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Vehicle Features

Subject **Page**

Initial Print Date: 12/04 Revision Date:

Vehicle Features

Model: E38, E39 and E53

Production: Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Understand PDC Operation
- Locate and Identify PDC Components
- Understand Cruise Control Operation
- Understand the Operation of the BMW Universal Transmitter

Park Distance Control

Introduction

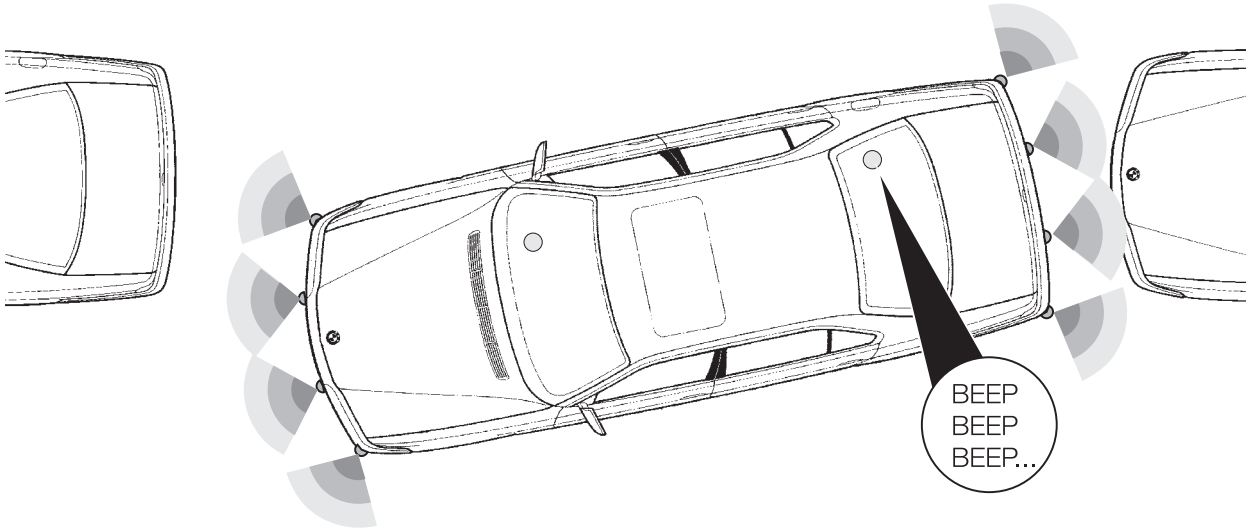
The Park Distance Control is a safety/convenience system that uses ultra-sonic sensors to detect the close proximity to other objects when maneuvering the vehicle in tight spaces (such as parallel parking or parking in a narrow garage).

The PDC monitors both the front and rear of the vehicle. The driver is warned, through an audible gong system, when the vehicle comes close to another object. As the object gets closer, the audible gong increases in frequency until a steady tone is produced.

As the distance to the object increase, the steady tone will return to a beep and stop when the vehicle moves away from the object.

The PDC is automatically switched “ON” when the ignition is switched on. However it does not become active until the vehicle is shifted into reverse.

The system can be manually switched “ON/OFF’ with the console mounted switch.



Components

The PDC system consists of the following components:

- PDC Control Module
- PDC Switch
- Ultrasonic PDC Sensors
- Gong/Speakers

PDC Control Module

Mounted in the right side of the trunk behind the trim cover. The PDC control module activates the ultrasonic sensors mounted in the bumper cover. After activation, the control module monitors the signals coming back through the sensors.

Through this signal, the PDC is able to determine the distance to any objects close to the bumpers of the vehicle. As the vehicle comes close to an object, the PDC control module will activate the respective gong (front/rear) at a specific frequency tone.

The PDC control module is linked to the I/K-Bus for the following:

- Vehicle speed
- Transmission range selection
- Diagnosis

Gong/Speaker - The PDC control module activates a gong and a speaker to alert the driver of the detected object. The front mounted gong is the existing check control gong located under the glove box. The rear mounted speaker is located under the right side of the parcel shelf.

PDC Switch

Mounted in the center console below the heater control panel or in SZM (99 and up). The system can be switched “ON”/”OFF” at any time using the switch. The LED in the switch will flash simultaneously with the gong/speaker tones when the system detects an object.

Ultra-Sonic Sensors

The number of PDC sensors depends upon vehicle application. Four sensors each front and rear, mounted in the bumpers. Some vehicle only use rear PDC. The PDC sensors are small transmitter/receiver modules. They are specifically designed for automotive use. The sensors are limited to the following angles of monitoring:

- 90° on the horizontal plane
- 60° on the vertical plane

The vertical angle is reduced to avoid unintentional signalling on steep grades.

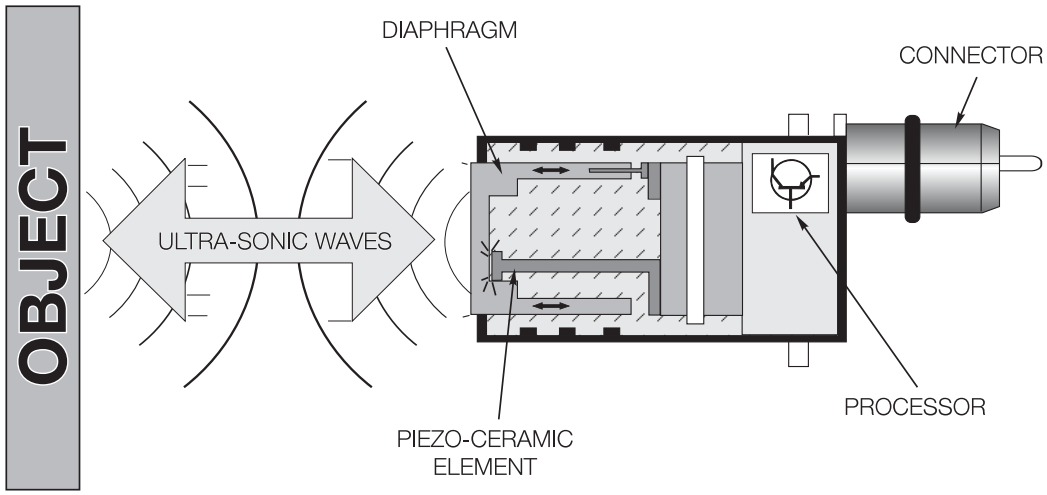
Transmitting Mode

The control module sends a 40 KHz signal to the sensor. The control module activates the sensors in a specific sequence (firing order). The ceramic element in the sensor vibrates and produces an ultra-sonic sound wave that is sent out from the bumper.

Receiving Mode

If the wave contacts an object, the wave is bounced back to the sensor. The returning wave causes the ceramic element to vibrate creating an electrical signal to be fed back to the control module.

The control module determines the distance to the object by the time difference between the sent and received ultra-sonic wave signals. The complete send/receive cycle, for one sensor lasts approximately 30ms (milli-seconds).



System Operation

When KL15 is switched “ON”, the PDC system is switched “ON”, in the standby mode. The system performs a self-check of the ultrasonic sensors and control electronics.

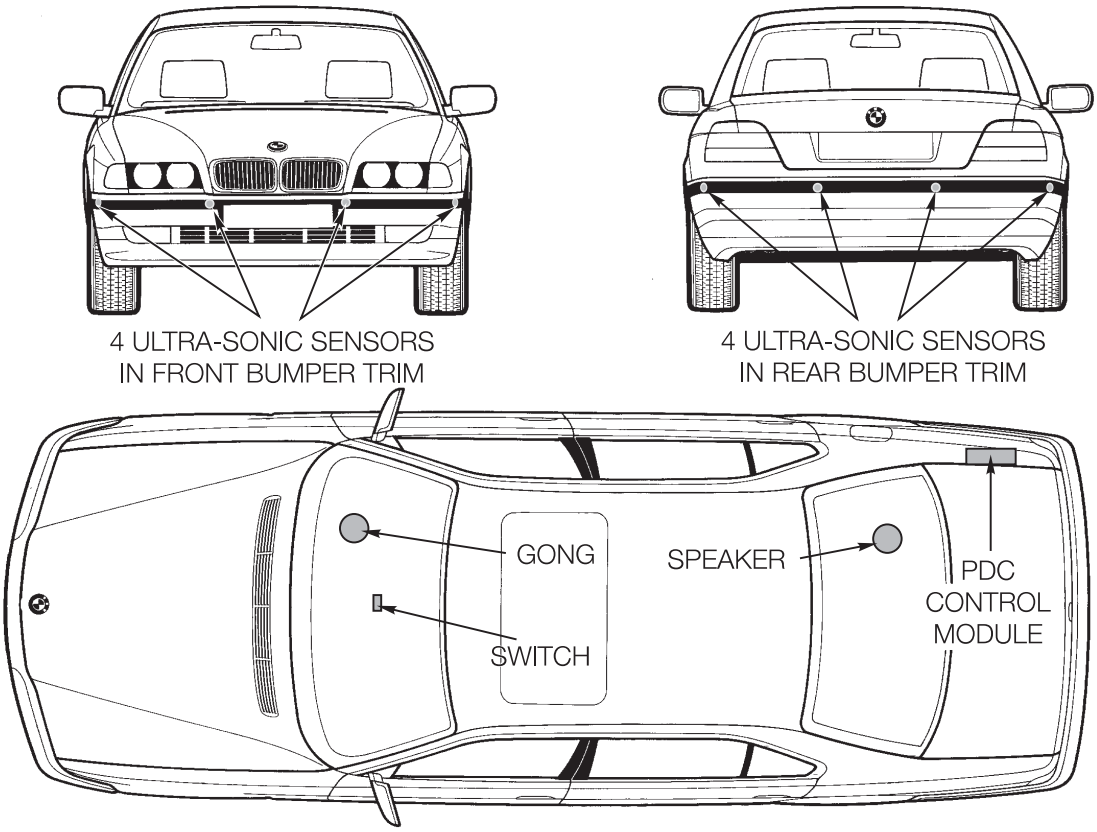
When the transmission is shifted into reverse, the system is activated and the sensors are activated in the pre-determined order.

The system stays active up to approximately 20 MPH. Above this, the system reverts to the standby mode.

If an object is detected within the operating range of the sensors, the control module will activate the respective gong/speaker (front/rear). The sensor closest to the object will receive additional activations to determine if the object is getting closer.

As the distance to the object decreases to approx. 1½ feet, the control module increases the activation frequency of the sensor. The output frequency of the gong will increase linearly up to a distance of approx. ¾ of a foot. At this time the frequency will change to a constant tone.

As the distance to the object increases, the frequency of the sensor and gong activation decreases until the object is out of the monitoring range of the sensor.



Diagnosis

The PDC system is connected to the diagnostic link through the I/K-Bus using the cluster/IKE as a gateway. The DISplus/Gt-1 is used for diagnosis and troubleshooting procedures when faults occur with the system.

Fault Symptom troubleshooting paths should be used to troubleshoot failures with the PDC system.

Cruise Control

Introduction

A familiar feature on BMW vehicle, cruise control has been upgraded beginning with the introduction of the E38. The new cruise control system (GR II) is similar in operation to the former system (FGR) found on older models (E32/E34 etc.). It offers improved control electronics to ensure that the set speed is reached and maintained without the sensation of fast acceleration or deviations of more than 1 MPH from the set speed.

The GR II continues to offer the following advantages:

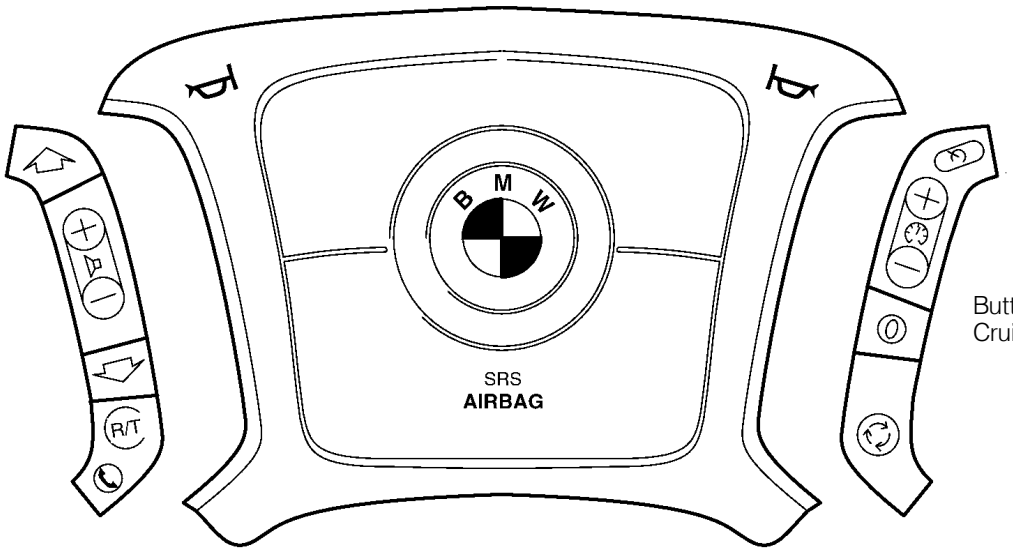
- Fatigue-free driving over long distances with a set speed.
- The constant travel speed results in lower fuel consumption.
- By setting a speed, speed limits are observed automatically.

Like most of the other systems in modern BMW vehicles, the GR II utilizes digital signal processing. This eliminates the amount of wiring required to achieve system operation and improves the reliability of cruise control operation.

The driver's request for cruise control functions is now activated from a new function selector switch pad mounted on the steering wheel (MFL).

The cruise control system also features an ON/OFF switch which ensures that the cruise control system is not inadvertently engaged while driving the vehicle.

The cruise control indicator lamp illuminates when the system is active (switched on). The new graphic symbol denotes constant speed maintenance.



Buttons for Cruise Control

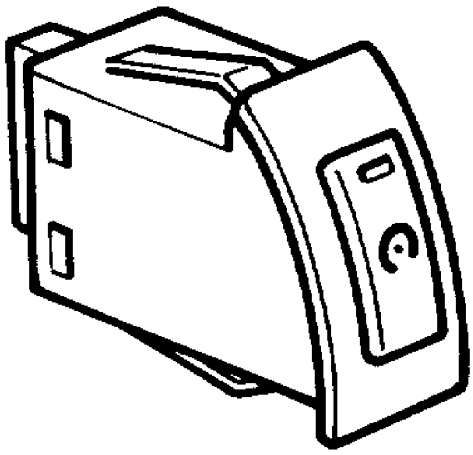
Components

The GR II system consists of the following components:

Main Switch

From introduction, the cruise control main switch is mounted on the right side of the dash panel below the instrument cluster. It produces a momentary ground signal to the GR II control module. When pressed the GR II control module switches on and the cruise enable indicator lamp in the instrument cluster (green in color) is illuminated.

From the 98 model year, the main switch is omitted and the MFL was updated with an ON/OFF button (I/O).



Cruise Control Switches

The cruise control switch pad is mounted on the right side of the steering wheel (MFL). All of the request functions (SET, ACCEL, DECEL, RESUME AND OFF) are activated from the cruise switch pad.

These request inputs are processed by the MFL switch pad and transmitted to the Steering Wheel Control Module (MFL-CM) on early E38 or directly to the I/K bus on later models.

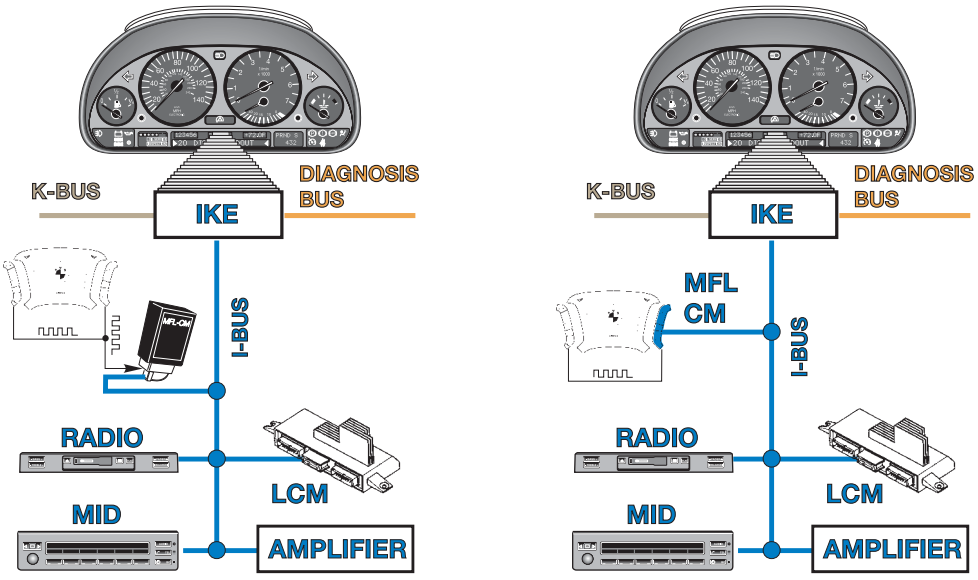
Depending upon model, year and engine, the data signals will go to the cruise control module (early V-8), EML module (V-12) or engine control module to regulate the engine speed via the throttle.

Multi-Function Steering Wheel

On the early E38, the MFL control switch pad on the steering wheel sent signals to the MFL-Control Module. The MFL-CM is mounted on the left side of the steering column behind the left side knee bolster.

The cruise control requests are processed and transmitted to the GR II (or EML) cruise control module over a data link.

From the 97 model year, the MFL-CM was omitted and the MFL switch pad controls contained the electronics to interface with the I/K-Bus.



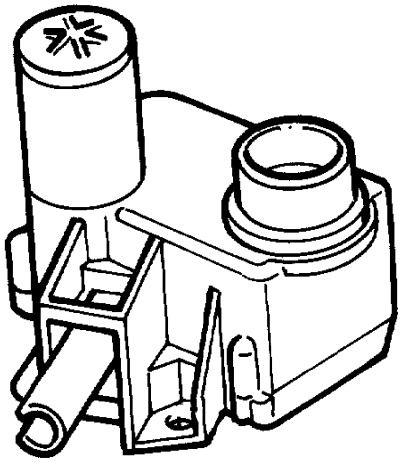
Cruise Control Module

The cruise control module is mounted in the E-box between the the DME and AGS control modules. It has one blue 26 pin ELO type connector.

The cruise control module is only used on the E38/E39 until the 99 model year. The cruise control electronics are integrated into the Engine Control Module (DME) on vehicle which use electronic throttle control. Also, the E38 750iL uses the EML control module for cruise control operation.

Cruise Control Actuator (V-8 95-98)

The cruise control actuator is mounted on the left fender well and contains the actuator motor, feedback potentiometer and actuator clutch.



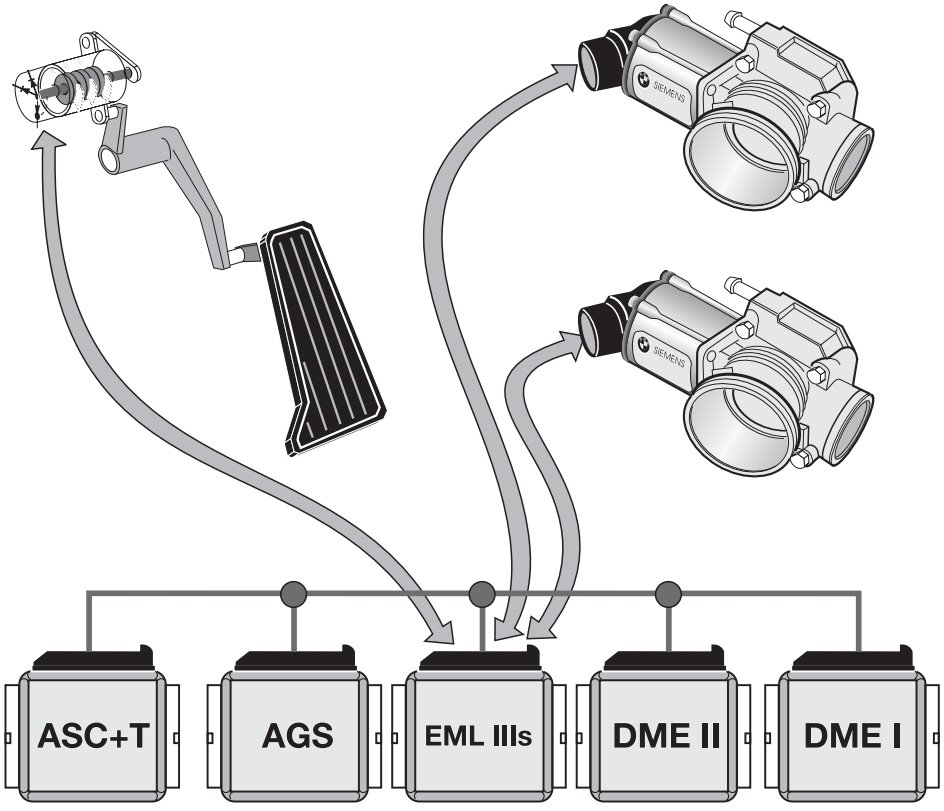
The actuator is connected to the throttle valve with a bowden cable parallel to the accelerator cable.

The actuator is omitted on vehicle which use electronic throttle control (EML). The throttles on EML equipped vehicles are regulated by the EML control module (V12) or the engine control module (DME on V8 and six cylinder.

Electronic Throttle Control

Beginning with the E38 750iL, the cruise control actuator and cruise control module are omitted. The cruise control electronics have been integrated into the EML control module (V12) or the DME (V8 and six cylinder).

The E38 750iL was introduced in 1996 with the M73 V-12 engine. All vehicles from the 99 model year have electronic throttle control.

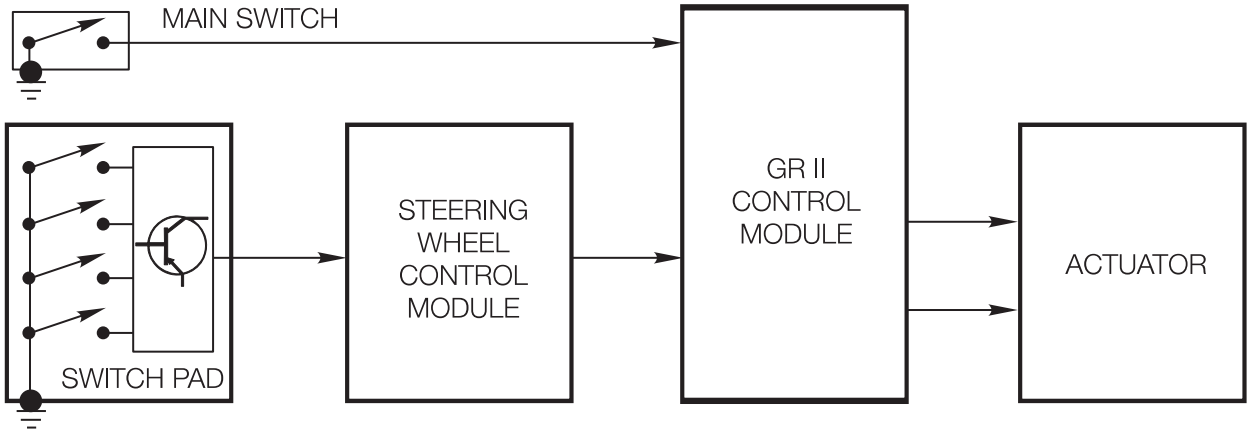


Cruise Control Operation

Early Models (pre-97)

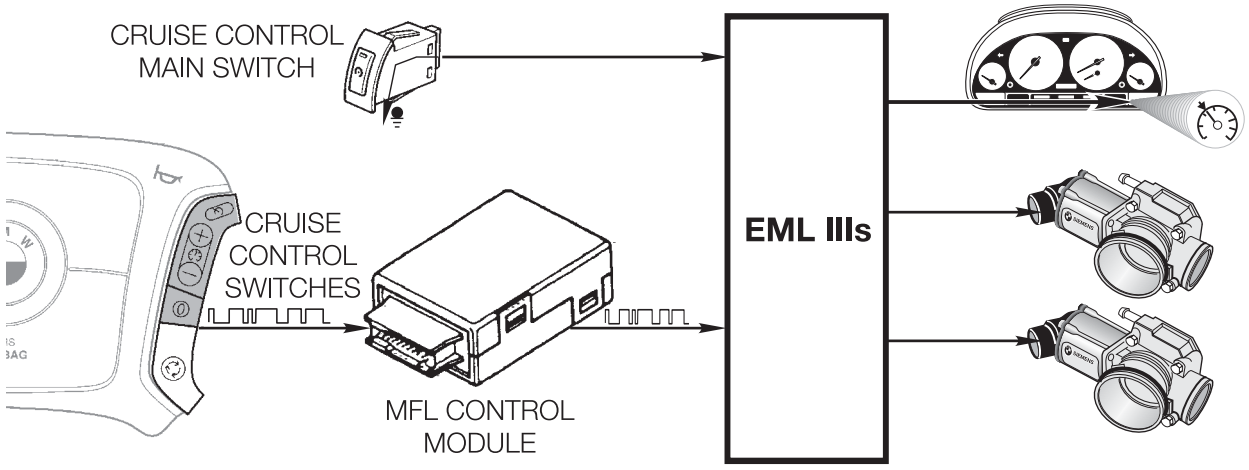
The cruise control switch pad provides momentary ground signals and converts them into a dynamic digital signal. The signal is sent to the steering wheel control module and passed through a gateway to the GR II control module .

The GR II carries out the systems functions based on this dynamic digital signal and other input signals. The actuator is controlled by final stage activation at both sides of the motor.



Vehicle with Electronic Throttle Control

The cruise control switches provide input to the MFL key pad which converts the requests into bus telegrams. These signals are sent via a bus link to the EML (V12) or engine control module. The throttles are regulated by the EML or engine control module to regulate vehicle speed.



Cruise Control Switch Operation
When the main switch is turned on and the vehicle speed is above 20 mph, the cruise control can be set or adjusted at the cruise control switch pad.

Resume - Briefly pressing the resume button will cause the vehicle to accelerate/decelerate to the stored speed value in the cruise control module.

Set/Accelerate/Tip Up - Pressing the set button will engage the cruise system and maintain the vehicle's current speed. Pressing and holding the set button will cause the vehicle to accelerate. When released, the vehicle's current speed will be the set speed.

Tapping the set button will cause the speed to increase by approx. 1 MPH. The number of times the tip feature will function is limited to 8.

Decelerate/Tip-Down - Pressing and holding the decelerate button will cause the vehicle to slow down. When the button is released, the current speed is the new set speed. Tapping the button will cause the vehicle speed to decrease by approx 1 MPH. The number of times the tip feature will function is limited to 8.

OFF - Pressing the off button will disengage the cruise control. The previous set speed is stored in memory until it is over written or the vehicle is switched off. In addition to switching off via the cruise control switch on the steering wheel, the system can also be switched off by:

- Depressing the main switch on the instrument panel.
- Applying the brakes.
- Shifting the transmission into neutral.

Cruise Control Module
The cruise control module contains new control logic for smoother operation. The new control logic prevents the maximum acceleration/deceleration feel that was characteristic with the FGR system.

The rate of acceleration in SET ACCELERATE and RESUME is based on the current road speed of the vehicle. The rate of acceleration is high at low vehicle speeds and gradually decreases as vehicle speed increases. This gives the feeling of steady smooth acceleration.

The rate of deceleration when the DECELERATE button pressed is linear until the throttle valve closes. The decel rate is then dependent on the engine braking effect and road conditions. This results in a smooth speed reduction.

If the set speed can not be maintained due to unusual operating conditions (severe up hill grades), the control module adopts a special resume mode. Once the unusual operating condition is overcome, the set speed will be resumed at a reduced acceleration rate.

This feature is designed to prevent a sensation of rapid accelerating.

The cruise control module is connected to the AGS control module through a data link. When cruise control functions are activated, the AGS shift program is adapted to match the requirements of the requested cruise control function. For example, when the GR II is set at a specific speed and a severe down hill grade causes the vehicle to overcome the set speed the GRII signals the AGS to downshift a gear. This will occur as needed to maintain the set speed as closely as possible.

Plausibility/Safety Features

To avoid malfunctions or unsafe conditions, the GR II continuously monitors the input and output signals. Redundant (or dual signal) processing ensures that the input signals are plausible and prevents unsafe cruise control operation from being carried out.

The following safety measures are also included in the total scope of cruise control operation:

- The minimum speed threshold for cruise control operation is 30 km/h (20 mph). If the speed drops below this value the cruise control will not operate.
- Shut off priority - The brake pedal and transmission neutral switch have priority for switching the system off. If a malfunction caused several commands to be called up at the same time, the brake switch signal would disengage the system.
- If the set speed is exceeded by more than 8km/h (approx. 5MPH), the system will disengage by the actuator clutch. When the speed drops below the threshold, the clutch will re-engage and the cruise will continue operation.
- The data link from the cruise control switch is continuously checked for signal integrity.

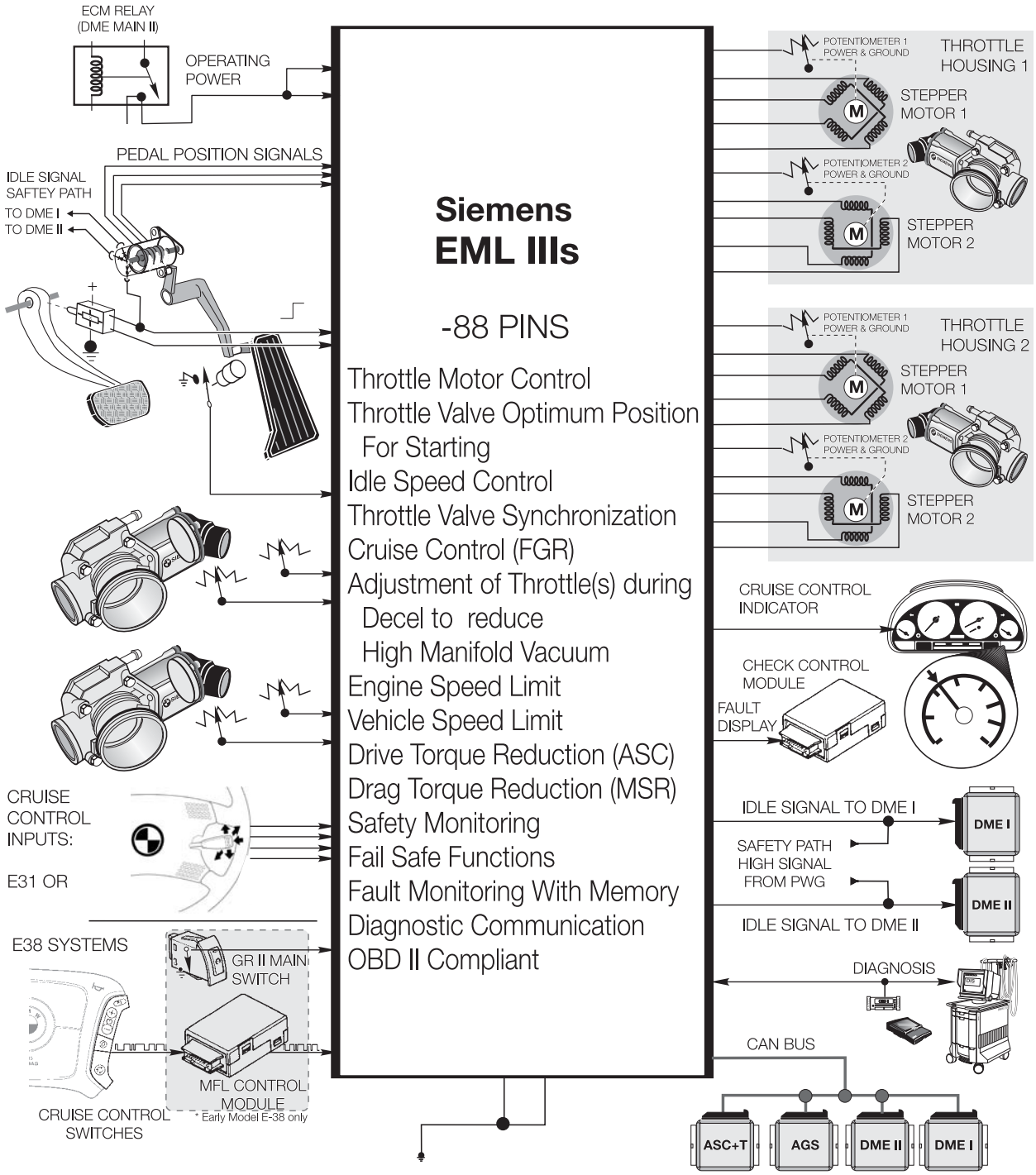
Diagnosis/Coding

Diagnosis of the GR II system is carried out with the DISplus/GT-1. On vehicles which have a cruise control module, the control module stores faults that occur with the input/output signals for cruise control operation.

Vehicle which use electronic throttle control will store system related faults in the EML or DME control module.

The MFL or MFL-CM stores faults that occur with the cruise control switch.

EML IPO (M73/M73TU)

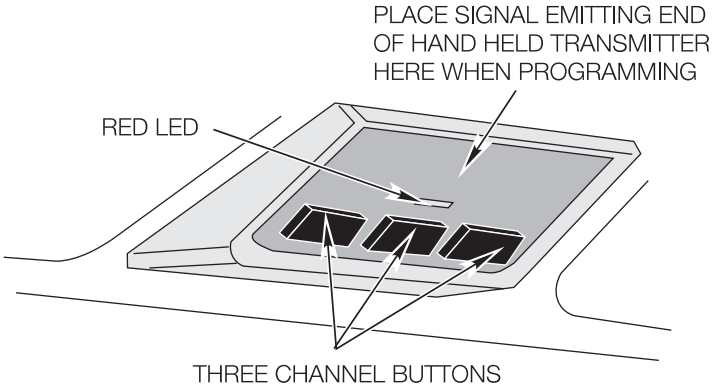


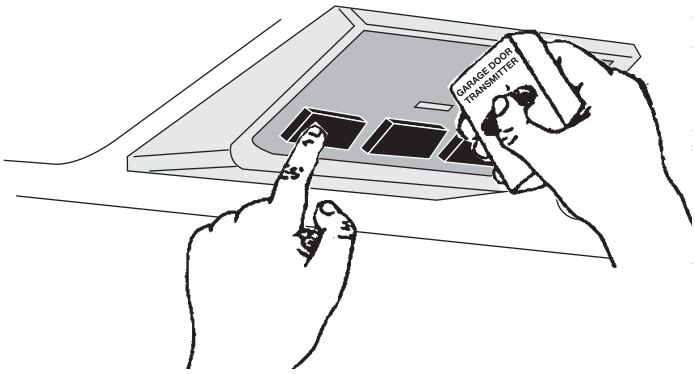
BMW Universal Transmitter

The BMW Universal Transmitter (UGDO), is used to provide convenience for customers that have various remote systems at their home. The UGDO can replace up to three remote transmitting devices. The UGDO is standard equipment on the 740iL and 750iL and optional on the E38/E39.

From 5/97 a new updated UGDO became available. Due to the new security technology regarding remote devices (garage door openers etc.), the UGDO was upgraded with the new “rolling code” technology. This allows compatibility with new devices.

The transmitter is located in the overhead switch panel above the rear view mirror.





The BMW Universal Transmitter replaces up to three remote transmitters such as:

- Garage Door Openers
- Home / office lighting and security systems
- Entrance Gate systems

Programming

1. Press the two outer buttons on the universal transmitter simultaneously until the red LED begins to flash. Release the buttons. This step initializes the memory and erases any previous settings on all three channels.
2. Place the signal emitting end of the hand held remote transmitter against the BMW universal transmitter so that you can still see the red LED.
3. Simultaneously press and hold the hand held remote transmitter button and the chosen button (1-3) on the BMW universal transmitter.
4. Continue to hold the buttons until you see the red LED begin to flash first slowly and then rapidly. It can take up to one minute before the LED begins to flash rapidly. Once it is flashing rapidly it indicates that the universal transmitter has been programmed successfully.
5. To program another button repeat steps 2-4 only.

Rolling Code UGDO

Starting from 5/97 the Universal Garage Door Opener-UGDO, (factory installed on E38, and retailer installed option on E39/E53) has been equipped with new circuitry for "rolling" access codes. This feature improves security by changing the digital, ultrasonic code every time the opener button is used. Operation and programming of the new door opener is described in the owner's manual.

The garage door opener may have a "rolling code" feature and has to be "trained" to operate in conjunction with BMW Universal Transmitter. To determine the type of opener, the customer has to depress the button on the BMW Universal Transmitter that has been programmed. If the indicator light on the UGDO flashes rapidly for one to two seconds, then continuously, the garage door opener has a rolling code system.

Procedure

The following "training" procedure should be performed by the customer on the Garage Door Opener equipped with a "rolling code":

1. Locate the training button on the garage door opener receiver . Exact location and color of the button may vary by the brand. In case of difficulty locating the button, refer to the garage door opener manual or call 800-355-3515 .
2. Press the training button on the garage door opener receiver for one to two seconds.
3. Press the programmed BMW Universal Transmitter button for the duration of the rapid flash until the training light turns solid (two seconds). Release the BMW Universal Transmitter button and press the button again to complete the training. Your garage door opener should now recognize your BMW Universal Transmitter.

All E38 or E39 (with UGDO option) manufactured prior to 5/97 can be retrofitted with the "rolling code" type transmitter. However, this upgrade is not covered by the BMW New Car Limited Warranty.

Heated Steering Wheel

The heated steering wheel system consists of the following components:

- A heating filament integrated into the steering wheel cover.
- An NTC temperature sensor, in the filament circuit, to regulate the heating current.
- A push button mounted in the right side MFL key pad.
- The control module located behind the air bag assembly.
- Slip ring assembly for the power and ground supply.

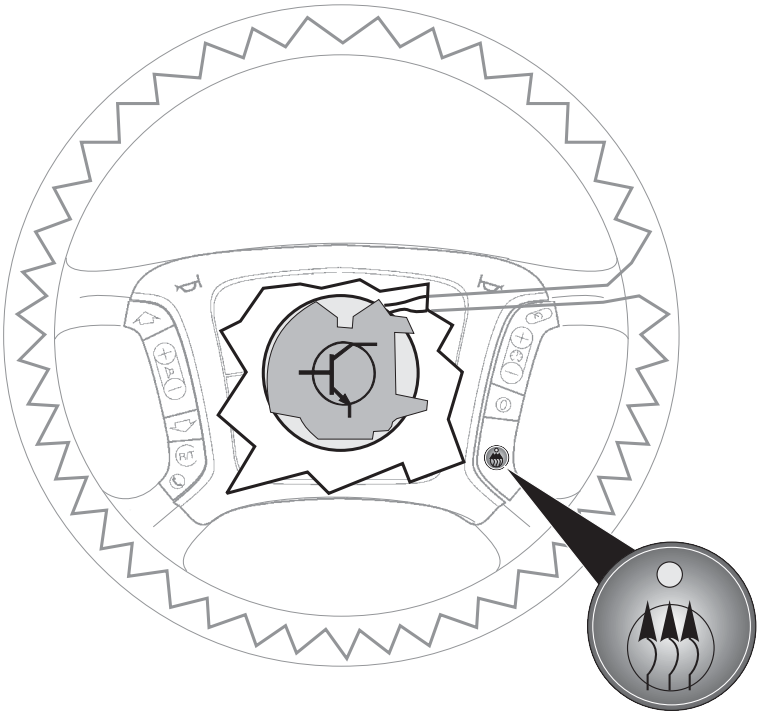
Operation

When KL 15 is switched ON, the heated wheel can be switched ON by pressing the button.

A green LED illuminates to indicate system operation. Maximum current is supplied and heats the filament to its operating temperature (surface temperature of approximately 90°F).

The NTC detects the temperature of the filament and causes the control module to cycle once the wheel is heated. Cycling is carried out with a pulse width modulated signal.

The system is not connected to the diagnostic link, however the control module does monitor operation of the system. If a fault occurs during operation, the system and green LED will switch OFF.



Heated Steering Wheel Schematic