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E70 Interior Lighting

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Interior Lighting

Model: E70

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Identify the components used in the interior lighting system
- Explain which control units are responsible for the interior lighting system
- Understand the Welcome light feature

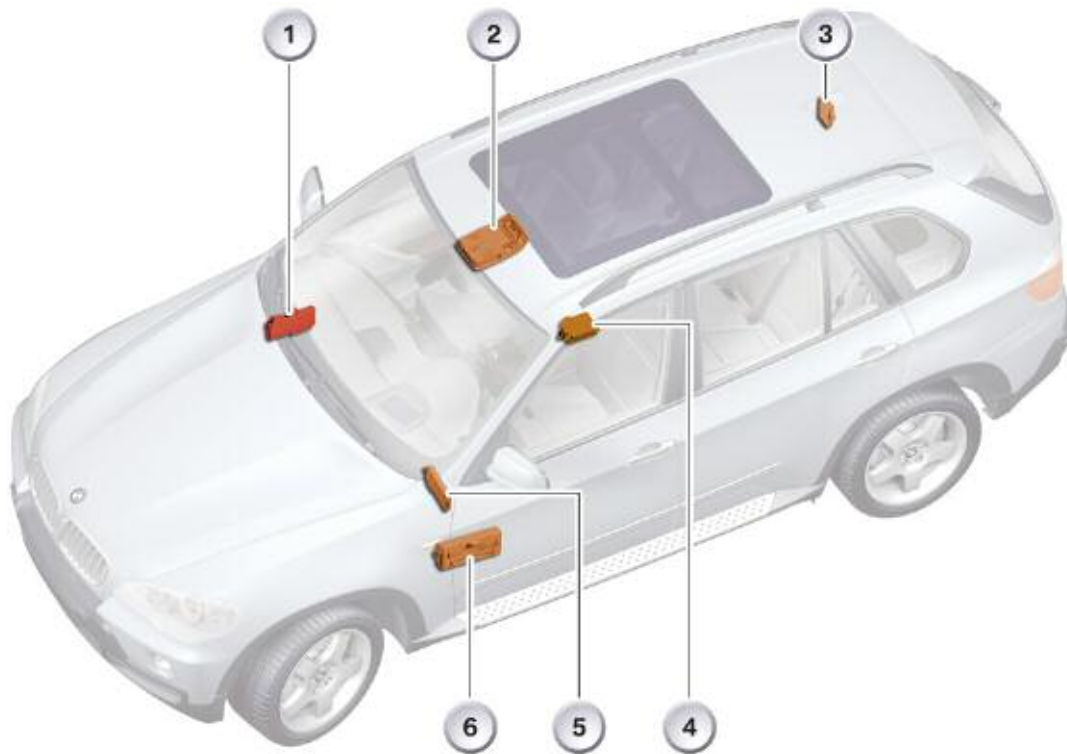
Introduction

The interior lighting in the E70 is based on the interior lighting system implemented in the E90. The interior lighting comprises the roof area, luggage compartment, footwell and inner door lighting.

The lighting in outer area of the doors is provided by the courtesy lighting (outer door handles) and the exit lights. The interior lighting in the roof area on the rear driver and passenger sides consists of two separate lamps. A new feature is the split glove compartment.

The complete glove compartment lighting is powered and controlled by an electronic module in the unlocking/release drive unit.

The following diagram shows where the control units responsible for the interior lighting are located in the E70.



Index	Explanation
1	Junction box control unit
2	Advanced crash safety management
3	Roof function center
4	Car access system 3
5	Comfort Access
6	Footwell module

Equipment Variants

The interior lighting system in the E70 is available in the standard version and the optional version SA 563 or included with the premium package.

The following table provides an overview showing what components are installed in the respective configuration variant.

Component	Standard	Option SA
Front interior lights unit with: <ul style="list-style-type: none"> • Interior light with interior light switch • Reading light with reading light button, driver and passenger • Top light, driver and passenger 	X X X	
Front door compartment lighting, driver/passenger side Front door handle lighting, driver/passenger side Front sill lighting, driver/passenger side Exit light, driver/passenger side Courtesy lighting, driver/passenger side Vanity mirror light, driver and passenger Footwell lights, driver and passenger Glove compartment light		X X X X X X X X
Rear interior lights unit, driver and passenger side: <ul style="list-style-type: none"> • Interior light with interior light switch • Reading light with reading light button, driver and passenger 		X X
Rear interior light, driver/passenger side Rear door compartment lighting, driver/passenger side Rear door handle lighting, driver/passenger side Rear footwell lights, driver and passenger Rear sill lighting, driver/passenger side Rear exit light, driver/passenger side Courtesy lighting, driver/passenger side	X	X X X X X X

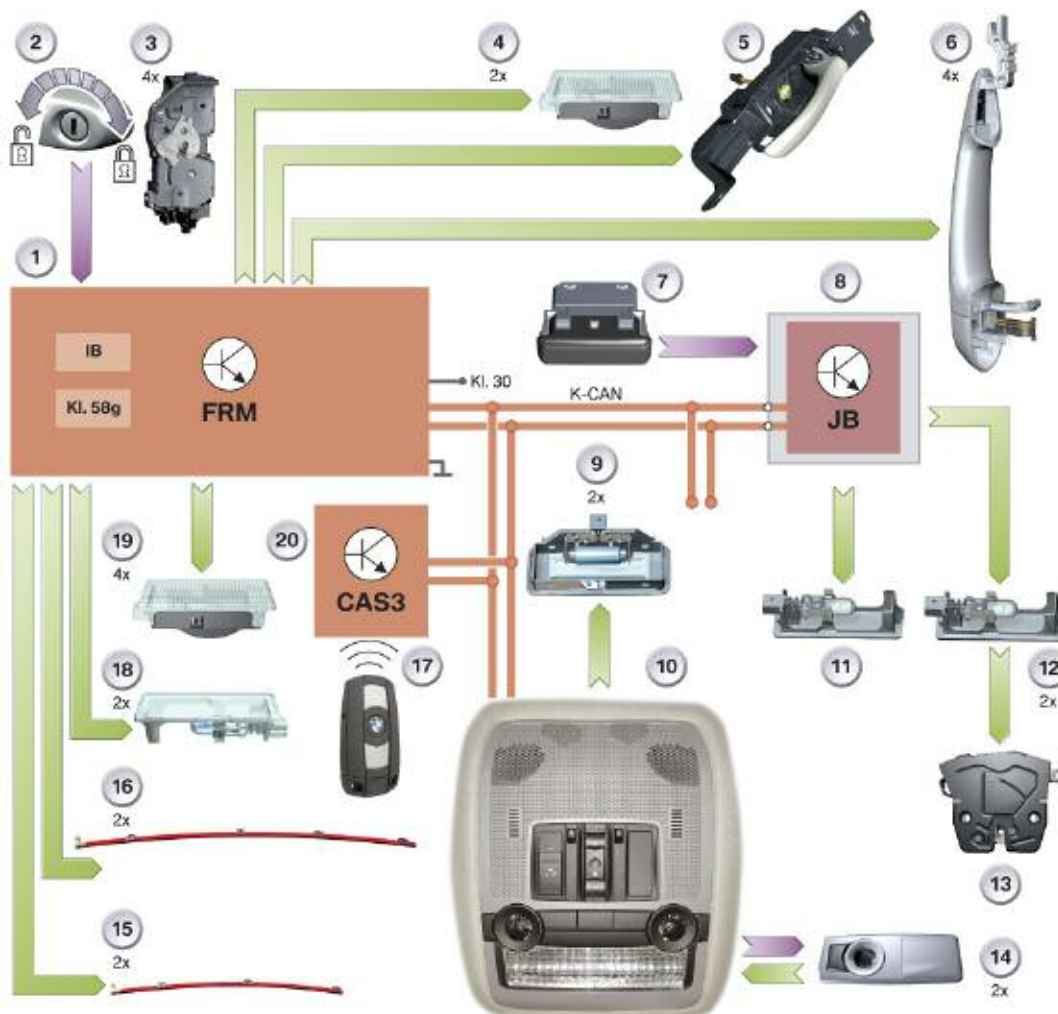
System Overview

The input/output diagram comes immediately after the following description and shows a general overview of the input and output signals.

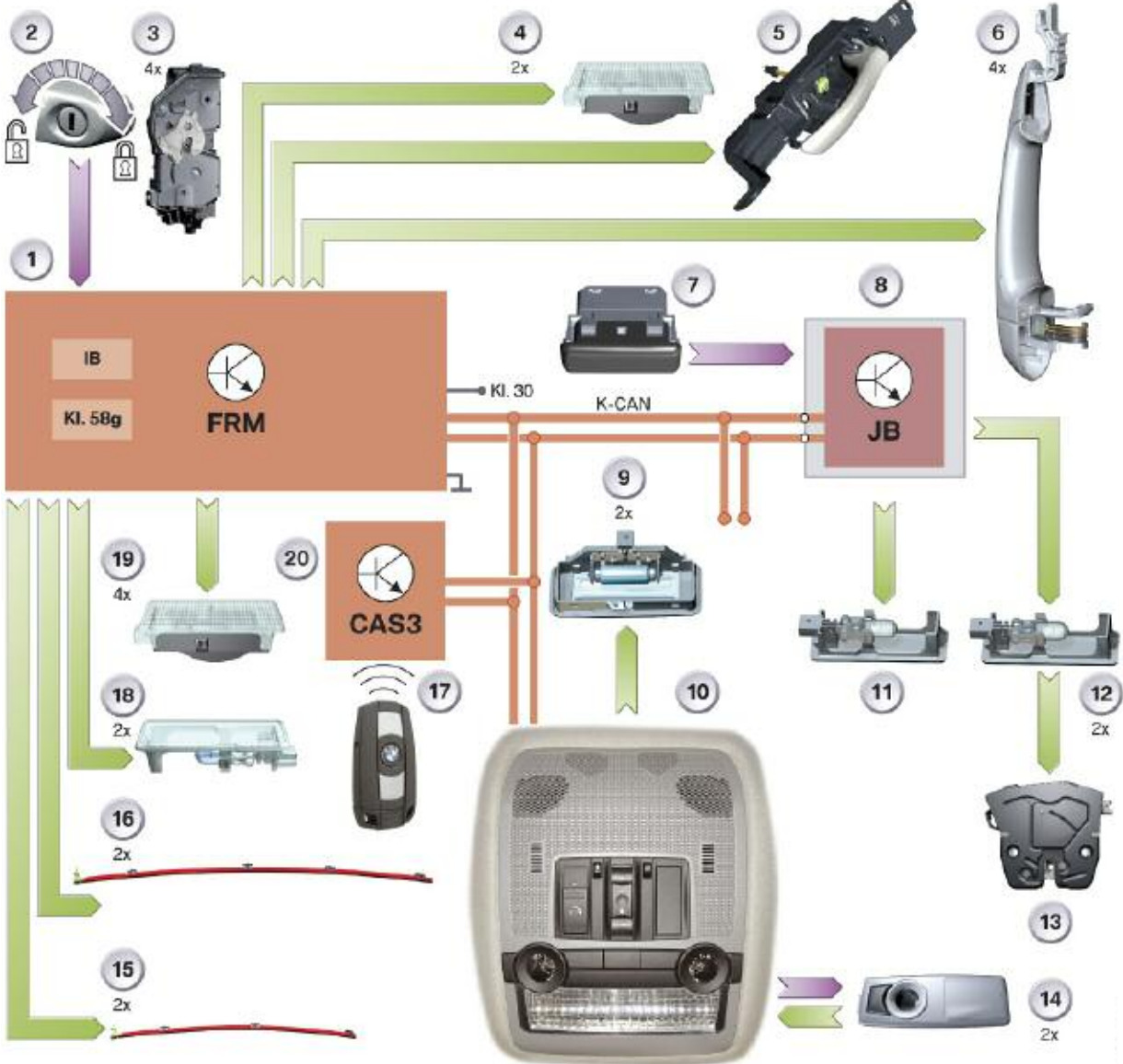
The status of the door contact (Hall sensor) in the lock (3) changes, for example, when the door is opened with the vehicle unlocked. The footwell module (1) evaluates the status and sends the request to switch on the interior lighting. The roof functions center (10) switches on the interior lighting in the area of the roof.

Parallel to this, the exit light (19) of the opened vehicle door as well as the footwell lighting (18) are switched on. The status of the door contact changes again when the vehicle door is closed. The footwell module initiates the procedure to switch off the interior lighting.

The status of the rear hatch contact in the rear window central locking (13) changes when the rear hatch is opened. The lighting for the luggage compartment (14) is connected to the power supply via terminal 30g so that the luggage compartment lights are switched on via the rear hatch contact.



Input/Output Interior Lighting

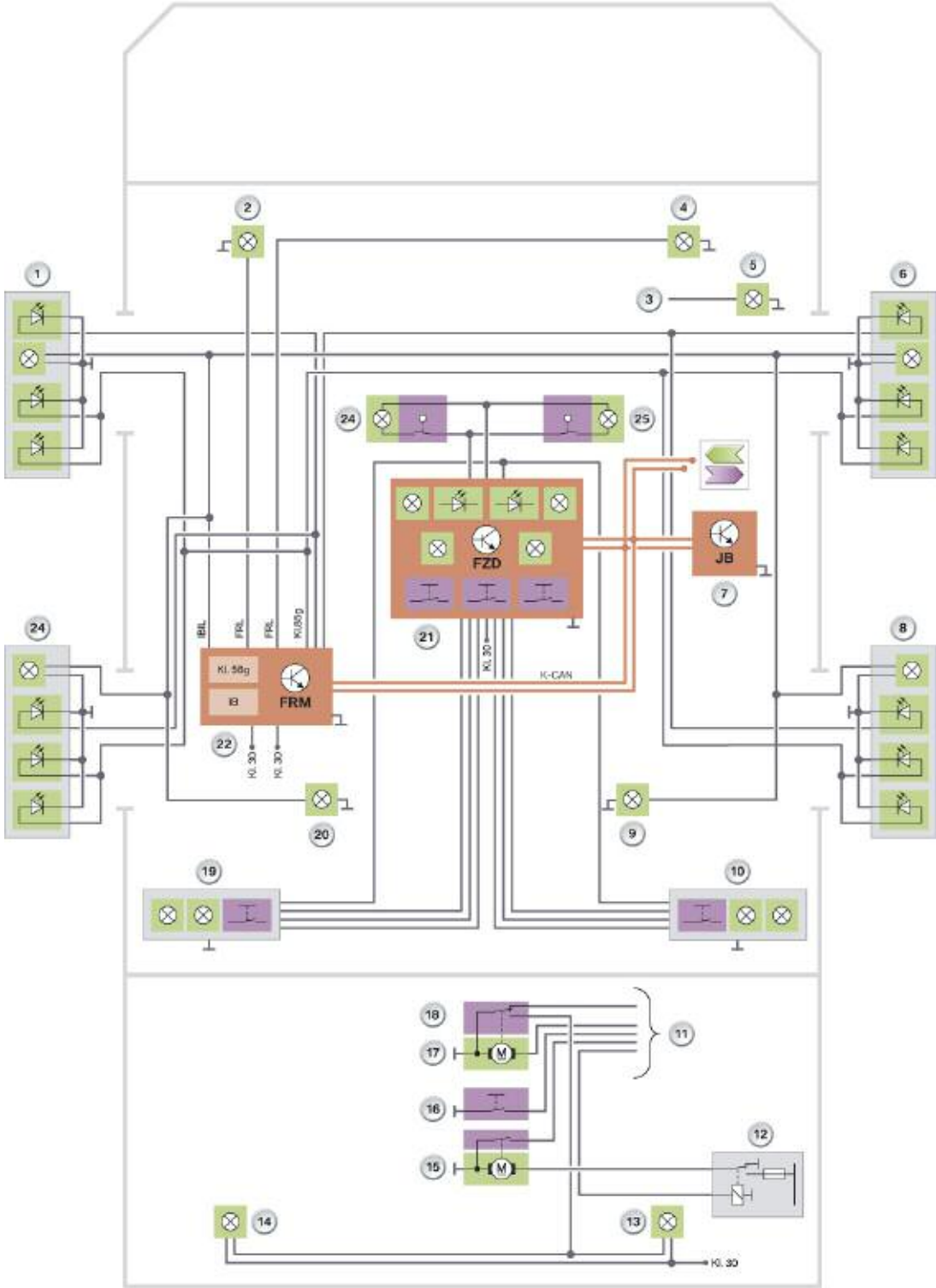


Legend for Input/Output Interior Lighting

Index	Explanation	Index	Explanation
1	Footwell module FRM	13	Central locking, rear hatch
2	Driver's door lock barrel	14	Rear reading/interior light 2x
3	Lock with door contact	15	Door compartment lighting, rear
4	Front footwell light 2x	16	Door compartment lighting, front
5	Grip recess plate lighting, inner door handle	17	Identification transmitter
6	Courtesy lighting, outer door handle 4x	18	Footwell light 2x
7	Glove compartment button	19	Exit light 4 x
8	Junction box control unit JB	20	Car access system 3 CAS 3
9	Vanity mirror light 2x	K-CAN	K-CAN Body CAN
10	Roof functions center	KL 30	Kl. 30 Terminal 30
11	Glove compartment light	KL 58g	Terminal 58g
12	Luggage compartment lighting	IB	Interior lighting control

K-CAN signals at the footwell module			
In/out	Information	Source/sink	Function
In	Status, central locking	Car access system 3 > footwell module	Interior lighting ON
In	Status, central locking	Car access system 3 > footwell module	Interior lighting OFF
In	Crash signal	Crash sensor > advanced crash safety management	Interior lighting ON
Out	Electrical load cutout	Footwell module > junction box control unit	Interior lighting OFF through electrical load cutout
Out	Status, terminal 58g	Light switch > footwell module	Instrument lighting ON (control buttons, instrument cluster, gear selector lever)

Schematic System Circuit Diagram



Legend for Schematic System Circuit Diagram

Index	Explanation	Index	Explanation
1	Lighting in driver's door	16	Automatic soft-close drive unit
2	Footwell light, driver's side	17	Central locking, rear hatch
3	Glove compartment unlock drive unit	18	Rear hatch contact
4	Footwell light, front passenger's side	19	Interior/reading light, rear driver's side
5	Glove compartment light	20	Footwell light, rear driver's side
6	Lighting in passenger's door	21	Roof functions center FZD with interior/reading light and top light at front
7	Junction box control unit JB	22	Footwell module FRM
8	Lighting in door, rear passenger's side	23	Lighting in door, rear driver's side
9	Footwell light, rear right	24	Vanity mirror light with switch, driver's side
10	Interior/reading light, rear passenger's side	25	Vanity mirror light with switch, passenger's side
11	Connection to junction box control unit	K-CAN	Body CAN
12	Relay for automatic soft-close drive unit	KL 30	Terminal 30
13	Luggage compartment light, right	KL 58g	Terminal 58g
14	Luggage compartment light, left	IB	Interior lighting control
15	Outer rear hatch button		

Note: Concerning item 3: The in-car unlock/release drive unit of the glove compartment supplies the power for the glove compartment lighting (5).

K-CAN signals at the footwell module			
In/out	Information	Source/sink	Function
In	Status, central locking	Car access system 3 > footwell module	Interior lighting ON
In	Status, central locking	Car access system 3 > footwell module	Interior lighting OFF
In	Crash signal	Crash sensor > advanced crash safety management	Interior lighting ON
Out	Electrical load cutout	Footwell module > junction box control unit	Interior lighting OFF through electrical load cutout
Out	Status, terminal 58g	Light switch > footwell module	Instrument lighting ON (control buttons, instrument cluster, gear selector lever)

System Components

Interior Lighting, Front

The components for the interior lighting in the front roof area are integrated in the roof functions center and in the sun visors. The footwell lighting is located on the underside of the dashboard.

Roof Function Center

The interior light unit is integrated in the roof functions center. Therefore, a roof functions center is always installed in the E70.

The vanity mirror lighting on the driver and passenger sides is powered by the roof functions center.

Various equipment options make it necessary to install additional components in the roof functions center.

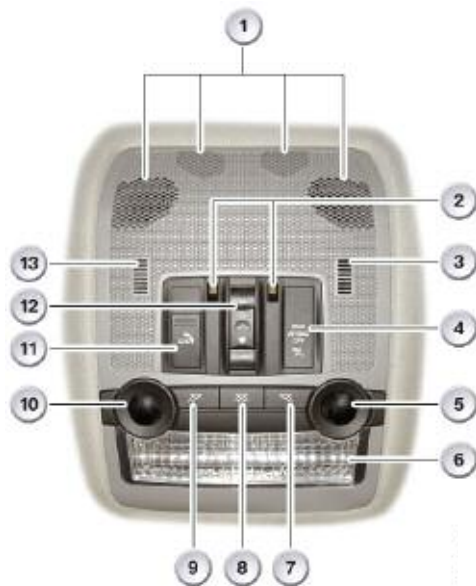
If a panoramic glass roof is installed, the roof functions center contains not only the button for the panoramic glass but also the necessary control and monitoring facilities.

The ultrasonic interior movement detector is completely integrated in the roof function center on vehicles equipped with an anti-theft alarm system.

The roof function center simply loops through the signals for all other components. This means the components are connected directly to their respective control units.

These components are:

- Emergency call button
- Passenger airbag OFF lamp
- Microphone for telephone
- Microphone for voice input.



Index	Explanation
1	Openings for ultrasonic interior movement detector
2	Ambient lighting
3	Passenger's side microphone for voice input
4	Passenger airbag OFF light
5	Passenger's reading lamp
6	Interior light
7	Passenger's reading light button
8	Interior lighting button
9	Driver's reading light button
10	Driver's reading light
11	Emergency call button
12	Button for panoramic glass roof
13	Telephone microphone, driver's side

Interior Light Unit, Rear

Two versions of the rear interior light unit are available for the E70:

- Standard version connected directly to the footwell module
- Optional version connected directly to the roof functions center.

In the standard version, the E70 has one interior light at the rear left and right.

The optional version features one interior light unit at the rear left and right.

The interior light unit consists of:

- Reading light, rear left/right with button
- Interior light.

Rear interior light/interior light unit



Index	Explanation
1	Interior light, rear
2	Rear interior light with button and reading lamp
3	Rear interior light, panoramic glass roof
4	Rear interior light, panoramic glass roof with button and reading light

Control Units

The "interior lighting" function is distributed over several control units that communicate with each other via the K-CAN. The individual control units are described in the following.

Car Access System 3

The car access system 3 sends the request to unlock/lock the central locking via the K-CAN.

The signals are required to switch the interior lighting on and off.

Footwell Module

Based on the signals from the car access system 3, the footwell module recognizes the request to switch the interior lighting on/off.

The following components are actuated directly by the footwell module:

- Courtesy lighting
- Exit lights
- Handle-recess light
- Storage space lighting
- Footwell lighting

The footwell module sends the roof function center the information to switch on the interior lighting in the roof area. The individual lamps are activated by the roof functions center.

The footwell module evaluates the status of the door contacts. The interior lighting is switched on when a door is opened.

Junction Box Control Unit

The junction box control unit is the interface to the luggage compartment and glove compartment lighting. It supplies the power (terminal 30g) the lighting in the luggage compartment. For lighting purposes, it reads the status of the button for unlocking and releasing the glove compartment.

The junction box control unit is connected directly to the electronics of the unlock/release device on the left and right, which it uses to make available the start signal for unlocking the glove compartment.

Roof Functions Center

The roof functions center directly activates the front interior light unit and powers the rear interior light unit on the C-pillar. The vanity mirrors are also powered by the roof function center.

Principles of Operation

The interior lighting on the E70 is switched on and off by the footwell module FRM.

The roof functions center FZD is responsible for the interior lighting components in the roof area.

The luggage compartment lighting is connected directly to terminal 30g. The following description outlines the interaction between the control units and functions in the interior lighting system.

Footwell Module

The footwell module is the central control unit for the interior lighting system. All interior lighting outputs of the footwell module are pulse-modulated. This ensures the interior lighting functions at a constant brightness level in the event of voltage fluctuations. The pulse width modulation is additionally used for the soft ON/soft OFF function.

The footwell module features the following functions for the interior lighting:

- Switching the interior lighting on/off
- Electric load shut-down after 8 minutes
- Lighting via terminal 58g.

Switching On

The footwell module receives numerous input signals that switch on the interior lighting. The input signals from the footwell module are read in directly or received via the K-CAN. The input signals for the interior lighting are listed in the following.

Input Signals	From
Central locking signals	CAS 3
Crash signal	ACSM
Door contacts	FRM
Driver's door barrel lock	FRM
Interior light switch	FRM/FZD
Central locking, rear hatch	JB

■ Switching-on Conditions

The interior lighting is switched on in response to one of the following conditions for switching on the interior lighting. The switch-on function is limited in terms of time. The electrical loads are:

- Unlock via barrel lock in driver's door
- Unlock via remote control/identification transmitter
- Terminal R OFF when terminal 58g was ON max. 2 minutes ago
- Lock button on remote control/identification transmitter pressed when the central locking has been in central arrest state for longer than 10 s

The interior lighting remains permanently switched on in certain situations. These situations are:

- Receiving crash signal
- Interior lighting button briefly pressed.

Switching Off

The footwell module receives numerous signals to switch off the interior lighting. The signals are received via the K-CAN or are read in directly by the footwell module.

■ Switch-off Conditions

The interior lighting is switched off under the following conditions:

- Central locking in central arrest, all doors and the rear hatch are closed
- Terminal R OFF after 8 minutes (electric load shut-down)
- Interior lighting button pressed for longer than 3 s
- Terminal R ON with doors closed
- Terminal 58g ON and terminal R OFF. The interior lighting is switched off if no door is opened within 20 s.
- The interior lighting is switched off if the vehicle is unlocked via the remote control/identification transmitter and no door is opened after 20 s.
- Terminal R OFF and a vehicle door is opened for longer than 1 minutes
- "Power down" via diagnosis

Electric Load Shut-Down

As from terminal R OFF, the interior lighting system is switched off by the footwell module after 8 minutes. For this purpose, the footwell module sends the electric load shut-down information via the K-CAN.

The roof functions center FZD receives this information and switches off the interior lighting in the roof area.

The interior lights that are switched on directly by the footwell module are also switched off.

Terminal 58g

The footwell module makes available terminal 58g via the K-CAN or conventionally wired. Terminal 58g is pulse width-modulated and features the following two brightness levels:

- The brightness level for the locator lighting is individually adjustable using the thumb wheel on the lights operating unit.
- The brightness level for the function lighting is not dimmed and is switched on at full brightness.

Hazard Warning Switch

As soon as the hazard warning switch is pressed, the footwell module switches on the switch lighting at full brightness.

Note: The hazard warning switch is not illuminated at full brightness level at terminal 58g. The brightness depends on the setting of the locator lighting.

Roof Functions Center

For the interior lighting system, the roof functions center represents the interface to the footwell module. Both control units are connected to the K-CAN to facilitate communication between each other. For instance, the roof functions center receives the instruction to switch the interior lighting on or off via the K-CAN.

The roof functions center is the link to the interior lights on the left and right in the rear area of the roof.

Interior Lighting Functions

The interior lighting functions in the roof functions center are:

- Switching the interior lighting on/off on request from the footwell module
- Reading the signals from the interior light buttons and transferring them to the footwell module
- Reading the signals from the interior light buttons at the rear left and right and transferring them to the footwell module.

Terminal 58g

The roof functions center receives the terminal 58g signal from the footwell module via the K-CAN and activates the lighting in the buttons.

Luggage Compartment Lighting

The junction box control unit provides the power supply (terminal 30g) for the luggage compartment lighting.

The status of the rear hatch contact changes when the rear hatch is opened manually or via the remote control/identification transmitter. This means the luggage compartment lights are connected to ground and therefore switched on.

The status of the rear hatch contact changes when the rear hatch is closed again. The ground connection is interrupted and the luggage compartment lighting switched off.

Glove Compartment Lighting

The electronics in the unlock/release devices of the glove compartment receive the request to open the glove compartment when the button to open the glove compartment is pressed.

The junction box control unit reads in and makes available the signal from the button. The electronic module in the unlock/release device (on inside of vehicle) evaluates the signal and switches on the glove compartment lighting. The lighting is switched on with the "Soft ON" function and off with the "Soft OFF" function.

This function is derived from the interior lighting.

The glove compartment lighting is switched off by closing the glove compartment.

Note: The electronic module in the unlock/release device on the inner side of the vehicle is always responsible for the glove compartment lighting.
The glove compartment lighting is connected directly to terminal 30g.

Car Access System 3

The car access system 3 makes available the status of the central locking system via the K-CAN. In this way, the footwell module recognizes when the vehicle has been unlocked and consequently switches on the interior lighting.