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E70 Audio Systems Workbook

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Subject

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Audio Systems

Model: E70

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Demonstrate the different functions of the Audio System on the E70.
- Identify the components on the E70 Audio System.

Audio Systems

The US vehicles are equipped with the new head unit platform called CHAMP (Central Head unit and Multimedia Platform) The CCC (Car Communication Computer) is available as the head unit for the Professional navigation system. The head units offer eight favorites buttons.

Professional Radio (CHAMP)

The CHAMP and CCC have eight favorite buttons, six assignable favorites buttons. Button 7 is assigned with FM/AM selection, button 8 is for toggling the operating mode.

CHAMP combines the following control modules in the one housing:

- RDS double tuner
- Audio system controller
- Gateway between MOST and K-CAN
- Interface to the Central Information Display.

CHAMP system can be used to control:

- Communication
- Entertainment
- Air conditioning (climate control)



Professional Radio with NAV (CCC)

Note: Button 7 is assigned with FM/AM selection, button 8 is for toggling the operating mode

The CCC combines the following control modules in one housing:

- Navigation computer/GPS module; map view and/or cursor view in the CID
- RDS double tuner
- Audio system controller
- Gateway between MOST and K-CAN
- Interface to control display (LVDS).

Two drives are integrated in the housing:

- DVD player
- CD player



When the navigation system is not in use, its DVD drive can be used to play audio CDs. The playback of video files is not supported. The system can be used to control:

- Communication
- Entertainment
- Navigation
- Air conditioning (climate control)
- Settings (5th menu). The MP3 directory structure corresponds to that of a PC. There is no limit to the number of directories, sub-directories and music tracks that the CCC can support. However, the time taken for the drive to read the contents of the CD when the CD is inserted is longer, depending on how much data is stored on the CD.

Amplifiers and Speakers

The speaker systems in the E70 are, as in other Series, available in two quality levels:

- HiFi system
- Top-HiFi system.

Even though the diameters of the speakers in the HiFi and Top-HiFi systems are the same, there are differences in the power output of the speakers. This is achieved through the use of different materials in the diaphragms, coils and magnets.

The HiFi system achieves double the power of the standard stereo system. In addition, the HiFi system is equipped with a 7-channel amplifier with digital equalizer.

The optional Top-HiFi system achieves double the power of the standard HiFi system and uses a digital 9-channel amplifier. Optimum audio playback in the vehicle is achieved thanks to complex digital signal processing.

The HiFi system has twelve speakers, five tweeters, five mid-range and two central bass speakers. The HiFi amplifier is woken by the Rad_On signal sent by hard wire from the Head unit and uses a K-CAN connection for diagnostics and coding.

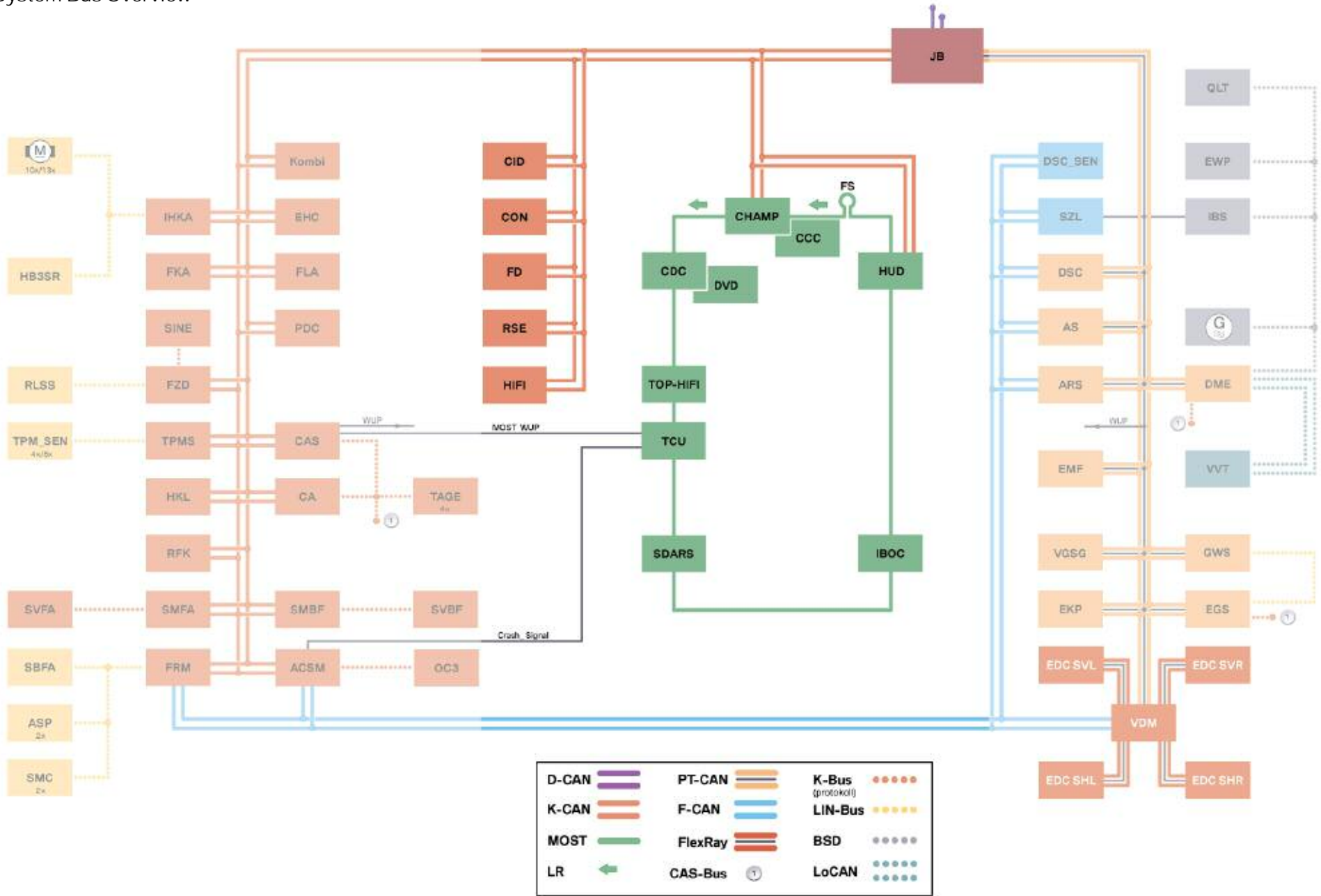
The Top-HiFi system has 16 speakers, seven tweeters, seven mid-range speakers and two central bass speakers. The Top-HiFi amplifier is connected to the MOST.

The central bass speakers are located under the front seats. They are coupled to the side sills to increase the resonance volume necessary for bass reproduction.

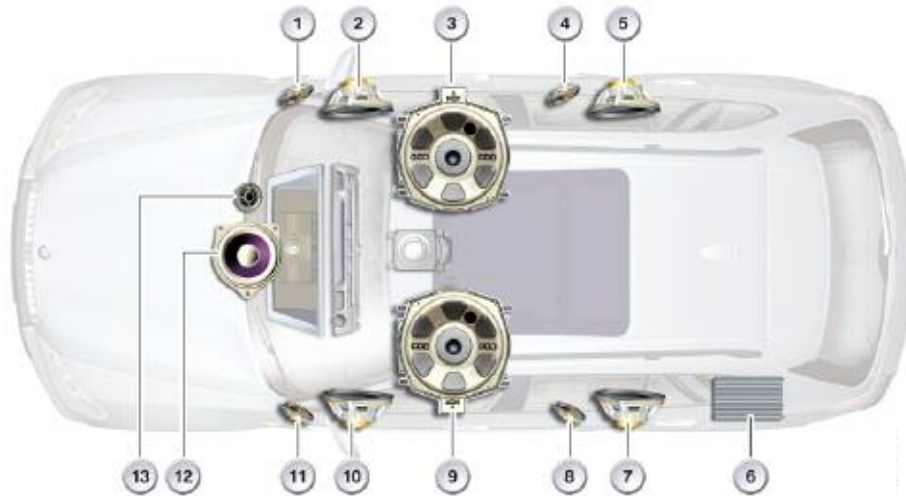
The CHAMP and the CCC (navigation system) can be combined with any of the amplifier/speaker systems, provided the specific national variants are taken into consideration.

Note: CHAMP receives the terminal 58g (lighting) signal via hard wire. The CCC receives it via the K-CAN.

System Bus Overview

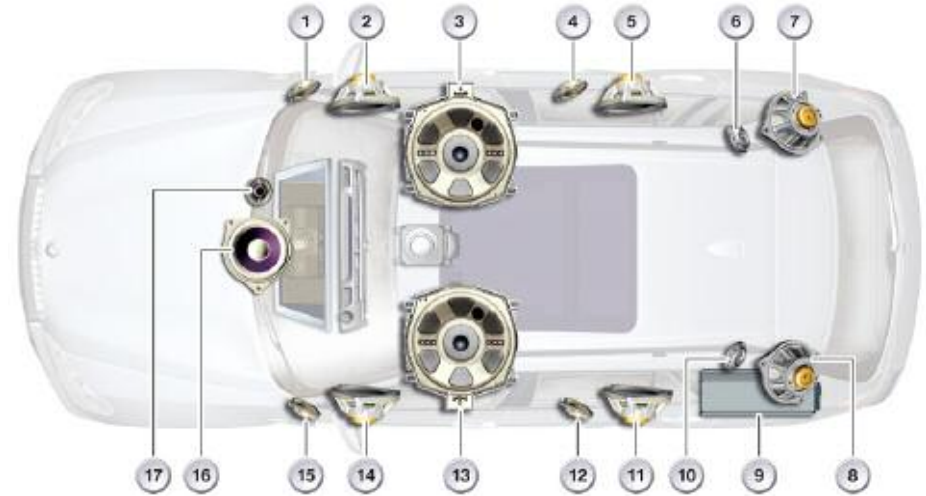


HiFi System



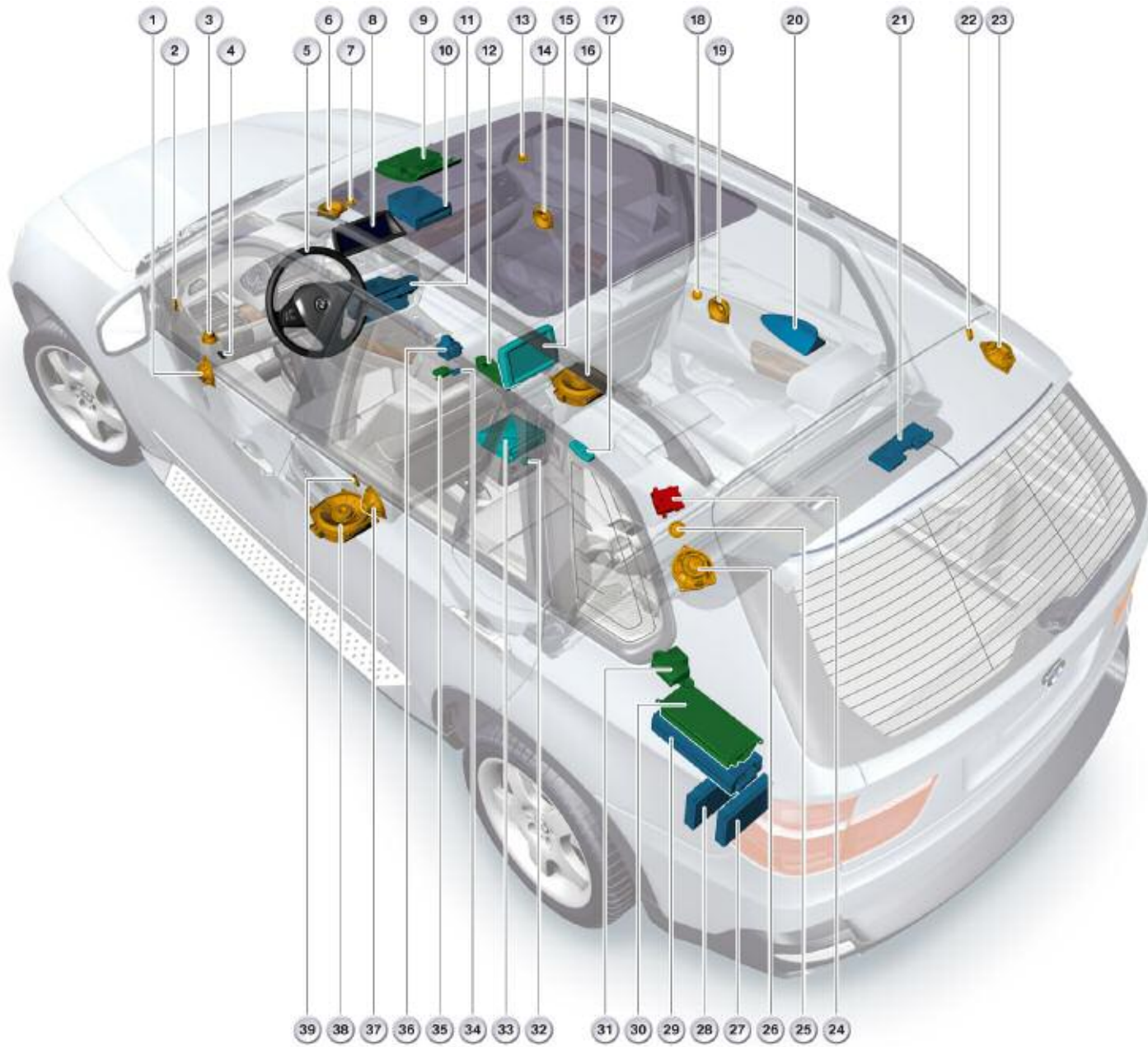
Index	Explanation	Index	Explanation
1	Tweeter, front right door	8	Tweeter ,rear left door
2	Mid-range speaker, front right door	9	Central bass speaker, left
3	Central bass speaker, right	10	Mid-range speaker, front left door
4	Tweeter, rear right door	11	Tweeter, front left door
5	Mid-range speaker ,rear right door	12	Mid-range speaker, front center
6	HiFi amplifier	13	Tweeter, front center
7	Mid-range speaker, rear left door		

Top-HiFi System



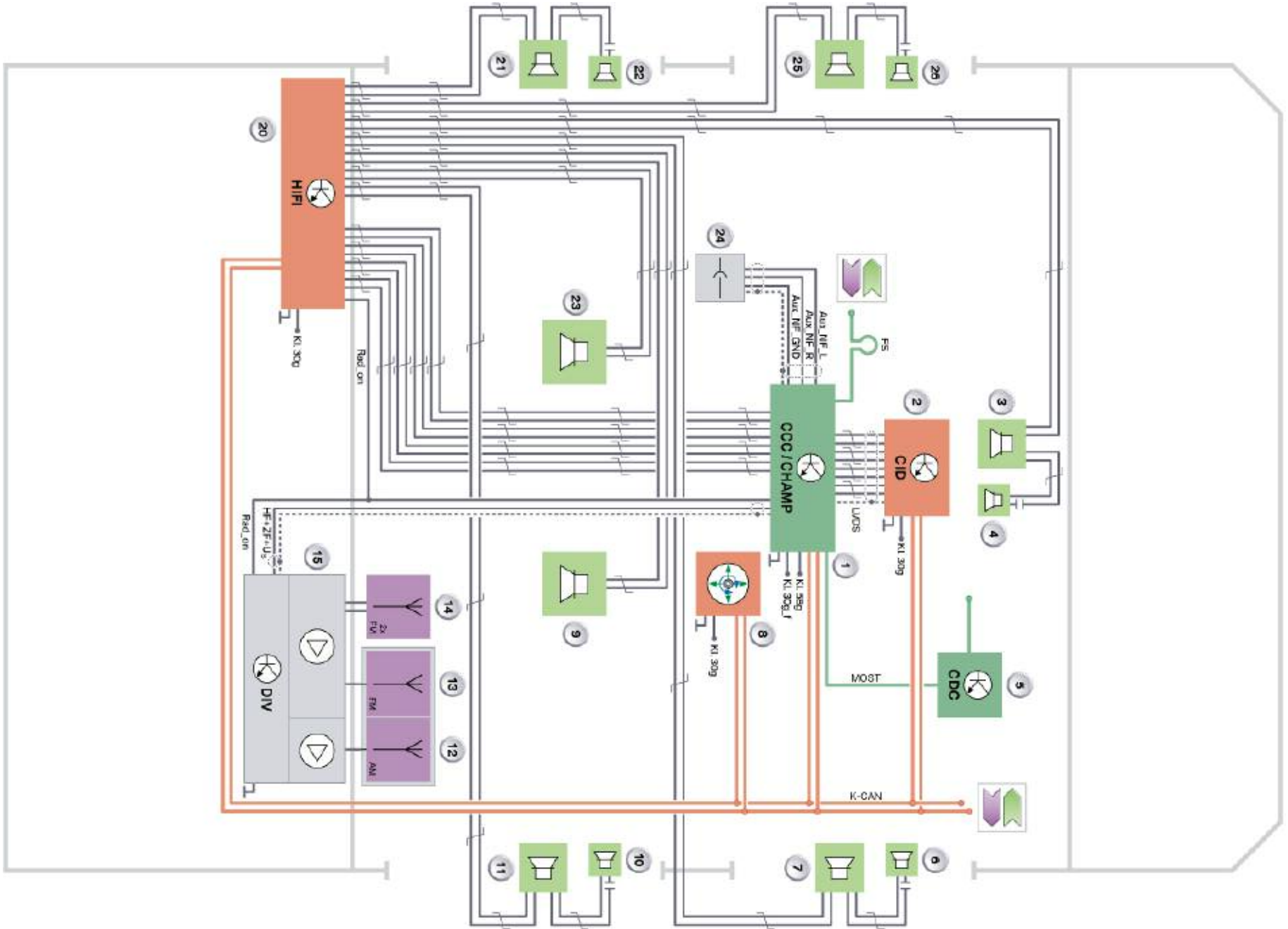
Index	Explanation	Index	Explanation
1	Tweeter ,front right door	10	Tweeter ,D-pillar left
2	Mid-range speaker, front right door,	11	Mid-range speaker, rear left door
3	Central bass speaker, right	12	Tweeter, rear left door
4	Tweeter, rear right door	13	Central bass speaker, left
5	Mid-range speaker, rear right door	14	Mid-range speaker, front left door
6	Tweeter, D-pillar right	15	Tweeter, front left door
7	Mid-range speaker, D-pillar right	16	Mid-range speaker, front center
8	Mid-range speaker ,D-pillar left	17	Tweeter, front center
9	Top-HiFi amplifier		

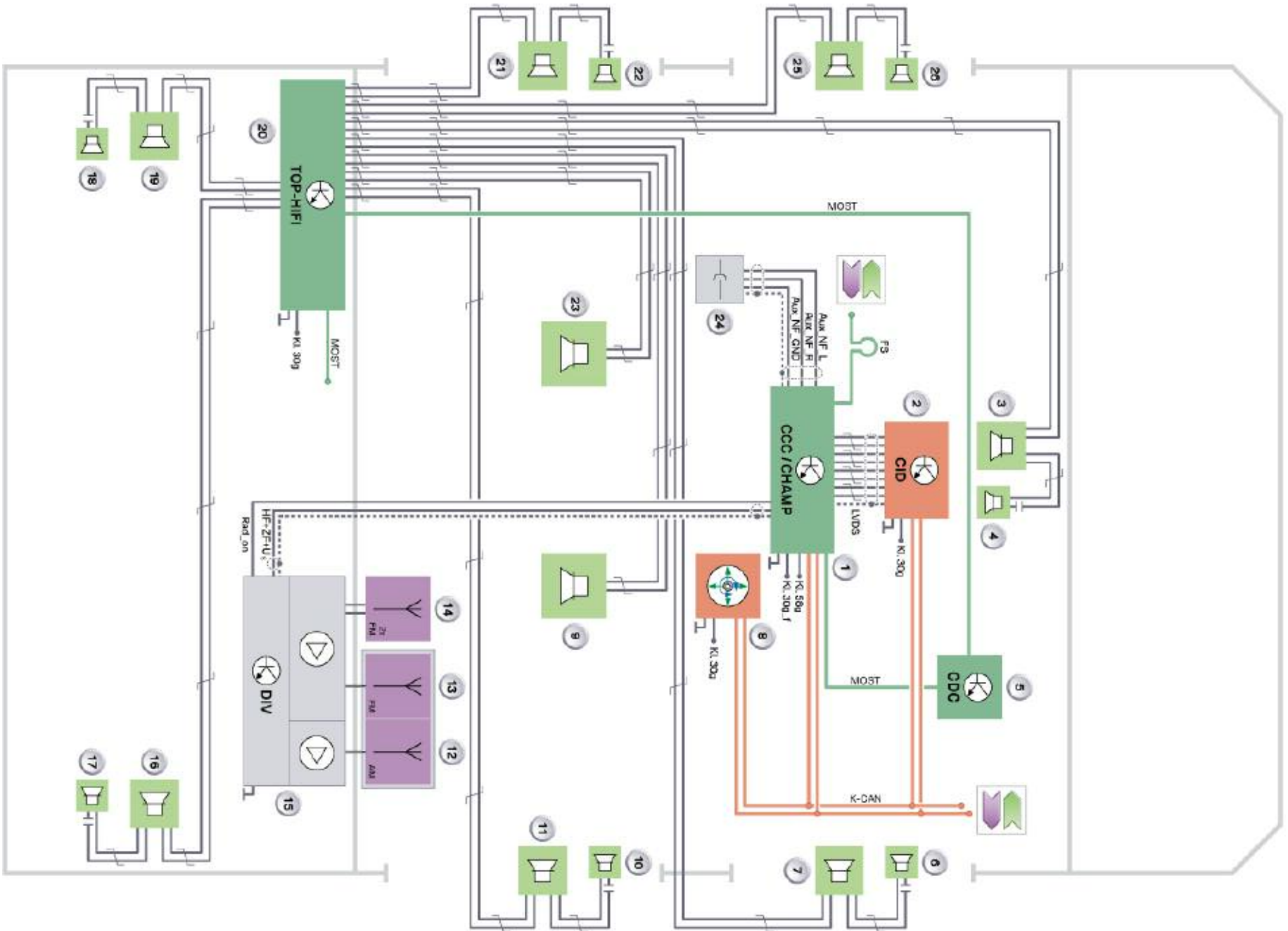
Audio Component Location



Index	Explanation	Index	Explanation
1	Broadband speaker or medium-range loudspeaker Left-hand front door	21	Aerial amplifier with diversity module
2	Tweeter, left-hand front door	22	Tweeter, right-hand rear D-post
3	SOS speaker	23	Medium-range loudspeaker, right-hand rear D-post
4	MOST direct access	24	Heated rear window blocking circuit with suppressor filter for additional brake light
5	Multifunction steering wheel (MFL)	25	Tweeter, left-hand rear D-post
6	Mid-range speaker, front center	26	Medium-range loudspeaker, left-hand rear D-post
7	Tweeter, front center	27	Satellite tuner (SDARS)
8	Central information display (CID)	28	High Definition Radio (IBOC)
9	Roof function center (microphone and emergency call button)	29	Audio amplifier (HiFi or Top-HiFi)
10	CD changer (CDC)	30	Telematics Control Unit (TCU)
11	Head Unit	31	SOS antenna
12	Snap-in adapter	32	Head phone connectors
13	Tweeter, right-hand front door	33	Rear seat entertainment (RSE)
14	Broadband speaker or medium-range loudspeaker, right-hand front door	34	Audio jack (AUX-In)
15	Rear display (RD)	35	Bluetooth antenna
16	Central bass speaker, right	36	Controller
17	Radio remote control (RRC) for rear seat entertainment	37	Broadband speaker or medium-range loudspeaker, left-hand rear door
18	Tweeter, right-hand rear door	38	Central bass speaker, left
19	Broadband speaker or medium-range loudspeaker, right-hand rear door	39	Tweeter, eft-hand rear door
20	Roof aerial (satellite tuner, GPS, telephone)		

HiFi System Circuit Diagram





HiFi and Top HiFi Systems Circuit Diagram Legend

Index	Explanation	Index	Explanation
1	Head unit	14	Rear window antennas (FM2, FM3)
2	Central information display	15	Antenna amplifier with diversity module
3	Mid-range speaker, front center	16	Mid-range speaker, D-pillar right
4	Tweeter, front center	17	Tweeter, D-pillar right
5	CD changer	18	Tweeter, D-pillar left
6	Tweeter, front right door	19	Mid-range speaker, D-pillar left
7	Mid-range speaker, front right door	20	Top-HiFi amplifier
8	Controller	21	Mid-range speaker, rear left door
9	Central bass speaker, right	22	Tweeter, rear left door
10	Tweeter, rear right door	23	Central bass speaker, left
11	Mid-range speaker, rear right door	24	Audio jack
12	Rear spoiler antenna (AM)	25	Mid-range speaker, front left door
13	Rear spoiler antenna (FM1)	26	Tweeter, front left door
LVDS	Low voltage differential signal	MOST	Media Oriented System Transport (digital bus)
Aux_NF	Audio input for additional audio sources	FS	MOST direct access
Rad_On	Control signal or power supply	US	Switching voltage
HF	High frequency signal	ZF	Intermediate frequency signal



Classroom Exercise - Review Questions

Compare the circuit diagrams and check all that apply.	HiFi System	Top HiFi System
Which system uses 16 speakers?		
Which system is on K Can Bus?		
Which system is on Most Bus?		
Which system amplifier requires a hard-wired Rad _on connection for wake up ?		
Which system can be ordered with, CHAMP or CCC?		

CD Changer

The new 6-disc CD changer (CDC) is available for the E70. The first time that a single-slot CD changer has been fitted in a BMW vehicle. It is manufactured by Alpine. The CD changer is located behind the glove box and it is integrated on the MOST network.

Single-slot CD changer means that the CDs are loaded individually into the device without a magazine. A CD can be loaded by pressing the load button, followed by the button for the operating tray of the CD to be inserted. If no button is pressed after the load button has been tapped, the LED in the operating tray button assigned to the first free tray flashes. In the meantime, the tray moves into position.

When the tray is in the correct position, the status display begins to flash and the CD can be loaded. The contents of the CD are read as soon as the CD is inserted. The next CD cannot be inserted until the contents of this CD have been read. The rapid loading feature must be activated to be able to insert all CDs immediately one after the other. To do this, the load button must be pressed for approximately 2 seconds. The LEDs in the operating buttons assigned to free trays begin to flash. Up to 6 CDs can be inserted one after the other, depending on the number of trays free. The contents of the CDs inserted are read either once the final free tray has been filled, on expiry of a time out or if the load or eject button is pressed. An individual CD can be ejected by pressing the eject button followed by the operating button concerned. Pressing and holding the eject button ejects all the CDs.

The CDs cannot be loaded unless the shutter is open. The status display flashes when it is possible to insert a disc. Operation is described in detail in the Owner's Handbook for the vehicle.

CD Changer Location



Note: If the eject button is no longer working, a CD can be ejected using the diagnostic tester. If the CD is mechanically jammed in the drive, it is necessary to send in the CD changer.

The CD changer supports the following compressed file formats:

- MPEG-1 Layer 3 Audio (MP3) with ID3 tag version 1 and version 2
- Windows Media Audio (WMA) with WMA tags
- Advanced Audio Coding (AAC).

The data on the CD is decoded by the CD changer and converted into the digital MOST format.

With the HiFi System, the digital data on the CD is sent to the head unit via the MOST, where it is then converted to analogue data and output via the amplifier and the speakers.

If the Top-HiFi system is installed, the decoded audio data is sent directly to the Top- HiFi amplifier via the MOST from where it is output. This direct transmission bypassing the head unit is made possible because data conversion and sound adjustment take place exclusively in the Top-HiFi amplifier.

Retrofitting a CD Changer

The fiber optics conductors for connecting the CD changer are arranged at the fiber optics connector in the luggage compartment such that they are not incorporated in the MOST ring. After retrofitting a CD changer, the fiber optics conductors for the CD changer preparation are unplugged at the fiber optics connector and connected to the MOST ring. It is then necessary to code the entire vehicle.

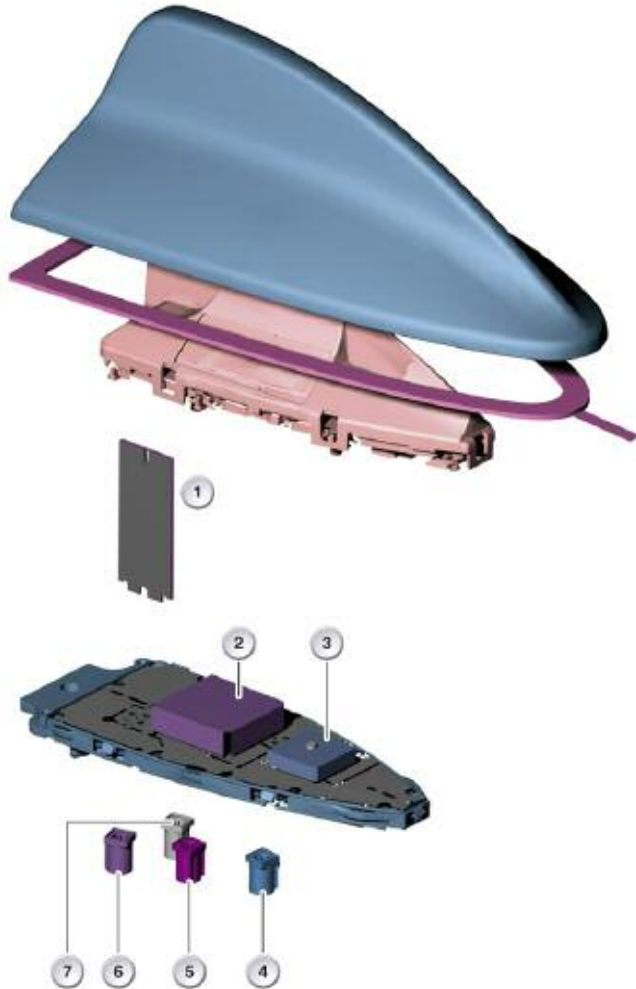
Note: For more information refer to the technical training material on available on TIS.



Index	Explanation	Index	Explanation
1	Buttons for operating trays	5	CD drive eject button
2	Load button for CD drive	6	MOST
3	Status display	7	Power supply
4	CD drive slot		

Roof Antenna

- Mobile phone antenna
- Telematics Control Unit (TCU) telephone antenna
- GPS antennal
- SDARS satellite reception antenna.



The SDARS system uses three satellites which follow an elliptical orbit around the Earth. Because of the arrangement of the orbits, there are always two satellites over the reception area. In areas without coverage, the SDARS signals are beamed terrestrially. Both SDARS signals (satellite and terrestrial) are received by an antenna patch in the roof antenna and made available to the SDARS control module.

Note: The antenna input to SDARS uses only one connection for the Satellite and the Terrestrial antenna.

Index	Explanation	Index	Explanation
1	Telephone antennas for mobile phone and Telematics Control Unit (TCU)	5	SDARS signal, satellite and terrestrial connector color code: pink
2	SDARS antenna for satellite reception	6	Telephone signal: connector color code: Bordeaux violet
3	GPS antenna	7	Telephone signal: connector color code: Grey
4	GPS signal connector color code: blue		



Workshop Exercise - Favorites Button

Operate the favorites buttons and the CD changer and fill out the information below.

What are the four functions of the favorites buttons? Match the action on the left column with the proper function on the right column.

Brief touching of the button

Touching of the button (>3 sec.)

Pressing of the button

Pressing and holding the button down

Programs button

Selects the programmed feature

Calls up a detailed menu on the CID on how buttons are programmed

Calls up a brief menu on the CID on how buttons are programmed

Which functions can be stored as one of the favorites buttons?

- Climate control function
- FM radio
- AM radio
- Sirius Digital Radio
- Weather band
- CD Track on CD placed in CD drive
- CD of CD Changer
- DVD drive
- Lighting setting
- Navigation destination
- Telephone number

Activate the fast load function to insert multiple CDs in the CD Changer. (Note the LED status of the CD Changer.)

Rear Seat Entertainment (RSE)



A rear entertainment system "Rear DVD system" is offered as an option in the new BMW X5 (E70). The system consists of the following components:

- Rear Seat Entertainment (RSE) control module
- 8" color monitor with folding mechanism and infrared transmitter
- Headphone connection
- Remote control.

The "DVD system in the rear" offers the following functions:

- Playback of photos, audio or video
- Connection to external equipment
- Headphone connection.

The rear seat entertainment is functionally independent of the other entertainment sources available in the vehicle. Via the iDrive, the driver or front passenger can release or lock the rear seat entertainment in the "Settings" menu. The rear seat entertainment program cannot be controlled by iDrive.

Once the rear seat entertainment system is activated, the rear-seat passengers can be entertained by the rear display and headphones or audio speakers in the vehicle. If headphones are used, a different medium can be enjoyed via the rear seat entertainment system, independently from the vehicle audio system. The rear seat entertainment display or headphones can be controlled by a remote control. The settings made are displayed in the rear display. No visual status signal display is issued for volume navigation.

Index	Explanation
1	Function LED
2	Thumbwheel
3	Confirmation button
4	Cross-control key (four buttons)
5	wired headphones eft/right
6	Station/track search
7	Wired headphones volume
8	Start menu



Rear Seat Entertainment



Index	Explanation	Index	Explanation
1	Car Communication Computer (CCC)	8	Connection to external equipment
2	Multifunction steering wheel (MFL)	9	Wired headphones(no equipment specification)
3	Central information display (CID)	10	Headphone sockets for wired headphones
4	Wheel speed sensor	11	Infrared headphones (no equipment specification)
6	Controller	13	Rear seat area display
7	Remote control	14	RSE control module

Initializing the Remote Control

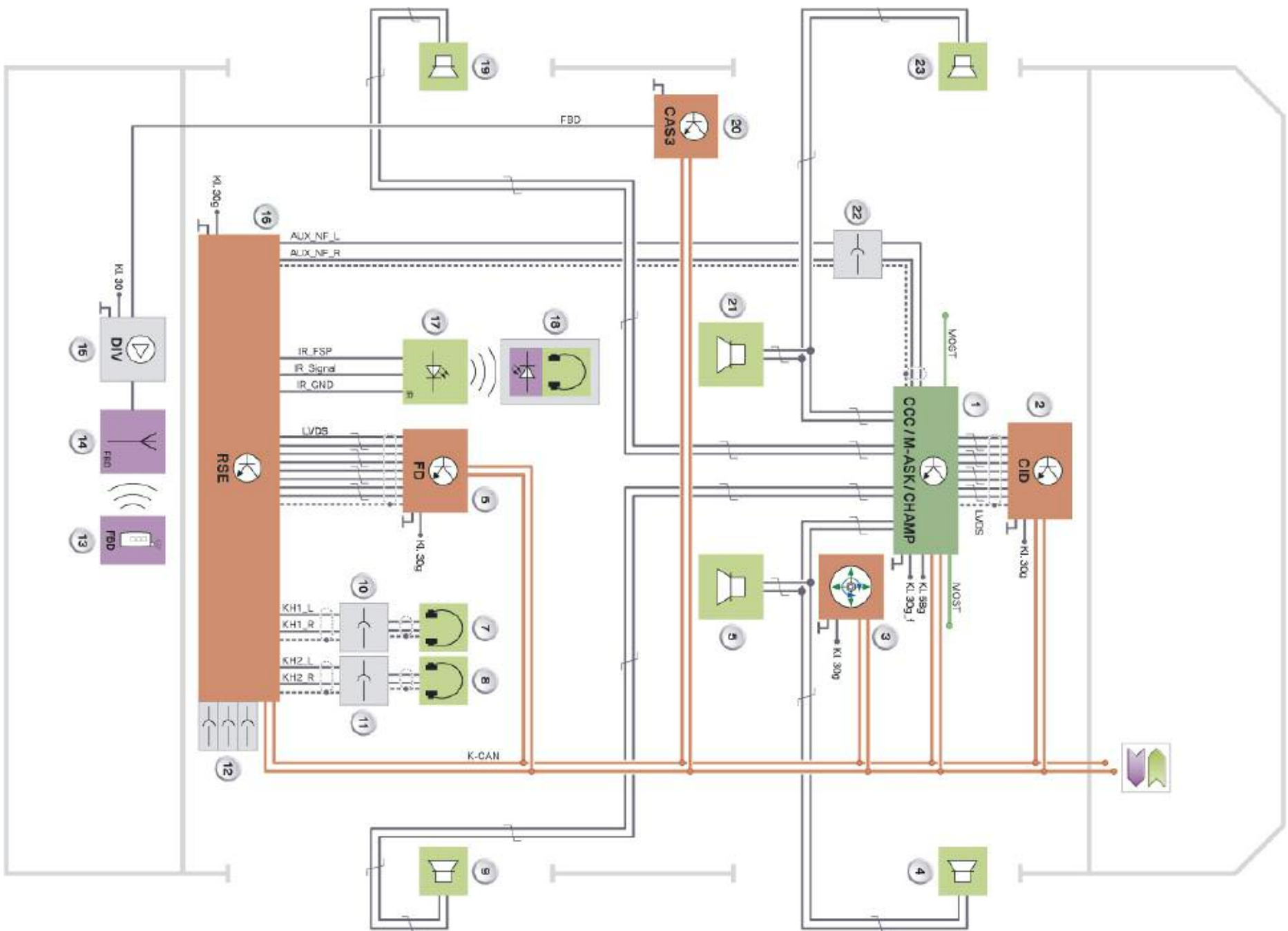
There is a test plan for teaching-in the remote control in the diagnostics under "Rear Seat Entertainment."

The test plan works through the following steps:

- The entry of the current detected remote control for the rear seat entertainment is deleted in CAS3.
- The remote control for the rear seat entertainment is initialized.
- Successful initialization of the remote control is acknowledged by the automatic closing and opening of the central locking.

Note: Remote controls are not interchangeable. Only the initialized remote control is functional in the vehicle.

Rear Seat Entertainment System Circuit Diagram



Rear Seat Entertainment System Circuit Diagram Legend

Index	Explanation	Index	Explanation
1	Headset	13	Remote control
2	Central information display	14	Remote control services aerial
3	Controller	15	Aerial amplifier with diversity module
4	Broadband speaker right-hand front door	16	Rear seat entertainment
5	Central bass speaker, right	17	Infrared transmitter
6	Rear seat area display	18	Infrared headphones
7	Wired headphones, left	19	Broadband speaker left-hand rear door
8	Wired headphones, right	20	Car Access System 3
9	Broadband speaker right-hand rear door	21	Central bass speaker, left
10	Headphone socket, right	22	Audio jack
11	Headphone socket, left	23	Broadband speaker left-hand front door
12	AV Input (external equipment)		
AUX_NF_L	Audio input for additional audio sources, left-hand channel	AUX_NF_R	Audio input for additional audio sources, right hand channel
FBD	Remote control services	IR_FSP	Power supply infrared transmitter
IR_GND	Infrared transmitter, ground	IR_SIGNAL	Infrared transmitter signal
KH1_L	Left-hand headphones, left hand channel-	KH1_R	Left-hand headphones, right hand channel
KH2_L	Right-hand headphones, left-hand channel	KH2_R	Right-hand headphones, right-hand channel
LVDS_	Low voltage differential signal (digital RGB signal)	MOST	Media Orientated System Transport (digital bus)

Note: Audio is played back either through the audio speakers in the vehicle or via the headphones. The road speed dependent volume control will only affect the audio playback through the speakers and not the headphones

The commands entered using the remote control of the rear seat entertainment are transferred via the transmission frequency, which is also used for the radio remote control key function.

The frequency used is dependent on the national variant and therefore relevant for coding, and therefore relevant for coding.

The commands are received by the FBD aerial and routed via the antenna amplifier with diversity module to the CAS3. The CAS3 converts the signals into K-CAN messages. The commands then reach the RSE control module via the K-CAN.

If audio is played back via the audio speakers in the vehicle, the audio signal is routed from the RSE control module via the AUX_NF cables and via the audio socket to the radio or navigation system Aux_In. The audio socket is standard equipment in the E70 and fitted under the center armrest. The connection to the RSE control module is disconnected manually by connection of an external item of equipment to the audio socket.

Other external items of equipment can be connected via the AV input to the RSE control module.

The programming, coding and diagnostics for the rear seat entertainment are performed via the K-CAN. The terminal status is also transferred as a K-CAN message.

The wheel speed signals are routed from the DSC control module to the PT-CAN and converted in the Junction-box ECU (JB) to the K-CAN protocol. The instrument cluster processes the road-speed signal and makes it available on the K-CAN.

Navigation Systems

Map navigation (Professional navigation system) based on the Car Communication Computer (CCC) is provided in the E70. The functions correspond with the areas already known in the E60, E61, E63, E64, E90, E91 and E92.

Via the voice input, the CCC supports the entry of whole words for a country, town and street. It is still also possible to spell the destination.

For the market launch of the E70 in the USA, the (RTTI) traffic warning system (Real Time Traffic Information) is provided. The service is controlled by the "Traffic information for navigation" option and is currently included in the range of functions of the "Professional navigation system" option.

RTTI is transferred in the form of a data stream from particular FM stations. The data is received from the CCC FM tuner, evaluated and made available for the navigation system. In the navigation map, traffic issues are indicated by symbols. The traffic issues are also available in a list. The list entries are then sorted by the current distance between the vehicle and the traffic issue. If the traffic issue is on the current route, there is a voice output.



Workshop Exercise - Rear Seat Entertainment

Operate the Rear Seat Entertainment

How is the RSE remote control "initialized"? _____

How can the following be changed on the FD?
(check the correct answer)

- | | | |
|----------|---------------------------------|------------------------------|
| Date | <input type="checkbox"/> iDrive | <input type="checkbox"/> RSE |
| Time | <input type="checkbox"/> iDrive | <input type="checkbox"/> RSE |
| Language | <input type="checkbox"/> iDrive | <input type="checkbox"/> RSE |

Is it possible to have media that is inserted into the Rear Seat Entertainment module played via the vehicle speakers?

- Yes No

Look up the Wiring Diagram of the AUX input jack.

How is the audio routed between the RSE and the head unit? _____

Insert an appropriate plug into the AUX jack in the center console.

How does this affect the audio output of the RSE? _____

Where are the volume controls for:

Audio output via vehicle speakers: _____

Audio output via IR headphones: _____

Audio output via cable bound headphones: _____



Workshop Exercise - Media Types

Utilize the media handed out by the instructor and note which media types are compatible for each control module (player).

		CCC		CD Changer	RSE
		CD Drive	DVD Drive		
DVD	Region 1				
	Region (other)				
	NTSC				
CD	Audio				
	mp3				
	m4a/AAC				
	wma				
	photo				
Other					
Other					