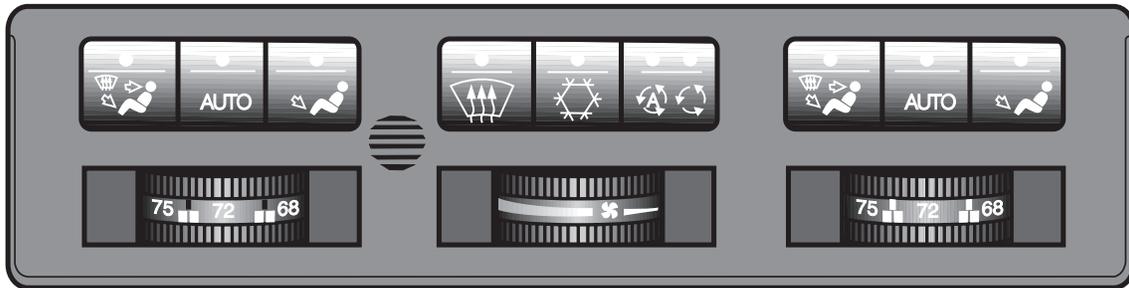


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## IHKA E31 CONTROL PANEL



The E31 control panel, while laid-out very differently from the E32 panel, contains almost all the same buttons and thumbwheels, and they operate the same way:

- Left Mode Buttons (3)
- Maximum Defrost Mode Button
- “Snowflake” Button
- Recirc./AUC Button
- Right Mode Buttons (3)
- Left Desired Temp. Thumbwheel
- Interior Temperature Sensor
- Blower Speed Thumbwheel
- Right Desired Temp. Thumbwheel

The IHKA E31 control panel does not contain the rear window defroster button. On E31 vehicles, this button is mounted located on the instrument panel, between the instrument cluster and the center face vent outlets.



**Left/Right Desired Temperature Thumbwheels:** Separate thumbwheels allow independent temperature regulation on the driver and passenger sides of the interior.

The numbers that appear on the thumbwheels do not indicate actual interior temperature - they correspond to a general comfort level.



**Left/Right Air Distribution Buttons:** Separate air distribution buttons allow the driver and passenger to select different air discharge locations. From left to right, the buttons are: Up/Down, AUTO, and Down.

The air distribution buttons are “opposing arrest” buttons - only one button in each three-button set can be depressed at any one time. Pressing an “extended” button causes the button already depressed to pop out.

If no buttons are depressed, the system will operate in “AUTO” mode by default.



**Up/Down Button:** For most operating conditions, this button provides the most evenly-distributed air flow since **some** air is discharged from **all** air distribution outlets (face vents, console rear outlet, footwells, windshield defrosting).

Some flap positions are modified when the A/C compressor is switched on, and the console rear outlet flap position depends upon rear seat switch position. Other flap positions depend upon Y-factor.

When up/down mode is selected, however, the face vent flaps are always fully open and the footwell flaps are always at least half open.



**Automatic Button:** When the “AUTO” button is pressed, the control module operates all the air discharge flap motors according to Y-factor.

If cooling is needed, the face vent outlet flaps are fully opened, while the windshield defroster and footwell flaps are fully closed. If heating is called for, the face vent outlet flaps are closed, and the footwell and windshield defroster flaps are fully opened. For some mid-range Y-factor values (e.g. 40%) all air distribution flaps are partially open.



**Down Button:** Pressing this button limits air discharge to the windshield defroster and footwell air distribution outlets.

When down mode is selected, the face vent outlet flaps are always fully closed, and the footwell flaps are always fully opened.

The windshield defroster flap positions depend on whether the A/C compressor is switched on, and Y-factor values. The defroster flaps are, however, always half open when the Y-factor is above 30%.

Detailed information about each of these three buttons appears later in this Handout under “IHKA E31 Air Distribution.”



**Blower Speed Thumbwheel:** The blower speed thumbwheel is linked to a potentiometer inside the control panel, and performs several functions:

- The thumbwheel is the “master controller” for the IHKA system rotating it fully to the left (“0” position) turns off the system.
- Rotating the thumbwheel to the right from “0” turns the system on and activates the blower. Blower speed increases the further the thumbwheel is rotated.
- Rotating the thumbwheel fully to the right detent locks for full blower speed, overriding C.U. influence



**Maximum Defrosting Button:** Pressing this button overrides all current system modes and functions, and activates the maximum defrosting mode:

- The fresh air intake flaps are fully opened (recirc. mode, if active, is overridden).
- The windshield defrosting flaps are fully opened.
- All other air distribution flaps are fully closed.
- The blower runs at near-maximum speed.
- The water valves are opened fully for maximum coolant flow through the heater cores. (At ambient temperatures above 32°F (0°C), the water valves are pulsed to regulate heater core temperature.)
- The rear window defroster is activated.

The maximum defrosting button works whether the IHKA system is turned on or off.



**A/C Compressor Button:** Pressing the “snowflake” button sends an A/C compressor “on” request to the IHKA control module (providing the blower speed thumbwheel is not in position “0”).



**AUC/Recirculating Air Button:** The recirculating air/AUC button controls air intake location. During normal operation, fresh air is drawn into the climate control system and heated or cooled.

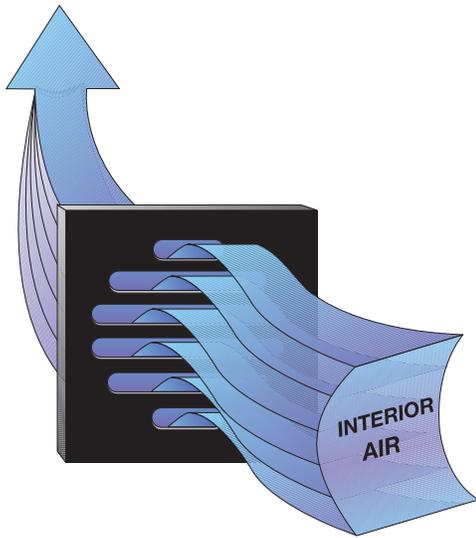
Pressing the recirculating air/AUC button **once** activates the automatic recirculating air function and light the left LED. An AUC sensor, located in the engine compartment, monitors the level of oxidizable gases in ambient air and notifies the control panel/module when these gases reach a specified level. When this occurs, the control panel/module **automatically:**

- closes the fresh air flaps **and**
- opens the recirculating air flaps **and**
- activates the A/C compressor



Pressing the recirculating air/AUC button **twice** causes the control module to light the right LED and immediately:

- close the fresh air flaps **and**
- open the recirculating air flaps **and**
- activate the A/C compressor **and**
- activate the auxiliary fan (at normal speed)

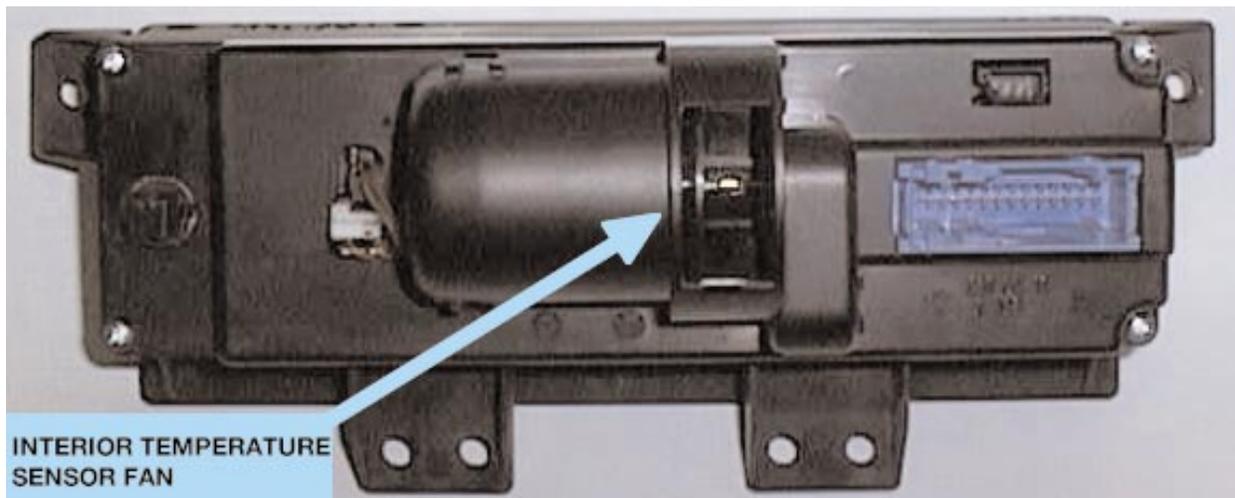


The interior temperature sensor is located behind an air intake grille on the control panel face.

A small electric fan, mounted on the back of the control panel, draws air over the sensor to avoid sampling "stale" interior.

The sensor fan runs whenever the ignition is turned on, whether the IHKA system is on or off.

The interior temperature sensor fan is shown here in the rear view of the IHKA E31 control panel:

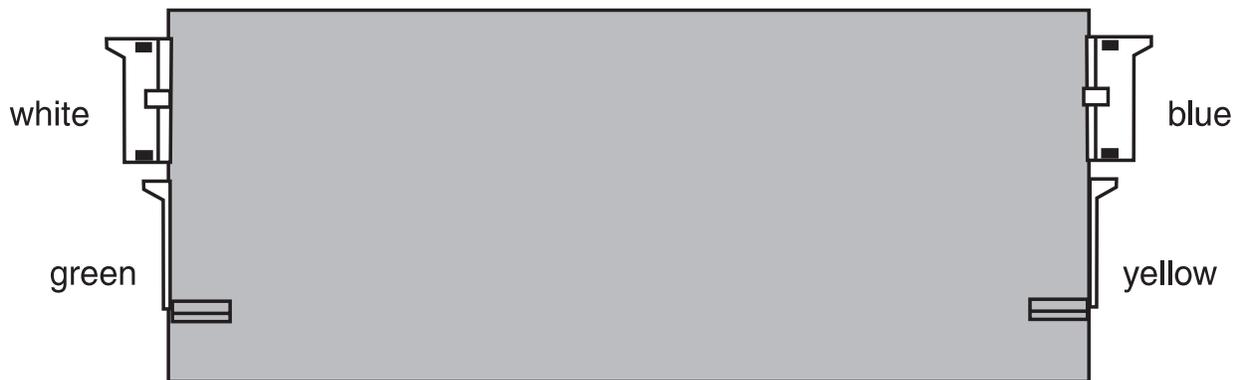


**Rear View of IHKA E31 Control Panel**

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## IHKA E31 CONTROL MODULE

On E31 vehicles the IHKA control module slides into a bracket at the forward, lower portion of the IHKA housing assembly. The module contains the electronics used to process information furnished by the system sensors, switches, and other input sources. The module also contains a non-volatile read-only-memory (ROM) where programmed operating instructions are stored.



The E31 control module uses the inputs to control:

- Blower speed
- Auxiliary coolant pump
- Auxiliary cooling fan
- Air intake flaps (fresh/recirculating)
- Air distribution flaps (face vent, foot-well, defroster)
- Mixing flaps
- Heater core temperatures
- Evaporator temperature
- Special programmed functions
- Windshield washer spray jet heaters

Initially introduced as software version "04," version "05" was released in April 1991. Version "05" was classified as a minor redesign.

- A significant version "05" change is that, in the "up/down" air distribution mode, the defroster flaps are fully open, regardless of Y-factor, etc. This change resulted in increased air flow to the windshield to reduce the chances of window fogging.

E31 control modules are not codeable. Also, the memory is volatile; fault codes stored are erased about 4 minutes after the ignition is switched "Off."

---

## IHKA E31 SUBSTITUTE VALUE OPERATION

If an input potentiometer or sensor (or its circuit) fails, the control module will ignore the faulty input. In its place, the module will use a substitute value which has been programmed into its memory for just this purpose. The substitute value, typically a mid-scale value for a particular input, allows the IHKA system to operate as normally as possible, despite the fault.

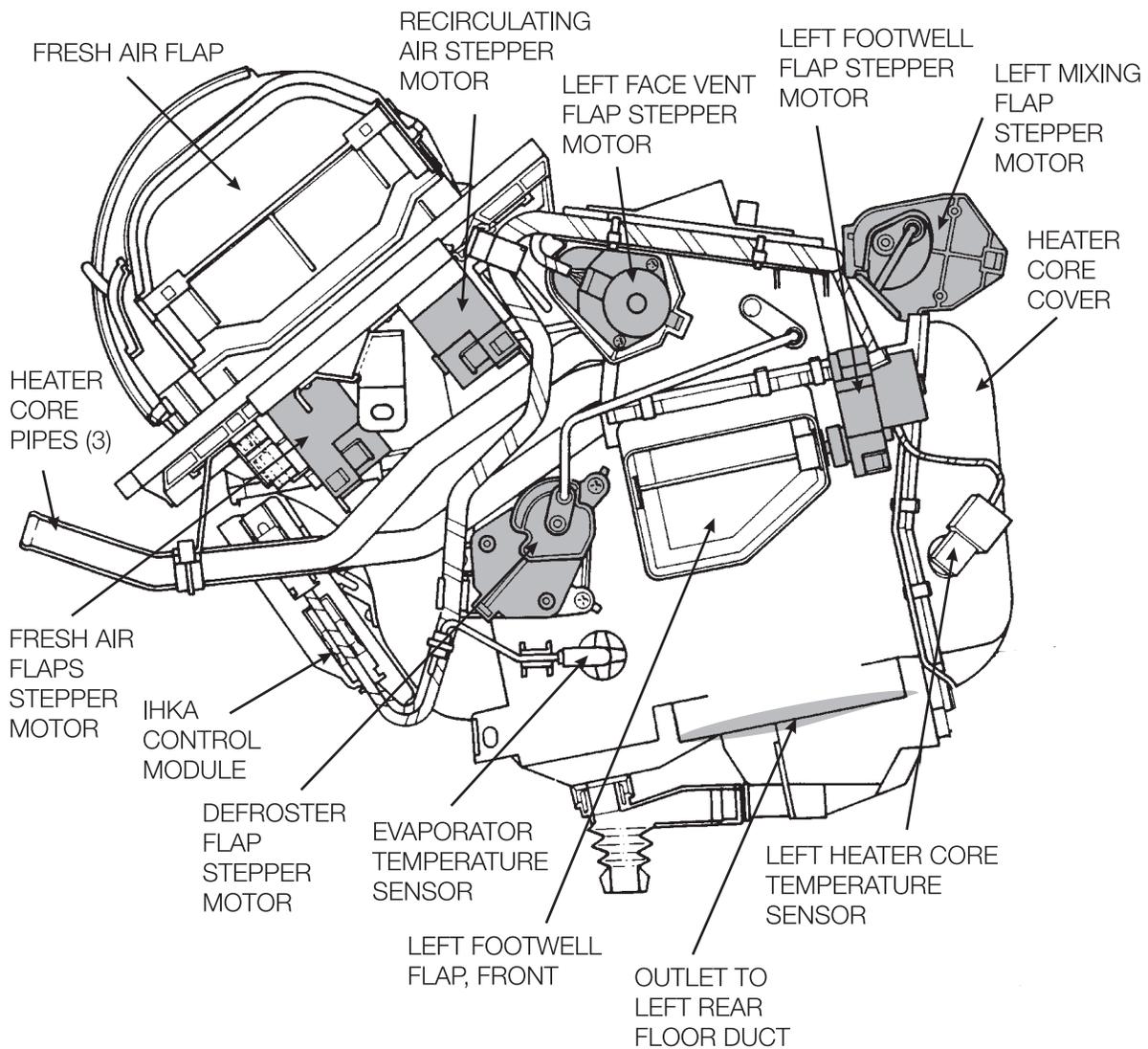
Substitute values for IHKA E31 components are:

- Desired temperature potentiometer (left or right) . . . . .75°F (24°C)
- Interior temperature sensor . . . . .75°F (24°C)
- Ambient temperature sensor . . . . .32°F (0°C)
- Heater core temperature sensor . . . . .130°F (55°C)
- Evaporator temperature sensor . . . . .23°F (-5°C)\*
- Blower speed potentiometer . . . . .50%
- Temperature mixing potentiometer . . . . .50%

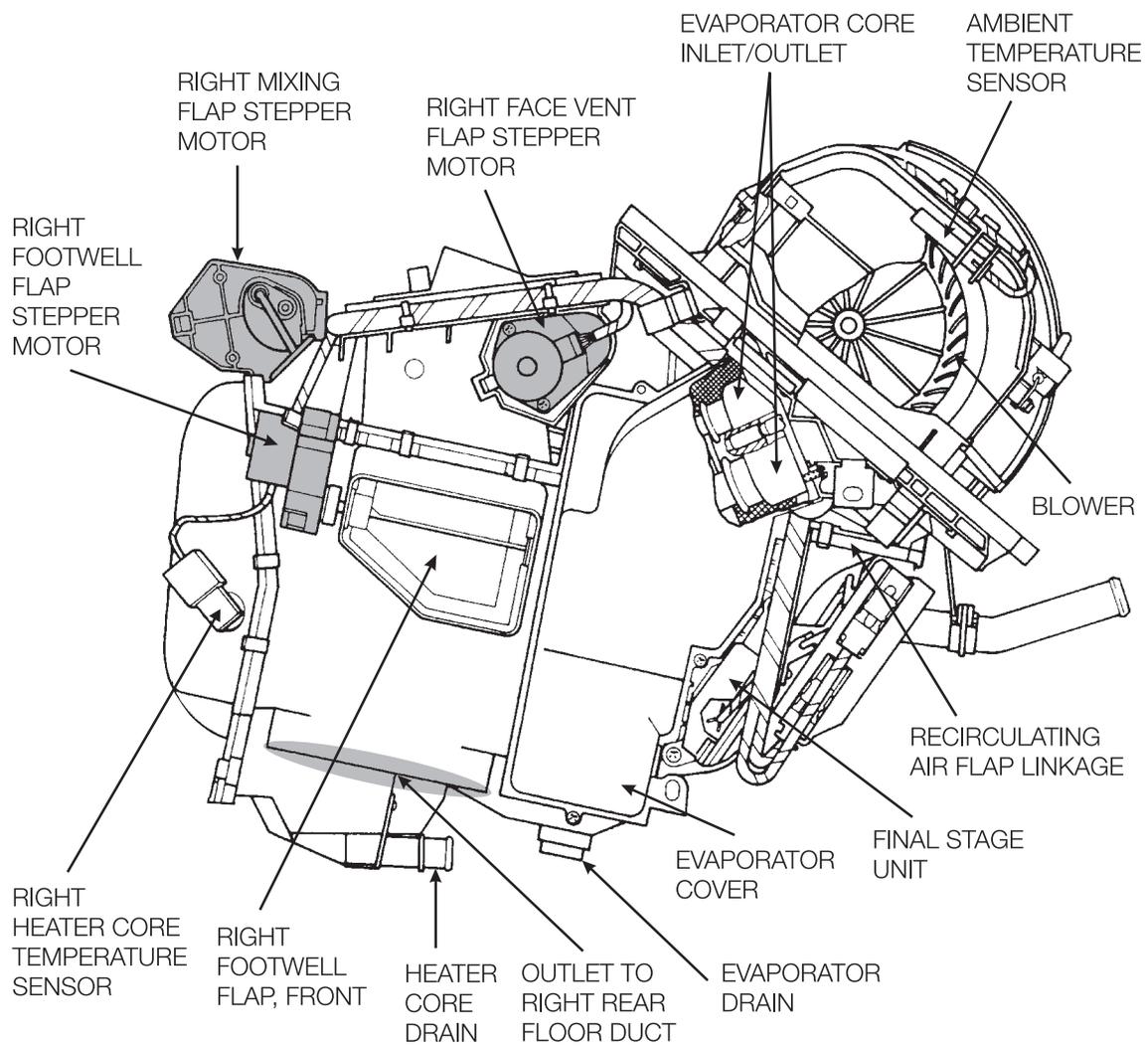
\* The substitute value for the evaporator temperature sensor is well below the A/C compressor cycling point (1-3°C). Therefore, if the evaporator temperature sensor signal is not plausible, the substitute value will switch the refrigeration system off.

## IHKA E31 HOUSING ASSEMBLY

The housing assembly is mounted behind the center of the instrument panel. Most of the climate control system components are mounted either inside or on the housing: 10 stepper motors (for flap control), heater cores (left and right), an evaporator, 4 temperature sensors, the IHKA control module, the blower motor, and the blower final stage unit



**IHKA E31 Housing Assembly, Left Side**

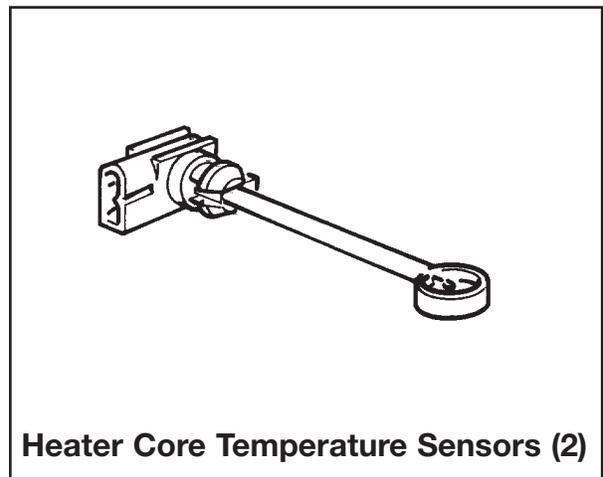
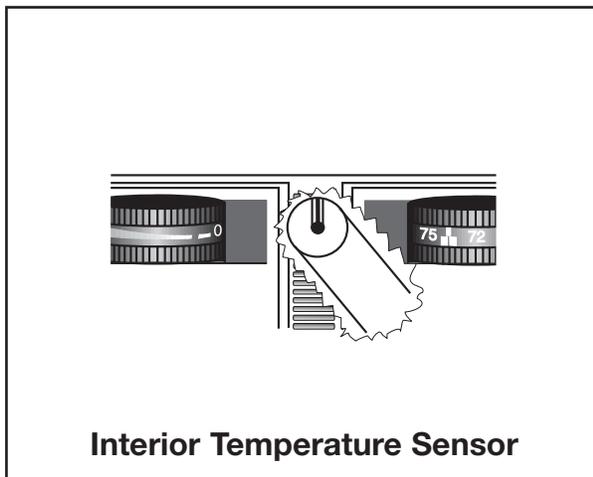
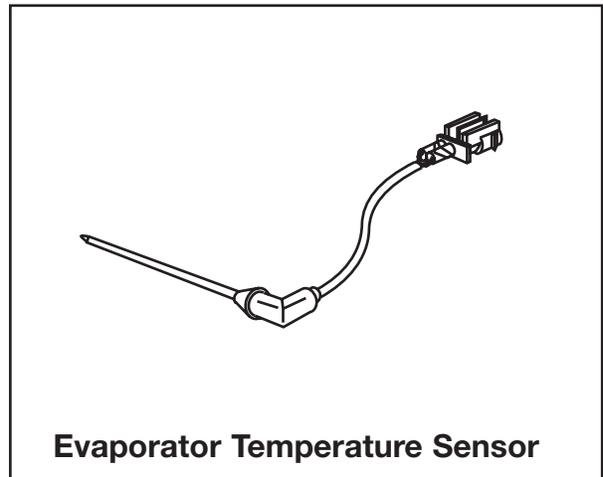
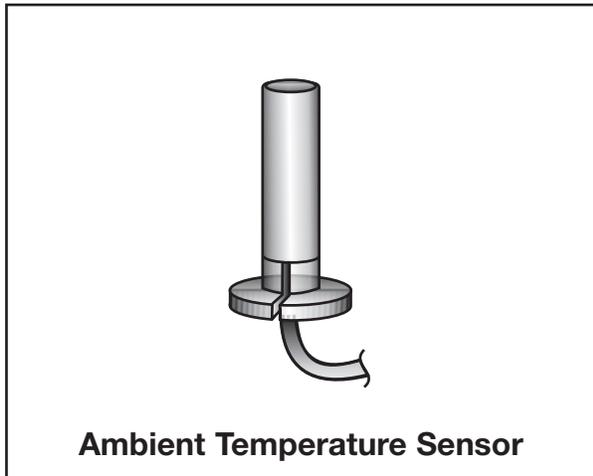


**IHKA E31 Housing Assembly, Right Side**

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## IHKA E31 TEMPERATURE SENSING

The IHKA E31 climate control system uses a total of 5 temperature sensors:

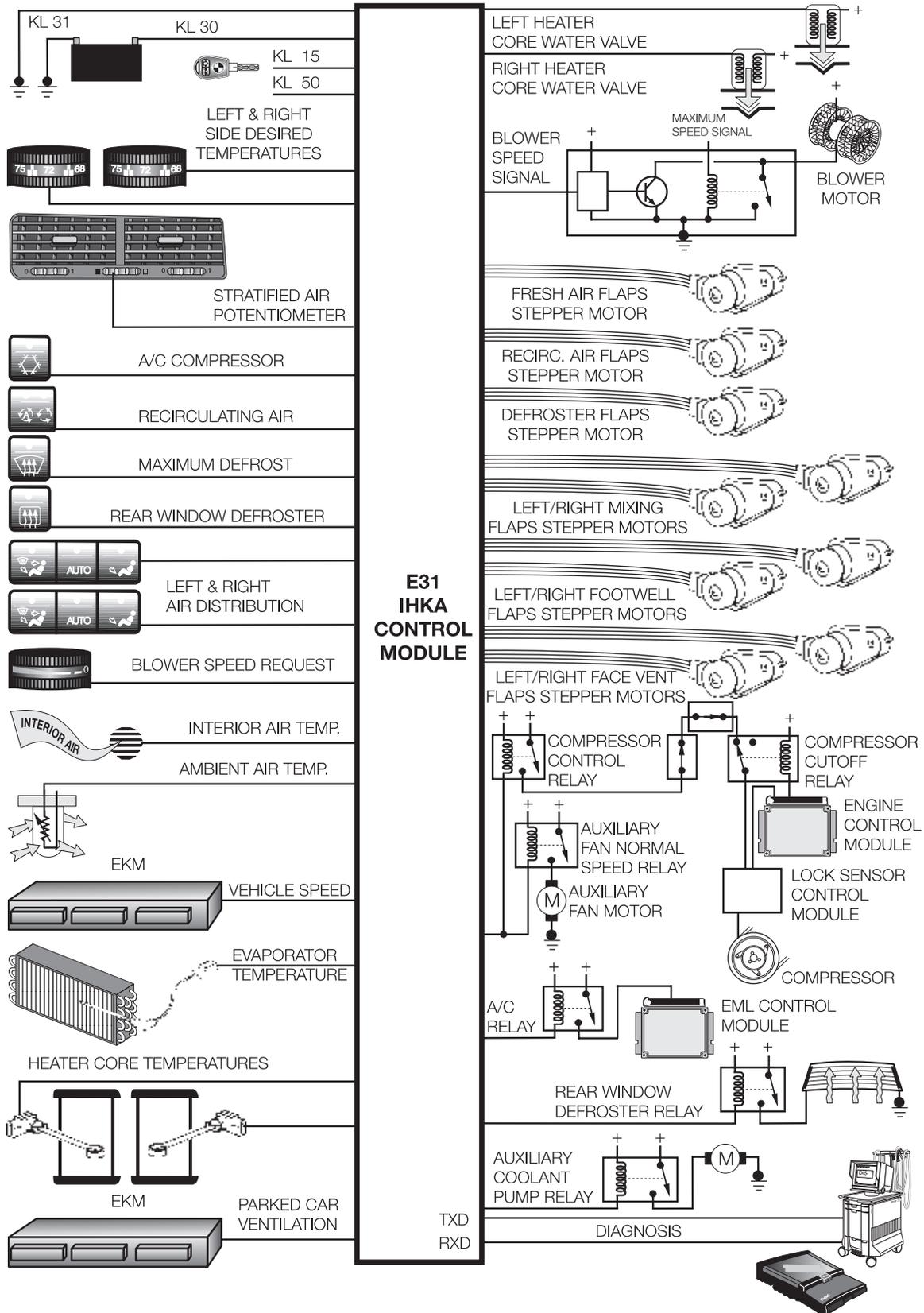


The ambient, evaporator, and heater core temperature sensors are mounted in, or on, the IHKA housing assembly.

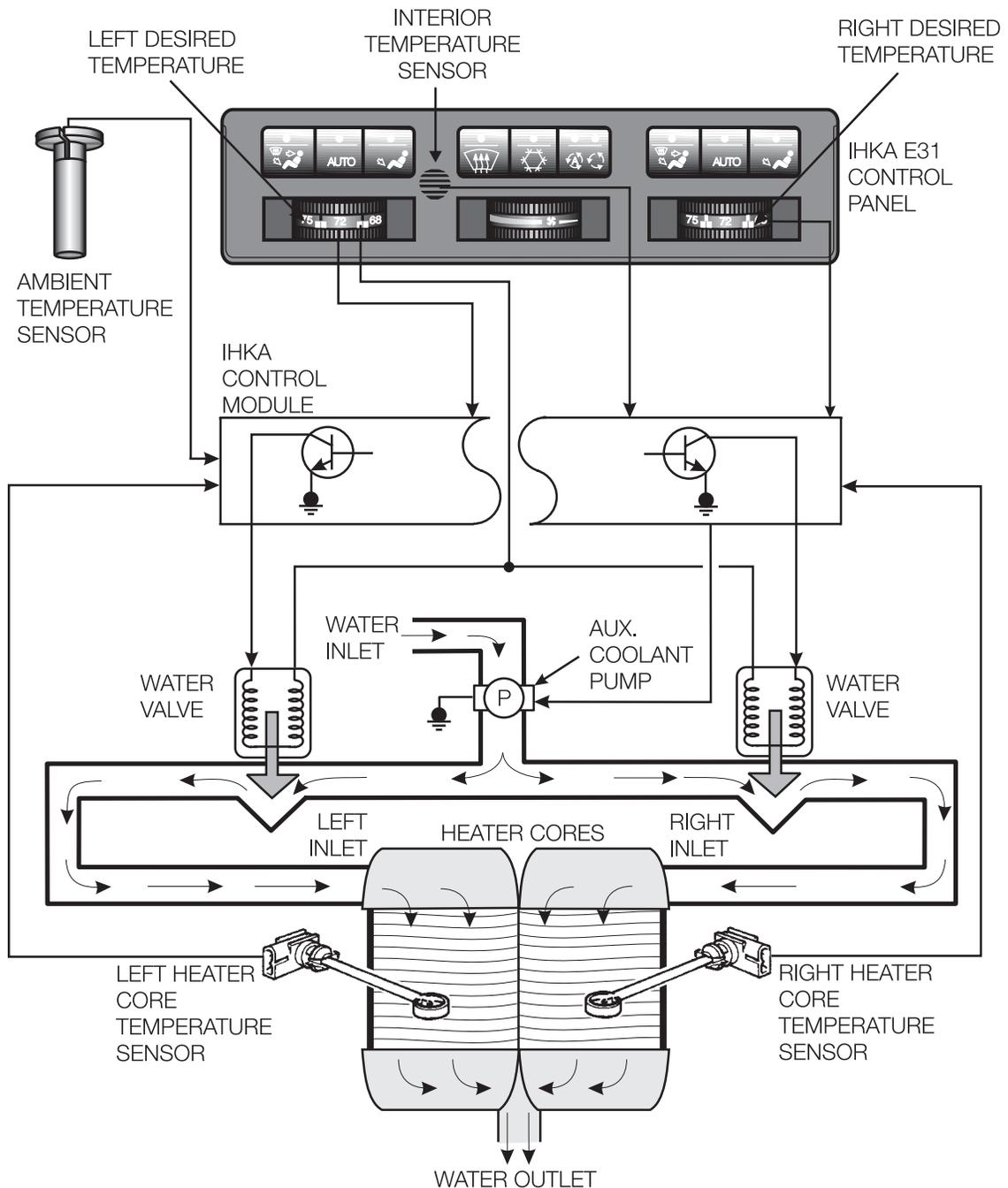
The interior temperature sensor is mounted inside the control panel, behind a protective grille.

All of the sensors are Negative Temperature Coefficient (NTC) thermistors. As temperature increases, sensor resistance decreases; as temperature decreases, sensor resistance increases.

# IHKA E31 IPO (as introduced)



# IHKA E31 TEMPERATURE REGULATION



Temperature regulation on E31 vehicles is accomplished by solenoid actuated water valves, normally help open by spring pressure, are pulsed closed by the IHKA E31 control module to regulate the flow of how coolant through the heater cores (and, thereby, the core temperatures).

E31 vehicles have an electrically powered auxiliary coolant pump to ensure that an adequate supply of hot water is always available to the heater cores.

---

The control module pulses the solenoid valves according to the Y-factor, which is calculated from the following inputs:

- Left desired temperature
- Right desired temperature
- Interior temperature
- Left heated core temperature
- Right heater core temperature
- Ambient air temperature
- Blower thumbwheel position

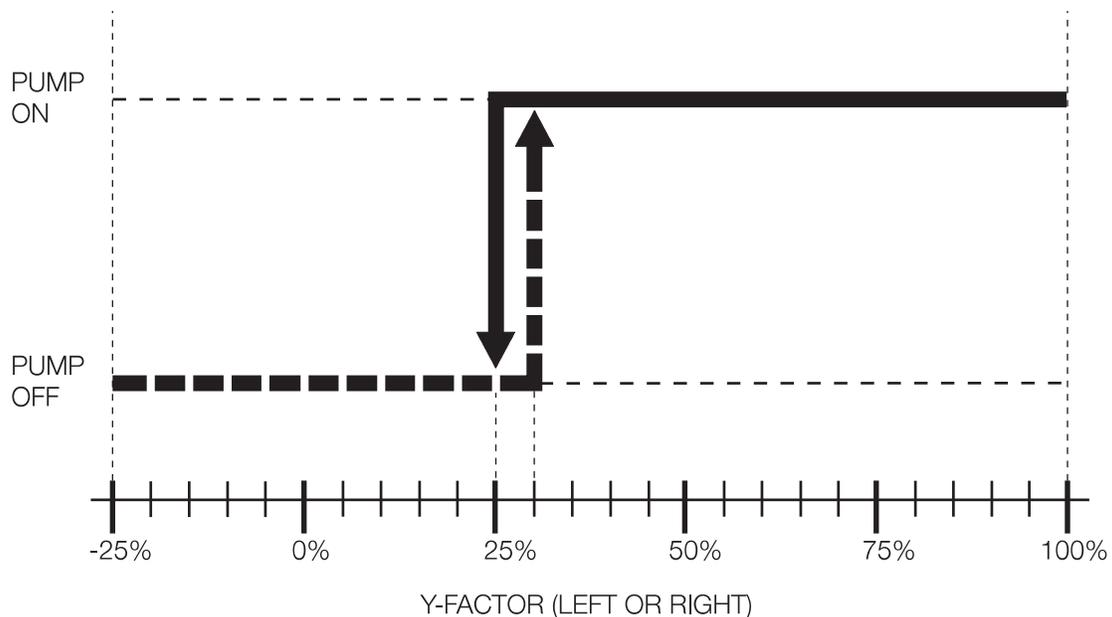
When the left desired temperature thumbwheel is rotated all the way to the right (maximum heating), temperature regulation is cancelled and the valves remain 100% open to provide maximum heat output.

Similarly, when the left temperature thumbwheel is rotated all the way to the left (maximum cooling) the control module keeps the valves closed for maximum cooling.

An electrically powered auxiliary coolant pump (mounted in the engine compartment, near the brake booster) is used to ensure an adequate supply of hot water to the heater cores at all times. The control module keeps the auxiliary coolant pump off:

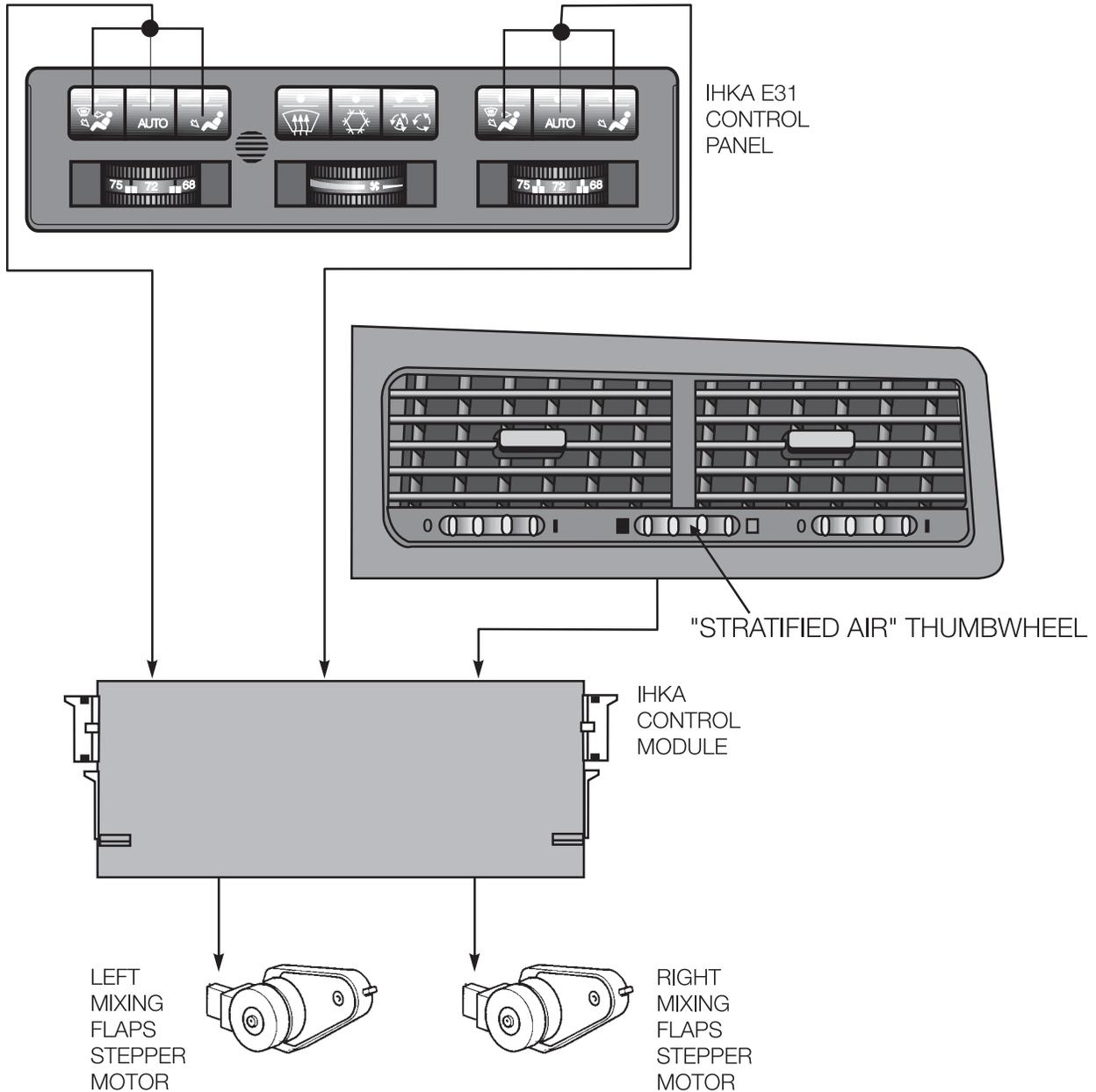
- Following a cold start, until one of the heater cores reaches 86°F (30°C), **and**
- Until the left or right Y-factor reaches 30%

Once the pump is started, the control module keeps it operating until the left or right Y-factors drops below 25%.



**Y-Factor Influence on Auxiliary Coolant Pump Operation**

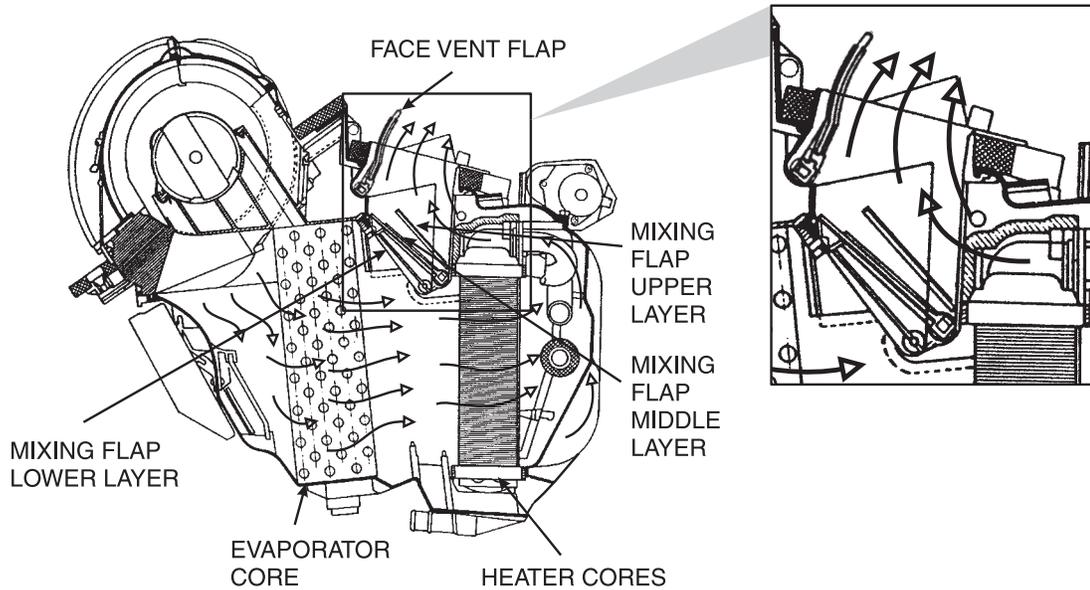
# IHKA E31 TEMPERATURE MIXING



On E31 vehicles, the left and right side temperature mixing flaps are operated separately by their own stepper motors, allowing different stratified air discharge temperatures on the left and right sides of the interior.

Prior to engine start-up, the mixing flaps on both sides are in the "warmest-air" position (fully closed). They are also in the warmest-air position when the IHKA system is turned "Off," and when maximum defrost mode is selected.

Also, if "down" mode is selected on one side of the interior, the mixing flaps on that side move to the warmest-air position.



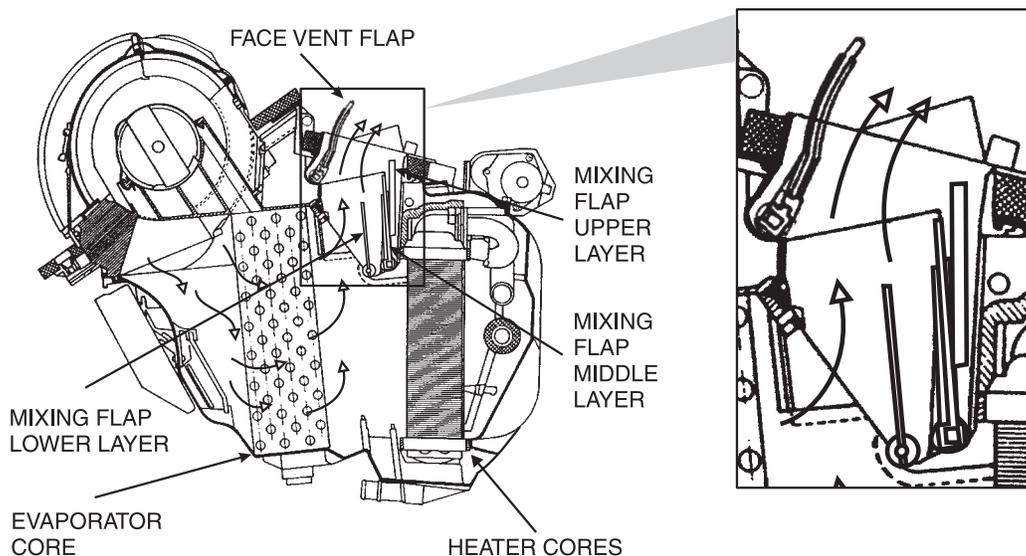
### Mixing Flaps, Warmest Air Position

When the ignition switch is turned to “Run,” and “up/down” or “AUTO” mode is selected, on one side of the interior, the mixing flaps for that side move to positions, determined by:

- center face-vent thumbwheel position (most important)
- interior temperature
- left (or right) desired temperature
- left (or right) Y-factor

In general, when “up/down” or “auto” mode is selected, the mixing flaps are:

- in the coolest air position (fully open) when the Y-factor is from -25% to 0%
- closed linearly (from fully open to 2/3 closed) at Y-factors from 0% to 5%
- positioned according to thumbwheel setting at Y-factors of 10% to 100%



### Mixing Flaps, Coolest Air Position

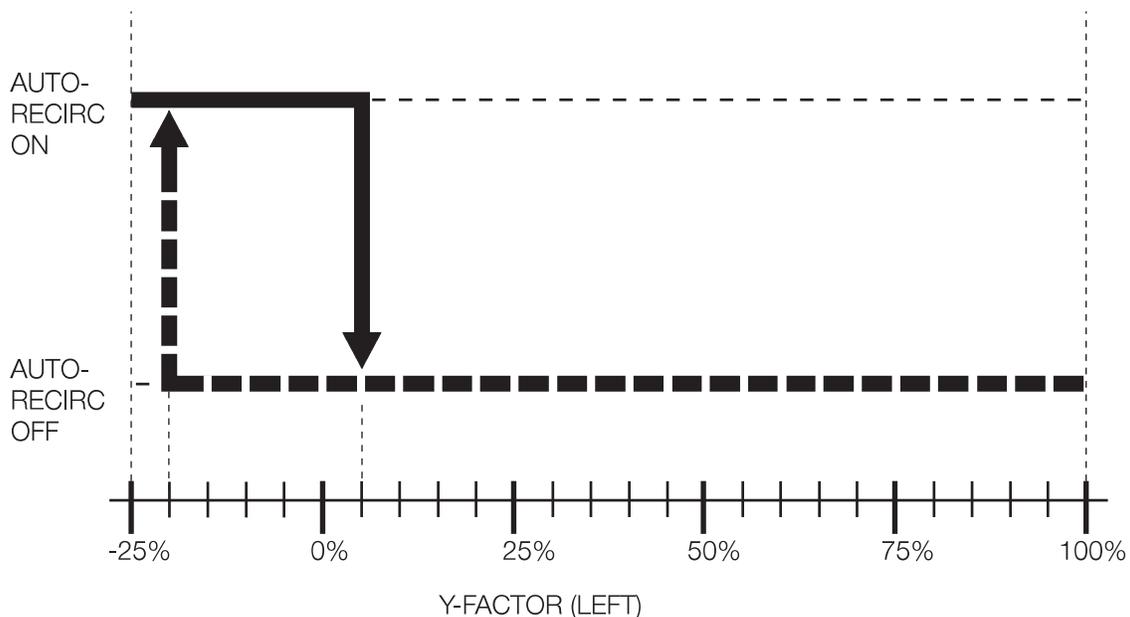
## IHKA E31 AIR INTAKE

The air intake flaps (2 fresh and 2 recirculating) are operated as pairs by stepper motors (fresh and recirculating) the same way as on the IHKR systems.

IHKA air intake flap operating logic is:

- With the engine running and the IHKA system turned “off” (blower thumbwheel in “0”), the control module closes the fresh air flaps and the recirculating air flaps.
- Rotating the thumbwheel out of position “0” turns on the IHKA system and the fresh air flaps open fully (100% open).
- With the IHKA system operating, pressing the recirculating air button causes the fresh air flaps to close and the recirculating air flaps to open.
- If, during normal system operation (A/C compressor button pressed, recirculating air button **not** pressed), the left Y-factor drops to -20% (heavy cooling demand), the control module **automatically** closes the fresh air flaps to about 1/3 open and fully opens the recirculating air flaps.
- This “auto-recirc” mode is maintained until the left Y-factor rises to 5% (moderate cooling demand), at which time the recirculating air flaps fully close and the fresh air flaps fully open again.

NOTE: The “auto-recirc” mode is possible only with the A/C compressor button pressed. If the A/C compressor button is **not** pressed, the fresh air flaps will remain fully open and the recirculating air flaps will remain fully closed, regardless of Y-factor.



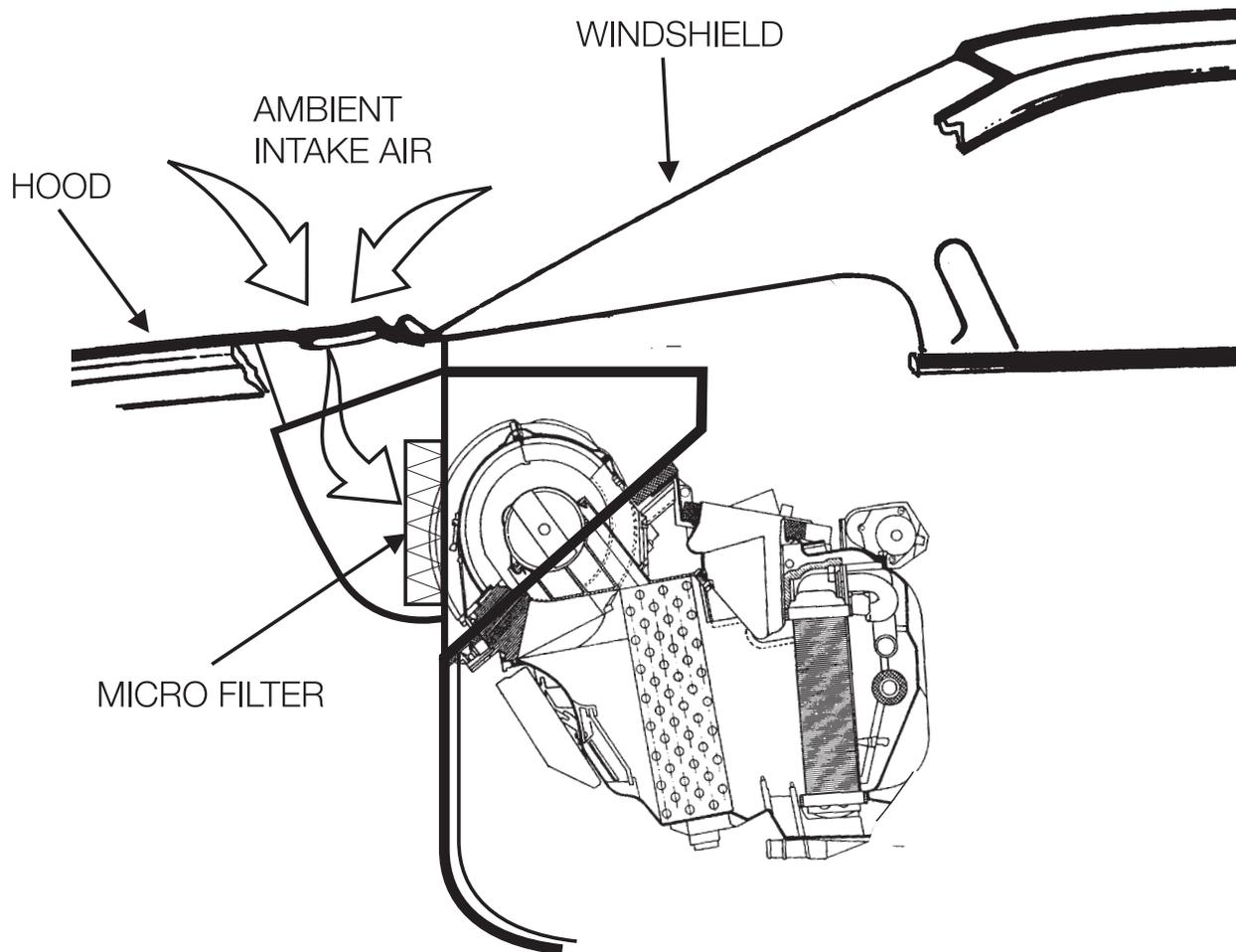
**Y-Factor Influence on Auto. Recirc. Mode Operation**

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## IHKA E31 AIR INTAKE

Fresh air, recirculating air, or a combination of these may be drawn into the IHKA system for heating and cooling.

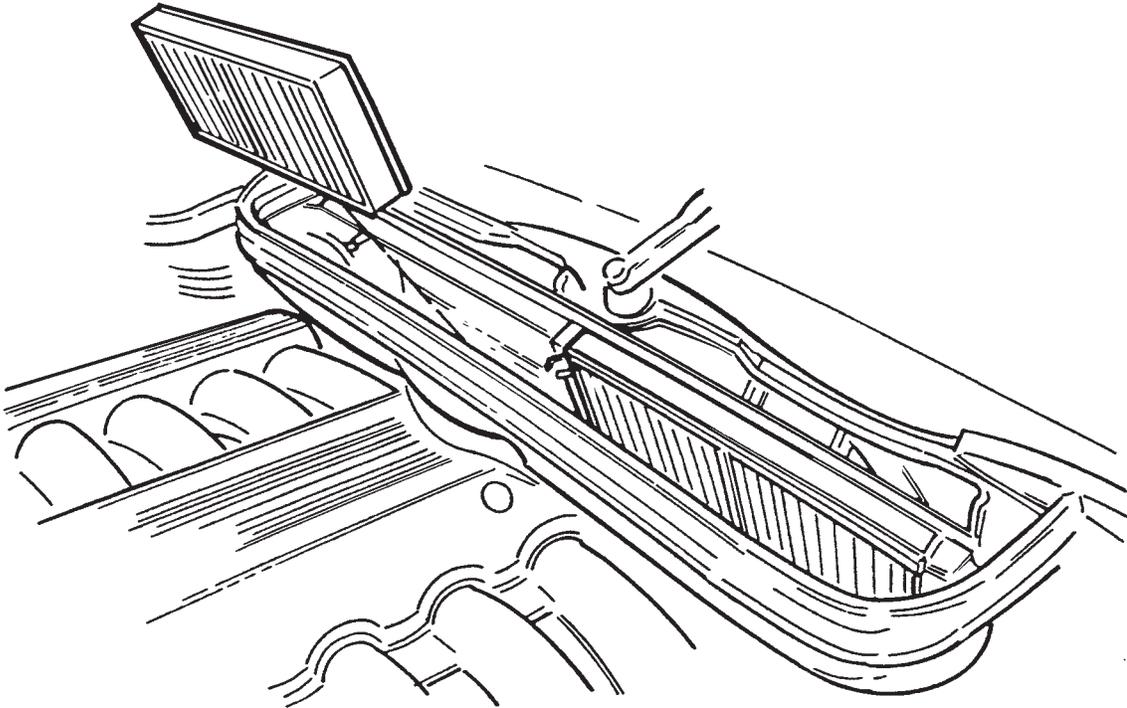
The microfilter is mounted outside the housing on E31 vehicles.



The filter fits inside a housing that mounts to the front side of the engine compartment bulkhead. Fresh air flows down through ducts behind the hood and into the filter housing. Only after passing through the microfilter does the filtered air enter the IHKA housing assembly through the fresh air flaps

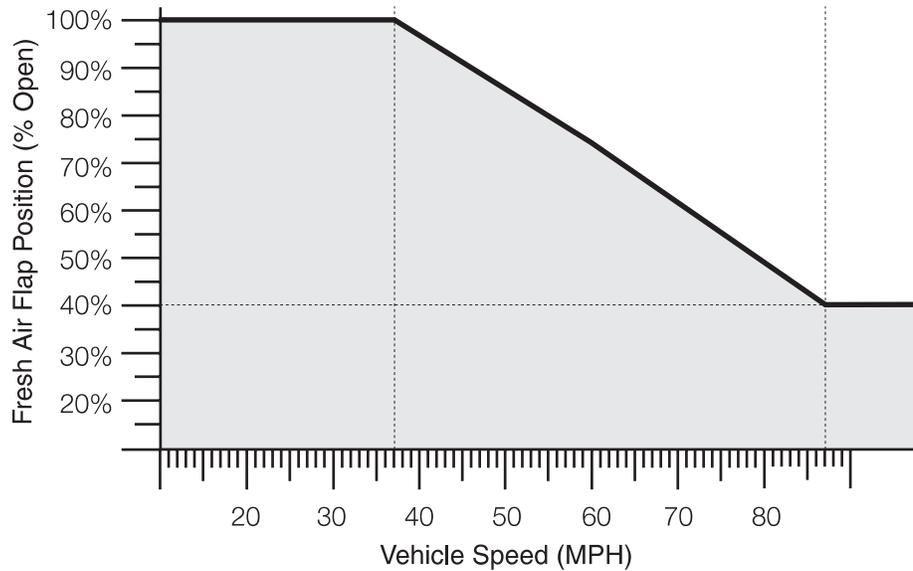


On the E31, there are tow filters, mounted side-by-side, and they are serviced from the engine compartment.



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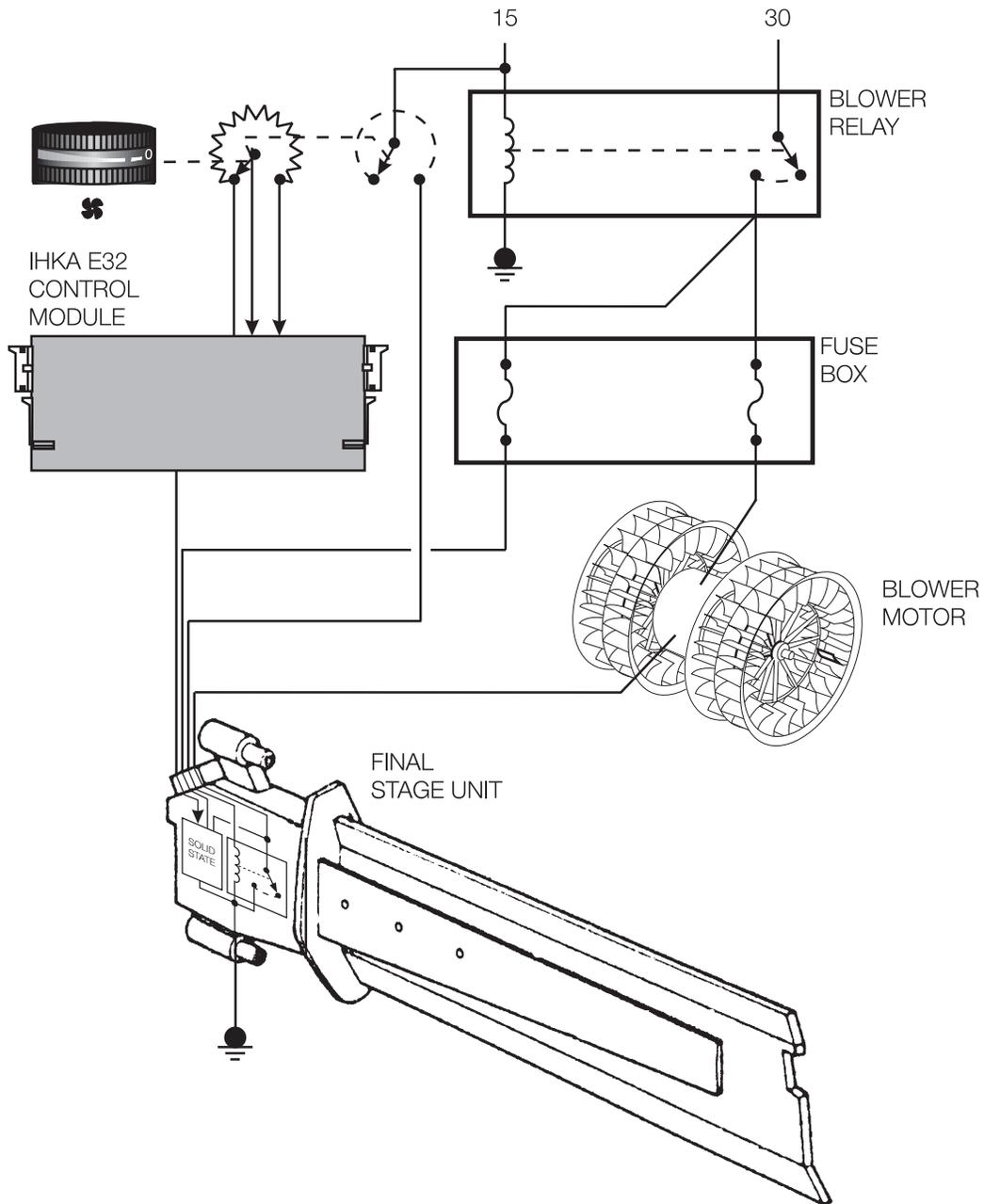
- 
- A combination of vehicle speed and blower motor voltage is monitored by the control module to regulate “ram air”.
  - At vehicle speeds above 37 mph the control module partially closes the fresh air flaps to compensate for the ram-air effect as shown below:



### **Vehicle Speed Influence on Fresh Air Flap Position**

- At engine shutdown (with the IHKA system operating), the control module moves the fresh air flaps to the fully open position.

# IHKA E31 BLOWER CONTROL



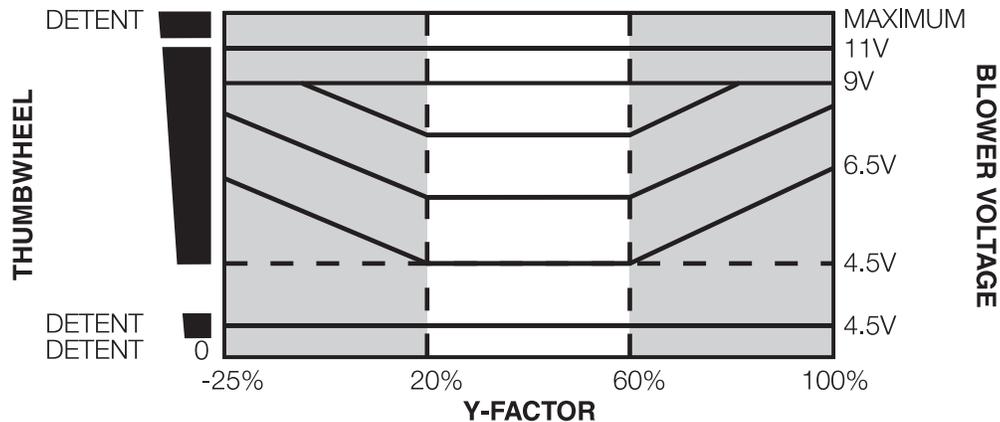
The IHKA E31 blower motor receives battery voltage from the blower relay as soon as the ignition is switched to “Run.” Blower speed is controlled by controlling the ground circuit.

The control module determines the appropriate blower speed using these primary inputs:

- Blower control thumbwheel position
- The Y-factor

The blower control thumbwheel drives a rotary potentiometer mounted inside the IHKA control panel. This potentiometer sends a voltage signal to the control module indicating desired blower speed.

The control module then “looks at” the current left Y-factor and other information, and signals the blower speed final stage unit with the appropriate blower motor speed. The final stage unit controls blower speed by varying the voltage applied to the motor.



**Y-Factor Influence on Blower Speed**

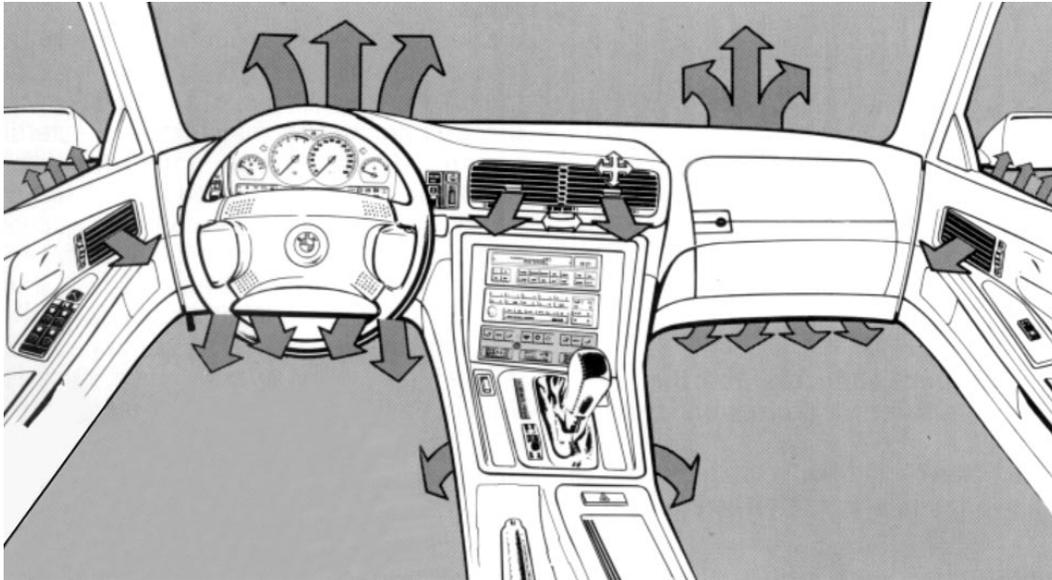
- As shown above, when the left Y-factor is between 20% and 60%, blower speed is directly proportional to thumbwheel position. The IHKA system is not working very hard to either cool or heat the interior - therefore, this center band between 20% and 60% is referred to as the **moderate correction** zone.
- If heating or cooling demands are higher, however, the control module automatically **boosts** blower voltage by up to 2 volts (maximum “boosted” voltage is 9 volts). The increased blower speed helps to warm or cool the interior quicker, without changing any control panel settings. The areas from -25% to +20% and 60% to 100% are referred to as **radical correction** zones.
- When the blower control thumbwheel is rotated to the end detent, a relay in the final stage unit is energized. Solid state circuitry in the final stage unit is bypassed, the blower motor receives full battery voltage, and the motor runs at maximum speed.

NOTE: The control module disables the blower motor when it receives the “engine cranking” (Kl. 50) signal.

NOTE: If the left heater core temperature is less than 68°F (20°C) at engine start-up, the control module signals the final stage unit to **reduce** blower voltage to 3 volts to prevent annoying drafts in the interior. As heater core temperature rises from 68°F (20°C) to 122°F (50°C), blower voltage rises linearly from 3 volts to the normal value. See “IHKA E31 Special Functions, Cold Start Arrest” later in this Handout for more information about this function.

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## IHKA E31 AIR DISTRIBUTION



**E31 Air Distribution Outlets**

The E31 air distribution outlet locations are shown above.

The E31 IHKA control module operates left and right face vent and footwell flaps separately, while left and right defroster flaps are operated as a pair.

Defroster flap operation changed slightly (effective 4/91) with the release of software version "05":

- Whenever "up/down" mode is selected, the defroster flaps open fully, regardless of Y-factor, to reduce the likelihood of window fogging.

---

## Defroster Outlets

Air flow from the windshield defroster outlets (and the left and right door glass defroster outlets) is controlled by defroster flaps, which are operated by the control module. The defroster flaps, while “split” left/right; they are operated as a pair using input signals from the left air distribution push buttons (and programmed control module information).

In general, the defroster flaps:

- are half open when the left “up/down” or “down” mode is selected **and the A/C compressor is turned off** (regardless of Y-factor)
- close while the system is cooling and during light heating demand (Y-factor from -25% to +20) **while the A/C compressor is operating**
- are half open when heating demand increases (left Y-factor is 35% and above)
- are about 1/3 open when the left “AUTO” mode button is pressed, the Y-factor is between -25% and +50%, **and the A/C compressor is off**
- open progressively as heating demand increases (they are half open at a left Y-factor of 100%) **and the A/C compressor is off**
- are completely closed when “AUTO” mode is selected, the Y-factor is between -25% and +20%, **and the A/C compressor is operating**
- fully open when the maximum defrosting button is pressed (all other distribution flaps are fully closed)

## Face Vent Outlets

Air flow from the top, center, left and right face vents is controlled by the left and right face vent flaps, which are operated separately by the control module.

Face vent flap operation strategy does **not** depend on whether the A/C compressor is on or off:

- When the “up/down” button on one side is pressed, the face vent flaps on that side are fully opened.
- When the “down” button on one side is pressed, the face vent flaps on that side are fully closed.
- When the “AUTO” button is pressed, the face-level flaps are fully open during heavy cooling demand (Y-factors from -25% to +15%) and fully closed during heavy heating demand (Y-factors between 90% and 100%). For Y-factors between 15% and 90% the face vent flaps close with increasing Y-factor.

A few minutes after engine shutdown, both face vent flaps close. At engine restart, the flaps move to the appropriate position, according to the control module inputs.

---

## Footwell Outlets

Air flow from the left footwell outlet and the left rear (underseat) outlet is controlled by the left footwell flaps. The right footwell flaps control the airflow from the right side outlets.

When “down” or “AUTO” mode is selected, footwell flap operation is **not** affected by whether the A/C compressor is on or off:

- Pressing the “down” button on one side causes the footwell flaps on that side open fully, regardless of Y-factor.
- Pressing the “AUTO” button causes the footwell flaps to fully close during system cooling and light heating (Y-Factors between -25% and +30%) and fully open during heavy heating demands (Y-factors above 43%).
- When the “AUTO” button is pressed and the Y-factor is between 30% and 43%, the footwell flaps open linearly (from fully closed to fully open) with increasing Y-factor.

When “up/down” mode is selected, footwell flap operation **does** depend on whether the A/C compressor is on or off.

- When the “up/down” button on one side is pressed **and the A/C compressor is off**, the footwell flaps on that side open fully regardless of Y-factor.
- When the “up/down” button is pressed **and the A/C compressor is operating**, the footwell flaps are half open during system cooling and light heating (Y-factors between -25% and +20%) and fully open during heavier heating demands (Y-factors above 30%).
- Between Y-factors of 20% and 30%, the footwell flaps open linearly (from half open to fully open) with increasing Y-factor.

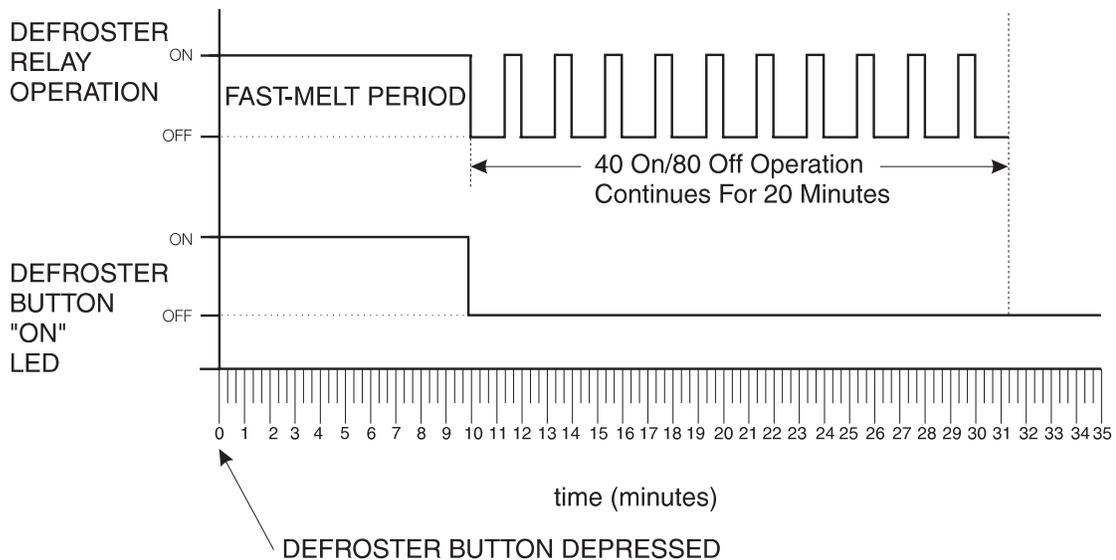
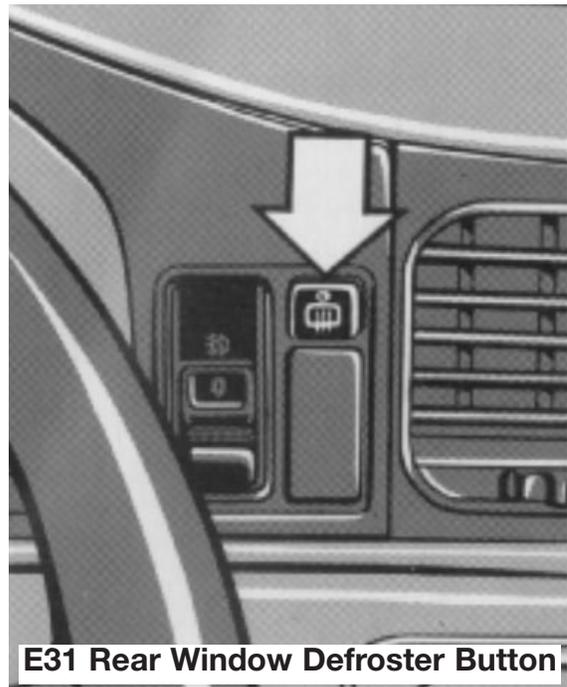
## Shutdown Operation

Three minutes after engine shutdown, the control module opens the defroster flaps fully and closes all the other air distribution flaps. Then, when the engine is started, air flows from the defroster outlets for the first few second of system operation (if the IHKA system is turned on), to ensure that the windshield is cleared first. The control module then resumes normal operation, moving all the flaps to their appropriate positions. (The only exception o this sequence occurs if the cold-start arrest function is activated at start-up; the cold start arrest function is described later in this Handout under “Special Functions”.)

## IHKA E31 REAR WINDOW DEFROSTER

The IHKA E31 rear window defroster is a two-stage defroster. Pressing the defroster button causes the defroster to operate at full power (100% on) for ten minutes. The control module then switches to pulsed operation (40 seconds on/80 seconds off).

On vehicles equipped with control modules having software version "01" or "02", the defroster will continue to operate in 40 on/80 off mode until the engine is shut off (or the defroster is switched-off manually). If the engine is restarted within three minutes, the IHKA control module resumes defroster intermittent operation.



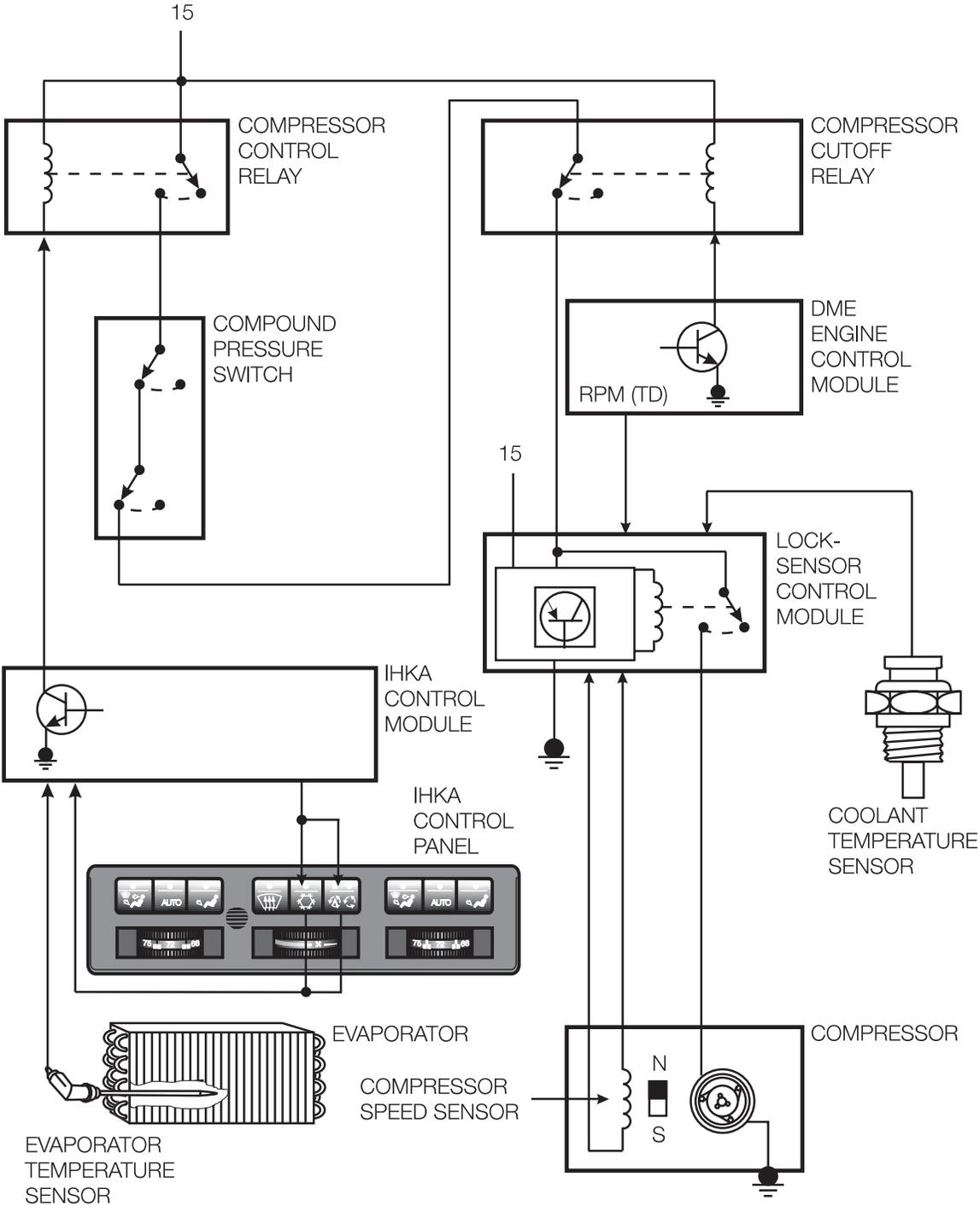
### IHKA E31 Rear Window Defroster Operation

For all software versions, pressing the rear window defroster button while the system is operating in fast-melt mode shuts off the defroster. And, if the button is pressed during pulsed operation, the system switches to fast-melt mode for another the minute period.

The rear window defroster is only powered when the engine is running.

The rear window defroster turns on automatically whenever "maximum defrost" mode is selected. If "maximum defrost" is then turned off, the rear window defroster continues to operated for its normal cycle.

# IHKA E31 COMPRESSOR CONTROL (850Ci/CSi)



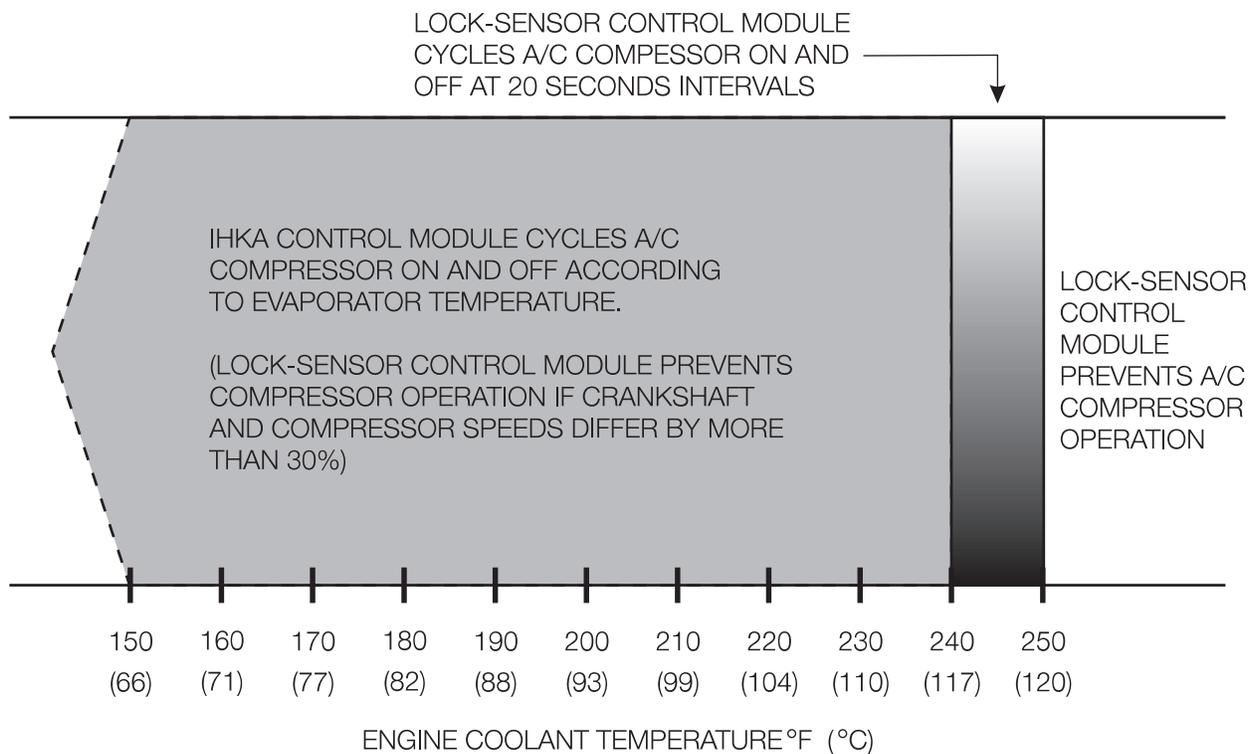
A compressor cut-off relay is placed between the pressure switch and the lock-sensor control module. When energized by the ECM, the cut-off relay interrupts the compressor request signal from the compressor control relay. The ECM energizes the cut-off relay during wide open throttle acceleration at low vehicle speeds (less than 5 mph (8 km/h)).

The lock-sensor control module monitors the following sensors:

- A/C compressor RPM (speed sensor inside compressor)
- Engine crankshaft RPM (TD signal from DME engine control module)
- Engine coolant temperature

If the compressor and engine crankshaft speeds differ by more than 30%, the lock-sensor control module assumes that the A/C compressor is slowing or seizing, and it interrupts power to the clutch. **Power remains interrupted until the ignition switch is cycled.**

The M70 V-12 lock-sensor control module also monitors engine coolant temperature. If it exceeds 240°F (117°C), the lock-sensor control module cycles the A/C compressor on and off (20 seconds on/20 seconds off), to reduce engine load. Above 250°F (120°C), the lock-sensor control module shuts off the A/C compressor.

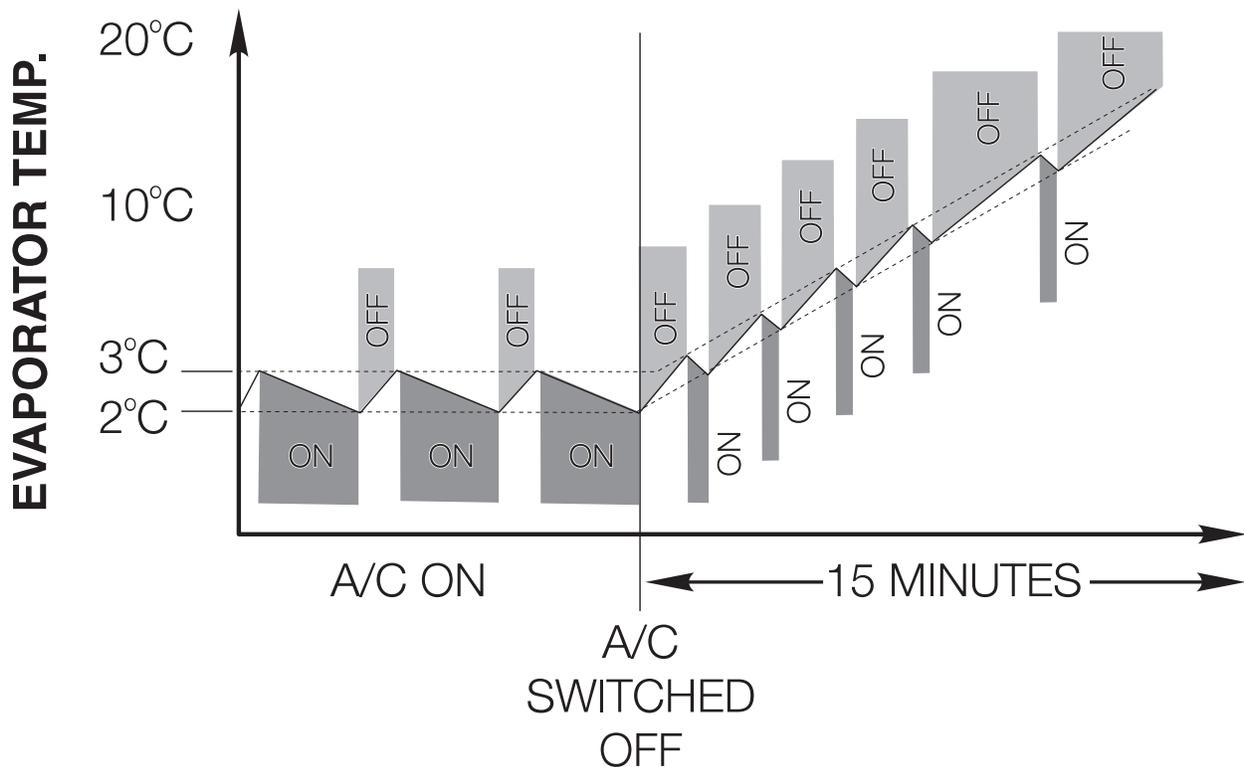


### Coolant Temperature Influence on A/C Compressor Operating Strategy

Another E31 difference is that the control module may run the A/C compressor at engine start-up **regardless** of “snowflake” button status, depending on ambient temperature and evaporator temperature.

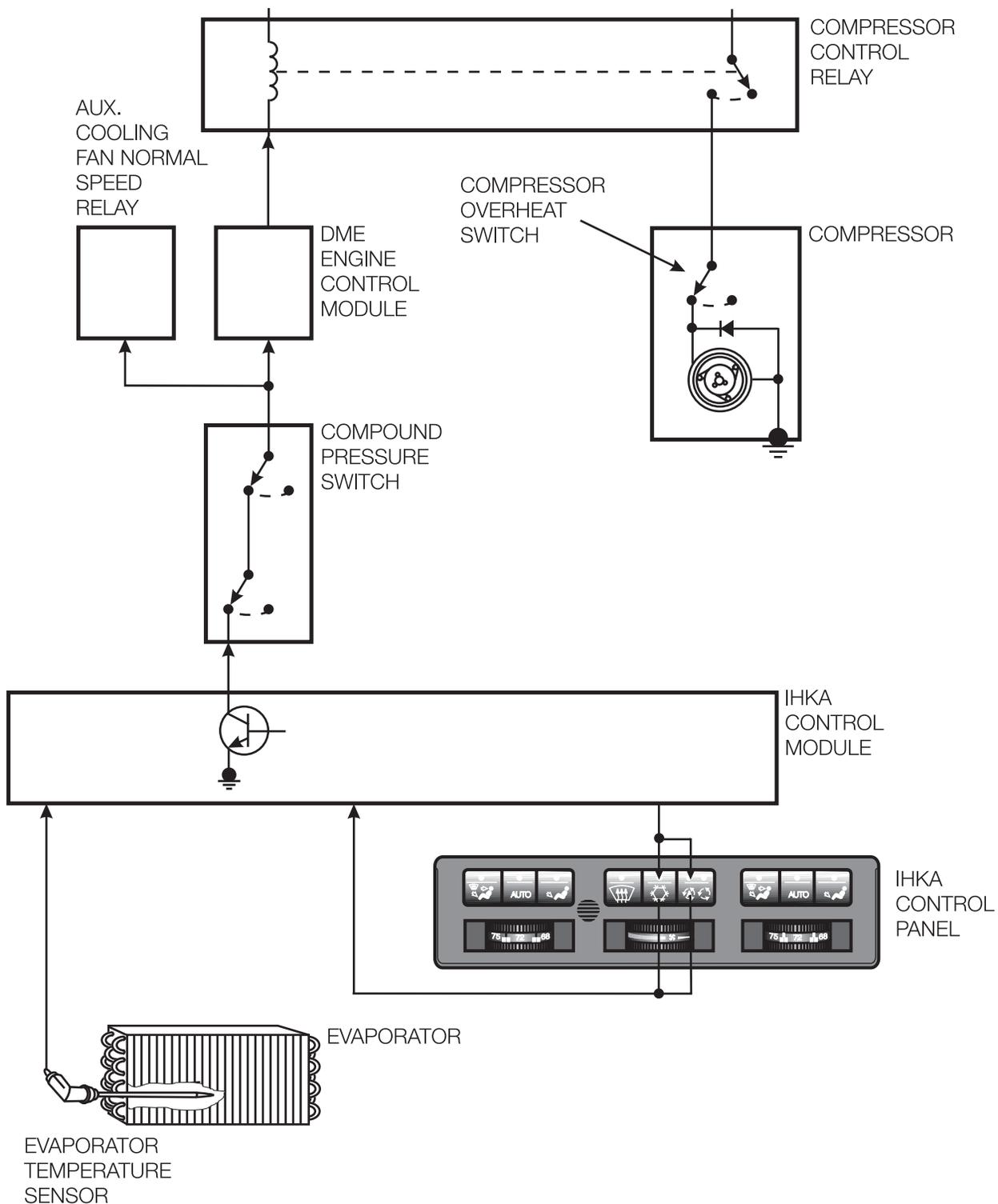
At start-up the control module compares these two temperatures and, if evaporator temperature is **lower** than ambient temperature, the compressor is cycled on and off (for increasingly shorter intervals) for up to 15 minutes. This allows the evaporator to gradually warm to ambient temperature, slowly removing condensation which may be present inside the housing assembly. If evaporator temperature is **higher** than ambient temperature at engine start-up, the control module does not automatically cycle the compressor.

Similarly, if the A/C compressor is switched “Off” while the engine is running, the compressor continues to run, cycling on and off for about 15 minutes. This allows the evaporator to gradually warm up to ambient temperature, thereby reducing the chances of window fogging.



**A/C Compressor Timed Shut Down, E31 V-12**

# IHKA E31 COMPRESSOR CONTROL (840Ci)



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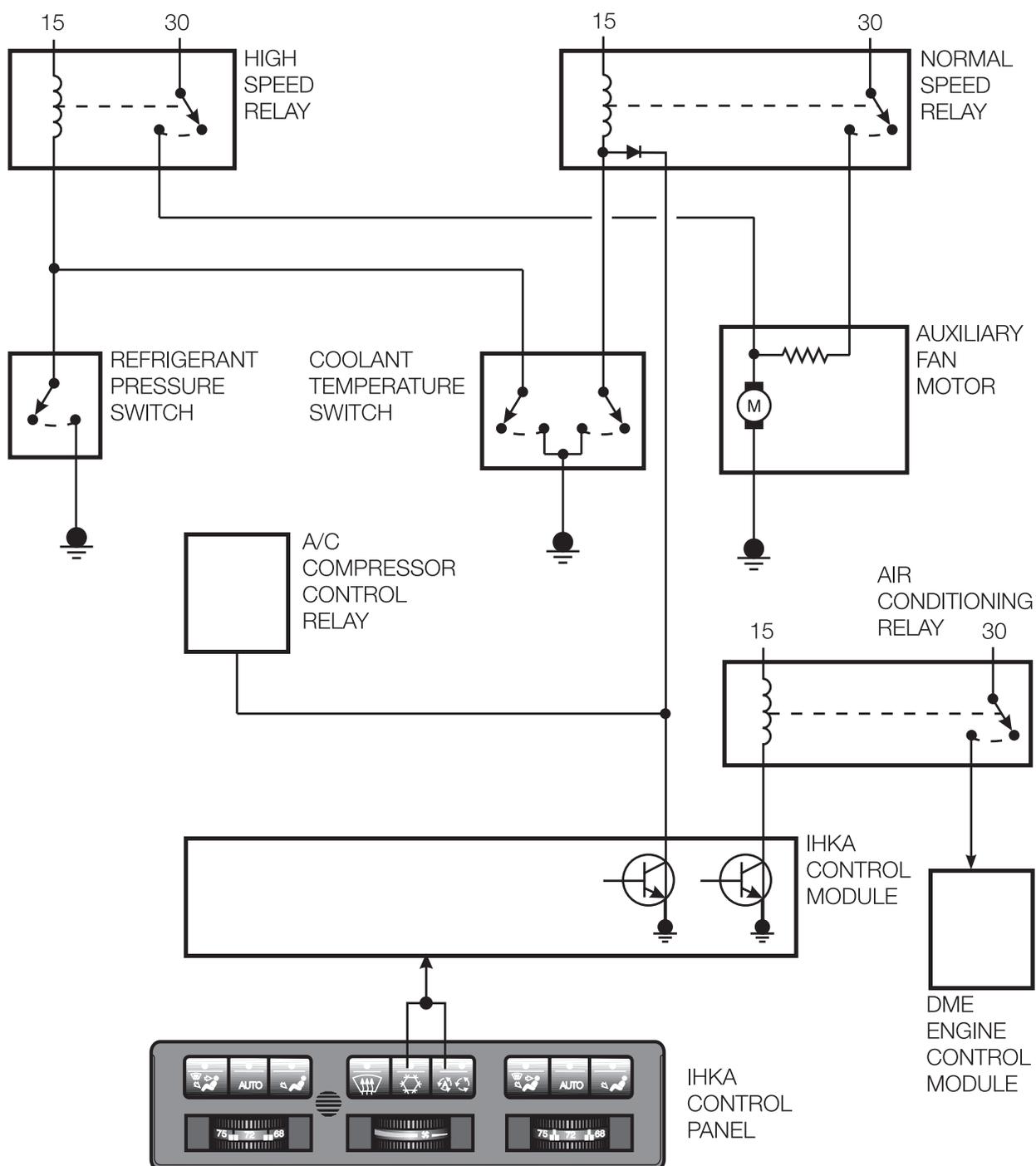
On the M60 840Ci the engine control module is programmed with A/C compressor control logic and determines whether or not the compressor should operate.

V-8 compressor control is as follows:

- When the “snowflake” or recirculating air button is pressed, the IHKA control panel sends a compressor request signal to the IHKA control module.
- The IHKA control module passes the request on to the engine control module (ECM) via the compound pressure switch (mounted on the receiver/dryer). For pressure switch specifications, refer to technical data in DIS/MoDiC.
  - If refrigerant high-side pressure is too high or too low, the compressor request will not reach the ECM.
  - If high-side pressure is within limits, the compressor request reaches the ECM. The ECM can then look at input data from other sensors and use it to stabilize engine speed and determine whether or not the compressor should operate.
- Under normal conditions, the ECM receives the compressor request signal and energizes the compressor control relay to provide power to the A/C compressor clutch
- If, however, engine coolant temperature is too high, or “full load” conditions exist, the ECM will not energize the clutch.
  - Full load is defined as wide-open throttle at a vehicle speed of 5 mph (8 kph) or less. Full load cut-out lasts for a maximum of 8 seconds.
- If evaporator temperature falls too low, the IHKA control module stops sending the A/C compressor request to the ECM and the ECM de-energizes the compressor control relay.

# IHKA E31 AUXILIARY FAN CONTROL

E31 vehicles are equipped with a two-speed “pusher” type fan, which mounts ahead of the A/C condenser.



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The auxiliary fan can be triggered three different ways:

- By a request from the IHKA control module (normal-speed operation)
- By high refrigerant pressure (high-speed operation)
- By high engine coolant temperature (normal- or high-speed operation)

Auxiliary fan activation by the IHKA control module can occur in different ways, depending upon vehicle model year.

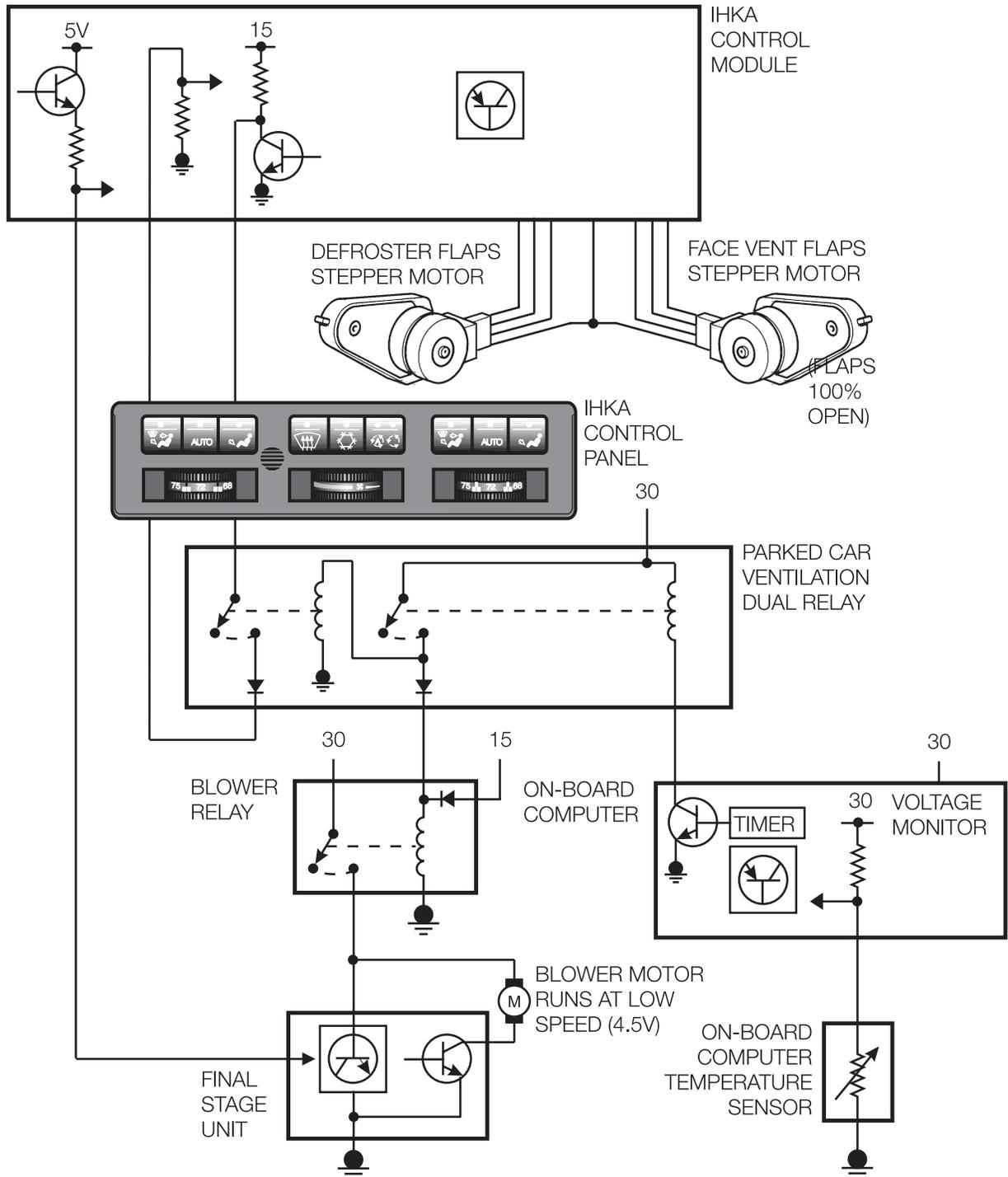
- **On 1990 to 1992** vehicles (schematic shown at left), the control module energizes the A/C compressor control relay and the normal speed relay at the same time. So the auxiliary fan and the A/C compressor get power simultaneously.
- **For 1993 and later** vehicles, the normal speed relay is placed in the signal circuit between the IHKA control module and the engine control module. (See the 840Ci compressor control schematic in this Handout for a schematic.) For the relay to be energized, high-side refrigerant pressure must be within limits.

Refrigerant pressure and coolant temperature triggered operation of the auxiliary fan are the same for all E31 vehicles, regardless of model year or engine type:

- When high-side pressure exceeds **260 psi (18 bar)**, the fan runs at high speed; when pressure drops to about **218 psi (15 bar)**, the fan shuts off.
- When coolant temperature reaches **196°F (91°C)**, the fan runs at normal speed.
- If coolant temperature reaches **210°F (99°C)**, the fan runs at high speed.

## IHKA E31 PARKED CAR VENTILATION (if equipped)

Parked car ventilation uses IHKA climate control system components to circulate fresh air through the interior driver pre-programmed times. This can lower interior temperature considerably. To confirm the vehicle is equipped, simply press the timer button. If the stopwatch feature appears the vehicle is not equipped. If “ventilation” appears the vehicle is equipped.



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On vehicles equipped with parked car ventilation, two additional components interact with the IHKA climate control system:

- the Parked Car Ventilation Dual Relay
- MID inputs to EKM (Electronic Vehicle Module E31)

For parked car ventilation to function, the driver must program interior ventilation time(s) into the Multi Information Display. When the clock in the MID/EKM reaches the programmed time(s), the EKM grounds a coil to energize half of the parked car ventilation dual relay. This part of the dual relay then directs power to two more relay coils.

One of the relays that is now energized sends a ventilation request signal to the IHKA control module. The module then opens the fresh air intake flaps and face vent flaps, closes all other flaps, and sends a low speed blower signal to the final stage unit.

The second relay, the blower relay, supplies battery voltage to the final stage unit and the blower motor.

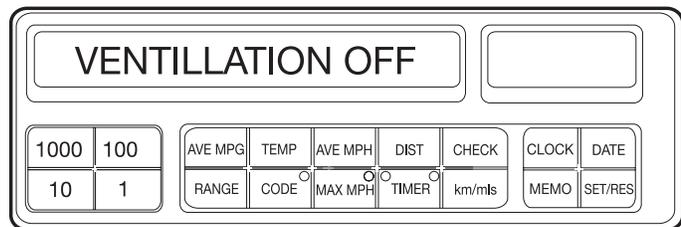
The EKM starts a timer when it activates parked car ventilation and, when **one-half hour** has elapsed, the EKM shuts off parked car ventilation.

Parked-car ventilation is switched off automatically if:

- battery voltage drops below 11 volts (measured by the EKM), **or**
- the driver enters the vehicle and turns the ignition switch to “run”

Ventilation time programming is as follows:

- Turn ignition switch to “Accessory” (Kl. R).
- Press the “Timer” button twice (“T1” is displayed).
- Enter the first desired “On” time.
- Press the “S/R” button (this turns the left LED “Off”).
- Press the “Timer” button again (“T2” is displayed).
- Enter the second desired “On” time.
- Press the “S/R” button (this turns the right LED “Off”).



The programmed times will remain in MID/EKM memory until they are overwritten by new times or the memory is cleared.

To deactivate the parked car ventilation system, press the “S/R” button while “T1” or “T2” is displayed (this turns the LED “Off”).

Parked car ventilation will not operate if ambient temperature is below 60°F (16°C). However, it can be activated for testing by pressing the “Timer” and “Temp” buttons simultaneously with the ignition switch at Kl. R.

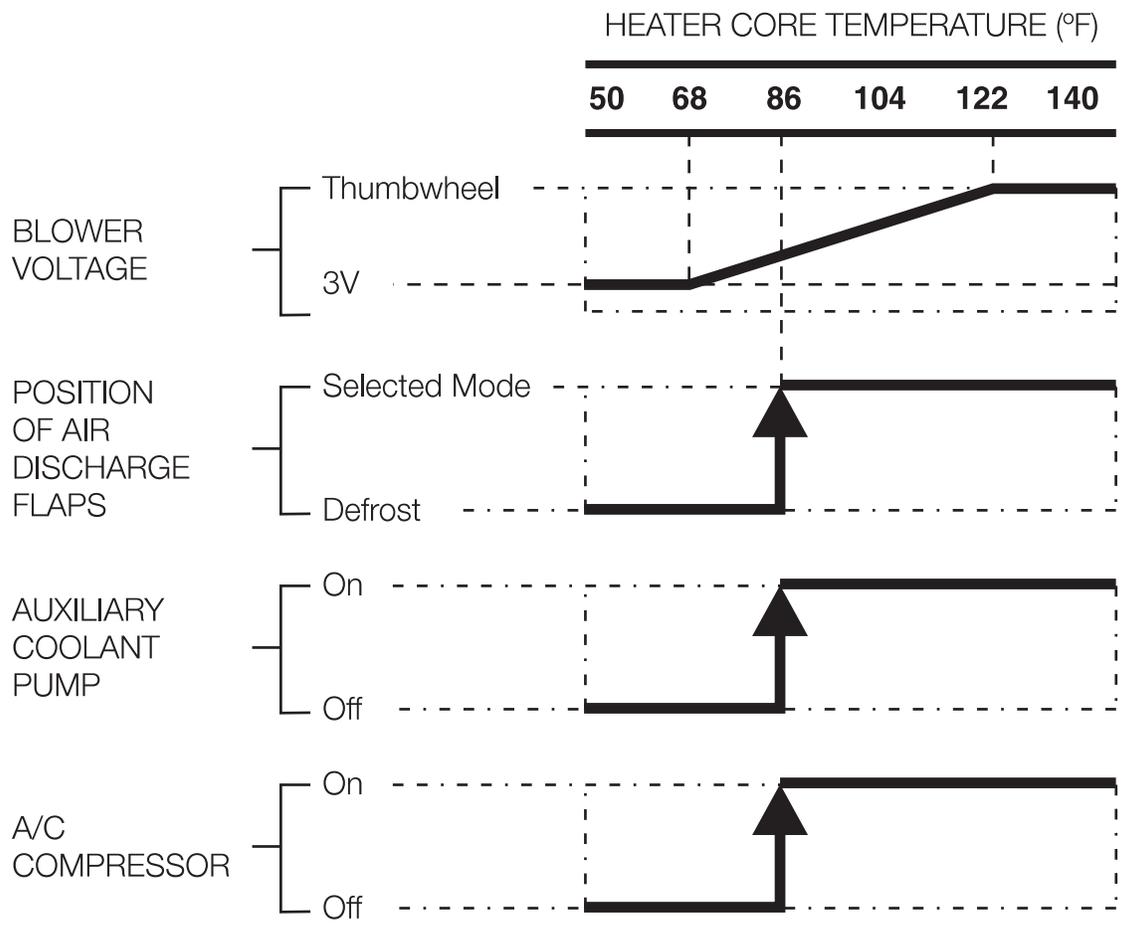
# IHKA E31 SPECIAL FUNCTIONS

The IHKA control module is programmed to perform some special functions automatically based on sensed inputs and ignition switch cycles. These functions are described below.

## Cold- Start Arrest

If, at engine start-up, engine coolant temperature is below 86°F (30°C), and the left Y-factor is 100%, the control module automatically initiates the cold-start arrest function. The purpose is to avoid cold drafts in the passenger compartment.

NOTE: Cold-start arrest is overridden if the “maximum defrost” program is selected or if the blower control thumbwheel is in the maximum speed detent position at engine start-up



**Cold-Start Arrest Operating Strategy**

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Cold-start arrest operation is as follows:

- The defroster flaps are fully opened; all other air distribution flaps are fully closed.
- The blower runs at very low speed (3 volts).
- The A/C compressor is turned “Off.”
- The auxiliary coolant pump is turned “Off.”

The control module monitors the coolant temperature as the engine warms up:

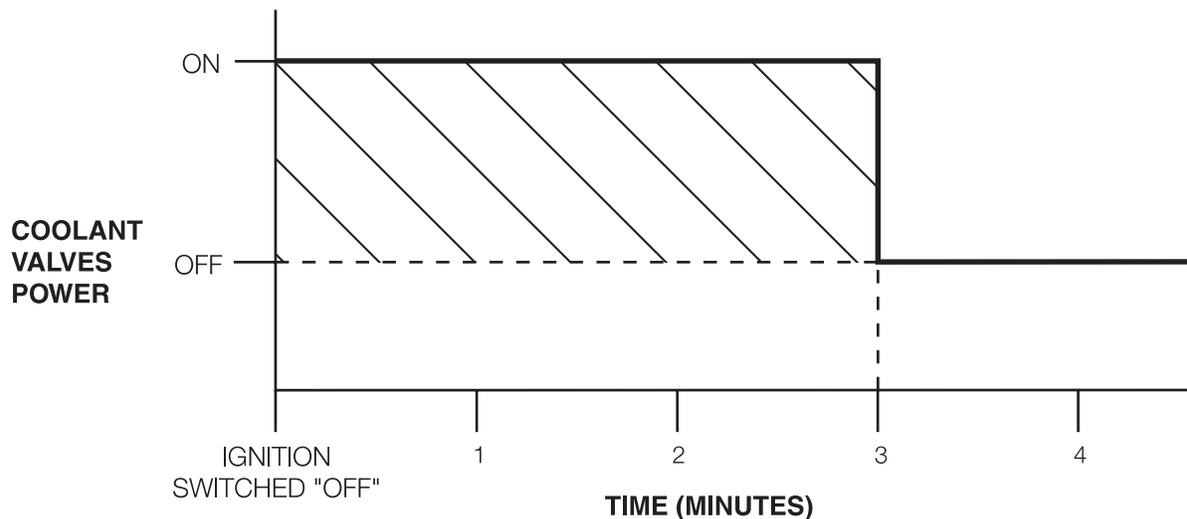
- When coolant temperature reaches 68°F (20°C), the module increases blower voltage with temperature.
- At 86°F (30°C), the A/C compressor is enabled, the auxiliary coolant pump is turned “On,” and air distribution is determined by control panel button positions.
- Above 122°F (50°C), blower voltage is determined by blower speed thumbwheel position.

The A/C compressor operates during cold-start arrest if the A/C compressor push button is depressed, to help prevent window fogging following engine start-up.

NOTE: If the IHKA system is “off” at engine start-up and remains “off” as the engine warms up, the blower motor turns off automatically when the cold-start arrest function ends.

### Service-Station Feature

The IHKA control module continues to power both coolant valves **closed** for about 3 minutes after the ignition is switched “Off.” This feature prevents the heater cores from being flooded with hot coolant when the engine is shut off for brief periods (e.g. during refueling).



**Service-Station Feature Operating Strategy**

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## **Calibration Run**

If the battery is disconnected, IHKA control module memory is cleared and the module loses its information about where the flaps are positioned. Therefore, when power is restored, the control module performs a calibration run, whether the IHKA system is turned “On” or “Off.”

The control module runs all the stepper motors at maximum speed to fully close the flaps, and then continues to run the motors for a few seconds more than the normal endstop-to-endstop time, in order to ensure the flaps are closed.

The calibration run takes about 40 seconds. During that time, soft “ticking” or “scratching” noises can be heard, as the flaps reach their endstops but continue to be pulsed.

The control module also monitors system voltage. A sudden surge or dropout causes the control module to automatically perform the calibration run.