

HEATER & AIR CONDITIONER

SECTION **HA**

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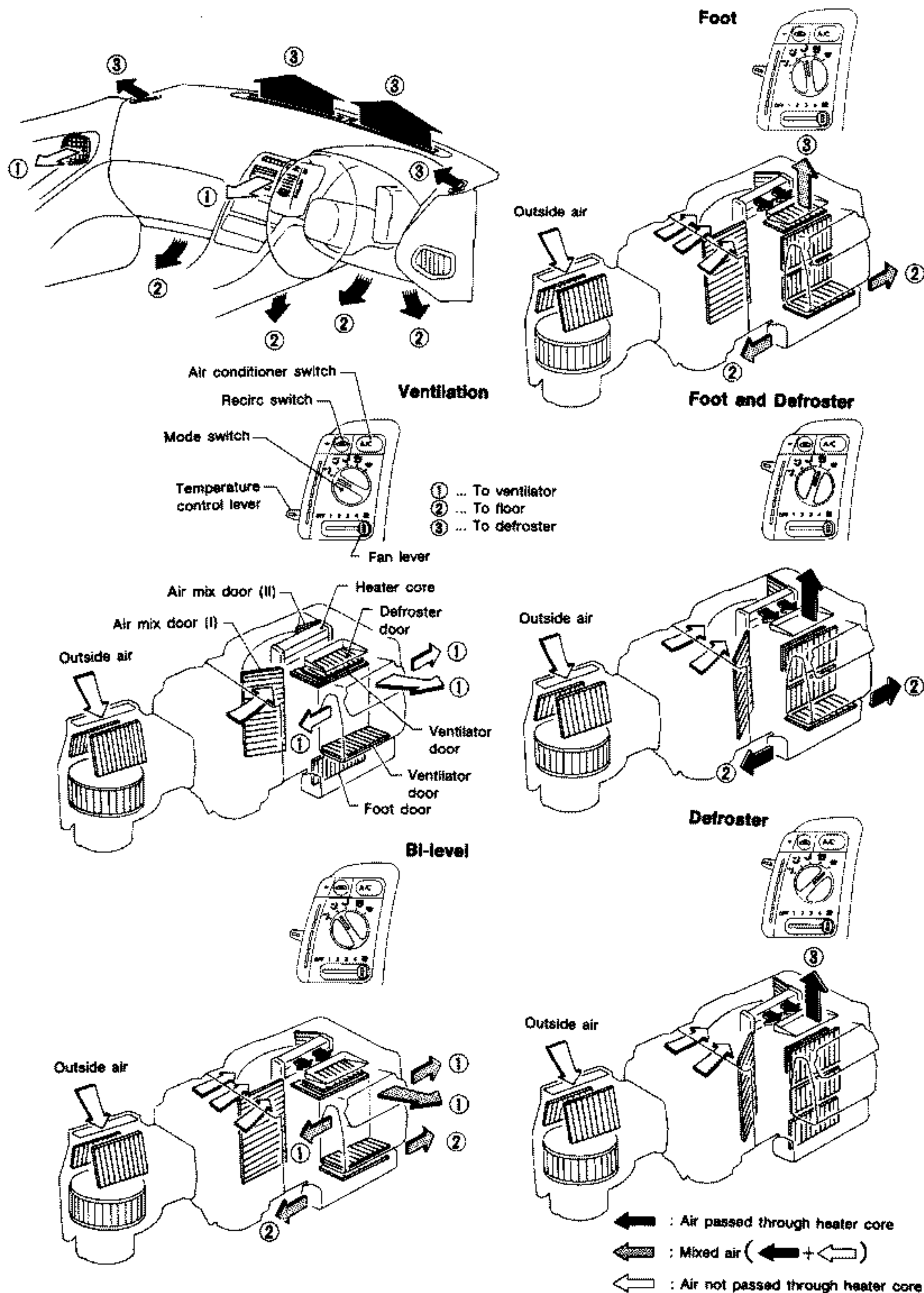
When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES".

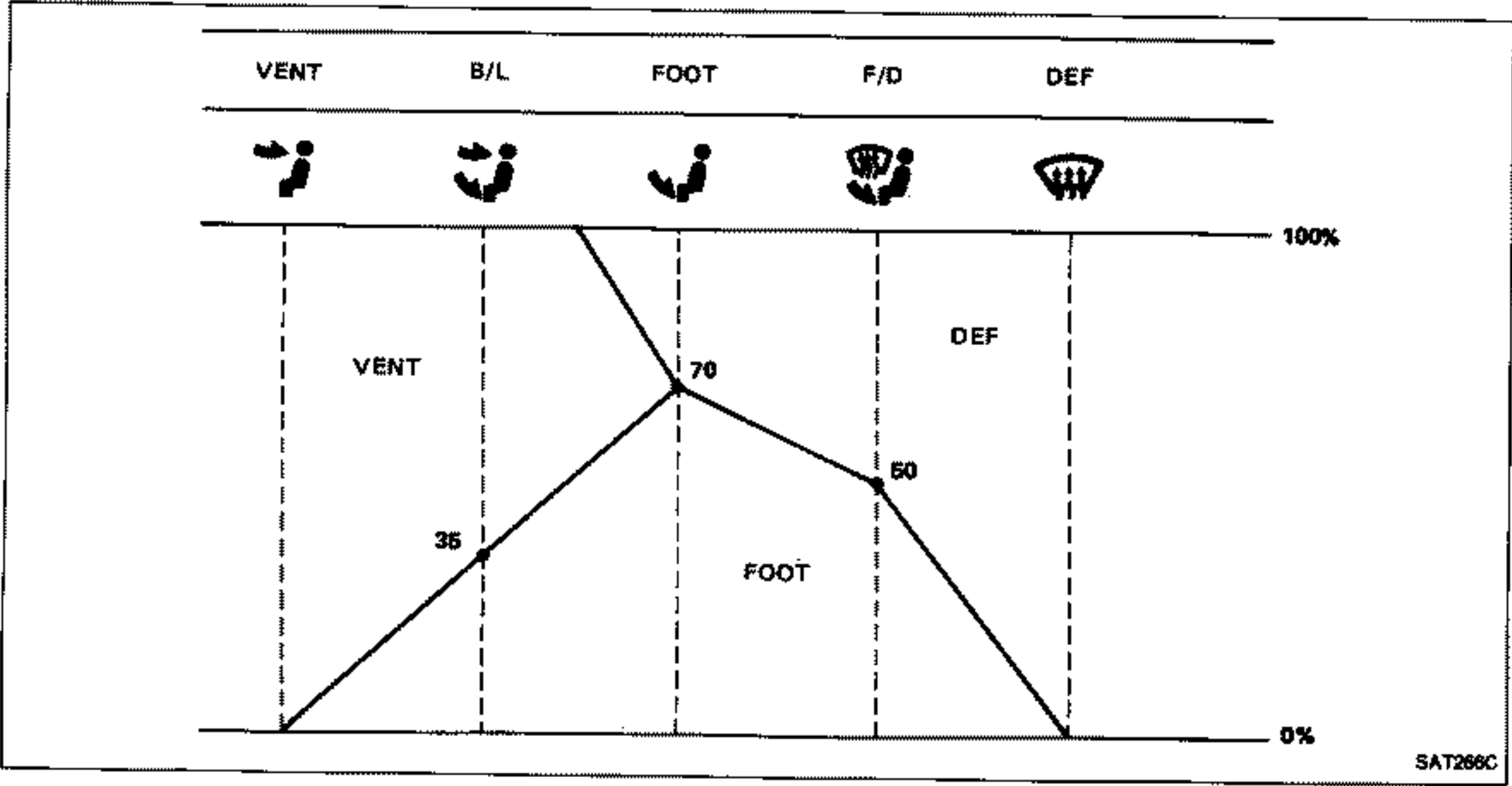
HA

Air Flow

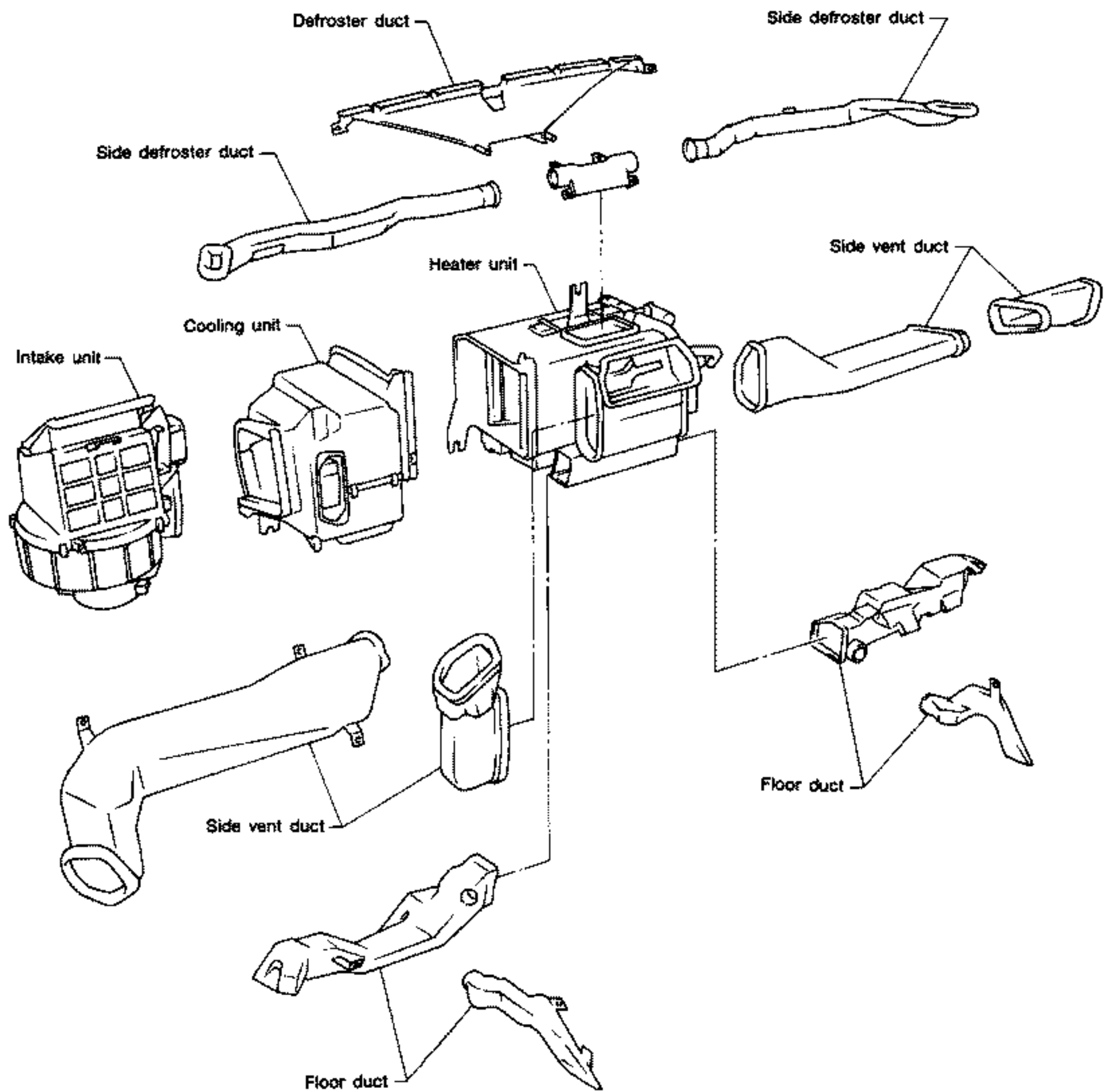


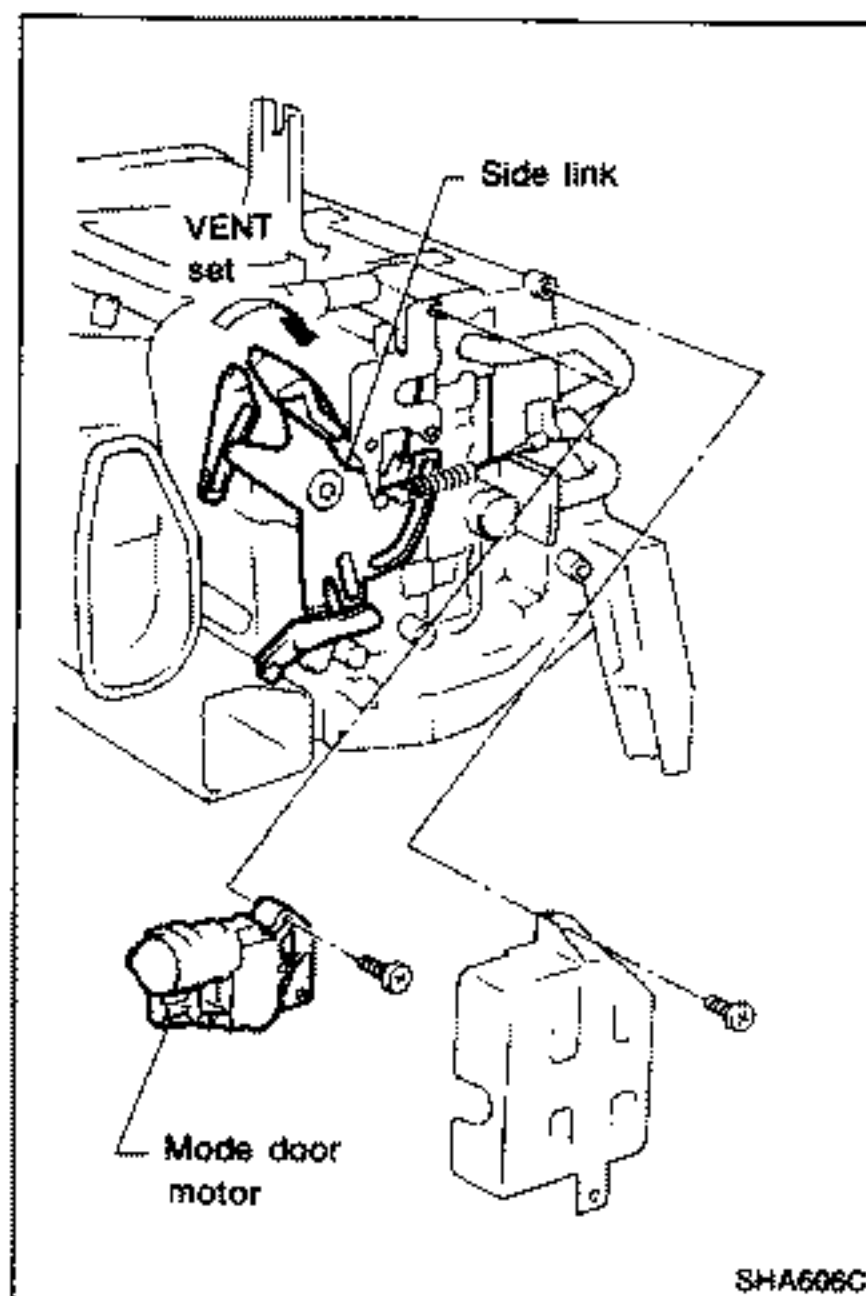
AIR FLOW AND COMPONENT LAYOUT — Manual Air Conditioner

**Air Flow (Cont'd)
AIR DISTRIBUTION RATIOS**



Component Layout

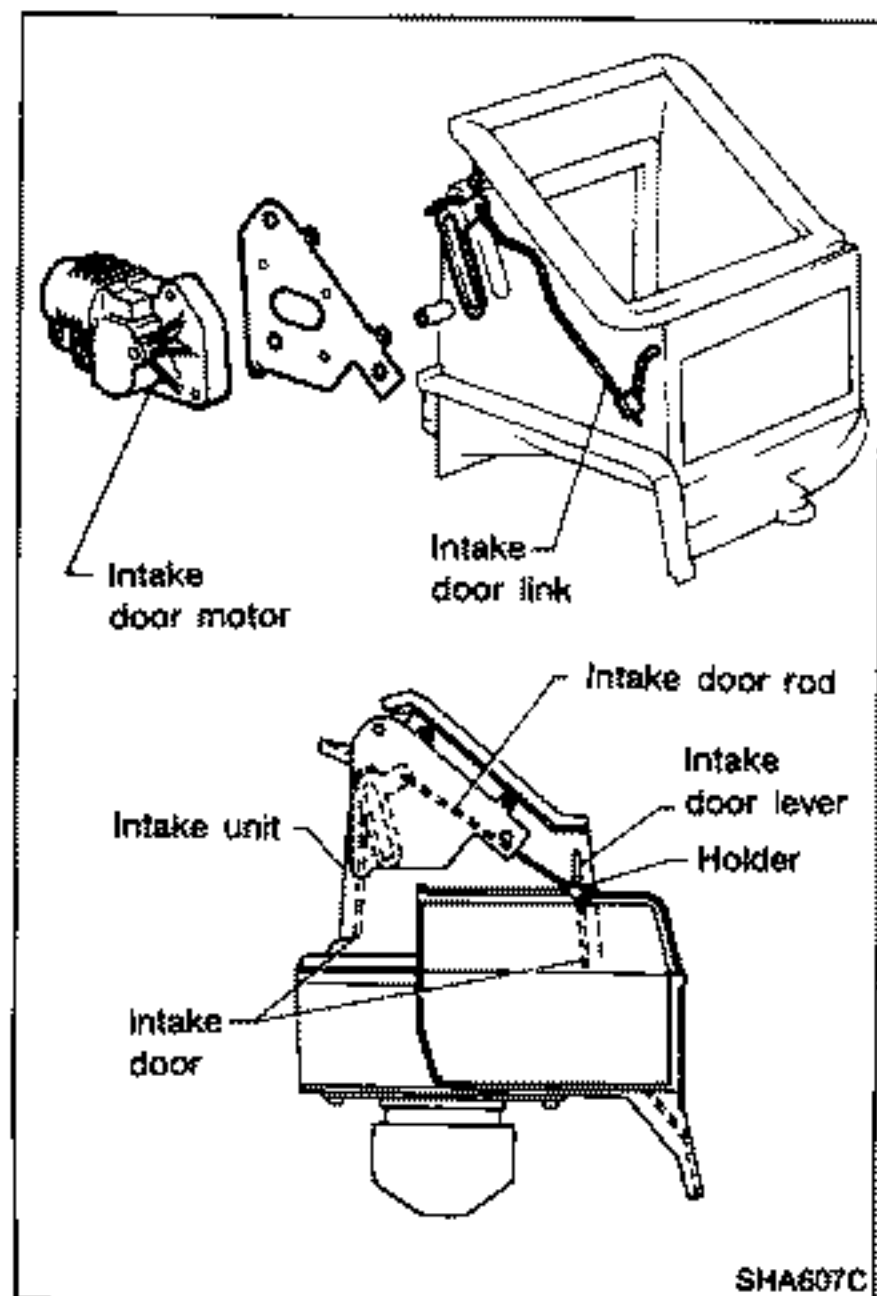




Control Rod Adjustment

MODE DOOR

1. Move side link by hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to harness.
3. Turn ignition switch to ACC.
4. Turn VENT switch ON.
5. Attach mode door rod to side link rod holder.
6. Check that when DEF position is selected, only DEF door is at full-open position, and when VENT position is selected, only VENT door is at full-open position.



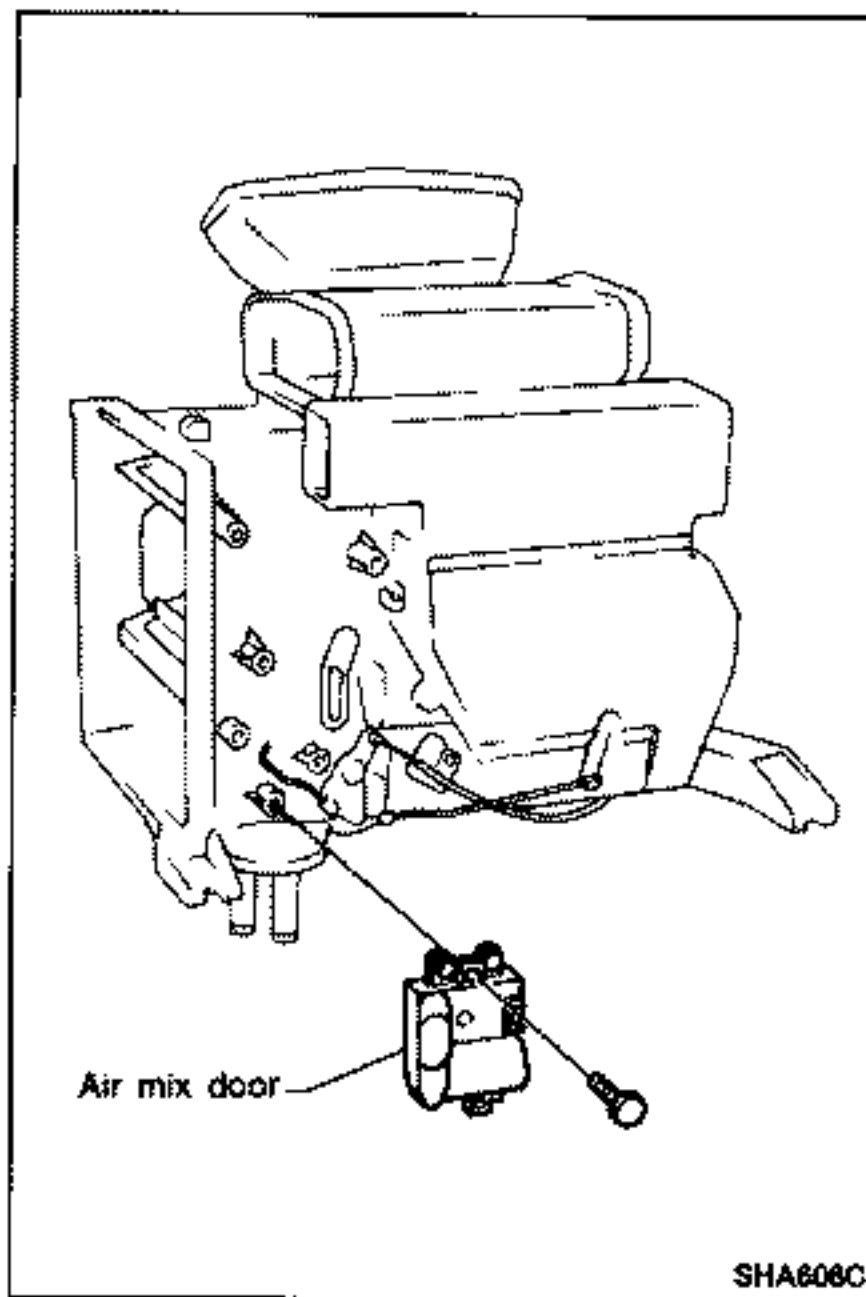
INTAKE DOOR

1. Install intake door motor on intake unit.
2. Connect intake door motor harness connector.
3. Turn ignition switch to ACC.
4. Turn REC switch ON.
5. Install intake door lever.
6. Set intake door rod in REC position and fasten intake door rod to holder on intake door lever.
7. Check that intake door operates properly when REC switch is turned ON and OFF.

Control Rod Adjustment (Cont'd)

AIR MIX DOOR

1. Connect harness to air mix door motor and set temperature control lever at full-cold position.
2. Set air mix doors I and II at full-cold position and fasten door rod.
3. Check that when temperature control lever is at full-cold, both doors are at full-cold position, and when temperature control lever is at full-hot, both doors are at full-hot position.



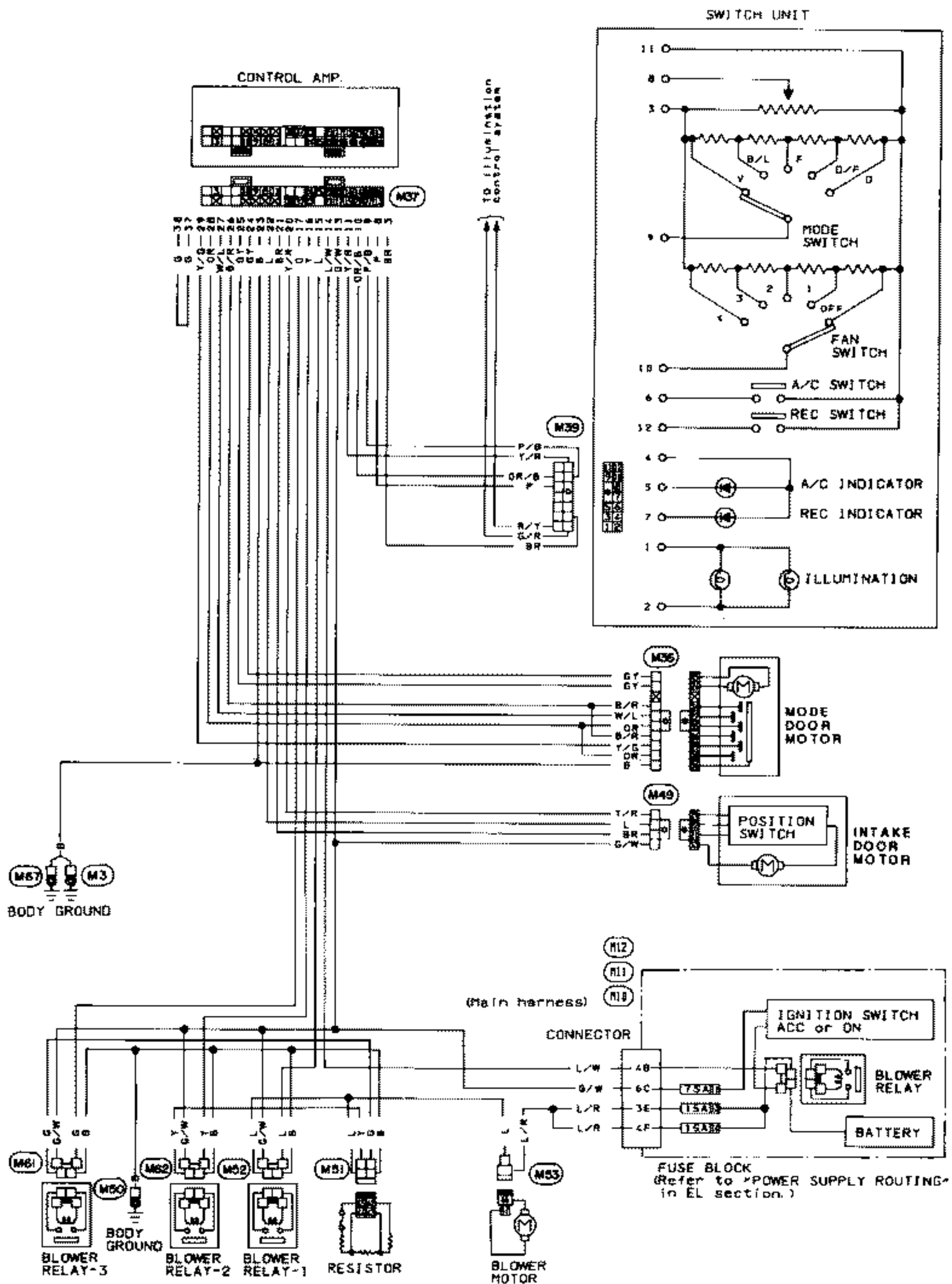
WATER COCK CONTROL CABLE

Clamp cable at full-close position when air mix doors I and II are at full-cold position, and full-open position when air mix doors I and II are at full-hot position.

HEATER ELECTRICAL CIRCUIT — Manual Air Conditioner

Wiring Diagram

R.H. DRIVE MODEL



PRECAUTIONS

Goggles



RHA260B

Gloves



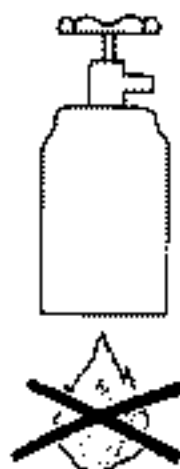
RHA261B

Avoid Open Flame



RHA262B

No Direct Heat
on Container



RHA263B

PRECAUTIONS FOR THE HANDLING OF REFRIGERANT

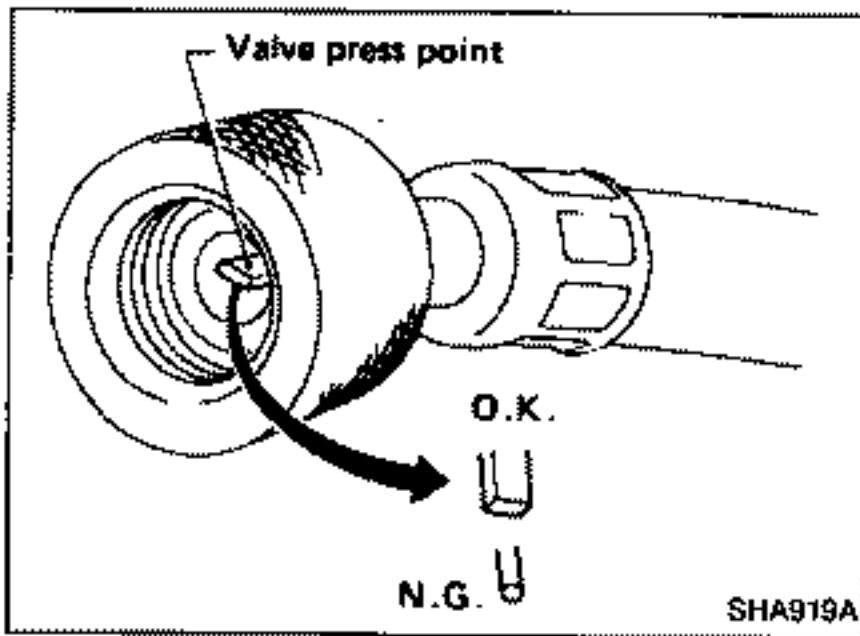
- Always wear eye protection when working around the system.
- Always be careful that refrigerant does not come in contact with your skin.
- Keep refrigerant containers stored below 40°C (104°F) and never drop from high places.
- Work in well-ventilated area because refrigerant gas evaporates quickly 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 increase can temperature beyond 40°C (104°F) in charging.
- Do not heat refrigerant container with an open flame. There is a danger that container will explode.

CAUTION:

- 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.

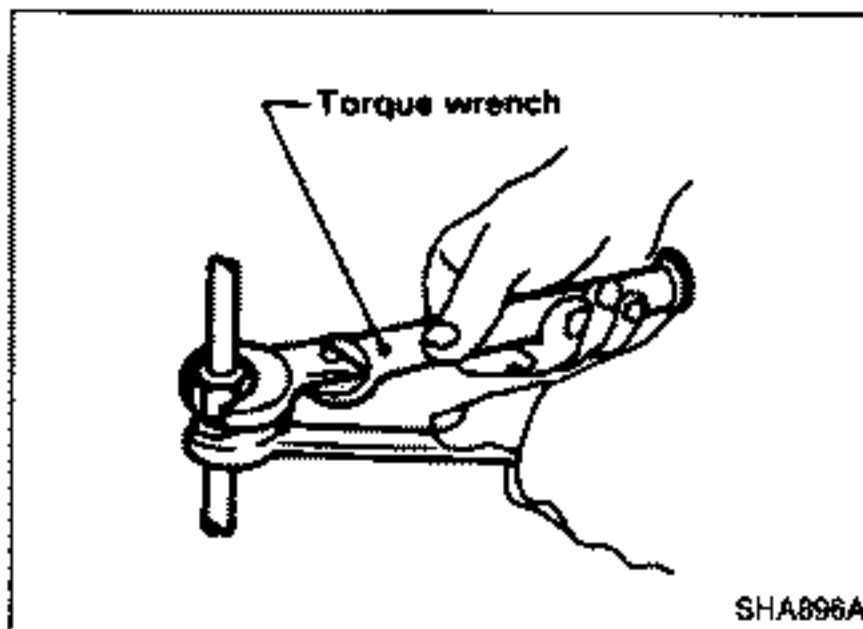
- Do not release refrigerant into the atmosphere.

PRECAUTIONS



- Do not use manifold gauge whose press point shape is different from that shown. Otherwise, insufficient evacuating may occur.
- Do not over-tighten service valve cap.
- Do not allow refrigerant to rush out. Otherwise, compressor oil will be discharged along with refrigerant.

PRECAUTIONS FOR REFRIGERANT CONNECTION



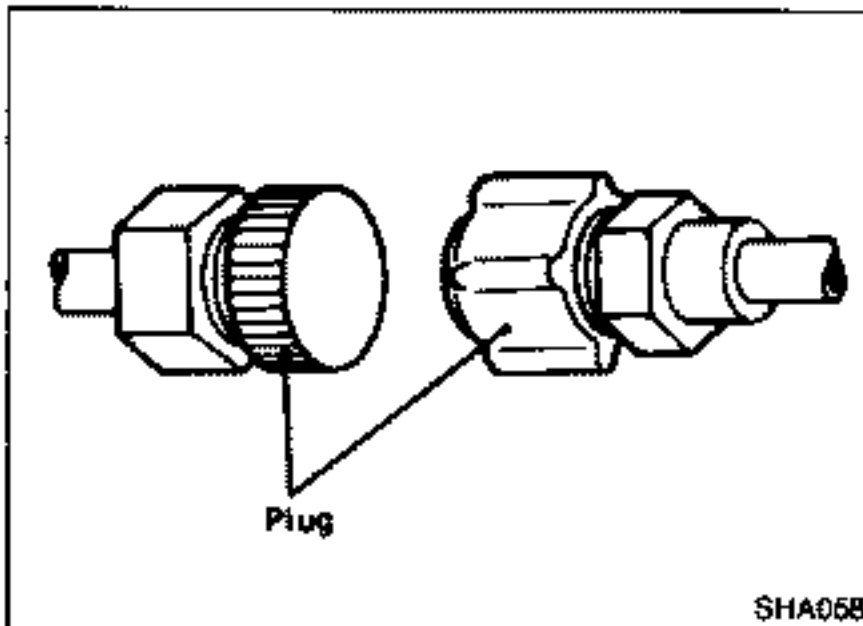
WARNING:

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

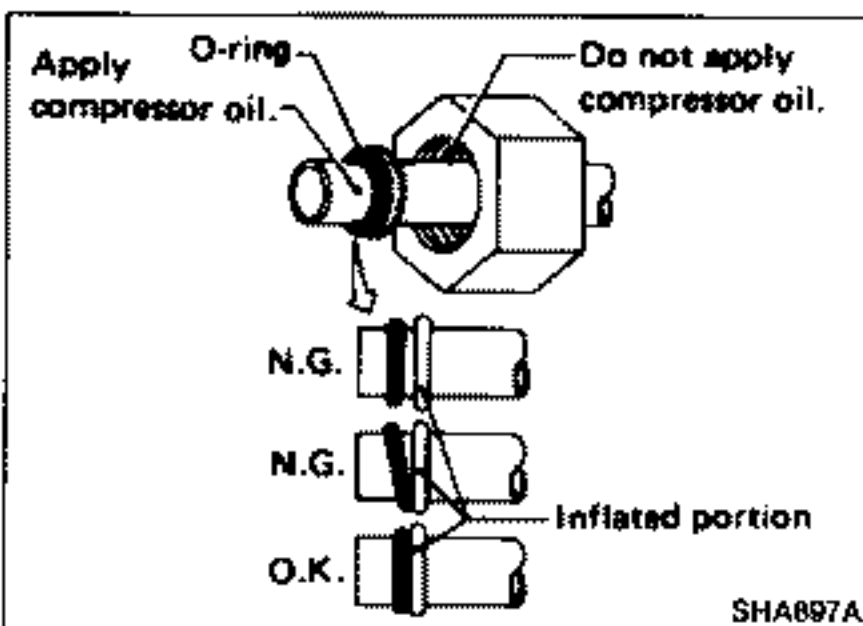
CAUTION:

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

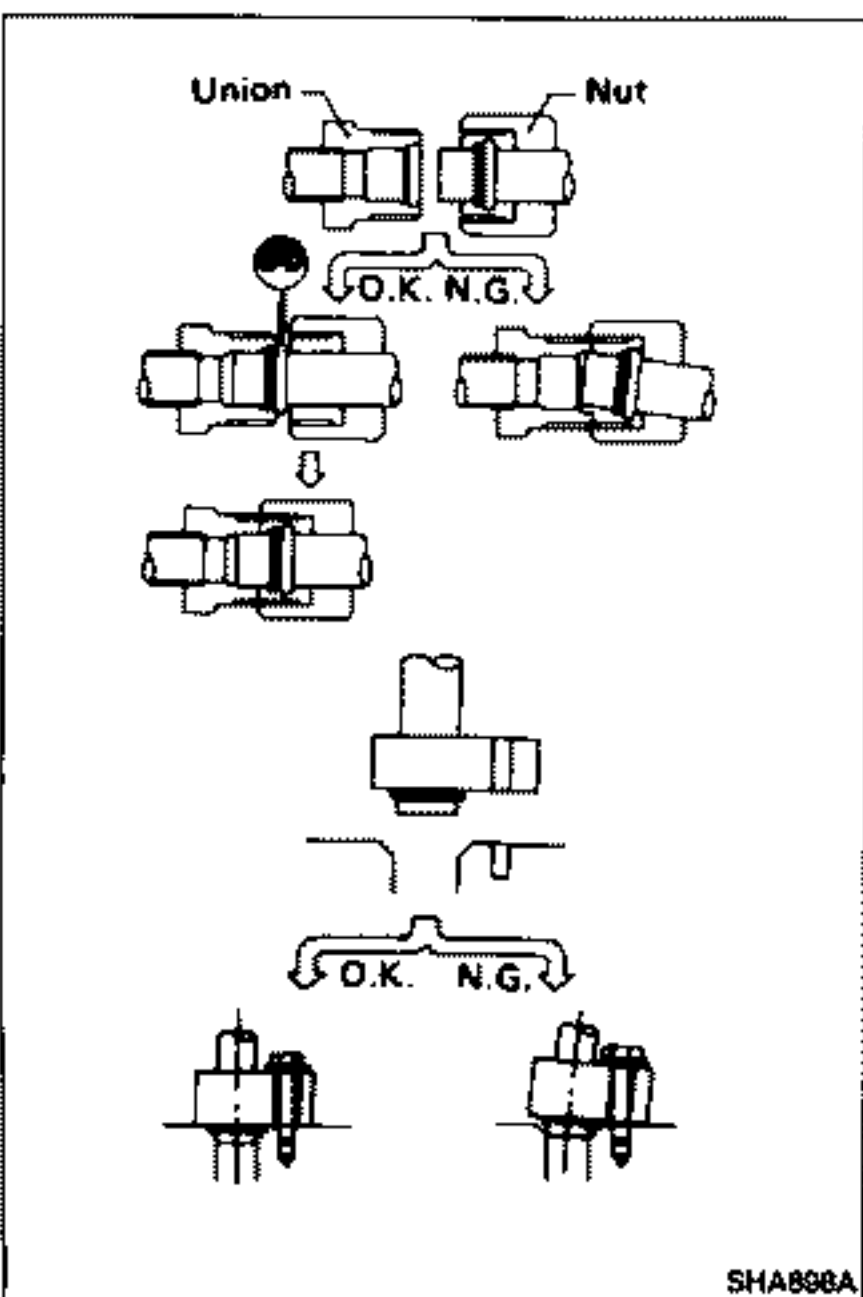
- Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.
- When connecting tubes, always use a torque wrench.



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



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



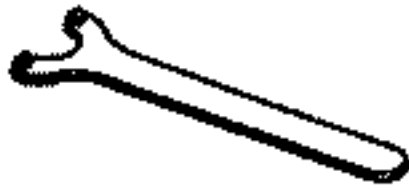
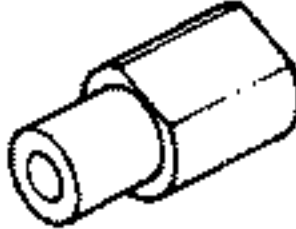
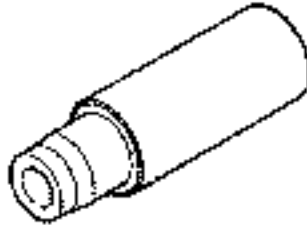
- After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.
- After connecting line, conduct leak test and make sure that there is no leakage from connections. If a gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.

PREPARATION

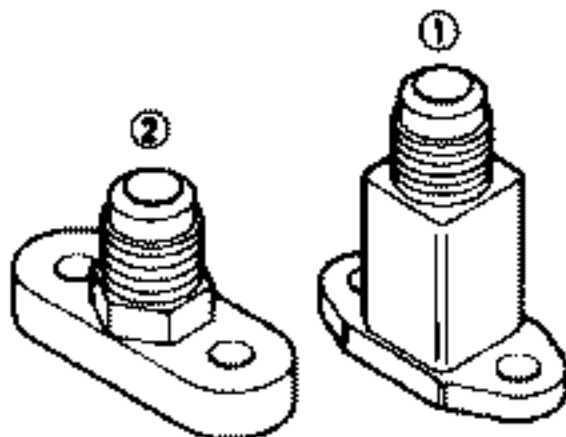
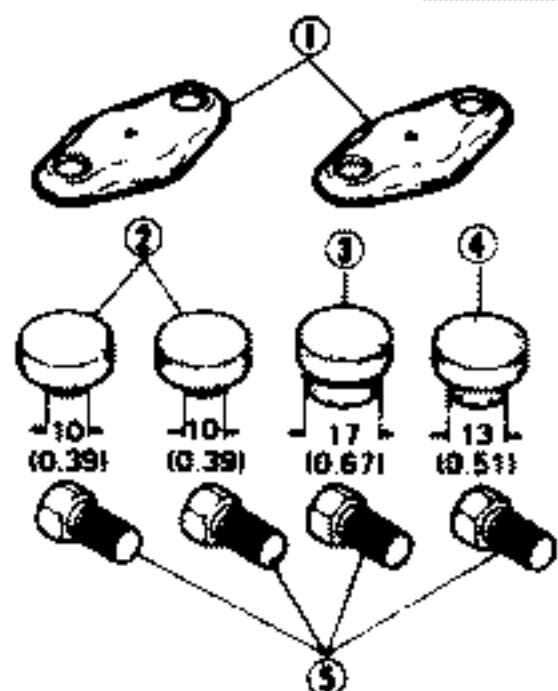
SPECIAL SERVICE TOOLS

MJS170 model

*: Special tool or commercial equivalent

Tool name Tool number	Description
Clutch disc wrench KV99412302*	Removing shaft nut and clutch disc 
Clutch disc puller KV994C5780	Removing clutch disc 
Shaft handle socket KV99412329*	Rotating compressor shaft 
Shaft seal remover KV99403043	Removing and installing shaft seal 
Shaft seal installer KV99403042	
Shaft seal pilot KV99403041*	Installing shaft seal 
Allen socket KV99412330*	Removing rear cover 
Cylinder head remover KV994C5785*	Removing rear cylinder head 

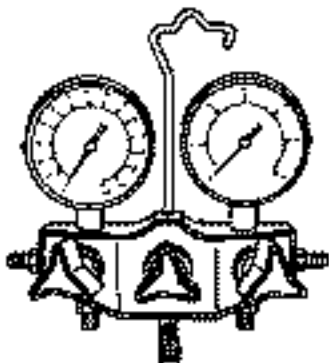
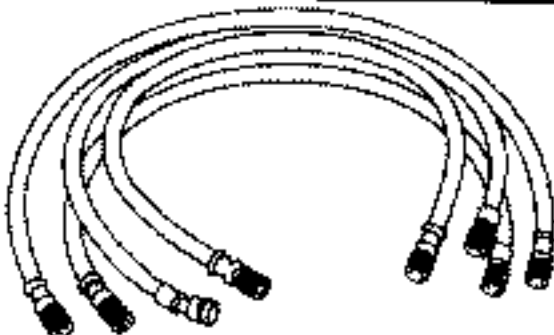
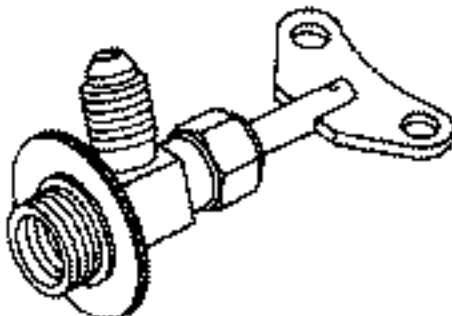
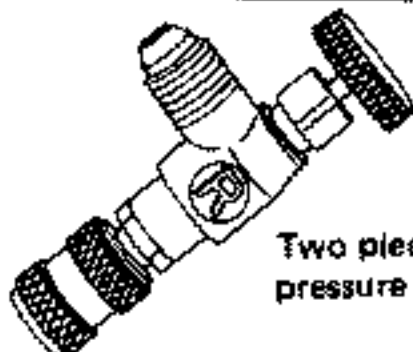
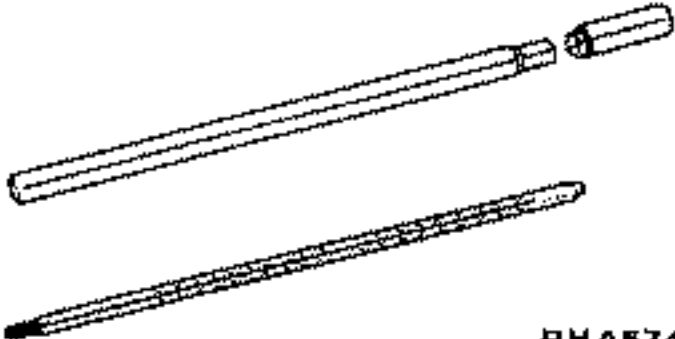
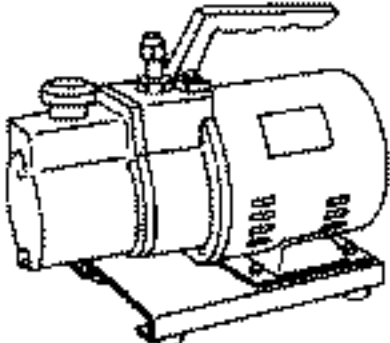
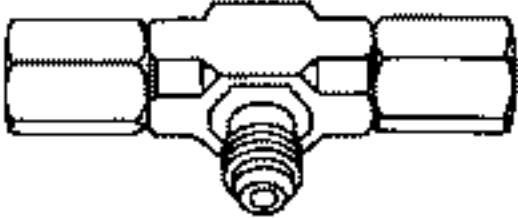
PREPARATION

Tool name Tool number	Description
Oil separator kit KV994A9690	 Separating oil from refrigerant
KV992C5079 Adapter connector A ① KV992C5081 Adapter connector B ② KV992C5082	 Using separate oil
Charge nozzle KV994C1552	 Charging refrigerant into compressor
Blind cover set KV994C4548 Blind cover ① KV994C4531 Gasket ② KV994C4532 Gasket (Useless) ③ KV994C4533 Gasket (Useless) ④ KV994C4534 Bolt ⑤ KV994C4559	 Blind cover Unit: mm (in)

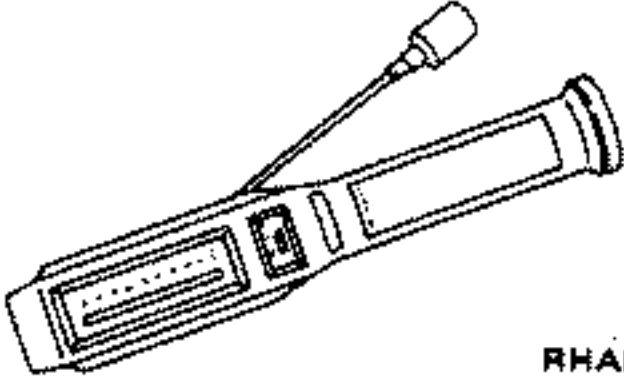
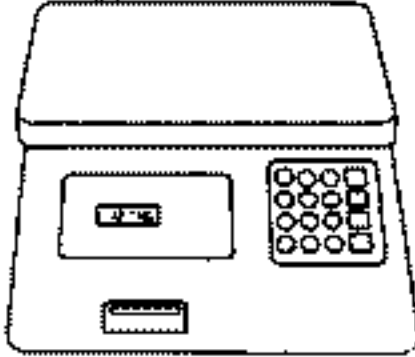
PREPARATION

Service Tools

RECOMMENDED TOOLS

Tool name	Description
Manifold gauge (3-valve type)	 RHA570B Discharging, evacuating and charging refrigerant
Charging hose (Four)	 RHA571B Discharging, evacuating and checking refrigerant
Charge valve	 RHA572B Discharging and charging refrigerant
Adapter valve	 Two pieces on each high pressure and low pressure line RHA573B Evacuating and charging
Thermometer	 RHA574B Checking temperature
Vacuum pump	 RHA575B Evacuating refrigerant
Joint adapter (T-type)	 RHA576B Charging refrigerant

PREPARATION
Service Tools (Cont'd)

Tool name	Description
Gas leak detector	Charging refrigerant leaks  RHA577B
Charging cylinder	Checking amount of refrigerant and charging refrigerant  RHA578B
Weight scale	Checking amount of refrigerant  RHA579B

For details of such handling methods, refer to the Instruction Manual attached to each of the service tools.

PREPARATION

Service Tools (Cont'd)

HANDLING METHOD AND STRUCTURE

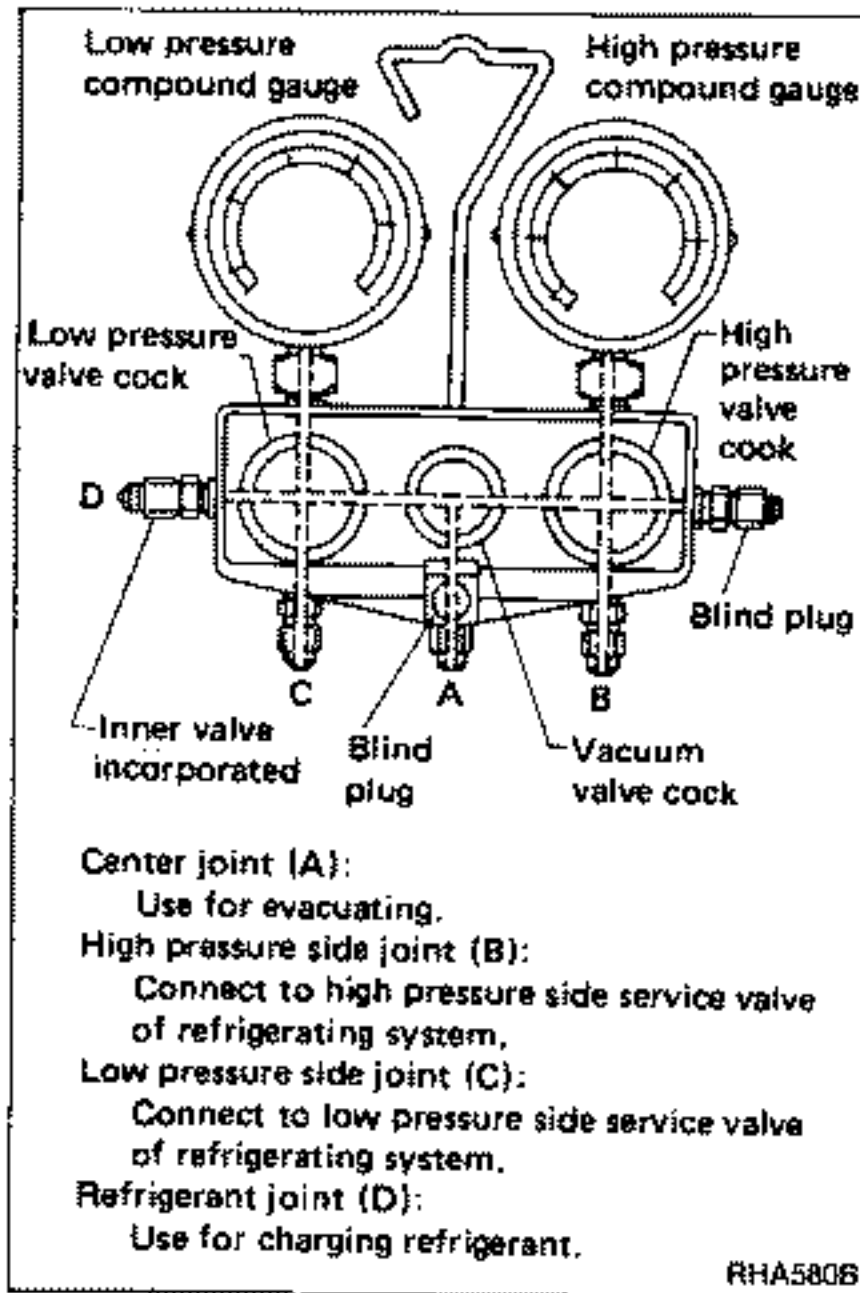
Manifold gauge

The manifold gauge is used to measure the operating pressure accurately in the high pressure and low pressure lines of the refrigerating system.

The high pressure gauge measures from -101.3 kPa ($-1,013 \text{ mbar}$, -760 mmHg , -29.92 inHg) to $2,942 \text{ kPa}$ (29.4 bar , 30 kg/cm^2 , 427 psi), and the low pressure gauge measures generally from -101.3 kPa ($-1,013 \text{ mbar}$, -760 mmHg , -29.92 inHg) to $1,471 \text{ kPa}$ (14.7 bar , 15 kg/cm^2 , 213 psi).

CAUTION:

- When installing the gauge to the refrigerating system, use utmost care not to mistake high pressure and low pressure line connections. (Wrong connections will lead to a damaged gauge.)
- Before evacuating, confirm that the gauge has a negative pressure scale. (If not, the gauge will be damaged.)

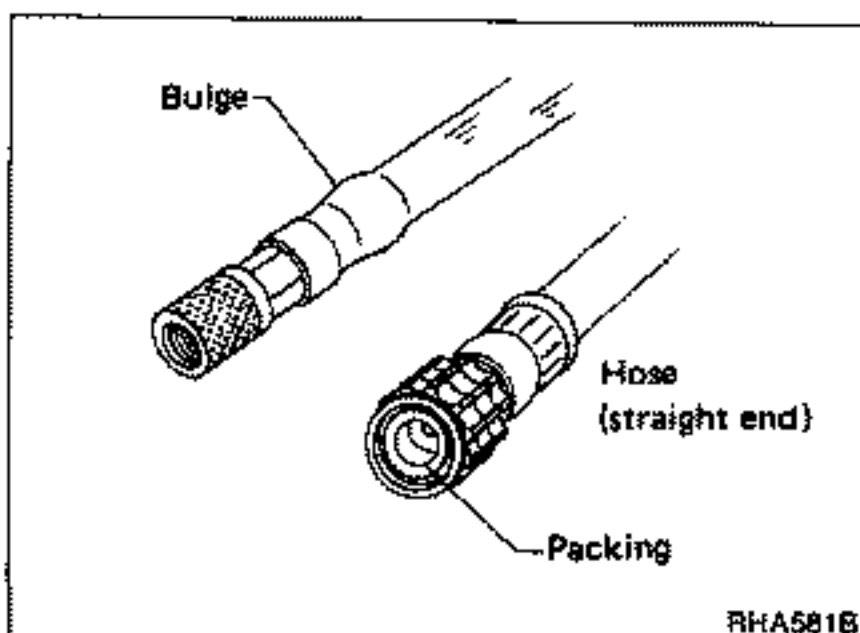


Charging hose

1. Completely tighten the high pressure valve, low pressure valve and vacuum pump valve cocks of the gauge manifold.
2. Connect the charging hoses to the high and low pressure lines.
3. Connect the charging hose fitted with a valve core to the refrigerant canister.
4. Connect the charging hose to the vacuum pump.

The high and low pressure hoses are color coded to prevent wrong connection.

High pressure line hose	Red
Low pressure line hose	Yellow
Refrigerant canister hose	Blue or green (with valve core)
Vacuum pump hose	Blue or green



CAUTION:

- Check each hose for cracks. If found, discard the hose.
- Do not use any hose if bulges are found.
- Check the rubber packing. If any deterioration or cracks are found, replace it with a new one.

PREPARATION

Service Tools (Cont'd)

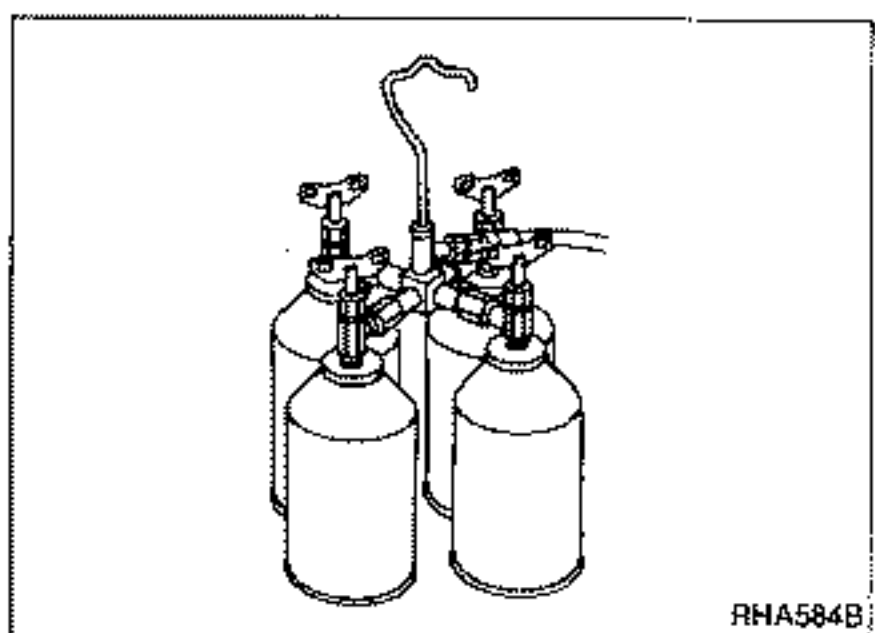
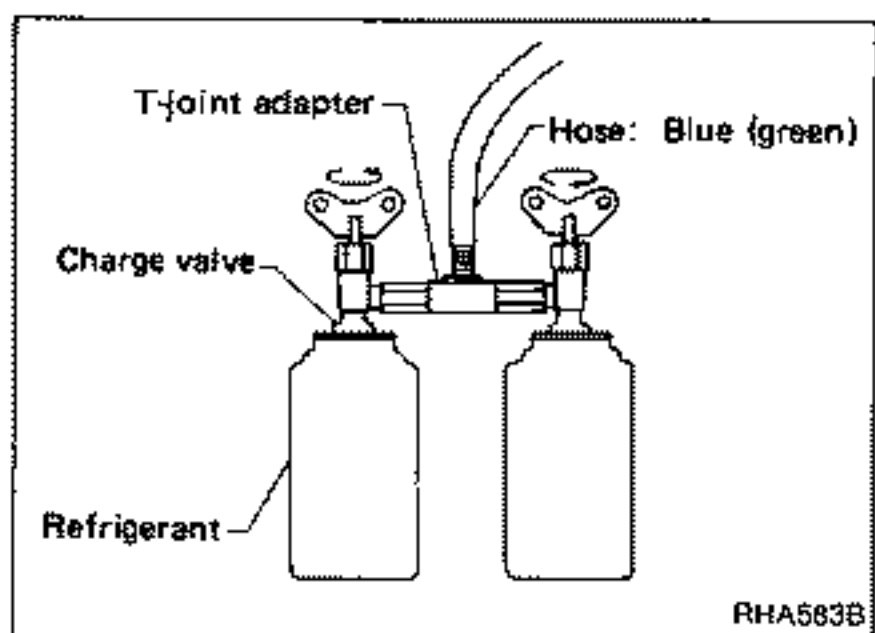
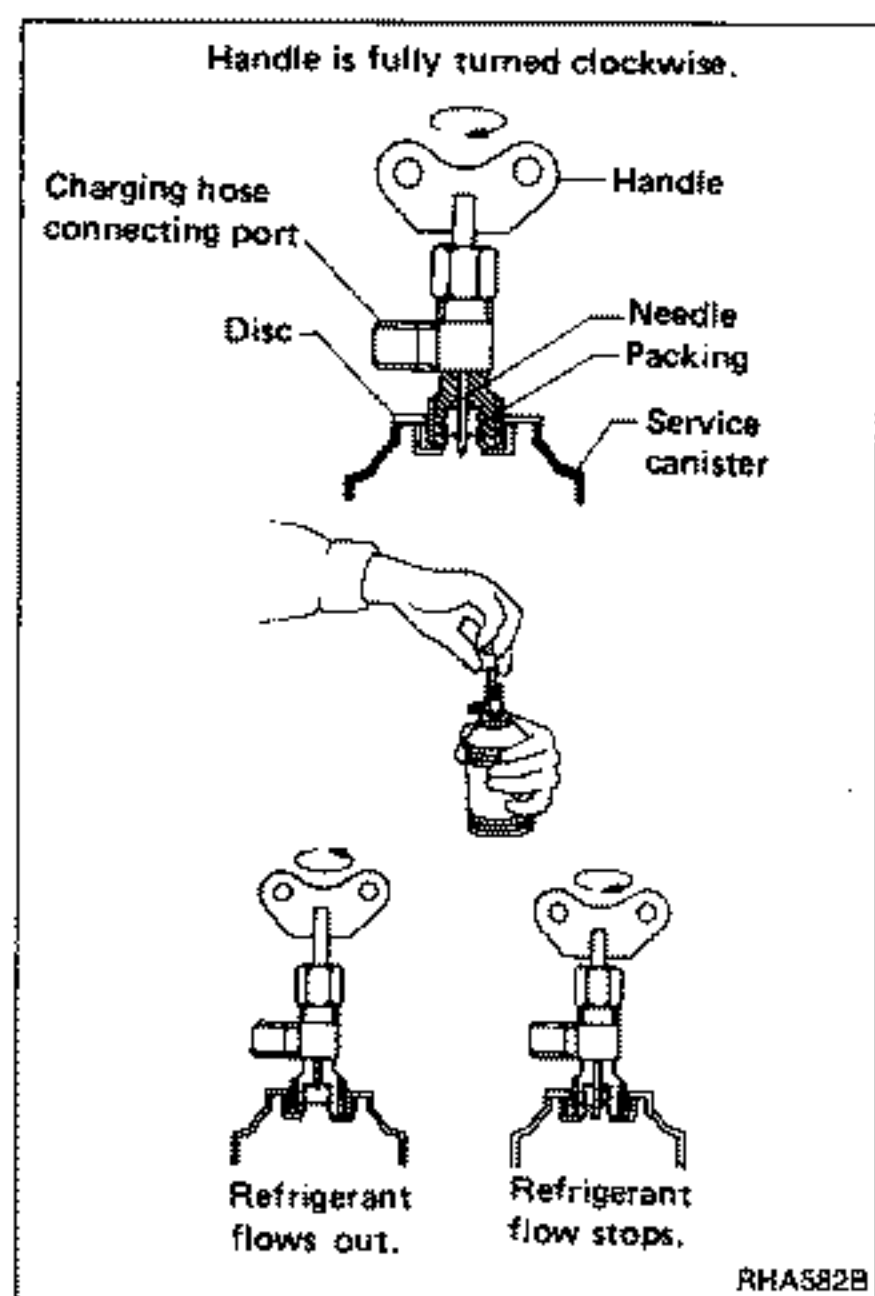
Charge valve

The charge valve is used to charge the refrigerant into the system from the service canister through the gauge manifold. Attach this valve to the head of a service canister by screwing it on. Then turn the handle clockwise to pierce the canister to allow the refrigerant to flow into the refrigerating system.

CAUTION:

Check the packing for any sign of deterioration or cracks. If any abnormalities are found, replace it with a new one.

1. Turn the charge valve handle counterclockwise to fully retract the needle, and then attach the charge valve to the service canister. Note that leakage will occur if the charge valve is attached to the canister without retracting the needle.
2. Securely fit the charge valve to the head of the service canister by turning it. Then turn the handle slowly clockwise to make a hole in the canister with the needle.
3. Turn the handle counterclockwise to retract the needle, and the refrigerant will flow into the gauge manifold through the hole. To stop the flow of the refrigerant, turn the handle clockwise to close the hole with the needle.



Connecting T-joint adapter

The T-joint adapter is used to connect two refrigerant canisters so that air purging and the accompanying discharge of refrigerant into the atmosphere can be eliminated when recharging the refrigerant. If only one service canister is sufficient to charge the refrigeration system, do not use this T-joint adapter.

1. Turn the handle of each charge valve fully counterclockwise, and attach the valve to a refrigerant canister.
2. Connect the T-joint adapter to both charge valves so that two refrigerant canisters are connected as shown.
3. Connect the charging hose with valve core to the T-joint adapter. Connect the valve core end of the charging hose to the manifold gauge.

If more than three service canisters are needed for charging, use a cross joint adapter to connect four service canisters.

PREPARATION

Service Tools (Cont'd)

Installing the adapter valve

Install the adapter valve to each of the high pressure and low pressure service valves so that air purging from the charging hose can be omitted. This also ensures that refrigerant leakage upon disconnection of the hose can be prevented.

1. Before connecting the adapter valve to the on-vehicle service valve, turn the adapter valve handle fully counterclockwise to retract the pin.

CAUTION:

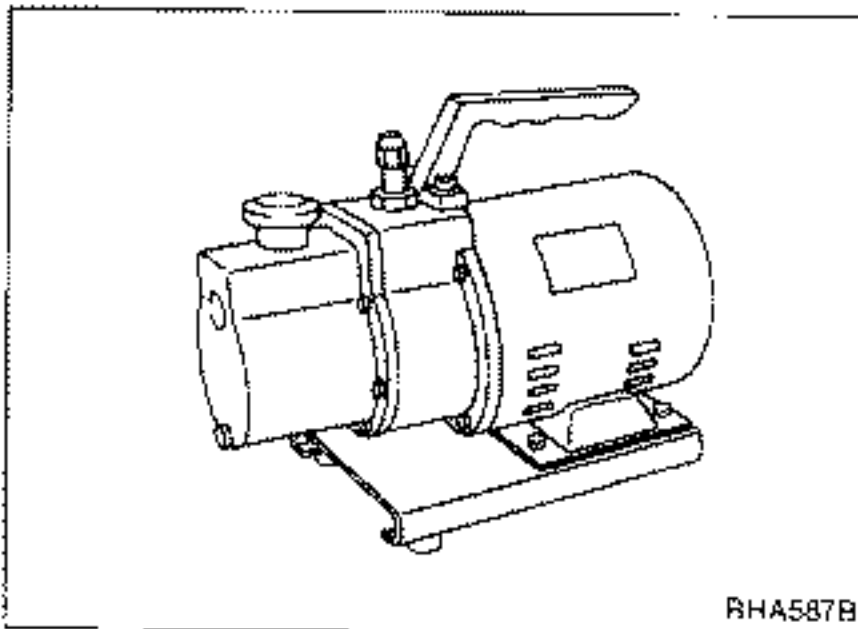
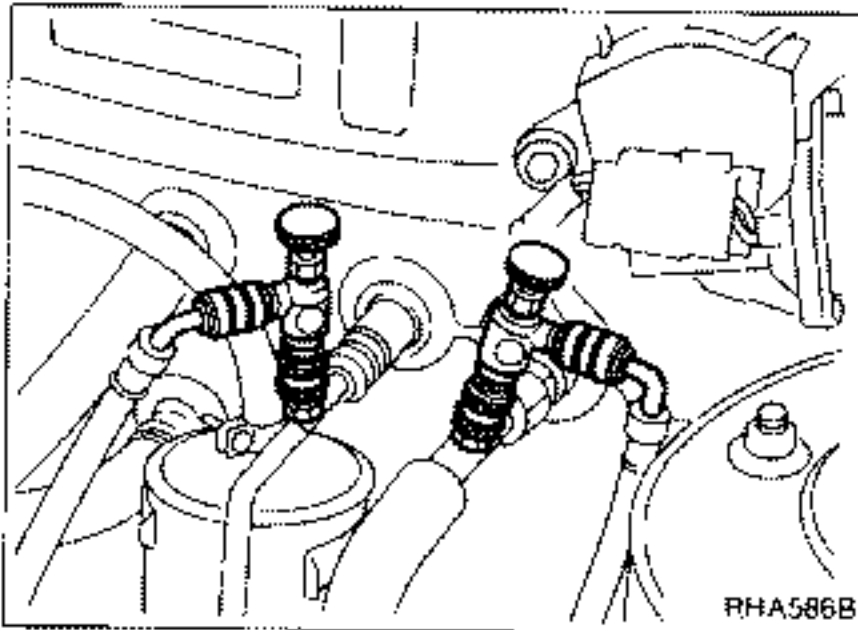
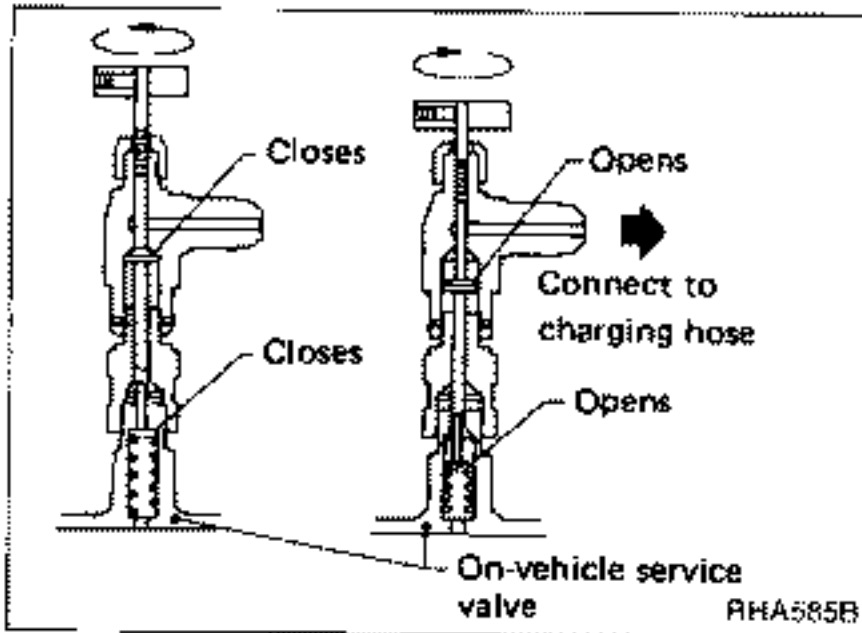
Check the packing for any sign of deterioration or cracks. If any abnormality is found, replace the packing with new.

2. Connect the charging hose to the adapter valve.

Turning the handle clockwise will cause the on-vehicle service valve pin to be pushed open by the adapter valve pin, thus opening the refrigerant passage.

Turning the handle counterclockwise will close the passage.

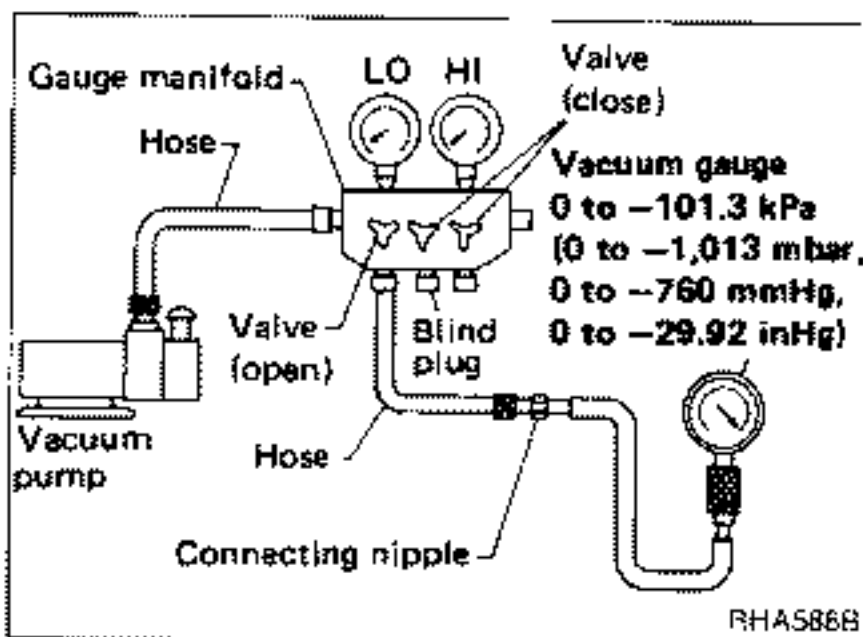
Before removing the adapter valve from the on-vehicle service valve, be sure to fully turn the handle counterclockwise to shut off the refrigerant passage.



Vacuum pump

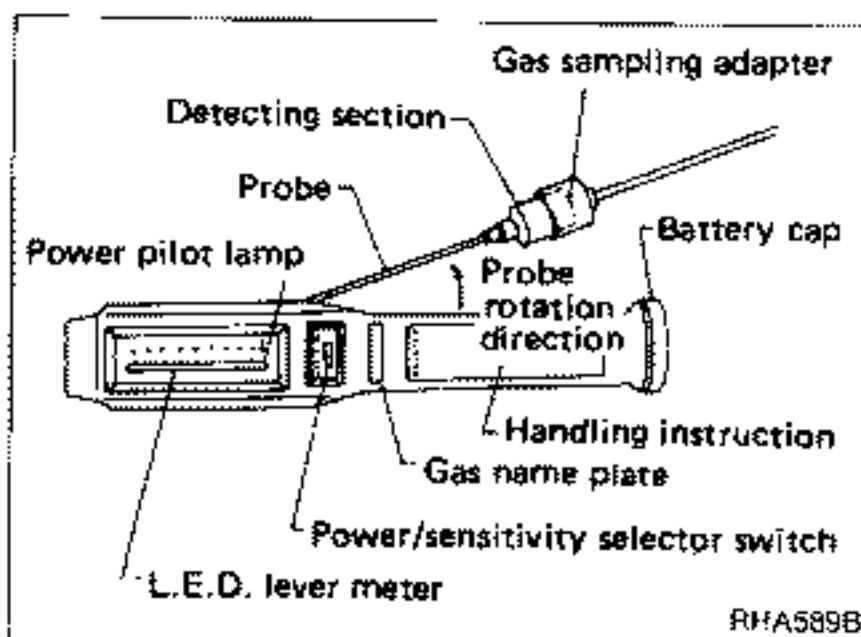
The vacuum pump is used to purge air and moisture from the inside of the refrigeration system by evacuation, thereby ensuring proper functioning of the air conditioner system.

Check the vacuum pump to see that the vacuum pump capacity is greater than -100.0 kPa ($-1,000$ mbar, -750 mmHg, -29.53 inHg).



Vacuum pump performance check procedure

1. Connect the vacuum gauge to the system.
2. Run the vacuum pump, and check to see that the needle pointers of the gauge manifold and vacuum gauge move smoothly, indicating a similar value.
3. After running the vacuum pump for two or three minutes, read the vacuum gauge. The measured value indicates the vacuum pump capacity.



Gas leak detector

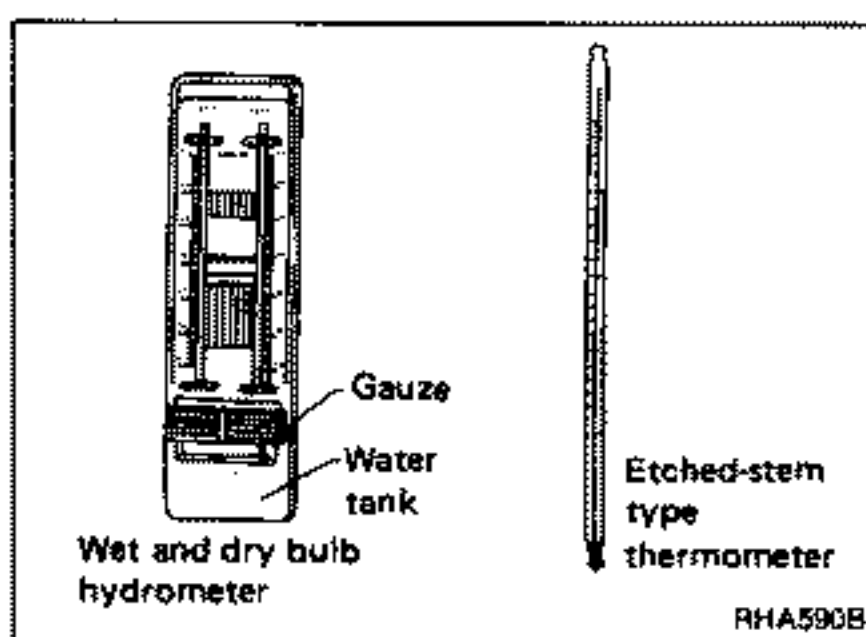
The gas leak detector is used to check whether the refrigeration system is leaking. The detector is available in two types; halide torch or electrical. The features of these gas leak detectors are listed on the next page.

PREPARATION

Service Tools (Cont'd)

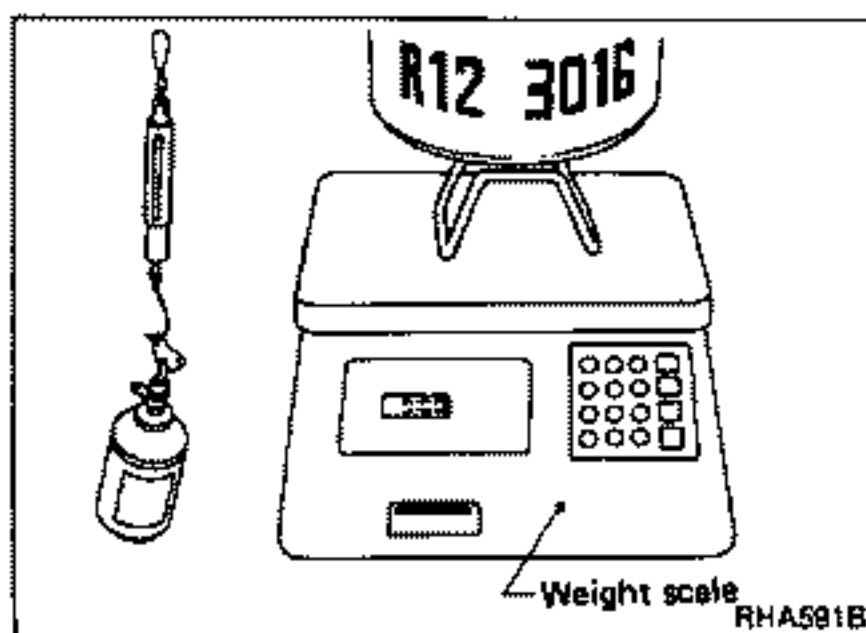
Type		Detection ability	Features
Halide torch		200 g (7.05 oz)/year (thin green)	● Low price ● Low sensitivity ● Less safe because of the use of flame for detection
Electrical	Discharge type (Suction type)	3 - 50 g (0.11 - 1.76 oz)/year	● Easy handling ● Medium sensitivity ● Each point needs two or more seconds for detection.
	Positive ion emission type (Suction type)	2 g (0.07 oz)/year	● High sensitivity ● High price ● Warm-up time is needed because a heater is incorporated.
Other simple checking method: Change in vacuum when evacuating		1 kg (2 lb)/month; if 13.3 kPa (133 mbar, 100 mmHg, 3.94 inHg) change in vacuum is detected in 10 minutes.	● Can be used easily in refrigerant charging operation. ● Detection ability is very low with vacuum gauge in gauge manifold.

- Leakage inspection of a refrigeration system needs a sensitivity greater than 20 g (0.71 oz)/year.
- The actual amount of leak is estimated at 5 to 10 times the detected amount.
- Insufficient cooling may be felt if leakage exceeds 150 to 200 g (5.29 to 7.05 oz).



Temperature gauge

Use to check the air conditioner performance. An etched stem type thermometer may be used. A hygrometer must also be used because the air conditioner performance depends on the humidity.



Scale

Measure the weight of the refrigerant to determine how much the refrigerant is charged.

PREPARATION

Service Tools (Cont'd)

Charging cylinder

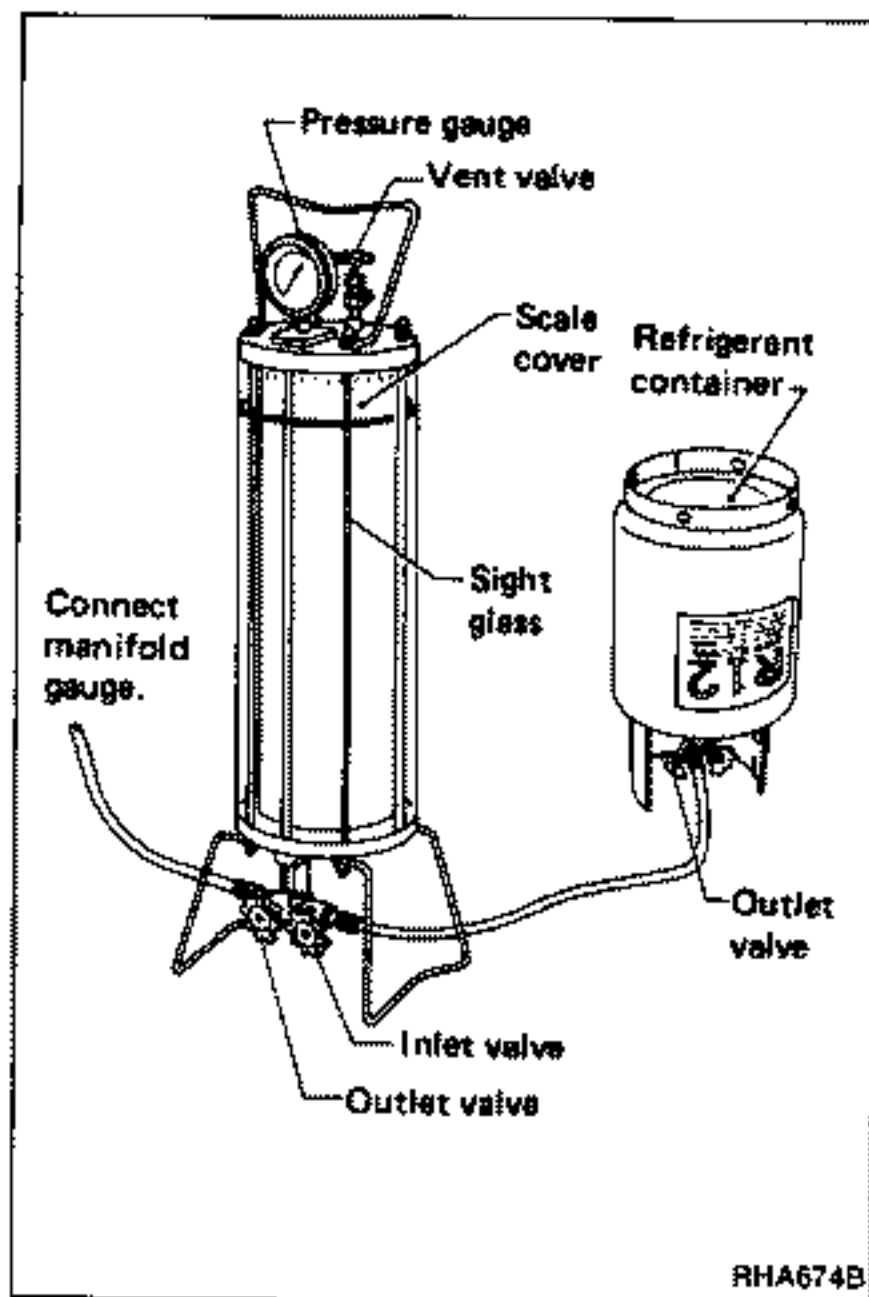
The charging cylinder is used to correctly measure the amount of refrigerant to be charged.

Features

- With the charging cylinder, the operator can measure correctly the amount of refrigerant to be charged into the system.
- Change in the refrigerant volume due to a change in temperature and pressure can be supplemented, and this ensures correct charging of refrigerant.

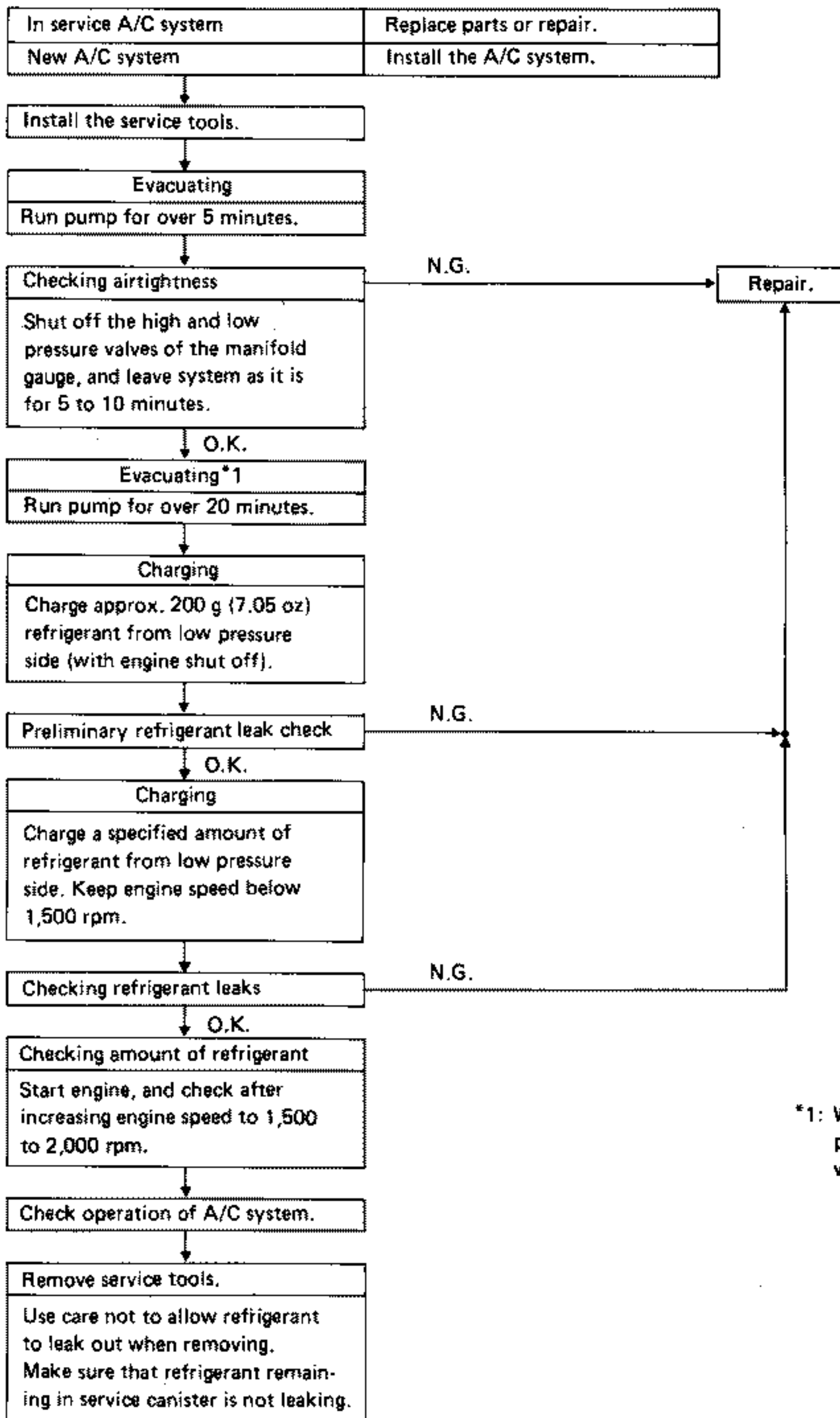
CAUTIONS:

- Never attempt to carry the charging cylinder containing refrigerant.
- Do not put the charging cylinder in a hot place. If the temperature and pressure of the refrigerant in the cylinder increase, the safety valve will be pushed open and the refrigerant will be released into the atmosphere.
- Do not expose the cylinder to the direct sunlight.
- Do not over-charge the refrigerant so that it exceeds the maximum limit of the cylinder.
- Do not charge the cylinder with more refrigerant than is needed.



Refrigerant Charging Procedure

WORK PROCEDURE



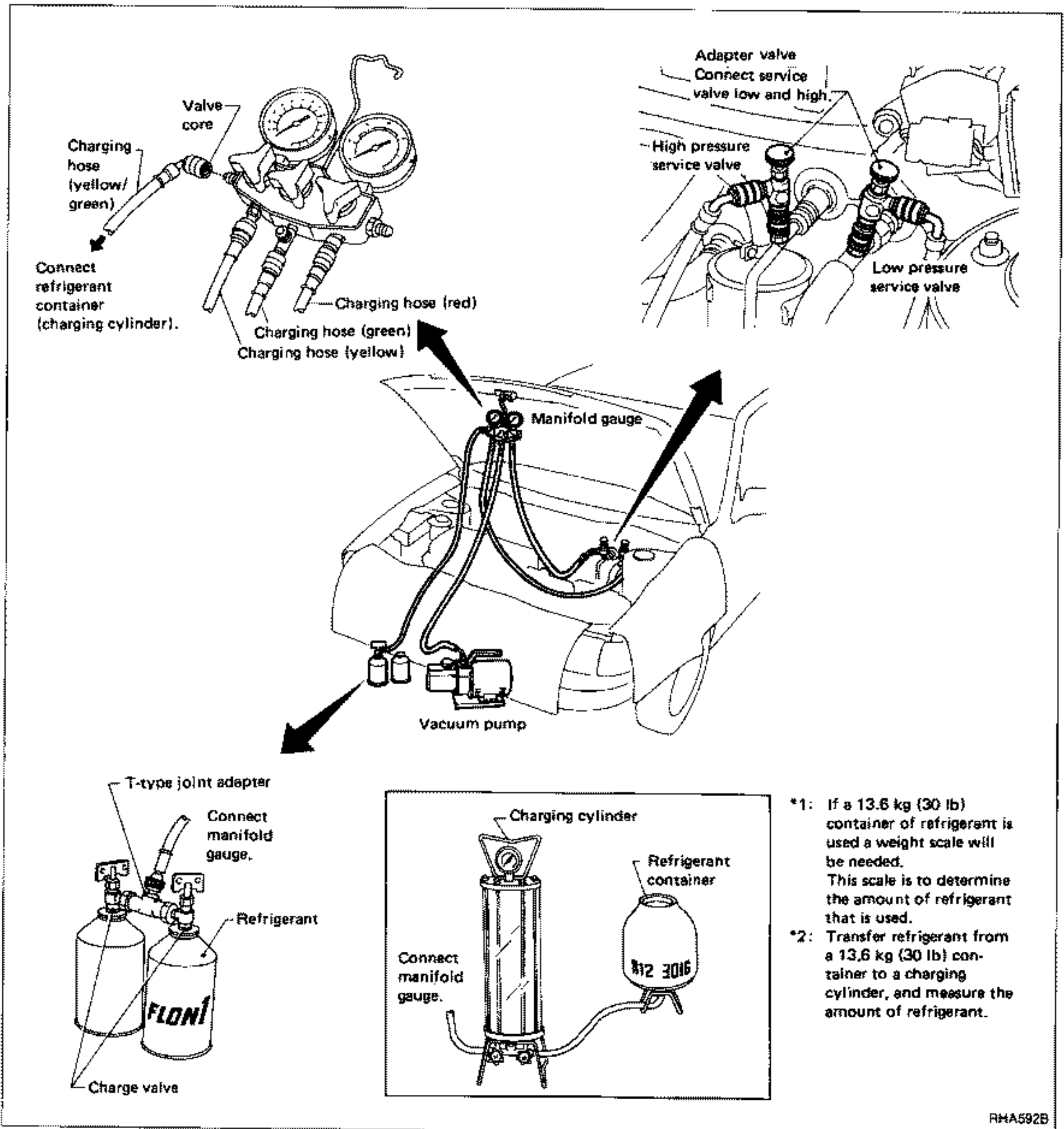
*1: Working operation depends upon the performance of the pump and the weather.

EVACUATING, CHARGING AND CHECKING

Refrigerant Charging Procedure (Cont'd)

SETTING OF SERVICE TOOLS

Make sure that the service tools are set as indicated below and that no refrigerant is leaking.



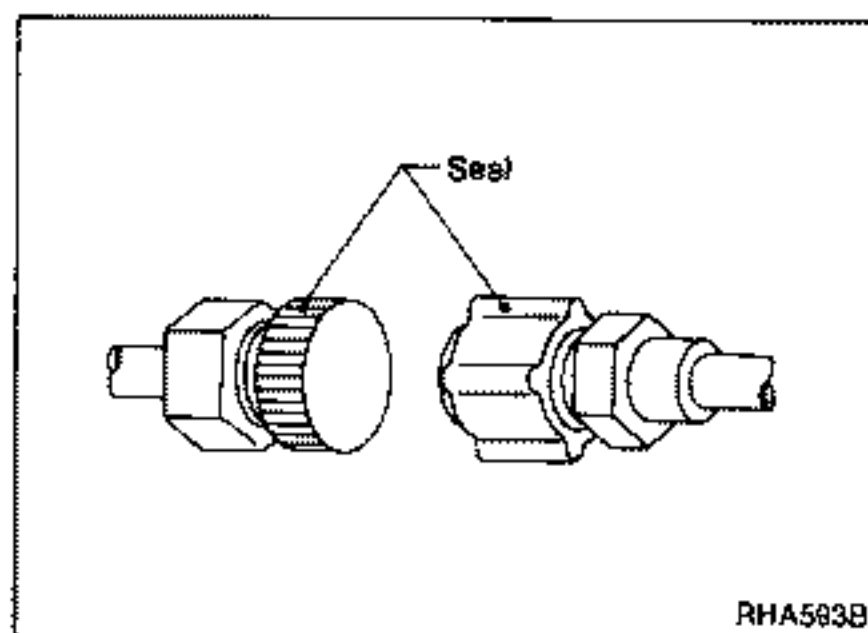
RMA592B

Evacuation

Why evacuation is needed

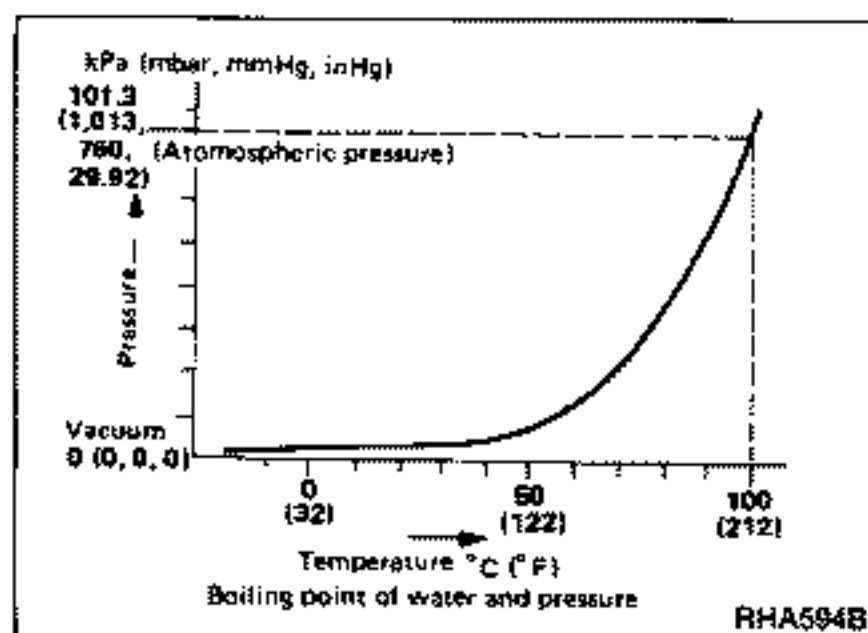
When installing a car air conditioner, it is essential to completely remove air and water from the inside of the refrigeration system beforehand. This process is called evacuation. If the air conditioner is operated without completely removing these substances, the following abnormalities may result.

- Poor cooling due to reduction in the thermal exchange rate in condenser
- Moisture recirculating together with the refrigerant through the refrigeration system freezes at the port of the cold expansion valve. This impedes the normal refrigerant flow, thus lowering the cooling efficiency.
- The refrigerant reacts with water chemically, generating corrosive hydrochloric acid thus causing corrosion to the refrigeration system components.



CAUTION:

- When installing an air conditioner in the vehicle, the pipes must be connected as the final stage of the operation. The seal caps of the pipes and other components must not be removed until their removal is required for connection.
- Before installing any air conditioner component that has been stored in a cool location to a vehicle that has been exposed to the hot sun, leave the component as it is for some time in a hot location with its seal cap unremoved. This step is necessary to prevent condensation of moisture inside the cold component.
- Thoroughly remove moisture from the refrigeration system before charging the refrigerant.



Relation between boiling point of water and atmospheric pressure

Water boils at 100°C (212°F) under normal atmospheric pressure. The boiling point lowers with the atmospheric pressure. This characteristic of water is utilized to purge it from the system. The pressure inside the refrigeration system is lowered by a vacuum pump so that water can evaporate at a normal temperature. The water vapor is then discharged to the outside together with the air.

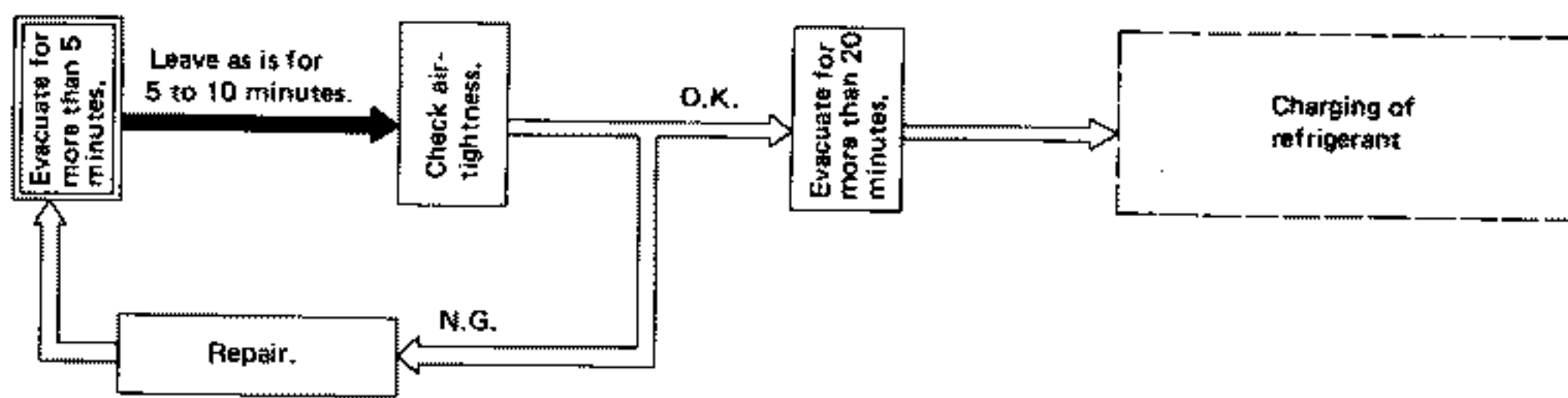
EVACUATING, CHARGING AND CHECKING

Evacuation (Cont'd)

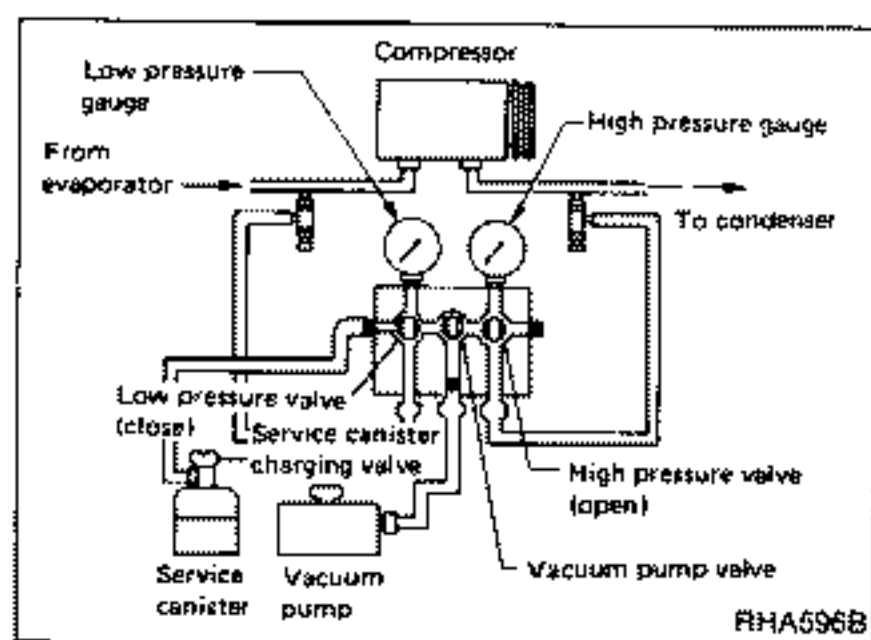
Vacuum pump

The degree of evacuation greatly affects the cooling capacity of the air conditioner and the service life of the refrigeration system components. However, use of a vacuum pump having insufficient capacity results in prolonged evacuation. It is necessary to use a vacuum pump with a sufficiently large capacity and also to maintain the pump to ensure its original pumping capacity.

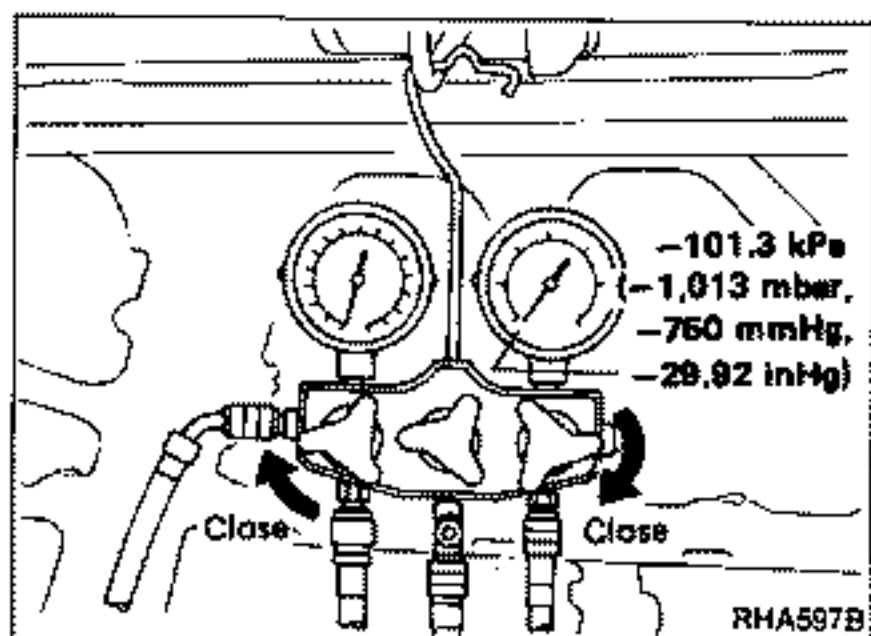
EVACUATION PROCEDURE



RHA595B



1. Completely tighten the low pressure and high pressure adapter valves.
Tightening of the valves opens the service canister valve.
2. Open the high and low pressure valves and vacuum pump valve of the gauge manifold.
3. Run the vacuum pump.



4. Perform evacuation for more than five minutes to stabilize the vacuum inside the system. Check to ensure that the low pressure gauge indicates -98.6 to -101.3 kPa (-986 to -1,013 mbar, -740 to -760 mmHg, -29.13 to -29.92 inHg).
5. Shut off the high and low pressure valves and vacuum pump valve of the gauge manifold.

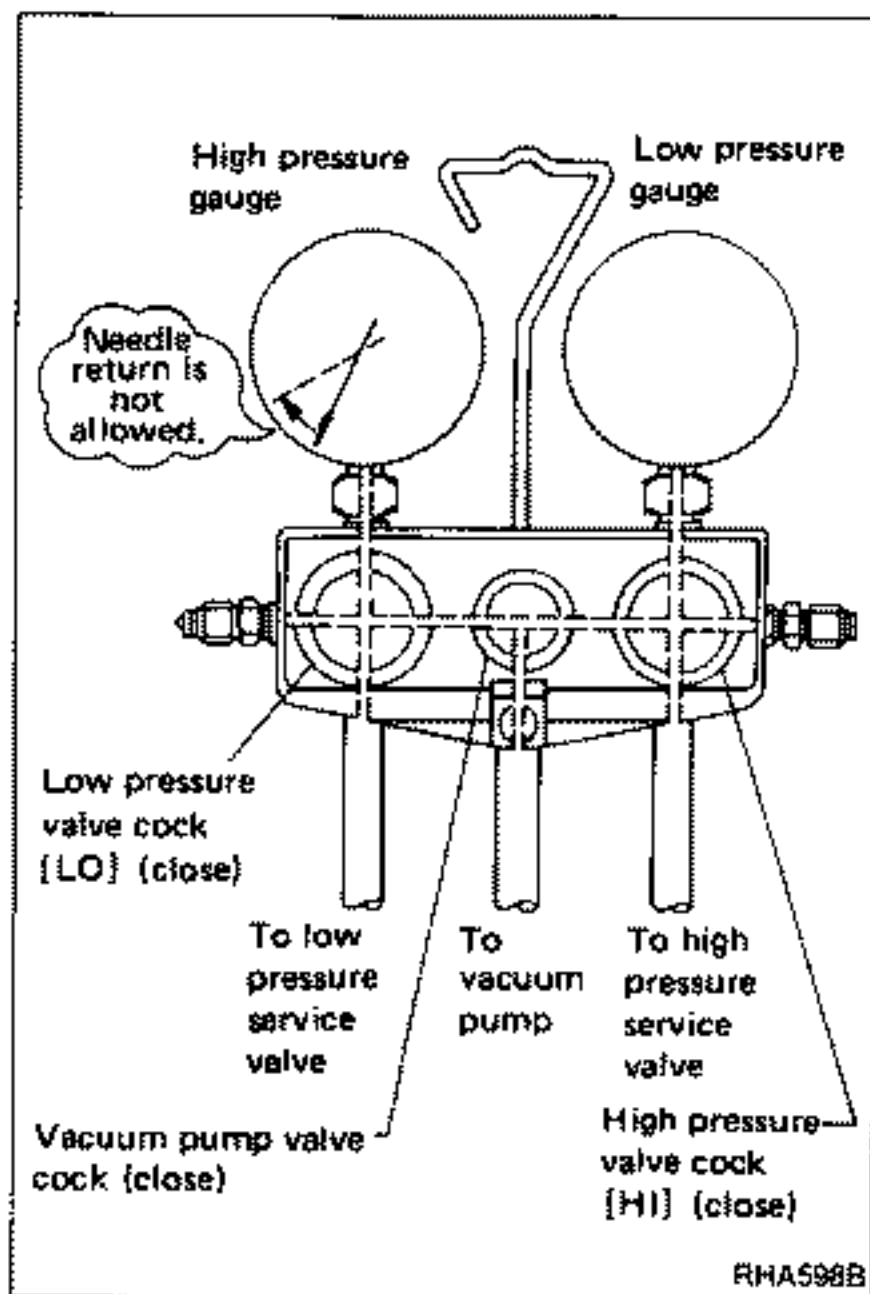
EVACUATING, CHARGING AND CHECKING

Evacuation (Cont'd)

CHECKING AIRTIGHTNESS

1. Shut off the high and low pressure valves and vacuum pump valve of the gauge manifold, and leave the system as it is for 5 to 10 minutes.
2. Make sure that the needle of the low pressure gauge will not move back toward the atmospheric pressure side (gauge pressure 0).

If any reverse movement is noted, it indicates poor system airtightness. Service the system until airtightness is complete. If pressure changes approx. 13.3 kPa (133 mbar, 100 mmHg, 3.94 inHg) in 10 minutes, the refrigerant in the system will be exhausted in about one month.



MAINTENANCE

If inadequate airtightness is detected, check and service the following portions:

Leak from pipe joints	Leak from gauge manifold
● Contaminated, damaged, or deformed O-ring ● No oil applied when connecting pipe ● Excessive or insufficient tightening of pipe joint	● Malfunctioning hose ● Improper installation of gauge ● Malfunctioning valve ● Malfunctioning packing

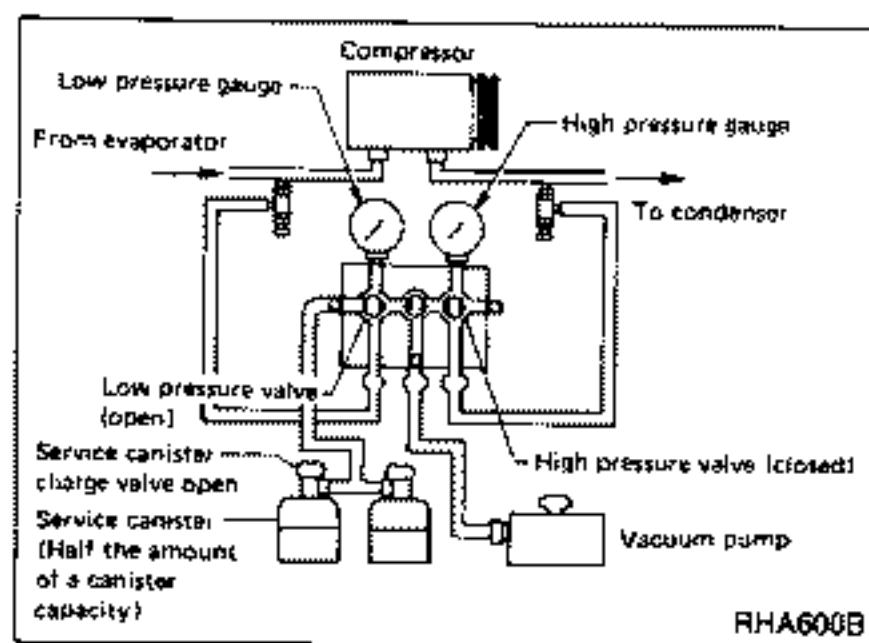
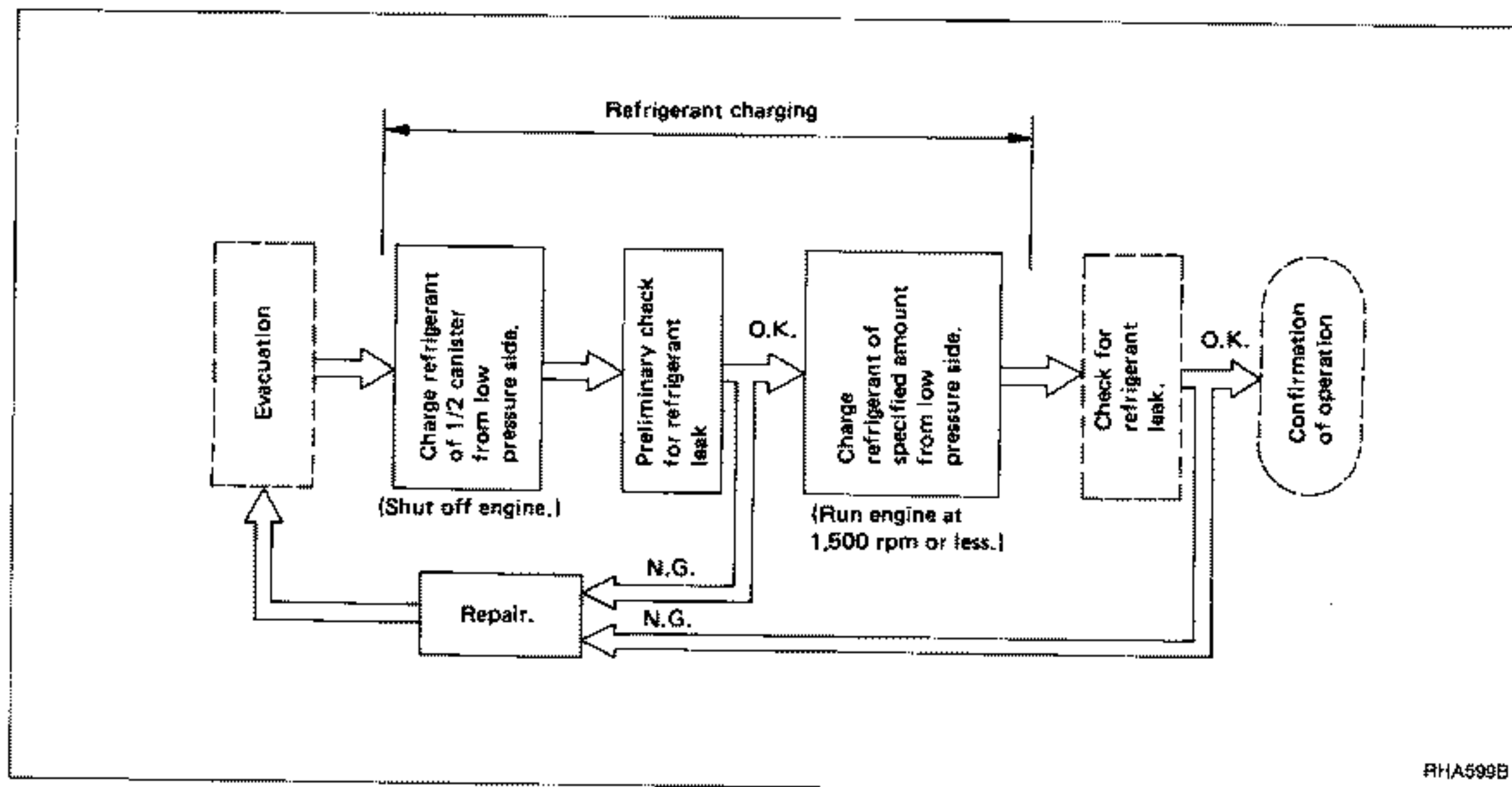
EVACUATION

If no abnormality is found during the airtightness check, perform evacuation again for more than 20 minutes.

1. Run the vacuum pump.
2. Open the high and low pressure valve and vacuum pump valve of the gauge manifold.
3. Evacuate for more than 20 minutes.
4. Close the high and low pressure valves and vacuum pump valve of the gauge manifold.

EVACUATING, CHARGING AND CHECKING

Charging Refrigerant Procedure



PRELIMINARY CHARGING PROCEDURE

This operation is performed to check the refrigerant leakage and to protect the compressor.

1. Turn the charge valve handle to open a hole in the service canister to allow the refrigerant to flow through the gauge manifold.
2. Open the low pressure valve of the gauge manifold, and charge the refrigerant into the system from the low pressure side.
3. After charging approx. 200 g (7.05 oz) of refrigerant, shut off the low pressure valve.

CAUTION:

- The refrigerant charging operation must be performed after shutting off the engine. If the compressor is operated with an insufficient amount of refrigerant, the compressor may seize up due to a lack of return of the compressor oil.
- Do not shake nor hold the refrigerant canister upside down.

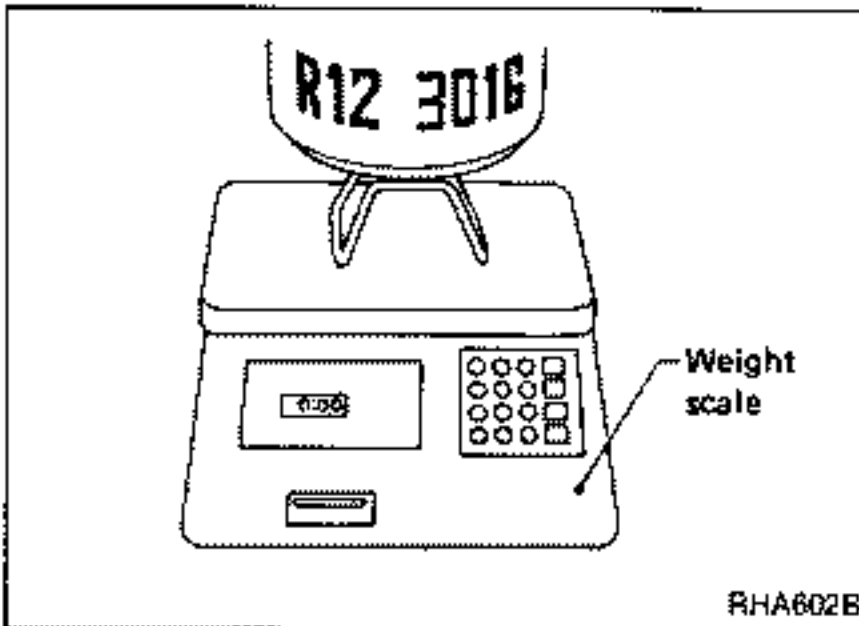
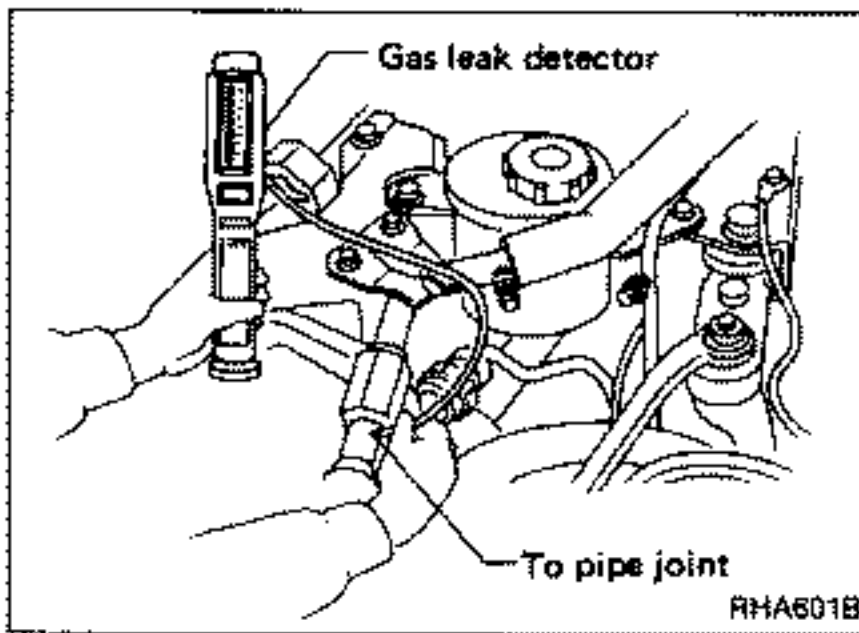
EVACUATING, CHARGING AND CHECKING

Charging Refrigerant (Cont'd)

PRELIMINARY CHECK FOR REFRIGERANT LEAKS

1. Make sure that the gauge manifold valve is closed.
2. Check for refrigerant leak from each connector in the system using the leak detector.

At this point, the pressure in the system is not high. Only large amounts of refrigerant leak due to loose pipe joints, etc. can be detected.



CHARGING REFRIGERANT

1. Make sure that the valves of the gauge manifold are closed.
2. Start the engine, and run the compressor.
3. Slowly open the low pressure valve of the gauge manifold.
4. Charge the specified amount of refrigerant.

The charged amount of refrigerant can be determined by subtracting the weight of the canister measured after charging from its weight measured before charging.

WARNING:

Never attempt to open the high pressure valve while the engine is running. If opened, the pressure in the refrigerant canister will increase, thus causing an explosion.

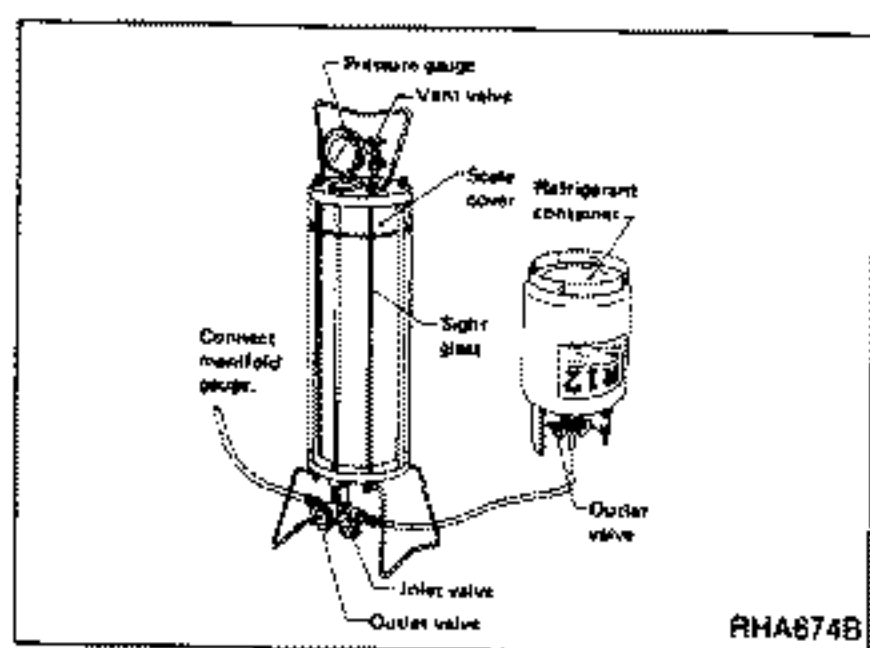
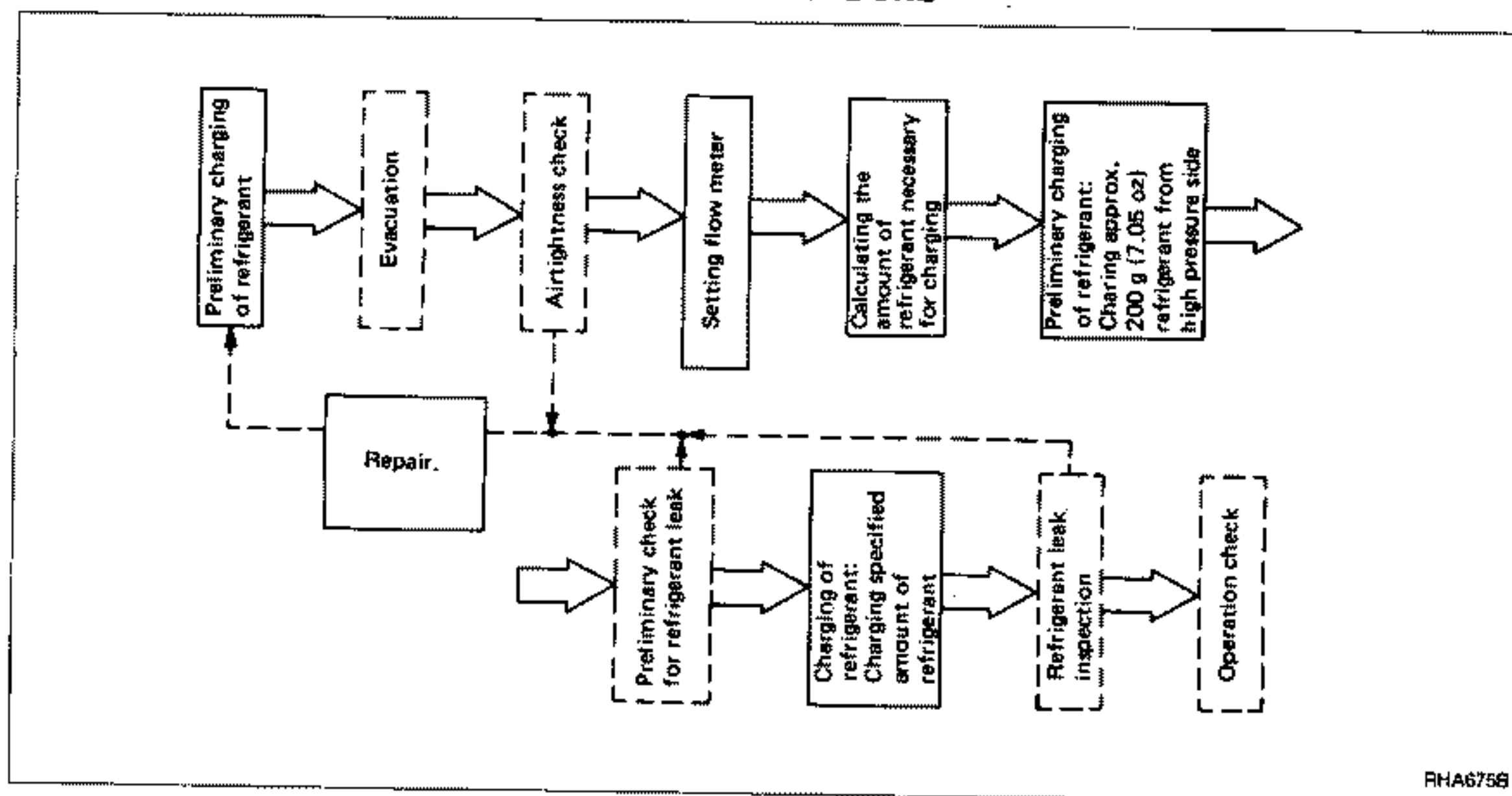
CHARGING REFRIGERANT WITHOUT USING T-JOINT ADAPTER

If the service canister used for charging is empty, replace the canister with a new one, and proceed as follows:

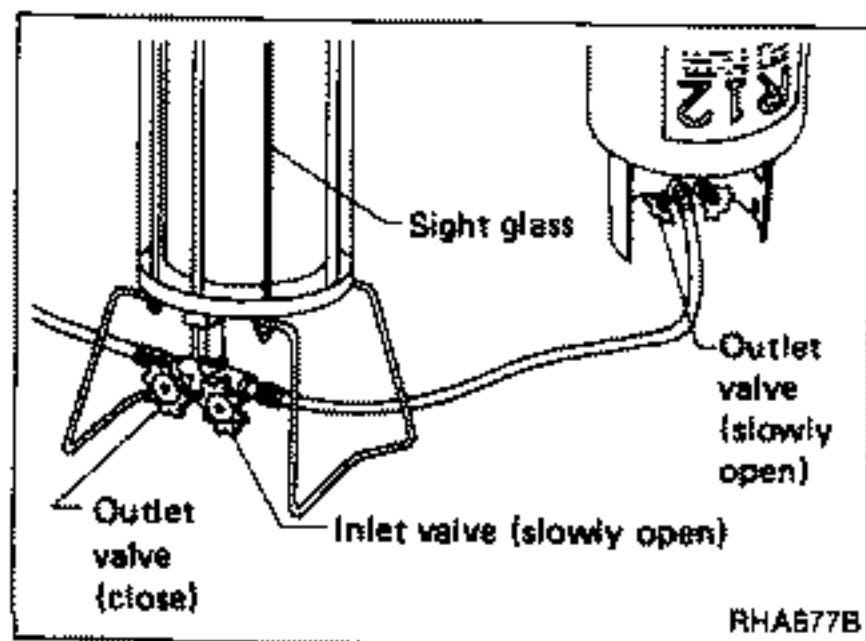
1. Make sure by shaking the canister that no refrigerant is left inside.
2. Shut off all the valves of the gauge manifold.
3. Disconnect the charge valve from the emptied canister, and attach it to a new service canister.
4. Run the vacuum pump, and open the vacuum valve (center) of the gauge manifold to purge air from the inside of the hose.
5. Run the vacuum pump for approx. 30 seconds.
6. Shut off the vacuum valve (center) and stop the vacuum pump.
7. Unseal the new canister, and open the charge valve.
8. Open the low pressure valve to charge the refrigerant into the system.

EVACUATING, CHARGING AND CHECKING

Charging Refrigerant — Charging cylinder WORK PROCEDURE



Install the charging cylinder correctly to the vehicle.
Refer to "SETTING OF SERVICE TOOLS" in "Refrigerant Charging Procedure".



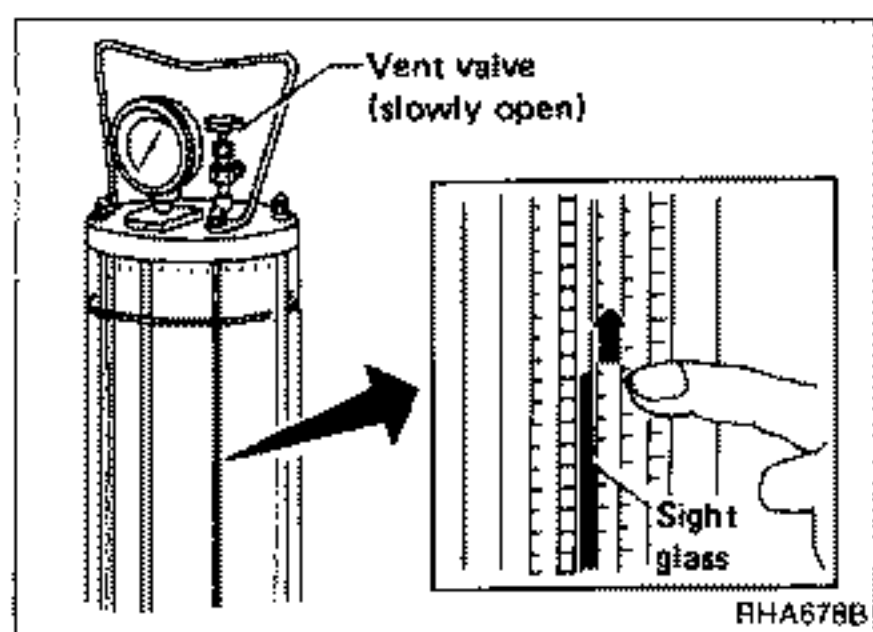
PRELIMINARY CHARGING OF REFRIGERANT-1

1. Make sure that the inlet and outlet valves of the charging cylinder are closed.
2. Slowly open the outlet valve of a refrigerant container [13.6 kg (30 lb)].
3. Slowly open the inlet valve of the charging cylinder.

The refrigerant will flow into the sight glass of the charging cylinder as the valve is opened.

EVACUATING, CHARGING AND CHECKING

Charging Refrigerant — Charging cylinder (Cont'd)

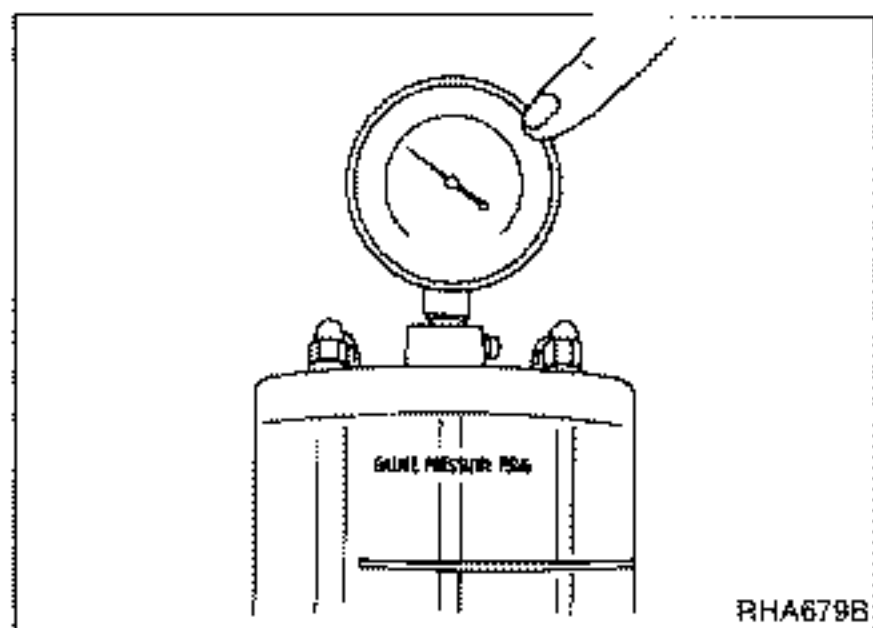


4. Slowly open the upper vent valve to release pressure from the charging cylinder. While doing so, continue charging until the required amount of refrigerant is reached.

The refrigerant volume changes with the temperature and pressure. It is necessary to charge refrigerant with a little more than the required amount (indicated on the sight glass).

Refer to the CAUTION label attached on the vehicle, or to the Service Manual.

5. Close the inlet valve and upper vent valve of the charging cylinder.



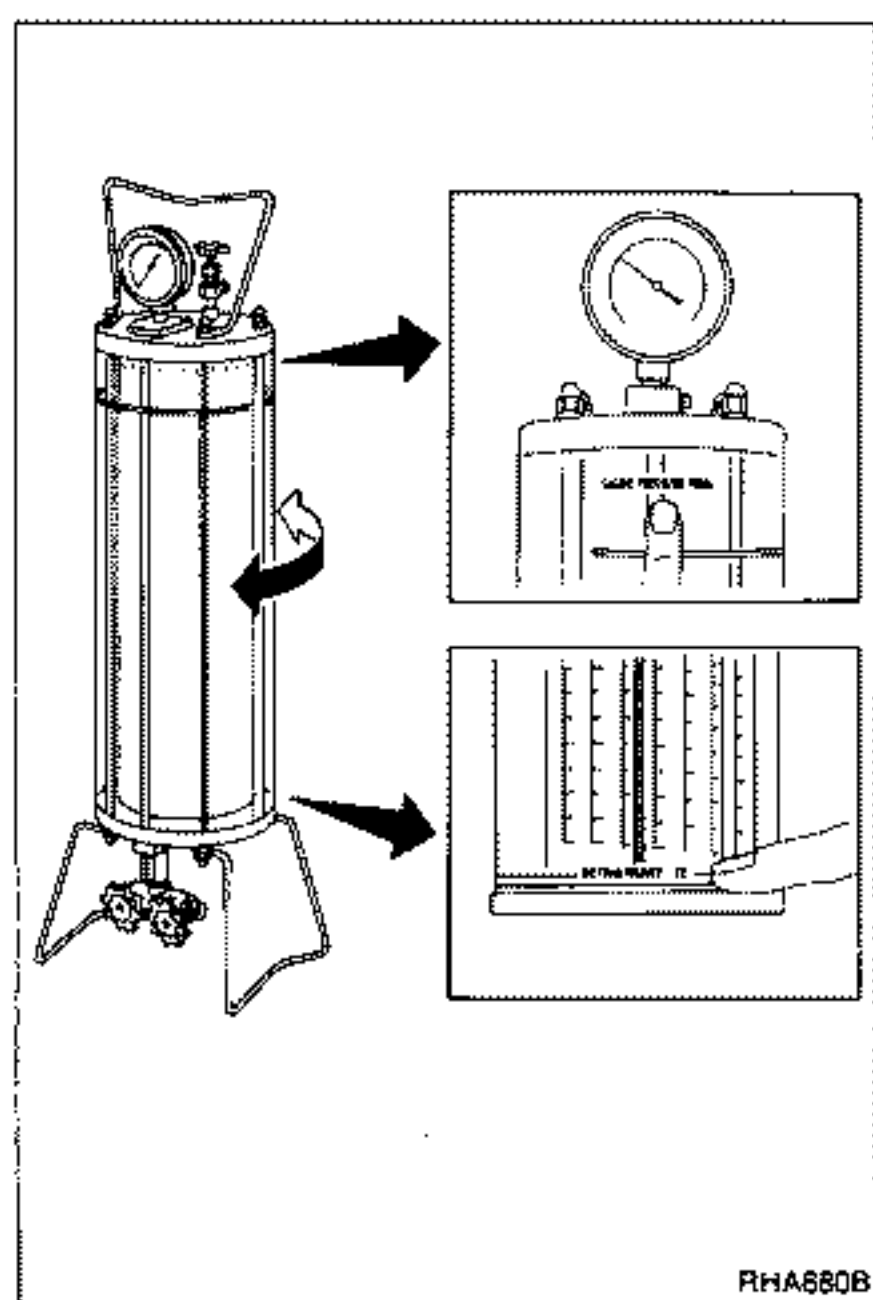
6. Turn on the heater switch (the charging cylinder is provided with a heater.)

The refrigerant charging time can be reduced by heating the refrigerant to increase its pressure. In this case, do not allow the pressure in the cylinder to rise higher than 1,030 kPa (10.30 bar, 10.5 kg/cm², 150 psi). (If pressure rises above this level, turn off the heater.)

The pressure in the charging cylinder can be measured by the upper pressure gauge.

EVACUATION AND AIRTIGHTNESS CHECK

Refer to "EVACUATION" and "CHECKING AIRTIGHTNESS" in "Evacuation".



SETTING OF FLOW METER

1. Rotate the charging cylinder main body until the scale for R12 is at the correct position on the sight glass.
2. Read the charging cylinder pressure gauge.
3. Rotate the charging cylinder so that the scale of the charging cylinder agrees with the pressure value indicated on the pressure gauge.
4. Open the outlet valve of the charging cylinder.

EVACUATING, CHARGING AND CHECKING

Charging Refrigerant — Charging cylinder (Cont'd)

CALCULATING CHARGING AMOUNT OF REFRIGERANT

1. Record the amount of refrigerant in the sight glass before charging.
2. Subtract the required amount of refrigerant (charge quantity specified for the vehicle) from the amount of refrigerant recorded in step 1. Charge refrigerant into the system until the remaining value equals to the value indicated on the sight glass.

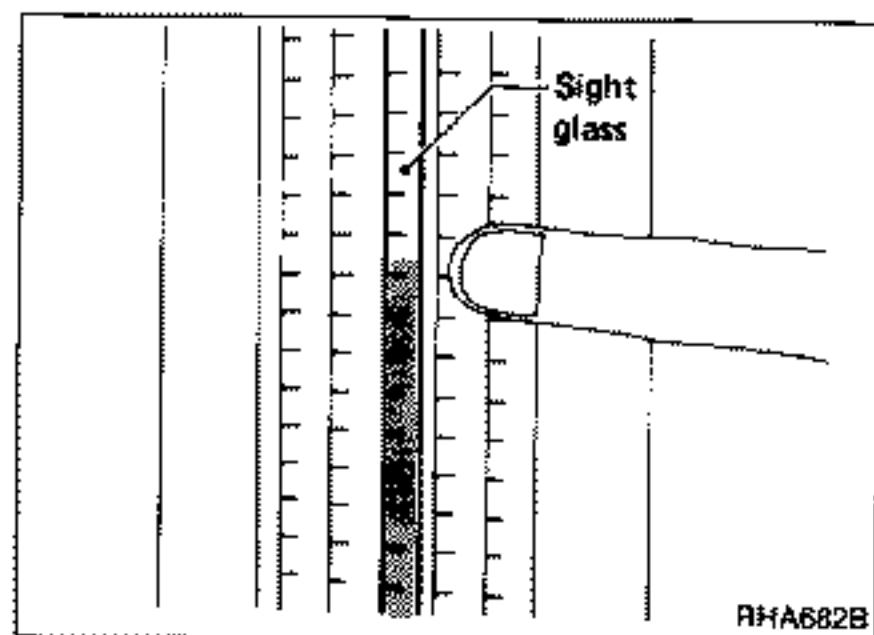
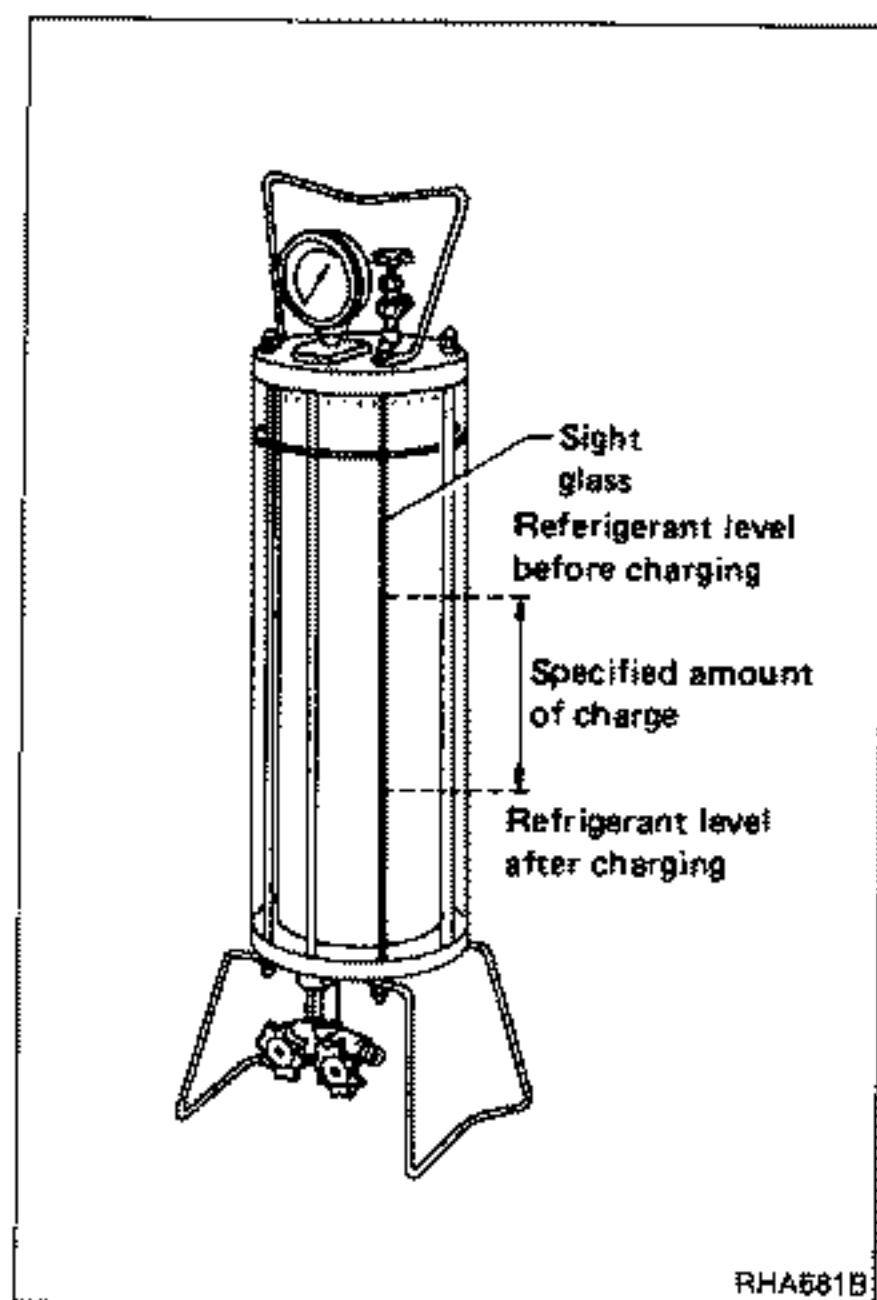
Example:

Level in sight glass: 3 lb 8 oz

Charge specification (from Service Manual) 2.0 - 2.4 lb.

Calculate charge quantity into lb and oz as follows: 1 lb = 16 oz, and 0.1 lb = 1.6 oz, so that 2.0 lb = 32 oz, 2.4 lb = 32 + (4 x 1.6) = 32 + 6.4 = 38.4, round off to 38. Therefore our charge quantity will be between 32 and 38 oz, or 2 lb 0 oz to 2 lb 6 oz. Subtract 2 lb 6 oz from the level in the sight glass (3 lb 8 oz) = 1 lb 2 oz.

This will be our ending point.



PRELIMINARY CHARGING OF REFRIGERANT-2

1. Slowly open the high pressure side valve of the manifold gauge to charge refrigerant from the high pressure side.
2. Close the high pressure valve after charging approx. 200 g (7.05 oz) refrigerant.

CAUTION:

The refrigerant in the charging cylinder is kept in the liquid state, so the refrigerant should be charged from high pressure side. Do not start the engine with the high pressure valve kept open.

PRELIMINARY CHECK FOR REFRIGERANT LEAKS

Refer to "PRELIMINARY CHECK FOR REFRIGERANT LEAKS" in "Charging Refrigerant".

CHARGING REFRIGERANT

1. Slowly open the high pressure valve of the manifold gauge, and charge the calculated amount of refrigerant in "CALCULATING CHARGING AMOUNT OF REFRIGERANT".

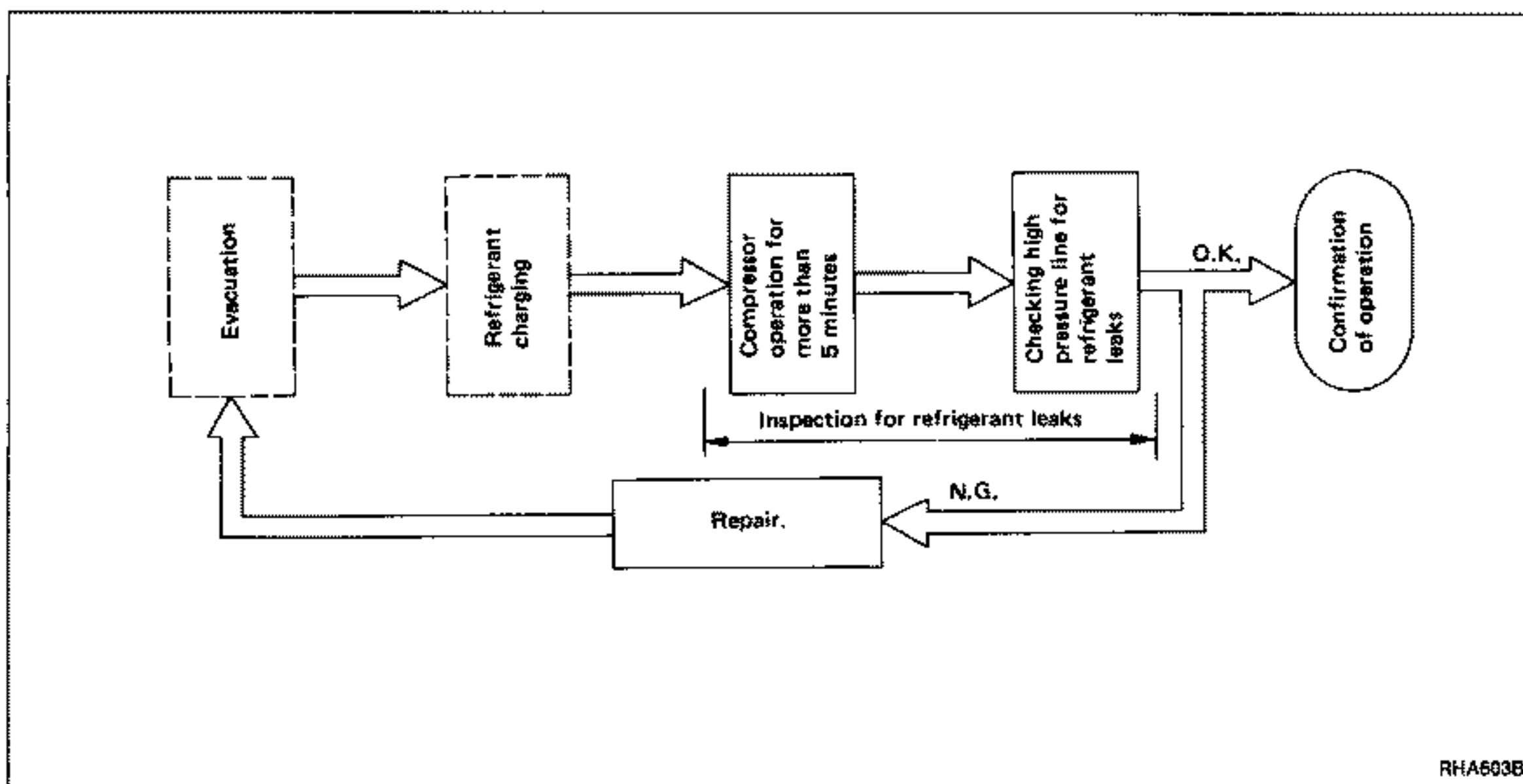
CAUTION:

The refrigerant in the charging cylinder is kept in the liquid state, so the refrigerant should be charged from high pressure side. Do not start the engine with the high pressure valve kept open.

2. Close the high pressure valve of the manifold gauge.
3. Make sure that the calculated amount of refrigerant is in the sight glass.
4. Close the charging cylinder outlet valve.
5. Turn off the heater if it is on (when using heater equipped type).

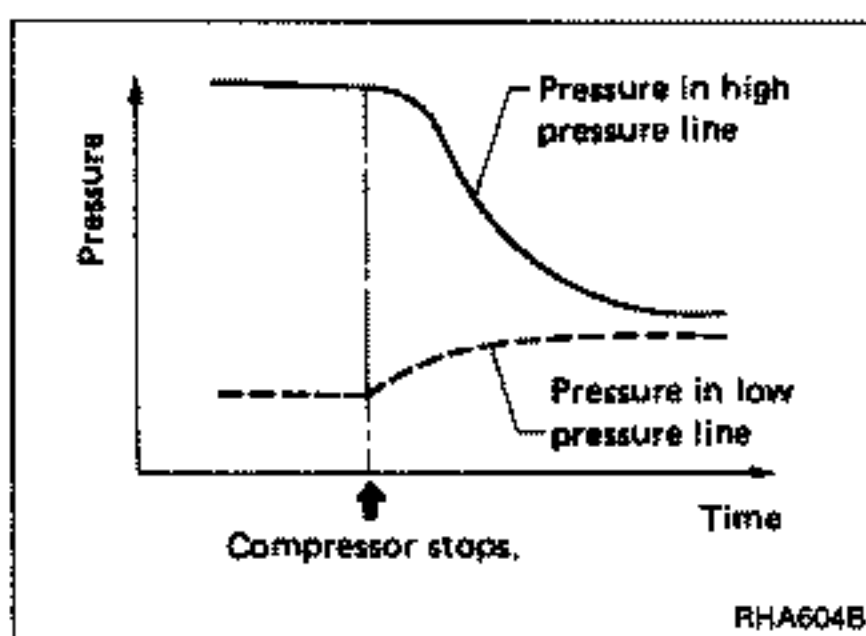
EVACUATING, CHARGING AND CHECKING

Inspection for Refrigerant Leaks WORK PROCEDURE



To facilitate inspection for refrigerant leaks, establish the following conditions:

- Start the engine.
- Run the air conditioner.
- Set the blower fan control to MAX.
- Set the temperature control to FULL COLD.
- Run the refrigerant system for more than 5 minutes after setting the above-mentioned conditions (to circulate the refrigerant through the system).



Refrigerant leaks should be checked immediately after stopping the engine, beginning with the high pressure line, using a gas leak tester. This is because the pressure in the high pressure line drops gradually after the refrigerant circulation stops while the pressure in the low pressure line rises gradually as shown in the graph. Leaks can be detected easily when pressure is high.

EVACUATING, CHARGING AND CHECKING

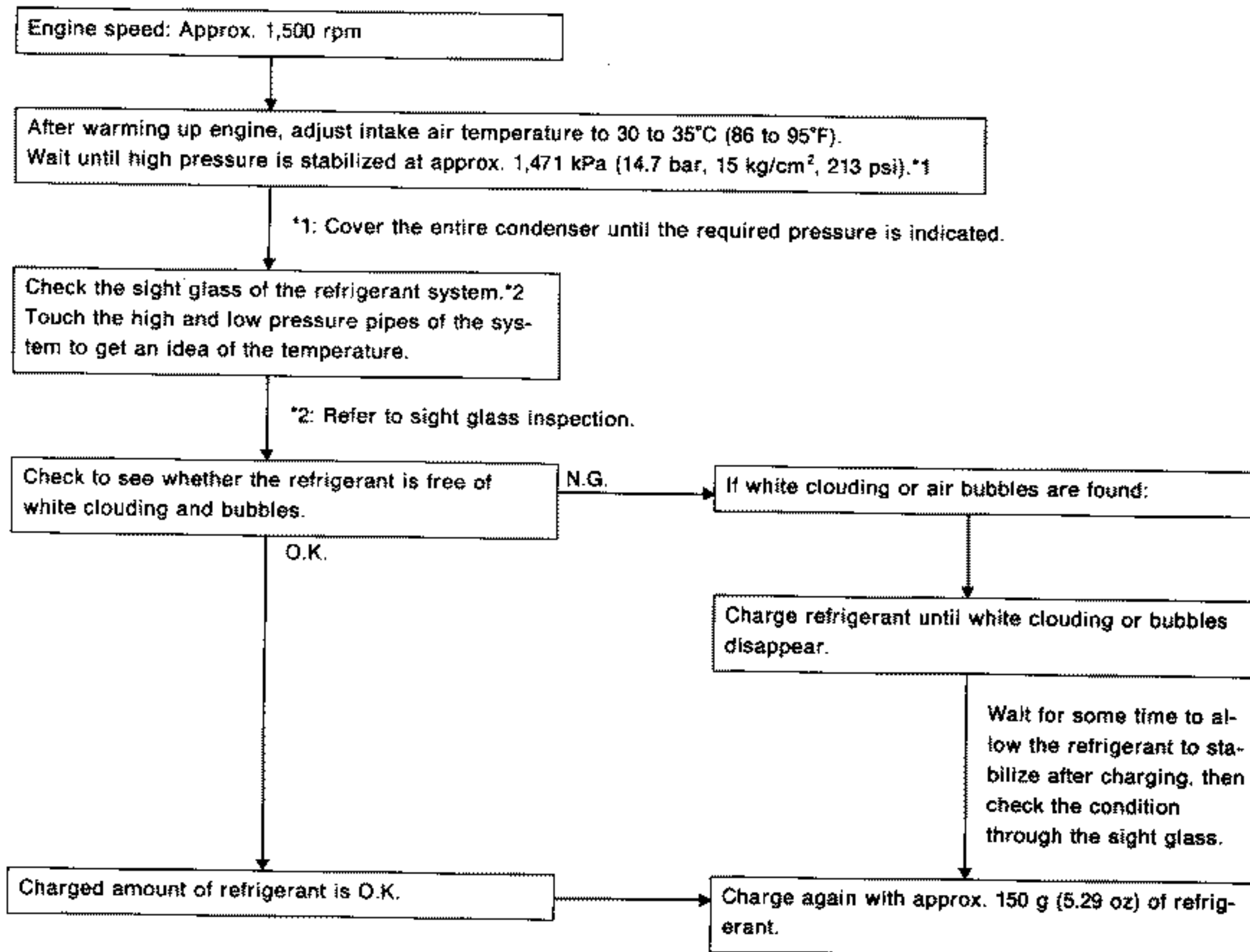
Confirmation of Amount of Charged Refrigerant

The amount of refrigerant charged into the system can be observed through the sight glass by watching the flow of the refrigerant and by reading the high pressure and low pressure manifold gauges under the following conditions:

CONDITIONS

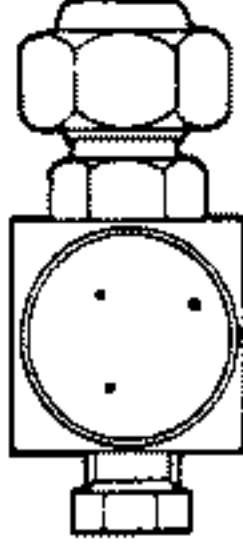
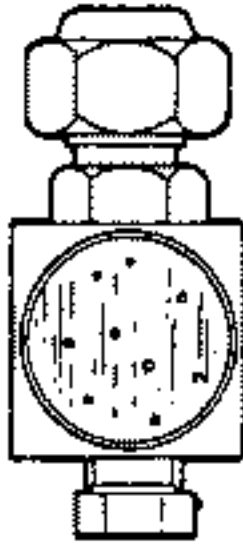
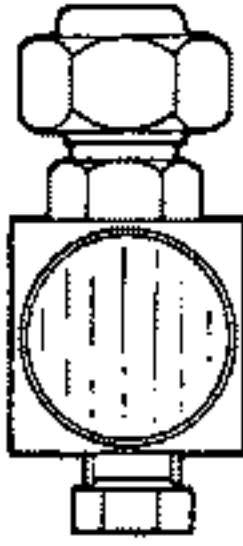
- Door window: Open
- A/C switch: ON (Manual Air Conditioner)
- Auto switch: ON (Auto Air Conditioner)
- TEMP. setting: Max. COLD
(Manual Air Conditioner)
1 (Auto Air Conditioner)
- FAN speed: 4 (Manual Air Conditioner)
HI (Auto Air Conditioner)
- Check sight glass after a lapse of about five minutes.

WORK PROCEDURE



EVACUATING, CHARGING AND CHECKING

Confirmation of Amount of Charged Refrigerant (Cont'd)

Amount of charge Check item	Appropriate	Refrigerant is insufficient	Almost no refrigerant	Overcharged, or air in system
Temperature of high and low pressure pipes	High pressure side is hot while low pressure side is cold.	High pressure side is warm and low pressure side is somewhat cold.	No difference is felt between high and low pressure sides.	High pressure side is very hot.
Flow of refrigerant viewed through sight glass	Mostly transparent. Occasionally some bubbles are seen when engine rpm is increased or decreased. 	Bubbles are always flowing. Refrigerant is cloudy. 	Nothing is visible. 	If overcharged, no bubbles are seen. If there is air in the system, large bubbles are seen.
Pressure	Normal high pressure: 1,373 - 1,765 kPa (13.7 - 17.7 bar, 14 - 18 kg/cm ² , 199 - 256 psi) Normal low pressure: 147 - 294 kPa (1.47 - 2.94 bar, 1.5 - 3 kg/cm ² , 21 - 43 psi)	Both high and low pressure values are insufficient.	High pressure value is very small.	Both high and low pressure values are excessive.
Action to take	Air bubbles may be generated when the receiver drier strainer is clogged, or when the expansion valve is opened excessively.	Add refrigerant after checking for leaks.	Check the refrigerant system.	Stop the compressor and extract excessive refrigerant. If air is found, perform evacuation, then charge the specified amount of refrigerant.

- a. The bubbles seen through the sight glass are influenced by the ambient temperature. Since the bubbles are hard to see 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.

When the STV (for the auto air conditioning system) activates at an ambient temperature of less than 20°C (68°F), bubbles can sometimes be seen through the sight glass. However, the amount of refrigerant is correct if the following conditions are met:

- (1) The air vent temperature is less than 7°C (45°F) as per the performance chart (HA-28).

- (2) Bubbles disappear under the following conditions:

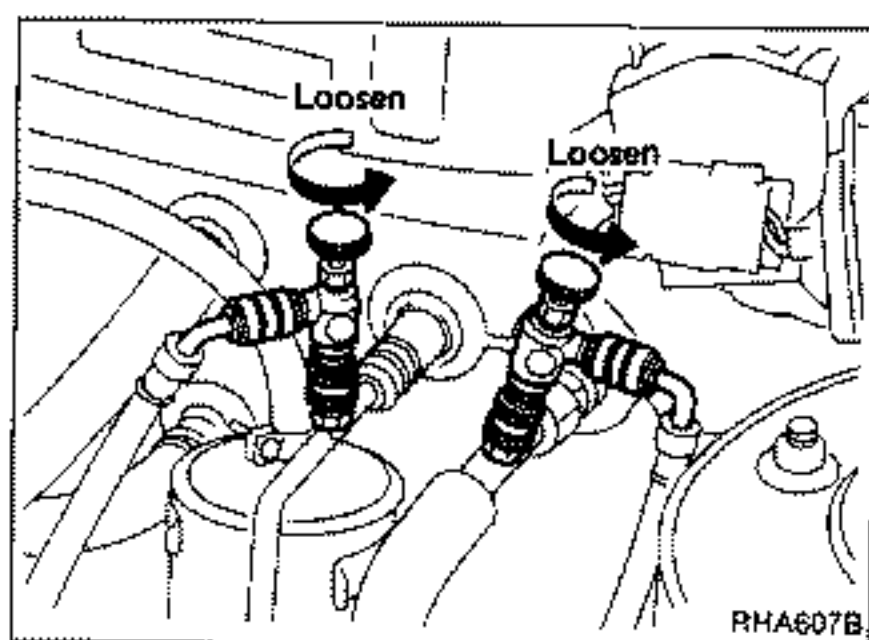
- Door windows: Closed
- Auto switch: ON
- TEMP. setting: 40
- FAN speed: Hi
- REC. switch: ON

Check sight glass after a lapse of about five minutes.

Recheck the amount when it exceeds 20°C (68°F). At higher temperatures the bubbles are easy to see.

- b. When the screen in the receiver drier is clogged, the bubbles will appear even if the amount of refrigerant is normal. In this case, the outlet side pipe of the receiver drier becomes considerably cold.

EVACUATING, CHARGING AND CHECKING



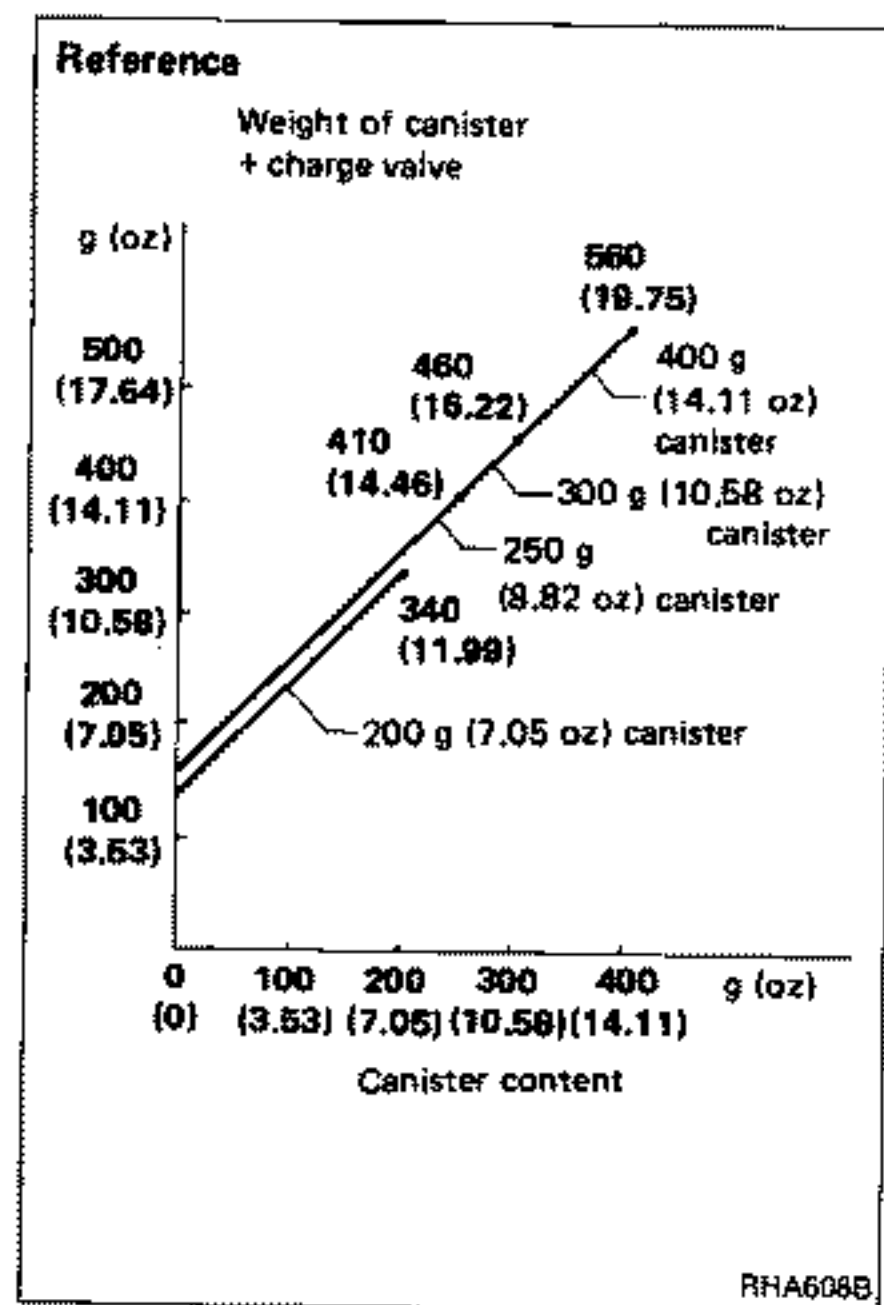
Recovery Procedure

REMOVAL OF REFRIGERANT CHARGING DEVICE

1. Completely loosen the adapter valves of the low pressure and high pressure lines.
The inner valve of the adapter valve will prevent the refrigerant from leaking out.
2. Remove both the high-pressure and low-pressure side adapter valves from the on-vehicle service valve.

If adapter valve is not used for charging, proceed as follows to minimize the refrigerant discharge into the atmosphere.

3. Loosen the nut of the low pressure charging hose while pressing it against the service valve to prevent refrigerant leakage.
4. After loosening the nut, quickly remove the charge valve from the service valve.
5. Wait until the high pressure gauge indication drops to below 981 kPa (9.8 bar, 10 kg/cm², 142 psi), then similarly disconnect the high pressure charging hose.



DISPOSAL OF RESIDUAL REFRIGERANT

Securely shut off each of the charge valves, adapter valves and manifold gauge valves to prevent the residual refrigerant from leaking out. Keep these valves in a safe location for the next charging.

The amount of refrigerant remaining in a service canister can be estimated from the Table shown here. It is recommended that a label be attached indicating the remaining amount in the canister.

Control Switches

SWITCHES AND THEIR CONTROL FUNCTIONS

Switch		Indicator illuminates		Air outlet	Intake air	Compressor
		A/C				
A/C		○				ON*1
Mode				VENT	*3	*1*4
				B/L	*5	*1*4
				FOOT	*5	*1*4
				F/D	*5	ON*1
				DEF	FRE	*1*4
			○		REC*2	ON*1

*1: Compressor is operated by thermo control amp. and E.C.C.S. control unit.

*2: Depending on mode switch position.

*3: When vent mode is selected, REC switch function is as in the following chart:

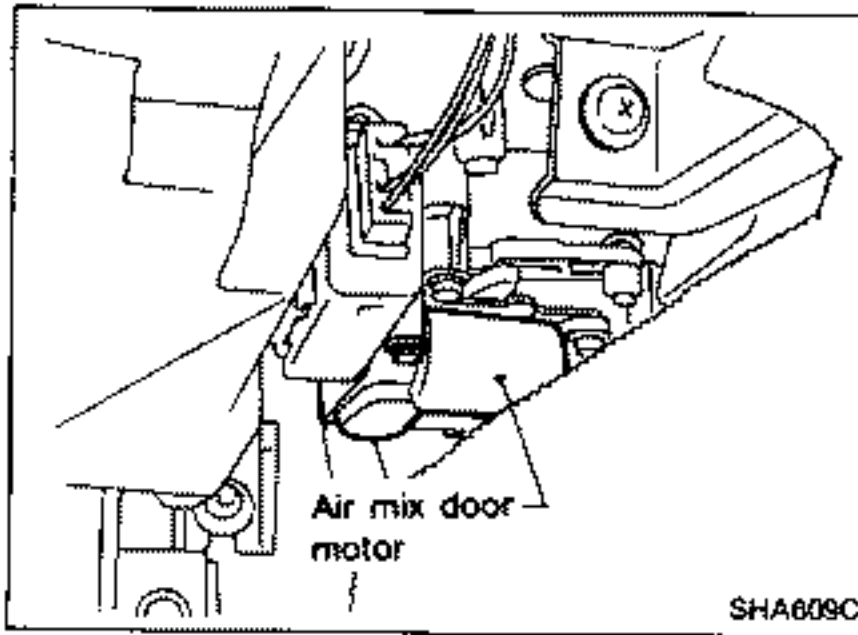
*4: Depending on A/C switch position.

*5: Depending on REC switch position.

		REC	
		ON	OFF
A/C SW	ON	REC	REC/FRE
	OFF	REC	FRE

SHA267C

DESCRIPTION — Manual Air Conditioner



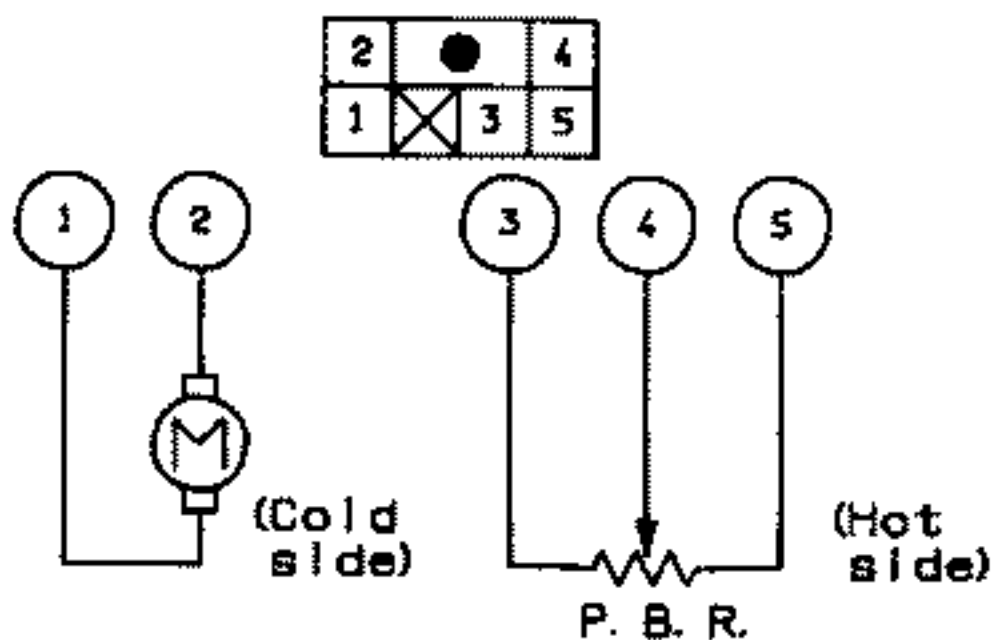
Specifications

AIR MIX DOOR MOTOR

The air mix door motor is attached to the heater unit. It rotates, opening the air mix door to the position set by the temperature control lever.

Motor rotation is conveyed through shafts and linkages. The air mix door position is fed back to the control amplifier by the Potentio Balance Resistor (P.B.R.) built into the air mix door motor.

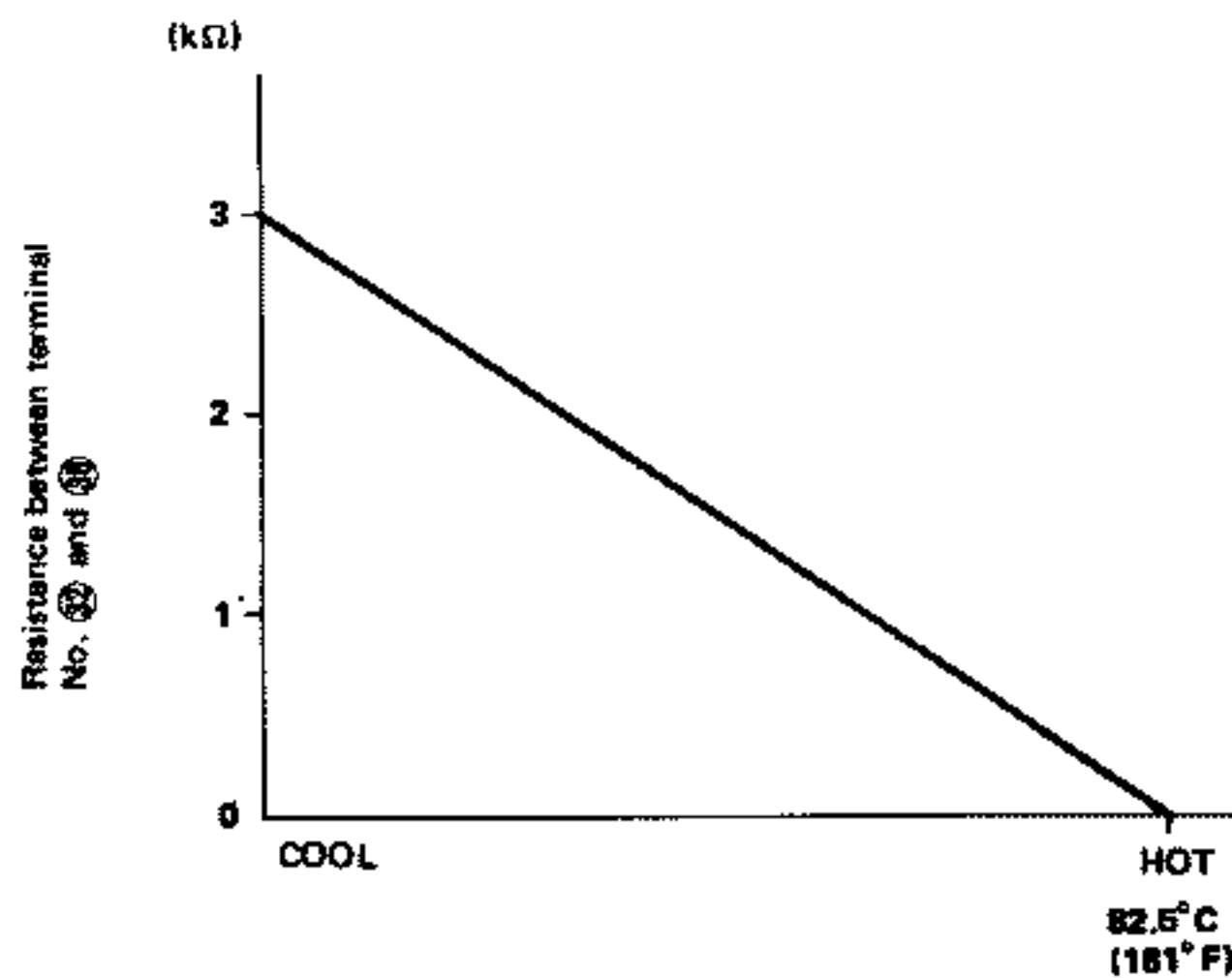
Air mix door motor operation



1	2	Air mix door operation	Direction of lever movement
⊕	⊖	COLD → HOT	Clockwise (Toward passenger compartment)
⊖	⊖	STOP	STOP
⊖	⊕	HOT → COLD	Counterclockwise (Toward engine compartment)

SHA637C

Characteristics of P.B.R.



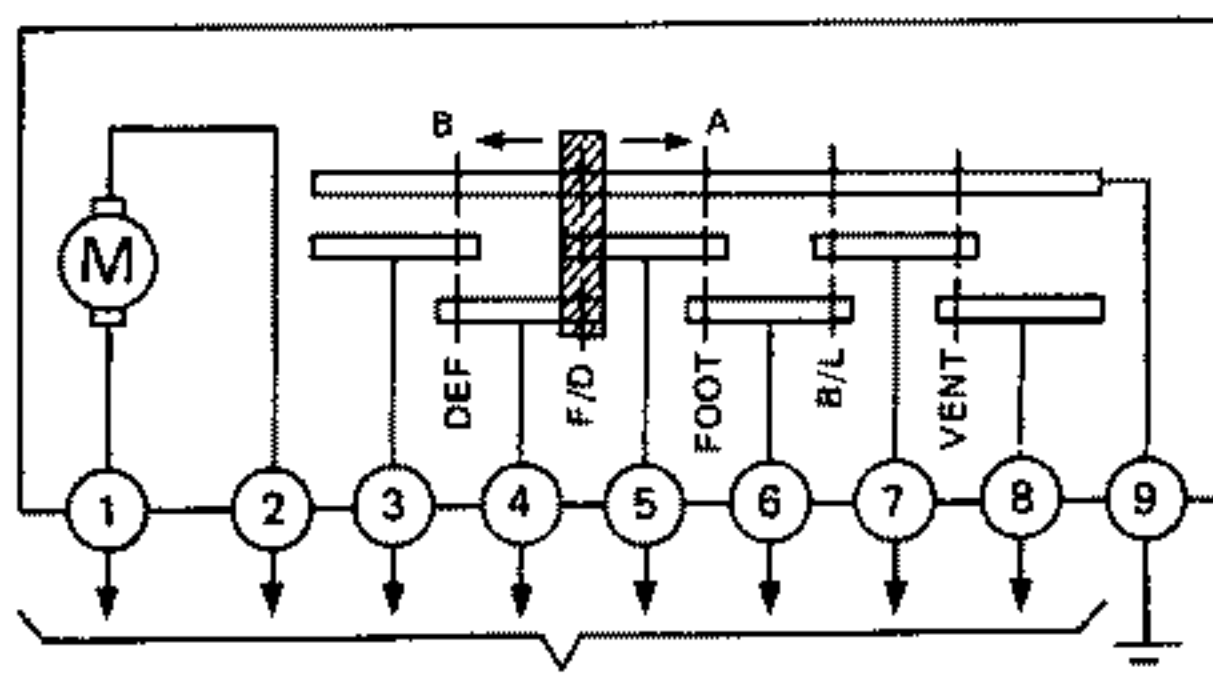
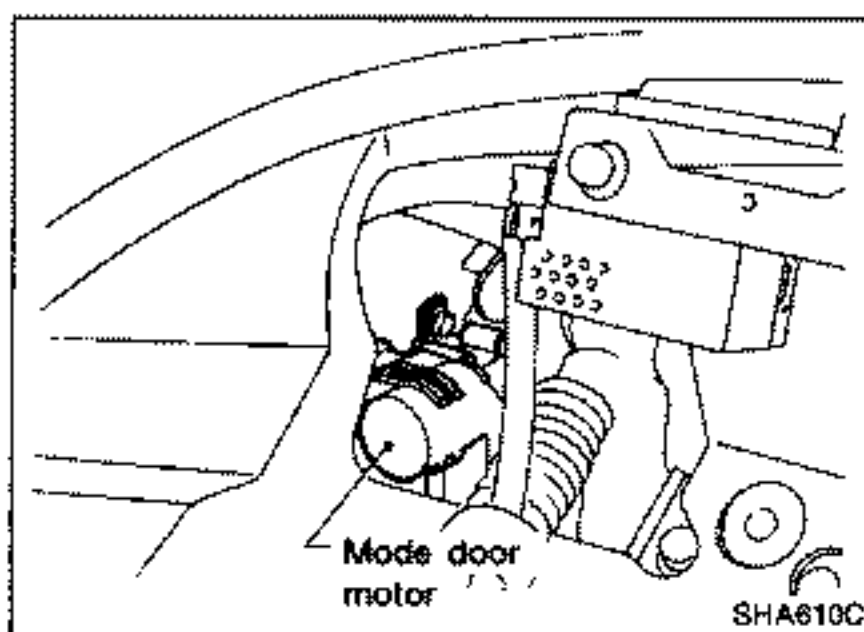
SHA270C

DESCRIPTION — Manual Air Conditioner

Specifications (Cont'd)

MODE DOOR MOTOR

When a mode switch is selected, the position switch built into it reads the corresponding mode to determine the direction of motor rotation. As soon as the desired mode is set, the position switch stops the motor.



To control amp.

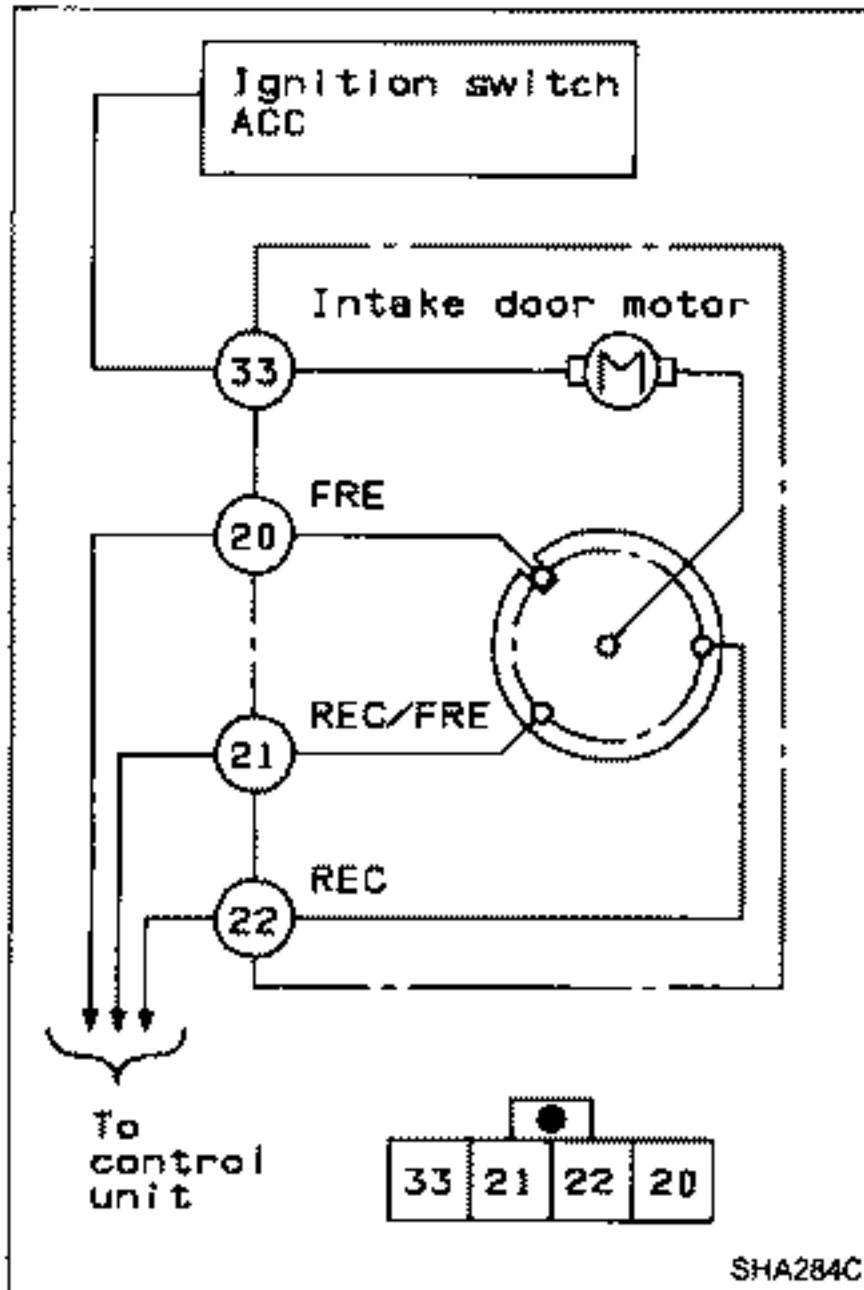
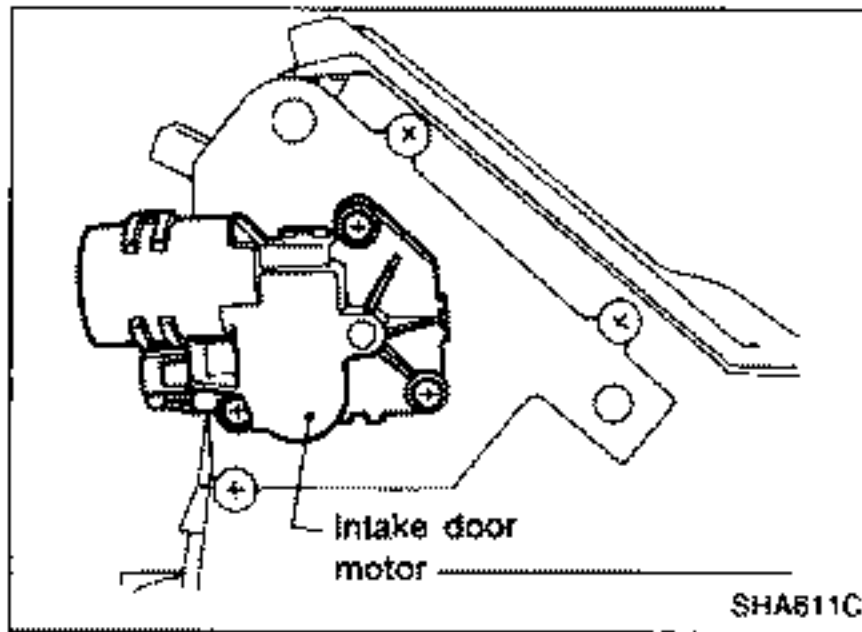


SHA638C

Specifications (Cont'd)

INTAKE DOOR MOTOR

The intake door motor is installed on the side portion of the intake unit. Using a rod and link it opens and closes the intake door. When the REC switch is ON (OFF), the ground line of the intake door motor is switched from terminal 20 to 22 (22 to 20). This causes the motor to start because the position switch contacts built into it are now set to the current flow position. The contacts turn along with the motor. When they reach the non-current flow position, the motor will stop. The motor always turns in the same direction. (FRE → REC → REC/FRE)



SERVICE PROCEDURES

Acceleration Cut System

This system is controlled by the E.C.C.S. control unit. When the engine is heavily overloaded, the compressor is turned off for several seconds to reduce overloading.

Water Cock Control System

The water cock is connected to the air mix doors with a cable. When the air mix doors are at the full-cold position, the water cock is fully closed, and when the air mix doors are at the full-hot position, the water cock is fully opened.

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.

Refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION (For manual air conditioner)

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 specified point, the thermo control amplifier allows compressor operation.

FREEZE PROTECTION (For auto air conditioner)

When the A/C is switched on, the compressor runs continuously, and the evaporator pressure is controlled by a suction throttle valve (S.T.V.) to prevent freeze up.

REFRIGERANT SYSTEM PROTECTION

Low-pressure switch

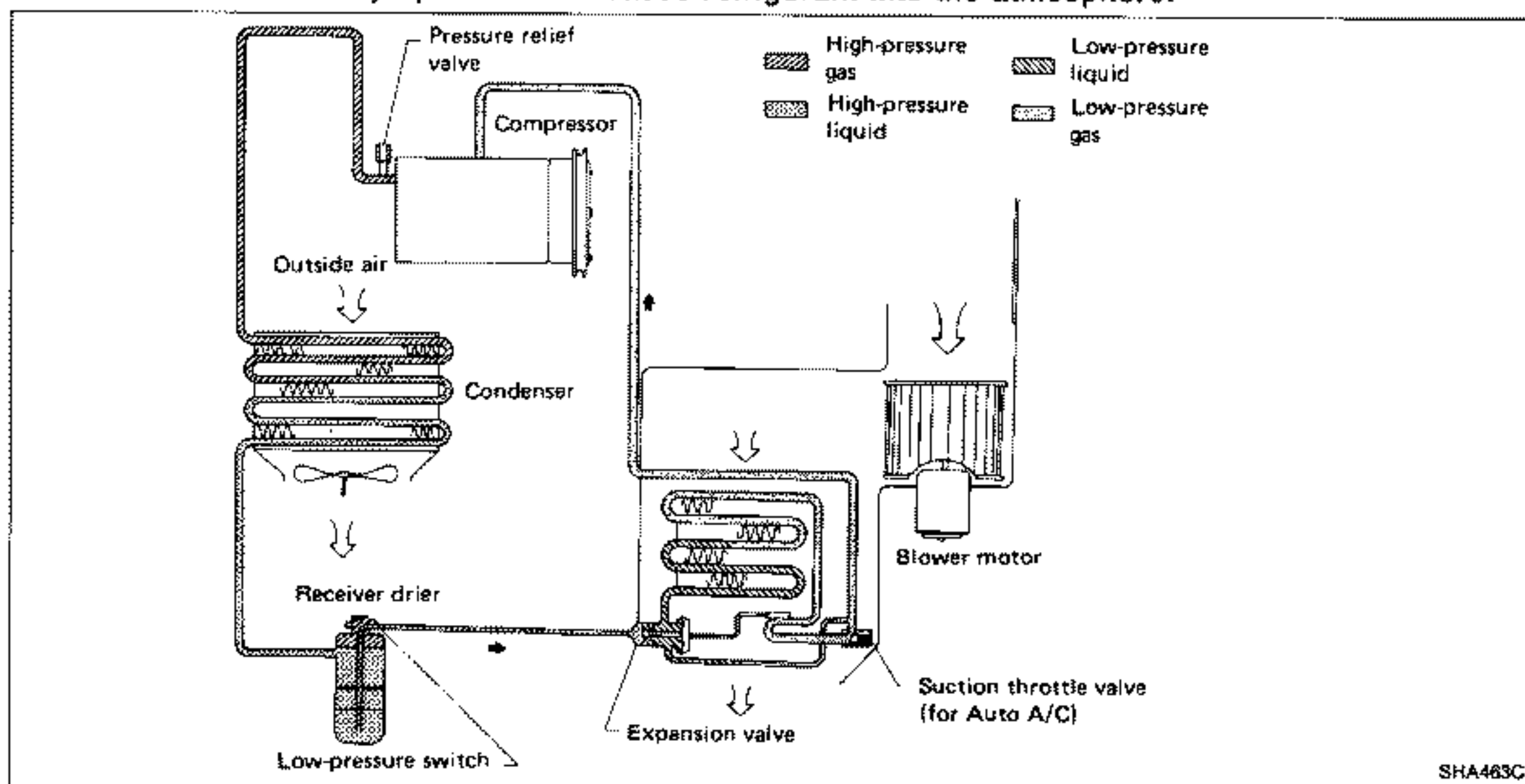
The refrigerant system is protected against excessively low pressures by the low-pressure switch, located on the receiver drier. If the system pressure falls below the specifications, the low-pressure switch opens to interrupt compressor operation.

Fusible plug

Opens at temperature above 105°C (221°F), thereby discharging refrigerant to the atmosphere. If this plug is melted and opened, check the refrigerant line and replace the receiver drier.

Pressure relief valve

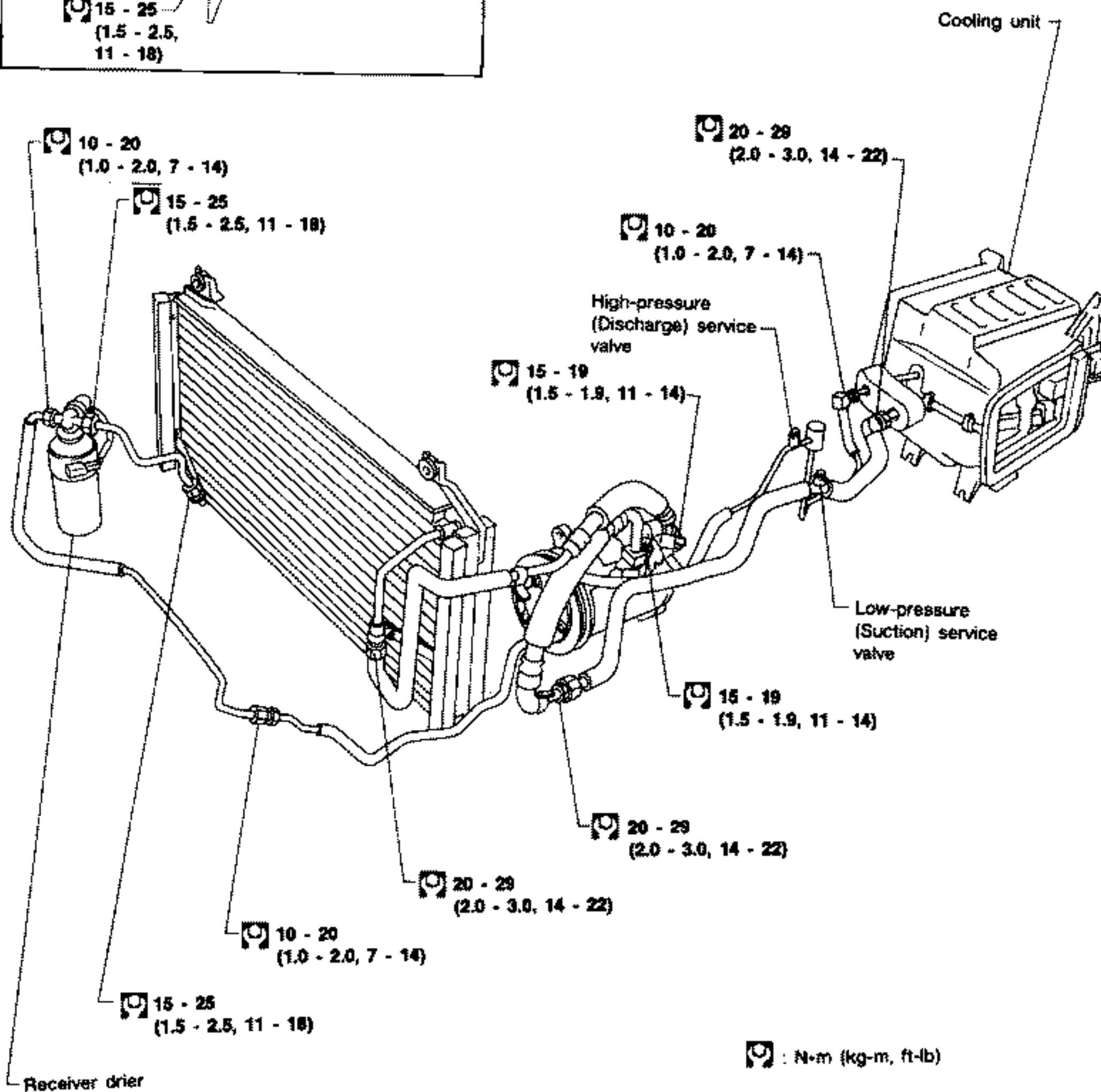
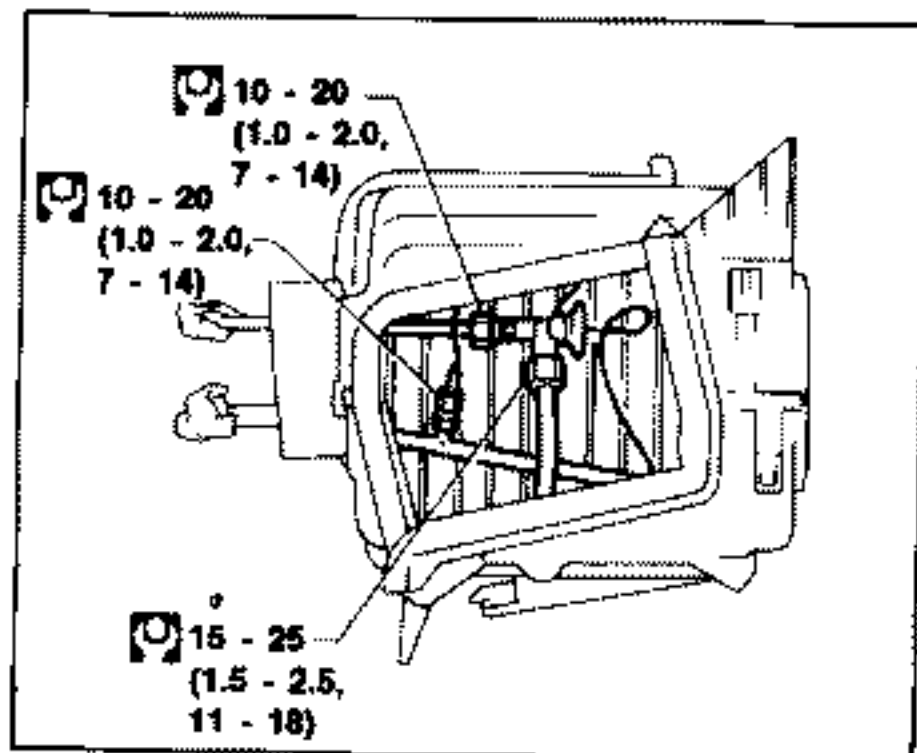
The refrigerant system is also protected by a pressure relief valve, located on the end of the high pressure flexible hose near the compressor. When the pressure of refrigerant in the system increases to an abnormal level [more than 3,727 kPa (37.3 bar, 38 kg/cm², 540 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



SERVICE PROCEDURES

Refrigerant Lines

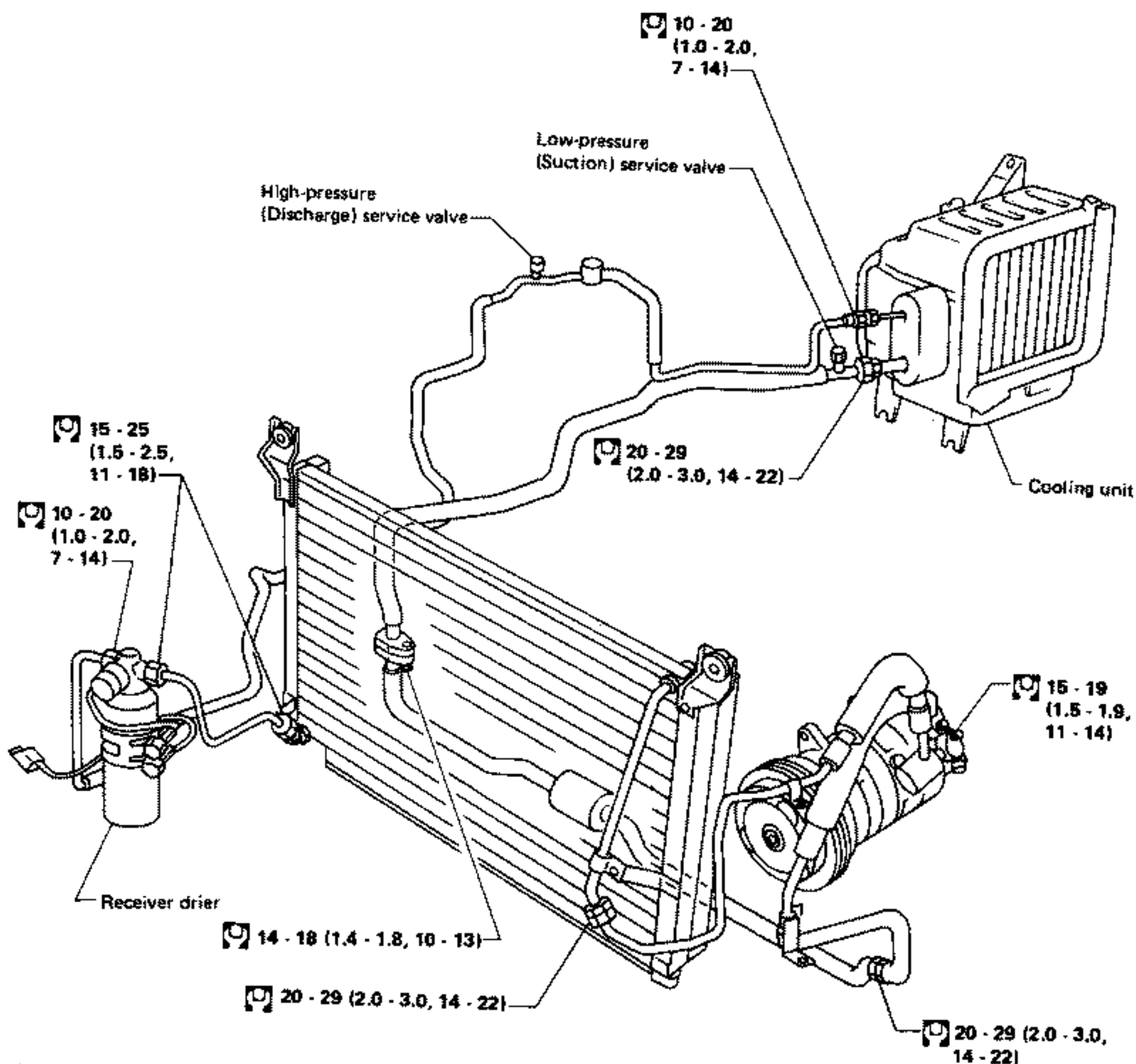
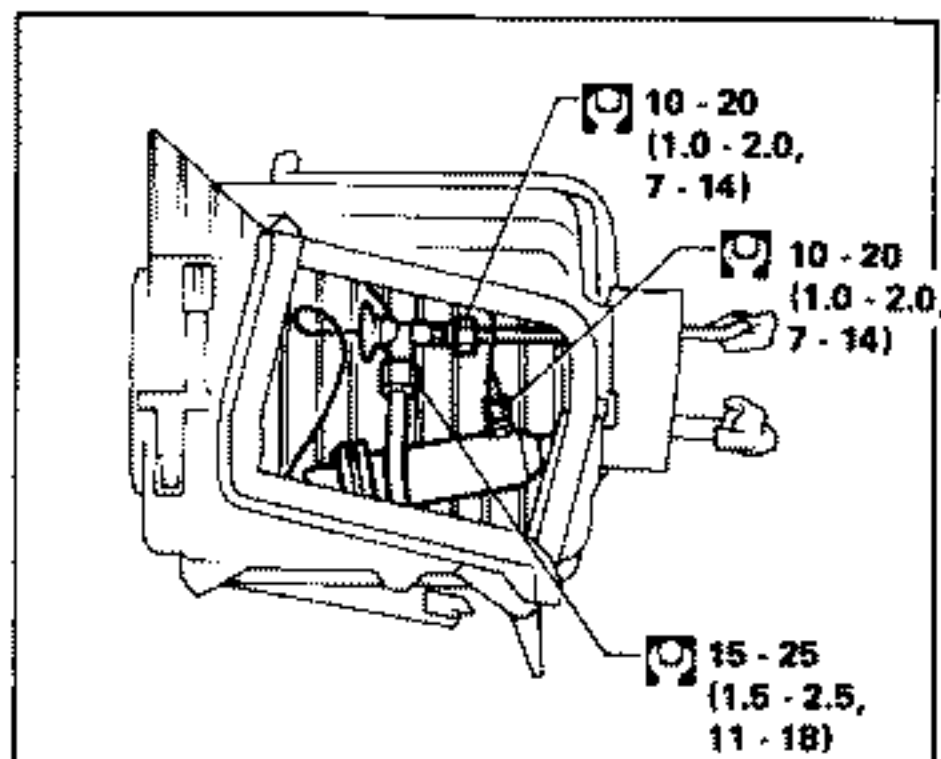
FOR AUSTRALIA



SERVICE PROCEDURES

Refrigerant Lines (Cont'd)

L.H.D. MODEL FOR EUROPE

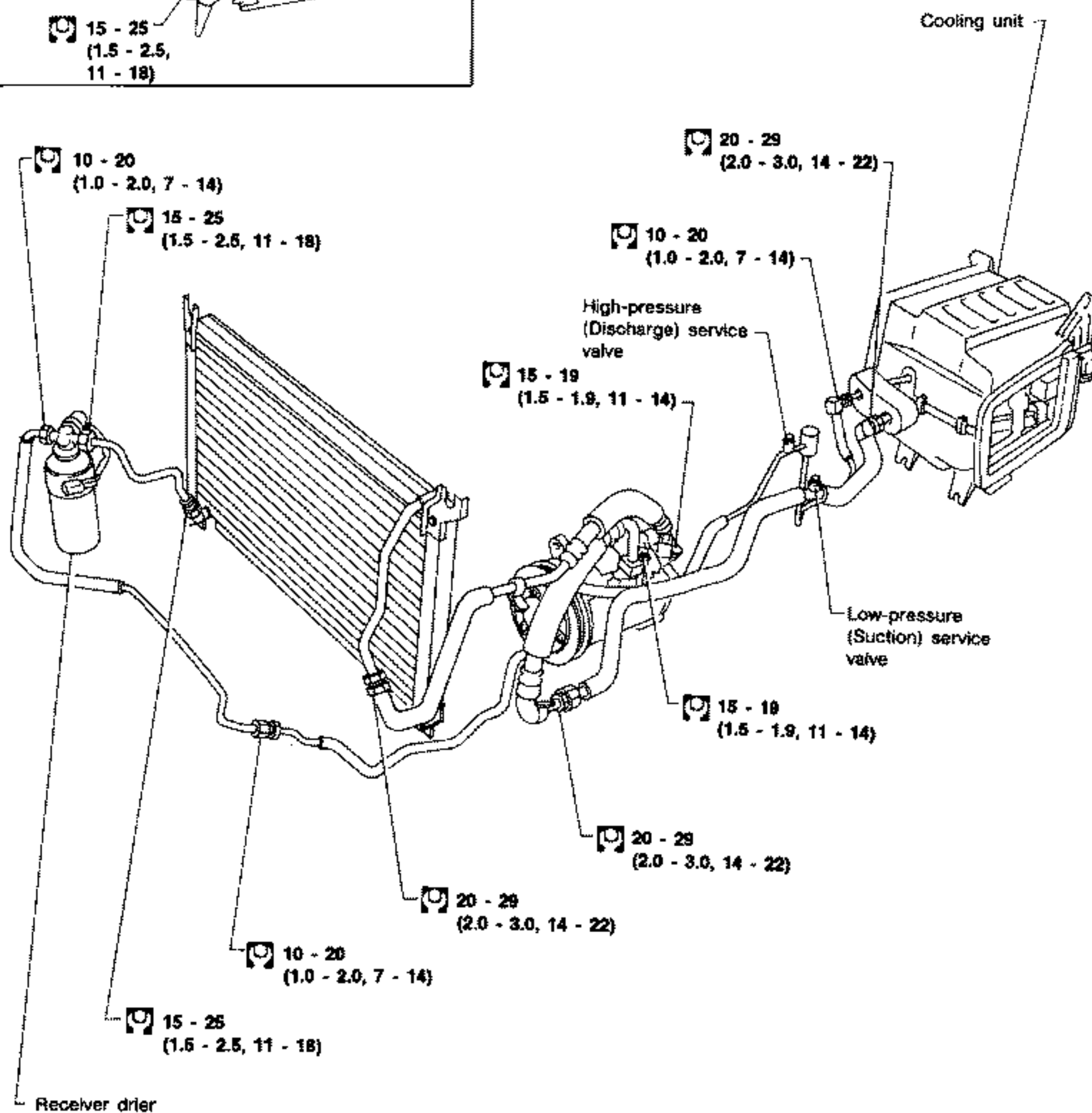
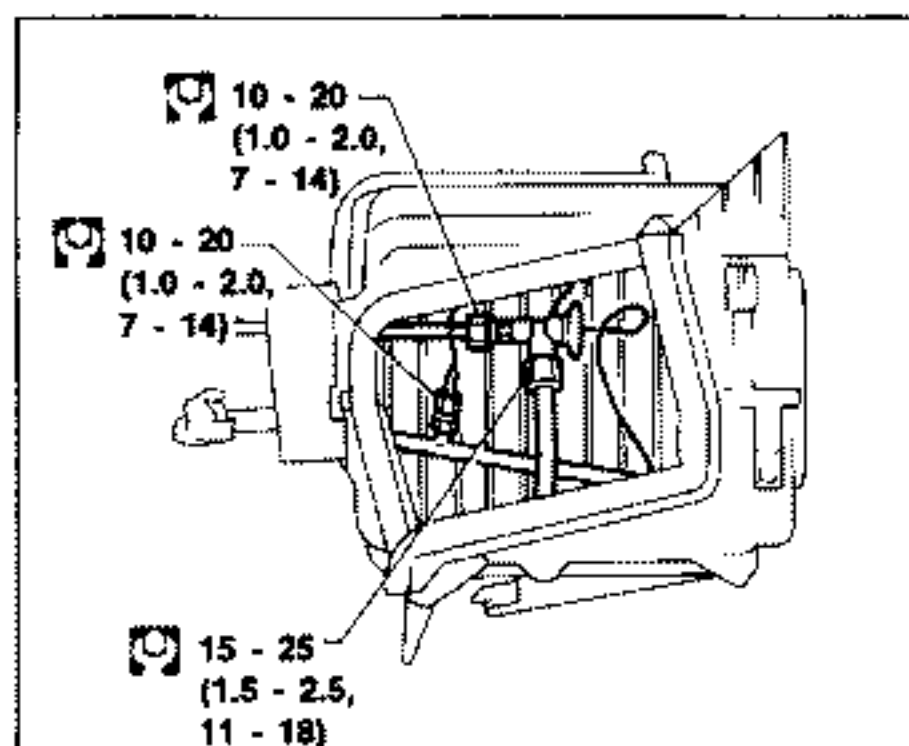


: N·m (kg·m, ft·lb)

SERVICE PROCEDURES

Refrigerant Lines (Cont'd)

R.H.D. MODEL FOR EUROPE

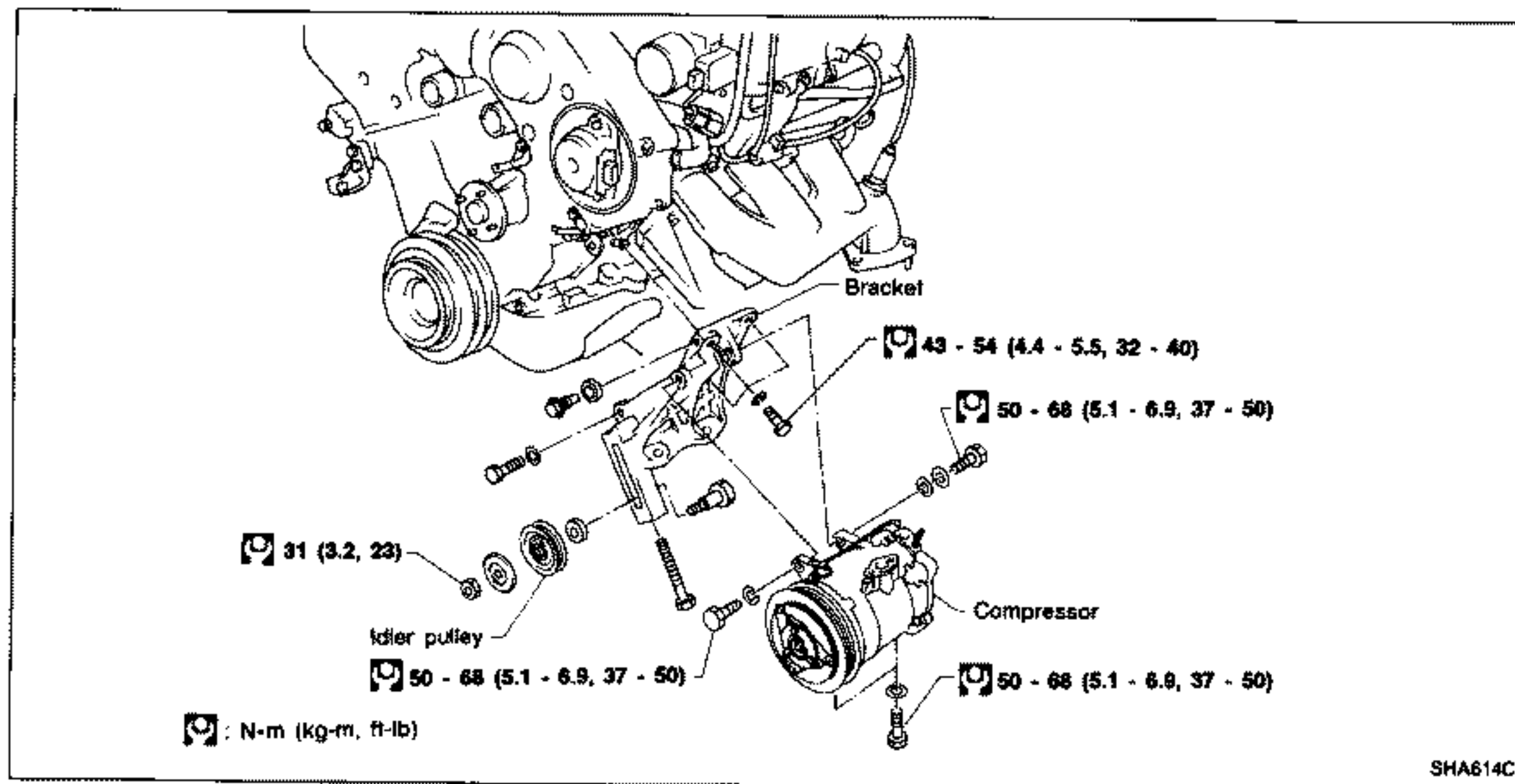


: N·m (kg·m, ft·lb)

SHA718C

SERVICE PROCEDURES

Compressor Mounting



Belt Tension

- Refer to section MA.

Fast Idle Control Device (F.I.C.D.)

- Refer to section EF & EC.

A/C PERFORMANCE TEST

Performance Chart

TEST CONDITION — For Manual Air Conditioner

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)

Doors: Closed

Door windows: Open

Hood: Open

TEMP. lever position: Max. COLD

Mode switch:  (Ventilation) set

REC switch:  (Recirculation) set

FAN lever position: Max. position

Engine speed: 1,500 rpm

Time required before starting testing after air conditioner starts operating: More than 10 minutes

TEST READING

For Australia

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	6.5 - 7.2 (44 - 45)
	25 (77)	11.0 - 12.0 (52 - 54)
	30 (86)	15.6 - 16.8 (60 - 62)
	35 (95)	20.3 - 21.6 (69 - 71)
60 - 70	20 (68)	7.2 - 7.9 (45 - 46)
	25 (77)	12.0 - 12.9 (54 - 55)
	30 (86)	16.8 - 17.9 (62 - 64)
	35 (95)	21.6 - 22.9 (71 - 73)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm ² , psi)	Low-pressure (Suction side) kPa (bar, kg/cm ² , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	1,079 - 1,324 (10.79 - 13.24, 11.0 - 13.5, 156 - 192)	105.9 - 129.5 (1.059 - 1.295, 1.08 - 1.32, 15.4 - 18.8)
	25 (77)	1,196 - 1,461 (11.96 - 14.61, 12.2 - 14.9, 173 - 212)	146.1 - 178.5 (1.461 - 1.785, 1.49 - 1.82, 21.2 - 25.9)
	30 (86)	1,373 - 1,687 (13.73 - 16.87, 14.0 - 17.2, 199 - 245)	187.3 - 228.5 (1.873 - 2.285, 1.91 - 2.33, 27.2 - 33.1)
	35 (95)	1,589 - 1,942 (15.89 - 19.02, 16.2 - 19.8, 230 - 282)	229.5 - 280.5 (2.295 - 2.805, 2.34 - 2.86, 33.3 - 40.7)
	40 (104)	1,804 - 2,197 (18.04 - 21.97, 18.4 - 22.4, 262 - 319)	269.7 - 329.5 (2.697 - 3.295, 2.75 - 3.36, 39.1 - 47.8)
	45 (113)	1,991 - 2,442 (19.91 - 24.42, 20.3 - 24.9, 289 - 354)	308.9 - 377.6 (3.089 - 3.776, 3.15 - 3.85, 44.8 - 54.7)

A/C PERFORMANCE TEST

Performance Chart (Cont'd)

TEST CONDITION — For Auto Air Conditioner

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated place)

Doors: Closed

Door windows: Open

Hood: Open

 Set up ACTIVE-TEST with CONSULT and set each component as follows:

Mode door: VENT

Intake door: REC

Air mix door: Full-cold

Compressor: ON

Blower motor: 12V

 Set up self-diagnosis STEP 2 and set code No. "66".

A/C PERFORMANCE TEST

Performance Chart (Cont'd)

VG30DETT engine L.H.D. model

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	7.0 - 7.8 (45 - 46)
	25 (77)	11.6 - 12.7 (53 - 55)
	30 (86)	16.5 - 17.7 (62 - 64)
	35 (95)	21.3 - 22.7 (70 - 73)
	40 (104)	26.2 - 27.8 (79 - 82)
60 - 70	20 (68)	7.8 - 8.7 (46 - 48)
	25 (77)	12.7 - 13.8 (55 - 57)
	30 (86)	17.7 - 18.9 (64 - 66)
	35 (95)	22.7 - 24.1 (73 - 75)
	40 (104)	27.8 - 29.6 (82 - 85)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm ² , psi)	Low-pressure (Suction side) kPa (bar, kg/cm ² , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	785 - 961 (7.85 - 9.61, 8.0 - 9.8, 114 - 139)	68.6 - 103.0 (0.686 - 1.030, 0.70 - 1.05, 10.0 - 14.9)
	25 (77)	912 - 1,108 (9.12 - 11.08, 9.3 - 11.3, 132 - 161)	118.7 - 150.0 (1.187 - 1.500, 1.21 - 1.53, 17.2 - 21.8)
	30 (86)	1,128 - 1,383 (11.28 - 13.83, 11.5 - 14.1, 164 - 201)	167.7 - 205.0 (1.677 - 2.050, 1.71 - 2.09, 24.3 - 29.7)
	35 (95)	1,353 - 1,657 (13.53 - 16.57, 13.8 - 16.9, 196 - 240)	213.8 - 260.9 (2.138 - 2.609, 2.18 - 2.66, 31.0 - 37.8)
	40 (104)	1,579 - 1,922 (15.79 - 19.22, 16.1 - 19.6, 229 - 279)	258.9 - 315.8 (2.589 - 3.158, 2.64 - 3.22, 37.5 - 45.8)
	45 (113)	1,795 - 2,207 (17.95 - 22.07, 18.3 - 22.5, 260 - 320)	304.0 - 372.7 (3.040 - 3.727, 3.10 - 3.80, 44.1 - 54.0)

A/C PERFORMANCE TEST

Performance Chart (Cont'd)

VG30DETT ENGINE R.H.D. MODEL

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	7.0 - 7.8 (45 - 46)
	25 (77)	10.2 - 11.4 (50 - 53)
	30 (86)	15.2 - 16.5 (59 - 62)
	35 (95)	20.4 - 21.5 (69 - 71)
	40 (104)	25.4 - 26.7 (78 - 80)
60 - 70	20 (68)	7.8 - 8.6 (46 - 47)
	25 (77)	11.4 - 12.4 (53 - 54)
	30 (86)	16.5 - 17.6 (62 - 64)
	35 (95)	21.5 - 22.8 (71 - 73)
	40 (104)	26.7 - 28.0 (80 - 82)

Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm ² , psi)	Low-pressure (Suction side) kPa (bar, kg/cm ² , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	1,098 - 1,353 (10.98 - 13.53, 11.2 - 13.8, 159 - 196)	122.6 - 152.0 (1.226 - 1.520, 1.25 - 1.55, 17.8 - 22.0)
	25 (77)	1,265 - 1,559 (12.65 - 15.59, 12.9 - 15.9, 183 - 226)	156.9 - 194.2 (1.569 - 1.942, 1.60 - 1.98, 22.8 - 28.2)
	30 (86)	1,451 - 1,785 (14.51 - 17.85, 14.8 - 18.2, 210 - 259)	185.4 - 226.5 (1.854 - 2.265, 1.89 - 2.31, 26.9 - 32.8)
	35 (95)	1,608 - 1,981 (16.08 - 19.81, 16.4 - 20.2, 233 - 287)	220.7 - 269.7 (2.207 - 2.697, 2.25 - 2.75, 32.0 - 39.1)
	40 (104)	1,765 - 2,158 (17.65 - 21.58, 18.0 - 22.0, 256 - 313)	247.1 - 313.8 (2.471 - 3.138, 2.52 - 3.20, 35.8 - 45.5)
	45 (113)	1,942 - 2,373 (19.42 - 23.73, 19.8 - 24.2, 282 - 344)	274.6 - 362.9 (2.746 - 3.629, 2.80 - 3.70, 39.8 - 52.6)

A/C PERFORMANCE TEST

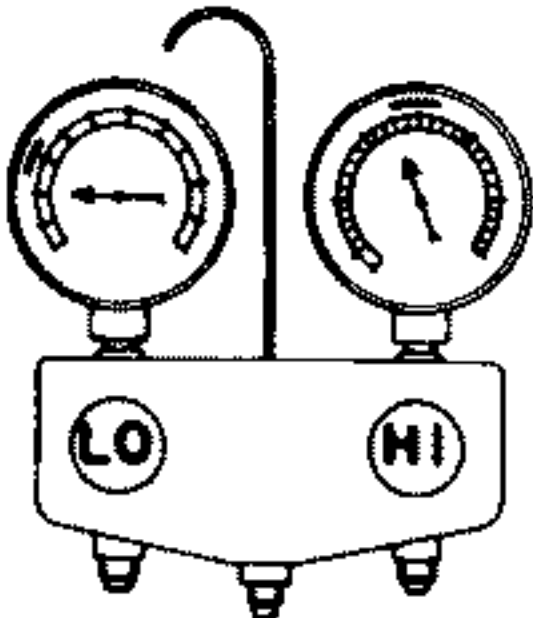
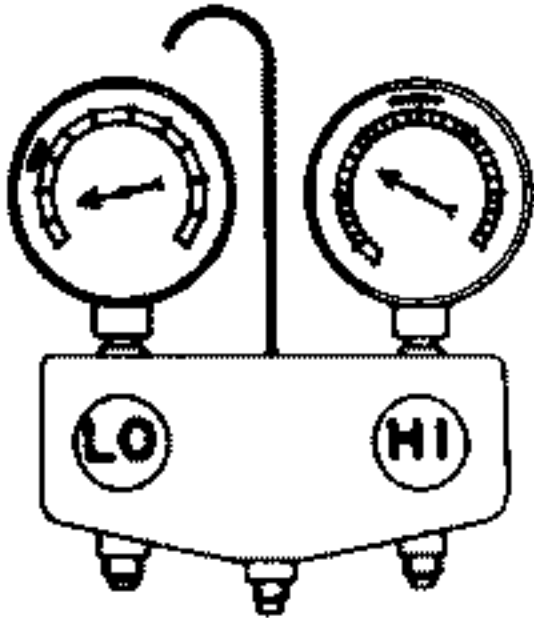
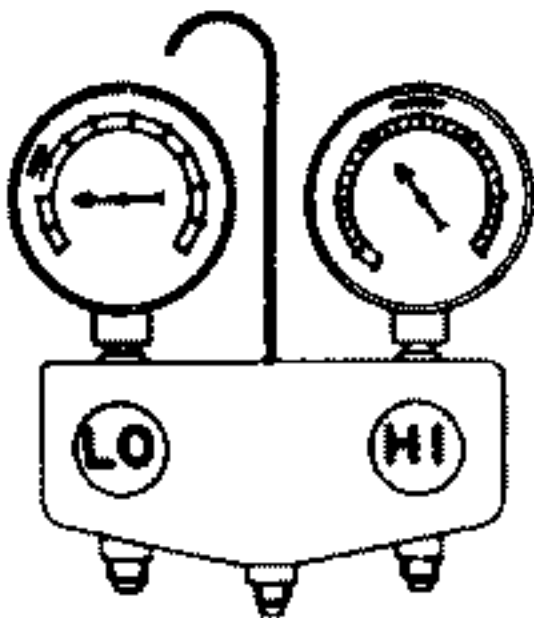
Performance Test Diagnoses

Characteristics revealed by the manifold gauge readings for the air conditioning system are shown in the following table.

For how to do the performance test, refer to the item "Performance Chart".

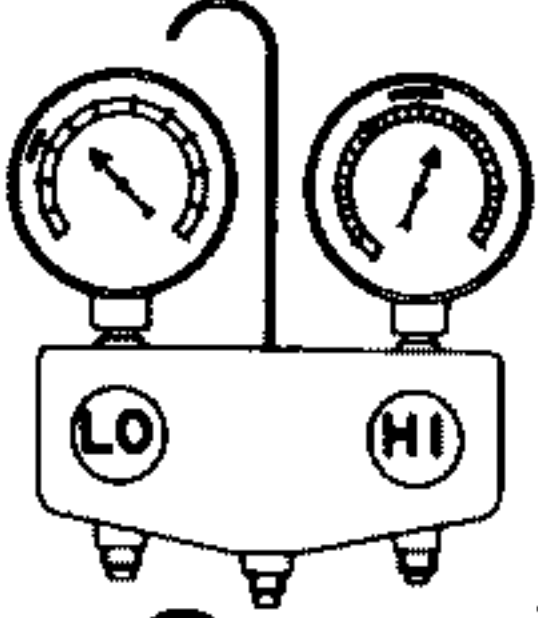
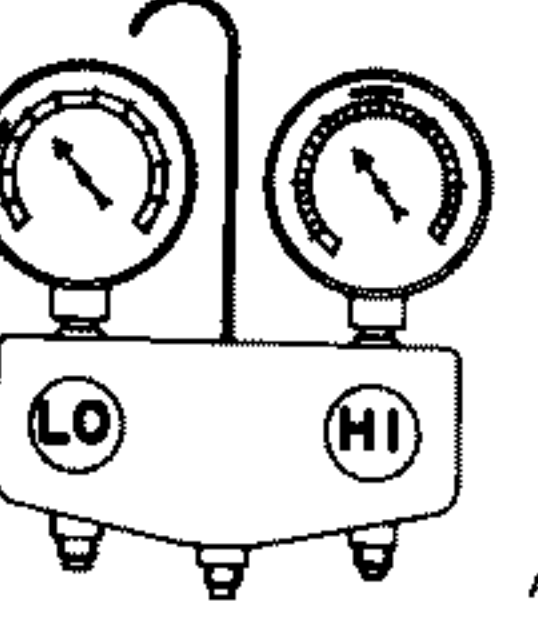
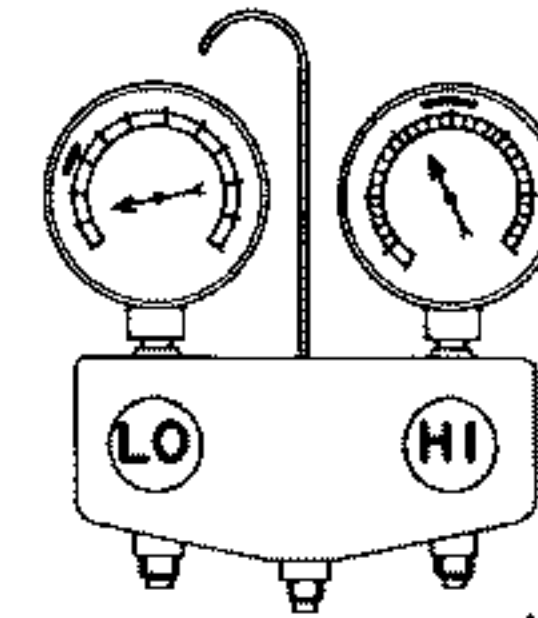
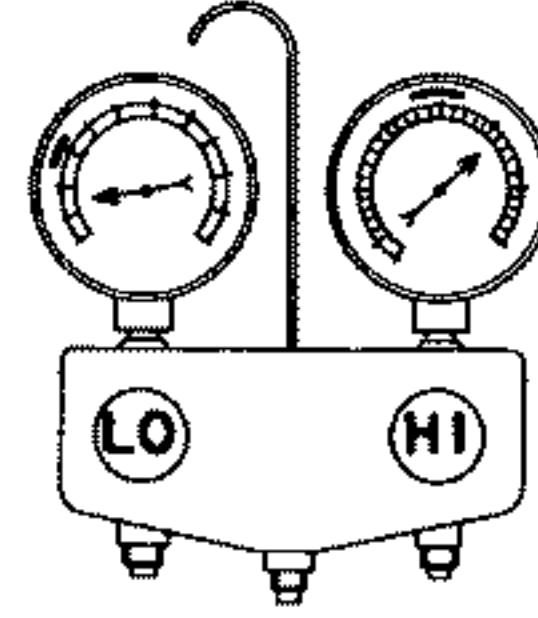
In the following table, the portion marked on each gauge scale indicates the range which shows that the air conditioning system is in good order.

This range is described in Performance Chart.

Condition	Probable cause	Corrective action
INSUFFICIENT REFRIGERANT CHARGE  Insufficient cooling. Bubbles appear in sight glass. AC352A	Refrigerant is low, or leaking slightly.	1. Leak test. 2. Repair leak. 3. Charge system. Evacuate, as necessary, and recharge system.
ALMOST NO REFRIGERANT  No cooling action. A lot of bubbles or something like mist appears in sight glass. AC353A	Serious refrigerant leak.	Stop compressor immediately. 1. Leak test. 2. Discharge system. 3. Repair leak(s). 4. Replace receiver drier if necessary. 5. Check oil level. 6. Evacuate and recharge system.
MALFUNCTIONING EXPANSION VALVE  Slight cooling. Sweat or frosting on expansion valve inlet. AC354A	Expansion valve restricts refrigerant flow. ● Expansion valve is clogged. ● Expansion valve is inoperative. Valve stuck closed. Thermal bulb has lost charge.	If valve inlet reveals sweat or frost: 1. Discharge system. 2. Remove valve and clean it. Replace it if necessary. 3. Evacuate system. 4. Charge system. If valve does not operate: 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

Condition		Probable cause	Corrective action
 AC355A  AC356A	Insufficient cooling. Sweat on suction line. No cooling. Sweat or frosting on suction line.	Expansion valve allows too much refrigerant through evaporator. Malfunctioning expansion valve.	Check valve for operation. If suction side does not show a pressure decrease, replace valve. 1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
MALFUNCTIONING SUCTION THROTTLE VALVE			
 AC357A	Insufficient cooling. Frosted evaporator.	Suction throttle valve is inoperative.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.
 AC358A	Insufficient cooling.	Suction throttle valve restricts refrigerant flow.	1. Discharge system. 2. Replace valve. 3. Evacuate and charge system.

A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

Condition	Probable cause	Corrective action
MALFUNCTIONING CONDENSER AC361A No cooling action: engine may overheat. Bubbles appear in sight glass of drier. Suction line is very hot.	Usually a malfunctioning condenser.	• Check fan belt and fluid coupling • Check radiator fan motor. • Check condenser for dirt accumulation. • Check engine cooling system for overheating. • Check for refrigerant overcharging. If pressure remains high in spite of all above actions taken, remove and inspect the condenser for possible oil clogging.
HIGH-PRESSURE LINE BLOCKED AC362A Insufficient cooling. Frosted high-pressure liquid line.	Drier clogged, or restriction in high-pressure line.	1. Discharge system. 2. Remove receiver drier or strainer and replace it. 3. Evacuate and charge system.
MALFUNCTIONING COMPRESSOR AC363A Insufficient cooling.	Internal problem in compressor, or damaged gasket and valve.	1. Discharge system. 2. Remove and check compressor. 3. Repair or replace compressor. 4. Check oil level. 5. Replace receiver drier. 6. Evacuate and charge system.

A/C PERFORMANCE TEST

Performance Test Diagnoses (Cont'd)

Condition	Probable cause	Corrective action
TOO MUCH OIL IN SYSTEM (Excessive) AC364A Insufficient cooling.	Too much oil circulates with refrigerant, causing the cooling capacity of the system to be reduced.	Refer to COMPRESSOR OIL for correcting oil level.
AIR IN SYSTEM AC359A Insufficient cooling. Sight glass shows occasional bubbles.	Air mixed with refrigerant in system.	1. Discharge system. 2. Replace receiver drier. 3. Evacuate and charge system.
MOISTURE IN SYSTEM AC360A After short operation, suction side may show vacuum pressure reading. During this condition, discharge air will be warm. As a warning of this, reading vibrates around 39 kPa (0.39 bar, 0.4 kg/cm², 6 psi).	Drier is saturated with moisture. Moisture has frozen in expansion valve. Refrigerant flow is restricted.	1. Discharge system. 2. Replace receiver drier (twice if necessary). 3. Evacuate system completely. (Repeat 30-minutes evacuating three times.) 4. Recharge system.

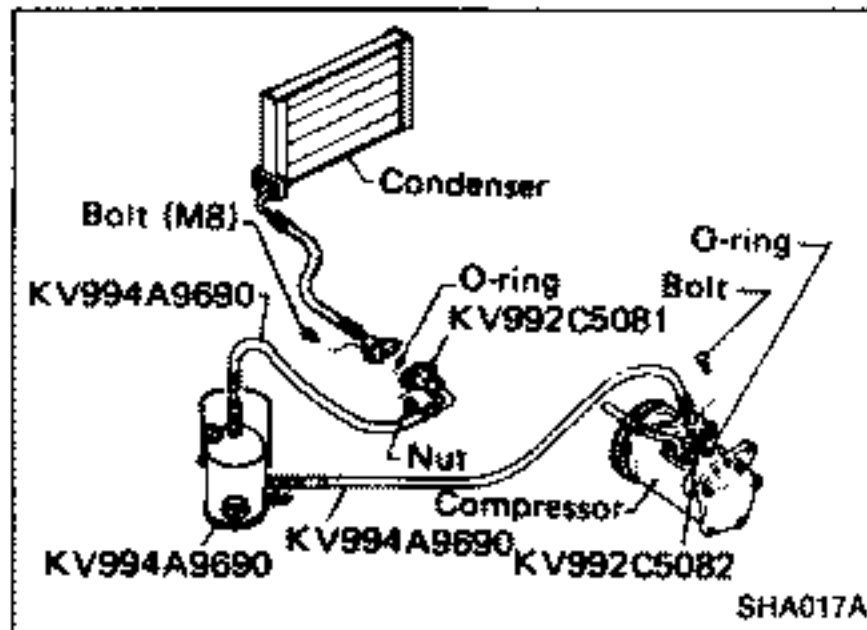
Checking and Adjusting

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.

Total amount of oil in the system:

150 ml (5.3 imp fl oz)



1. Connect oil separator KV994A9690 between compressor discharge side and condenser.
2. Evacuate and charge the system.
3. Operate compressor at engine idling with air conditioner set for maximum cooling and high fan speed.
4. Stop compressor operation after 10 minutes.

CAUTION:

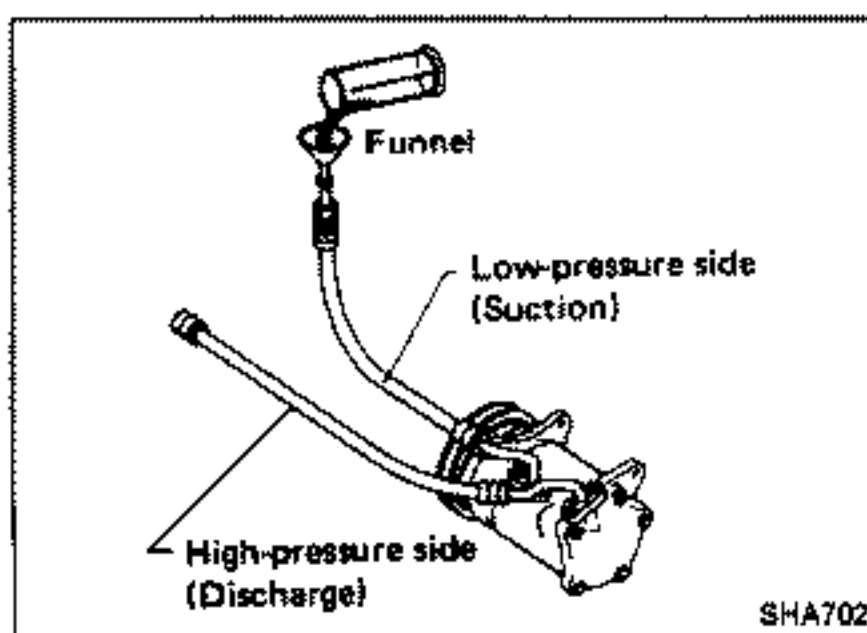
Never allow engine speed to exceed idling speed.

Do not continue compressor operation for more than 10 minutes.

5. Disconnect oil separator and connect refrigerant line to original positions.
6. Disconnect low flexible hose from compressor suction valve.
7. Add new oil from compressor suction port.

Amount of oil to be added:

120 ml (4.2 imp fl oz)



- **About 30 ml (1.1 imp fl oz) of oil remains unremoved in the system.**

8. After adding oil, rotate compressor clutch by hand 5 to 10 turns.
9. Connect refrigerant line and evacuate and charge system.
10. Conduct leak test and performance test.
11. Gradually loosen drain cap of oil separator to release residual pressure. Remove cap and drain oil.
12. To prevent formation of rust and intrusion of moisture or dust, perform the following before placing oil separator kit into storage.
 - 1) Cap each opening of flexible hose and double union securely.
 - 2) Cap oil separator, evacuate it from service valve, and charge refrigerant.

When oil contains chips or other foreign material. After air conditioner system has been flushed with refrigerant replace receiver drier. Then pour in 150 ml (5.3 imp fl oz) of oil into air conditioner system.

COMPRESSOR OIL — For MJS170 (HITACHI make)

IF OIL SEPARATOR IS NOT AVAILABLE

Add oil accordance with the table below.

Condition		Amount of oil to be added mℓ(imp fl oz)
Replacement of compressor		1. Remove all oil from new and old compressors.* 2. Charge new compressor with the same amount of oil as was in the old compressor.
Replacement of front cooling unit		70 (2.5)
Replacement of rear cooling unit		15 (0.5)
Replacement of cool box		10 (0.4)
Replacement of receiver drier (liquid tank)		10 (0.4)
Replacement of condenser	There is no sign of oil leakage from condenser.	10 (0.4)
	There are evidences of a large amount of oil leakage from condenser.	60 (2.1)
Replacement of flexible hose or pipe	There is no sign of oil leakage.	Oil need not be added.
	There are evidences of a large amount of oil leakage.	60 (2.1)
Gas leakage	There is no sign of oil leakage.	Oil need not be added.
	There are evidences of a large amount of oil leakage.	60 (2.1)

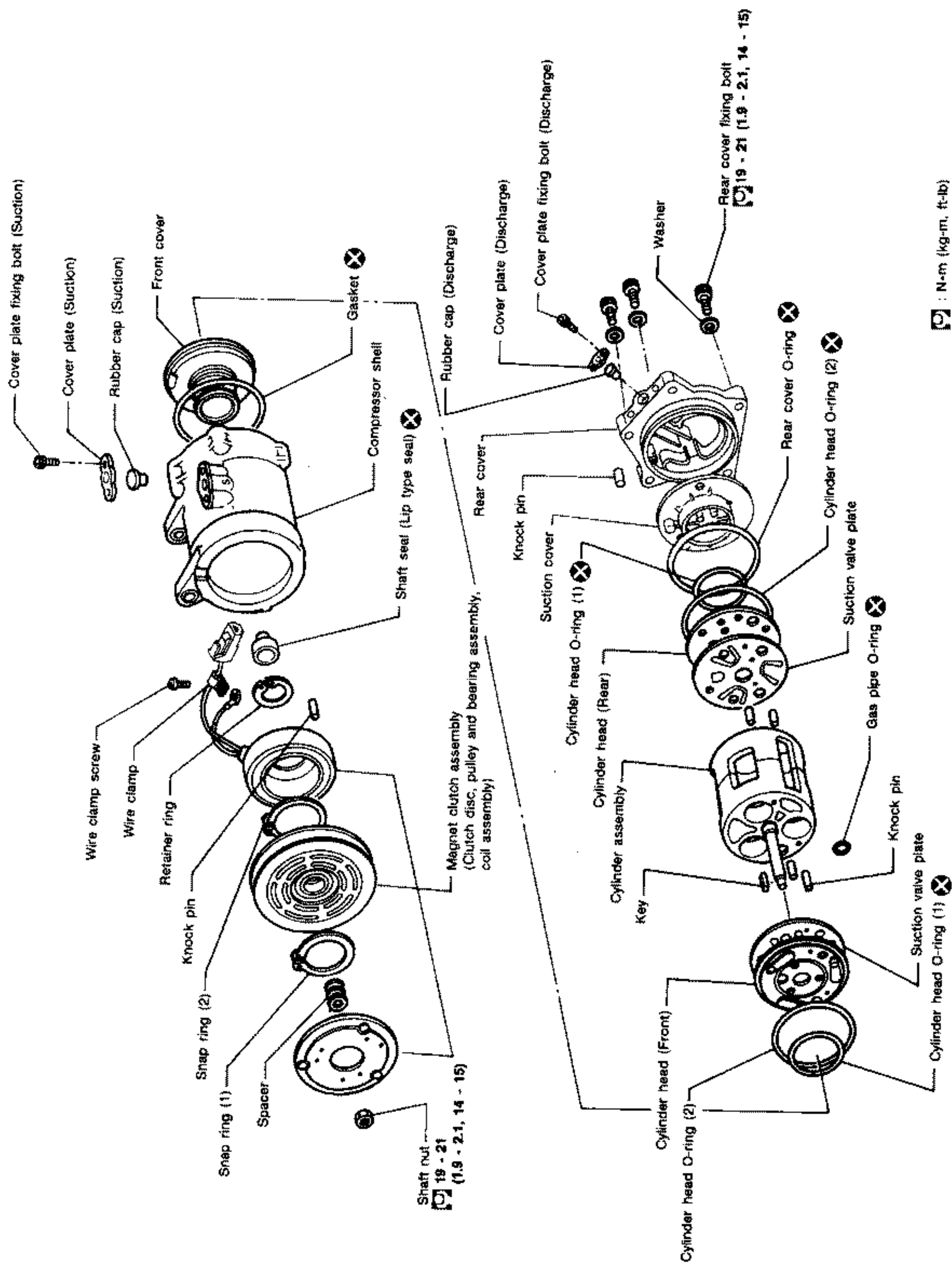
*: Remove compressor oil as follows.

1. With the compressor upside down, completely drain the oil through the suction port (from the embossed letter "s" mark side).
2. When the oil stops flowing out, rotate the clutch hub two or three times to completely drain the oil.

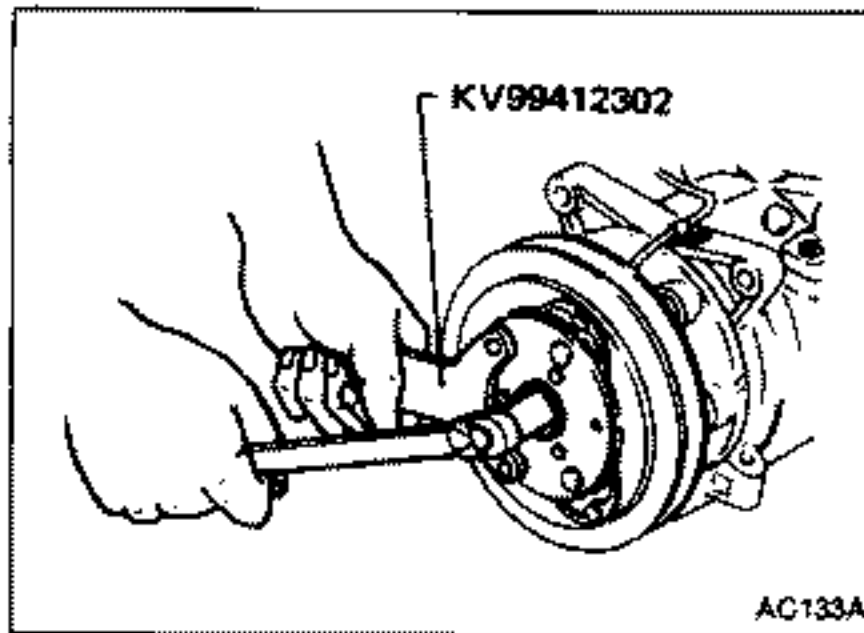
Precautions

- 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.
- When installing shaft seal, O-ring and gaskets, apply compressor oil sparingly to the contact surface. Do not reuse them.
- After replacement or repairs, conduct a Leak Test.

COMPRESSOR — Model MJS170 (HITACHI make)



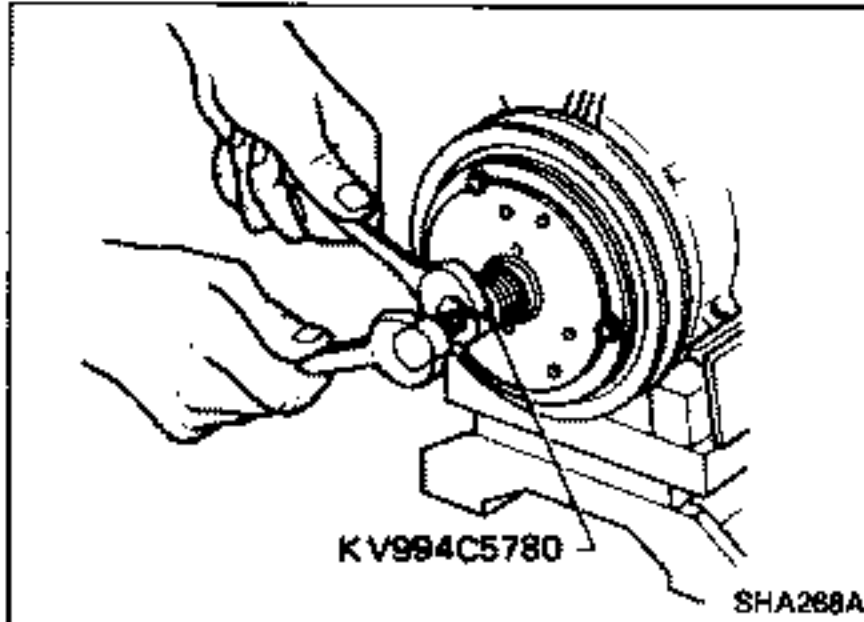
⊗ : N·m (kg·m, ft·lb)



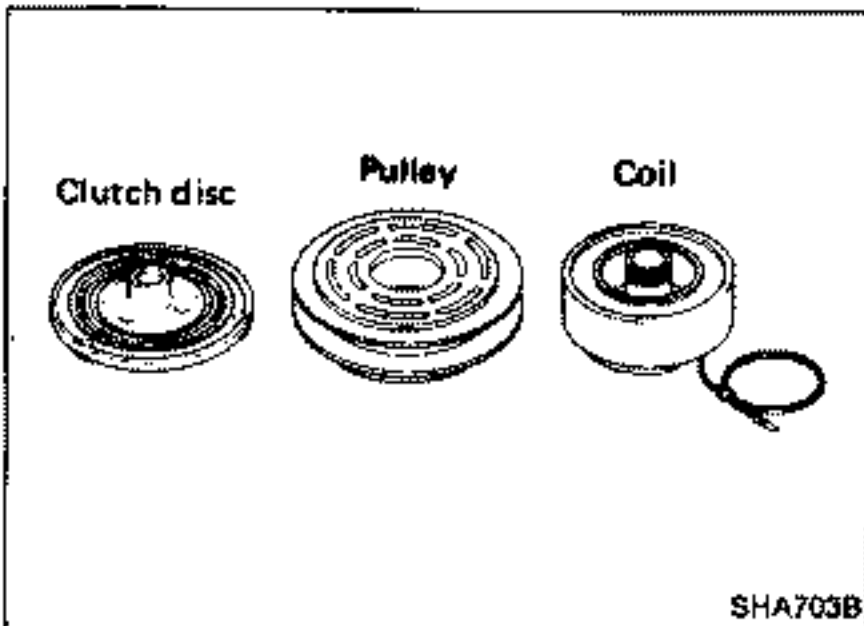
Compressor Clutch

REMOVAL

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



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



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 reinstallation.

Coil

Check coil for loose connection or cracked insulation.

COMPRESSOR — Model MJS170 (HITACHI make)

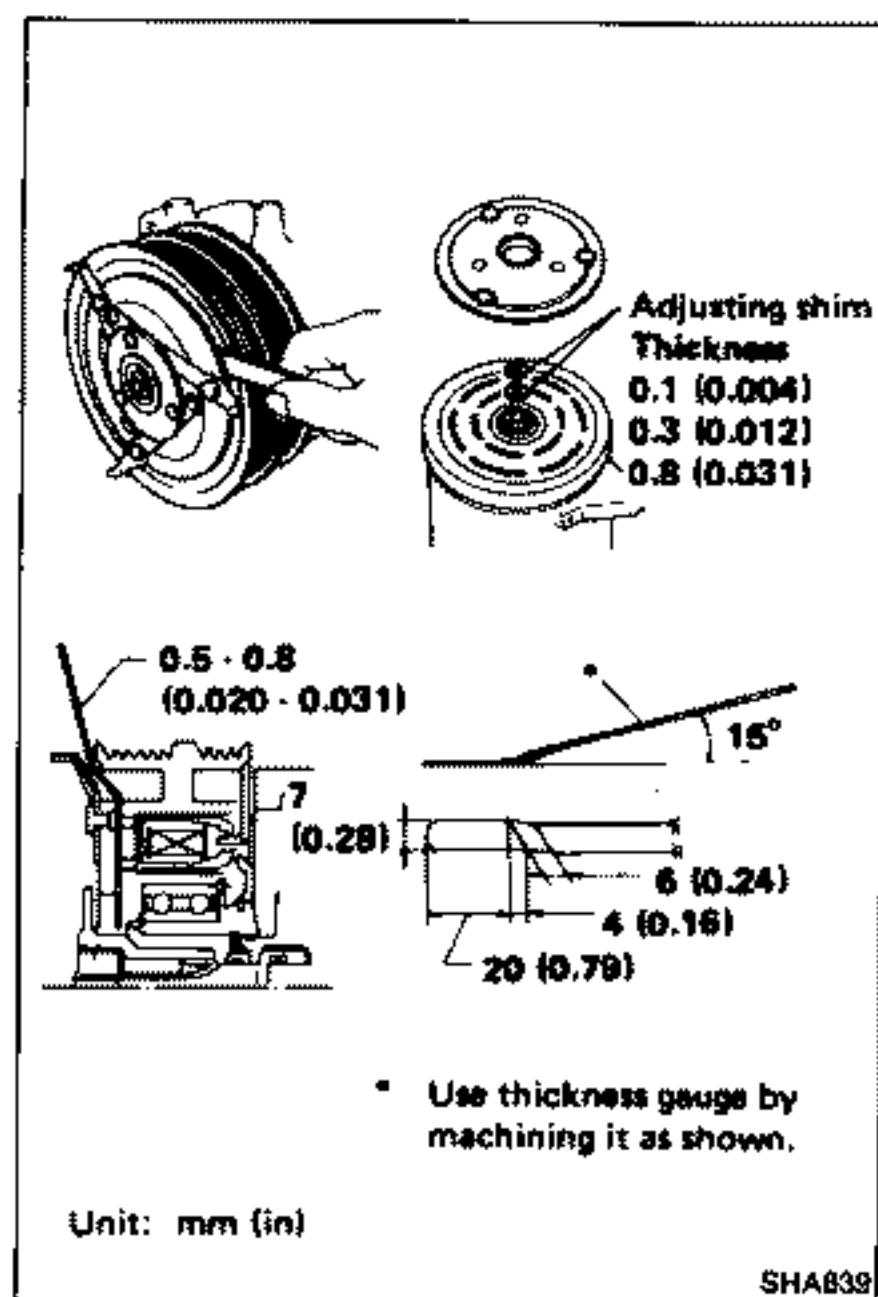
Compressor Clutch (Cont'd)

ADJUSTMENT

- When assembling clutch disc, adjust disc-to-pulley clearance with shims.

BREAK-IN OPERATION

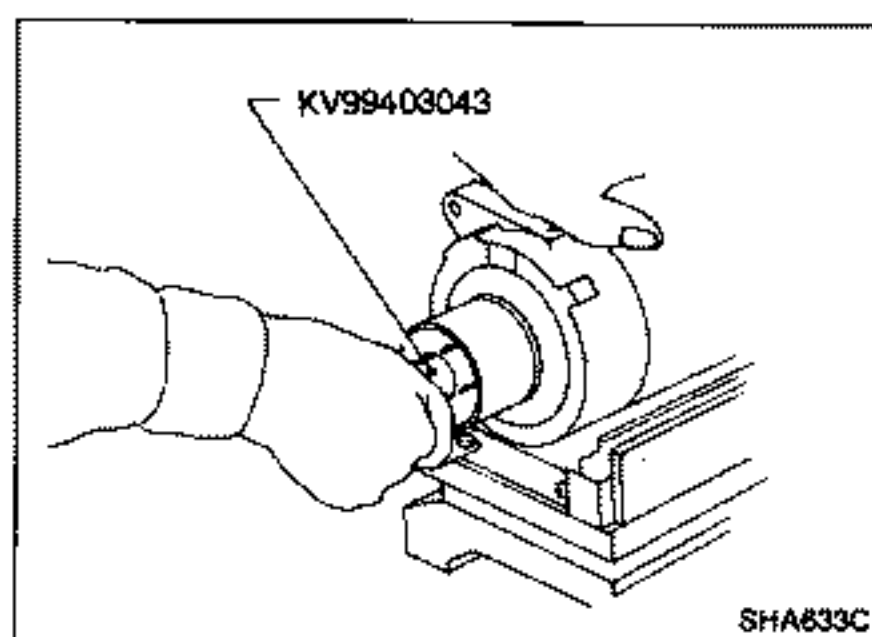
When replacing compressor clutch assembly, do not forget break-in operation, accomplished by engaging and disengaging the clutch about thirty times. Break-in operation raises the level of transmitted torque.



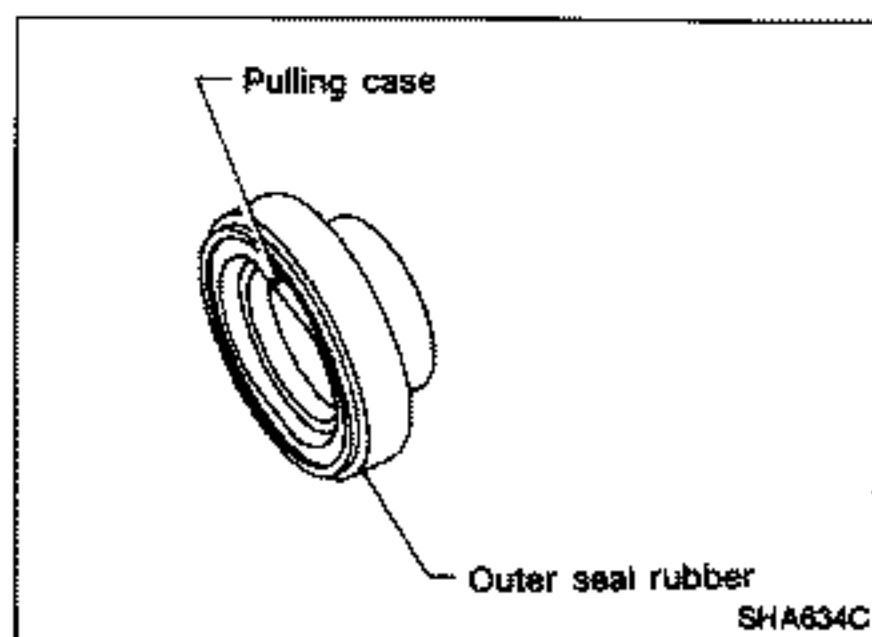
Shaft Seal

REMOVAL

- Before disassembling, be sure to measure the amount of oil. After assembling, charge with the same amount of new oil.



- With Tool KV99403043, remove shaft seal by hooking the pulling case.



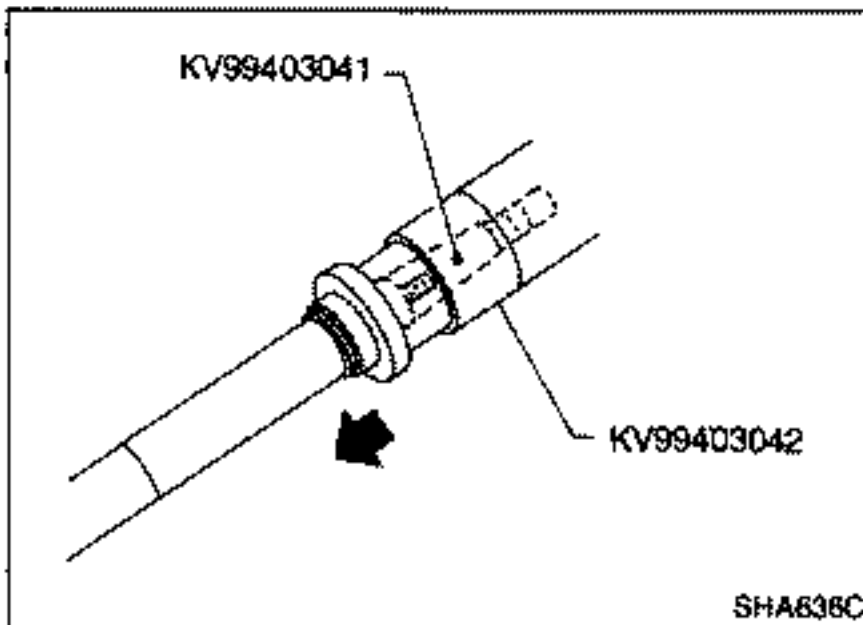
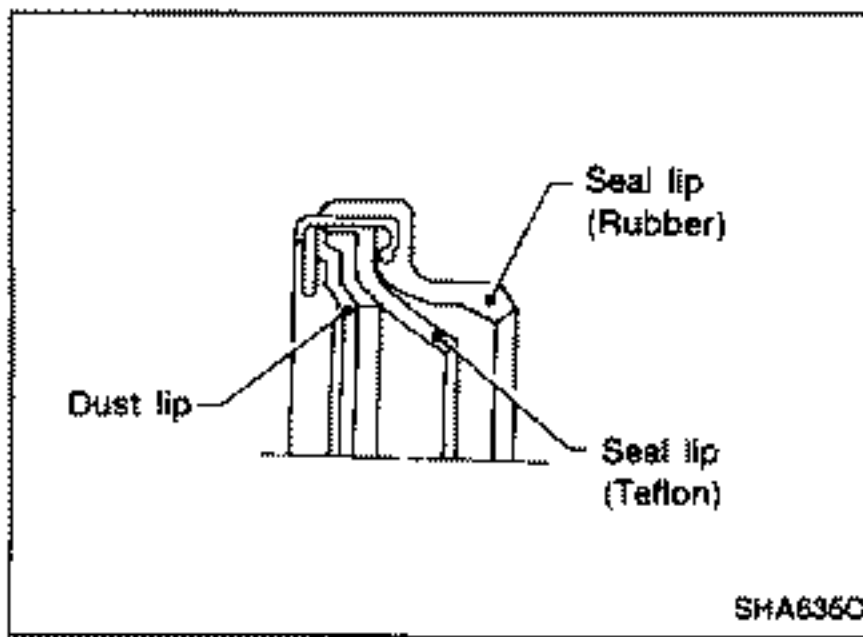
INSPECTION

- Check the outer seal rubber for scars and hardening.

COMPRESSOR — Model MJS170 (HITACHI make)

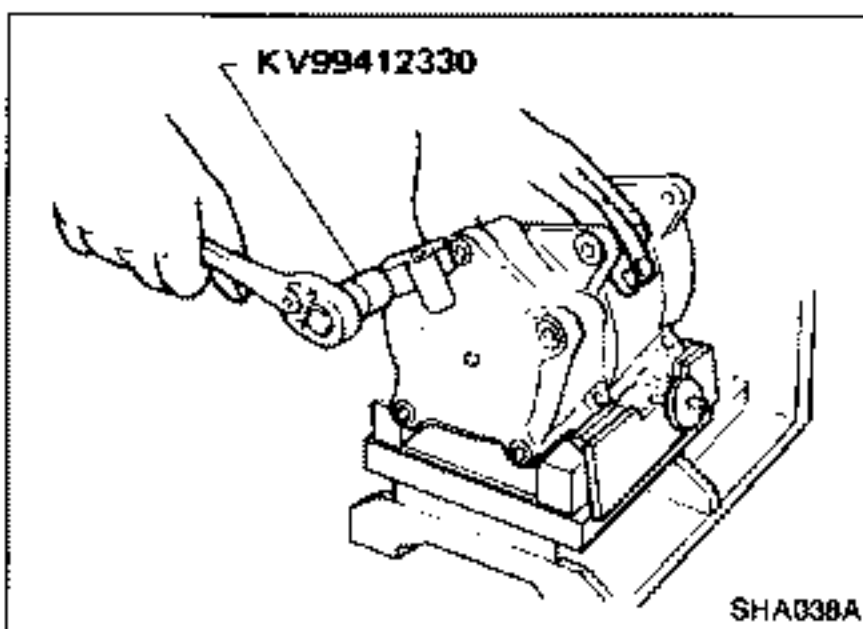
Shaft Seal (Cont'd)

- Check the seal lips for scars and wear.



INSTALLATION

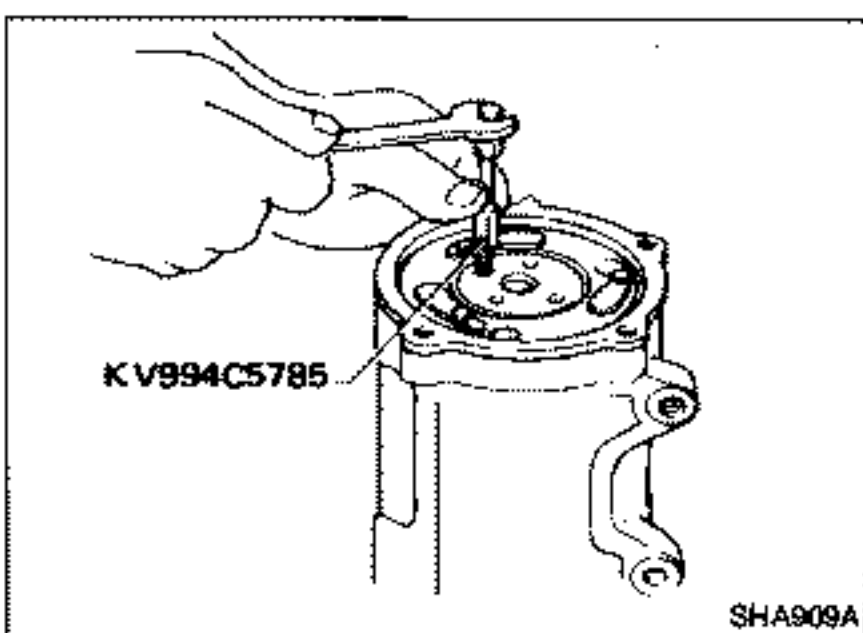
- When installing shaft seal;
 - 1) Cap shaft seal pilot to the top end of compressor shaft.
 - 2) Using shaft seal installer, insert shaft seal.



Cylinder Head, Valve and Cylinder

REMOVAL (Rear)

- Using Allen socket, remove rear cover.



- Using cylinder head remover, remove rear cylinder head.

INSPECTION

- Check suction valve plate and cylinder head for signs of damage.

COMPRESSOR — Model MJS170 (HITACHI make)

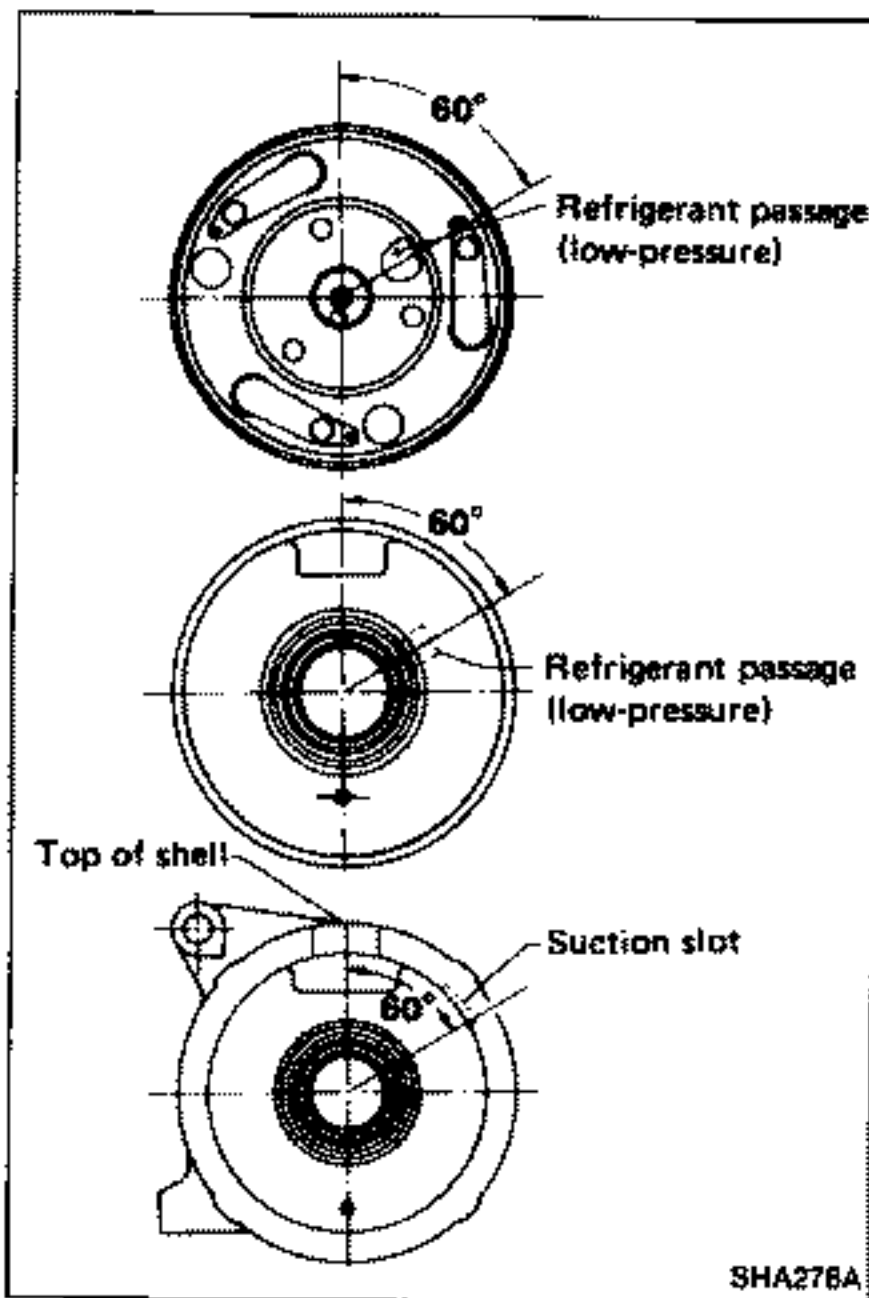
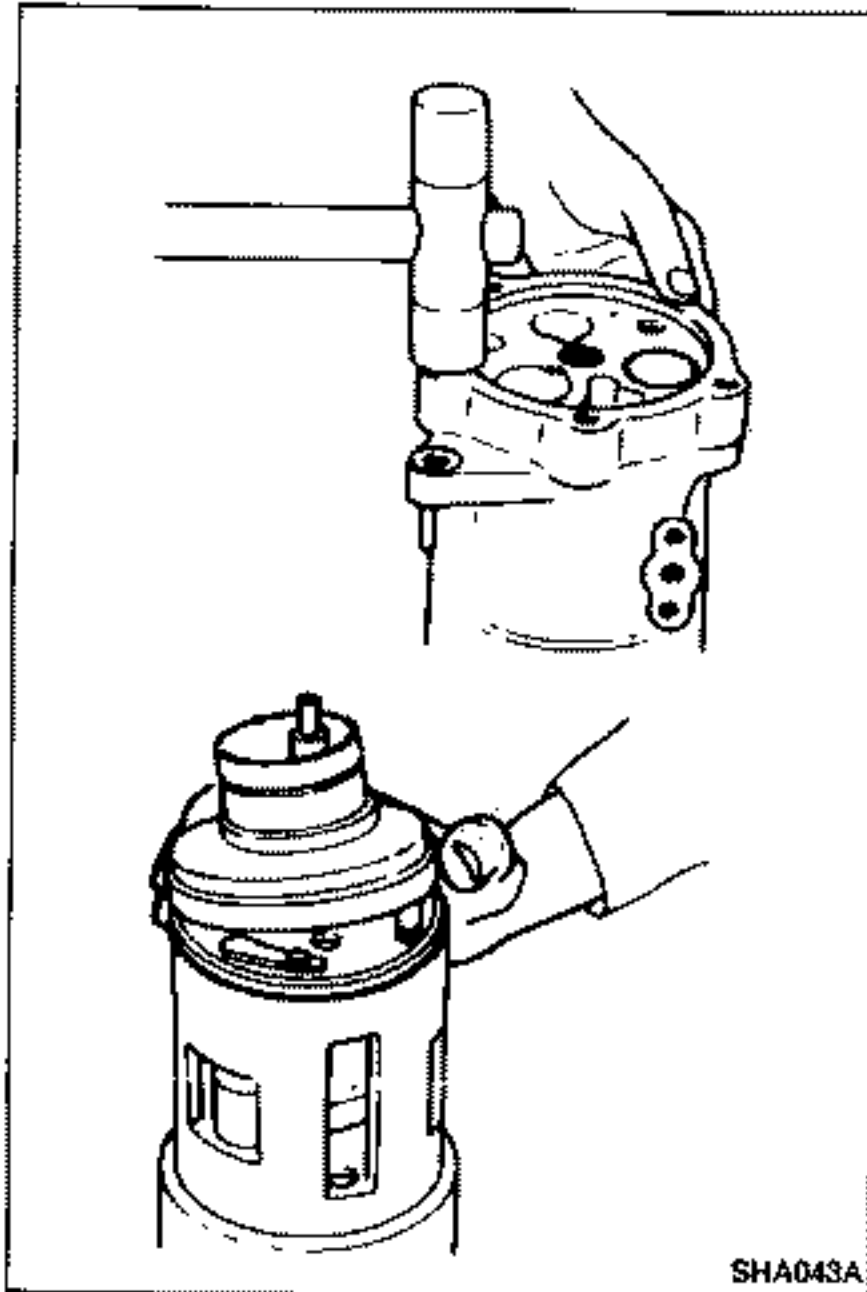
Cylinder Head, Valve and Cylinder (Cont'd)

REMOVAL (Front)

- With the front facing downward, support compressor shell. Using a plastic mallet, tap at the rear end of the shell flange, driving shell straight downward.
- Detach front cover from cylinder assembly.

INSPECTION

- Check suction valve plate and cylinder head for signs of damage.
- Check to make sure contact surfaces of cylinders, compressor shaft and compressor shell are free from any sign of scratches.



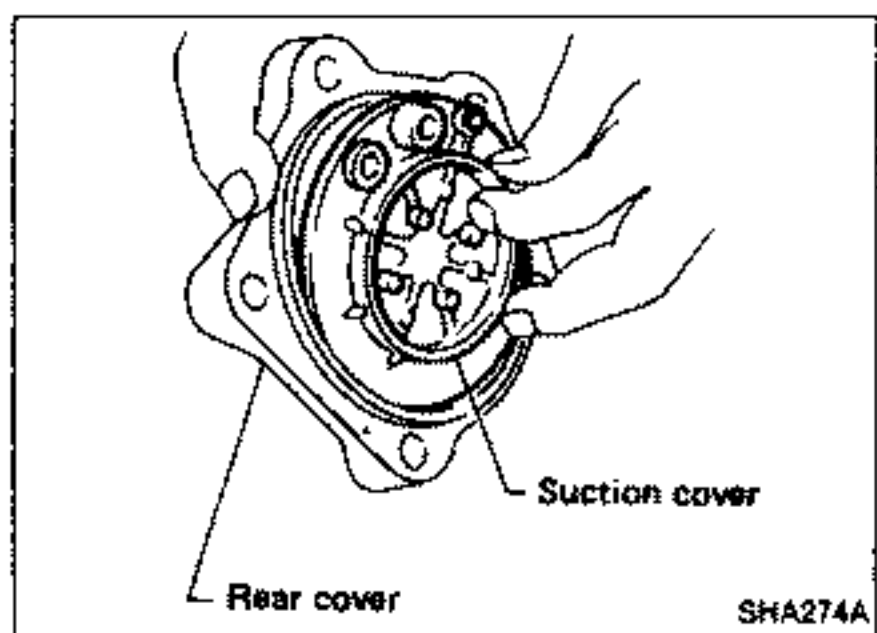
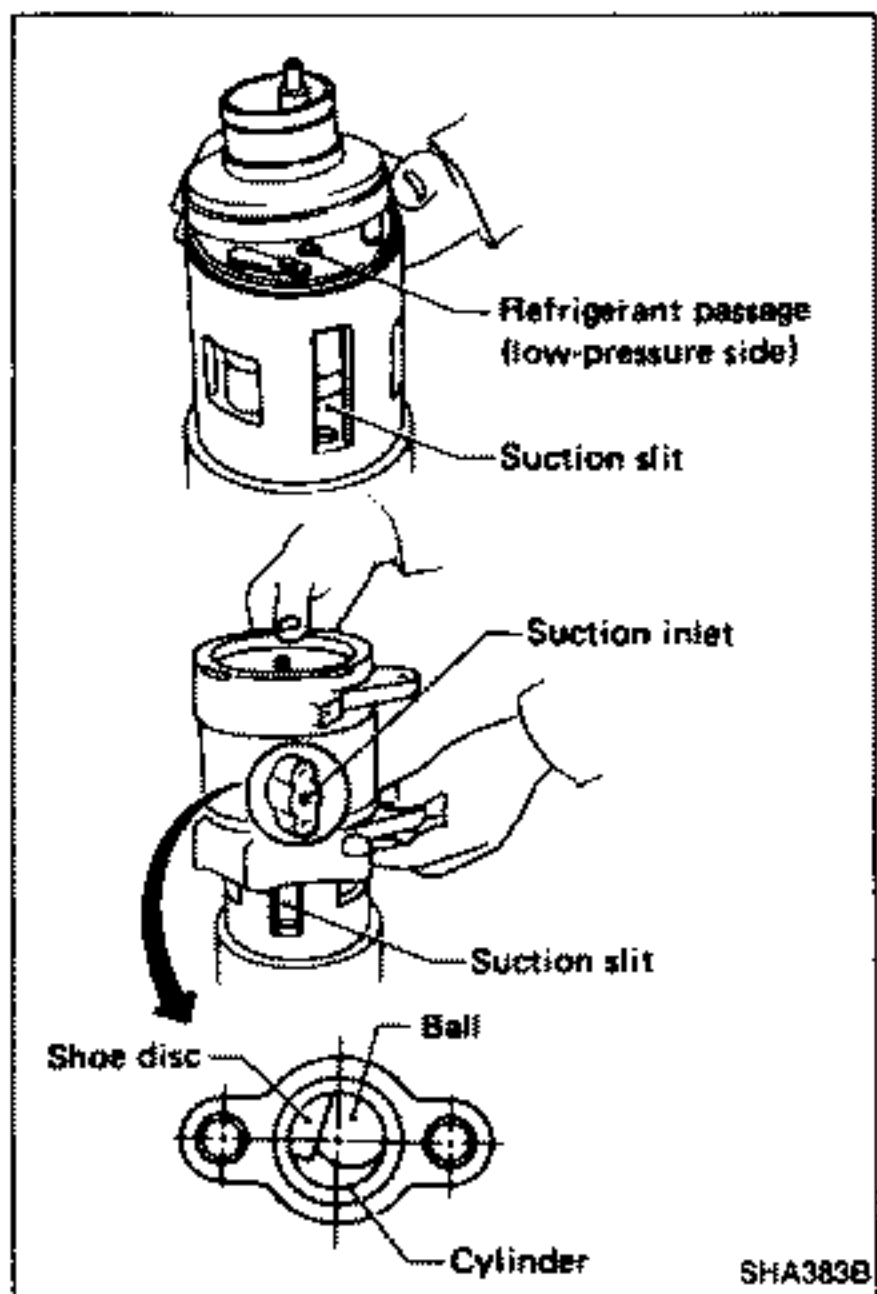
INSTALLATION

1. Front cover must be installed so that the cutout portions of front cover and shell are aligned. For this purpose, install front cover on cylinder head so that angle between threaded hole in front cover and low-pressure side refrigerant passage in cylinder head is about 60°.

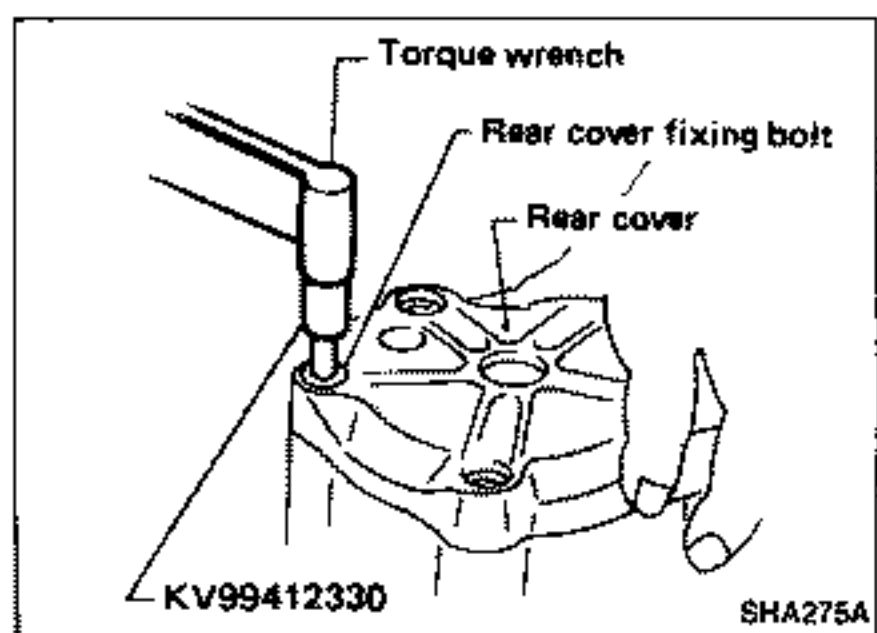
COMPRESSOR — Model MJS170 (HITACHI make)

Cylinder Head, Valve and Cylinder (Cont'd)

2. When installing shell on cylinder, adjust position of shell so that suction inlet of shell opens in the same direction as suction slit of cylinder visible in suction inlet by removing suction valve.

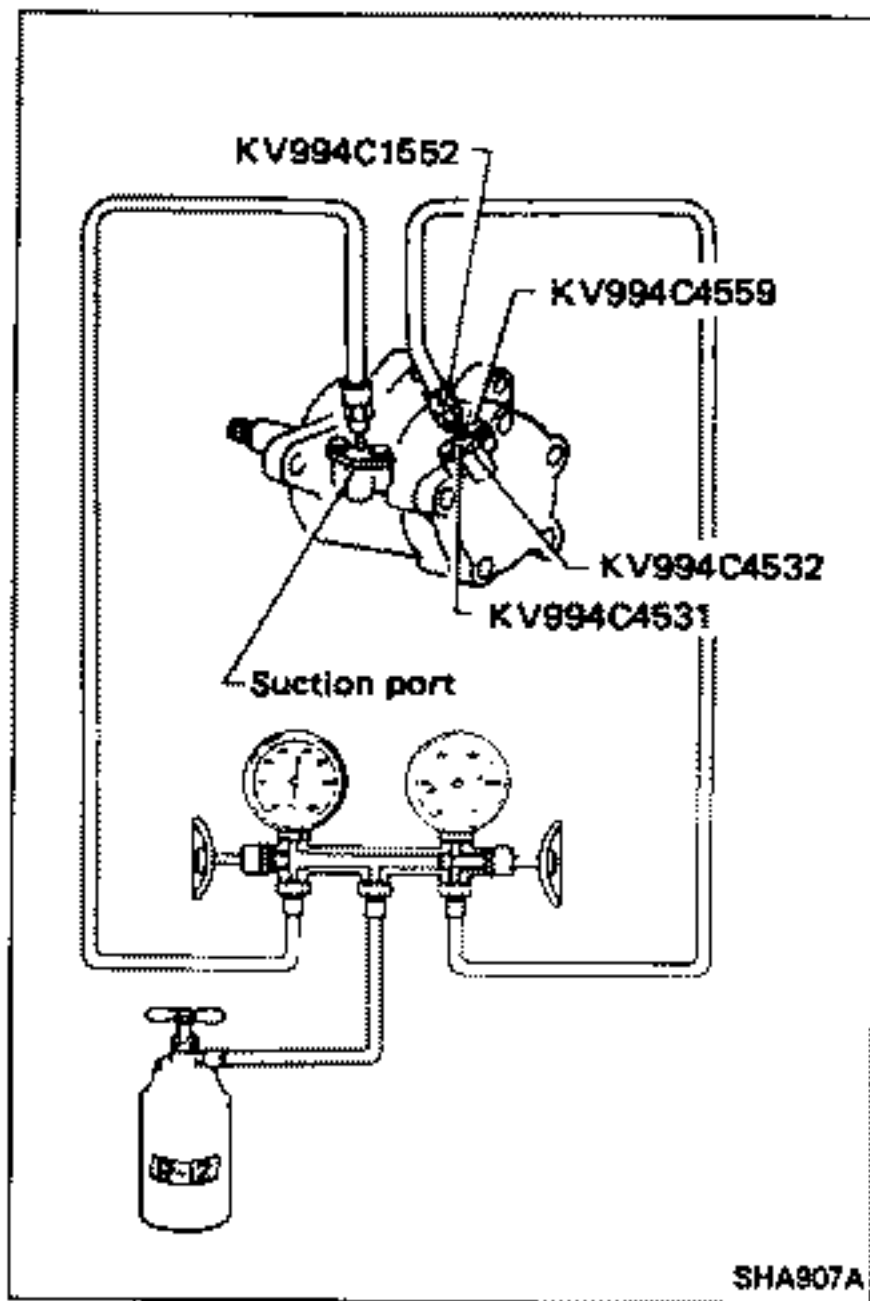


- When installing suction cover to rear cover, align knock pin.



- Using Allen socket, install rear cover.

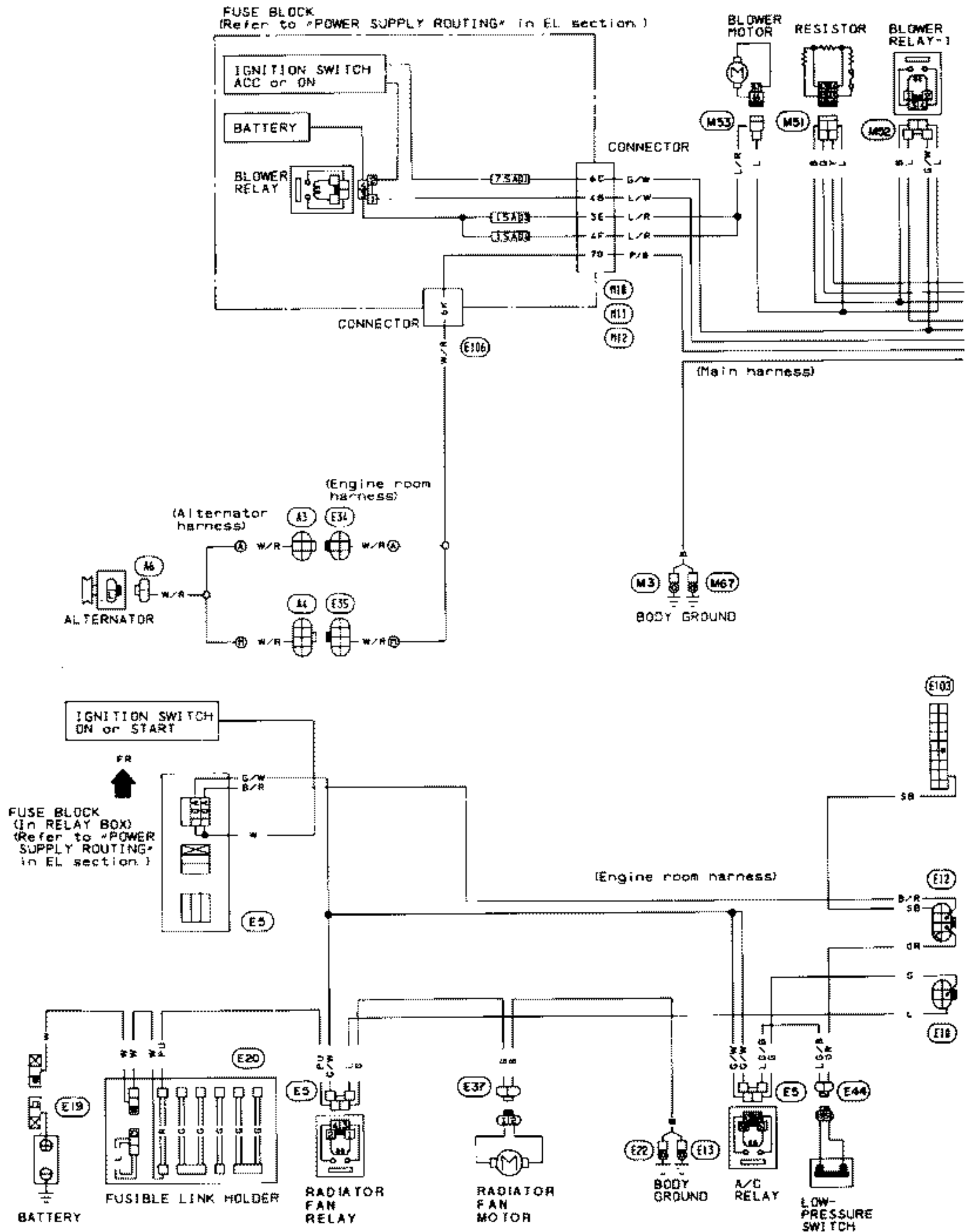
COMPRESSOR — Model MJS170 (HITACHI make)



Leak Test

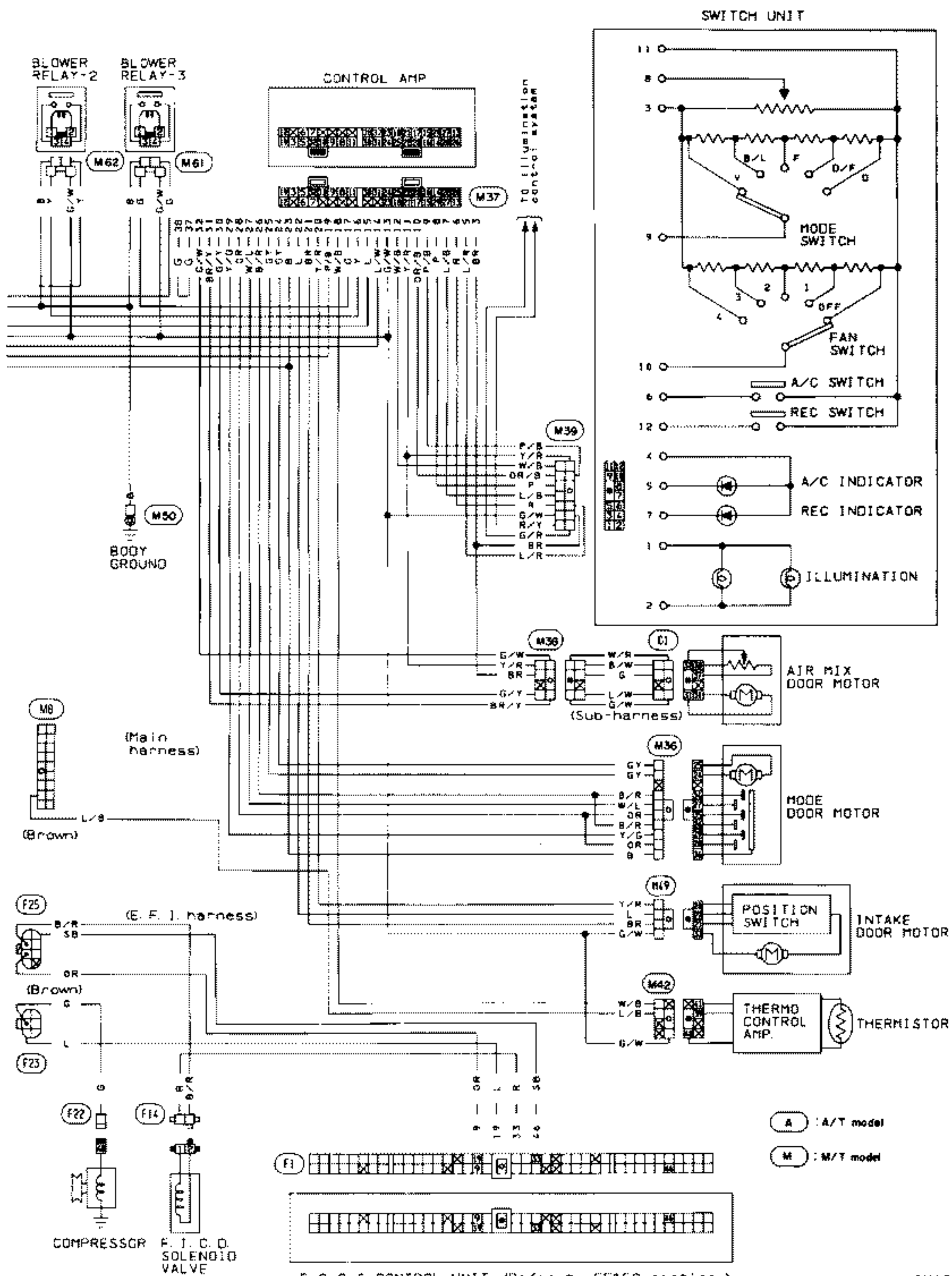
- Charge refrigerant from suction side and evacuate air from discharge side. Then conduct leak test.

Wiring Diagram



A/C ELECTRICAL CIRCUIT — Manual Air Conditioner

Wiring Diagram (Cont'd)



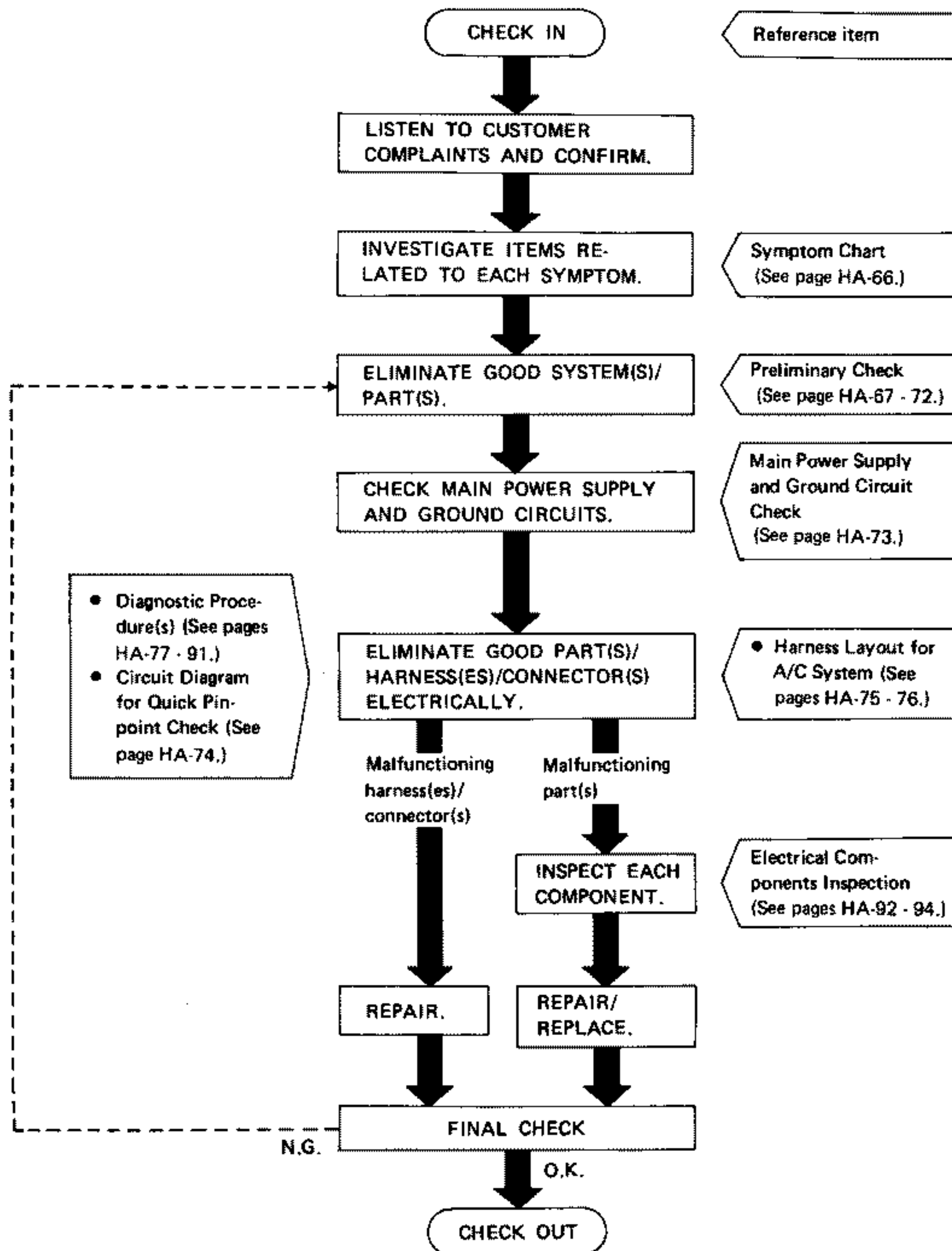
SHA892C

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How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



Symptom Chart

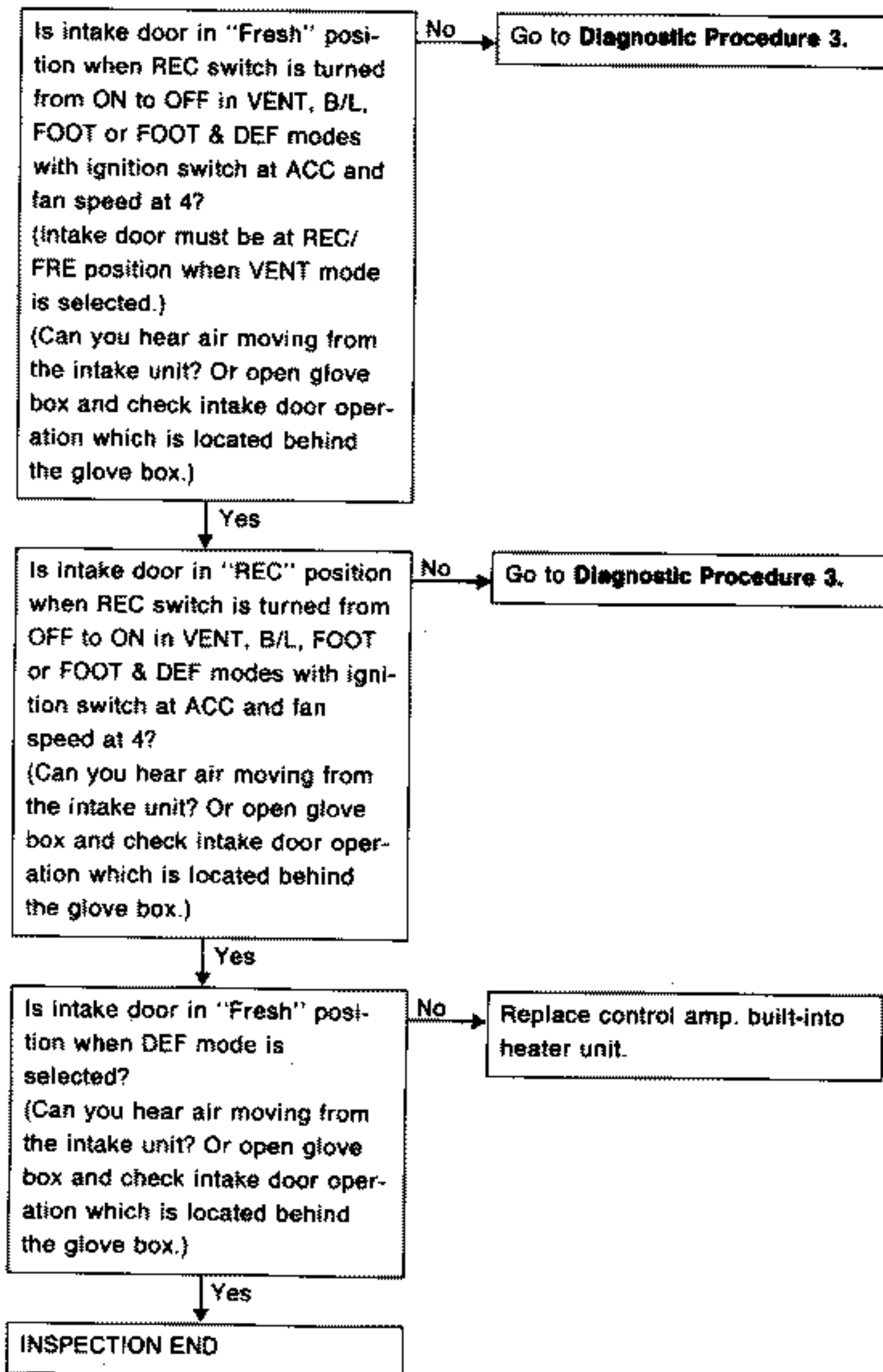
DIAGNOSTIC TABLE

PROCEDURE	Preliminary check						Diagnostic Procedure						Main power supply and Ground circuit check		Electrical components inspection												
REFERENCE PAGE	HA-67	HA-68	HA-69	HA-70	HA-71	HA-72	HA-77	HA-79	HA-81	HA-82	HA-86	HA-90	HA-73	—	HA-92	HA-92	HA-92	HA-93	HA-93	HA-93	HA-94	HA-94	—	—	—	—	—
SYMPTOM	Preliminary check 1	Preliminary check 2	Preliminary check 3	Preliminary check 4	Preliminary check 5	Preliminary check 6	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	Diagnostic procedure 4	Diagnostic procedure 5	Diagnostic procedure 6	Control amp.	Fuses	Fan switch	Blower motor	Blower resistor	A/C switch	Low pressure switch	RELAYS	MODE switch	THERMO CONTROL AMP.	Air mix door motor	Mode door motor	Intake door motor	Compressor	Harness
A/C does not blow cold air.		①					○			○		○	○	○		○	○		○	○						○	○
Insufficient heating						②	○					○	○			○	○						○				○
Blower motor does not rotate.		①					②						○	○		○	○										
Air outlet does not change.				①				②					○	○							○			○			○
Intake door does not change in VENT, B/L or FOOT modes.									①				○	○											○		○
Intake door is not set at "FRESH" in DEF mode.	①								○				○	○											○		○
Magnet clutch does not engage when A/C switch and fan switch are ON.		①								②									○	○		○				○	
Magnet clutch does not engage in FOOT & DEF or DEF mode.		①	②							○				○	○			○	○	○						○	○
Illumination or indicators on switch panel do not come on.											①			○													○
Noise					①																						

Preliminary Check

PRELIMINARY CHECK 1

Intake door is not set at "FRESH" in DEF mode.

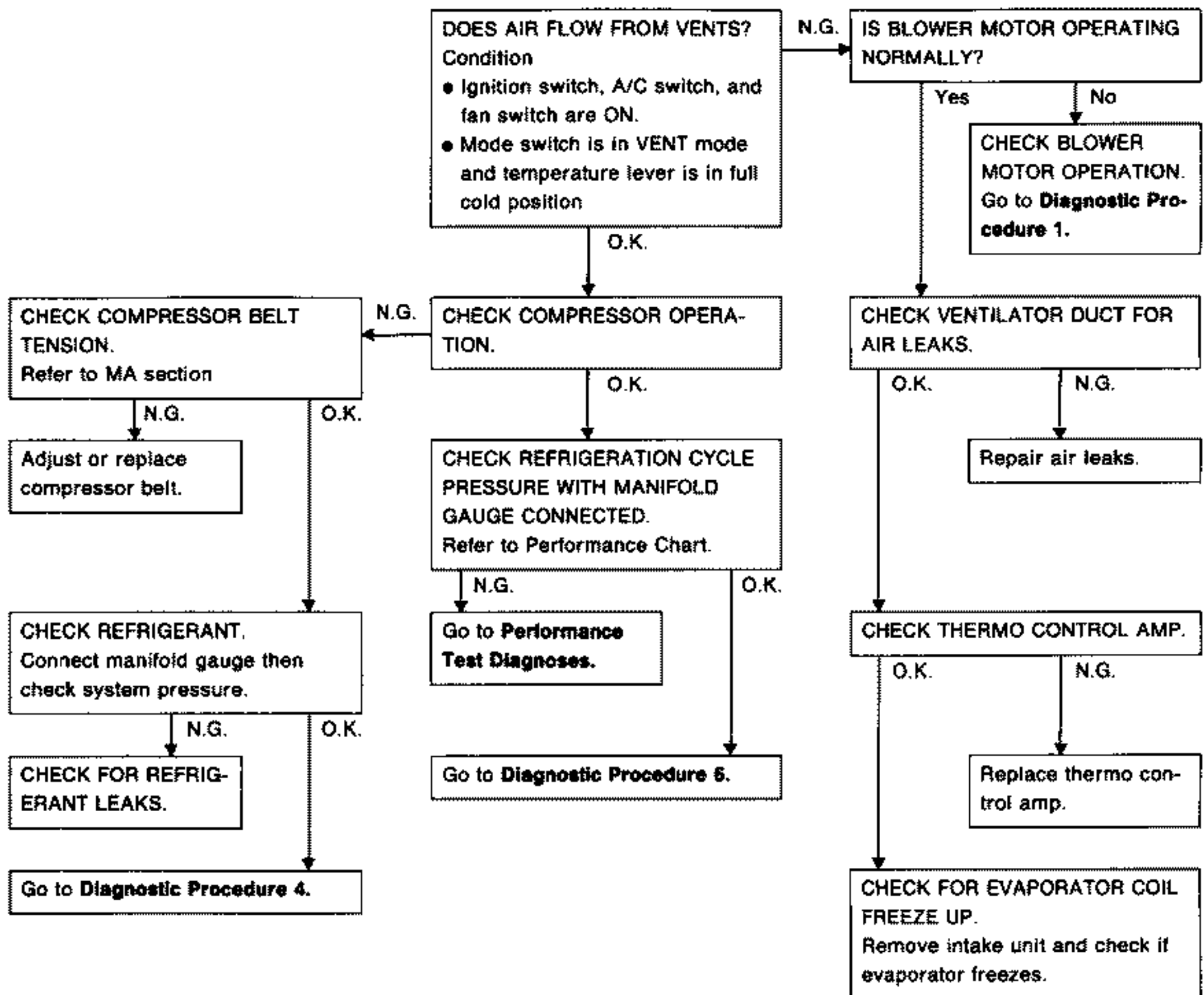


TROUBLE DIAGNOSES — Manual Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

A/C does not blow cold air.

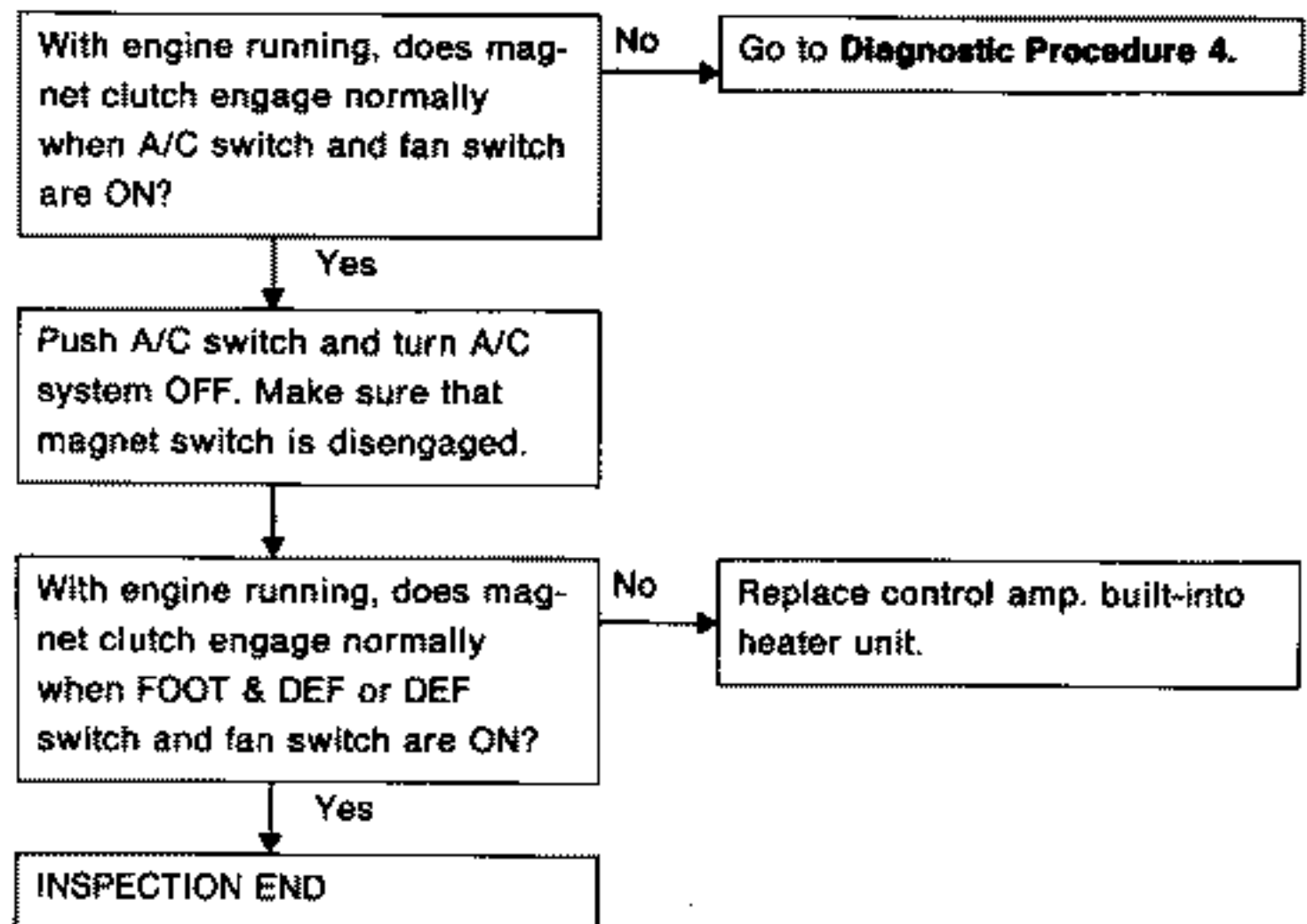


Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

Magnet clutch does not engage in FOOT & DEF or DEF modes.

- Perform PRELIMINARY CHECK 2 and 4 before referring to the following flow chart.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

Air outlet does not change.

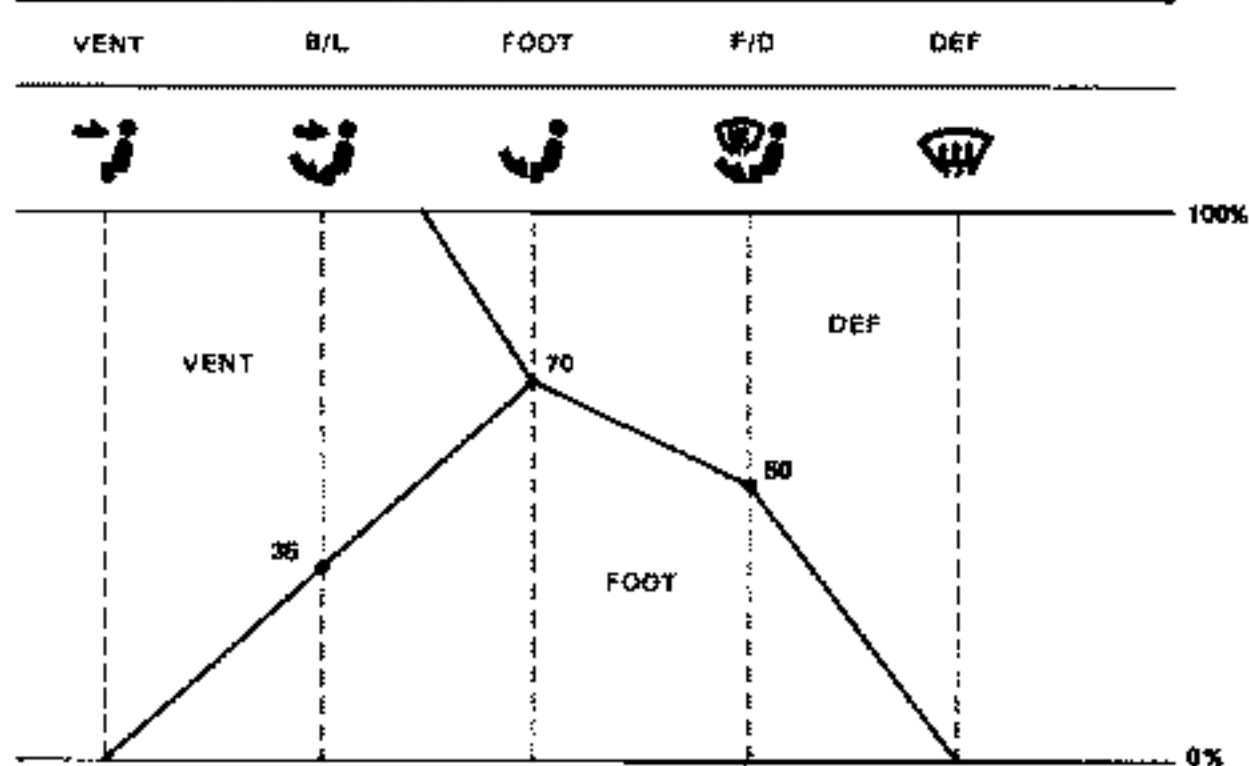
DOES AIR COME OUT FROM EACH DUCT NORMALLY WHEN EACH MODE SWITCH IS SELECTED WITH IGNITION SWITCH AT ACC?

No

Go to Diagnostic Procedure 2

Switch		Air outlet
Mode		VENT
		FOOT & VENT
		FOOT & DEF
		FOOT & DEF
		DEF

AIR DISTRIBUTION RATIOS



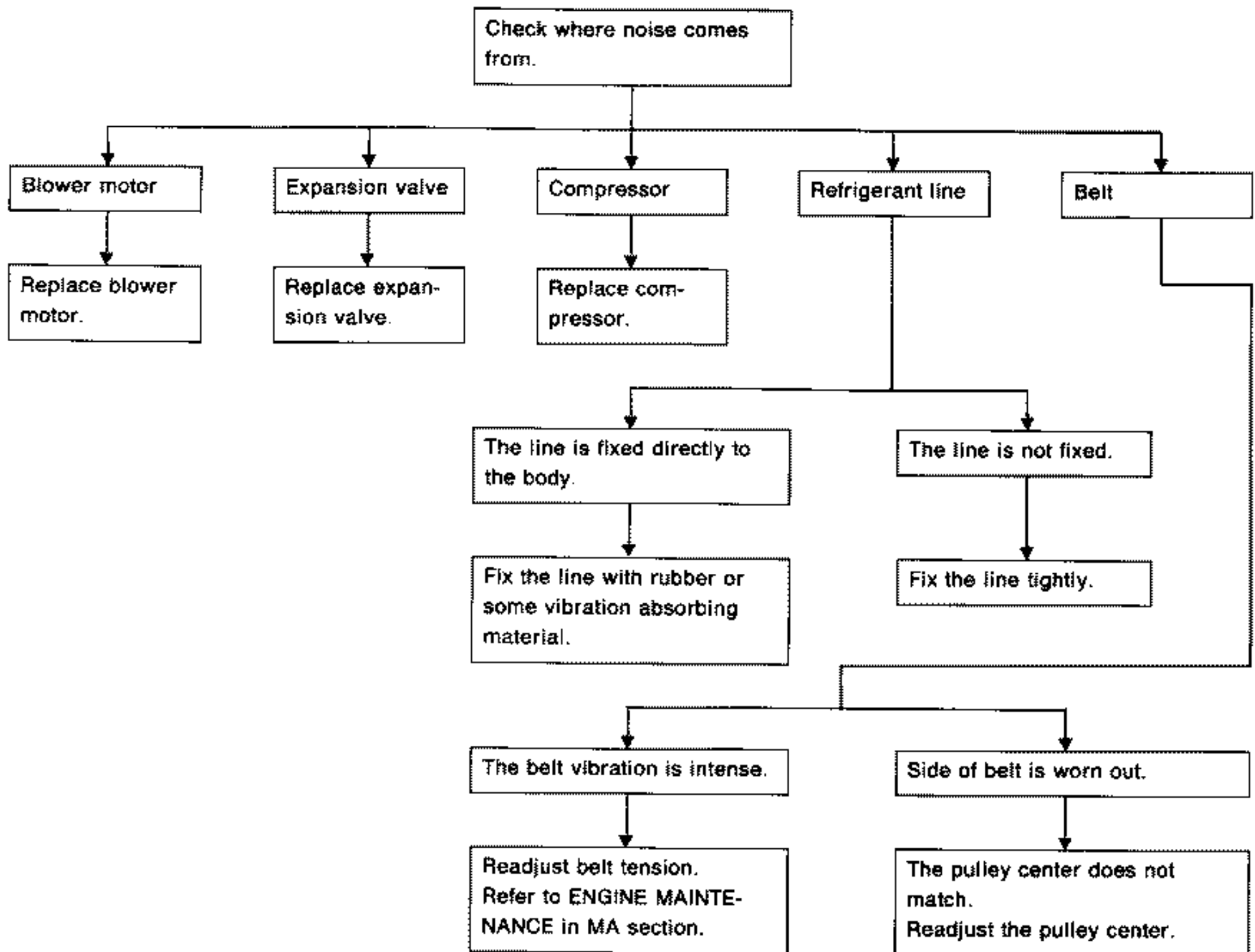
Yes

INSPECTION END

Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

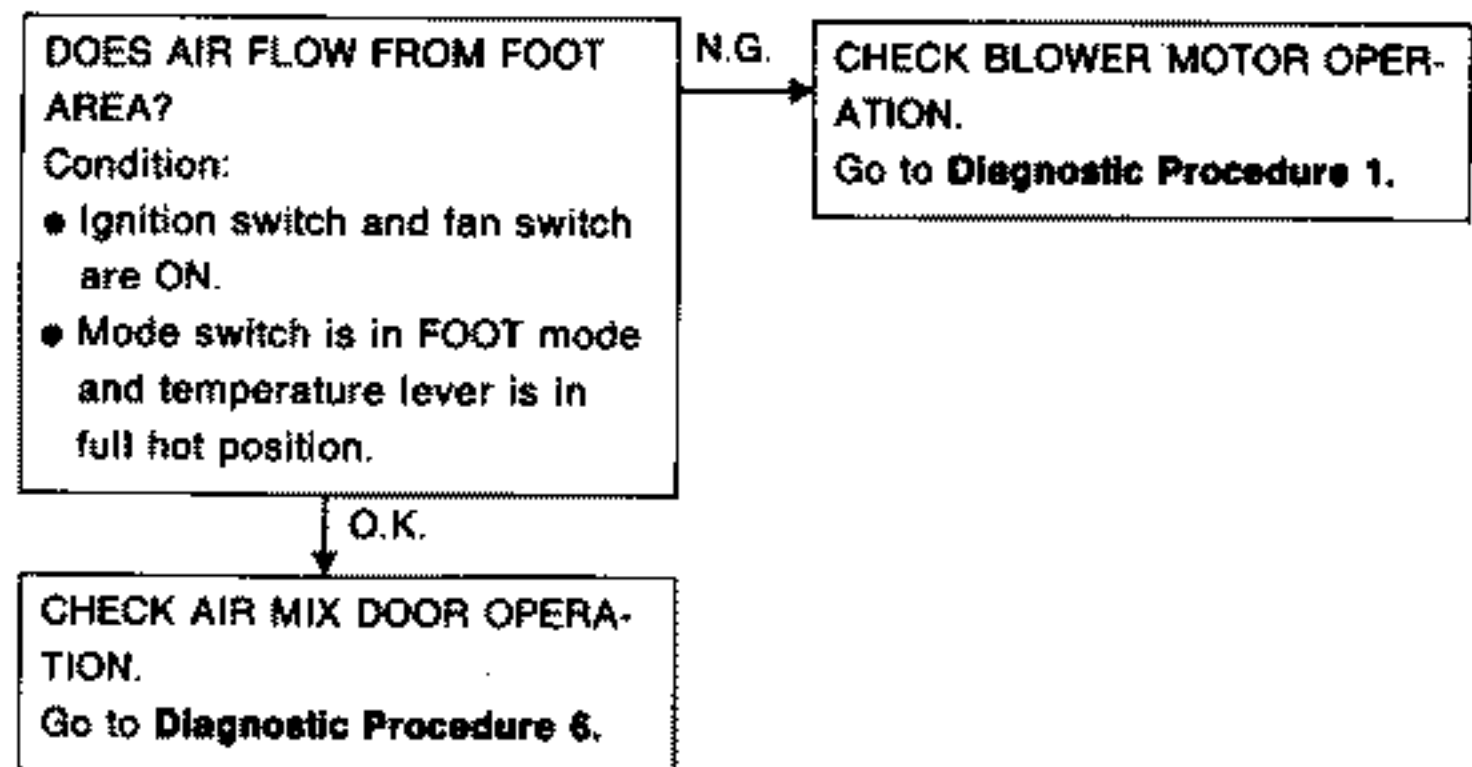
Noise



Preliminary Check (Cont'd)

PRELIMINARY CHECK 6

Insufficient heating



Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

Refer to "POWER SUPPLY ROUTING" in section EL and A/C ELECTRICAL CIRCUIT.

CONTROL AMP. REMOVAL

1. Remove driver side instrument lower lid.
2. Remove vent duct.
3. Remove control amp. with harness connected.

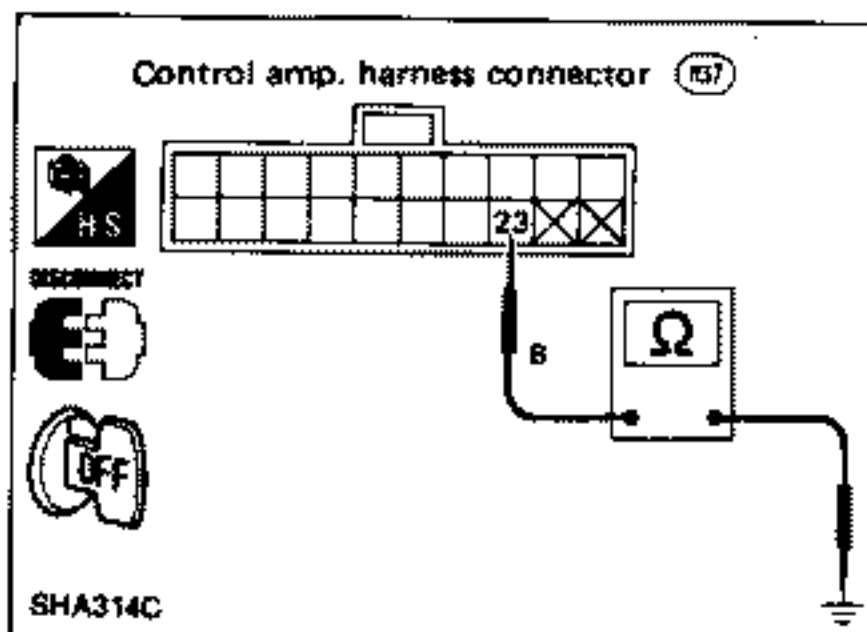
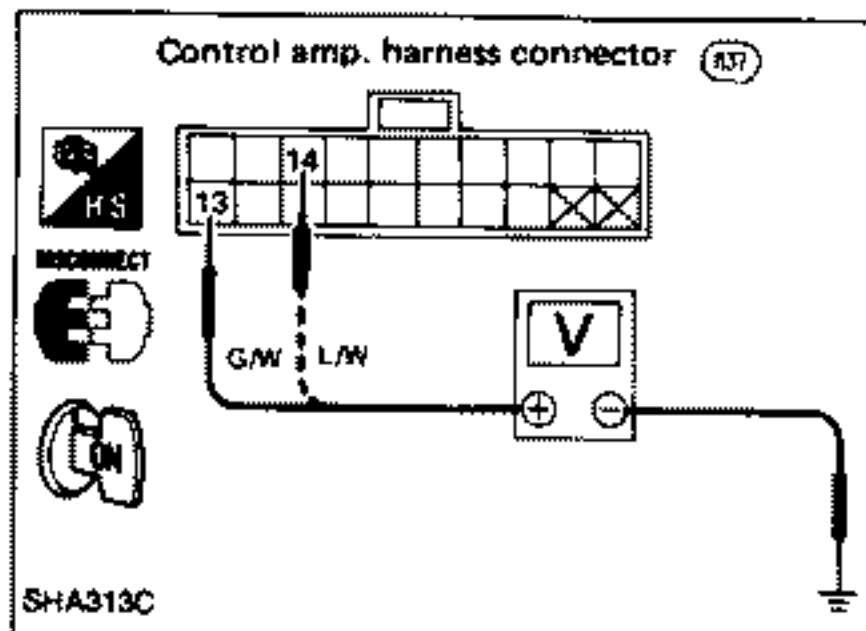
CONTROL AMP. CHECK

1. Disconnect control amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ⑬ or No. ⑭ and body ground.

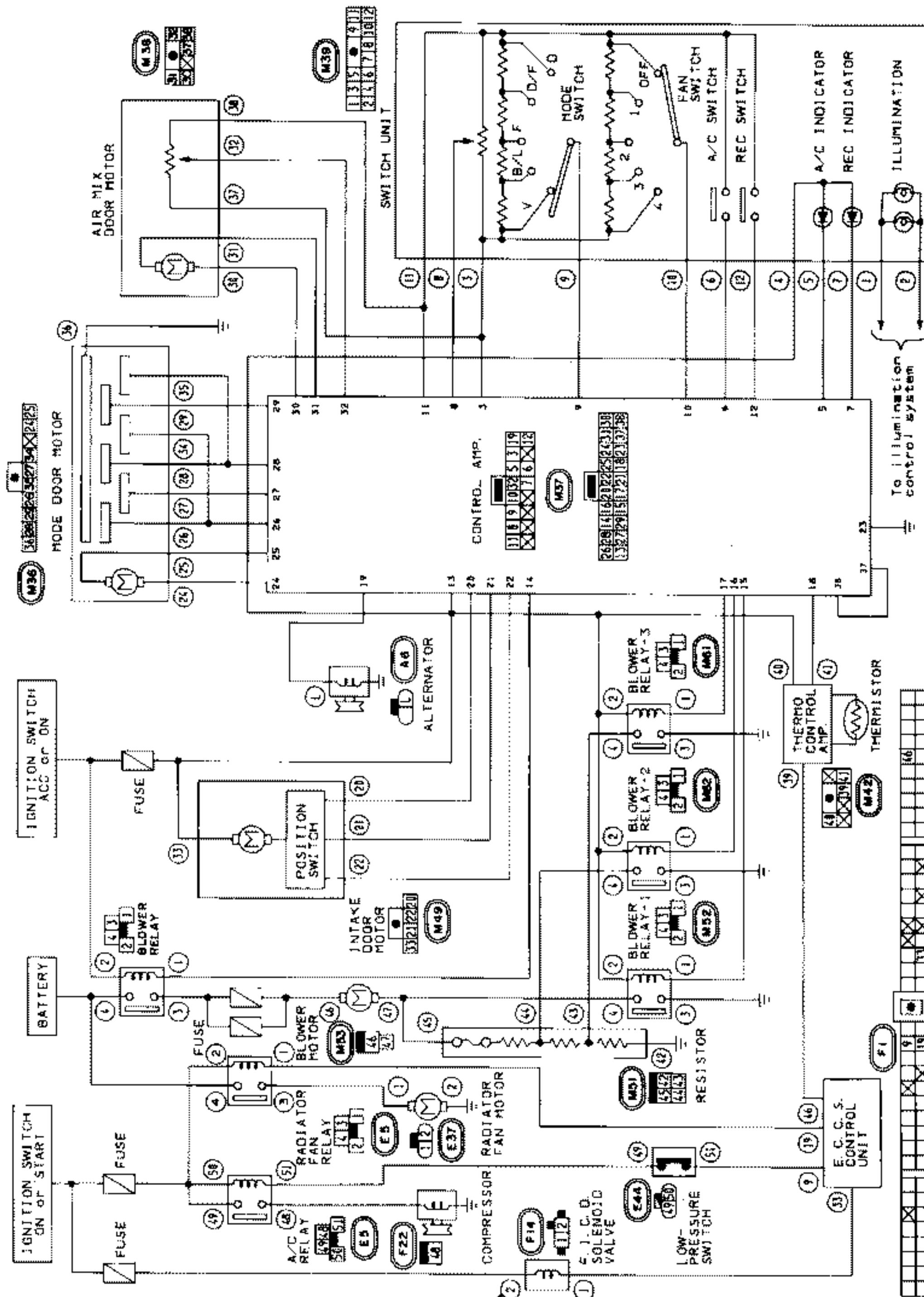
Voltmeter terminal		Voltage
⊕	⊖	
⑬	Body ground	Approximately. 12V
⑭		

Check body ground circuit for control amp. with ignition switch OFF.

1. Disconnect control amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check continuity between terminal No. ⑳ and body ground.



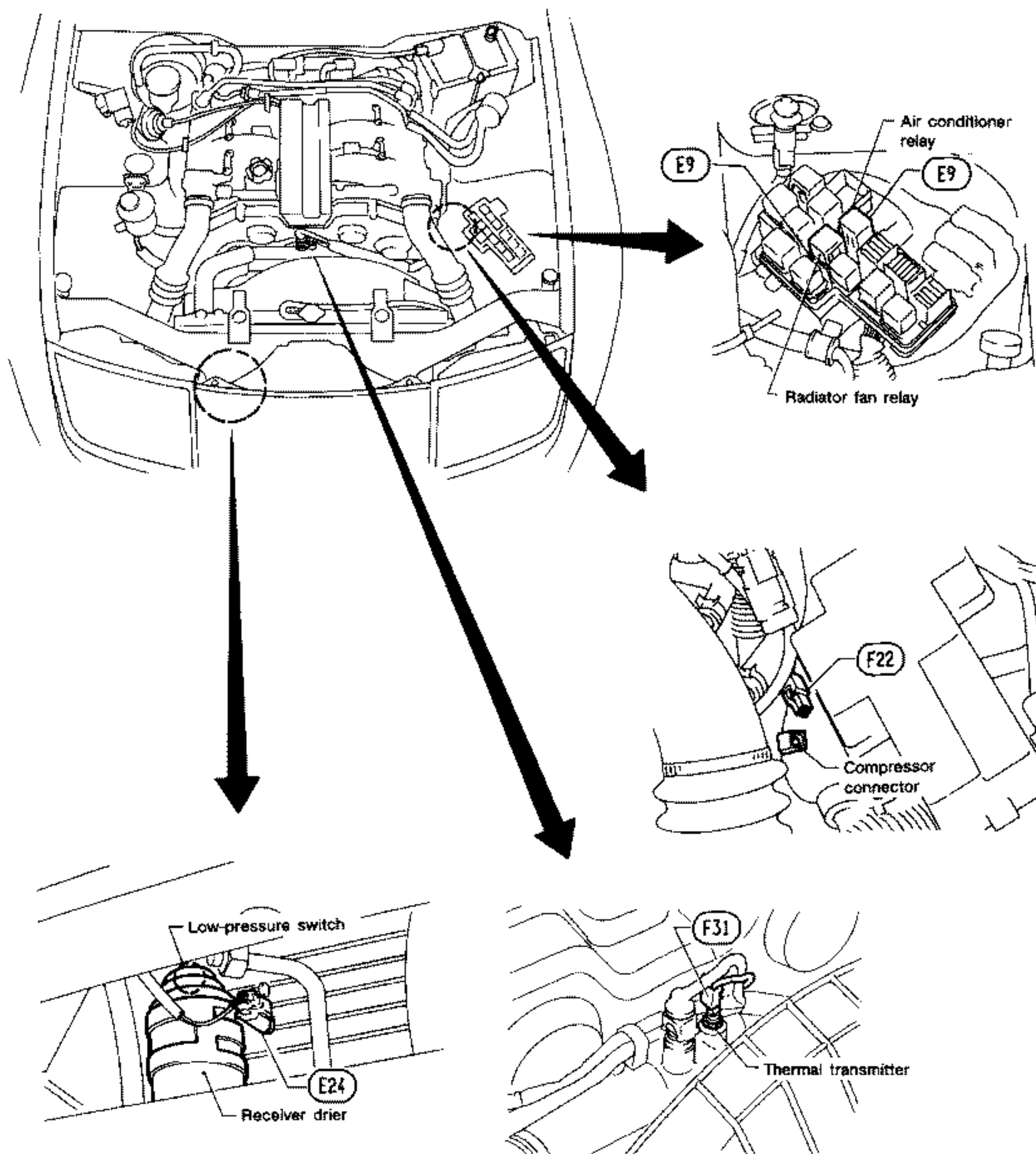
Circuit Diagram for Quick Pinpoint Check



- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle "⊖" are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-75 - 76.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle "○".

Harness Layout for A/C System

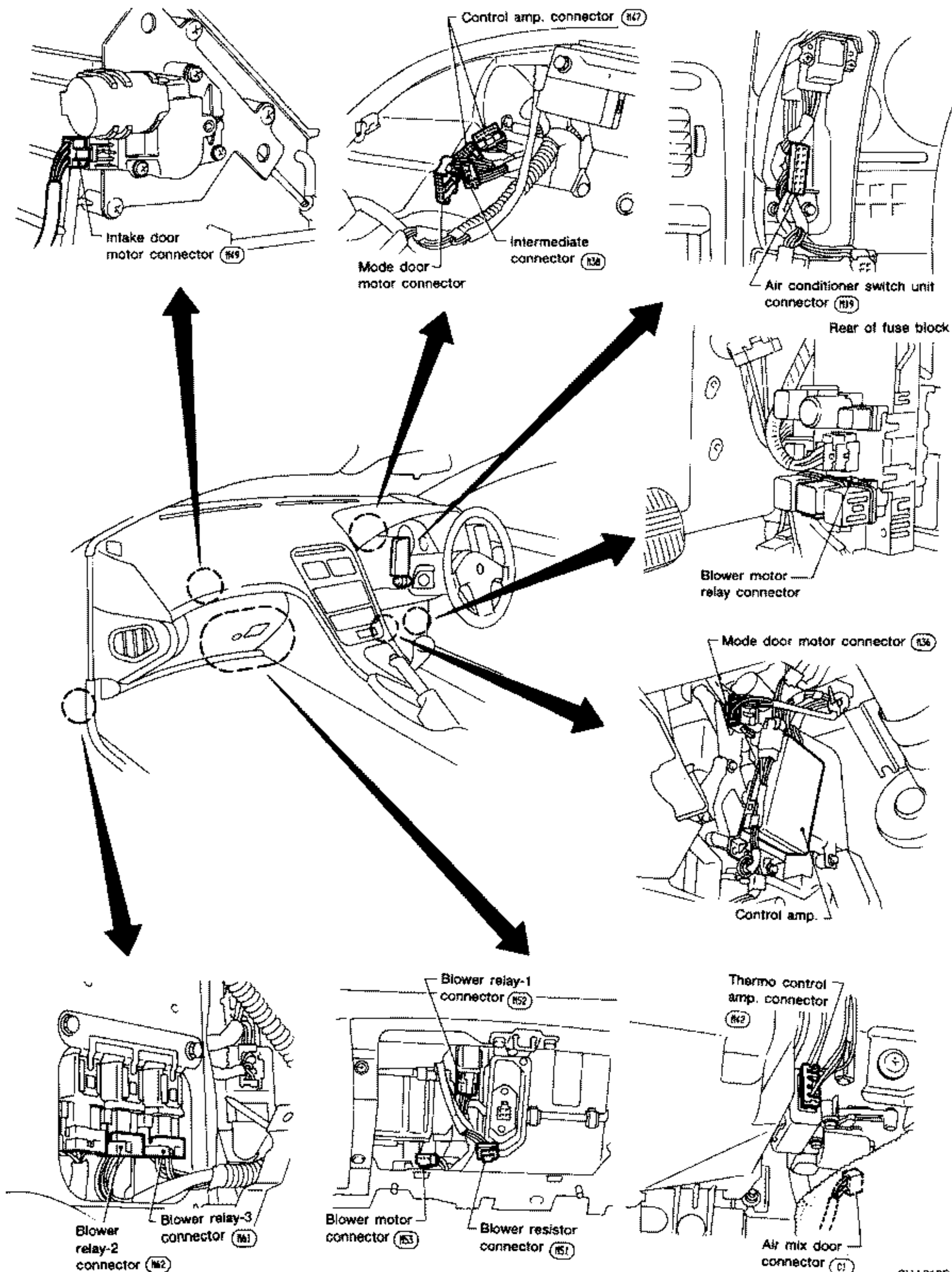
ENGINE COMPARTMENT



TROUBLE DIAGNOSES — Manual Air Conditioner

Harness Layout for A/C System (Cont'd)

PASSENGER COMPARTMENT



SHAB16C

TROUBLE DIAGNOSES — Manual Air Conditioner

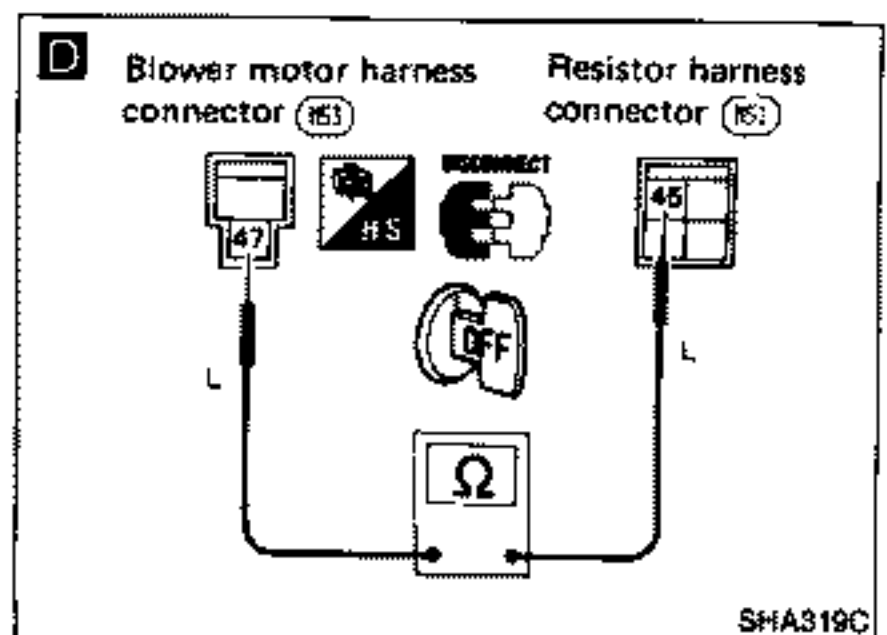
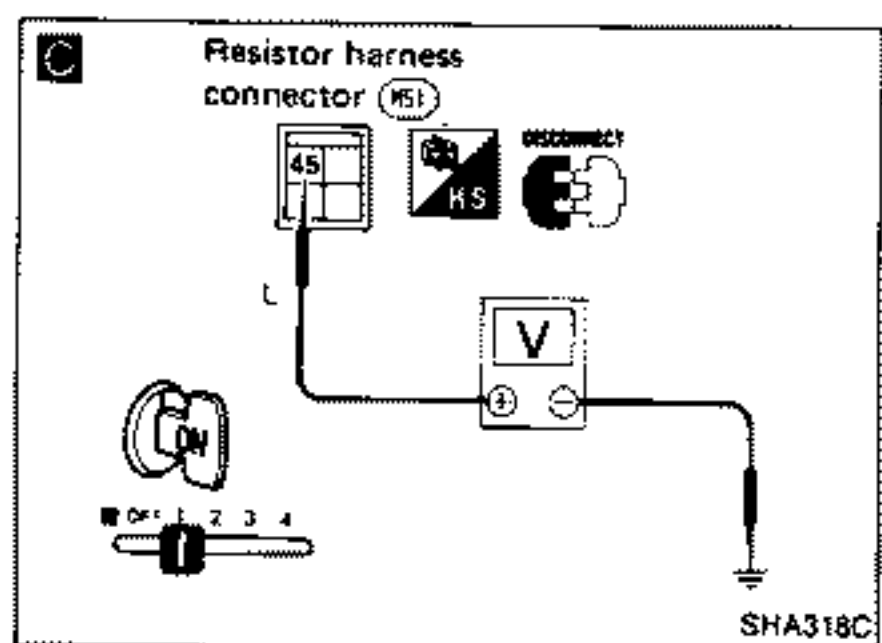
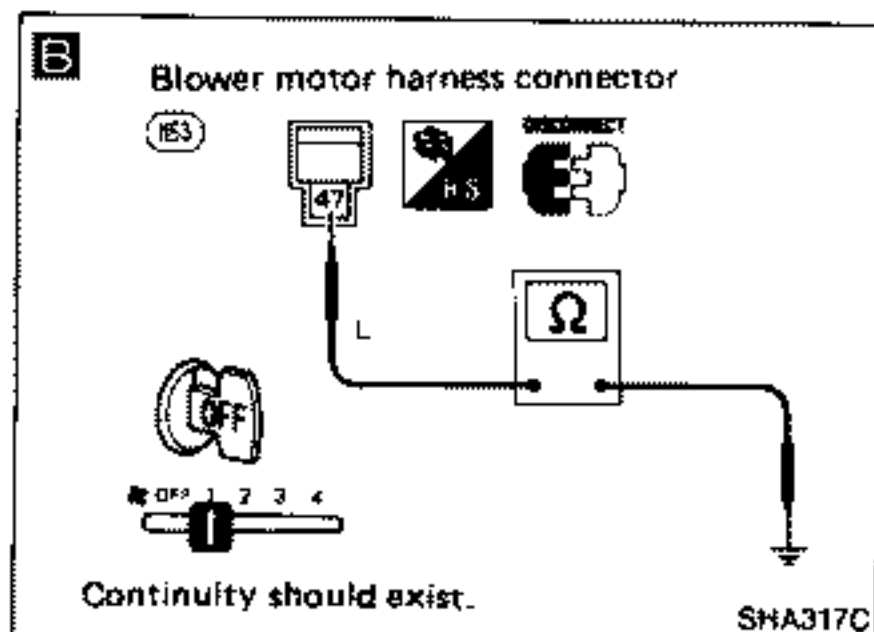
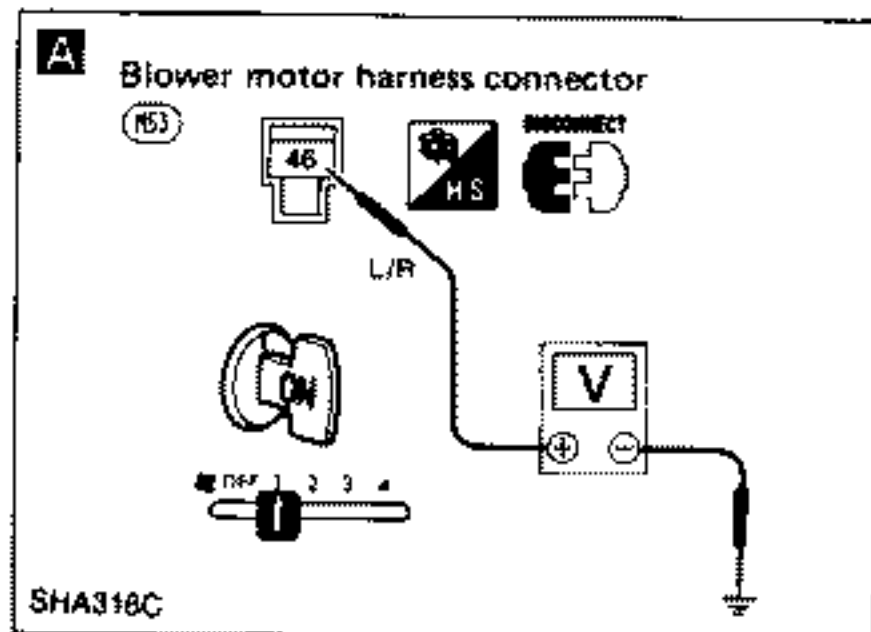
	INCIDENT	Flow chart No.
1	Fan fails to rotate	1
2	Fan does not rotate at speed 1.	2
3	Fan does not rotate at speed 2.	3
4	Fan does not rotate at speed 3.	4
5	Fan does not rotate at speed 4.	5

Diagnostic Procedure 1

SYMPTOM: Blower motor does not rotate.

- Perform **PRELIMINARY CHECK 2** before referring to the following flow chart.

Check if blower motor rotates properly at each fan speed. Conduct checks as per flow chart.



A CHECK POWER SUPPLY FOR BLOWER MOTOR.
Disconnect blower motor harness connector.
Do approximately 12 volts exist between blower motor harness terminal No. ④⑥ and body ground?

N.G.

Check fuses at fuse block.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

B Check circuit continuity between blower motor harness terminal No. ④⑦ and body ground.

N.G.

Reconnect blower motor harness connector.

C CHECK BLOWER MOTOR.
(Refer to Electrical Components Inspection.)

N.G.

Replace blower motor.

C CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
Do approximately 12 volts exist between resistor harness terminal No. ④⑤ and body ground?

N.G.

Disconnect blower motor and resistor harness connectors.

D

Note
Check circuit continuity between blower motor harness terminal No. ④⑦ and resistor terminal No. ④⑤.

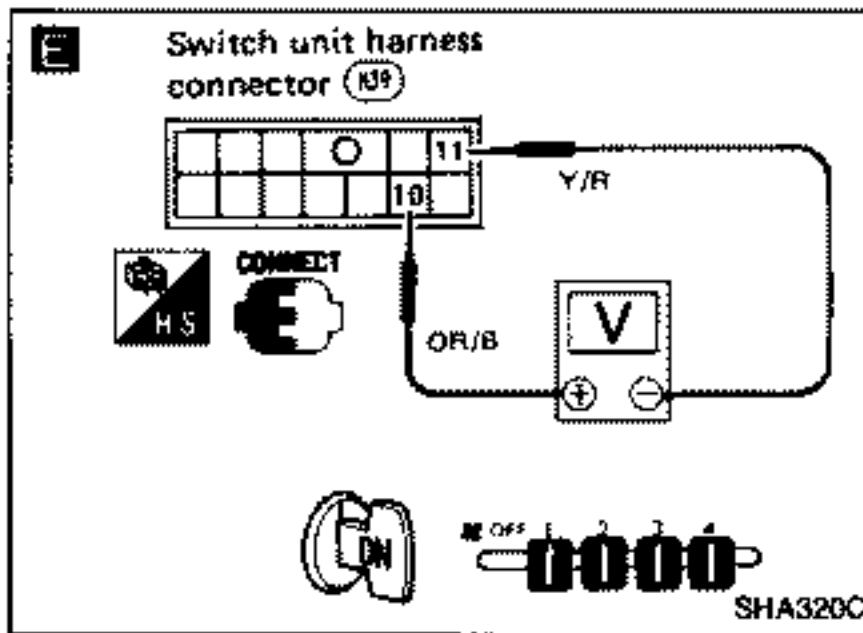
A

(Go to next page.)

Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 1 (Cont'd)



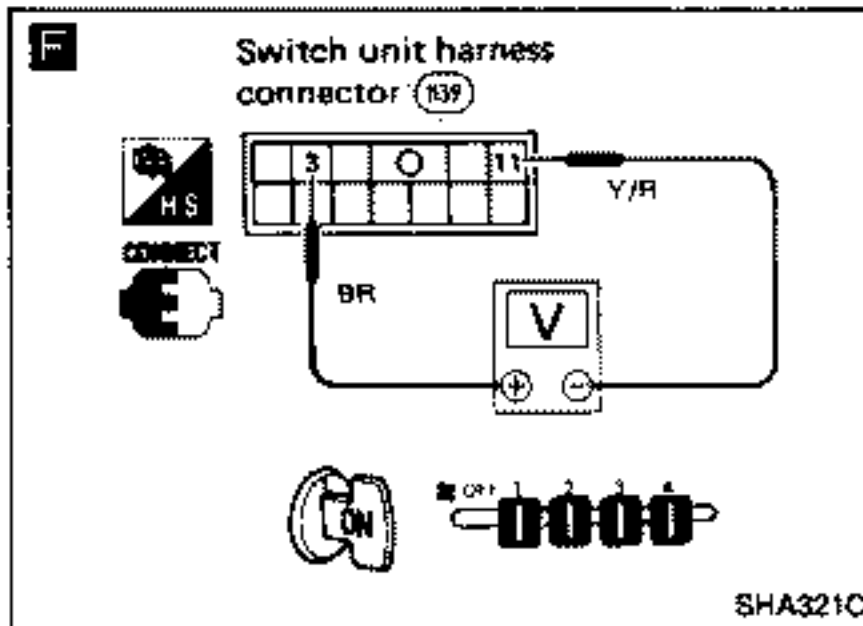
1 CHECK RESISTOR AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

O.K.

N.G.

Replace resistor.

Reconnect resistor harness connector.



2 **3** **4** **5**
E CHECK FAN SWITCH CIRCUIT.
Do normal volts exist between switch unit harness connector terminal?

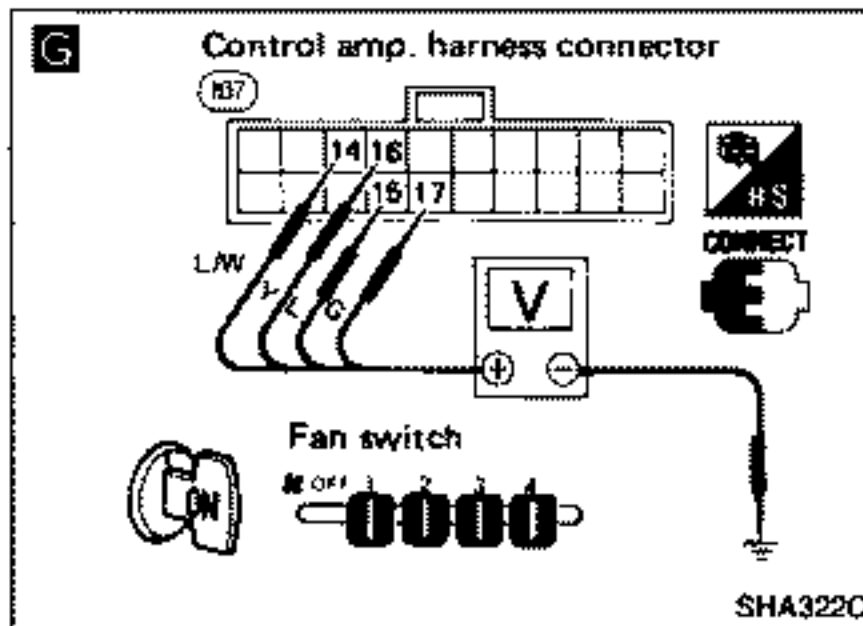
Flow chart No. (Fan SW position)	Terminal No.		Normal voltage (Approx.)
	+	-	
2 (1)	⑩	⑪	2V
3 (2)			3V
4 (3)			4V
5 (4)			5V

N.G.

F Do approx. 5 volts exist between control panel terminals No. ③ and No. ⑪?

O.K.

Replace fan switch.



5 **G** O.K.

CHECK CONTROL AMP. HARNESS TERMINAL VOLTAGE.
Do approximately 12 volts or 0 volts exist between control amp. harness terminals No. ⑭, ⑮, ⑯ or ⑰ and body ground?

Flow chart No.	Terminal No.	Fan SW operation	
		ON	OFF
2	⑭	0V	Approx. 12V
3	⑰	0V	Approx. 12V
4	⑯	0V	Approx. 12V
5	⑰	0V	Approx. 12V

N.G.

Replace control amp.

O.K.

Replace blower motor.

Diagnostic Procedure 2

SYMPTOM: Air outlet does not change.

- Perform **PRELIMINARY CHECK 4** and **Main Power Supply and Ground Circuit Check** before referring to the following flow chart.

A

CHECK MODE DOOR MOTOR POSITION SWITCH.
Measure voltage between switch unit harness connector terminals No. ⑨ and ⑪.

Mode switch	Terminal No.		Voltage (Approx.)
	+	-	
VENT			5V
B/L			4V
FOOT	⑨	⑪	3V
F/D			2V
DEF			0V

O.K.

D

Measure voltage between control amp. harness connector terminals No. ⑨ and ⑪.

Mode switch	Terminal No.		Voltage (Approx.)
	+	-	
VENT			5V
B/L			4V
FOOT	⑨	⑪	3V
F/D			2V
DEF			0V

O.K.

E

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR.
Does continuity exist between mode door motor harness connector terminal No. ③⑥ and body ground?

O.K.

(Go to next page.)

N.G.

Disconnect switch unit harness connector.

B

Do approximately 5 volts exist between switch unit harness connector terminal No. ③ and ⑪.

N.G.

O.K.

Replace switch unit.

C

Do approximately 5 volts exist between control amp. harness connectors No. ③ and ⑪.

N.G.

O.K.

Repair harness or connector.

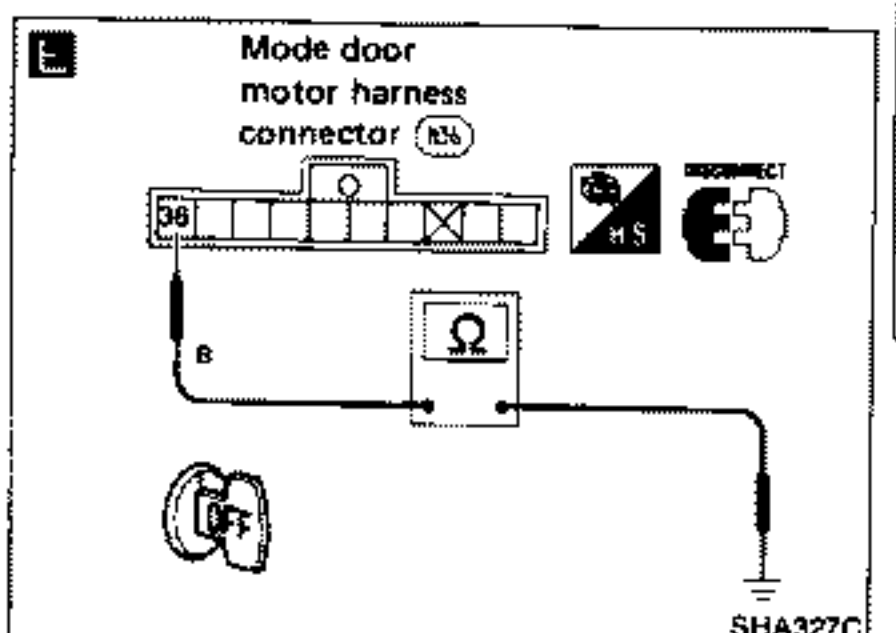
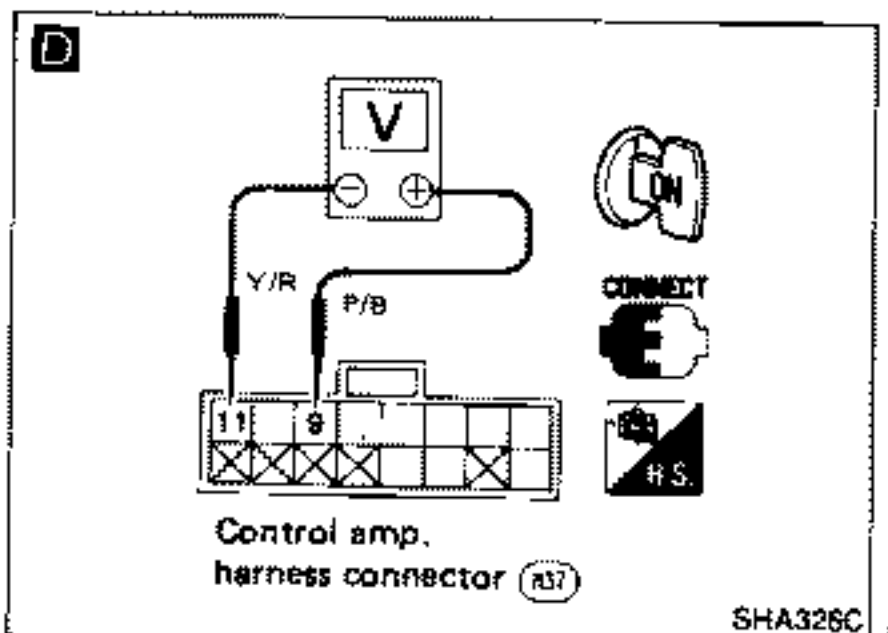
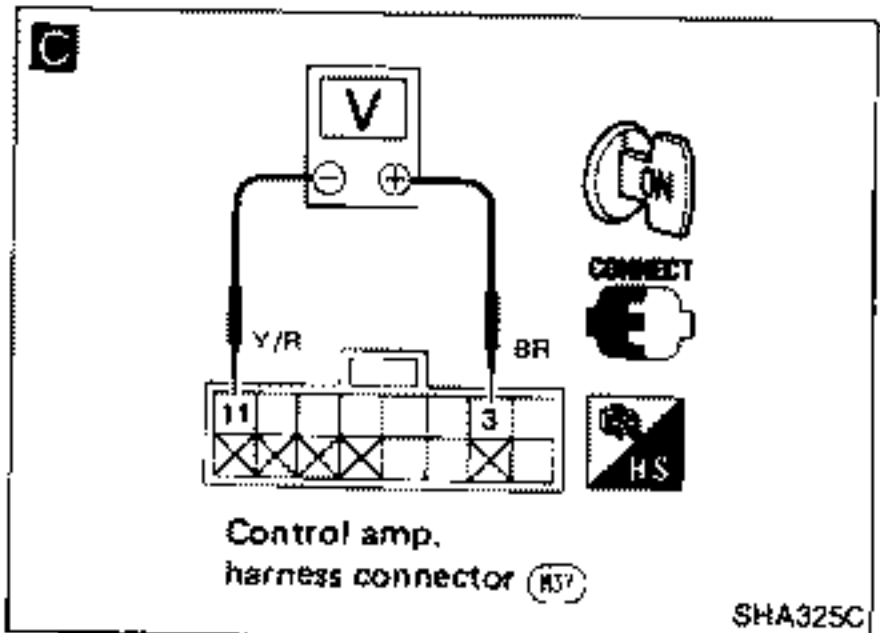
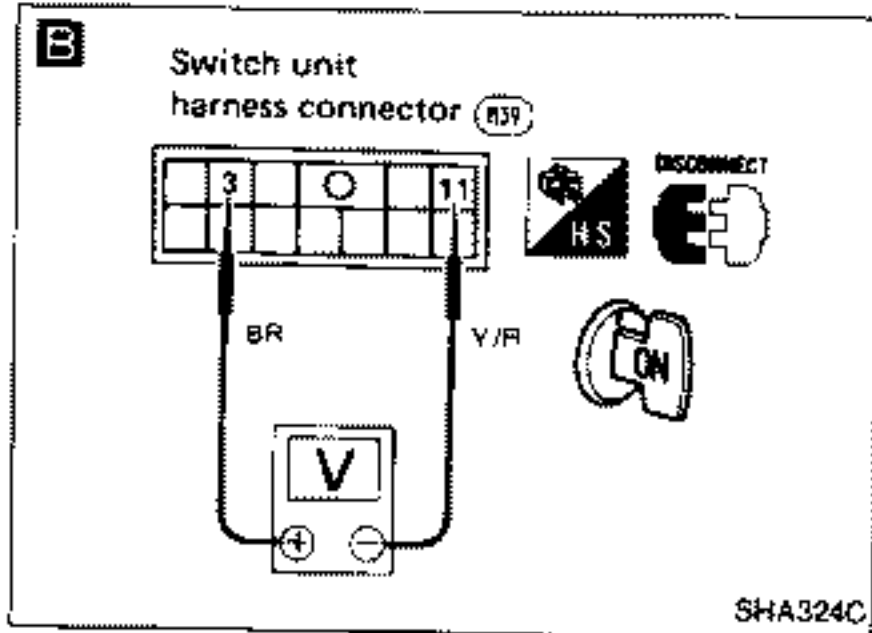
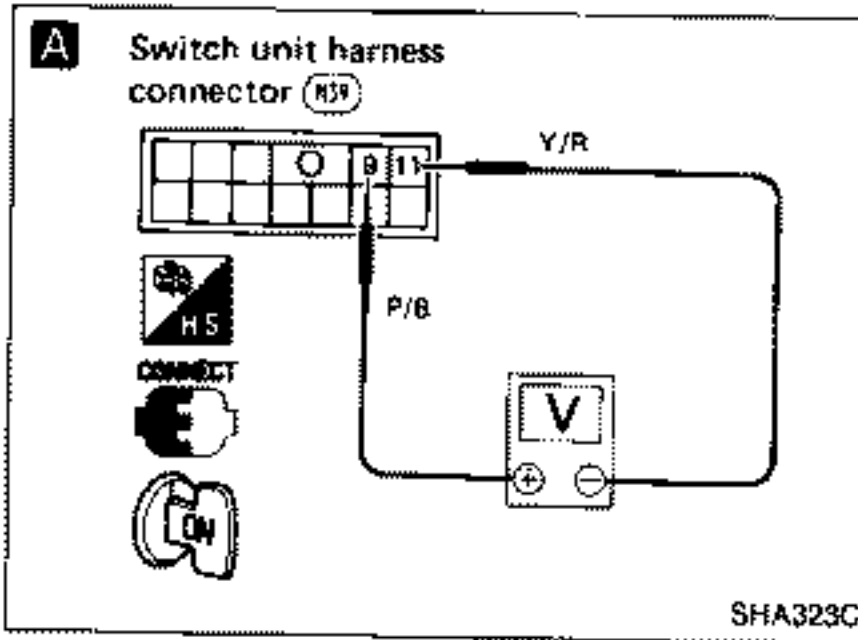
Replace control amp.

N.G.

Repair harness or connector.

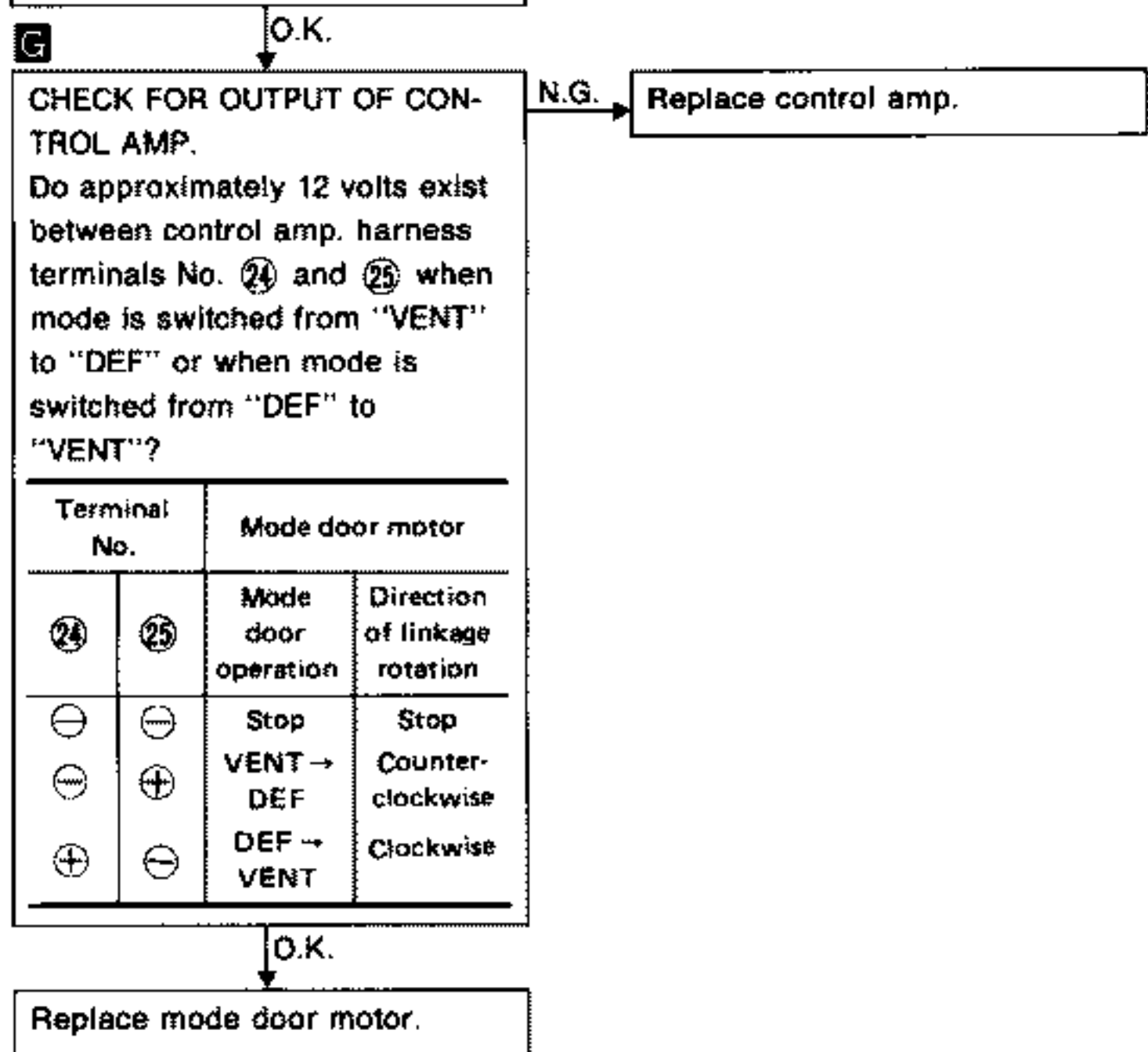
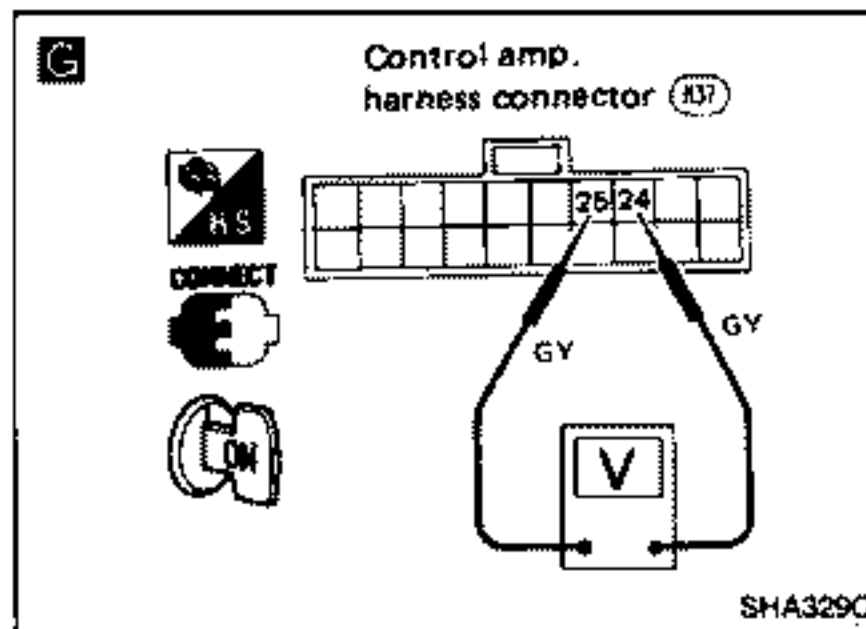
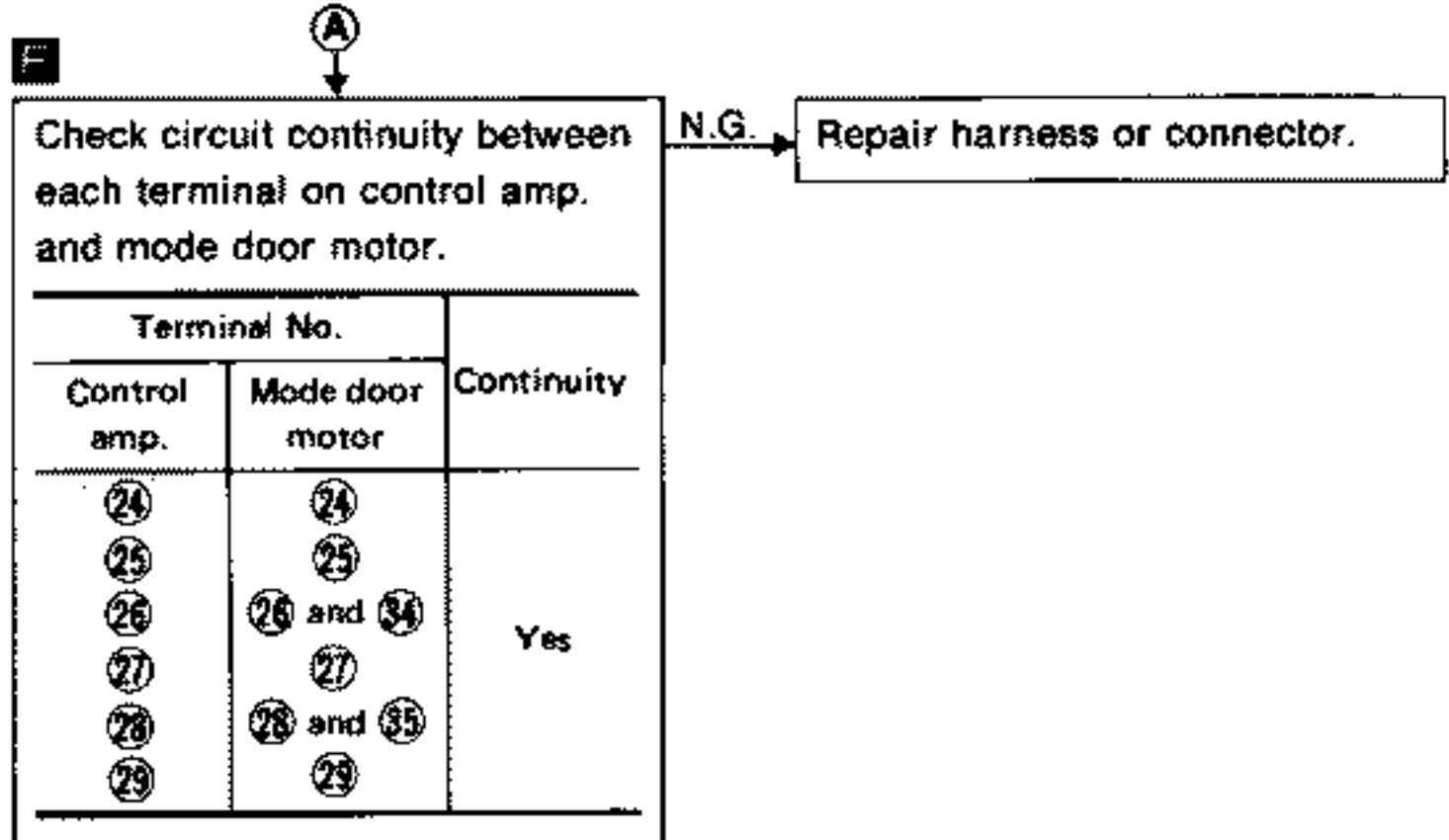
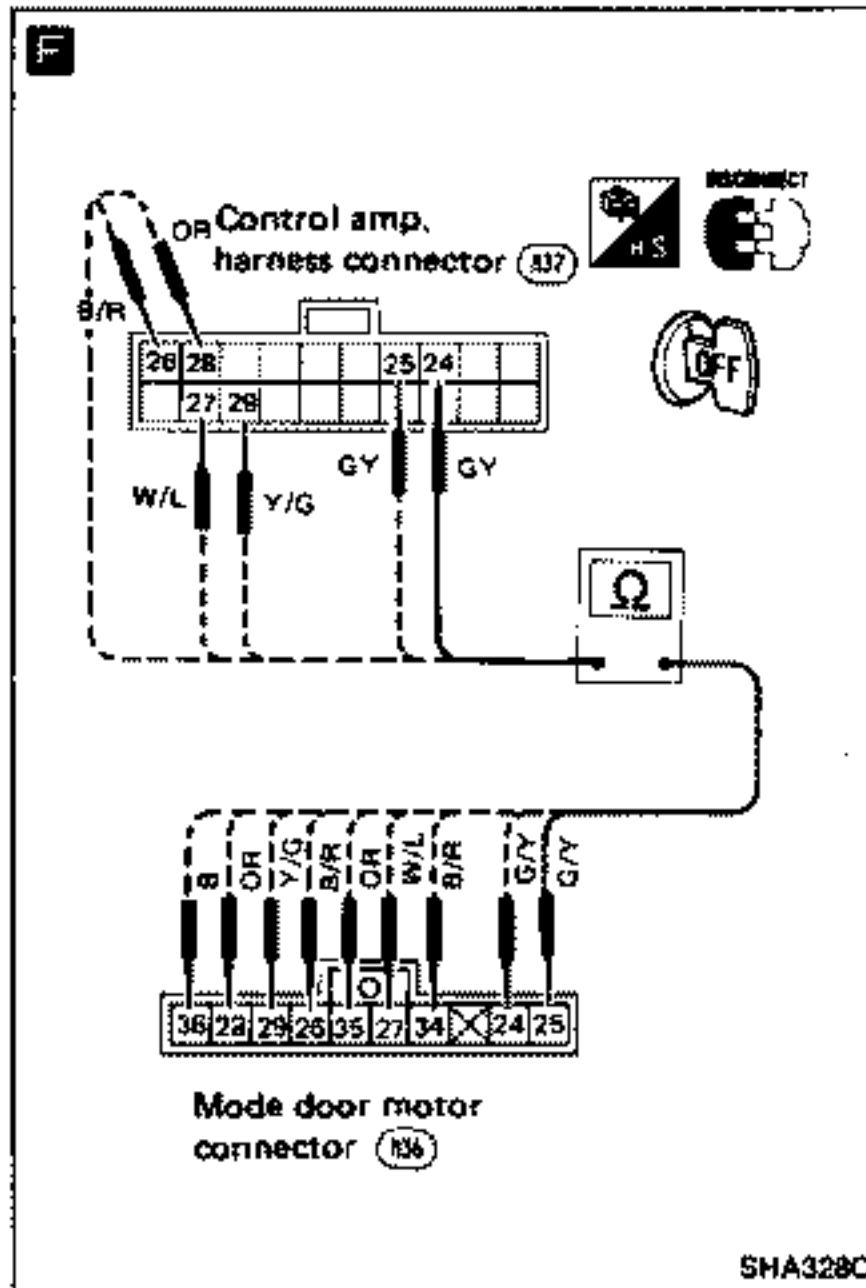
N.G.

Repair harness or connector.



TROUBLE DIAGNOSES — Manual Air Conditioner

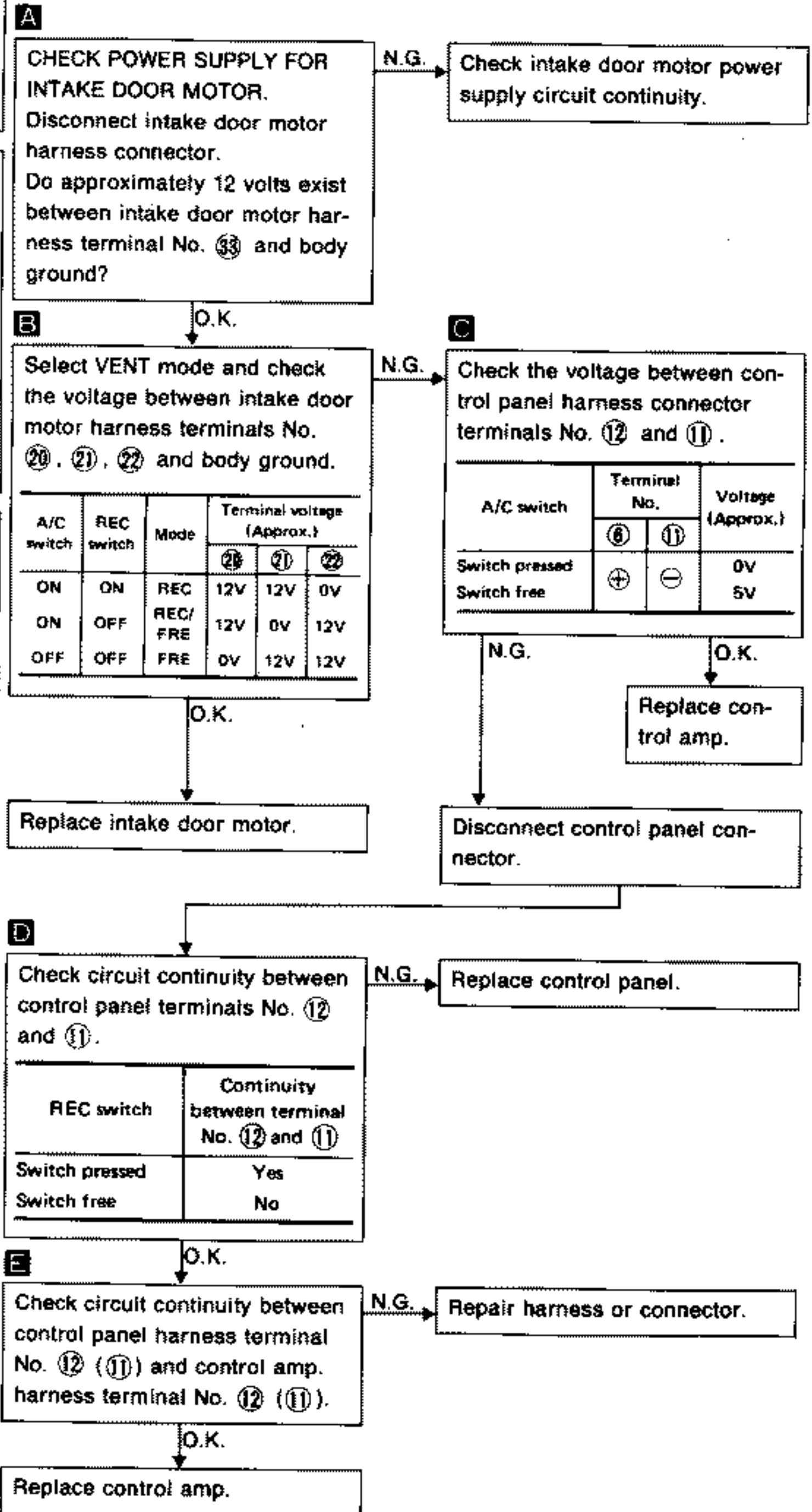
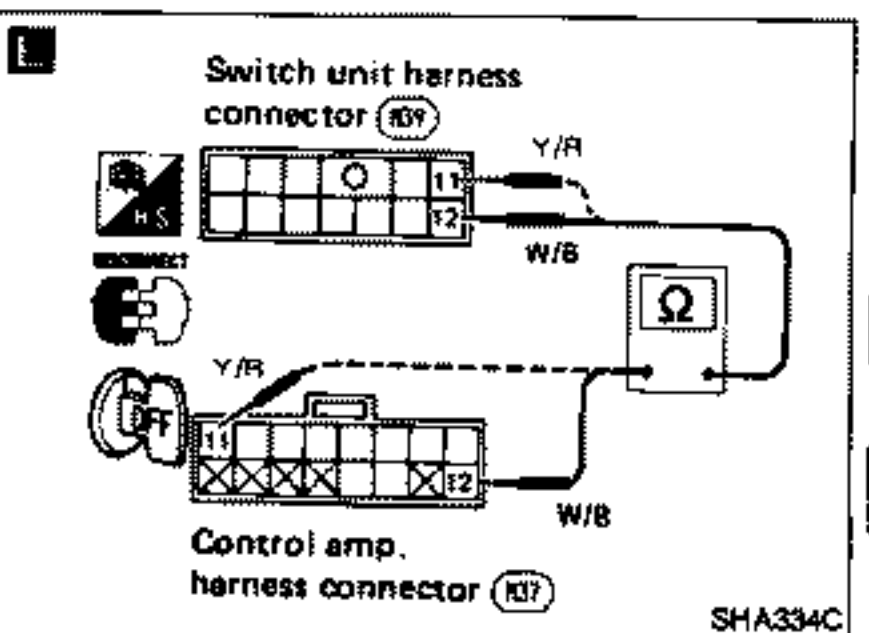
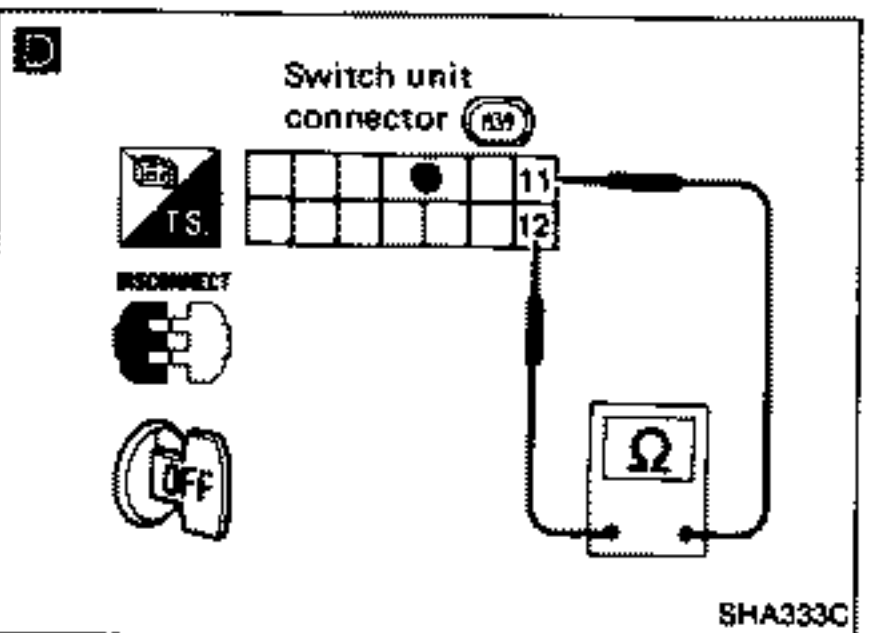
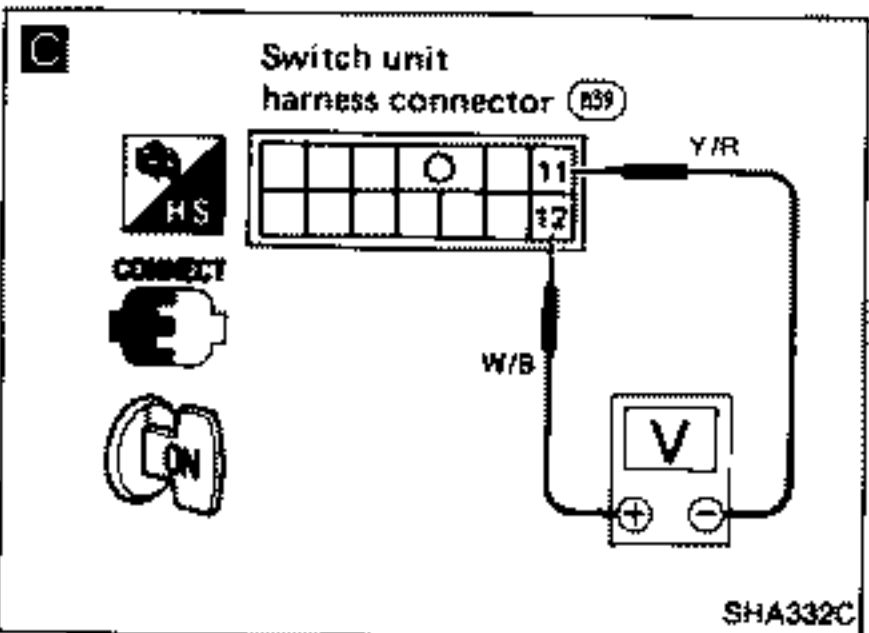
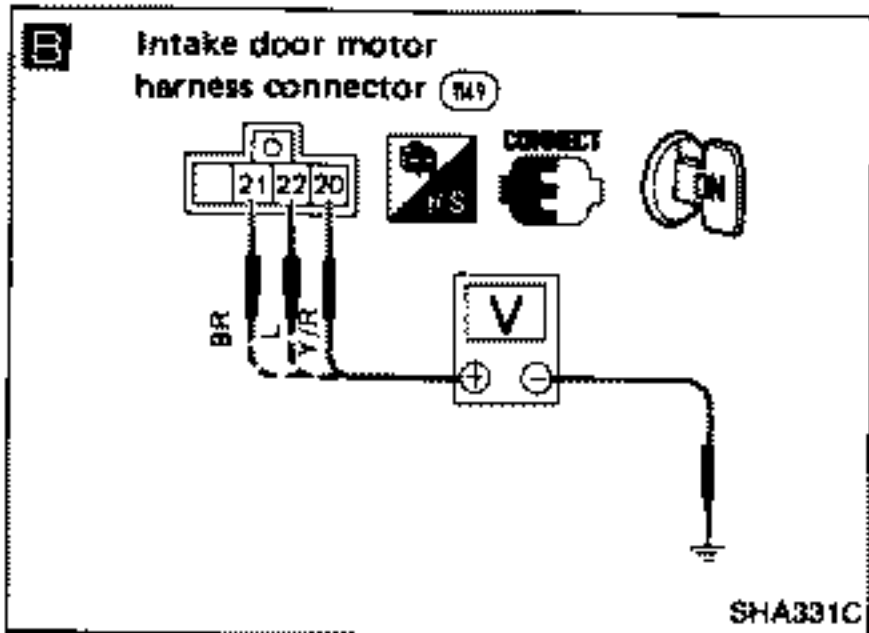
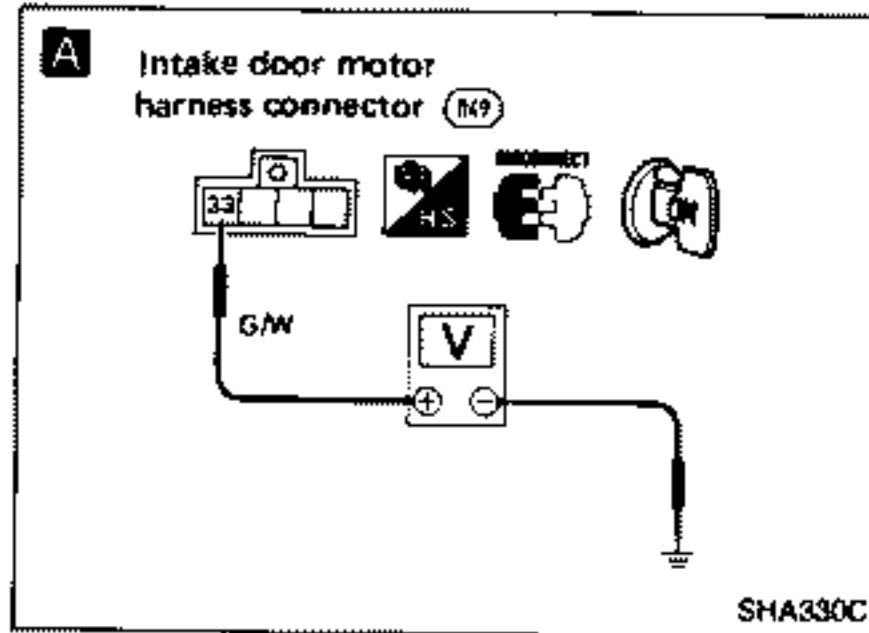
Diagnostic Procedure 2 (Cont'd)

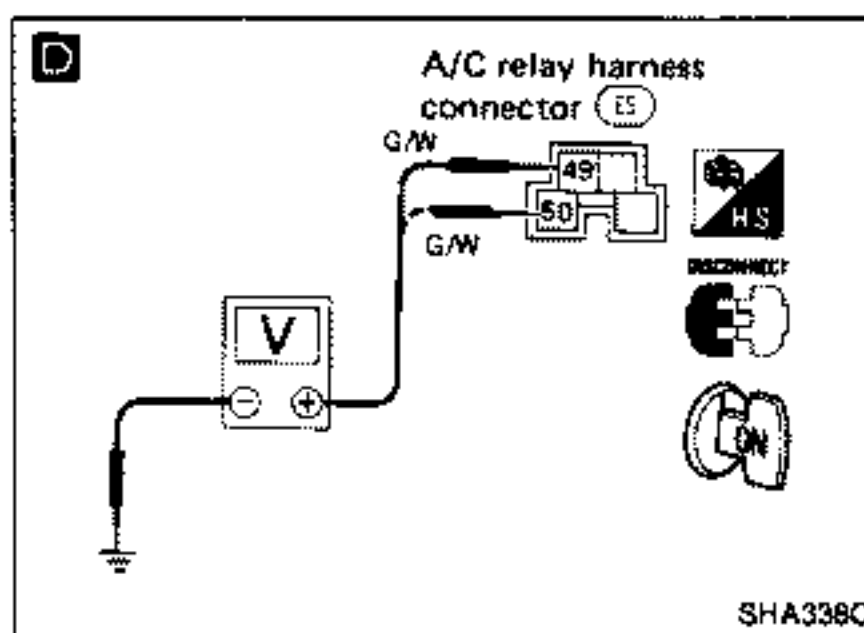
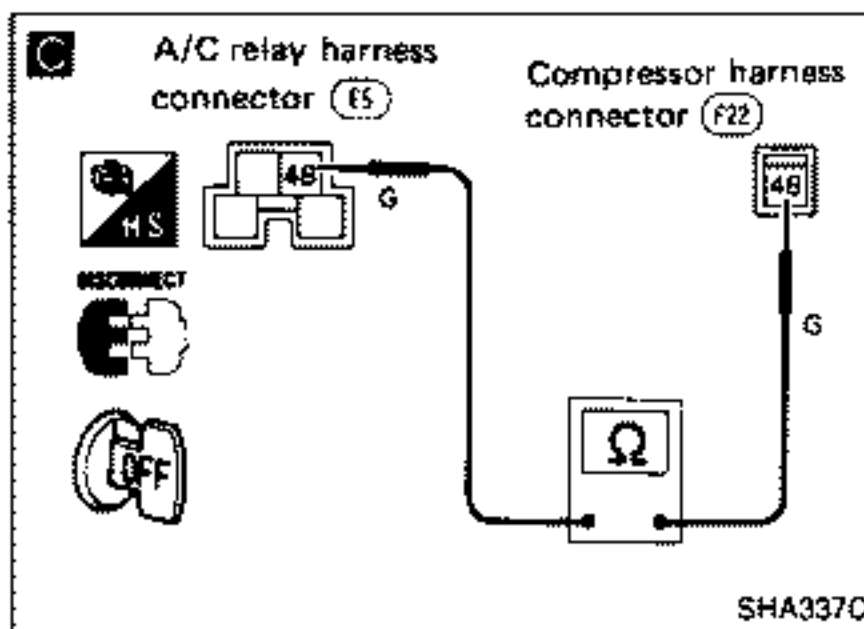
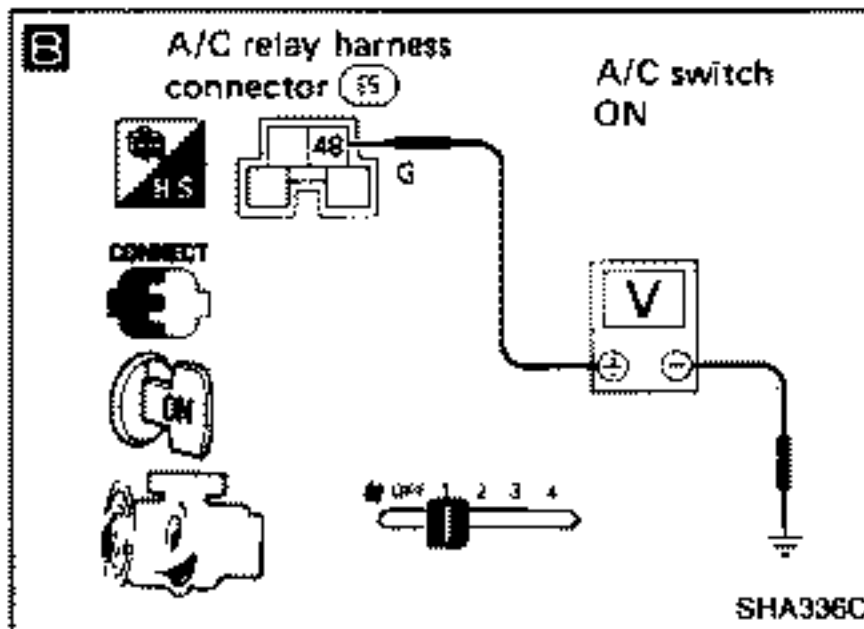
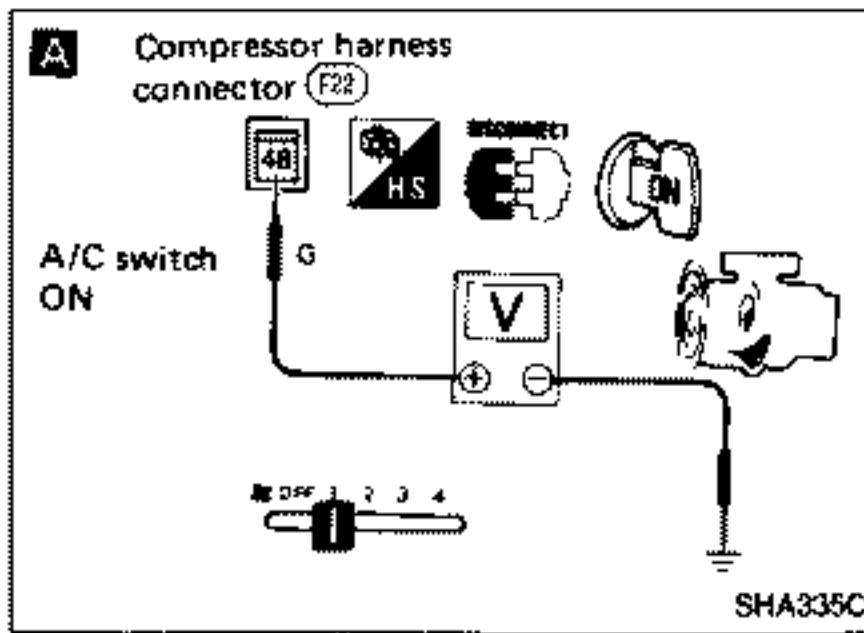


Diagnostic Procedure 3

SYMPTOM: Intake door does not change in VENT, B/L, or FOOT modes.

- Perform PRELIMINARY CHECK 1, and Main Power Supply and Ground Circuit Check before referring to the following flow chart.

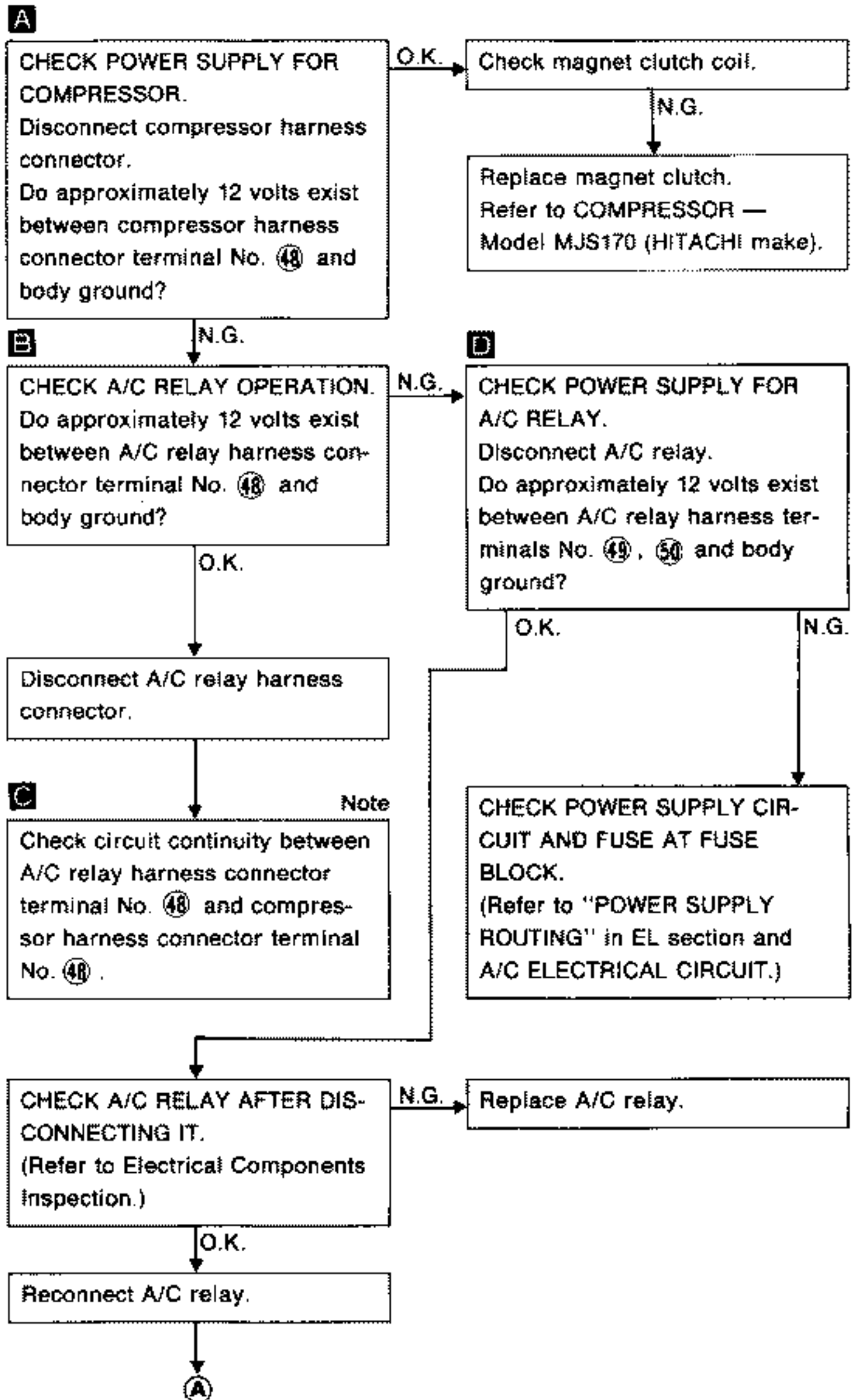




Diagnostic Procedure 4

SYMPTOM: Magnet clutch does not engage with A/C switch and fan switch are ON.

- Perform **PRELIMINARY CHECK 2** before referring to the following flow chart.

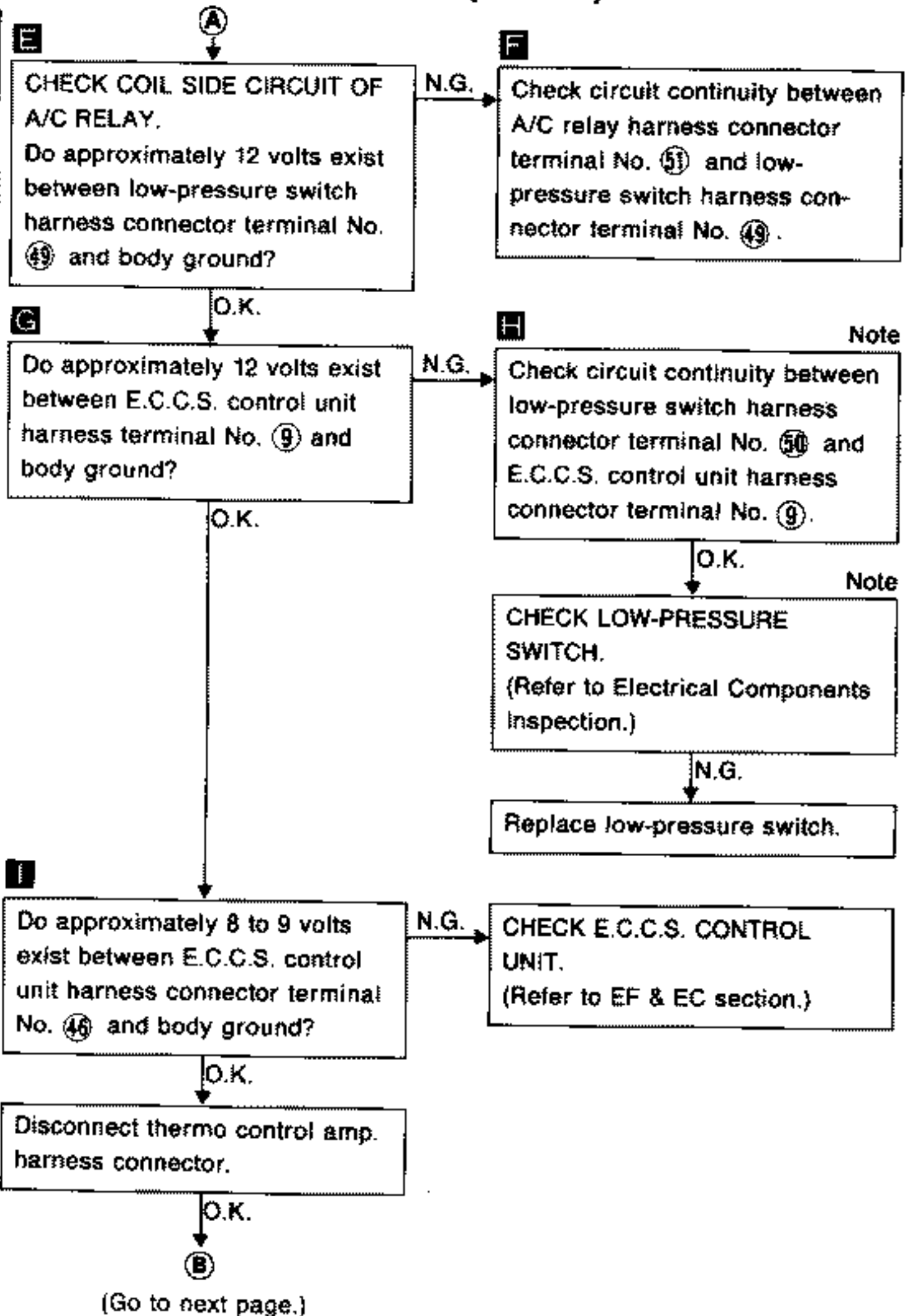
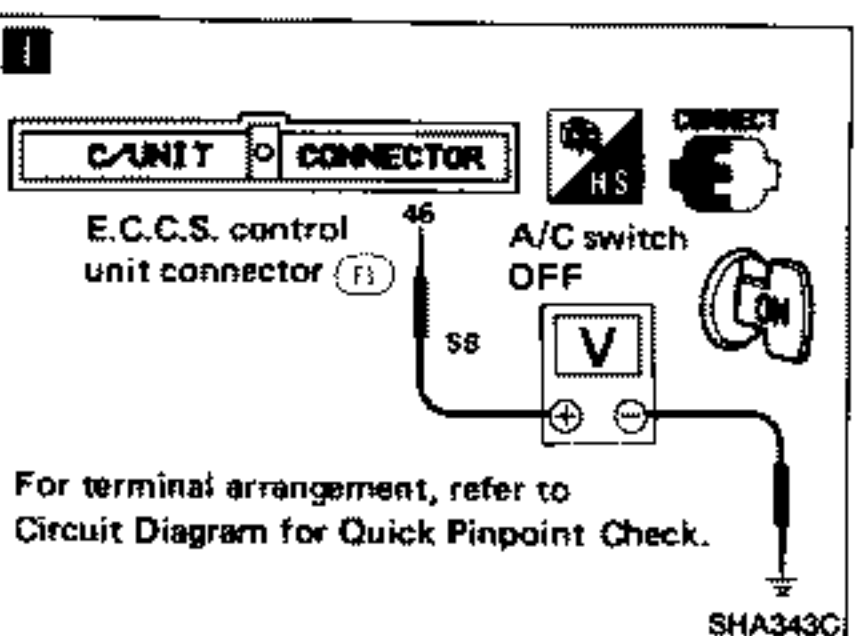
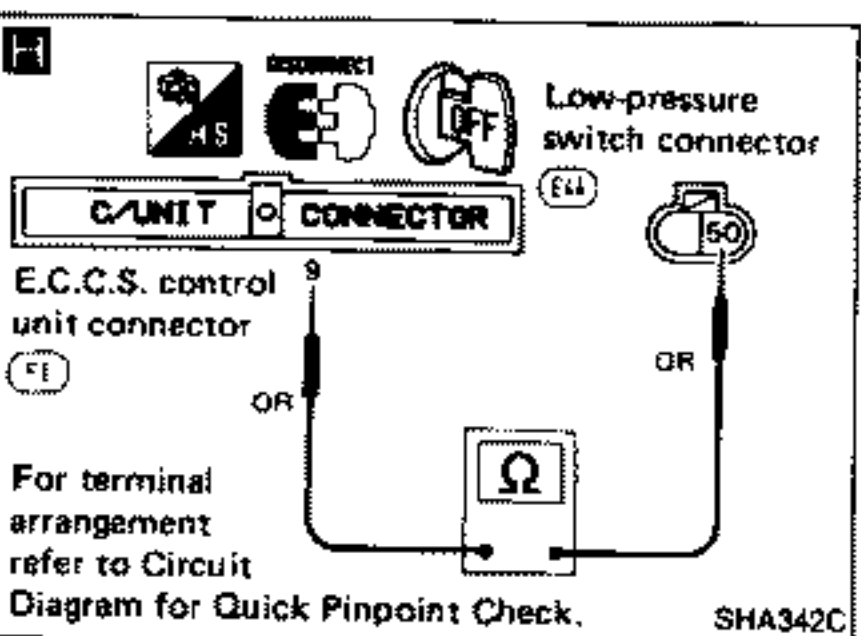
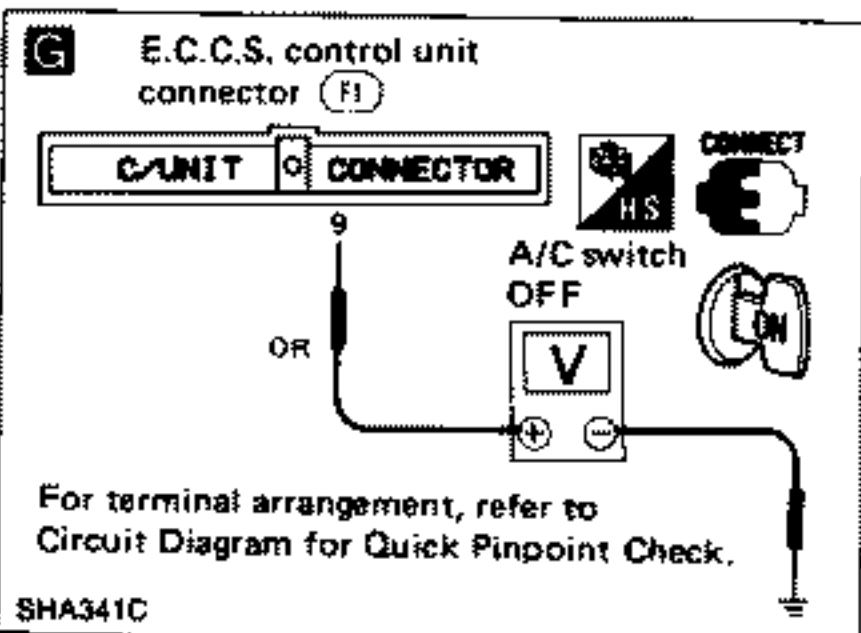
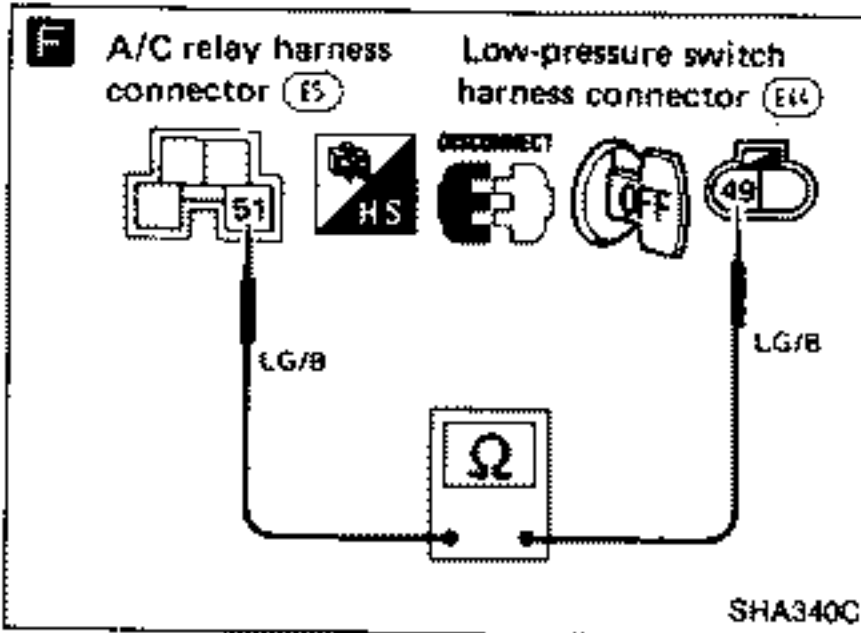
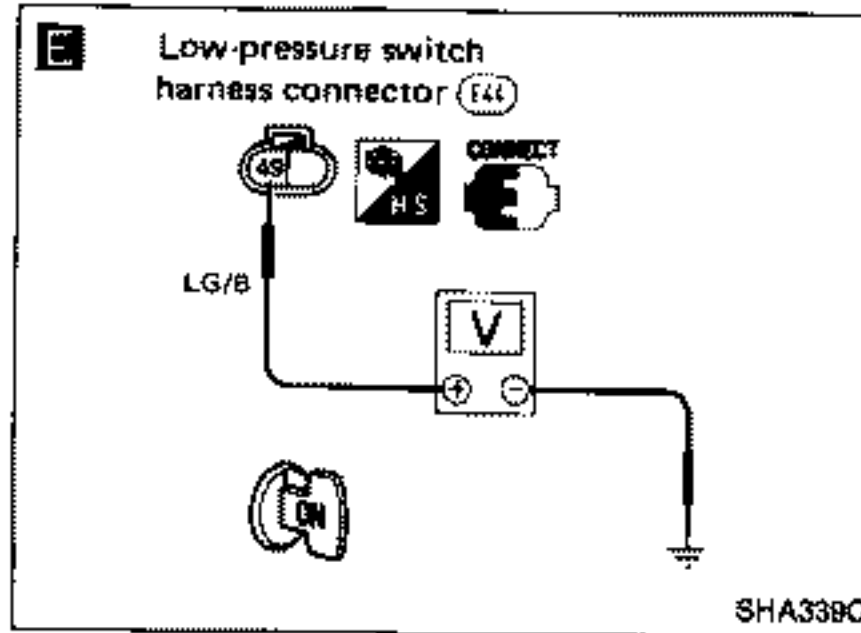


Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Manual Air Conditioner

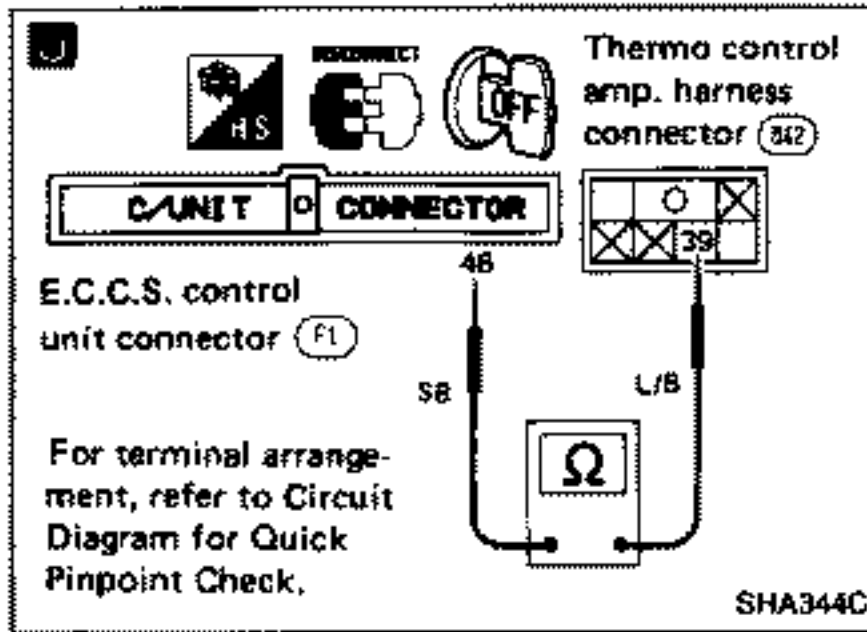
Diagnostic Procedure 4 (Cont'd)



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

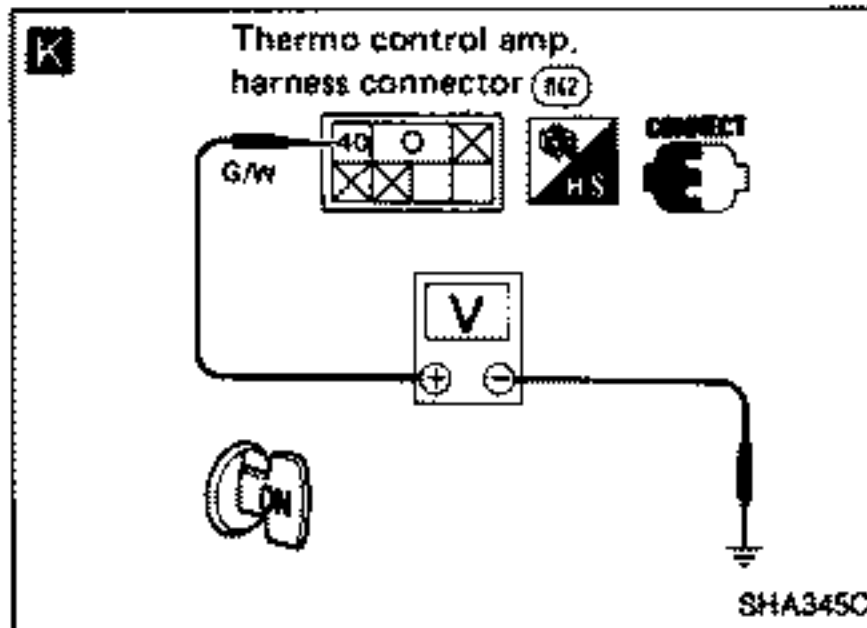
TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 4 (Cont'd)



Note

Check circuit continuity between thermo control amp. harness connector terminal No. 39 and E.C.C.S. control unit harness connector terminal No. 48.



K

O.K.

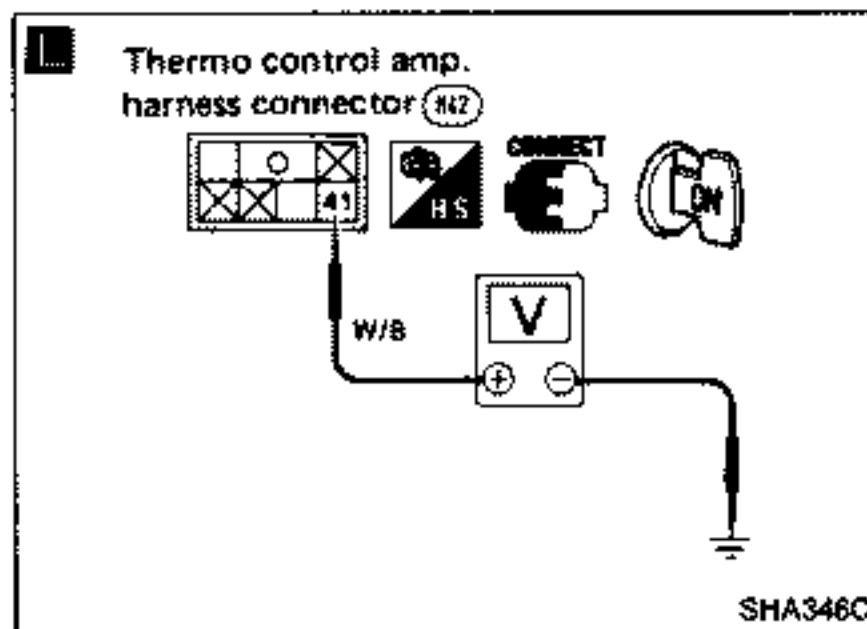
CHECK POWER SUPPLY FOR THERMO CONTROL AMP.

Do approximately 12 volts exist between thermo control amp. harness connector terminal No. 40 and body ground?

N.G.

CHECK POWER SUPPLY CIRCUIT AND FUSE AT FUSE BLOCK.

(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)



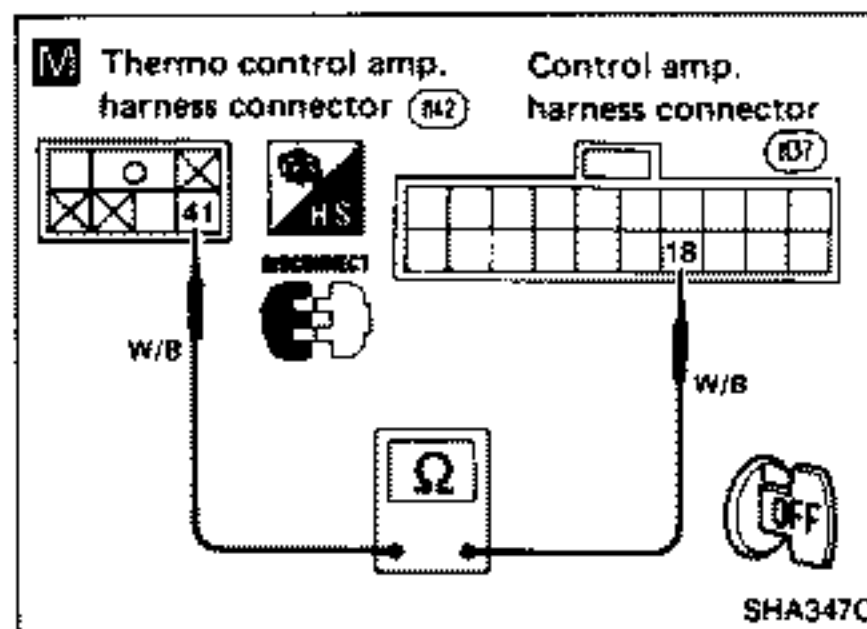
O.K.

L

Is the voltage between thermo control amp. harness connector terminal No. 41 and body ground approximately 0V?

N.G.

Replace thermo control amp.



O.K.

Note

Check continuity between thermo control amp. harness connector terminal No. 41 and control amp. harness connector terminal No. 18.

N

O.K.

CHECK A/C SWITCH OF SWITCH UNIT.

Check the voltage between switch unit harness connector terminals No. 6 and 11

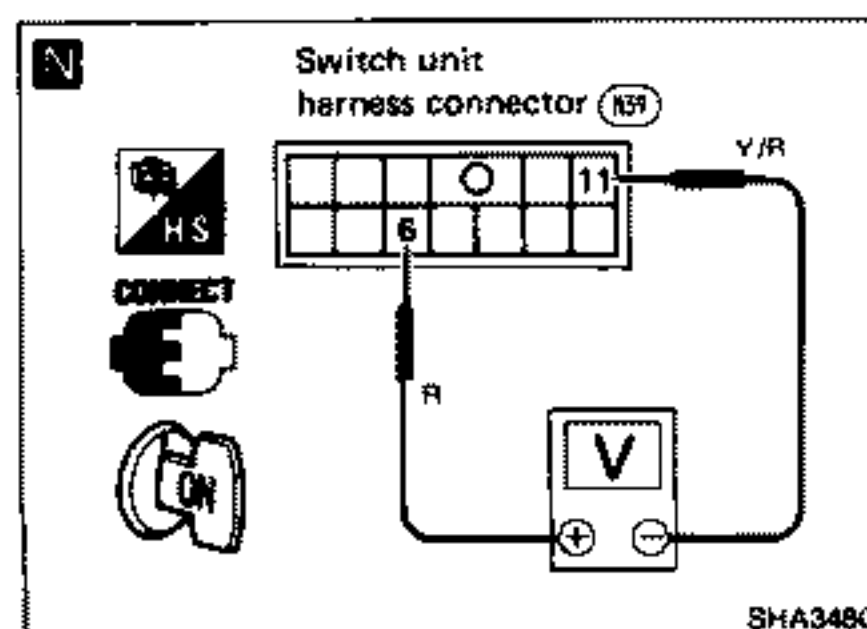
REC switch	Terminal No.	Voltage (Approx.)	
	12	11	
Switch pressed	+	-	0V
Switch free	+	-	5V

N.G.

Disconnect switch unit connector.

O.K.

Replace control amp.



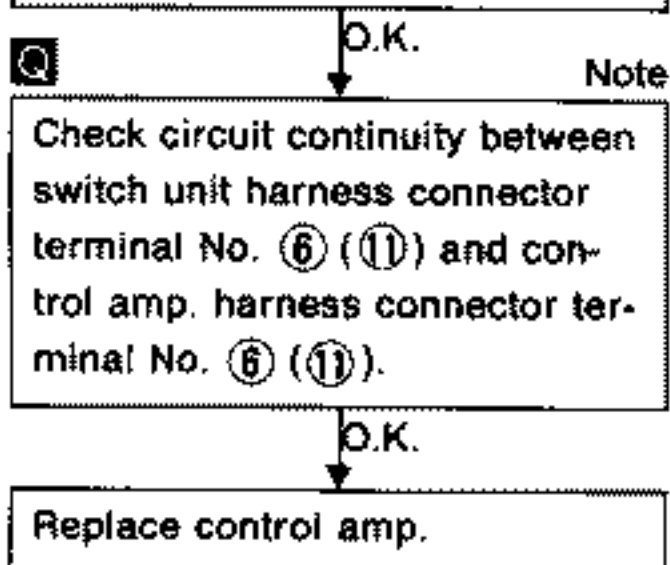
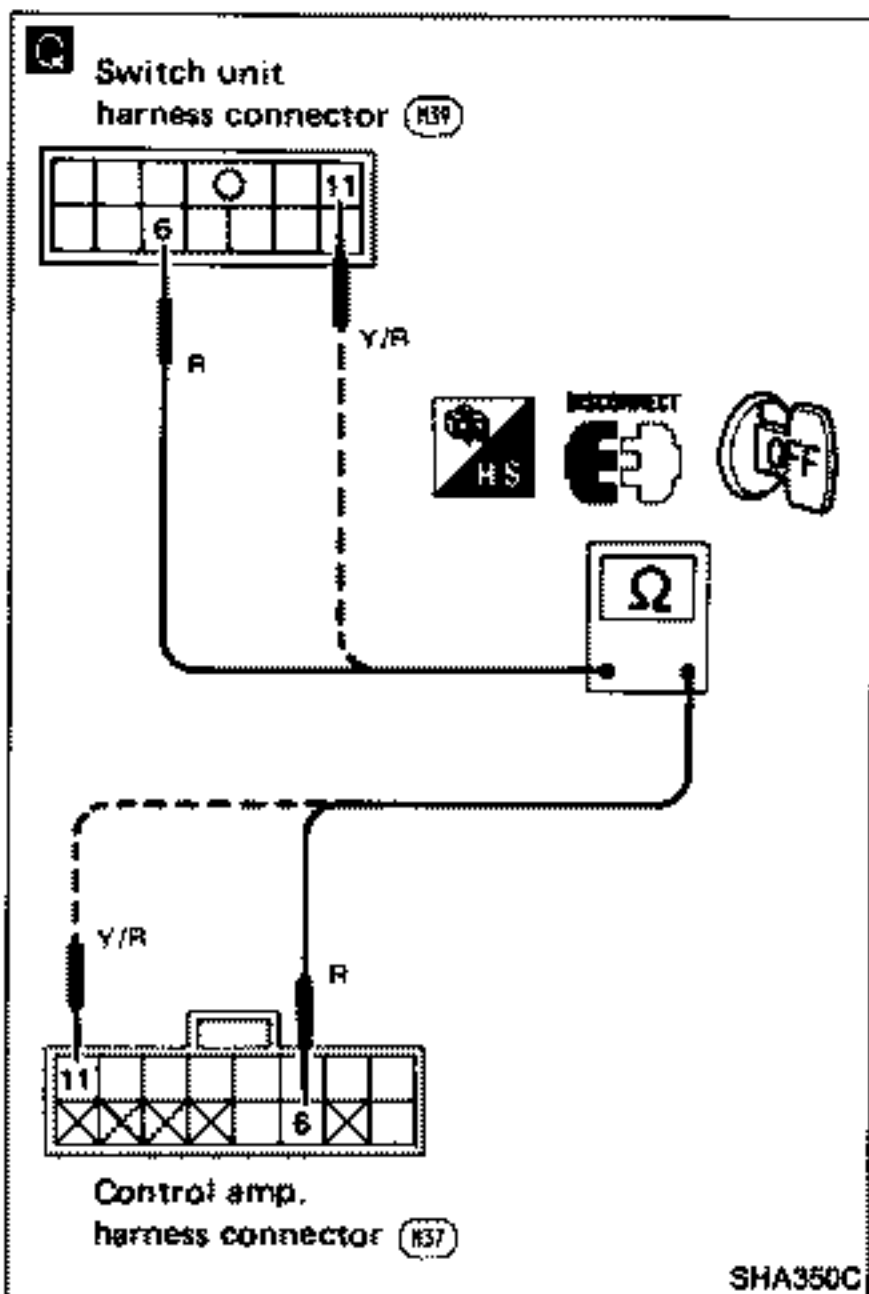
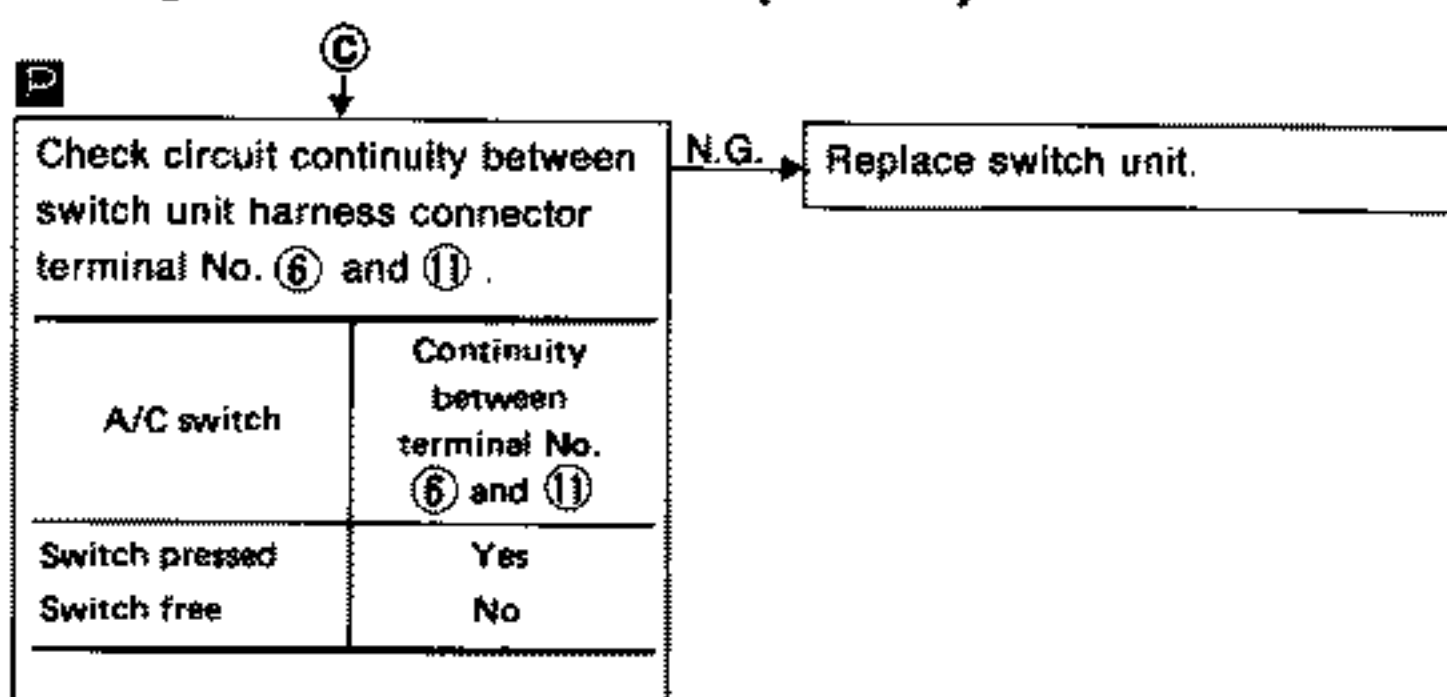
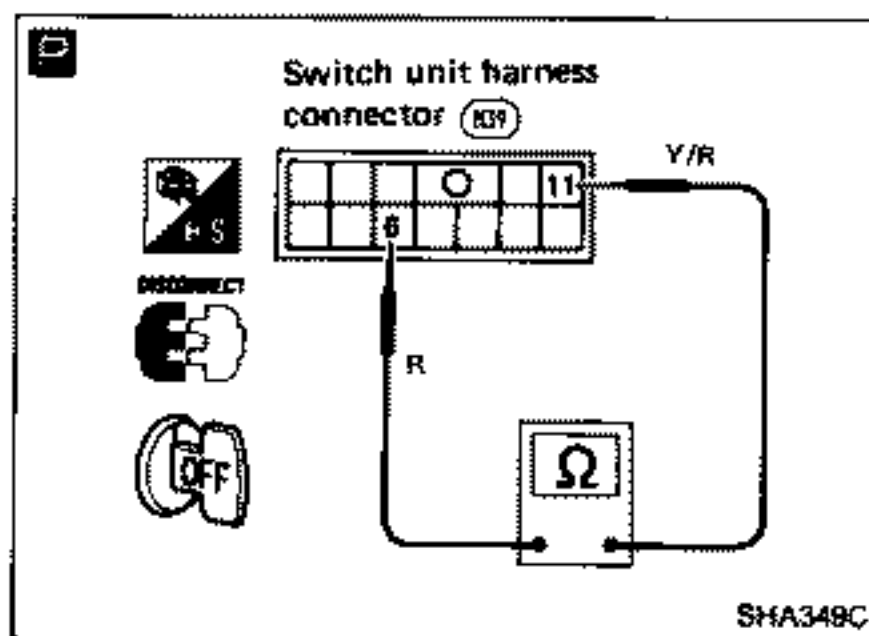
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

(Go to next page.)

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 4 (Cont'd)



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5

SYMPTOM: Illumination or control panel indicators do not come on.

- Perform Main Power Supply and Ground Circuit Check before referring to the following flow chart.

Turn ignition switch and lighting switch ON.



CHECK ILLUMINATION AND INDICATORS.

- Turn A/C, REC and fan ON.
- Rotary VENT, B/L, FOOT, F/D and DEF switches in order.
- Check for incidents and follow the repairing methods as shown.

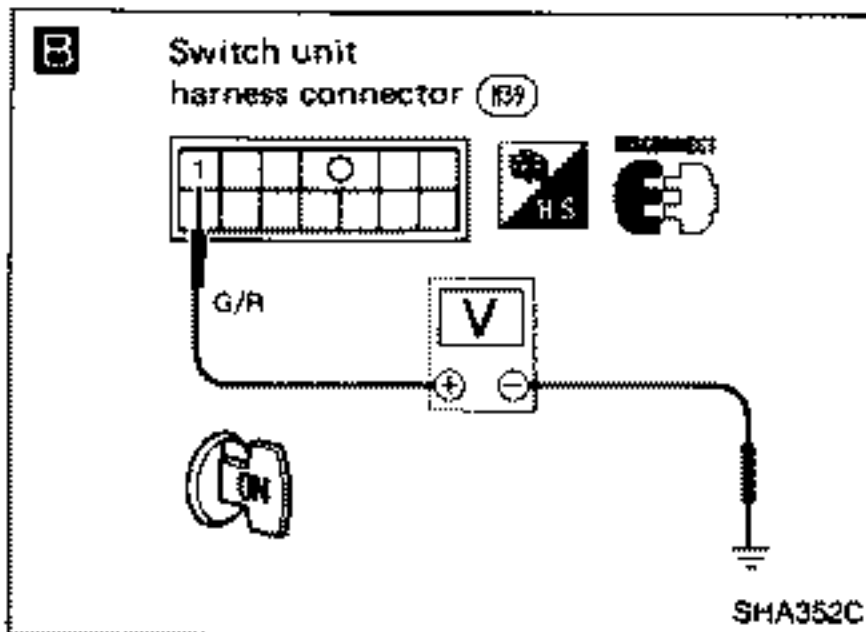
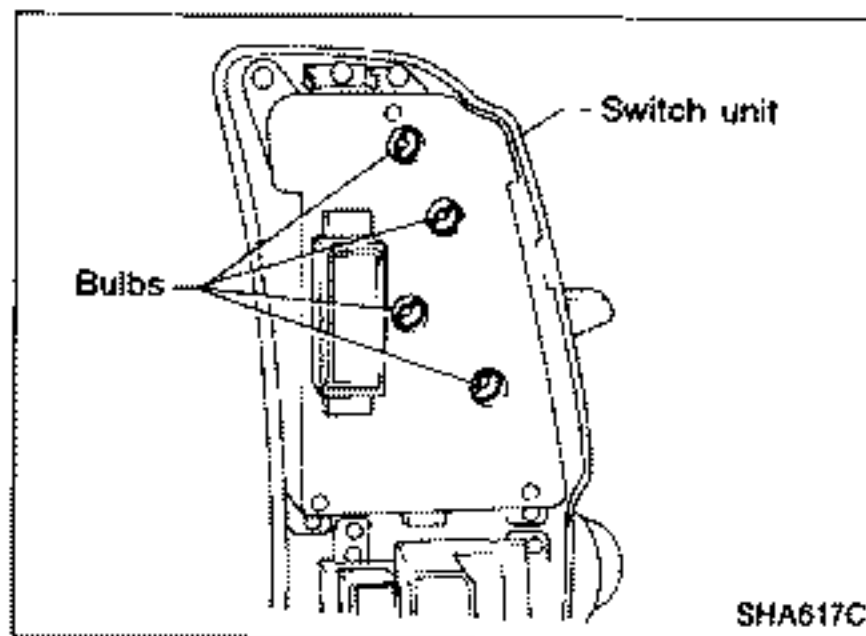
INCIDENT			How to repair
ILL	A/C	REC	
Control panel			
X	○	○	Go to DIAGNOSTIC PROCEDURE 5-1.
○	X	○	Go to DIAGNOSTIC PROCEDURE 5-2.
○	○	X	Go to DIAGNOSTIC PROCEDURE 5-3.
○	X	X	Go to DIAGNOSTIC PROCEDURE 5-4.

○: Illumination or indicator comes on.

X: Illumination or indicator does not come on.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-1



CHECK THE OTHER ILLUMINATION SYSTEMS EXCEPT FOR A/C SYSTEM.
Do the other illuminations come on with ignition switch and lighting switch ON?

N.G.

CHECK ILLUMINATION SYSTEM.
Refer to Illumination/Wiring Diagram in EL section.

O.K.

Turn ignition switch and lighting switch OFF.

A

CHECK ILLUMINATION BULB.
Remove switch unit and disconnect harness connectors. Remove illumination bulb(s) and check them.

N.G.

Replace illumination bulb(s).

O.K.

B

CHECK POWER SUPPLY FOR ILLUMINATION WITH LIGHTING SWITCH ON.
Do approximately 12 volts exist between switch unit connector harness terminal No. ① and body ground?

N.G.

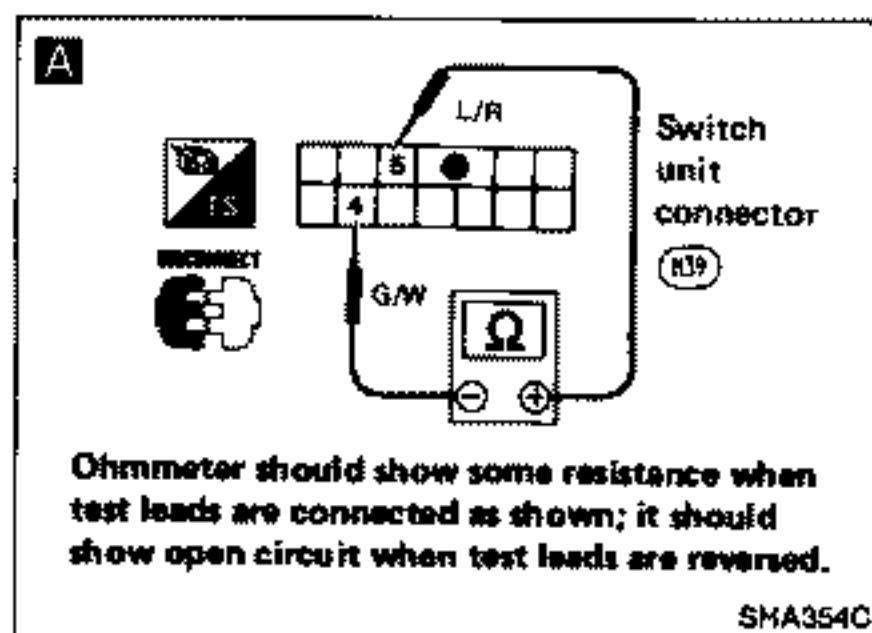
CHECK POWER SUPPLY FOR ILLUMINATION SYSTEM.
Refer to Illumination/Wiring Diagram in EL section.

O.K.

CHECK TIME CONTROL SYSTEM.
Refer to TIME CONTROL SYSTEM in EL section.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-2



CHECK MAGNET CLUTCH OPERATION.
Does magnet clutch operate normally when engine is ON and A/C switch, fan switch are ON?

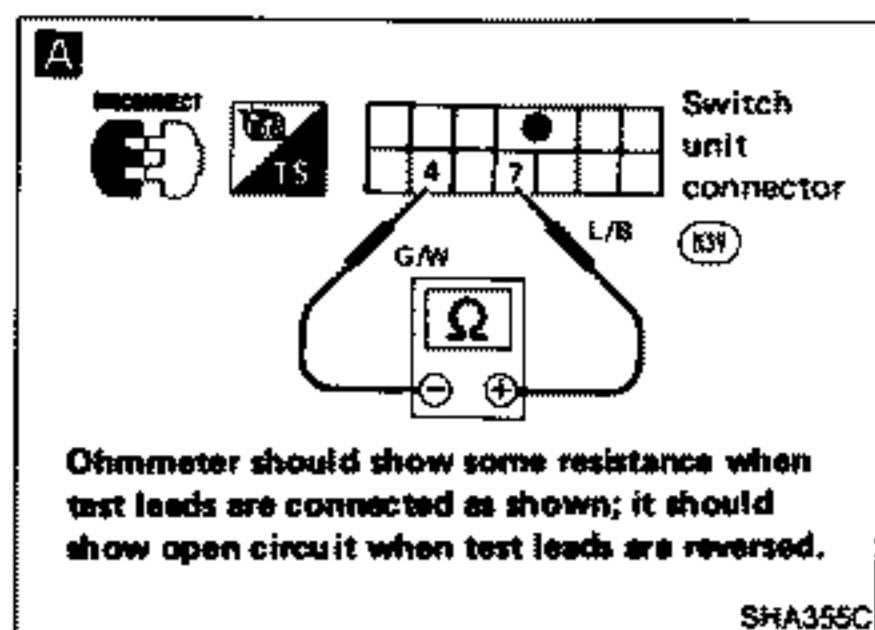
N.G.

Go to **Diagnostic Procedure 4.**

A O.K.
Check circuit continuity of L.E.D.

N.G.

Replace switch unit.



DIAGNOSTIC PROCEDURE 5-3

CHECK INTAKE DOOR OPERATION.
Does intake door operate normally when engine is ON and A/C switch, fan switch are ON?

N.G.

Go to **Diagnostic Procedure 3.**

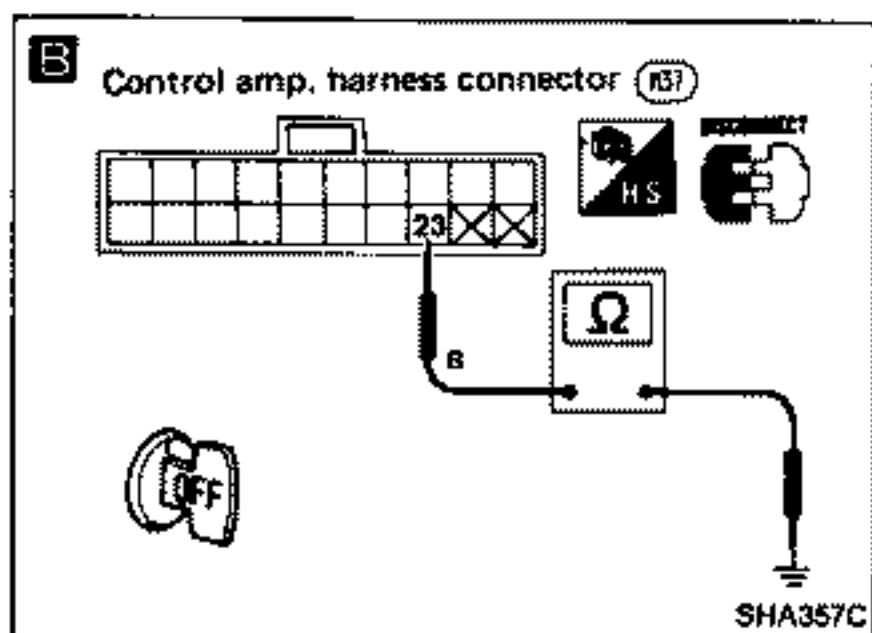
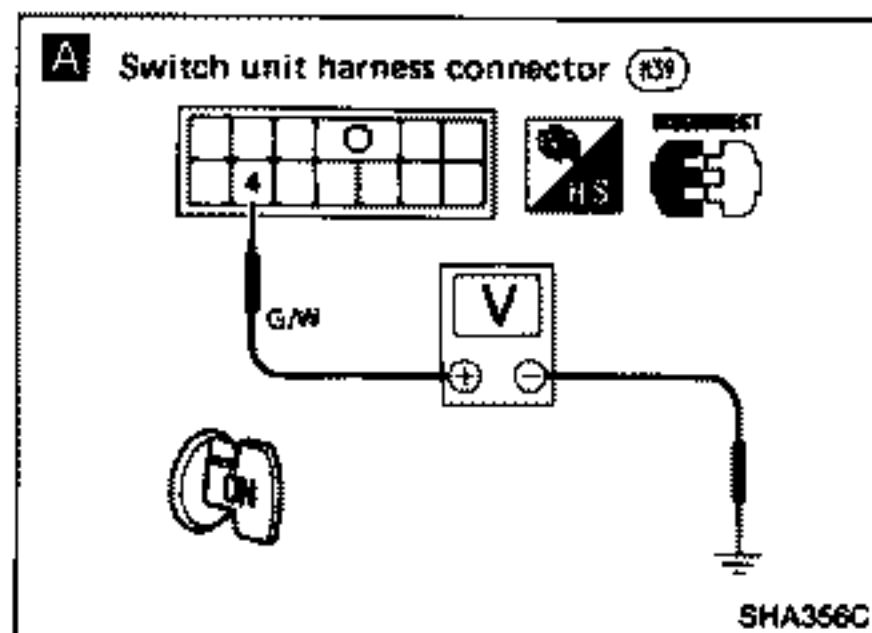
A O.K.
Check circuit continuity of L.E.D.

N.G.

Replace control panel.

Diagnostic Procedure 5 (Cont'd)

DIAGNOSTIC PROCEDURE 5-4



Turn ignition switch and lighting switch OFF.

Disconnect switch unit harness connector.

A

CHECK POWER SUPPLY FOR SWITCH UNIT
Do approximately 12 volts exist between switch unit harness connector terminal No. ④ and body ground?

N.G. Check harness of switch unit power supply circuit.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

O.K.

B

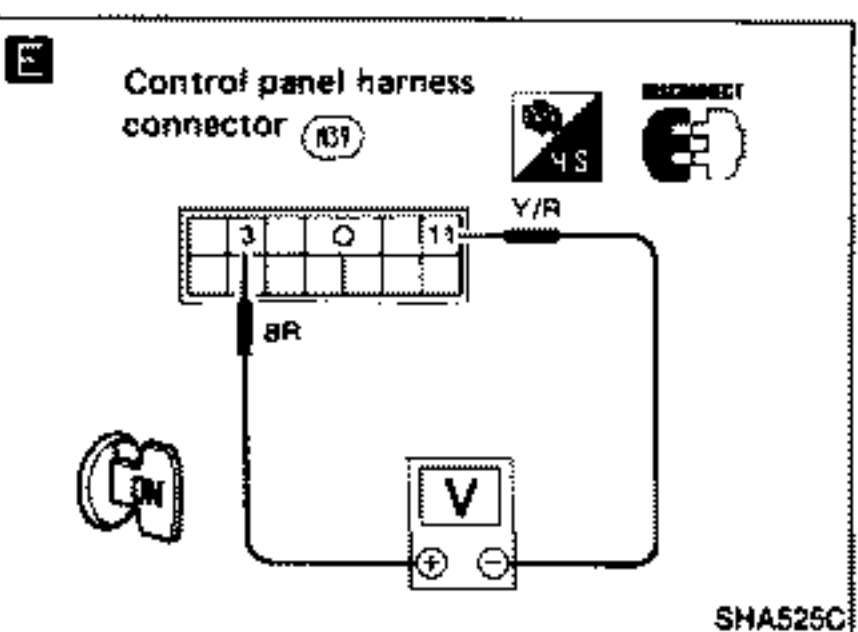
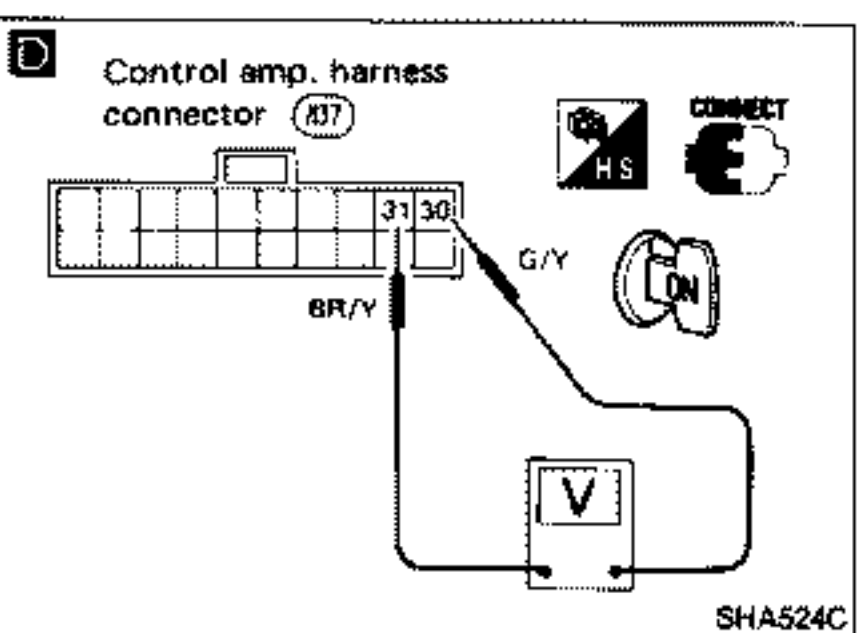
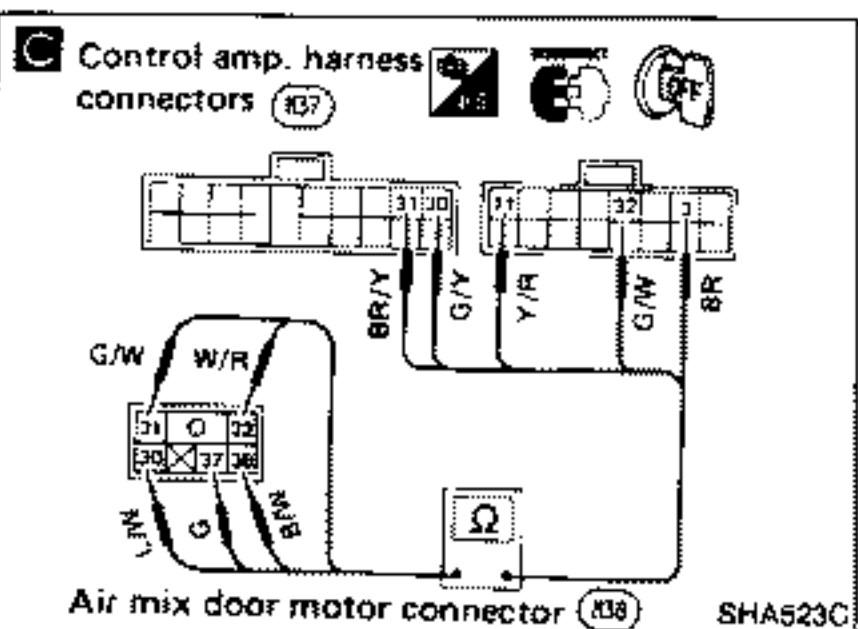
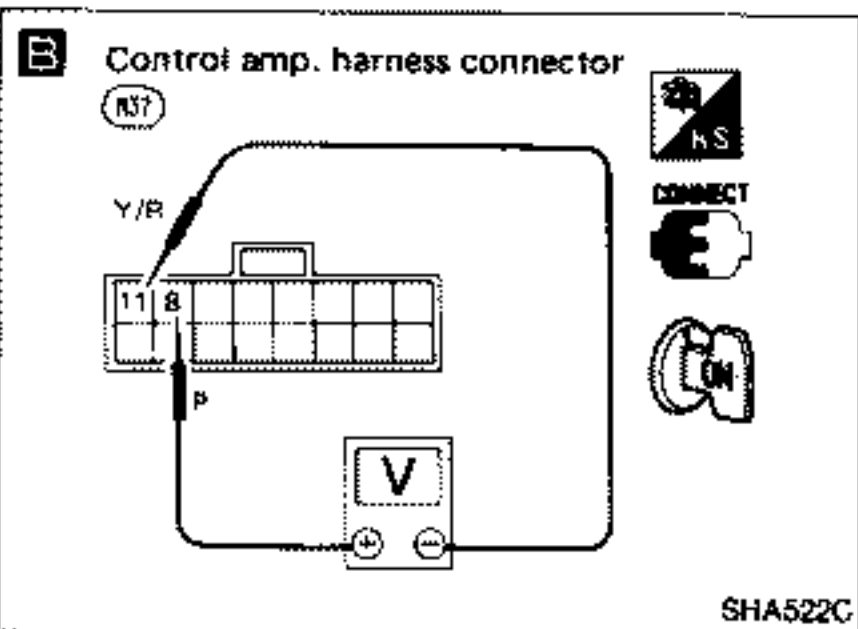
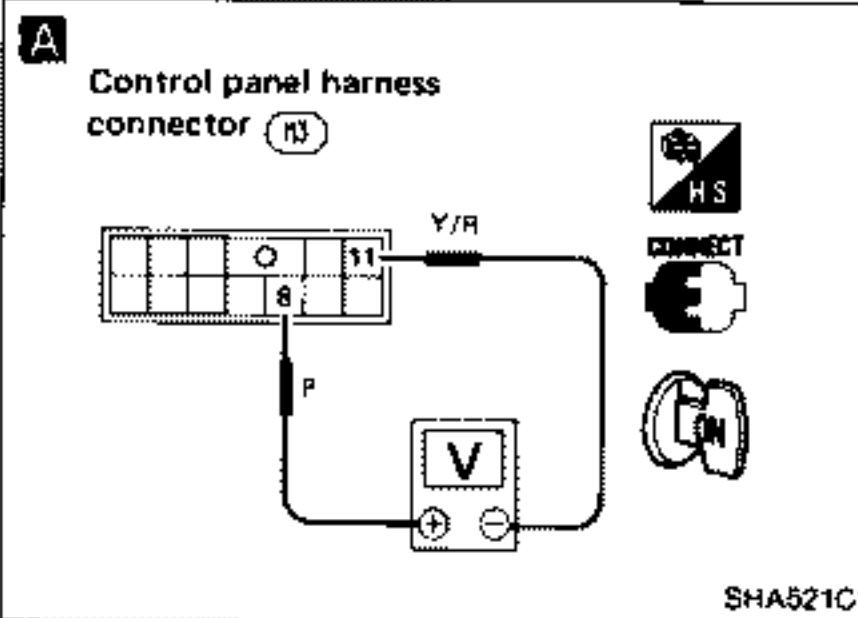
CHECK BODY GROUND CIRCUIT FOR CONTROL AMP.
Does continuity exist between control amp. harness connector terminal No. ②③ and body ground?

O.K.

Replace control amp.

Diagnostic Procedure 6

SYMPTOM: Temperature of air outlet does not change.



A CHECK TEMPERATURE CONTROL LEVER.
Measure voltage between control panel harness connector terminals No. ⑧ and ⑪.

Temp. control lever	Terminal No.		Voltage (approx.)
	+	-	
Full hot	⑧	⑪	5V
Full cold	⑧	⑪	0V

N.G. Disconnect control amp. harness connector.

E Check if approximately 5 volts exist between control panel harness connector terminals No. ⑧ and ⑪.

N.G. O.K.

Replace control amp.

Ⓐ (Go to next page.)

O.K. Measure voltage between control amp. harness connector terminals No. ⑧ and ⑪.

Temp. control lever	Terminal No.		Voltage (approx.)
	+	-	
Full hot	⑧	⑪	5V
Full cold	⑧	⑪	0V

O.K. Check continuity between each terminal of control amp. and air mix door motor.

N.G. Repair harness or connector.

Terminal No.		Continuity
Control amp.	Air mix door motor	
③⑩	②⑩	Yes
③⑪	③⑪	
③⑫	③⑫	
③⑬	③⑬	
③⑭	③⑭	

O.K. CHECK FOR CONTROL AMP. OUTPUT.
Check if 12 volts exist between control amp. harness connector terminals No. ③⑩ and ③⑪ when temp. control lever is moved.

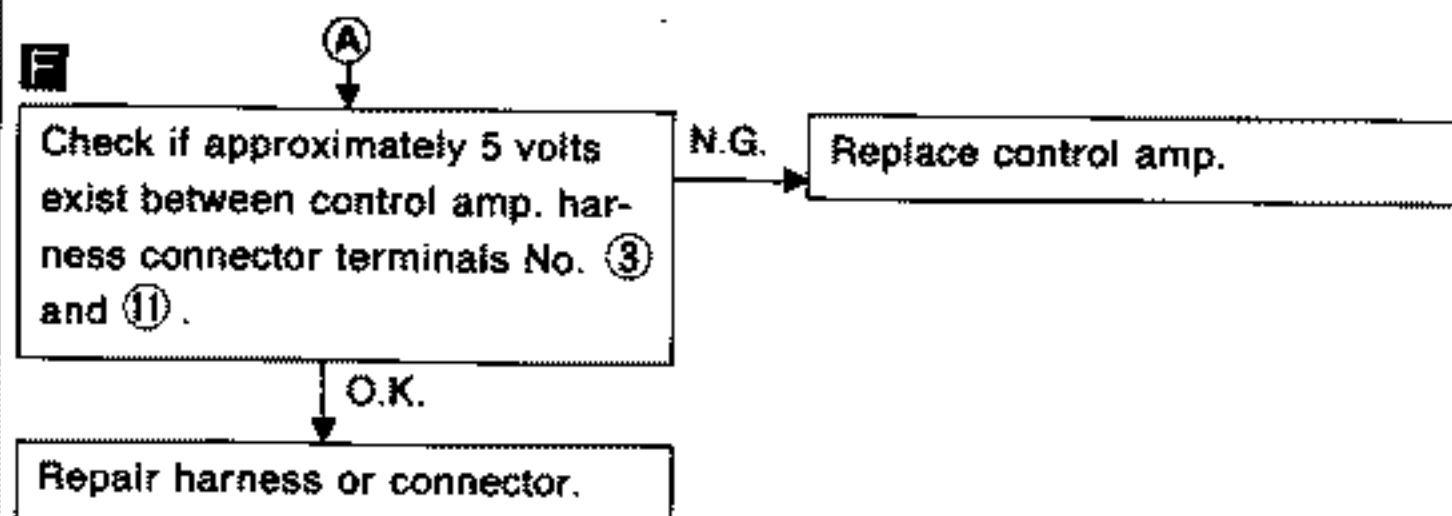
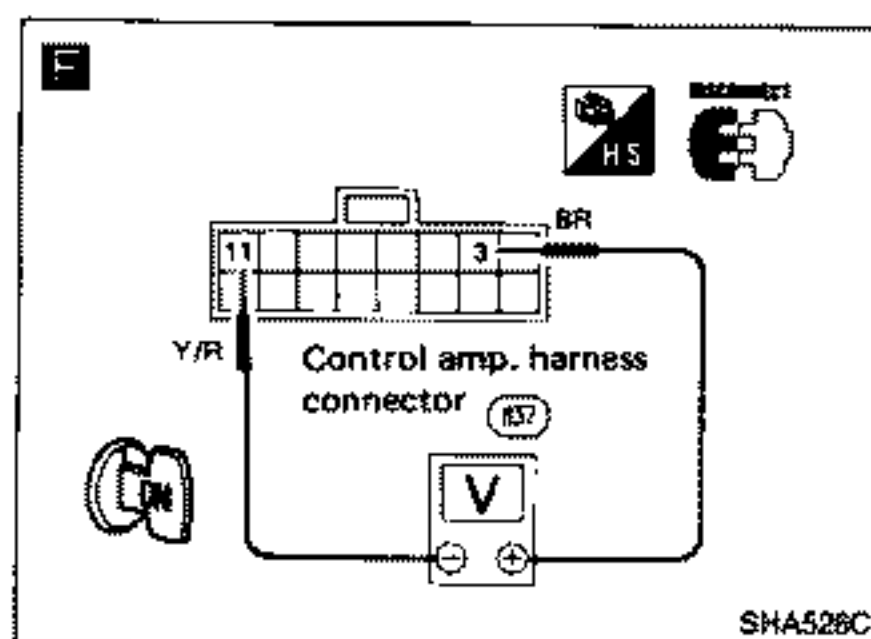
N.G. Replace control amp.

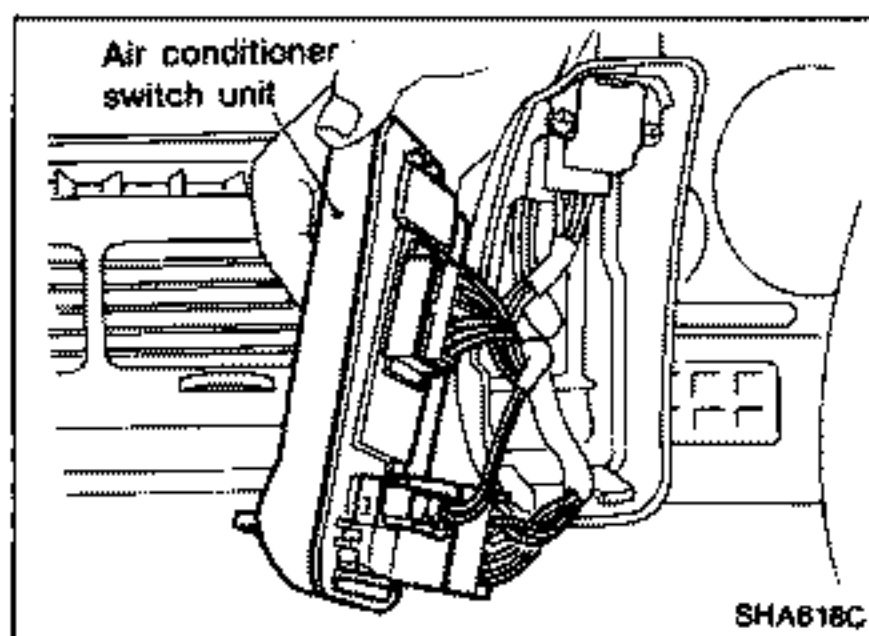
Terminal No.	Air mix door motor	Direction of linkage rotation
③⑩	③⑪	
+	+	Stop
-	+	Cold → Hot
+	-	Hot → Cold
-	-	Stop
-	+	Counter-clockwise
+	-	Clockwise

O.K. Replace air mix door motor.

TROUBLE DIAGNOSES — Manual Air Conditioner

Diagnostic Procedure 6 (Cont'd)



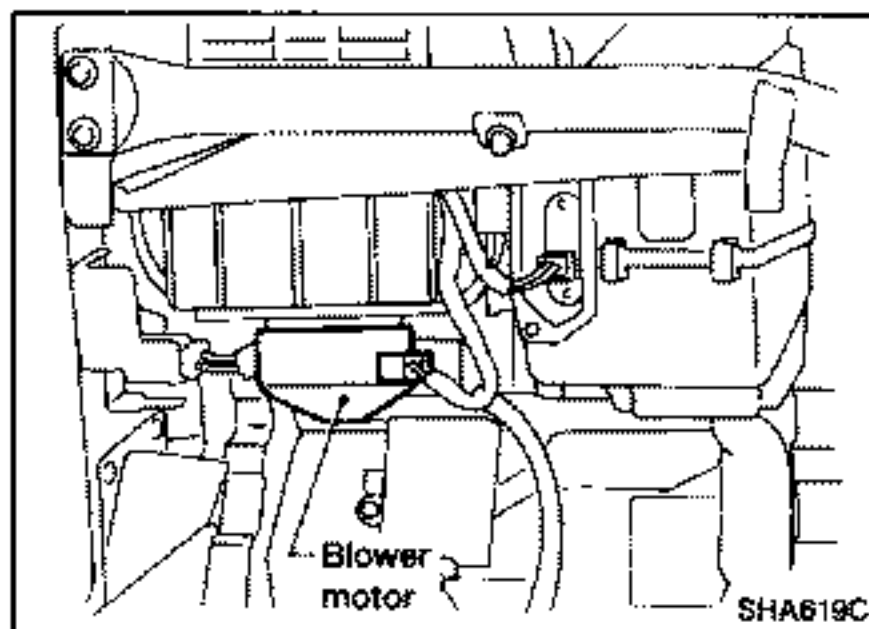
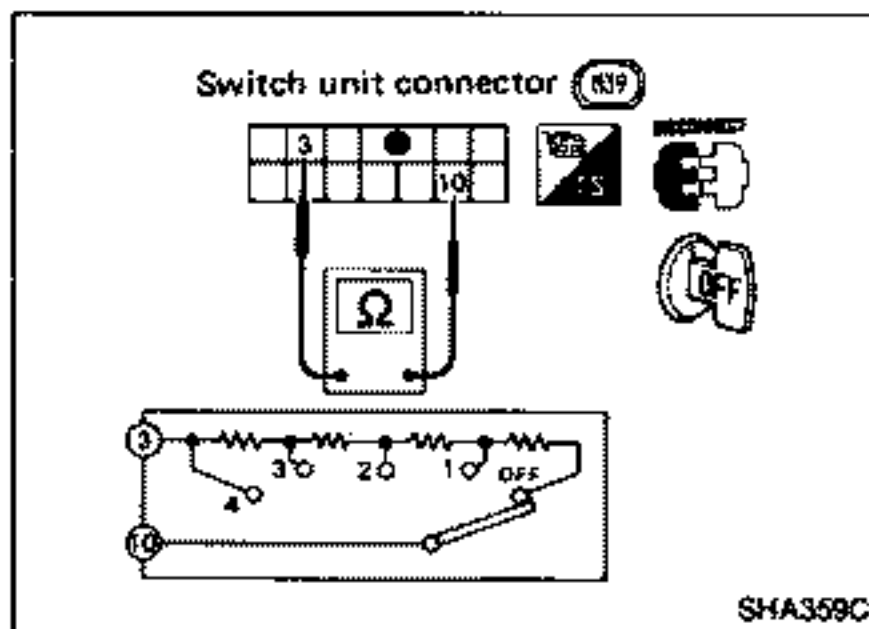


Electrical Components Inspection

FAN SWITCH

Check resistance between terminals at each switch position.

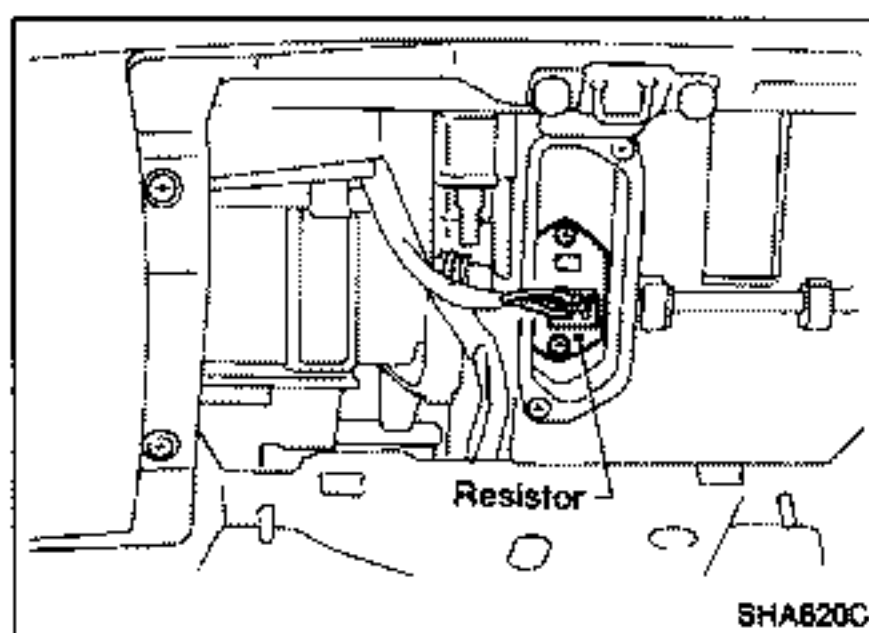
Switch position	Resistance between terminals No. ③ and ⑩ (Approx. Ω)
OFF	710
1	1,140
2	460
3	270
4	0



BLOWER MOTOR

Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.

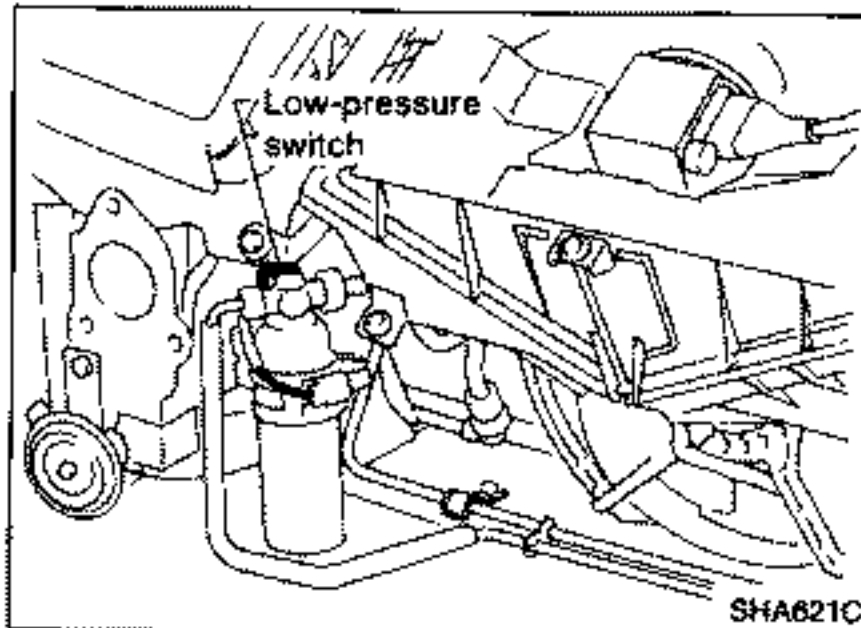
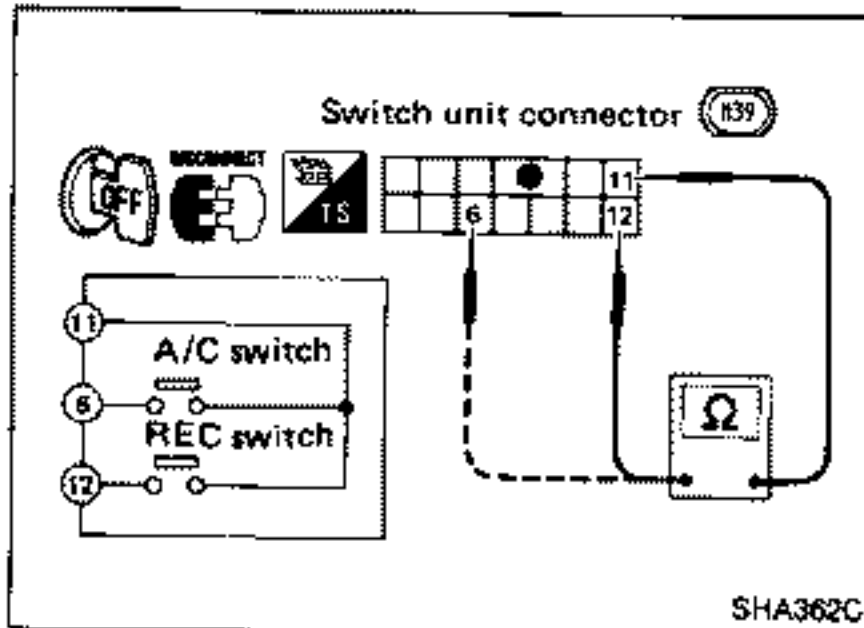
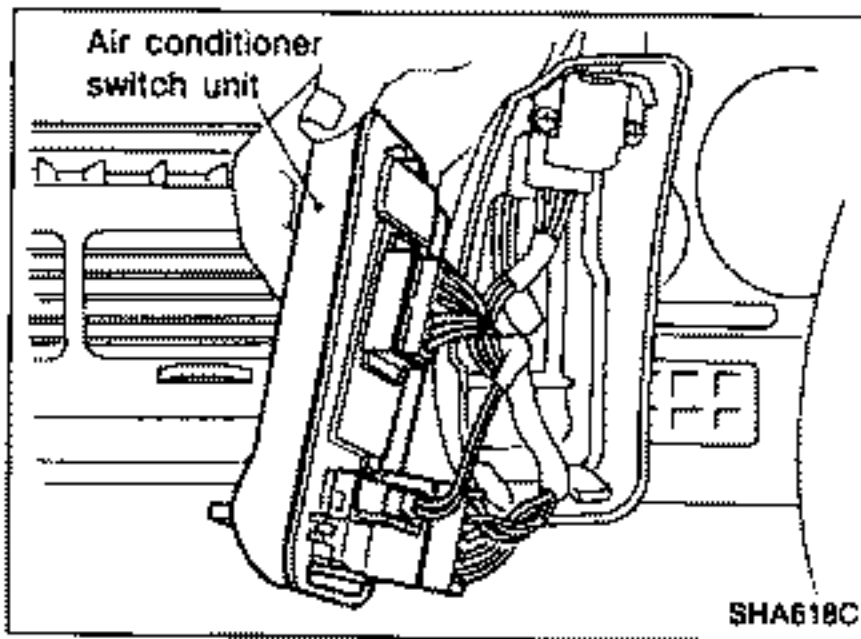
TROUBLE DIAGNOSES — Manual Air Conditioner

Electrical Components Inspection (Cont'd)

A/C SWITCH

Check continuity between terminals at each switch position.

Switch condition	Terminal No.		Continuity
While A/C switch is pushed	⑥	⑬	Yes
While REC switch is pushed	⑬	⑪	Yes

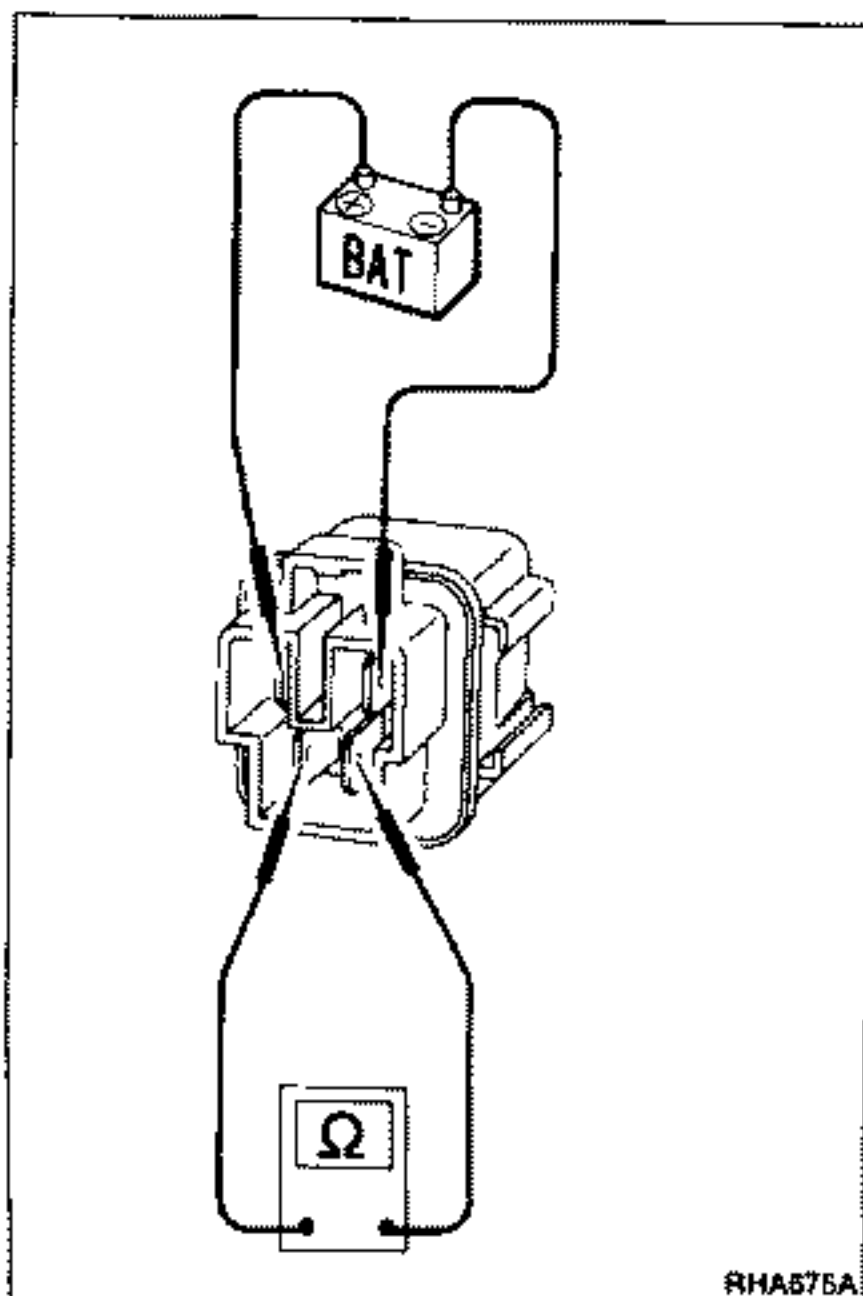


LOW-PRESSURE SWITCH

High-pressure side line pressure kPa (bar, kg/cm ² , psi)	Operation	Continuity
196 (1.96, 2.0, 28)	Turn OFF	Does not exist
206 (2.06, 2.1, 30)	Turn ON	Exist

RELAY

Check circuit continuity between terminals by supplying 12 volts to coil side terminal of relay.

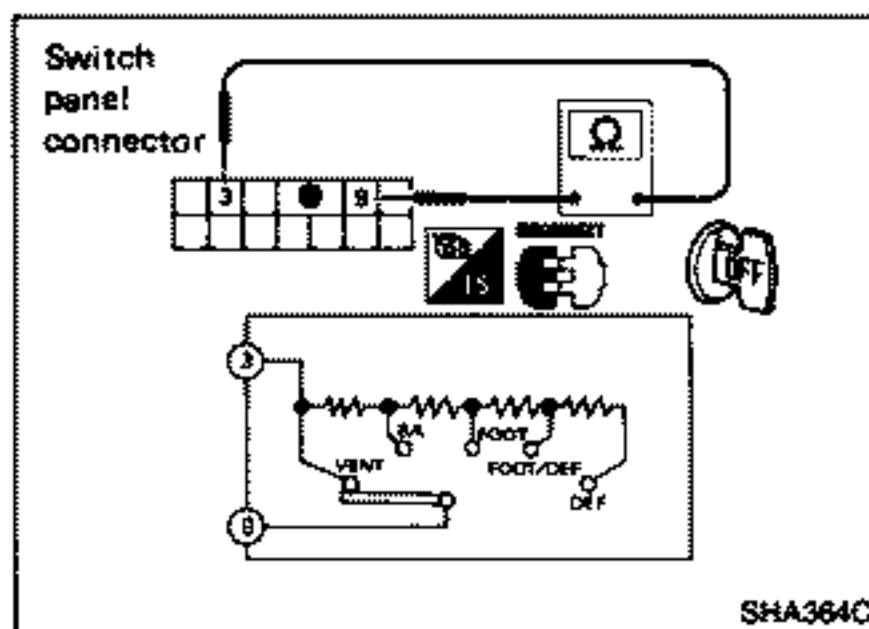
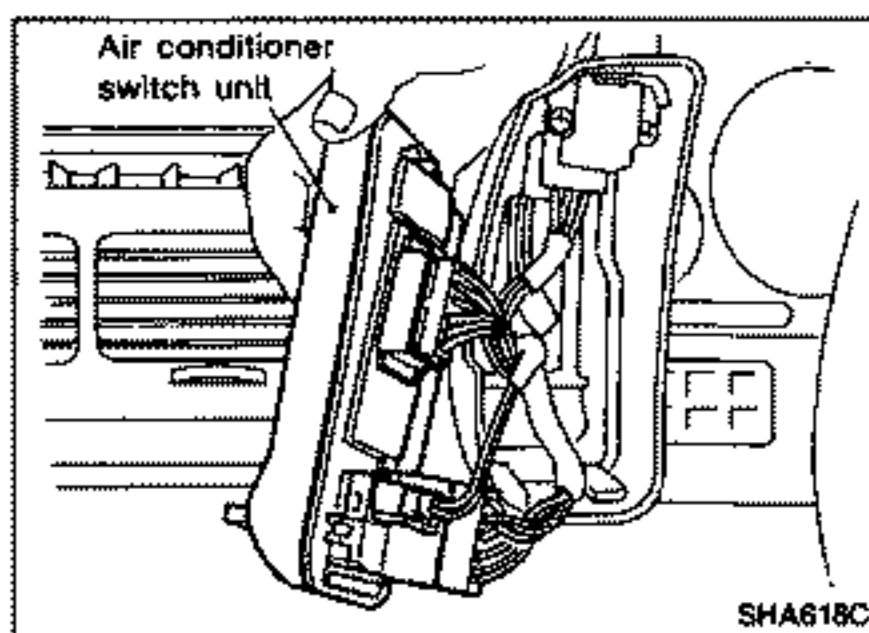


TROUBLE DIAGNOSES — Manual Air Conditioner

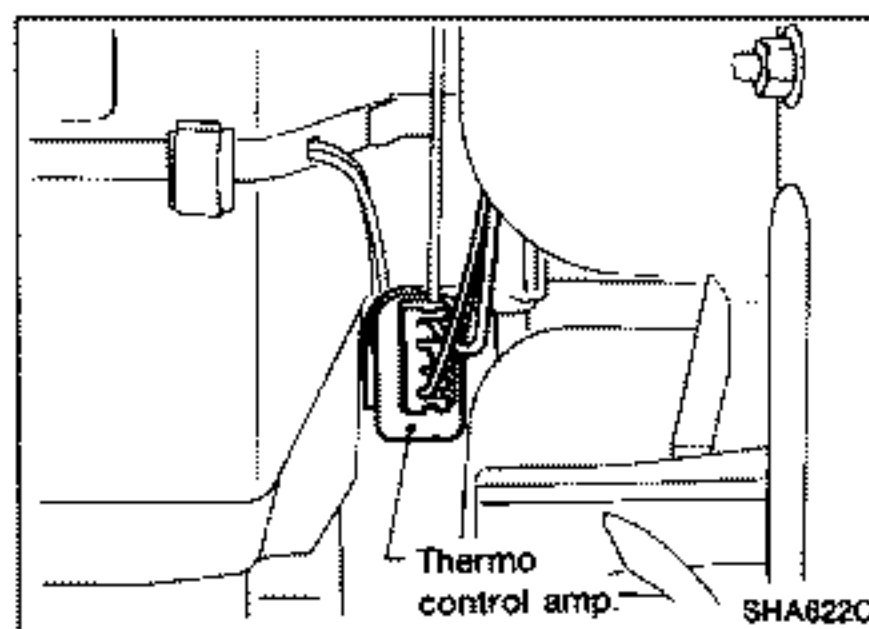
Electrical Components Inspection (Cont'd)

MODE SWITCH

Check resistance between terminals at each switch position.



Switch position	Resistance between terminals No. ⑨ and No. ③ (Ω)
VENT	0
B/L	270
FOOT	460
FOOT/DEF	1,140
DEF	710



THERMO CONTROL AMP.

1. Run engine and operate A/C system.
2. Connect the voltmeter from harness side.
3. Check thermo control amp. operation shown in the table.

Evaporator outlet air temperature °C (°F)	Thermo control amp. operation	Voltage (Approx.)
Decreasing to 3.0 (37)	Turn OFF	12V
Increasing to 4.5 (40)	Turn ON	0V

Features

OUTLET AIR TEMPERATURE CONTROL (Air mix door control)

When the desired temperature is set on the control panel, the automatic temperature control system determines both the head and foot target temperatures, as well as target upper (VENT and DEF) and lower (FOOT) outlet air temperatures. This computation is accomplished in relation to the desired temperature, and outside conditions (ambient temperature and sunload). The automatic temperature control system then controls the air mix door position so that the outlet air temperatures meet target* outlet air temperatures.

A summary of the automatic temperature control system is as follows:

1. The upper and lower air temperatures are independently controlled to provide a comfortable ride.
2. Optimum outlet air temperatures can be set to the passenger's preference.
3. Outlet air temperature feedback control through duct sensors permits a "potentiometerless" air mix door design. It requires no adjustment, increases service life and improves performance reliability.

FAN SPEED CONTROL

The A.T.C. system continuously regulates fan speed according to the difference between the target temperature and the temperatures detected at the upper and lower in-vehicle sensors. The greater the difference between the temperatures the higher the blower speed. If the cabin sunload or ambient temperature is high, fan speed will be increased.

INTAKE DOOR CONTROL

The A.T.C. system adjusts the intake door position once every sixty seconds. The system is programmed to take in outside air as much as possible.

OUTLET DOOR CONTROL

The A.T.C. system controls distribution of air through the VENT, DEF and FOOT outlets based on the cabin sunload, ambient temperature and the set temperature.

COMPRESSOR MAGNET CLUTCH CONTROL

The A.T.C. system automatically shuts off the compressor at temperatures lower than 0°C (32°F).

SELF-DIAGNOSTIC SYSTEM

The A.T.C. system contains an on-board diagnostic system which can be used to check the A.T.C. system sensors and motors and any trouble data stored in the memory.

Pushing the "AUTO" and "OFF" switches at the same time for more than 5 seconds will give the self-diagnostic mode. There are 4 kinds of self-diagnostic systems (STEP 1 to STEP 4). Each step can be accessed by pushing the "AUTO" switch. The functions of each step are as follows:

- STEP 1 — Monitor diagnosis
- STEP 2 — Actuator test
- STEP 3 — Change of difference between upper and lower target temperature
- STEP 4 — Readout of trouble data memory

*: Target temperature

When a temperature for the cabin is set using the TEMP. SET switch, the A.T.C. system calculates an initial target temperature based on information from the various A.T.C. system sensors. This target temperature is continuously updated to bring the cabin temperature to the set temperature in the most comfortable way possible for the occupants. (The program for this was made after careful study of comfort levels related to car interiors).

Switch Functions on Control Unit

DEF SWITCH	
INTAKE DOOR POSITION	OUTSIDE AIR
OUTLET DOOR POSITION	DEFROSTER
AIR MIX DOOR POSITION	AUTOMATIC CONTROL
FAN SPEED	AUTOMATIC CONTROL
COMPRESSOR	ON [outside air temperature above 0°C (32°F)]
REMARKS	Fan speed can be set at "HI" or "LO".

TEMP. SET SWITCH
Each time corresponding switch is pressed, set temperature is increased or decreased by 1°F. When it is pressed for more than 0.5 seconds, set temperature can be continuously changed.

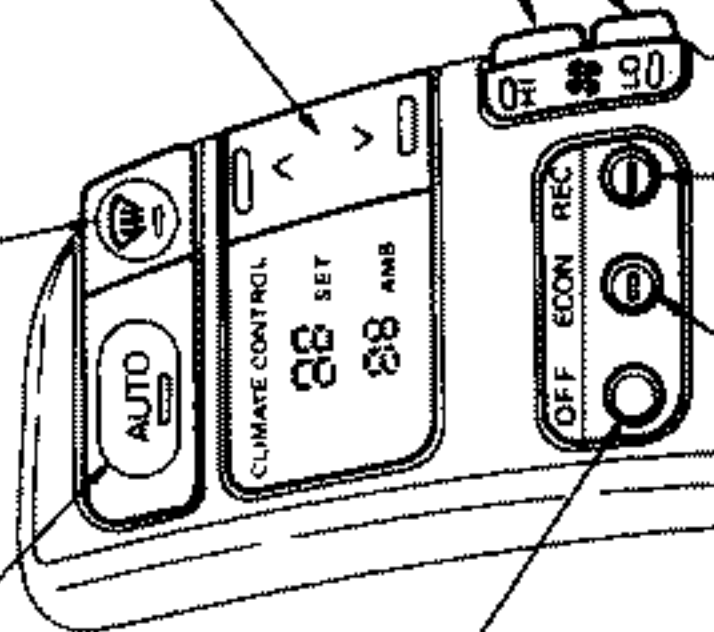
FAN SPEED FIXING SWITCH		
INDICATOR	HI	LO
FAN SPEED	HI SPEED	LO SPEED
Each function is cancelled when corresponding switch is pressed again.		

RECIRC SWITCH		
INDICATOR	ON	OFF
INTAKE DOOR POSITION	RECIRCULATED AIR	AUTOMATIC CONTROL
REMARKS	Recirculation mode changes to automatic control mode ten minutes after "RECIRC" switch is turned "ON". "RECIRC" switch does not function when compressor is "OFF" or when it is in "ECON" or "DEF" mode. Recirculation function is cancelled when "RECIRC" switch is pressed again.	

AUTO SWITCH	
INTAKE DOOR POSITION	AUTOMATIC CONTROL
OUTLET DOOR POSITION	
AIR MIX DOOR POSITION	
FAN SPEED	
COMPRESSOR	ON [outside air temperature above 0°C (32°F)]
REMARKS	Fan speed can be set at "HI" or "LO".

OFF SWITCH	
INTAKE DOOR POSITION	OUTSIDE AIR
OUTLET DOOR POSITION	AUTOMATIC CONTROL
AIR MIX DOOR POSITION	
FAN SPEED	
COMPRESSOR	
REMARKS	REC switch can be set.

ECON SWITCH		
INDICATOR	ON	OFF
INTAKE DOOR POSITION	OUTSIDE AIR	AUTOMATIC CONTROL
COMPRESSOR	OFF	ON [outside air temperature above 0°C (32°F)]
REMARKS	"ECON" switch does not function when compressor is "OFF" and DEF switch is "ON". "ECON" switch function is also cancelled when pressed again.	

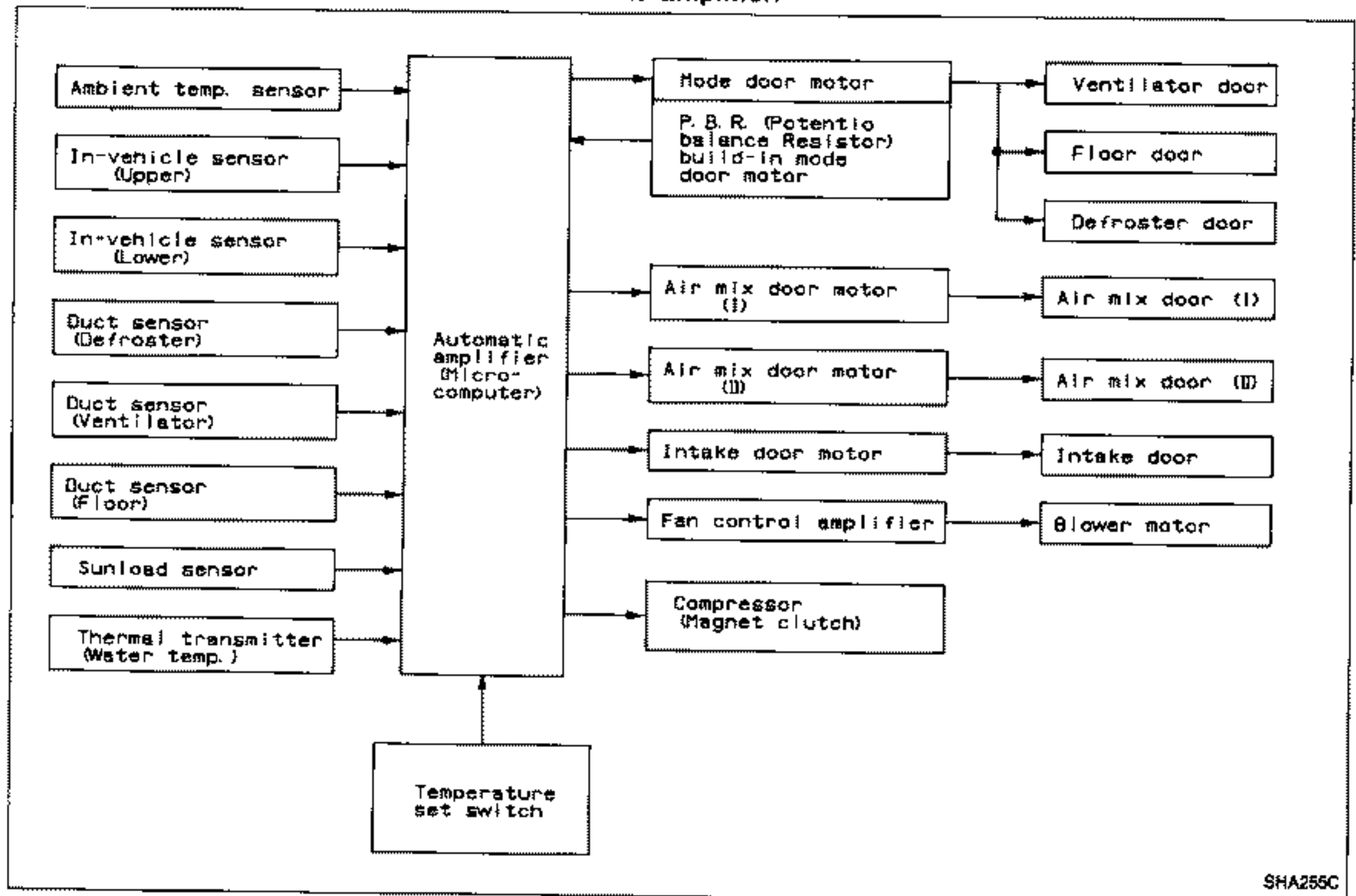


Specifications

AUTO AMPLIFIER

The auto amplifier has a built-in microcomputer which processes information from the A.T.C. system sensors. Signals are sent from the auto amplifier to activate the A.T.C. system depending upon the information sent by these sensors and the set temperature selected on the switch panel.

The A.T.C. system's self-diagnostic capabilities are built into the auto amplifier.



SHA255C

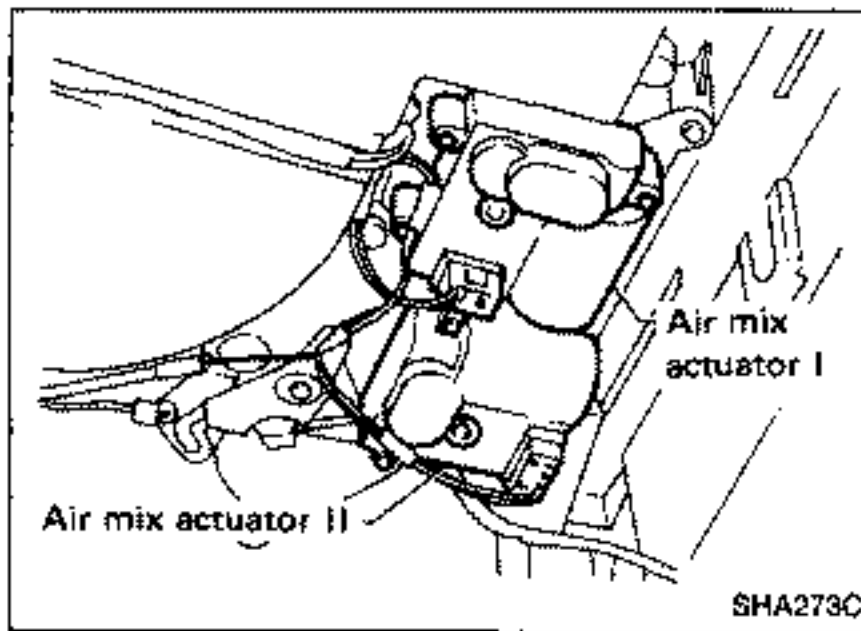
DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd)

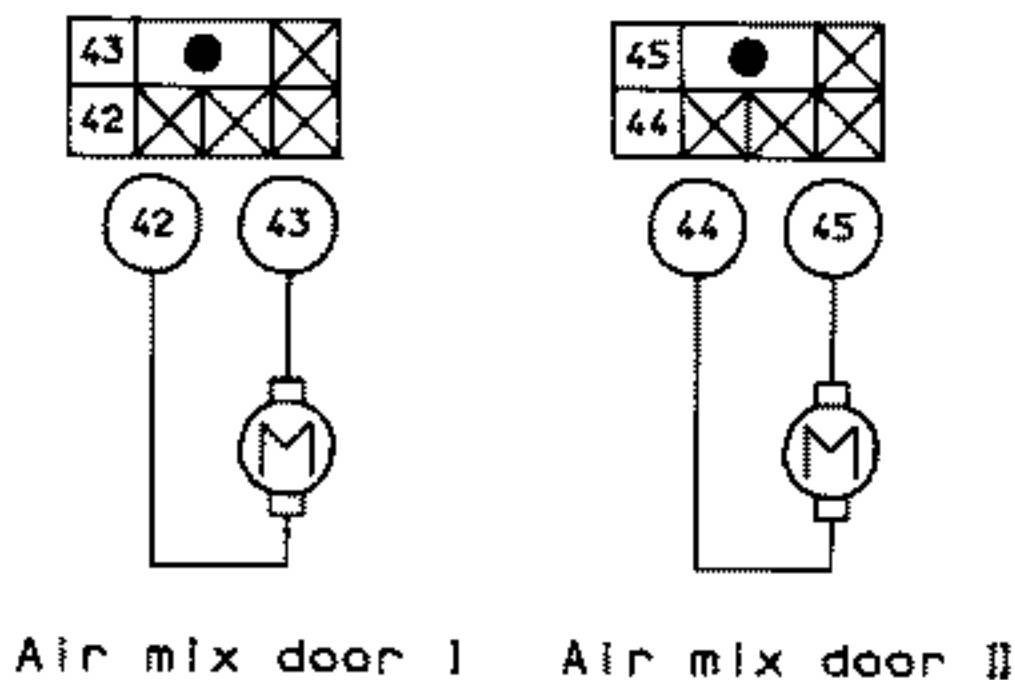
AIR MIX DOOR I and II MOTORS

Component and related parts

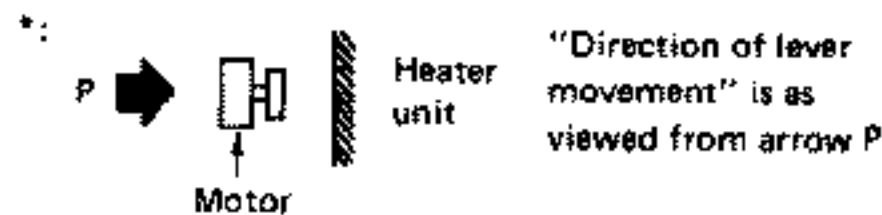
- Auto amplifier
- Air mix door motors
- In-vehicle sensors (upper and lower)
- Duct sensors (vent, floor, defroster)
- Ambient sensor
- sunload sensor



Operation of air mix door I and II motors



④② ④④	④③ ④⑤	Air mix door I and II operation	Direction of lever movement
⊖	⊕	COLD → HOT	*Clockwise
⊖	⊖	STOP	STOP
⊕	⊖	HOT → COLD	*Counterclockwise



System operation

The air mix door motors are attached to the bottom of the heater unit. The motors rotate, moving a lever system which varies the air mix door position to heat or cool the inlet air. Outlet air temperature is measured by the duct sensors, signals from which are sent to the auto amplifier which uses them to modify the air mix door position to achieve the current target temperature.

- It takes about 1 minute to stabilize duct air temperature.
- When ambient temperature is below 5°C (41°F) or above 60°C (140°F), air mix door position is fixed.

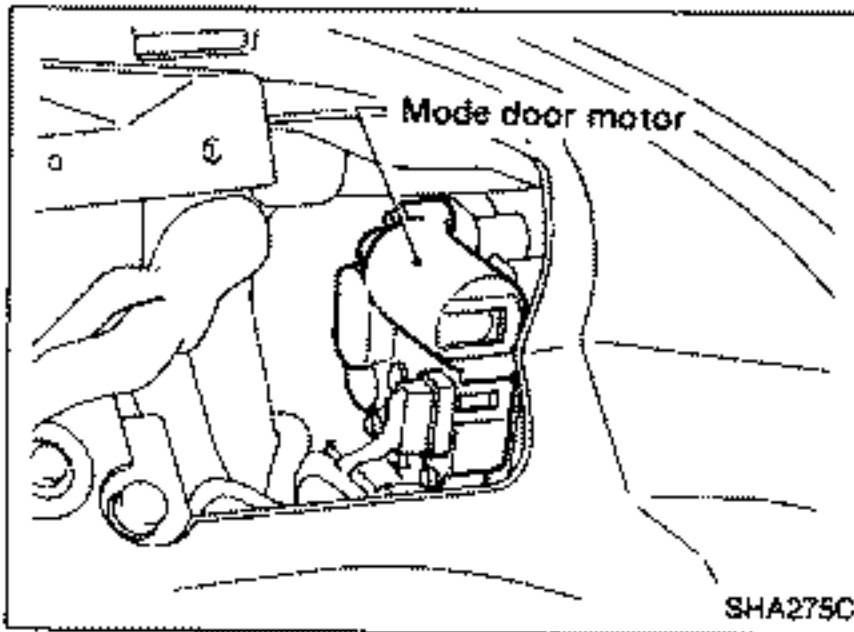
DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd)

MODE DOOR MOTOR

Component and related parts

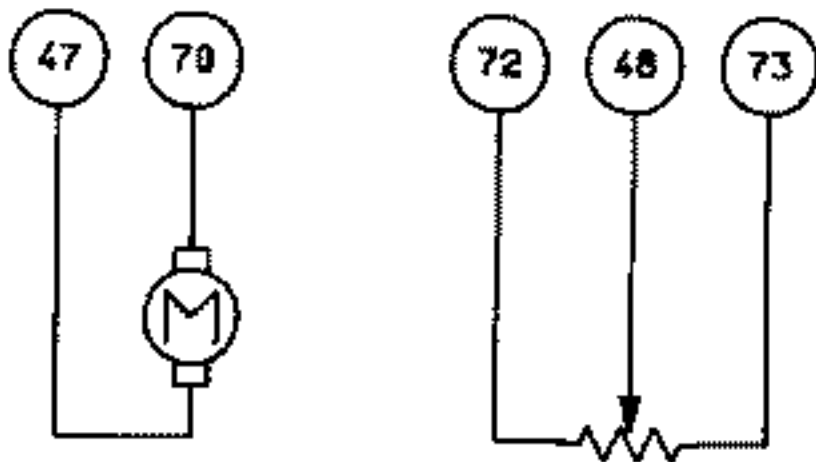
- Auto amplifier
- Mode door motor with potential ballast resister (P.B.R.)
- Lower in-vehicle sensor
- Ambient sensor
- Sunload sensor



Mode door motor operation

Mode door motor operation

70	●	48
47	X	73 72



(47)	(70)	Mode door operation	Direction of side link rotation
⊖	⊕	VENT → DEF	Clockwise
⊖	⊖	STOP	STOP
⊕	⊖	DEF → VENT	Counterclockwise

SHA276C

System operation

The mode door motor is attached to the heater unit. The motor operates a cam assembly which moves the air outlet doors. The auto amplifier controls air distribution to the VENT, DEF and FOOT outlets. Outlet door position is conveyed to the auto amplifier by the P.B.R. built into the mode door motor.

The auto amplifier computes air outlet conditions according to ambient temperature, set temperature and sunload. When thermal loads are great, the air outlet computation is additionally influenced by the foot area temperature. The air outlet positions are smoothly adjusted in response to changes in ambient temperatures.

When the set temperature is decreased or when the sunload is increased, the air flow volume from the vent outlets is increased.

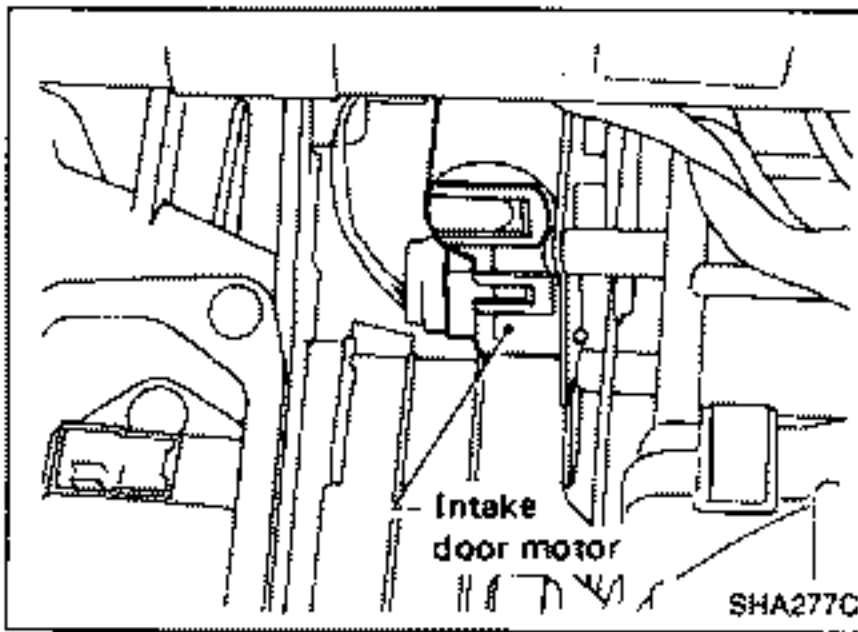
DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd)

INTAKE DOOR MOTOR

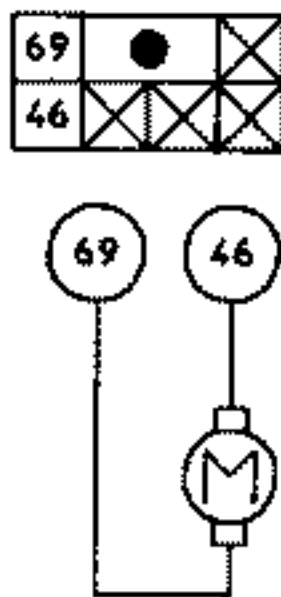
Component and related parts

- Auto amplifier
- Intake door motor
- Upper in-vehicle sensor
- Vent duct sensor
- Ambient sensor
- Sunload sensor



Intake door operation

Intake door operation



④⑥	⑥⑨	Intake door operation	Direction of lever rotation
⊖	⊕	REC → FRE	Counterclockwise
⊖	⊖	STOP	STOP
⊕	⊖	FRE → REC	Clockwise

SHA278C

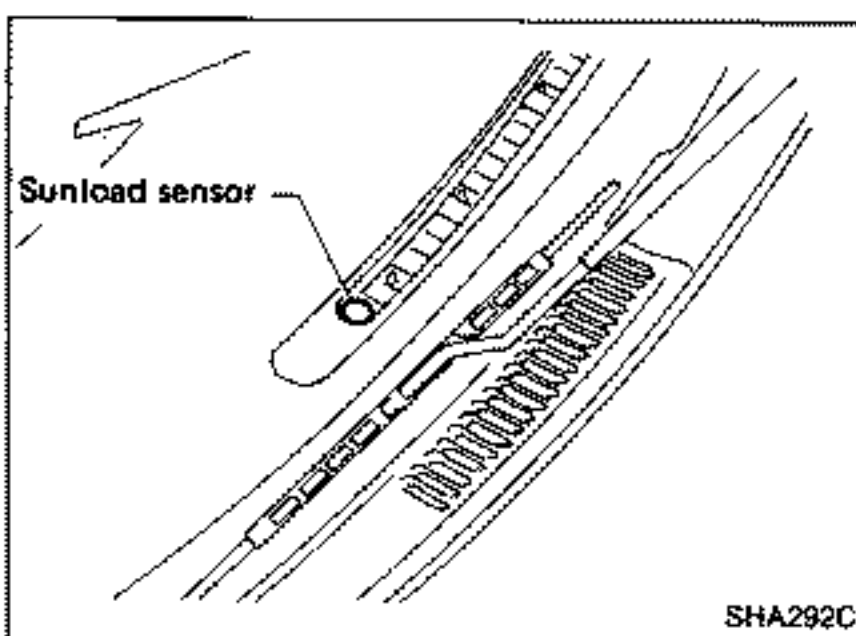
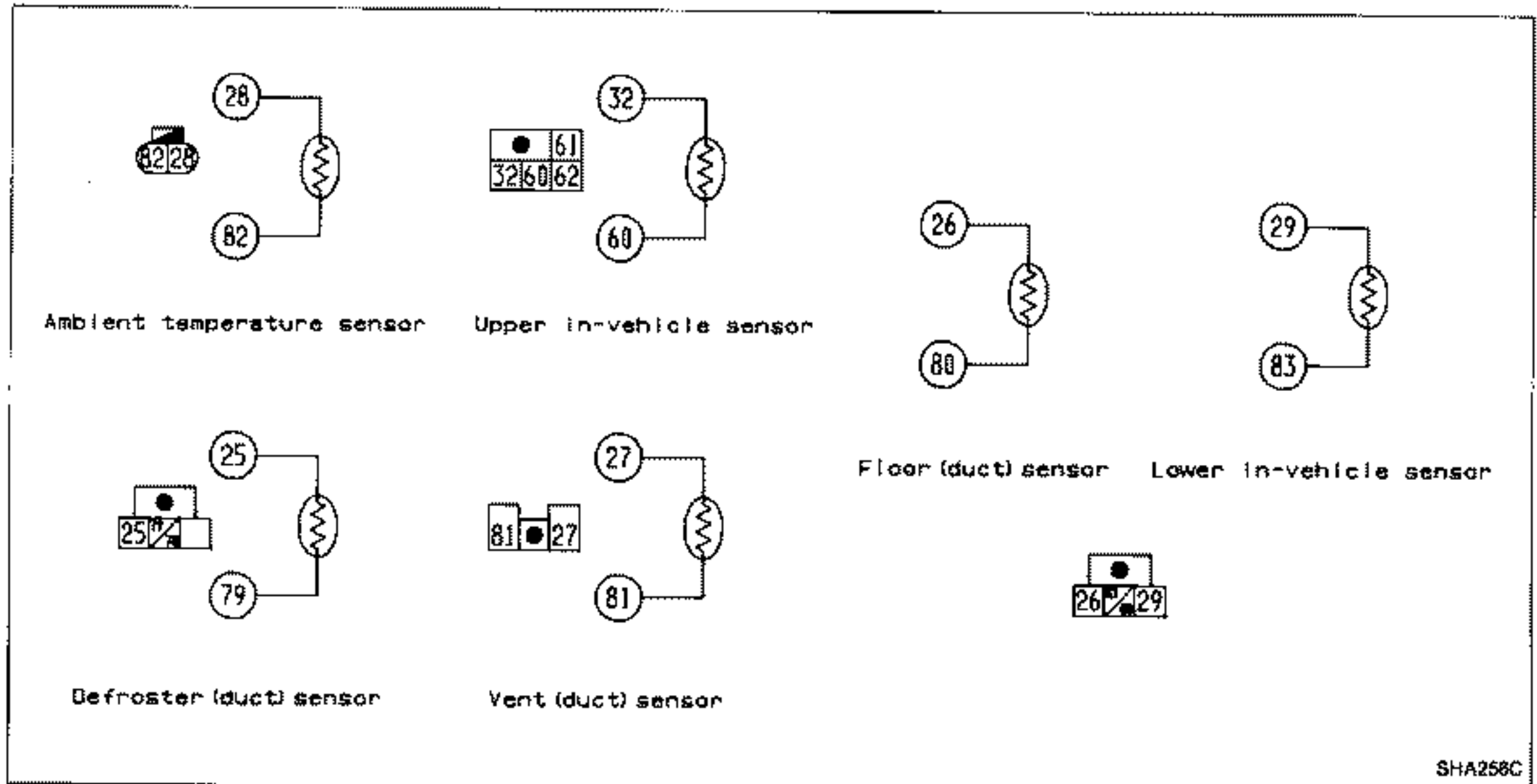
System operation

The intake door motor is attached to the air intake unit. Intake door position is controlled approximately once every minute, according to the difference between target and actual vent air temperatures. When the actual outlet air temperature is higher than the target vent air temperature, the intake door will gradually shift toward the recirculation-air side. When the outlet air temperature reaches the target outlet air temperature, the intake door will gradually shift toward the fresh air side. However, when the ambient temperature is lower than 20°C (68°F), 100% fresh air is taken in regardless of outlet air temperatures.

When the compressor is "OFF" the auto amplifier sets the intake door at the "FRESH" position except when the "RECIRC" switch is "ON".

DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd) TEMPERATURE SENSORS



SUNLOAD SENSOR

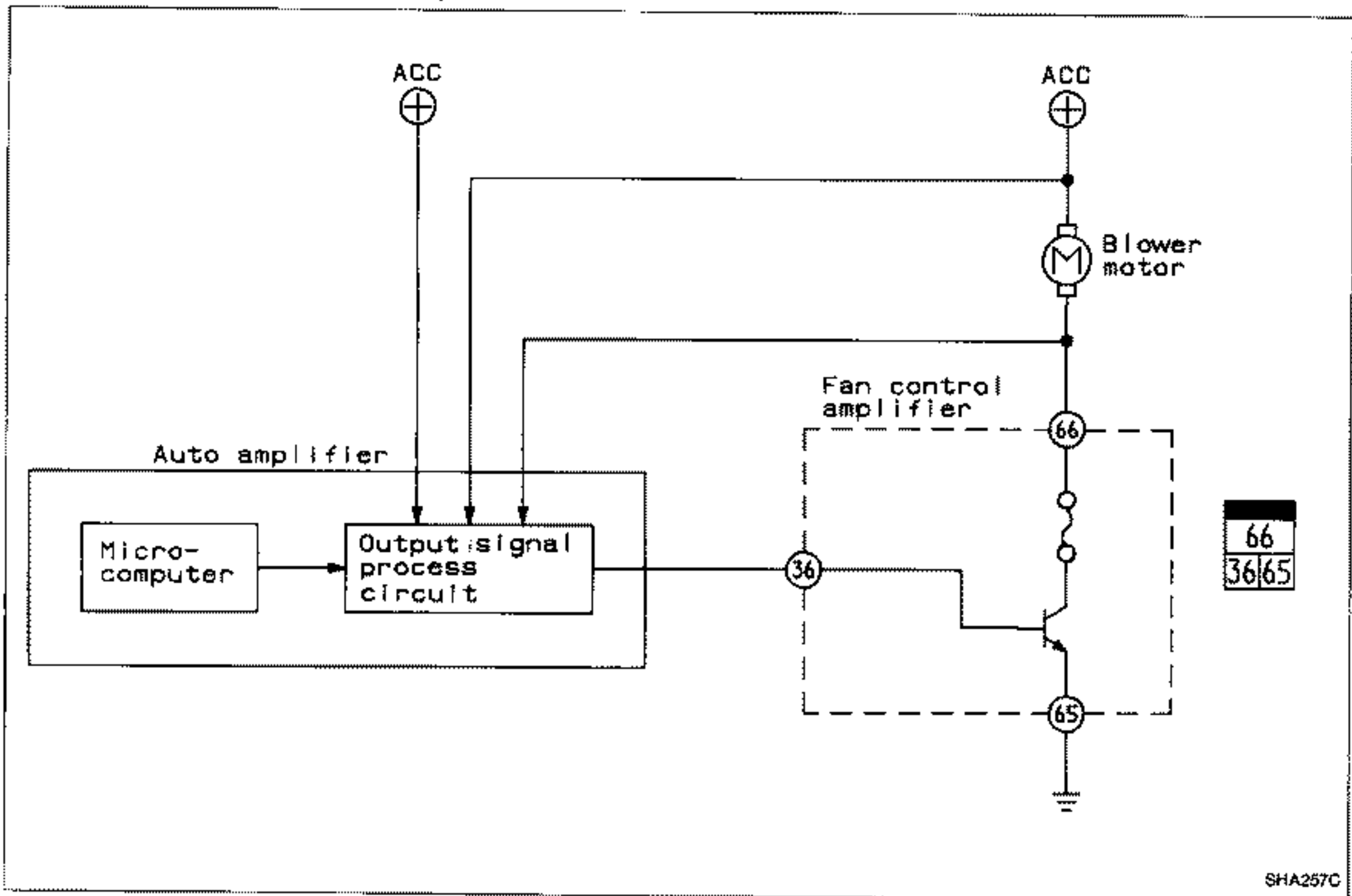
The sunload sensor is located on the right defroster grille. It detects sunload entering through the windshield by means of a photo diode and converts it into a current value which is then input into the auto amplifier.

DESCRIPTION — Auto Air Conditioner

Specifications (Cont'd)

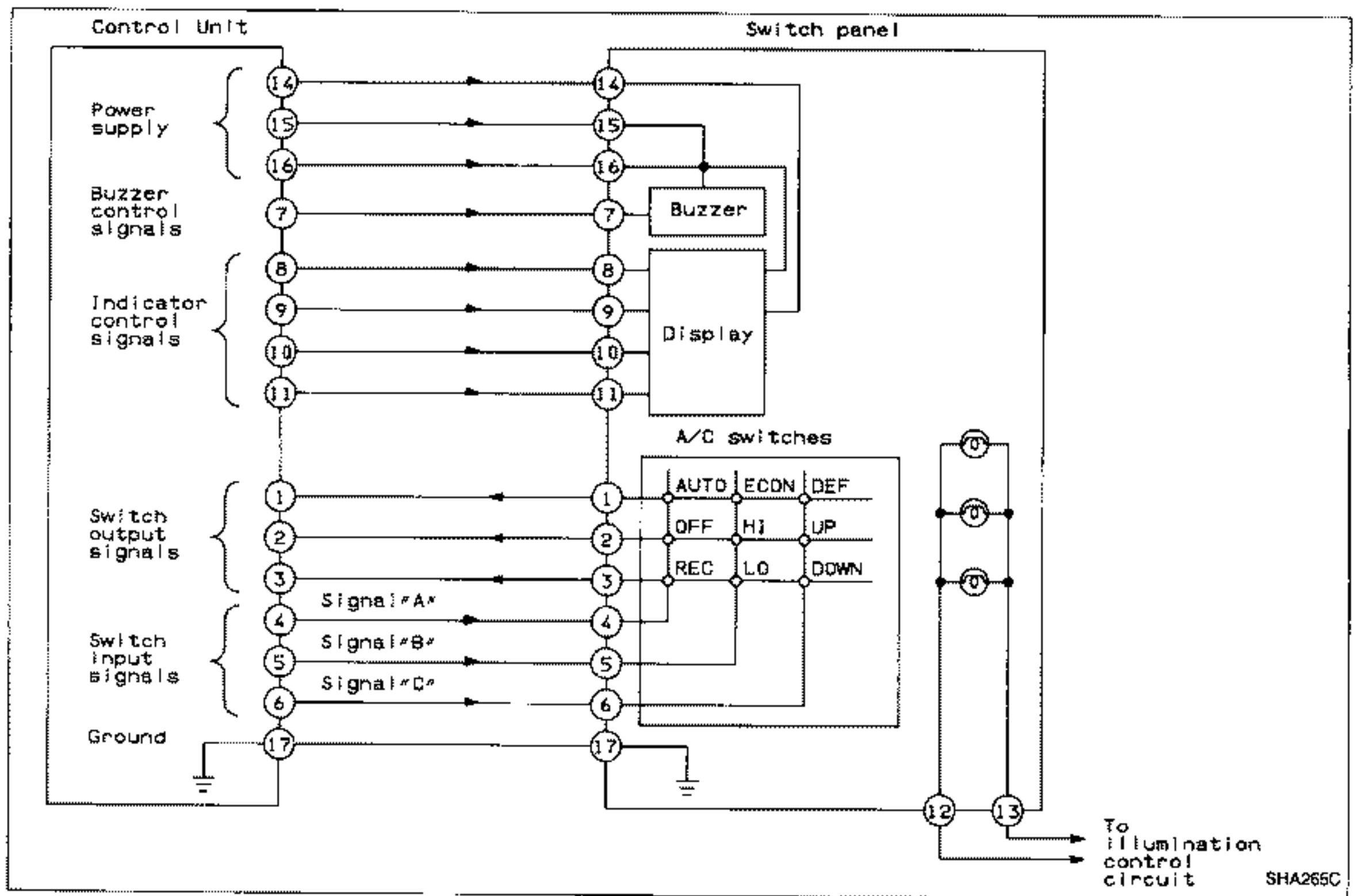
FAN CONTROL AMPLIFIER

The fan control amplifier is located on the cooling unit. It amplifies the base current flowing from the auto amplifier to change the blower speed.



System Operation

SWITCH PANEL



System operation

Except for illumination lamp terminals ⑫ and ⑬, the switch panel is operated by signals emitted from the control unit. There are three categories of signals.

- 1) Power and ground signals
- 2) Indicators (VFD and LED) and buzzer control signals
- 3) Switch input and output signals

The control unit always sends three different signals to the switch panel on three lines ④, ⑤, and ⑥. For example, when the "Auto" switch is pushed, signal "A" returns to the control unit on line No. ①. And when the "Econ" switch is pushed, signal "B" returns to the control unit on line No. ②. Similarly for the other switches; the control unit recognizes which signal returns on which line, and then identifies which switch is pushed.

DESCRIPTION — Auto Air Conditioner

System Operation (Cont'd)

AMBIENT TEMPERATURE INPUT PROCESS

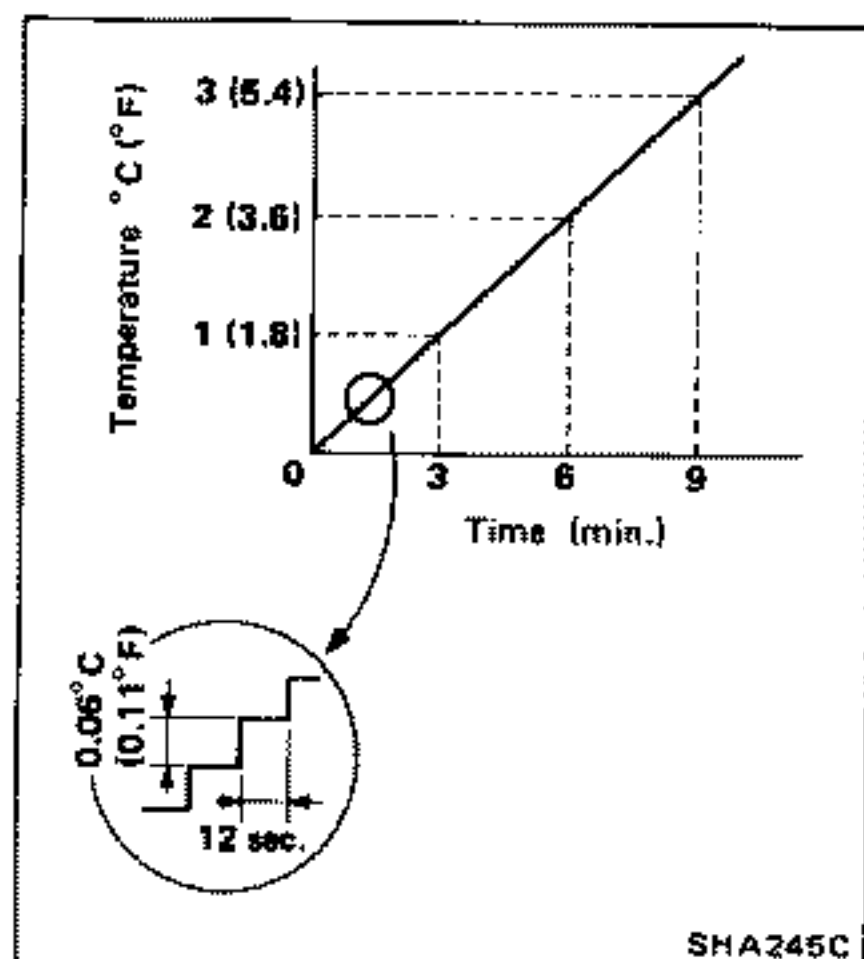
For A.T.C. system operation an accurate ambient sensor signal is necessary. The auto amplifier contains a circuit to ensure accurate measurement of increases in ambient temperature. Sudden increase in temperature of 16°C (61°F) or more, which may be detected after encountering heavy traffic after a period of high speed cruising, are processed through a delay circuit. The delay circuit processes any temperature increase in increments of 0.06°C (0.11°F) every 12 seconds and, in this way, the A.T.C. system is protected from any sudden changes in ambient sensor signal due to low air flow around the sensor.

Temperature decreases are not processed through the time delay circuit.

Example:

In the case of a signal stop after high-speed cruising, the ambient temperature will rise suddenly.

The ambient temperature input process functions at this time to prevent unpleasant air conditioning system changes.

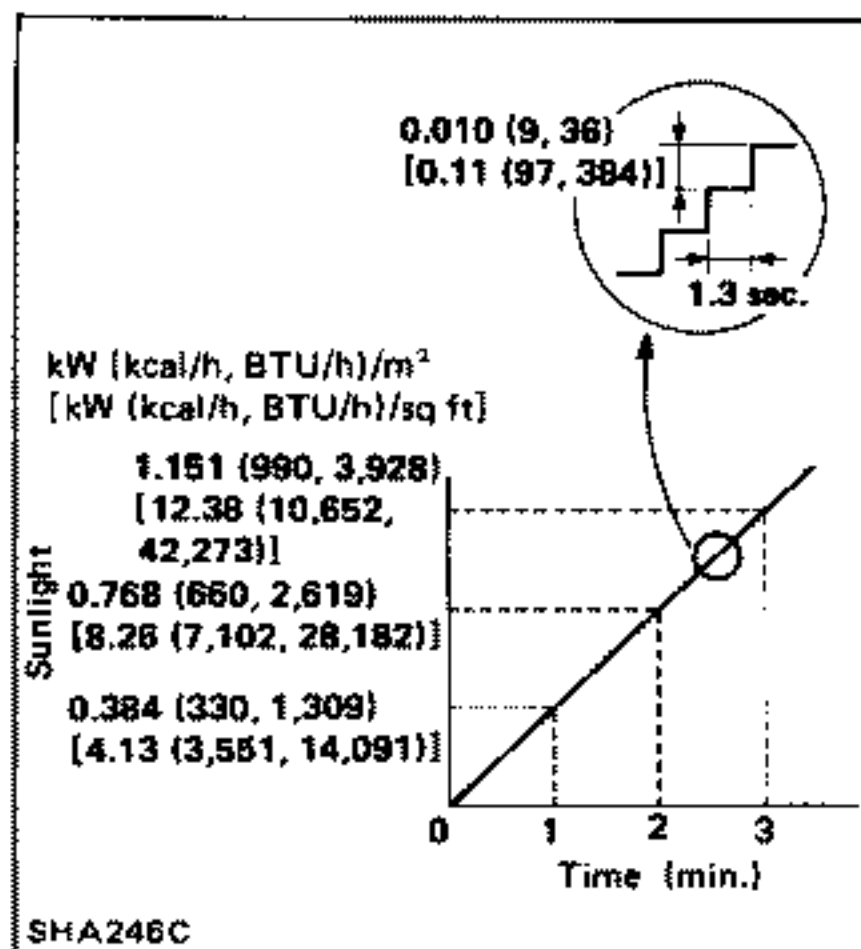


SUNLOAD INPUT PROCESS

The sunload input circuit in the auto amplifier also features a time delay to prevent abrupt A.T.C. system changes. This feature operates under rapid increases and decreases in sunload.

Example:

When entering a tunnel the sunload will change suddenly. The sunload input process system functions at this time to prevent unpleasant air conditioning system changes.

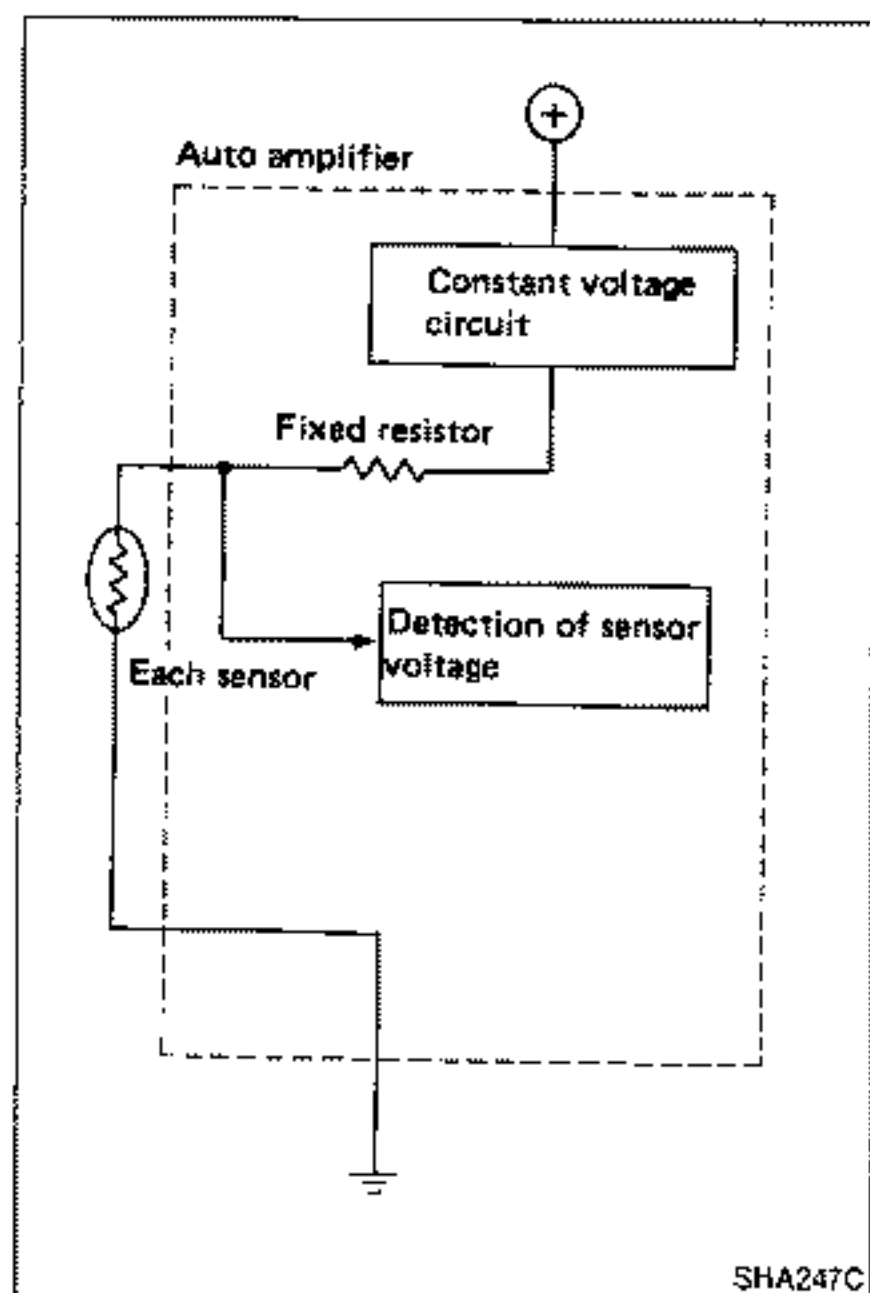


System Operation (Cont'd)

SENSOR INPUT PROCESS

A fixed resistor is built into the auto amplifier. 12V DC is converted to 5V DC by the constant voltage circuit where it is then applied to the ground line of the auto amplifier by the fixed resistor and sensors. The auto amplifier monitors the voltage between each sensor and the fixed resistor. The resistance of each sensor varies according to temperature.

Accordingly, the voltage at each sensor varies according to the temperature. The voltage signal is processed by the auto amplifier for A.T.C. system operation.



STARTING FAN SPEED AND OUTLET DOOR CONTROL

Component parts

Starting fan speed and outlet door control components are:

- Auto amplifier
- Fan control amplifier
- In-vehicle sensors (Upper and Lower)
- Duct sensor (Defroster, Ventilator and Floor)
- Ambient sensor
- sunload sensor
- Thermal transmitter (Engine coolant temperature sensor)

System operation

- Fan speed control

At a set temperature of 25°C (77°F), when the upper compartment temperature is below 21°C (70°F) and the outlet duct temperature is lower than 35°C (95°F), the fan starts at minimum flow rate. As the discharge air temperature increases, the air flow rate increases to bring the compartment temperature to the target level as quickly as possible.

When the ambient temperature is above 40°C (104°F), fan air flow rate is at full volume.

As interior temperature begins to reach the target temperature, fan speed decreases.

Under heavy sunload conditions, fan speed is increased to maintain uniform interior temperature. Fan speed also increases if the set temperature is decreased.

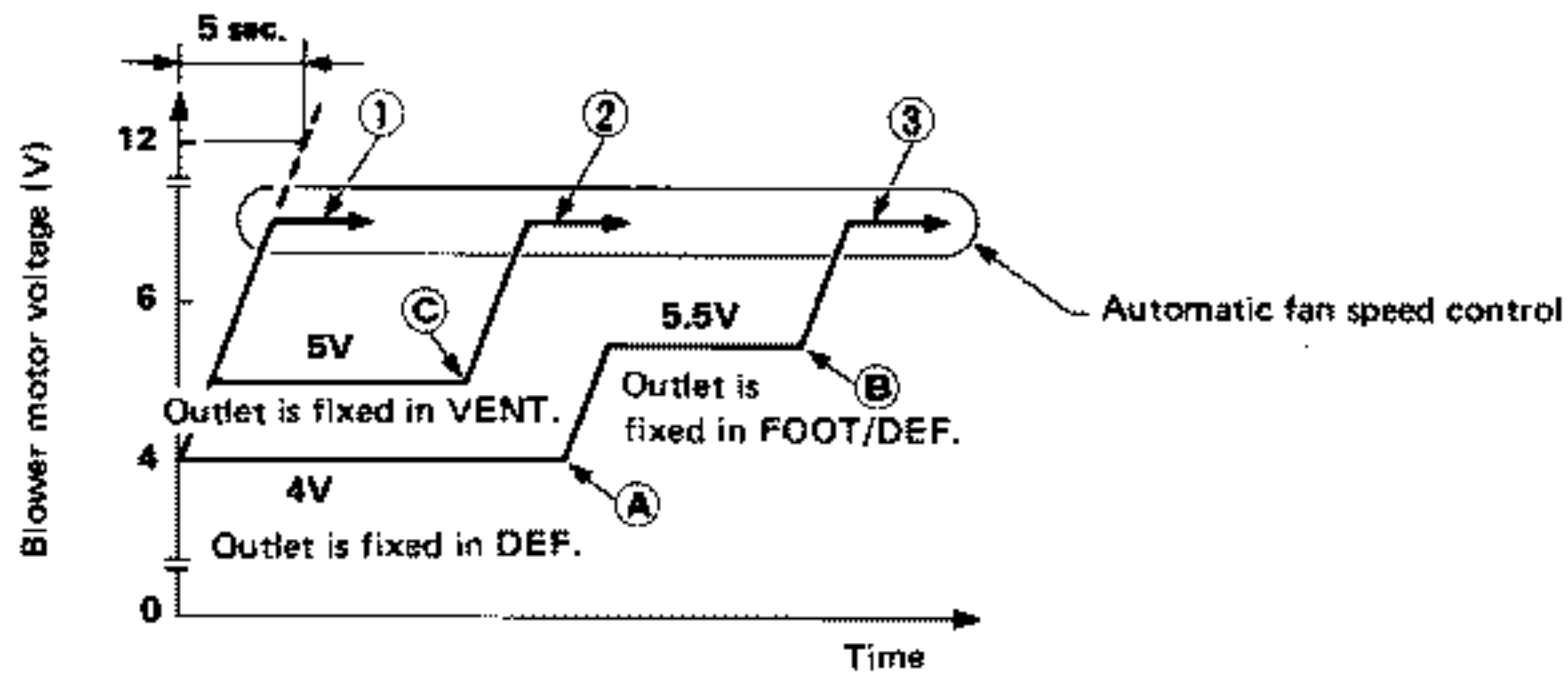
- Outlet door control

At a set temperature of 25°C (77°F), when the upper in-vehicle temperature is lower than 21°C (70°F) and all of the outlet air temperatures are lower than 35°C (95°F), the system starts with the minimum airflow rate in the defroster mode. When defroster duct temperature rises above 35°C (95°F), the air outlet mode changes from the defroster mode to the DEF/FOOT mode. When floor duct temperature exceeds 40°C (104°F), the starting fan speed control and outlet door control mode is replaced by the normal automatic control mode. When the upper in-vehicle temperature is far greater than the lower in-vehicle temperature because of a large sunload, the system starts with the ventilator mode, which is replaced by the automatic control mode as the coolant temperature and outlet air temperature increases.

DESCRIPTION — Auto Air Conditioner

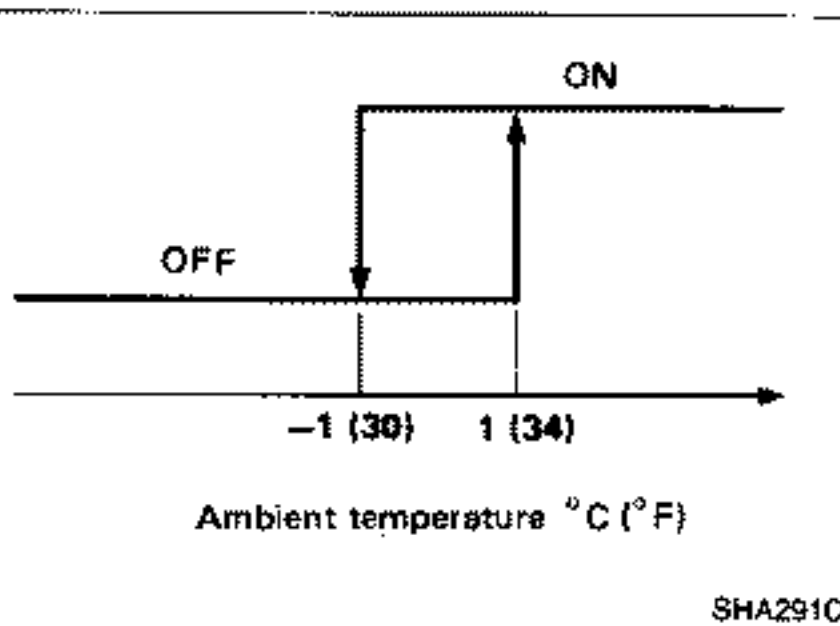
System Operation (Cont'd)

Starting fan speed and outlet door control specifications



- ① : When both upper and lower in-vehicle temperatures are much higher than set temperature.
- ② : When upper in-vehicle temperature is higher than set temperature.
- ③ : When upper in-vehicle temperature is lower than set temperature.
- Ⓐ : VG30DE engine model
When DEF duct temperature rises above 35°C (95°F)
VG30DE engine model
When DEF duct temperature rises above approximately 20°C (68°F)
(Exact temperature depends on ambient temperature.)
- Ⓑ : VG30DE engine model
When FLOOR duct temperature rises above 40°C (104°F)
VG30DETT engine model
When FLOOR duct temperature rises above approximately 36°C (97°F)
(Exact temperature depends on ambient temperature.)
- Ⓒ : When water temperature rises above 40°C (104°F) and difference between outlet air temperature and target temperature is lower than 5°C (9°F).

SHA290C

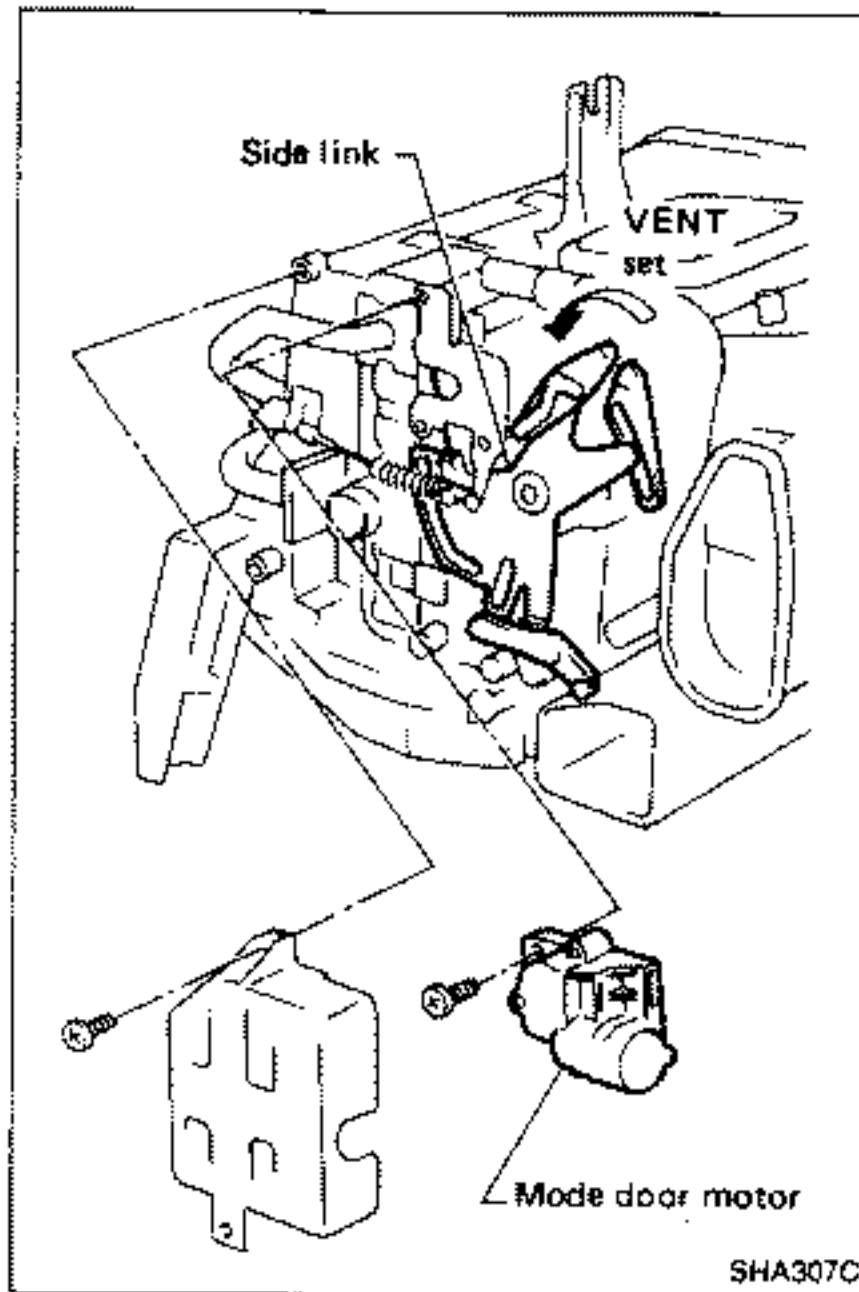


SHA291C

MAGNET CLUTCH CONTROL

The auto amplifier controls compressor operation by the ambient temperature and signals from the E.C.C.S. unit.

The auto amplifier will turn the compressor 'ON' or 'OFF' as determined by a signal detected by the ambient temperature sensor.



Control Rod Adjustment

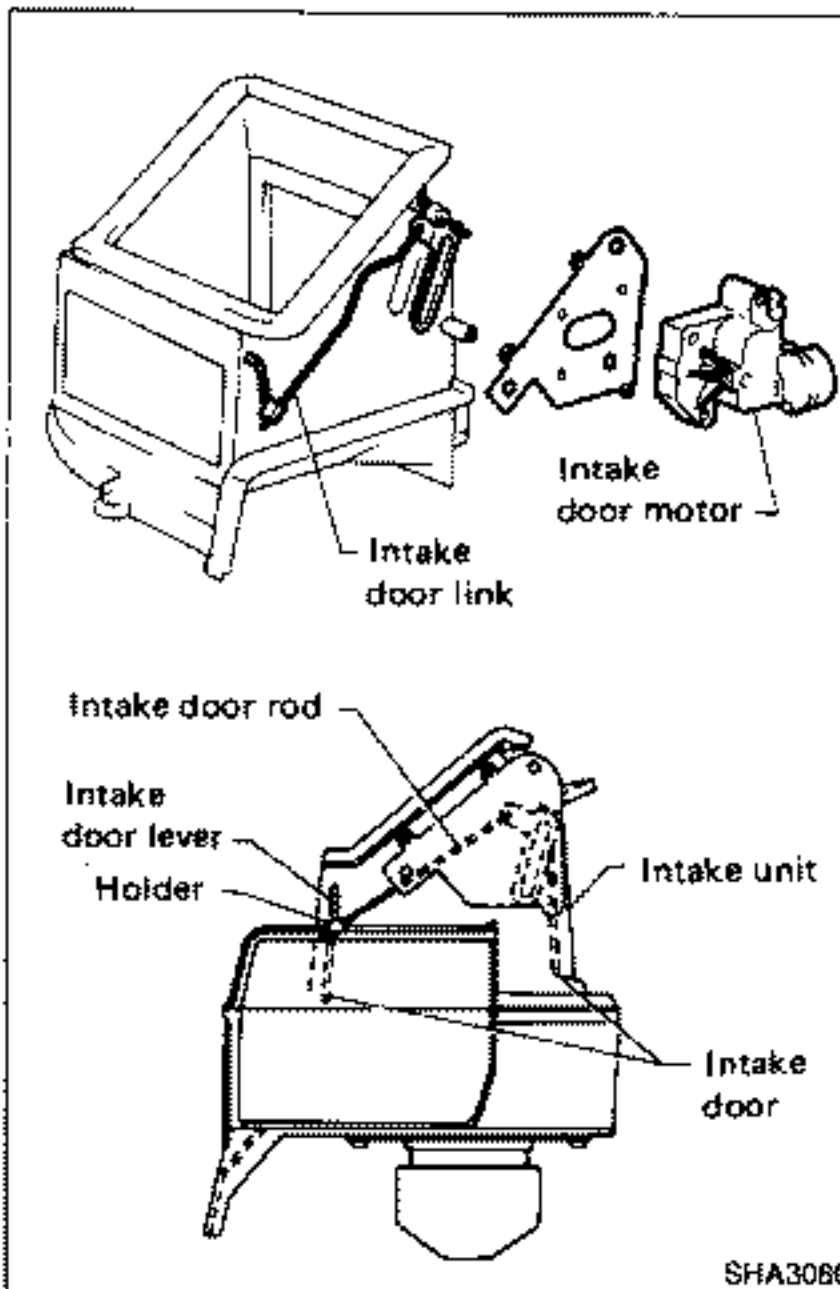
MODE DOOR

1. Move side link by hand and hold mode door in VENT mode.
2. Install mode door motor on heater unit and connect it to harness.
3. Turn ignition switch to ACC.
4. Set up "ACTIVE TEST" mode with CONSULT or set up self-diagnosis STEP 2.
5. Set MODE DOOR position as in the following table.

	
MODE DOOR POSITION	Code No.
VENT	6X

6. Attach mode door rod to side link rod holder.
7. Check mode door operates when position is changed with CONSULT or when code No. 6X is changed to others.

	3X	4X	5X	6X
Code No.				
Mode door position	DEF	HEAT	B/L	VENT



INTAKE DOOR

1. Install intake door motor on intake unit.
2. Connect intake door motor to harness.
3. Turn ignition switch to ACC.
4. Set up "ACTIVE TEST" mode with CONSULT or set up self-diagnosis STEP 2.
5. Set INTAKE DOOR position as in the following table.

	
INTAKE DOOR POSITION	Code No.
REC	6X

6. Install intake door lever.
7. Set intake door rod in REC position and fasten intake door rod to holder intake door lever.
8. Check intake door operates properly when position is changed with CONSULT or when code No. 6X is changed to others.

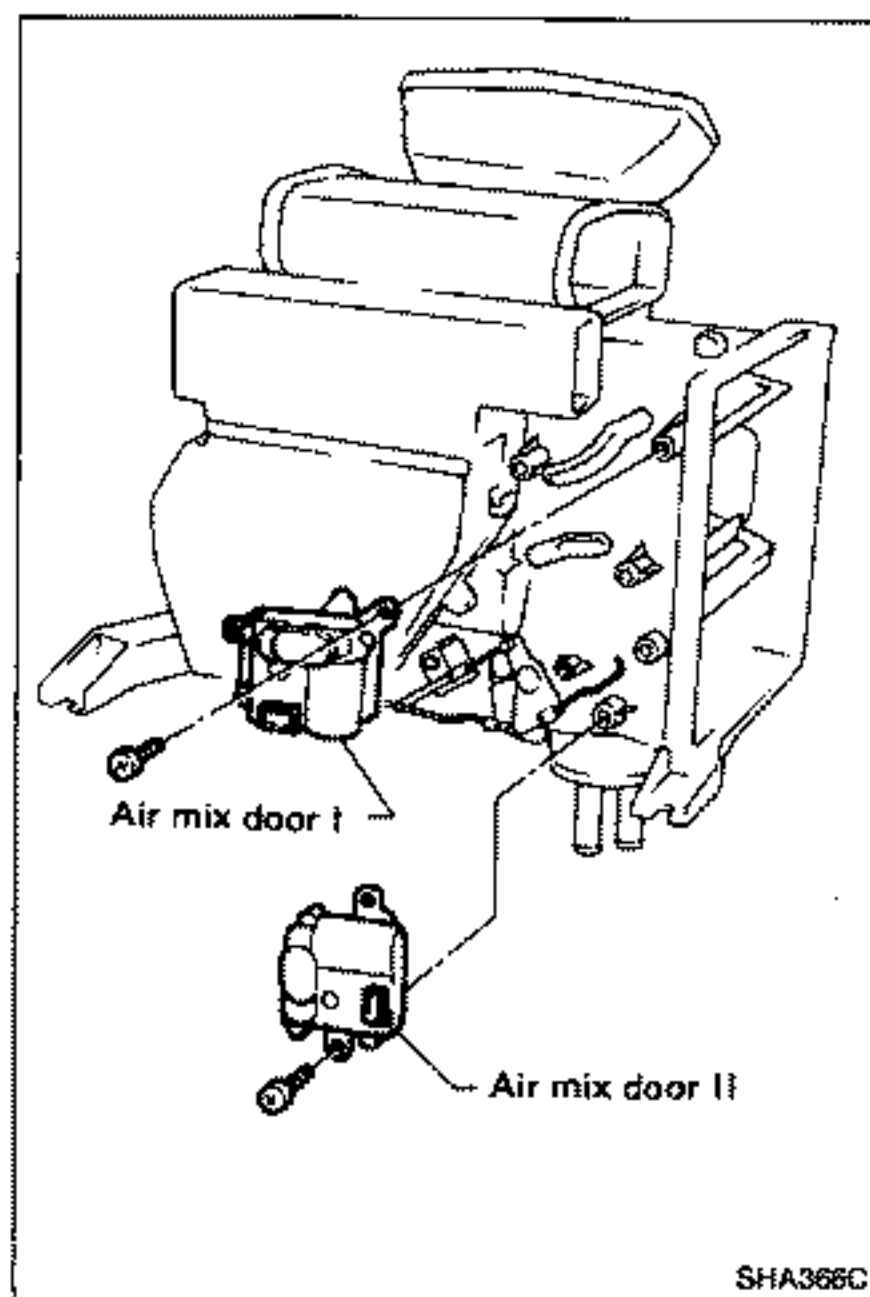
	3X	4X	5X	6X
Code No.				
Intake door position	Outside air		Partial outside air	Recirculation

DOOR CONTROL — Auto Air Conditioner

Control Rod Adjustment (Cont'd)

AIR MIX DOOR

1. Connect harness to air mix door motors I and II and set temperature control lever at full-cold position.
2. Set air mix doors I and II at full-cold position and fasten door rod.
3. Check that when temperature control lever is at full-cold, both doors are at full-cold position, and when temperature control lever is at full-hot, both doors are at full-hot position.



WATER COCK CONTROL CABLE

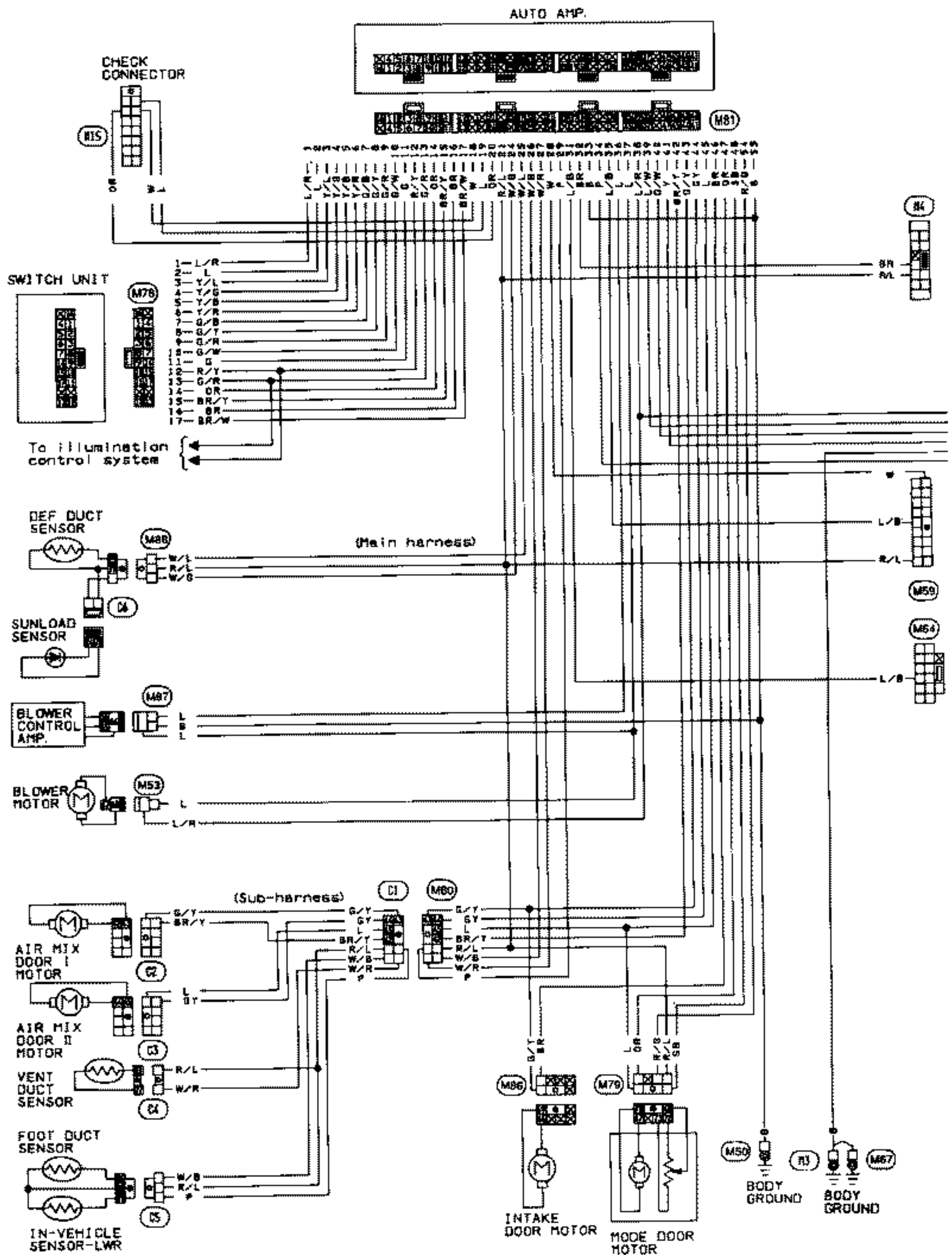
Clamp cable at full-close position when air mix door II is at full-cold position, and full-open position when air mix door II is at full-hot position.

NOTE

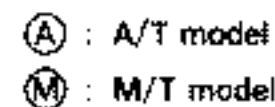
A/C ELECTRICAL CIRCUIT — Auto Air Conditioner

Wiring Diagram

L.H. DRIVE MODEL



Wiring Diagram (Cont'd)



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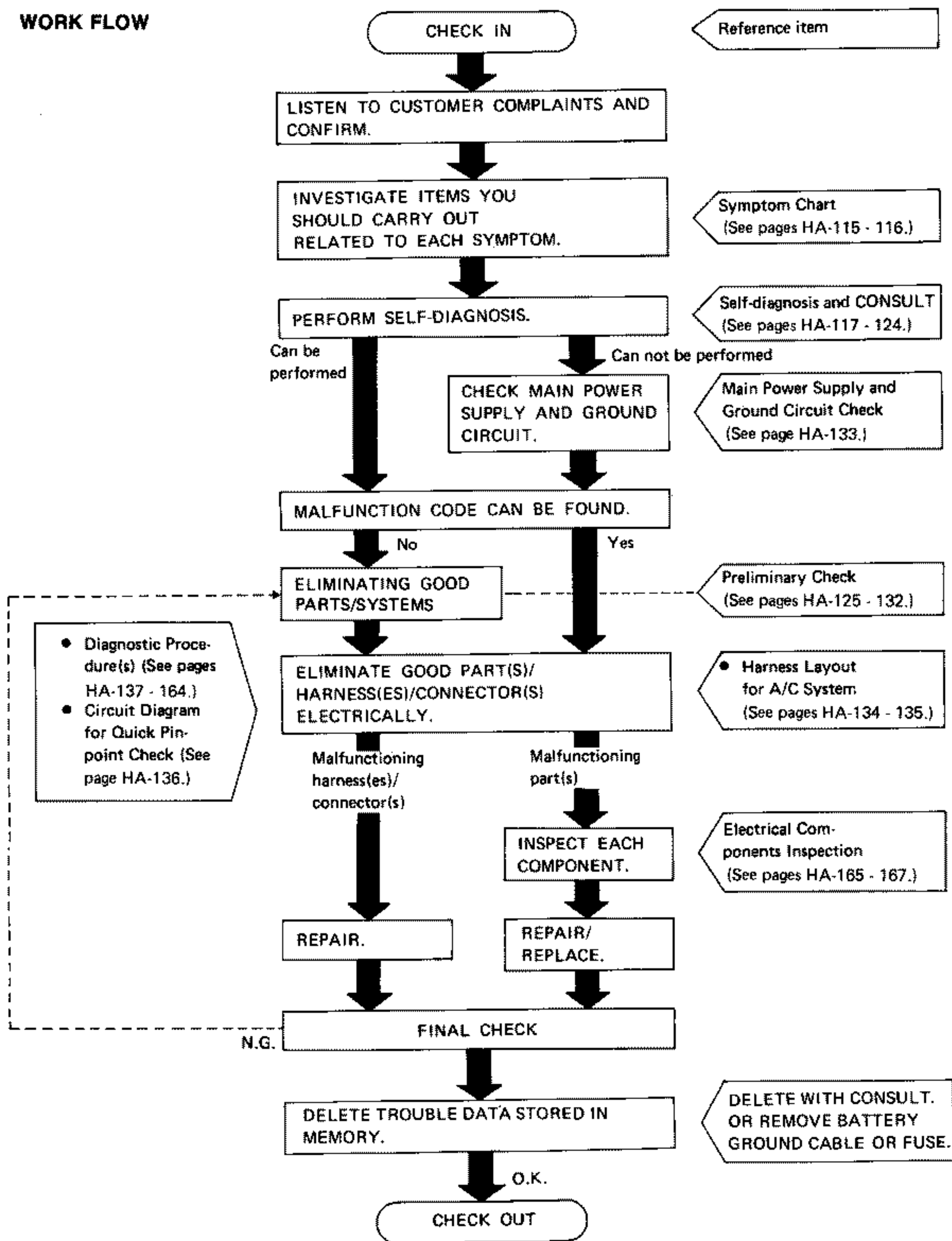
TROUBLE DIAGNOSES — Auto Air Conditioner

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How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



TROUBLE DIAGNOSES — Auto Air Conditioner

Symptom Chart

DIAGNOSTIC TABLE

Symptom	Possible cause	Diagnostic procedure
Air outlet does not change	● Mode door motor not operating correctly ● Inaccurate sensor input ● No output to mode door motor from auto amplifier	Proceed to Preliminary check 1, then to Diagnostic procedures 17 and 18 if air mix door is malfunctioning.
Intake door does not change	● Intake door motor or mechanism malfunctioning ● Inaccurate sensor input ● No output to intake door motor from auto amplifier	Proceed to Preliminary check 2, if intake door is malfunctioning, go to Diagnostic Procedure 16.
Insufficient cooling	● Compressor clutch not engaged ● Air mix door motors not working properly ● Condenser fan inoperative ● Low freon level	Proceed to Preliminary check 3. If air mix doors do not operate properly, go to Diagnostic procedure 15. Check compressor clutch operation and freon level of system.
Discharged air temperature does not change	● Air mix doors do not operate correctly ● Incorrect sensor input	Proceed to Preliminary check 7.
Noise	● Compressor belt tension ● Compressor component malfunction ● Blower motor interference ● Radiator cooling fan interference	Proceed to Preliminary check 8.
Air conditioner control switch panel illumination does not come on	● Blown fuse ● Loose or open in harness ● Blown bulb	Proceed to Diagnostic procedure 20.
Insufficient heating	● Coolant temperature is low ● Air mix doors not in correct position ● Incorrect sensor input	Proceed to Preliminary check 4. If air mix doors do not operate correctly, go to Diagnostic procedure 15.
Blower motor operation is malfunctioning	● Blower motor is not receiving power ● Vents may be obstructed ● Motor does not spin freely ● Air intake obstructed ● Blown fuse ● Malfunctioning blower relay	Proceed to Preliminary check 5. If blower motor is malfunctioning, go to Diagnostic procedure 25.
Magnet clutch does not engage	● Blown fuse ● A/C relay inoperative ● Open in wiring ● Open ambient sensor circuit ● Low freon level ● Malfunctioning clutch assembly	Proceed to Preliminary check 6, then Diagnostic procedure 19 if clutch is malfunctioning.

TROUBLE DIAGNOSES — Auto Air Conditioner

Symptom Chart (Cont'd)

Symptom	Possible cause	Diagnostic procedure
No display on A/C switch panel	● Blown fuse ● Malfunctioning bulb	Proceed to Diagnostic procedure 20.
Set temperature and ambient temperature do not appear on display window	● Malfunctioning switch unit ● Open in circuit ● Malfunctioning auto amplifier	Proceed to Diagnostic procedure 21.
When air conditioner switch is operated, it does not beep	● Malfunctioning A/C switch ● Open in harness or connector ● Malfunctioning auto amplifier	Proceed to Diagnostic procedure 22.
Set and ambient temperature do not appear in display and indicator lamp (L.E.D.) does not come on	● Open in harness ● Malfunctioning switch panel ● Malfunctioning auto amplifier	Proceed to Diagnostic procedure 23.
Switches do not work	● Malfunctioning switch panel ● Open in harness ● Malfunctioning auto amplifier	Proceed to Diagnostic procedure 24.

TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis

CONSULT AND ONBOARD SELF-DIAGNOSTIC SYSTEM

Function of CONSULT and ONBOARD SELF-DIAGNOSTIC SYSTEM are as follows:

ITEM	MONITOR		CHANGE PARAMETER		READOUT OF TROUBLE DATA STORED IN MEMORY	
	CONSULT	ONBOARD	CONSULT	ONBOARD	CONSULT	ONBOARD
Ambient temp.	○	○			○	○
In-vehicle temp. (Upper)	○	○			○	○
In-vehicle temp. (Lower)	○	○			○	○
Duct temp. (Defroster)	○	○			○	○
Duct temp. (Ventilator)	○	○			○	○
Duct temp. (Floor)	○	○			○	○
Sunload	○	○			○	○
Water temp.	○	○				
Mode door P.B.R.	○	○				
In-vehicle target temp. (Upper)	○					
In-vehicle target temp. (Lower)	○					
Outlet air target temp. (Upper)	○		○	*○		
Outlet air target temp. (Lower)	○		○	*○		
Mode door target position	○		○	*○		
Intake door target position	○		○	*○		
Blower motor target voltage	○		○	*○		
Difference between upper and lower target temp.	○		○	*○		
Output signal to compressor	○		○	*○		
Set temp.	○					
Selected mode	○					
Operated switches status	○					

*: These can be set by self-diagnosis step II; their combinations are as follows:

SET 30		Actuator test				
AMB	code	Code	Intake	Outlet	A/M door	Comp
		3x	Outside air	Def	F/H	On
		4x	Outside air	Heat	F/H	Off
		5x	Partial outside air	B/L	30°C (86°F)	On
		6x	Recirculation air	Vent	F/C	On

Press Ht SW.

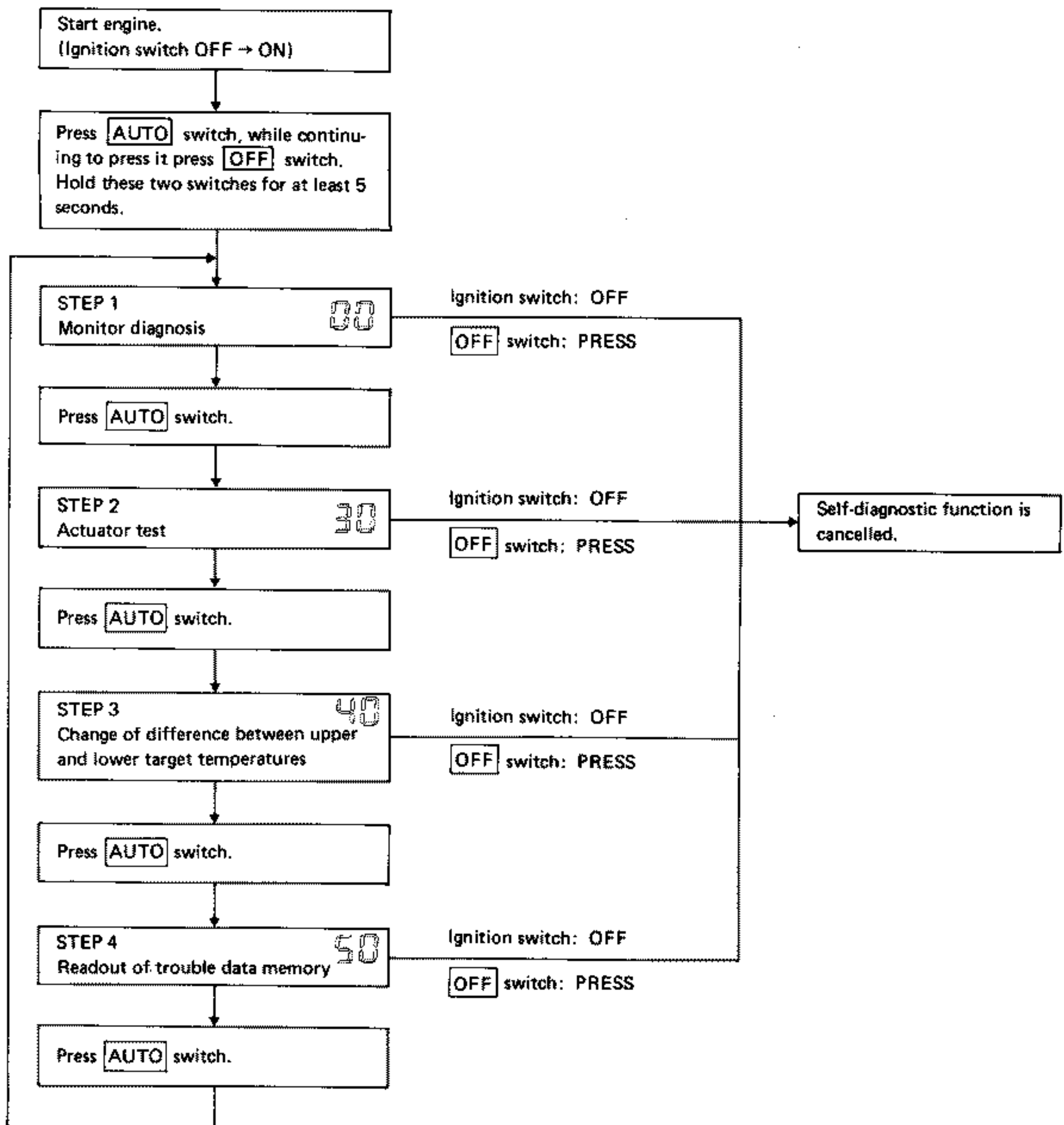
Press LO SW.		[Blower voltage (fixed)]	
		Code	Voltage
		x3	4V
		x4	6V
		x5	9V
		x6	12V

*: "x" refers to any value of 3, 4, 5 and 6.

Self-diagnosis (Cont'd)

The self-diagnostic system diagnoses the sensors, door motors, blower motor, etc. by system line. Refer to applicable sections (items) for details. Shifting from normal control to the self-diagnostic system is accomplished by starting the engine (turning ignition switch from "OFF" to "ON"), and pressing both the (AUTO) and (OFF) switch for at least 5 seconds.

This system will be cancelled by either pressing the (OFF) switch or turning the ignition switch "OFF". Shifting from one step to another is accomplished by means of pushing the (AUTO) switch, as required.

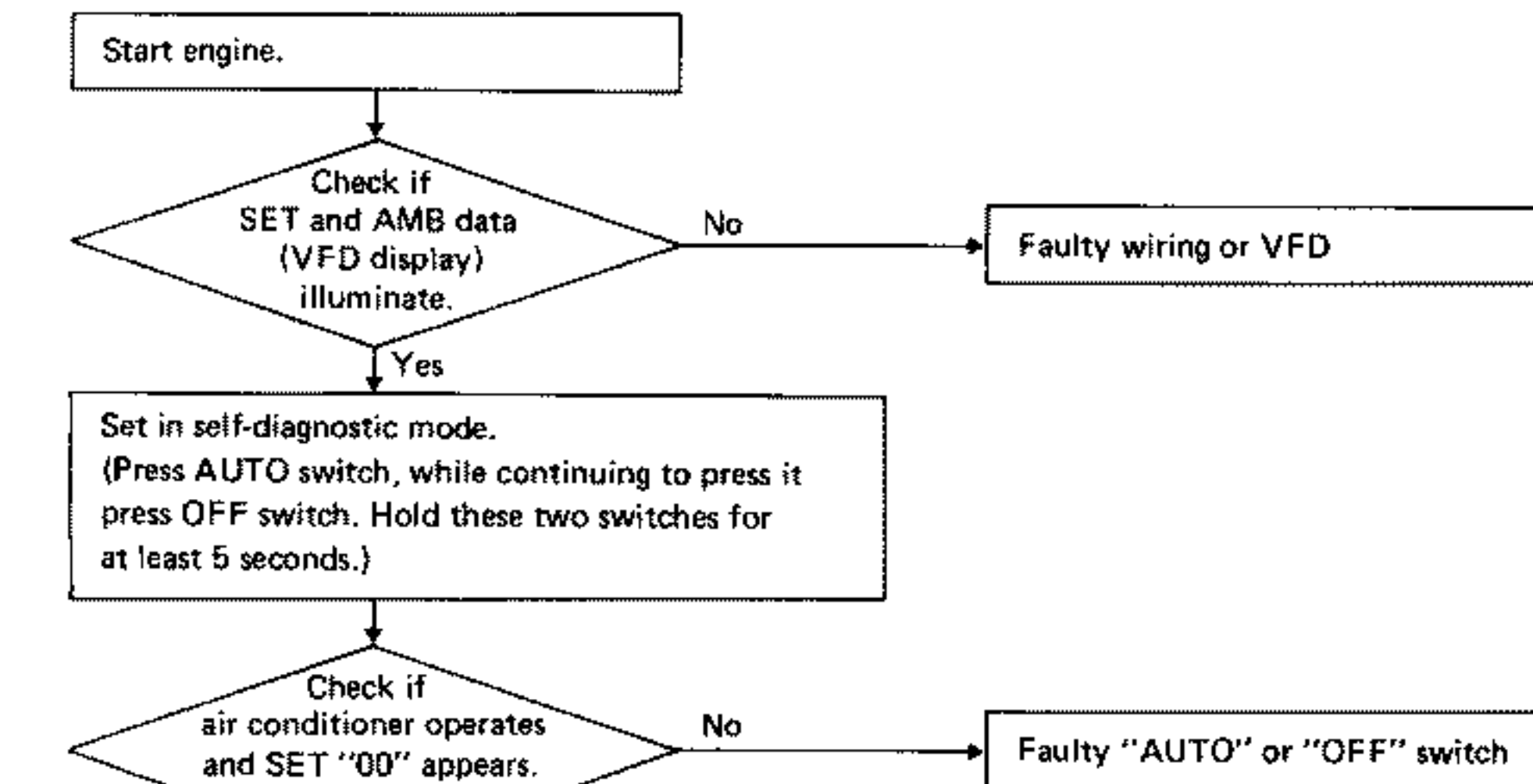


TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis (Cont'd)

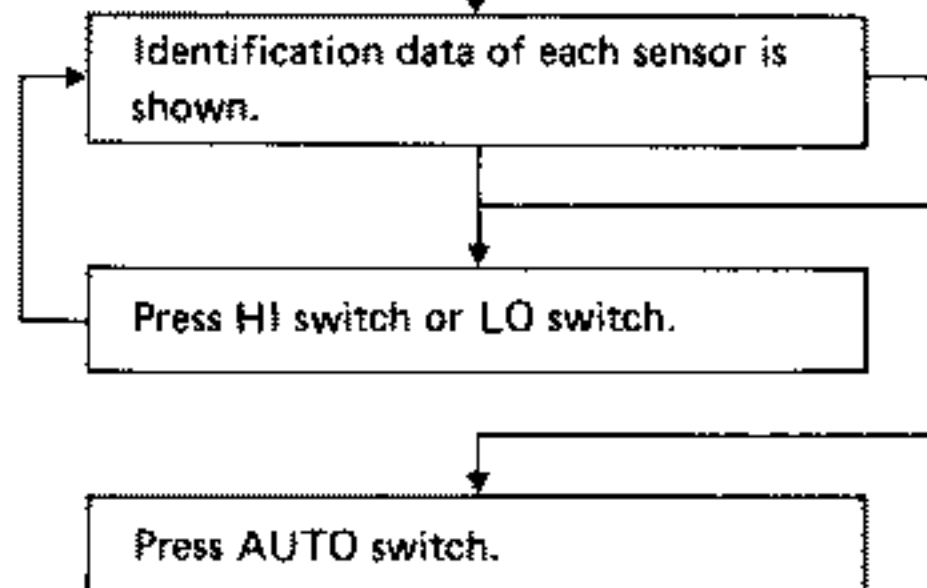
CHECKING PROCEDURE

Note



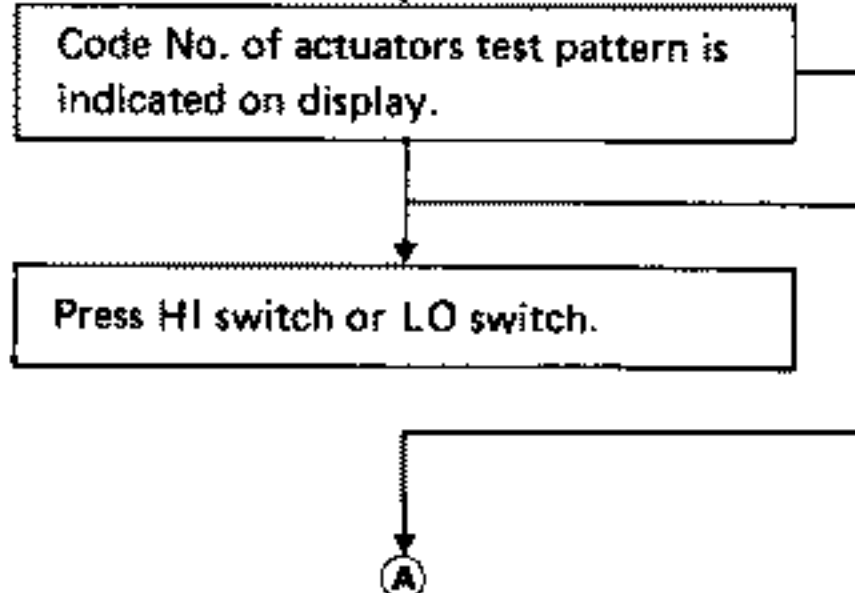
STEP 1

SET 0 0 SENSOR MONITOR



STEP 2

SET 3 0 ACTUATOR TEST



Sensor monitor

Code	Item	Temperature variation range (When compartment temperature is stabilized)
00	Ambient temperature	-30 to 45°C (-22 to 113°F)
01	Upper compartment temperature	18 - 30°C (64 - 86°F)
02	Lower compartment temperature	20 - 35°C (68 - 95°F)
03	DEF outlet air temperature	5 - 70°C (41 - 158°F)
04	VENT air temperature	5 - 40°C (41 - 104°F)
05	FLOOR outlet air temperature	20 - 70°C (68 - 158°F)
06	Sunload	*1 0 - 1,047 kW (0 - 900 kcal/h, 0 - 3,671 BTU/h)/m² [0 - 11.26 kW (0 - 9,684 kcal/h, 0 - 38,430 BTU/h)/sq ft]
07	Water temperature	*2 20°C (68°F) or 80°C (176°F)
08	MODE door voltage	0 - 5V
09	Internal data	...

*1: Indication figure is one tenth of the value in kcal/h unit.

*2: When coolant temperature is below 40°C (104°F) indicates 20°C (68°F). When coolant temperature is above 40°C (104°F) indicates 80°C (176°F).

Actuator test

Code	Intake	Outlet	A/M door	Comp
3x	Outside air	Def	F/H	Off
4x	Outside air	Heat	F/H	Off
5x	Partial outside air	B/L	30°C (86°F)	On
6x	Recirculation air	Vent	F/C	On

(Blower voltage (fixed))

Code	Voltage
x3	4V
x4	6V
x5	9V
x6	12V

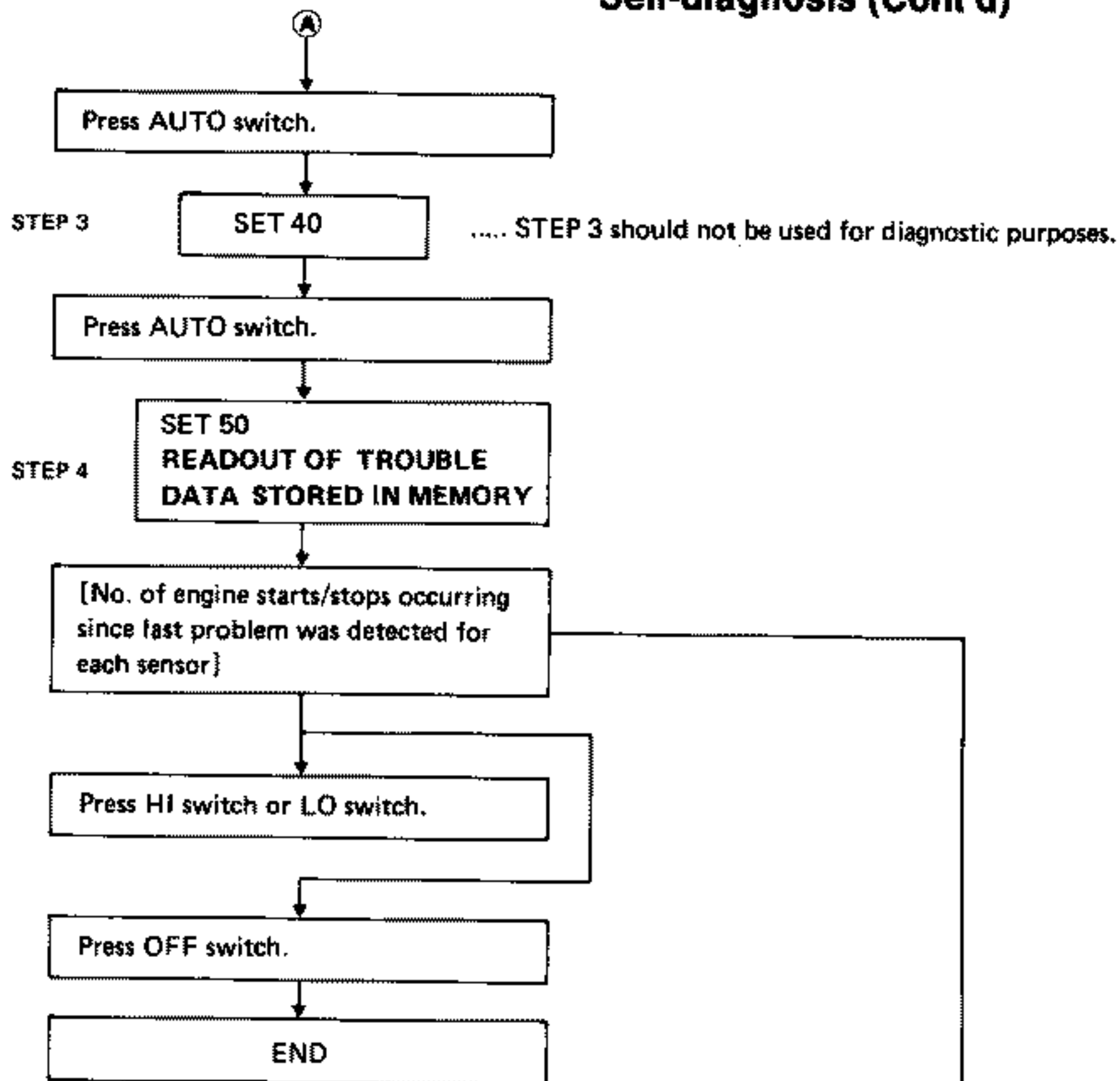
*: "x" refers to any value of 3, 4, 5 and 6.

Note:

- Without engine running, STEP 1 and 2 are not useful for some case because compressor not operate.
- While in the self-diagnosis mode, set temperature switch functions remain as usual.

TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis (Cont'd)



Readout of trouble data stored in memory			
Code	Data contents	Trouble diagnosis criteria	Remarks
50	Ambient sensor trouble data	Less than -70°C (-94°F), greater than 141°C (286°F)	
51	Upper in-vehicle sensor trouble data		
52	Lower in-vehicle sensor trouble data		
53	Defroster (duct) sensor trouble data	Less than -38°C (-36°F), greater than 141°C (286°F)	
54	Vent (duct) sensor trouble data		
55	Floor (duct) sensor trouble data		
56	Sunload sensor trouble data	Greater than 1.784 kW ($1,534\text{ kcal/h}$, $6,087\text{ BTU/h}$)/ m^2 [19.19 kW ($16,506\text{ kcal/h}$, $65,502\text{ BTU/h}$)/sq ft]	Detects shorted side only

Identification of trouble data

Shorted sensor trouble

Open circuit in sensor

No. of engine starts/stops occurring since last problem was detected

Trouble data = 50 : No problems

49 ~ 01 : Problem existed

0 : Problem exists

Self-diagnosis (Cont'd)

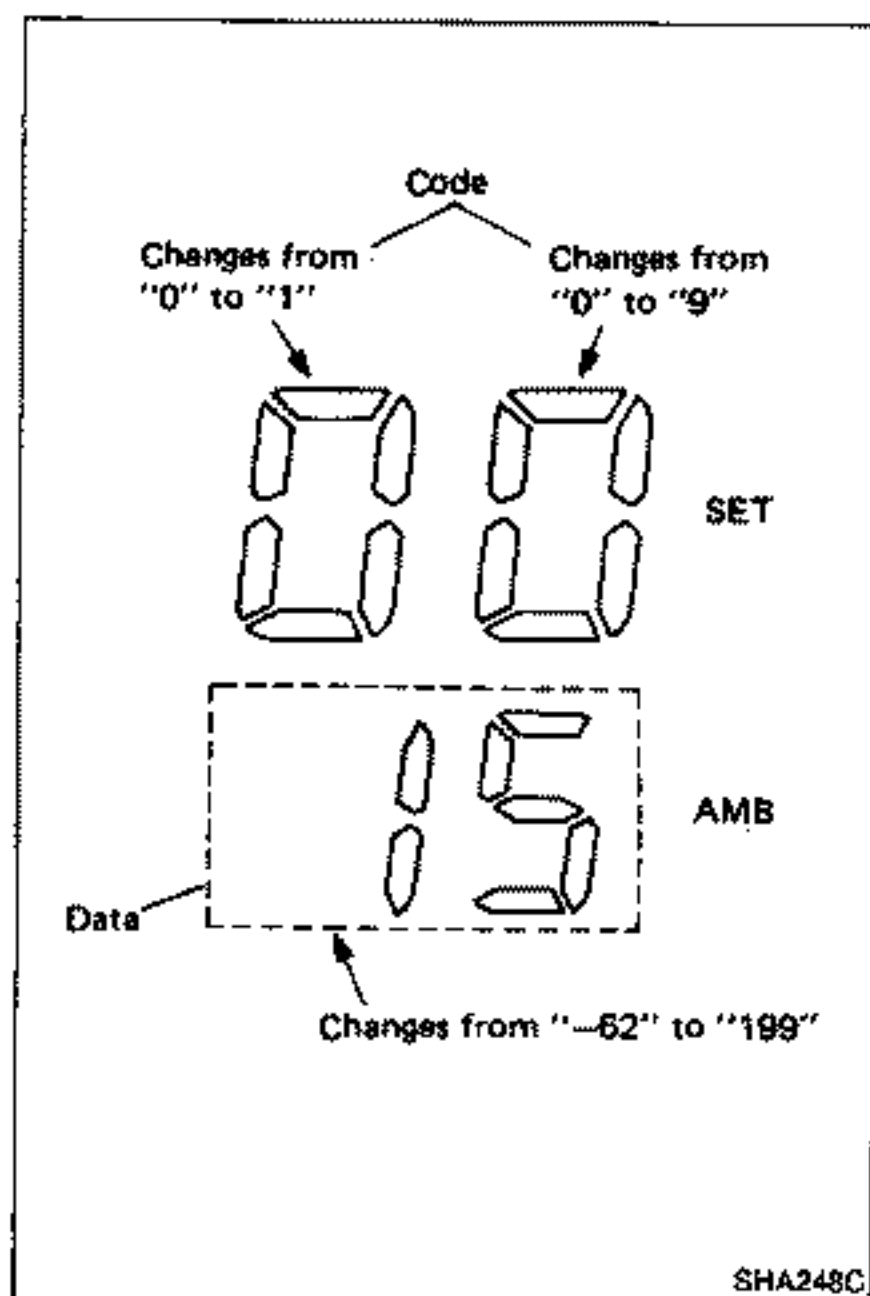
STEP 1: MONITOR DIAGNOSIS

In STEP 1 mode, "00" and "data", respectively appear in SET and AMB section of display.

Each time the "HI" switch is pressed, the code number in the SET section advances one number, and data corresponding with the code number appears in the AMB section. Each time the "LO" switch is pressed, the code number reduces by one number, and data corresponding with the code number appears in the AMB section.

If the temperature shown on the display greatly differs from the actual temperature, check the sensor circuit first, then inspect the sensor itself according to the procedures described in Electrical Components Inspection.

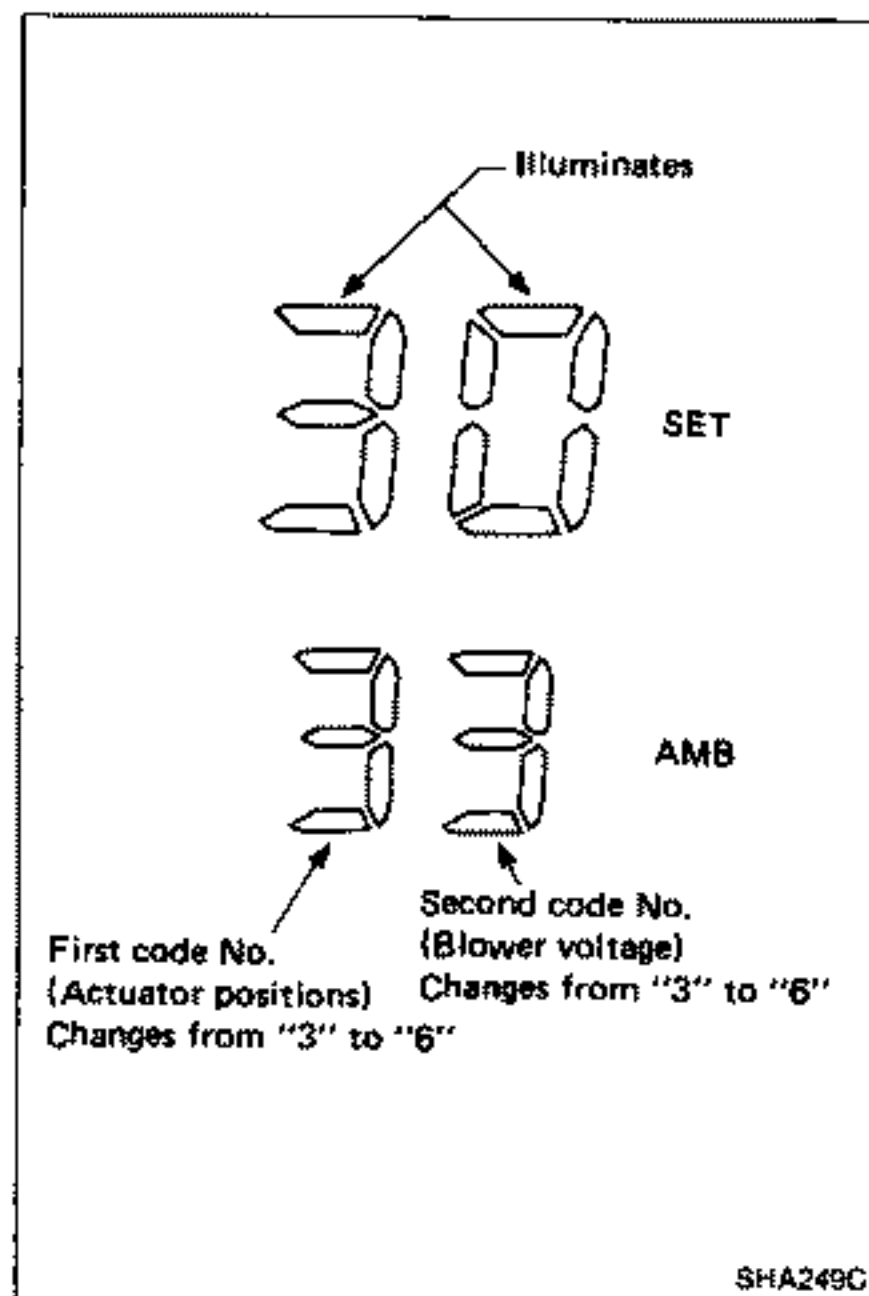
* For cross-reference of code number and corresponding data, refer to "Monitor Diagnosis" in STEP 1.



STEP 2: ACTUATOR TEST

In STEP 2 mode, "30" and "33" respectively appear in the SET and AMB sections of the display.

When the "HI" switch is pressed one time, the first code advances. This code returns to "3" after it reaches "6". Similarly, when the "LO" switch is pressed one time, the second code advances one number. After the code number "6" appears, it returns to "3".



TROUBLE DIAGNOSES — Auto Air Conditioner

Self-diagnosis (Cont'd)

During inspection in STEP 2 mode, the auto amplifier will forcefully transmit an output to the affected actuators in response to the code No. shown on the display, as indicated in the table below.

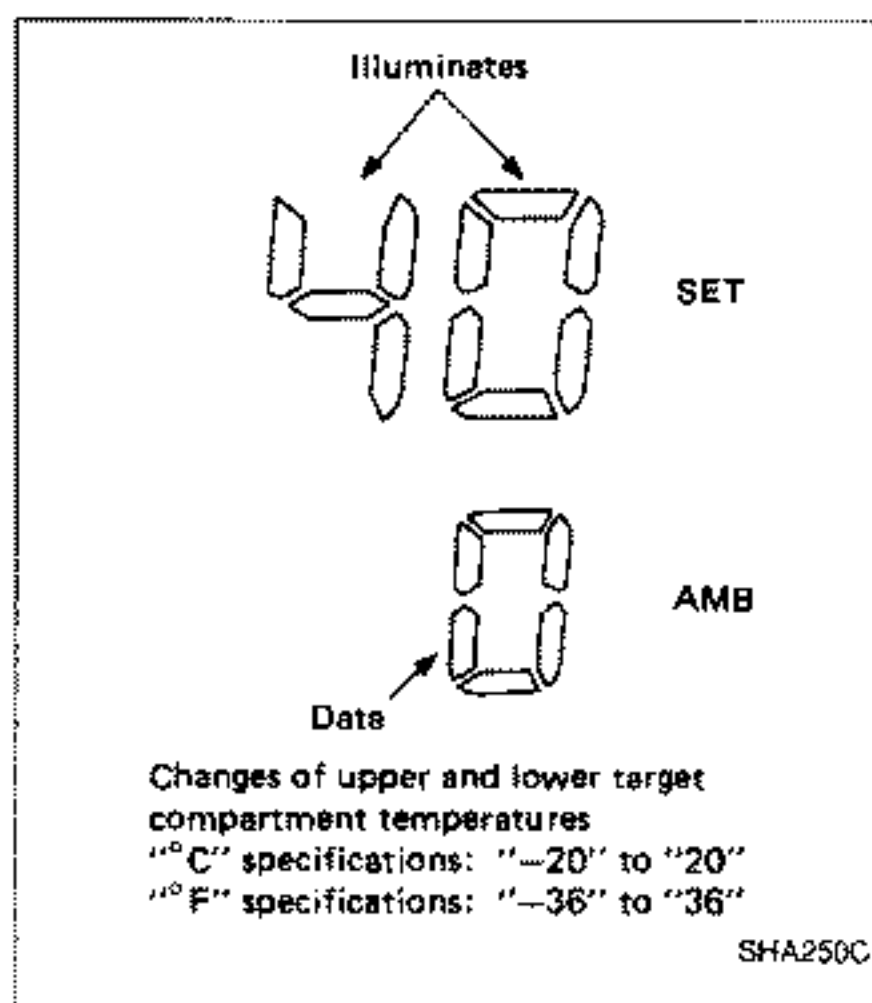
Checks must be made for improper operation visually, by listening to any noise, or by touching air outlets with your hand, etc.

First code No.	3	4	5	6
Actuator				
Mode door	DEF	HEAT	B/L	VENT
Intake door	FRE	FRE	50% FRE	REC
Air mix door	Full Hot	Full Hot	30°C (86°F)	Full Cold
Compressor	OFF	OFF	ON	ON

Second code No.	3	4	5	6
Blower motor				
Voltage	4V	6V	9V	12V

Operating condition of each actuator cannot be checked by indicators.

- * 1) First and second codes can be set independently.
- 2) When first code "5" appears, air mix door activates.
A stabilized outlet temperature 30°C (86°F) is reached after air mix door has been operating for approximately one minute.



STEP 3:AUXILIARY MECHANISM

Changes of difference between upper and lower target temperatures.

* Figures in parentheses "()" refer to values for "°F" specifications.

In STEP 3 mode, "40" and "0" (if this number is changed, the corresponding number appears) respectively appear in the SET and AMB sections of the display.

Each time the "HI" switch is pressed, the number in the AMB section advances. This number will increase up to 20 for °C specifications and 36 for °F specifications. Each time the "LO" switch is pressed, the number decreases. This number decreases to -20 for °C specifications and -36 for °F specifications. For °C specifications, pressing the "HI" or "LO" switch each time increases or decreases the data number by "1" degree (and by "1" through "3" degrees for °F specifications).

°C specifications	Data	-20	— — —	-1	0	1	— — —	20
	Difference between upper and lower target temperatures	-2.0°C	— — —	-1°C	0°C	0.1°C	— — —	2.0°C
°F specifications	Data	-36	— — —	-2	0	2°C	— — —	36
	Difference between upper and lower target temperatures	-3.6°F	— — —	-0.2°F	0°F	0.2°F	— — —	3.6°F

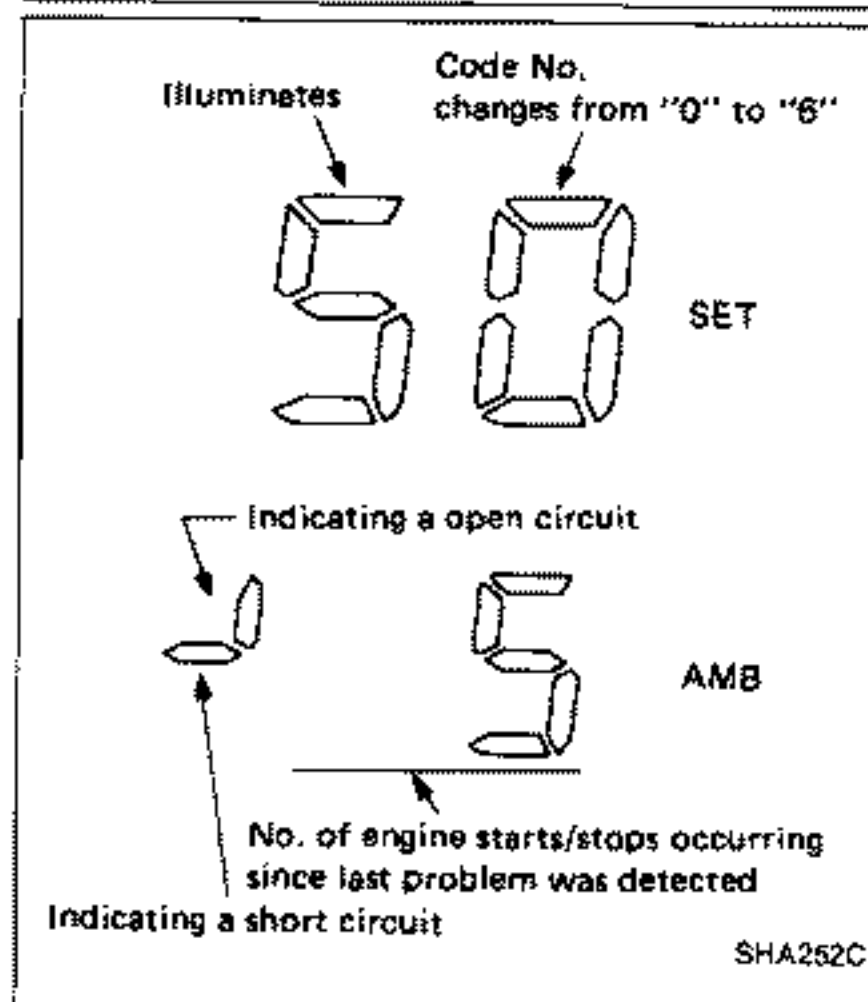
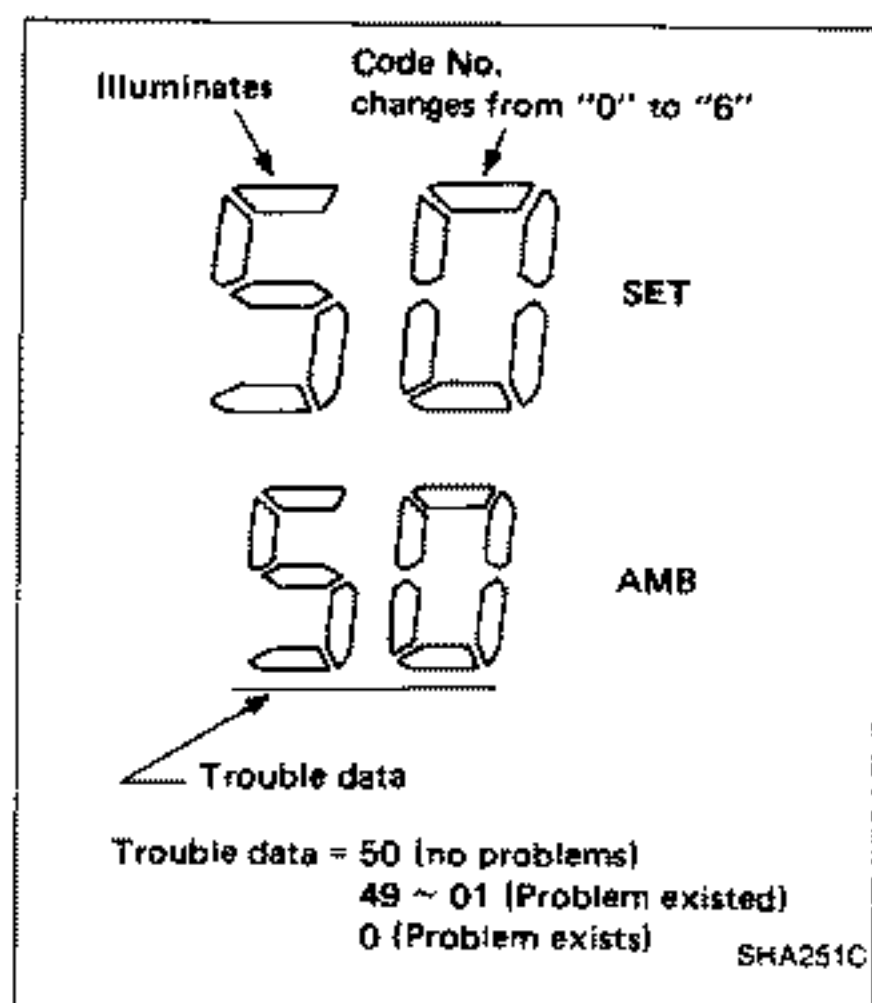
Difference between upper and lower target temperatures changed in the preceding procedure is kept until the next change is done or the battery cable is removed.

Self-diagnosis (Cont'd)

STEP 4: READOUT OF TROUBLE DATA STORED IN MEMORY

In STEP 4 mode, "50" and "trouble data" respectively appear in the SET and AMB sections.

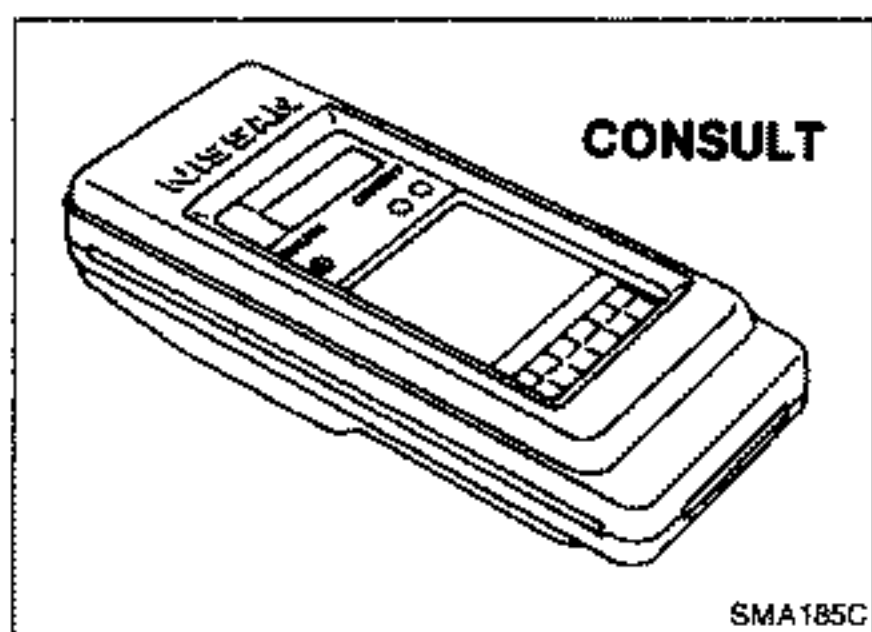
Each time the "HI" switch is pressed, the code number advances by one number. After it reaches "6", it will return to "0". Each time the "LO" switch is pressed, the code number reduces by one number. After it reaches "0", it will return to "6".



When the sensor becomes inoperative, number of engine starts/stops occurring since last problem was detected, appears in the AMB section of the display.

Open circuit or short circuit is indicated by "0" or "∞".

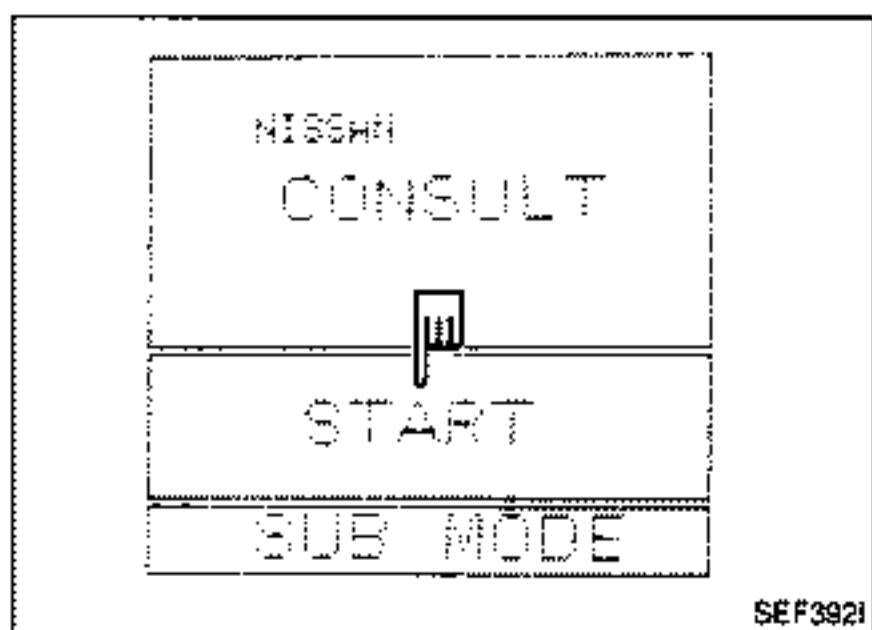
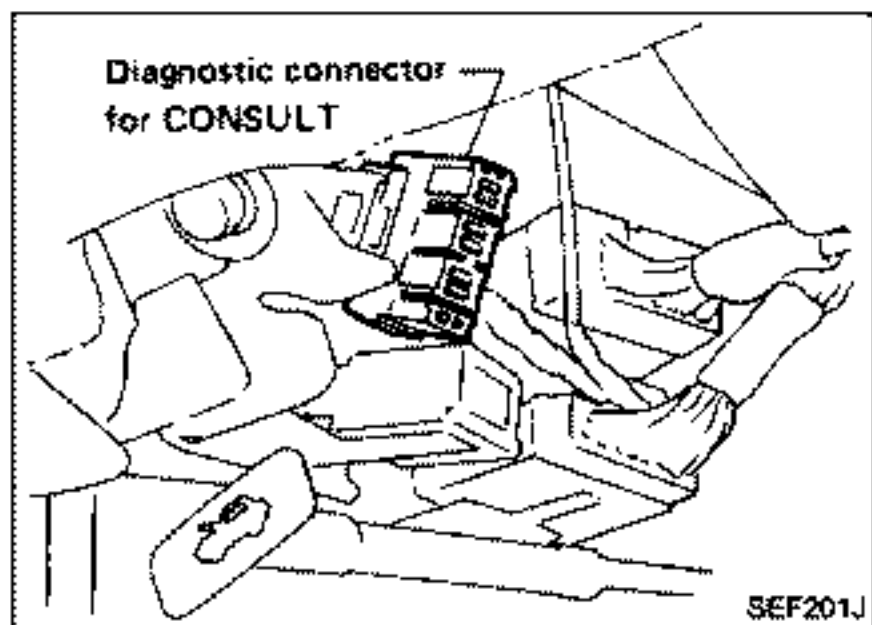
Code No.	Sensor	Open circuit	Short circuit
50	Ambient sensor	Less than -70°C (-94°F)	Greater than 141°C (286°F)
51	Room upper sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
52	Room lower sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
53	DEF duct sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
54	VENT duct sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
55	Floor duct sensor	Less than -38°C (-36°F)	Greater than 141°C (286°F)
56	Sunload sensor	Open circuit can not be detected by self-diagnosis.	Greater than 1.784 kW (1,534 kcal/h, 6,087 BTU/h)/m ² [19.19 kW (16,506 kcal/h, 65,502 BTU/h)/sq ft]



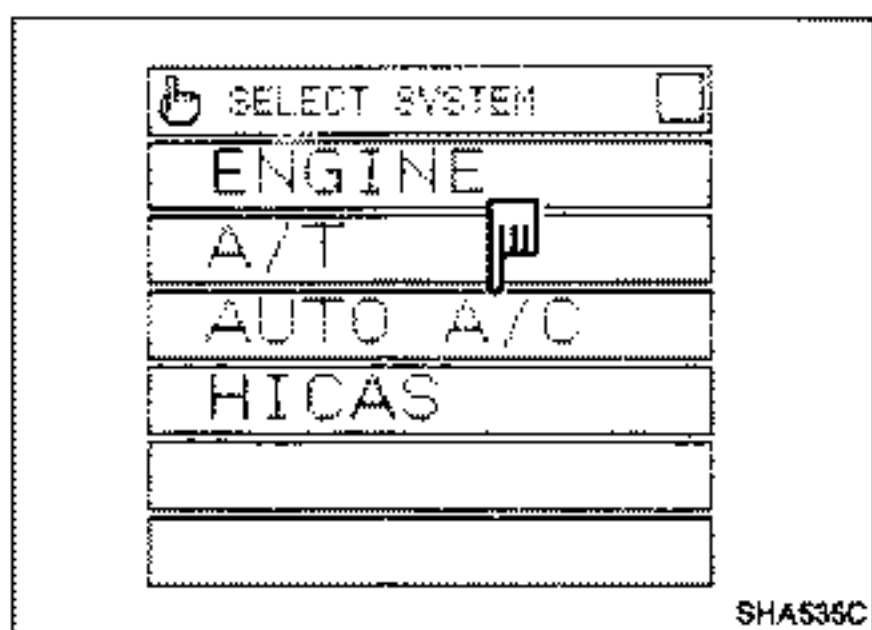
Consult

CONSULT INSPECTION PROCEDURE

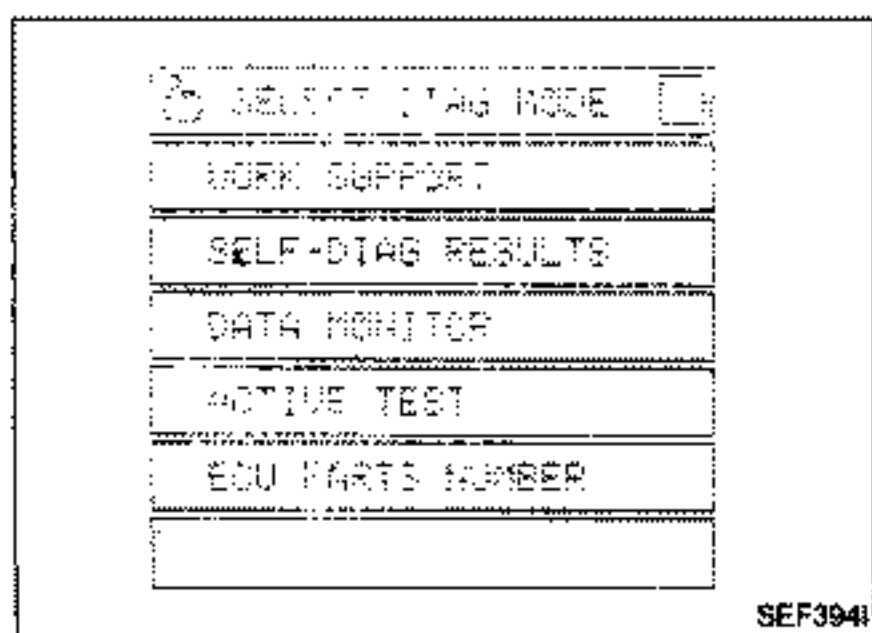
1. Turn off ignition switch.
2. Connect "CONSULT" to diagnostic connector.
(Diagnostic connector is located in left dash side panel.)



3. Turn on ignition switch.
4. Touch "START".



5. Touch "AUTO A/C".



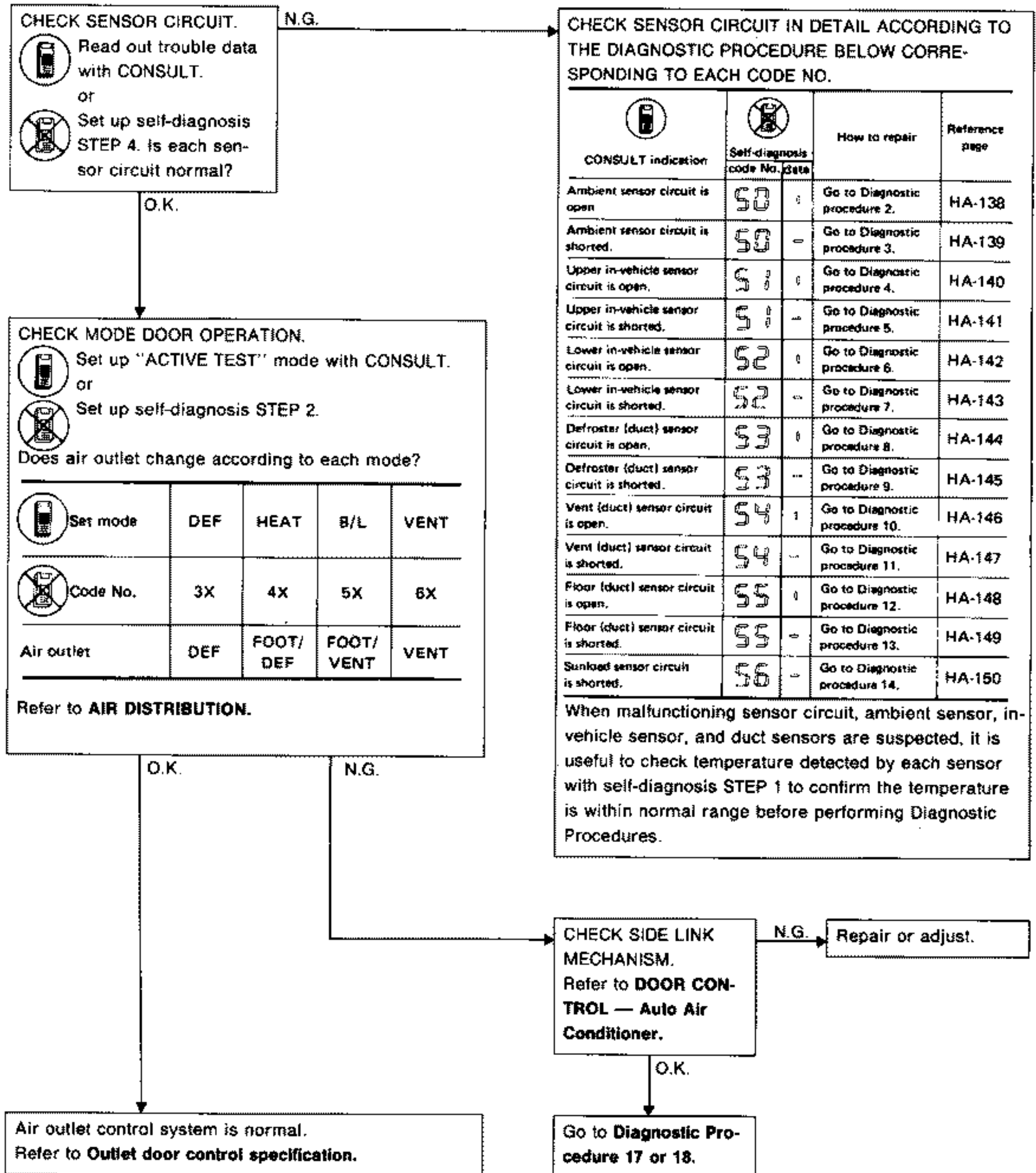
6. Perform each diagnostic mode according to the inspection sheet as follows:

For further information, read the CONSULT Operation Manual.

Preliminary Check

PRELIMINARY CHECK 1

Air outlet does not change.

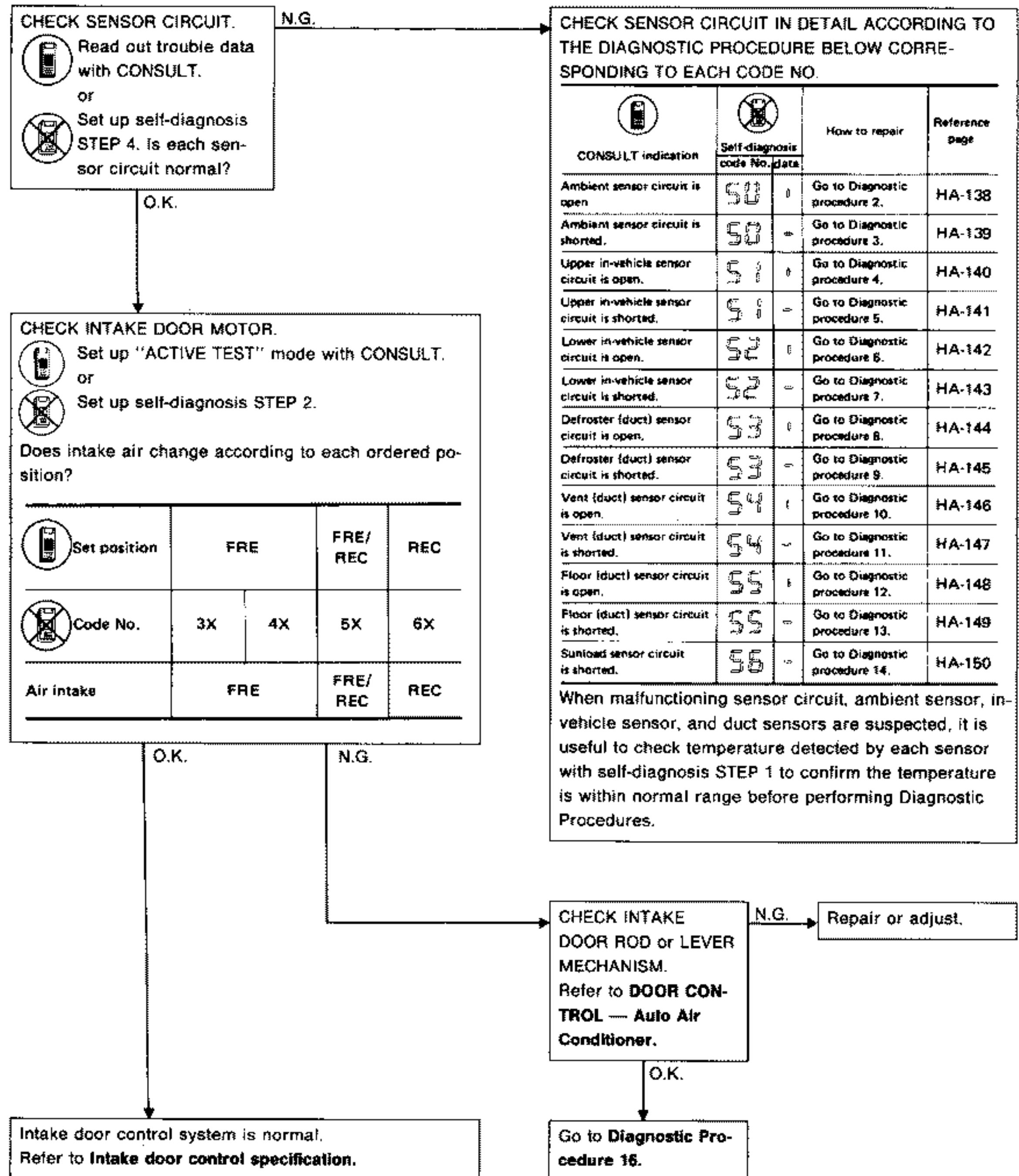


TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

Intake door does not change.

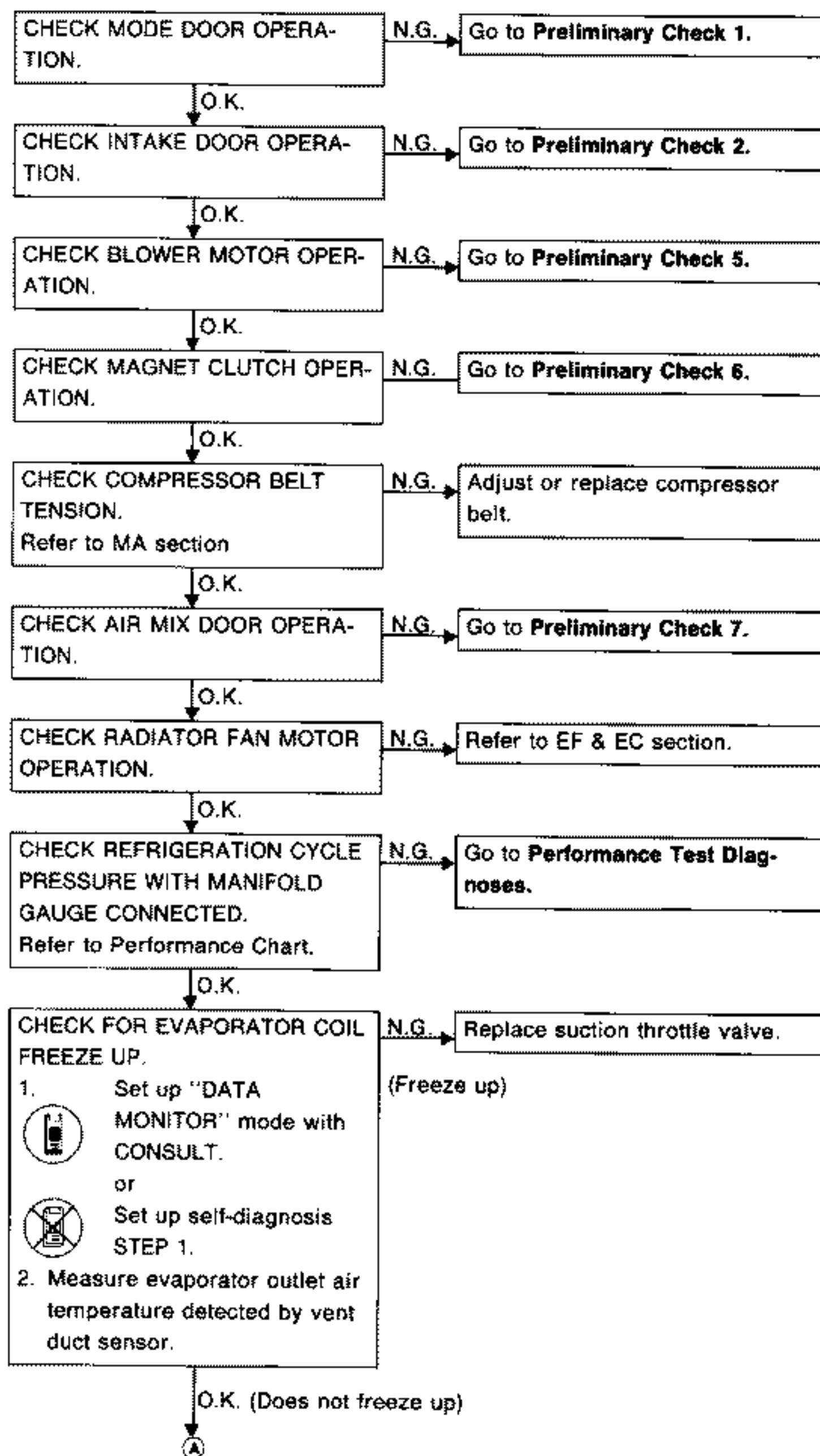


Preliminary Check (Cont'd)

PRELIMINARY CHECK 3

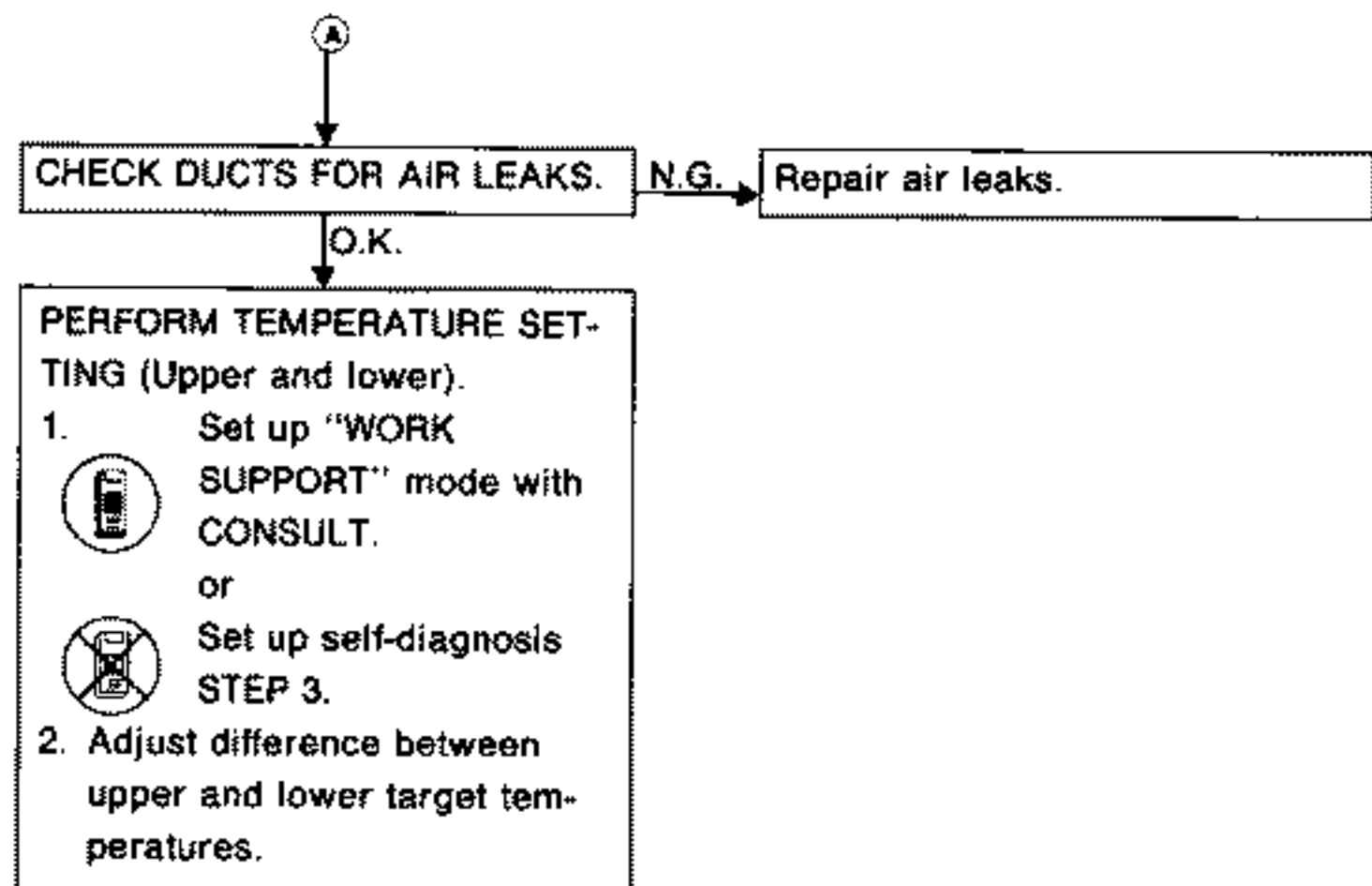
Insufficient cooling

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)



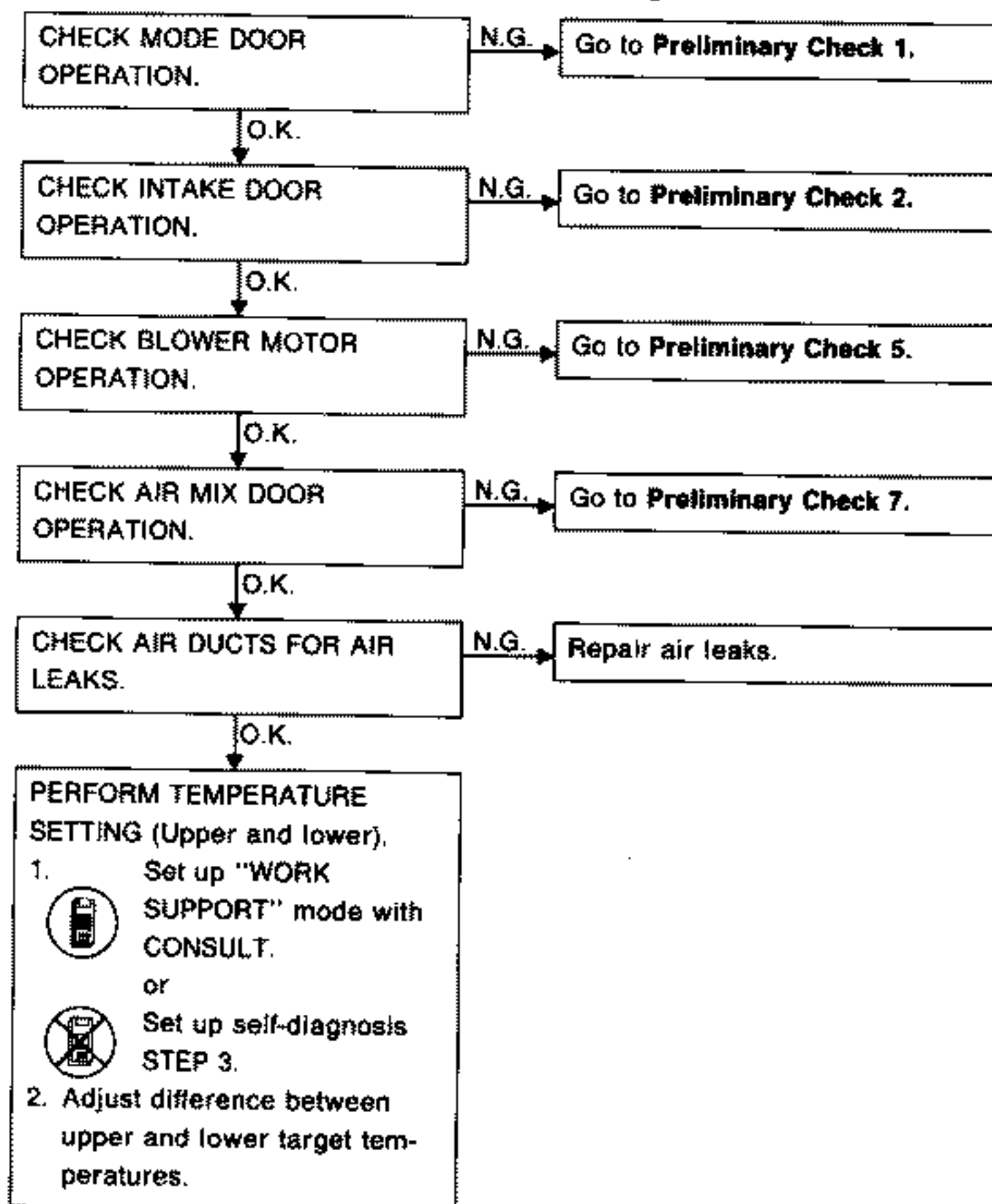
TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 4

Insufficient heating

- Check coolant level, engine temperature and heater hoses and read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 5

Blower motor operation is malfunctioning.

CHECK SENSOR CIRCUIT.

 Read out trouble data with CONSULT.
or
 Set up self-diagnosis STEP 4. Is each sensor circuit normal?

N.G.

O.K.

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

 CONSULT indication	 Self-diagnosis		How to repair	Reference page
	code No.	data		
Ambient sensor circuit is open.	50	1	Go to Diagnostic procedure 2.	HA-138
Ambient sensor circuit is shorted.	50	-	Go to Diagnostic procedure 3.	HA-139
Upper in-vehicle sensor circuit is open.	51	1	Go to Diagnostic procedure 4.	HA-140
Upper in-vehicle sensor circuit is shorted.	51	-	Go to Diagnostic procedure 5.	HA-141
Lower in-vehicle sensor circuit is open.	52	1	Go to Diagnostic procedure 6.	HA-142
Lower in-vehicle sensor circuit is shorted.	52	-	Go to Diagnostic procedure 7.	HA-143
Defroster (duct) sensor circuit is open.	53	1	Go to Diagnostic procedure 8.	HA-144
Defroster (duct) sensor circuit is shorted.	53	-	Go to Diagnostic procedure 9.	HA-145
Vent (duct) sensor circuit is open.	54	1	Go to Diagnostic procedure 10.	HA-146
Vent (duct) sensor circuit is shorted.	54	-	Go to Diagnostic procedure 11.	HA-147
Floor (duct) sensor circuit is open.	55	1	Go to Diagnostic procedure 12.	HA-148
Floor (duct) sensor circuit is shorted.	55	-	Go to Diagnostic procedure 13.	HA-149
Sunload sensor circuit is shorted.	56	-	Go to Diagnostic procedure 14.	HA-150

When malfunctioning sensor circuit, ambient sensor, in-vehicle sensor, and duct sensors are suspected, it is useful to check temperature detected by each sensor with self-diagnosis STEP 1 to confirm the temperature is within normal range before performing Diagnostic Procedures.

Go to Diagnostic Procedure 25.

Is engine coolant temperature below 40°C (104°F) and foot duct temperature below 30°C (86°F)?

N.G.

Blower motor operation is normal.
Refer to **Fan speed control specification**.

O.K.

IS BLOWER MOTOR CONTROLLED UNDER FAN STARTING SPEED CONTROL?
Refer to **Starting fan speed control specification**.

No

Check engine temperature sensor control circuit.
Refer to EF & EC section.

Yes

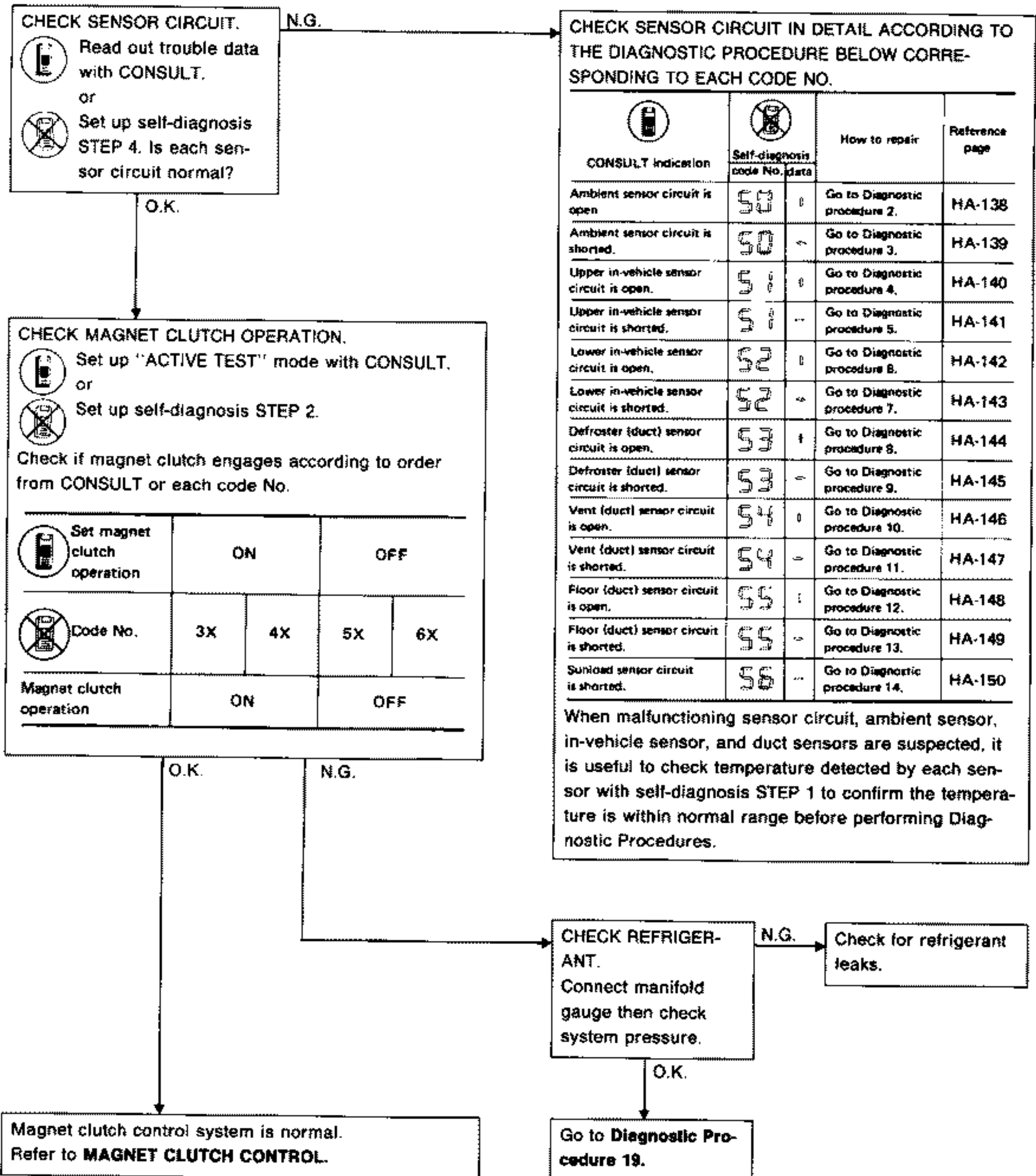
Blower motor operation is normal.

TROUBLE DIAGNOSES — Auto Air Conditioner

Preliminary Check (Cont'd)

PRELIMINARY CHECK 6

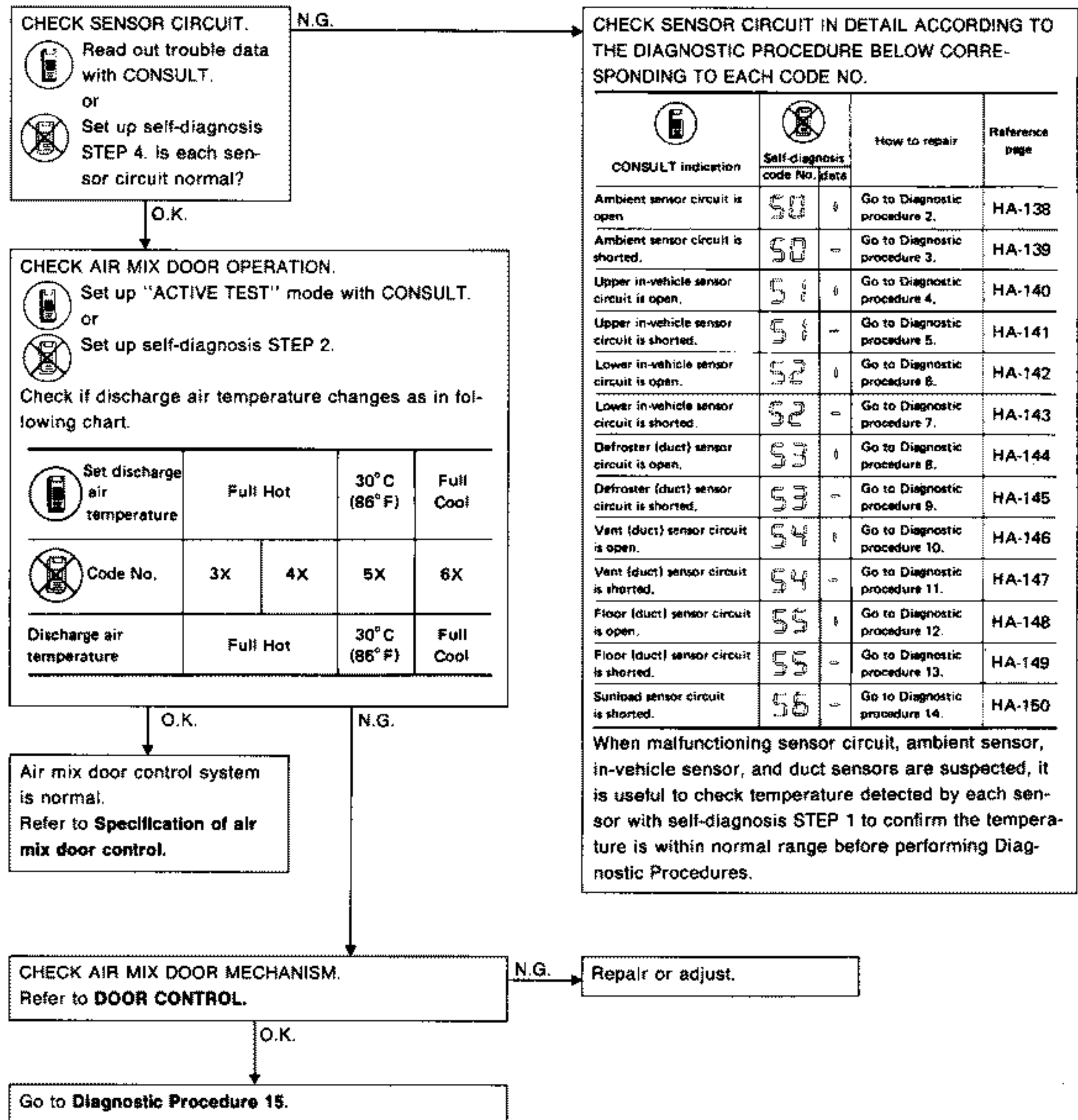
Magnet clutch does not engage.



Preliminary Check (Cont'd)

PRELIMINARY CHECK 7

Discharged air temperature does not change.



Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.

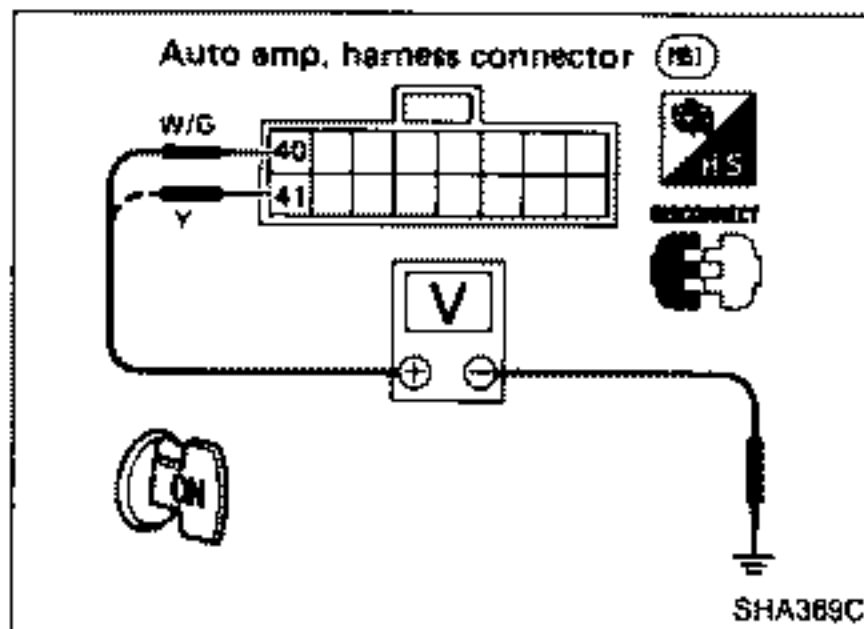
Refer to "POWER SUPPLY ROUTING" in section EL and A/C ELECTRICAL CIRCUIT — Auto Air Conditioner.

AUTO AMP. REMOVAL

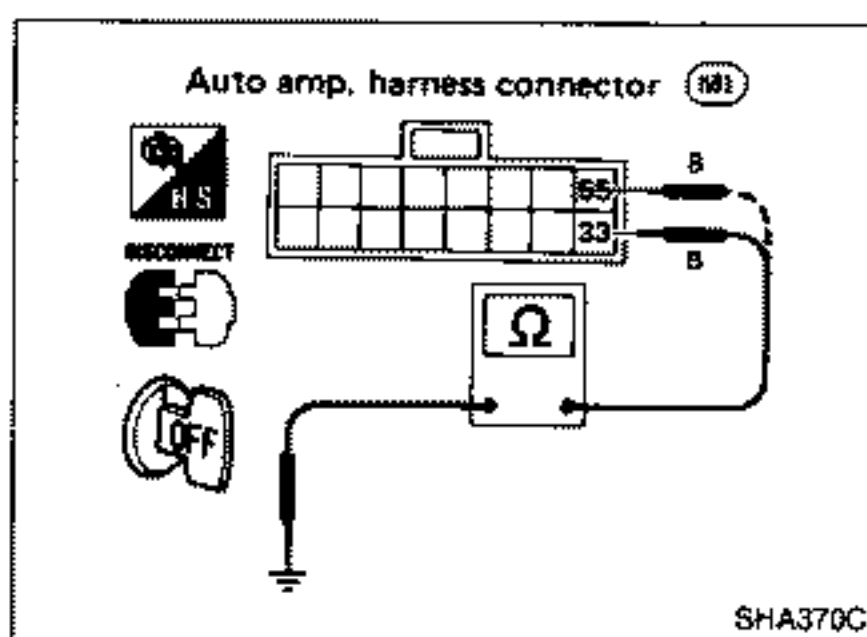
1. Remove driver side instrument lower lid.
2. Remove vent duct.
3. Remove auto amp. with harness connected.

AUTO AMP. CHECK

1. Disconnect auto amp. harness connectors.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. ④① or No. ④② and body ground.



Voltmeter terminal		Voltage (Approx.)
⊕	⊖	
④①	Body ground	12V
④②		

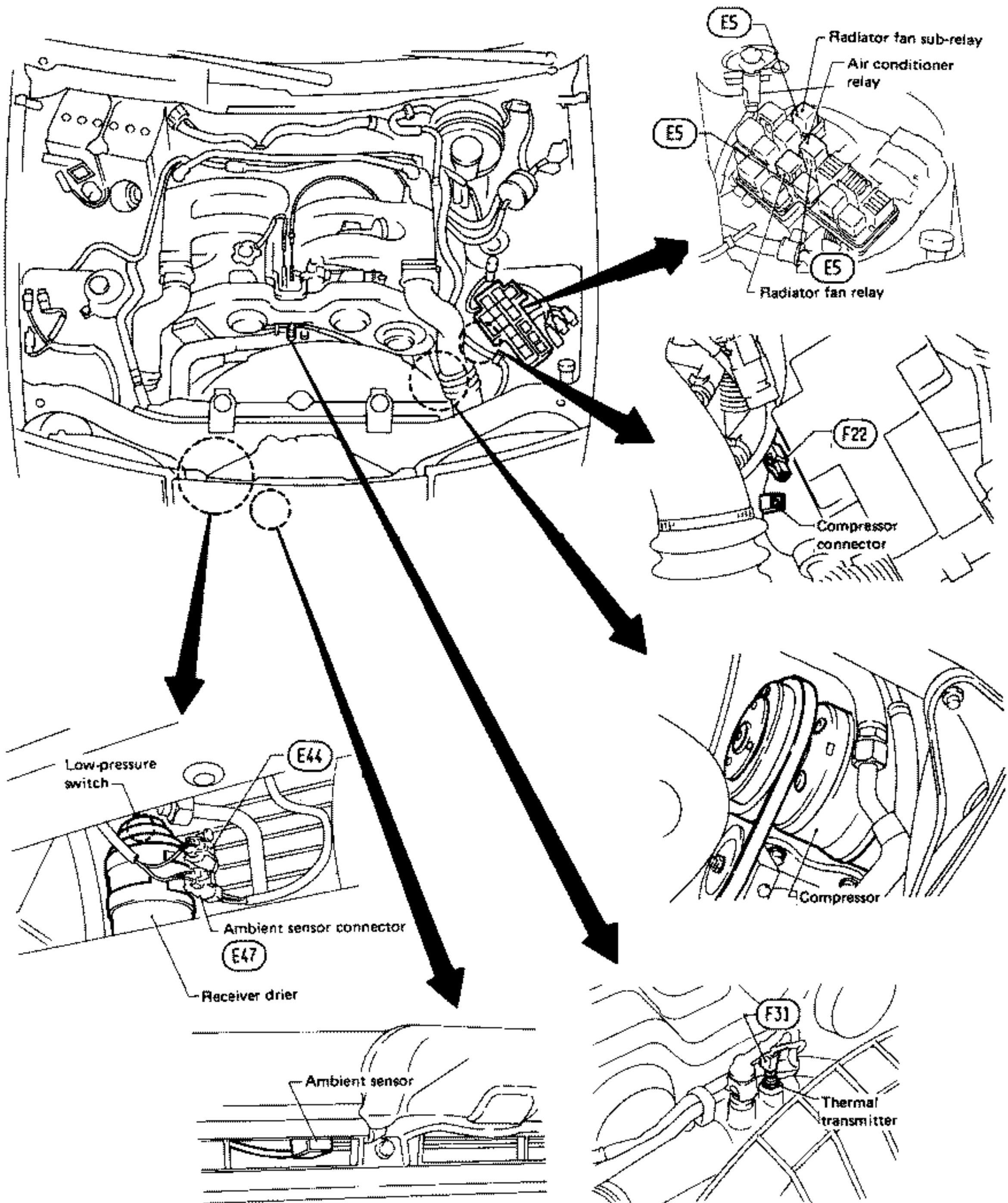


Check body ground circuit for control unit with ignition switch OFF

1. Disconnect auto amp. harness connector.
2. Connect ohmmeter from harness side.
3. Check continuity between terminal No. ③③ or ⑤⑤ and body ground.

Harness Layout for A/C System

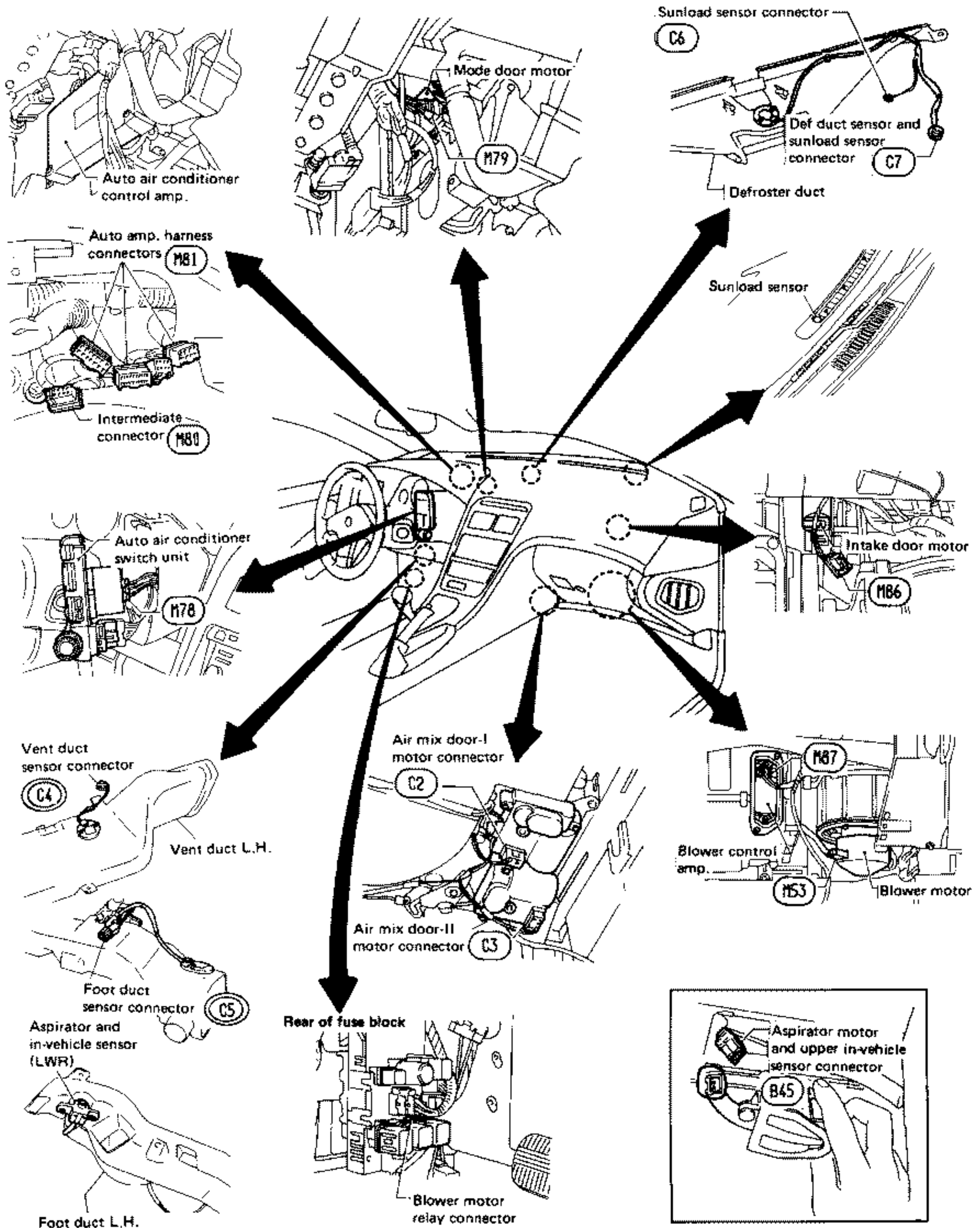
Engine compartment



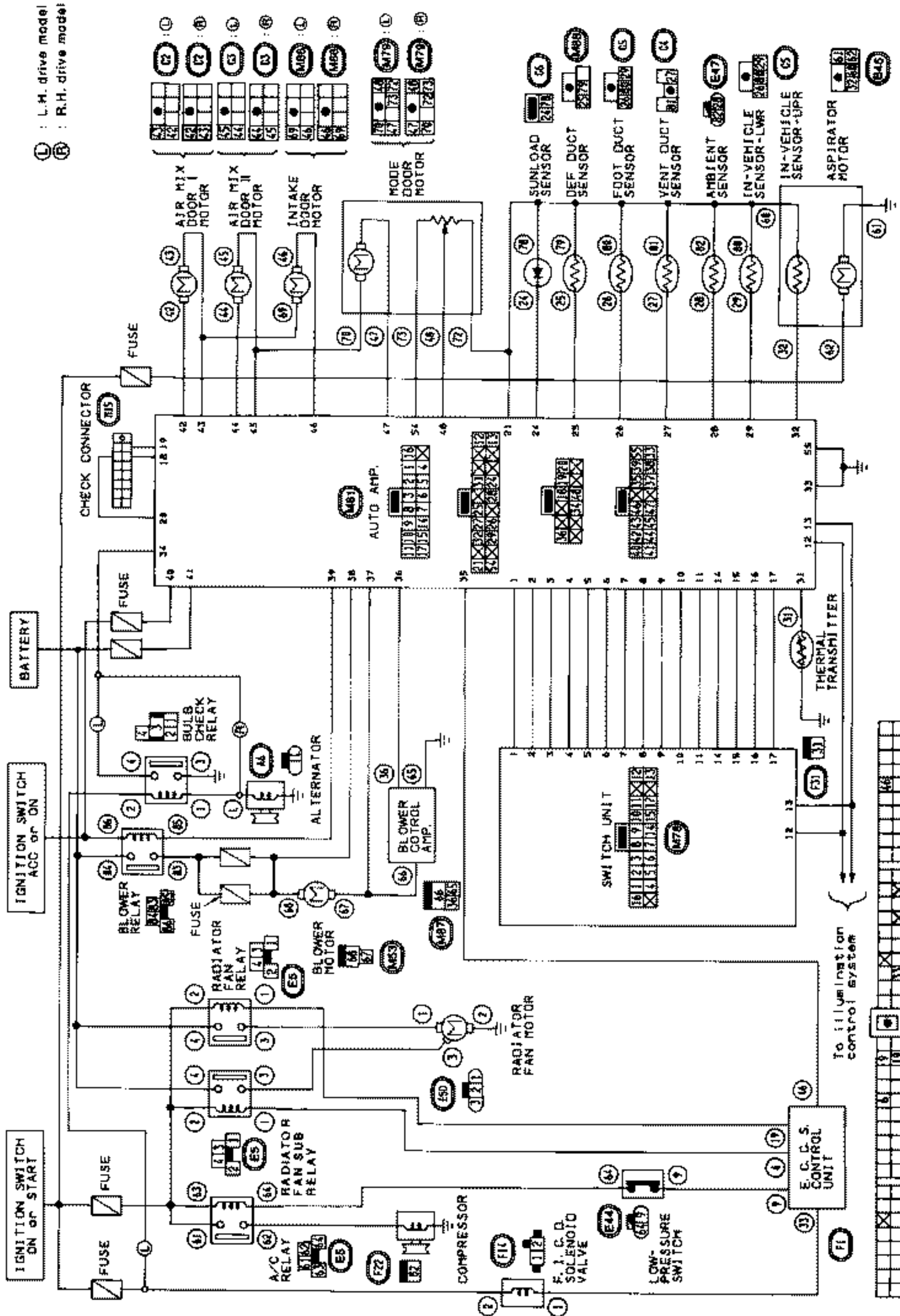
TROUBLE DIAGNOSES — Auto Air Conditioner

Harness Layout for A/C System (Cont'd)

Passenger compartment



Circuit Diagram for Quick Pinpoint Check



- All connectors shown in this illustration are unit side connectors.
- The unit side connectors with a double circle " " are connected to the harness side connectors shown in the "Harness Layout for A/C System". (See pages HA-134 - HA-135.)
- The terminal numbers in the connector coincide with the circuit numbers surrounded by a single circle " ".

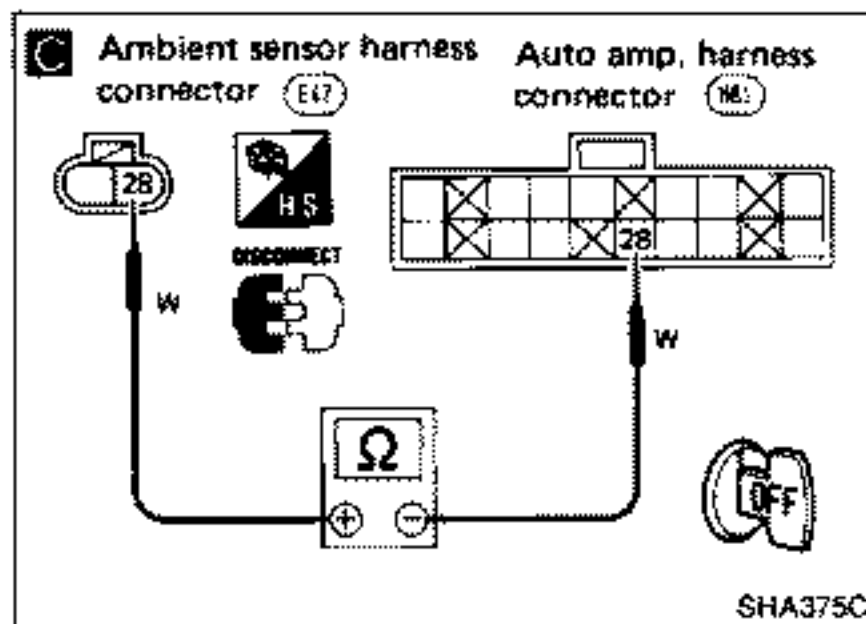
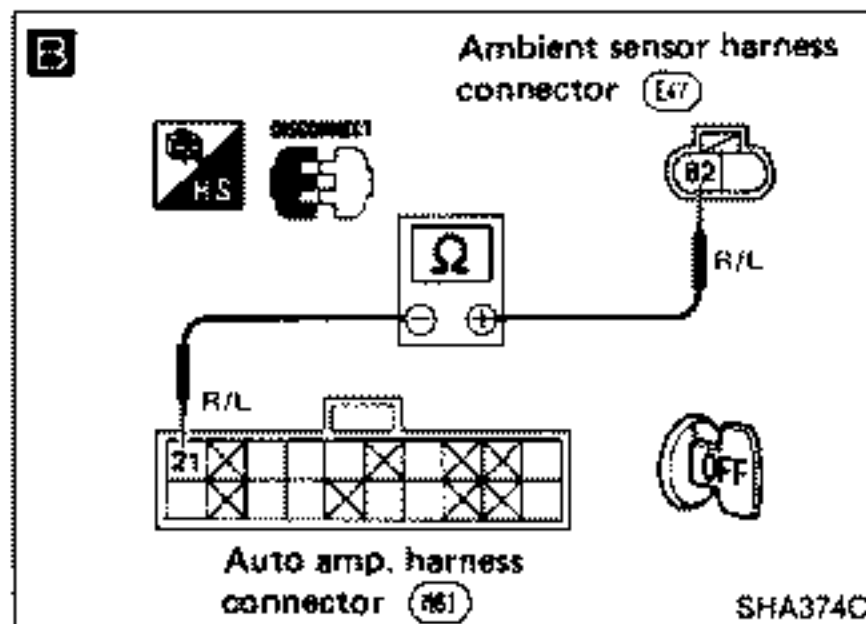
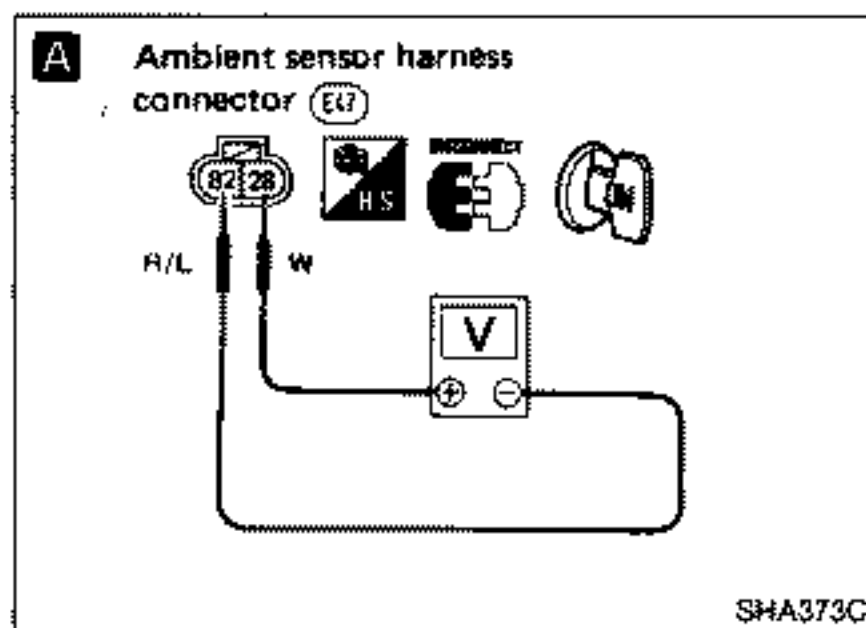
TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 1

SYMPTOM: Self-diagnosis detects intermittent short or open circuit in each sensor circuit.

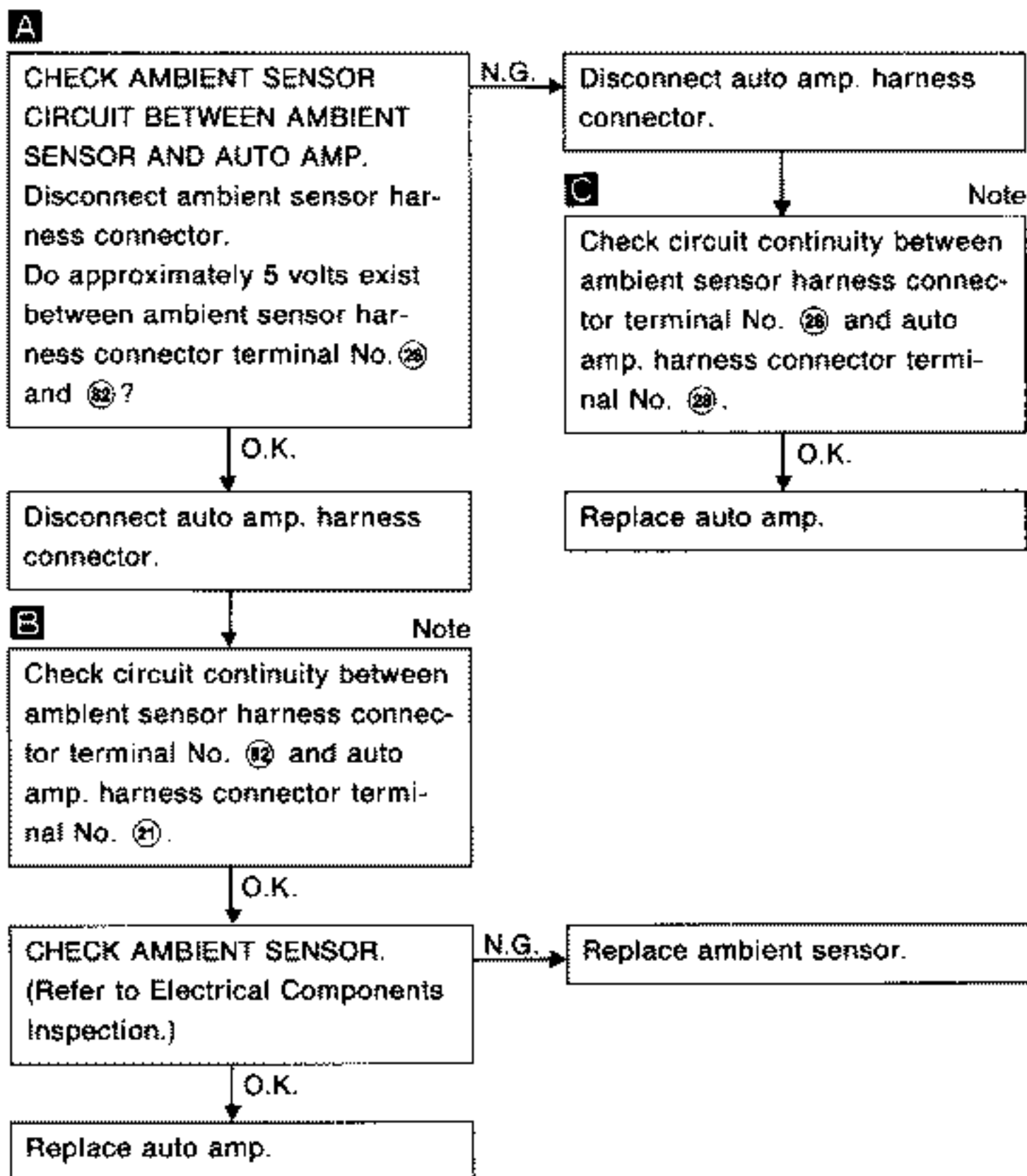
Check each connector connection as shown in the following table, and check the condition of each wire.

Malfunctioning circuit	Connector No. to be checked			
	Main harness	Engine room harness	Body harness	A/C sub-harness
Ambient sensor				
(L.H.D. model)	(M59) (M81)	(E47) (E112)		
(R.H.D. model)	(M8) (M81)	(E47) (E103)		
Upper in-vehicle sensor				
(L.H.D. model)	(M4) (M81)		(B2) (B45)	
(R.H.D. model)	(M5) (M81)		(B3)	
Lower in-vehicle sensor	(M80) (M81)			(C1) (C5)
DEF duct sensor	(M81) (M88)			
VENT duct sensor	(M80) (M81)			(C1) (C4)
Floor duct sensor	(M80) (M81)			(C1) (C5)
Sunload sensor	(M81) (M88)			(C6) (C7)



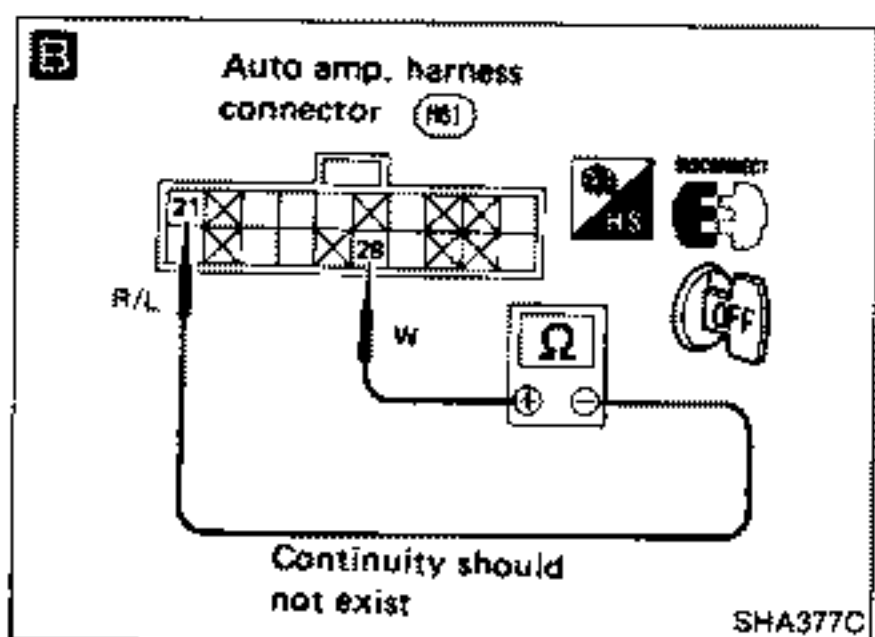
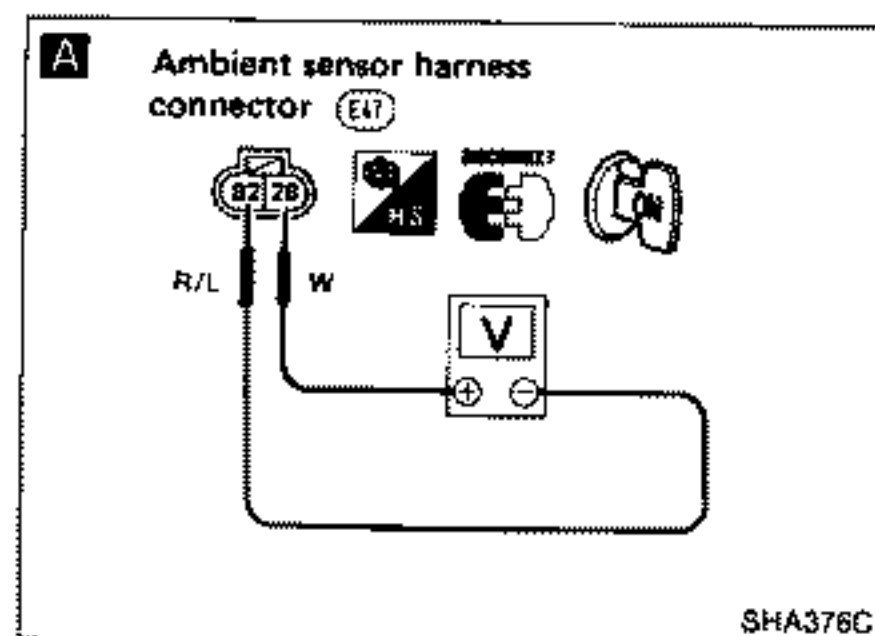
Diagnostic Procedure 2

SYMPTOM: Ambient sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



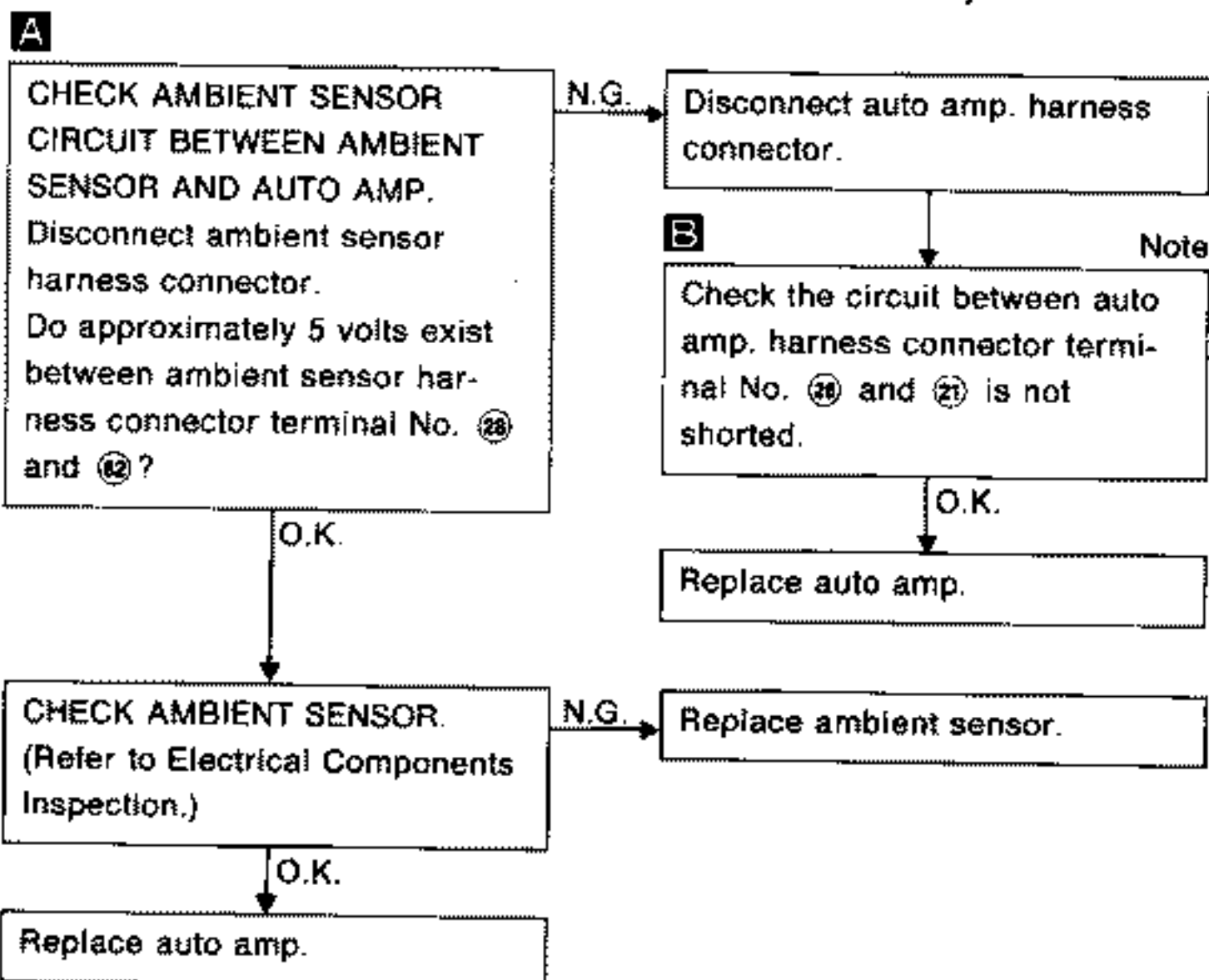
Note:

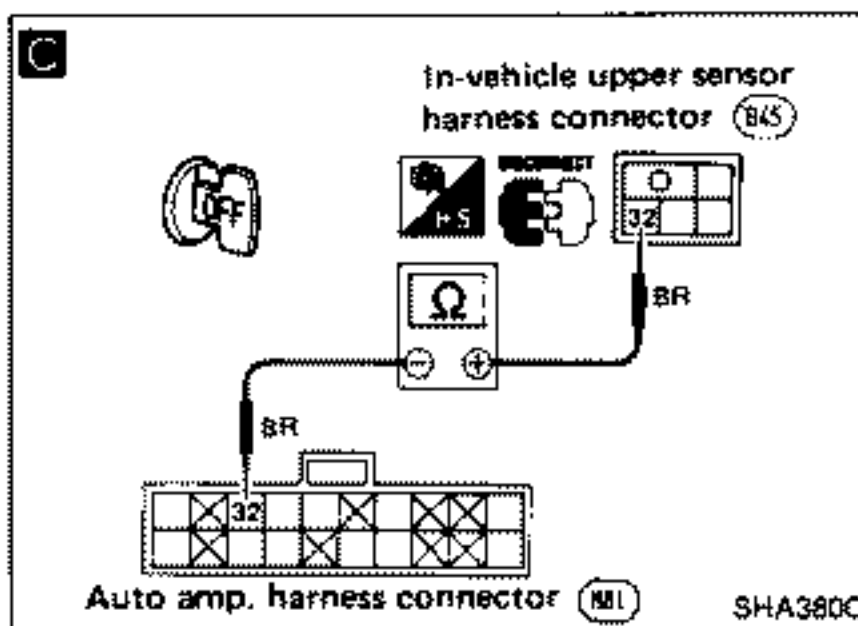
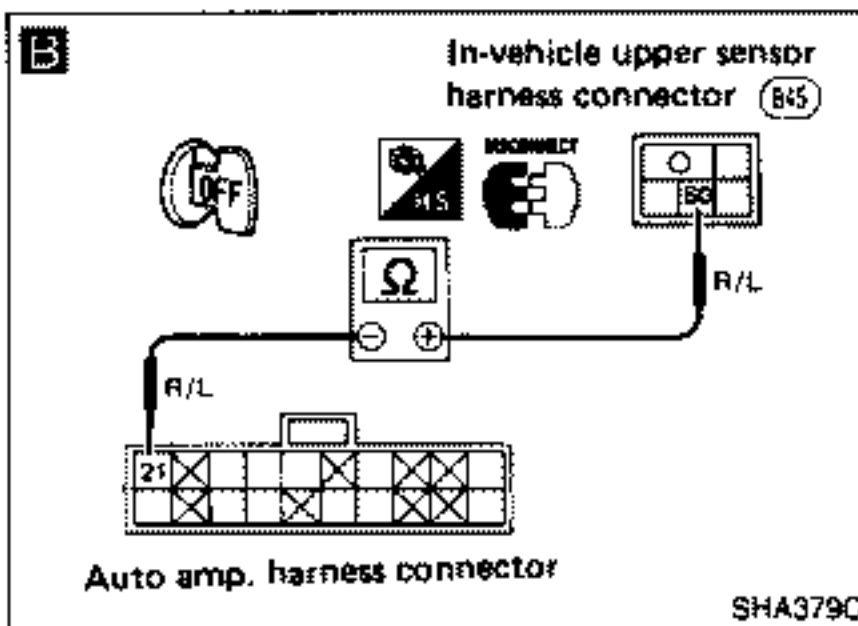
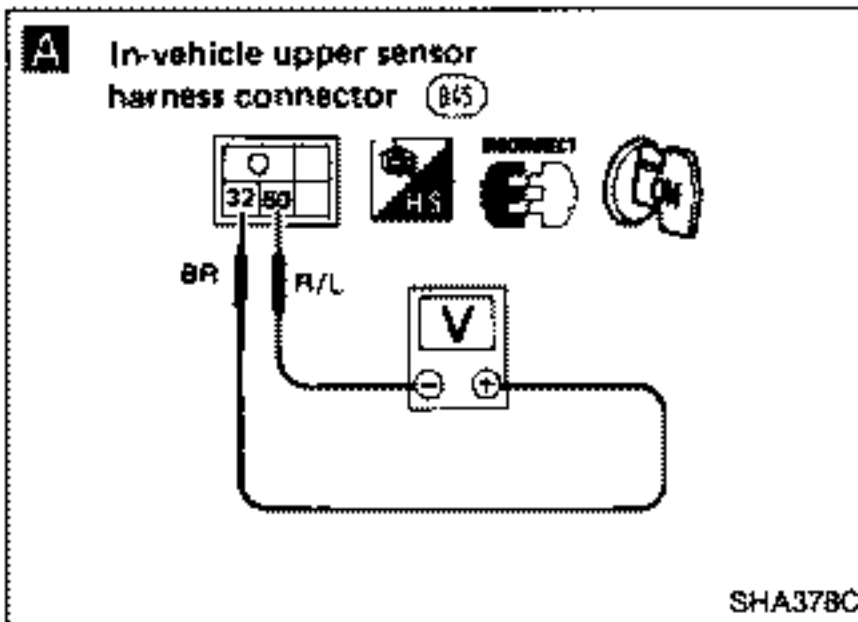
If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 3

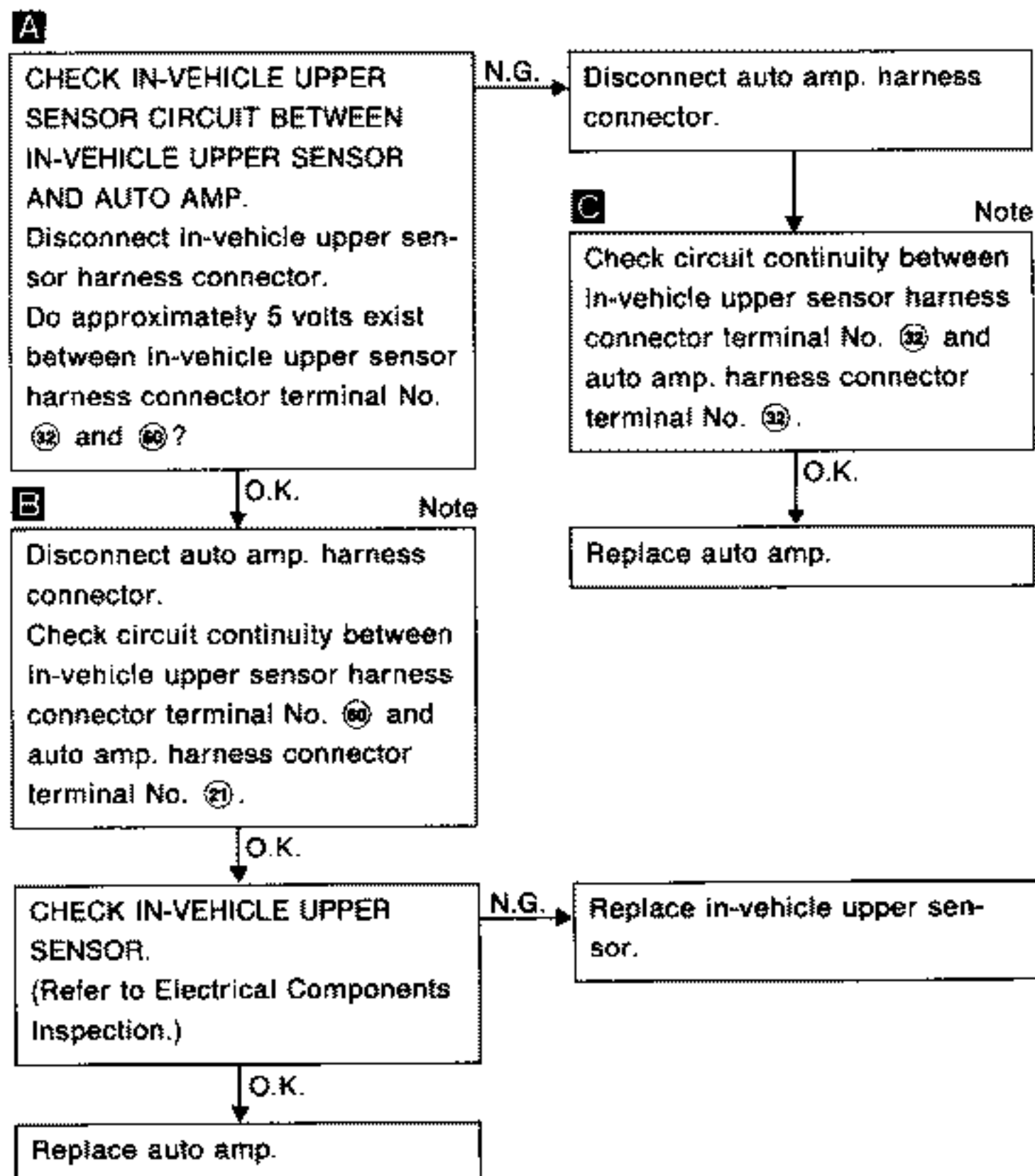
SYMPTOM: Ambient sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)





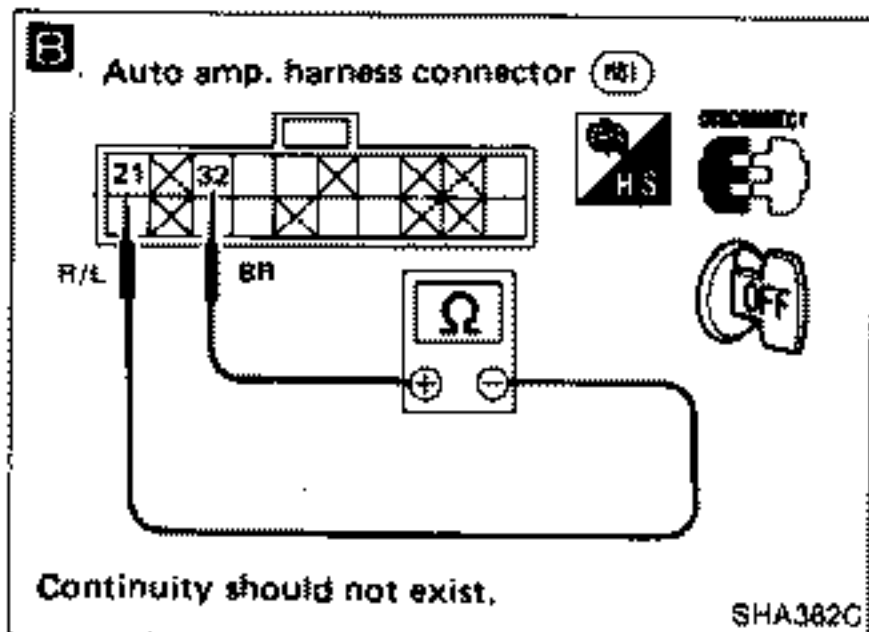
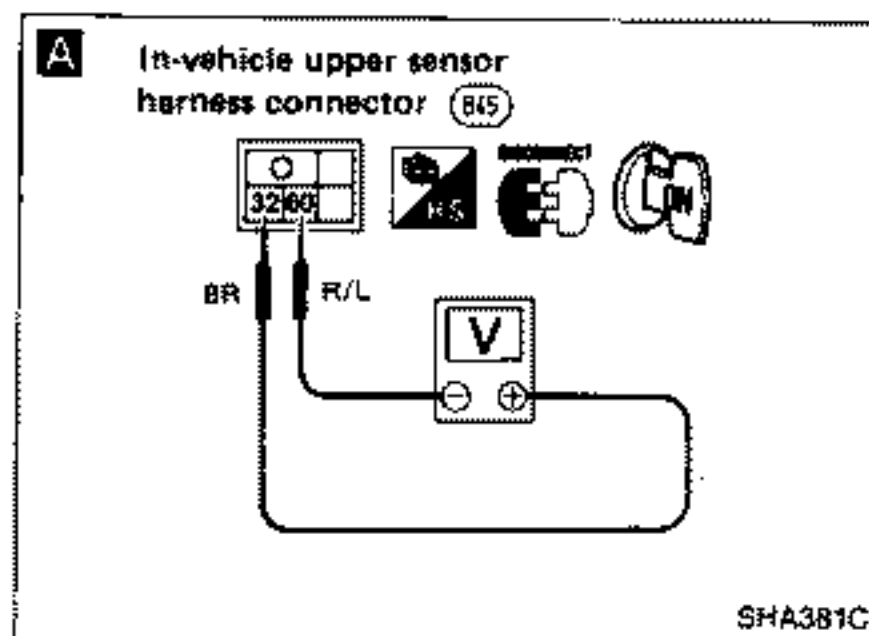
Diagnostic Procedure 4

SYMPTOM: Upper in-vehicle sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



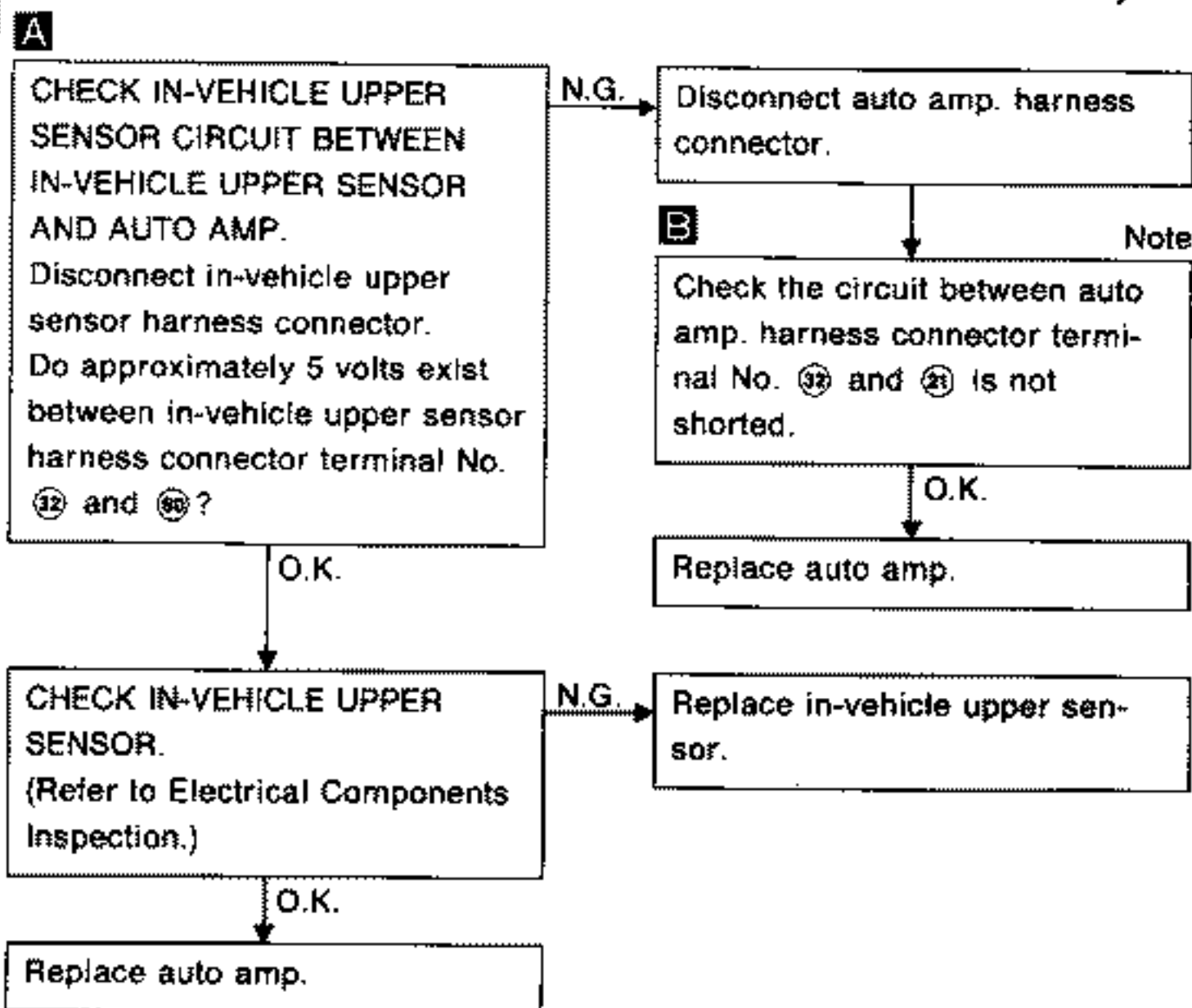
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



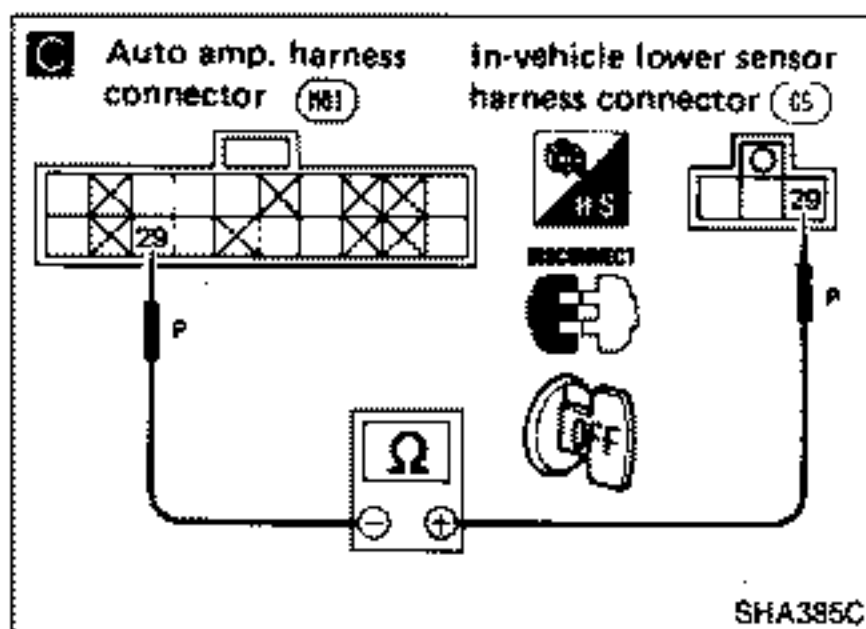
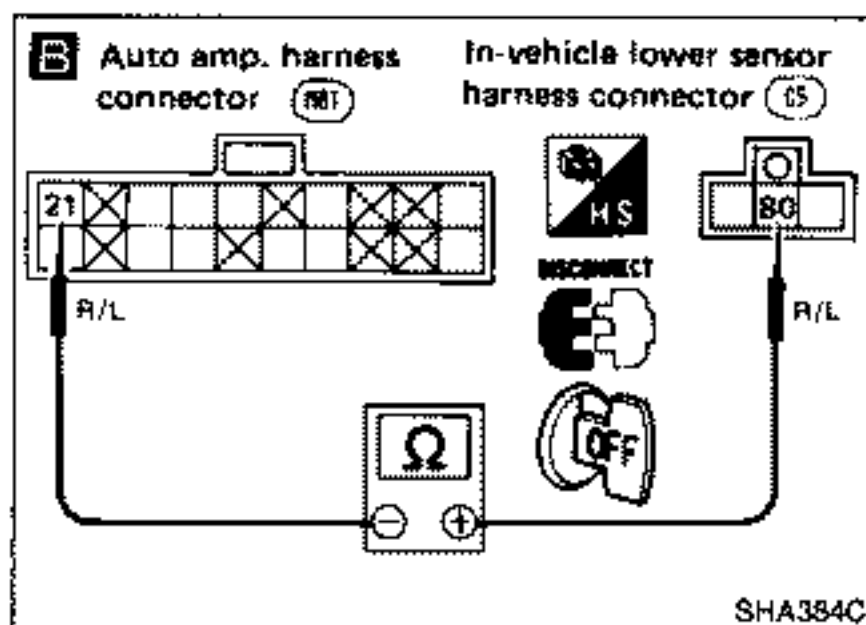
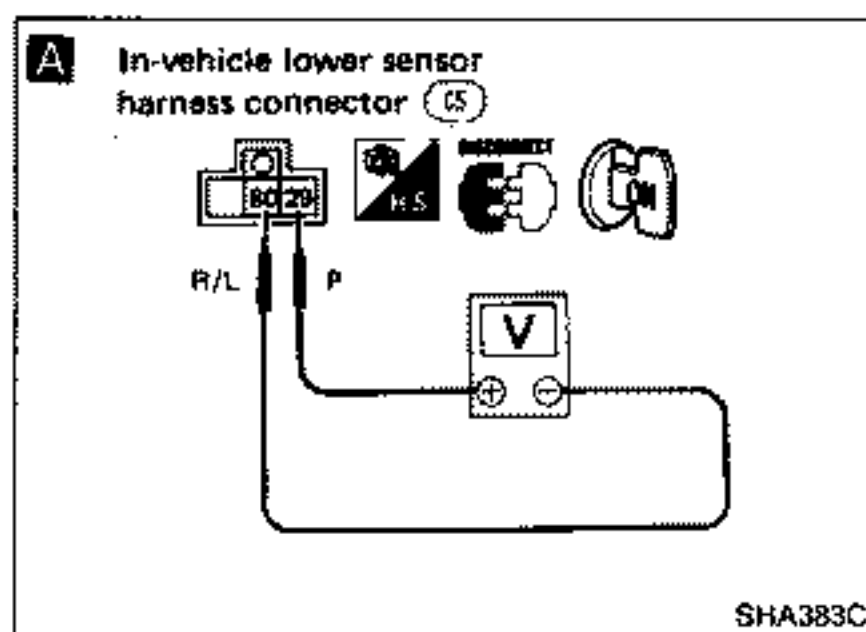
Diagnostic Procedure 5

SYMPTOM: Upper in-vehicle sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 Indicates this.)



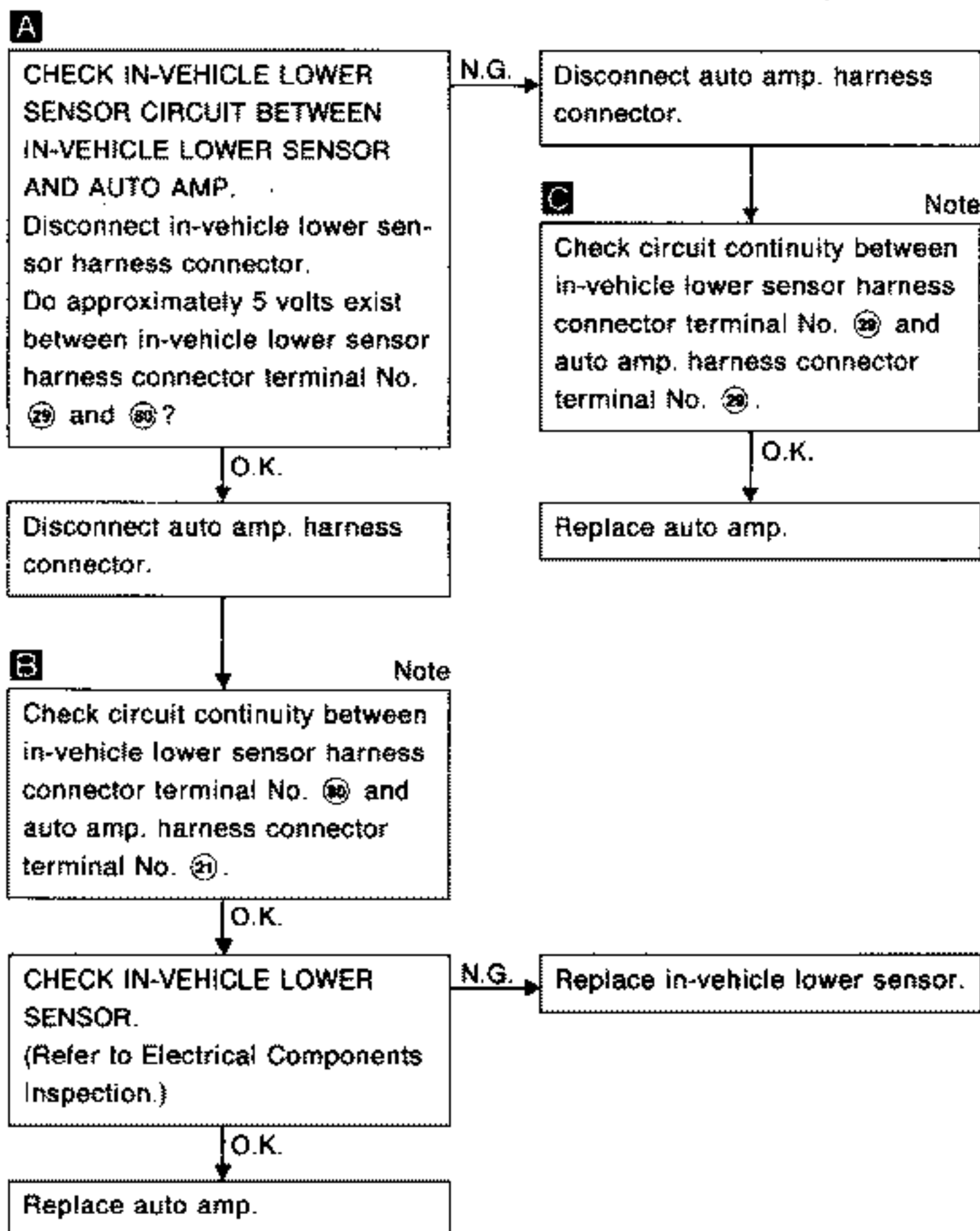
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



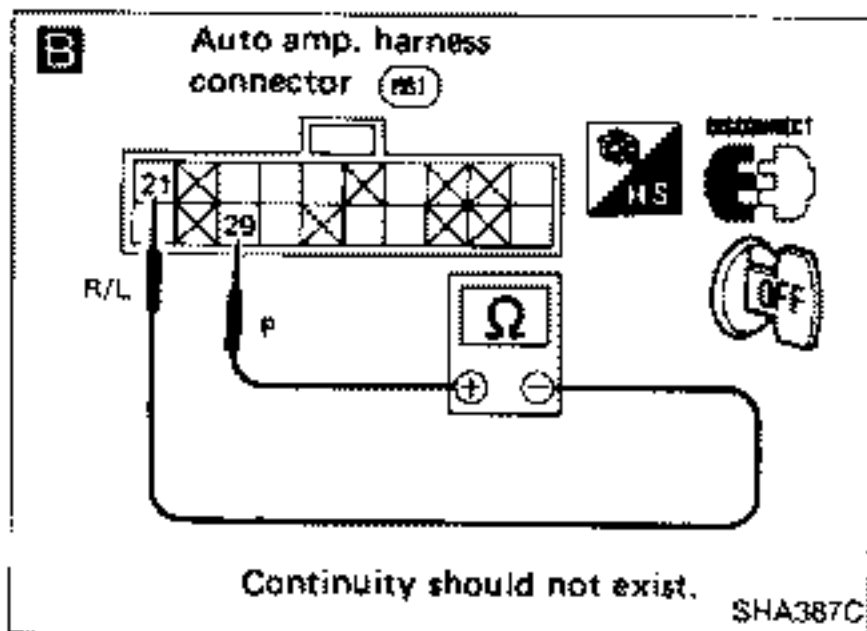
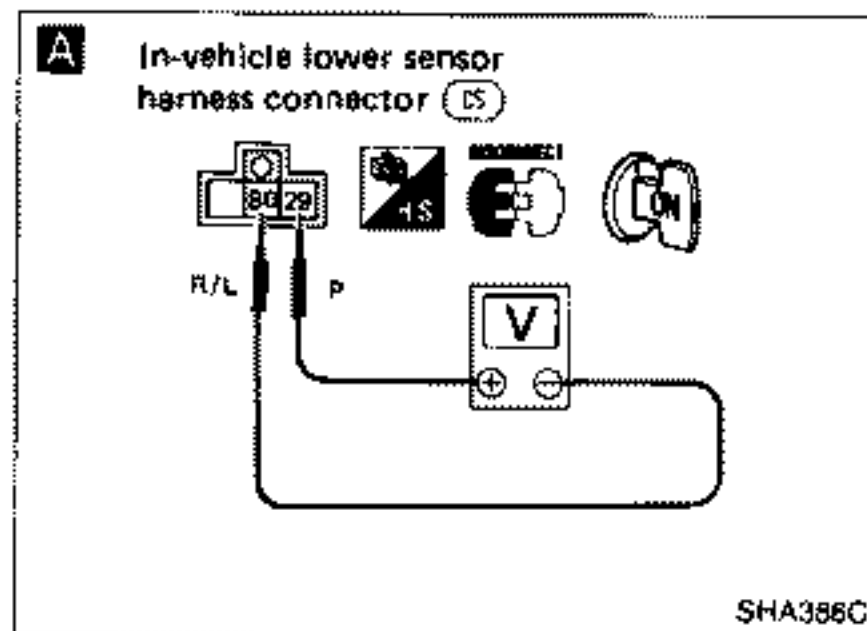
Diagnostic Procedure 6

SYMPTOM: Lower in-vehicle sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



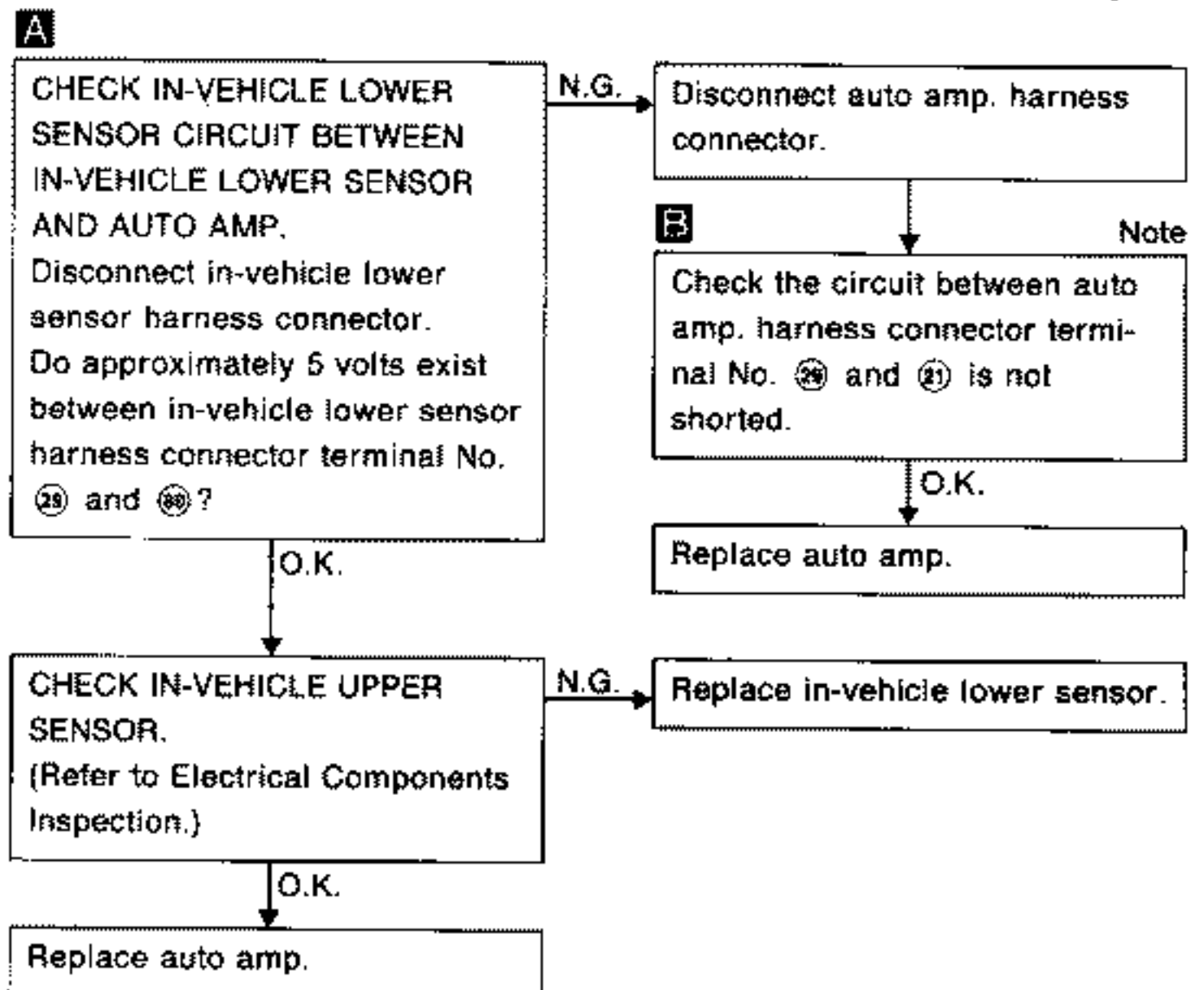
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



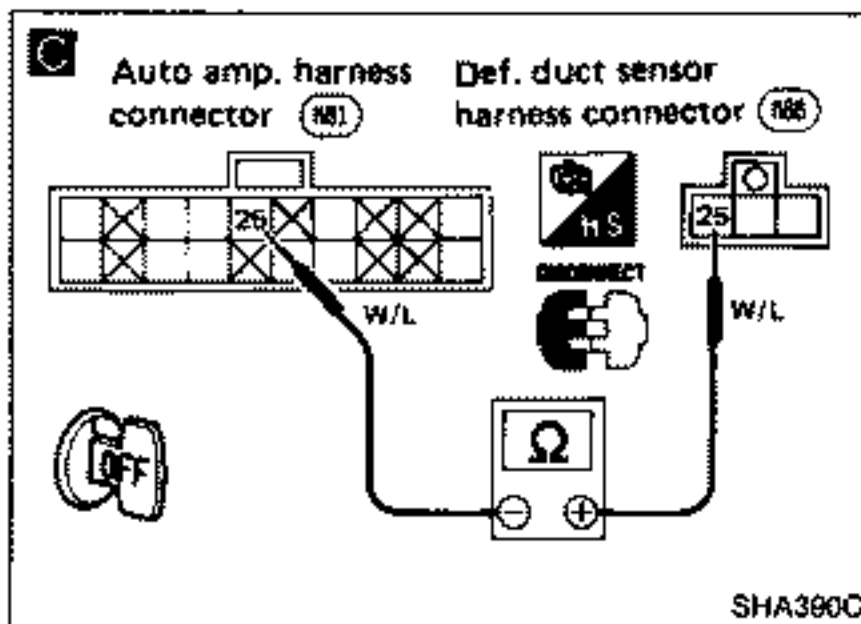
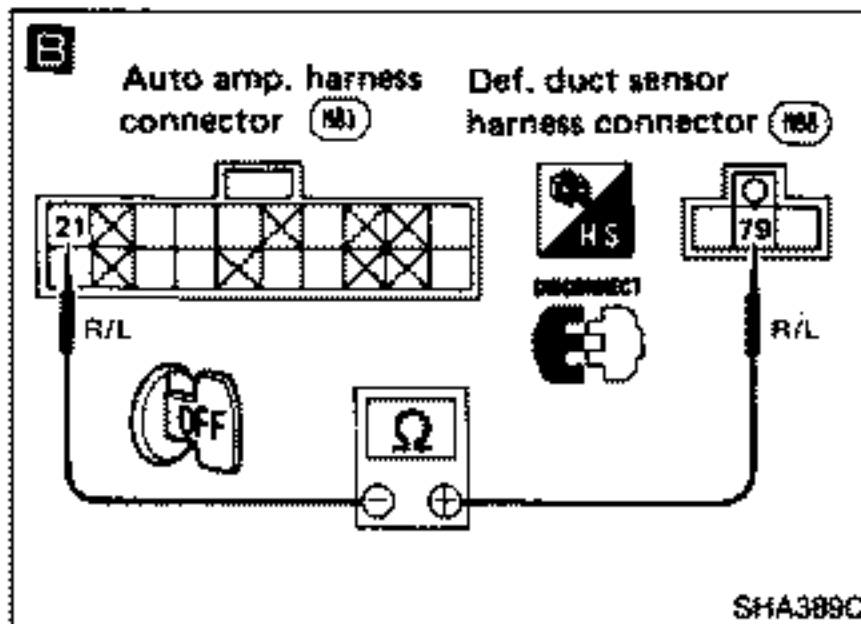
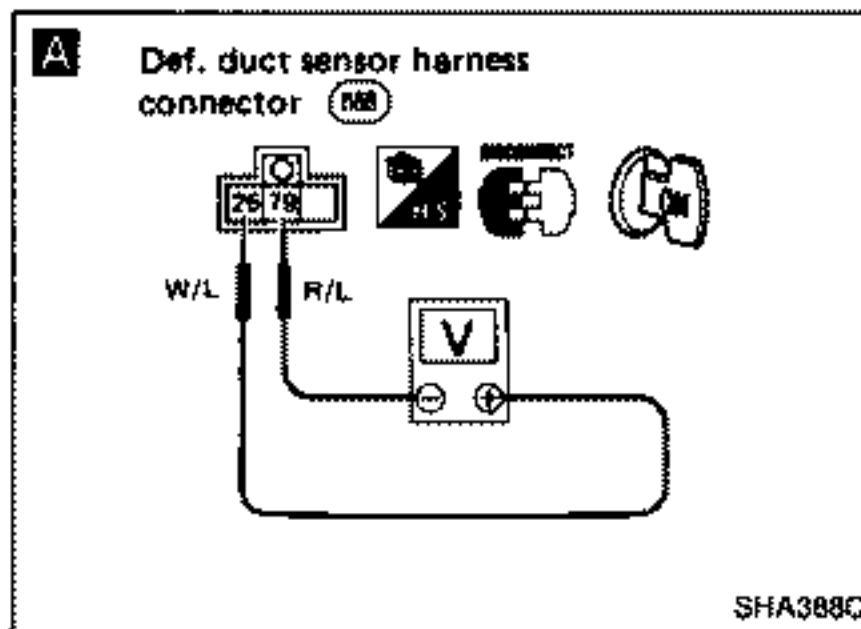
Diagnostic Procedure 7

SYMPTOM: Lower in-vehicle sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)



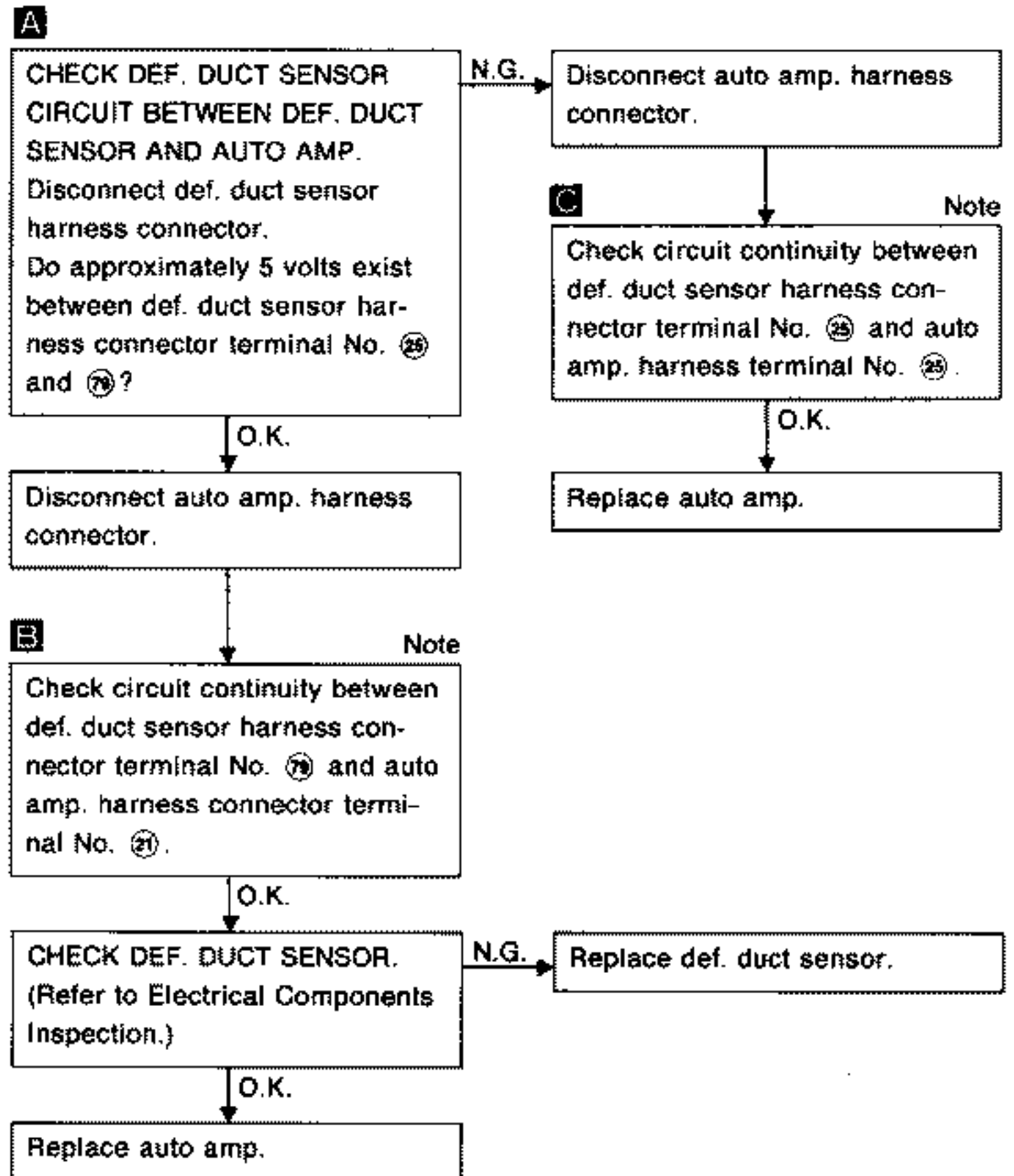
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



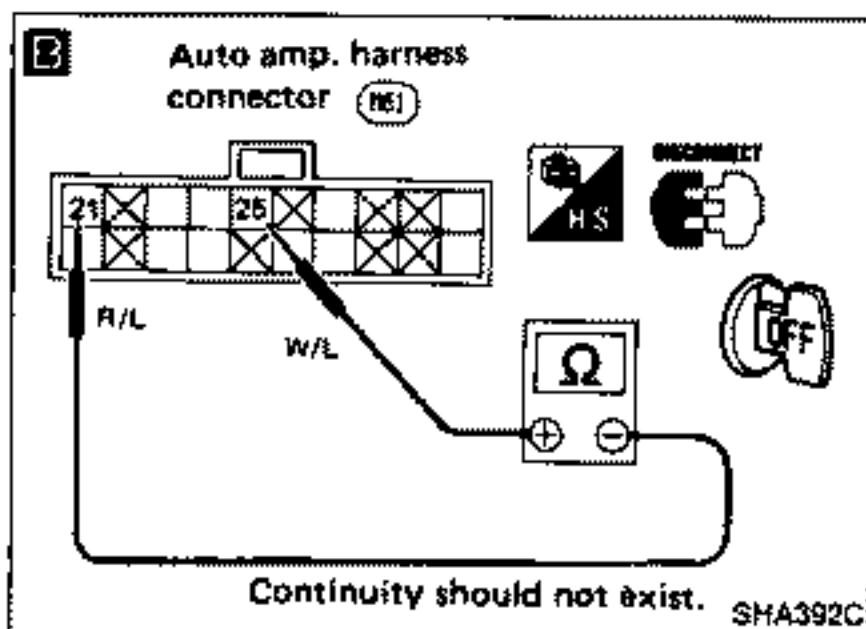
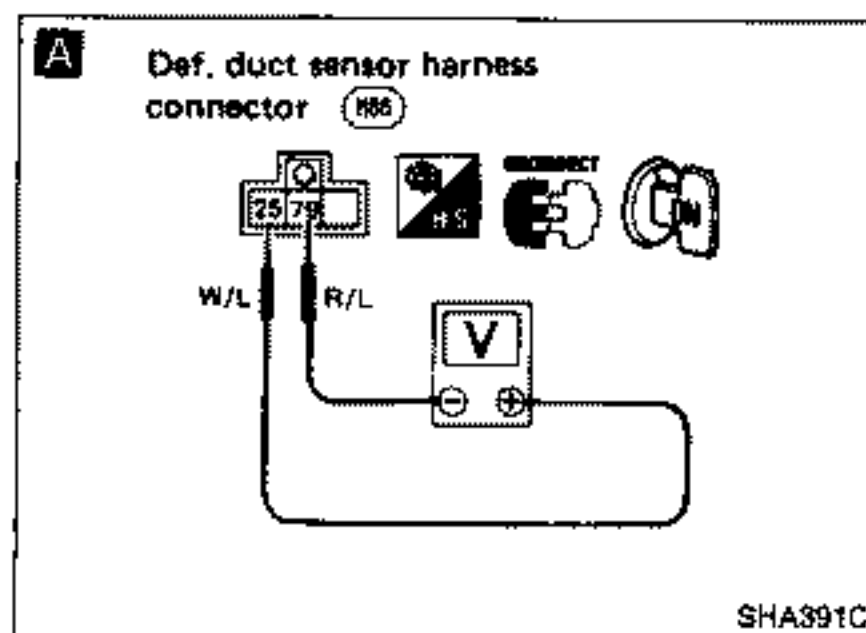
Diagnostic Procedure 8

SYMPTOM: Def. duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



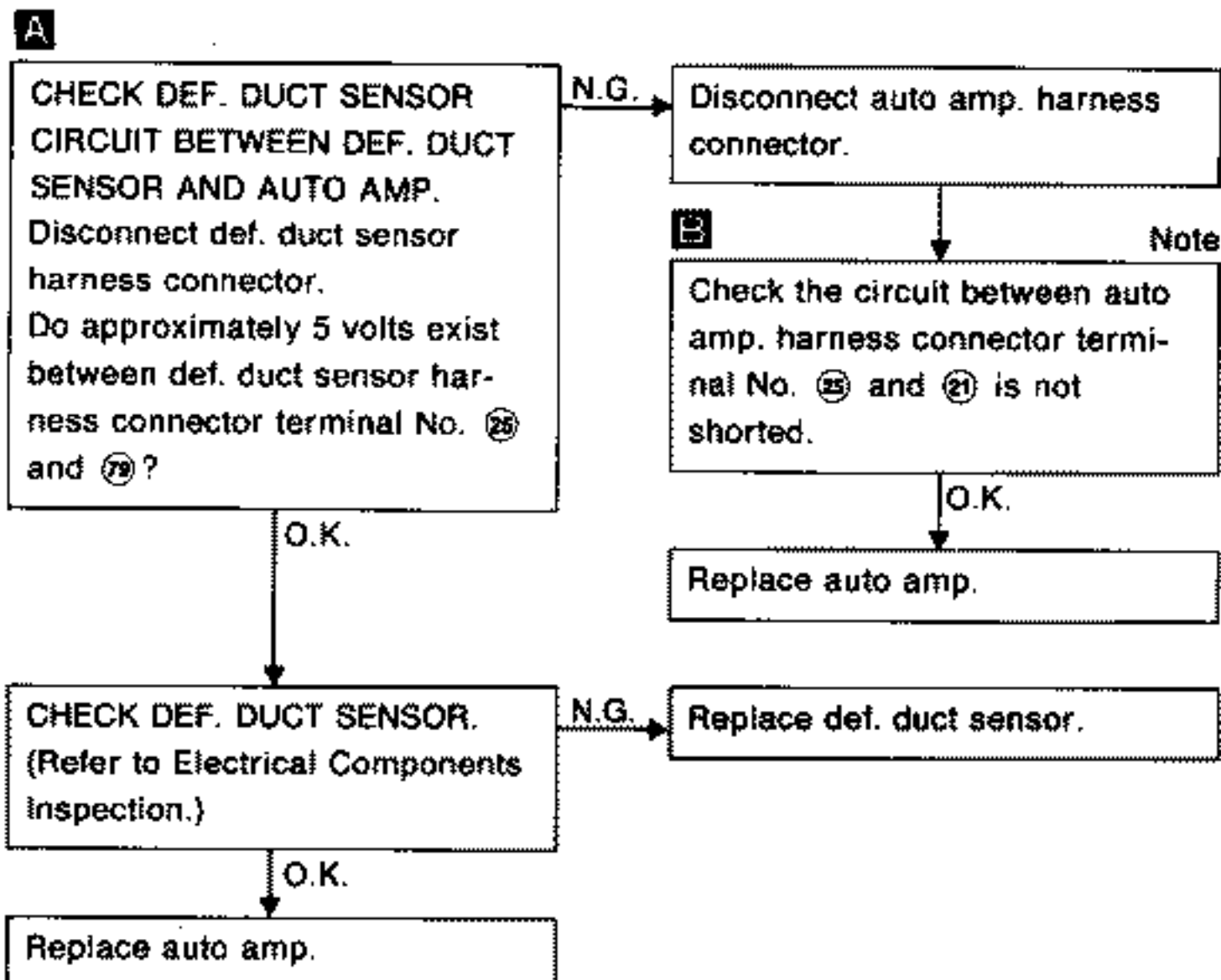
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



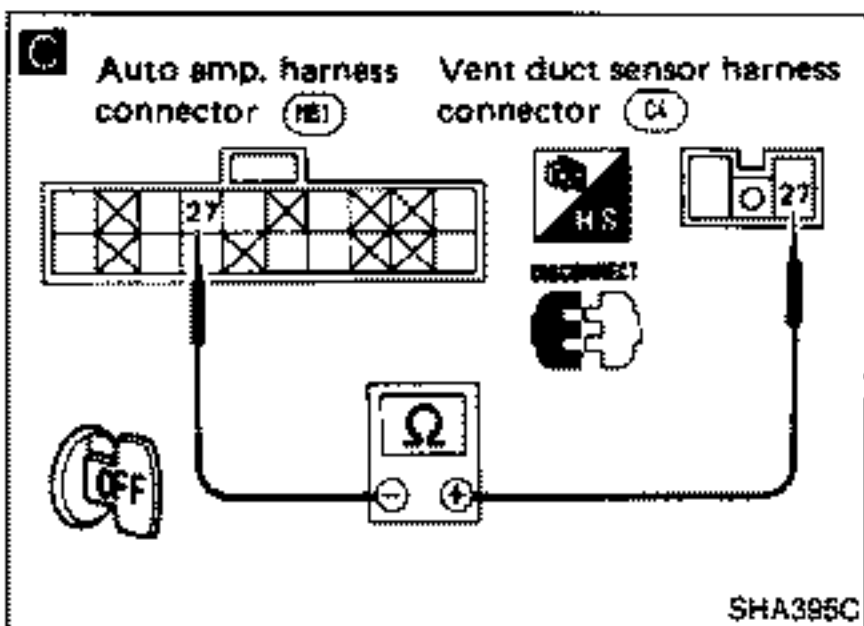
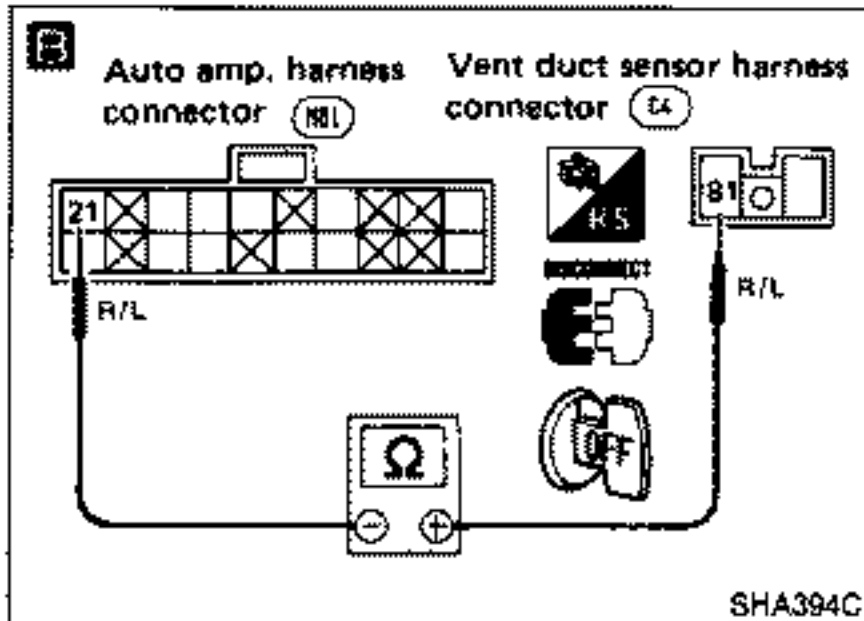
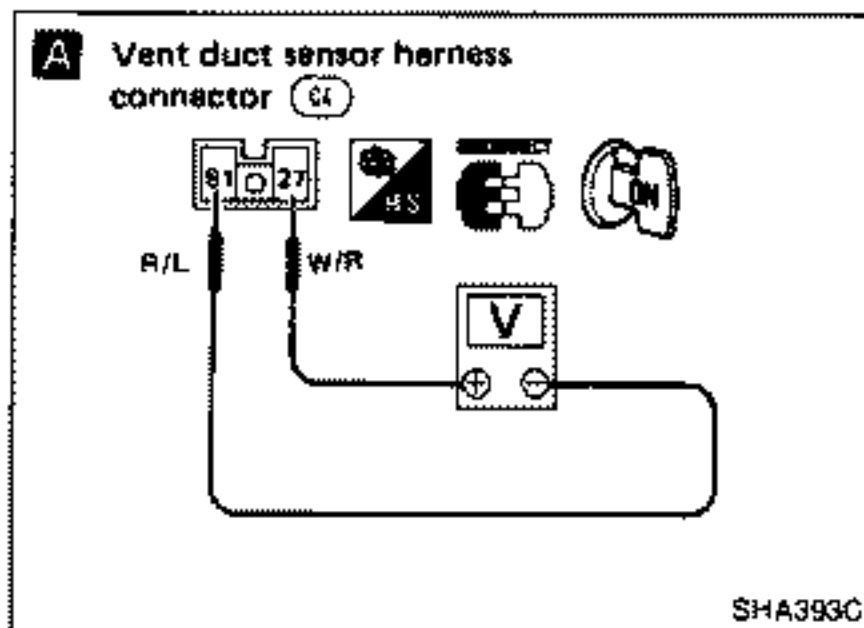
Diagnostic Procedure 9

SYMPTOM: Def. duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)



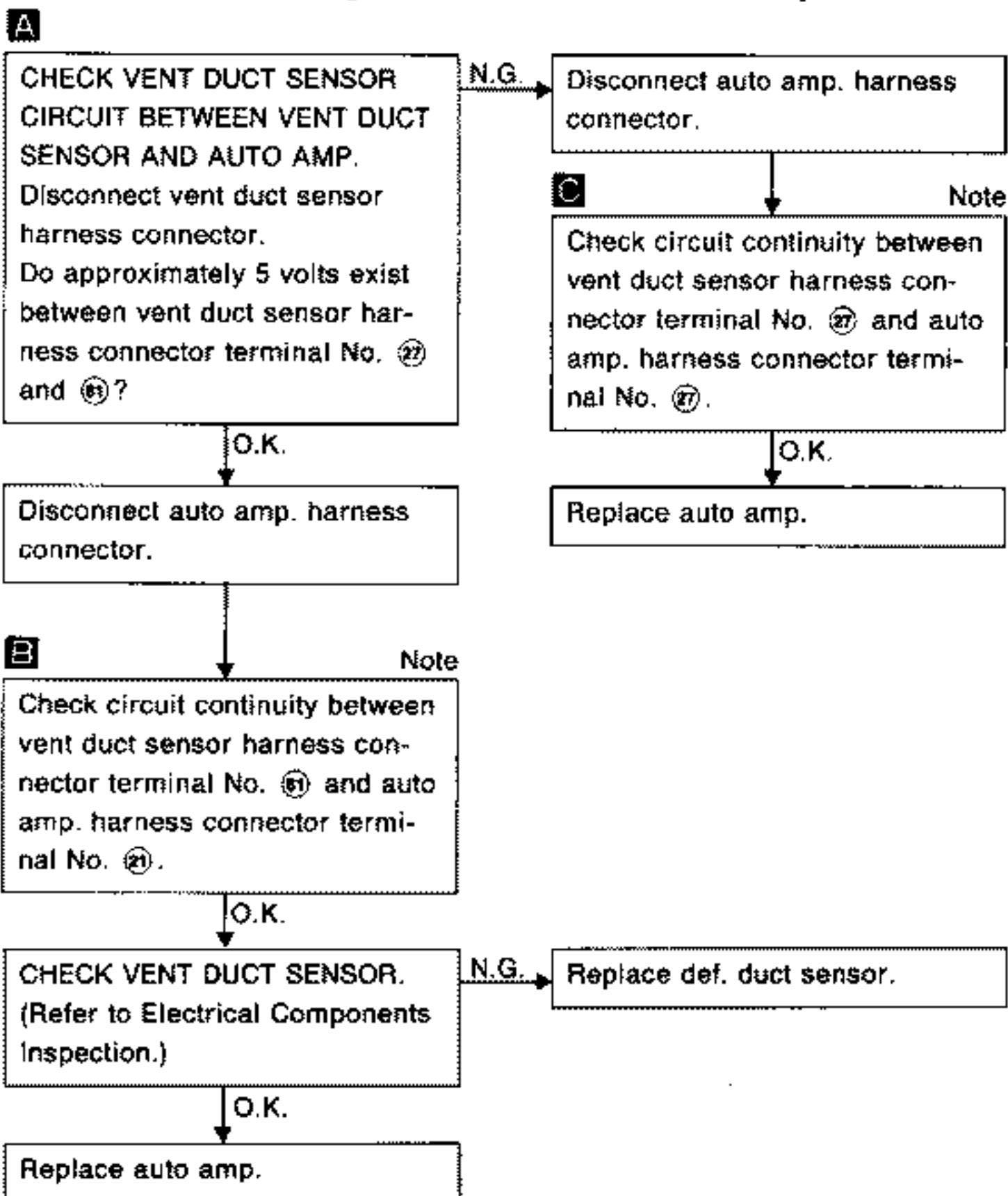
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



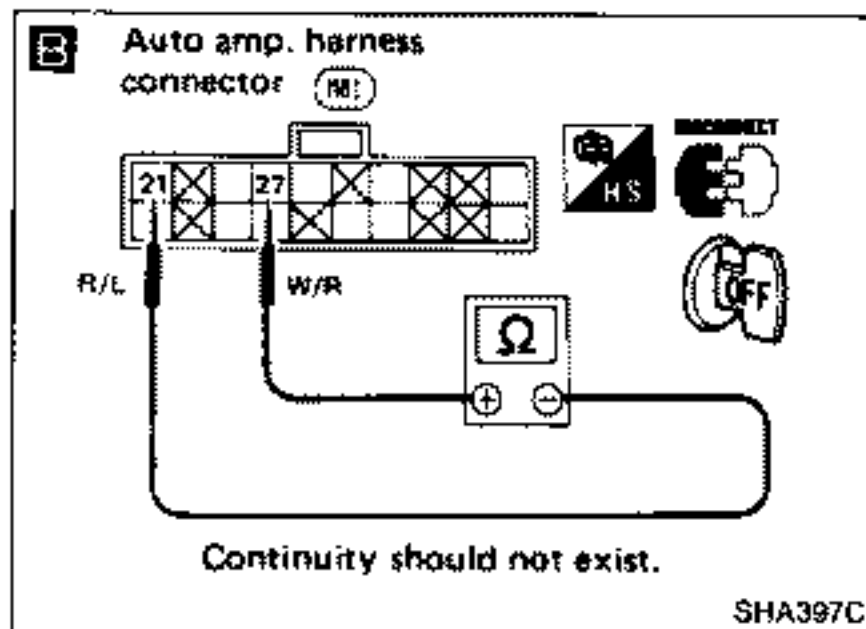
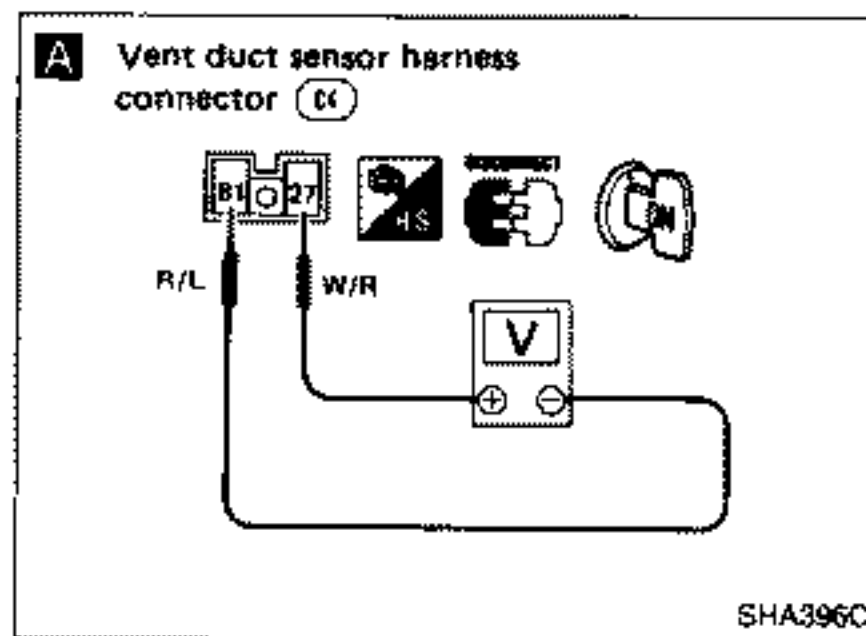
Diagnostic Procedure 10

SYMPTOM: Vent duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



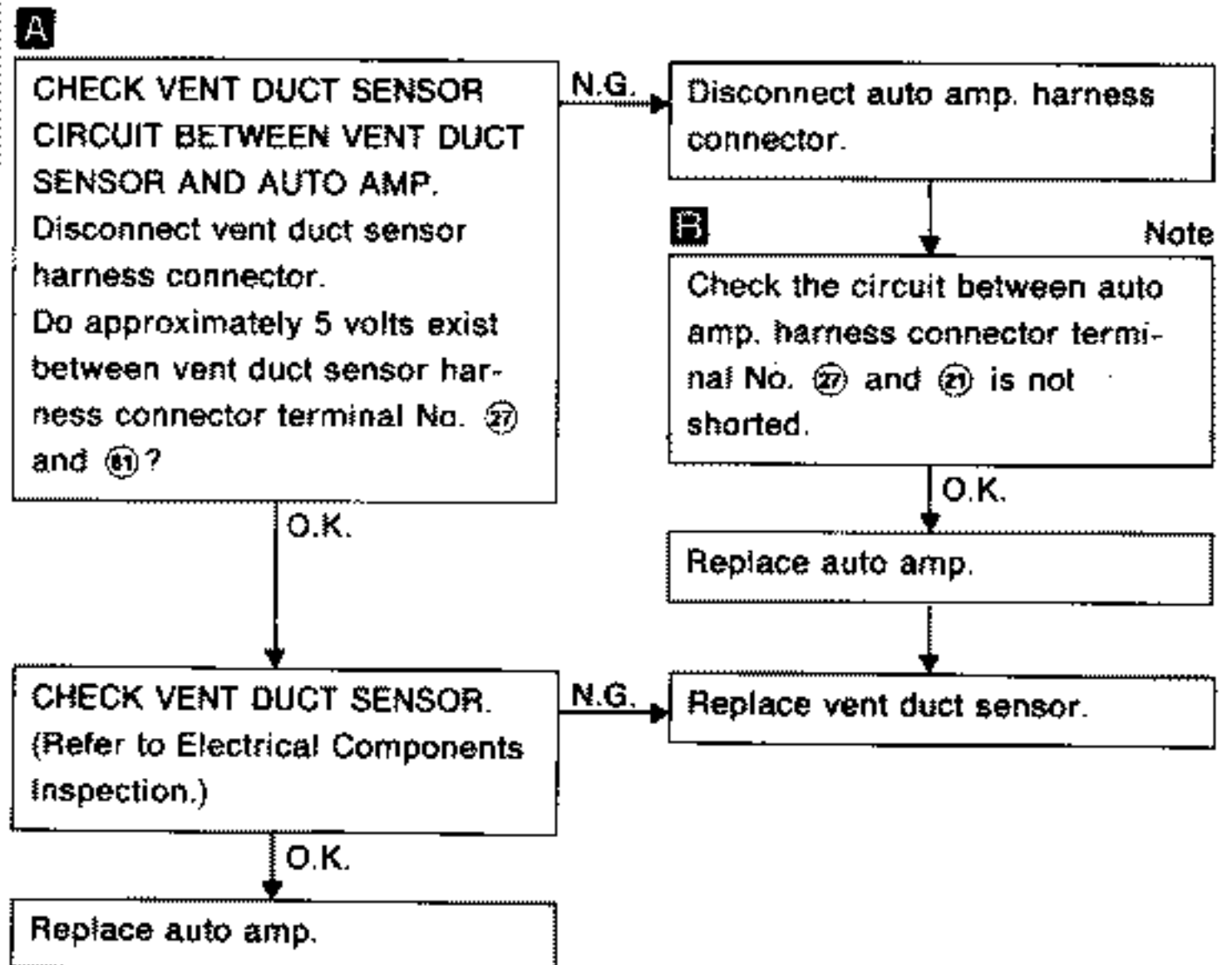
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 11

SYMPTOM: Vent duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

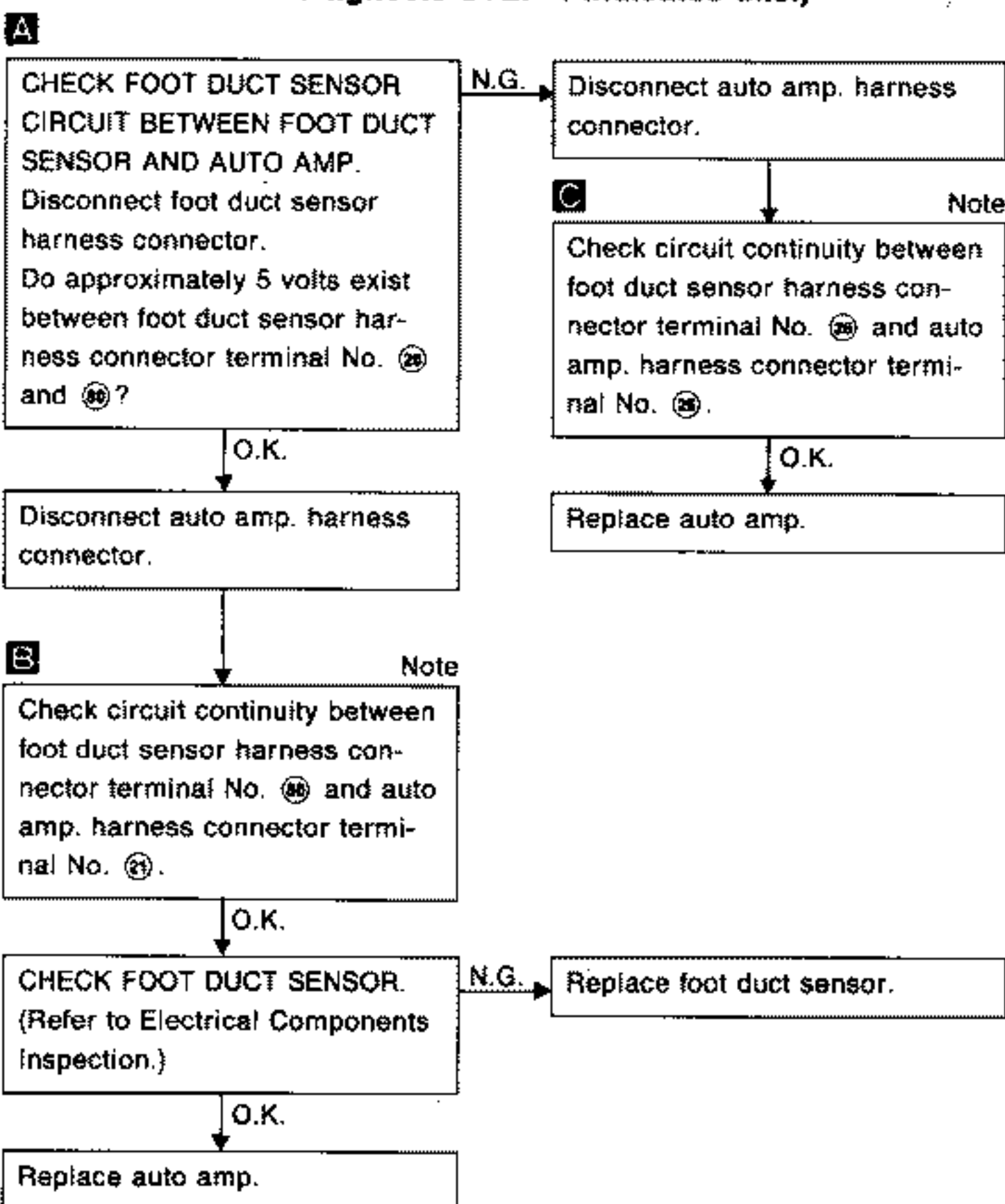
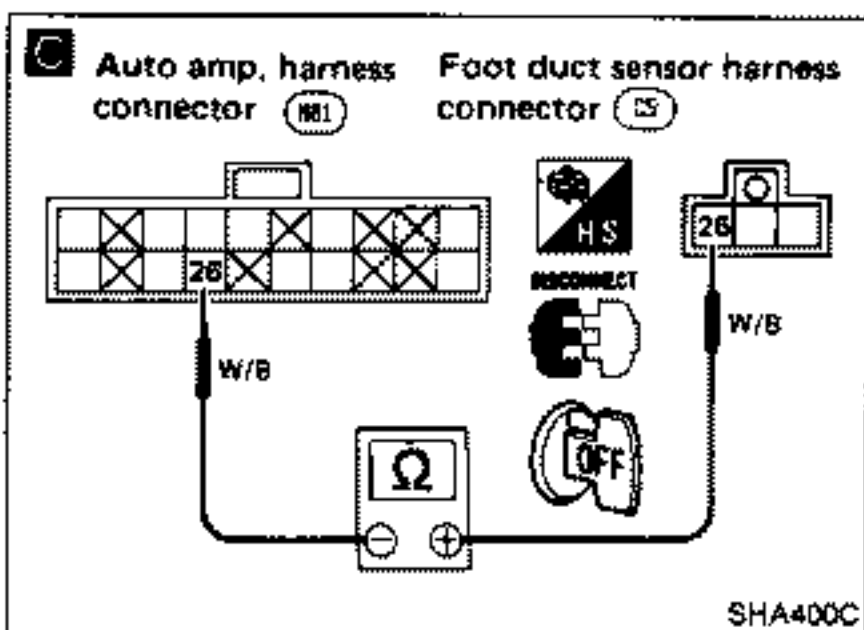
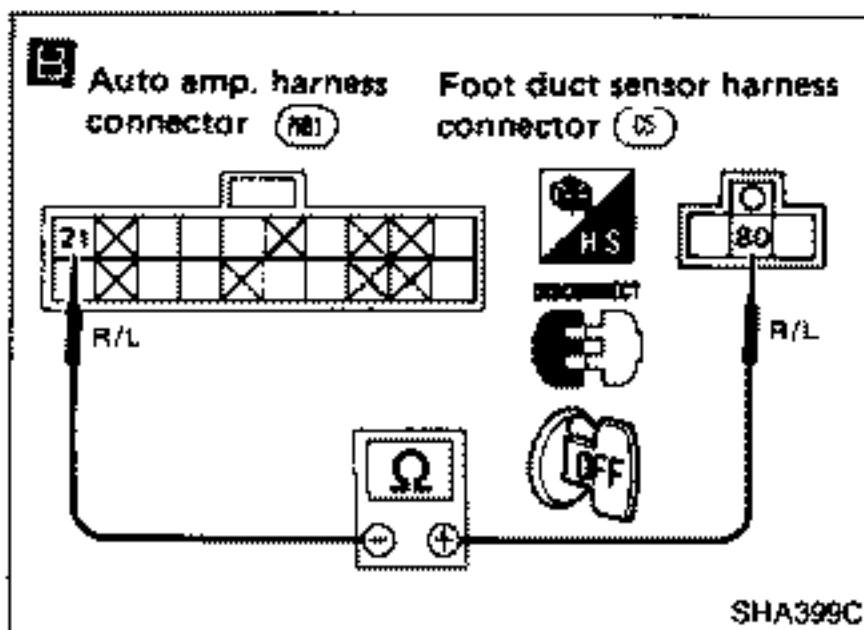
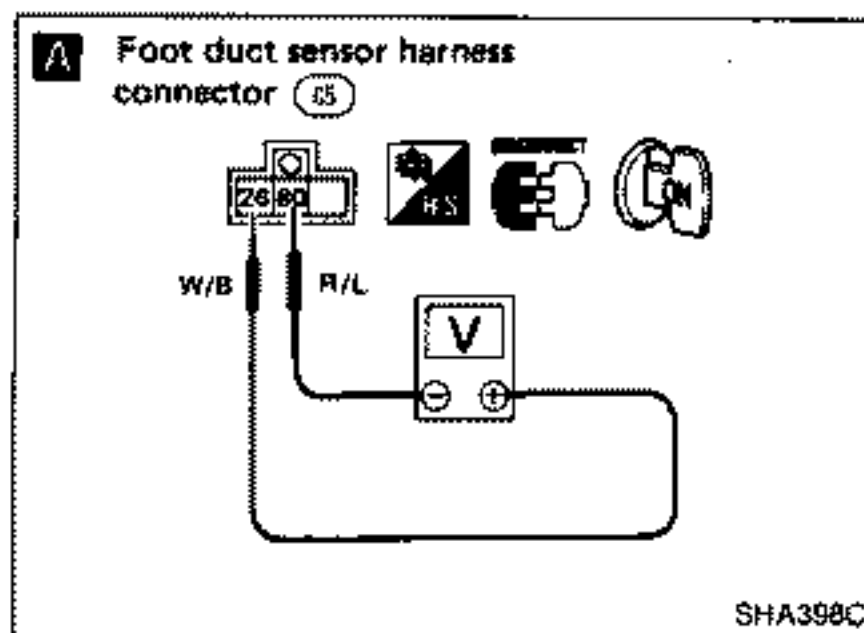


Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

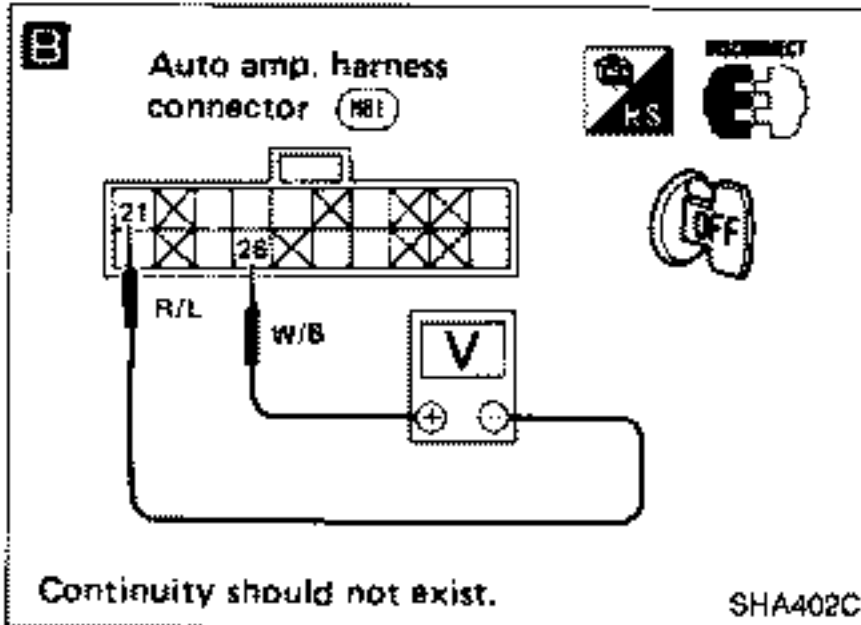
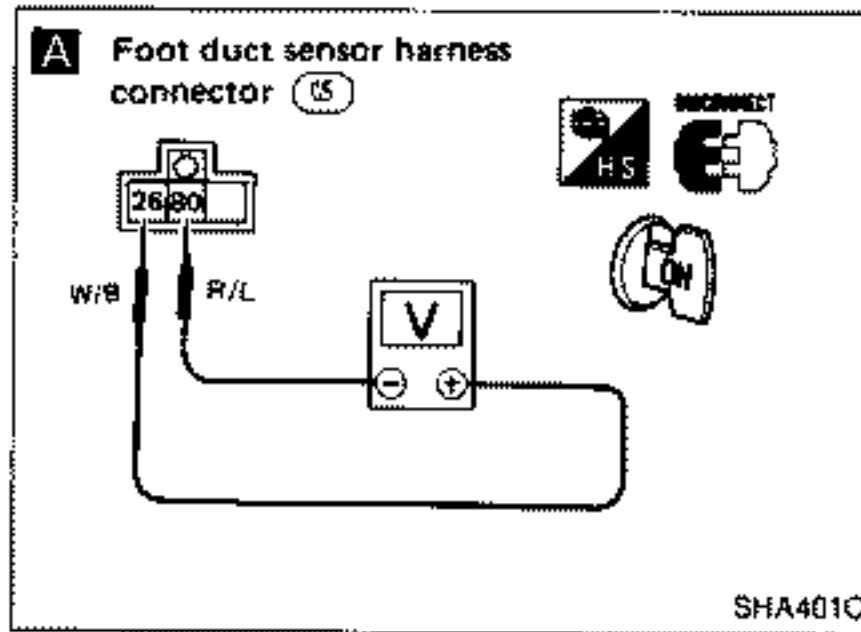
Diagnostic Procedure 12

SYMPTOM: Floor duct sensor circuit is open. (CONSULT or self-diagnosis STEP 4 indicates this.)



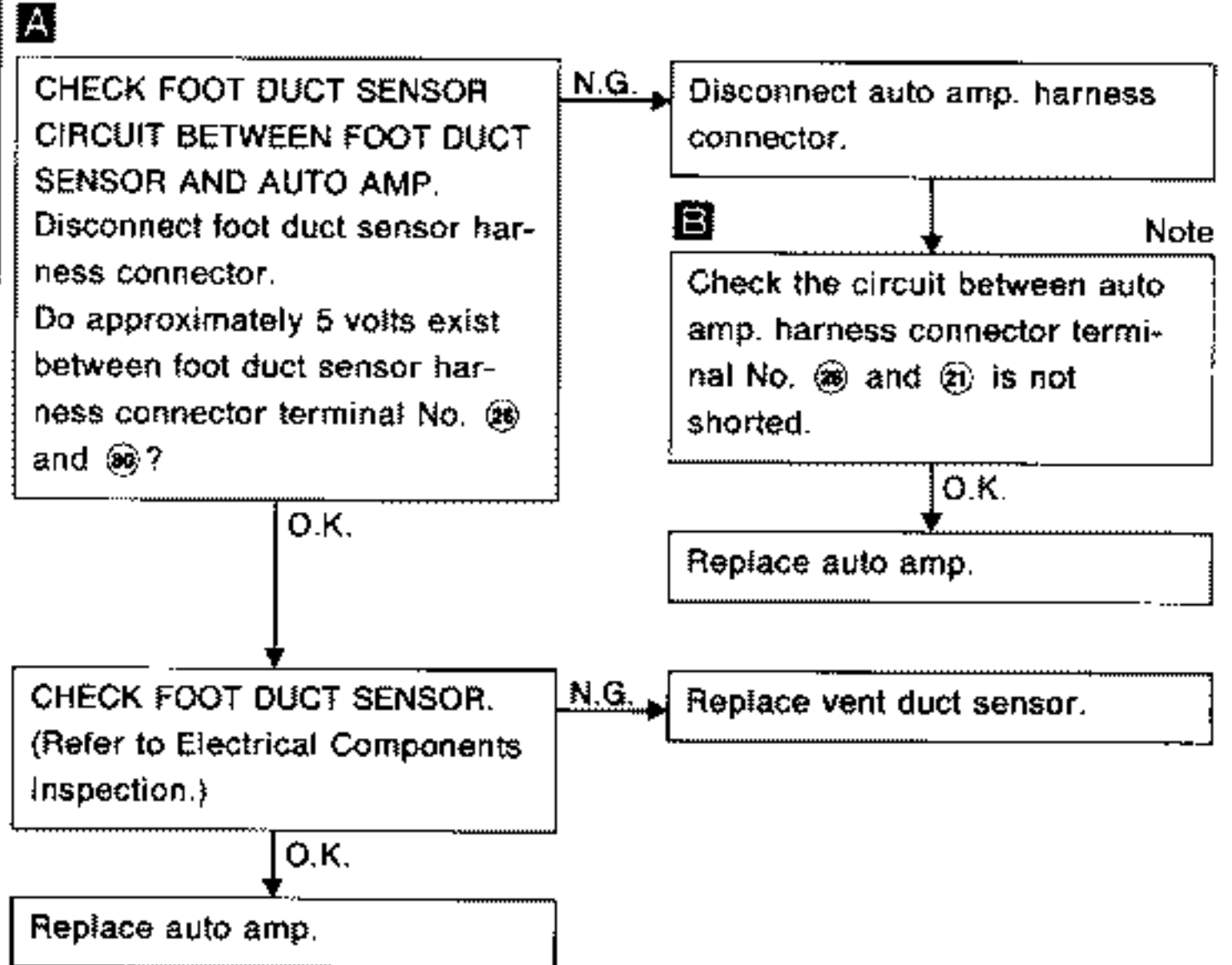
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



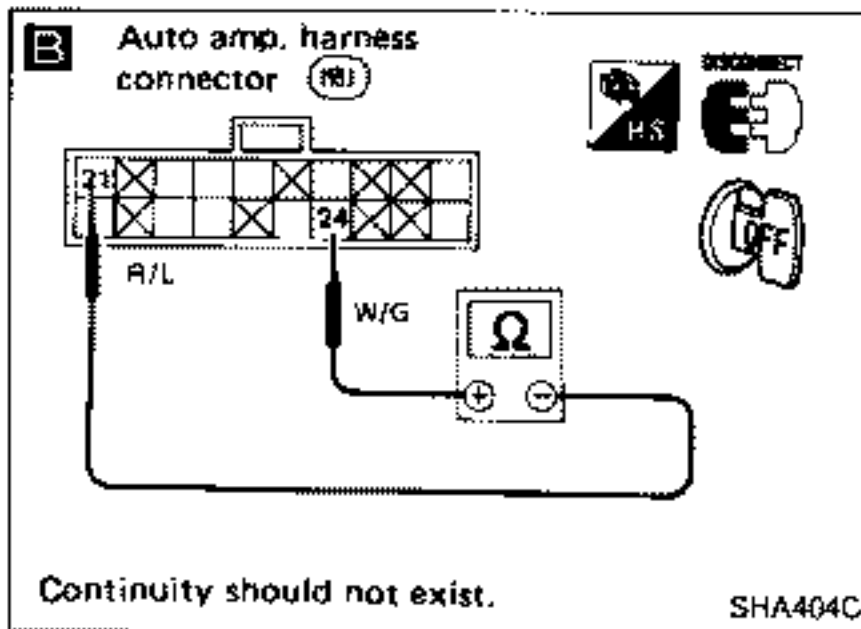
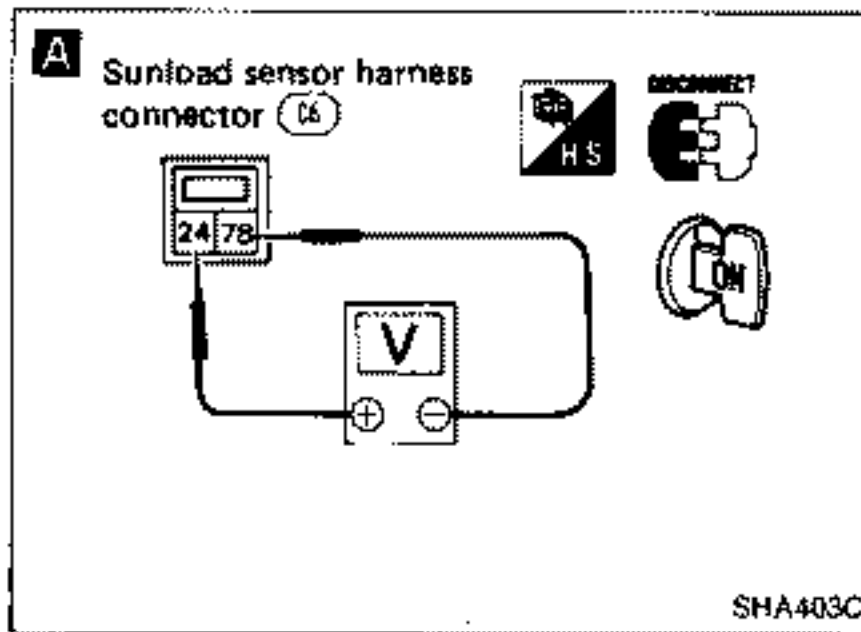
Diagnostic Procedure 13

SYMPTOM: Floor duct sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)



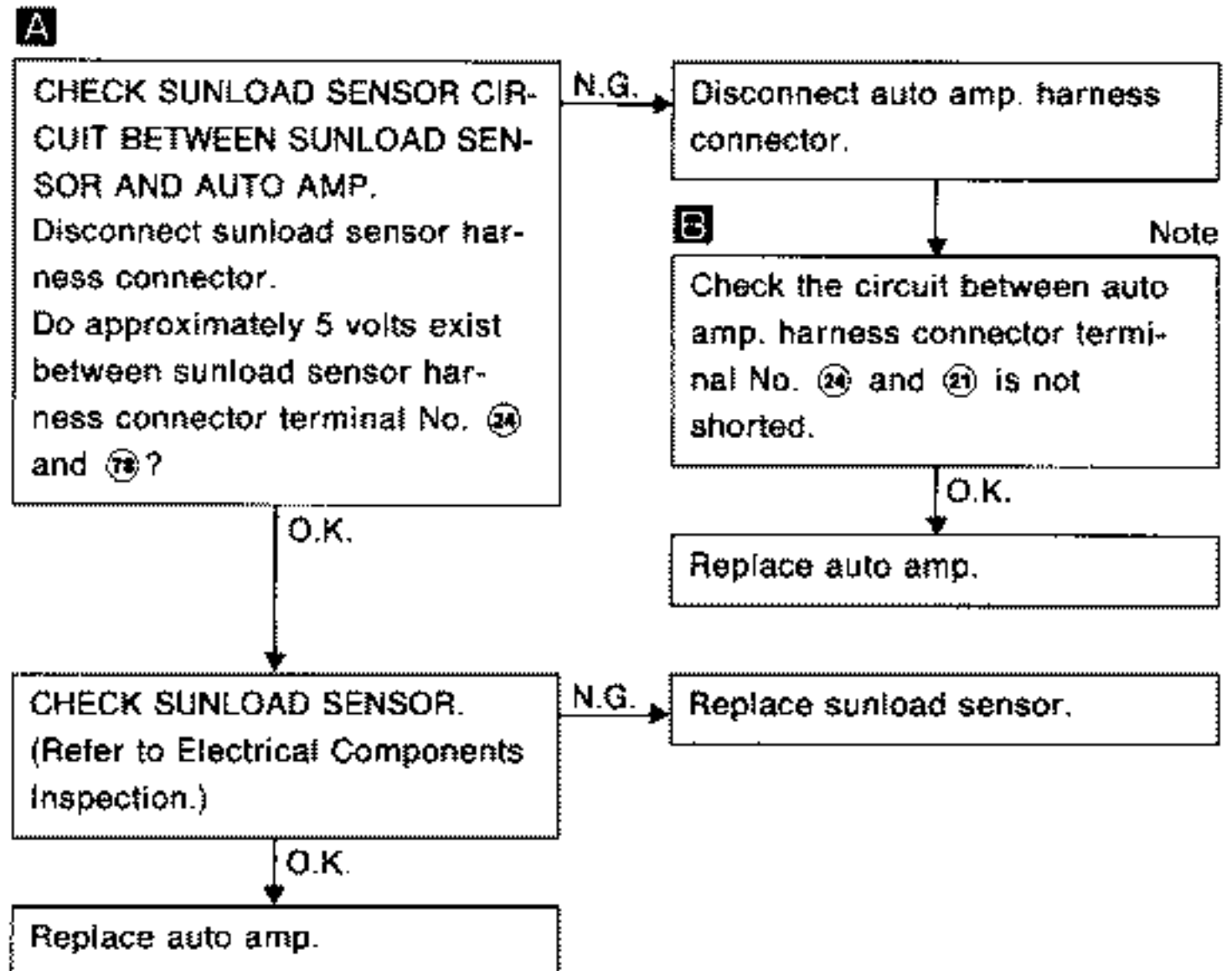
Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.



Diagnostic Procedure 14

SYMPTOM: Sunload sensor circuit is shorted. (CONSULT or self-diagnosis STEP 4 indicates this.)

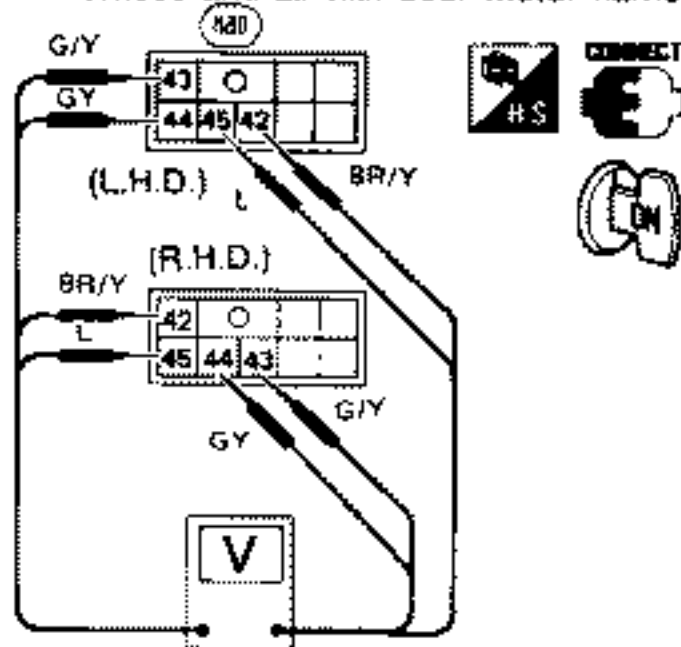


Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

A

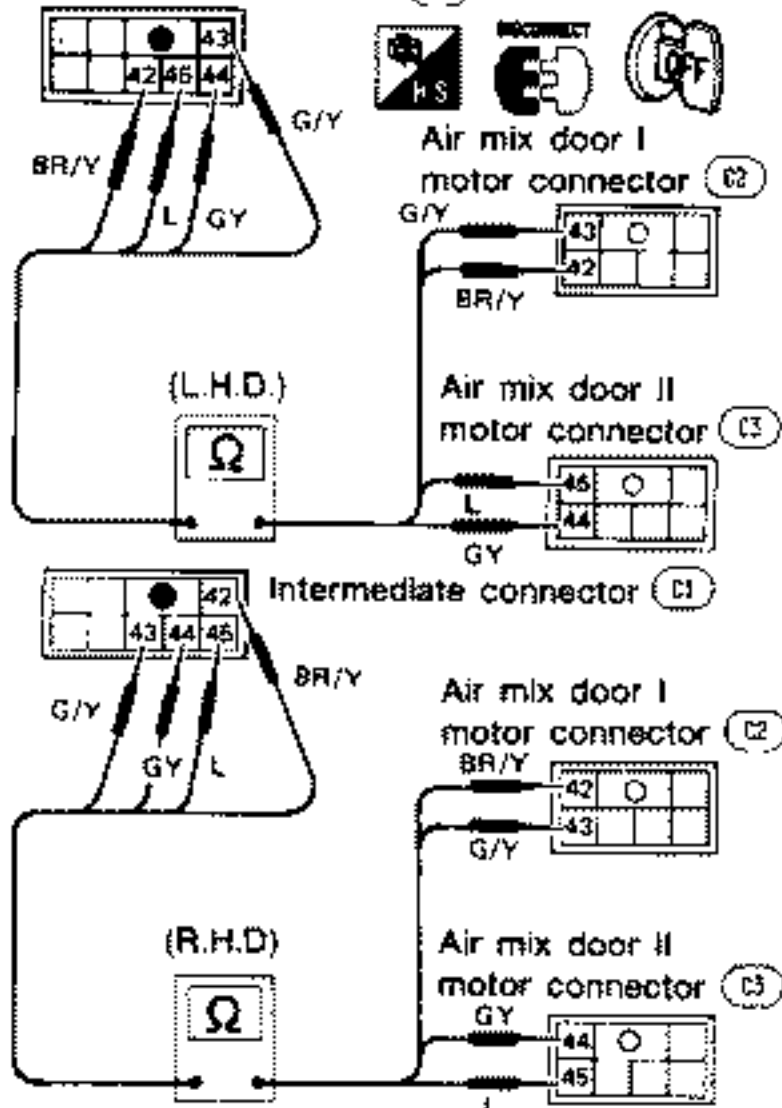
Intermediate connector between auto amp. harness and air mix door motor harness.



SHA698C

B

Intermediate connector (C1)

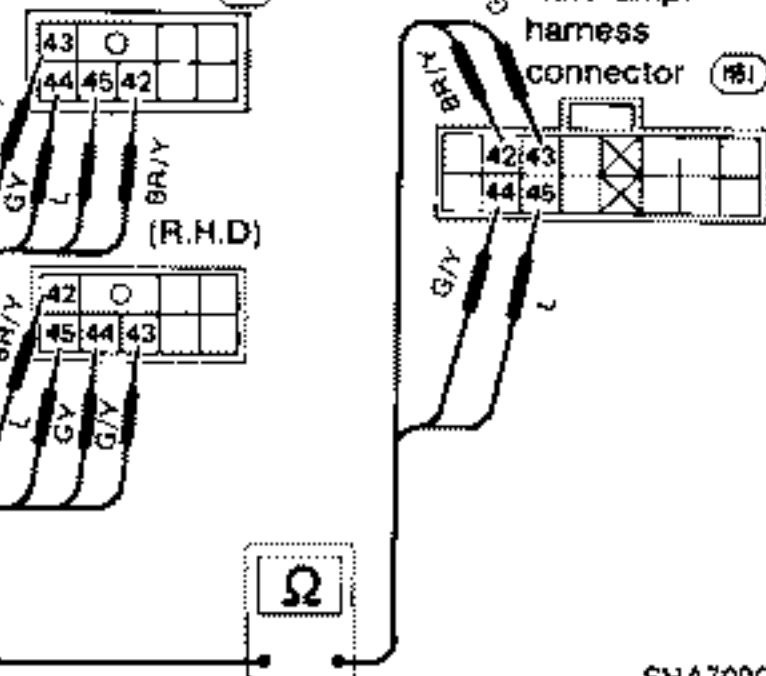


SHA699C

C

(L.H.D.)

Intermediate connector (N80)



SHA700C

Diagnostic Procedure 15

SYMPTOM: Air mix door does not operate normally.

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.
- Remove combination meter assembly to make working space and reconnect air conditioner switch connector.

A

CHECK FOR SIGNALS TO AIR MIX DOOR MOTOR.

- Set up "ACTIVE TEST" mode with CONSULT.
- Set up self-diagnosis STEP 2.

Set air mix door position as shown in the following chart. Check if approximately 10V exists for 3 seconds every 10 seconds between each terminal.*

Air mix door position	Code No.	Terminal No.			
		Air mix door I		Air mix door II	
Full-Hot	3X	42	43	44	45
Full-Cool	6X	42	43	44	45

O.K.

*: After two minutes power supply is automatically cut off.

Remove heater unit assembly.

B

Check continuity between intermediate connector terminal and each air mix door motor harness connector terminal.

Inter-mediate connector	Air mix door I motor connector	Continuity
42	42	Yes
43	43	Yes
Inter-mediate connector	Air mix door II motor connector	Continuity
44	44	Yes
45	45	Yes

O.K.

Replace air mix door motor.

C

Check circuit continuity between auto amp. harness connector terminals and intermediate connector terminals.

Inter-mediate connector	Auto amp. connector	Continuity
42	42	Yes
43	43	Yes
44	44	Yes
45	45	Yes

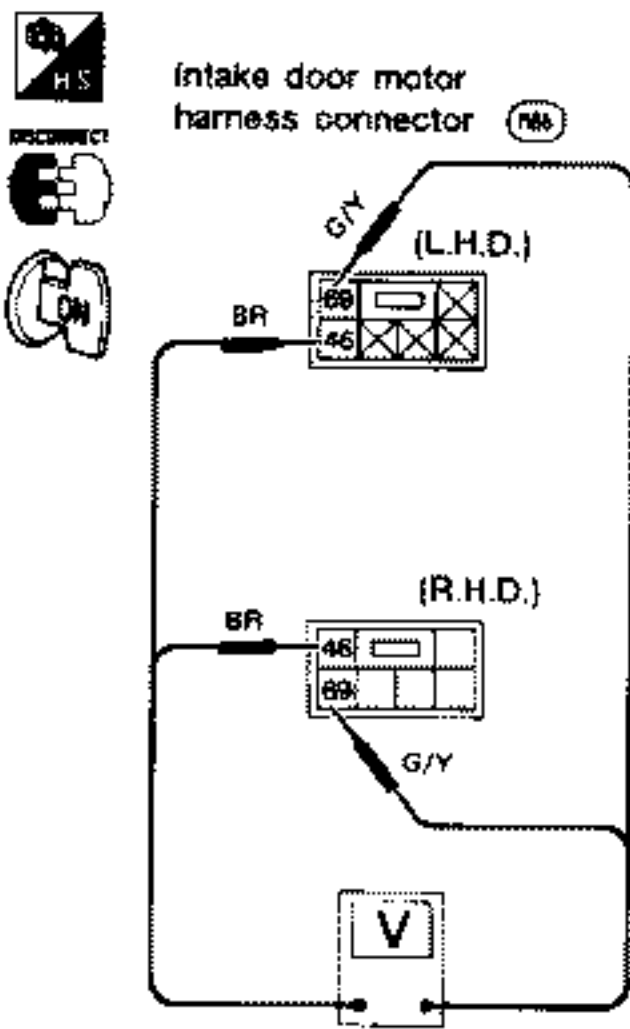
O.K.

Replace auto amp.

N.G.

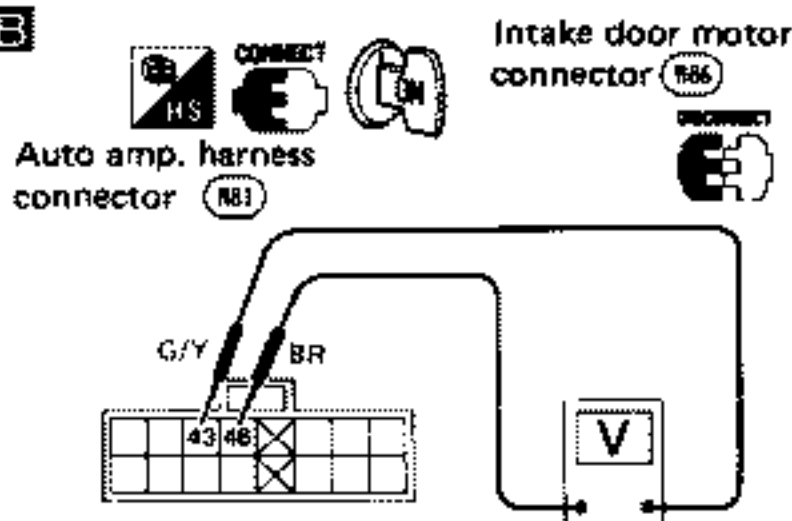
Repair harness or connector.

A



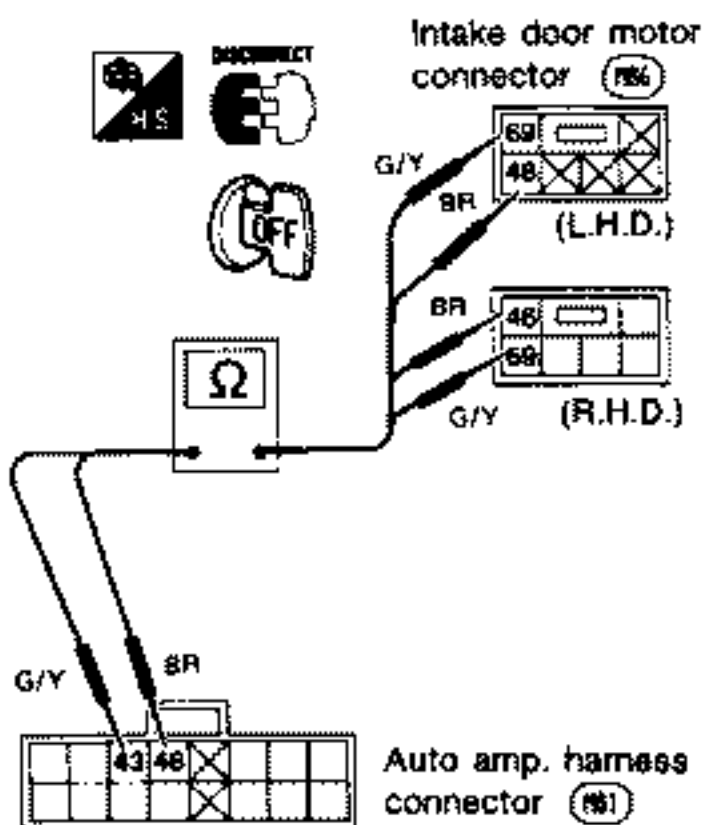
SHA701C

B



SHA409C

C



SHA702C

Diagnostic Procedure 16

SYMPTOM: Intake door does not operate normally.

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.

A

CHECK FOR SIGNALS TO INTAKE DOOR MOTOR.

Disconnect intake door motor harness connector.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set intake door position as shown in the following chart. Check if approximately 10V exists for 2.5 seconds between each terminal.

Intake door position	Code No.	Terminal No.	
		+	-
5X → 6X	FRE/REC → REC	46	69
6X → 3X	REC → FRE	69	46

O.K.

Replace intake door motor.

B

CHECK OUTPUT OF AUTO AMP.

Set up "ACTIVE TEST" mode with CONSULT.

Set up self-diagnosis STEP 2.

Set intake door position as shown in the following chart. Check if approximately 10V exists for 2.5 seconds between each terminal.

Intake door position	Code No.	Terminal No.	
		+	-
5X → 6X	FRE/REC → REC	46	49
6X → 3X	REC → FRE	49	46

O.K.

Replace auto amp.

N.G.

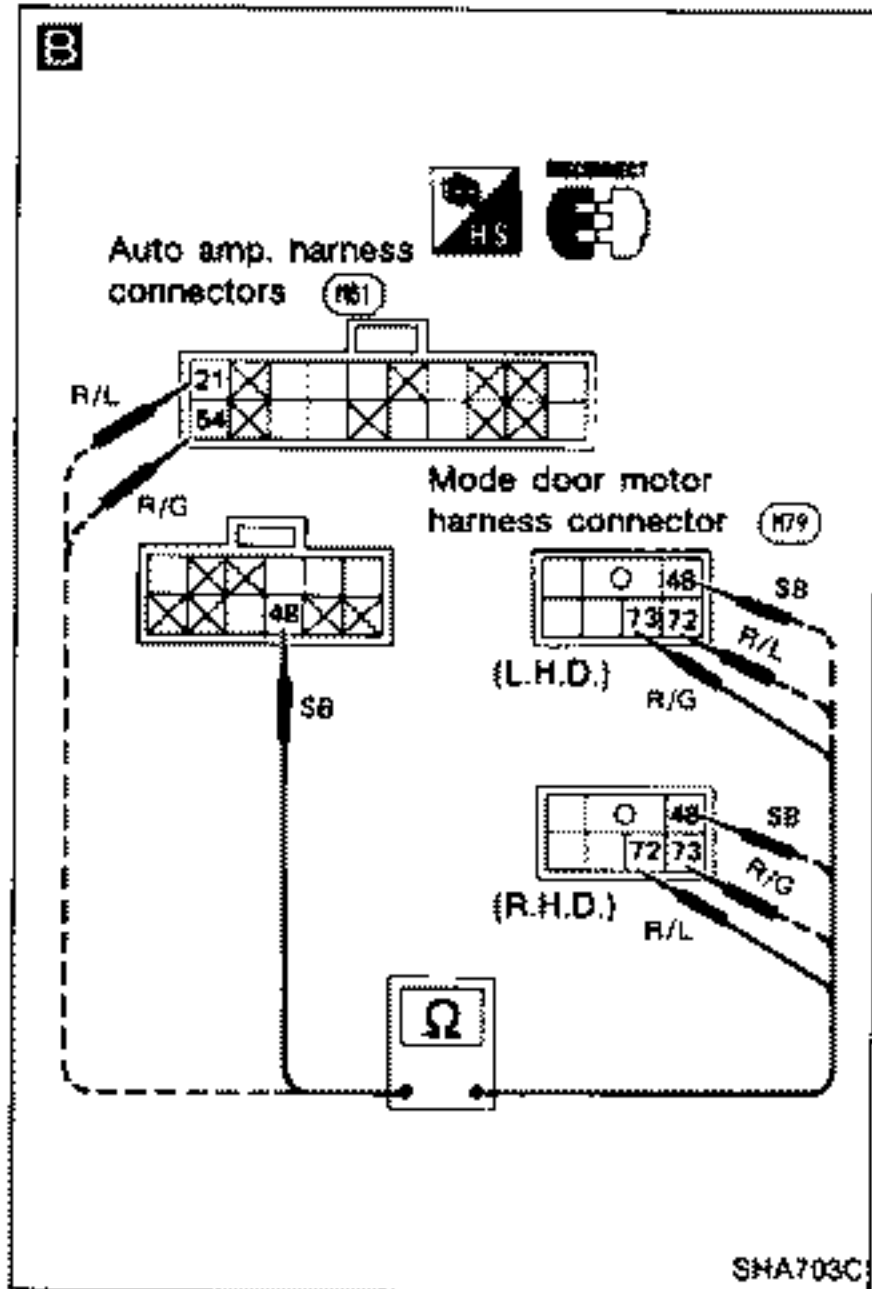
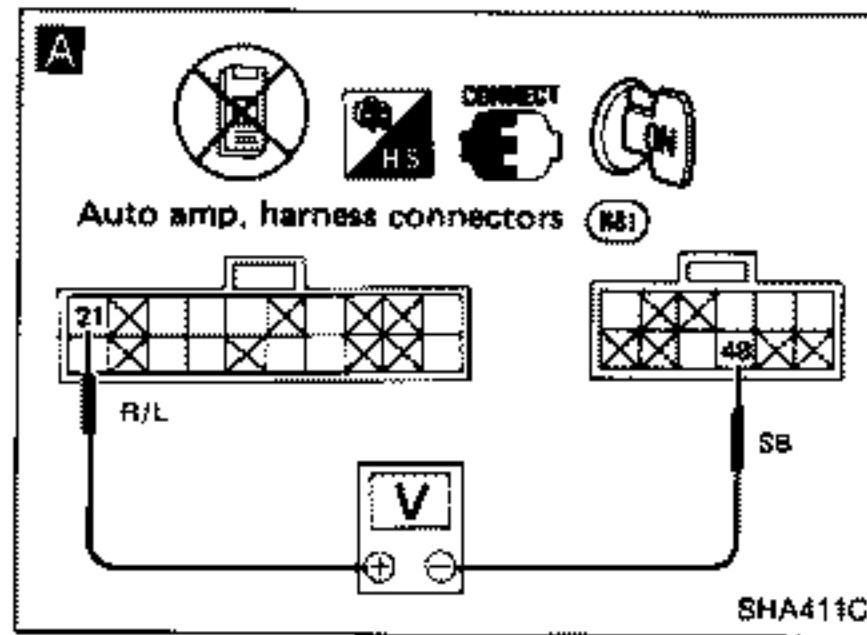
C

Check continuity between auto amp. harness connector terminal No. 46 and intake door motor harness connector terminal No. 46.

Check auto amp. harness connector terminal No. 49 and intake door motor harness connector terminal No. 69.

N.G.

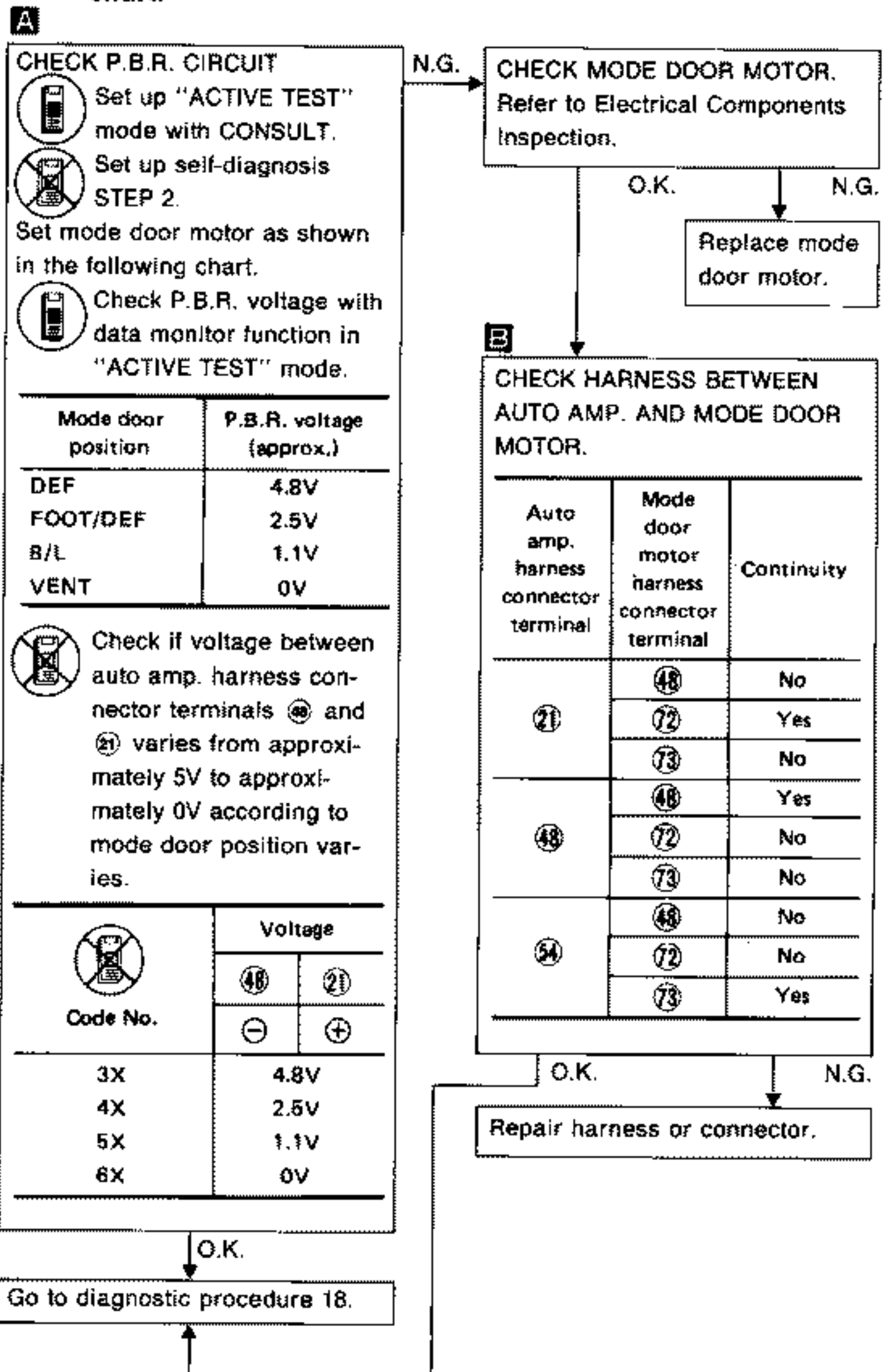
Repair harness or connector.

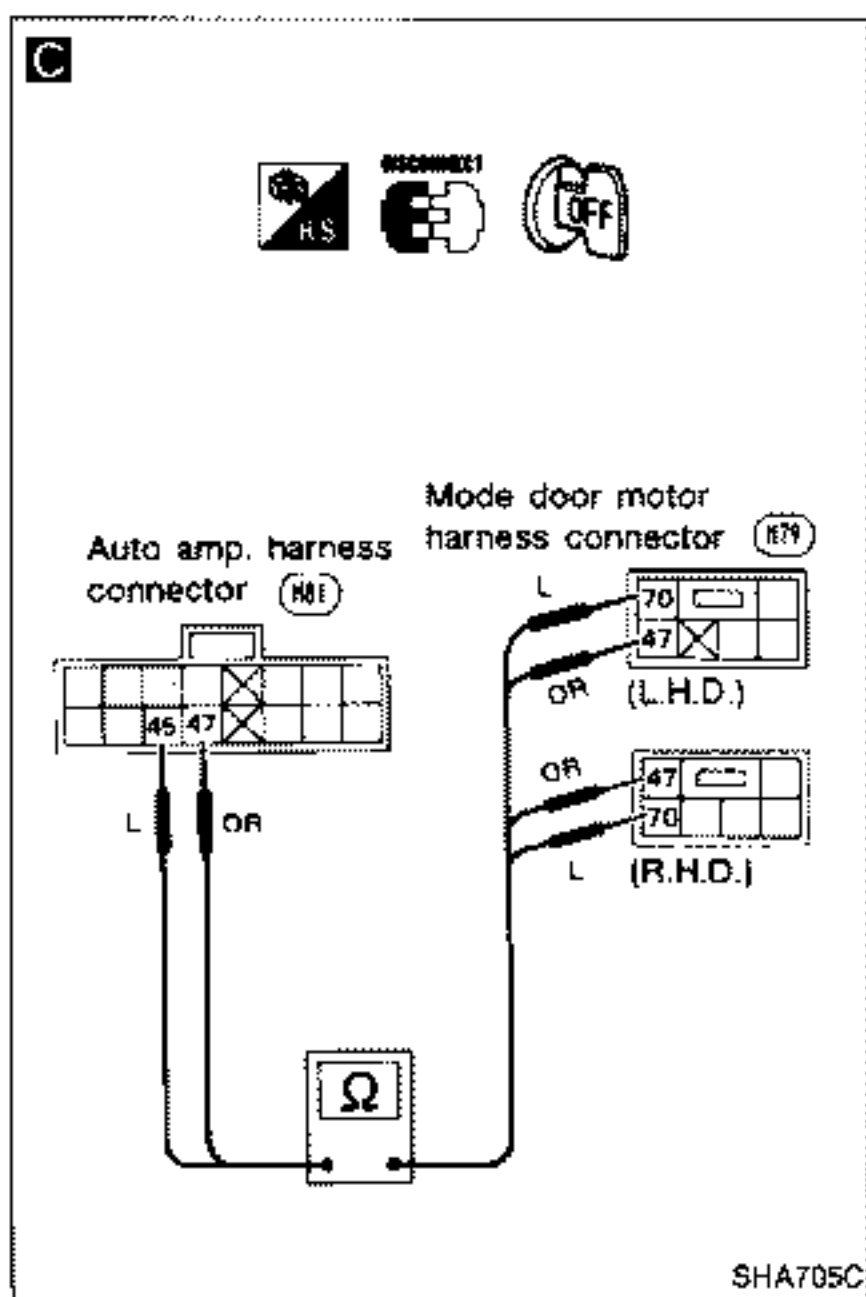
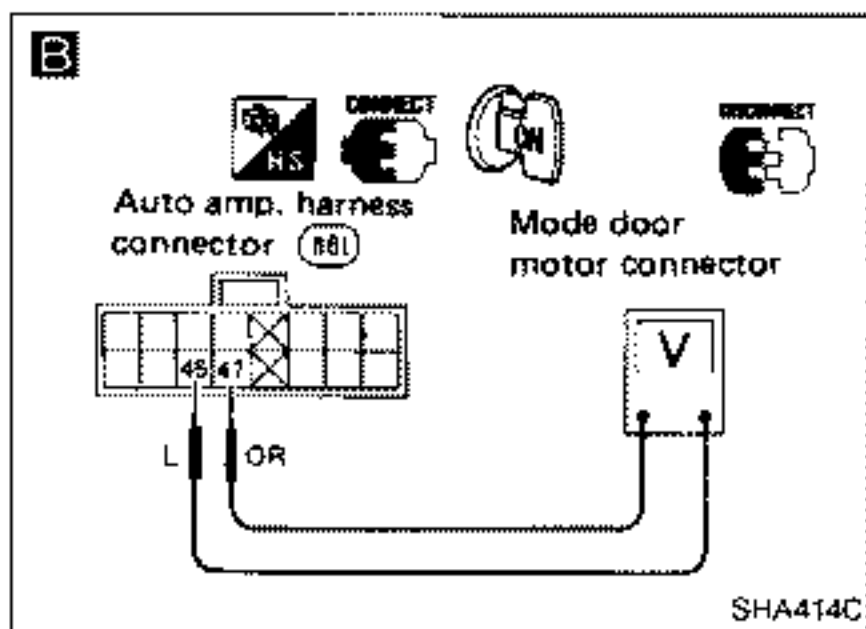
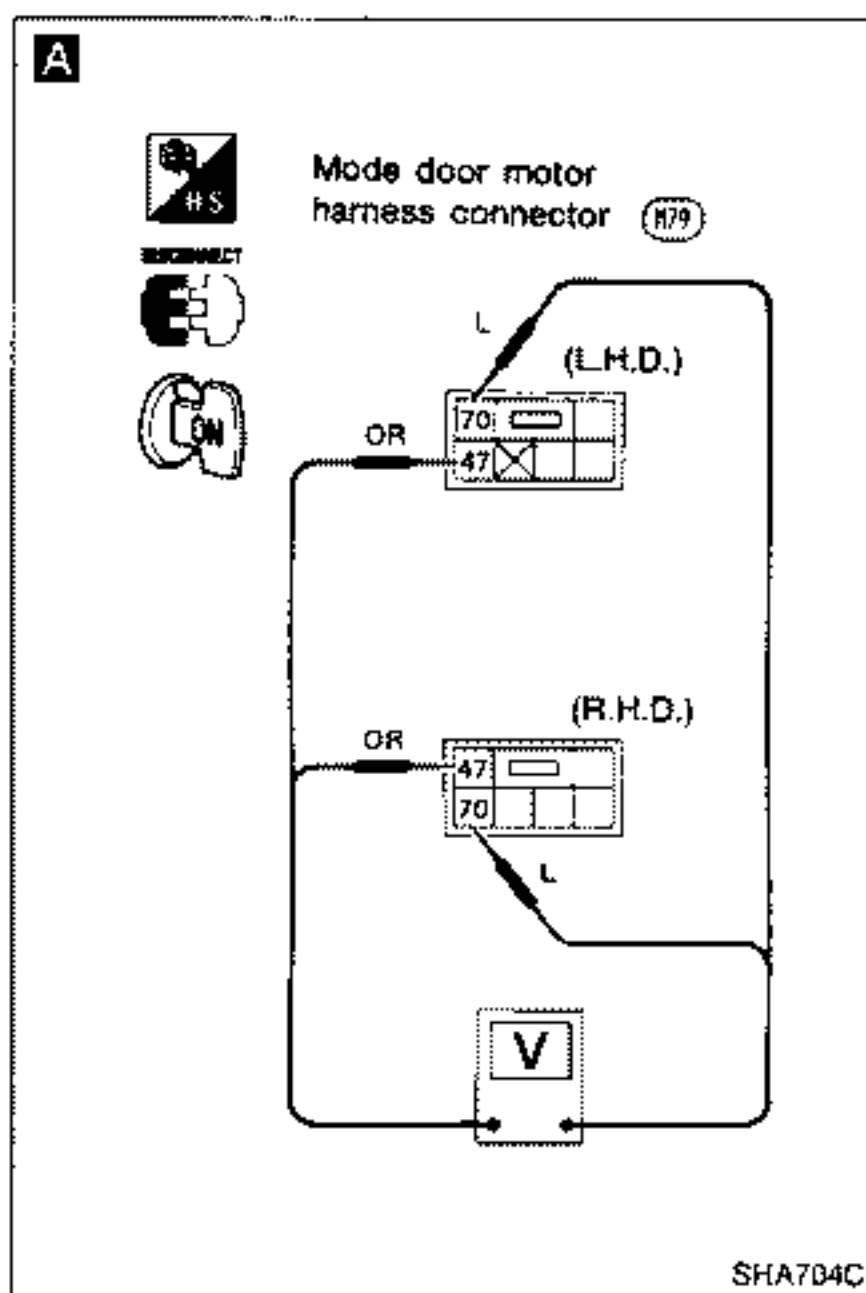


Diagnostic Procedure 17

SYMPTOM: Mode door does not operate normally.

- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.

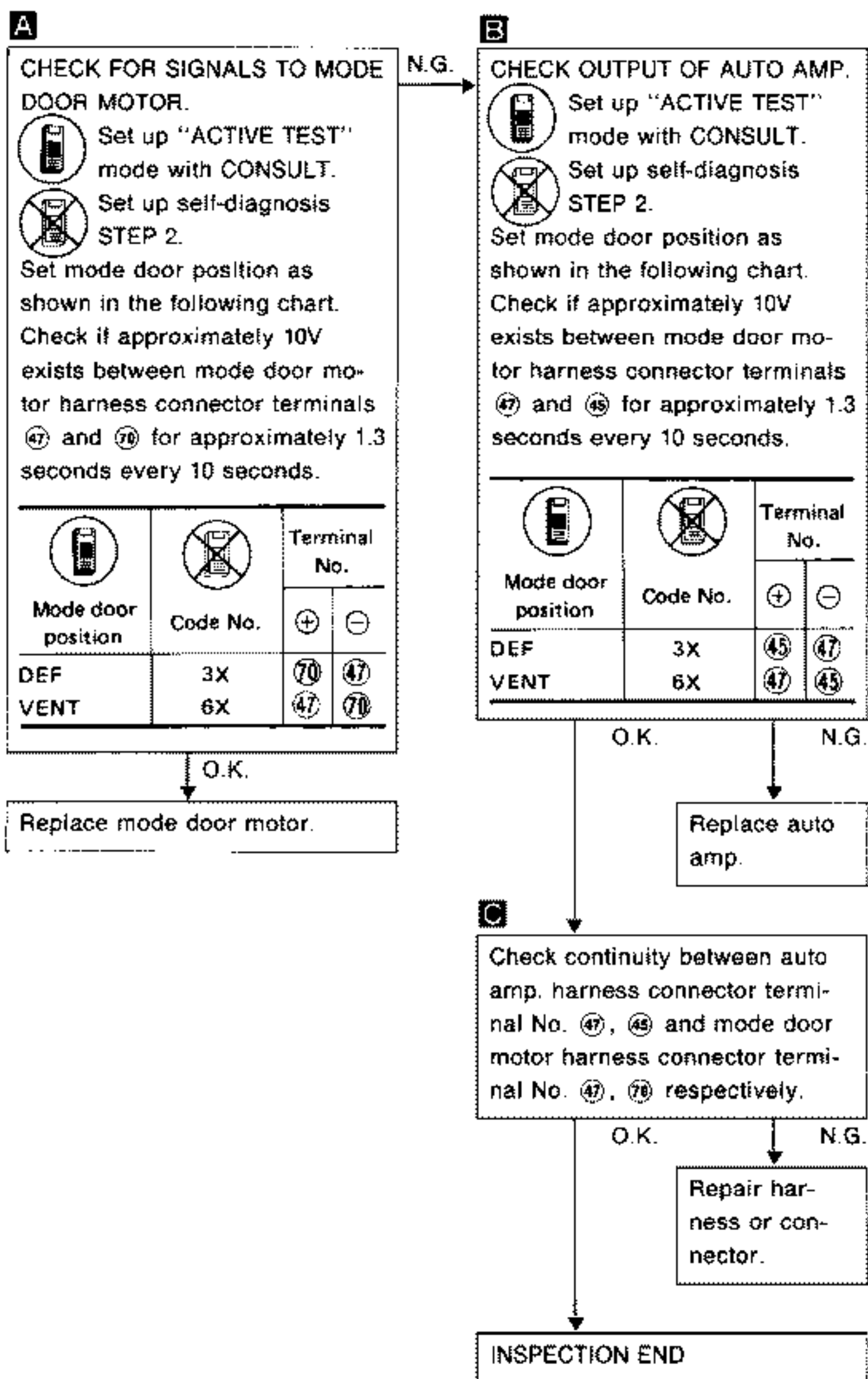




Diagnostic Procedure 18

SYMPTOM: Mode door does not move at all.

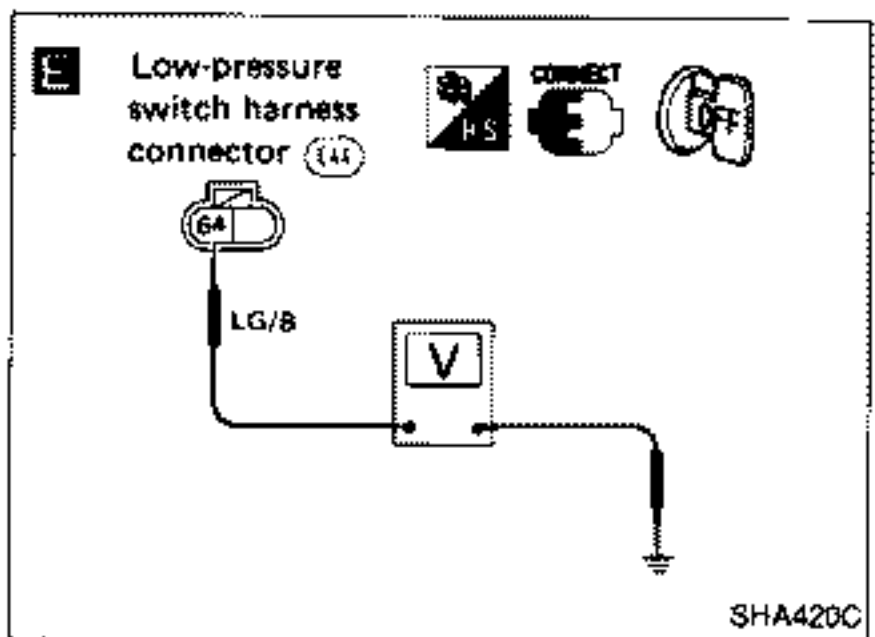
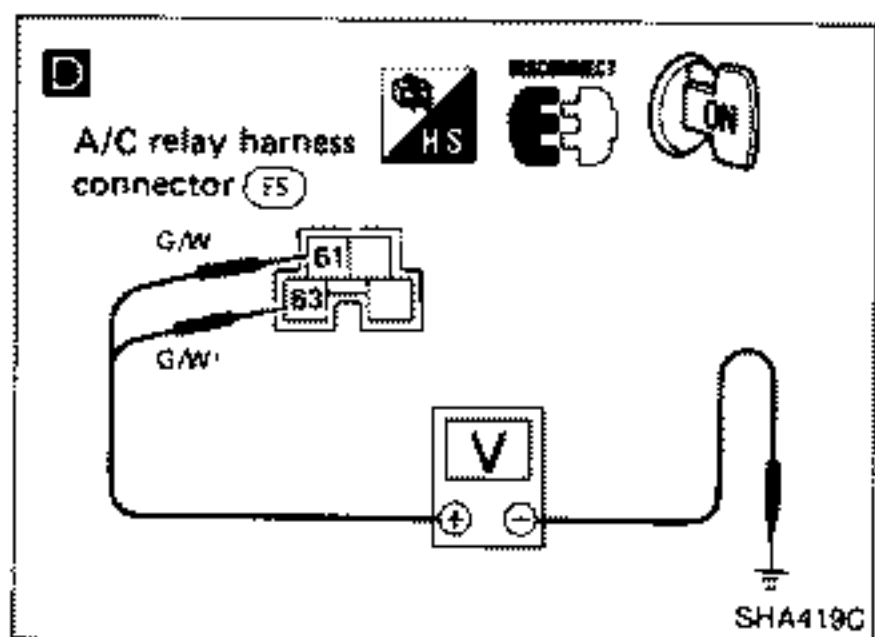
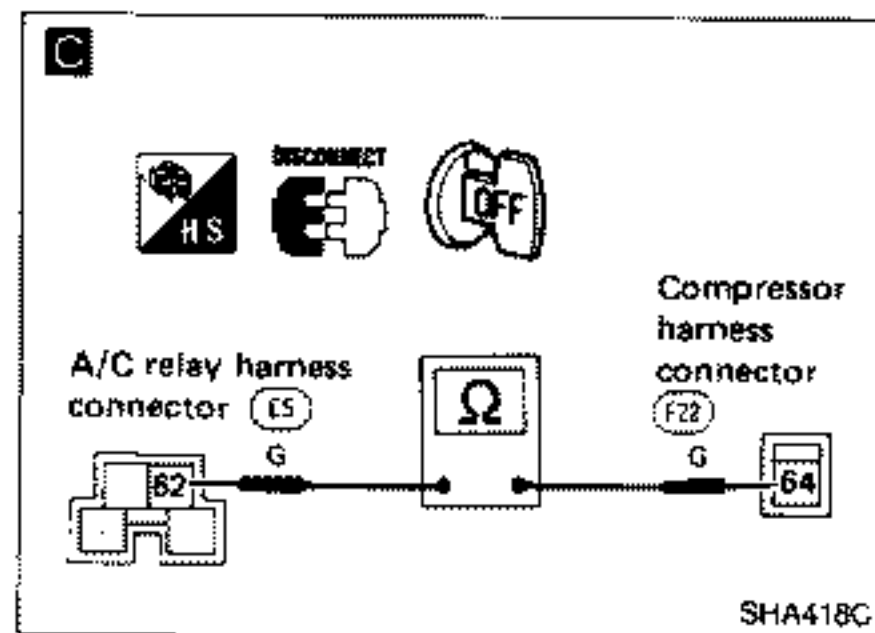
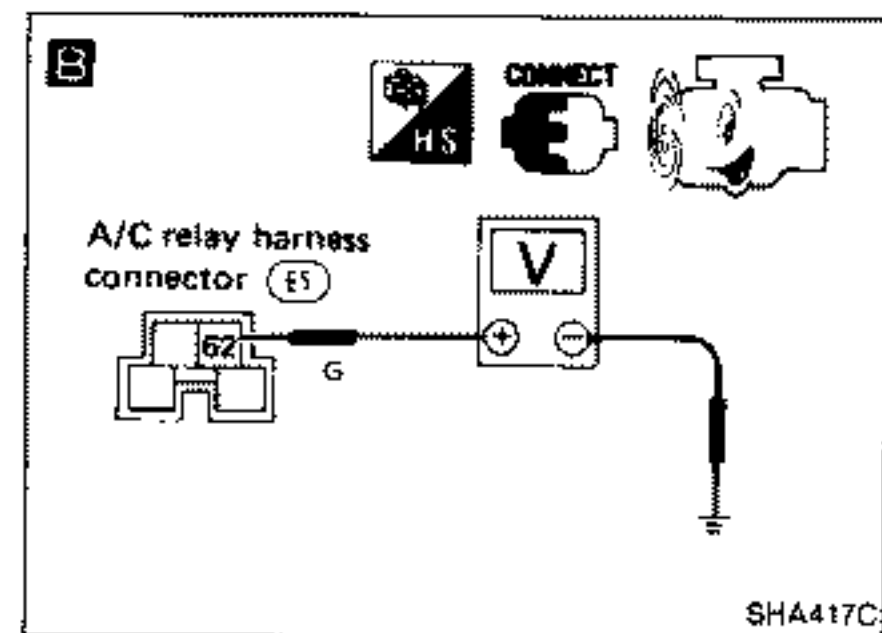
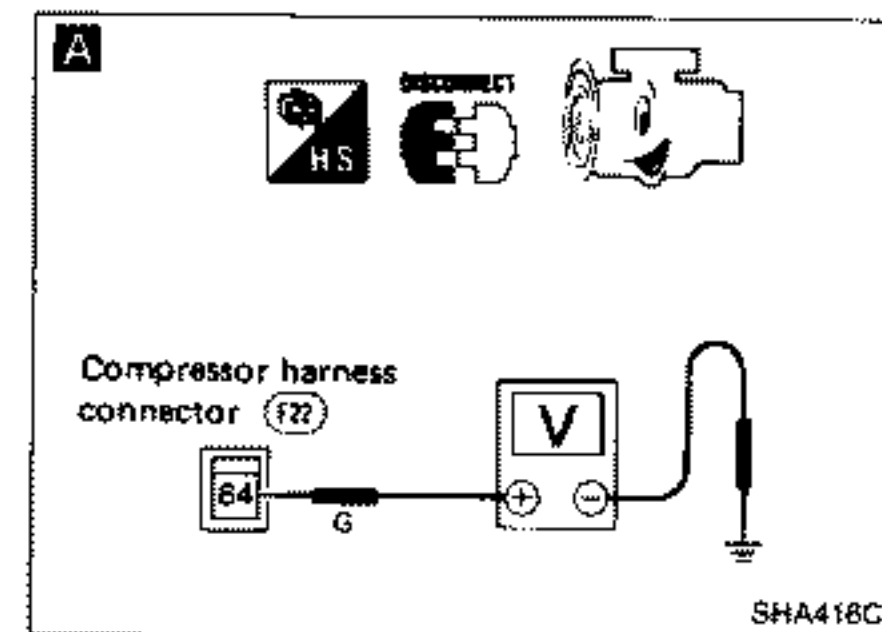
- Read out self-diagnosis result with CONSULT or perform self-diagnosis STEP 4 before referring to the following flow chart.



Diagnostic Procedure 19

SYMPTOM: Magnet clutch does not engage.

- Perform Preliminary check 6 before referring to the following flow chart.



A

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.

- Set up "ACTIVE TEST" mode with CONSULT.

- Set up self-diagnosis STEP 2.

Set compressor as shown in the following chart.

Check if approximately 12V exists between compressor harness connector terminal and body ground.

Compressor	Code No.	Terminal No.
ON	6X	64 Body ground

O.K.

Check magnet clutch.

N.G.

Replace magnet clutch.
Refer to COMPRESSOR — Model MJS170 (HITACHI make).

D

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approximately 12 volts exist between A/C relay harness connector terminal No. 61, 63 and body ground respectively?

O.K.

CHECK A/C RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection.)

O.K.

Reconnect A/C relay.

A

(Go to next page.)

B

CHECK A/C RELAY OPERATION.
Do approximately 12 volts exist between A/C relay harness connector terminal No. 62 and body ground?

N.G.

O.K.

Disconnect A/C relay harness connector.

C

Note
Check circuit continuity between A/C relay harness connector terminal No. 62 and compressor harness connector terminal No. 64.

N.G.

CHECK POWER SUPPLY CIRCUIT.
(Refer to "POWER SUPPLY ROUTING" in EL section and A/C ELECTRICAL CIRCUIT.)

N.G.

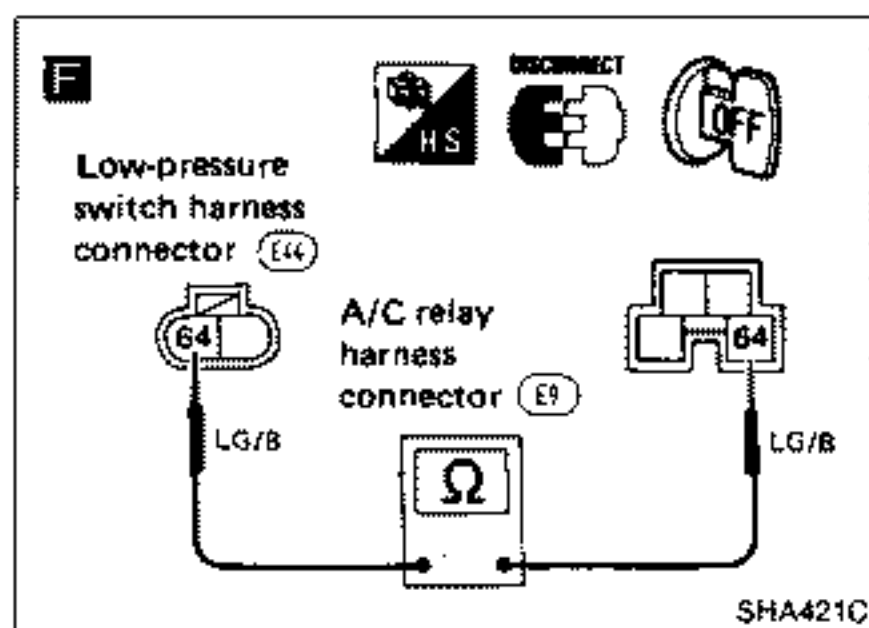
Replace A/C relay.

Note:

If the result is N.G. after checking circuit continuity, repair harness or connector.

TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 19 (Cont'd)



A

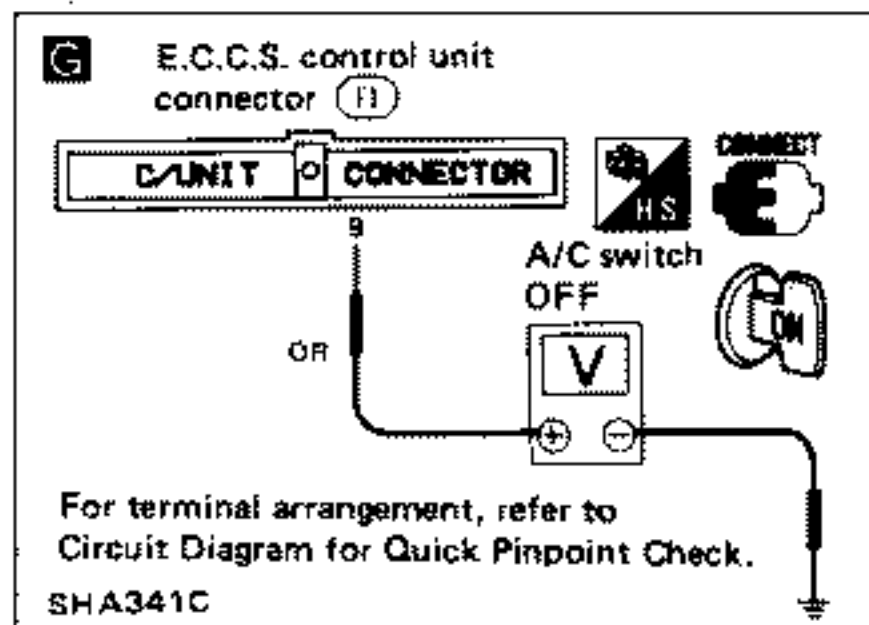
Turn ignition switch ON and press OFF switch.

E

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approximately 12 volts exist between low-pressure switch harness connector terminal No. 64 and body ground?

N.G. **F** **Note**

Check circuit continuity between A/C relay harness connector terminal No. 64 and low-pressure switch harness connector terminal No. 64.

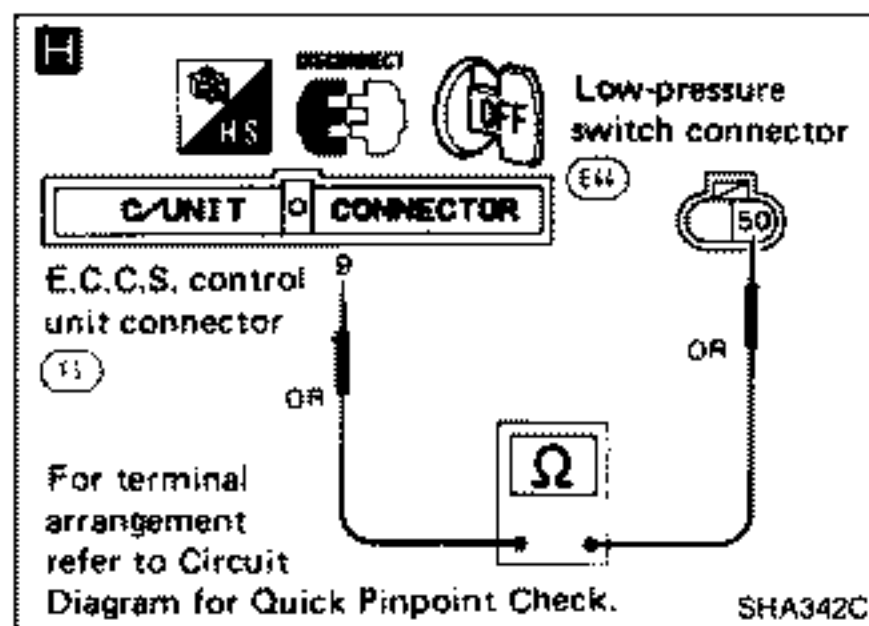


G

Do approximately 12 volts exist between E.C.C.S. control unit harness connector terminal No. 9 and body ground?

N.G. **H** **Note**

Check circuit continuity between low-pressure switch harness connector terminal No. 9 and E.C.C.S. control unit harness connector terminal No. 9.



O.K.

I

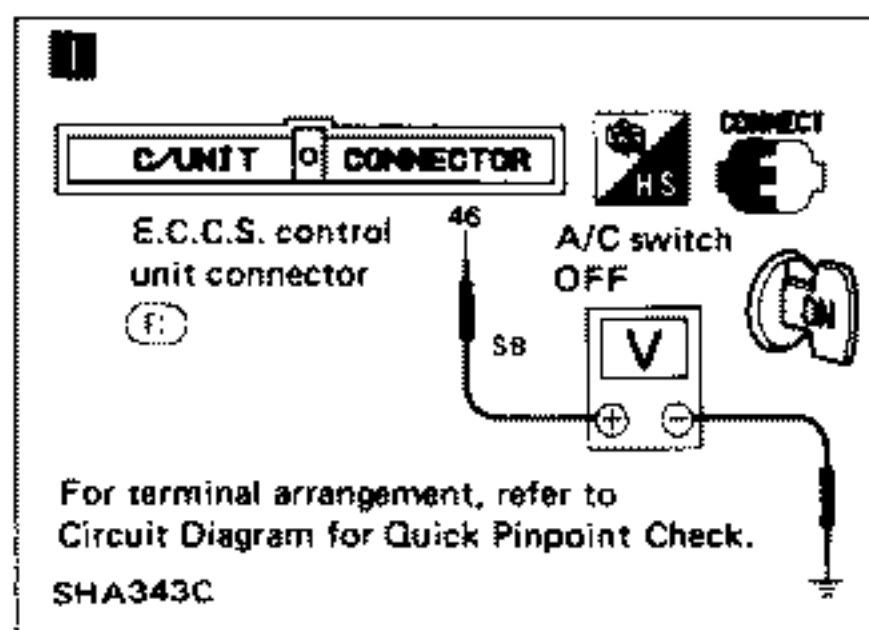
Do approximately 8 to 9 volts exist between E.C.C.S. control unit harness connector terminal No. 46 and body ground?

O.K.

CHECK LOW-PRESSURE SWITCH.
(Refer to Electrical Components Inspection.)

N.G.

Replace low-pressure switch.



O.K.

Disconnect auto amp. harness connector.

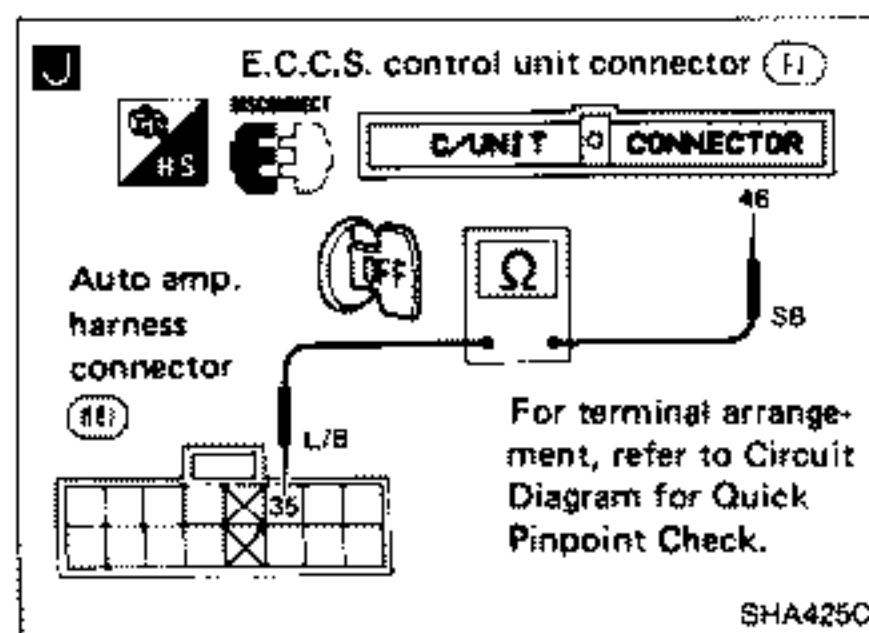
J

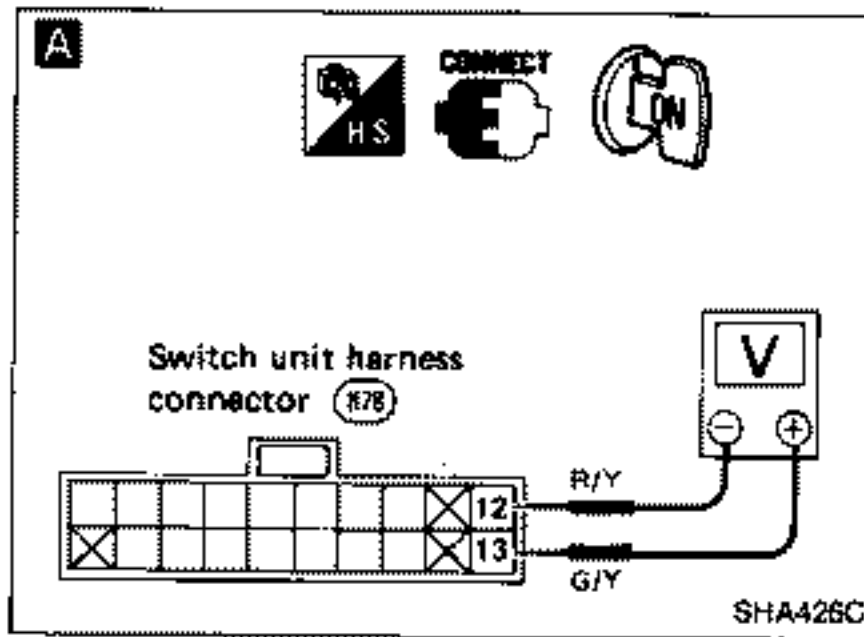
Check circuit continuity between auto amp. harness connector terminal No. 35 and E.C.C.S. control unit harness connector terminal No. 46.

O.K.

Replace auto amp.

Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.





Diagnostic Procedure 20

SYMPTOM: Air conditioner control switch panel illumination does not come on.

A

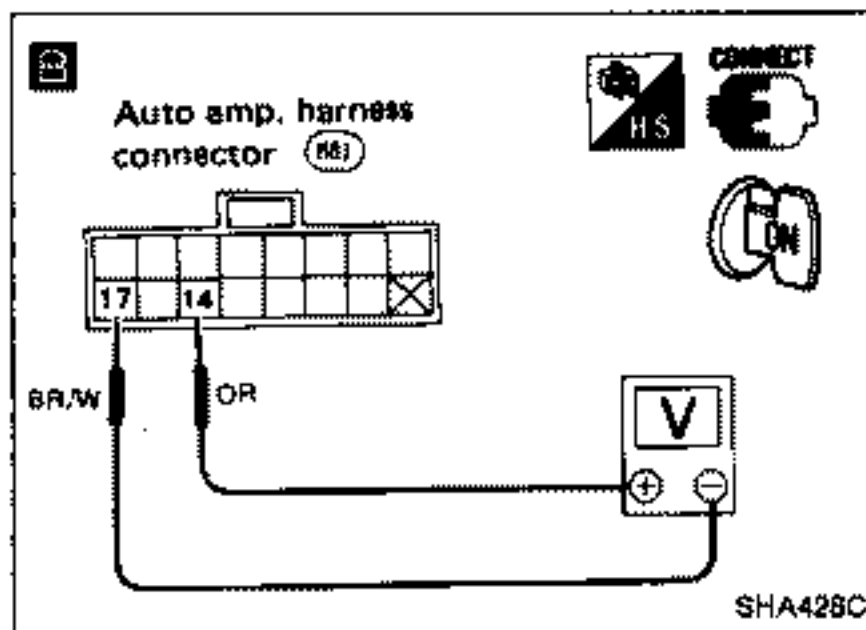
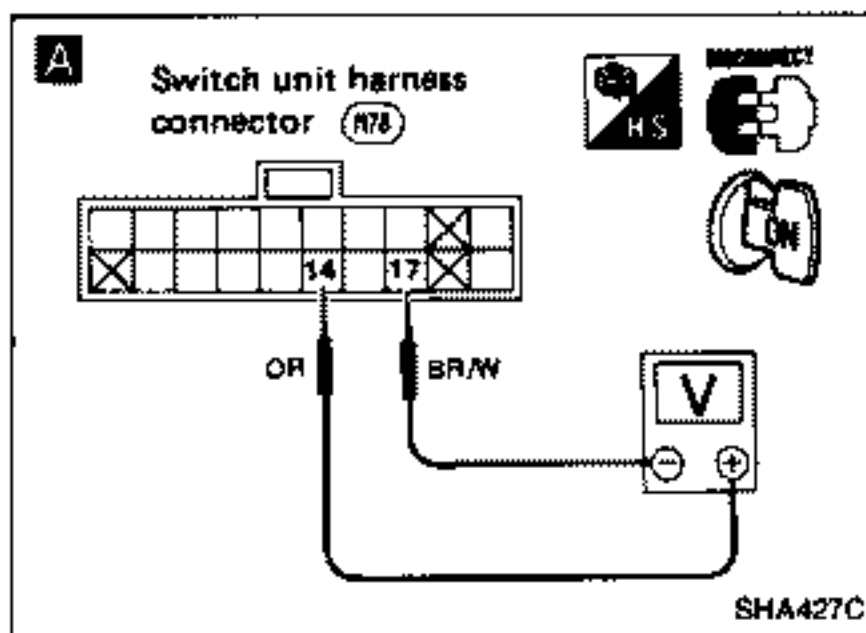
Turn on light switch.
Set illumination control switch at the brightest position.
Check if approximately 12V exists between switch panel harness connector terminal No. ⑫ and ⑬.

N.G.

Check illumination control system. Refer to section EL.

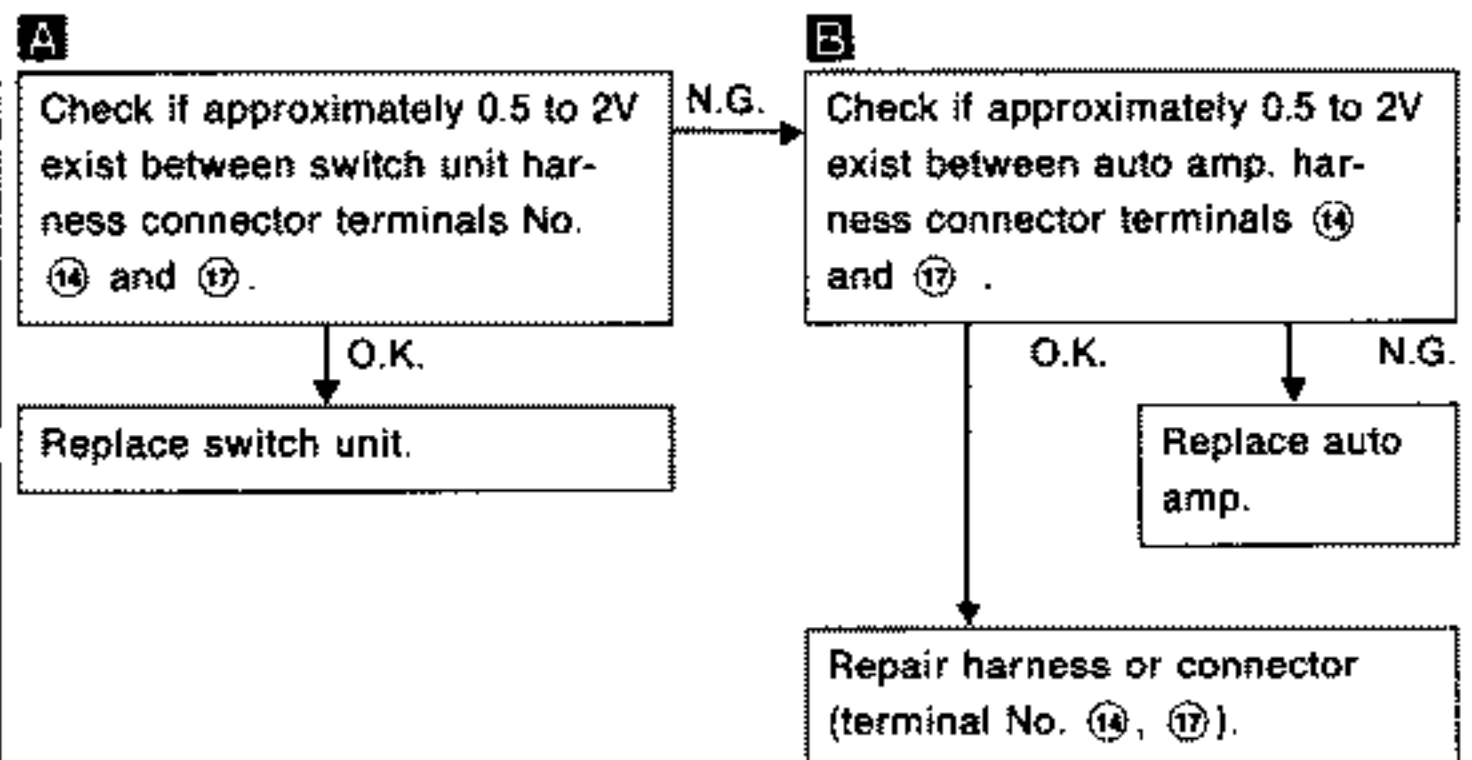
O.K.

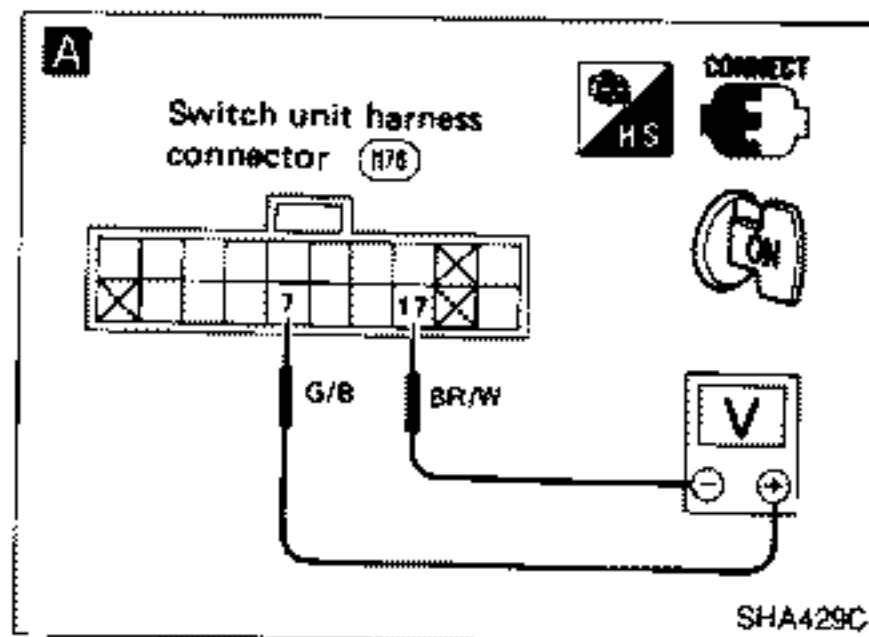
Replace bulb.



Diagnostic Procedure 21

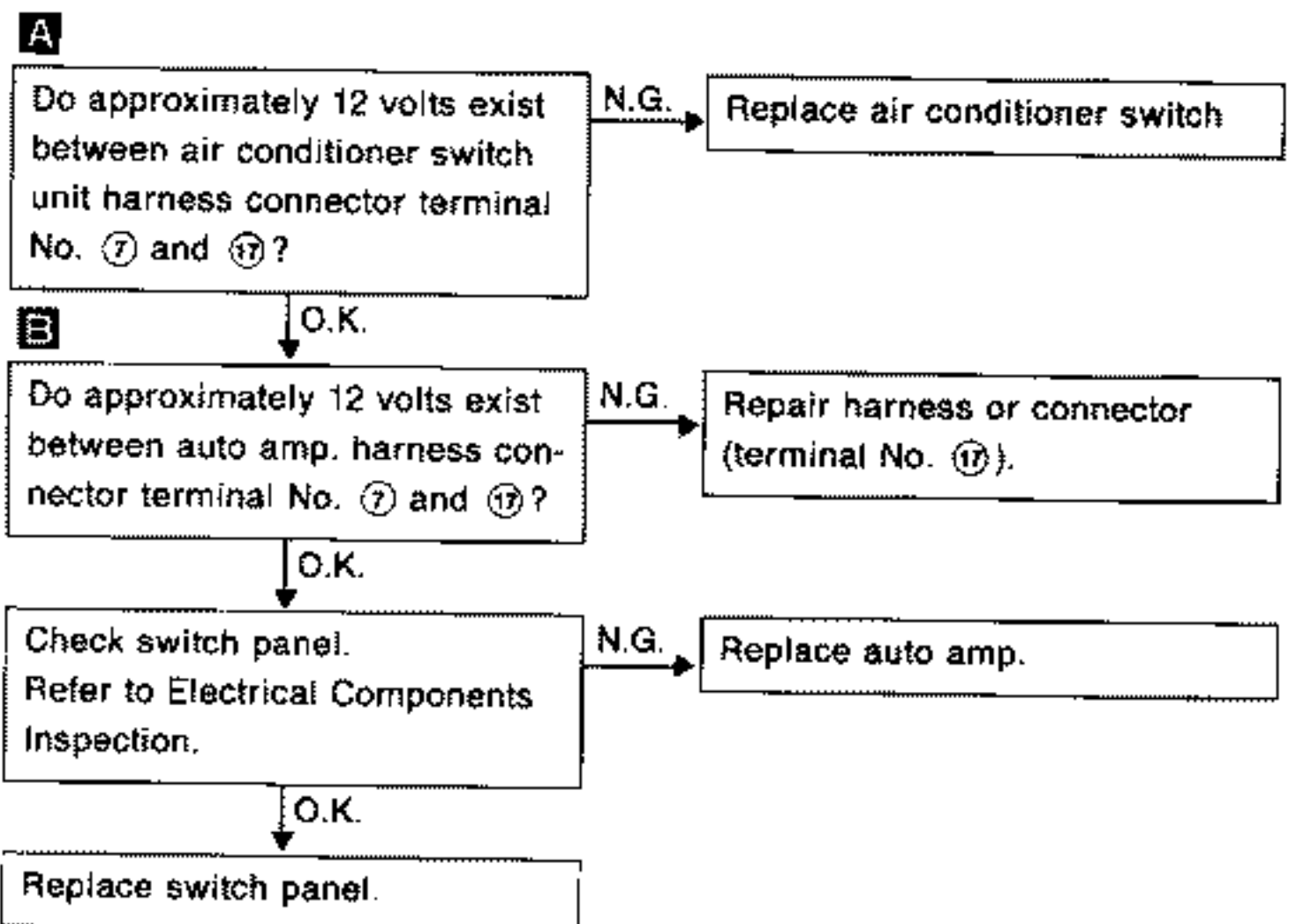
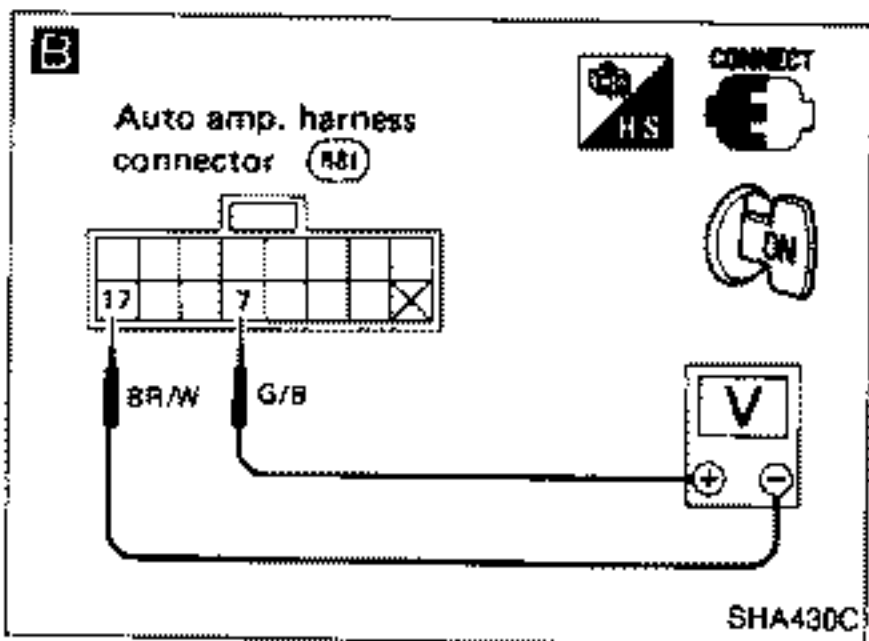
SYMPTOM: Set temperature and ambient temperature do not appear on display window.





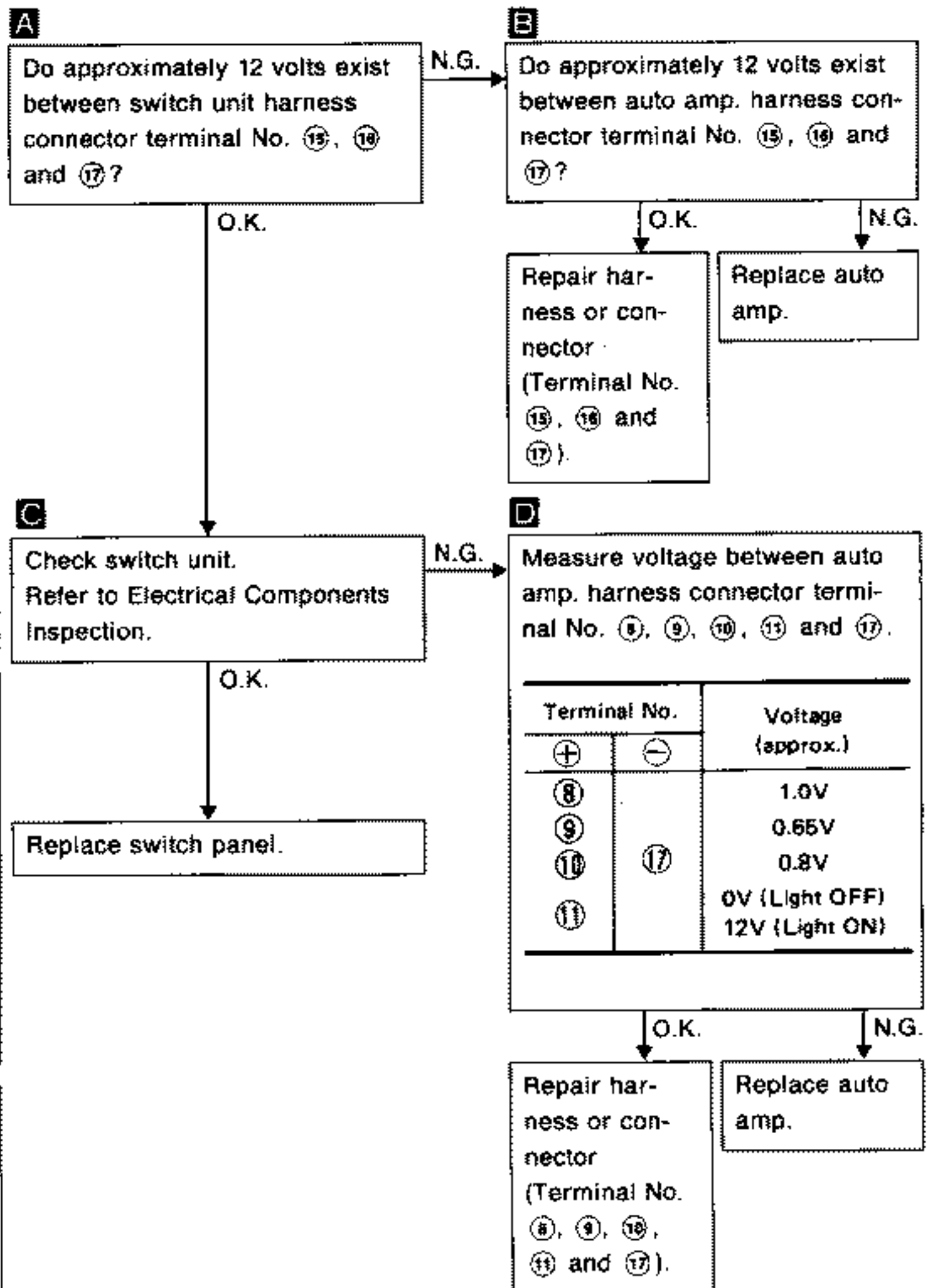
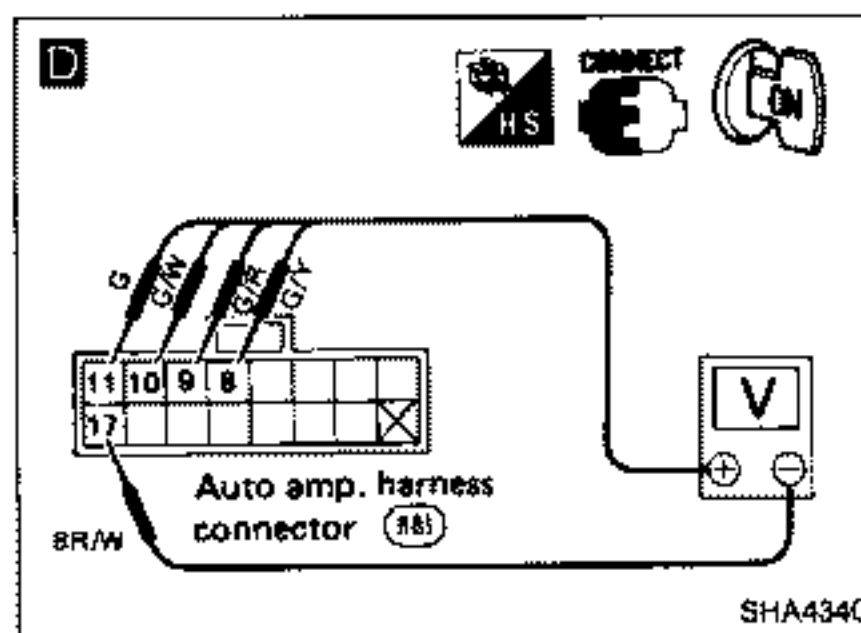
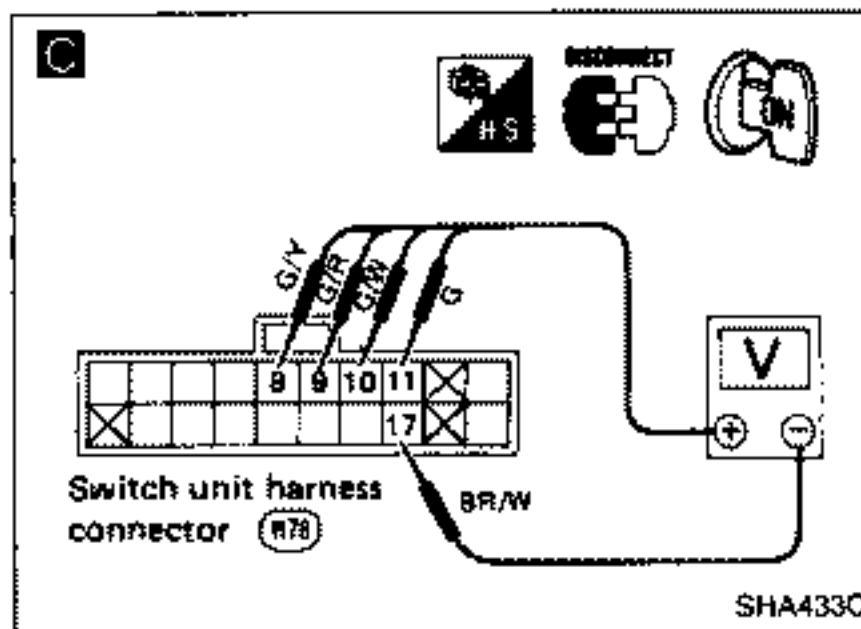
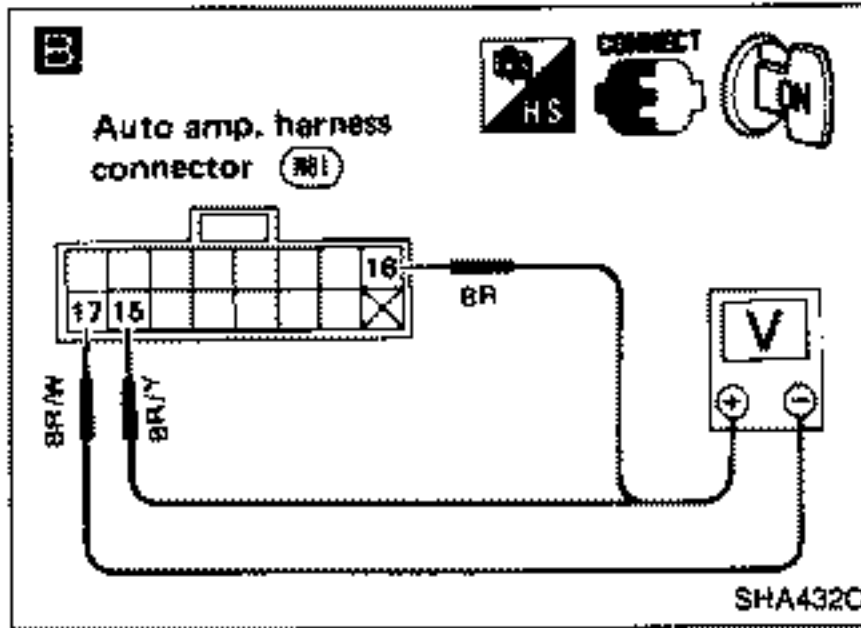
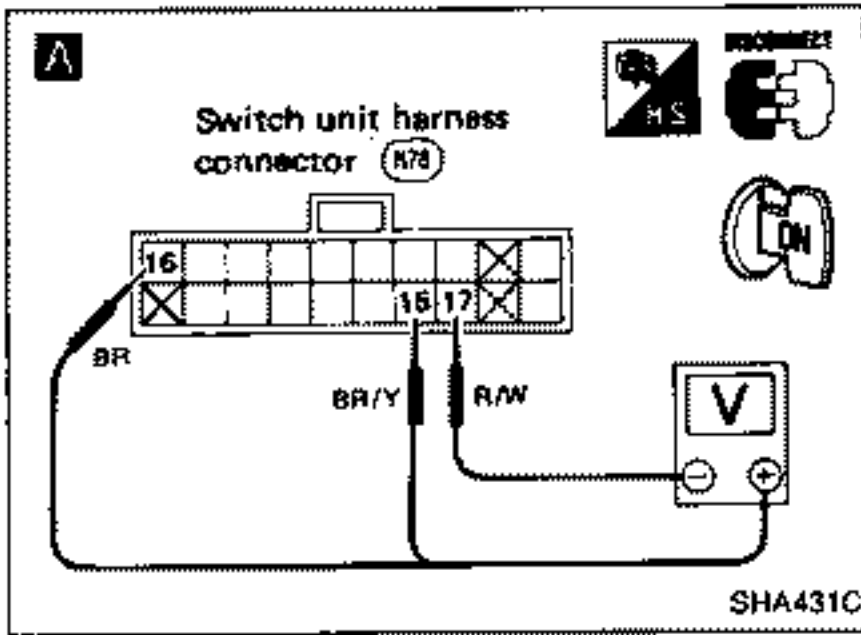
Diagnostic Procedure 22

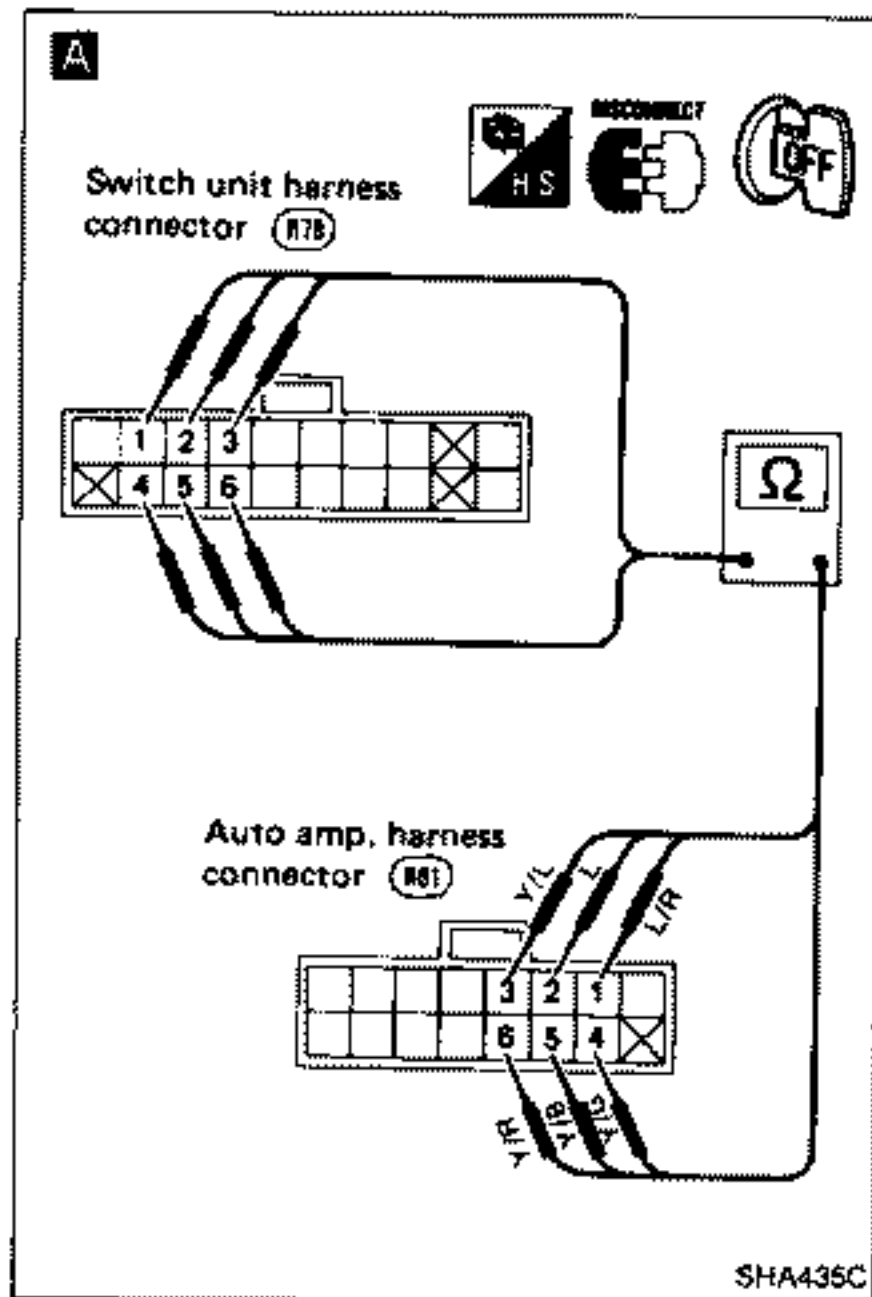
SYMPTOM: When air conditioner switch is operated it does not beep.



Diagnostic Procedure 23

SYMPTOM: Figures of set temperature and ambient temperature do not appear on the display window and Indicator lamp (L.E.D.) does not come on.





Diagnostic Procedure 24

SYMPTOM: Switches do not work.

Check switch panel.

Refer to Electrical Components Inspection.

N.G.

Replace switch panel.

O.K.

A Check continuity between auto amp. harness connector terminal No. ① ~ ⑥ and switch panel harness terminal No. ① ~ ⑥ respectively.

N.G.

Repair harness or connector.

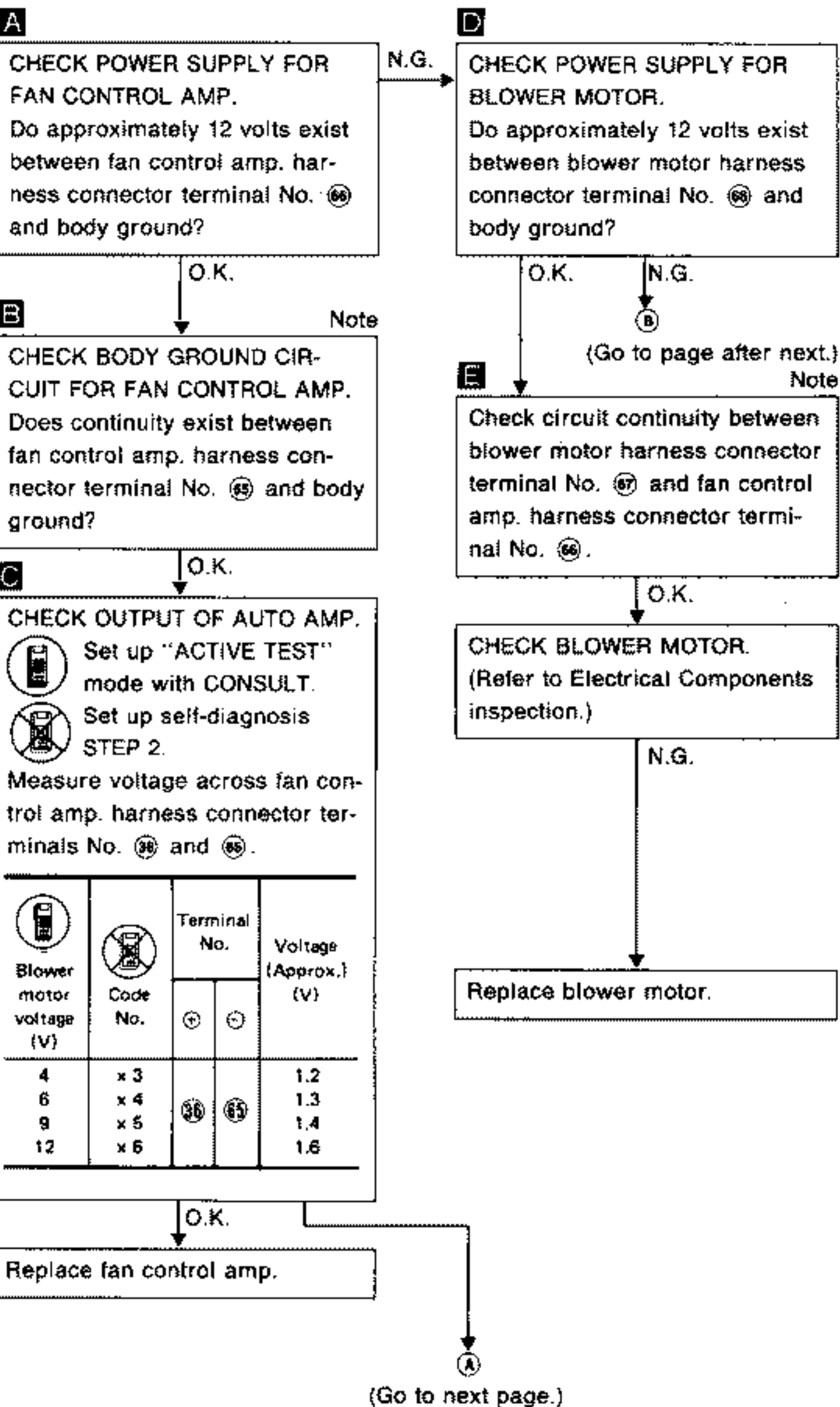
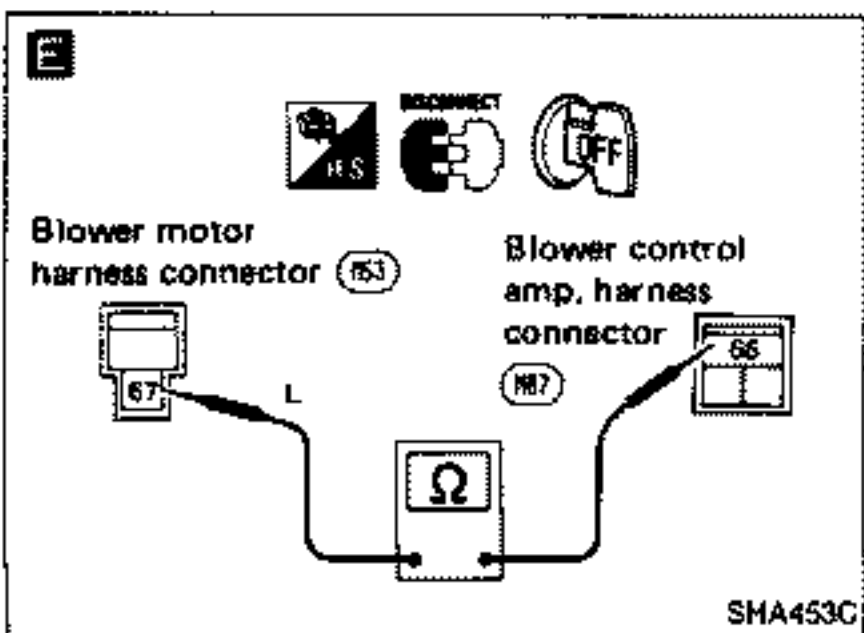
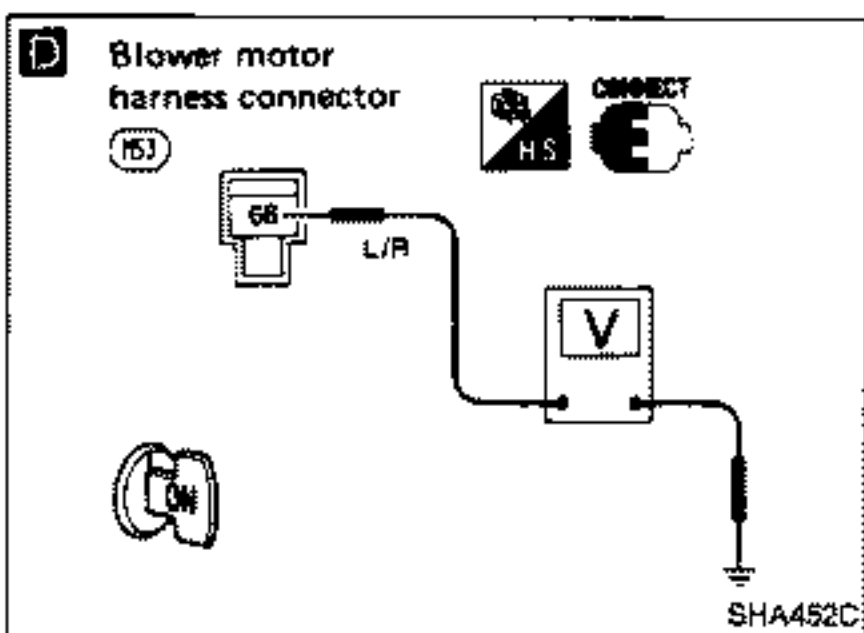
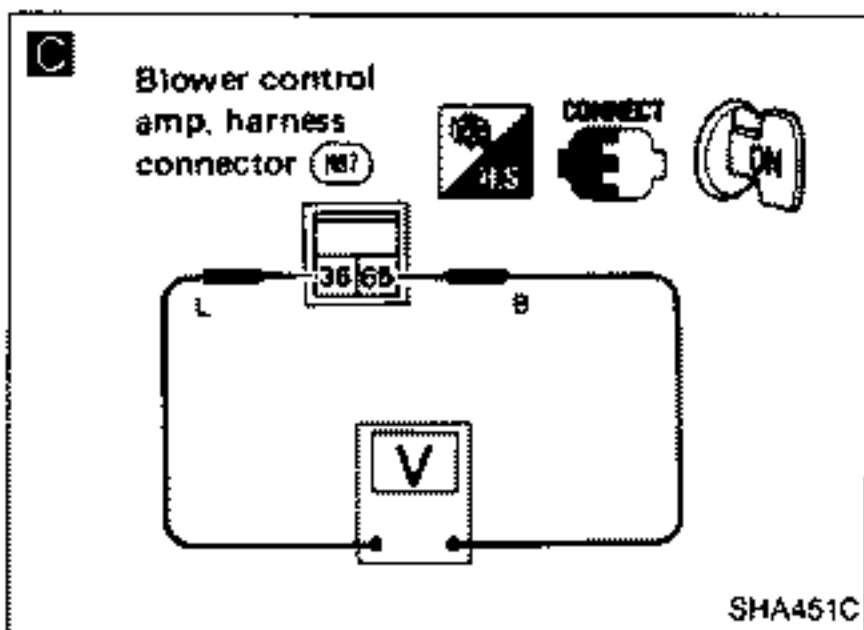
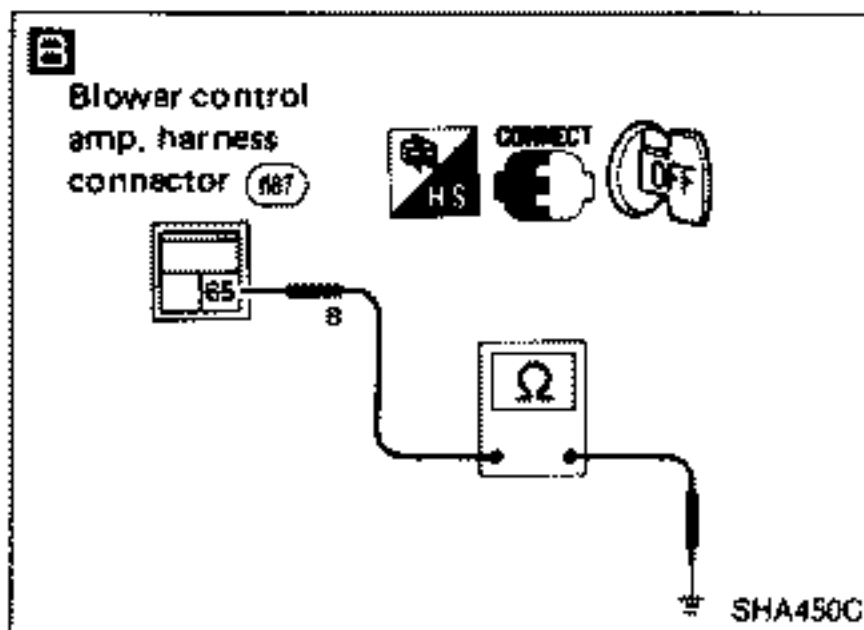
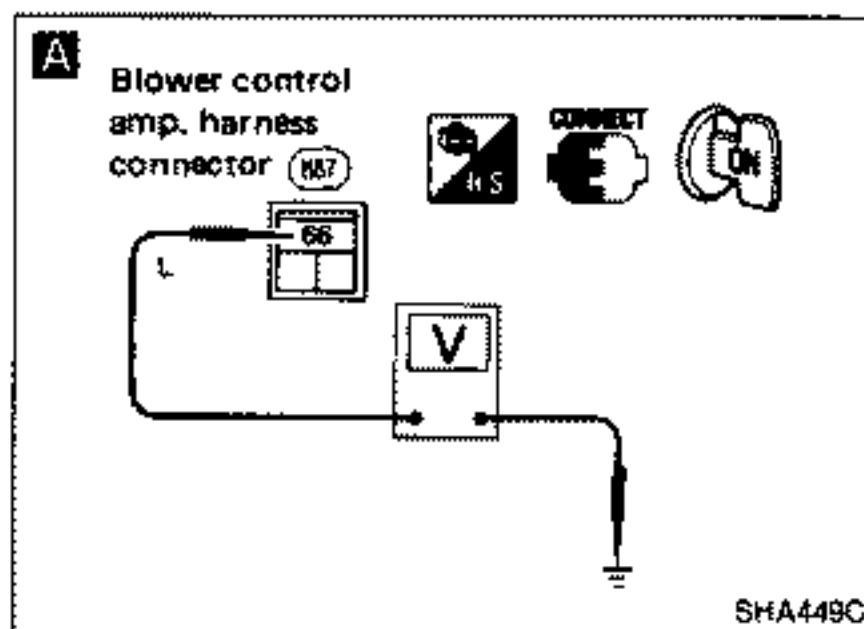
O.K.

Replace auto amp.

Diagnostic Procedure 25

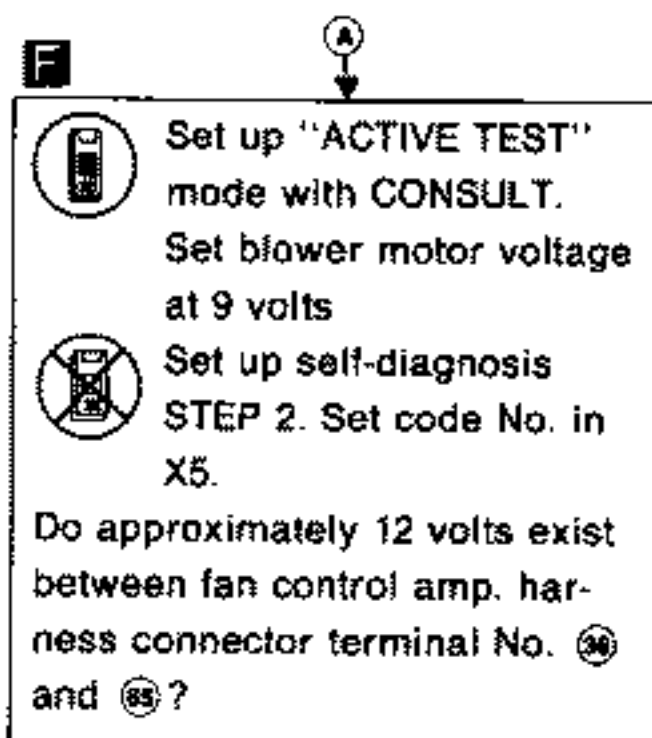
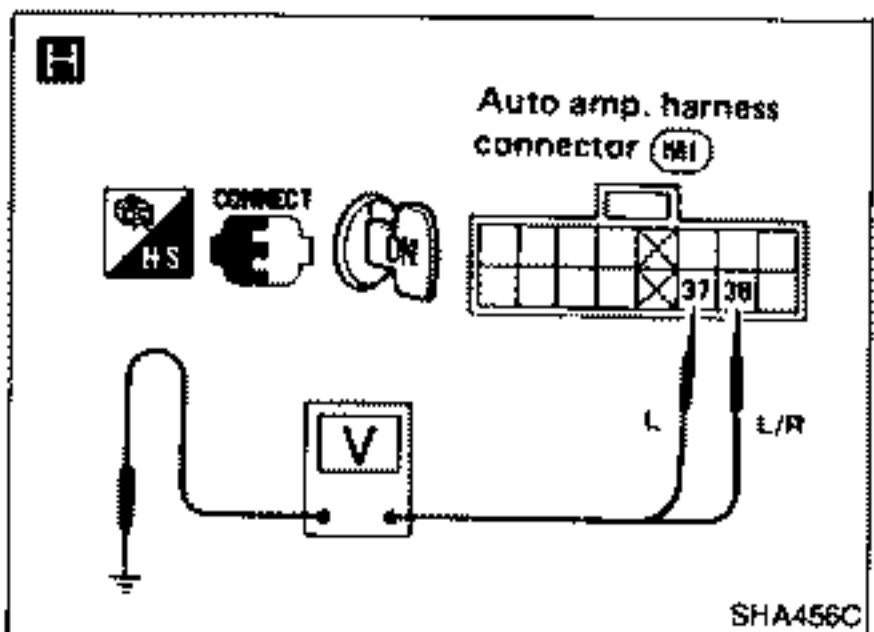
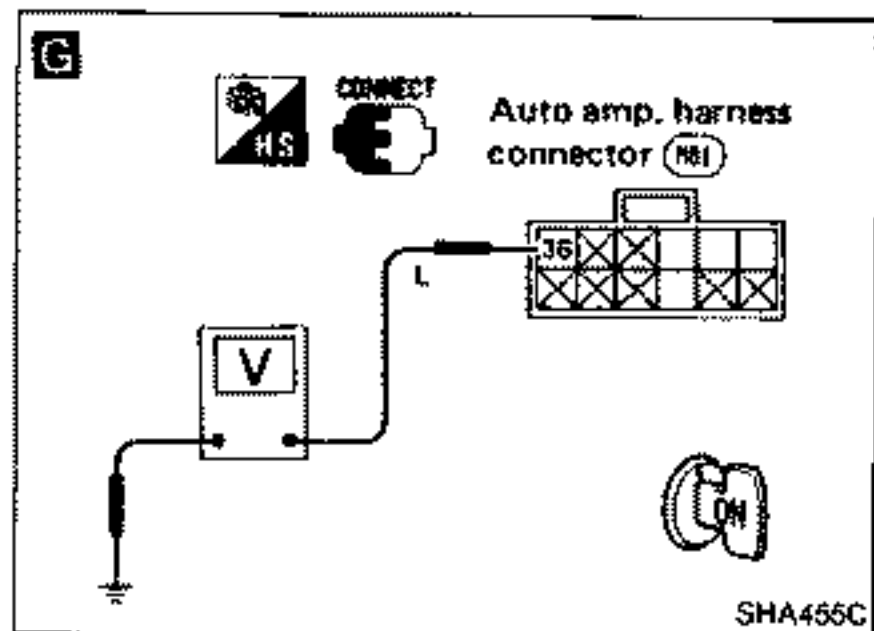
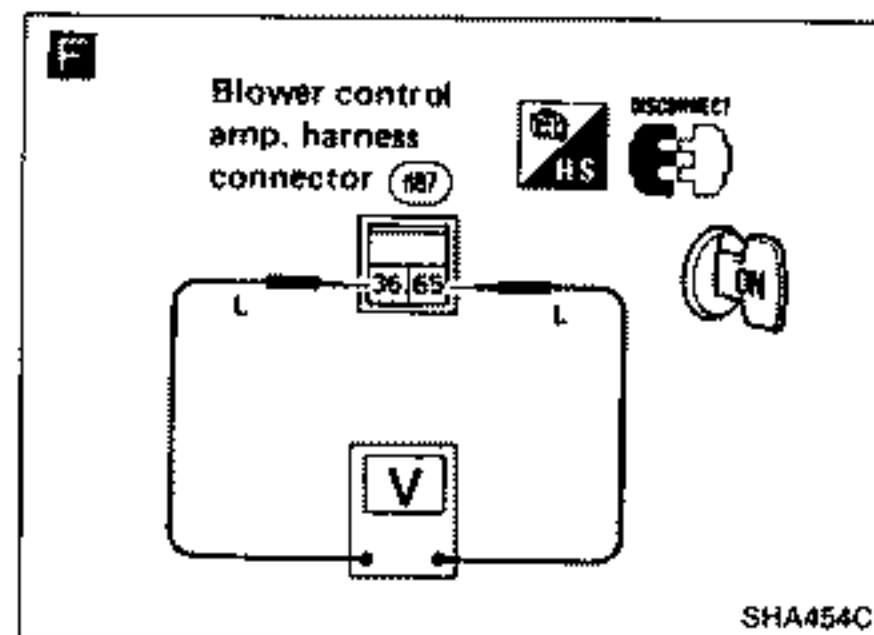
SYMPTOM: Blower motor operation is malfunctioning.

- Perform Preliminary check 5 before referring to the of flowing flow chart.

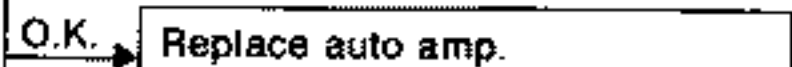
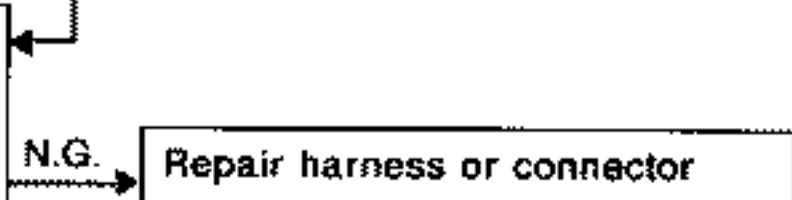
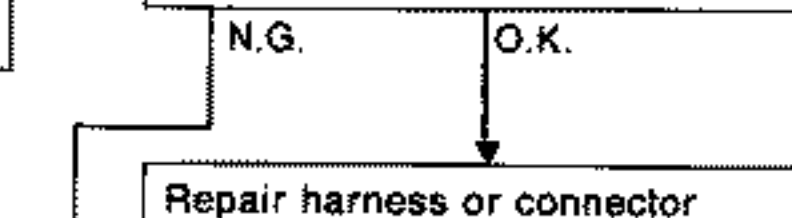
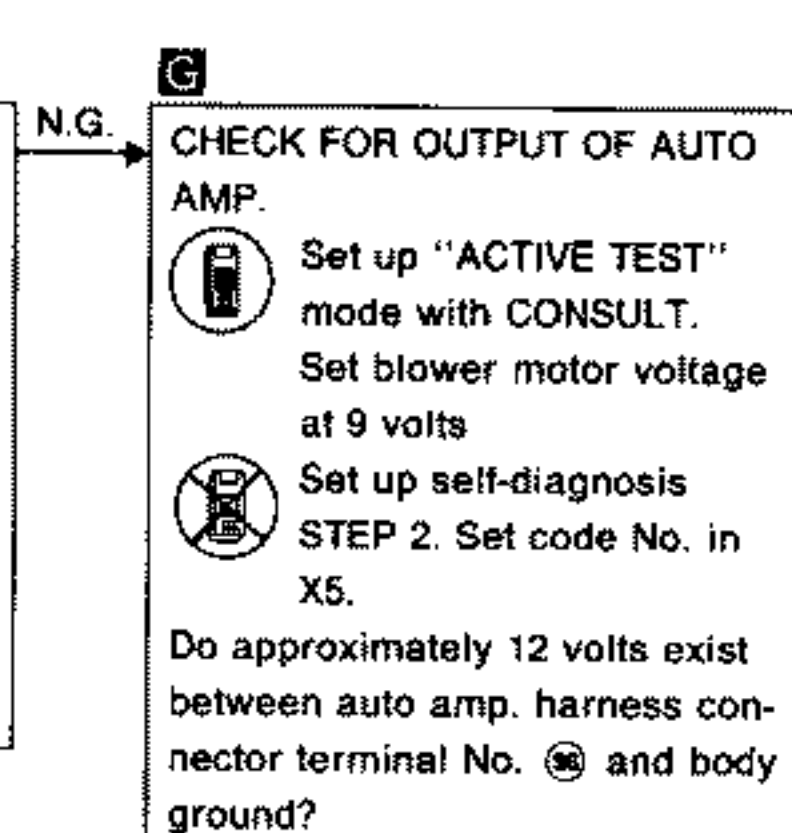
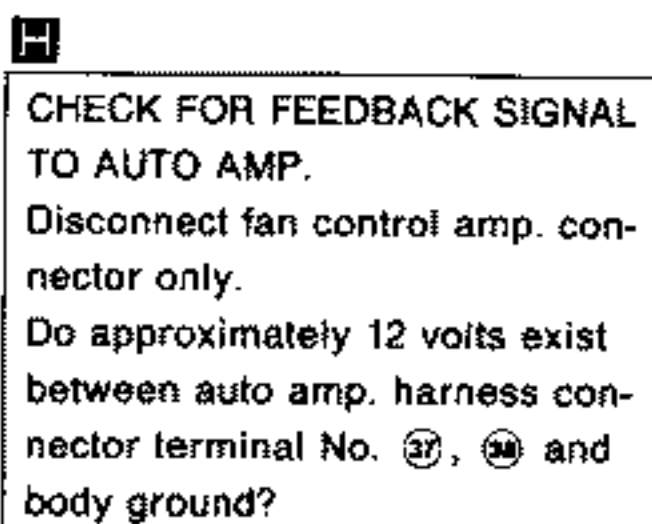


TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 25 (Cont'd)

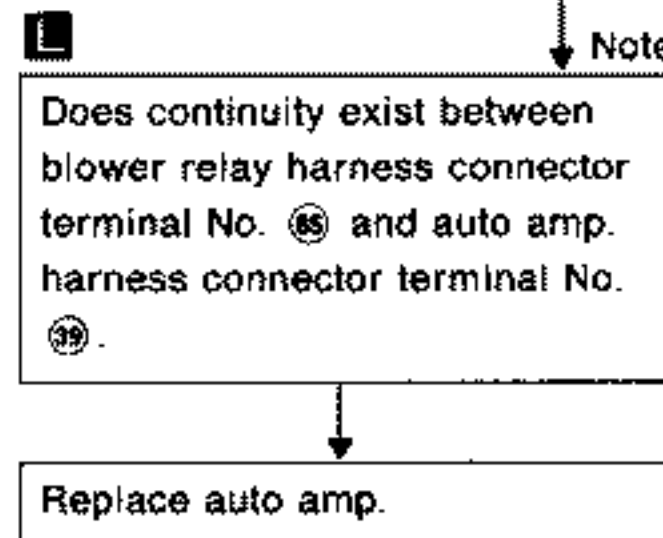
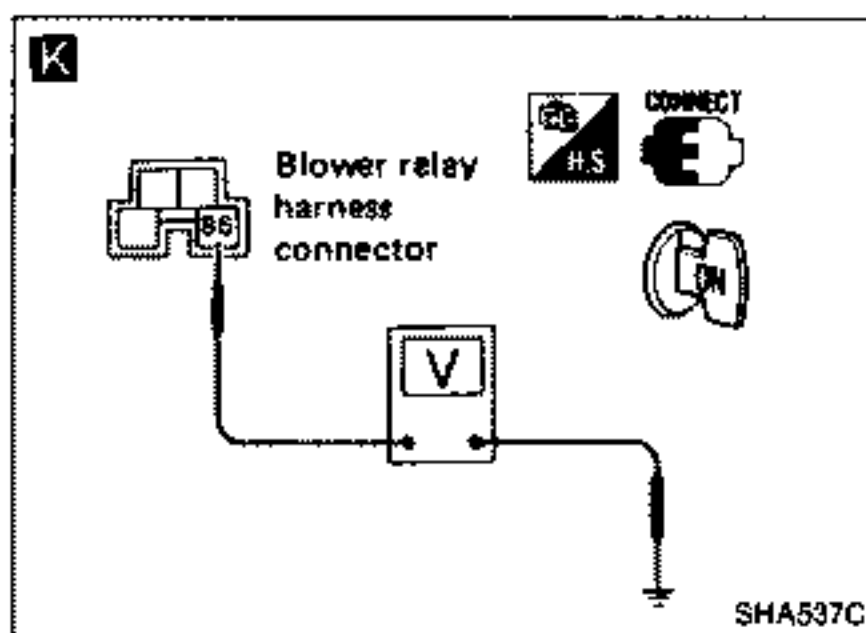
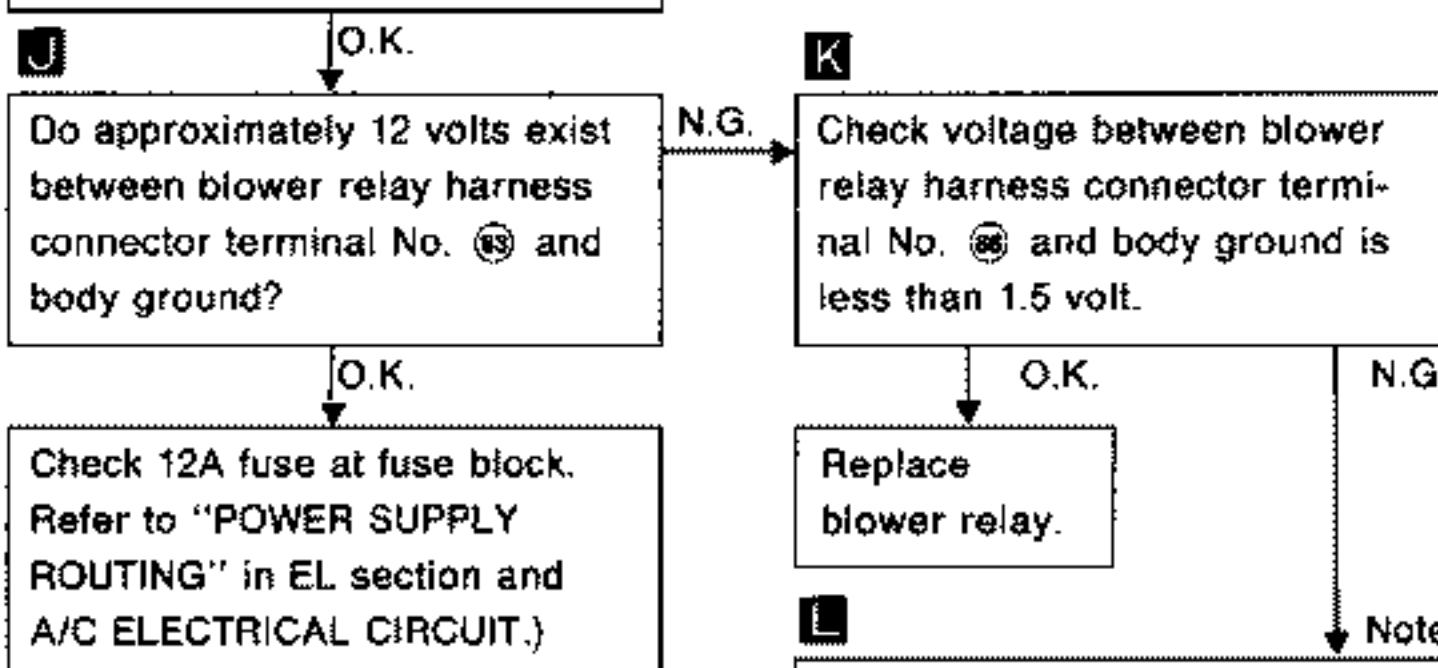
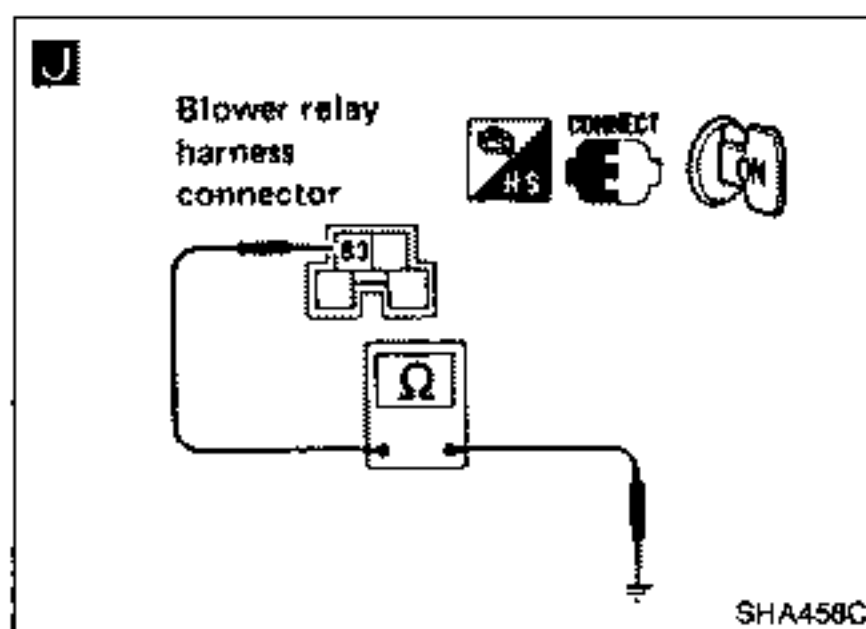
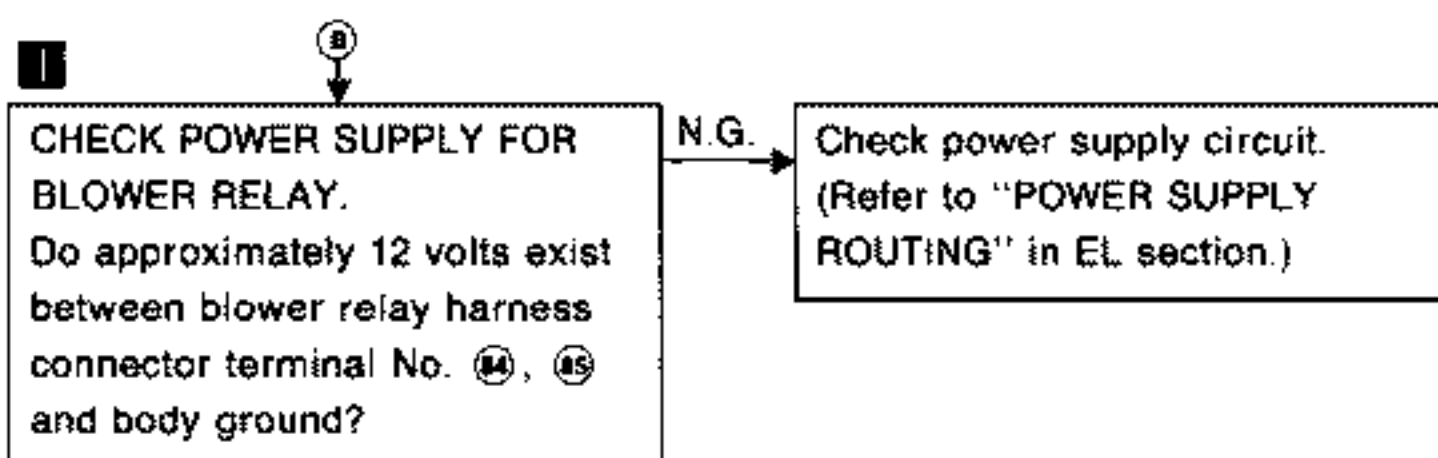
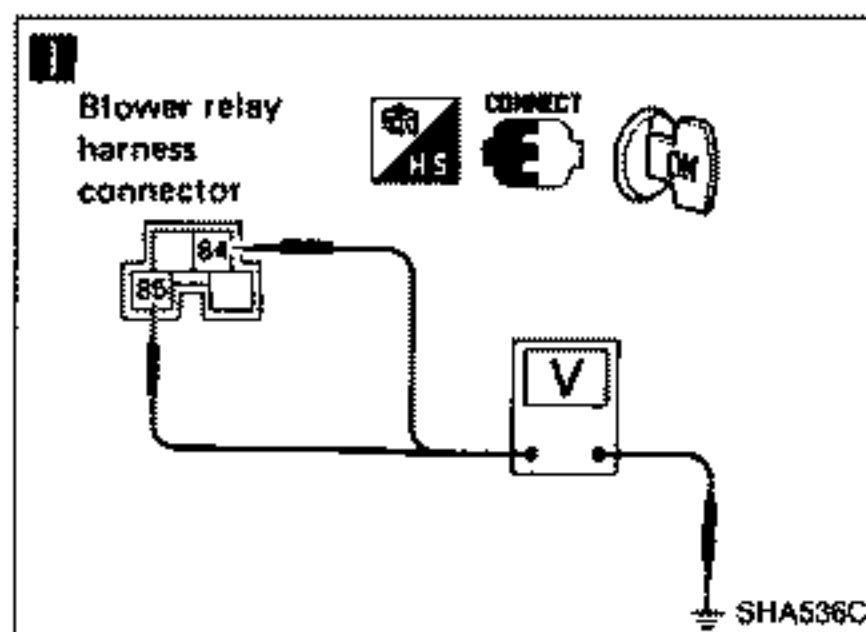


Replace fan control amp.

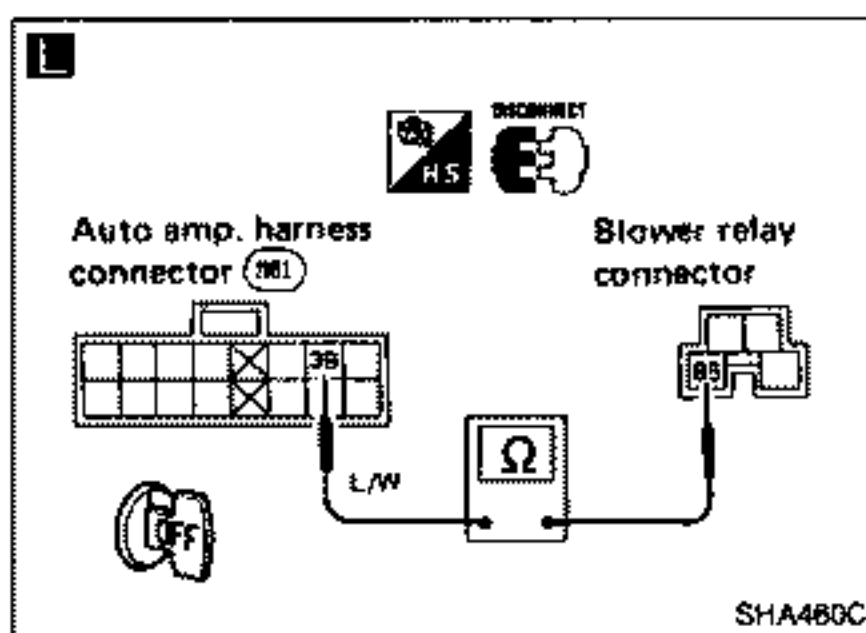


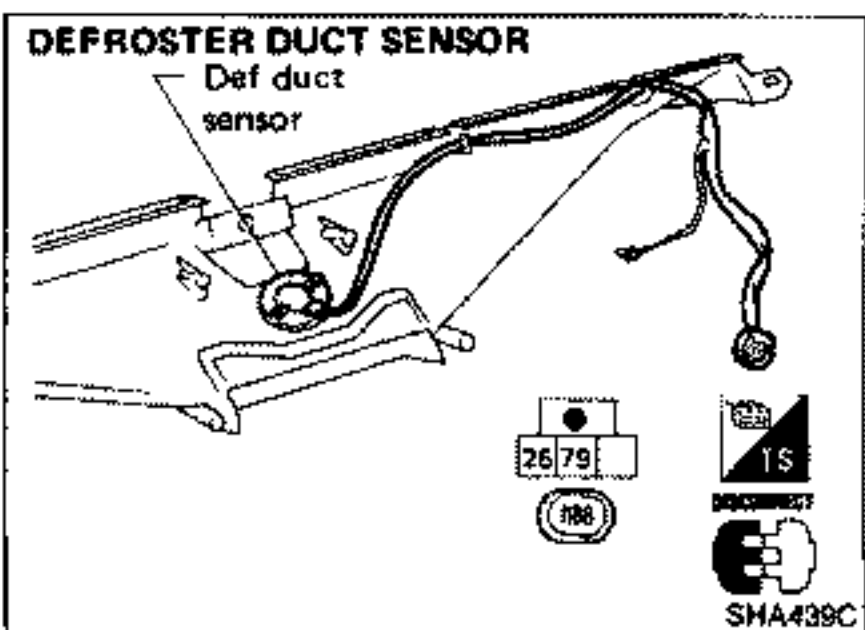
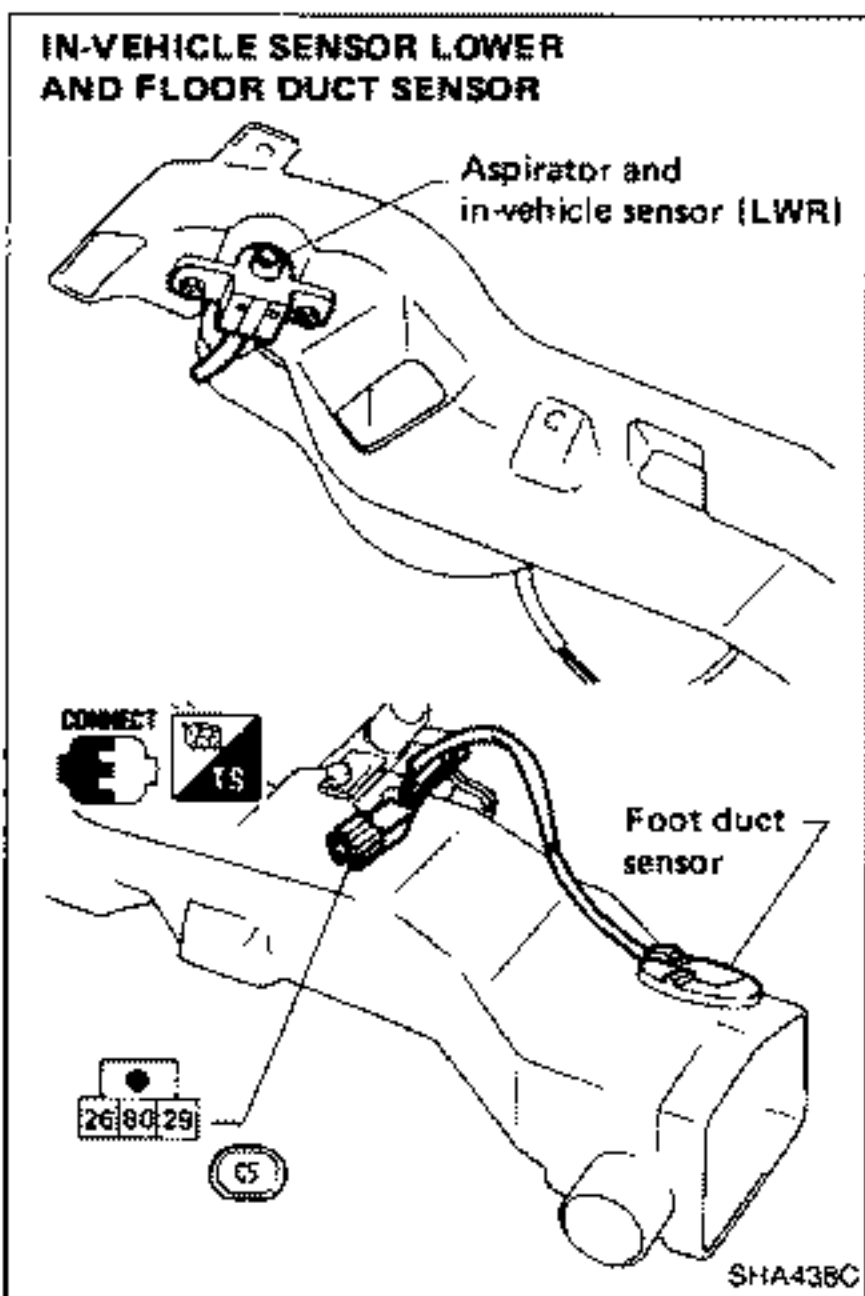
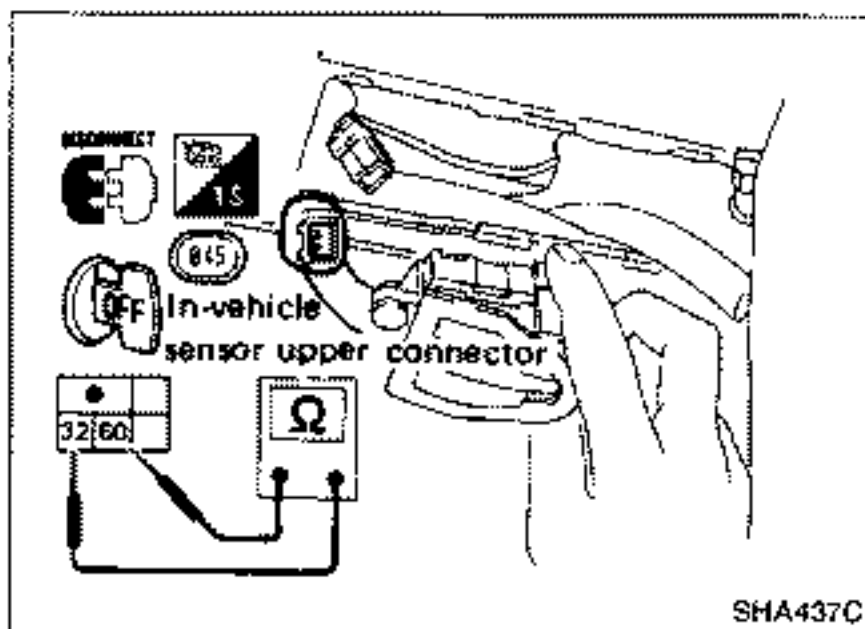
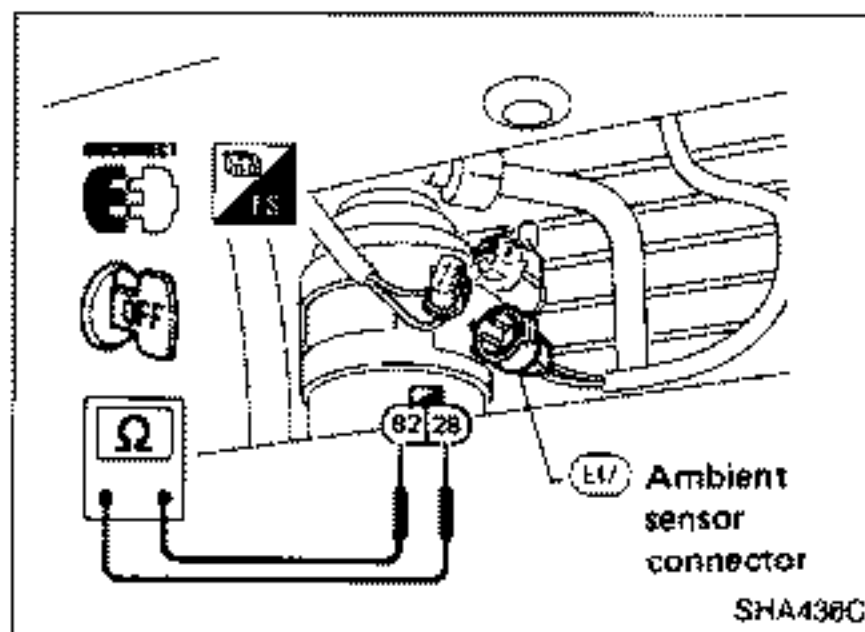
TROUBLE DIAGNOSES — Auto Air Conditioner

Diagnostic Procedure 25 (Cont'd)



Note:
If the result is N.G. after checking circuit continuity, repair harness or connector.





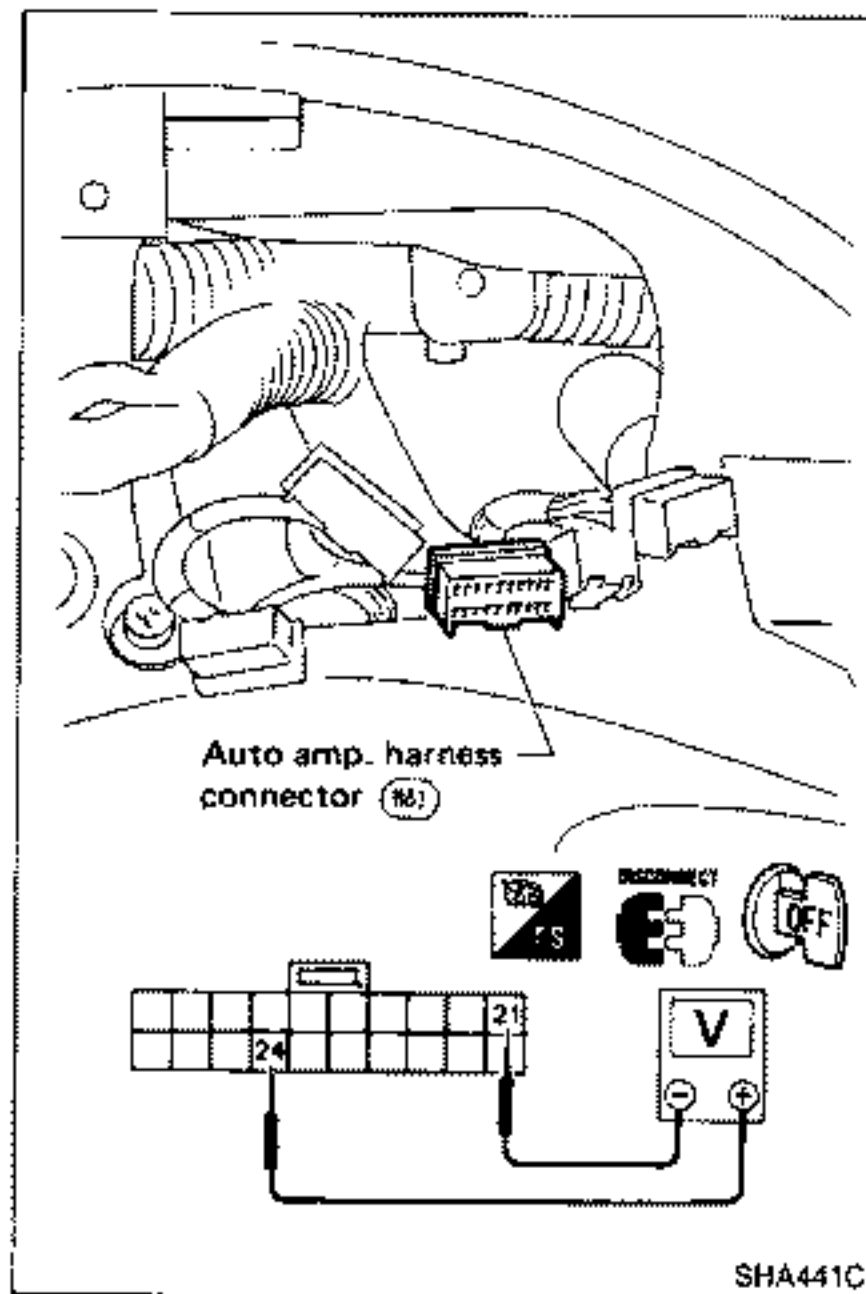
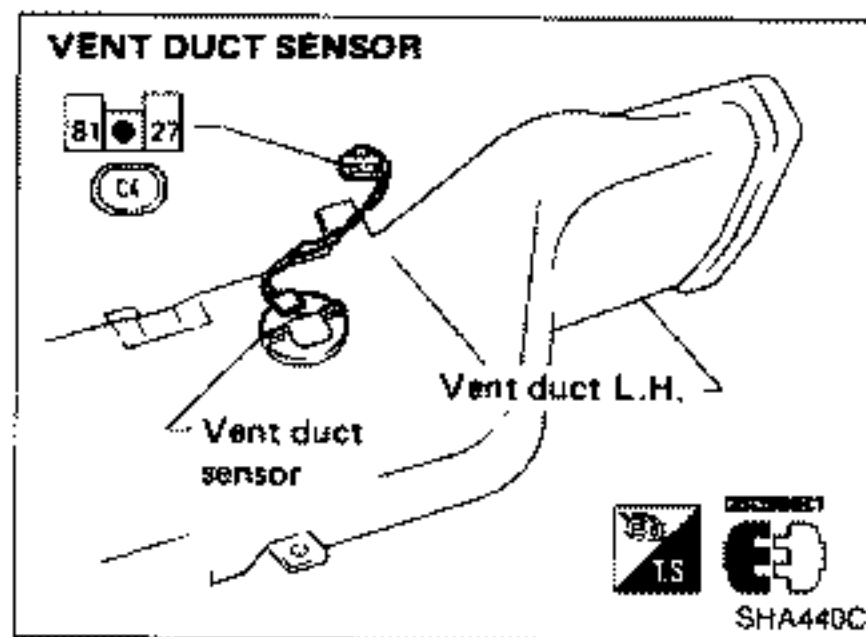
Electrical Components Inspection

TEMPERATURE SENSORS

After disconnecting temperature sensors harness connector measure resistance between terminals of each sensor, using the table below.

Temperature °C (°F)	Resistance kΩ
-40 (-40)	210.55
-35 (-31)	146.86
-30 (-22)	103.97
-25 (-13)	74.63
-20 (-4)	54.28
-15 (5)	39.97
-10 (14)	29.77
-5 (23)	22.43
0 (32)	17.07
5 (41)	13.11
10 (50)	10.18
15 (59)	7.96
20 (68)	6.29
25 (77)	5.00
30 (86)	4.01
35 (95)	3.24
40 (104)	2.63
45 (113)	2.15
50 (122)	1.77
55 (131)	1.47
60 (140)	1.22
65 (149)	1.02
70 (158)	0.86
75 (167)	0.73
80 (176)	0.62

Electrical Components Inspection (Cont'd)

**SUNLOAD SENSOR**

Measure voltage between terminals ②① and ②④ at vehicle harness side using the table below.

Input current mA	Output voltage (V)
0	5
0.1	4
0.2	3
0.3	2
0.4	1
0.5	0

- When checking sunload sensor, select a place where sun shines on it directly.

MODE DOOR MOTOR

Check to see if motor rotates when 12V is applied across mode door motor connector terminals No. ④⑦ and No. ⑦⑩.

Terminal No.		Mode door operation
④⑦	⑦⑩	
⊖	⊕	VENT → DEF
⊖	⊖	STOP
⊕	⊖	DEF → VENT

Check to see if mode door P.B.R. resistance is varied according to mode door position, as shown in the following table.

Mode door position	Resistance between terminal No. ④⑥ and ⑦②
DEF	3 kΩ
FOOT/DEF	1.6 kΩ
B/L	0.7 kΩ
VENT	0Ω

Electrical Components Inspection (Cont'd)

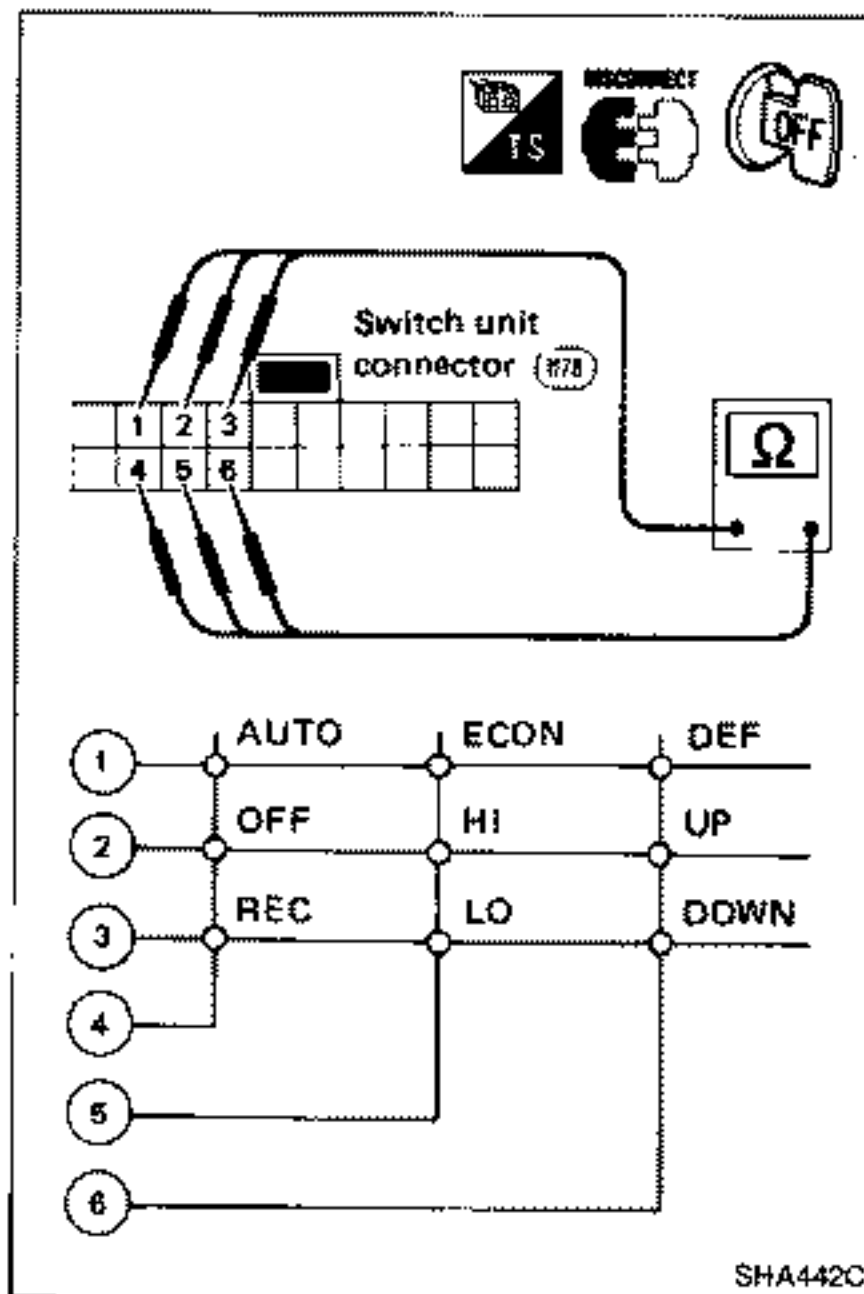
AIR CONDITIONER SWITCH UNIT

Check the resistance between switch unit connector terminals as follows:

Switch condition	Resistance
Press	Less than 500Ω
Free	∞

Example:

When Auto switch is pressed, the resistance between terminal No. ① and ④ is less than 500Ω.



BLOWER MOTOR

- Refer to page HA-92.

RELAY

- Refer to page HA-93.

LOW-PRESSURE SWITCH

- Refer to page HA-93.

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

General Specifications

COMPRESSOR

Model	HITACHI make MJS170
Type	Swash plate
Displacement cm ³ (cu in)/Rev.	170 (10.37)
Cylinder bore x stroke mm (in)	40.0 x 22.6 (1.575 x 0.890)
Direction of rotation	Clockwise (Viewed from drive end)
Drive belt	Poly V

LUBRICATION OIL

Model	HITACHI make MJS170
Type	SUNISO 5GS
Capacity ml (Imp fl oz)	
Total in system	150 (5.3)
Amount of oil which can be drained	Approx. 120 (4.2)
Compressor (Service parts) charging amount	150 (5.3)

REFRIGERANT

Type	R-12
Capacity kg (lb)	
VG30DE engine model	0.85 - 0.95 (1.87 - 2.09)
VG30DETT engine model	0.75 - 0.85 (1.65 - 1.87)

Inspection and Adjustment

ENGINE IDLING SPEED (When A/C is ON.)

- Refer to EF & EC section.

BELT TENSION

- Refer to Checking Drive Belts (MA section).

COMPRESSOR

Model	MJS170
Clutch disc-pulley clearance mm (in)	0.5 - 0.8 (0.020 - 0.031)