)

(G5) Faulty magnet clutch (incl. relay to magnet clutch harness)

N.G. → (G6)

(G6) Faulty relay

N.G. → (G9)

(G9) Check if continuity exists between terminal (Y/R) of relay and terminal 567 (Y/L) of connector ⑥.

O.K. → (G10)

(G10) Faulty control unit

N.G. → (G11)

(G11) Poor harness connection

N.G. → (G3)

(G3) Faulty relay

N.G. → (G7)

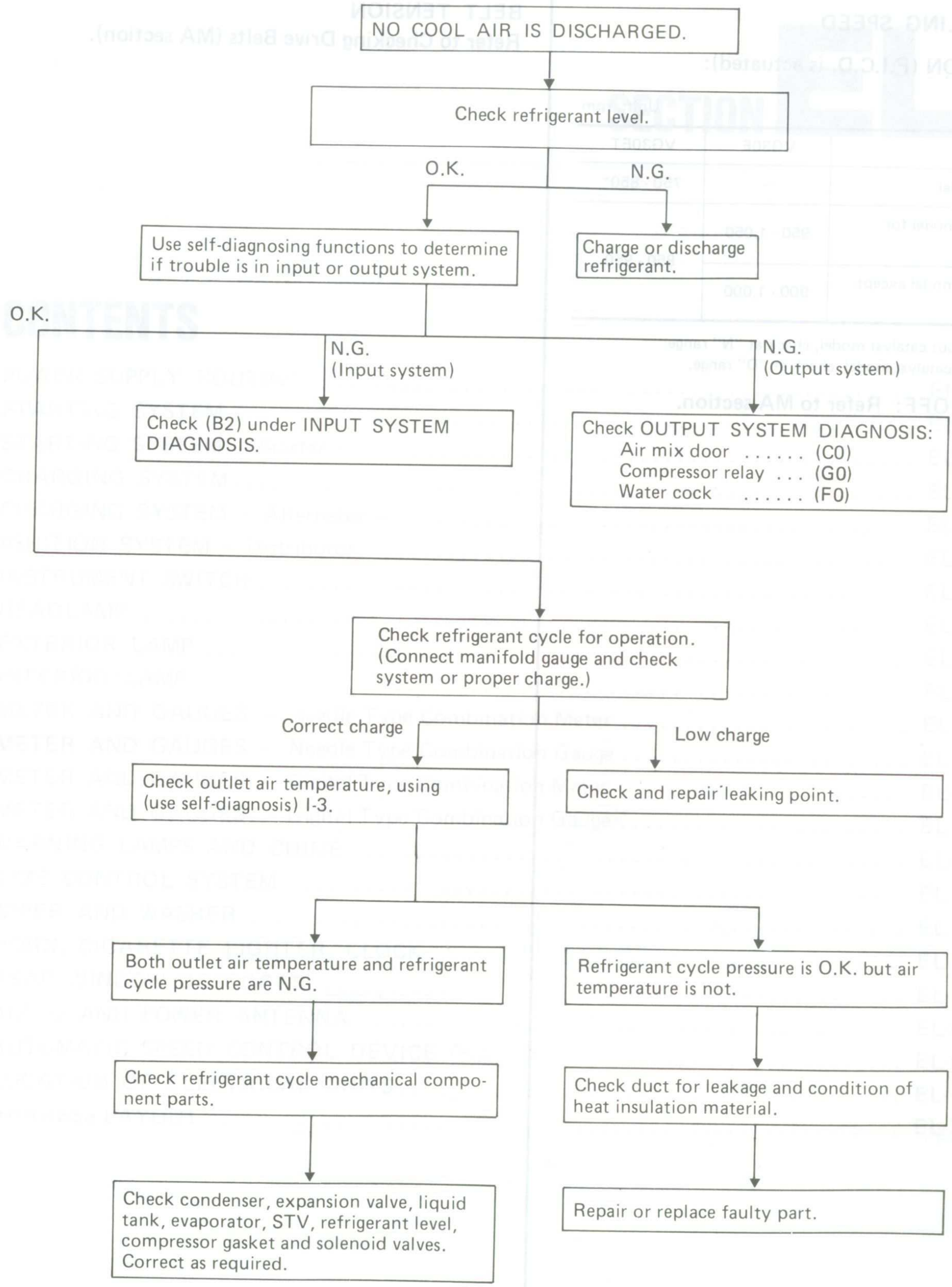
(G7) Check if continuity exists between lead wire (L side) of compressor relay and IGN.

O.K. → (G8)

(G8) Poor harness connection

Compressor operation

	Relay
Compressor ON	ON
Compressor OFF	OFF


NO COOL AIR IS DISCHARGED.
Check refrigerant level.
O.K.
N.G.
Use self-diagnosing functions to determine if trouble is in input or output system.
Charge or discharge refrigerant.
O.K.
N.G. (Input system)
N.G. (Output system)
Check (B2) under INPUT SYSTEM DIAGNOSIS.
Check OUTPUT SYSTEM DIAGNOSIS:
Air mix door ..... (C0)
Compressor relay ... (G0)
Water cock ..... (F0)
Check refrigerant cycle for operation. (Connect manifold gauge and check system or proper charge.)
Correct charge
Low charge
Check outlet air temperature, using (use self-diagnosis) I-3.
Check and repair leaking point.
Both outlet air temperature and refrigerant cycle pressure are N.G.
Refrigerant cycle pressure is O.K. but air temperature is not.
Check refrigerant cycle mechanical component parts.
Check duct for leakage and condition of heat insulation material.
Check condenser, expansion valve, liquid tank, evaporator, STV, refrigerant level, compressor gasket and solenoid valves. Correct as required.
Repair or replace faulty part.

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

General Specifications

ENGINE IDLING SPEED

When A/C is ON (F.I.C.D. is actuated):

Unit: rpm

	VG30E	VG30ET
With catalyst model	—	750 - 850*
Without catalyst model for Europe	950 - 1,050	850 - 950
Without catalyst model except for Europe	900 - 1,000	

- For A/T without catalyst model, check at "N" range.
*: For A/T with catalyst model, check at "D" range.

When A/C is OFF: Refer to MA section.

Inspection and Adjustment

BELT TENSION

Refer to Checking Drive Belts (MA section).