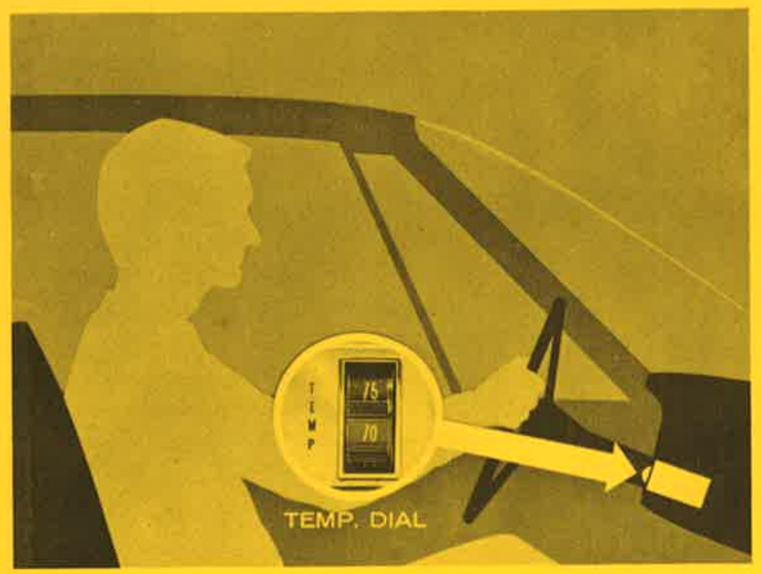
OLDSMOBILE

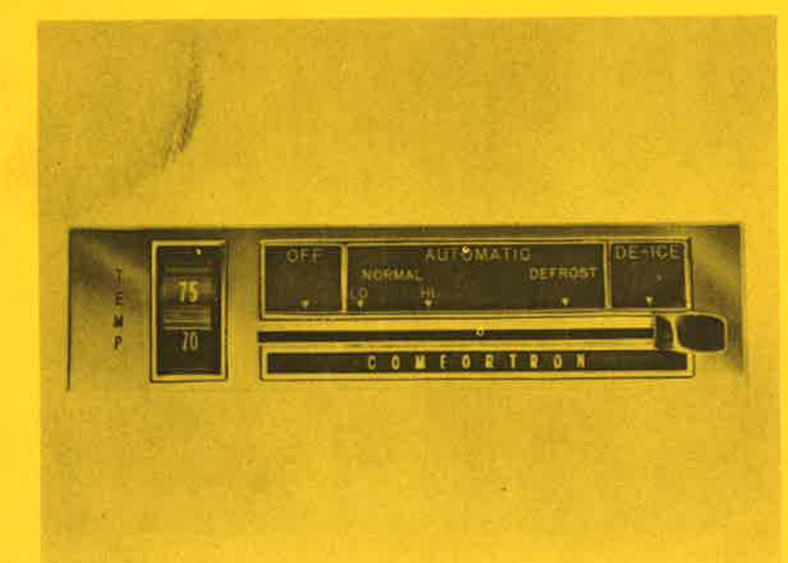
COMFORTRON

OPERATION AND DIAGNOSIS

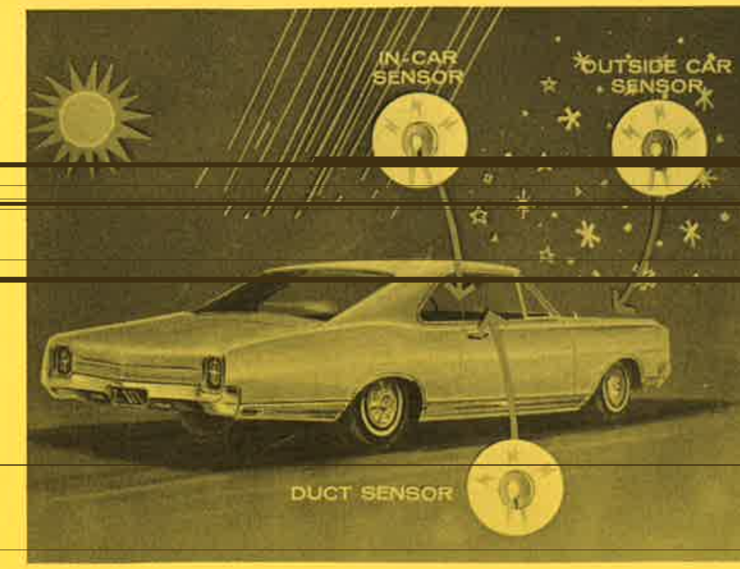
SERVICE DEPARTMENT • OLDSMOBILE DIVISION • GENERAL MOTORS CORPORATION



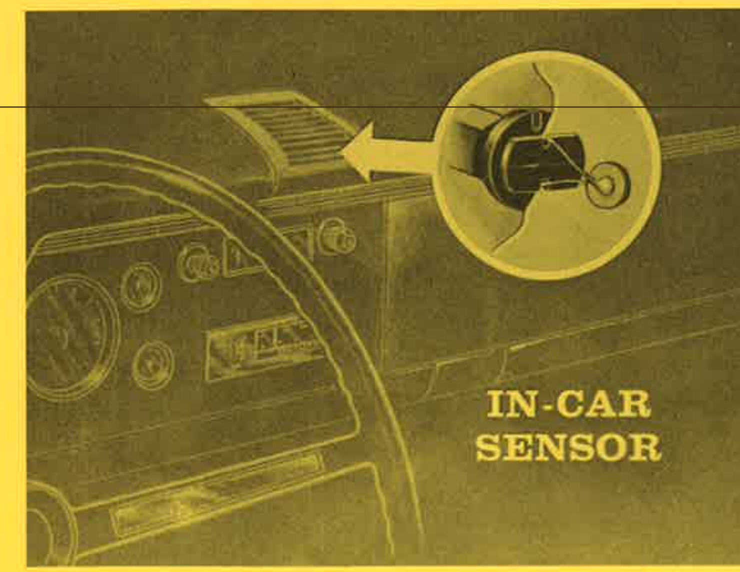
Although the air-mix principle as used in the past is applied to this new system, the mixing of hot and cold air is all automatic. [illegible] the desired temperature inside the car despite the weather *outside* [illegible] Comfortron [illegible] We want you to know [illegible] about this [illegible] system that senses changes in the outside weather conditions and compensates for them automatically to maintain the desired temperature inside the car [illegible] the new compensator dial, and what happens when the driver sets the temperature the driver wants inside the car.

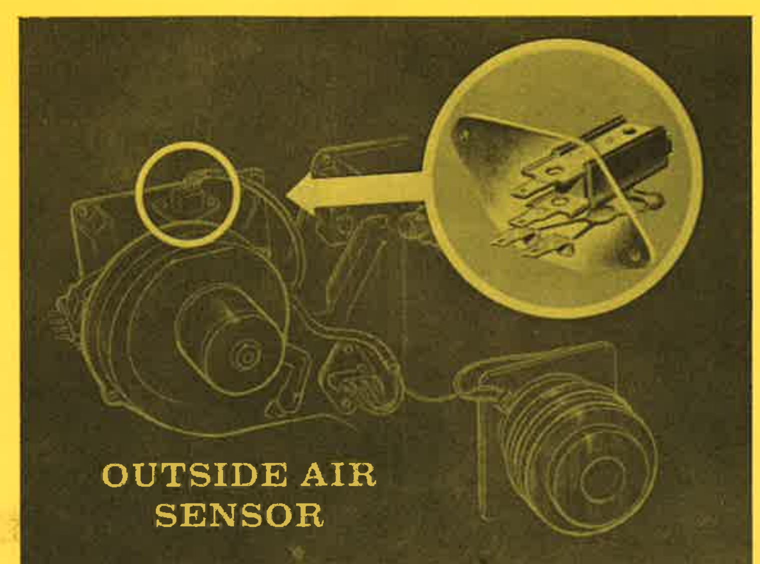


Then, what takes place when the sliding lever is moved. There are two specific areas where we need full explanation and information to understand Comfortron. We must first understand the new control devices—and how they operate to provide the desired temperature.

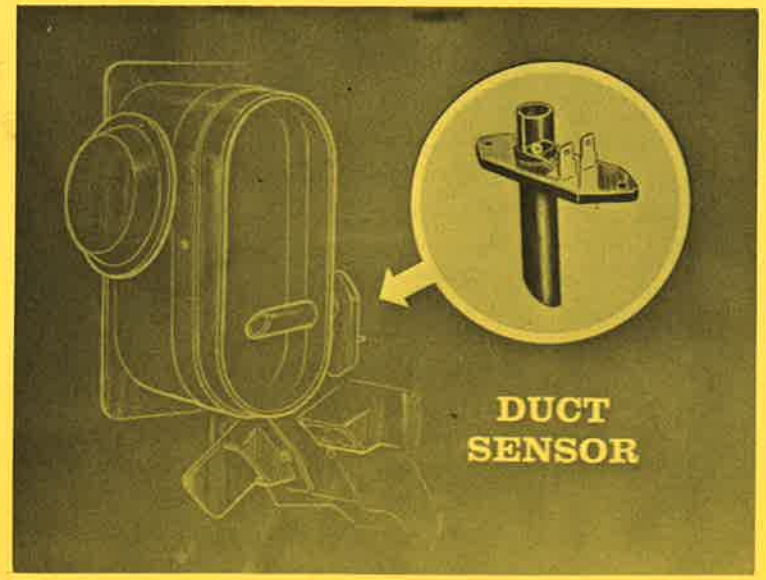


Comfortron uses temperature-sensing and vacuum-control devices to automatically operate the system to maintain the desired in-car temperature. The Refrigerant System and the Hot Water Heater are the same as used in the past. Service procedures on these units remain unchanged. This book deals with the automatic control system that operates the air flow doors and blower speed. Let's discuss the temperature sensing devices—or "sensors" first. "Sensors" are thermostats . . . and in Comfortron, there are *three* sensors. One to keep a check on air entering the car . . . one for air coming out the ducts . . . and one to check temperature inside the car. What *are* "sensors"?

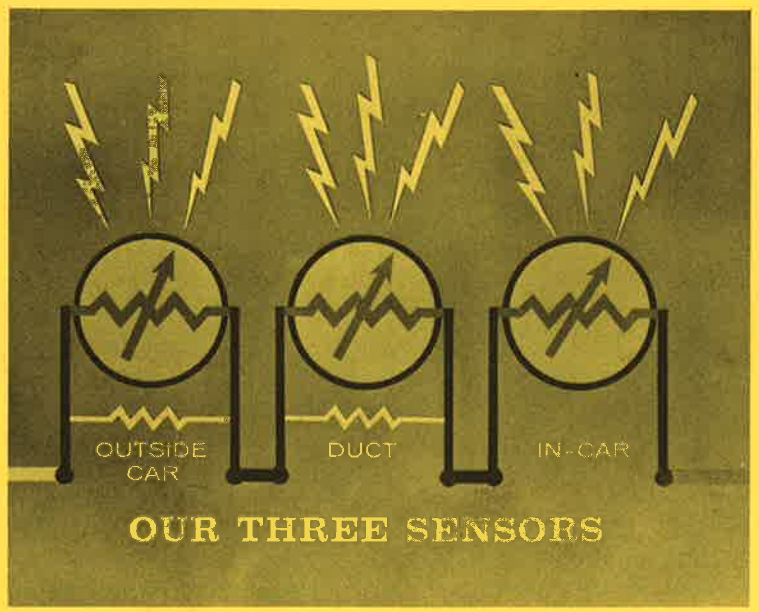




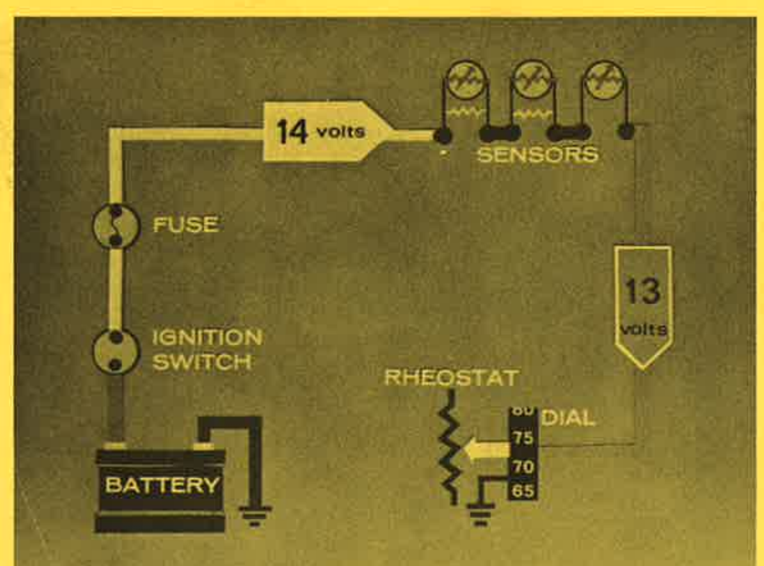
Next, we have the outside-air "sensor." It is the weather forecaster for the system. The outside-air "sensor" is located in the outside air-inlet duct where it can check the temperature of all incoming air and alert the system as to whether heating or cooling will be required.



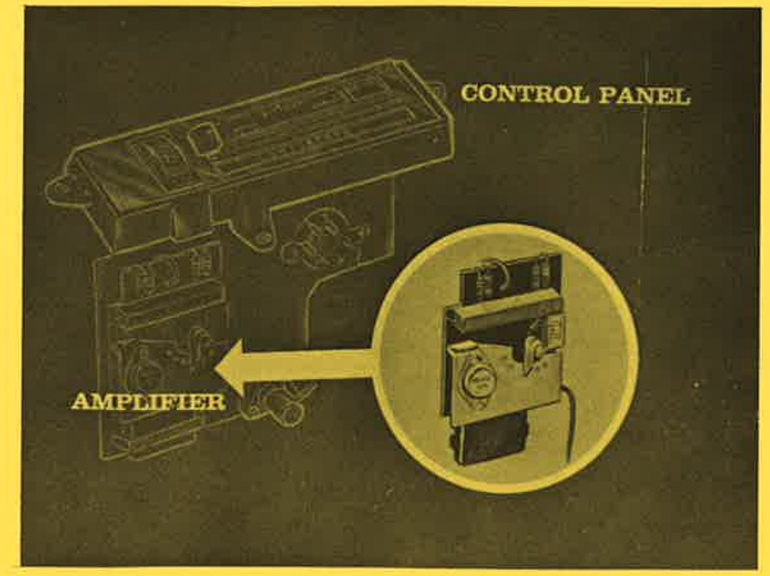
Last, to check the temperature of the air as it is discharged into the car, is the duct "sensor". It is located inside a crossover tube between the heater duct and the air-conditioning duct. Since the crossover tube is open to both ducts, this "sensor" can sample the air, regardless of whether the system is working as a heater or an air conditioner.



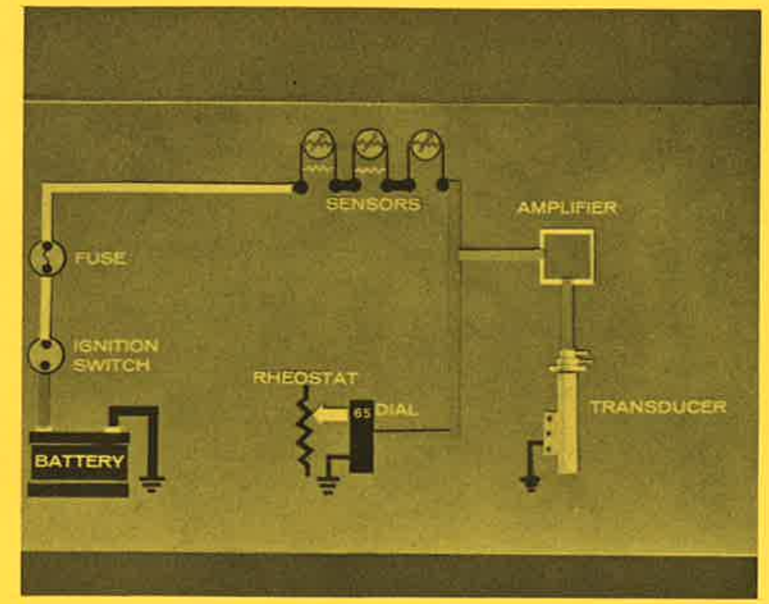
The operation of the system depends upon the "weather reports" from the three "sensors".



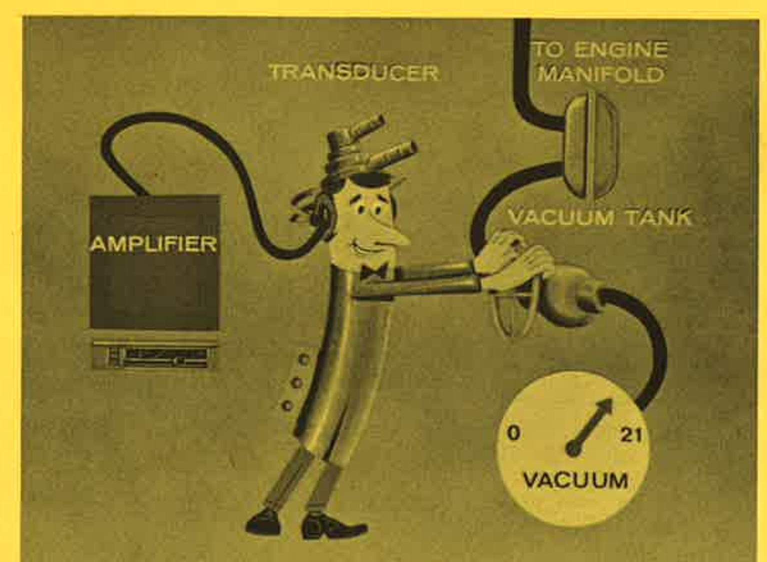
This information originates as an electrical voltage developed by sending battery current through all three "sensors", connected in series. This current flows whenever the engine is running. The circuit is completed by going through the temperature-dial rheostat to ground. With the generator charging the battery at about fourteen volts, there will be approximately thirteen volts left over after going through the "sensors". This will vary when the "sensors" change temperature, or when the dial is moved. The amount of variation may be only a few tenths of a volt, but this is all that is required to control the system.



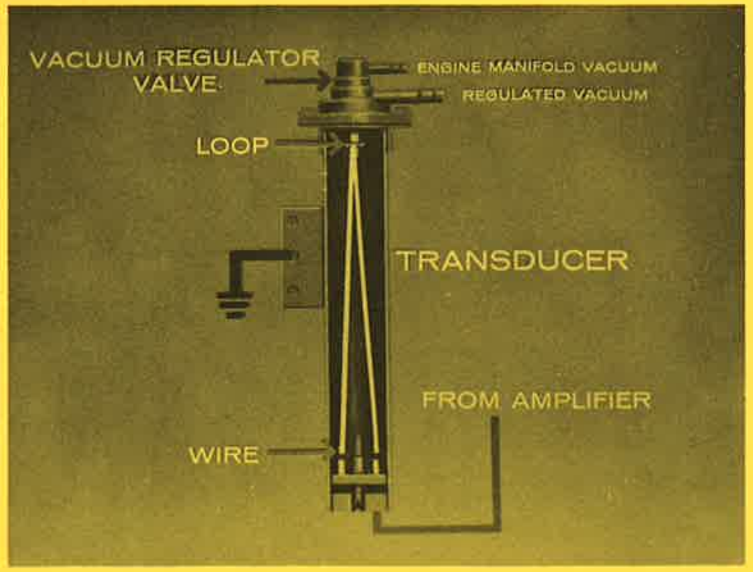
In the control panel — along with the rheostat operated by the dial — is a transistorized amplifier. This amplifier magnifies the small voltage variations caused by changes in temperature at the "sensors". Even a change as small as a tenth of a volt can be built up enough to shift the system all the way from heating to cooling.



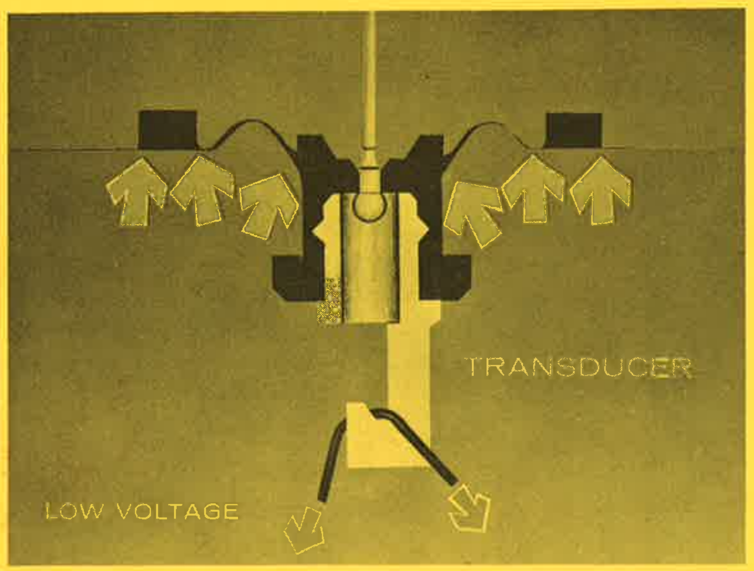
The amplifier output voltage may range all the way from zero volts in cold weather up to nine volts in hot weather. This amplified variable voltage is directed to the transducer to interpret the variable voltage from the amplifier and translate it into regulated vacuum.



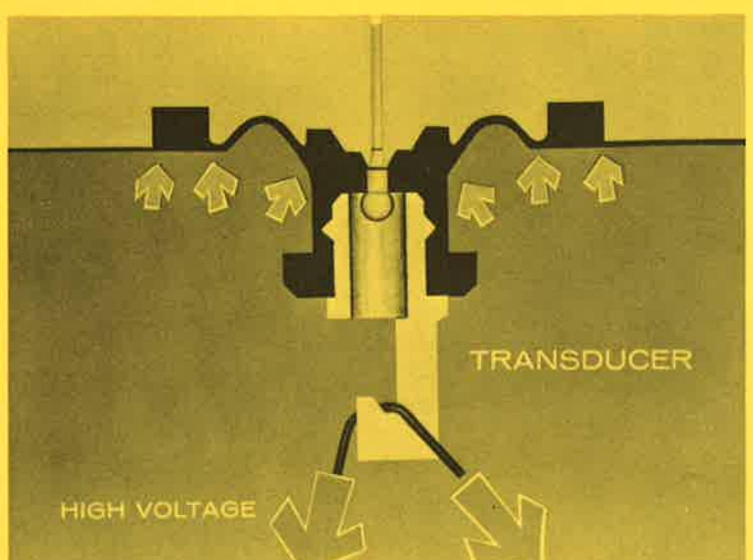
The amplifier-output voltage and full engine vacuum are supplied to the transducer. It must interpret the amplifier voltage and operate a needle valve to regulate vacuum so that it can be used to operate the Comfortron system. Now, let's take a closer look and see how the transducer works.



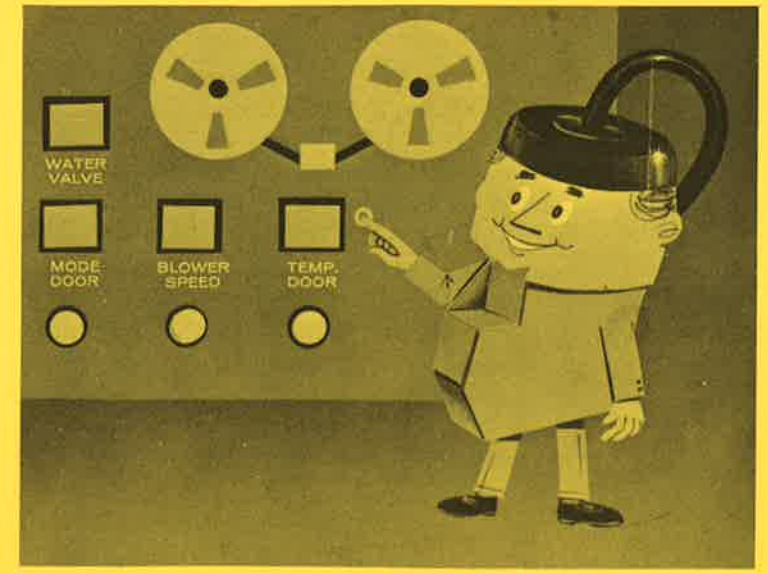
As you can see, the wire from the amplifier is connected to the wire inside the transducer. The wire inside the transducer is looped over the bottom of the vacuum regulator valve and down to a ground connection. For this reason, the transducer must always be grounded. The amplifier voltage goes through this stretched wire and heats it, causing it to relax some of its tension. Variation in amplifier voltage causes a variation in tension on the wire.



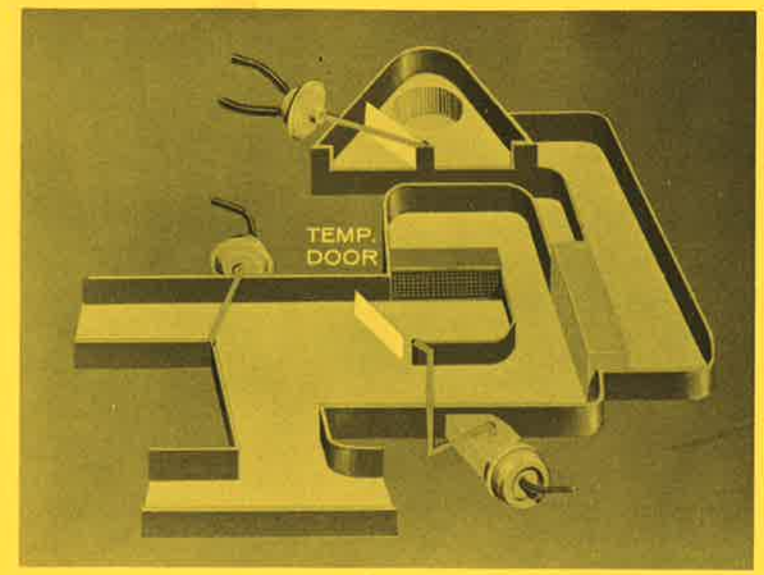
The diaphragm is balanced between atmospheric pressure and the tension on the wire. When the voltage is low, the wire tightens up and pulls on the diaphragm, producing a strong vacuum. When the voltage is high, the wire relaxes, producing a weak vacuum.



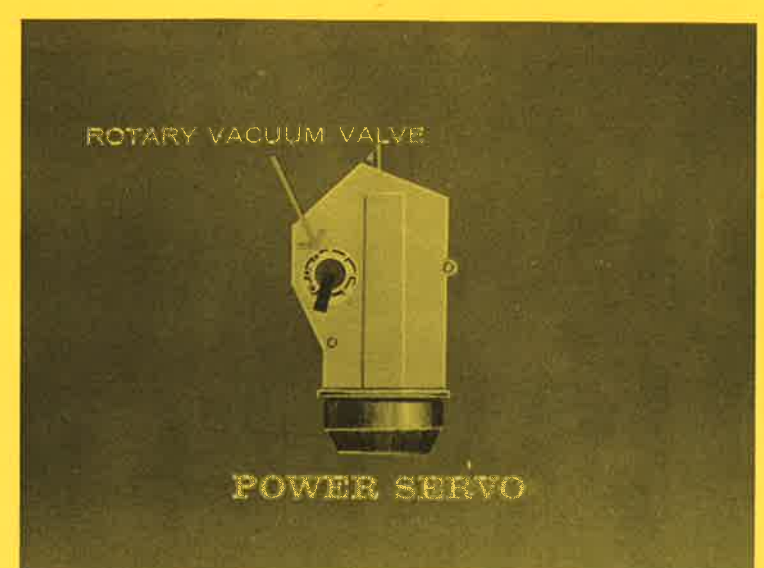
Let's take a closer look at the vacuum regulator, because for diagnosis purposes it is important for you to remember the lower the voltage, the higher the vacuum — and the higher the voltage, the lower the vacuum.



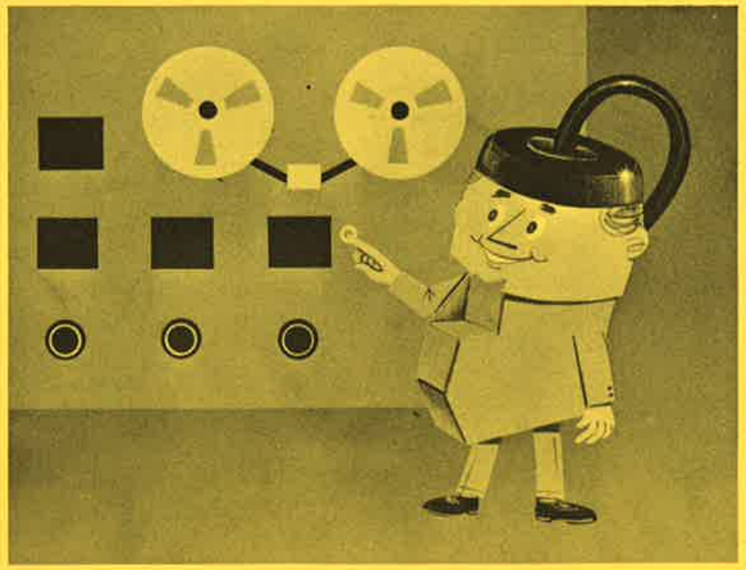
This carefully regulated vacuum is directed to a power servo, the muscle man of the Comfortron control system. It is a vacuum-operated power cylinder that operates linkage in response to variable vacuum from the transducer.



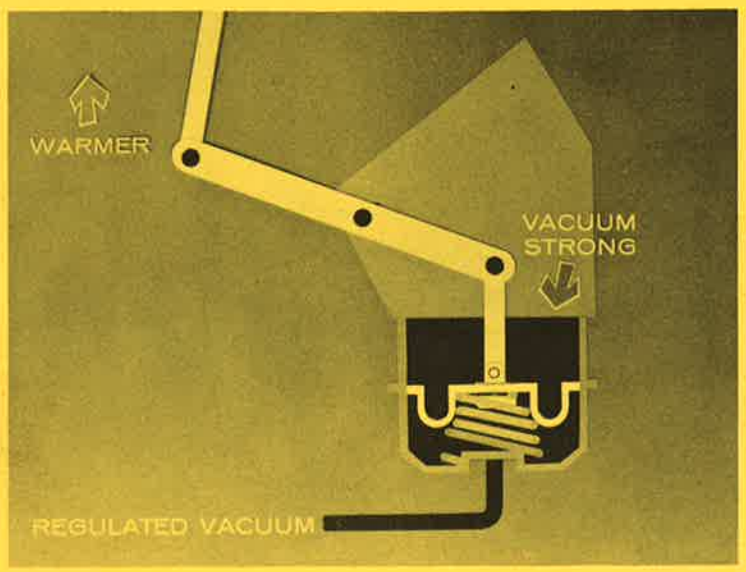
The linkage is connected to the temperature door. The power servo can assume any number of positions, because it is supplied with regulated vacuum. But, moving the temperature door isn't the only job it performs.



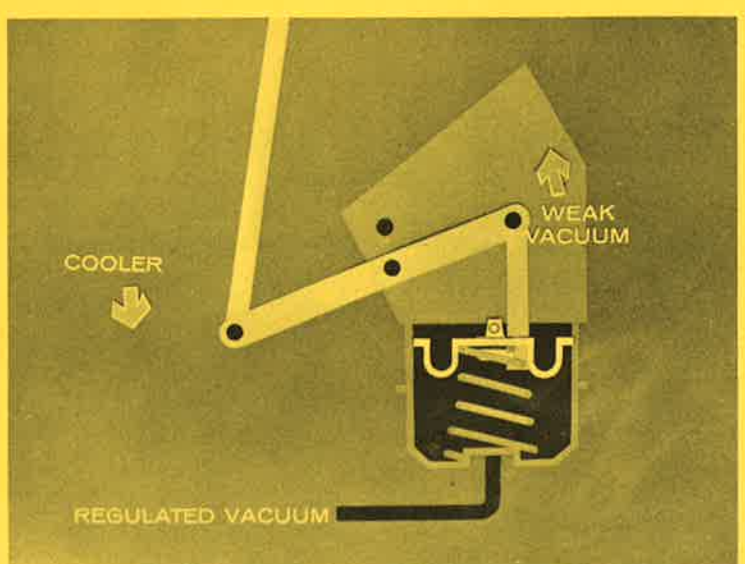
The power-servo linkage also operates a rotary vacuum valve to operate the mode door which was formerly called the selector door. This door directs air out the heater outlets or air-conditioning outlets. The power-servo assembly also operates the water valve and the blower-speed switch which controls blower speed automatically.



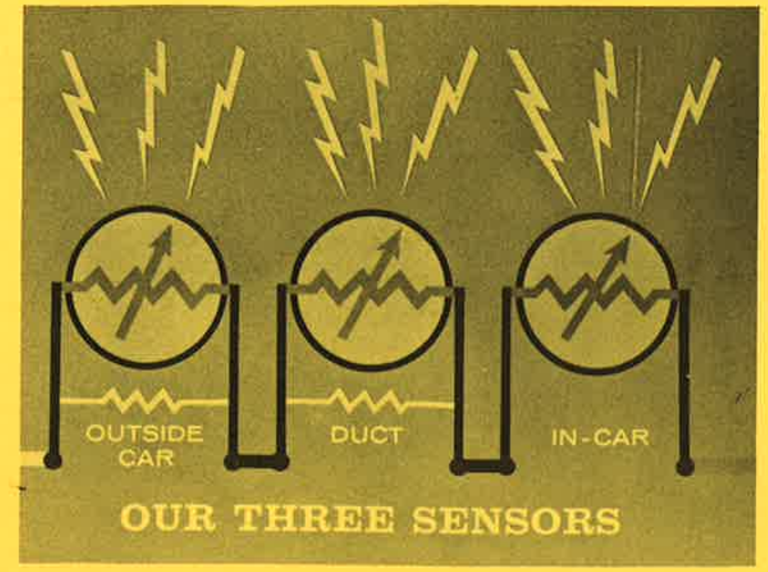
The power servo handles these jobs like a computer, according to a carefully prearranged program that represents the ideal way to operate the combined heater-air conditioner, constantly making the best possible decisions as to the proper mode and the *minimum* blower speed required to maintain the desired in-car temperature. However, the power servo doesn't make these decisions by itself.



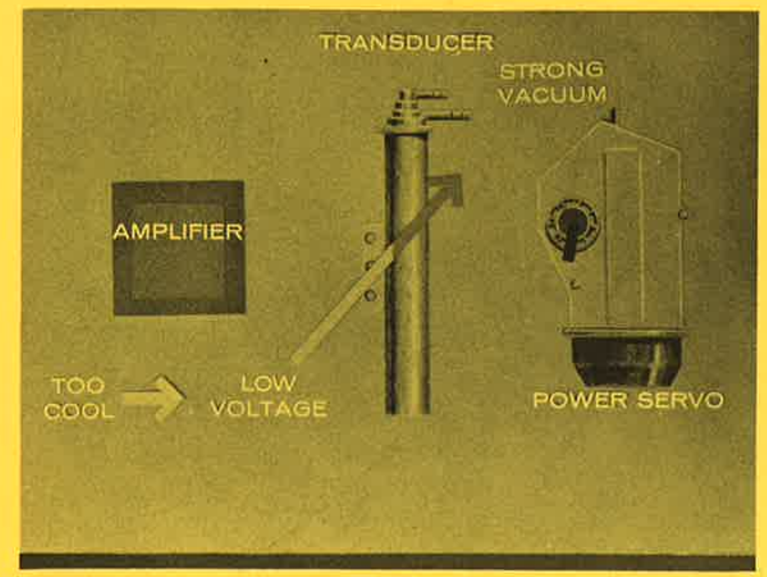
It gets its instructions, as we said, in the form of regulated vacuum.



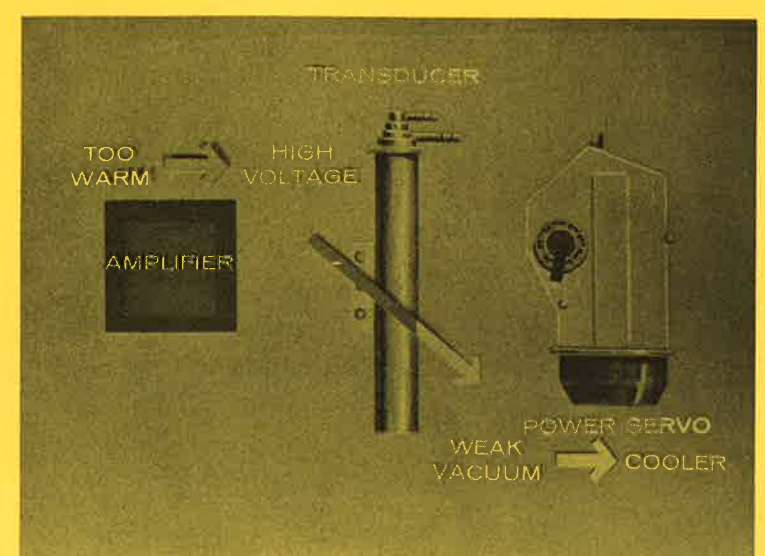
A strong vacuum at the power servo means "make it warmer", while a weak vacuum means "make it cooler."



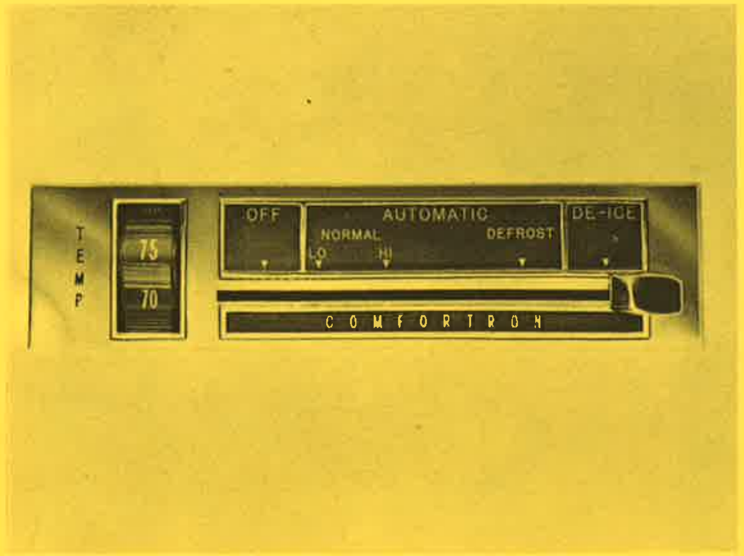
These instructions are, of course, based on the "weather reports" we spoke of earlier from the three "sensors."



If the "sensors" signal it is too cool, a low voltage causes a strong vacuum, making it warmer. With this sensitive electronic-vacuum system in complete control, any temperature changes are counteracted as soon as they occur and the temperature is stabilized within one degree.

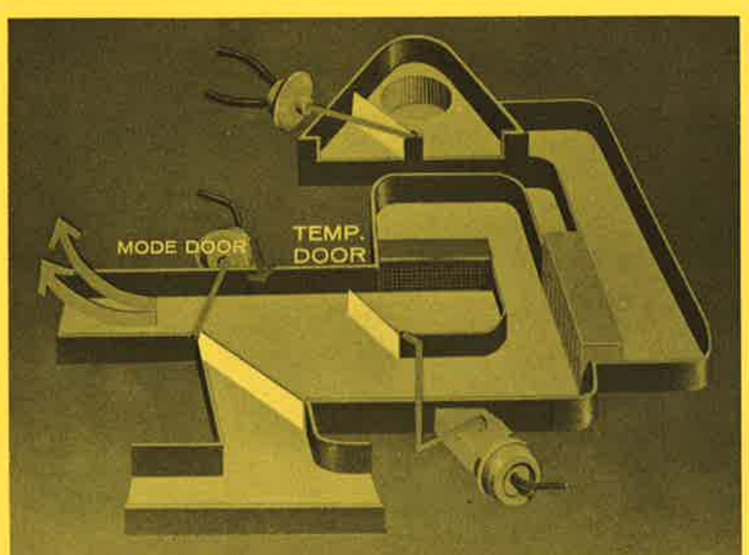


If the "sensors" signal it is too warm, a high voltage causes a weak vacuum, making it cooler. Now then, we are well on our way toward learning how the system operates.



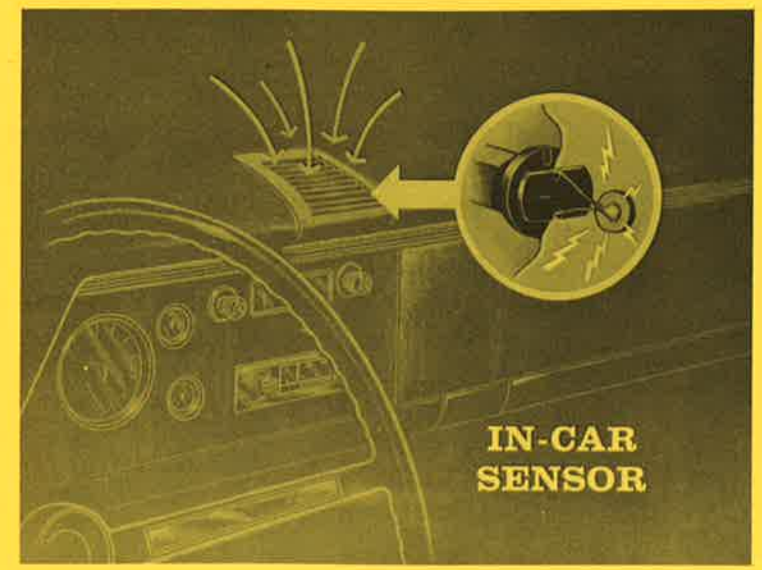
Now, let's take a look at the control panel to see what the driver can do with the controls. There are *two* controls. The temperature dial on the left side of the panel is used to select any temperature between 65° and 85°. The sliding lever is used to turn the system off — to select low-blower speed range or high-blower speed range — and defrost as well as "de-ice". Moving the lever from low to high increases blower speed for increased air circulation particularly for rear-seat passengers. This does *not* affect air temperature, because air temperature is automatically controlled regardless of blower speed range.

Let's assume the driver has the temperature dial set at approximately 73 degrees and he is driving on a cool morning. Say the outdoor temperature is about 58 degrees. Now let's look inside the system and see what is happening.

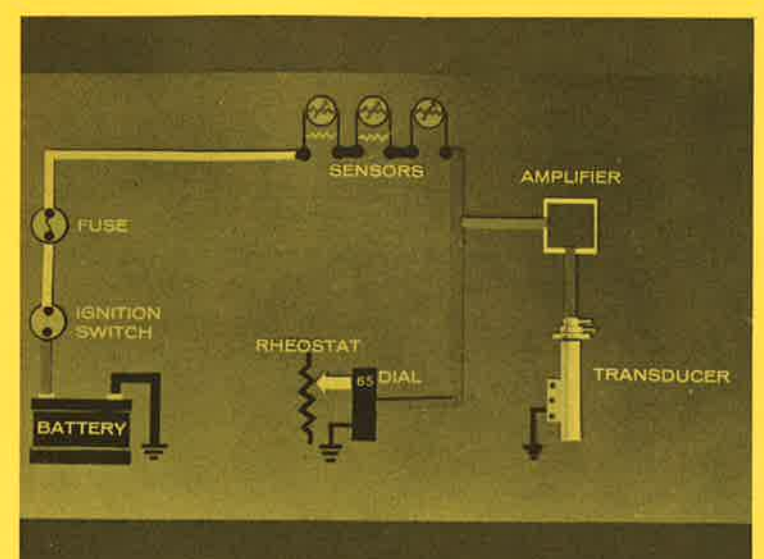


Here we see the mode door in the *heat* position, allowing air to come out the heater outlets. The power servo is keeping the temperature door in a position that allows just enough hot air from the heater to mix with cold air from the evaporator to keep the in-car temperature at 73 degrees.

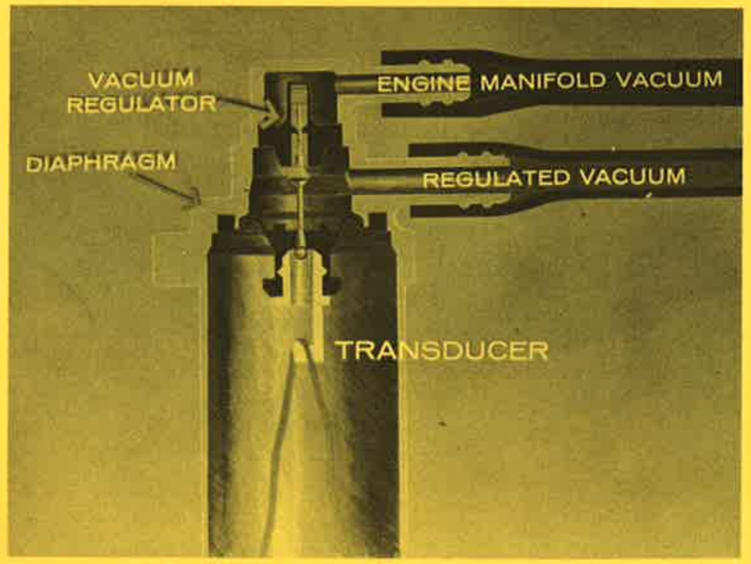
Now, the early-morning sun slowly raises the outside temperature and the outside "sensor" detects this increase. It signals the amplifier to compensate for the warmer air entering the cowl inlet. The duct "sensor", constantly checking the tempered air in the duct, also signals the amplifier. The combined signal to the amplifier from these two "sensors" then is averaged, leaving the big decision to be made by the in-car "sensor".



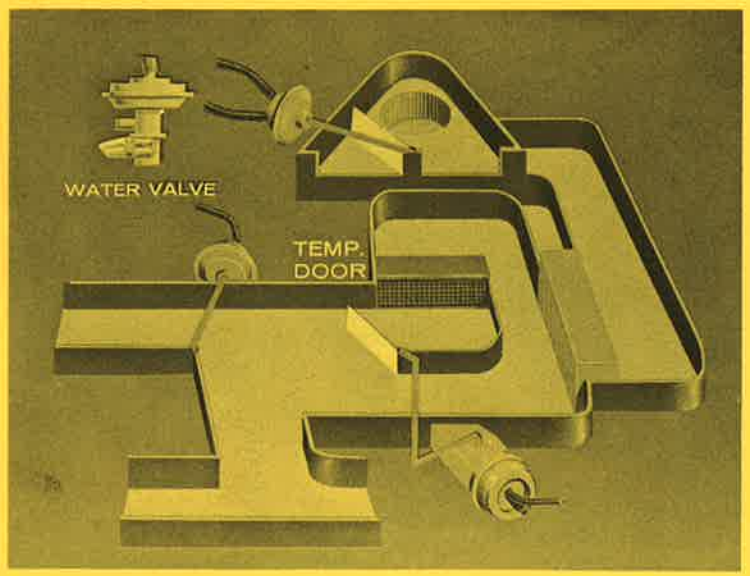
The in-car "sensor" is mounted so that the sunshine warms it just as it does the driver. It casts the deciding vote by signaling the amplifier that cooler air is required even before the driver is aware of the change. If a lower or higher in-car temperature is desired, rotation of the dial is all that is required.



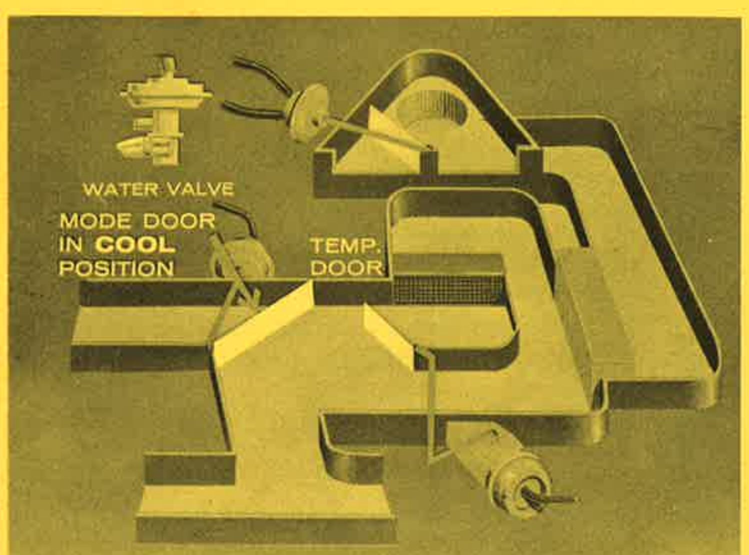
Let's move the dial to maximum cooling — that's 65 degrees — and see what happens. Rotating the dial increases the signal voltage to the amplifier. The amplifier then increases the voltage to the transducer.



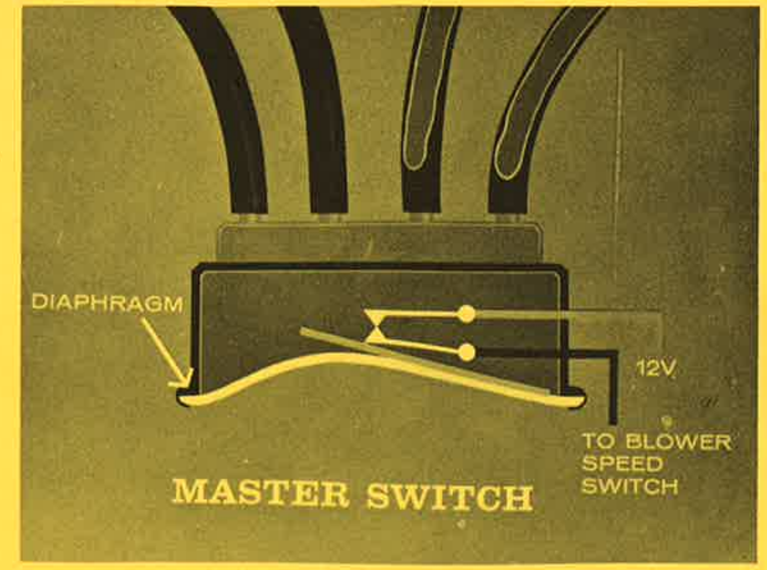
The increased voltage to the transducer heats the wire and relaxes the tension, which reduces the regulated vacuum.

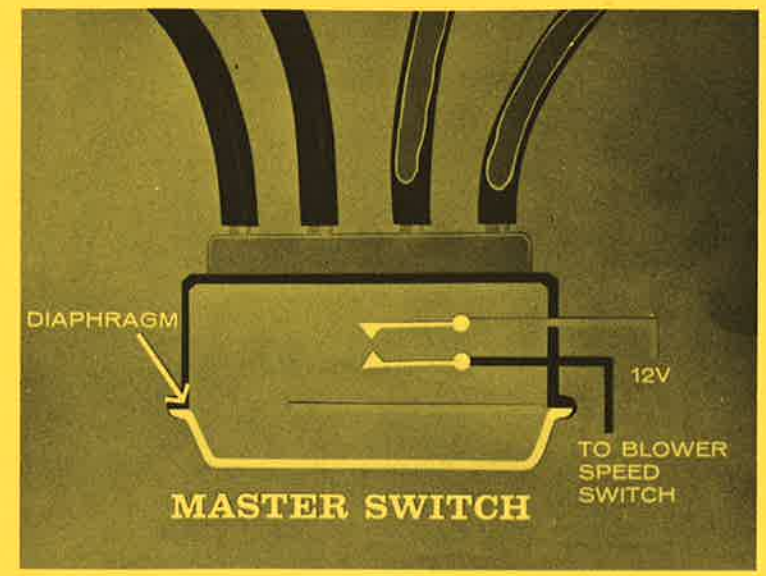


Reduced regulated vacuum to the power servo permits the servo spring to move the linkage which moves the temperature door to the maximum cooling position. This also moves the blower-speed switch to the high-speed position and causes the vacuum valve to supply full vacuum to the water valve, cutting off water flow to the heater core.

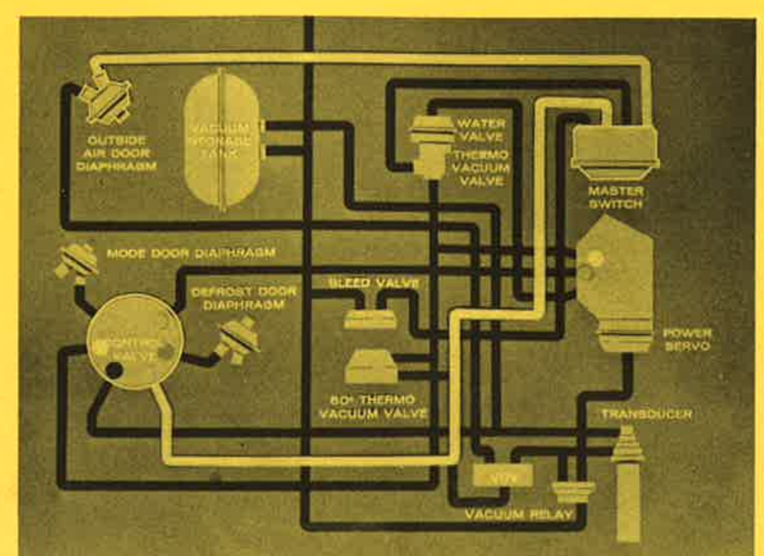


Rotation of the vacuum valve also cuts off vacuum to the mode door and the spring moves it to the air-conditioning mode so that the cold air will be directed to the air-conditioning duct and out the nozzles. Now, let's look at another very important part of the system.





Here it is. The master switch. The master switch turns the blower "off" and "on", and also directs vacuum to the outside door recirculation diaphragm. Notice that a visual inspection of the diaphragm on the master switch will tell you if vacuum is applied, the diaphragm will be collapsed. If not, it will be expanded.



The master switch is a vacuum-operated electric switch. It is operated by vacuum directed to it from the vacuum valve on the control panel. Moving the sliding lever on the control panel to "off" cuts off vacuum to the master switch. This turns off the blower, and, because the same vacuum that is operating the master switch is also directed through the switch to the outside air door, the door closes by spring force when the vacuum supply is cut off.