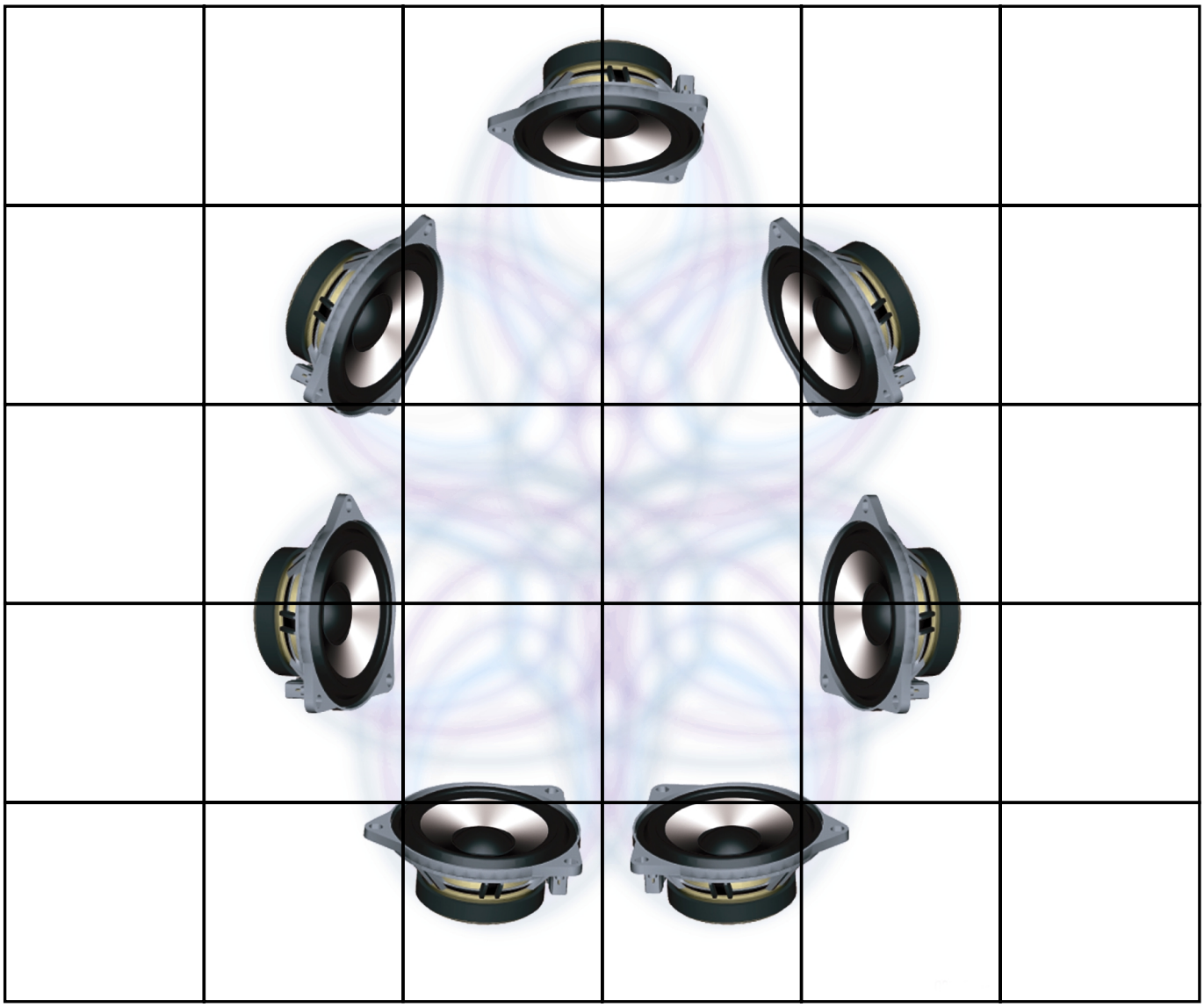
BMW Group
Aftersales Training

E60 Infomation and Communication
Participant Manual



NOTE
The information contained in this participant manual is intended for participants of the Aftersales Training.
Refer to the relevant "BMW Service" information for any changes/ supplements to the Technical Data.

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Contents

Information/Communication Technology IKT

Introduction

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Fig. 1: The new 5 Series E60

The E60 offers the same scope of information and communication systems as the E65. The systems were further developed to combine more functions in fewer control units.

On the E60, a differentiation is made between basic and High information and communication systems. The multi-audio system controller (M-ASK) is the central control unit for the basic variant. The Car Communication Computer is the central control unit of the High variant. The basic and High variants are determined by the scope of optional equipment.

Option (SA) assignments M-ASK/Car Communication Computer

Option	SA No.	M-ASK	CCC	5.8"	6.5"	8.8"
Basic vehicle		X	-	X		
IHKA High	534	X	(X)	-	X	(X)
HiFi	676	X	(X)	X	(X)	(X)
Top-HiFi	677	X	(X)	X	(X)	(X)
CD changer	672	X	(X)	X	(X)	(X)
MP3 player, double tuner	663	X	(X)	X	(X)	(X)
Telephone	638	X	(X)	X	(X)	(X)
Navigation Business (arrow)	606	X	-	-	X	-
Navigation Professional (map)	609	-	X	-	-	X
TV	601	-	X	-	-	X
DVD changer	696	-	X	-	-	X
Rear compartment monitor	603	-	X	-	X	X
Online package	613	-	X	-	-	X
Voice control	620	-	X	-	-	X

(X) = depending on options

- New features compared to E39

- Multi-audio system controller M-ASK
- Car Communication Computer (optional)
- Controller with simplified operation
- Navigation system integrated in M-ASK or Car Communication Computer
- Top-HiFi amplifier with LOGIC7
- New fixed installation telephone system with GSM dual band and telematics
- Head-up display
- Voice input system integrated as software (Car Communication Computer only)
- Rear compartment entertainment centre with a second display and DVD changer (not from series launch)
- Headset interface (not from series launch)

Multi-audio system controller

The multi-audio system controller M-ASK is the central control unit of the information and communications systems. The M-ASK combines up to four control units in one, used as the central control unit in the basic version.

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Fig. 2: Multi-audio system controller

Car Communication Computer

The Car Communication Computer is the central control unit of the High equipment. The Car Communication Computer comprises the functions of the M-ASK, plus some additional functions. Voice control of the systems and the Professional navigation system with map presentation are additionally possible in connection with the Car Communication Computer. The Car Communication Computer also contains the driver for the rear passenger compartment display.

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Fig. 3: Car Communication Computer

Controller

The controller is the central control/operating element for all comfort and several car functions. The operating principle is identical to that of the E65. The directions in which the controller can be pushed has been reduced to four.

The controller comes in two versions, i.e. basic and High. The basic version is fitted with a mechanical locating mechanism for the check-back signal while in the High version the controller function is electrically generated for the check-back signal.

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Fig. 4: E60 controller with additional control buttons (High version)

Navigation systems

Two navigation systems are offered. The Business navigation system features an arrow display and voice instructions (former radio navigation).
The Professional navigation system features a map display in the central information display. The E60 no longer features a separate navigation computer. The navigation computer has been integrated in the M-ASK or the Car Communication Computer.

Top-HiFi amplifier with LOGIC7

The E60 offers three different audio systems to choose from: stereo, HiFi and Top-HiFi. In the Top-HiFi version, the amplifier has a LOGIC7 function, i.e. there is optimum surround sound.

Telephone system

The E60 is equipped with the new fixed installation telephone system based on the Everest platform. It features a dualband GSM telephone and various telematics functions.

Voice input system

The Car Communication Computer is combined with a voice input system, which can be used to execute most of the functions by way of voice commands in the communications network.

Head-Up display

A further innovation in the E60 is the head-Up display. Here additional information is beamed into the driver's field of vision. The driver can read this information without having to take his/her eyes off the road ahead, this representing an effective safety feature.

Rear-compartment entertainment centre

A rear-compartment entertainment centre will be provided at a later stage in conjunction with the Car Communication Computer. This entertainment centre will allow the rear passengers to watch a DVD film on a second display in the rear compartment while the car is moving. TV reception with videotext will also be possible.

Headset interface

The headset interface will allow passenger to listen simultaneously to different audio sources in the car (not at series launch).

System overviews

- Bus overview EU

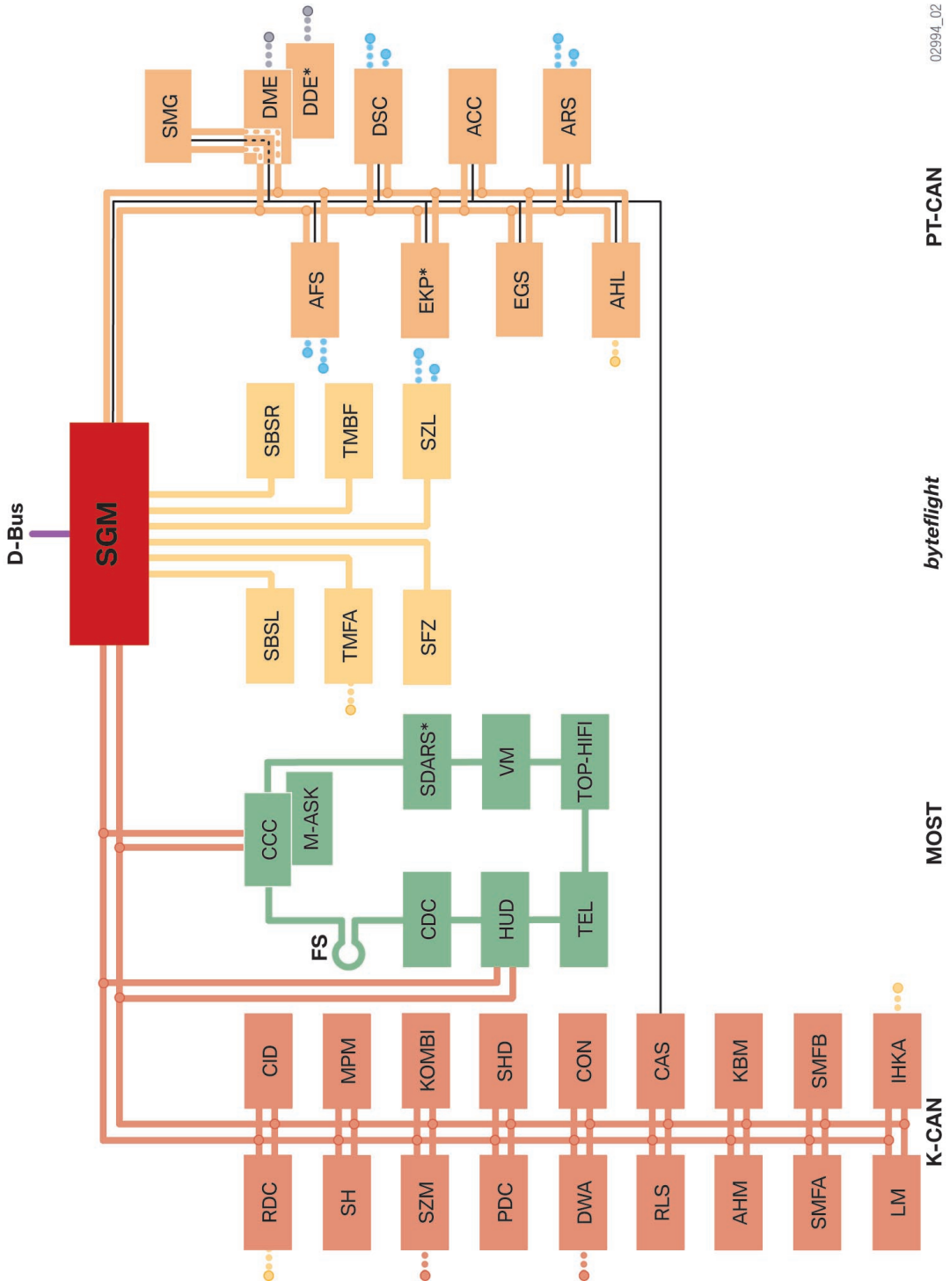

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Fig. 5: Bus overview E60

Index	Explanation	Index	Explanation
RDC	Tyre pressure monitoring system	HUD	Head Up Display
SH	Independent heating	TEL	Telephone
SZM	Centre console switch centre	TOP-HIFI	Top-HiFi amplifier
PDC	Park distance control	VM	Video module
DWA	Antitheft alarm system	SDARS*	Satellite Digital Audio Radio Services (US only)
RLS	Rain/low beam sensor	SGM	Safety and gateway module
AHM	Trailer module	SBSL	B-pillar satellite, left
SMFA	Driver's seat module	TMFA	Driver's door module
LM	Light module	SFZ	Vehicle centre satellite
IHKA	Integrated heating and air conditioning control	SZL	Steering column switch cluster
SMBF	Driver's seat module	TMBF	Passenger door module
KBM	Basic body module	SBSR	B-pillar satellite, right
CAS	Car Access System	AFS	Active steering
CON	Controller	EKP	Electric fuel pump control
SHD	Slide/tilt sunroof	EGS	Electronic gearbox control
KOMBI	Instrument cluster	AHL	Adaptive head light
MPM	Micro power module	ARS	DynamicDrive
CID	Central information display	ACC	Active cruise control
CCC	Car Communication Computer	DSC	Dynamic stability control
M-ASK	Multi-audio system controller	DME	Digital motor electronics
FS	Flash connector	DDE	Digital diesel electronics
CDC	CD changer	SMG	Sequential manual gearbox

- System circuit diagram EU

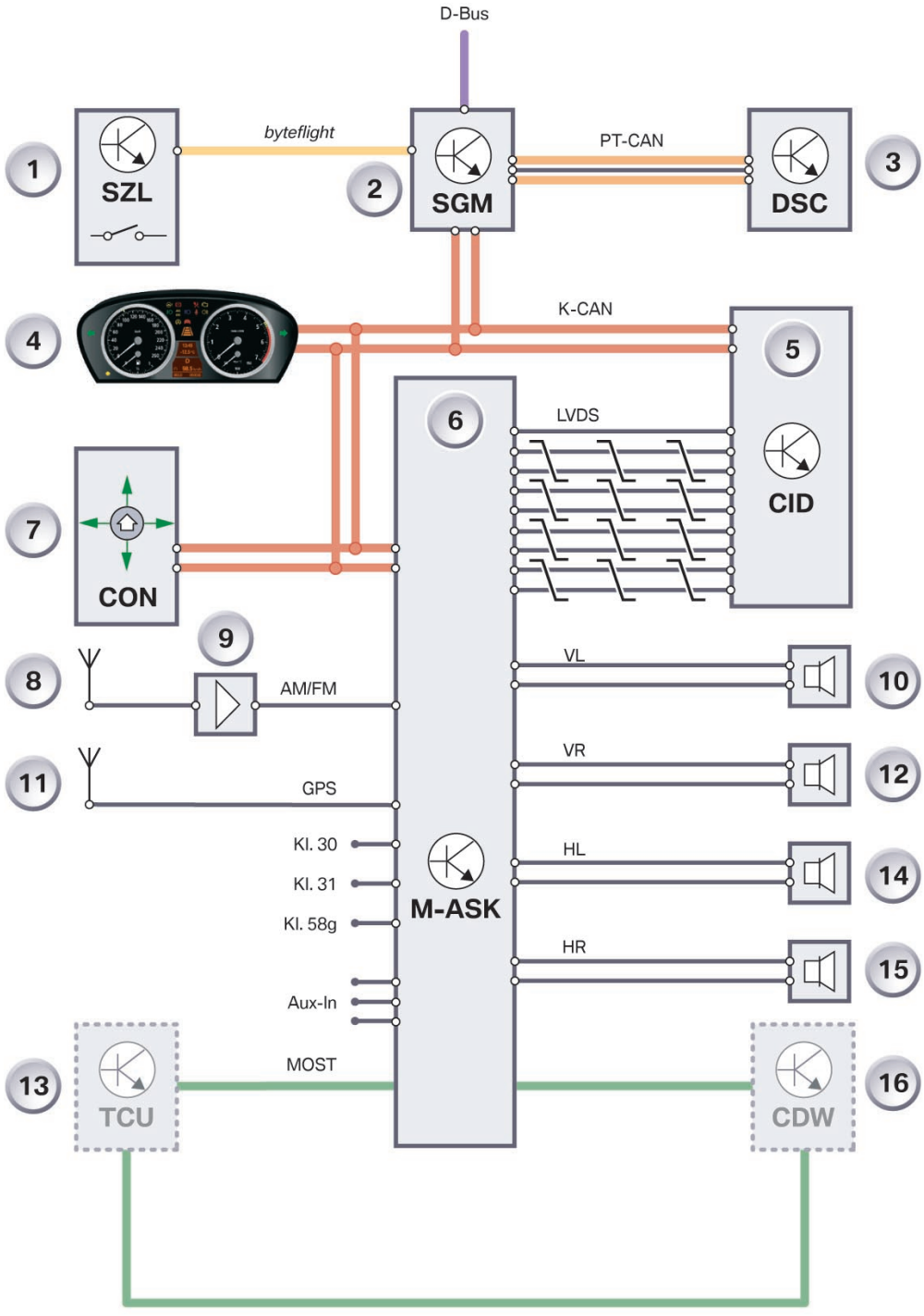

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Fig. 6: System diagram M-ASK

Index	Explanation
1	Steering column switch cluster with buttons for volume and station selection
2	Safety and gateway module
3	Instrument cluster for check control messages
4	Central information display
5	Multi-audio system controller
6	Controller
7	Radio aerials
8	Antenna diversity
9	Front left speaker
10	GPS antenna for navigation
11	Front right speaker
12	Rear left speaker
13	Rear right speaker
14	Telematic control unit (telephone option)
15	CD changer (option)
16	Top-HiFi amplifier (option)

Rear view M-ASK

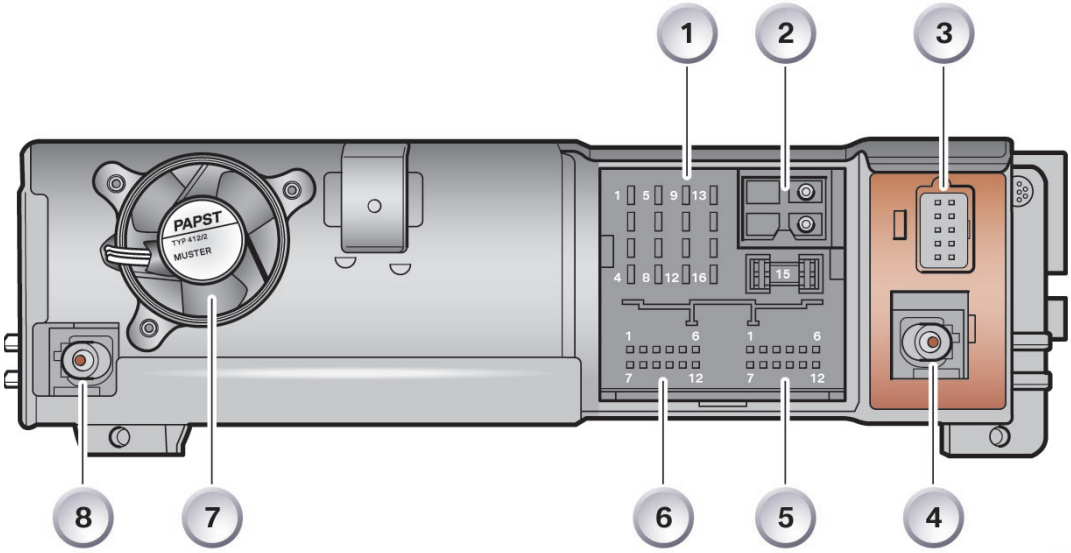

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Fig. 7: Connector assignments M-ASK

Pin	Description
1	16-pin connector
2	MOST connector
3	LVDS connector
4	GPS antenna connector
5	12-pin connector, right
6	12-pin connector, left
7	Fan motor
8	Radio antenna connector

Multi-audio system controller

- Introduction

The M-ASK combines the following control units in one housing:

- Audio system controller
- Aerial amplifier/tuner
- MOST CAN gateway, interface to control display
- Navigation computer (optional)

In the E65, these modules are installed in separate control units.

The following advantages are achieved by combining several control units in one component:

- Fewer plug connections therefore fewer sources of fault
- Improved overall quality
- Less installation area required for control units
- Weight saving of control units
- Low closed-circuit current requirement

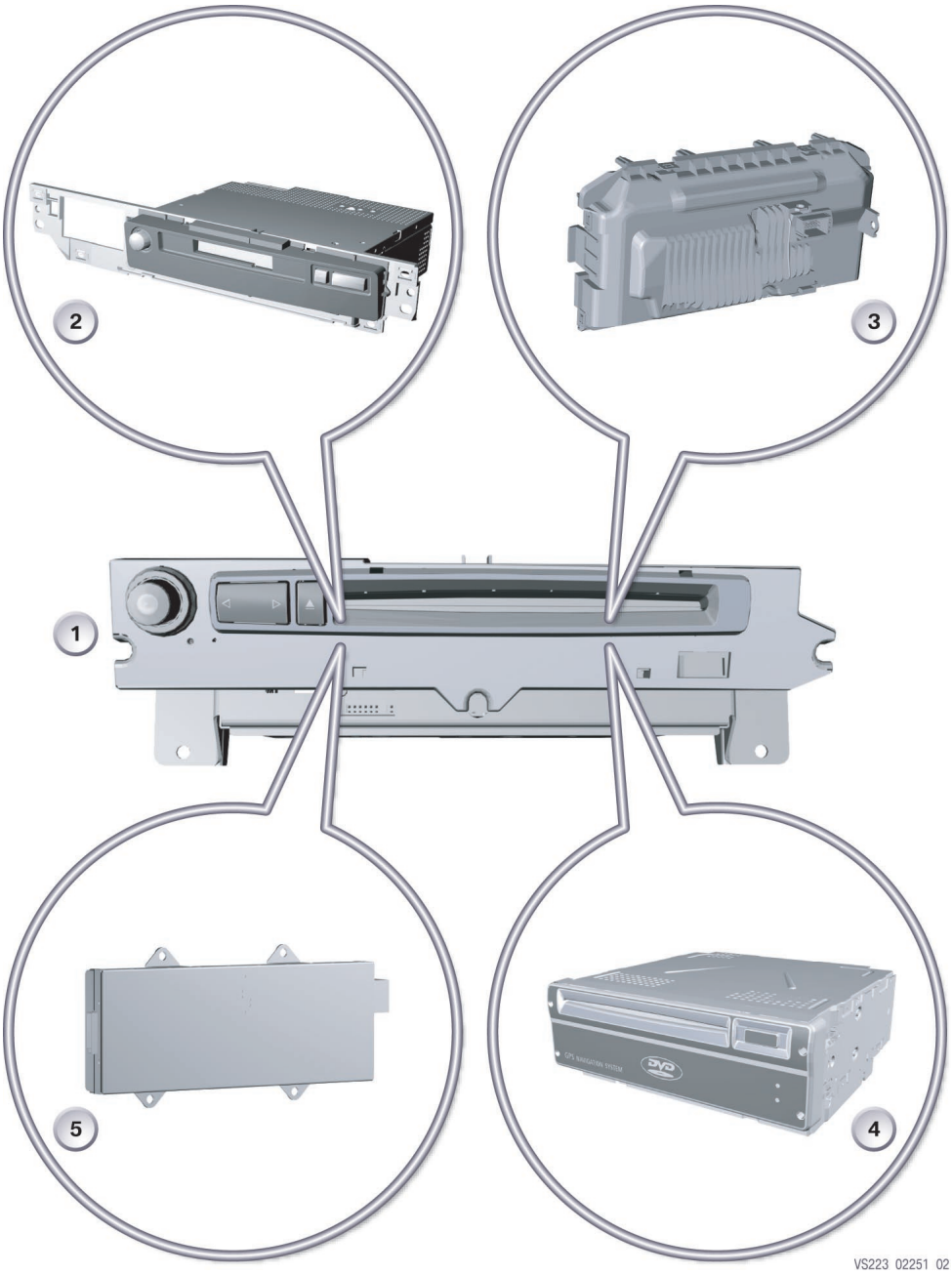

Fig. 8: Overview of the integrated functions in the M-ASK

Index	Explanation
1	Multi-audio system controller
2	Audio system controller function E65
3	Control unit for control display (MMI/Gateway function)
4	Navigation computer
5	Aerial amplifier/tuner (radio function)

- M-ASK variants

Corresponding to the optional equipment configuration, the multi-audio system controller is installed in one of the following hardware variants.

ASK with	Tuner	Drive	Music	MP3-files	Navi-data
Radio Business Basis	Single	CD-Drive	X		
Radio Professional option	Double	CD-ROM-Drive	X	X	
Navi Business option	Double	DVD-Drive	X	X	X

- M-ASK functions

The M-ASK undertakes the most important and central functions as well as control tasks in the communication network. It is responsible for the control and communication of the individual systems among each other. These tasks comprise the following main functions:

- MOST-CAN gateway
- LVDS driver
- MOST functions
- Navigation Business
- Radio function
- Audio master function
- Audio output stages

- MOST-CAN gateway

The M-ASK forms a gateway (interface) between the MOST bus and the K-CAN. The gateway connects the various bus systems of the vehicle network. The bus systems operate with different transmission rates and data formats. The information must be converted in the gateway in order to be able to use it in the various systems.

- LVDS driver

The LVDS driver (low voltage differential signal) receives the digital RGB signals from the graphic processor. The LVDS driver converts the RGB signals into LVDS signals and sends them via the LVDS cable to the central information display thus providing digital image signals on the display.

- MOST functions

System master

The system master function that was still part of the control display on the E65/66 is now integrated in the M-ASK. The system master has the overall system knowledge and combines the individual control units to form one system.

Power master

In the E65/66 the power master function is in the control display and is now integrated in the M-ASK. The power master has following functions:

Wake-up, initialization, power-down

The power master wakes the bus and is responsible for ensuring correct initialization of the network. The network master is also responsible for initiating the power-down. Each power-down is requested at this master and initialized by it.

Network master

The M-ASK is the network master for the MOST bus. The network master undertakes all control and monitoring tasks of the MOST bus. It performs following functions:

Configuration control

The network master detects the exact system configuration each time that the network is started and compares it to a stored target configuration.

Fault code memory

The network master contains the central fault code memory of the MOST network. In addition to deviations from the specified configuration, all faults that occur during operation of the network are stored in this fault code memory.

- Navigation system Business

The following navigation systems are offered as options (SA) in the E60:

- Navigation system Business, including 6.5" colour display
- Navigation system Professional, including 8.8" colour display

Only the Business navigation system is described in the following.

The navigation system Professional with map presentation and 8.8" colour display is offered only in connection with the Car Communication Computer and a description can be found there.

The navigation system Business corresponds to the familiar radio navigation with arrow presentation and voice announcements. A new feature of the Business navigation system is its integration in the M-ASK and the memory navigation.

The M-ASK features a DVD drive in connection with the Business navigation system. The navigation data stored on a DVD can be read in via this drive. The DVD drive can also play audio CDs and CD-ROMs (MP3).

Note: The DVD drive cannot be used to play audio DVDs and video DVDs.

In addition to the components integrated in the M-ASK, the navigation system still requires the following components and information:

- GPS antenna
- Wheel speed information from DSC
- TMC data (traffic message control)

GPS antenna

The GPS antenna is located together with the telephone antenna in the roof antenna. The GPS antenna receives the signals from the satellites and transfers the data to the GPS receiver in the M-ASK for the purpose of calculating the position. This is particularly important during initial or re-initialization of the system. The data are permanently checked for any changes.

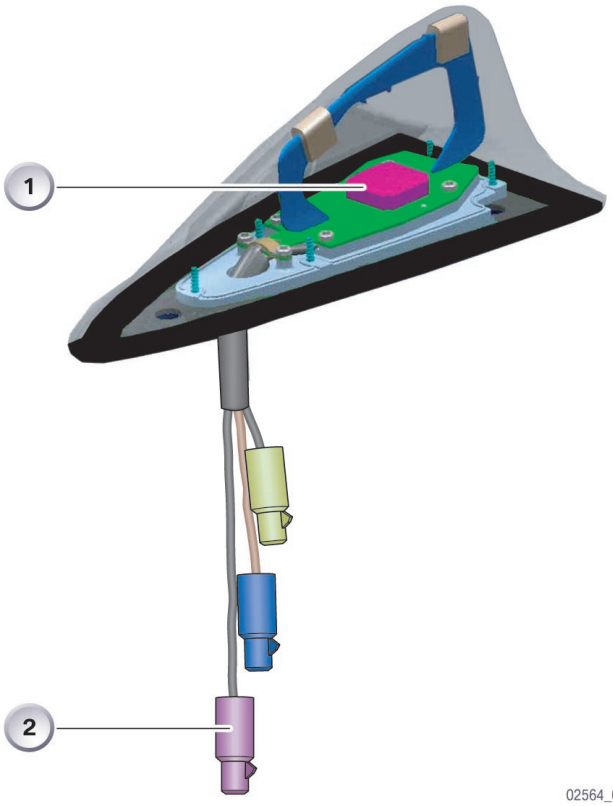

Fig. 9: GPS antenna

Index	Explanation	Index	Explanation
1	GPS antenna	2	Connection for GPS antenna

Wheel speed sensors

The wheel speed sensors determine the rotation of the wheels. The signals are routed to the DSC control unit where the speed and distance are calculated. The driving direction (heading) is also detected by means of the wheel speed sensors. The processed signals are made available to the navigation system. The front left/right and rear left wheel speed sensors are evaluated.

TMC data

The TMC data are received by the double tuner and made available to the navigation system. This data is used to show the current status and plan alternative routes.

New functions

The Business navigation system is based on the DVD navigation as already used in the E46/E39. The following functions are new compared to the MK3:

- Navigation data for all of Europe on one DVD
- Navigation data on RAM
- Via function
- Dynamic route planning by incorporating TMC data
- Simplified destination list
- Route list
- More accurate calculation of time of arrival
- Improved navigation information

Navigation data on DVD

A special data DVD is required for the memory navigation in the M-ASK. This DVD can also only be read in the M-ASK. In contrast to the map navigation system where the DVD contains digitized maps, data packages are stored on the DVD for the memory navigation system. The navigation data of all of Europe and the USA can be stored thanks to the higher storage capacity of a DVD.

Memory navigation from the main memory

The data necessary for route planning are loaded from the DVD to the main memory (SDRAM) as data packages. Not only is the route (A) loaded, but also a corridor to the left and right of the route (B). The width of the corridor depends on the length of the route and the storage capacity of the main memory.

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Fig. 10: Comparison between route storage in MK3 and route with corridor in M-ASK

The advantages of memory navigation are:

- After loading the route, the DVD drive can be used for playing audio CDs or MP3 files.
- In the event of deviations from the planned route, a new route is output at a very fast rate as no DVD access is necessary.
- The route criteria can be changed without the need to access the DVD.
- Traffic queues can be avoided automatically with the dynamic route planning without the need for DVD access.

Via function

With the via function it is possible for the customer to intervene actively in the route planning. Example: route from Munich to Cologne:

Based on the shortest and fastest route, the system suggests the following:

Munich - Nuremberg - Würzburg - Frankfurt - Cologne

The customer can now intervene and change the route, e.g. via:

Munich - Augsburg - Würzburg - Frankfurt - Cologne

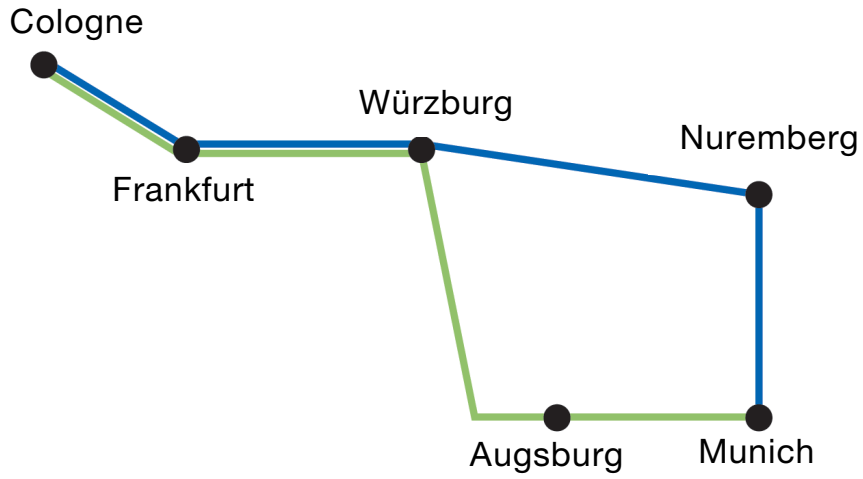

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Fig. 11: Via function

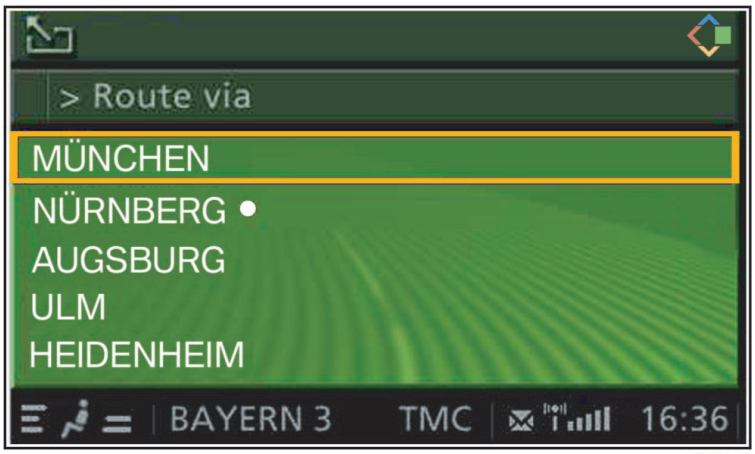

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Fig. 12: Route change menu

Dynamic route planning

If the navigation system determines on the basis of TMC data (traffic message channel) that there is a traffic queue on the planned route still to be covered, the traffic queue is avoided by driving on alternative routes.

Simplified destination list

Several destinations can be entered in the destination list. On reaching the first destination, the next destination must be selected and started manually.

More accurate calculation of time of arrival

The expected time of arrival is calculated more accurately by incorporating the different types of roads (motorway, trunk road, byroad) and the average vehicle speed corresponding to the type of road.

The average speed is taken from the on-board computer. Based on the selected route, the computer calculates the share of different types of road and the determined average speed so that it can calculate the time of arrival more accurately.

Improved navigation information

When changing from a motorway or trunk road to another type of road, the number of the road is announced with the aid of the voice announcements.

- Radio

The radio function is integrated in the M-ASK. The tuner is also located in the M-ASK. The tuner serves as the receiver. It converts the RF signal into an audio signal and transfers this signal via the audio output stages to the speakers.

The radio is controlled by means of the controller in the centre console and the menu in the central information display. The familiar control functions are available.

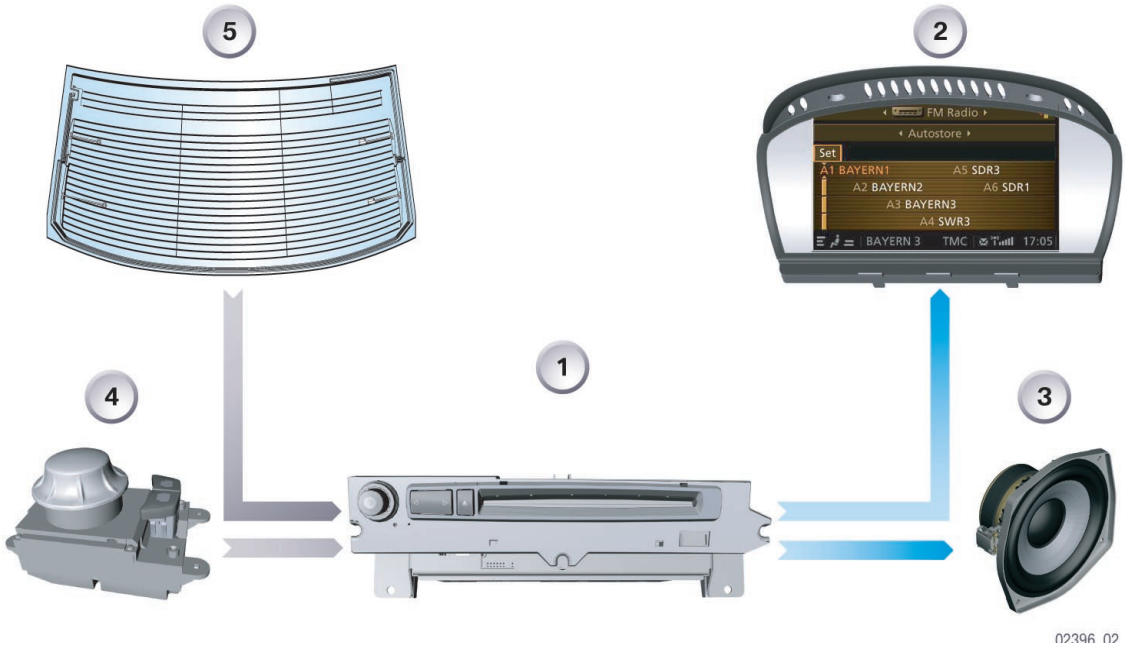

Fig. 13: Function diagram, radio

Index	Explanation
1	Multi-audio system controller
2	Central information display
3	Audio speaker
4	Controller
5	AM/FM antennas

Radio variants

The multi-audio system controller (M-ASK) is equipped with one of the following two variants:

- BMW radio Business with single tuner
- BMW radio Professional with double tuner

The radios are world tuners, i.e. they can be programmed for all frequencies (EU/USA/OCN). The radios feature the familiar functions.

Note: The M-ASK with Business navigation system is always coupled with the radio Professional (double tuner).

BMW radio Business

The BMW radio Business is a single-tuner unit. The single-tuner is used for audio and RDS reception. It receives the radio frequencies VHF, LW, MW.

The AM/FM antennas in the rear window receive the radio waves transmitted by the stations. The received RF signal is routed via the antenna diversity facility on the rear window and a coaxial cable to the tuner.

BMW radio Professional

The BMW radio Professional is a double tuner unit. The double tuner consists of an audio tuner and a second FM tuner. A second FM tuner (data tuner) serves as a search and data receiver. Short-wave (SW/49 m band) and the weatherband in the USA can be additionally received with the audio tuner.

While the audio tuner receives the selected station and the music signal is output, the data tuner works in the background, searching the broadcasting area for additional signals. It checks, for example whether the received station is transmitting a stronger signal on another frequency and consequently the audio tuner then switches over to alternative frequencies (AF tracking).

The data tuner receives additional data (Traffic Message Control) that are broadcast together with the transmit signal and evaluates these data. The TMC data are transferred to the navigation system in order to provide information on traffic queues and to calculate diversions.

Furthermore, the data tuner can receive and output traffic announcements on FM even if the customer is listening to an AM station.

The data tuner compiles a list of all receivable stations. It also makes a list of all receivable traffic information stations.

Antennas

The tuner is connected to the antenna diversity of the rear window via an antenna connector (Fakra) and a coaxial cable. The following antennas are located in the rear window:

- FM antennas FM1-4
- AM antennas LW, MW, SW
- Remote control services (FBD) antenna

In addition to the antennas in the rear window, there is also a roof antenna for the telephone, GPS and satellite radio (US only).

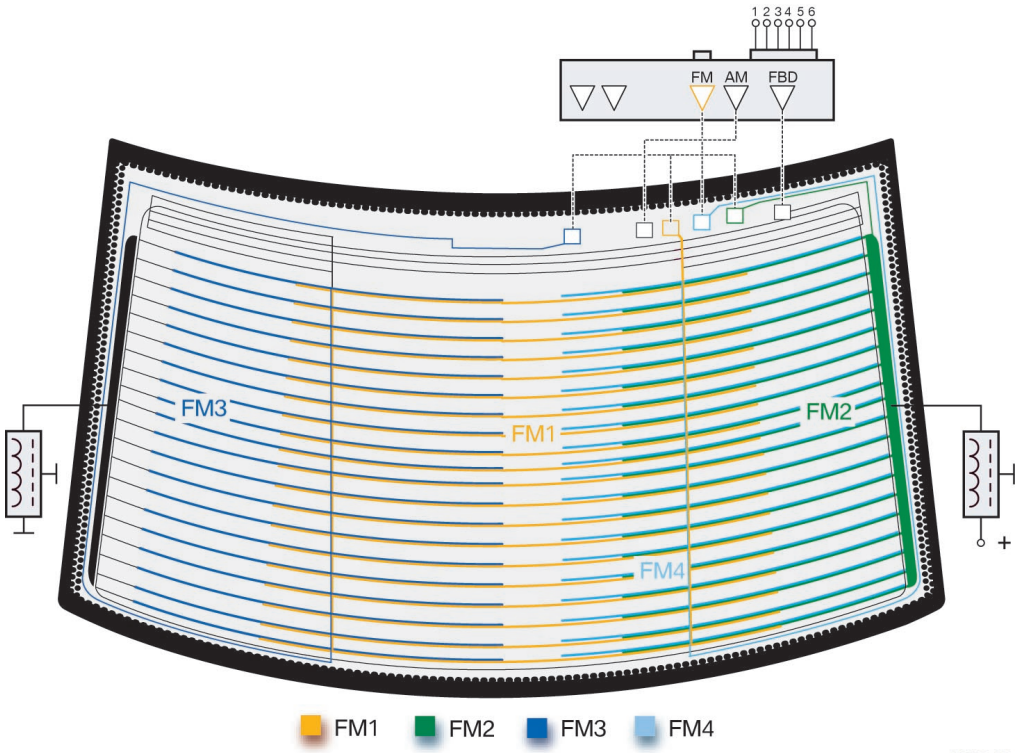

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Fig. 14: FM antenna arrangement in the E60

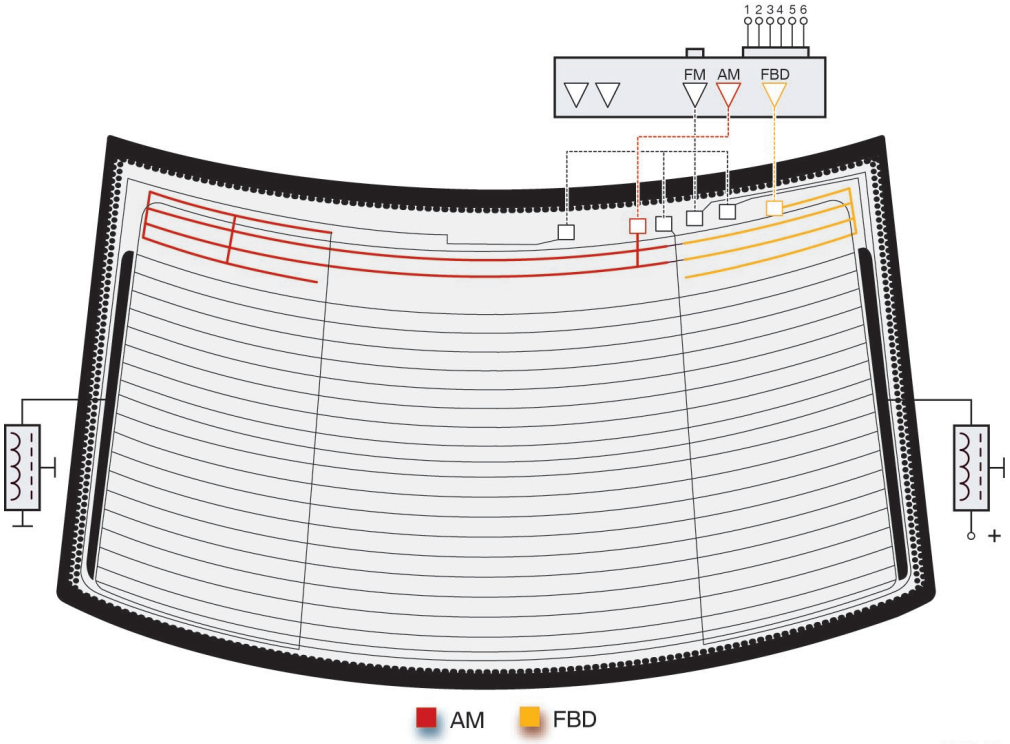

Fig. 15: AM/FBD antenna arrangement in the E60

Design

The antenna structures are located on the inside and are the same on all rear windows. They are applied in a screen print process. The heating conductors of the rear window defogger are integrated in the antenna structures.

The carrier frame for the antenna diversity module is bonded at the top right directly to the rear window. The antenna diversity module is clipped onto the carrier frame and is connected by means of spring contacts to the antenna structure.

Note: Particular care must be taken when removing the antenna diversity module to ensure that the clips of the carrier frame do not break off, otherwise the rear window will have to be renewed.

The different country-specific and optional equipment variants are covered by the various antenna diversity modules.

Antenna diversity

The antenna diversity features consists of various modules. The basic version always includes an AM/FM antenna amplifier, a diversity function for switching over the 4 FM antennas and an FBD receiver.

The voltage for the AM/FM antenna amplifier is supplied via terminal RAD_ON. The voltage to the FBD receiver is supplied by terminal 30.

Aerial diversity applies only to the 4 FM aerials. The IF signal (10.7 MHz intermediate frequency) is transmitted on the coaxial cable from the tuner to the aerial diversity and evaluated. A superimposed DC voltage on the IF signal activates the aerial diversity at high level. The FM aerial 1 is always active at low level, i.e. it is not switched. The aerials are arranged in a switching sequence (1-4) and are switched in succession. The system switches over to the next FM aerial when the RF level collapses and simultaneously the noise level in the AF signal (demodulated audio signal) increases.

- Audio master function

One of the main functions of the M-ASK is the audio master. The task of the audio master is to collect, process and output all audio signals in the vehicle.

A further task of the audio master is to generate and make available the audio signals (with exception of the direction indicator noise) required by the various systems in the vehicle. The special acoustic signals are required for warnings or as information for the driver such as the PDC signal, jingles (gong).

In addition to the generated audio signals, the following audio signals are processed and output or made available on the MOST bus.

- Radio
- CD changer
- Telephone
- Navigation message
- AUX-In
- SDARS (US only)

The M-ASK controls all sound and acoustic setting requirements of the customer. The level of a signal is not changed abruptly but rather smoothly, e.g. by mixing, fading in and fading out or intermittent attenuation of the signal in the sink for the purpose of achieving high quality overall acoustics.

The M-ASK ensures clear cut acoustic changeover between the sources when a control unit is requested to output an information or warning signal.

The acoustic signals or audio sources requested in the M-ASK are output in accordance with a defined priority structure.

Priority of individual audio sources

The incoming requests in the M-ASK relating to the output of the audio sources are processed on the basis of the priority table.

Output of audio signals

The audio master controls the output of audio signals. The following conditions must be maintained:

- The simultaneous output of various jingles is not permitted
- A maximum of 3 signals can be output simultaneously
- If a fourth signal requests output, the signal with the lowest priority is faded out
- The entertainment source is muted if three higher priority signals are output. If the entertainment source is a drive, it is stopped and faded out. When faded back in, the stopped position is restarted

Connection master

The task of the connection master is to make available the channels for the audio sources and the acoustic signals.

The audio signals are distributed over speakers defined in a list.

- Example 1: entertainment sources at all speakers
- Example 2: hands-free telephone front left and right

- Audio output stage

The multi-audio system controller M-ASK features 4 audio output stages each with 25 W output rating. The output stages are designed as bridge-type output stages. An electric fan feeds cooling air to the output stages and processors to ensure they do not cause the M-ASK to heat up. The electric fan is temperature-controlled and is regulated in three stages.

Audio systems

Three audio systems are available:

- Stereo audio system
- HiFi audio system
- Top-HiFi audio system

The stereo audio system is the standard system. The HiFi and Top-HiFi audio systems are available as options (SA).

The audio systems correspond to the audio standards defined by BMW. The audio standards stipulate:

- Division into 3 audio systems: stereo, HiFi, Top-HiFi
- Symmetry of the sound field
- Sound pressure
- Linearity of the stereo signal

The further developed central bass system have realized a distinct improvement in the bass range compared to the E39.

The Top-HiFi audio systems offers additional features such as 7-band graphic equalizer and surround sound.

- Stereo audio system

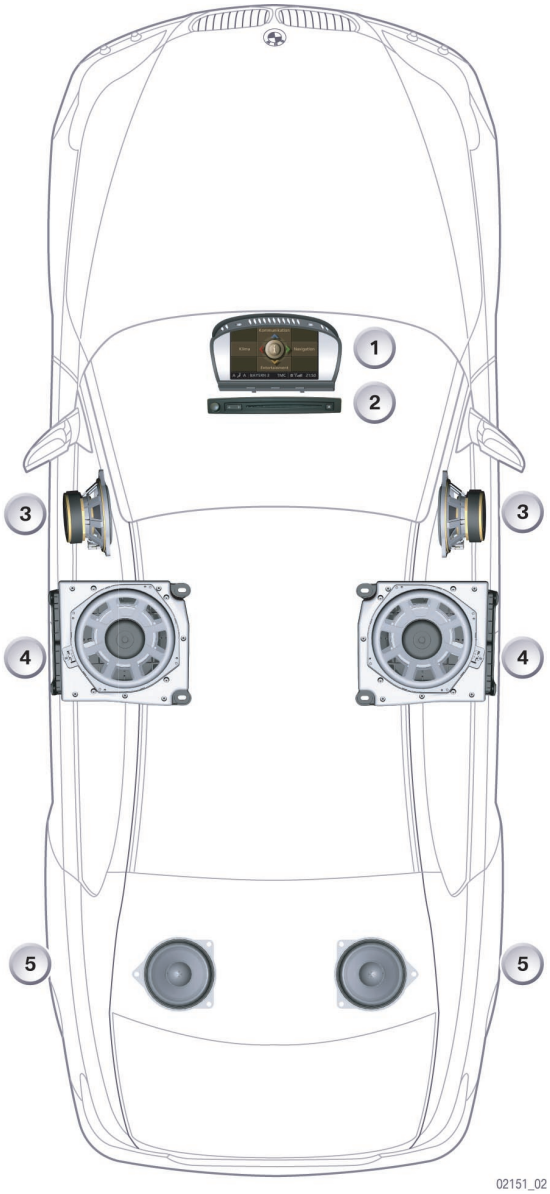

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Fig. 16: Stereo audio system with components

Index	Explanation
1	Central information display
2	Multi-audio system controller
3	Mid-range speaker, front
4	Central woofer
5	Mid-range speaker, rear

Stereo system diagram

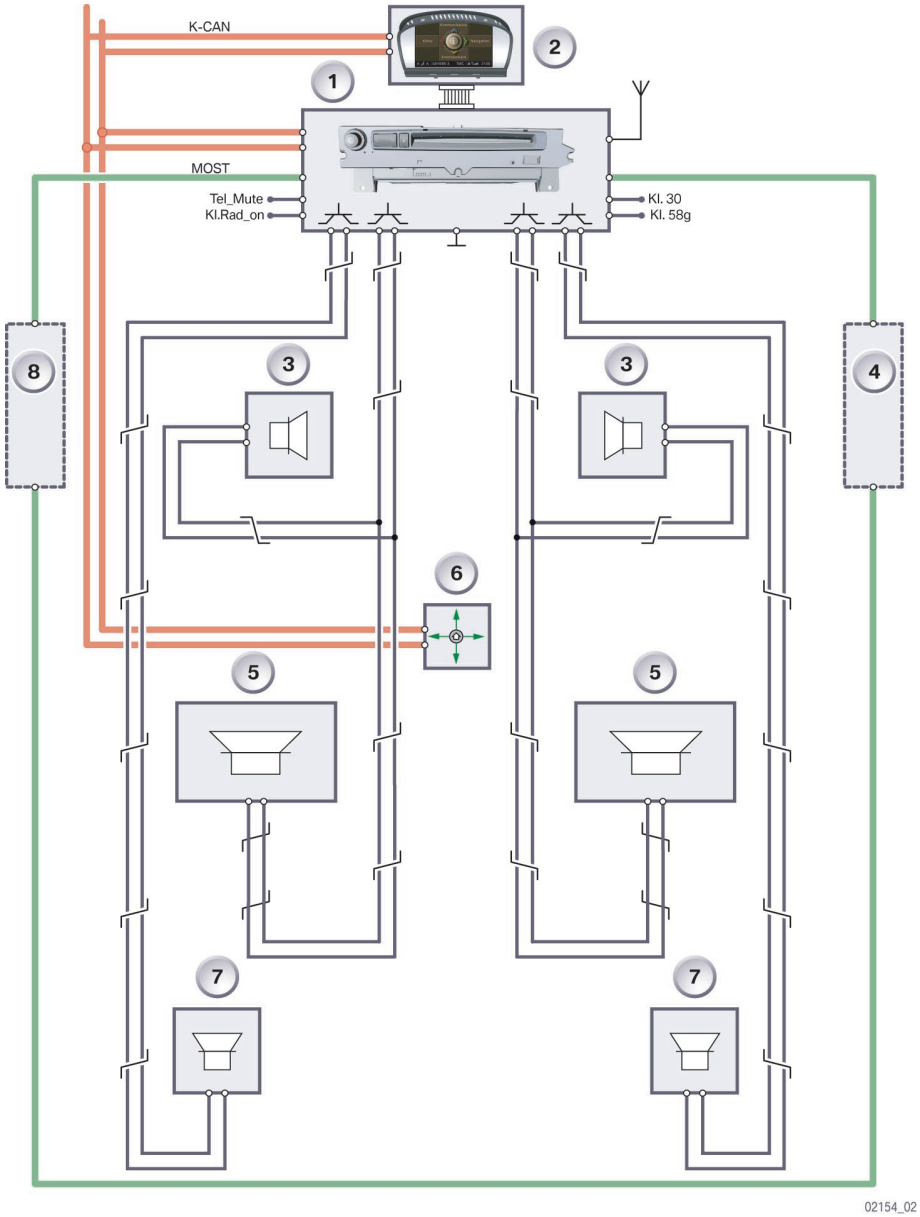

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Fig. 17: Stereo system diagram

Index	Explanation	Index	Explanation
1	Multi-audio system controller	5	Central woofer
2	Central information display	6	Controller
3	Mid-range speaker, front	7	Mid-range speaker, rear
4	Other MOST bus users	8	Other MOST bus users

Components

The stereo audio system is the standard basic system in the E60 and consists of the following components:

- Multi-audio system controller M-ASK
- Central information display CID
- Controller
- Front left and right mid-range speaker
- Left and right central woofer
- Rear left and right mid-range speaker

Multi-audio system controller

The M-ASK controls the stereo audio system. It contains the tuner for radio reception. Furthermore, the output stages for the audio outputs are integrated in the M-ASK. The M-ASK features four output stages each with an output power of 25 W.

Central information display

The CID serves the purpose of displaying and controlling the radio and audio functions.

Controller

The menus in the CID are selected and activated via the controller.

Mid-range speakers

The front and rear mid-range speakers are identical. In the stereo and HiFi audio systems, the speakers have a load rating of 25 W. The mid-range speaker is equipped with a paper diaphragm. The effective frequency range is from 100 Hz to 15000 Hz.

The front mid-range speakers are located in the doors. The rear mid-range speakers are mounted under the rear window shelf.

Central woofers

High sound pressures can be achieved with the aid of the central woofers. A sufficiently large space for the resonance volume is made available by connecting the central bass housing to the sill area of the vehicle. The high sound pressures of the central woofers create a distortion-free bass in the low frequency range.

In the stereo audio system, the central woofers are connected in parallel with the front mid-range speakers. The central woofers have a diameter of 160 mm and a load bearing capacity of 40 W. The central woofer is equipped with a paper diaphragm. The effective frequency range is from 30 Hz to 500 Hz.

The two central woofers are located in the vehicle floor under the driver's and passenger's seats. The output of the central woofers is directed upward under the seats.

- HiFi audio system

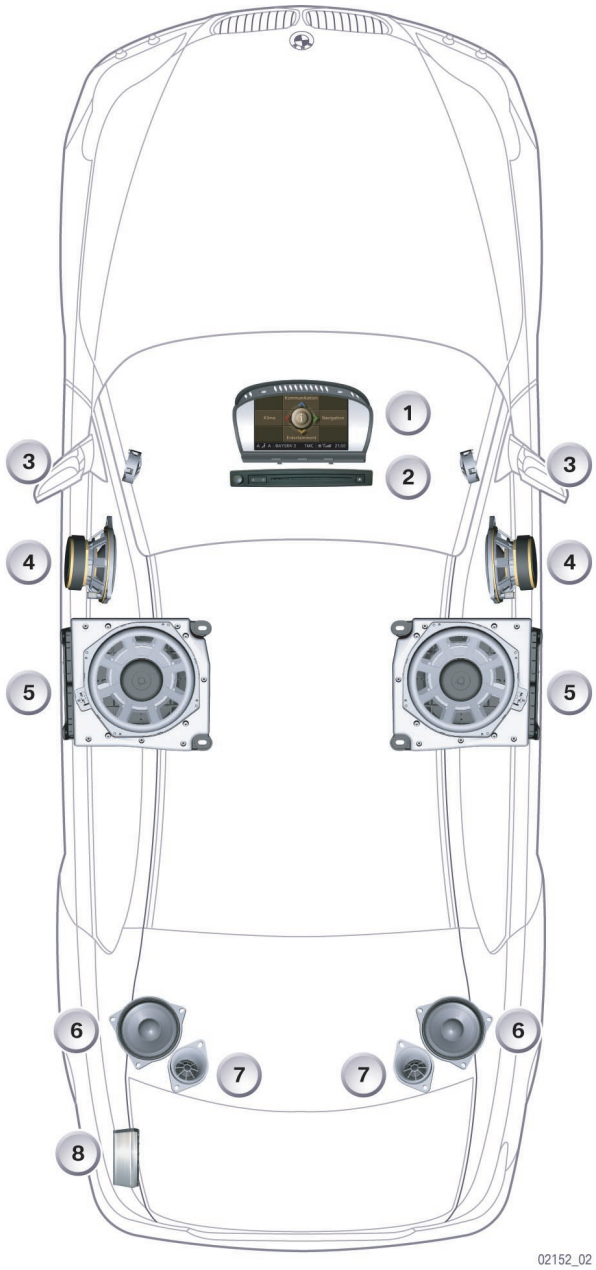

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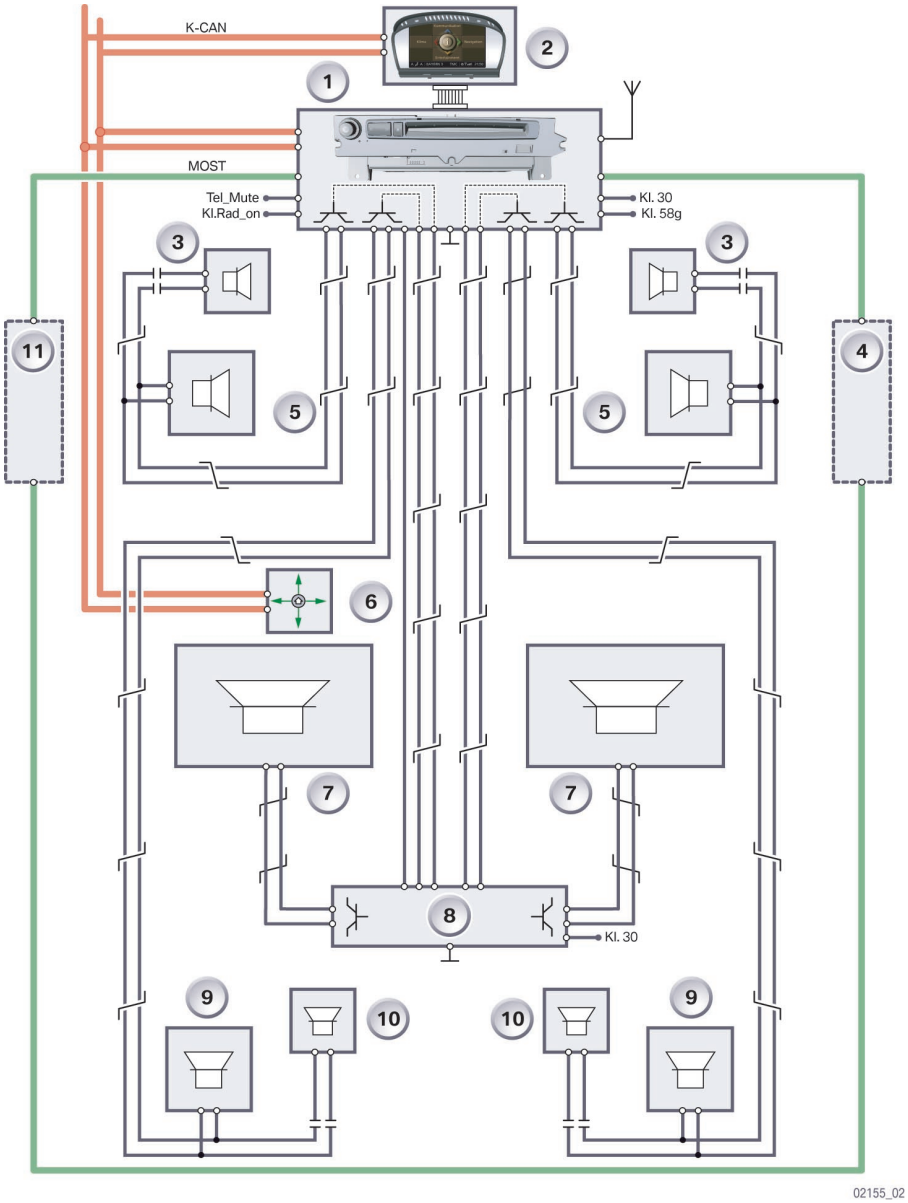
Fig. 18: HiFi audio system with components

Index	Explanation	Index	Explanation
1	Central information display	5	Central woofer
2	Multi-audio system controller	6	Mid-range speaker, rear
3	Tweeter, front	7	Tweeter, rear
4	Mid-range speaker, front	8	HiFi amplifier

HiFi system diagram



KT-10845

Fig. 19: HiFi system diagram

Index	Explanation	Index	Explanation
1	Multi-audio system controller	7	Central woofer
2	Central information display	8	HiFi amplifier
3	Tweeter, front	9	Mid-range speaker, rear
4	Other MOST bus users	10	Tweeter, rear
5	Mid-range speaker, front	11	Other MOST bus users
6	Controller		

Components

It differs from the stereo audio system by the addition of the following components:

- HiFi amplifier
- Front left and right tweeter (high-range speaker)
- Rear left and right tweeter (high-range speaker)

HiFi amplifier

The HiFi amplifier is designed as an analogue two-channel amplifier with an output power of 2x40 W. The HiFi amplifier is connected via two channels to the M-ASK. The input signals are amplified via integrated band filters and bridge-type output stages to 2x40 W and output to the central woofers.

The control takes place via the M-ASK. Due to the distribution of the output stages in the M-ASK and in the HiFi amplifier, the output stages must be switched on/off synchronously. The time required to switch on the output stages must not exceed 25 ms to ensure no crackling or clicking noise is heard.

The HiFi amplifier does not feature diagnostic capabilities.

KT-9155

Fig. 20: View of HiFi amplifier

The HiFi amplifier is installed on the rear left in the luggage compartment.

Central woofers

Modified central woofers are used in connection with the HiFi audio system. The central woofers have a diameter of 200 mm and a load bearing capacity of 40 W. The transmitted frequency is between 30 Hz and 500 Hz.

Tweeters (high-range speakers)

The HiFi audio system features additional tweeters (high-range speakers) at the front and rear. In connection with the HiFi audio system, the speakers are designed with a load rating of 25 W. The tweeters are equipped with spherical caps made of silk. The effective frequency range is from 5000 Hz to 20000 Hz.

The tweeters are connected in parallel with the supply line of the front mid-range speakers. The frequency range is determined by means of capacitors in the supply line. The tweeters feature an enclosed self-contained design, i.e. the speakers and resonance volume form one unit.

The front tweeters are located in the mirror triangles while the rear tweeters are mounted under the rear window shelf.

- Top-HiFi audio system

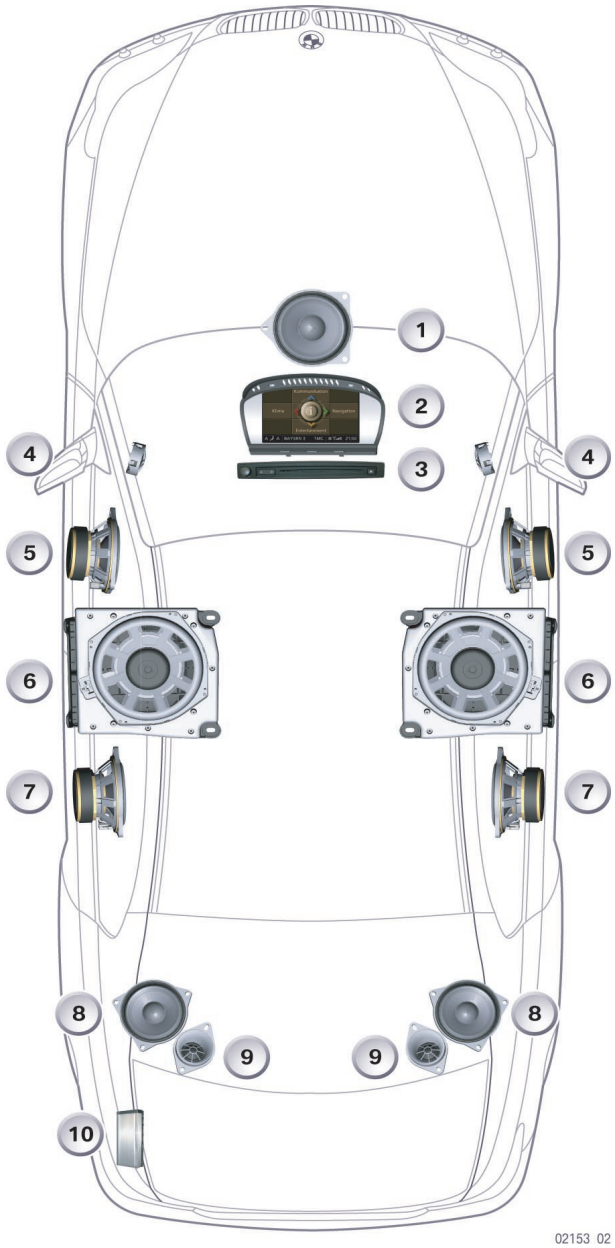


Fig. 21: Top-HiFi audio system and components

Index	Explanation	Index	Explanation
1	Front centre speaker	6	Central woofer
2	Central information display	7	Mid-range speaker, centre
3	Multi-audio system controller	8	Mid-range speaker, rear
4	Mid-range speaker, front	9	Tweeter, rear
5	Tweeter, front	10	Top-HiFi amplifier

Top-HiFi system diagram

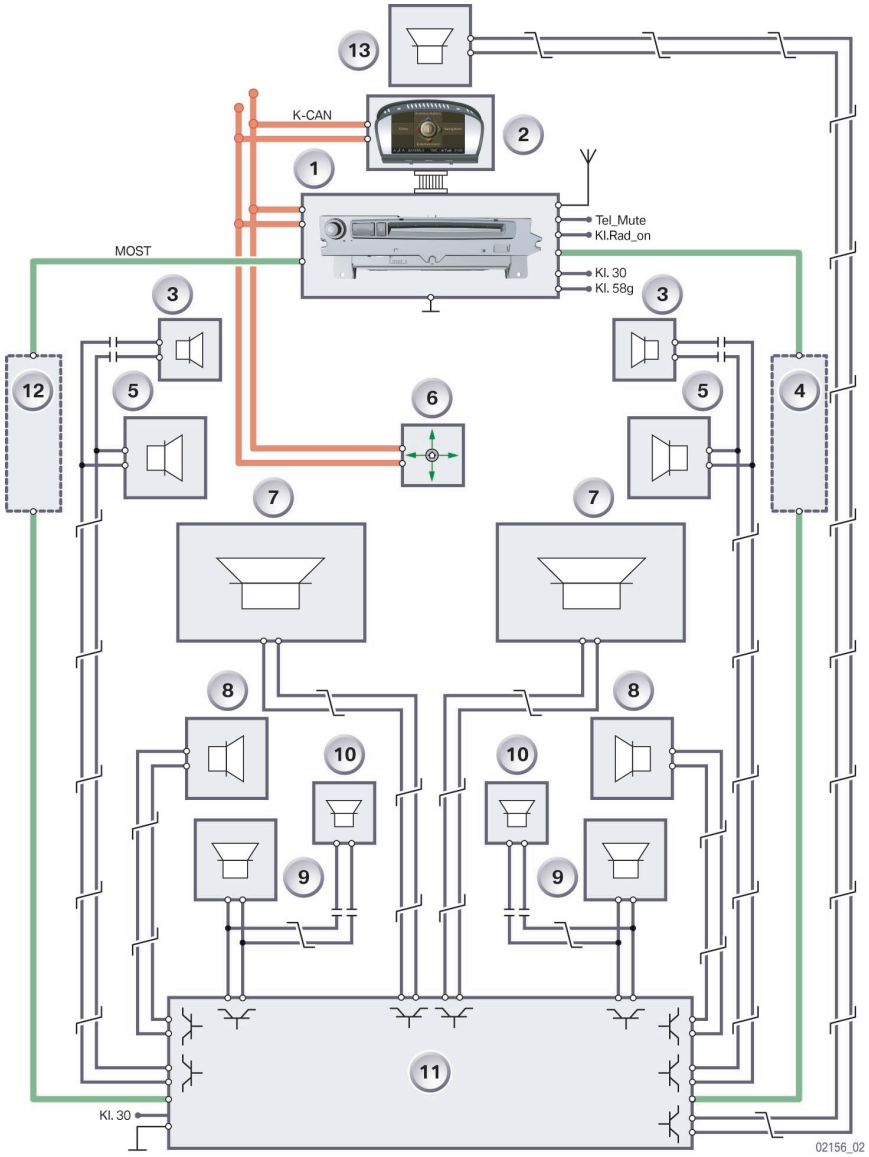


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Fig. 22: Top-HiFi system diagram

Index	Explanation	Index	Explanation
1	Multi-audio system controller	8	Mid-range speaker, centre
2	Central information display	9	Mid-range speaker, rear
3	Tweeter, front	10	Tweeter, rear
4	Other MOST bus users	11	Top-HiFi amplifier
5	Mid-range speaker, front	12	Other MOST bus users
6	Controller	13	Mid-range speaker, front centre
7	Central woofer		

Components

The Top-HiFi audio system differs from the HiFi audio system by higher grade speakers and the addition of following components:

- Top-HiFi amplifier
- Front mid-range speaker mounted centrally in instrument panel
- Mid-range speakers in rear left and right doors

Higher grade speakers are used in the Top-HiFi audio system. The mid-range speakers are equipped with aluminium diaphragms, the tweeters with aluminium spherical caps. The speakers were adapted corresponding to the higher output power of the Top-HiFi amplifier.

Top-HiFi amplifier

The Top-HiFi amplifier is designed as an analogue 7-channel amplifier (LOGIC7). It features 7 bridge-type output stages with an output power rating of 7x40 W at 2 Ω and a bandwidth of 200 Hz - 20 kHz. In addition, two bridge-type output stages rated 2x70 W at 4 Ω and a bandwidth of 20 Hz - 200 Hz are available for the central woofers.

This amplifier is connected via the MOST bus to the M-ASK. All audio signals are transmitted from the M-ASK via the MOST bus.

The Top-HiFi amplifier is equipped with the LOGIC7 function.

LOGIC 7

LOGIC7 is a registered trademark of Lexicon, Inc., a company of the Harman International Group. It was especially developed for applications in motor vehicles.

LOGIC7 is a sound system that creates a 7-channel surround sound from 2-channel audio sources (radio, CD, CC). The incoming stereo signals are decoded in the digital sound processor (DSP), distributed over 7 channels and remixed. The entire transmission width is used on each channel, thus creating perfect surround sound that gives the listener the impression of being in the middle of the space.

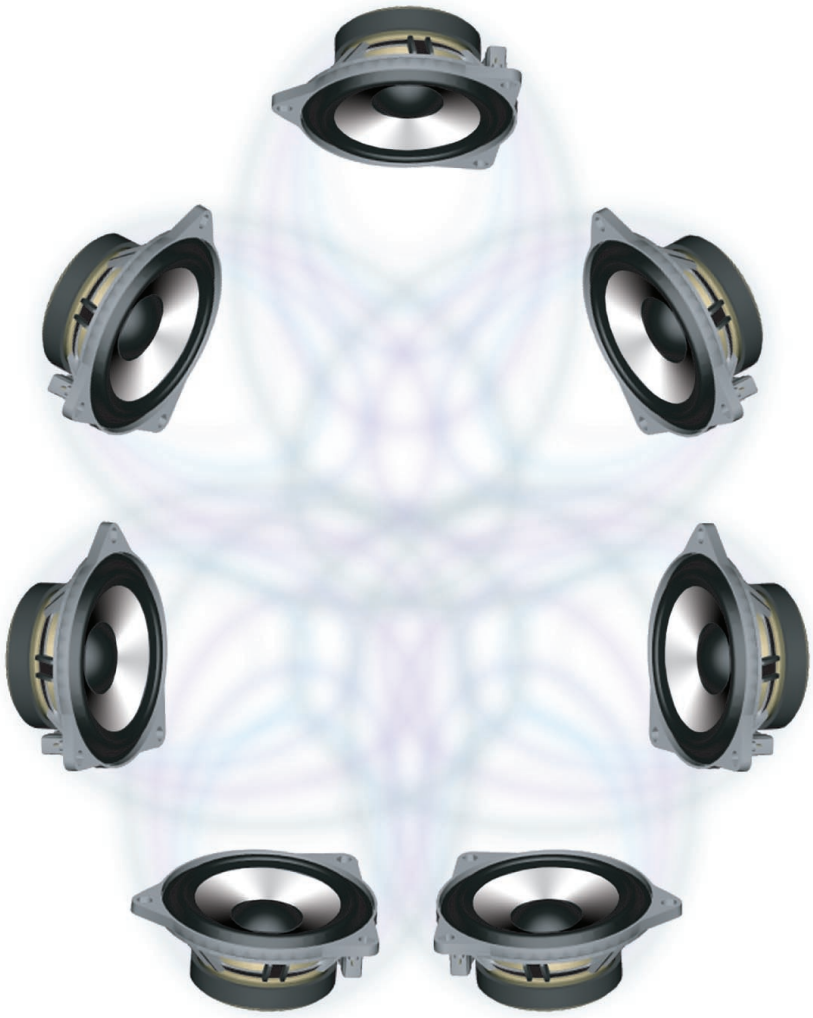

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Fig. 23: LOGIC7 Surround sound

The acoustic conditions in motor vehicles are particularly problematic as only a small space is available. The interior trim absorbs virtually all signals so that there is scarcely any resonance.

In stereo systems, the signal is split into a left and right channel. Due to the arrangement of the speakers and the seat positions in the vehicle, a displaced acoustic pattern is created as the times for the signal to reach the listener from the speakers differs in length. The different signal runtimes can be compensated by correspondingly adjusting the balance. The setting, however, applies only to one listener.

In the case of multi-channel surround sound, the optimally processed signals are output by all speakers for the purpose of achieving perfect surround sound. The surround sound is arranged such that each listener has the impression that he is in the middle of the respective space.

LOGIC7 enables the reproduction of two-channel sources corresponding to separate digital multi-channel formats such as Dolby Digital and DTS (digital theatre system).

LOGIC7 can also process multi-channel technology as used on DVD. Two functions are available for this purpose. The listener can choose between an optimized music setting and later change to an optimized film setting.

KT-11095

Fig. 24: Location of Top-HiFi amplifier

The Top-HiFi amplifier is installed on the rear left in the luggage compartment.

Mid-range speakers

The load rating of the mid-range speakers was increased to 40 W for the Top-HiFi audio system. The mid-range speakers are equipped with aluminium diaphragms. Aluminium diaphragms are particularly lightweight and feature a higher rigidity. These properties result in improved inherent dynamics and a clearer sound over the entire frequency range. The effective frequency range is from 100 Hz to 10000 Hz.

The Top-HiFi audio system was extended by three mid-range speakers. A mid-range speaker was positioned in the centre of the instrument panel in order to realize the surround sound function in the vehicle. Two further mid-range speakers were integrated in the rear doors.

Tweeters (high-range speakers)

The tweeters (high-range speakers) have also been adapted. The load rating was increased to 40 W. The tweeters are equipped with aluminium spherical caps. They feature sealed design. The effective frequency range is from 5000 Hz to 20000 Hz.

Central woofers

Compared to the HiFi audio system, further modified central woofers are used in the Top-HiFi audio system. The central woofers have a diameter of 200 mm and a load bearing capacity of 70 W. The transmitted frequency is between 30 Hz and 500 Hz.

- System functions of the Top-HiFi amplifier

Input signals

The Top-HiFi amplifier receives all audio signals (radio, CD, jingles, hands-free, etc.) from the M-ASK via the MOST bus. In addition, the customer settings are transmitted as control signals via the MOST bus.

Settings

All settings required by the customer are realized in the Top-HiFi amplifier. Following settings are possible:

- Volume
- Bass
- Treble
- Balance (left/right)
- Fader (front/rear)
- LOGIC7 (OFF/audio/movie)
- 7-band graphic equalizer

KT-11170

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Fig. 25: Menu for treble/bass sound setting

KT-11169 02565_02

Fig. 26: Menu for balance/fader sound setting

Surround sound (LOGIC7)

Three surround sound settings are available to switch surround on and off, a setting for music-optimized reproduction and, for later applications, a setting for film-optimized reproduction of audio signals.

KT-11174 02570 02

Fig. 27: Menu for LOGIC7 functions

7-band graphic equalizer

The equalizer is divided into 7 frequency ranges. The customer can set individual settings within these frequency ranges, e.g. increase or lower the bass/treble. A range of +/- 10 dB is available for the setting which can be changed in steps of 1 dB.

KT-11173

Fig. 28: Menu for graphic equalizer settings

Functions

Various adaptations have been made in the Top-HiFi amplifier with the aid of software for the purpose of improving the overall acoustic impression. The following adaptations are performed automatically in the amplifier:

- Loudness
- Equalizing, vehicle-specific
- Equalizing, driving dynamics
- Internal temperature monitoring
- Speed-dependent volume control (GAL)
- Dynamic compression

Loudness

To improve listening quality, the low frequencies are raised slightly at low volume settings.

Equalizing, driving dynamics

As the vehicle speed increased, not only is the volume increased by the speed-dependent volume control function but also the acoustics is adapted to the increasing driving noise level.

Equalizing, vehicle-specific

The acoustics is specifically adapted to the vehicle interior.

Internal temperature monitoring

The temperature of the output stages is permanently monitored. Initially in the event of excessively high temperature, the power of the output stages is reduced in order to cool the output stages. If the temperature at an output stage is still too high, e.g. due to a short-circuit, the output stage is switched off.

Likewise, the temperature of the MOST components is monitored. If an excessively high temperature occurs at the MOST components, initially, the application is switched off. If excessively high temperatures occur at the MOST interface, the MOST bus is interrupted.

Speed-dependent volume control (GAL)

The volume is increased as the driving speed increases. 6 different characteristic curves are available. The characteristic curves can be set individually in the service functions of the M-ASK.

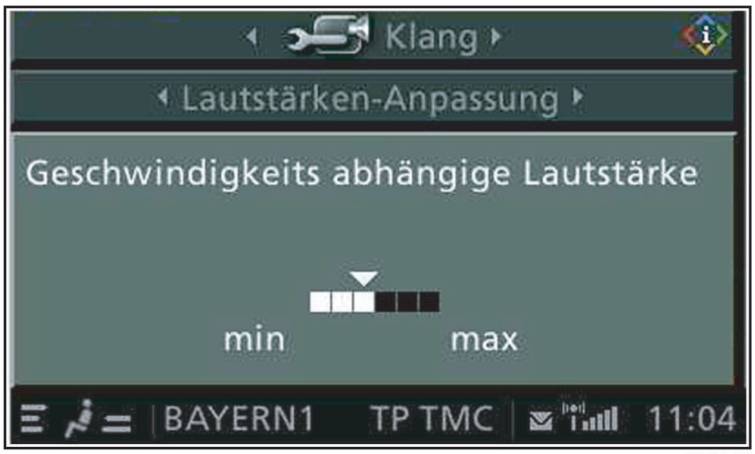

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Fig. 29: Menu for speed-dependent volume control

Dynamic compression

The dynamics must be compressed in order to avoid overmodulation of the system.

The effective dynamics are limited at the top end by the output power of the amplifier and the load rating of the speakers. For this reason, the speed-dependent volume cannot be increased infinitely. At the same time, the dynamics is compressed.

- Audio CD changer

New system features

The audio CD changer in the E60 is a new development. The following details have changed:

- The housing dimensions are smaller and more lightweight
- The magazine is newly designed
- The CD changer has an optical bus link

The magazine is newly designed and now features a transparent cover making it possible to see what compartment is loaded with a CD. The new design now also differentiates distinctly from the DVD magazine.

Design

As before, the CD changer is designed as a 6-compartment changer with magazine. The housing dimensions have been distinctly reduced so that less space is required, making it possible to fit he CD changer in the glove compartment.

Location

The CD changer is located in the units carrier behind the glove compartment. The glove compartment must be opened in order to change the magazine.

KT-11387

Fig. 30: Location of CD changer in glove compartment

Function

The familiar functions of the CD changer known to date were retained. A new feature is the optical link to the MOST bus. The CD changer sends the digital audio signals via the MOST bus to the multi-audio system controller.

In the Top-HiFi audio system, the digital audio signals are sent directly to the Top-HiFi amplifier. All controls and operating signals are also sent via the MOST bus.

Telephone systems

- System overview

Corresponding to the country variant, the following telephone systems and variants are offered for the E60:

- **Car phone, Professional**
  Fixed installation telephone GSM with dual band and Bluetooth keypad handset for EU vehicles
- **Complete preparation USA/CDN incl. Telematics**
  Telephone preparation AMPS/CDMA for US/CDN with telematic functions (emergency call)
- **Car phone preparation for Japan**
  Telephone preparation PDC for mobile phones without telematic functions (not described in this documentation)
- **Car phone preparation**
  Multifunction wiring harness with antenna for GSM telephones (not described in this documentation)
- **Universal mobile phone preparation US Standard**
  Preparation for US telephones in EU vehicles
  (e.g. country-specific version South Korea, Latin America, etc.)
  (not described in this documentation)
- **Universal mobile phone preparation Bluetooth**
  Preparation for universal Bluetooth mobile phones with hands-free and charger facility for EU vehicles (this option will not be available at series launch and is not described in this documentation)

GSM = Global System for Mobile Communication
AMPS = American Mobile Phone Standard
CDMA = Code Division Multiplex Algorithm
PDC = Personal Digital Standard

- New system features

New features compared to previous BMW systems

A new fixed installation telephone system is used in the E60. For this purpose, a standardized platform (Everest) was created worldwide for all fixed installation telephones. The Everest platform is available in two variants, i.e. for MOST bus and K-bus vehicles. The MOST variant will be used in the E60.

The Everst platform is a basic control unit that can be configured corresponding to the country-specific version and requirements. The control unit has the designation **T**elematic **C**ontrol **U**nit **TCU**.

Depending on the country-specific version, the telematic control unit offers the following new features:

- GSM dual band 900/1800 MHz
- AMPS/CDMA 800/1900 MHz
- Standard platform for the telephone, telematics, SMS functions
- Integrated GPS receiver
- Bluetooth module
- Cordless keypad handset with Bluetooth link
- Telematics functions (emergency call, breakdown call, teleservice)
- Secure Bluetooth protocol
- Voice control

- System circuit diagram EU

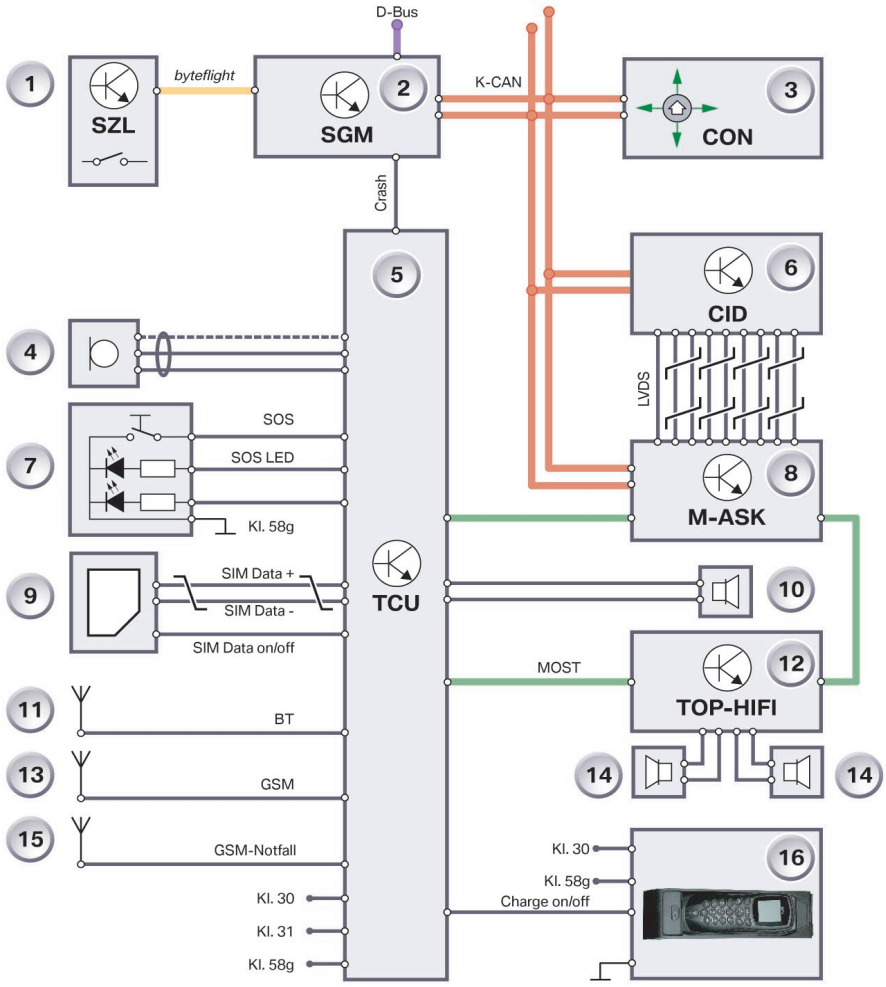

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Fig. 31: System circuit diagram, telephone Professional

Index	Description	Index	Description
1	Send/receive button in multi-function steering wheel	9	SIM card reader
2	Safety and gateway module	10	SOS speaker
3	Controller	11	Bluetooth antenna
4	Hands-free microphone	12	Top-HiFi amplifier
5	Telematic control unit TCU	13	GSM antenna
6	Central information display	14	Speaker
7	Emergency call button	15	GSM SOS antenna
8	Multi-audio system controller	16	Eject box with SBDH

- Fixed installation telephone Professional

Components

The fixed installation car telephone Professional is offered in EU vehicles only. It is based on the GSM standard and consists of the following components:

- Telematic control unit (TCU) with dual band for GSM 900/1800 MHz
- Eject box with SIM card reader
- Cordless keypad handset SBDH with Bluetooth link
- Microphone for hands-free facility
- GSM antenna
- GSM SOS antenna
- Bluetooth antenna
- Emergency battery
- Multifunctional steering wheel
- Central information display
- Multi-audio system controller
- Controller

Telematic control unit TCU

The telematic control unit TCU is the transmitter and receiver unit for the fixed installation telephone Professional.

The TCU contains the following assemblies:

- Transmitter/receiver modules
- Bluetooth module
- DSP module
- Voltage supply and power management
- MOST bus interface
- Interfaces
- Antenna inputs

KT-10542

Fig. 32: Telematic control unit TCU

Location

On the E60, the TCU is installed on the rear left in the luggage compartment.

Transceiver module

The EU version of the telematic control unit features a network access device (NAD) that operates corresponding to the GSM standard with the frequencies 900/1800 MHz. In Germany, for example, this facilitates the use of D1/D2 and E-Plus. The output power is 2 W at 900 MHz and 1 W at 1800 MHz. In view of the good network availability, the output power was reduced to 2 W (same as for mobile phone). The maximum output power is 1 W in the 1800 MHz network.

Based on the SIM card (subscriber identity module) inserted in the card reader in the eject box, the TCU recognizes the type of system and enables the telephone accordingly.

Bluetooth module

The Bluetooth module used in the TCU utilizes the Bluetooth protocol of Bluetooth version 1.1. The Bluetooth antenna is connected to the Bluetooth module. The cordless keypad handset SBDH also features a Bluetooth interface. The telephone function is executed from the keypad handset via the Bluetooth antenna with the TCU. The TCU sets up the external link via the GSM antenna. The connection of further Bluetooth devices is possible, but currently not realized.

DSP module

The DSP module consists of a digital sound processor. The hands-free function is processed in the DSP module. This involves noise reduction and echo compensation for the hands-free microphones. The two hands-free microphones are connected directly to the TCU and are routed to the DSP. The MOST interface assigns channels to the DSP module for voice output. The DSP module now transfers voice output via the MOST bus to the audio output stages in the M-ASK or Top-HiFi amplifier that in turn outputs this signal at the speakers.

A further function of the DSP module is voice control of the telephone. The telephone functions can be controlled by voice commands (e.g. *Dial number*).

Voltage supply and power management

The power management module in the TCU monitors and controls the voltage supply of the telephone system. The telephone system is switched off in the event of undervoltage/overvoltage in the system network. The afterrunning time that can be set by the customer is also monitored. Once the afterrunning time has elapsed, the voltage supply for the SBDH charge function is interrupted.

To secure the telematics functions (emergency call) after an accident, as from 09/04 an additional rechargeable battery will be used for the voltage supply of the TCU.

MOST bus interface

The TCU is connected via the MOST bus interface to the MOST bus and therefore to the bus systems of the vehicle. Control data (e.g. telephone book entries) and audio signals for voice output (voice of call partner) are transmitted via the MOST interface. The TCU is woken up by the MOST bus.

Interfaces

The TCU features an interface to the eject box for the purpose of reading the data of the customer SIM card.

A further interface is provided for the SOS button.

Antenna inputs

KT-11326

Fig. 33: Antenna connections of the TCU

Pin	Description	Pin	Description
1	Bluetooth antenna	3	GSM SOS antenna
2	Not included in EU version	4	GSM antenna

Functions

The TCU enables various telephone functions:

- Hands-free mode
- Privacy mode
- Telematics mode
- SMS mode
- Voice mode

Hands-free mode

Legislation stipulates that the use of a keypad handset or mobile phone is permitted only when the vehicle is stationary or by passengers.

Hands-free mode is enabled by accepting a call with the accept button on the multifunction steering wheel. The conversation now takes place via the hands-free microphone and the audio speakers in the vehicle.

Privacy mode

In privacy mode, the telephone call is conducted with the keypad handset so that only the person using the handset can hear the telephone conversation.

Telematics mode

Telematics mode is encoded country-specific. The location data are loaded only in connection with the navigation system. The following telematics functions are available for the customer:

- Manual Emergency Call
- Automatic Emergency Call
- Breakdown call

Note: An emergency call is possible at any time even when the customer SIM card is not inserted.

SMS mode

An incoming SMS (short message service) can be shown in the display of the keypad handset (SBDH) or in the central information display. It is possible to write and send an SMS only with the keypad handset.

Voice mode

The TCU contains a voice module that makes it possible to control various telephone functions by way of voice commands.

Eject box

The eject box is located in a compartment in the centre console. The keypad handset should be inserted in the eject box while driving in order to charge its batteries.

The telephone functions (with exception of emergency call) are only active when a customer SIM card is inserted in the card reader.

KT-11327

Fig. 34: Eject box with keypad handset

Index	Explanation
1	Eject button for keypad handset
2	Cordless keypad handset (SBDH)
3	SIM card reader
4	Eject box with electronic charging module

The charging module for the keypad handset is also located in the eject box. The electronic charging module is switched on and off by the charger ON/OFF signal. The TCU monitors the afterrunning time during which the batteries in the keypad handset are charged after shutting down the vehicle. The telephone remains active during the afterrunning period.

Cordless keypad handset (SBDH)

The data exchange between the keypad handset and TCU is realized by means of Bluetooth technology. With the keypad handset it is possible to use the telephone within a 10 m radius about the vehicle.

As part of the initial operation procedure, the keypad handset must be connected by means of a coupling procedure to the TCU.

The charge status of the Li-Ion rechargeable battery is constantly monitored and recharged as required.

KT-10586

Fig. 35: Cordless keypad handset (SBDH)

Functions

The keypad handset provides the following functions:

- Switching telephone system on/off
- Accept and end telephone call
- Dial number and set up call connection
- Repeat dial
- Changeover during a call from privacy to hands-free and vice versa
- Conference circuit
- Send and receive SMS
- Send emergency call (112) also without SIM card inserted
- Display and edit telephone book
- Status indicator for battery capacity
- Status indicator for battery charge
- Status indicator for reception quality

Hands-free microphones

The E60 may be equipped with two hands-free microphones that are located in the roof console at the front. The microphone on the driver's side is used for hands-free mode. A further microphone is installed in the roof console if the vehicle is equipped with a Car Communication Computer with voice control.

The hands-free microphone operates in full duplex mode. This means that the AF signals can be switched freely for both conversation partners so that it is possible to speak and listen simultaneously. Call feedback is prevented by an echo compensation function.

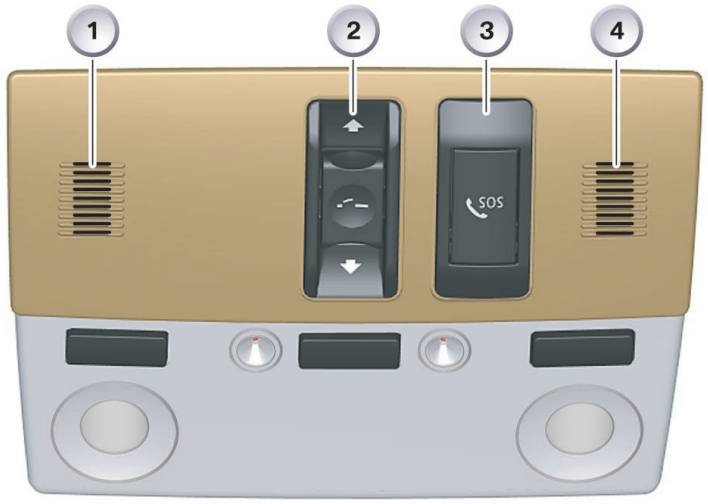

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Fig. 36: Location of hands-free microphones

Index	Explanation
1	Hands-free microphone, left for telephone
2	Slide/tilt sunroof button
3	Emergency call button
4	Hands-free microphone, right optional with voice control system

GSM antenna

The GSM antenna is designed as a dual band antenna and is set to the frequency ranges 900/1800 MHz in the EU version. The GSM antenna is located together with the GPS antenna in the roof antenna. For design reasons, the roof antenna is always fitted and painted in the vehicle colour.

Note: Particular attention must be paid to ensuring a tight seal when bonding the antenna to ensure that no water can enter the interior.

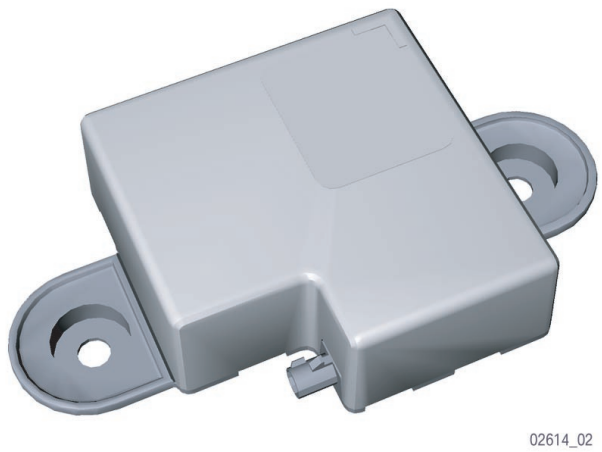
GSM SOS antenna

The roof antenna may be damaged and no longer operative in the event of a crash where the vehicle rolls over. Consequently, it would no longer be possible to send an emergency call. For this reason, a second GSM antenna is mounted under the rear window shelf. In this case, it would assume the function of the transmitting antenna.

The GSM emergency aerial is connected directly to the TCU. In the event of a crash, the safety and gateway module sends a crash telegram to the TCU. Consequently, the TCU triggers an automatic emergency call.

The TCU checks whether the emergency call can be sent via the roof aerial. If this is not the case the system switches over internally to the GSM emergency aerial which then adopts the function of the transmitter aerial.

The system does not switch over to the emergency aerial in the event of interference/disturbances in the transmit/receive function of the roof aerial. Changeover takes place only for a crash telegram.



KT-11193

Fig. 37: GSM SOS antenna

Emergency battery

The SOS battery will be used in vehicles with TCU as from 09/04. The aim of the SOS battery is to make sure an emergency call is possible even after a crash with the system voltage interrupted.

The SOS battery is a rechargeable powerpack consisting of lithium ion batteries. The SOS battery is fitted directly next to the TCU. The system switches over to the SOS battery if necessary when the SGM sends a crash signal.

The SOS battery is checked for undervoltage and interruption. A fault code is entered in the fault code memory if a defect is found. In addition, a CC message is output to inform the driver.

Note: The SOS battery is maintenance-free. The SOS battery must be replaced after an emergency call or after 4 years.

SOS speaker

Damage to the MOST bus can cause a system failure in the event of a crash. A separate SOS speaker is fitted to ensure a call can still be sent to the emergency call centre.

The system switches over to the SOS speaker when the SGM sends a crash signal. The SOS speaker is connected directly to the TCU. The SOS speaker is located under the steering column in the footwell trim on the driver's side.

Bluetooth antenna

The Bluetooth antenna operates in the ISM band (industrial science medical band) on a frequency of 2.45 GHz. It is located under the rear window shelf. It is connected directly to the TCU.

Note: To ensure unrestricted reception, care should be taken to ensure that no objects are placed on the rear window shelf as they could considerably influence the reception capability of the Bluetooth antenna.

Multifunctional steering wheel

The multifunction steering wheel has a send/receive button for accepting and ending a call. The TCU switches to hands-free mode if the call is accepted by pressing the receive button.

Multi-audio system controller M-ASK

The multi-audio system controller is responsible for the control of the MOST bus and channel allocation. It also controls the audio output at the speakers.

Central information display

Various telephone functions can be displayed with the aid of the central information display. The addresses stored on the customer SIM card can be shown as telephone book entries. An address can be selected and a connection set up with the aid of the controller.

Controller

The controller is used to operate the telephone functions. Various menus can be selected and the functions executed with the aid of the controller.

Country-specific version US

The option 639 Complete telephone preparation including telematics is offered for the country-specific version USA. The complete preparation uses the Everest platform for the telephone and telematics functions.

Three different expansion stages are offered for the American market:

- TCU only with telematics function emergency call (E-call) and breakdown call (B-call) as standard.
- TCU with telematics function emergency call and enabling by the provider. In addition to the standard telematics emergency call function, the customer can use further functions of the TCU by enabling them at the provider.
- TCU with telematics and telephone functions via hands-free facility or mobile phone (after retrofitting a telephone).

- System circuit diagram US

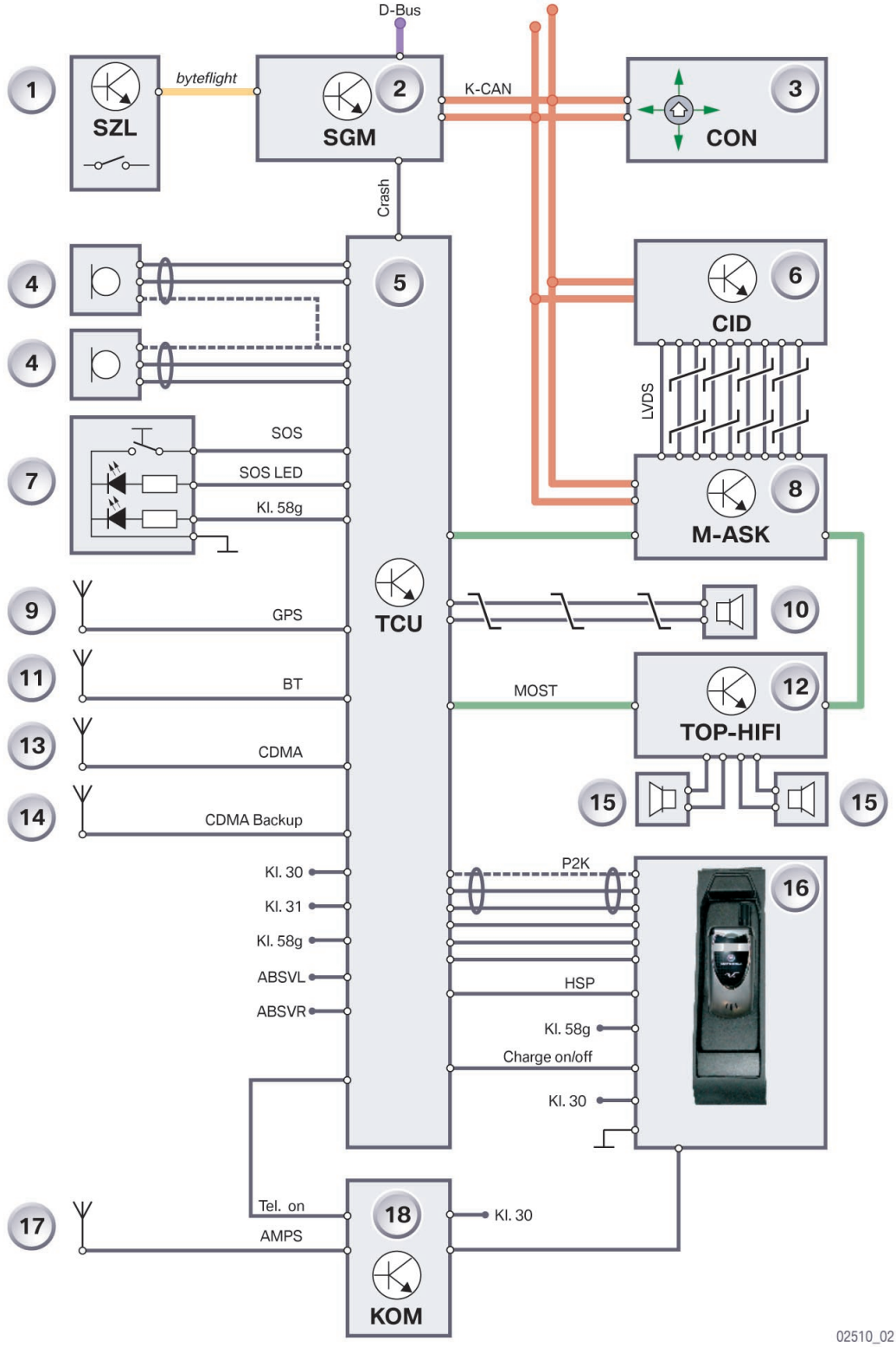


Fig. 38: System circuit diagram US

Index	Description
1	Transmit/receive button on multifunction steering wheel
2	Safety and gateway module
3	Controller
4	Hands-free microphones
5	Telematic control unit TCU
6	Central information display
7	Emergency call button
8	Multi-audio system controller
9	GPS antenna
10	SOS speaker
11	Bluetooth antenna
12	Top-HiFi amplifier
13	Telematics antenna CDMA (code division multiplex algorithm)
14	Telematics SOS antenna (CDMA backup)
15	Speaker
16	Eject box with Motorola Phoenix V60
17	Telephone antenna AMPS (American Mobile Phone Standard)
18	Compensator

- Components US

In the country-specific version US, the option comprises the complete telephone preparation including telematics. A part of the telephone preparation is installed ex-factory, the remainder is retrofitted in the USA. The complete preparation consists of the following components:

- Telematic control unit TCU (standard)
- Telephone antenna (standard)
- SOS antenna (standard)
- GPS antenna (standard)
- Bluetooth antenna (standard)
- Hands-free microphones (standard)
- Eject box (retrofitted in USA)
- Motorola mobile phone Phoenix V60 (retrofitted in USA)
- Compensator (retrofitted in USA)
- Enabling by provider (customer)

Note: In the following chapter, only components and functions that differ from those in the EU version are described.

- Telematic control unit TCU
- Eject box
- Motorola mobile phone Phoenix V60
- Compensator
- SOS antenna
- GPS antenna

Telematic control unit

The TCU is always installed in the country-specific version US even if no telephone was ordered. The telematic functions emergency call and breakdown call are standard features. The scope of functions differs from the EU version by following features:

- The TCU is always installed to facilitate the emergency call even if no telephone is fitted
- Dual band 800 MHz and 1900 MHz
- Combined transceiver module NAD (network access device) for the analogue AMPS standard (American Mobile Phone Standard) and the digital CDMA standard (Code Division Multiplex Algorithm)
- Eject box with charger for Motorola Phoenix V60
- Telematics functions (E/B call)
- GPS receiver for determining the position (if no navigation system is fitted)

Location

The telematic control unit is located in the luggage compartment on the rear left wheel arch.

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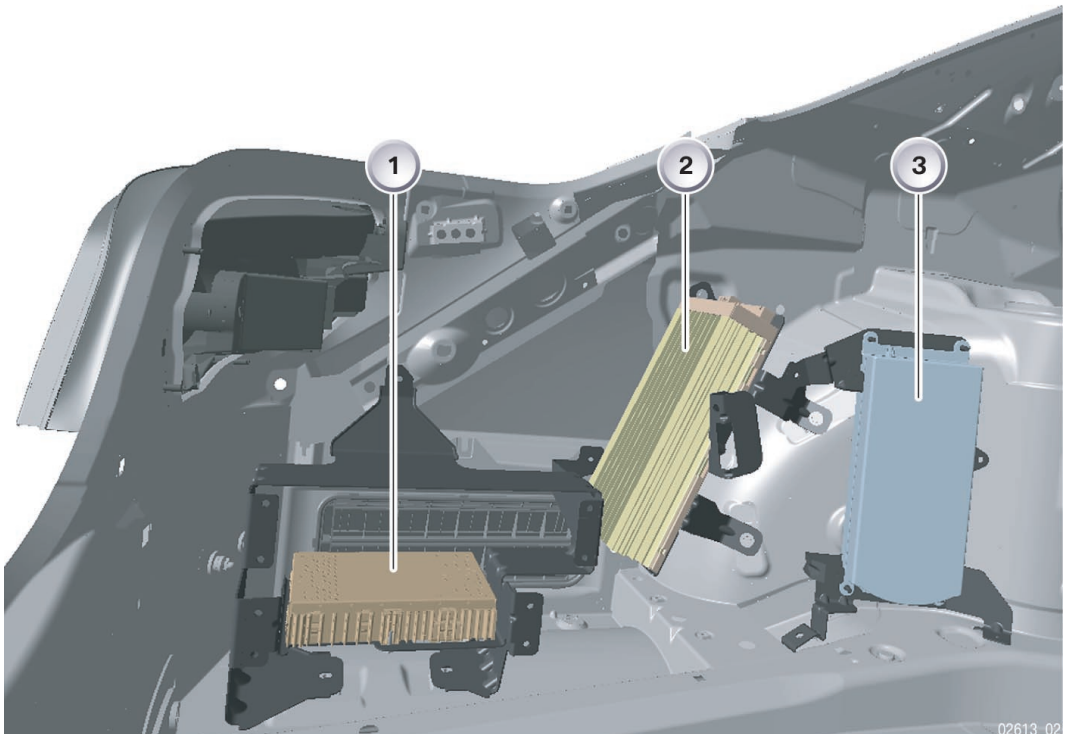

Fig. 39: Location of telematic control unit

Index	Explanation
1	Satellites, radio receiver
2	Top-HiFi amplifier
3	Telematic control unit

Design

The design of the TCU in the US version is identical to that of the EU version (Everest platform). The difference is in a different transceiver module (NAD) that is adapted to the specific requirements. The TCU features a modular design and is equipped corresponding to the country-specific version and requirements.

Operating principle

In the US version, the telematic control unit features a combined transceiver module NAD (network access device). The NAD operates in accordance with the AMPS/CDMA standard with the frequencies 800/1900 MHz.

The TCU features an antenna selector switch for the AMPS/CDMA antenna. The TCU operates in the digital CDMA network. If a sufficient network supply cannot be ensured, the TCU switches over to the AMPS network. The widespread AMPS network is used especially in rural areas.

If the option Professional navigation system is not installed, the TCU will be fitted with an internal GPS receiver. The GPS receiver is connected to the GPS antenna that is integrated in the roof antenna.

In the US version, the telephone/telematics functions are available in three stages:

- Basic
- Business
- Professional

TCU with telematics function only (basic)

All US vehicles are equipped with a TCU as standard. Consequently, in the event of an accident, an emergency call, or if necessary, a manual emergency call can be triggered by the push of a button. It is possible to trigger a breakdown call by means of a button in the central information display.

In all cases, the current position of the vehicle is sent in the form of an SMS. The time and, if the vehicle is moving, the vehicle heading are also transmitted.

If no navigation system is fitted, the position is determined by way of the integrated GPS receiver.

The following schematic diagram illustrates the signal progression for the telematics function:

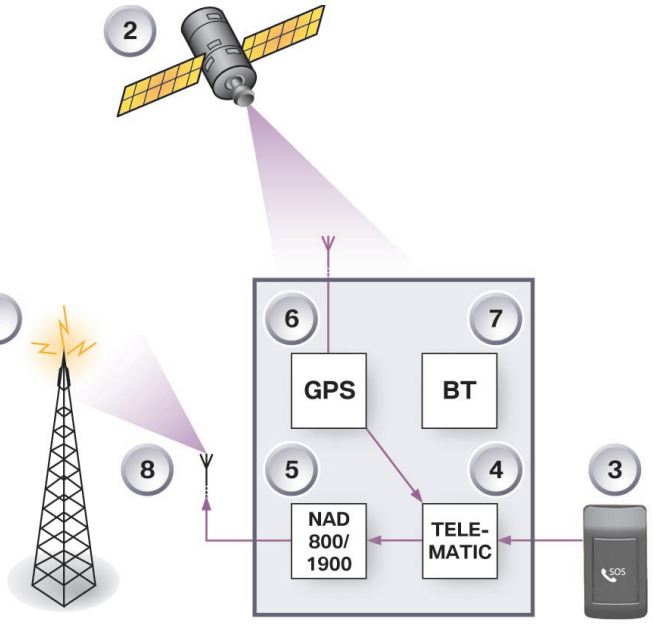

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Fig. 40: Signal progression for telematics function, basic (emergency call)

Index	Explanation	Index	Explanation
1	Transmit/receive mast	5	Transceiver module
2	GPS signal	6	GPS module
3	SOS switch signal	7	Bluetooth module
4	Telematics module	8	Transmit signal

TCU with telematics and enabling hands-free function (Business)

In addition to the standard telematics emergency call function, the customer can use additional functions of the TCU by enabling them with the service provider.

The customer then additionally has the option of accepting incoming calls with the send/receive button on the multifunction steering wheel. The call is conducted via the hands-free facility and ended by pressing the same button.

A telephone number can be entered using the digit entry function in the central information display and selected with the send/receive button.

The differences compared to the complete telephone equipment are:

- No telephone book is available (storage in mobile phone)
- SMSs cannot be received or sent
- Privacy mode by means of mobile phone is not possible (occupants or passers by can hear conversation)
- No connection of a mobile phone as there is no eject box

The following schematic diagram illustrates the signal progression for telematics and enabling the hands-free function:

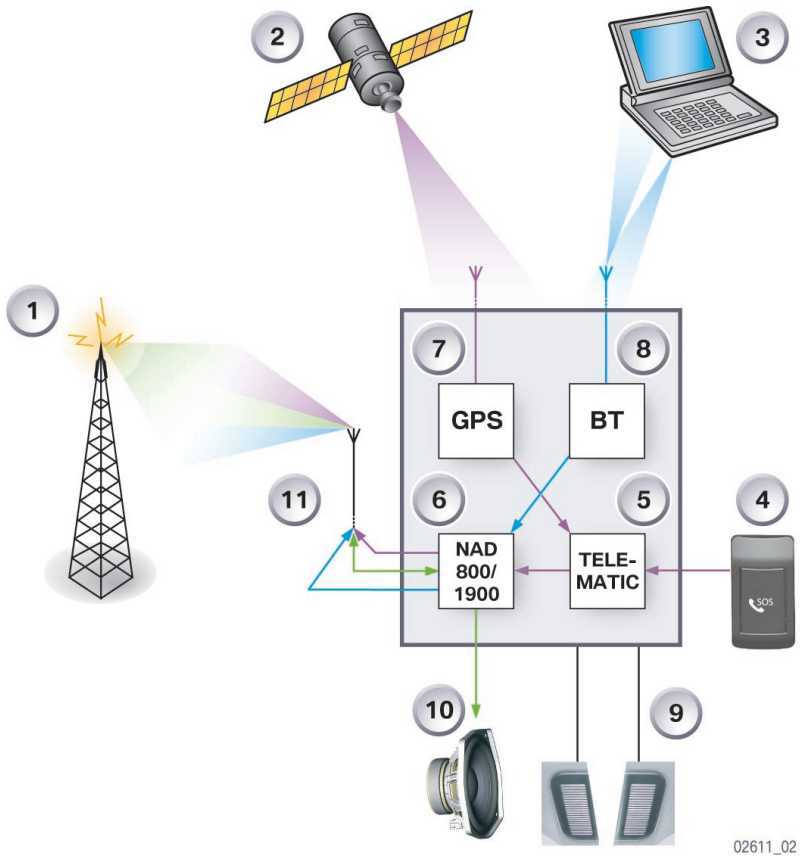

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Fig. 41: Signal progression for telephone/telematics Business

Index	Explanation	Index	Explanation
1	Transmit/receive mast	7	GPS module
2	GPS signal	8	Bluetooth module
3	Laptop with Bluetooth interface (not at SOP)	9	Hands-free microphones
4	SOS switch signal	10	Output speaker
5	Telematics module	11	Transmit/receive signal for telematics and modem
6	Transceiver module		

TCU with telematics and Motorola Phoenix V60 telephone (Professional)

The following parts must be retrofitted at the dealer in order to be able to use all telephone functions in the vehicle:

- Eject box
- Motorola Phoenix mobile phone
- Compensator

With this retrofit, the customer has available the following functions:

- Telematics (E/B call)
- Hands-free facility
- Privacy mode via mobile phone when it is taken out of the eject box or via a second Bluetooth mobile phone
- Parallel transmission of telematics and telephone functions on different bands (AMPS/CDMA)
- Telephone book function in mobile phone
- Send and receive SMS

The following schematic diagram illustrates the signal progression for telematics and telephone functions:

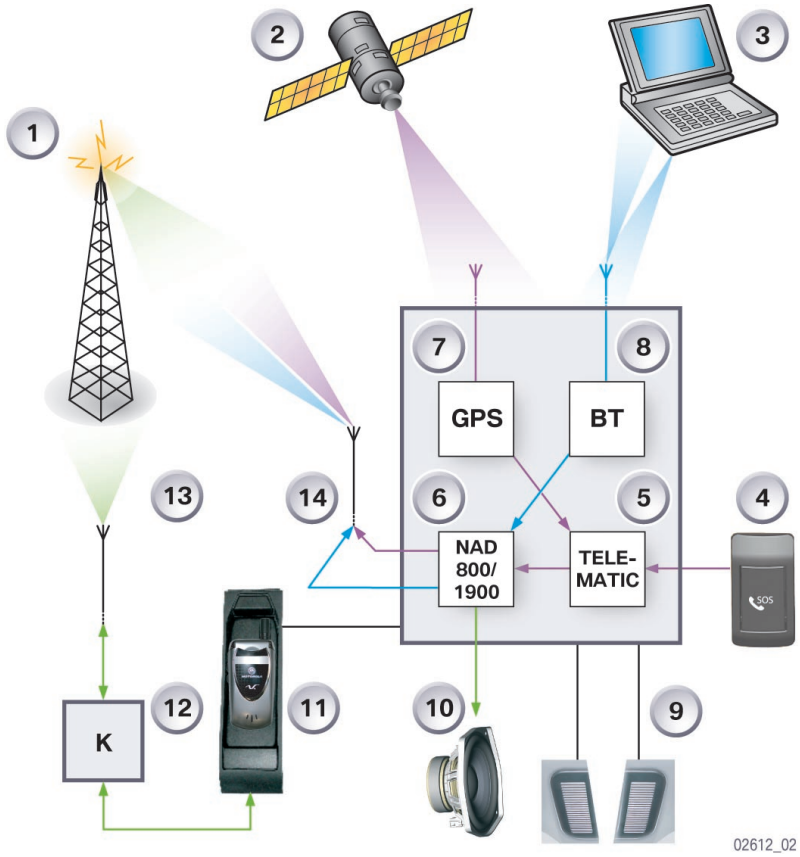

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Fig. 42: Signal progression for telephone/telematics function Professional

Index	Explanation	Index	Explanation
1	Transmit/receive mast	8	Bluetooth module
2	GPS signal	9	Hands-free microphones
3	Laptop with Bluetooth interface (not at SOP)	10	Output speaker
4	SOS switch signal	11	Eject box with Motorola telephone
5	Telematics module	12	Compensator
6	Transceiver module	13	Transmit/receive signal for telephone
7	GPS module	14	Transmit/receive signal for telematics and modem

Eject box

The eject box is an additional component that must be retrofitted in the USA. The eject box serves the purpose of accepting the Motorola Phoenix V60 mobile phone and is located in a compartment in the centre console.

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Fig. 43: Eject box with Motorola Phoenix V60

Pin	Description
1	Eject button for Motorola mobile phone
2	Motorola Phoenix V60
3	Eject box with electronic charging module

The charger for the mobile phone is integrated in the eject box. The antenna connection for the AMPS antenna is also located directly in the eject box. Data transfer from the mobile phone to the TCU takes place by means of a multi-core cable (P2K, point to connect).

Motorola mobile phone Phoenix V60

The Motorola Phoenix V60 mobile phone is the standard telephone in the US version. The mobile phone is also a component part of the retrofit.

All functions are available only when the mobile phone functions are provided. The telephone book is integrated in the mobile phone. SMSs can only be sent with the mobile phone.

Compensator

The compensator is connected in the antenna line between the roof antenna and the mobile phone. The task of the compensator is to compensate for losses on the antenna line and to ensure the full transmit power of the mobile phone is available at the roof antenna. The compensator is not an amplifier that boosts the transmit power output.

SOS antenna

The SOS antenna is fitted as standard under the rear window shelf. It ensures an emergency call can be sent even after a crash and failure of the roof antenna.

The GSM emergency aerial is connected directly to the TCU. In the event of a crash, the safety and gateway module sends a crash telegram to the TCU. Consequently, the TCU triggers an automatic emergency call.

The TCU checks whether the emergency call can be sent via the roof aerial. If this is not the case the system switches over internally to the GSM emergency aerial which then adopts the function of the transmitter aerial.

he system does not switch over to the emergency aerial in the event of interference/disturbances in the transmit/receive function of the roof aerial. Changeover takes place only for a crash telegram.

Emergency battery

The SOS battery will be used in vehicles with TCU as from 09/04. The aim of the SOS battery is to make sure an emergency call is possible even after a crash with the system voltage interrupted.

The SOS battery is a rechargeable powerpack consisting of lithium ion batteries. The SOS battery is fitted directly next to the TCU. The system switches over to the SOS battery if necessary when the SGM sends a crash signal.

The SOS battery is checked for undervoltage and interruption. A fault code is entered in the fault code memory if a defect is found. In addition, a CC message is output to inform the driver.

Note: The SOS battery is maintenance-free. The SOS battery must be replaced after an emergency call or after 4 years.

SOS speaker

Damage to the MOST bus can cause a system failure in the event of a crash. A separate SOS speaker is fitted to ensure a call can still be sent to the emergency call centre.

The system switches over to the SOS speaker when the SGM sends a crash signal. The SOS speaker is connected directly to the TCU. The SOS speaker is located under the steering column in the footwell trim on the driver's side

GPS antenna

The GPS antenna is integrated in the roof antenna. It receives the signals from the satellites of the global positioning system and sends these signals to the GPS receiver.

Notes for Service

- Service information

This chapter describes in detail the following service information:

- Replacement of the central bass housing
- Replacement of the CD changer
- GSM antenna
- Bluetooth antenna

Replacement of the central bass housing

Particular care must be taken when removing or replacing the central bass housing to ensure that the cellular rubber seal is fitted in the correct position between the speaker housing and sill. Furthermore there is also a rubber seal fitted under the housing for the water drain.

Water can penetrate the vehicle interior if this rubber seal is omitted or fitted in the wrong position.

There will be no positive connection to the sill area if the cellular rubber seal is not fitted. As a result, the resonance volume and therefore the acoustics of the speaker will change.

Replacement of the CD changer

When replacing the CD changer, the transport retainer screws must be removed and the holes covered off with the pieces of adhesive film provided.

GSM antenna

During assembly particular attention must be paid to ensuring a tight seal when bonding the antenna to ensure that no water can enter the interior.

Bluetooth antenna

In the event of complaints concerning the range or the reception quality of the Bluetooth interface, particular care must be taken to ensure that there are no objects placed on the rear window shelf.

- Diagnosis

The following functions are monitored in the Top-HiFi amplifier and fault codes stored in the fault code memory should faults occur. The fault codes can be read out with the aid of the diagnostic program:

- Monitoring of digital sound processor
- Monitoring of output stages for short-circuits
- Temperature monitoring of output stages
- Temperature monitoring of MOST components

Troubleshooting is performed with the diagnostic program in the DISplus or GT1.

Diagnosis of the telephone systems comprises following functions:

- Read identification
- Read fault code memory
- Deleting the fault code memory
- Diagnosis query

- Programming

The MOST control units can be programmed by means of OPPS via the MOST bus.

- Encoding

The TCU must be encoded in service after the following changes:

- Replacement of the TCU
- Retrofitting a telephone
- Enabling BMW ASSIST
- Enabling US telephones
- Retrofitting a US mobile phone

- Car & key memory

The following function can be coded by the dealer in the car & key memory:

- Deactivation of the SOS button at terminal R off. The SOS button is active when terminal R is on.

The following functions can be stored in the car & key memory by the customer:

- Speed-dependent volume control, GAL setting
- Equalizer settings
- LOGIC7 settings