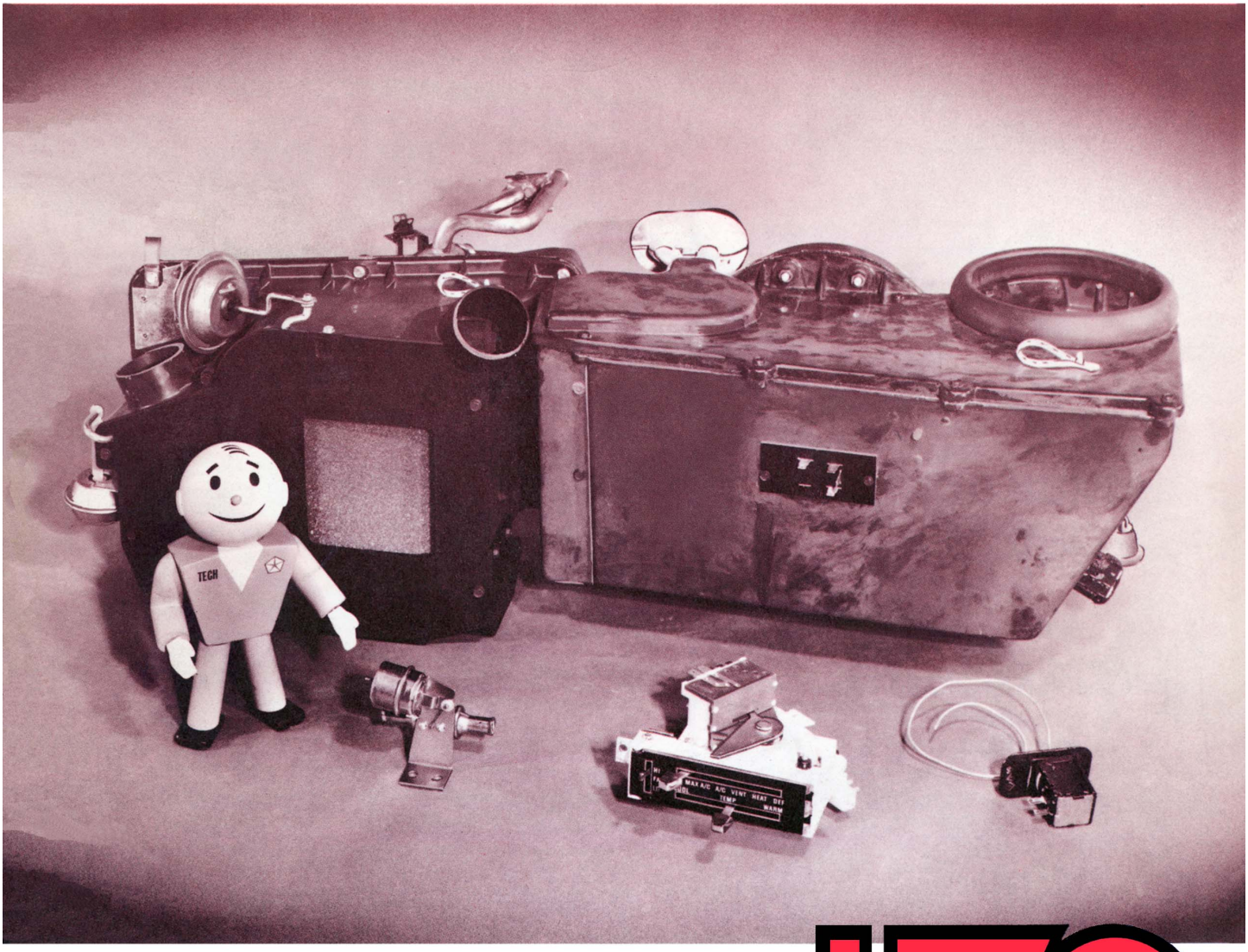
MASTER TECHNICIANS SERVICE CONFERENCE



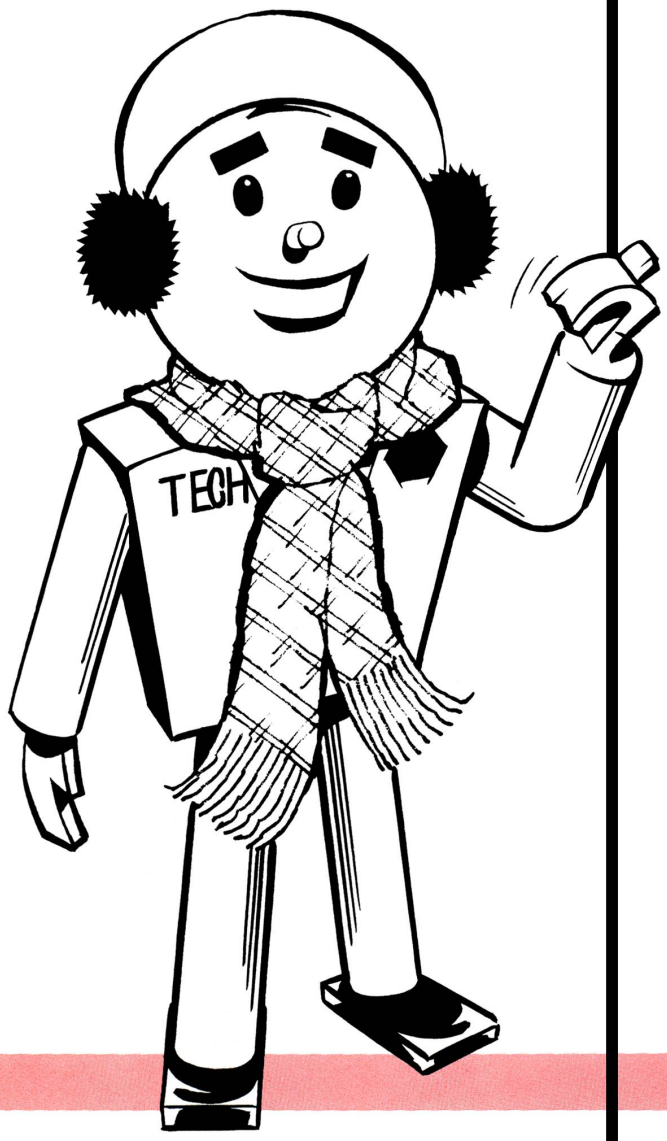
REFERENCE BOOK 4

'73

1973 VALIANT AND DART AIR CONDITIONING

PLYMOUTH · DODGE · CHRYSLER · IMPERIAL · DODGE TRUCK

CHRYSLER MOTORS CORPORATION



THIS IS WHAT IT'S ALL ABOUT. . .

The air-conditioning system for our 1973 compact models has been redesigned. The heating, cooling and ventilation functions have been completely integrated. This new system operates on the reheat principle to provide dehumidifying as well as heating and cooling.

For the first time a blend-air system is used to provide comfortable discharge air temperature for cooling, heating and ventilation. Although a blend-air door has been used to control discharge air temperature for heating, it has not been used for air conditioning and ventilation. So, this new unit is entirely different from the temperature control system used on our other models and on past model Valiants and Darts.

The objective of this reference book is to orient the technician to the air flow, temperature control and mode selection principles used with this new system. An understanding of exactly what *should* happen for every mode selected will provide the technician with the working knowledge he will need to diagnose and service the system.

TABLE OF CONTENTS

INTRODUCTION

The combination heater/air conditioner controls and directs air flow by opening and closing a series of doors. The blend-air door controls the temperature of the air delivered to the interior of the car by blending heated air with unheated air. The blend-air door position is controlled by a cable connected to the temperature control lever on the instrument panel. All of the other doors, as well as the water flow valve, are vacuum operated.

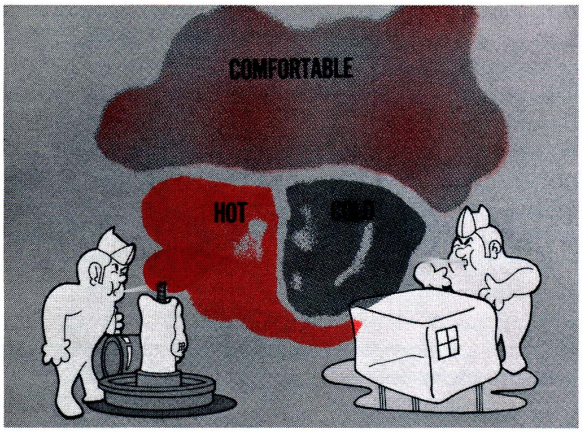


Fig. 1—Hot air plus cold air equals comfortable air

Fig. 2—The air-conditioning controls and air outlets

Three cooling air outlets are contained in one unit which is attached to the lower edge of the instrument panel. Each outlet can be adjusted independently to direct air up, down or to either side. Controls for the system consist of a mode lever, a temperature control lever and the fan or blower speed switch.

REFRIGERATION SYSTEM IS UNCHANGED . . . ALMOST!

The refrigeration part of the system is essentially the same as on past model compacts. Minimum evaporator temperature is still controlled by cycling the compressor clutch. However, clutch cycling is now used for the sole purpose of preventing evaporator freeze-up.

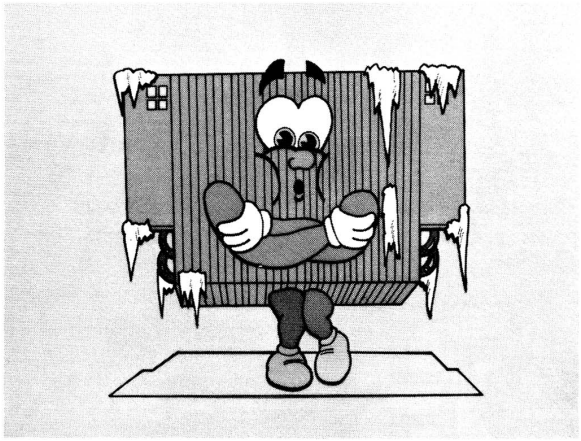


Fig. 3—Clutch cycling prevents evaporator freeze-up

If the refrigeration system were allowed to operate continuously, the evaporator would get so cold that moisture would freeze on the evaporator fins. Frost could build up and restrict air flow through the evaporator. To prevent this, the refrigeration system is turned off by disengaging the compressor clutch before the evaporator temperature drops below the frost point.

A WORD ABOUT PAST MODEL COMPACTS

Past model Valiants and Darts have an adjustable thermal switch. It has a temperature sensing tube inserted between the evaporator fins. This type of switch does two things. Since it

is adjustable, it is used to change the operating range of the refrigeration system and the temperature of the evaporator. Thus, the thermal switch determines the temperature of the air delivered to the car interior when cooling is called for. On these past models, a blend-air door is used to control temperature for heater and defroster operation only. In other words, the heating and cooling functions are not completely integrated.

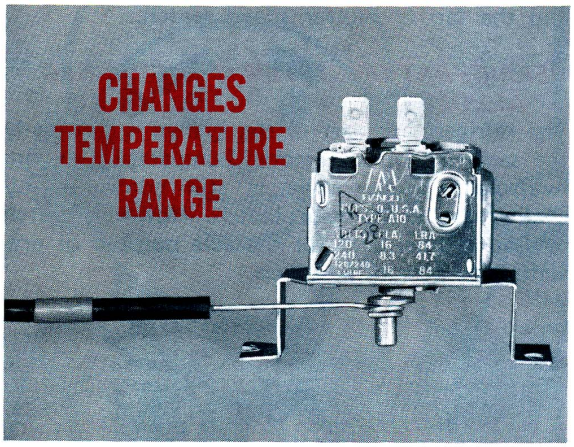


Fig. 4—Past-model adjustable thermal switch

The thermal switches used on past model compacts are calibrated to control minimum operating temperature. As a result, the thermal switch prevents evaporator frosting as well as adjusting the temperature operating range of the refrigeration system.

THE NON-ADJUSTABLE ANTIFREEZE SWITCH

On the 1973 compacts, the adjustable thermal switch has been replaced by a non-adjustable antifreeze switch. It opens the clutch circuit before the evaporator gets cold enough to cause frosting. The antifreeze switch opens the clutch circuit at about 33 degrees. It closes and engages the compressor clutch circuit again as soon as the evaporator temperature reaches about 38 degrees.

ANTIFREEZE SWITCH AND CLUTCH CIRCUIT TEST

You can use the suction gauge to check the operation of the antifreeze switch and the cycling of the compressor clutch. To establish conditions which will insure cycling of the clutch, the system should be operated on MAX A/C. Close all windows and doors and run the blower at low speed. This will put a minimum heat load on the evaporator so that it will get cold enough to open the antifreeze switch and disengage the compressor clutch.

The clutch should disengage when the suction pressure drops to approximately 12 to 20 p.s.i. The clutch should engage again as soon as the suction pressure increases to approximately 35 p.s.i.

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BASIC AIR FLOW CONTROL

Although the refrigeration changes in the 1973 air-conditioning system for compacts are minor, the air flow and temperature controls are entirely new. Figure 5 provides an overall orientation to the system components. For all operating conditions, except MAX A/C, outside air is drawn in through the grille and plenum chamber. These are an integral part of the body structure. Notice that the blower is now located between the evaporator and the heater core and all air must pass through the evaporator.

CONTROL STARTS AT THE INLET AIR DOOR

Air flow control starts at the inlet air door. In Figure 5 the inlet air door is positioned so that only outside air enters the system. For all operating modes, except MAX A/C, the system operates on outside air.

Figure 6 illustrates air flow for MAX A/C. The inlet air door is closing off outside air and has opened to inside or recirculated air. This door also closes off outside air flow when the selector lever is moved to the OFF position.

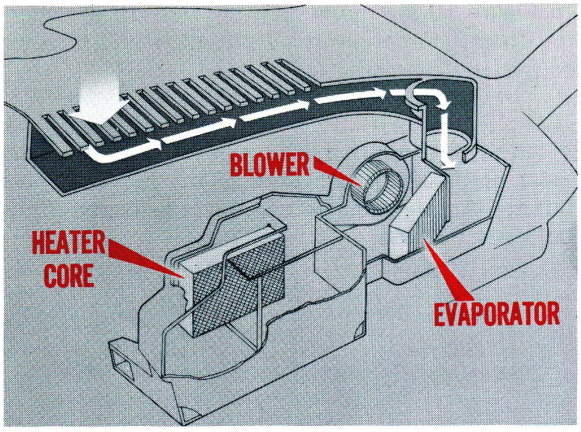

Fig. 5—Orientation to system components

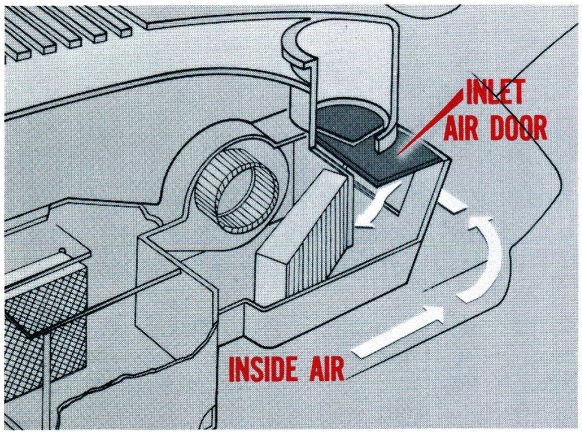

Fig. 6—Air door open to inside air

THE BLEND-AIR DOOR IS AN AIR FLOW SWITCH

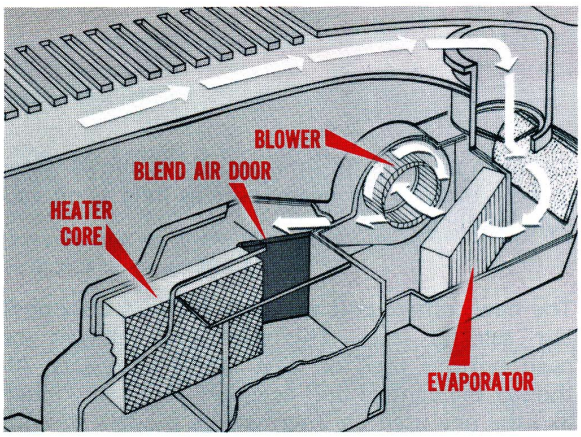

Fig. 7—All air passes through the evaporator

All air entering the system is pulled through the evaporator by the blower and then blown toward the blend-air door and the heater core. The blend-air door determines what portion of the air will be blown through the heater core and how much will bypass it. Blend-air door position is controlled mechanically by the temperature control lever on the instrument panel.

When the blend-air door is in the warm position, it directs all air through the heater core. This is the door position when maximum heat is called for.

Figure 8 illustrates air flow when the blend-air door is in the mid position. Part of the air is directed through the heater core. The remainder of the air bypasses the core without being heated. In other words, heated and unheated air are blended to obtain the temperature desired by the driver.

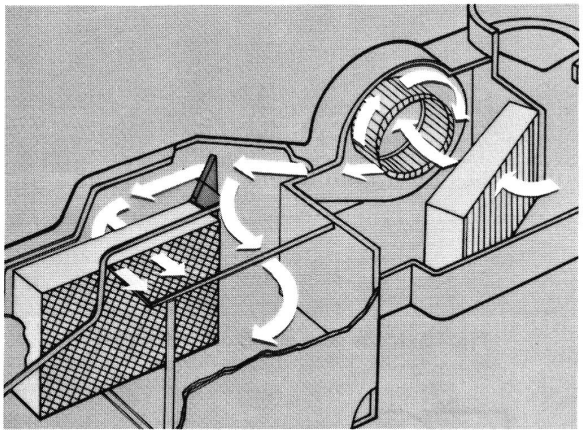

Fig. 8—Blend-air door in the mid position

In the cool position the blend-air door shuts off flow through the heater core. All air bypasses the heater core and is delivered to the distribution outlets without being heated.

THE AIR-CONDITIONING/HEAT DOOR

The air-conditioning/heat door is also referred to as the mode door. This door directs air to either the air-conditioning outlets or the heat and defroster outlets. For cooling and ventilation modes, air is delivered through the air-conditioning outlets. When warm air is called for, the mode door directs air flow to the heat and defroster outlets.

In Figure 9 the mode door is positioned so that the mode door is open. As a result, all air is delivered through the air-conditioning outlets.

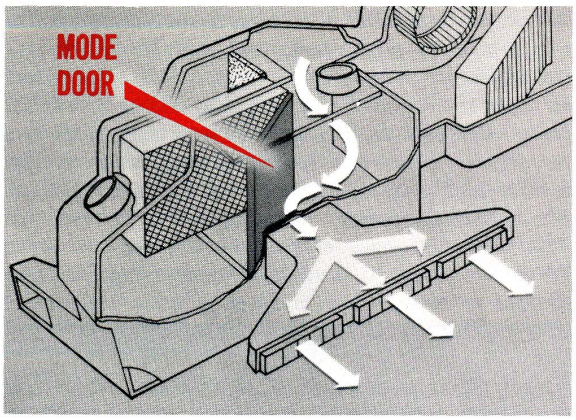

Fig. 9—Mode door open to the A/C outlets

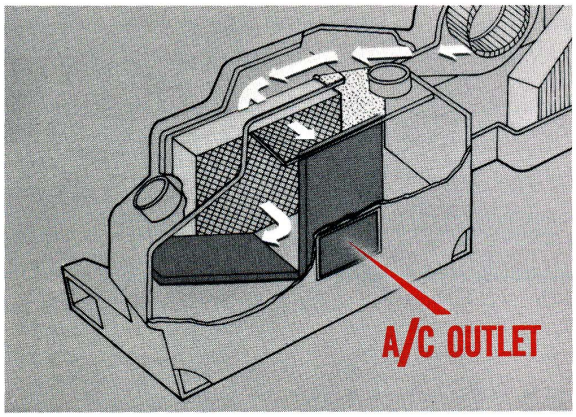

Fig. 10—Mode door closes off A/C outlet

In Figure 10 the mode door has shut off the opening to the air-conditioning outlets. Air is directed to the heat/defrost door.

THE HEAT/DEFROST DOOR

When the heat/defrost door is in the "up" position, most of the air is delivered to the low-level heat outlets. A much smaller amount is delivered to the defroster outlets.

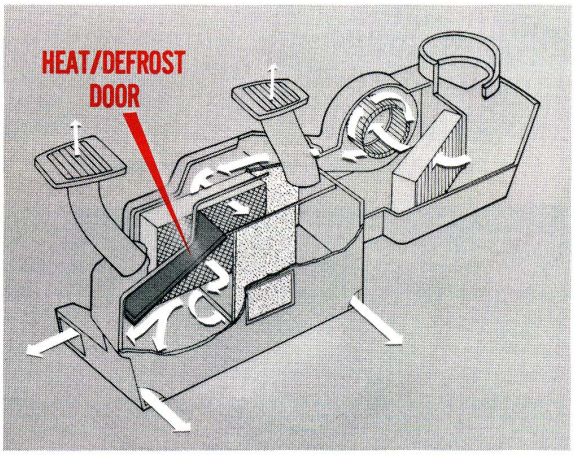

Fig. 11—Heat/Defrost door in the HEAT position

In the "down" position the heat/defrost door directs most of the air upward to the defroster outlets. A smaller amount of air is directed to the low-level heat outlets.

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SYSTEM COMPONENTS AND CIRCUITS

So far we have covered the basic air flow and the various doors used to direct air through the system. Next, let's get acquainted with the controls and the hardware so you'll know what the control levers, switches, vacuum actuators and doors actually look like.

THE WATER FLOW VALVE

An "ON" or "OFF" water valve is used. It does not adjust the amount of water flowing through the heater core. This new valve is spring-loaded in the open position. In other words, it allows water to flow through the heater core as long as no vacuum is applied to it.

SELECTOR LEVER REPLACES PUSH BUTTONS

The new control unit assembly features a six-position selector lever. This slide lever replaces the push buttons used on past model compacts. Although the control unit assembly looks very much like the one used on intermediate models, it is different — it has a vacuum transfer switch. The oper-

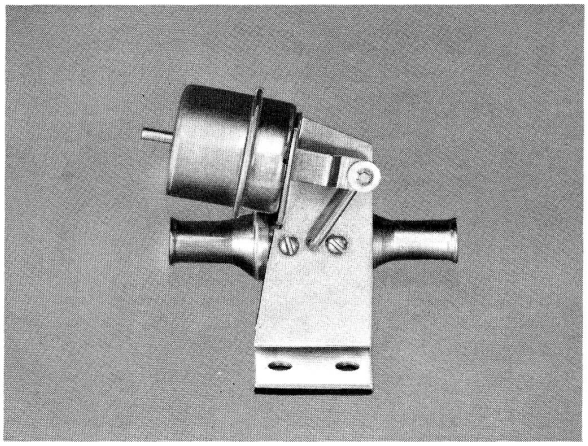


Fig. 12—Vacuum-operated water flow valve

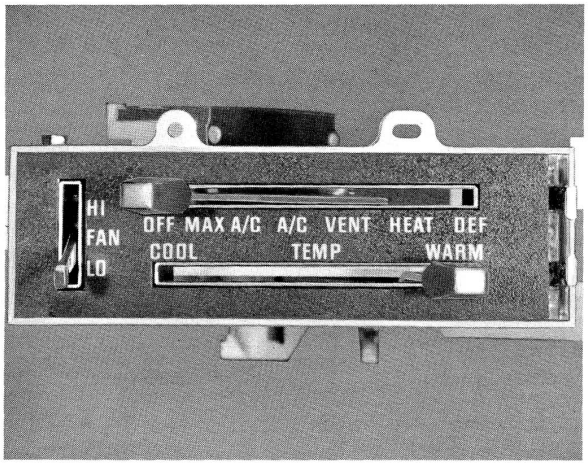


Fig. 13—Mode lever has six operating positions

ating positions or modes are OFF . . . MAX A/C . . . A/C . . . VENT . . . HEAT . . . and DEFROST. As was pointed out earlier, VENT or outside air ventilation has now been completely integrated into the system.

The fan switch is located at the left in Figure 13. This switch permits selection of HIGH . . . MEDIUM . . . or LOW blower speed. The fan operates at one of these speeds for all positions of the selector lever except OFF.

COMBINATION ELECTRIC/VACUUM SWITCH

The selector lever is mechanically connected to a combination electrical and vacuum switch. The electrical portion of the switch turns the compressor clutch and blower motor *feed* circuits off and on depending on the mode selected.

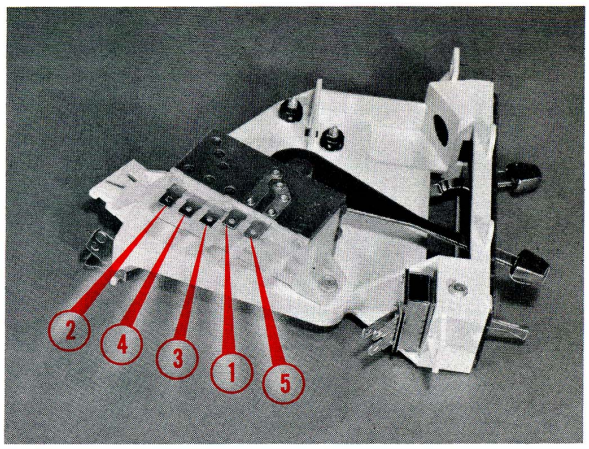


Fig. 14—Combination electrical and vacuum control switch

There are actually two input or feed terminals at the switch. The terminal at the right (5), in Figure 14, is for the blower circuits. The second terminal from the right (1) is the input for the compressor clutch circuit.

Two switch input terminals are used so that the blower and clutch circuits are independent of each other and can be protected by separate fuses. The terminal at the far left (2) is the output terminal leading to the antifreeze switch and the compressor clutch. The remaining two terminals are blower feed terminals. Of these, the second terminal from the left (4) feeds the blower switch directly without going through the resistor block. This circuit provides higher blower speeds when a cooling mode is selected.

The center or remaining terminal (3) feeds a circuit which goes through one of the resistors in the resistor block before going to the blower switch. This circuit is activated when a heating mode is selected and results in somewhat lower blower speeds than those provided for cooling. The electrical control circuit details are shown in the wiring diagram at the end of the book.

THE VACUUM PART OF THE SWITCH

The vacuum part of the switch controls the vacuum circuits for the door actuators and the vacuum-operated water valve. Figure 15 is the vacuum connector for the vacuum part of the switch.

To assist you in troubleshooting, each of the seven vacuum connections have been numbered and the function of each of these circuits is identified as follows:

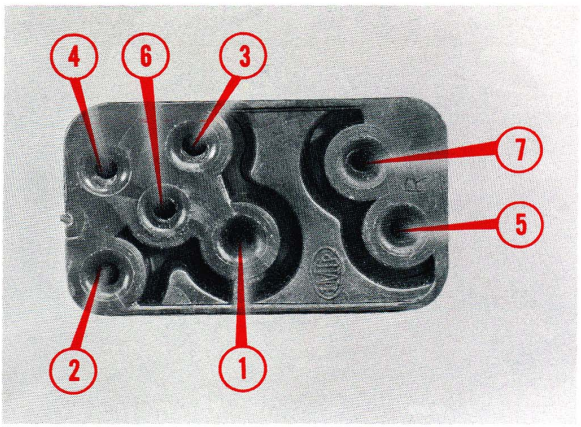


Fig. 15—Hose connector for vacuum control switch

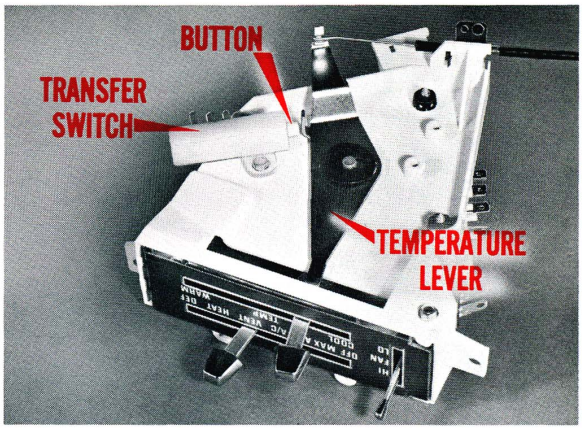


Fig. 16—Vacuum transfer switch in closed position

1. Plain Black Hose: To vacuum source at the reservoir.
2. White Hose Tracer: To *INLET AIR DOOR* actuator. Vacuum opens door to inside air.
3. Red Hose Tracer: To rod side of *INLET AIR DOOR* actuator. Vacuum opens door to outside door.
4. White Hose Tracer: To *MODE DOOR* actuator and vacuum transfer switch. Vacuum opens door to A/C outlets and supplies vacuum to the *TRANSFER SWITCH.*
5. Red Hose Tracer: To rod side of *MODE DOOR* actuator. Vacuum opens door to heat/defrost outlets.
6. Yellow Hose Tracer: To *DEFROSTER/HEAT DOOR* actuator. Vacuum opens door to heat outlets with bleed to defroster outlets.
7. Short Sealed Hose: Not used in this application.

THE TEMPERATURE CONTROL LEVER

The temperature control lever is connected to the blend-air door in the heater housing by a flexible cable. This lever also operates a vacuum transfer switch which routes vacuum to the water flow valve when the temperature control lever is moved all the way to the left and the mode lever is in the VENT . . . MAX A/C . . . A/C . . . or OFF position. Since the water valve is spring-loaded in the open position, applying vacuum closes it. This shuts off coolant flow to the heater core. In other words, routing water valve control vacuum through the transfer switch insures that the heater core will be cold when the temperature control lever is moved to the left. If water were allowed to flow through the heater core, some heat would be transferred to the air stream even when the blend-air door was in the full bypass position.

Moving the temperature control lever 1/4 or more of its travel to the right releases a button on the end of the transfer switch. This cuts off vacuum to the water flow valve. The spring opens the valve and coolant flows through the heater core. Moving the temperature selector lever to the right opens the water flow valve regardless of the position of the mode selector lever.

When HEAT or DEFROST is selected, no vacuum is supplied to the transfer switch. As a result, no vacuum is supplied to the water valve so the water valve remains open regardless of the position of the temperature selector lever.

THE INLET AIR DOOR

Inlet air door position is determined by a vacuum

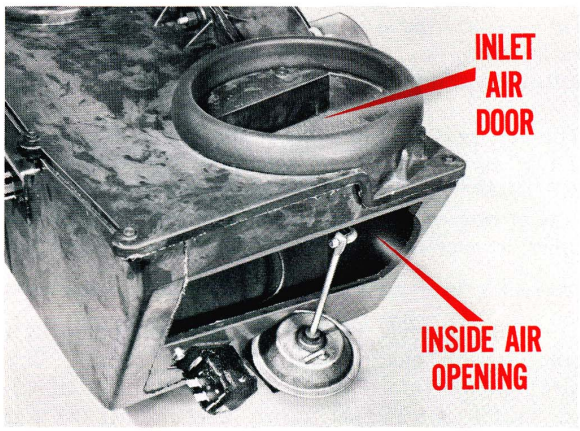


Fig. 17—Inlet air door closes outside air opening

actuator. Figure 17 shows the inlet air door positioned so that the outside air opening is closed and the inside or recirculating air opening is open.

Applying vacuum to the rod side of the inlet air door actuator opens the door to outside air and shuts off the inside air opening at the end of the evaporator housing. The inlet air door is open to outside air and closed to inside air for all operating modes except MAX A/C. Of course it is also closed to outside air flow when the selector lever is moved to OFF. Applying vacuum to the other side of the actuator moves the door so that the system is open to inside air and closed to outside air. This is the inlet air door position for MAX A/C and OFF.

ANTIFREEZE SWITCH

The antifreeze switch is located adjacent to the inlet air door actuator. As you can see in Figure 18, it is covered with a thermoplastic material to minimize its sensitivity to changes in the temperature of the surrounding air. This switch gets its temperature signals from a tube inserted between the fins of the evaporator.

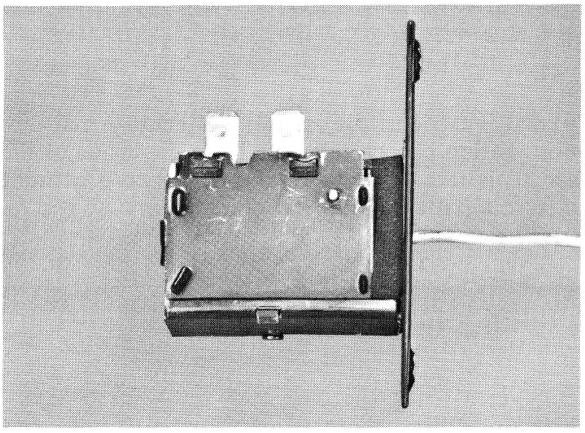


Fig. 18—The new evaporator antifreeze switch

BLOWER CIRCUIT RESISTOR BLOCK

The resistor block for the blower circuit is mounted on the passenger side of the evaporator housing. In this location it is readily accessible for service.

THE EVAPORATOR HOUSING ASSEMBLY

In designing this new air-conditioning system a great deal of thought has been given to accessibility and serviceability. The entire evaporator housing assembly can be removed from the car for service without disturbing the heater housing, heater core or blower.

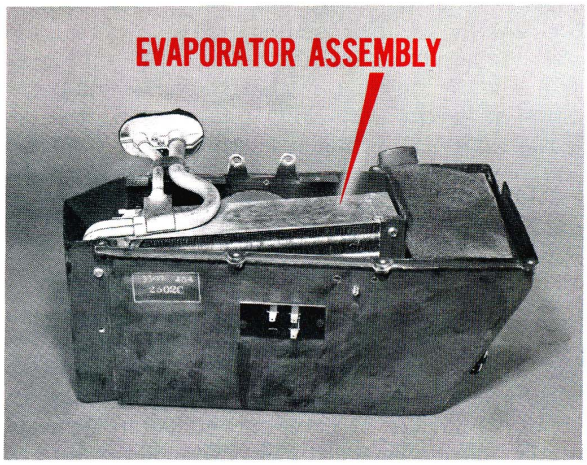


Fig. 19—The evaporator housing is made in two parts

The evaporator housing is made in two parts. The upper or cover part can be removed allowing easy access to the evaporator.

The evaporator housing is referred to as a bathtub design. That's because it is deep enough to collect moisture condensate that runs off the evaporator and like a tub, it has no seams which might develop a leak.

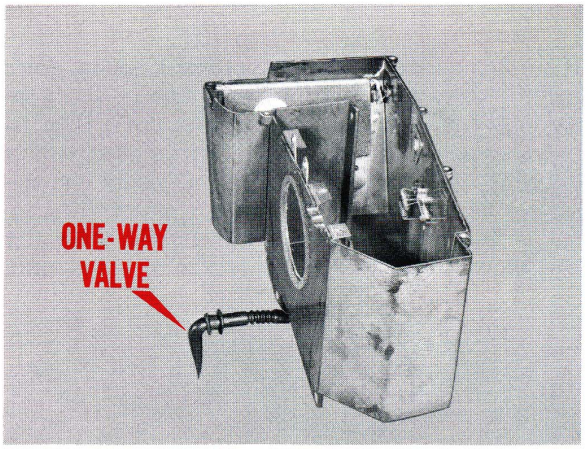


Fig. 20—The evaporator housing has no seams

The rubber evaporator drain tube is a one-way valve. When a sufficient amount of water collects in the bottom of the evaporator housing, the weight of this water opens the closure at the end of the drain tube. The tip of the drain tube automatically closes as soon as the water has drained out to prevent hot air and engine fumes from entering the system and the car interior.

Incidentally, locating the evaporator on the suction side of the blower and the heater core on the pressure side of the blower greatly reduces the possibility of evaporator condensate reaching the defroster outlets. Condensed moisture is collected and drained from the evaporator housing by the one-way drain tube, located on the suction side of the system.

DRAIN TUBE SERVICE TIPS

If the air-conditioning system is not operated for a long period of time there is a possibility that engine heat will cause the tip of the drain tube to stick in the closed position. If this happens, an abnormal amount of water may collect in the evaporator housing before it exerts enough pressure to open the valve at the tip of the drain tube. This condition can easily be corrected by squeezing the tip of the tube to open it mechanically. Chances are that this will correct the sticking condition and the periodic flow of water through the tube will keep the valve from sticking again.

Another condition that may result in an abnormal amount of water collecting in the evaporator housing is a pinched drain tube. If the front compartment floor mat is incorrectly positioned, it can pinch the tube closed so that water cannot drain.

DON'T CUT THE DRAIN TUBE

If water collects in the evaporator housing, don't cut the valve tip from the drain tube or you'll introduce two new problems. If the drain tube remains open, air will be sucked into the evaporator housing. The resulting air flow will cause condensate to be picked up from the bottom of the evaporator housing. The blower will suck up this water and blow it into the discharge side of the system.

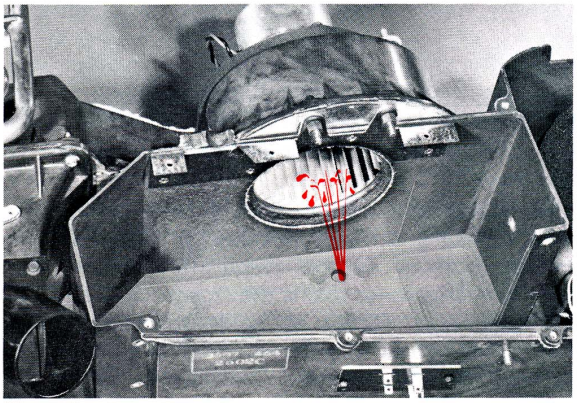


Fig. 21—An open drain tube could cause water problems

A leak in the drain tube can also reduce cooling efficiency. Since the drain is on the suction side of the blower and downstream from the evaporator, any hot air that is sucked in through the drain will go through the system without being cooled.

MORE SERVICEABILITY CONSIDERATIONS

The blower can be removed from the engine compartment side of the firewall without disturbing any of the other components.

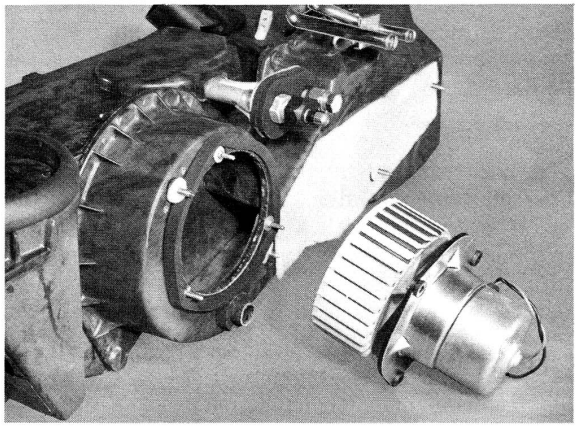


Fig. 22—The blower is removed from the engine side

At the left end of the assembly, the entire distribution section can be removed from the inside of the car. This lets you service the heater core without disturbing the evaporator or any part of the refrigeration system.

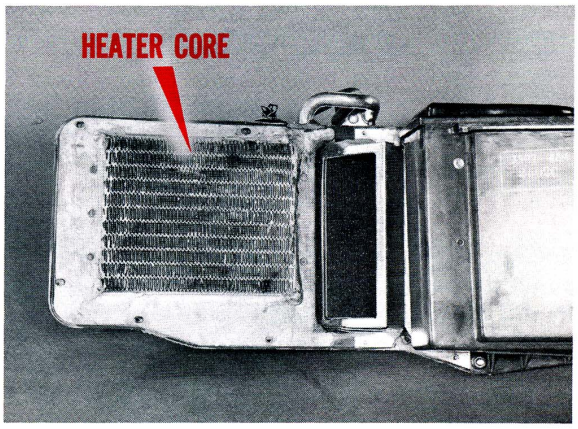


Fig. 23—The heater core is accessible for service

THE BLEND-AIR DOOR

As was pointed out earlier, the blend-air door controls discharge air temperature for cooling, heating

and ventilation by mixing heated air with unheated air. The blend-air door is connected by a flexible cable to the temperature control lever on the instrument panel.

Figure 24 shows the blend-air door in the full bypass position. All air will bypass the heater core and be delivered to the car interior without being heated. Of course, when the door is in this position the temperature control lever is all of the way to the left. Vacuum will be supplied to the water valve for all selector lever positions, except HEAT and DEFROST, so there will be no flow through the heater core and it will be cold.

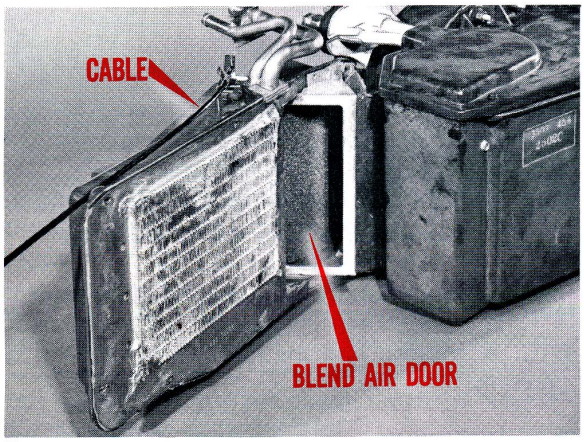


Fig. 24—The blend-air door is controlled by a cable

As the temperature control lever is moved to the right, more and more air flows through the heater core and less air bypasses it. Also, vacuum to the water valve will be cut off so the heater core will be warm.

MODE DOOR (AIR CONDITIONING/HEAT DOOR)

The mode door is controlled by a double-acting vacuum actuator. Vacuum applied to the rod side of the actuator closes the air-conditioning outlet opening so that all air is directed to the heat and defroster outlets.

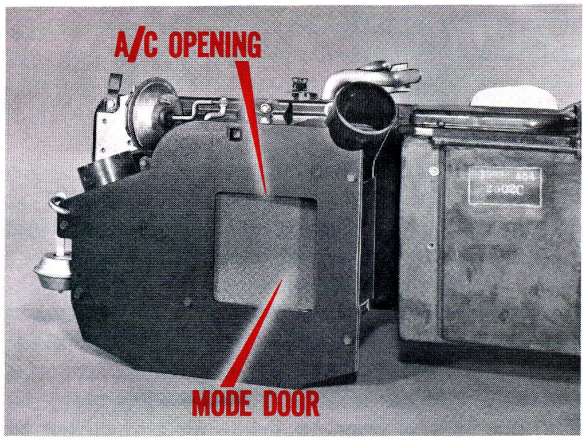


Fig. 25—Mode door closes off A/C outlet opening

Vacuum applied to the other side of the actuator shuts off air to the heat and defroster outlets . . . uncovers the opening leading to the air-conditioning outlets.

HEAT/DEFROST DOOR

The actuator which operates the Heat/Defrost door is spring-loaded and has only one vacuum connection. Vacuum pulls the door upward when HEAT is selected. A spring pushes the door downward when DEFROST is selected.

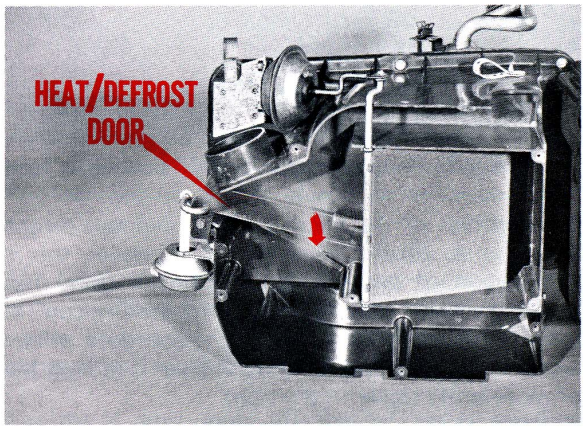
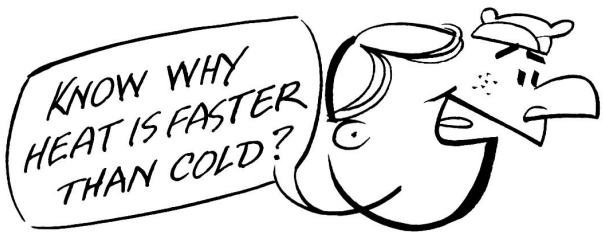


Fig. 26—Heat/Defrost door is spring-loaded



So far we have explained the basic air flow and have looked at the actual components. Now let's put it all together and review exactly what happens for each position of the selector lever.

SELECTOR LEVER IN THE "OFF" POSITION

When the selector lever is in the OFF position, the inlet air door is open to inside air and closed to outside air. The evaporator is warm and the blower is turned off because the electrical feed circuits are not closed.

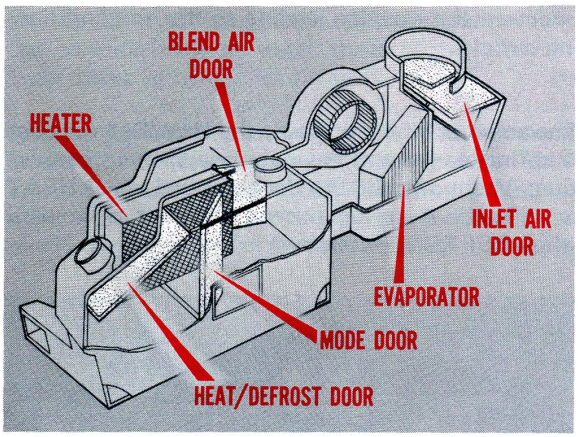


Fig. 27—Selector lever in the OFF position

The position of the blend-air door depends on the temperature control lever setting. However, this is not important because there is no air flow. The heater core will be cold if the temperature control lever is at the left. Of course the heater core will be warm if the temperature control lever is moved 1/4 or more of its travel to the right.

The heat/defrost door is up . . . in the heat position and the mode door has uncovered the air-conditioning outlet opening. Here again, door position is not important because there is no air flow.

SELECTOR LEVER IN THE "MAX A/C" POSITION

When MAX A/C is selected, the inlet air door uncovers the inside air opening and shuts off all outside air. The evaporator is cold because the electrical circuits have been completed, the compressor clutch is engaged and the refrigeration system is operating.

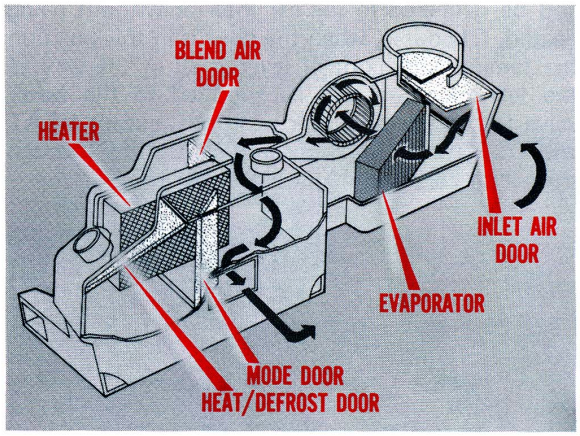


Fig. 28—Selector lever in the MAX A/C position

To obtain the maximum amount of cooling, the blend-air door would cut off all air flow through the heater core. The heater core would be cold because for maximum cooling the water valve would be closed. However, if the temperature lever is moved to the right more than 1/4 of its travel, vacuum from the transfer switch will open the water valve. At the same time, the blend-air door will route some of the air through the heater core. In other words, at least a portion of the air will be reheated. If the temperature control lever is moved all of the way to the right, all of the air will be reheated and maximum dehumidification will be provided.

The mode door is positioned to direct all air flow to the air-conditioning outlets. The heat/defrost door is in the "up" or heat position but the mode door has shut off all flow to the heat and defroster outlets.

SELECTOR LEVER IN THE "A/C" POSITION

When A/C is selected, the inlet air door is opened to outside air. All other conditions are essentially

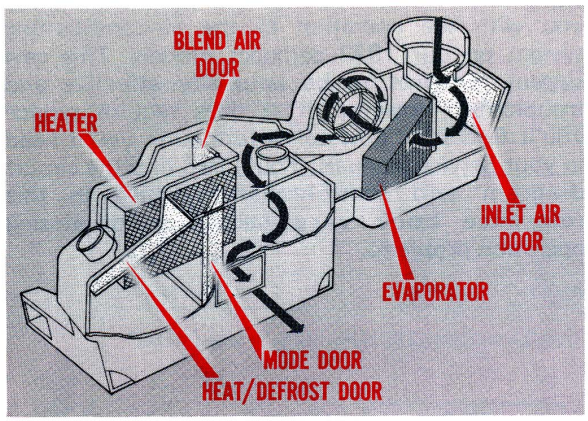


Fig. 29—Selector lever in the A/C position

the same as for MAX A/C. The evaporator is cold. The position of the blend-air door depends on how much cooling or how much reheat is desired. The heater core will not be hot unless reheat and reduced cooling is preferred. And of course the mode door will be positioned so that all air is delivered through the air-conditioning outlets.

SELECTOR LEVER IN THE "VENT" POSITION

When outside air ventilation is selected, the system operates on outside air . . . the same as it does when A/C is selected. However, the evaporator will not be cold because the clutch circuit is open and the compressor is not running.

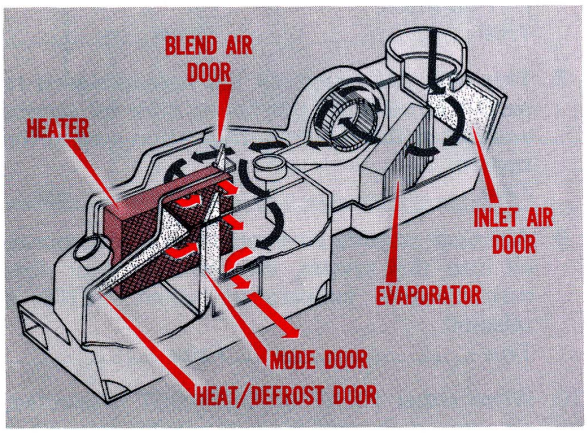


Fig. 30—Selector lever in the VENT position

The blower feed circuit is closed so the blower operates at the speed selected. This provides positive forced-air ventilation. The blend-air door is controlled by the temperature control lever. The heater core will be cold if the temperature control lever is moved to the left. Moving the temperature control lever to the right opens the water valve. In other words, you can have heated fresh-air ventilation and the blend-air door will control the temperature of the ventilating air. However, the mode door will be positioned so that all air will be delivered through the air-conditioning outlets. This is the big difference between the VENT mode and the HEAT mode.

SELECTOR LEVER IN THE "HEAT" POSITION

When heat is selected, the system operates on outside air. There is no cooling at the evaporator because the compressor clutch feed circuit is open. The blower operates at the speed selected.

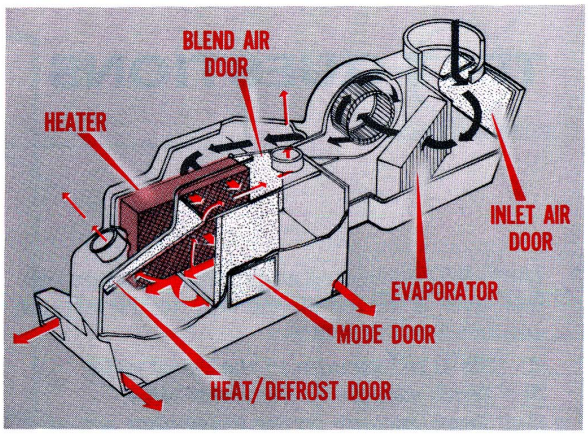


Fig. 31—Selector lever in the HEAT position

The temperature lever and blend-air door control air flow through or around the heater core. For full heat all air will be directed through the heater core. For reduced heat, part of the air will bypass the heater core.

The heater core will be hot because the water valve is open. That's because vacuum to the transfer switch and thus to the water valve is cut off when either HEAT or DEFROST is selected.

The mode door shuts off the A/C outlet opening and directs all air flow to the heat/defrost door. This door will be in the "up" position so that most of the air will be delivered through the low-level heat outlets. A small amount of air will be delivered through the defroster outlets.

SELECTOR LEVER IN THE "DEFROST" POSITION

All operating conditions and air flow for DE-

FROST is the same as for HEAT with the exception of the final distribution of the air to the car interior. For DEFROST, the heat/defrost door directs most of the heat to the defroster outlets and much less to the low-level heat outlets.

IN CONCLUSION

The purpose of this Tech session is to familiarize you with the operation of the air-conditioning system on our 1973 compact models. This new system promises to be unusually effective and troublefree. However, if it does require service you'll find the "how to" information you'll need in your Service Manuals. You'll also find the circuit diagram and control chart supplied in this reference book very helpful in diagnosing operation problems.

TEST QUESTIONS

1. When A/C is selected and the temperature control lever is moved all the way to the left, the vacuum transfer switch:
   A. Shuts off vacuum to the water valve.
   B. Sends vacuum to the water valve.
   C. Sends vacuum to the mode door actuator.

2. If the vacuum hose with white tracer is disconnected from the inlet air door actuator, the inlet air door:
   A. Will not shut off outside air when OFF is selected.
   B. Will shut off outside air when HEAT is selected.
   C. Will shut off outside air when OFF is selected.

3. If the sensing tube of the antifreeze switch is not inserted between the fins of the evaporator:
   A. The compressor clutch will not engage.
   B. Operating suction pressure will be lower than the 12 to 20 p.s.i. range.
   C. Evaporator temperature will be higher than 38 degrees.

4. The A/C system for 1973 compact models features an adjustable antifreeze switch which controls discharge air temperature.
   True _____ *False* _____

5. The blend-air door mixes inside with outside air to provide more heat in extremely cold weather.
   True _____ *False* _____

6. The new water flow valve is spring-loaded in the open position and closes when vacuum is applied to it.
   True _____ *False* _____

7. Moving the temperature selector at least 1/4 of its travel to the right opens the water flow valve even when the mode selector is in the OFF position.
   True _____ *False* _____

8. This new A/C assembly has been designed to permit removal of the heater core for service without disturbing the refrigeration part of the system.
   True _____ *False* _____

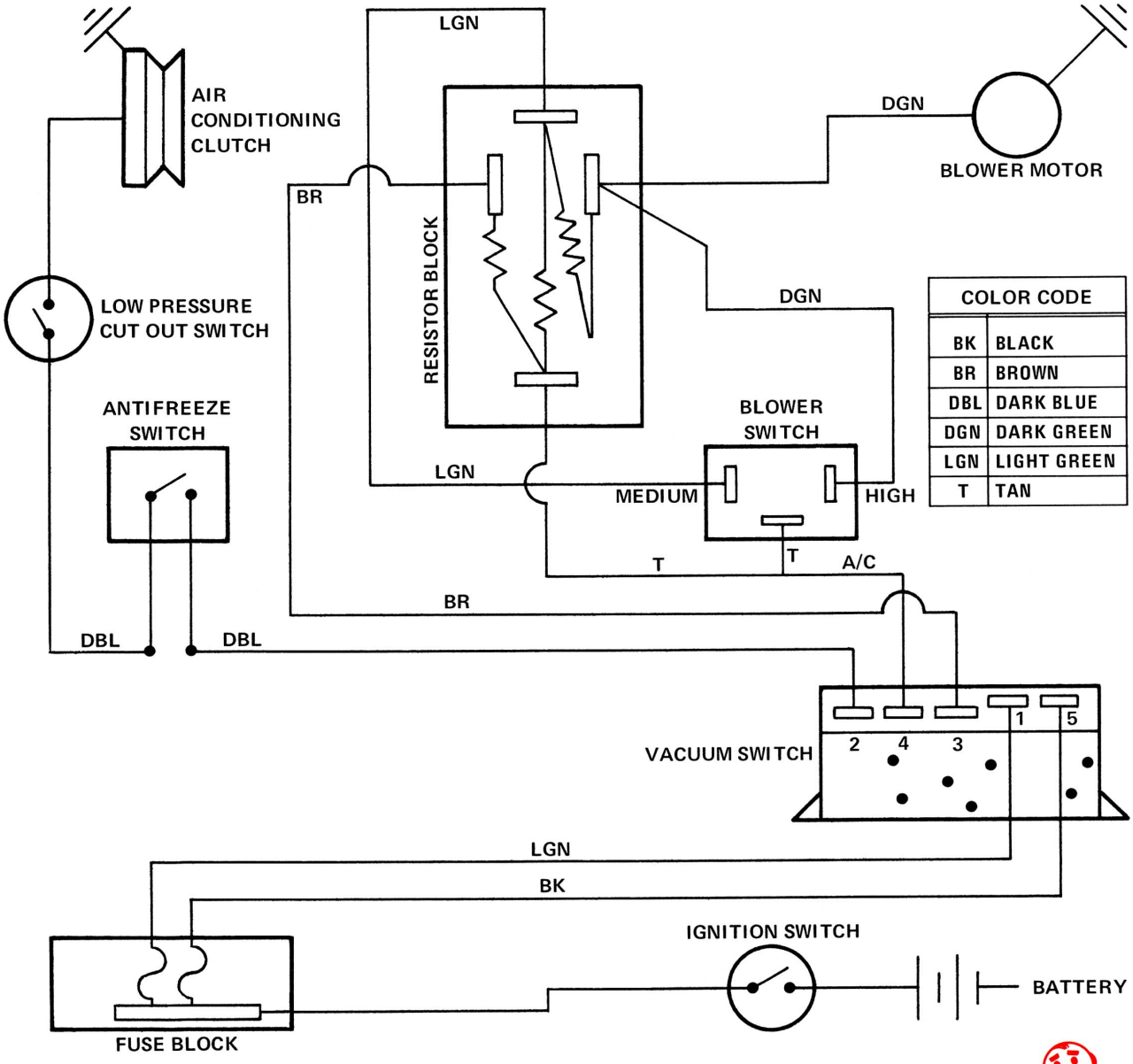
9. Although outside air ventilation is incorporated into this system, the blend-air door does not control temperature when VENT is selected.
   True _____ *False* _____

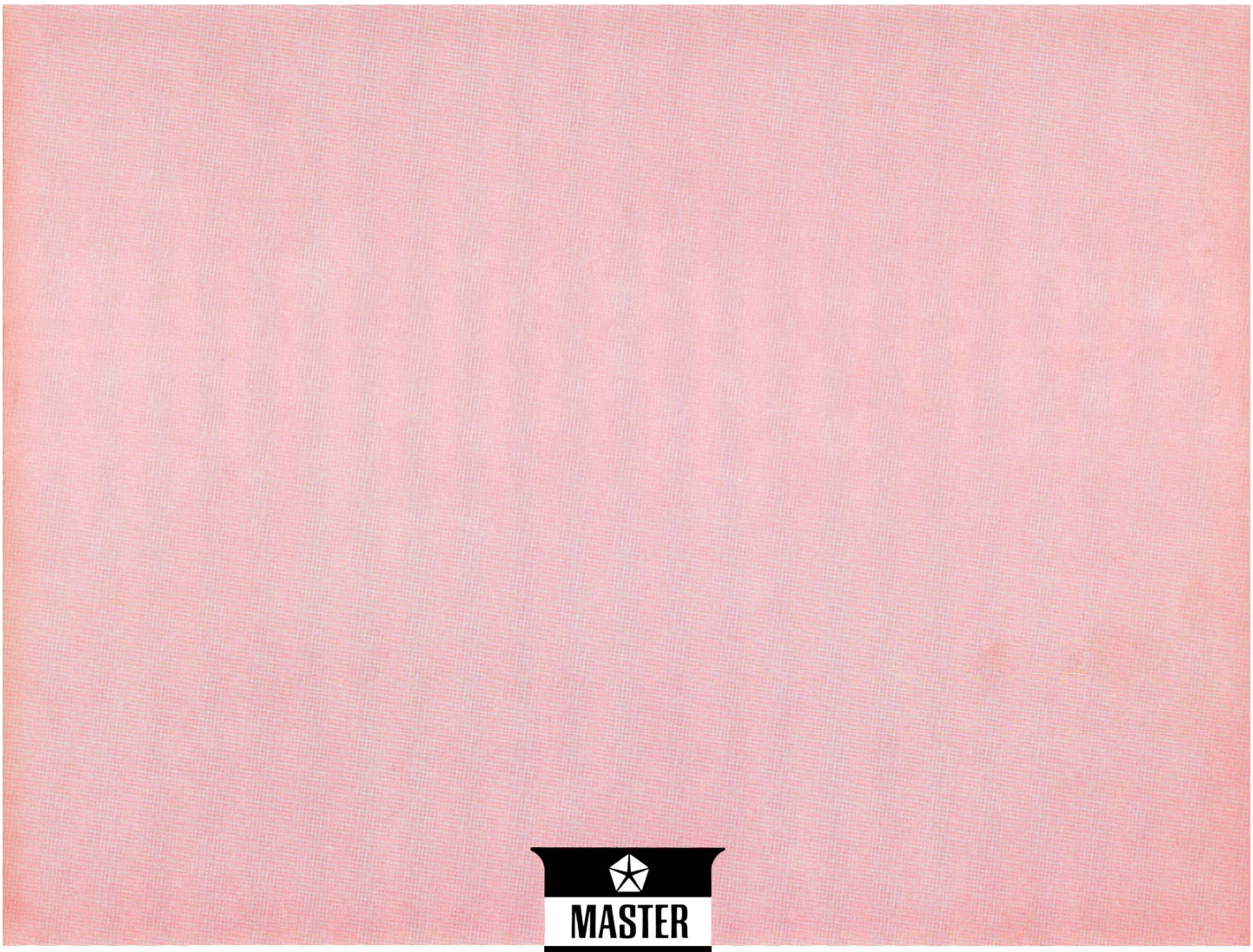
10. When either HEAT or DEFROST is selected, no vacuum is applied to the water valve so it remains open, permitting coolant flow through the heater core.
    True _____ *False* _____

CONTROL CHART

Control Position	Off	Max. A/C	A/C	Vent	Heat	Defrost
Inlet Air Door (Open To)	Inside	Inside	Outside	Outside	Outside	Outside
Mode Door (Open To)	A/C	A/C	A/C	A/C	Heat	Heat
Heat Defrost (Open To)	Heat	Heat	Heat	Heat	Heat	Defrost
Compressor Clutch	Off	On	On	Off	Off	Off
Blower Motor	Off	On	On	On	On	On
Water Valve	Closed*	Closed*	Closed*	Closed*	Open	Open

**Water valve is open when temperature control lever is moved 1/4 to the right.*





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