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iDRIVE: DRIVING AREA

Subject **Page**

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iDRIVE: DRIVING AREA

Model: E65 - 745i

Production Date: 11/2001 - Start of Production

Objectives:

After completing this module you should be able to:

- Understand the concept principles of iDrive.
- Recognize the controls contained in the Driving Area.

iDrive

Introduction

What is iDrive?

The number of advanced driver assistance systems, communication and convenience functions with new capabilities is continually increasing in modern-day vehicles. That trend is set to continue at an ever growing speed, driven on by the digitization of electronic and communication technologies.

Conventional display and control systems are reaching the limits of their capabilities. The 700 or so control functions that are possible on the E65 would create a totally unmanageable conglomeration of switches, controls and displays if the conventional arrangement had to be used. iDrive redefines the concept of active driving and specifically, driver-orientated ergonomics.

This new control and display concept enables driver and passenger to access more information and functions in spite of the smaller number of buttons and switches. It lends a unique and intuitive feel to the process of controlling the E65, thereby increasing safety on the road as well as the pleasure of driving.

The name iDrive does not identify a specific system or component, it is a term which expresses BMW's trademark driver's-car image. The letter **i** in iDrive stands for the philosophy of the entire control and display concept:

- interactive
- intelligent
- innovative
- intuitive
- integrated
- informative
- inspired

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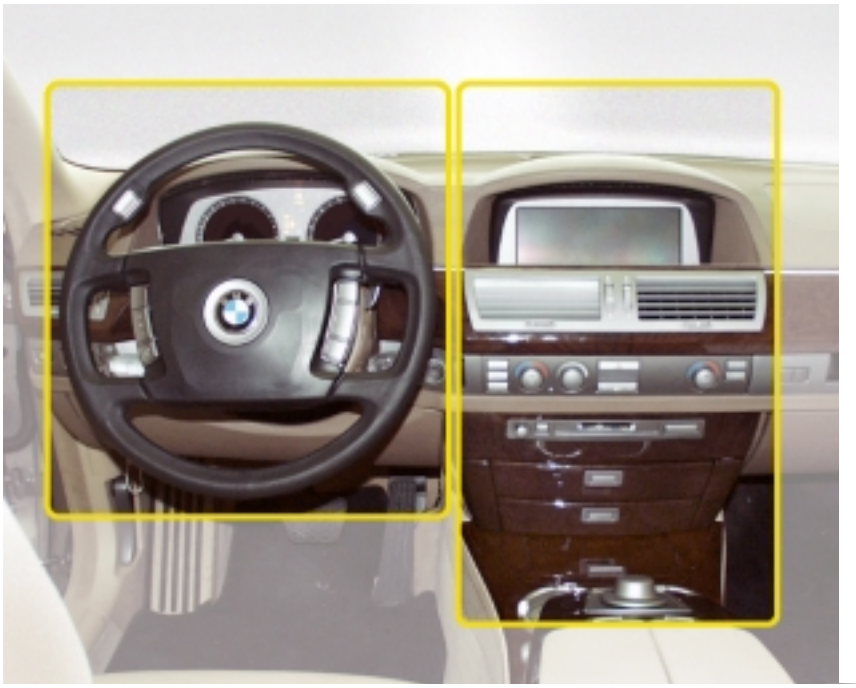
The iDrive concept is divided into two sections:

- The "Driving Area" (steering wheel and immediately adjacent controls operated by driver only); all driver-operated functions are concentrated in the area immediately with in the driver's reach.

- The "Comfort Area" (in the middle of the dashboard) which gives both the driver and front passenger easy access to all convenience functions.



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Tri-Level Function Structure

1. Basic functions such as gear shifting, windscreen wipers and electro-mechanical parking brake (EMF), that are of greatest importance in terms of driving and safety, are positioned in the area around the steering wheel within the immediate reach of the driver.

2. Frequently used basic functions such as lights, air conditioning/ heating temperature, radio volume and rear window heater are controlled by means of switches on the instrument panel in the conventional manner.

3. The additional convenience, communication and driver-assistance functions are operated by means of the Controller (central control device) and displayed on the Control Display (central display screen).

Driving Area

Components

The following components are within the Driving Area:

- Ignition Switch (CAS/ZAS) with start/stop button.
- Instrument Cluster.
- Steering Column Switch Center (SZL).
- Multi-function Steering Wheel (MFL).
- Electro-mechanical Parking Brake button (EMF).

All important control functions for driving and road safety such as automatic transmission selector lever, cruise control switch and turn indicator and high beam switches are arranged within the Driving Area. That means that the driver can direct his/her full attention to the road and traffic conditions.

1. **Ignition Switch (CAS/ZAS)**
2. **Instrument Cluster**
3. **Steering Column Switch Center (SZL) and Multi-Function Steering Wheel (MFL).**
4. **Parking Brake Button.**

Ignition Switch (CAS/ZAS)

The car can be started by means of the start/stop button in combination with the ignition switch and key once access authorization has been confirmed (clearance signal from Car Access System) and the brake pedal is depressed.

The start/stop button can also be used to switch off the engine or to select the various electrical system statuses when the brake pedal is not depressed.

The ignition switch no longer consists of the conventional ignition switch/steering lock and matching ignition key. The ignition switch now consists of:

- Remote control holder unit with electro-mechanical lock.
- Start/stop button.
- Coil for scanning the transponder and charging the battery in the remote control.

Refer to the chapter “Power Management for more information concerning the ignition switch functions.

Instrument Cluster (refer to separate module)

As the description of the instrument cluster is very extensive, it has not been included here in the module on the "Driving Area."

Information about the instrument cluster can be found in the separate module, "E65 Instrument cluster."

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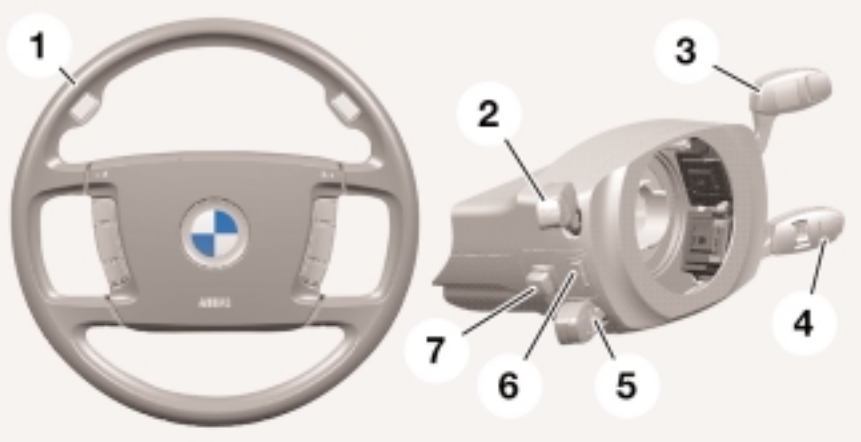
Steering Column Switch Center (SZL)

The Steering Column Switch Center (SZL) handles all functional components of the Multi-Function Steering Wheel (MFL) and the steering column. Those functions include:

- Audio system, telephone, transmission shift, horn and a freely programmable-function button via the MFL function buttons.
- Direction indicators/high-beam headlights, transmission selector lever, windscreen wiper, cruise control via the 4 control stalks on the steering column.
- Electrical steering wheel adjustment via the button on the left of the steering column.
- Steering wheel heater via the button on the left of the steering column.



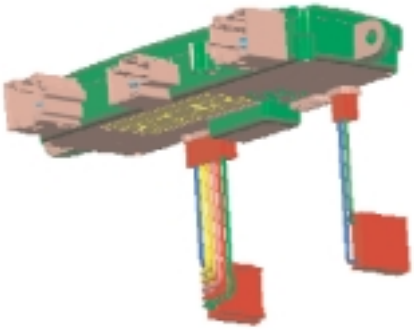
1. **MFL with function buttons.**
2. **Turn signal/high beam stalk.**
3. **Transmission selector lever.**
4. **Wiper switch**
5. **Cruise control stalk**
6. **Steering wheel heating switch.**
7. **Steering column adj. stalk.**

The electronic control system for the SZL is divided between two electronic modules that are integrated respectively in the Steering Column Switch Center and inside the steering wheel.

Signal transmission from the controls of the MFL is passed on to the SZL by means of a coil-spring (slip-ring) conductor.

The steering angle sensor for DSC is also integrated in the SZL. The SZL processes the control commands and sends them via the *byteflight* bus system to the appropriate control units (e.g. DSC, LM).

The E65 is the first model on which a steering column switch center with such an extensive range of functions has been used.



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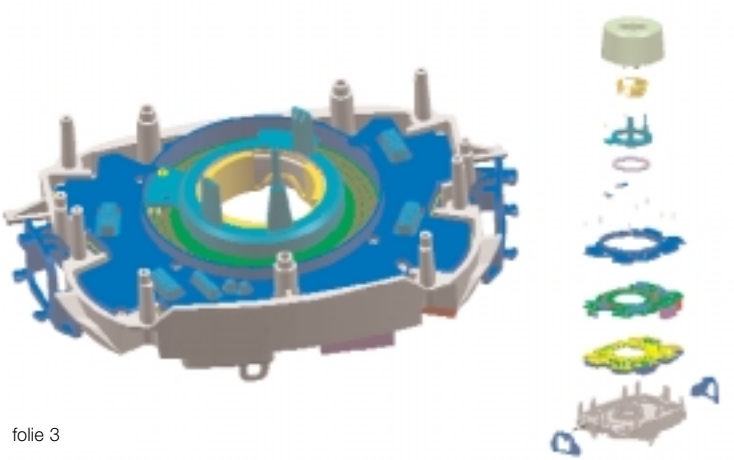
Integrated Steering Wheel Electronics Module located in steering wheel.



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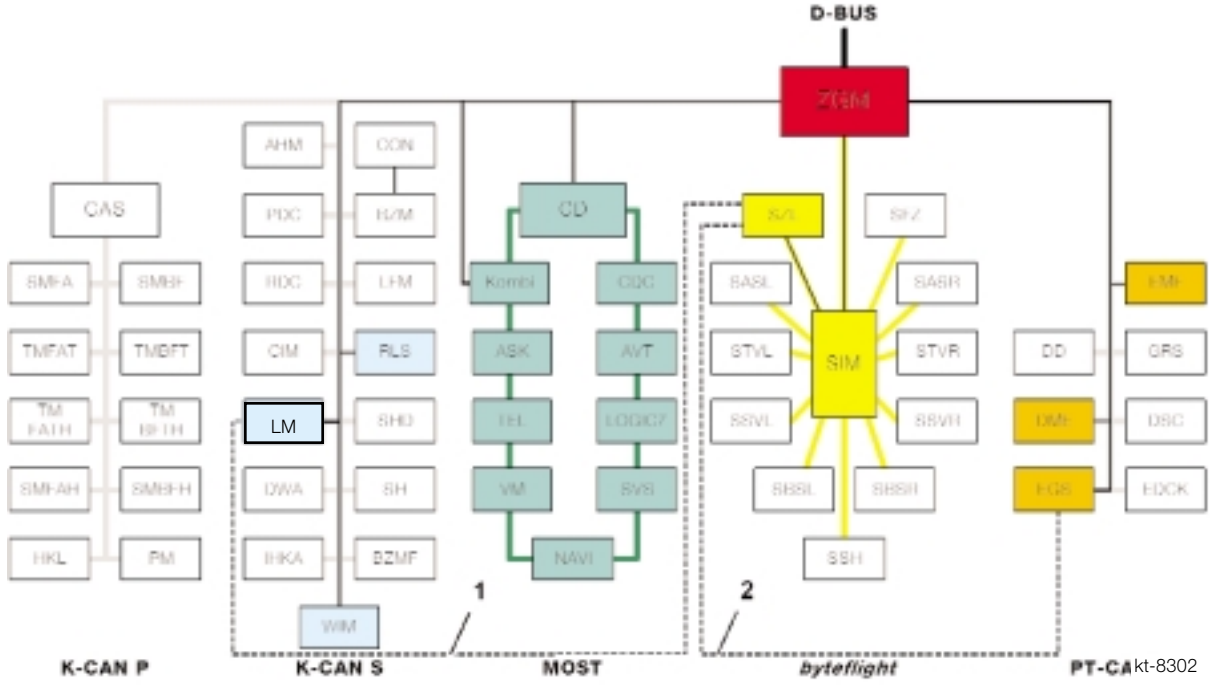
Exploded view of the SZL and integrated steering angle sensor.

The steering angle sensor is a component of the SZL module and is integrated inside it.



The SZL is a satellite of the overall ISIS system (Intelligent Safety and Integration System) on the ***byteflight*** bus system.

More detailed information about the Intelligent Safety and Integration System can be found in the chapter "Passive Safety."

In addition to the bus link, there are also two hard-wire cable connections to the LM and EGS systems for (redundancy) safety reasons.

Steering Wheel Components

The Multi-Function Steering Wheel (MFL) in the E65 is the most complex steering wheel produced by BMW and consists of the following components:

- Steering wheel
- Airbag unit
- Left and right-hand function buttons
- Shift buttons
- Steering wheel module (control unit)

In addition to the MFL buttons familiar from the E38, the transmission can now also be shifted from the steering wheel. The left-hand group of function buttons on the steering wheel are used to control the functions: voice input, audio/nav/telephone(volume), telephone (send/end call).

The function buttons on the right operate the functions: “Low” program for the transmission , station search for radio channels, and an additional programmable function button.

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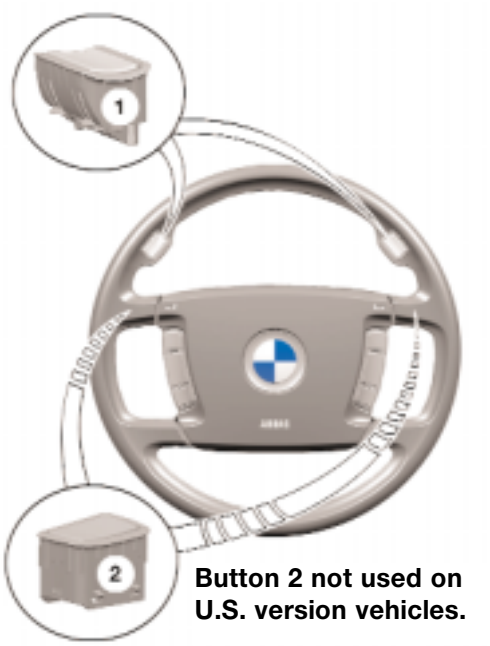
1. **Steptronic Buttons for up-shifting (not used for 745i)**
2. **Shift buttons for down-shift.**
3. **“Low” program button.**
4. **Search buttons for audio system.**
5. **“Free” programmable button.**
6. **Telephone send/end button.**
7. **Volume control.**
8. **Voice input (push-to-talk).**

Transmission Shift Buttons

The transmission shift buttons are integrated in the steering wheel. For reasons of convenience (changing gear one-handed) the switches are duplicated on each side



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Button 2 not used on U.S. version vehicles.

"Low" program: Operating the two buttons on the face of the steering wheel signals the EGS (TCM) to perform a down-shift.

Before the EGS (TCM) will respond to the buttons the "Low" program must be activated using the "L" button in the right-hand MFL button group.

The shift buttons are Hall-effect sensors.

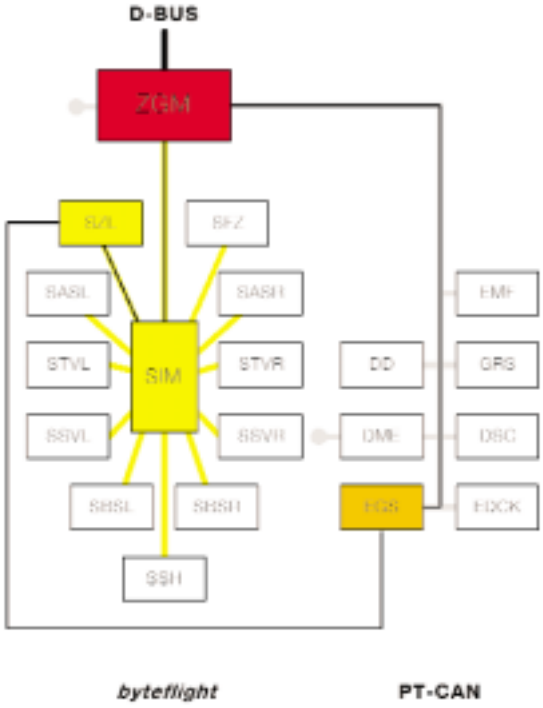
Signal Path

When the shift +/- buttons are pressed, the signal is sent via the steering wheel electronics module and the slip-ring to the SZL module.

From the SZL the signal is passed on to the *byteflight* bus.

It then travels via the Safety Information Module (SIM) and the Central Gateway Module (ZGM) to the PT-CAN and ultimately the EGS (TCM) where it is processed.

For safety reasons, there is a hard-wired serial data cable available as redundant back-up in case of any bus problems.



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MFL Function Buttons

Left-Side Function Buttons

Pressing the voice input button ("push to talk") activates the Speech Processing System (SVS).

The +/- rocker allows adjustment of the volume of audio system, telephone and navigation system. The telephone receiver button is used to make or end a telephone call or accept an incoming call.

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Right-Side Function Buttons

Pressing the L button signals the EGS (TCM) to engage the “Limiting program”. The limiting mode is indicated on the instrument cluster display by the letter "L" when active. Pressing the button again restores the normal drive program.

See the chapter “GA6HP 26Z” for functional information.

Pressing the “up/down” rocker button activates the radio station search function. When a compact disc is playing, touching the rocker button moves playback to the next/previous track. With a telephone, it can be used to scroll through the stored phone book.

The bottom button is a programmable-function button with Key Memory function. The Key Memory function allows the button to be programmed differently for different drivers (keys).

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The "Settings" menu in the Control Display offers a choice of functions such as "Automatic Hold" (automatic parking brake operation) and "Air Recirculation" for which the button can be programmed.

Those functions are selected using the controller. The button is then assigned the selected function.

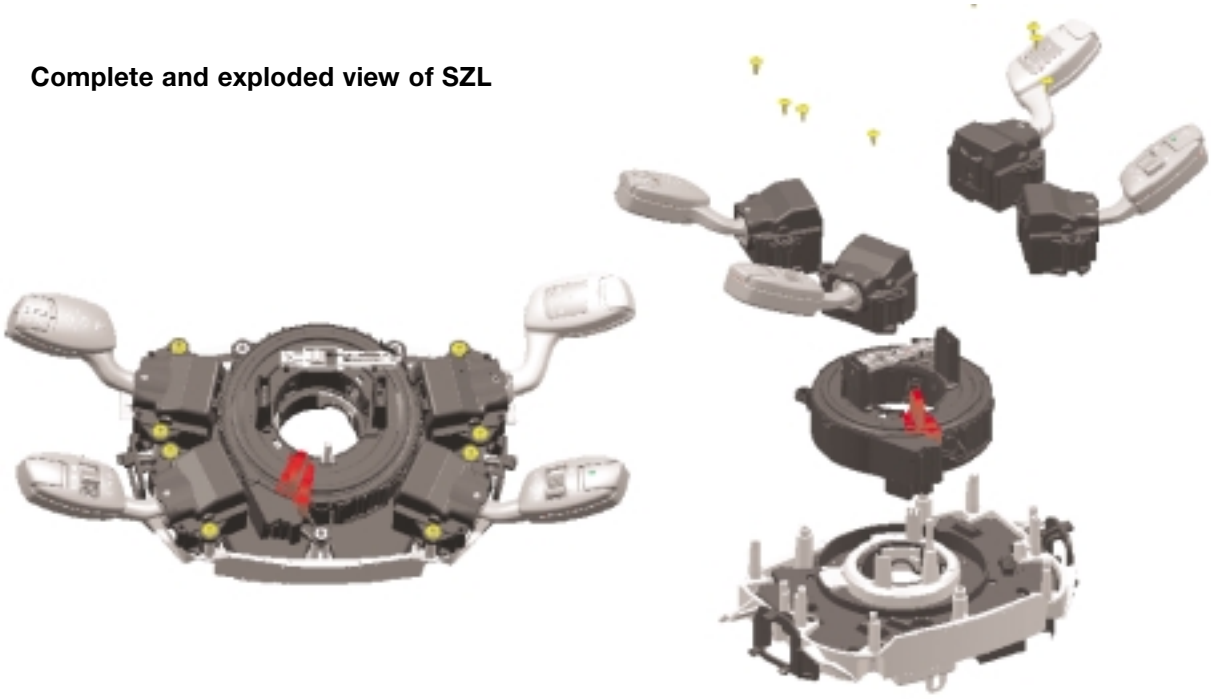
Steering Column Components

The 4 steering column stalks and the steering column module (SZL) are a single unit.

The steering column stalks of the SZL are:

- Turn signal and high beam switch.
- Transmission selector lever.
- Wiper switch.
- Cruise control lever.

Complete and exploded view of SZL



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On the E65, a new design of steering column stalk has been introduced.

What is new is that the steering column stalks are now essentially buttons (momentary switches).

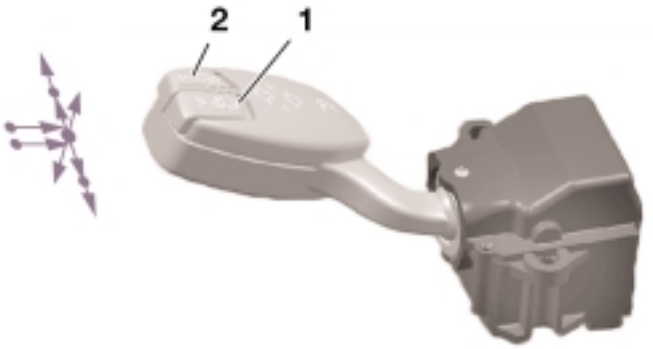
That means that they no longer engage in fixed positions for their various functions.

In order to operate the direction indicators, for example, the stalk is pushed beyond a point of resistance (detent). When released, it returns to its center position.

Turn signal, High beam, BC and CC Switch

The turn signal and high beam switch is a button (momentary switch) that is used to operate the high beam, direction indicators and to switch on the parking lights.

The turn signal switch incorporates two axial (push button) switches for the On-Board Computer displays.



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The top switch (2) activates the board computer display on the instrument cluster below the tachometer. This shows information such as average fuel consumption and average speed. The lower switch (1) activates the On-Board Computer display on the instrument cluster below the speedometer. This shows information such as fuel level and range.

Automatic cancelling of the turn signals is controlled by the signal from the steering angle sensor. The SZL sends the command via the bus system to the light module (LM) where it is converted.

Brief operation of the turn signals can be accomplished by touching the stalk as far as (but not beyond) the point of resistance.

The parking light function is switched on by pressing the stalk beyond the point of resistance when the ignition is off. The function is cancelled by pressing the stalk in the opposite direction.

To switch the high beam “ON”, the stalk is tapped forwards, and to switch high beam “OFF” or flash the headlights, it is tapped backwards. When the driver operates the turn signal or high beam switch, a message is sent to the light module.

The signal travels from the SZL via the ***byteflight*** bus to the SIM. From there is passes to the ZGM and onto the K-CAN SYSTEM and the light module (LM).

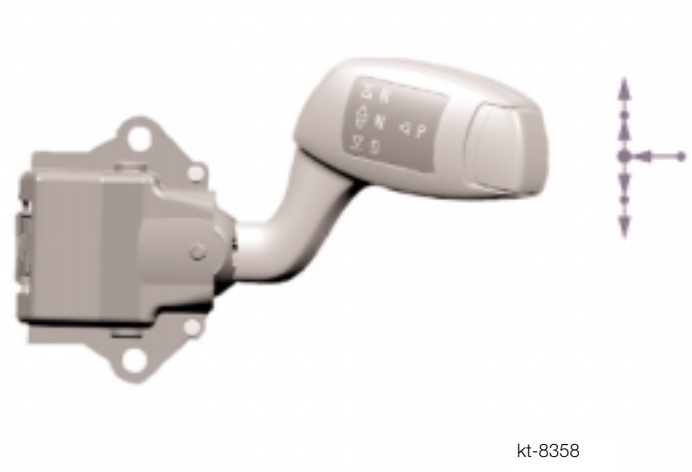
The light module simultaneously analyzes a redundant back-up signal from the SZL. This is transmitted via a separate lead. This means that the signal is independent of the K-CAN SYSTEM and the ***byteflight*** bus.

The purpose of this duplication is to ensure vehicle safety. Even if the bus systems fail, the functions can still be operated.

Transmission Selector Lever

The new automatic transmission for the E65 has an electronic gear shift system. That means there is no mechanical link between the selector lever and the gearbox.

The transmission selector lever is positioned on the right-hand side of the steering column and like the turn signal switch, is a momentary switch.



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The selector lever is used to select the transmission modes R - N - D and P.

Advantages of electronic gear shift system:

- Greater ease of operation, e.g. the parking lock is engaged automatically when the key is removed from the ignition.
- The components of an electronic gear shift system take up less space.
- No transmission of noise or vibration as there is no physical connection between lever and gearbox.
- Electronic shift lock prevents unauthorized operation. This means that the steering lock is no longer required as an anti-theft feature.

The transmission selector lever is the main input device for controlling the electronic transmission control unit (EGS).

The selector lever has 7 Hall-effect sensors that are duplicate-coded in such a way that the failure of one of sensors does not result in failure of the complete selector lever.

The driver's request is detected by the dual-system sensors in the transmission selector lever and transmitted by the SZL to the electronic transmission control unit (EGS).

The EGS checks that the gear shift is permissible and initiates the operation via the electronic-hydraulic control unit that is integrated in the automatic gearbox.

The currently selected gear and any Check Control messages such as "Press brake pedal to engage gear" are displayed on the instrument cluster for the information of the driver.

The selector lever signals are not carried out unless the EGS has received a clearance signal from the Car Access System (CAS). That means that an authorized key must have been detected in the holder unit of the ignition switch. If the key is removed from the ignition, the parking lock is automatically engaged.

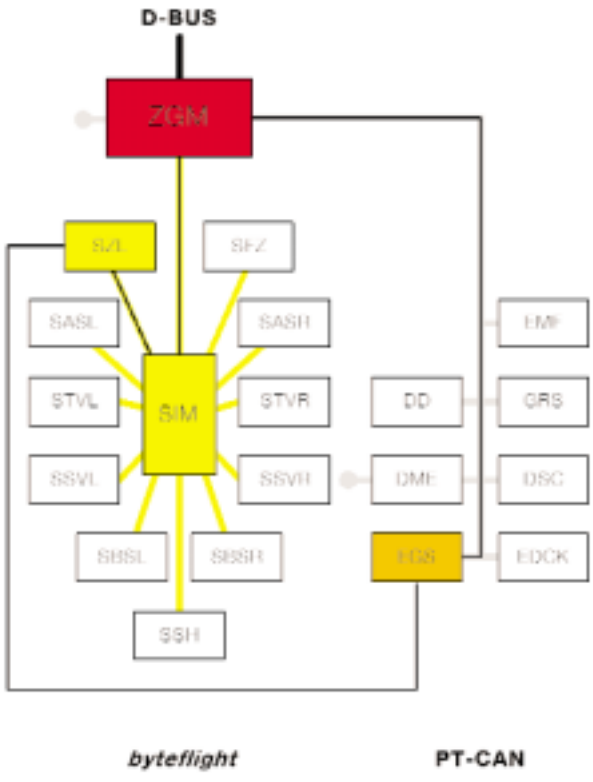
The gear shift "gate" pattern on the selector lever is fitted with locator lighting (controlled by terminal 58g).

When the selector lever is operated, the signal is transmitted to the SZL.

From the SZL the signal is passed to the byteflight bus.

It then travels via the SIM and the ZGM to the PT-CAN and ultimately the electronic transmission control unit (EGS) where it is processed.

For safety reasons, there is a serial cable available as redundant back-up in case of any bus problems.



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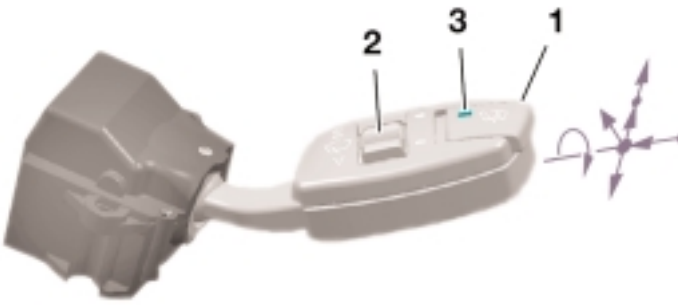
Wiper Switch

The wiper switch is also a momentary switch. It does not engage in fixed positions for its various functions.

The control concept incorporates a sequential mode. That means that the wiper speed settings are selected by tapping the stalk repeatedly the required number of times in the desired direction.



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The wiper switch also incorporates an axial (push-button) switch (1). The Rain/Light sensor (RLS), system is switched on and off by this switch. The function is indicated by an LED (3).

When the ignition is switched “OFF”, the wiper and the rain sensor are switched off at the same time.

The rain sensor is activated by means of the push-button switch on the wiper stalk. The LED then lights up.

When the rain sensor is switched on, the windscreen wipers are controlled automatically according to how much precipitation (rain or snow) is on the windscreen.

That includes switching them on and off and selecting the required setting from intermittent to continuous wipe. The rain sensor is switched off by touching the push-button switch again or automatically when the ignition is switched OFF.

The adjuster wheel sets the sensitivity of the rain sensor to a choice of 4 levels.

Cruise Control Lever

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The cruise control (FGR) is a function of the DME (ECM) and has multi-speed storing capability on the E65.

This new multi-speed function allows the driver to program and store multiple speed settings which can then be activated as desired.

Frequently required speed settings such as 55, 65 or 70 mph can be selected directly at the touch of a button without having to drive the vehicle at precisely that speed beforehand. This is a considerable added convenience. Those preset cruise control speeds are programmed by the driver in advance and then activated when driving.The memory can store up to 6 preset speeds.

Information on programming and deleting preset speeds is found in the "ME 9.2" chapter.

1. **Speedometer display**
2. **Preset speed markers**
3. **Cruise control active pointer illuminated.**
4. **Cruise control not active pointer dim.**

Function	Operation
Engage cruise control Accelerate/set	Push lever forward
Decelerate/set	Pull lever back
Activate Multi-speed function	Push lever forward past detent
Select higher preset speed	Push lever forward past detent
Select lower preset speed	Pull lever back past detent
Cancel cruise control	Tap lever up/down
Resume/set/delete preset speeds	Touching lever inwards

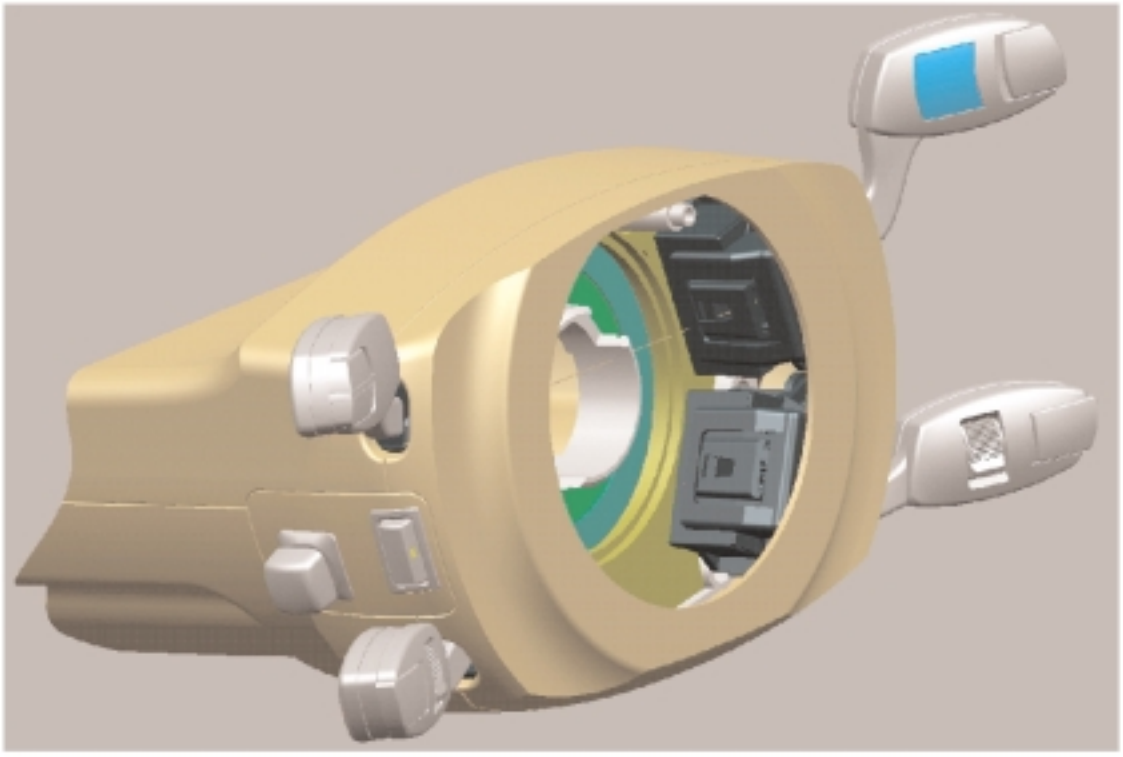
The signal path for the cruise control switch is from the SZL to the SIM to the ZGM via the ***byteflight***.

The signal then is placed on the PT-CAN by the ZGM and received by the DME (ECM).

Steering Column Adjustment

The E65 is supplied with electrical steering column adjustment.

The adjuster knob for the adjustment is located on the left-hand side of the steering column trim.



The electrical steering column adjustment incorporates the comfort entry function. The steering wheel can be adjusted fore and aft and vertically to suit the driving position.

The steering wheel position is a car memory function and is memorized together with the driver's seat position and stored in the Seat Module (SMFA).

When the ignition is switched off and the door opened, the steering wheel is moved to its highest and most forward position to make getting in and out of the car easier.

The adjuster button has four possible directions of movement. These enable the steering wheel to be moved up, down, forwards or backwards.

The signal from the adjustment knob is from the SZL to the SIM to the ZGM via the ***byte-flight***. The signal then is placed on the K-CAN-S by the ZGM and received by the CIM.

Control of the electric motors for steering column adjustment is carried out by the Chassis Integration Module (CIM)

Steering Wheel Heater Switch

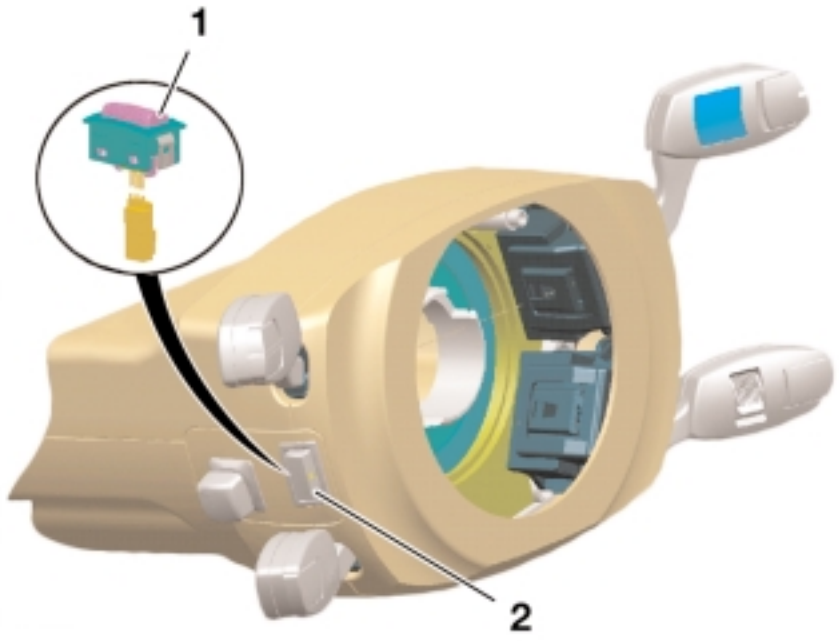
The steering wheel heater is switched on by a button on the left-hand side of the steering column between the two steering column stalks.

It can be switched on provided the electrical system status is at least terminal 15. An LED on the switch indicates when the steering wheel heater is on.

The steering wheel heater consists of a coil heater element in the steering wheel rim.

A temperature sensor (PTC sensor) in the steering wheel sends the temperature signal back to the steering wheel electronics module.

Operation of the steering wheel heating is explained in the “Central Body Electronics” Chapter.



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Electro-Mechanical Parking Brake Button

The parking brake is an automated electro-mechanical parking brake system (EMF) introduced for the first time on the E65.

When the engine is running, the parking brake system operates the front and rear disc brakes via the brake hydraulics. When the engine is switched off, the parking brake is operated by an electro-mechanical system. Two cables are then used to actuate the rear parking brake drums.

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When the vehicle is stationary with the ignition switched on, the parking brake is applied or released by pressing the button.

The parking brake can also be applied with the ignition switched off. The indicator lamp on the instrument cluster lights up briefly.

The parking brake can only be released when the ignition is switched on.

In an emergency, (e.g. if the brake pedal is jammed by an object), the parking brake can also be used as a dynamic emergency brake when the vehicle is in motion.

The vehicle is then braked by means of the brake hydraulics and the front and rear disc brakes as long as the parking brake button is pressed.

Automatic application of the parking brake, e.g. in stop-and-go traffic or when performing a hill start (Automatic Hold), can be activated/deactivated on the Control Display ("Settings" menu) using the Controller. Automatic Hold is a key memory function.

If automatic application is activated, "Auto P" appears on the instrument cluster.

If the parking brake is released by pressing the button when the engine is running, this also deactivates the automatic application function.

Review Questions

1. List the controls found within the driver area of iDrive.

2. How many control modules make up the Steering Column Switch Center (SZL)?

3. Which functions of the SZL use a redundant hardwired-data cable for plausibility and safety?