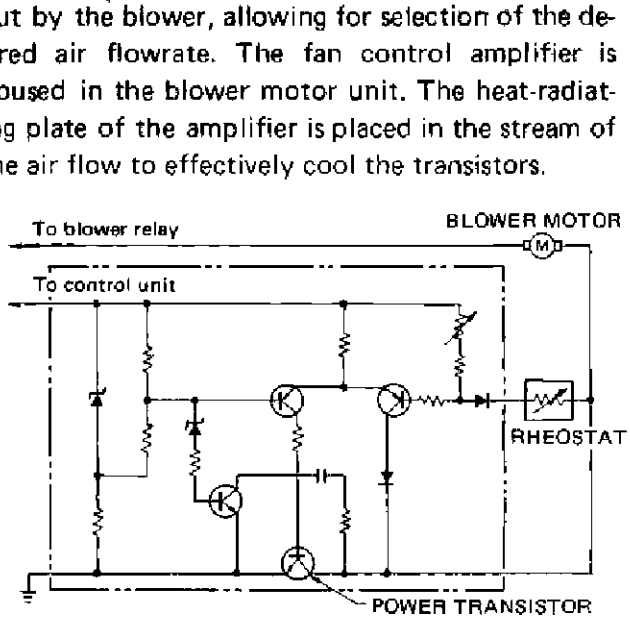
HEATER & AIR CONDITIONER

SECTION HA

CONTENTS

Continuously Variable Air Flow Control

The fan control amplifier, which utilizes transistor circuits, continuously controls the air flow blown out by the blower, allowing for selection of the desired air flowrate. The fan control amplifier is housed in the blower motor unit. The heat-radiating plate of the amplifier is placed in the stream of the air flow to effectively cool the transistors.

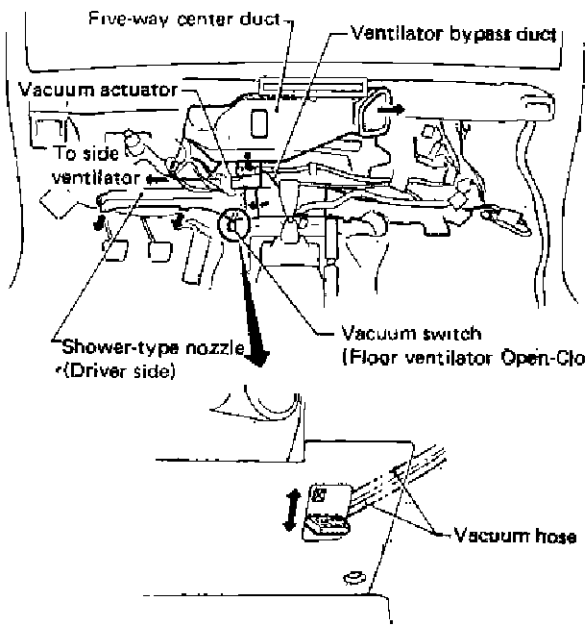


FAN CONTROL AMPLIFIER

SHA255B

Device for Distributing Cool Air to the Feet during "FACE MODE"

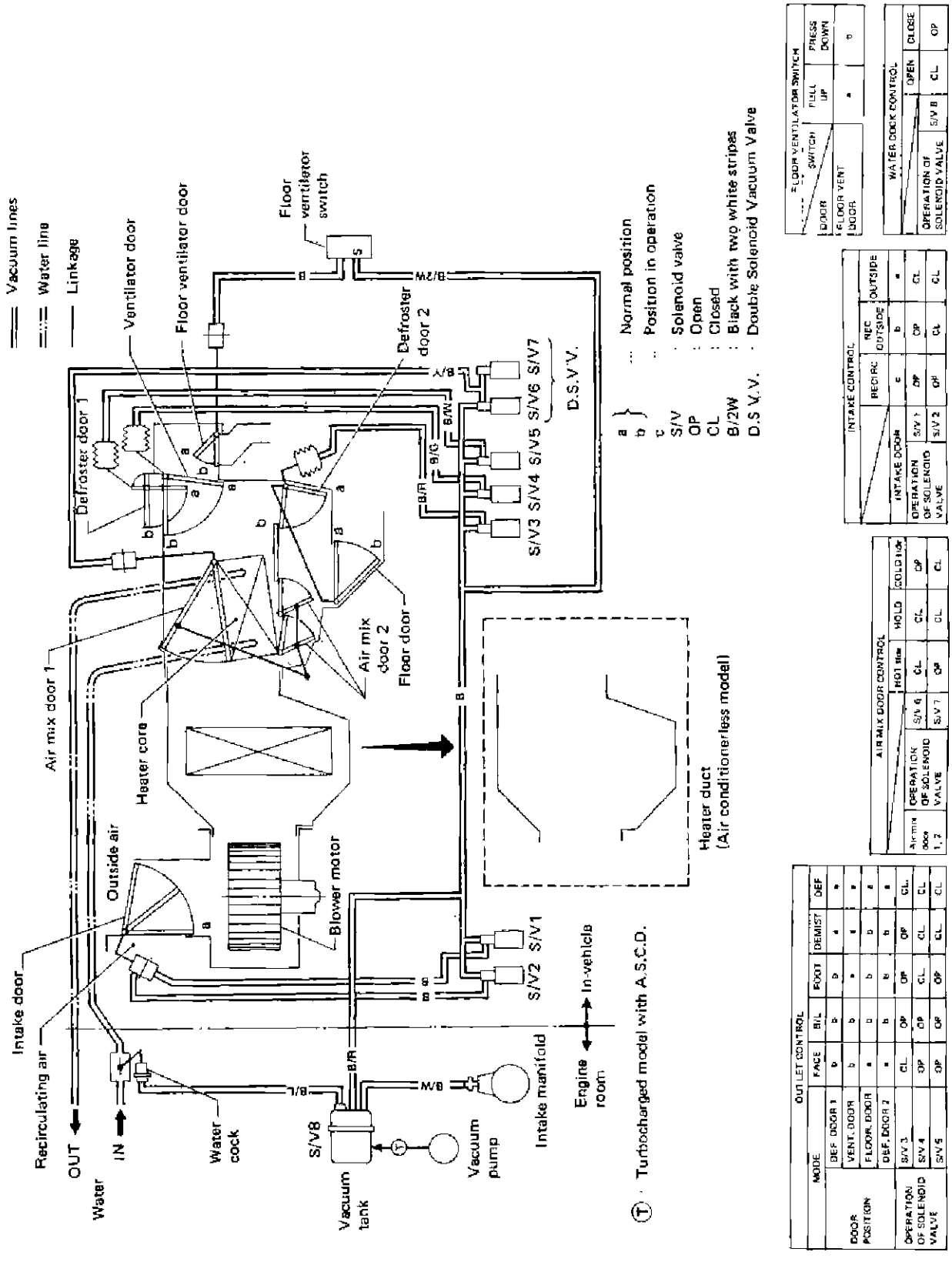
A vacuum actuator is used in the cool-air distribution device to remove the hot air directed to the floor area and distribute the optimum air temperature to the driver's compartment. When the vacuum switch is turned "ON", part of the outside air (or: part of the cool air on models equipped with air conditioning systems) taken in the vehicle is bypassed to the shower duct on the driver's side through the operation of the actuator.



SHA23

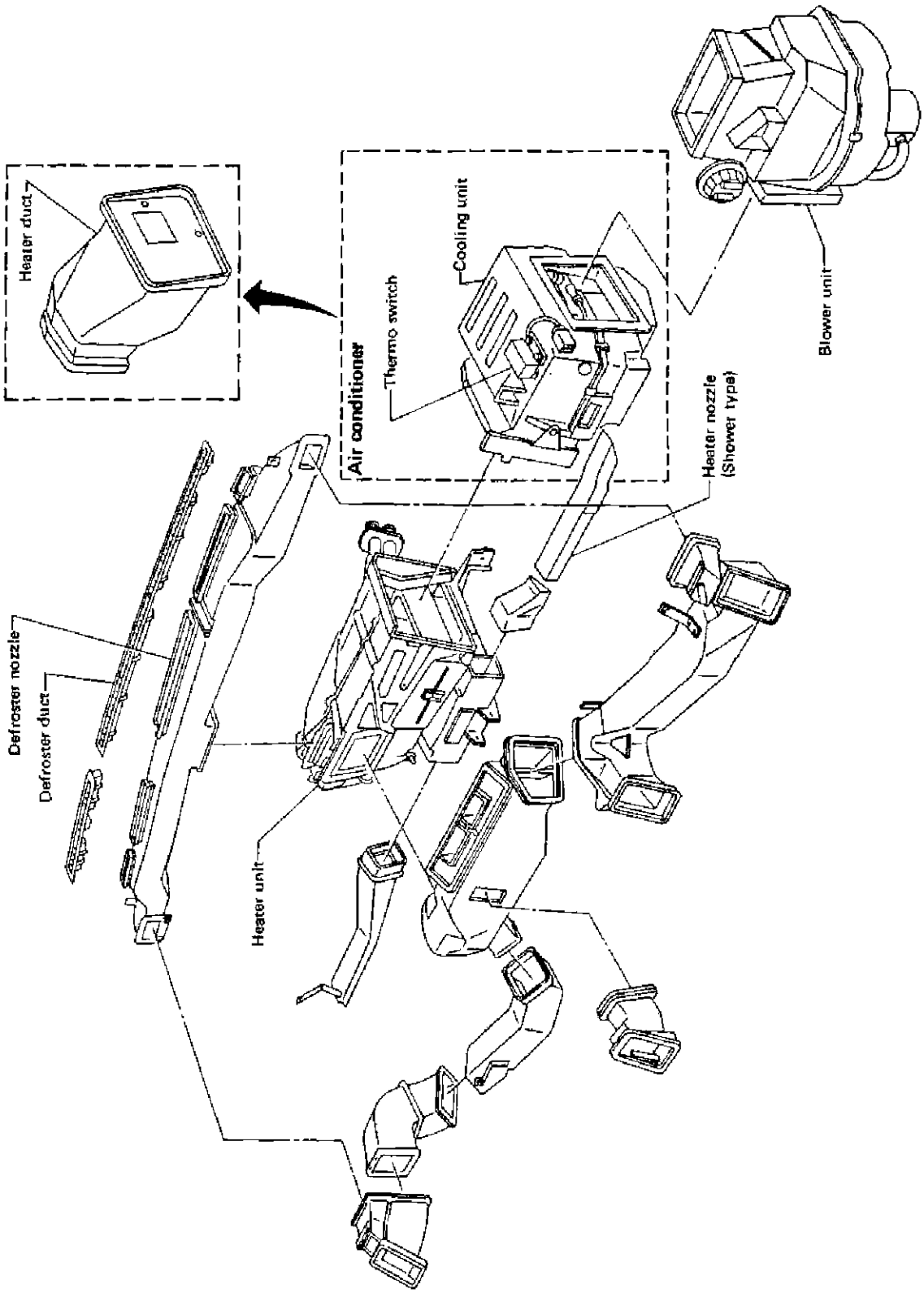
AIR FLOW AND COMPONENT LAYOUT (Manual)

Air Flow



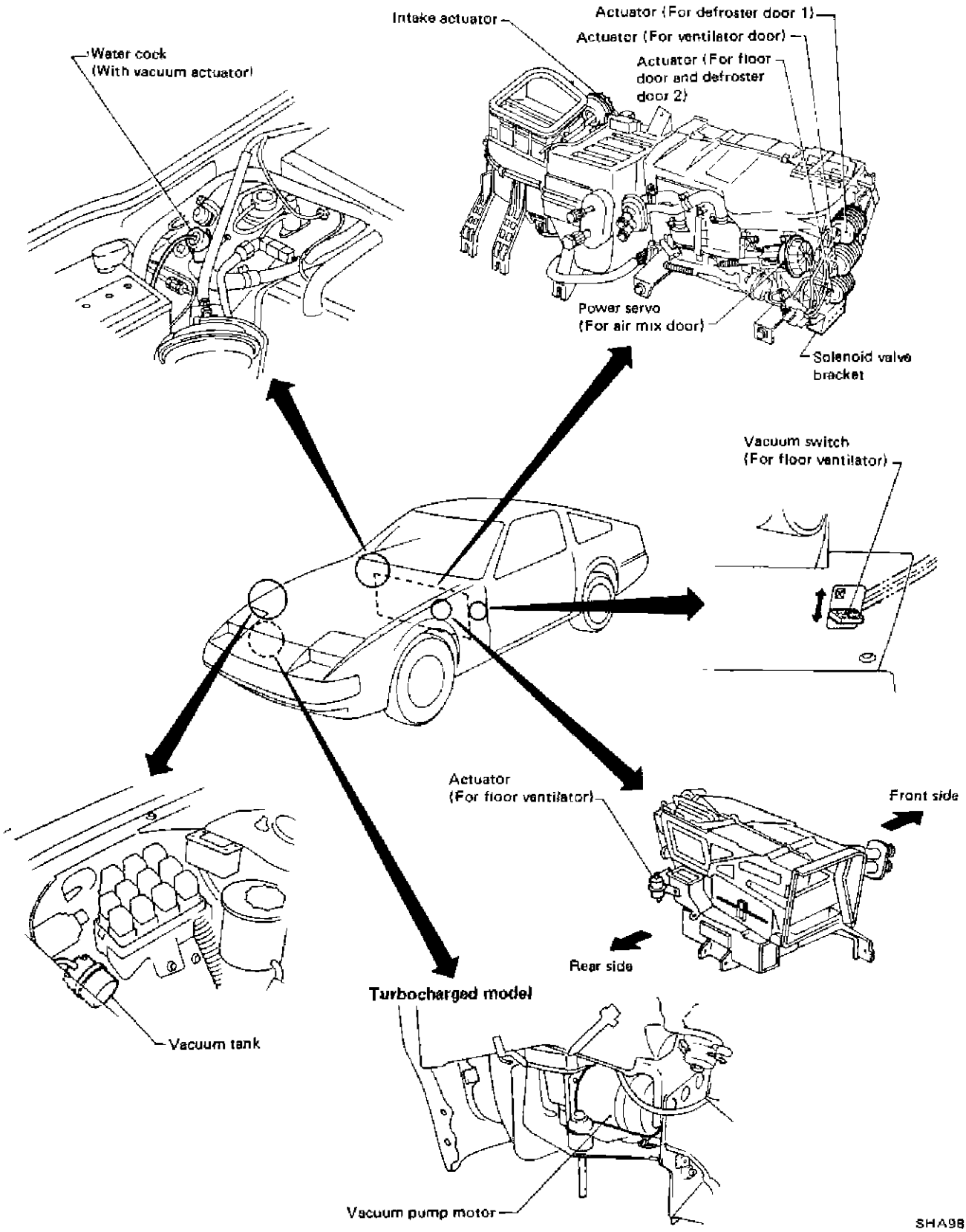
SHA231B

Component Layout



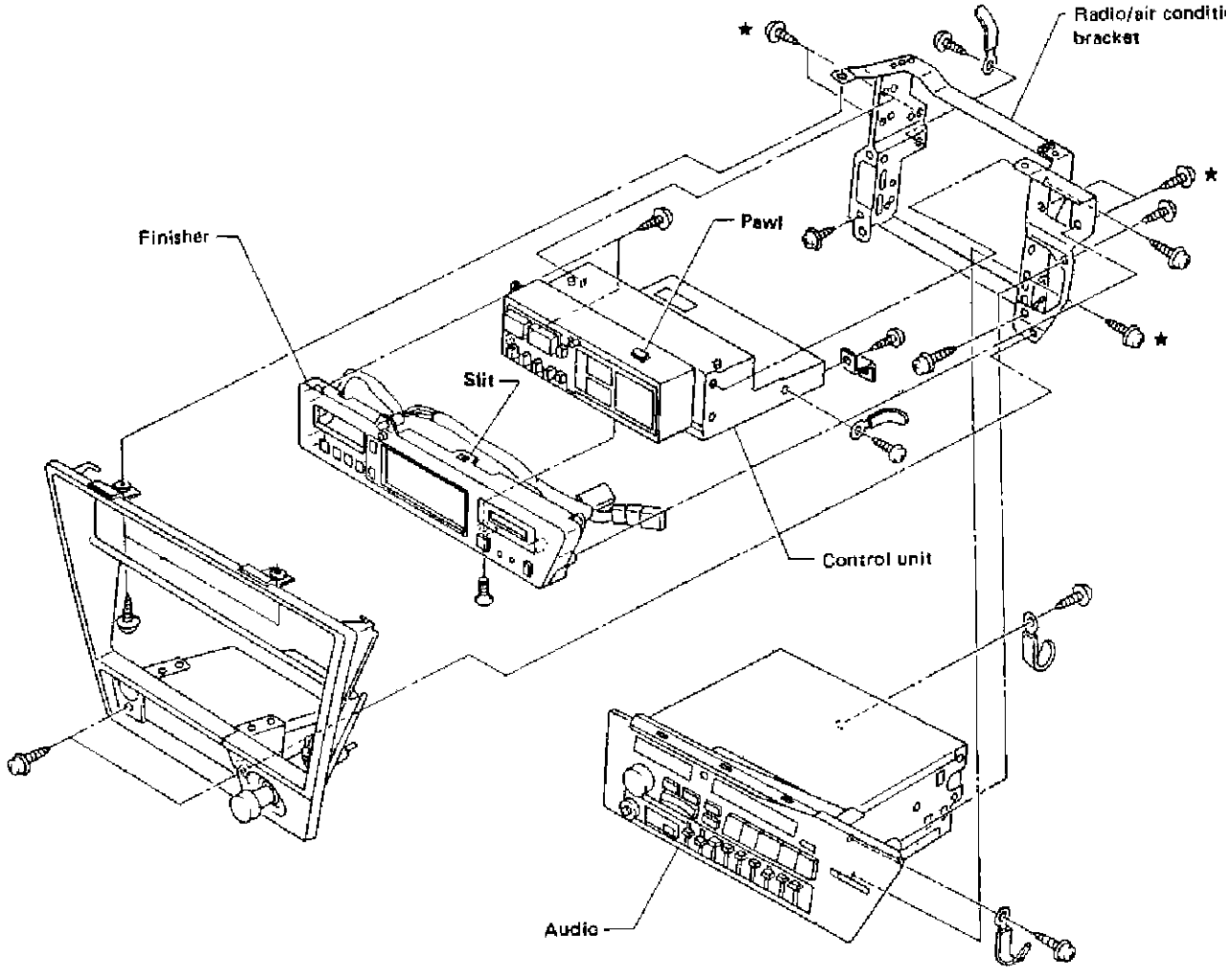
SHA79

LOCATION OF VACUUM COMPONENTS (Manual)



CONTROL

Heater and Air Conditioner Control Removal

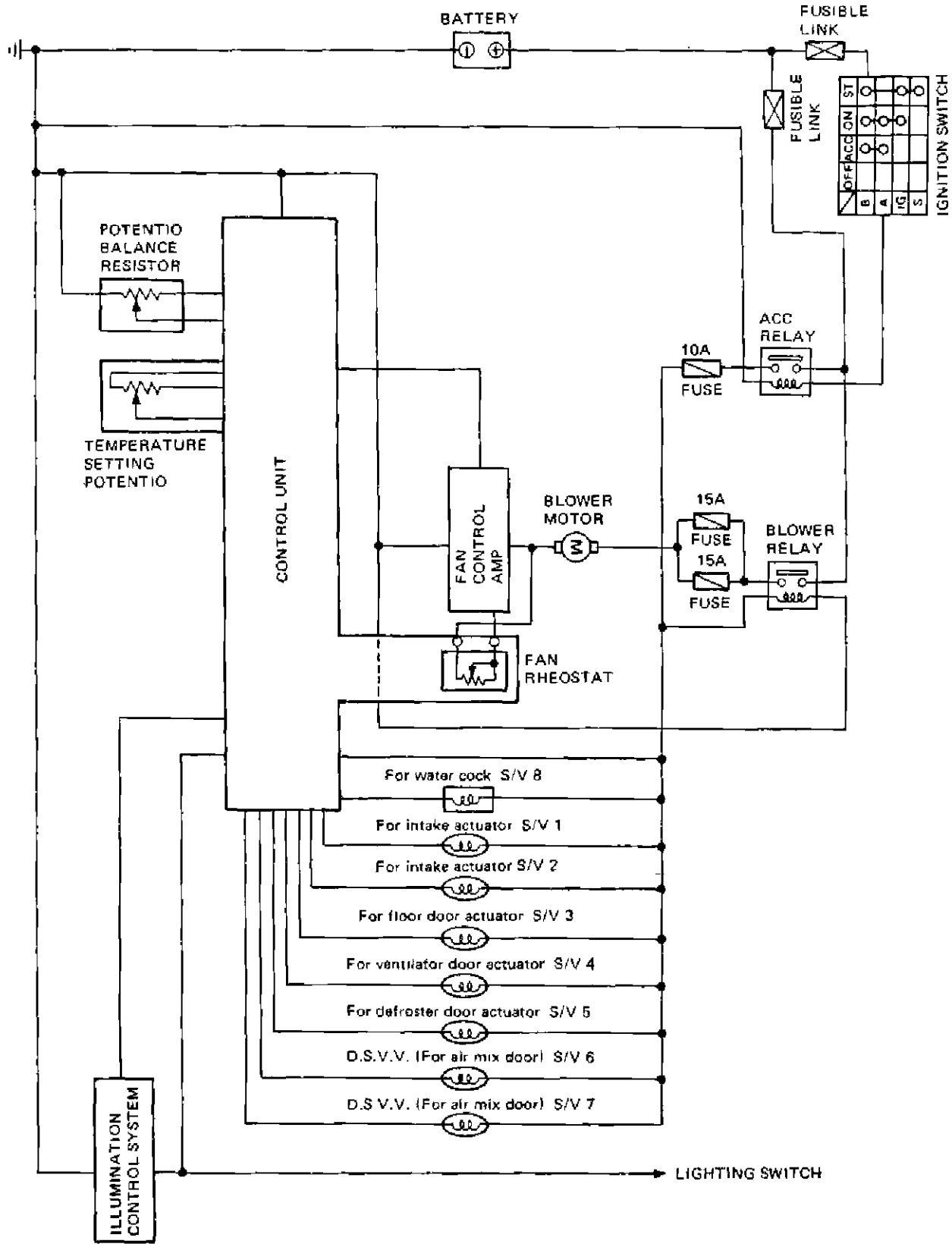


★: Heater and air conditioner control assembly mounting bolts

SHA981

HEATER ELECTRICAL CIRCUIT

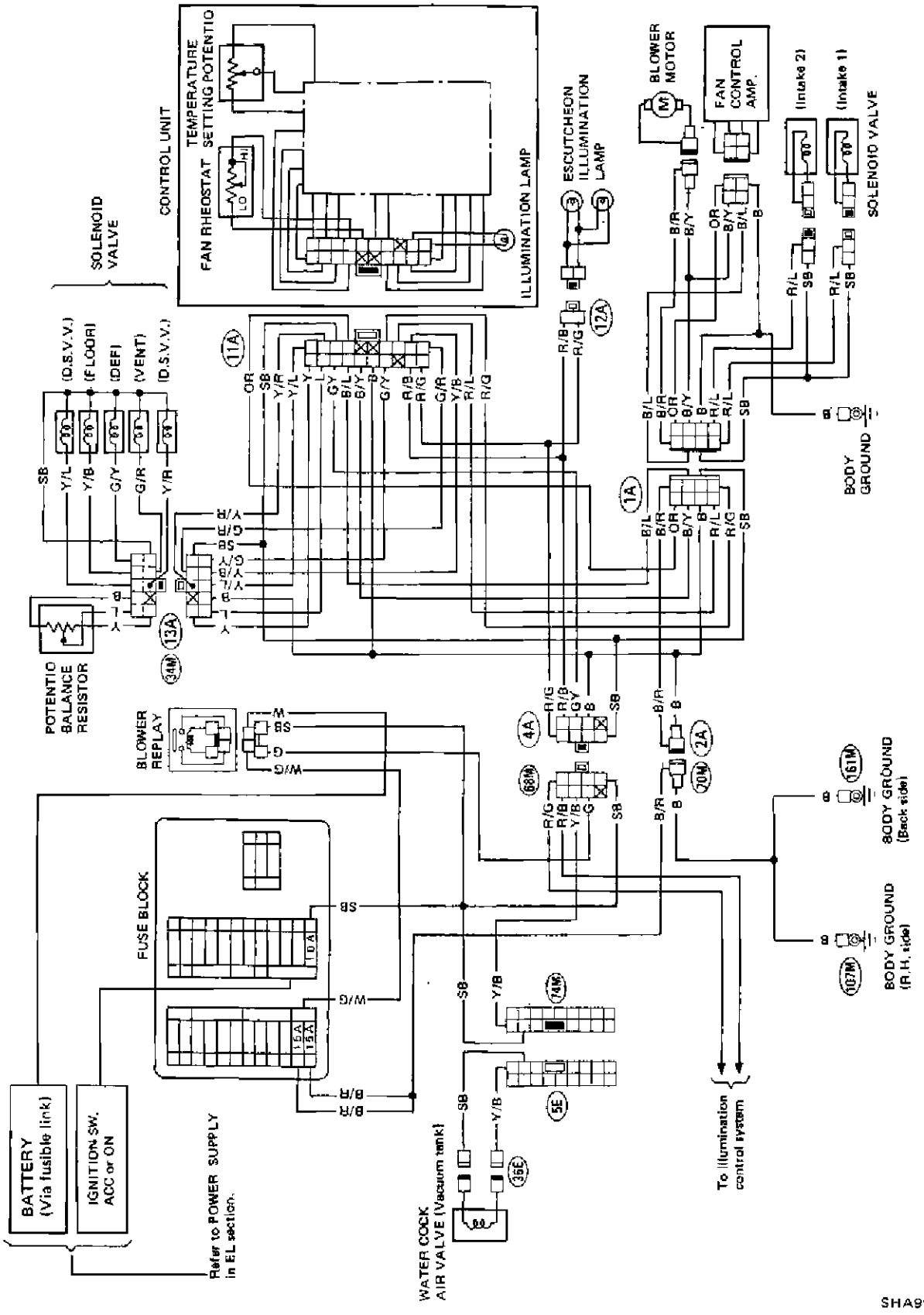
Schematic



SHA417B

HEATER ELECTRICAL CIRCUIT

Wiring Diagram



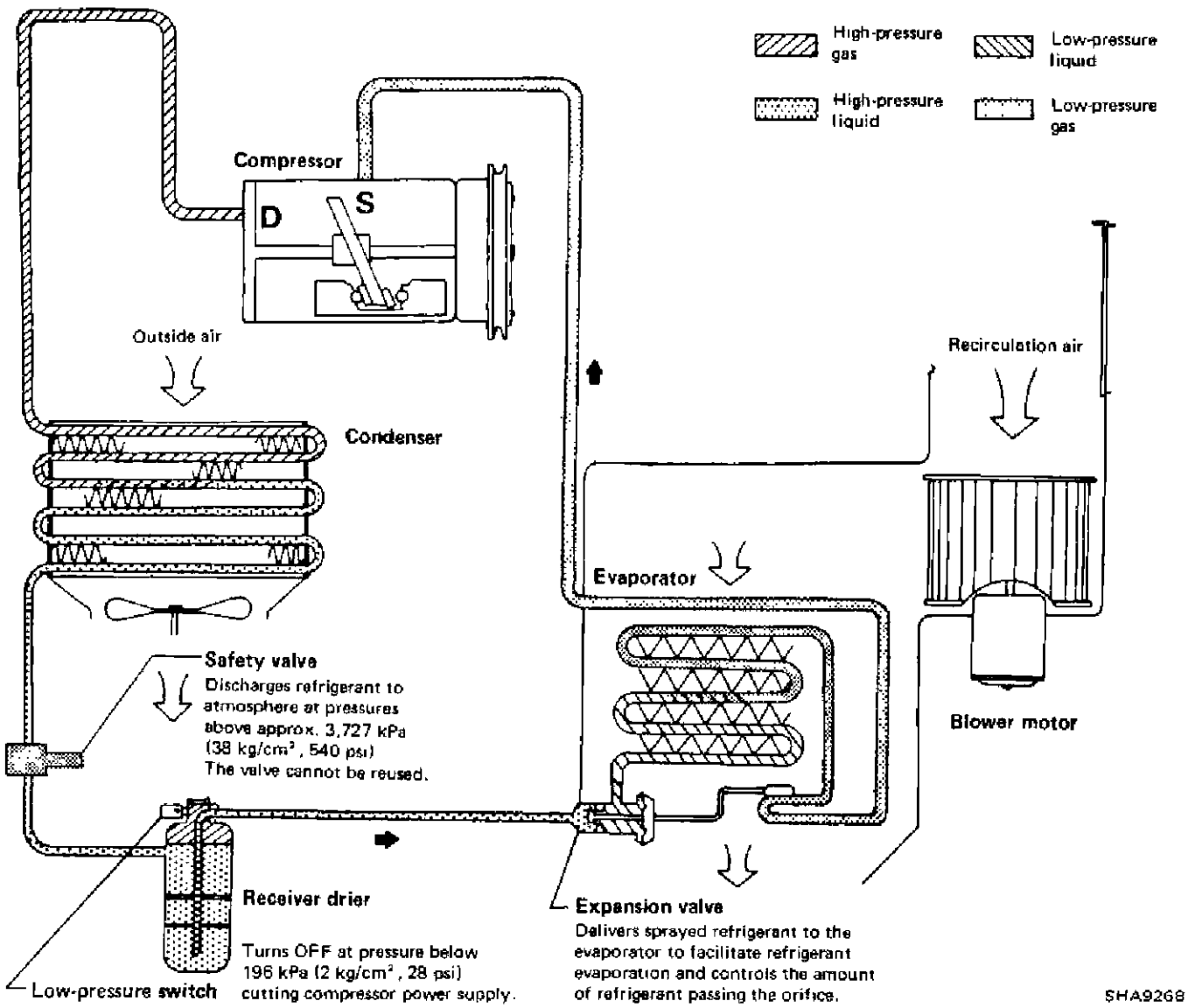
Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the evaporator, and back to the compressor.
The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION — Compressor control

The compressor cycles on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.
The refrigerant system is protected against excessively high pressure by a pressure relief valve located between the receiver drier and the condenser. Protection against excessively low pressure (interruption of compressor operation) is provided by a low pressure switch, located on the receiver drier.

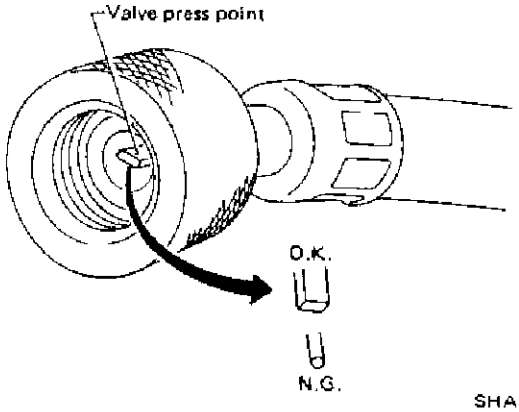


DISCHARGING, EVACUATING, CHARGING AND CHECKING

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.

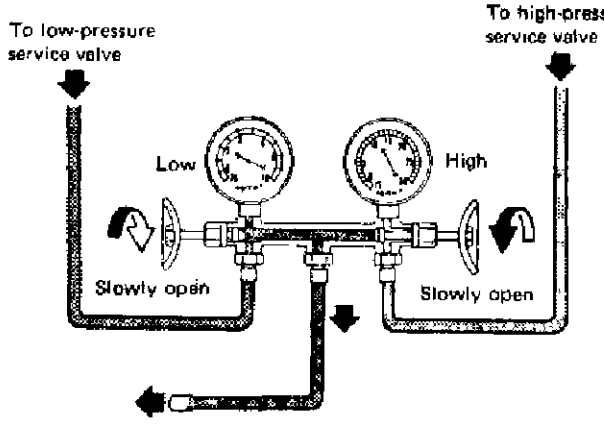


SHA919A

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

Discharging

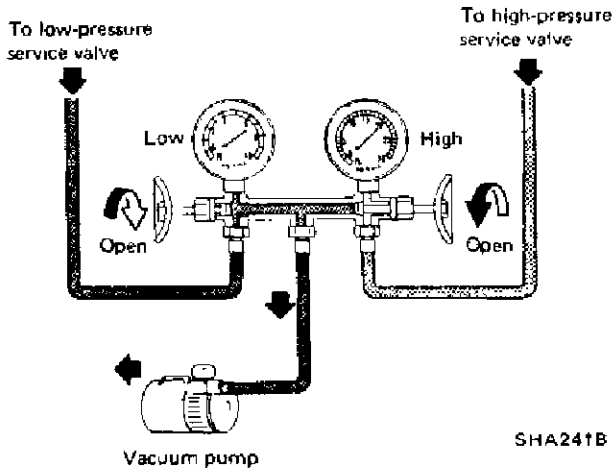
Slowly open the valves to discharge only refrigerant. If they are opened quickly, compressor oil will also be discharged.



SHA24

Evacuating the System—Step one

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



2. When low gauge has reached approx. 101.3 kPa (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 (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 (mmHg, inHg)
0 (0)	101.3 (760, 29.92)
300 (1,000)	98.0 (735, 28.94)
600 (2,000)	94.6 (710, 27.95)
900 (3,000)	91.3 (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 (25 mmHg, 0.98 inHg) in five minutes.

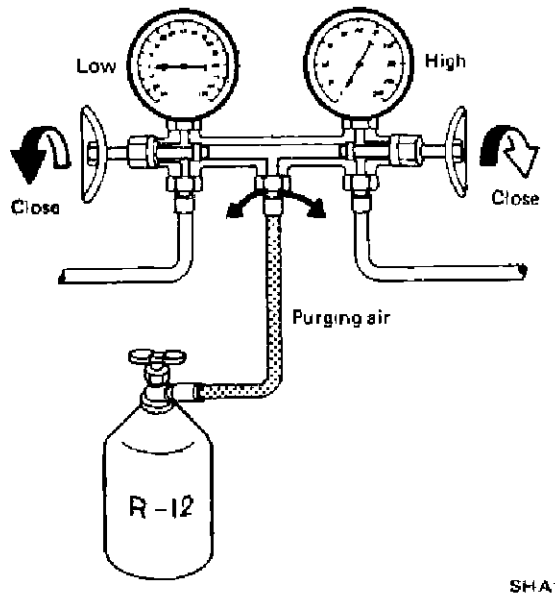
Charging—Step one

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.

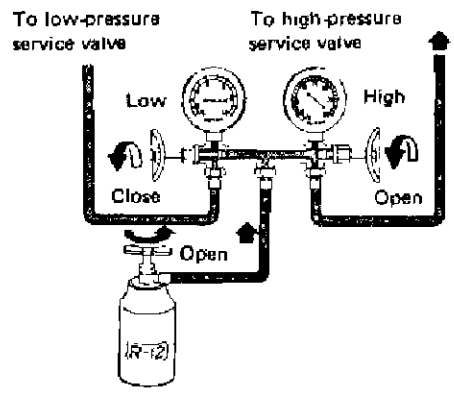


4. Charge refrigerant into system.

WARNING:

Ensure that engine is off.

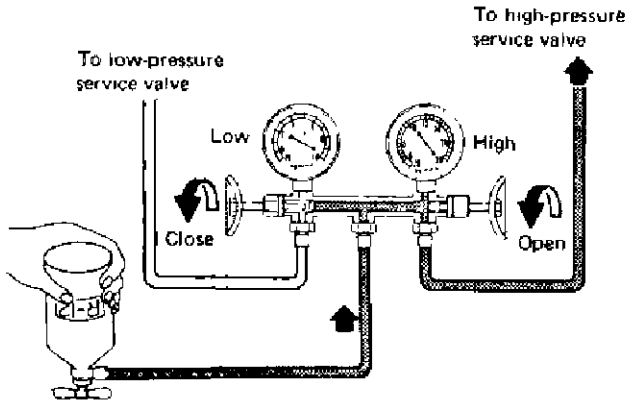
1) Open high-pressure valve of manifold gauge and charge refrigerant into system.



DISCHARGING, EVACUATING, CHARGING AND CHECKING

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.

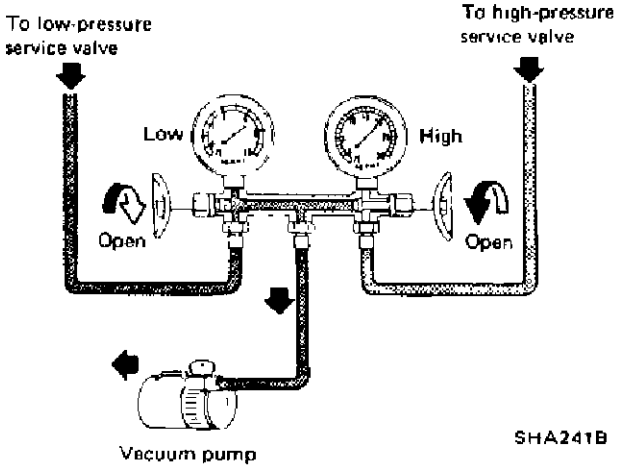


SHA244B

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

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.

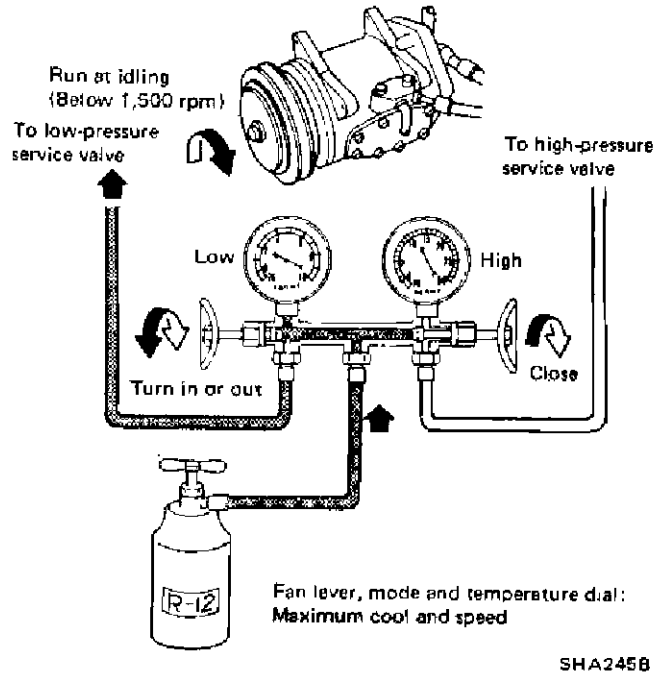


SHA241B

Charging—Step two

Refer to "Changing—step one" of Nos. 2 through 4.

4. When refrigerant charging speed slows down, close high-pressure valve of manifold gauge and 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)

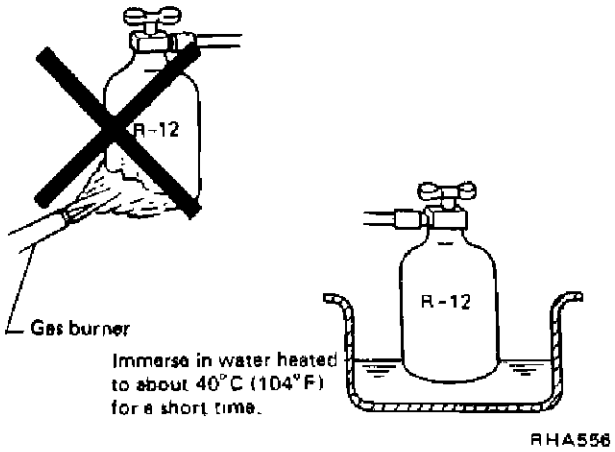
6. Charge refrigerant while controlling low-pressure gauge reading at 275 kPa (2.8 kg/cm², 40 psi) or less by turning in or out low-pressure valve of manifold gauge.

- **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).

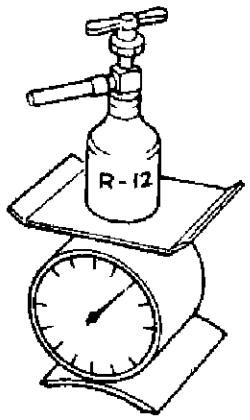
WARNING:
Do not heat can directly. There is danger of it exploding.



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 whether the amount of charged refrigerant is small or not. 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 refrigerant charging is performed with a charging cylinder, charging station, or automatic charging equipment, engine off, charge only through high side, after specified refrigerant amount has entered the system, close high pressure valve on gauge set. Start engine return to idle speed, operate A/C at maximum temperature setting, high blower. Observe sight glass to confirm complete charge.

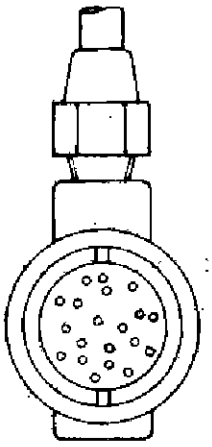
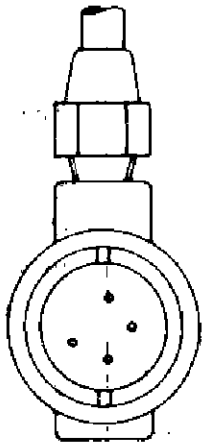
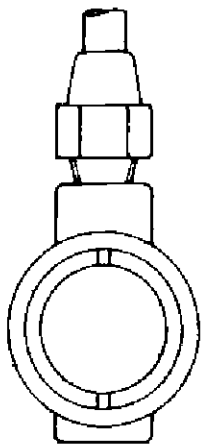
Overcharging will result in increased high pressures, and reduced performance.

DISCHARGING, EVACUATING, CHARGING AND CHECKING

Checking Refrigerant Level

CONDITION

- Door window: Open
- A/C switch: ON
- TEMP. lever position: Max. COLD
- FAN lever position: 4
- Check sight glass after a lapse of about fi minutes.

Check item \ Amount of refrigerant	Almost no refrigerant	Insufficient	Suitable	Too much refrigerant
Temperature of high pressure and low pressure lines.	Almost no difference between high pressure and low pressure side temperature.	High pressure side is warm and low pressure side is fairly cold.	High pressure side is hot and low pressure side is cold.	High pressure side is abnormally hot.
State in sight glass.	Bubbles flow continuously. **Bubbles will disappear and something like mist will flow when refrigerant is nearly gone.**	The bubbles are seen at intervals of 1 - 2 seconds.	Almost transparent. Bubbles may appear when engine speed is raised and lowered. **No clear difference exists between these two conditions.**	No bubbles can be seen.
	 AC256	 AC257	 AC258	
Pressure of system.	High pressure side is abnormally low.	Both pressure on high and low pressure sides are slightly low.	Both pressures on high and low pressure sides are normal.	Both pressures on high and low pressure sides are abnormally high.
Repair	Stop compressor immediately and conduct an overall check.	Check for gas leakage, repair as required, replenish and charge system.		Discharge refrigerant from service valve of low pressure side.

a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to show up in comparatively low temperatures below 20°C (68°F), it is possible that a slightly larger amount of refrigerant would be filled, if supplied according to the sight glass. Be sure to recheck the amount when it exceeds 20°C (68°F). In higher temperature the bubbles are easy t show up.

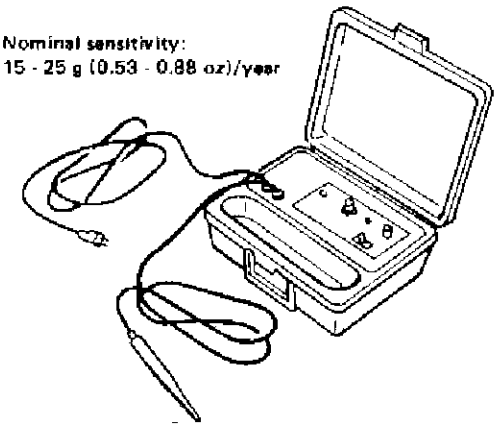
b. When the screen in the receiver drier is clogge the bubbles will appear even if the amount refrigerant is normal. In this case, the outl side pipe of the receiver drier becomes consi erably cold.

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.



SHA733A

GENERAL PRECAUTIONS FOR HANDLING LEAK DETECTOR

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

As to check cooling unit, wait for 10 seconds or more.

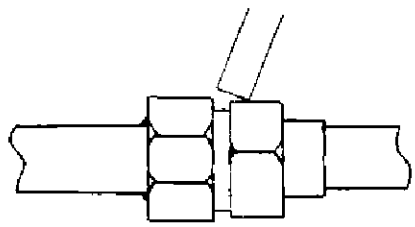
WARNING:

As detector's meter moves even slightly, keep the probe as still as possible for one more minute.

NOTICE:

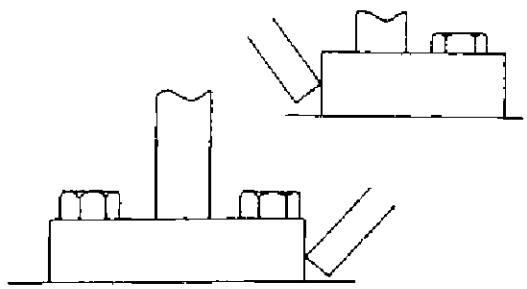
When fixing single bolt flange, place the probe on opposite side of the fitting.

UNION TYPE



RHA279

PLATE TYPE



RHA280

MEASUREMENT STANDARD

If any reaction is noted using a detector having a nominal sensitivity of 15 to 25 g (0.53 to 0.88 oz)/year, that portion found leaking 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 any trace of oil is noted at and around connection fittings, it is a sure indication that refrigerant is leaking.

A/C PERFORMANCE TEST (Manual)

Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location:	Indoors or in the shade (in a well ventilated place)
Doors:	Closed
Door window:	Open
Hood:	Open
TEMP. lever position:	Max. COLD
Mode switch position:	(Face)
Recirculation switch position:	RECIRC. ON
FAN speed:	MAX. HI
Engine speed:	1,500 rpm
Time required before starting testing after air conditioner starts operating:	More than 10 minutes

TEST READING

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	At temperature °C (°F)	
50 - 60	20 (68)	4.5 - 5.0 (40 - 41)
	25 (77)	8.6 - 9.5 (47 - 49)
	30 (86)	12.7 - 14.1 (55 - 57)
	35 (95)	16.7 - 18.6 (62 - 65)
	40 (104)	20.8 - 23.1 (69 - 74)
60 - 70	20 (68)	5.0 - 5.5 (41 - 42)
	25 (77)	9.5 - 10.5 (49 - 51)
	30 (86)	14.1 - 15.5 (57 - 60)
	35 (95)	18.6 - 20.5 (65 - 69)
	40 (104)	23.1 - 25.4 (74 - 78)

Performance Chart (Cont'd)

Ambient air temperature to compressor pressure table

Ambient air		High pressure (Discharge side) kPa (kg/cm^2, psi)	Low pressure (Suction side) kPa (kg/cm^2, psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	853 - 1,049 (8.7 - 10.7, 124 - 152)	59 - 78 (0.6 - 0.8, 9 - 11)
	25 (77)	1,040 - 1,275 (10.6 - 13.0, 151 - 185)	88 - 108 (0.9 - 1.1, 13 - 16)
	30 (86)	1,216 - 1,491 (12.4 - 15.2, 176 - 216)	108 - 137 (1.1 - 1.4, 16 - 20)
	35 (95)	1,393 - 1,706 (14.2 - 17.4, 202 - 247)	137 - 167 (1.4 - 1.7, 20 - 24)
	40 (104)	1,579 - 1,932 (16.1 - 19.7, 229 - 280)	157 - 196 (1.6 - 2.0, 23 - 28)

a. The pressure will change in the following manner with changes in conditions:
- When blower speed is low, discharge pressure will drop.
- When the relative humidity of intake air is low, discharge pressure will drop.

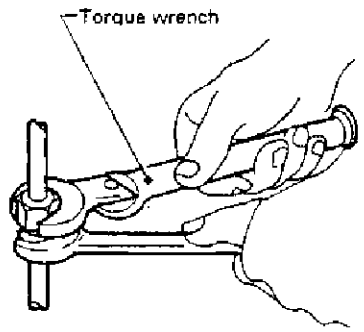
b. The temperature will change in the following manner with changes in conditions:
When the ambient air temperature is low, the outlet air temperature will become low.

WARNING:

Gradually loosen discharge side hose fitting, and remove it after remaining pressure has been released.

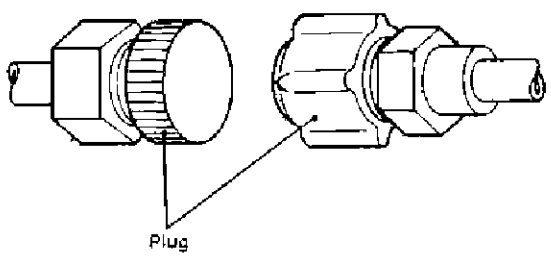
When replacing or cleaning refrigerant cycle components, observe the following.

- Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.
- When connecting tubes, be sure to use a torque wrench.



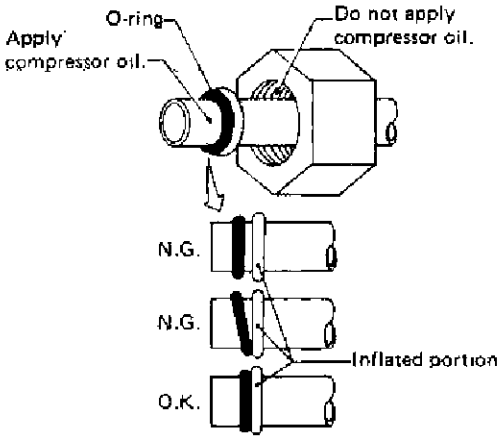
SHA896A

- After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.



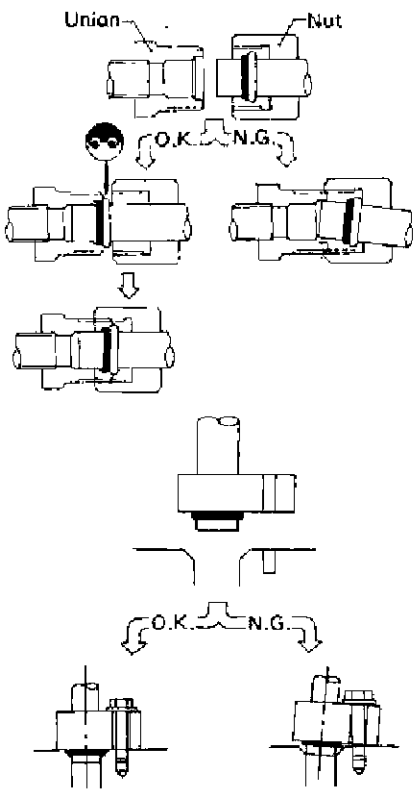
SHA058

- Do not reuse used O-ring.
- When connecting tube, apply compressor oil to portions shown in illustration. Be careful not to apply oil to threaded portion.
- O-ring must be closely attached to inflated portion of tube.



SHA8

- After inserting tube into union until O-ring no more visible, tighten nut to specified to que.

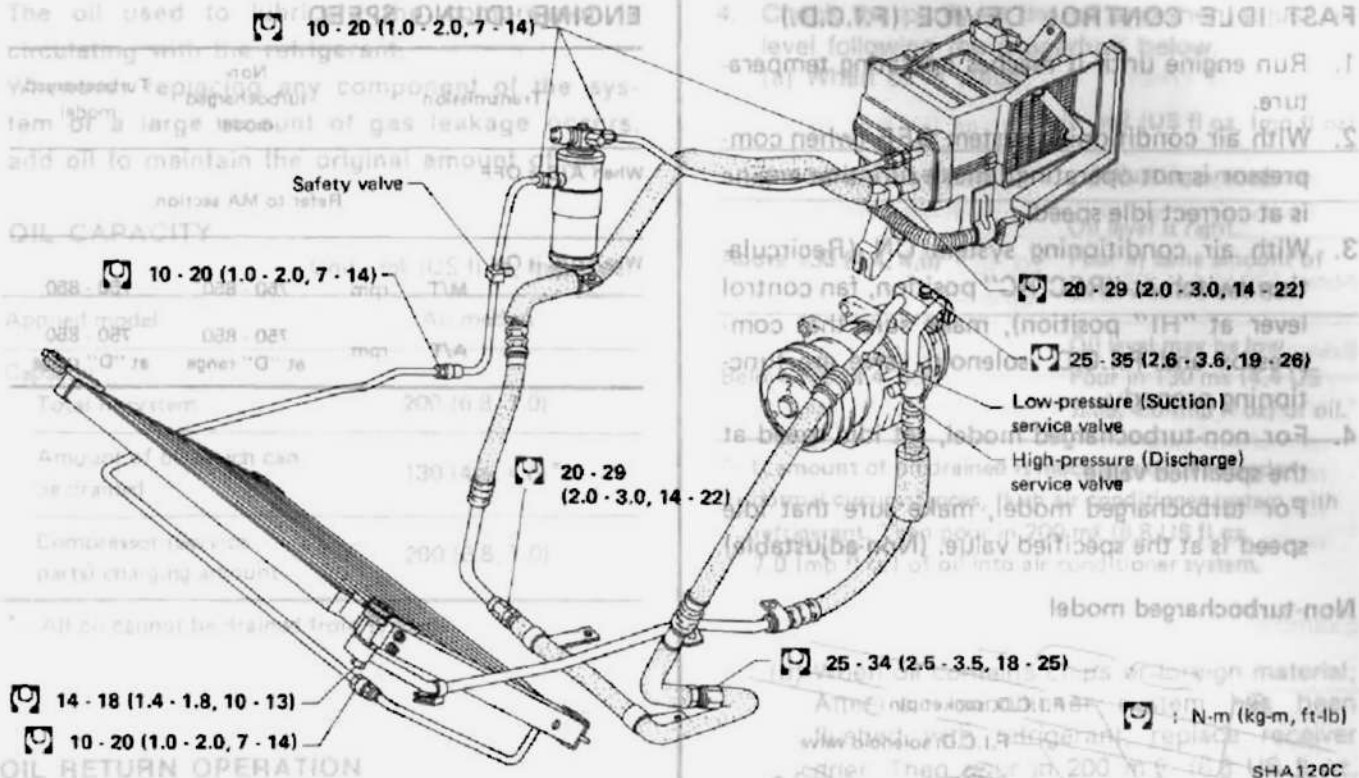


SHA8

- After connecting line, conduct leak test a make sure that there is no leak from conn tions. When the gas leaking point is found, d connect that line and replace the O-ring. Che fit for further use and then tighten connectio to seal seat for the specified torque.

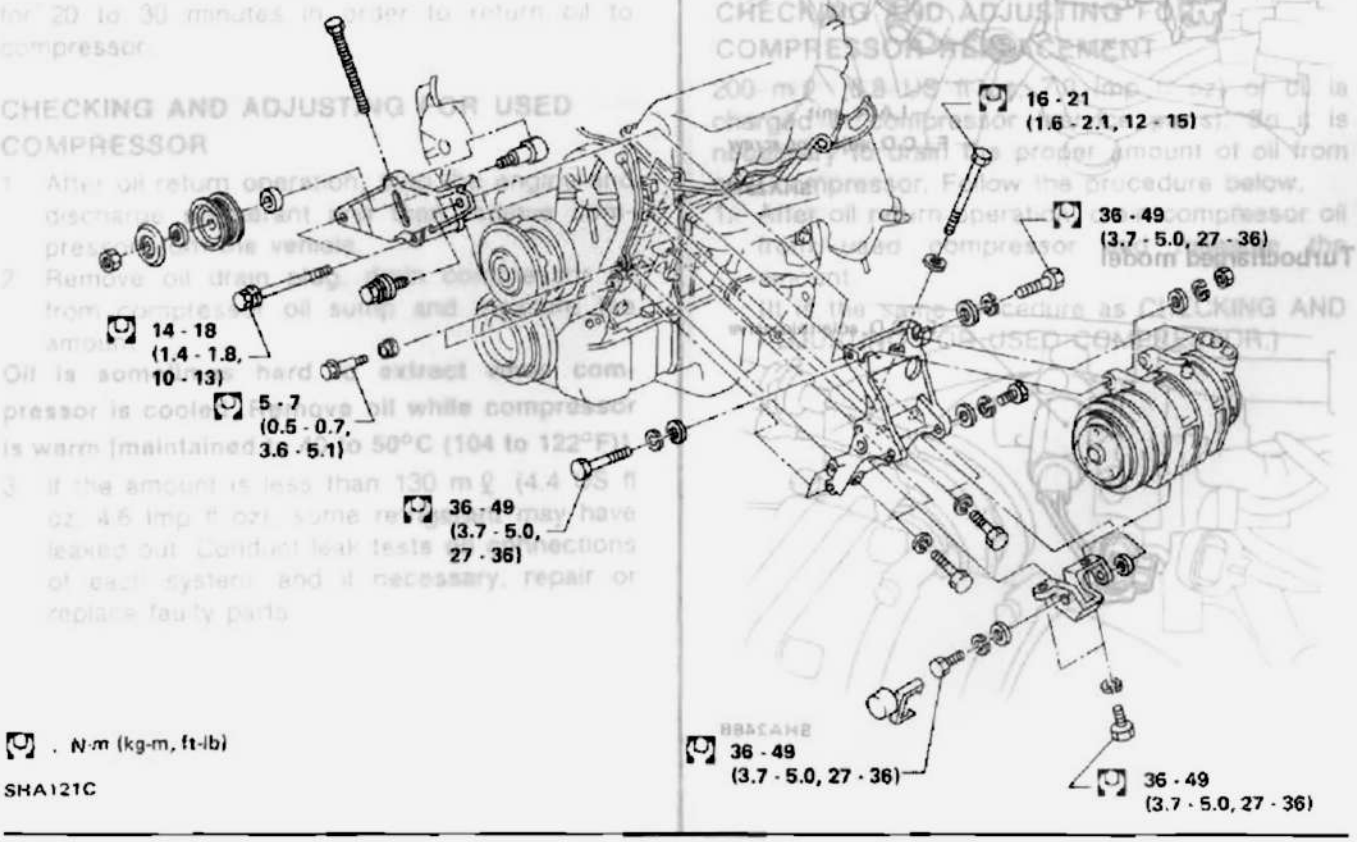
PIPING, COMPRESSOR MOUNTING AND F.I.C.D.

Refrigerant Lines



SHA120C

Compressor Mounting



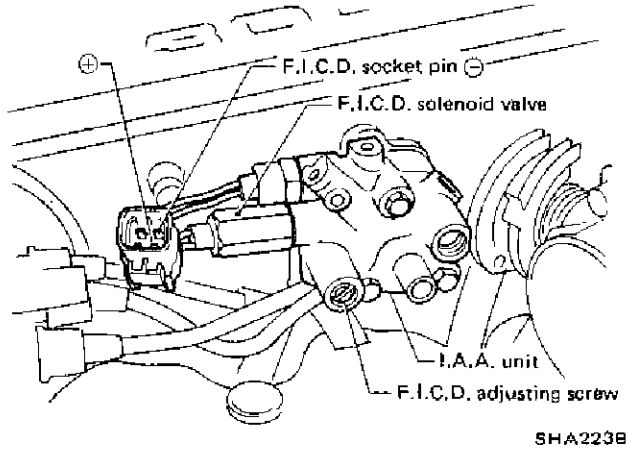
SHA121C

Idle Speed Adjusting and Checking

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

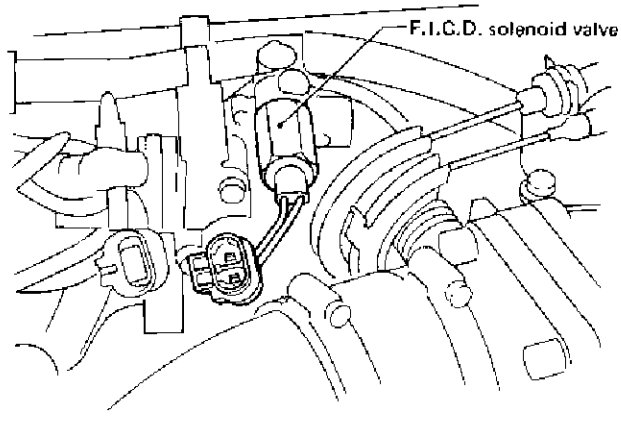
1. Run engine until it reaches operating temperature.
2. With air conditioning system OFF (when compressor is not operating), make sure that engine is at correct idle speed.
3. With air conditioning system ON (Recirculation switch at "RECIRC" position, fan control lever at "HI" position), make sure that 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

Transmission			Non-turbocharged model	Turbocharged model
When A/C is OFF			Refer to MA section.	
When A/C is ON	M/T	rpm	750 - 850	750 - 850
	A/T	rpm	750 - 850 at "D" range	750 - 850 at "D" range

COMPRESSOR OIL—For DKS-16H (DIESEL-KIKI make)

Checking and Adjusting

The oil used to lubricate the compressor is circulating with the refrigerant.
Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

OIL CAPACITY

Unit: mℓ (US fl oz, Imp fl oz)

Applied model	All models
Capacity	
Total in system	200 (6.8, 7.0)
Amount of oil which can be drained	130 (4.4, 4.6)*
Compressor (Service parts) charging amount	200 (6.8, 7.0)

*: All oil cannot be drained from system.

OIL RETURN OPERATION

Before checking and adjusting oil level, operate compressor at engine idling speed, with controls set for maximum cooling and high blower speed, for 20 to 30 minutes in order to return oil to compressor

CHECKING AND ADJUSTING FOR USED COMPRESSOR

1. After oil return operation, stop the engine and discharge refrigerant and then remove compressor from the vehicle.
2. Remove oil drain plug, drain compressor oil from compressor oil sump and measure the amount.

Oil is sometimes hard to extract when compressor is cooled. Remove oil while compressor is warm [maintained to 40 to 50°C (104 to 122°F)].

3. If the amount is less than 130 mℓ (4.4 US fl oz, 4.6 Imp fl oz), some refrigerant may have leaked out. Conduct leak tests on connections of each system, and if necessary, repair or replace faulty parts
4. Check the purity of the oil and then adjust oil level following the procedure below.
   (a) When oil is clean:

Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained	Adjusting procedure
Above 130 (4.4, 4.6)*	Oil level is right. Pour in same amount of oil as was drained out.
Below 130 (4.4, 4.6)	Oil level may be low. Pour in 130 mℓ (4.4 US fl oz, 4.6 Imp fl oz) of oil.

*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then pour in 200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

   (b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then pour in 200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil into air conditioner system.

CHECKING AND ADJUSTING FOR COMPRESSOR REPLACEMENT

200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor (service parts). So it is necessary to drain the proper amount of oil from new compressor. Follow the procedure below.

1. After oil return operation, drain compressor oil from used compressor and measure the amount.
   (It is the same procedure as CHECKING AND ADJUSTING FOR USED COMPRESSOR.)

Checking and Adjusting (Cont'd)

2. Check the purity of the oil and then adjust oil level following the procedure below.
   (a) Oil is clean;

Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
Above 130 (4.4, 4.6)*	200 (6.8, 7.0) − [Amount of oil drained + 25 (0.8, 0.9)]
Below 130 (4.4, 4.6)	130 (4.4, 4.6)

*: If amount of oil drained is much greater than under normal circumstances, flush air conditioner system with refrigerant. Then install new compressor. [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is changed compressor service parts.]

Example:

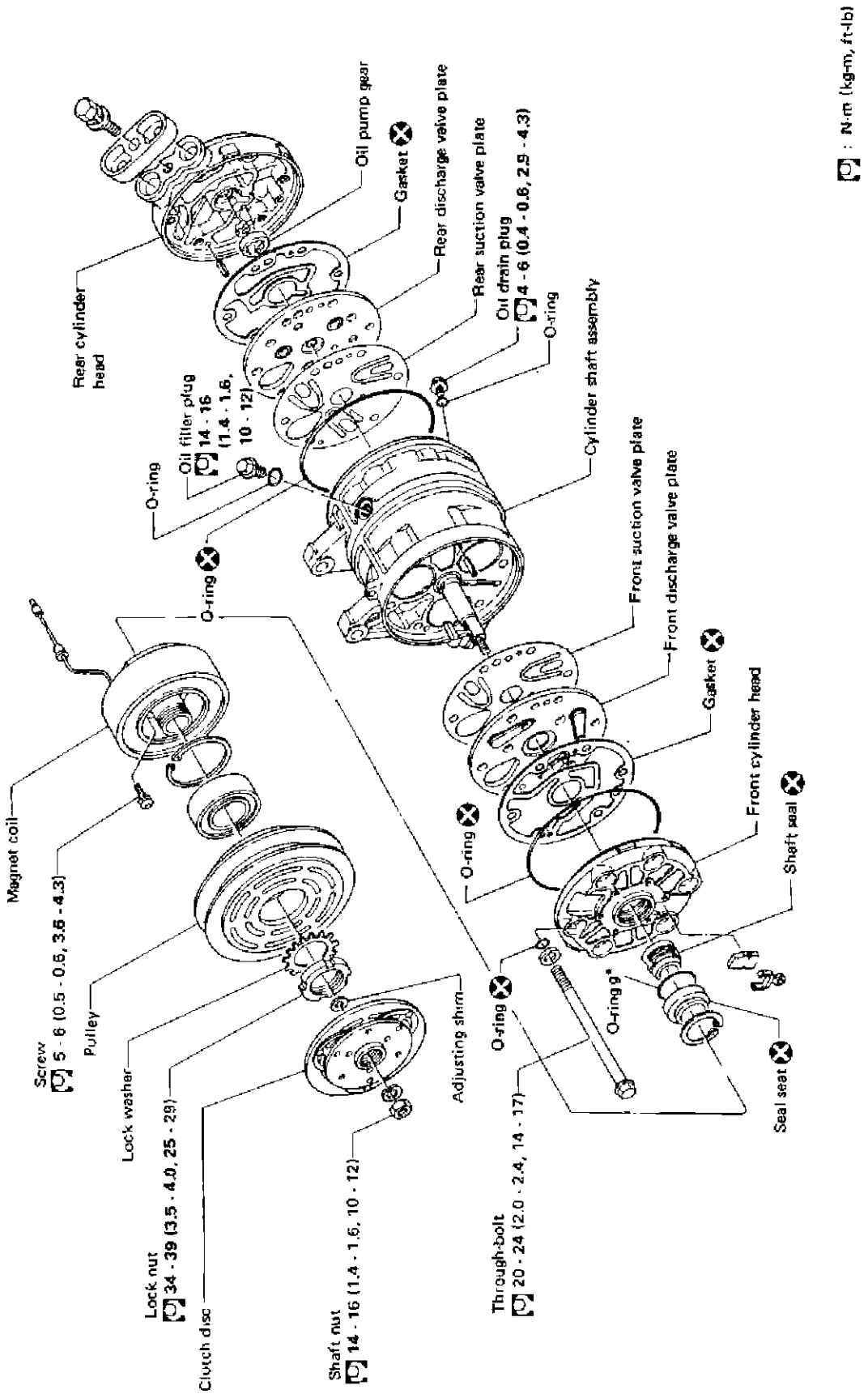
Unit: mℓ (US fl oz, Imp fl oz)

Amount of oil drained from used compressor	Draining amount of oil from new compressor
145 (4.9, 5.1)	30 (1.0, 1.1)
95 (3.2, 3.3)	130 (4.4, 4.6)

(b) When oil contains chips or foreign material; After air conditioner system has been flushed with refrigerant, replace receiver drier. Then install new compressor. [200 mℓ (6.8 US fl oz, 7.0 Imp fl oz) of oil is charged in compressor service parts.]

- Plug all openings to prevent moisture and foreign matter from entering.
- Do not leave compressor on its side or upside down for more than 10 minutes.
- When replacing or repairing compressor, check compressor oil level in system.
- When replacing with a new compressor, drain specified oil from new compressor. Refer to COMPRESSOR OIL.
- Be sure there is no oil or dirt on frictional surface of clutch disc and pulley.
- When replacing compressor clutch, be careful not to scratch shaft or bend pulley.
- When replacing compressor clutch assembly, do not forget BREAK-IN OPERATION.
- When storing a compressor, be sure to fill it with refrigerant to prevent rust formation. Add refrigerant at the low-pressure side and purge air at the high-pressure side, while rotating shaft by hand.
- Replace shaft seal, seal seat, oil seal and O-ring as a set.
- When installing shaft seal, seal seat, oil seal, O-ring and gaskets, apply compressor oil sparingly to the contact surface. Do not reuse them.
- After replacement or repaires, conduct a Leak Test.

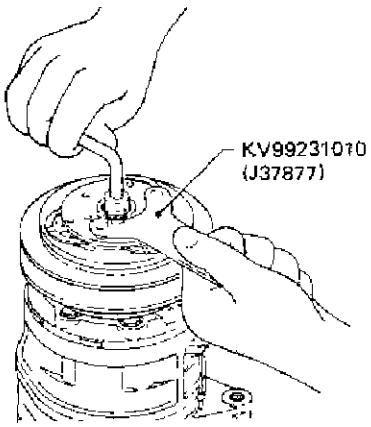
COMPRESSOR—Model DKS-16H (DIESEL-KIKI make)



Compressor Clutch

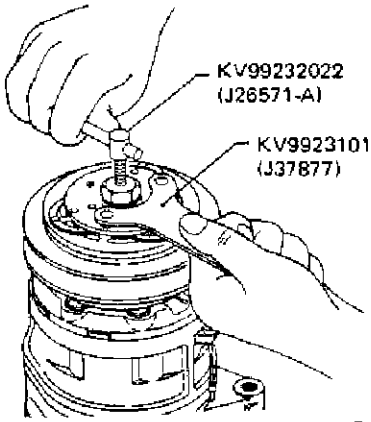
REMOVAL

- When removing shaft nut, hold clutch disc with clutch disc wrench.



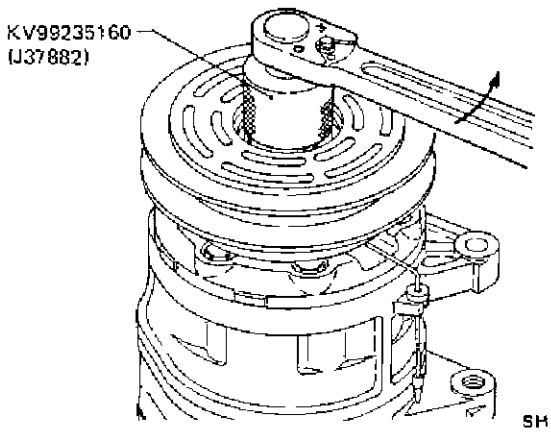
SHA899B

- Using clutch disc puller, clutch disc can be removed easily.



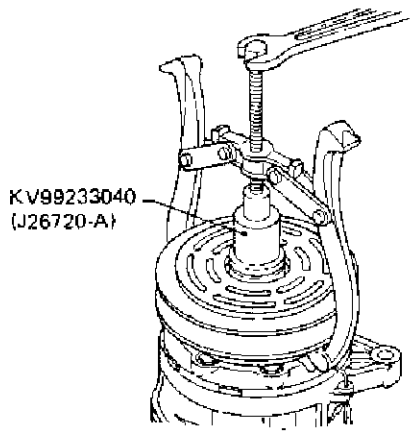
RHA474A

- Bend down pawl of lock washer.
- When removing pulley, remove lock nut with nut wrench.



SHA900B

- Remove the pulley by hand. If difficult, use puller pilot.



SHA700B

INSPECTION

Clutch disc

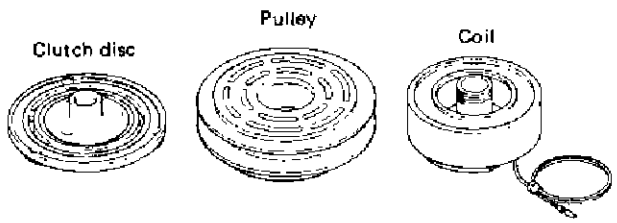
If the contact surface shows signs of damage due to excessive heat, the drive plate and pulley should be replaced.

Pulley

Check the appearance of the pulley assembly. If the contact surface of the pulley shows signs of excessive grooving due to slippage, both the pulley and drive plate should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before re-installation.

Coil

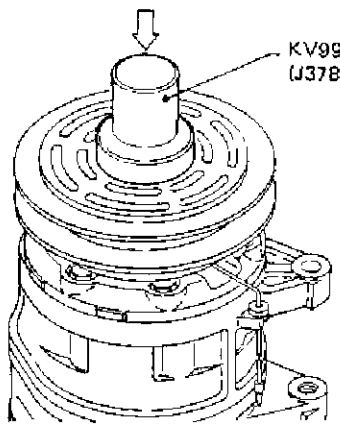
Check coil for loose connection or cracked insulation.



SHA703B

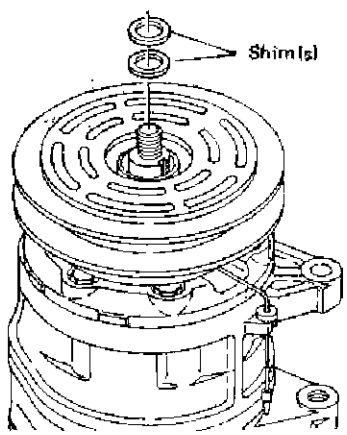
INSTALLATION

- Install the key in the keyway on the compressor drive shaft.
- Install the coil to compressor (lead wire up) and tighten the mounting screws.
- Install the load wire with its holder into the hold.



SHA704B

- Install lock washer and nut with nut wrench.
- Bend one pawl of the lock washer up against the nut to prevent the nut from loosening.



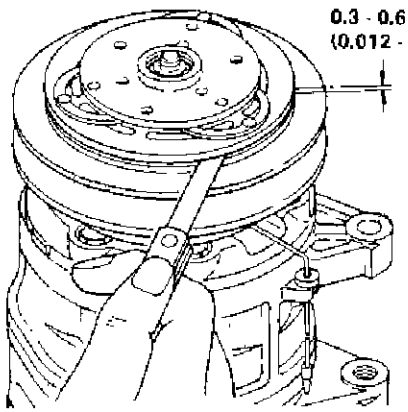
SHA705B

- Check to ensure that the clutch clearance between 0.3 to 0.6 mm (0.012 to 0.024 i Adjust the clearance using shim(s) as necessa

BREAKE-IN OPERATION

When replacing compressor clutch assembly, not forget break-in operation, accomplished engaging and disengaging the clutch about thi times.

Break-in operation raises the level of transmitt torque.



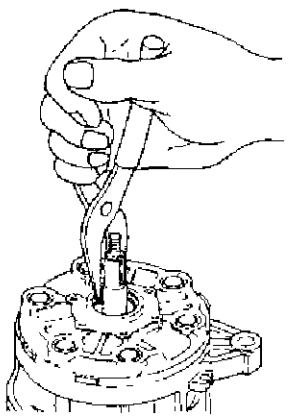
SHA7

Shaft Seal Assembly

The shaft seal assembly is a precision-part, with it's critical parts finished to extremely close tolerances and, as such, must be handled with great care. Its slip face demands particularly careful handling.

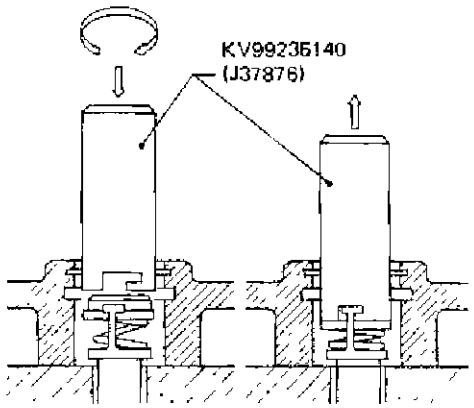
REMOVAL

- Remove the magnetic clutch assembly, as outlined in "REMOVAL" of Compressor Clutch.
- Using Internal Snap Ring Pliers, remove the seal seat/compressor snap ring.
- Remove and discard seal seat.
- Using a suitable piece of wire, remove the O-ring from the inside groove of the shaft seal housing. Discard the O-ring.



SHA710B

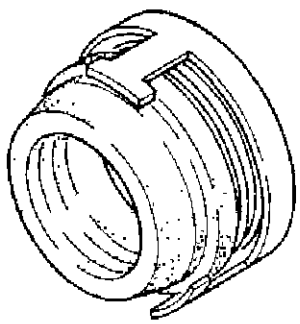
- Remove the shaft seal as follows: Turning clockwise, engage the remover hook with the shaft seal hook, and slowly draw out the seal. Discard the shaft seal.
- Check the shaft and inside of the compressor neck for dirt of foreign material and ensure these areas are perfectly clean before installing new shaft seal.



SHA712B

INSPECTION

- Shaft seal assembly should not be reused. Always use a new shaft seal kit on reassembling the compressor. Be extremely careful to ensure that the face of the shaft of the shaft seal to be installed is not scratched or damaged in anyway. Make sure the seal seat and shaft seal are free of lint and dirt that could damage the shaft seal surface.



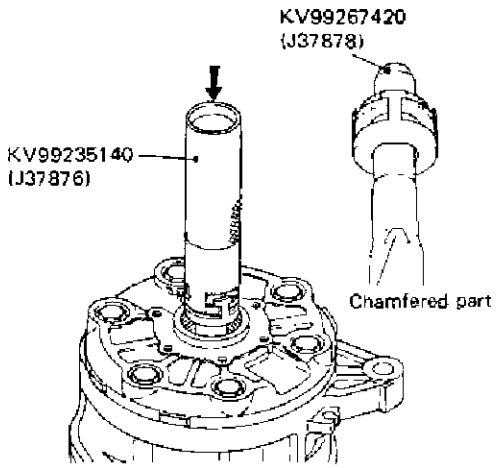
SHA713B

Shaft Seal Assembly (Cont'd)

INSTALLATION

Clean the sealed section of the compressor. Apply clean compressor oil to the new shaft seal and the drive shaft. If the slip faces are dirty, clean them with thinners and after drying the cleaned faces, apply clean compressor oil.

Fit the new O-ring with clean compressor oil to the groove inside the compressor neck. Apply clean compressor oil to the seal seat.

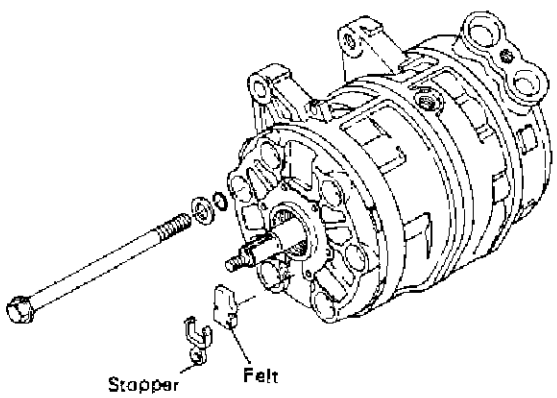


SHA714B

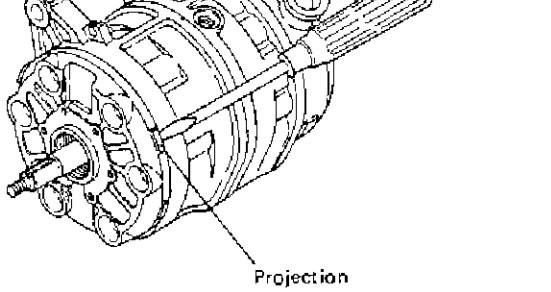
Cylinder Heads (Front & rear)

DISASSEMBLY

- Remove the compressor clutch assembly, outlined in "REMOVAL" of Compress Clutch.
- Remove the oil filler plug and drain plug, a then draw out the oil.
- Remove the shaft seal assembly, as outlin in "REMOVAL" of Shaft Seal Assembly.
- Remove the felt, stopper and six throug bolts securing the head, using a wrench.
- Alternately tap four projections on the circu ference of the front head with a screwdriv and a plastic mallet, and remove the fro cylinder head.



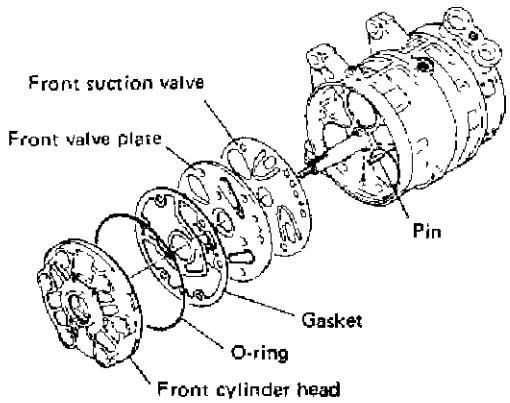
SHA71



SHA7

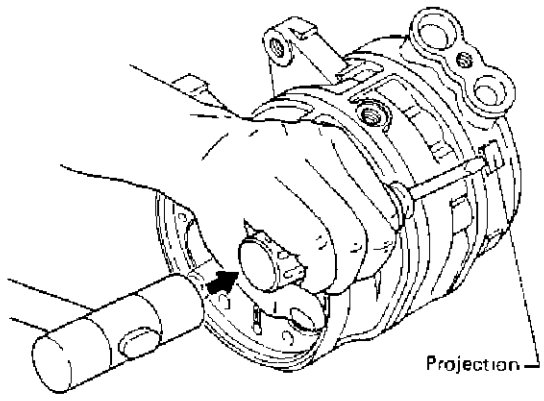
Cylinder Heads (Front & rear) (Cont'd)

- Remove and discard the O-ring from the front cylinder head.
- Remove all gasket material from the front cylinder head and front valve plate.



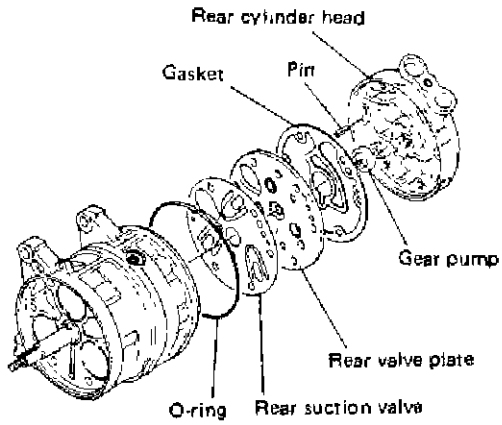
SHA726B

- Alternately tap four projections on the circumference of the rear head with a screwdriver and a plastic mallet, and remove the rear cylinder head.



SHA719B

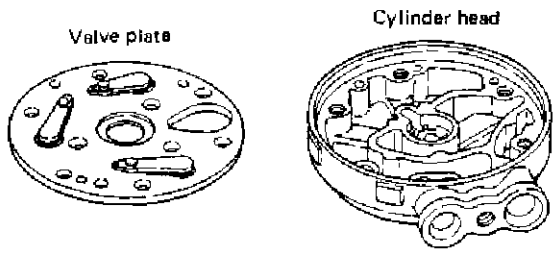
- Remove the gear pump from the rear cylinder head or drive shaft end.
  Remove all gasket material from the rear cylinder head and rear valve plate.
  Remove and discard the O-ring from the rear side of the cylinder shaft assembly.



SHA725B

INSPECTION

Check the front and rear valve plates for scratched, bent or otherwise damaged parts. Inspect both cylinder heads and both valve plate assemblies for nicks or burrs on the sealing surfaces. Clean, or replace if badly damaged. Make sure that all passages in the valve plate are unobstructed. If either the cylinder head or valve plate is cracked, it must be replaced.



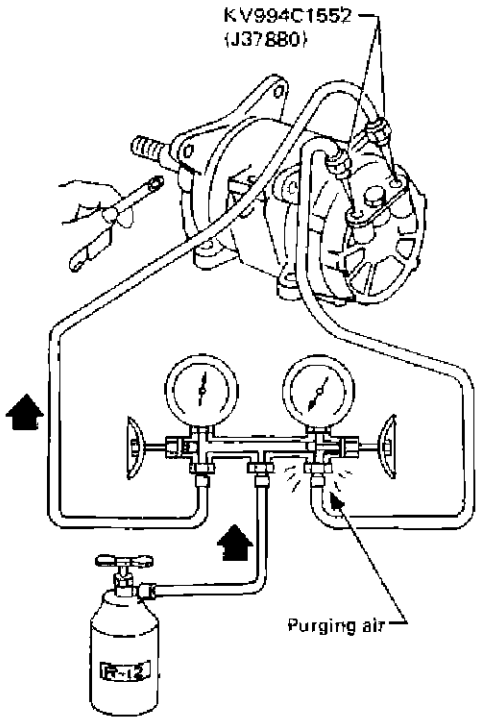
SHA721B

INSTALLATION

- Installation is the reverse of removal.
- Tighten bolts or plugs to specified torques.

Leak Test

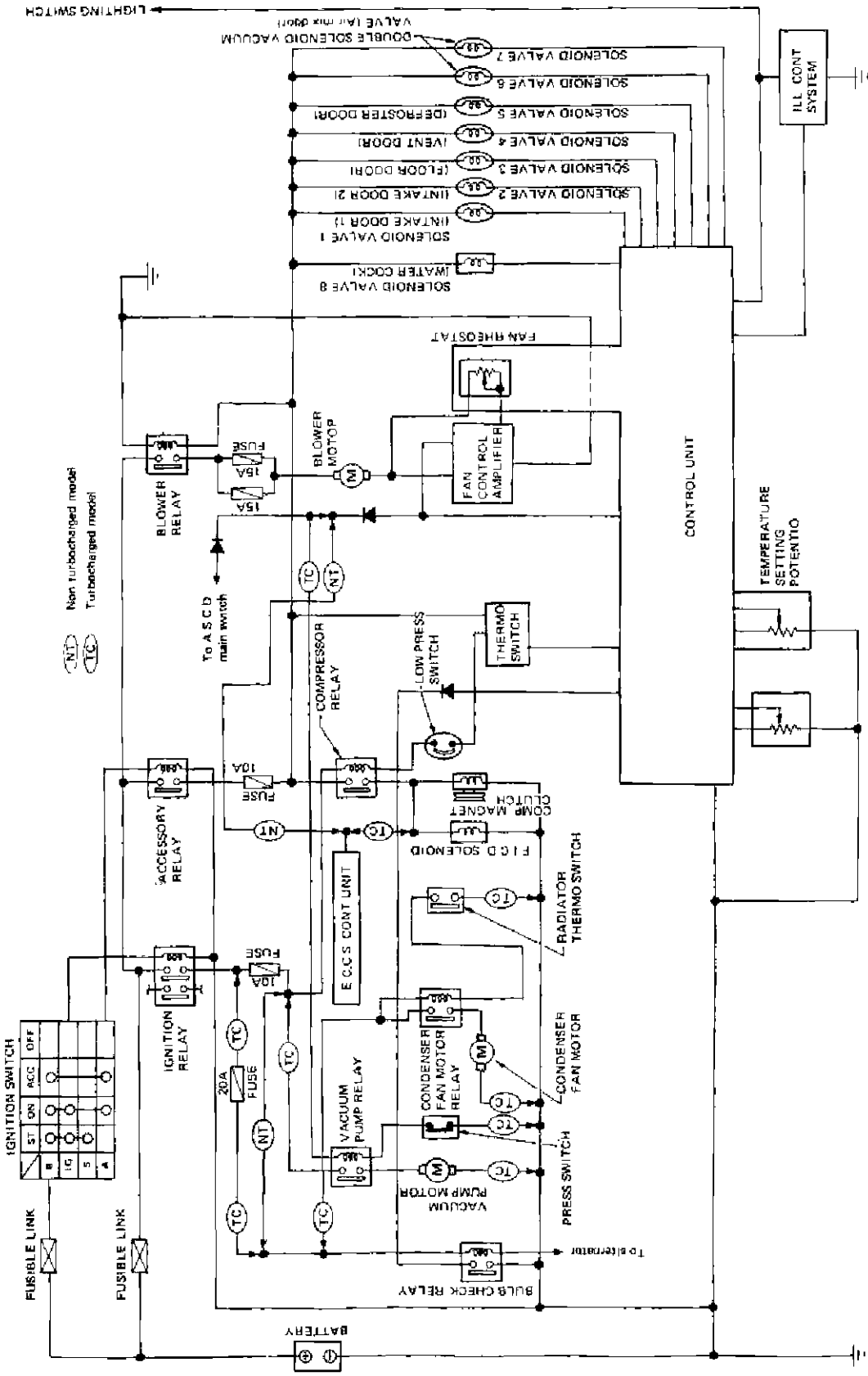
- Charge refrigerant from suction side and evacuate air from discharge side. Then conduct leak test.



SHA873A

A/C ELECTRICAL CIRCUIT (Manual)

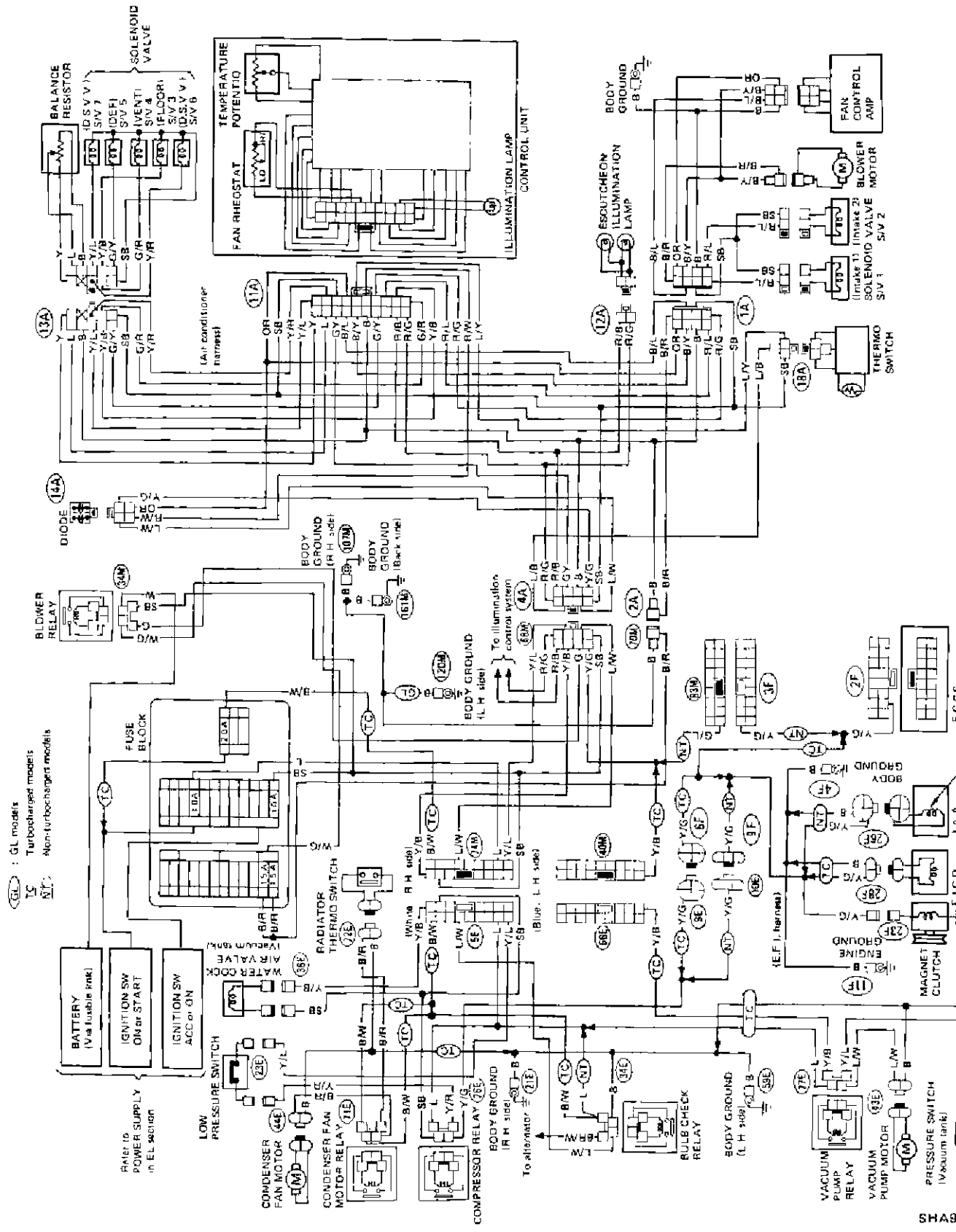
Schematic



SHA9918

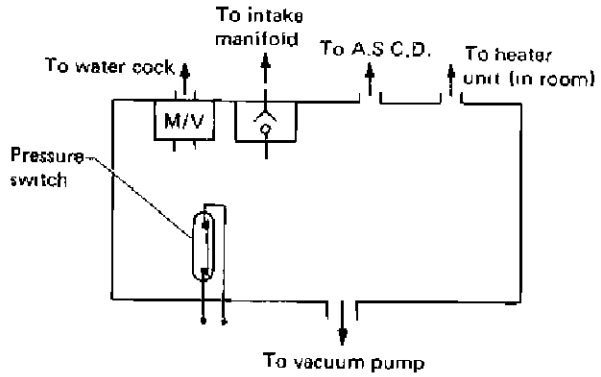
A/C ELECTRICAL CIRCUIT (Manual)

Wiring Diagram



Inspection

VACUUM TANK

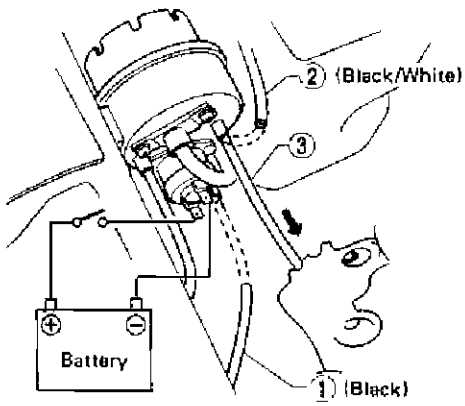


M/V : Magnet valve

: Check valve (One way)

SHA253B

Solenoid valve check for water cock

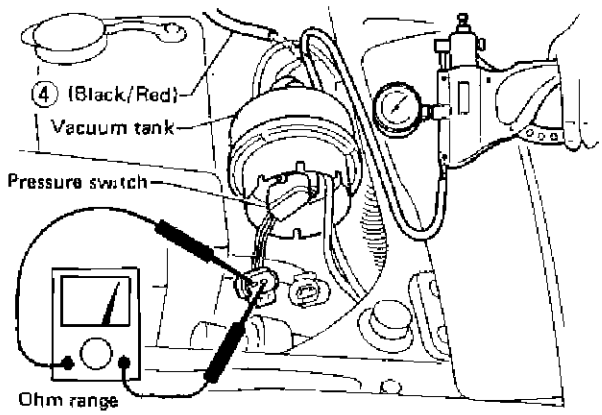


SHA254B

1. Disconnect vacuum hose ①.
2. Disconnect vacuum hose ② and connect hose ③ instead. Suck in through hose ③ to confirm that air does not flow through the hose and that check valve is closed.
3. While sucking vacuum hose ③, change voltage to solenoid to check for open-close operation of solenoid valve.

Applied voltage to solenoid (V)	Operation of solenoid valve
0	Close
12	Open

Pressure switch check for turbocharged model



Pressure	Resistance (Ω)
Atmospheric pressure	0
Vacuum pressure more than 46.7 kPa (350 mmHg, 13.78 inHg)	∞

SHA255B

1. Disconnect vacuum hose ④ from the terminal and connect a vacuum handy pump with the same terminal.
2. Check pressure switch using a vacuum handy pump.

Inspection (Cont'd)

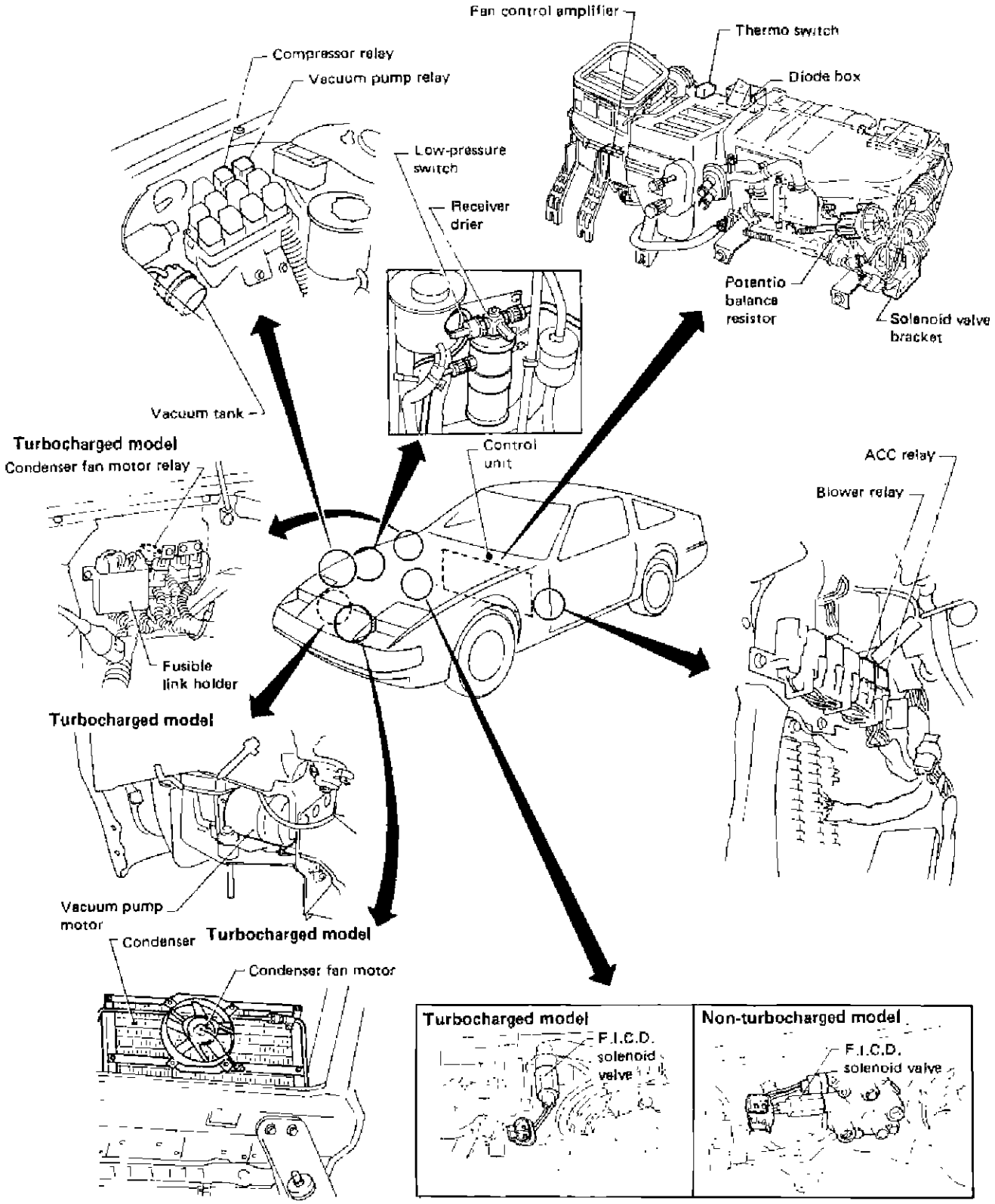
VACUUM PUMP MOTOR

1. Turn ignition switch "OFF". Disconnect vacuum hose ④ (Refer to "Pressure Switch Check") from vacuum tank and connect it again.
2. Make sure air conditioner switch is "OFF".
3. Turn ignition switch "ON" (Do not start the engine).
4. Push cruise control main switch to make sure vacuum pump starts. (A sound should be heard from the pump.)
5. The vacuum pump is operating properly if it stops within 20 seconds after it has started.
6. If it fails to stop within 20 seconds, and vacuum hoses are in good order, it is malfunctioning.

SOLENOID VALVE

Perform operational check, referring to the "Table of operation of solenoid valve in Air Flow (page HA-3) and Wiring Diagram (page HA-8 or HA-32).

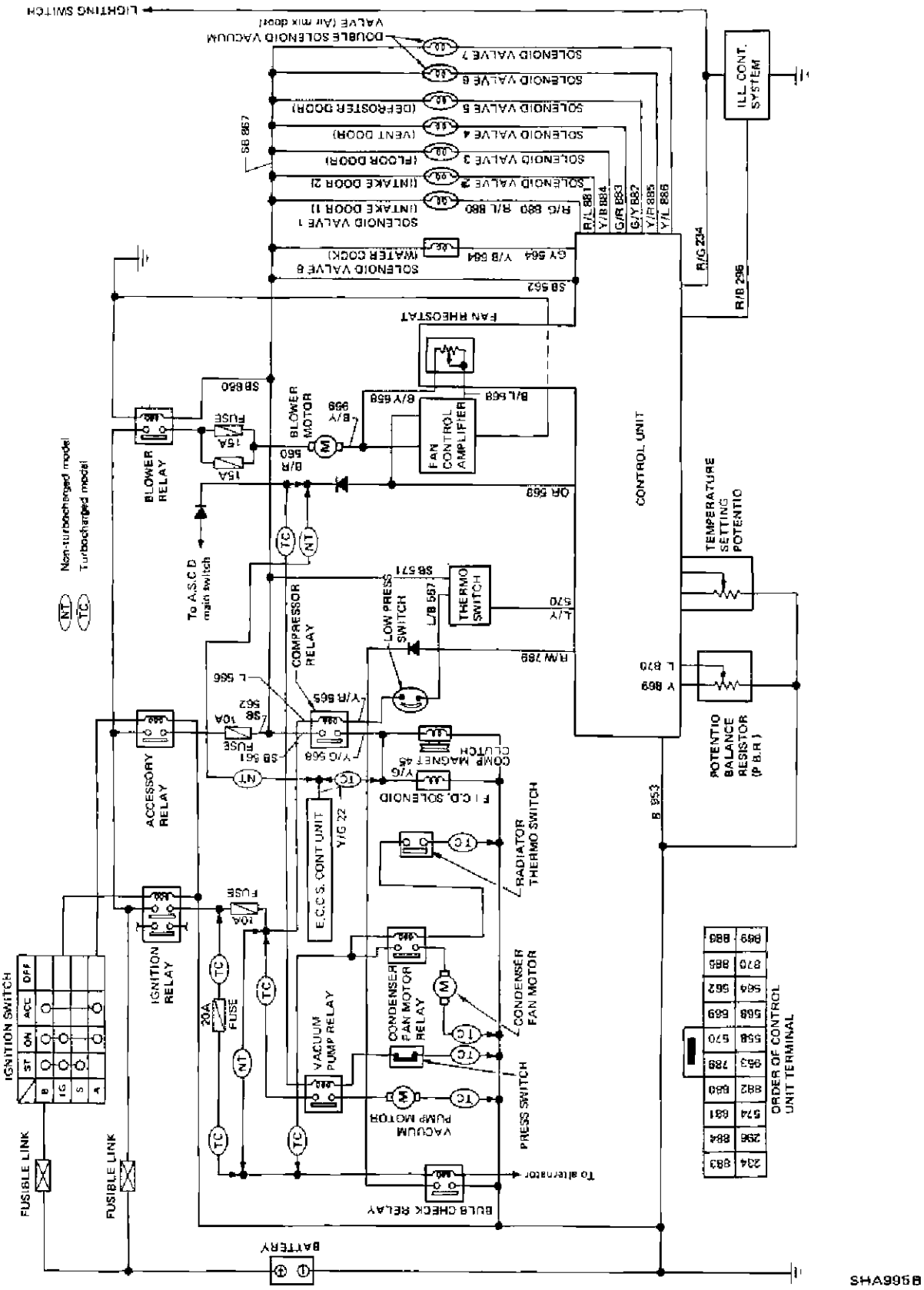
LOCATION OF A/C ELECTRICAL COMPONENTS (Manual)



SHA997B

CONTENTS

Circuit for Trouble Diagnoses

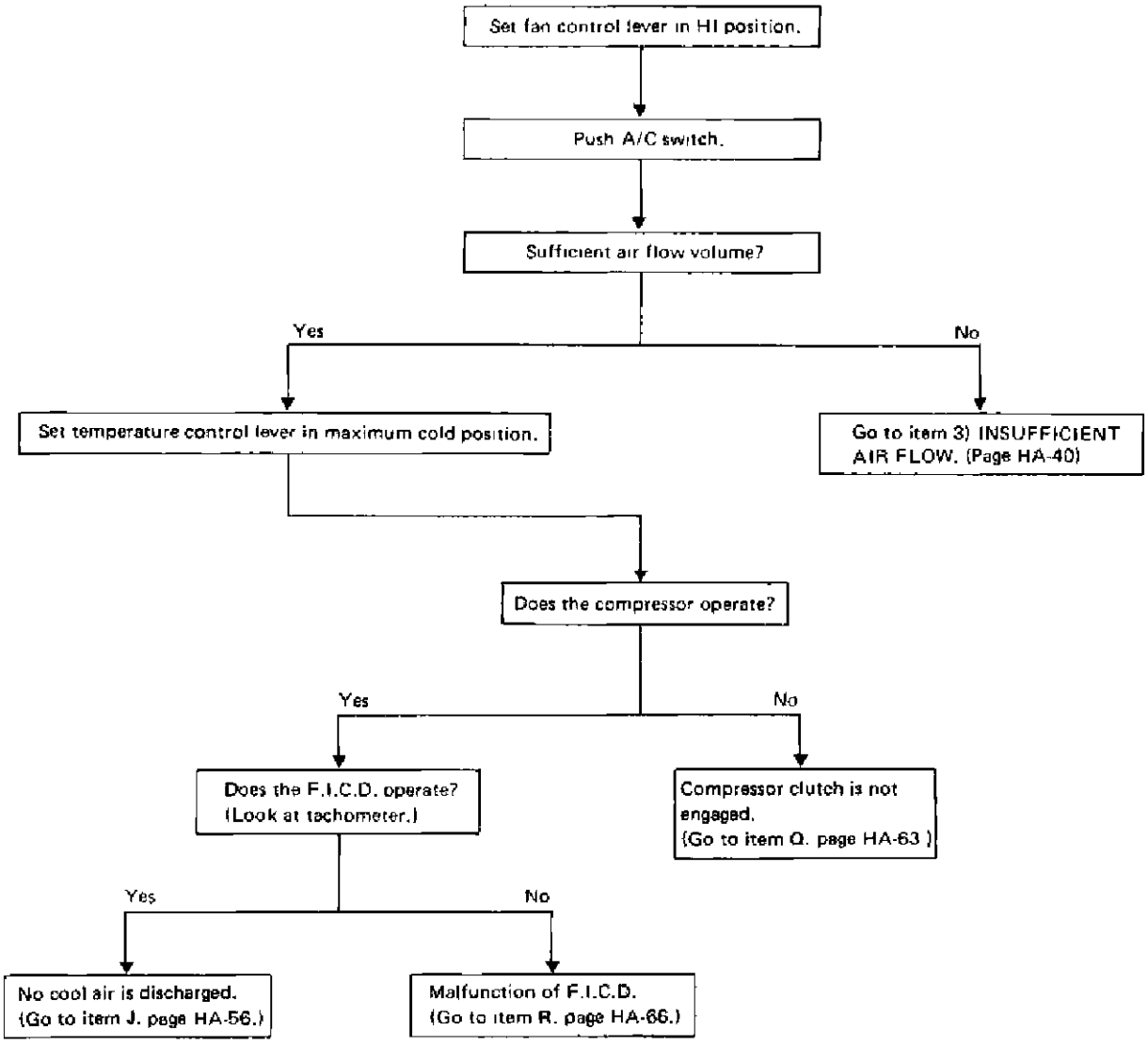


TROUBLE DIAGNOSES (Manual)

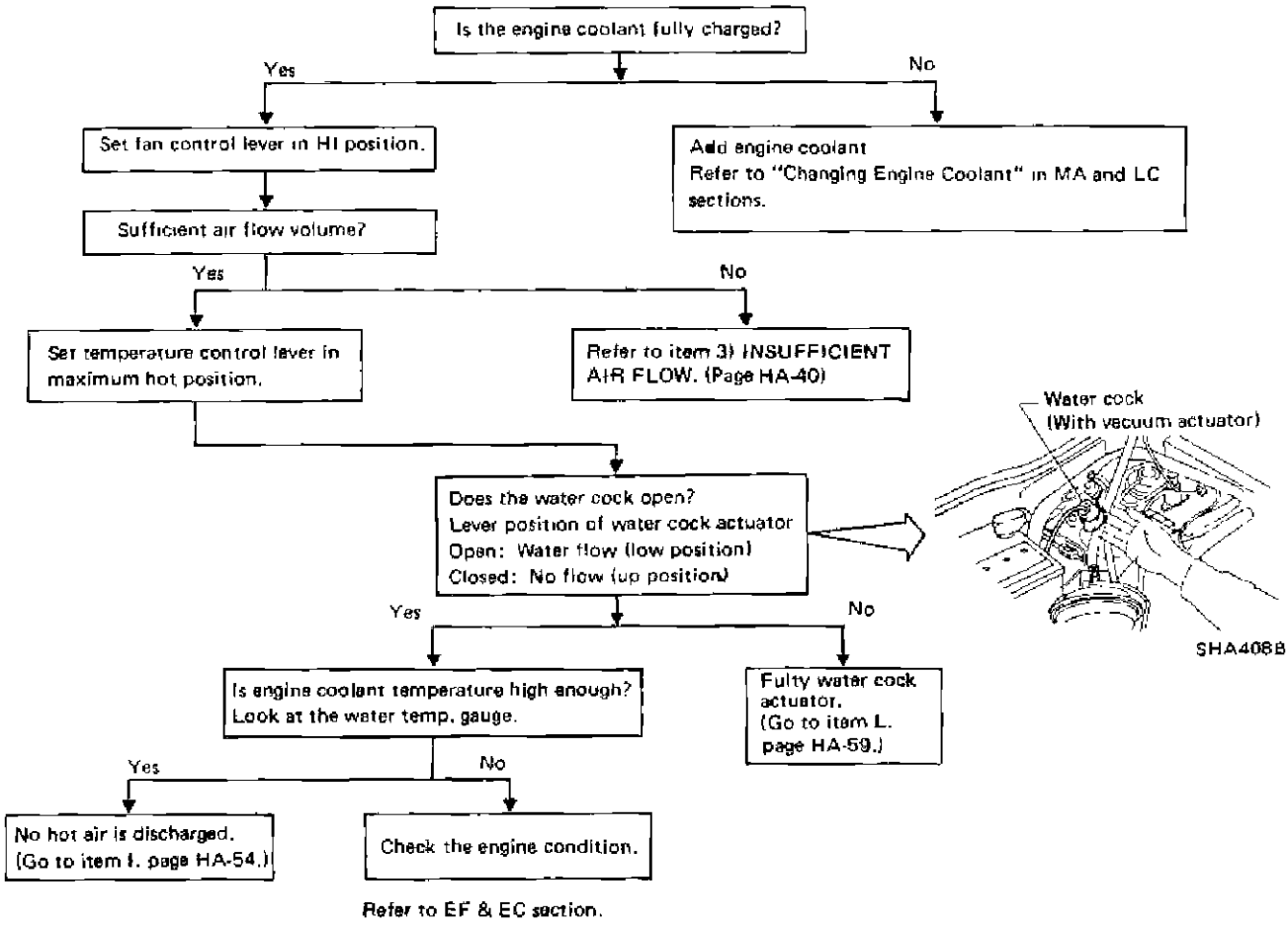
Preliminary Check

Before starting to diagnose the trouble, check the items below in order to completely understand the troubl symptom.

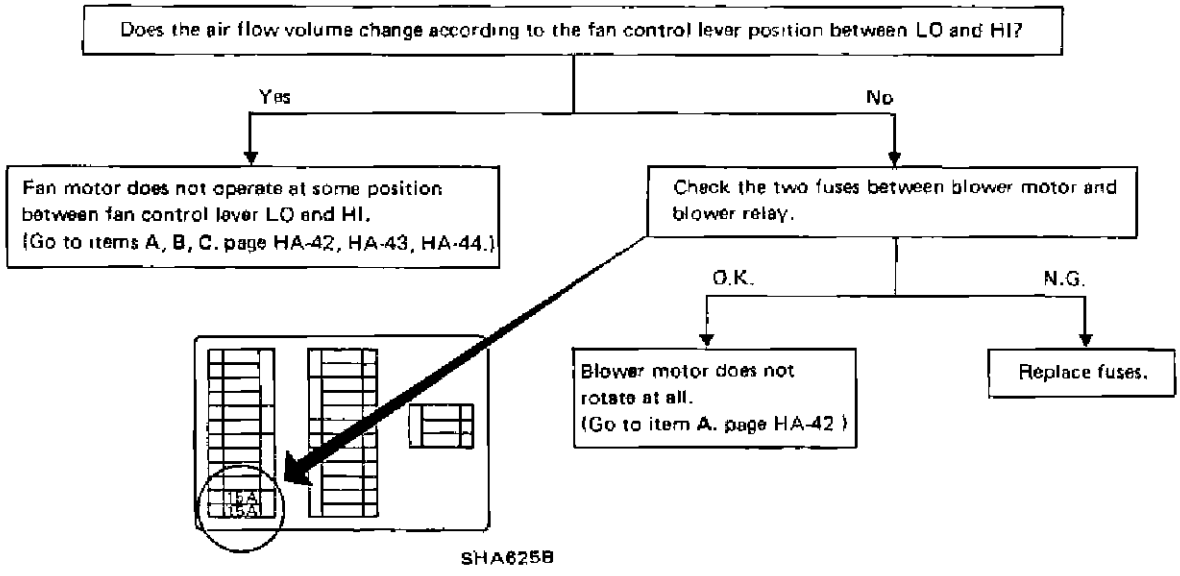
1) INSUFFICIENT COOLING (Mode switch position: "FACE")



2) INSUFFICIENT HEATING

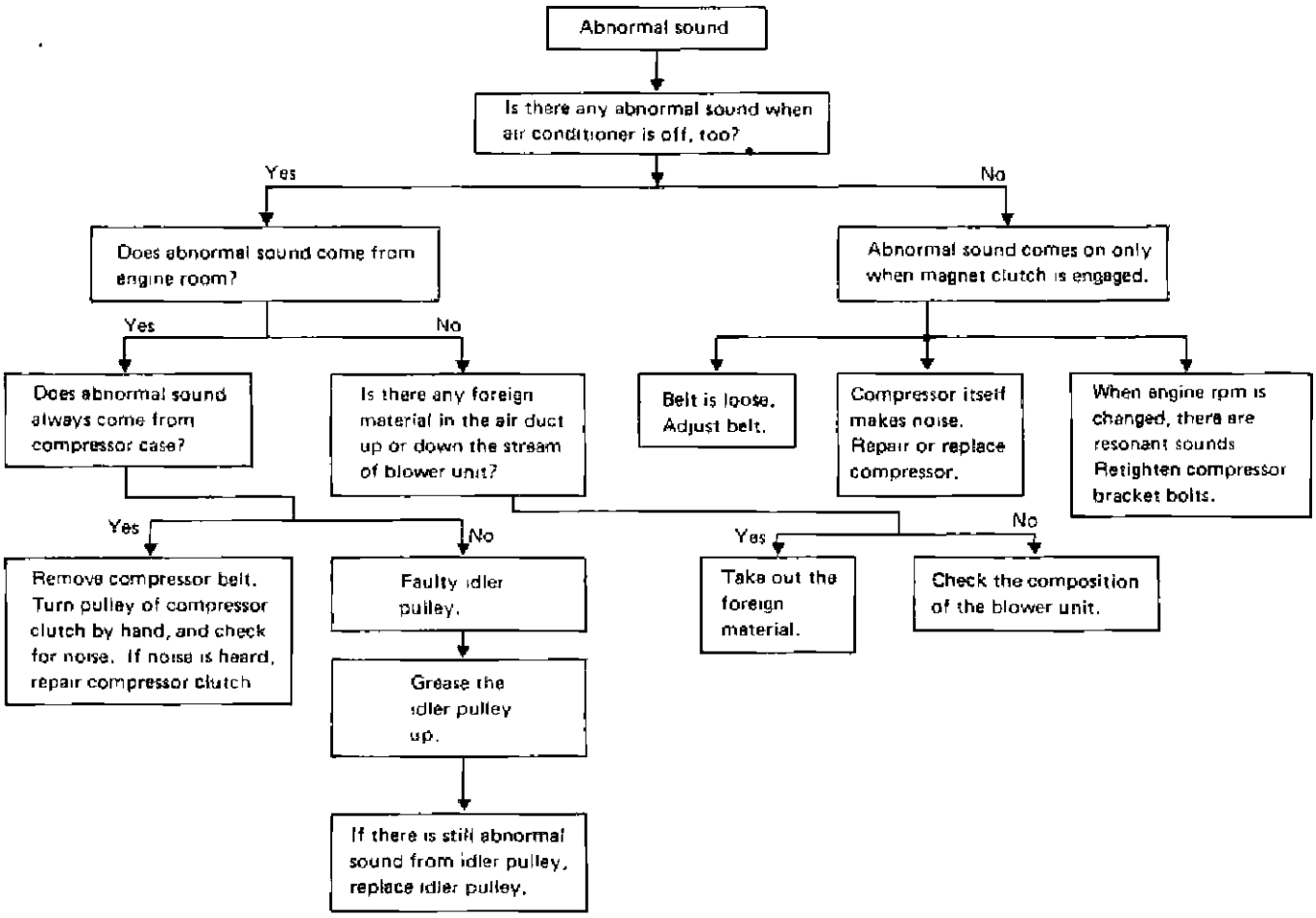


3) INSUFFICIENT AIR FLOW (Blower motor does not rotate.)



Preliminary Check (Cont'd)

4) ABNORMAL SOUND



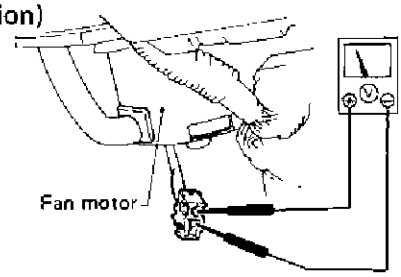
Trouble Diagnoses from Abnormal Conditions

(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. 1.5 volts exist between negative terminal of motor and body ground? (HI position)

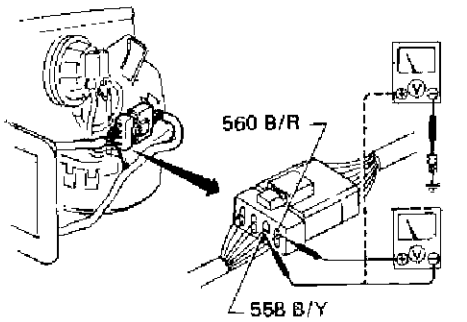


SHA45

Applied voltage of motor check.

Yes → Go to item B. (Page HA-43)

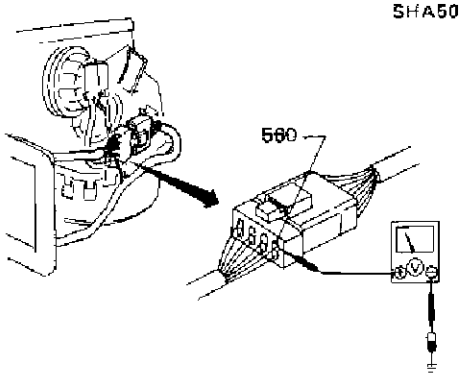
No → Does approx. 1.5 volts exist between negative terminal of motor and body ground? (Fan switch on high)



SHA50

Yes → Open circuit in motor and negative side.

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



SHA50

Yes → Repair.

No → Check fuses and blower relay for continuity

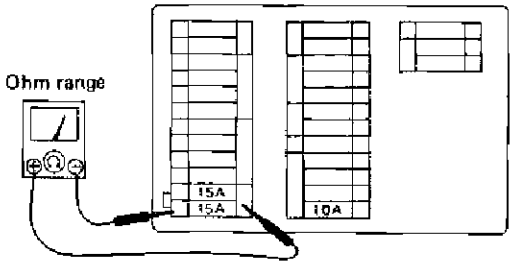
Blower relay check (Fan switch: ON position)

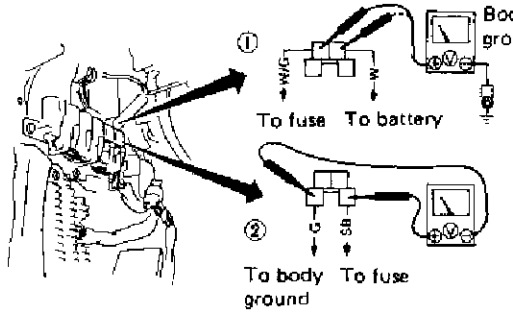
Remove relay bracket and check the relay operation from the back side of the electrical connector.

① Terminal voltage check (Correct voltage: Approx. 12

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

Fuse check
(Ignition switch: OFF position)



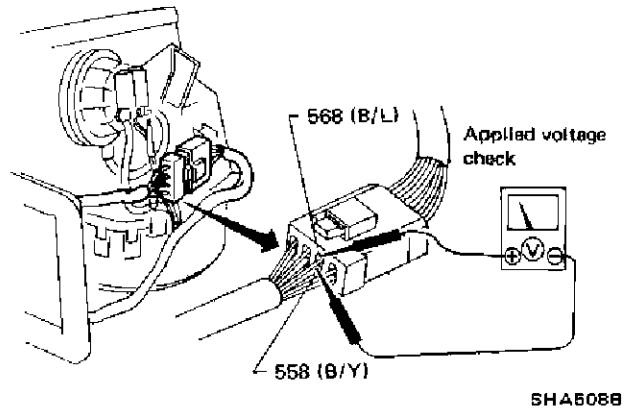


SHA39

Trouble Diagnoses from Abnormal Conditions (Cont'd)

(B) AIR FLOW CANNOT BE CHANGED BETWEEN HI AND LO.

Check voltage between terminal 558 (B/Y) and 568 (B/L) by moving the fan control switch from high to low. Ignition switch must be on for this test.
Hi = approx. 8.0 volts
Lo = approx. 0.02 volts



O.K. → Faulty fan control amplifier.

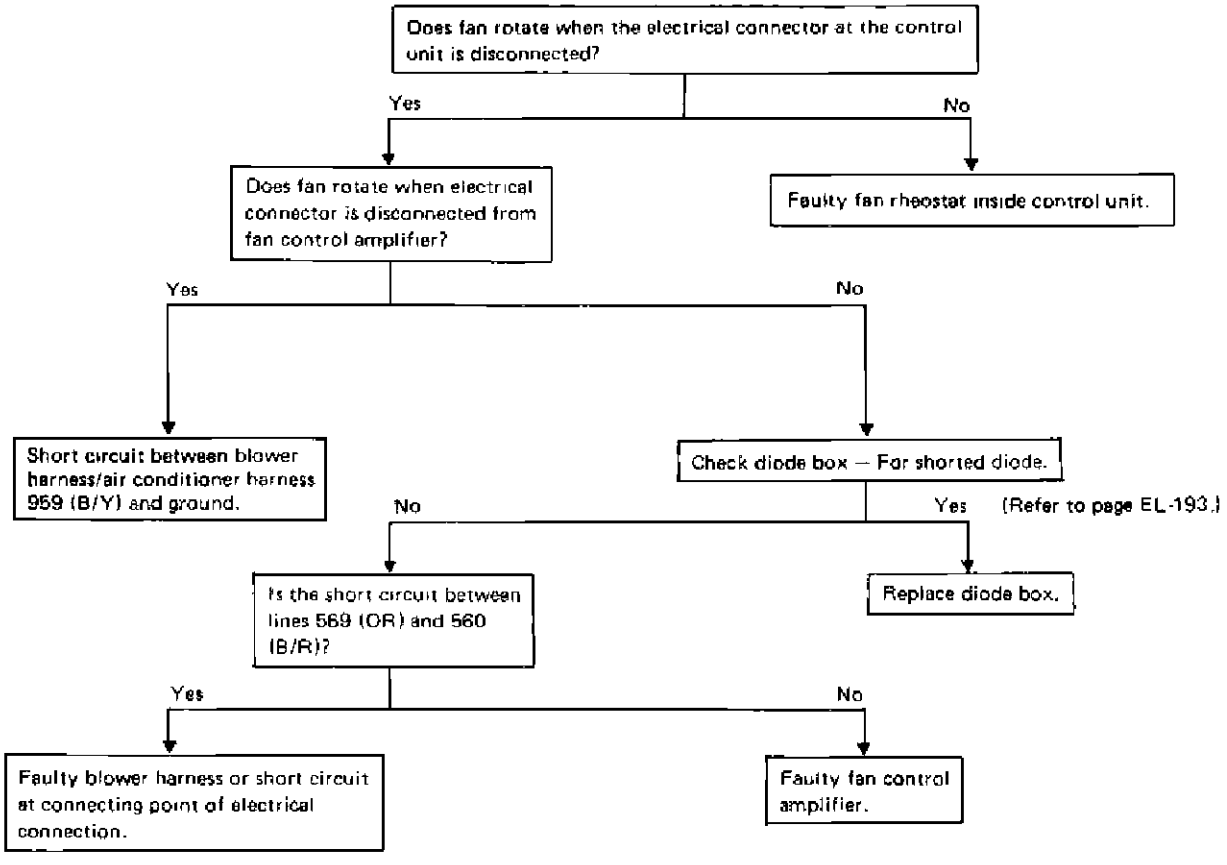
N.G. → Remove control unit.

Check conditioning of blower harness and air conditioner harnesses running between fan control amplifier and control unit.

O.K. → Faulty fan rheostat.

N.G. → Faulty harnesses.

(C) BLOWER MOTOR CONTINUES TO ROTATE WHEN FAN SWITCH IS TURNED OFF.



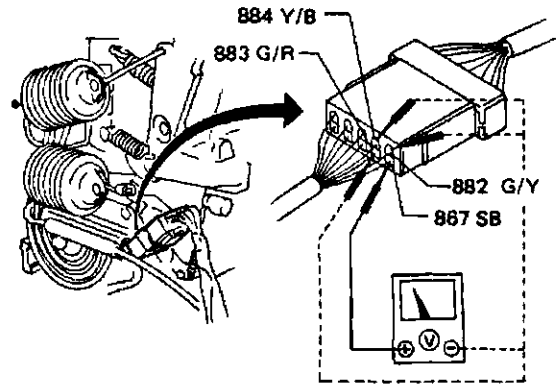
Trouble Diagnoses from Abnormal Conditions (Cont'd)

(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

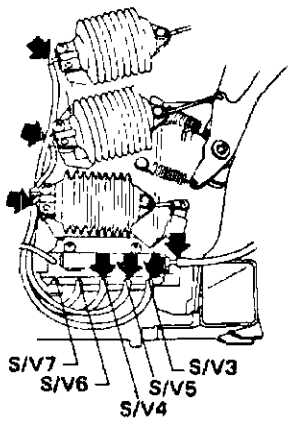


SHA626B

Yes

No

Verify if vacuum exists at solenoid box.



SHA400B

Yes

No

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

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

Yes

No

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

Faulty solenoid valve.

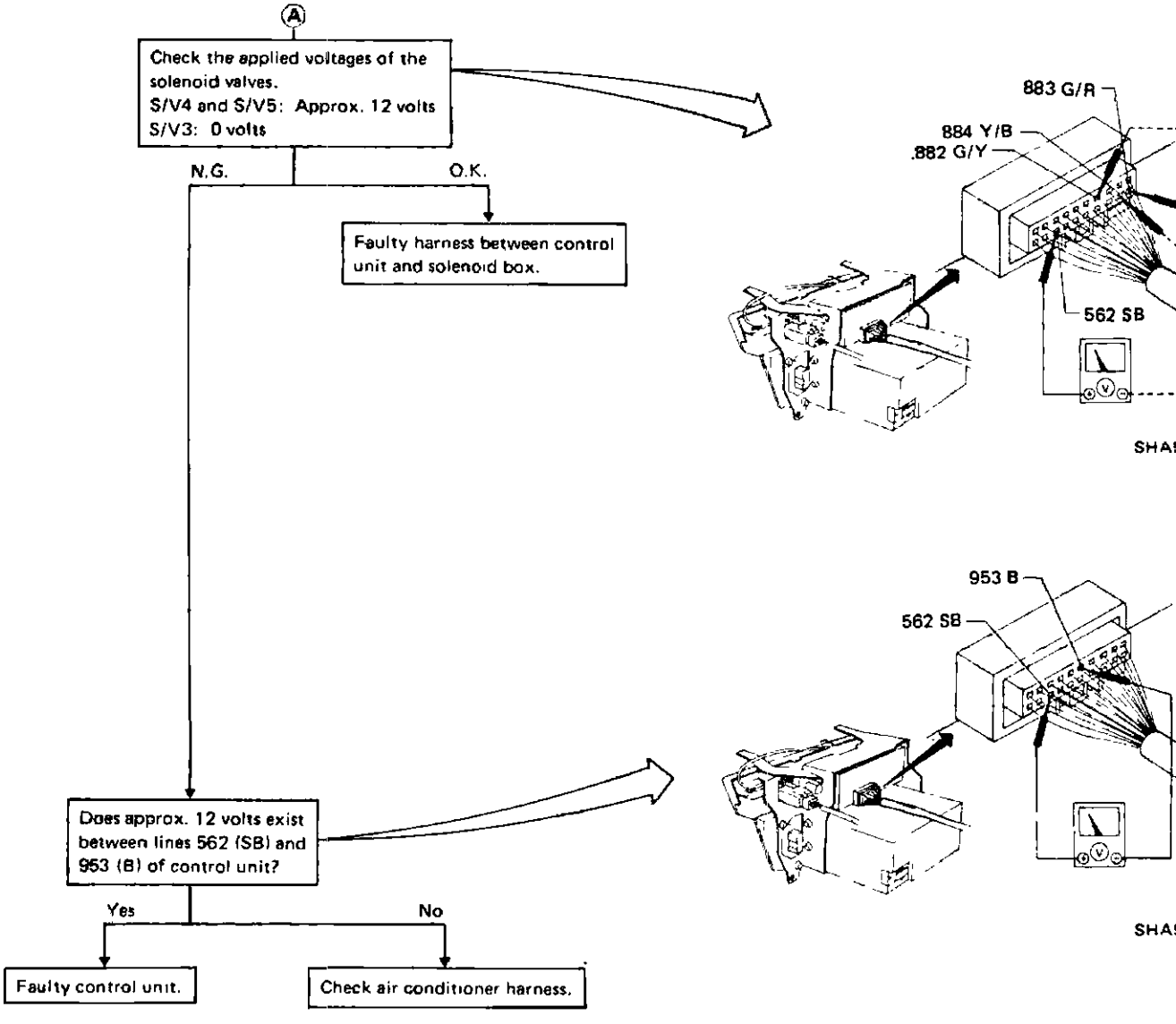
O.K.

N.G.

Faulty vacuum actuator or linkage.

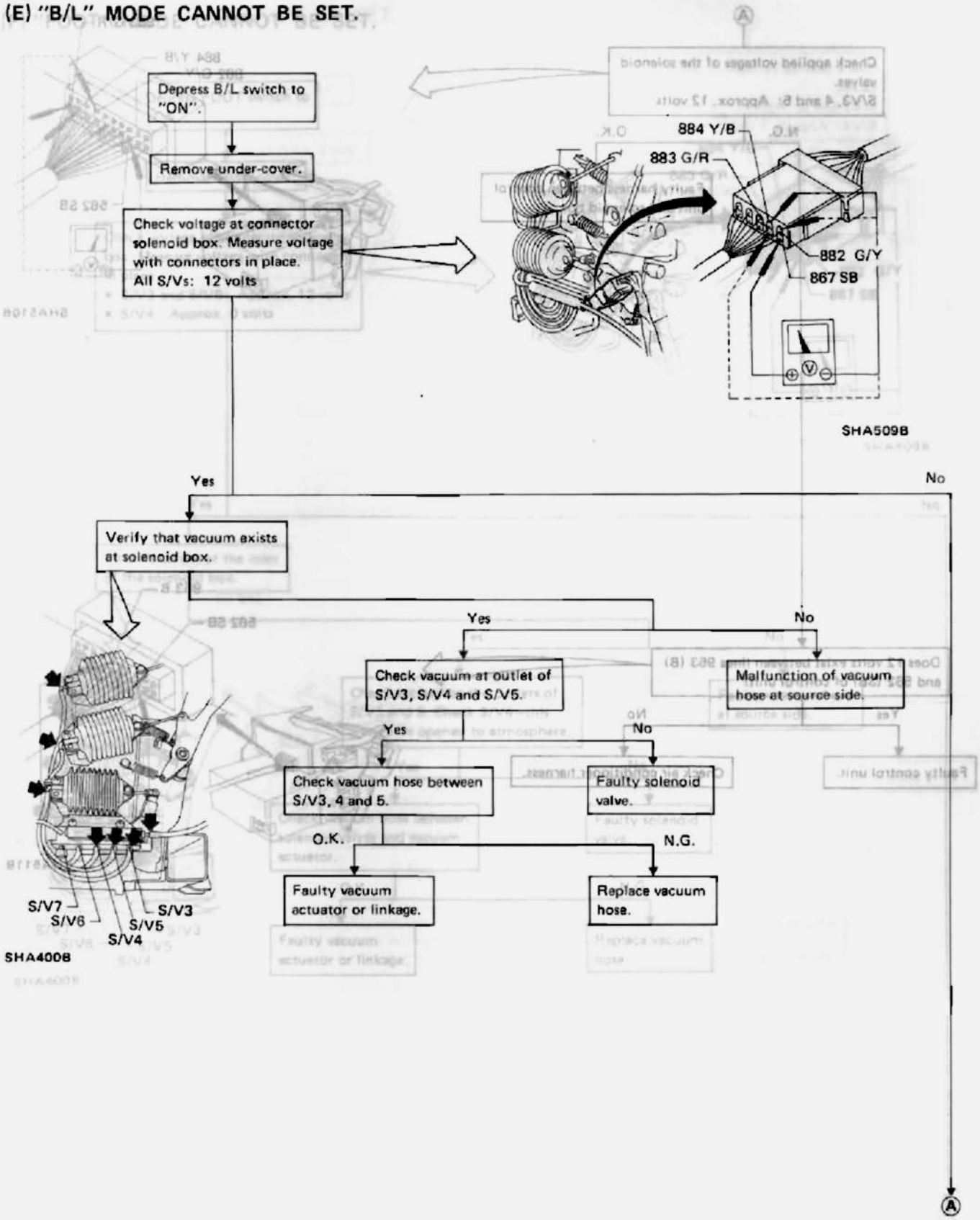
Replace vacuum hose.

Ⓐ

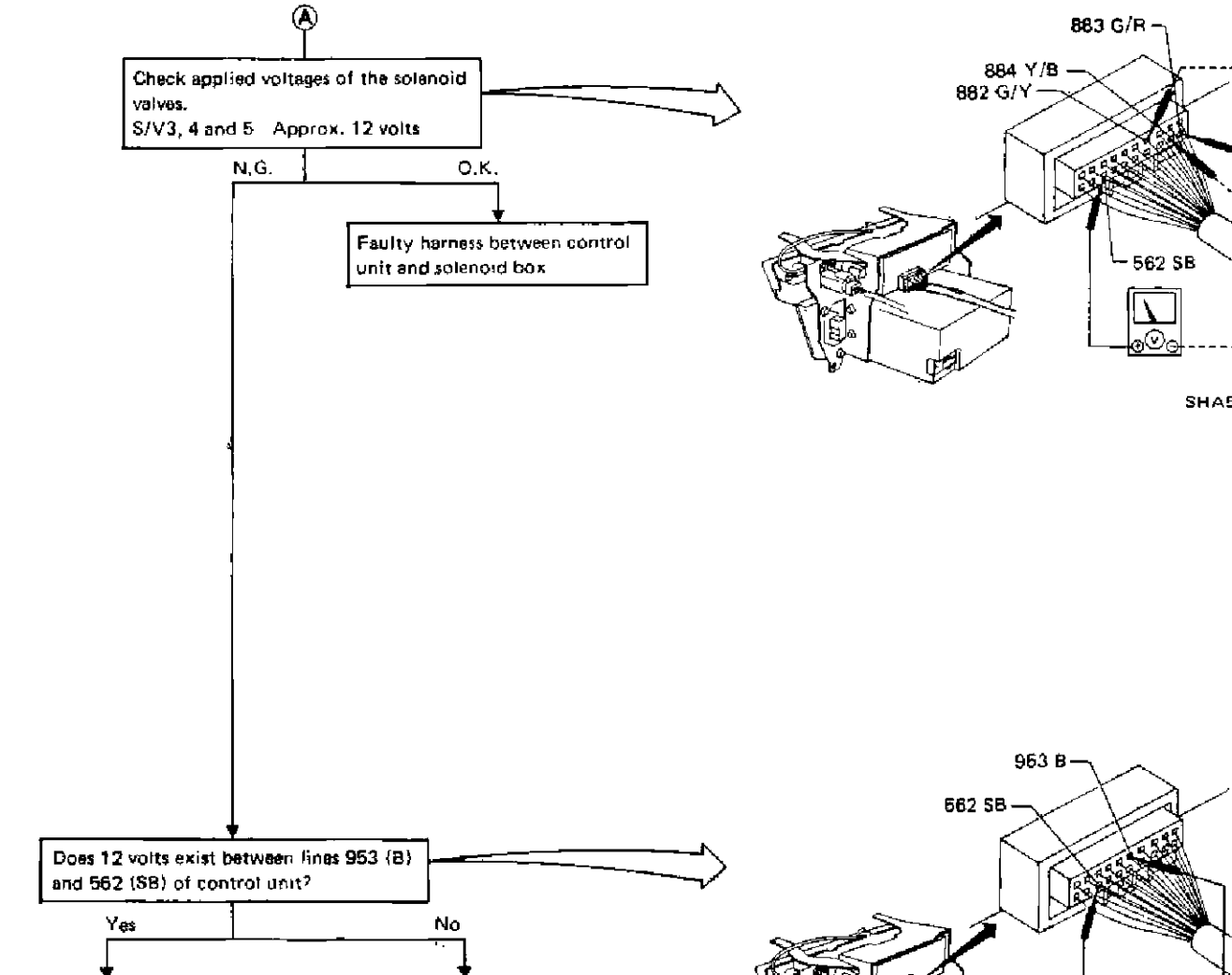

Ⓐ
Check the applied voltages of the solenoid valves.
S/V4 and S/V5: Approx. 12 volts
S/V3: 0 volts
N.G.
O.K.
Faulty harness between control unit and solenoid box.
883 G/R
884 Y/B
882 G/Y
562 SB
SHA
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?
953 B
562 SB
Yes
No
Faulty control unit.
Check air conditioner harness.
SHA

Trouble Diagnoses from Abnormal Conditions (Cont'd)

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



Trouble Diagnoses from Abnormal Conditions (Cont'd)

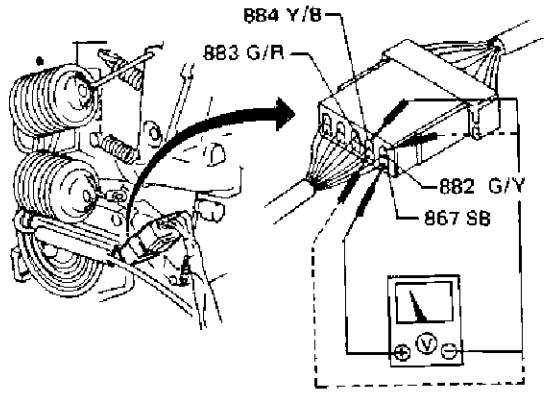


(F) "FOOT" MODE CANNOT BE SET.

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

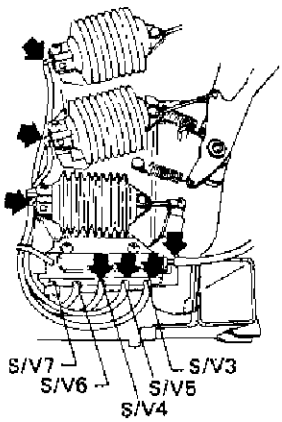


SHA509B

Yes

No

Check vacuum at the inlet of the solenoid box.



SHA400B

Yes

No

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

Faulty vacuum hose at source side.

Yes

No

Check vacuum hose between solenoid valves and vacuum actuator.

Faulty solenoid valve.

O.K.

N.G.

Faulty vacuum actuator or linkage.

Replace vacuum hose.

Ⓐ

Trouble Diagnoses from Abnormal Conditions (Cont'd)

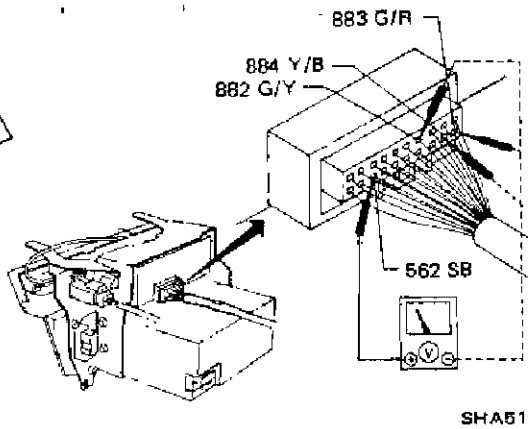
Ⓐ

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

No

Yes

Faulty harness between control unit and solenoid box.



SHA51

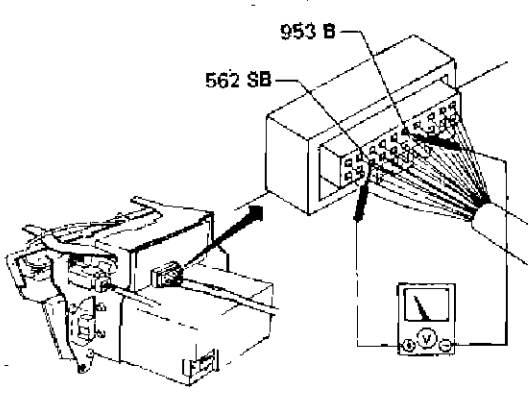
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?

Yes

No

Faulty control unit

Check air conditioner harness.



SHA51

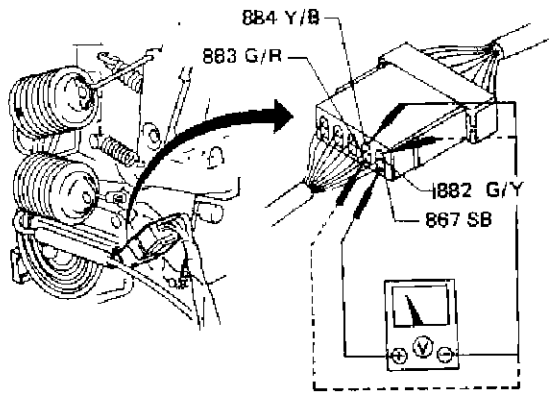
Trouble Diagnoses from Abnormal Conditions (Cont'd)

(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

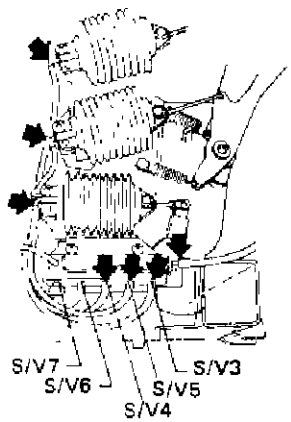


SHA509B

Yes

No

Check vacuum at the inlet of the solenoid box.



SHA400B

Yes

No

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

Faulty vacuum hose at source side.

Yes

No

Check vacuum hose between solenoid valve and vacuum actuator.

Faulty solenoid valve.

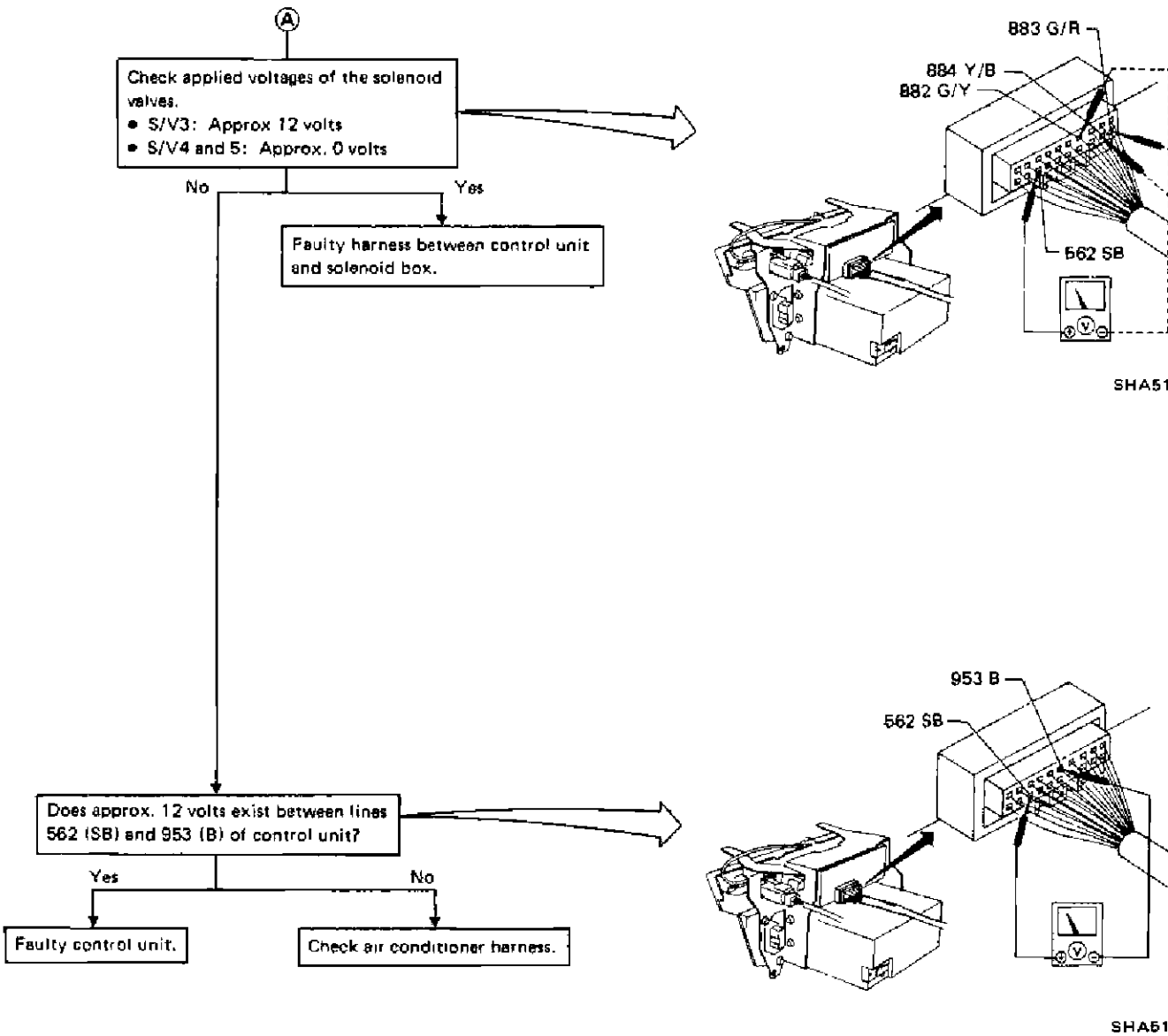
O.K.

N.G.

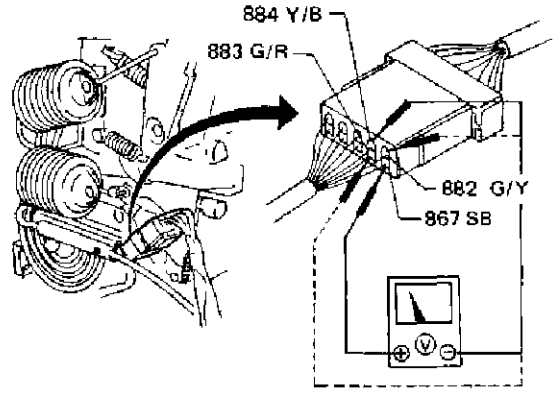
Faulty vacuum actuator or linkage.

Replace vacuum hose.

Ⓐ


Ⓐ
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.
883 G/R
884 Y/B
882 G/Y
562 SB
SHA51
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?
Yes
No
Faulty control unit.
Check air conditioner harness.
953 B
562 SB
SHA51

(H) "DEF" MODE CANNOT BE SET.



Turn DEF switch to "ON"

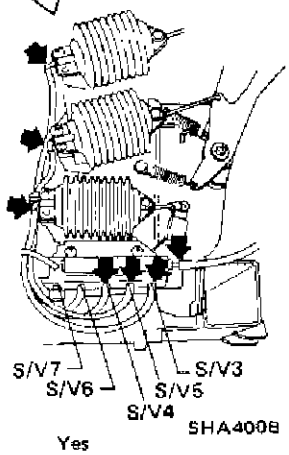
Remove under-cover from driver's side.

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

Yes

No

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



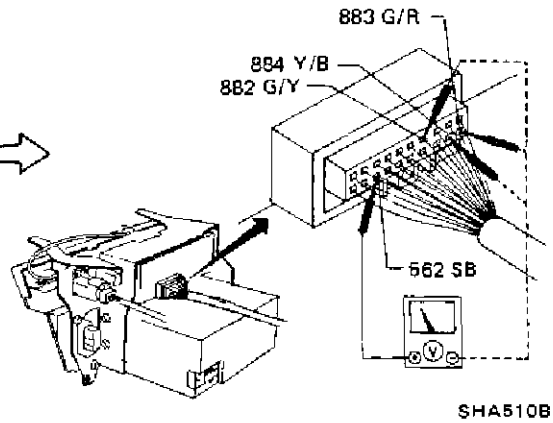
Yes

No

Faulty actuator or disconnected linkage.

Faulty solenoid valve.

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



Yes

No

Faulty harness between control unit and solenoid box.

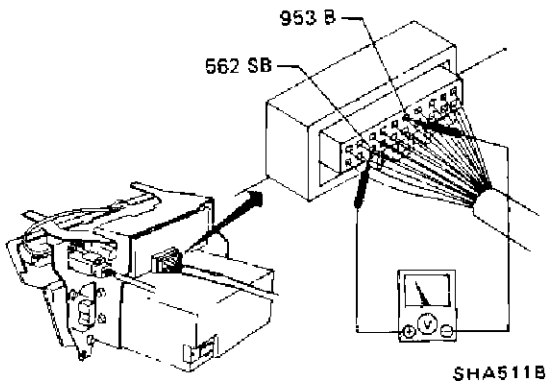
Does approx. 12 volts exist between lines 562 (SB) and 953 (B) of control unit?

Yes

No

Faulty control unit

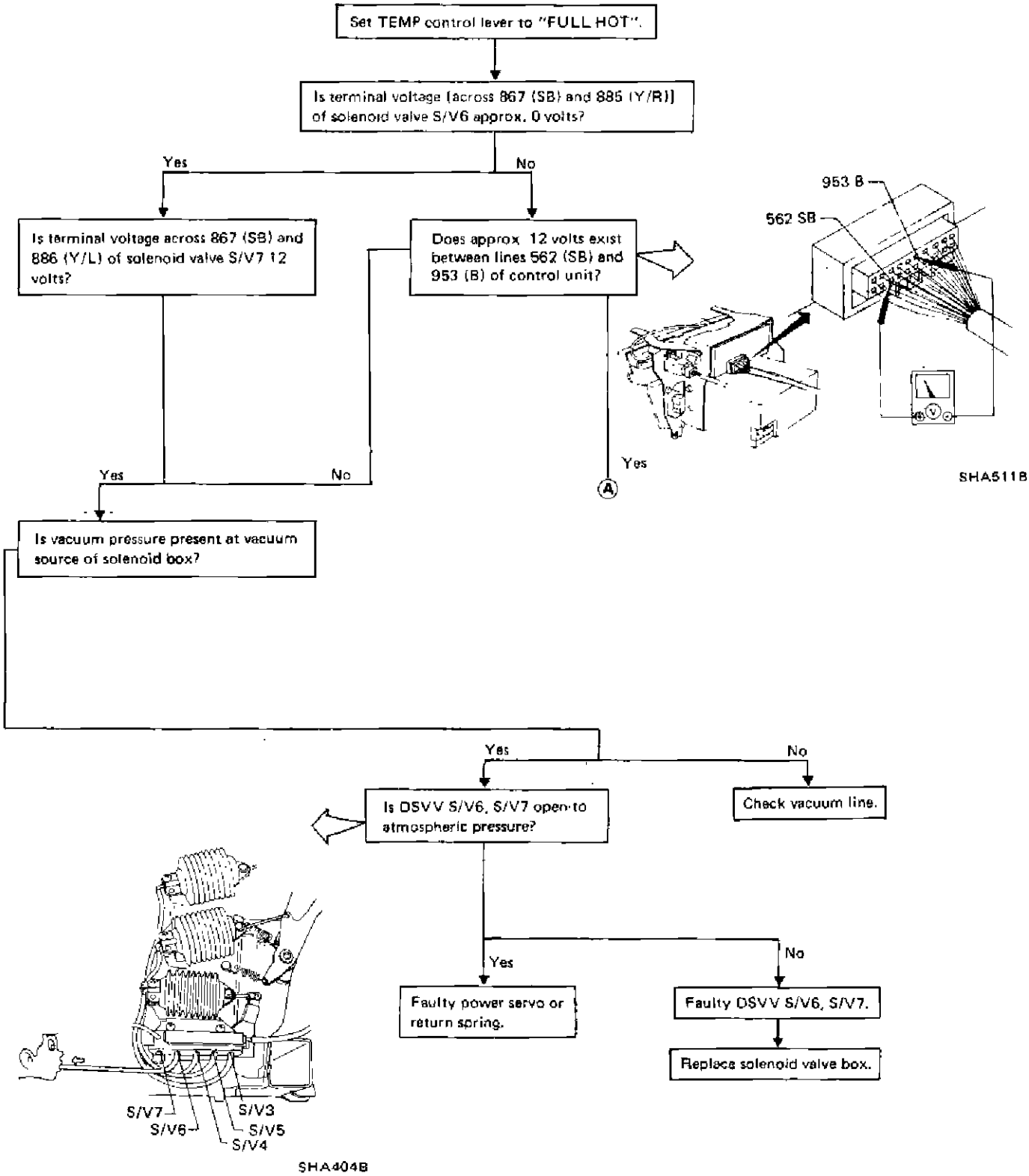
Check air conditioner harness.



TROUBLE DIAGNOSES (Manual)

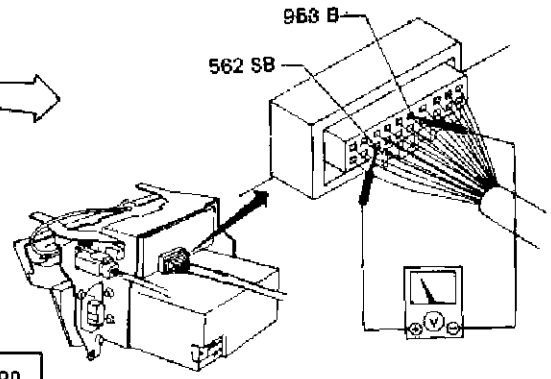
Trouble Diagnoses from Abnormal Conditions (Cont'd)

(I) OUTLET AIR WILL NOT BECOME WARM.



Ⓐ

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.



SHA511B

Does approx. 12 volts exist between lines 562 (SB) and 953 (B), or the control unit (Ignition ON)?

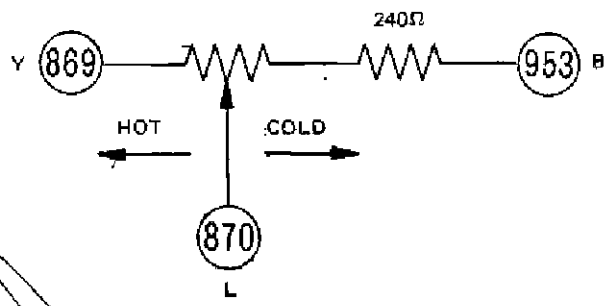
Yes

No

A/C harness malfunction

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

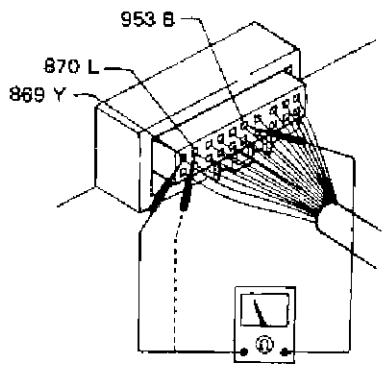
O.K.

N.G.

Malfunction of control unit.

Malfunction of the A/C wiring harness.

Ignition switch: OFF position



SHA933B

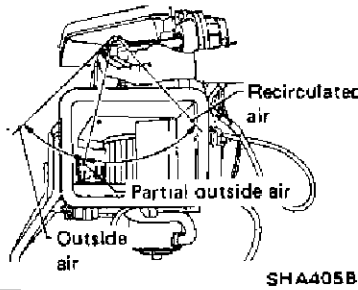
Trouble Diagnoses from Abnormal Conditions (Cont'd)

(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?

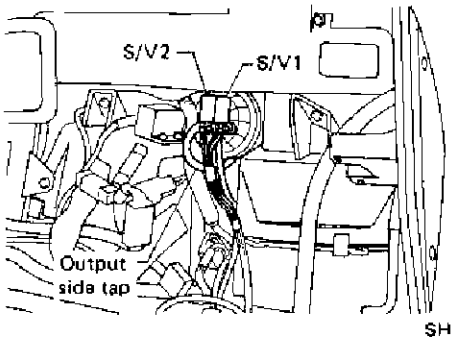
No

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.

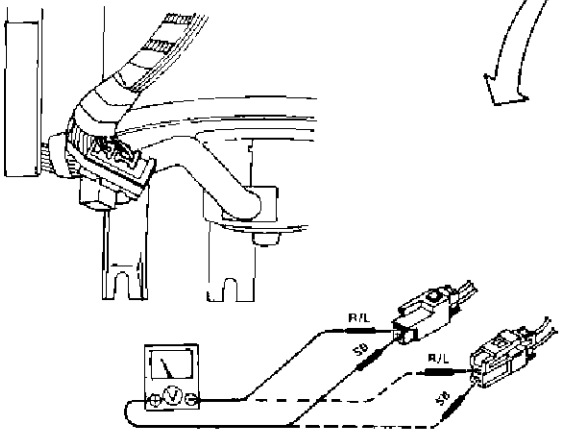
No



SHA406B

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 from Abnormal Conditions (Cont'd)

Ⓐ

Yes

Does approx. 12 volts exist between lines 867 (SB) and 886 (Y/R) of solenoid valve S/V6?

Yes

Is vacuum pressure present at vacuum source side of solenoid valve box?

Ⓑ

No

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

No

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.

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

Yes

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). Approx. 1.3 kΩ
870 (L) and 953 (B): Approx. 240Ω - 1.3 kΩ**
**DSVV with no vacuum applied 1.3 kΩ
DSVV with vacuum applied 240Ω

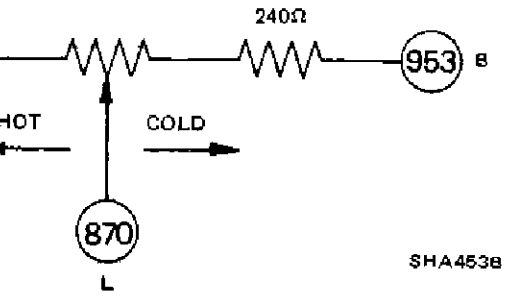
or

Voltage check, vehicle must be running.
Move temperature control lever to full hot, then to full cool, taking the following voltage measurements:
① 953 (B) Negative 869 (Y) Positive
Full hot = 5.14V Approx.
Full cold = 5.26V Approx.
② 953 (B) Negative 870 (L) Positive
Full hot = 4.86V Approx.
Full cold = 0.90V Approx.

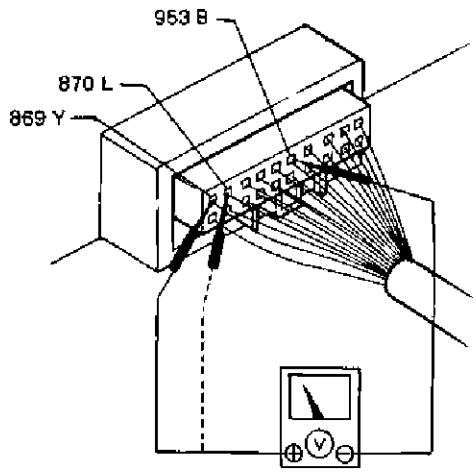
Ⓐ

No

A/C harness malfunction

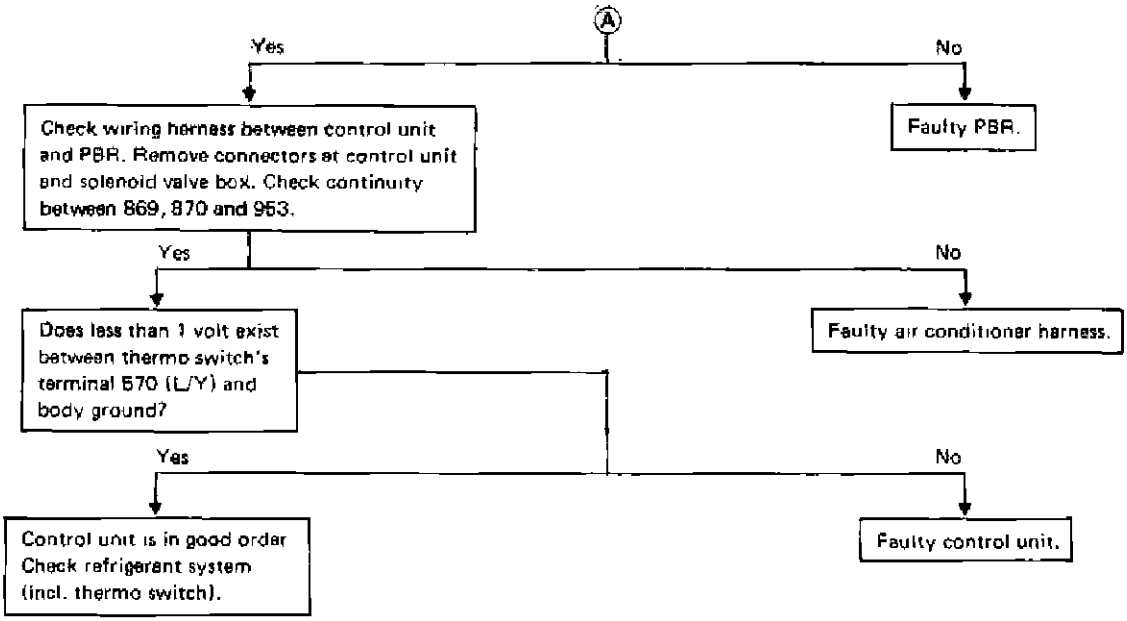


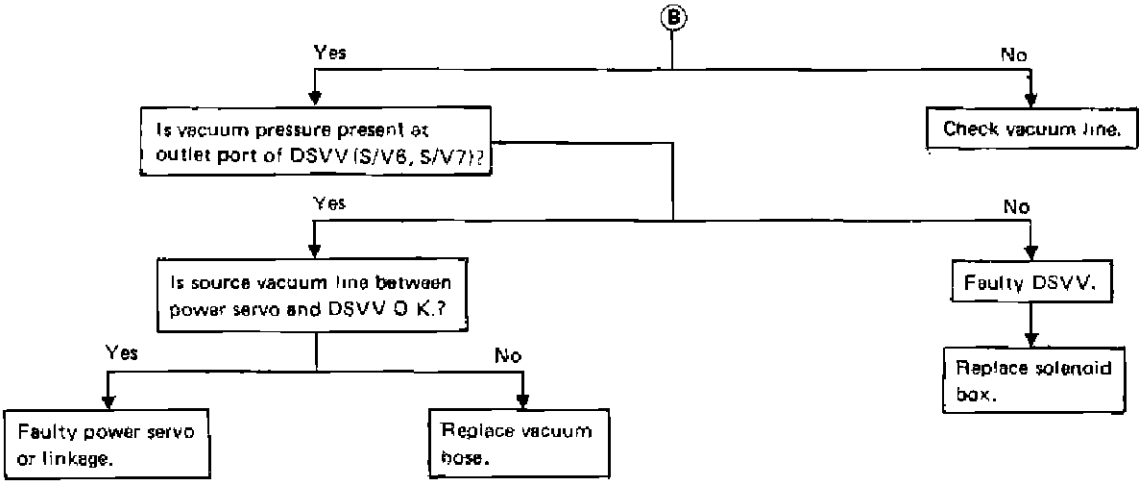
SHA453B



SHA512B

Trouble Diagnoses from Abnormal Conditions (Cont'd)

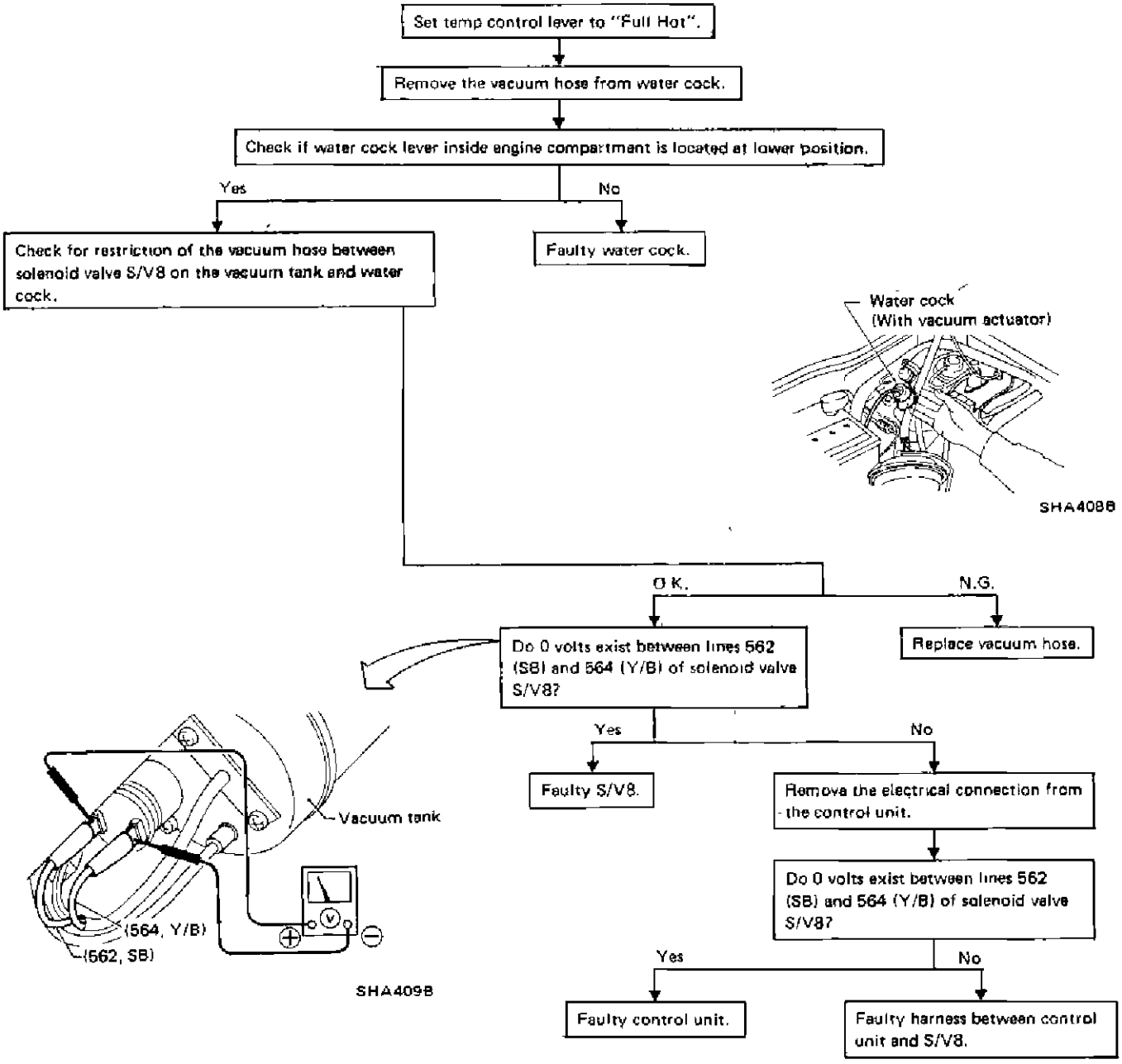




(K) OUTLET AIR TEMPERATURE CANNOT BE CHANGED WITH TEMP. CONTROL LEVER.

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

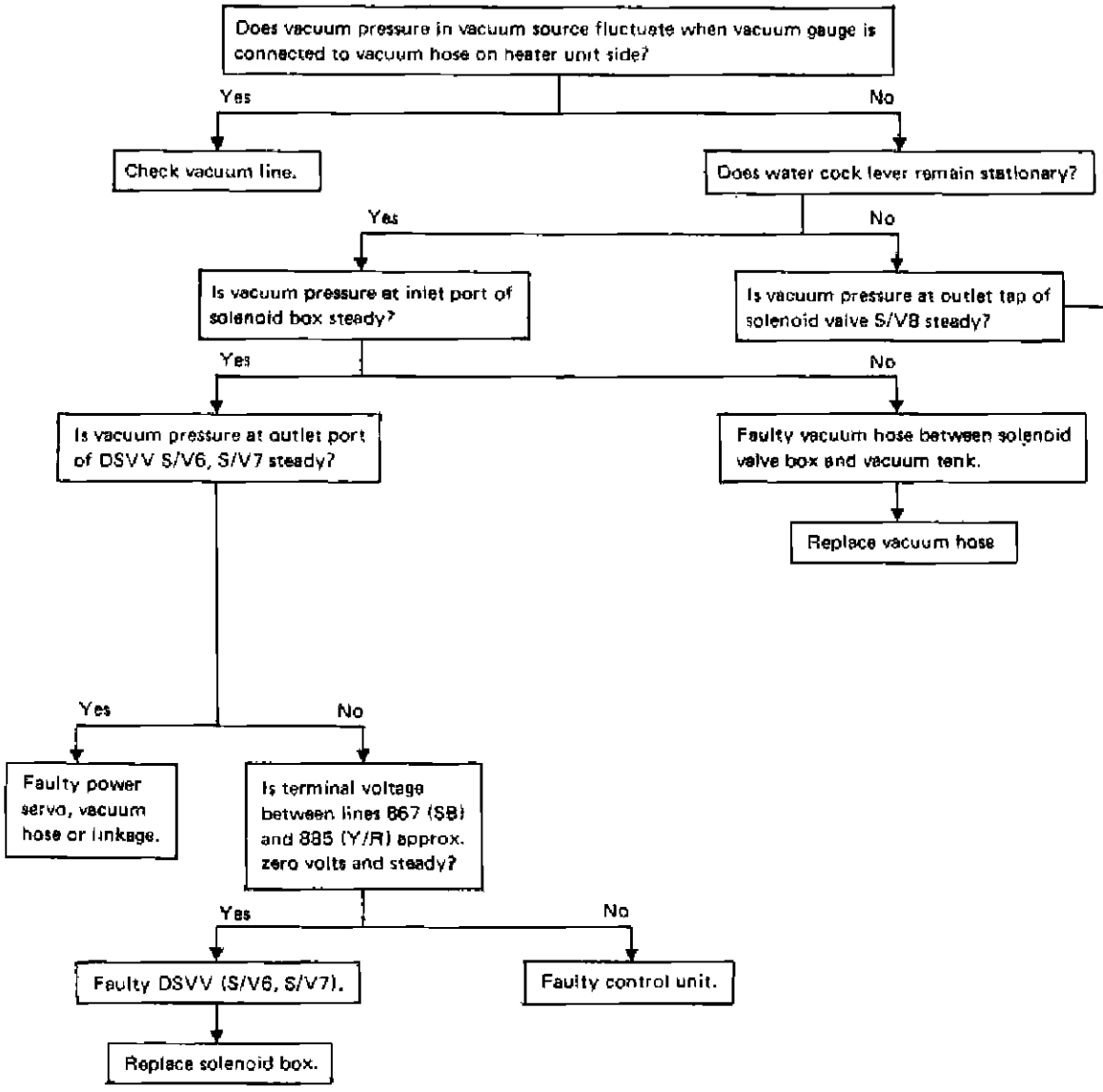
(L) MALFUNCTION OF WATER COCK OPERATION.



TROUBLE DIAGNOSES (Manual)

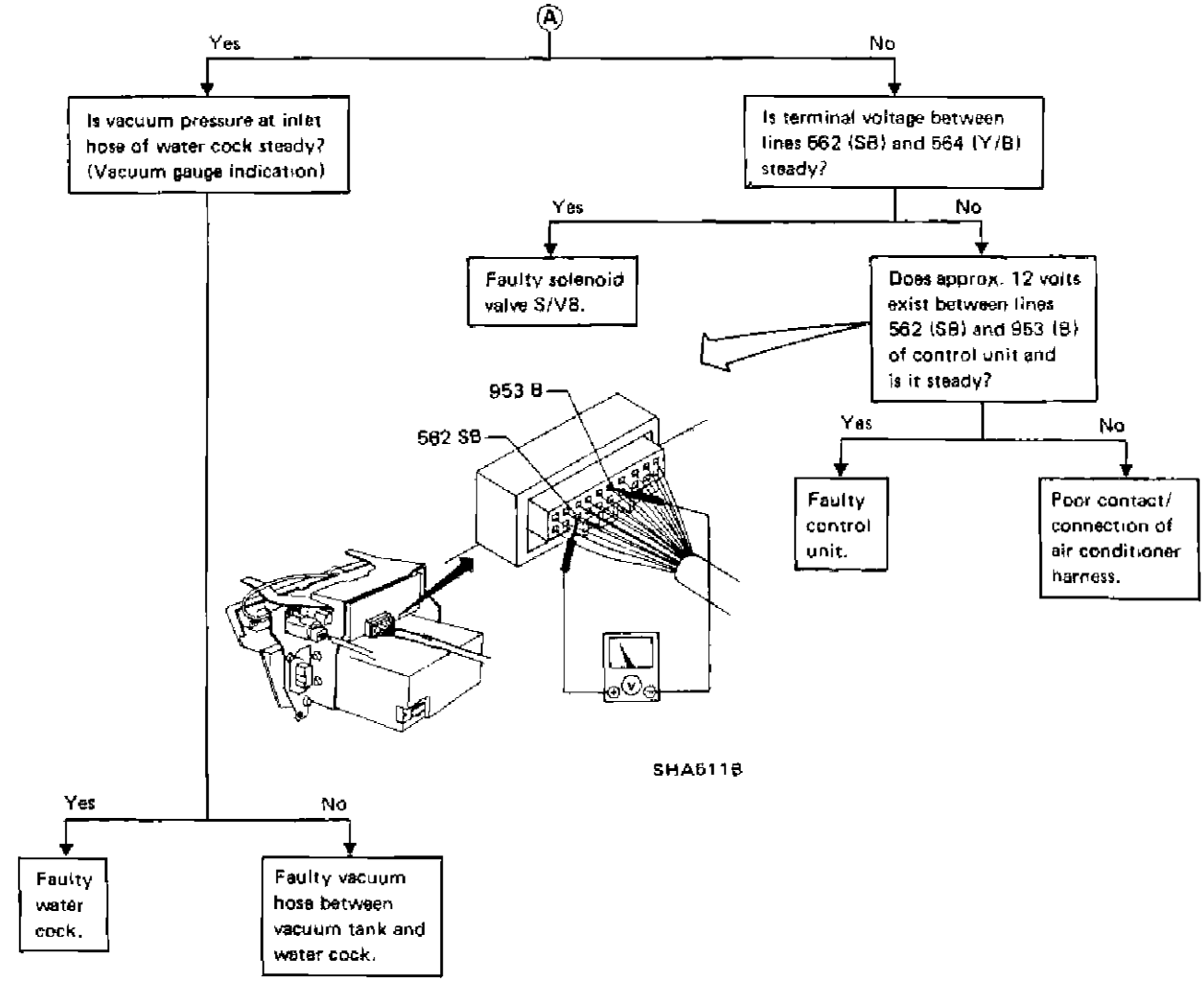
Trouble Diagnoses from Abnormal Conditions (Cont'd)

(M) OUTLET AIR TEMPERATURE FLUCTUATES.

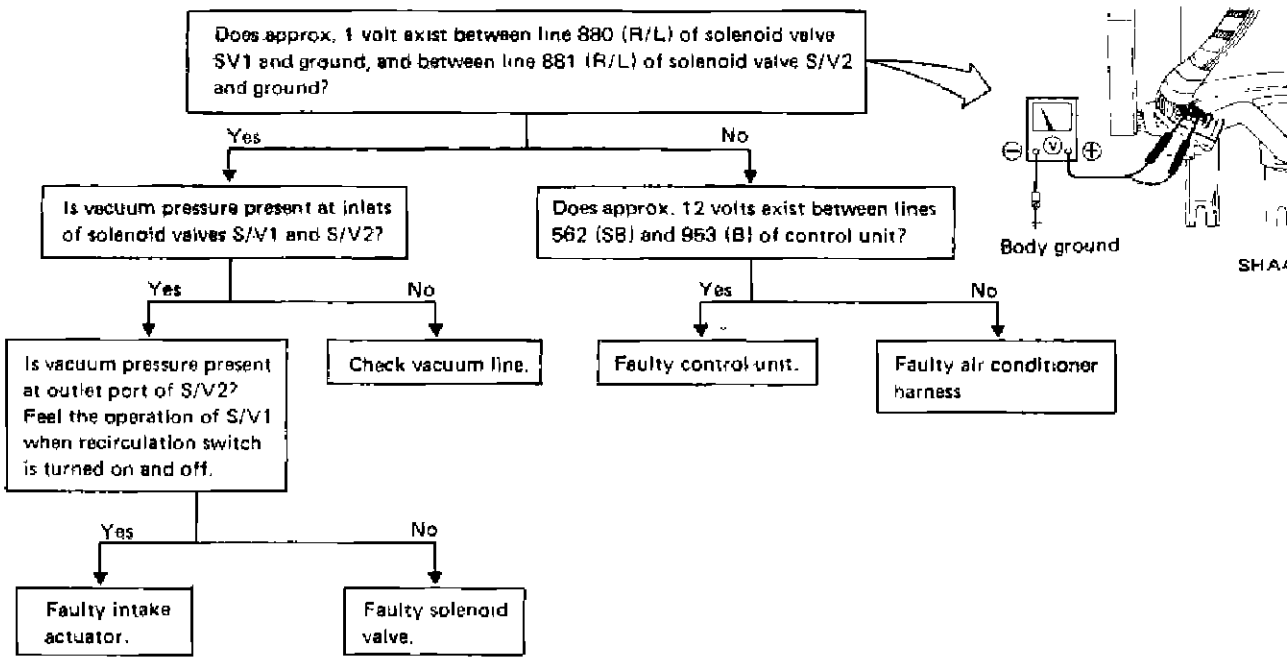


Ⓐ

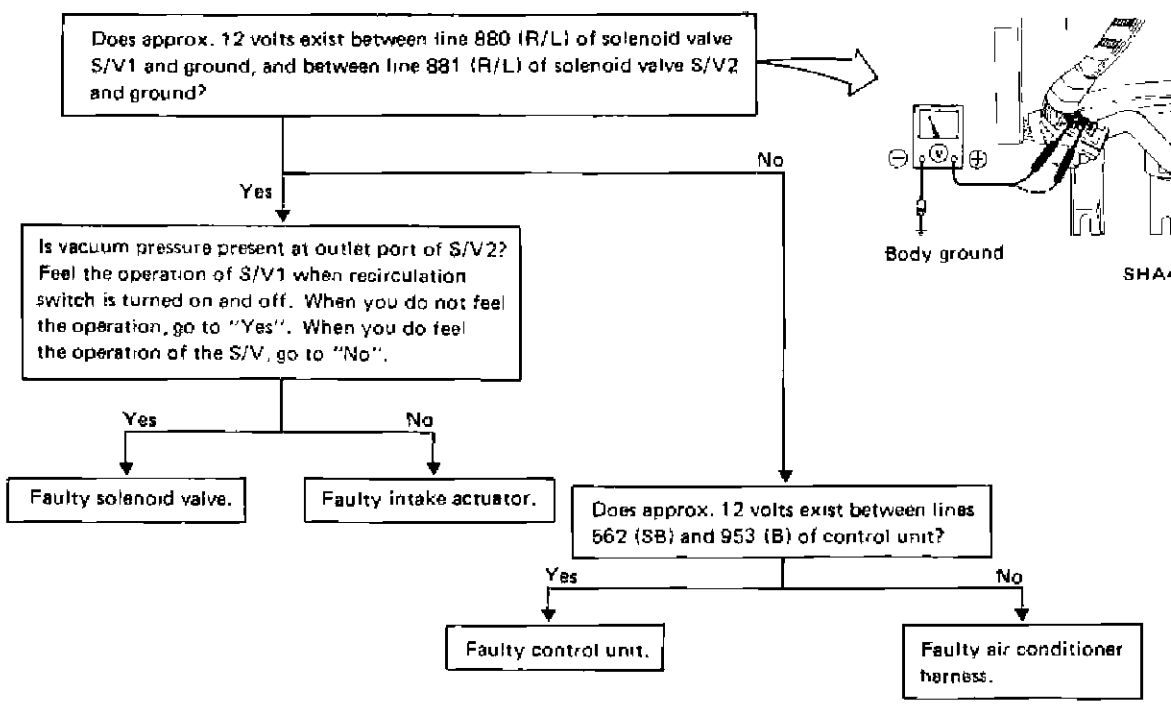
Trouble Diagnoses from Abnormal Conditions (Cont'd)



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

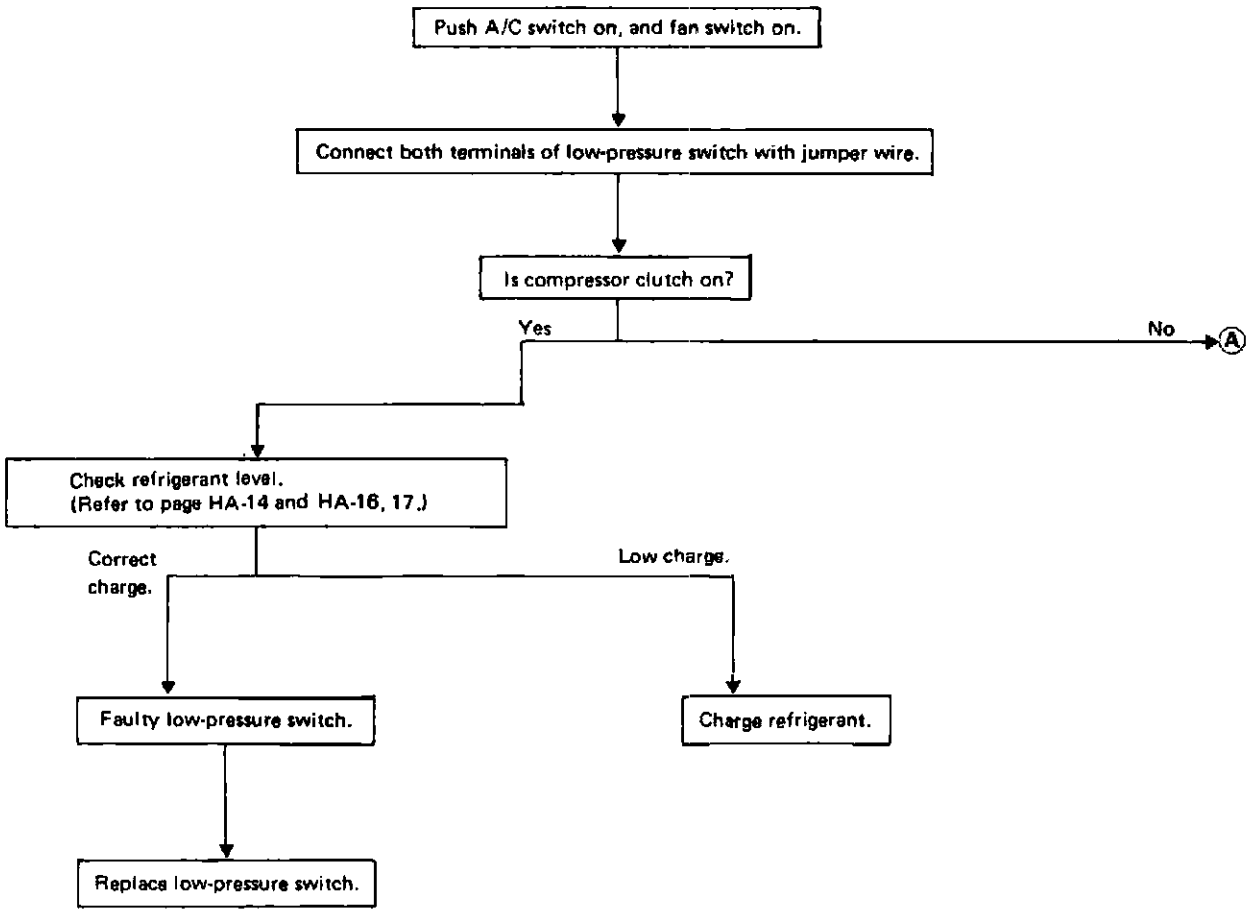


(P) OUTSIDE AIR IS NOT DRAWN INTO COMPARTMENT WHEN "REC" SWITCH IS TURNED OFF.



Trouble Diagnoses from Abnormal Conditions (Cont'd)

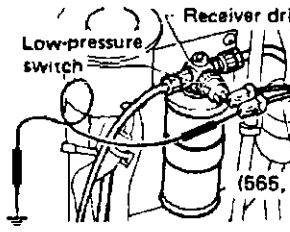
(Q) COMPRESSOR CLUTCH IS NOT ENGAGED.



Trouble Diagnoses from Abnormal Conditions (Cont'd)

Ⓐ

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



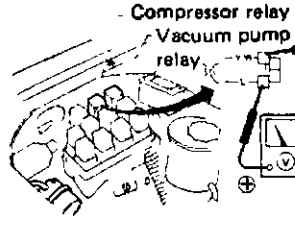
SHA4

ON

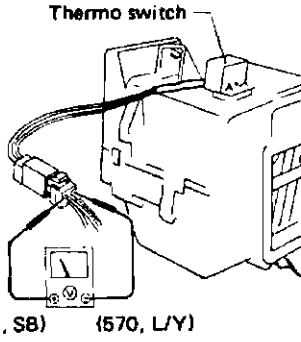
OFF

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

Ⓑ



SHC0



SHA

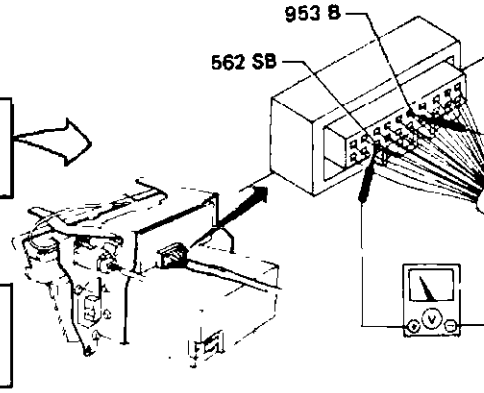
Is applied voltage between terminals 570 and 571 of thermo switch 12 volts?

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.

SHA

Trouble Diagnoses from Abnormal Conditions (Cont'd)

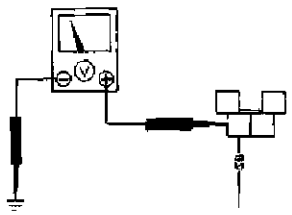
Ⓑ

Yes

No

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

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



SHA452B

Yes

No

Is the compressor relay terminals (SB561 and Y/G568 of compressor relay) shorted?

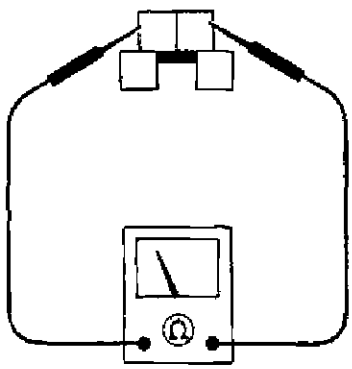
Malfunction of wiring harness (check between compressor relay SB561 and fuse 562).

Yes

No

Faulty compressor relay.

Reinsert compressor relay.



SHA982B

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

Yes

No

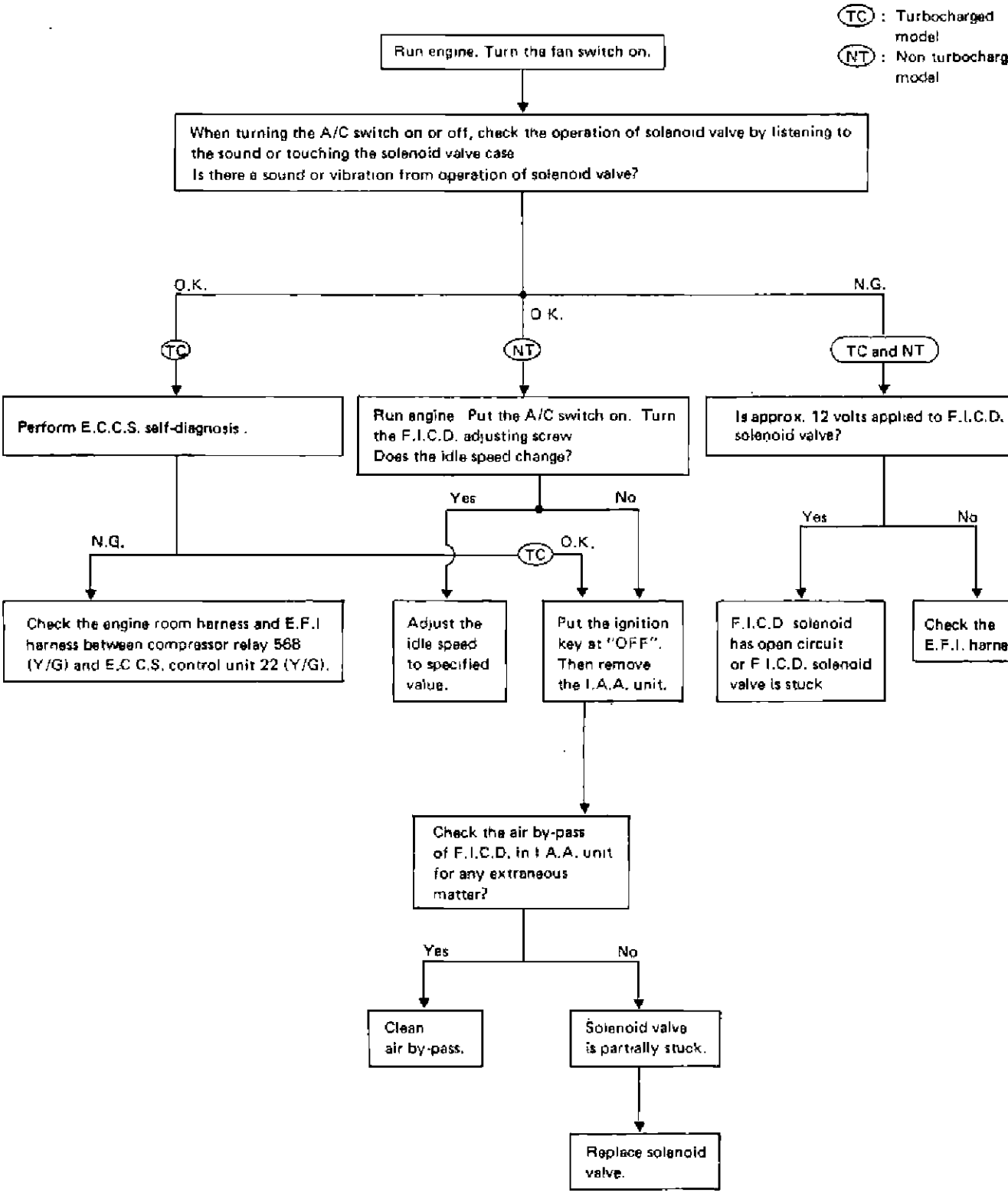
Faulty magnet clutch.

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

TROUBLE DIAGNOSES (Manual)

Trouble Diagnoses from Abnormal Conditions (Cont'd)

(R) MALFUNCTION OF F.I.C.D.



(S) BLOWER MOTOR ROTATES INTERMITTENTLY.

Remove fan control amplifier from blower motor unit.

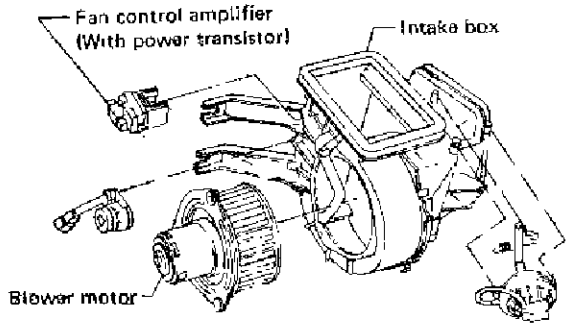
Does water stand on the fan control amplifier?

Yes

Remove the water and install the fan control amplifier again.

No

Go to item (A). (Page HA-42)



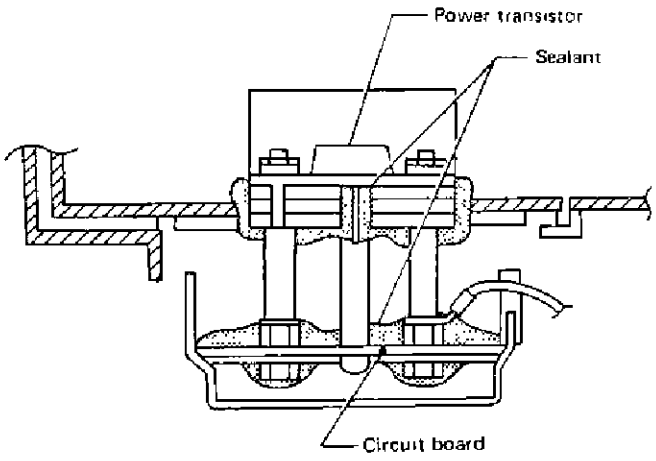
SHA318B

Normal operation

Modify the fan control amplifier as follows:
Apply sealant around the power transistor cover and the terminals of the power transistor.
Apply sealant to the surface of the circuit board.

N.G.

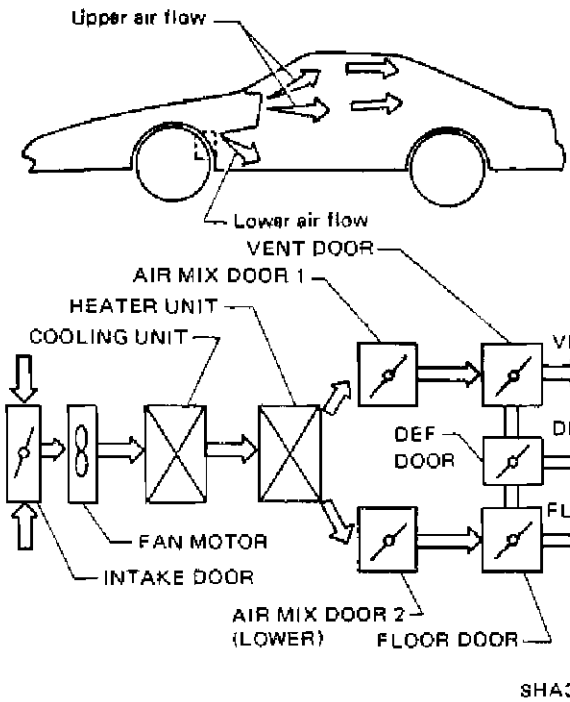
Replace fan control amplifier.



SHA521B

Features

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



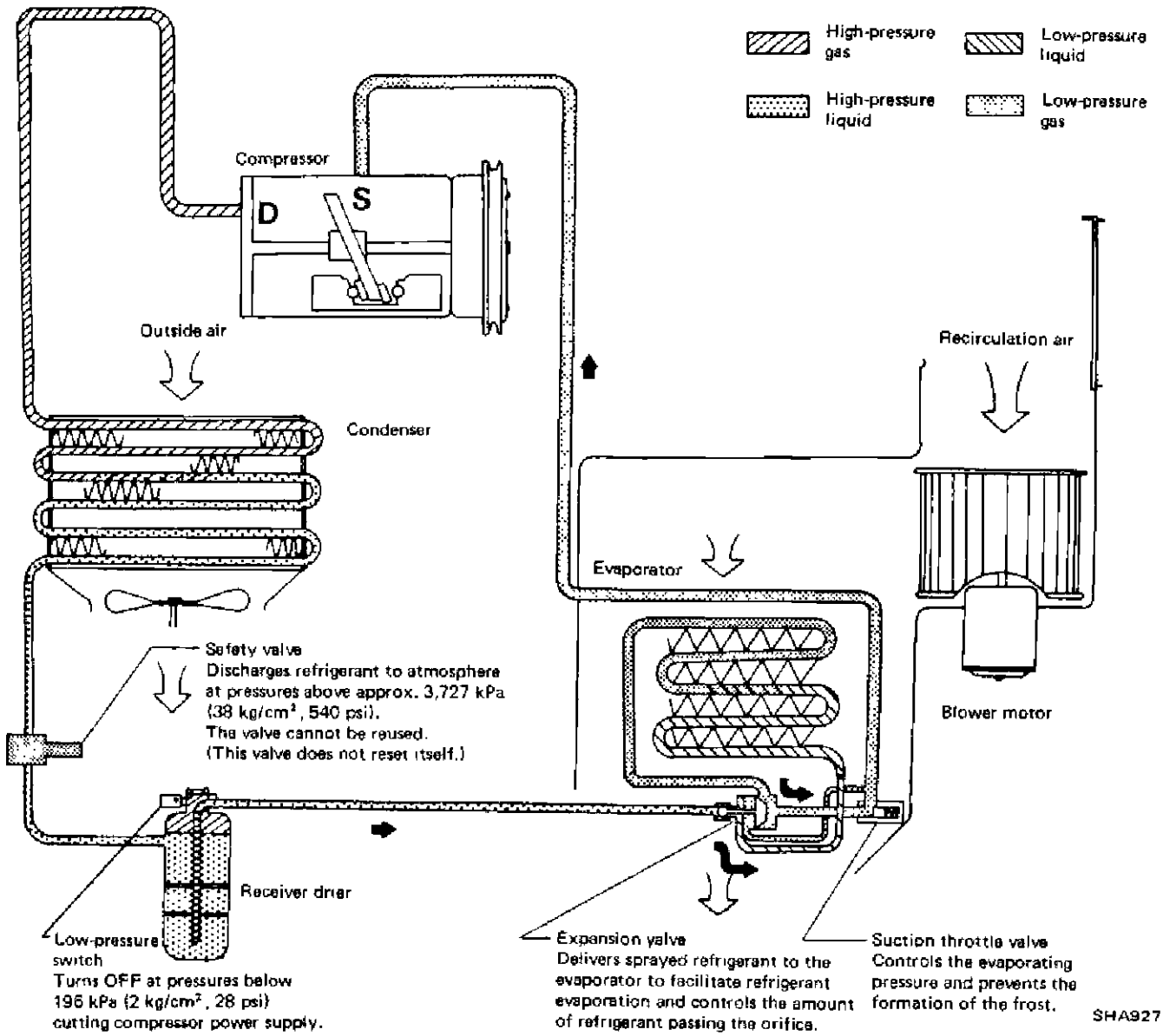
Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the receiver drier, through the evaporator, and back to the compressor.
The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

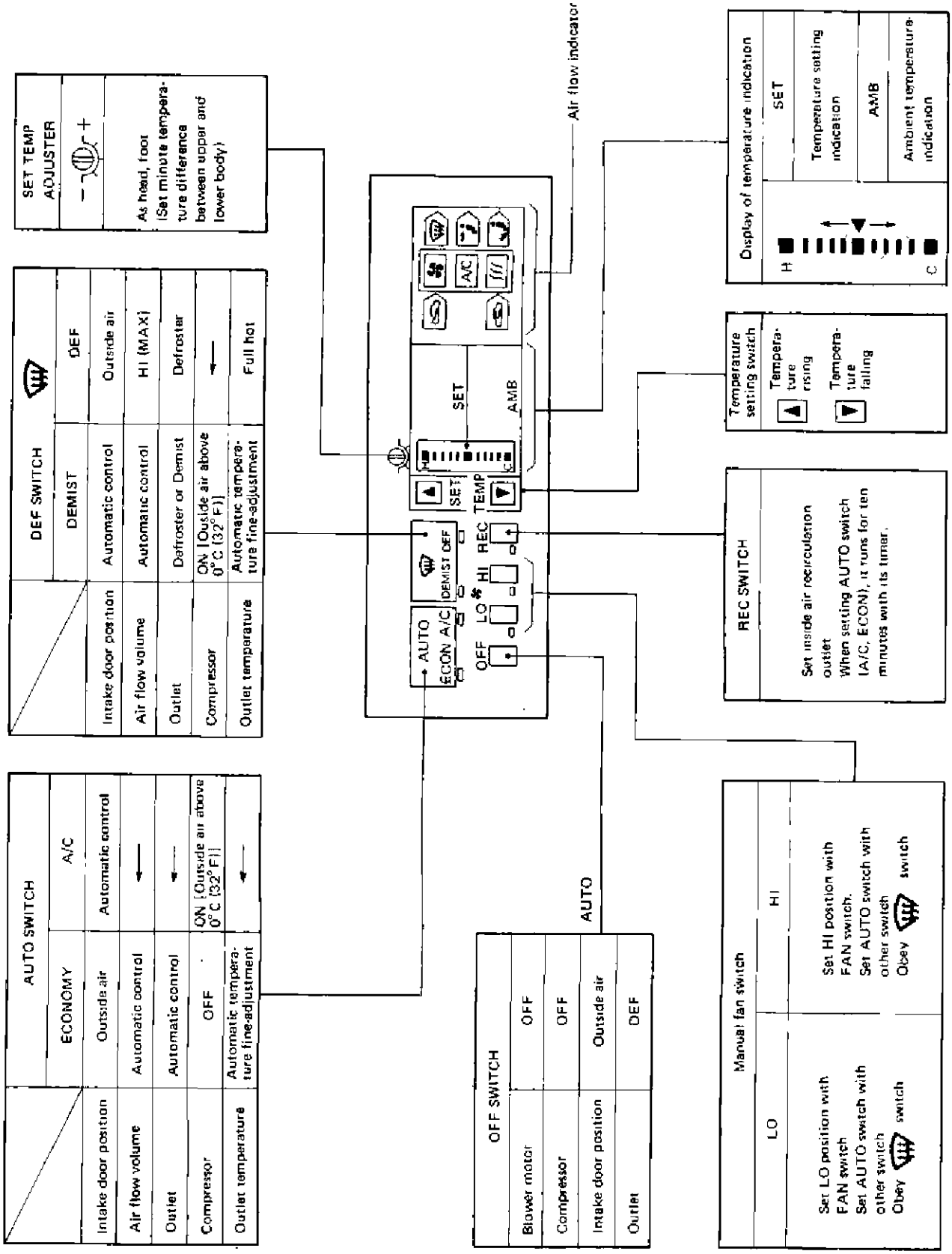
FREEZE PROTECTION — Compressor control

When the A/C is switched on, the compressor runs continuously, and the evaporator pressure is controlled by a suction throttling valve (S.T.V.) to prevent freeze up.
The refrigerant system is protected against excessively high pressure by a pressure relief valve located between the receiver drier and the condenser. Protection against excessively low pressure (interruption of compressor operation) is provided by a low pressure switch, located on the receiver drier.



DESCRIPTION — Air Conditioner (Auto)

Function of the Switches on Control Unit

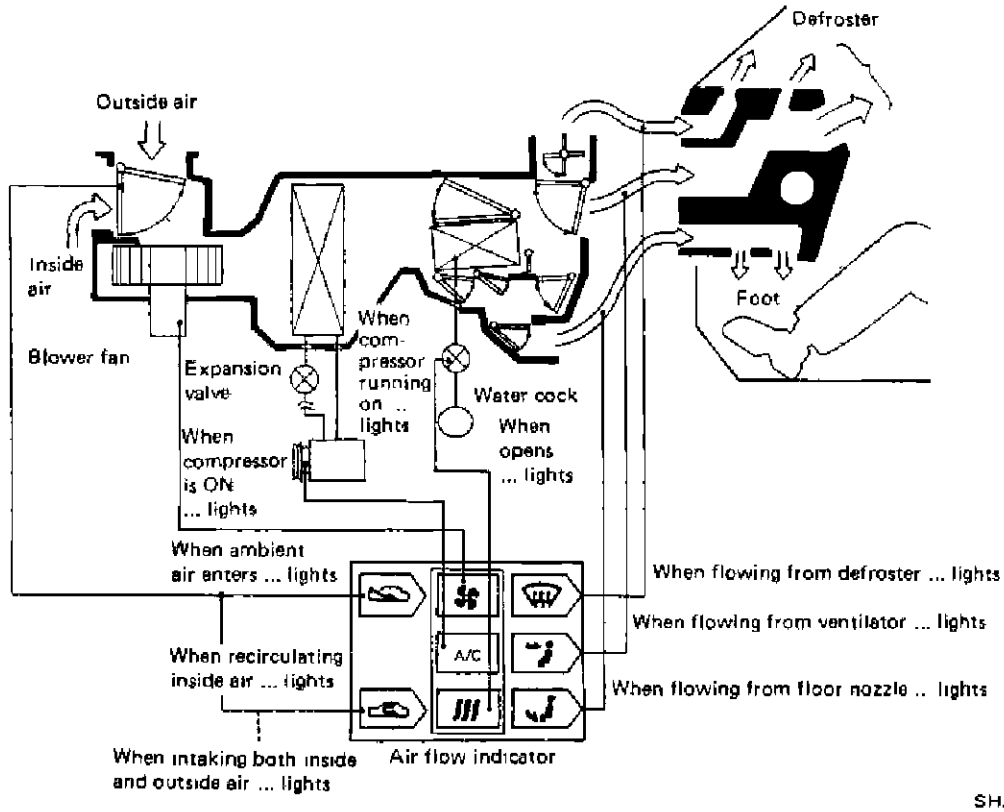


SHA983B

(3) SWITCHES AND THEIR CONTROL FUNCTIONS

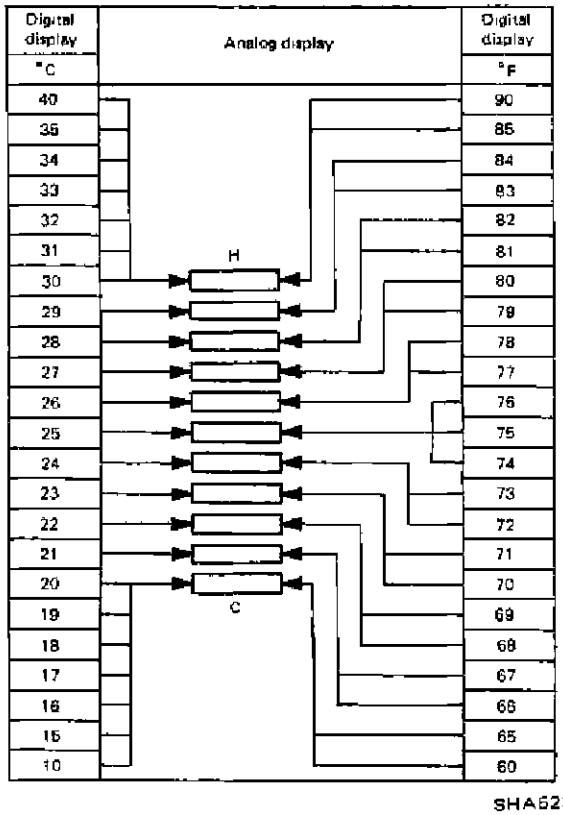
Switch \ Item to be controlled		Air flow	A/M door	Compressor	Water cock (W/C)	Intake air	Air outlet	Control When starting	Remarks	
OFF		OFF	Auto	OFF	Auto	Outside air	Auto		Display (SET)/(AMB) is ON with ignition switch set to ACC. A/M door and W/C control air temperature obtained by ram pressure.	
AUTO 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.	
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.	

Display of the Air Flow Indicator



SHA79

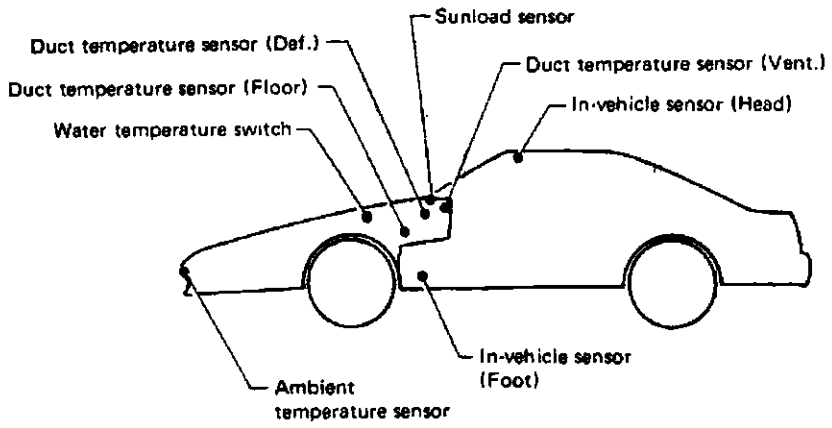
Display of Temperature Setting



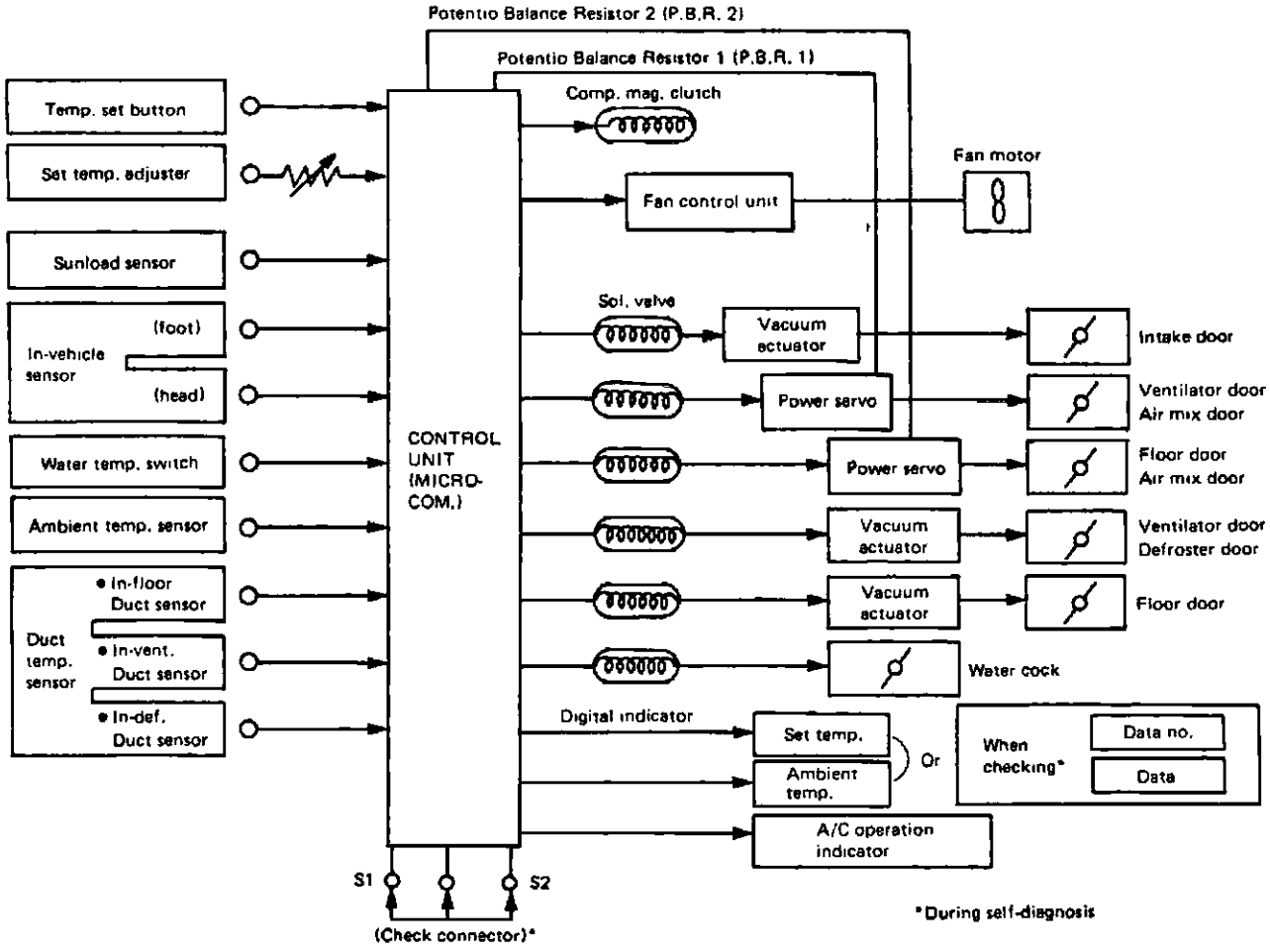
SHA623B

Control System

SENSOR & SWITCH LOCATION



SHA925B



SHA799B

DESCRIPTION — Air Conditioner (Auto)

System Operation (Air mix door control)

AIR MIX DOOR CONTROL
(Automatic temperature control)

1. Component parts

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

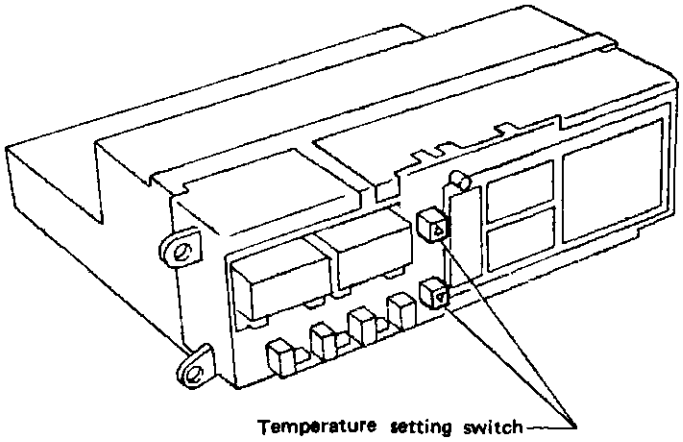
1) Automatic amplifier (with microcomputer)
2) Temperature setting switch
3) Two in vehicle sensors (head/foot)
4) Ambient temperature sensor
5) Three duct temperature sensors (defroster duct, ventilator duct, floor duct)
6) Sunload sensor
7) Power servo 1 and Power servo 2
8) PBR1 and PBR2
   (P.B.R.: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

- Automatic amplifier

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

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

- **Temperature setting switch**

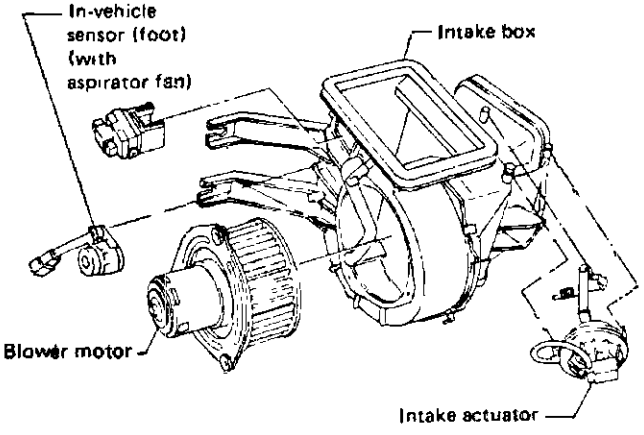


SHA984B

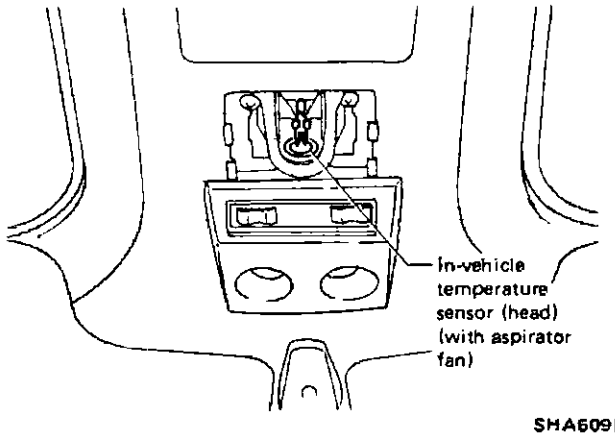
This switch is used for setting the in-vehicle temperature. Temperature set by the temperature setting switch is electrically memorized by the microcomputer in the automatic amplifier.

- **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.

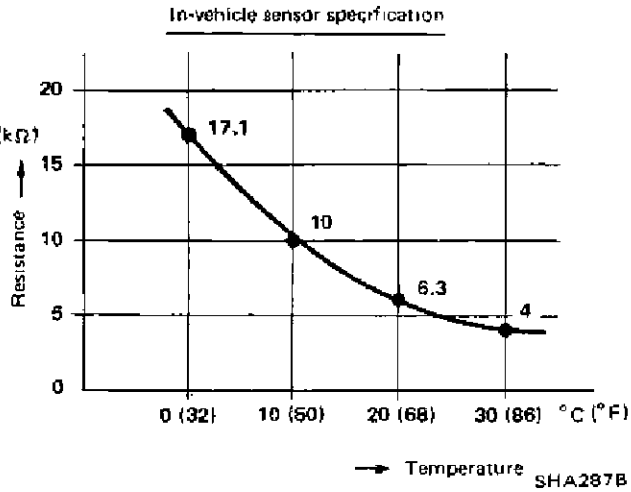


SHA318B



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

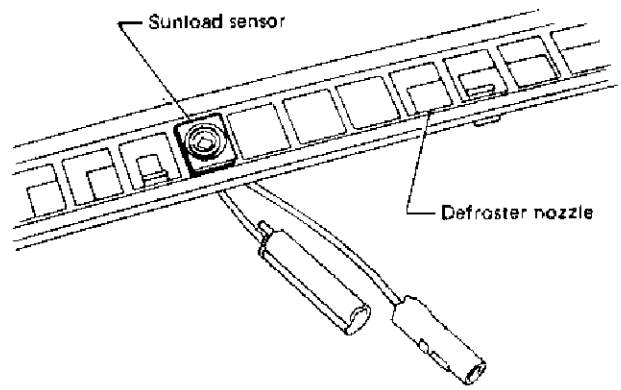
- **Defroster duct temp. sensor, ventilator duct temp. sensor, floor duct temp. sensor**

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).

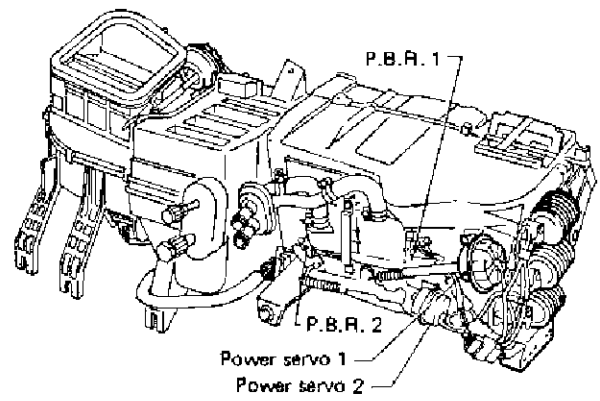
- **Sunload sensor (Photo diode)**

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



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

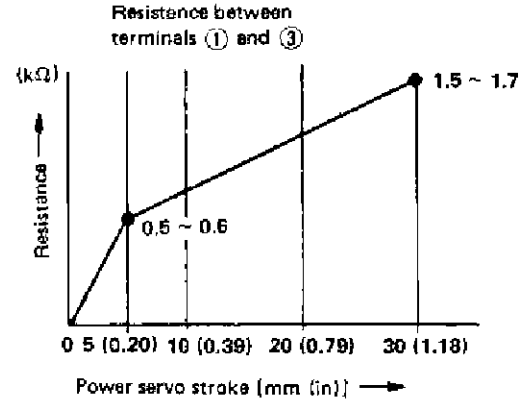
The power servo varies its stroke depending on the vacuum or atmospheric pressure led through the D.S.V.V. for controlling the air mix door. The P.B.R. is a variable resistor interlinked to the power servo, and the air mix door position (opening) information is input into the auto amplifier in terms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



DESCRIPTION — Air Conditioner (Auto)

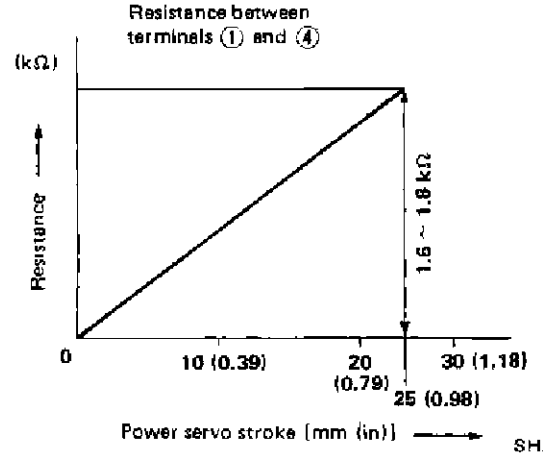
System Operation (Air mix door control) (Cont'd)

P.B.R. 1

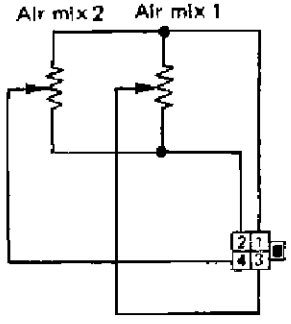


SHA610B

P.B.R. 2

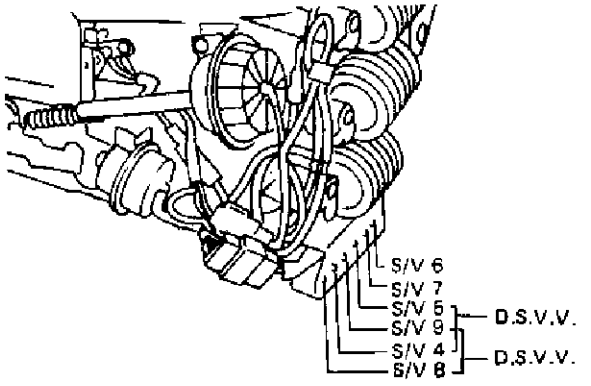


SHA301B



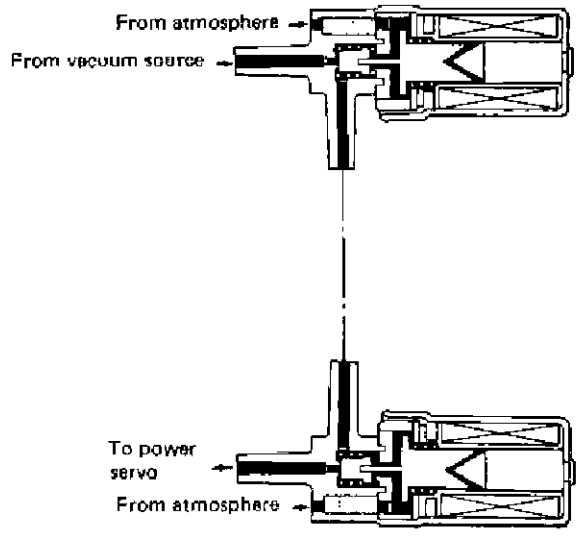
SHA611B

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



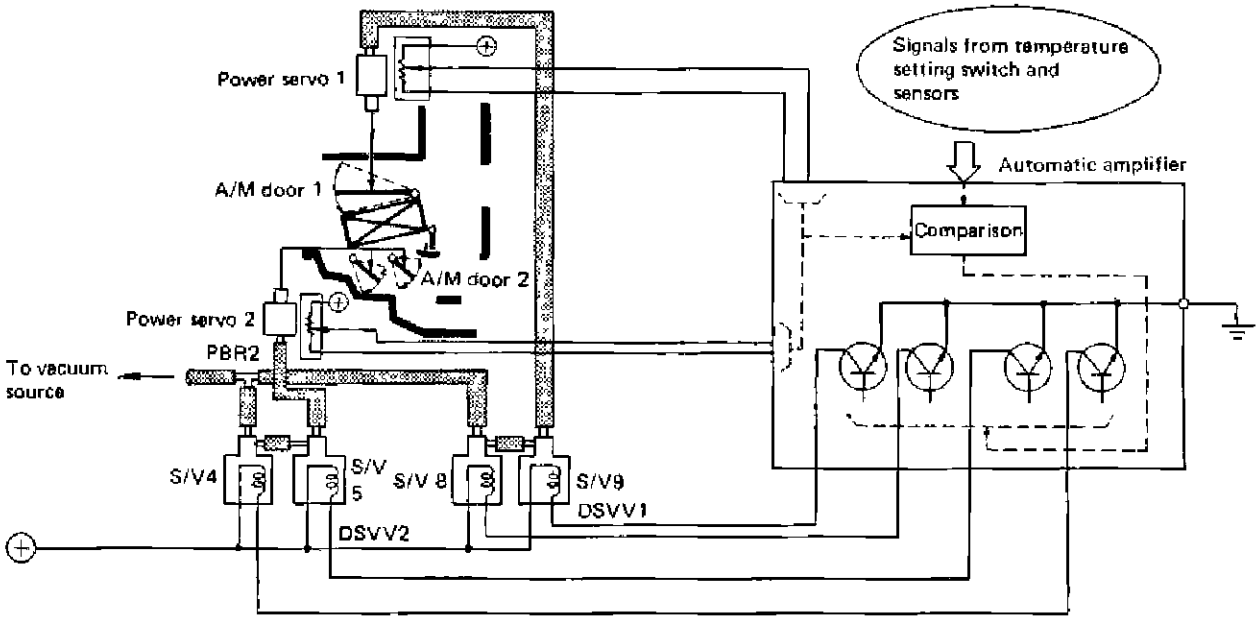
SHA986

Inner structure of D.S.V.V.



SHA289

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



SHA288B

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

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

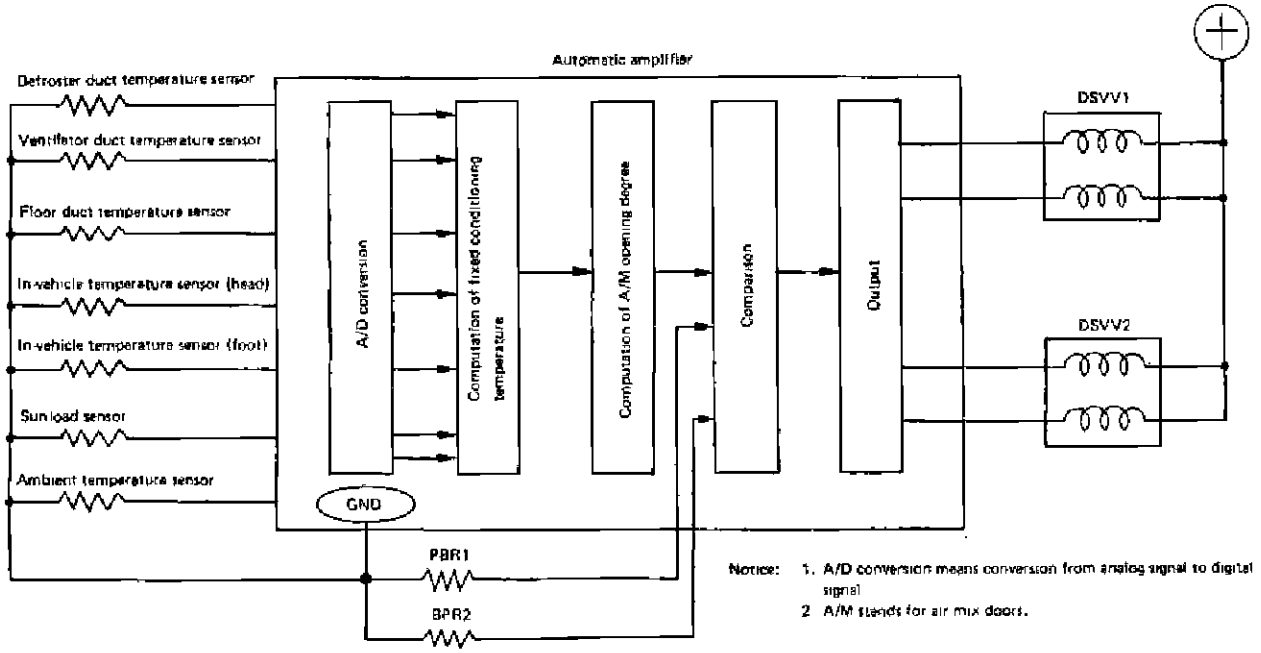
AIR MIX DOOR CONTROL

			HOT side	HOLD	COLD side
Air mix door 1	Operation of solenoid valve	S/V8	CL	CL	OP
		S/V9	OP	CL	OP
Air mix door 2		S/V4	CL	CL	OP
		S/V5	OP	CL	OP

DESCRIPTION — Air Conditioner (Auto)

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

2. System operation of air mix door control



SHA290B

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

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

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

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

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

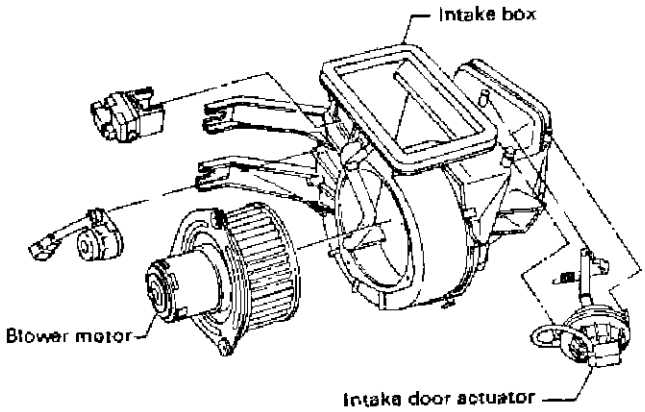
System Operation (Intake door control)

INTAKE DOOR CONTROL

1. Component parts

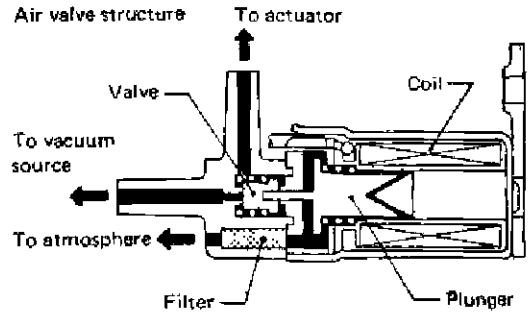
The next parts are added to the component parts of air mix door control system.

- **Intake door actuator**



SHA318B

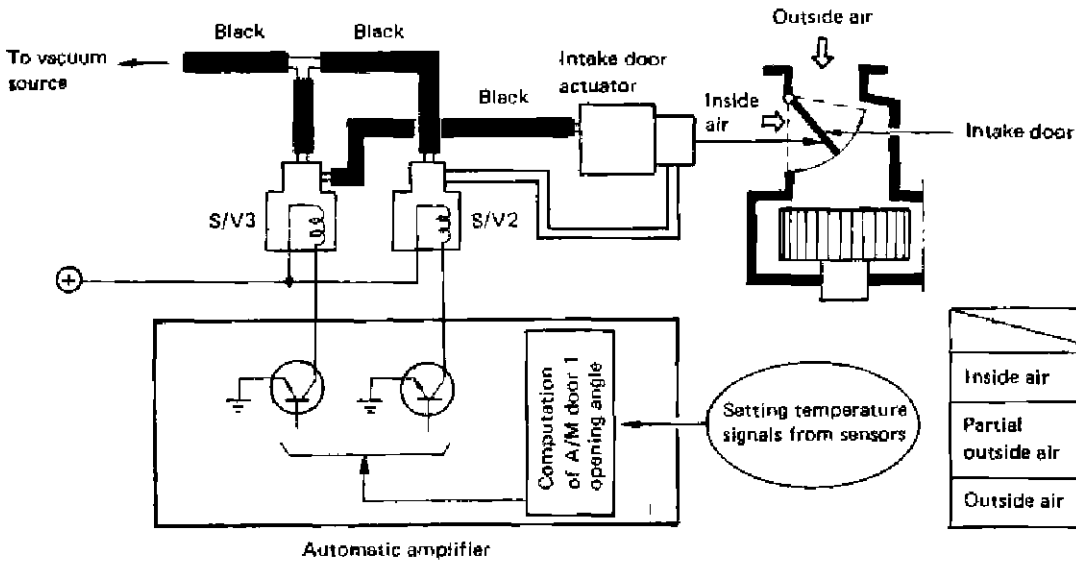
- **Solenoid valve (Air valve type)**



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

SHA302B

2. System operation of intake door control



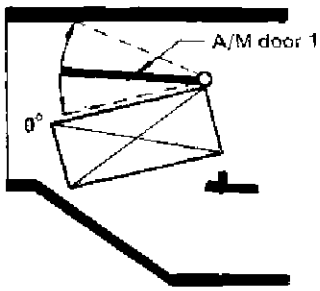
	S/V3	S/V2
Inside air	OPEN	OPEN
Partial outside air	OPEN	CLOSED
Outside air	CLOSED	CLOSED

SHA303B

DESCRIPTION — Air Conditioner (Auto)

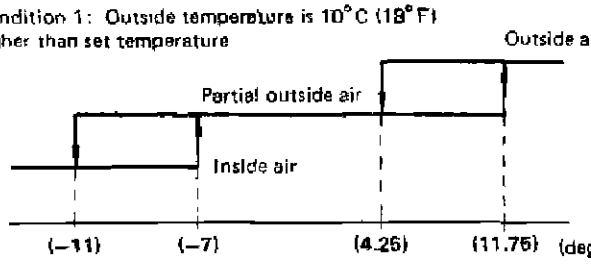
System Operation (Intake door control) (Cont'd)

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.



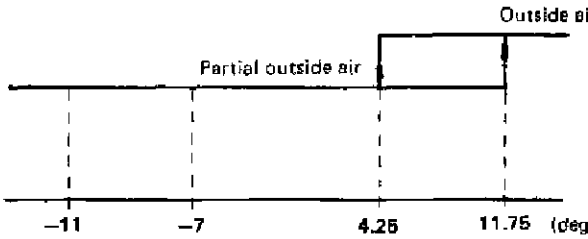
SHA304B

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



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

Condition 2: Except for Condition 1



A/M door 1 angle (Opening angle): setting value. SHA305

System Operation (Outlet door control)

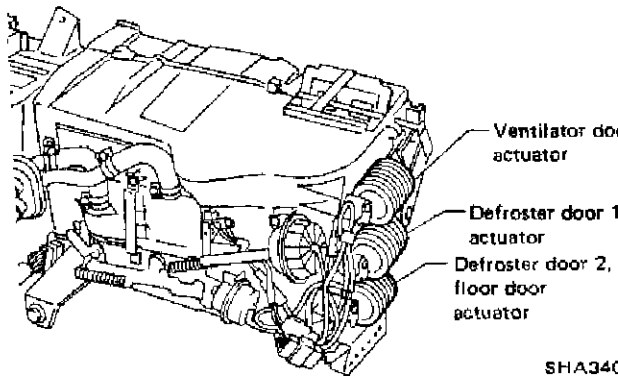
OUTLET DOOR CONTROL

1. Component parts

Outlet door control system consists of the parts shown below.

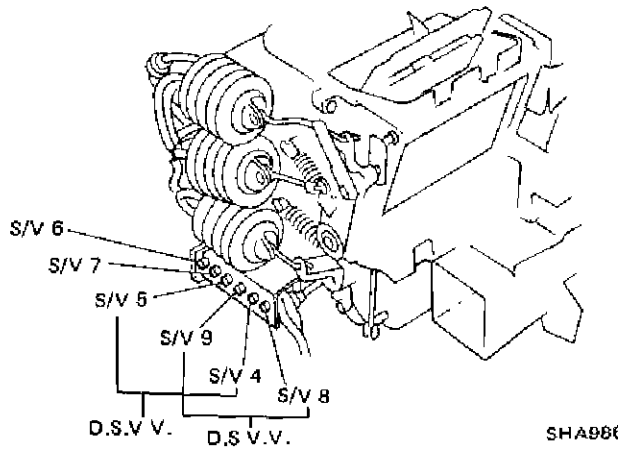
1) Defroster door actuator
2) Ventilator door actuator
3) Defroster and floor door actuator
4) Solenoid valve 6, 7
5) Sunload sensor
6) Ambient temperature sensor
7) Automatic amplifier

- Actuators



SHA340

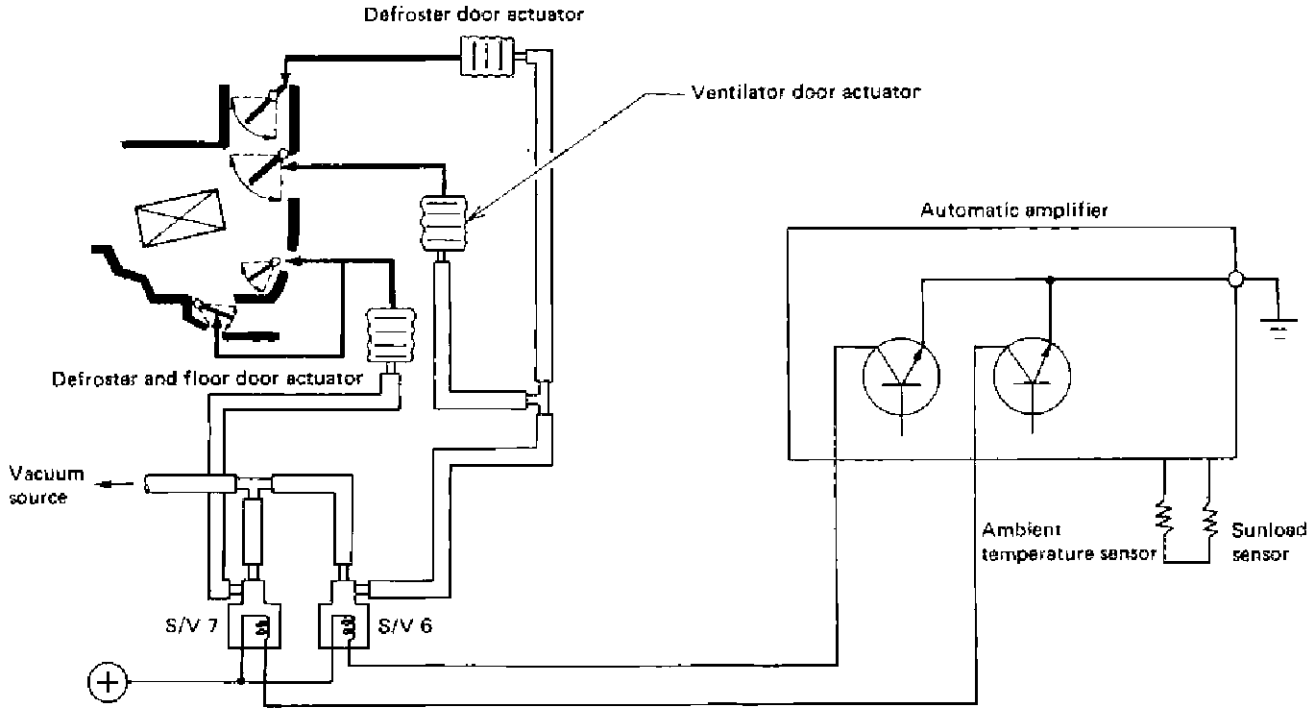
- **Solenoid valve 6, 7**



SHA986

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

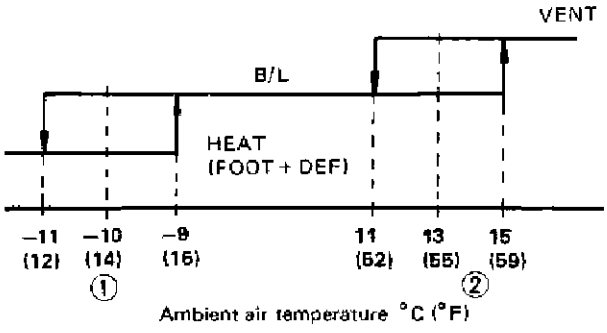
2. System operation of outlet door control



SHA291B

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

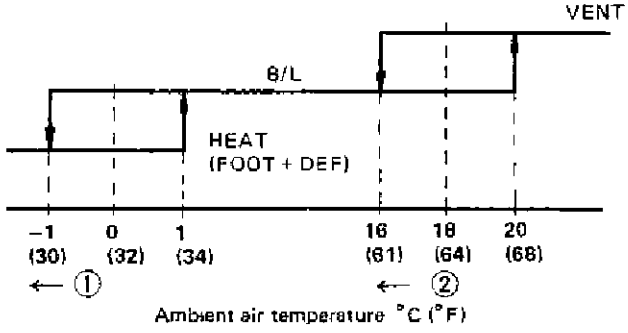
Condition: Very fine in midsummer
(Sunload: Approximately 0.768 kW
(660 kcal/h, 2,619 BTU/h)/m²
[0.0713 kW (61.3 kcal/h, 243.2 BTU/h)/sq ft])



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)

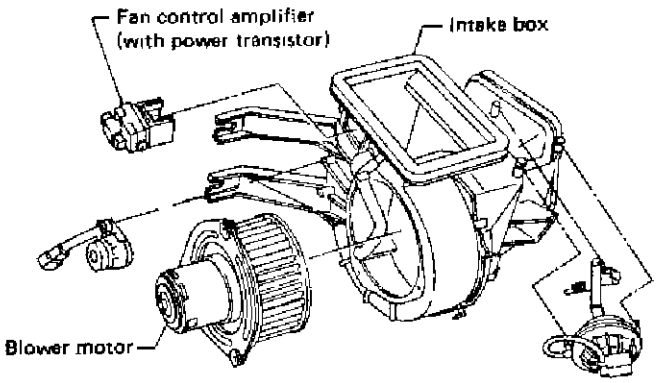
AIR FLOW VOLUME CONTROL

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.

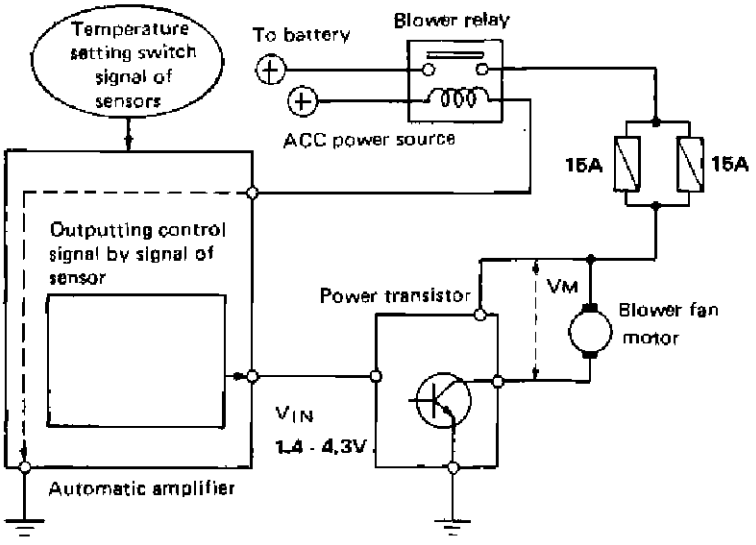


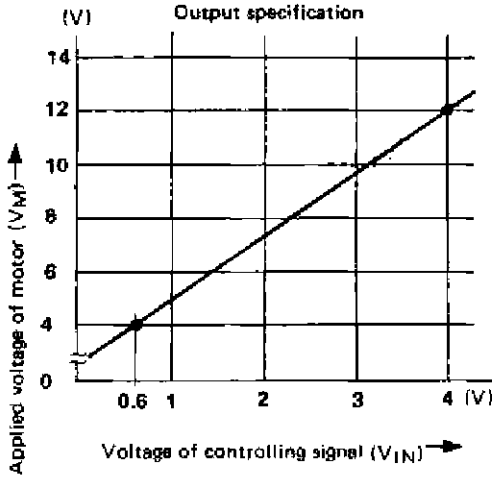
SHA318B

2. System operation of air flow volume control

The auto amplifier computes signals from th setting temperature switch and sensors that com pose the air mix door control, and sends the con trol signal voltage (V_{IN}: 0.6 to 4 V) to the powe transistor.

The power transistor amplifies this control signa voltage to change the voltage (V_M) fed to th motor terminals. Accordingly, the air flow is con trolled 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 H position.





SHA802

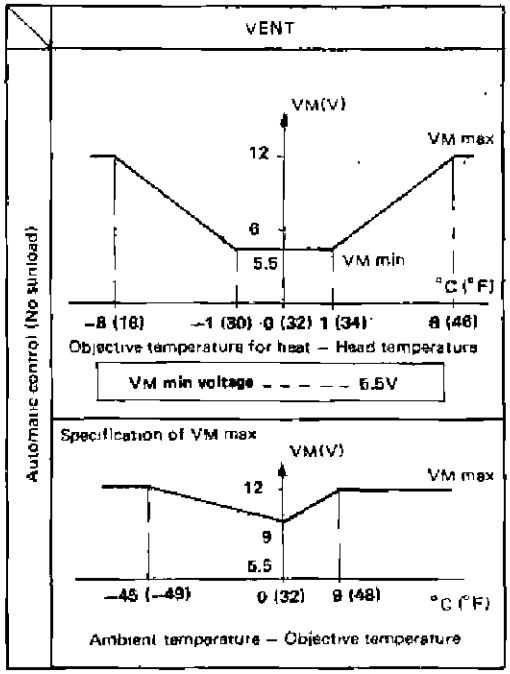
System Operation (Air flow volume control) (Cont'd)

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.

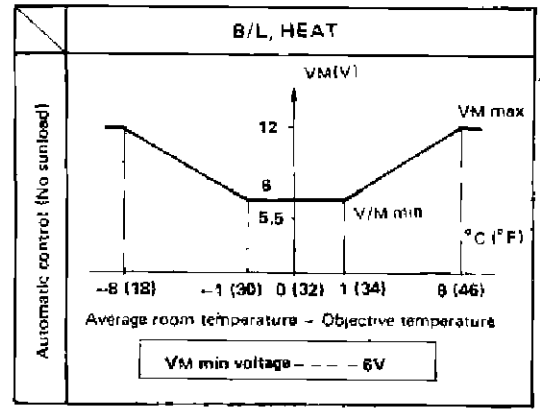


SHA310B

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.



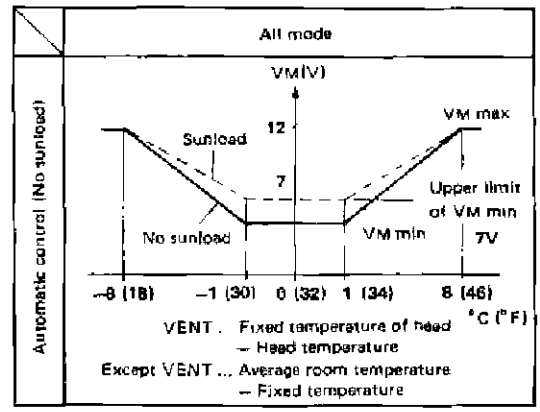
SHA311B

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

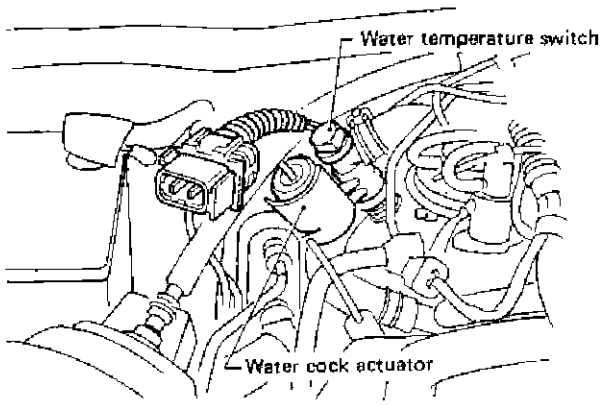
System Operation (Control at starting)

CONTROL AT STARTING

1. Component parts

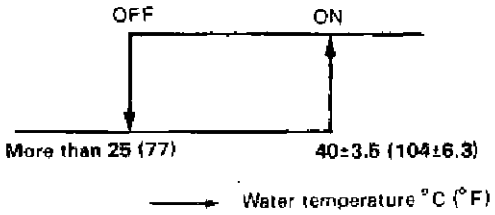
Water temperature switch is added to the component parts of air mix door control system.

- **Water temperature switch**



SHA312B

Specification

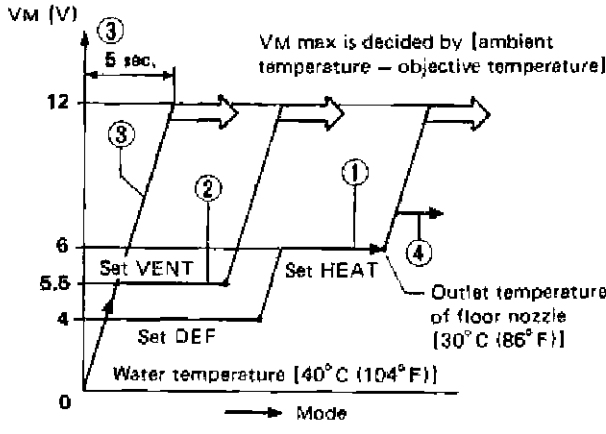


SHA293B

2. System operation of control at starting

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

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



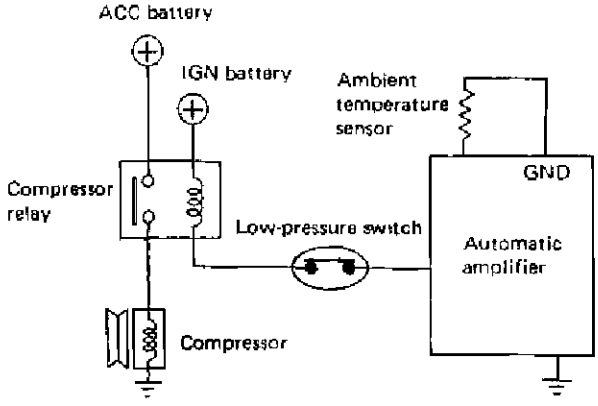
SHA313B

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

COMPRESSOR CONTROL

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

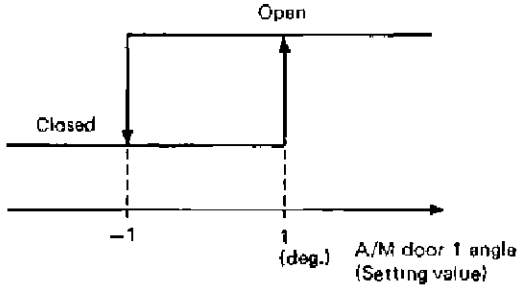
Ambient temperature	Control
More than 0°C (32°F)	ON
Less than 0°C (32°F)	OFF



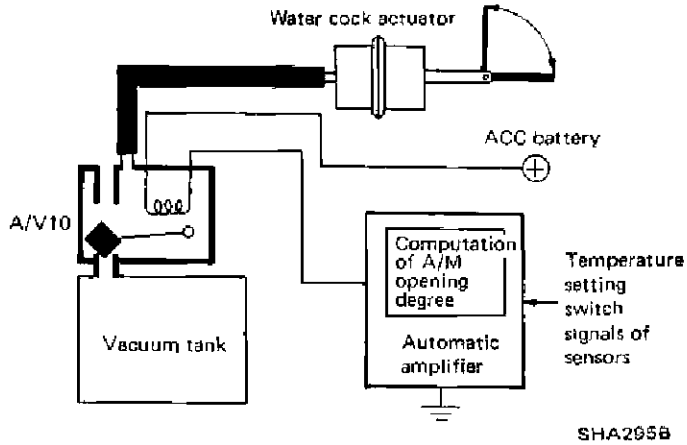
SHA294B

WATER COCK CONTROL

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



SHA314B

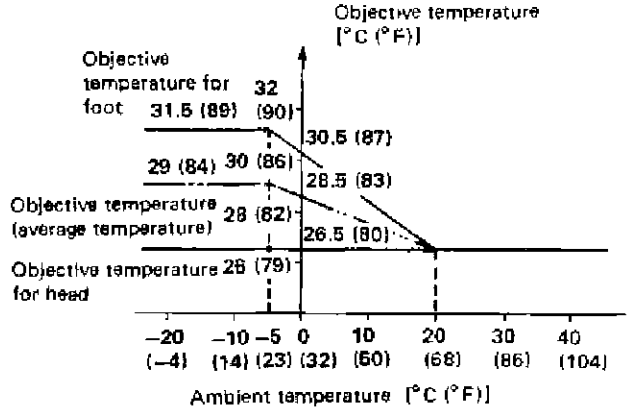


SHA295B

COMPENSATION FOR AMBIENT TEMPERATURE

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

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

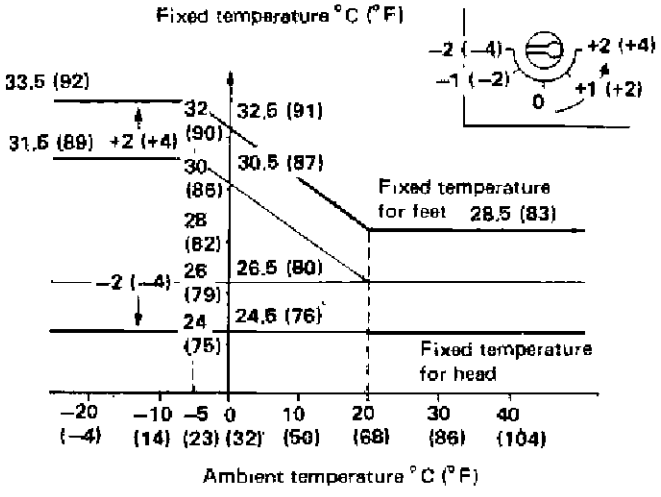


SHA803B

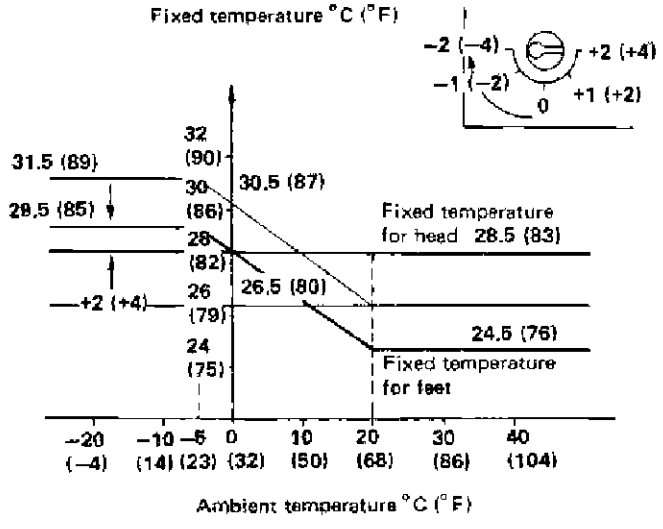
System Operation (Function of set TEMP. adjuster)

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

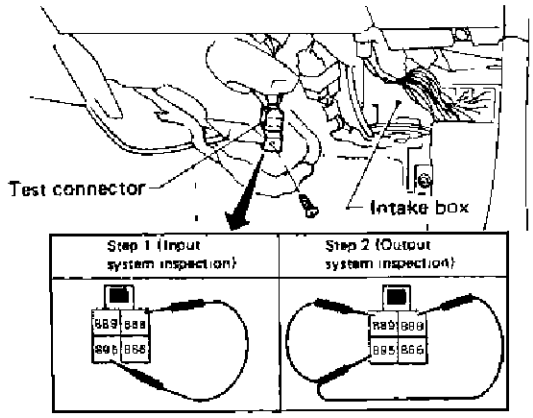
Function of Self-diagnosis of Trouble

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 test connector

To change the system to the diagnosis mode, short the terminals of test connector located under the right side of the instrument panel.

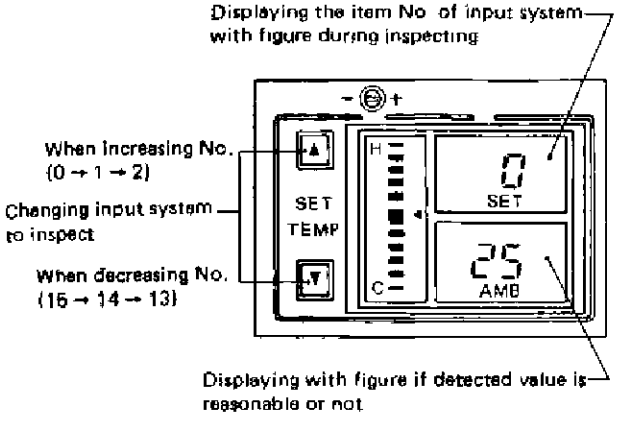


SHA126C

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 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.



SHA998B

STEP 2 INSPECTION OF OUTPUT SYSTEM

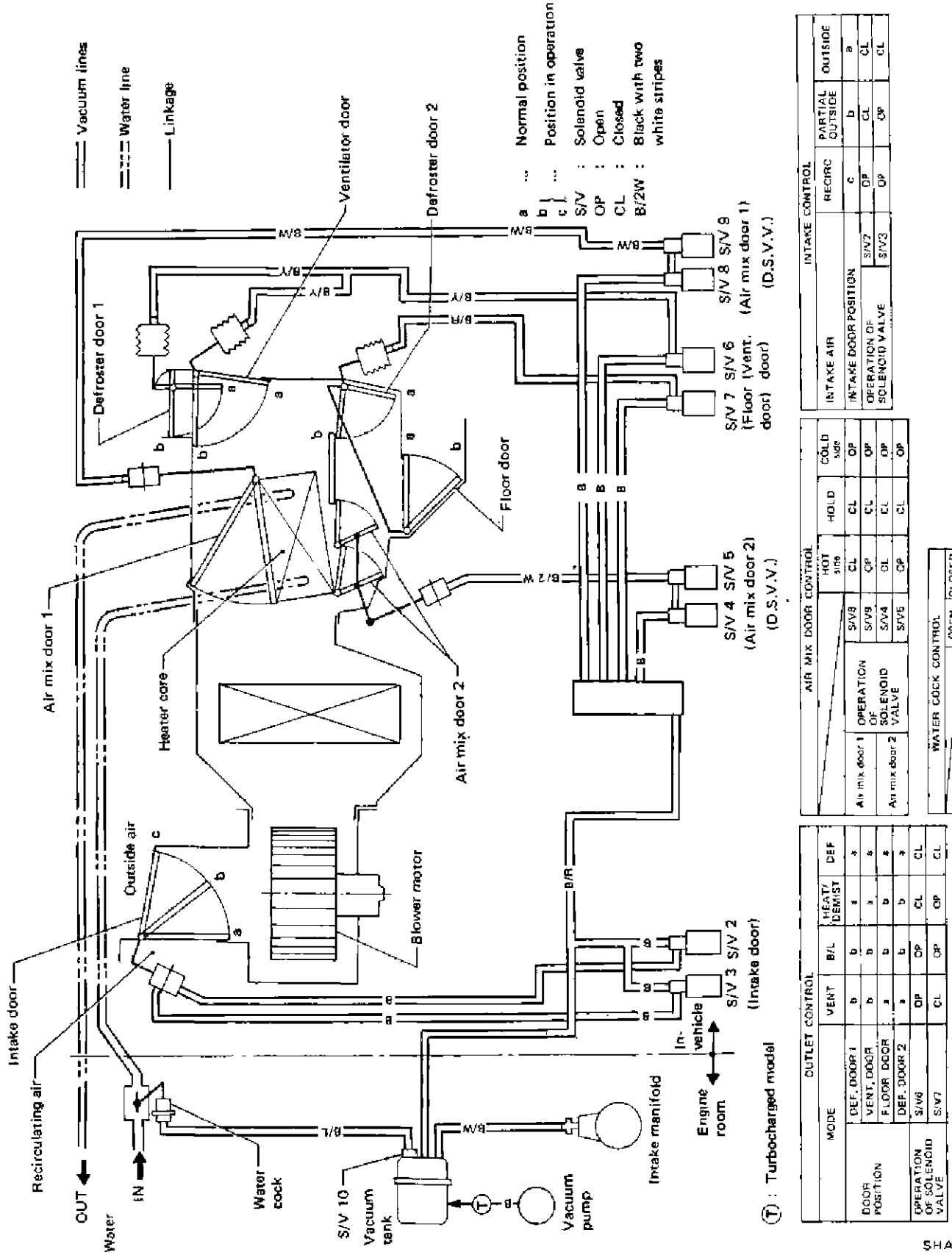
- Whether the parts of the output system are operating normally according to the predetermined pattern can be checked by applying a hand to the outlet door, observing the air flow indicator, listening to the operating noise, or by measuring the applied voltage.
- Once the step 2 program starts, the following six parts begin their operation sequentially, moving between stroke ends or changing all positions.

- **Operating parts**

1. Air mix door 1 and air mix door 2 (same motion)
2. Outlet doors (All mode)
3. Intake door
4. Water cock
5. Compressor magnet clutch
6. Blower motor

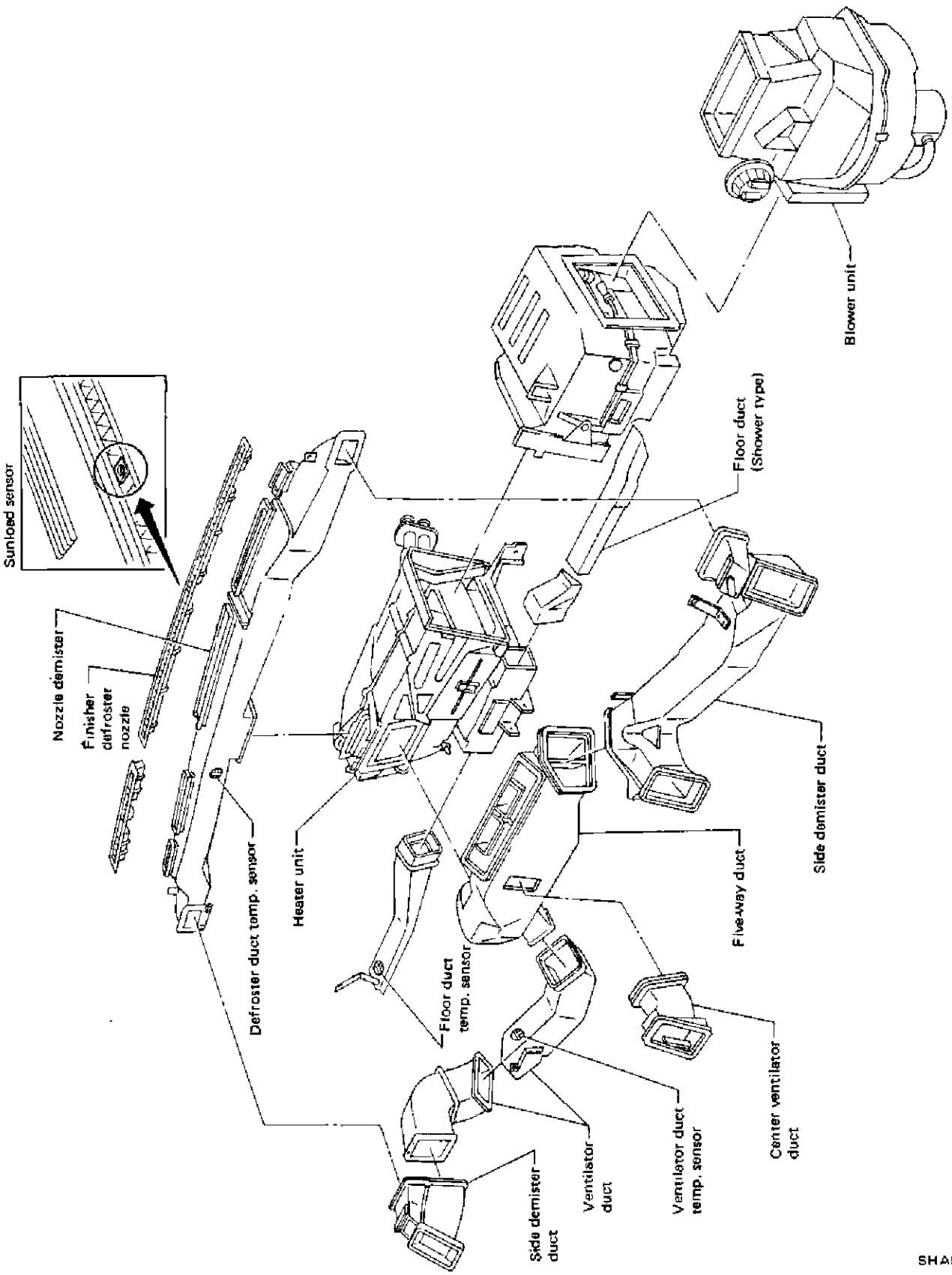
AIR FLOW AND COMPONENT LAYOUT (Auto)

Air Flow

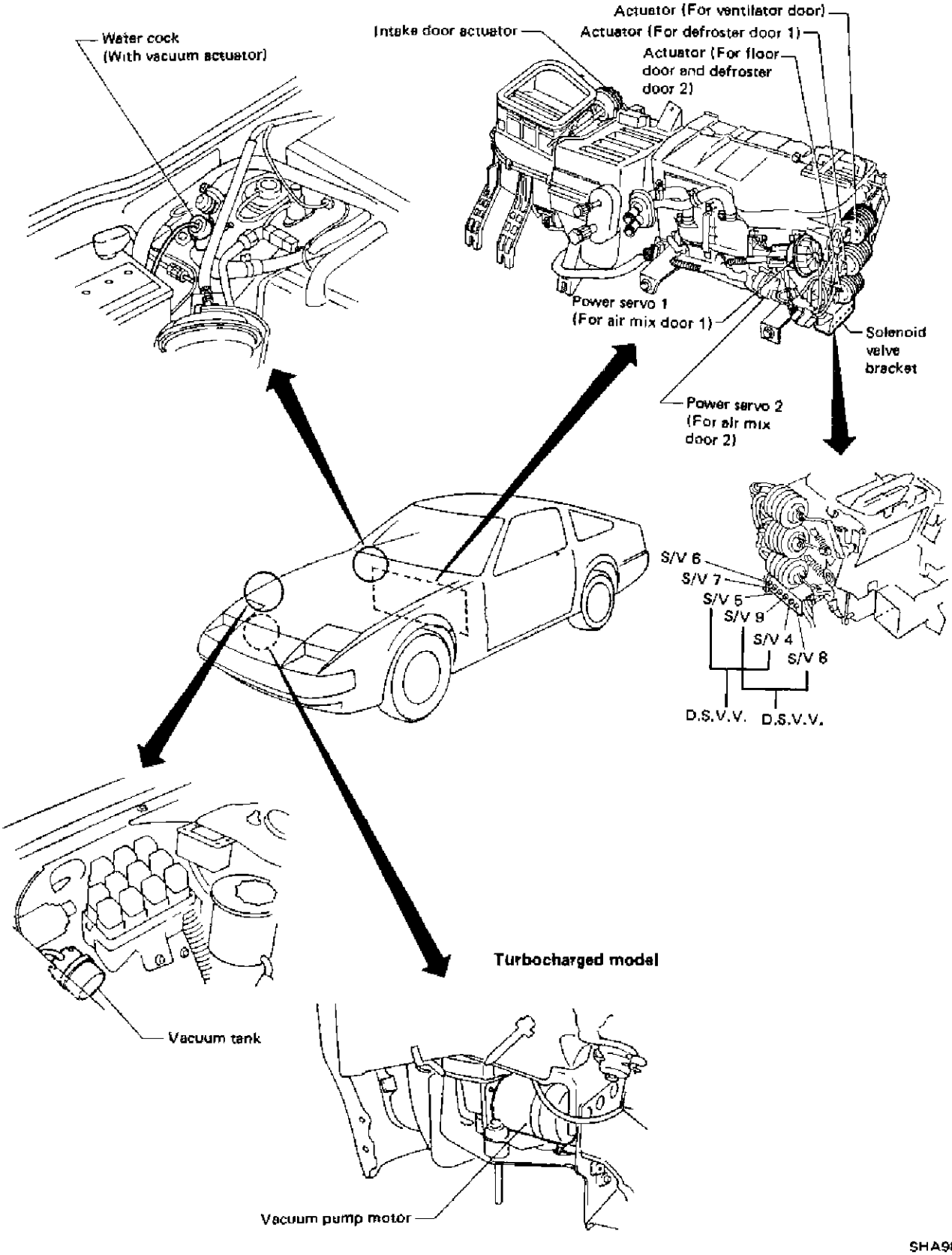


AIR FLOW AND COMPONENT LAYOUT (Auto)

Component Layout



LOCATION OF VACUUM COMPONENTS (Auto)



SHA989

A/C PERFORMANCE TEST (Auto)

Performance Chart

TEST CONDITION

Testing must be performed as follows:

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

*Connect 895 (L/B) and 866 (BR/W) terminals of check connector with jumper wire.

TEST READING

Recirculating-to-discharge air temperature table

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

Performance Chart

Ambient air temperature to compressor pressure table

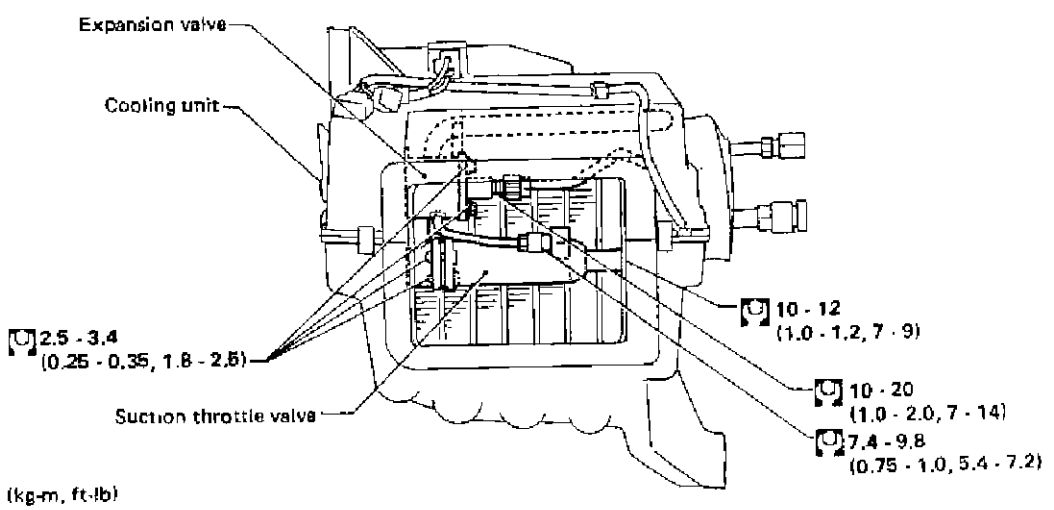
Ambient air		Low pressure (Suction side) kPa (kg/cm², psi)	High pressure (Discharge side) kPa (kg/cm², psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	59 - 98 (0.6 - 1.0, 9 - 14)	755 - 892 (7.7 - 9.1, 109 - 129)
	25 (77)	78 - 127 (0.8 - 1.3, 11 - 18)	883 - 1,030 (9.0 - 10.5, 128 - 149
	30 (86)	98 - 157 (1.0 - 1.6, 14 - 23)	1,010 - 1,187 (10.3 - 12.1, 146 - 17
	35 (95)	118 - 186 (1.2 - 1.9, 17 - 27)	1,138 - 1,334 (11.6 - 13.6, 165 - 19
	40 (104)	137 - 216 (1.4 - 2.2, 20 - 31)	1,295 - 1,510 (13.2 - 15.4, 188 - 21
70 - 90	20 (68)	98 - 137 (1.0 - 1.4, 14 - 20)	883 - 1,020 (9.0 - 10.4, 128 - 148
	25 (77)	127 - 177 (1.3 - 1.8, 18 - 26)	1,030 - 1,177 (10.5 - 12.0, 149 - 17
	30 (86)	157 - 216 (1.6 - 2.2, 23 - 31)	1,187 - 1,344 (12.1 - 13.7, 172 - 19
	35 (95)	186 - 255 (1.9 - 2.6, 27 - 37)	1,334 - 1,530 (13.6 - 15.6, 193 - 22
	40 (104)	216 - 304 (2.2 - 3.1, 31 - 44)	1,510 - 1,736 (15.4 - 17.7, 219 - 25

a. The pressure will change in the following manner with changes in conditions:
- When blower speed is low, discharge pressure will drop.
- When the relative humidity of intake air is low, discharge pressure will drop.

b. The temperature will change in the follow manner with changes in conditions:
When the ambient air temperature is low, outlet air temperature will become low.

Refrigerant Lines—Cooling Unit

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

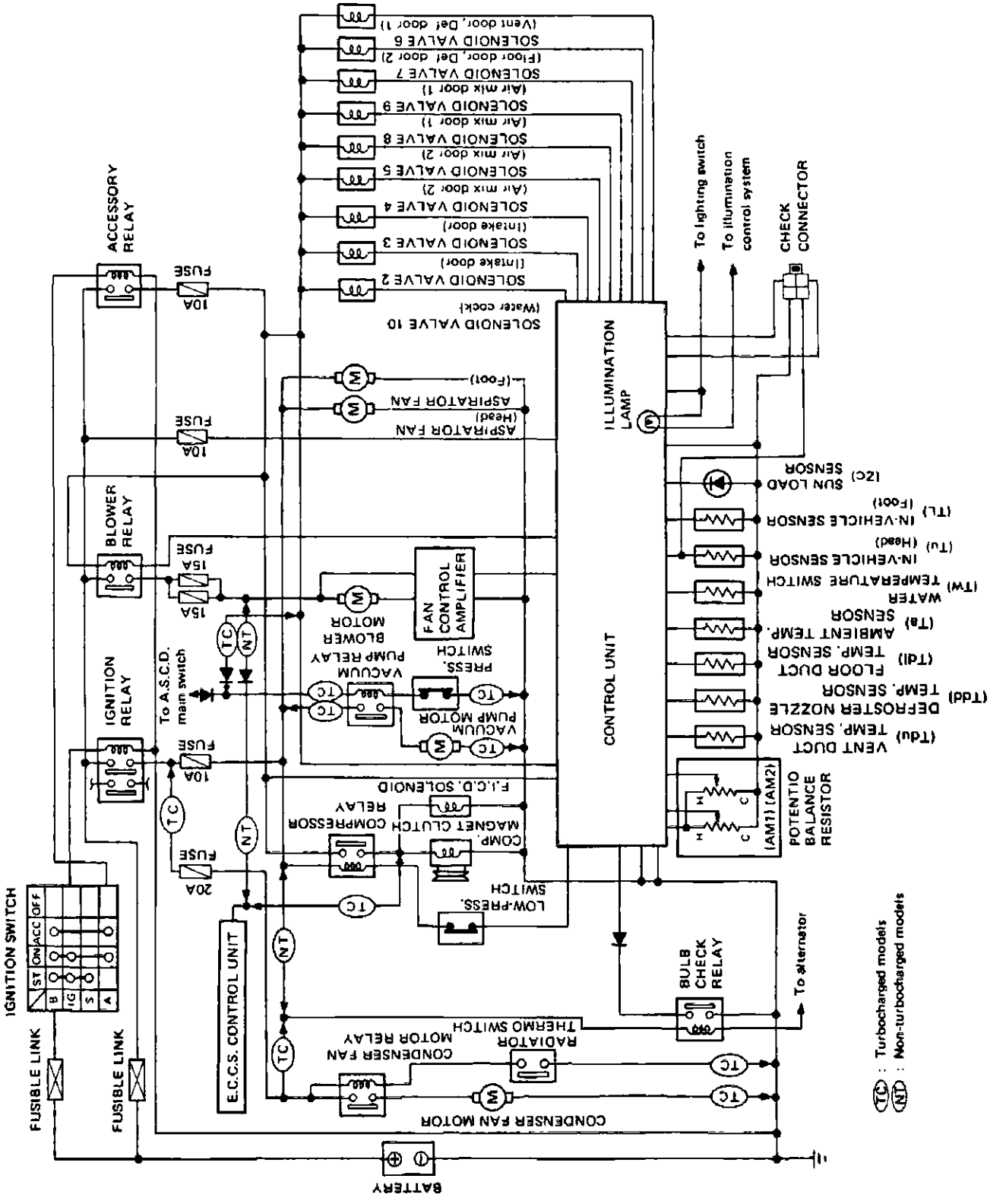


: N·m (kg-m, ft-lb)

SHA

A/C ELECTRICAL CIRCUIT (Auto)

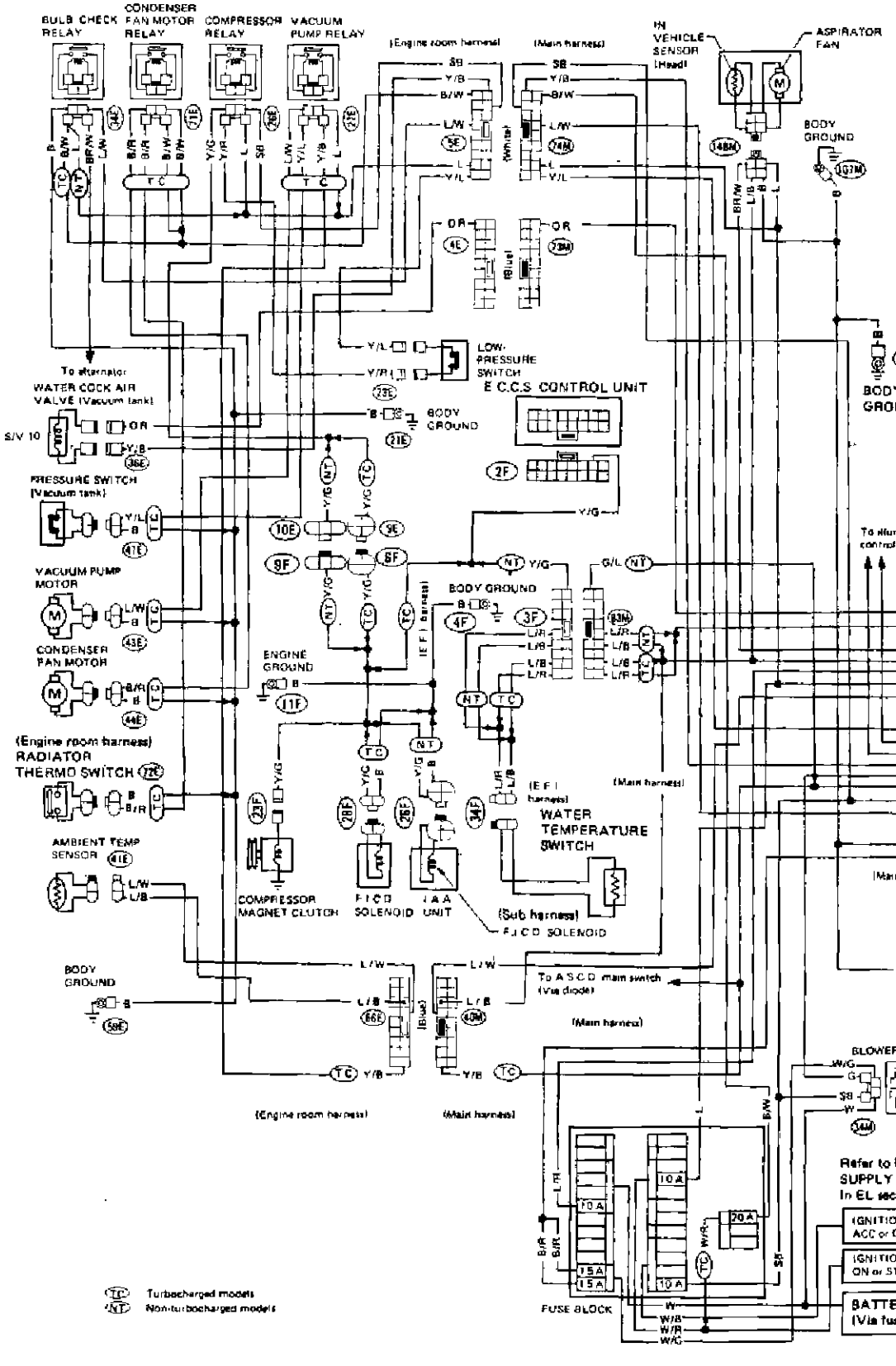
Schematic



SHA993B

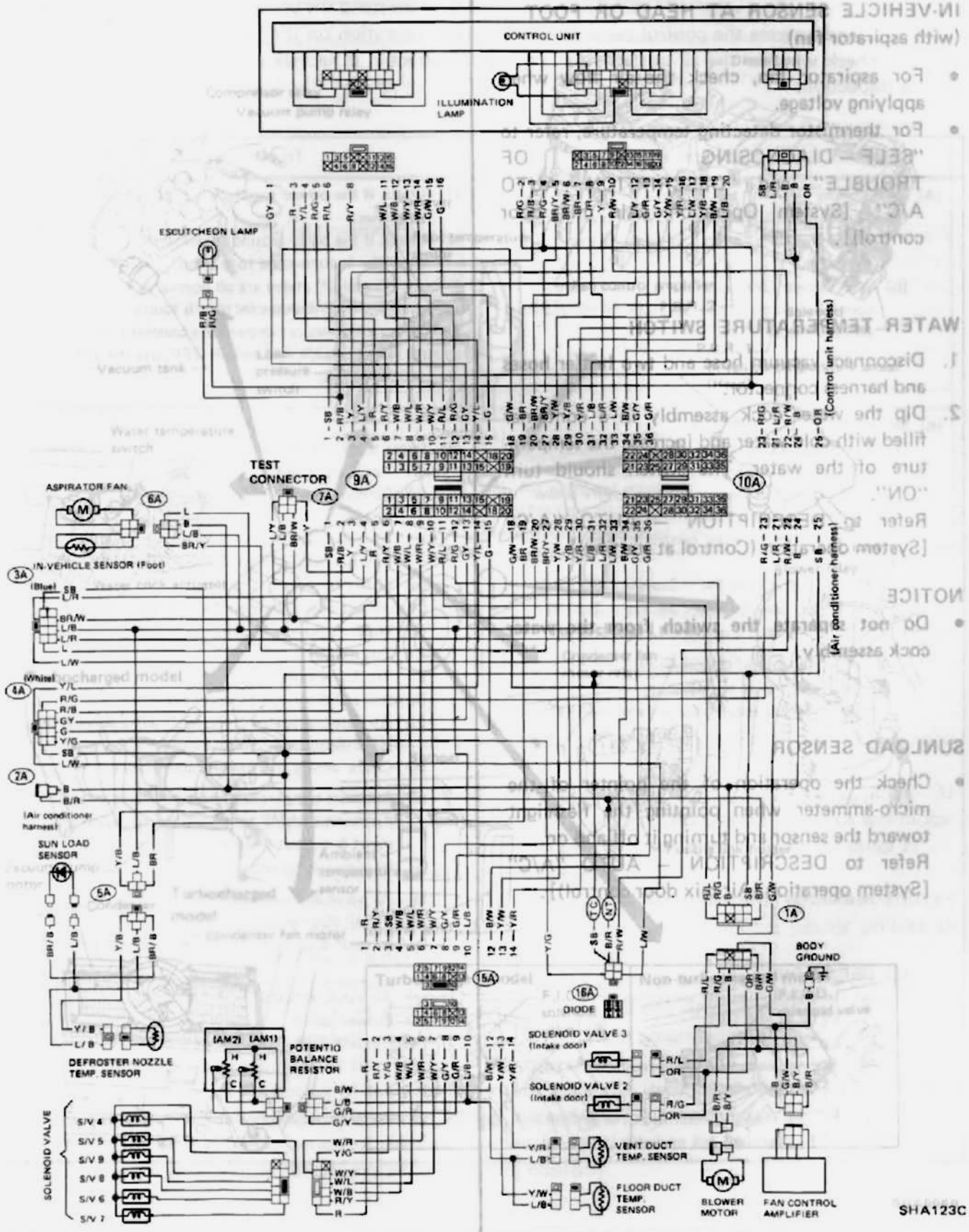
A/C ELECTRICAL CIRCUIT (Auto)

Wiring Diagram



A/C ELECTRICAL CIRCUIT (Auto)

Wiring Diagram (Cont'd)



Inspection

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

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

WATER TEMPERATURE SWITCH

1. Disconnect vacuum hose and two heater hoses and harness connector.
2. Dip the water cock assembly in a container filled with cold water and increase the temperature of the water. The switch should turn "ON".
   Refer to DESCRIPTION – AUTO "A/C" [System operation (Control at starting)].

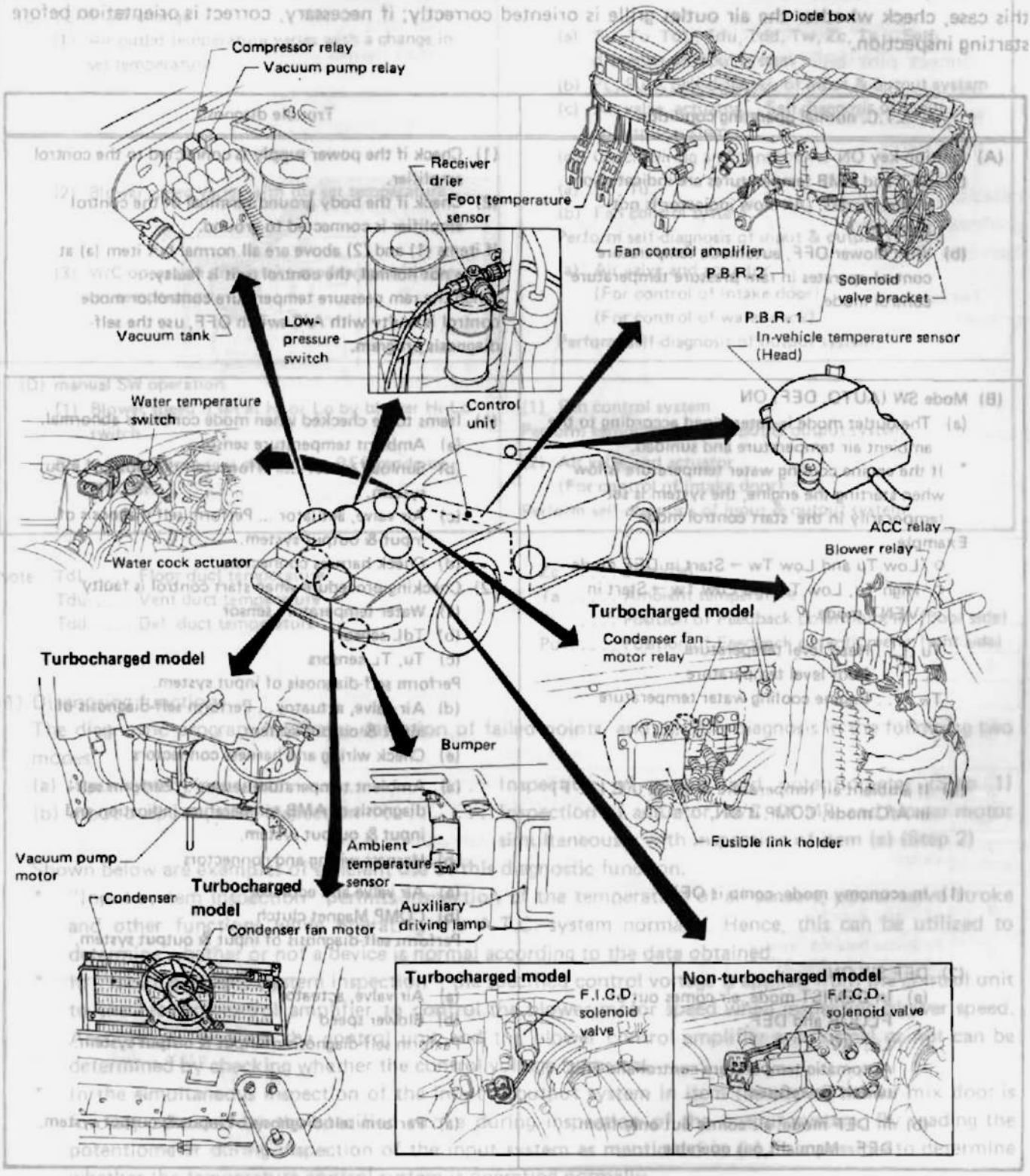
NOTICE

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

SUNLOAD SENSOR

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

LOCATION OF A/C ELECTRICAL COMPONENTS (Auto)



SHA996B

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 is 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 the power supply is connected to the control amplifier. (2) Check if the body ground terminal of the control amplifier is connected to ground. If items (1) and (2) 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 T_L and Low Tw → Start in VENT mode Tu . . . . Head level temperature T_L . . . . Foot level temperature Tw . . . . Engine cooling water temperature	(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, T_L sensors Perform self-diagnosis of input system. (d) Air valve, actuator ... Perform self-diagnosis of input & output system. (e) Check wiring and harness connectors
(b) If ambient air temperature is above 0°C (32°F) in A/C mode, COMP is ON.	(a) Ambient temperature sensor ... Perform self-diagnosis of AMB temperature indication and input & output system. (b) Harness wiring and connectors
(1) In economy mode, comp is OFF.	(a) Air valve and actuator (b) COMP Magnet clutch Perform self-diagnosis of input & output system.
(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.	(a) Air valve, actuator (b) Blower speed Perform self-diagnosis of input & output system.
(b) In DEF mode, air comes out only from DEF. Manual Lo is operable.	(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) TL, Tu, TdL, Tdu, Tdd, Tw, Zc, Ta ... Self-diagnosis of input system (b) PL, 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) TL, 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
PL ..... 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.

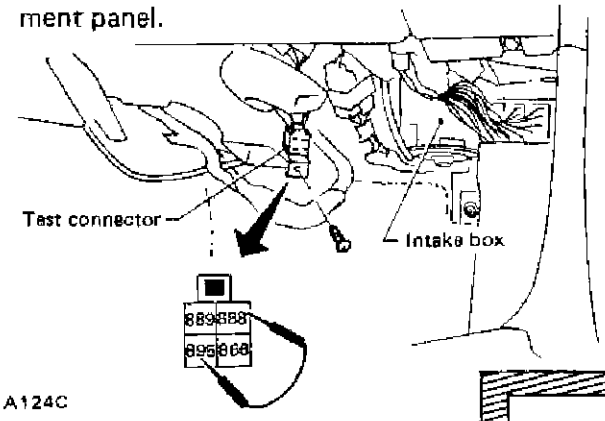
* "Input system inspection" permits inspection of the temperature of all sensors, power servo stroke and other functions while operating the A.T.C. system normally. Hence, this can be utilized to determine whether or not a device is normal according to the data obtained.
* In "Input & output system inspection", 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.

SELF-DIAGNOSING SYSTEM OF TROUBLE (Auto)

Inspection of Input System

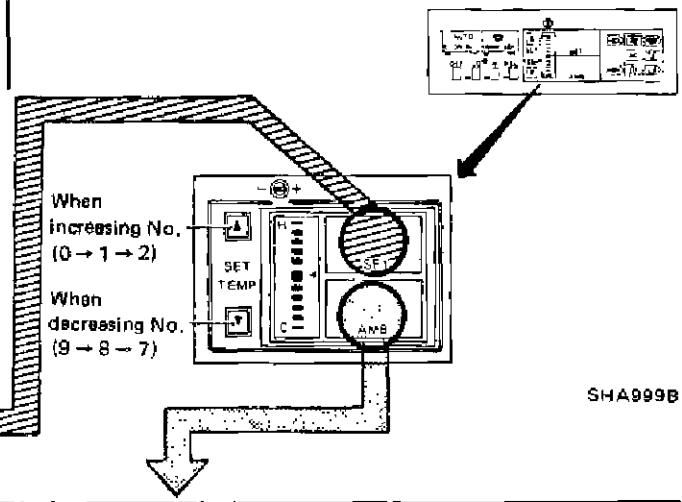
CHECKING PROCEDURES FOR INPUT SIGNALS

1. To perform the input system inspection, connect pins 888 (Y) and 895 (L/B) of the test connector (7A), as shown. The connector is located under the right side of the instrument panel.



SHA124C

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.



SHA999B

Step No.	Unit to be checked	"Set"	Results (Ambient section)	
			Correct	Incorrect
0	In-vehicle sensor (foot level) (TL)	0	Indicates the approximate temperature at the location of the sensor.	All other figures: −17 (2) indicates open circuit. 83 (181) indicates short circuit. Proceed to Step (B2), Page HA-110.
1	In-vehicle sensor (head level) (Tu)	1		
2	Floor duct sensor (Tdl)	2		
3	Vent duct sensor (Tdu)	3		
4	Defrost duct sensor (Tdd)	4		
5	Water temperature switch (Tu)	5	Water temp. under 40°C (104°F) = −17 (2) Water temp. over 40°C (104°F) = 83 (181)	All others: Refer to Step (B3), Page HA-110.
6	Sunload sensor (Tc)	6	0 (32) no sunload 40 (104) high sunload (Note 1)	No change: Refer to Step (B4), Page HA-110.
7	Objective temperature adjusting switch	7	Set temperature adjuster setting equal to approx. temp. difference	Varies from actual temp. difference. Refer to Step No. 4, Page HA-122.
8	Potentio balance resistor (Air mix door No. 2)	8	Varies in the range of approx. 40 to approx. 20 (approx. 104 to approx. 68). (Must perform output system diagnosis to read variation)	No variation: Improper variation: Refer to Step (C0), Page HA-112.
9	Potentio balance resistor (Air mix door No. 1)	9		

NOTE 1: Values change gradually while simulating sensor with incandesent lamp.
NOTE 2: Values in ( ) indicate °F.

0 - 64 (32 - 147) 0 (32) — + 64 (147) 32 (90)

Set Temp. Adjuster

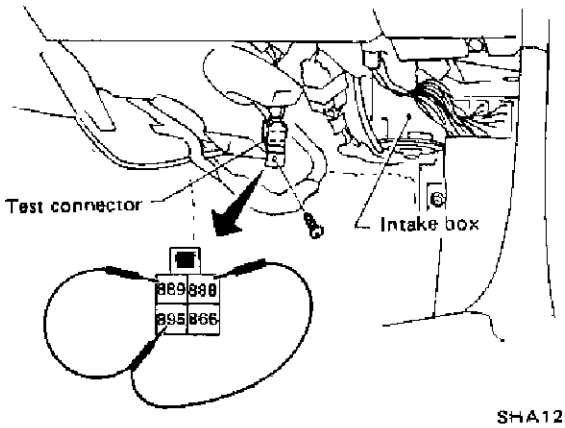
Inspection of Ambient Temperature Sensor

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. (U.S.A. model)

Inspection of Output System

CHECKING PROCEDURES FOR OPERATION OF ACTUATORS

1. To perform the output system inspection, connect pins 889 (L/Y), 888 (Y) and 895 (L/B) of the test connector (7A), as shown. The connector is located under the right side of the instrument panel.

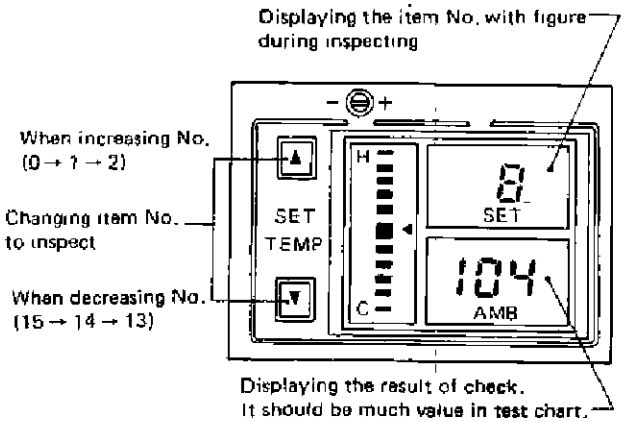


SHA125C

2. Start the engine and press the "ECON/AC" button.
3. Check that output parts operate smoothly using the following chart. (Refer to pages HA-102, 103.)

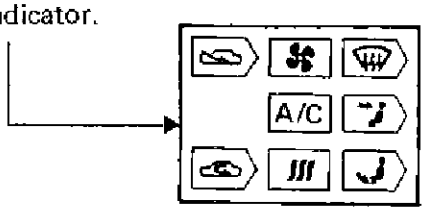
- The way to make sure of the operation of actuators.

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.

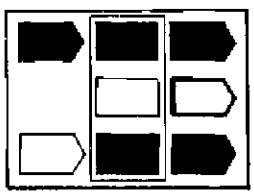


SHA001C

2) By air flow indicator.



SHA002C



Checking items are displayed in the indicator during inspecting.

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

Inspection of Output System (Cont'd)

The following 4 steps can be selected by pushing the OFF Switch.
Step number increases by pushing the switch. Each single push advances to next Step.
(1st push → 2, 2nd push → 3, 3rd push → 4, 4th push → 1)

Checking item		Procedures of confirming operation		Step No. 1	2	3	4	Terminal
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 104° (40)	104° (40)	86° (30)	68° (20)	
	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. 104° (40)	104° (40)	86° (30)	68° (20)	
O-2	Outlet	• Air flow indicator • Check each outlet by hand.	DEF VENT B/L DEMIST					DEF/VEN Changeov 887 (R/Y) FOOT Opens/ Clo 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/I)
Display								

Note:
- Value marked * is for U.S.A. model.
- The letter in ( ) indicates lead wire color.
- If approx. ±7 deference exists between-indicated value and the value in test chart, this is normal.
- Location of components is shown on page HA-90, HA-97.

SHA0

SELF-DIAGNOSING SYSTEM OF TROUBLE (Auto)

Inspection of Output System (Cont'd)

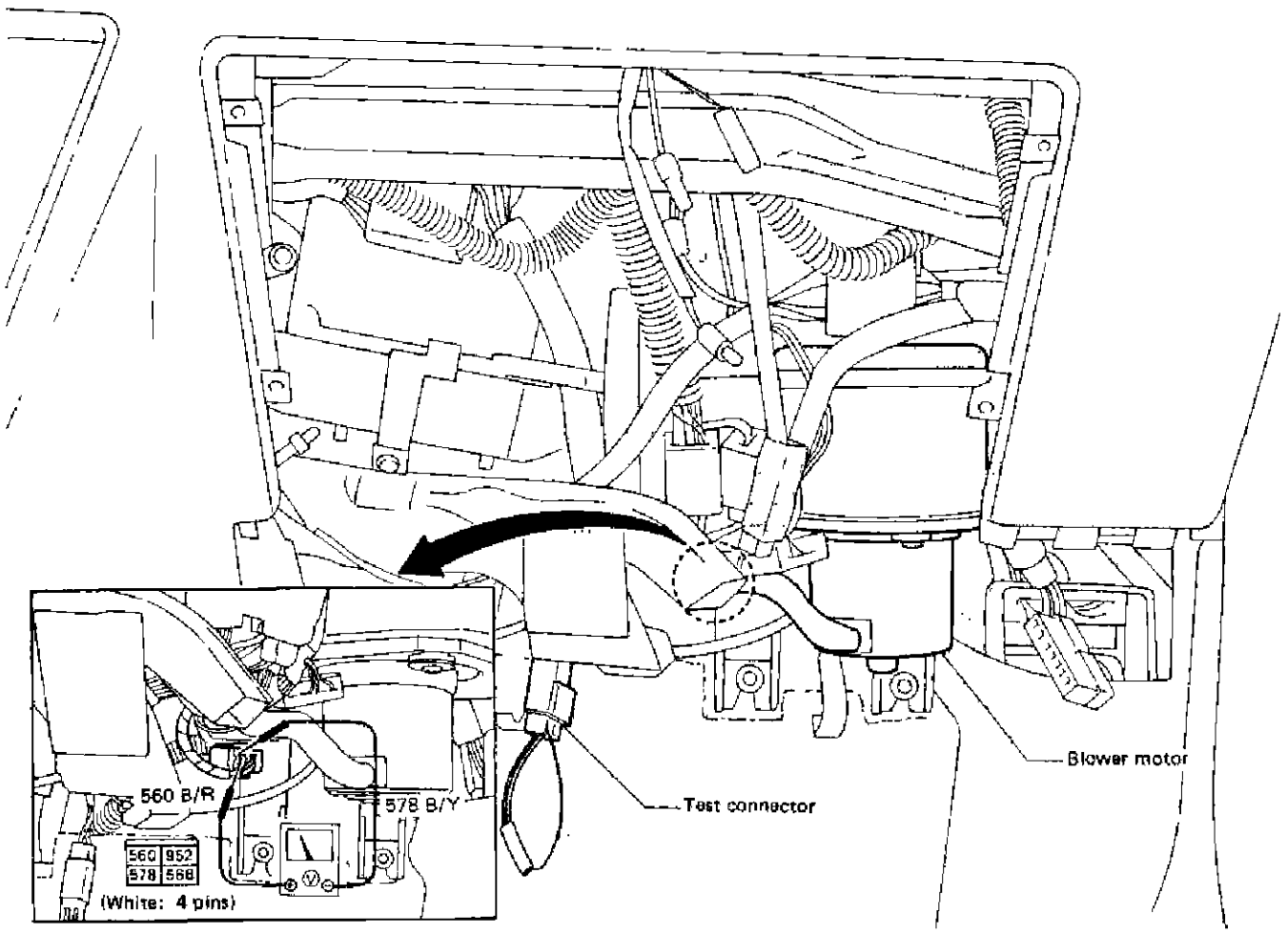
Blower motor can be checked by the following procedure.
4 steps can be selected by pushing the Lo Switch. Step No. increases by pushing the switch.

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

Measurement of blower motor applied voltage

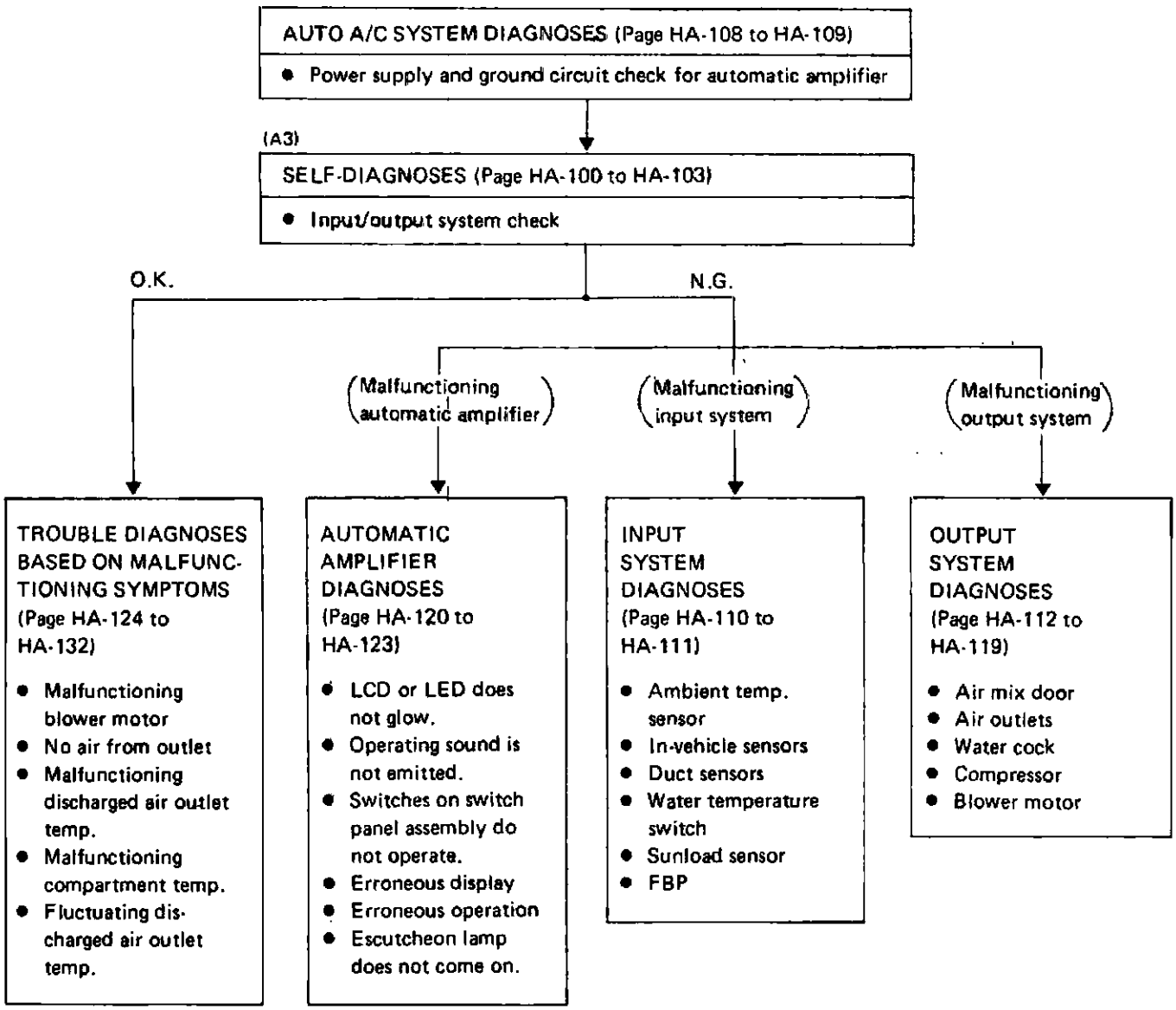


SHA004C

TROUBLE DIAGNOSES (Auto)

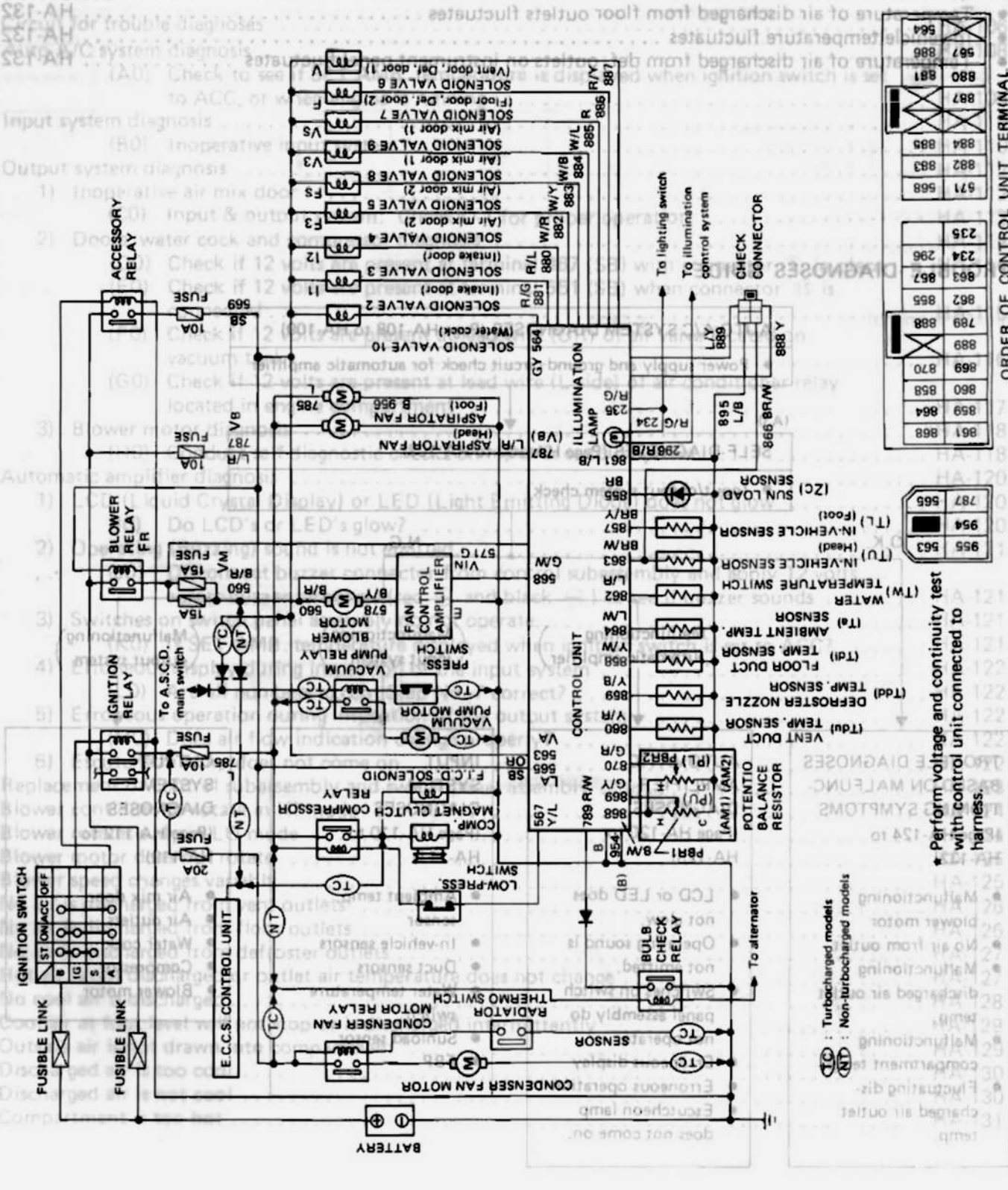
CONTENTS

TROUBLE DIAGNOSES GUIDE

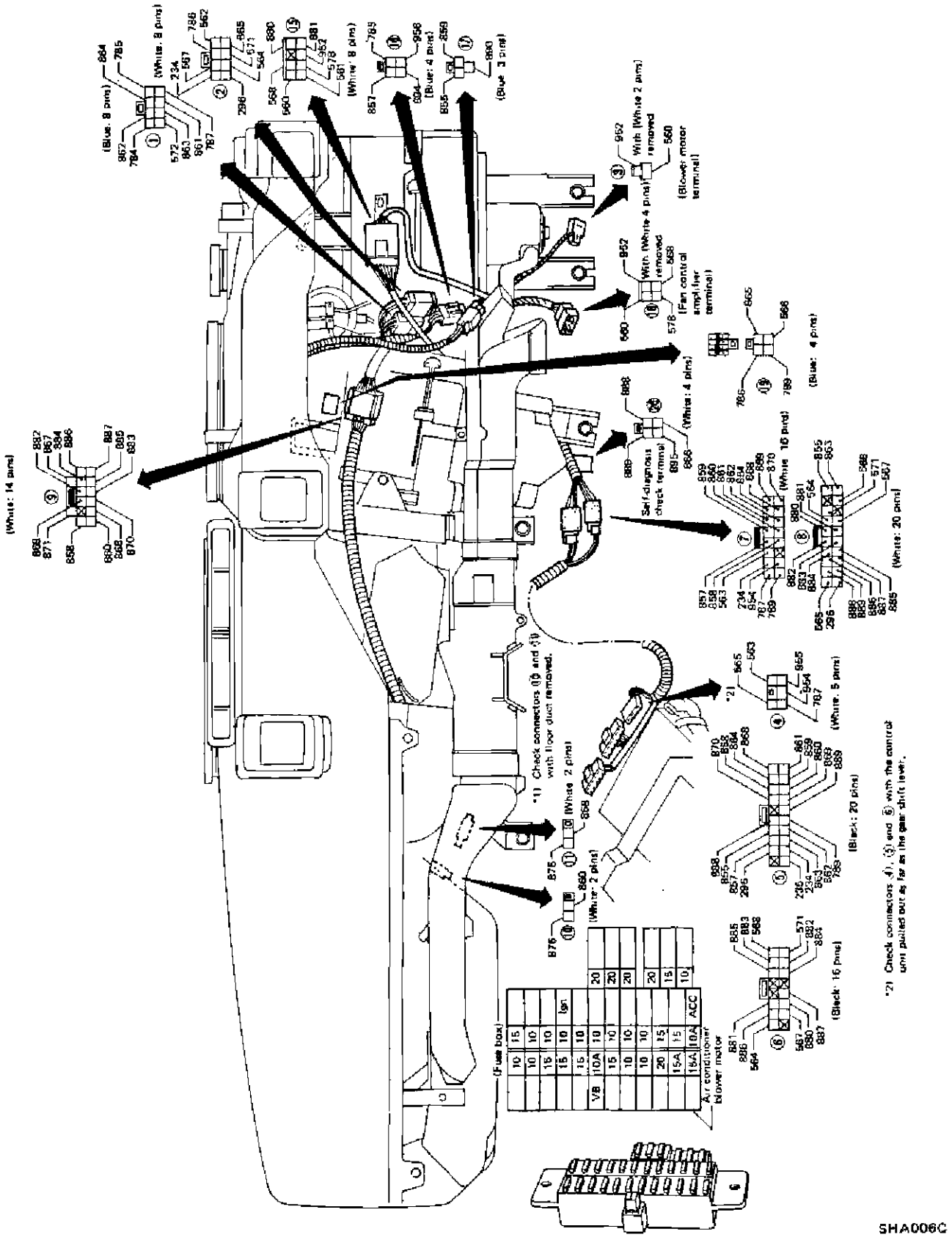


TROUBLE DIAGNOSES (Auto)

Circuit for Trouble Diagnoses

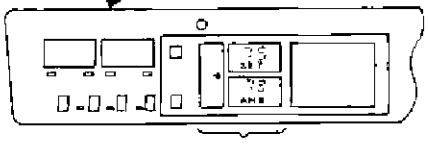


SHA005C


(Blue: 8 pins)
(White: 8 pins)
(White: 8 pins)
(Blue: 4 pins)
(Blue: 3 pins)
With (White 2 pins) removed
(Blower motor terminal)
With (White 4 pins) removed
(Fan control amplifier terminal)
(White: 4 pins)
Self-diagnosis check terminal
(White: 14 pins)
(White: 16 pins)
(White: 20 pins)
(Blue: 4 pins)
(White: 5 pins)
(Black: 20 pins)
(Black: 16 pins)
(White: 2 pins)
(White: 2 pins)
(Fuse box)
Air conditioner blower motor
*1) Check connectors (4), (5) and (6) with floor duct removed.
*2) Check connectors (4), (5) and (6) with the control unit pulled out as far as the gear shift lever.
SHA006C

AUTO A/C SYSTEM DIAGNOSIS

(A0) Check to see if SET AMB. temperature is displayed when ignition switch is set to ACC, or when engine is running



* Temperature indicator section

SHA007C

* Temperature indicator section alone lights up when ignition switch is ON.

O.K.

(A1) Check to see if air flow indicator glows when AUTO ECON A/C or DEM/DEF, switch is pushed.

O.K. / N.G.

(A2) Faulty automatic amplifier.

(A3) Check input and output systems, using self-diagnosing functions.

N.G. / O.K.

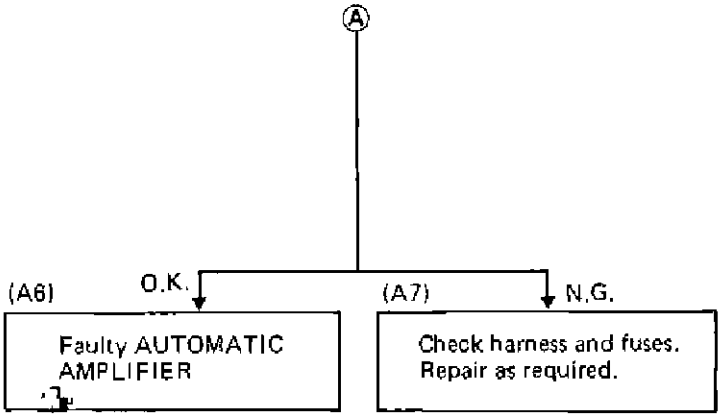
(A4) Check, repair and/or replace faulty parts.

If no faulty condition is detected in diagnosing steps 1 and 2, check connectors ④, ⑤, ⑥, ⑦ and ⑧, then firmly secure them before delivery to the user.

N.G.

(A5) Check to see if 9.0 volts (approx.) are applied to automatic amplifier's power terminals (563, 565 and 787).

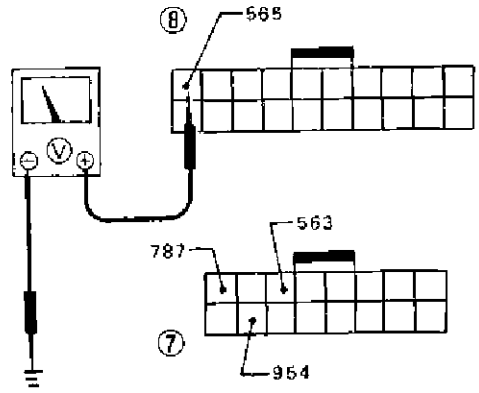
Ⓐ Ⓑ



Ⓑ

Inspection procedure:
Refer to Connector arrangement diagrams ① to ⑳ shown in HA-107.

1. Inspection of connectors ⑦ and ⑧, located near the cooling unit, to heater unit connecting section.
   (1) Disconnect the connector and check the voltage at terminals 563, 565 and 787 on the cooling unit side. (Voltage must be greater than 9 volts.)



   (2) Check the voltage of terminal 954. (Voltage must be 0 volt.)

2.
   (1) If the result of inspection 1 above is no good, check the fuse of 10A (ACC) and 10A (VB) in the fuse box.
   (2) If the result of inspection 1 above is O.K., connect connectors ⑦ and ⑧ and disconnect connector ④ on the rear side of the control unit.

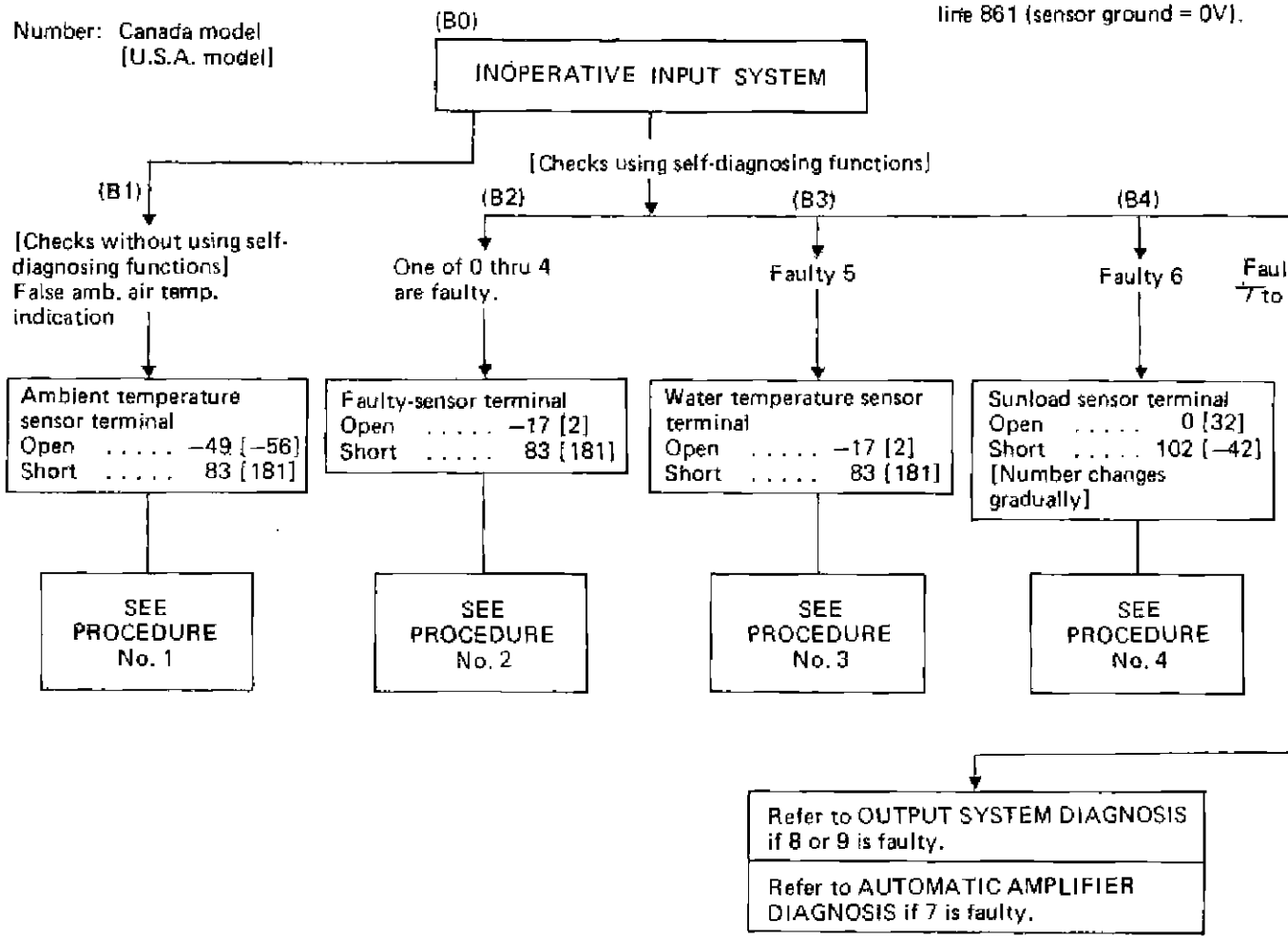
565	□	563
787	954	955

   Check the voltage of terminals 563 (OR), 565 (SB), 787 (L/B), 954 (B) and 955 (B). If it is difficult to check with connectors ⑦ and ⑧ connected, this inspection may be substituted with the continuity check between connectors ⑦ and ⑧ and connector ④.

3.
   (1) If the result of inspection 2 above is no good, continuity of the harness between connectors ⑦ and ⑧ and connector ④ is faulty.
   (2) If the result of inspection is O.K., the control unit is faulty.

INPUT SYSTEM DIAGNOSIS (Page HA-100)

★ Numbers displayed on indicators. When the indicator at Step No. 0 thru 4 shows only −17 [2], check line 861 (sensor ground = 0V).



INSPECTION PROCEDURE

Conduct inspection referring to connector arrangement diagram on page HA-107.

Procedure 1

(1) If ambient display on the control panel is faulty, disconnect the ambient sensor connector at the front bumper. If the display is −49°C (−56°F) when disconnected and 83°C (181°F) when the voltage side is shorted to ground, the auto amplifier and harness are O.K. Check the ambient sensor for temperature-resistance characteristics. (See page HA-75.)

(2) If the display does not change from −49°C (−56°F) even when shorted, check terminal 864 for approx. 5.0 volts with the sensor disconnected. No = faulty auto amplifier. Yes = proceed to step 3.

(3) Check circuit 864 through to sensor.

Procedure 2

(A) If display Nos. 0, 1, 2, 3, or 4 are faulty, disconnect harness connector at the sensor location. If the display is −17°C (2°F) with the connector disconnected, and 83°C (181°F) when the voltage side is shorted to ground, the auto amplifier and harness are O.K. Check the sensor temperature—resistance characteristics.

(B) If the display does not change from −17°C (2°F) even when shorted, check for approx. 5.0 volts at the appropriate terminal of the auto amplifier harness.

No = Faulty auto amplifier Yes = Proceed to (C).

(C) Check faulty circuit from auto amplifier through to sensor.

Procedure 3

(A) Disconnect harness connector at the sensor. If the display is −17°C (2°F) with the harness disconnected, and 83°C (181°F) when the voltage side is shorted to ground, replace water temperature switch.

(B) If the display does not change from −17°C (2°F) even when shorted, check for approx. 5.0 volts at terminal 862 (L/R) of auto amplifier harness.

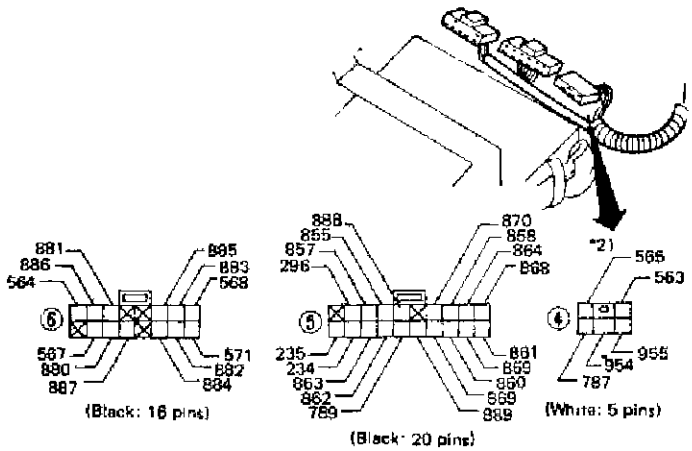
No = Faulty auto amplifier Yes = Proceed to (C).

(C) Check circuit from connector No. 5 through to connector (34F) .

Procedure 4

(A) If 0 (32) is displayed with connector No. 17 removed, move vehicle into the sun and check for a change in current value between male terminals 855 (BR) and 890 (L/B). No change = Replace sensor.

* Under high sunload condition: If the output is on the order of 0.05 to 2.0 mA and it drops to 0 mA when the sunload sensor is covered, the display is normal.



*2) Check connectors (4), (5) and (8) with the control unit pulled out as far as the gear shift lever.

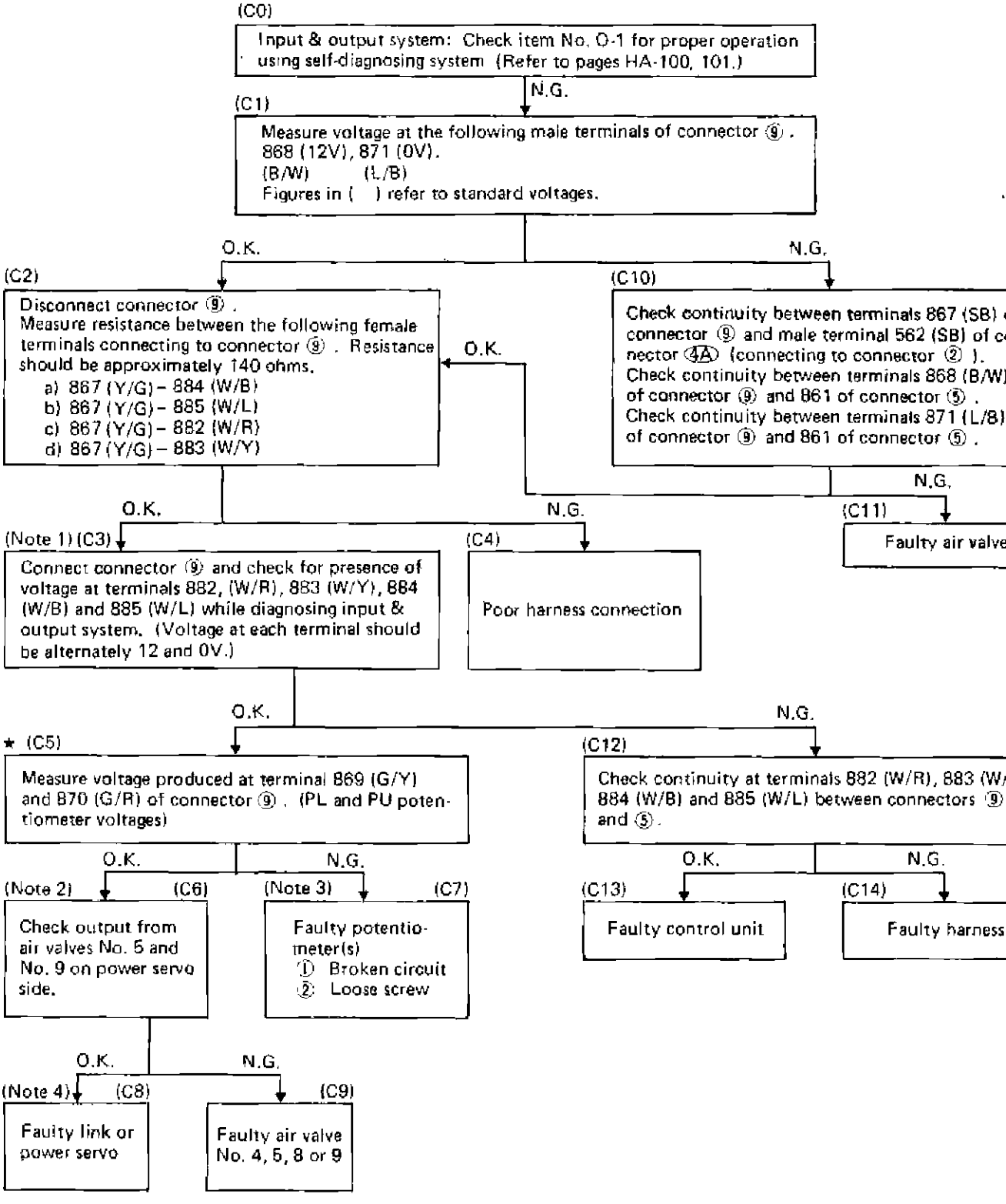
STEP NO.	SENSOR	TERMINAL
0	TL	857 (BR/Y)
1	Tu	863 (BR/W)
2	TdL	858 (Y/W)
3	Tdu	860 (Y/R)
4	Tdd	859 (Y/B)

SHA008C

OUTPUT SYSTEM DIAGNOSIS (Page HA-101 to HA-103)

1) Inoperative air mix door

INSPECTION PROCEDURE – Air Mix Door



INSPECTION PROCEDURE

Use layout of connectors ① through ⑳ on page HA-107 as an inspection guide.

(Note 1) Check with engine running while diagnosing input and output system.

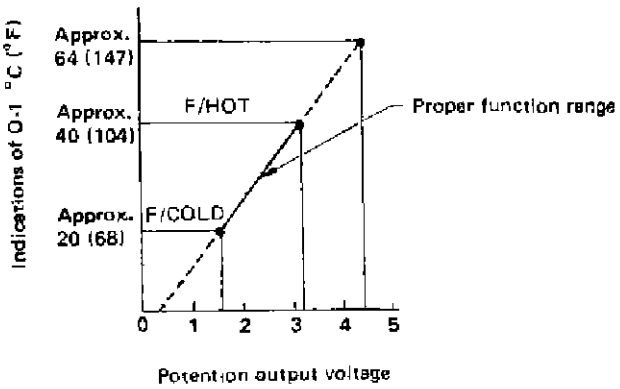
(Note 2) Same as Note 1 above. Faulty input vacuum line can be determined by fixed DEF mode.

(Note 3) After disconnecting vacuum hose from air valve No. 5 or No. 9, connect vacuum hose (on hand) to the hose. Suck air from and blow air into hose orally or by using a vacuum pump and check if potentiometer reading varies with changes in air temperature. If potentiometer reading does not change, link may be jammed, power servo may not be installed properly (loose screws, etc.) or power servo may be faulty.

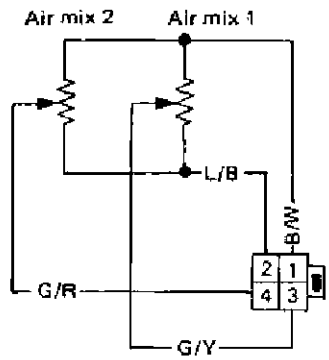
(Note 4) In a manner similar to Note 3 above, disconnect vacuum hose from air valve No. 5 or No. 9 and connect vacuum hose (on hand) to the hose. Suck air from and blow air into hose orally or by using a vacuum pump. If air temperature does not change regardless of control operation of photo amplifier for power servo, link may be jammed, power servo may be installed improperly (loose screws, etc.) or power servo is not functioning.

Other If air valves constantly repeat ON-OFF operation when ATC and input & output system function properly, air valve(s) may be leaking.

★ Performance characteristics of PL and PU-potentiometer voltages and input indications (#8 and 9)



SHA616B



SHA009C

POTENTIOMETER ADJUSTMENT PROCEDURE

With the heater assembly removed from the vehicle, check to be sure that there is no binding of either the air mix doors or linkage. With both air mix doors in the full heat position, (no vacuum applied), adjust the resistance between terminals No. 1 (B/W) and No. 3 (G/Y) of the P.B.R. harness to 2.8k. Adjust the resistance between terminal No. 1 (B/W) and No. 4 (G/R) to 3.0k.

2) Doors, water cock and compressor diagnosis
While checking input, output system, check solenoid valves, relays, vacuum pressure, etc., using following tables as a guide.

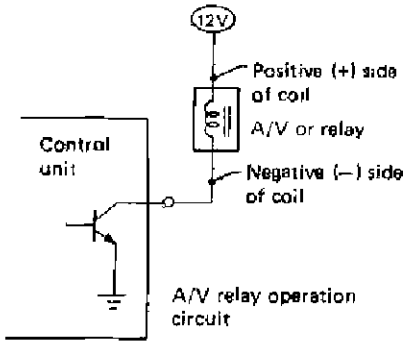
Normal solenoid valve and relay operation
Positive (+) side: Approx. 12 V (Constant)
Negative (−) side: OFF (approx. 12 V)
ON (0 volts)

INSPECTION PROCEDURE – Doors, Water Cock and Compressor

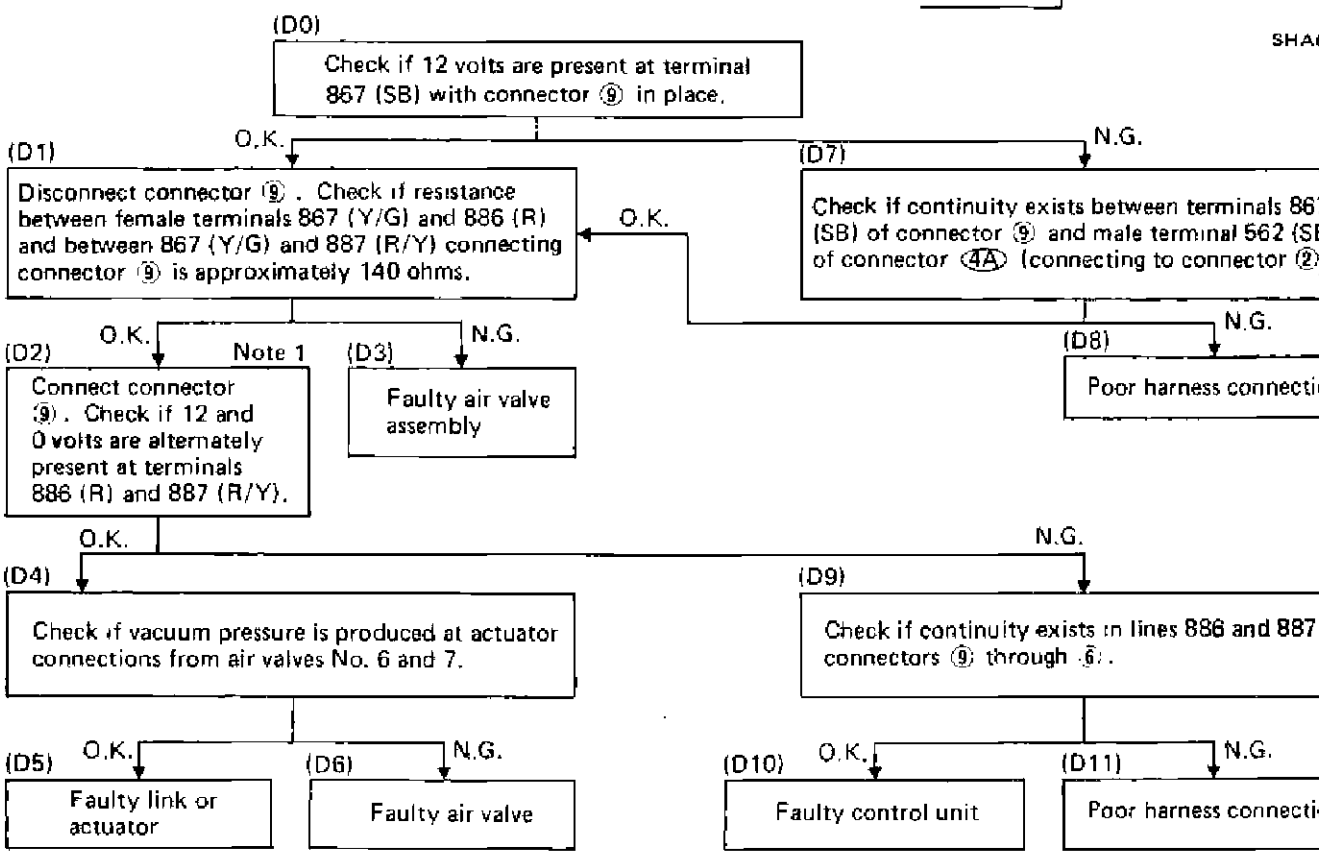
Check operation of air valves and relays while operating input and output system SELF DIAGNOSIS FUNCTION.

Air valves and relays

Positive (+) side: Approximately 12 volts (constant)
Negative (−) side: Approximately 0 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.



2-1 Inspection Procedure – Air Outlets

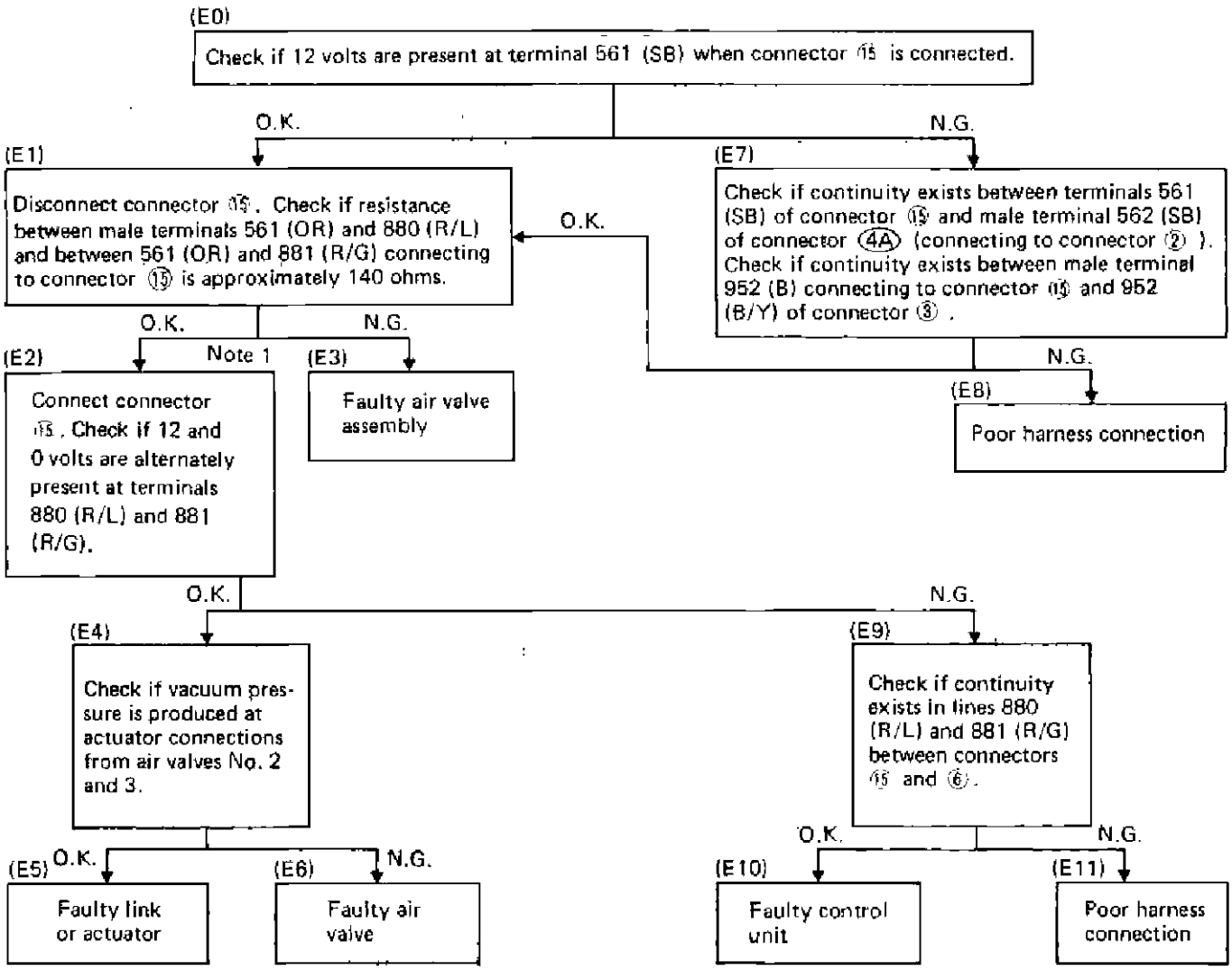


NOTE 1: Check with engine running while operating Input and Output System Test.

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

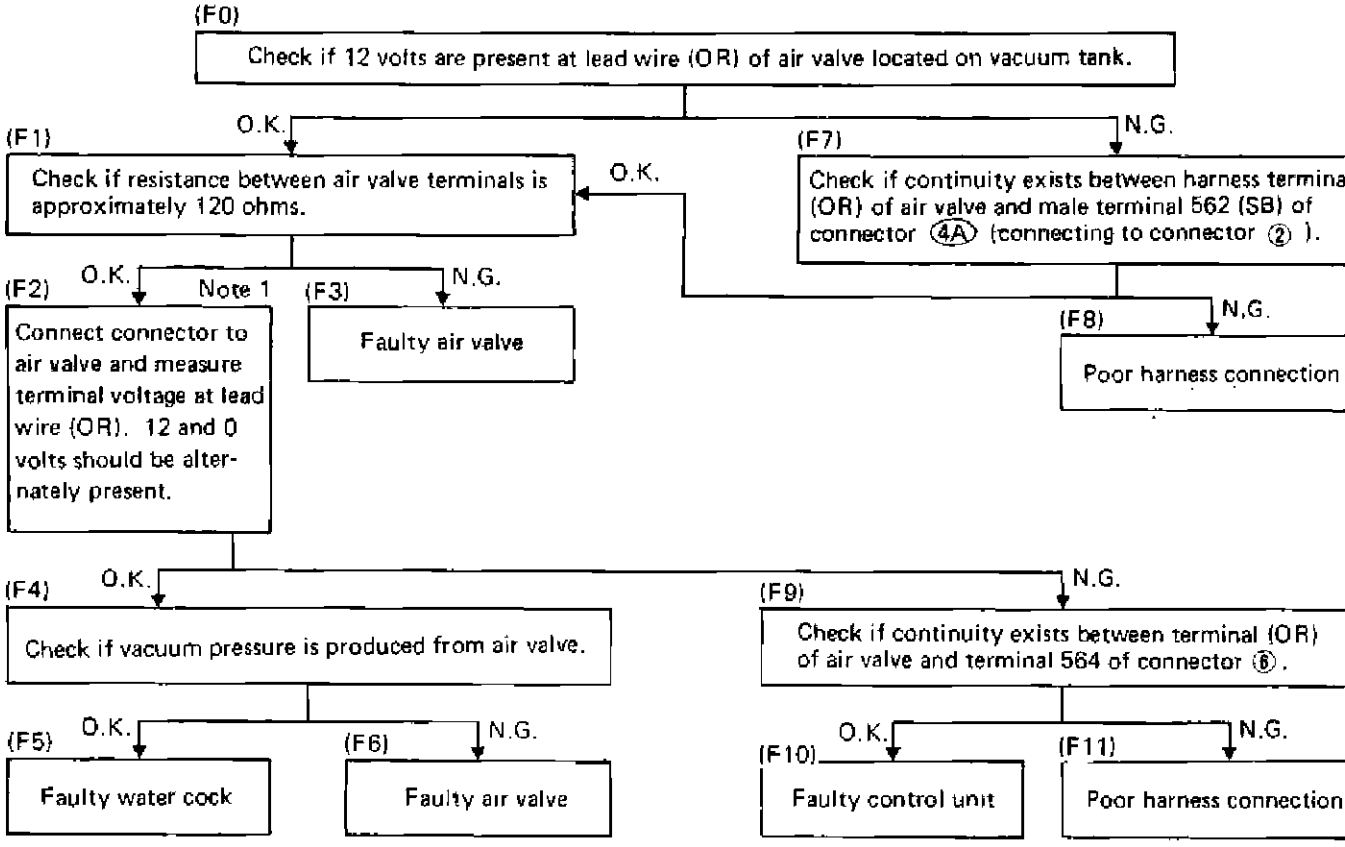


NOTE 1: Check with engine running while operating Input and Output System Test.

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

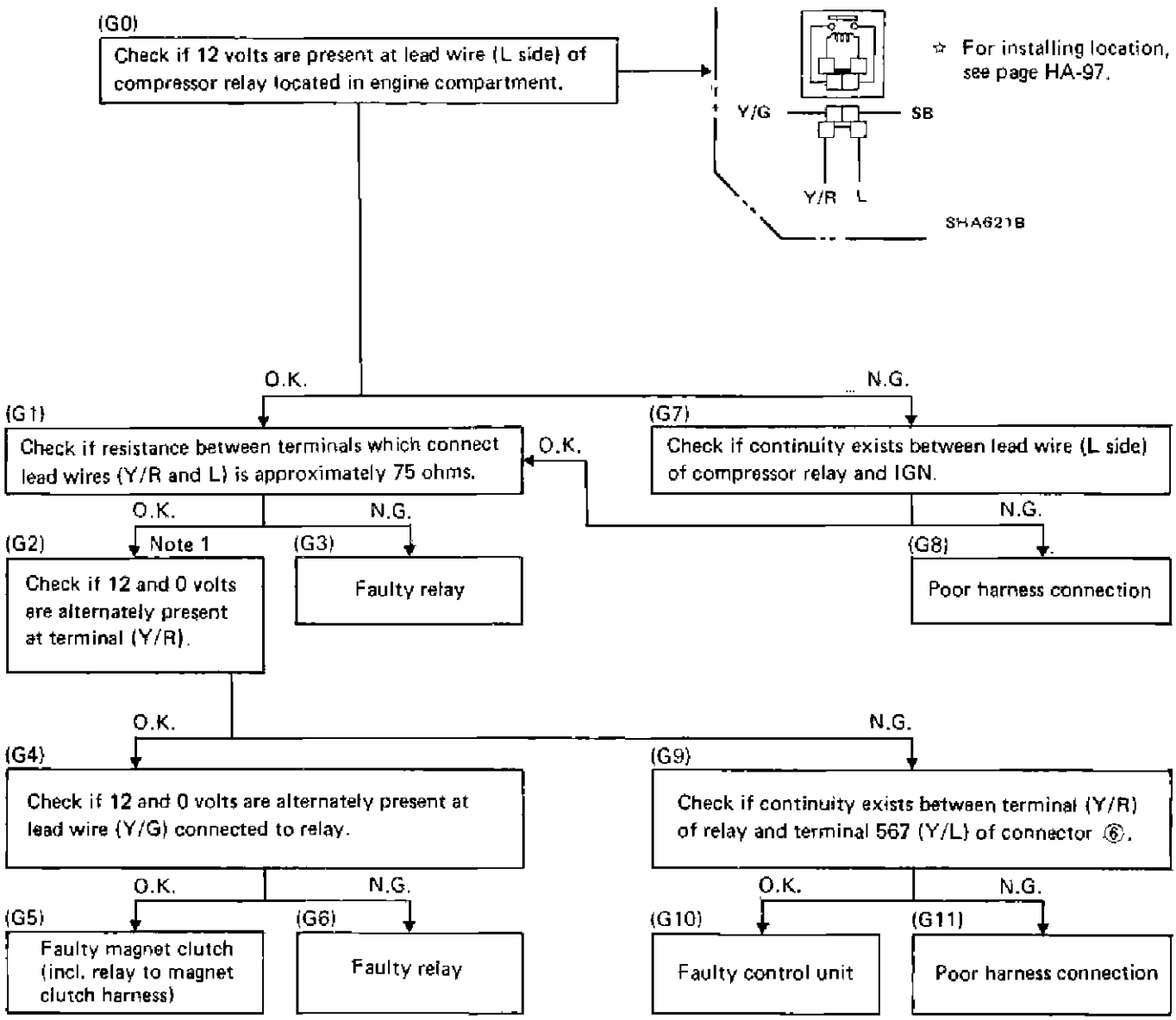


NOTE 1: Check with engine running while operating Input and Output System Test.

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



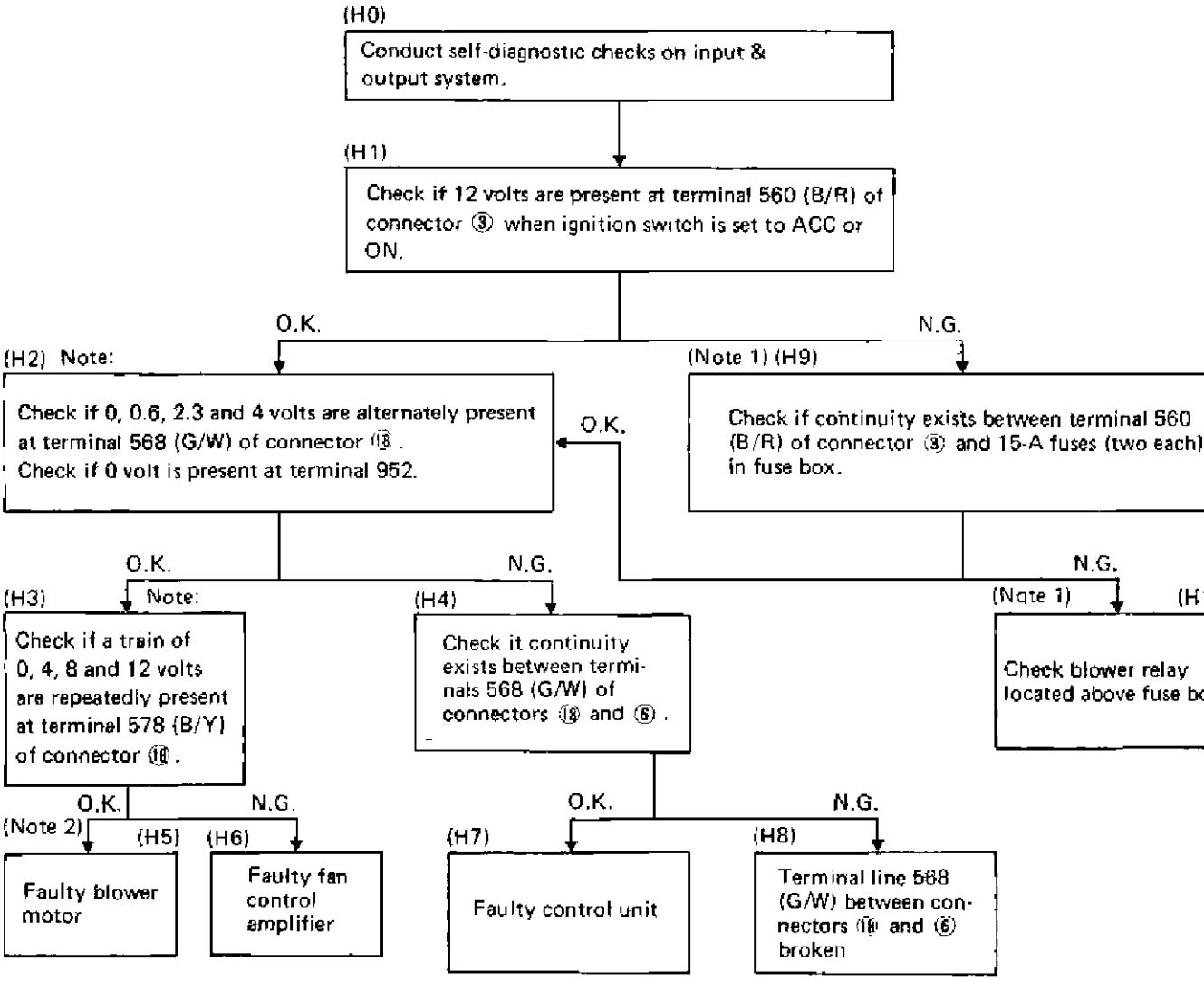
Compressor operation

	Relay
Compressor ON	ON
Compressor OFF	OFF

NOTE 1: Check with engine running while operating Input and Output System Test.

3) Blower motor diagnosis

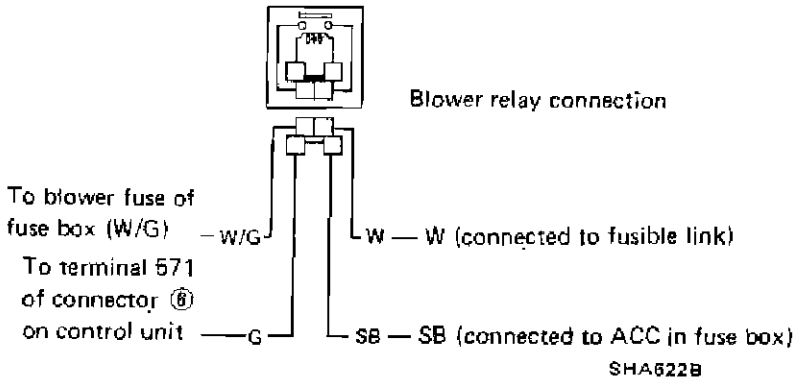
INSPECTION PROCEDURE – Blower & Motor



NOTE: Check with engine running while performing Input and Output System Test.

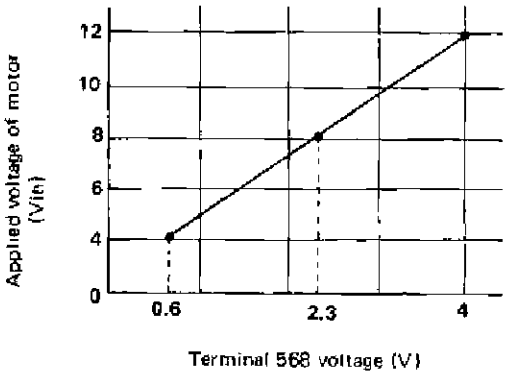
(Note 1) When ignition switch is set to ACC, current flows through blower relay coil. With ignition switch held there, activating switches "AUTO" and "DEF" on control unit causes downstream side of relay coil to be grounded so that blower relay activates. If blower motor does not activate due to problems in its power supply, it will be due to one of the following causes:

(a) Lead wire (W) between fusible link and relay is broken,
(b) The line between lead wire (W/G) of relay and terminal 560 of connector (3) (including two 15-A fuses) is broken,
(c) The line between lead wire (S/B) of relay and fuse (ACC) is broken, or
(d) The line between lead wire (G) of relay and terminal 571 of connector (6) is broken.



SHA622B

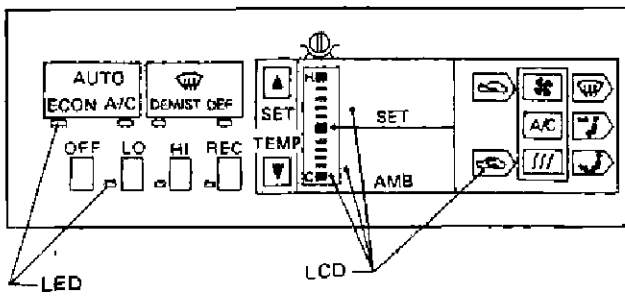
(Note 2) Output performance characteristics of fan control is shown below:



SHA620B

AUTOMATIC AMPLIFIER DIAGNOSIS

1) LCD (Liquid Crystal Display) or LED (Light Emitting Diode) does not glow.



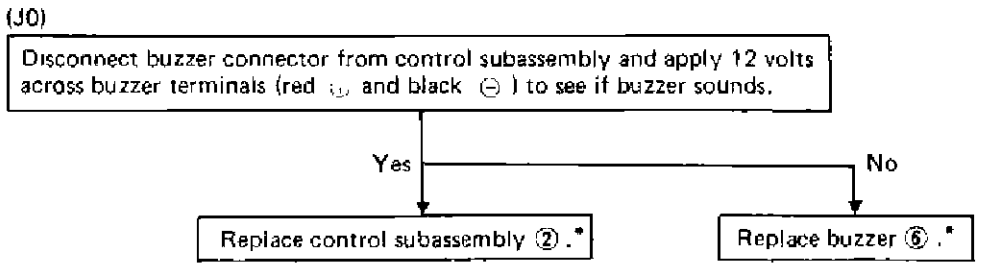
SHA0

(I0) Do LCD's or LED's glow?

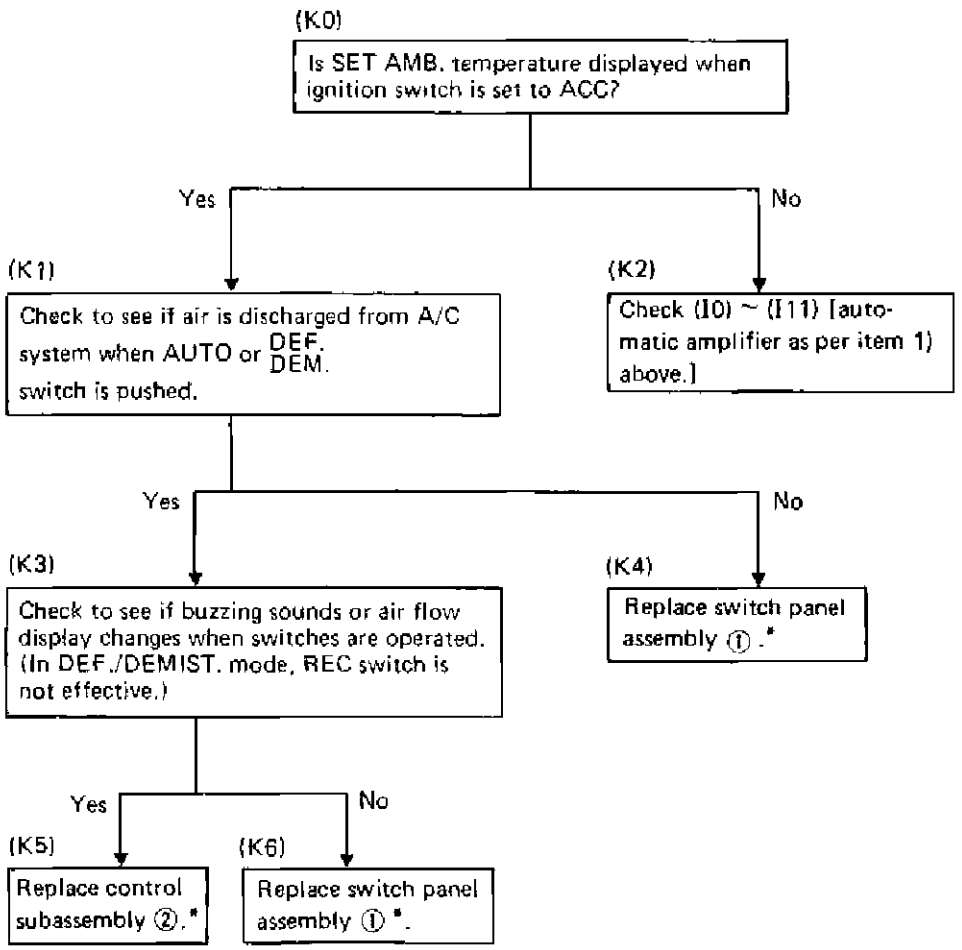
- LCD's & LED's off → (I1) When ignition switch is set to ACC, check to see if more than 9 volts are produced at 563, 565 and 787 and 0 volts at 954 and 955.
  - Yes → (I2) Check to see if air is discharged from A/C system when AUTO or DEF./DEM. switch is pushed.
    - Yes → (I3) Replace switch panel assembly ①.*
    - No → (I4) Replace control subassembly ②.*
  - No → (I5) Check harness 563, 565, 954 and 959 line. If there are faulty lines, repair these lines.
- LED's off → (I6) Replace switch panel assembly.
- LCD's off → (I7) Do some LCD's glow
  - Yes → (I8) Replace switch panel assembly ①.*
  - No → (I9) Check to see if two back lamps located c rear of control panel are burned out.
    - Yes → (I10) Replace faulty back lamp(s) ⑤.*
    - No → (I11) Replace control subassembly ②

*: Refer to REPLACEMENT OF CONTROL SUBASSEMBLY AND SWITCH PANEL ASSEMBLY. (Page HA-123)

2) Operating (Buzzing) Sound is not Emitted.

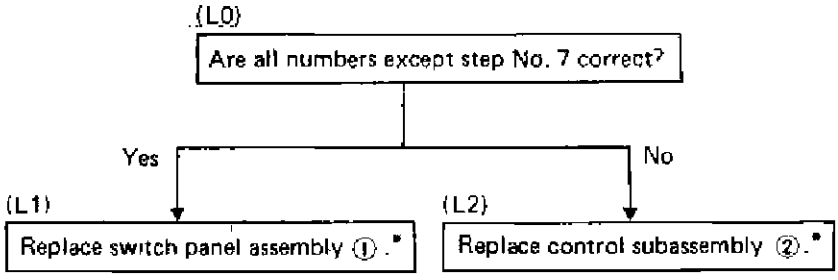


3) Switches on Switch Panel Assembly do not Operate.

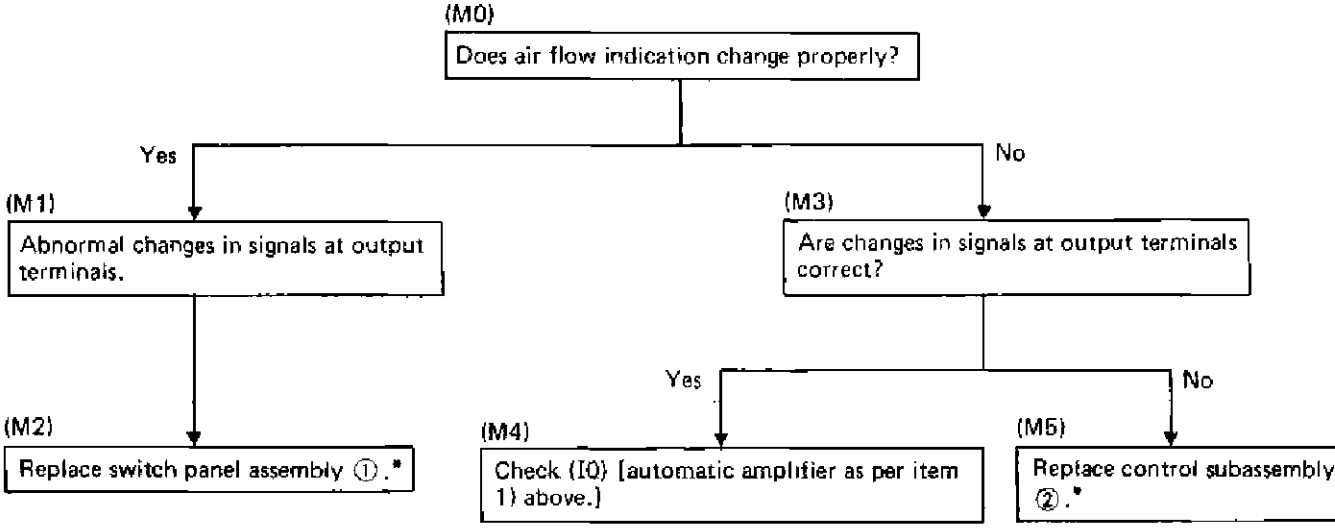


*: Refer to REPLACEMENT OF CONTROL SUBASSEMBLY AND SWITCH PANEL ASSEMBLY. (Page HA-123)

4) Erroneous Display during Inspection of the Input System



5) Erroneous Operation during Inspection of the Output System

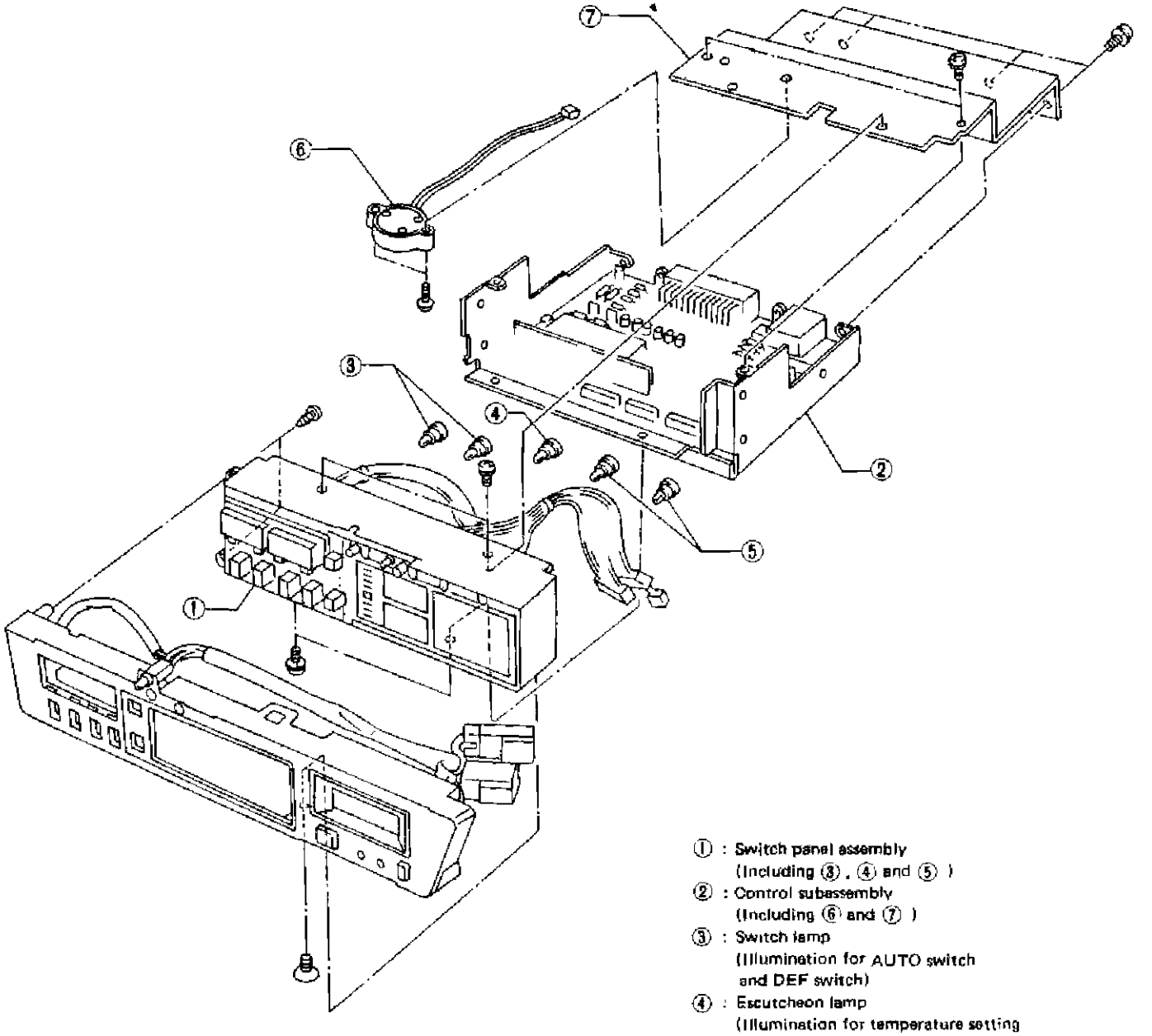


6) Escutcheon lamp does not come on.
Check for burned-out lamp located at rear of switch panel assembly ④.*

*: Refer to REPLACEMENT OF CONTROL SUBASSEMBLY AND SWITCH PANEL ASSEMBLY. (Page HA-123)

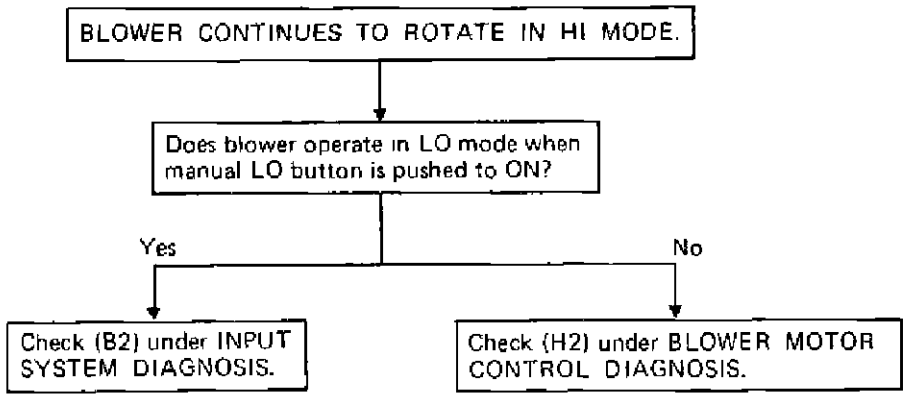
REPLACEMENT OF CONTROL SUBASSEMBLY AND SWITCH PANEL ASSEMBLY

- Before performing various operational checks of the automatic amplifier, check to make sure the four switch panel assembly-to-control subassembly connectors and buzzer connector are secure and tight and are free from damage.
- On the rear of the control panel assembly are five light bulbs that can be serviced as required.



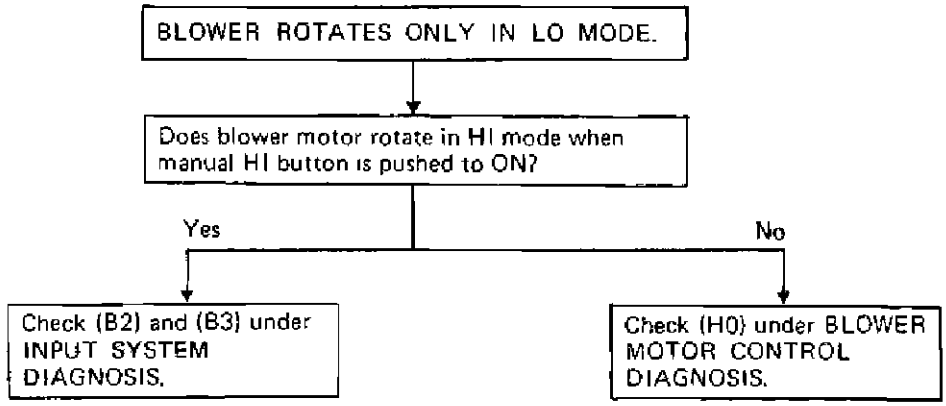
① : Switch panel assembly
(Including ③, ④ and ⑤)
② : Control subassembly
(Including ⑥ and ⑦)
③ : Switch lamp
(Illumination for AUTO switch and DEF switch)
④ : Escutcheon lamp
(Illumination for temperature setting switch and display of temperature indication)
⑤ : Back lamp (For LCD)
⑥ : Buzzer
⑦ : Case

SHA011C



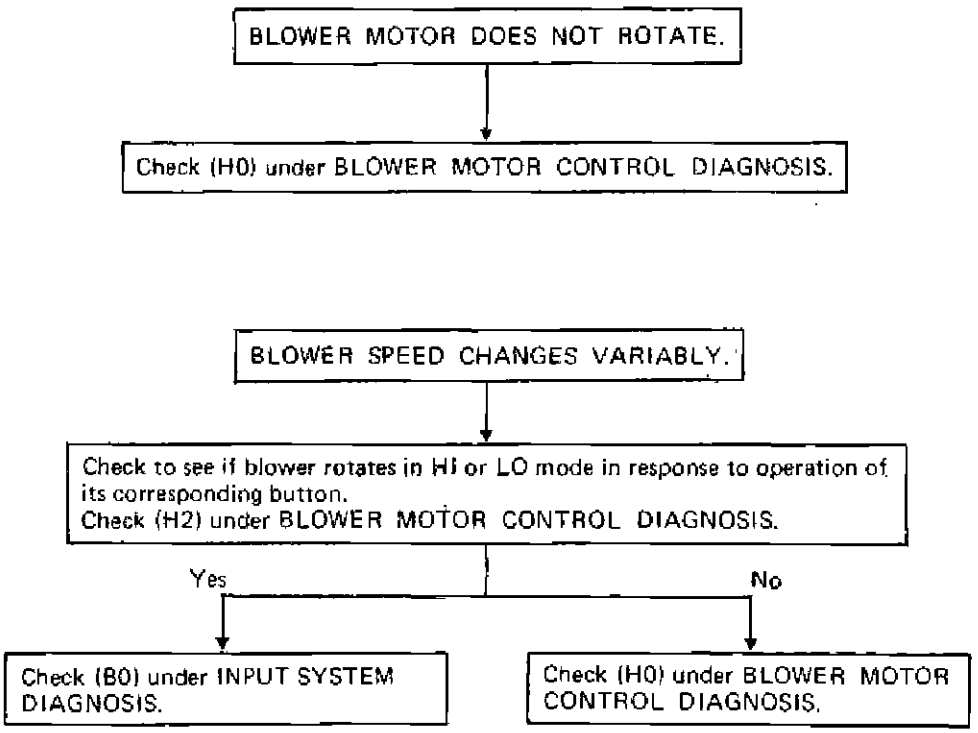
[CHECK POINTS]
(1) Open or shorted sensor (Tu, Tdu, or Tdd)
(2) Aspirator motor does not rotate and "Tu" value is close to "T_A" value.

T_U: In-vehicle sensor (Head)
T_A: Ambient temp. sensor



[CHECK POINTS]
Harnesses, connectors and sensors in relation to T_L, Tu, T_{dL}, Tdu, Tdd

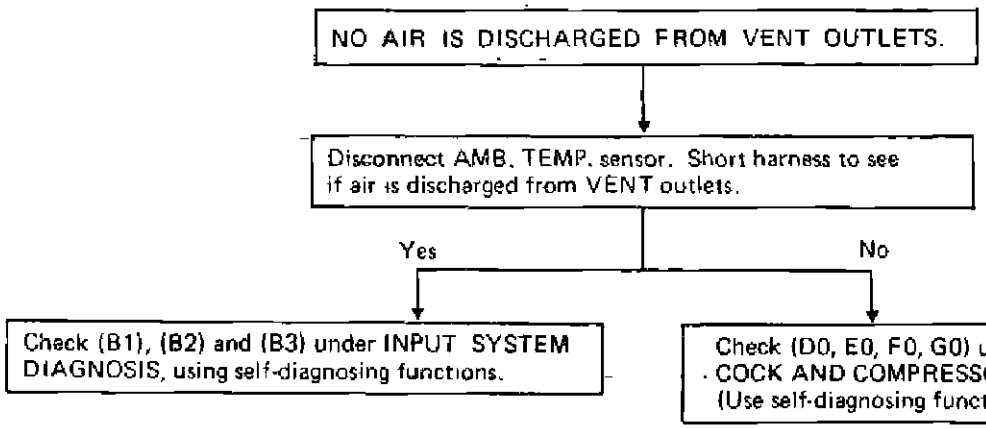
T_L: In-vehicle sensor (Foot)
Tu: In-vehicle sensor (Head)
T_{dL}: Floor duct temp. sensor
Tdu: Vent duct temp. sensor
Tdd: Defroster nozzle temp. sensor



[CHECK POINTS]

(1) Poor or faulty connection of In-vehicle sensor (Foot), In-vehicle sensor (Head), Floor duct temp. sensor, Vent duct temp. sensor, Defroster nozzle duct temp. sensor, Ambient temp. sensor, Sunload sensor, Potentio Balance Resistor (AM1), Potentio Balance Resistor (AM2).

(2) Start-stop operation of aspirator motor and voltage measurements at sensors (Remove sensor assembly to gain access to sensors.)



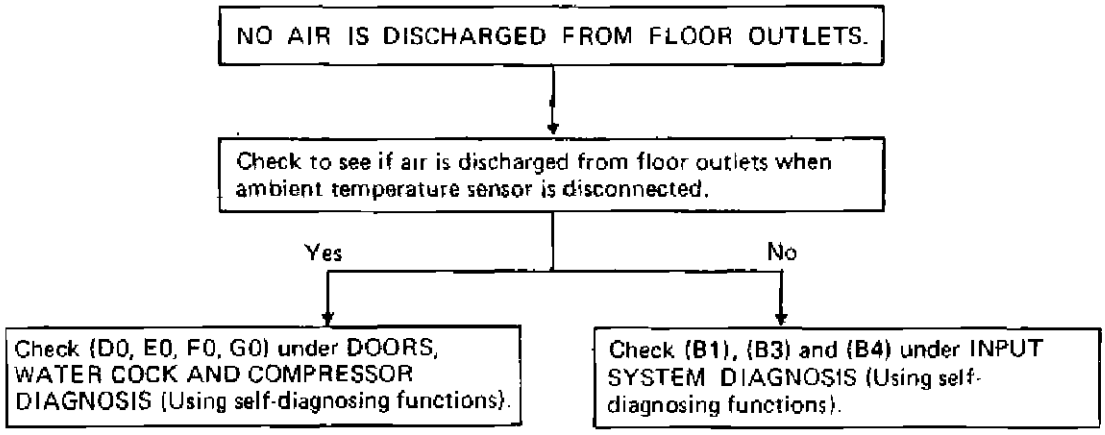
[CHECK POINTS]

(1) Open circuit in TA, TL, Tu and DL sensors.

TA: Ambient temp. sensor
TL: In-vehicle sensor (Foot)
Tu: In-vehicle sensor (Head)
TdL: Floor duct temp. sensor

[CHECK POINT]

(1) Harness (line 887), solenoid valve, etc.
(2) Damage to hose between solenoid valve (6) and actuator air valve, or condition of link system affected.

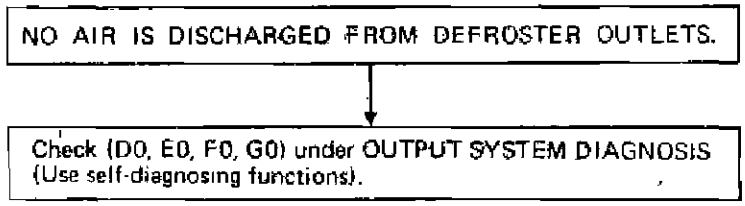


[CHECK POINTS]

Short circuit in ambient temp. sensor and sunload sensor

[CHECK POINTS]

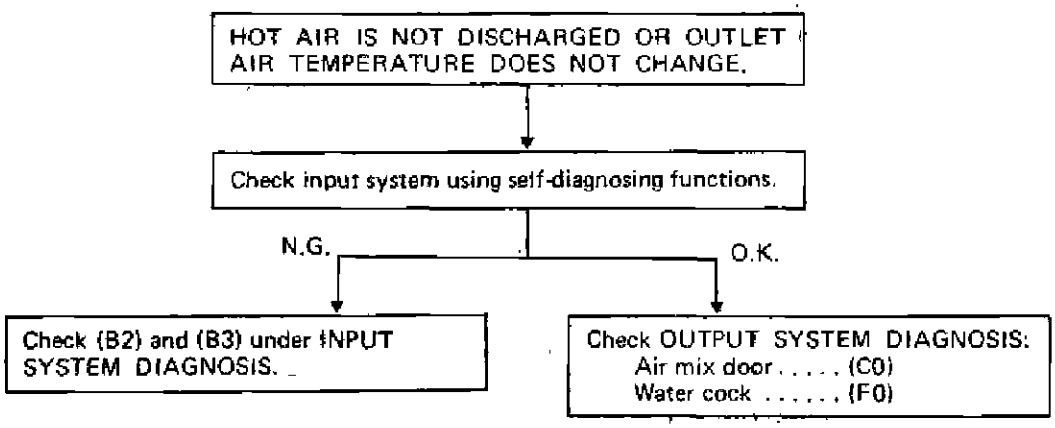
(1) Harness (line 886) and solenoid valve (7)
(2) Damage to hose between solenoid valve (7) and floor actuator Af, and condition of link system affected

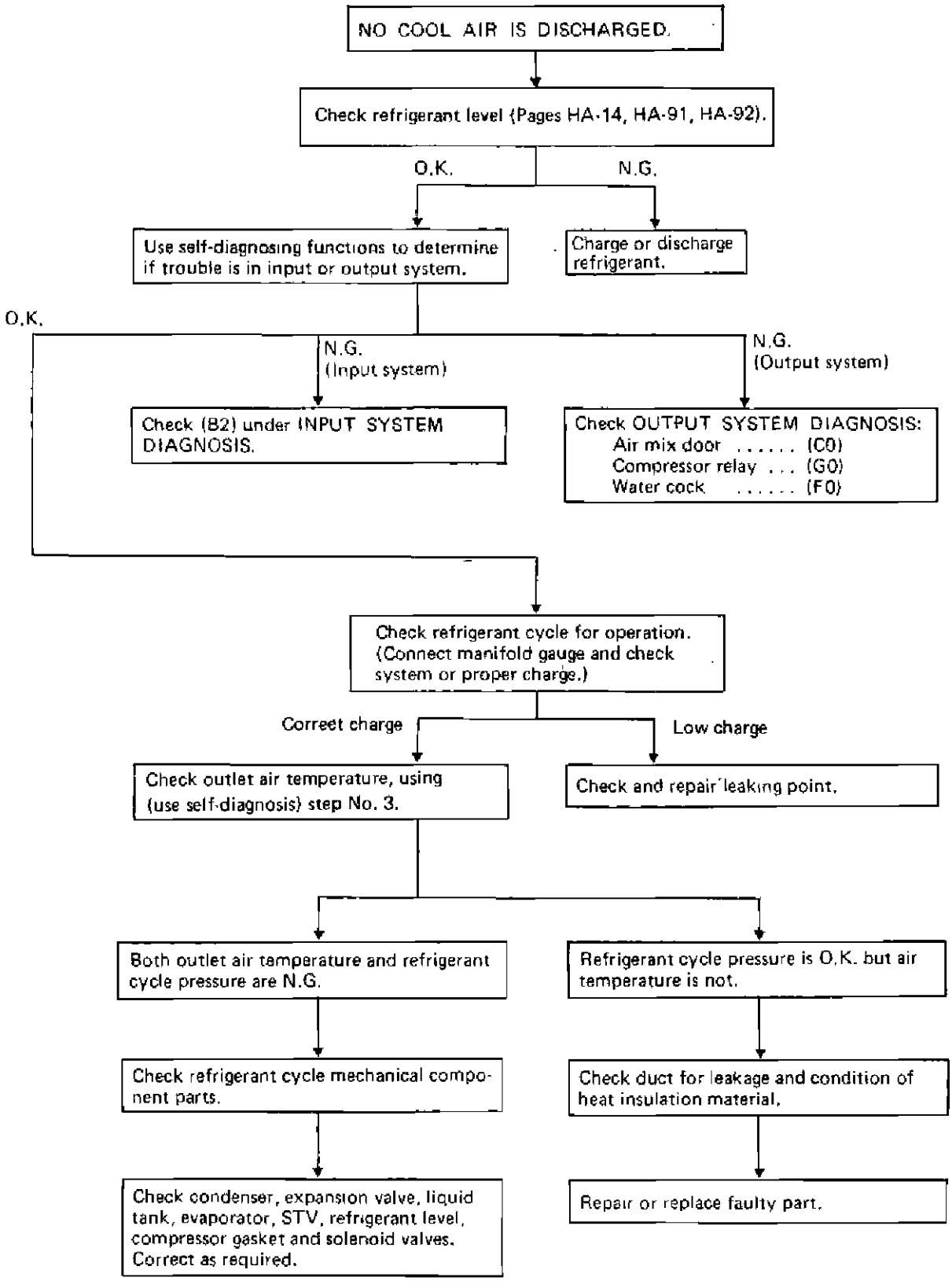


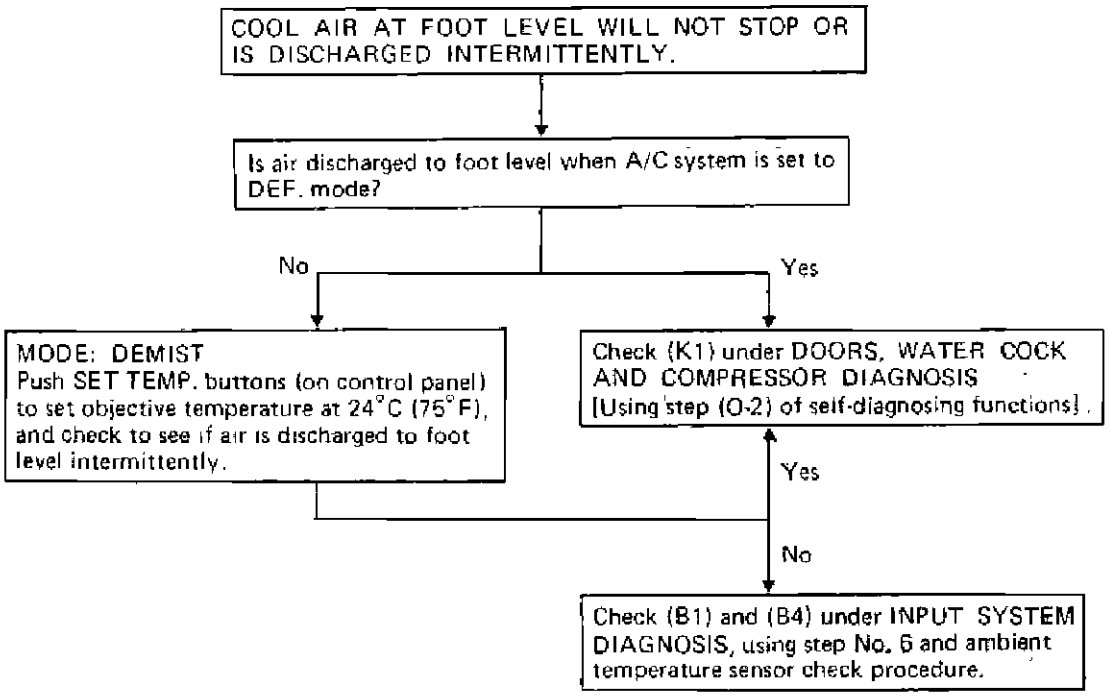
[CHECK POINTS]

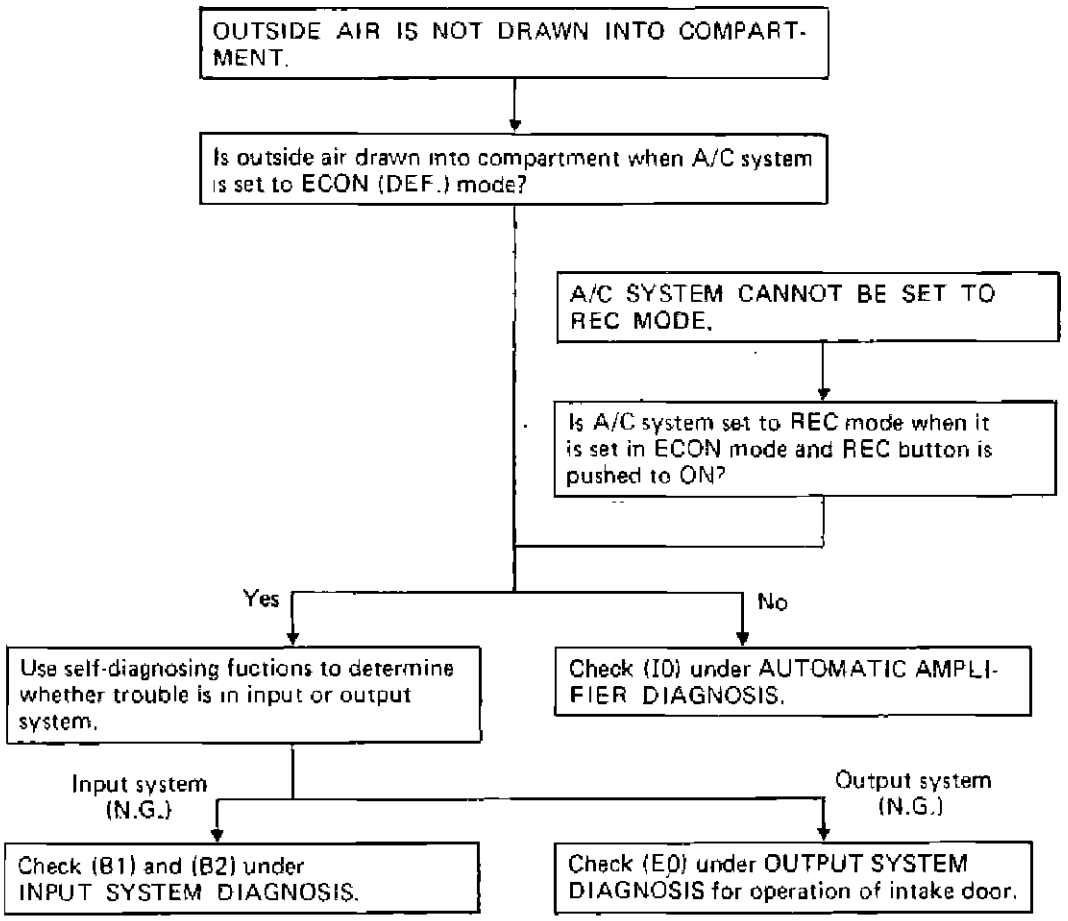
(1) Harness (line 887) and solenoid valve 6

(2) Damaged hose/link between solenoid valve 6 and actuator Ad (DEF. door Actuator)

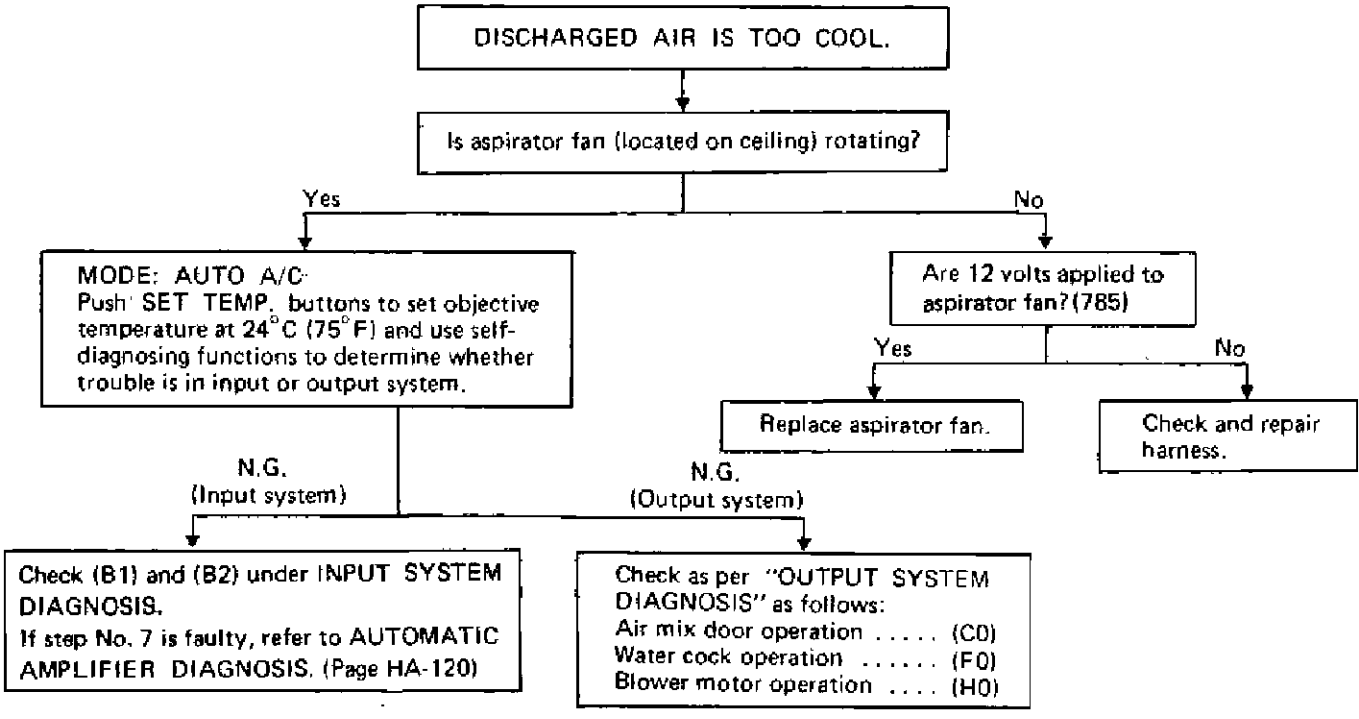


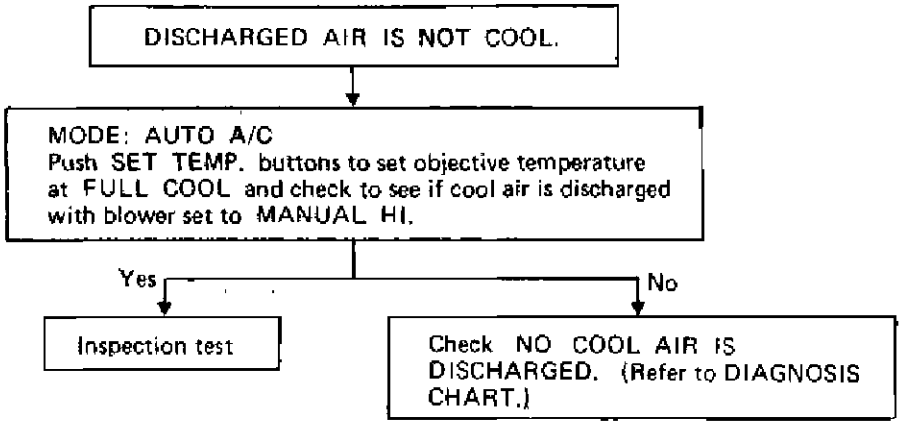

NO COOL AIR IS DISCHARGED.
Check refrigerant level (Pages HA-14, HA-91, HA-92).
O.K.
N.G.
Use self-diagnosing functions to determine if trouble is in input or output system.
Charge or discharge refrigerant.
O.K.
N.G. (Input system)
N.G. (Output system)
Check (B2) under INPUT SYSTEM DIAGNOSIS.
Check OUTPUT 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) step No. 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.

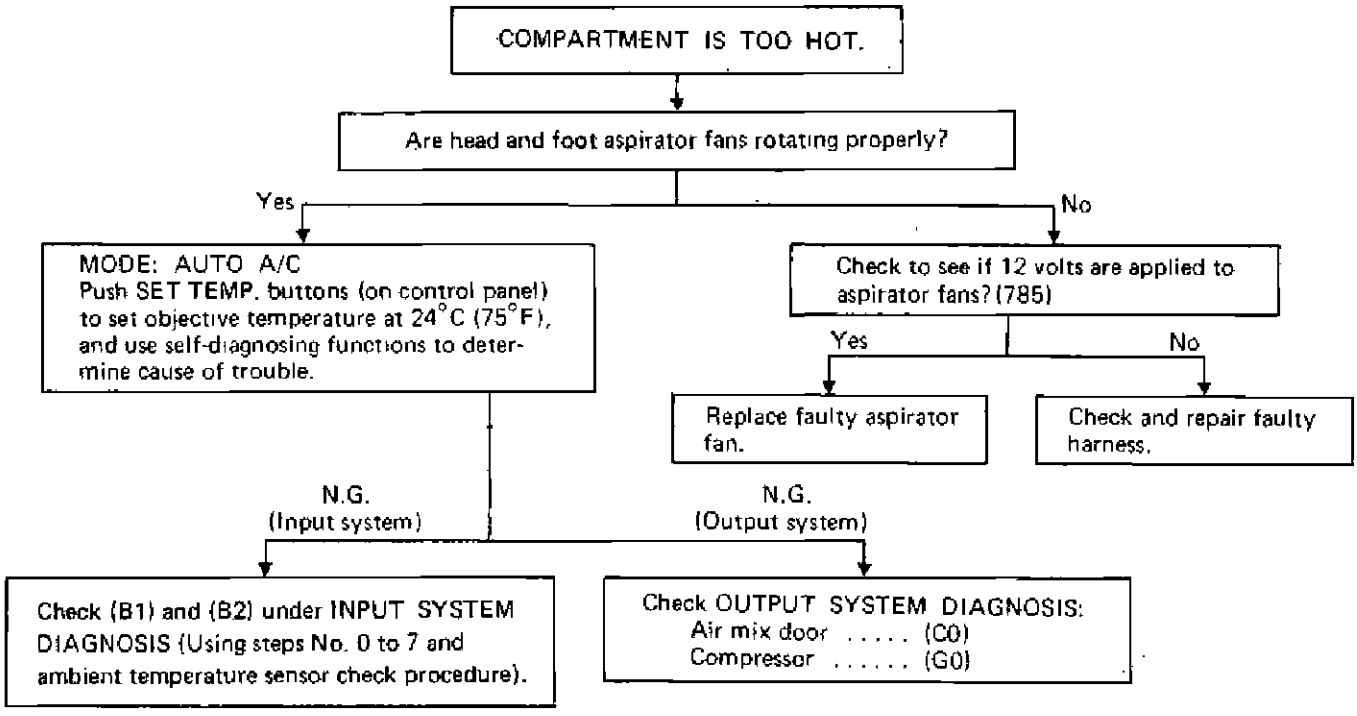

COOL AIR AT FOOT LEVEL WILL NOT STOP OR IS DISCHARGED INTERMITTENTLY.
Is air discharged to foot level when A/C system is set to DEF. mode?
No
Yes
MODE: DEMIST
Push SET TEMP. buttons (on control panel) to set objective temperature at 24°C (75°F), and check to see if air is discharged to foot level intermittently.
Check (K1) under DOORS, WATER COCK AND COMPRESSOR DIAGNOSIS [Using step (O-2) of self-diagnosing functions].
Yes
No
Check (B1) and (B4) under INPUT SYSTEM DIAGNOSIS, using step No. 6 and ambient temperature sensor check procedure.

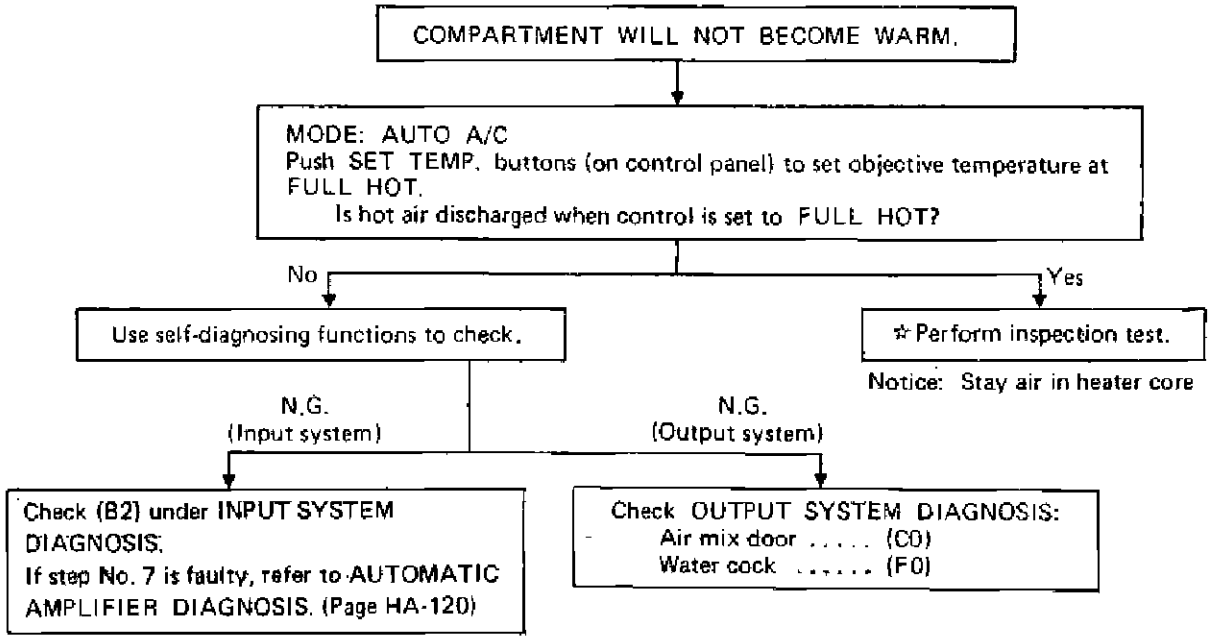

OUTSIDE AIR IS NOT DRAWN INTO COMPARTMENT.
Is outside air drawn into compartment when A/C system is set to ECON (DEF.) mode?
A/C SYSTEM CANNOT BE SET TO REC MODE.
Is A/C system set to REC mode when it is set in ECON mode and REC button is pushed to ON?
Yes
No
Use self-diagnosing fuctions to determine whether trouble is in input or output system.
Check (I0) under AUTOMATIC AMPLIFIER DIAGNOSIS.
Input system (N.G.)
Output system (N.G.)
Check (B1) and (B2) under INPUT SYSTEM DIAGNOSIS.
Check (E0) under OUTPUT SYSTEM DIAGNOSIS for operation of intake door.

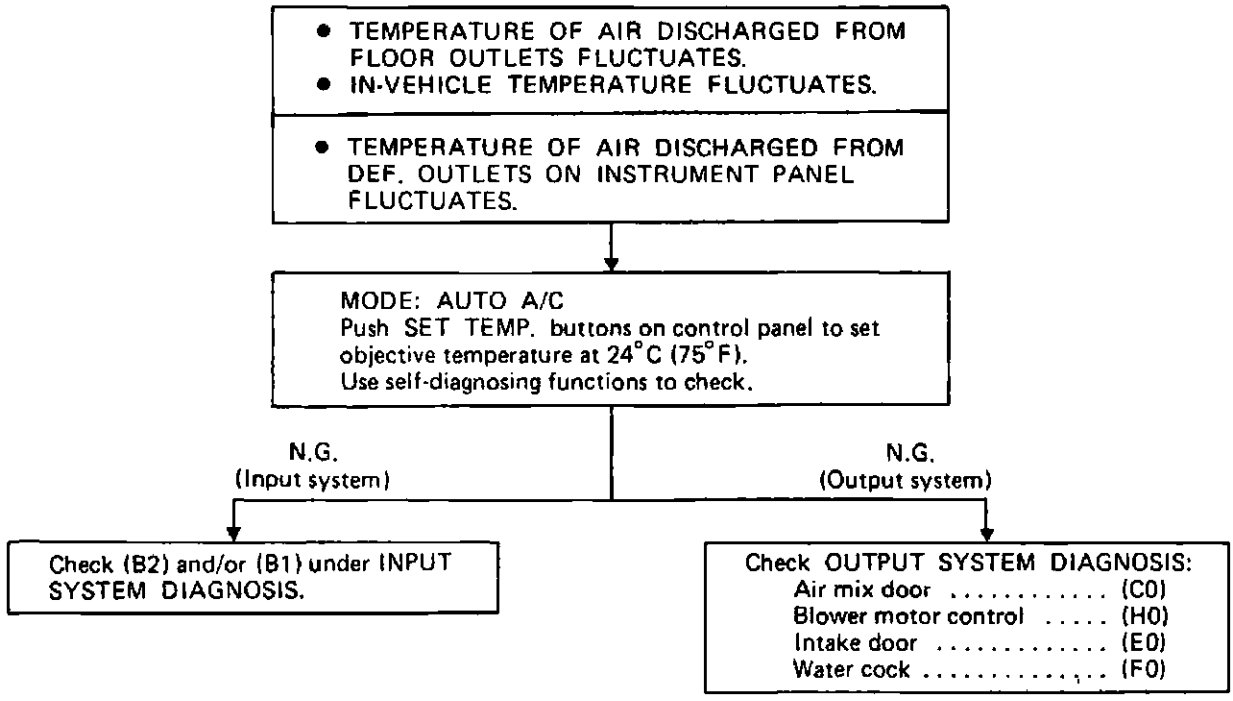
TROUBLE DIAGNOSES (Auto)






COMPARTMENT IS TOO HOT.
Are head and foot aspirator fans rotating properly?
Yes
No
MODE: AUTO A/C
Push SET TEMP. buttons (on control panel) to set objective temperature at 24°C (75°F), and use self-diagnosing functions to determine cause of trouble.
Check to see if 12 volts are applied to aspirator fans? (785)
Yes
No
Replace faulty aspirator fan.
Check and repair faulty harness.
N.G. (Input system)
N.G. (Output system)
Check (B1) and (B2) under INPUT SYSTEM DIAGNOSIS (Using steps No. 0 to 7 and ambient temperature sensor check procedure).
Check OUTPUT SYSTEM DIAGNOSIS:
Air mix door ..... (C0)
Compressor ..... (G0)


COMPARTMENT WILL NOT BECOME WARM.
MODE: AUTO A/C
Push SET TEMP. buttons (on control panel) to set objective temperature at FULL HOT.
Is hot air discharged when control is set to FULL HOT?
No
Yes
Use self-diagnosing functions to check.
☆Perform inspection test.
Notice: Stay air in heater core
N.G. (Input system)
N.G. (Output system)
Check (B2) under INPUT SYSTEM DIAGNOSIS.
If step No. 7 is faulty, refer to AUTOMATIC AMPLIFIER DIAGNOSIS. (Page HA-120)
Check OUTPUT SYSTEM DIAGNOSIS:
Air mix door ..... (C0)
Water cock ..... (F0)



[CHECK POINTS]

Poor connection of connector harness under vibrating conditions, such as when vehicle is being driven.

If outlet discharged air temperature fluctuates (sometimes becomes warm), check continuity betwe terminals corresponding to each symptom using following table.

Portions to be inspected			Outlet from which discharged air temperature is fluctuating			Remarks
Terminal (harness line) No. See HA-106 & 107.	Connector No. See HA-107.	Circuit connection	VENT	FLOOR	DEF.	
864 (L/W)	① ⑤ ⑦	AMBIENT TEMP. SENSOR		◎	◎	Refer to step (B1) Page HA-110.
857 (BR/Y)	⑤ ⑦ ⑯	IN-VEHICLE SENSOR (FOOT)		◎		Refer to step (B2) Page HA-110.
863 (BR/W)	① ⑤ ⑧	IN-VEHICLE SENSOR (HEAD)	◎		○	
858 (Y/W)	⑤ ⑦ ⑨ ⑪	FLOOR DUCT TEMP. SENSOR		◎		
860 (Y/R)	⑤ ⑦ ⑨ ⑩	VENT DUCT TEMP. SENSOR	◎			
859 (Y/B)	⑤ ⑦ ⑰	DEFROSTER DUCT TEMP. SENSOR			◎	
868 (B/W)	⑤ ⑦ ⑨	P.B.R. 1 & 2	◎	◎	○	–
882 (W/R)	⑥ ⑧ ⑨	S/V 4		◎		For air mix door 2
883 (W/Y)	⑥ ⑧ ⑨	S/V 5		◎		
884 (W/B)	⑥ ⑧ ⑨	S/V 8	◎		○	For air mix door 1
885 (W/L)	⑥ ⑧ ⑨	S/V 9	◎		○	
567 (Y/L)	② ⑥ ⑧	COMPRESSOR RELAY	◎	◎		–

- This table indicates the portions to be inspected for each type of symptom. It is necessary for each symptom to check circuit connections marked "◎" or "○".
- Prior to portions marked "○", check portions marked "◎".

General Specifications

COMPRESSOR

Model	DIESEL-KIKI make DKS-16H
Type	Swash plate
Displacement cm³ (cu in)/Rev.	167 (10.19)
Cylinder bore x stroke mm (in)	37.0 x 25.8 (1.457 x 1.016)
Direction of rotation	Clockwise (viewed from drive end)
Drive belt	Poly V

LUBRICATION OIL

Model	DIESEL-KIKI make DKS-16H
Type	SUNISO 5G6
Capacity mℓ (US fl oz, Imp fl oz) Total in system	200 (6.8, 7.0)
Amount of oil which can be drained	130 (4.4, 4.6)
Compressor (Service parts) charging amount	200 (6.8, 7.0)

REFRIGERANT

Type		R-12
Capacity	kg (lb)	0.9 - 1.1 (2.0 - 2.4)

ENGINE IDLING SPEED

Transmission			Non-turbocharged model	Turbocharged model
When A/C is OFF			Refer to MA section.	
When A/C is ON	M/T	rpm	750 - 850	750 - 850
	A/T	rpm	750 - 850 at "D" range	750 - 850 at "D" range

Inspection and Adjustment

COMPRESSOR

Model	DKS-16H
Clutch disc-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)

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

Tightening Torque

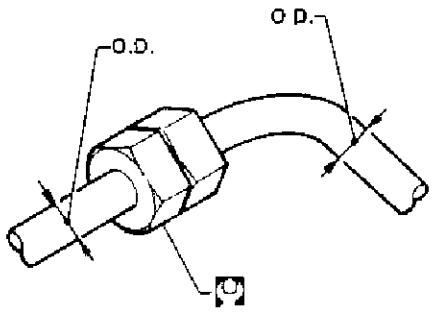
COMPRESSOR INSTALLATION

	N·m	kg-m	ft-lb
Compressor bracket to cylinder block	36 - 49	3.7 - 5.0	27 - 36
Compressor to compressor bracket	36 - 49	3.7 - 5.0	27 - 36
Compressor shaft nut	14 - 16	1.4 - 1.6	10 - 12
Compressor lock nut	34 - 39	3.5 - 4.0	25 - 29

REFRIGERANT LINE

When connecting lines made of different material, basically use the lower tightening torque of the two.

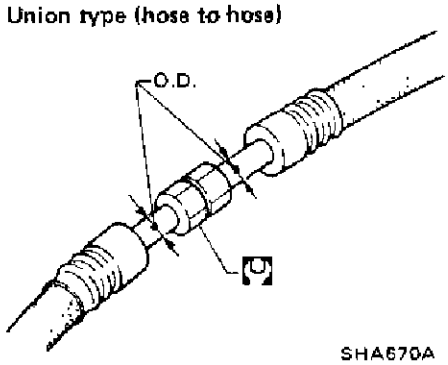
Union type (pipe to pipe)



SHA669A

Pipe O.D. mm (in)	Material					
	Steel or copper			Aluminum		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
6 (1/4)	10 - 20	1.0 - 2.0	7 - 14	–	–	–
8 (5/16)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
10 (3/8)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
12 (1/2)	20 - 29	2.0 - 3.0	14 - 22	15 - 25	1.5 - 2.5	11 - 18
16 (5/8)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22
19 (3/4)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22

Union type (hose to hose)

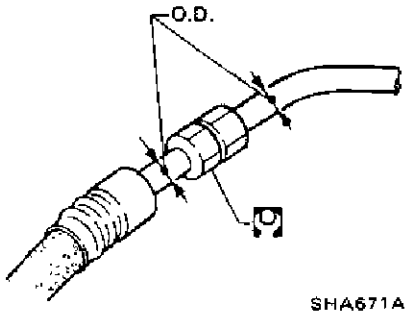


SHA670A

Pipe O.D. mm (in)	Material					
	Steel or copper			Aluminum		
	N·m	kg-m	ft-lb	N·m	kg-m	ft-lb
6 (1/4)	10 - 20	1.0 - 2.0	7 - 14	–	–	–
8 (5/16)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
10 (3/8)	15 - 25	1.5 - 2.5	11 - 18	10 - 20	1.0 - 2.0	7 - 14
12 (1/2)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22
16 (5/8)	25 - 34	2.5 - 3.5	18 - 25	20 - 29	2.0 - 3.0	14 - 22

Tightening Torque (Cont'd)

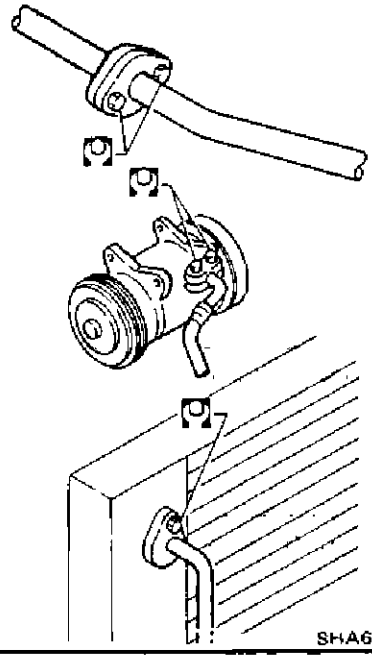
Union type (hose to pipe)



SHA671A

- Use tightening torque for flexible hose.

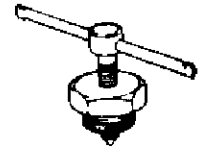
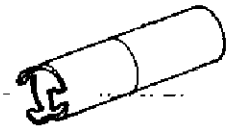
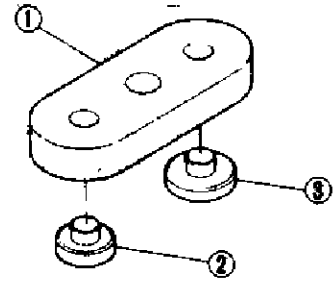
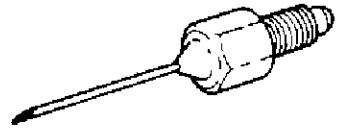
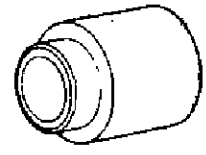
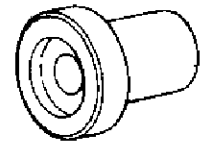
Plate type

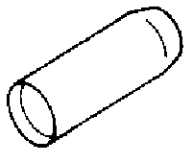

SHA672A

Bolt type				Tightening torque		
Grade	Nominal size	Bolt diameter mm	Pitch mm	N·m	kg-m	ft-lb
	M6	6.0	1.0	3 - 4	0.3 - 0.4	2.2 - 2.9
4T	M8	8.0	1.25	8 - 11	0.8 - 1.1	5.8 - 8.0
	M10	10.0	1.5	16 - 22	1.6 - 2.2	12 - 16

In case of 7T Bolt has been installed in vehicle,
Tightening torque is as same as 4T bolt.

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Description	
KV99232022 (J26571-A) Clutch disc puller		Removing clutch disc
KV99235140 (J37876) Shaft seal remover and installer		Removing and installing shaft seal.
KV99241420 (J37881) Blind cover set ① KV99241400 (—) ② KV99211100 (—) ③ KV99211300 (—)		Blind cover
KV994C1552 (J37880) Charge nozzle		Using charge refrigerant
KV99231010 (J37877) Clutch disc wrench		Removing shaft nut and clutch disc
KV99233040 (J26720-A) Puller pilot		Removing pulley
KV99234160 (J37879) Pulley installer		Installing pulley

Tool number (Kent-Moore No.) Tool name	Description	
KV99267420 (J37878) Shaft seal guide		Installing shaft seal
KV99235160 (J37882) Nut wrench		Removing lock nut