

Technical training.
Product information.

G05 General Vehicle Electronics



BMW Service

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Technical Training

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General information

Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:



Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

Information status: July 2018

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

The information contained in the training course materials is solely intended for participants in this training course conducted by BMW Group Technical Training Centers, or BMW Group Contract Training Facilities.

This training manual or any attached publication is not intended to be a complete and all inclusive source for repair and maintenance data. It is only part of a training information system designed to assure that uniform procedures and information are presented to all participants.

For changes/additions to the technical data, repair procedures, please refer to the current information issued by BMW of North America, LLC, Technical Service Department.

This information is available by accessing TIS at www.bmwcenternet.com.

Additional sources of information

Further information on the individual topics can be found in the following:

- Owner's Handbook
- Integrated Service Technical Application
- Aftersales Information Research (AIR)

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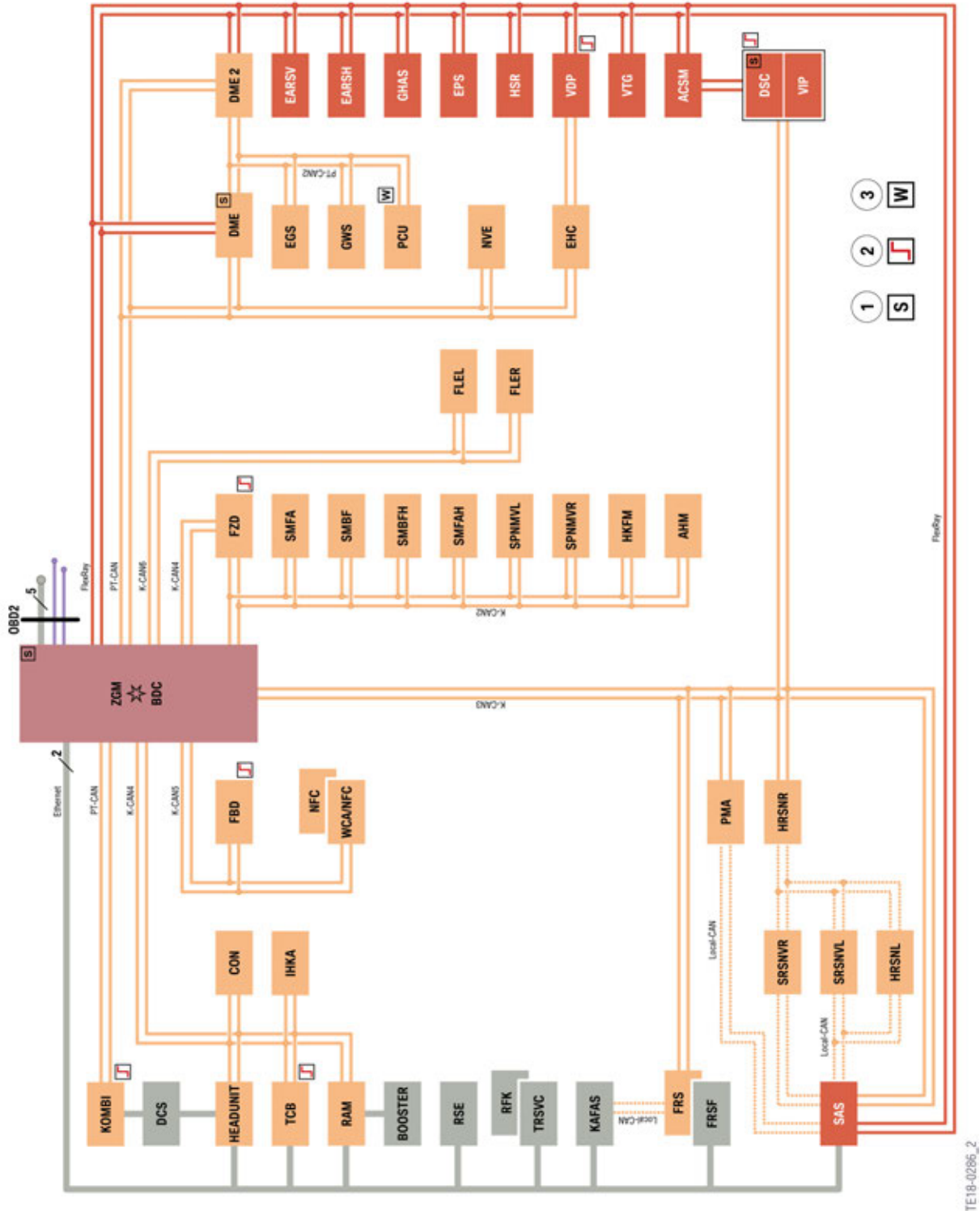
1. Introduction

The Service Pack 2018 vehicle electrical system is used in the G05. The technology and the design of the 2018 vehicle electrical system is described in the Product Information "ST1856 General Vehicle Electronics 2018", as in also features in other BMW Group vehicles. Adaptations and changes to the vehicle electrical system and also be found in the Product Information "ST1856 General Vehicle Electronics 2018".

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2. Bus Systems

2.1. Bus overview



Bus overview

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2. Bus Systems

Index	Explanation
ACSM	Advanced Crash Safety Module
AHM	Trailer module
BDC	Body Domain Controller
Booster	Hi-fi booster
CON	Controller
DME	Digital Motor Electronics
DME2	Digital Engine Electronics 2
DSC	Dynamic Stability Control
DCS	Driver Camera System
EARSH	Electric active roll stabilization rear
EARSV	Electric active roll stabilization front
EGS	Electronic transmission control
EHC	Electronic ride height control
EPS	Electromechanical Power Steering
FBD	Remote control receiver
FLER	Frontal Light Electronics Right
FLEL	Frontal Light Electronics Left
FRS	Front radar sensor
FRSF	Front radar sensor long range
FZD	Roof function center
GWS	Gear selector switch
GHAS	Regulated rear axle differential lock
HKFM	Tailgate function module
HRSNL	Rear radar sensor short range left
HRSNR	Rear radar sensor short range right
HSR	Rear axle slip angle control
HEADUNIT	Head Unit
IHKA	Integrated automatic heating/air conditioning
KAFAS	Camera-based driver assistance systems
KOMBI	Instrument cluster
NFC	Near Field Communication
NVE	Night Vision Electronics
PCU	Power Control Unit
PMA	Parking Manoeuvring Assistant
RAM	Receiver Audio Module

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2. Bus Systems

Index	Explanation
RFK	Rear view camera
RSE	Rear Seat Entertainment
SAS	Optional equipment system
SMBF	Front passenger seat module
SMFA	Driver's seat module
SMBFH	Seat module, front passenger's side, rear
SMFAH	Seat module, driver's side, rear
SPNMVL	Seat pneumatics module front left
SPNMVR	Seat pneumatics module front right
SRSNVL	Side radar sensor short range front right
SRSNVR	Side radar sensor short range front left
TCB	Telematic Communication Box
TR SVC	Top rear side view camera
VDP	Vertical Dynamic Platform
VIP	Virtual Integration Platform
VTG	Transfer box
WCA	Wireless charging station
ZGM	Central Gateway Module
1	Start-up node control units for starting and synchronizing the FlexRay bus system
2	Control units authorized to perform wake-up function
3	Control units also connected at terminal 15WUP

2.2. Main bus systems

2.2.1. K-CAN

A number of K-CAN bus systems are used in the G05.

K-CAN bus systems:

- K-CAN2
- K-CAN3
- K-CAN4
- K-CAN5
- K-CAN6

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2. Bus Systems

The control units on the K-CAN5 are not displayed in the bus overview by the BMW diagnosis system. Diagnosis is performed via the Body Domain Controller.

All K-CAN data buses have a data transfer rate of 500 kBit/s.

2.2.2. PT-CAN

Two versions of the PT-CAN are used in the G05.

PT-CAN bus systems:

- PT-CAN
- PT-CAN2

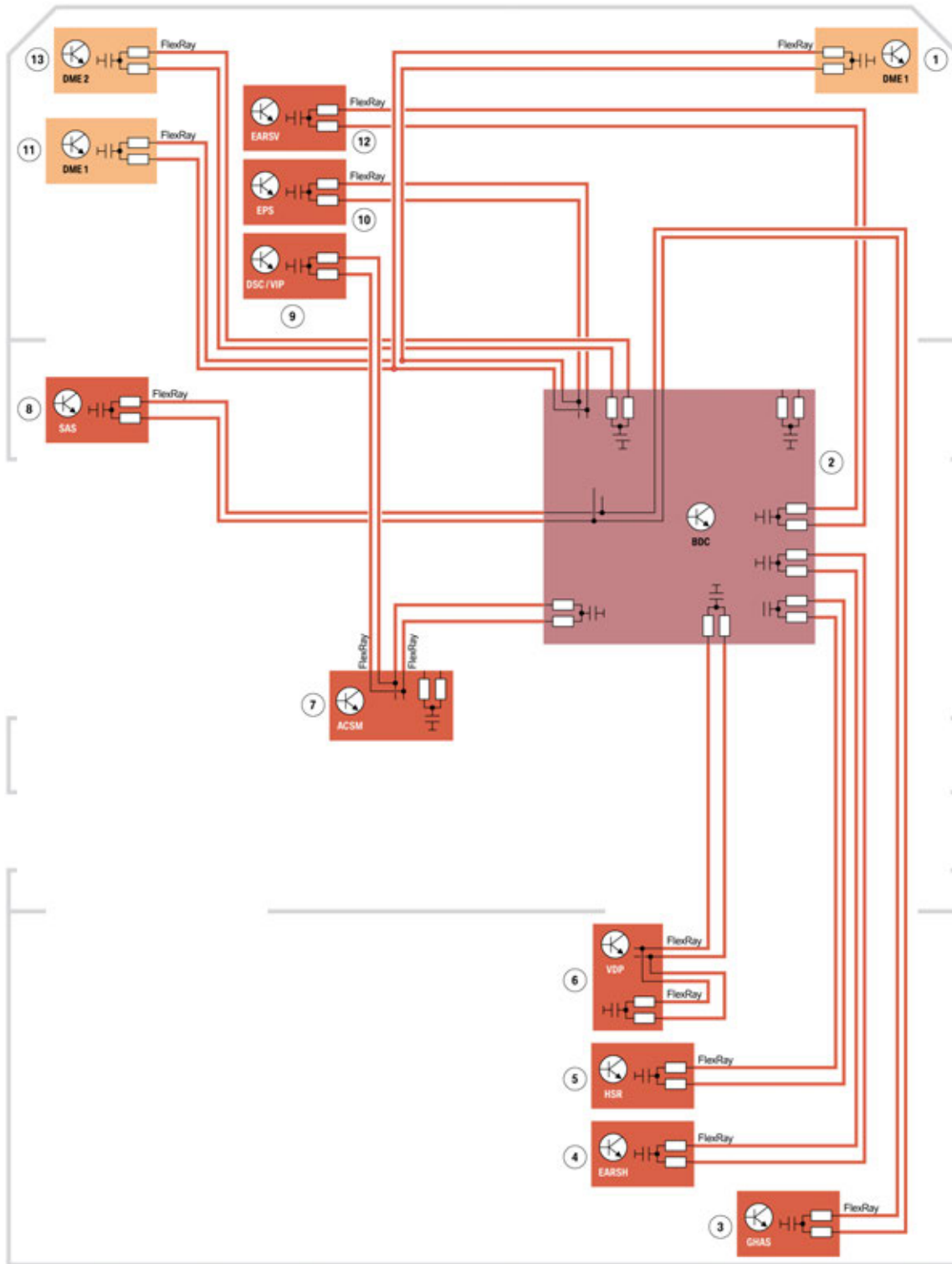
The gateway for the PT-CAN2 is located in the DME.

Both PT-CAN data buses have a data transfer rate of 500 kBit/s.

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2. Bus Systems

2.2.3. FlexRay



TE18-0503_2

FlexRay overview

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2. Bus Systems

Index	Explanation
1	Digital Motor Electronics (DME1) (only 8-cylinder engine)
2	Body Domain Controller (BDC)
3	Regulated rear axle differential lock (GHAS)
4	Electric active roll stabilization rear (EARSH)
5	Rear axle slip angle control (HSR)
6	Vertical Dynamic Platform (VDP)
7	Advanced Crash Safety Module (ACSM)
8	Optional equipment system (SAS)
9	Dynamic Stability Control (DSC)
10	Electronic Power Steering (electromechanical power steering) (EPS)
11	Digital Motor Electronics (DME1) (only 6-cylinder engine)
12	Electric active roll stabilization front (EARSV)
13	Digital Motor Electronics (DME2) (only 8-cylinder engines)

The FlexRay overview includes all engine versions and optional equipment. The DME1(no. 1) is present for 6-cylinder engines. On 8-cylinder engines the DME2 (no. 13) and DME1 (no. 1) are present. The terminating resistors for line termination are located in the control units and in the Body Domain Controller.

The FlexRay has a data transfer rate of 10 MBit/s.

2.2.4. Ethernet

Two different Ethernet versions of the are used. Thus, in the G05, the variant with 5 lines (4 data lines and 1 activation line) is used for the OBD2 interface to the Body Domain Controller. Diagnosis and programming of the connected control units are performed via the Ethernet.

The second variant is already familiar from the G12 and is used as 2-wire OABR Ethernet (Open Alliance BroadR-Reach).

Control units on the 2-wire OABR Ethernet:

- Camera-based driver assistance systems (KAFAS)
- Top Rear Side View Camera (TRSVC)
- Head Unit High (HU-H)
- Rear Seat Entertainment (RSE)
- Optional equipment system (SAS)
- Telematic Communication Box 2 (TCB2)
- Receiver Audio Module (RAM)
- Front radar sensor long range (FRSF).

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2. Bus Systems

The standard "Open Alliance BroadR-Reach" (OABR Ethernet) has been specially developed as a new data transmission layer for use in vehicles. OABR Ethernet only requires an unshielded twisted two-wire connection. OABR Ethernet supports bidirectional 100 MBit/s communication between 2 nodes. This means that both nodes can simultaneously send and receive at a data transfer rate of 100 MBit/s. OABR Ethernet requires point-to-point networking. This means that the bus system is not split up between multiple nodes, as is the case e.g. with the CAN (Controller Area Network). Instead, Ethernet switches are used for the connection of further nodes. Today, Ethernet switches are integrated in the following control units: Body Domain Controller (BDC), head unit (HU), optional equipment system (SAS), top rear side view camera (TRSVC).



A wake-up line may be required for control units that are only connected to the Ethernet and are not additionally connected to a K-CAN.

Control units on the Ethernet cannot be woken up via the bus. Instead, the control units are activated via the wake-up line or switched directly via terminal 15.

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2. Bus Systems

Index	Explanation
1	Front radar sensor long range (FRSF)
2	Front camera
3	Camera-based driver assistance systems
4	Body Domain Controller
5	Exterior mirror camera, right
6	Rear view camera (RFK) (single camera without KAFAS)
7	Rear view camera
8	Booster
9	Receiver Audio Module (RAM)
10	Telematic Communication Box (TCB)
11	Rear Seat Entertainment (RSE)
12	Exterior mirror camera, left
13	Head Unit High (HU-H)
14	Instrument cluster (KOMBI)
15	Driver Camera System (DCS)
16	Top Rear Side View Camera (TR SVC)
17	Optional equipment system (SAS)

2.2.5. D-CAN

The D-CAN is still needed for control units which do not have an Ethernet connection for diagnosis. The D-CAN has a data transfer rate of 500 kBit/s.

Diagnosis and programming of the connected control units are performed via the D-CAN.

2.3. Sub-bus systems

The sub-bus systems on the one hand relieve the load on the main bus systems and on the other hand do not require a high data transfer rate.

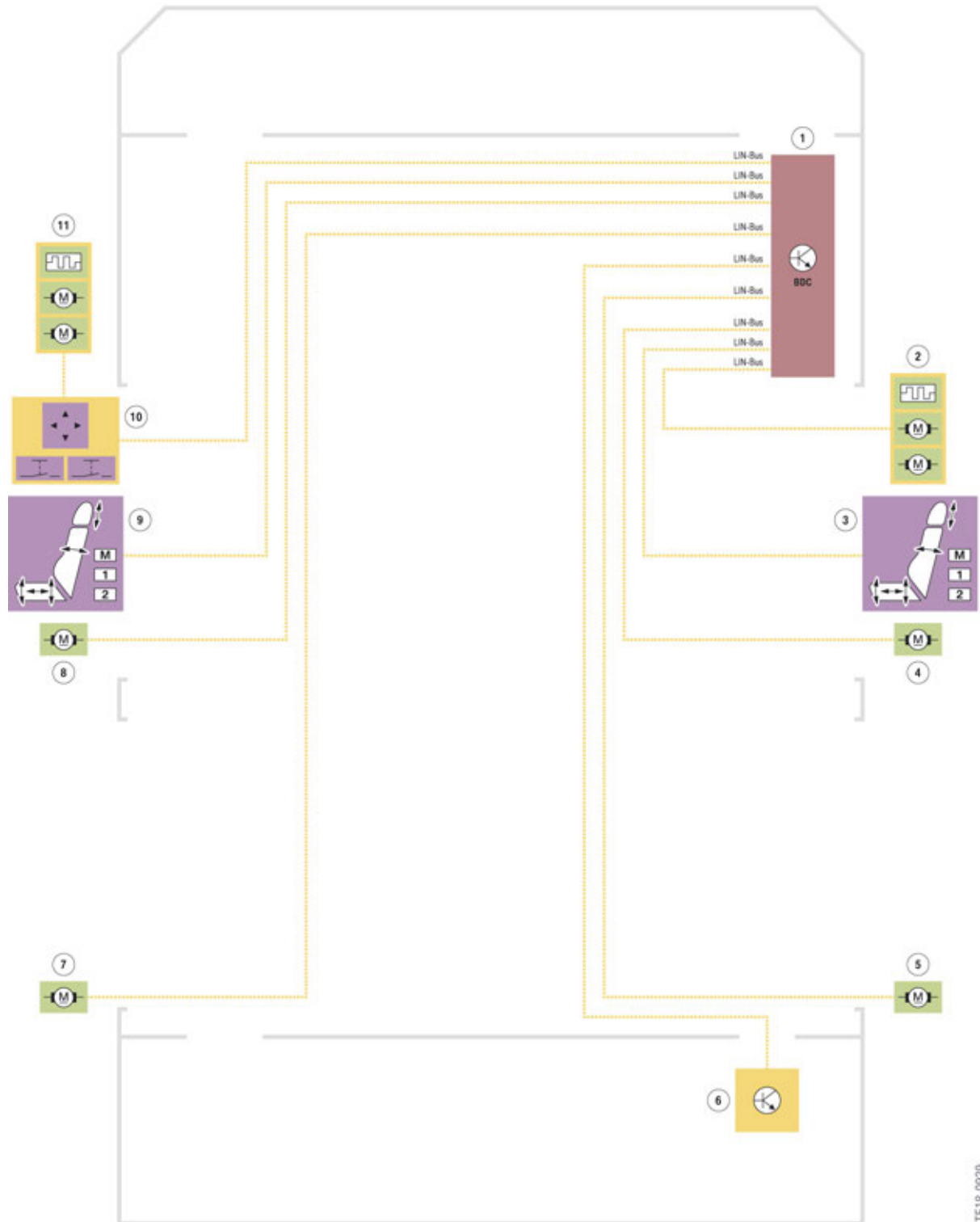
2.3.1. LIN bus

For a better overview, the LIN buses are divided up between several wiring diagrams for the G05.

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2. Bus Systems

LIN bus in the area of the doors



LIN bus overview in the area of the doors

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G05 General Vehicle Electronics

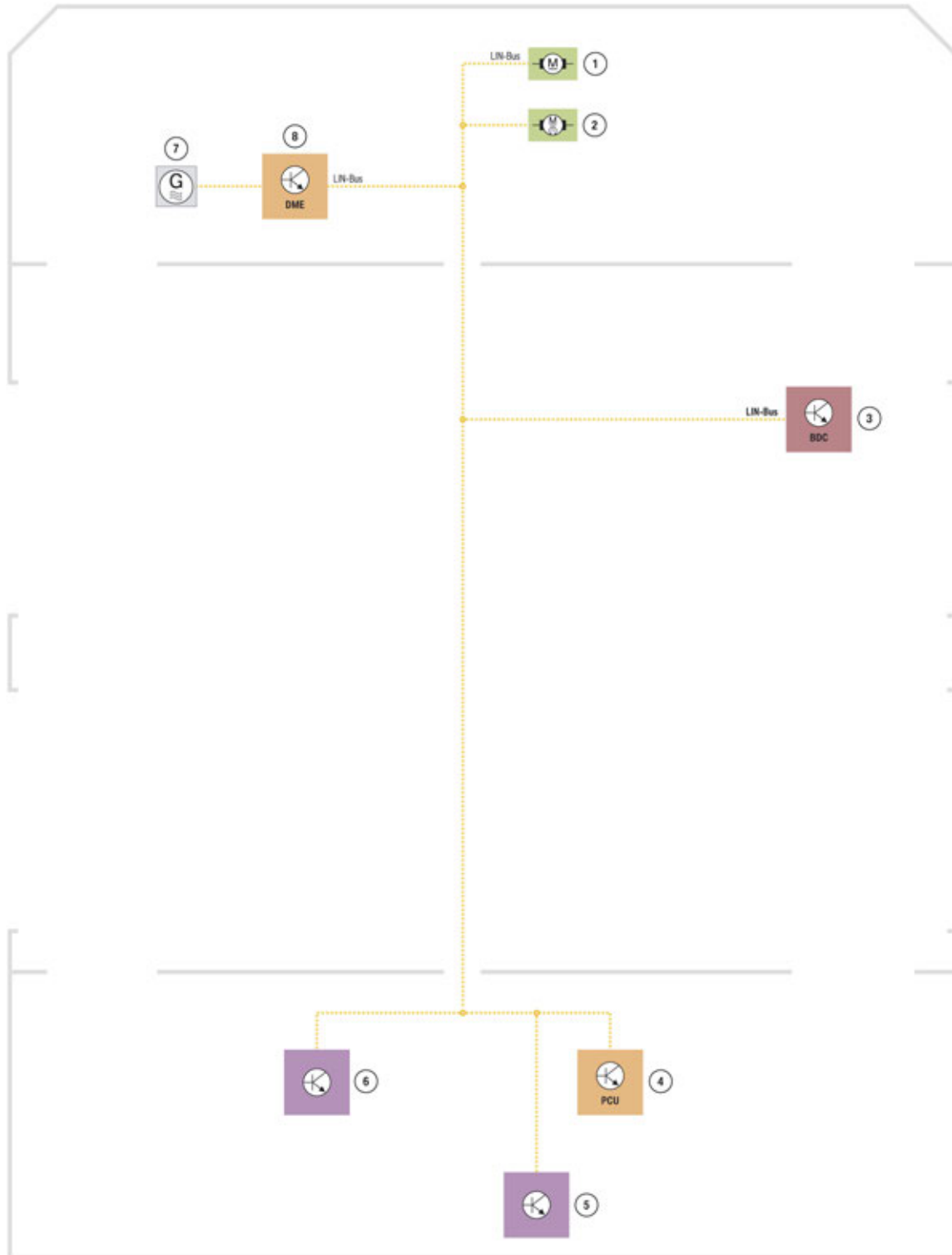
2. Bus Systems

Index	Explanation
1	Body Domain Controller (BDC)
2	Exterior mirror, front passenger side
3	Memory seat, front passenger's side
4	Power window electronics, passenger's side front
5	Power window electronics, passenger's side rear
6	Non-contact tailgate opening
7	Power window electronics, driver's side rear
8	Power window electronics, driver's side front
9	Memory switch, driver's side front
10	Switch block, driver's door
11	Exterior mirror, driver's side

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2. Bus Systems

LIN bus for engine electrical system and voltage supply



LIN bus overview for engine electrical system and voltage supply

TE18-0505

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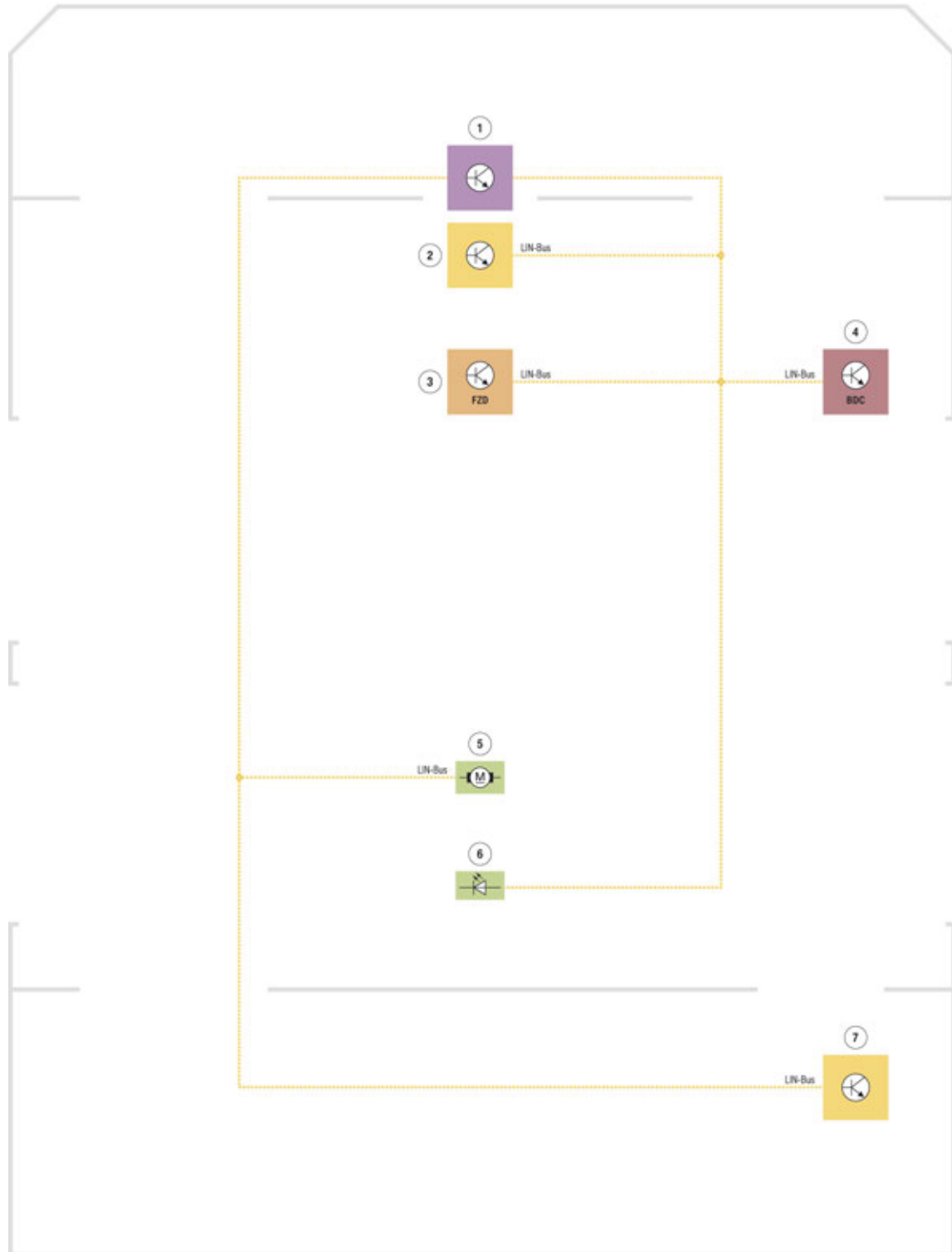
2. Bus Systems

Index	Explanation
1	Air damper control
2	Electric fan
3	Body Domain Controller (BDC)
4	Power Control Unit (PCU) 500 W
5	Power distribution box, rear right
6	Intelligent Battery Sensor (IBS)
7	Alternator
8	Digital Motor Electronics (DME)

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2. Bus Systems

LIN bus for roof function center



LIN bus overview for roof function center

TE18-0930

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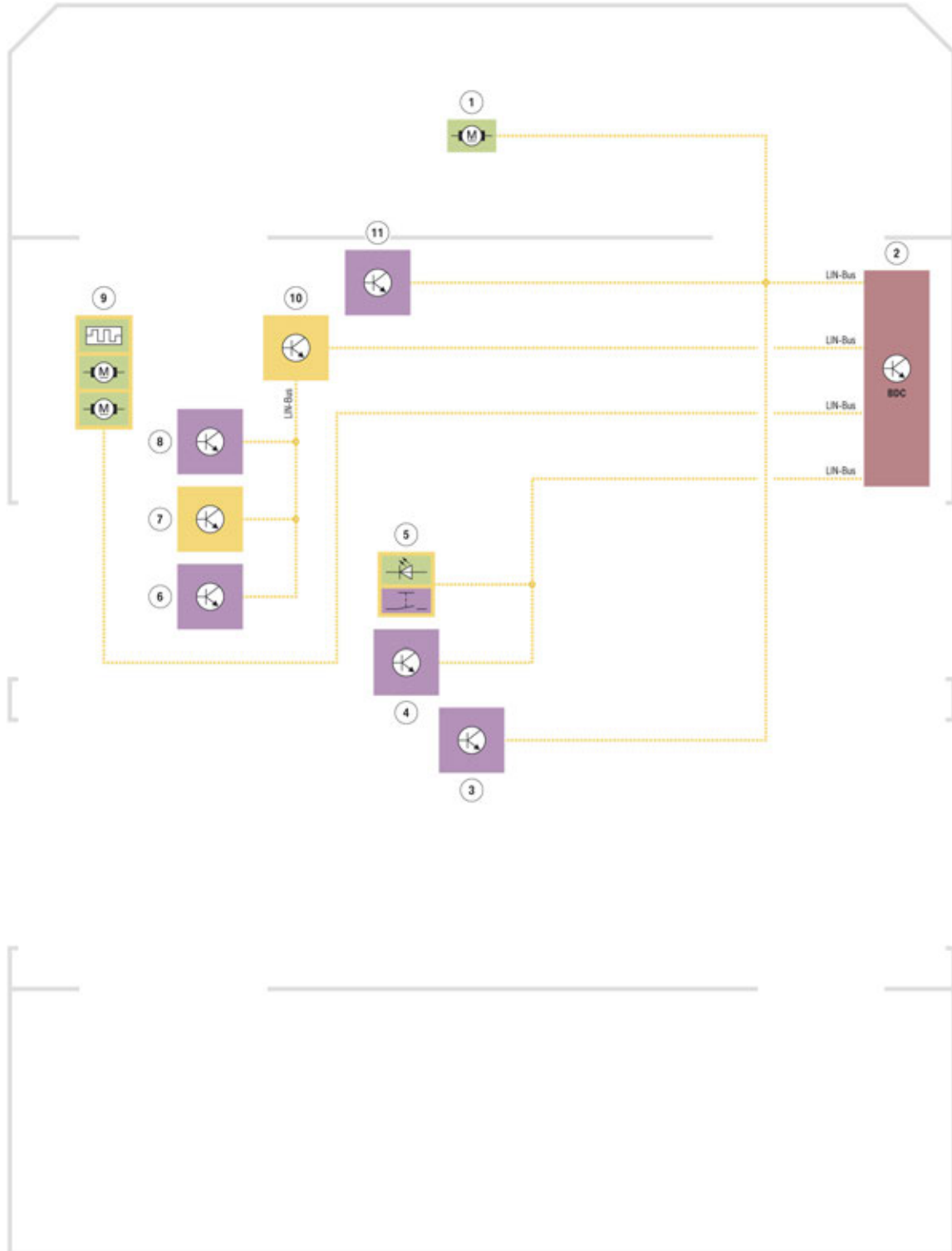
2. Bus Systems

Index	Explanation
1	Rain-light-solar-condensation sensor
2	Inside mirror
3	Roof function center (FZD)
4	Body Domain Controller (BDC)
5	Sliding roofliner motor
6	Interior lighting, rear
7	Siren with tilt alarm sensor (SINE)

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2. Bus Systems

LIN bus for steering column switch cluster and operating units



LIN bus overview for steering column switch cluster and operating units

TE18-0931

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2. Bus Systems

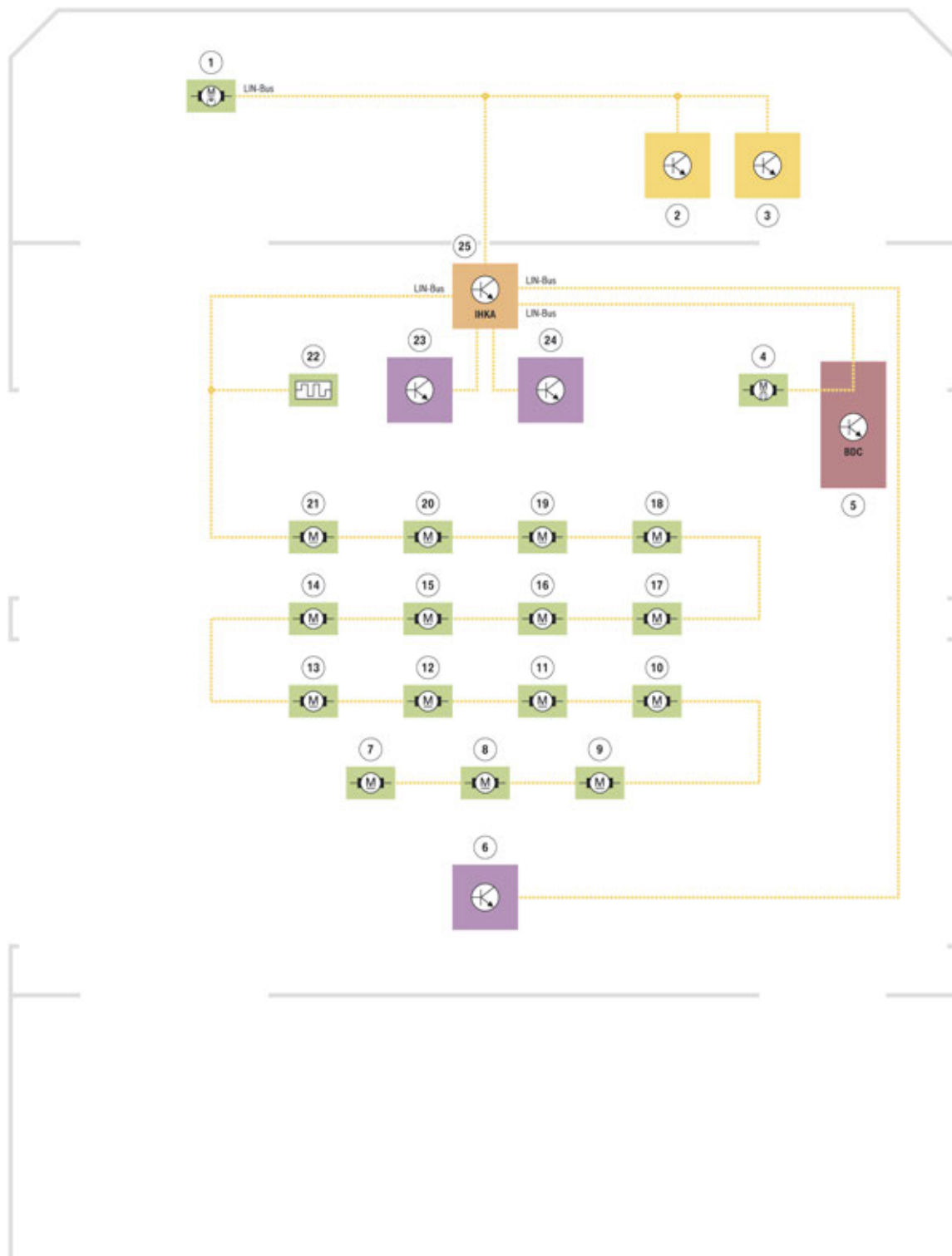
Index	Explanation
1	Wiper motor
2	Body Domain Controller (BDC)
3	Operating unit, center console
4	Audio operating facility
5	Hazard warning switch/Intelligent Safety button
6	Touch detection (Hands-Off Detection)
7	Steering wheel module
8	Multifunction steering wheel buttons, right
9	Steering column adjustment
10	Steering column switch cluster (SZL)
11	Operating unit for light

LIN bus for integrated automatic heating/air conditioning system

The LIN bus overview shows the integrated automatic heating/air conditioning system (IHKA) with the maximum possible LIN bus components. Depending on the version of the IHKA, any components not required are omitted.

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2. Bus Systems



LIN bus overview for integrated automatic heating/air conditioning system

TE18-0932

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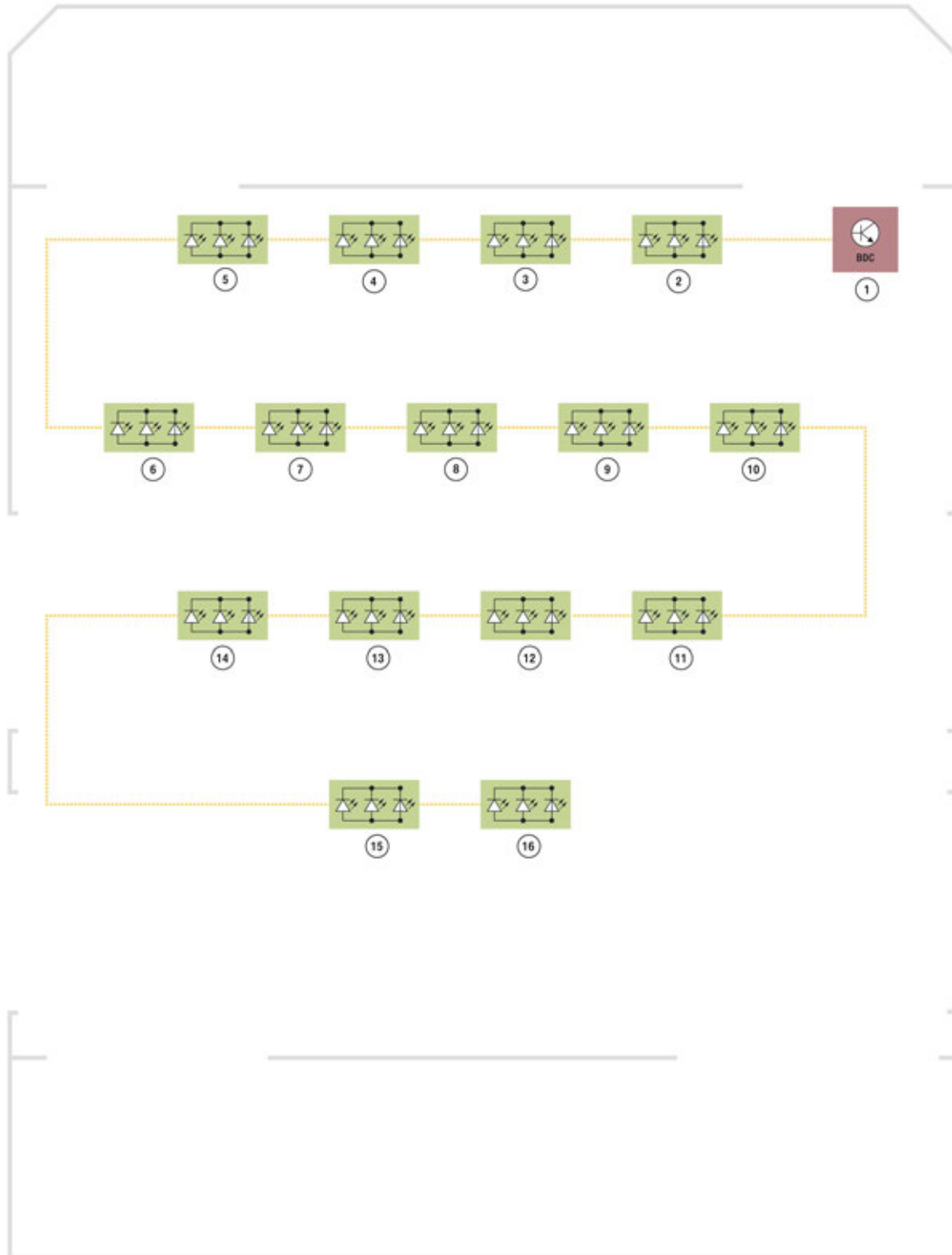
2. Bus Systems

Index	Explanation
1	Auxiliary heating
2	Air freshener (not for US)
3	Ioniser (not for US)
4	Blower motor
5	Body Domain Controller (BDC)
6	Operating unit, rear passenger compartment
7	Stepper motor for blending flap, right rear passenger compartment
8	Stepper motor for blending flap, left rear passenger compartment
9	Stepper motor for blending flap, right
10	Stepper motor for blending flap, left
11	Stepper motor for air distribution, right rear passenger compartment
12	Stepper motor for air distribution, left rear passenger compartment
13	Stepper motor for footwell, right
14	Stepper motor for footwell, left
15	Stepper motor for stratification, right
16	Stepper motor for stratification, left
17	Stepper motor for ventilation, right
18	Stepper motor for ventilation, left
19	Stepper motor for defrost function
20	Stepper motor for air recirculation function
21	Stepper motor for fresh air
22	Electric auxiliary heater
23	Operating unit, air conditioning
24	Touch control box in the center grille
25	Integrated automatic heating/air conditioning (IHKA)

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2. Bus Systems

LIN bus for ambient lighting



LIN bus overview for ambient lighting

TE18-0672

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2. Bus Systems

Index	Explanation
1	Body Domain Controller (BDC)
2	Driver's seat, lighting, backrest, left
3	Driver's seat, lighting, backrest, bottom left
4	Front passenger seat, lighting, backrest, left
5	Front passenger seat, lighting, backrest, bottom left
6	Contour line lighting, instrument panel, passenger's side, bottom right
7	Contour line lighting, instrument panel, passenger's side, middle right
8	Contour line lighting, instrument panel, passenger's side, top right
9	Contour line lighting, instrument panel, driver's side, top left
10	Contour line lighting, instrument panel, driver's side, bottom left
11	Sky Lounge panorama roof lighting, rear left
12	Sky Lounge panorama roof lighting, rear left
13	Sky Lounge panorama roof lighting, rear right
14	Sky Lounge panorama roof lighting, rear right
15	Sky Lounge panorama roof lighting, front right
16	Sky Lounge panorama roof lighting, front left

2.3.2. Local CAN

The local CAN is often used if two control units are to be directly connected to each other. Up to 4 different connections can be used, depending on the vehicle equipment.

Local CAN connections:

- Electronic transmission control (EGS) to gear selector switch (GWS).
- Camera-based driver assistance system (KAFAS) to front radar sensor.
- Optional equipment system (SAS) to side radar sensor short range front right and left.
- Optional equipment system (SAS) to rear radar sensor short range right and left.

The control units on the local CAN are not displayed in the bus overview by the BMW diagnosis system. Diagnosis takes place via the corresponding primary control unit.

The local CAN has a data transfer rate of 500 kBit/s.

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2. Bus Systems

2.3.3. USB

Different USB interfaces are provided in the G05 depending on the vehicle equipment.

USB interfaces:

- Type A in the center console.
- Type C in the center armrest.
- Type C charging only 2 x in the backrests.
- Type C 2 x in the Rear Seat Entertainment control panel (from 11/18).

A charge current of max. 1.5 A is available via the USB port in the center console.

A charge current of max. 3 A is available via the USB port in the center armrest and via all the other USB ports in the rear passenger compartment.

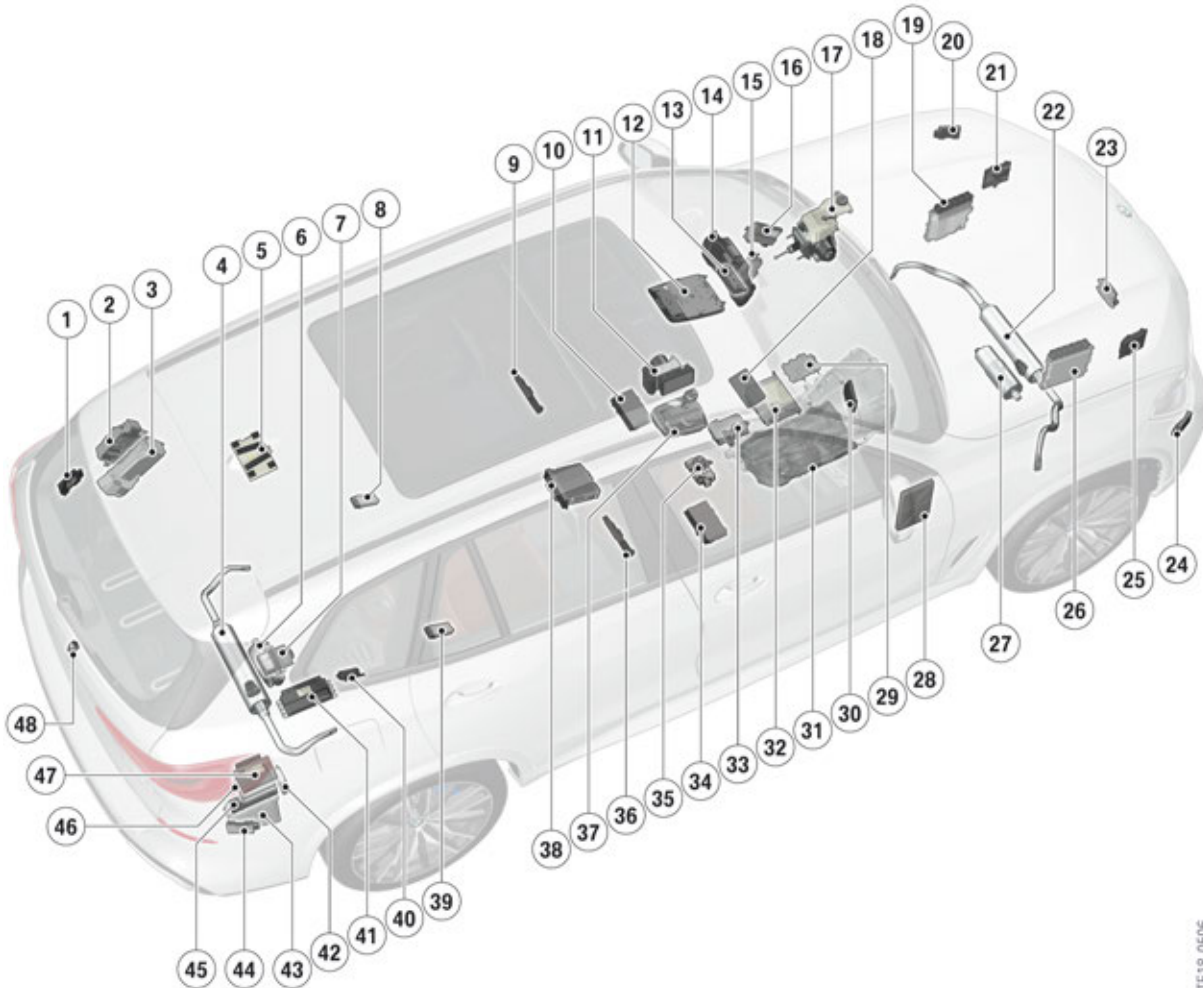


Detailed information on USB interfaces can be found in the Product Information G05 Infotainment and Infotainment 2018.

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3. Control Units

3.1. Installation locations of control units



TE18-0506

G05 Installation locations of control units

Index	Explanation
1	Rear radar sensor short range left (HRSNL)
2	Receiver Audio Module (RAM)
3	Booster
4	Electric active roll stabilization rear (EARSH)
5	Telematic Communication Box (TCB)
6	Rear axle slip angle control (HSR)
7	Regulated rear axle differential lock (GHAS)
8	Driver's seat module, rear (SMFAH)
9	Seat pneumatics module front left (SPNMVL)
10	Driver's seat module (SMFA)

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3. Control Units

Index	Explanation
11	Electronic ride height control (EHC)
12	Roof function center (FZD)
13	Camera-based driver assistance systems (KAFAS)
14	Instrument cluster (KOMBI)
15	Optional equipment system (SAS)
16	Control unit for rear view camera and SideView (TR SVC)
17	Dynamic Stability Control (DSC/VIP)
18	Wireless charging station (WCA/NFC)
19	Digital Motor Electronics (DME)
20	Side radar sensor short range front left (SRS NVL)
21	Frontal Light Electronics Left (FLEL)
22	Electric active roll stabilization front (EARSV)
23	Front radar sensor (FRS)/Front radar sensor long range (FRSF)
24	Side radar sensor short range front right (SRS NVR)
25	Frontal Light Electronics Right (FLER)
26	Digital Engine Electronics 2 (DME2)
27	Electronic Power Steering (EPS)
28	Body Domain Controller (BDC)/Central Gateway Module (ZGM)
29	Night vision electronics NVE
30	Integrated automatic heating/air conditioning (IHKA)
31	Electronic transmission control (EGS)
32	Head unit (HU-H)
33	Advanced Crash Safety Module (ACSM)
34	Front passenger seat module (SMBF)
35	Transfer box
36	Seat pneumatics module front right (SPNMVR)
37	Controller (CON)/Gear selector switch (GWS)
38	Rear Seat Entertainment (RSE)
39	Seat module, passenger's side rear (SMBFH)
40	Remote control receiver (FBD)
41	Vertical Dynamic Platform (VDP)
42	Parking Manoeuvring Assistant (PMA)
43	Power Control Unit (PCU)
44	Rear radar sensor short range right (HRSNR)

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3. Control Units

Index	Explanation
45	Tailgate function module (HKFM)
46	Trailer module (AHM)
47	Selective Catalytic Reduction (SCR) (not for US)
48	Rear view camera (RFK)

3.2. Gateway

3.2.1. Body Domain Controller (BDC)



Body Domain Controller (BDC)

BDC functions:

- Gateway
- Electronic immobilizer
- Terminal control
- Central locking system
- Exterior lights
- Power windows
- Horn
- Interior light

G05 General Vehicle Electronics

3. Control Units

- Wash/wipe system
- Vehicle data storage
- Data transfer for Condition Based Service (CBS).

Fuses in the BDC

- Audio operating facility
- Operating facility for assist systems
- Operating unit for light
- Power windows
- Heated rear window
- Tailgate function module
- Integrated automatic heating/air conditioning
- OBD2 interface
- Power Control Unit
- Rain-light-solar-condensation sensor
- Steering column switch cluster
- Telematic Communication Box
- Outside door handle electronics
- Vertical Dynamic Platform (electronics)
- Central locking system.

Relay in the BDC

- Terminal 30F
- Power window regulator
- Central locking system
- Heated rear window

Gateway in the BDC

The central gateway module (ZGM) is integrated in the BDC. It is viewed as a control unit within a control unit. The task of the central gateway module is to connect all the main bus systems to each other. By connecting them in this way, it is possible to use information from the individual bus systems on a generalized level. The central gateway module is able to implement different protocols and speeds on other bus systems. The programming data for the control units is transmitted by Ethernet to the vehicle via the ZGM.

The BDC is the gateway for many components on the LIN bus.

G05 General Vehicle Electronics

3. Control Units

LIN bus components:

- Exterior mirror, left and right
- Switch block, driver's door, front passenger door
- Steering column switch cluster
- Light switch
- Intelligent Safety button
- Audio operating facility
- Inside mirror
- Rain-light-solar-condensation sensor
- Roof function center (interior lighting)
- Comfort seat, rear passenger compartment, left and right
- Electric steering column adjustment
- Wiper
- Operating unit, center console
- Power distribution box, rear.

Wake-up function in the BDC:

- Battery charging unit
- Intelligent battery sensor
- Electric fan
- Active air flap control
- Digital Motor Electronics.

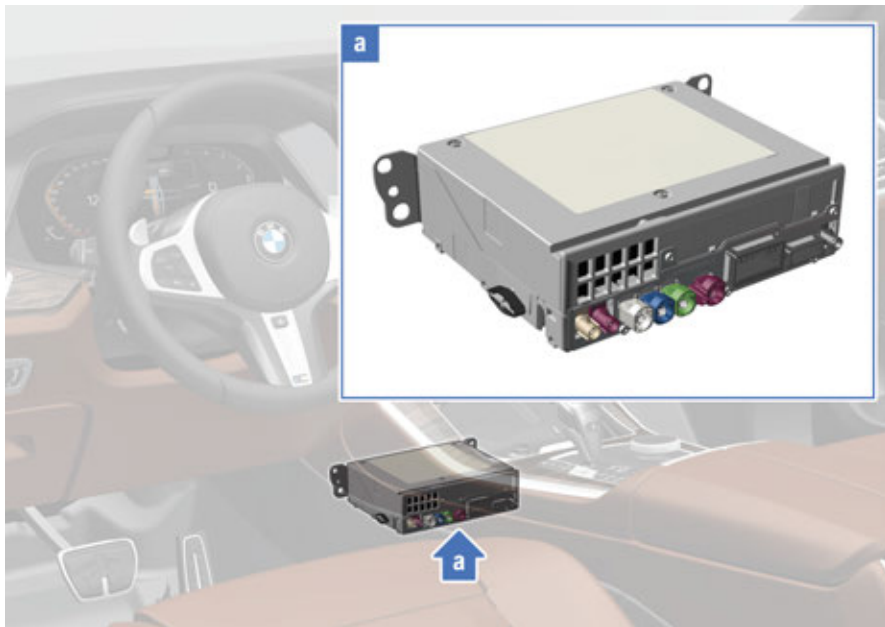
The BDC assumes only the wake-up function for the control units listed under wake-up function. The primary and gateway function remains with the engine control.

G05 General Vehicle Electronics

3. Control Units

3.3. Control units on the Ethernet

3.3.1. Head unit



Head unit

On the G05, the head unit can be operated by touch at the CID in addition to operation via the controller. In the case of optional equipment with BMW gesture control, selected functions can also be operated by means of gestures.

3.3.2. Receiver Audio Module (RAM)

The Receiver Audio Module (RAM) is a control unit and part of the infotainment system. The Receiver Audio Module (RAM) is an audio amplifier with integrated tuners and an integrated sound processor. The Receiver Audio Module (RAM) also contains Active Sound Design (ASD), and therefore an additional control unit is not required.

G05 General Vehicle Electronics

3. Control Units



Receiver Audio Module (RAM)

The Receiver Audio Module (RAM) comes in a variety of versions and power levels.

Versions and power levels:

- RAM BASIC
- RAM MID
- RAM HIGH

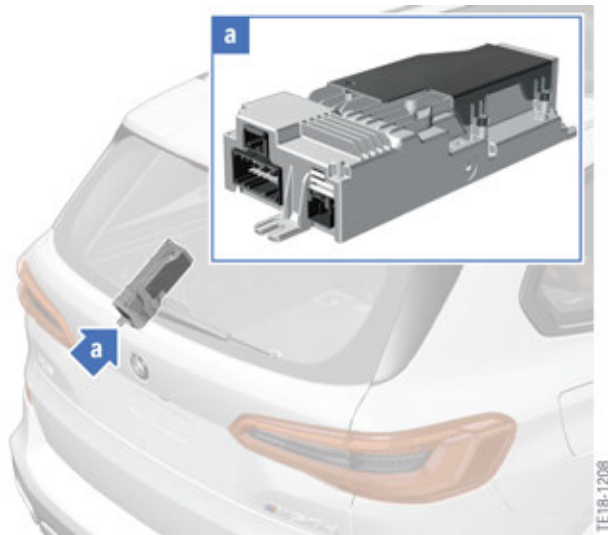
Depending on the number and power of the speakers, a booster, to which the audio data are streamed via an Ethernet connection, is additionally installed.

3.3.3. Booster

An additional booster is installed, depending on the audio variant. Normally there is no booster for stereo and hi-fi. However, if an outside speaker is required for the outside sound on a vehicle, depending on the engine version, a booster is installed. For "Harman Kardon Surround Sound system" and "Bowers & Wilkins Diamond Surround Sound system" (SA 6F1) the corresponding booster is installed.

G05 General Vehicle Electronics

3. Control Units



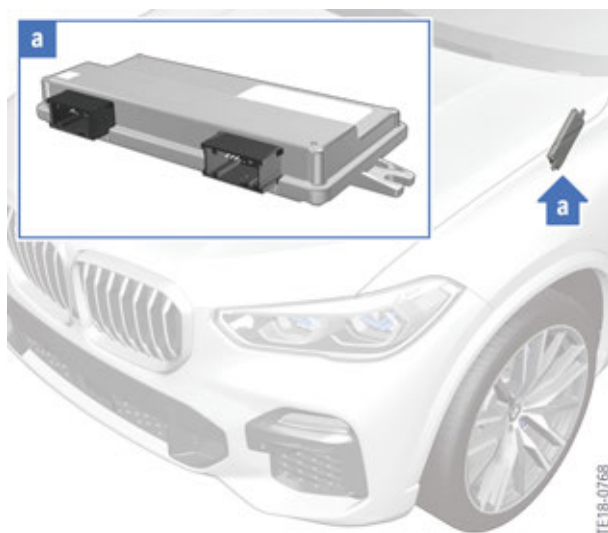
Booster variants

Index	Explanation
1	Booster for Harman Kardon Surround Sound system
2	Booster for Bowers & Wilkins Diamond Surround Sound system

The booster is available in different versions and power levels, depending on the audio variant. The power output stages for the corresponding speakers are located in the booster.

The booster is connected via Ethernet to the Receiver Audio Module (RAM).

3.3.4. Top Rear Side View Camera (TRSVC)



Installation location, Top Rear Side View Camera (TRSVC)

The Top Rear Side View Camera control unit receives the picture information from the cameras in order to show the "bird's-eye view".

G05 General Vehicle Electronics

3. Control Units

Connected cameras:

- Front camera
- Exterior mirror camera, left
- Exterior mirror camera, right
- Rear view camera

The cameras are connected to the TRSVC via Ethernet.

3.3.5. Camera-based driver assistance systems (KAFAS)



Installation location, camera-based driver assistance systems (KAFAS)

The highest expansion stage of the camera-based driver assistance systems (KAFAS) contains 6 assistance functions.

Available assistance functions:

- Active Cruise Control with Stop&Go function
- Traffic Jam Assistant
- Speed Limit Information
- Collision Warning
- Daytime Pedestrian Protection
- Frontal Collision Warning with City Collision Mitigation.

G05 General Vehicle Electronics

3. Control Units

3.3.6. Front radar sensor (FRS)



Installation location, front radar sensor (FRS)

The front radar sensor (FRS) supplies the input data for:

- Collision Warning
- Daytime Pedestrian and Cyclist Protection
- Dynamic Cruise Control with braking function
- Active Cruise Control with Stop&Go function

3.3.7. Front radar sensor long range (FRSF)



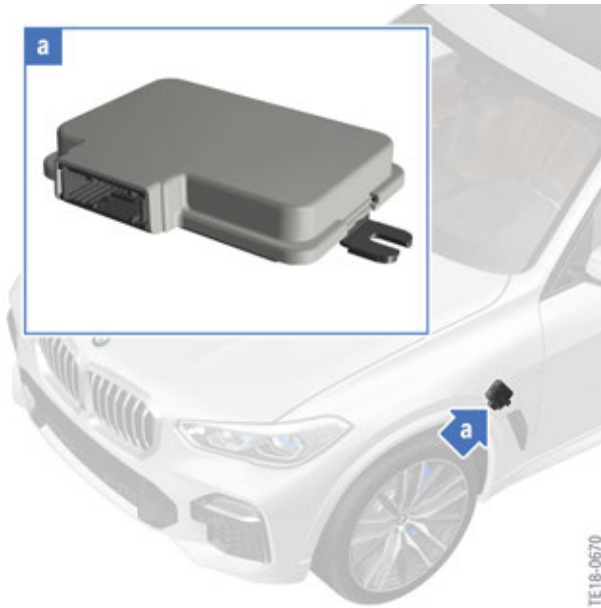
Front radar sensor long range (FRSF)

G05 General Vehicle Electronics

3. Control Units

The front radar sensor long range (FRSF) is installed with the optional equipment Driving Assistant Professional.

3.3.8. Optional equipment system (SAS)



Optional equipment system (SAS)

The optional equipment system (SAS) control unit provides a variety of driver assistance functions. The SAS does not have any installed sensors. The information needed for the functions is made available by the corresponding control units and sensors. The SAS activates the control units necessary for the corresponding function.

Possible functions:

- Collision warning with city braking function
- Dynamic Brake Control
- Person recognition with city braking function
- Parking Manoeuvring Assistant
- Extended Traffic Jam Assist
- Camera-based cruise control with Stop&Go function
- Proactive driving assistant
- Steering and lane control assistant including traffic jam assistant
- Lane change warning
- Collision warning with city braking function
- Distance information
- Dynamic Cruise Control with braking function
- Speed limit

G05 General Vehicle Electronics

3. Control Units

- Lane departure warning
- Crossing traffic warning
- Speed Limit Assist

The image information required by the optional equipment system is provided by the camera-based driver support systems.

3.4. Control units on the K-CAN2

3.4.1. Trailer module (AHM)



Trailer module (AHM)

The trailer module is responsible for:

- Supply and control for the trailer lighting

G05 General Vehicle Electronics

3. Control Units

3.4.2. Roof function center (FZD)



Roof function center (FZD)

Depending on the vehicle equipment the roof function center FZD includes the corresponding components for:

- Alarm system
- Control, slide/tilt sunroof
- Gesture recognition camera
- Emergency call button.

On vehicles with BMW gesture control the gesture recognition camera is installed in the FZD. The gesture recognition camera is not shown as a control unit by the BMW diagnosis system. Diagnosis takes place via the FZD. The gesture recognition camera is connected to the PT-CAN4. As a result, the bus signals do not have to be forwarded to another CAN bus by the Body Domain Controller.

The FZD is not responsible for the control of the interior light. The interior light unit and the FZD electronics are located in the same housing.

G05 General Vehicle Electronics

3. Control Units

3.4.3. Tailgate function module (HKFM)



Tailgate function module (HKFM)

The control unit for the tailgate function module (HKFM) is responsible for control of the tailgate lift.

3.4.4. Seat modules



Seat module

The following seat modules are present corresponding to the vehicle equipment:

- Driver's seat module (SMFA)
- Front passenger seat module (SMBF)

G05 General Vehicle Electronics

3. Control Units

The seat modules are responsible for actuation of the servomotors in the corresponding seat. Depending on the equipment, there may be 2 identical seat modules installed in the vehicle. Encoding of the control units takes place by connection to the wiring harness. The control unit is assigned correspondingly in the vehicle depending on the additional ground encoding.

3.4.5. Seat pneumatics modules



Seat pneumatics module back right (SPNMHR)

The following seat pneumatics modules are present corresponding to the vehicle equipment:

- Seat pneumatics module front left (SPNMVL)
- Seat pneumatics module front right (SPNMVR)

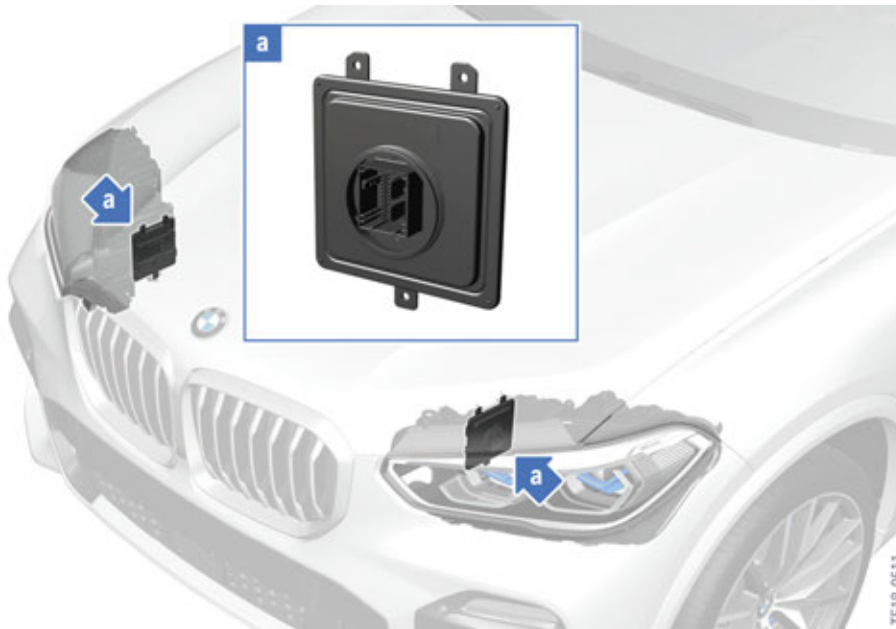
The seat pneumatics modules are responsible for the massage function in the corresponding seat. Depending on the equipment, there may be 2 identical seat pneumatics modules installed in the vehicle. Encoding of the control units takes place by connection to the wiring harness. The control unit is assigned correspondingly in the vehicle depending on the additional ground encoding.

G05 General Vehicle Electronics

3. Control Units

3.5. Control units on the K-CAN3

3.5.1. Frontal Light Electronics



Frontal Light Electronics Right and Left

The control units Frontal Light Electronics Right (FLER) and Frontal Light Electronics Left (FLEL) are installed in the corresponding headlight.

The Frontal Light Electronics includes:

- LED activation in the corresponding headlight
- Activation of the turn indicators
- Activation of the stepper motor for the headlight beam throw adjustment
- Actuation of the fans

G05 General Vehicle Electronics

3. Control Units

3.5.2. Parking Manoeuvring Assistant (PMA)



Parking Manoeuvring Assistant (PMA)

The PMA control unit performs the corresponding functions, depending on equipment:

- Park Distance Control (PDC)
- Park Assistant
- Parking Manoeuvring Assistant Plus.

Park Distance Control (PDC) assists the driver when manoeuvring in and out of a parking space. The current distance from an obstruction is indicated by acoustic signals and on a visual display.

The Parking Manoeuvring Assistant performs parking in parking spaces.

G05 General Vehicle Electronics

3. Control Units

3.5.3. HRSNR lane change warning (SWW)



Lane change warning (SWW)

Both lane change warning HRSNL left and HRSNR right control units are shown in the graphic. The rear radar sensor short range right (HRSNR) is a further development of lane change warning (SWW). Both control units can now be read out individually by way of diagnosis with the BMW diagnosis system.

- Driving Assistant (SA 5AT)

The SWW primary control unit is the HRSNR and it is also used for diagnosis of the additional control units connected to the local CAN. The lane change warning HRSNL (secondary) control unit is required for the lane change warning.

The following control units are additionally required for the optional equipment Driving Assistant Plus:

- Radar sensor, front left
- Radar sensor, front right

G05 General Vehicle Electronics

3. Control Units

3.6. Control units on the K-CAN4

3.6.1. Controller (CON)



Controller (CON)

On the G05 a controller with a touchpad is used.

3.6.2. Integrated automatic heating/air conditioning (IHKA)

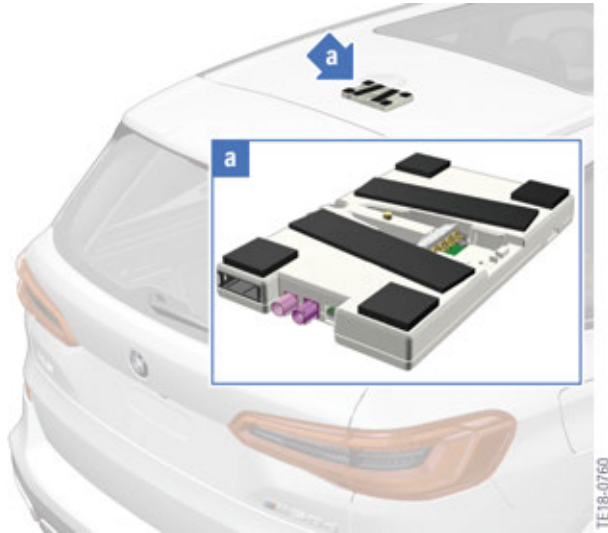


The integrated automatic heating/air conditioning system (IHKA) is standard equipment in the G05.

G05 General Vehicle Electronics

3. Control Units

3.6.3. Telematic Communication Box (TCB 2)



Telematic Communication Box (TCB 2)

The 2nd-generation Telematic Communication Box (TCB) is installed in the G05. The Telematic Communication Box (TCB 2) is connected directly to the roof-mounted aerial and is responsible for the following functions:

- BMW ConnectedDrive services (incl. BMW Assist with eCall (emergency call function)) + BMW Online
- BMW Internet using a SIM card integrated in the vehicle (P-SIM)
- Remote functions (reception and controller)
- "Speech-to-text" function in Office area
- BMW Teleservices via P-SIM
- WLAN hotspot via P-SIM.

G05 General Vehicle Electronics

3. Control Units

3.7. Control units on the K-CAN5

3.7.1. Remote control receiver (FBD)



Remote control receiver

The control unit remote control receiver FBD is responsible for communication of the remote control services. It receives the data of the wheel electronics for the tire pressure control.

The control unit for the remote control service is not shown in the bus overview by the BMW diagnosis system ISTA. Diagnosis is performed via the Body Domain Controller.

3.7.2. Near Field Communication (NFC) with wireless charging station (WCA)



NFC with WCA

In the G05 the WCA is installed in the center stack storage compartment.

G05 General Vehicle Electronics

3. Control Units

The control unit Near Field Communication NFC is required for Near Field Communication in the vehicle.

The NFC control unit and the WCA are not shown in the bus overview by the BMW diagnosis system ISTA. Diagnosis is performed via the Body Domain Controller.



Further information on the wireless charging station (WCA) can be found in the Product Information "General Vehicle Electronics 2018".

3.8. Control units on the Ethernet

3.8.1. Active Cruise Control (ACC)



Active Cruise Control (ACC)

The control unit for active cruise control for ACC Stop&Go contains a radar-based sensor (FRS) for sensing the area in front of the vehicle. Both the near and far ranges are monitored by one sensor.

G05 General Vehicle Electronics

3. Control Units

3.8.2. Rear view camera (RFK)

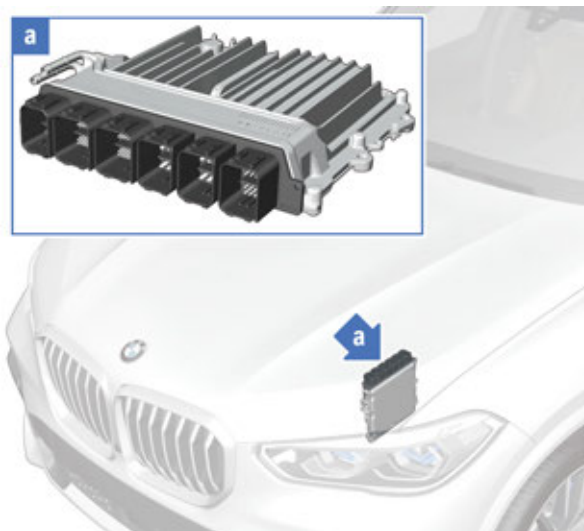


Rear view camera

On vehicles with a rear view camera without other cameras a rear view camera on the Ethernet is used.

3.9. Control units on the PT-CAN

3.9.1. Digital Motor Electronics (DME)



Digital Motor Electronics DME and DME2

The DME control units are pictured in the graphic. The DME control unit is located on the left side in the direction of travel.

The DME is responsible for the control of the combustion engine. In addition, the DME is the gateway between PT-CAN and PT-CAN2.

G05 General Vehicle Electronics

3. Control Units

The DME control unit is installed for 6-cylinder gasoline engines.

The DME2 control unit is installed in addition to the DME control unit for 8-cylinder engines.

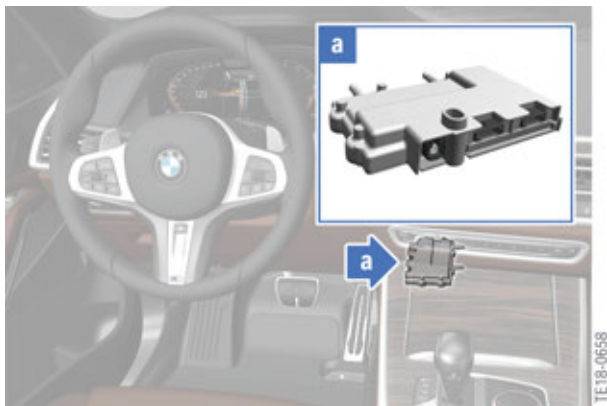
3.9.2. Instrument cluster (KOMBI)



Instrument cluster (KOMBI)

Exclusively the multifunctional instrument display is used in the G05.

3.9.3. Night vision electronics (NVE)



Night vision electronics (NVE)

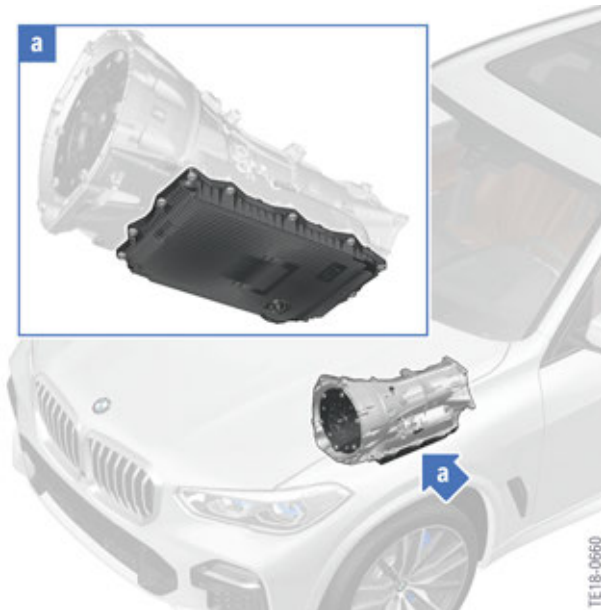
The control unit Night Vision Electronics receives picture information from the Night Vision camera. The picture information is transmitted via Color Video Blanking Signal to the HEAD UNIT and can then be displayed on demand in the CID, instrument cluster and Head-Up Display.

G05 General Vehicle Electronics

3. Control Units

3.10. Control units on the PT-CAN2

3.10.1. Electronic transmission control (EGS)



Electronic transmission control (EGS)

The control unit for electronic transmission control is installed directly in the automatic transmission.

3.10.2. Gear selector switch (GWS)



Gear selector switch (GWS)

The gear selector switch GWS is used for selecting a drive position.

G05 General Vehicle Electronics

3. Control Units

The bus connection is realized via the PT-CAN2 and additionally via a local CAN to the electronic transmission control (EGS) unit.

3.10.3. Power Control Unit (PCU)



PCU

The Power Control Unit is required:

- For charging the auxiliary battery
- For supplying the vehicle electrical system from the auxiliary battery.

The Power Control Unit (PCU) contains a DC/DC converter with a power of 500 W.

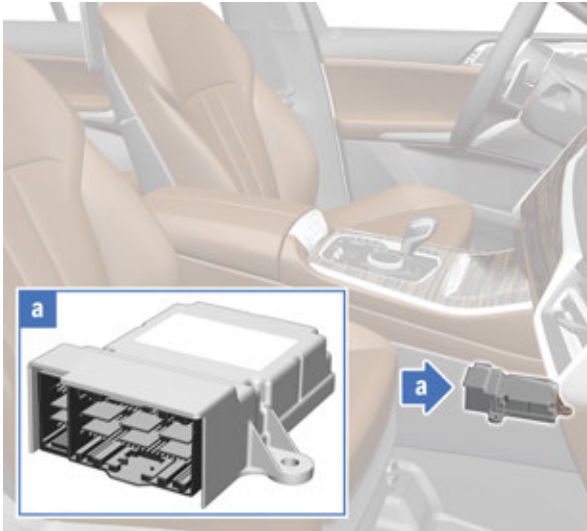
The preconditions for the direction of the energy management are calculated from the use of the vehicle. The auxiliary battery is charged by the PCU when the engine is running. When the combustion engine is not running, e.g. automatic engine start-stop function, the PCU supplies energy from the auxiliary battery to the vehicle electrical system.

G05 General Vehicle Electronics

3. Control Units

3.11. Control units on the FlexRay

3.11.1. Advanced Crash Safety Module (ACSM)



Crash Safety Module (ACSM)

The ACSM records the yaw rate and sends this information on the FlexRay data bus.

The function of the Crash Safety Module (ACSM) is to permanently evaluate all sensor signals in order to identify a crash situation. The ACSM evaluates the information from the sensors and then forwards corresponding measures for selective activation of the necessary restraint systems.

No additional yaw sensors are therefore required for the other systems.

3.11.2. Dynamic Stability Control (DSCi)



Dynamic Stability Control (DSCi)

G05 General Vehicle Electronics

3. Control Units

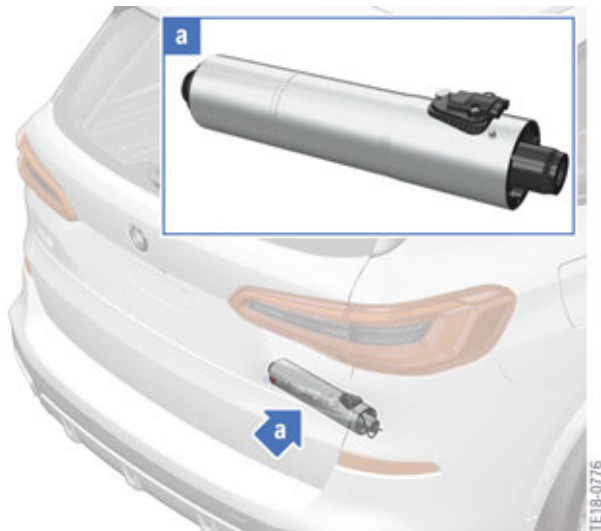
DSCi consists of 2 integrated control units, the Dynamic Stability Control and the Virtual Integration Platform.

The DSCi control unit and the DSCi hydraulic control unit are screwed together. The DSCi control unit can be replaced individually to reduce servicing costs. The functions of the tire pressure control (RDC) and the electric parking brake are integrated in the DSCi control unit.

3.11.3. Electric active roll stabilization



Electric active roll stabilization front (EARSV)



Electric active roll stabilization rear (EARSH)

Electric active roll stabilization rear (EARSH), Electric active roll stabilization front (EARSV).

The Electric active roll stabilization control units are installed directly in the corresponding actuator.

G05 General Vehicle Electronics

3. Control Units

3.11.4. Electronic Power Steering (EPS)



Electronic Power Steering (EPS)

The Electronic Power Steering (electromechanical power steering) is supplied with 12 V.

The steering angle information is determined by the EPS and made available to the other control units via the FlexRay bus.

3.11.5. Rear axle slip angle control (HSR)



Rear axle slip angle control (HSR)

The control unit for slip angle control is responsible for steering the rear axle.

G05 General Vehicle Electronics

3. Control Units

3.11.6. Transfer box



Transfer box

The control unit for the transfer box controls the clutch in the transfer box on vehicles with xDrive.

3.11.7. Vertical Dynamic Platform (VDP)



Vertical Dynamic Platform (VDP)

The control unit for the vertical dynamic platform is required for the following equipment:

- Dynamic Damper Control

G05 General Vehicle Electronics

3. Control Units

The VDP control unit has the following tasks:

- Controlling the valves in the shock absorbers
- Sensing the ride heights of the vehicle through the ride height sensors.

3.12. Control units on the local CAN

The control units on the local CAN are not shown in the bus overview by the BMW diagnosis system ISTA. Diagnosis takes place via the corresponding primary control unit.

3.12.1. Front radar sensor, short-range sensor



Radar sensor right (RSR) and radar sensor left (RSL)

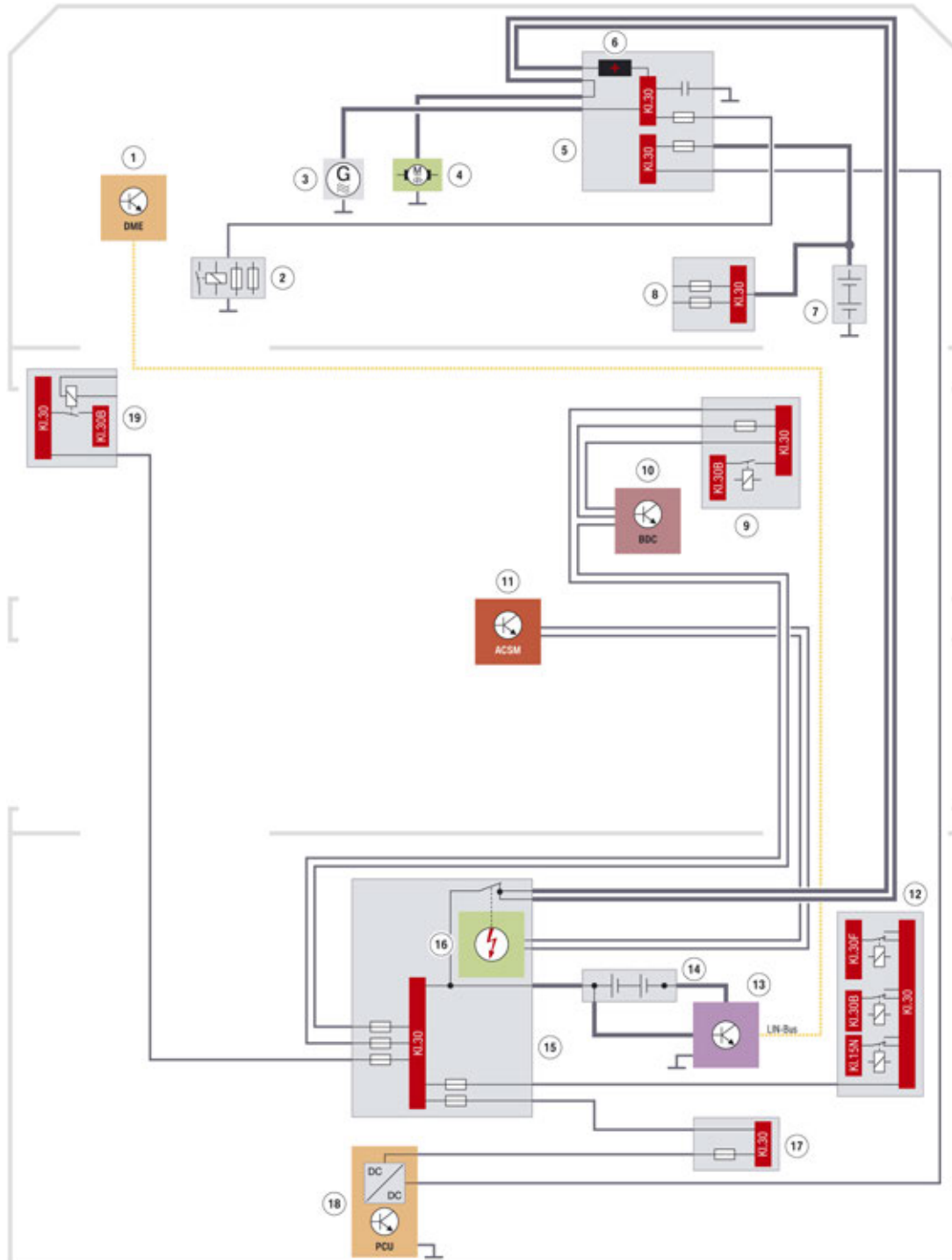
The control units for radar sensor front right (RSR) and radar sensor front left (RSL) are installed at the front right and front left of the vehicle for the optional equipment Driving Assist Plus.

G05 General Vehicle Electronics

4. Voltage Supply

4.1. Overview of voltage supply

4.1.1. System wiring diagram, version 1



TE18-1104

Voltage supply, version 1

G05 General Vehicle Electronics

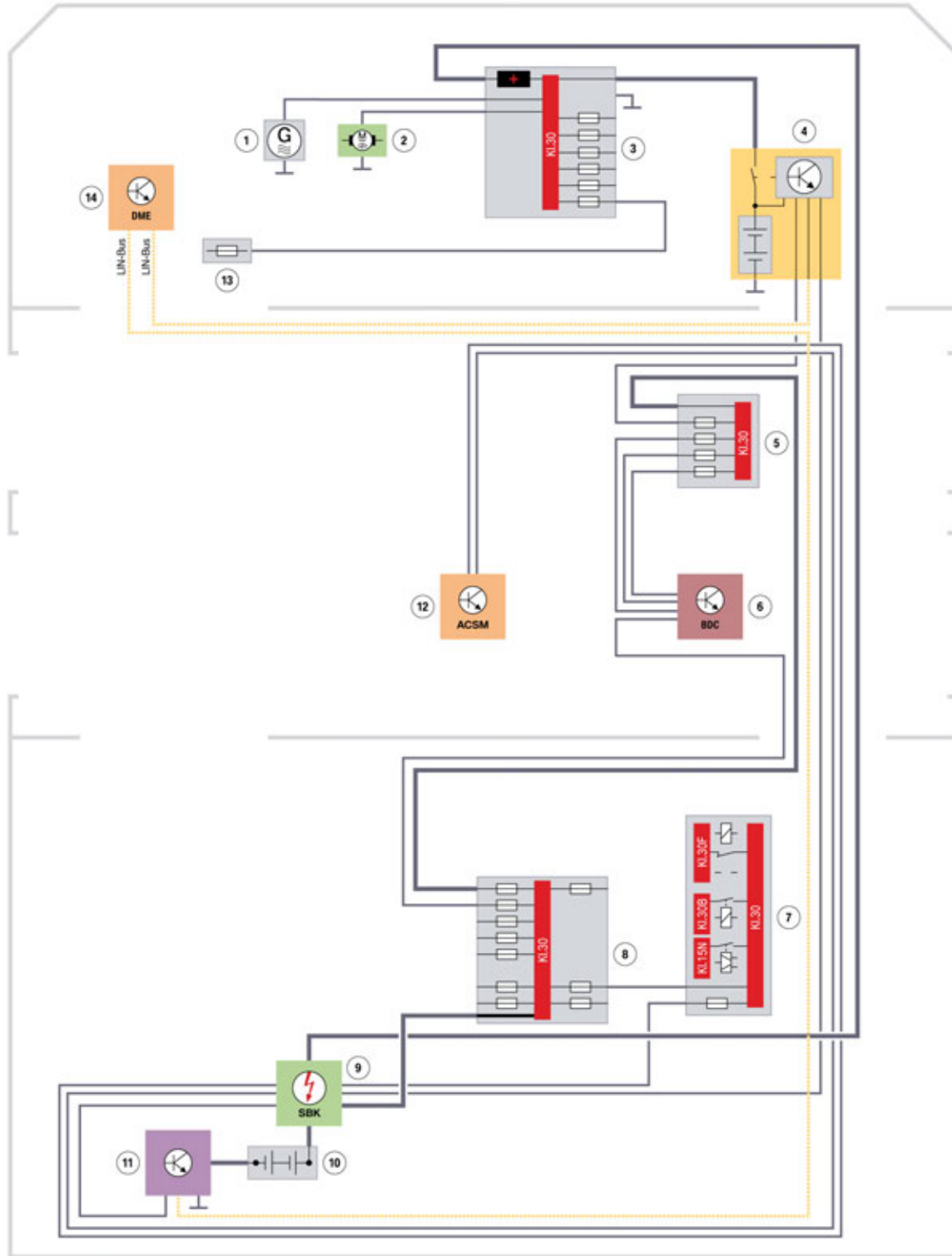
4. Voltage Supply

Index	Explanation
1	Digital Motor Electronics (DME)
2	Power distribution box, front left
3	Alternator
4	Starter motor
5	Power distribution box, engine compartment
6	Remote positive terminal, auxiliary battery, engine compartment
7	Auxiliary battery, engine compartment
8	Power distribution box, engine compartment
9	Power distribution box, vehicle interior, right
10	Body Domain Controller (BDC)
11	Advanced Crash Safety Module (ACSM)
12	Power distribution box, rear right
13	Intelligent Battery Sensor (IBS)
14	Battery
15	Fuse in the rear power distribution box, battery, rear
16	Safety battery terminal
17	Fuse in the power distribution box, (PCU)
18	Power Control Unit (PCU) 500 W
19	Power distribution box, vehicle interior, left

G05 General Vehicle Electronics

4. Voltage Supply

4.1.2. Dual storage system, system wiring diagram, version 2



Voltage supply, version 2

TE17-2258_2

G05 General Vehicle Electronics

4. Voltage Supply

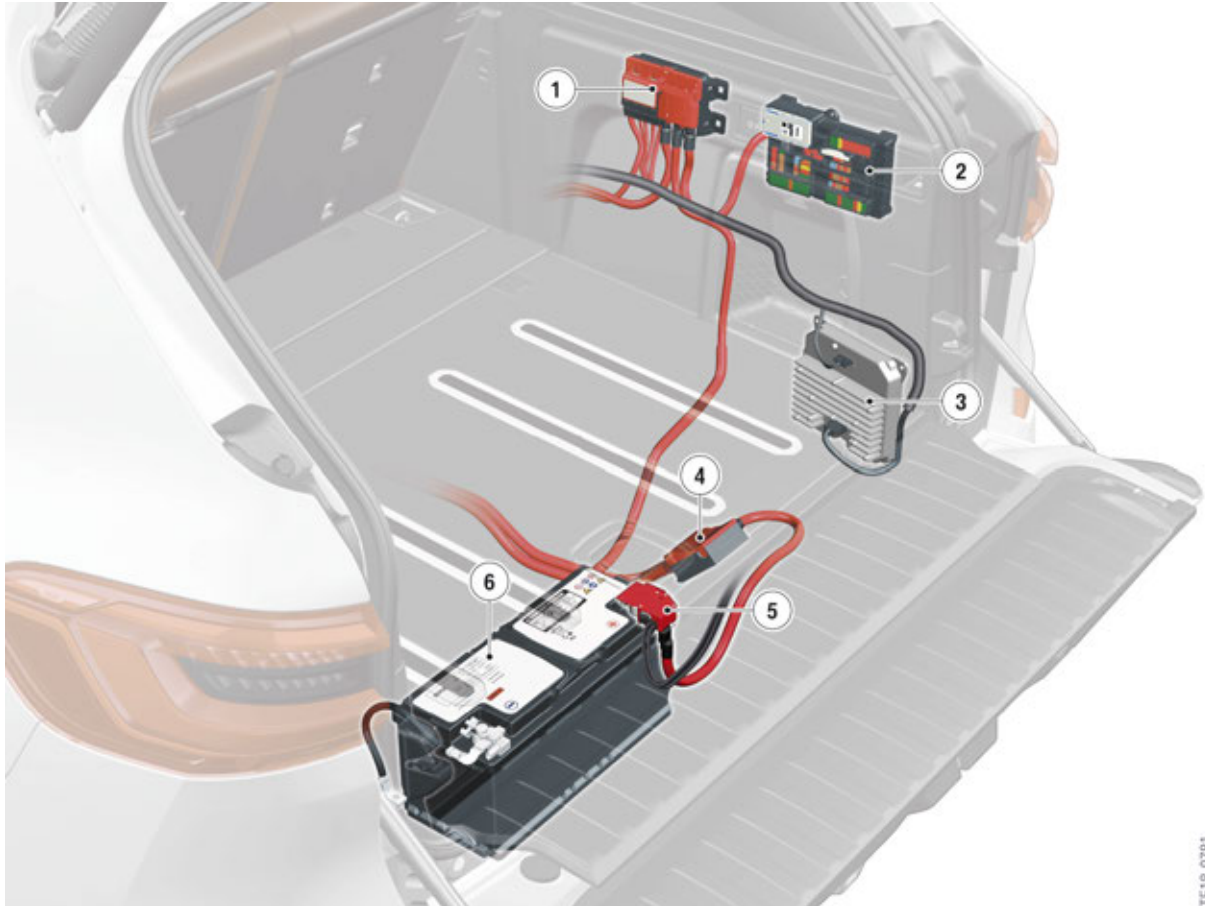
Index	Explanation
1	Alternator
2	Starter motor
3	Power distribution box, engine compartment
4	Auxiliary lithium ion battery, engine compartment
5	Power distribution box, vehicle interior, right
6	Body Domain Controller (BDC)
7	Power distribution box, rear right
8	Fuse in the rear power distribution box, battery, rear
9	Safety battery terminal
10	Battery
11	Intelligent Battery Sensor (IBS)
12	Crash Safety Module (ACSM)
13	Power distribution box, front left
14	Digital Motor Electronics (DME)

G05 General Vehicle Electronics

4. Voltage Supply

4.2. Components

4.2.1. Overview of luggage compartment



Battery

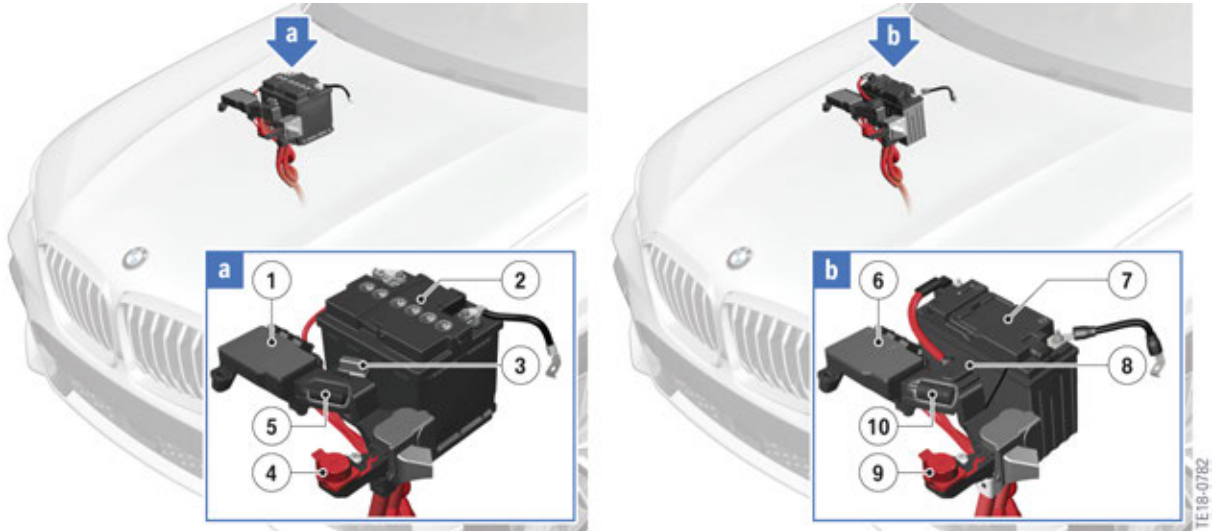
Index	Explanation
1	Power distribution box, battery, right
2	Power distribution box, rear
3	Power Control Unit (PCU) 500 W
4	Power distribution box, battery, middle
5	Safety battery terminal
6	Battery

The vehicle battery in the G05 is an AGM battery with 90 Ah or 105 Ah. The battery variant depends on the engine version, optional equipment.

G05 General Vehicle Electronics

4. Voltage Supply

4.2.2. Overview of engine compartment



Auxiliary battery, engine compartment

Index	Explanation
a	Version 1, AGM auxiliary battery 60 Ah
b	Version 2, lithium ion auxiliary battery 10 Ah
1	Power distribution box, engine compartment
2	Auxiliary AGM battery, engine compartment 60 Ah
3	Remote positive terminal, auxiliary battery, engine compartment
4	Jump start terminal point
5	Capacitor
6	Power distribution box, engine compartment
7	Auxiliary lithium ion battery, engine compartment 10 Ah
8	Remote positive terminal, 10 Ah battery
9	Jump start terminal point
10	Capacitor

The auxiliary battery in the engine compartment of the G05 is an AGM battery with 60 Ah or a 10 Ah lithium ion battery. The battery variant is dependent on the optional equipment active roll stabilization (ARS).

G05 General Vehicle Electronics

4. Voltage Supply

4.2.3. Battery

AGM batteries are used for the voltage supply in the G05.

There may be 2 batteries of different sizes in the vehicle, depending on the engine version and the vehicle equipment:

- AGM starter battery in the luggage compartment with 90 Ah or 105 Ah
- Auxiliary AGM battery in the engine compartment with 60 Ah
- Lithium ion auxiliary battery in the engine compartment with 10 Ah

An auxiliary battery in the engine compartment is used to provide assistance for the vehicle electrical system. On vehicles with electric active roll stabilization, the two anti-roll bar actuators are also supplied with power by this battery.

The dual storage system is used in vehicles without active roll stabilization; a 10 Ah lithium ion battery is installed parallel to the AGM battery.

The dual storage system is used for the first time in the US market.



Detailed information on the battery and the dual storage system can be found in the document "General Vehicle Electronics 2018"

4.2.4. Intelligent battery sensor

The IBS records the following data of the 12 V battery:

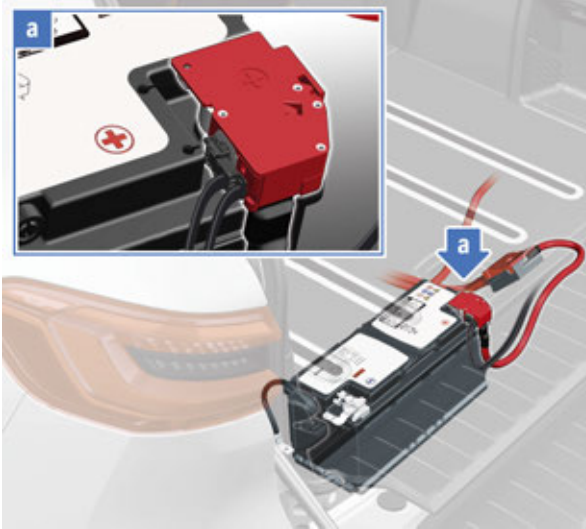
- Voltage
- Current
- Pole temperature.

The IBS performs the calculation and the evaluation of the information. The results are then forwarded via the LIN bus to the higher-level control units (Electrical Digital Motor Electronics and Body Domain Controller).

G05 General Vehicle Electronics

4. Voltage Supply

4.2.5. Safety battery terminal



Safety battery terminal

The safety battery terminal (SBK) is activated in the event of an accident of corresponding severity. The voltage supply to the positive battery connection point in the engine compartment is interrupted and the consumers connected to this are de-energized. The safety battery terminal is installed in the power distribution box next to the battery.

4.2.6. AGLR alternator

Alternators with increased efficiency (active alternator power regulation) are used in the G05. The increase in alternator efficiency is achieved by reducing the losses in the rectifier. The loss-causing diodes are replaced by actively activated MOSFET transistors. A reduction in fuel consumption is achieved by increasing the efficiency.

Different alternators are used depending on the engine type and vehicle equipment.

Versions:

- Bosch with 180 A and 250 A for 6-cylinder engine
- Valeo with 250 A for 8-cylinder engine

G05 General Vehicle Electronics

4. Voltage Supply

4.2.7. Integrated supply module



Integrated supply module

The engine control and its components are supplied with a 12 V voltage via the integrated supply module.

4.2.8. Power distribution box, front right



Power distribution box, front right

A relay for terminal 30B is installed in the front right power distribution box.

Consumers are supplied with terminal 30, terminal 30B and terminal 15N and provided with corresponding fuse protection by the front right power distribution box. Terminal 15N is supplied from the front power distribution box by the rear power distribution box.

G05 General Vehicle Electronics

4. Voltage Supply

4.2.9. Power distribution box, front left



Power distribution box, front left

A relay for terminal 30B is installed in the front left power distribution box.

Consumers are supplied with terminal 30 and terminal 30B and provided with corresponding fuse protection by the front left power distribution box.

4.2.10. Power distribution box, rear



Power distribution box, rear

G05 General Vehicle Electronics

4. Voltage Supply

The following relays are installed in the rear power distribution box:

- 2 relays, terminal 30F
- 2 relays, terminal 30B
- Relay, terminal 15N
- Relay for rear window heating

All relays are of bi-stable design. The relays are activated by the Body Domain Controller via the LIN bus. The hard-wired terminal 30B relays of the two front power distribution boxes are activated via the rear power distribution box.

4.2.11. Body Domain Controller

The Body Domain Controller (BDC) is responsible for the terminal control.

A terminal 30F relay is installed in the BDC.

A number of consumers are supplied with terminal 30 and terminal 30F and provided with corresponding fuse protection via the BDC.

4.2.12. PCU with vehicle electrical system assistance measure



PCU

Modern vehicles have a high energy consumption due to the many electrical consumers. As a result, there is a high demand on the battery, particularly in phases in which the combustion engine is not running and the alternator supplies no energy (e.g. engine start-stop phases).

In order to protect the vehicle battery, a DC/DC converter is installed in the Power Control Unit (PCU) and an auxiliary battery in the engine compartment in the G05.

G05 General Vehicle Electronics

4. Voltage Supply

The preconditions for the direction of the energy management are calculated from the use of the vehicle. When the engine is running the auxiliary battery is charged from the conventional vehicle electrical system. During the phases in which the combustion engine is not running, e.g. automatic engine start-stop function, the energy is supplied from the auxiliary battery into the conventional vehicle electrical system.

The Power Control Unit (PCU) contains a control unit which is connected to the PT-CAN2 and a DC/DC converter with a power of 500 W.

In vehicles with the electric active roll stabilization equipment this is supplied by the AGM 60 Ah auxiliary battery in the engine compartment.

G05 General Vehicle Electronics

5. Terminal Control

5.1. Introduction

The terminal control in the G05 is identical to the terminal control of the G12. In the G05, the vehicle is always in the right condition from the point of view of the customer. The terminals are controlled via a customer-oriented condition management. The terminal control is dependent on the vehicle conditions.

5.2. Vehicle conditions

The G05 vehicle may be in the following conditions:

- PARKING
- RESIDING
- DRIVING

The different vehicle functions are possible depending on the relevant conditions.

PARKING

- Customer not in the vehicle.
- Vehicle secured or not used for a certain time.
- Vehicle functions cannot be operated.

RESIDING

- Customer in the vehicle.
- No driving readiness.
- Functions that are relevant when the vehicle is stationary can be operated.

DRIVING

- Customer in the vehicle.
- Driving readiness established.
- All functions are available.

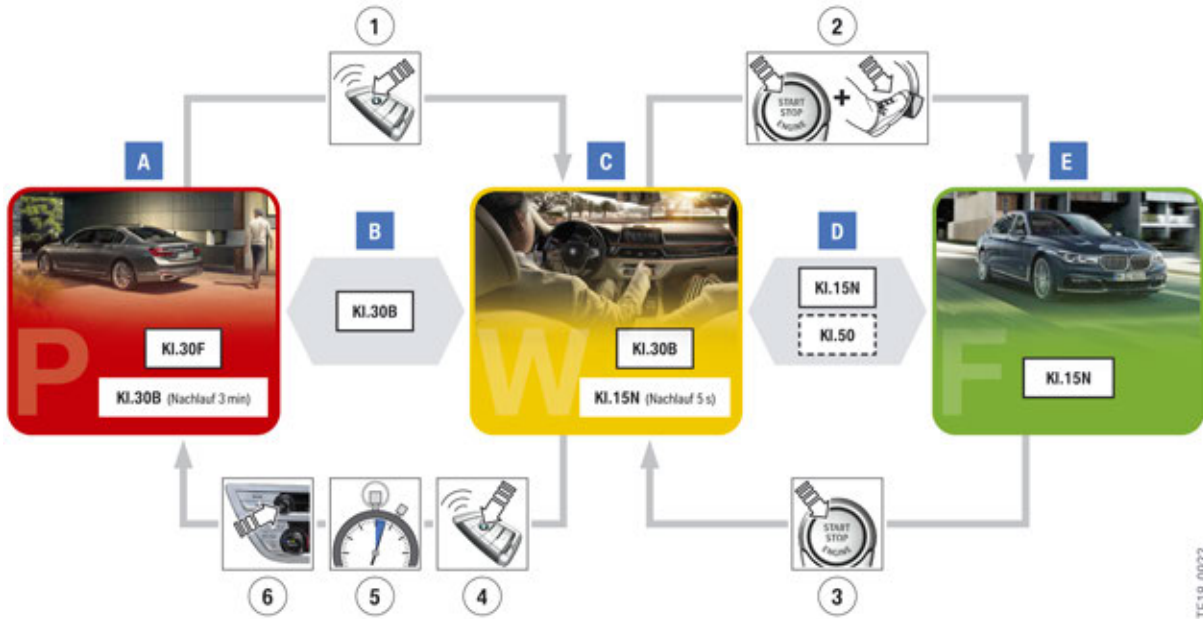
The vehicle conditions are changed by condition management, taking into account the customer behavior. Additional information is also evaluated that may help to determine the vehicle condition, e.g.:

- Door opening.
- Door closing.
- Operations in the vehicle.

G05 General Vehicle Electronics

5. Terminal Control

The following diagram shows the changes between the vehicle conditions:



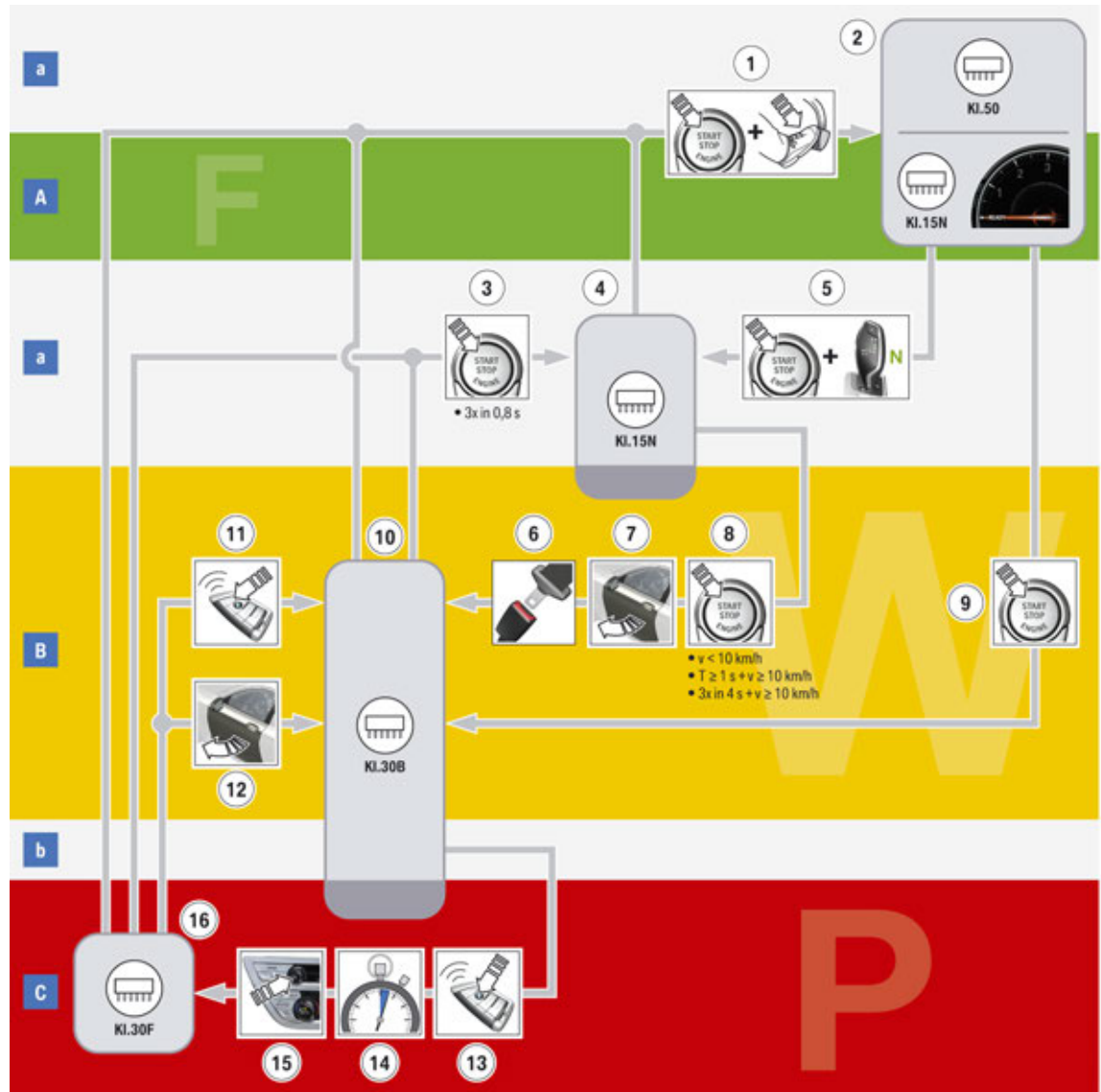
Vehicle conditions

Index	Explanation
A	Vehicle condition PARKING
B	Transitional condition with stationary functions
C	Vehicle condition RESIDING
D	Transitional condition for establishing driving readiness, ending driving readiness or Check/Analysis/Diagnosis
E	Vehicle condition DRIVING
1	Unlock vehicle
2	Press start/stop button + brake pedal
3	Press START-STOP button
4	Locks vehicle
5	No activity of a vehicle user detected for 10 min
6	Extended press

G05 General Vehicle Electronics

5. Terminal Control

Detailed overview of vehicle conditions.



Overview of vehicle conditions

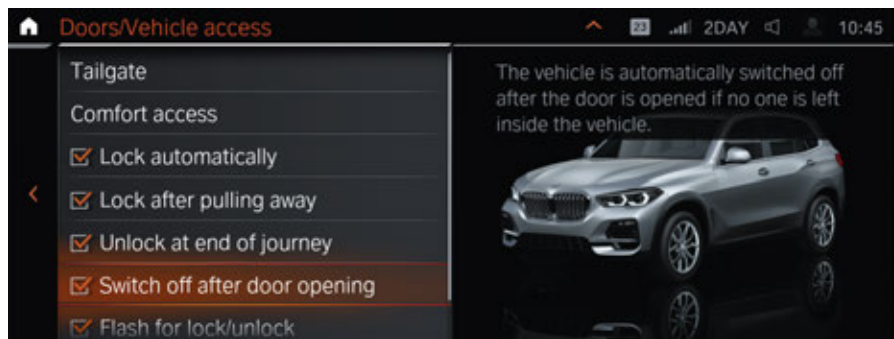
Index	Explanation
A	Vehicle condition DRIVING
B	Vehicle condition RESIDING
C	Vehicle condition PARKING
a	Transitional condition for ESTABLISHING/ENDING DRIVING READINESS, CHECK/ANALYSIS/DIAGNOSIS
b	Transitional condition with STATIONARY FUNCTIONS
1	Operation of start/stop button + brake pedal + valid remote control or valid ID transmitter in the vehicle interior

G05 General Vehicle Electronics

5. Terminal Control

Index	Explanation
2	Driving readiness established, terminal 15N (terminal 50)
3	Operation of start/stop button (three times within 0.8 s) + valid remote control or valid ID transmitter in the vehicle interior
4	Terminal 15N
5	Operation of start/stop button + selector lever in Neutral
6	Undoing driver's seat belt ($v < 0.1$ km/h, driver's door opened, selector lever not in Neutral, brake not pressed, low beam off, no OBD communication, no diagnosis mode, no assembly mode)
7	Door contact change ($v < 0.1$ km/h, driver's seat belt undone, selector lever not in Neutral, brake not pressed, low beam off, no OBD communication, no diagnosis mode, no assembly mode)
8	Press start/stop button + vehicle is stationary or press start/stop button for at least 1 s + driving speed ≥ 10 km/h or press start/stop button at least three times within 4 s + driving speed ≥ 10 km/h
9	Press START-STOP button
10	Terminal 30B
11	Unlock vehicle
12	Residing interaction or stationary function interaction
13	Locks vehicle
14	No customer interaction for 10 minutes
15	Extended press of head unit media button
16	Terminal 30F

Automatic switch-off



Automatic switch-off

Switch off after door opening.

In the menu "Doors/Keys", an immediate change from the vehicle condition RESIDING to the vehicle condition PARKING can be activated.

If this option is activated, the system will immediately change to the vehicle condition PARKING when the driver's door is opened. The omission of the after-running period in the vehicle condition RESIDING saves energy.

G05 General Vehicle Electronics

5. Terminal Control

5.3. Power supply terminals

Control units in the vehicle must be supplied with power only when they are needed. The following terminals are used in the G05:

- Terminal 15N
- Terminal 30B
- Terminal 30F
- Terminal 30.

Terminal 15N supplies control units which are needed only when driving and which may be needed to safely end a journey. After-run of 5 s starts at the transition from DRIVING to RESIDING.

Terminal 30B is used to supply control units that are needed in the stationary mode in the condition RESIDING and for stationary functions where the customer is not in the vehicle. An after-run of 6 minutes starts at the transition from RESIDING to PARKING, and terminal 30B is then switched off.

Terminal 30F is used to supply control units which must perform functions in PARKING condition. Terminal 30F is normally switched on in PARKING condition, but may be switched off due to faults in the vehicle electrical system. Terminal 30F is switched off with an after-running period of 1 minute if a fault is detected.

Terminal 30 control units (e.g. alarm system) are always supplied with voltage and are also not switched off in the event of a fault.

	Terminal 30F	Terminal 30B	Terminal 15N
PARKING, vehicle electrical system not OK (fault in vehicle electrical system)	off	off	off
PARKING, vehicle electrical system OK	one	off	off
Stationary functions (customer not in vehicle)	one	one	off
RESIDING	one	one	off
DRIVING	one	one	one

Testing-analysis-diagnosis (PAD) mode

The vehicle condition testing-analysis-diagnosis is still present for diagnosis. All terminals are switched on in this mode. This ensures that diagnosis can be performed with all control units. This vehicle condition is displayed in the BMW diagnosis system ISTA.

Activation of the PAD mode:

- Operation of the start/stop button (three times within 0.8 s) + valid remote control or valid ID transmitter in the vehicle interior
- By the BMW diagnosis system ISTA.

G05 General Vehicle Electronics

5. Terminal Control

The PAD mode is exited by pressing the start/stop button or by closing the diagnosis with BMW diagnosis system ISTA.

5.4. Partial network operation

Today's premium vehicles contain up to 70 control units with well over 100 micro controllers which are networked with each other. However, depending on the current vehicle condition or the vehicle user requirement, not all comfort and assistance systems may always be needed.

It is possible to save energy, relieve the load on the battery and also prolong the battery life by targeted deactivation and activation on control units which are not needed, so-called selective partial network operation.

If functions are not used or needed when driving, e.g.:

- Seat adjustment
- Trailer lighting (no trailer attached)

The corresponding control units can be switched off.

In vehicles with combustion engine, the electrical energy consumption is indirectly linked to the fuel consumption via the alternator. As a result, selective deactivation of control units that are not currently needed can contribute to reducing fuel consumption and thus also CO₂ emissions.

5.4.1. Prerequisites for partial network operation

The partial network primary in the Body Domain Controller calculates a partial network status on the basis of the current vehicle condition and the required functions. The control units that are not required are switched off by means of the corresponding bus messages.

5.4.2. Prerequisites of control units for partial network operation

Different transceivers are used in order to realize partial network operation in control units. These transceivers are able to evaluate and interpret messages. This control unit remains switched off as long as any bus communication takes place without a valid wake-up event for the corresponding control unit being present. If a valid wake-up event for the corresponding control unit is sent on the bus, the transceiver can activate the voltage regulator of the micro controller and the control unit starts up. The control unit is switched off by deactivation of the voltage regulator.

G05 General Vehicle Electronics

6. Exterior Lighting

6.1. Versions

The following exterior light versions are offered for the G05:

- Adaptive Full LED headlight (standard all models)
- BMW laserlight optional all models (SA 5AZ).

The G05 no longer features a turning light switch.

The new light operating unit comprises only buttons.



The low-beam headlight is automatically switched on when the system recognizes that it is dark, even in the OFF mode and when driving readiness is activated (country-specific).

6.2. Front exterior lights

Headlight versions for the G05:



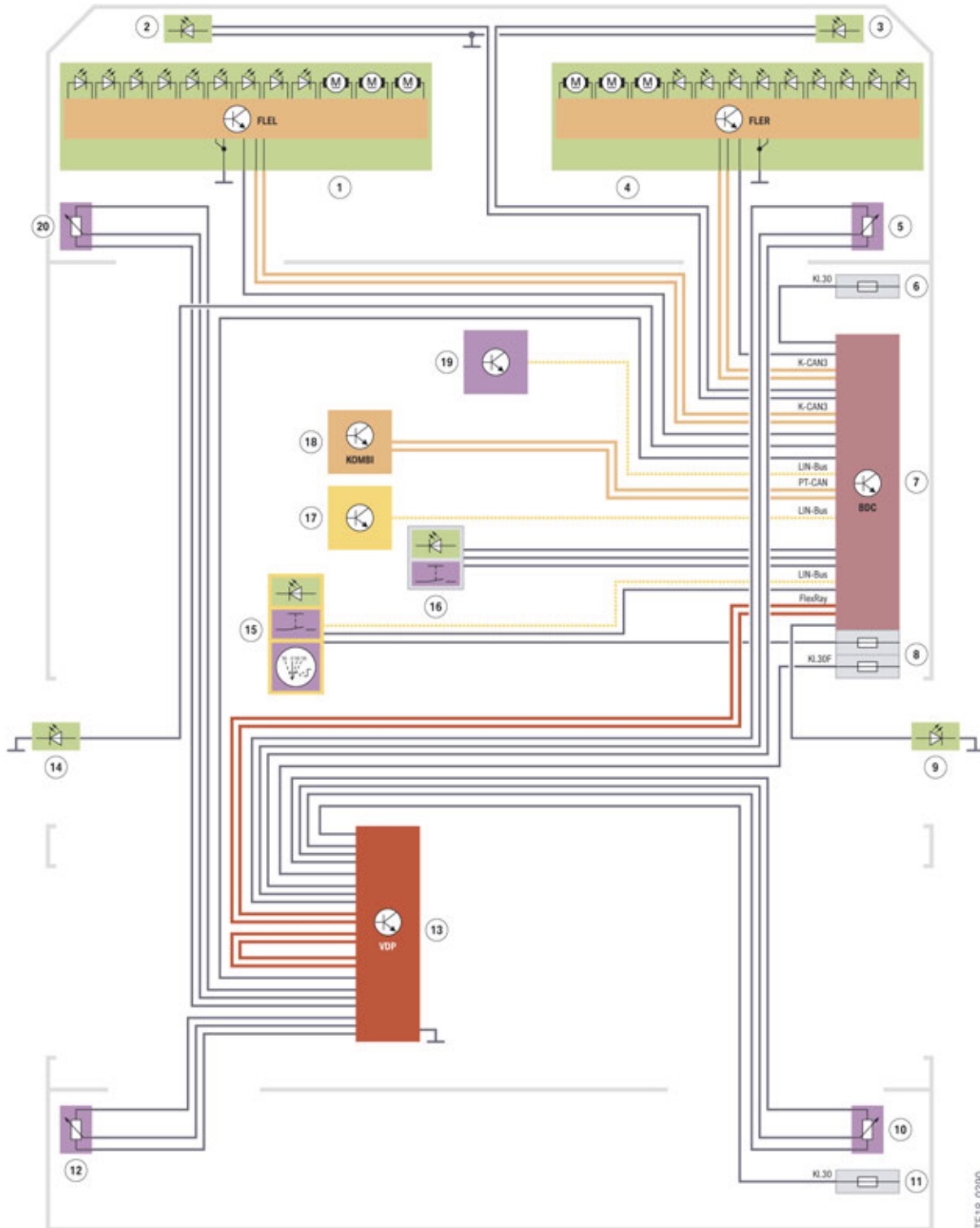
Headlight versions

Index	Explanation
1	Adaptive Full LED headlights
2	BMW Laserlight

G05 General Vehicle Electronics

6. Exterior Lighting

6.2.1. System wiring diagram



TE18-0090

Front exterior lights

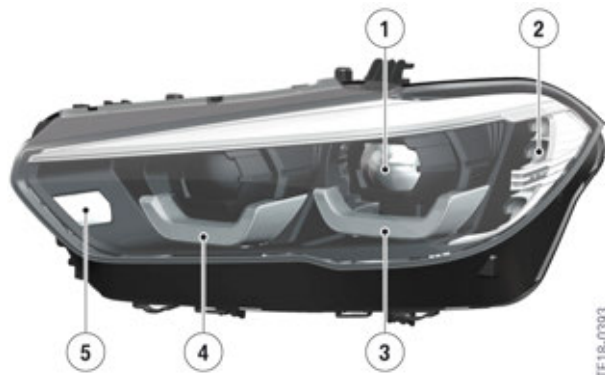
G05 General Vehicle Electronics

6. Exterior Lighting

Index	Explanation
1	Left headlight with Frontal Light Electronics Left (FLEL)
2	Left fog light
3	Right fog light
4	Right headlight with Frontal Light Electronics Right (FLER)
5	Ride height sensor, front right
6	Fuses in the power distribution box, front right
7	Body Domain Controller (BDC)
8	Fuse in the Body Domain Controller
9	Turn indicator on exterior rearview mirror, right
10	Ride height sensor, rear right, CAN terminator
11	Fuse for rear right power distribution box
12	Ride-height sensor, rear left
13	VDP control unit
14	Turn indicator on exterior rearview mirror, left
15	Light switch
16	Hazard warning switch/Intelligent Safety button
17	Steering column switch cluster (SZL)
18	Instrument cluster (KOMBI)
19	Rain-light-solar-condensation sensor (RLSBS)
20	Ride height sensor, front left

All headlight versions and turn indicators are fitted exclusively with LEDs.

6.2.2. Adaptive Full LED headlights



Adaptive Full LED headlights

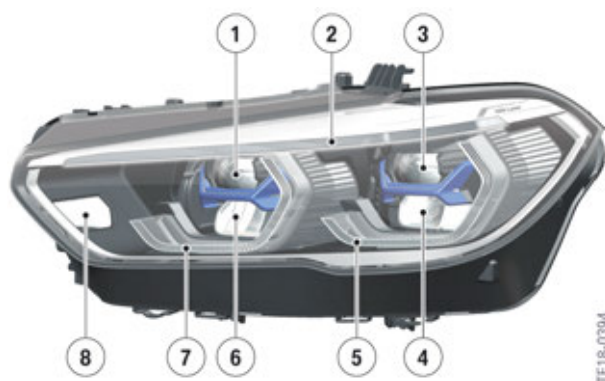
G05 General Vehicle Electronics

6. Exterior Lighting

Index	Explanation
1	Low-beam headlight/High-beam headlight
2	Turn indicator
3	Side lights and daytime driving lights
4	Side lights and daytime driving lights
5	Cornering light

On the adaptive LED headlight the low-beam headlight and high-beam headlight are in the same reflector.

6.2.3. BMW laserlight



BMW laser light

Index	Explanation
1	Low-beam headlight
2	Turn indicator
3	Low-beam headlight
4	High beam
5	Side lights and daytime driving lights
6	High beam
7	Side lights and daytime driving lights
8	Cornering light

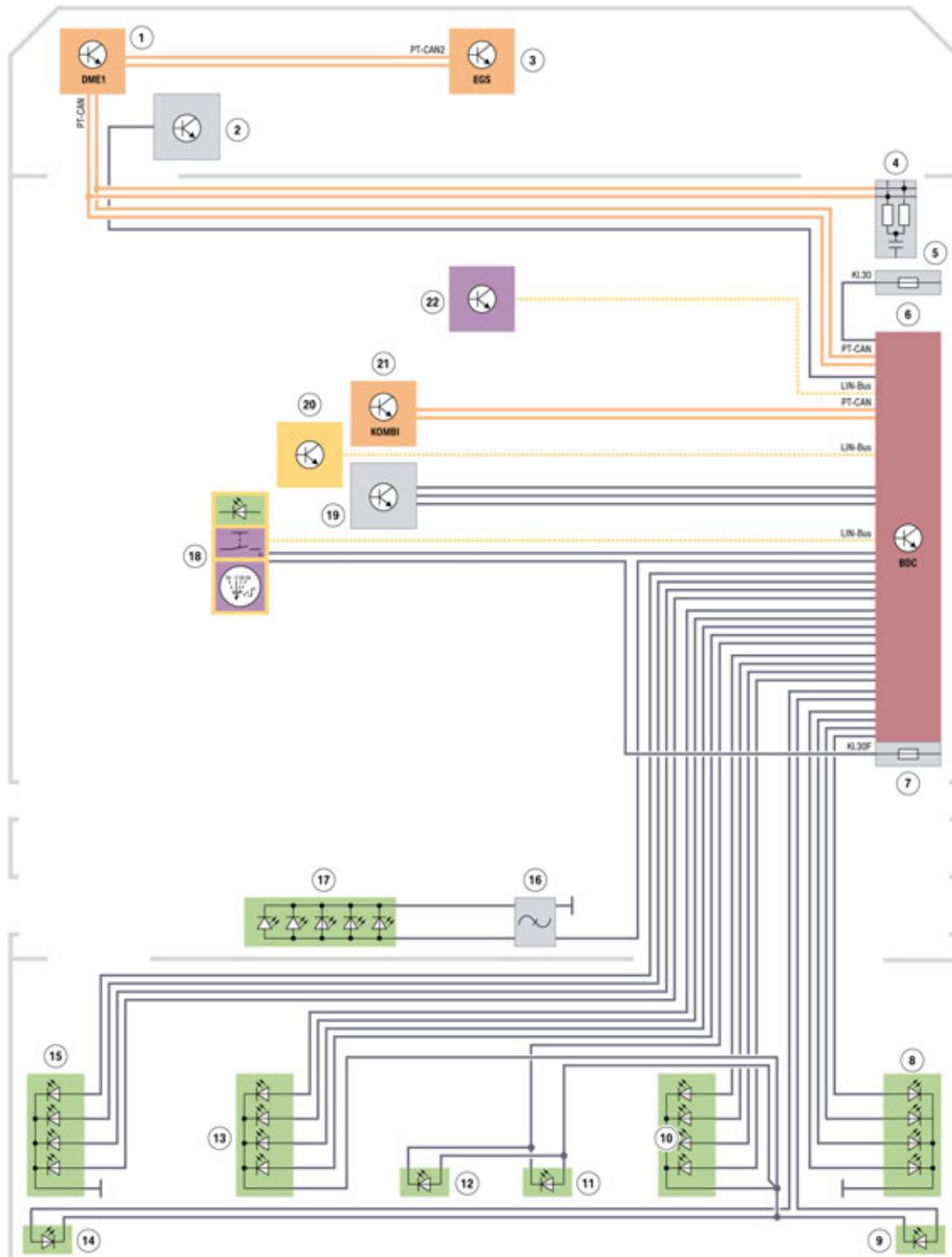
The manufacturer of Laser Light II is the company Automotive Lighting.

G05 General Vehicle Electronics

6. Exterior Lighting

6.3. Rear exterior lights

6.3.1. System wiring diagram



Rear exterior lights

TE18-0512_2

G05 General Vehicle Electronics

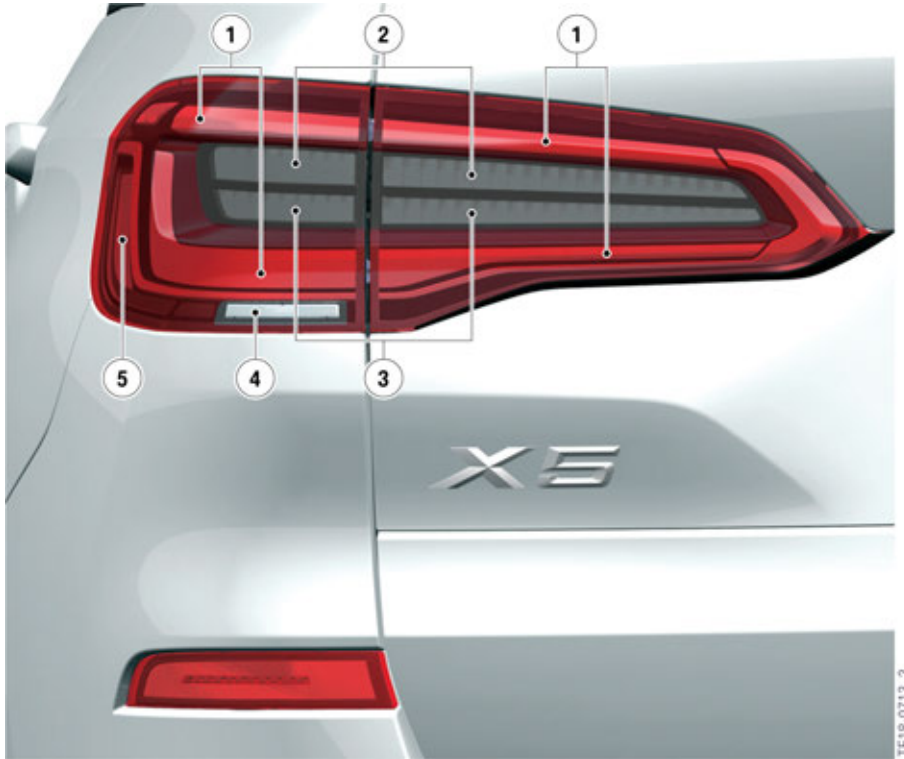
6. Exterior Lighting

Index	Explanation
1	Digital Motor Electronics (DME)
2	Future Brake System (IB)
3	Electronic transmission control (EGS), fuses in the power distribution box, front right
4	CAN terminator
5	Fuse, front right
6	Body Domain Controller (BDC)
7	Fuse in the Body Domain Controller
8	Rear light cluster, right outer
9	Rear fog light, right (not for US)
10	Rear light cluster, right inner
11	Number-plate light, right
12	Number-plate light, left
13	Rear light cluster, left inner
14	Rear fog light, left (not for US)
15	Rear light cluster, left outer
16	Interference suppression filter
17	Additional brake light
18	Operating unit for light
19	Hazard warning switch/Intelligent Safety button
20	Steering column switch cluster (SZL)
21	Instrument cluster (KOMBI)
22	Rain-light-solar-condensation sensor (RLSBS)

G05 General Vehicle Electronics

6. Exterior Lighting

6.3.2. Rear light



Rear light

Index	Explanation
1	Tail light
2	Brake light
3	Turn indicator
4	Reversing light
5	Side marker light

G05 General Vehicle Electronics

6. Exterior Lighting

6.4. KAFAS

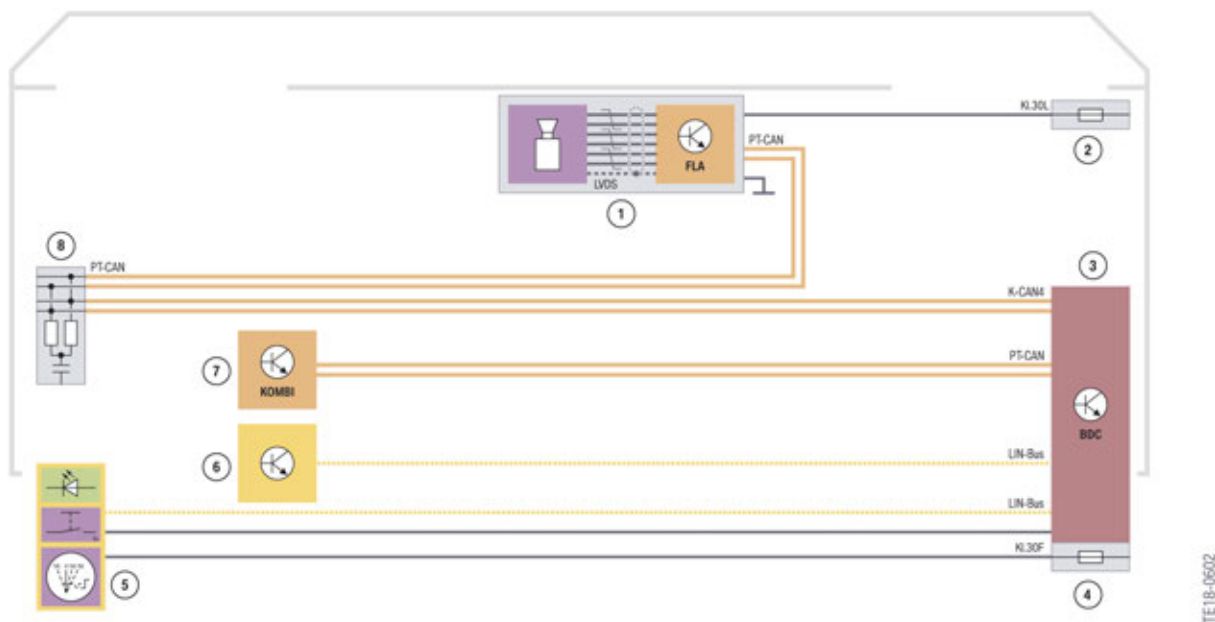
On vehicles with camera-based driver assistance systems (KAFAS), the function of the high-beam assistant is performed by KAFAS.



KAFAS camera

Index	Explanation
A	KAFAS Mid
B	KAFAS High

6.4.1. System wiring diagram



KAFAS camera with high-beam assistant

G05 General Vehicle Electronics

6. Exterior Lighting

Index	Explanation
1	High-beam assistant (FLA)
2	Fuse for front right power distribution box
3	Body Domain Controller (BDC)
4	Fuse in the Body Domain Controller
5	Operating unit for light
6	Steering column switch cluster (SZL)
7	Instrument cluster (KOMBI)
8	CAN terminator



Detailed information on the KAFAS camera can be found in the document "General Vehicle Electronics 2018"

6.5. Ground lighting

The ground lighting is integrated in the corresponding door modules. The LEDs of the ground lighting are activated directly by the Body Domain Controller (BDC).

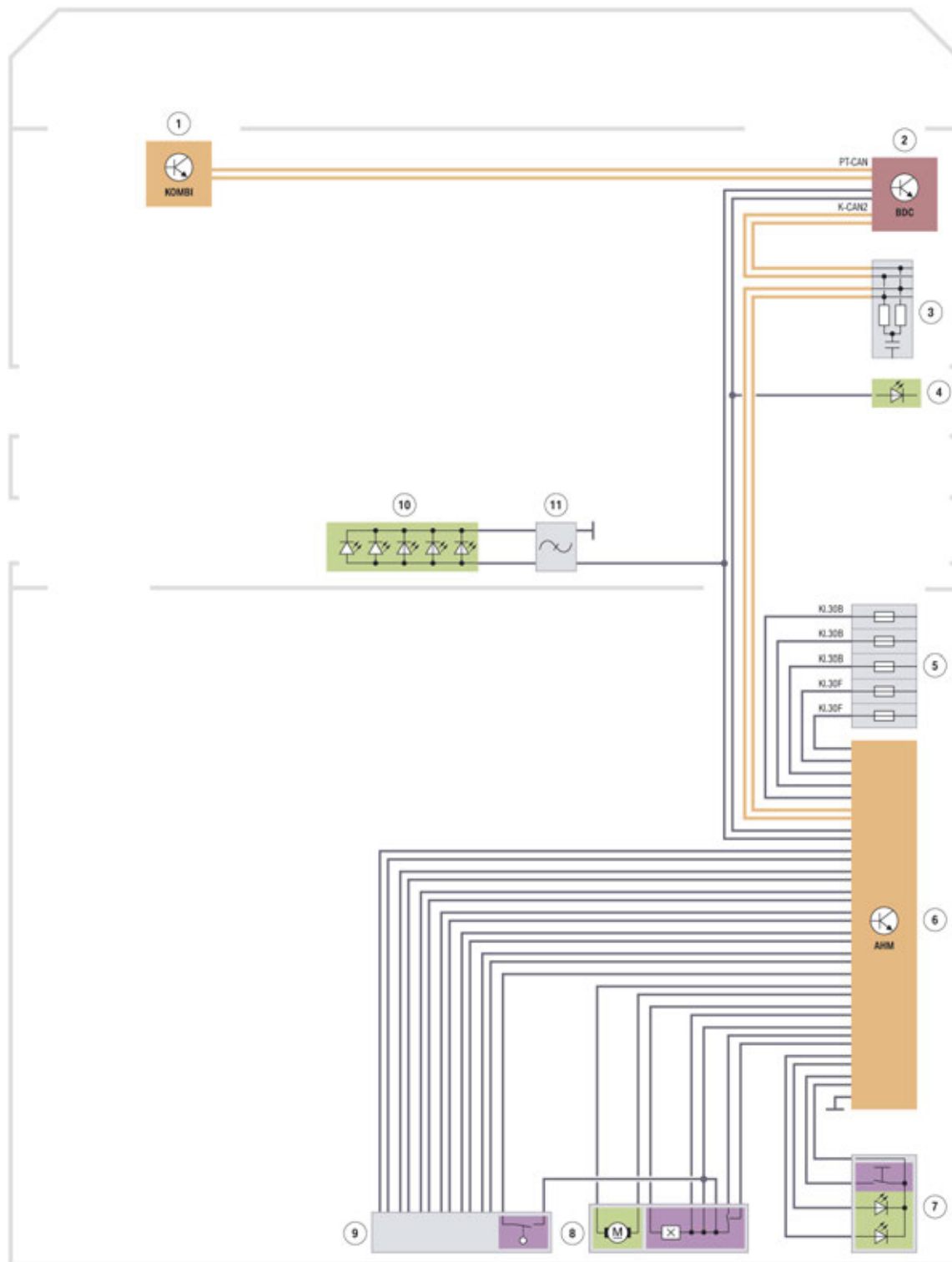
6.6. Light carpet

The light source is integrated in the side sill so that it is invisible for the customer. The function can be realized in a very small installation space through the use of a multi-lens array system. A very flat angle of radiation is also possible. The graphic is superposed several times by the multi-lens array system and is therefore insensitive to dirt contamination. The light carpet is activated by the Body Domain Controller (BDC).

6.7. Trailer lighting

6. Exterior Lighting

6.7.1. System wiring diagram



TE18-0513

Trailer lighting

G05 General Vehicle Electronics

6. Exterior Lighting

Index	Explanation
1	Instrument cluster (KOMBI)
2	Body Domain Controller
3	CAN terminator
4	Exterior mirror, front passenger side
5	Fuse in the Body Domain Controller
6	Trailer module (AHM)
7	Button for trailer tow hitch
8	Motor for trailer tow hitch
9	Trailer socket
10	Additional brake light
11	Interference suppression filter

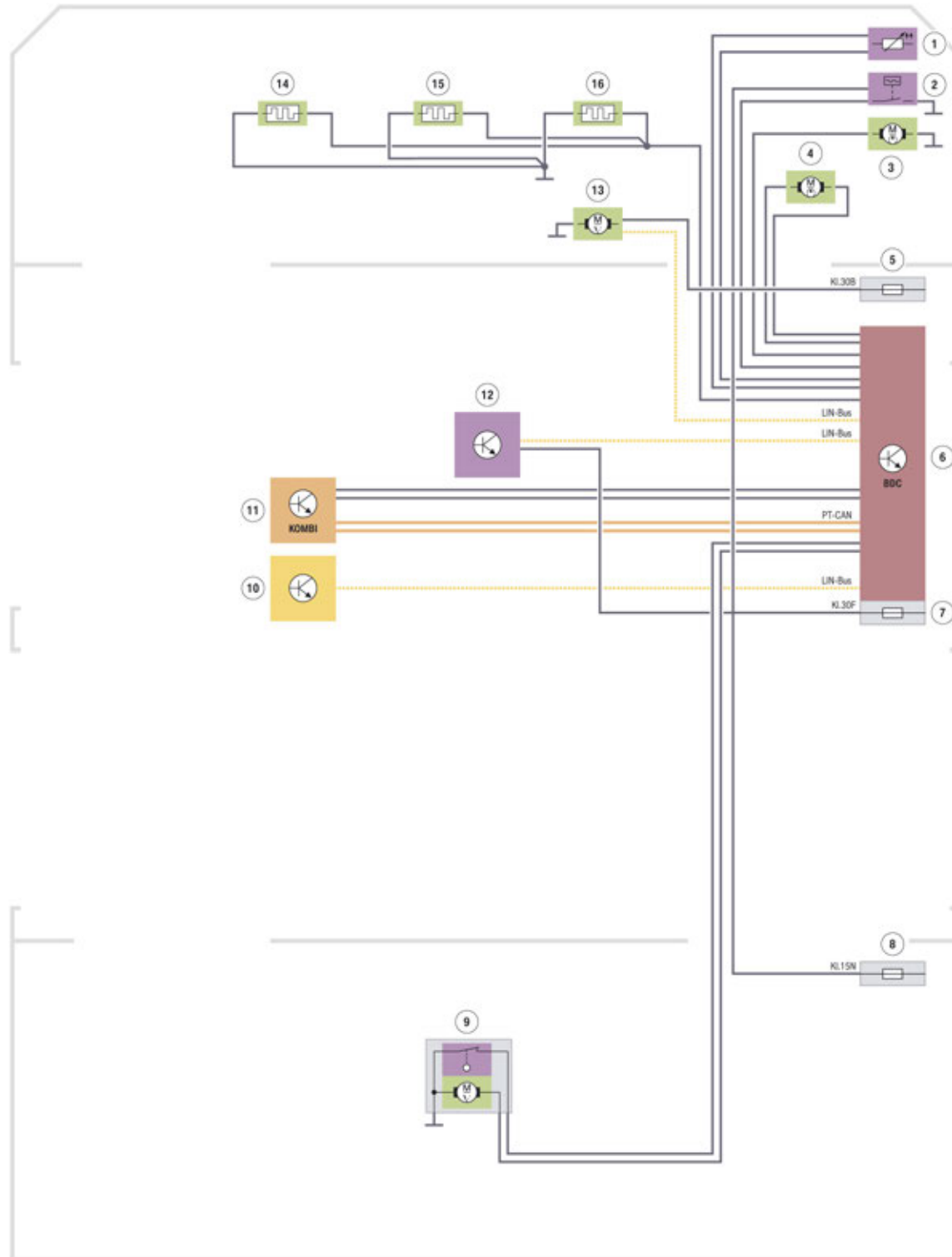
Vehicles with a trailer coupling are equipped with a trailer module AHM. The trailer module is responsible for the following functions:

- Light control for trailer
- Monitoring the trailer power circuits
- Control and monitoring of the fully automatic trailer tow hitch.

G05 General Vehicle Electronics

7. Wash/Wipe System

7.1. System wiring diagram



TE18-0391

Wash/wipe system

G05 General Vehicle Electronics

7. Wash/Wipe System

Index	Explanation
1	Outside temperature sensor
2	Washer fluid level sensor
3	Washer pump for Night Vision camera
4	Motor for window washer pump, windscreen and rear window
5	Fuses in the power distribution box, front right
6	Body Domain Controller (BDC)
7	Fuse, BDC
8	Fuse, rear right
9	Wiper motor, tailgate
10	Steering column switch cluster (SZL), wiper motor
11	Instrument cluster (KOMBI)
12	Rain-light-solar-condensation sensor
13	Wiper motor
14	Heated washer jet, left
15	Heated washer jet, center
16	Heated washer jet, right

The wiper motor is a 12 V motor with gearing. The control unit, the wiper motor and the transmission form one replaceable unit. This wiper motor unit comprises:

- A permanently excited direct current motor with attached reduction gear
- Control unit electronics with eccentric shaft sensor and suppressor components with attached plug connection.

The control unit in the wiper motor is able to identify the following faults:

- Faults in the control unit electronics
- Short circuits at the motor and sensor system
- Open lines at the motor and sensor system.

The control unit in the wiper motor does not have a fault memory. The fault code entry is effected in the Body Domain Controller (BDC).

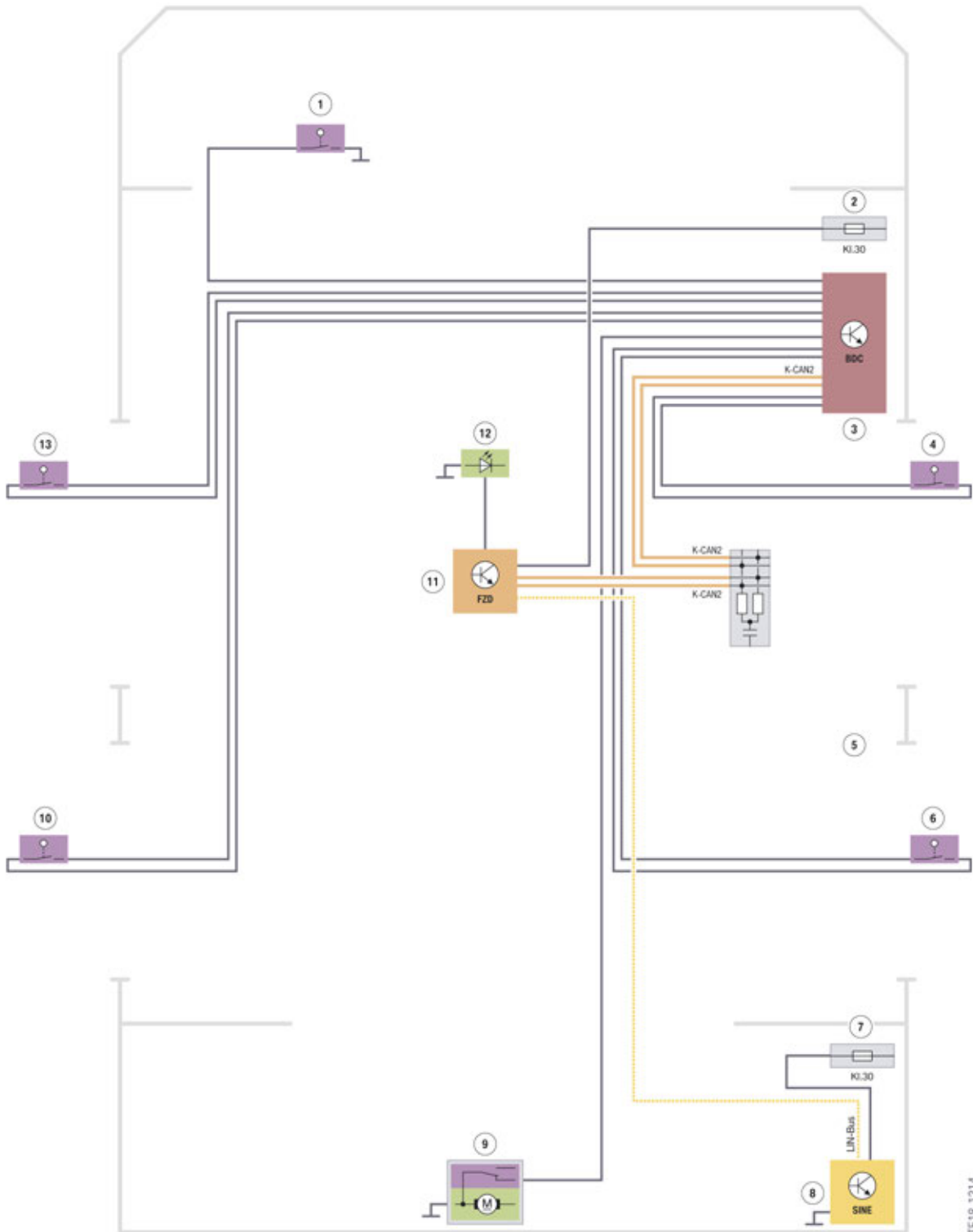
The heated washer jets are activated by the Body Domain Controller.

The Body Domain Controller is also responsible for actuation of the window washer pumps and evaluation of the washer fluid level switch.

G05 General Vehicle Electronics

8. Alarm System

8.1. System wiring diagram



TE18-1214

Alarm system

G05 General Vehicle Electronics

8. Alarm System

Index	Explanation
1	Hood contact switch
2	Fuse for front right power distribution box
3	Body Domain Controller (BDC)
4	Door contact, front passenger side, front
5	CAN terminator
6	Door contact on front passenger side, rear
7	Fuse for rear right power distribution box
8	Siren with tilt alarm sensor
9	Tailgate contact switch in the tailgate lock
10	Door contact on driver's side, rear
11	Roof function center (FZD)
12	LED in the interior mirror
13	Door contact, driver's side, front

The alarm system in the G05 is equipped with an ultrasonic interior movement detector for monitoring the vehicle interior. The ultrasonic interior movement detector (USIS) is fully integrated in the roof function center (FZD).

The door contacts, engine compartment lid contact switch and the opening of the tailgate are monitored by the Body Domain Controller. As soon as a status changes, the ultrasonic interior movement detector receives this information via the K-CAN2. If the alarm system is activated, the siren with tilt alarm sensor is activated by the control unit in the event of a break-in.

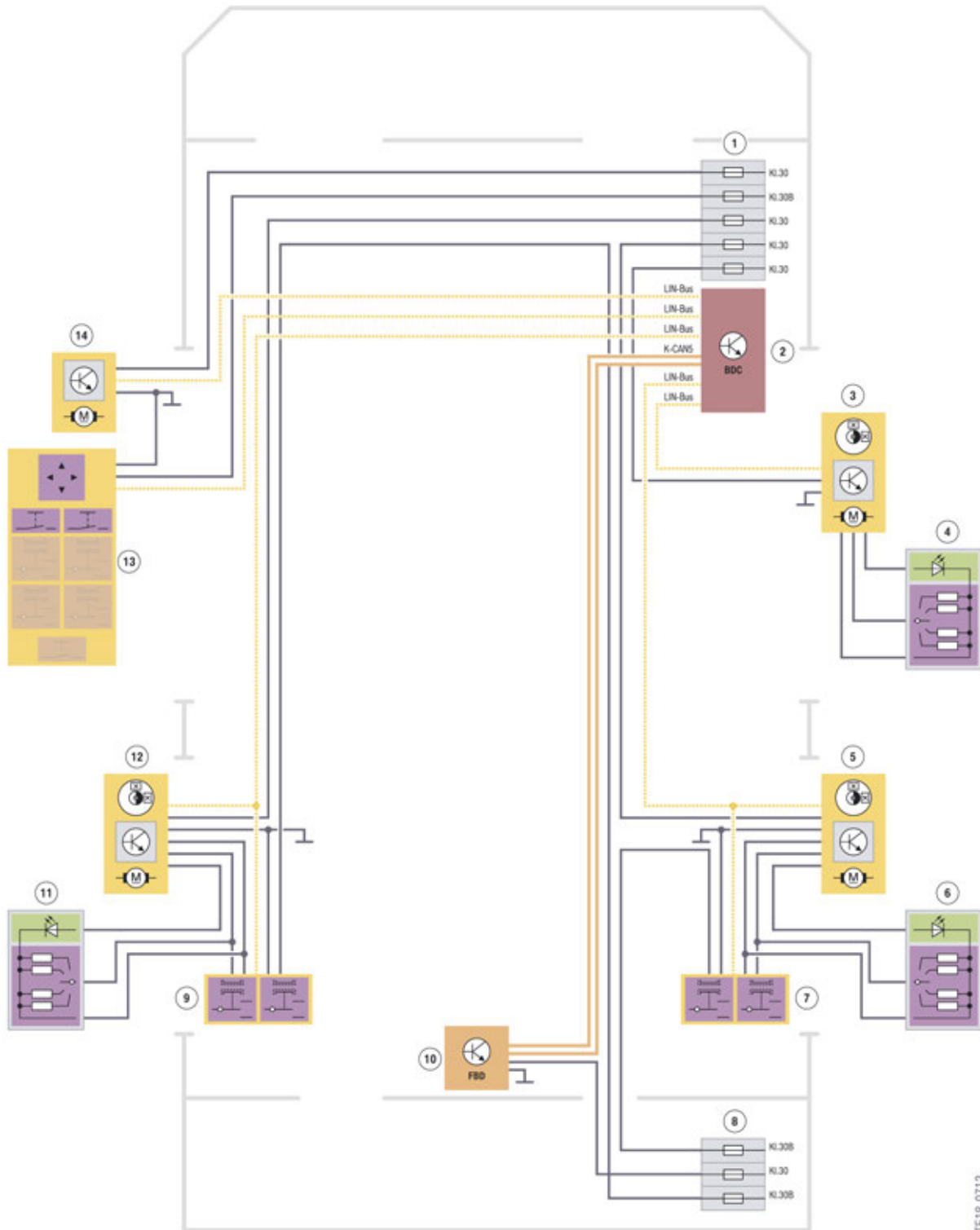
The siren with tilt alarm sensor (SINE) is connected via a local LIN bus to the roof function center.

The status of the alarm system is displayed via the LED at the interior mirror.

G05 General Vehicle Electronics

9. Power Window Regulator

9.1. System wiring diagram



TE18-0712

Power window regulator

G05 General Vehicle Electronics

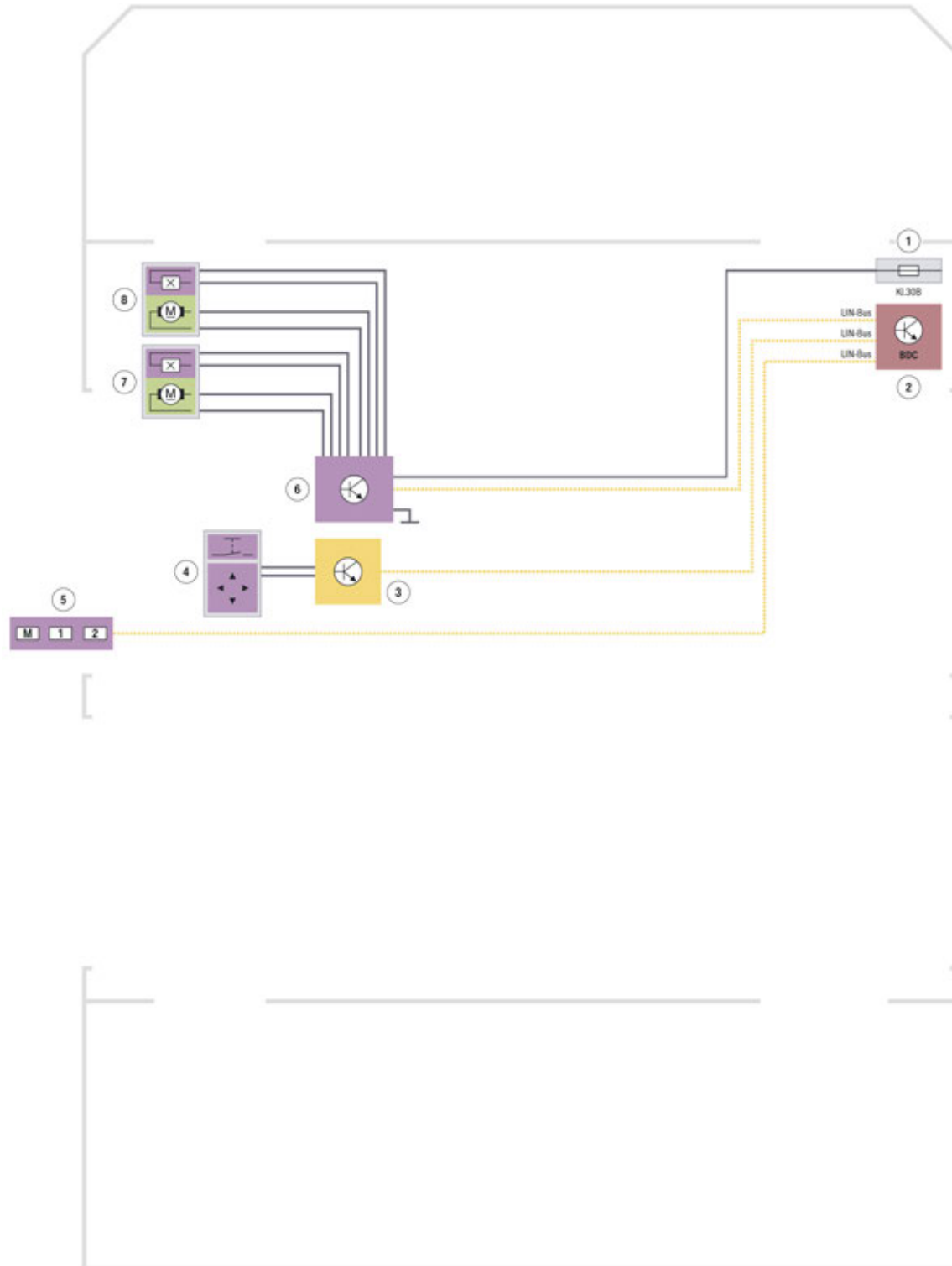
9. Power Window Regulator

Index	Explanation
1	Fuses in the power distribution box, front right
2	Body Domain Controller (BDC)
3	Power window motor, passenger's side
4	Power window switch, front passenger side, front
5	Power window motor, passenger's side rear
6	Power window switch, front passenger side rear
7	Switch, side window roller sun blind, rear right
8	Fuses in the power distribution box, rear right
9	Switch, side window roller sun blind, rear left
10	Remote control receiver (FBD)
11	Power window switch driver's side, rear
12	Power window motor, driver's side rear
13	Switch block, driver's door
14	Power window motor, driver's side front

G05 General Vehicle Electronics

10. Electric Steering Column

10.1. System wiring diagram



TE16-0936

Electric steering column

G05 General Vehicle Electronics

10. Electric Steering Column

Index	Explanation
1	Fuse for front right power distribution box
2	Body Domain Controller (BDC)
3	Steering column switch cluster (SZL)
4	Steering column adjustment button
5	Memory switch
6	Electronics for steering column adjustment
7	Motor for electric steering column adjustment, height
8	Motor for electric steering column adjustment, vertical

G05 General Vehicle Electronics

11. Interior Lighting

11.1. Ambient lighting

The Body Domain Controller controls the ambient lighting that includes 11 predefined, selectable light designs.

The Sky Lounge panorama roof is available as optional equipment and an enhancement of the ambient lighting. It can be activated with six different colors.

3 LED modules are installed on either side of the panorama roof for the ambient lighting. The light design, special functions and brightness can be selected via the controller. The selected design is displayed on the CID.

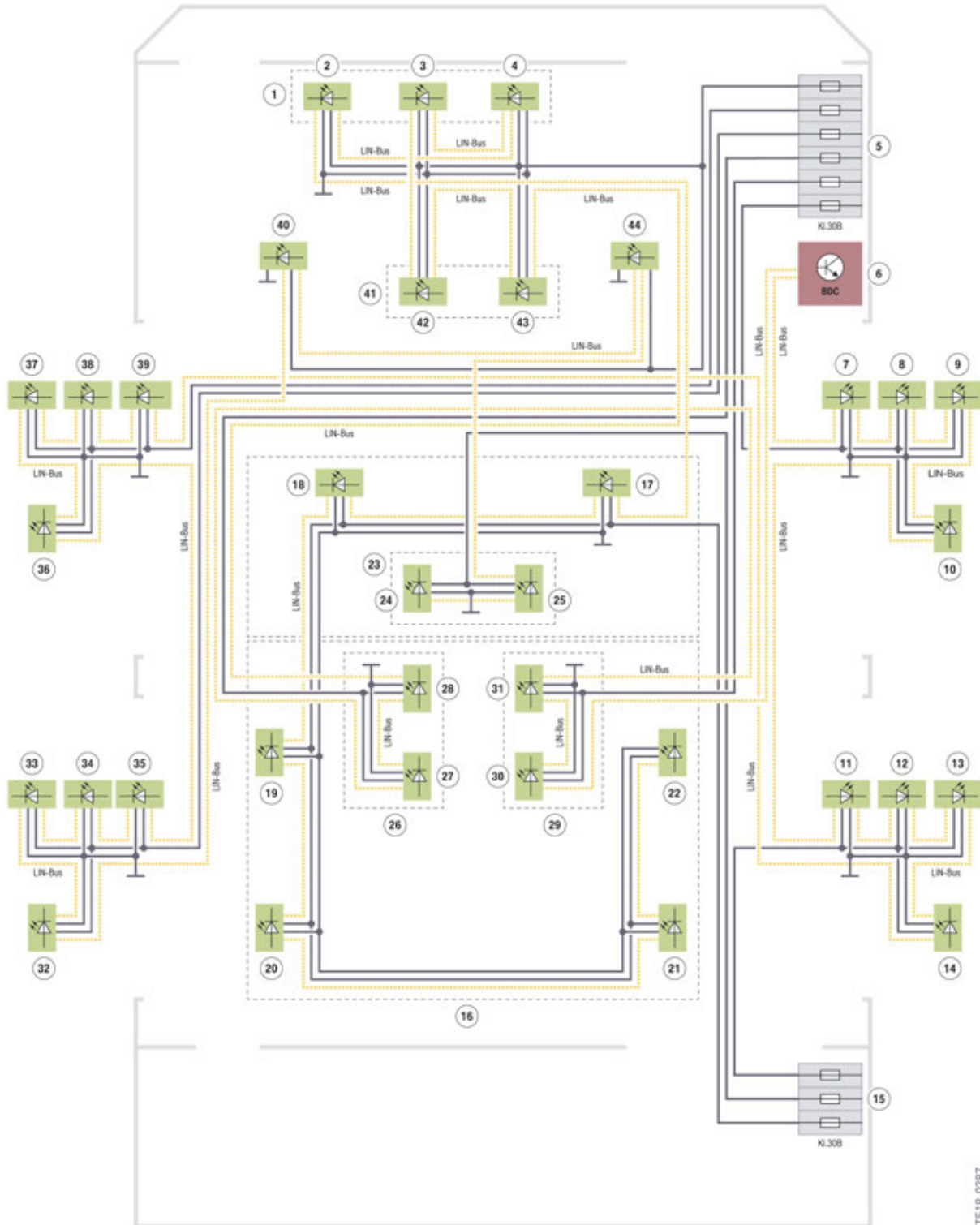
Some functions additional functions can be implemented for alerts using the ambient lighting:

- The ambient lighting can change the colors as a warning, e.g. when a door is opened.
- In the event of an incoming call, the ambient lighting can indicate this visually.
- Welcome/Goodbye dimming is also available as a further function.

G05 General Vehicle Electronics

11. Interior Lighting

11.1.1. System wiring diagram



Interior lighting, ambient lighting

TE18-0387

G05 General Vehicle Electronics

11. Interior Lighting

Index	Explanation
1	Ambient lighting, instrument panel, top
2	Lighting, instrument panel, left
3	Lighting, instrument panel, middle
4	Lighting, instrument panel, right
5	Fuses in power distribution box, front right
6	Body Domain Controller (BDC), lighting, center stack
7	Lighting, storage compartment, door, passenger's side, front right
8	Lighting, door opener, passenger's side, front right
9	Lighting, power window switch, passenger's side, front right
10	Contour line lighting, door, passenger's side, front right
11	Lighting, storage compartment, door, passenger's side, rear right
12	Lighting, door opener, passenger's side, rear right
13	Lighting, power window switch, passenger's side, rear right
14	Contour line lighting, door, passenger's side, rear right
15	Fuses, power distribution box, rear right
16	Panorama glass roof, rear
17	Sky Lounge panorama roof lighting, front right
18	Sky Lounge panorama roof lighting, front left
19	Sky Lounge panorama roof lighting, rear left
20	Sky Lounge panorama roof lighting, rear left
21	Sky Lounge panorama roof lighting, rear right
22	Sky Lounge panorama roof lighting, rear right
23	Center console, lighting
24	Center console, accent lighting, left
25	Center console, accent lighting, right
26	Driver's seat, lighting
27	Driver's seat, lighting, backrest, left
28	Driver's seat, lighting, backrest, bottom left
29	Front passenger seat, lighting
30	Front passenger seat, lighting, backrest, right
31	Front passenger seat, lighting, backrest, bottom right
32	Contour line lighting, door, driver's side, rear left
33	Lighting, door opener, driver's side, front left
34	Lighting, power window switch, driver's side, front left
35	Contour line lighting, door, driver's side, front left

G05 General Vehicle Electronics

11. Interior Lighting

Index	Explanation
36	Contour line lighting, door, driver's side, front left
37	Lighting, door opener, driver's side, rear left
38	Lighting, power window switch, driver's side, rear left
39	Contour line lighting, door, driver's side, rear left
40	Footwell light, front left
41	Contour lines, instrument panel
42	Contour line lighting, instrument panel, bottom right
43	Contour lines, instrument panel, right
44	Footwell light, front right

RGB (red, green, blue) LED modules are used for the ambient lighting.

The ambient lighting is controlled via a separate LIN bus. The individual LED modules are connected via a local interconnect network bus. The LED modules are connected in series to the LIN bus around the vehicle.

If the LIN bus is interrupted at a certain point or the micro controller on the LED is faulty, then further light transmittance is interrupted at this point. A search for the fault must be carried out at the location where the last LED illuminates.

11.2. Speaker illumination

In a vehicle with a Bowers & Wilkins audio system, the lighting for the speaker trims is activated via the Receiver Audio Module (RAM).

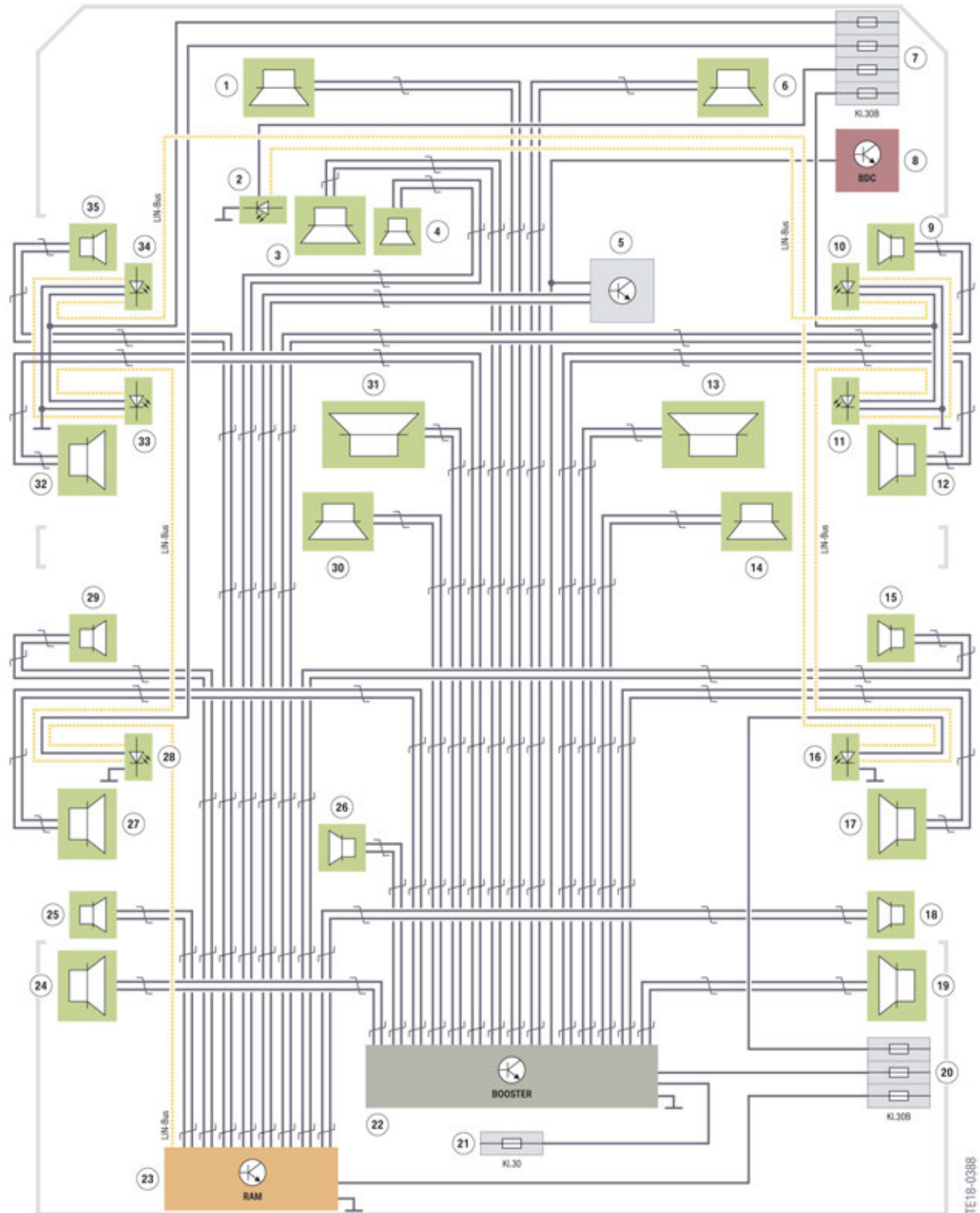
LED modules are used for the speaker cover lighting.

The lighting is controlled via a local LIN bus by RAM to the LED modules of the speaker trims.

G05 General Vehicle Electronics

11. Interior Lighting

11.2.1. System wiring diagram



RAM control unit

G05 General Vehicle Electronics

11. Interior Lighting

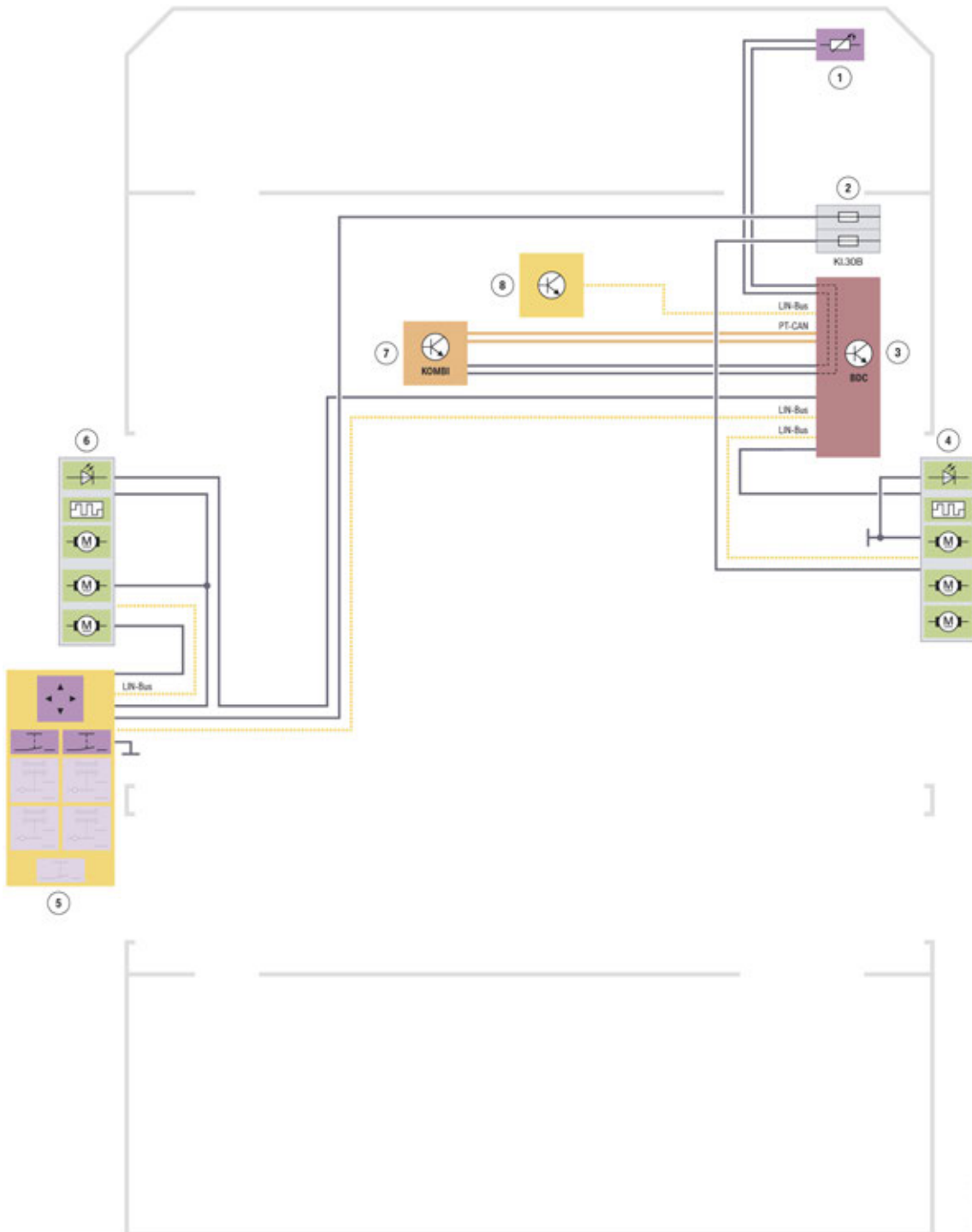
Index	Explanation
1	Mid-range speaker, roof, front left
2	Lighting for center speaker
3	Mid-range speaker, front center
4	Tweeter, front center
5	Head Unit High
6	Mid-range speaker, roof, front right
7	Fuses in the power distribution box, front right
8	Body Domain Controller (BDC), lighting
9	Tweeter, door, passenger's side, front right
10	Lighting, trim, tweeter, door, passenger's side
11	Lighting, trim, tweeter, door, passenger's side
12	Mid-range speaker, door, passenger's side, front right
13	Bass speaker, right
14	Mid-range speaker, roof, rear right
15	Tweeter, door, passenger's side, rear right
16	Lighting, trim, mid-range speaker, door, passenger's side, rear
17	Mid-range speaker, door, passenger's side, rear right
18	Tweeter, D-pillar, passenger's side, rear right
19	Mid-range speaker, D-pillar, passenger's side, rear right
20	Fuses in the power distribution box, rear right
21	Fuse, battery distributor, rear
22	Booster (hi-fi)
23	RAM (Receiver Audio Module)
24	Mid-range speaker, D-pillar, passenger's side, rear left
25	Tweeter, D-pillar, passenger's side, rear left
26	Speaker for outside sound
27	Mid-range speaker, door, driver's side, rear left
28	Lighting, trim, mid-range speaker, door, driver's side, rear
29	Tweeter, door, driver's side, rear left
30	Mid-range speaker, roof, rear left
31	Bass speaker, left
32	Mid-range speaker, door, driver's side, front left
33	Lighting, trim, mid-range speaker, door, driver's side
34	Lighting, trim, tweeter, door, driver's side
35	Tweeter, door, driver's side, front left

G05 General Vehicle Electronics

12. Door Mirror

12.1. Exterior mirror High

12.1.1. System wiring diagram



Exterior mirror High

G05 General Vehicle Electronics

12. Door Mirror

Index	Explanation
1	Outside temperature sensor
2	Fuses in the power distribution box, front right
3	Body Domain Controller (BDC)
4	Exterior mirror, front passenger side
5	Switch block, driver's door
6	Exterior mirror, driver's side
7	Instrument cluster (KOMBI)
8	Inside mirror

The instrument cluster receives the value of the ambient temperature from the outside temperature sensor and makes this available via the PT-CAN. The Body Domain Controller evaluates the signal and triggers the activation of the mirror heating via the local interconnect network bus. The control of the heater output is dependent on the ambient temperature and the switch position of the driving experience switch.

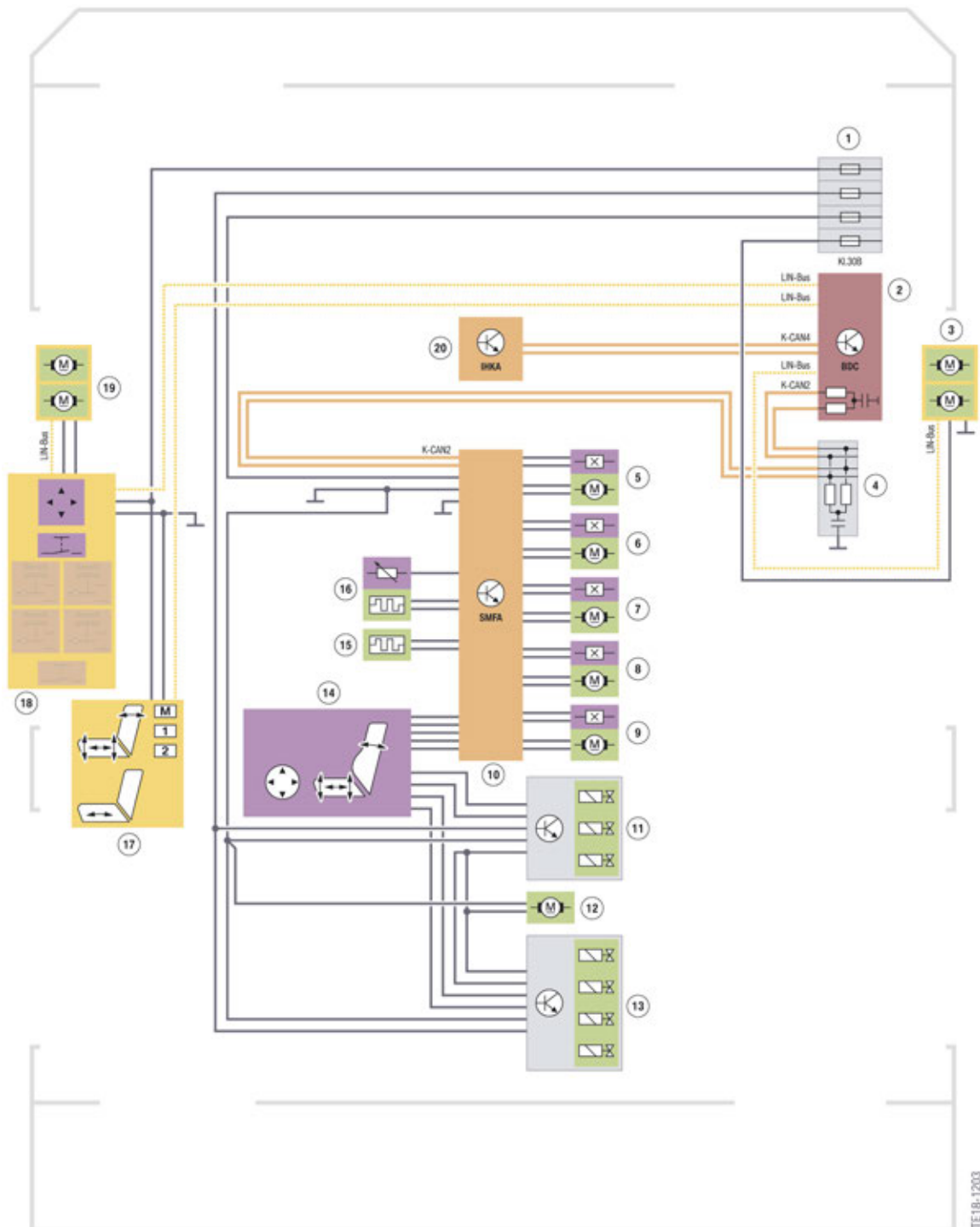
The mirror servomotors are activated by the mirror electronics. The request for adjusting the exterior mirror is received by the mirror electronics via the local interconnect network bus.

G05 General Vehicle Electronics

13. Seats

13.1. Front seats

13.1.1. Memory sports seat, driver's side, front



Memory sports seat, driver's side, front

G05 General Vehicle Electronics

13. Seats

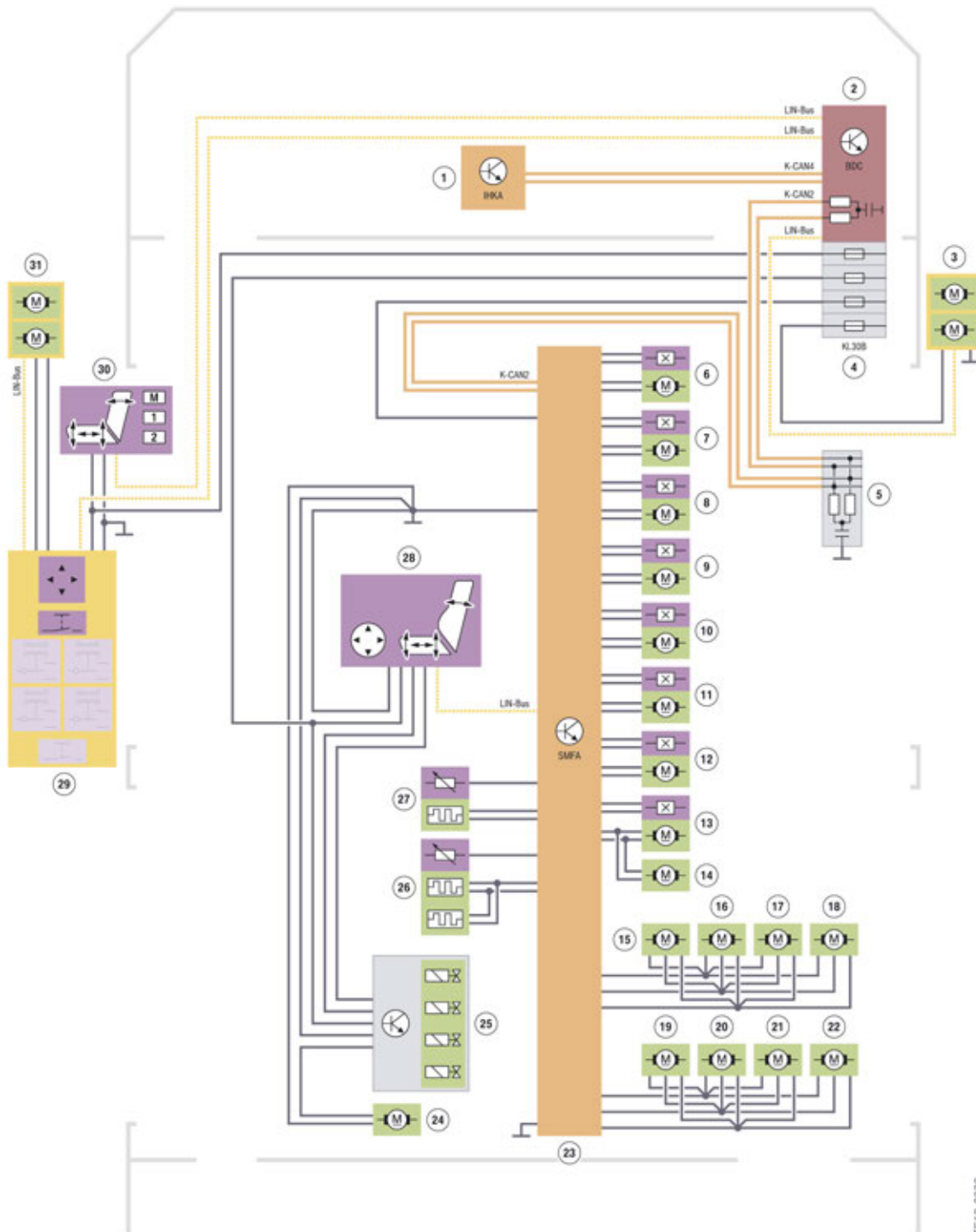
Index	Explanation
1	Fuses in the power distribution box, front right
2	Body Domain Controller (BDC)
3	Exterior mirror, front passenger side
4	CAN terminator
5	Motor, longitudinal seat adjustment
6	Motor, seat angle adjustment
7	Motor, seat height adjustment
8	Motor, backrest angle adjustment
9	Motor, head restraint height adjustment
10	Driver's seat module SMFA
11	Valve block, backrest width adjustment
12	Seat pneumatics module pump
13	Valve block, lumbar-support adjustment
14	Switch, seat adjustment
15	Seat heating pad, backrest
16	Seat heating pad, seat surface
17	Memory switch
18	Switch block, driver's door
19	Exterior mirror, driver's side
20	Integrated automatic heating/air conditioning (IHKA)

G05 General Vehicle Electronics

13. Seats

13.1.2. Multi-contour seat, front

The following wiring diagram shows the seat on the driver's side. The passenger's side is identical but reversed left-to-right.



Multi-contour seat, front, driver's side

G05 General Vehicle Electronics

13. Seats

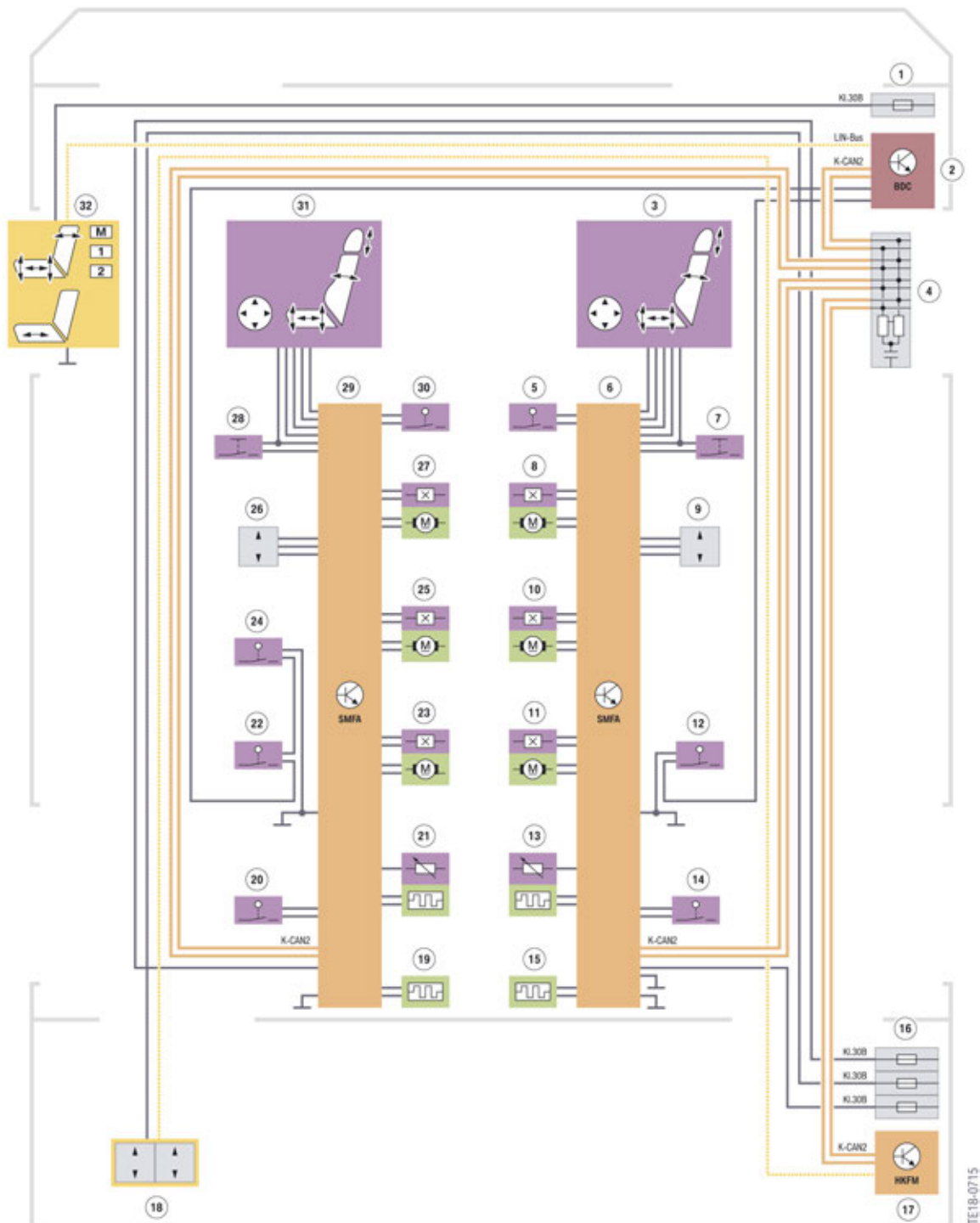
Index	Explanation
1	Integrated automatic heating/air conditioning (IHKA)
2	Body Domain Controller (BDC)
3	Exterior mirror, front passenger side
4	Fuses in the power distribution box, front right
5	CAN terminator
6	Motor, longitudinal seat adjustment
7	Motor, seat angle adjustment
8	Motor, seat height adjustment
9	Motor, backrest angle adjustment
10	Motor, head restraint height adjustment
11	Motor, seat depth adjustment
12	Motor, backrest head adjustment
13	Motor, backrest width adjustment
14	Motor, backrest width adjustment
15	Motor, active seat ventilation, seat surface
16	Motor, active seat ventilation, seat surface
17	Motor, active seat ventilation, seat surface
18	Motor, active seat ventilation, seat surface
19	Motor, active seat ventilation, backrest surface
20	Motor, active seat ventilation, backrest surface
21	Motor, active seat ventilation, backrest surface
22	Motor, active seat ventilation, backrest surface
23	Driver's seat module (SMFA)
24	Seat pneumatics module pump
25	Valve block, lumbar-support adjustment
26	Seat heating pad, backrest
27	Seat heating pad, seat surface
28	Switch, seat adjustment
29	Switch block, driver's door
30	Memory switch
31	Exterior mirror, driver's side

G05 General Vehicle Electronics

13. Seats

13.2. Electric seats, rear passenger compartment

13.2.1. Electric seats with seat heating, rear passenger compartment



Electric seats, rear passenger compartment

G05 General Vehicle Electronics

13. Seats

Index	Explanation
1	Fuse, front right
2	Body Domain Controller
3	Seat adjustment switch, rear right
4	CAN terminator
5	Switch, through-loading facility, right
6	Seat module, rear right
7	Switch, seat folding, right
8	Motor, backrest angle adjustment, right
9	Switch, convenient entry, right
10	Motor, longitudinal seat adjustment, right
11	Motor, convenient entry, right
12	Microswitch, end position, convenient entry, right
13	Seat heating pad, seat surface, passenger's side rear
14	Switch, backrest emergency release, right
15	Seat heating pad, backrest, passenger's side rear
16	Fuse, rear right
17	Rear function module
18	Switch, longitudinal seat adjustment, in luggage compartment
19	Seat heating pad, backrest, driver's side rear
20	Switch, backrest emergency release, left
21	Seat heating pad, seat surface, driver's side rear
22	Microswitch, end position, convenient entry
23	Motor, convenient entry, left
24	Microswitch, end position, convenient entry
25	Motor, longitudinal seat adjustment, left
26	Switch, convenient entry, left
27	Motor, backrest angle adjustment, left
28	Switch, seat folding, left
29	Seat module, rear left
30	Switch, through-loading facility, left
31	Seat adjustment switch, rear left
32	Memory switch

G05 General Vehicle Electronics

13. Seats

13.3. Massage

8 different massage functions in the backrest and seat cushion are available to activate or relax muscles. This allows the back muscles to be relaxed and the strain on the spinal discs to be relieved. The 8 programs are divided into 3 categories:

- Mobilization .
- Relaxation.
- Vitalization.

In the case of mobilization , the strain on the spine is relieved by targeted body movements.

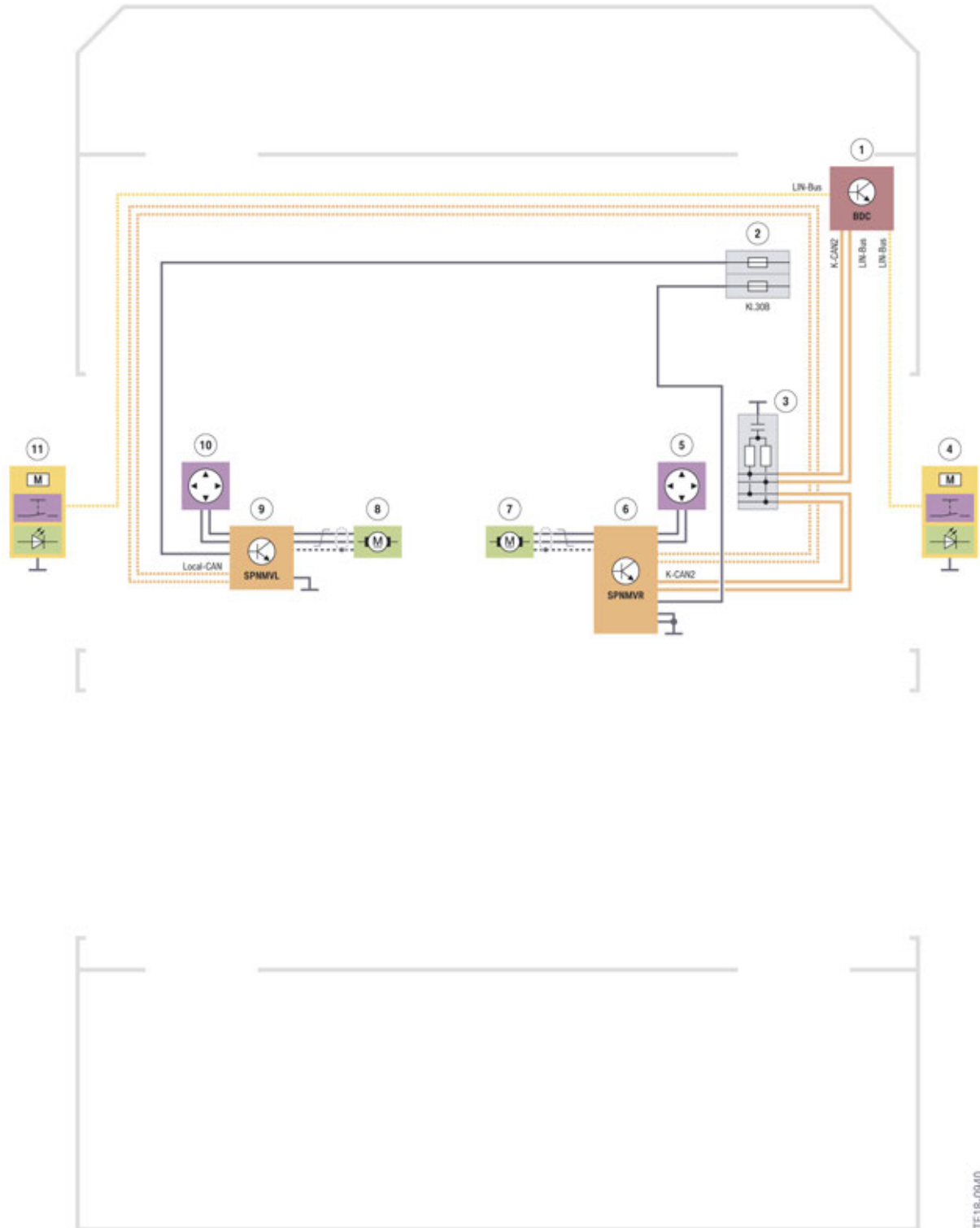
In the relaxation program, the muscles are relaxed by massage.

The vitalization program is made up of both mobilization and relaxation. The combination of movement and massage ensures relaxation and recuperation particularly on long journeys.

G05 General Vehicle Electronics

13. Seats

13.3.1. Seat massage, both front seats



Seat massage, both front seats

TE18-0940

G05 General Vehicle Electronics

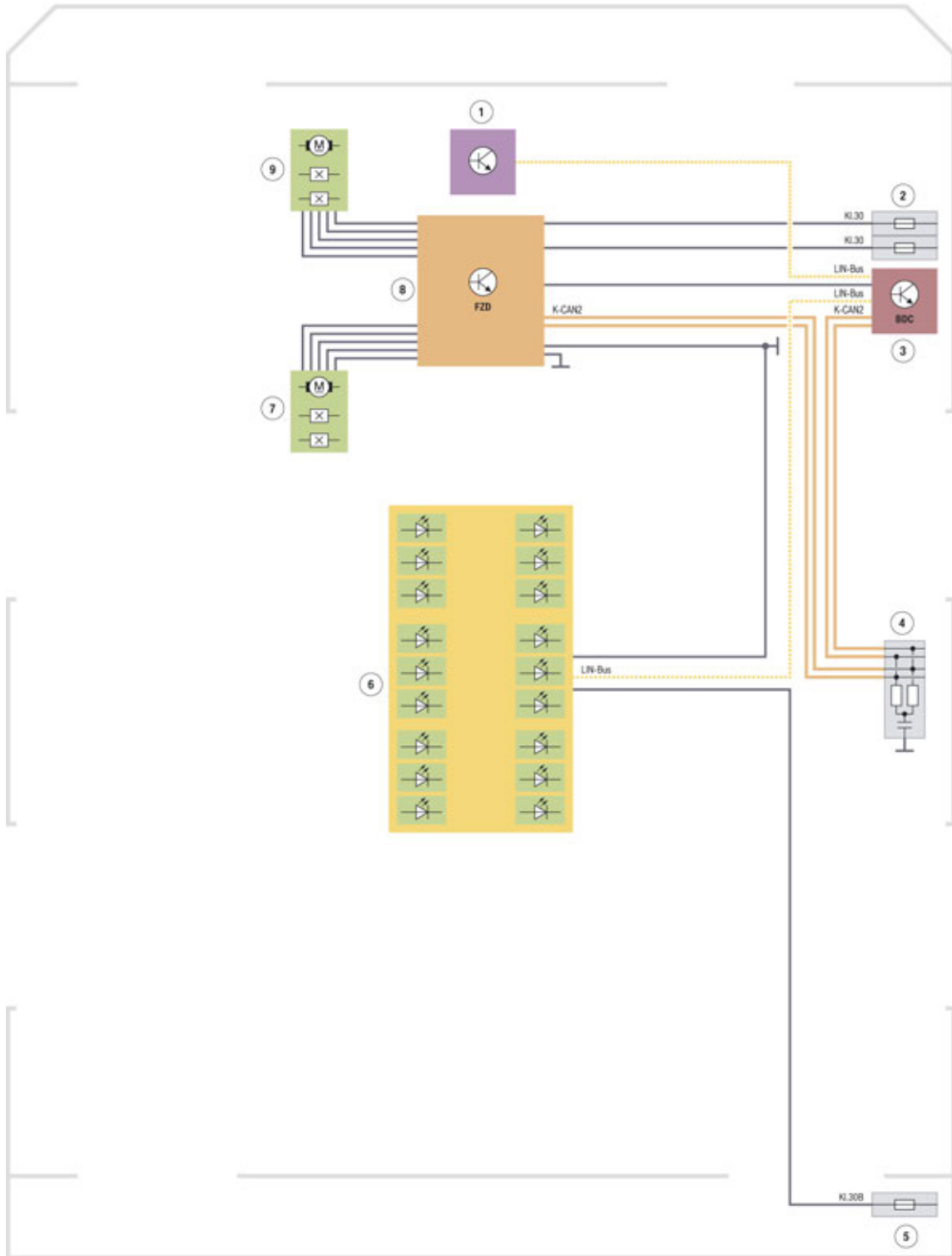
13. Seats

Index	Explanation
1	Body Domain Controller (BDC)
2	Fuse for front right power distribution box
3	CAN terminator
4	Switch block, front passenger door
5	Switch, lumbar support, front passenger seat
6	Seat pneumatics module front right
7	Seat pneumatics module pump, front passenger seat
8	Seat pneumatics module pump, driver's seat
9	Seat pneumatics module front left
10	Switch, lumbar support, driver's seat
11	Switch block, driver's door

G05 General Vehicle Electronics

14. Panorama Roof

14.1. System wiring diagram



Panorama roof

TE18-0710

G05 General Vehicle Electronics

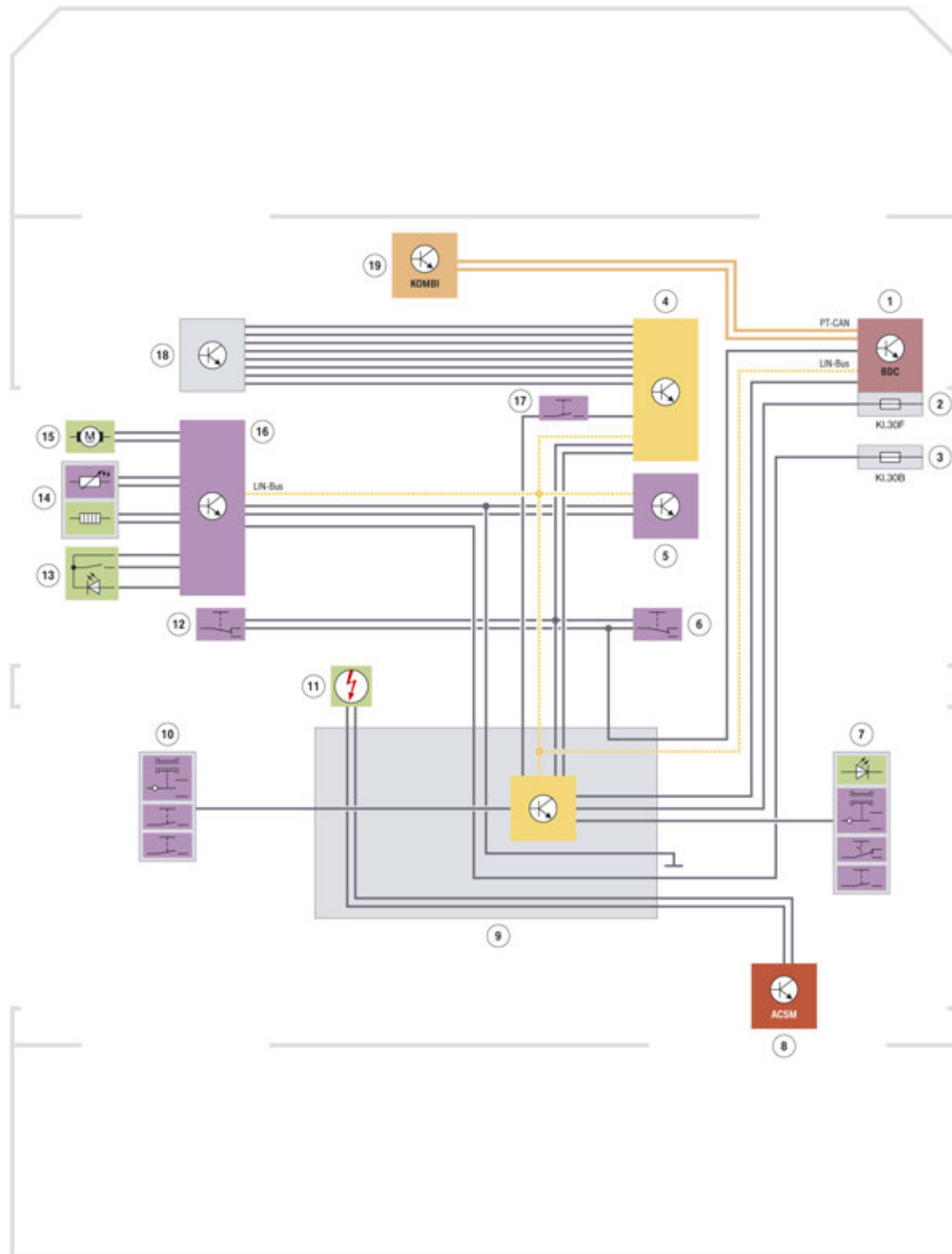
14. Panorama Roof

Index	Explanation
1	Motor, slide/tilt sunroof
2	Roof function center (FZD)
3	Fuses in the power distribution box, front right
4	Body Domain Controller (BDC)
5	CAN terminator
6	Sliding roofliner motor

G05 General Vehicle Electronics

15. Steering Column Switch Cluster

15.1. System wiring diagram



Steering column switch cluster

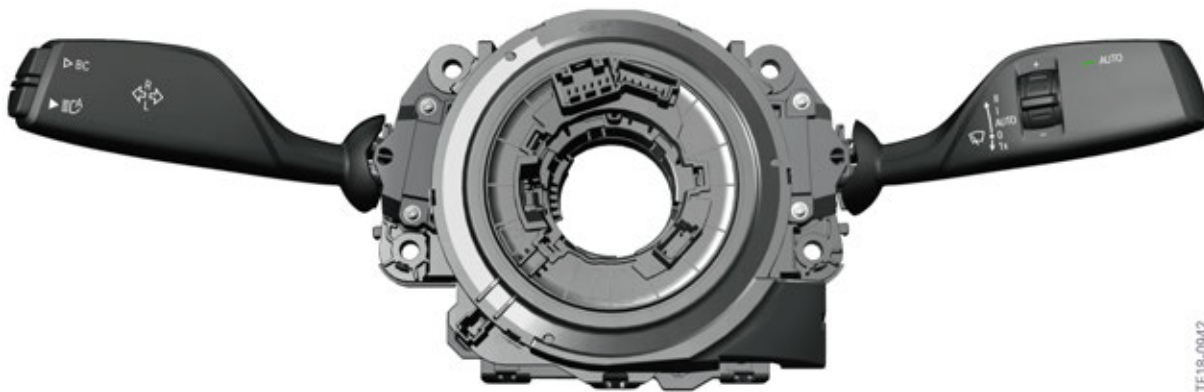
TE18-0941

G05 General Vehicle Electronics

15. Steering Column Switch Cluster

Index	Explanation
1	Body Domain Controller (BDC)
2	Fuse in the Body Domain Controller
3	Fuse for front right power distribution box
4	Multifunction steering wheel buttons, right
5	Touch detection (Hands-Off Detection)
6	Shift paddle, right
7	Steering column switch, right
8	Advanced Crash Safety Module (ACSM)
9	Steering column switch cluster (SZL)
10	Steering column switch, left
11	Driver's airbag
12	Shift paddle, left
13	Steering-wheel heating button
14	Steering wheel heating
15	Vibration motor
16	Steering wheel module
17	Horn button
18	Multifunction steering wheel buttons, left
19	Instrument cluster (KOMBI)

15.2. SZL



Steering column switch cluster (SZL)

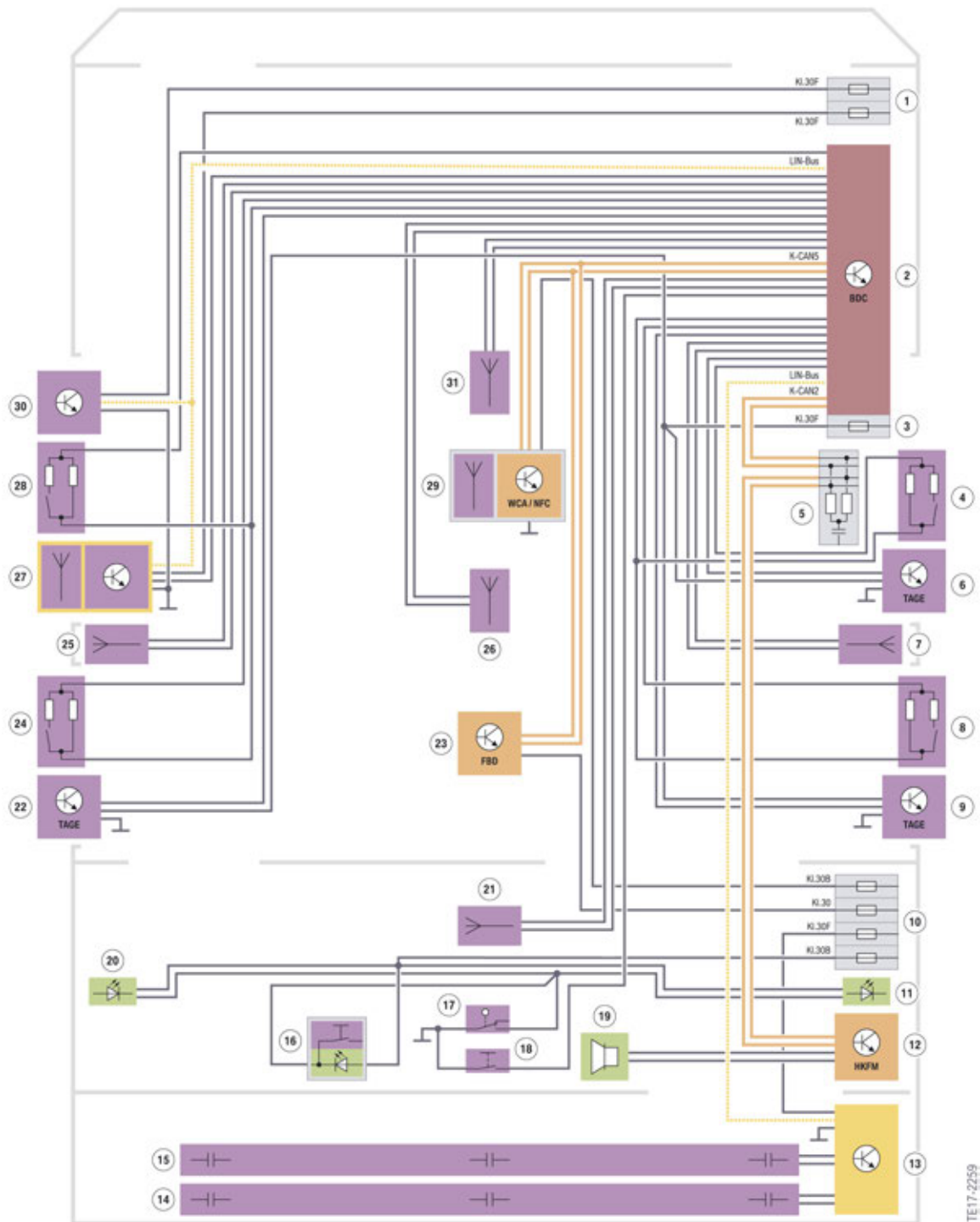
All signals of the buttons and switches of the multifunction steering wheel (MFL) and the steering column switch cluster (SZL) are transmitted via LIN to the Body Domain Controller (BDC). The turn signal/high beam switch on the G05 engages mechanically in the corresponding position when operated. The return is mechanical via the steering wheel.

G05 General Vehicle Electronics

16. Locking and Security Functions

16.1. Comfort Access 2.0.

16.1.1. System wiring diagram



G05 General Vehicle Electronics

16. Locking and Security Functions

Index	Explanation
1	Fuses in the power distribution box, front right
2	Body Domain Controller (BDC)
3	Fuse in the Body Domain Controller
4	Switch in door lock, front passenger door
5	CAN terminator
6	Outside door handle electronics (TAGE), front passenger door
7	Comfort Access aerial, side sill, right
8	Switch in door lock of rear passenger door
9	Outside door handle electronics (TAGE), rear passenger door
10	Fuses in the power distribution box, rear right
11	Luggage compartment light, right
12	Tailgate function module (HKFM)
13	Control unit for contactless tailgate opening
14	Sensor at bottom for contactless tailgate opening
15	Sensor at top for contactless tailgate opening
16	Button for closing tailgate
17	Tailgate contact switch in the tailgate lock
18	Button for tailgate
19	Acoustic warning device for tailgate activation
20	Luggage compartment light, left
21	Comfort Access aerial, luggage compartment
22	Outside door handle electronics (TAGE), rear driver's side door
23	Remote control receiver (FBD)
24	Switch in door lock of rear driver's side door
25	Comfort Access aerial, side sill, left
26	Comfort Access aerial, vehicle interior
27	Outside door handle electronics (TAGE), driver's door, with Near Field Communication (NFC)
28	Switch in door lock of driver's door
29	Wireless charging station with control electronics for Near Field Communication
30	Power window electronics, driver's side front
31	Comfort Access aerial, vehicle interior

G05 General Vehicle Electronics

16. Locking and Security Functions



Detailed information on Comfort Access 2.0 can be found in the document "General Vehicle Electronics 2018"

G05 General Vehicle Electronics

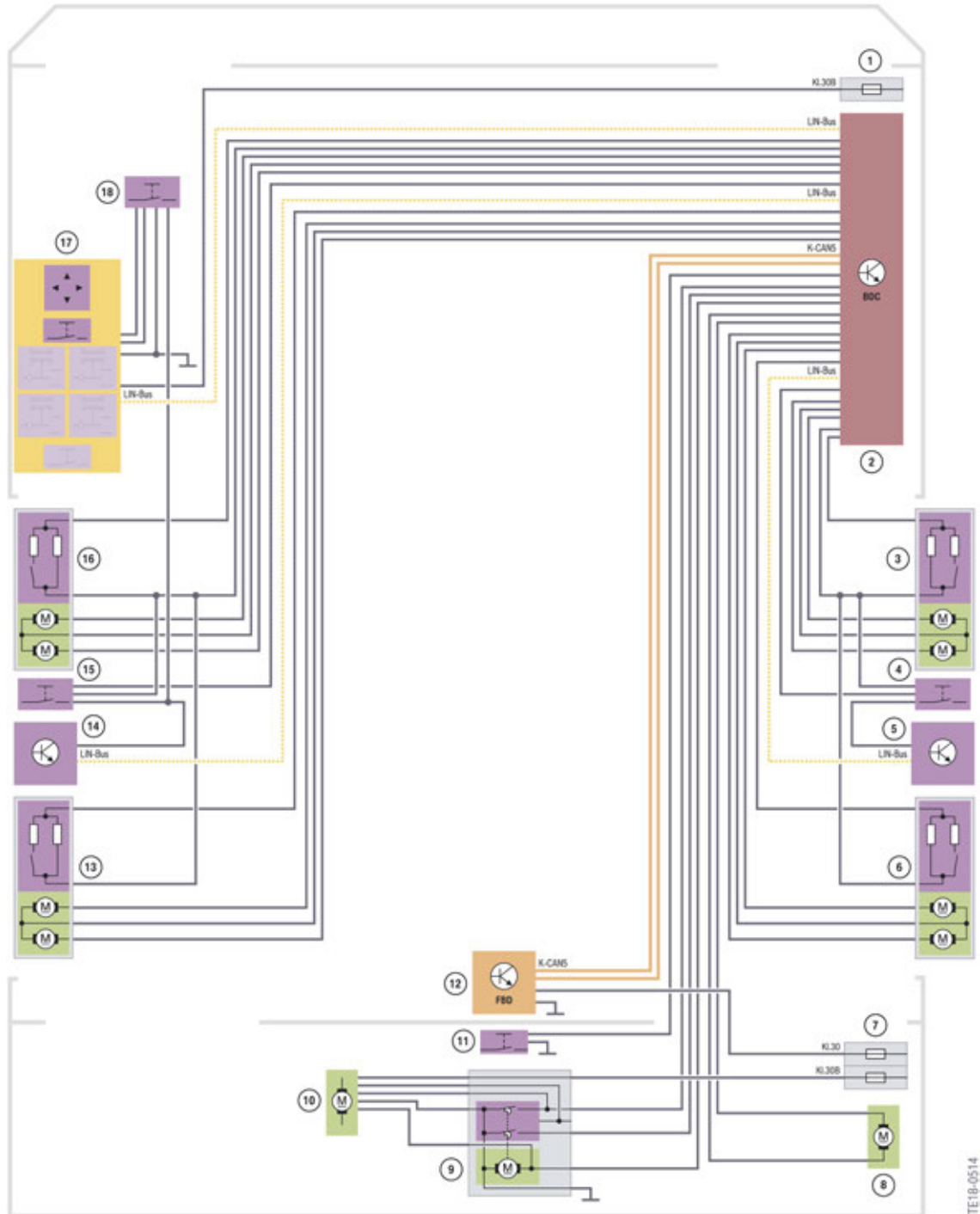
16. Locking and Security Functions

16.2. Central locking system

G05 General Vehicle Electronics

16. Locking and Security Functions

16.2.1. System wiring diagram



Central locking system

TE19-0514

G05 General Vehicle Electronics

16. Locking and Security Functions

Index	Explanation
1	Fuses in power distribution box, front right, hotel position switch (dependent on national-market version)
2	Body Domain Controller (BDC)
3	Door lock, front passenger door
4	Central locking button, front passenger door (depending on the national-market version)
5	Integrated power window electronics, front passenger door
6	Door lock, passenger's side, rear
7	Fuse in the rear power distribution box
8	Servodrive for fuel filler flap
9	Tailgate contact switch in the tailgate lock
10	Automatic Soft Close drive
11	Button for closing tailgate
12	Remote control receiver (FBD)
13	Door lock, driver's side, rear
14	Integrated power window electronics, driver's door
15	Central locking button, driver's door
16	Door lock, driver's door
17	Switch block, driver's door
18	Button for opening tailgate

16.2.2. Function

The function of the central locking system of the G05 is based on that of current BMW models. All functions relevant for the central locking system are controlled by the Body Domain Controller. The function is as follows:

- The radio signal from the ID transmitter is received by the remote control receiver.
- The signal causes the BDC to activate the central locking system and the interior lighting.
- The BDC evaluates the status of all the door contacts, the tailgate and the hotel position switch.
- The status of the central locking system button is also evaluated by the BDC. The BDC activates the central locking system, depending on the status.
- The BDC is responsible for activation of the central locking system and the drive for soft-close automatic in the tailgate.
- Activation of fuel filler flap unlocking is also performed by the BDC.

G05 General Vehicle Electronics

16. Locking and Security Functions

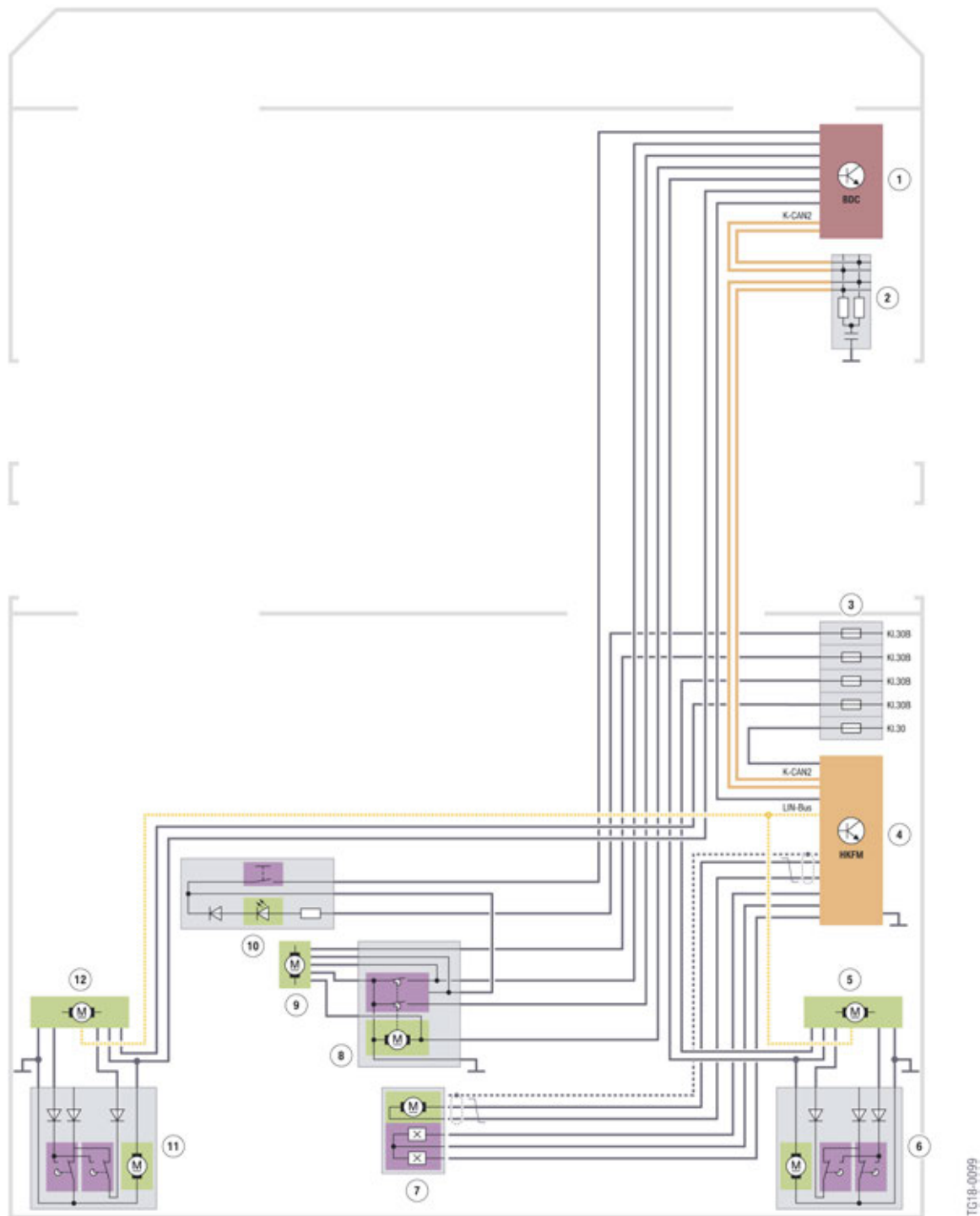
Index	Explanation
1	Instrument cluster (KOMBI)
2	Fuses in the power distribution box, front right
3	Body Domain Controller (BDC)
4	Fuse in the Body Domain Controller
5	CAN terminator
6	Fuses in the rear power distribution box
7	Tailgate lift drive, right
8	Tailgate function module HKFM
9	Acoustic warning device for tailgate activation
10	Button for tailgate
11	Button for closing tailgate (inner)
12	Tailgate lift drive, left
13	Remote control receiver (FBD)
14	Switch block, driver's door
15	Button for opening tailgate, driver's door
16	Power window motor, driver's side front

G05 General Vehicle Electronics

16. Locking and Security Functions

16.4. Tailgate lower section

16.4.1. System wiring diagram



G05 Wiring diagram, lower section of tailgate

TG18-0099

G05 General Vehicle Electronics

16. Locking and Security Functions

Index	Explanation
1	Body Domain Controller
2	CAN terminator
3	Power distribution box, rear right
4	Tailgate function module
5	Automatic Soft Close drive, right
6	Tailgate lock, right
7	Spindle drive, lower section of tailgate
8	Door lock, tailgate, top
9	Automatic Soft Close drive, tailgate upper section
10	Tailgate push-button
11	Tailgate lock, left
12	Automatic Soft Close drive, left



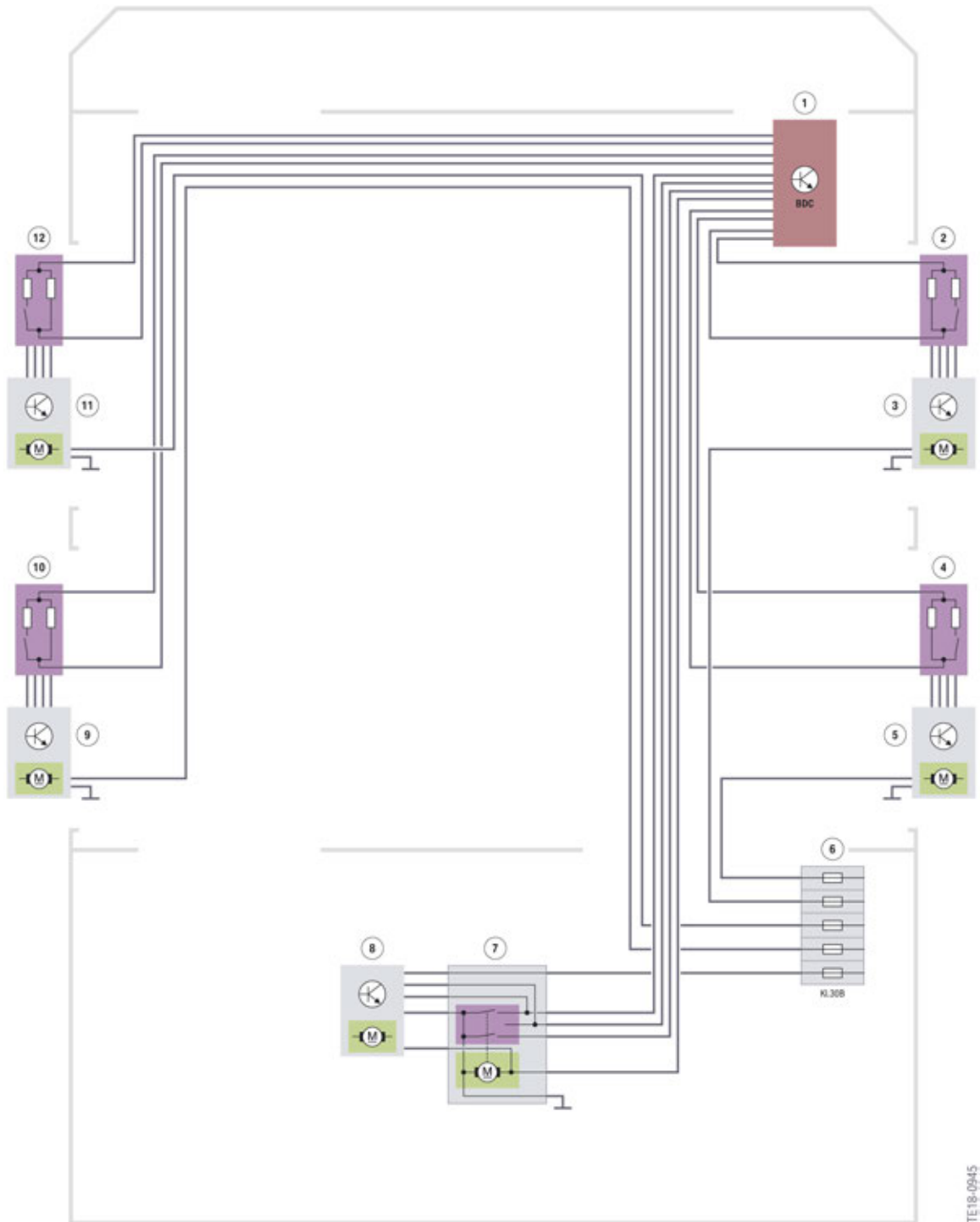
Detailed information on the tailgate can be found in the document "G05 Complete Vehicle"

G05 General Vehicle Electronics

16. Locking and Security Functions

16.5. Automatic Soft Close system

16.5.1. System wiring diagram



Automatic Soft Close system

TE18-0945

G05 General Vehicle Electronics

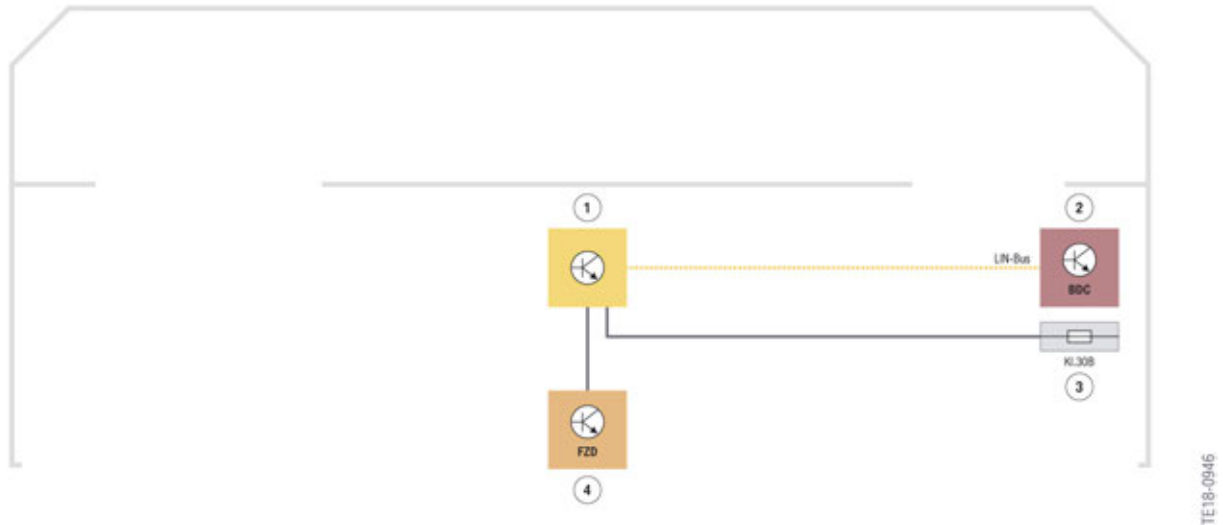
16. Locking and Security Functions

Index	Explanation
1	Body Domain Controller (BDC)
2	Switch in door lock, front passenger door
3	Automatic Soft Close drive, front passenger door
4	Switch in door lock of rear passenger door
5	Automatic Soft Close drive, rear passenger door
6	Fuses in the power distribution box, rear right
7	Tailgate contact switch in the tailgate lock
8	Automatic Soft Close drive, tailgate
9	Automatic Soft Close drive, rear driver's-side door
10	Switch in door lock of rear driver's side door
11	Automatic Soft Close drive, driver's door
12	Switch in door lock of driver's door

G05 General Vehicle Electronics

17. Interior Mirror

17.1. System wiring diagram



Inside mirror

Index	Explanation
1	Inside mirror
2	Body Domain Controller
3	Fuse for front right power distribution box
4	Roof function center (FZD)

The interior mirror is connected with the Body Domain Controller via LIN bus.

The LED for the alarm system is located at the interior mirror.

G05 General Vehicle Electronics

18. Passive Safety System

The passive safety system of the G05 is based on the objectives and characteristics of current BMW models. The passive safety system fulfils all legislative requirements worldwide.

The restraint systems ensure that the risk of injury is reduced.

A 5th generation Advanced Crash Safety Module (ACSM) is used as the central airbag control unit for the passive safety system in the G05.

18.1. System overview.

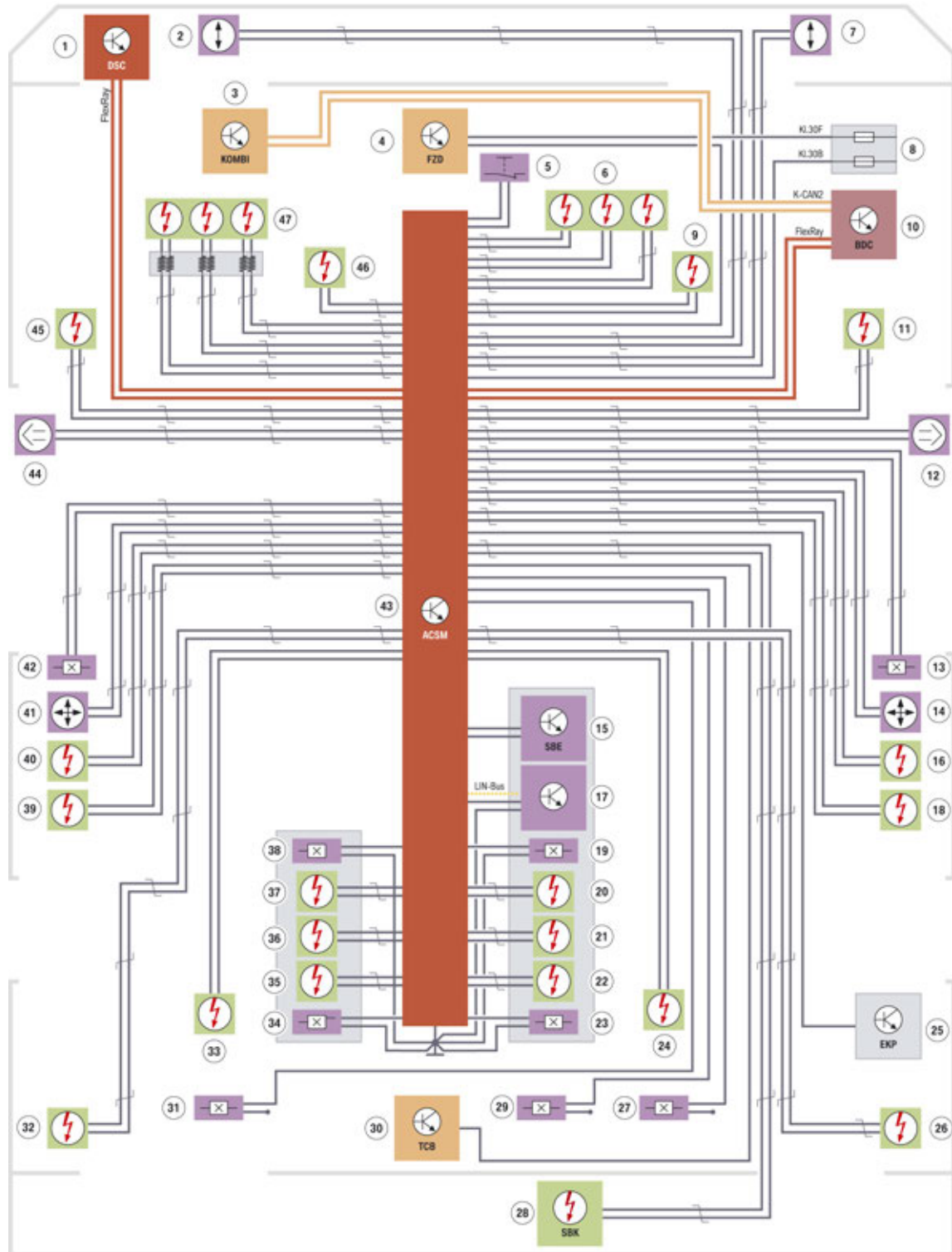
18.1.1. System wiring diagrams

To carry out repairs on the passive safety system, please always use the wiring diagram specified in the diagnosis system.

G05 General Vehicle Electronics

18. Passive Safety System

System wiring diagram



G05 System wiring diagram

TE18-0655

G05 General Vehicle Electronics

18. Passive Safety System

Index	Explanation
1	Dynamic Stability Control (integrated DSCi)
2	Airbag front sensor, left
3	Instrument cluster KOMBI
4	Roof function center (FZD)
5	Switch for front passenger airbag deactivation (not US)
6	Front passenger airbag
7	Airbag front sensor, right
8	Fuses in power distribution box, front right
9	Knee airbag, front passenger
10	Body Domain Controller (BDC)
11	Head airbag, right
12	Airbag sensor, door, right (pressure)
13	Reversible electromotive reel, front passenger (REMA)
14	Acceleration sensor, B-pillar on right
15	Seat occupancy mat (not US)
16	Adaptive belt force limiter, passenger's side
17	Seat occupancy mat, CIS mat
18	Automatic tensioner, front passenger
19	Seat-position sensor, front right
20	End fitting pretensioner, front right
21	Crash-active head restraint, front passenger
22	Side airbag, front passenger
23	Seat belt buckle switch, front passenger
24	Side airbag, rear right
25	Electronic fuel pump control
26	Seat belt, rear right (with reel pretensioner depending on national-market version)
27	Seat belt buckle switch, rear right
28	Safety battery terminal SBK
29	Seat belt buckle switch, rear center
30	Telematic Communication Box 2 (TCB2)
31	Seat belt buckle switch, rear left
32	Seat belt, rear left (with reel pretensioner depending on national-market version)
33	Side airbag, rear left
34	Seat belt buckle switch, driver

G05 General Vehicle Electronics

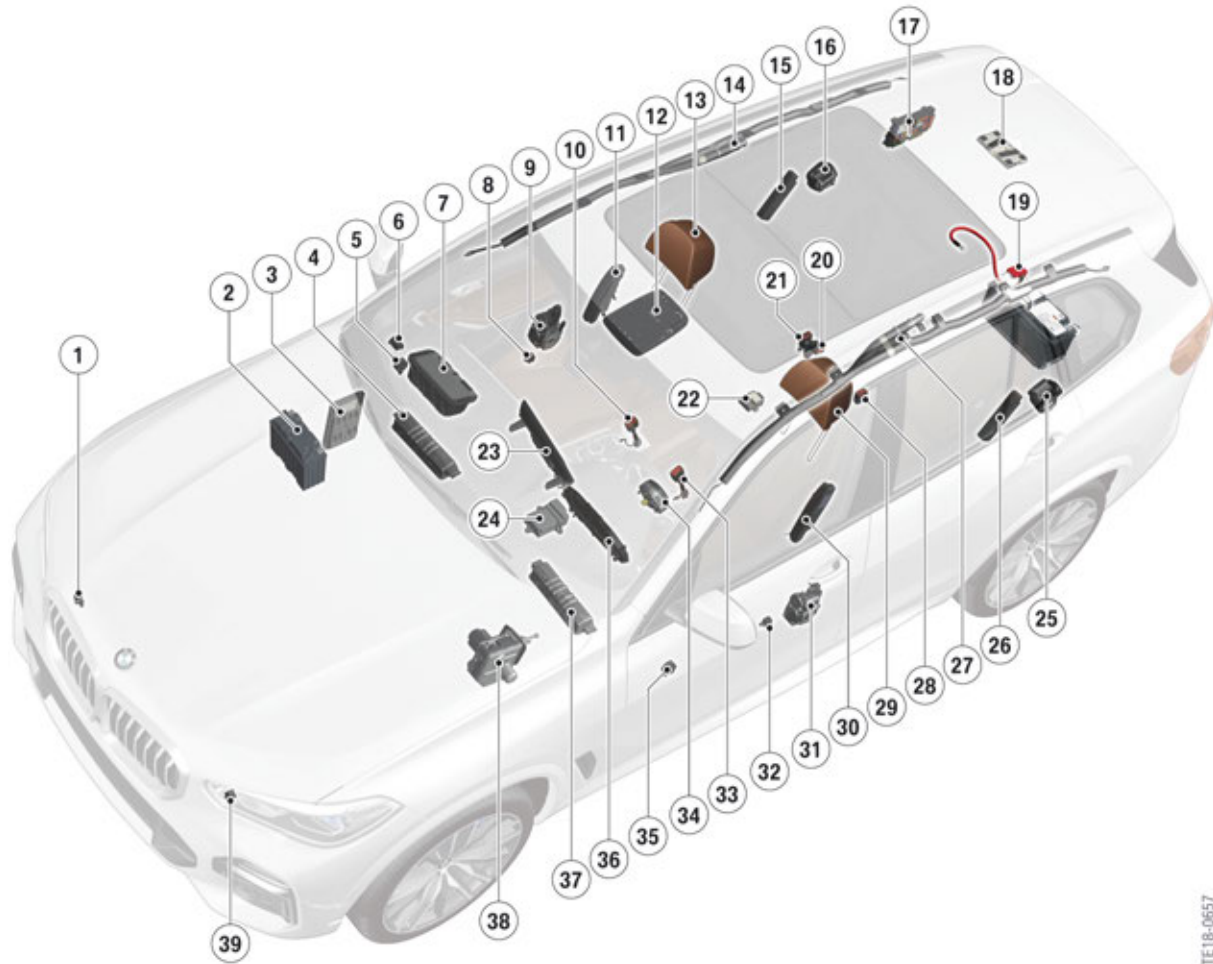
18. Passive Safety System

Index	Explanation
35	Side airbag, driver's side
36	Crash-active head restraint, driver
37	End fitting pretensioner, front left
38	Seat-position sensor, front left
39	Automatic tensioner, driver
40	Adaptive belt force limiter, driver's side
41	Acceleration sensor, B-pillar on left
42	Reversible electromotive reel, driver (REMA)
43	Advanced Crash Safety Module (ACSM)
44	Airbag sensor, door, left (pressure)
45	Head airbag, left
46	Knee airbag, driver
47	Driver's airbag

G05 General Vehicle Electronics

18. Passive Safety System

System overview of US version



TE18-0657

G05 system overview for vehicles in US version

Index	Explanation
1	Airbag front sensor, right
2	Lithium ion battery* (if installed)
3	Body Domain Controller (BDC)
4	Knee airbag, front passenger
5	Switch for front passenger airbag deactivation (not for US)
6	Airbag sensor, door, right (pressure)
7	Front passenger airbag
8	Acceleration sensor, B-pillar on right
9	Automatic tensioner, front passenger
10	Seat belt buckle switch, front passenger
11	Side airbag, front passenger

G05 General Vehicle Electronics

18. Passive Safety System

Index	Explanation
12	Roof function center (FZD)
13	Crash-active head restraint, front passenger
14	Head airbag, right
15	Side airbag, rear right
16	Seat belt, rear right (with reel pretensioner depending on national-market version)
17	Power distribution box, luggage compartment
18	Telematic Communication Box 2 (TCB2)
19	Safety battery terminal SBK
20	Seat belt buckle switch, rear center
21	Seat belt buckle switch, rear right
22	Electronic fuel pump control
23	Central information display CID
24	Crash Safety Module (ACSM)
25	Seat belt, rear left (with reel pretensioner depending on national-market version)
26	Side airbag, rear left
27	Head airbag, left
28	Seat belt buckle switch, rear left
29	Crash-active head restraint, driver
30	Side airbag, driver's side
31	Automatic tensioner, driver
32	Acceleration sensor, B-pillar on left
33	Seat belt buckle switch, driver
34	Driver's airbag
35	Airbag sensor, door, left (pressure)
36	Instrument cluster KOMBI
37	Knee airbag, driver
38	Dynamic Stability Control (integrated DSCi)
39	Airbag front sensor, left

*The lithium ion battery has an integrated battery isolating relay, which also switches off if the safety battery terminal (SBK) is triggered.

G05 General Vehicle Electronics

18. Passive Safety System



Lithium ion battery

Index	Explanation
1	Battery isolating relay

18.2. Functions.

18.2.1. System monitoring functions

Deactivation of airbags

Provision is made in US versions of the vehicles for the airbag to be deactivated automatically in order to satisfy the regulations of the National Highway Traffic Safety Administration NHTSA. When the child seats listed in the regulation are occupied by a child this must lead to deactivation of the airbag.

To do so, a seat occupancy mat is used on the front passenger seat for the purpose of occupancy detection and classification of occupants in the front passenger seat. A Capacitive Interior Sensing mat (CIS mat) is used in the G05.

The CIS mat is made up of two elements: A sensor wire, which runs parallel to the seat heating in the seat cushion, and an evaluation unit. The CIS mat measures the capacity and ohmic resistance between the sensor wire (anode) and the vehicle ground (cathode) at a frequency of 120 kHz. The CIS mat determines from the change in capacity and resistance whether the front passenger seat is occupied by an adult or a child in a child seat.

The deactivation of the front passenger airbag, the side airbag and knee airbag on the passenger's side is signalled by the indicator lamp for front passenger airbag deactivation.

G05 General Vehicle Electronics

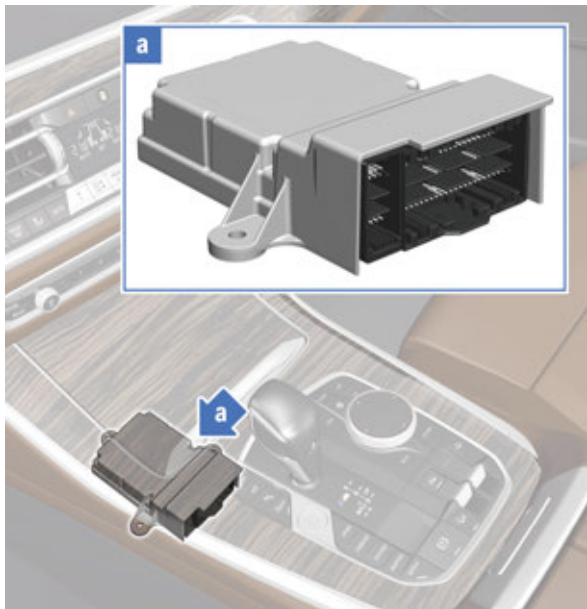
18. Passive Safety System

The indicator lamp for front passenger airbag deactivation in the roof function center lights up if a child seat with child, for e.g. a child restraint system that has been tested in accordance with the NHTSA regulations and is holding a small child, was detected on the front passenger seat or if the front passenger seat is unoccupied.

18.3. System components.

18.3.1. Advanced Crash Safety Module

The Advanced Crash Safety Module (ACSM) in the G05 is located centrally in the vehicle under the center console between the two front seats. The central sensor system is integrated in the Advanced Crash Safety Module (ACSM).



G05 Crash Safety Module ACSM

The ACSM 5 of the G05 is a bus user in the FlexRay. The sensor data of the central sensor system which was previously provided by Integrated Chassis Management (ICM) can be transmitted directly by the Crash Safety Module (ACSM) via FlexRay.

18.3.2. Sensors and switches

Lateral and longitudinal acceleration sensor

The lateral and longitudinal acceleration sensors assist with the identification of head-on crashes, side-on crashes and rear-end crashes.

The airbag sensor consists of a longitudinal acceleration sensor and a lateral acceleration sensor. The acceleration sensors measure in X and Y direction the positive and negative acceleration. The resultant from the X and Y signals is decisive in identifying the direction of the crash. The airbag

G05 General Vehicle Electronics

18. Passive Safety System

sensors assist with the identification of head-on, side-on and rear-end crashes. The airbag sensors on the left and right are of identical design and are allocated by way of mechanical encoding during installation.



G05 Lateral and longitudinal acceleration sensor

Door airbag sensor (pressure)

Pressure sensors are installed in the driver's and front passenger doors on the G05. The pressure sensors in the doors are now no longer attached with a bolt as was previously the case, but instead are screwed into the bracket (inner door panel) and the electrical connections and plug connections can only be connected once the relevant sensors have been installed.

Side crashes are identified with the assistance of the airbag sensors. In addition to the lateral acceleration values that are present, the pressure in the door cavity also increases in the event of a side-on crash.

The airbag sensors in the doors are used to verify the plausibility of the acceleration signals from the B-pillar airbag sensors and the Advanced Crash Safety Module (ACSM) when a side-on crash is detected. The airbag sensors are situated in the inner panel of the doors and measure the pressure increase in the event of a side-on collision. In the event of a side-on collision at the door the outer skin is pushed inwards. The door interior is reduced in size and the inner pressure increases. This pressure change is measured by the airbag sensors. The airbag sensor also includes electronics, in addition to the pressure sensor, that digitize the pressure readings and transmit them cyclically to the Crash Safety Module (ACSM). The data transfer is effected analog to the airbag sensors in the B-pillars. The pressure readings are evaluated in the Advanced Crash Safety Module (ACSM).

G05 General Vehicle Electronics

18. Passive Safety System



G05 Door airbag sensor (pressure)

Airbag front sensor

Two front sensors are installed in the front area of the engine support in the US version of the vehicles. The measured values are forwarded to the Advanced Crash Safety Module (ACSM) where they are evaluated.

The airbag front sensors on the left and right assist with the identification of a head-on crash.

The sensors deliver additional information to the Advanced Crash Safety Module (ACSM) on the characteristics and severity of the collision. Each sensor contains an acceleration sensor for recording the deceleration, signal processing technology and electronics for data transfer. The measured values are sent in the form of a message to the Advanced Crash Safety Module (ACSM) and are used in the calculation of the algorithm.

G05 General Vehicle Electronics

18. Passive Safety System



G05 Airbag front sensor

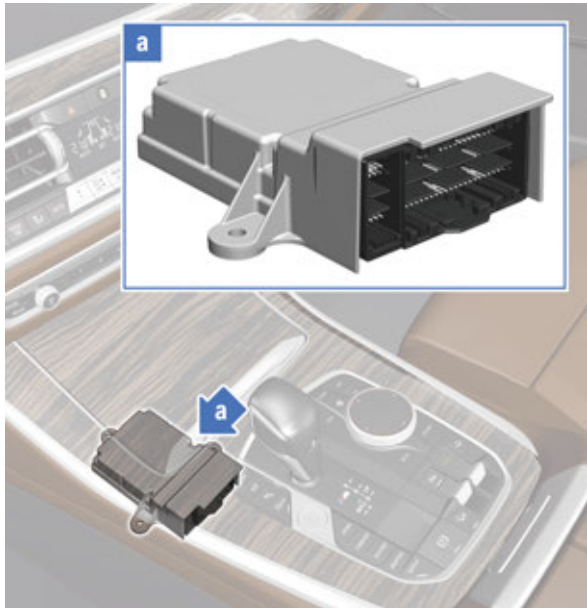
Sensors in the ACSM

In the G05, the central sensor system is integrated in the Crash Safety Module (ACSM). The Crash Safety Module (ACSM) contains a longitudinal and lateral acceleration sensor, a vertical acceleration sensor and a roll rate sensor for impact detection. The Crash Safety Module (ACSM) also includes a longitudinal and lateral acceleration sensor and a yaw sensor for the driving dynamics control.

The sensor data for impact detection is evaluated in the Crash Safety Module (ACSM) and helps to identify side-on, rear-end or head-on crashes and assists with roll-over detection. The sensor data not yet evaluated for the driving dynamics control is sent to the DSC control unit via FlexRay where it is processed.

G05 General Vehicle Electronics

18. Passive Safety System



G05 Crash Safety Module (ACSM)

Emergency call button

The emergency call button is located in the roof function center.



G05 Roof function center FZD with emergency call button

Index	Explanation
1	Emergency call button

G05 General Vehicle Electronics

18. Passive Safety System

Front passenger airbag deactivation

On the US version of vehicles, the capacitive interior sensing mat (CIS mat) is fitted in the front passenger seat. The CIS mat detects whether the front passenger seat is occupied by an adult or a child in a child seat. The deactivation of the front passenger airbag, the side airbag and the knee airbag on the passenger's side is signalled by the indicator light for front passenger airbag deactivation.

Indicator lamp for front passenger airbag deactivation

In the G05, the indicator lamp for front passenger airbag deactivation is located in the roof function center. The indicator lamp for front passenger airbag deactivation in the European and US versions of the vehicles is identical. With the European version of the vehicles the indicator lamp for front passenger airbag deactivation is activated and lights up yellow if the front passenger airbag and the side airbag on the front passenger side have been deactivated by the switch for front passenger airbag deactivation. In the US version of the vehicles, the indicator lamp for front passenger airbag deactivation is automatically activated if the CIS mat detects a small child in a child seat or if the front passenger seat is unoccupied.



G05 Indicator lamp for front passenger airbag deactivation

Index	Explanation
1	Indicator lamp for front passenger airbag deactivation

Seat-position sensors

In accordance with the US legal requirement (FMVSS208), a height identification for the person in the driver and front passenger seat must be effected. This height identification is effected via the adjustment travel of the forward/back seat adjustment. In US-version vehicles, the exact position is identified using the seat-position sensors for the driver and front passenger seats.

The job of the seat-position detector is to distinguish between a relatively small person and a person of normal height within the lengthways adjustment range of the seat. This detection is another technical feature aimed at increasing the safety of the occupants. The deployment of the two airbag stages is then adjusted to the driver's/front passenger's seat position.

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18. Passive Safety System

The seat-position detector takes the form of a 2-wire hall effect sensor and is supplied with power via the Crash Safety Module (ACSM). The current level of the seat-position sensor changes depending on the seat position.

18.3.3. Actuators

Overview

The following actuators are installed in the G05:

- Two-stage driver's airbag
- Two-stage front passenger airbag
- Knee airbag, front left and right
- Head airbag, left and right
- Crash-active head restraint, front left and right
- Side airbag, front left and right
- Side airbag, rear left and right
- Belt tensioner with adaptive force limiter
- Safety battery terminal

In addition, the following indicator lights inform the vehicle occupants about the condition of the safety systems:

- Airbag indicator light
- Seat belt warning light
- Indicator lamp for front passenger airbag deactivation.

The familiar three-point seat belts are used as the seat belt systems for all seats in the G05.

For further information, please refer to the Product Information "G01 Passive Safety System".

