

Participant's Manual

E87 Information and Communication Technology IKT



The information contained in this participant's manual is intended solely for the participants of this seminar run by BMW Aftersales Training.

Refer to the latest relevant "BMW Service" information for any changes/supplements to the Technical Data.

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Participant's Manual

E87 Information and Communication Technology IKT

Audio systems

Navigation systems

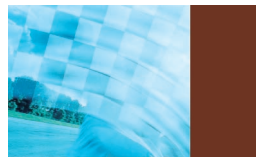
Telephone systems

Voice recognition systems



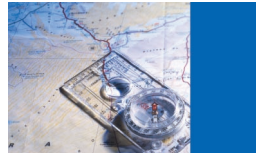
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IKT



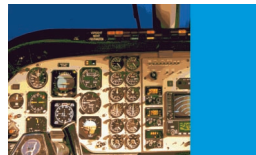
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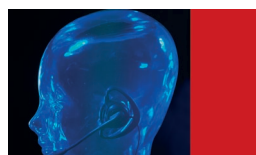
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Infotainment in the BMW 1 Series

This participant's manual introduces the new features of the information and communication technology as relevant to servicing and implemented on the E87. It deals with the following topics:

- Audio systems
- Navigation systems
- Telephone systems
- Voice recognition systems

This manual is designed to accompany you through the seminar. Working through the manual in connection with the practical exercises should enable you to perform servicing work on the information and communication systems in the BMW 1 Series.

This document is intended to convey a fundamental understanding of the system with particular use made of the input/output diagrams and system circuit diagrams. The layout of the system circuit diagrams is such that components with the same or similar function are positioned in the same place.

They are therefore also assigned identical item numbers. This may result in gaps in the numbering depending on the specific variant. This procedure is intended to facilitate effective comparison of the diagrams and to achieve the targeted level of understanding and comprehension of the system.

Prior knowledge of the models already introduced (especially the E65 and E60) will make it easier to understand the systems presented in this manual and their functions.



Introduction

IKT

Information and Communication Technology

Information and communication technology IKT comprises systems that inform or entertain the driver and passengers. Corresponding to the equipment configuration, the IKT also serves the purpose of making available servicing-relevant data and sending messages in the case of emergency.

For the first time in this vehicle class, a fibre optics-based bus is used for data transmission in information and communication applications (IKT). This bus is the so-called MOSTbus (Media Orientated Systems Transport) as already known from the E65 and E60.

Audio systems

Radios are available that are in part equipped with a CD or MD player. There are also DVD navigation systems which, in addition to navigation, also feature radio, CD and amplifier functions.

The radios and navigation systems can be enhanced with more powerful audio amplifier and speaker systems.

New features/changes include:

- Radio Professional as new radio with MOST capabilities
- Additional audio input for external devices installed as standard
- Playback of MP3 files
- Rod antenna on vehicle roof

Navigation systems

The two available navigation systems Business and Professional are already known from the E60.

This section will deal with the changes in the navigation presentation and system connection.

Telephone systems

The already familiar ULF (SA644 "Universal mobile phone preparation") will be implemented on the BMW 1 Series. This facilitates easy connection of mobile phones with Bluetooth capabilities to the vehicle.

Telematics, TeleService and online functions (e.g. automatic emergency call, BMW Assist

and e-mail) can be realized only in connection with a fixed installation telephone (TCU). They will be available at a later point in time with a new telephone system.

Voice recognition systems

The two available voice recognition systems are also known from the E60. The basic version supports control of the telephone and notebook by means of voice commands. In the expanded version, many of the functions

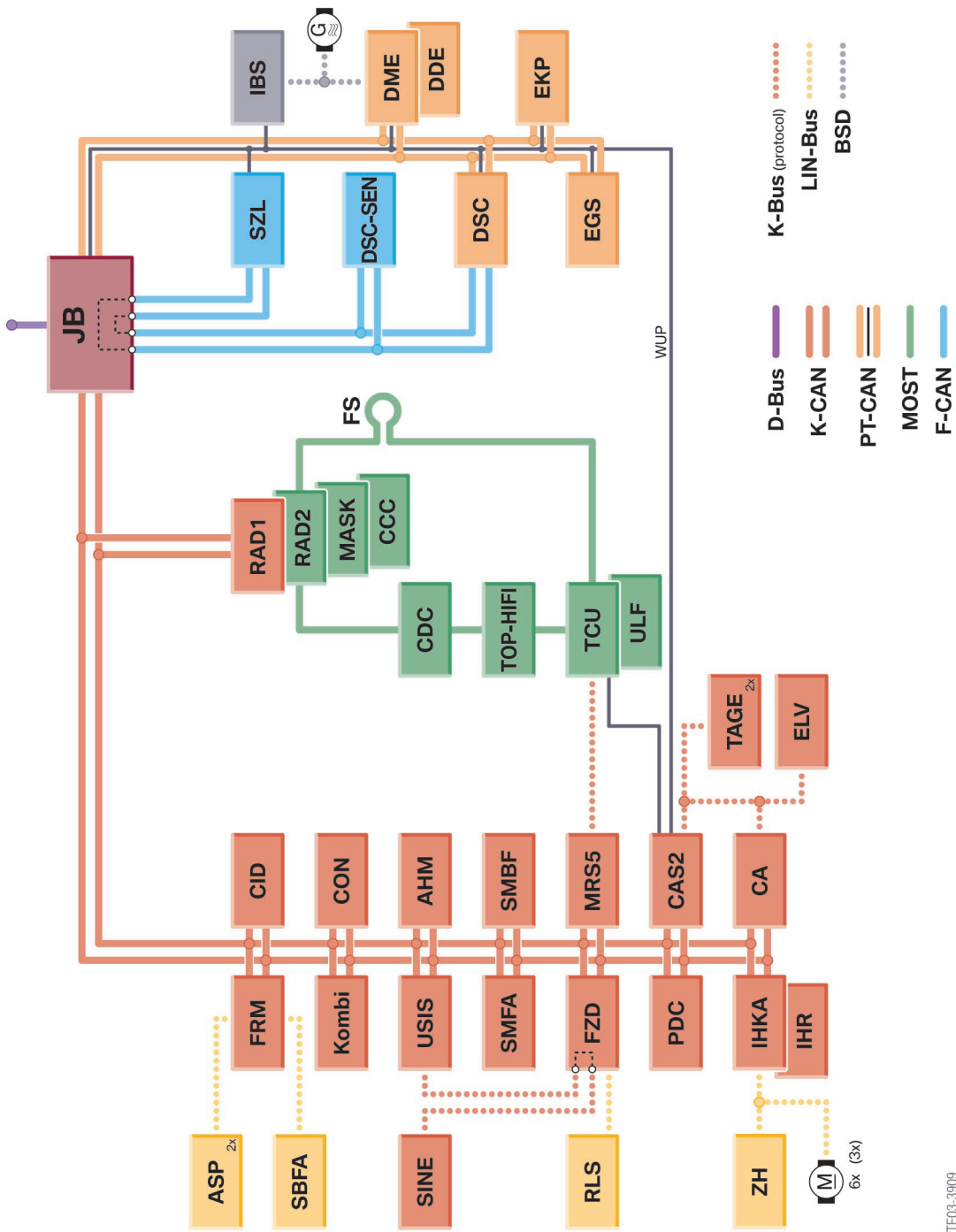
that can be selected in the CID via the iDrive can be controlled with voice commands.



System overview

IKT

Bus overview

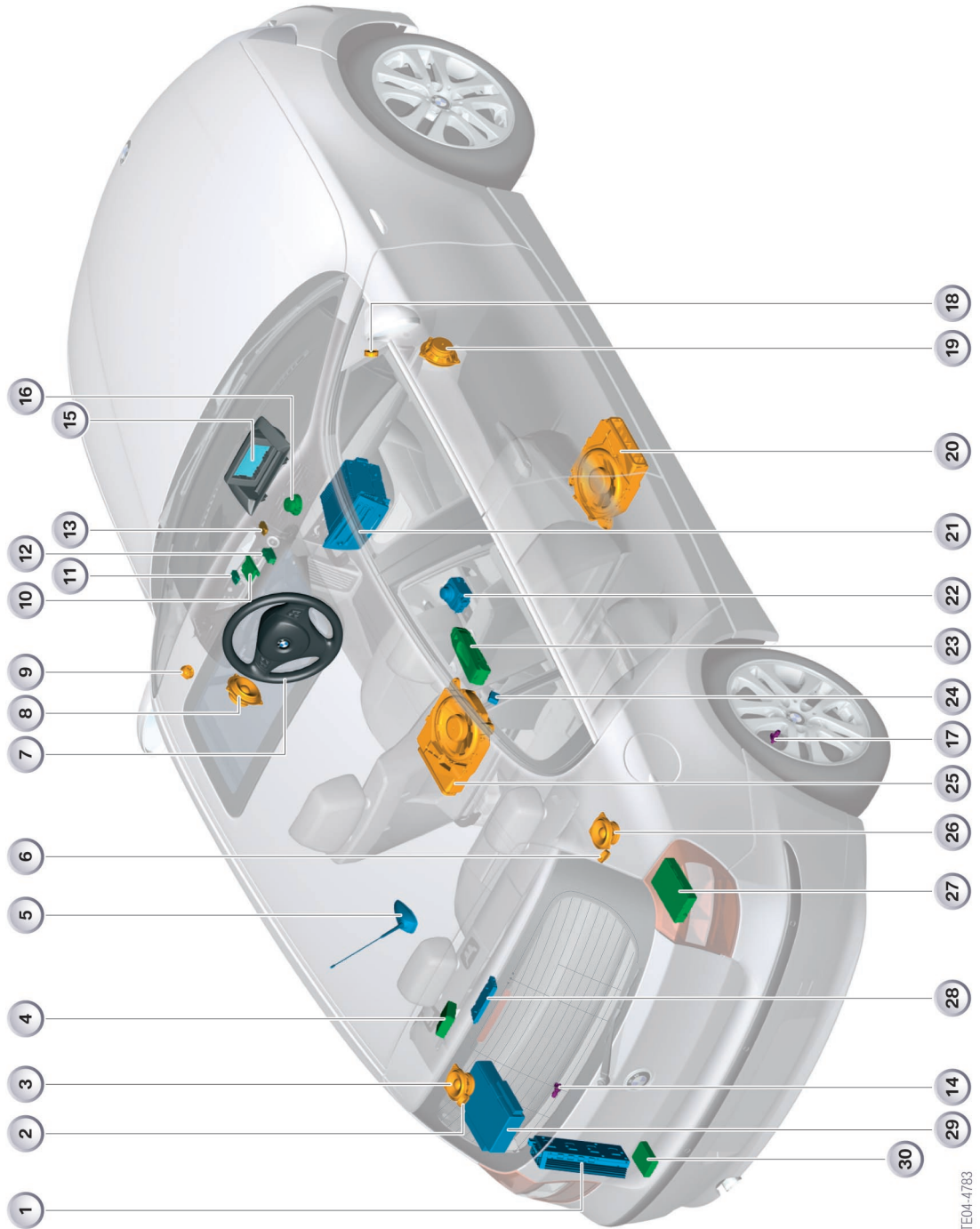


1 - E87 Bus overview (main and sub-busses)

Index	Explanation
FRM	Footwell module
CID	Central information display
Kombi	Instrument cluster
CON	Controller
USIS	Ultrasonic passenger-compartment sensor
AHM	Trailer module
SMFA	Driver's seat module
SMBF	Passenger's seat module
FZD	Roof function centre
MRS5	Multiple restraint system 5
PDC	Park distance control
CAS2	Car access system 2
IHKA	Automatic climate control
IHR	Integrated heating control
CA-SG	Comfort access control unit
RAD1	Radio 1 (radio Audio / radio Business CD)
RAD2	Radio 2 (radio Professional)
M-ASK	Multi-audio system controller
CCC	Car communication computer
CDC	CD changer
TOP-HIFI	Top-HiFi amplifier
TCU	Telematics control unit
ULF	Universal charging and hands-free facility
JB	Junction box
SZL	Steering column switch cluster
DSC-SEN	DSC Sensor
DSC	Dynamic stability control
EGS	Electronic transmission control unit
DME	Digital motor electronics
DDE	Digital diesel electronics
EKP	Control unit for electric fuel pump
ASP	Outside mirrors
SBFA	Driver's door switch cluster
SINE	Siren, interior sensor
RLS	Rain/light sensor
ZH	Electric auxiliary heater based on PTC principle
IBS	Intelligent battery sensor
FS	MOST direct access
WUP	Wake-up line



Locations



2 - Locations of IKT components

TE04-4783

Index	Explanation	Index	Explanation
1	Audio amplifier (HiFi or Top-HiFi)	16	Emergency speaker (only in connection with TCU)
2	Tweeter, rear left	17	Wheel speed sensor, right wheel arch
3	Broadband or mid-range speaker, rear left	18	Tweeter, front right
4	Emergency call antenna, rear left wheel arch (only in connection with TCU)	19	Broadband or mid-range speaker, front right
5	Roof antenna (AM, FM1, GPS, telephone)	20	Central bass speaker, right
6	Tweeter, rear right	21	Radio or navigation system
7	Multifunction steering wheel (MFL)	22	Controller
8	Broadband or mid-range speaker, front left	23	Telephone with snap-in adapter
9	Tweeter, front left	24	Audio jack (AUX-In)
10	Bluetooth antenna	25	Central bass speaker, left
11	Microphone, driver's side (telephone)	26	Broadband or mid-range speaker, rear right
12	Emergency call button (only in connection with TCU)	27	Universal charging and hands-free kit (ULF) or telematics control unit (TCU)
13	Microphone, passenger's side (voice recognition system)	28	Antenna amplifier with diversity module
14	Wheel speed sensor, left wheel arch	29	CD changer (CDC)
15	Central information display (CID)	30	Line compensator (optional)

Audio systems

Input/output diagram

Stereo

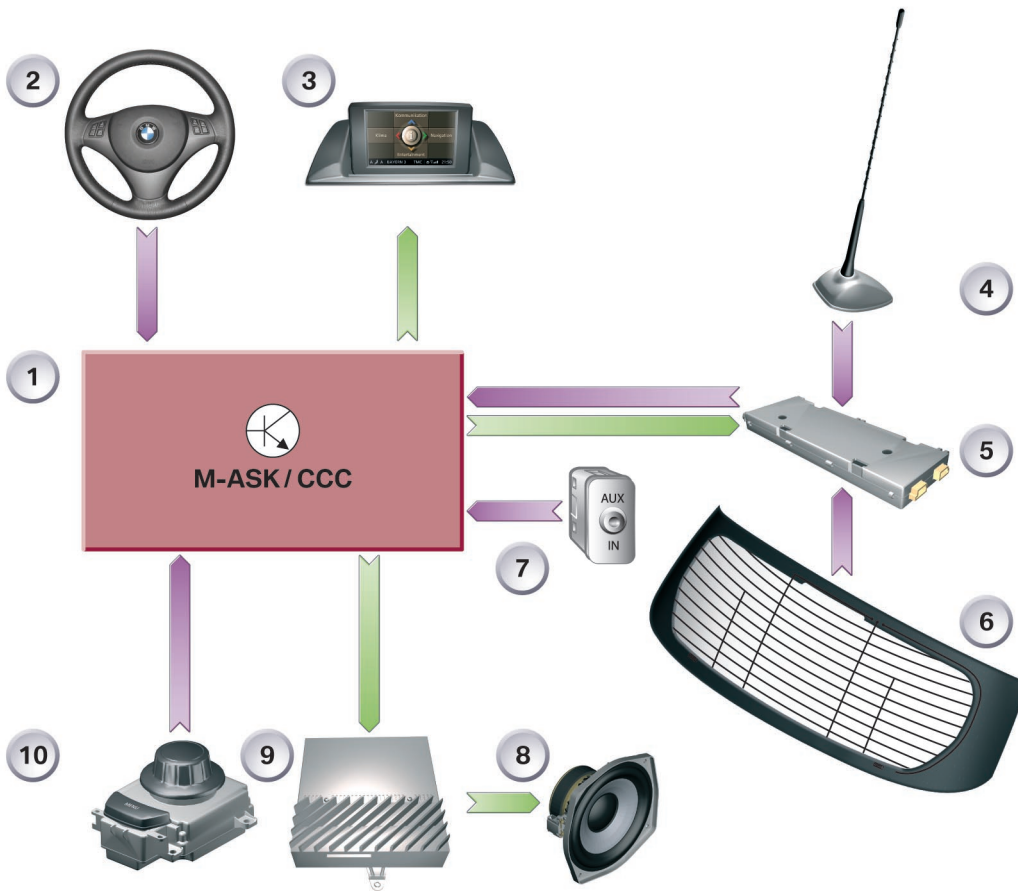


3 - Stereo system with radio Audio

TE04-4775

Index	Explanation	Index	Explanation
1	Radio Audio	4	Audio jack (AUX-In)
2	Multifunction steering wheel (MFL)	5	Audio speaker
3	Roof antenna (AM, FM1)		

HiFi and Top-HiFi



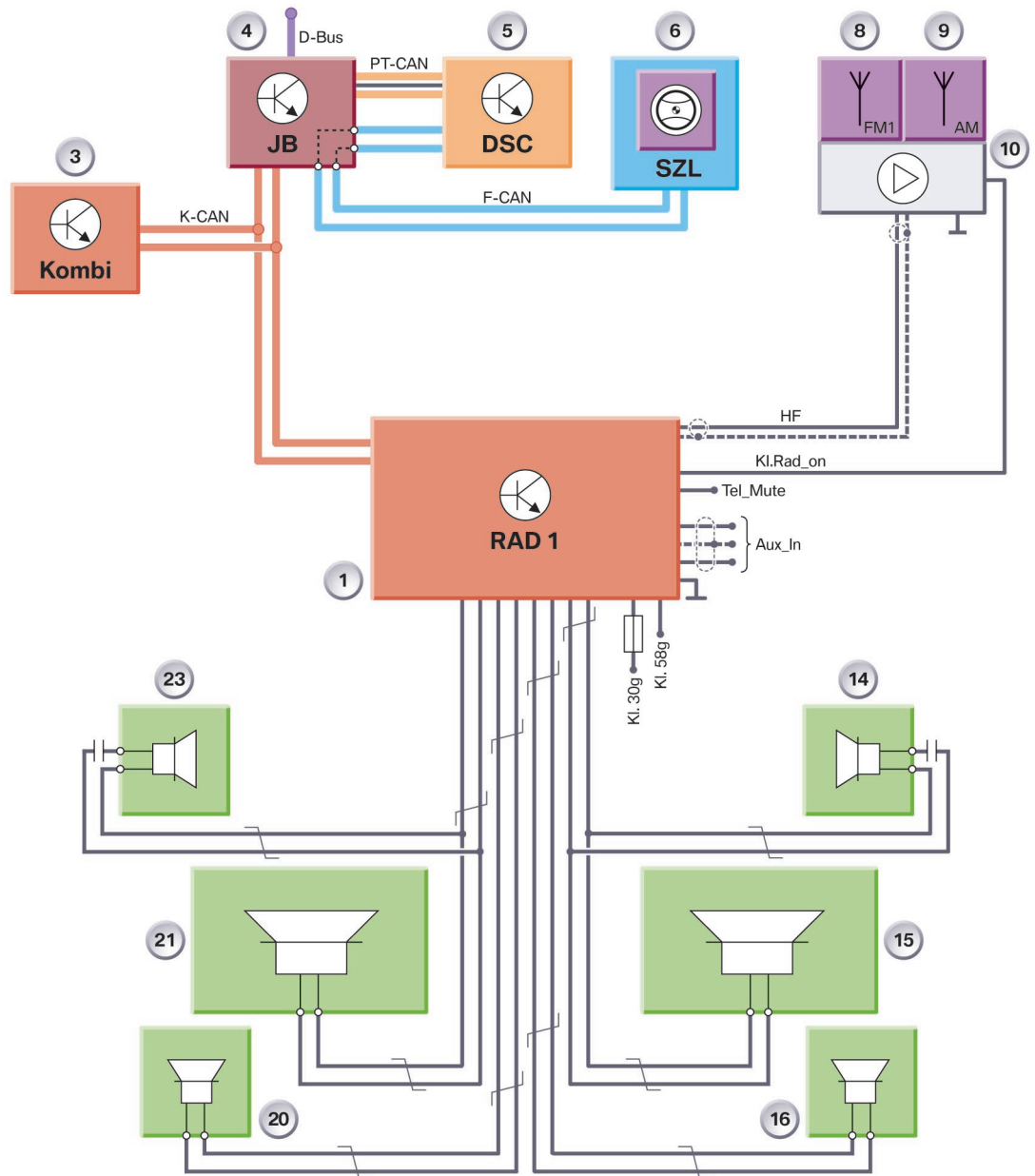
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4 - HiFi system with navigation system Business or Professional

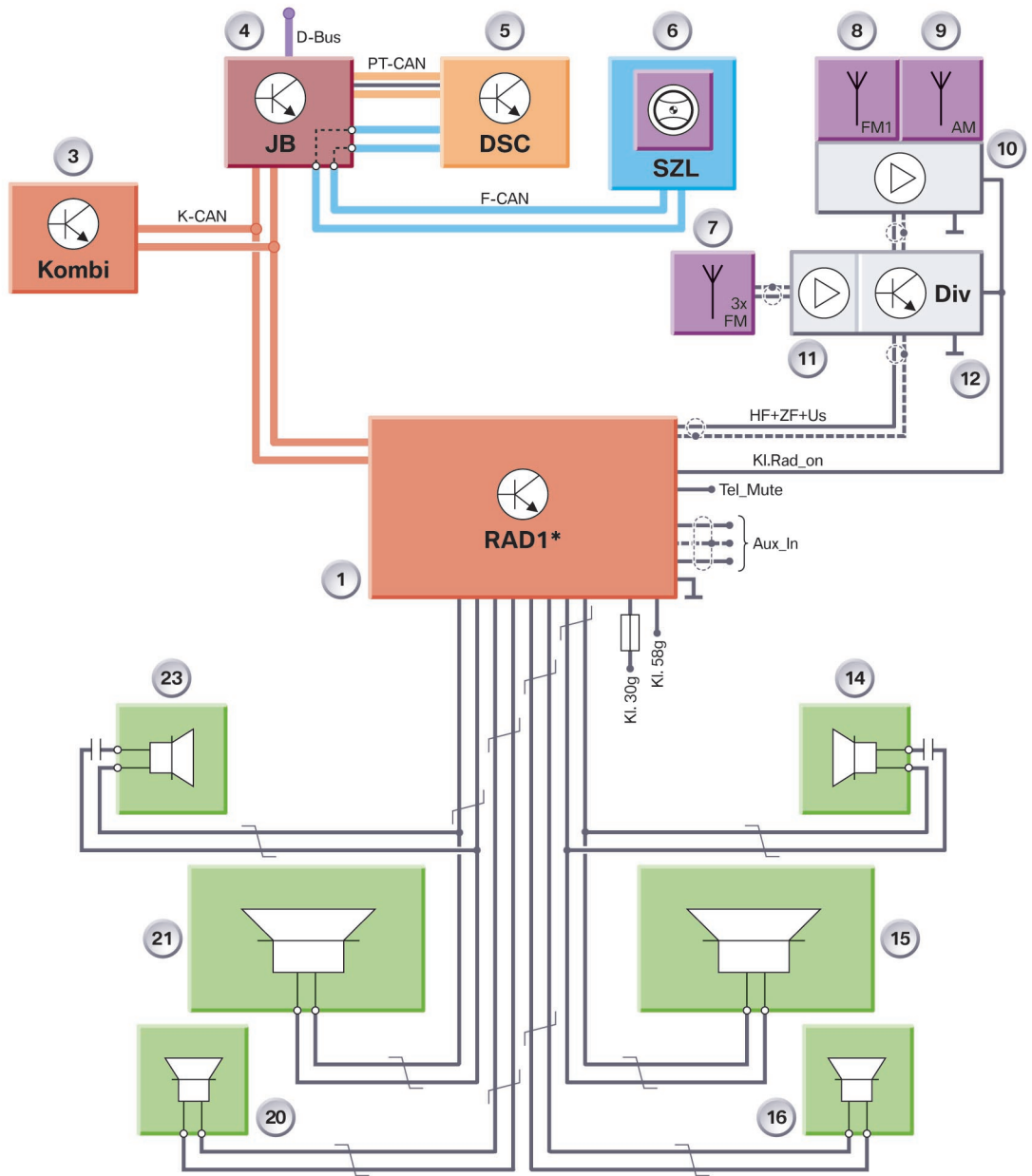
Index	Explanation	Index	Explanation
1	Navigation system Business (M-ASK) or Professional (CCC)	6	Rear window antennas (FM2, FM3, FM4)
2	Multifunction steering wheel (MFL)	7	Audio jack (AUX-In)
3	Central information display (CID)	8	Audio speaker
4	Roof antenna (AM/FM1)	9	Audio amplifier (HiFi or Top-HiFi)
5	Antenna amplifier with diversity module	10	Controller

System circuit diagram

Stereo



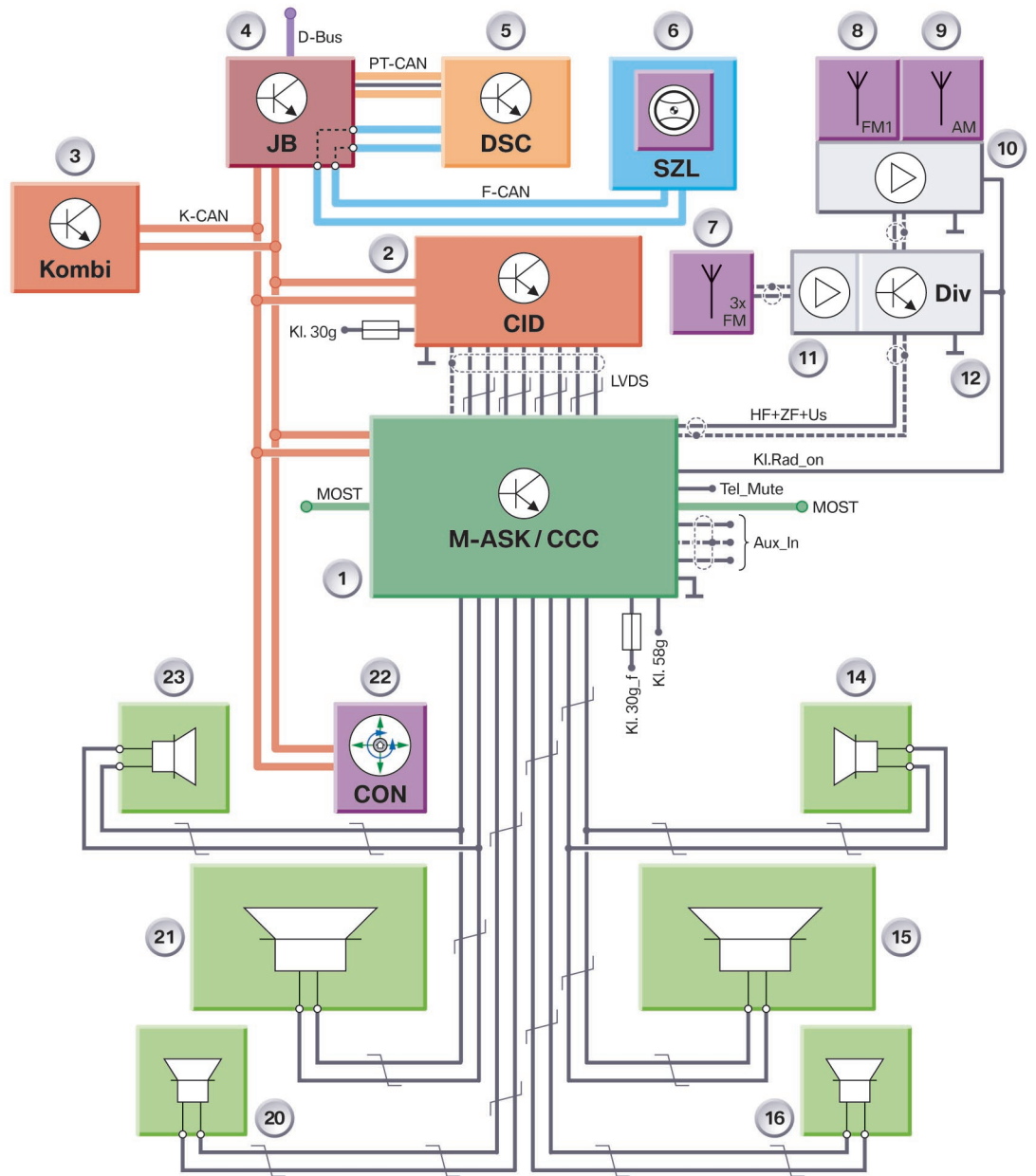
Index	Explanation	Index	Explanation
1	Radio Audio	10	RF amplifier in antenna base, separate for AM and FM1
3	Instrument cluster	14	Broadband speaker, front right
4	Junction box	15	Central bass speaker, right
5	Dynamic stability control	16	Broadband speaker, rear right
6	Steering column switch cluster	20	Broadband speaker, rear left
8	FM1 antenna (roof antenna)	21	Central bass speaker, left
9	AM antenna (roof antenna)	23	Broadband speaker, front left
Aux_In	Audio input for additional audio sources	Kl. Rad_on	Control signal or power supply
Tel_Mute	Radio muting during telephone operation	HF	High frequency signal



6 - Stereo system with radio Business CD

TE03-4077

Index	Explanation	Index	Explanation
1	Radio Business CD	11	RF amplifier in diversity module
3	Instrument cluster	12	Diversity module
4	Junction box	14	Broadband speaker, front right
5	Dynamic stability control	15	Central bass speaker, right
6	Steering column switch cluster	16	Broadband speaker, rear right
7	FM2, FM3, FM4 antenna (rear window)	20	Broadband speaker, rear left
8	FM1 antenna (roof antenna)	21	Central bass speaker, left
9	AM antenna (roof antenna)	23	Broadband speaker, front left
10	RF amplifier in antenna base, separate for AM and FM1		
Aux_In	Audio input for additional audio sources	HF	High frequency signal
Tel_Mute	Radio muting during telephone operation	ZF	Intermediate frequency signal
Kl. Rad_on	Control signal or power supply	Us	Changeover voltage, AM/FM antenna diversity mode

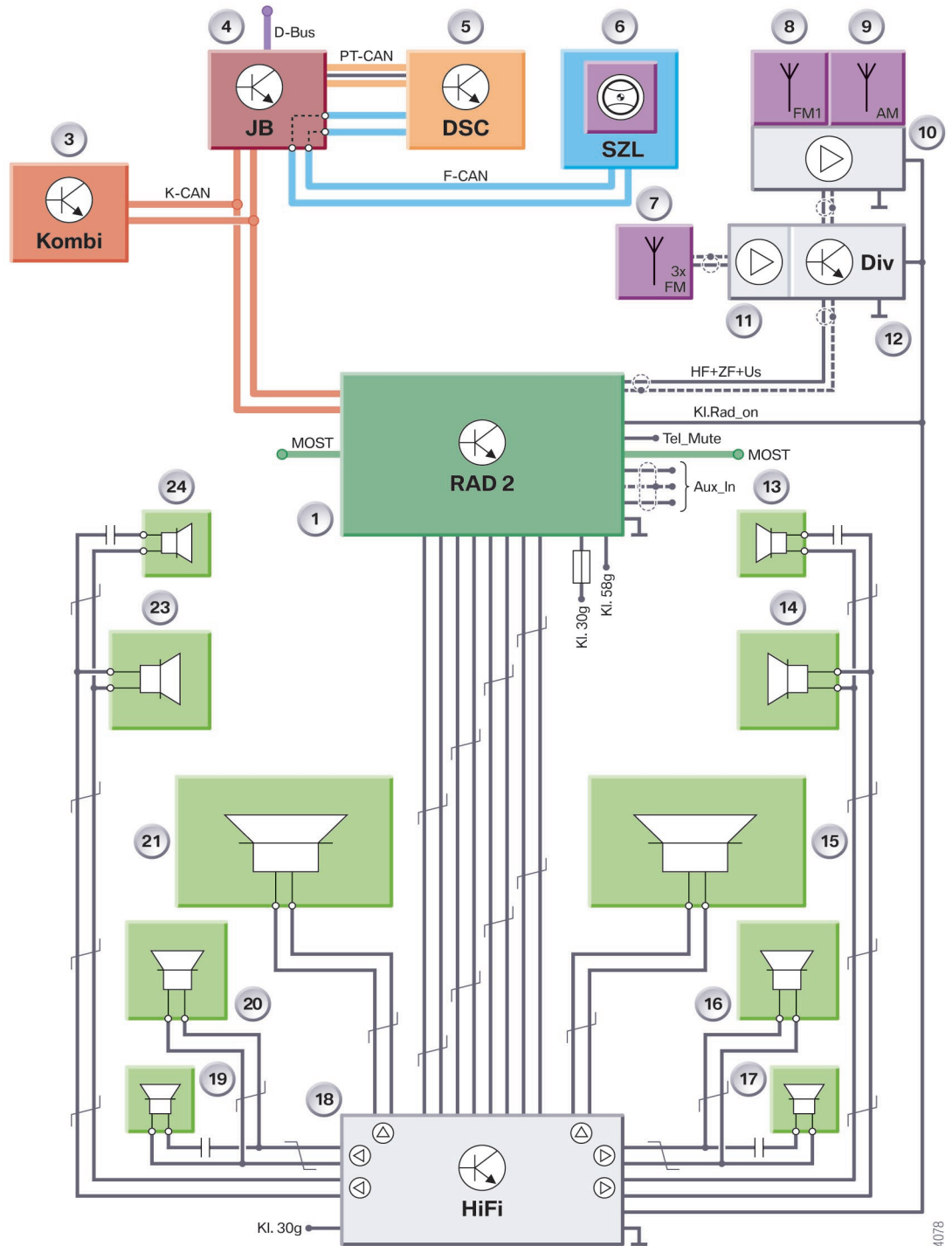


7 - Stereo system with navigation system Business or Professional

TE04-4761

Index	Explanation	Index	Explanation
1	M-ASK: Navigation system Business CCC: Navigation system, Professional	11	RF amplifier in diversity module
2	Central information display	12	Diversity module
3	Instrument cluster	14	Broadband speaker, front right
4	Junction box	15	Central bass speaker, right
5	Dynamic stability control	16	Broadband speaker, rear right
6	Steering column switch cluster	20	Broadband speaker, rear left
7	FM2, FM3, FM4 antenna (rear window)	21	Central bass speaker, left
8	FM1 antenna (roof antenna)	22	Controller
9	AM antenna (roof antenna)	23	Broadband speaker, front left
10	RF amplifier in antenna base, separate for AM and FM1		
LVDS	Low voltage differential signal	MOST	Media orientated system transport (digital bus)
Aux_In	Audio input for additional audio sources	HF	High frequency signal
Tel_Mute	Radio muting during telephone operation	ZF	Intermediate frequency signal
Kl. Rad_on	Control signal or power supply	Us	Changeover voltage, AM/FM antenna diversity mode

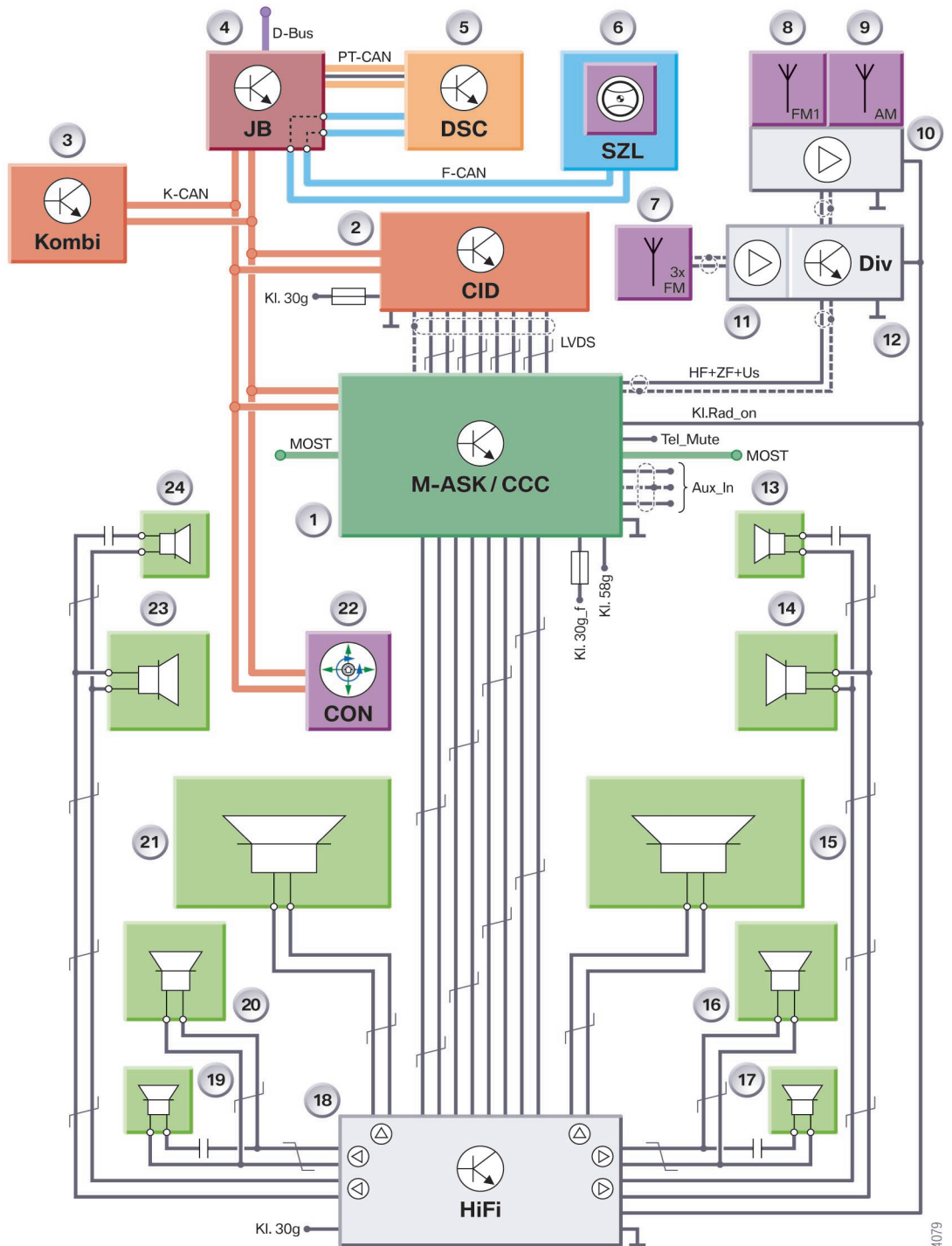
HiFi



TE03-4078

8 - HiFi system with radio Professional

Index	Explanation	Index	Explanation
1	Radio Professional	13	Tweeter, front right
3	Instrument cluster	14	Mid-range speaker, front right
4	Junction box	15	Central bass speaker, right
5	Dynamic stability control	16	Mid-range speaker, rear right
6	Steering column switch cluster	17	Tweeter, rear right
7	FM2, FM3, FM4 antenna (rear window)	18	HiFi amplifier
8	FM1 antenna (roof antenna)	19	Tweeter, rear left
9	AM antenna (roof antenna)	20	Mid-range speaker, rear left
10	RF amplifier in antenna base, separate for AM and FM1	21	Central bass speaker, left
11	RF amplifier in diversity module	23	Mid-range speaker, front left
12	Diversity module	24	Tweeter, front left
Aux_In	Audio input for additional audio sources	MOST	Media orientated system transport (digital bus)
Tel_Mute	Radio muting during telephone operation	HF	High frequency signal
Kl. Rad_on	Control signal or power supply	ZF	Intermediate frequency signal
Us	Changeover voltage, AM/FM antenna diversity mode		

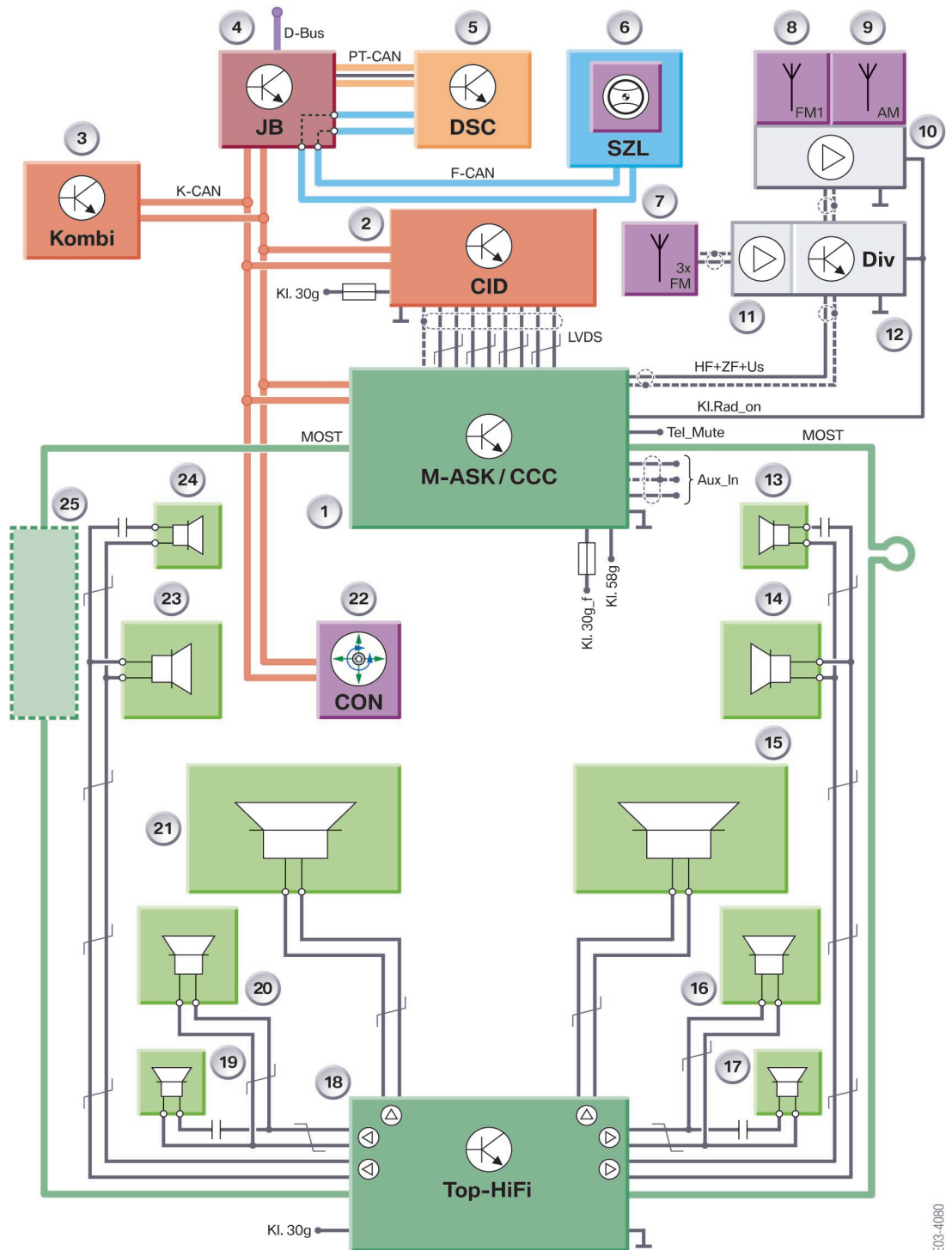


TE03-4079

9 - HiFi system with navigation system Business or Professional

Index	Explanation	Index	Explanation
1	M-ASK: Navigation system Business CCC: Navigation system, Professional	13	Tweeter, front right
2	Central information display	14	Mid-range speaker, front right
3	Instrument cluster	15	Central bass speaker, right
4	Junction box	16	Mid-range speaker, rear right
5	Dynamic stability control	17	Tweeter, rear right
6	Steering column switch cluster	18	HiFi amplifier
7	FM2, FM3, FM4 antenna (rear window)	19	Tweeter, rear left
8	FM1 antenna (roof antenna)	20	Mid-range speaker, rear left
9	AM antenna (roof antenna)	21	Central bass speaker, left
10	RF amplifier in antenna base, separate for AM and FM1	22	Controller
11	RF amplifier in diversity module	23	Mid-range speaker, front left
12	Diversity module	24	Tweeter, front left
LVDS	Low voltage differential signal	MOST	Media orientated system transport (digital bus)
Aux_In	Audio input for additional audio sources	HF	High frequency signal
Tel_Mute	Radio muting during telephone operation	ZF	Intermediate frequency signal
Kl. Rad_on	Control signal or power supply	Us	Changeover voltage, AM/FM antenna diversity mode

Top-HiFi



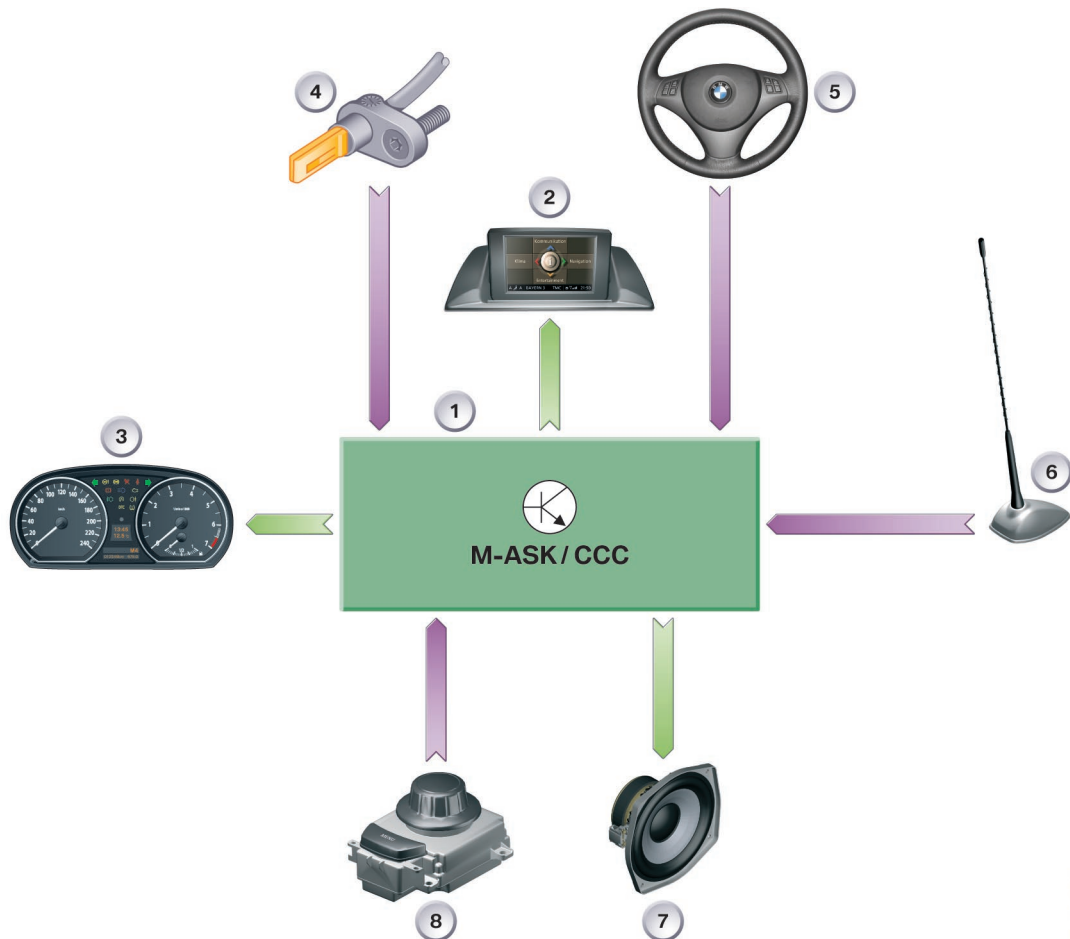
10 - Top-HiFi system with navigation system Business or Professional

TE03-4080

Index	Explanation	Index	Explanation
1	M-ASK: Navigation system Business CCC: Navigation system, Professional	14	Mid-range speaker, front right
2	Central information display	15	Central bass speaker, right
3	Instrument cluster	16	Mid-range speaker, rear right
4	Junction box	17	Tweeter, rear right
5	Dynamic stability control	18	Top-HiFi amplifier
6	Steering column switch cluster	19	Tweeter, rear left
7	FM2, FM3, FM4 antenna (rear window)	20	Mid-range speaker, rear left
8	FM1 antenna (roof antenna)	21	Central bass speaker, left
9	AM antenna (roof antenna)	22	Controller
10	RF amplifier in antenna base, separate for AM and FM1	23	Mid-range speaker, front left
11	RF amplifier in diversity module	24	Tweeter, front left
12	Diversity module	25	MOST components (optional)
13	Tweeter, front right	LVDS	Low voltage differential signal
FS	MOST direct access	MOST	Media orientated system transport (digital bus)
Aux_In	Audio input for additional audio sources	HF	High frequency signal
Tel_Mute	Radio muting during telephone operation	ZF	Intermediate frequency signal
Kl. Rad_on	Control signal or power supply	Us	Changeover voltage, AM/FM antenna diversity mode

Navigation systems

Input/output diagram

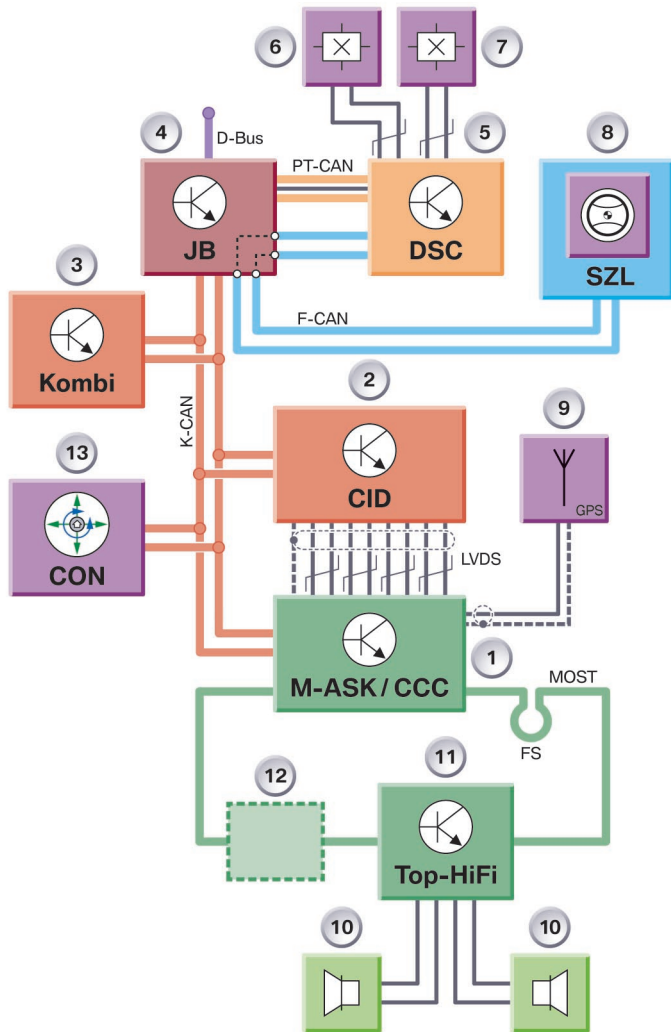


11 - Navigation system Business or Professional

TE04-4801

Index	Explanation	Index	Explanation
1	Navigation system Business (M-ASK) or Professional (CCC)	5	Multifunction steering wheel (MFL)
2	Central information display (CID)	6	GPS antenna
3	Instrument cluster	7	Audio speaker
4	Wheel speed sensor (2x)	8	Controller

System circuit diagram



TE04-4860

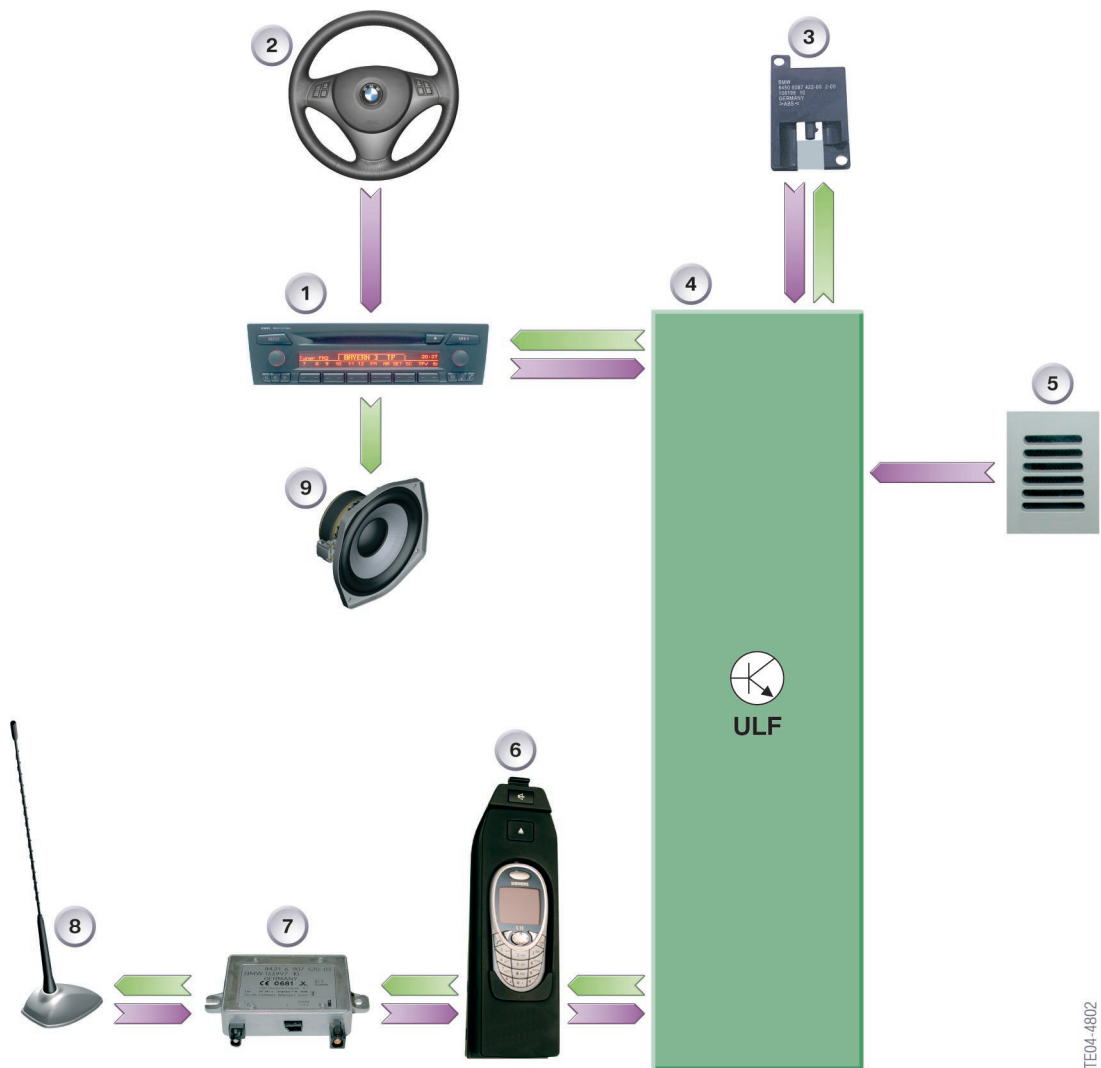
12 - Navigation system
Business or Professional

Index	Explanation	Index	Explanation
1	Navigation system Business or Professional	8	Steering column switch cluster
2	Central information display	9	GPS antenna
3	Instrument cluster	10	Audio speaker
4	Junction box	11	Audio amplifier
5	Dynamic stability control	12	MOST components (optional)
6	Wheel speed sensor, left	13	Controller
7	Wheel speed sensor, right	LVDS	Low voltage differential signal (digital RGB signal)
FS	MOST direct access	MOST	Media orientated system transport (digital bus)

Telephone systems

Input/output diagram


SA644 "Universal mobile phone preparation"



13 - Universal mobile phone preparation

TE04-4802

Index	Explanation	Index	Explanation
1	Radio Professional	6	Telephone with snap-in adapter
2	Multifunction steering wheel (MFL)	7	Line compensator
3	Bluetooth antenna	8	Telephone antenna
4	Universal charging and hands-free facility (ULF)	9	Audio speaker
5	Microphone, driver's side (telephone)		

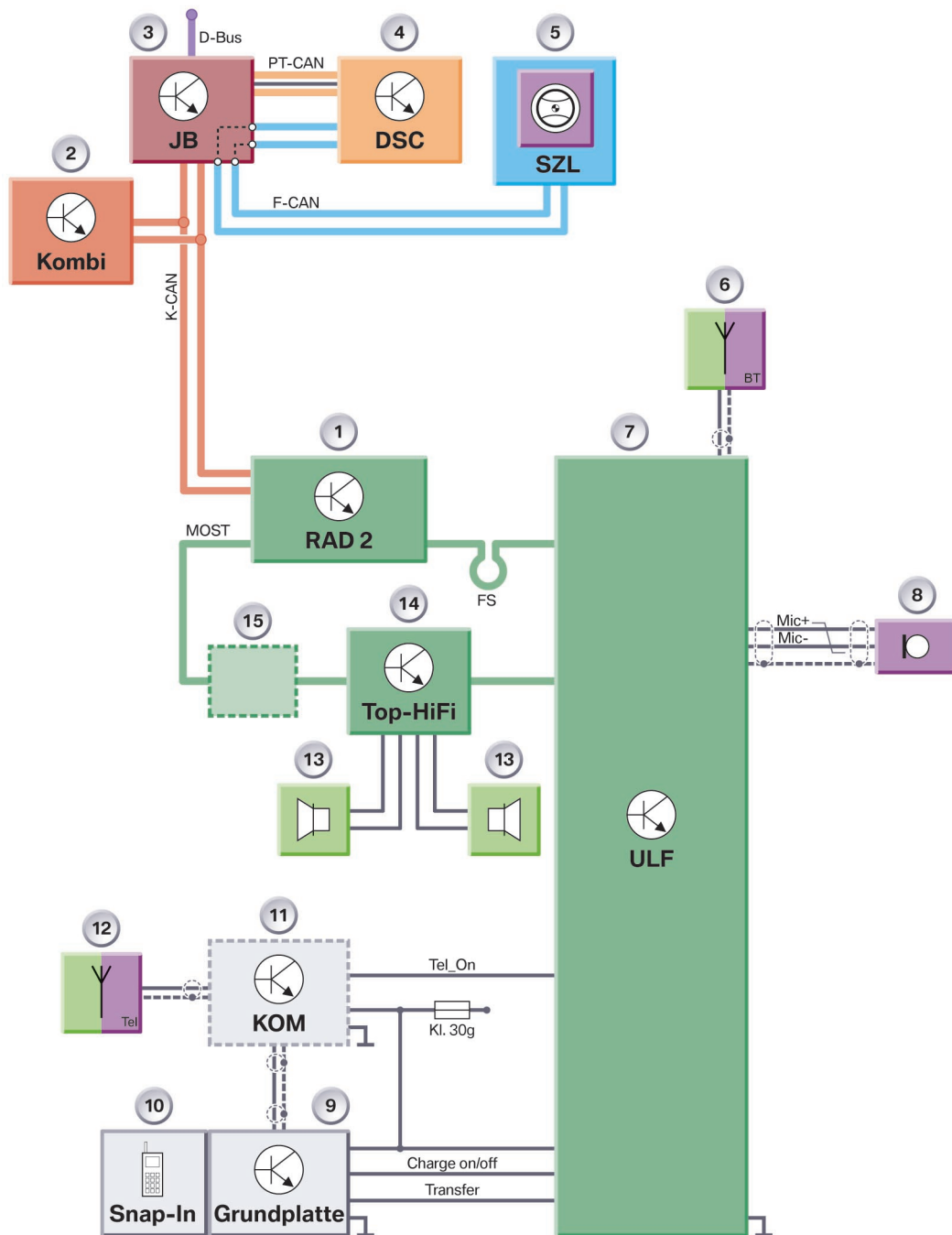


Here the radio Professional serves as an example also for the navigation systems

Business or Professional (with controller and CID).

System circuit diagram

SA644 "Universal mobile phone preparation"



14 - Universal mobile phone preparation

TE03-4120

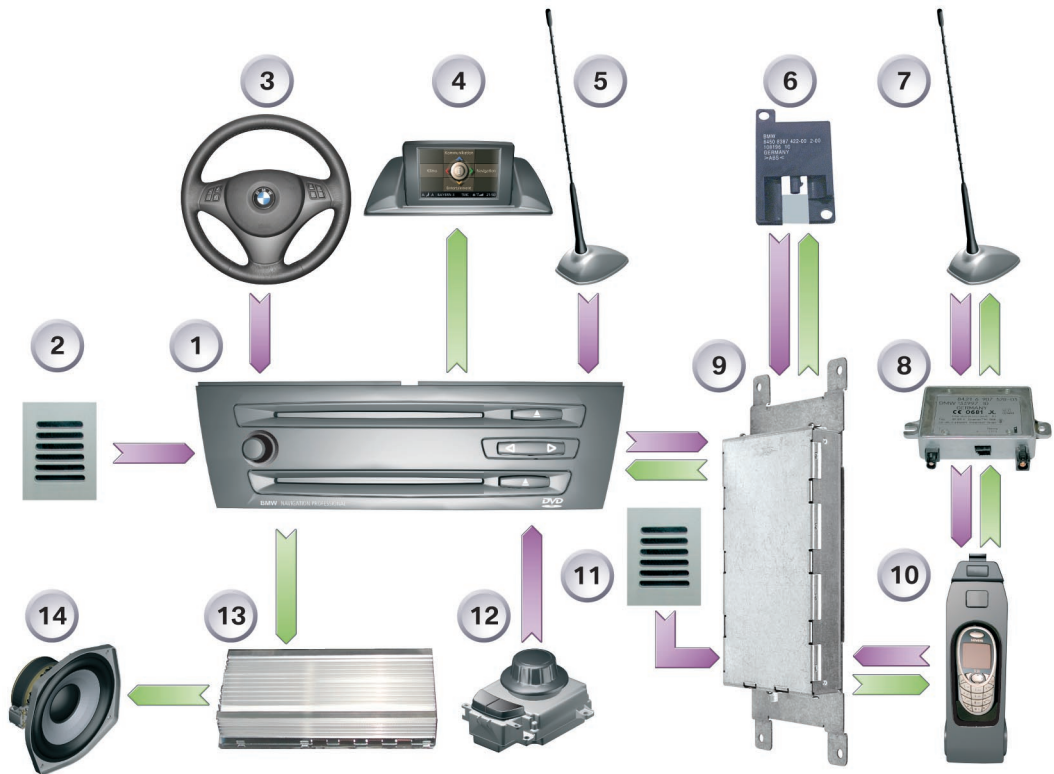
Index	Explanation	Index	Explanation
1	Radio Professional	9	Eject box
2	Instrument cluster	10	Snap-in adapter
3	Junction box	11	Line compensator
4	Dynamic stability control	12	Telephone antenna
5	Steering column switch cluster	13	Audio speaker
6	Bluetooth antenna	14	Audio amplifier
7	Universal charging and hands-free facility	15	MOST components (optional)
8	Microphone, driver's side (telephone)	Tel_On	Telephone signal for muting audio system
Mic+	Microphone, positive	Mic-	Microphone, negative
Transfer	Switchover between privacy mode and hands-free	Charge on/off	Telephone charging function
FS	MOST direct access	MOST	Media orientated system transport (digital bus)

Here the radio Professional serves as an example also for the navigation systems

Business or Professional (with controller and CID).

Voice recognition systems

Input/output diagram



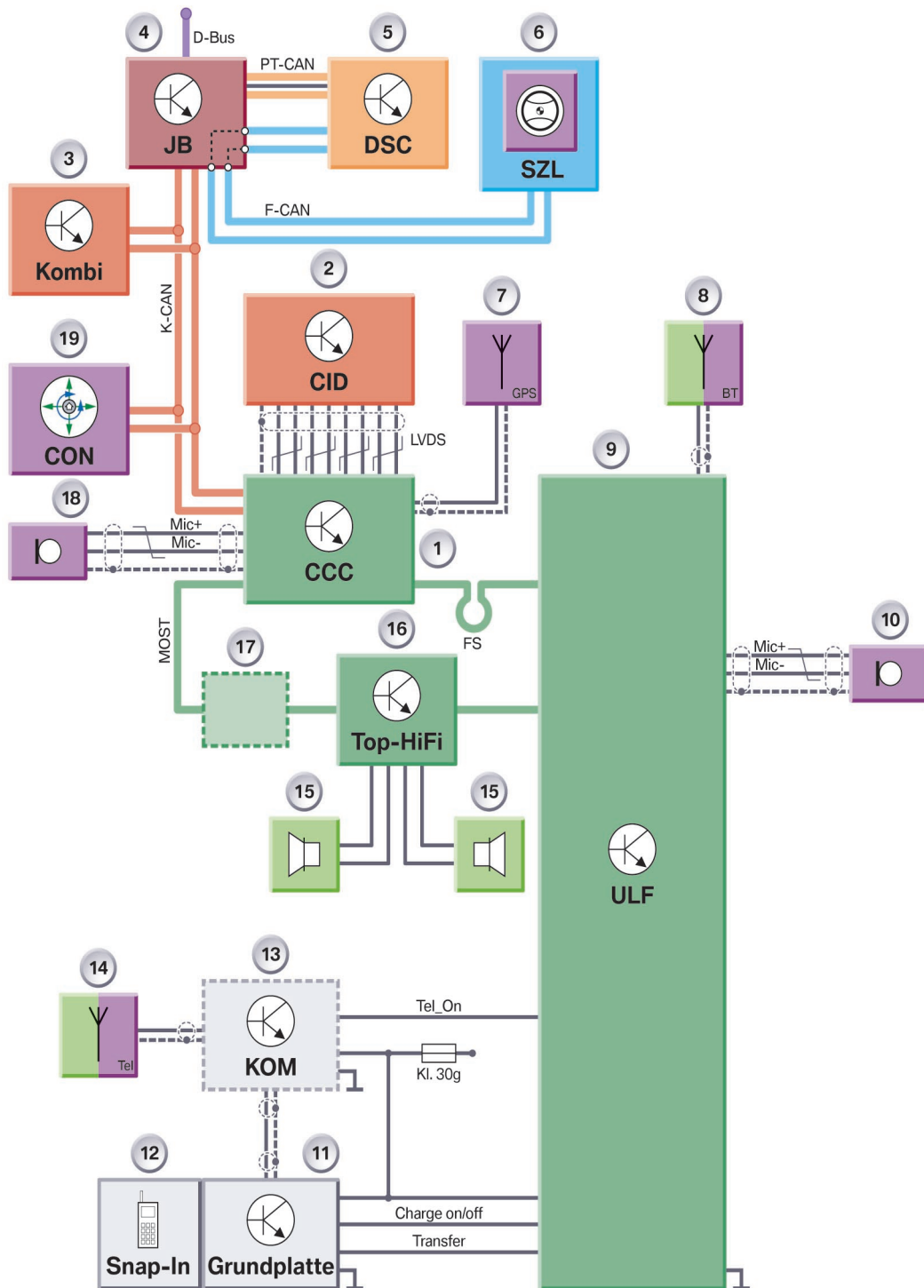
TE04-4896

15 - Voice recognition systems

Index	Explanation	Index	Explanation
1	Navigation system Professional (CCC)	8	Compensator
2	Microphone, passenger's side (voice recognition system)	9	Universal charging and hands-free facility (ULF)
3	Multifunction steering wheel (MFL)	10	Telephone with snap-in adapter
4	Central information display (CID)	11	Microphone, driver's side (telephone)
5	GPS antenna	12	Controller
6	Bluetooth antenna	13	Audio amplifier
7	Telephone antenna	14	Audio speaker



System circuit diagram



16 - Voice control system

TE04-4895

Index	Explanation	Index	Explanation
1	Navigation system, Professional	11	Eject box
2	Central information display	12	Snap-in adapter
3	Instrument cluster	13	Line compensator
4	Junction box	14	Telephone antenna
5	Dynamic stability control	15	Audio speaker
6	Steering column switch cluster	16	Audio amplifier
7	GPS antenna	17	MOST components (optional)
8	Bluetooth antenna	18	Microphone, passenger's side (voice recognition system)
9	Universal charging and hands-free facility	19	Controller
10	Microphone, driver's side (telephone)		
Mic+	Microphone, positive	Mic-	Microphone, negative
Transfer	Switchover between privacy mode and hands-free	Charge on/off	Telephone charging function
Tel_On	Telephone signal for muting audio system	LVDS	Low voltage differential signal (digital RGB signal)
FS	MOST direct access	MOST	Media orientated system transport (digital bus)



Audio systems

This section describes the audio systems in the E87. It is divided into the following chapters:

- Radios
- Amplifiers and speakers
- Antennas
- Peripherals (CD changer, audio socket (jack))






The radios and navigation systems with integrated audio function can be combined with the stereo, HiFi and Top-HiFi speaker systems.

Radios

Overview

The following table provides an overview of the audio features of the radios and navigation systems available for selection.

More detailed information than in the table is provided in the following chapters.

	Radio Audio	Radio Business CD	Radio Professional	Navigation Business	Navigation Professional
	SA667	SA662	SA663	SA606	SA609
					
Designation	RD-72	CD-72	CD-73, MD-73	M-ASK	CCC
Display	Single-line	Single-line	Two-line	CID 6.5"	CID 6.5"
Manufacturer	Visteon	Visteon	Alpine	Harman/Becker	Siemens VDO
Bus connection	K-bus	K-bus	K-bus, MOST	K-bus, MOST	K-bus, MOST
AM tuner range	Single LW,MW	Single LW,MW	Single LW,MW	Single LW,MW,SW	Single LW,MW,SW
FM tuner (RDS)	Single	Single	Single	Double	Double
FM diversity	---	✓	✓	✓	✓
CD	---	✓	✓	---	✓
MD (instead of CD)	---	---	✓	---	✓ (Japan only)
DVD	---	---	---	✓	✓
MP3 playback	---	---	✓	Planned	Planned
Audio jack	✓	✓	✓	✓	✓
AUX level matching	✓	✓	✓	---	---
Top-HiFi operation	---	---	✓	✓	✓
Telephone operation	---	---	✓	✓	✓
CD changer operation	---	---	✓	✓	✓

The radios are options on the BMW 1 Series. If no radio is installed, the simplest roof antenna (AM/FM1 rod antenna) will still be installed for design reasons. Corresponding covers will then close off the speaker apertures under the seats and in the doors. The empty housings of the central bass

speakers extending to the side sills are also closed off. A radio preparation (wiring harness) cannot be ordered.

Radio Audio Radio Business CD



TE04-4451

1 - Radio Audio



TE04-4452

2 - Radio Business CD

In terms of function and operation, the radios Audio and Business CD correspond to the radios as known, for example, from the E45. Supplementary information on the features specified in the table:

- Since these radios do not have a digital sound processor (DSP) for generating sound, they also do not support signal generation functions as necessary, for example for the park distance control system (PDC). In this case, the signal sounds are generated by the corresponding control units themselves. In connection with PDC, the PDC control unit is responsible for generating sound/control.
- The radios Audio and Business CD are not world radios. The frequency bands Oceania and Japan are not supported.

Radio Professional



3 - Radio Professional

The radio Professional is a new radio for the MOST system network. In addition to the M-ASK and CCC, it serves as a further MOST master. In the same way as the two navigation systems Business and Professional, it represents the gateway between the K-CAN and MOST bus.

Playback of MP3/WMA

In addition to standard audio CDs, the CD player can play back CDs with compressed audio files (MP3/WMA). Information such as folder name, music track or artist are represented with 8 characters. Detailed information based on ID3 tags can also be represented. ID3 tags contain additional information that is added to the music data.

What is MP3?

- MP3 stands for MPEG Layer 3 (MPEG = Moving Pictures Expert Group)
- MP3 is a music compression process that was originally designed for digital sound or image transmission (MPEG 1 or 2)

- It requires 8 to 12 times less storage space for virtual CD quality. Approximately 10 audio CDs in compressed form can be stored on a standard 640 MB data CD.
- MP3 was developed by the German Fraunhofer Institute for integrated circuits (Fraunhofer IIS Audio)

What is WMA?

- As MP3, Windows Media Audio (WMA) is a compression method for audio data that produces a sound with more details than MP3 at low bit rates (up to approx. 112 kbit/s).

Note: It may take up to 20 seconds to read in the data depending on the directory and data structure. The directory structure corresponds to that of the PC. Interlacing is possible to a depth of up to 7 directory levels. A maximum of 256 directories and a total of 999 music tracks can be managed per CD.

Navigation system Business



4 - Navigation system Business

The navigation system Business is based on the M-ASK (multi-audio system controller) whose functions are already known from the E60.

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

- Navigation computer and GPS module; arrow view in CID
- RDS double tuner
- Audio system controller (ASK)
- Gateway between MOST and K-CAN bus
- Interface to control display (LVDS)

The integrated DVD player is necessary for navigation. The necessary data are read by the

navigation DVD and stored after programming in the RAM (Random Access Memory) of the M-ASK (memory navigation). After entering the destination, the DVD player can be used to play audio CDs.

Together with the controller and CID, the M-ASK forms the iDrive system. The system can be used to control:

- Communication
- Entertainment
- Navigation
- Climate

Navigation system Professional



5 - Navigation system Professional

The navigation system Professional is based on the CCC (car communication computer) whose functions are already known from the E60.

The CCC combines the following control units in one housing:

- Navigation computer/GPS module; map presentation or arrow mode in CID
- RDS double tuner
- Audio system controller (ASK)
- MOST-CAN gateway
- Interface to control display (LVDS)

Two player drives are integrated in the housing

- DVD player
- CD player

The Japan country-specific version additionally offers:

- MD player instead of CD player
- Calculation and image preparation of the Japan navigation data by means of a separate navigation computer in the luggage compartment

When the navigation system is not used, the installed DVD player can be used to play audio CDs.

Together with the controller and CID, the CCC also forms the iDrive system (see navigation system Business).



Amplifiers and speakers

System concept

The audio systems in the E87 follow the already familiar principle of the 3 quality stages:

- Stereo system
- HiFi system
- Top-HiFi system

In addition to the higher achievable sound pressure, the audio systems are also distinguished by the improved system linearity. For the customer, the additional features such as the 7-band graphic equalizer

and the spatial sound (Logic7) provide both visible as well as audible added value.

The stereo system comprises 6 speakers while the HiFi/Top-HiFi system consists of 10 speakers and various additional amplifiers.

The central basses are located under the front seats. They are coupled to the side sills, thus enlarging the resonance volume necessary for bass reproduction.

The following table outlines the possible combinations of the radios, navigation systems with the speaker/amplifier systems:

	Stereo	HiFi	Top-HiFi
	Standard equipment when radio installed	SA676 "HiFi speaker system"	SA677 "HiFi system Professional"
Radio Business	✓	✓	---
Radio Professional	✓	✓	✓
Navigation system Business	✓	✓	✓
Navigation system, Professional	✓	✓	✓

The stereo, HiFi and Top-HiFi systems exhibit different performance features in terms of symmetry of the sound field, sound pressure and linearity of the frequency response.

As on the E83, a broadband speaker is used in the stereo system for the high and mid-ranges. A separate tweeter is not installed. Instead, separate speakers are installed for the high and mid-ranges in the HiFi and Top-HiFi systems.

Even though the diameters of the speakers in the HiFi and Top-HiFi systems are the same, there are differences in the output of the speakers. This is achieved by the use of different materials for the diaphragms, coils, magnets etc. To distinguish between them, the designations Medium and High are used in the table below.

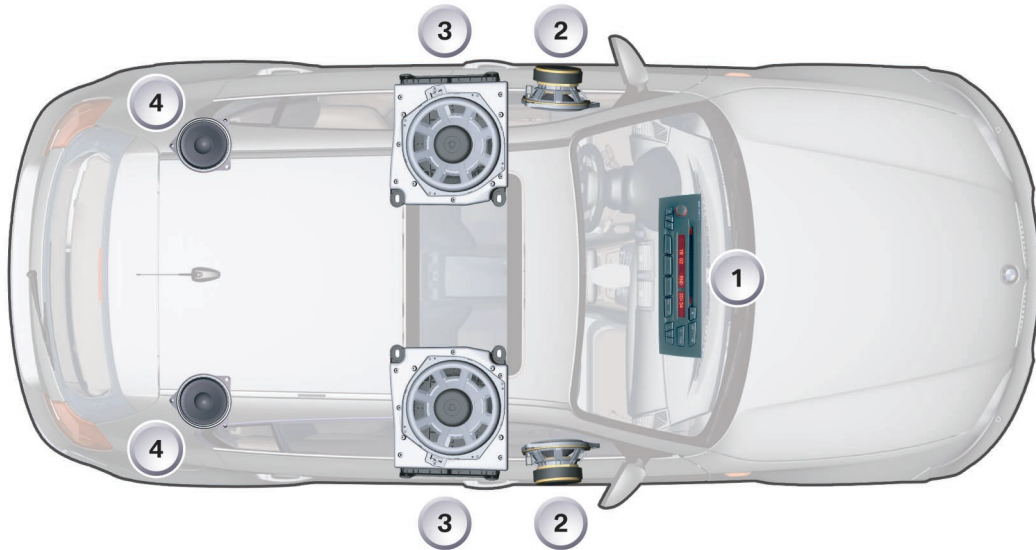


	Stereo	HiFi	Top-HiFi
Output	Radios: 4*15W (4Ω) M-ASK: 4*40W (2Ω) CCC: 4*25W (2Ω)	Auxiliary amplifier: 2*40W (2Ω) Bass 4*25W (2Ω)	Auxiliary amplifier: 2*70W (4Ω) Bass 4*40W (2Ω)
Max. sound pressure	98 dB as from 63 Hz	104 dB as from 50 Hz	110 dB as from 40 Hz
Bandwidth	50 Hz to 14 kHz	40 Hz to 20 kHz	30 Hz to 20 kHz
Linearity	±3 dB	±3 dB	±1.5 dB
Tweeter Manufacturer	---	26 mm (medium) Harman/Becker	26 mm (high) Harman/Becker
Broadband speaker Manufacturer	100 mm Philips	---	---
Mid-range speaker Manufacturer	---	100 mm (medium) Harman/Becker	100 mm (high) Harman/Becker
Central bass speaker Manufacturer	160 mm Philips	217 mm (medium) Harman/Becker	217 mm (high) Harman/Becker

Note: The housings of the central bass speakers are identical for the stereo, HiFi and Top-HiFi audio systems (package space and sill connection). Due to its smaller diameter (160 mm instead of 217 mm), the stereo

central bass speaker features an additional spacer ring for mounting on the inside of the central bass housing.

Stereo



TE03-4081

6 - Stereo system with components

Index	Explanation	Index	Explanation
1	Radio Business CD	3	Central woofers
2	Broadband speaker, front	4	Broadband speaker, rear

In the stereo system, the speakers are driven without an additional amplifier directly by the audio output stages of the radios or navigation systems. The stereo speaker system is standard equipment as soon as a radio or navigation system is installed.

6 speakers are driven via 4 audio channels.

- A broadband speaker in each of the front doors with a central bass speaker connected in parallel under each of the front seats
- A broadband speaker in each of the supports of the rear window shelf

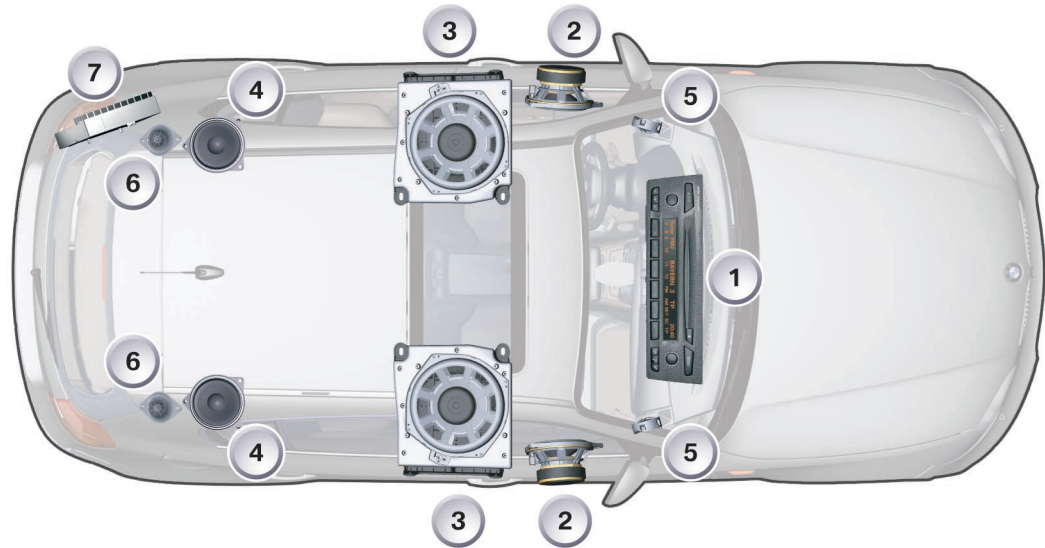
The broadband speakers in the front doors and the central bass speakers are activated per side by a common radio output stage of the radio/navigation system. The speaker supply line is branched in the A-pillar of the vehicle. From here, the signal is routed separately to the speakers.

A capacitor is series-connected to the front broadband speakers in order to protect the audio output stages of the radios Audio, Business CD and Professional from

overloading due to the parallel-connected speakers. (Refer to the system circuit diagrams "Stereo system with radio Audio" and "Stereo system with radio Business CD" provided in the chapter "System overview".) The capacitor for alternating current is a resistor that changes its value as a function of frequency. The lower the frequency, the greater the resistance. This measure ensures the total resistance (impedance) of the central bass speaker, capacitor and broadband speaker is in a non-critical range for the audio output stage.

The audio output stages of the navigation systems Business (M-ASK) and Professional (CCC) can drive two parallel-connected speakers. The above-mentioned capacitor for resistance adaptation is therefore not necessary (see the system circuit diagram "Stereo system with navigation system Business or Professional" in the chapter "System overview").

HiFi



TE04-4117

7 - HiFi system with components

Index	Explanation	Index	Explanation
1	Radio Professional	5	Tweeter, front
2	Mid-range speaker, front	6	Tweeter, rear
3	Central woofers	7	HiFi amplifier
4	Mid-range speaker, rear		

The analogue 6-channel HiFi amplifier has the same technical data as that installed in the E83. The HiFi amplifier, however, features settings specific to the E87 (diplexers, equalizing). This amplifier can be operated with any of the offered radios or navigation systems.

The HiFi amplifier is located behind the rear left side panel trim in the luggage compartment.

The audio signals are transmitted in analogue form from the radios or navigation systems to the HiFi amplifier. This amplifier amplifies the signals and transfers them to the speakers.

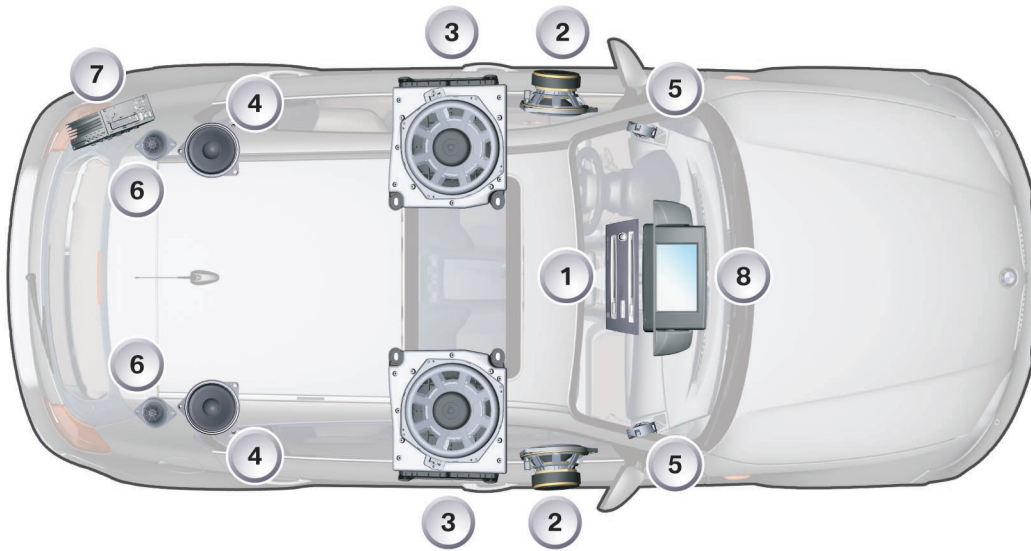
A total of 10 speakers are driven by 6 audio channels:

- A high-range and mid-range speaker each in the front doors
- A high-range and mid-range speaker each in the supports of the rear window shelf

- A central bass speaker each under the front seats

The high-range and mid-range speakers are connected in parallel and are powered by means of a common supply line from the four amplifier output stages. There is a frequency diplexer (high-pass filter) at the mid-range speaker (door or rear window shelf) that decouples the signal for the high-range speaker. The frequency diplexer is designed as a capacitor. The AC resistance (impedance) becomes lower at higher frequency, i.e. the capacitor becomes more conductive. In this way, only higher-frequency signals are routed to the high-range speakers. The low-frequency signals that are damaging for the high-range speaker are suppressed.

Top-HiFi



TE03-4082

8 - Top-HiFi system with components

Index	Explanation	Index	Explanation
1	Navigation system, Professional	5	Tweeter, front
2	Mid-range speaker, front	6	Tweeter, rear
3	Central woofers	7	HiFi amplifier
4	Mid-range speaker, rear	8	Central information display (CID)

The digital Top-HiFi amplifier with Logic7 (Surround Sound) is of identical design to that used in the E60. This amplifier is an MOST bus user and can be operated only with radios or navigation systems with MOST capabilities.

Since there is no mid-range speaker fitted in the instrument panel (dashboard) but one would be necessary for the surround sound, the Top-HiFi amplifier simulates the spatial sound by re-distributing the audio signals to the front door speakers.

The audio signals are sent in digital form via the fibre optics conductor (MOST bus) from the radio or navigation systems to the Top-HiFi amplifier. The amplifier converts the digital signals to analogue signals, amplifies them and routes them to the speakers. The sound adjustment (7-band equalizer, spatial sound, fader etc.) takes place prior to the analogue conversion in the DSP of the amplifier.

The Top-HiFi amplifier is installed in the same location as the HiFi amplifier.

A total of 10 speakers are driven by 6 audio channels:

- A high-range and mid-range speaker each in the front doors
- A high-range and mid-range speaker each in the supports of the rear window shelf
- A central bass speaker each under the front seats

The connection of the high-range and mid-range speakers as well as the design of the frequency diplexer are described in the section "HiFi".

Note: If there is no audio reproduction after replacing the radio Professional or the navigation systems, the Top-HiFi system must be coded in the replaced radio or navigation system.

Antennas

Overview

The E87 has up to 3 antenna systems corresponding to the option:

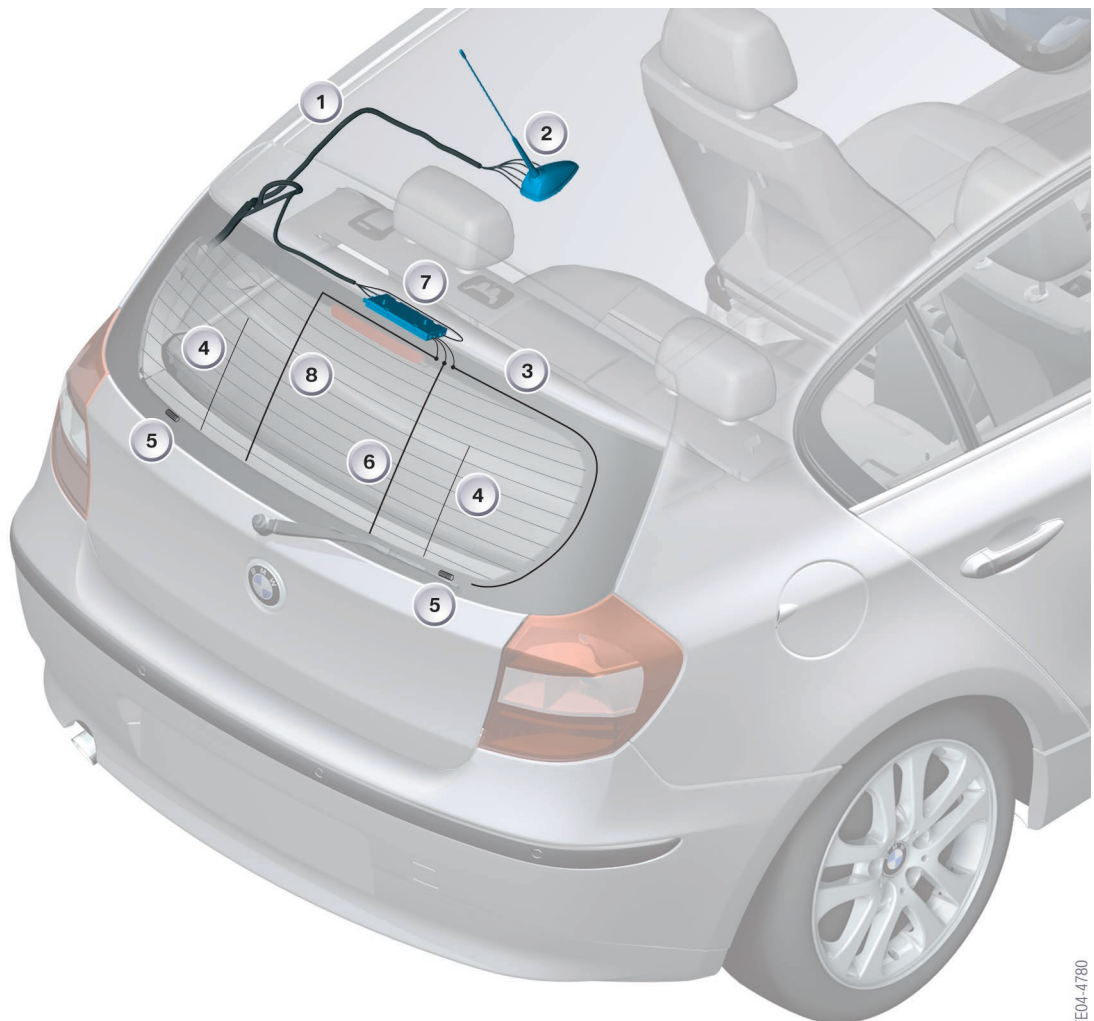
- Radio (roof and rear window antennas)
- Navigation (in base of roof antenna)
- Telephone (roof antenna) additionally:
 - Bluetooth antenna in steering column trim panel for mobile telephone connection
 - Emergency antenna in rear left wheel arch (only in connection with the planned

option SA633 "Mobile phone preparation Business")

Added to these is still the antenna for the remote control services FBD) and the 6 antennas for the comfort access system. Both systems are described in the section "E87 General vehicle electrical systems - Part 1 - Distributed functions"

The radio antennas for AM (LW, MW, SW range) and FM (VHF range) are described in the following.

The antennas for the navigation and telephone systems are described in the respective chapters.



9 - Antennas at rear of vehicle

TE04-4780

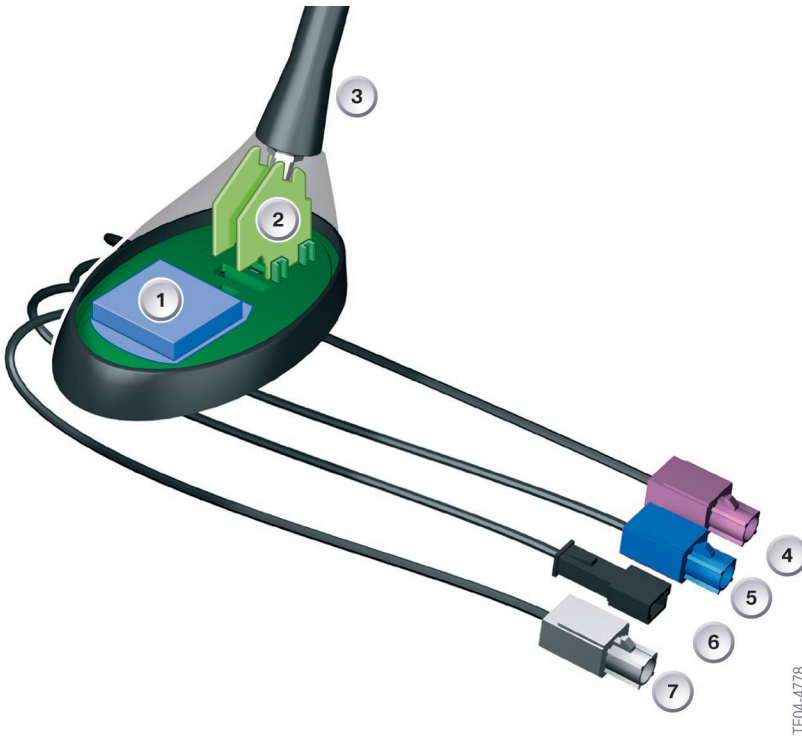


Index	Explanation	Index	Explanation
1	Antenna wiring harness	5	Interference suppression chokes, rear window defogger
2	Roof antennas (AM, FM1 antenna, telephone, GPS)	6	FM3 antenna
3	FM4 antenna	7	Antenna amplifier with diversity module
4	TV antennas (not used)	8	FM2 antenna

Roof antenna

In its maximum configuration, the roof antenna consists of the following components:

- Antenna rod (AM, FM1, Tel)
- Antenna base (GPS, AM/FM amplifier)



TE04-4778

10 - Antenna base structure

Index	Explanation	Index	Explanation
1	GPS antenna	5	GPS signal connector colour code: blue
2	Antenna amplifier, separate for AM and FM1	6	Power supply connector colour code: black
3	Antenna rod	7	AM/FM1 signal connector colour code: white
4	Telephone signal: connector colour code: violet		

Various antenna rods are installed ex-factory. The simplest rod consists of the AM and FM1 antenna.

Note: The visible spiral on the antenna rod serves the purpose of reducing wind noise. It has no electrical function.

Radio antennas

The high-frequency signals broadcast by the radio stations are received via the rod antenna on the vehicle roof (AM/FM1) and via the three rear window antennas (FM2, FM3, FM4). The Audio radio is an exception. This radio does not support the antenna diversity function. The three rear window antennas FM2, FM3 and FM4 have no function in connection with this equipment variant. The diversity module is therefore not installed.

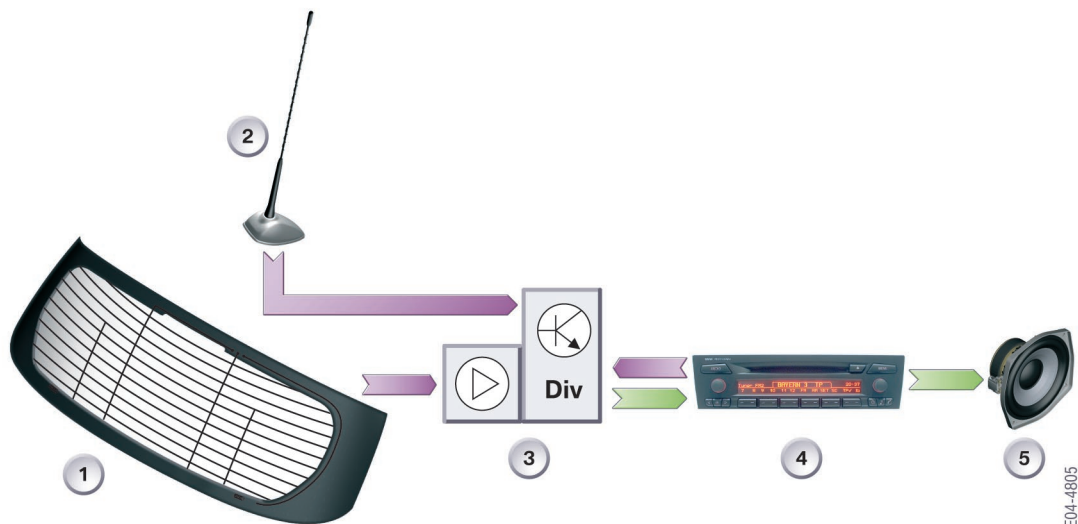
Separate antenna amplifiers are provided for AM and FM1 in the antenna base. The antenna amplifier for FM2 to FM4 is located in the diversity module. The antenna amplifier with diversity module is located on the inside of the rear hatch above the rear window. Both antenna amplifier systems receive a DC voltage supply when the radio is switched on (via terminal Rad_On).

The amplified high-frequency signals of the AM and FM1 antenna are routed via a common coaxial cable. When the radio Audio

is installed, the high-frequency signal is routed directly from the roof antenna to the radio. The signal is demodulated in the radio and output in the form of an audio signal through the speakers. For all other radios and navigation systems, the high-frequency signal from the roof antenna is routed to the diversity module at the rear window. The signal quality of the currently selected FM antenna (FM1 to FM4) is evaluated and assessed in the diversity module. The next FM antenna is selected if the signal quality of the received radio station deteriorates in connection with the active antenna. The diversity module transfers the high-frequency signal of the active FM antenna via a coaxial cable to the radio or navigation system where it is demodulated and output as an audio signal through the speakers.

Note: There is no filter as on the E46 Touring or E83 for example for suppressing interference during operation of the auxiliary brake light. The rear brake light (HBL) does not interfere with radio reception.

FM Antenna diversity



11 - FM Antenna diversity

Index	Explanation	Index	Explanation
1	Rear window antennas (FM2-FM4)	4	Audio source
2	Roof antenna (AM/FM1) with amplifier	5	Speaker
3	Antenna amplifier with diversity module		

A quadruple FM antenna diversity system is used in the E87 except when the Audio radio is installed which does not support this function.

FM antenna diversity comprises:

- FM1 antenna
- FM2, FM3, FM4 antennas
- FM antenna amplifier with antenna diversity module

The antenna diversity module is located in the same housing as the antenna amplifier for FM2 to FM4.

The radio or navigation system detects that a diversity module is installed and correspondingly generates the changeover voltage U_s and the intermediate frequency signal (IF) necessary for diversity operation.

The tuner is connected via a coaxial cable to the antenna amplifier with diversity module. Diversity module switches over to the next antenna as soon as the signal quality at the active FM antenna drops below a defined threshold. The changeover takes place such that no interruption can be heard. The signal quality is evaluated and the changeover takes place only in the diversity module. For this purpose, electronic circuitry correspondingly

evaluates the intermediate frequency signal (IF) coming from the radio. The intermediate frequency signal is a copy of the radio station currently tuned in on the frequency 10.7 MHz.

The changeover between AM/FM1, FM diversity and diagnosis mode takes place with the aid of a DC voltage U_s . This voltage is generated by the radio and used in the diversity module for evaluation purposes. Diversity mode is active at $U_s = 2.5$ V. AM mode is active at $U_s = 0$ V, i.e. the FM1 antenna is selected. Diagnosis mode is active at $U_s = 5$ V.

In total, up to three signals are therefore applied on the coaxial cable simultaneously.

- RF signal (e.g. 88-108 MHz) from the diversity module to the radio
- Control DC voltage U_s from the radio to the diversity module
- Intermediate frequency ($f_{IF} = 10.7$ MHz) from the radio to the diversity module as the basis for evaluating the quality of the RF signal.

Mutual influencing is not possible due to the different frequencies.

Peripherals

CD changer

The E87 is offered with the option SA672 "CD changer for 6 CDs" (CDC). The changer is an MOST bus user and is already known from the E60. It can be used together with the radio Professional and the navigation systems Business or Professional.

The CD changer is located behind a flap on the left in the luggage compartment.

When the vehicle is equipped with the stereo or HiFi speaker system, the digital data of the CD are transferred via the MOST bus to the radio or navigation system. Here they are converted to analogue data and output via the amplifier and the speakers.

When a Top-HiFi system (Logic7) is installed, the audio data are routed in digital form via the MOST bus from the CD changer directly to the Top-HiFi amplifier where they are output. The data can be sent directly from the CD changer to the Top-HiFi amplifier. This is

possible as data conversion and sound adjustment take place exclusively in the Top-HiFi amplifier.

The option SA694 "Preparation for CD changer" is also available in certain markets. The fibre optics conductors for connecting the CD changer are arranged at the fibre optics connector in the luggage compartment such that they are not incorporated in the MOST ring. After retrofitting a CD changer, the fibre optics conductors for the CD changer preparation are unplugged at the fibre optics connector and connected to the MOST ring. Subsequent coding of the system is then necessary.

Note: It is planned to introduce a new CD changer that supports the playback of MP3-CDs.

Audio jack



12 - Audio jack location



Index	Explanation	Index	
1	12V socket	2	Audio jack

The audio jack (AUX-In) is used to connect external audio sources such as MP3, cassette or CD playback devices.

It is located below the centre armrest. A 12 V socket outlet is located in the immediate vicinity of the audio jack.

Connection is provided by means of a 3.5 mm latch connector.

Apart from the navigation systems, the audio level can be adapted for all radios. This adaptation serves the purpose of avoiding volume differences that occur during the playback of different audio sources.

Navigation systems

This section describes the two navigation systems of the E87. With few exceptions, with regard to function, display and operation, these navigation systems correspond to the navigation systems used in the E60.

Available systems:

- SA606 "Navigation system Business" (M-ASK)
- SA609 "Navigation system Professional" (CCC)

Both navigation systems are made up of the following components:

- Navigation computer with GPS receiver and yaw rate sensor in the M-ASK or CCC control unit
- GPS antenna
- Double tuner (radio/TMC data)
- DVD player with navigation DVD

Additional information:

- Wheel speed sensor information from DSC control unit (bus message)
- Reverse gear signal from footwell module (bus message)
- TMC data (Traffic Message Control)

Note: The information from the wheel speed sensors is sent by the DSC in the form of bus messages. On the E60, this information is sent directly by the DSC to the M-ASK/CCC control unit.

Note: The data structure of the navigation DVDs for both navigation systems differs and is therefore not compatible. The navigation DVDs Business (M-ASK) and Professional (CCC) of the E60, E61, E63 and E64 can be used for comparable systems in the E87. The DVD player can play audio CDs. The playback of audio DVDs and video DVDs is not supported. Please refer to the Owner's Handbook for more detailed information on operation.

Functional principle of the navigation system

Each satellite transmits messages with the following (simplified) information:

- Number of the satellite
- Current position of the satellite
- Message time

The satellite additionally broadcasts so-called orbit (path) and almanac data. These orbit and almanac data are stored in the navigation system and used for subsequent calculations to enable fast acquisition of the currently available satellites. Almanac data contain information on the orbits of all satellites, time correction factors and atmospheric delay parameters.

To determine the position, the GPS data are received by the GPS antenna in the antenna base and routed via a coaxial cable to the navigation computer (CCC or M-ASK). The GPS data are decoded. To determine the location, the navigation system compares the time at which the signal was sent with the time at which the signal was received. The distance of the satellite can be calculated from this time difference. The time calculations are based on a highly accurate atomic clock (UTC: Universal Time Co-ordinated). The current position can now be determined by adding measurements from other satellites. The GPS receiver can determine its position on the earth's surface with the aid of at least three satellites. This process is known as "2D position fix". Two-dimensional because the receiver must assume that it is located directly on the earth's surface. The absolute spatial position can be determined with the aid of four or more satellites ("3D position fix"). The altitude is necessary, for example, on multi-tier road junctions and intersections.

Note: A clear view of the sky is necessary for the reception of GPS data. Rain or snow normally do not interfere with reception. However, a very dense cover of wet leaves or shadow areas (high-sided buildings, rows of trees) may impair reception. In addition, depending on the time of day, there may be fluctuations in satellite reception at one location during a 24 hour period (example: Munich 5-10 satellites). This is due to the orbits of the satellites.

The navigation system therefore calculates

- longitude
- latitude
- altitude from the satellite data.

Based on repeated measurements, the

- direction of movement and
- speed can also be calculated by way of GPS.

Navigation mode

The current position is known before the start of the trip as it was either stored or was currently checked and determined. During vehicle operation, the navigation system receives the "distance covered" information from the DSC control unit via the bus (PT-CAN/junction box/K-CAN). The wheel speed sensors on the rear axle supply the information necessary for this purpose to the DSC control unit.

The yaw rate sensor determines any changes in direction such as when cornering. Changes in altitude are not detected by the two-dimensional yaw rate sensor. The current position can be determined by combined evaluation of the "distance covered" and "driving direction". The position calculated in this way is compared to the navigation data stored on the DVD. If considerable deviations occur (incorrect calculations due to inaccurate sensor data, outdated map data), priority is given to the current position determined by the GPS. During normal operation, the position is therefore determined during navigation operation based on correspondingly processing the wheel speed and yaw rate sensor information. The footwell

module makes available the "reversing" information in the form of a bus message to the navigation system and this information is taken into account in the position calculation. On manual transmission vehicles, the reverse gear switch is located on the manual gearbox. On automatic transmission vehicles, the reverse gear information is provided by the transmission control unit that evaluates the setting of the selector lever position switch.

Note: After the navigation computer has been disconnected from the power supply, it can take up to 10 minutes before the navigation system determines the current position as an update of the almanac data and the received satellite data is necessary in this case. Delayed positioning can also occur after longer parking periods (e.g. holidays).

The following aids are available for route guidance purposes:

- Display of current position on the screen
- Direction arrows as orientation for further road routing
- Distance information up to the next change in direction (turn off)
- Voice announcements for further route guidance
- Distance to destination
- Route list and destination list
- Calculated route indicated by a white line to the destination in the map presentation (CCC only)

SA606 "Navigation system Business"

The navigation system Business is based on the M-ASK and features the familiar scope of functions:

- Navigation with arrow mode
- Memory navigation (navigation DVD can be removed after programming)
- Dynamic route planning with traffic queue avoidance based on RDS-TMC (Radio Data System - Traffic Message Channel)
- Input via the mechanical controller

- Display on 6.5" colour CID
- The navigation DVD of the E60, E61, E63 and E64 can be used for the navigation Business.

Note: Transmission of the TMC information is constantly active and cannot be influenced. The TMC transmitter with the best reception is automatically selected.

SA609 "Navigation system Professional"

The navigation system Professional is based on the CCC (already known from the E60) and features the following scope of functions:

- Navigation with map or arrow view (no split screen presentation)
- NEW: Perspective map presentation
- Dynamic route planning with traffic queue avoidance based on RDS-TMC (Radio Data System - Traffic Message Channel)
- Input via controller with electrically controlled haptics (feel), optionally controlled by voice commands (SA620)

- Display on 6.5" colour CID
- The navigation DVD of the E60, E61, E63 and E64 can be used for the navigation Professional.

In the Japan country-specific version, the navigation data are calculated by a separate navigation computer (JNAV). The data are sent via the CCC to the CID.

Note: TMC function can be activated in the "Settings" menu. The current TMC transmitter can be selected from a list of TMC transmitters that can be currently received.



13 - Perspective (left) and direction-indicating (right) map presentation

Telephone systems

The following telephone preparations are installed on the E87:

- SA640 "Car telephone preparation"
- SA644 "Universal mobile phone preparation"

The telematics, TeleService and online functions are coupled to a TCU (Telematics Control Unit) and will be available with the introduction of the option SA633 "Mobile phone preparation Business". This option represents a combination of the known fixed installation telephone (TCU) with the

functionality of the universal charging and hands-free kit (ULF).

No fixed installation telephone will be offered as series launch of the E87.

Note: A changeover module will be available from Sales in the form of a retrofit component for the radios Audio and Business CD. This retrofit makes it possible to connect a mobile telephone in a vehicle without radio/navigation systems with MOST capabilities (radio Audio and Business CD).

SA644 "Universal mobile phone preparation"

The option SA644 "Universal mobile phone preparation" facilitates the connection of mobile telephones with Bluetooth capabilities to the vehicle.

The telephone functions can be operated by means of voice commands (see telephone voice control).

The components and functions of this option correspond to those implemented in the E60, E61, E63 and E64.

A compensator can be additionally connected in the antenna line between the roof antenna and mobile phone. The compensator compensates for line losses on the antenna line. This option can be retrofitted on customer request. The compensator makes available the maximum, legally permitted transmit power at the telephone antenna on the vehicle roof (GSM mobile radio network max. 2 Watt). This feature minimizes interruptions in telephone connections in shadow areas (obstructions).

Snap-in adapters are currently available for the following mobile phones:

- Siemens S55, S65
- SonyEricsson T610, T630
- Nokia 6310, 6310i
- Motorola V525, V600

The adapters are identical to those used in the E60.

A Bluetooth mobile telephone is coupled to the navigation system (M-ASK, CCC) via the "Settings" menu. The coupling takes place in

the "TEL" menu in connection with the radio Professional.

SMS functions are not supported as the data transfer by means of Bluetooth protocol necessary for this purpose is not supported by all mobile phone manufacturers.

All radios and navigation systems with MOST capabilities support the integration in the vehicle systems network and telephone operation. For further information, please refer to the telephone operating instructions.

Up to 4 Bluetooth mobile phones can be logged in on the vehicle in succession. If a fifth mobile phone is logged in at the vehicle, the sign-on data of a logged in mobile phone will be deleted. Applicable to radio Professional: The sign-on data of the mobile phone first logged in are deleted. Applicable to CCC and M-ASK: The sign-in data of the mobile phone in last position in the list are deleted.

A similar procedure applies when the vehicle detects several logged in mobile phones simultaneously. The mobile phone with the highest priority can be used in this case. In connection with the radio Professional, this is the mobile phone last logged in. In the CCC and M-ASK systems, this is the mobile phone in top position in the list.

Note: CCC and M-ASK show a list (that can be edited) of the logged in mobile phones on the CID.

Voice recognition systems

Telephone voice control

The voice control function is available as standard together with the option SA644 "Universal mobile phone preparation".

The voice control is realized by means of software in the ULF control unit.

The microphone for voice control of the telephone is located in the roof functions centre on the driver's side. It is connected to the ULF control unit.

6 languages are supported:

- German
- English US
- English UK

- French
- Italian
- Spanish

The voice control comprises the telephone function and a voice-controlled telephone book that is separate from the address book in the mobile phone or on the SIM card. Up to 50 names and telephone numbers can be stored. The telephone book managed by means of voice control cannot be transferred to the mobile phone.

Note: The notepad function previously supported in the ULF is not available in the E87.

SA620 "Voice recognition system"

Voice recognition is available only in connection with the option SA609 "Navigation system Professional" as the voice recognition system is realized as software in the CCC.

Many of the functions that are otherwise selected via the controller in the CID can be operated by means of voice commands.

The microphone is located in the roof functions centre on the passenger's side and is connected directly to the CCC.

The voice recognition system supports 6 languages:

- German
- English US
- English UK
- French

- Italian
- Spanish

Note: The language of the voice recognition system cannot be changed in the CID. The language that can be selected in the CID (one of three languages) refers only to the display texts and the announcement language for the navigation system. During the CCC programming procedure, the language of the voice recognition system is programmed corresponding to the vehicle order (country assignment). The language cannot be easily changed over as for the display language due to the size of the software package. The language of the voice recognition can currently not be changed in BMW service.

Audio systems

Radios

General

Service mode

In the case of customer complaint or malfunctions, certain important functions can be checked directly at the radio with the aid of service mode. This service mode can also be used to implement settings that are not intended for the customer. For this purpose, it is first necessary to enter service mode. This procedure differs for the various radios and navigation systems (M-ASK/CCC).

Activation of service mode for radio Audio, Business CD and Professional:

- Switch on radio
- Within 8 s, press and hold the "m" button for at least 8 s
- The various menus can be selected in service mode
- Switch off the radio to exit service mode

Explanations of service menu entries

Menu	Display content (example)	Explanation
Serial number	AL87013SPL0122	Serial number of device
Type	MC57CD72	Radio type
SW Ver	H8S 00-0000 4.25.1 ST10 18-3203 4.40.4	Device software status
Revision index	02	Revision index
GAL	3	Set level of speed-dependent volume control
ANT	AUTO	Antenna selection: ANT1 = FM1 antenna ANT2 = FM2 antenna ANT3 = FM3 antenna ANT4 = FM4 antenna AUTO = Automatic selection of FM antenna with best reception
F/Q	FM1 1 89.3 5 11	Current FM memory Current memory location Current frequency Field strength of current station Signal quality of current station
DSP/Volume	DSP 1 V4	DSP 0 = No DSP installed DSP 1 = DSP installed V = Volume setting increment
TP-V	0	Traffic information setting, minimum volume Setting range: -9 to +9
Display check		Display check
Area	ECE	Country-specific version: ECE = Europe USA = United States JPN = Japan OCE = Oceania
AF	Auto	RDS and alternative frequency tracking: RDS Off = RDS function not available as soft-key button. AF Off = RDS function available, alternative frequency tracking off AF Man = RDS function available, alternative frequency tracking only active in mute pauses (e.g. station selection via station buttons, frequency band change, telephone muting) AF Auto = RDS function and automatic alternative frequency tracking active
Key memory	ON	To switch car and key functions on and off

Note: The "Tool" menu is for development purposes. It is of no significance for BMW Service.

Assignment of service menus

Menu	Radio Audio	Radio Business CD	Radio Professional
Serial number	✓	✓	✓
Type	✓	✓	---
SW Ver	✓	✓	✓
Revision index	✓	✓	✓
GAL	---*	---*	✓*
ANT	✓	✓	✓
F/Q	✓	✓	✓
DSP/Volume	---	---	✓
TP-V	---*	---*	✓*
Display check	✓	✓	✓
Area	✓	✓	✓
AF	✓	✓	---
Key memory	✓	✓	✓

* Customer function, see operating instructions

CCC and M-ASK currently do not feature a defined service mode. Numerous menus are visible on selection. Some menus permit changes to be made. However, these values should remain unchanged. They are not intended for BMW Service but rather they are predominantly used for equipment development purposes. The functions and effects of changing parameters are therefore not documented here.

Reset

The radios Audio, Business CD and Professional as well as the M-ASK can be reset by implementing the following procedure:

- Switch system ON/OFF
- Disconnect from vehicle electrical system
- BMW diagnosis system

No button or button combination is provided for this purpose on the device.

The CCC can be reset by simultaneously pressing the eject buttons on the DVD and CD player and the rotary push-button for approx. 10 s. The CID becomes blank. The CCC is then restarted.

Note: The MOST gateway (radio Professional, M-ASK or CCC) is muted for 2 s when resetting an MOST control unit.

Interference in radio reception

Check the following in the event of interference in radio reception:

- Power supply terminal Rad_On for the antenna amplifier in the antenna base and diversity module.
- Antenna connector at diversity module

- Antenna connector at radio or navigation system

Note: Care must be taken as the antenna plug connection may be damaged due to the restricted package space behind the CCC.

Service concept

The following are replaced as complete units:

- Radio Audio
- Radio Business CD
- Radio Professional
- Navigation system Business (M-ASK)

The service concept of the CCC permits replacement of individual assemblies. It is based on the concept implemented on the E60. The following assemblies can be replaced:

- Fan
- CD and DVD player
- Front panel
- HIP, gyro sensor

Note: Observe the ESD-guidelines when replacing components.

Note: The CCC must not be placed on its rear side as the sockets could be damaged by its own weight.

Diagnosis

The control unit entries listed in the table below can be found on the BMW diagnosis system for the radios and navigation systems:

Radio Audio RD-72	Radio Business CD CD-72	Radio Professional CD-73/MD-73	Navigation system Business M-ASK	Navigation system Professional CCC
RAD	RAD	RAD2-GW	M-ASK-GW	CCC-GW
		RAD2-BO	M-ASK-BO	CCC-BO
			M-ASK-NAV	CCC-A
				CCC-ANT
				CCC-ASK

Key:

GW: Gateway

BO: User interface

NAV: Navigation system

A: Applications

ANT: Antenna tuner

ASK: Audio system controller

Antennas

Antenna diagnosis

Antenna diagnosis on the E87 is performed in the same way as the diagnostic procedure on the E60:

- The self-diagnosis procedure for the diversity module is initiated in the diagnosis module of the BMW diagnosis system. The self-diagnosis comprises a check of the antenna inputs based on DC measurement. Following positive completion, each individual FM antenna is specifically switched on one after the other and the signal quality evaluated (antenna scan). The AM reception can be evaluated in the LW, SW and MW range with the AM amplifier switched on and off. The diagnosis system evaluates the measurements and deduces the status when the self-diagnosis of the diversity module provides a positive result.

This procedure can also be performed manually via service mode of the radios Audio, Business CD and Professional:

The signal quality and field strength of the station currently tuned in can be displayed in service mode. The active antenna can also be specifically controlled. A defective antenna can be located by switching over the active antenna and evaluating the signal quality and field strength. Refer to "Service mode" above.

Note:

- A fault is detected during self-diagnosis if "ANT Error" is indicated in radio service mode.
- Low values with regard to signal quality and field strength may indicate to damaged antennas or the absence of terminal Rad_On. Terminal Rad_On supplies power to the antenna amplifier and the diversity module.

Peripherals

Audio jack

The audio inputs can be coded as follows:

- "No AUX": Audio inputs not active
The audio jack is inoperative. "AUX" is no longer offered as a menu item for mode changeover in the radio.
- "AUX": Audio inputs active (basic setting in the E87 when a radio or navigation system is installed)
The audio jack is operative. "AUX" is offered as a menu item for mode changeover in the radio.

- "AUX and Tel": Audio inputs and telephone active

The changeover module available as a retrofit component from Sales (VT-Z) is installed. Consequently, both an external audio device as well as a telephone can be operated via the AUX inputs.

Note: Particular care must be taken to ensure the audio inputs are activated by means of coding when the radio/navigation system is replaced.

Navigation systems

Navigation DVD

The navigation DVDs of the navigation system Business (M-ASK) and of the navigation system Professional (CCC) are not mutually compatible. These DVDs, however, are compatible with other vehicles (e.g. E60) with the same equipment (M-ASK or CCC).

Note: If the navigation DVD is not recognized although the correct DVD is loaded in the player, the DVD should be removed and reinserted.

Media ejection

If the navigation DVD is not ejected during normal operation by pressing the Eject button, carry out the following procedure:

- Reset CCC
- Press the Eject button several times during start-up

Alternatively, the system can be activated by means of the BMW diagnosis unit (control unit functions).

Note: No mechanical emergency release facility is provided on the DVD player to remove media.

Start-up

After disconnecting the battery, due to the necessary data transmission, it may take up to

10 minutes before the navigation system correctly displays the current position.



Telephone systems

A variable passkey that must have at least one character is used for the purpose of coupling

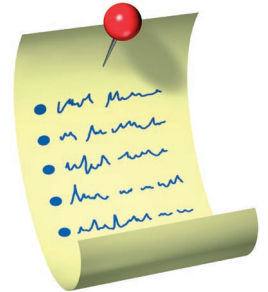
Bluetooth mobile phones. A predefined key is no longer necessary.



Points to remember

The most important information relating to information and communication technology in the BMW 1 Series is summarized in the following table.

This list outlines the main points in concise form and provides the opportunity of rechecking the most important facts provided in this participant's manual.



Points to remember for everyday theoretical and practical applications.

Audio systems



Three radios and two navigation systems are available for the BMW 1 Series.

The radios Audio and Business CD

- have a K-CAN link
- can be combined with the stereo and HiFi system

The radio Professional and the navigation systems Business and Professional

- have a K-CAN and MOST link
- can be combined with the stereo, HiFi and Top-HiFi systems

The radio antennas (four FM, one AM) are located in the antenna rod and on the rear window. Only the roof antenna (FM1/AM) is used in connection with the Audio radio.

With the exception of the Audio radio, FM antenna diversity is supported.

The FM antenna diversity function switches the FM antenna with the best reception quality to the radio or navigation system.

External devices can be integrated in the audio system via an audio jack.

A 6-CD changer with MOST capabilities is available.

Navigation systems



The navigation system Business (arrow mode) is based on the M-ASK

The navigation system Professional (map presentation) is based on the CCC.

The map navigation system permits a perspective view.

The GPS antenna is located in the base of the roof antenna.

Telephone systems



Mobile phones with Bluetooth capabilities can be used in connection with the universal charging and hands-free kit (ULF) in the vehicle when the radio Professional or a navigation system is installed.

The telephone antenna is located in the antenna rod on the vehicle roof.

The Bluetooth antenna is located behind the steering column trim panel.

No telematics, TeleService and online functions will be available at series launch. These functions will be introduced at a later point in time together with the fixed installation telephone.

Voice recognition systems

A distinction is made between two voice recognition systems:



- Telephone voice control (coupled to the option SA644 "Universal mobile phone preparation")
- SA620 "Voice recognition system" (coupled to the option SA609 "Navigation system Professional")

The microphone on the driver's side is assigned to the telephone function.

The microphone on the passenger's side is linked to SA620 "Voice recognition system".

Catalogue of questions

The knowledge gained during the seminar can be checked in this section with corresponding

questions relating to the topics on information and communication technology.

Audio systems

Radios

Question 1

What bus connection does the radio Business CD have?

Question 2

What radios support the antenna diversity function?

Question 3

How is the service menu called up in connection with radio Professional?

Amplifiers and speakers

Question 1

From what vehicle is the Top-HiFi amplifier already known?

Question 2

With what radio can the HiFi system be combined?

Antennas

Question 1

How many FM antennas are involved in the antenna diversity function?

Question 2

What antennas are located in the antenna rod?

Question 3

What antennas are vapour-deposited on the rear window?

Peripherals

Question 1

Can the CD changer be controlled with the radio Audio?

Question 2

Where is the audio jack located?

Question 3

What is the purpose of the audio jack?

Navigation systems

Question 1

What control units can be used for the navigation function?

Question 2

What navigation system offers map navigation?

Telephone systems

SA644 "Universal mobile phone preparation"

Question 1

Via what control units is the signal path of the telephone buttons on the multifunction steering wheel routed?

Voice recognition systems

Question 1

What buttons can be used to activate the voice recognition system?

Question 2

What control units make available the voice recognition function in the E87?

Abbreviations

AF	Alternative frequency
AHM	Trailer module
AM	Amplitude modulation
ANT	Antenna
Aux_In	Audio input
BO	User interface
CA-SG	Car access control unit
CCC	Car communication computer
CD	Compact disc
CDC	CD changer
CID	Central information display
CON	Controller
dB	Decibel
DC	DC voltage
DDE	Digital diesel electronics
DME	Digital motor electronics
DSC	Dynamic stability control
DSC-SEN	Dynamic stability control sensor
DSP	Digital sound processor
DVD	Digital versatile disc
EGS	Electronic transmission control unit
EKP	Electric fuel pump
ESD	Electrostatic discharge
FBD	Remote control service
FRM	Footwell module
FZD	Roof function centre
GAL	Speed-dependent volume control
GPS	Global positioning system
GW	Gateway
HBL	Raised brake lights
HF	High frequency
HiFi	High fidelity
Hz	Hertz
IBS	Intelligent battery sensor
IHKA	Integrated automatic climate control
IHR	Integrated heating control
JB	Junction box, junction box control unit
JNAV	Japan Navigation
K-CAN	Body controller area network

KI.	Terminal
KW	Short wave
LVDS	Low voltage differential signal
LW	Long wave
M-ASK	Multi-audio system controller
MD	Minidisc (BMW internal spelling defined by VS-41)
MFL	Multifunction steering wheel
MOST	Media oriented system transport
MP3	MPEG Layer 3
MW	Medium wave
NAV	Navigation
PDC	Park distance control
PT-CAN	Powertrain controller area network
RAD	Radio
RAM	Random access memory
RDS	Radio Data System
RLS	Rain/light sensor
SINE	Siren with tilt alarm sensor
SMBF	Passenger's seat module
SMFA	Driver's seat module
SW Ver	Software version
SZL	Steering column switch cluster
TCU	Telematics control unit
TMC	Traffic message channel
UKW	Very high frequency
ULF	Universal charging/hands-free facility
USIS	Ultrasonic passenger-compartment sensor
WMA	Windows Media Audio
WUP	Wake-up line
ZF	Intermediate frequency

