



Troubleshoot Automatic Climate Control System

by [Larry Carley](#) copyright 2019 AA1Car.com

Today's automatic climate control systems allow hands-free temperature regulator, whether hot or cold. Once you set a temperature on your car's automatic climate control system, it should maintain that temperature regardless of what's going on outside.

HOW AUTOMATIC CLIMATE CONTROL DIFFERS FROM MANUAL AIR CONDITIONING

Manual air conditioning systems are just what the name implies: they require the A/C temperature settings to be adjusted manually. Manual A/C systems have an on-off switch, a temperature control knob or slide switch and a knob or switch for adjusting fan speed.

With a manual A/C system, you turn on the A/C when you want cool air and select a temperature setting and blower speed. If the air gets too cold, you turn down the blower speed or change the position of the temperature setting. If the air isn't cold enough, you crank it all the way up.

The temperature slide switch on most manual systems is connected with cables or vacuum hoses to the airflow control doors inside the HVAC (heating ventilation air conditioning) unit under the instrument panel. Changing the temperature setting opens or closes the doors to increase or decrease airflow through the A/C evaporator. It is a relatively simple, trouble-free control system that does not require a lot of complicated electronics.

Automatic temperature control systems, by comparison, can be very complicated (and troublesome). These type of systems control both heating and cooling with a single temperature setting. The system then monitors the temperature inside your car and automatically chooses heating, cooling or a blend, as well as blower speeds to maintain the desired temperature you have chosen.

"Dual Zone" automatic temperature control systems that are offered in many newer vehicles allow the occupant of each front seat to choose their own comfort setting. One side can blow cool air and the other side can blow warm air.

AUTOMATIC TEMPERATURE CONTROL

Maintaining a relatively constant temperature setting is not as easy as it sounds because the temperature inside and outside the vehicle is constantly changing. The ambient (outside) temperature affects how much heating or cooling is required to heat or cool the incoming air to the desired temperature. Sun load can also change the interior temperature and cooling requirements.

As the air temperature inside your car gradually changes, the automatic climate control system has to compensate by altering the blower speed and temperature settings. It's a constant balancing act that requires a number of inputs and controls.

AUTOMATIC CLIMATE CONTROL COMPONENTS

To regulate the temperature inside your car, the automatic climate control system uses an ambient air temperature sensor outside the passenger compartment, one or more in-vehicle air temperature sensors (which may include an "infrared" sensor that measures the actual body temperature of you and/or your passengers), a "sunload" sensor to compensate for sunlight entering the vehicle through the glass, one or more electronic control modules, and vacuum or electronic controls for the various HVAC airflow control doors.

Most of the newer automatic climate control systems use small electric motors (actuators) to operate the airflow doors in the HVAC unit. There are 5-wire, 3-wire and 2-wire motors, all of which operate differently and must be replaced with the same type of motor. The 5-wire motors have a feedback circuit to keep the control module informed about their position. The 3-wire "smart" motors often have their own microchip to control and self-calibrate their position. The 2-wire motors are simple reversible 12-volt motors that push the airflow doors one way or the other. The controller keeps tabs

on their position by running the motors full open and full closed, then counting the revolutions of the motor armature to figure their exact position. Like we said, these are complex, sophisticated systems.

Some vehicles, such as late model Chrysler minivans, have a "triple-zone" automatic climate control system. This system has separate controls for the driver, front passenger and rear passengers, and uses infrared sensors front and rear to monitor cabin temperature. It also uses a "smart" 2-wire electric motor to control all the blend air doors in the HVAC system. The motor not only operates the doors but keeps the control unit informed about its exact position. The system has 22 different control modules that communicate back and forth over a common bus network of multiplex wiring.

Another example of how complex these systems can be is Mercedes C320 dual-zone automatic climate control system. Unlike most other A/C systems that cycle the compressor clutch on and off to regulate the refrigeration circuit, this system has no clutch on the compressor. The belt-driven variable displacement compressor runs all the time and is controlled by a pulse width modulated signal from the A/C control module (more and more new cars are switching to this type of A/C system). Cooling is controlled by varying the compressor's output from 2 to 100 percent according to the cooling load on the system. Mercedes also uses a "smog sensor" to close off the outside air inlet if it sniffs hydrocarbons or other bad odors. Ten electric motors are used to control the various blend doors in the HVAC system, and a sunload sensor on the dash modifies A/C/ output to compensate for sun load. Even the engine cooling fan is also partially controlled by the climate control system, and 15 different interior control modules are used to regulate cooling within the passenger compartment.

TROUBLESHOOTING YOUR AUTOMATIC CLIMATE CONTROL SYSTEM

Troubleshooting an automatic climate control systems is usually beyond the abilities of a do-it-yourselfer because it often requires specialized training and tools. If an A/C cooling problem is not due to a fault in the refrigeration circuit (bad compressor, plugged orifice tube, low refrigerant, leaky evaporator, etc.), you can probably blame the automatic temperature control system. To find out why, though, usually requires the use of a scan tool that can access and read HVAC codes (which ordinary engine-only scan tools cannot), and a digital voltmeter to test circuits and sensors.

Most late model automatic temperature control systems have self-diagnostic capabilities and can generate fault codes that indicate the nature of the problem. But in most cases, a technician still has to check out various components by measuring voltages, resistance, looking for opens or shorts in the wiring, etc. before he replaces an parts (in theory, anyway).

Accurate diagnosis is very important on these systems because many replacement parts can be VERY expensive. Parts like control modules can cost hundreds or even

thousands of dollars to replace, depending on the vehicle application. Other parts such as sensors, switches, relays, resistors, vacuum valves, vacuum motors, electric motors and blower motors won't break the bank if you have to replace one, but the labor to install some of these parts (if you don't do it yourself) can take hours.

Tearing apart your dash and the HVAC system can be a very time-consuming and daunting task. So unless you are a very skilled do-it-yourselfer, this is one job you should let a professional do for you.

COMMON AUTOMATIC CLIMATE CONTROL PROBLEMS & POSSIBLE CAUSES:

No cooling (air blowing out of ducts is warm when it should be cool).

This could be a fault in the refrigeration circuit (bad compressor, plugged orifice valve, blown fuse or bad relay, low refrigerant or no refrigerant in system), or it could be a bad BLEND AIR door control motor inside the HVAC unit that is not routing the air through the A/C evaporator.

Temperature does not match the desired setting (too warm or too cold).

The system might have a bad interior temperature sensor, or a bad BLEND AIR door control motor inside the HVAC unit.

No air blows out of ducts when A/C or heat is turned on.

Possible causes here include a bad blower fan relay or fan motor.

Air fails to blow out of desired ducts (dash outlets, or lower outlets, or defroster outlets).

The problem here is likely a bad AIR CONTROL door motor that is not changing position to route the air to the desired outlets.

Nothing happens when you turn the automatic climate control system on.

Check the main system to see if it has blown (refer to your owner's manual for the fuse location). If blown, replace the fuse with one that has the SAME amp rating as the original. If the new fuse blows, there is a short or overload in the wiring that will have to be diagnosed and repaired.

If the fuse is okay, the control module may have died. The way to confirm this would be to hook up a scan tool to see if the scan tool can communicate with the control module. No communication would indicate a dead module or a wiring fault.

If the battery was recently disconnected or replaced, some automatic climate control systems will not operate until they are reset with a scan tool. The relearn procedure teaches the control module the positions of the various air flow control doors so it can control air flow and temperature.



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