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E92 Complete Vehicle Workbook

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Complete Vehicle Workbook

Model: E92

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Identify the E92 coupe body styling cues and fabrication techniques.
- Describe the operation of the new EWS4 Immobilizer system.
- Identify the changes made to the vehicle energy management system.
- Describe the operation of the E92 Seat Belt Extender System.
- Describe the different lighting functions found on the E92 Coupe.
- Identify the additional systems/modules in the vehicle Bus System.

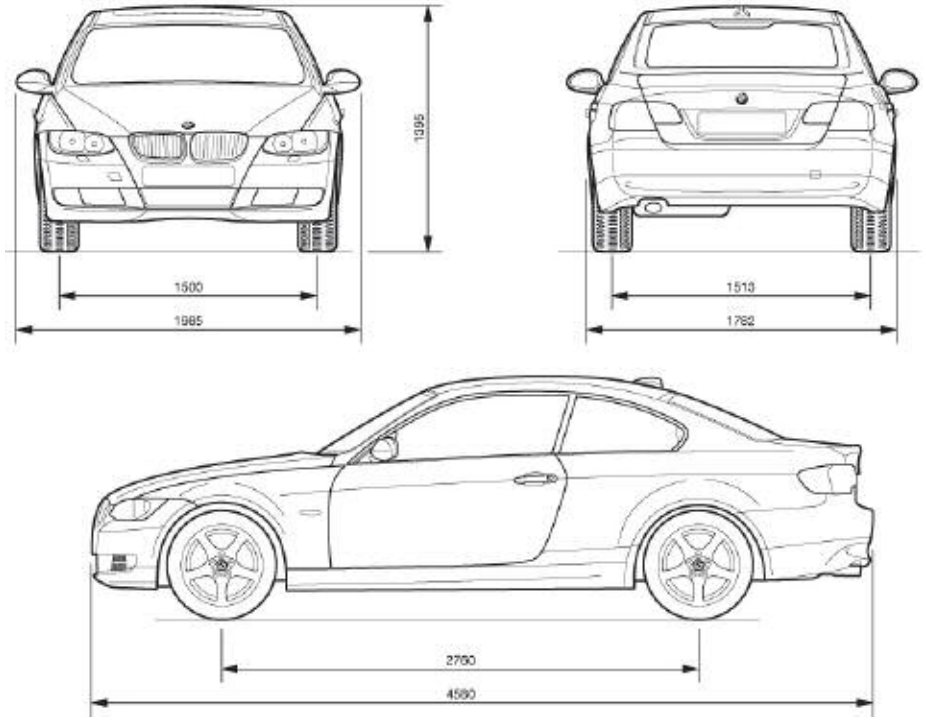
Introduction

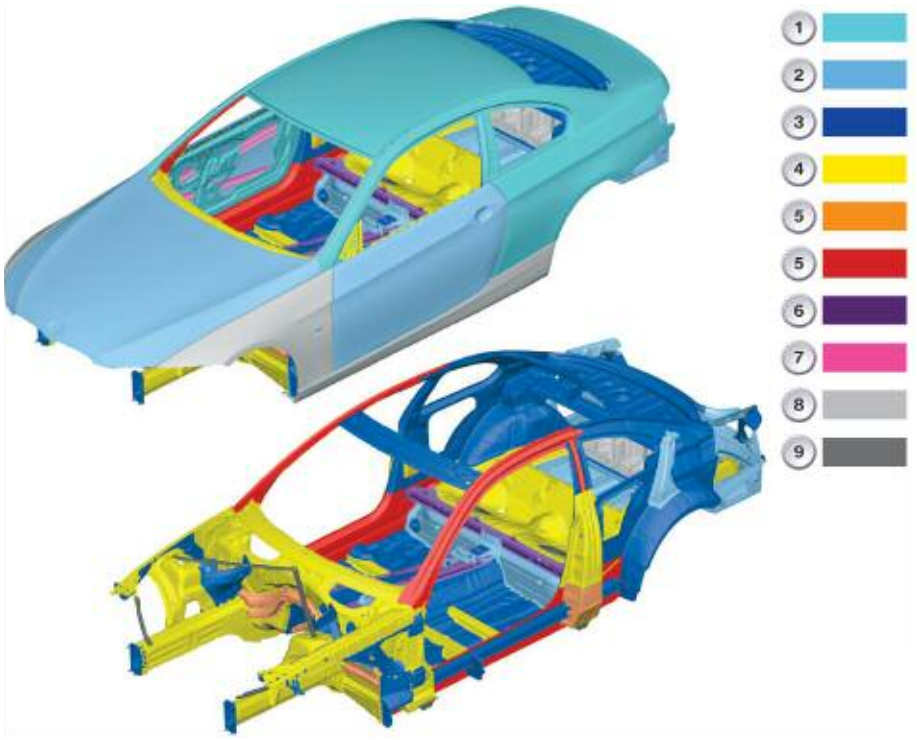
The third generation of the 3 Series Coupes is here, developed on the basis of the E90 and honoring the long line of BMW coupes of the past with its sporty new 2 door body styling. The use of lighter and stronger body components, more powerful engines and enhanced features make this coupe stand out among its competition.

The 335i will replace the 330i and it gets the new N54 twin turbo, direct injected engine with 300hp and 300ft/lb. The 328i will replace the 325i and will come with a further developed N52 engine with increased horse power to 230hp and torque to 200ft/lb. There is also a N51 SULEV engine that will be available only with automatic transmission.

- The front fenders and rocker panel covers are fabricated from Thermo-Plastic material to promote weight distribution.
- Upgraded brakes on 335i: front disc diameter increased from 13.0 (330i) to 13.7 in.
- New lighting features like Bi-Xenon headlamp standard the addition of Welcome lights (a BMW first) that greet the driver as the vehicle is opened. Adaptive headlights with Cornering lights help illuminate around the dark corners as well as Daytime running lights with corona rings promote daytime vehicle visibility.
- Vehicle security is enhance with the use of EWS4 immobilizer.
- The use of a Seat Belt Extender and the Easy-Entry (rear compartment) functions promote occupant comfort.
- The Tire Pressure Monitoring System Has been updated to comply with the most recent US regulations.
- IBOC (In Band on Channel) digital radio has been added.

Body





External dimensions (mm)	E92	E46/2
Vehicle length	4580	4448
Overall vehicle width	1782	1757
Vehicle height, unladen	1395	1369
Wheelbase	2760	2725
Overhang front	771	774
Overhang rear	1049	1049
Track width front	1500	1474
Track width rear	1513	1486
Wheels /tires	225/45 R17	205/55 R16

Index	Explanation	Index	Explanation
1	DX54, DX56 Steel	6	HC600,HD680 Steel
2	HC 180,HX180 Steel	7	Docol 1000,22Mn B5 Steel
3	HC220,HX220 Steel	8	Plastic
4	HC300, HX 300 Steel	9	Other metals materials
5	HC 400 Steel		

Walk Around

E92 Exterior

Lets walk around the E92 and try to identify the visible features that BMW has implemented here that differ from the E90 and from past 3 Series coupes.

Workshop Exercise - Walk Around Body

Let's walk around the E92 and try to identify the visible features that BMW has implemented here that differ from the E90 and from past 3 Series coupes.

What body styling features are noticed immediately?

Which body components are made from Thermo-plastic?

How is the exhaust different from the E90?

Open the door and inspect the interior.

How many passengers does the E92 accommodate?

What distinctive features do you notice in the interior?

Why did BMW incorporate a seat belt extender in the design of the E92 interior?

What is the difference between the normal seat adjustment speed and the Easy-Entry seat adjustment speed?

CAS3 EWS4

With the launch of the E92, we have a new electronic vehicle immobilizer. The Car Access System 3 with the new generation of electronic vehicle immobilizer EWS4 was introduced in E92 vehicles with the N52/N54 gasoline engine.

The vehicle immobilizer consists of the ID transmitter which is identical for the vehicle and therefore to CAS3. CAS3 exchanges data with the DME via the CAS-bus and cancels the vehicle immobilization function.

The EWS4 is a new development and uses a new, modern encryption method. A 128 bit long secret key is assigned to each vehicle and stored in the BMW database.

This secret key is known only to BMW. The secret key is programmed and locked in the CAS and in the DME control unit. Once entered in the control unit, the secret key can no longer be changed or deleted. This therefore means that each control unit is assigned to a specific vehicle.

One control unit in the system sends an encrypted code to another control unit for the purpose of checking the authorization. In turn, this control unit sends back a corresponding code.

Replacement of Control Units

The procedure described below must be followed in order to replace a defective control unit (CAS/DME). The required control unit is ordered together with the necessary vehicle data (VIN) from the Parts Department.

A new "blank" control unit is programmed with the corresponding program data for the vehicle and the secret key from the BMW database, locked and sent to the dealer.

The new control unit is installed in the vehicle and started.

Note: No alignment procedure is necessary as in earlier EWS systems. Since the control units are assigned to the specific vehicle, replacement with a unit from another vehicle is not possible.

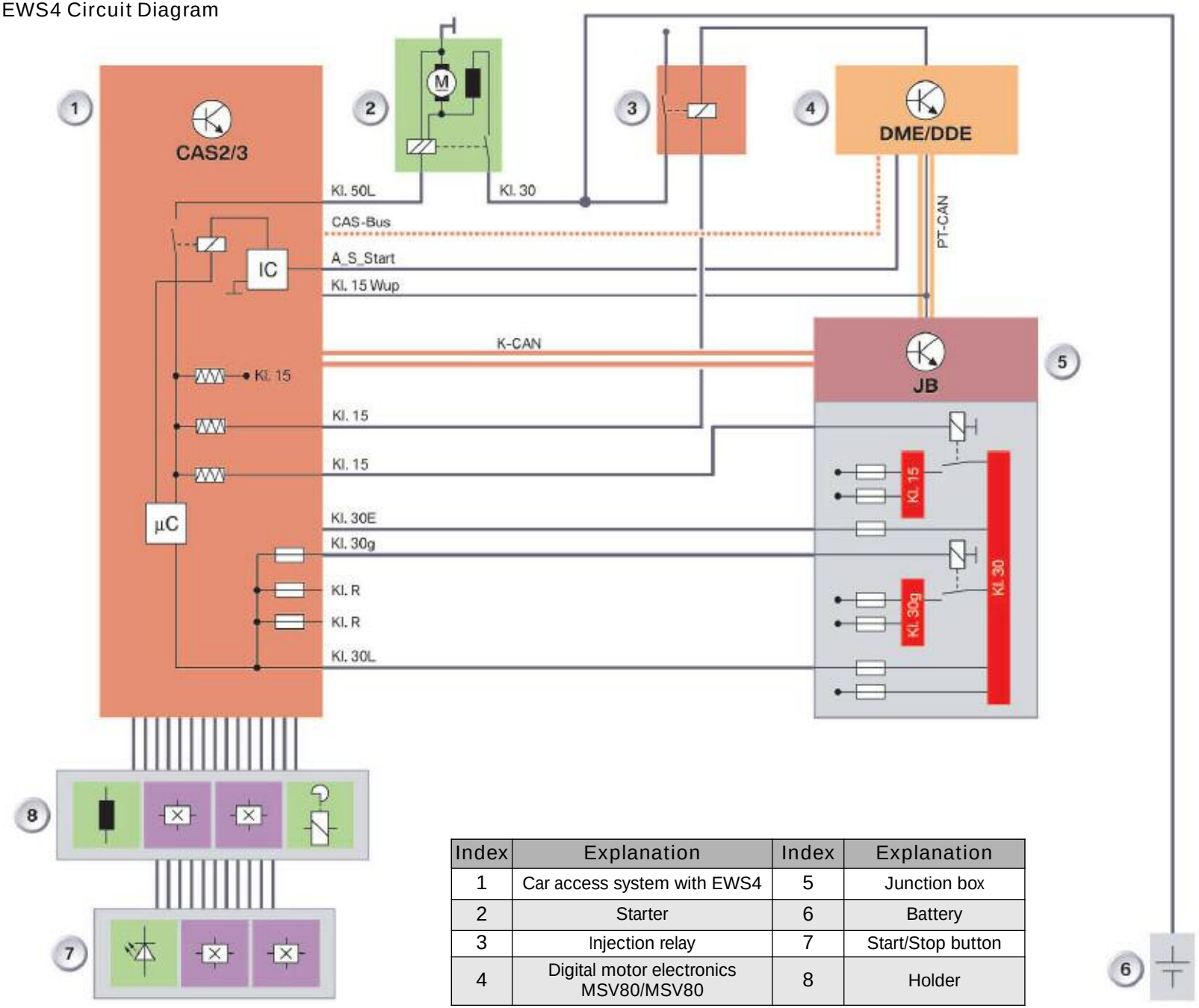
The electronic vehicle immobilizer consists of several components. In the E92 these components are the CAS3 and the DME MSV80/MSD80.

The CAS3 contains the software for the EWS4 and, with corresponding identification of the ID transmitter, the enable of terminal R, 15 and 50 for the starter. The enable for the ignition and fuel injection systems is done by the DME.

Both control units are connected by the K-CAN, the junction box serving as the gateway and the PT-CAN. Data is also exchanged on the CAS-bus. The data is always transmitted parallel via both bus systems. The signals that arrive first are used.

The DME activates the fuel injection relay for the power supply of the fuel injectors. The DME features a direct line to the starter relay in the CAS in order to initiate the start procedure and, if necessary, to terminate it, in the event of a PT-CAN fault or a faulty signal, like no engine speed signal.

CAS3 with EWS4 Circuit Diagram



Index	Explanation	Index	Explanation
1	Car access system with EWS4	5	Junction box
2	Starter	6	Battery
3	Injection relay	7	Start/Stop button
4	Digital motor electronics MSV80/MSV80	8	Holder

Start Enable

The start procedure is enabled by means of a special request and response procedure known as challenge-response. The DME generates a random number in a random generator and sends it as the challenge to the CAS. The CAS and the DME contain the same secret key and both control units use the same calculation algorithm. The CAS now calculates the result from the received random number, the secret key and the algorithm. The result is sent as the CAS response to the DME. During this time, the DME now calculates the same random number with the secret key and the algorithm and already knows the result. The response of the CAS is compared with the result of the DME. Start is enabled if the result is identical.

Time-based Query

As from terminal R or terminal 15 ON, a query (challenge-response) is performed as long as the engine is not yet running. A fault code is entered in the CAS if no DME response is received approximately 10 seconds after the start of the query or if the response deviates.

Key Memory Expansion in CAS3

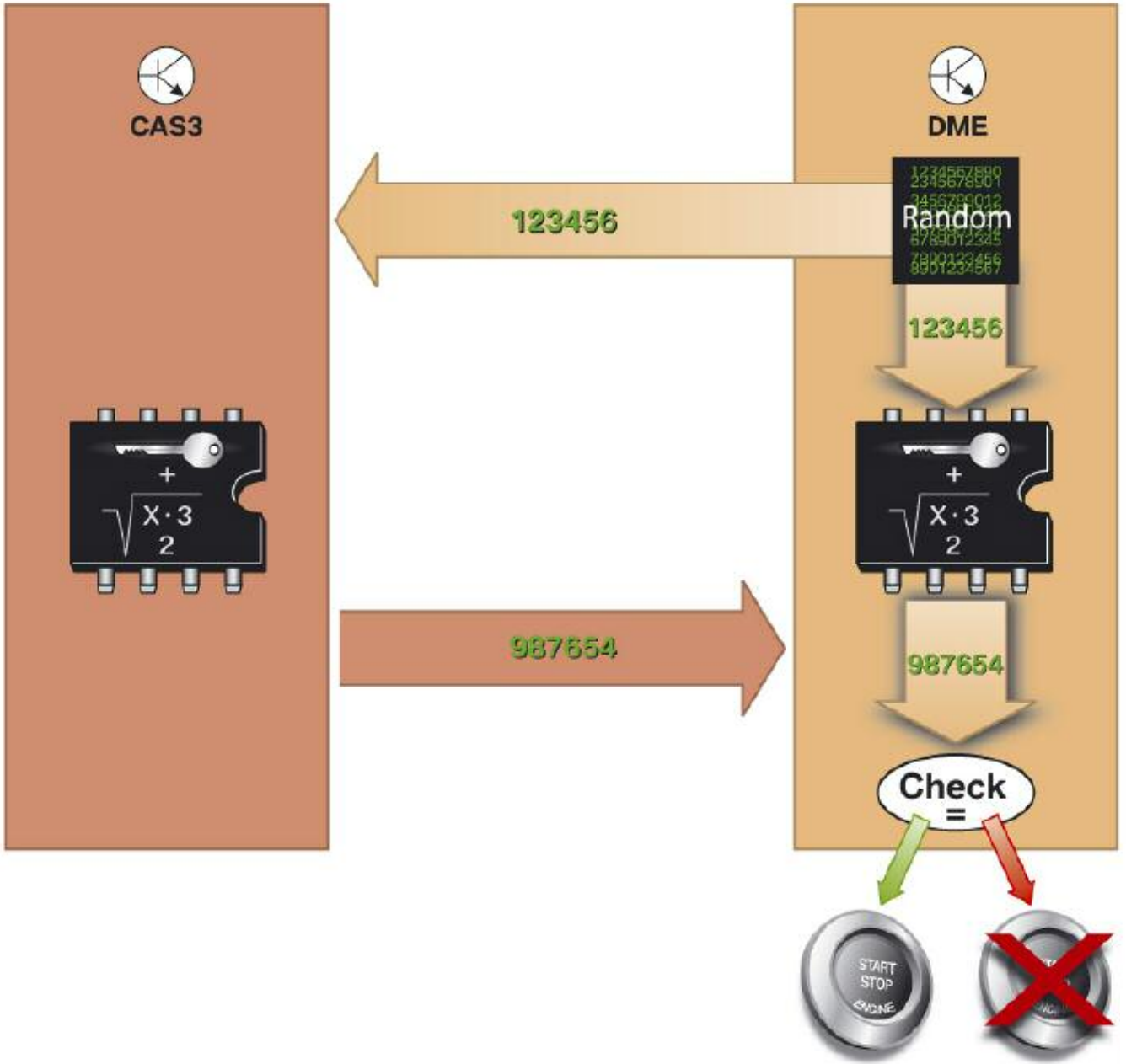
The data memory of the remote key in vehicles equipped with CAS3 is increased from 256 bytes to 512 bytes.

The benefit of this key memory expansion for the customer is that more accurate information on the time and scope of the workshop visit can be provided as part of the service acceptance procedure.

The following system network information can be read out from the identification transmitter with the key reader in the service workshop.

Data	Previous	New	Remark
Mileage reading	X		Current mileage (km) reading of vehicle
Vehicle Identification (VIN)	X		
Key number	X		Number of identification transmitter
Service- relevant CC message	X		
DTC Information (fault code memory)	X		As from SAM 25, the DTC data is indicated and linked to possible measures in PUMA
NAVI-DVD version		X	Data status of NAVI-DVD
Engine oil		X	Information on topping up or draining the engine oil (overfilling)
Battery condition		X	Change status of the battery in the vehicle
Integration stages		X	I-stage that left the factory, I-stage last programmed and I-stage currently available in the dealership network

EWS4 Immobilizer



Energy Management

As in the current models, an energy management system is also used on the BMW 3 Series Coupe to ensure a balanced energy supply in the vehicle. The energy management functions are integrated in the power management system that is implemented in the form of software in the Engine Control Module (ECM/DME). The power management, the components and the various functions of the system differ depending on the equipment configuration of the vehicle.

Two energy management control systems are installed:

- Basic Power Management BPM
- Advanced Power Management APM. On vehicles equipped with advanced power management modifications have been made in the terminal shut-down system through relay 30g and 30g_f.

Advanced Power Management APM

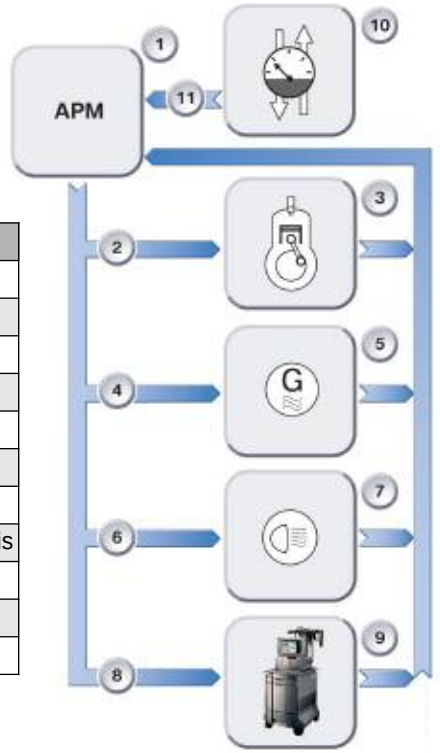
Advanced power management APM is used on vehicles featuring certain options.

The advanced power management has been expanded by the intelligent battery sensor IBS. The IBS provides precise information on the condition of the battery. For example, the battery temperature is no longer calculated but measured directly by the IBS.

In addition to the change in the idle speed and the specified charging voltage target value, the system includes the following functions that differ from the BPM.

- Electric load reduction
- Electric load shut-down
- Systems network diagnosis
- Battery diagnosis.

Index	Explanation
1	Advanced power management
2	Idle speed boost
3	Combustion engine
4	Changing voltage target value
5	Alternator
6	Electric load reduction
7	Electric loads
8	Electric system and battery diagnosis
9	BMW diagnostic system
10	Intelligent battery sensor
11	Battery data



Terminal Shut-down Identification

Note: To provide clear identification of the terminal shut-down function, the control units are identified with colored triangles. The identification and assignment to the individual terminals is shown in the illustration on page 18.

Electric load shut-down terminal 30g relay

Time-dependent shut-down

The E92 is equipped with a terminal 30g relay for switching off the power supply to the majority of the control units. Most convenient electric loads such as the radio are switched off after 30 minutes by terminal 30g in order to maintain the starting capability of the battery.

Power to the terminal 30g relay is activated by the car access system for an extra 60 minutes if a telephone or auxiliary heating system is installed in the vehicle.

Electric load shut-down terminal 30g_f relay
Fault-dependent shut-down

The terminal 30g_f relay is installed in the junction box of the E92 only when one of the following equipment options is ordered:

- M-Audio system controller (M-ASK)
- Car communication computer
- Telephone (US vehicles)

The terminal 30g_f relay is a bi-stable relay and is always in the ON state under normal conditions. It switches off the connected electric loads only in the case of fault. The switching status is retained even when no power is applied.

The terminal 30g_f relay is activated by the junction box control unit and switches off the connected electric loads if a fault occurs.

The calculations required for activating the terminal 30g_f relay take place in the ECM/DME and in the junction box.

The following activities are monitored in the junction box control unit:

- Unauthorized wake-ups within the bus system
- Sleep mode preventers (control units that constantly keep the bus systems active)

Note: The battery values are constantly read out and evaluated in the Engine Control Module (ECM/DME). The relay is also switched off when the starting capability limit of the vehicle battery is reached.

Control Units Connected to Terminal 30

Reasons for remaining connected to terminal 30.

Note: Due to their functionality, some control units can not be switched off.

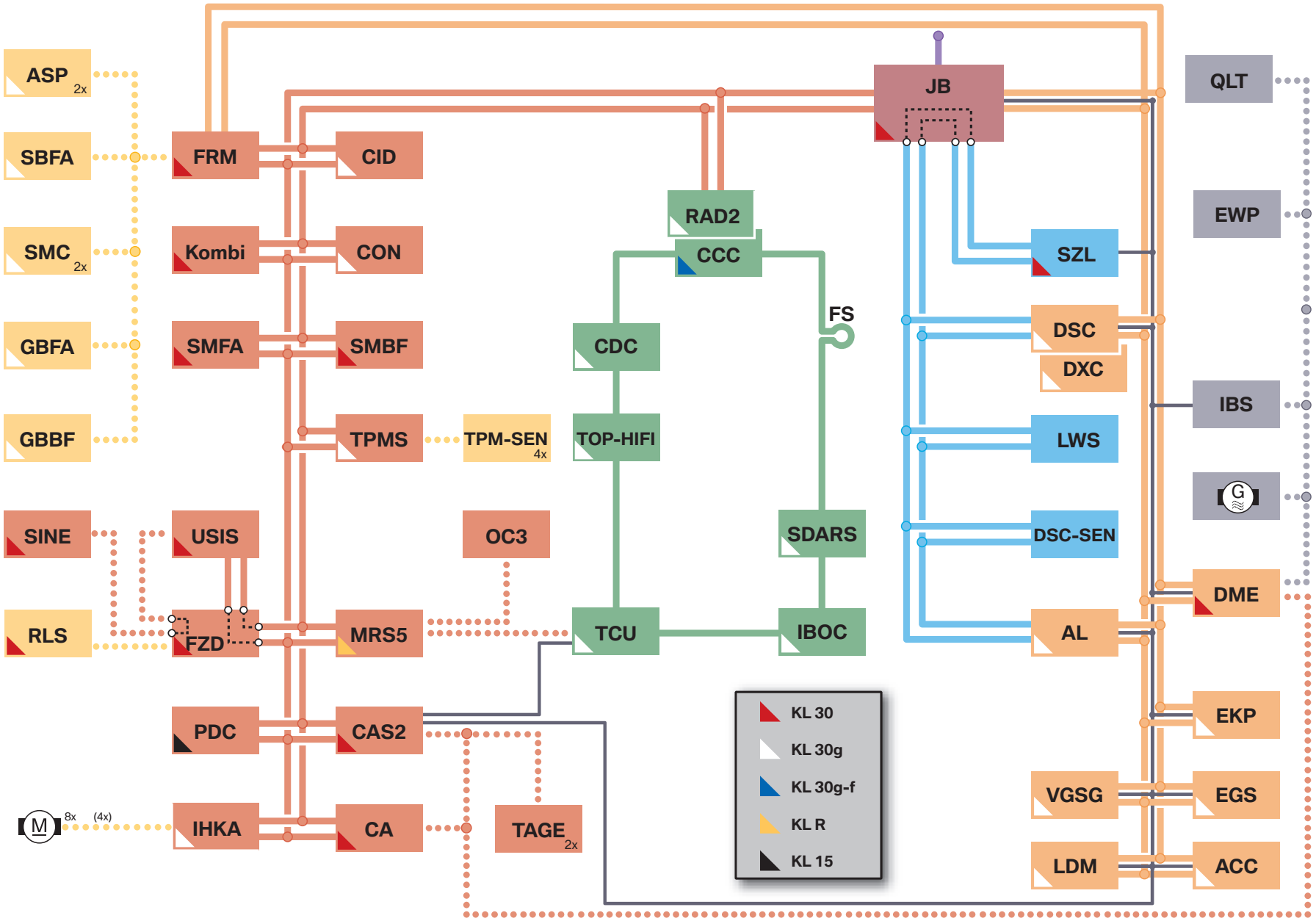
Control unit	Explanation
JB	Because of the master functionality
FRM	Because of the legally required hazard warning function
FZD-	Because of the connection of the DWA components
SINE	Because of the DWA functionality
USIS	Because of the vehicle interior monitoring
CAS	Because of the “Unlock vehicle” function
CA	Because of the “Unlock vehicle” function
SMFA	Because of the power draw of the seat heating
SMBF	Because of the high power draw of the seat heating
SZL	Because of the steering angle sensor whose data is stored only volatile
DME	Because of the power management
KOMBI	Because of the data saving function (mph reading)

Control units connected to terminal R and 15

Control units that have only one functionality connected to terminal R or 15 can be switched off directly.

- The MRS control unit is connected to terminal R.
- The high beam assistant and park distance control are connected to terminal 15

E92 Bus System Overview - Control Units



Classroom Exercise - List the controllers under their correct power source.

1. Which controllers are connected to KL 30?

2. Which controllers are connected to KL 30g?

3. Which controllers are connected to KL 30g_f?

4. Which controllers are connected to KL R?

5. Which controllers are connected to KL 15?

Legend for E92 Bus System Overview - Control Units

Index	Explanation	Index	Explanation
ACC	Active cruise control	JB	Junction box
AL	Active steering system	KOMBI	Instrument cluster
ASP	Outside mirror	LDM	Longitudinal dynamic management
CA	Comfort access	LWS	Steering angle sensor
CAS	Car access system	M-ASK	Multi-audio system controller
CCC	Car communication computer	MRS	Multiple restraint system
CDC	CD changer	OC3	Seat occupancy detection mat
CID	Central information display	PDC	Park distance control
CON	Controller	QLT	Quality, level, temp, oil sensor
DME	Digital motor electronics	RAD	Radio 1, radio 2
DSC	Dynamic stability control	RLS	Rain/driving light sensor
DSC-Sen	DSC Sensor	SBFA	Driver’s door switch cluster
DWA	Anti-theft alarm system	SDARS	Satellite tuner
DXC	Dynamic traction control	SINE	Emergency current siren w/ tilt alarm sensor
EGS	Electronic transmission control unit	SMBF	Passenger’s seat module
EKP	Electric fuel pump control unit	SMC	Stepper motor controller
ELV	Electric steering lock	SMFA	Driver’s seat module
EWP	Electric water pump	TONS	Temperature, oil level sensor
FRM	Footwell module	Top-HiFi	Top-HiFi amplifier
FS	Most direct access	TPMS	Tire pressure monitoring system
FZD	Roof function center	TPM-sen	TPMS sensors X4
GBBF	Passenger’s seat belt extender module	ULF	Universal charging and hands-free facility
GBFA	Driver’s seat belt extender module	USIS	Ultrasonic passenger compartment protection
IBOC	In band on channel (digital radio)	VGSG	Transfer box control unit
IBS	Intelligent battery sensor	ZH	Electric auxiliary heater based on PTC principle
IHKA	Automatic climate control	SZL	Steering column switch cluster
TCU	Telematics control unit	TAGE	Electric outer door handle module

Seat Belt Extender

In line with its concept and design, the E92 Coupe features large doors. As a result, the B-pillar with the reversal point for the seat belt is located further towards the rear relative to the seat position. This makes the seat belt difficult to reach for the driver or front passenger.

For this reason, an electrically operated seat belt extender is installed on the E92. The seat belt extender extends and moves the seat belt out of its rest position at the B-pillar by approximately 25 cm in the direction of the driver and front passenger. This makes it considerably easier and more convenient for the driver and front passenger to fasten the seat belt.

Note: The side curtain air bags are now riveted, on the E92. Refer to the most current repair procedure information found in TIS.

System Function

The seat belt extender system essentially consists of the footwell module with the master functionality and the two seat belt extender controllers connected via the LIN-BUS.

The footwell module receives the terminal status from the car access system via the K-CAN. The footwell module receives further important information from the airbag control unit via the K-CAN. The information contains the status of the seat belt contacts and of the seat occupancy detection facility on the front passenger seat.

The footwell module evaluates this information together with the determined status of the door contacts and decides whether the seat belt extenders are extended or retracted.

The footwell module informs the seat belt controllers of this decision via the LIN-bus.

The corresponding seat belt controller activates the seat belt extender motor and extends or retracts the toothed rack of the seat belt extender. The seat belt controller evaluates the Hall signals for the speed and end position and informs the footwell module of the position.

The functions of the seat belt extender are uniform throughout the world. Only a difference is made between the driver and front passenger in terms of functionality.

The driver and passenger doors must be closed the key in the ignition or the ignition on for the seat belt extenders to operate.

System Components

The system consists of the following components:

- Controller for driver's seat belt extender GBFA
- Controller for passenger's seat belt extender GBBF
- Driver's seat belt extender
  - – Seat belt extender motor
  - – Hall sensor
  - – End position sensor
- Front passenger's seat belt extender
  - – Seat belt extender motor
  - – Hall sensor
  - – End position sensor
- Footwell module with sensors and LIN-bus connection
- Junction box for power supply
- Airbag control unit for sensor information

Seat Belt Extender Controller

The universal control unit that is also used in other systems is used as the controller for the seat belt extender.

The controller for the seat belt extenders is connected via the LIN-bus to the footwell module. This LIN-bus has a data rate of 19.2 Kbit/s.

The controllers for the driver/passenger seat belt extenders are identical and differ in terms of their ground coding.

The control unit is connected by means of three plugs. Plug connector (1) is used for the power supply and ground coding. This plug connector also features the LIN-bus connection.

Plug connector (2) connects the end position sensor. Plug connector (3) connects the motor and the speed Hall sensor. (See graphic on the following page.)

The controller is located behind the side trim panel along with the seat belt extender. The controller is constantly monitoring the extension and retraction of the seat belt extender and it’s designed to shut down in the event of over voltage (16V) or under voltage (9V) condition.

Seat Belt Extender Motor

The seat belt extender motor is a DC motor. The motor is connected to the toothed rack by means of a step-down gear mechanism. A Hall sensor, mounted on the seat belt extender motor measures motor’s speed.

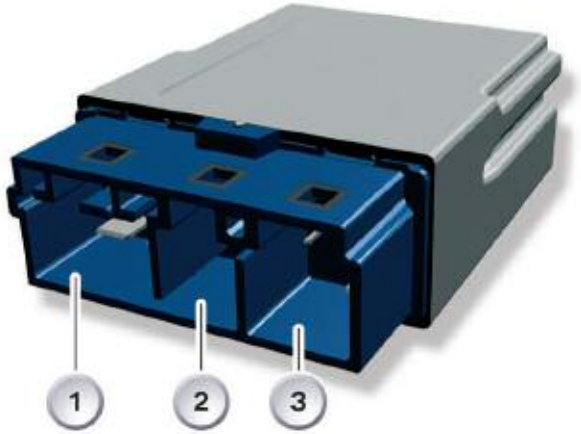
A Hall signal is generated for each revolution of the motor. Based on the number of Hall signals, the control unit always knows the exact position of the seat belt extender. The Hall pulses are added as the seat belt extender extends and the motor is switched off on reaching the maximum number of pulses. This represents the "extended" end position.

When the seat belt extender is retracted, power is applied to the motor until the magnet in the toothed rack reaches the end position sensor. The system is initialized by reaching the end position. Initialization is performed every time the seat belt is retracted.

Seat Belt Extender and Controller

Index	Explanation	Index	Explanation
1	End position sensor	4	Toothed rack
2	Electric motor	5	Seat belt guide with chrome cover
3	Magnet for end position sensor		

Note: Only the chrome cover or the complete seat belt extender can be replaced for repair purposes.



Index	Explanation
1	Plug connection to vehicle system network
2	Plug connection to end position switch
3	Plug connection to drive unit

Blocking Detection

If, during extension, the Hall signals are not received for 250ms, this situation is interpreted as blocking of the extender and the motor is switched off. The seat belt extender motor is reversed and the toothed rack retracted.

The motor is driven for 1 second if the toothed rack is blocked. This procedure is repeated up to three times. The motor is then no longer activated.

A renewed attempt to drive the motor is made only on reactivation of the system (door contact and terminal R). The system must be checked by a BMW dealer workshop if the system is actually blocked mechanically.

Extend Conditions	Driver's Extender	Passenger's Extender
Terminal R*	X	X
Terminal 15*	X	X
Seat belt contact open	X	X
Door contact detects closed state	X	X
Seat occupancy**		X
ID transmitter in the vehicle with comfort access	X	X

* Depending on when the door was closed.
** The passenger seat belt extender extends at terminal R after 10 seconds regardless of whether the seat is occupied or not.

Retract Conditions	Driver's Extender	Passenger's Extender
Seat belt contact closed	X	X
Door contact detects opened state	X	X
Driving speeds above 7kph	X	X
Seat belt extender extended longer that 60 sec.	X	X
Seat detected as not occupied		X
30 sec. after switching from terminal R	X	X
Mechanical blocking	X	X

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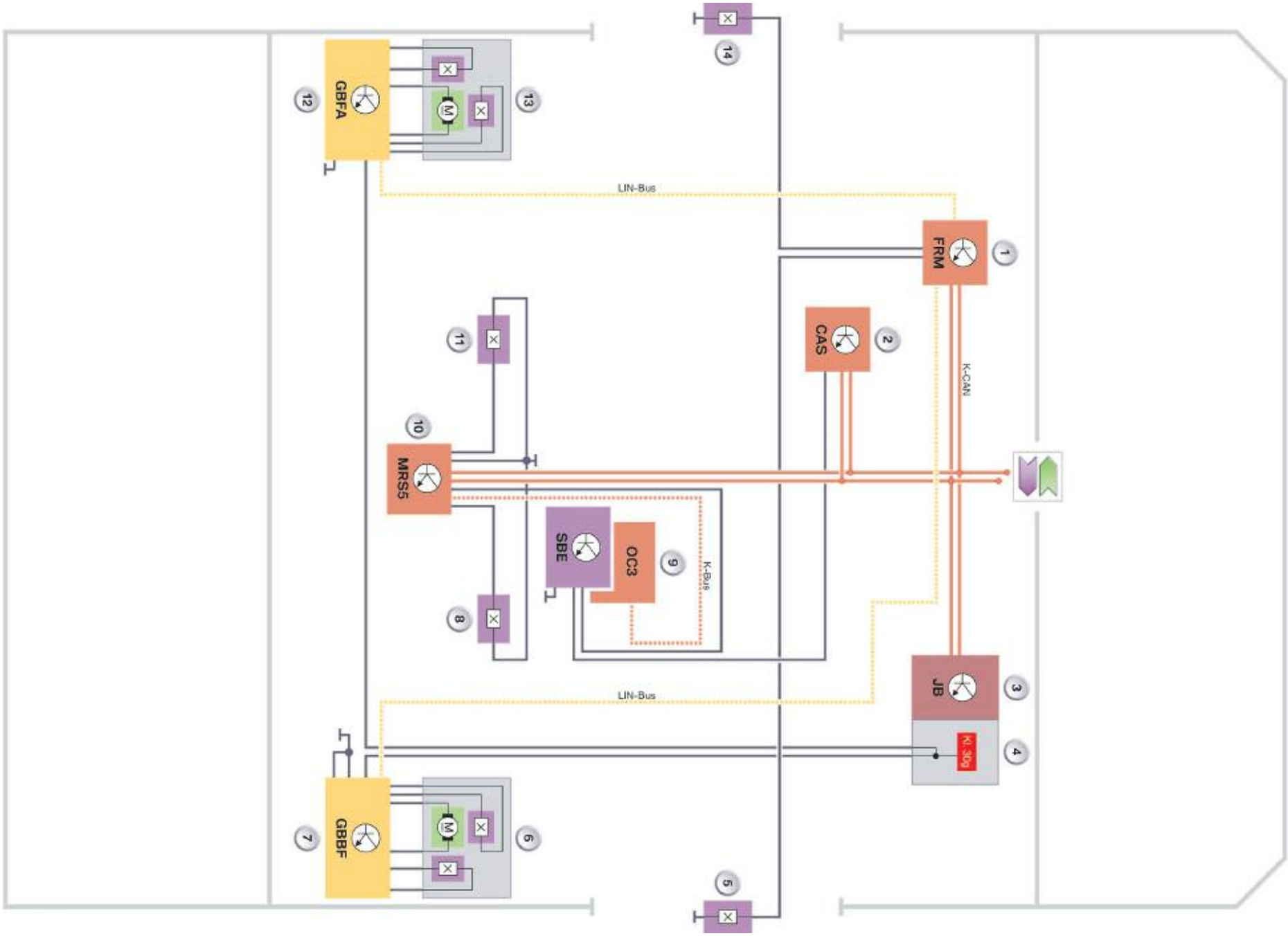
Seat Belt Extender Circuit Diagram



Seat Belt Extender Circuit Diagram Legend

Index	Explanation	Index	Explanation
1	Footwell module	8	Passenger seat belt contact
2	Car access system	9	Seat occupancy detection system
3	Junction box electronics	10	Airbag control unit
4	Power distribution box, junction box	11	Driver seat belt contact
5	Door contact, passenger's side	12	Controller for driver seat belt extender
6	Seat belt extender motor with Hall switch for speed and end position, passenger's side.	13	Seat belt extender motor with Hall switch for speed and end position, driver's side.
7	Controller for passenger seat belt extender	14	Door contact, driver's side

Diagnosis

Diagnosis of the controller for the seat belt extender or of the seat belt extender itself takes place through the footwell module. If there is a fault, like a defective Hall sensor, the controller of the seat belt extender sends this status via the LIN-bus to the footwell module. The footwell module stores the fault code and communicates with the diagnosis tool.

Coding

After replacing the controller for the seat belt extender it must be encoded by the footwell module via the LIN-bus. It is not possible to address the LIN-bus control units direct.

Workshop Exercise - Seat Belt Extender Diagnosis Work Sheet

Using an instructor designated vehicle, perform complete short test on vehicle. Proceed with diagnosis based on complaint listed below. Complete worksheet using proper format regarding, "Complaint/ Cause and Correction".

Vehicle: _____ Chassis #: _____ Production Date: _____

Complaint: _____

Cause: _____

Correction: _____

Workshop Exercise - Seat Belt Extender Diagnosis

Using an instructor designated vehicle, perform complete short test on vehicle. Proceed with diagnosis based on complaint listed below. Complete worksheet using proper format regarding, "Complaint/ Cause and Correction".

What relevant faults are there stored after performing the Short Test?

What Test Plans are available under Function Selection?

What Test Plans are available under Symptoms Path?

What Status Requests are there available under Control Module Functions?

What Component Activation Requests are there available under Control Module Functions?

Using the Inputs/Processing/Outputs principle fill out the following table.

Inputs	Processing	Outputs

What portion of this principle is operating properly?

Workshop Exercise - Seat Belt Extender Diagnosis

What portion of this principle is not operating properly?

What is the cause of the inoperative seat belt extender?

Note: Please fill out the Diagnosis Work Sheet that outlines the Complaint/Cause/Correction on the previous page.

How many punches would be required to complete this work order properly following approved BMW procedure?

Exterior Lighting

Compared to the E90, several changes have been made in the exterior lighting system of the E92:

- The E92 is equipped with standard bi-xenon headlights.
- Adaptive headlights with cornering lights are available as an option.
- Standard daytime running light function, realized by the parking light corona rings.

Welcome Lights

The welcome lights are also a new function. The interior lights are activated for 20 sec. when the vehicle is unlocked but also the parking light corona rings, the tail lights, license plate lights, the door handle area lights and side markers.

Note: The welcome lights operate only in automatic and are not activated when the light switch is in the 0 position. This provides the customer with the option of deactivating the system if he/she does not want this function.

Daytime Running Lights

The daytime running lights function is realized by the two corona rings in the headlights and activation of the tail lights and license plate lights.

The corona rings light brighter during the day to realize the daytime running lights function. The brightness of the corona rings is reduced to that of the side lights when the low beam headlight is switched on by the rain/light sensor or by switch position 2.

Note: Non serviceable LEDs are used for the front headlamp side marker and on the tail lamp, LEDs are integrated to fiber optic strips to realize the rear parking light.

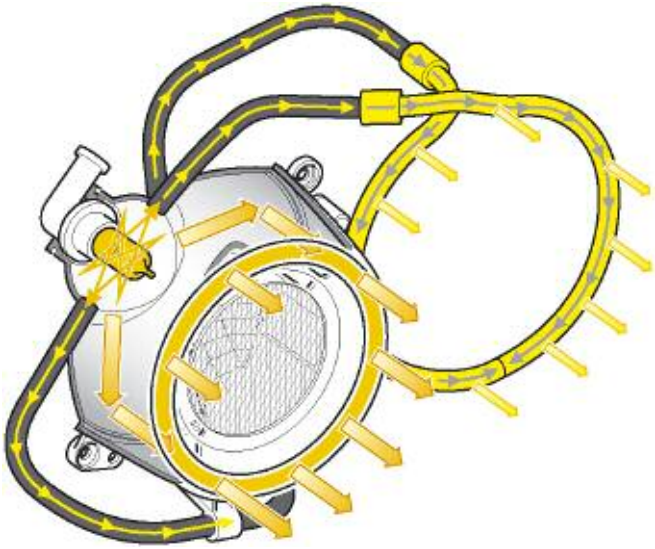
The corona rings are always switched on at terminal 15 ON. The corona rings are activated pulse width-modulated. The pulse width modulation ensures the daytime running lights and parking light function can be realized with one lamp bulb.

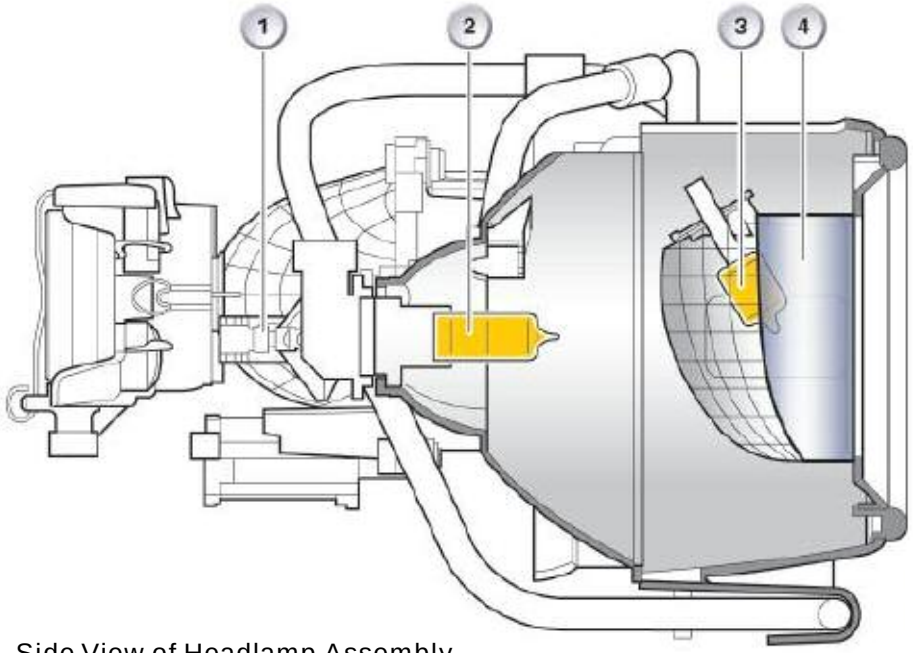
Light distribution in headlight for daytime running light function

The daytime running light uses the same corona rings as the side lights. Both corona rings feature a common H8 bulb. The H8 lamp bulb is activated differently depending on the side light or daytime running light function.The inner ring is illuminated from the rear by reflectors. The outer rings around the headlight are supplied via fiber optic glass rods. The light from the H8 bulb is directed by mirrors into the fiber optic glass rods.

Deactivating the daytime running lights function

The function can be deactivated if required by the customer. On vehicles equipped with a central information display, the function can be deactivated in the "Light settings" menu. The function is deactivated in the instrument cluster on vehicles with no CID.





Side View of Headlamp Assembly

Index	Explanation
1	Bi-xenon lamp
2	H8 bulb for side light and daytime running light
3	H3 bulb for cornering light
4	Mirror for cornering light

Cornering Lights

Cornering lights will be introduced for the first time with the launch of the E92.They represent an expansion of the functions of the adaptive headlights. In addition to the adaptive headlight, the cornering light illuminates the area in front of and to the side the vehicle.
The cornering light is integrated in the headlight where the previous high beam lamp was located. The light beam is reflected to the side by the special shape of the deflector and the position of the H3 bulb. The cornering light cannot be ordered as a separate option as it is an added function of Adaptive Headlights (SA 524)

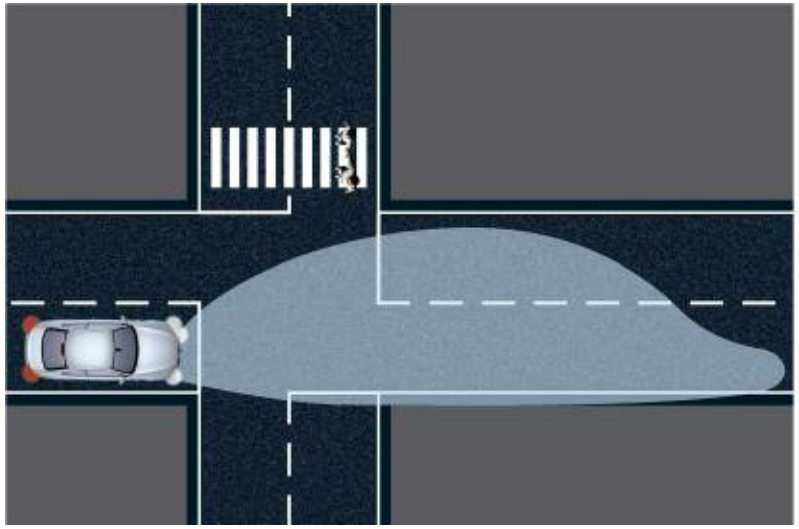
The special arrangement of the mirror surface in the reflector and the special shape of the lens deflect the light beams to the side while preventing forward dazzle.

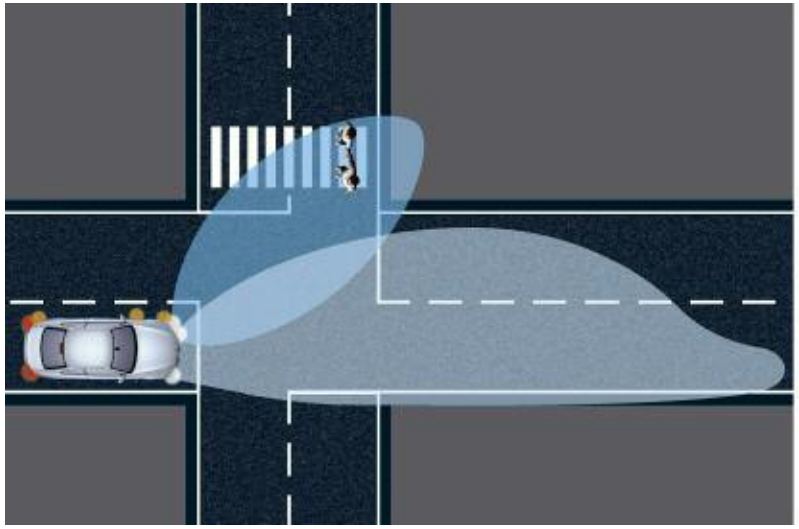
The cornering lights illuminate when the respective turn signal is operated and or the steering angle sensor indicates a turn below 40mph.

The angle of the steering wheel to activate the cornering light differs depending on the type of steering system used (power steering or active steering), steering gear and steering gear ratio. The steering wheel lock to activate the cornering light when the vehicle is stationary is between approximately 40° and 75° depending on the type of steering.

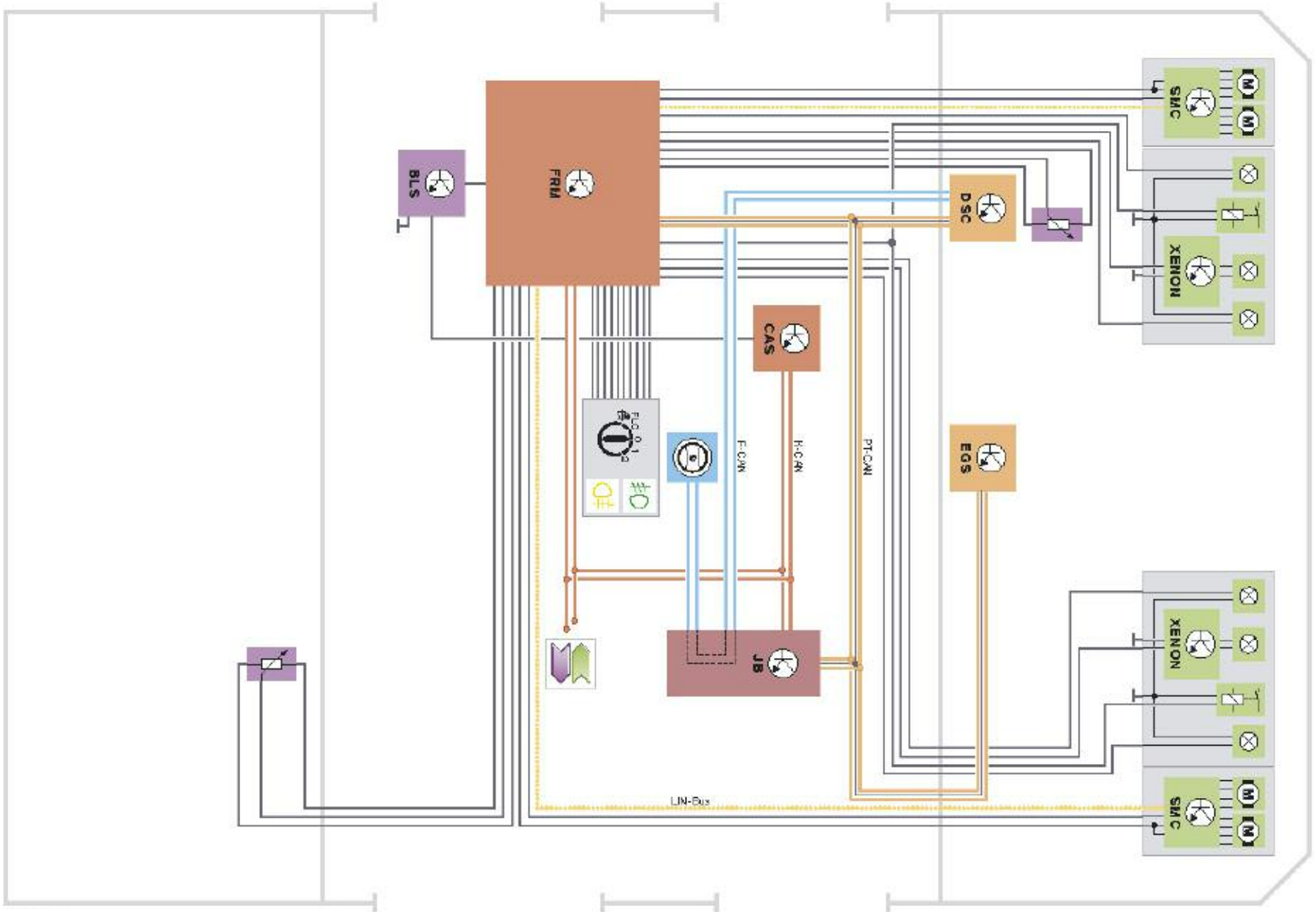
Flash to pass does not affect the cornering light nor does the hazard function activate it.

Note: Both cornering lights come on when the reverse gear is selected to help illuminate the way.





Bi-xenon Headlamp Diagram



Bi-xenon Headlamp Diagram Legend

Index	Explanation
1	Left controller with stepper motor
2	Side light/daytime running light
3	High beam shutter
4	Bi-xenon light bulb, left
5	Cornering light left
6	Cornering light right
7	Bi-xenon light bulb, right
8	High beam shutter right
9	Side light/Daytime running light, right
10	Right controller with stepper motor
11	Junction Box
12	Ride-height sensor, rear
13	Brake light switch
14	Footwell module
15	Light switch cluster
16	Steering column switch cluster
17	Car access system
18	Electronic transmission control unit
19	Dynamic stability control
20	Ride-height sensor, front

Switch-on conditions for the cornering lights

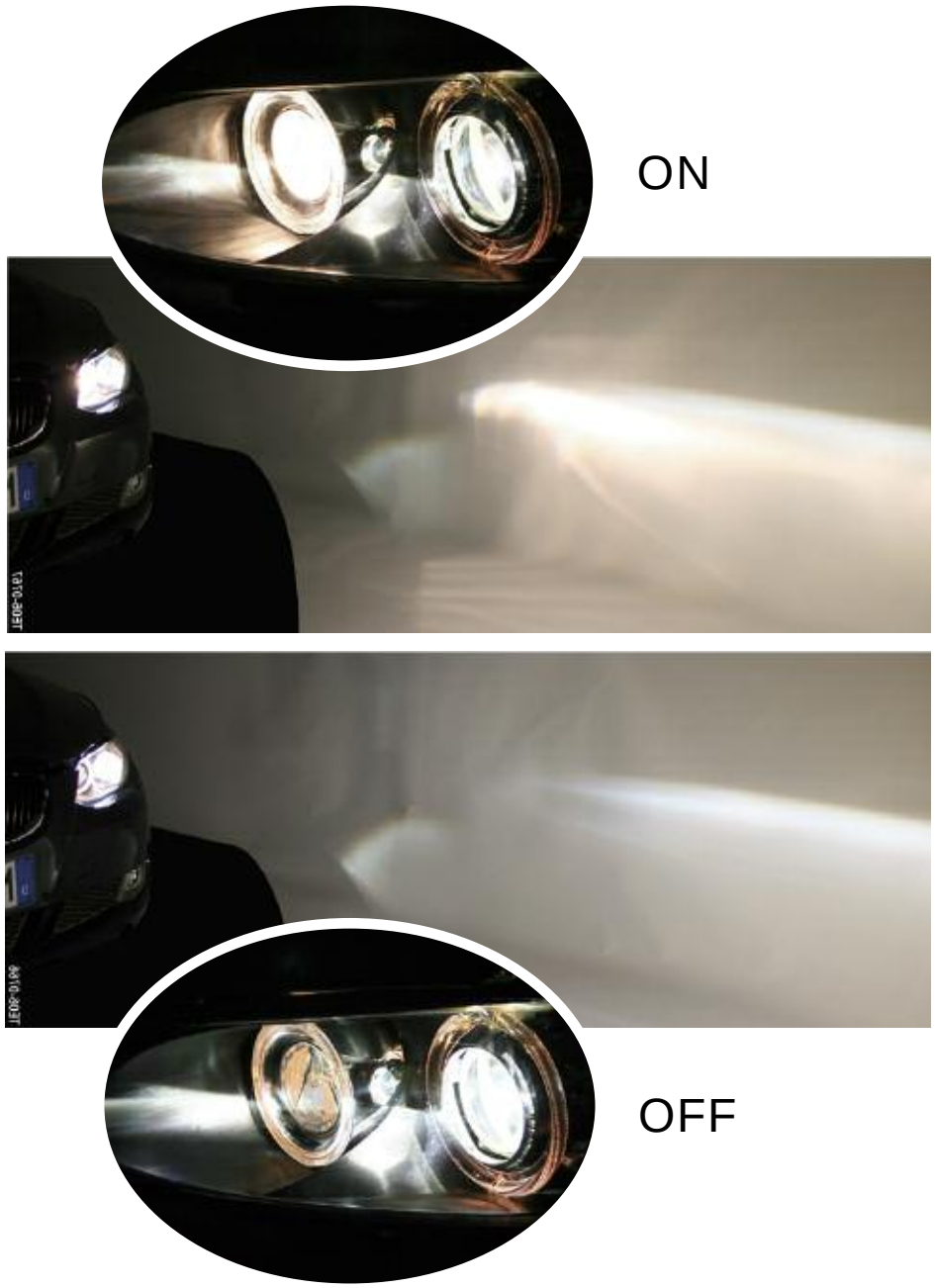
The corresponding cornering lights will illuminate depending on the following criteria:

- The selection of the turn signal below 65kph/40mph
- Steering angle input while driving below 65kph/40mph
- With vehicle stationary and engine running a steering angle of 40° to 70°, depending on the steering system
- With reverse gear engaged both cornering light will illuminate

Switch-off conditions for the cornering lights

The cornering lights switches off in the following conditions:

- Adaptive headlight off
- Direction indicator off
- Directional constantly on above 40kph/25mph
- Steering angle is reduced (by 5°-10° after switch-on condition with vehicle stationary)
- Steering angle increased while driving above 70kph/43mph
- While drifting (Steering lock and yaw rate in opposite directions)
- While turning at a traffic light there is a 4 sec time out
- Headlight temperature too high (headlight protection)
- Reverse gear disengaged



Workshop Exercise - Headlamp Functions

Using an instructor assigned vehicle, Inspect headlamp assemblies and Identify the following functions.

Open the vehicle with remote and list all the lights that come on.

What do we call this lighting function?

Turn the light switch to position 1 (parking lights) and verify operation.

Which of the parking lamps cannot be serviced with out replacing the lamp assembly?

With the light switch in Automatic position turn on Left side turn signal, then the Right turn signal and describe what happens?

With the Engine OFF put the gear selector in the reverse position.

Describe what happens at the headlamps.

Return the gear selector to the Park/Neutral position and put the headlight switch in the position 2.

Describe which lamps come on.

Apply the Flash to Pass function.

Describe which lights are used to realize the Flash to Pass.

Apply the High Beam function.

Describe which lights are used to realize the High Beam function.

Workshop Exercise - Headlamp Functions

Fill in the individual lamp/function.

Bus Systems

With the adoption of the bus systems from the E90 with the junction box as the gateway and the footwell module as a further control unit with many functions, the system overview of the bus systems are, to a large extent identical.

The E90/E92 bus systems differ only slightly by the addition of new control units. The following changes have been made in the various bus systems:

Changes in PT-CAN

The transfer case control unit is installed in vehicles equipped with the xDrive all-wheel drive system option. The DSC is replaced by the DXC. The DXC performs the functions of the DSC and has been expanded to include additional all-wheel drive functions.

Changes in MOST

IBOC (In-Band On-Channel), a terrestrial digital radio, has been newly added

Changes in K-CAN

Further exterior lighting functions have been implemented in the footwell module. These functions include :

- Daytime driving lights
- Welcome light
- Cornering light on vehicles with active headlight

The tire pressure monitoring system TPMS replaces the tire failure indicator RPA to conform to US legal requirements.

The EWS 4 has been implemented in the CAS 3 on gasoline engine vehicles.

A 4-channel PDC for the rear is offered in the E92. There is no PDC button in the center console.

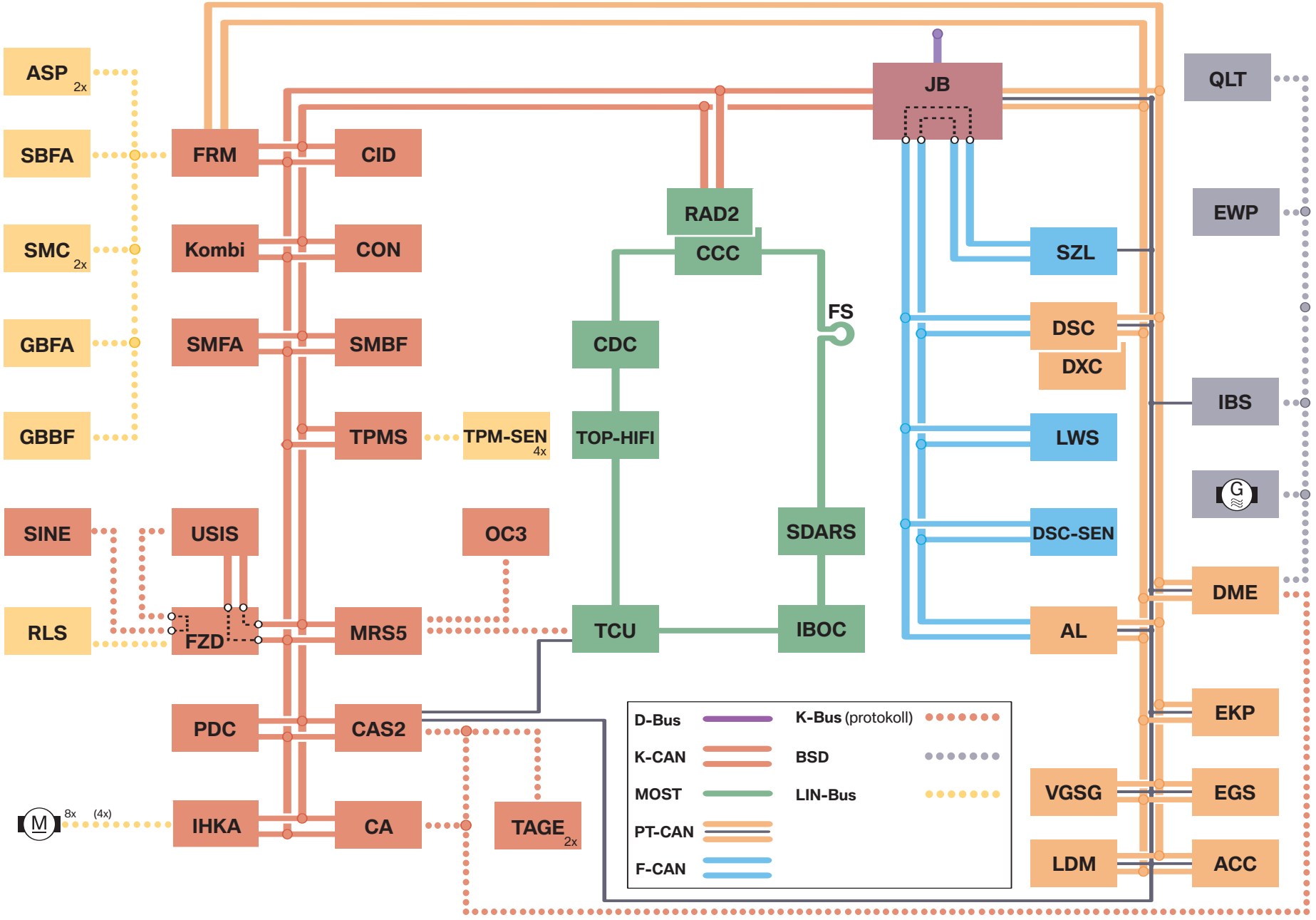
A new addition is the front passenger seat module SMBF for evaluating the Hall sensor of the seat forward/backward adjustment facility on vehicles with electrically adjustable seats for the rear compartment easy entry function.

Changes in LIN-bus

New features in the LIN-bus include the two control units for the driver and front passenger seat belt extender.

Note: There are no changes in the F-CAN system nor the Bit-serial Data interface (BSD).

E92 Bus System Overview



Legend for E92 Bus System Overview

Index	Explanation	Index	Explanation
ACC	Active cruise control	JB	Junction box
AL	Active steering system	KOMBI	Instrument cluster
ASP	Outside mirror	LDM	Longitudinal dynamic management
CA	Comfort access	LWS	Steering angle sensor
CAS	Car access system	M-ASK	Multi-audio system controller
CCC	Car communication computer	MRS	Multiple restraint system
CDC	CD changer	OC3	Seat occupancy detection mat
CID	Central information display	PDC	Park distance control
CON	Controller	QLT	Quality, level, temp, oil sensor
DME	Digital motor electronics	RAD	Radio 1, radio 2
DSC	Dynamic stability control	RLS	Rain/driving light sensor
DSC-Sen	DSC Sensor	SBFA	Driver's door switch cluster
DWA	Anti-theft alarm system	SDARS	Satellite tuner
DXC	Dynamic traction control	SINE	Emergency current siren w/ tilt alarm sensor
EGS	Electronic transmission control unit	SMBF	Passenger's seat module
EKP	Electric fuel pump control unit	SMC	Stepper motor controller
ELV	Electric steering lock	SMFA	Driver's seat module
EWP	Electric water pump	TONS	Temperature, oil level sensor
FRM	Footwell module	Top-HiFi	Top-HiFi amplifier
FS	Most direct access	TPMS	Tire pressure monitoring system
FZD	Roof function center	TPM-sen	TPMS sensors X4
GBBF	Passenger's seat belt extender module	ULF	Universal charging and hands-free facility
GBFA	Driver's seat belt extender module	USIS	Ultrasonic passenger compartment protection
IBOC	In band on channel (digital radio)	VGSG	Transfer box control unit
IBS	Intelligent battery sensor	ZH	Electric auxiliary heater based on PTC principle
IHKA	Automatic climate control	SZL	Steering column switch cluster
TCU	Telematics control unit	TAGE	Electric outer door handle module

Classroom Exercise - Review Questions

1. What vehicle use the N51 engine?

2. How many bulbs in the headlamp assembly are used to realize the the high beam function on the E92? And why?

3. When should the DME / CAS alignment be performed? And why?

4. Thermo Plastic used in the fabrication which parts of the E92 body?

5. What is special about the new key?