REFRIGERANT COMPONENTS ALL SERIES

CONTENTS

DESCRIPTION AND OPERATION

OPERATION OF AIR CONDITIONER PORTION OF SYSTEM

The state of the refrigerant at the inlet port of the compressor is a low pressure gas. The compressor compresses the gas into a high pressure, high temperature gas (See Figure 9B-104). Because of the increase in pressure, the heat in the gas has been concentrated and therefore is increased above the ambient (outside air) temperature. This heat in excess above the ambient temperature tends to dissipate itself. A condenser is utilized in the refrigeration circuit to provide a means whereby the heat of the refrigerant can be easily dissipated. The high pressure, high temperature (hot) gas flows through the condenser and is cooled and condensed to a high pressure liquid as it gives up its heat. From the condenser the high pressure liquid flows to the receiver-dehydrator and then to the expansion valve where the pressure is reduced and the liquid is allowed to expand in the evaporator. When the pressure is reduced the refrigerant will successively transform itself from a high pressure liquid to a low pressure liquid, and then to a low pressure gas. As the low pressure liquid expands and becomes a low pressure gas it absorbs heat. To satisfy the refrigerant demand for heat, the air passing over the evaporator gives up heat to the evaporator and in doing so, is cooled.

The low pressure gas returns to the inlet port of the compressor (the original starting point) where the cycle just described repeats itself. Although the foregoing description holds true in actual system operation, it should be qualified insofar as whenever the compressor is running, a portion of the refrigerant remains in a liquid state and consequently there is a certain amount of continuous liquid flow of refrigerant and oil throughout the system at all times during the refrigerating cycle.

DESCRIPTION OF AIR CONDITIONING COMPONENTS

Compressor

The compressor is located on the right side of the engine compartment. The purpose of the unit is to draw the low pressure gas from the evaporator and compress this gas into a high temperature, high pressure gas. This action will result in the refrigerant having a higher temperature than the surrounding air.

The compressor is of basic double action piston design. Three horizontal double acting pistons make up a six cylinder compressor (see Figure 9B-106). The pistons operate in 1-1/2 inch bore and have a 1-1/8 inch stroke. An axial plate keyed to the shaft drives the pistons. The shaft is belt driven through a magnetic clutch and pulley arrangement. An oil pump mounted at the rear of the compressor picks up oil from the bottom of the compressor and lubricates the bearings and other internal parts of the compressor.

Reed type valves at each end of the compressor open or close to control the flow of incoming and outgoing refrigerant. Two gas tight passages interconnect chambers of the front and rear heads so that there is one common suction port, and one common discharge port. The internal parts of the compressor function as follows:

1. Suction Valve Reed Discs and Discharge Valve Plates - The two suction valve reed discs and two discharge valve plates (see Figure 9B-1) operate in a similar but opposite manner. The discs are composed of three reeds and function to open when the pistons are on the intake portion of their stroke (downstroke), and close on the compression stroke. The reeds allow low pressure gas to enter the cylinders. The discharge valve plates also have three reeds, however, they function to open when the pistons are on the compression portion of their stroke (upstroke), and close on the intake stroke. High pressure gas exits from the discharge ports in the discharge valve plate. Three retainers riveted directly above the reeds on the valve plate serve to limit the opening of the reeds on the compression stroke.

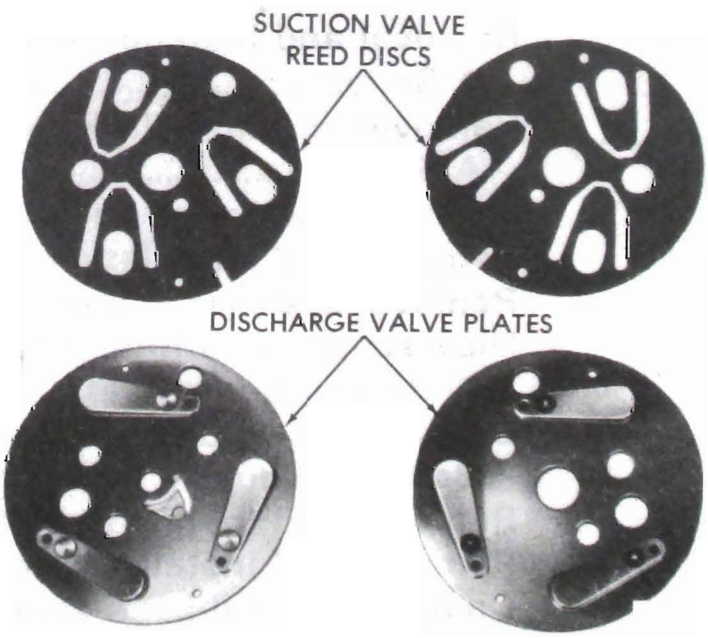


Figure 9B-1 Compressor Suction Valve Reed Discs and Discharge Valve Plates

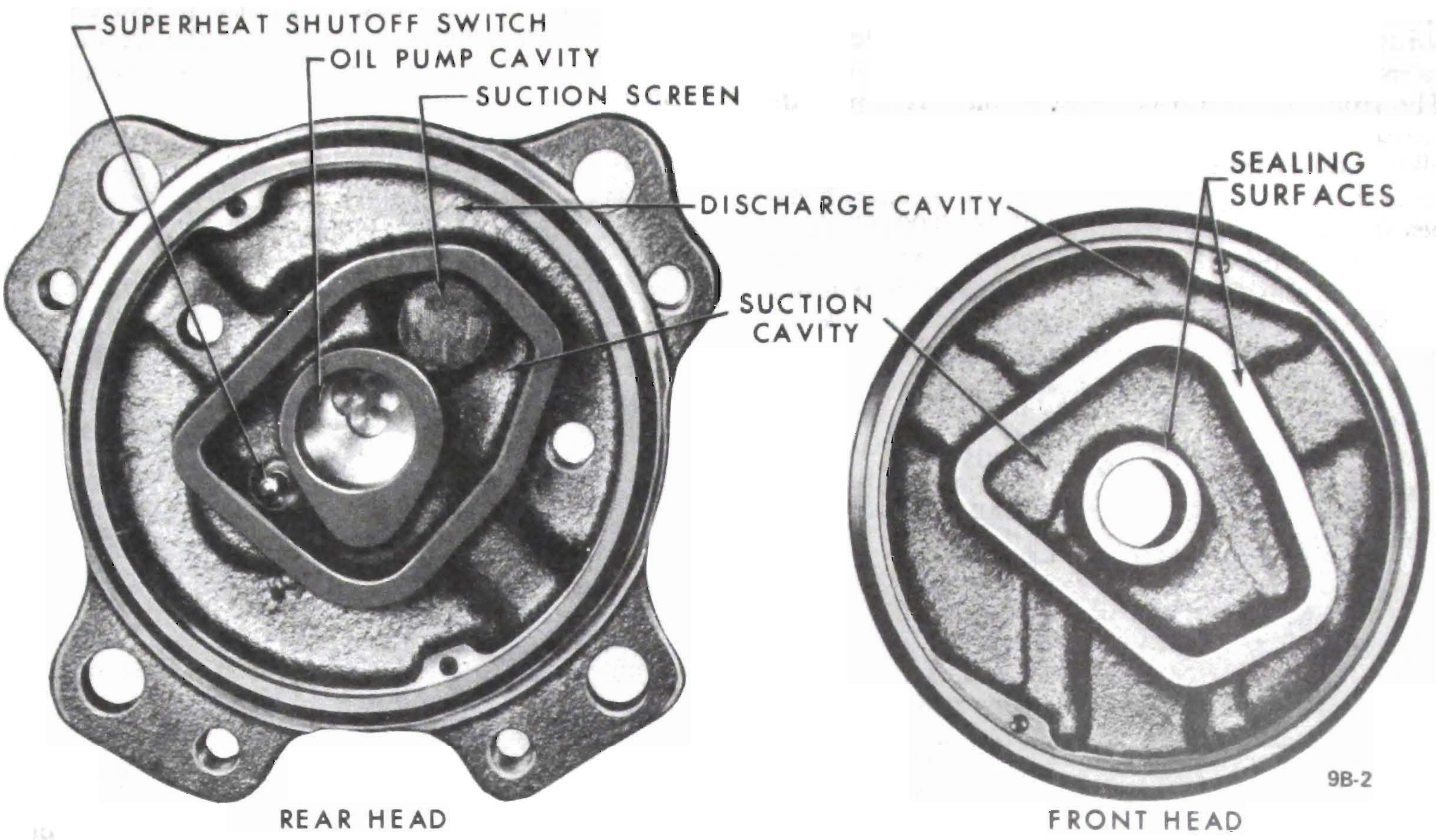


Figure 9B-2 Compressor Front and Rear Heads

2. Front and Rear Heads - The front and rear heads (Figure 9B-2) serve to channel the refrigerant into and out of the cylinders. The front head is divided into two separate passages and the rear head is divided into three separate passages. The outer passage on both the front and rear heads channels high pressure gas from the discharge valve reeds. The middle passage on both front and rear heads channels low pressure gas to the suction valve plate reeds. The middle passage of the rear head also contains the port opening to the superheat switch cavity. This opening in the rear head permits the superheat switch to be affected by suction gas pressure and suction gas temperature for the operating protection of the compressor. The inner passage on the rear head houses the oil pump inner and outer rotors. "O" rings are used to affect a seal between the mating surfaces of the heads and the shell. The front head suction and discharge passages are connected to the suction and discharge passages of the rear head by a discharge tube and suction passage in the body of the cylinder assembly. A screen located in the suction port of the rear head prevents foreign material from entering the circuit.

3. Oil Pump - An internal tooth outer rotor and external tooth inner rotor comprise the oil pump. The pump works on the principle of a rotary type pump. Oil is drawn up from oil reservoir in underside of shell through the oil inlet tube (see Figure 9B-3) and circulated through the system via a 3/16 inch diameter oil passage through the shaft center and also four 5/64 inch diameter holes drilled perpendicular to the shaft. The inner rotor is driven by the shaft.

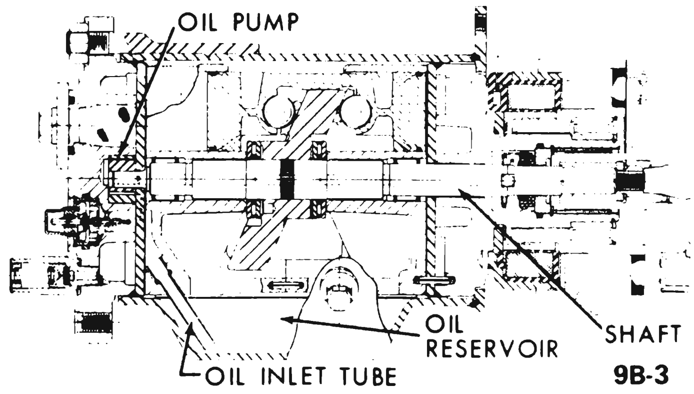


Figure 9B-3 Compresor Oil Flow

4. Shaft and Axial Plate Assembly - The shaft and axial plate assembly (see Figure 9B-106) consists of an elliptical plate positioned obliquely to the shaft. As the plate and shaft rotate, the surface of the plate moves to and fro lengthwise relative to the centerline of the shaft. This reciprocating motion is transmitted to the pistons which contact the surface of the axial plate. A woodruff key locks the axial plate onto the shaft. The axial plate and shaft are serviced as an assembly. The shaft is driven by a pulley when the magnetic clutch is energized. A needle thrust bearing and a mainshaft bearing support the shaft horizontally and vertically.

5. Needle Thrust Bearing and Races - Two needle thrust bearings, each "sandwiched" between two races are located on either side of the axial plate hub. The front needle thrust bearing and races provide 0.010" to 0.015" clearance between the top of the pistons and the rear side of the front suction valve reed disc (see Figure 9B-4). The rear needle thrust bearings and races provide 0.0005" to 0.0015" clearance between the hub of the axial plate and the rear hub of the rear cylinder. Races of various thicknesses are provided for service replacement to achieve required clearances when rebuilding units.

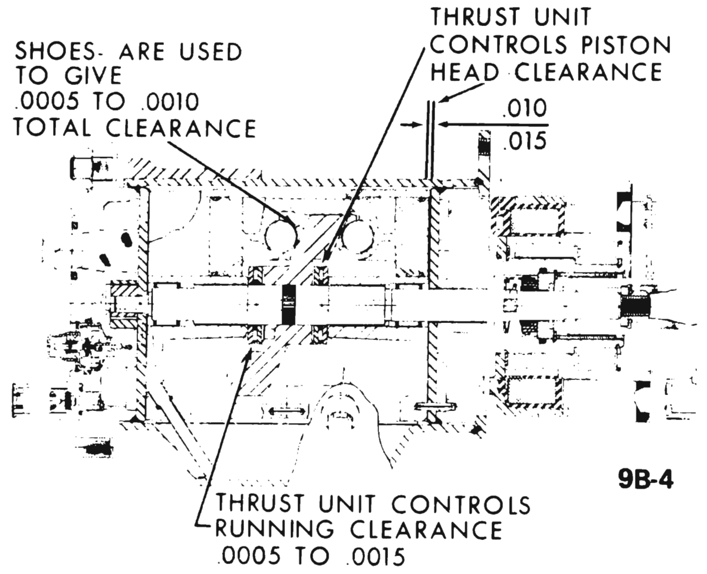


Figure 9B-4 Compressor Needle Thrust Bearings and Races

6. Cylinder Assembly and Pistons - The cylinder assembly (front cylinder and rear cylinder) is serviced only as a matched set. Alignment of the two halves is maintained by two dowel (locater) pins.

The double ended pistons are made of cast aluminum. There are two grooves on each end of the piston. The outer grooves will receive a piston ring. The inner grooves act as oil scraper grooves to collect any excess oil. Two oil return holes are drilled into the scraper grooves and allow oil to drain back into the reservoir.

7. Shoe Discs - The shoe discs are made of bronze and act as a bearing between the ball and the axial plate. An oil circulation hole is provided through the center of each shoe for lubrication purposes. These shoes are of various thicknesses and are provided in 0.0005 inch increments. Ten sizes are available for service replacement. A basic "zero" shoe size is available for preliminary gauging procedures when rebuilding a cylinder assembly.

8. Suction Passage Cover - The suction passage cover fits over a suction passage (see Figure 9B-5) in the body of the cylinder assembly. Low pressure vapor flows from the suction port through the suction passage in the cylinder assembly, and into the suction cavity of the front head.

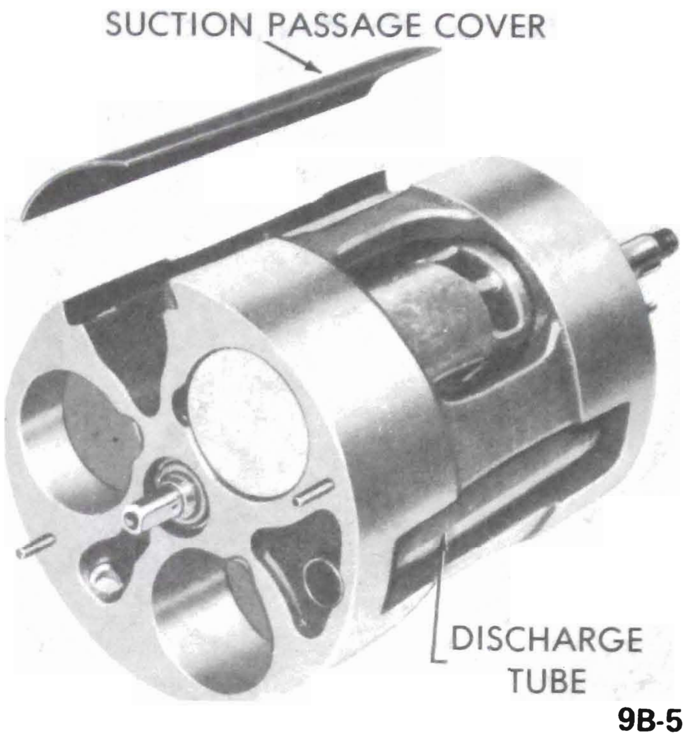


Figure 9B-5 Suction Passage and Discharge Tube

9. Discharge Tube - The discharge tube is used to connect the discharge cavity in the front head with the discharge cavity in the rear head. High pressure vapor discharge is channeled via the tube to the discharge cavity and port. A slightly modified discharge tube is provided to be used as a service replacement (see Figure 9B-6). The service replacement tube has a reduced end and a built up shoulder to accommodate an "O" ring and bushing. These added parts achieve the necessary sealing of the high pressure vapor within the compressor.

10. Pressure Relief Valve - The purpose of the pressure relief valve is to prevent the discharge pressure from exceeding 440 psi. Opening of the pressure relief valve will be accompanied by a loud popping noise and the ejection of some refrigerant from the valve. If the pressure relief valve is actuated due to excessive pressures in the compressor, the cause of the malfunction should be corrected immediately. The pressure relief valve is located on the rear head of the compressor.

11. Shell and Oil Drain Screw - The shell of the compressor contains a reservoir which furnishes a continuous supply of oil to the moving parts of the compressor. A baffle plate covers the reservoir and is tack-welded to the inside of the shell. In addition an oil drain screw and gasket are located on the side of the reservoir and are provided for draining or adding of oil to system. To add oil, compressor must be removed from car. The necessity to add oil should only be required when the system has ruptured vio-

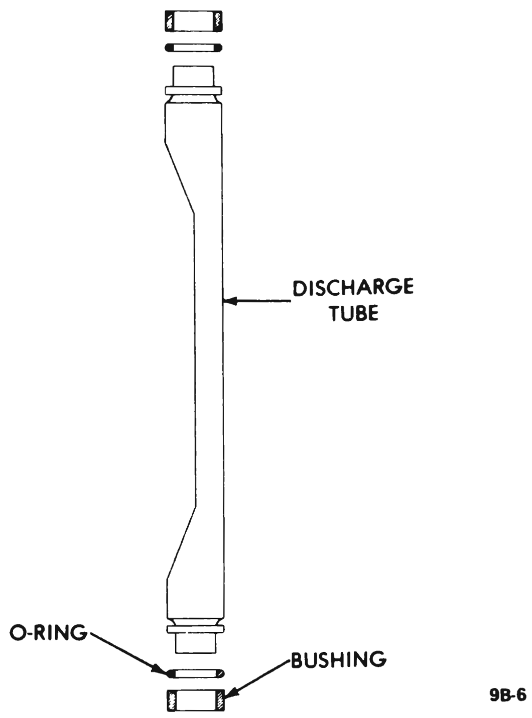


Figure 9B-6 Service Replacement Discharge Tube

lently and oil has been lost along with refrigerant. Under controlled conditions or slow leak conditions it is possible to loose only a small amount of oil with the refrigerant gas. The serial number, part or model number, and rating of the compressor is stamped on name plates located on top of shell.

12. Magnetic Clutch and Pulley Assembly - The magnetic clutch and pulley assembly (see Figure 9B-7) together transmit power from the engine crankshaft to the compressor. The magnetic clutch is actuated when the air conditioning clutch compressor switch and the fan switch located on the instrument panel control assembly are closed. When the switches are closed, the coil sets up a magnetic field and attracts the armature plate (movable element of the clutch driven plate). The armature plate portion of the clutch driven plate moves forward and contacts the friction surface of the pulley assembly, thereby mechanically linking the compressor to the engine. The compressor will operate continuously whenever the air conditioner clutch compressor switch and the fan switch are closed. When one or both of the switches are open the armature plate will be released due to spring tension and move away from the pulley assembly. This allows the pulley to rotate without driving the shaft. It should be noted that if the air conditioner system was in use when the engine was turned off, the armature plate may remain in contact with the pulley due to residual magnetism. When the engine is started the armature plate will separate from the pulley assembly. The coil is rated at 3.85 ohms (85 degrees F.) and will draw 3.2 amperes at 12 volts D.C.

Muffler

A muffler is located on the discharge line side of the compressor. The muffler acts to reduce the characteristic pumping sound of the compressor. To further reduce compressor noise transfer through the body to the passenger compartment, a sheet of soft rubber insulation is wrapped around the outside of the muffler.

Condenser

The condenser which is made of aluminum is located in front of the radiator so that it receives a high volume of air flow. Air passing over the condenser absorbs the heat from the high pressure gas and causes the refrigerant to condense into a high pressure liquid.

Receiver - Dehydrator - A Series

The receiver-dehydrator is mounted on the front of the condensor. The purpose of the receiver-dehydrator is twofold: the unit insures a solid column of

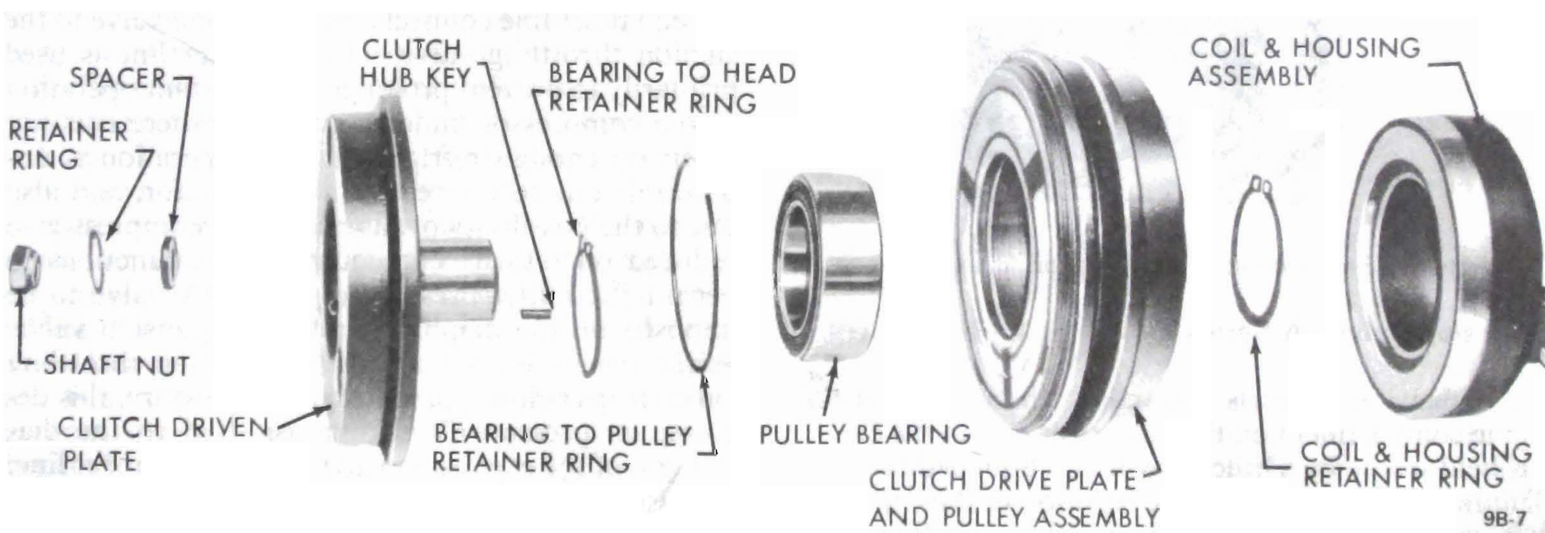


Figure 9B-7 Magnetic Clutch and Pulley Assembly liquid refrigerant to the expansion valve at all times, and also absorbs any moisture in the system that might be present. A bag of desiccant (moisture absorbing material) is provided to absorb moisture. A sight glass (see Figure 9B-8) permits visual checking of the refrigerant flow for bubbles or foam. The continuous appearance of bubbles or foam above an ambient temperature of 70 degrees F. usually indicates an inadequate refrigerant charge. Bubbles or foam appearing at ambient temperatures below 70 degrees F. do not necessarily indicate an inadequate charge and may appear even when the system is operating properly. A filter screen in the unit prevents foreign material from entering the remainder of the system.

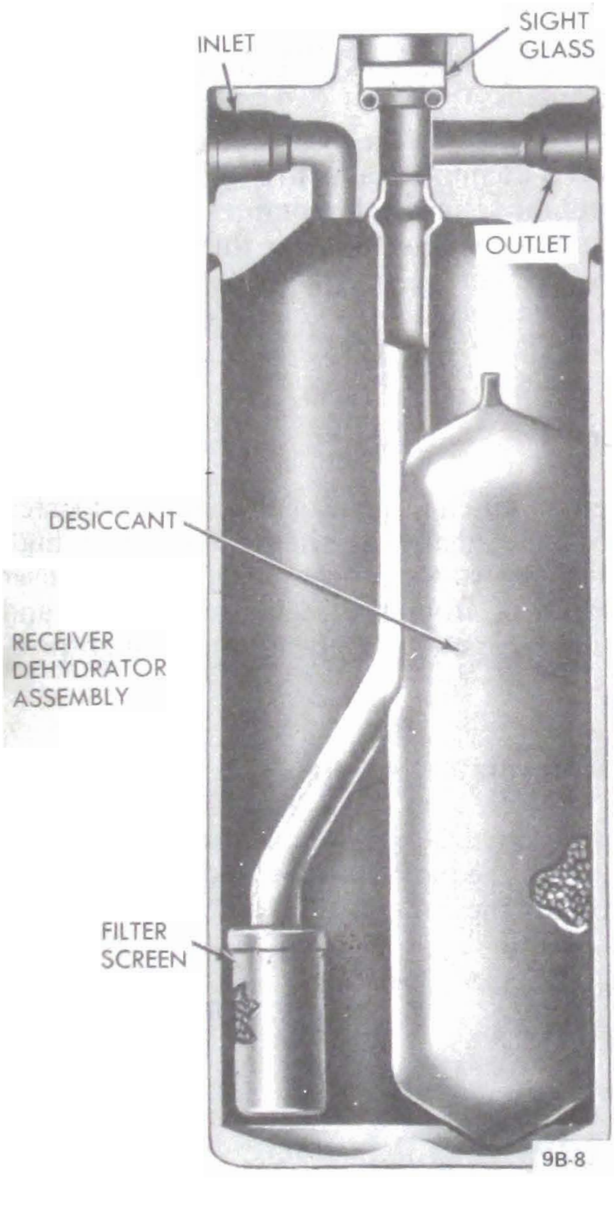


Figure 9B-8 Receiver - Dehydrator Assembly

Expansion Valve - A Series

The expansion valve is located at the rear of the engine compartment on the passenger side of the car. It is held secure by a bracket which is attached to the plenum blower assembly. The function of the expansion valve is to automatically regulate the flow of refrigerant into the evaporator. The expansion valve is the dividing point in the system between the high and low pressure liquid refrigerant. A temperature sensing bulb is connected by a capillary tube to the expansion valve (see Figure 9B-10). The temperature sensing bulb (clamped to the outlet pipe on the evaporator) measures the temperature of the evaporator outlet pipe and transmits the temperature variations to the expansion valve (see Figure 9B-10). The capillary tube and bulb are filled with carbon dioxide and sealed to one side of the expansion valve diaphragm.

An increase in temperature will cause the carbon dioxide in the bulb and capillary tube to expand, overcoming the spring pressure and pushing the diaphragm against the operating pins (see Figure 9B-10). This in turn will force the valve off its seat. When the refrigerant low pressure gas flowing through the outlet pipe of the evaporator becomes more than 6 degrees higher or warmer than the temperature at which it originally began to vaporize or boil, the expansion valve will automatically allow more refrigerant to enter evaporator. If the temperature of the low pressure gas decreases to less than 6 degrees above the temperature at which it originally began to vaporize or boil, the expansion valve will automatically reduce the flow of refrigerant. Thus, an increase or decrease in the flow of refrigerant through the evaporator will result in an increase or decrease in the cooling by the evaporator. The temperature, humidity and volume of the air passing over the evaporator affects the rate of absorption of heat by the evaporator. As the ambient temperature varies, the frequency which the temperature bulb calls for more or less refrigerant will increase or decrease. When the air is very warm, the heat transfer from the air to the refrigerant is great and a greater quantity of refrigerant is required to maintain the temperature at the evaporator pipe at the predetermined value. Conversely, cool days will result in less heat transfer and thereby require lesser quantities of refrigerant to maintain the predetermined temperature of the evaporator outlet pipe.

An equalizer line connects the expansion valve to the suction throttling valve. The equalizer line is used primarily to prevent prolonged or constant operation of the compressor under conditions where it is not receiving enough refrigerant. This operation is undesirable due to the resultant noise factor, and also due to the possibility of subjecting the compressor to reduced oil return. The equalizer line functions to permit the outlet pressure of the POA valve to be imposed on the diaphragm of the expansion valve. When the outlet pressure of the suction throttling valve drops below a predetermined pressure, this decrease in pressure is also transmitted to the diaphragm of the expansion valve, via the equalizer line. The expansion valve is caused to open and flood refrigerant through the evaporator, thereby resulting in an increase in the evaporator pressure. This action only occurs during times when the compressor capacity becomes greater than the evaporator output

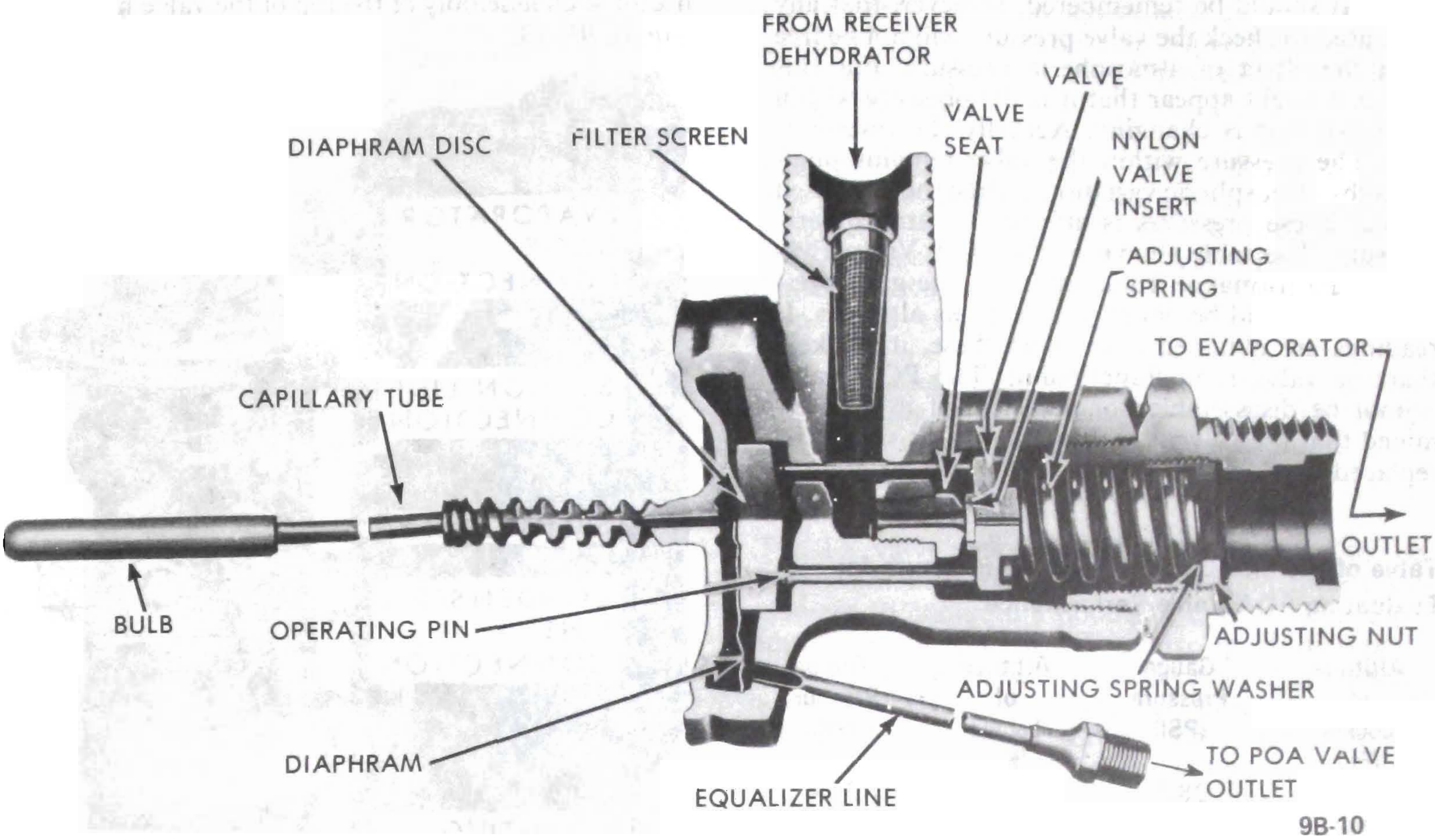


Figure 9B-10 Expansion Valve - A Series

with the resultant drop in POA suction throttling valve outlet pressure.

Evaporator

The function of the evaporator is to cool and dehumidify the air flow before it enters the passenger compartment. The evaporator assembly consists of an aluminum core enclosed in a reinforced plastic housing. A water drain port is located in the bottom of the housing. Two refrigerant lines are connected to the side of the evaporator core: one at the bottom and one at the top. The expansion valve on the A series, is attached to the lower (inlet) pipe, and the suction throttling valve is attached to the upper (outlet) pipe. The temperature sensing bulb of the expansion valve is clamped to the outlet pipe of the evaporator core, on the A Series. The high pressure liquid refrigerant, after it is metered through the expansion valve, passes into the evaporator core where it is allowed to expand under reduced pressure. As a result of the reduced pressure the refrigerant begins to expand and return to the original gaseous state. To accomplish this transformation it begins to boil.

The boiling action of the refrigerant demands heat. To satisfy the demand for heat, the air passing over the core gives up heat to the evaporator and is subsequently cooled.

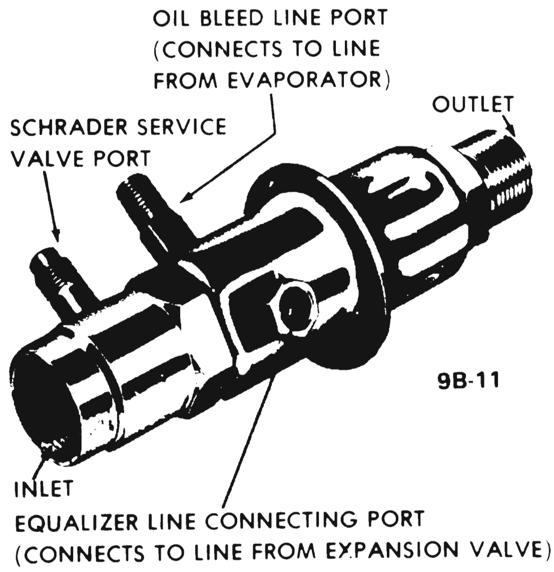


Figure 9B-11 Pilot Operated Absolute - Suction Throttling Valve (POA Valve) - A Series

POA Valve - A Series

The pilot operated absolute suction throttling valve (POA valve) regulates the pressure inside the evaporator and thereby affects the air temperature at the instrument panel outlets (See Figure 9B-11). The POA valve has a sealed inner chamber which controls the pressure regulating mechanism of the valve independently of the exterior atmospheric pressure. This design insures that the valve does not change its calibration as the system is operated in various altitudes. It should be remembered; however, that any gage used to check the valve pressure will not be free from the effect of atmospheric pressure. For this reason it might appear that it is the pressure within the valve that is changing. Actually the reverse is true. The pressure within the valve remains unaffected by atmospheric variations, while the gage used to read these pressures is affected by atmospheric pressure The table shown in the POA Valve Evaluating Performance Table indicates the gage pressure that should be obtained at various altitudes. If readings are obtained other than these, it is likely that the valve is malfunctioning. The POA valve cannot be disassembled or adjusted. If it is determined that the valve is malfunctioning, it should be replaced.

Table of Altitude-Corrected Gauge Pressure for Evaluating POA Valve Performance

Altitude of Locale (Ft.)	Gauge Pressure (PSI)	Altitude of Locale (Ft.)	Gauge Pressure (PSI)
0 (Sea Level)	28.5	6,000	31.4
1,000	29.0	7,000	31.8
2,000	29.5	8,000	32.3
3,000	30.0	9,000	32.7
4,000	30.5	10,000	33.2
5,000	31.0		

Allowable Tolerance of POA Valve is ± 1 PSI

Construction of the Valves-In-Receiver Assembly (V.I.R.) B-C-E Series

The Valves-In-Receiver (VIR) Assembly, Figure 9B-12, combines the thermostatic expansion valve, POA suction throttling valve, receiver-dehydrator and sight glass into one integral unit. It is mounted adjacent to the evaporator. The assembly design eliminates the external equalizer line between the thermostatic expansion valve and outlet of the POA suction throttling valve. The equalizer function is accomplished by a drilled hole in the wall between the POA suction throttling valve and thermostatic expansion valve cavities of the valve housing, Figure 9B-13. The thermobulb and capillary line for the thermostatic expansion valve are eliminated as the power element or diaphragm end of the thermostatic expansion valve capsule is now exposed directly to the refrigerant vapor entering the VIR unit from the outlet of the evaporator. The liquid sight glass is located in the valve housing at the inlet of the thermostatic expansion valve. The drier desiccant is field replaceable by removing the receiver shell and replacing the bag of desiccant. The thermostatic expansion valve and POA suction throttling valve capsules are replaceable by removing the inlet connector shell assembly at the top of the valve housing, Figure 9B-13.

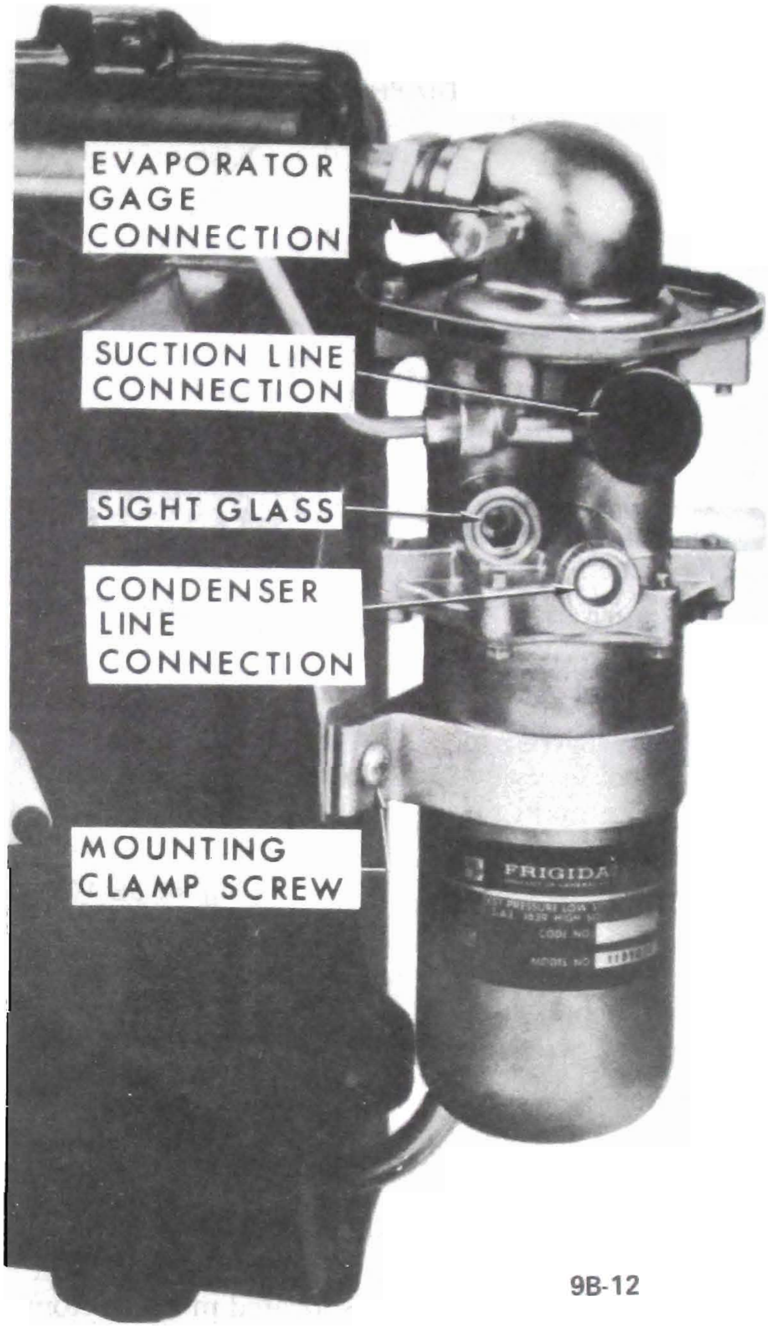


Figure 9B-12 Valves-In-Receiver Assembly

In operation, liquid refrigerant from the condenser flows into the liquid inlet port of the valve housing to the receiver where it can come in contact with the drier desiccant. The liquid refrigerant flows directly from the receiver through the filter screen at the bottom of the liquid pickup tube, through the pickup tube to the lower portion of the TX valve cavity, Figure 9B-13. The TX valve meters the liquid refrigerant to the evaporator.

Refrigerant vapor from the evaporator returns through the inlet connector shell assembly at the top of the VIR assembly and the POA valve then regulates the rate of refrigerant flow back to the compressor, Figure 9B-13.

The evaporator gage fitting with Schrader type valve

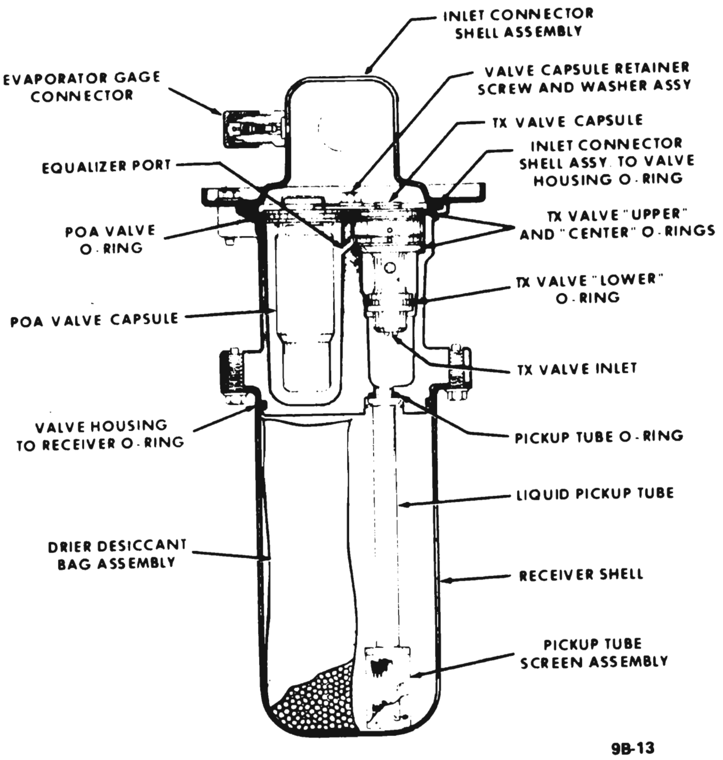


Figure 9B-13 Cross Sectional View of VIR Assembly

is located in the inlet connector shell assembly at the top of the VIR unit. The liquid bleed fitting is located in the VIR valve housing and vents directly into the suction outlet of the valve.

The liquid bleed valve opens to by-pass oil mixed with liquid R-12 when the pressure differential between the evaporator pressure and suction pressure is greater than 10-20 psi. This ensures the return of oil to the compressor under low refrigerant charge or low evaporator load conditions. The valve is closed below 10 psi pressure differential to prevent loss of capacity.

Thermostatic Expansion (TX) Valve

The new capsule type TX valve is located in the Valves-In-Receiver (VIR) unit, Figure 9B-13. This valve controls the flow of refrigerant to the evaporator by sensing the temperature and pressure of the refrigerant gas as it passes through the VIR unit on the return to the compressor. The refrigerant path through the TX valve is as indicated in Figure 9B-14.

The pressure within the power diaphragm of the TX valve is affected by the temperature of the return refrigerant passing through the VIR inlet connector shell assembly on its flow path to the inlet of the POA valve. The power diaphragm is further affected by the pressure of the return refrigerant acting on the outside surface of the power diaphragm through the drilled equalizer port between the POA valve cavity and the power diaphragm portion of the TX valve cavity, Figure 9B-13.

The TX valve cavity is divided into three separate pressure zones. The area below the lower "O" ring and center "O" ring essentially corresponds to evaporator pressure. The area between the middle "O" ring and upper "O" ring is basically compressor suction pressure.

The power diaphragm is partially filled with charcoal granules held in place by a filter and filter retainer. The diaphragm is assembled into the valve body, crimped in place and charged with a specific amount of R-22 refrigerant. The process opening is then sealed with a steel ball plug.

The operating pin, spring guide, adjusting spring, and adjusting nut are assembled into the valve body and the valve adjusted into the predetermined operating range.

The TX valve meters the flow of refrigerant to the evaporator in response to the pressure-temperature changes to maintain a flooded evaporator for maximum cooling efficiency. The valve operation is basically the same as that of the previous thermostatic expansion valve with external sensing bulb and equalizer connections. Cross section views of the valve in the open and closed conditions are shown in Figure 9B-14. The valve is factory set and is not adjustable or field repairable. When it is determined that the valve is malfunctioning the complete TX valve capsule must be replaced.

POA Suction Throttling Valve

The new capsule type POA suction throttling valve is located in the Valves-In-Receiver (VIR) unit adjacent to the TX valve capsule, Figure 9B-15. The function of this valve is to control the flow of refrigerant from the evaporator to maintain a constant evaporator pressure of 30 psi. At this pressure the evaporator coil temperature is maintained at approximately 32F. Should the evaporator pressure drop much lower than 30 psi it is possible that ice would form in the finned area of the evaporator and block the air flow through the coil.

The capability of the valve to maintain 30 psi is dependent on compressor capacity. At low compressor speed and high evaporator load the pressure may be well above 30 psi and the valve could be wide open. At high compressor speed and low evaporator load the valve closes down and restricts the flow of the refrigerant from the evaporator to maintain evaporator pressure to no lower pressure than 30 psi.

The POA valve capsule consists primarily of the valve body, valve piston, valve piston spring, bellows retainer, bellows and valve needle assembly and valve needle seat spring. The POA valve capsule is sealed into its cavity in the VIR unit by means of an "O" ring at the top of the valve.

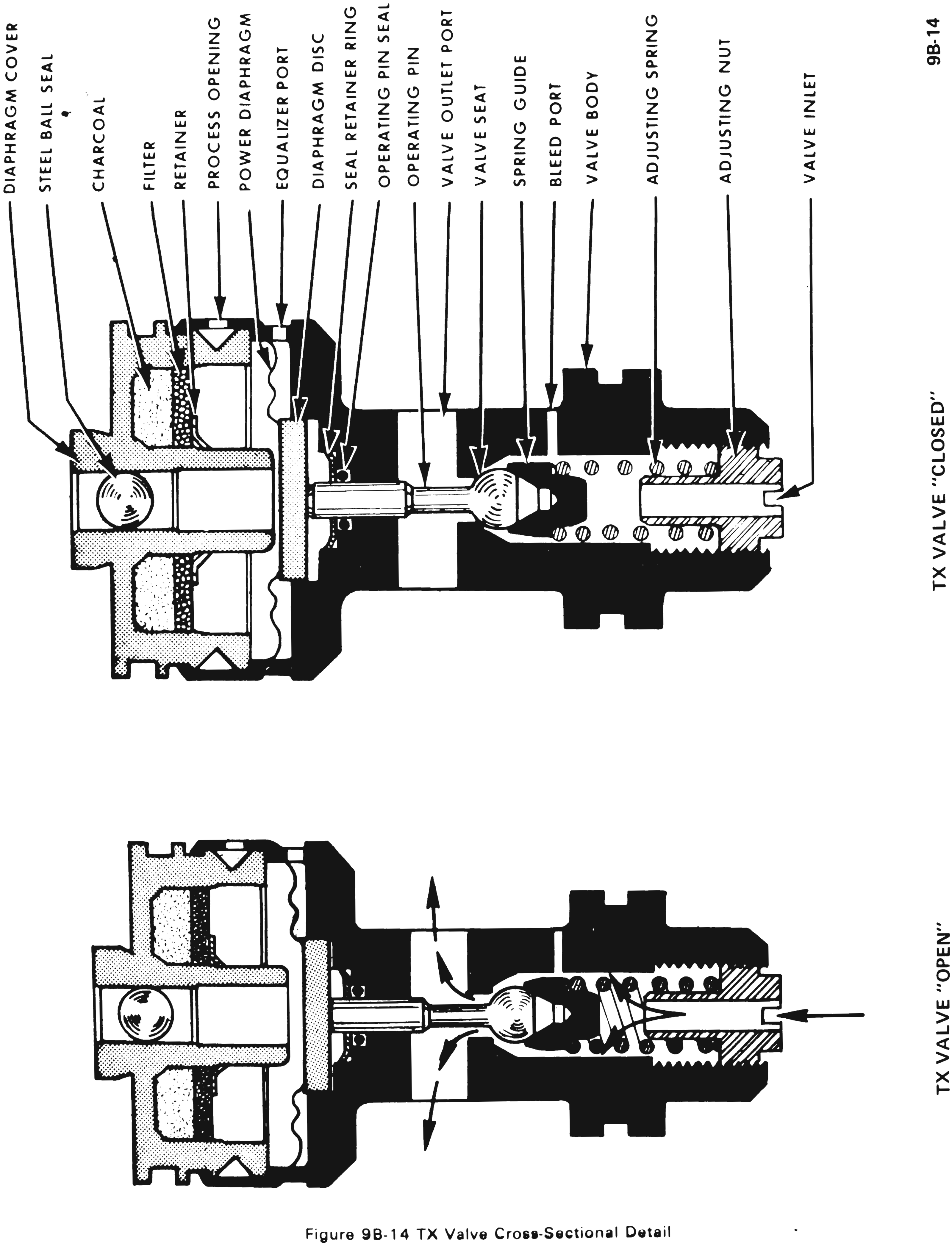


Figure 9B-14 TX Valve Cross-Sectional Detail

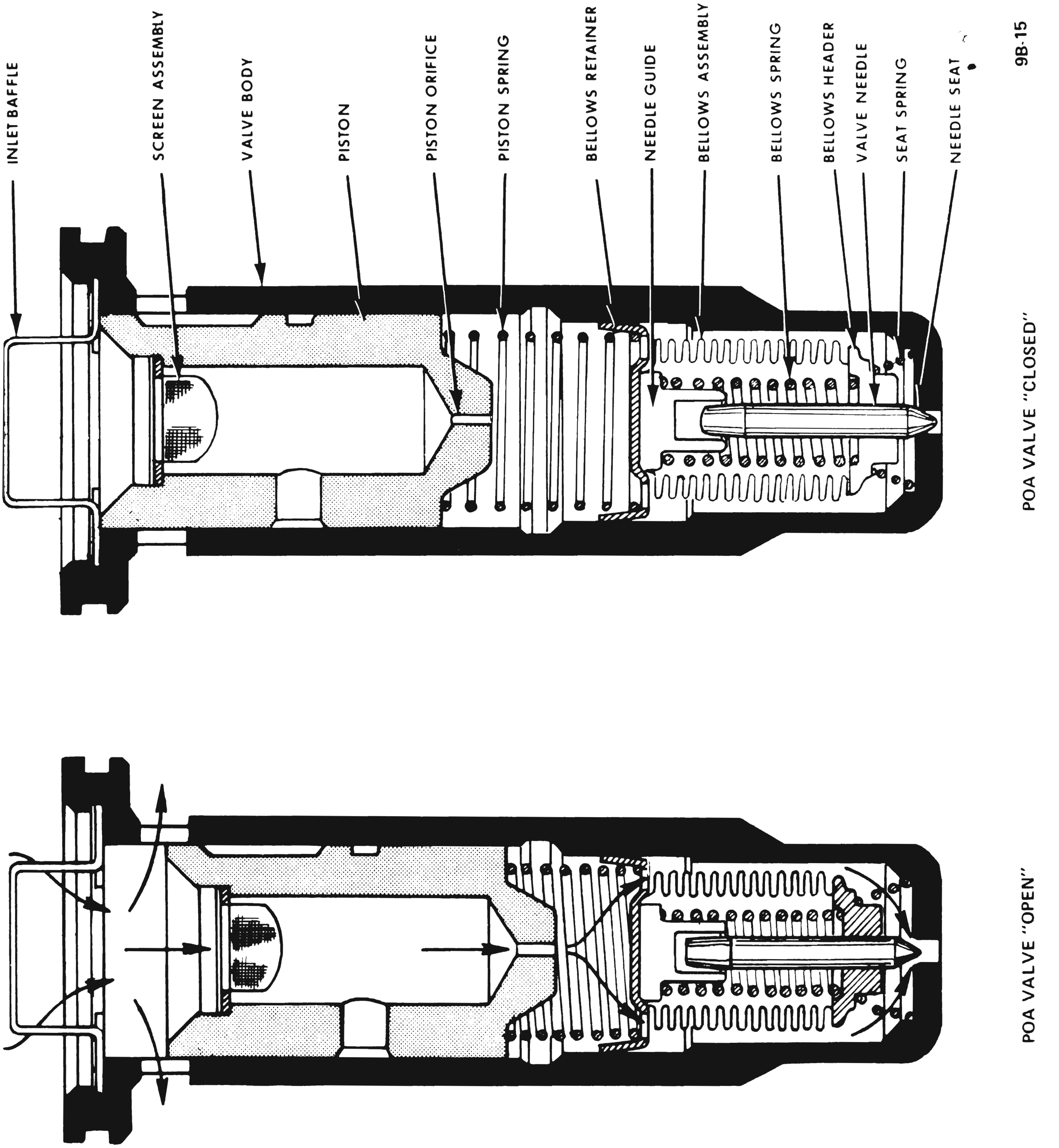


Figure 9B-15 POA VALVE Cross Sectional Detail

The exterior portion of the POA valve capsule below the "O" ring is subjected to the compressor suction pressure. That portion of the POA valve capsule above the "O" ring and the inlet end of the valve piston are subjected to the evaporator pressure.

The bellows and valve needle assembly acts as a pilot type valve and is evacuated to a near perfect vacuum. It is affected by refrigerant pressure external to the bellows and reacts to pressure as a spring would to force. When pressure around the bellows increases, the bellows will compress and on pressure decrease the bellows will extend. A spring, needle guide and a portion of the valve needle are contained within the bellows. The conical valve needle seat spring is located between the bellows assembly and the valve needle seat of the POA valve body and holds the bellows assembly in contact with the bellows retainer. As the pressure around the bellows increases the pilot needle moves away from the needle seat to permit the refrigerant in the bellows chamber to flow out through the orifice to reduce the pressure. As the pressure around the bellows decreases, the pilot needle moves toward the seat to decrease the refrigerant flow. In this manner the bellows and valve needle assembly regulates the pressure in the area below the valve piston.

The valve piston has a .020-.022" diameter hole in the spring end of the piston which permits refrigerant to pass to the piston spring and bellows cavity of the valve body. Two holes in the bellows retainer permit the refrigerant to pass from the piston spring area into the area surrounding the bellows. The bellows retainer remains stationary at the "valve set" position determined during the assembly process.

The pressure in the valve piston spring and bellows cavity is the same and will be referred to as "Bellows Cavity Pressure".

When the system is in operation, evaporator pressure is applied to the inlet end of the valve piston. Refrigerant passes through the piston screen and drilled hole in the piston to the bellows cavity. As the evaporator pressure becomes higher the force of the valve piston spring and the bellows cavity pressure will be overcome and the piston will move to open the main valve port for refrigerant flow from the evaporator back to the compressor. The piston movement to open the valve port occurs because the combined force of the piston spring plus the pressure in the bellows cavity against the piston is less than the force against the piston due to evaporator pressure. With the valve open and metering refrigerant flow back to the compressor, the evaporator pressure will decrease toward 30 psi and as the combined force of the piston spring plus the pressure in the bellows cavity against the piston overcomes the force against the piston due to evaporator pressure, the valve will move to close the valve port and decrease the flow of refrigerant back to the compressor.

When the evaporator pressure is greater than the pressure in the bellows cavity, refrigerant flows through the piston orifice to maintain control pressure in the bellows cavity. This pressure affects valve piston movement and bellows movement of the valve needle to control the flow of refrigerant through the needle seat orifice to maintain a modulating control pressure in the bellows cavity.

When the pressure surrounding the evacuated bellows increases, the bellows will compress and lift the needle from the seat. The refrigerant will then flow from the bellows cavity through the needle seat orifice to the suction line. When the flow of refrigerant through the needle seat orifice exceeds the flow of refrigerant into the bellows cavity through the piston orifice, the bellows cavity pressure will decrease and the bellows will expand to move the needle toward the seat.

The balance of forces acting upon the valve piston (evaporator pressure on one side versus bellows cavity pressure and piston spring force on the opposite side of the piston) and the piston controlled flow of refrigerant through the needle seat orifice tend to hold the valve piston and valve needle in the modulated flow positions thus maintaining the predetermined bellows cavity pressure to control evaporator pressure.

The POA valve capsule is factory set and is not adjustable or field repairable. When it is determined that the valve is malfunctioning the complete POA valve capsule must be replaced.

Fan Drive Clutch Assembly

During periods of operation when radiator discharge air temperature is low (below approximately 150 degrees F.), the fan clutch limits the fan speed to 800-1600 RPM. Under these conditions the clutch is disengaged since a small oil pump gear driven by the separator plate forces the silicone oil into the reservoir between the separator plate and the front cover assembly. Under these conditions also, the passage from this cavity to the clutch area is closed by the coil spring leaf valve. As operating conditions produce a high radiator discharge air temperature (above approximately 150 degrees F.), the temperature sensitive bimetal coil tightens to move the leak valve (attached to the coil) which opens a port in the separator plate. Silicone oil flows into the clutch chamber engaging the clutch and providing a maximum fan speed of approximately 2350 RPM.

The clutch coil is calibrated so that at road load with an ambient temperature of approximately 90 degrees F., the clutch is just at a point of shift between high and low fan speed.

No attempt should be made to disturb the calibration of the engine fan clutch assembly as each assembly is individually calibrated at the time of manufacture.

Superheat Switch

System Description

The low refrigerant charge protector system consists of a superheat shutoff switch located in the rear head of the compressor, connected in series by an electrical lead to the thermal fuse which is basically a temperature sensitive fuse link between the air conditioning system ambient switch and the clutch coil connection.

A wiring diagram of the superheat shutoff switch and the thermal fuse interconnected with the associated system components is shown in Figure 9B-16. A schematic electrical diagram of the system circuiting is shown in Figure 9B-17.

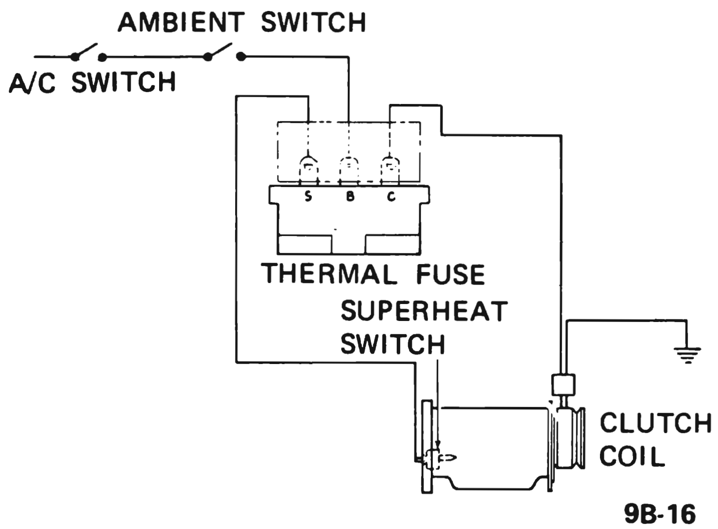


Figure 9B-16 Wiring Circuit Diagram - Superheat Shutoff System

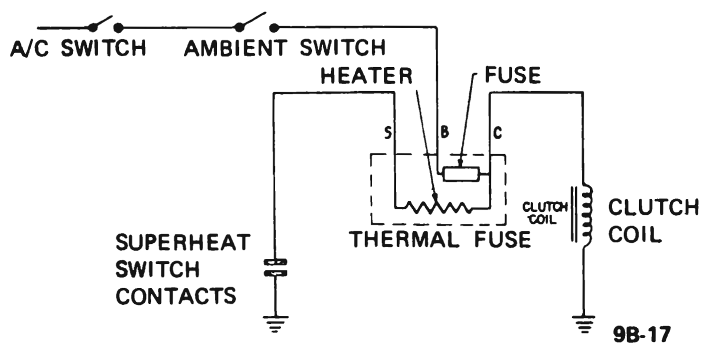


Figure 9B-17 Schematic - Superheat Shutoff System

Protector System Operation

During normal air conditioning system operating conditions, current flows through the air conditioner switch, the ambient switch, and through the thermal fuse link to the clutch coil to actuate the compressor clutch. Should a partial or total loss of refrigerant in the system cause the superheat switch to sense low system pressure and a high suction gas temperature, the superheat switch contacts will close. When the contacts close, current flows to energize the resistance-type heater in the thermal fuse. See Figure 9B-14. The resultant heat warms the fuse link to its specific melt temperature, thus opening the circuit to the compressor clutch coil. Compressor operation ceases and compressor damage due to a loss of refrigerant charge is prevented. The cause of the refrigerant loss must be corrected and the system charged prior to replacing the thermal fuse.

Construction - Superheat Shutoff Switch and Thermal Fuse

SUPERHEAT SHUTOFF SWITCH - A cross sectional view of the superheat shutoff switch construction is shown in Figure 9B-18. The assembly consists of the diaphragm, sensing tube, and base assembly which threads into the switch housing and terminal assembly. The switch terminal pin is hermetically sealed with a glass-to-metal seal in the switch housing. The diaphragm and sensing tube mounting base contains four (4) holes for passage of refrigerant vapor in and around the diaphragm, permitting the operating suction pressures to affect external diaphragm assembly pressure. The diaphragm and sensing tube assembly is charged with R-114 refrigerant and the sensing tube protrudes into the suction cavity of the rear compressor head to sense suction gas temperatures. The internal pressure of the diaphragm and sensing tube assembly is affected thermally by the suction gas temperature and the diaphragm affected externally by the suction pressure.

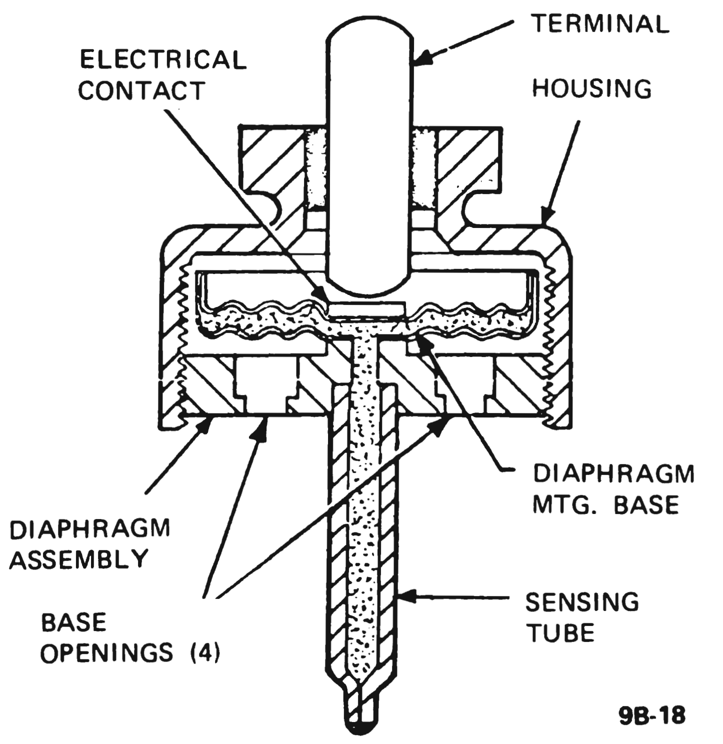
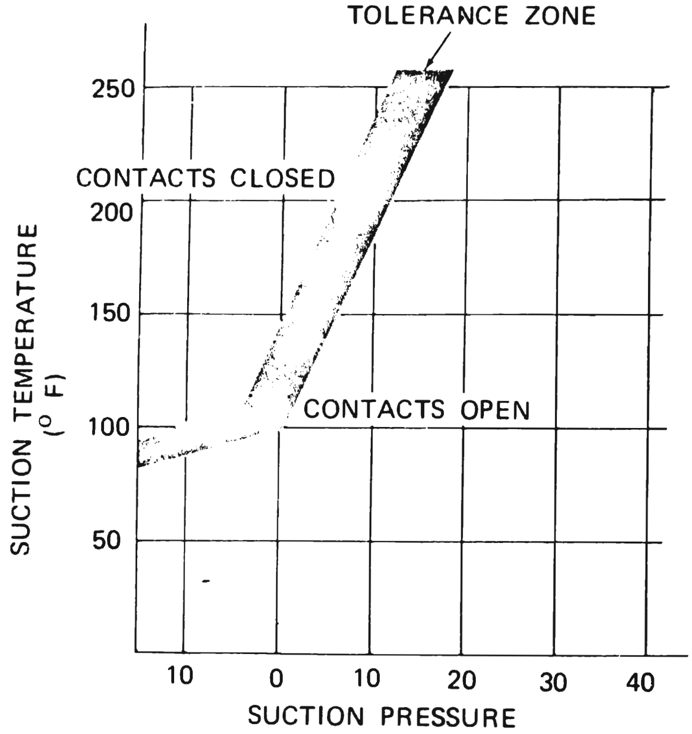


Figure 9B-18 Cross Sectional View of the Superheat Shutoff Switch

The electrical contact welded to the diaphragm will only contact the terminal pin during a low pressure high temperature condition. High pressure - high temperature, or low pressure - low temperature conditions will not cause the contacts to close. Figure 9B-19 shows the temperature-pressure curve of the superheat shutoff switch. The contacts may be either OPEN or CLOSED in the Tolerance Zone, depending on the characteristics of the switch and accuracy of pressure and temperature readings taken.



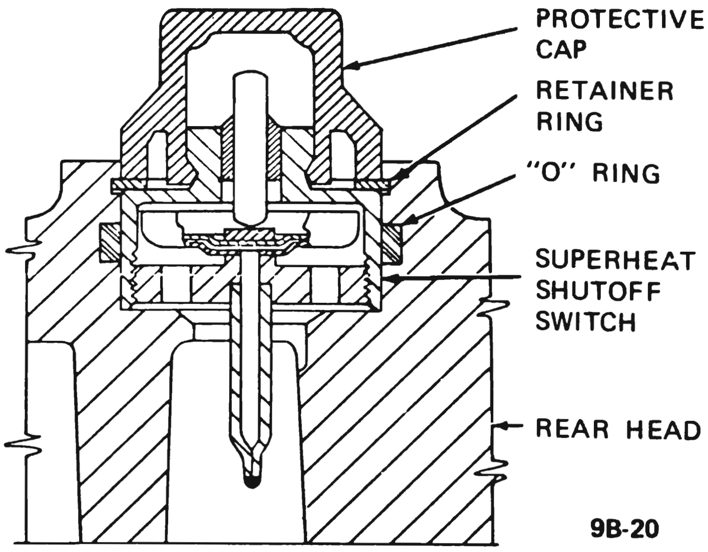
9B-19

Figure 9B-19 Superheat Switch Operating Characteristics

The superheat switch is mounted and sealed in the rear head by means of an O ring between the switch housing and the cavity wall of the rear head, as shown in Figure 9B-21. A specially-formed retaining ring holds the switch in place and electrically grounds the switch housing to the compressor. The switch retaining ring must be installed with the high point of the curved sides adjacent to the switch housing. The flat side of the retainer ring provides a positive seat in the retaining ring groove and the tips of the ring give a more positive electrical continuity.

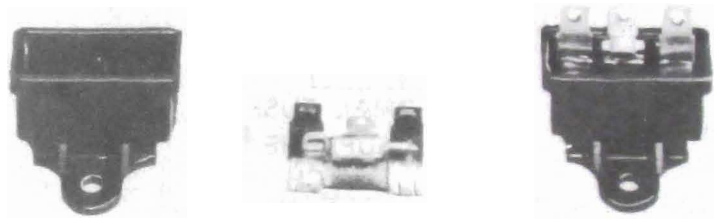
THERMAL FUSE - The thermal fuse consists of a temperature sensitive fuse link, a wire-wound resistor, and three (3) spade-type electrical terminals, potted with epoxy in a plastic housing, Figure 9B-22. The terminals are positioned for in-line plug-on connection with a wiring harness. The thermal fuse construction provides for a time delay in blowing the fuse link which prevents "blown fuse" nuisance due to momentary switch contact closings during certain transient conditions.

A blown thermal fuse indicates that the air conditioning system is either low or completely out of refrigerant charge, and that the superheat switch and thermal fuse have performed their protective function.



9B-20

Figure 9B-21 Cross Sectional View - Superheat Shutoff Switch in Rear Head



9B-21

Figure 9B-22 Thermal Limiter Detail

DIAGNOSIS

GENERAL INFORMATION

The following is a brief description of the type of symptom each refrigerant component will evidence if a malfunction occurs:

Compressor

Compressor malfunction will appear in one of four ways: noise, seizure, leakage or low discharge pressure.

Resonant compressor noises are not cause for alarm; however, irregular noise or rattles may indicate broken parts or excessive clearances due to wear.

When the air conditioning system has not been used for several months or the vehicle has been stored for a long period of time, the oil in the compressor is drained away from the surfaces of the pistons and axial plate. This can result in increased internal friction to the extent the compressor drive belt will slip as evidence by the screeching sound during initial compressor operation.

If the compressor clutch does not have any visual signs of overheating or mechanical damage, the following procedure is recommended to determine if the compressor is satisfactory:

1. With the engine off, disconnect the electrical connector at the clutch, or remove thermal limiter.

2. Manually rotate the compressor hub two or three turns counterclockwise, as viewed looking at the clutch from front of vehicle. This is opposite of its normal rotation. If the hub is not free to rotate by hand, a spanner type wrench (J-9403) should be used.

3. a. If compressor hub rotates, reverse the direction (clockwise) for two or three turns.

b. Check and tighten belt to specification for model being inspected.

c. Reconnect the electrical connection at compressor clutch or thermal limiter.

d. Start engine and operate at approximately 2,000 RPM, position control for compressor operation and run for at least one minute to determine system cooldown capability. If air condition system is funcitioning properly, the compressor is satisfactory.

4. If compressor hub will not rotate in Step 2 above, the compressor should be removed and repaired.

Low discharge pressure may also be due to an insufficient refrigerant charge or a restriction elsewhere in the system. These possibilities should be checked prior to servicing the compressor. If the compressor is inoperative; but, is not seized, check to see if current is being supplied to the magnetic clutch coil terminals.

Condenser

A condenser may malfunction in two ways: it may leak, or it may be restricted. A condenser restriction will result in excessive compressor discharge pressure. If a partial restriction is present, sometimes ice or frost will form immediately after the restriction as the refrigerant expands after passing through the restriction. If air flow through the condenser or radiator is blocked, high discharge pressures will result. During normal condenser operation, the outlet pipe will be slightly cooler than the inlet pipe.

Receiver-Dehydrator

A receiver-dehydrator may fail due to a restriction inside body of unit. A restriction at the inlet to the receiver-dehydrator will cause high head pressures. Outlet tube restrictions will be indicated by low head pressures and little or no cooling. An excessively cold receiver-dehydrator outlet may be indicative of a restriction.

Expansion Valve

Expansion valve failures usually will be indicated by low suction and discharge pressures, and insufficient evaporator cooling. The failure is generally due to malfunction of the power element and subsequent closing of the valve - "A" Series. A less common cause of the above symptom is a clogged inlet screen - "A" Series.

The capillary line and temperature bulb for the expansion valve are eliminated with the VIR System, as the power element or diaphragm end of the expansion valve capsule is exposed directly to the refrigerant before entering the VIR unit from the outlet of the evaporator.

Evaporator

When the evaporator malfunctions, the trouble will show up as inadequate supply of cool air. A partially plugged core due to dirt, a cracked case, or a leaking seal will generally be the cause.

POA Valve

If the POA valve is defective, it may cause evaporator pressure (hence air temperature) to be either too high or too low depending on the type of failure. No adjustment is possible on POA valves. If it is determined that a POA valve has failed it should be replaced.

Refrigerant Line Restrictions

Restrictions in the refrigerant lines will be indicated as follows:

1. Suction Line - A restricted suction line will cause low suction pressure at the compressor, low discharge pressure and little or no cooling.

2. Discharge Line - A restriction in the discharge line generally will cause the pressure relief valve to open.

3. Liquid Line - A liquid line restriction will be evidenced by low discharge and suction pressure, and insufficient cooling.

Use of Receiver-Dehydrator Sight Glass for Diagnosis

At temperatures higher than 70 degrees F, the sight glass may indicate whether the refrigerant charge is sufficient. A shortage of liquid refrigerant is indicated after about five minutes of compressor operation by the appearance of slow-moving bubbles (vapor) or a broken column of refrigerant under the glass. Continuous bubbles may appear in a properly charged system on a cool day. This is a normal situation. If the sight glass is generally clear and performance is satisfactory, occasional bubbles do not indicate refrigerant shortage.

If the sight glass consistently shows foaming or a broken liquid column, it should be observed after partially blocking the air to the condenser. If under this condition the sight glass clears and the performance is otherwise satisfactory, the charge shall be considered adequate.

In all instances where the indications of refrigerant shortage continues, additional refrigerant should be added in 1/4 lb. increments until the sight glass is clear. An additional charge of 1/2 lb. lower series, 1 lb. upper series, should be added as a reserve. In no case should the system be overcharged.

LEAK TESTING SYSTEM

The following two methods are recommended when attempting to locate refrigerant leaks in the system. Loss of refrigerant is always indicative of a leak since refrigerant is not consumed and does not wear out.

The location of the VIR unit makes it vulnerable to accumulating road, engine oil and dirt, expecially since it has moisture condensing on its exterior surface when the system is operating.

Refrigerant acts as a carrier for the A/C system oil and past practice has always been to look for an oil show around a fitting or component if a leak was suspected. If the A/C system is low on refrigerant, do not misdiagnose the VIR unit as leaking by the presence of such dirt and oil.

The diagnosis chart in Figure 9B-23 will aid in troubleshooting the VIR Valves-In-Receiver system.

1. Open Flame Method - This method utilizes a gas operated torch type leak detector (J-6084). Use of this method is recommended when checking for leaks in confined areas. To perform test, light torch and adjust to obtain a pale blue flame, approximately 3/8 inch in height, in burner.

Explore for leaks by moving end of search tube around suspected area. Check bottom of connections since Refrigerant-12 is heavier than air and will be more apparent at underside of fittings. The flame color will turn yellow-green when a small leak is detected. Large leaks will turn the flame blue or purple.

WARNING: Do not breathe fumes resulting from burning of refrigerant gas. These fumes are extremely poisonous.

When leak testing the POA valve, "A" Series, it is necessary to check only the hose coupling ends. When using the propane torch leak detector, no evidence of Refrigerant-12 should be present at the POA valve "A" Series.

2. Liquid Leak Detectors - This method utilizes a solution which will bubble (soap solution) to signify a gas leak. Use of this method of checking is recommended for locating small leaks.

FUNCTIONAL TESTING SYSTEM "A" SERIES

Functional testing is a measurement of the air conditioner system performance to determine if discharge air temperature, pressure in suction line, and pressure in discharge line are within specific limitations.

To perform functional test proceed as follows:

1. Remove protective caps from Schrader valve located on suction throttle valve and Schrader valve located on compressor discharge port.

2. Interconnect manifold and gage set (J-5725-01), gage charging lines (J-5418) and gage adapters (J-5420) to air conditioning system as shown in Figure 9B-24.

3. Close doors, open windows and hood of the car.

4. Set temperature lever to extreme left position and fan to "HI", Selector lever in "A/C".

5. Idle engine at 2000 RPM in neutral.

6. Place a high volume industrial type fan in front of radiator grille to insure minimum differential between temperature of air passing through radiator grille and condenser, and temperature of air flow through cowl air inlet and past evaporator core.

7. Measure relative humidity and ambient temperature in immediate vicinity of car to be tested. The temperature obtained at the air outlets will be lower on dry days and higher on humid days.

8. Open all air conditioner outlets and measure temperature at right and left outlets.

9. Compare the actual pressures and temperatures with the pressures and temperatures indicated in Test No. 1 of Functional Test Table (see Figure 9B-103).

If it appears from the test results that either the POA valve or the expansion valve is at fault, the following

REFRIGERATION DIAGNOSIS CHART – VIR VALVES-IN-RECEIVER SYSTEM

Observe refrigeration system in areas listed below while engine operates at 2,000 RPM with control lever in "HI" and temperature dial at 65 on automatic climate control systems. On regular A/C systems, set control lever in A/C position and temperature lever in "cold" position and fan switch in "HI" position. All windows should be open and hood should be up. Blower motor should be disconnected when required in chart.

System Condition	OBSERVED OPERATING CONDITIONS						System Correction
	Outlet Air Temp.	Sight Glass	Head Pressure at Ambient Temperature	Evaporator Pressure	Evaporator Outlet Pipe Temperature	Oil Bleed Line Temperature	
			70° 80° 90° 100°				
Normal	40 – 50°	Clear	160# to 200#; 190# to 230#; 220# to 260#; 250# to 290#	28-32 PSIG	Cold	Warm	
With Blower Lead Off	No Air Flow	Clear	Lower than Normal	Maintains Pressure	Cold	Gets Cold	
Refrigerant Charge Low *	Warm	Foamy or Bubbly †	Lower than Normal	Normal to Low	Warm	Cold	Find Leak Repair and Recharge
VIR Liquid Pickup Tube Screen Partially Plugged *	Warm	Foamy or Bubbly	Low	Normal to Low	Cool or Warm	Cool or Warm	Clean Screen and System as Required Change Desiccant and Recharge
Refrigerant Charge Lost *	Warm	Clear	Very Low	Very Low	Warm	Warm	Find Leak, Repair, Change Desiccant and Recharge ††
Refrigerant Overcharge Blows Relief Valve on Hot Days	Normal	Clear	High	Normal	Cold	Warm	Recharge to the Specified Charge
Expansion Valve Diaphragm * Discharged **	Warm	Clear	Low	Low	Warm	Cold	Replace Expansion Valve Capsule
Vacuum Loss in POA Capsule Bellows or Valve Piston Stuck Closed *	Warm	Foamy or Bubbly	Low	High	Warm	Warm	Replace POA Valve Capsule
POA Valve Stuck * Open ***	Cold Evaporator May Ice Up Affecting Air Flow	Clear	Low	Normal to Low	Cold	Warm	Replace POA Valve Capsule
POA Valve Setting Too High	Warm	Clear	Normal	High	Cool to Warm	Cool or Warm	Replace POA Valve Capsule

– Superheat Switch May Close and Thermal Fuse Link Open to Shut Off the Compressor.

– Allow the System to Warm Up and Equalize Before Repeating the Test. If the Condition Doesn't Recur the System has Excess Moisture Causing Ice to Form in the Valve. Discharge the System, Replace the Bag of Desiccant, Evacuate the System for 30 Minutes and Recharge.

*** – Goes to Low Pressure or Vacuum with Blower Lead Disconnected.

† – May Be Bubbly or Vapor Clear with Blower Disconnected.

†† – Change Desiccant Only If System Has Been Opened or Receiver Shell Requires Removal for Repair.

9B-22

Figure 9B-23 VIR System Refrigeration Diagnosis Chart

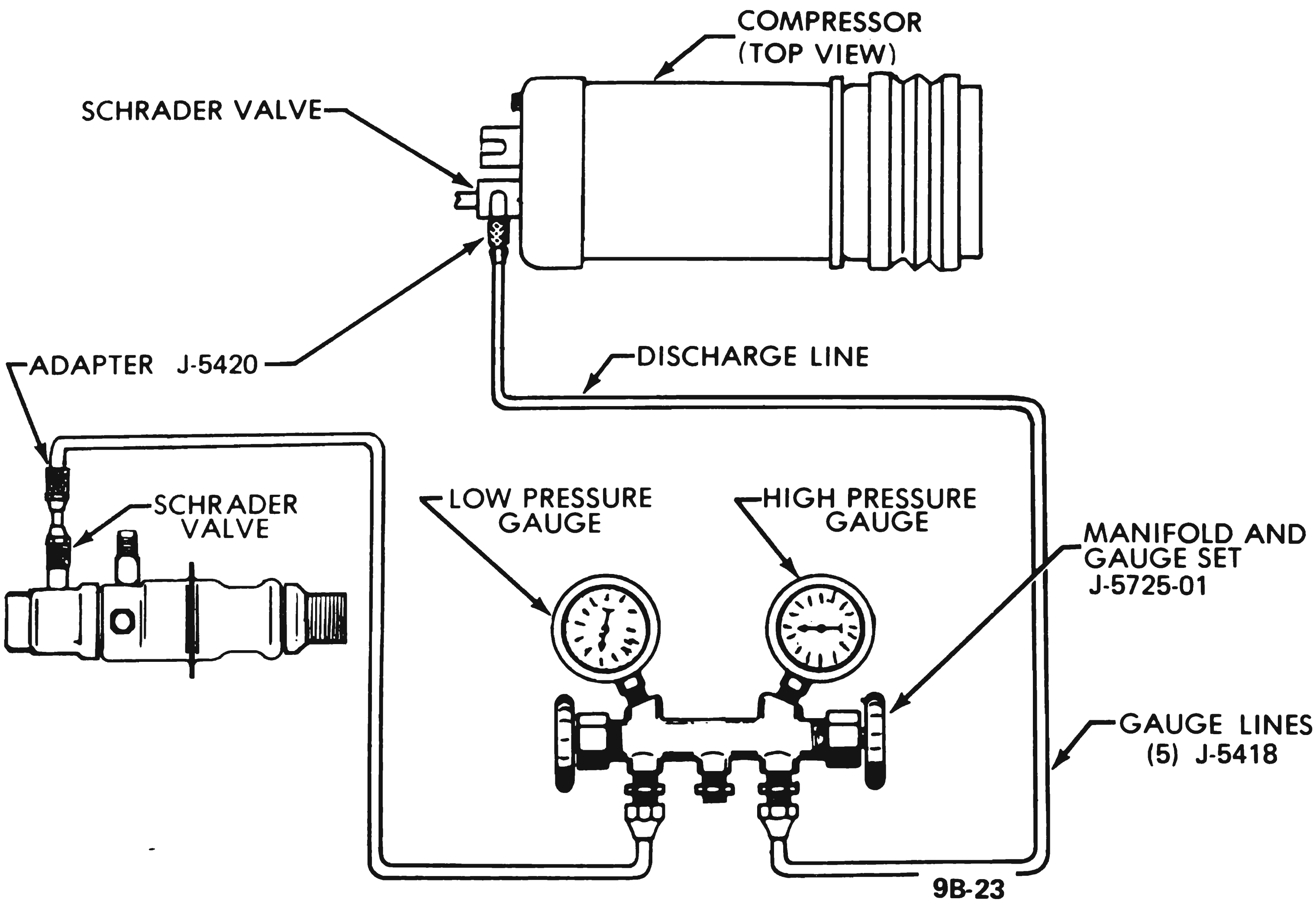


Figure 9B-24 Functional Test Set-Up - A Series

procedure will help determine which to replace.

a. Check temperature door, make sure the door seals in the cool position, readjust the Bowden cable if necessary.

b. Check air hoses and ducts for proper connections.

c. Check the sight glass for "clear" condition and make sure compressor clutch is engaged.

After these basic visual checks, install evaporator and head pressure gages. Operate the engine at 1500 RPM, "A/C" selector lever setting, and "LO" blower.

d. If evaporator pressure is 30 psi or less (and discharge air temperatures are too warm), replace the expansion valve.

e. If evaporator pressure is above 30 psi, even with blower wire disconnected, make sure the expansion valve feeler bulb is clamped tightly to the evaporator outlet pipe and the feeler bulb insulation is in place. If the bulb and insulation are OK, replace the POA valve.

f. If evaporator pressure is 30 psi plus or minus 1 psi (and discharge air temperatures are abnormal), partially cover the condenser to obtain head pressure from 325 psi to 375 psi maximum. If evaporator pressure rises above 30 psi, change the expansion valve. If expansion pressure remains at 30 psi, install a new receiver dehydrator.

HEATER-AIR CONDITIONER REFRIGERANT CIRCUIT TROUBLE DIAGNOSIS GUIDE - "A" SERIES

Insufficient Cooling (Check Air Flow)

Normal Air Flow

(Inspect system for visual defects. Run functional tests.)

Discharge Air - Normal Temp Check for air leaks through dash, car body, windows, or from heater or ventilators.

Discharge Air - High Temp Check sight glass for foaming and compressor clutch for engagement.

No Compressor Clutch Engagement Check connections at clutch switch, harness connectors, and check clutch switch.

No Foaming Compare evaporator pressure to that on functional test table.

Foaming System is probably low on refrigerant. Check for leaks, repair, evacuate, and charge. If foaming still occurs, check for restriction in refrigerant lines between condenser and receiver dehydrator.

Evaporator Pressure Normal Compare head pressure to pressure on functional test table.

Evaporator Pressure Low Ice may be forming on evaporator. Low volume of air discharging at A/C outlet after system has been running above idle condition for approximately 15-30 minutes. Discharging air gradually elevating in temperature. Check expansion valve. If valve isn't permitting flow of liquid, this will be indicated by a warm pipe out of the evaporator. This may be caused by: 1) Clogged or plugged inlet screen in the expansion valve; 2) Broken capillary line; or 3) Discharged temperature bulb. If the valve is okay, the pipe out of the evaporator will be cold.

POA valve may be inoperative because of ice formation inside POA due to excessive moisture in refrigerant system. This may be indicated by initially good POA valve temperature control and satisfactory cooling, then situation progressively becomes unsatisfactory with ice forming on evaporator and blocked air output at elevated temperatures. Stop engine, allow system to warm up, restart engine. If system indicates a duplication of okay-to-poor performance, replace POA valve. POA may have too low a setting. Also, replace receiver-dehydrator and evacuate thoroughly.

Evaporator Pressure High Check the expansion valve to determine if thermobulb is making good contact and is properly insulated. Operate engine at 2000 RPM with maximum air conditioning setting. If evaporator pressure remains high, feel suction line. If line feels frosty or extremely cold with relative high ambient conditions, then partially cover the condenser to obtain head pressures from 325 psi to 375 psi maximum. If evaporator pressure rises above 30 psi, change the expansion valve.

Observe operation on functional test to see if pressures and temperatures at start are normal but become progressively higher in pressure and temperature. This may be the result of ice forming inside POA valve due to excessive moisture in the system. Replace receiver-dehydrator and evacuate thoroughly.

If correction is still not affected, malfunction may be the result of a defective POA valve. Replace valve.

Another possibility is a restriction in the suction line (outlet of POA to inlet of compressor).

Also, check if compressor may be the cause due to some internal or external mechanical trouble which prevents reduction of pressure. Check for external troubles, slipping belt, bad clutch and/or pulley, or improper clutch engagement, before investigating the compressor internally.

Head Pressure High Check for the following: Condenser air flow low, air in system, excessive refrigerant in system, restriction in condenser.

Head Pressure Low Restriction in flow of refrigerant to evaporator, or expansion valve plugged or defective.

Head Pressure Normal Check that temperature air door is in proper position.

Low Air Flow

(Check blower operation and evaporator. Check operation of controls.)

Ice Blocking Evaporator Run functional test. If evaporator pressure is low, ice may form on evaporator and reduce air flow.

Evaporator Pressure Low Ice may be forming on evaporator. Low volume of air discharging at A/C outlet after system has been running above idle condition for approximately 15-30 minutes. Discharging air gradually elevating in temperature. Check expansion valve. If valve isn't permitting flow of liquid, this will be indicated by a warm pipe out of the evaporator. This may be caused by: 1) Clogged or plugged inlet screen in the expansion valve; 2) Broken capillary line, or 3) Discharged temperature bulb. If the valve is okay, the pipe out of the evaporator will be cold.

Blower Not Operating Check for the following: Fuse blown, blower switch defective, wire broken or loose connection, poor ground connection, or blower motor defective.

Blower Operating Normal Check for the following: Flexible air hose loose, restriction or leakage in air ducts, A/C outlet not opening.

Blown Thermal Fuse

Possible Cause - Low refrigerant charge or totally discharged system.

Correction - Inspect for leaks, repair, evacuate, recharge system, and then replace thermal fuse according to procedures.

Possible Cause - Inoperative expansion valve.

Correction - Replace expansion valve according to normal procedures and then replace the thermal fuse.

Possible Cause - Thermal fuse installed in improper location where temperatures exceed 260 degrees F.

Correction - Install new thermal fuse in proper location.

Possible Cause - Thermal fuse blown during charging.

Correction - Jump connector plug during charging and replace thermal fuse.

Possible Cause - Faulty superheat switch.

Correction - Replace superheat switch according to procedure, recharge system, and replace thermal fuse.

Superheat Heat Switch

Car engine off, lead disconnected from superheat switch terminal.

Check for the following: Continuity between switch housing and ground. (If not grounded, check continuity, switch housing to retainer ring, and retainer ring to rear head.)

Check for the following: Continuity between switch terminal and switch housing. (If no continuity, contacts are open. If continuity exists, contacts are closed.)

Install suction gauge and determine the suction pressure, determine the approximate rear head temperature, and compare conditions noted to Calibration Chart, Figure 9B-19. If contacts are not OPEN or CLOSED according to temperature-pressure relations shown, discharge system and remove switch for bench check.

(Switch off of compressor.)

Check for the following: Closed contacts. (Housing to terminal contacts should be open at atmospheric pressure and temperatures below 100 degrees F.)

Check for the following: Closed contacts. (With switch in a hot bath 150 degrees F. or higher, or with sensing tube held in match flame 15-20 seconds.)

If switch contacts are not OPEN or CLOSED per these checks, the switch is defective and must be replaced.

MAINTENANCE AND ADJUSTMENTS

GENERAL SERVICE INFORMATION AND SAFETY PRECAUTIONS

General Information

All subassemblies are shipped sealed and dehydrated. They are to remain sealed until just prior to making connections, and should be at room temperature before uncapping. This prevents condensation of moisture from air that enters the system.

All precautions should be taken to prevent damage to fittings or connections. Even minute damage to a connection could cause it to leak. Any fittings with grease or dirt on them should be wiped clean with a cloth dipped in alcohol.

Do not clean fitting or hoses with solvents because they are contaminants. If dirt, grease or moisture gets inside the pipes or hoses and cannot be removed, the pipe or hose is to be replaced. Use a small amount of clean refrigeration oil on all tube and hose connecting joints, and lubricate the "O" ring gasket with this oil before assembling the joint. The oil will help in effecting a leak-proof joint and assist the "O" ring to slip into the proper location without being cut or damaged. Always use new "O" rings.

When tightening joints, use a second wrench to hold the stationary part of the connection to prevent twisting and to prevent hose kinking. Kinked hoses are apt to transmit noise and vibration. Tighten all connections in accordance with recommended torques (see Specifications).

Do not connect receiver-dehydrator assembly until all other connections have been made. This is necessary to insure maximum moisture removal from system - "A" Series.

It is important that air conditioning hoses do not rest on or contact body or chassis sheet metal except where necessary. Because of the high frequency at which the compressor operates, the passenger compartment is susceptible to transfer of noise.

Safety Precautions

The following safety precautions should always be followed when servicing refrigerant charged components:

1. Do not leave Refrigerant-12 cylinder uncapped.

2. Do not carry cylinder in passenger compartment of car.

3. Do not subject cylinder to high temperatures.

4. Do not weld or steam clean on or near cylinder.

5. Do not fill cylinder completely.

6. Do not discharge vapor into area where flame is exposed or directly into engine air intake.

7. Do not expose eyes to liquid - WEAR SAFETY GOGGLES whenever discharging, charging or leak testing system.

CHARGING AND DISCHARGING SYSTEM WITH LOW REFRIGERANT CHARGE PROTECTOR SYSTEM

Removal of any part in the refrigerant circuit will require discharging of the entire system.

Disconnect electrical connector from thermal limiter assembly. Insert a jumper wire between terminals B and C of connector if compressor operation will be required prior to refrigerant system being fully charged. See Figure 9B-16.

Discharging the System (B-C-E Series)

1. With the engine stopped, remove the protective caps from the Schrader type valves located on the compressor discharge connector and the Valves- In-Receiver inlet connector shell assembly.

2. Connect the Gauge Set J-5725 with valve adapters J-5420 to the Schrader type valves.

3. Crack open both high and low pressure gauge valves and allow the refrigerant to escape through the center outlet of the gauge set.

Place the end of the discharge hose into a clean open container to catch any oil discharged with the refrigerant so that the oil quantity may be measured and a like quantity of new oil be added to the system during system recharge. After the system has been completely discharged of refrigerant, any part of the refrigeration system may be serviced.

Discharging the System (A Series)

1. Remove caps from suction gauge fitting on the P.O.A. valve and discharge valve gauge fitting on the compressor.

2. With both valves on manifold gauge set (J-5725-04) closed (clockwise), attach manifold to the P.O.A. valve and compressor, using J-5420 valve adapter at suction gauge fitting and J-9459 valve adapter at discharge gauge fitting. See Figure 9B-25.

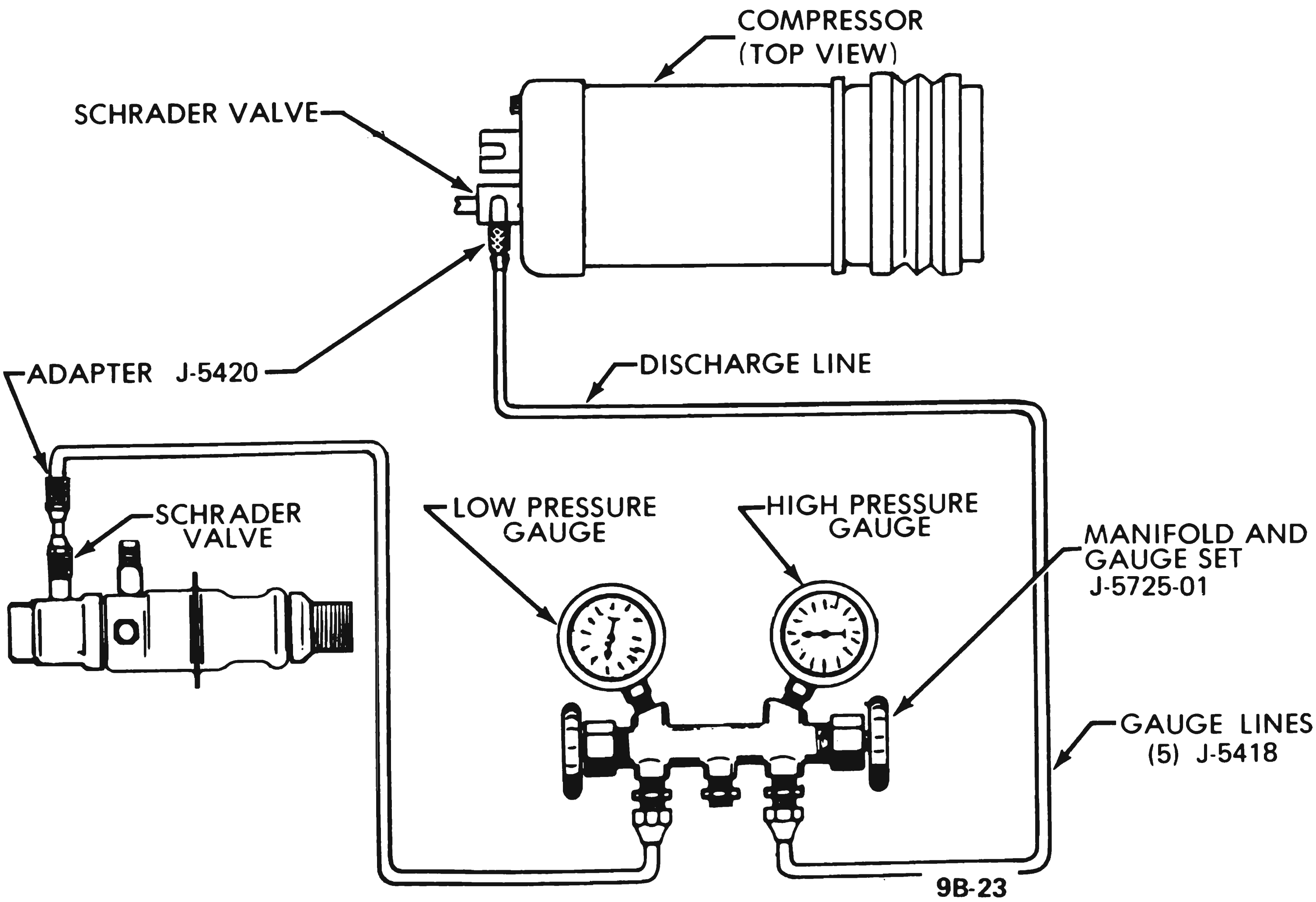


Figure 9B-25 Set-Up for Discharging System

3. Fully open high pressure valve on manifold gauge set to allow escape of refrigerant from system through the manifold gauge set and out the center fitting and hose. (Place end of hose in clean container to collect oil loss due to rapid discharge of system.)

4. When hissing ceases, indicating all refrigerant has escaped, close high pressure valve on manifold gauge set by turning valve clockwise.

Evacuating the System

When the refrigeration system is depressurized and opened for service, some air will enter the lines, regardless of how quickly openings are capped. In order to remove this air and as much as possible of the moisture it contains, the complete system must be evacuated. Evacuating is merely the process of removing all air from the system, thereby creating a vacuum in the system.

Under no circumstances should alcohol be used in the system in an attempt to remove moisture, regardless of the successful use of alcohol in other refrigeration systems.

Preparations for Evacuating Complete System

1. Check the low pressure gauge for proper calibration. With the gauge disconnected from the refrigeration system, be sure that the pointer indicates to the center of zero. Lightly tap gauge a few times to be sure pointer is not sticking. If necessary, calibrate as follows:

a. Remove cover from gauge.

b. Holding gauge pointer adjusting screw firmly with one hand, carefully force pointer in the proper direction in proper amount to position pointer through the center of "0" position. Tap gauge a few times to be sure pointer is not sticking. Replace gauge cover.

2. If gauge set is not already connected to P.O.A. valve and compressor, connect as follows:

a. Close hand shut-off valves on gauge set by turning clockwise.

b. Remove caps from gauge fittings on the P.O.A. valve and compressor.

c. Attach valve adapter (J-5420) to end of the hose from the low pressure gauge and connect this adapter fitted hose to suction gauge fitting.

d. Attach valve adapter (J-9459) to end of hose from the high pressure gauge and connect this adapter fitted hose to the discharge fitting.

3. Attach a flexible gauge hose to center fitting of the gauge set and attach the other end of this hose to vacuum pump (J-5428-03).

Evacuating Complete System

1. Turn hand shut-off valve on low pressure gauge of gauge set to full clockwise position.

2. Slowly turn valve on high pressure gauge counterclockwise from full clockwise position, letting any pressure build-up escape completely. Close high pressure valve.

3. Check oil level in vacuum pump and, if necessary, add refrigeration oil. Make sure dust cap on discharge side of pump has been removed.

4. Start the vacuum pump and slowly open low and high pressure sides of manifold gauge set to avoid forcing oil out of refrigeration system and pump. Pressure is now being reduced on both sides of the refrigeration system. If oil is blown from the vacuum pump, it should be refilled to the proper level.

5. Observe low pressure gauge and operate vacuum pump until gauge shows 28-29 inches vacuum. In all evacuating procedures, specifications of 28-29 inches of vacuum is used. This evacuation can only be attained at or near sea level.

For each 1000 feet above sea level where this operation is being performed, the specification should be lowered by one inch of mercury vacuum. At 5000 feet elevation, only 23 inches to 24 inches of vacuum can normally be obtained.

If vacuum cannot be pulled to the minimum specification for the respective altitude, it indicates a leak in the system or gauge connections or a defective vacuum pump. In this case, it will be necessary to check for leaks as described under "Leak Testing Refrigerant System".

When specified vacuum level (28-29 inches at sea level) is obtained, continue to run vacuum pump for ten (10) additional minutes. During these ten (10) minutes:

a. Prepare for charging the system. If using a charging station, fill charging cylinder. If using manifold gauge set, make all preparations for charging system as described under "Disposable Can Method" or "Refrigerant Drum Method".

b. Measure oil loss collected as a result of rapid discharge.

c. Uncap compressor oil injector (J-24095) and open valve. Flush J-24095 with refrigerant, close valve and insert pick-up tube into graduated container of clean refrigerant oil.

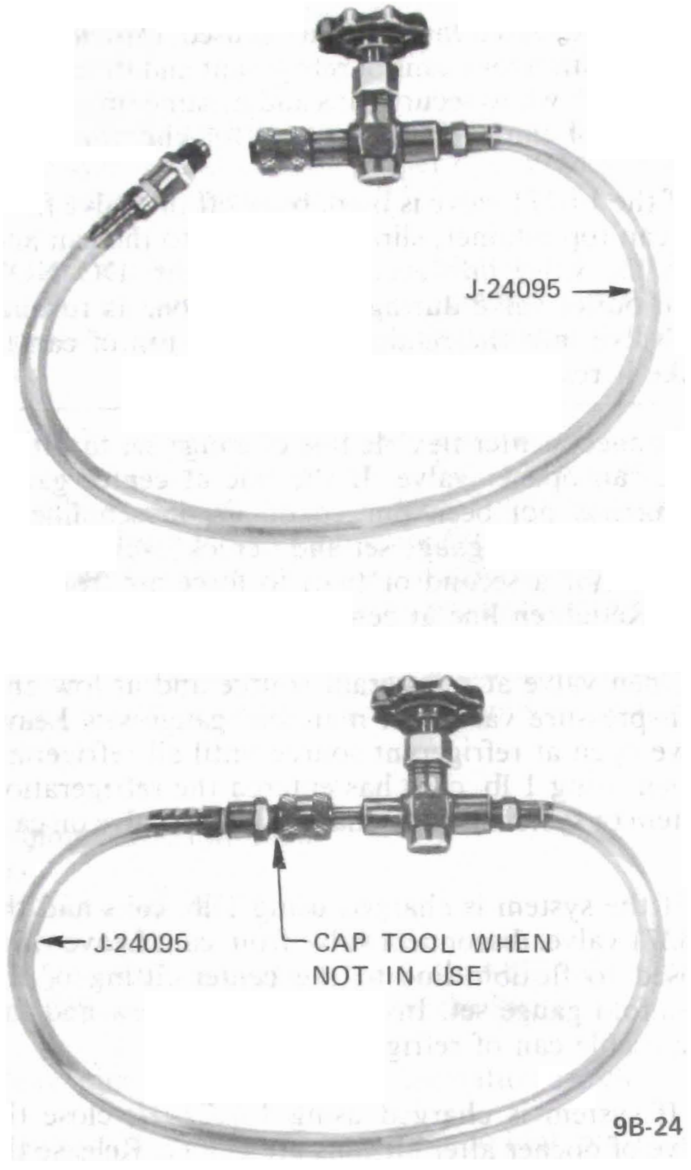


Figure 9B-26 Oil Injector J-24095

d. Connect J-24095 to suction fitting at P.O.A. valve or V.I.R. assembly. When valve on J-24095 is opened, the vacuum applied to the discharge side of the system will suck oil into system from container. Therefore, close observation of oil level in the container is necessary.

e. Note level of oil in container. Open valve on J-24095 until oil level in container is reduced by an amount equal to that lost during discharge of system, then shut valve. Take care not to add more oil than was lost.

f. Disconnect J-24095 and attach pick-up tube fitting to schrader fitting to cap tool. See Figure 9B-26.

6. Turn hand shut-off valves at low and high pressure gauges of gauge set to full clockwise position with vacuum pump operating, then stop pump. Carefully check low pressure gauge approximately for two (2) minutes to see that vacuum remains constant. If vacuum reduces, it indicates a leak in the system or gauge connections.

Charging the System

The system should be charged only after being evacuated as outlined in "Evacuating the System".

Disconnect electrical connector from thermal limiter assembly. Insert a jumper wire between terminals B and C of connector if compressor operation will be required prior to refrigerant system being fully charged. See Figure 9B-16.

Refrigerant Drum Method

1. Connect center flexible line of gauge set to refrigerant drum.

2. Place refrigerant drum in a pail of water which has been heated to a maximum of 125 degrees F.

WARNING: *Do not allow temperature of water to exceed 125 degrees F. High temperature will cause excessive pressure and possible softening of fusible safety plugs in the refrigerant drum. It may not be necessary to use hot water if a large drum is used (over approximately 100 lbs.).*

3. Place refrigerant drum (in pail of water) on scales (bathroom or commercial, preferably commercial).

Do not turn refrigerant drum upside down, as this would allow liquid refrigerant to enter compressor which may cause damage.

4. If line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and crack valve on refrigerant drum to blow air from line. Retighten line at center fitting and record exact weight of refrigerant tank in water on the scales.

5. Open valve on refrigerant drum and both valves on gauge set to allow refrigerant to flow into system. Continue charging until the scales show that 4 1/2 lbs. A Series or 4 lbs. B-C-E Series of refrigerant have been transferred from refrigerant drum to system.

If full charge cannot be obtained, close both valves on gauge set, start engine, and set temperature control lever to full cold position with system in A/C mode. Open low pressure valve on gauge set slowly and leave open until full charge is added.

WARNING: *Observe high pressure gauge while charging with compressor running. Shut off engine if pressure exceeds 435 psi. A large fan placed in front of the car will help reduce excessively high head pressure.*

6. Close both valves on gauge set (high pressure valve will already be closed if charging was completed by

running compressor) and close valve on refrigerant drum.

If the engine was used to complete the charge into the system, close valve on refrigerant drum to permit compressor to draw any refrigerant left in the line from the drum to the center fitting of the gauge set, then close the low pressure valve on the gauge set.

7. Operate engine at 2000 RPM with temperature control lever at full cold, blower speed switch on high and system in the A/C position. After ten minutes of operation, observe appearance of refrigerant in receiver-dehydrator. If bubbles are observed, open low pressure gauge valve and valve on refrigerant drum to allow more refrigerant to enter system. Close valve when receiver-dehydrator clears up.

If air inlet temperature is below 70 degrees F. when this check is made, bubbles may appear, even though the proper amount of refrigerant is in the system. Air inlet temperature must be 70 degrees F. or above to make an accurate check.

8. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under "Operational Test".

9. When satisfied that the air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on the V.I.R. assembly or the P.O.A. valve and compressor fittings.

WARNING: *A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure gauge fitting at the compressor with a shop cloth before disconnecting the valve from the gauge fitting, to prevent injury to personnel.*

10. Using a leak detector; check the complete system for leaks.

Disposable Can Method

After having depressurized, repaired (if necessary) and evacuated the refrigerant system, the system may be charged as follows using refrigerant in disposable cans:

1. Obtain five 1 lb. cans or one 12 lb. can of refrigerant.

2. If using 1 lb. cans, mount four cans in J-6272-02 (multi-opener) or attach J-6271 (single-can opener valve) on one can. If using the 12 lb. disposable can, attach J-23390 (disposable can control valve) on can.

WARNING: *Make sure outlet valve on opener is closed (clockwise) before installing opener.*

a. If the J-6272-02 multi-opener is used, raise locking lever, position four cans of refrigerant and force locking lever down to secure cans and at same time puncture top of can to make it ready for charging.

b. If the J-6271 valve is used, back off the valve from the can top retainer, slip the valve onto the can and turn the valve into retainer until tight. DO NOT open outlet valve during this operation, as turning the valve into the retainer punctures top of can to make it ready for charging.

3. Connect center flexible line of gauge set to fitting on a can opener valve. If the line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and "crack" valve at can opener (for a second or two) to force air from the line. Retighten line at center fitting.

4. Open valve at refrigerant source and at low and high pressure valves on manifold gauge set. Leave valve open at refrigerant source until all refrigerant (when using 1 lb. can) has entered the refrigeration system or system is fully charged. Close valve on can.

a. If the system is charged using 1 lb. cans and the J-6271 valve, disconnect valve from can. Leave valve closed to flexible line to the center fitting of the manifold gauge set. Install valve on a new and full disposable can of refrigerant.

b. If system is charged using J-6272-02, close the valve of opener after all cans are empty. Release the locking lever and discard the four empty cans. If this tool will be used to complete the charge with additional cans to provide the required refrigerant charge, leave three of the empty cans in positon, locate one full can and lock the lever into place. These empty cans balance the assembly and prevent the loss of refrigerant through the open "series" passage. Align the pierced hole in the empty can with the punch in the cover of the tool.

If the J-6271 valve for single cans is available, complete charging as explained in 4a preceding.

5. Close high side valve on manifold gauge set.

WARNING: *Prior to starting up engine, the high side valve on the charging manifold must be closed due to excessive pressure build-up which can result in bursting of the container(s) causing serious injury. If you are inexperienced in the use of this procedure, seek professional assistance.*

6. Operate engine at 2000 RPM with temperature control lever at full cold position and blower speed on high in A/C mode. If air inlet temperature at the condenser is below 70 degrees F. when this check is made, bubbles may appear, even though the proper amount of refrigerant is in the system. Air inlet tem-

perature must be 70 degrees F. or above to make an accurate check.

7. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under "Operational Test".

8. When satisfied that the air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on suction and discharge fittings.

WARNING: *A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure fitting at the compressor with a shop cloth before disconnecting the valve from the gauge fitting to prevent damage or injury to personnel.*

9. Using a leak detector, check the complete system for leaks.

Charging Station Method

INSTALLING J-8393-02

1. Be certain compressor hand shut-off valves to gauge fittings are closed (counterclockwise).

2. Be certain all valves on charging station are closed.

3. Connect high pressure gauge line to high pressure gauge fitting.

4. Turn high pressure hand shut-off valve one turn clockwise, and high pressure control one turn counterclockwise (open). Crack open low pressure control and allow refrigerant gas to hiss from low pressure gauge line for three seconds, then connect low pressure gauge line to low pressure gauge fitting. (Place J-9459 adapter on hose, then attach adapter to gauge fitting.)

FILLING CHARGING CYLINDER

1. Open control valve on refrigerant container.

2. Open valve on bottom of charging cylinder, allowing refrigerant to enter cylinder.

3. Bleed charging cylinder to valve (behind control panel) only as required to allow refrigerant to enter cylinder. When refrigerant reaches desired charge level, close valve at bottom of charging cylinder and be certain cylinder bleed valve is closed securely.

While filling the cylinder, it will be necessary to close the bleed valve periodically to allow boiling to subside so that refrigerant level in the charging cylinder can be accurately read.

CHARGING THE SYSTEM USING J-8393-02

1. With charging station connected, as previously described, remove low pressure gauge line at P.O.A. valve or V.I.R.

2. Crack open high and low pressure control valves on station and allow refrigerant gas to purge from system. Purge slowly enough so that oil does not escape from system along with refrigerant.

3. When refrigerant flow nearly stops, connect low pressure gauge line to P.O.A. valve or V.I.R.

4. Turn on vacuum pump and open vacuum control valve.

5. With system purged as above, run pump until 26-28 inches of vacuum is obtained. Continue to run pump for 15 minutes after the system reaches 26-28 inches vacuum.

In all evacuating procedures, the specification of 26-28 inches of mercury vacuum is used. These figures are only attainable at or near sea level. For each 1000 feet above sea level where this operation is being performed, the specifications should be lowered by 1 inch. For example, at 5000 feet elevation, only 21 to 23 inches vacuum can normally be obtained.

6. If 26-28 inches vacuum (corrected to sea level) cannot be obtained, close vacuum control valve and shut off vacuum pump. Open refrigerant control valve and allow some refrigerant to enter system. Locate and repair all leaks.

7. After evacuating for 15 minutes, add 1/2 lb. of refrigerant to system. Purge this 1/2 lb. and re-evacuate for 15 minutes. This second evacuation is to be certain that as much contamination is removed from the system as possible.

8. Only after evacuating as above, system is ready for charging. Note reading on sight glass of charging cylinder. If it does not contain a sufficient amount for a full charge, fill to proper level.

9. Close low pressure valve on charging station. Fully open station refrigerant control valve and allow all liquid refrigerant to enter system. When full charge of refrigerant has entered system, turn off refrigerant control valve and close both hand shut-off valves.

10. If full charge of refrigerant will not enter system, close high pressure control and refrigerant control valves. Start engine and run at low idle with compressor operating. Crack refrigerant control valve and low pressure control on station. Watch low side gauge and keep gauge below 50 psi by regulating refrigerant control valve. Closing valve will lower

pressure. This is to prevent liquid refrigerant from reaching the compressor while the compressor is operating. When required charge has entered system, close refrigerant control valve and close low pressure control.

11. System is now charged and should be performance- tested before removing gauges.

Adding Refrigerant

The following procedure should be used in adding small amounts of refrigerant that may have been lost by leaks or while opening system for servicing the compressor. Before adding refrigerant to replace that was lost by leaks, check for evidence of oil loss and add oil if necessary.

This procedure will only apply if the air inlet temperature is above 70 degrees F. at the condenser.

1. Remove caps from P.O.A. valve or V.I.R. assembly and compressor gauge fitting. Attach gauge set to gauge fittings, making sure adapter (J-5420) is between low pressure gauge hose and suction gauge fitting, and J-9459 is between high pressure gauge hose and discharge gauge fitting.

2. Start engine, turn air conditioning temperature control lever to full cold position, blower switch to high speed and system selector lever to the A/C mode. Operate for ten (10) minutes at 2000 RPM to stabilize system.

3. Observe the refrigerant through the sight glass cover of receiver-dehydrator with the system operating, to see if there are any bubbles evident.

a. If no bubbles are evident, then bleed system slowly through the discharge valve until bubbles appear in the receiver-dehydrator. Add 1 lb. of refrigerant as explained under "Charging the System".

b. If bubbles are visible in the receiver-dehydrator with the temperature control lever in the full cold position and the blower at HI speed, it indicates a partial or complete plug in a line, a shortage of refrigerant, or both. Correct condition. Add refrigerant until the sight glass clears, then add another 1 lb. of refrigerant.

4. Attach flexible hose from center fitting of gauge set loosely to refrigerant drum or on disposable can valves. Open high and low pressure valves on the gauge set slightly to purge pressure gauge lines of air. Tighten fitting of refrigerant drum or can when satisfied that all air has been removed from gauge lines. Close (clockwise) both hand shut-off valves or gauge set.

5. Partially charge system.

REFRIGERANT DRUM METHOD:

a. Place pail containing hot water that does not have a temperature exceeding 125 degrees F. on scales, place refrigerant drum in pan containing water, note weight and only open low pressure valve on gauge set.

b. Start engine, move temperature control lever to full cold position and place blower switch on high speed. Operate engine for ten (10) minutes at 2000 RPM to stabilize system.

c. With compressor operating, slowly open valve on refrigerant drum and allow refrigerant to flow into system (through manifold gauge set) until liquid indicator clears up and immediately shut off valve at gauge set or on refrigerant drum. Check weight of refrigerant drum and pail of water. Then slowly open valve on gauge set (or refrigerant drum) and add one more lb. of refrigerant. Note total amount of refrigerant added.

DISPOSABLE CAN METHOD:

a. Make sure the outlet valve on the J-6271 valve is fully clockwise and attach the J-6271 to a 1 lb. can of refrigerant by backing off the valve from the top of the retainer, slipping the valve onto the can and turning the valve into the retainer until tight. DO NOT accidentally open outlet valve during this operation, as turning the valve into the retainer punctures the top of the can to make it ready for charging.

b. Connect center flexible line of gauge set to the fitting on the valve.

c. Start engine, move temperature control lever to full cold position, set blower switch to high speed and system to A/C mode. Operate engine for ten (10) minutes at 2000 RPM to stabilize system.

d. With compressor operating, slowly open valve on refrigerant can and allow refrigerant to flow into system (through manifold gauge set) until liquid indicator clears up and immediately shut off valve at gauge set and on refrigerant can. Check weight of can and valve assembly and record.

e. Add an additional 1 lb. of refrigerant by adding refrigerant from the can just weighed until can is empty. Attach another can and add refrigerant until can and valve assembly weigh the same as recorded.

6. Close valves at refrigerant drum or can.

7. Test for leaks and make operational check of system.

ADDING OIL TO THE SYSTEM (MAJOR OVERHAUL)

The oil in the refrigeration system does not remain in the compressor during system operation, but circulates throughout the system. The compressor is initially charged with 10-1/2 oz. of 525 viscosity oil. After system has been in operation the oil content in the compressor will vary depending on the engine RPM and air conditioning load. At higher engine RPM's a lesser amount of oil will be retained in the compressor reservoir. It is important that the total system oil content does not vary from a total of 10-1/2 oz. Excessive oil content will reduce cooling capacity. Inadequate oil content may result in damage to compressor moving parts.

The refrigeration system will not require adding of oil unless there is an oil loss because of a ruptured line, badly leaking compressor seal, replacement of evaporator, compressor, receiver-dehydrator, or loss due to a collision. Oil is generally added to the system via the oil drain hole in the lower side of the compressor for this condition. To add oil to the system via the compressor, the compressor must be removed. If no major loss of oil has occurred and a component (condenser, receiver-dehydrator or evaporator) is removed for servicing, the oil may be added directly to the component. To add oil to a component removed for servicing and when no major loss has occurred, drain and measure oil in component, then replace with a like amount. To add oil to the system when a major loss of oil is evidenced, or when the compressor is being serviced, remove compressor, drain and measure oil, and replace oil amount specified in the Oil Replacement Table.

Oil Replacement Table

Condition	Amount of Oil Drained From Compressor	Amount of 525 Oil to Install In Compressor
1. Major loss of oil and a component (condenser, receiver-dehydrator, or evaporator) has to be replaced.	a. More than 4 oz.	a. Amount drained from compressor, plus amount for component being replaced. Evaporator - Add 2 oz. Condenser - Add 1 oz. Receiver-Dehydrator - Add 1 oz.
	b. Less than 4 oz.	b. Install 6 oz., plus amount for component being replaced as shown above.
2. Compressor being replaced with a service replacement compressor - no major oil loss.	a. More than 1 1/2 oz.	a. Same amount as drained from compressor being replaced.
	b. Less than 1 1/2 oz.	b. Install 6 oz.
3. Compressor being replaced with a service replacement compressor - major oil loss evident.	a. More than 4 oz.	a. Same amount as drained from compressor being replaced.
	b. Less than 4 oz.	b. Install 6 oz.
4. Compressor being rebuilt or repaired - no major oil loss evident.	a. More than 1 1/2 oz.	a. Same amount as drained from compressor, plus 1 oz. additional.
	b. Less than 1 1/2 oz.	b. Install 7 oz.

Condition	Amount of Oil Drained From Compressor	Amount of 525 Oil to Install In Compressor
5. Compressor being rebuilt or repaired - major loss of oil evident.	a. More than 4 oz.	a. Same amount as drained from compressor, plus 1 oz. additional.

If foreign material is noted in oil drained from system or evidence of moisture is obvious in the components removed, it is recommended that the entire system be flushed (ref. to "Flushing the System") and the receiver dehydrator be replaced or desiccant bag in V.I.R. assembly. A full oil charge of 10-1/2 oz. of 525 viscosity refrigeration oil should be replaced in the system. It should be noted that all service replacement compressors will be supplied with 10-1/2 oz. of oil. In most cases it will be necessary to drain oil from service replacement compressor and refill it with amount as specified in Figure 9B-27.

FLUSHING THE SYSTEM

Flushing of the system may involve all the components of the system or individual components in the system. The components may be flushed while mounted in the engine compartment or may be removed for flushing. When a component is not removed, disconnect all refrigerant lines or hoses attached to component. To perform flushing operation, connect a cylinder of refrigerant-12 to the component to be flushed, then invert the cylinder and open the cylinder valve so that the liquid refrigerant pours out and through the component. When liquid Refrigerant-12 reaches atmospheric pressure, it immediately drops to minus 21.7 degrees F. Insure that area immediately surrounding outlet of component is clear of anything that may be damaged by contact because of the sudden drop in temperature.

In all cases where a complete system flushing operation is performed, the receiver-dehydrator and the filter screen on the expansion valve should be replaced. If the evaporator assembly is flushed while installed in the car, the temperature bulb on the evaporator outlet pipe must be disconnected to keep the expansion valve from closing at the inlet source.

It is recommended that dry nitrogen be used as a flushing agent due to the low cost involved. In addition, dry nitrogen will not cause a temperature drop, as in the case of refrigerant-12, which results in thickening of refrigerant oil. Dry nitrogen has the additional advantage of removing moisture from the system.

MAJOR REPAIR

In removing and replacing any part of the refrigeration system the following must be considered and performed as required.

To prevent an unnecessary "blown thermal fuse" in the Low Refrigerant Charge Protector System when evacuating and charging the system, disconnect the thermal limiter connector plug.

1. Discharge the system refrigerant to the atmosphere, see "Discharging the System".

2. Remove and replace the component part according to the appropriate recommended step procedure.

3. Add oil to the system according to the quantity lost during the discharge of the system plus the recommended quantity to be added for the specific component changed. (See the recommendations for checking and adding oil.)

It is recommended that the desiccant bag in the V.I.R. Assembly be changed each time it is necessary to service the system. Do not expose the desiccant bag to the atmosphere any longer than necessary to remove the bag from its shipping container, place it in the receiver shell and immediately install the receiver shell on the valve housing. See Drier Desiccant - Remove and Replace.

4. Evacuate the system according to the System Evacuation Procedure.

5. Charge the system with the proper amount of Refrigerant 12 specified for the refrigerant system.

6. Leak test the refrigerant system, particularly the connections which were disconnected.

SERVICING OF THE REFRIGERATION SYSTEM COMPONENTS

In removing and replacing any part of the refrigeration system the following must be considered and performed as required.

To prevent an unnecessary "blown thermal fuse" in the Low Refrigerant Charge Protector System when evacuating and charging the system, disconnect the thermal limiter connector plug.

1. Discharge the system refrigerant to the atmosphere, see "Discharging the System".

2. Remove and replace the component part according to the appropriate recommended step procedure.

3. Add oil to system according to the quantity lost during the discharge of the system plus the recommended quantity to be added for the specific component changed.

It is recommended that the desiccant bag be changed each time it is necessary to service the VIR unit. Do not expose the desiccant bag to the atmosphere any longer than necessary to remove the bag from its shipping container, place it in the receiver shell and immediately install the receiver shell on the valve housing. See Drier Desiccant - Remove and Replace.

4. Evacuate the system according to the System Evacuation Procedure.

5. Charge the system with the proper amount of Refrigerant 12 specified for the refrigerant system.

6. Leak test the refrigerant system, particularly the connections which were disconnected.

REMOVAL AND INSTALLATION OF VIR ASSEMBLY

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging The System".

While the system is discharging, clean the surface dirt from the exterior surface of the VIR Assembly and the line connection areas. Blow any loose dirt away with an air hose.

2. When the system is completely discharged (high or low sides), loosen and remove the suction line, the liquid line and the liquid bleed line connections from the VIR assembly.

3. Loosen the evaporator inlet and outlet connection nuts at the VIR assembly.

4. Remove the VIR mounting clamp from the liquid receiver and carefully slide the VIR assembly off the evaporator outlet tube first and then off the evaporator inlet tube.

5. Remove and discard all of the old line connection "O" rings. At this point the VIR assembly may be replaced by a complete VIR assembly or disassembled for the replacement of individual parts as required. An exploded view of the (VIR) Valves-In-Receiver assembly is shown in Figure 9B-28. Refer to Disassembly procedures and observe all warnings.

All line connections and openings should be plugged or sealed to prevent the entry of dirt and moisture into the system. The new VIR assembly should remain capped and sealed until ready for immediate installation. If the VIR assembly has been reoperated the VIR connection openings should be plugged during reassembly and the desiccant bag added to the receiver shell just prior to the receiver shell being assembled to the valve body and the immediate installation of the complete VIR assembly.

6. Lubricate all VIR assembly connection "O" rings liberally with refrigerant oil (525 Viscosity) and install the O-Rings on the connection tubes. When making all connections use care to prevent nicking the "O" rings and cross threading the connection threads. See Figure 9B-30.

7. Remove the plugs from the evaporator inlet and outlet tube connection openings of the VIR Assembly. Assemble the VIR assembly onto the evaporator inlet tube first and then onto the outlet tube. When the assembly is in proper position install the VIR mounting clamp. Tighten the evaporator inlet connection to a 15 to 20 Lbs. Ft. torque and the evaporator outlet connection to a 28 to 33 Lbs. Ft. torque.

8. Remove the plug from the liquid bleed line connection opening of the VIR assembly. Connect and tighten the liquid bleed line connection to the VIR assembly to a 5 to 7 Lbs. Ft. torque.

9. Remove the plug from the liquid line connection opening in the VIR assembly. Connect and tighten the liquid line connection to the VIR assembly to a 11 to 13 Lbs. Ft. torque.

10. Remove the plug from the suction line connection opening in the VIR assembly. Connect and tighten the suction line connection at the VIR assembly to a 28 to 33 Lbs. Ft. torque.

11. Evacuate, leak check and charge the system.

12. Reconnect the thermal limiter connector plug.

DRIER DESICCANT - REMOVAL AND INSTALLATION

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging, clean the surface dirt from the exterior of the VIR assembly. Use an air hose to blow the area free of loose dirt.

2. When the system is completely discharged, loosen the screws that mount the receiver shell to the VIR valve housing. Partially remove the screws approximately 3 turns.

WARNING: *For personal safety DO NOT remove the screws entirely until Step 5.*

3. Remove the VIR mounting bracket from the receiver.

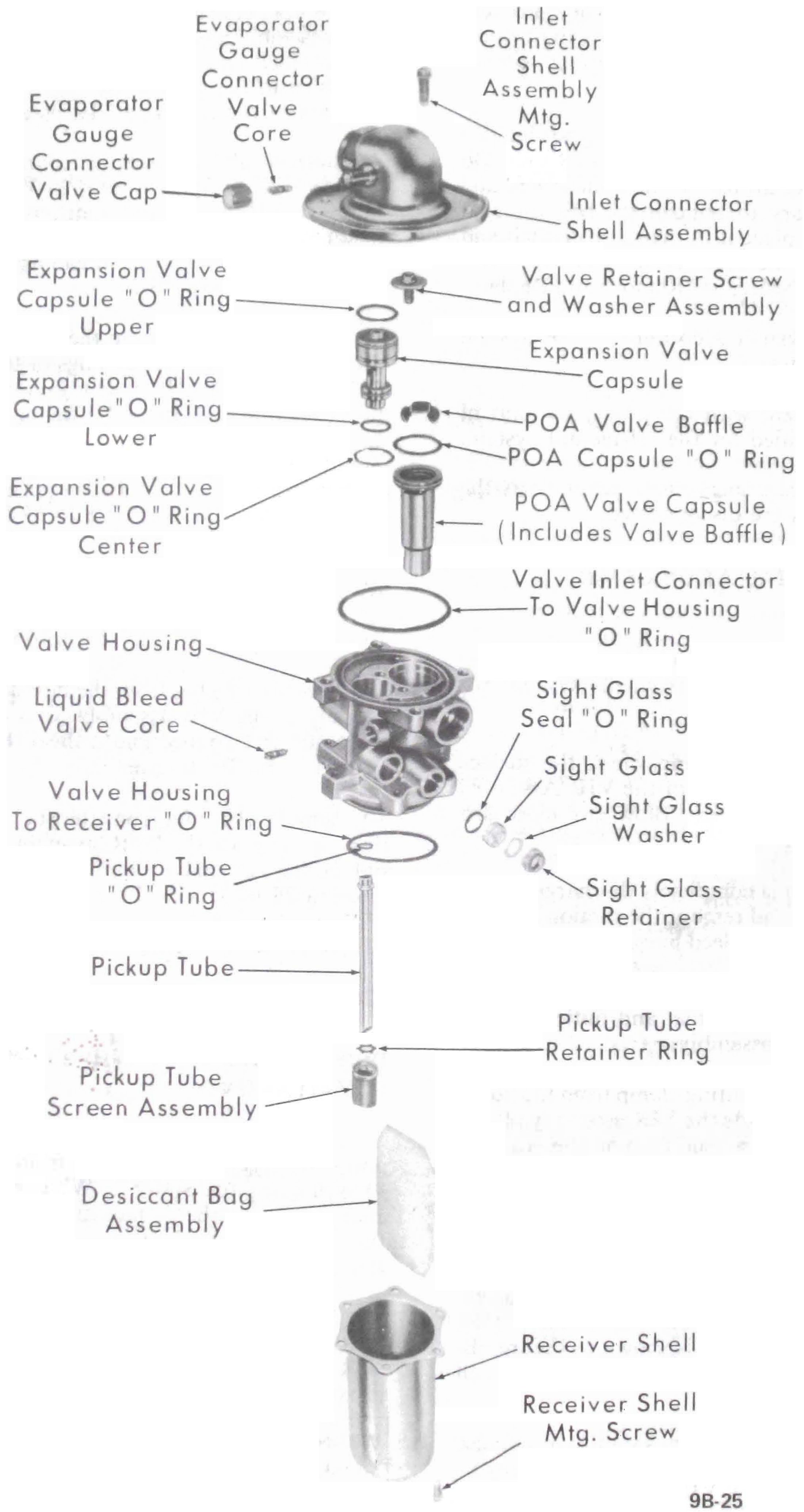


Figure 9B-28 Exploded View - Valves in Receiver Assembly

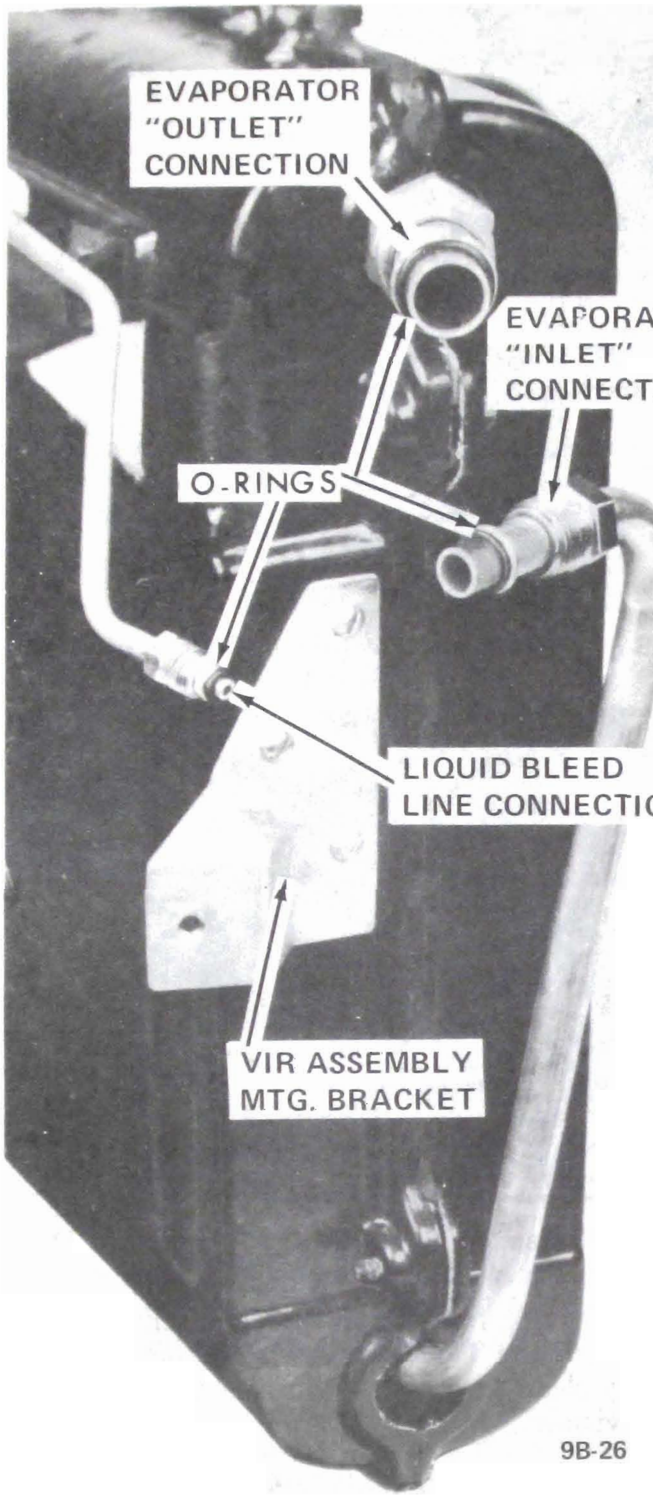


Figure 9B-30 Evaporator Connections to the VIR Assembly

4. Hold the VIR valve housing and push on the lower end of the receiver to break the seal to the housing.

If the receiver sticks and is hard to cock to one side, use a flat blade screwdriver and carefully pry between the receiver mounting flange and the condenser line connection to free the receiver.

5. Remove the receiver mounting screws and remove the receiver by lowering it downward to clear the liquid pickup tube and filter screen. See Figure 9B-31.

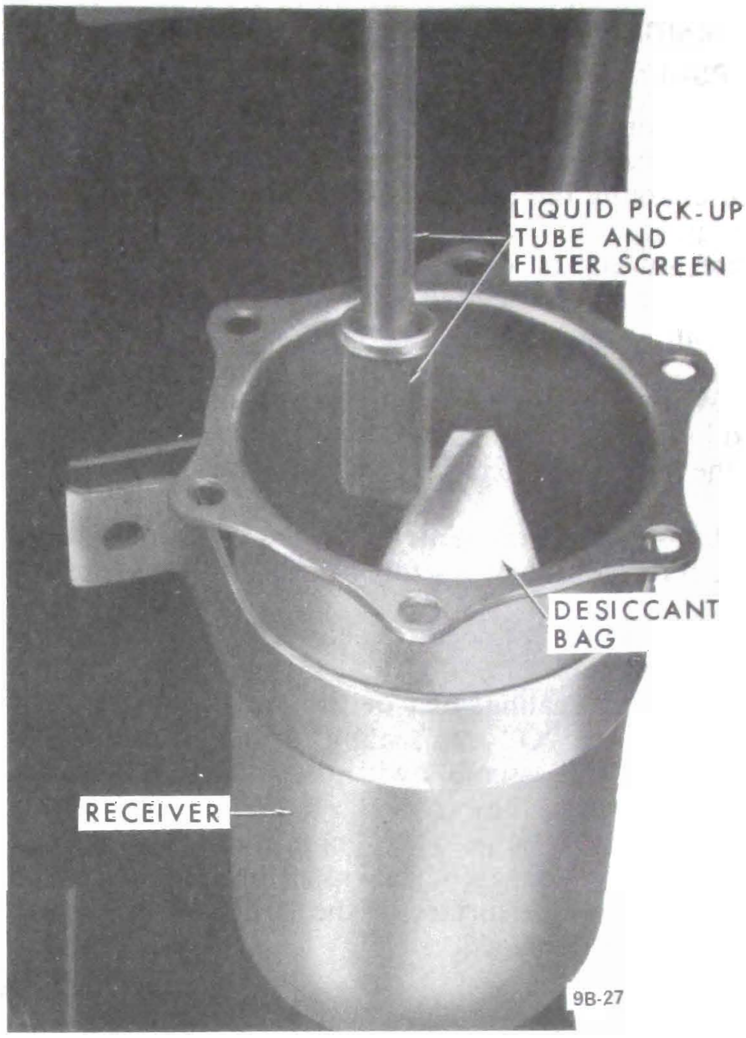


Figure 9B-31 Receiver Shell Removed for Access to Desiccant Bag

6. Discard the bag of old desiccant and the valve housing to receiver "O" ring. Wash the liquid pickup tube filter screen and the interior of the receiver with clean solvent as required and blow dry with air.

7. Lubricate the new valve housing to receiver "O" ring with clean refrigerant oil (525 Viscosity) and install the "O" ring to the valve housing groove.

8. Add a film of oil at the inner top of the receiver to facilitate assembly. Reassemble the filter screen to the liquid pickup tube. Be sure the screen is all the way onto the tube.

9. Add one ounce of new refrigerant oil and a new bag of drier desiccant to the receiver and assemble the receiver to the valve housing. Tighten the receiver mounting screws to 5 to 7 Lbs. Ft. torque.

10. Reassemble the VIR mounting bracket to the receiver.

11. Evacuate, leak check and charge the system.

12. Reconnect the thermal limiter connector plug.

THERMOSTATIC EXPANSION (TX) VALVE CAPSULE - REMOVAL AND INSTALLATION

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging, clean the surface dirt from the upper exterior surface of the valve housing and the inlet connector shell assembly. Blow any loose dirt away with an air hose.

2. When the system is completely discharged (high and low sides) loosen the evaporator tube connection at the VIR inlet connector shell assembly.

3. Loosen and remove all the screws that mount the inlet connector shell assembly to the valve housing.

Slip the inlet connector shell assembly off the evaporator tube carefully to avoid damaging either the "O"ring sealing area of the valve housing or scratching the "O" ring sealing surface of the inlet connector shell assembly with the valve capsule retaining screws or the POA valve baffle. Discard both the evaporator outlet tube connection "O" ring. Place the inlet connector shell assembly in a location where the sealing surface of the flange will not be scratched or damaged.

4. Clean the top area of the valve housing of any dirt dislodged from the bottom flange of the inlet connector shell assembly during removal. Blow any loose dirt away with an air hose.

WARNING: *Be certain that the complete refrigeration system is "totally discharged of refrigerant". All pressure must be released and the TX valve and POA valve freed in their cavities before removing the capsule retaining screw and washer assembly in Step 8. Perform Steps 5 through 8 in sequence as follows for personal safety.*

5. Loosen the TX valve and POA valve capsule retaining screws and partially remove one of the screw and washer assembly entirely. See Figure 9B-32.

6. Attach the TX valve removal tool J-24182-1 to the tapered groove projection on the diaphragm end of the TX valve. See Figure 9B-33.

7. Position the handle of the removal tool over the partially removed retaining screw and press down on the tool handle to lift and free the TX valve in its cavity. See Figure 9B-33.

WARNING: *The POA valve must be freed in its cavity before removing the TX valve.*

8. When the TX valve lifts free, remove the removal tool, the retaining screw and washer assembly and remove the TX valve capsule.

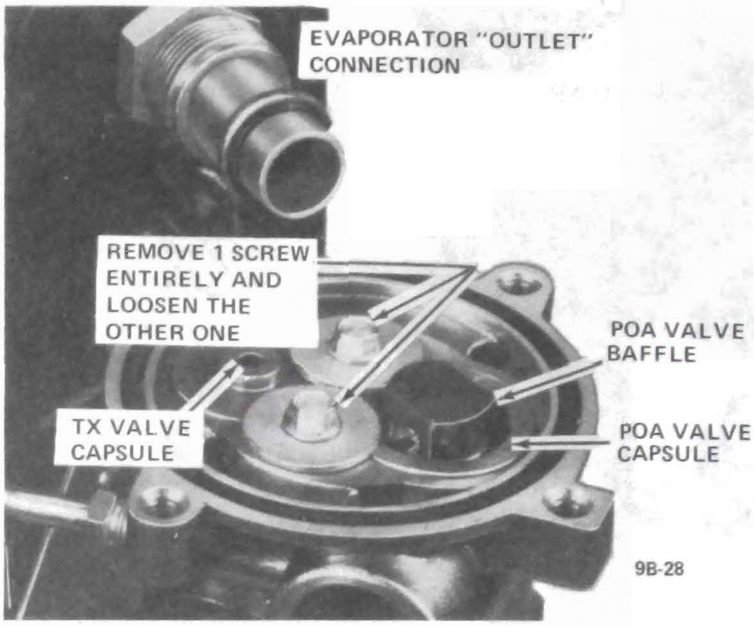


Figure 9B-32 VIR Assembly with Inlet Connector Shell Assembly Removed

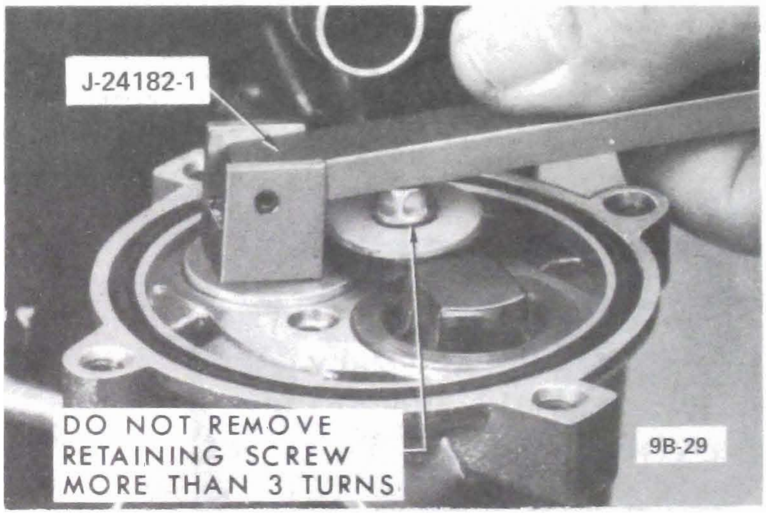


Figure 9B-33 Capsule Removal Tool Attached to TX Valve Capsule

9. Using "O" ring removal tool J-9553, remove the "O" ring from the TX valve cavity. Wipe the TX valve cavity clean with a clean lint free cloth, if any residue is visible.

10. Lubricate the three TX valve "O" rings and TX valve cavity with clean refrigerant oil (525 viscosity).

11. Install the new TX valve "O" ring to the TX valve cavity. The center "O" ring seals between bottom of expansion valve capsule and casting cavity, not around equalizer groove. Carefully install the new TX valve capsule in the valve cavity and press into place by hand. See Figure 9B-34.

12. Reinstall the two valve retaining screw and washer assemblies and tighten to 5-7 Lbs. Ft. torque.

13. Clean the entire bottom flange surface of the inlet connector shell assembly to be free of all dirt. Inspect the "O" ring sealing area of the flange for any scratches that could result in a leak.

14. Apply clean refrigerant oil to the new valve housing to inlet connector shell assembly "O" ring and

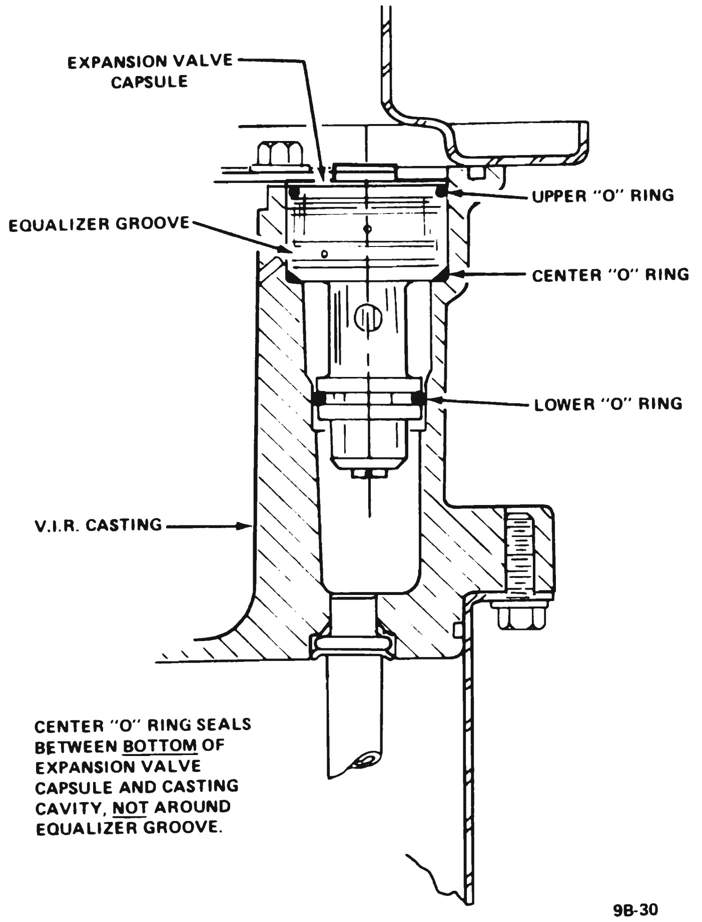


Figure 9B-34 Location of Upper and Lower "O" Rings on TX Valve

the new evaporator outlet tube to VIR inlet connector shell assembly "O" ring. Carefully install the VIR inlet connector shell assembly onto the evaporator outlet tube and start the thread of the nut into the connector of the VIR inlet connector shell assembly but do not tighten.

Use care in moving the inlet connector shell assembly across the top of the VIR valve housing to prevent scratching the flange sealing surface.

15. Position the inlet connector shell assembly over the valve housing and install the mounting screws. Tighten the screws to 5 to 7 Lbs. Ft. torque.

16. Tighten the evaporator outlet tube connection nut at the VIR inlet connector shell assembly to 28 to 33 Lbs. Ft. torque.

17. Replace the desiccant bag. See "Drier Desiccant - REMOVAL AND INSTALLATION".

18. Evacuate leak check and charge the system.

19. Reconnect the thermal limiter connector plug.

POA Valve Capsule - Removal and Installation

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging clean the surface dirt from the upper exterior surface of the valve housing and inlet connector shell assembly. Blow any loose dirt away with an air hose.

2. When the system is completely discharged (high and low sides) loosen the evaporator tube connection at the VIR inlet connector shell assembly.

3. Loosen and remove all the screws that mount the inlet connector shell assembly to the valve housing.

Slip the inlet connector shell assembly off the evaporator outlet tube carefully to avoid damaging either the "O" ring sealing area of the valve housing or scratching the "O" ring sealing surface of the inlet connector shell assembly with the valve retaining screws or the POA valve baffle.

4. Place the inlet connector shell assembly in a location where the sealing surface of the flange will not be scratched or damaged. Discard both the evaporator outlet tube connection "O" ring and the inlet connector shell assembly to valve housing "O" ring.

5. Clean the top area of the valve housing of any dirt dislodged from the bottom flange of the inlet connector shell assembly during removal. Blow any loose dirt away with an air hose.

6. Loosen the TX valve and POA valve capsule retaining screw and washer assemblies and partially remove one of the screw and washer assembly 3 turns. Remove the other screw and washer assembly entirely. See Figure 9B-35.

WARNING: *Be certain that the complete refrigeration system is "totally discharged of refrigerant". All pressure must be released and the POA valve and TX valve freed in their cavities before removing the capsule retaining screw and washer assembly in Step 9. For personal safety and to ensure that the pressure in the receiver and inlet side of the TX valve is released, perform Steps 1 through 4 of "Drier Disiccant - Remove and Install" before removing the retaining screw and washer assembly.*

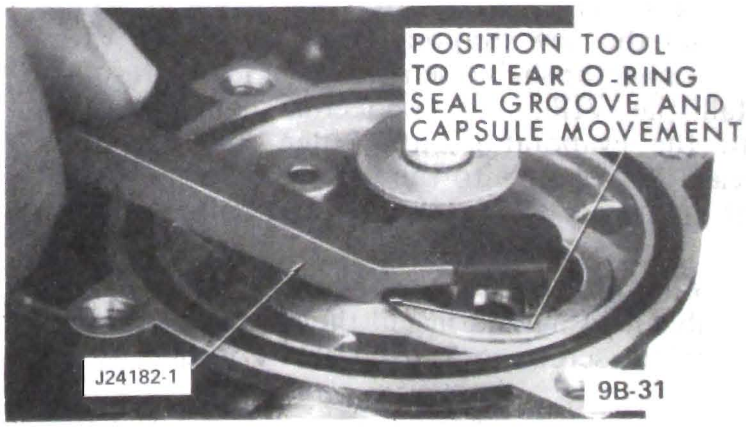


Figure 9B-35 Removing POA Valve Capsule with Removal Tool

7. Insert the POA valve capsule removal tool J24182-1 into the valve baffle of the POA valve, Figure 9B-35, so that the step edge of the tool clears the edge of the POA valve capsule.

Position the fulcrum heel of the removal tool away from the "O" ring sealing area to prevent damaging the "O" ring groove of the valve housing.

8. Keep the tool firmly engaged with the valve baffle while pressing down on the handle of the removal tool to free the POA valve capsule in the cavity.

WARNING: *The TX valve must be freed in its cavity before removing the POA valve.*

9. When the POA valve capsule breaks free, remove the removal tool, the retaining screw and washer assembly and remove the POA valve capsule.

10. Wipe the POA valve cavity and mounting flange recess clean, using a clean lint free cloth if residue is visible.

11. Lubricate the new POA valve capsule "O" ring and the POA valve cavity mounting flange recess area with clean refrigerant oil (525 Viscosity).

12. Install the new "O" ring on the new POA valve capsule and carefully install the POA valve capsule in the valve cavity. Press into place by hand.

13. Reinstall the two valve capsule retaining screw and washer assemblies and tighten to 5 to 7 Lbs. Ft. torque.

14. Clean the entire bottom flange surface of the inlet connector shell assembly to be free of all dirt. Inspect the "O" ring sealing area of the flange for any scratches that could result in a leak.

15. Apply clean refrigerant oil to the new valve housing to inlet connector shell assembly "O" ring and the new evaporator outlet tube to VIR inlet connector shell assembly "O" ring. Carefully install the VIR inlet connector shell assembly onto the evaporator outlet tube and start the thread of the nut into the connector of the VIR inlet connector shell assembly but do not tighten.

16. Position the inlet connector shell assembly over the valve housing and install the mounting screws. Tighten the screws to 5 to 7 Lbs. Ft. torque.

17. Tighten the evaporator outlet tube connection nut at the VIR inlet connector shell assembly to 28 to 33 Lbs. Ft. torque.

18. Complete the "Drier Desiccant - Remove and Replace".

19. Evacuate, leak check and charge the system.

20. Reconnect the thermal limiter connector plug.

HOUSING VIR VALVE - REMOVAL AND INSTALLATION

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging, clean the surface dirt from the exterior of the VIR assembly, particularly in the area of the external connections. Use an air hose to blow the line connection areas free of any loose dirt.

2. When the system is completely discharged, loosen all line connections to the VIR assembly.

3. Remove the VIR assembly mounting bracket screw and carefully disconnect each line from the VIR and remove the VIR assembly. Plug or cap all refrigerant lines and openings to prevent entry of dirt and moisture to the evaporator, compressor and condenser lines. Discard all external connection "O" rings.

4. Remove the inlet connector shell assembly mounting screws and remove the inlet connector shell assembly. Discard the inlet connector shell assembly to valve housing "O" ring.

5. Remove one of the two valve capsule retaining screw and washer assemblies. Loosen the other screw and washer assembly and partially remove 3 turns.

6. Using Tool J24182-1, lift the TX valve capsule free in its cavity, Figure 9B-33.

7. Remove the remaining screw and washer assembly and the TX valve capsule. Remove and discard the three TX valve "O" rings (two from the TX valve capsule and one from the TX valve cavity in the valve housing).

8. Using Tool J24182-1, lift the POA valve capsule

9. Remove the receiver shell mounting screws and remove the receiver shell. Discard the receiver shell to valve housing O-Ring and the desiccant bag. Clean the receiver shell and liquid pickup tube screen as required before reassembling.

10. Using a small screwdriver blade, or similar tool, raise each tang of the pickup tube retainer ring a little at a time, moving around the retainer

in a circular manner until the retainer ring is free of the valve housing opening, Figure 9B-36.

11. Remove the pickup tube and discard the pickup tube retainer and O-Ring.

12. Reassemble the VIR using the new valve housing and all new O-Rings according to the following procedure.

The new valve housing contains the liquid bleed valve core and sight glass assembly. These parts are factory assembled into the housing and torqued in place. Check to be sure the new valve assembly is free of lint or dirt in all cavities and connections. Clean with solvent if necessary and blow dry with air.

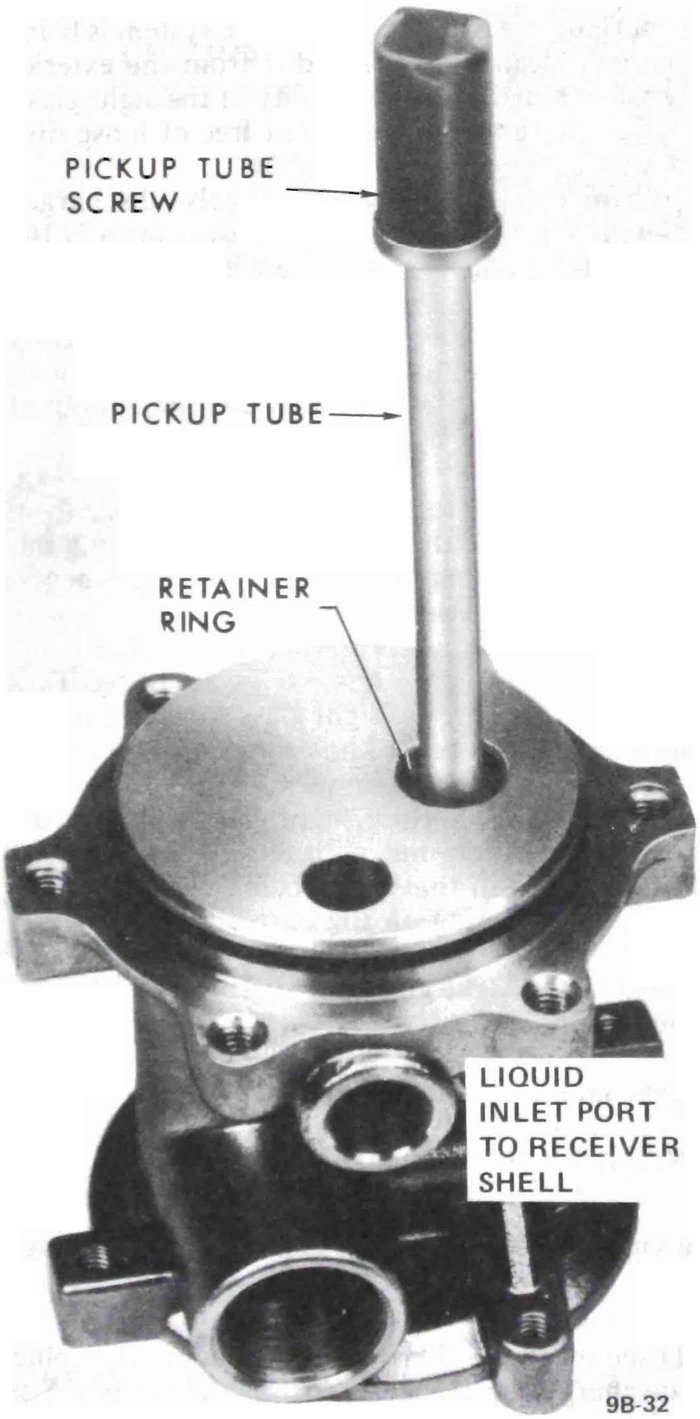


Figure 9B-36 Pick-Up Tube Assembly to Valve Housing

13. Place the new valve housing upside down on a clean flat surface. Install a new O-Ring and pickup tube retainer on the pickup tube. Lubricate the O-Ring with clean 525 Viscosity oil.

14. Using tool J24182-3, install the pickup tube into the valve housing. Be sure the tube is bottomed in the opening and the tool vertically in line before seating the tube retainer in place. Visually check the seating of the retainer ring tangs and that no tang fractured during the installation. See Figures 9B-36 and 9B-37.

15. Lubricate the top of the POA valve capsule cavity of the valve housing and the new POA valve capsule O-Ring with clean 525 Viscosity oil and install the POA valve in its cavity in the valve housing. Thumb or hand press into place.

16. Lubricate the TX valve cavity of the valve housing and the new TX valve capsule O-Rings with clean 525 Viscosity oil. Install the upper and lower O-Rings to the capsule and the center O-Ring in the TX valve capsule cavity of the valve housing. The center "O" Ring seals between the bottom of the expansion valve capsule and casting cavity, not around equalizer groove. See Figure 9B-34.

17. Install the TX valve capsule and thumb or hand press into place. Install both capsule retaining screw and washer assemblies and torque to 5 to 7 Lbs. Ft. torque.

18. Lubricate the inlet connector shell assembly to valve housing O-Ring with clean 525 Viscosity oil and install in the valve housing O-Ring groove.

19. Install the inlet connector shell assembly in proper alignment and torque the mounting screws to 5 - 7 Lbs. Ft. torque.

20. Lubricate the valve housing to receiver shell O-Ring with clean 525 Viscosity oil and install in the valve housing O-Ring groove.

21. Lubricate the inner top surface of the receiver shell with clean 525 Viscosity oil and install the pickup tube screen to the pickup tube.

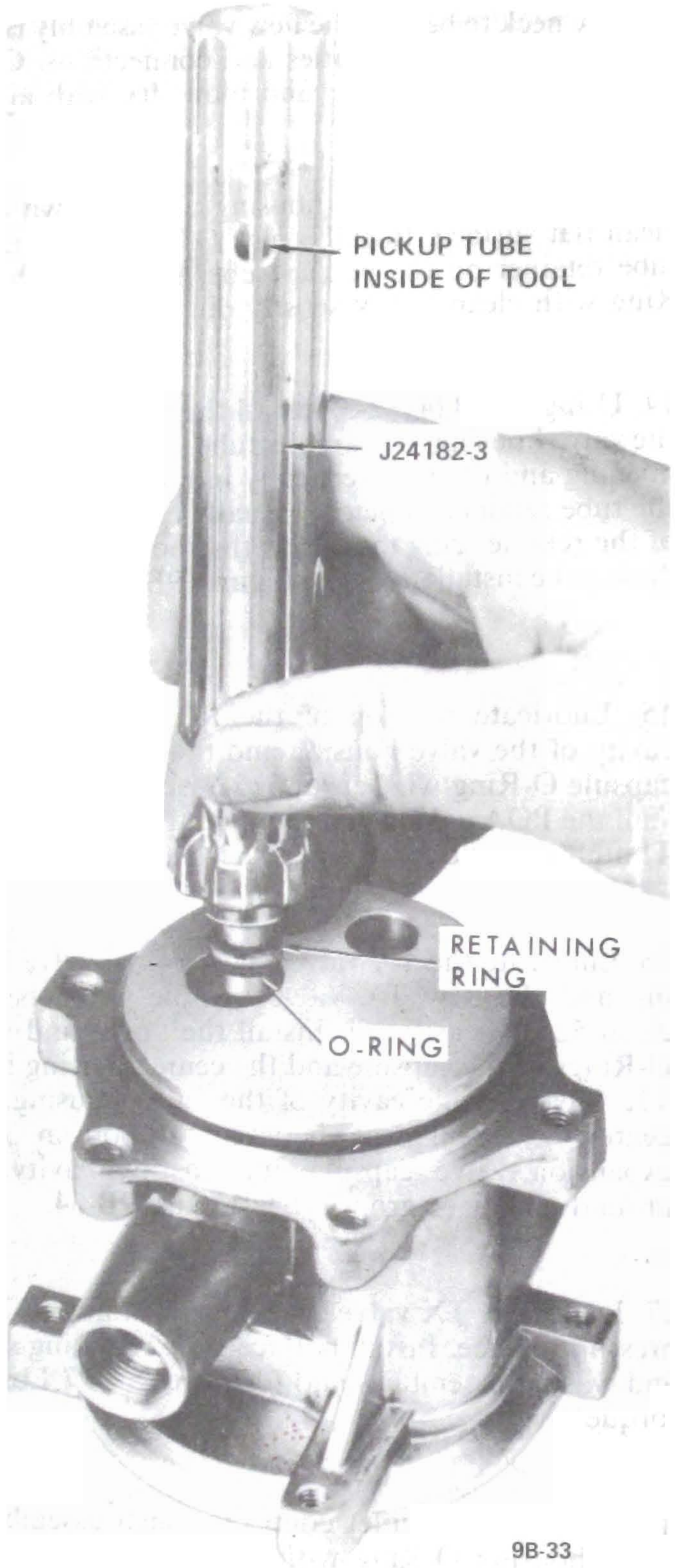


Figure 9B-37 Installing Pick-Up Tube with Retaining Ring Installing Tool

22. Unpack the new desiccant bag and immediately place the bag in the receiver shell and install the receiver shell to the valve housing. Torque the mounting bolts to 5 - 7 Lbs. Ft. torque.

23. Lubricate all external connection O-Rings and install the O-Rings on the respective connection tubes.

24. Carefully reconnect the tubes and lines to the VIR assembly to prevent damaging the O-Rings or the connection threads. Torque the line connections as follows:

Evaporator outlet and suction line connections to VIR 28-33 Lbs. Ft.

Evaporator inlet connection to VIR 15-20 Lbs. Ft.

Liquid line connection to VIR 11-13 Lbs. Ft.

25. Evacuate, leak check and charge the system.

26. Reconnect the thermal limiter connector plug.

Sight Glass - Removal and Installation

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is being discharged, clean the surface dirt from the exterior of the valve housing in the vicinity of the sight glass. Use an air hose to blow the area free of loose dirt.

2. When the system is completely discharged remove the sight glass retaining nut by using a 7/16" male hex drive tool or allen wrench.

3. Hold a finger in the sight glass opening to lightly hold the glass. Slightly pressurize the system with refrigerant vapor to eject the glass and force it out of the opening.

It may be necessary to shift the finger pressure from side to side to guide the glass out of the opening but only a very minimum of refrigerant pressure is necessary to expel the glass.

4. Remove the sight glass "O"Ring using Tool J9533. Discard all the old sight glass parts and install the new sight glass parts kit.

5. Coat the new "O"Ring, sight glass, nylon thrust washer and retaining nut with clean refrigerant oil and install them in that order being careful to prevent dirt from getting on the parts.

6. Tighten the sight glass nut to 20 to 25 Lbs. In. torque.

7. Evacuate, leak check and charge the system.

8. Reconnect the thermal limiter connector plug.

Core Liquid Bleed Valve - Removal and Installation

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging clean the surface dirt from the exterior of the VIR assembly in the area of the liquid bleed line

connection. Use an air hose to blow the line connection area of any loose dirt.

2. When the system is completely discharged, disconnect the liquid bleed line, remove and replace the bleed valve core using tool J24182-2. Discard the old valve core. See Figure 9B-38.

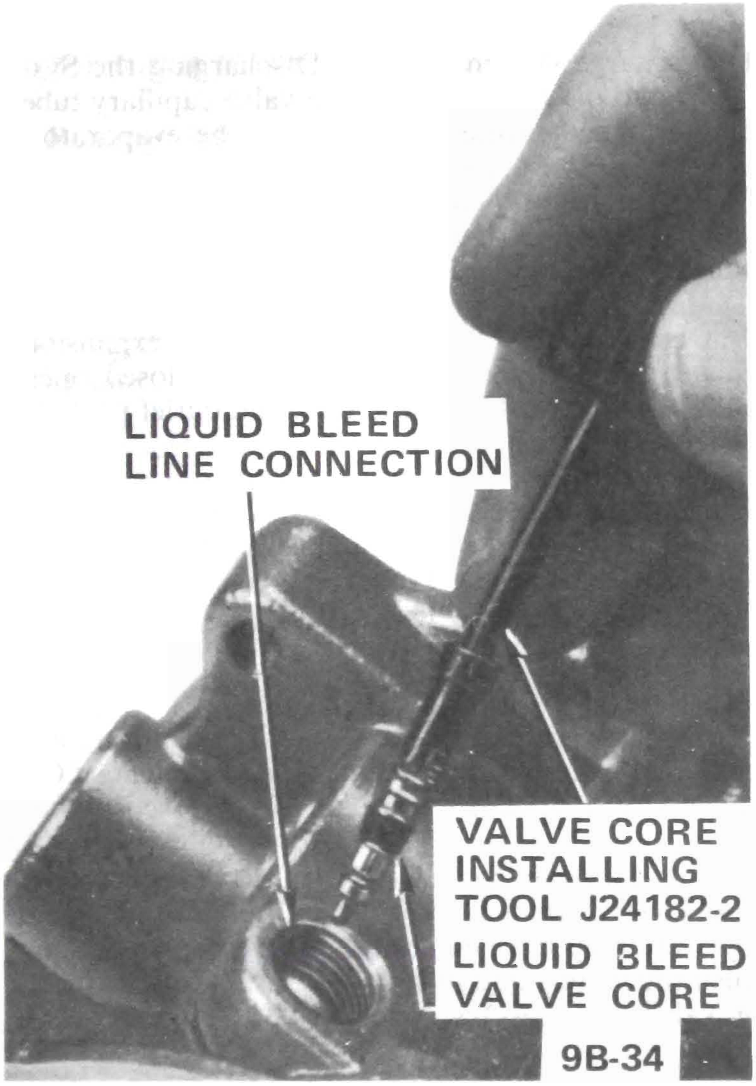


Figure 9B-38 Installing or Removing Liquid Bleed Valve Core with Tool J-24182-2

When tightening the new valve core, turn the core inward until the core threads just start to tighten. Note the position of the tool and rotate the tool an additional travel of 180 degrees to approximate a setting of 24-36 ounce inches of torque. The proper valve core is 5914817 and is different from the evaporator gage core.

3. Install a new liquid bleed line connector O-Ring and reconnect the liquid bleed line. Torque the line connection to a 5 to 7 Lbs. Ft. torque.

4. Evacuate, leak check and charge the system.

5. Reconnect the thermal limiter connector plug.

CORE EVAPORATOR GAUGE VALVE - REMOVAL AND INSTALLATION

1. Disconnect the thermal limiter connector plug and discharge the refrigerant from the system. See "Discharging the System". While the system is discharging, clean the surface dirt from the exterior of the VIR assembly in the area of the Evaporator Gage connector. Use an air hose to blow the area free of any loose dirt.

2. When the system is completely discharged, disconnect the gage line from the connector. Remove and replace the valve core using tool J24182-2. Discard the old valve core.

When tightening the valve core, turn the core inward until the core threads just start to tighten. Note the position of the tool and rotate the tool an additional travel of 180 degrees to approximate a setting of 24-36 ounce inches of torque. The proper valve core is 1138041 and is different from the liquid bleed core.

3. Evacuate leak check and charge the system.

4. Reconnect the thermal limiter connector plug.

REMOVAL AND INSTALLATION OF MUFFLER

Removal

1. Discharge system (refer to "Discharging the System").

2. Disconnect refrigerant lines connected to muffler and tape closed both open ends of refrigerant lines.

Installation

1. Install muffler reverse of removal, using new "O" rings coated with No. 525 viscosity oil during installation.

If refrigerant circuit or muffler has been exposed to the atmosphere for any amount of time and moisture may be present in the circuit, flush the muffler or system as necessary (refer to "Flushing the System". Install a new receiver-dehydrator in system.

2. Charge the system (refer to Par. "Discharging the System").

REMOVAL AND INSTALLATION OF CONDENSER RECEIVER-DEHYDRATOR ASSEMBLY - A SERIES

Removal

1. Discharge system (refer to "Discharging the System").

2. Disconnect inlet and outlet pipes of condenser receiver dehydrator and tape closed the open ends of refrigerant lines, and also the open ends of the inlet and outlet pipes of the condenser.

3. Remove one bolt securing each cross brace to the upper tie bar and position braces out of way.

4. Remove three screws securing underside of center support and locking mechanism to upper tie bar, one screw securing lower end of center support to lower tie bar, and two nuts securing center support to grille. Then remove center support locking mechanism.

5. Remove screws holding right and left flanges of condenser to radiator support and remove condenser.

Installation

1. Install condenser reverse of removal and use new "O" rings during installation. Lubricate "O" rings prior to installation using NO. 525 viscosity oil.

If refrigerant circuit or condenser has been exposed to the atmosphere and moisture may be present in circuit, the system and/or component must be flushed prior to installation (refer to "Flushing the System").

2. Charge the refrigerant circuit (refer to "Charging the System").

REMOVAL AND INSTALLATION OF RECEIVER - DEHYDRATOR - A SERIES

Removal

1. Discharge system (refer to "Discharging the System").

2. Remove necessary parts to gain access to receiver-dehydrator.

3. Disconnect refrigerant lines to both ends of receiver-dehydrator and tape closed open ends of refrigerant lines, and also the open ends of the inlet and outlet pipes of the receiver-dehydrator.

4. Remove two screws securing receiver-dehydrator and clamp to support bracket and lift out receiver-dehydrator.

Installation

1. Install receiver-dehydrator reverse of removal and use new "O" rings during installation. Lubricate O rings with No. 525 viscosity oil prior to installation. If the receiver-dehydrator has been exposed to the atmosphere for any amount of time, (more than 5 minutes) the receiver-dehydrator should be replaced, since the life of dessicant is probably expended.

2. Charge refrigerant circuit (refer to "Charging the System").

REMOVAL AND INSTALLATION EXPANSION VALVE - A SERIES

Removal

1. Discharge system (ref. to "Discharging the System") and disconnect expansion valve capillary tube bulb attached to the outlet pipe of the evaporator.

2. Disconnect the equalizer line from the body of valve. Tape closed equalizer line port on POA valve, and also open end of equalizer line.

3. Disconnect inlet and outlet ends of expansion valve from refrigerant lines, and tape closed open ends of refrigerant lines and inlet and outlet ports of expansion valve.

4. Remove outer clamp of bracket securing expansion valve and POA valve to plenum blower and air valve assembly, and remove expansion valve.

Installation

1. Install expansion valve reverse of removal, and use new "O" rings during installation. Lubricate "O" rings prior to installation using No. 525 viscosity oil.

If expansion valve or refrigerant lines have been exposed to the atmosphere for any amount of time and moisture may have entered the valve or the system, flush the system and install new receiver-dehydrator or valve as necessary (refer to "Flushing the System").

2. Charge system (refer to "Charging the System").

Due to the possible adjustment difficulties involved if the expansion valve is disassembled, disassembly of the valve is not recommended. The valve may be cleaned by submerging it in a bath of trichlorethylene, alcohol, or similar solvent. Dry by blowing filtered compressed air through the outlet port of the valve. The filter screen at the inlet port may be replaced. Remove screen by threading a 10-32 NF screw into old filter screen. With a washer and a nut on the screw arranged to work as a puller screw, hold the body of the screw and turn the nut. Insert the new filter screen into the inlet port and lightly tap screen only enough to seat.

REMOVAL AND INSTALLATION OF EVAPORATOR

Removal

(A Series)

1. Remove right front fender skirt.

2. Discharge refrigerant from system (ref. to "Discharging the System") and disconnect suction line from POA valve and liquid line from expansion valve. Tape closed openings in valve and line.

3. Disconnect resistor connector and remove one screw securing blower motor ground wire to dash.

4. Remove four nuts and six screws securing evaporator-blower assembly to dash. See Figure 9B-110. Remove evaporator-blower assembly.

5. Disconnect oil bleed line from POA valve. Peel back black insulation putty around evaporator outlet pipe and remove capillary tube bulb from evaporator outlet pipe.

6. Disconnect POA valve and expansion valve from evaporator outlet and inlet pipes. Tape closed all connection openings.

7. Remove six screws securing right and left halves of evaporator-blower assembly and remove evaporator.

(B-C-E Series)

1. Discharge refrigerant from system (refer to "Discharging the System").

2. Disconnect blower motor, resistor and ambient switch electrical connectors.

3. Remove V.I.R. Assembly (refer to V.I.R. Assembly - Remove and Replace).

4. Loosen the bolts holding the case to the bulkhead so the case can be rotated to clear the studs through the bulkhead.

5. Remove the screws securing the 2 sections of the case and remove the inboard half.

6. Remove the evaporator core.

7. Tape closed all refrigerant line openings.

Installation

(ALL SERIES)

1. Reverse removal procedure to install, using new "O" rings on line fittings.

2. Evacuate, charge and leak test system.

REMOVAL AND INSTALLATION OF POA VALVE - A SERIES

Removal

When replacing a POA valve, the serviceman should check the interior of the old valve for corrosion or crystalization of salts. This would indicate excessive moisture in the system. If this condition exists, the receiver-dehydrator should be replaced and the system evacuated for one hour.

1. Discharge system (refer to "Discharging the System").

2. Disconnect evaporator oil bleed line from body of POA valve and tape closed opening on POA valve and also end of oil bleed line.

3. Disconnect equalizer line from the body of the POA valve. Tape closed equalizer line port on body of valve and also end of equalizer line.

4. Disconnect inlet and outlet ends of POA valve from refrigerant lines, and tape closed inlet and outlet ends of valve. Also tape closed both refrigerant lines.

5. Remove screw securing POA valve to bracket and remove POA valve.

Installation

1. Install reverse of removal using new "O" rings lubricated with No. 525 viscosity oil.

If POA valve and refrigerant line openings have been exposed excessively to the atmosphere it is recommended that system be flushed out to remove any traces of moisture (refer to "Flushing the System").

2. Charge system (refer to "Charging the System").

REMOVAL AND INSTALLATION OF SUPERHEAT SWITCH

Removal

1. Completely discharge the air conditioning system according to procedure.

2. After the system is discharged, remove the superheat switch retainer ring, Figure 9B-40, using Tool J-5403.

3. Remove the superheat switch from the rear head by pulling at the terminal housing groove with seal seat remover and installer (J-9393).

4. Remove the O ring from the switch cavity in the rear head. Use O ring removal (J-9553).

5. Recheck the superheat switch for closed contacts.

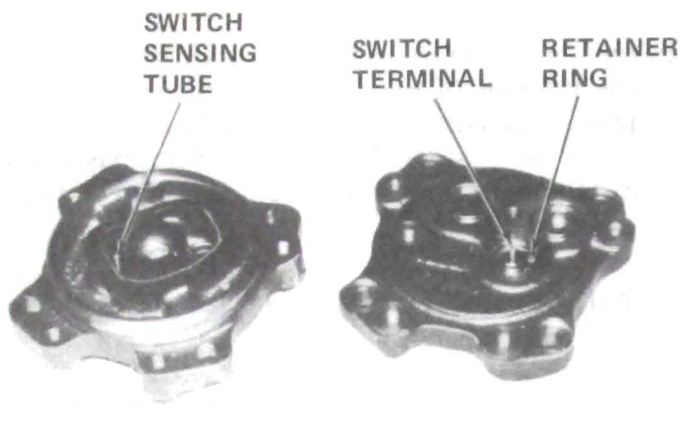


Figure 9B-40 Superheat Shutoff Switch Installed in Rear Head

See Superheat Switch Check in Diagnosis section. Replace as necessary.

Installation

1. Check the superheat switch cavity and O ring groove in the rear head for dirt or foreign material and be sure area is clean before installing the O ring. Install a new O ring in the groove of the superheat switch cavity in the rear head. Lubricate the O ring liberally with 525 viscosity oil before installing.

2. Lubricate the housing of the superheat switch with 525 viscosity oil and insert the switch carefully into the switch cavity until the switch bottoms. The seal seat remover and installer (J-9393) may be used to install the switch.

3. Using internal snap ring pliers (J-5403), install the superheat switch retaining ring with the high point of the curved sides adjacent to the switch housing. Be sure the retainer ring is properly seated in the snap ring groove.

4. Check for electrical continuity between the switch housing and the rear head. Also check for continuity between the switch terminal and switch housing to be sure the contacts are open according to the Calibration Chart, Figure 9B-19.

5. Evacuate and recharge the system with refrigerant according to the following special charging procedure:

To prevent the possibility of "blowing" the new thermal fuse during evacuation, charging or analysis of the system, disconnect the connector plug from the thermal fuse and install a jumper between the center terminal (B) and the clutch lead terminal (C) of the connector plug. See Figure 9B-16.

6. Evacuate, recharge, and leak check the entire air conditioning system according to normal procedures. Repair any leaks, check and add oil, as required and deemed necessary for proper operation of the system.

7. When the system is operating normally, remove the jumper from the connector plug and reconnect the plug to the thermal fuse.

DISASSEMBLY AND REASSEMBLY OF CLUTCH DRIVE PLATE AND SHAFT SEAL

It is not necessary to remove the compressor or disconnect refrigerant lines to remove or install clutch parts. However, it is necessary to position the compressor out of the mounting brackets for tool clearance.

Disassembly

1. Firmly clamp holding fixture (J-9396) in a vise and attach compressor assembly to fixture (see Figure 9B-41).

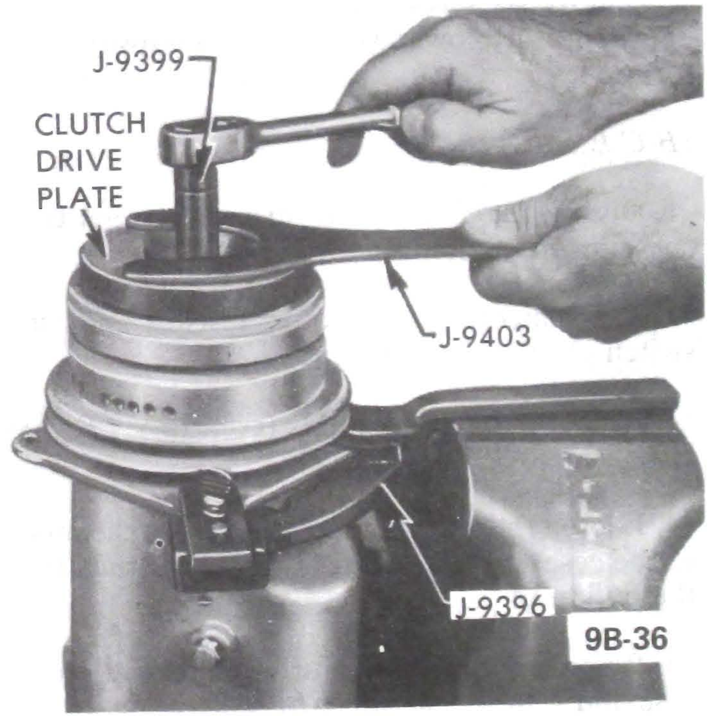


Figure 9B-41 Removing or Installing Shaft Nut

2. Hold hub of clutch drive plate with wrench (J-9403). Using special thin wall 9/16 inch socket (J-9399) and 3/8 inch drive, remove shaft nut.

3. Install threaded hub puller (J-9401) onto hub of clutch drive plate (see Figure 9B-42). Hold body of hub puller with wrench, tighten center screw of hub puller, and lift off clutch drive plate and woodruff key.

4. Using No. 21 Truarc pliers (J-5403) take out retainer ring from hub of clutch drive plate (see Figure 9B-43). Lift out spacer.

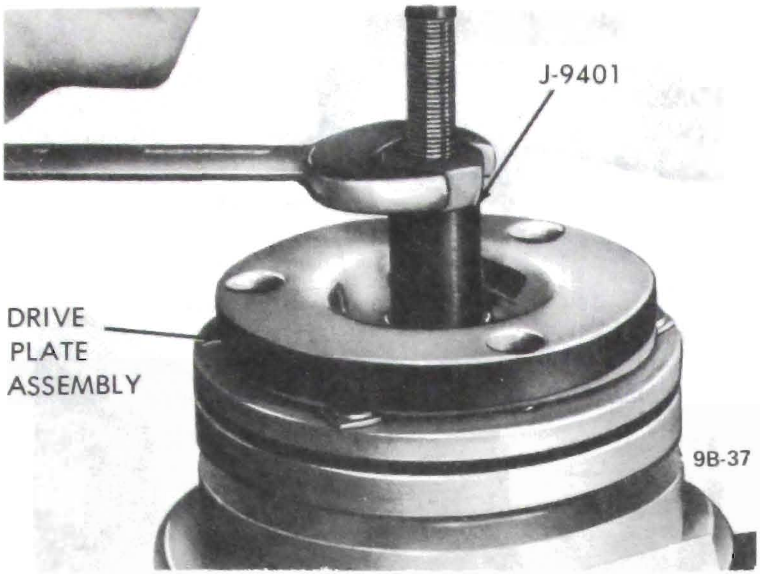


Figure 9B-42 Removing Clutch Drive Plate

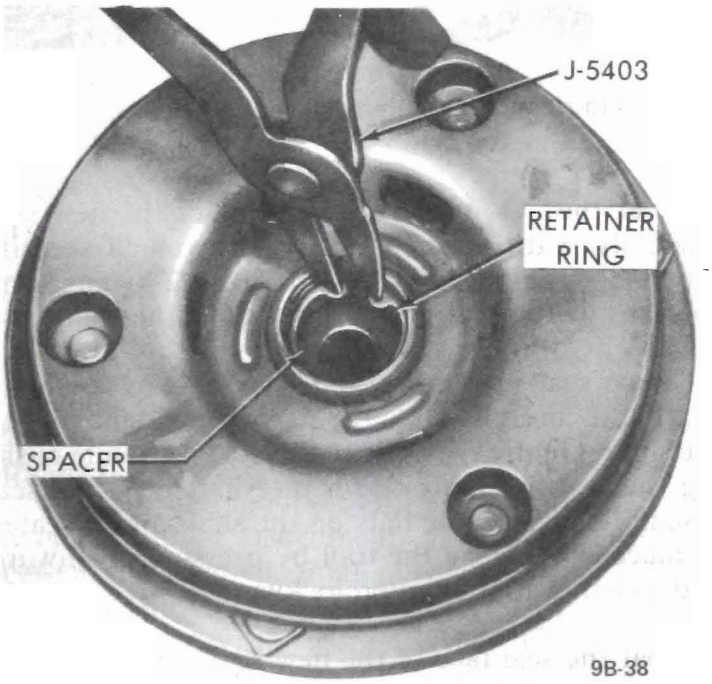


Figure 9B-43 - Removing or Installing Retainer Ring in Clutch Drive Plate

5. If compressor has an absorbent sleeve in the neck, pry out the sleeve retainer and remove the sleeve. Remove the seal seat retainer ring, using No. 21 Truarc pliers, Tool J-5403, (see Figure 9B-44).

6. Thoroughly clean the area inside the compressor neck surrounding the shaft, the exposed portion of the seal seat and the shaft itself of any dirt or foreign material. This is absolutely necessary to prevent any such material from getting into the compressor.

7. Remove the seal seat (see Figure 9B-46) using Tool J-23128. Insert Tool J-23128 into seal seat and tighten, using a twisting motion remove the seal seat.

8. Remove the seal assembly, using Tool J-9392. Press tool downward on seal while twisting it clockwise to engage the tabs of the seal assembly. Gently but firmly, pull tool straight out (see Figure 9B-47).

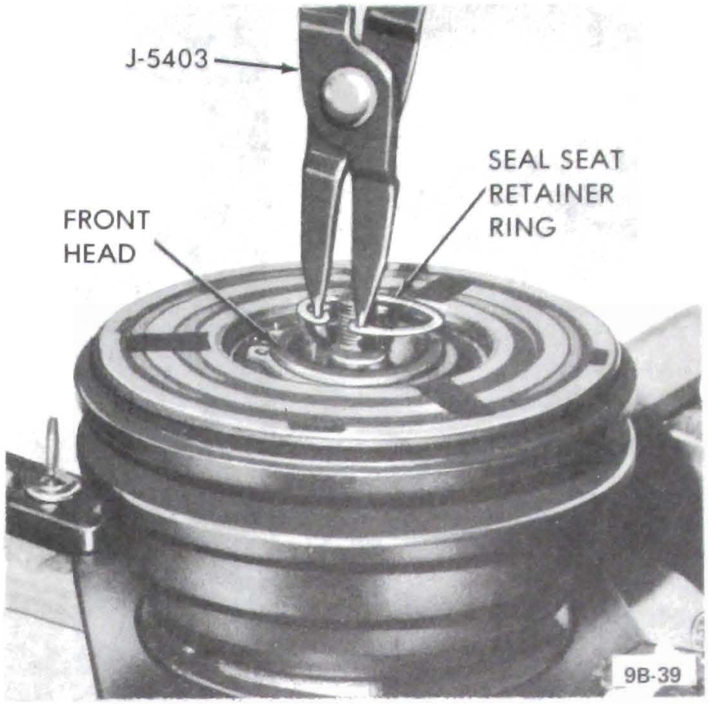


Figure 9B-44 Removing or Installing Shaft Seal Seat Retaining Ring

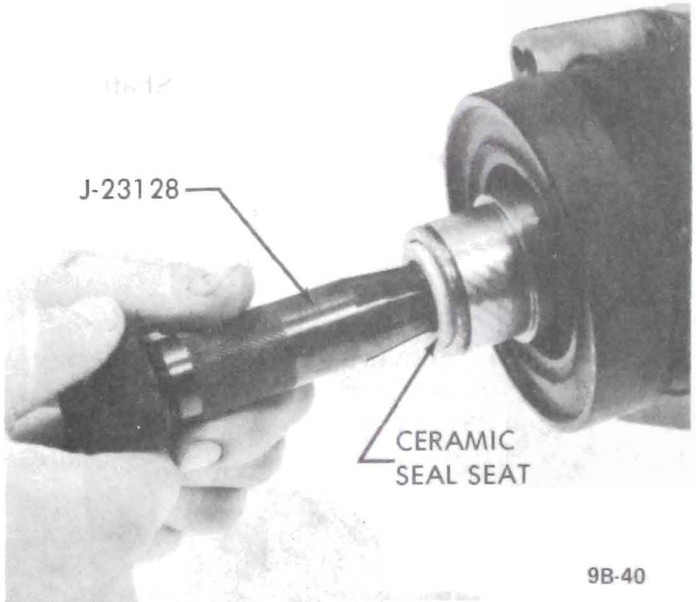


Figure 9B-46 Removing or Installing Ceramic Shaft Seal Seat

9. Remove the seal seat "O" ring, using Tool J- 9553 (see Figure 9B-48).

10. Re-check the inside of the compressor neck and the shaft. Be sure these areas are perfectly clean before installing new parts.

Reassembly

1. Coat the new seal seat "O" ring with clean refrigeration oil and install it in its groove in the compres-

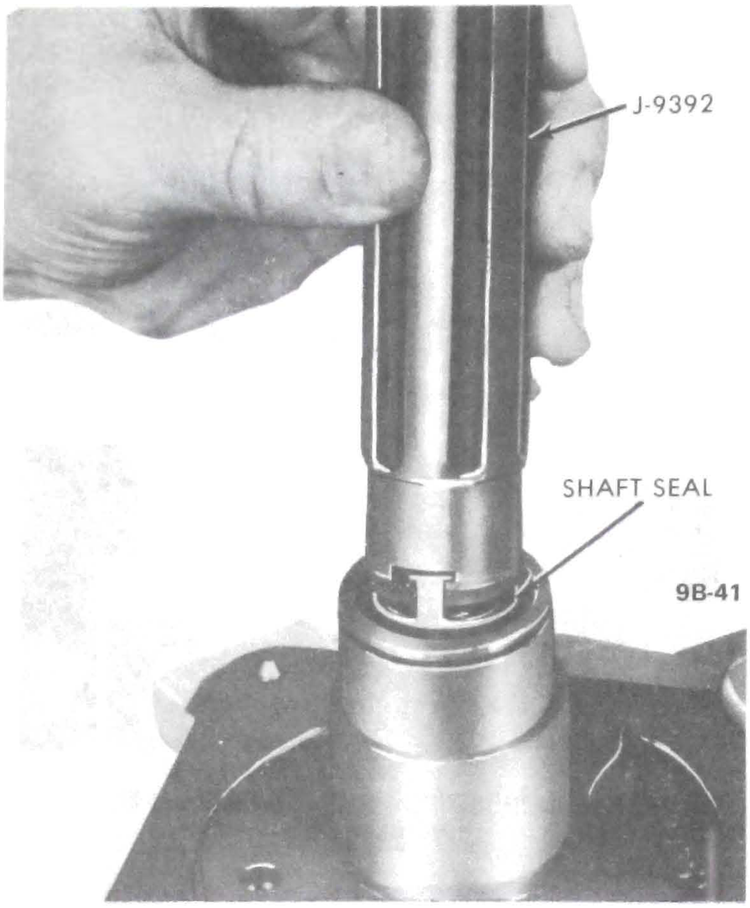


Figure 9B-47 Removing or Installing Shaft Seal

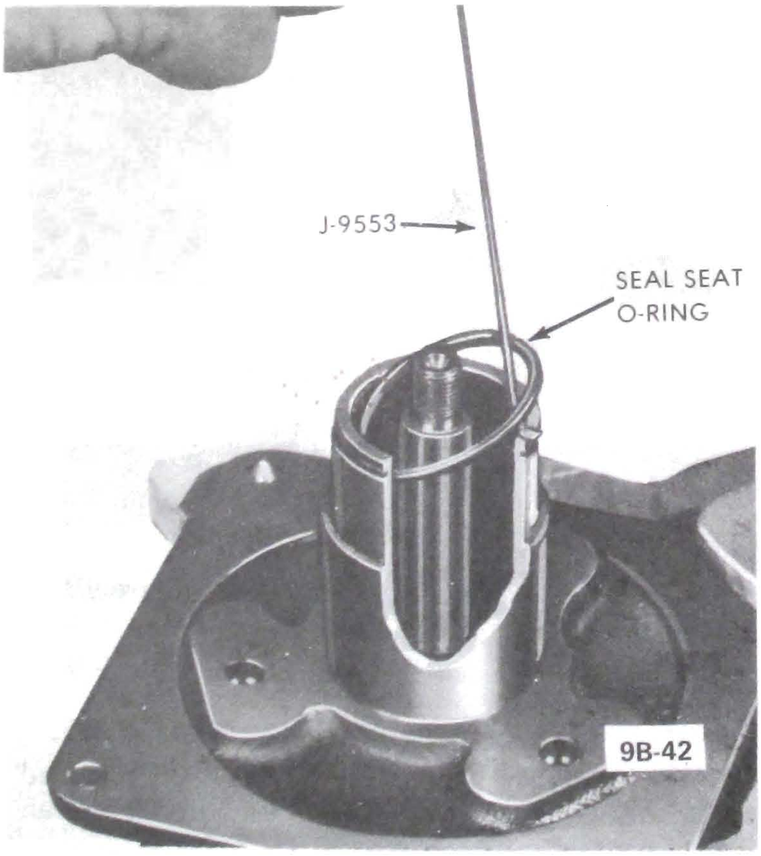


Figure 9B-48 Removing Seal Seat O Ring

sor neck. Tool J-21508 may be used to accomplish this (see Figure 9B-50).

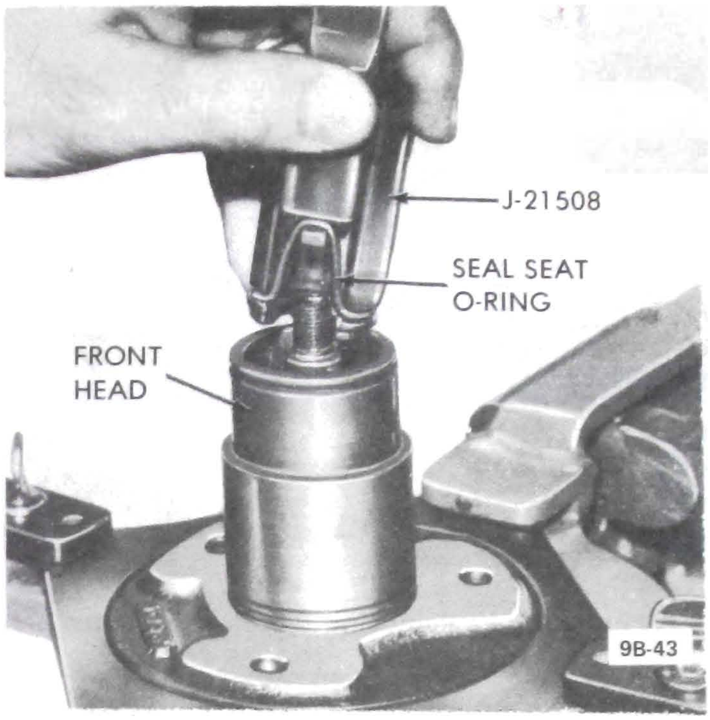


Figure 9B-50 Installing Seal Seat O Ring

2. Coat the "O" ring and seal face of the new seal assembly with clean refrigeration oil. Carefully mount the seal assembly to Tool J-9392 by engaging the tabs of the seal with the tangs of the tool.

3. Place seal protector, Tool J-22974, over end of shaft and carefully slide the new seal assembly onto the shaft. Gently twist the tool clockwise while pushing the seal assembly down the shaft until the seal assembly engages the flats on the shaft and is seated in place. Disengage the tool by pressing downward and twisting tool counterclockwise.

4. Coat the seal face of the new seal seat with clean refrigeration oil. Mount the seal seat on Tool J-9393 and install it in the compressor neck, taking care not to dislodge the seal seat "O" ring and being sure the seal seat makes a good seal with the "O" ring.

5. Install the new seal seat retainer ring with its flat side against the seal seat, using No. 21 Truarc pliers (J-5403). Use the sleeve from Tool J-9393 to press in on the seal seat retainer ring so that it snaps into its groove. Remove seal protector J-22974 from the end of the shaft.

6. Install Compressor Leak Test Fixture (J-9625) on rear head of compressor and connect gage charging lines as shown in Figure 9B-51. Pressurize suction side of compressor with Refrigerant-12 vapor to drum pressure. Temporarily install the shaft nut and, with compressor horizontal and oil sump down, rotate the compressor shaft in normal direction of rotation several times by hand. Leak test the seal with a propane torch type leak detector in good condition. Correct any leak found. Remove and discard the shaft nut.

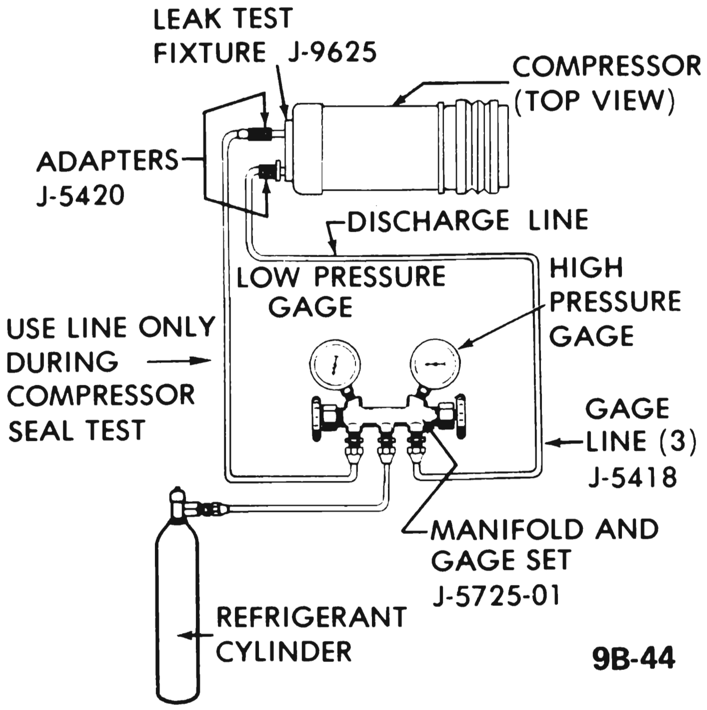


Figure 9B-51 Leak Testing Shaft Seal and Seal Seat O Ring

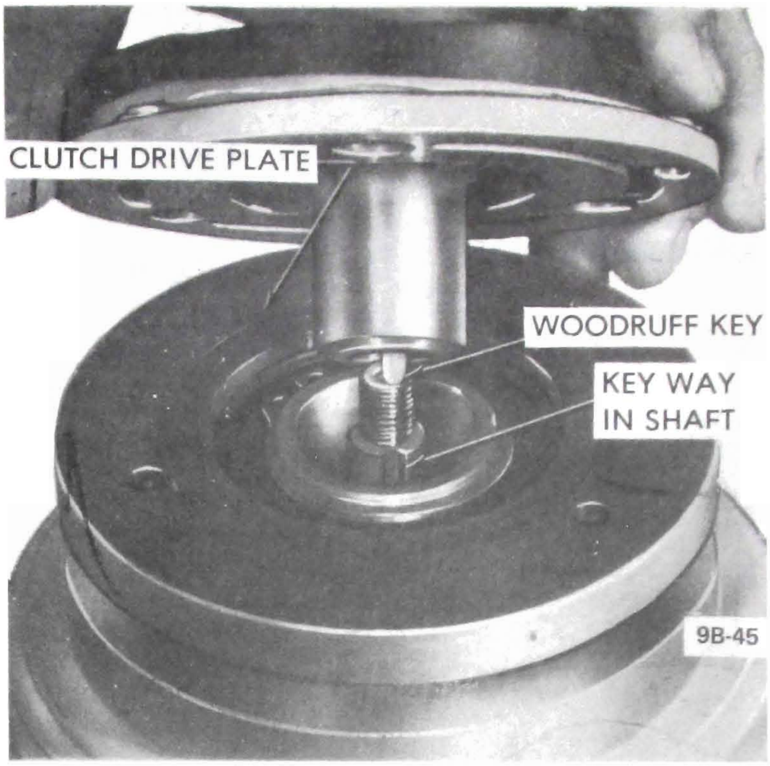


Figure 9B-52 Positioning Clutch Drive Plate on Shaft

7. Remove any excess oil, resulting from installing the new seal parts, from the shaft and inside the compressor neck.

8. Install the new absorbent sleeve by rolling the material into a cylinder, overlapping the ends, and slipping it into the compressor neck with the overlap at the top of the compressor. Using a small screwdriver or similar instrument, carefully spread the sleeve so that in its final position, the ends butt together at the top vertical centerline. Install the new sleeve retainer so that its flange face will be against the front end of the sleeve. Using the sleeve from Tool J-9393, press and tap with a mallet, setting the retainer and sleeve into place, until the outer edge of the sleeve retainer is recessed approximately 1/32" from the face of the compressor neck.

9. Insert woodruff key into hub of clutch drive plate so that it projects out approximately 3/16 inch (see Figure 9B-52) and position clutch drive plate onto shaft.

10. Using drive plate installer (J-9480), screw installer on end of shaft as shown in Figure 9B-53. Hold nut and turn bolt until clutch drive plate is pressed within 3/32 inch of the pulley assembly.

11. Reassembly spacer into hub of clutch drive plate.

12. Reassemble retainer ring into hub of clutch drive plate (see Figure 9B-43) using No. 21 truarc pliers (J-5403).

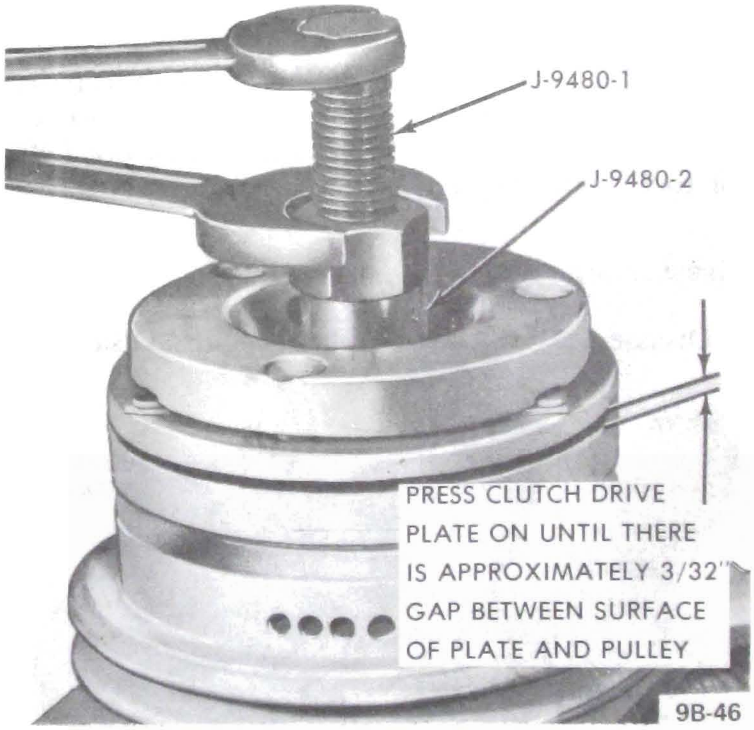


Figure 9B-53 Installing Clutch Drive Plate

13. Thread on new shaft nut using special thin wall 9/16 inch socket (J-9399) and 3/8 inch drive. Hold clutch drive plate secure using Wrench (J-9403) and torque nut to 15 lb. ft. The air gap between the friction surfaces of the pulley assembly and clutch drive plate should be approximately 1/32 to 1/16 inch (see Figure 9B-54).

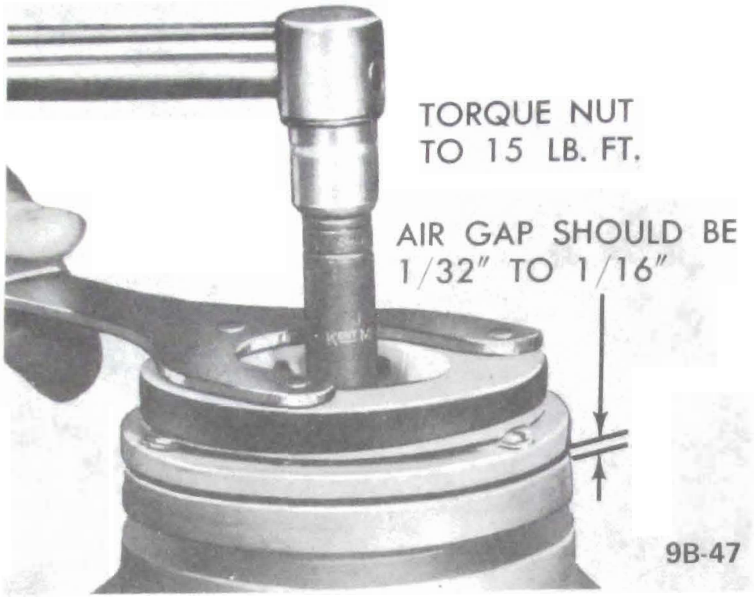


Figure 9B-54 Torquing Shaft Nut

DISASSEMBLY AND REASSEMBLY OF PULLEY ASSEMBLY, COIL AND HOUSING ASSEMBLY

It is not necessary to remove the compressor assembly or disconnect refrigerant lines to perform the following operations. However, it is necessary to position the compressor out of the mounting brackets for tool clearance.

Disassembly

1. Disassemble clutch drive plate (ref. to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal").

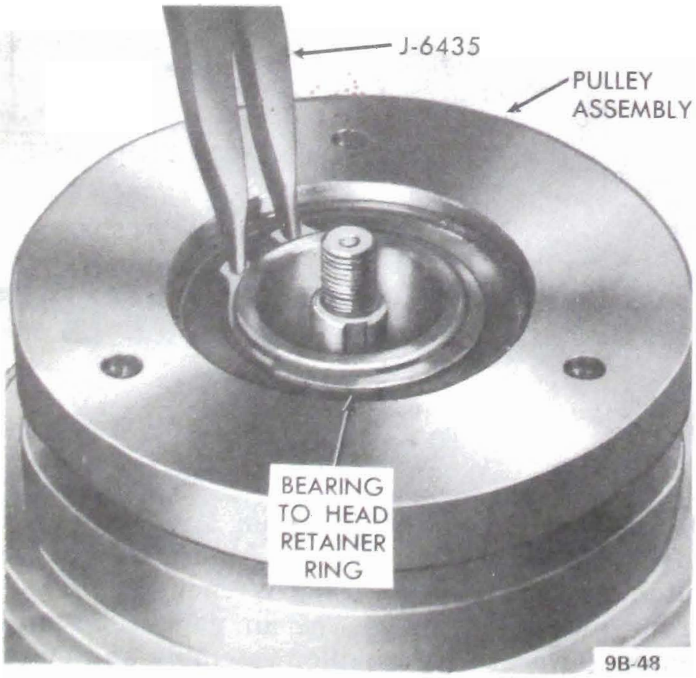


Figure 9B-55 Removing or Installing Bearing to Head Retainer Ring

2. Using No. 26 Truarc pliers (J-6435) remove bearing to head retainer ring (see Figure 9B-55).

3. Place puller pilot (J-9395) on hub of front head and take off pulley assembly (see Figure 9B-56), using pulley puller (J-8433).

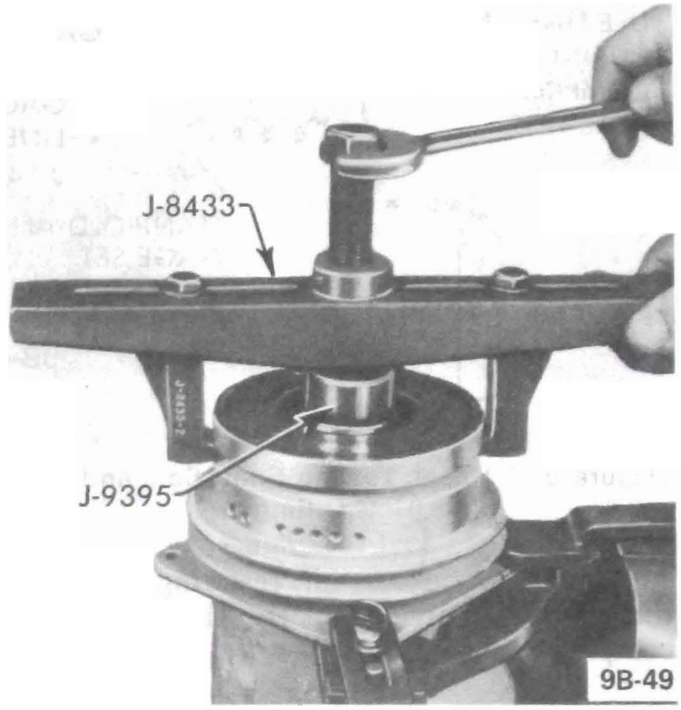


Figure 9B-56 Removing Pulley Assembly

Puller pilot (J-9395) must be used. If force is exerted on shaft, damage will result to the internal parts of the compressor.

4. Remove bearing to pulley retaining ring with a small screwdriver (see Figure 9B-57).

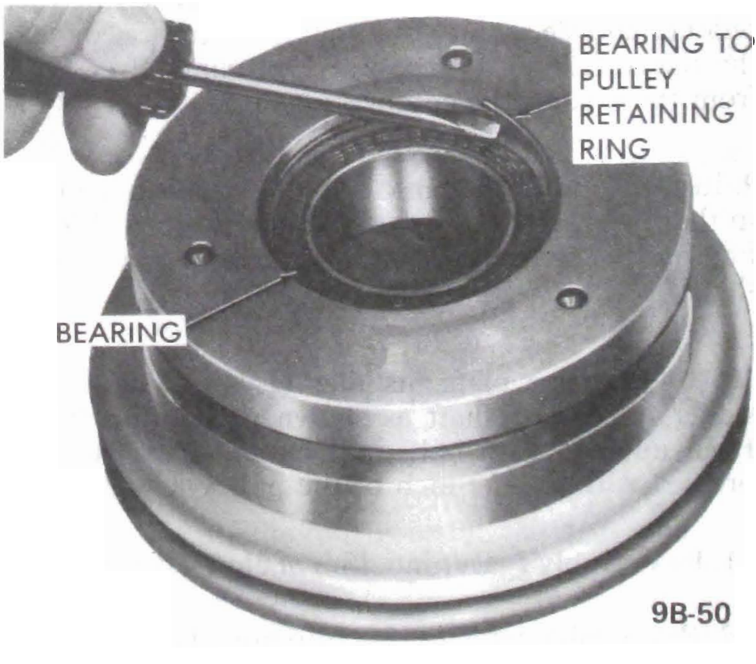


Figure 9B-57 Removing Pulley Bearing Retainer

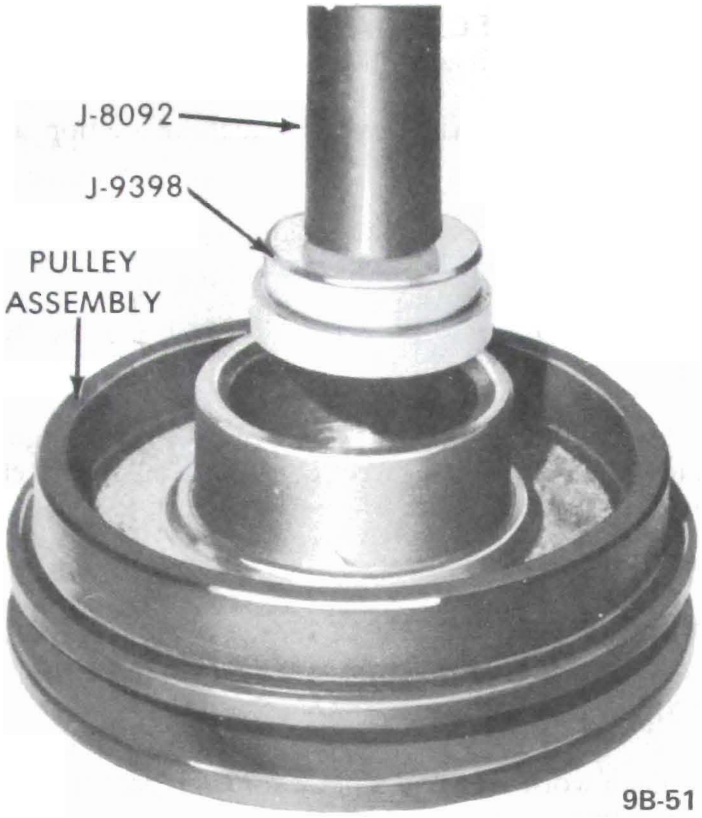


Figure 9B-58 Removing Bearing from Pulley Assembly

5. Drive out bearing (see Figure 9B-58) by use of puller Pilot (J-9398) and Handle (J-8092).

Do not take out pulley bearing unless it is going to be replaced as removal may damage bearing.

6. Mark position of coil and housing assembly in relationship to shell of compressor, remove coil and housing retainer ring (see Figure 9B-60) using No. 26 truarc pliers (J-6435), and lift out coil and housing assembly.

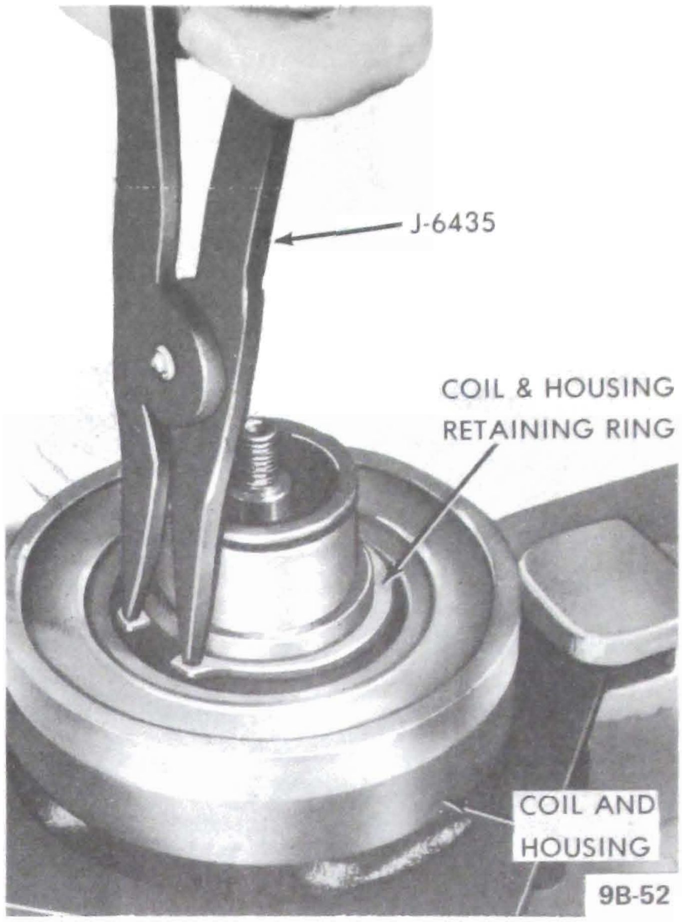


Figure 9B-60 Removing or Installing Coil and Housing Retainer Ring

Reassembly

1. Reassemble coil and housing assembly reverse of disassembly.

2. Drive new bearing into pulley assembly (see Figure 9B-61) with installer (J-9481) and handle (J-8092).

3. Lock bearing in position with bearing to pulley retainer ring (see Figure 9B-57).

4. Drive pulley assembly onto hub of front head (see Figure 9B-62) using installer (J-9481) and handle (J-8092).

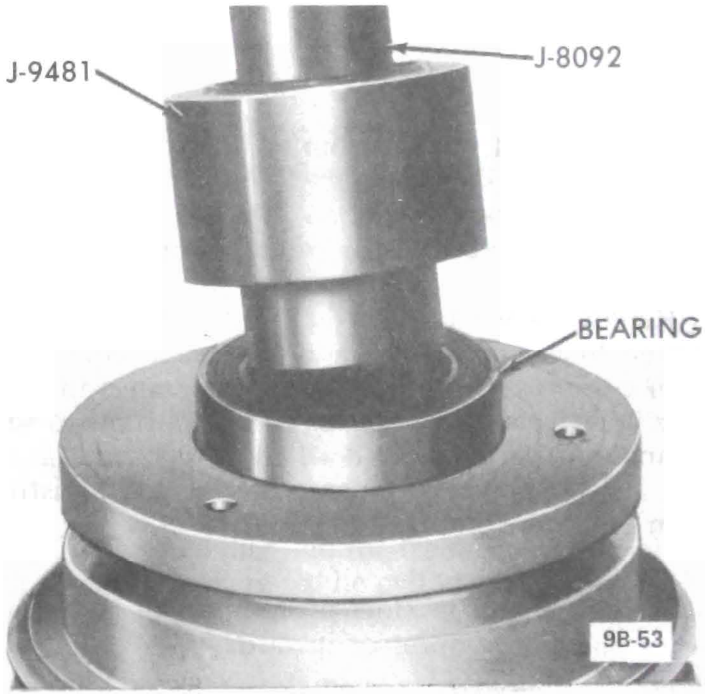


Figure 9B-61 Installing Bearing into Pulley Assembly

If the pulley assembly is going to be reused, clean the friction surface with trichlorethylene, alcohol, or a similar solvent.

5. Lock pulley assembly in position with bearing to head retainer ring (flat side of retainer ring downward) using No. 26 Truarc pliers (J-6435). See Figure 9B-55.

6. Reassemble clutch drive plate (refer to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal").

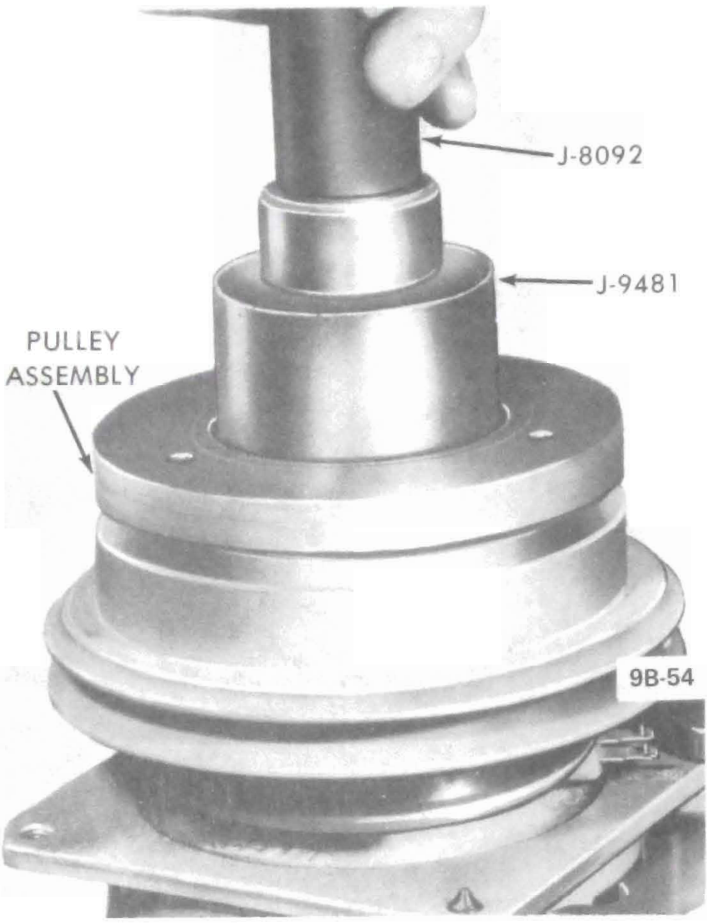


Figure 9B-62 Installing Pulley Assembly

REMOVAL AND INSTALLATION OF COMPRESSOR

Removal

1. Discharge refrigerant from system (refer to "Discharging the System").

2. Remove wire connector from compressor.

3. Remove bolt and plate holding suction and discharge lines into rear head. Disengage both lines from compressor and tape closed openings in both lines and ports in rear head. It is important to seal compressor ports to avoid a loss of refrigeration oil and also to prevent foreign material and moisture from entering compressor.

4. Remove bolts in slots of compressor mounting brace and tilt compressor inward.

5. Remove two bolts holding front and rear adapter plates to compressor mounting bracket and lift out compressor. During removal, maintain the compressor position so that the sump is downward. Do not rotate compressor shaft.

Installation

1. Installation is reverse of removal. Torque bolts as specified in "SPECIFICATIONS". Insure that compressor has sufficient oil charge.

2. Use new "O" rings when attaching suction and discharge lines.

3. Adjust compressor belt tension to 100 pounds using a reliable belt tension gage.

4. Charge compressor (refer to "Charging the System").

5. Make sure compressor hoses are properly aligned and do not have any direct contact with sheet metal or each other.

DISASSEMBLY AND REASSEMBLY OF INTERNAL PARTS OF COMPRESSOR AND LEAK TESTING COMPRESSOR

A clean work area and a place for each part removed is required to properly disassemble and reassemble compressor. The internal parts of the compressor must be kept free of dirt or foreign material.

When working with compressor, under no circumstances should compressor be rested on pulley end.

Disassembly of Rear Head, Oil Pump, Rear Discharge Valve Plate, and Rear Suction Valve Reed Disc

If compressor is not going to be disassembled any further than removal of rear head, oil pump, rear discharge valve plate, or rear suction valve reed disc, omit Steps "1, 2 and 4".

1. Disassemble clutch drive plate and shaft seal (ref. to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal").

2. Disassemble pulley assembly, and coil and housing assembly (ref. "Disassembly and Reassembly of Pulley Assembly, and Coil and Housing Assembly ").

3. Clean surface of compressor shell and dry with compressed air.

4. Remove compressor from holding fixture (J-9396), unscrew drain screw. Drain, measure and record amount of oil in compressor.

5. Reinstall compressor in holding fixture (J-9396) positioned as shown in Figure 9B-63.

6. Unscrew and discard four lock nuts from rear of compressor, and lift off rear head by tapping it with a mallet. If sealing surface is damaged (see Figure

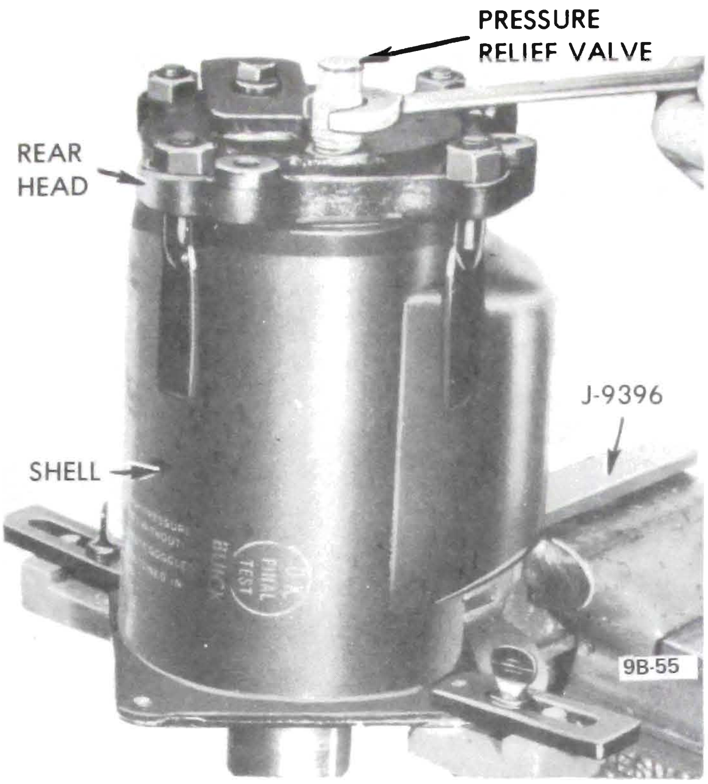


Figure 9B-63 Compressor Installed in Holding Fixture

9B-64), replace rear head. Clean or replace suction screen as necessary.

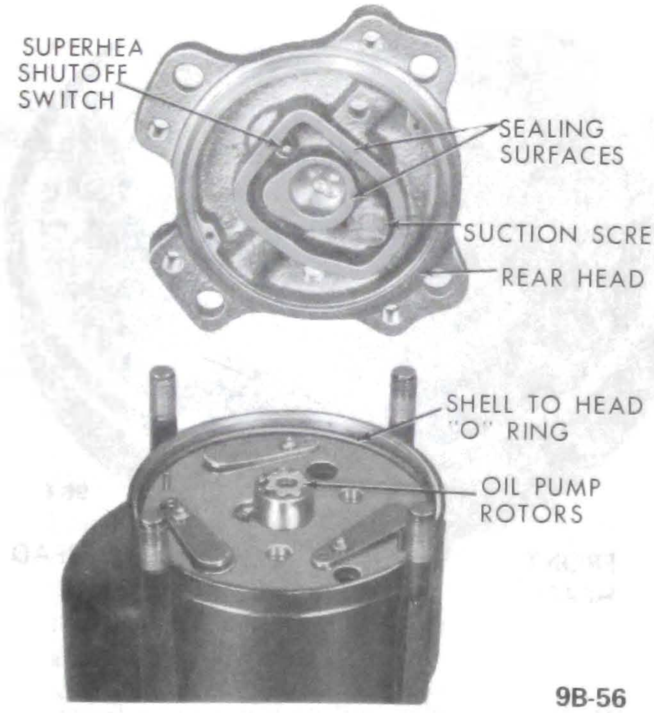


Figure 9B-64 Rear Head Removal

7. Pencil mark top side of both oil pump rotors and lift out rotors. Replace both oil pump inner and outer rotors if one or both are damaged or worn.

8. Take out and discard shell to head "O" ring.

9. Carefully pry out rear discharge valve plate and rear suction valve reed disc with screwdrivers (see Figure 9B-65 and 9B-66). Check both pieces and replace as necessary.

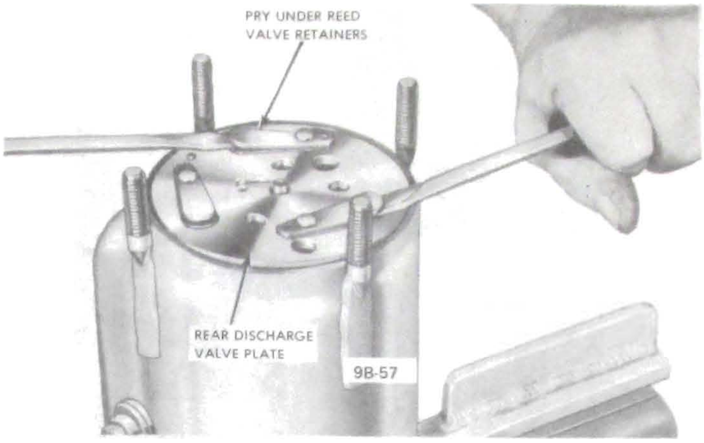


Figure 9B-65 Removing Rear Discharge Valve Plate

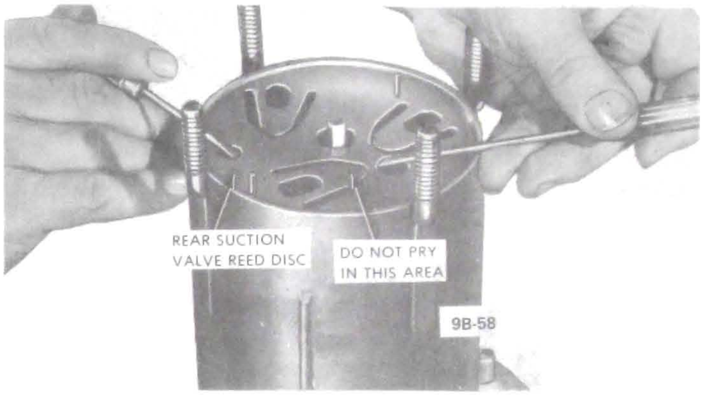


Figure 9B-66 Removing Rear Suction Valve Reed Disc

During disassembly, the disc generally adheres to the plate and both pieces lift out together.

Removing Cylinder Assembly, and Disassembly of Front Suction Valve Reed Disc, Front Discharge Valve Plate, and Front Head

1. Pull out oil inlet tube (see Figure 9B-67) and oil inlet tube "O" ring using Remover (J-6586).

2. Push shaft upward from front head and lift out cylinder assembly (see Figure 9B-68), front suction valve reed disc, and front discharge valve plate.

When lifting out the cylinder assembly, the front suction valve reed disc and the front discharge valve plate generally adhere to the cylinder assembly and lift out with it. Check and replace if necessary.

Depending on wear or damage to cylinder assembly, it may be advisable to replace complete cylinder assembly. If service replacement cylinder is used omit following steps and continue on with subparagraph entitled "FINAL REASSEMBLY OF CYLINDER ASSEMBLY".

3. Disassemble front head from shell by tapping front head with a mallet to unseat head, and lifting straight out through rear of shell the front head and shell to head "O" ring (see Figure 9B-70). Discard "O" ring.

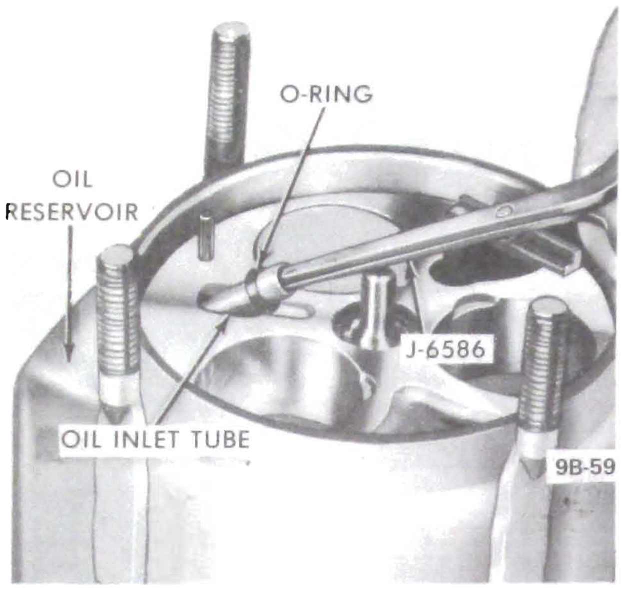


Figure 9B-67 Removing Oil Inlet Tube

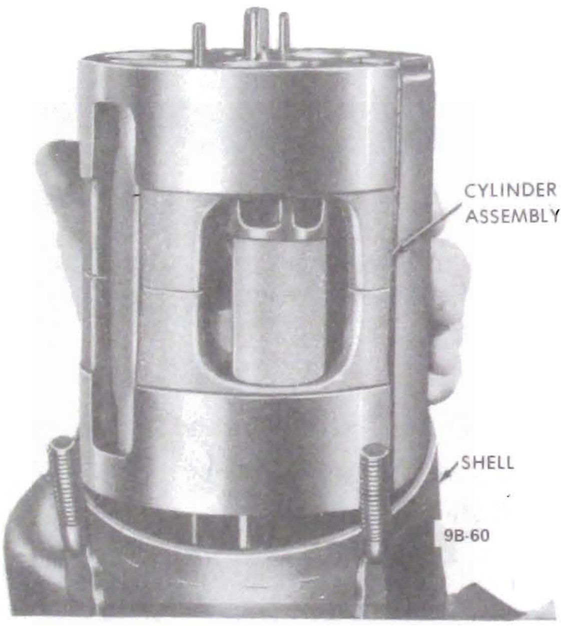


Figure 9B-68 Removing Internal Cylinder Assembly

If sealing surfaces of front head (see Figure 9B- 71) are damaged, replace front head.

Disassembly of Cylinder Assembly

1. Pry off suction pass cover using screwdriver (see Figure 9B-72).

2. Place cylinder assembly (front end downward) on top of compressing fixture (J-9397), number pistons and cylinders "1, 2 and 3" to facilitate reassembly (see Figure 9B-73), and separate cylinder halves using a hard rubber mallet or hammer and wood block.

3. Disassemble rear cylinder half and discharge tube from cylinder assembly and discard discharge tube.

Depending on whether or not discharge tube comes out with rear cylinder half or remains in front cylinder half it may be necessary to rotate shaft and axial plate assembly (using 9/16 inch opened wrench on shaft seal portion of shaft) to achieve necessary clearance.

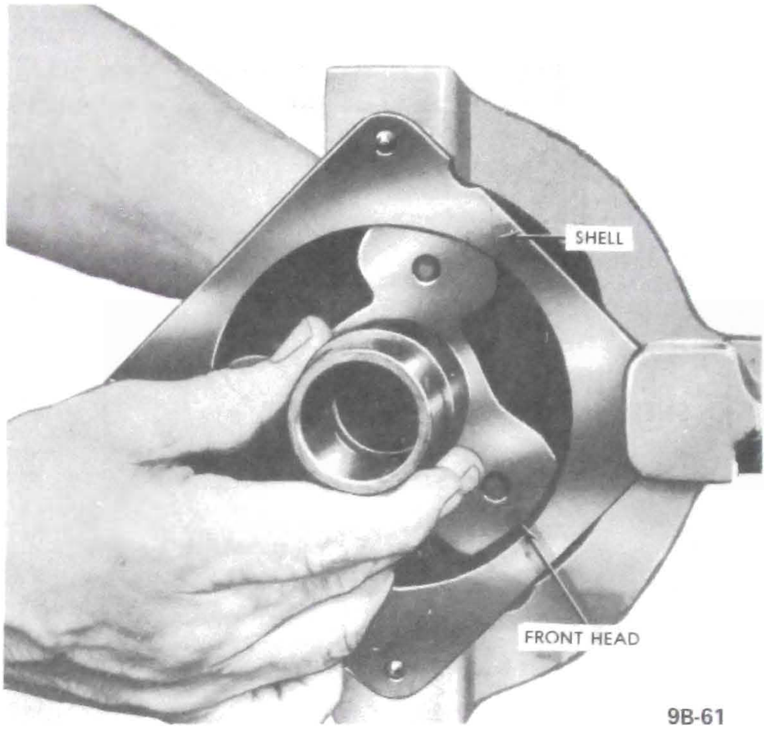


Figure 9B-70 Removing Front Head

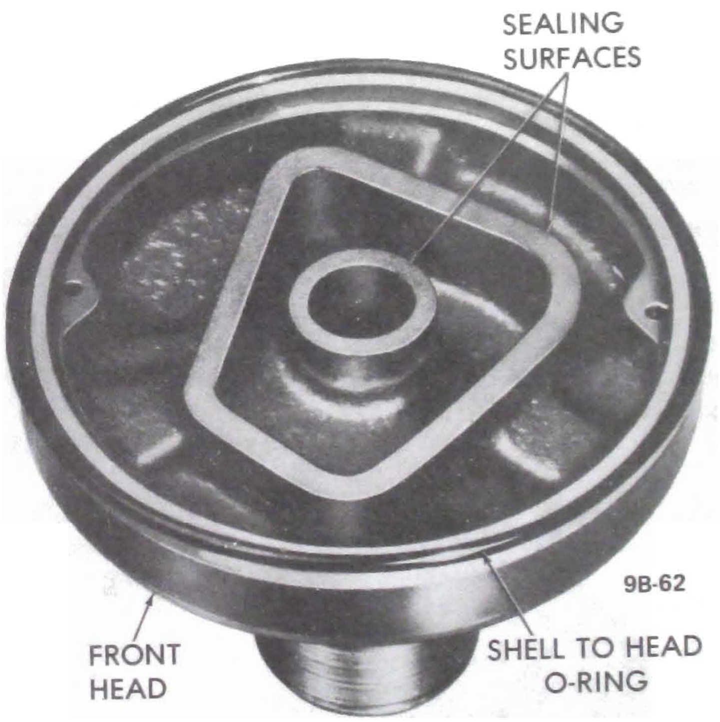


Figure 9B-71 Front Head Sealing Surfaces

4. Carefully disassemble from cylinder assembly (see Figure 9B-74) and lay in respective place on parts tray (J-9402) the following: number "1, 2 and 3" pistons, piston drive balls, and piston rings. To disassemble, rotate axial plate until piston is at highest point, raise axial plate approximately 1/2 inch and lift out piston and related parts one at a time. Dis-

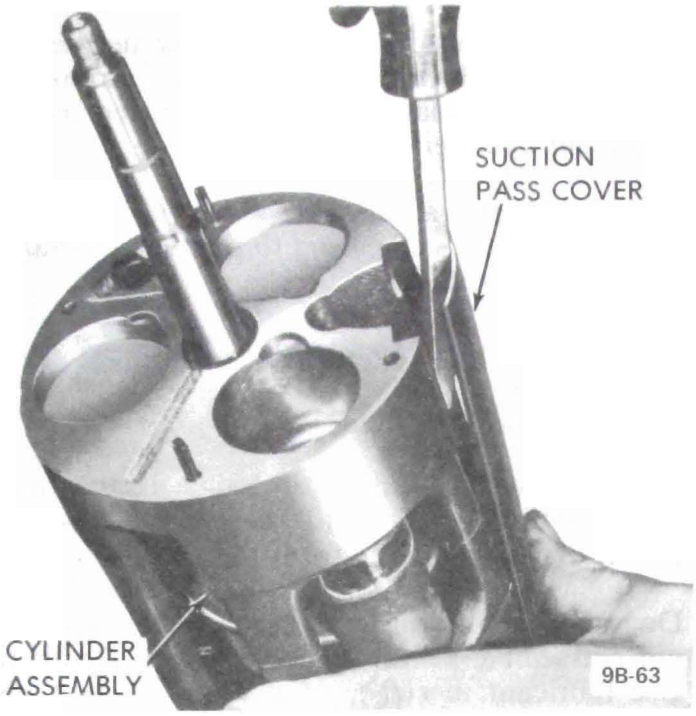


Figure 9B-72 Removing Suction Pass Cover

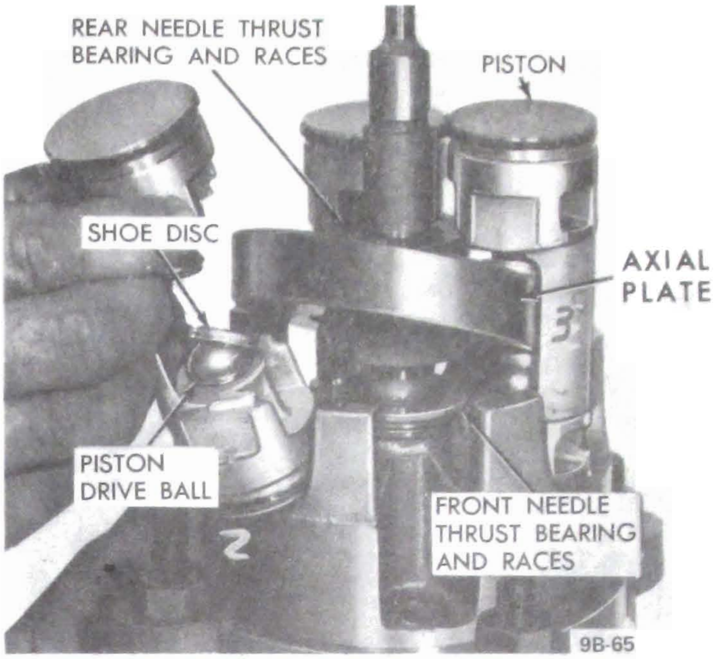


Figure 9B-74 Disassembly of Cylinder Assembly

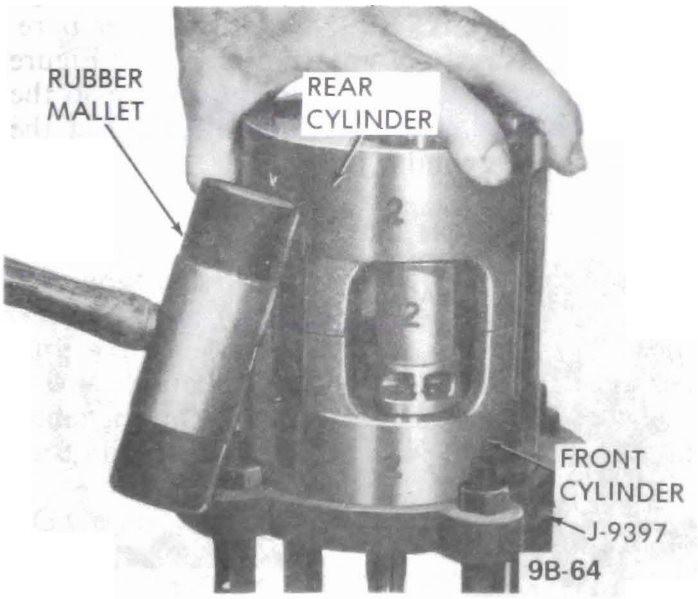


Figure 9B-73 Separating Cylinder Halves

card shoe discs and rear needle thrust bearing and races.

Examine piston drive balls and replace if necessary. The front end of the piston may be identified by a recessed notch (see Figure 9B-75).

5. Lift out shaft and axial plate assembly and front needle thrust bearing races. Discard front needle thrust bearing and races.

Examine shaft and axial plate assembly and replace as necessary.

6. Wash all salvaged parts of cylinder assembly in bath of trichlorethylene, alcohol, or similar solvent and dry parts with filtered, dry compressed air.

Examine front and rear cylinder halves, front and

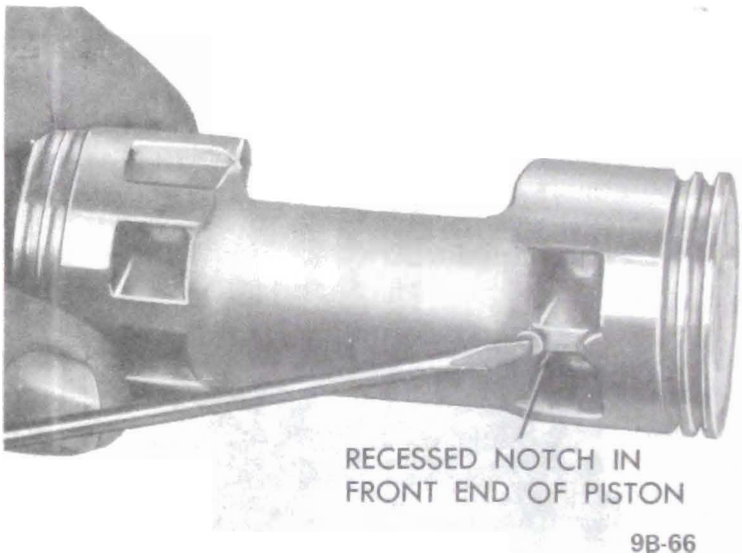


Figure 9B-75 Piston Identification

rear main shaft bearings, and replace as necessary. If bearings are to be replaced, drive out of cylinder halves with suitable socket or punch. Install new bearing (lettering on bearing edge facing outward) using bearing installer (J-9432). See Figure 9B-76.

Partial Reassembly of Cylinder Assembly, and Gaging of Piston Play and Shaft End Play

1. Obtain from parts stock four "zero" thrust races, two needle thrust bearings, and three "zero" shoe discs.

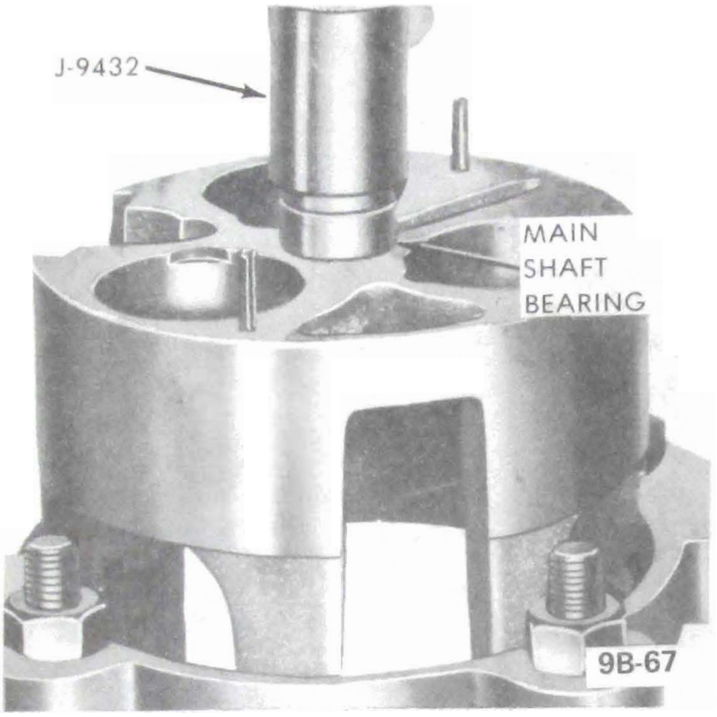


Figure 9B-76 Installing Main Shaft Bearing

2. Place front cylinder on top of compressing fixture (J-9397) as shown in Figure 9B-77.

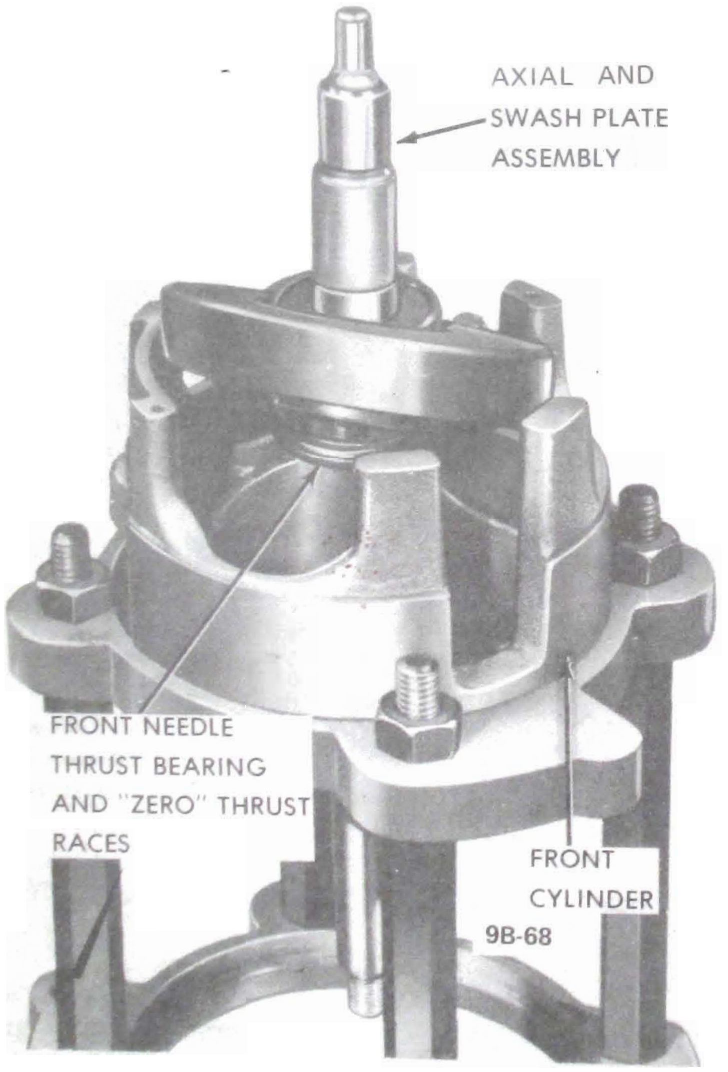


Figure 9B-77 Shaft and Front Needle Thrust Bearing in Cylinder Half

3. Generously coat with clean No. 525 Viscosity Oil two "zero" thrust races, and a new needle thrust bearing. Assemble races and bearing to front end of shaft and axial plate assembly and insert assembly into front cylinder (see Figure 9B-77.)

4. Assemble two additional "zero" thrust races and a new needle thrust bearing to rear end of shaft and axial plate assembly.

5. Lightly coat ball pockets of the three pistons with clean No. 525 Viscosity Oil and place a piston drive ball in each pocket.

6. Lightly coat the three "zero" shoe discs with clean No. 525 Viscosity Oil and place a disc on only the piston drive ball at the front of each piston.

Do not place shoe discs on rear piston drive balls. Do not reassemble piston rings on pistons at this time. Use lubricant in sufficient quantity so that piston drive balls and shoe discs stick to piston.

7. Rotate shaft and axial plate assembly until high point of axial plate is over No. "1" cylinder bore. Position No. "1" piston onto axial plate (see Figure 9B-77) and lower the piston and axial plate so the front end (notched end - see Figure 9B-78) of the piston enters the cylinder bore.

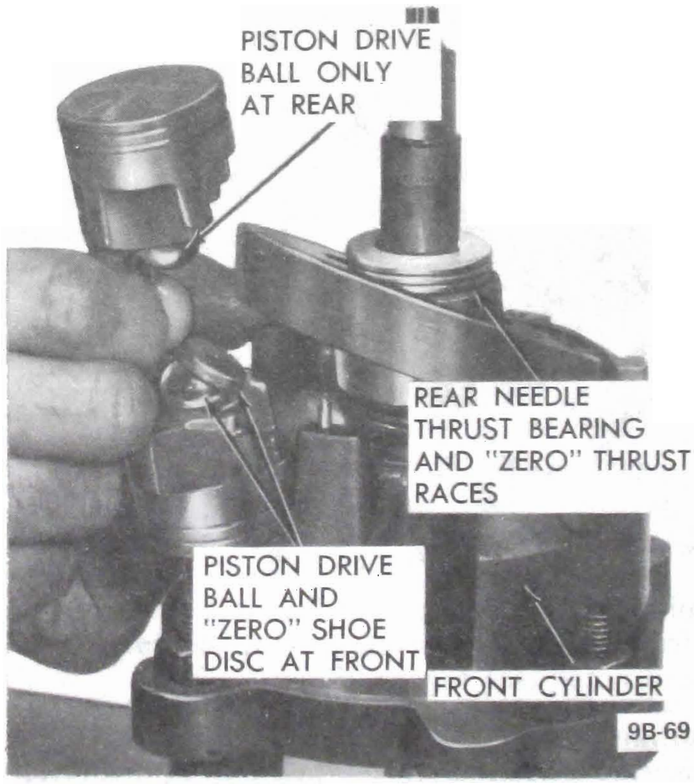


Figure 9B-78 Installing Piston into Cylinder Half

In order to fit the piston onto the axial plate, the shaft and axial plate assembly must be raised approximately 1/2 inch, and also the front needle thrust bearing and races must be held up against the hub of the axial plate.

8. Repeat preceding step for reassembly of pistons No. "2" and No. "3".

9. Reassemble rear cylinder onto front cylinder using wood block and mallet (see Figure 9B-80).

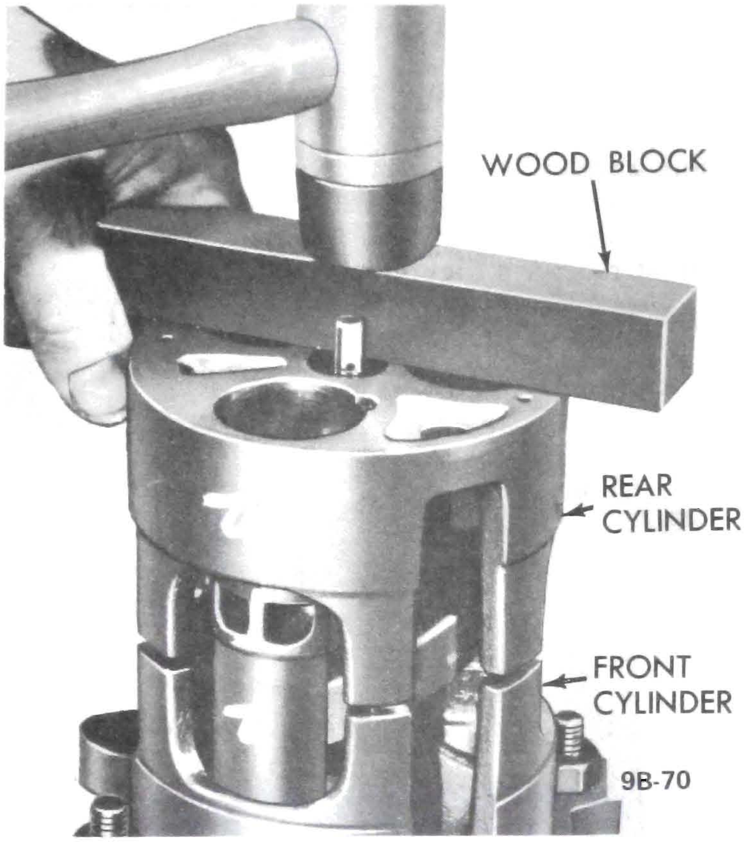


Figure 9B-80 Assembling Rear Cylinder Half

10. Remove cylinder assembly from on top of compressing fixture (J-9397), position assembly inside fixture so that discharge tube opening in cylinder halves is located between fixture legs, and front of cylinder assembly is downward. Install and torque fixture nuts to 15 lb. ft.

11. Gage piston play as follows:

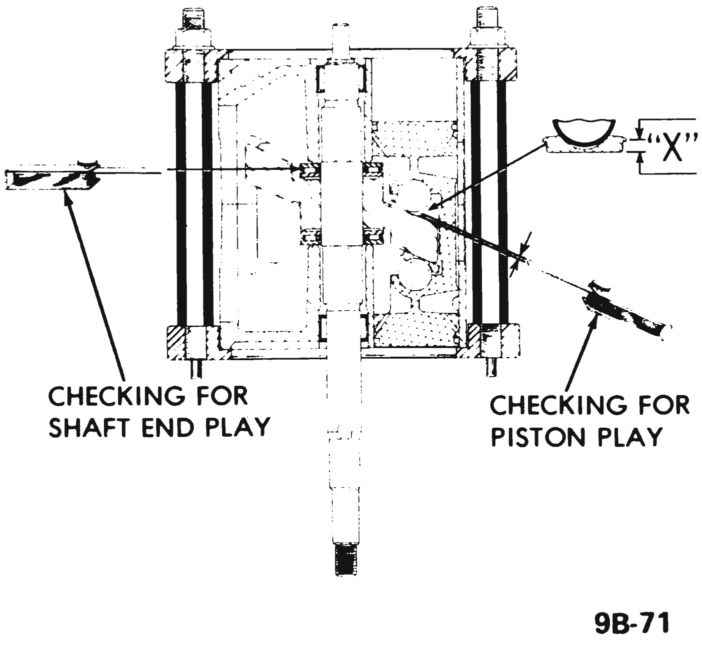


Figure 9B-81 Checking Piston and Shaft End Play

(a) Using a feeler gage, select a leaf or combination of leaves which result in satisfactory "feel" when inserted between rear piston drive ball and axial plate (see Figures 9B-81 and 9B-82).

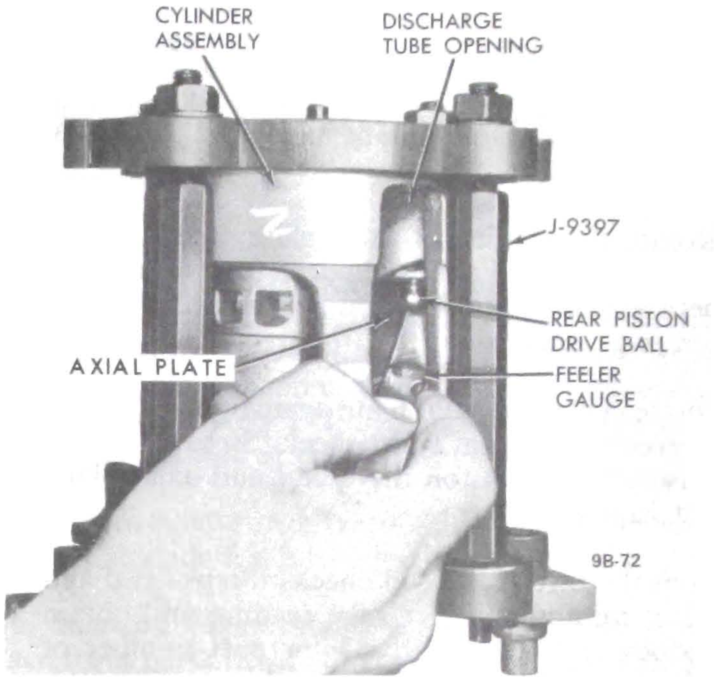


Figure 9B-82 Checking Clearance Between Rear Piston Drive Ball and Axial Plate

(b) Remove selected leaf or leaves from feeler gage and attach end of spring scale that is calibrated in ounces. (A generator brush spring scale (J-5184) or the spring scale for checking distributor point setting may be used for this step).

(c) Reinsert feeler gage leaf or leaves between rear piston drive ball and axial plate and draw leaf or leaves out again, simultaneously measuring "drag" on leaf or leaves (see Figure 9B-83). If correct leaf (leaves) has been selected, spring scale will read be-

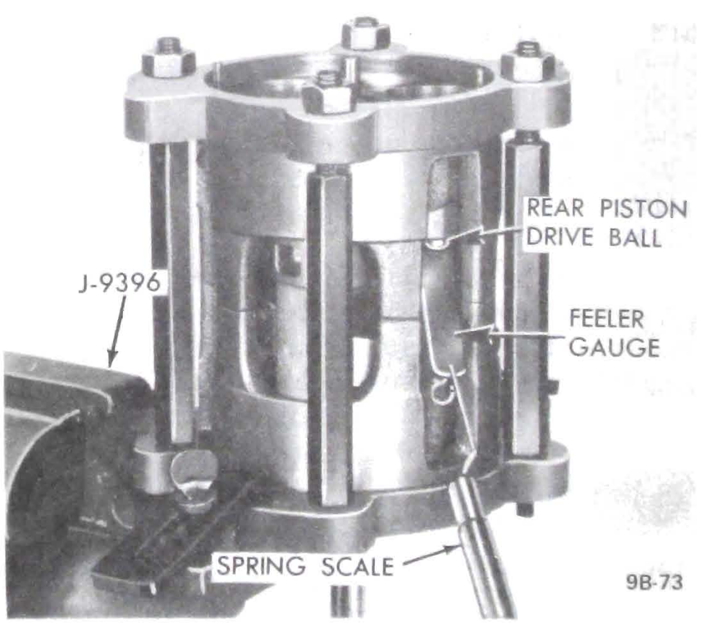


Figure 9B-83 Checking Drag on Selected Feeler Gage Leaf with Spring Scale tween 4 to 8 ounces pull (the higher reading is desired). To perform this step correctly, feeler gage leaf (leaves) must be withdrawn straight out with a steady even motion, and all surfaces involved must be coated with No. 525 viscosity oil. Record gage dimension.

Use of the spring scale establishes a standard of measurement of the amount of feeler gage leaf "drag" required.

(d) Rotate the shaft and axial plate assembly 120 degrees and perform a second check (Steps "a, b and c") between same piston drive ball and axial plate. Record gage dimension.

(e) Rotate shaft and axial plate again approximately 120 degrees and repeat third check (Steps "a, b and c") between same piston drive ball and axial plate. Record gage dimension.

(f) From the three recorded checks (Steps "c, d and e") select minimum feeler gage reading and obtain from stock (ref. Figure 9B-84 for part number of shoe disc) one shoe disc corresponding to the minimum gage reading (ref. example below). Place shoe disc in respective position on parts tray (J-9402).

Figure 9B-84 - Shoe Disc Table

SERVICE PART NO.	STAMPED SHOE DISC ID NO.
6557000	0 ("Zero" Shoe Disc)
6556175	17 1/2
6556180	18
6556185	18 1/2
6556190	19
6556195	19 1/2
6556200	20
6556205	20 1/2
6556210	21
6556215	21 1/2
6556220	22

EXAMPLE

Piston No.	1st Check	2nd Check	3rd Check
1	.019	.020	.019
(Select No. 19 - Shoe Disc)			
2	.020	.020	.019
(Select No. 19 - Shoe Disc)			
3	.021	.020	.021
(Select No. 20 - Shoe Disc)			

(g) Repeat Steps "c, d, e and f" for other two pistons and obtain two more selected shoe discs for other two pistons. In the rebuilt cylinder assembly, each piston will have one selected shoe disc and one "zero" shoe disc.

12. Gage shaft end play as follows:

(a) Using a feeler gage, select a leaf or combination of leaves which result in satisfactory "feel" when inserted between rear needle thrust bearing and outer rear thrust race (see Figure 9B-85).

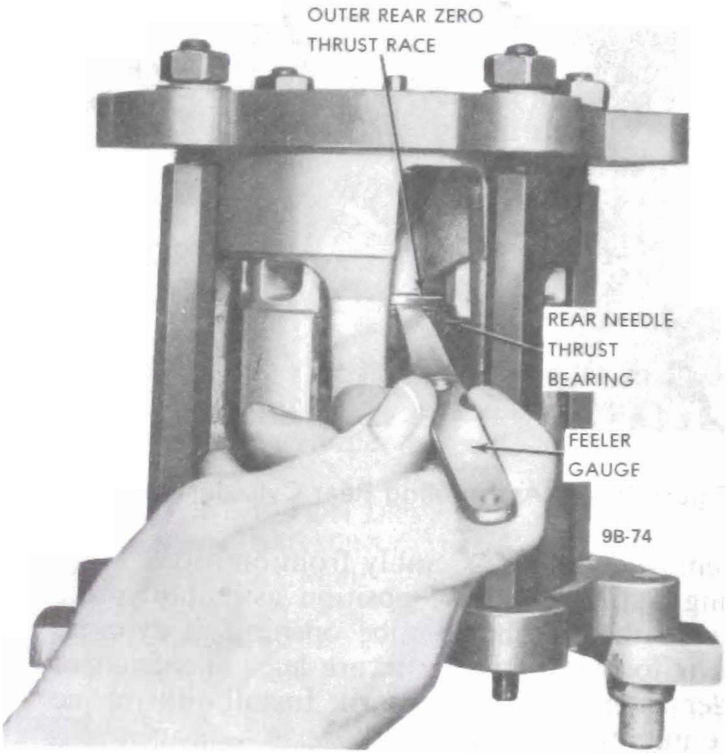


Figure 9B-85 Gaging Clearance Between Rear Needle Thrust Bearing and Outer Rear Thrust Race

(b) Remove selected leaf or leaves from feeler gage. Attach to end of spring scale calibrated in ounces. (A generator brush spring scale (J-5184) or the spring scale for checking distributor point setting may be used for this step).

(c) Reinsert feeler gage leaf (leaves) between rear needle thrust bearing and outer rear thrust race and draw leaf (leaves) out again, this time simultaneously noting the "drag" or pull on the leaf (leaves) as measured by the spring scale (see Figure 9B-86). If correct leaf (leaves) have been selected, spring scale will read between 4 to 8 ounces pull (the higher reading is desired). To perform this step correctly, the feeler gage leaf (leaves) must be withdrawn straight out with a steady, even motion. All contacting surfaces involved in gaging operation must be coated with No. 525 viscosity oil.

The measurement for selection of the thrust race needs to be performed at only one place on the shaft and axial plate assembly.

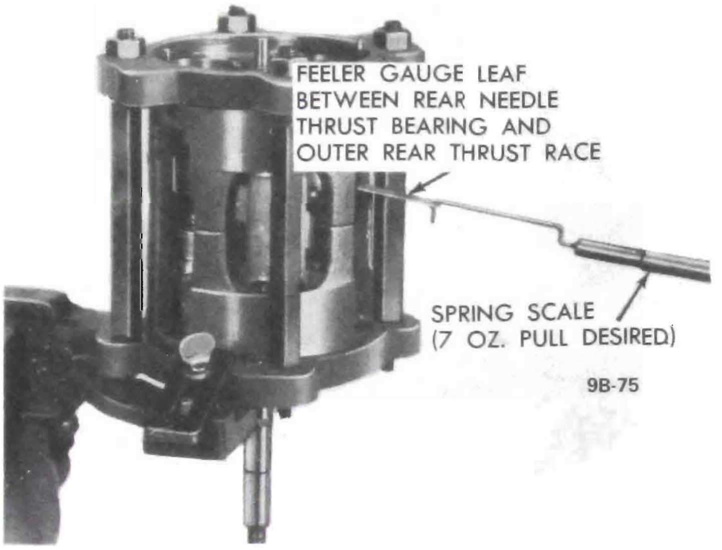


Figure 9B-86 Checking Drag on Selected Feeler Gage Leaf with Spring Scale

(d) Select from stock one thrust race (ref. Figure 9B-87 for part number of thrust race) corresponding to the feeler gage reading determined in Step "c", and place the selected thrust race in the parts tray slot designated for the outer rear thrust race. If, for example a feeler gage reading of 0.009 inch results, a thrust race with a number "9", stamped on it should be selected.

Figure 9B-87 - Thrust Race Table

SERVICE PART NO.	ID NO. ON RACE	THICK-NESS
6556000	0	.0920
6556050	5	.0965
6556055	5 1/2	.0970
6556060	6	.0975
6556065	6 1/2	.0980
6556070	7	.0985
6556075	7 1/2	.0990
6556080	8	.0995
6556085	8 1/2	.1000
6556090	9	.1005
6556095	9 1/2	.1010
6556100	10	.1015
6556105	10 1/2	.1020
6556110	11	.1025
6556115	11 1/2	.1030
6556120	12	.1035

The selected thrust race will replace only the "zero" outer rear thrust race. The remaining three "zero" thrust races will remain as part of the cylinder assembly.

13. Remove cylinder assembly from inside compressing fixture (J-9397), place on top of compressing fixture (see Figure 9B-73) and disassemble rear cylinder from front cylinder using rubber mallet or hammer and wood block.

14. Carefully disassemble one piston at a time from front cylinder and lay piston, front and rear piston drive balls and front "zero" shoe disc in respective slot of parts tray (J-9402). To disassemble, rotate axial plate until piston is at highest point, raise axial plate approximately 1/2 inch and lift out piston and related parts, one at a time.

15. Remove outer rear "zero" thrust race from shaft and set it aside for future gaging procedures.

16. Remove previously selected outer rear thrust race from parts tray, lightly coat with clear No. 525 Viscosity Oil and assemble onto shaft.

Final Reassembly of Cylinder Assembly

1. Reassemble piston rings onto pistons (ring scraper groove toward center of piston) and rotate ring so that break or gap in ring can be squeezed together when piston is being inserted into cylinder bore.

2. Reassemble piston drive balls, "zero" and selected shoe discs onto No. "1" piston, and apply clear petroleum jelly to piston pockets and shoe discs so that balls and discs stick to piston. BE SURE to reassemble balls and shoe discs into their specific positions on front and rear of piston.

3. Rotate shaft and axial plate assembly until high point of swash plate is over No. "1" cylinder bore. Position No. "1" piston onto axial plate (see Figure 9B-88) and lower the piston and axial plate so that the front end (notched end) of the piston enters the cylinder bore.

In order to fit the piston onto the axial plate and into the cylinder bore, the axial plate must be raised approximately 1/2 inch, the front needle thrust bearing and races must be held up against the hub of the axial plate, and the piston rings must be squeezed together (see Figure 9B-90). Lubricate cylinder bore, piston assembly and axial plate with No. 525 viscosity oil to facilitate reassembly.

4. Repeat procedure in Steps 1 and 2 for installation of No. 2 and No. 3 pistons.

5. Obtain new service replacement discharge tube and assemble into front cylinder (see Figure 9B-91).

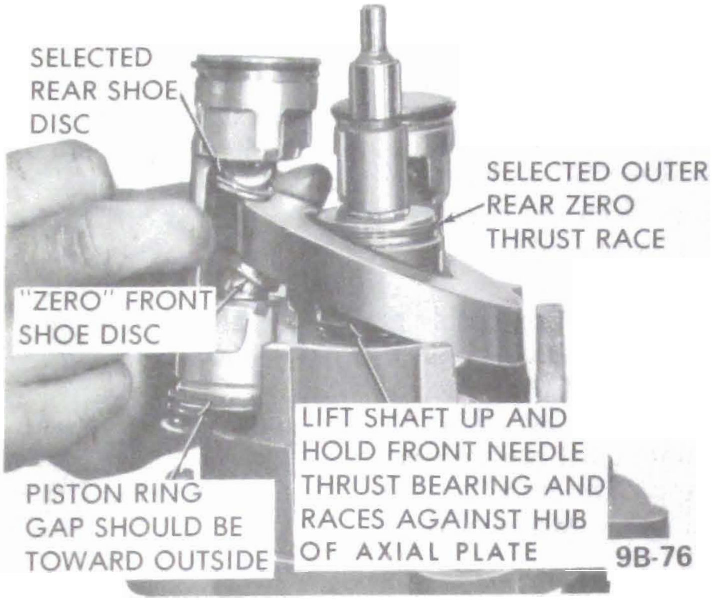


Figure 9B-88 Installing Piston Assembly in Front Cylinder Half

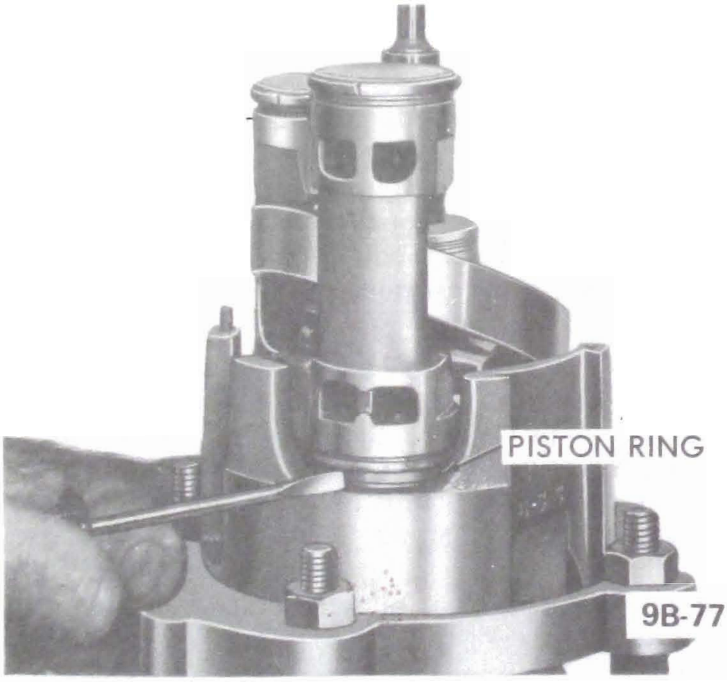


Figure 9B-90 Compressing Front Piston Rings

6. Liberally lubricate cylinder bores of rear cylinder with No. 525 viscosity oil and reassemble rear cylinder onto front cylinder being sure to compress piston rings. Align discharge tube and dowel pins, and tap cylinder halves together. Check for free rotation of shaft.

If pistons are postioned in a "stair-step" arrangement (see Figure 9B-92), installation of rear cylinder will be facilitated. In addition once the piston and ring are started into the cylinder, slight rotation of the shaft to and fro will work the ring into the bore.

7. Liberally lubricate with No. 525 viscosity oil, suction pass cover and lips of suction passage in body of cylinder assembly, and reassemble suction pass cover over suction passage (see Figure 9B-93).

SERVICE TYPE DISCHARGE

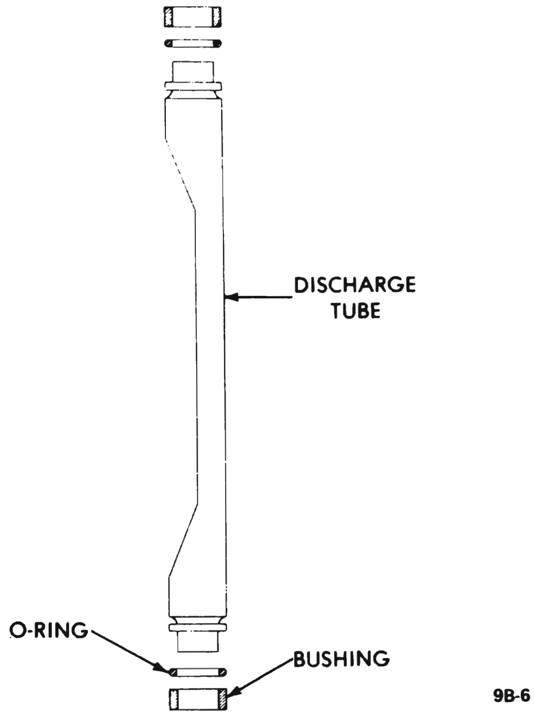


Figure 9B-91 Service Replacement Discharge Tube

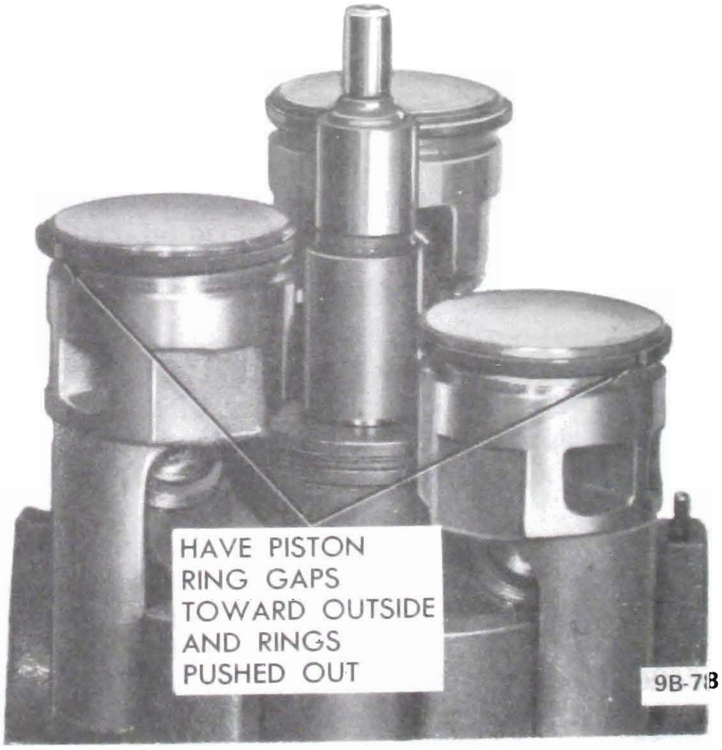


Figure 9B-92 Pistons Postioned in Stair-Step Arrangement

8. Assemble both service replacement discharge tube "O" rings and bushings (see Figure 9B-94) onto cylinder assembly.

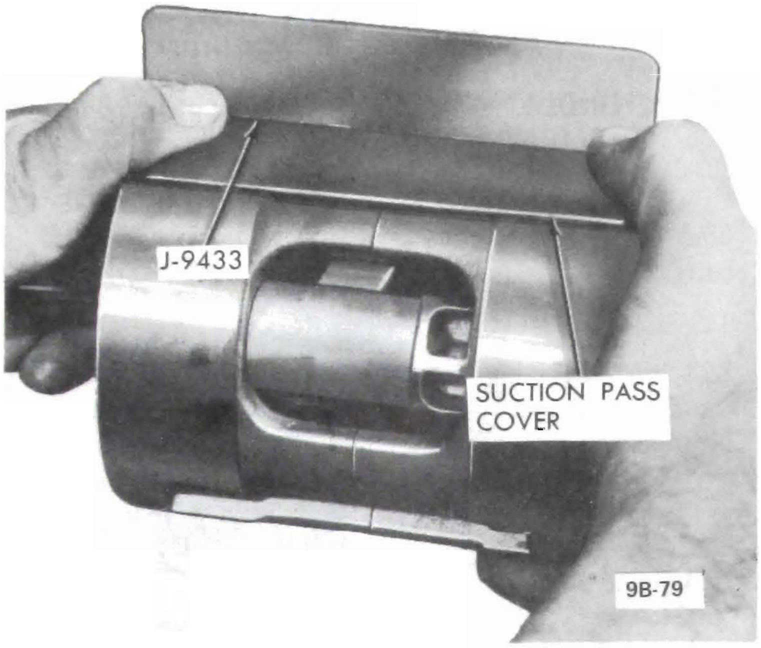


Figure 9B-93 Installing Suction Pass Cover

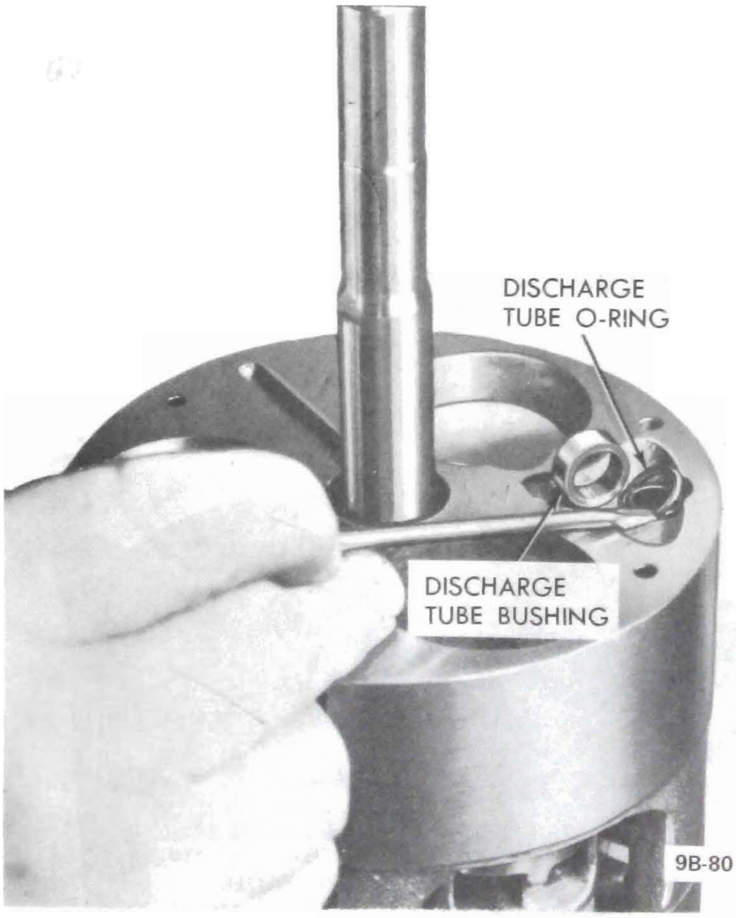


Figure 9B-94 Installing Discharge Tube O Ring and Bushing

Reassembly of Front Suction Valve Reed Disc, Front Discharge Valve Plate, Front Head, and Installing of Cylinder Assembly

1. Assemble suction reed valve disc to front of cylinder assembly and align with dowel pins, suction port and discharge port (see Figure 9B-95).

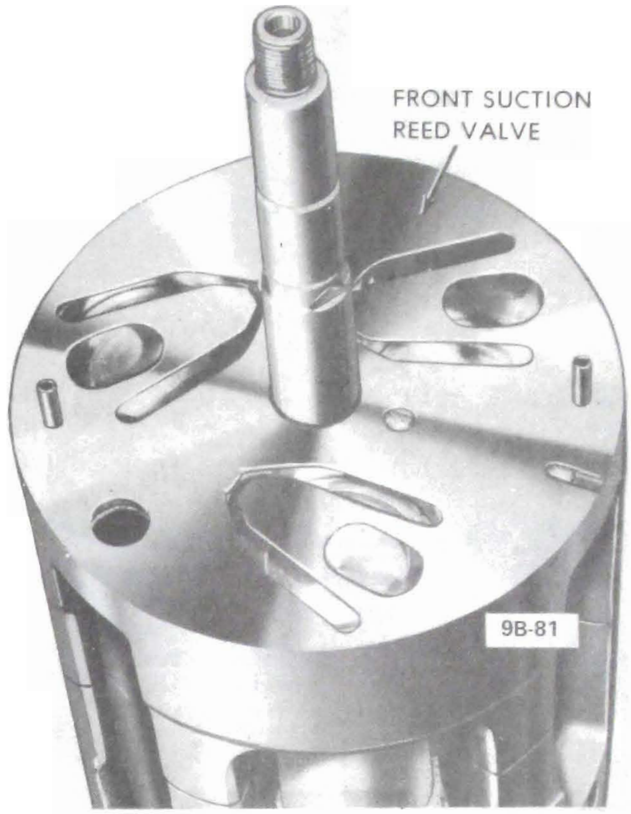


Figure 9B-95 Front Suction Valve Reed Disc Installed

2. Assemble front discharge valve plate to front of cylinder assembly and align with dowel pins.

3. Coat sealing surfaces on front head (see Figure 9B-96) with No. 525 viscosity oil.

Figure 9B-96 Placing Front Head on Cylinder Assembly

4. Mark with pencil on side of front head the location of dowel pin holes (see Figure 9B-96), align front head with dowel pins, and tap head lightly with mallet to seat on cylinder assembly.

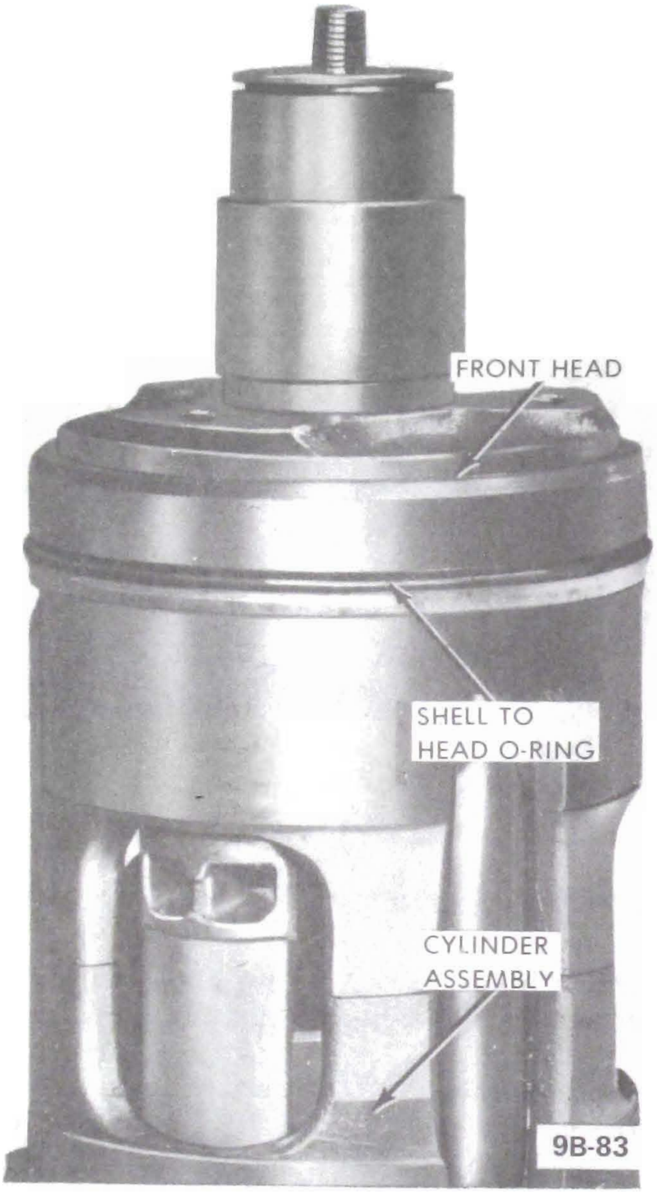


Figure 9B-97 Shell to Front Head O Ring Installation

5. Place new shell to head "O" ring on shoulder of front head (see Figure 9B-97) and liberally coat "O" ring and front head sealing surface with No. 525 viscosity oil.

6. Install shell in holding fixture (J-9396) and postion so that rear studs of shell are up. Coat inside surface of shell with No. 525 viscosity oil.

7. Reassemble, as a unit, cylinder assembly and front head into the shell. See Figure 9B-98. Extreme care must be used to prevent shell to head "O" ring seal from being damaged.

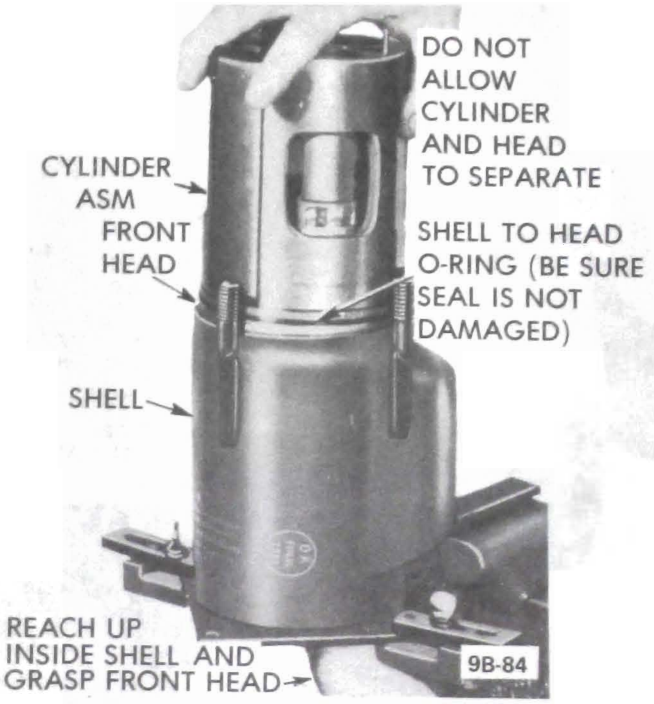


Figure 9B-98 Installing Front Head and Cylinder Assembly in Shell

Reassembly of Rear Suction Valve Reed Disc, Rear Discharge Valve Plate, Oil Pump and Rear Head

1. Rotate the cylinder assembly and front head until the hole for the oil inlet tube in the cylinder assembly is aligned with the reservoir hole in the shell, and reassemble the oil inlet tube and "O" ring.

2. Assemble suction reed valve disc to rear of cylinder assembly and align with dowel pins, suction port, and discharge port of cylinder assembly.

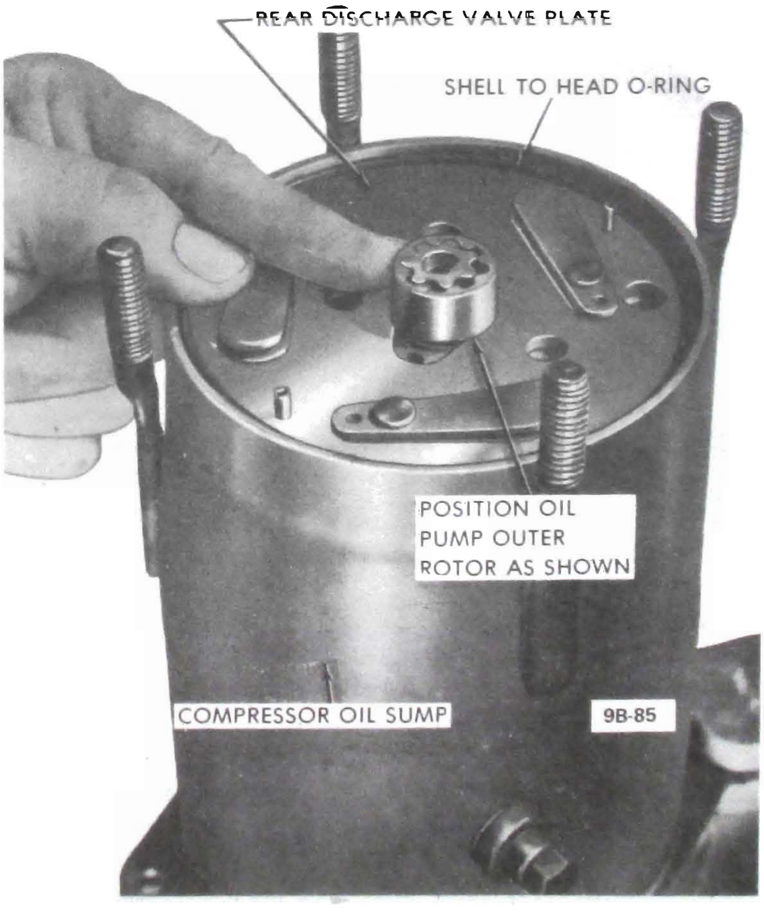


Figure 9B-100 Positioning Oil Pump Outer Rotor

3. Assemble rear discharge valve plate to rear of cylinder assembly and align with dowel pins.

4. Reassemble inner and outer oil pump rotors so that the sides previously identified are in their original location, and then position oil pump outer rotor as shown in Figure 9B-100.

5. Generously coat with No. 525 viscosity oil new shell to head "O" ring and install in shell (see Figure 9B-100).

6. Coat sealing surface of rear head with No. 525 viscosity oil, mark with pencil on side of rear head the location of the dowel pin holes and reassemble onto compressor.

It may be necessary to reposition oil pump outer rotor slightly in order to install rear head. In addition, if dowel pins do not engage holes in rear head, grasp front head and rotate cylinder assembly slightly (See Figure 9B-101).

Figure 9B-101 Installing Rear Head

7. Assemble new nuts to threaded shell studs and torque to 20 lb.ft. If pressure relief valve has been removed, reassemble using a new pressure relief valve gasket.

8. Reassemble new lubricated suction and discharge "O" rings into suction and discharge ports of rear head.

9. Assemble shaft seal onto compressor shaft (ref. to Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal"). Do not reassemble clutch drive plate at this time.

Leak Testing Compressor

1. After the shaft seal pressure test (ref. to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal") has been performed, change the test circuit to the configuration shown in Figure 9B-102.

2. With hose attached only to high pressure side of Leak Test Fixture J-9625, open high pressure valve to charge high pressure side of compressor. As soon as high pressure gage stabilizes reading, close valve. If high pressure gage drops back immediately when valve is closed, an internal leak is indicated. Correct leak as necessary.

If an internal leak is indicated, the leak may exist about the head sealing surface, discharge tube, shell to head "O" rings, or suction valve reed discs.

3. Remove drain screw from shell and add No. 525 viscosity oil as specified in "Adding Oil to the System".

4. Reassemble pulley assembly, and coil and housing assembly onto hub of front head (ref. to "Disassembly and Reassembly of PUlley Assembly, Coil and Housing Assembly").

5. Complete reassembly by installing clutch drive plate onto hub of front head (refer to "Disassembly and Reassembly of Clutch Drive Plate and Shaft Seal"). See Figure 9B-108 disassembled view of compressor.

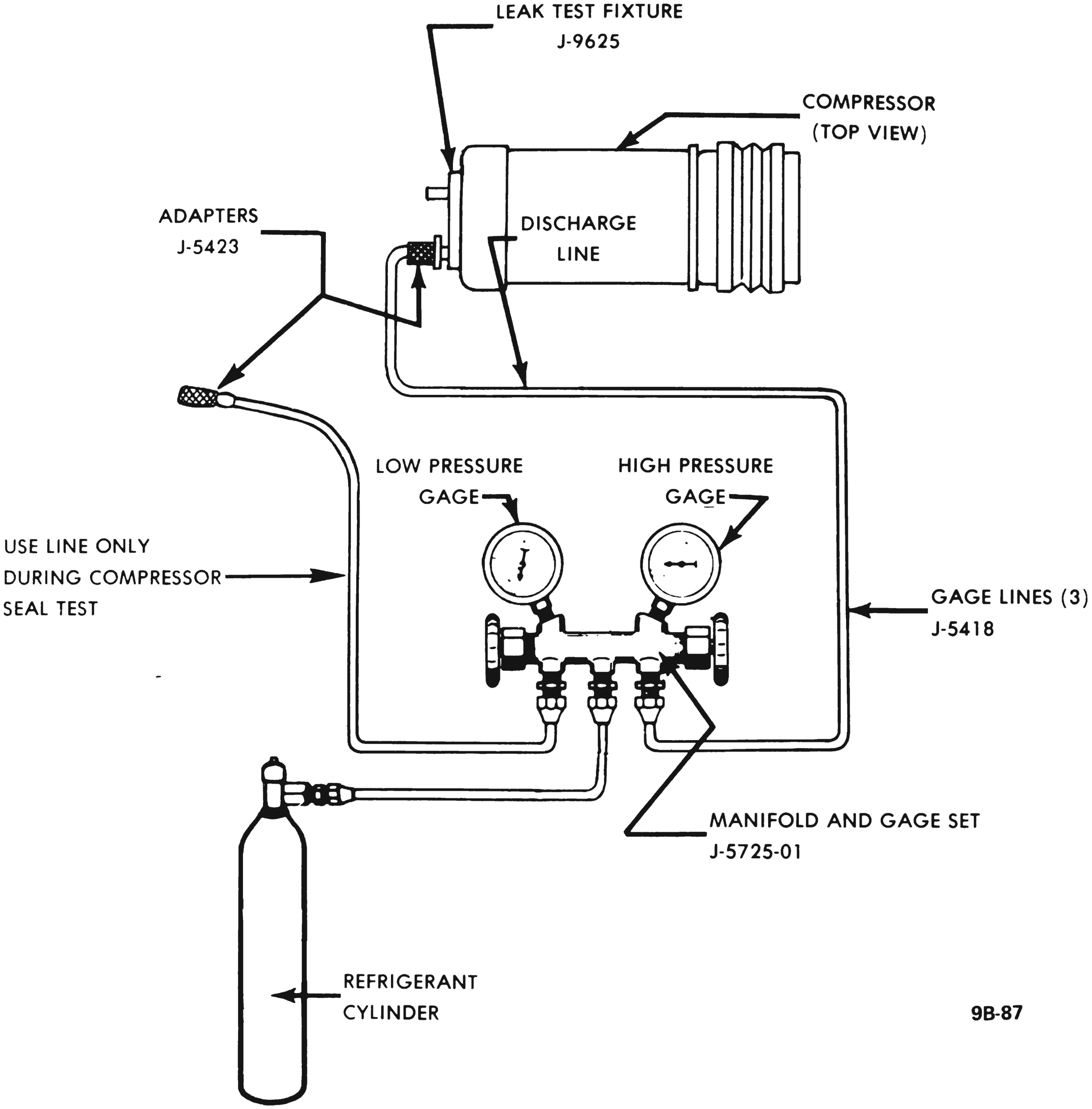


Figure 9B-102 Compressor Internal Leak Test

SPECIFICATIONS

Tightening Specifications

Part	Location	Torque Lb.Ft.
Nut	Drive Plate Nut to Compressor Shaft	15
Nut	Rear Head to Shell	21
Cap	Schrader Service Valve	5

Tightening Specifications V.I.R.

Part	Location	Torque Lb. Ft.
Nut	Evaporator Inlet Connection	18
Nut	Evaporator Outlet Connection	31
Nut	Liquid Bleed Line Connection	6
Nut	Liquid Line to VIR	12
Nut	Suction Line to VIR	31
Screw	Receiver Shell Mounting Screws	6
Screw	POA and TX Valves Retaining Screws	6
Screw	Connector Shell Assembly Retaining Screws	6
Nut	Sight Glass Retaining Nut	23 Lb.In.
Valve Core	Liquid Bleed Valve Core	30 Ounce In.
Valve Core	Evaporator Gage Valve Core	30 Ounce In.

Compressor Specifications

Type	Six Cylinder Axial Opposed
Make	Frigidaire
Effective Displacement (Cu.In.)	12.6
Oil	525 Viscosity
Oil Content (New)	10 1/2 Fl.Oz.
Air Gap Between Clutch Drive Plate and Pulley	0.022 to 0.057 In.
Clutch Type	Magnetic
Belt Tension	100 Lbs.

Pipe and Hose Connection Torque Chart

Metal Tube Outside Dia.	Thread and Fitting Size	Steel Tubing Torque Lb.Ft.	Aluminum or Copper Tubing Torque Lb.Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
5/8	7/8	30-35	21-27	1 1/16
3/4	1 1/16	30-35	28-33	1 1/4

If a connection is made with steel to aluminum or copper, use torques for aluminum. In other words, use the lower torque specification.

Use steel torques *only* when *both* ends of connection are steel.

General Specifications

Thermostat Opening Temperature (All)	190°
Capacity of Cooling System With Air Conditioner (Quarts)	
350 Cu. In. "A"	15.5
350 Cu. In. "B"	16.6
455 Cu. In.	20.0
Type of Refrigerant	Refrigerant 12
Refrigerant Capacity (Fully Charged)	
A Series	4 1/2 Lbs.
B-C-E Series	4 Lbs.

FUNCTIONAL TEST # 1 — Set Engine Idle Speed @ 2000 RPM

Ambient Temperature (°F)	Evap. Pressure at POA Valve (PSIG)	Compressor Head Pressure (PSIG)	Right A/C Outlet Temp. (°F)	Left A/C Outlet Temp. (°F)
		A Series	A Series	
70	28-31	150-225	39-42	39-42
80	28-31	200-245	40-43	40-43
90	29-32	240-290	42-45	43-45
100	29-32	270-330	44-47	45-48
110	29-35	310-345	47-52	47-52

FUNCTIONAL TEST # 2

Ambient Temperature (°F)	Relative Humidity	Engine Speed (RPM)	Evap. Pres. at POA Valve (PSIG)	Compressor Head Pres. (PSIG)	Right A/C Outlet Temp. (°F Approx.)	Left A/C Outlet Temp. (°F Approx.)
		A Series	A Series	A Series	A Series	A Series
90	Low	400	35	190	54	52
90	High	480	35	210	59	57
100	Low	550	35	230	55	54
100	High	570	35	235	60	58
110	Low	615	35	270	58	58
110	High	940	35	320	59	59

NOTE: Functional test No. 2 is provided as a closer set of specifications designed to determine if the compressor is in fact at fault. Occasionally a system will check out according to the specifications in test No. 1; however, the customer will not be satisfied when car is returned to service. Under these circumstances the problem may be that the compressor is failing under load. Test No. 2 should show an inadequate compressor output if the compressor is malfunctioning.

9B-88

Figure 9B-103 Air Conditioner Functional Test Table - A Series

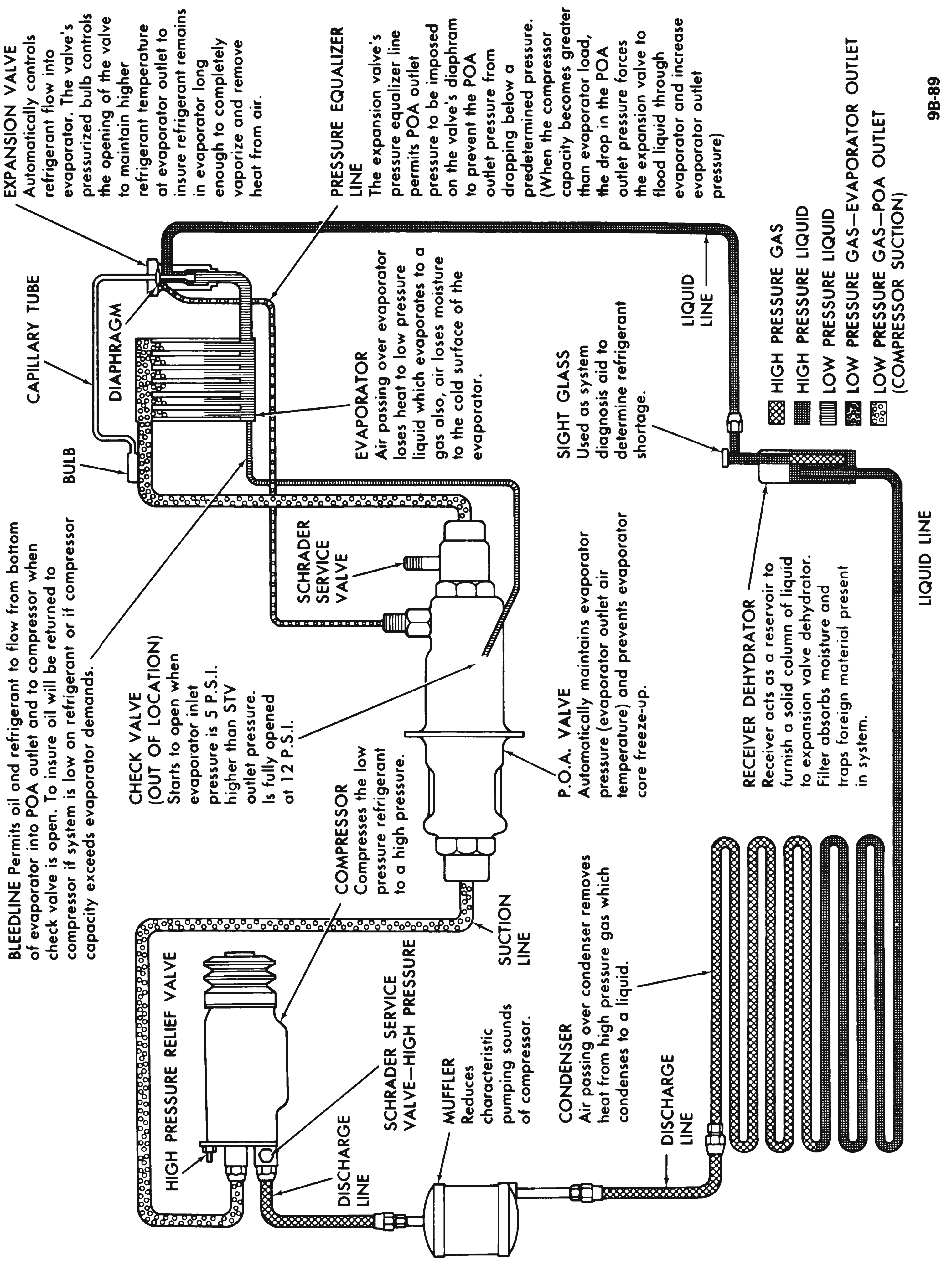


Figure 9B-104 Refrigeration Circuit - A Series

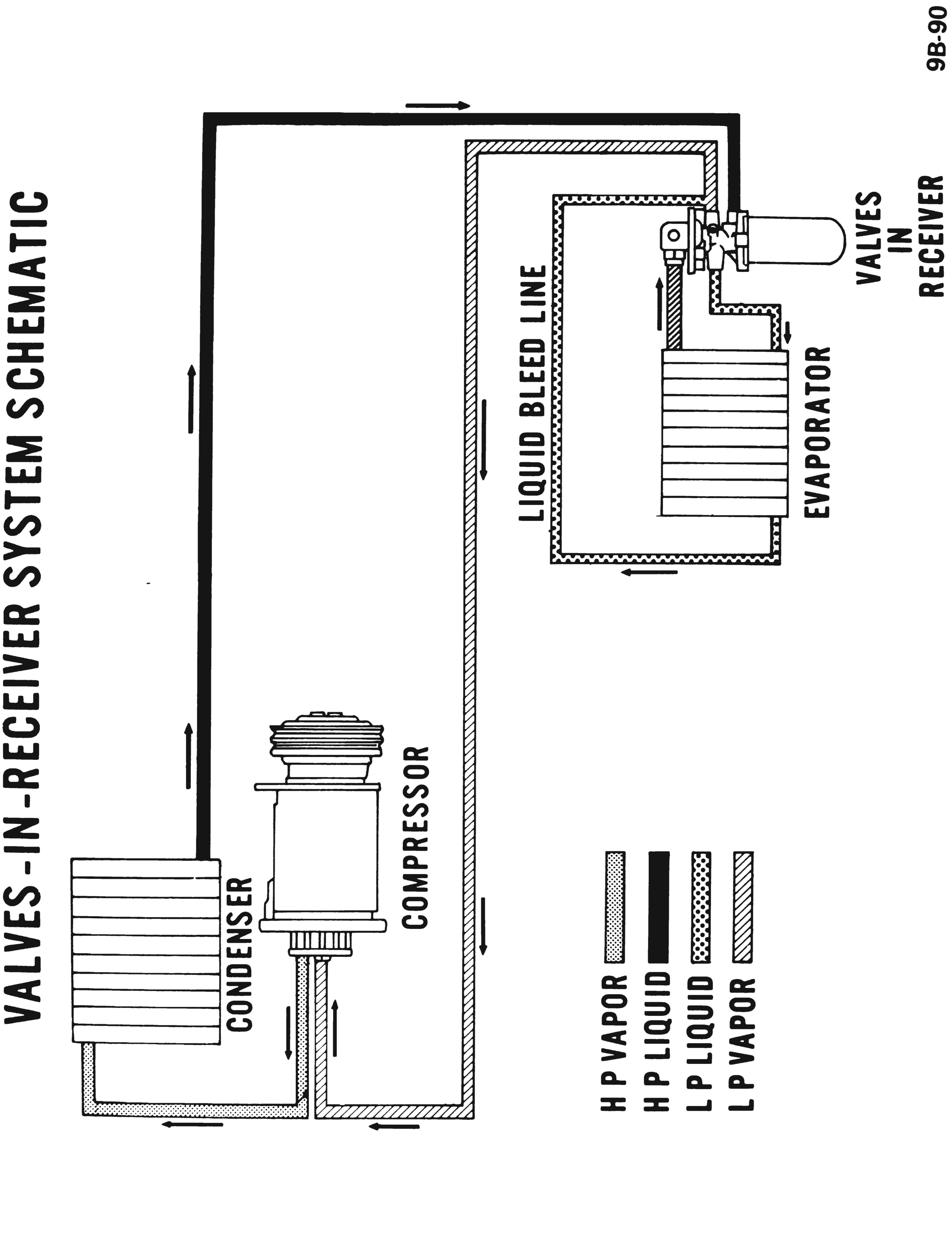


Figure 9B-105 Refrigeration Circuit - B-C-E Series

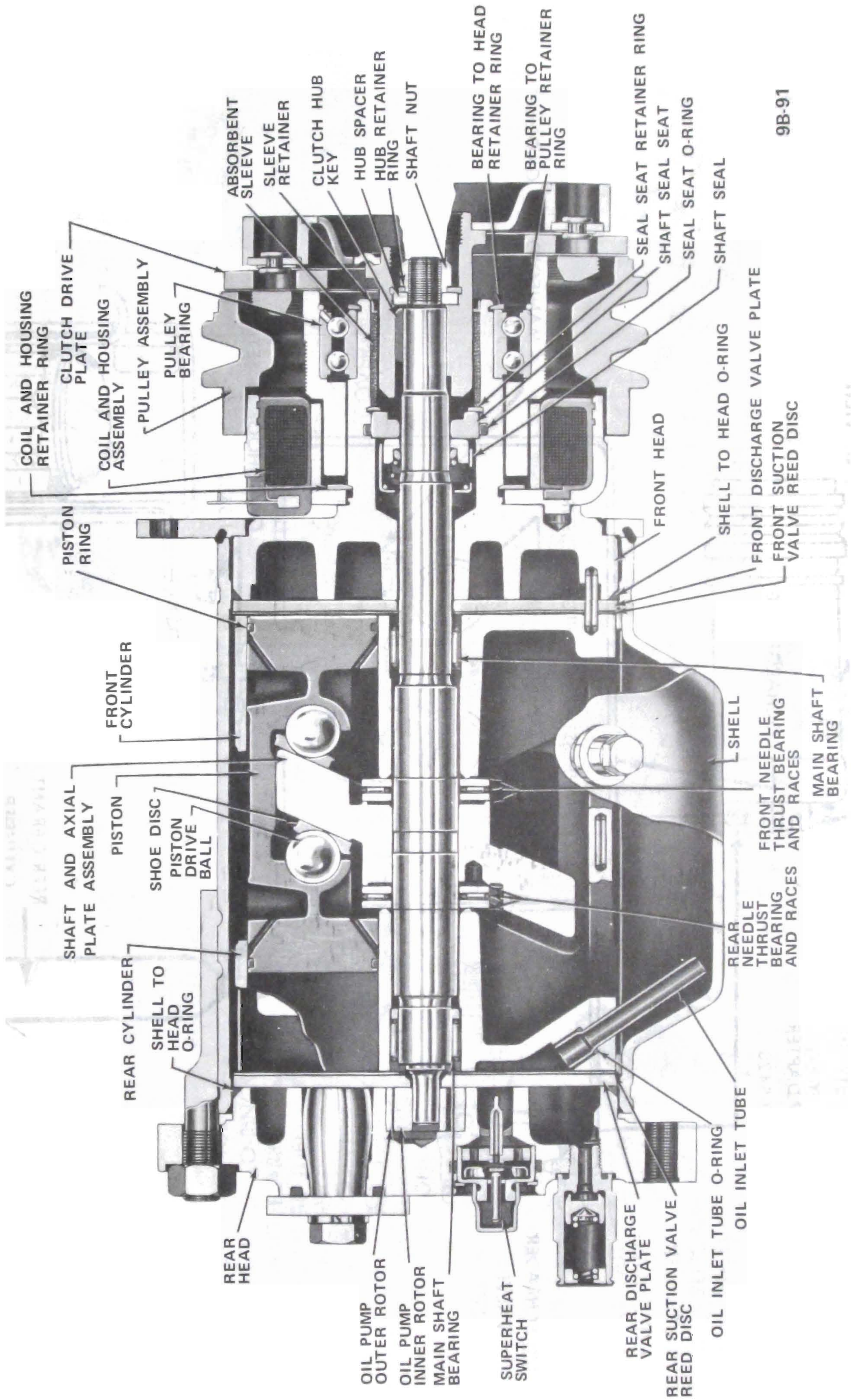


Figure 9B-106 Compressor - Section View

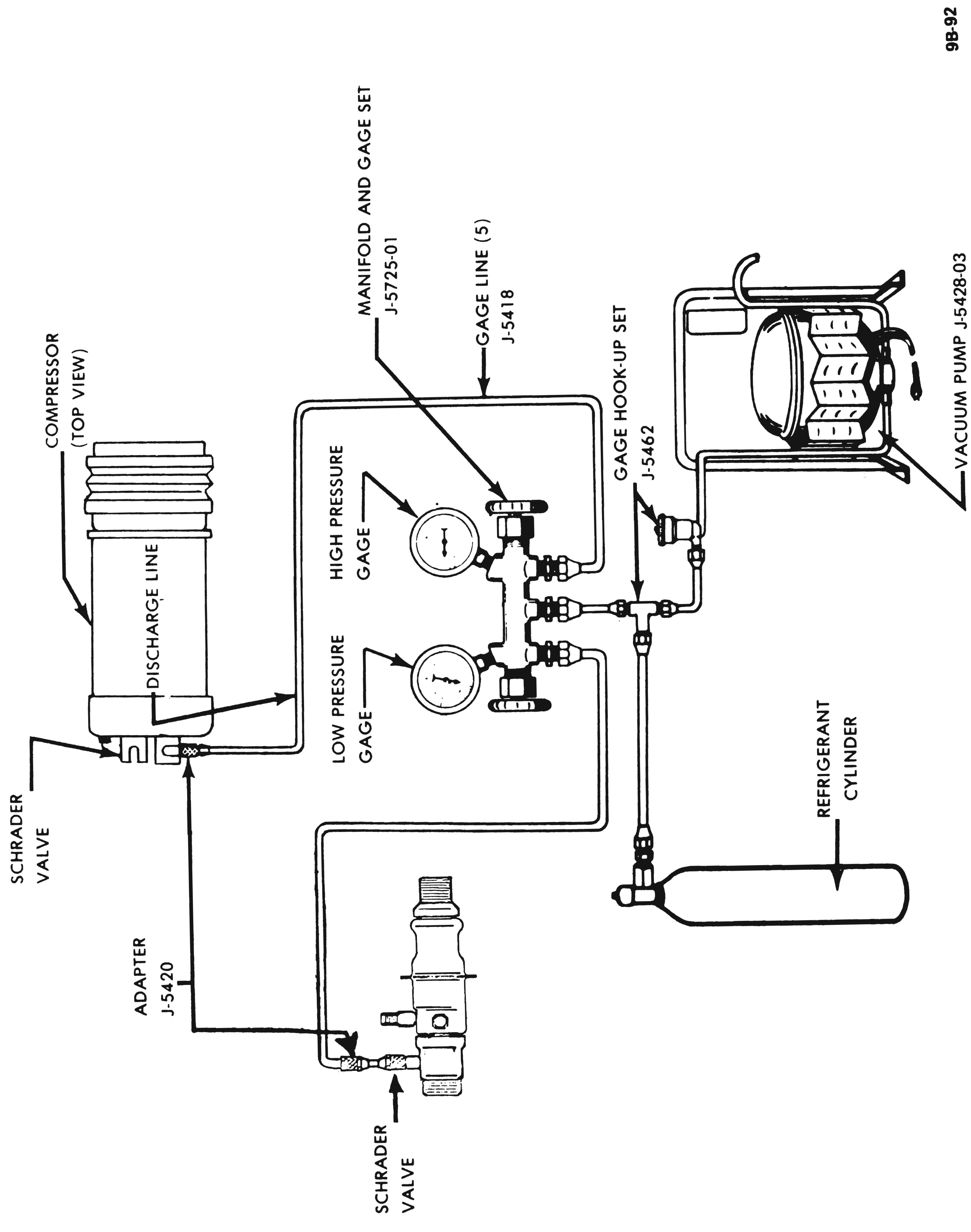


Figure 9B-107 Charging Air Conditioner System

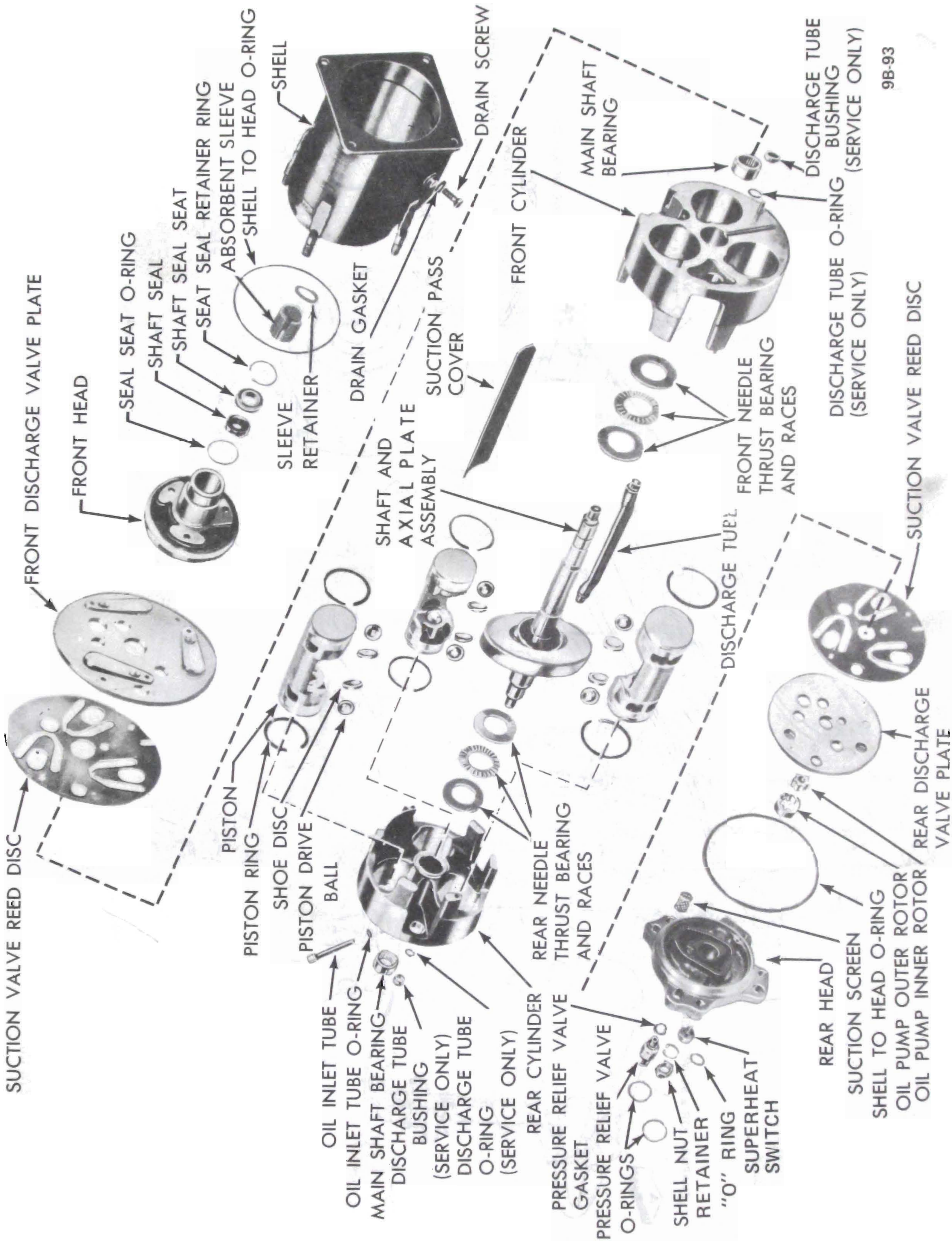


Figure 9B-108 Compressor - Exploded View

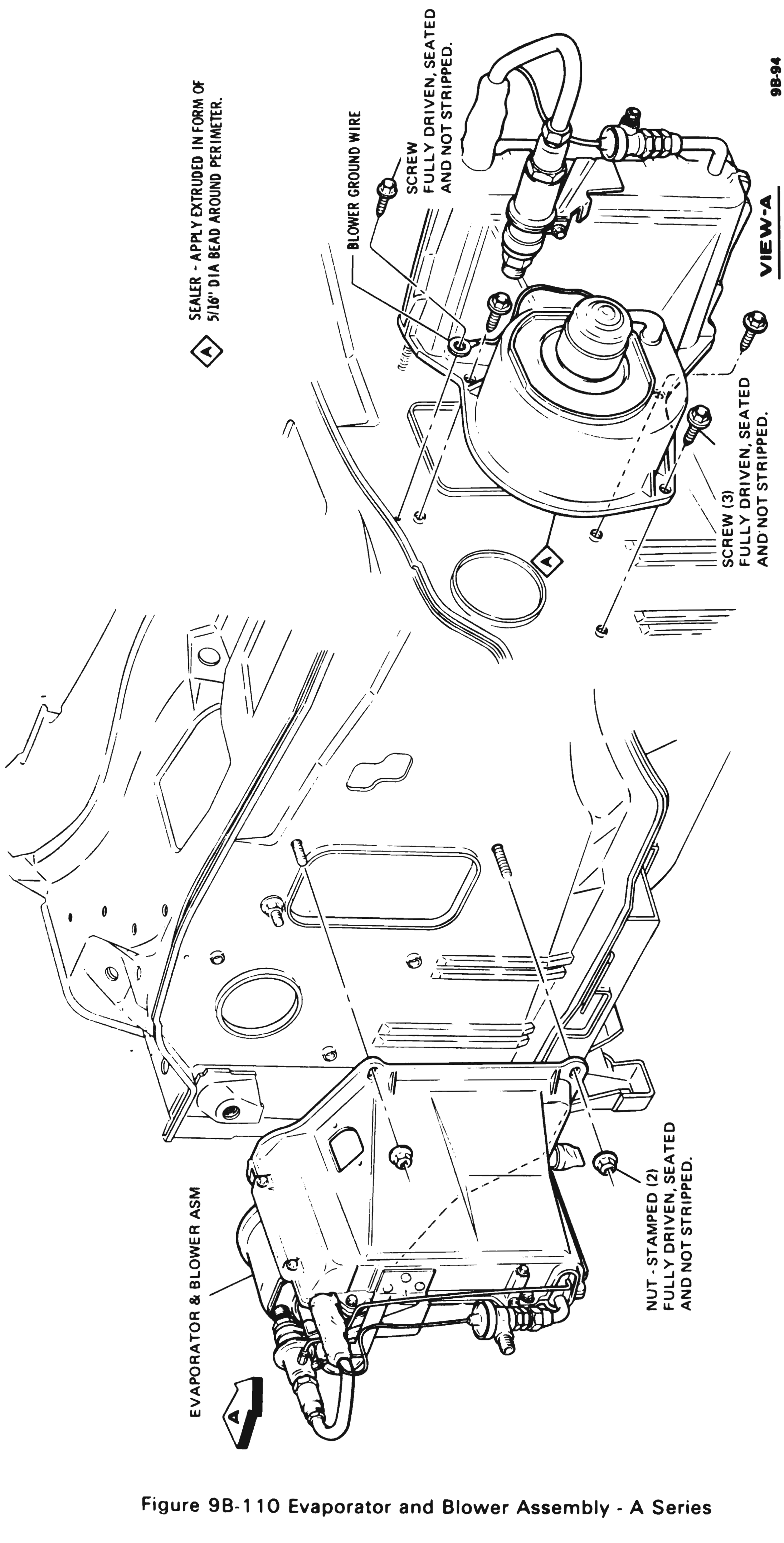


Figure 9B-110 Evaporator and Blower Assembly - A Series

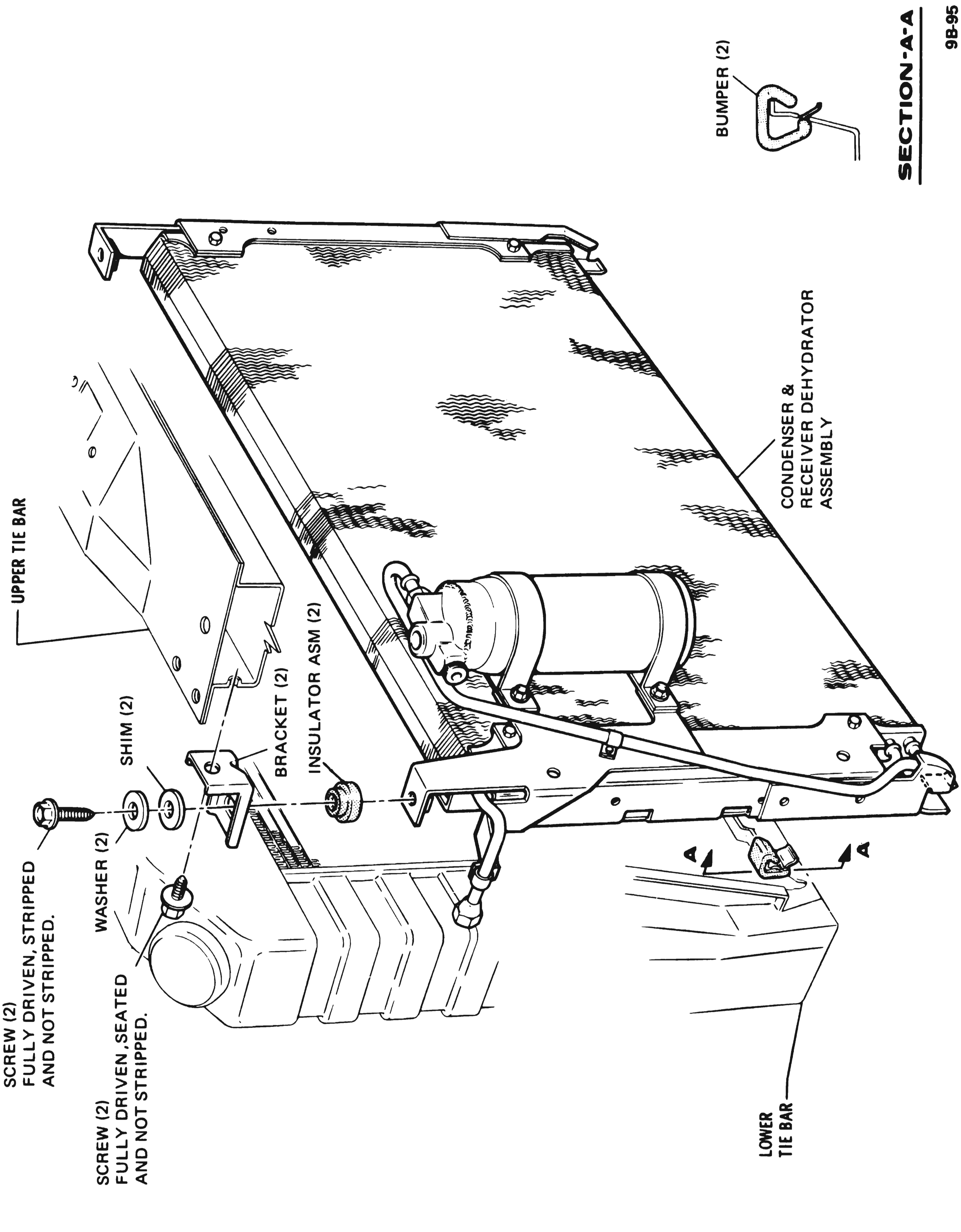


Figure 9B-111 Condenser and Receiver Dehydrator Mounting - A Series

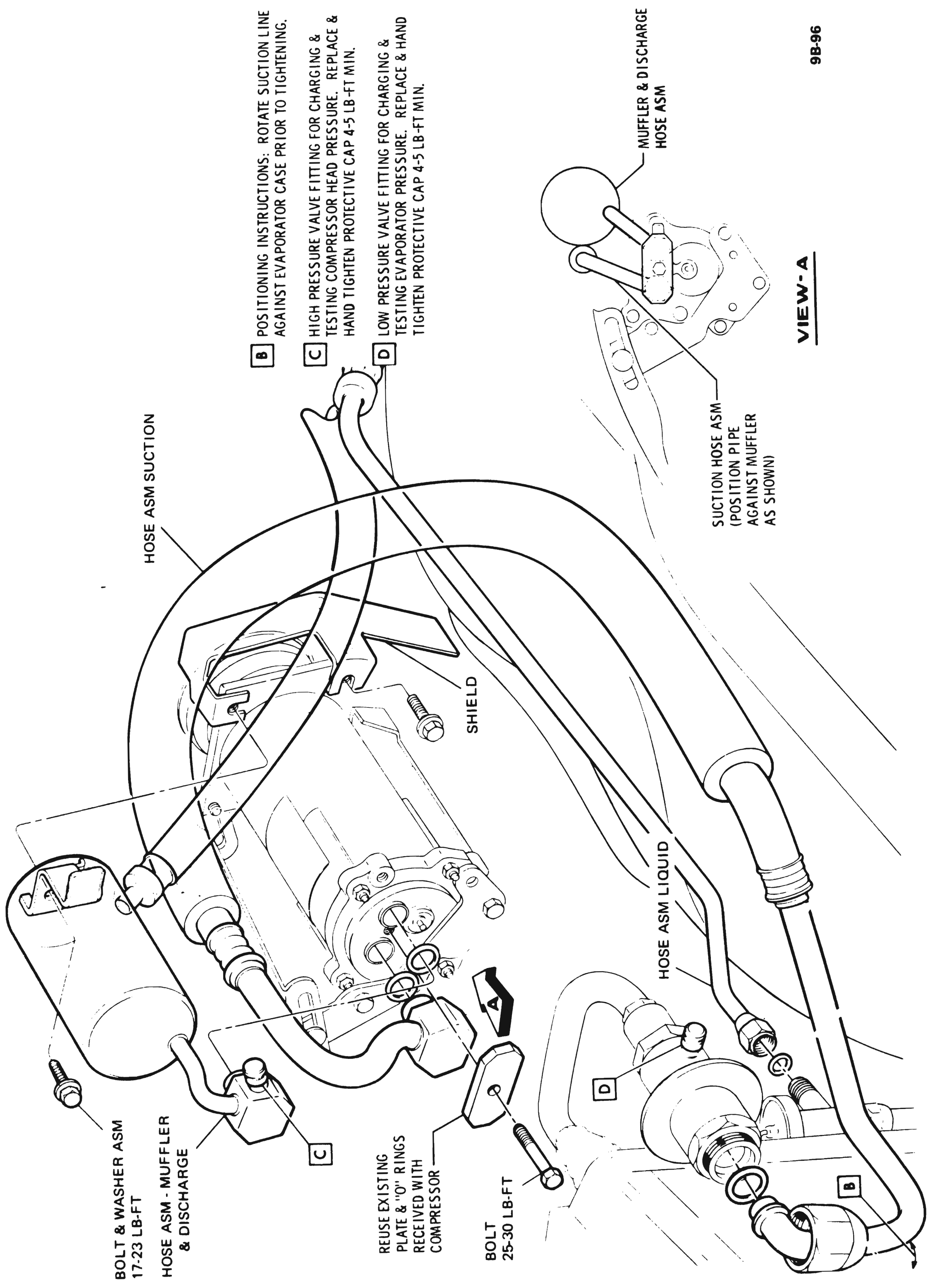


Figure 9B-112 Muffler, Discharge and Suction Hose - A Series

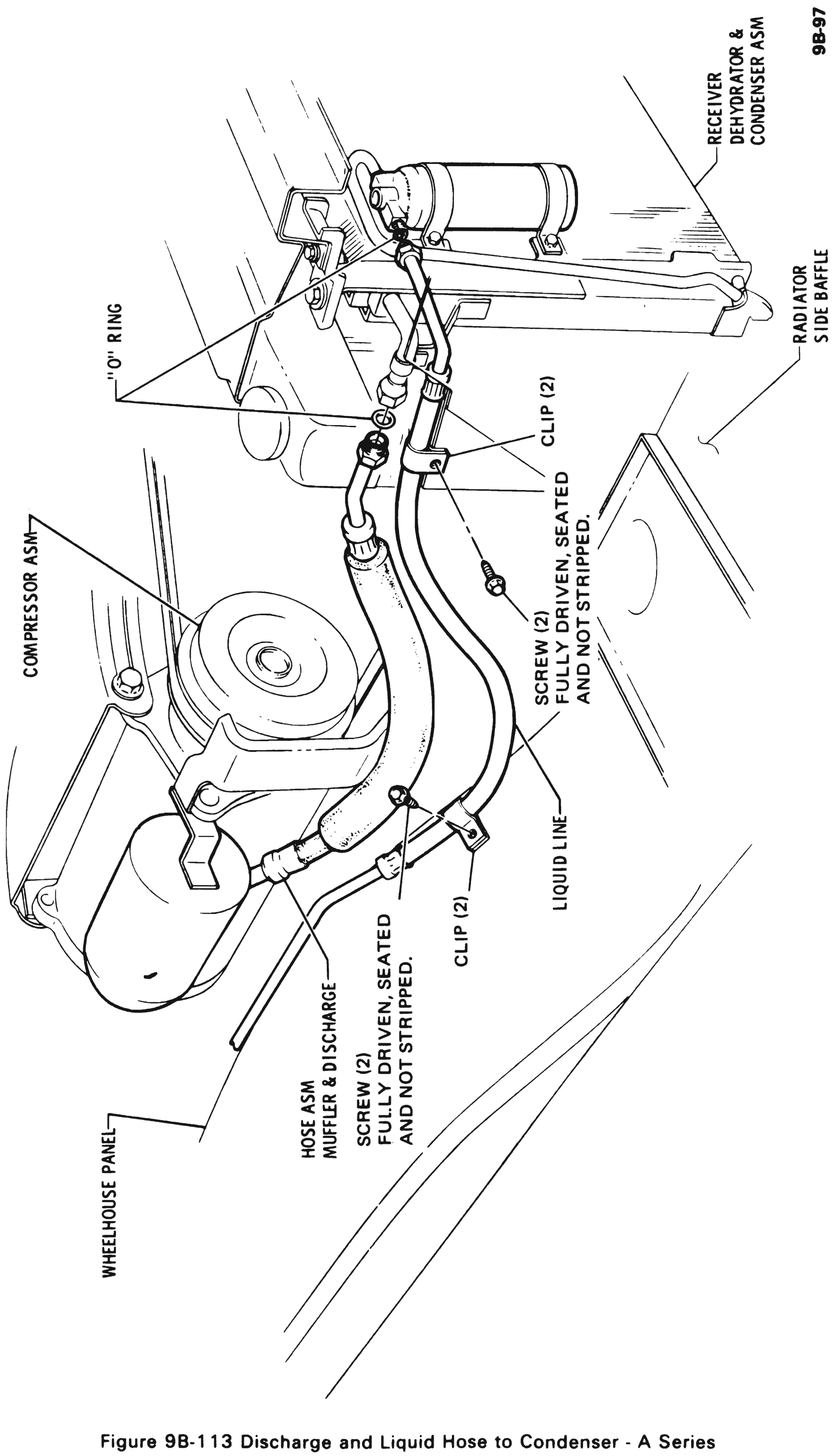


Figure 9B-113 Discharge and Liquid Hose to Condenser - A Series

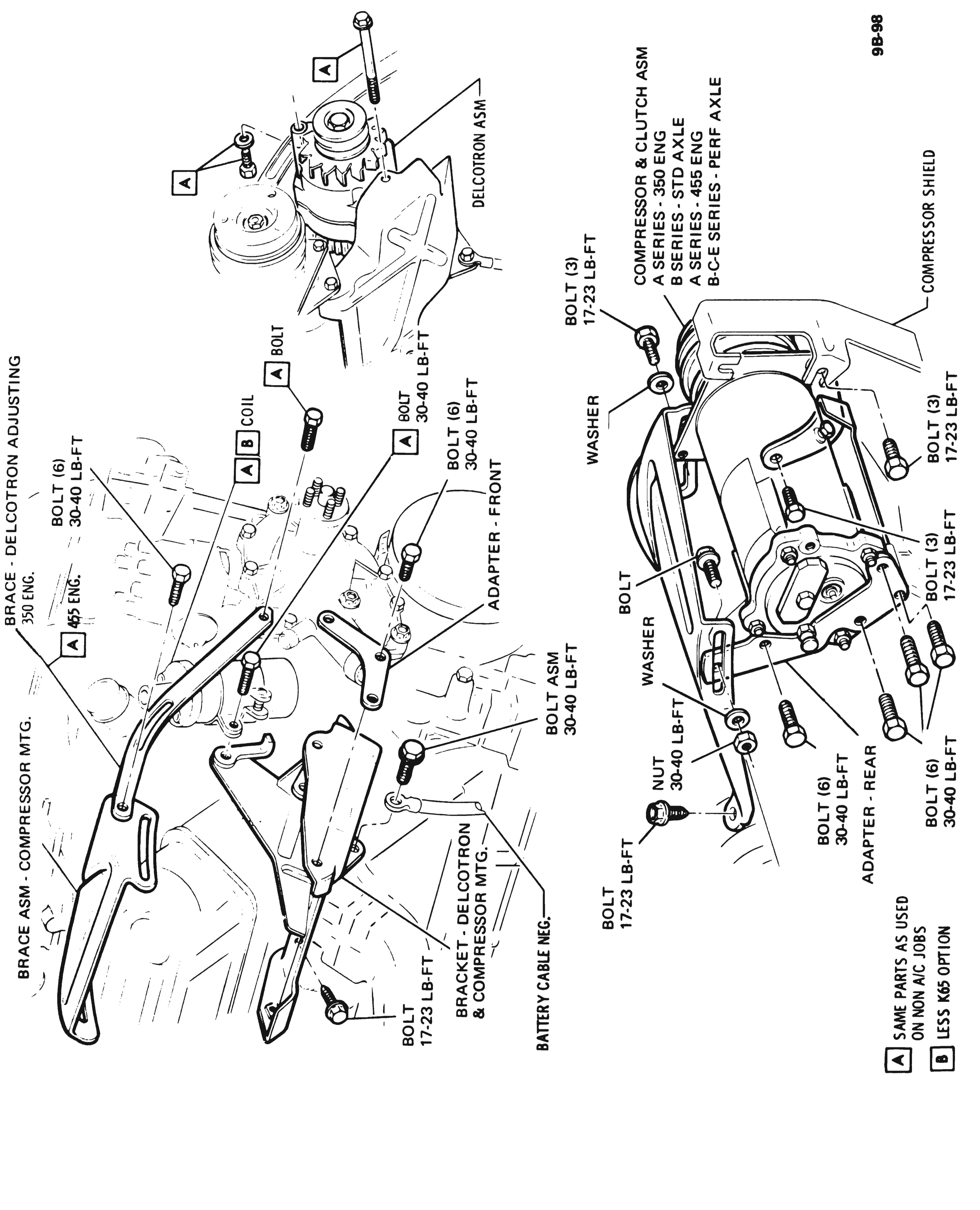


Figure 9B-114 A/C Compressor and Mounting - All Series

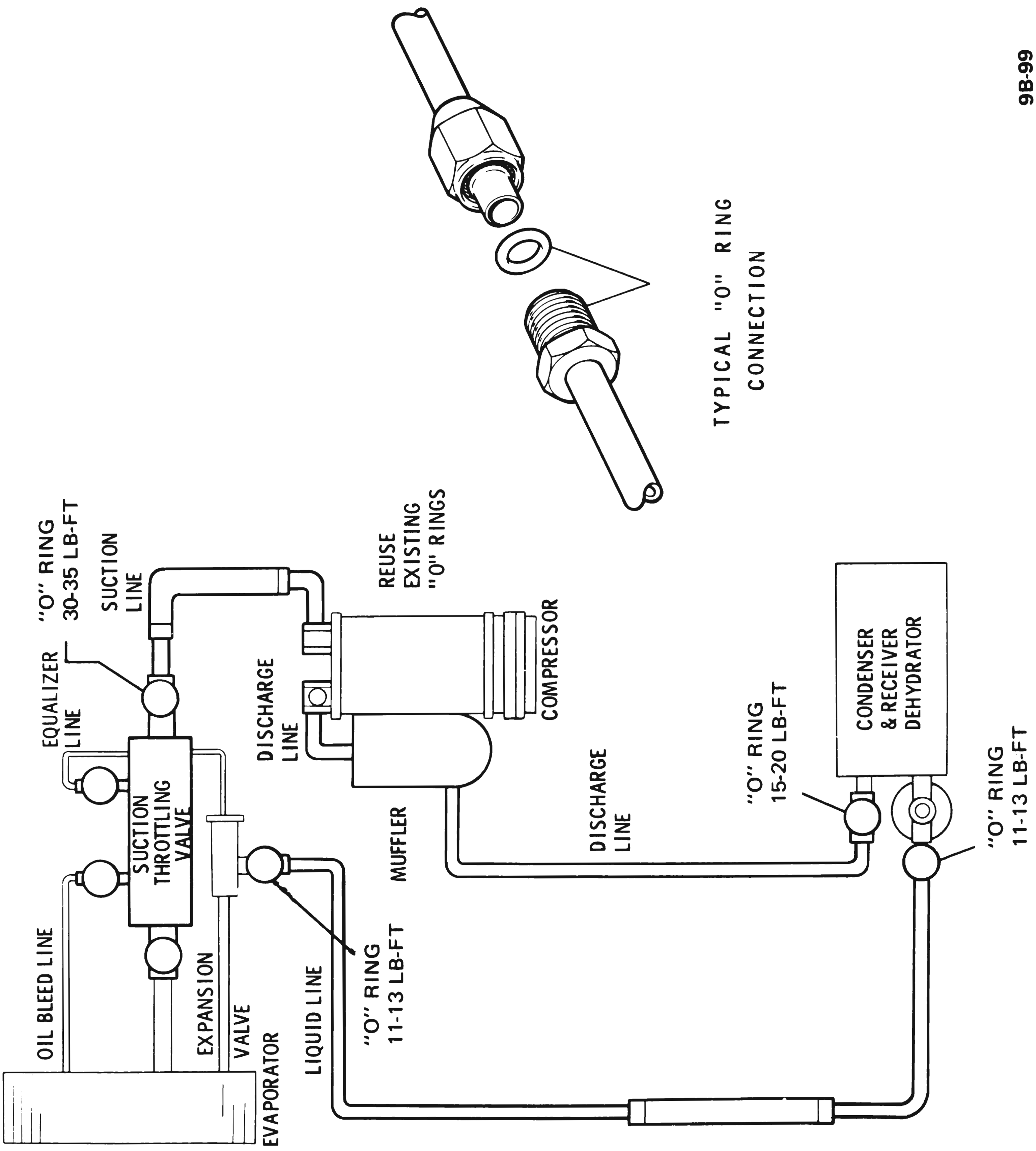


Figure 9B-115 "O" Ring Schematic - A Series

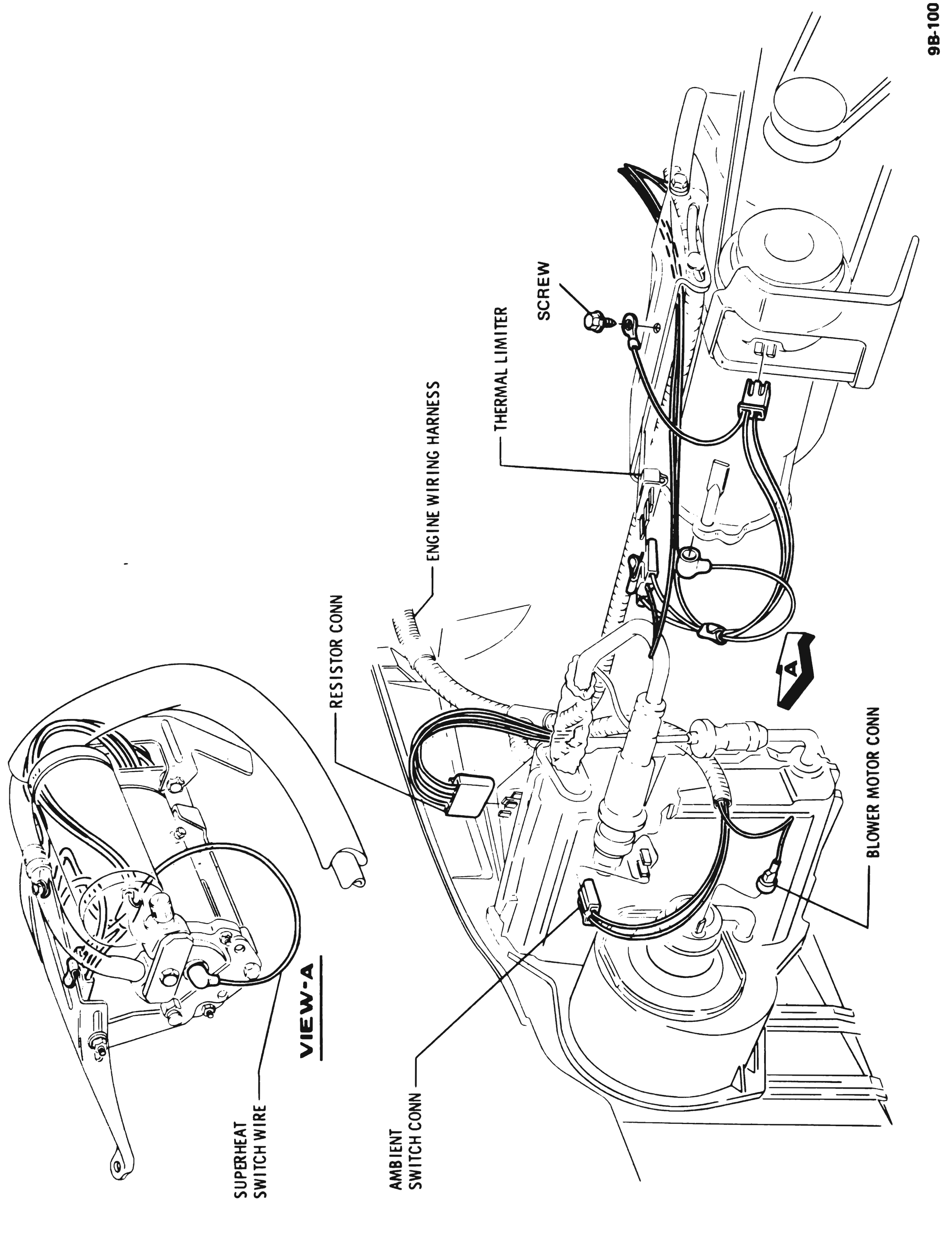


Figure 9B-116 A/C Blower Motor and Compressor Wiring - A Series

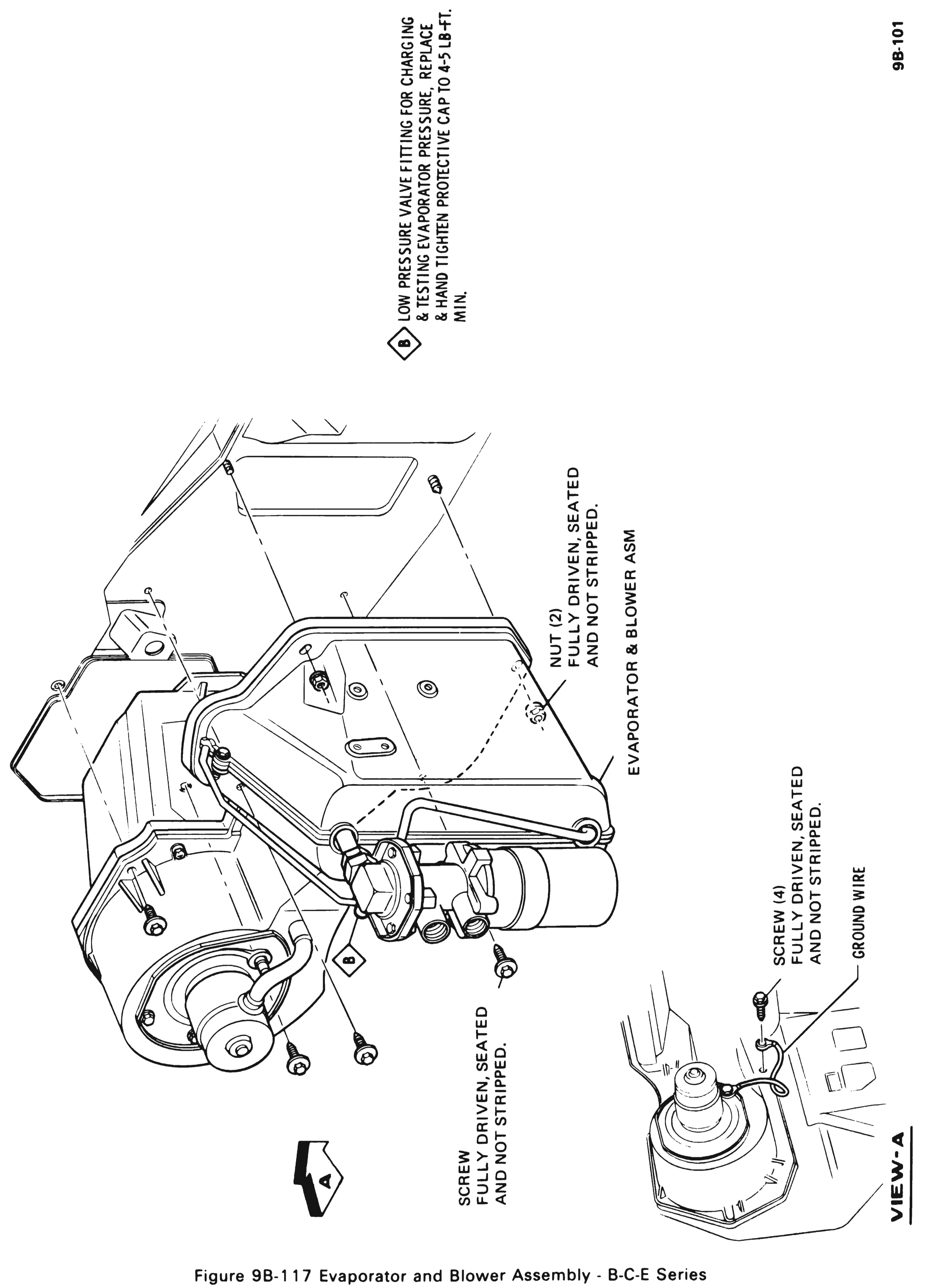


Figure 9B-117 Evaporator and Blower Assembly - B-C-E Series

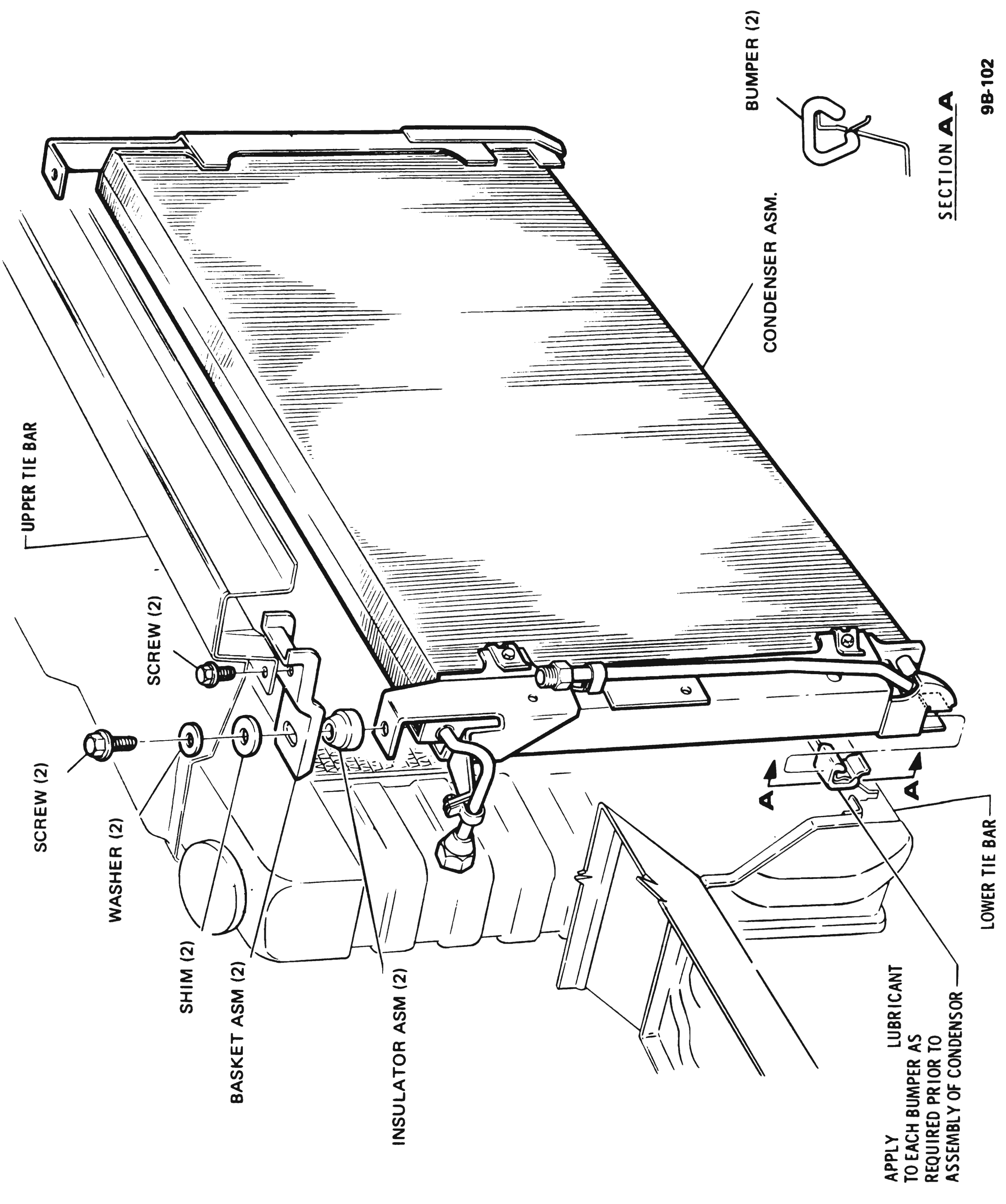


Figure 9B-118 Condenser Assembly Mounting - B-C-E Series

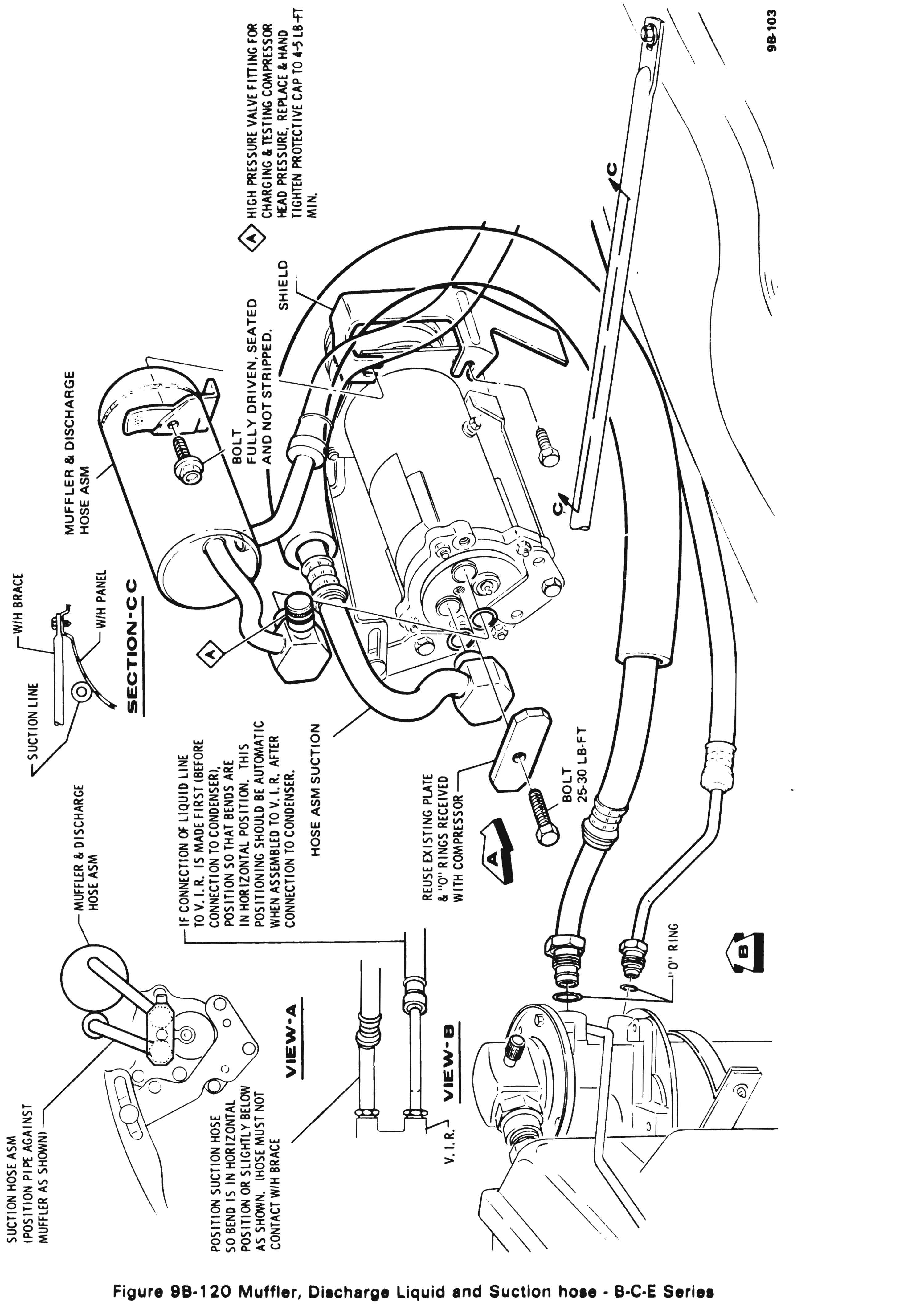


Figure 9B-120 Muffler, Discharge Liquid and Suction hose - B-C-E Series

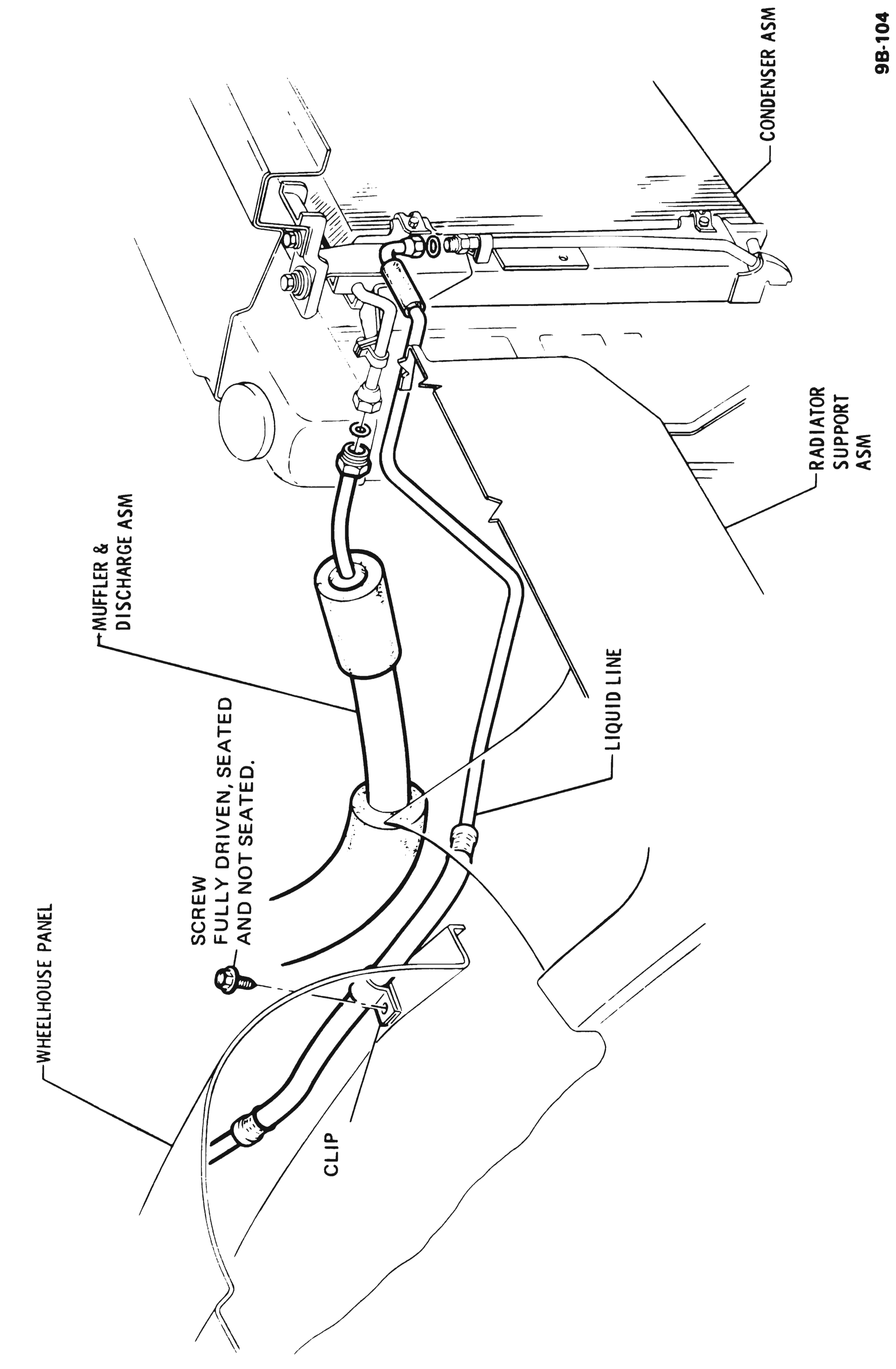


Figure 9B-121 Discharge and Liquid Hose To Condenser - B-C Series

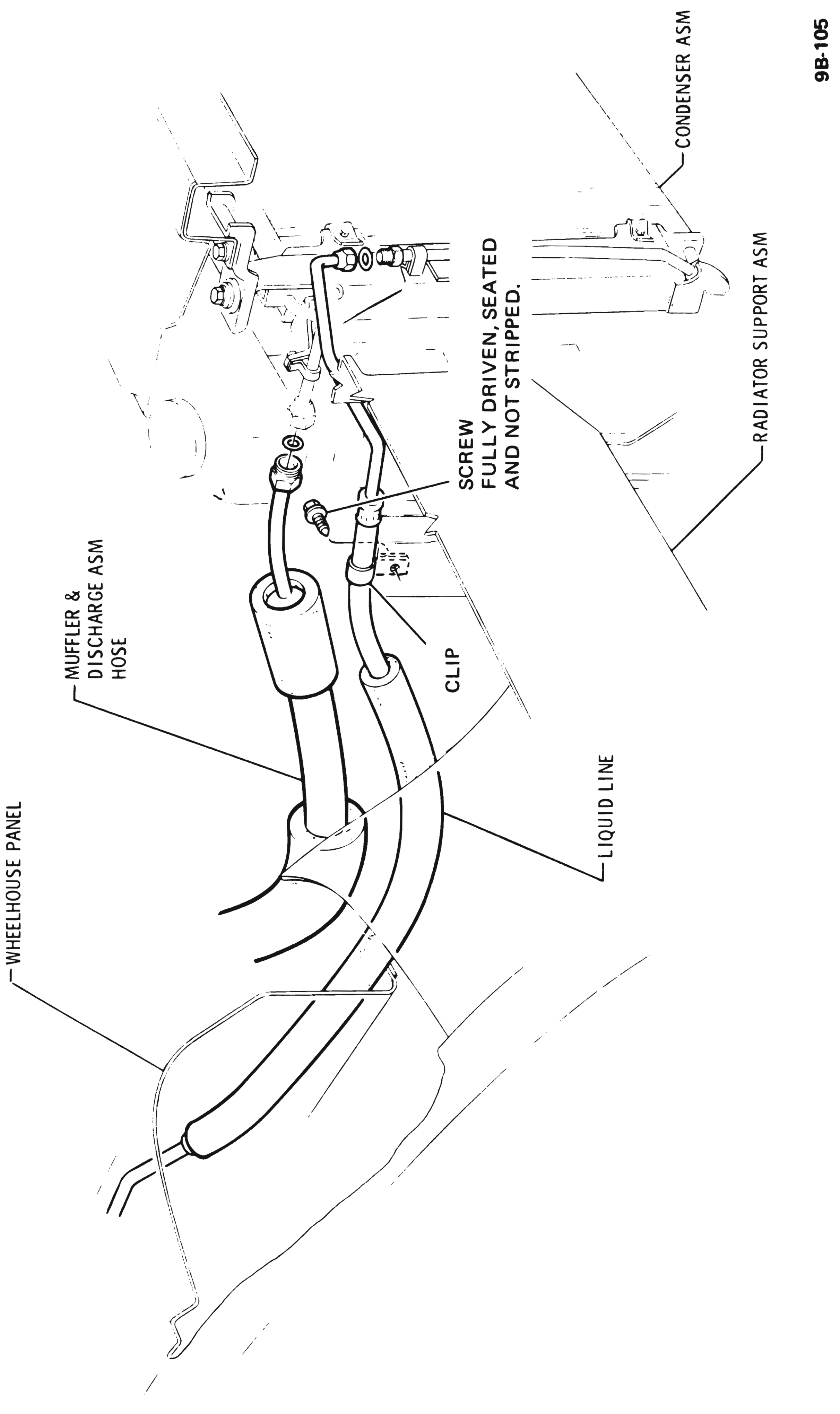


Figure 9B-122 Discharge and Liquid Hose to Condenser - E Series

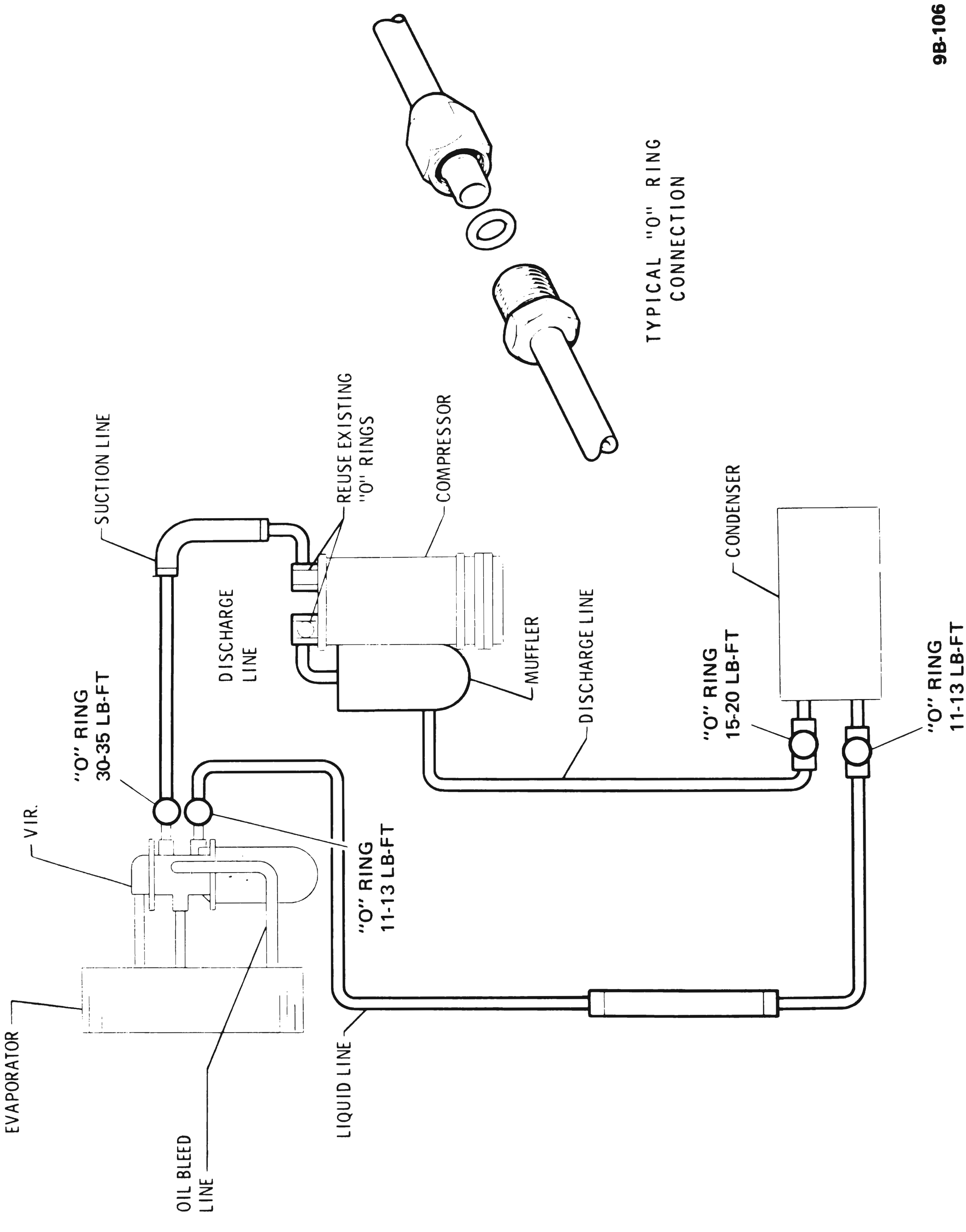


Figure 9B-123 "O" Ring Schematic - B-C-E Series

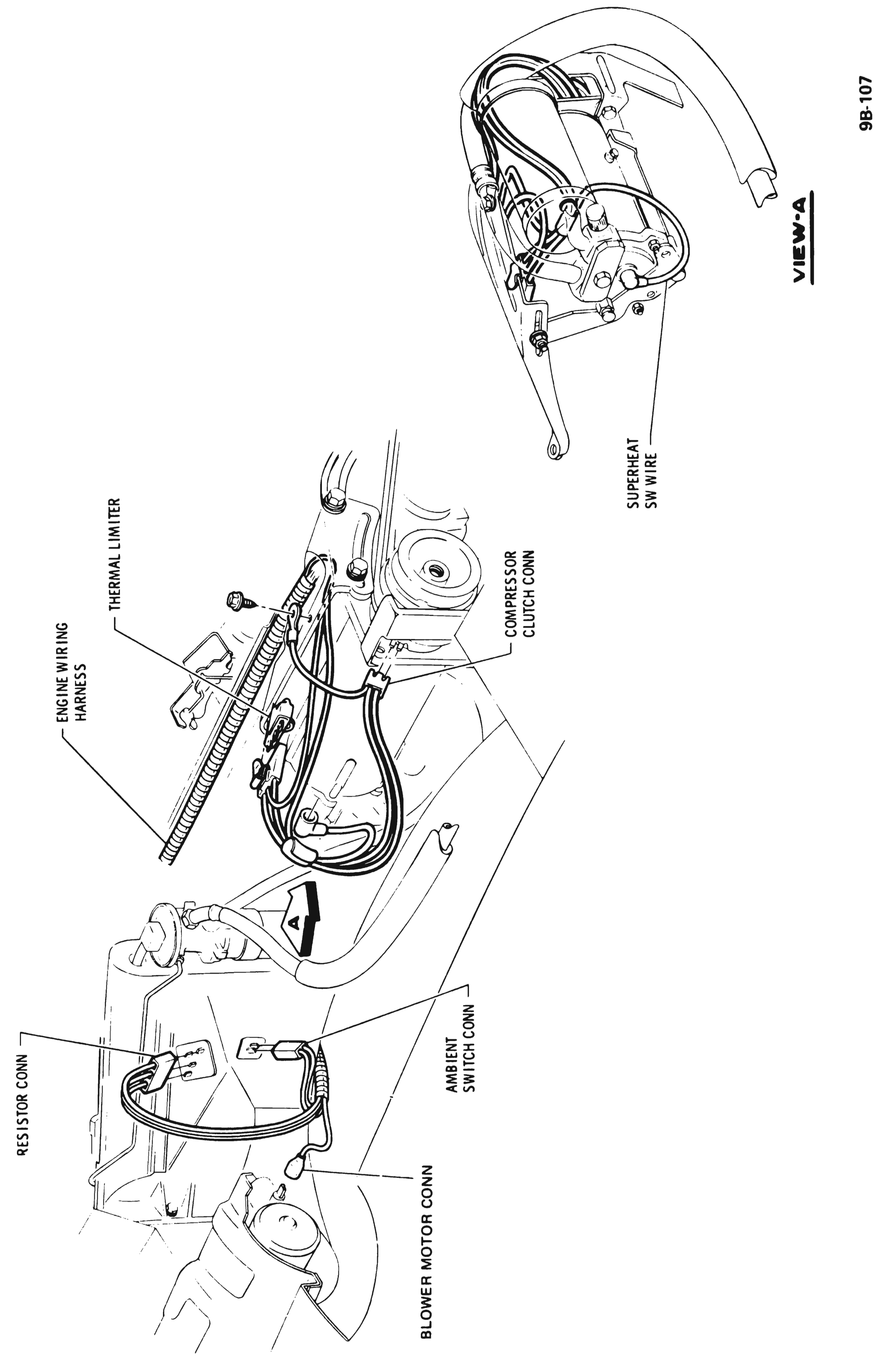


Figure 9B-124 Compressor and Blower Motor Wiring - Manual A/C - B-C-E Series

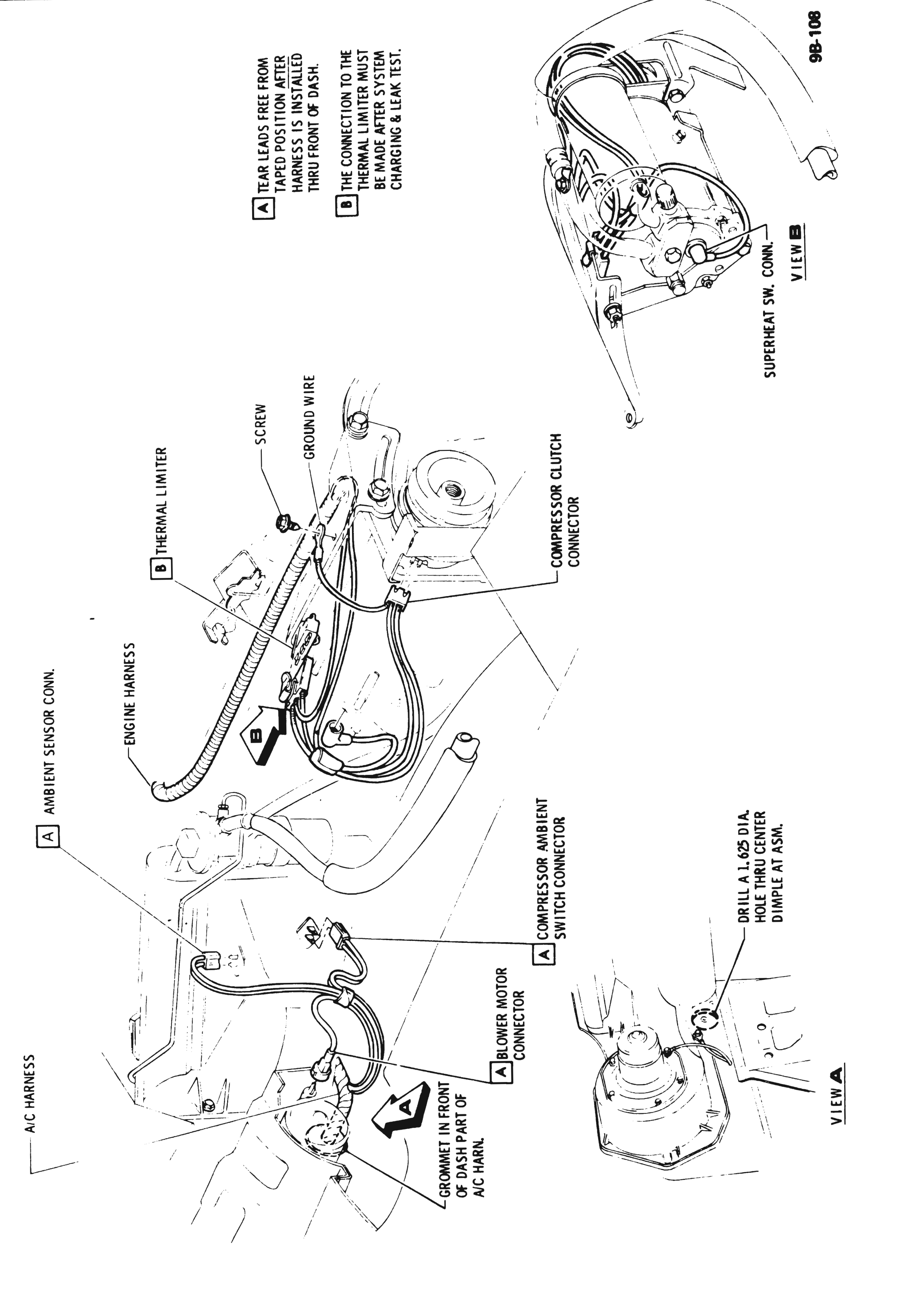
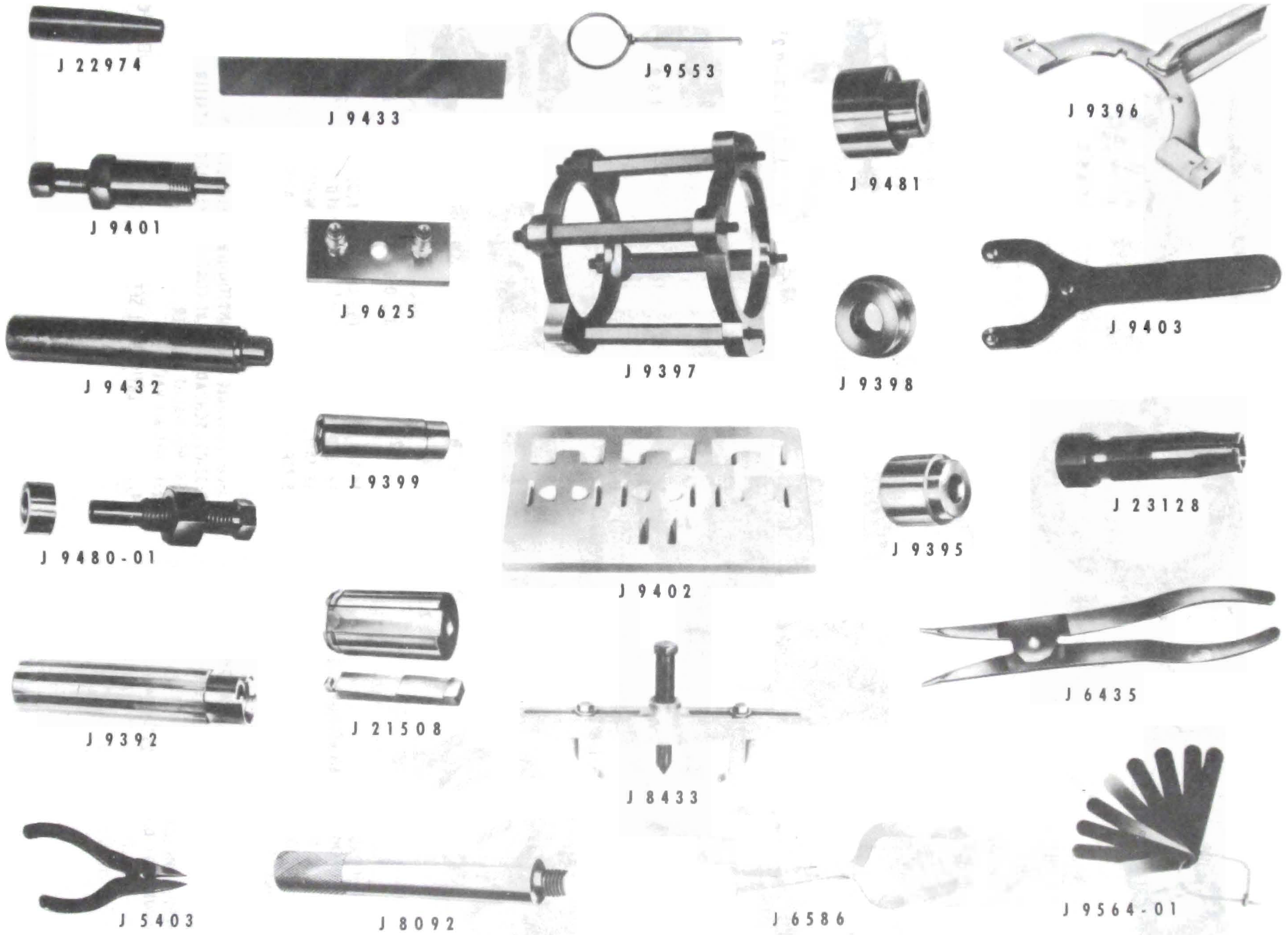


Figure 9B-125 Compressor and Blower Motor Wiring - Automatic A/C - B-C-E Series



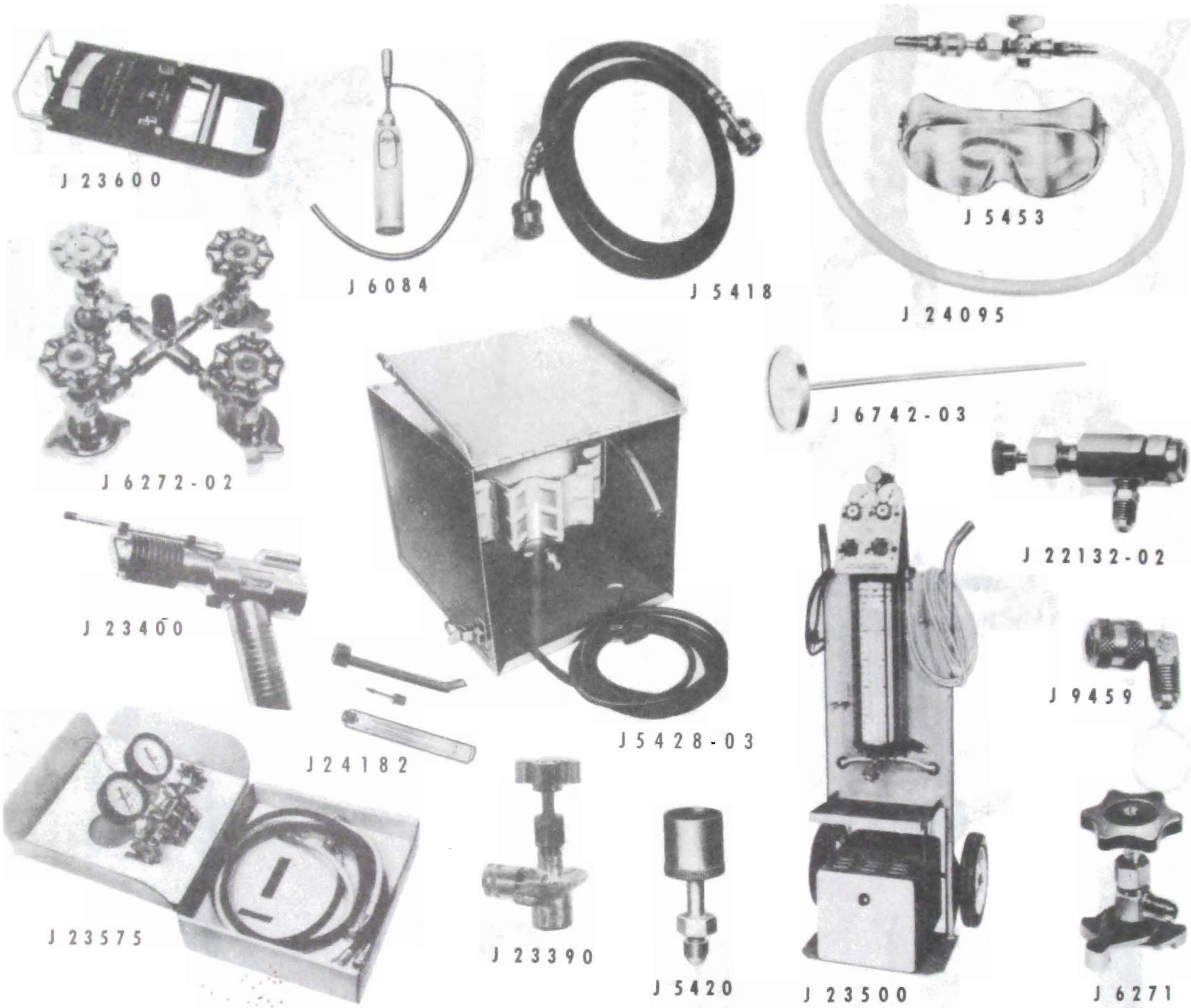
J 22974 SEAL PROTECTOR
J 9401 HUB AND DRIVE PLATE ASSEMBLY REMOVER
J 9432 NEEDLE BEARING INSTALLER
J 9480-01 HUB AND DRIVE PLATE ASSEMBLY INSTALLER
J 9392 SHAFT SEAL REMOVER AND INSTALLER
J 5403 SNAP RING PLIERS
J 9433 SUCTION CROSS-OVER COVER SEAL INSTALLER
J 9625 PRESSURE TEST SET

J 9399 COMPRESSOR SHAFT NUT SOCKET
J 21508 "O" RING INSTALLER
J 8092 THREADED DRIVER HANDLE
J 9553 "O" RING REMOVER
J 9397 COMPRESSING FIXTURE
J 9402 PISTON ASSEMBLY TRAY
J 8433 PULLEY PULLER
J 9481 PULLEY BEARING AND PULLEY INSTALLER

J 9398 PULLEY BEARING REMOVER
J 9395 PULLEY PILOT
J 9396 HOLDING FIXTURE
J 9403 CLUTCH HUB HOLDING TOOL
J 6586 OIL INLET TUBE REMOVER
J 23128 CERAMIC SEAL SEAT REMOVER AND INSTALLER
J 6435 SNAP RING PLIERS
J 9564-01 FEELER TENSION GAUGE SET

9B-109

Figure 9B-126 Special Tools



J 23600 BELT TENSION GAUGE
J 6272-02 #4 MULTI-OPENER - 4 CAN REFRIGERANT OPENER
J 23400 ELECTRONIC LEAK DETECTOR
J 23575 COMPLETE MANIFOLD ASSEMBLY
J 6084 LEAK DETECTOR
J 5428-03 VACUUM PUMP
J 23390 12 LB. DISPOSABLE REFRIGERANT CAN CONTROL VALVE
J 5420 GAUGE ADAPTER
J 5453 GOGGLES
J 24095 COMPRESSOR OIL INJECTOR
J 6742-03 THERMOMETER - DIAL TYPE (25°-125°)

J 5418-36B GAUGE CHARGING LINE - 36" BLUE
J 5418 -36R " " " - 36" RED
J 5418-48W " " " - 48" WHITE
J5418-72B " " " - 72" BLUE
J 5418-72R " " " - 72" RED
J 5418-72W " " " - 72" WHITE
J 23500 PORTABLE AIR CONDITIONER SERVICE STATION
J 22132-02 SCHRADER VALVE CORE REMOVER AND INSTALLER
J 9459 90° GAUGE ADAPTER
J 6271 FITS-ALL VALVE
J 24182 V.I.R. SERVICE TOOL SET

9B-110

Figure 9B-127 Special Tools

HEATER - AIR CONDITIONER SYSTEM
ALL SERIES

CONTENTS

DESCRIPTION AND OPERATION

BASIC DESCRIPTION OF SYSTEM OPERATION

OFF POSITION

The 1973 Climate Control System is completely "shut-off" when the ignition switch of the car is in the "OFF" position. However, when the ignition switch is turned on, the electrical circuit to the Climate Control system is completed and the "LO" blower will come on after the engine coolant reaches 140 degrees F.

A/C POSITION

The compressor will run at temperatures above 37 degrees F. Cooled conditioned air will flow out of all six outlets, and in "RECIRC", recirculated air at "HI" blower speed will occur automatically until a warmer temperature is selected. After passenger comfort is obtained, move the temperature lever to the right of the detent for normal air conditioning.

VENT POSITION (TEMPERATURE LEVER IN COLD)

The blower will come on in "LO" automatically after the engine water temperature reaches 140 degrees F. and outside air is distributed into the passenger compartment through the A/C and heater outlets. The blower will run in two (2) "MED" speeds or "HI", immediately, regardless of engine coolant temperature.

HEAT POSITION (TEMPERATURE LEVER IN MID RANGE)

The blower will come on in "LO" automatically after the engine coolant temperature reaches 140 degrees F., and air is distributed into the passenger compartment through the heater and through defroster ducts after 30 to 60 seconds. The blower will run in two (2) "MED" speeds or "HI", immediately, regardless of engine coolant temperature.

BI-LEVEL POSITION (TEMPERATURE LEVER IN MID RANGE)

The blower will come on in "LO" automatically after the engine water temperature reaches 140 degrees F., and the A/C compressor is running to provide dehumidified air flow from the A/C, heater, and defroster outlets. Air is bled through the defroster outlets after a 30 to 60 second delay. The blower will run in two (2) "MED" or "HI", immediately, regardless of engine coolant temperature.

DEF POSITION (TEMPERATURE LEVER IN MAX HOT)

The blower will come on in "LO" automatically after the engine water temperature reaches 140 degrees F., and the A/C compressor will run to dehumidify air if temperature is above 37 degrees F. A majority of air will flow out of the defroster outlets with some air flowing out the heater outlet. The blower will run in two (2) "MED" speeds or "HI", immediately, regardless of engine coolant temperature.

ELECTRICAL SYSTEM OPERATION

OFF POSITION

When the selector lever is in the "OFF" position, the system is locked in "LO" blower operation. When the fan switch is in the "LO" position, the ignition switch in the "RUN" position, and the engine thermal switch is open, the blower motor will not run until engine coolant reaches approximately 140 degrees F. Then the thermal switch will close allowing current to flow to the blower motor.

A/C POSITION

With the ignition switch in "RUN", the selector lever in the "A/C" position, and the temperature lever at "RECIRC", the fan is in fixed "HI" blower regardless of fan switch position. In "RECIRC" position also, the recirculate door and water valve are actuated through a vacuum switch on the dash control. Moving the temperature lever from the "RECIRC" to the detent position (approximately 3/8 inch travel right) causes the recirculate override switch to open, and allows blower speed to be controlled from the fan switch. The detent position will open the hot water valve. Also, from this detent position to MAX "HOT" position, the temperature door is modulated to provide greater amounts of air to be diverted through the heater core.

The compressor will run above 37 degrees F. which is controlled by the opening (below 37 degrees F.) and closing (above 37 degrees F.) of the ambient switch.

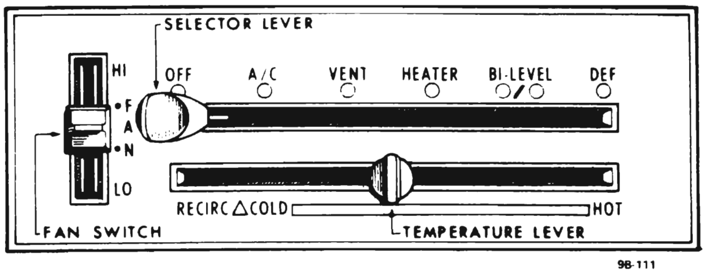


Figure 9B-150 Instrument Panel Control Assembly

VENT POSITION

With the ignition switch in "RUN" and the selector lever in the "VENT" position, the fan is controlled by the fan switch. Compressor is shut off.

The engine thermal switch closes when the engine coolant temperature reaches 140 degrees F. allowing current to flow to the blower motor or "LO" fan speed. If fan switch is in "MED" or "HI", the blower will run regardless of engine coolant temperature, because the thermal switch is by-passed.

HEAT POSITION

With the ignition switch in "RUN" and the selector lever in the "HEAT" position, the fan speed is controlled by the fan switch.

The engine thermal switch closes when the engine coolant temperature reaches 140 degrees F. allowing current to flow to the blower motor or "LO" fan speed.

If the fan switch is in two (2) "MED" speeds or "HI", the blower will run, regardless of engine coolant temperature because the thermal switch is bypassed.

BI-LEVEL POSITION

With the ignition switch in "RUN" and the selector lever in the "BI-LEVEL" position, the fan is locked in "LO" blower operation when the fan switch is in the "LO" position.

The compressor runs in this position above 37 degrees F. which is controlled by the opening (below 37 degrees F.) and closing (above 37 degrees F.) of the ambient switch, to provide dehumidified air regardless of temperature lever position.

The engine thermal switch closes when the engine coolant temperature reaches 140 degrees F., and allows current to flow to the blower motor.

If the fan switch is in "MED" or "HI", the blower will run regardless of engine coolant temperature because the thermal switch is by-passed.

DEF POSITION

With the ignition switch in "RUN" and the selector lever in the "DEF" position, the fan is locked in "LO" blower operation when the fan switch is in the "LO" position.

The compressor runs in this position above 37 degrees F., which is controlled by the opening (below 37 degrees F.) and closing (above 37 degrees F.) of the ambient switch, to provide dehumidified air regardless of temperature lever position.

The engine thermal switch closes when the engine coolant temperature reaches 140 degrees F., and allows current to flow to the blower motor.

If the fan switch is in "MED" or "HI", the blower will run regardless of engine coolant temperature because the thermal switch is by-passed.

VACUUM SYSTEM OPERATION

OFF POSITION (TEMPERATURE LEVER IN RECIRC)

With the selector lever in the "OFF" position and the engine running, the system is turned on whenever the thermal switch closes. Air flows from the heater outlets at "LO" blower speed. Vacuum is applied to the water valve holding the valve closed. See Figure 9B-152.

A/C POSITION (TEMPERATURE LEVER IN RECIRC)

With the selector lever in the "A/C" position and the temperature lever in the "RECIRC" position, vacuum is applied to the recirc door diaphragm closing the door to the outside air causing recirculation of most of the air while introducing some outside air into the passenger compartment. Vacuum is also applied to the upper and lower heater door diaphragms causing the doors to open, allowing air to flow from the A/C outlets. Vacuum is applied to the water valve holding the valve closed. See Figure 9B-153. After passenger comfort is obtained, move the temperature lever to the right of the detent for normal air conditioning. See Figure 9B-154.

VENT POSITION (TEMPERATURE LEVER IN COLD)

Air is drawn in through the outside air door and is distributed from the A/C and heater outlets at whatever blower speed is selected. Vacuum is applied to the lower mode door diaphragm which causes it to open and directs a portion of the air to the A/C outlets. No vacuum is applied to the upper mode door directing the remaining air through the heater outlets. Vacuum is applied to the water valve holding the valve closed.

HEAT POSITION (TEMPERATURE LEVER IN MID RANGE)

In this position, outside air is drawn in through the outside air door and then is divided by the air mix door. Part of the air passes through the heater core to be warmed while the rest of the air by-passes the core. The air is then mixed and distributed into the passenger compartment through the heater and defroster outlets.

Vacuum is applied to the defroster door diaphragm and is restricted to delay partial bleed to the windshield for 30-60 seconds. No vacuum is applied to the upper and lower mode door diaphragm so the majority of the air is directed through the heater outlets. No vacuum is applied to the water valve allowing the valve to open. See Figure 9B-156.

BI-LEVEL POSITION (TEMPERATURE LEVER IN MID RANGE POSITION)

In this position outside air is drawn in through the outside air door and then is divided by the mix door. Part of the air passes through the heater core to be warmed while the rest of the air bypasses the core. The incoming air is dehumidified before it reaches the mix-door since the A/C compressor is running if the outside temperature is above 37 degrees F. The air is then mixed and distributed into the passenger compartment through the heater, A/C, and defroster outlets. Defroster bleed air is delayed 30 to 60 seconds. Vacuum is applied to the lower mode door diaphragm opening the door, allowing a portion of the air to flow out of the A/C outlets while no vacuum is applied to the upper mode door diaphragm allowing air to flow from the heater outlets. Vacuum is applied to the defroster door diaphragm but is restricted not to allow the door to open only partially. No vacuum is applied to the water valve allowing the valve to open. See Figure 9B-157.

DEF POSITION (TEMPERATURE LEVER IN MAX HOT POSITION)

In this position outside air is drawn in through the outside air door and then is directed through the heater core. The incoming air is dehumidified before it reaches the heater core since the A/C compressor is running if the outside temperature is above 37 degrees F. Vacuum is applied to both defroster door diaphragm ports causing the door to fully open, directing the majority of the air to flow out of the defroster outlets. A small portion of air will come out of the heater outlets since no vacuum is applied to the upper and lower mode doors. No vacuum is applied to the water valve allowing the valve to open.

DIAGNOSIS

TROUBLE DIAGNOSIS GUIDE

Blower Inoperative

Possible Causes

Disconnected, loose, or corroded blower ground wire.

Disconnected feed wire.

Defective blower.

Defective fuse.

LO Blower Only

Possible Cause

Disconnected plug at control head to instrument harness.

Defective Relay.

No LO Blower in ALL Positions

Possible Causes

Disconnected thermal delay switch

Shorted thermal delay switch.

Immediate LO Blower - Car Start-Up

Possible Causes

Defective engine thermal switch.

Warm engine - normal operation.

LO Blower Inoperative All Positions

Possible Cause

Defective engine thermal switch.

Temperature of Discharge Air Too Hot or Too Cool

Possible Cause

Misadjusted or disconnected temperature door cable.

Insufficient Heat

Possible Causes

Misadjusted or disconnected temperature door cable.

Defective water valve.

Defective engine thermostat.

Low coolant.

No Full A/C or Heater (Only Bi-Level)

Possible Cause

Vacuum lines switched at upper and lower mode door diaphragms.

Partial Air Flow to Windshield in DEF and No Air Flow to Windshield in BI-LEVEL Position

Possible Cause

Vacuum lines to defroster (dual) diaphragm switched. Normal "BI-LEVEL" operation has a delay before door opens.

No Air Flow to Windshield in Either BI-LEVEL or DEF Position

Possible Causes

Either vacuum line to defroster diaphragm disconnected.

Leaking dual diaphragm.

MAINTENANCE AND ADJUSTMENTS

ADJUSTMENT OF CONTROL WIRE ASSEMBLY

1. Assemble control wire to control assembly.

2. Secure temperature wire to temperature control valve.

3. Adjust control cable so that 1/16 to 1/8 inch springback is obtained in the "Hot" position.

MAJOR REPAIR

REMOVAL AND INSTALLATION OF CONTROL ASSEMBLY - A SERIES

1. Remove instruments trim plate by pulling rearward and unsnapping from instrument panel.

2. Remove 4 heater control attaching screws. See Figure 9B-162.

3. Pull control out from the instrument panel and disconnect vacuum, electrical connectors and Bowden cable. See Figure 9B-163.

4. Install in reverse of removal adjusting control cable so that 1/16 to 1/8 inch springback is obtained in the "HOT" position.

REMOVAL AND INSTALLATION OF BLOWER MOTOR - A SERIES

1. Disconnect blower motor wire.

2. Remove screws securing blower motor to air inlet assembly.

3. Install in reverse of removal.

REMOVAL AND INSTALLATION OF HEATER ASSEMBLY OR HEATER CORE - A SERIES

1. Drain radiator and disconnect heater inlet and outlet water hoses at dash.

2. Disconnect temperature control cable from temperature door guide and vacuum hoses from actuator diaphragms.

3. Remove resistor assembly and reach through opening and remove 1 attaching nut to dash. Remove 1 attaching nut to dash directly over transmission and 2 attaching nuts to upper and lower inboard evaporator case half.

4. From inside the car remove 1 screw in lower righthand corner on passenger side.

5. Remove lower attaching outlet(s) and work assembly rearward until studs clear dash and remove heater assembly.

6. Install heater assembly reverse of removal procedures and seal along mating surfaces between dash and heater assembly.

7. Adjust control cable so that 1/16 to 1/8 inch springback is obtained in the hot position.

REMOVAL AND INSTALLATION OF CONTROL ASSEMBLY - B-C-E SERIES

Removal

1. Disconnect battery.

2. Remove headlight switch.

3. Remove lower dash trim.

4. Remove 2 see-lights from trim plate.

5. Remove 4 screws from control face.

6. Remove 1 screw from under dash which connects heater control to instrument panel forward support.

7. Disconnect vacuum, electrical connectors, and Bowden wires.

8. Remove control assembly.

Installation

1. Install control assembly reverse of removal procedure.

2. Adjust control cable so that 1/16 to 1/8 inch springback is obtained in the "Hot" position.

REMOVAL AND INSTALLATION OF BLOWER MOTOR - B-C-E SERIES

Removal

1. Disconnect blower motor wire. Remove screws securing blower motor to air inlet assembly.

Installation

Install blower motor assembly in reverse of removal procedures sealing along mating surfaces.

REMOVAL AND INSTALLATION OF HEATER ASSEMBLY OR HEATER CORE - B-C-E SERIES

Removal

1. Drain radiator and disconnect heater inlet and outlet hoses at dash.

2. Disconnect control wires from defroster door and

vacuum hose diverter door actuator diaphragm and control cable from temperature door lever.

3. Remove 4 nuts securing heater assembly to dash.

4. Remove screw securing defroster outlet tab to heater assembly.

5. Work heater assembly rearward until studs clear dash and remove heater assembly.

Installation

1. Install heater assembly reverse of removal procedures and seal along mating surfaces between dash and heater assembly.

2. Adjust control cable so that 1/16 to 1/8 inch springback is obtained in the "Hot" position.

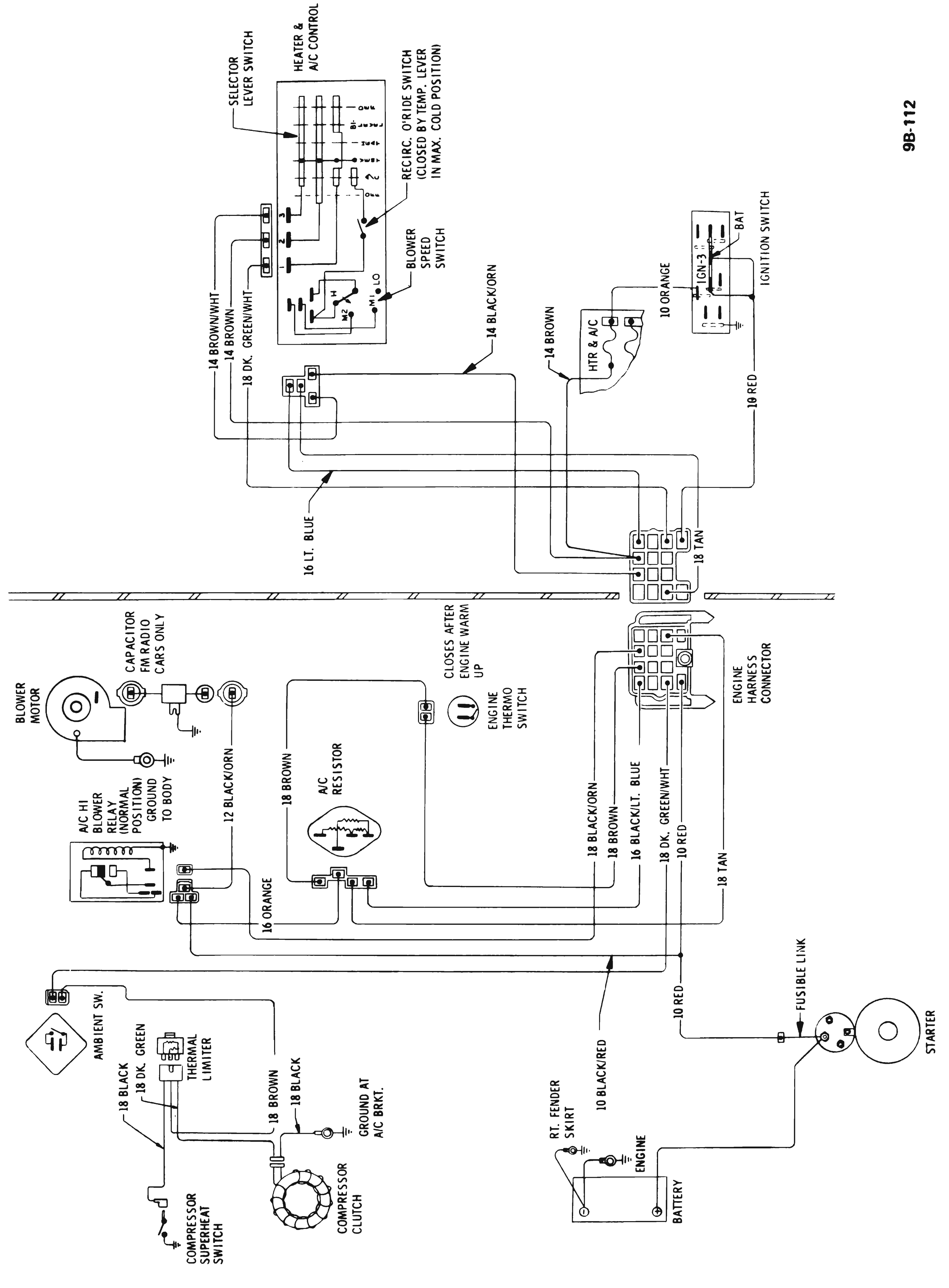


Figure 9B-151 Heater - Air Conditioner Wiring Diagram - All Series

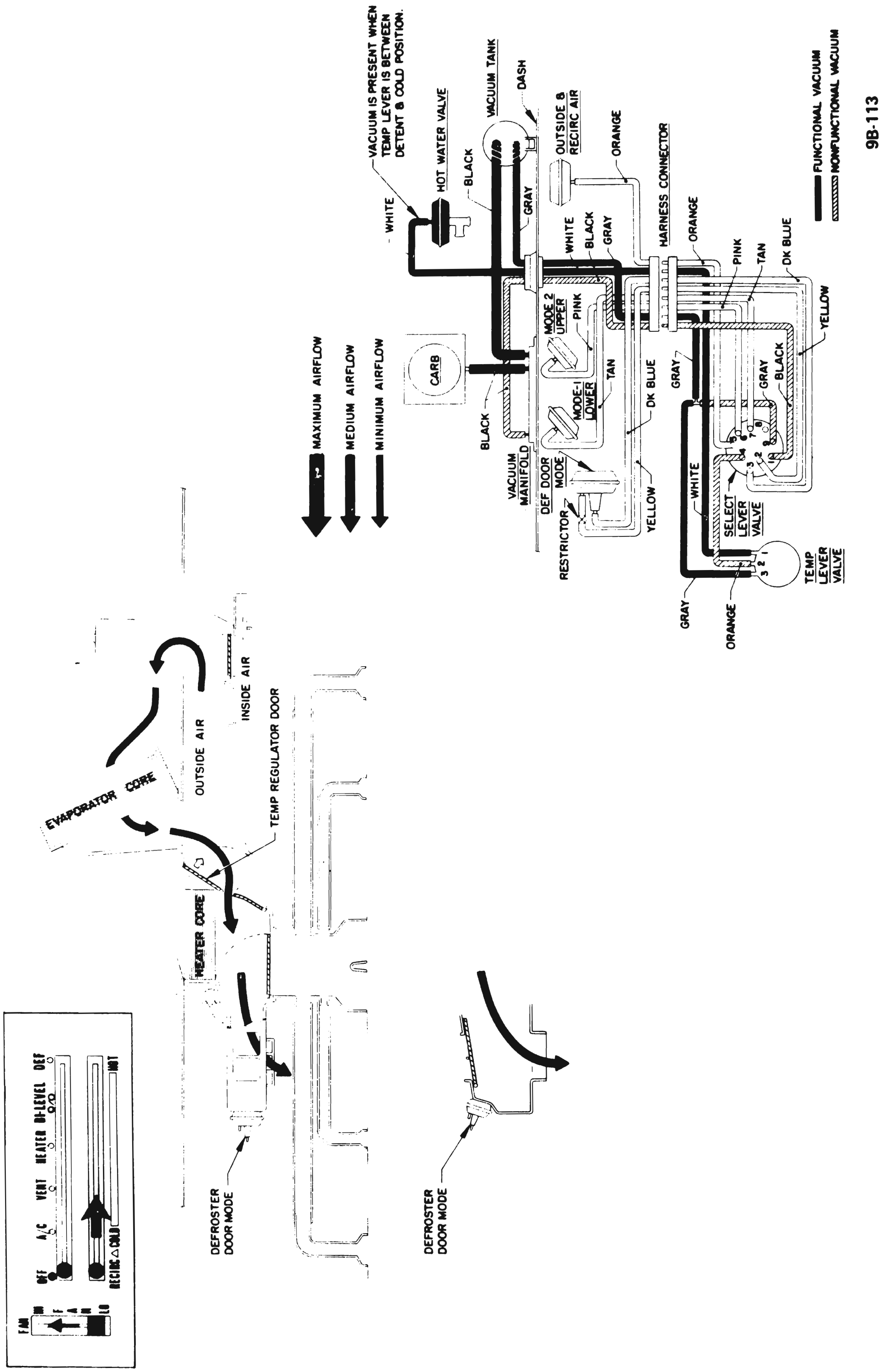


Figure 9B-152 Control Position, Vacuum Circuits, and Air Flow During OFF Mode - All Series

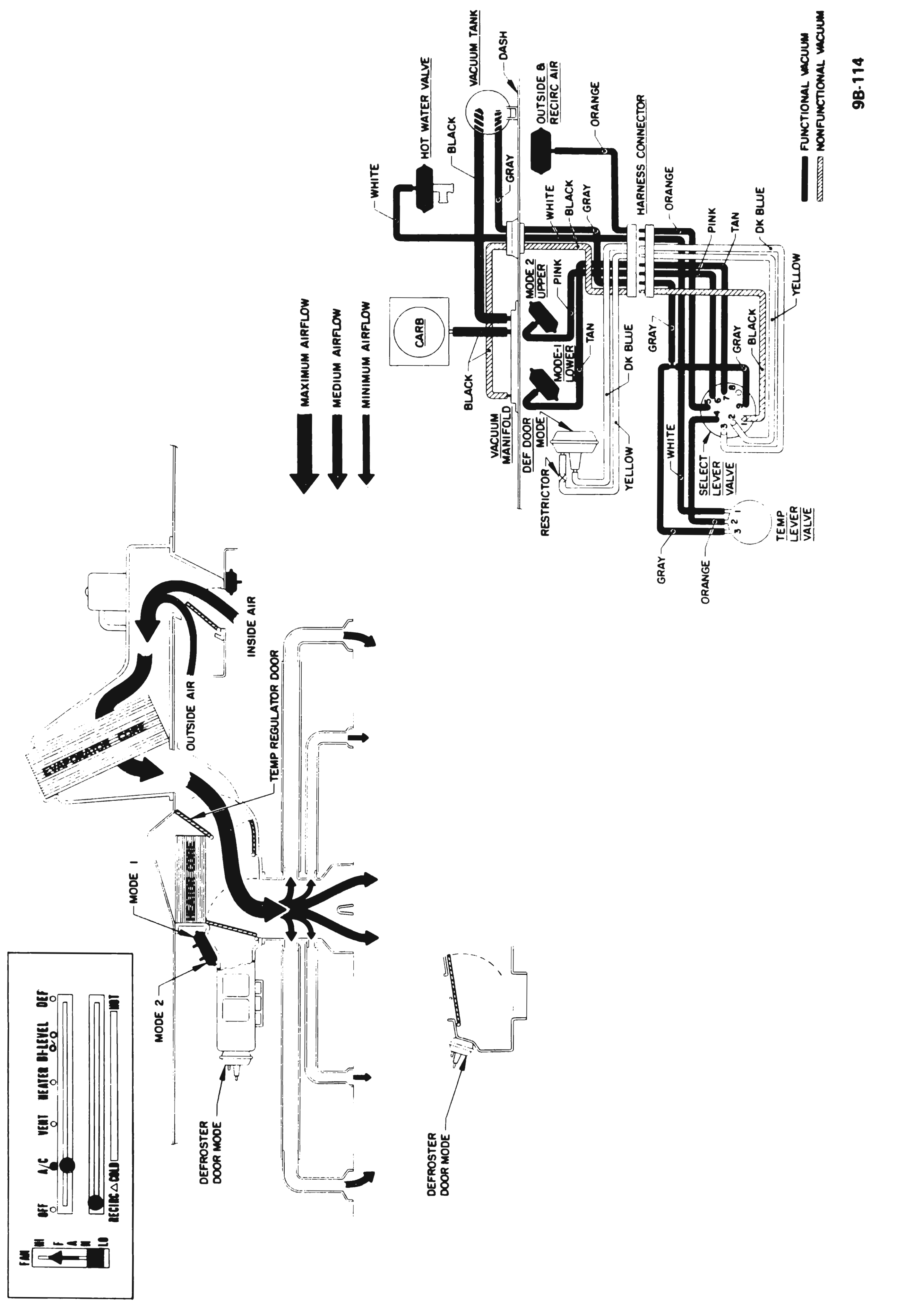


Figure 9B-153 Control Position, Vacuum Circuits, and Air Flow During A/C Mode - Recirc - All Series

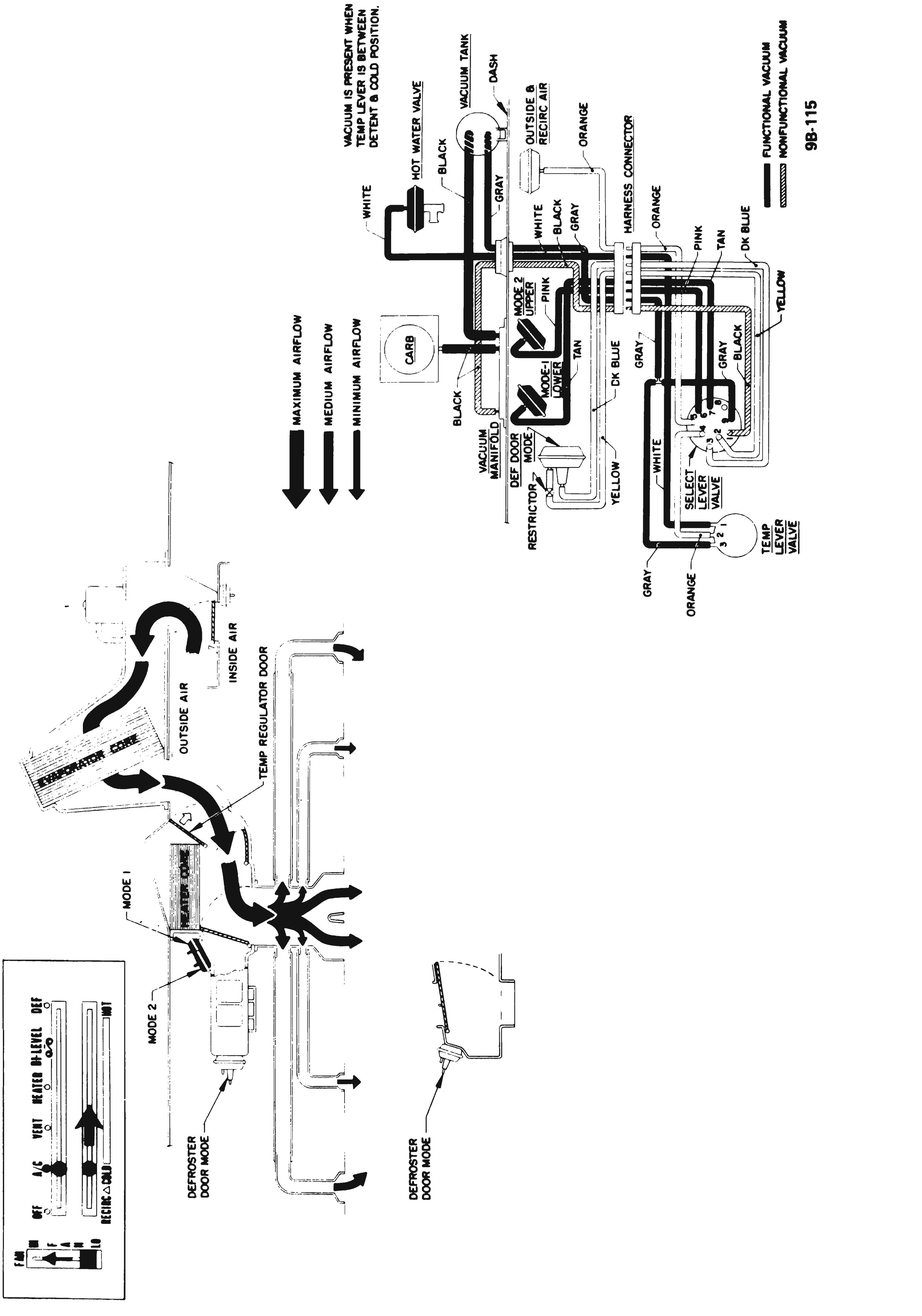


Figure 9B-154 Control Position, Vacuum Circuits, and Air Flow During A/C Mode - All Series

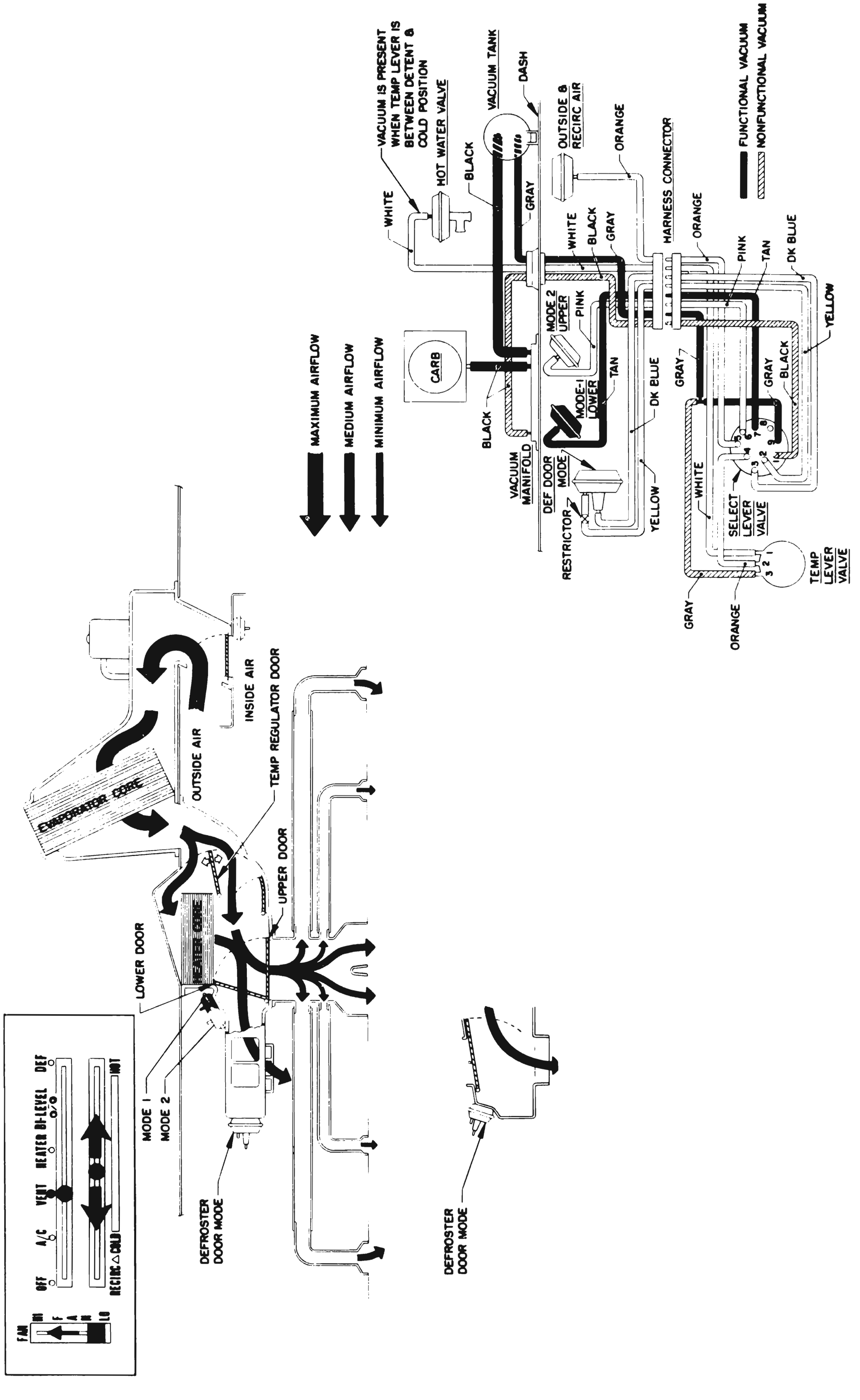


Figure 9B-155 Control Position, Vacuum Circuits, and Air Flow During VENT Mode - All Series

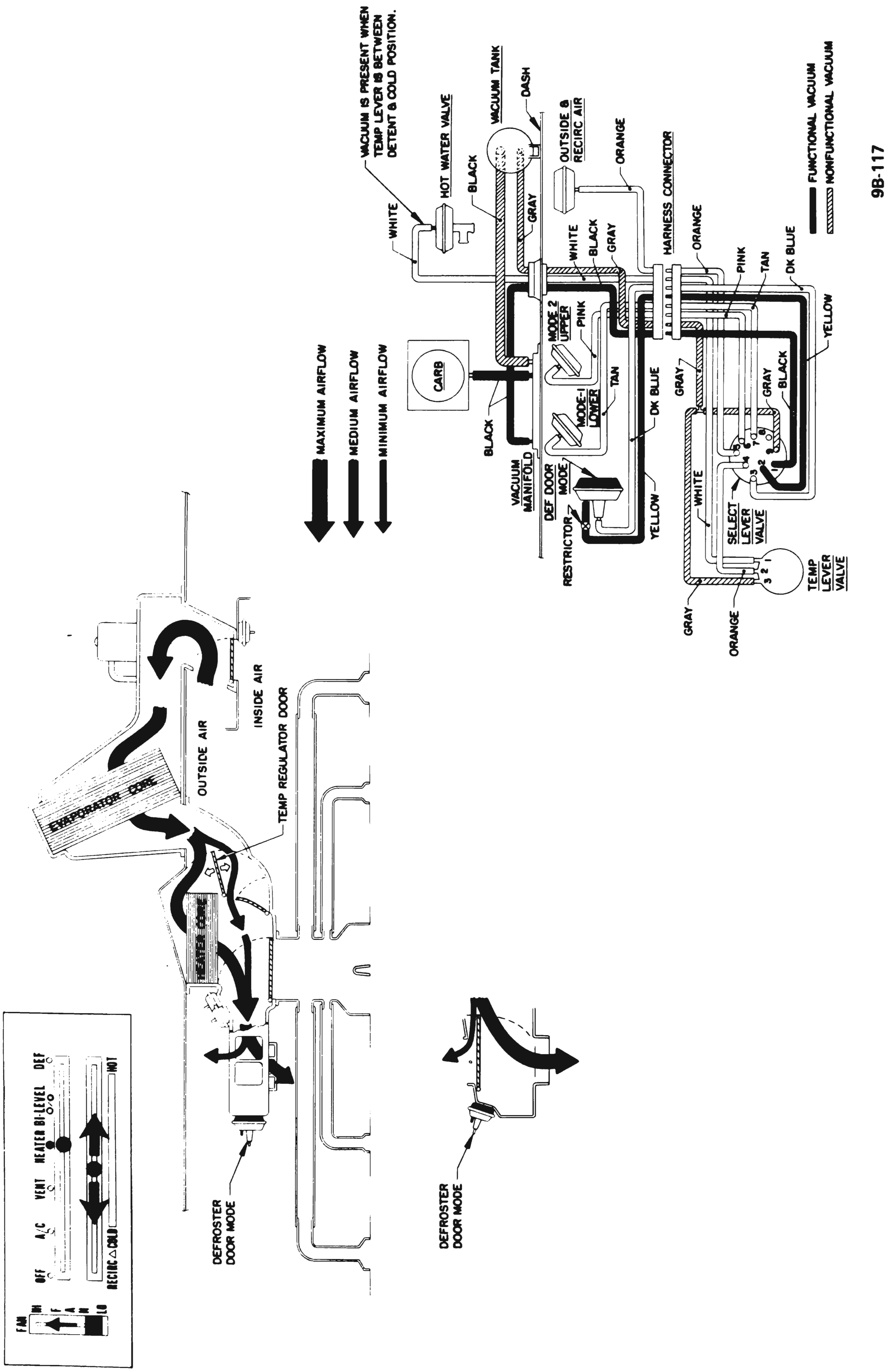


Figure 9B-156 Control Position, Vacuum Circuits, and Air Flow During HTR Mode - All Series

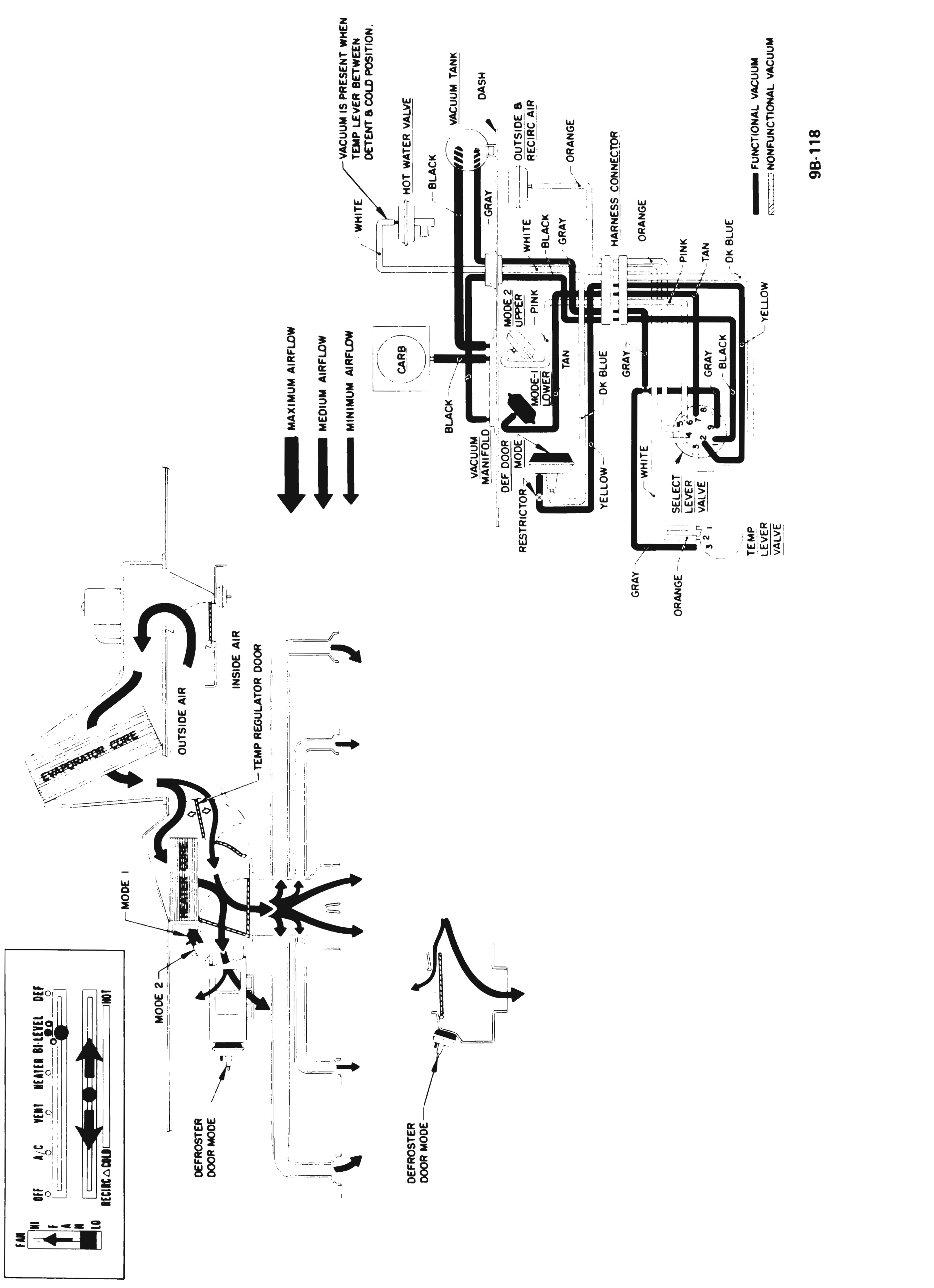


Figure 9B-157 Control Position, Vacuum Circuits, and Air Flow During BI-LEVEL Mode - All Series

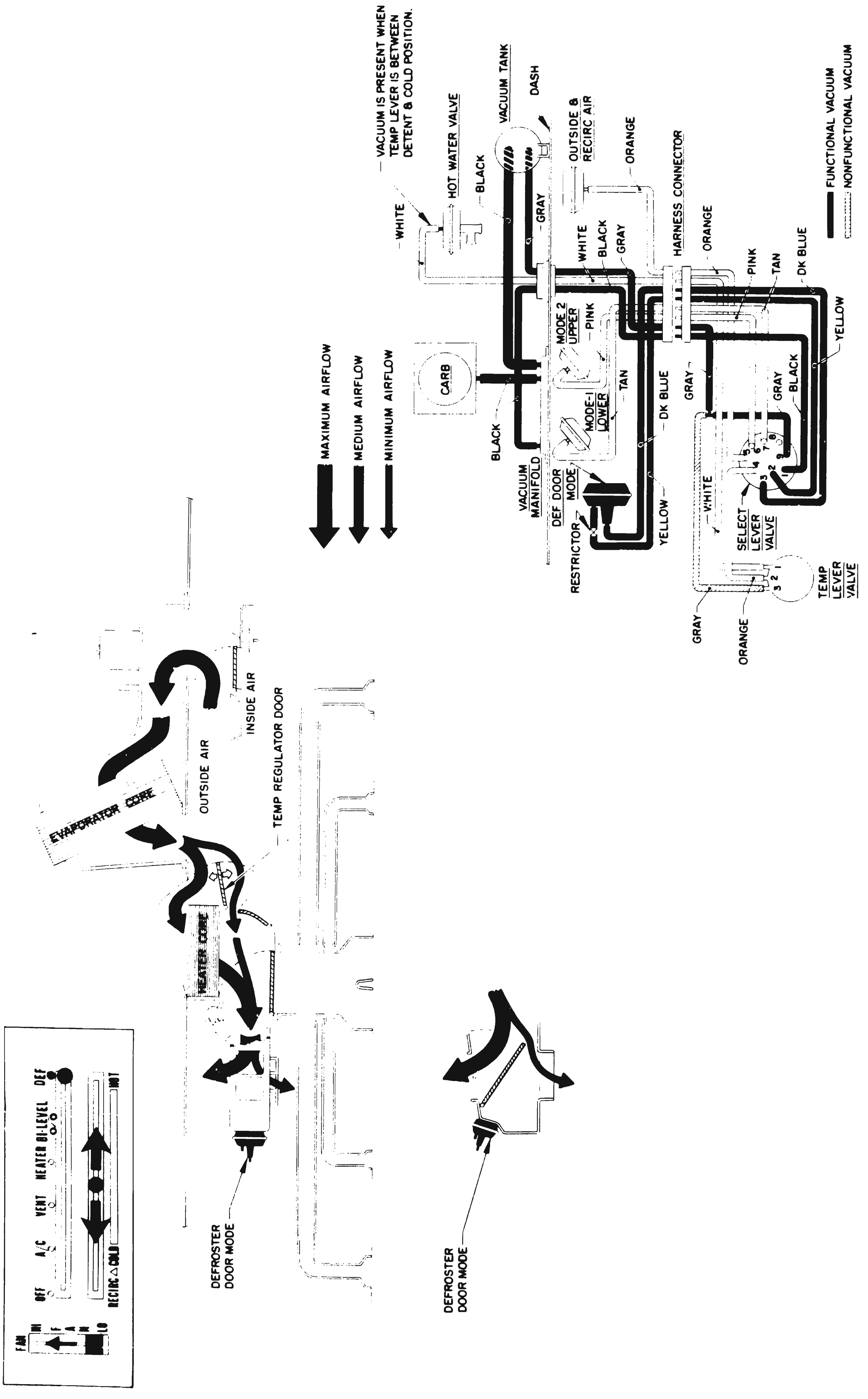


Figure 9B-158 Control Position, Vacuum Circuits, and Air Flow During DEF Mode - All Series

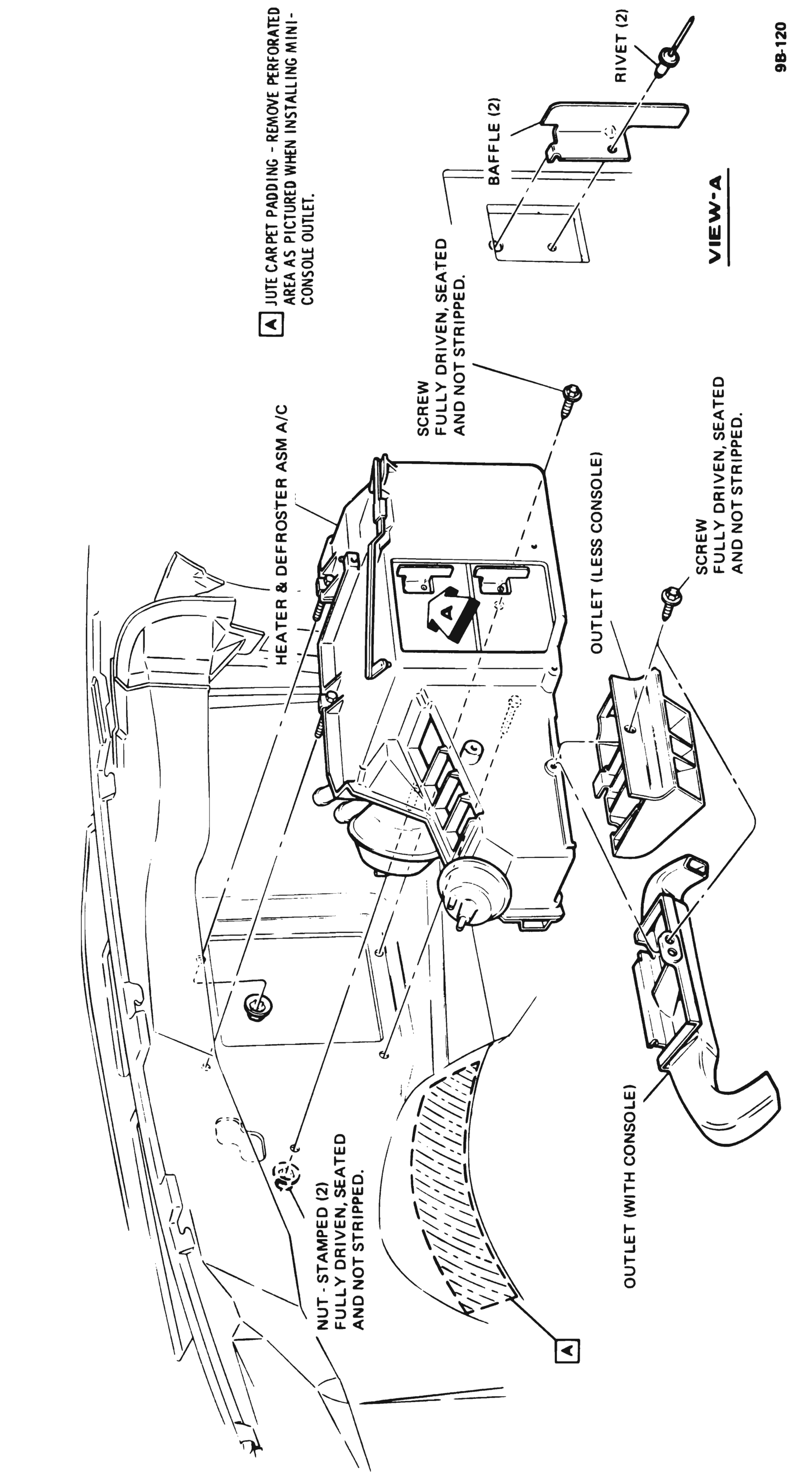


Figure 9B-160 A/C Heater-Defrost Assembly and Center Outlet - A Series

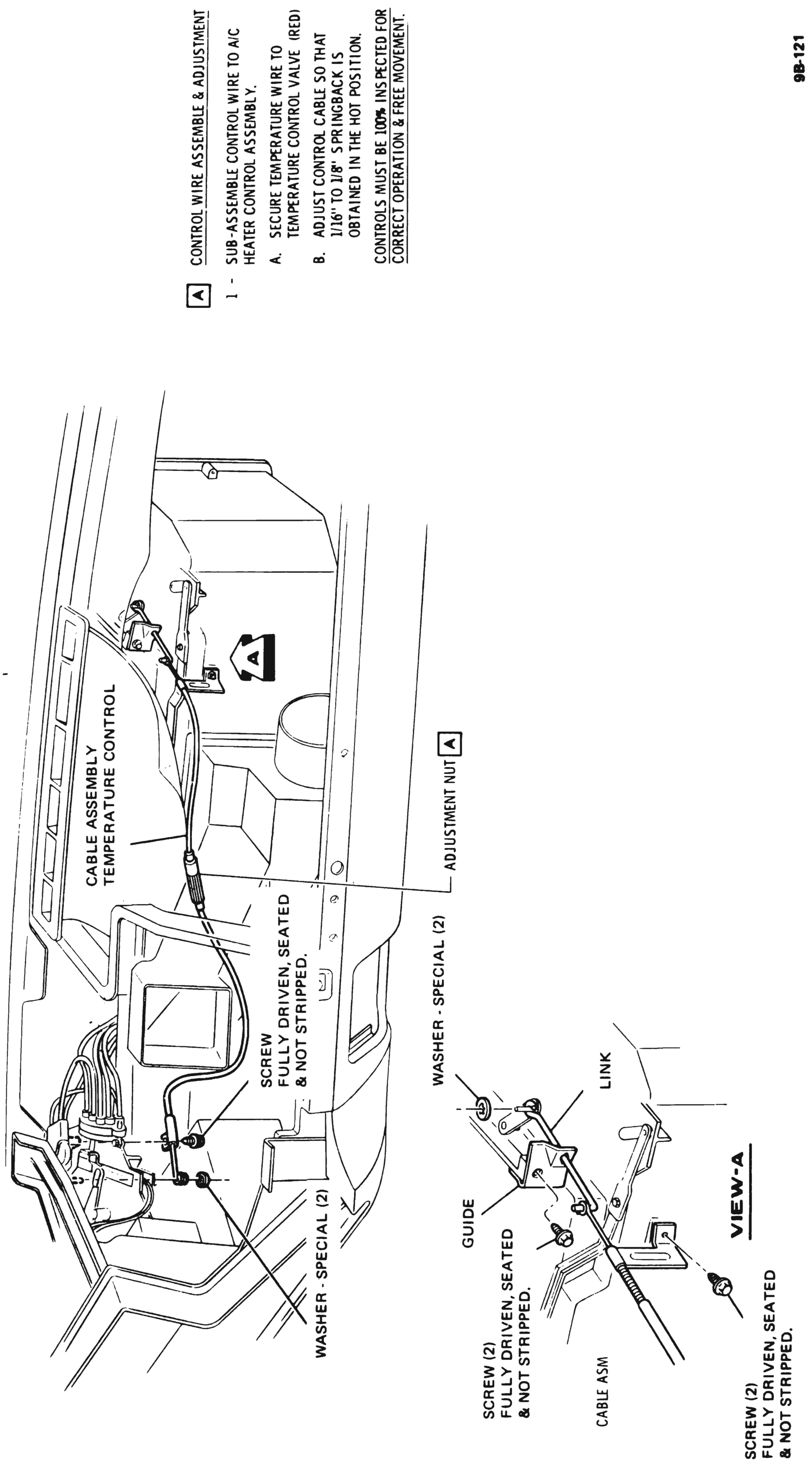


Figure 9B-161 A/C Control Cable - A Series

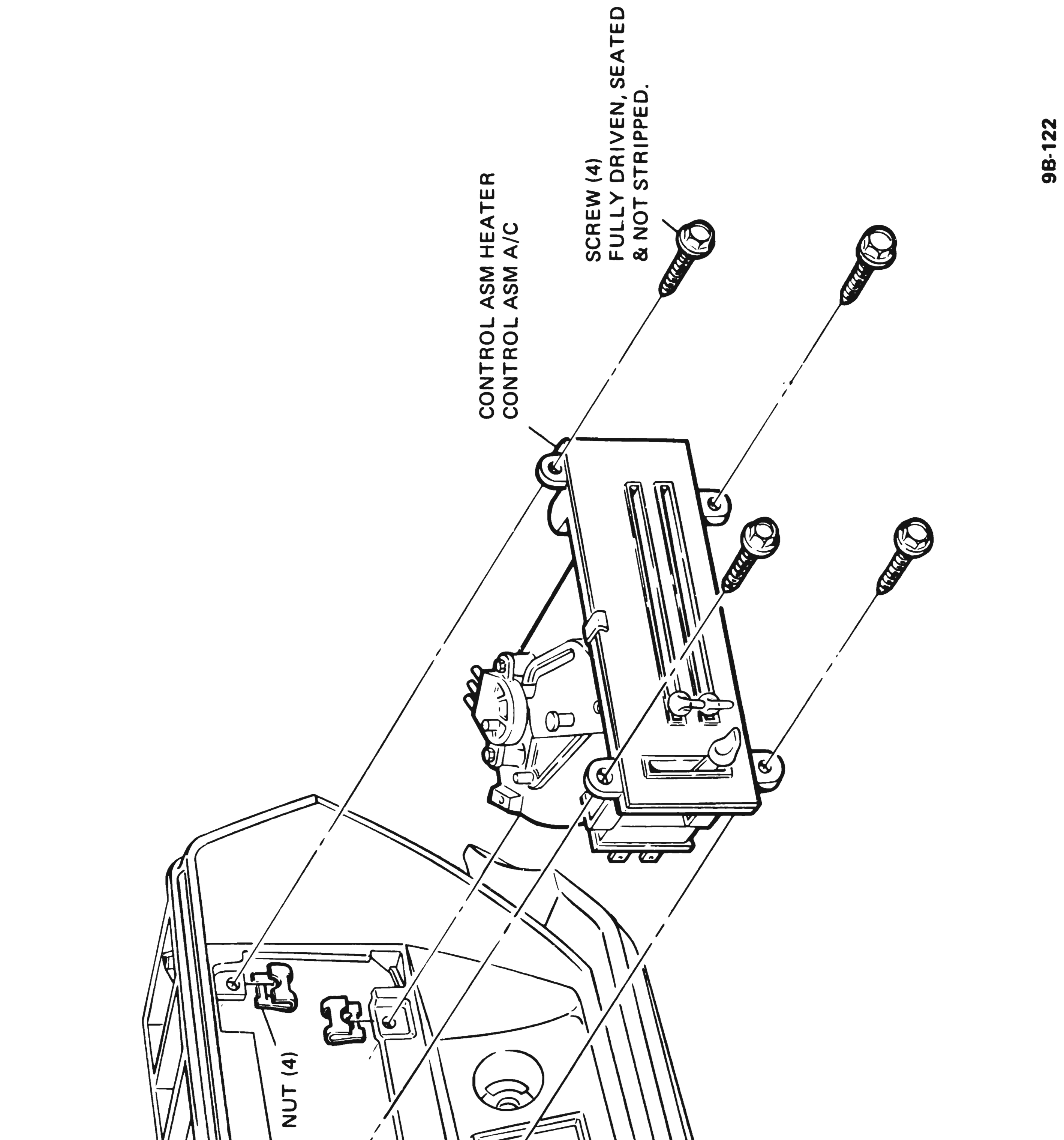


Figure 9B-162 Heater and A/C to Housing Control Assembly - A Series

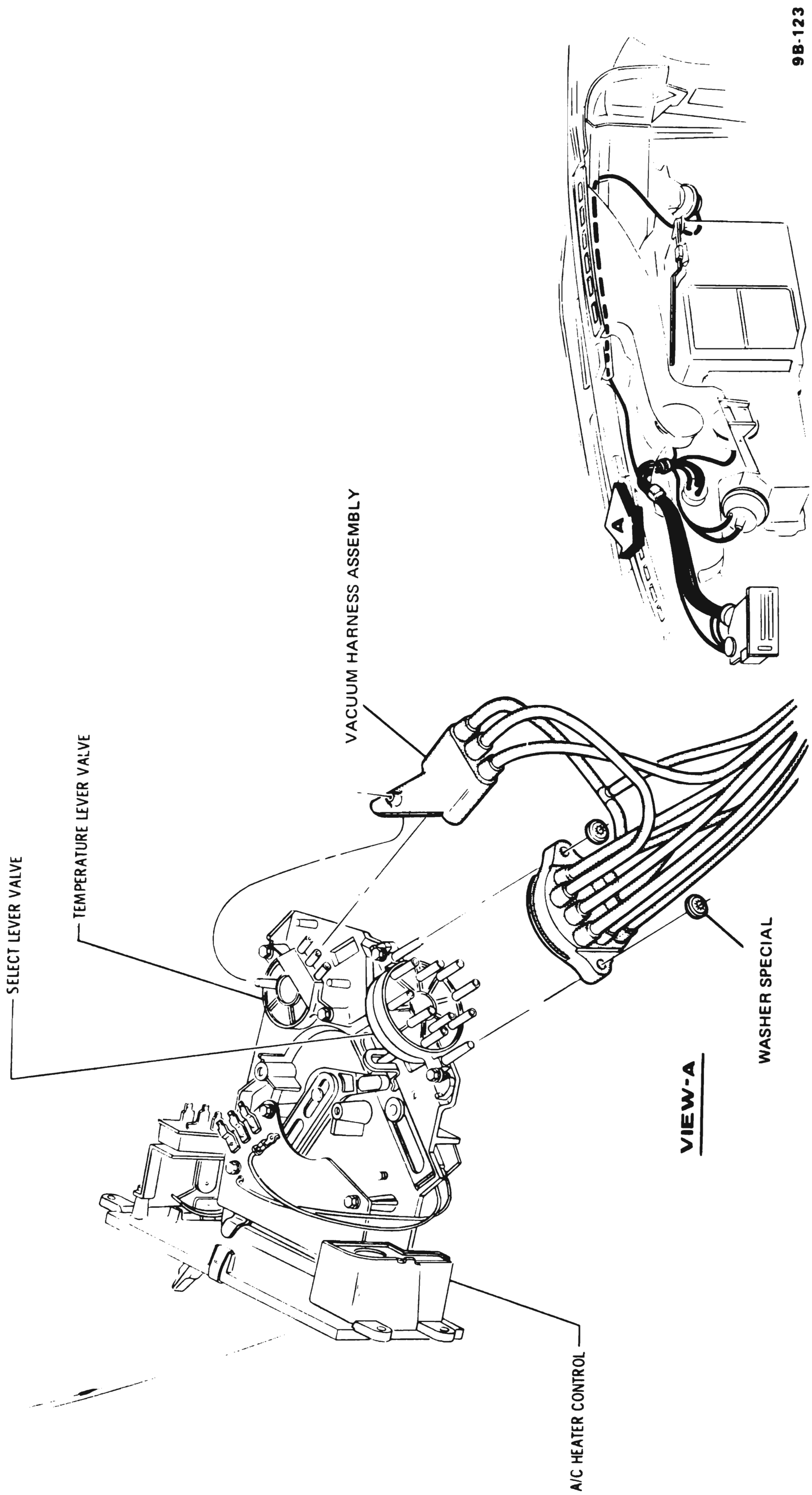


Figure 9B-163 A/C Control Vacuum Harness - A Series

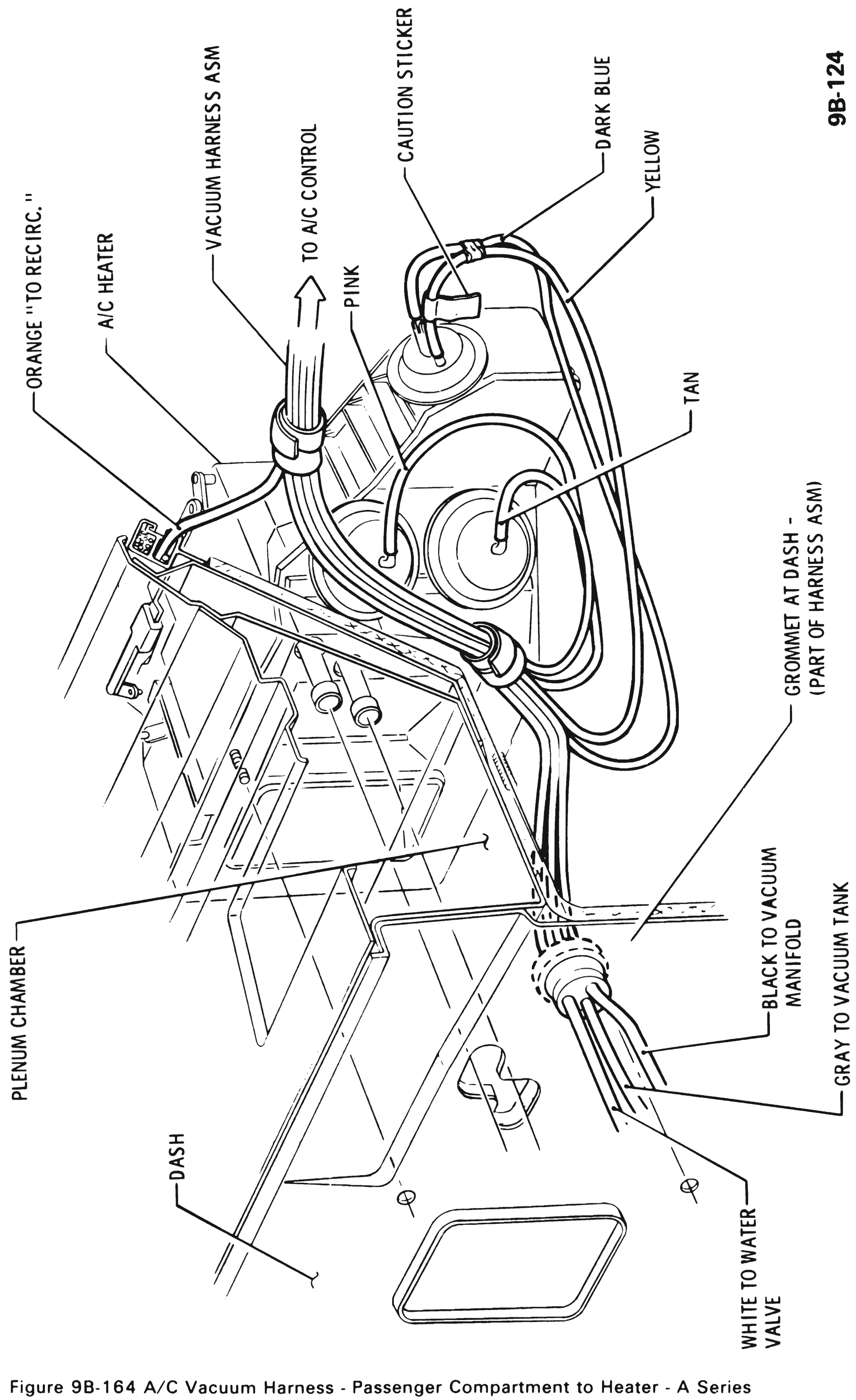


Figure 9B-164 A/C Vacuum Harness - Passenger Compartment to Heater - A Series

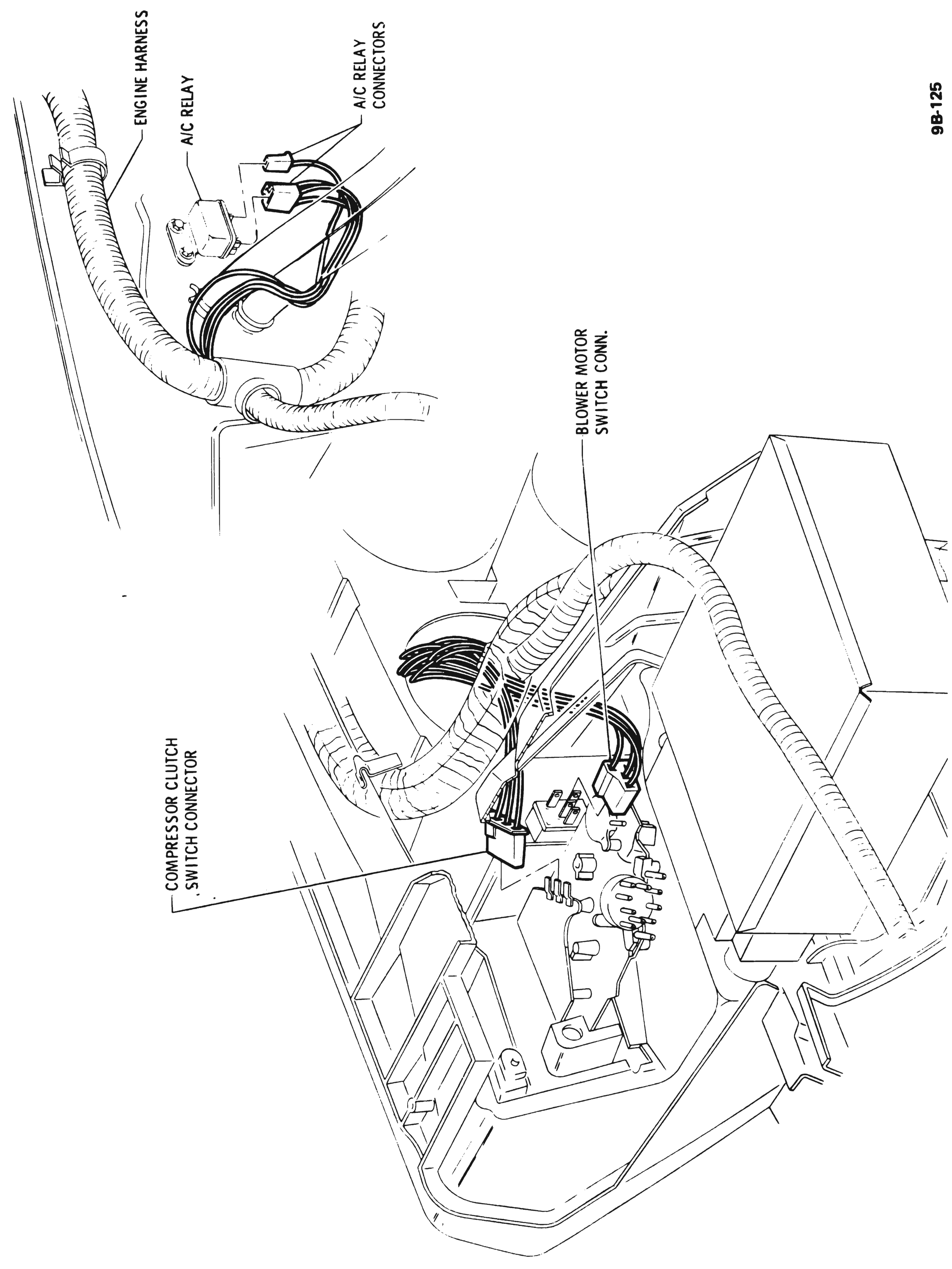


Figure 9B-165 A/C Controls and Relay Wiring - A Series

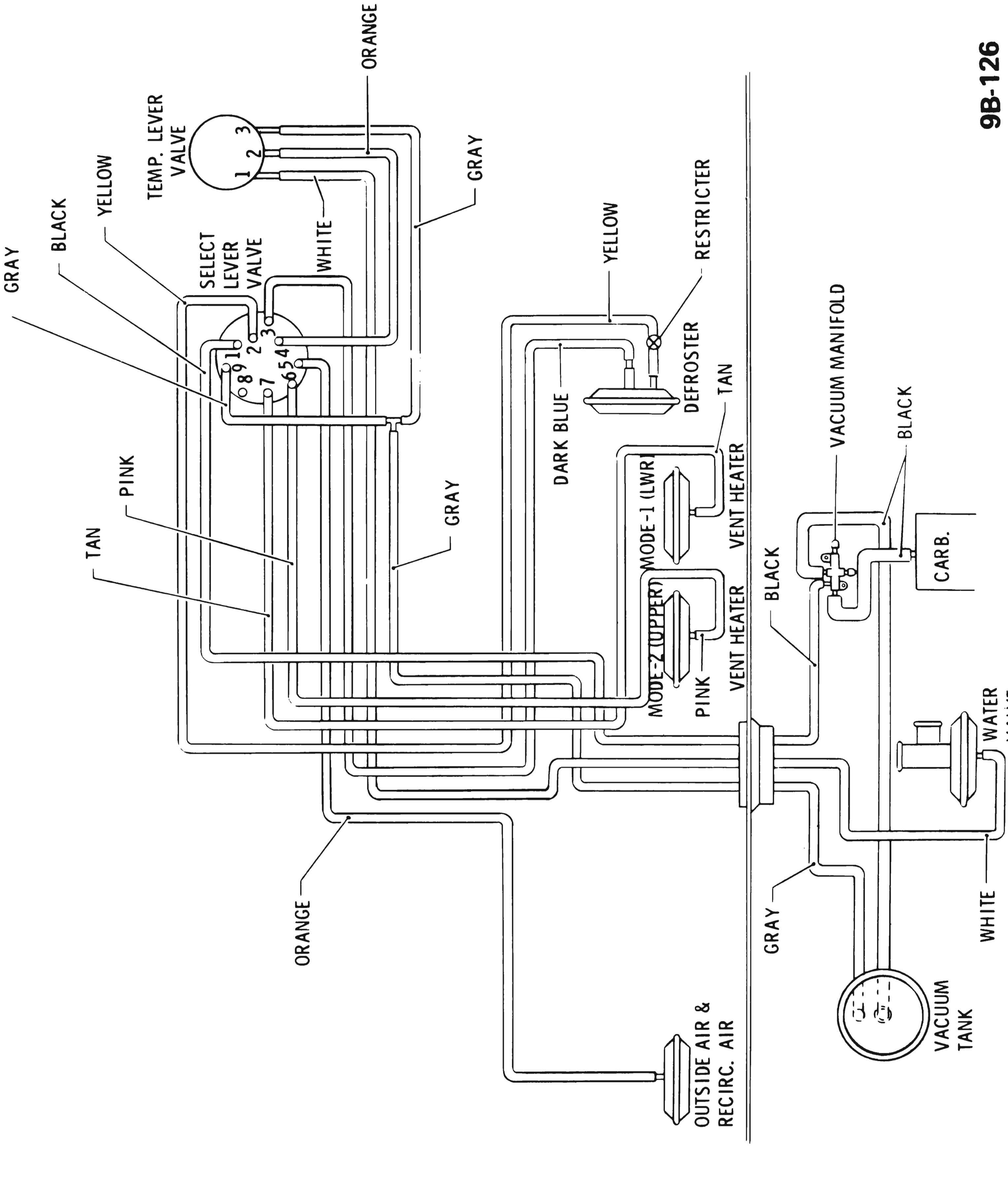


Figure 9B-166 A/C Vacuum Hose Schematic - A Series

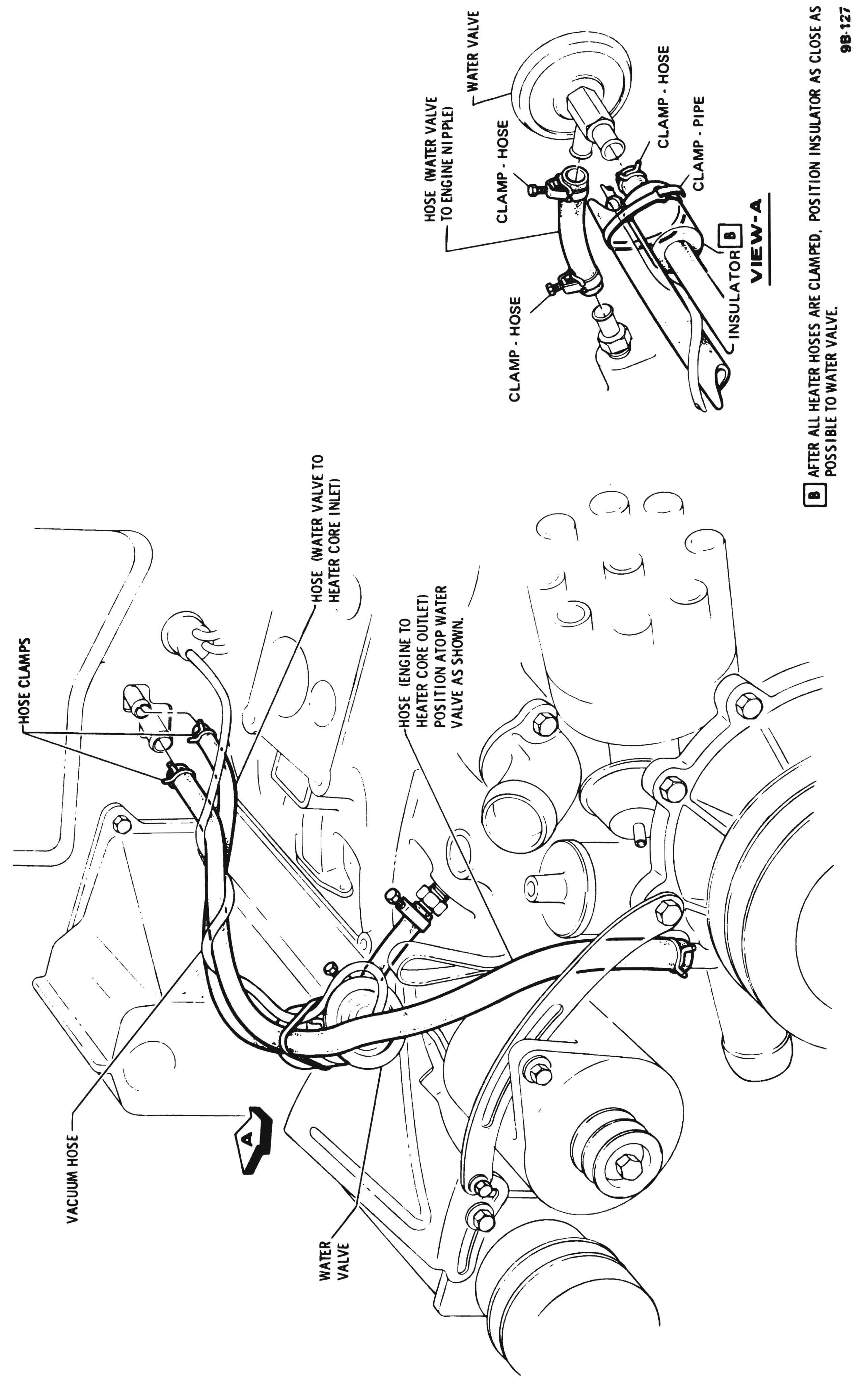


Figure 9B-167 Heater Hoses With A/C - A Series

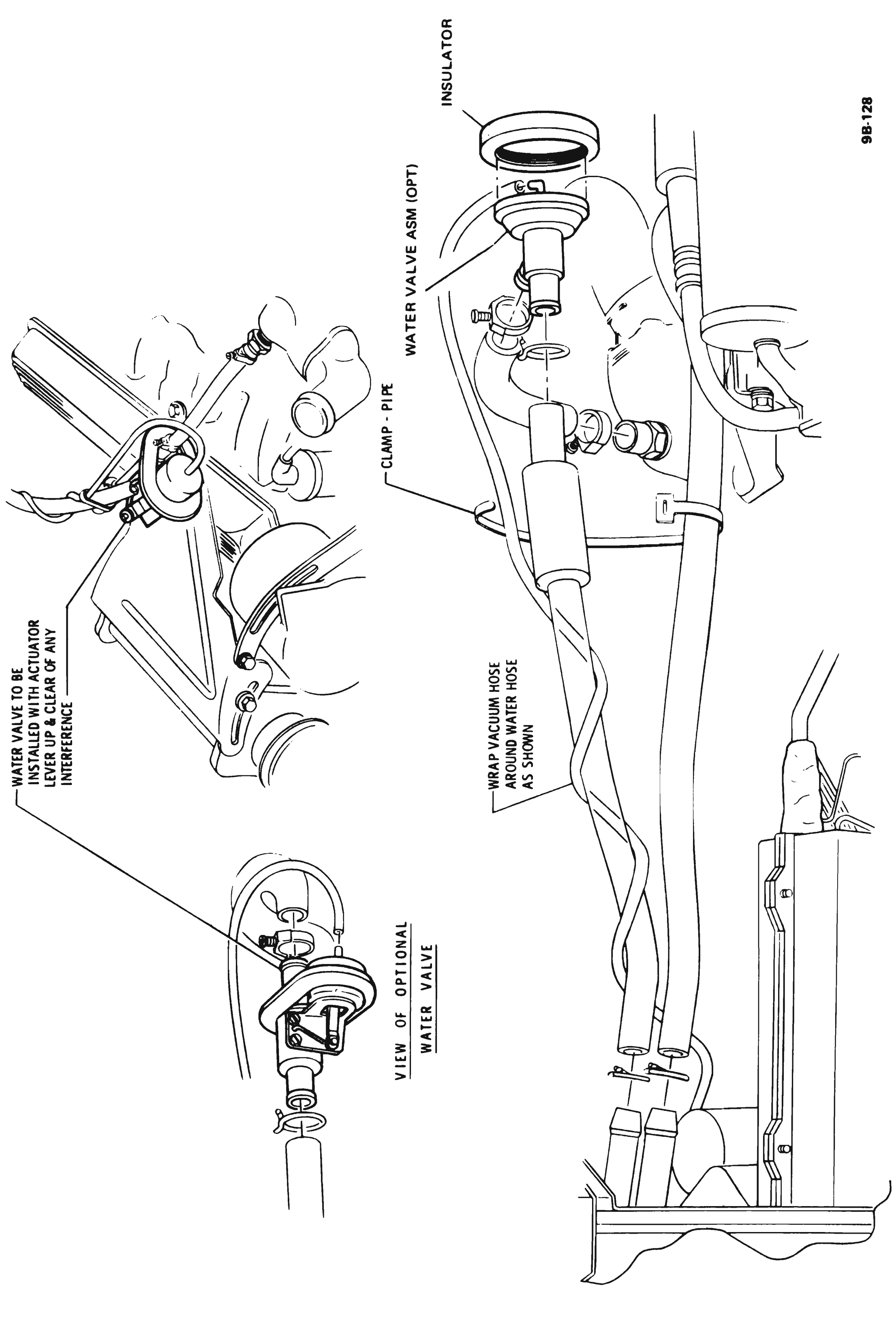


Figure 9B-168 A/C Water Valve Insulator and Strap - A Series

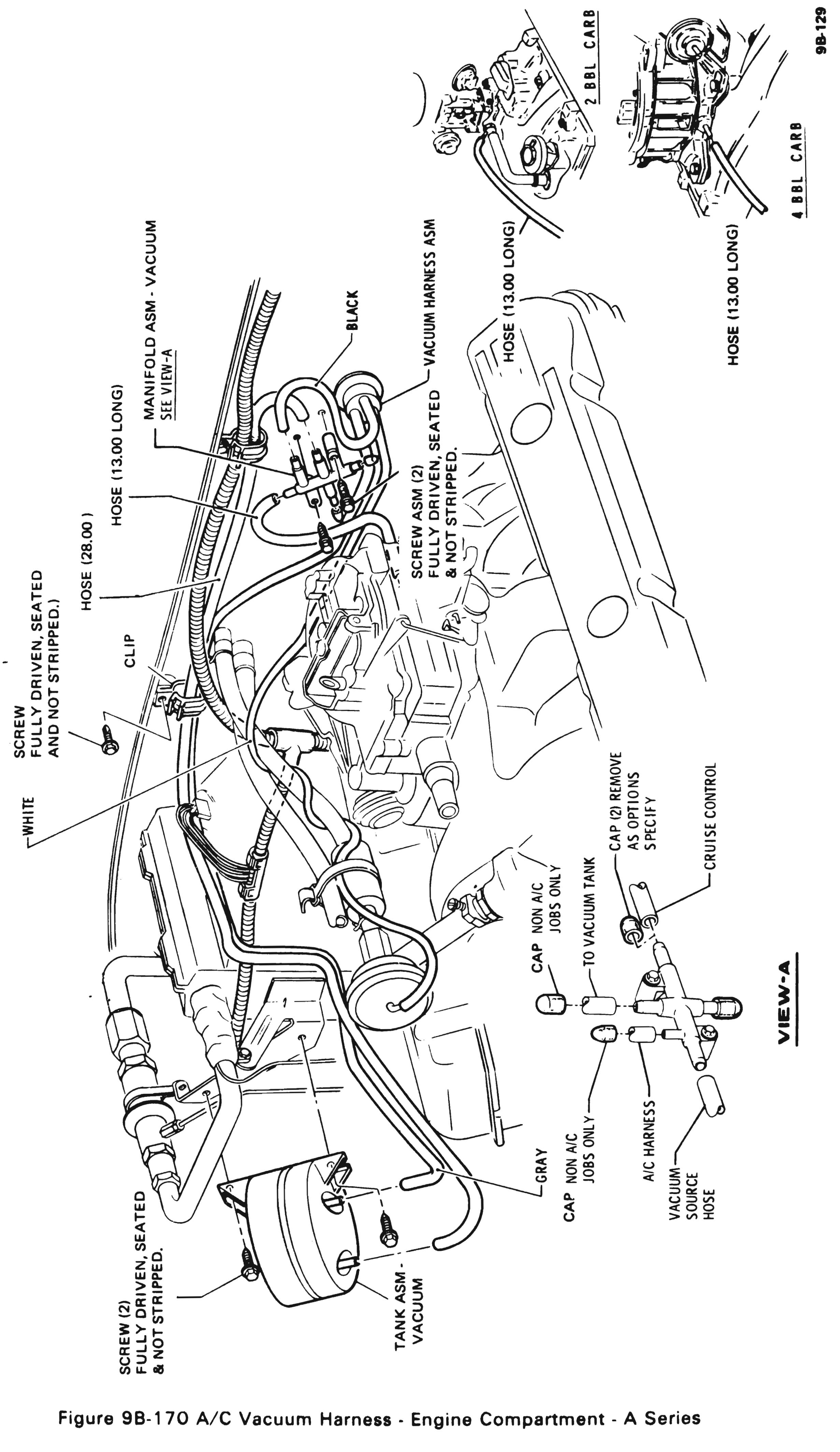


Figure 9B-170 A/C Vacuum Harness - Engine Compartment - A Series

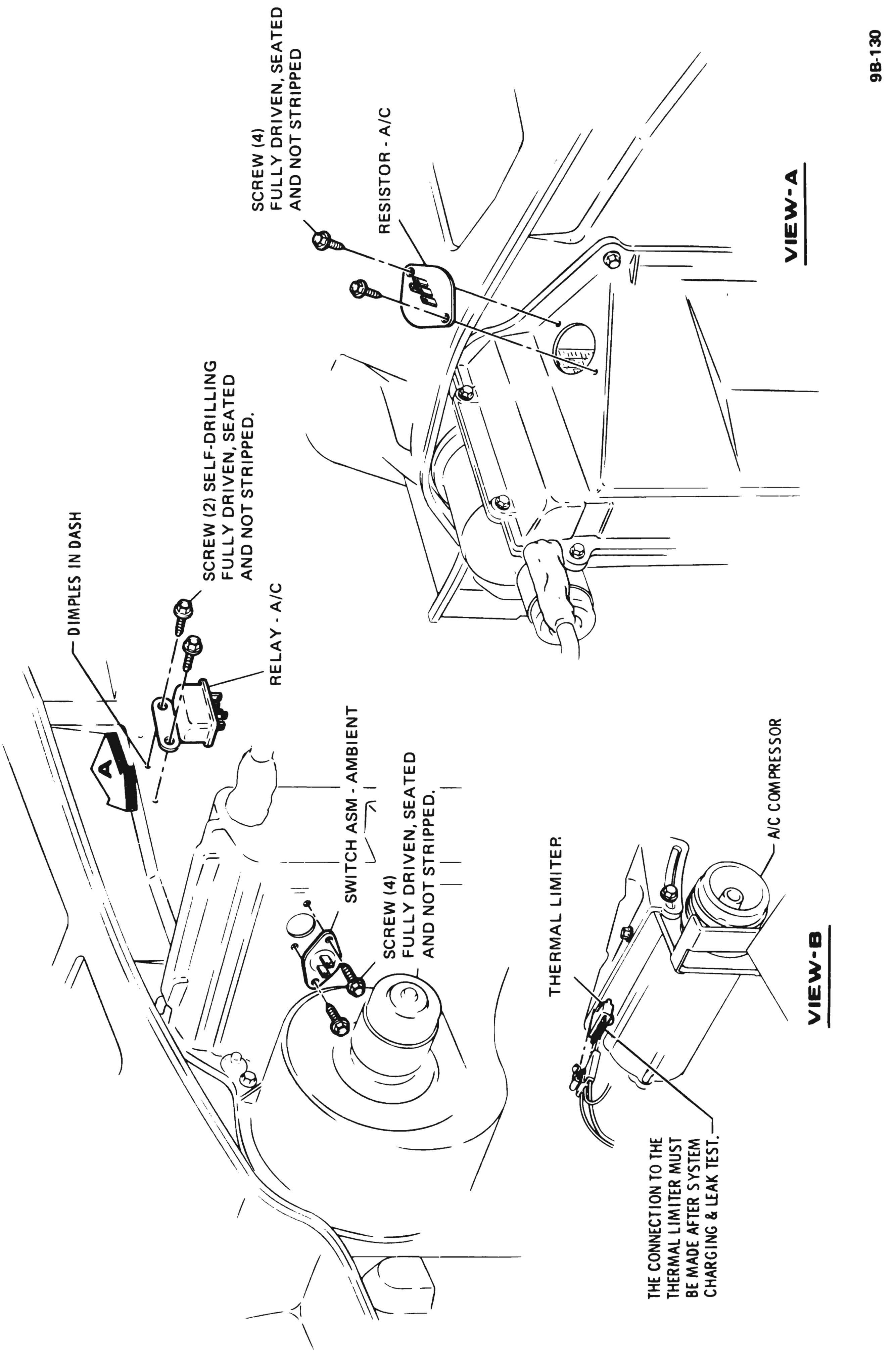


Figure 9B-171 A/C Ambient Switch, Resistor, Relay and Thermal Limiter - A Series

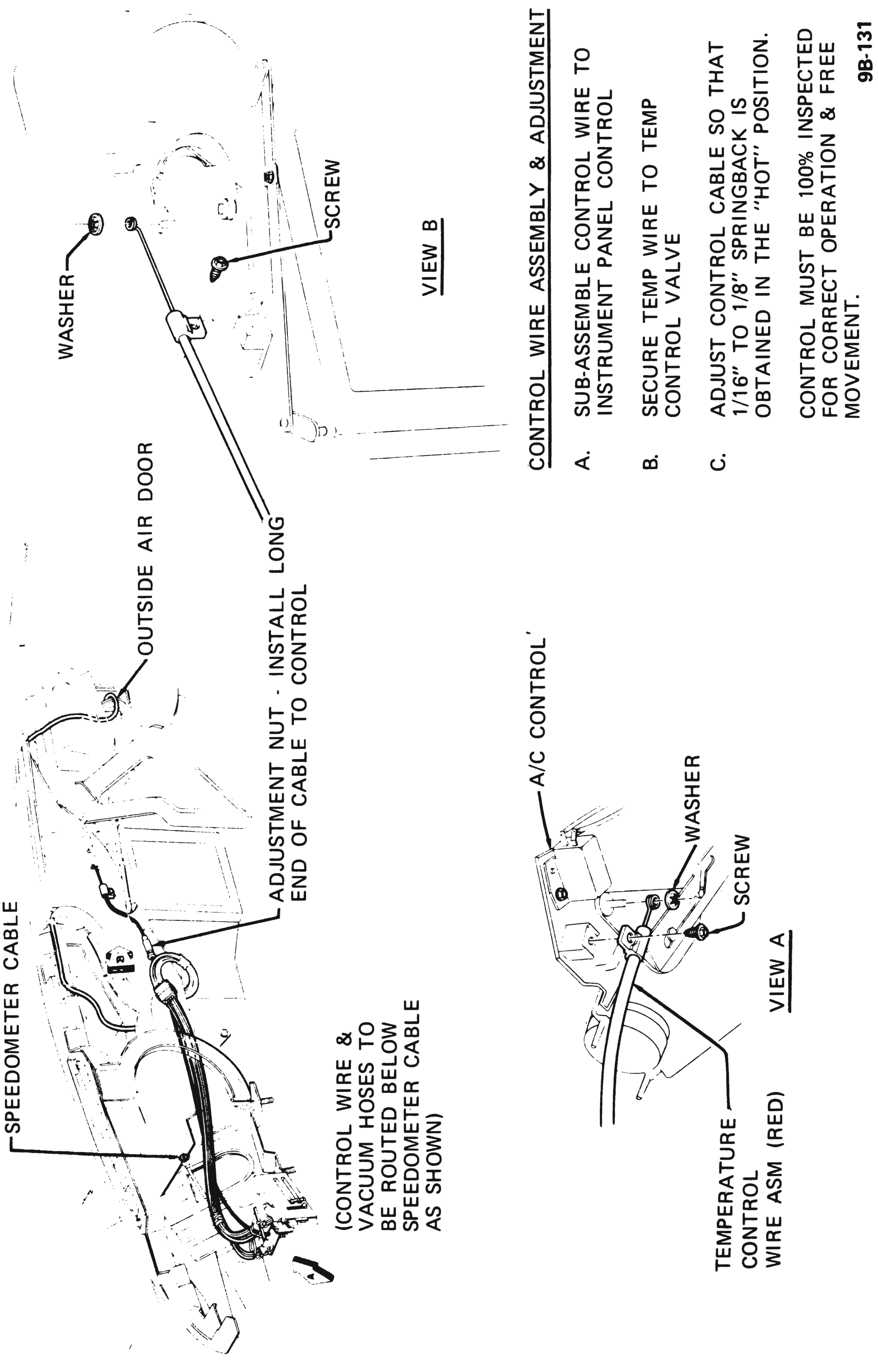


Figure 9B-172 Heater Air Conditioning Control Wire - B-C-E Series

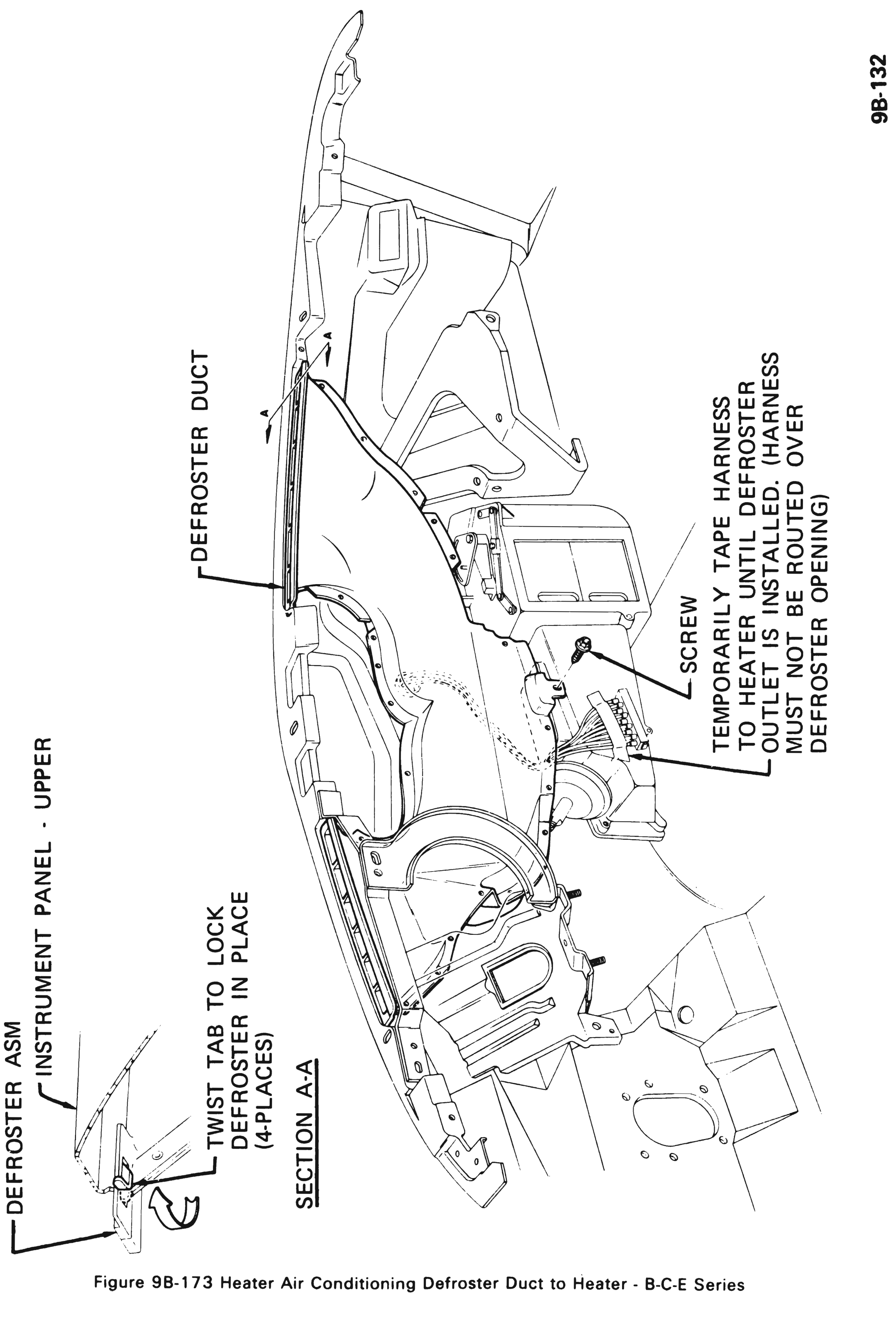


Figure 9B-173 Heater Air Conditioning Defroster Duct to Heater - B-C-E Series

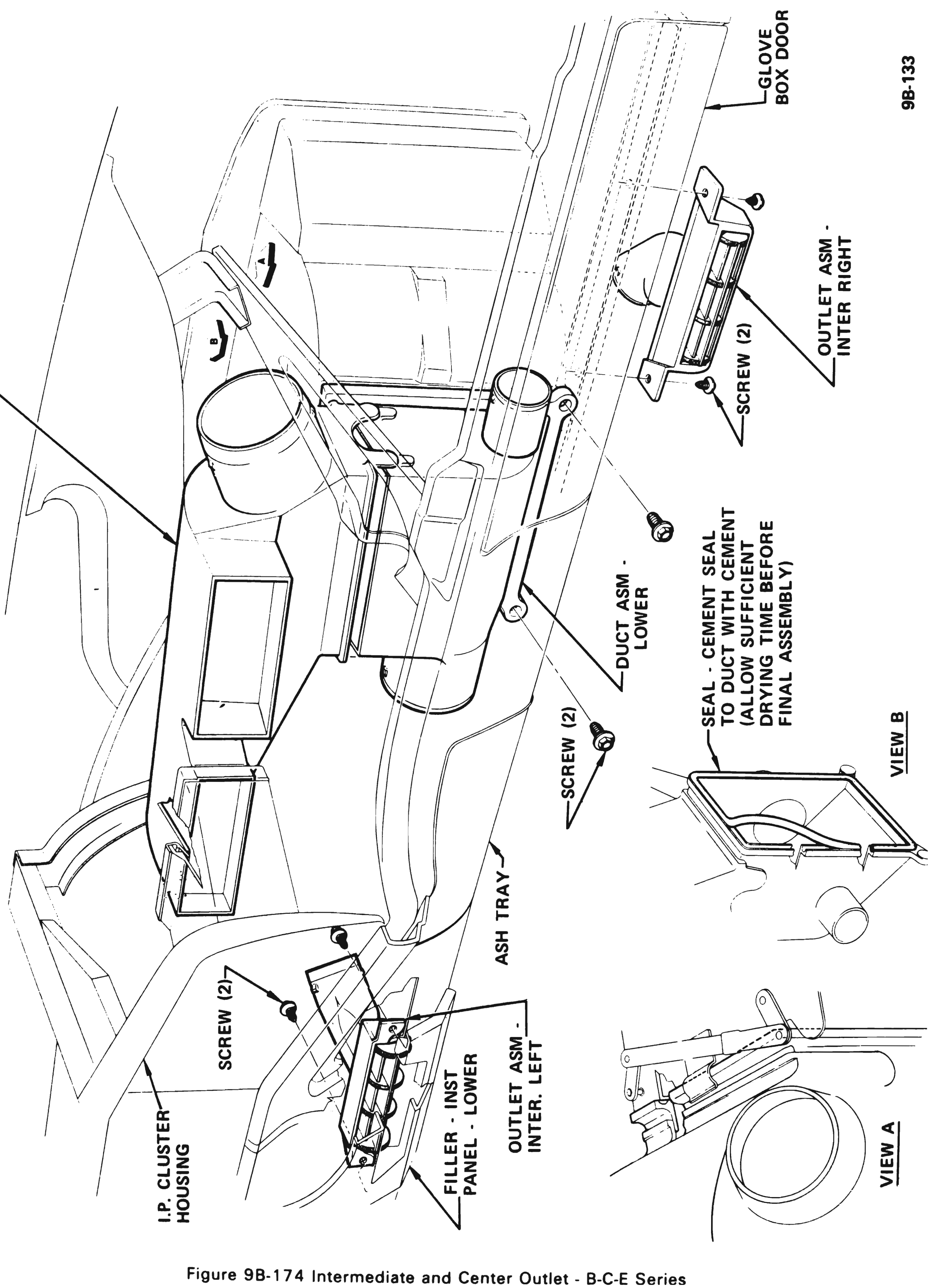


Figure 9B-174 Intermediate and Center Outlet - B-C-E Series

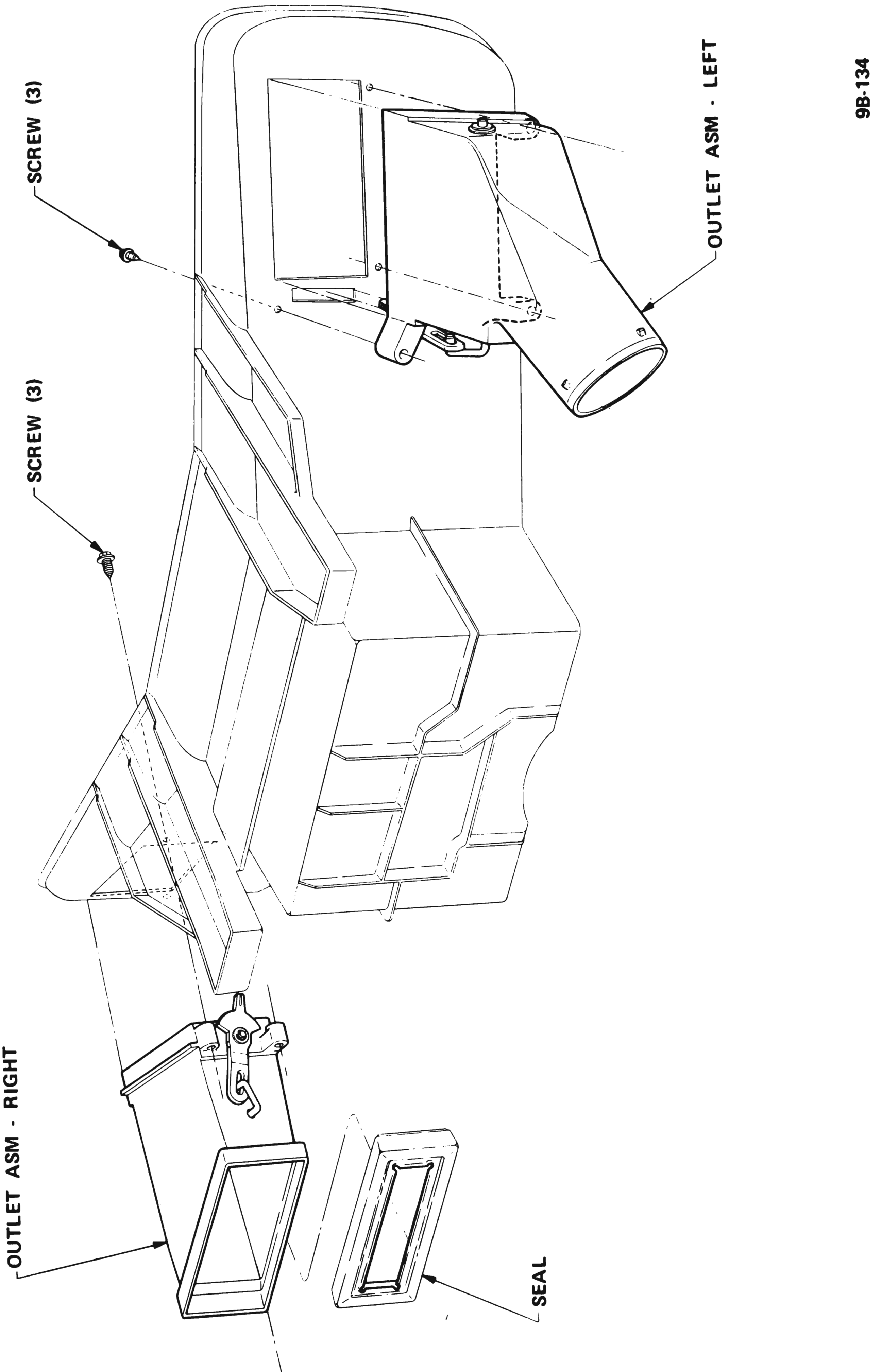


Figure 9B-175 Outlets to Instrument Panel Cluster Housing - B-C-E Series

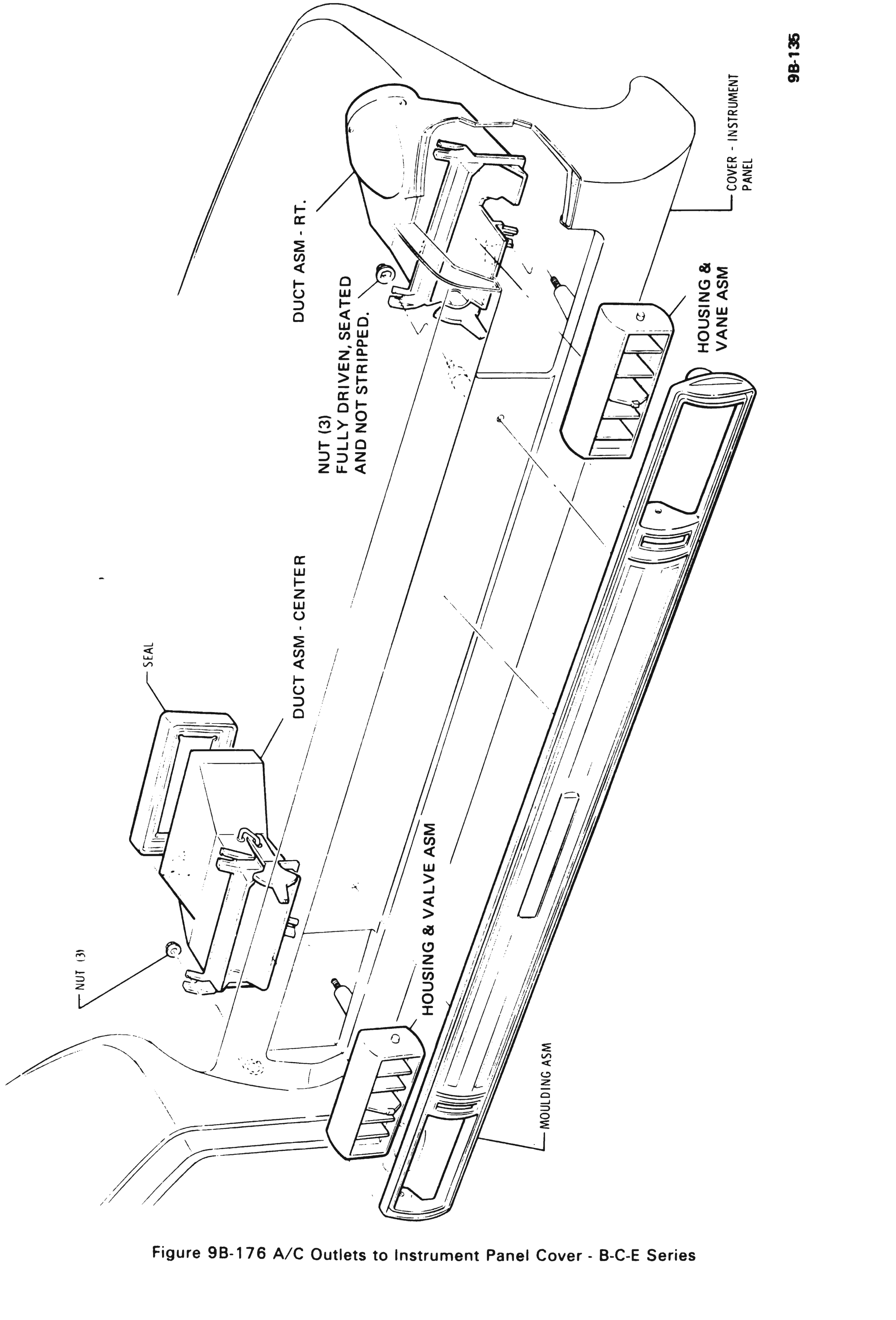


Figure 9B-176 A/C Outlets to Instrument Panel Cover - B-C-E Series

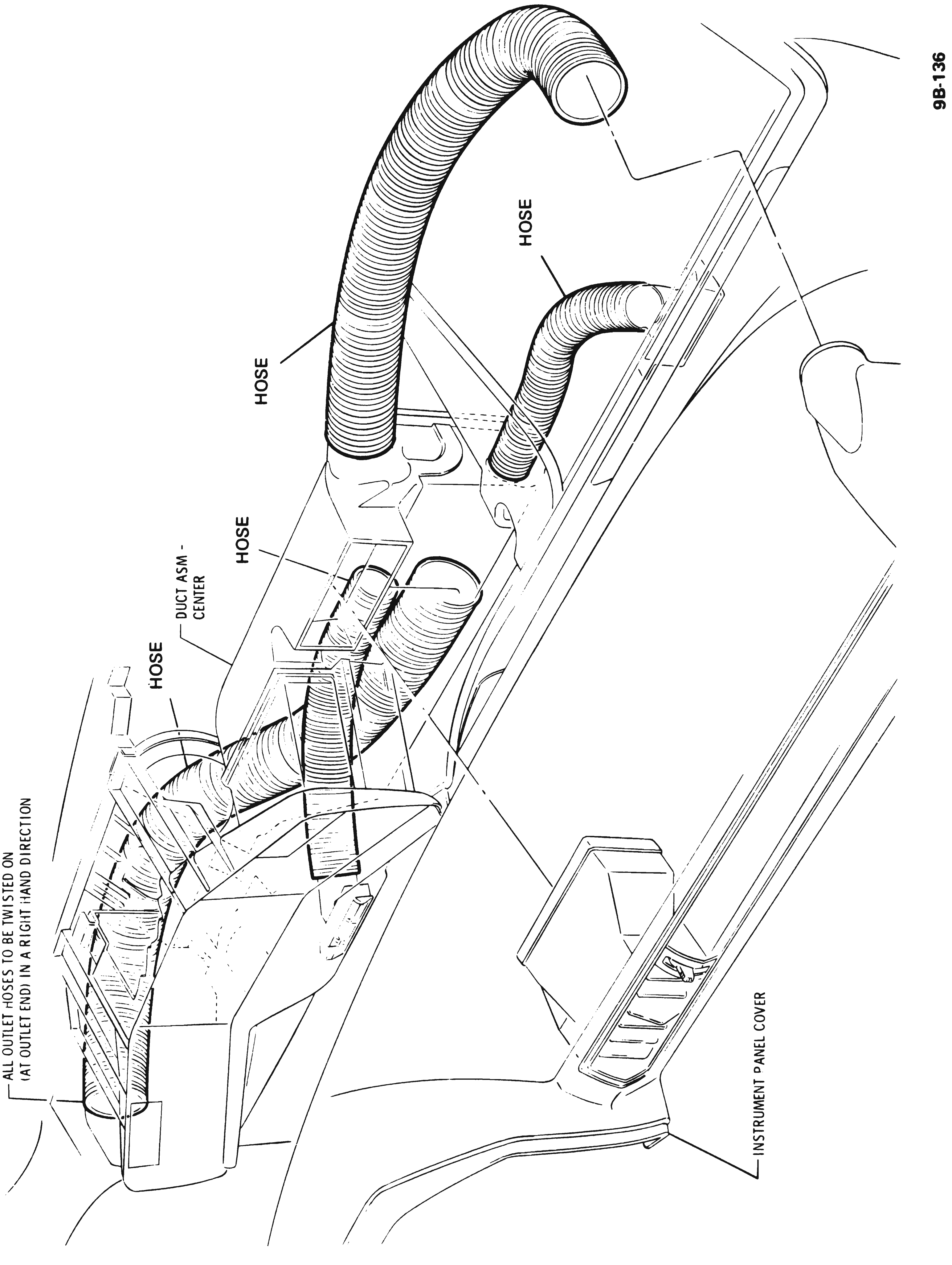


Figure 9B-177 A/C Outlet Hoses - B-C-E Series

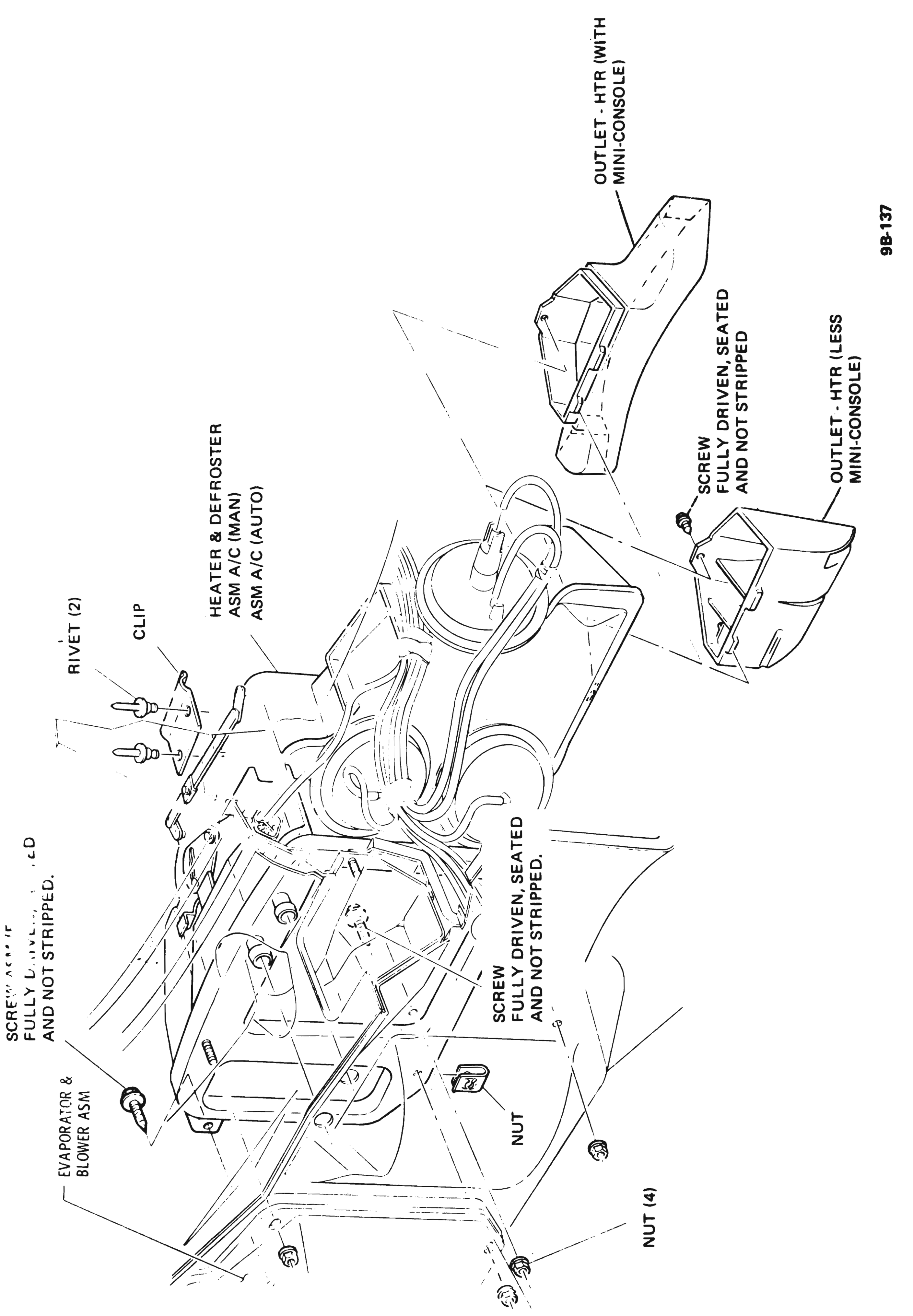


Figure 9B-178 A/C Heater and Defroster Assembly - B-C-E Series

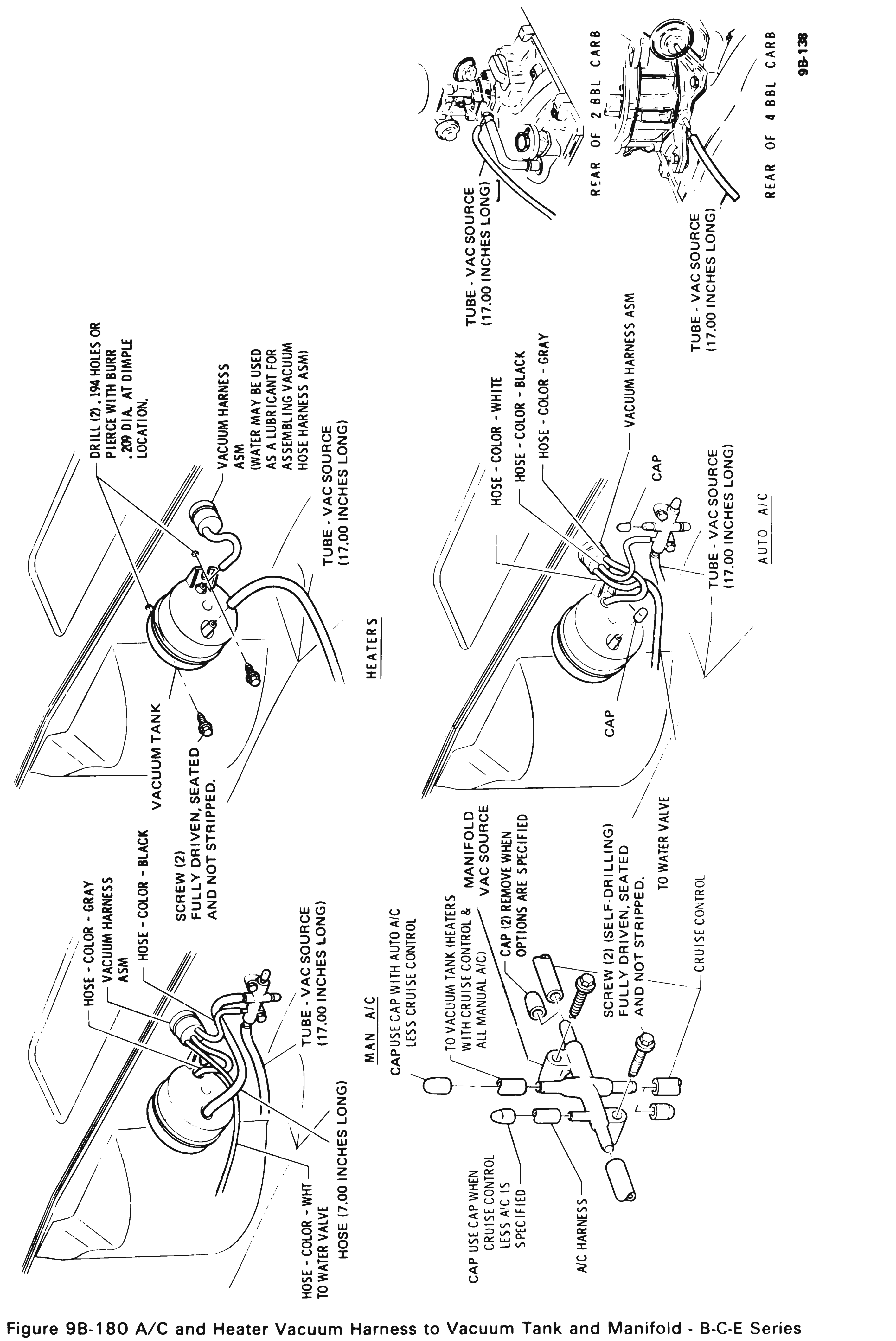


Figure 9B-180 A/C and Heater Vacuum Harness to Vacuum Tank and Manifold - B-C-E Series

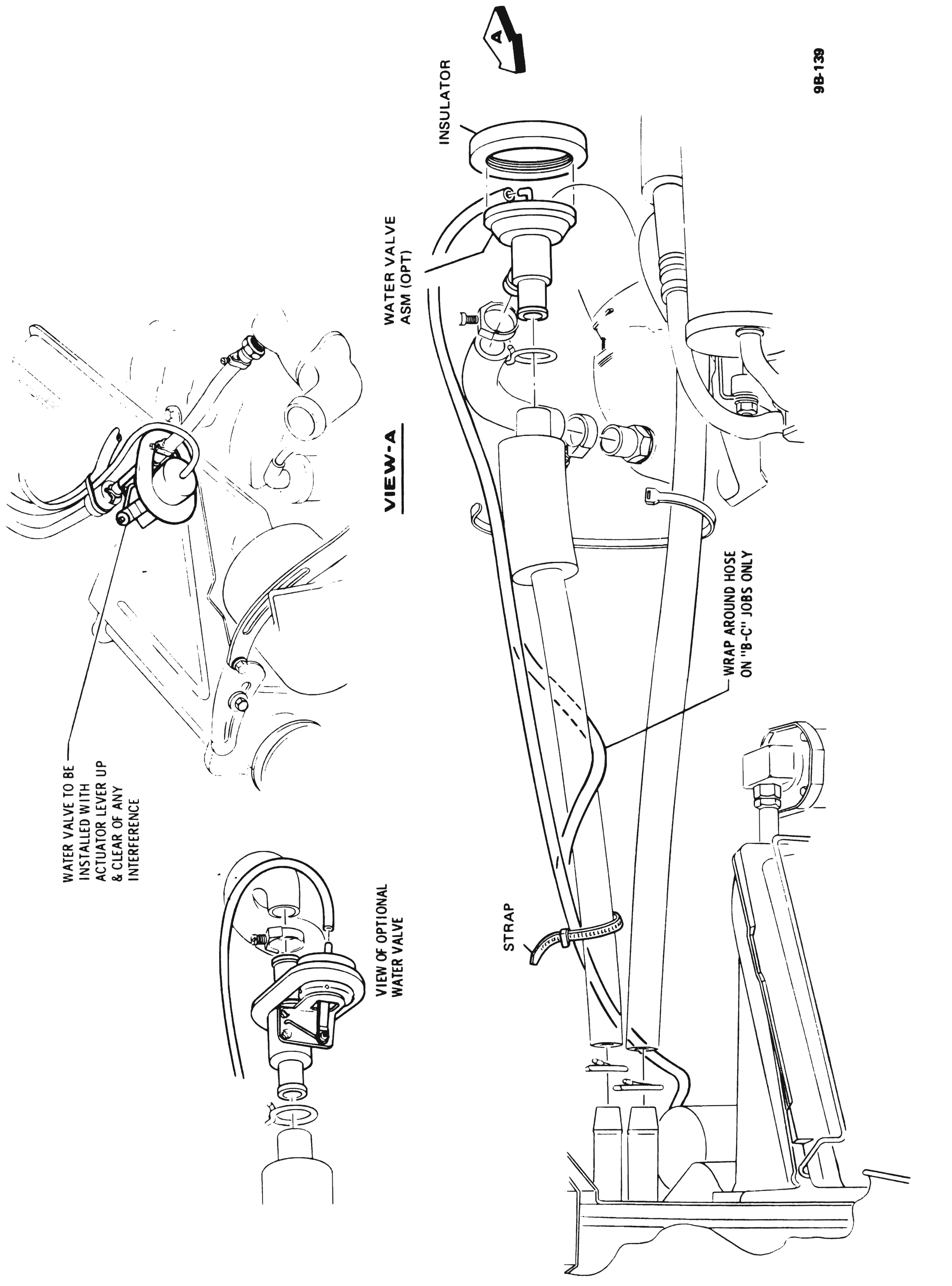


Figure 9B-181 A/C Water Valve, Insulator and Strap - B-C-E Series

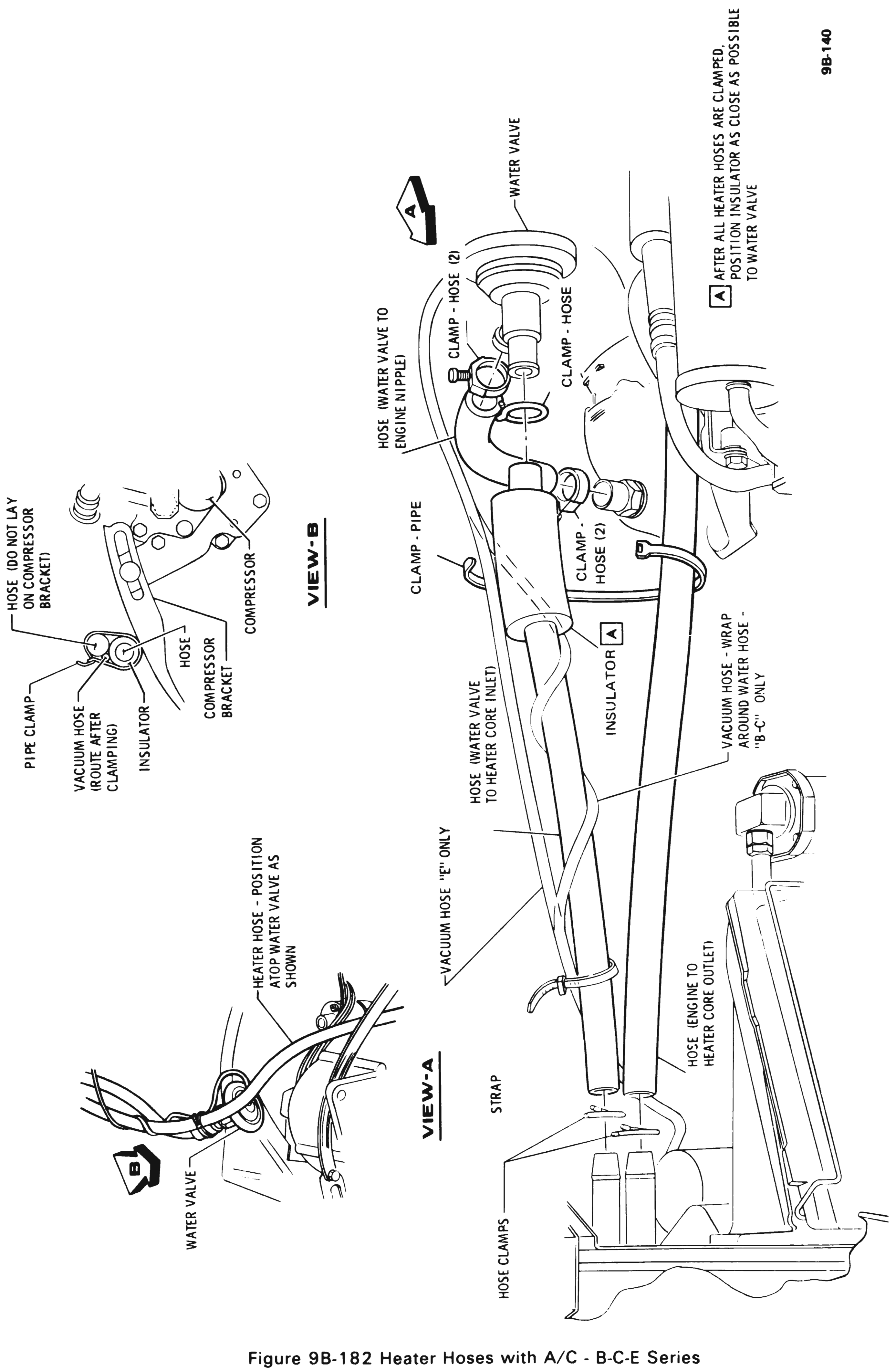


Figure 9B-182 Heater Hoses with A/C - B-C-E Series

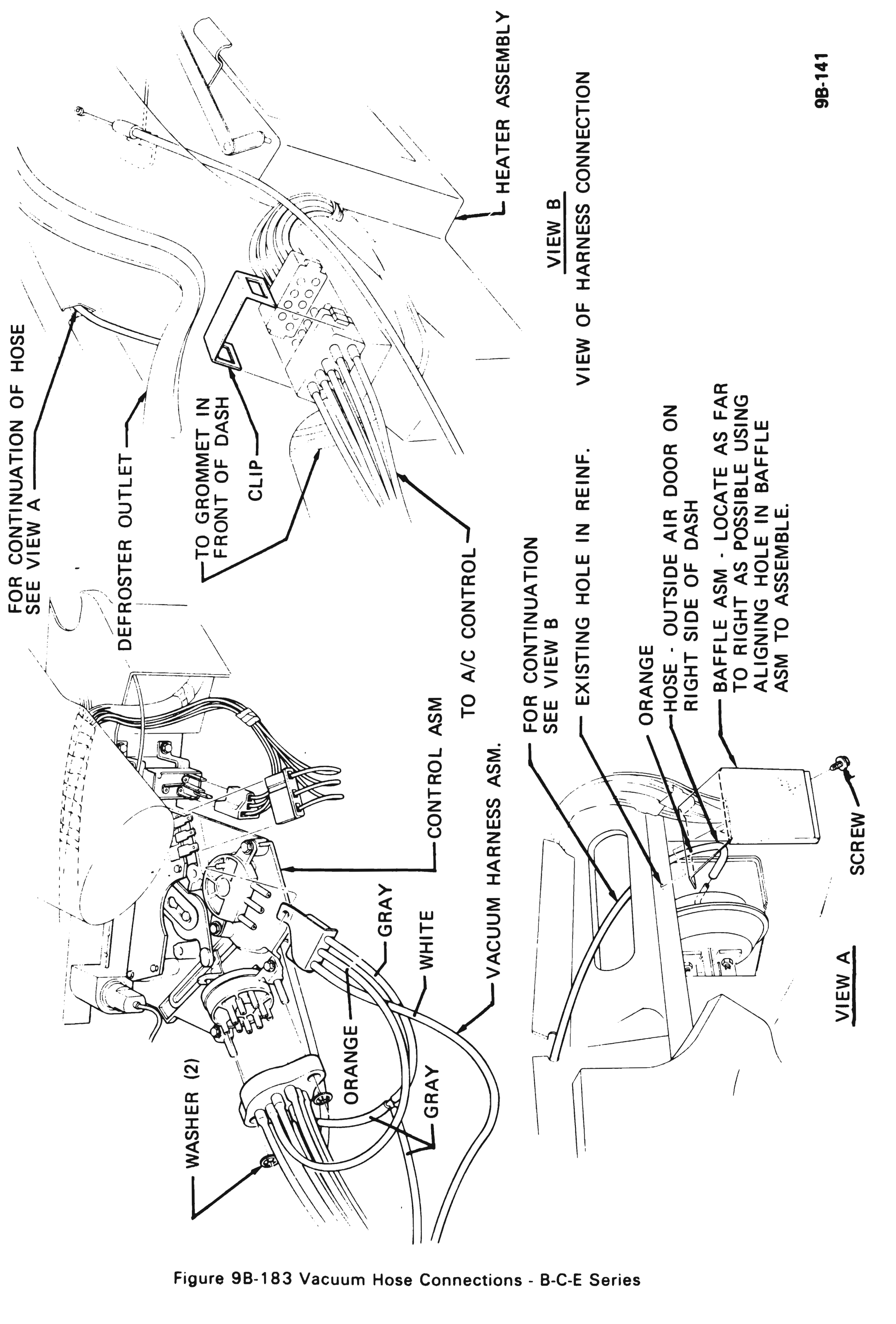


Figure 9B-183 Vacuum Hose Connections - B-C-E Series

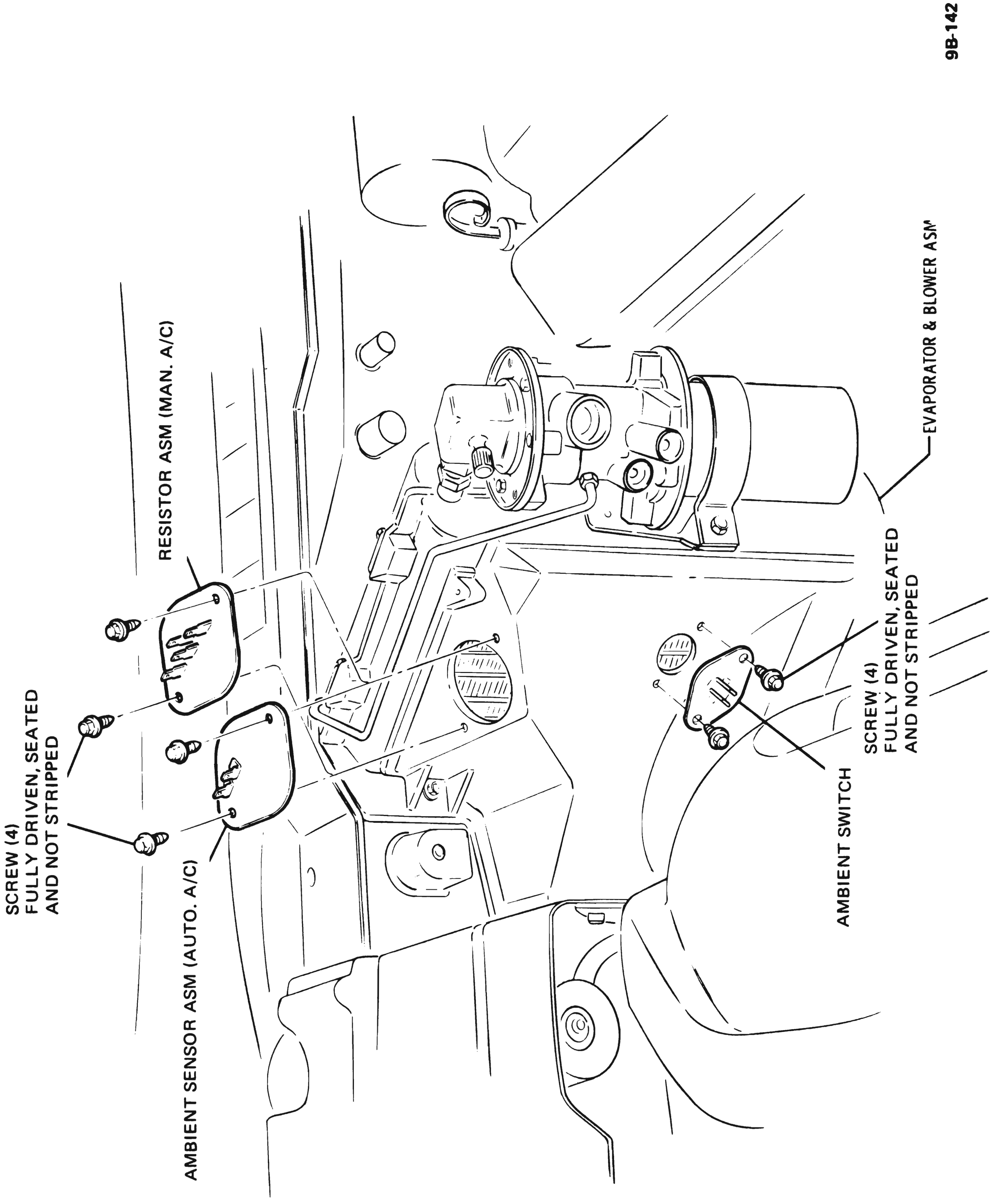


Figure 9B-184 A/C Ambient Sensor Switch and Resistor - B-C-E Series

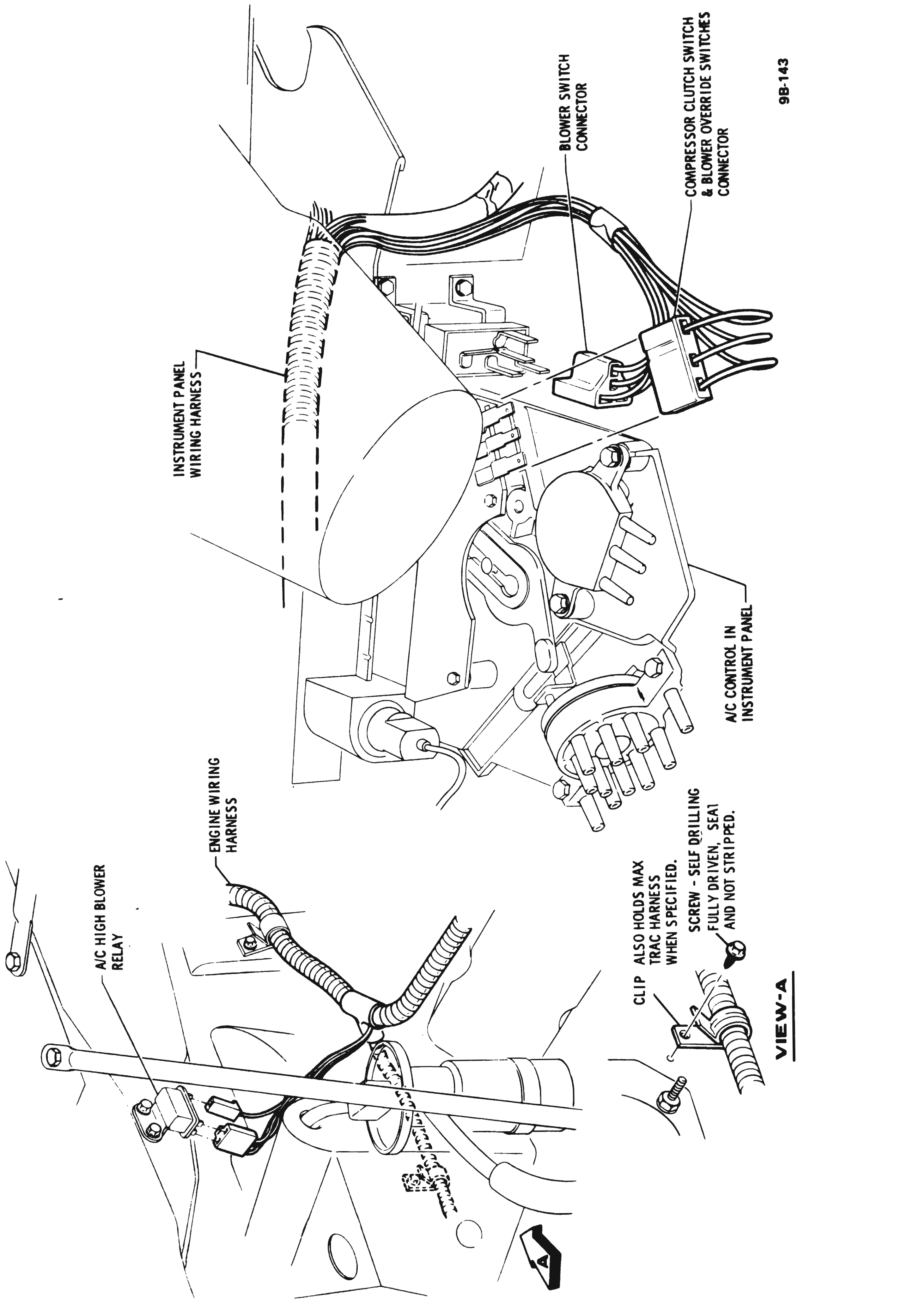


Figure 9B-185 A/C Wiring - Control and Relays - B-C-E Series

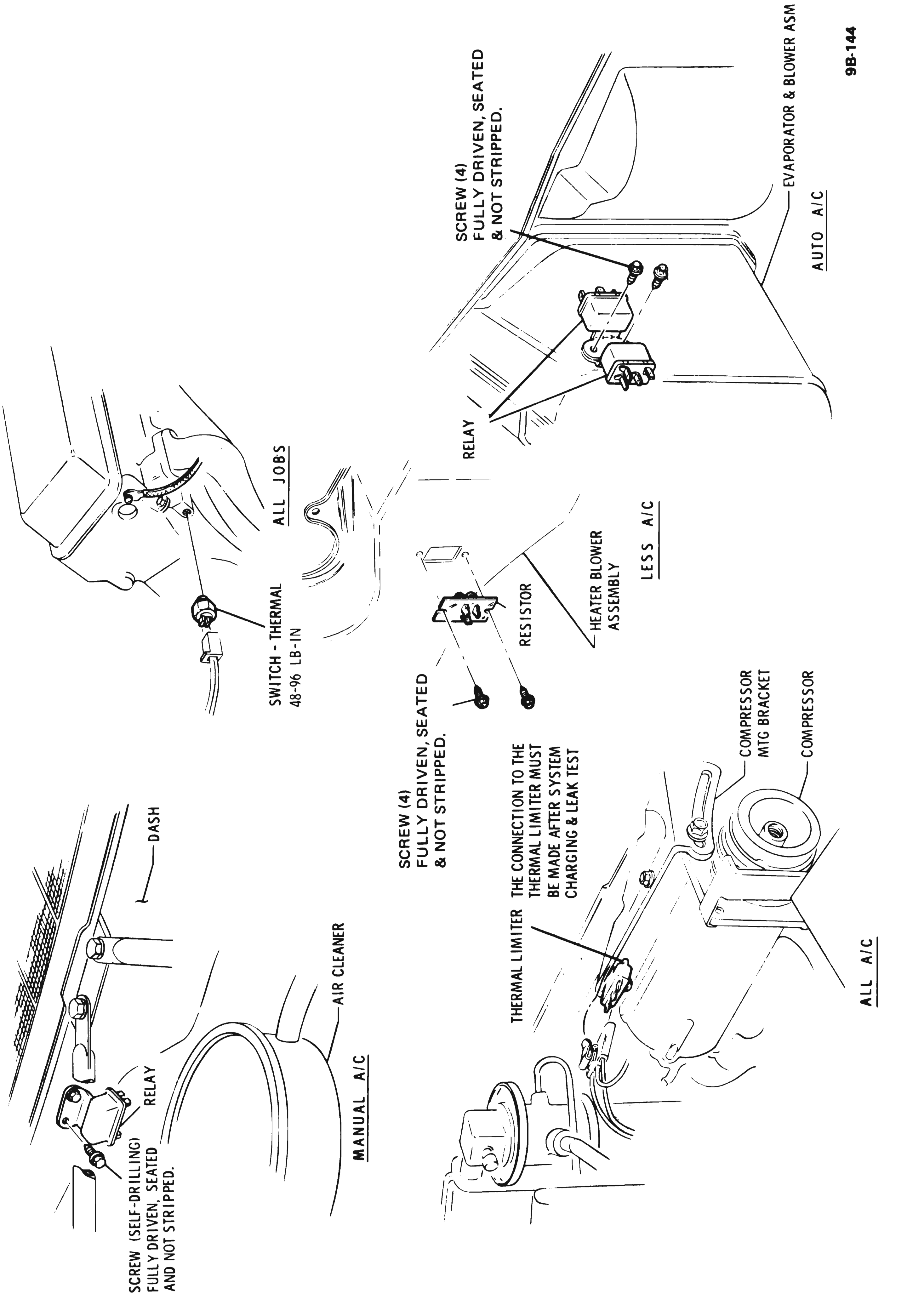


Figure 9B-186 A/C Relays, Thermal Limiter, Switch and Heater Resistor - B-C-E Series

AUTOMATIC CLIMATE CONTROL - HEATER - AIR CONDITIONER SYSTEM B-C-E SERIES

CONTENTS

DESCRIPTION AND OPERATION

GLOSSARY OF A.C.C. TERMS

Incar Sensor This is a semi-conductor type thermister whose resistance varies inversely with temperature. This sensor is mounted on the instrument panel and is aspirated (air is circulated past it). This is the most sensitive of the two sensors.

Ambient Sensor This is a semi-conductor type thermister whose resistance varies inversely with temperature. This sensor is mounted in the duct work to monitor the incoming air temperature.

Ambient Switch This switch allows the AC compressor to be activated whenever the ambient temperature is above 32 degrees F.

Engine Thermal Switch This bi-metal thermal switch is mounted on the engine block. Whenever the engine water temperature is above 140 degrees F, this switch is closed and the Automatic Climate Control system is allowed to turn on.

Blower This is the blower which draws in outside air and forces it into the passenger compartment.

Air Mix Door This door is located in the duct work and is controlled by the A.C.C. programmer. Its position determines the temperature of the air which is being distributed into the passenger compartment by blending hot and cold air.

Outside Air Door This door is open, allowing outside air to be drawn into the duct work in all modes of operation except air conditioning recirculation. When in this mode, the outside air door is closed and the passenger compartment air is recirculated through the duct work for maximum cooling.

Defrost Door This door is located in the duct work and controls the amount of air distributed to the windshield. This door has three positions and is controlled by a dual vacuum diaphragm. The three positions are: 1) Closed; 2) Partially Open; and 3) Open.

Lo Relay This relay is located on the firewall in the engine compartment and is energized whenever the control head is in "Vent" or "Def", or the incar temperature switch is closed, or whenever the engine thermal switch is closed. This allows the blower motor to operate at low blower speed. It is possible for the lo relay to be energized whenever the ignition switch is in the "On" position, but the control head selector lever is in the "Off" position.

Lower Mode Door When no vacuum is supplied to the diaphragm controlling this door, air is distributed from the heater ducts. When vacuum is supplied to this diaphragm, air is distributed from the A/C outlets as well as the heater outlets.

Upper Mode Door When no vacuum is supplied to the diaphragm controlling this door, air is distributed from the heater outlets. When vacuum is supplied to the diaphragm, air is distributed from the A/C ducts.

Auto Relay This relay is energized whenever the engine thermal switch, the incar temperature switch, or the control head is in "Auto", "High", "Bi-Level", or "Def" positions. This allows the system to automatically vary the blower speed from low to high blower.

Hot Water Vacuum Valve This valve is located in the engine compartment and controls the flow of water into the heater core. Vacuum to this valve is supplied from the programmer rotary vacuum valve. Vacuum applied to the valve stops the water flow for maximum cooling.

Outside Air Door Vacuum Diaphragm This diaphragm is controlled by the programmer rotary vacuum valve and determines the position of the outside air door. The door is closed to outside air when vacuum is applied (recirculation mode - actuated at maximum A/C in "HI" only).

Defrost Door Vacuum Diaphragm This dual vacuum diaphragm controls the position of the defrost door. When the system is in "HTR or DEF", vacuum is applied after a 30 second delay through a restrictor to the side port of the diaphragm. When the control head is in the "DEF" position, vacuum is applied to both ports from the control head vacuum valve.

Restrictor This is a porus sintered metal plug that is installed in the vacuum harness in the outer port of the defroster vacuum diaphragm and in the recirc vacuum hose. This produces a delay in vacuum being applied to the diaphragms.

Compressor Clutch This clutch is part of the compressor assembly and is activated when power is applied to it. When the clutch is activated, the compressor will operate, resulting in air-conditioned air in the duct work.

Control Head This is the unit which protrudes through the instrument panel and allows the owner of the car to control the operation of the automatic temperature control system.

Control Head Vacuum Valve This valve is located toward the rear of the control head and controls vacuum being supplied to the defroster, lower-mode, upper-mode and recirc doors. All of the ports on this valve are vented when in the "Off" position, except ports 1, 4, and 9.

Control Head Selector Lever This lever is located on the control head and allows the customer to select the desired mode of operation of the automatic temperature control system.

Temperature Dial This thumbwheel dial allows the customer to select the temperature which he desires in the passenger compartment.

Incar Temperature Switch This temperature-sensitive switch is located either on the control head or at the incar sensor. Whenever the incar temperature is above 80 degrees F, this switch is closed and allows the Automatic Climate Control system to turn on immediately for instant air conditioning.

Car Vacuum Harness This includes all of the vacuum lines controlling the Automatic Climate Control system that are external to the programmer.

Car Electrical Harness This includes all of the electrical wiring for the Automatic Climate Control system that is external to the programmer.

Car Ignition Switch This is the on-off switch which is located on the steering column of the car. When the switch is in the "Run" position, power is applied to the programmer.

Car Fuse Block This block is located under the dash of the car and contains a 25 ampere fuse which fuses the Automatic Climate Control system.

Door Link This link is connected between the programmer output shaft and the air-mix door arm. The link is adjusted at the programmer end and has a retainer disconnect at the temperature door end.

Programmer This unit is located under the dash behind the glove box and controls the blower speeds, the air-mix door, and vacuum diaphragms.

Vacuum Motor This is the vacuum diaphragm which is located inside the programmer. The modulated vacuum from the transducer results in movement of the vacuum motor which controls the position of the output shaft of the programmer, the programmer vacuum valve, the amplifier feedback "pot", and the blower speed.

Amplifier Circuit Board This circuit board is located in the programmer and amplifies the DC signal supplied from the sensor string. The output of the amplifier controls the operation of the transducer.

Programmer Blower Switch This set of contacts is located in the programmer and moves as the vacuum motor moves. These contacts complete the electrical circuit to the blower motor providing stepping blower speeds in Auto and BiLevel modes.

Vacuum Checking Relay This vacuum relay is located in the programmer. If the manifold vacuum supplied to the programmer is lost, the relay will check or hold the vacuum to the vacuum motor. Also, the vacuum supplied to the car vacuum diaphragms is sealed off, preventing them from shifting position.

Transducer This unit is located in the programmer. The electrical current supplied from the amplifier is transformed into a vacuum signal in the output of the transducer. This vacuum output controls the movement of the vacuum motor. No current gives 9 to 11 in. Hg. and current reduces the vacuum level.

Programmer Output Shaft This shaft extends from the programmer approximately four inches. Movement of this shaft controls the position of the air-mix door via the door link.

Feedback Potentiometer This potentiometer is part of the amplifier circuit board. Movement of the vacuum motor changes the resistance of this potentiometer, cancelling out resistance changes in the sensor string providing dampened response.

Feedback Potentiometer Arm Mechanism This mechanism is connected to the vacuum motor and drives the feedback potentiometer as the vacuum motor moves.

Power Spring This spring connects to the vacuum motor mechanism and extends to a retainer at the edge of the programmer housing. When the vacuum motor diaphragm is vented, the spring positions the vacuum motor in the full A/C position.

Mylar Heat Sink Insulator This insulator covers the heat sink of the Darlington amplifier located on the amplifier circuit board. The insulator prevents the heat sink from being grounded to the programmer housing.

Programmer Vacuum Valve This vacuum valve is controlled by the vacuum motor and supplies vacuum to the control head and the other vacuum diaphragms in the system.

Vacuum Valve Spring This spring is located in the programmer directly beneath the programmer vacuum valve and holds the feedback potentiometer arm mechanism in place.

Heat Sink Retainer This retainer clips over the side of the programmer housing and holds the heat sink of the Darlington amplifier in the proper position.

Control Head Base Plate This plate is mounted to the back of the control head face. The selector lever and the control head vacuum valve are mounted on this plate.

Conditioned Air Conditioned air is hot and cold air which has been blended in the ductwork and is distributed from the outlets, providing the proper comfort level in the passenger compartment.

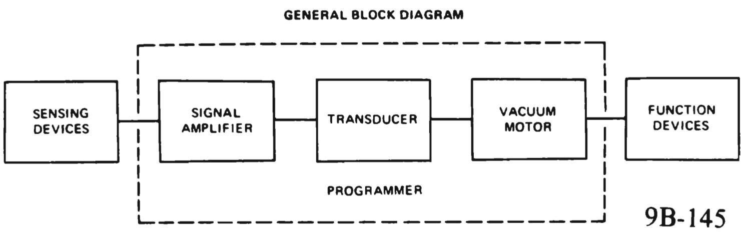
Darlington Amplifier This is a two-transistor circuit contained in one package which serves as the power amplifier for the signal provided to the transducer.

Bi-Level Operation This occurs when the passenger compartment temperature is stabilized and the blower is operating at low speed. Conditioned air flows from both the A/C and heater outlets.

GENERAL THEORY OF SYSTEM OPERATION

A.C.C. is designed to automatically control the heating and air conditioning components in the automobile so that a constant interior temperature is maintained, regardless of varying ambient conditions. The Automatic Climate Control system is beneficial in both summer and winter. In hot weather, it will cool the car rapidly to the pre-set comfort level and then modulate cooling to whatever degree is required to maintain contstant comfort. In mild weather, the interior of the vehicle remains comfortable without having to reset the controls. In cold weather, the system will heat the car quickly to the desired temperature, then level out to maintain the pre-set comfort level desired by the passengers.

The existing heater and air conditioning components provide a series system so that the primary control function is to position an air mix door and a mode door in order to release properly-heated or cooled air from the proper duct outlets.



1. Sensing Devices - Thermistors

2. Programmer

a. Signal Amplifier - DC Transistor Amplifier

b. Transducer - Electrical to Vacuum Converter

c. Vacuum Motor - Vacuum-Powered Servo

3. Function Devices - Door Diaphragms, Air Mix Door, Hot Water Valve, Etc.

The purpose of the incar sensor and the ambient sensor is to monitor the air temperature of the environment in which they are situated. They are semiconductor material thermistors whose resistance varies inversely with temperature changes. These sensors are connected in series with the temperature dial potentiometer which is located on the control head. Whenever the resistance of any of these three devices changes, a new signal is sent to the three-stage DC amplifier.

The DC amplifier enlarges or amplifies the signal supplied from the sensors and the temperature dial and feeds this strong signal to the transducer.

The transducer is actually a solenoid with a vacuum valve connected to the end of the plunger which is located inside the windings. The plunger is positioned inside the winding, depending upon the amount of current flow from the amplifier. The transducer plunger is spring-loaded so that with no current flow through the windings, the plunger is pulled out of the windings. When current flows through the windings, the plunger is pulled into the winding, causing the transducer vacuum valve to have a slight leak to outside air. This results in a lower vacuum level from the regulated vacuum port of the transducer (see Figure 9B-200).

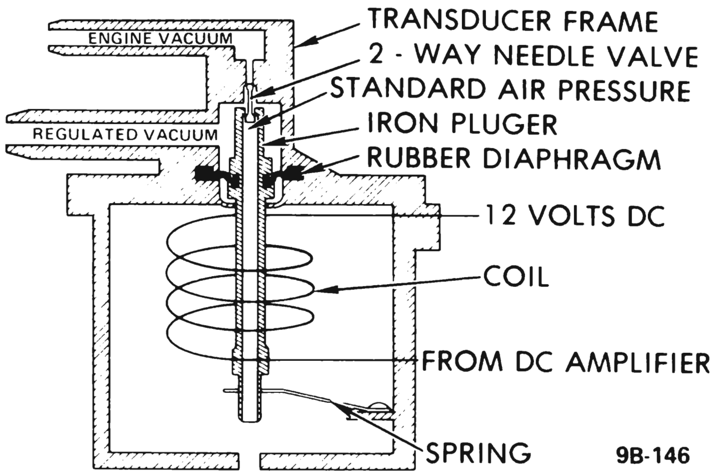


Figure 9B-200 Cross Section - Transducer

If a decrease in current flow from the DC amplifier occurs, the plunger moves out of the winding, opening the transducer vacuum valve and resulting in more vacuum from the regulated vacuum port of the transducer.

The vacuum output from the transducer is fed to the

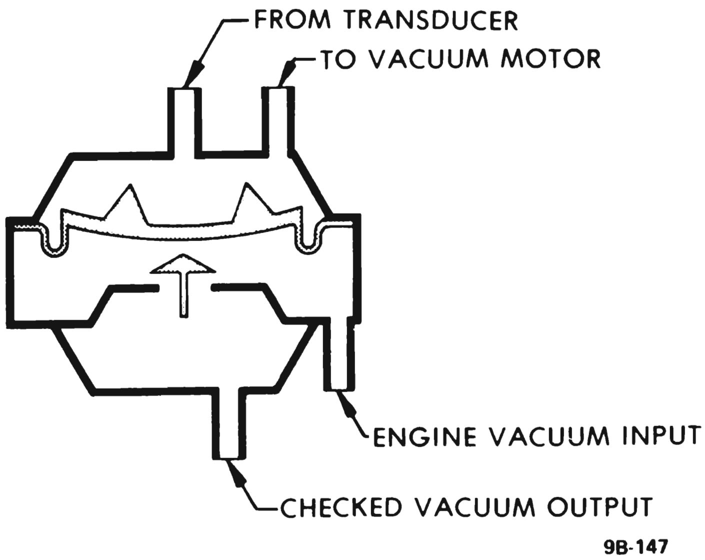


Figure 9B-201 Checking Relay - Open

vacuum checking relay. When engine vacuum is applied to the checking relay, the relay opens (Figure 9B-201), allowing the regulated vacuum output from the transducer to be fed directly to the vacuum motor, positioning it. If engine vacuum to the checking relay is not present, the relay closes (Figure 9B-202), sealing the vacuum applied to the vacuum motor. This locks the vacuum motor in place until engine vacuum is again applied to the vacuum relay.

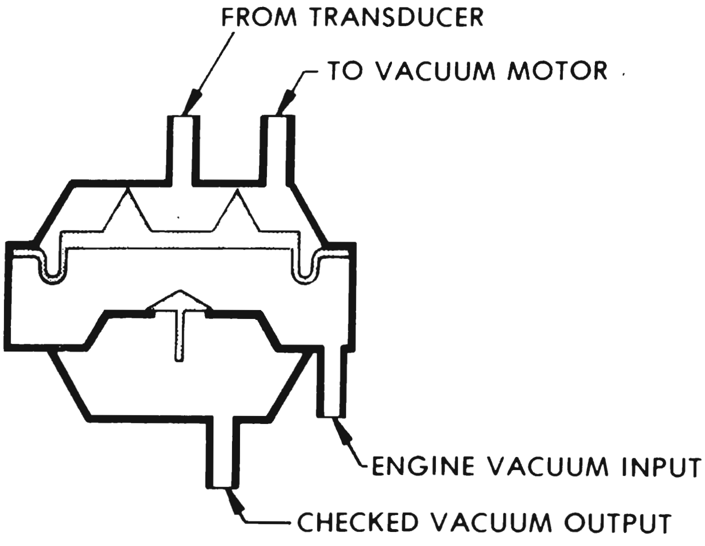


Figure 9B-202 Checking Relay - Closed

The vacuum checking relay also has another section which checks the input vacuum to the door diaphragms whenever engine vacuum is not present. This holds the doors in place until the engine vacuum is again present.

The vacuum motor mechanism is positioned as the result of the vacuum from the transducer. The vacuum motor mechanism is directly connected to electrical wiper contacts that control the various blower speeds. The mechanism is also connected to a rotary vacuum valve in the programmer and also to an output shaft.

The rotary vacuum valve channels vacuum to various vacuum diaphragms and to the rotary vacuum valve on the control head. The output shaft controls the position of the air-mix door, controlling the temperature of the air which is distributed into the passenger compartment.

As the vacuum motor in the programmer moves, a gear meshed with the mechanism rotates the amplifier feedback potentiometer. This potentiometer indicates when the vacuum motor has reached the proper position and cancels out the change in resistance of the sensor string or the temperature dial.

This signals the amplifier to stop the movement of the vacuum motor.

Whenever an appreciable amount of variation in resistance occurs in the sensor string or the temperature dial, the vacuum motor moves to supply either warmer or cooler conditioned air to counteract the resistance change.

BASIC SYSTEM OPERATION

The numbers on the temperature dial thumbwheel control located on the control head indicate the various temperatures which can be obtained in the passenger compartment of the car. This temperature dial serves the same function as the thermostat in your home. The temperature dial controls the incar temperature when the selector lever is in the "Off", "Lo", "Auto", "Hi", "Bi-Level", or "DEF" position. See Figure 9B-203.

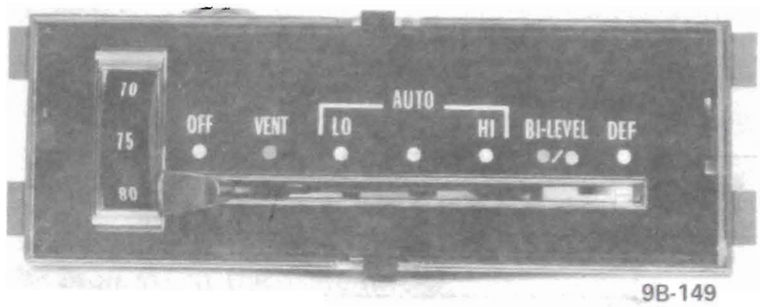


Figure 9B-203 A.C.C. Control Panel

OFF Position

The 1973 Automatic Climate Control system is completely "shut off" when the ignition switch of the car is in the "Off" position. When the car ignition switch is turned on, the electrical circuit to the A.C.C. system is accomplished. With the control head selector lever in the "Off" position, the system will come on when the engine water temperature reaches about 140 degrees F, or if the inside car temperature reaches about 80 degrees F. The fan will run at "Lo Blower" speed and conditioned air will flow from the heater outlets. The temperature of the air depends on the temperature dial setting.

VENT Position

When the selector lever is in the "Vent" position, the switch is in the "Run" position. The blower runs at "Lo Blower" speed and outside air is distributed into the passenger compartment of the car through the A/C outlets. The compressor is off and the outside air is delivered untempered.

LO Position

With the control head selector lever in the "Lo" position, the system will not come on until either the inside car temperature reaches about 80 degrees F, or the engine water temperature reaches about 140 degrees F. The blower will then operate at "Lo Blower" speed only. Conditioned air will flow from the A/C outlets, the heater outlets, or both when the system is in "Bi- Level" operation.

AUTO Position

The operation of the A.C.C. system when the selector lever is in the "Auto" position is the same as the "Lo" position, except that the blower is no longer locked in "Lo Blower" operation. The programmer will select any of the four blower speeds ("Lo", "Med. 1", "Med. 2", and "Hi") in order to maintain the proper comfort level in the car.

HI Position

When the control head selector lever is placed in the "Hi" position, the blower operates only at "Hi Blower" speed. The temperature selected on the temperature dial will be maintained inside the passenger compartment. If maximum A/C is required, the inside air will be recirculated through the A/C system for maximum cooling. When the system operation has stabilized and the blower is operating at lower speeds, the conditioned air will be distributed from both the A/C and heater outlets. This is "Bi-Level" operation.

BI-LEVEL Position

The blower operates at "Lo", "Med. 1", "Med. 2", or "Hi" speeds when the control head selector lever is in the "BI-LEVEL" position. The desired temperature level inside the car will be maintained. Conditioned air is distributed from the heater, A/C, and defroster outlets, resulting in "tri-level" operation. The system will come on immediately when the engine thermal switch or the incar temperature switch is closed.

DEF Position

With the control head selector lever in the "DEF" position, the system comes on immediately when the ignition switch is turned on. The fan is locked on "Hi Blower" speed and all of the air is distributed from the defroster outlets onto the windshield. Some air is bled to floor on "DEF". The comfort level selected on the temperature dial will be maintained in the car.

ELECTRICAL SYSTEM OPERATION

OFF Position

When the control head selector lever is in the "OFF" position, the system is locked in "Lo Blower" operation when the ignition switch is in the "Run" position and the engine thermal switch is closed and the "Lo Relay" is closed. The engine thermal switch closes whenever the engine water temperature is above 140 degrees F. If the temperature inside the car is above 80 degrees F, the incar temperature switch is closed, which also causes the "Lo Relay" to close, resulting in "Lo Blower" operation (see Figure 9B-223).

With ignition switch in the "Run" position, power is supplied to the programmer, allowing it to operate. The incar sensor, the ambient sensor, and the temperature dial setting on the control head cause the programmer to move the air-mix door. The proper hot- cold air mixture is then distributed from the heater outlets, maintaining the incar temperature at the comfort level selected on the temperature dial.

VENT Position

With the ignition switch in "Run" and the selector lever in the "Vent" position, the "Lo Relay" will be closed and the system will come on immediately with the fan locked on "Lo Blower" speed. The vacuum motor in the programmer is in the A/C position, since the incar sensor and the ambient sensor are shorted out by the control head switch. The ambient switch is closed when the ambient temperature is above 32 degrees F. However, the compressor will not run, since no voltage is applied to it through the control head switch. The engine thermal switch is closed when the engine water temperature is above 140 degrees F. The incar temperature switch is closed if the incar temperature is above 80 degrees F. In "Vent" immediate start-up occurs, irrespective of temperature delay settings. The "Auto Relay" is always open in this mode. The engine thermal switch is closed when the engine water temperature is above 140 degrees F, which causes the "Lo Relay" to be energized (see Figure 9B-224).

LO Position

With the selector lever in the "Lo" position, the system will come on when the incar temperature is above 80 degrees F, which closes the incar temperature switch, or when the engine water temperature reaches 140 degrees F. The "Lo Relay" is then closed, allowing the blower to be locked on "Lo Blower" speed. The "Auto Relay" remains open.

When the ambient temperature is above 32 degrees F, the ambient switch is closed, supplying voltage to energize the compressor clutch via the control head switch (see Figure 9B-225).

AUTO Position

With the selector lever in the "Auto" position, the system will come on when the incar temperature is above 80 degrees F, which closes the incar temperature switch, or when the engine water temperature reaches 140 degrees F. The "Lo Relay" and the "Auto Relay" are both closed and the position of the blower wiper contacts in the programmer determines the speed at which the blower operates. When the ambient temperature is above 37 degrees F, the compressor clutch is energized via the ambient switch and the control head switch (see Figure 9B-226).

HI Position

When the selector lever is in the "Hi" position, the system turn-on is the same as described in the "Auto" position section. Both the "Lo" and "Auto" relays are closed when the system is operating and a direct circuit path via the control head switch is connected from the battery circuit to the blower motor. This locks the blower on "Hi Blower" operation. When the ambient temperature is above 32 degrees F, the ambient switch is closed and the compressor clutch is energized. If the system is calling for maximum cooling, the system will operate in the recirculation mode; however, there is no change in the electrical function when this mode is achieved (see Figure 9B- 227).

BI-LEVEL Position

With the selector lever in the "BI-LEVEL" position, the system turn-on is the same as described in the "Auto" position section. The "Lo" and "Auto" relays are both closed and the position of the blower wiper contacts in the programmer determines the speed at which the blower operates. When the ambient temperature is above 32 degrees F, the ambient switch is closed and the compressor clutch is energized (see Figure 9B-228).

DEF Position

With the selector lever in the "DEF" position, the system comes on immediately and the blower is locked on "Hi" speed. The "Lo Relay" and the "Auto Relay" always remain energized.

The temperature dial must be used to obtain maximum heat when it is desired to override the automatic control (see Figure 9B-230).

VACUUM SYSTEM OPERATION

OFF Position

With the selector lever in the "Off" position and the engine running, the system is turned on whenever the engine thermal switch or the incar temperature switch is closed. The vacuum motor in the programmer moves to a position that will moderate the incar temperature. Air flows from the heater outlets at "Lo Blower" speed (see Figure 9B-231).

VENT Position

Air is drawn in through the outside air door and is distributed from the A/C and defroster outlets at "Lo Blower" speed. The programmer is in the maximum A/C position (see Figure 9B-232).

LO Position

When maximum cooling is required (see Figure 9B-233), cold air is distributed from the A/C outlets. The blower is locked on "Lo Blower" speed. Recirculation of air is not possible in the "Lo" selector lever position. A small amount of this cold, dry air is also blown onto the windshield.

When the vacuum motor moves from maximum A/C, the porting in the programmer vacuum valve changes.

As the air temperature from the outlets reaches a moderate temperature, the system goes into "Bi-Level" operation and air flows from the A/C and the heater outlets. Some moderate temperature, dry air is also released from the defroster outlets onto the windshield (see Figure 9B-233).

When heating is required, hot air is distributed from the heater outlets. A small amount of hot, dry air is also released from the defroster outlets.

AUTO Position

Even though maximum A/C is required, the system cannot go into recirculation operation. Air is released from the A/C outlets at "Hi Blower" speed (see Figure 9B-237).

As the incar temperature begins to lower, the programmer moves out of the maximum A/C position.

When the outlet air temperature reaches a moderate temperature, the system goes into "Bi-Level" operation. Conditioned air flows from both the heater and A/C outlets. Also, a small amount of moderate, dry air is distributed from the defroster outlets.

When maximum heating is required from the system, air is distributed from the heater outlets at "Hi Blower" speed. Some hot, dry air is also blown onto the windshield (see Figure 9B-248).

HI Position

The passenger compartment air is recirculated through the A/C system when maximum cooling is required. Cold air is distributed from the A/C outlets at "Hi Blower" speed (see Figure 9B-248).

As the programmer moves from the maximum A/C position, air is drawn in from outside the car to be conditioned. This air is distributed from the A/C and defroster outlets at "Hi Blower" speed.

As the outlet air reaches moderate temperature, the system begins to operate in the "Bi-Level" mode. Some cool, dry air is also released from the defroster outlets.

When the system goes into heater operation, the warm air is released from the heater outlets at "Hi Blower" speed. Some warm, dry air is also released from the defroster outlets.

BI-LEVEL Position

If maximum cooling is required, the outside air door is closed for recirculation operation and the blower is operating at "Hi Blower" speed. Cold, dry air is distributed from the heater, A/C, and defroster outlets, resulting in "Tri-Level" operation (see Figure 9B-241).

When maximum cooling is no longer required, the outside air door opens and the blower speed decreases (see Figures 9B-241 and 9B-242). Complete blower programming is used in the "BI-LEVEL" position. When heating is required from the system, the blower speed increases and reaches "Hi Blower" speed at maximum heating.

DEF Position

With the selector lever in the "DEF" position, the outside air door is closed when maximum cooling is required. All of the air is directed onto the windshield from the defroster outlets at "Hi Blower" speed (see Figure 9B-256). When maximum cooling is no longer required, the outside air door opens but the fan remains on "Hi Blower" speed.

Amplifier Theory of Operation

The purpose of the three-stage amplifier used in the Automatic Climate Control system is to amplify the DC signals that are created due to resistance changes in either the temperature dial, the incar sensor, or the ambient sensor (see Figure 9B-270). The feedback potentiometer, temperature dial, incar sensor, ambient sensor and R12 form a voltage divider circuit that results in a voltage at the base of Q1. Also, at Q1 in the emitter circuit, R13, R15, and D1 form a voltage divider, resulting in a fixed voltage on the emitter of Q1. During stable operation of the A.C.C. system, the voltage difference between the base and the emitter remains constant that causes Q1 to conduct a constant amount of current (electron flow).

This current flow in Q1 actually flows from ground, through the E-B diode of Q3, through the E-B diode of Q2, and through Q1. This current flow forward biases Q2 and Q3, the Darlington amplifier, and causes it to conduct. This results in current flow through the transducer. This constant current through the transducer produces a constant vacuum output from the transducer.

If the resistance of a sensor increases as the result of a temperature decrease, or if the temperature setting on the temperature dial is increased, a larger voltage will be present at the base of Q1. This reduces the current flow through Q1, which in turn reduces the conduction of the Darlington amplifier through the transducer. Low transducer current produces high vacuum at the transducer vacuum output. The vacuum motor moves in the direction of "more heat". The feedback potentiometer is mechanically connected to the vacuum motor mechanism. As the vacuum motor moves to the "increased heat" position, the feedback "pot" reduces in resistance. This movement yields a cancelling effect to the increased resistance which caused the movement. When the feedback "pot" completely offsets the increase, the voltage at the base of Q1 is the same as it was earlier, as described in the stable operation and the movement stops.

If the temperature at a sensor increases or the temperature dial is moved to a lower temperature setting, the voltage at the base of Q1 will decrease. More current will now conduct through Q1, Q2, and Q3. The increased current flow through Q1 causes Q2 and Q3 to conduct more current through the transducer. The vacuum at the transducer output will now decrease, causing the vacuum motor to move in the direction of more cooling. As the vacuum motor moves, the feedback "pot" increases in resistance, offsetting the original resistance decrease. The amplifier has now stabilized again and the movement stops.

The .1 Mfd. capacitor at the base of Q1 filters out any high-frequency AC signals from entering the DC amplifier. AC signals result in erratic operation of the A.C.C. system. The 2 Mfd. capacitor controls the reaction time of the amplifier and helps to stabilize its operation. This eliminates any oscillations in the system's operation. R25 is a feedback resistor that reduces the gain of the DC amplifier and results in more stable operation of the system.

Diode D1 is physically located under the Darlington amplifier. When the Darlington heats up, it tries to conduct more current. D1 also heats up and reduces in resistance. This lowers the emitter voltage of Q1 and reduces its conduction. This results in lower conduction of the Darlington amplifier, thereby bringing it back to its original conduction level.

Diode D2 is a spike suppression diode. This prevents any voltage spikes from the input supply line from entering the amplifier.

DIAGNOSIS

GENERAL INFORMATION

The following trouble diagnosis applies only to those components which make up the Automatic Control System. Information on diagnosing and correcting components which are a part of the Heater Air Conditioner System is contained in the "Heater-Air Conditioner System" Section.

TESTING A.C.C. SYSTEM USING TESTER J-23678

This tester has been designed and developed to be used in troubleshooting the Automatic Climate Control System in the car. The tester can be used to isolate the problem to the control head, the sensor string, the A.C.C. vacuum system, or the programmer. If a problem is determined to be in the programmer, the tester can also be used to completely troubleshoot each component in the programmer.

A hard rubber, dummy plug, two sizes of vacuum tees, and a supply of hose unions are located in the tester's storage compartment. The rubber dummy plug is used to plug all of the vacuum ports on the programmer, except the raw vacuum input for isolating a vacuum problem between the programmer and the A.C.C. vacuum system. The tees and unions are used to connect the rubber hose from the tester's vacuum gauge into the system to make various vacuum checks.

The wiring harness from the tester is actually a "patch cable", which can be plugged into the programmer and into the car electrical harness.

The voltmeter on the tester's panel is a 0 to 15 volt meter. The voltage monitored by the meter is controlled by the "voltage" knob just below the meter at all times, *except when* the "Temperature Dial Calibration" switch is in the calibrate position. The "No. 2 Feed" position allows the tester to directly monitor the input voltage to the programmer. The "No. 6 Blower" position allows the tester to directly monitor the voltage applied to the blower motor. The "No. 7 Lo-Relay" position indicates that the lo-relay has energized and that the relay contacts have closed if battery voltage is read on the meter. The "No. 8 Auto-Relay" position indicates that the auto-relay has energized and that the relay contacts have closed if battery voltage is read on the meter. The "Probe and Clip" position connects the probe and clip in the tester's storage compartment directly to the voltmeter. This makes it possible to use the voltmeter to check various other voltages in the A.C.C. system. The red probe should always be connected to the more negative terminal.

When the "Manual-Automatic" toggle switch is in the automatic position, the tester monitors voltages on the voltmeter according to the "Voltage" knob position when the "Temperature Dial Calibration" switch is in the "Off" position. When the "Manual-Automatic" toggle switch is in the manual position, the temperature dial on the control head, the ambient sensor, and the in-car sensor are *disabled* and the *"Manual Control" knob replaces them.* The numbers around the "Manual Control" knob represent the resistance in ohms that is replacing the resistance of the temperature dial, the ambient sensor, and the in-car sensor. If the knob is rotated to the "Max. Cold" position, the programmer should move to the full A/C position. If the knob is rotated to the "Max. Heat" position, the programmer should move to the maximum heat position. *The "Manual Control" knob is operational ONLY when the "Manual-Automatic" toggle switch is in the "Manual" position.*

When the "Temperature Dial Calibration" switch is in the calibrate position, the voltmeter monitors the voltage directly across the temperature dial on the control head. When the "Compare" button is pressed, the voltmeter reads the voltage across a precision resistor in the tester. By moving the temperature dial on the control head, the two voltage readings can be made the same. After this is accomplished, the temperature dial on the control head should read the correct temperature, as indicated on the tester panel. If it does not, the temperature dial clutch should be held and the dial slipped to read the correct temperature (see Temperature Dial Calibration Procedure).

The "Temperature Dial Calibration" switch should always be in the "Off" position, unless the temperature dial on the control head is being calibrated.

A.C.C. SYSTEM TROUBLESHOOTING OBJECTIVE

The main objective when troubleshooting an A.C.C. system is to isolate the problem to either the control head, the sensor string, the A.C.C. vacuum system, or the programmer. After this preliminary isolation is completed, the actual problem can then be diagnosed quickly.

The programmer *should not* be removed from the car, unless the problem has been isolated positively as being in the programmer. If the programmer is defective, it should either be repaired at your Buick dealership or sent to a United Delco Service Account which is authorized to make repairs on these units. *Programmers cannot be returned under warranty - they must be repaired.*

PRELIMINARY TROUBLESHOOTING INFORMATION

The most important part of diagnosing a problem is to determine exactly what the complaint is and whether this complaint actually stems from a malfunction in the system. Because of this, before attempting a repair, the serviceman should read through the General Operation section on the A.C.C. system to be sure that he has a thorough understanding of how the system is supposed to operate.

If a customer is complaining of a malfunction in the A.C.C. system that occurs only periodically, the malfunction should be observed before the repair is attempted. This will greatly reduce the diagnosis time and eliminate a possible "comeback" because the wrong part was changed. Do not skip any steps in the Troubleshooting Procedure, unless instructed to do so.

TROUBLESHOOTING PROCEDURE

1. Start the car and place the control head selector lever in the "Auto" position and the temperature dial at 75. Allow enough time for the car engine to warm up and A.C.C. system to come on if the system was acting normally. If the system does not come on, skip to Step 3.

2. After the system has turned on, rotate the temperature dial slowly back and forth looking for abnormal operation of the system. Then move the selector lever to each of the various positions and look for any malfunction in the system's operation. By observing any malfunctions and noting when they occur, often times the serviceman will be able to isolate the problem to a certain area of the system.

3. Remove the cover of the programmer (while it is still mounted in the car) and connect J-23678 A.C.C. Tester electrical harness to the programmer and the car harness.

4. Place the control head selector lever in the "Auto" position and the temperature dial on 75.

5. On the tester, place the "Temperature Dial Calibrator" switch in the "Off" position and the "Manual-Automatic" switch in the "Manual" position.

6. Rotate the "Manual Control" knob to Max. Heat". The programmer should move to the full heat position and the fan should run at high-blower speed. (The vacuum motor mechanism will move into the vacuum motor.) Rotate the knob to "Max. Cold". The programmer should move to the full A/C position and the fan should run at high-blower speed. (The vacuum motor mechanism will move out of the vacuum motor.) If only partial programmer movement occurs, or "Hi Blower" is not obtained at both extremes, make the air mix door link adjustment *before* proceeding to the next step. If the programmer does *not* move at all, skip to Step 9.

7. Rotate the "Manual Control" slowly counterclockwise. The vacuum motor mechanism should first start to move at precisely 180 ohms (plus or minus 1 ohm) on the "Manual Control" knob. If this first movement occurs before or after 180 ohms, make the programmer amplifier calibration (feedback "pot" adjustment).

8. Rotating the "Manual Control" knob to the "Max. Cold" position should cause the system to shift to full A/C operation and the vacuum motor mechanism will move out of the vacuum motor. If the programmer moves normally when rotating the "Manual Control", skip to Step 11.

Programmer Does Not Move

9. On the A.C.C. Tester, place the "Temperature Dial Calibration" switch in the "Off" position and the "Voltmeter" control in the "Programmer 12-V Supply" position. Battery voltage should appear on meter. No voltage indicates the *lack of* a ground on terminal No. 1 of the programmer or the *lack of* battery supply to terminal No. 2 of the programmer.

10. Plug the tester's dummy vacuum plug on the programmer vacuum valve. Connect the dummy hose to the vacuum supply hose (Port No. 2) in the car vacuum harness. Make sure vacuum is present. The programmer now has vacuum supply with no car vacuum system components connected. If the programmer functions using the "Manual Control" on the tester, troubleshoot the A.C.C. vacuum system. If the programmer does not function, the defect is in programmer. Remove the dummy plug and reconnect the vacuum harness after making this test.

Sensor String Test

11. Place the control head selector lever in the "Auto" position and the temperature dial on 75.

12. On the J-23678 A.C.C. Tester, place the "Manual- Automatic" switch in the "Auto" position.

13. Observe the position of the vacuum motor mechanism.

14. On the A.C.C. Tester, switch the "Manual- Automatic" switch to the "Manual" position and then adjust the "Manual Control" knob until the vacuum motor mechanism assumes the same position as it had in Step 13. When the "Manual Control" knob is properly adjusted, switching the "Manual-Automatic" switch back and forth will result in no movement of the vacuum motor mechanism.

15. Read the setting of the "Manual Control". This resistance reading is the same as the resistance of the two sensors and the temperature dial combined and should be 120 to 150 ohms at 70 to 75 degrees F. room temperature. If this reading is incorrect, try

calibrating the temperature dial. If the calibration can be accomplished, then the temperature dial is "good". Visually check the ambient and in-car sensors for shorts or bad connections.

Lo Relay Test

16. Place the A.C.C. Tester's "Temperature Dial Calibration" switch in the "Off" position and the "Voltmeter" knob in the "Lo Relay" position.

17. Place the control head selector lever in the "Vent" or "Def" position. If the "Lo Relay" is energized, the voltmeter will read battery voltage. The "Lo Relay" is operated by: 1) Hot engine thermal switch; 2) Hot in-car temperature switch; 3) Control head in "Vent" or "De-Ice" position. If the relay does *not* energize in the control head "Vent" or "De-Ice" position, the relay or the control head switch is defective.

Programmer Blower Switch Test

20. Place the A.C.C. Tester's "Temperature Dial Calibrator" switch in the "Off" position, the "Voltmeter" knob in the "Blower" position, and the "Manual-Automatic" switch in the "Manual" position.

21. Using the "Manual Control" move the programmer from full heat to the full A/C position. The voltage at the blower (coming from programmer terminal No. 5) should be battery voltage in full heat. As the programmer moves from full heat, the voltage should drop in steps, indicating different blower speeds, and then increase in steps to battery voltage in full A/C. If the voltage steps are not present or battery voltage is not indicated on the tester voltmeter when in full heat and full A/C operation, then the programmer is defective.

CALIBRATION PROCEDURE USING TESTER J-23678 AND TOOL J-21530

Preliminary Calibration Information

Be sure to allow sufficient time for the car engine to warm up and for the system to turn on before attempting calibration. *Do not skip any steps in the Calibration Procedure.*

Temperature Dial Calibration

1. Connect the A.C.C. Tester J-23678 into the wiring harness and the programmer.

2. Place the control head selector lever in the "Vent" position.

3. Place the "Manual-Automatic" switch on the tester in the "Manual" position.

4. Place the "Temperature Dial Calibrator" switch on the tester in the "Calibrate" position.

5. Note the voltmeter reading.

6. Press the "Calibrate" button and note the voltmeter reading.

7. With the "Calibrate" button pressed in, rotate the temperature dial on the control head until the voltmeter reading is the same as it was in Step 5 (when the button is not pressed in).

8. The temperature dial should be set at the temperature dial setting on the tester panel. If it does not, use Tool No. J-21530 to hold the gear on the left side of the temperature dial and slip the temperature dial to the correct setting. If the temperature dial cannot be calibrated using this procedure, it is defective.

Programmer Amplifier Calibration (Feedback Pot Adjustment)

1. Remove the plastic cover from the programmer while it is still mounted in the car.

2. Connect the A.C.C. Tester J-23678 into the wiring harness and the programmer.

3. Place the control head selector lever in the "Auto" position.

4. Place the "Manual-Automatic" switch on the tester in the "Manual" position.

5. Place the "Temperature Dial Calibrator" switch of the tester in the "Off" position.

6. Rotate the "Manual Control" knob on the tester to the "Max. Heat" position. The programmer should move to the full heat position.

7. Rotate the "Manual Control" knob to 180 and STOP. DO NOT OVER-TRAVEL.

8. Using a blade-type screwdriver, slip the shaft of the feedback potentiometer fully counterclockwise to its stop (see Figure 9B-204 for location of the feedback potentiometer in the programmer). The vacuum motor mechanism will be "in" the vacuum motor indicating full heat operation.

9. Using the screwdriver, very slowly slip the feedback potentiometer clockwise until the first movement of the vacuum motor mechanism can be seen. Stop the adjustment when the movement first occurs. (Do not watch the programmer output shaft.)

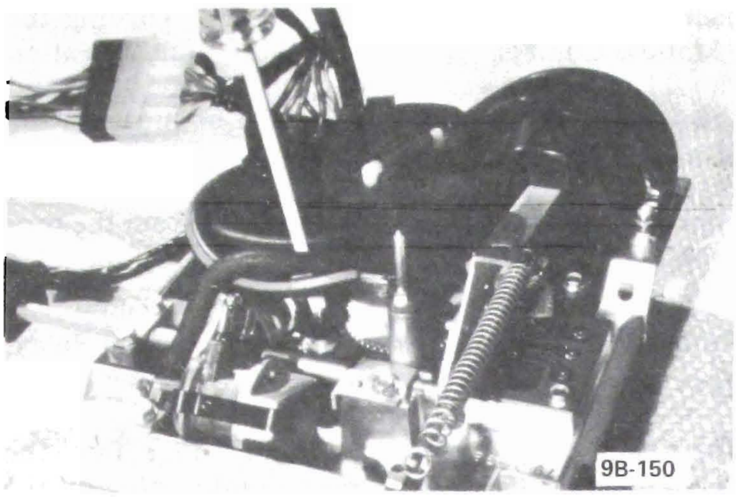


Figure 9B-204 Feedback Potentiometer Adjustment

10. To check the adjustment, rotate the "Manual Control" knob to the "Max. Heat" position. Then slowly rotate the "Manual Control" knob counterclockwise and the vacuum motor mechanism should first start to move when the "Manual Control" knob is exactly at 180 plus or minus 1. Touch up the feedback potentiometer adjustment in the programmer so that the mechanism movement occurs exactly at 180. If this adjustment cannot be made, the programmer is defective.

ON-THE-BENCH TROUBLESHOOTING PROCEDURE FOR PROGRAMMER

Equipment Required

1. A good filtered D.C. Power Supply, rated at 5 amperes at 12 volts.

2. Kent-Moore No. J-23678 Automatic Temperature Control Tester.

3. Vacuum Supply, capable of 20 inches of Hg. or more (Kent-Moore No. J-5428-03 or No. J-23178 or equivalent).

4. 1/4 inch hollow socket spin tight.

5. Medium size blade screwdriver.

6. Long-nose pliers.

7. Electrical test connector (Kent-Moore No. J-23713).

Refer to Figure 9B-283 for identification of all programmer components. Before attempting to repair or adjust a programmer, locate the "output shaft", the "feedback potentiometer", the "vacuum motor", the "blower switch", the "vacuum checking relay", the "transducer", and the "rotary vacuum valve".

When following the troubleshooting procedure, do not skip any steps unless instructed to do so.

The A.C.C. tester "Manual-Automatic" switch should always be in the "Manual" position and the "Temperature Dial Calibration" switch should always be in the "Off" position when troubleshooting the programmer on the bench.

1. Plug the male connector of the A.C.C. Tester electrical harness into programmer.

2. Plug the electrical test connector No. J-23713 into female connector of A.C.C. tester electrical harness.

3. Plug the hard rubber dummy plug from the tester onto the programmer rotary valve and then connect it to the vacuum supply. Turn on the vacuum supply to 20 inches Hg. or more.

4. Connect the positive lead of a 12-volt DC power supply altered to the yellow wire from electrical test connector and connect the negative lead of the supply to the black wire of the test connector. The "Voltage" knob of the tester should read 12 volts when in the "No. 2 Feed" position, the "No. 7 Lo-Relay" position, and the "No. 8 Auto Relay" position. If it doesn't, check the voltage supply and hook-up.

5. On the A.C.C. tester, place the "Manual-Automatic" switch in the "Manual" position and the "Temperature Dial Calibration" switch in the "Off" position.

6. Rotate the A.C.C. tester "Manual Control" knob from "Max. Heat" to Max. Cold". (Make sure the power supply is adjusted for 12 volts DC and vacuum supply is at 20 inches Hg. or more.) The programmer output shaft should rotate 120 degrees (1/3 rotation of shaft) from maximum heat to maximum cold. If it does rotate normally, skip to Step 18.

7. If the programmer output shaft does not operate properly in Step 6, remove the cover of the programmer and reconnect the tester electrical connector and the rotary vacuum valve rubber dummy plug. Recheck programmer operation as described in Step 6. If the programmer output shaft now operates normally, look for pinched vacuum hose, loose electrical connection, pinched or shorted wires, shorted Darlington Amplifier heat sink, or a mechanical bind with the programmer cover. Be sure to tap the programmer components with the handle of a screwdriver to check for intermittent problems.

Amplifier Test

8. If the programmer output shaft still does not operate properly, place the "Voltage" knob of the tester in the "Probe and Clip" position. Connect the alliga-

tor clip lead to the transducer terminal with the gray wire. Do not short transducer terminals together or amplifier will be damaged.

Push the probe into the programmer connector body making contact with terminal No. 2 which connects to a yellow wire.

9. Rotating the "Manual Control" knob from "Max. Heat" to "Max. Cold" (or vice-versa), the voltmeter reading should *change 5 volts or more* (after it is stabilized). This change indicates that the amplifier is "good". If the 5 volts or more change is *not* obtained, check the amplifier heat sink insulator for proper positioning. If the heat sink is shorted to the programmer chassis, the programmer will go to the full AC position.

If the voltage change cannot be obtained and the insulator is okay, check the calibration of the amplifier according to the instructions in Step 18. If the programmer still does not function properly, replace the amplifier circuit board and be sure to *install the new heat sink insulator properly.* The new amplifier *must be calibrated* according to Step 18 after installation.

Transducer Test

10. If the 5 volts change was present in the amplifier check in Step 9, but the programmer output shaft does not operate normally, leave the "Probe and Clip" connected, as instructed in Step 8 *throughout Transducer Test Procedure.*

11. Disconnect vacuum hose from the small diameter port of the transducer and connect A.C.C. tester's hose to the vacuum gauge directly to this hose. About 20 inches Hg. or more vacuum should be present on this transducer vacuum supply hose. If vacuum is proper, restore hose connection. If 20 inches Hg. or more is *not* present, check the vacuum supply vacuum level and then go to Steps 14, 15, 16, and 17 to check for vacuum leaks in the vacuum checking relay and the rotary vacuum valve.

12. To check for properly-regulated vacuum output from the transducer, disconnect the long hose from the transducer to the vacuum checking relay *at the relay.*

This long hose must be at least 15 inches long, or the transducer will make a buzzing noise.

Connect the A.T.C. tester's vacuum gauge directly to the long hose at the vacuum checking relay.

13. Position the programmer in an upright position so that the output shaft points straight up. With the "Manual Control" knob in the "Max. Heat" position, 0 volts should be read on the voltmeter and the vacuum should be 9 to 11 inches Hg. Turning the "Manual Control" knob to the "Max. Cold" position should make the vacuum drop to 0 inches Hg. and the voltage should increase 5 volts or more. If the above indications *do not occur,* the transducer is defective. After the check is completed, restore hose connection. Disconnect probe and clip from the programmer.

Rotary Vacuum Valve and Vacuum Checking Relay Test

14. Connect the tester's vacuum gauge into the vacuum feed line to the rubber dummy plug on the programmer rotary vacuum valve. Disconnect the center hose from the side port of the rotary vacuum valve and seal off the port by placing your finger over the port. The tester's vacuum gauge should read 20 inches Hg. or more. If it does not, either the vacuum checking relay or the rotary vacuum valve is leaky. If 20 inches Hg. or more vacuum is read, skip to Step 16 and restore the hose connection.

15. Remove all three hoses from the side ports of the rotary vacuum valve. Remove the short hose from the transducer and connect it across the two outer ports on the side of the rotary valve. Place finger over center side port of the rotary vacuum valve. If the tester's vacuum gauge now reads 20 inches Hg. or more, the *vacuum checking relay* is defective. If it does *not,* the rotary valve is defective and leaking. After repair of programmer, restore all hose connections.

Vacuum Motor and Vacuum Checking Relay Test

16. Disconnect electrical connector from programmer. *Do not disconnect* the vacuum input to programmer. The programmer should go to the full heat position (the vacuum motor mechanism will move into the vacuum motor). If it does not, then either the vacuum checking relay or the vacuum motor has a severe leak. If it does go to full heat, a slight leak may be present and the vacuum motor will move toward "Max. Cold" after removing the rubber dummy plug from the programmer.

17. If the vacuum motor mechanism moves, the vacuum motor or vacuum checking relay is leaking. Disconnect the short hose at vacuum motor. Apply raw vacuum to the vacuum motor input port, then pinch the hose at the vacuum motor with long nose pliers and hold for 30 seconds. If the mechanism moves, the vacuum motor is defective. If it does *not* move, the vacuum checking relay is defective.

Amplifier Calibration (Feedback Pot Adjustment)

18. a. Remove the programmer cover and make the connections to programmer, as described in Steps 1 through 4.

b. Using a screwdriver, slip the shaft of the feedback potentiometer, turning the shaft fully counterclockwise (gear does not move). See Figure 9B-204. The vacuum motor should now be in the "Full Heat" position. (The vacuum motor mechanism will move into the vacuum motor.)

c. Place the "Manual-Automatic" switch in "Manual" position. Rotate the "Manual Control" to the "Max. Heat" position.

d. Carefully adjust the "Manual Control" to "180" and *do not overshoot.*

e. Slip the shaft of the feedback "pot" very slowly clockwise looking for signs of *vacuum motor, mechanism movement.* (Do not watch the output shaft.) Stop the adjustment when movement first occurs.

f. Check the adjustment with the "Manual Control". Rotate the "Manual Control" to the "Max. Heat" position. Watch for signs of vacuum motor mechanism movement while slowly rotating the "Manual Control" back toward "180". The first sign of movement should occur when the "Manual Control" knob is exactly on "180". Touch up the feedback potentiometer adjustment in the programmer so that the mechanism movement occurs exactly at "180".

Programmer Blower Switch Test

19. Place the "Voltage" knob in the "No. 6 Blower" position. Rotate the "Manual Control" knob to the "Max. Heat" position. The voltmeter reading should be 12 volts DC (supply voltage). As the "Manual Control" knob is slowly rotated toward "Max. Cold", at about "175", the voltage will drop slightly . Then at about "160" the voltage will again drop slightly and at about "155", the voltage will again drop slightly. At about "130", the voltage will increase slightly. At about "120", the voltage will again increase slightly and again at about "110", a slight increase should be noted. If these steps in blower voltage are not present, the blower switch in the programmer is defective.

20. Tap the components of the programmer while rotating the "Manual Control" knob and watch for any erratic operation due to intermittent problems. Replace programmer cover and rotate "Manual Control" knob, checking for normal rotation of the output shaft.

TROUBLE DIAGNOSIS GUIDE

Blower Inoperative

Possible Causes

Disconnected loose or corroded blower ground wire.

Disconnected feed wire.

Defective blower.

Defective fuse.

Defective blower switch in programmer.

Test programmer with Tester J-23678.

Blower, Programmer, and Compressor Inoperative

Possible Causes

Connection broken at:

Engine Harness Connector Plug (No. 10 red wire and green wire)

Cluster Extension Harness to I/P Harness Connector Plug

Cluster Extension Harness to Body Extension Harness Connector Plug

Hi Blower Only MAX HEAT Position

Possible Cause

Disconnected plug at programmer.

Lo Blower Only

Possible Causes

Disconnected plug at control head to body extension harness.

Disconnected plug at auto relay.

No LO Blower in OFF, VENT, and LO Positions

Possible Causes

Disconnected plug at the lo relay.

Defective relay.

Immediate Lo Blower - Car Start-Up - In-Car Temperature Below 80 Degrees

Possible Cause

Defective engine thermal switch.

Immediate Lo Blower - Car Start-Up - In-Car Temperature Above 80 Degrees

Possible Causes

Check preceding causes.

Low Blower Inoperative All Positions

Possible Cause

Defective engine thermal switch.

Compressor Inoperative Above 32 Degrees Ambient

Possible Causes

Disconnected ambient switch.

Defective ambient switch.

Disconnected plug at compressor.

Defective compressor coil.

Missed terminal in engine harness connection.

Compressor Operates Below 32 Degrees

Possible Causes

Shorted ambient switch.

Shorted wire in compressor circuit.

Defective compressor clutch.

Maximum Heat Mode AUTO RANGE Positions - No Temperature Control - No Automatic Blower Changes

Possible Causes

Disconnected ambient sensor.

Disconnected in-car sensor. Buzzing of programmer transducer may occur when selector lever is changed to "VENT" position.

Disconnected vacuum hose in programmer - vacuum valve to checking relay (purple).

Maximum Heat Mode All Positions - No Temperature Control - No Automatic Blower Changes

Possible Cause

Disconnected vacuum plug at:

Control Head (Vacuum)

Programmer (Vacuum)

Main Vacuum Harness Connector

Vacuum Manifold defective

Maximum Heat Mode and Cold Air From Heater Outlet

Possible Causes

Disconnected vacuum hose in programmer - vacuum valve to checking relay (black).

Disconnected vacuum hose at vacuum source line (black at firewall).

Defective vacuum manifold.

Max. A/C All Positions

Possible Causes

Shorted ambient sensor.

Shorted in-car sensor.

Disconnected vacuum hose in programmer at:

Source to transducer (short black hose).

Vacuum motor to transducer (black and white hose).

Max. A/C Only in AUTO RANGE Positions Cold Air Out of Outlets

Possible Cause

Disconnected vacuum hose in programmer - vacuum motor to checking relay (yellow) - shorted sensor string.

Erratic Temperature Control

Possible Causes

Kinked or disconnected aspirator hose.

Defective programmer.

Defective control head. Test programmer with Tester J- 23678.

Temperature of Discharge Air Too Hot or Too Cool at Mode Change

Possible Cause

Misadjusted temperature door linkage.

Insufficient Heat

Possible Causes

Misadjusted temperature door linkage.

Defective water valve.

Defective engine thermostat.

Low coolant.

Modes Will Not Change in AUTO RANGE Positions From A/C to Heat

Possible Causes

Black and grey vacuum source lines switched.

Disconnected source vacuum hose to reservoir.

Leaking vacuum reservoir.

Excessive Temperature Difference at Outlets Bi-Level Operation (Left Outlet Warmer Than Center)

Possible Cause

Vacuum lines switched at upper and lower mode door diaphragms.

Partial Air Flow to Windshield in DEF and No Air Flow to Windshield in BI-LEVEL Position

Possible Cause

Vacuum lines to defroster (dual) diaphragm switched.

Normal BI-LEVEL operation has a delay before door opens.

No Air Flow to Windshield in Either BI-LEVEL or DEF Position

Possible Causes

Either vacuum line to defroster diaphragm disconnected.

Leaking dual diaphragm.

MAINTENANCE AND ADJUSTMENTS

ADJUSTMENT OF AUTOMATIC CLIMATE CONTROL PROGRAMMER, LINK ASSEMBLY, AND TEMPERATURE DOOR

1. Loosen the hex screw of the door link at the output shaft of the programmer. See Figure 9B-272.

2. Place the control head selector lever in the "DE-ICE" position.

3. Remove the electrical connector from the programmer which results in the proper position of the output shaft of the programmer.

4. Check to make sure that the air mix door is in the full heat position. The blower air flow will now hold the mix door in the proper position.

5. Without disturbing the door link or the output shaft position, tighten the hex screw on the door link.

6. Connect ATC tester J-23678 into the wiring harness and the programmer. With the "Manual-Automatic" switch in the "Manual" position, rotate the "manual control knob" from maximum heat to maximum cold and check for full travel of the air mix door and the programmer.

7. Install vacuum and electrical connections.

TEMPERATURE DIAL CALIBRATION

Be sure to allow sufficient time for car engine to warm up and A.C.C. system to turn-on before attempting calibration.

1. Connect A.C.C. Tester J-23678 into the A.C.C. wiring harness and the programmer.

2. Place control panel selector lever in "VENT".

3. Place manual-automatic switch on the tester in the manual position.

4. Place the temperature dial calibrator switch on the tester in the "CAL" position.

5. Note the voltmeter reading on tester.

6. Press "Compare" button and note voltmeter reading.

7. With the "Compare" button pressed in, rotate the temperature dial on the control panel until the voltmeter reading is the same as it was in Step 5 (button not pressed in).

8. The control panel temperature dial should be set at the temperature dial setting on the tester panel ("75"). If it does not, use Tool J-21530 to hold the gear on the left side of the temperature dial and slip the dial to the correct setting. If the temperature dial cannot be calibrated using this procedure, it is defective.

MAJOR REPAIR

REMOVAL AND INSTALLATION OF DASH CONTROL ASSEMBLY

Removal

1. Disconnect battery.

2. Unscrew headlight escutcheon and remove headlight switch.

3. Remove lower dash trim.

4. Remove 2 see-lights from trim plate.

5. Remove 4 screws from control face.

6. Remove 1 screw from under dash which connects heater control to instrument panel forward support.

7. Disconnect vacuum and electrical connectors.

8. Remove control assembly.

Installation

1. Install control assembly reverse of removal procedure.

REMOVAL AND INSTALLATION OF BLOWER MOTOR

Removal

1. Disconnect blower motor wire.

2. Remove screws securing blower motor to air inlet assembly.

Installation

Install blower motor reverse of removal procedure.

REMOVAL AND INSTALLATION OF HEATER ASSEMBLY OR HEATER CORE

Removal

1. Drain radiator and disconnect heater inlet and outlet hoses at dash.

2. Disconnect control wires from defroster door and vacuum hose diverter door actuator diaphragm and control cable from temperature door lever.

3. Remove 4 nuts securing heater assembly to dash.

4. Remove screw securing defroster outlet tab to heater assembly.

5. Work heater assembly rearward until studs clear dash and remove heater assembly.

Installation

Install heater assembly reverse of removal procedures and seal along mating surfaces between dash and heater assembly.

REMOVAL AND INSTALLATION OF IN-CAR SENSOR

Removal

1. Open glove box door.

2. Reach up through opening in glove box and grasp sensor body and twist 1/4 turn clockwise and pull down through opening.

3. Disconnect wire connector from sensor.

4. Disconnect aspirator hose from sensor.

5. Remove sensor.

Installation

To replace, reverse removal procedure, making sure sensor body spacer is in between body and sensor grille.

REMOVAL AND INSTALLATION OF PROGRAMMER

Removal

1. Remove glove box.

2. Loosen adjustment screw on link assembly.

3. Remove vacuum and electrical connections.

4. Remove 3 screws from programmer and remove programmer.

Installation

1. To replace, install programmer onto the heater defroster assembly.

2. Install the link assembly onto the output shaft leaving the hex screw loose.

3. Place the control head selector lever in the "DE-ICE" position and install the vacuum harness assembly.

4. Check to make sure that the air mix door is in the full heat position. The blower air flow will hold the mix door in the proper position.

5. Without disturbing the door link or the output shaft position, tighten the hex screw on the door link.

6. Connect ATC tester J-23678 into the wiring harness and the programmer. With the "Manual-Automatic" switch in the "Manual" position, rotate the "Manual Control Knob" from maximum heat to maximum cold and check for full travel of the air mix door and the programmer.

7. Install the electrical connector.

REMOVAL AND INSTALLATION OF PROGRAMMER COMPONENTS

Vacuum Valve Removal

1. Identify vacuum hoses connected to the two outboard side ports of the vacuum valve and the port to which each is connected. Disconnect the two vacuum hoses.

2. Disconnect vacuum hose to center port on valve at the transducer.

3. Remove two vacuum valve retaining studs and remove valve. Lift valve drive arm off of vacuum motor mechanism boss when removing valve.

Installation

1. Make certain vacuum valve spring is in place. Refer to Figure 9B-205.

2. Place vacuum valve on the spring and valve drive arm on vacuum motor mechanism boss.

3. Replace two vacuum valve retaining studs.

4. Reconnect vacuum hose from the center port on the valve to the transducer.

5. Reconnect the 2 vacuum hoses going from the 2 outboard side ports of the vacuum valve to ports 3 and 5 of vacuum checking relay.

Checking Relay Removal

1. Disconnect 2 vacuum hoses from vacuum valve at the relay. Identify hoses and relay ports to which they connect for reconnecting.

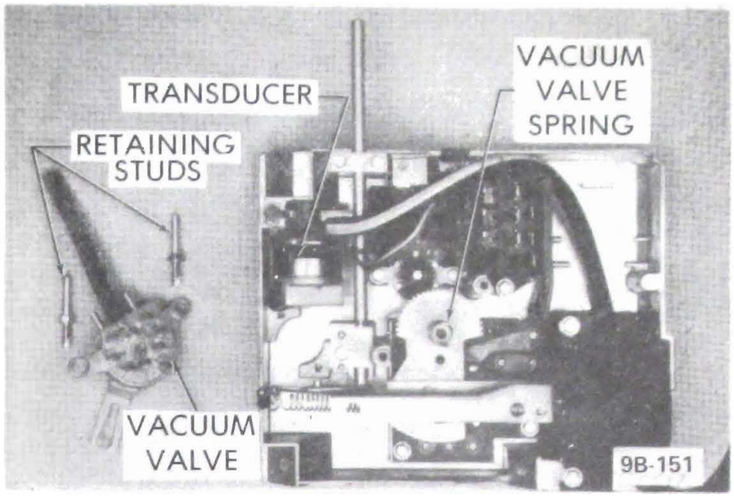


Figure 9B-205 Vacuum Valve - Removed

2. Disconnect long vacuum hose at other side of relay and short vacuum hose at the vacuum motor and remove relay.

Installation

If long vacuum hose (from checking relay to transducer) is replaced, the replacement hose must be at least 15 inches in length. See Figure 9B-206.

1. Reconnect long vacuum hose (white) to port 2 of relay and short vacuum hose (yellow) to the vacuum motor.

2. Reconnect the 2 vacuum hoses going from the 2 outboard side ports of the vacuum valve to ports 3 and 5 of the checking relay.

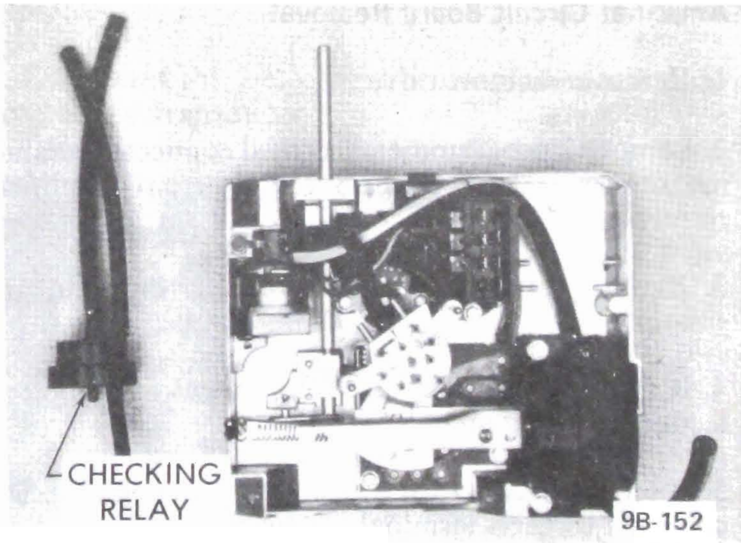


Figure 9B-206 Checking Relay - Removed

Transducer Removal

1. Disconnect two vacuum hoses at transducer; identify hoses and ports for reconnection.

2. Disconnect and identify 2 electrical terminals to transducer.

3. Remove hex screw, retaining clip, and transducer.

Installation

1. Replace transducer, retaining clip, and hex screw. See Figure 9B-207.

2. Reconnect the 2 electrical terminals to the transducer.

3. Reconnect the 2 vacuum hoses to the transducer. The white hose goes to the larger port of the transducer and the black hose from the vacuum valve goes to the smaller port of the transducer.

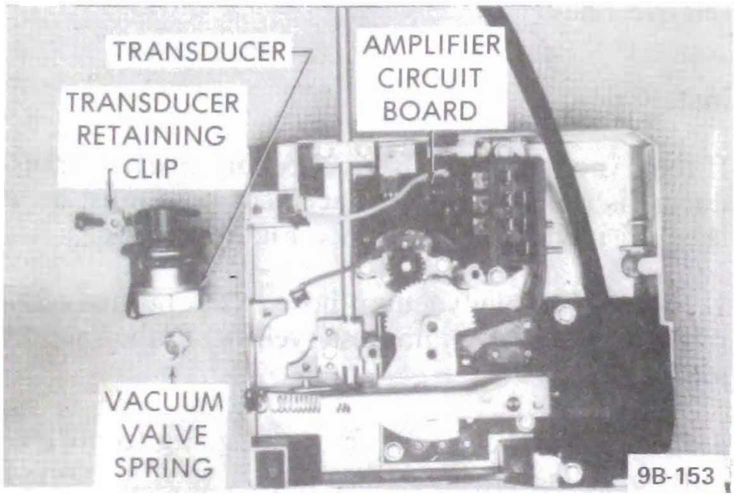


Figure 9B-207 Transducer - Removed

Amplifier Circuit Board Removal

1. Remove vacuum valve.

2. Remove 2 programmer electrical connector retaining screws and lift connector body from amplifier terminals.

3. Remove amplifier heatsink retainer clip and insulator.

4. Remove 2 amplifier retaining screws at amplifier feedback potentiometer.

5. Disconnect 2 wires at transducer. Note which wire connects to each terminal.

6. Remove amplifier circuit board.

Installation

1. Replace electrical connector to amplifier terminals on circuit board and place circuit board back into the programmer. See Figure 9B-208.

2. Replace the 2 amplifier retaining screws at amplifier feedback potentiometer.

3. Replace the 2 programmer electrical connector retaining screws.

4. Replace amplifier heatsink retainer clip and insulator.

5. Reconnect grey and yellow wires to transducer.

6. Replace vacuum valve.

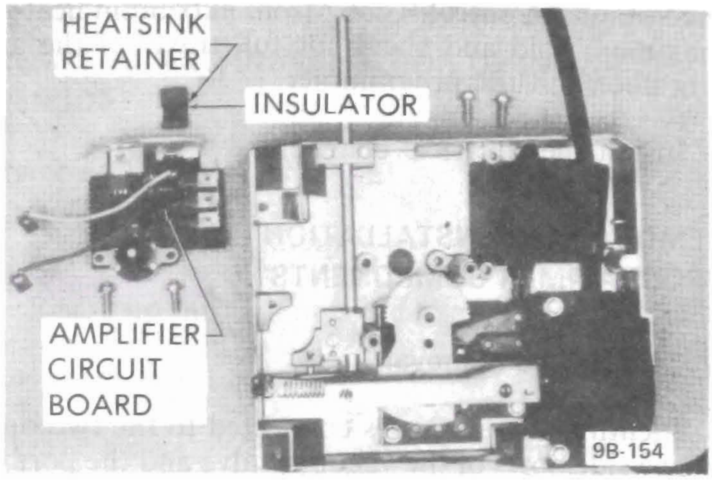


Figure 9B-208 Amplifier Circuit Board - Removed

Vacuum Motor Removal

1. Remove vacuum valve retaining studs and lift vacuum valve to remove drive arm from boss on vacuum motor mechanism.

2. Remove retaining clip and power spring from motor mechanism.

3. Disconnect vacuum hose from port on motor.

4. Remove 2 motor retaining screws and remove motor, lifting upward.

Installation

1. Replace vacuum motor mechanism into proper place on mix door operating arm and tighten down retaining screw on the mix door operating arm bracket. See Figure 9B-210.

2. Position vacuum motor mechanism and motor into place and replace the motor retaining screws.

3. Reconnect vacuum hose to port on motor.

4. Replace retaining clip and power spring.

5. Replace the drive arm from the vacuum valve onto

the boss of the vacuum motor mechanism and tighten the vacuum valve retaining studs.

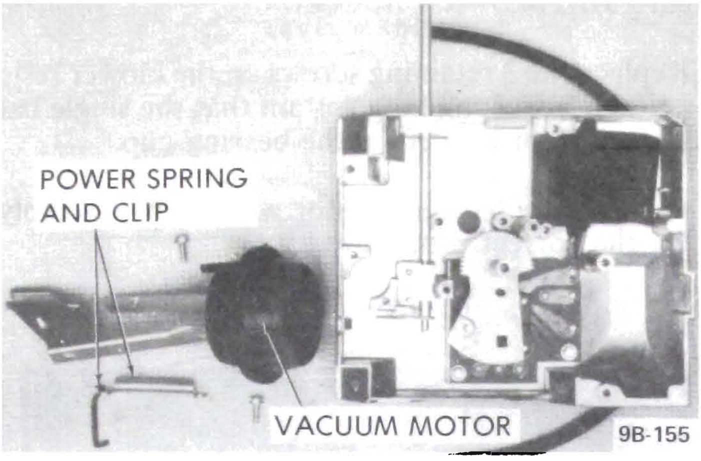


Figure 9B-210 Vacuum Motor and Power Spring - Removed

Blower Resistor Wiper Arm Assembly or Feedback Pot Arm Assembly Removal

1. Remove vacuum valve and spring.

2. Remove vacuum motor and power spring.

3. Lift blower resistor wiper arm and feedback pot arm off of blower resistor circuit board. Take care to locate single ball bearing, making certain it is located in bearing cup on blower resistor circuit board.

4. Separate blower resistor wiper arm from feedback pot arm. Be sure to locate 2 single ball bearings and insure their location in bearing cups on wiper arm.

Installation

1. Put blower resistor wiper arm and feedback pot arm back together, making certain that the 2 ball bearings are located properly in the bearing cups on the wiper arm. See Figure 9B-212.

2. Place blower resistor wiper arm and feedback pot arm onto the blower resistor circuit board, making certain that the single ball bearing is located properly in the bearing cup on the blower resistor circuit board.

3. Replace vacuum motor and power spring.

4. Replace vacuum valve and spring.

Mix Door Operating Arm Removal

1. Remove vacuum valve.

2. Remove vacuum motor retaining screws and

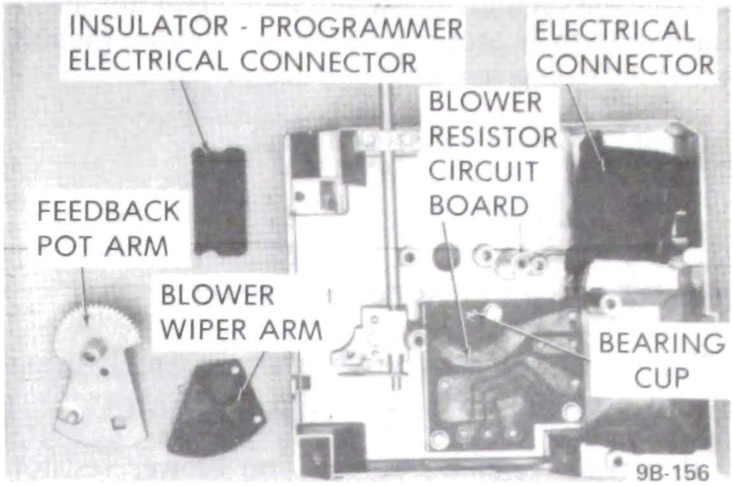


Figure 9B-212 Blower Wiper Arm and Feedback Pot Arm - Removed

power spring. Position motor mechanism to disengage mix door operating arm (programmer output shaft).

3. Disconnect electrical terminals and vacuum hoses at transducer. Identify connections for reassembly.

4. Remove 3 retaining screws and 2 retaining clips and remove mix door arm.

Installation

1. Replace mix door operating arm into holders. See Figure 9B-213.

2. Replace the 3 retaining screws and 2 retaining clips.

3. Reconnect the 2 electrical terminals and vacuum hose at the transducer.

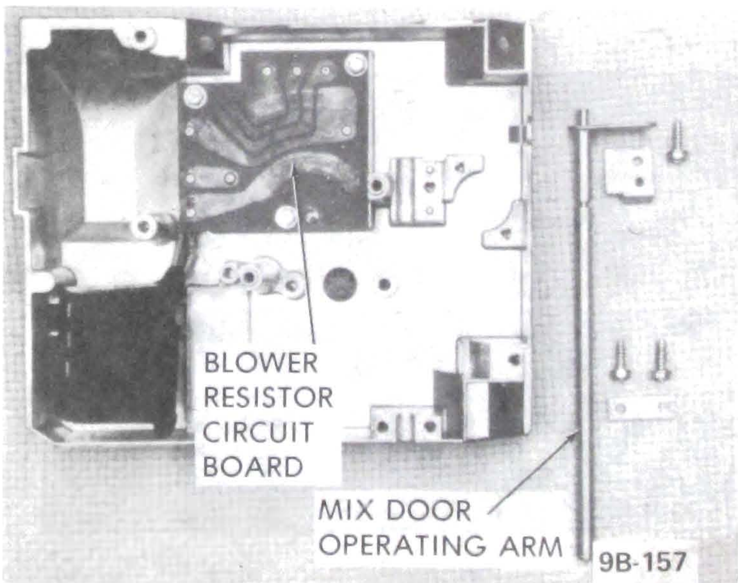


Figure 9B-213 Mix Door Operating Arm - Removed

4. Place the vacuum motor and vacuum motor mechanism into their proper position and tighten vacuum motor retaining screws.

5. Replace power spring and retainer.

6. Replace vacuum valve.

Blower Resistor Circuit Board Removal

1. Remove blower resistor wiper arm assembly using correct procedure.

2. Remove 3 retaining screws and blower resistor circuit board. Take care that single ball bearing is kept located in bearing cup on circuit board.

3. Remove 3 electrical terminals from programmer electrical connector body.

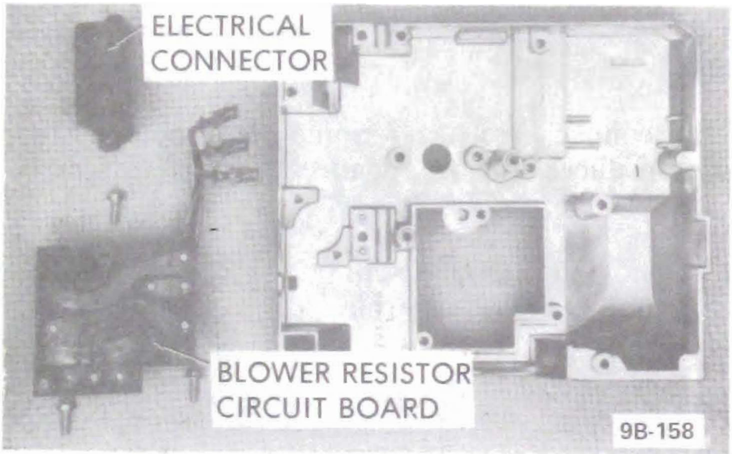


Figure 9B-214 Blower Resistor Circuit Board - Removed

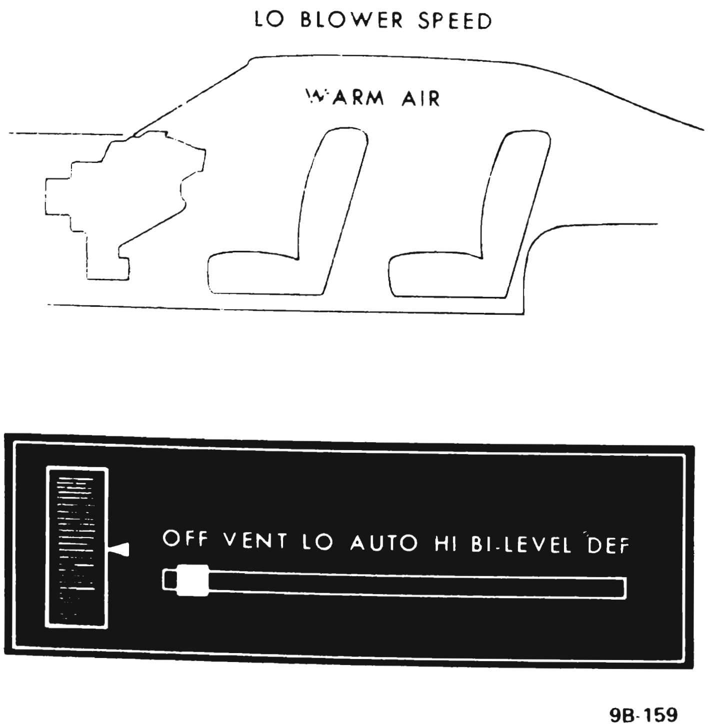


Figure 9B-215 Comfort Level - Selector Lever in OFF

Installation

1. Replace electrical terminals and electrical body connector and tighten the 2 retaining screws. See Figure 9B-214.

2. Replace the 3 retaining screws on the blower resistor circuit board, making certain that the single ball bearing is kept located in the bearing cup.

3. Replace the blower resistor wiper arm assembly, using the correct procedure.

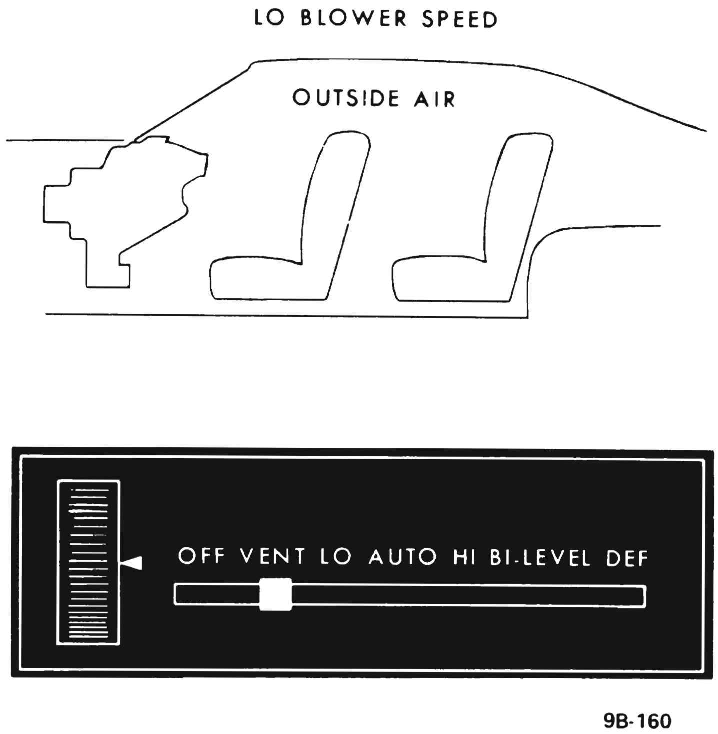


Figure 9B-216 Comfort Level - Selector Lever in VENT

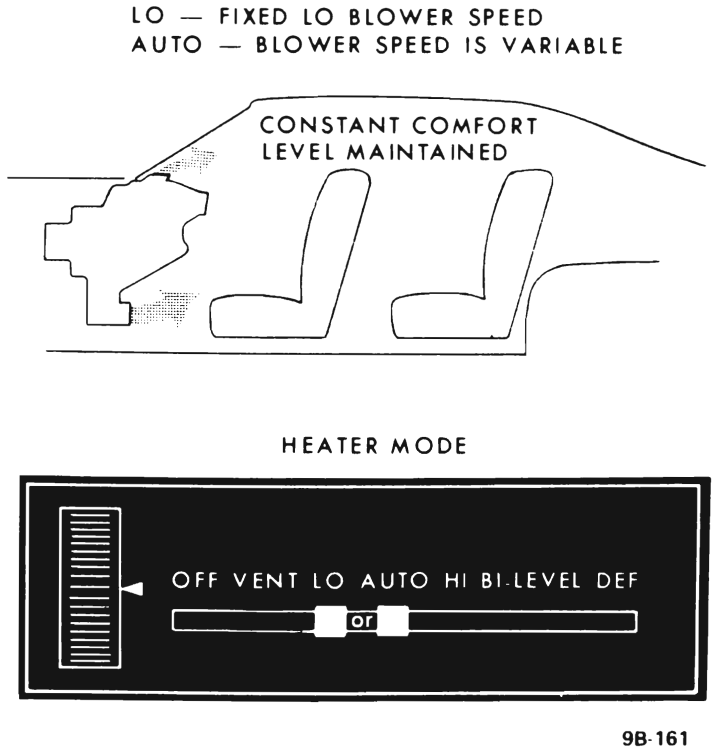
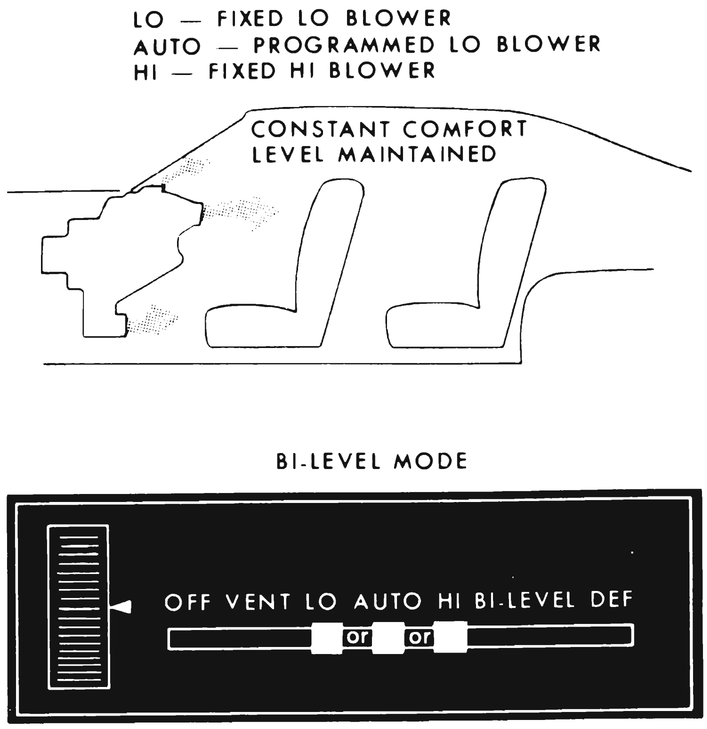
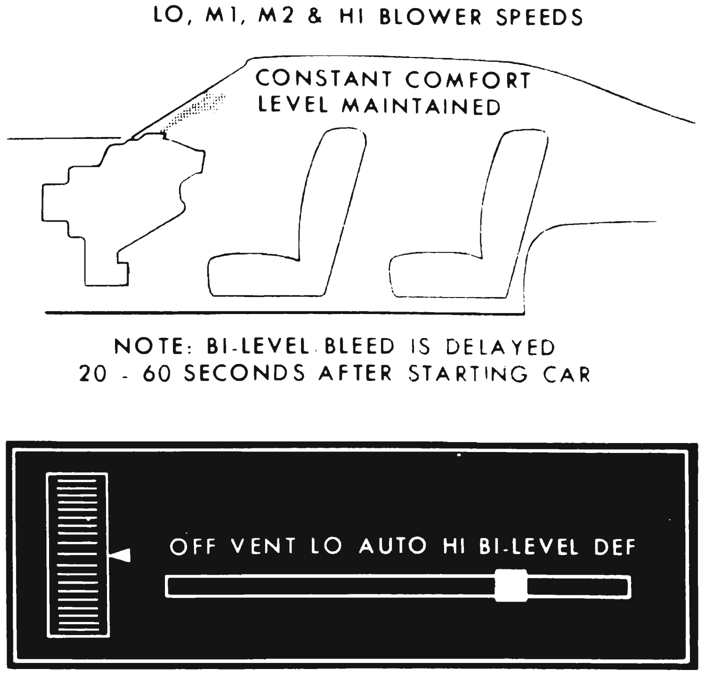


Figure 9B-217 Comfort Level - Selector Lever in AUTO LO



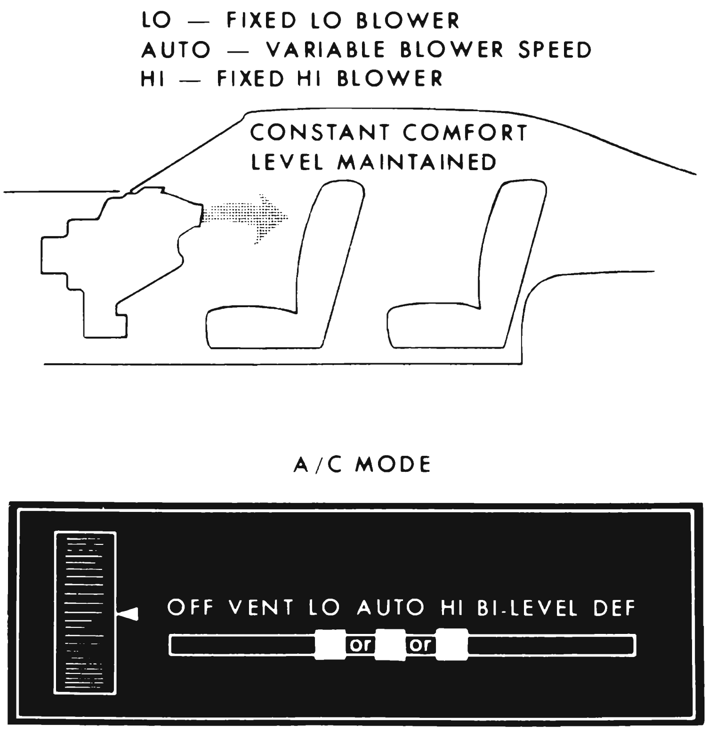
9B-162

Figure 9B-218 Comfort Level - Selector Lever in AUTO



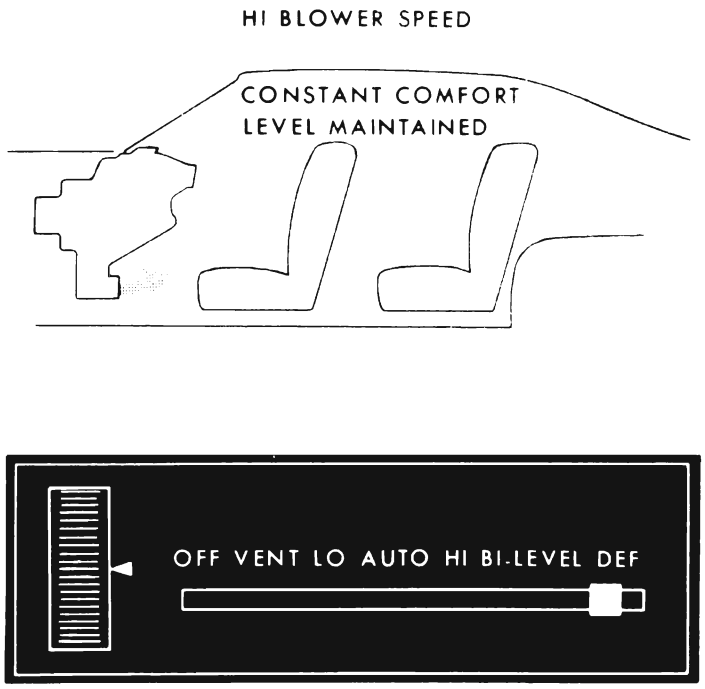
9B-164

Figure 9B-221 Comfort Level - Selector Lever in BI-LEVEL



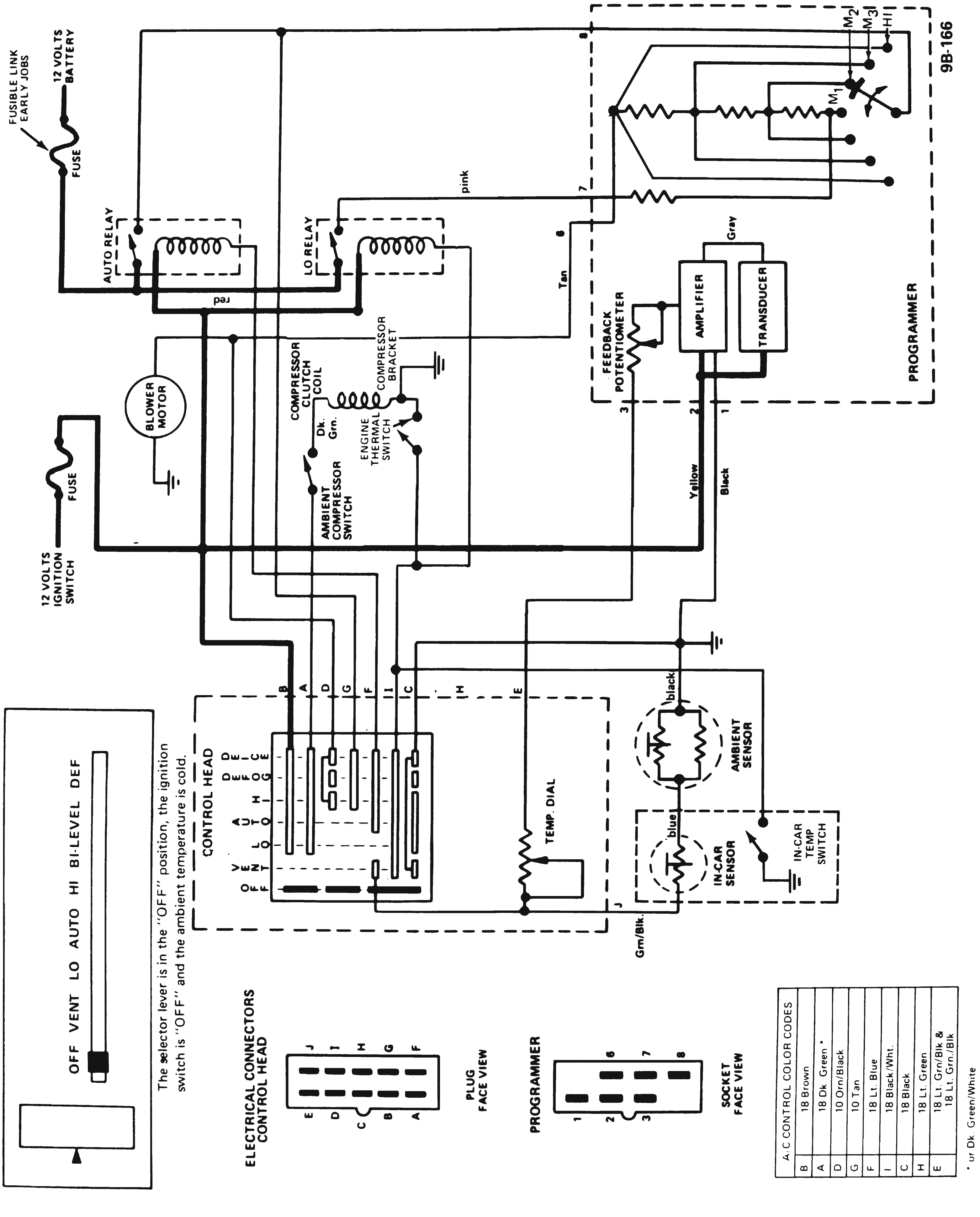
9B-163

Figure 9B-220 Comfort Level - Selector Lever in AUTO HI



9B-165

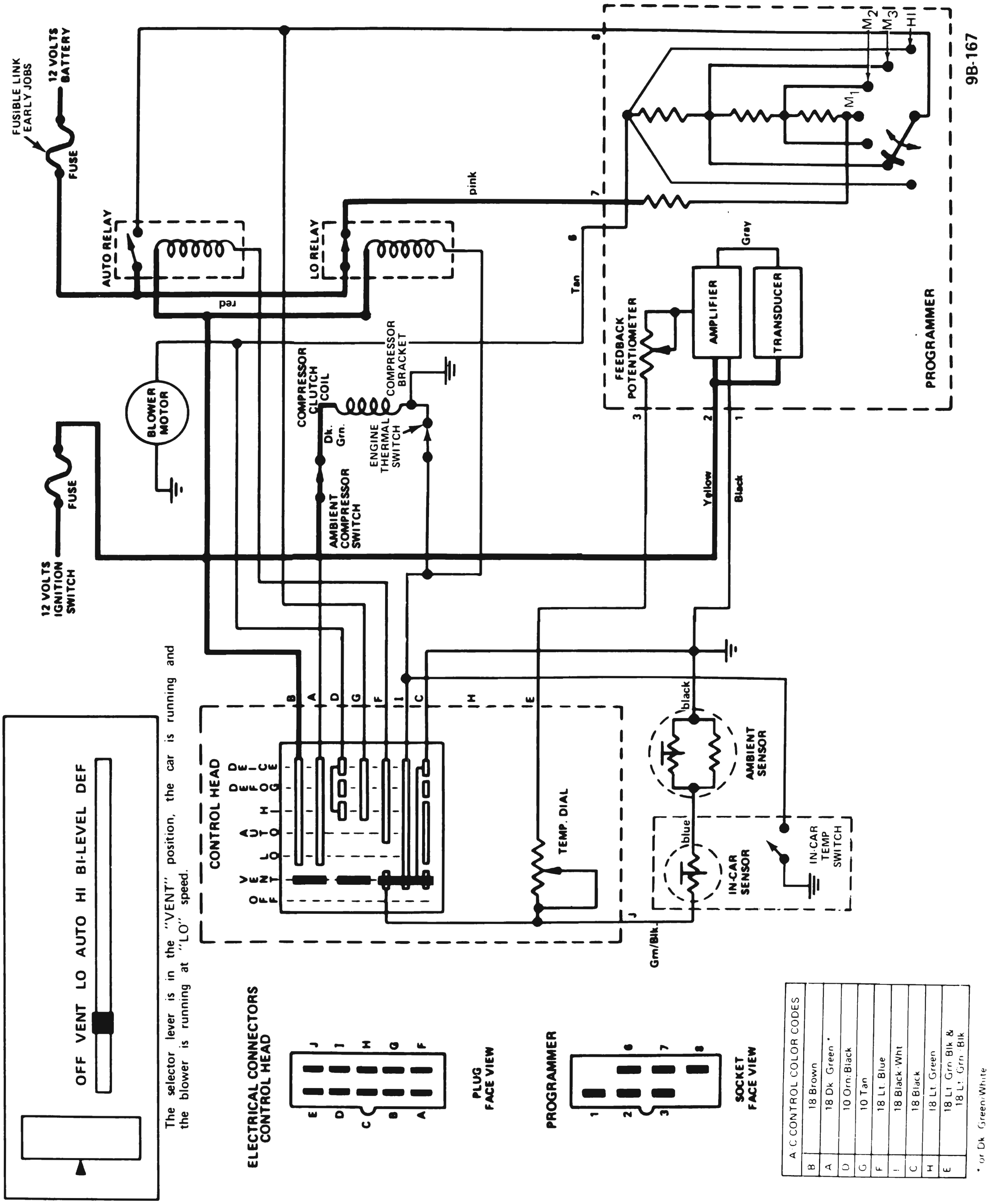
Figure 9B-222 Comfort Level - Selector Lever in DEF



A/C CONTROL COLOR CODES	
B	18 Brown
A	18 Dk. Green *
D	10 Orn/Black
G	10 Tan
F	18 Lt. Blue
I	18 Black/Wht.
C	18 Black
H	18 Lt. Green
E	18 Lt. Grn/Blk & 18 Lt. Grn./Blk

* or Dk. Green/White

Figure 9B-223 Electrical Operation - Selector Lever in OFF



A C CONTROL COLOR CODES	
B	18 Brown
A	18 Dk Green *
D	10 Orn Black
G	10 Tan
F	18 Lt. Blue
I	18 Black Wht
C	18 Black
H	18 Lt. Green
E	18 Lt Grn Blk & 18 Lt Grn Blk

* or Dk Green/White

Figure 9B-224 Electrical Operation - Selector Lever in VENT

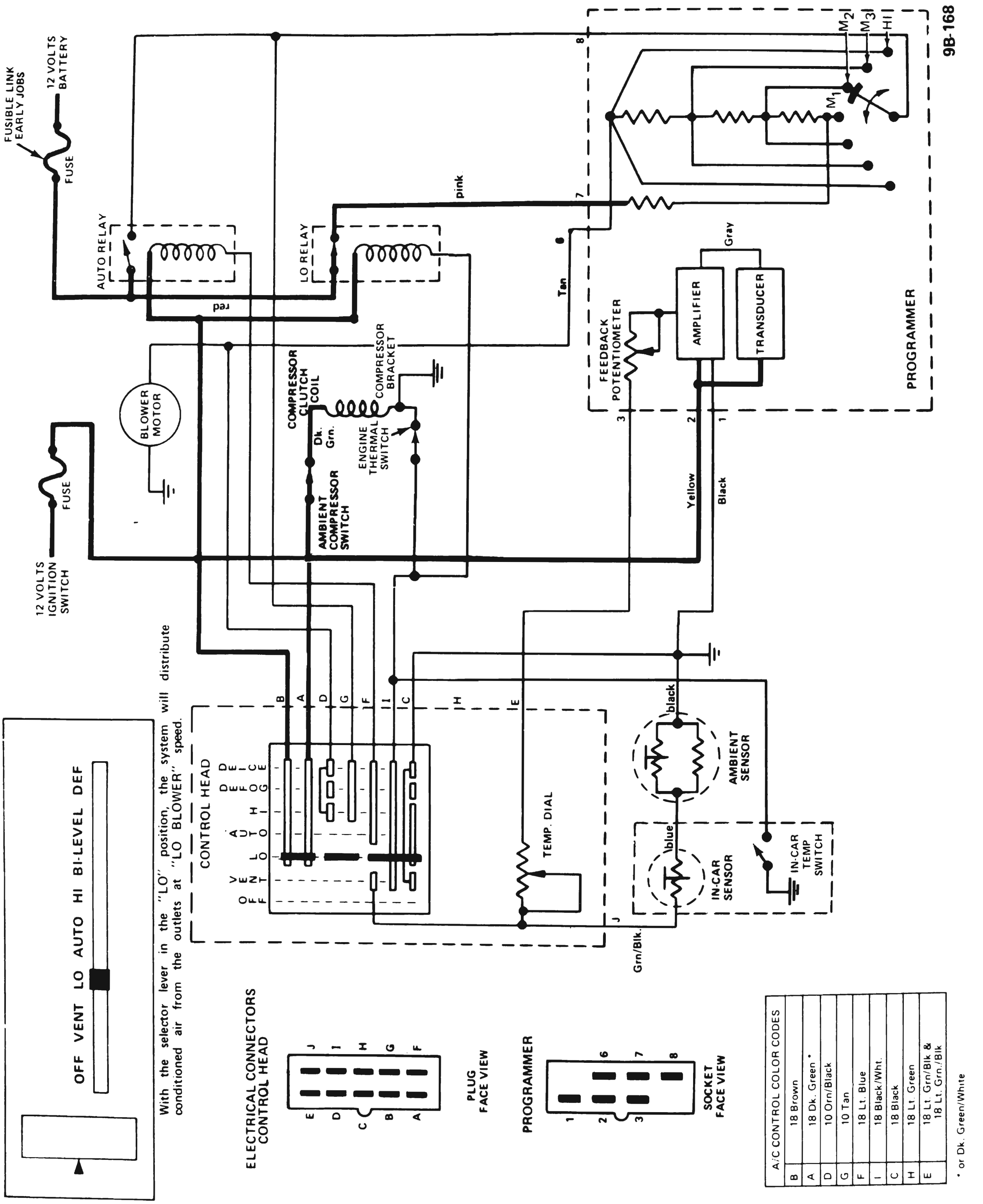
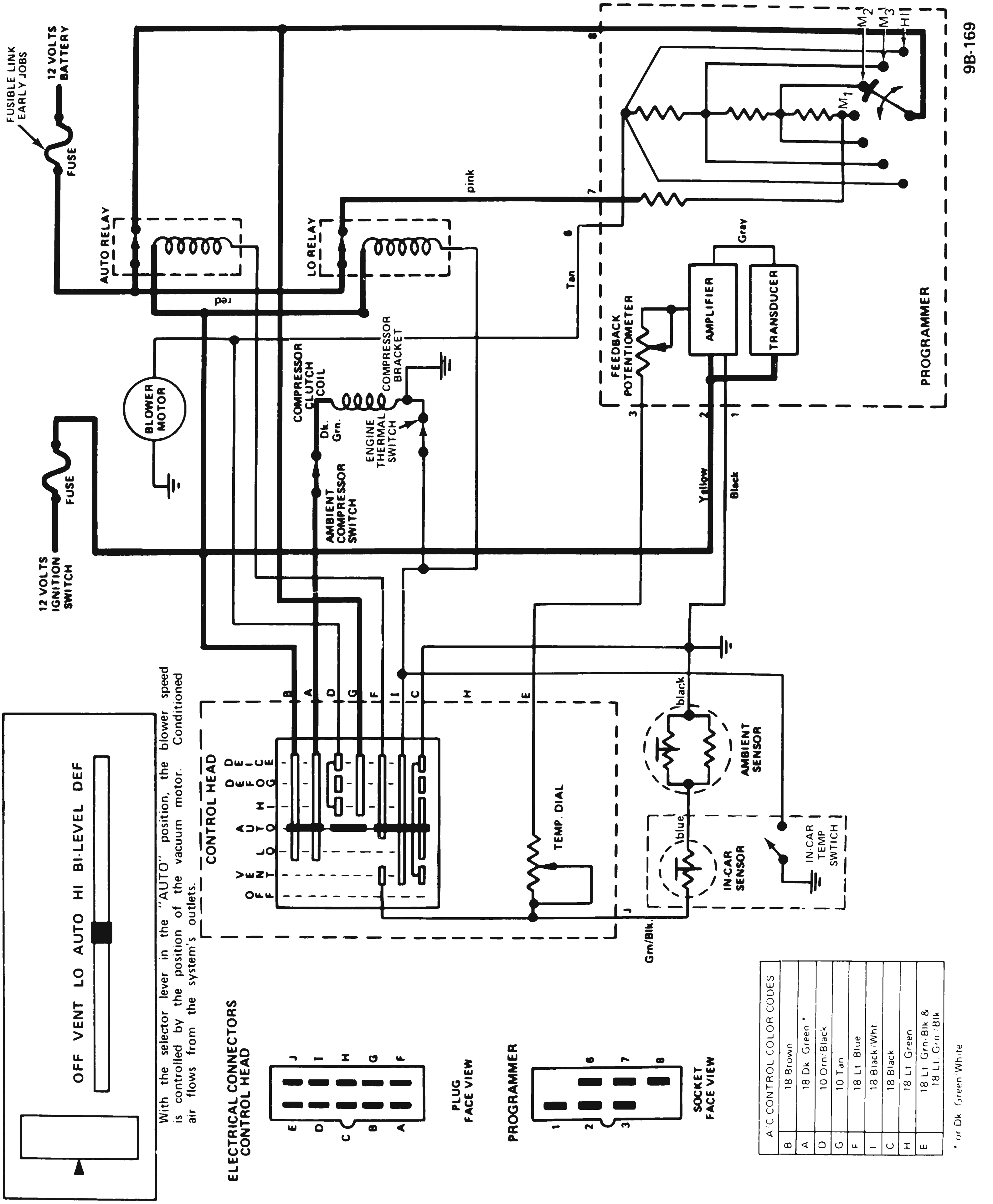


Figure 9B-225 Electrical Operation - Selector Lever in LO

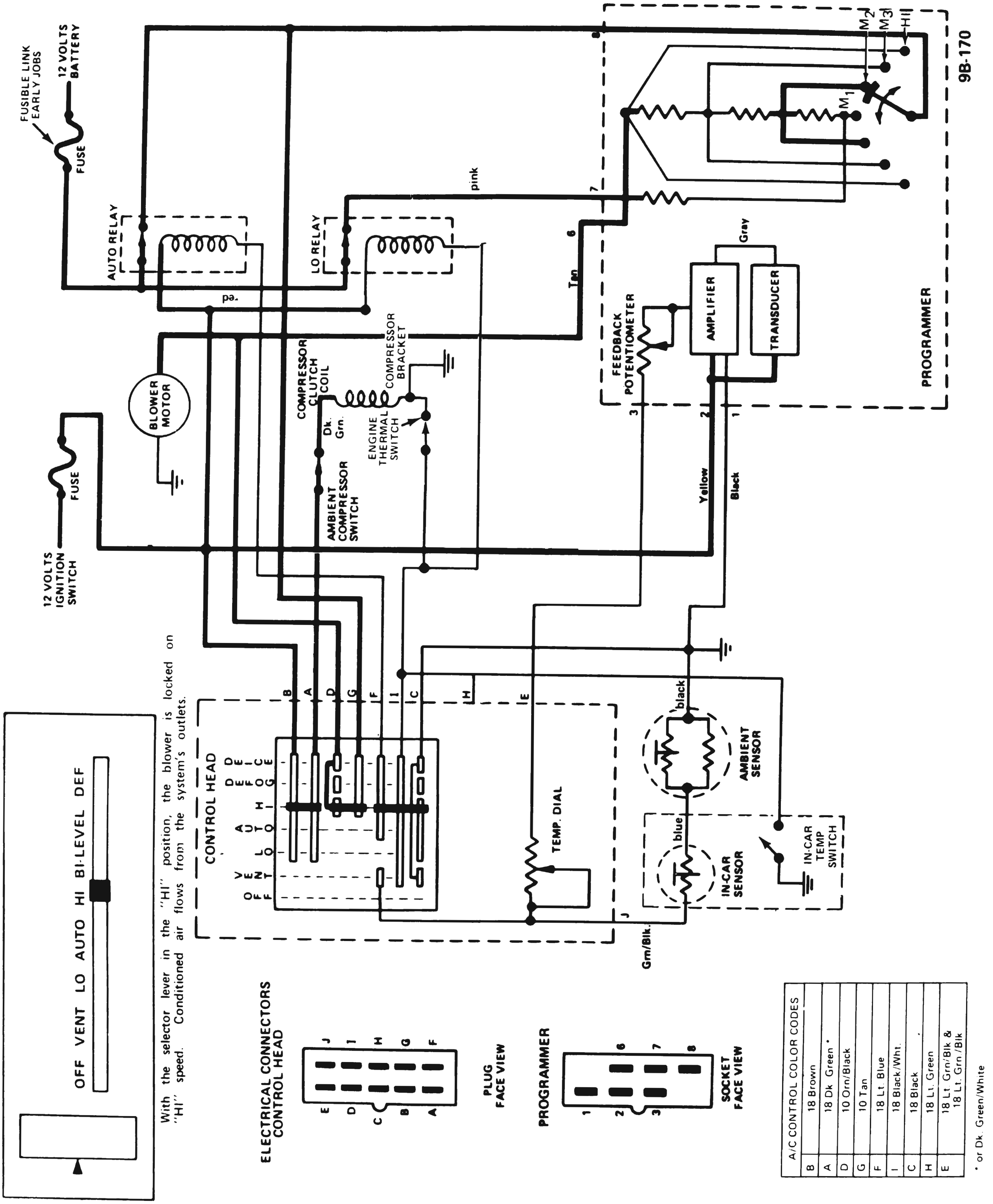


With the selector lever in the "AUTO" position, the blower speed is controlled by the position of the vacuum motor. Conditioned air flows from the system's outlets.

A/C CONTROL COLOR CODES	
B	18 Brown
A	18 Dk Green*
D	10 Orn/Black
G	10 Tan
F	18 Lt Blue
I	18 Black/Wht
C	18 Black
H	18 Lt Green
E	18 Lt Grn/Blk & 18 Lt Grn/Blk

* or Dk Green White

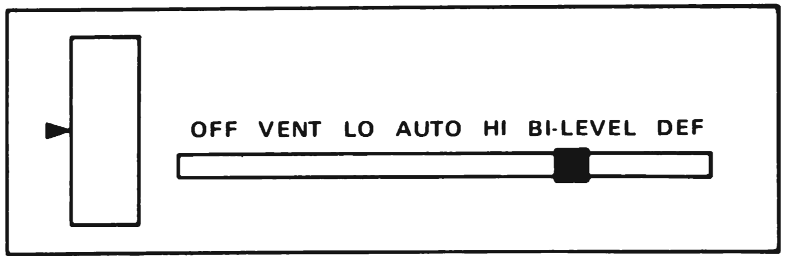
Figure 9B-226 Electrical Operation - Selector Lever in AUTO



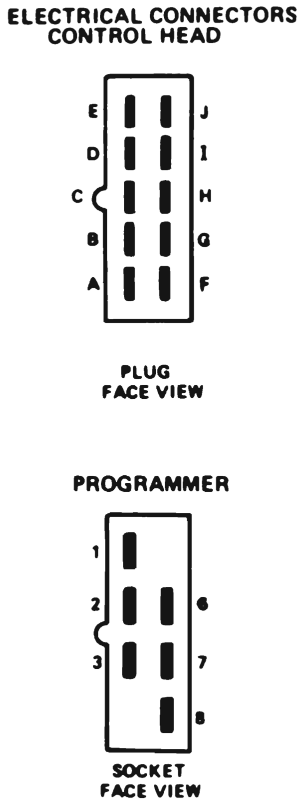
A/C CONTROL COLOR CODES	
B	18 Brown
A	18 Dk Green *
D	10 Orn/Black
G	10 Tan
F	18 Lt. Blue
I	18 Black/Wht.
C	18 Black
H	18 Lt. Green
E	18 Lt. Grn/Blk & 18 Lt. Grn/Blk

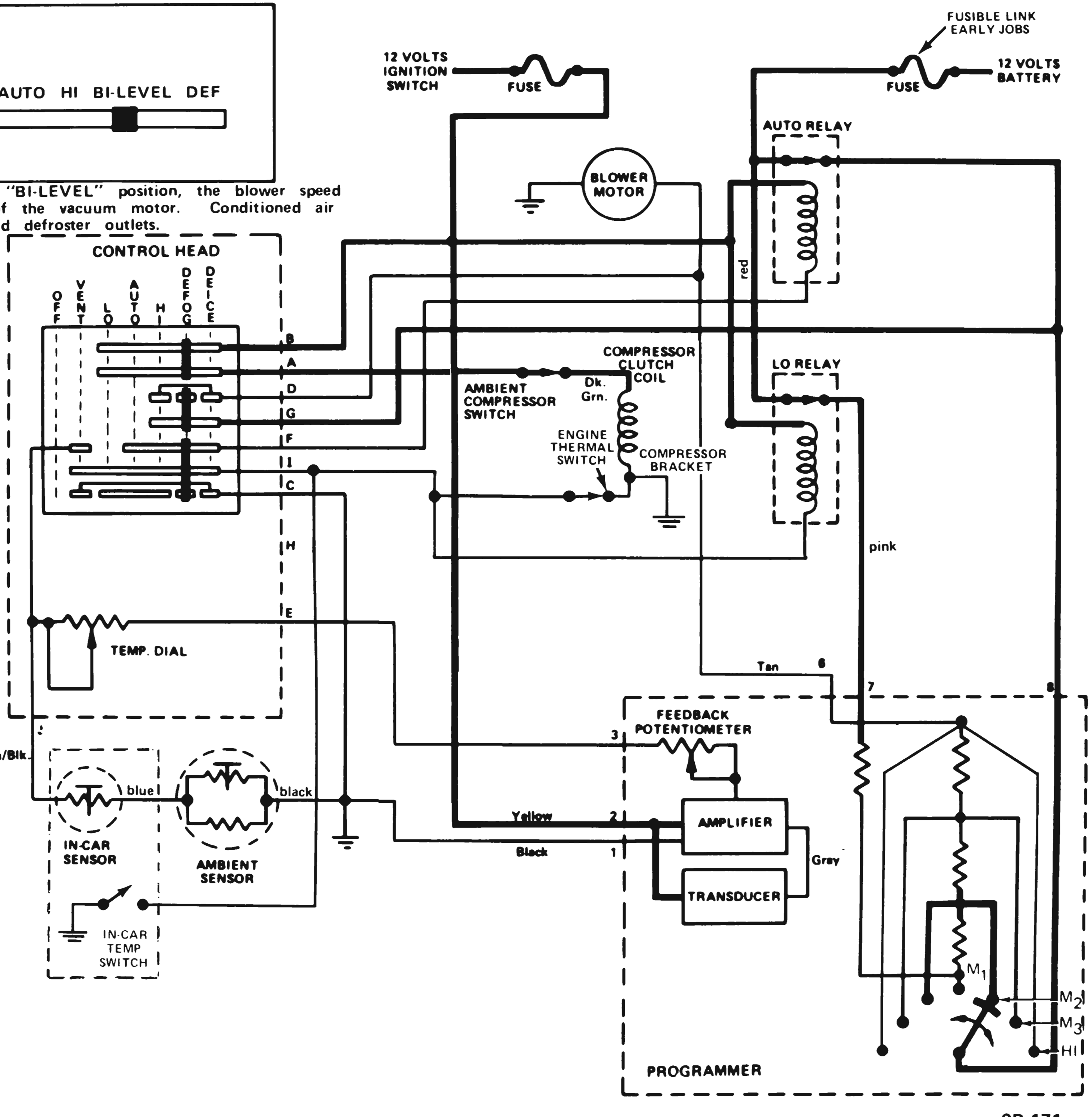
* or Dk. Green/White

Figure 9B-227 Electrical Operation - Selector Lever in HI



With the selector lever in the "BI-LEVEL" position, the blower speed is controlled by the position of the vacuum motor. Conditioned air flows from the heater, A/C and defroster outlets.

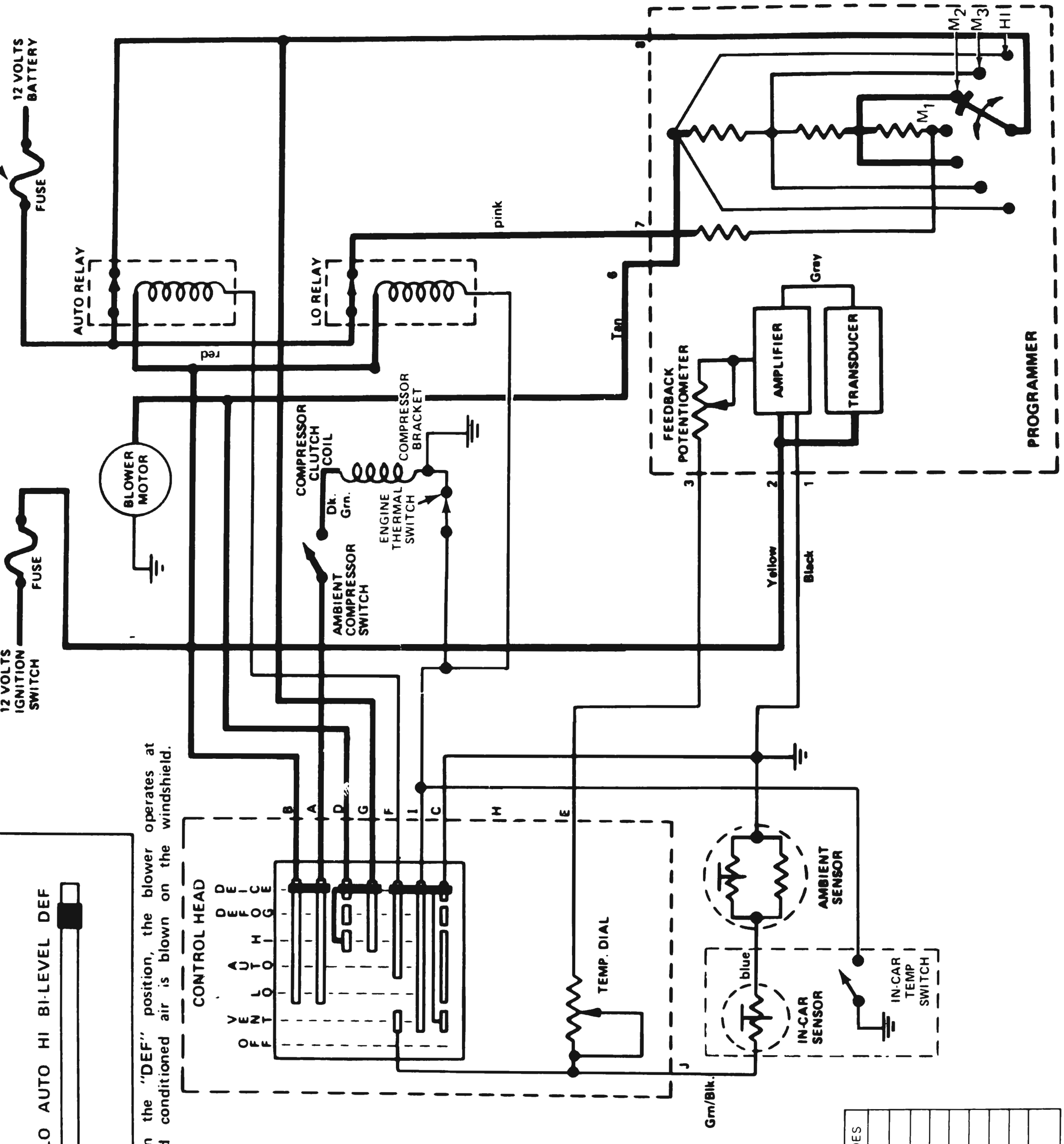


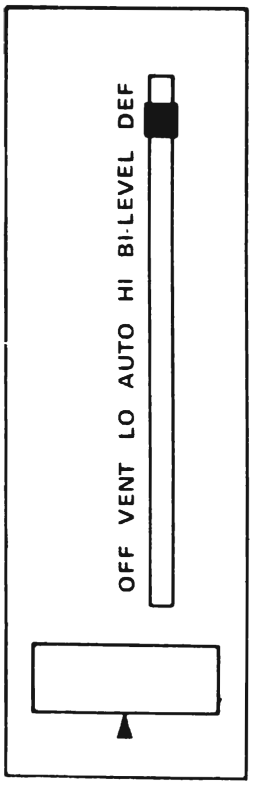


A C CONTROL COLOR CODES	
B	18 Brown
A	18 Dk. Green *
D	10 Orn Black
G	10 Tan
F	18 Lt. Blue
I	18 Black Wht
C	18 Black
H	18 Lt. Green
E	18 Lt. Grn Blk & 18 Lt. Grn Blk

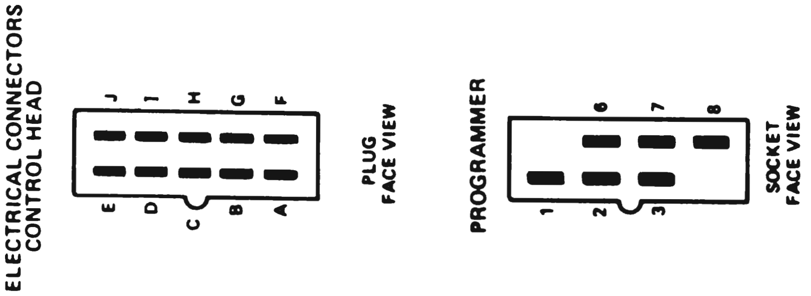
* or Dk. Green White

Figure 9B-228 Electrical Operation - Selector Lever in BI-LEVEL





With the selector lever in the "DEF" position, the blower operates at "HI BLOWER" speed and conditioned air is blown on the windshield.



A.C CONTROL COLOR CODES	
B	18 Brown
A	18 Dk. Green
D	10 Orn/Black
G	10 Tan
F	18 Lt. Blue
I	18 Black/Wht
C	18 Black
H	18 Lt. Green
E	18 Lt. Grn/Blk & 18 Lt. Grn/Blk

* or Dk. Green/White

Figure 9B-230 Electrical Operation - Selector Lever in DEF

9B-173

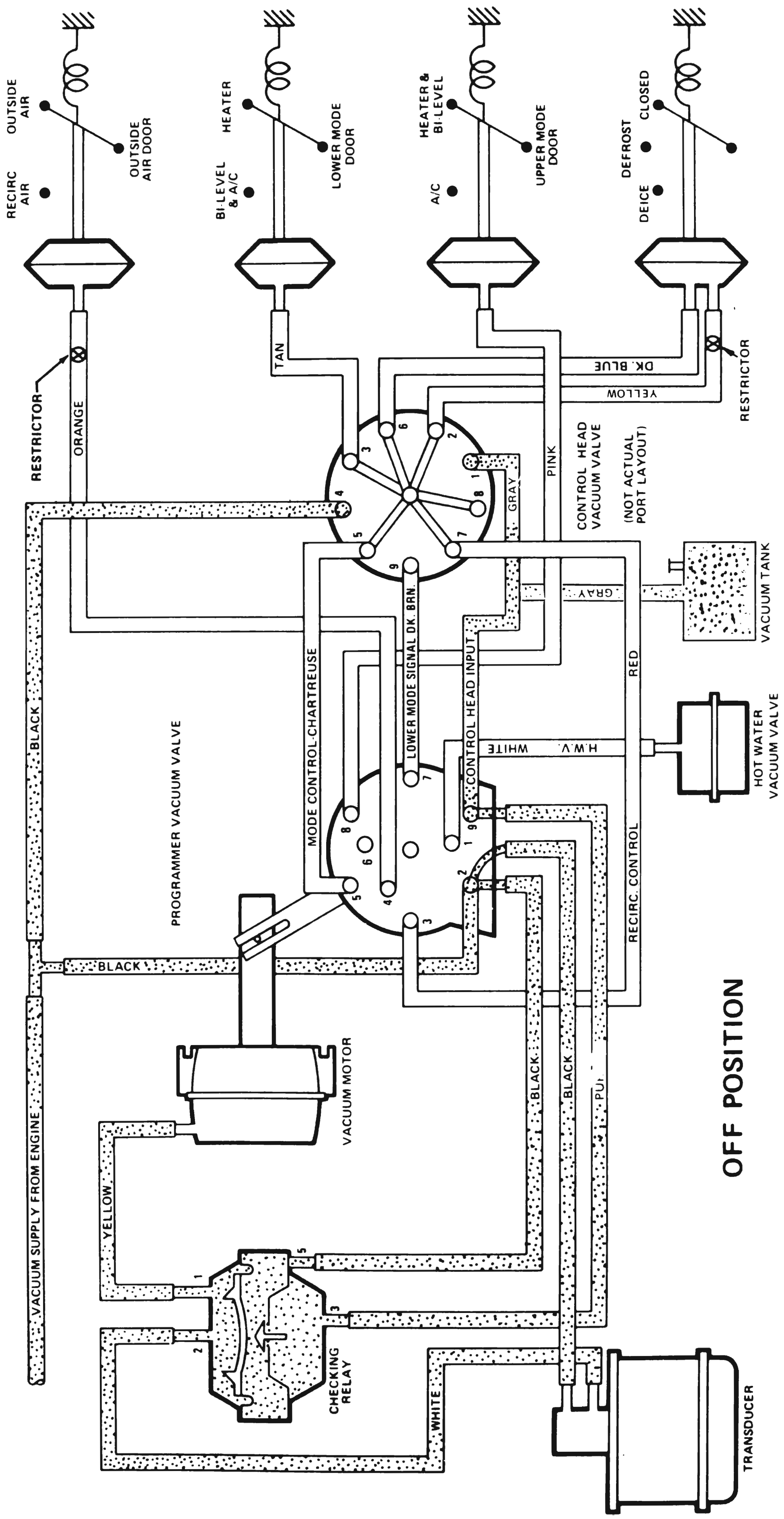
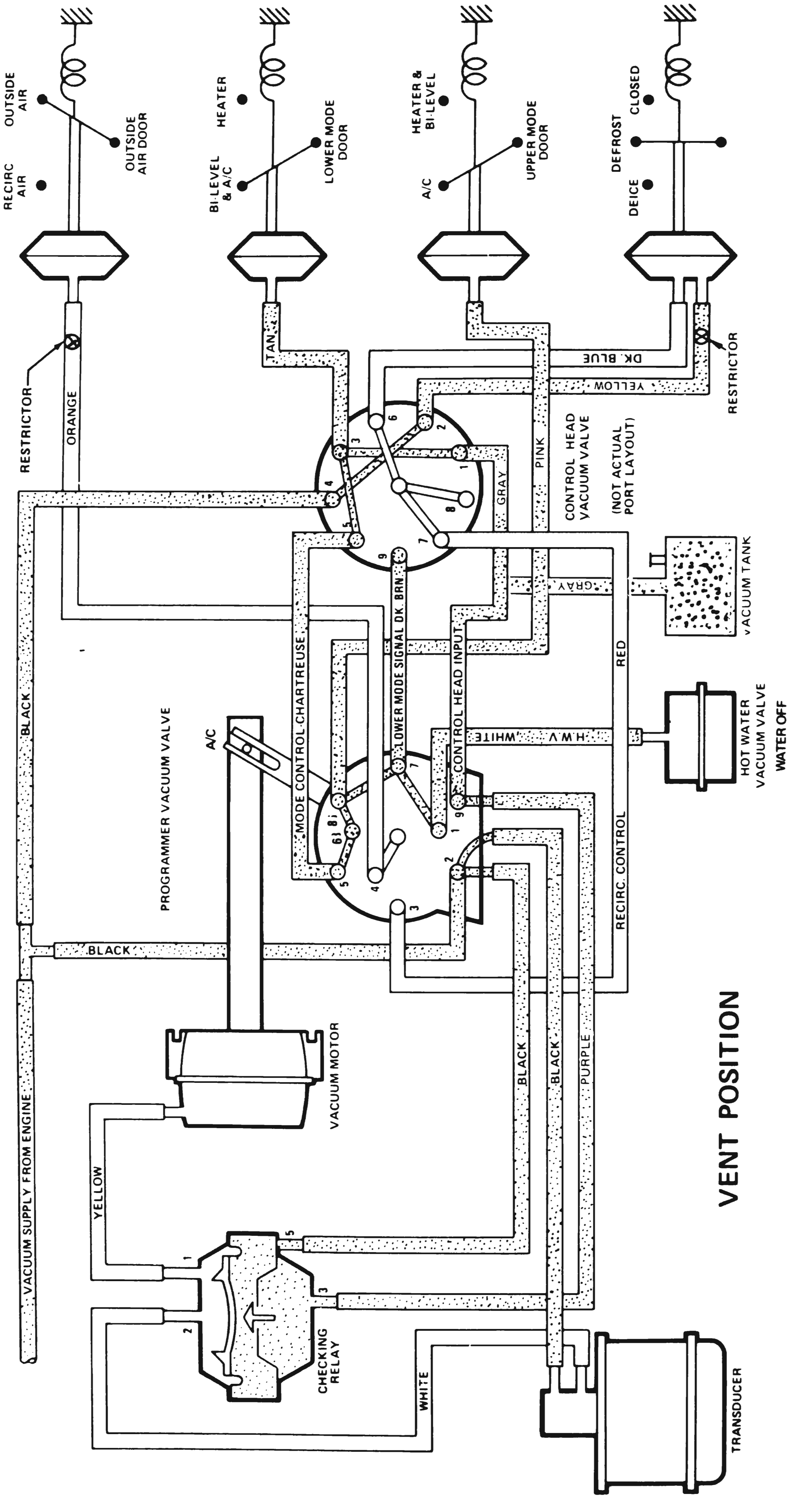
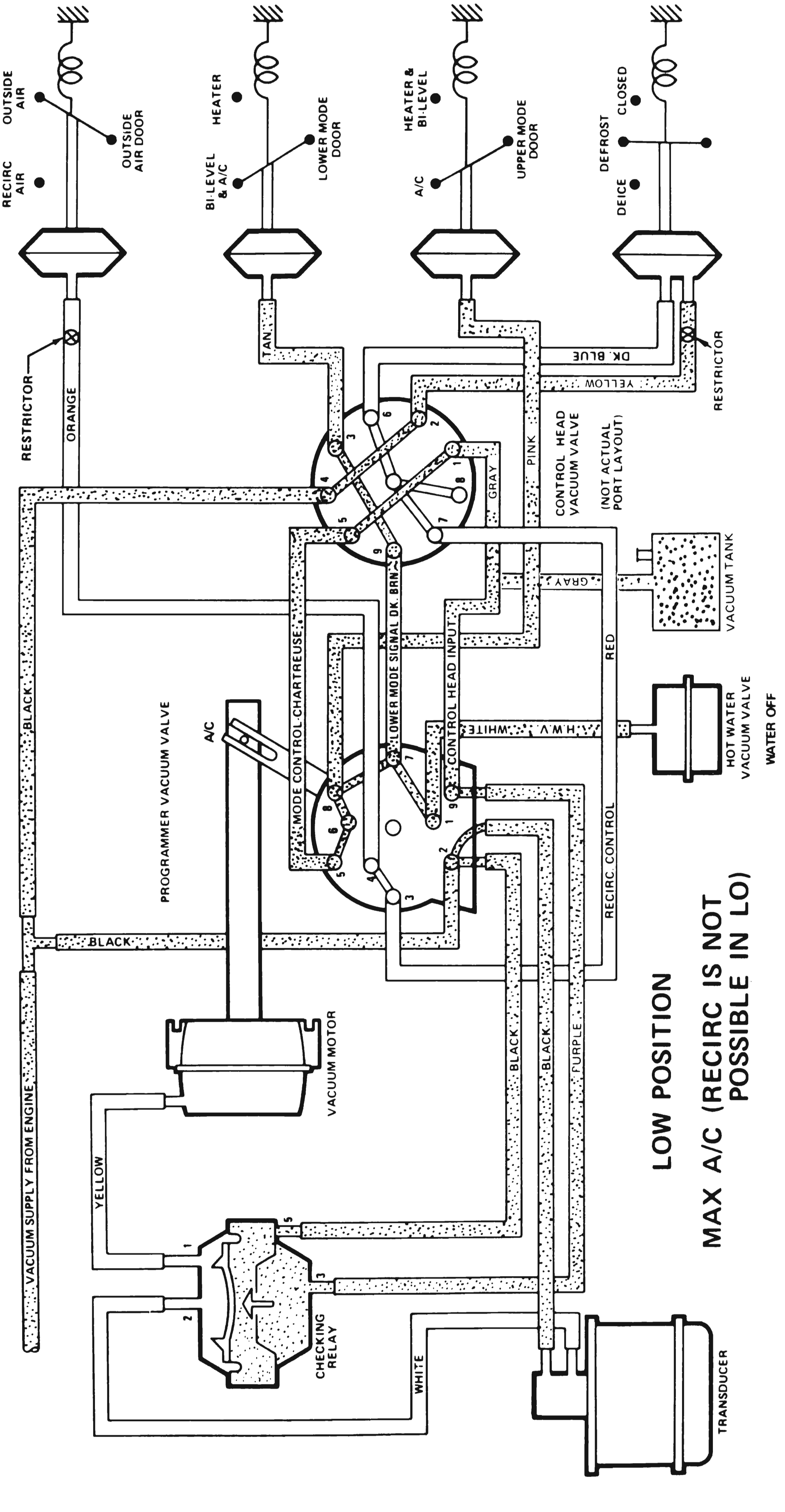


Figure 9B-231 Vacuum Circuits - OFF Position



9B-174

Figure 9B-232 Vacuum Circuits - System in VENT Position



9B-175

Figure 9B-233 Vacuum Circuits - System in MAX A/C LO Position (Recirc Impossible in LO)

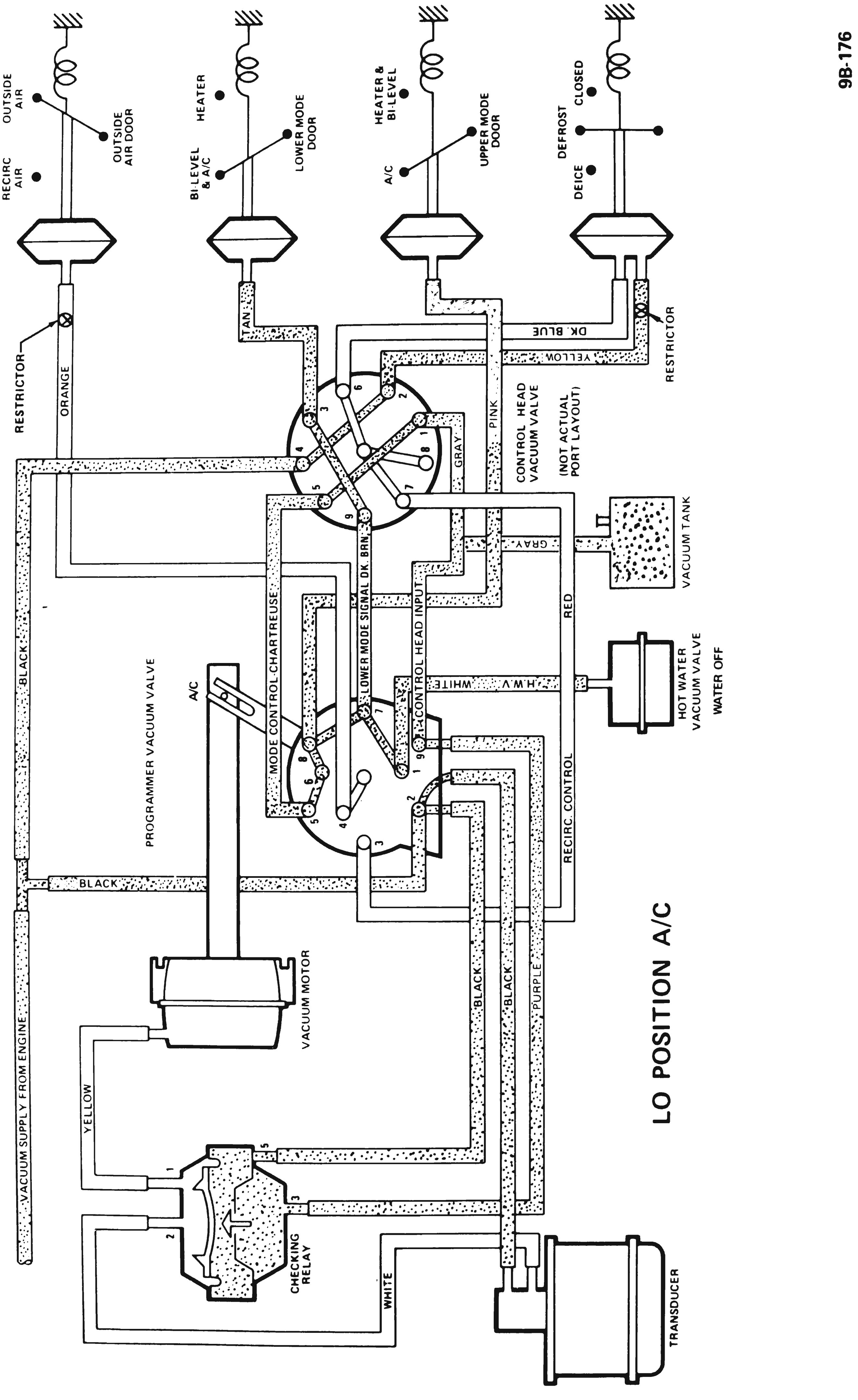
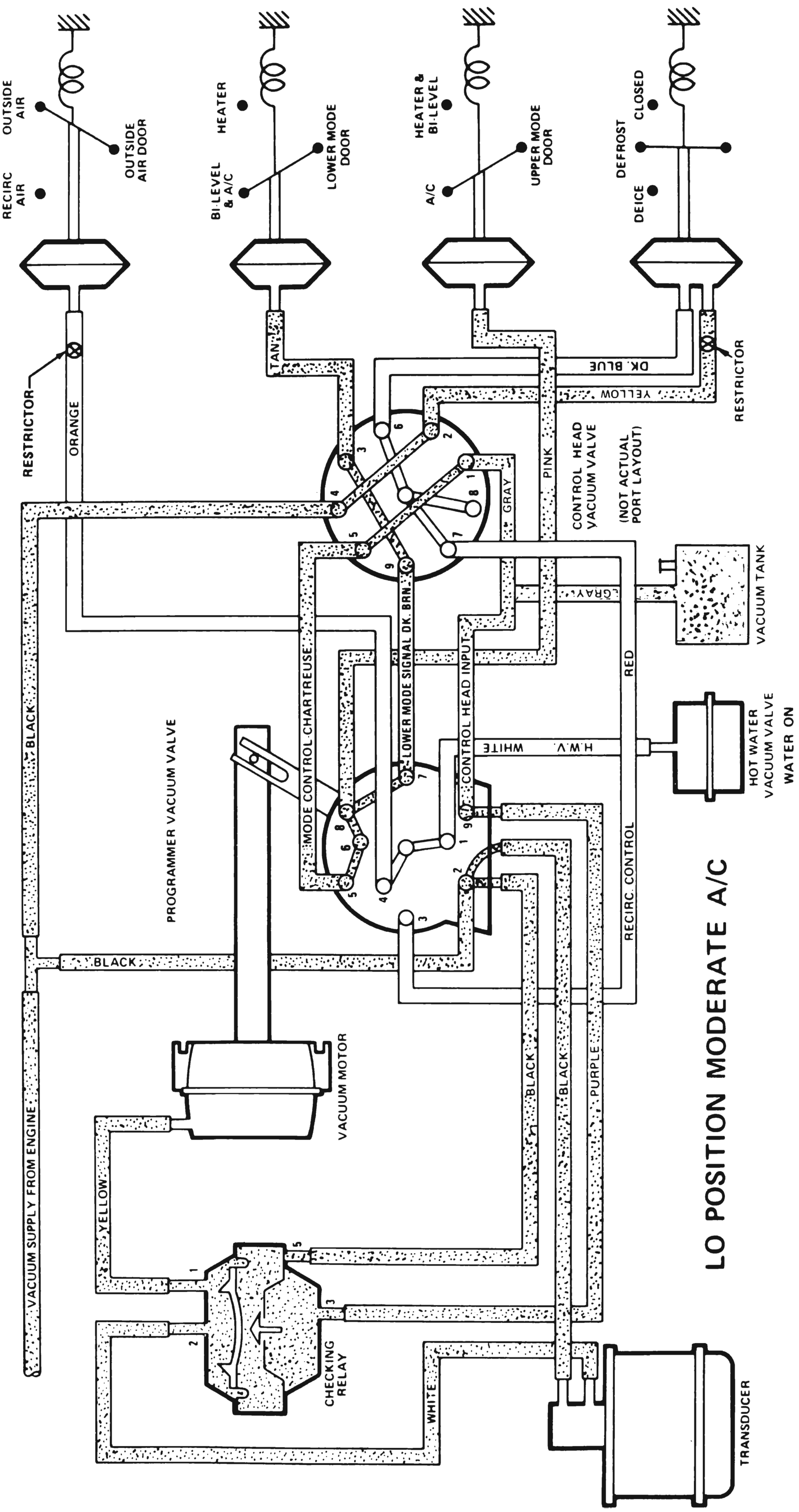


Figure 9B-234 Vacuum Circuits - System in LO Position A/C



9B-177

Figure 9B-235 Vacuum Circuits - System in LO Position Moderate A/C

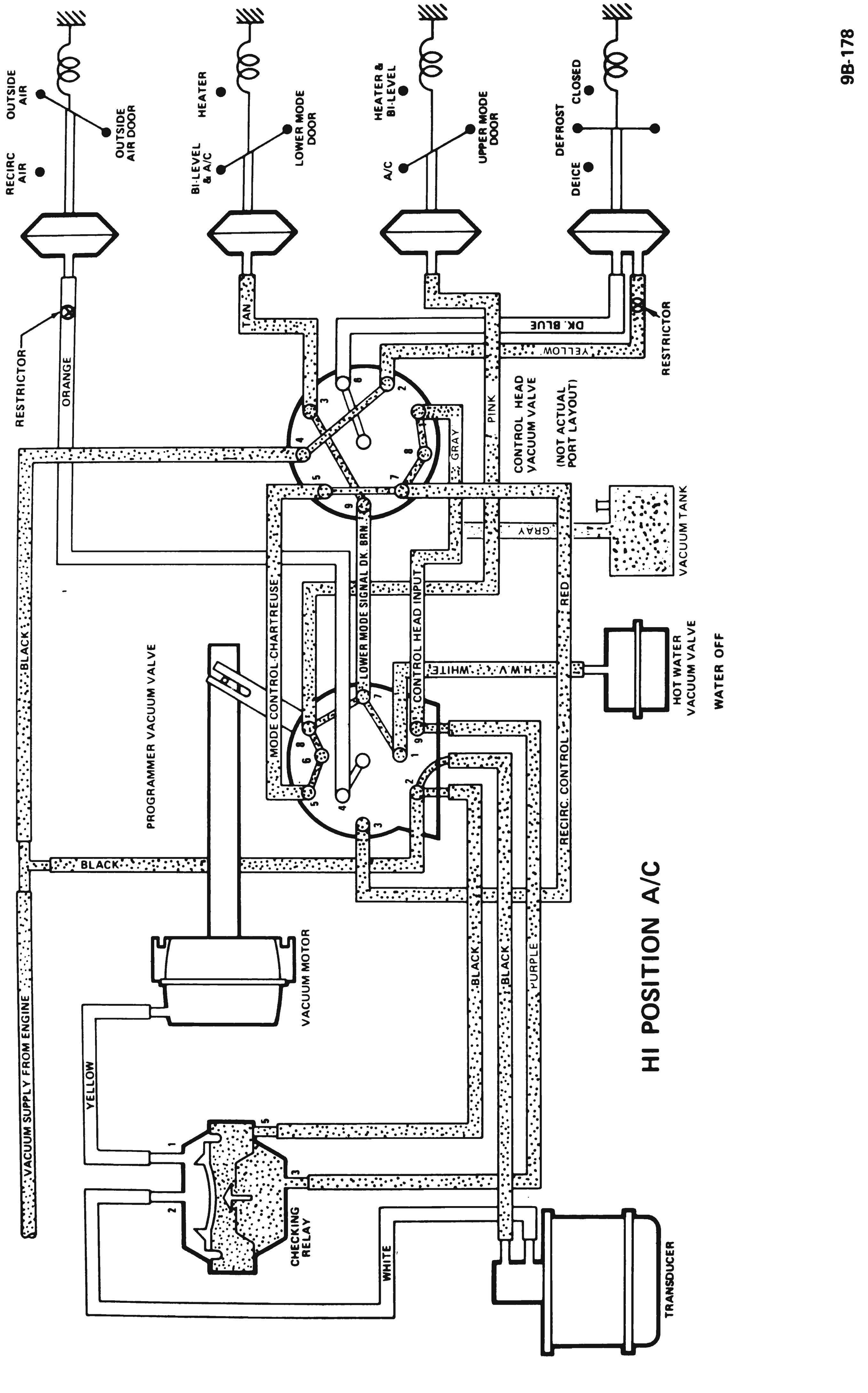


Figure 9B-236 Vacuum Circuits - System in HI Position A/C

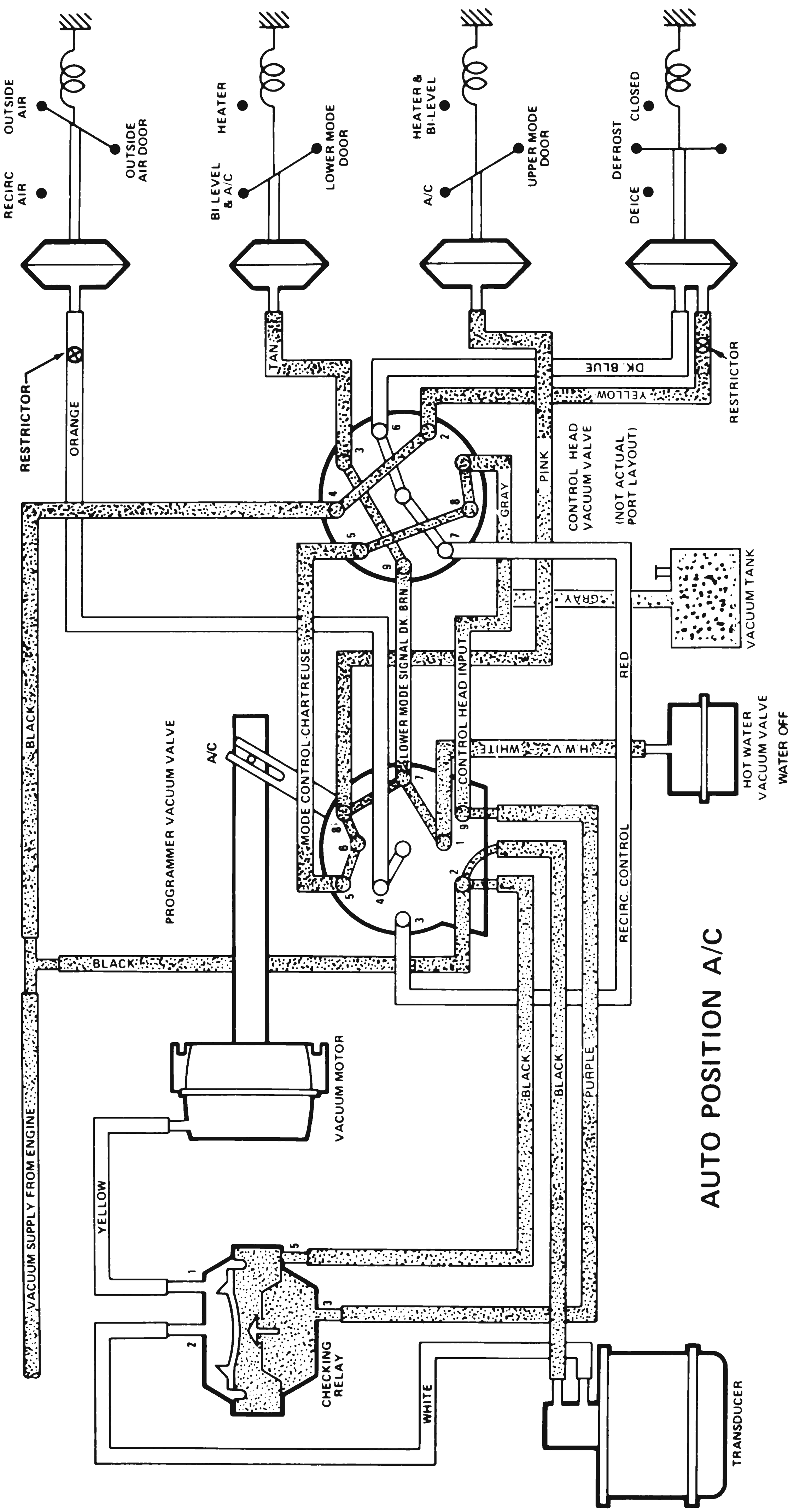


Figure 9B-237 Vacuum Circuits - AUTO Position A/C

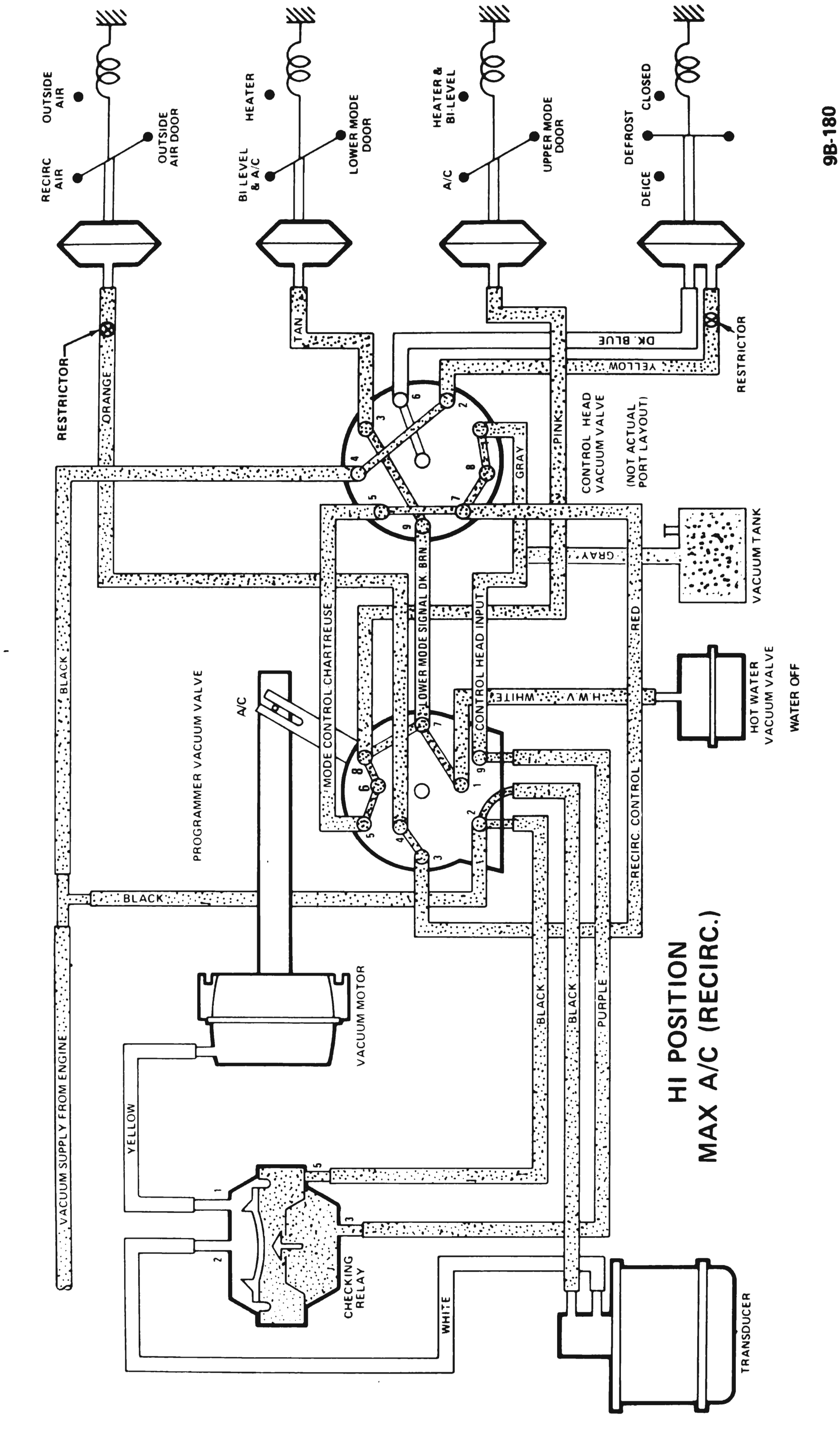


Figure 9B-238 Vacuum Circuits - System in HI Position MAX A/C (Recirc)

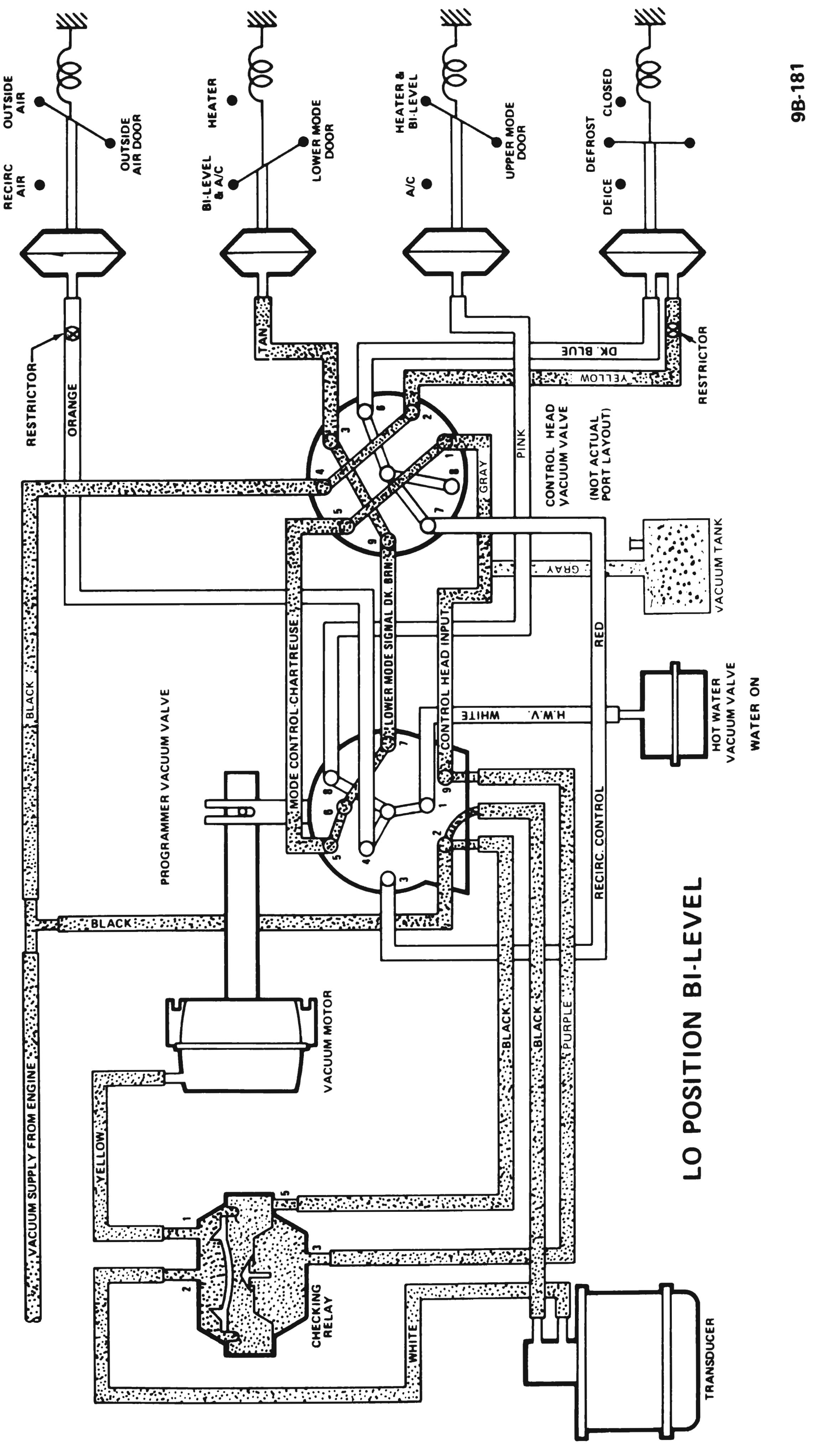


Figure 9B-240 Vacuum Circuits - System in LO Position Bi-Level

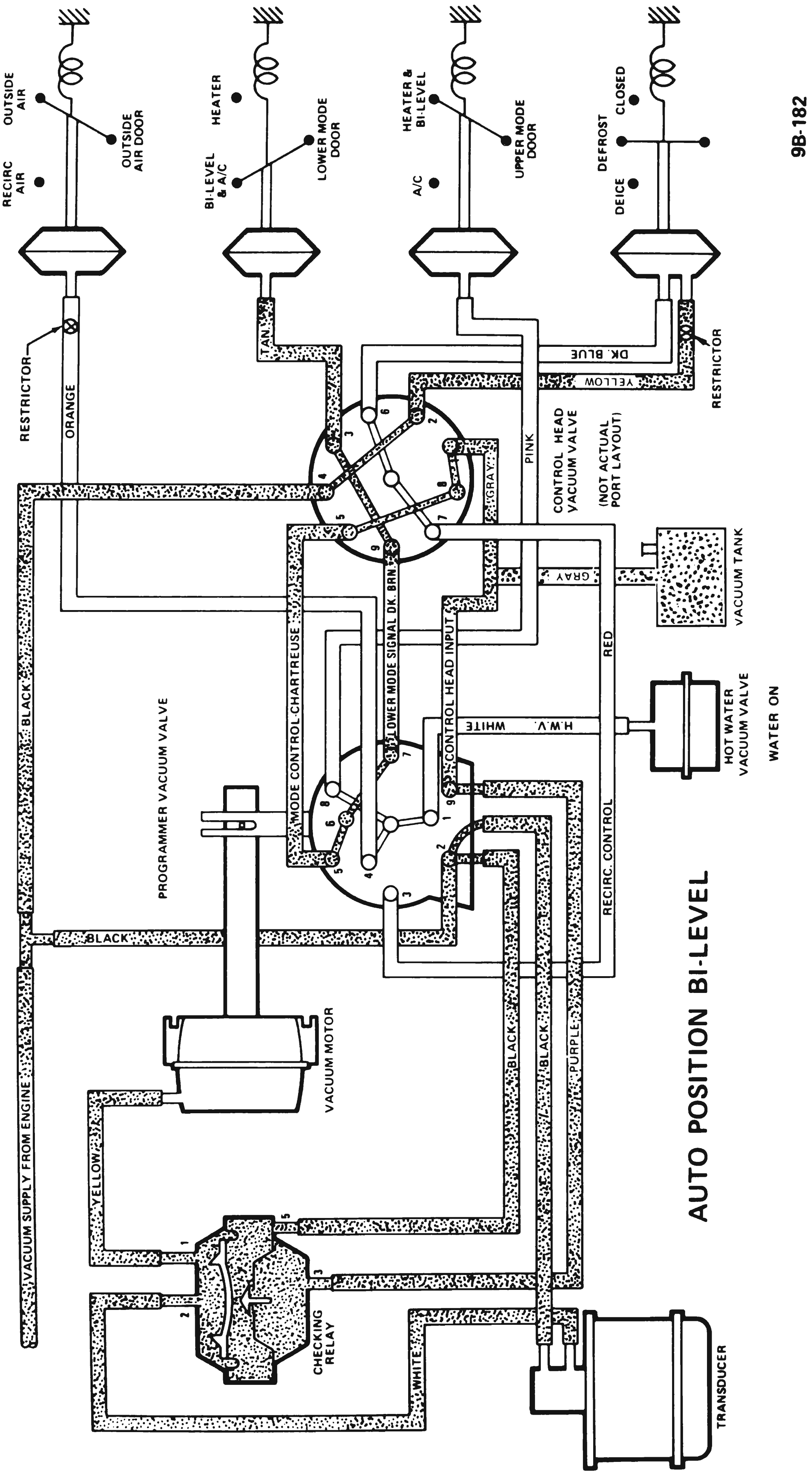


Figure 9B-241 Vacuum Circuits - System in AUTO Position Bi-Level

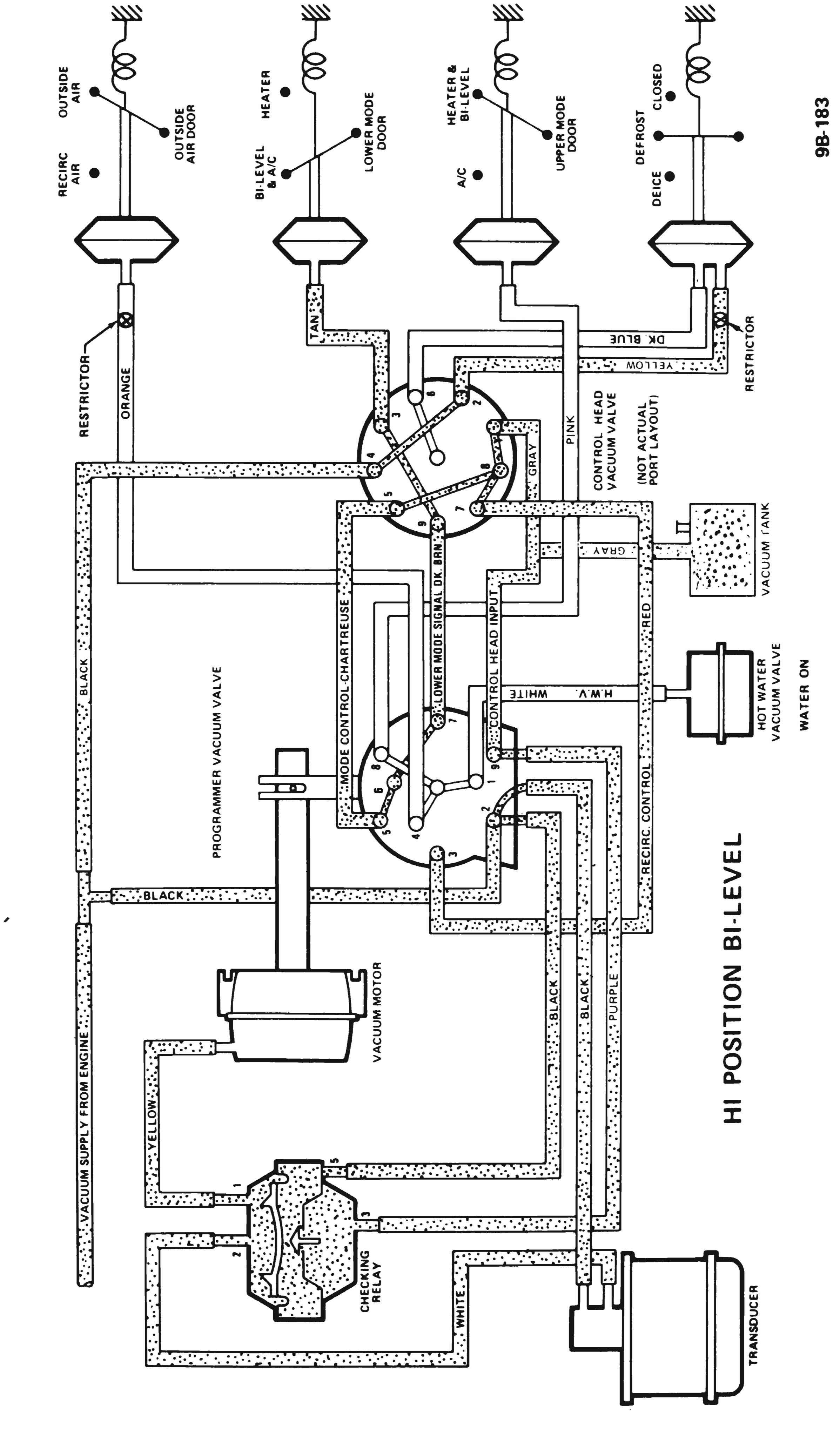


Figure 9B-242 Vacuum Circuits - System in HI Position Bi-Level

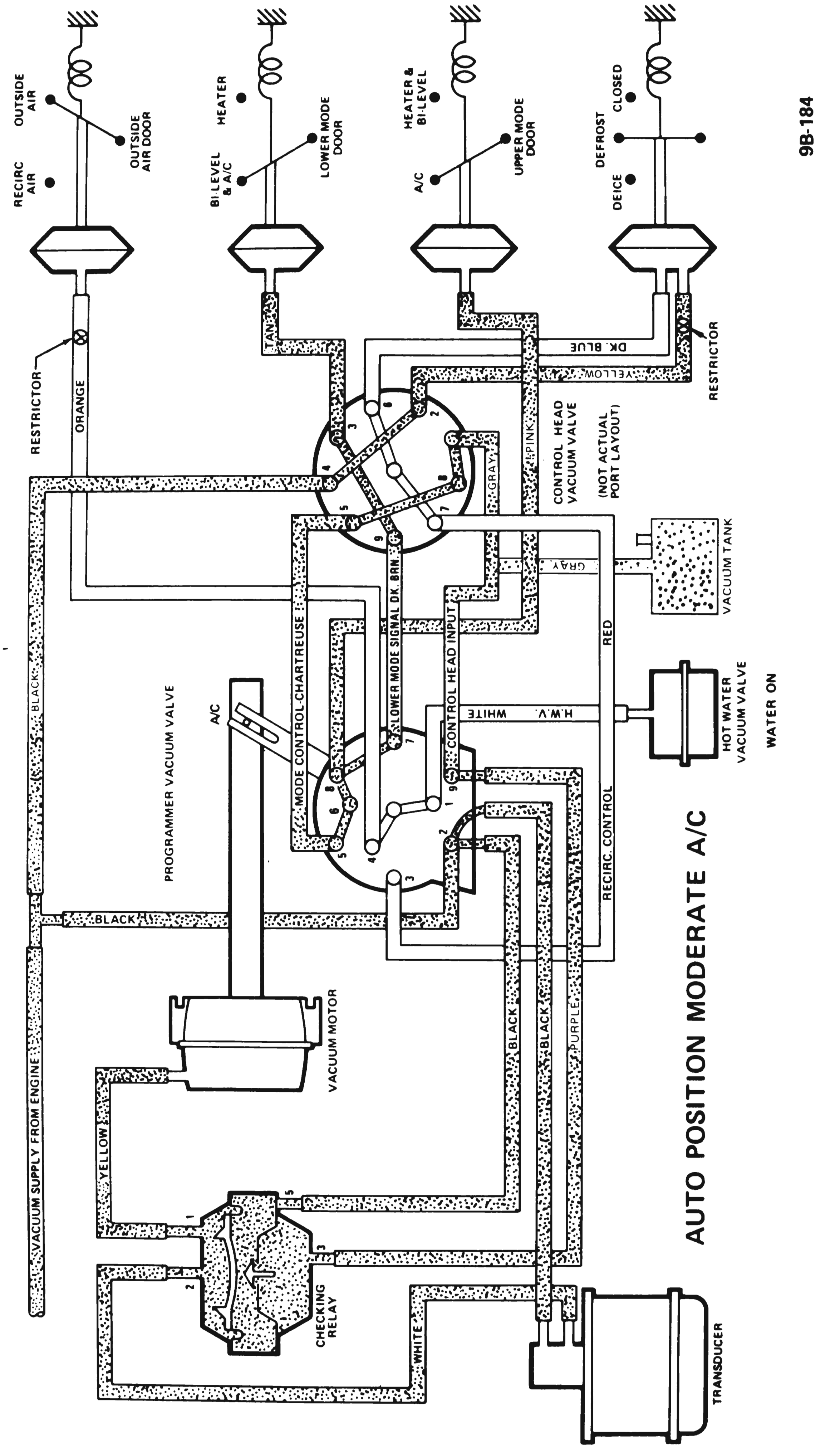


Figure 9B-243 Vacuum Circuits - System in AUTO Position Moderate A/C

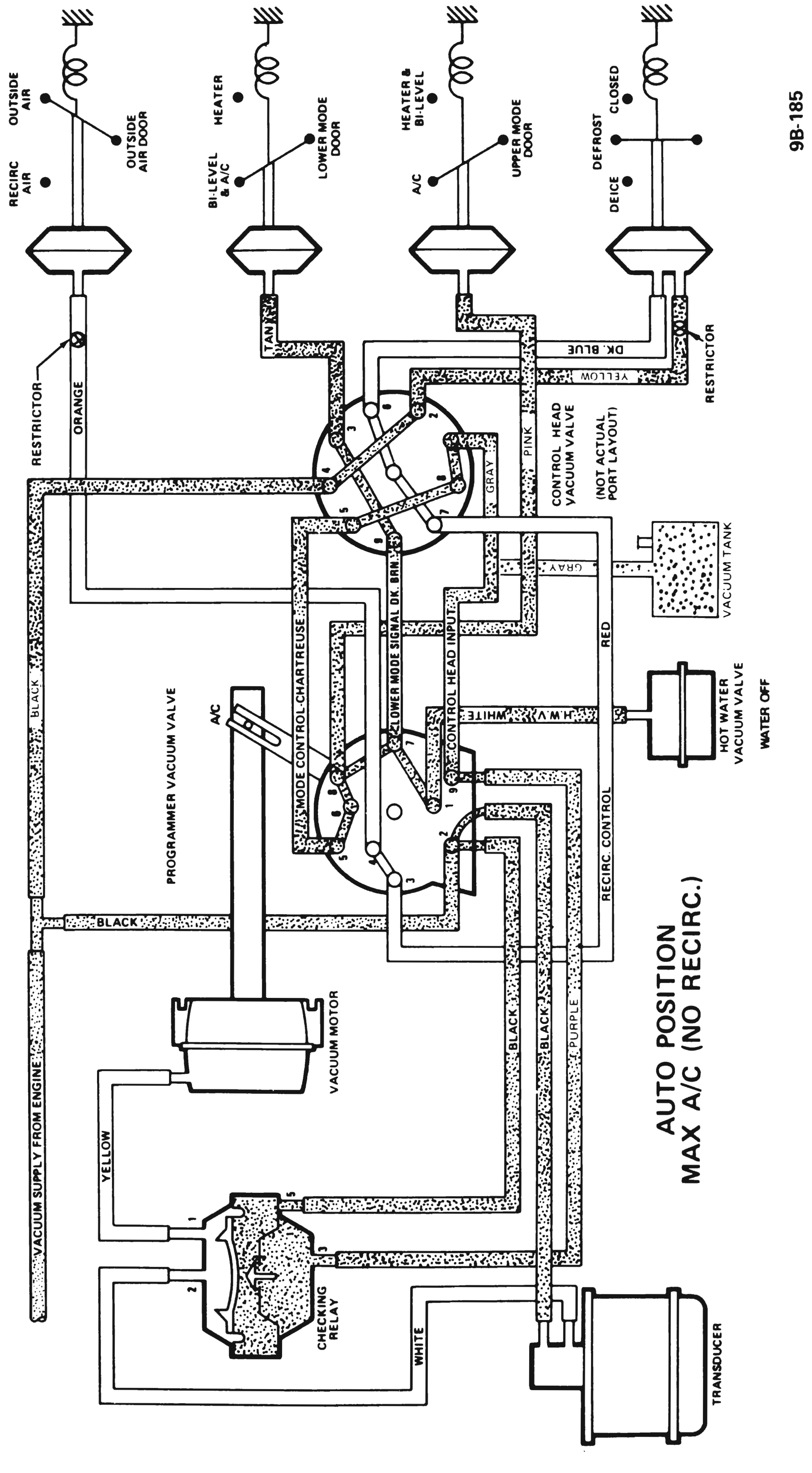


Figure 9B-244 Vacuum Circuits - AUTO Position MAX A/C (No Recirc)

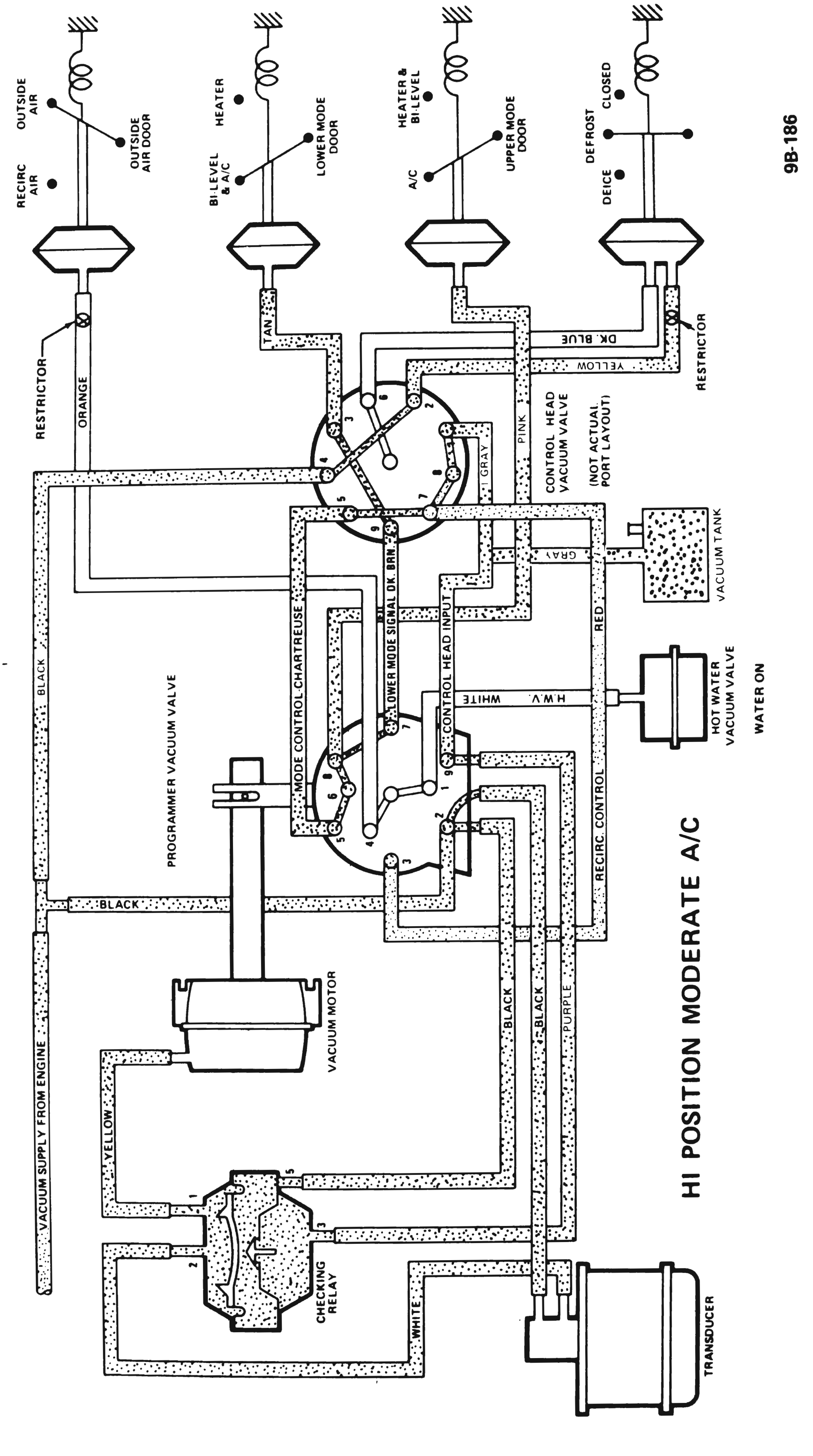


Figure 9B-245 Vacuum Circuits - System in HI Position Moderate A/C

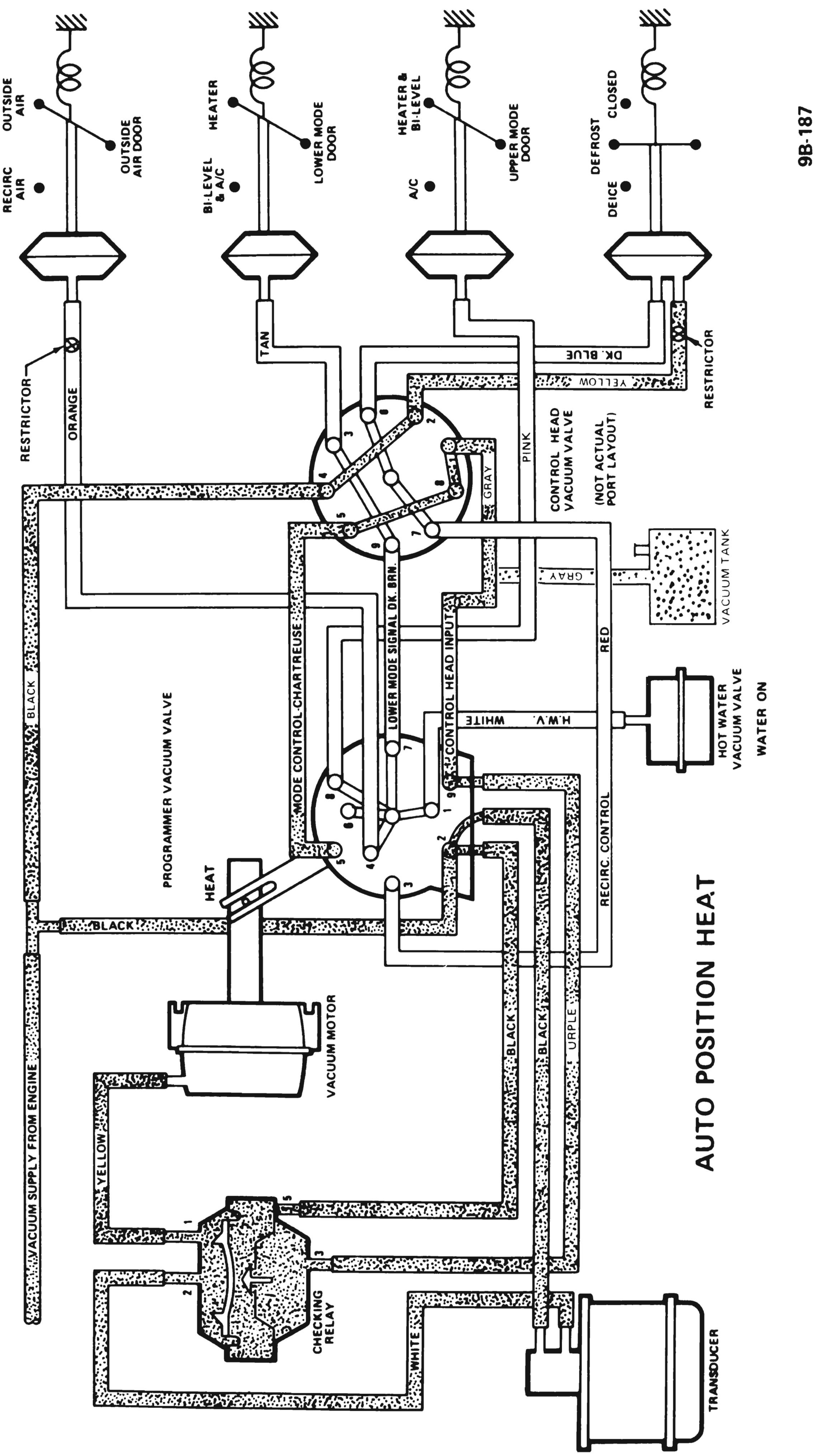


Figure 9B-246 VACUUM Circuits - AUTO Position Heat

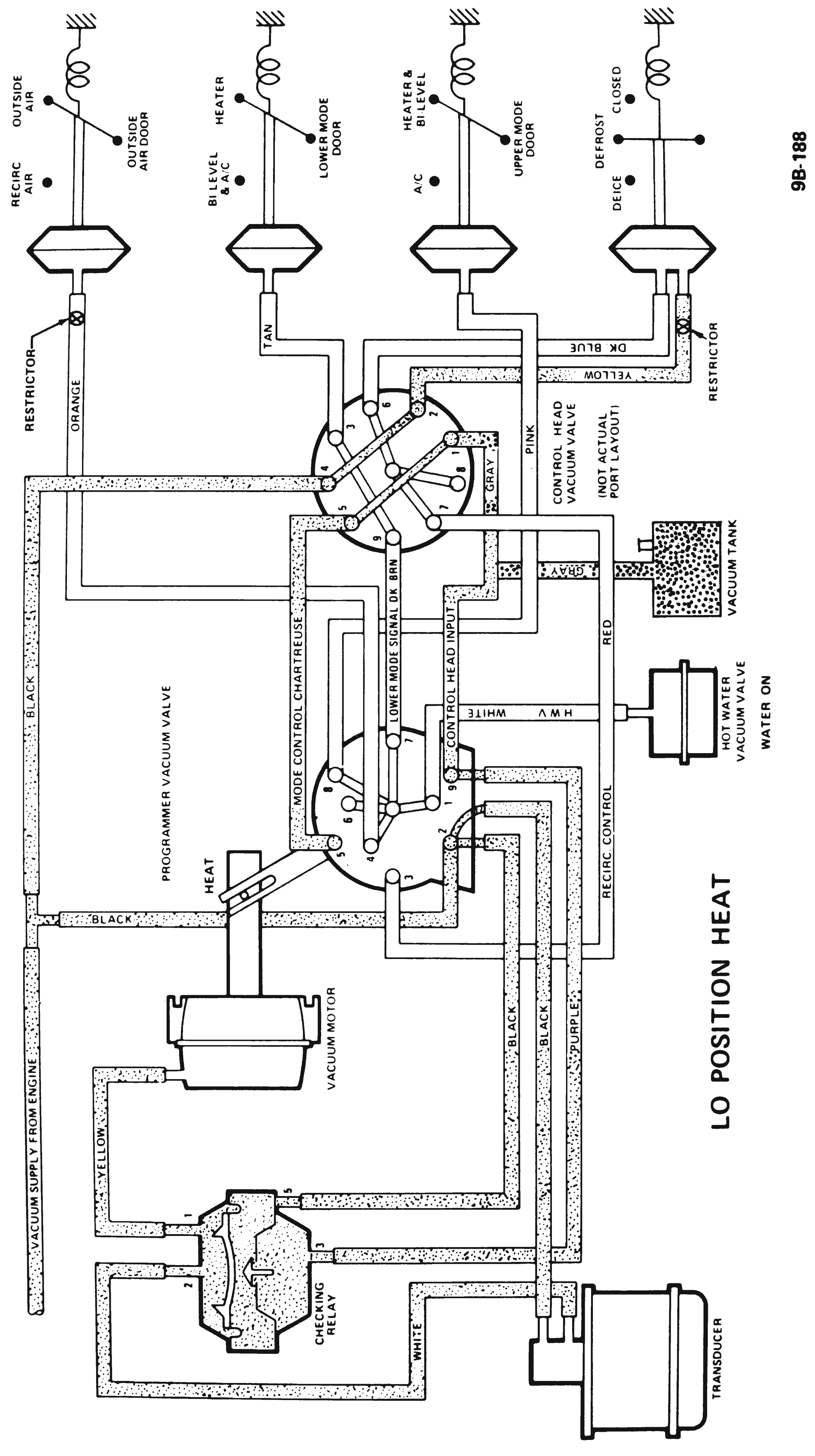


Figure 9B-247 Vacuum Circuits - System in LO Position Heat

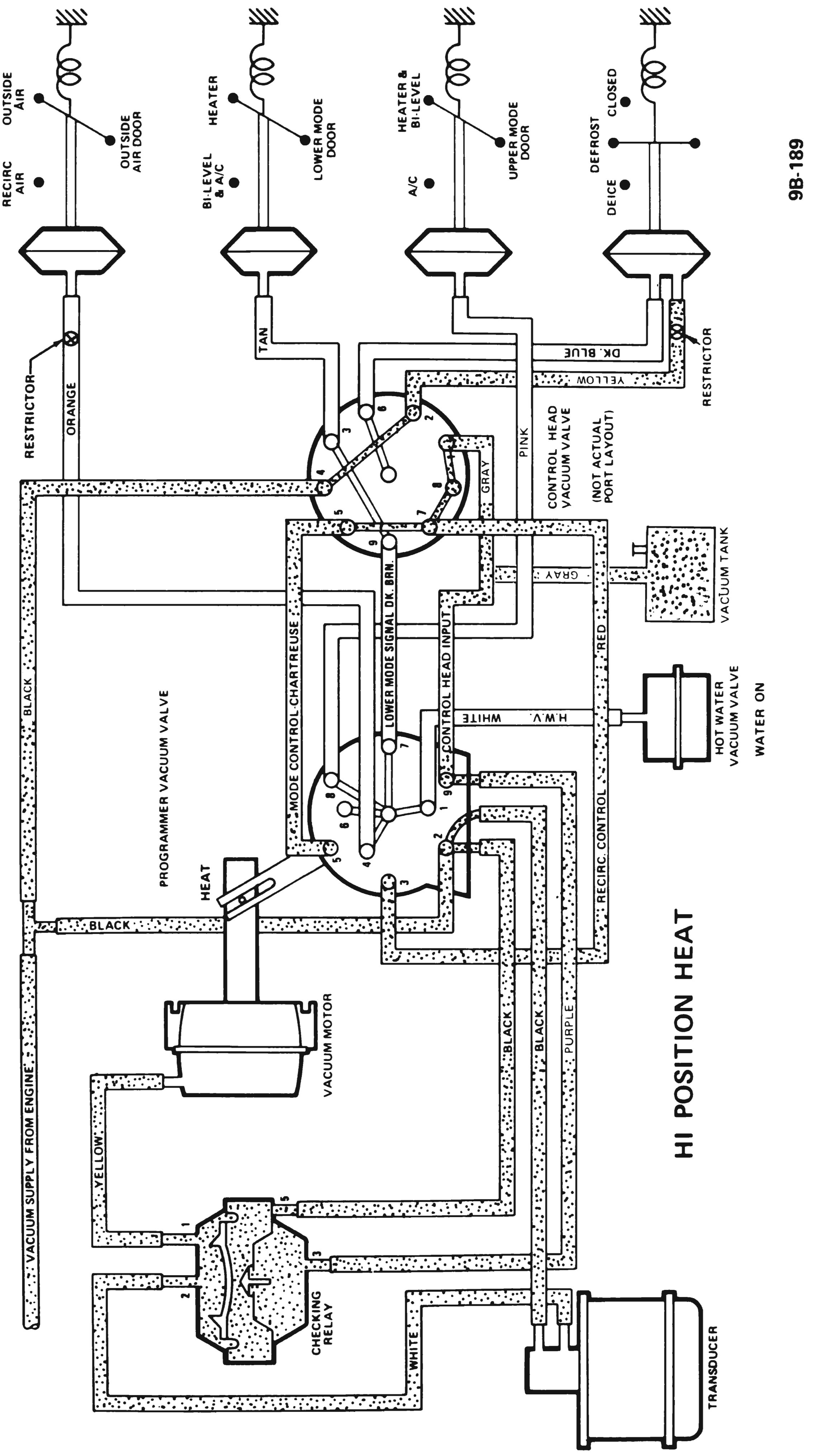


Figure 9B-248 Vacuum Circuits - System in HI Position Heat

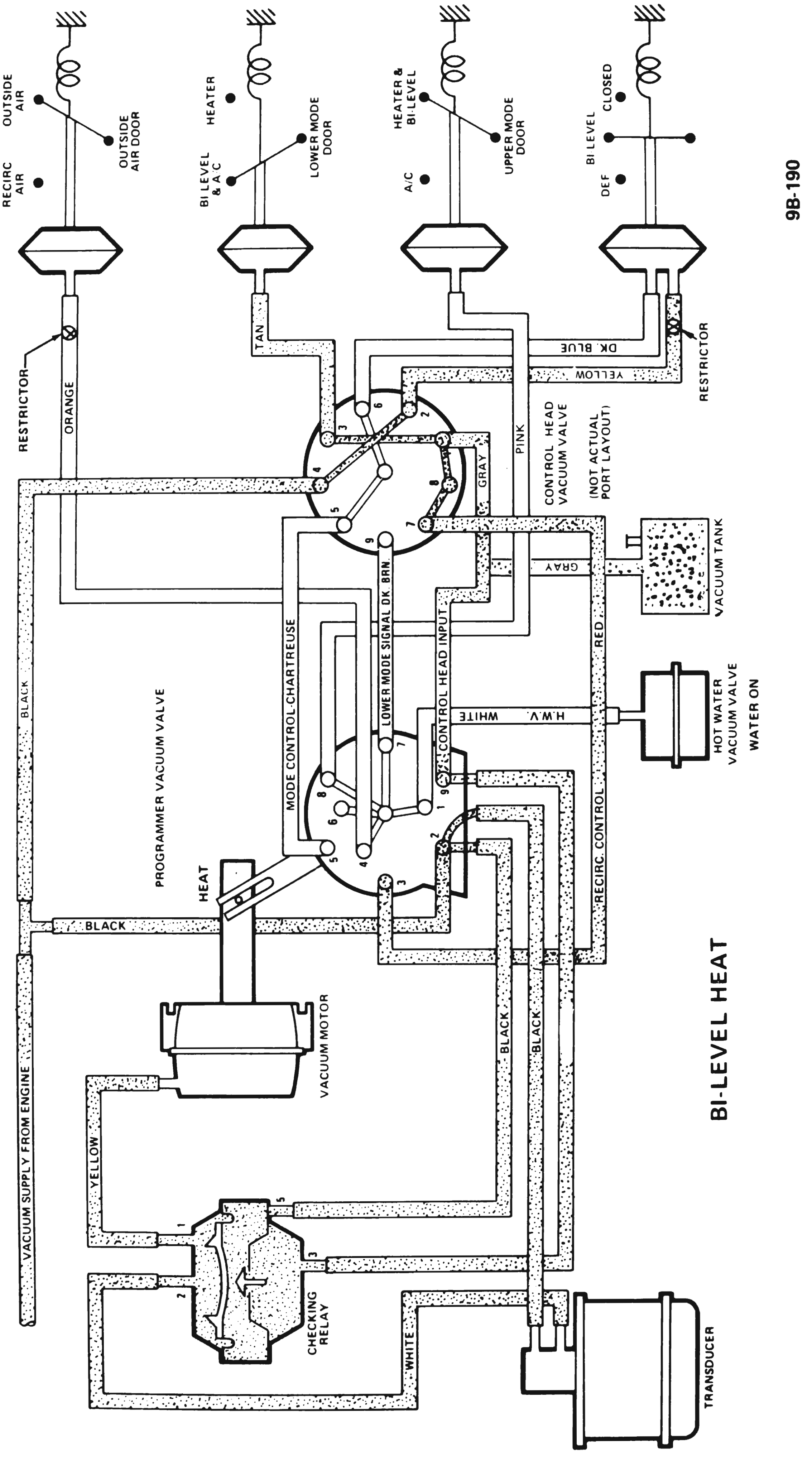


Figure 9B-250 Vacuum Circuits - System in BI-LEVEL Heat

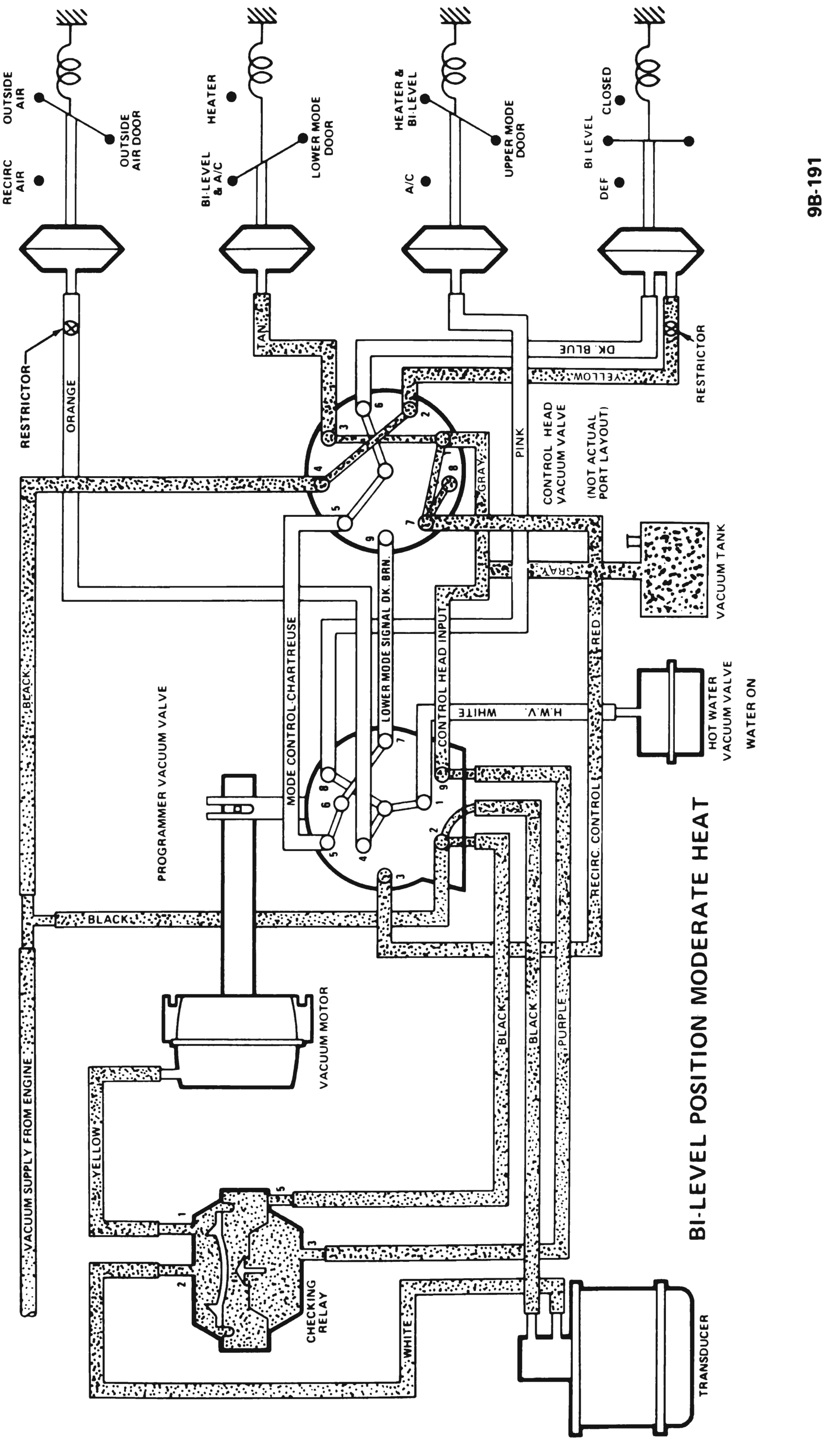


Figure 9B-251 Vacuum Circuits - BI-LEVEL Position Moderate Heat

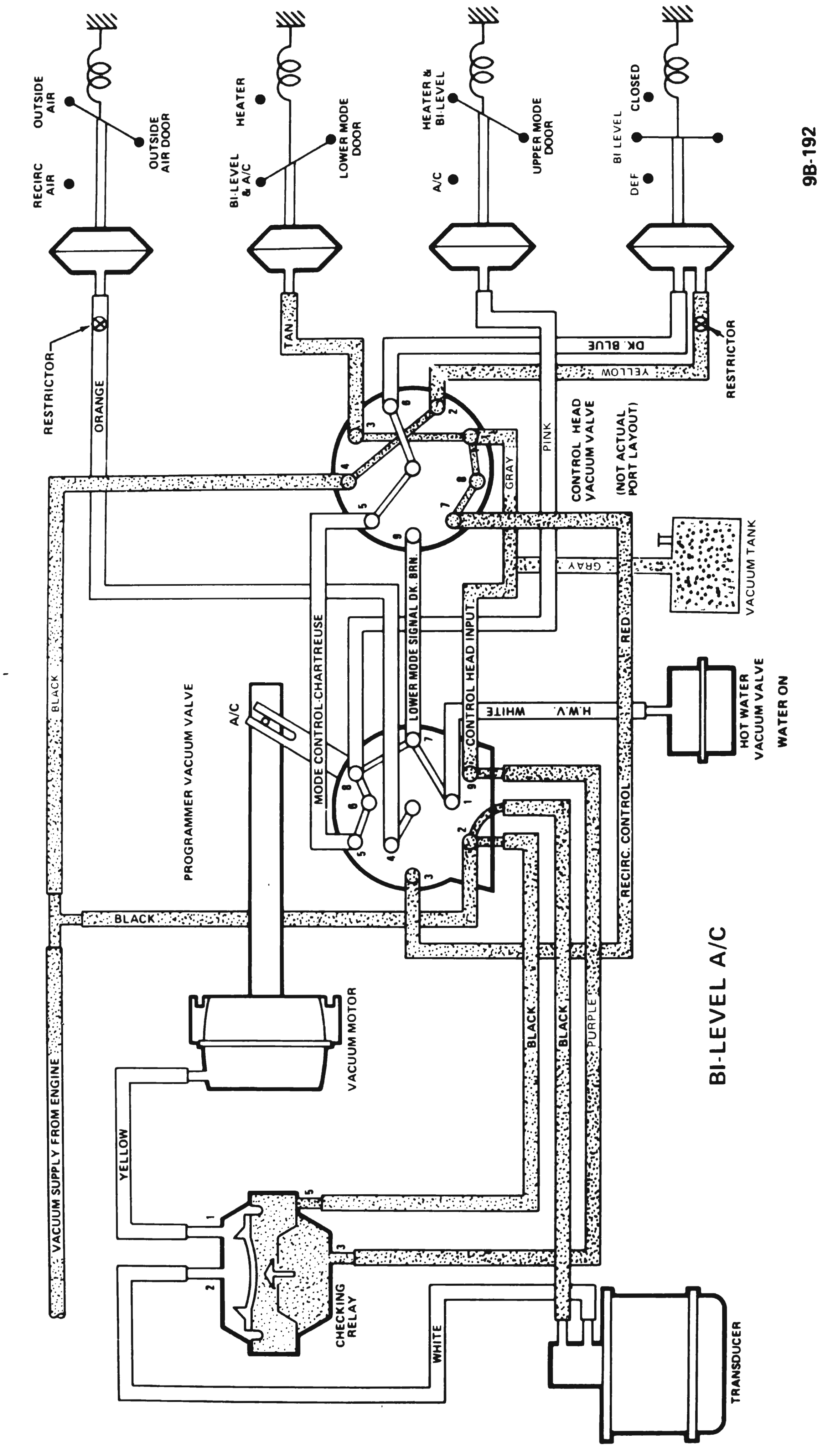


Figure 9B-252 Vacuum Circuits - System in BI-LEVEL A/C

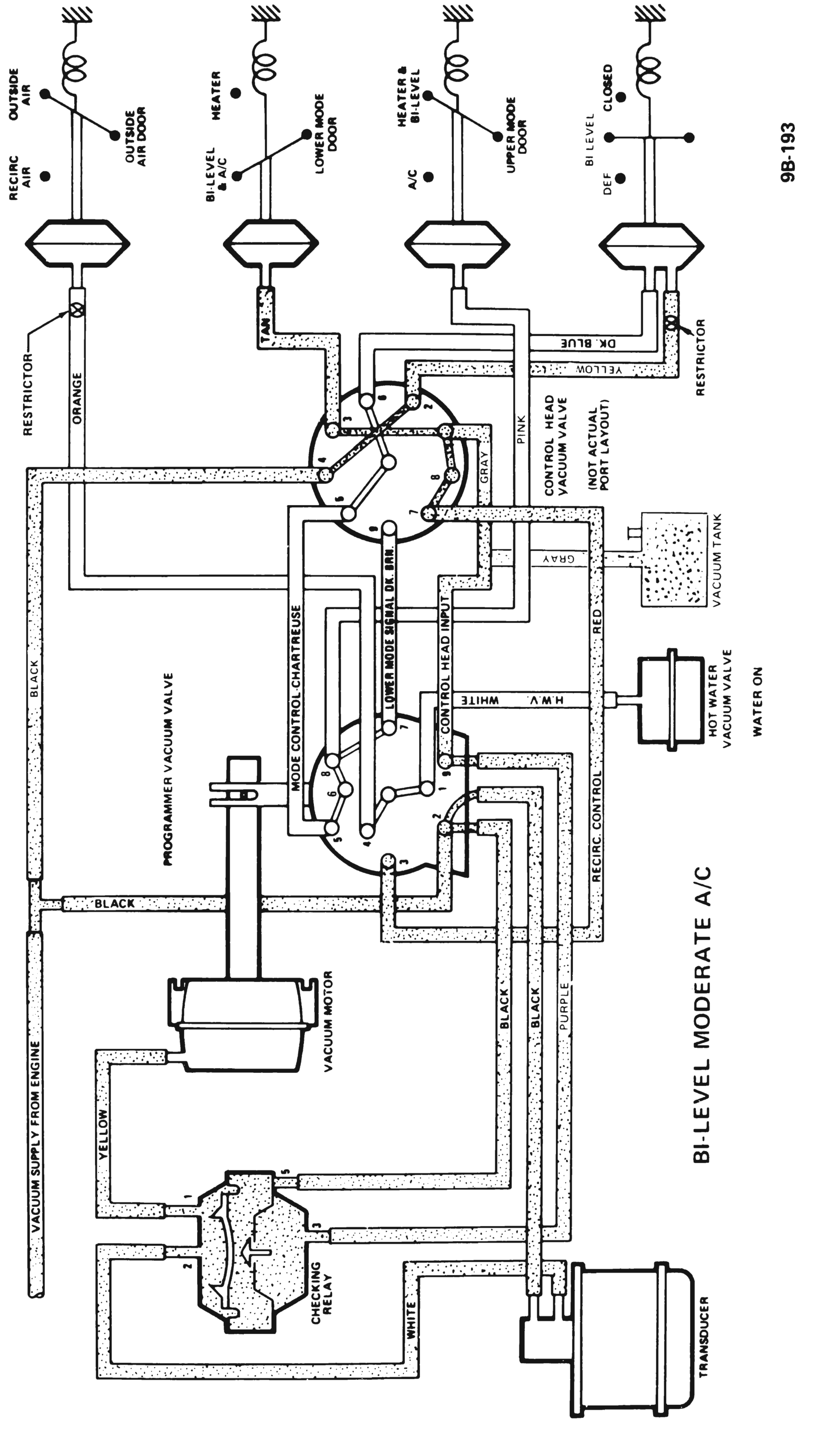


Figure 9B-253 Vacuum Circuits - System in BI-LEVEL Moderate A/C

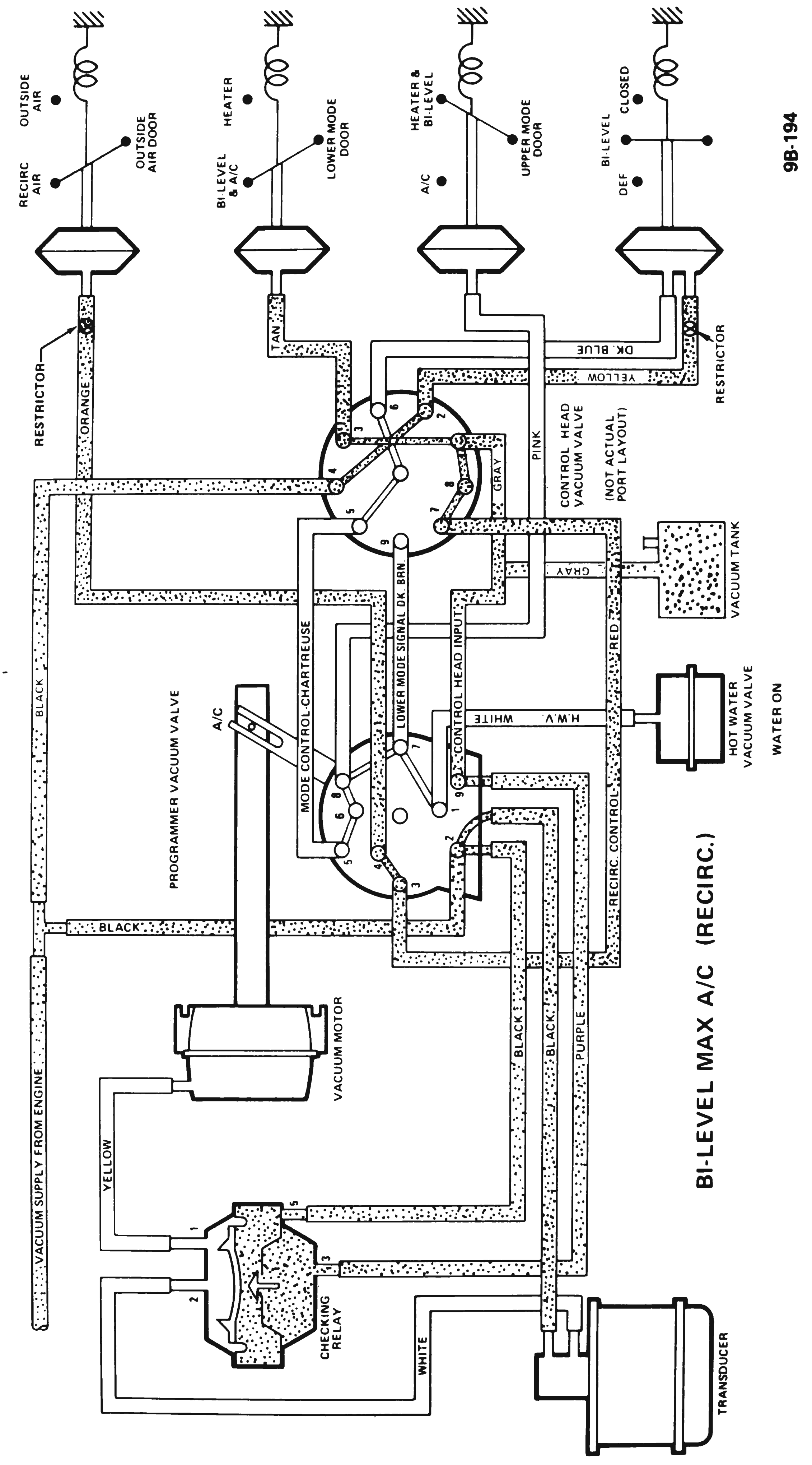


Figure 9B-254 Vacuum Circuits - System in BI-LEVEL MAX A/C (Recirc)

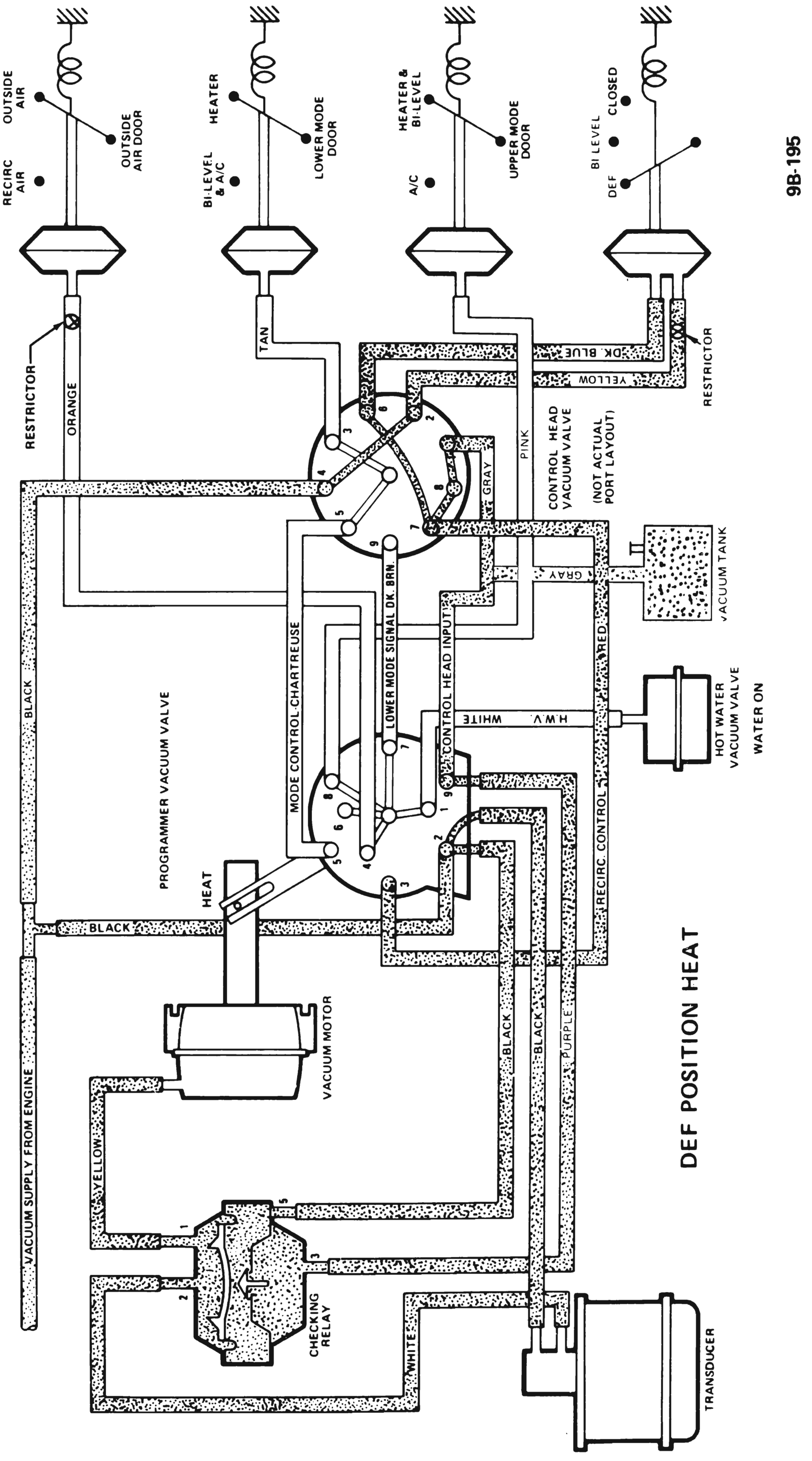


Figure 9B-255 Vacuum Circuits - System in DEF Position Heat

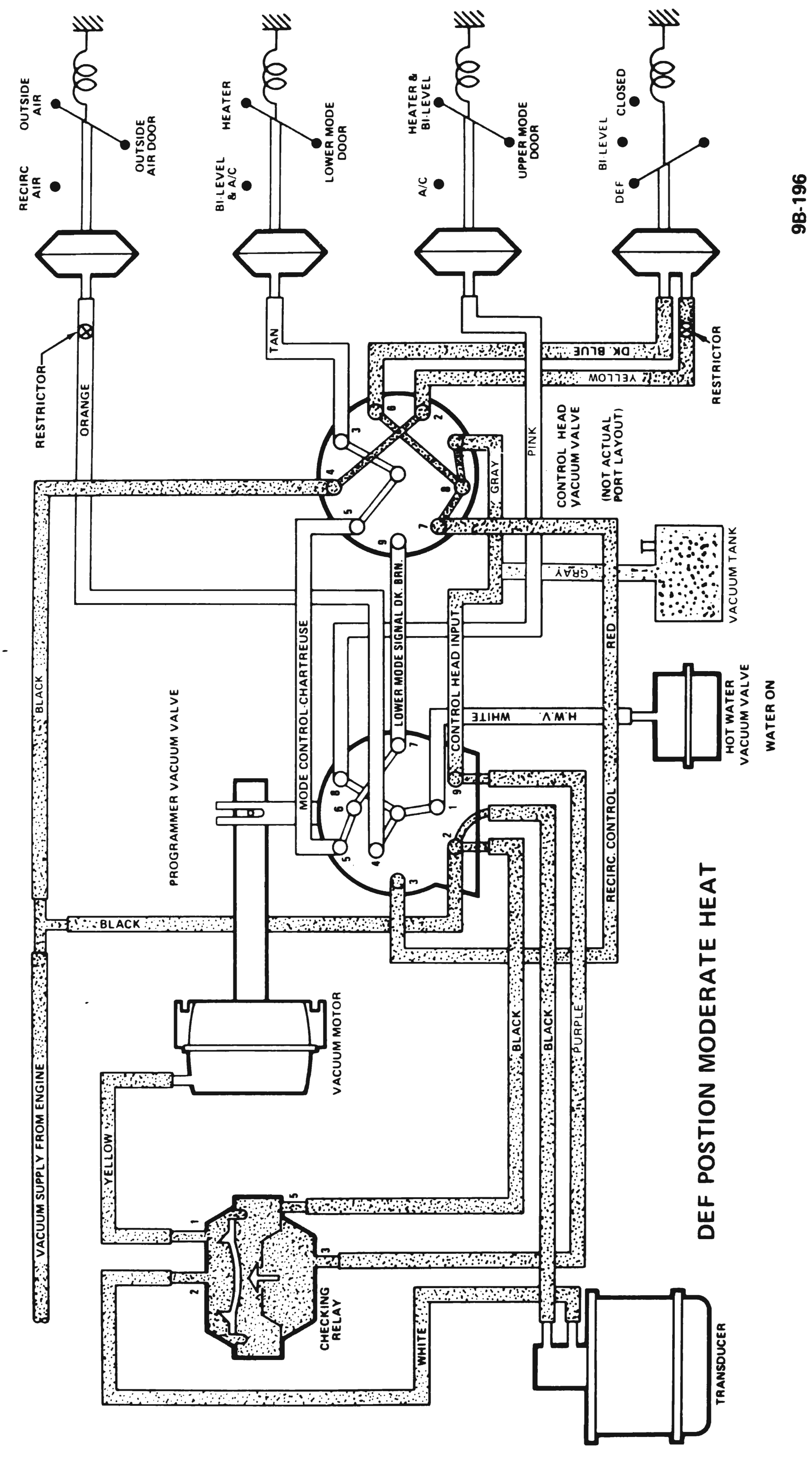


Figure 9B-256 Vacuum Circuits - DEF Position Moderate Heat

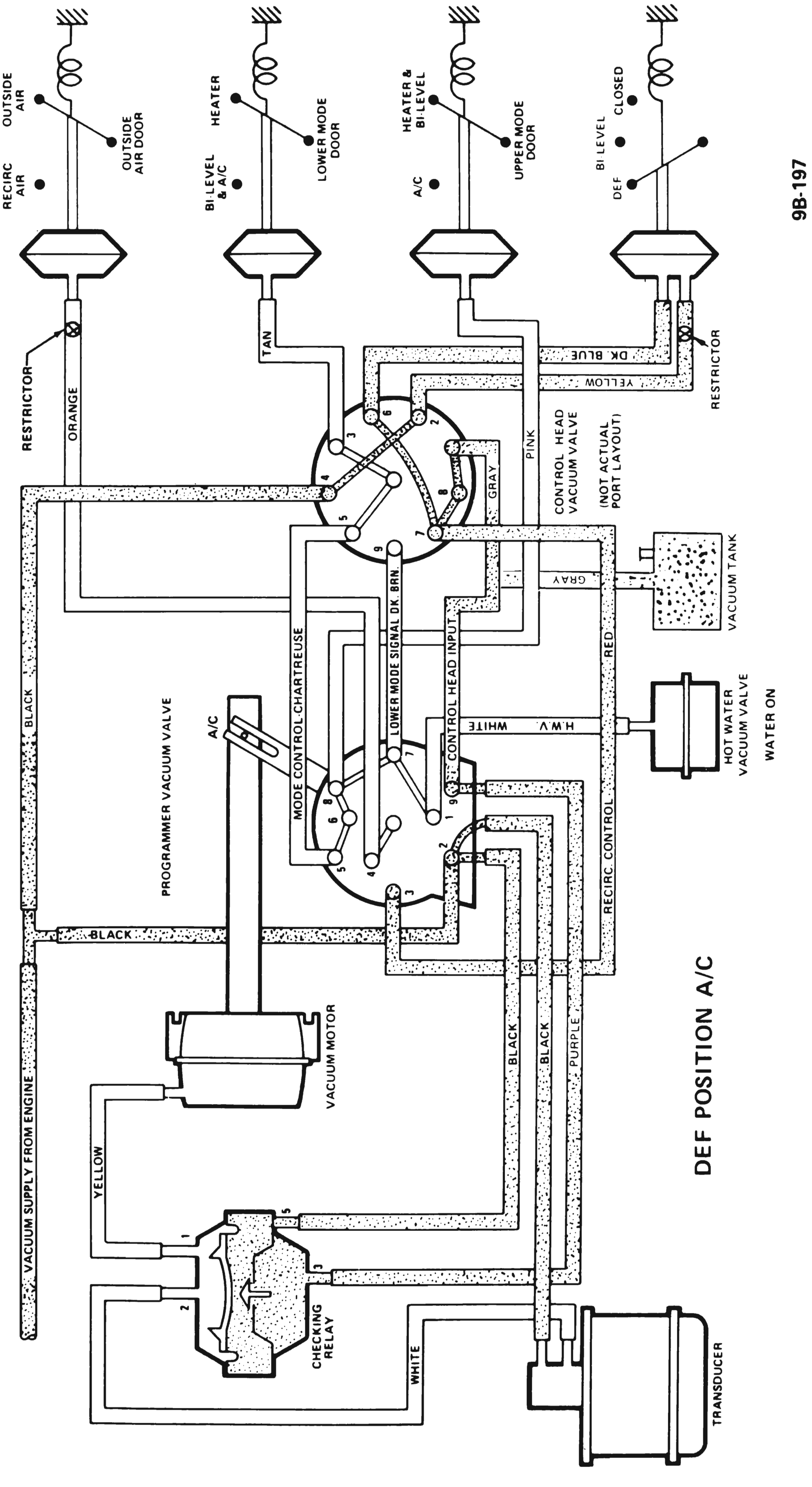


Figure 9B-257 Vacuum Circuits - System in DEF Position A/C

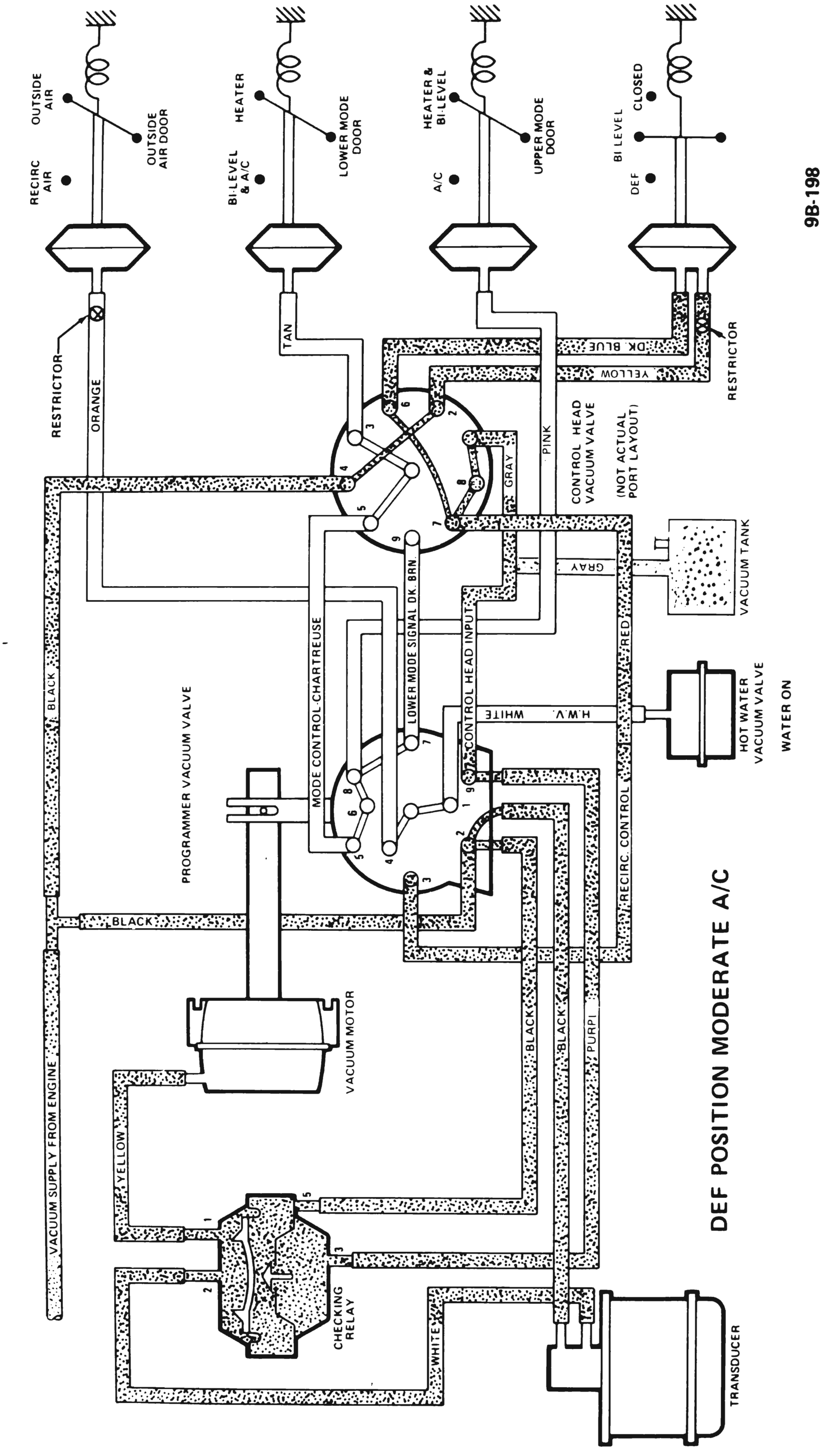


Figure 9B-258 Vacuum Circuits - System in DEF Position Moderate A/C

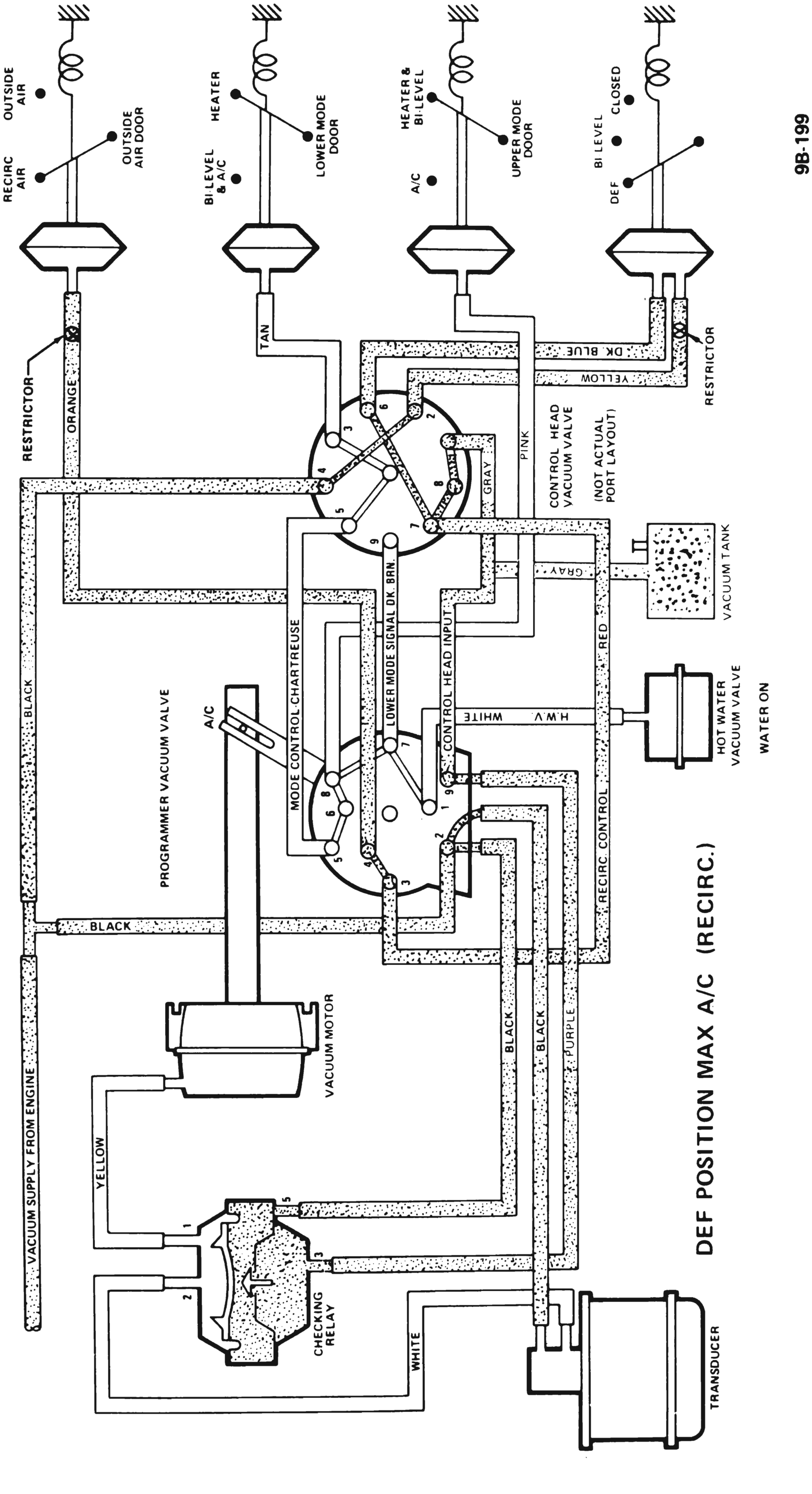


Figure 9B-260 Vacuum Circuit - System in DEF Position MAX A/C (Recirc)

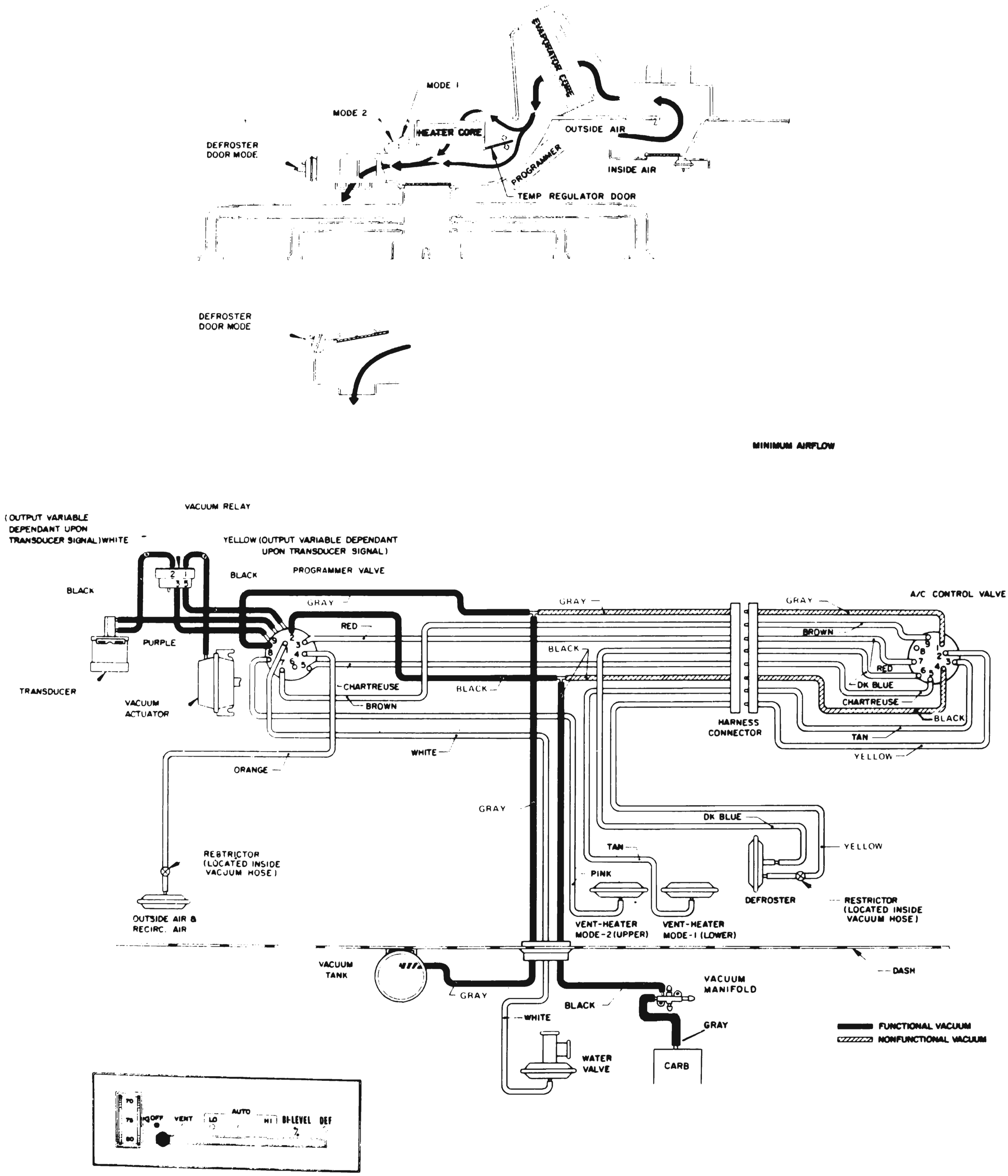


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Figure 9B-261 Air Flow and Vacuum Circuits - System in OFF Position

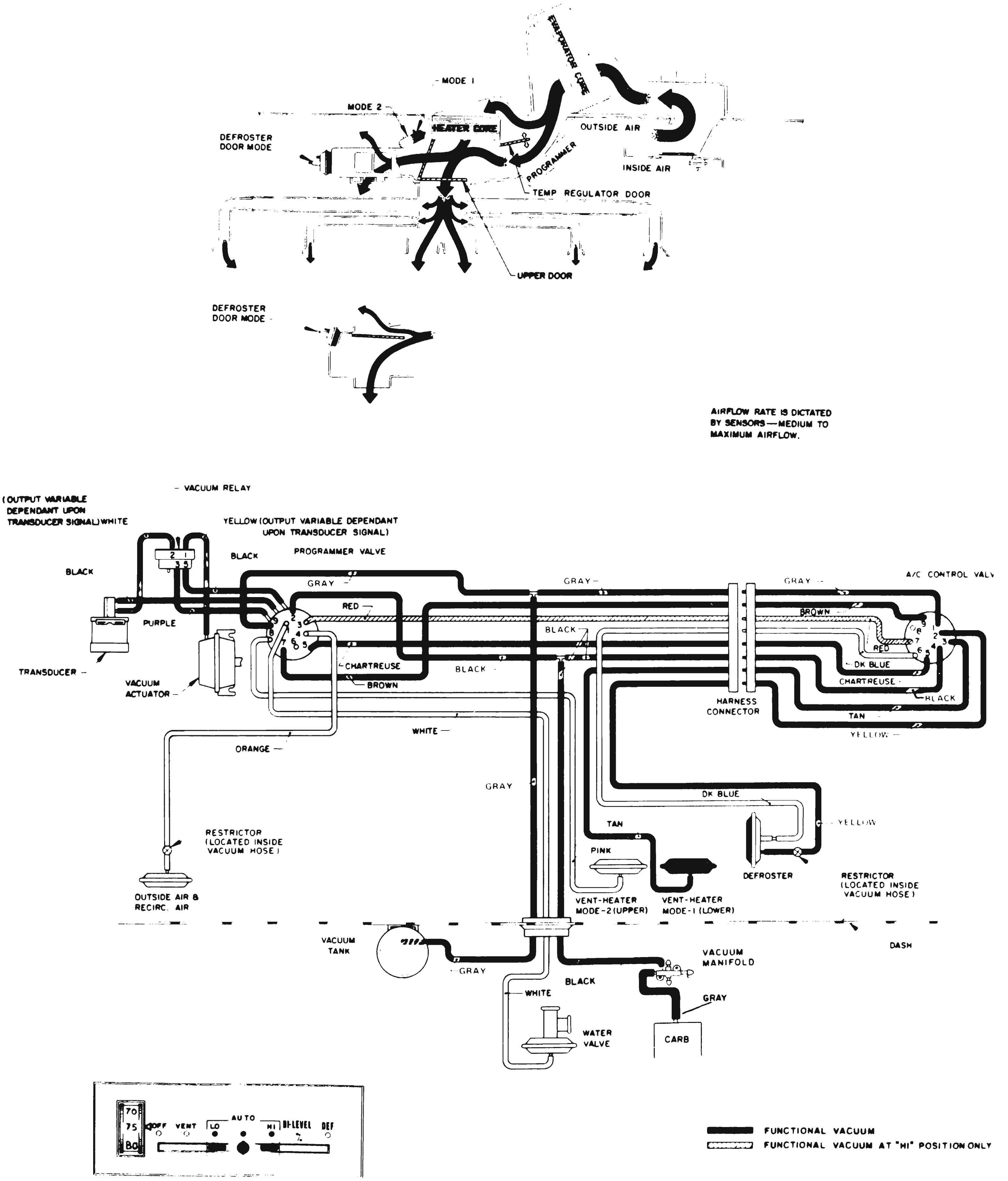

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Figure 9B-262 Air Flow and Vacuum Circuits - System in VENT Position

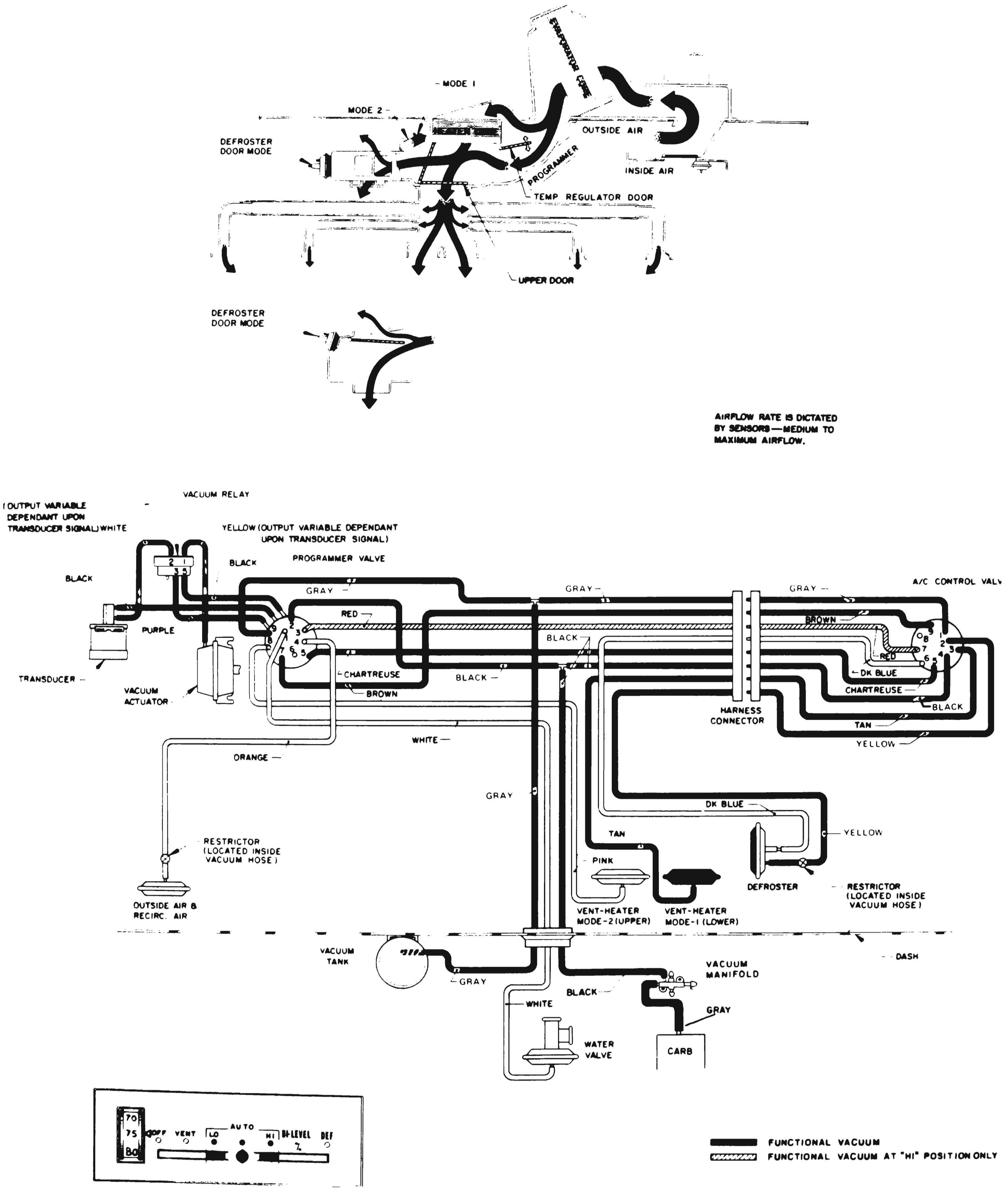

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Figure 9B-263 Air Flow and Vacuum Circuits - System in AUTO Position

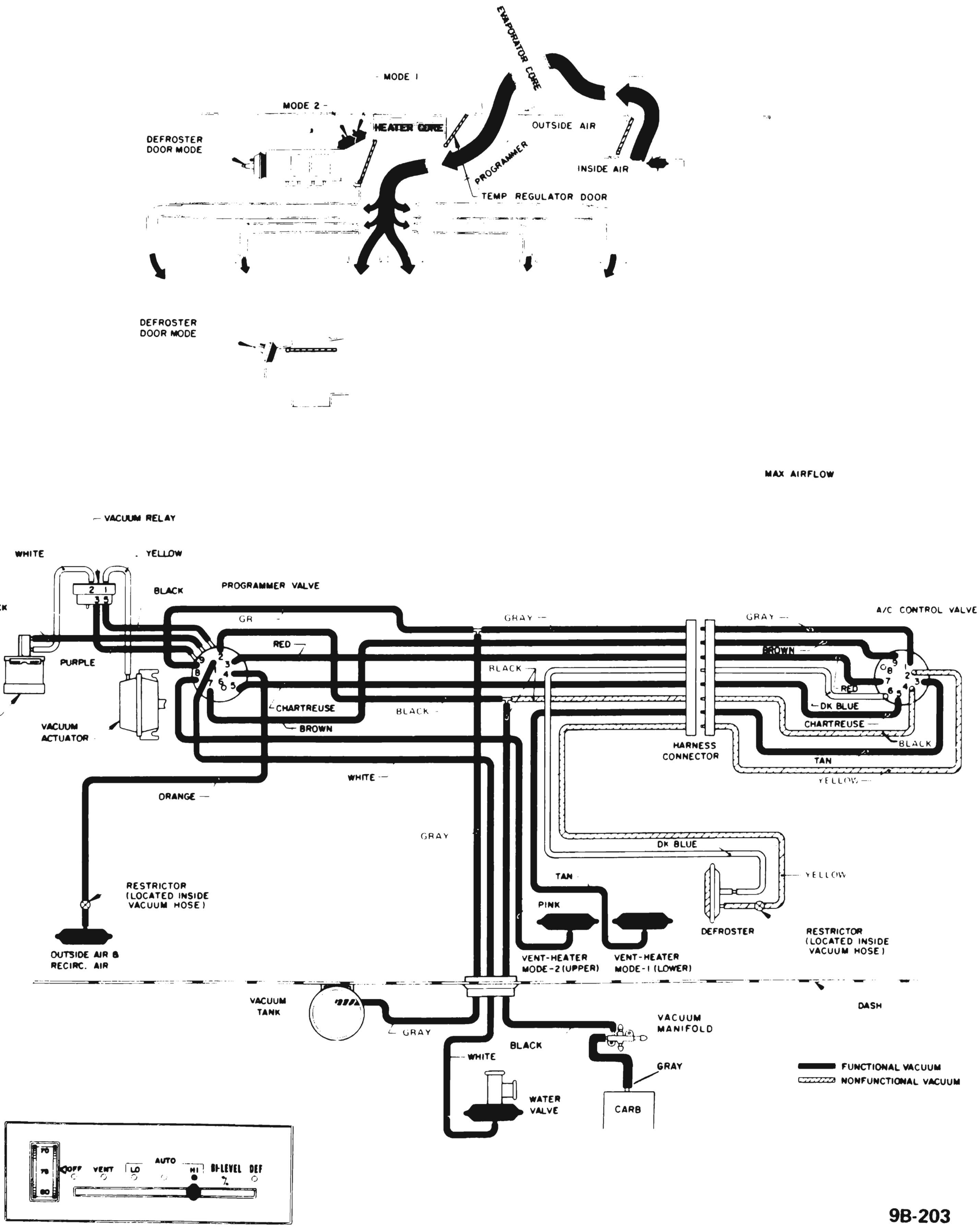


Figure 9B-264 Air Flow and Vacuum Circuits - System in AUTO HI Position

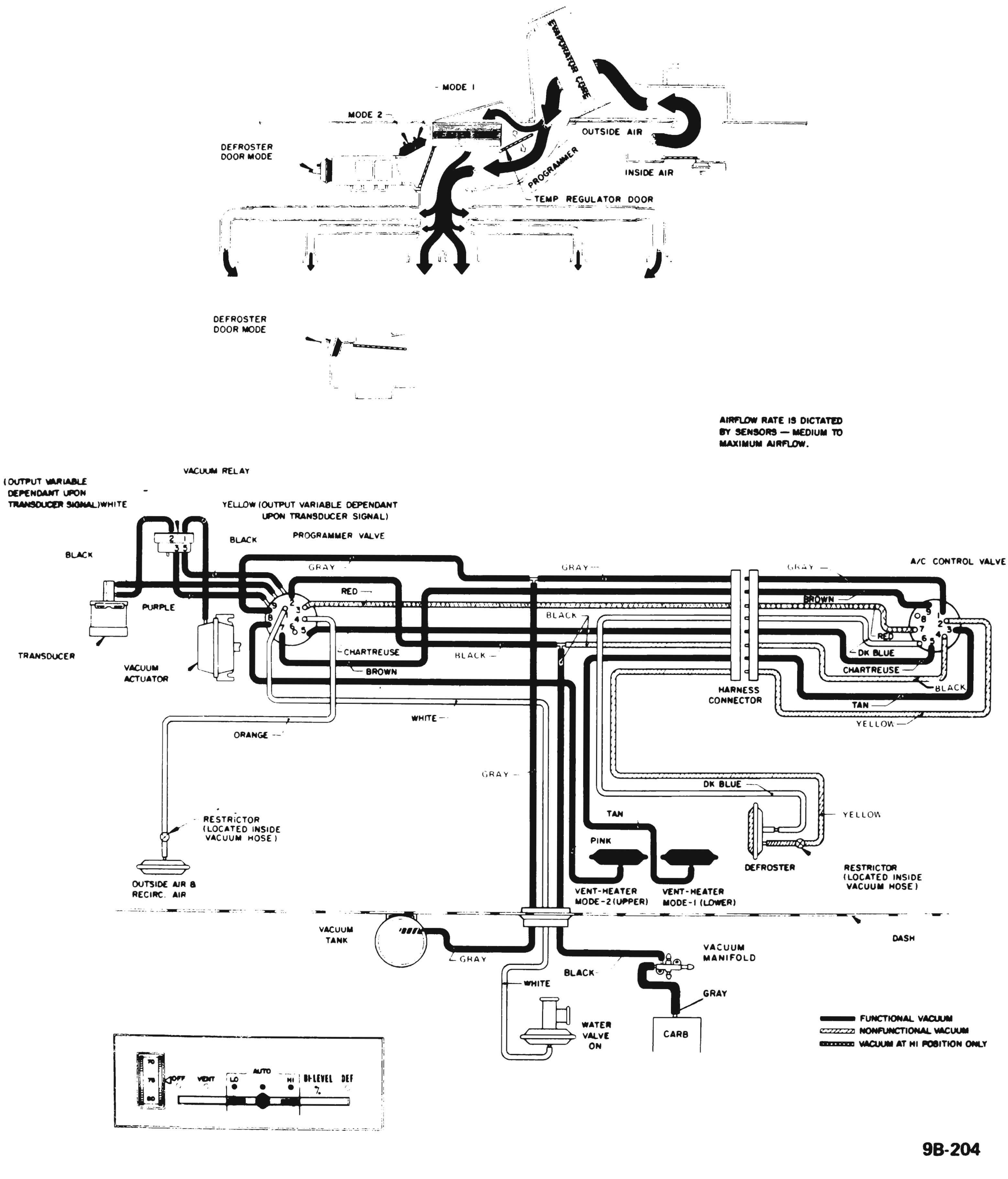
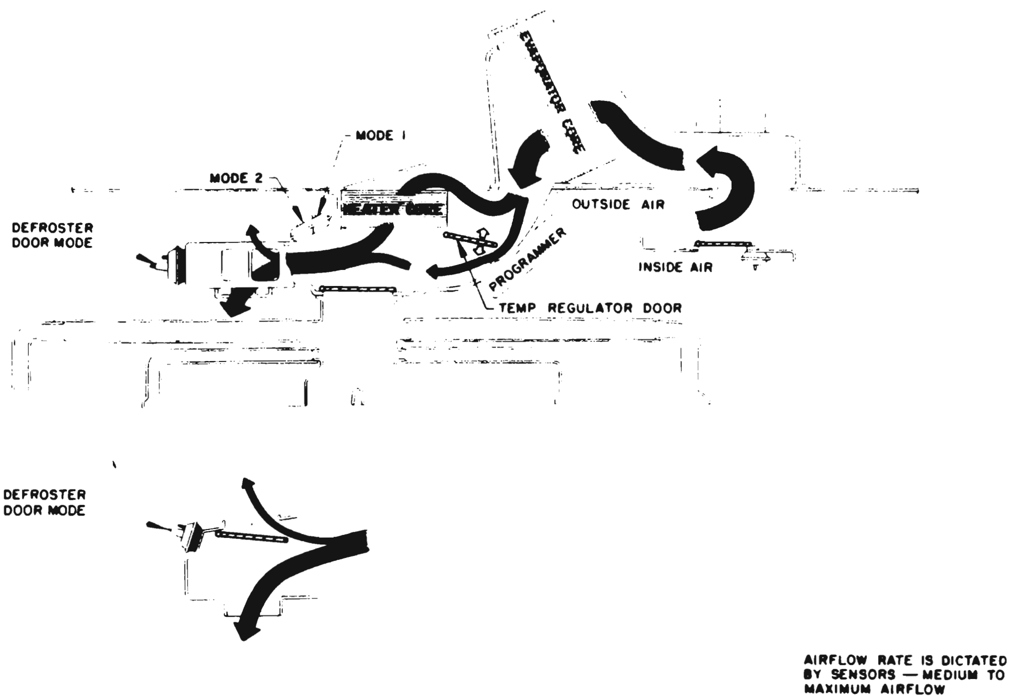


Figure 9B-265 Air Flow and Vacuum Circuits - System in AUTO Position



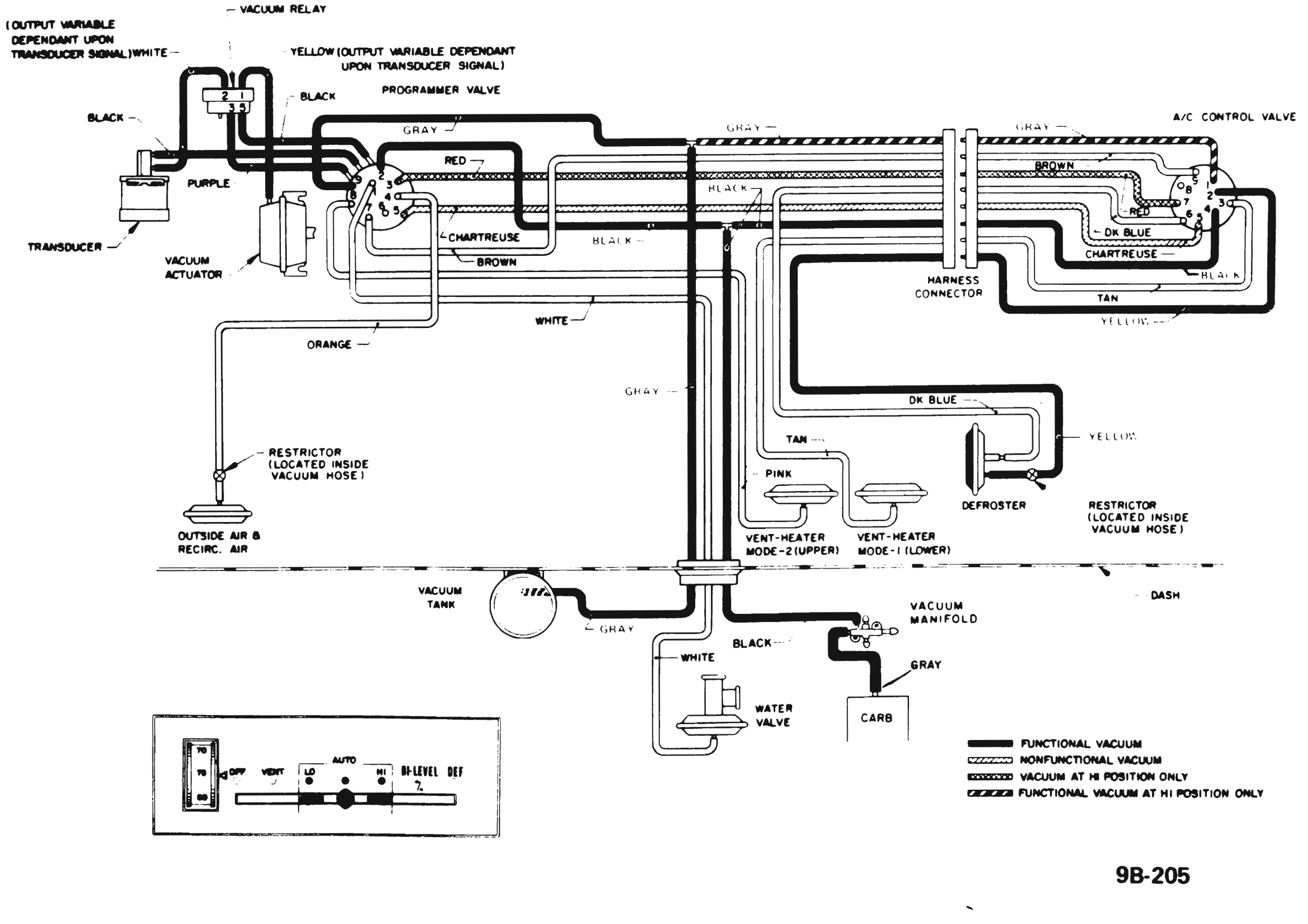


Figure 9B-266 Air Flow and Vacuum Circuits - System in AUTO Position

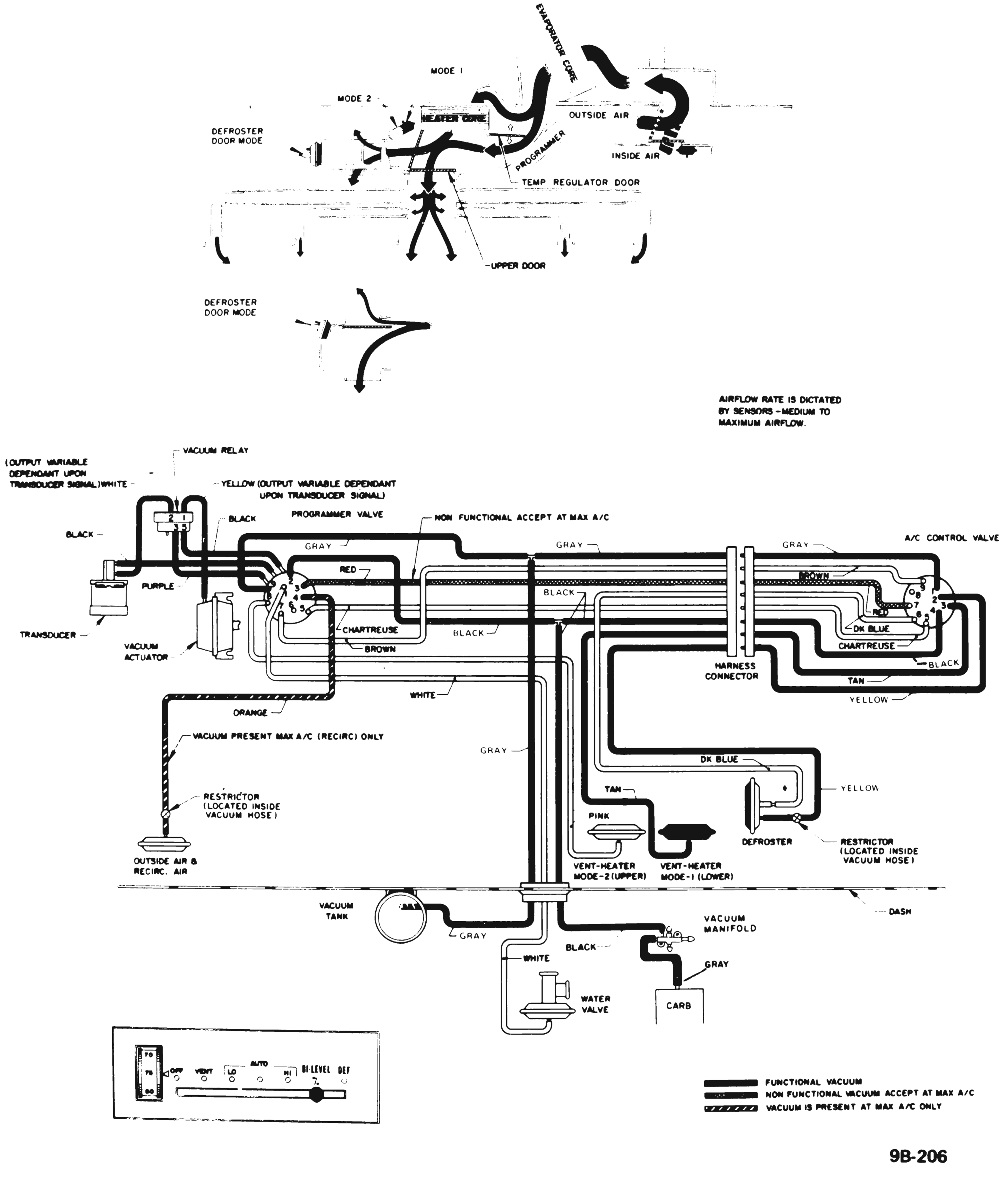


Figure 9B-267 Air Flow and Vacuum Circuits - System in BI-LEVEL Position

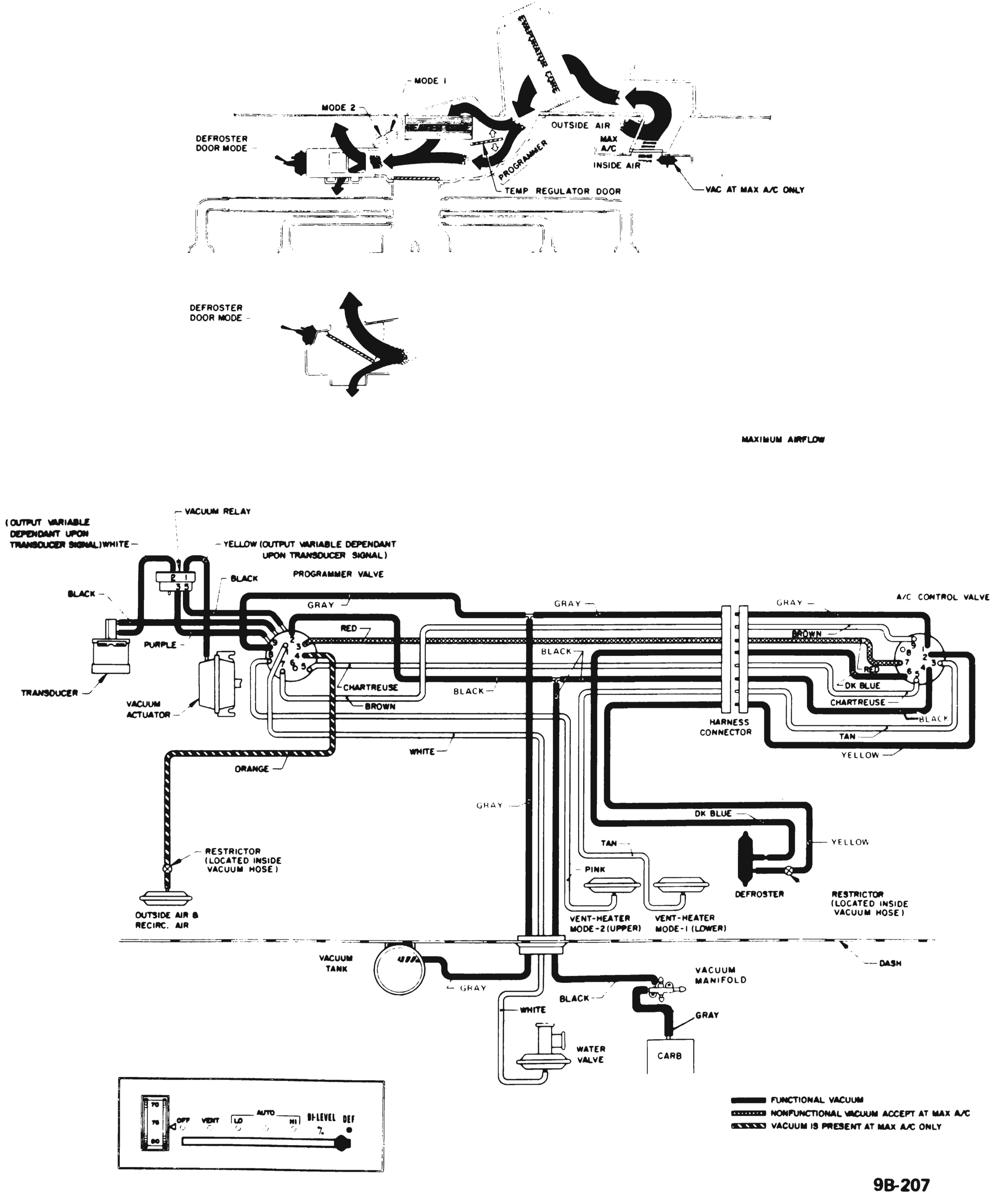


Figure 9B-268 Air Flow and Vacuum Circuits - System in DEF Position

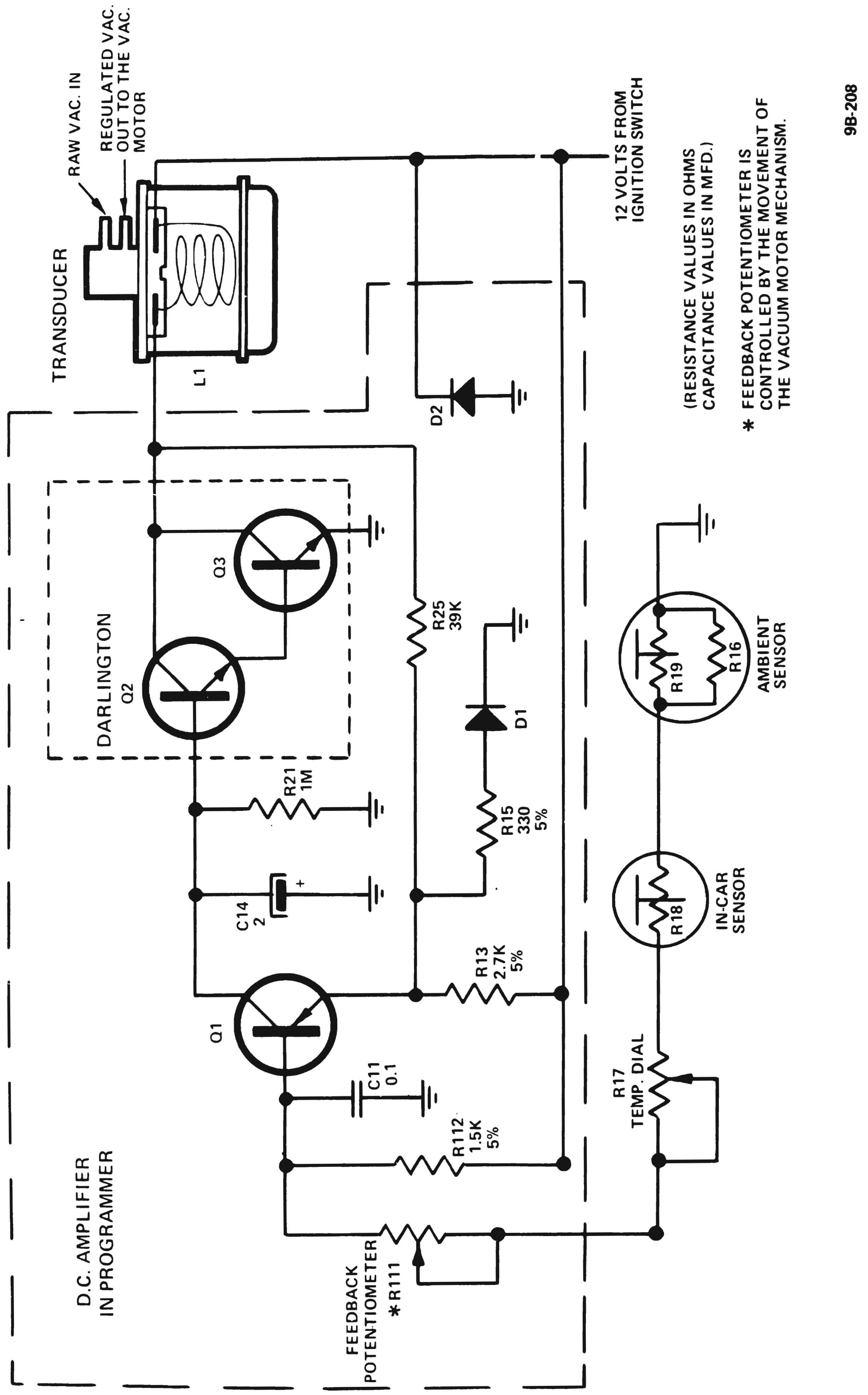


Figure 9B-270 Amplifier Circuit Schematic

TYPICAL OPERATING CHARACTERISTICS OF PROGRAMMER

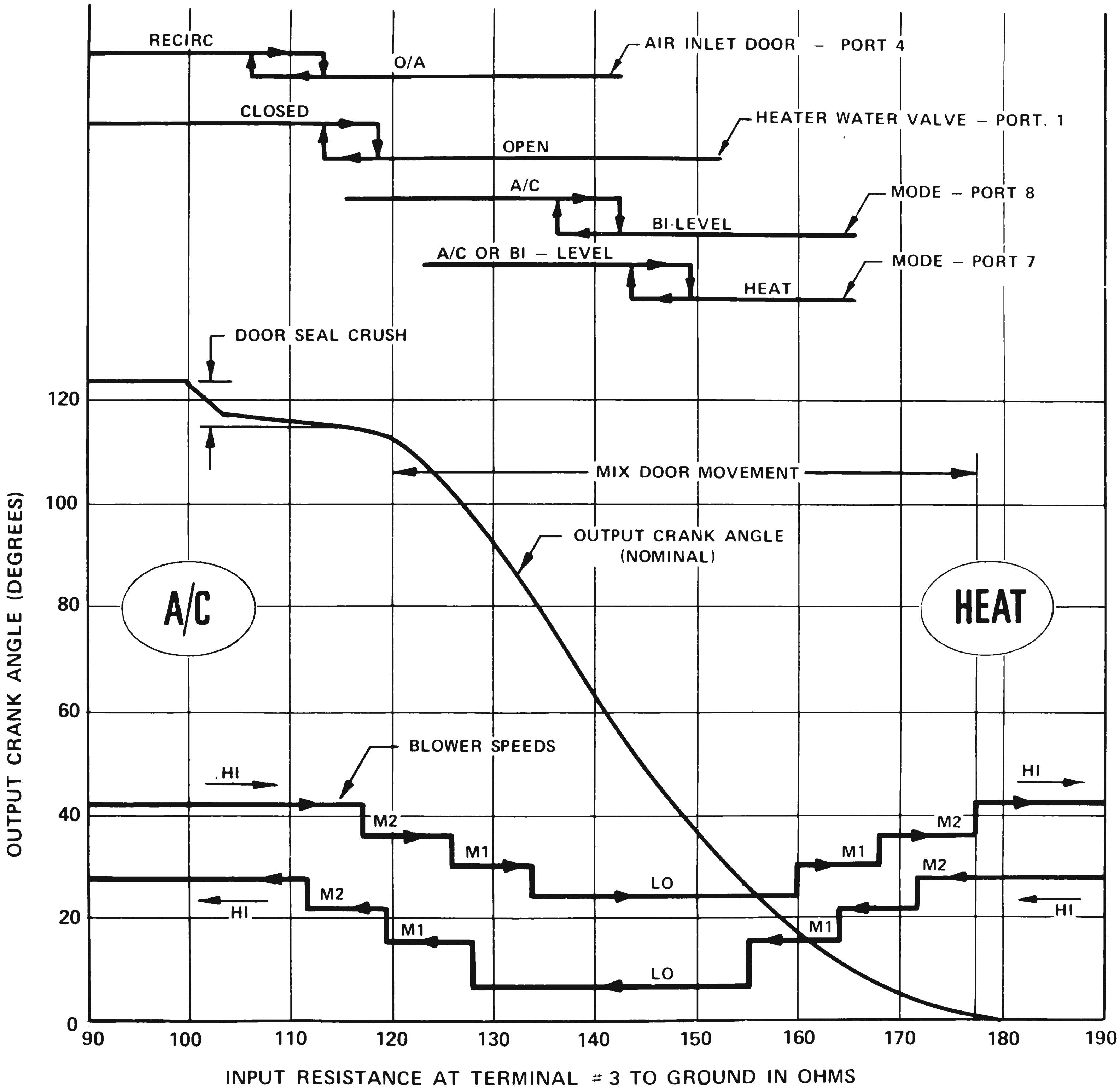


Figure 9B-271 Typical Operating Characteristics of Programmer

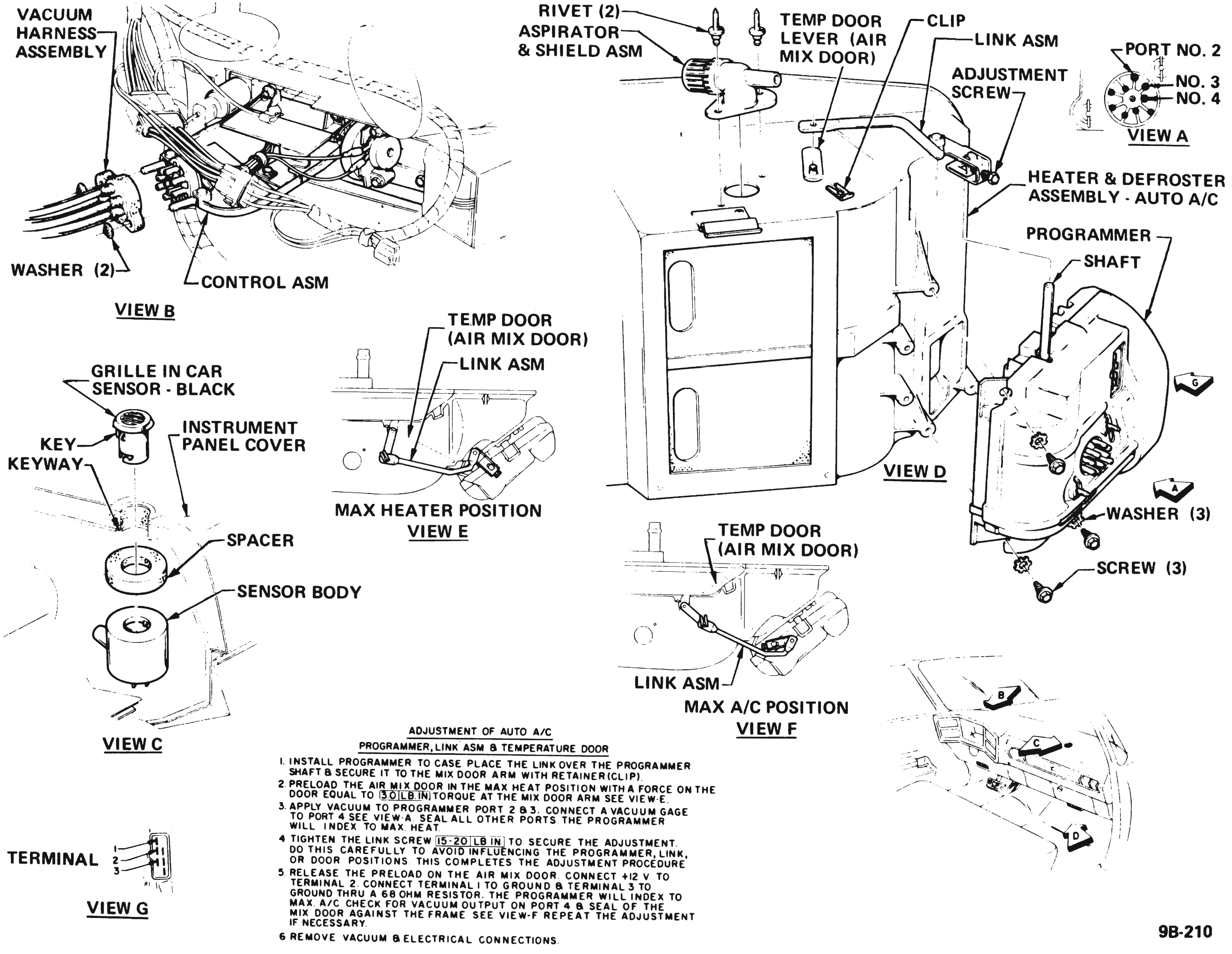


Figure 9B-272 Automatic A/C Programmer Control and In Car Sensor

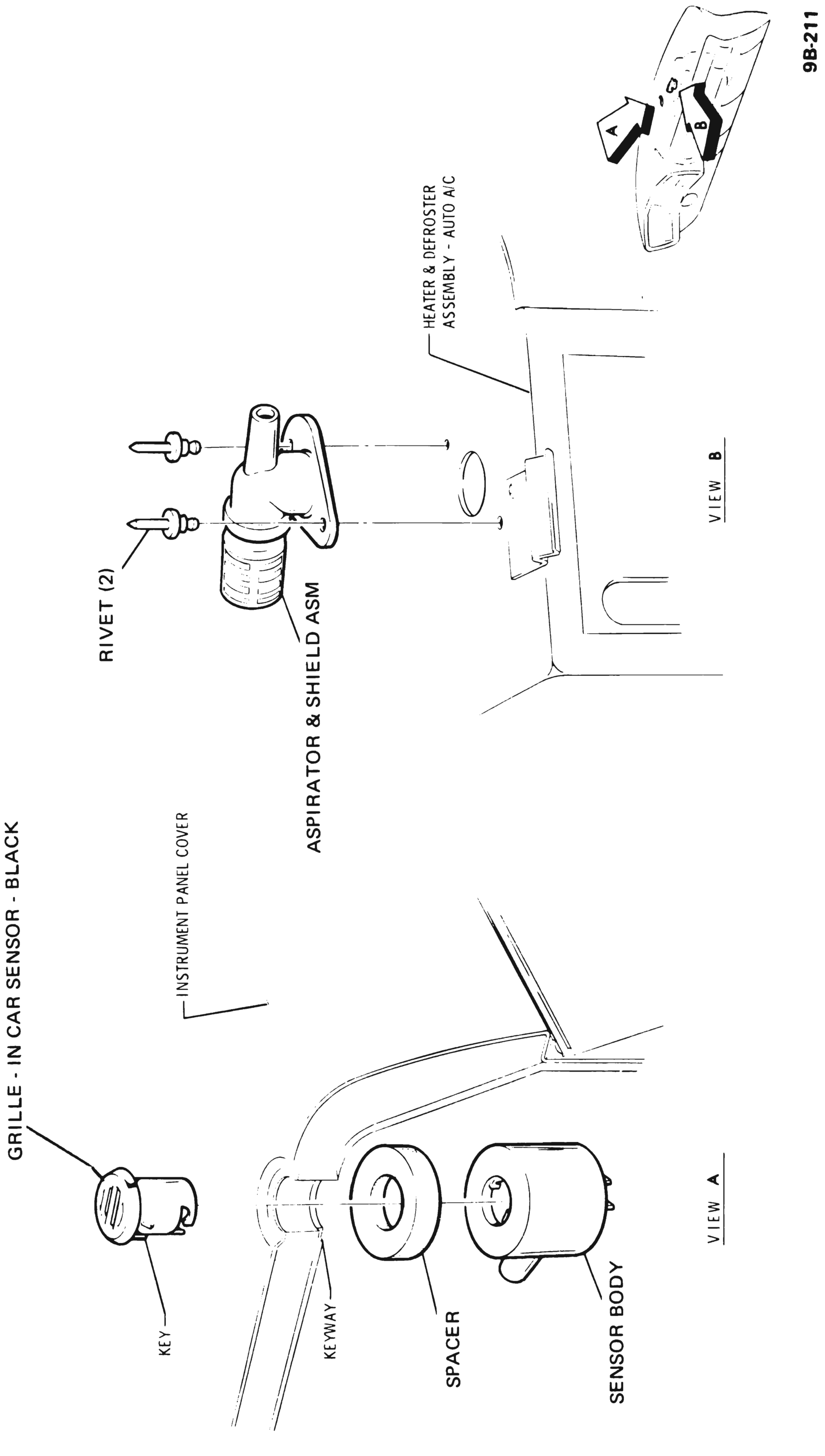


Figure 9B-273 Automatic A/C in Car Sensor and Aspirator

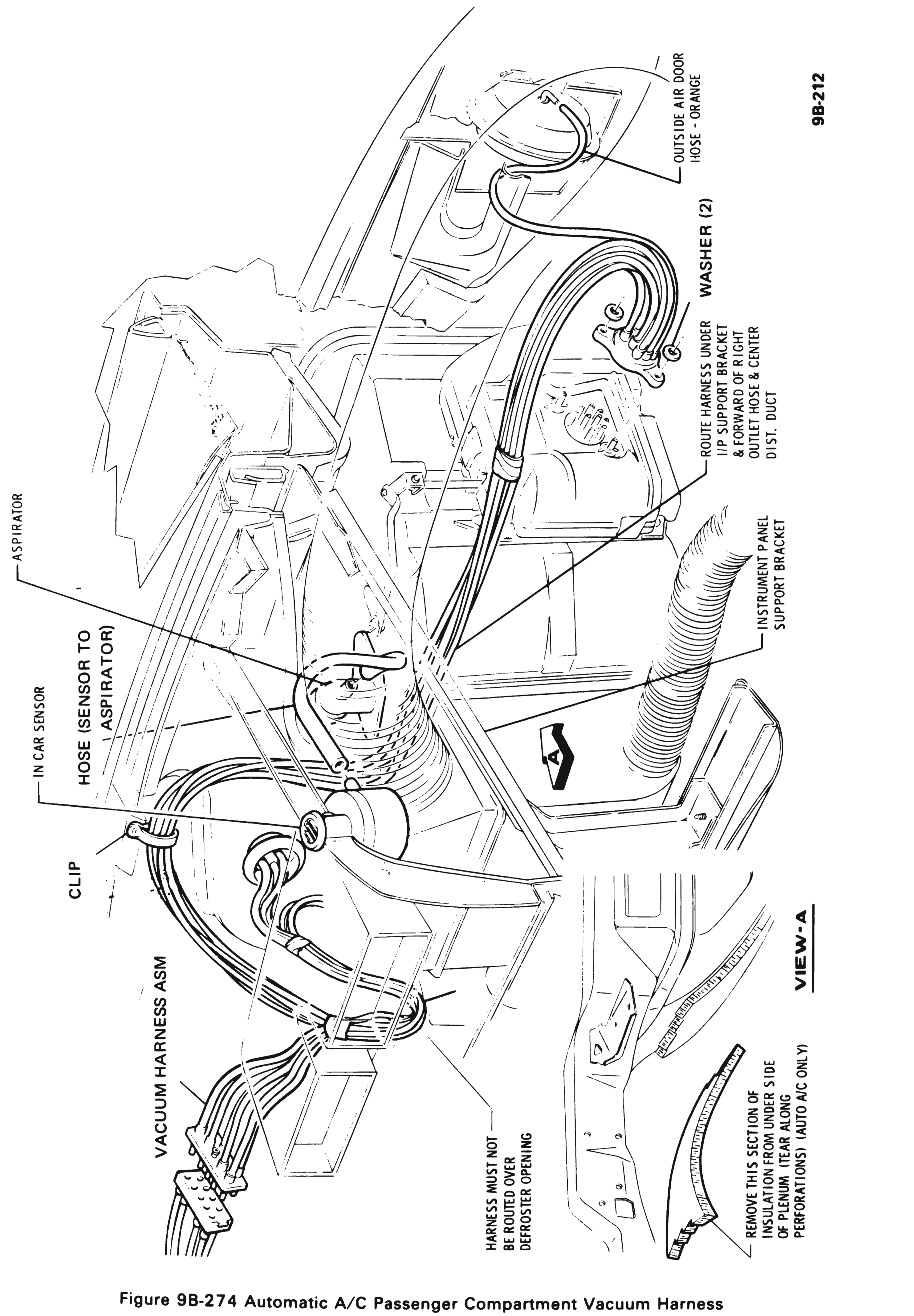


Figure 9B-274 Automatic A/C Passenger Compartment Vacuum Harness

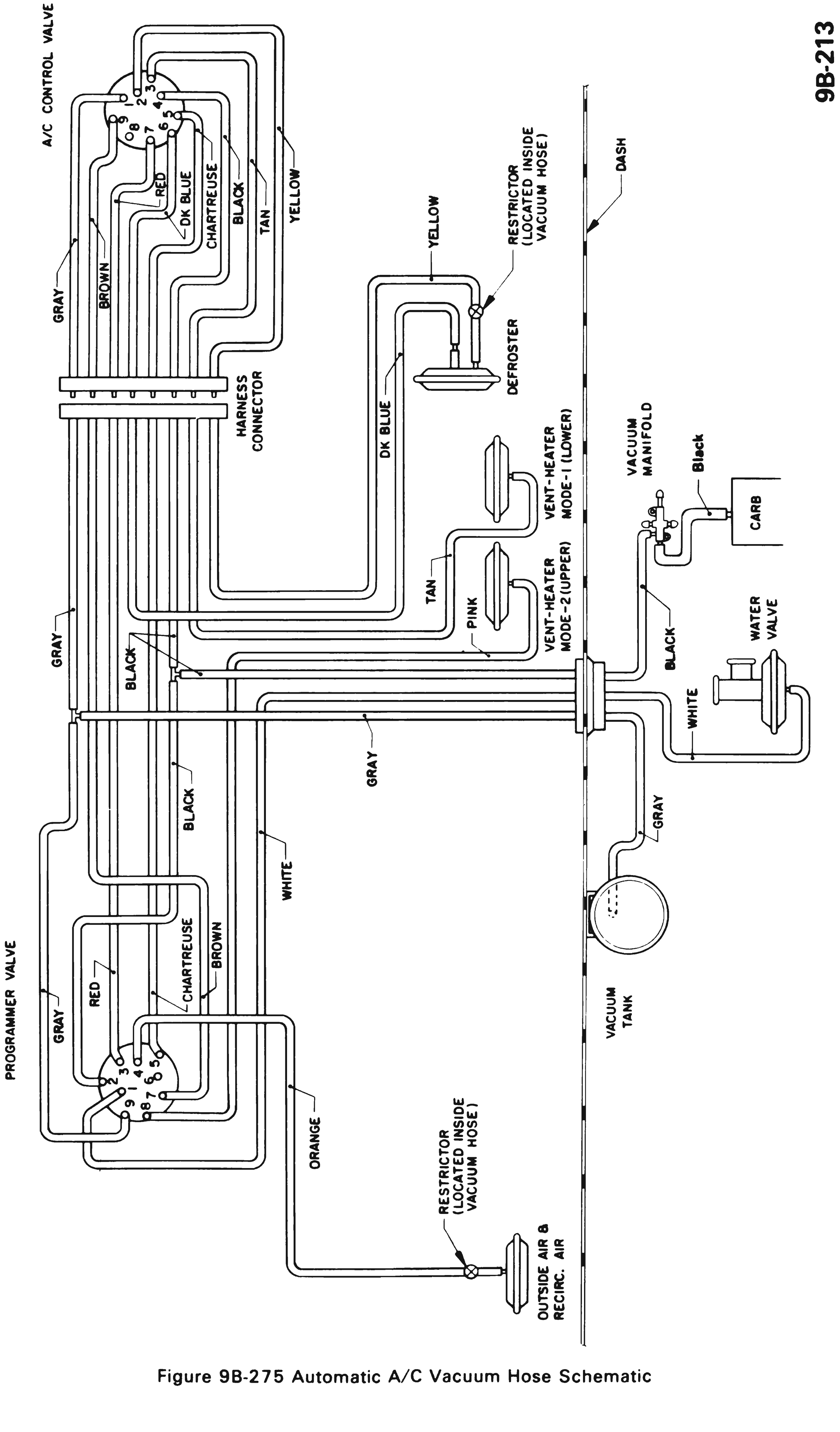


Figure 9B-275 Automatic A/C Vacuum Hose Schematic

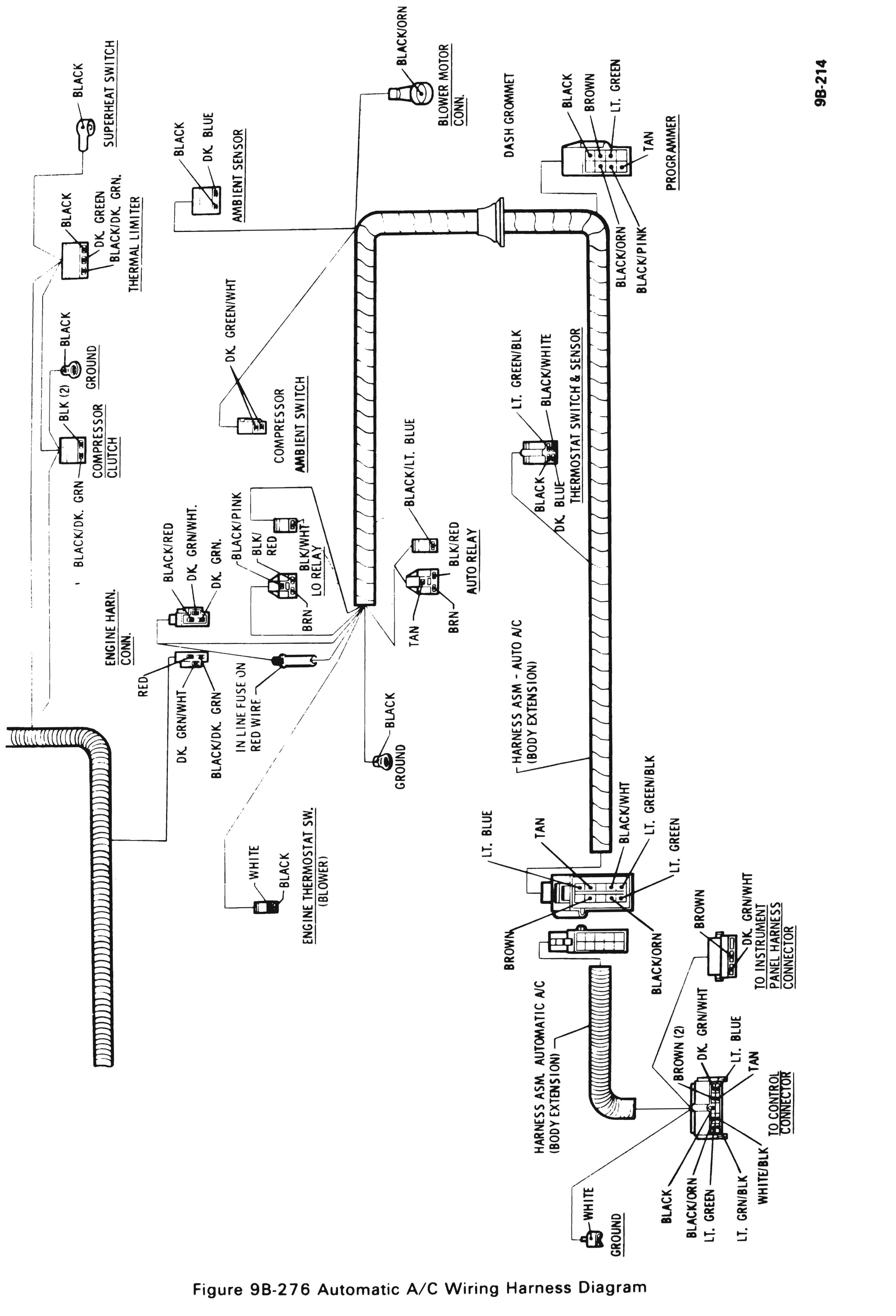


Figure 9B-276 Automatic A/C Wiring Harness Diagram

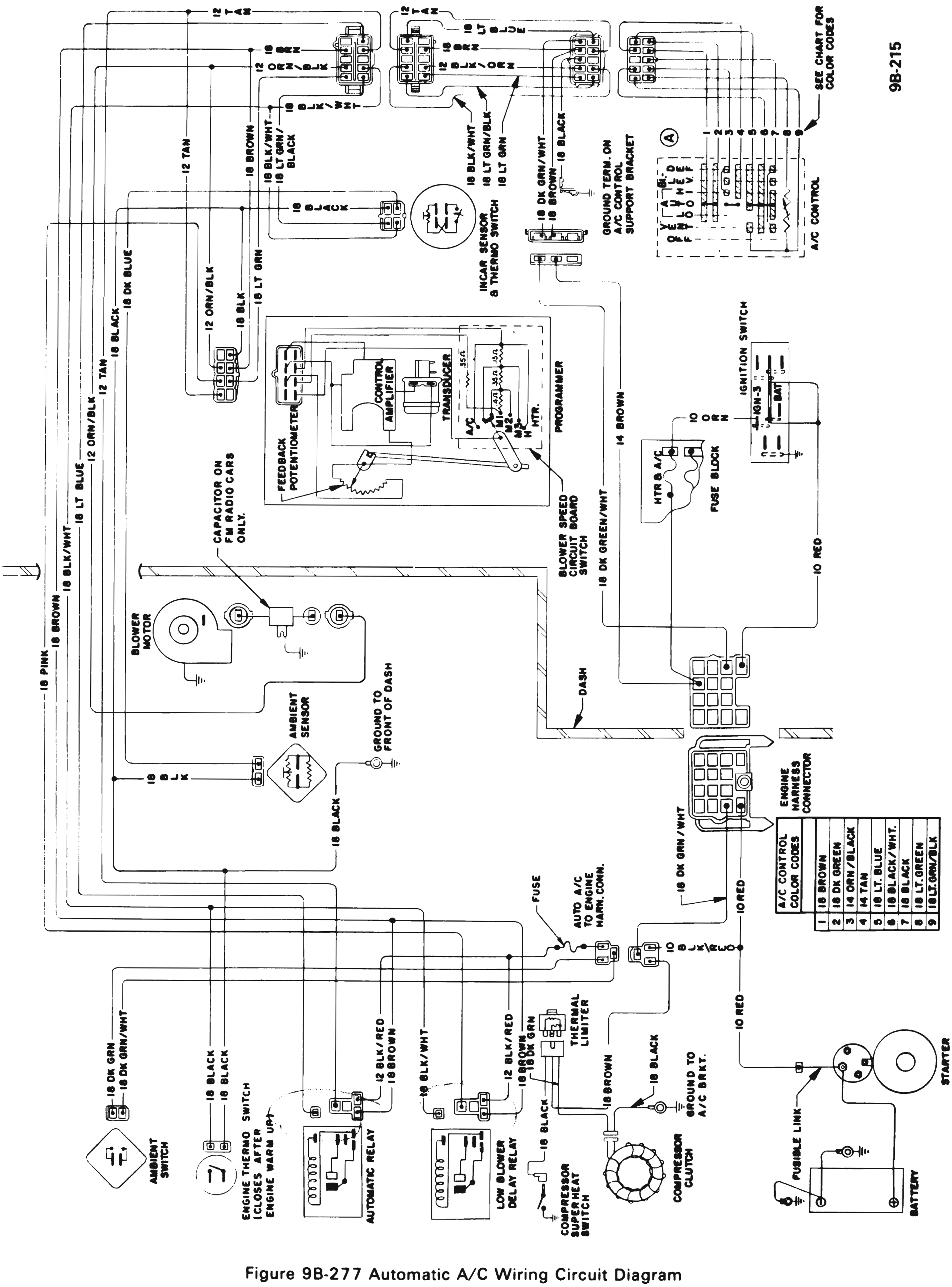


Figure 9B-277 Automatic A/C Wiring Circuit Diagram

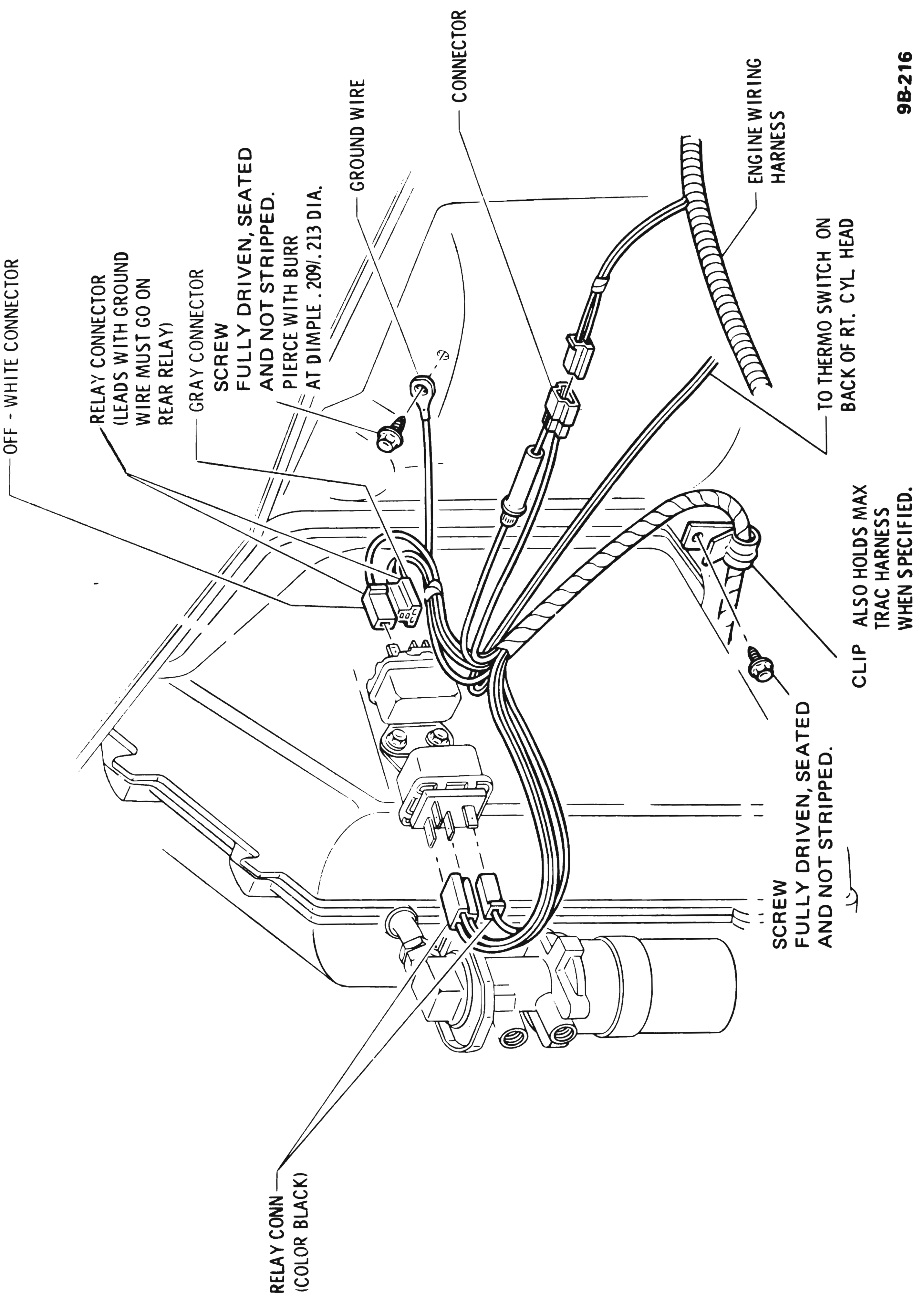


Figure 9B-278 Automatic A/C Relays Wiring

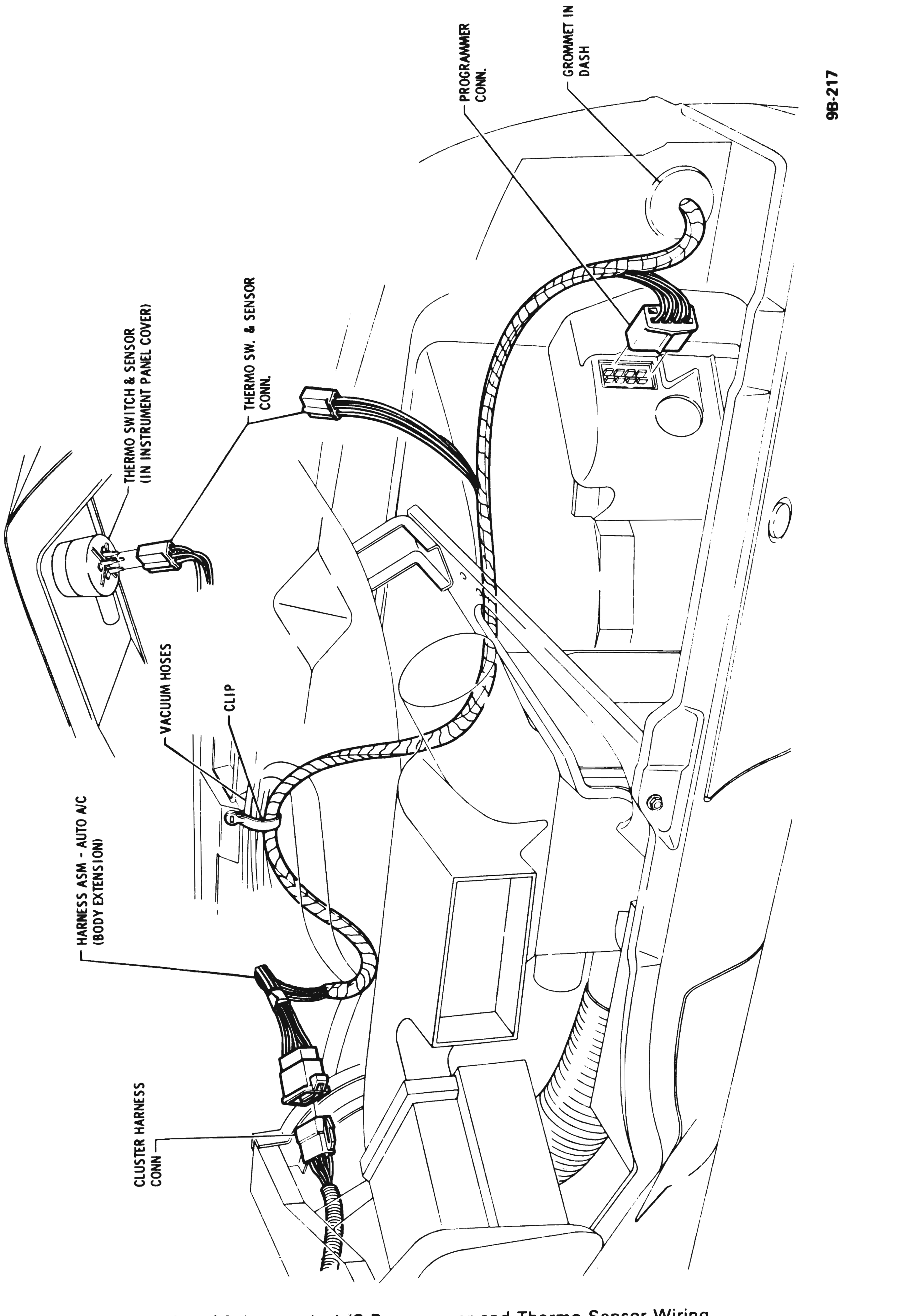


Figure 9B-280 Automatic A/C Programmer and Thermo Sensor Wiring

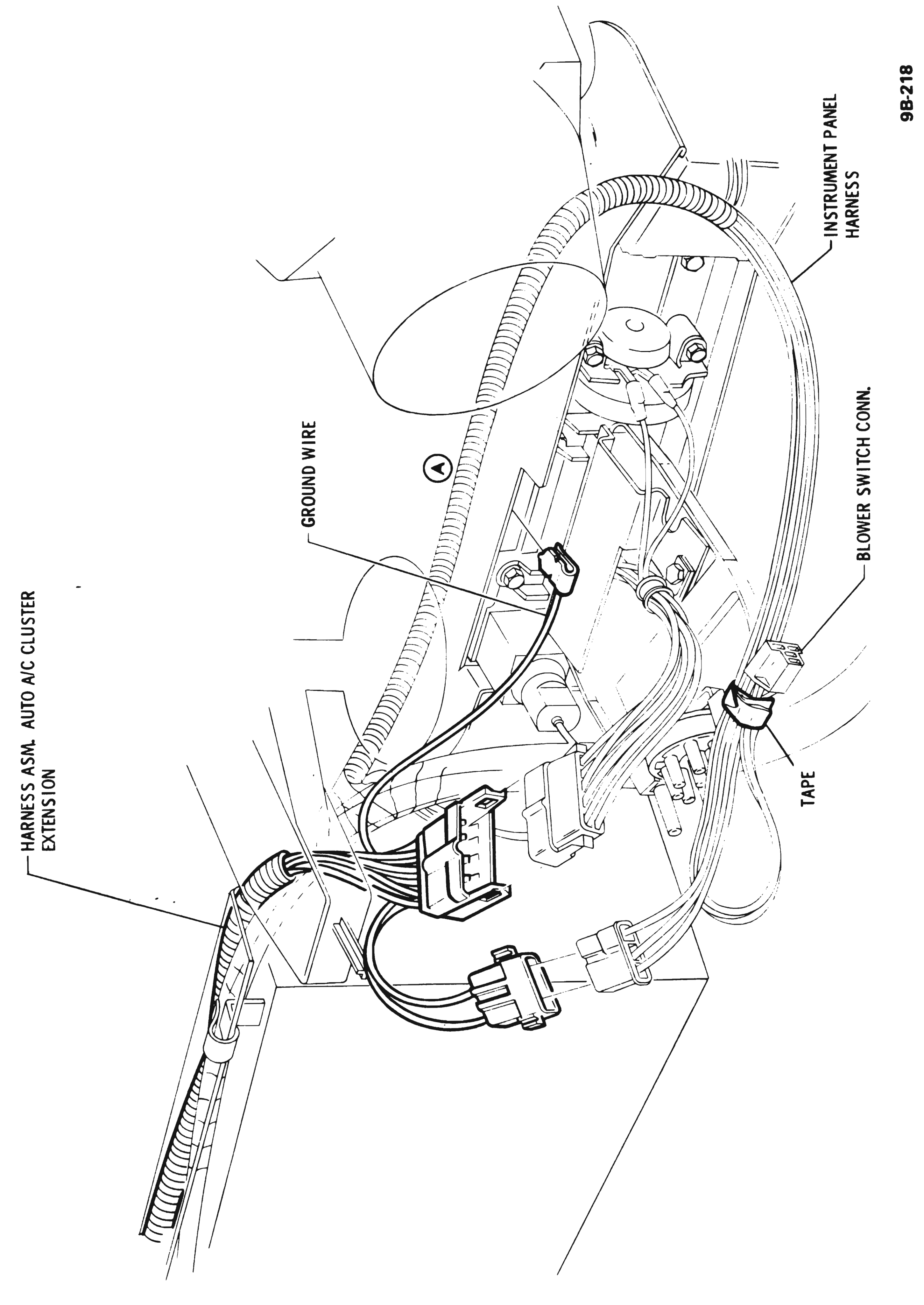


Figure 9B-281 Automatic A/C Control Wiring

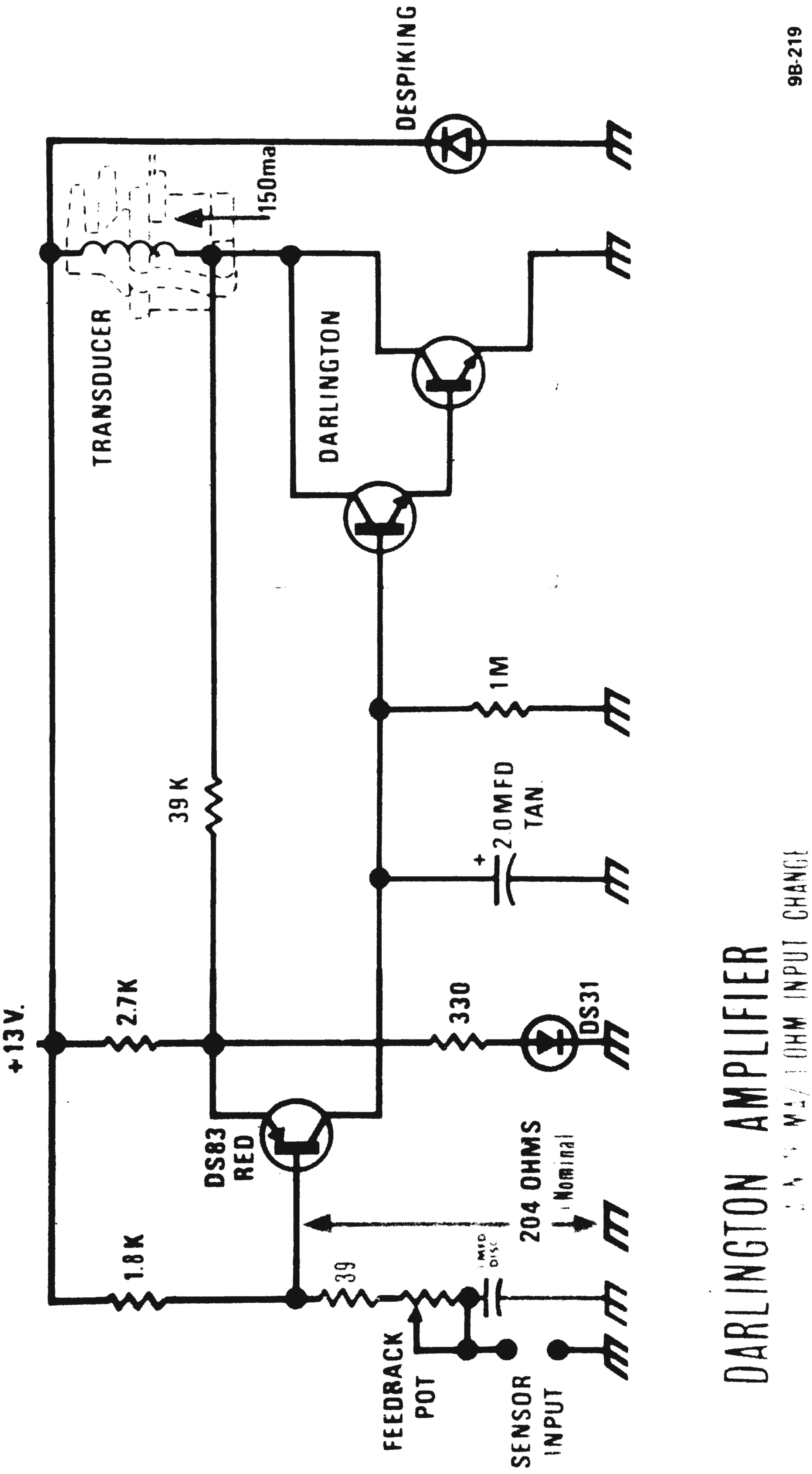


Figure 9B-282 Darlington Amplifier

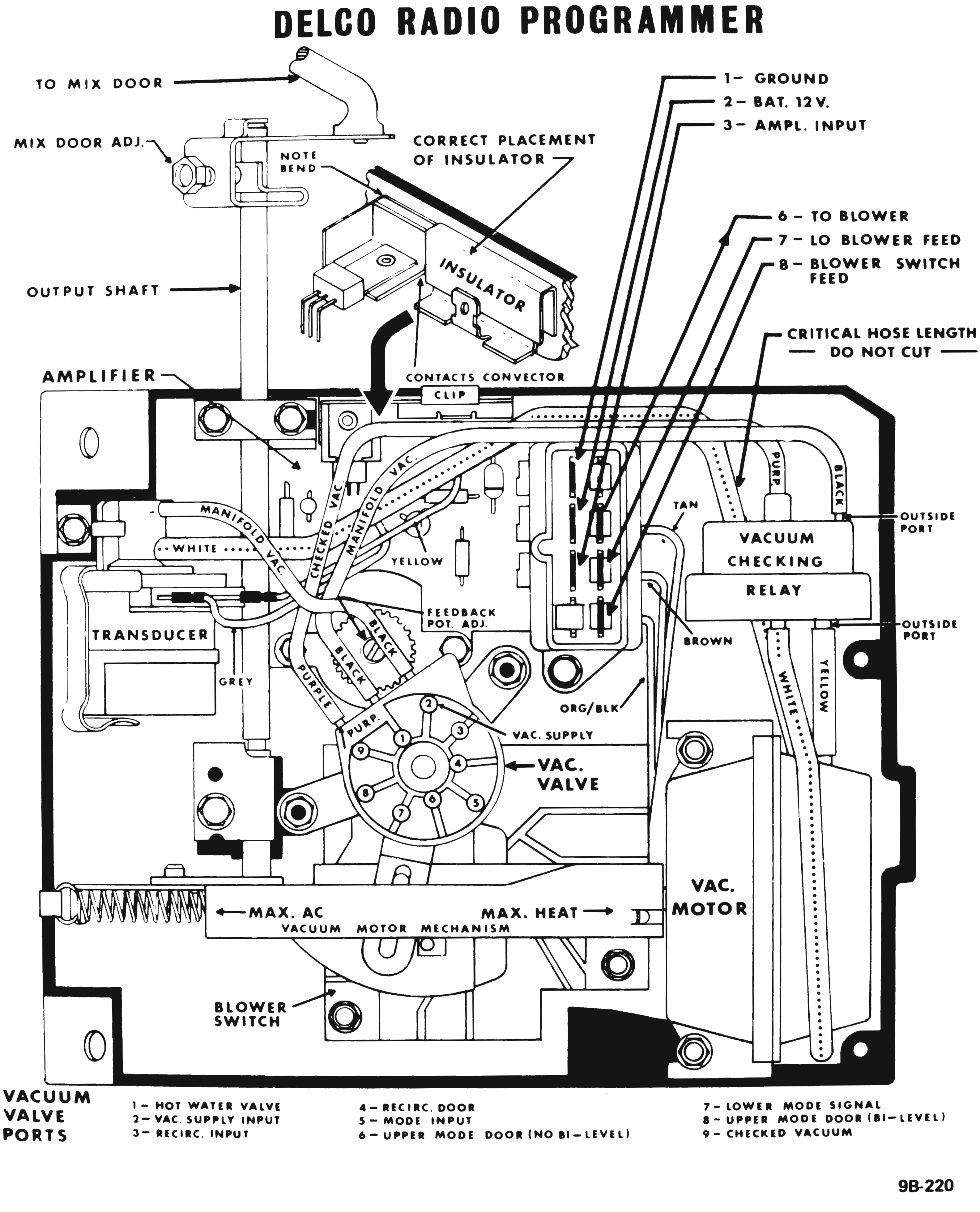
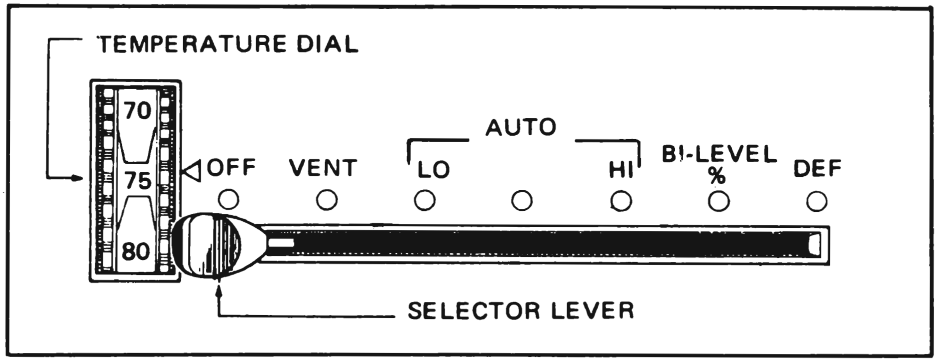


Figure 9B-283 Delco Radio Programmer

AUTOMATIC CLIMATE CONTROL



COMFORT PREFERENCE	SELECTOR SWITCH POSITION	TEMPERATURE DIAL POSITION	COMMENTS
VENTILATION	VENT	No effect	A/C Compressor off Fixed LO blower speed Untreated outside air enters thru Air Conditioner outlets
	OFF	Set between "70" & "80" to approximate temperature preference.	A/C Compressor off Fixed LO blower speed (after engine warm-up). Outside air enters thru heater outlet
AUTOMATIC CLIMATE CONTROL OPERATION FOR WARMING OR COOLING DEPENDING ON WEATHER	AUTO (Center Position)		ALL WEATHER OPERATION Blower speeds alternate automatically from HI to Lo as necessary to maintain temperature setting. Treated air may come from heater and/or Air Conditioning outlets depending on system demands. A/C compressor on above 35° F to dehumidify and cool.
	AUTO ("LO")	If adjustment is necessary after temperature stabilizes, move dial only slightly to avoid discomfort of extreme temperatures.	OPTIONAL FOR MODERATE WEATHER Same as above except blower speed on fixed LO to maintain temperature setting.
	AUTO ("HI")		OPTIONAL FOR EXTREME WEATHER Blower speed on fixed HI to maintain temperature setting. In hot weather incoming air is initially recirculated for maximum air conditioning and then outside air is cooled to maintain temperature setting.
WINDSHIELD DEFOGGING OR DEFROSTING	BI-LEVEL		A/C Compressor on to dehumidify (above 35° F) Air enters thru Air Conditioning, heater, & defroster outlets to defog windshield & side windows.
	DEF		A/C Compressor on to dehumidify (above 35° F) Fixed high blower speed. Majority of air out defroster outlets - some out heater outlet.

NOTE: To insure passenger comfort in cool weather, the Full Flow Ventilation blower fan will not start until engine warm-up with Selector lever at "OFF or "AUTO".

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Figure 9B-284 Function Chart

<table>
<tr><th>LEVER</th><th>AIR INLET DOOR LOCATION</th><th>PROGRAMMER AND TEMP. DOOR</th><th>MODE DOORS POSITION</th><th>DEFROSTER DOOR POSITION</th><th>COMPRESSOR CLUTCH</th><th>WATER VALVE (NORMALLY OPEN)</th><th>BLOWER RELAYS</th><th>BLOWER SPEEDS</th></tr>
<tr><td>OFF</td><td rowspan="4">OUTSIDE AIR</td><td>VARIES</td><td>HEATER</td><td>CLOSED</td><td rowspan="2">DE-ENERGIZED</td><td>EITHER</td><td>LOW RELAY CLOSED BY IN-CAR SWITCH OR BY ENGINE SWITCH CLOSING</td><td rowspan="3">FIXED LOW</td></tr>
<tr><td>VENT</td><td>FORCED TO MAX. A/C</td><td>A/C</td><td rowspan="5">BLEED POSITION AND WILL DELIVER SMALL AMOUNT OF AIR TO W/S IF IN HEATER OR BI-LEVEL MODE</td><td>SHUT-OFF</td><td>LOW RELAY IS CLOSED BY CONTROL HEAD SWITCH</td></tr>
<tr><td>LO</td><td rowspan="5">VARIES FROM MAX. HTR. TO MAX. A/C DEPENDING ON SENSOR STRING RESISTANCE</td><td rowspan="3">EITHER HEATER BI-LEVEL OR A/C DEPENDING ON PROGRAMMER POSITION</td><td rowspan="5">ENERGIZED IF ABOVE FREEZING</td><td rowspan="3">USUALLY OPEN HOWEVER SHUT-OFF IF PROGRAMMER IS IN MAX. A/C POSITION</td><td>SAME AS CONTROL HEAD IN "OFF"</td></tr>
<tr><td>AUTO</td><td rowspan="3">LOW AND AUTO RELAYS CLOSED BY IN-CAR SWITCH OR BY ENGINE SWITCH CLOSING</td><td>VARIABLE BLOWER PROGRAM</td></tr>
<tr><td>HI</td><td rowspan="3">RECIRCULATE AIR WHEN PROGRAMMER IS IN MAX. A/C OTHERWISE OUTSIDE AIR</td><td>FIXED HIGH</td></tr>
<tr><td>BI-LEVEL</td><td>BI-LEVEL</td><td rowspan="2">OPEN</td><td>VARIABLE BLOWER PROGRAM</td></tr>
<tr><td>DEF</td><td>HEATER</td><td>FULL OPEN TO W/S</td><td>LOW AND AUTO RELAYS CLOSED BY CONTROL HEAD SWITCH</td><td>FIXED HIGH</td></tr>
</table>

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