
Control Components

The Electronic Manual Temperature Control (EMTC) system control components are used to select:

- air inlet source (outside or recirculated).
- blower motor speed.
- discharge air temperature (temperature blend).
- discharge air location (defrost, panel, floor).
- A/C compressor operation.

Electronic Manual Temperature Control (EMTC)

Control System Inputs

HVAC Module

The EMTC system uses a remote HVAC module that is separate from the control interface. The Front Controls Interface Module (FCIM) provides the interface for the vehicle occupants to control the climate control system. When selections are made, the FCIM communicates the selections to the HVAC module over the Medium Speed Controller Area Network (MS-CAN) . The remote HVAC module controls the climate control system based on the FCIM selections.

The HVAC module is mounted to the instrument panel support behind the FCIM .

Control System Outputs

Blower Motor Speed

The blower motor speed control controls the blower motor speed by converting low power signals from the HVAC module to a high-current, variable ground feed for the blower motor. The HVAC module adjusts blower motor speed based on the blower speed selector position. A delay function is used to provide a gradual increase or decrease in blower motor speed under all conditions.

The blower motor speed control is located on the heater core and evaporator core housing near the blower motor.

Airflow Mode Door Position

The climate control system uses 2 electric airflow mode door actuators to control the airflow mode doors.

The panel/defrost airflow mode door actuator uses a cam and lever assembly to position the panel and defrost airflow mode doors on command from the HVAC module. The panel/defrost mode door actuator contains a reversible electric motor and potentiometer. The potentiometer allows the HVAC module to monitor the position of the panel and defrost airflow mode doors. The potentiometer circuit consists of a 5-volt reference signal connected to one end of a variable resistor, and a signal ground connected to the other. A signal circuit is connected to a contact wiper, which is driven along the variable resistor by the actuator shaft. The signal to the HVAC module from the contact wiper indicates the position of the airflow mode doors. The HVAC module powers the actuator motor to move the airflow mode doors to the desired position. The desired position is set by the vehicle occupants using the mode selector buttons.

The floor airflow mode door actuator positions the floor mode door on command from the HVAC module. The floor mode door actuator is driven to, and will automatically stop at, the full open or full closed position and does not require a feedback circuit to report its position to the HVAC module. The desired position is set by the vehicle occupants using the mode selector buttons.

Air Inlet Mode Door Position

The air inlet mode door actuator moves the air inlet door between the fresh and RECIRC positions on command from the HVAC module. The air inlet mode door actuator is driven to, and will automatically stop at, the full RECIRC or full fresh air inlet position and does not require a potentiometer circuit to monitor its position. The air inlet mode door does not stop at any point between the RECIRC or fresh air inlet position.

Temperature Blend Door Position

The temperature blend door actuator moves the temperature blend door on command from the HVAC module.

The temperature blend door actuator contains a reversible electric motor and a potentiometer. The potentiometer circuit consists of a 5-volt reference signal connected to one end of a variable resistor, and a signal ground connected to the other. A signal circuit is connected to a contact wiper, which is driven along the variable resistor by the actuator shaft. The signal to the HVAC module from the contact wiper indicates the position of the temperature blend door. The HVAC module powers the actuator motor to move the temperature blend door to the desired position. The desired position is set by the vehicle occupants using the temperature selector knob.

The temperature blend door actuator is located on the heater core and evaporator core housing to the left of the glove compartment.

Electronic Automatic Temperature Control (EATC)

The HVAC module analyzes input from the following major sources:

- Temperature, airflow direction, blower, A/C and RECIRC selection (made by the vehicle occupants)
- In-vehicle temperature sensor
- Ambient air temperature sensor
- Solar radiation sensor (sunload sensor)
- Vehicle speed
- Engine coolant temperature

Using these inputs, the HVAC module determines the correct conditions for the following outputs:

- A/C compressor operation
- Blower motor speed
- RH and LH temperature blend door positions
- Defrost/panel/floor airflow mode door positions
- Air inlet mode door position

Control System Inputs

The Electronic Automatic Temperature Control (EATC) system has 4 control system inputs.

HVAC Module

The EATC system uses a remote HVAC module that is separate from the control interface. The Front Controls Interface Module (FCIM) provides the interface for the vehicle occupants to control the climate control system. When selections are made, the FCIM communicates the selections to the HVAC module over the Medium Speed Controller Area Network (MS-CAN) . The remote HVAC module controls the climate control system based on the FCIM selections or will automatically control the climate control system in the AUTO mode.

The HVAC module is mounted to the instrument panel support behind the FCIM .

In-Vehicle Temperature Sensor

The in-vehicle temperature sensor contains a thermistor, which measures the in-vehicle air temperature and sends that reading to the HVAC module. The in-vehicle temperature sensor uses an internal fan to draw in-vehicle air through the in-vehicle temperature sensor (across the thermistor).

The in-vehicle temperature sensor is mounted to the center instrument panel finish panel below the FCIM .

Solar Radiation Sensor (Sunload Sensor)

The solar radiation sensor supplies information to the dual-zone HVAC module indicating sunload. When sunload is detected, the information from the sensor is used to lower the A/C temperature output to compensate for radiant heat warming the vehicle interior and occupants.

The sunload sensor is located on the center of the instrument panel at the base of the windshield.

Ambient Temperature Sensor

The ambient temperature sensor signal is received by the dual-zone HVAC module and indicates the outside air temperature. The ambient temperature sensor is located in front of the radiator on the radiator support.

Control System Outputs

Blower Motor Speed

The blower motor speed control controls the blower motor speed by converting low power signals from the HVAC module to a high-current, variable ground feed for the blower motor. The HVAC module adjusts blower motor speed based on the difference between the in-vehicle temperature sensor signal and set temperature. A delay function is used to provide a gradual increase or decrease in blower motor speed under all conditions.

The blower motor speed control is located on the heater core and evaporator core housing near the blower motor.

Airflow Mode Door Position

The climate control system uses 2 electric airflow mode door actuators to control the airflow mode doors.

The panel/defrost airflow mode door actuator uses a cam and lever assembly to position the panel and defrost airflow mode doors on command from the HVAC module. The panel/defrost mode door actuator contains a reversible electric motor and potentiometer. The potentiometer allows the HVAC module to monitor the position of the panel and defrost airflow mode doors. The potentiometer circuit consists of a 5-volt reference signal connected to one end of a variable resistor, and a signal ground connected to the other. A signal circuit is connected to a contact wiper, which is driven along the variable resistor by the actuator shaft. The signal to the HVAC module from the contact wiper indicates the position of the airflow mode doors. The HVAC module powers the actuator motor to move the airflow mode doors to the desired position. The desired position is set by the vehicle occupants using the mode selector buttons.

The floor airflow mode door actuator positions the floor mode door on command from the HVAC module. The floor mode door actuator is driven to, and will automatically stop at, the full open or full closed position and does not require a feedback circuit to report its position to the HVAC module. The desired position is set by the vehicle occupants using the mode selector buttons.

Under certain conditions, the panel/defrost and floor airflow mode doors may move at the same time to prevent pressurizing.

Air Inlet Mode Door Position

The air inlet mode door actuator moves the air inlet door between the fresh and RECIRC positions on command from the HVAC module. The air inlet mode door actuator is driven to, and will automatically stop at, the full RECIRC or full fresh air inlet position and does not require a potentiometer circuit to monitor its position. The air inlet mode door does not stop at any point between the RECIRC or fresh air inlet position.

Temperature Blend Door Positions

The dual-zone EATC system uses 2 temperature blend door actuators to control 2 separate temperature blend doors. The temperature blend doors independently vary the LH side and RH side temperature settings, as desired. The temperature blend door actuators each contain a reversible electric motor and a potentiometer. The potentiometer circuit consists of a 5-volt reference signal connected to one end of a variable resistor, and a signal ground connected to the other. A signal circuit is connected to a contact wiper, which is driven along the variable resistor by the actuator shaft. The signal to the HVAC module from the contact wiper indicates the position of the temperature blend door. The HVAC module powers the actuator motors to move the temperature blend doors to the desired positions. The desired temperature blend door positions are calculated by the HVAC module based on the set temperature, in-vehicle temperature, ambient temperature and sunload.

The LH temperature blend door actuator is located on the heater core and evaporator core housing near the accelerator pedal. The RH temperature blend door actuator is located on the heater core and evaporator core housing to the left of the glove compartment.

