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IHKA E36 COMPARED TO IHKA E38

Beginning with the 1996 model year, a new IHKA system is installed on all E36 vehicles except the 318ti and Z3. Referred to as IHKA E36, it replaces the IHKR system previously used on these vehicles.

In comparison to previous IHKA systems, IHKA E36 is most similar to IHKA E38. IHKA E36, however, does not have many of the features found on IHKA E38.

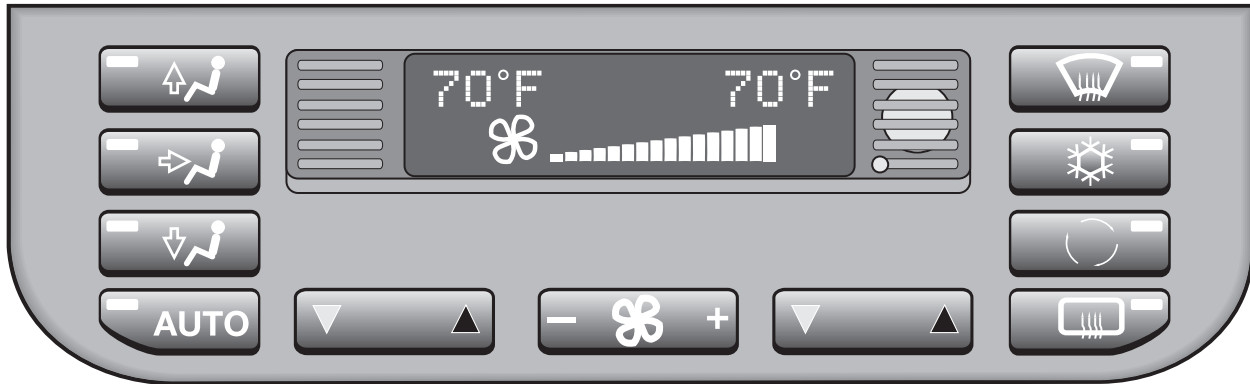
SIMILARITIES TO E38 IHKA

- Combined control panel/module
- Rocker switches for left/right desired temperature selection.
- Digital LCD display of left/right desired temperatures.
- Separate buttons to select windshield, face, or footwell air distribution.
- “Auto” button that turns air distribution control over to the control panel/module.
- “Smart” stepper motors operate all flaps except the fresh air flaps.
- Fault codes stored in non-volatile memory (EEPROM).

DIFFERENCES FROM E38 IHKA

- There is only one desired blower speed input.
- Eight distinct blower speeds are available.
- Blower speed is shown on the digital LCD display.
- No face vent air temperature sensors.
- No auxiliary coolant pump.
- Dedicated IHKA system ambient temperature sensor.
- Engine control module controls the A/C compressor.
- One set of air distribution buttons for both left and right sides.
- No windshield or washer spray jet heaters.
- Sensor values and other input status data can be displayed on the control panel/module.
- No “Rest” function.
- No console outlet rear flap.

IHKA E36 CONTROL PANEL/MODULE



The E36 control panel and control module is integrated into one unit. IHKA E36 control panel/module features are listed below.

NOTE: When the IHKA E36 system is “Off,” pressing **any** button on the control panel/module turns it on again.



Air Distribution Buttons: The E36 control panel/module air distributions are the same as E38, except there is only one set of buttons, which control air distribution on both sides.



If the “up arrow” button is pressed, air flows from the windshield defroster outlets.

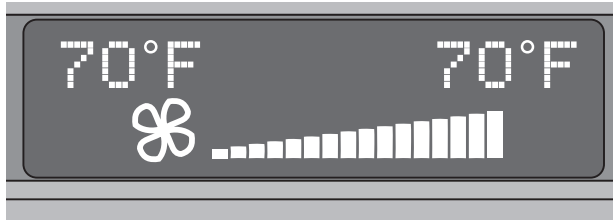


Pressing the “right arrow” button causes air to flow from the face vent outlets.

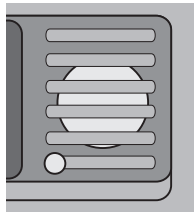
When the “down arrow” is pressed, air flows from the footwell outlets (front and rear).



If the “AUTO” button is pressed, the control module automatically selects the appropriate flap positions for the sensed conditions. When cooling is required, air flows from the face vents. When heating is required, air flows from the footwells and the windshield defroster outlets.



LCD Display: The E36 control panel/module has a backlit LCD display where left and right desired temperatures and blower speed are shown. Display brightness varies according to ambient light levels when the headlamps and parking lamps are “off.” With the lamps “on,” brightness depends on dimming rheostat thumbwheel position.



Interior Temperature Sensor: As on all previous IHKA systems, an interior temperature sensor is located inside the control panel/module. also as on previous systems, the sensor has its own electric fan to ensure adequate air flow over the sensor.

Photocell: The photocell, located just below the interior temperature sensor grille, monitors ambient light levels to influence LCD display brightness (as on E38s).



Temperature Selection Rocker Switches: The temperature selection rocker switches (left and right), function the same as those on E38 vehicles.



Blower Rocker Switch: Blower speed is selected using a rocker switch. Speed is increased by pressing the “+” end of the switch and decreased by pressing the “-” end.

When the system is at the lowest blower speed (speed “1”), pressing the “-” end turns the system “Off.”



Maximum Defrosting Button: This button functions the same as the one on E38, except that the mixing flaps are not affected (they are cable operated). When pressed:

- the fresh air flaps are opened **and**
- the recirc. flaps are closed **and**
- the windshield defrost flaps are opened **and**
- all other distribution flaps are closed **and**
- the blower runs at maximum speed **and**
- the rear window defroster switches on.

The A/C compressor does not turn on automatically, but will run if the “snowflake” button is pressed.



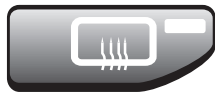
A/C Compressor “snowflake” Button: Pressing the “snowflake” button causes the control panel/module to signal the engine control module (ECM) that A/C compressor operation is desired.

The ECM then energizes a relay to run the compressor.



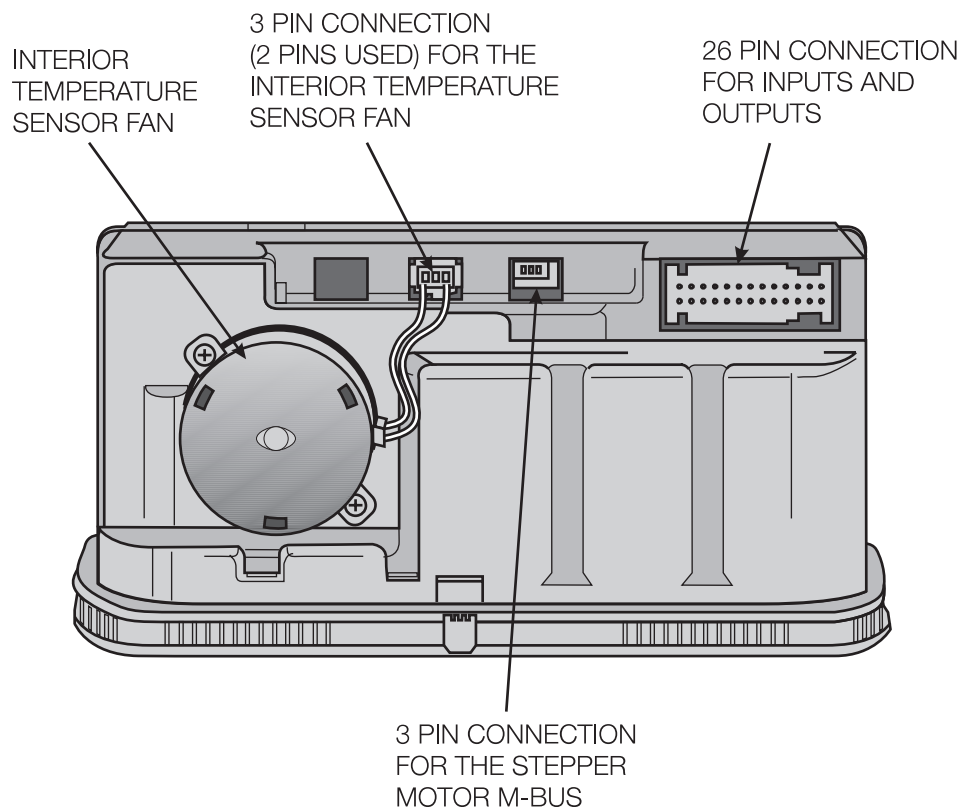
Recirculating Air Button: This button controls air intake location as on previously covered IHKA systems.

On IHKA E36, though, recirculating air mode has no time limit. Once activated, it continues until the button is pressed again.



Rear Window Defroster Button: Pressing the rear window defroster button activates the rear window heating for about 17 minutes.

Viewed from the **bottom**, the IHKA E36 control panel/module has the following features:



IHKA E36 CONTROL PANEL/MODULE FUNCTIONS

The control panel/module handles all the functions necessary to operate the IHKA system:

- Blower speed
- Auxiliary cooling fan
- Air intake flaps (fresh/recirculating)
- Air distribution flaps (face vent, foot-well, defroster)
- Heater core temperatures
- Evaporator temperature
- Special programmed functions
- Rear window defrost timing

And, like the E38 control panel/module, the E36 version has an EEPROM for fault code storage. The module can go into “sleep mode” to reduce power consumption when the ignition is switched “off,” but still retain control panel settings and fault code information.

Another feature, **unique to the E36 control panel/module**, is that temperature sensor readings, “Y-factor” values, software version and other information can be displayed on the panel face for diagnosis. Refer to “Special Functions” later in this Handout for more information.

NOTE: If the control module is replaced it must be coded.

SUBSTITUTE VALUE OPERATION

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

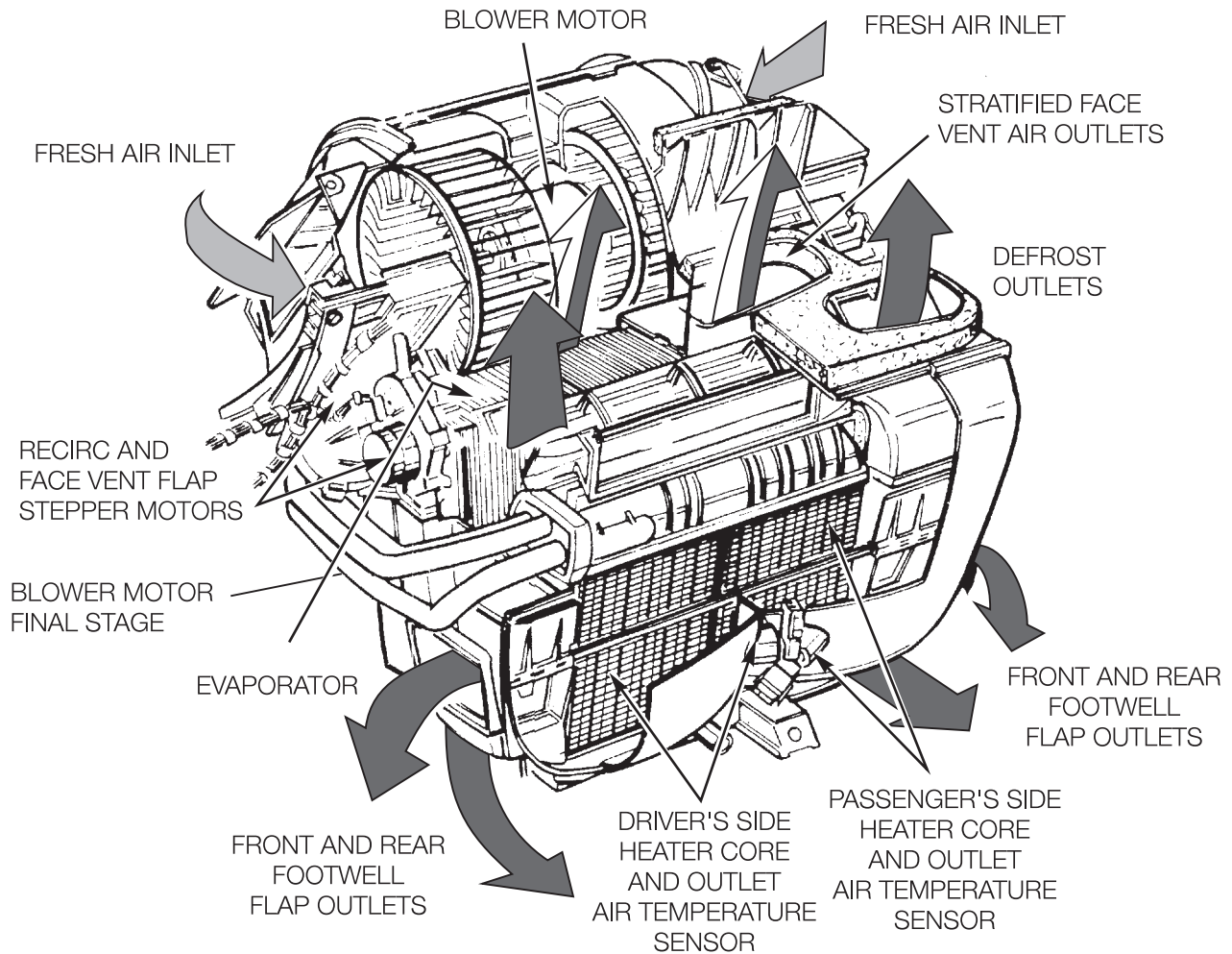
Substitute values for IHKA E36 components are:

- Desired temperature value (left or right)72°F (22°C)
- Interior temperature sensor75°F (24°C)
- Heater core temperature sensor (left or right)130°F (55°C)
- Evaporator temperature sensor23°F (-5°C)*
- Ambient temperature sensor32°F (0°C)

* The substitute value for the evaporator temperature sensor is significantly 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 E36 HOUSING ASSEMBLY

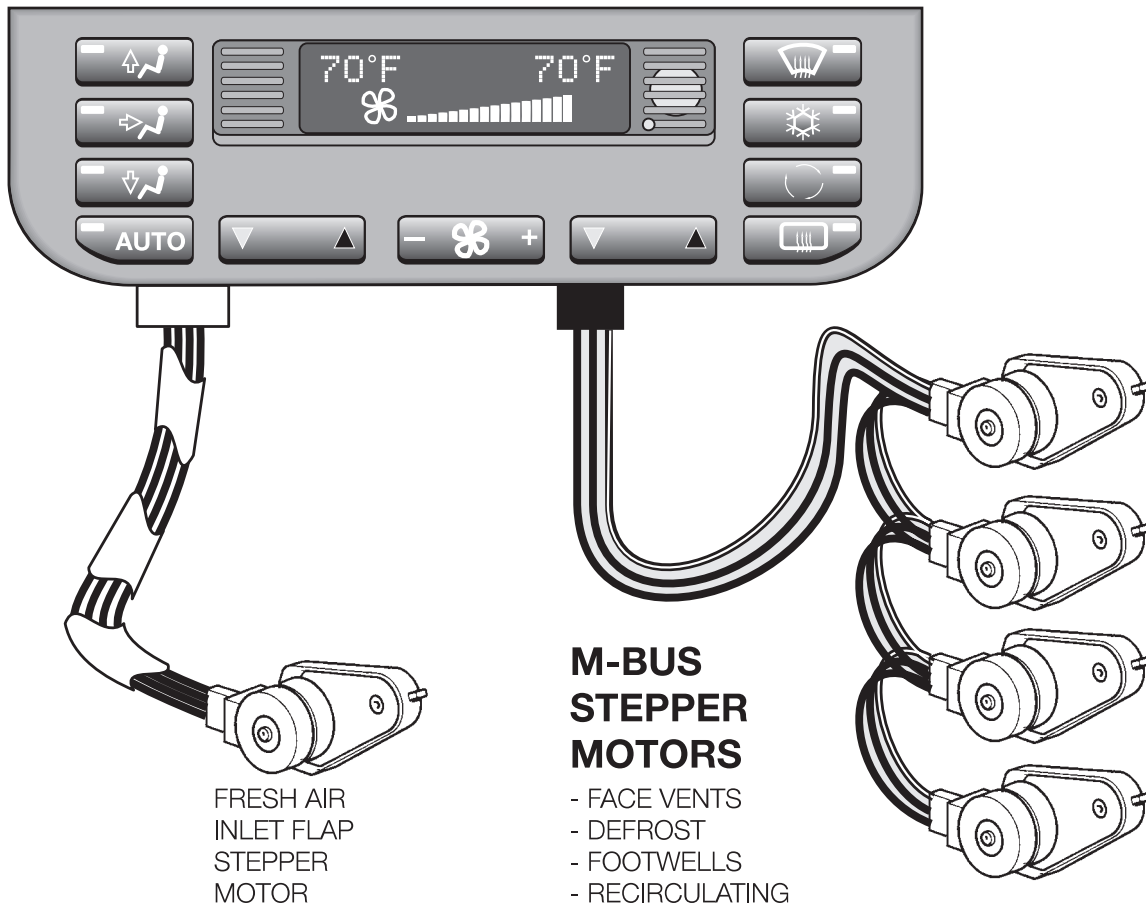
The IHKA housing assembly, shown below, is very similar in construction and layout to the IHKR (earlier system) E36 housing assembly.



IHKA E36 Housing Assembly

NOTE: The E36 final stage unit fits into the lower left side of the housing.

And, the temperature mixing flap is manually operated using a thumbwheel and cable arrangement - there is no stepper motor on the housing assembly.



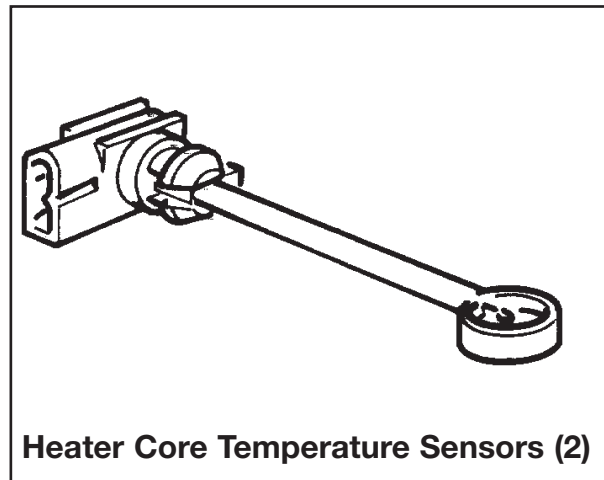
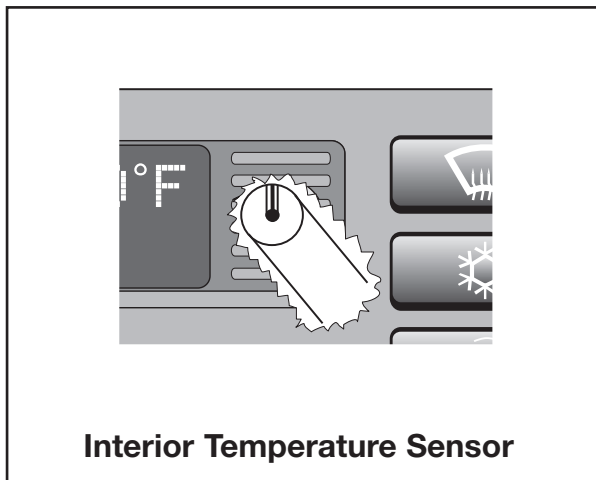
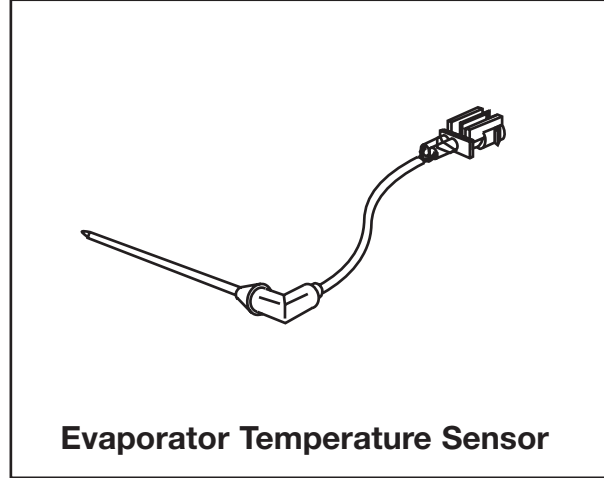
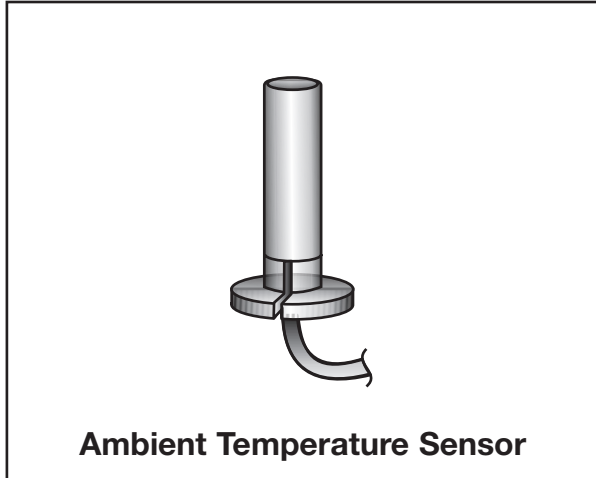
Like IHKA E38, IHKA E36 uses an M-Bus to control all stepper motors except the fresh air flaps stepper motor. IHKA E36, however, uses only five stepper motors:

- Fresh air flaps (conventional)
- Recirculating air flaps (smart)
- Defroster flaps (smart)
- Face vent flaps (smart)
- Footwell flaps (smart)

The fresh air flaps stepper motor is connected to the control panel/module by four circuits. The “smart” stepper motors are all linked together and receive their positioning commands over the M-bus.

IHKA E36 TEMPERATURE SENSING

IHKA E36 uses five dedicated NTC thermistor temperature sensors.



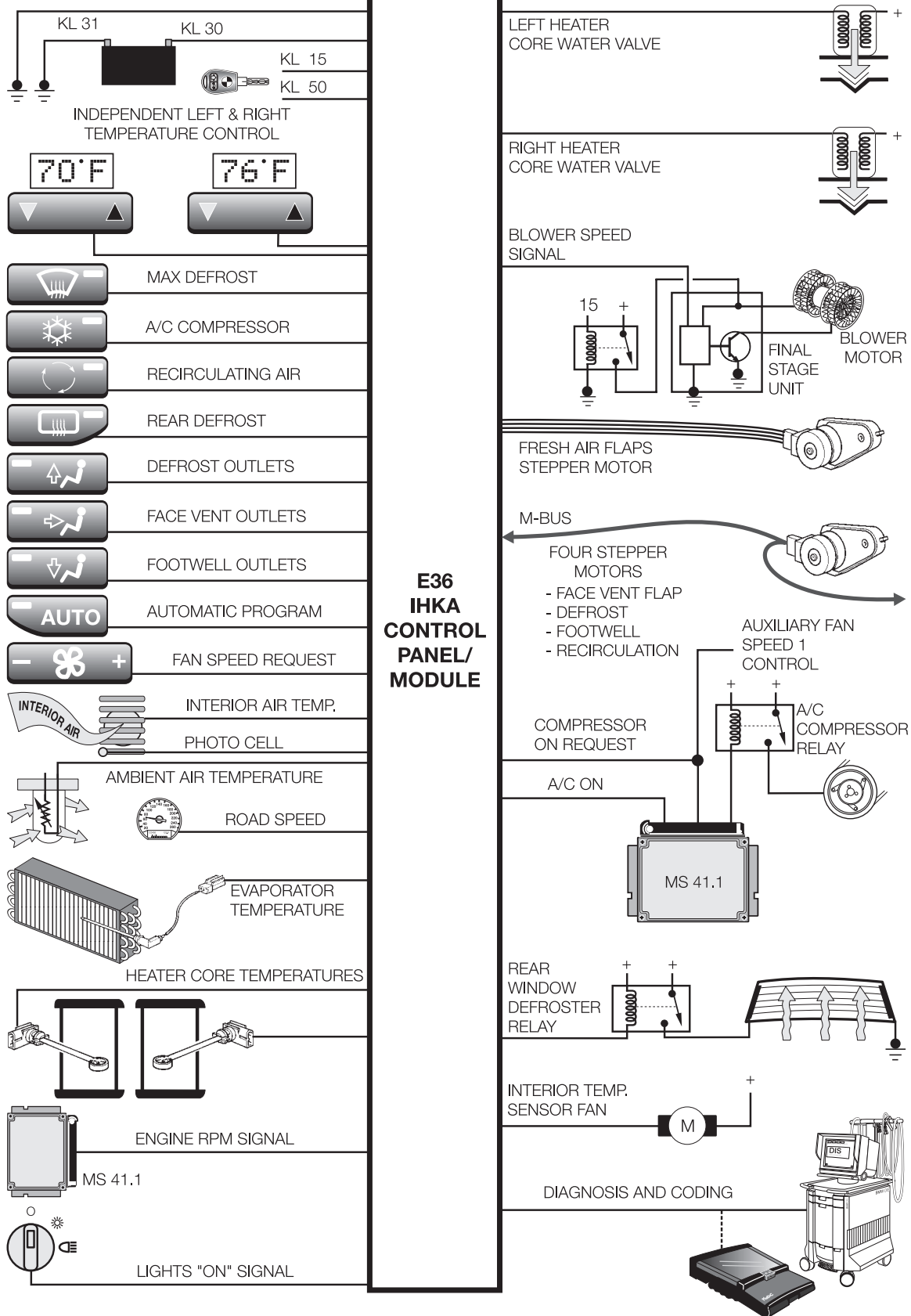
IHKA E36 REAR WINDOW DEFROSTER

Rear window defroster operation on E36 vehicles is **not** influenced by ambient temperature, as it is on E38 vehicles.

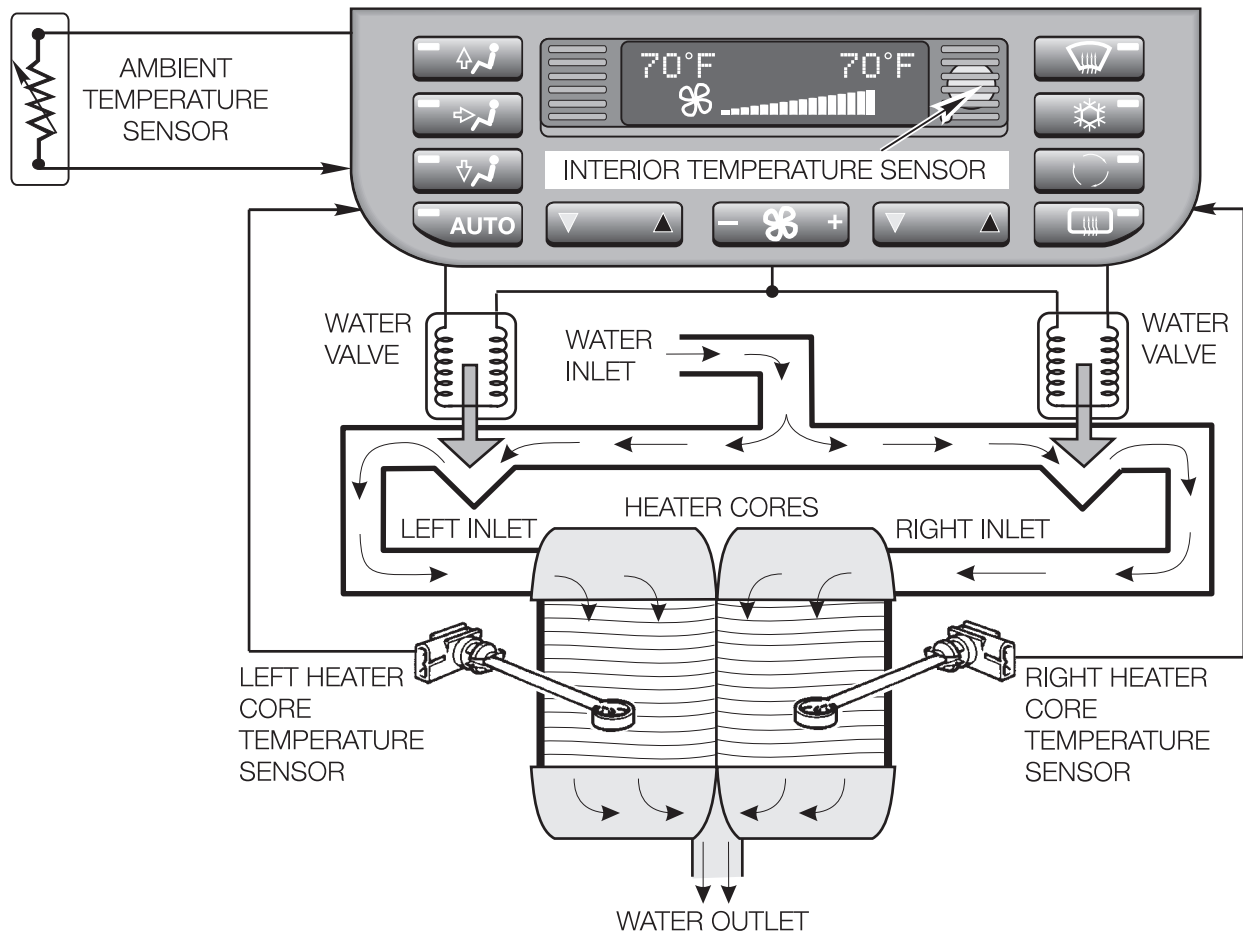
Pressing the rear window defroster button turns on the defroster and it operates for 17 minutes. The defroster then shuts off automatically.

Refer to the IHKA E36 IPO on page 98 for a defroster schematic.

IHKA E36 IPO



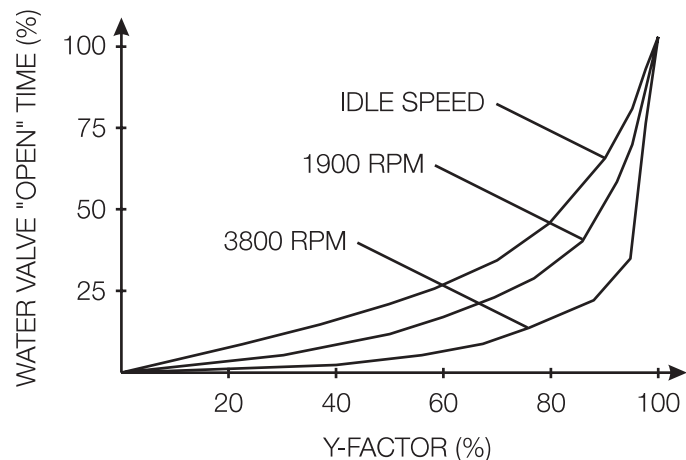
IHKA E36 TEMPERATURE REGULATION



Temperature regulation is accomplished the same way as on the IHKA systems already covered:

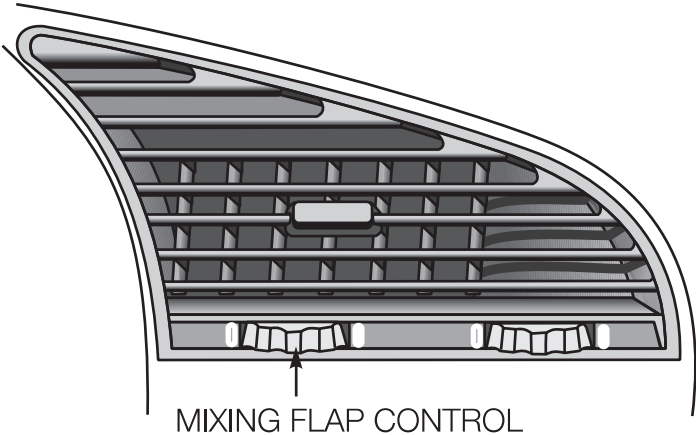
- solenoid actuated water valves control the flow of hot coolant through the heater cores
- the valves, sprung open, are powered closed by the control panel/module in response to sensed inputs and buttons pressed on control panel/module face.

An important difference from IHKA E31, and E38 is that IHKA E36 does **not** use an electric pump to boost coolant flow through the heater cores. Instead, the control panel/module monitors engine speed and compensates for low flow at lower engine speeds by increasing water valve "open" time.

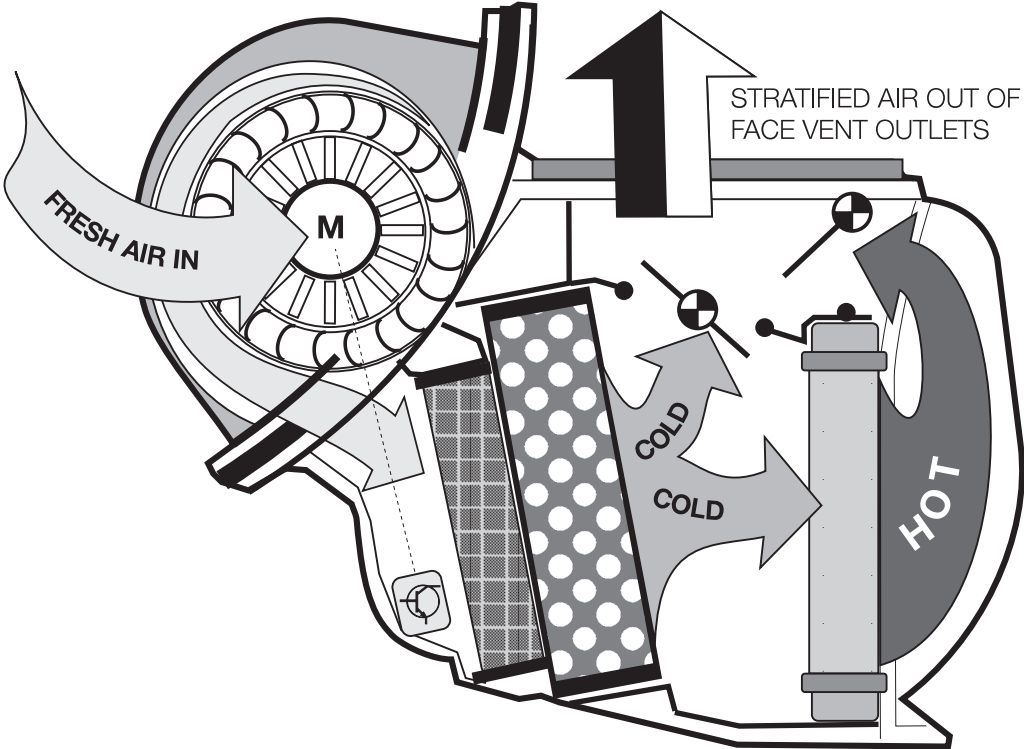


IHKA E36 TEMPERATURE MIXING

The temperature mixing flap is mechanically actuated, using the thumbwheel at the bottom left corner of the center face vent.

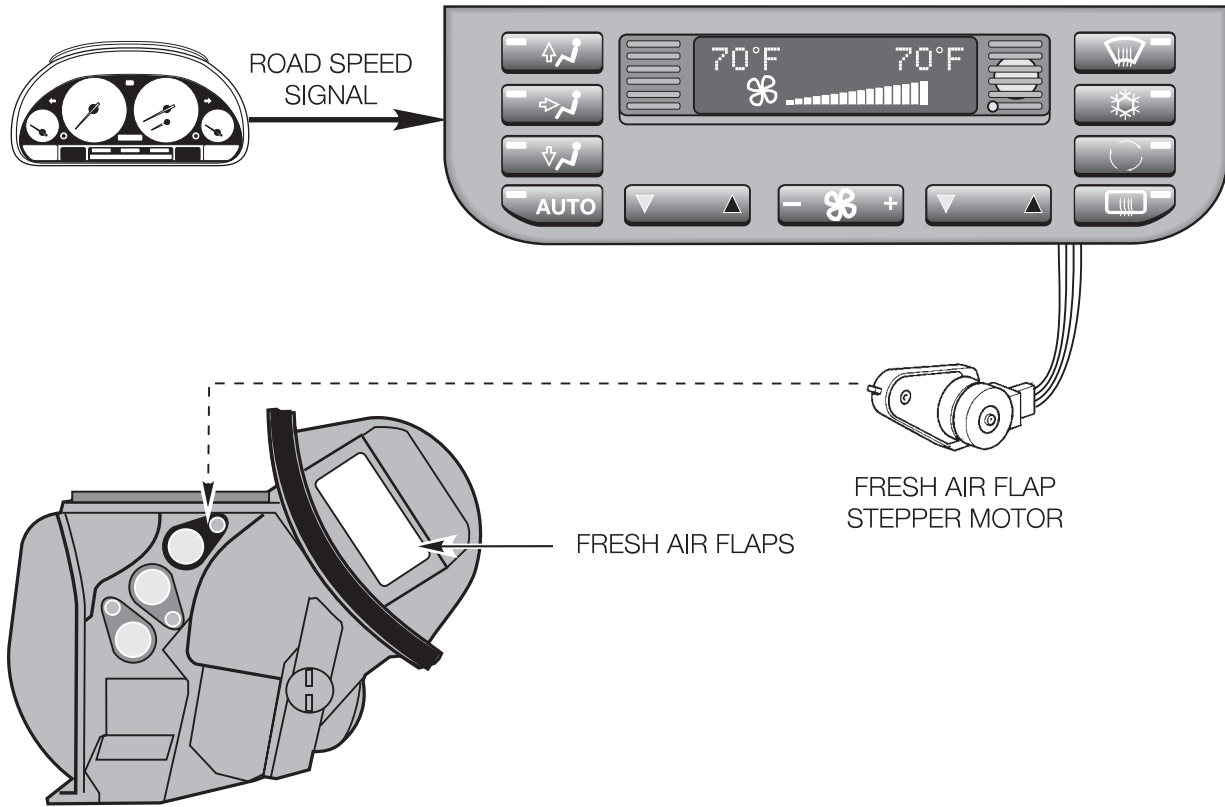


Any time that the face vents are open, rotating the thumbwheel will operate the mixing flap which is located above the space between the evaporator and the heater cores. Opening the mixing flap allows more cooled air to enter the face vent ductwork. Closing the flap increases the proportion of heated air which enters the face vent ductwork.



NOTE: DEFROST AND FOOTWELL OUTLETS ARE NOT ILLUSTRATED

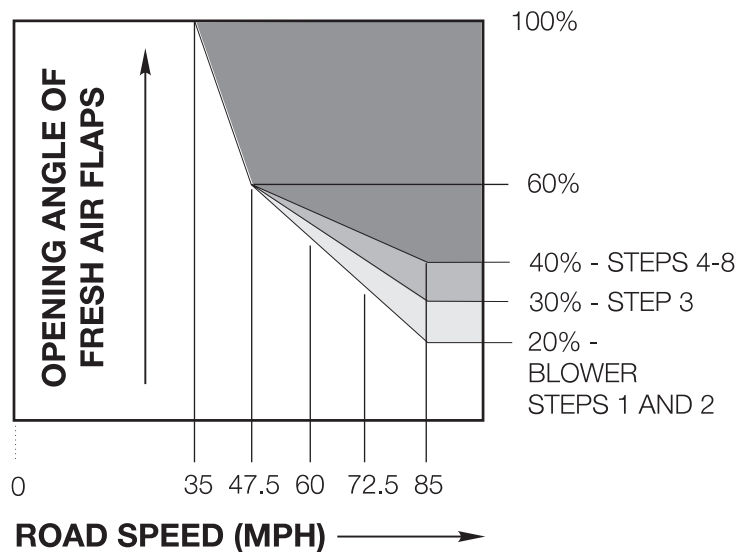
IHKA E36 AIR INTAKE



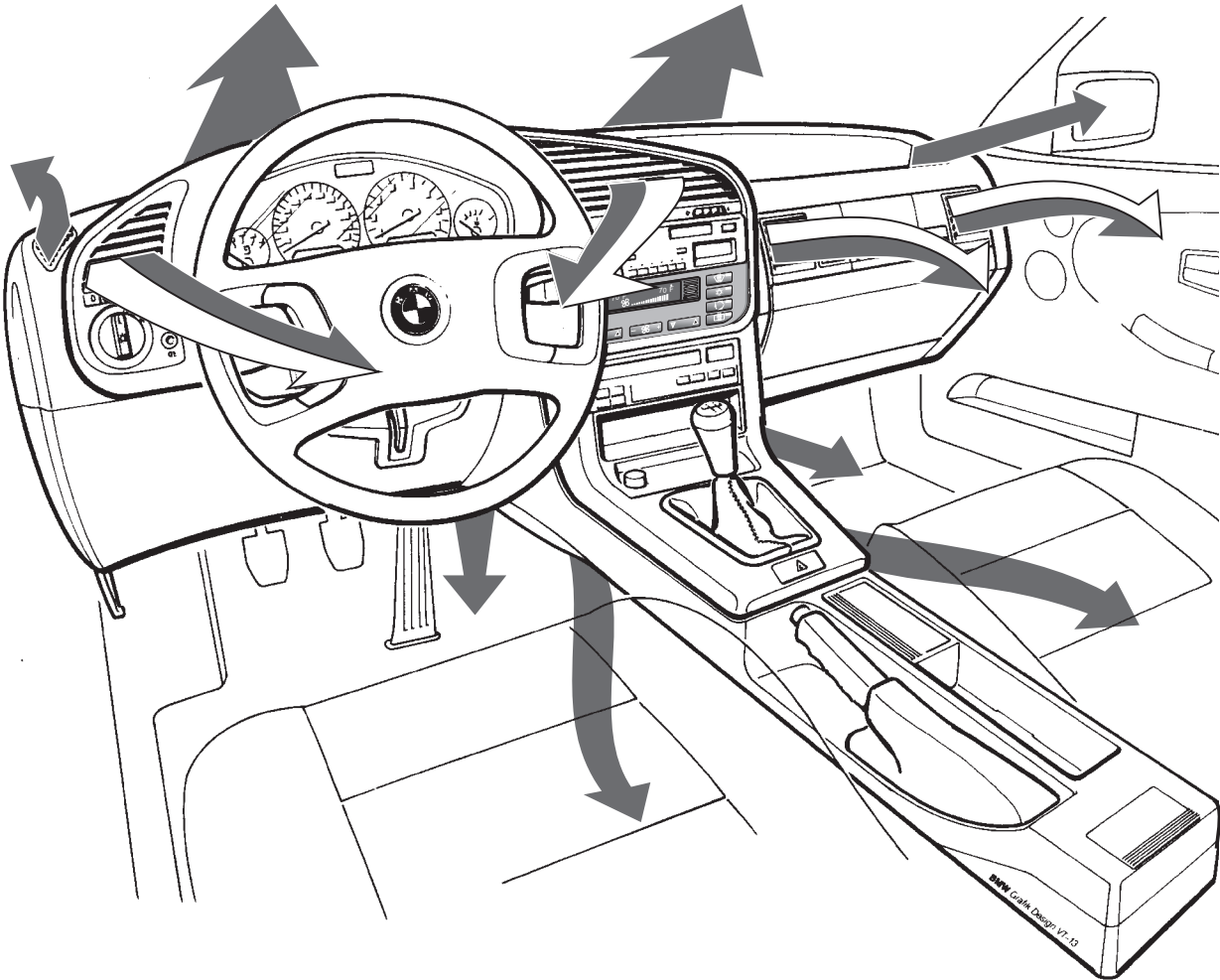
The fresh air flaps stepper motor operates only when the ignition switch is in “Run.” At engine shut-down, the fresh air flaps stay in their “last-used” position. When the ignition switch is again turned to “Run,” the control module/panel operates the stepper motor to move the flaps, if necessary.

When open, the flaps are positioned according to road speed; the flaps close incrementally with every 12.5 mph change in road speed (to prevent the flaps from continually opening and closing due to slight changes in speed). At 85 mph the fresh air flaps are only 20% to 40% open (depending on blower speed).

In the recirculating air mode, the fresh air flaps are 20% open.



IHKA E36 AIR DISTRIBUTION



All outlet flaps are operated by M-bus stepper motors, controlled by the control panel/module:



- Defrosting



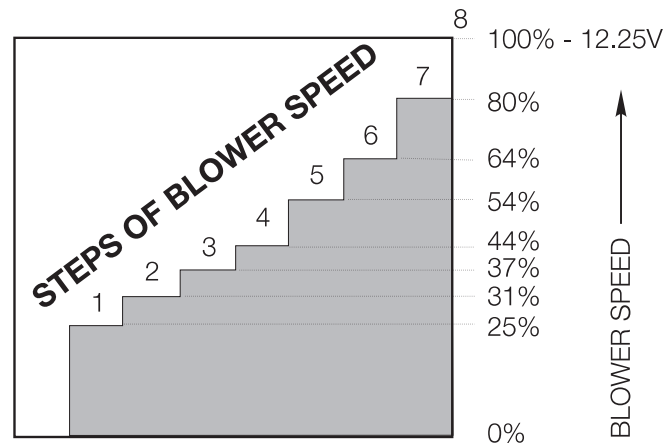
- Face vents



- Footwells

IHKA E36 BLOWER CONTROL

IHKA E36 blower control is most similar to that of IHKA E31 since a separate final stage unit is mounted on the housing assembly. E36, however, offers eight discrete speeds.



The control panel/module processes the blower speed rocker switch input and sends a signal to the final stage unit. The final stage unit then regulates blower motor voltage to control blower speed.



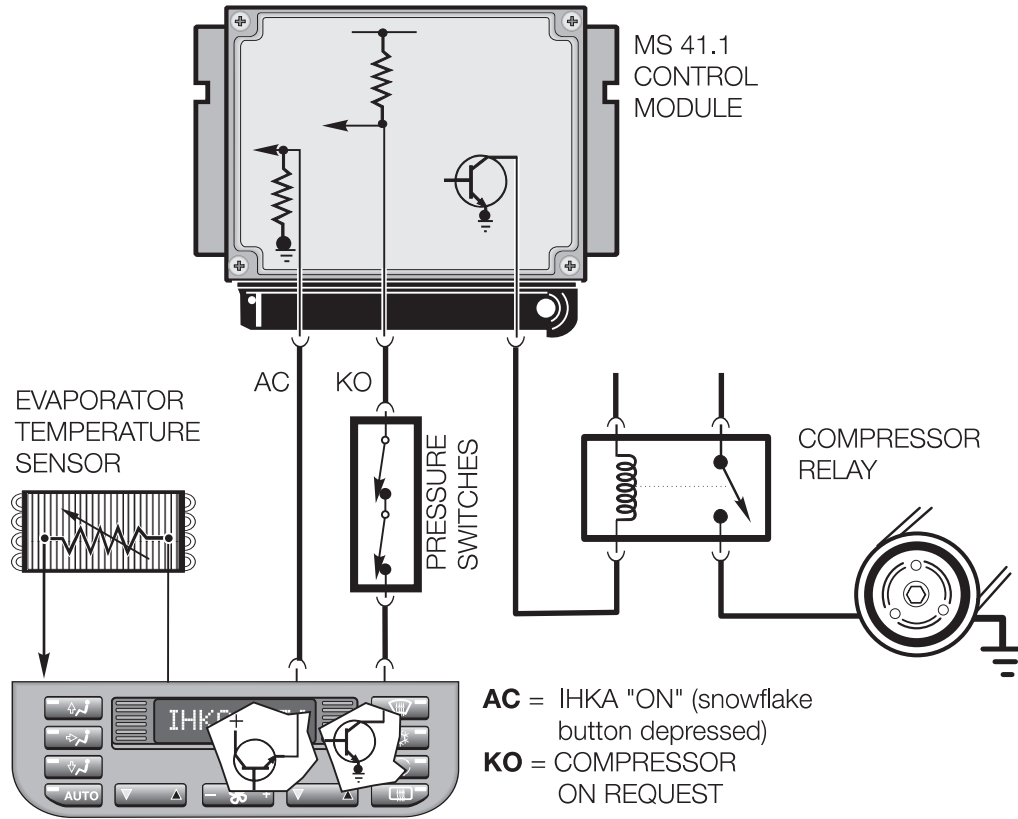
The blower rocker switch is the master controller for the IHKA system as it can be used to switch the system “Off.” This is done by lowering blower speed to the lowest speed and then pressing the “-” button one more time:

- The blower motor turns off **and**
- **All** flaps are closed **and**
- All function LEDs and the LCD display are switched off **and**
- The rear window defroster is switched off **and**
- The A/C compressor is switched off.

The interior temperature sensor blower continues to operate, though, and the control panel/module pulses the appropriate water valve if either left or right desired temperature is above the sensed interior temperature.

The IHKA E36 system can be turned “on” again by pressing any button on the control panel/module face.

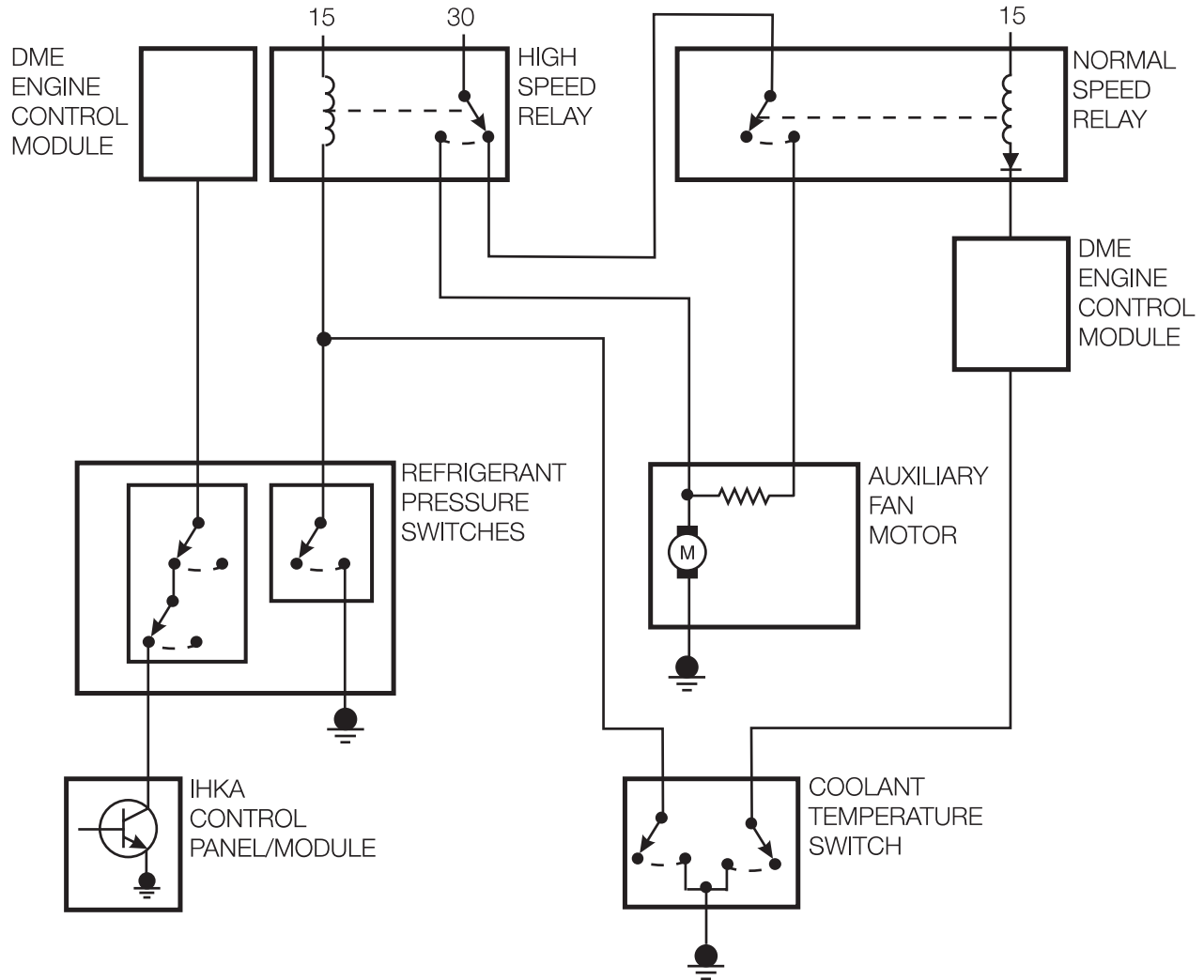
IHKA E36 COMPRESSOR CONTROL



When A/C is requested (by pressing the "snowflake"), the IHKA control panel/module sends a request signal to the engine control module.

If A/C refrigerant pressures are within limits, the engine control module stabilizes engine idle and determine whether or not to energize the A/C compressor clutch (by grounding the compressor control relay).

IHKA E36 AUXILIARY FAN CONTROL



4-Cylinder Engine Aux. Cooling Fan Circuit

The auxiliary fan can be turned on by:

- A request from the IHKA control panel/module (normal speed operation).
- High refrigerant pressure (high-speed operation).
- High coolant temperature (normal or high-speed operation).

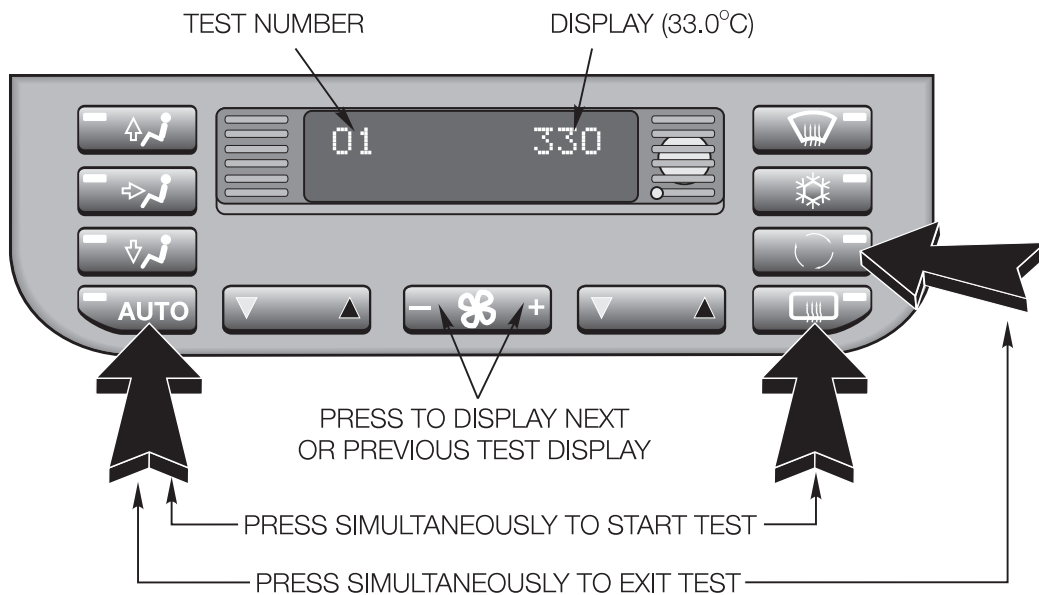
6- and 4-cylinder engines have different circuits. On 6-cylinder engines, the IHKA control panel/module circuit used to request A/C compressor operation is also used to energize the auxiliary fan normal speed relay. On 4-cylinder engines, the engine control module grounds the relay.

On 6-cylinder engines, the coolant temperature switch activates the normal speed relay. On 4-cylinder engines, the coolant temperature switch signals the engine control module that the coolant is too hot, and the engine control module activates the relay.

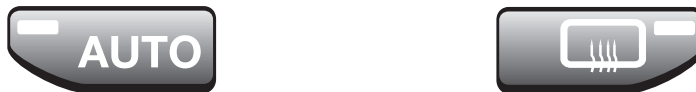
SPECIAL FUNCTIONS

Control Panel/Module Test Display (12-95 to 3-97 production)

The E36 IHKA control panel/module includes additional programming that allows system diagnosis without the use of the DIS or MoDiC; sensor values and other inputs are shown on the LCD display. This function is found on systems produced from 12-95 thru 3-97.



The sensor display mode is activated by pressing the “AUTO” and rear window defroster buttons simultaneously.



Available displays are:

1. Interior temperature
2. Ambient temperature
3. Left heater core temperature
4. Right heater core temperature
5. Evaporator temperature
6. Engine speed
7. Road (vehicle) speed
8. Y-factor value
9. Fresh-air flap position (in % up to 99.5%)
10. AUC sensor voltage (if equipped)
11. Battery voltage
12. Software version.

The sensor display is switched “Off” by pressing the “AUTO” and recirculating air buttons simultaneously, or by switching the ignition “Off.”



Note: The control panel/module LED display does not include a decimal point or percent symbol, so 99.5% is displayed as 995.

Temperatures are always shown in degrees Celsius, regardless of module coding.

Blower speed cannot be adjusted during sensor display mode.

Service-Station Feature

This service station feature continues on IHKA E36. The control panel/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).

Cold Start Arrest

IHKA E36 also includes an automatically activated cold start arrest function. The control panel/ module checks for the necessary conditions at engine start-up:

- IHKA system turned “on” **and**
- Maximum defrosting request is **not** present **and**
- Left Y-factor is 100% (maximum heating required) **and**
- Left side “AUTO” mode request is present **and**
- Left heater core temperature is less than 68°F (20°C).

If these conditions exist, the control panel/module will:

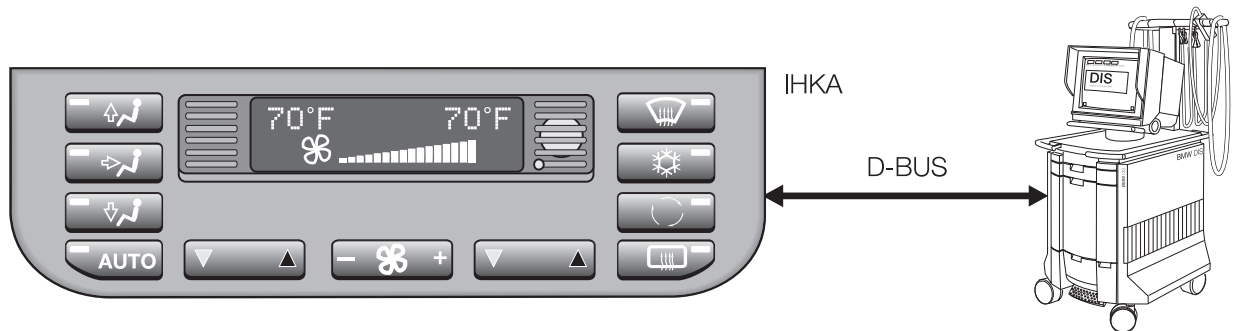
- Open the defroster flaps **and**
- Close all other air distribution flaps **and**
- Operate the blower motor, A/C compressor, fresh air flaps, and recirc. air flaps **according to control panel/module settings.**

When the left heater core temperature reaches 68°F (20°C), cold start arrest ends and **all** IHKA system functions depend upon control panel/module settings and sensed conditions.

Calibration Run

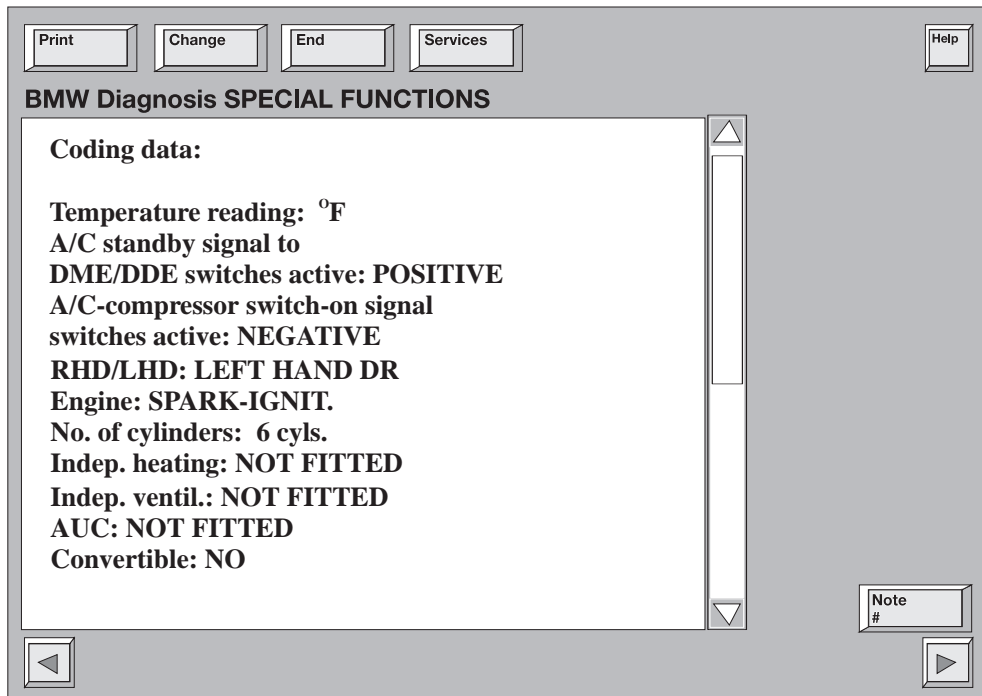
The control panel/module initiates a “calibration run” every 20th time the ignition switch is turned to “Off.” The calibration run is necessary because the stepper motors move relative to the end-of-travel position (0% or 100%).

CONTROL PANEL/MODULE CODING



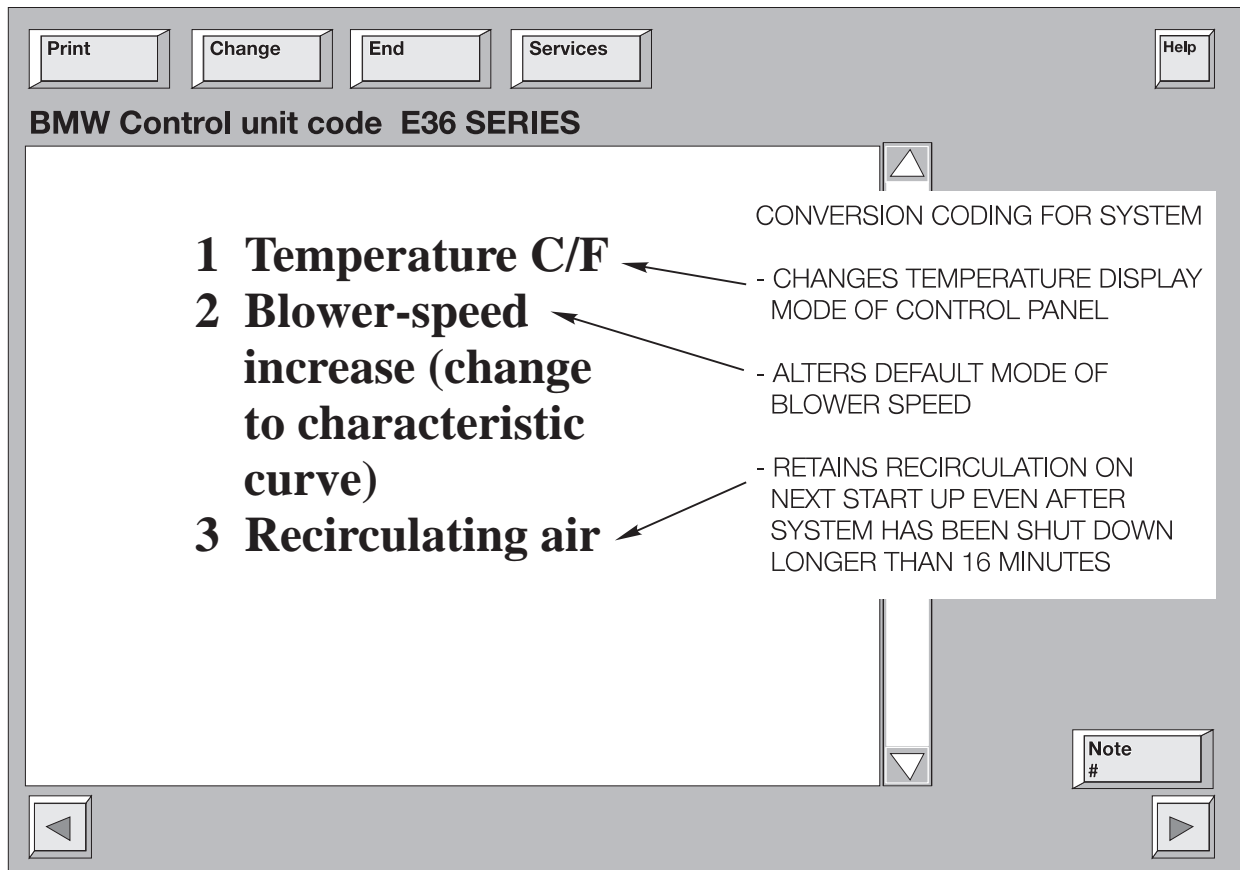
The IHKA control panel/module is coded with the central coding key (ZCS) using the DIS or MoDiC. The ZCS coding procedure is the same as on previous systems.

After coding a new or replacement control module, disconnect it from the battery completely (unplug the control module from the vehicle wiring harness) for a minimum of 10 seconds. This allows the new coding data to overwrite any previous coding data.



Coding Conversion Features

Coding conversions provide flexibility for various system functions and allow a vehicle owner to customize the car's climate control system.



The E36 IHKA is capable of the following conversions:

- Temperature C/F
- Blower enhancement - increase the blower default speed (only possible from software version 37, introduced September 1995)
- Air recirculation - retain the recirculate air function for use at restart.