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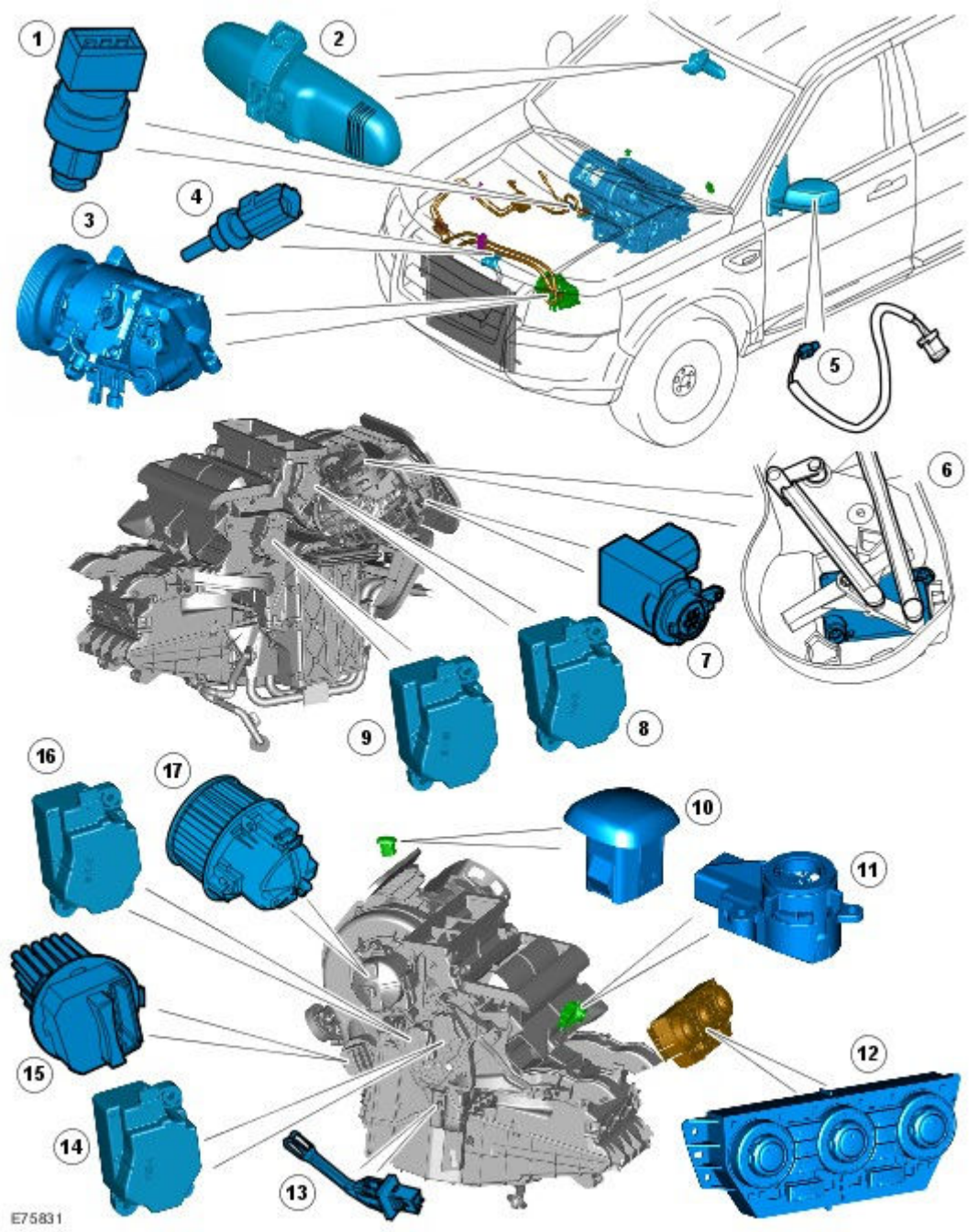
Control Components

COMPONENT LOCATION



Item	Part Number	Description
1		Refrigerant pressure sensor
2		Cabin humidity sensor (if fitted)
3		Air Conditioning (A/C) compressor (i6 shown)
4		Engine Coolant Temperature (ECT) sensor
5		Ambient air temperature sensor
6		Air intake stepper motor
7		Pollution sensor (if fitted)
8		Windshield distribution (defrost) stepper motor

9		Right Hand (RH) temperature blend stepper motor
10		Sunload sensor
11		Cabin temperature sensor
12		Automatic Temperature Control (ATC) module
13		Evaporator temperature sensor
14		Left Hand (LH) temperature blend stepper motor
15		Blower motor control module
16		Face/feet distribution stepper motor
17		Blower motor

OVERVIEW

The climate control system incorporates the heating, ventilation and A/C systems. There are 2 main types of climate control system available;

- a single zone manual system
- a dual zone automatic system.

The climate control functions for both systems are controlled by the ATC module. The ATC module is mounted in the center console and contains both the system electronic software and user controls.

The ATC module works in conjunction with a number of other vehicle control modules, including the Engine Control Module (ECM), which controls a number of climate control sub-systems on receipt of requests from the ATC module.

The single zone climate control system features manual control for air temperature, air distribution and air source, although a small amount of automatic control does exist in the ATC software. In response to system inputs, the ATC module controls the operation of 3 stepper motors mounted on the heater assembly. The stepper motors then adjust the position of the air temperature, air distribution and air source flaps accordingly.

The dual zone climate control system features automatic control of air temperature, air distribution and blower motor speed. The ATC module is also able to control individual temperature requests for both the driver and passenger side of the cabin.

NOTE:

The ATC module can only maintain a maximum temperature difference between the 2 sides of the cabin of up to approximately 3ºC (4ºF). This is due to the movement and mix of air within the cabin.

The dual zone climate control system features 2 additional sensors; a cabin temperature sensor and a sunload sensor. The cabin temperature sensor provides a temperature feedback to enable the ATC module software maintain a constant cabin temperature. The sunload sensor provides a reading of solar loading on the vehicle occupants and enables the ATC module to adjust the output from the climate control system accordingly.

Higher specification versions of the dual zone climate control system are also available. These systems feature 2 more additional sensors; a pollution sensor and a cabin humidity sensor.

The pollution sensor detects pollutants entering the cabin, allowing the ATC module to react by changing the position of the air intake flap. The cabin humidity sensor calculates the probability of misting on the windshield. The ATC module monitors the signal from the cabin humidity sensor and adjusts blower speed, air distribution and A/C compressor displacement accordingly.

Stop/Start Vehicles - From 2010 MY

To support the Stop/Start system, a number of changes have been made to the logic and operation of climate control system within a Stop/Start cycle to:

- maintain occupant comfort
- prevent windshield misting
- conserve battery power.

This has been achieved by the module monitoring and varying when necessary, various climate control functions within a Stop/Start cycle. For additional information, refer to Starting System (303-06C)

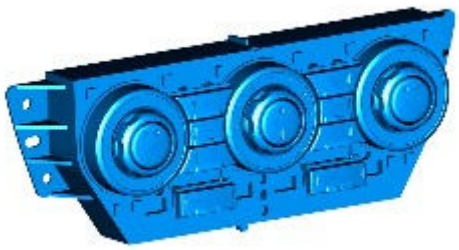
To maintain the cabin temperature when the engine is shutdown in a Stop/Start cycle, an auxiliary electric coolant-

pump has also been integrated into the cooling system to maintain the coolant flow through the cabin's heater core. The pump is directly hardwired to the ECM. On vehicles fitted with a FFH (fuel fired heater), the FFH coolant pump is utilized and activated via the FFH. For additional information, refer to Starting System (303-06C)

NOTE:

From 2010 MY, the 'ECON' switch will be labeled 'A/C' to prevent confusion with the 'Eco' switch which operates the 'Stop/Start' and 'Gear Change Indicator' systems.

ATC MODULE



E78197

The ATC module is mounted in the center console and is integral with the control panel. The module works in conjunction with the ECM to control all aspects of heating, ventilation, and A/C. An 18-pin electrical connector on the rear of the module provides hardwired, Controller Area Network (CAN) bus and Local Interconnect Network (LIN) bus connections to allow interaction with A/C system components and other vehicle control modules. For additional information, refer to Communications Network (418-00 Module Communications Network)

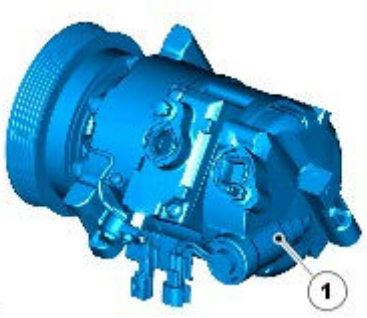
Six different ATC modules (2 single zone, 4 dual zone) are available, depending on vehicle specification. Low specification vehicles feature 3 rotary controllers and 3 top hinged momentary switches to control the quality, temperature and distribution of air into the cabin. High specification vehicles feature 3 rotary controllers, 6 top hinged momentary switches, and 2 dual function momentary switches to control the quality, temperature and distribution of air into the cabin.

In addition to the A/C system, the ATC module controls operation of:

- The seat heaters
- The rear window heater
- The windshield heater
- The exterior mirror heaters.

For more information, refer to the 'Principles of Operation' section below.

COMPRESSOR SOLENOID VALVE



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Item	Part Number	Description
1		Compressor solenoid valve

The compressor solenoid valve is integral with the A/C compressor. Operation of the solenoid valve is controlled by

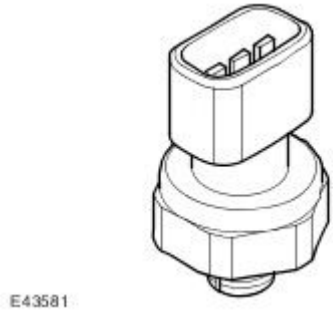
the ECM using a Pulse Width Modulated (PWM) signal of differing values. By controlling the flow of refrigerant (displacement) through the compressor, the solenoid valve can control evaporator operating temperature and cabin humidity by varying the pressure within the A/C system.

NOTE:

The A/C compressor solenoid valve is fitted to i6 petrol vehicles only.

For additional information, refer to Air Conditioning (412-01 Climate Control)

REFRIGERANT PRESSURE SENSOR



The refrigerant pressure sensor provides the ECM with a pressure input from the high pressure side of the refrigerant system. The pressure sensor is located in the refrigerant line between the condenser and the thermostatic expansion valve.

The ECM supplies a 5 V reference feed to the pressure sensor and receives a return signal voltage, between 0 V and 5 V, related to system pressure. The ECM uses the signal from the sensor to protect the refrigerant system from extremes of pressure.

If the pressure within the refrigerant system exceeds the minimum or maximum pressure limits, the ECM will;

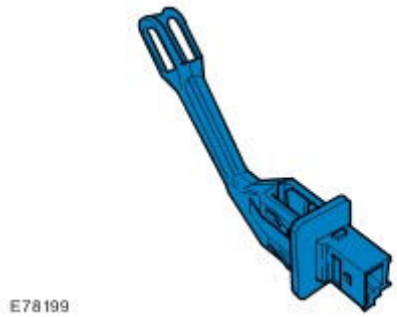
- disable the A/C compressor (TD4 vehicles)
- reduce A/C compressor displacement (i6 vehicles).

If a reduction in A/C compressor displacement fails to bring the system back into it's optimum pressure range, the i6 ECM will disable the A/C compressor.

The ECM constantly sends a refrigerant system pressure signal to the ATC module. The signal is transmitted from the ECM to the Central Junction Box (CJB) over the high speed CAN bus. The CJB acts as a gateway and provides the pressure signal to the ATC module over the medium speed CAN bus.

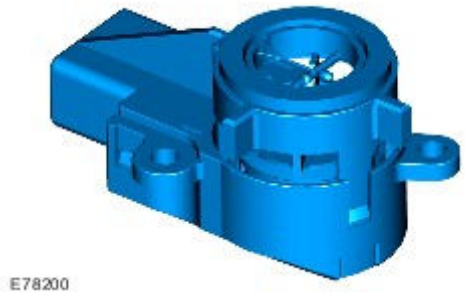
If the pressure within the refrigerant system rises above its maximum pressure limit, the ATC module will increase the amount of recirculated air entering the cabin. This helps lower the pressure within the refrigerant system and thus helps to avoid having to disable the A/C compressor.

EVAPORATOR TEMPERATURE SENSOR



The evaporator temperature sensor is a Negative Temperature Coefficient (NTC) thermistor. The sensor is mounted on the LH side of the heater casing, and measures the temperature of cooled air once it has traveled over the evaporator. The sensor receives a 5 V reference feed from the ATC module. By monitoring the returned voltage, the ATC module can calculate the resistance of the sensor and hence evaporator temperature.

CABIN TEMPERATURE SENSOR

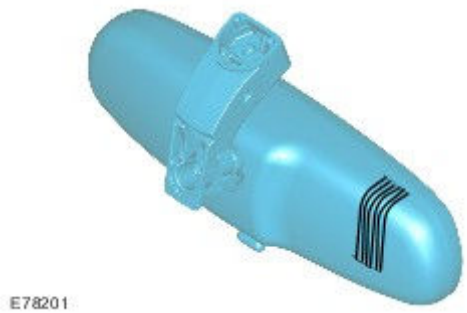


The cabin temperature sensor comprises a NTC thermistor and a motor. The sensor is mounted behind a grill on the drivers side of the instrument panel, adjacent the steering column.

NOTE:
The cabin temperature sensor is only fitted to vehicles with a dual zone, automatic climate control system.

The motor is provided an electrical feed from the ATC module and draws cabin air in through the grill and over the thermistor. The thermistor receives a 5 V reference feed from the ATC module. By monitoring the returned voltage, the ATC module can calculate air temperature within the cabin.

CABIN HUMIDITY SENSOR



The cabin humidity sensor is located within the interior mirror and comprises 3 individual elements:

- A humidity sensor
- An air temperature sensor
- A windshield glass temperature sensor.

NOTE:
The cabin humidity sensor is an optional fit only.

The readings from these 3 sensors combine to reduce the risk of misting on the windshield.

The humidity sensor element is contained behind a nylon mesh cover. The sensor comprises an element made up of film capacitors on different substrates. The dielectric is a polymer which absorbs or releases water proportional to the humidity of the air being drawn through the sensor. This causes a change in the capacitance of the sensor.

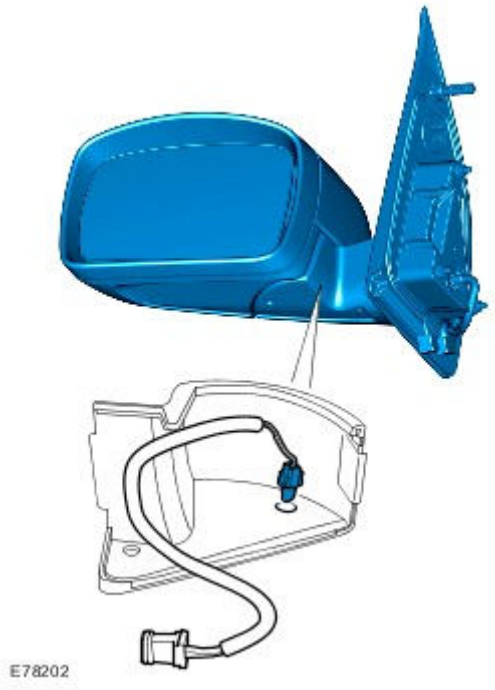
Humidity within the cabin is controlled by raising or lowering the temperature of the evaporator. An increase in evaporator temperature increases the moisture content of the air in the cabin. Lowering the evaporator temperature reduces the moisture content of the air in the cabin.

The capacitance of the sensor, together with both temperature values, are provided as LIN bus messages to the ATC module. The ATC module uses these signals to calculate the dew point of the air at the windshield. When the temperature of the windshield glass reaches or falls below this value, misting is likely to occur. In this instance, the ATC module will;

- raise the temperature of the air leaving the heater assembly
- adjust the position of the windshield distribution (defrost) stepper motor

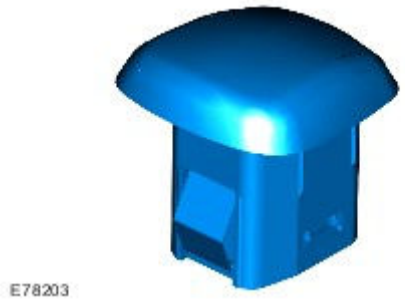
- adjust the position of the air intake stepper motor
- reduce A/C compressor displacement (i6 only)
- power the windshield heater elements (if fitted).

AMBIENT AIR TEMPERATURE SENSOR



The ambient air temperature sensor is a NTC thermistor, and is mounted in the LH door mirror. The sensor receives a 5 V reference feed from the ECM. By monitoring the returned voltage, the ECM can calculate the resistance of the sensor and hence ambient air temperature. The ECM transmits an ambient air temperature value over the high speed CAN bus. This value is relayed to the ATC module by the CJB over the medium speed CAN bus.

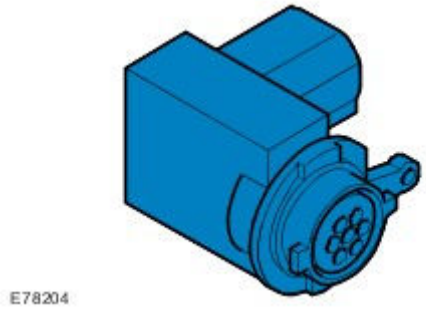
SUNLOAD SENSOR



The sunload sensor is mounted in the center of the instrument panel upper surface. The sensor contains a photoelectric cell, which provides the CJB with an input of light intensity equating to the solar heating effect on the cabin.

The solar heating value is transmitted from the CJB to the ATC module over the medium speed CAN bus. The ATC module compensates for the solar heating effect by adjusting blower speed, air output temperature and air distribution to maintain the required cabin temperature.

POLLUTION SENSOR



The pollution sensor allows the ATC module to monitor intake air for the level of carbon monoxide (CO) and oxides of nitrogen (NOx). The sensor is mounted on the RH side of the heater casing.

NOTE:

The pollution sensor is an optional fit on vehicles with a dual zone, automatic climate control system.

The pollution sensor is provided an ignition controlled feed from the Battery Junction Box (BJB) and provides one of the following 4 signals to the ATC module based on ambient air quality:

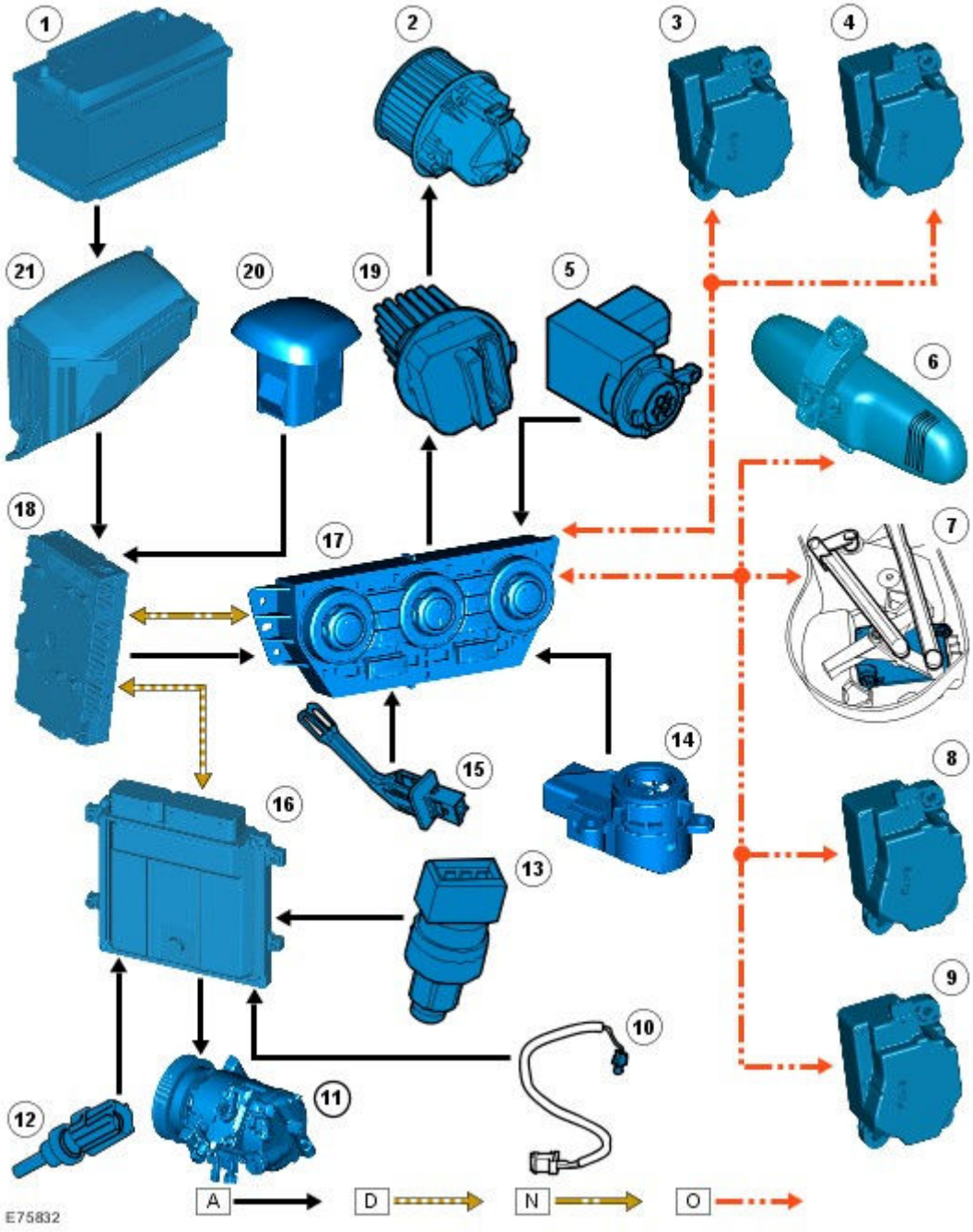
- Static or reduced pollution levels
- Small increase in pollution levels
- Medium increase in pollution levels
- Rapid or large increase in pollution levels.

Based on the signal from the pollution sensor, the ATC module is able to control the intake air source to reduce the amount of contaminants entering the cabin. This function is fully automatic, but can be overridden by manual selection of the air intake source using the fresh/recirculated air switch on the control panel.

CONTROL DIAGRAM

NOTE:

A = Hardwired; **D** = High Speed CAN bus; **N** = Medium Speed CAN bus; **O** = LIN bus



Item	Part Number	Description
1		Battery
2		Blower motor
3		LH temperature blend stepper motor
4		Windshield distribution (defrost) stepper motor
5		Pollution sensor
6		Cabin humidity sensor
7		Air intake stepper motor
8		RH temperature blend stepper motor
9		Face/feet distribution stepper motor
10		Ambient air temperature sensor
11		A/C compressor solenoid - i6 only
12		ECT sensor
13		Refrigerant pressure sensor

14		Cabin temperature sensor
15		Evaporator temperature sensor
16		ECM
17		ATC module
18		Fuse 27, CJB
19		Blower motor control module
20		Sunload sensor
21		Fusible link 17, BJB

PRINCIPLES OF OPERATION

Intake Air Control - Single Zone Manual System

The intake air source is controlled manually by pressing the fresh/recirculated air switch located on the control panel. When pressed, the ATC module will illuminate the switch tell-tale Light Emitting Diode (LED) and close the air intake door. A second press of the switch will cause the ATC module to extinguish the switch LED and open the air intake door, allowing fresh air to enter the cabin.

NOTE:

The ATC module will reduce the amount of fresh air entering the cabin to reduce the ram effect caused by forward motion of the vehicle.

When recirculated air is selected, the ATC module will return the air intake door to the open position after a period of 3 minutes. This helps prevent misting within the cabin. The 3 minute time period for recirculated air can be overridden by pressing and holding the fresh/recirculated air switch until the switch LED flashes 3 times. The air intake door will now remain closed until the next drive cycle.

The ATC module controls the position of the air intake door by providing LIN bus messages to the air intake door stepper motor. A Hall effect sensor located within the stepper motor informs the ATC module that movement of the stepper motor is taking place.

Intake Air Control - Dual Zone Automatic System

The intake air source is controlled automatically unless overridden by pressing the fresh/recirculated air switch located on the control panel. Under automatic control, the ATC module determines the required position of the air intake door using its 'comfort' algorithm based on inputs from the ambient air temperature sensor and the cabin temperature sensor.

When the vehicle first enters power mode 6 (ignition on), the tell-tale LED on the fresh/recirculated air switch will be illuminated and the air intake source will be automatically controlled by the ATC module. The ATC module will control the intake air source according to ambient air temperature and requested cabin temperature. The intake air door will be opened to allow fresh air into the cabin, although a small amount of recirculated air will also be present.

NOTE:

The ATC module will reduce the amount of fresh air entering the cabin to reduce the ram effect caused by forward motion of the vehicle.

A single press of the fresh/recirculated air switch will extinguish the tell-tale LED. The ATC module will now close the air intake door and provide only recirculated air into the cabin for a period of 3 minutes. After this period, the ATC module will return the air intake door to automatic control. This helps prevent misting within the cabin.

A second press of the fresh/recirculated air switch will also return the intake air source to automatic control and illuminate the tell-tale LED.

The 3 minute time period for recirculated air can be overridden by pressing and holding the fresh/recirculated air switch until the switch LED flashes 3 times. The air intake door will now remain closed until the next drive cycle.

The ATC module controls the position of the air intake door by providing LIN bus messages to the air intake door stepper motor. A Hall effect sensor located within the stepper motor informs the ATC module that movement of the stepper motor is taking place.

Intake Air Control - Dual Zone Automatic System with Pollution Sensor

The intake air source is controlled automatically unless overridden by pressing the fresh/recirculated air switch located on the control panel. Under automatic control, the ATC module determines the required position of the air intake door using its 'comfort' algorithm based on inputs from the ambient air temperature sensor, the cabin temperature sensor and the pollution sensor.

NOTE:

The ATC module will reduce the amount of fresh air entering the cabin to reduce the ram effect caused by forward motion of the vehicle.

When the vehicle first enters power mode 6 (ignition on), the 'AUTO' tell-tale LED on the fresh/recirculated air switch will be illuminated and the air intake source will be automatically controlled by the ATC module. A single press of the fresh/recirculated air switch will extinguish the 'AUTO' tell-tale LED and illuminate the 'MAN' tell-tale LED. The ATC module will now close the air intake door and provide only recirculated air into the cabin for a period of 3 minutes. After this period, the ATC module will return the air intake door to automatic control. This helps prevent misting within the cabin.

A second press of the fresh/recirculated air switch will extinguish both the 'AUTO' and 'MAN' tell-tale LED's. The ATC module will now control the intake air source according to ambient air temperature and requested cabin temperature. The air intake door will be opened to allow fresh air into the cabin, but a small amount of recirculated air will also be present. The amount of recirculated air is determined by the ATC module using its 'comfort' algorithm based on inputs from the ambient air temperature sensor and the cabin temperature sensor.

A third press of the fresh/recirculated air switch returns the air intake source to automatic control and will illuminate the 'AUTO' tell-tale LED.

The 3 minute time period for recirculated air can be overridden by pressing and holding the fresh/recirculated air switch until the switch LED's flash 3 times. The air intake door will now remain closed until the next drive cycle.

The ATC module controls the position of the air intake door by providing LIN bus messages to the air intake door stepper motor. A Hall effect sensor located within the stepper motor informs the ATC module that movement of the stepper motor is taking place.

Air Temperature Control - Single Zone Manual System

Cabin temperature selection is made by turning the LH rotary controller to the required position. Turning the controller counter clockwise will lower the temperature of the air exiting the heater assembly; turning the controller clockwise will raise the temperature of the air exiting the heater assembly.

Maximum heating and cooling is represented on the control panel by a red and blue dot respectively. When either maximum heating or cooling is selected, the 'comfort' algorithm in the ATC module will adopt a suitable strategy for air source, air distribution and blower speed to maintain maximum heating or cooling within the cabin.

The ATC module adjusts the temperature of the air exiting the heater assembly by moving the position of the temperature blend door. The temperature blend door directs a proportion of cooled air from the evaporator through the heater core to produce the required temperature output. The ATC module adjusts the position of the temperature blend door by providing LIN bus messages to the blend door stepper motor. A Hall effect sensor located within the stepper motor informs the ATC module that movement of the stepper motor is taking place.

Air Temperature Control - Dual Zone Automatic System

Dual zone systems feature 2 rotary heating controllers, which allow individual climate control for the LH and RH sides of the cabin. Temperature selection can be made by turning the controller to the required temperature marked on the control panel. Turning either controller past the 16°C (61°F) mark will initiate the maximum cooling strategy; turning either controller past the 28°C (82°F) mark will initiate the maximum heating strategy.

NOTE:

Maximum cooling or heating can only be achieved if both rotary controllers are set to the same position.

The ATC module is able to maintain constant temperatures in both sides of the cabin by monitoring the feedback from the cabin temperature sensor. Unless any manual overrides have been selected, the ATC module will automatically control the intake air source, air distribution into the cabin and blower speed to maintain the required temperatures.

Dual zone systems feature 2 temperature blend doors, allowing individual temperature output for the LH and RH sides of the cabin.

NOTE:

The drivers side temperature setting has priority over the passengers side temperature setting.

The temperature blend doors are mounted on the LH side of the heater assembly and direct a proportion of cooled air from the evaporator through the heater core to provide the required temperature outputs. The ATC module controls the position of the temperature blend doors by providing LIN bus messages to the blend door stepper motors. Hall effect sensors located within the stepper motors inform the ATC module that movement of the stepper motors is taking place.

Blower Motor Control - Single Zone Manual System

Blower motor speed is set by turning the RH rotary controller to the required position. The RH rotary controller allows the selection of 14 blower motor speeds. Turning the controller fully counter clockwise will turn the blower motor off.

Operation of the blower motor is controlled by the ATC module via the blower motor control module. The ATC module provides a PWM signal to the blower motor control module based on the selected blower speed. The blower motor control module interprets the PWM signal as a blower motor speed and controls the voltage to the blower motor accordingly.

Blower Motor Control - Dual Zone Automatic System

Blower motor speed is controlled automatically by the ATC module unless a manual override has been requested. Manual overrides to blower motor speed can be made by turning the central rotary controller to the required position. The rotary controller allows the manual selection of 7 blower motor speeds. Turning the controller fully counter clockwise will turn the blower motor off. When a manual override has been made, the 'AUTO' LED located in the center of the rotary controller will extinguish.

NOTE:

The central rotary controller contains 2 LED's. The top (round) LED will illuminate when the blower motor is under automatic control. The bottom (rectangular) LED will illuminated when air distribution into the cabin is under automatic control (see below).

The blower motor can be returned to automatic control by pressing the 'AUTO' switch located in the center of the rotary controller. Under automatic control, the ATC module varies the speed of the blower motor in line with its 'comfort' algorithm to maintain the required cabin temperature. The ATC module will also vary the blower motor speed to compensate for the ram effect on intake air produced by forward movement of the vehicle.

Operation of the blower motor is controlled by the ATC module via the blower motor control module. The ATC module provides a PWM signal to the blower motor control module based on the required blower speed. The blower motor control module interprets the PWM signal as a blower motor speed and controls the voltage to the blower motor accordingly.

Air Distribution Control - Single Zone Manual System

Air distribution into the cabin can be adjusted by turning the central rotary controller to the required position. The ATC module adjusts the position of the air distribution door to the required position by providing LIN bus messages to the air distribution door stepper motor. A Hall effect sensor located within the stepper motor informs the ATC module that movement of the stepper motor is taking place.

Air Distribution Control - Dual Zone Automatic System

Air distribution into the cabin is controlled automatically by the ATC module unless any manual overrides have been requested. Manual overrides can be made by pressing the appropriate air distribution momentary switch on the control panel. If a manual override has been requested, the 'AUTO' LED located in the center of the blower motor rotary controller will extinguish.

NOTE:

The central rotary controller contains 2 LED's. The top (round) LED will illuminate when the blower motor is under automatic control (see above). The bottom (rectangular) LED will illuminated when air distribution into the cabin is under automatic control.

Air distribution can be returned to automatic control by pressing the 'AUTO' switch located in the center of the blower motor rotary controller. This will illuminate the 'AUTO' LED and allow the ATC module to control air distribution in line with its 'comfort' algorithm

Air distribution is controlled by 2 air distribution doors. The ATC module controls the position of the air distribution doors by providing LIN bus messages to the door stepper motors. Hall effect sensors located within the stepper motors inform the ATC module that movement of the stepper motors is taking place.

ECON - Single Zone Manual System

Pressing the 'ECON' momentary switch on the control panel will switch off the A/C system. When selected, the ATC module will transmit a message over the high speed CAN bus to the ECM requesting the A/C compressor is disabled. The ECM disables the compressor by de-energizing the A/C compressor control relay located in the BJB. The tell-tale LED in the switch will illuminate to alert the vehicle occupants that the system is in 'ECON' mode.

When 'ECON' mode is selected, temperature control is still available but no cooling of intake air will take place. The minimum output air temperature from the system will be ambient air temperature plus any heat pick up in the air intake path.

A/C can be switched back on by pressing the 'ECON' switch a second time. This will also extinguish the 'ECON' LED.

Stop/Start Vehicles - From 2010 MY

From 2010 MY, the 'ECON' switch will be labeled ‘A/C’ to prevent confusion with the ‘Eco’ switch which operates the ‘Stop/Start’ and 'Gear Change Indicator' systems. For additional information, refer to Starting System (303-06C)

ECON - Dual Zone Automatic System

Pressing the 'ECON/OFF' momentary switch in the control panel will switch off the A/C system. When selected, the ATC module will transmit a message over the high speed CAN bus to the ECM requesting the A/C compressor is disabled. The ECM disables the compressor by de-energizing the A/C compressor control relay located in the BJB. The 'ECON' tell-tale LED in the switch will illuminate to alert the vehicle occupants that the system is in 'ECON' mode.

When 'ECON' mode is selected, temperature control is still available but no cooling of intake air will take place. The minimum output air temperature from the system will be ambient air temperature plus any heat pick up in the air intake path.

A second press of the 'ECON/OFF' switch will extinguish the 'ECON' LED and illuminate the 'OFF' LED. When in 'OFF' mode the ATC module sets the blower motor speed to 0. Air distribution into the cabin will remain as previously selected. All LED's on the control panel will be extinguished, although night time illumination will remain active.

NOTE:

When in 'OFF' mode, the heated seat, heated windshield and heated rear window functions will still be available.

A third press of the 'ECON/OFF' switch returns the system to normal (A/C) operation and extinguishes the 'OFF' LED. The system can be returned to automatic operation at any time by pressing the 'AUTO' switch mounted in the central (blower motor) rotary controller.

Stop/Start Vehicles - From 2010 MY

From 2010 MY, the 'ECON' switch will be labeled ‘A/C’ to prevent confusion with the ‘Eco’ switch which operates the ‘Stop/Start’ and 'Gear Change Indicator' systems. For additional information, refer to Starting System (303-06C)

Programmed Defrost

The programmed defrost function is only available on vehicles fitted with a dual zone heating, ventilation and A/C system. The function is selected by pressing the 'PROG' momentary switch on the control panel. When selected, the ATC module provides maximum windshield defrosting/demisting by configuring the system as follows:

- 'AUTO' mode off
- Intake air set to fresh air
- Air distribution set to windshield
- Blower motor speed set to maximum
- Heated windshield on
- Rear window heater on.

When programmed defrost is selected, the set temperature will remain unchanged. Programmed defrost can be cancelled by any of the following methods:

- Pressing any air distribution momentary switch

- Pressing the 'AUTO' switch located in the center of the blower motor rotary controller
- Pressing the 'PROG' momentary switch a second time.

NOTE:

Blower motor speed can be adjusted without terminating programmed defrost.

Windshield Heater

The windshield heater comprises 2 heater elements, LH and RH, bonded between the glass laminations. The system is switched on by pressing the momentary switch located on the control panel. When selected, the ATC module transmits a heating request on the high speed CAN bus to the CJB. On receipt of the message, the CJB energizes the windshield heater relay located in the BJB by providing a ground path for the relay coil. The energized relay provides a battery feed to both heater elements. After a period of 4 minutes the ATC module removes the request for windshield heating. The CJB then powers down the windshield heater by removing the ground path for the relay coil.

The ATC module will only request windshield heater operation if the engine is running. An engine status signal is provided to the ATC module by the ECM over the high speed CAN bus.

Rear Window Heater

The rear window heater comprises a single heater element bonded to the inner surface of the glass. The system is switched on by pressing the momentary switch located on the control panel. When selected, the ATC module transmits a heating request on the high speed CAN bus to the CJB. On receipt of the message, the CJB energizes the rear window heater relay located in the Auxiliary Junction Box (AJB) by providing a ground path for the relay coil. The energized relay provides a battery feed to the heater element. After a period of 12 minutes the ATC module removes the heating request. The CJB then powers down the rear window heater by removing the ground path for the relay coil.

The ATC module will only request rear window heater operation if the engine is running. An engine status signal is provided to the ATC module by the ECM over the high speed CAN bus.

Exterior Mirror Heaters

Operation of the exterior mirror heaters is fully automatic and requires no input from the driver. The exterior mirror heaters are active when the ambient air temperature is below 5°C (41°F) and engine coolant temperature is below 65°C (149°F). Ambient air and engine coolant temperature values are provided by the ECM on the high speed CAN bus. On receipt of these temperature values, the CJB determines if exterior mirror heating is required.

The CJB requests exterior mirror heating by transmitting a high speed CAN bus message to both the drivers and passenger door modules. The door modules provide feed and ground paths to the respective exterior mirror heating elements. When ambient and engine coolant temperature rises above the values stated earlier, the CJB transmits a high speed CAN bus message to the door modules cancelling the heating request.

Seat Heaters

Operation of the seat heaters is controlled by the ATC module on receipt of a heating request from either of the seat heater momentary switches located on the control panel. The switches are mounted in the LH and RH rotary controllers. A single press of a seat heater switch will implement low level heating and illuminate a tell-tale LED. A second press of the switch will implement high level heating and illuminate 2 tell-tale LED's. A third press of the switch will turn the seat heater off.

Seat heating requests are transmitted from the ATC module to the seat heater control modules on the LIN bus. Two seat heater control modules are fitted, one under each front seat. The seat heater control modules provide an electrical supply to the seat heater elements and a temperature sensor located in the seat cushion.

The seat heater control module provides a 5 V reference feed to the seat heater temperature sensor. The seat heater temperature sensor is an NTC thermistor. By monitoring the returned voltage, the control module can calculate the temperature of the seat. If the temperature rises above the target temperature, the control module will disable operation of the heater elements.