

Universal charger and hands-free system

E60



Introduction

On the E60, option 644 "Universal charger and hands-free system" (ULF) is connected to the MOST bus (Media-Oriented System Transport bus). The ULF is not a transmitter/receiver system in the conventional sense. The ULF serves as a connection for bluetooth-compatible mobile phones, e.g. GSM mobile phones (Global System for Mobile Communication), to the vehicle's electrical system. [System overview ...]

The ULF is the interface between the bluetooth-compatible mobile phone and the components and functions on the vehicle.

Option 644 "Universal charger and hands-free system" (ULF) is designed for all bluetooth-compatible mobile phones. Units are bluetooth-compatible if they have a bluetooth interface that meets the bluetooth radio standard. [more ...]

The benefits of the universal charger and hands-free system are:

- You can make a phone call while you are driving:
 - It is legally permissible to make a phone call using a hands-free device while you are driving.
 - However, the prerequisite for making a phone call with a mobile phone is a connection to a GSM mobile phone network (Global System for Mobile communications).
- Automatic radio connection between the ULF control unit and a bluetooth mobile phone coupled to the ULF control unit.
- Making a phone call without operating the bluetooth mobile phone by using hands-free mode:
 - You can select a phone number from the telephone directory
 - Make a connection
 - Accept a phone call

With ULF, use can be made of the control functions of the multi-function steering wheel (MFL) and of the transmit/receive button on the bluetooth mobile phone.

Moreover, the ULF allows the following functions with the multi-audio system controller (M-ASK):

- Transmit and receive via the vehicle's external aerial
- Operate functions using voice commands through the voice recognition system
- Recharge batteries (e.g. lithium ion battery) in the bluetooth mobile phone

The following features are **not** included in option 644 "Universal charging and hands-free system" (ULF):

- Bluetooth mobile phone
- Snap-in adapter
- Compensator (optional)

To obtain a bluetooth mobile phone and snap-in adapter:

- Information about bluetooth mobile phones approved for use in vehicles of the BMW Group is available from BMW Parts Department. Approved bluetooth mobile phones can be ordered from BMW Parts Department or may be purchased on the open market.
- The snap-in adapter to fit an approved bluetooth mobile phone is available from the BMW Parts Department.

The compensator (optional) is available from the BMW Parts Department. The installation of a compensator improves the use of the bluetooth mobile phone in the GSM mobile phone network.

In principle, all bluetooth mobile phones that meet the bluetooth radio standard can be used with option 644 "Universal charging and hands-free system" (ULF). Suitable snap-in adapters are currently only available for the following tri-band bluetooth mobile phones:

- Siemens S55
- Sony Ericsson T610

Option 620 "Voice recognition system" cannot be used in conjunction with option 644 "Universal charger and hands-free system" (ULF). The functions for hands-free mode are integrated into the ULF.

Brief description of components

The universal charger and hands-free system consists of the following components:

- **ULF control unit**

The ULF control unit contains the components for communication between equipment with bluetooth interface and the vehicle components and functions needed to use such equipment in the vehicle.

The ULF control unit is connected to the MOST bus and the vehicle wiring harness.

The ULF control unit also monitors and regulates the power supply for the bluetooth mobile phone locked in the snap-in adapter. In case of insufficient voltage in the vehicle electrical system, the power supply is deactivated. The vehicle system voltage is supplied via terminal 30g, which is activated by the CAS (Car Access System). [more ...]

- **Eject box with cover**

The eject box provides the connection of the bluetooth mobile phone to the vehicle wiring harness and to the ULF control unit. In the eject box is a hands-free button for switching from privacy mode to hands-free mode. This function depends on the bluetooth mobile phone used. The snap-in adapter is fitted to the eject box. [more ...]

- **Snap-in adapter on the eject box**

The snap-in adapter is the connecting piece between the eject box and the bluetooth mobile phone. The snap-in adapter makes the connection to the GSM antenna and to the vehicle electrical system. [more ...]

- **Bluetooth mobile phone in snap-in adapter**

When it is engaged in the snap-in adapter, the reverse of the bluetooth mobile phone is connected to the aerial connector on the GSM antenna cable. The battery (e.g. lithium ion battery) in the bluetooth mobile phone receives its charge voltage through the charging contacts. The circuitry electronically adapts the charging voltage to the battery. [more ...]

- **Compensator**

The compensator (optional) equalizes losses in the antenna cable from the snap-in adapter to the GSM antenna. The compensator is only needed if the operation conditions in a mobile phone network are unfavourable. [more ...]

- **GSM antenna**

The GSM antenna is the transmit/receive aerial for the bluetooth mobile phone.

The GSM antenna is fitted to the outside of the vehicle. The GSM antenna improves communications with mobile phone network. [more ...]

- **Bluetooth antenna**

The bluetooth antenna is the transmit/receive aerial of the ULF control unit. Communication between the bluetooth-compatible equipment is made via the bluetooth antenna.

[more ...]

The overall function includes:

- **Multi-audio system controller (M-ASK)**

The M-ASK serves to call up functions and menus in the Central Information Display (CID).

On the **basic version** of the E60, the following functions are integrated into the M-ASK:

- Voice recognition system (control of output of different voice packages for foreign languages)
- Navigation (control of navigation system with option 606 "Navigation system Business")
- Audio (functions for generating acoustic signals, sound settings, fading audio sources in and out and distributing sound to the loudspeakers)

The M-ASK is also used when a bluetooth mobile phone is signed on or off from the ULF control unit.

In addition, the M-ASK is needed for operating telephone functions.

M-ASK is connected to the K-CAN.

- **Central Information Display (CID)**

The following menus are displayed on the CID:

- On-board info (with option 606 "Navigation system Business" installed, the Navigation menu is displayed)
- Entertainment
- Communication
- Climate
- Settings

The CID (Central Information Display) is connected to the K-CAN.

- **Controller**

The controller is used to call up the menus for the M-ASK functions. Commands to execute these functions are entered with the controller. The controller is connected to the K-CAN.

- **Hands-free microphone**

Voice information is entered into the hands-free module with the hands-free microphone. The hands-free microphone converts the voice information into low-frequency signals. Hands-free mode allows the bluetooth mobile phone to be operated by speaking. Speaking the commands means there is no need for the bluetooth mobile phone to be operated manually while the vehicle is being driven.

Telephone numbers can be selected and telephone connections established using voice commands.

- **Loudspeakers**

The loudspeakers output the voice signals from the phone call into the vehicle. The loudspeakers receive the voice signals in the form of digital signals from the hands-free module. The loudspeakers convert the digital signals into analog signals (= audio output).

System functions

The functions needed for making a phone call with a bluetooth mobile phone and ULF are based on wireless data transmission with bluetooth radio standard. [more ...]

Important! Please comply with local legal authorisation for bluetooth technology.

Bluetooth technology is not approved for use in all countries. If approval has not been issued, the bluetooth connection between the bluetooth mobile phone and the ULF control unit must be temporarily separated for as long as you are in such a jurisdiction.

Function sequences

- Automatic prioritisation for establishing connection to bluetooth mobile phones according to list of bluetooth mobile phones signed on
- Hands-free mode with
 - full duplex mode (both partners can speak and listen at the same time)
 - echo compensation (suppression of background noises)
 - operating status display
- transmission of audio data / telephone directory and telephone status
- automatic recharging of battery in bluetooth mobile phone [more ...]

Basic settings

- Pairing of bluetooth mobile phone to the ULF control unit
 - 4 bluetooth mobile phones may be **paired** (signed on) to the ULF control unit **at the same time**
 - However, the bluetooth mobile phones can only be used **one at a time**.
- De-pairing of bluetooth mobile phone from the ULF control unit [more ...]

Operation

Bluetooth mobile phone

Bluetooth technology automatically establishes the radio connection in the vehicle. After the bluetooth mobile phone has been paired to the ULF control unit, no further settings need to be made on the bluetooth mobile phone.

Central Information Display (CID) and controller

Select and call up menus and settings are needed for the following functions:

- Dial phone number
- Make a call
 - Accept call
 - Conduct a call in hands-free mode
 - End call
- Transfer telephone directory
- TOP-8 list (= the 8 most frequently dialled phone numbers)
- Redial
- Show accepted calls
- Show missed calls
- Change between privacy mode and hands-free mode

If voice control function is available, the functions needed to use the bluetooth mobile phone can be called up and settings made via the hands-free device. [more ...]

Notes for service staff

Service staff should note the following points:

- General information: [more ...]
- Diagnosis: [more ...]
- Encoding/programming: [more ...]
- Car and Key Memory: ---

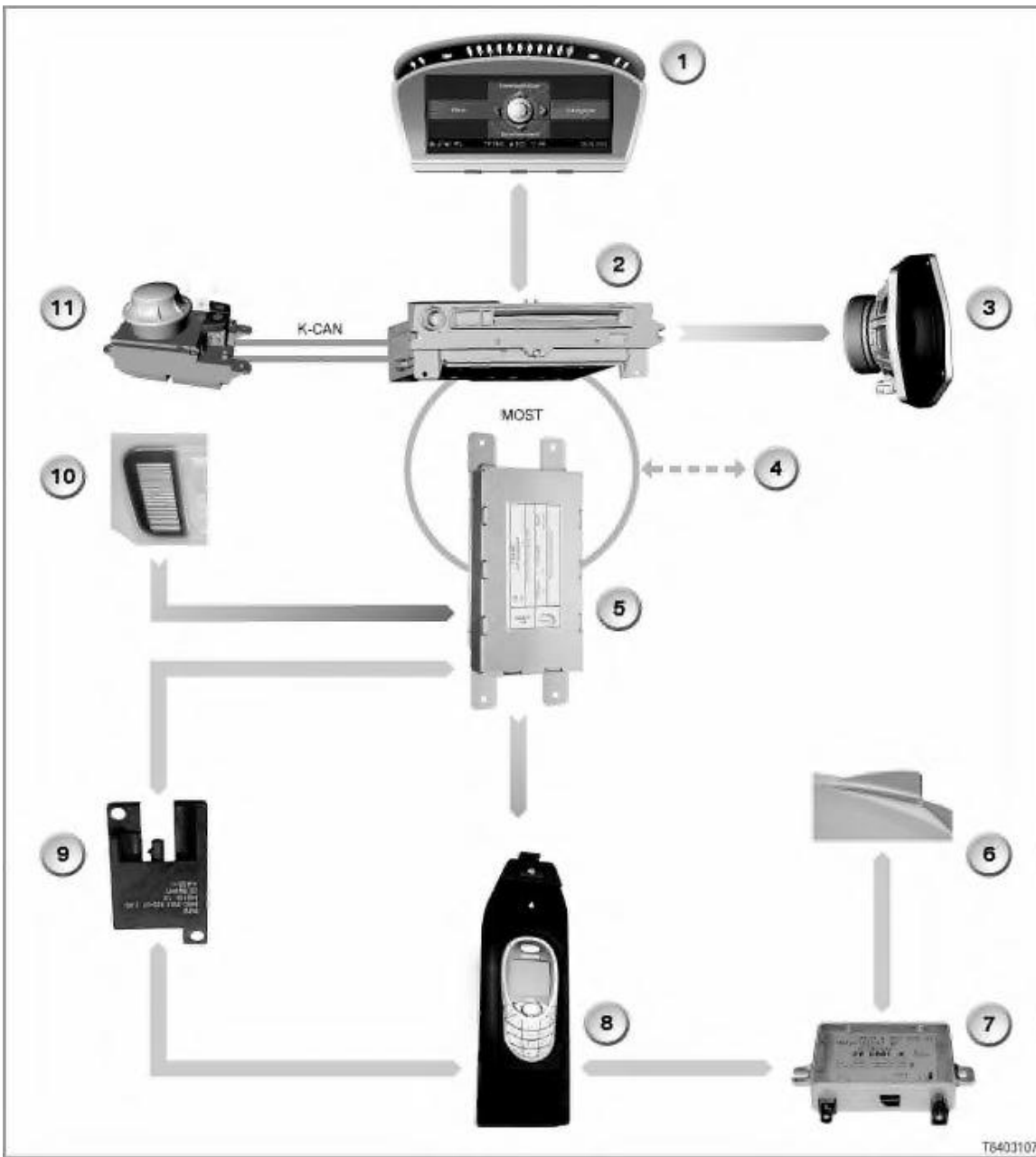
Subject to change.

E60 - ULF, system overview

This system overview comprises the following overviews:

- Inputs/outputs
- System circuit diagram
- Overview of control units

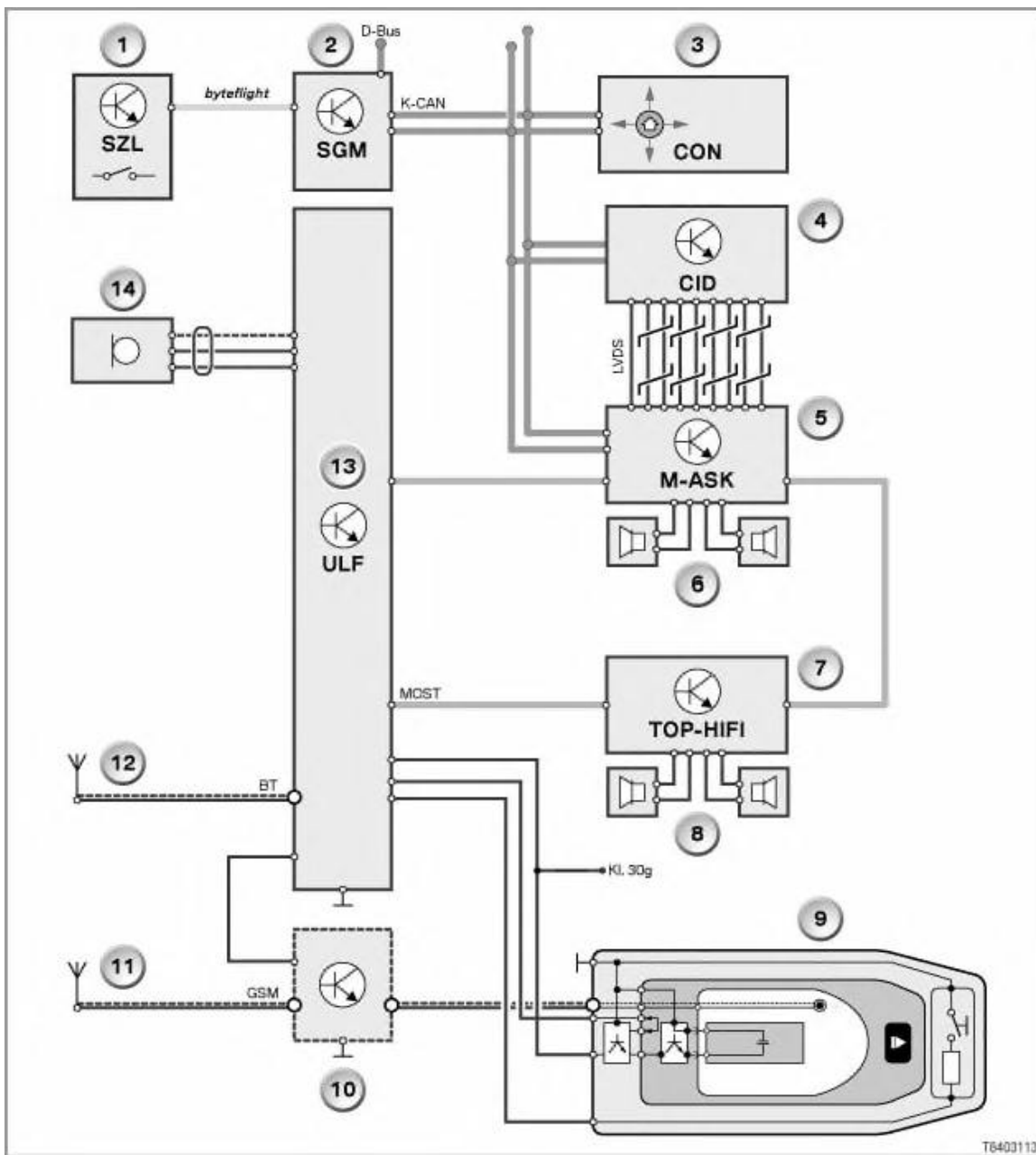
- Inputs/outputs



Key	Explanation	Key	Explanation
1	Central Information Display (CID)	2	Multi-audio system controller (M-ASK)

3	Loudspeaker	4	TOP-HiFi amplifier (AMP)
5	Universal charger and hands-free system (ULF) control unit	6	GSM antenna
7	Compensator (optional)	8	Eject box with bluetooth mobile phone
9	Bluetooth antenna	10	Hands-free microphone
11	Controller	K-CAN	Body controller area network
MOST	Media-Oriented System Transport bus		

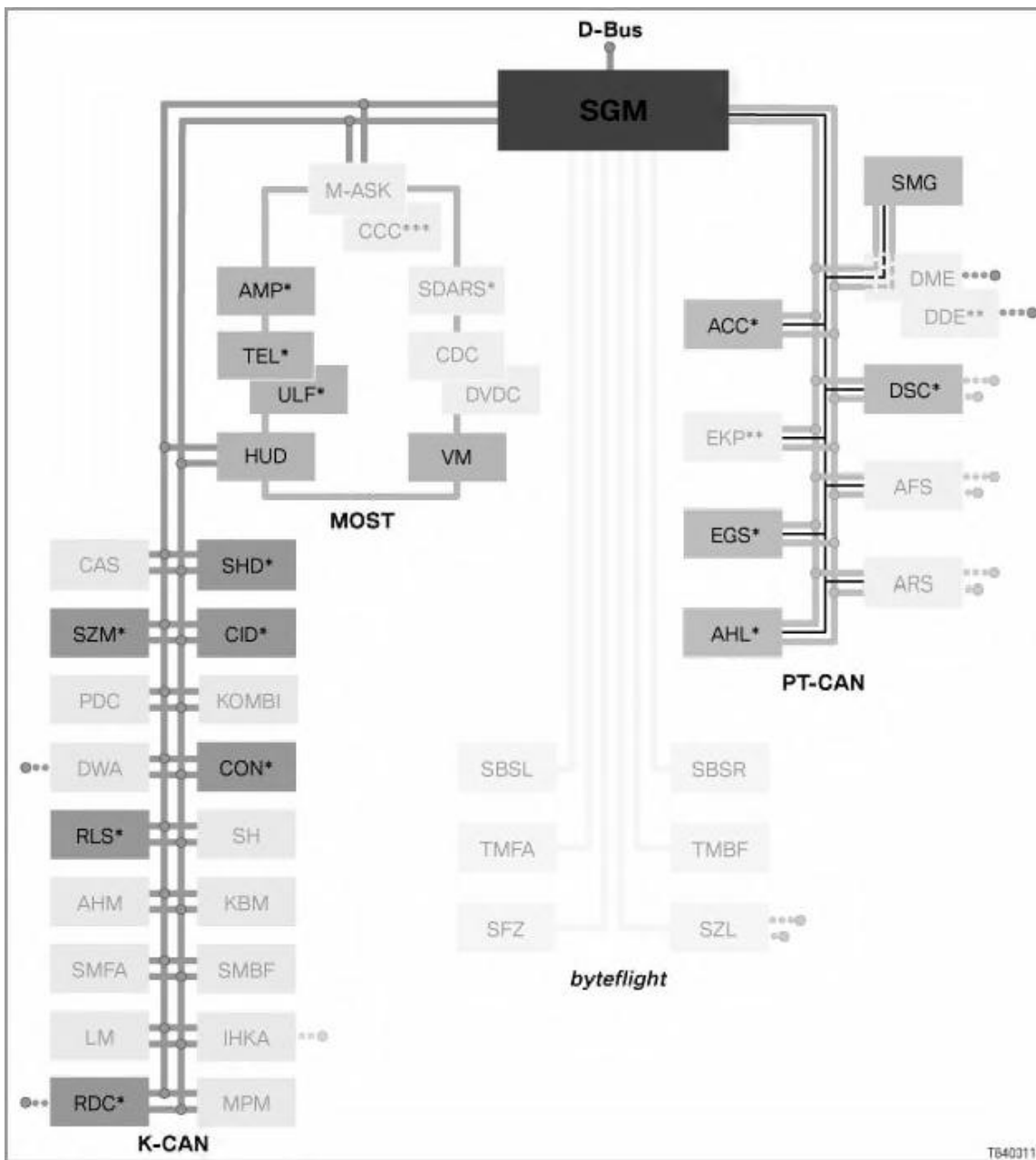
- System circuit diagram



Key	Explanation	Key	Explanation
1	Steering column switch cluster (SZL)	2	Safety and gateway module (SGM)

3	Controller (CON)	4	Central Information Display (CID)
5	Multi-audio system controller (M-ASK)	6	Loudspeaker
7	TOP-HiFi amplifier (AMP)	8	Loudspeaker
9	Base plate with snap-in adapter	10	Compensator (optional)
11	GSM antenna (GSM)	12	Bluetooth antenna (BT)
13	ULF control unit	14	Hands-free microphone
byteflight	Bus from airbag control units in satellites to safety and gateway module (SGM)	D-Bus	Diagnosis bus
K-CAN	Body controller area network	MOST	Media-Oriented System Transport bus
Kl. 30g	Terminal 30g (on-board supply voltage, active)		

- Overview of control units



Key	Explanation	Key	Explanation
D-Bus	Diagnosis bus	SGM	Safety and gateway module

M-ASK	Multi-audio system controller	CCC***	Car Communication Computer
SDARS*	Satellite Digital Audio Radio Service	CDC	CD changer
DVDC	DVD changer	VM	Video module
MOST	Media-Oriented System Transport bus	HUD	Head-up display
ULF*	Universal charger and hands-free system	TEL*	Telephone (Telematic Control Unit, TCU)
AMP*	Amplifier	CAS	Car access system
SZM*	Centre console switch cluster	PDC	Park Distance Control
DWA	Anti-theft alarm system	RLS*	Rain-light sensor
AHM	Trailer module	SMFA	Seat module, driver
LM	Light module	RDC*	Tyre pressure control
K-CAN	Body controller area network	MPM	Micro-power module
IHKA	Integrated automatic heating and air-conditioning system	SMBF	Seat module, front-passenger
KBM	Body, basic module	SH	Independent heating
CON*	Controller	KOMBI*	Instrument cluster
CID*	Central Information Display	SHD*	Sliding/tilting sunroof
SBSL	B-pillar satellite, left	TMFA	Door module, driver
SFZ	Vehicle centre satellite	byteflight	Bus from airbag control units in satellites to safety and gateway module (SGM)
SZL	Steering column switch cluster	TMBF	Door module, front-passenger
SBSR	B-pillar satellite, right	ACC*	Active Cruise Control

AHL*	Adaptive headlight	PT-CAN	Powertrain controller area network
ARS	Dynamic Drive (Active Roll Stabilisation)	AFS	Active Front Steering
DSC*	Dynamic Stability Control	DDE**	Digital diesel electronics
DME	Digital engine electronics	SMG	Sequential manual transmission

Control units marked * are activated by terminal 30g. Terminal 30g is activated by the CAS (car access system). CAS deactivates defined consumers off according to a priority list to make sure the battery is able to start the vehicle.

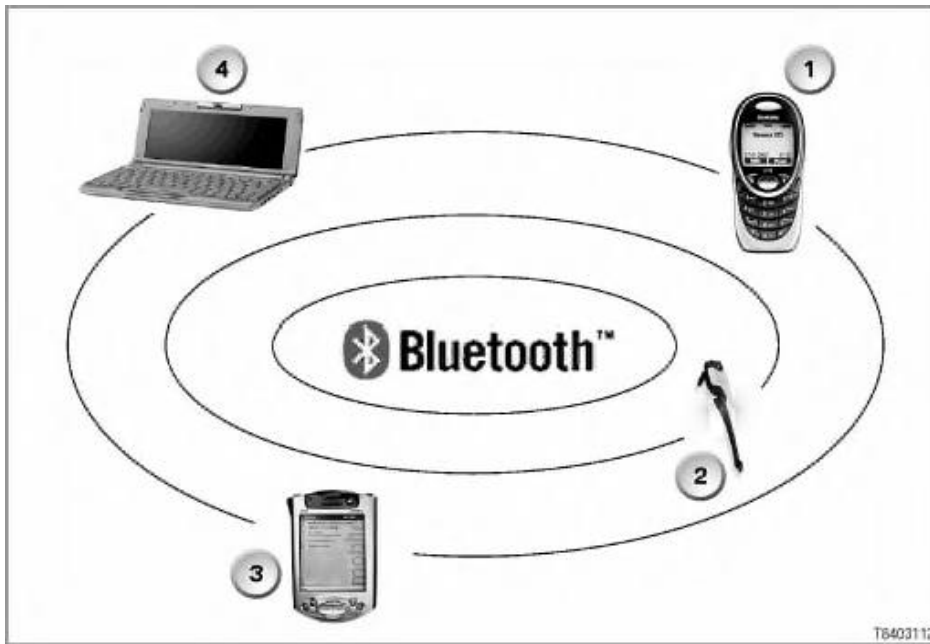
Control units marked ** are only installed in diesel vehicles.

The control unit marked *** is only installed in the High version.

E60 - bluetooth radio standard

Bluetooth radio standard

Bluetooth is a new short-range radio standard with which several units with bluetooth interface are able to communicate with each other at once. Bluetooth allows up to 8 bluetooth-compatible transmission/reception devices within the space of up to 10 m to be networked together. 4 bluetooth mobile phones can be paired to the ULF control unit. However, only one of the paired bluetooth mobile phones can be used for communication.



Key	Explanation	Key	Explanation
1	Bluetooth mobile phone	2	Radio headphones with microphone with bluetooth interface
3	Personal digital assistant (PDA) with bluetooth interface (operation with ULF currently not available)	4	Laptop with bluetooth interface (operation with ULF currently not available)

Radio frequency

Bluetooth uses the licence-free, global Industrial Scientific Medical waveband (ISM) at 2.45 GHz. The frequency range from 2.402 GHz to 2.480 GHz is divided into 79 channels, each with a band-width of 1 MHz. To prevent malfunctions in other electrical equipment and to increase call-monitoring security (privacy mode), the channel is changed 1600 times every second.

The ISM frequency band can be freely used by anybody. The ISM frequency band is used for medical research, for microwave ovens and for radio remote controls for garage doors systems.

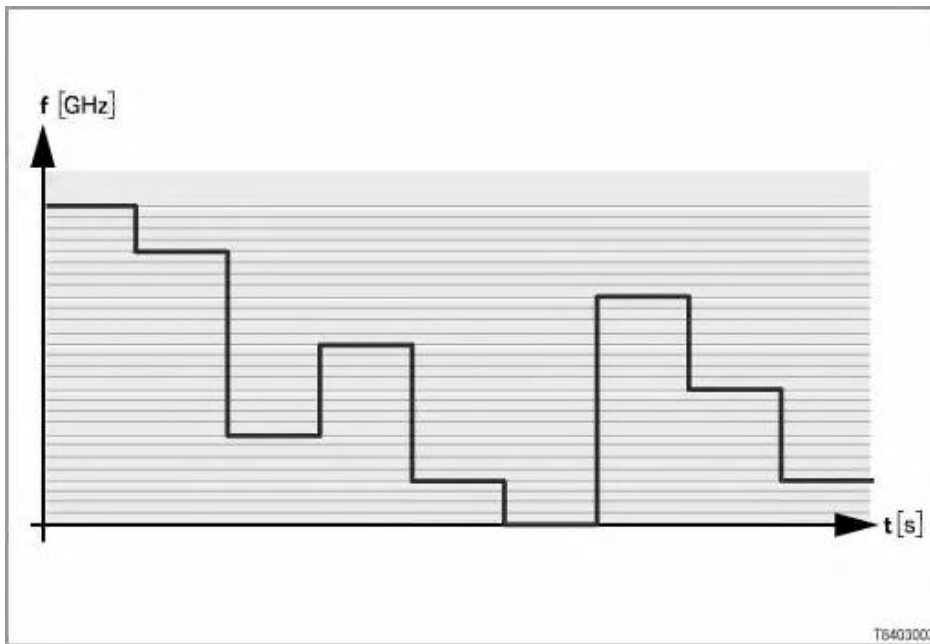
Note: Transmission quality

The transmission quality of the hands-free system deteriorates if there are people or

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jects in the transmission/reception area between the bluetooth mobile phone and the bluetooth antenna.



Key	Explanation	Key	Explanation
f [GHz]	Frequency in gigahertz	t [s]	Time in seconds

Data and speech

Voice information and data can be transmitted with the bluetooth.

A band-width of

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. 1 MBit/s is available for the transmission of audio data, telephone directory and the current operating status of the bluetooth telephone.

Voice data can be transmitted in either hands-free mode or in privacy mode.

Call-monitoring security

Call-monitoring security is characterised by the following measures:

- Frequency change (1600 times per second).
- Applied encryption procedure
 - Every bluetooth-compatible unit has its own 48-bit address.
 - All data transmitted can be encrypted and deciphered with a key up to 128 bit long.

This makes it possible to distinguish up to 281 trillion different units.

- The relatively short range of

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.10 m makes it more difficult to manipulate the flow of data. The flow of data can only be manipulated from within the immediate vicinity of the telematic control unit (TCU).

E60 - ULF control unit

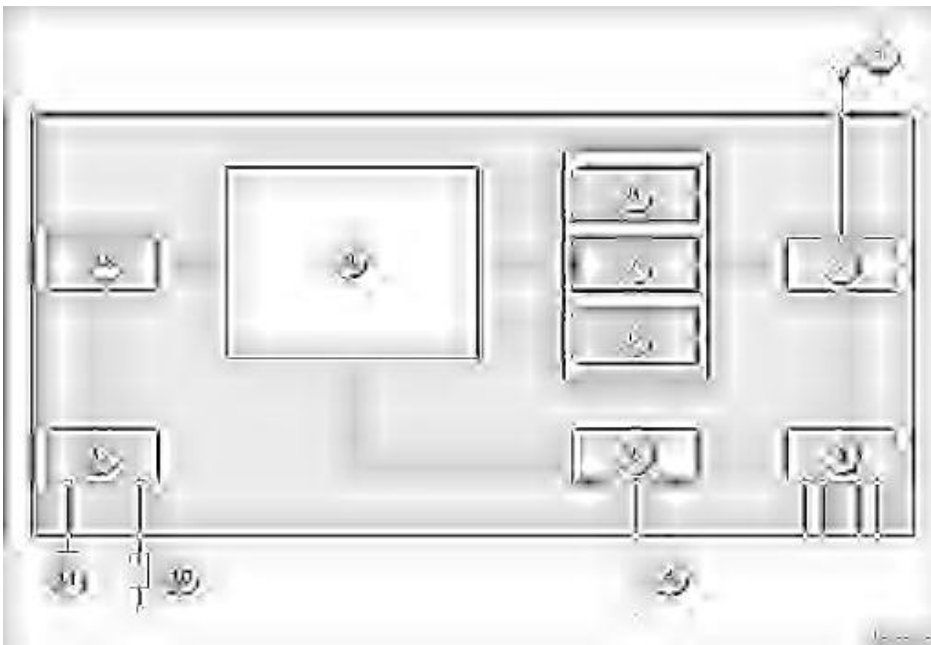
Installation location

On the E60, the ULF control unit is installed in the luggage compartment on the left-hand wheel arch.



Construction

The ULF control unit comprises the components illustrated in the following block diagram:



Key	Explanation	Key	Explanation
1	Bluetooth antenna	2	Bluetooth module
3	Digital Sound Processor, audio interface, input/output for hands-free mode	4	MOST bus (Media-Oriented System Transport)
5	MOST interface	6	Data memory (FLASH)
7	Working memory (Synchronous Dynamic Random Access Memory, SDRAM)	8	Fault memory (Electrically Erasable Programmable Read-Only Memory, EEPROM)
9	Microprocessor	10	On-board supply voltage, from CAS (Car Access System) via terminal 30g active
11	Terminal 31, earth	12	Power supply
13	Voltage monitoring		

The connection of the ULF control unit to the vehicle electrical system is made via a 54-pin connector. The ULF is connected to the vehicle's bus

system via the MOST bus.

Pin assignment, 54-pin connector

Pin	Type	Description
1	E	Positive terminal for microphone 1
2	E	Positive terminal for microphone 2 (with voice recognition system, SVS)
3	---	---
4	---	---
5	---	---
6	---	---
7	---	---
8	---	---
9	---	---
10	---	---
11	A	Switch-on signal for battery charger in snap-in adapter
12	---	---
13	---	---
14	---	---
15	---	---
16	---	---
17	V	Terminal 30g: power supply, active (run-on time / cutoff by CAS, Car Access System)

18	---	---
19	E	Negative terminal for microphone 1
20	E	Negative terminal for microphone 2 (with voice recognition system, SVS)
21	E	Screening for microphone wire
22	---	---
23	---	---
24	---	---
25	---	---
26	---	---
27	---	---
28	---	---
29	---	---
30	---	---
31	---	---
32	E	Switch signal from hands-free button, hands-free mode on
33	---	---
34	A	Switch-on signal for compensator (optional)
35	---	---
36	M	Terminal 31, earth
37	---	---

38	---	---
39	M	---
40	---	---
41	---	---
42	---	---
43	---	---
44	---	---
45	---	---
46	---	---
47	---	---
48	---	---
49	---	---
50	---	---
51	---	---
52	---	---
53	---	---
54	---	---

A = Output

E = Input

E/A = Input and output

M = Earth

V = Supply

For current specifications regarding pin assignments, please refer to BMW diagnostic system

How it works

The ULF is connected to the vehicle's bus system via the SGM (safety and gateway module).

The on-board supply voltage is fed to the ULF via terminal 30g, which is activated by the CAS (Car Access System).

The ULF control unit controls the hands-free system and the recharging of the bluetooth mobile phone battery.

Bluetooth module

The bluetooth module forms the interface between the bluetooth-compatible mobile phone and the telephone functions in the vehicle. An aerial cable connects the bluetooth module to the bluetooth antenna. Information is transmitted between the equipment with bluetooth interface and the vehicle via the bluetooth connection complying with the bluetooth radio standard. Inside the bluetooth module, transmission profiles are defined for:

- audio data (radio headphones with microphone)
- hands-free mode
- entries in telephone directory
- authentication

The above profiles must also be stored in the bluetooth mobile phone to ensure that all functions of the "universal charging and hands-free system" (ULF) can be used.

Audio interface

In hands-free mode, the audio interface controls the input and output of voice information using a digital sound processor.

In hands-free mode, voice information is entered via the hands-free microphone (in headlining, front middle).

The hands-free microphone is also used for the voice recognition system (SVS) 'Basic' (for operating telephone functions via the M-ASK).

Voice information is output through the loudspeakers connected to the M-ASK. Voice information from the hands-free microphone is fed in the form of low-frequency signals. The low-frequency signals are digitalised for further processing. Voice information fed to the loudspeakers is converted from this digital form to low frequency signals.

Voice recognition system 'Basic'

With the voice recognition system (SVS) 'Basic', only telephone functions can be controlled using voice recognition. The system is controlled using voice commands. The voice commands entered are not acknowledged on the CID (Central Information Display). The following telephone functions can be controlled with voice commands:

- Enter phone number
- Correct entry
- Read out entry
- Confirm entry
- Dial phone number
- Store name
- Select name
- Delete name
- Read out telephone directory
- Select telephone directory entry during reading.
- Delete telephone directory
- Help
- Cancel

MOST interface

The interface for the MOST bus (Media-Oriented System Transport Bus) controls the transmission and reception during data exchange on the MOST bus.

Power supply

The power supply generates the operating voltage for the ULF control unit from the on-board supply voltage. The vehicle voltage is fed in via the activated terminal 30g. When the ignition lock is in position 0 (vehicle at rest), terminal 30g is deactivated by the CAS (Car Access System) according to defined priorities. This deactivation ensures that the battery remains able to start the vehicle.

Voltage monitoring

Voltage monitoring monitors the voltage and regulates the recharging of the bluetooth mobile phone battery. If there is insufficient voltage in the vehicle electrical system, the voltage monitoring switches the onboard power supply off.

E60 - Eject box with cover

Installation location

The eject box is installed in the stowage compartment between the front seats. To open the stowage compartment lid, press the release button.



Key	Explanation	Key	Explanation
1	Release button	2	Cover

Construction

The eject box comprises:

- Base plate
- Snap-in adapter

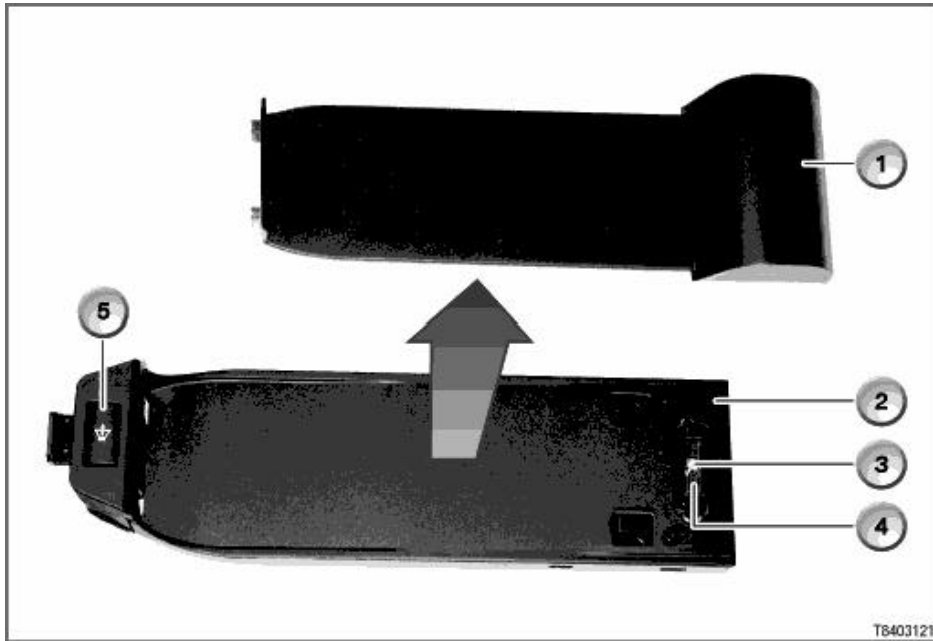
The base plate with cover is part of the delivery specification of the basic telephone fittings. The base plate serves as a holder for the snap-in adapter,

which in turn acts as a holder for the matching bluetooth mobile phone.

The base plate is used to create the connection to the ULF control unit and the wiring harness.

When the vehicle is delivered, a cover is engaged on the base plate. If option 644 "Universal charging and hands-free system" is installed, the cover is replaced by a snap-in adapter for the bluetooth mobile phone selected.

An 18-pin plug connector creates the connection to the rest of the vehicle electrical system.



Key	Explanation	Key	Explanation
1	Cover	2	Base plate
3	Antenna connection	4	Contacts for power supply
5	Hands-free button		

How it works

The eject box creates the connection between the bluetooth mobile phone and the wiring harness to the ULF control unit (via the snap-in adapter). The ULF is connected to the vehicle's bus system via the MOST bus.

Signal path: bluetooth mobile phone <=> Snap-in adapter <=> Eject box <=> Wiring harness <=> GSM antenna

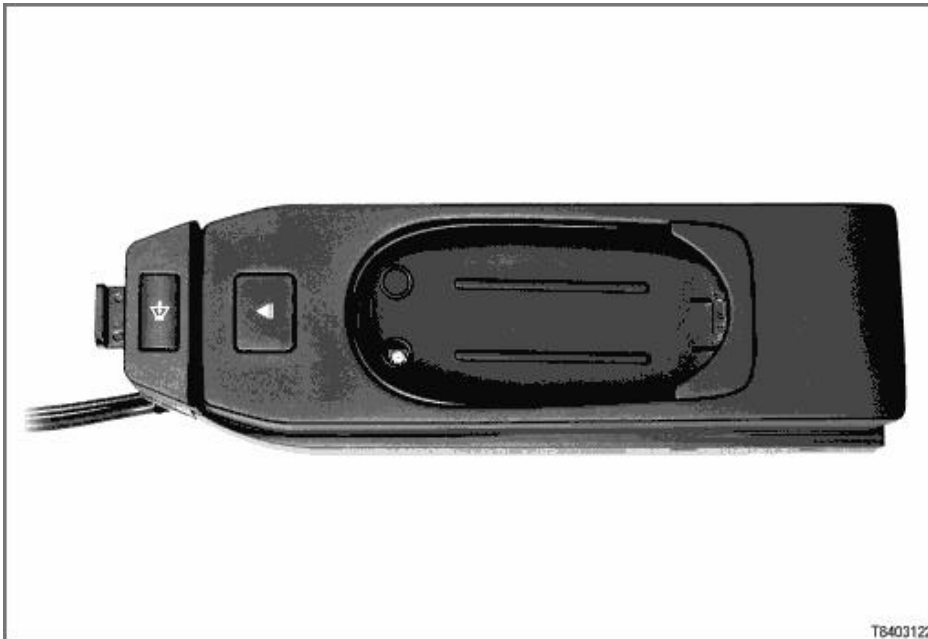
The base plate holds the charging module for recharging the battery in the bluetooth mobile phone. The charging module is connected to terminal 30g. The voltage from terminal 30g is filtered, smoothened and fed to the snap-in adapter.

In addition, the hands-free button for switching from privacy mode to hands-free mode is installed on the base plate.

E60 - Snap-in adapter on eject box

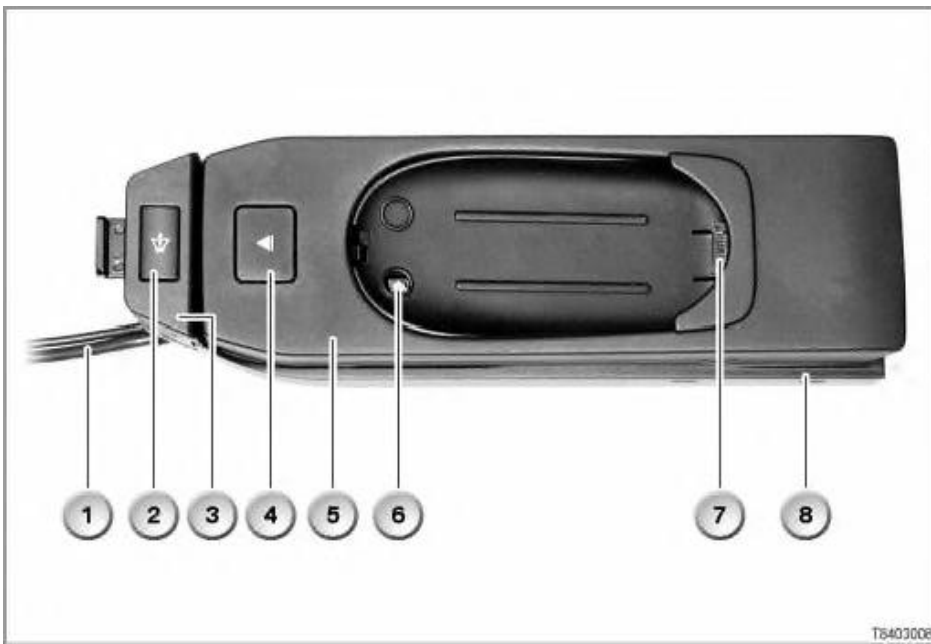
Installation location

The snap-in adapter is engaged on the eject box in the stowage compartment between the front seats.



Construction

The snap-in adapter is the connecting piece between the eject box and the engaged bluetooth mobile phone.



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Key	Explanation	Key	Explanation
1	Connector wire	2	Hands-free button
3	Eject button for snap-in adapter	4	Eject button for bluetooth mobile phone
5	Snap-in adapter	6	Connector for GSM antenna
7	Charge voltage contacts for battery	8	Base plate

How it works

The following connections are established to the bluetooth mobile phone at the snap-in adapter:

- The bluetooth mobile phone is connected to the GSM antenna on the vehicle exterior via the GSM antenna connection.
- The bluetooth mobile phone is connected to the battery charger via the charging contacts.

GSM antenna connection

Connecting the bluetooth mobile phone to the GSM antenna on the vehicle exterior has the following advantages:

- Radiation inside the vehicle is drastically reduced.
- Transmission and reception conditions for the bluetooth mobile phone are greatly improved.

Recharging of battery in bluetooth mobile phone

The recharging of the battery is controlled by the charge management circuit in the ULF control unit. The charge management circuit in the ULF control unit sends a signal to activate the battery charger in the snap-in adapter (via the control line).

To recharge the battery in the bluetooth mobile phone, each snap-in adapter has an integrated battery charger that is specially configured for the matching bluetooth mobile phone.

Important! Only recharge the bluetooth mobile phone for which the snap-in adapter is intended.

The recharging process is specially configured for the selected bluetooth mobile phone. Other, "foreign" bluetooth mobile phones are not to be recharged in this snap-in adapter.

The bluetooth mobile phone battery is charged when the following conditions are satisfied:

- Snap-in adapter engaged on the base plate
- Bluetooth mobile phone engaged in the snap-in adapter
- Terminal R ON (ignition lock position 1)
- No overvoltage in vehicle electrical system (voltage greater than 16 volt)
- No undervoltage in vehicle electrical system (voltage less than 9 volt)

E60 - bluetooth mobile phone in snap-in adapter

Installation location

The bluetooth mobile phone is engaged in the snap-in adapter on the eject box.



Construction



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Key	Explanation	Key	Explanation
1	Snap-in adapter	2	Tri-band bluetooth mobile phone, Siemens S55

Note: Approved bluetooth mobile phones

- Information about bluetooth mobile phones that have been approved for use in vehicles of the BMW Group and about their matching snap-in adapters is available from the BMW Parts Service.
- At present, the tri-band bluetooth mobile phones Siemens S55 and Sony Ericsson T610 are approved for use in BMW Group vehicles.



Key	Explanation	Key	Explanation
1	Tri-band bluetooth mobile phone, Siemens S55	2	Tri-band bluetooth mobile phone, Sony Ericsson T610

How it works

Each bluetooth mobile phone that corresponds to the bluetooth radio standard can be operated in a **matching** bluetooth mobile phones stated above are approved.

Once engaged in the snap-in adapter, the bluetooth mobile phone is connected to the ULF charge management circuit in the ULF control unit and to the GSM antenna (Global System for Mobile communication).

The tri-band bluetooth mobile phones Siemens S55 and Sony Ericsson T610 are suitable for the following applications:

- Operation in Global System for Mobile communication (GSM, European and US networks)
- Operation in frequency ranges 900/1800/1900 MHz.

E60 - Compensator

Installation location

The compensator (optional, special equipment) is installed in the luggage compartment on the left-hand wheel arch, next to the ULF control unit.



Construction

The compensator is located in an enclosed housing. The compensator has 3 connections:

- Aerial connector for aerial cable from snap-in adapter
- Aerial connector for aerial cable to GSM antenna
- Connection for switch signal from ULF control unit

How it works

The compensator can be used to compensate for losses in the aerial cable between the snap-in adapter and the GSM antenna. The compensator is

activated by the telematic control unit (TCU) when terminal R is switched ON (= ignition lock position 1). The compensator remains active until terminal R is switched OFF. The compensator improves the versatility of the bluetooth mobile phone, especially in areas where mobile phone networks are not well developed and under unfavourable conditions, e.g. in cities.

The use of the compensator increases the transmission output to the GSM antenna to a maximum of 2 watts. Increasing the transmission power extends the range within the GSM mobile phone network.

E60 - GSM antenna

Installation location

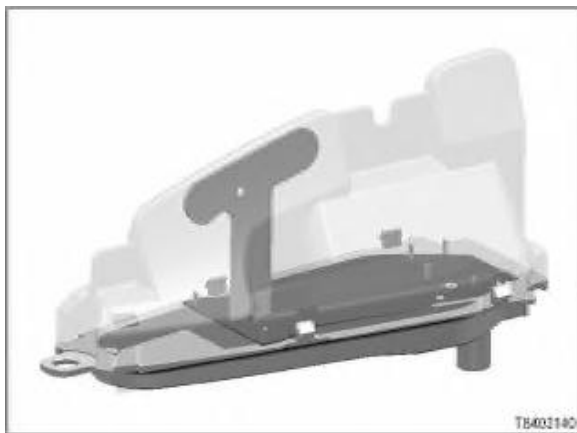


The GSM antenna is integrated into the telephone and GPS aerial. The telephone and GPS aerial is installed on the rear edge of the roof.

Construction

The configuration of the European version of the GSM antenna depends on the special equipment installed. The following configurations are used:

- Only antenna 1 for telephone 1
- Antenna for telephone 1 and GPS aerial (Global Positioning System) for navigation

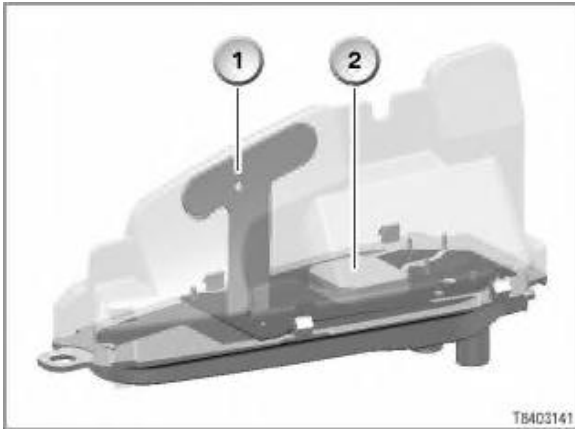


Antenna 1 for telephone 1

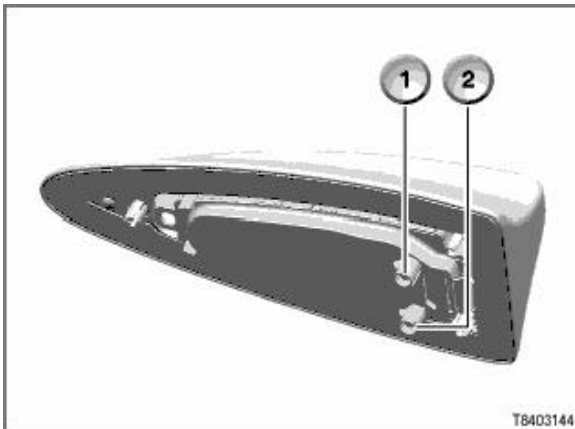
Aerial connector for telephone aerial 1



1. Telephone aerial 1
2. GPS aerial (Global Positioning System)



1. Aerial connector for telephone aerial 1
2. Aerial connector for GPS aerial



How it works

The GSM antenna is a dual-band aerial for mobile phones. The European version of the GSM antenna is configured for the frequency ranges 900/1800 MHz.

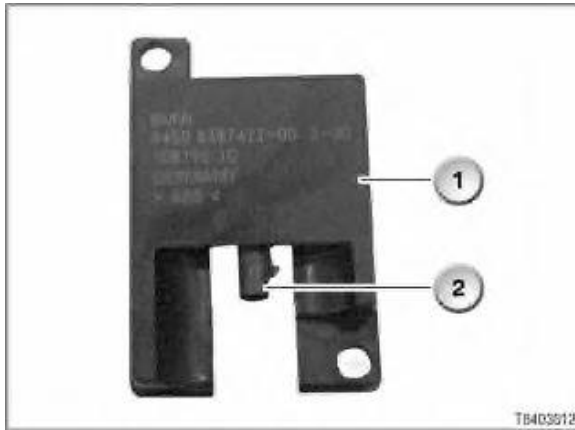
E60 - bluetooth antenna

Installation location

The bluetooth antenna is installed in the centre console (not illustrated).

Construction

The bluetooth antenna is located in an enclosed housing.



- 1) Bluetooth antenna
- 2) Aerial connector

How it works

The bluetooth antenna is the transmission/reception aerial of the ULF control unit for communications with equipment with a bluetooth interface (e.g. mobile phone). The bluetooth antenna is designed for a frequency of 2.45 GHz.

E60 ULF, function sequences on universal charger and hands-free system

Automatic prioritisation of connected bluetooth mobile phones

Up to 4 bluetooth mobile phones can be paired in sequence to the universal charger and hands-free system.

- If there is more than one bluetooth mobile phone in the reception area of the ULF, the bluetooth mobile phone that is first on the list of paired bluetooth mobile phones has top priority for a connection.
- If there are already 4 bluetooth mobile phones signed on to the ULF, the last bluetooth mobile phone on the list will be deleted the next time a bluetooth mobile phone is signed on. This bluetooth mobile phone must then be paired again (basic settings) before it can be used again.

Hands-free mode

- Voice output

The high-frequency signals received by the GSM antenna are forwarded to the bluetooth mobile phone in the snap-in adapter (optionally via a compensator). In the bluetooth mobile phone, the incoming voice signals are encoded by the bluetooth interface of the bluetooth mobile phone and transmitted by the bluetooth antenna.

The signals emitted are received by the bluetooth antenna of the ULF control unit. From the bluetooth antenna, the signals are fed to the bluetooth interface in the ULF control unit. The signals are then digitalised in the ULF control unit. The digitalised signals are then transmitted through the MOST bus to the multi-audio system controller (M-ASK). In the M-ASK, the signals are converted

back

into

low-frequency signals. The voice signals are output into the vehicle through the

loudspea

kers

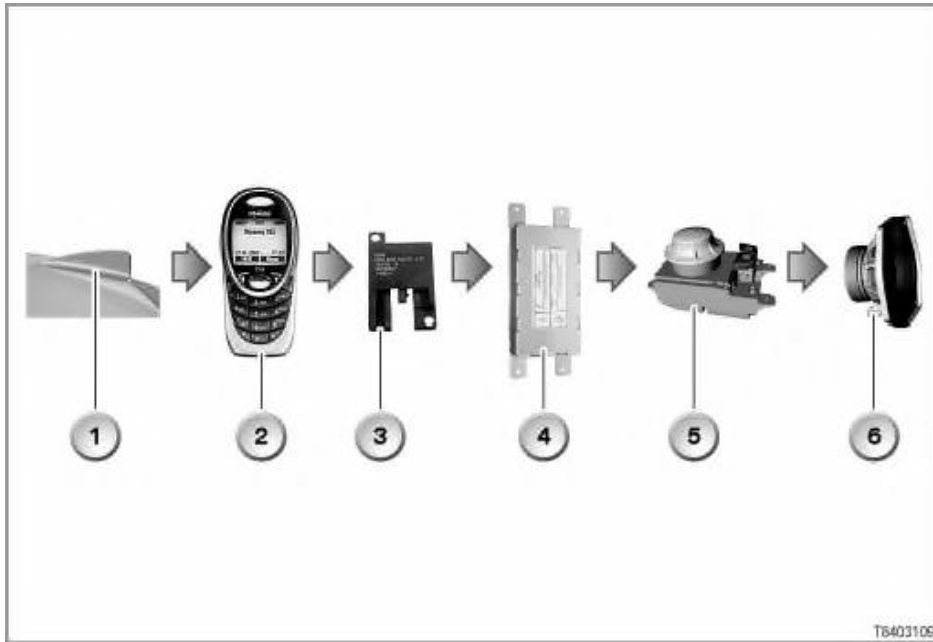
connected to the M-ASK.

If a Top-HiFi amplifier is installed, the digitalised signals are transmitted through the MOST bus, via the M-ASK to the Top-HiFi amplifier. The voice signals are then output into the vehicle by the

loudspea

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ers connected to the Top-HiFi amplifier.



Key	Explanation	Key	Explanation
1	GSM antenna	2	Tri-band bluetooth mobile phone, Siemens S55
3	Bluetooth antenna	4	ULF control unit
5	Multi-audio system controller (M-ASK)	6	Loudspeaker

- **Voice input**

The ULF control unit receives the voice information input via the hands-free microphone. The low-frequency signals from the hands-free microphone are encoded in the ULF control unit in the bluetooth module. The encoded low-frequency signals are transmitted at low output to the bluetooth mobile phone via the connected bluetooth antenna inside the vehicle.

The signals received by the aerial of the bluetooth mobile phone are forwarded to the GSM antenna by the bluetooth mobile phone in the snap-in adapter (optionally via a compensator). The signals are transmitted with maximum output by the GSM antenna.

Important! The mobile phone must be engaged in the snap-in adapter.

To achieve maximum transmission range, the bluetooth mobile phone must be engaged in the snap-in adapter.

Full duplex transmission

The hands-free facility is designed to allow the simultaneous transmission of voice signals in 2 directions (full duplex). The full duplex transmission

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es it possible to

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and hear the other person at the same time. Voice signals are transmitted simultaneously:

- Hands-free microphone => ULF

and

- ULF =>

loudspea

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ers in vehicle

Echo compensation

If the hands-free microphone and the

loudspea

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ers in the vehicle are active at the same time, there will be

feedbac

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. This annoying effect is suppressed by echo compensation.

Bac

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ground noises are dampened.

Operating radio headphones with microphone

Important! It is not always possible to operate radio headphones with microphone.

A set of headphones with microphone will be deactivated when there is an active bluetooth connection between the bluetooth mobile phone and the ULF control unit.

To establish a connection between the bluetooth mobile phone and a set of headphones with microphone, the connection between the ULF control unit and the bluetooth mobile phone must be separated as follows:

- Select the menu "bluetooth off" on the Central Information Display (CID) with the controller.
- Press the controller.

Operating status display

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hen the bluetooth function is switched on, the symbol (square with

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) is shown on the Central Information Display (CID).

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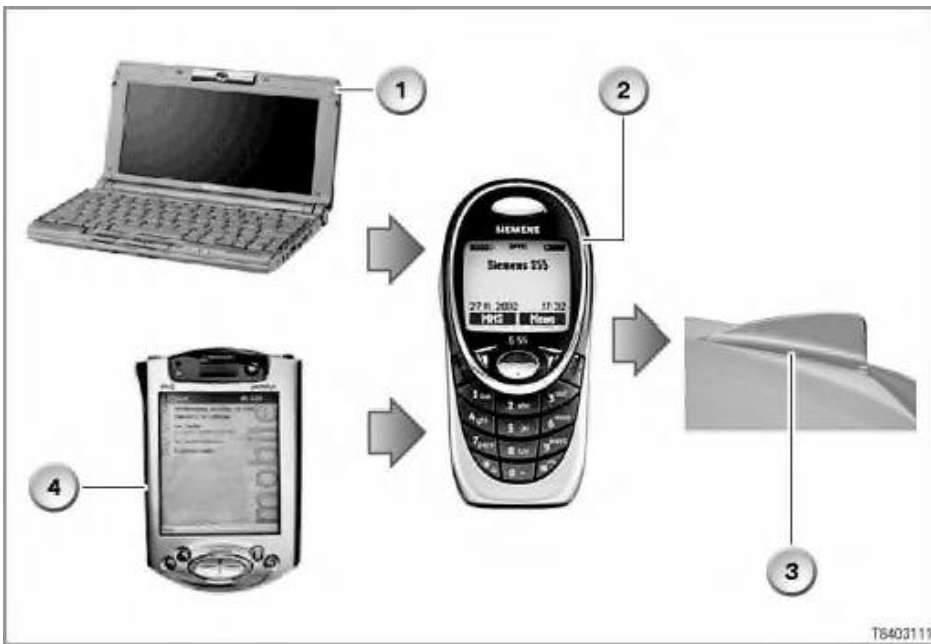
hen bluetooth is not active (no connection to bluetooth mobile phone), the Central Information Display (CID) will show: "Please activate telephone".

Transmission of audio data, telephone directory, operating status of bluetooth mobile phone

Audio data, telephone directory and the current operating status of the bluetooth mobile phone can be transmitted with bluetooth.

Voice data can be transmitted via the bluetooth mobile phone in privacy mode or in hands-free mode.

A band-width of approx. 1 MBit/s is available for transmission.



Key	Explanation	Key	Explanation
1	Laptop with bluetooth interface (operation currently not available)	2	Tri-band bluetooth mobile phone, Siemens S55
3	GSM antenna	4	Personal digital assistant (PDA) with bluetooth interface (operation currently

Recharging of battery in bluetooth mobile phone

The charge management circuit in the ULF control unit activates a switch-on signal to start the recharging of the battery in the bluetooth mobile phone. Recharging starts as soon as the bluetooth mobile phone is engaged in the snap-in adapter.

E60 ULF, basic settings on universal charger and hands-free system

Pairing of bluetooth mobile phone to the ULF control unit

Note: Actions to be controlled on the vehicle

All actions to be controlled on the vehicle are described in the operating instructions for the universal charger and hands-free system, which can be found in the vehicle.

Each bluetooth mobile phone must be paired to the ULF control unit before it can be used in the reception area. Pairing assigns the bluetooth mobile phone to the ULF control unit. After this assignment, the ULF control unit will automatically recognise the bluetooth mobile phone when it enters the reception area.

Note: Pairing a bluetooth mobile phone

When it is paired to the ULF control unit, the bluetooth mobile phone must be switched on and be within the reception area of the ULF control unit.

Proceed as follows the first time a connection is established between a bluetooth mobile phone and a ULF control unit:

1. Perform the following settings with the controller on the Central Information Display (CID):
 - Press the MENU button => The start menu is called up.
 - Press the controller (menu i is called up).
 - Select "Communication" settings (press controller).
 - Select "bluetooth" (press controller).
 - Select "Telephone/modem" (press controller).

2. Make the settings on the bluetooth mobile phone as specified in the operating instructions. To do this, carry out a search under, e.g.:
 - "Search for bluetooth unit"
 - "Pair bluetooth unit"

- "Connect bluetooth unit"
The prompt to enter the bluetooth passkey depends on the function of the bluetooth mobile phone.
The prompt may be displayed:
 - on the display of the bluetooth mobile phone,
 - on the Central Information Display (CID).
3. Perform the following settings with the controller on the Central Information Display (CID):
- Select "Add unit" (press controller).
 - Enter bluetooth passkey.
 - The bluetooth passkey is a random number with up to 16 digits.
 - You have up to 30 seconds to enter the passkey on the bluetooth mobile phone or on the CID. This time depends on the bluetooth mobile phone used.
 - Select "Confirm passkey" (press controller). After a few seconds, the Central Information Display (CID) will show the bluetooth mobile phones that are currently paired.

Important! Do not press the controller until the pairing process has been completed

Do not press the controller again until the Central Information Display (CID) shows that the pairing process has been completed with:
"Telephone/modem".

The ULF control unit will recognise the bluetooth mobile phone the next time it is used in the reception area of the ULF control unit. Recognition will take place a maximum of 30 seconds after terminal R is switched ON, i.e. ignition lock position 1.

As soon as a bluetooth mobile phone is recognised by the ULF control unit, the transmission of entries onto the SIM card and/or the entries in the internal telephone directory in the bluetooth mobile phone will start.

This function depends of the possibilities offered by the bluetooth mobile phone. Data transmission may last several minutes.

All bluetooth mobile phones paired to the ULF control unit are displayed in a list.

The bluetooth mobile phone at the top of the list can be operated as follows:

- By selecting and calling up a menu in the Central Information Display (CID) with the controller.
- By pressing the telephone buttons on the multi-function steering wheel (MFL).
- By entering voice commands via the hands-free system.

The hands-free system cannot be used for as long as the list is displayed.

Note: The order of the bluetooth mobile phones in the list can be changed

Change the order in the list as described in the operating instructions for the bluetooth mobile phone.

Cancelling the process of pairing a bluetooth mobile phone to the ULF control unit

To cancel the pairing process:

- On the Central Information Display (CID), select: "Reject connection".
- Press the controller.

De-pairing of bluetooth mobile phone from the ULF control unit

To cancel the connection of a bluetooth mobile phone to a ULF control unit using the central information display (CID) and the controller:

- Press the MENU button => The start menu is called up.
- Press the controller (call up menu i).
- Select "Communication" settings (press controller).
- Select "bluetooth" (press controller).
- Select "Telephone/modem" (press controller).
- Select the bluetooth mobile phone concerned from the list (press controller).
- Select "Delete unit" (press controller). The selected bluetooth mobile phone is deleted from the list. The telephone directory entries transferred from the bluetooth mobile phone to the ULF control unit are also deleted from the ULF control unit.

E60 ULF, universal charger and hands-free system operation

Storing the bluetooth mobile phone in the vehicle

Important! When you are driving, engage the bluetooth mobile phone in the snap-in adapter.

This has the following benefits:

- Reduced risk of injury from loose objects inside the vehicle in the event of sharp braking
- Reduced radiation for bluetooth mobile phone user due to connection of an external GSM antenna. This reduces the output power transmitted inside the vehicle.
- Continuous recharging of the battery
- Prevention of interference with other vehicle systems due to reduced output power transmitted inside the vehicle

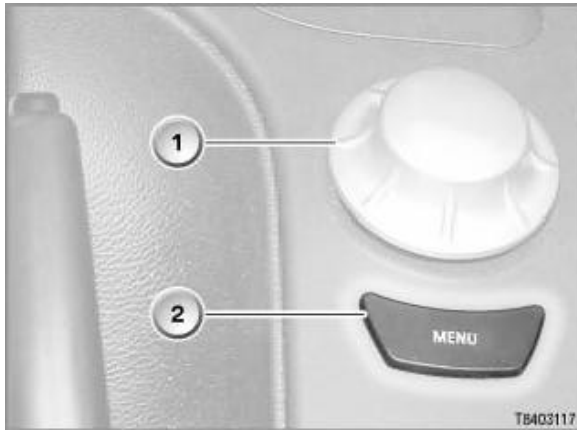
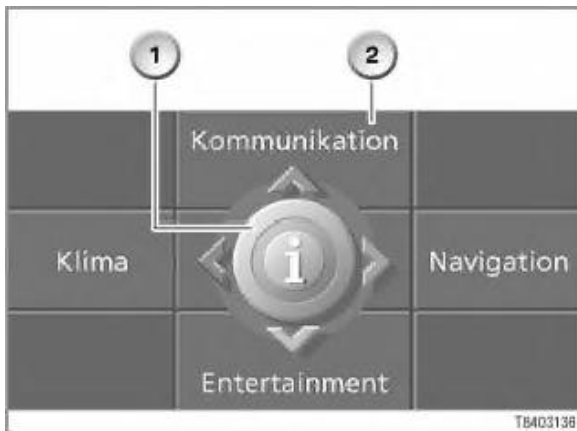
Operating the bluetooth mobile phone

The operation of the bluetooth mobile phone is described in the operating instructions.

Operation using the Central Information Display and controller

The communications functions can be operated with menus using the CID (Central Information Display) and the controller. To operate, carry out the following operations:

1. Press the MENU button => The start menu is displayed
 - Throughout operation, pressing the MENU button will return to the start menu.
2. Press the controller => Menu i is displayed.
3. Select "Communication settings" (press controller).
 - Continue operation with menu and controller
 - Operate as described in operating instructions



Start menu display on CID (central information display):

1. Menu i
2. "Communication" menu

1. Controller
2. MENU button

Important! No emergency call function integrated.

- The "universal charger and hands-free system" (ULF) does not have an integrated emergency call function.
- An emergency call can be made with or without a SIM card by dialling the country-specific emergency number.

Important! Please comply with local legal authorisation for bluetooth technology.

- Bluetooth technology is not approved for use in all countries
- If approval has not been issued, the bluetooth connection between the bluetooth mobile phone and the ULF control unit must be temporarily separated for as long as you are in such a jurisdiction.
The pairing of the bluetooth mobile phone is not affected.

- Temporarily separate the connection as described in the operating instructions.

Making a call

When a bluetooth mobile phone is connected, a ringing tone sounds from the bluetooth mobile phone when a call is received. At the same time, the bluetooth interface of the bluetooth mobile phone transmits a signal to the bluetooth antenna inside the vehicle. The bluetooth antenna is connected to the universal charger and hands-free system.

The universal charger and hands-free system recognises the incoming call and switches the radio audio output to mute. At the same time, the loudspeakers in the vehicle are activated for voice signal output by the DSP (digital sound processor).

After pairing a bluetooth mobile phone to the ULF control unit, the unit can be operated as follows:

- By selecting and calling up a menu in the Central Information Display (CID) with the controller.
- By pressing the telephone buttons on the multi-function steering wheel (MFL).
- By entering voice commands via the voice recognition system.

Operation using the CID (central information display) and the controller

When the bluetooth mobile phone is operated with the CID (Central Information Display) and the controller, the following functions can be used:

- Dial phone number
- Telephone directory
- Top-8
- Redial
- Show accepted calls
- Show missed calls

The following conditions must be satisfied for the functions to be used:

- The bluetooth mobile phone is signed on to the ULF control unit.
- The bluetooth connection between the mobile phone and the ULF control unit is active.

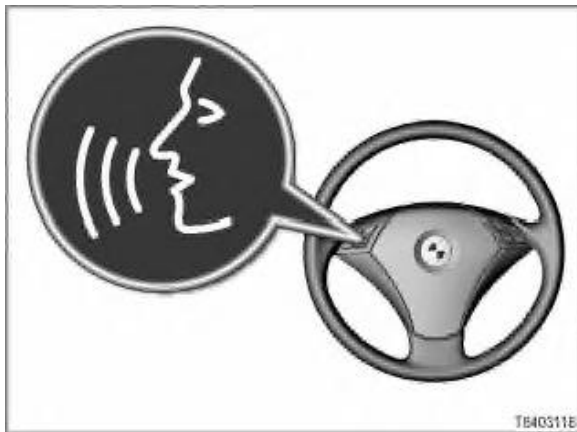
- The bluetooth mobile phone is recognised by the ULF control unit.
- The PIN (personal identification number) has been entered.

Operating using voice recognition

The bluetooth mobile phone can be operated using voice recognition. Voice commands are given that are converted to signals for operation. Voice recognition supports operation with commands or questions.

The following conditions must be satisfied for voice recognition to be used:

- The bluetooth mobile phone is signed on to the ULF control unit.
- The bluetooth connection between the bluetooth mobile phone and the ULF control unit is active.
- The bluetooth mobile phone is recognised by the ULF control unit.
- The PIN (personal identification number) has been entered.
- The ignition lock is in position 2 (terminal 15 ON).



To activate voice recognition, press the hands-free button on the multi-function steering wheel.

Switching on is verified with an acoustic signal.

To deactivate voice recognition, press the hands-free button or enter the voice command "Cancel".

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uired announcement volume can be set on the M-ASK (multi-audio system controller).



1. Multi-audio system controller (M-ASK)
2. Volume adjustment button

To set the volume, turn the adjustment button clockwise or anti-clockwise during an announcement. The set volume will remain unchanged even if other audio sources are set to minimum volume.

Note: Do not use voice recognition in emergency situations!

In stressful situations, your voice may change to such an extent that the establishment of a telephone connection using voice recognition could be delayed.

Continue operation of the bluetooth mobile phone using voice recognition as described in the vehicle's Owner's Handbook.

Accepting a call (incoming call)

Depending on the functions of the vehicle

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uipment, an incoming call can be accepted as follows:

- By pressing the transmit/receive button on the multi-function steering wheel (if fitted).
- By pressing the transmit/receive button on the bluetooth mobile phone.

Hands-free mode is possible if the call is accepted as follows:

- By pressing the transmit/receive button on the multi-function steering wheel (MFL).
- By pressing the transmit/receive button on the bluetooth mobile phone.
The call is conducted through the hands-free microphone and the loudspeakers in the vehicle.
- By pressing the transmit/receive button on the CID (Central Information Display).

If the call is accepted by pressing the transmit/receive button on the bluetooth mobile phone, the reaction depends on the bluetooth mobile phone used.

Conducting a call in hands-free mode

To conduct a call in hands-free mode, the hands-free system must be activated. The hands-free system works with full duplex transmission. With full duplex transmission, both partners can speak and listen at the same time.

- To switch on the hands-free system:
The hands-free system is switched on by pressing the transmit/receive button on the multi-function steering wheel. When the transmit/receive button is pressed, the incoming call is made through the loudspeakers inside the vehicle. Audio output remains deactivated so long as the hands-free facility is active.
 - A call that has been accepted by pressing the transmit/receive button on the bluetooth mobile phone is conducted through the bluetooth mobile phone in privacy mode.
- Calls begun outside the vehicle may be continued in hands-free mode inside the vehicle.

Note: Please comply with the operating instructions for the bluetooth mobile phone.

For how to accept a call, please refer to the operating instructions for the bluetooth mobile phone.

Note: Automatic prioritisation of bluetooth mobile phones

For incoming and outgoing calls, only the user whose bluetooth mobile phone was coupled to the ULF control unit first can make use of the hands-free system.

If 2 users enter the coupling range at the same time, only the user with the higher priority is cleared for outgoing calls.

Switching from privacy mode to hands-free mode

How to switch from privacy mode to hands-free mode depends on the functions of the bluetooth mobile phone used and can be as follows:

- The system will automatically switch when a call is accepted.
- The switch must be performed manually. To switch, the hands-free button must be pressed from (privacy mode => hands-free mode) on the eject box.



Hands-free button on base plate

A telephone call in hands-free mode can be switched to privacy mode. In privacy mode, hands-free mode is deactivated. The call is conducted using the bluetooth mobile phone and it is more difficult for other people to hear the conversation.

Possible ways of switching:

- Hands-free mode => privacy mode:
Only via the menu of the bluetooth mobile phone.
- Privacy mode => hands-free mode:
Only via the menu of the bluetooth mobile phone, depending on the hands-free button on the bluetooth mobile phone.

Ending a call

To end a call, proceed as follows:

- Press the transmit/receive button on the multi-function steering wheel.
- Press the transmit/receive button on the bluetooth mobile phone.

- Press the "End" button on the CID (Central Information Display).

Note: Making a call when the vehicle is at rest

- A call that is already in progress can be continued with the hands-free system for up to 25 minutes after the ignition is switched off (ignition lock position 0).
- The telephone functions may be cut off earlier if the car battery reaches the limit of its starting capability. To make sure that the battery remains capable of starting the engine, the CAS (car access system) will cause the battery voltage to be cut off via terminal 30g.

Transferring telephone directory

Note: Transfer telephone directory

The transmission of the entries in the telephone directory depends on the functions of the bluetooth mobile phone used, as follows:

- The phone numbers are automatically transmitted in the pairing range.
- The phone numbers must be transmitted by manually starting the transmission process.

The tri-band bluetooth mobile phones Siemens S55 and Sony Nokia T610 use the same transmission process:

- Automatic transfer of telephone directories stored on the SIM card (Subscriber Identity Module).
- Phone numbers stored internally in the bluetooth mobile phone are not transferred.
(Please refer to operating instructions).

ULF, general information for service staff regarding the universal charger and hands-free system

Deactivated functions:

The following functions are no currently possible with option 644 "Universal charging and hands-free system" (ULF):

- BMW ASSIST
- Read SMS (Short Message Service, text messages) on CID (Central Information Display) and on bluetooth mobile phone (from 03/04)
- Display receiving power

Installation:

- When installing option 644 "Universal charger and hands-free system", exchange the cover on the eject box for the snap-in adapter needed for the bluetooth mobile phone as follows:
 - Press the eject button on the eject box.
 - Eject the cover and remove it from the eject box.
 - Connect up the snap-in adapter matching the bluetooth mobile phone.
 - Insert the snap-in adapter in the eject box and engage.

Exchange:

The bluetooth passkey will change if the universal charger and hands-free system control unit is replaced. The bluetooth passkey can be selected at random. The pairing procedure must be repeated so that the bluetooth mobile phone is recognised by a new ULF control unit.

Important! Bluetooth mobile phones must be paired again after the ULF control unit has been exchanged.

Because of the new bluetooth passkey, bluetooth mobile phones must be paired again if the ULF control unit has been replaced.

ULF, universal charger and hands-free system diagnosis

Diagnosis can be performed on option 644 "Universal charger and hands-free system" using the BMW diagnostic system at the diagnosis connection on the vehicle. Diagnosis with the BMW diagnostic system comprises:

- Reading fault memory
- Clearing fault memory
- Diagnosis request

ULF, universal charger and hands-free system - encoding/programming

Important! Perform encoding/programming after replacing the ULF control unit

- Perform flash programming using OPPS/OPS optical testing and programming system/optical programming system as standard on the new ULF control unit.
- Programming time will be longer if programming is performed using the OBD interface (on-board diagnosis).