

## Car Communication Computer

E60, E61, E63, E64, E70, E87, E90, E91, E92, E93, R56



### Introduction

The Car Communication Computer (CCC) is fitted in conjunction with the "Professional" navigation system, voice recognition system or TV options. Several control units and the CD-ROM/MD/DVD drives are integrated into a single housing. The CCC controls all information and communication systems.

The Central Information Display (CID) is fitted with the CCC.

- E60, E61, E63, E64 - [System overview ...]
- E70: [System overview ...]
- E87, E90, E91, E92, E93: [System overview ...]
- R56: [System overview ...]
- Navigation system "Professional", voice recognition system, TV function, arrangement of boards [system overview ...]

The CCC has a modular construction. The most important systems in the communications network are integrated as modules in the CCC. Depending on what is required, the CCC can be configured and extended.

The following functions and interfaces are integrated in the CCC:

- **CCC aerial tuner (CCC-ANT)**  
Radio reception with the two-tuner radio
- **CCC applications (CCC-A)**  
"Professional" navigation system with map view

- Voice recognition system
- TV function
- Online Services (WAP application), not R56
- **CCC user interface (CCC-BO)**
  - Operating system
  - Processor for graphics display
  - Central information display activation
  - Controller for selecting menus
- **CCC gateway (CCC-GW)**
  - Interface between the MOST bus and K-CAN
  - Control and monitoring of the MOST bus
- **CCC audio system controller (CCC-ASK)**
  - Generates acoustic signals
  - Fades acoustic signals in and out
  - Distributes and outputs audio signals through the loudspeakers
- **Interfaces**
  - For expansion with future applications

**New features:**

> E70 and E93 from start of series production

8 favorites buttons (programmable buttons) enable certain functions to be stored for fast access.

**Brief description of components**

The Car Communication Computer (CCC) receives signals from the following components:

- **CON: Controller**
  - > E60, E61, E63, E64 and E70, plus E87, E90, E91, E92, E93
  - The Controller is the central control element for all menus on the Central Information Display (CID).
- **MJOY: MINI joystick**
  - > R56
  - The MINI joystick is the central control element for all menus on the Central Information Display (CID).
- **Favourites buttons**
  - > E70 and E93 from start of series production
  - The favourites buttons enable the following functions to be stored for faster access (depending on special equipment fitted):
    - Radio stations (AM, FM, digital tuner, also Weatherband on US version)
    - Destinations
    - Destinations
    - TV channels
    - Access to CD in CD drive or in CD changer
    - AUX-In connection
  - The favourites buttons contain a touch-sensitive capacitive sensor.
    - Short touch (less than 2 seconds):

brief description of button assignment in Central Information Display (CID)

- Long touch (more than 2 seconds):  
Detailed description of button assignment in CID
- Short press on button:  
Calls up stored function.
- Long press on button (press and hold for 2 seconds):  
Stores the function currently displayed on the CID.

The assignment of all favourites buttons can be deleted in the menu "Settings" -> "Vehicle". How to assign the favourites buttons is described in detail in the Owner's Handbook.

#### - **Telephone**

The telephone delivers the signal for the radio mute circuit and the low-frequency output signal to transmit the call to the loudspeakers.

#### - **CD changer**

The CD changer supplies low-frequency output signals for activating the output stages.

#### - **Aerials**

Most aerials are integrated in the rod aerial, roof-mounted aerial, side window and in the rear window. The aerials supply signals for radio and TV reception and for the remote control.

> E87, E90, E91, E92, R56: [For further information, please refer to SI Technology (SBT) 65 02 05 114]

#### - **GPS aerial**

The GPS aerial receives signals from the GPS satellites. The signals to the HIP module and the navigation system are transmitted via the aerial cable to other connections.

#### - **DSC: Dynamic Stability Control**

DSC calculates the data for distance, speed and direction for the navigation system.

#### - **Navigation DVD**

The navigation DVD supplies the data to the Central Information Display (CID) for the map display and for calculating the distance.

#### - **Wheel-speed sensors**

The wheel-speed sensors deliver the signals for the distance, speed and direction (forwards and backwards) for calculation in the DSC control unit.

#### - **SZL: Steering column switch cluster**

The SZL delivers the steering angle signal for the navigation system.

#### - **Multi-function steering wheel**

The multi-function steering wheel houses the buttons for volume and station selection. The push-to-talk button activates/deactivates the voice recognition system.

#### - **VM: Video module (not E87)**

The video module (VM) is the central processing unit for the video signals from the DVD drive/changer to the CCC. The video module contains 2 analogue TV tuners to guarantee trouble-free TV reception. The HYBRID video module is designed to receive both analogue and digital TV signals.

The video module is available in the following versions:

- VM HYBRID FBAS = EURO version
- VM RGB = Japan version (not R56)
- VM FBAS = Version for other countries

Video module has the following functions:

- Reception of television stations

- Power supply for aerial amplifier TV 1 and TV 2 in aerial diversity
- Self-diagnosis

[more ...]

The Car Communication Computer (CCC) consists of the following components:

- **Housing**

The size of the CCC corresponds to 2 DIN radio housings stacked one on top of the other.

[more ...]

- **CD-ROM drive**

The CD-ROM drive allows the following CDs to be played:

- Audio CD
- CD-ROM

[more ...]

- **DVD drive**

The DVD drive is used for the navigation DVD. When the navigation system is not in use, the DVD drive can also be used to play audio CDs and CD-ROMs. [more ...]

- **HIP module**

The HIP module (Host Independent Positioning) contains the GPS receiver. The GPS receiver deciphers the navigation system signals received from the aerial.

[more ...]

- **Yaw-rate sensor**

The yaw-rate sensor supplies the data for changes of direction. This data is required to identify the location more precisely.

[more ...]

- **Two-tuner radio**

The two-tuner radio consists of tuner 1 and tuner 2. Tuner 1 is able to receive AM and FM stations. Tuner 2 acts as a receiver for additional information from the Radio Data System (RDS) and from the Traffic Message Channel (TMC).

[more ...]

- **Motherboard with processors**

The motherboard holds slots for additional cards and for the memory chips for CCC applications. The following processors are found on the CCC motherboard, which work in the same way as control units and can be flash-programmed.

- CCC applications (CCC-A)
- CCC gateway (CCC-GW)
- CCC user interface (CCC-BO)
- CCC audio system controller (CCC-ASK)

[more ...]

- **Power board**

The power board contains the 4 audio output stages for the loudspeakers and provides the power supply for all printed circuits and modules.

[more ...]

- **Audio board**

The audio board contains the CCC audio system controller and 2 digital sound processors. The voice recognition system can be used at the same time as audio signals are being processed. Information (e.g. Park Distance Control (PDC)) can be output at the same time as the voice recognition system is in use.

[more ...]

- **Memory chip for CCC applications**

The memory chip for CCC applications contains two RAM memories. The memory chip is located above the two permanent RAM memories and is connected to the motherboard by a plug-in contact.

- **Front panel**

The front panel acts as a cover panel for the control elements of the Car Communication Computer (CCC)

> R56

The R56 has a removable control panel.

[more ...]

- **Aerial diversity**

The aerial diversity contains the aerial amplifier and switches over the aerials to FM.

[more ...]

- **Possibilities for expansion**

The Car Communication Computer (CCC) can be extended in a modular fashion for future applications. There are 3 slots available for later retrofitting with PMC (PCI Mezzanine Card) and PCMCIA (Personal Computer Memory Card International Association).

- **Electric fan**

The Car Communication Computer (CCC) has an electric fan for cooling the audio output stages and processors. The electric fan is controlled in stages, depending on the temperature of the CCC.

The Car Communication Computer (CCC) emits the following signals:

- **KOMBI: Instrument cluster**

The instrument cluster is used to display Check-Control messages.

> R56

Depending on the equipment fitted, the instrument cluster may have recesses for:

- Radio control panel
- Central Information Display (CID) on vehicles with Car Communication Computer

- **CID: Central Information Display**

The following functions can be displayed on the CID:

- Navigation
- Entertainment
- Communication
- Air conditioning (not R56)
- Settings (R56: Setup)

- **Audio operation**

The following signals can be output via the loudspeakers:

- Audio signals
- Parking aid (PDC: Park Distance Control)
- Audible signals (jingles), e.g. signals during Check-Control messages

## System functions

The following functions are described by the Car Communication Computer (CCC):

- CCC aerial tuner (CCC-ANT)

- Radio
- CCC applications (CCC-A)
  - "Professional" navigation system
  - Voice recognition system
  - TV function
  - Online services
  - Telephone
  - Telematics
  - CD changer
- CCC gateway (CCC-GW)
  - System master
  - Power master
  - Network master
- CCC audio system controller (CCC-ASK)
  - Audio master
  - Connection master
- CCC user interface (CCC-BO)

#### **CCC aerial tuner**

- Radio

The "radio" function is implemented in a two-tuner radio. Tuner 1 is principally responsible for radio reception. Tuner 1 receives the radio frequencies FM (VHF) and AM (MW, SW and LW). The radio waves from the radio station are received by the aerials in the rear window. Aerial diversity (on the rear window) feeds the HF signals received to the aerial input of the two-tuner radio via a coaxial cable.

While tuner 1 receives the radio station required, tuner 2 continues to work in the background. Tuner 2 searches the station frequencies for additional signals. If a radio station transmits a stronger signal on another frequency, tuner 2 automatically switches to this alternative frequency.

Tuner 2 receives additional information from the Radio Data System (RDS) and from the Traffic Message Channel (TMC). The additional RDS and TMC information is transmitted together with the signal from the FM radio station.

TMC information is used by the navigation system to detect tailbacks and traffic congestion. If an AM station is selected, tuner 2 will continue to receive RDS traffic information announcements from an FM station. The station is faded out and the traffic information announcement is output through the loudspeakers. Tuner 2 also generates a list of all RDS radio and traffic information stations that can be received.

#### **CCC applications**

- "Professional" navigation system

The "Professional" navigation system has been integrated in the Car Communication Computer (CCC). There is no longer a separate navigation system. The "Professional" navigation system has the following new features:

- Map information on DVD
- Complete display of Europe and US
- Several scales 1000 km, 500 km, ...
- Dynamic route planning

The navigation data can be displayed on the Central Information Display (CID) on the left-hand section of the screen, or on the right in the assist window. The left-hand area of the screen has a resolution of 400x240 pixels. The secondary screen has a resolution of 240x240 pixels. Navigation data can be displayed in the following form:

- Map north-oriented
- Map orientated to direction of travel
- Arrow display
- Location

In addition to the navigation data, the following information can be displayed on the secondary screen:

- On-board trip computer
- On-board computer

The following components are integrated in the CCC for the "Professional" navigation system:

- DVD drive for reading map information
- HIP module for receiving satellite signals
- Yaw-rate sensor for precise location identification

The navigation system software is fitted in the CCC. The navigation system uses the memories and processors in the CCC. The navigation system uses the Traffic Message Channel (TMC) to detect tailbacks and traffic congestion.

If a tailback or traffic congestion is detected, an alternative route around the hindrance is computed. The system has its own diagnosis address.

#### GPS satellites

GPS satellites move around the earth in 6 nearly circular orbits. There are 4 GPS satellites per orbit, therefore there is a maximum number of 24 GPS satellites. Before the navigation system can process the reference signal from the GPS satellites (minimum 4 GPS satellites), the Almanac data must first be loaded.

#### Loading almanac data

Almanac data delivers the following data and information to the navigation system:

- UTC (Universal Time Coordinate)
- Date
- Location of the GPS satellites
- Orbits
- Operational capacity of the GPS satellites

Once the navigation system has been switched on for the first time (terminal R ON) the GPS satellite Almanac data is received and loaded. The loading time depends on the number of "visible" GPS satellites and can take up to 20 minutes during the adaptation phase. Otherwise the almanac data is permanently stored in the system.

*Note: After longer periods of not being used (longer than 1 week) it is possible that navigation will be inaccurate at first.*

Almanac data must be reloaded if the vehicle is not used for a prolonged period of time or if it is transported over a distance of more than 300 km from the starting point, e.g. after:

- Transportation from the Dingolfing factory.
- Return transport from abroad in the case of damage.
- Transporting the vehicle on a train.

- Shutdown of the micro power module if the idle current is violated

Navigation in the adaptation phase is possible when the vehicle is stationary or in motion. Navigation is highly inaccurate at first. The end of the adaptation phase and thus the maximum precision of the navigation system will be achieved after some time or a lengthy journey.

When the Almanac data is loaded, the navigation system is ready for operation 10 to 15 seconds after starting each time.

- Voice recognition system

A voice recognition system (SVS) is integrated in the CCC. The SVS can be used to operate all buttons that are displayed in the CID by means of voice commands. The advantage of this is that the driver does not have to take his/her hands off the steering wheel to change the settings during a journey. The SVS can be used to control the following systems:

- Entertainment
- Communication
- Navigation
- Air conditioning (not R56)
- Settings (R56: Setup)

There are specified voice commands that are used for the SVS. SVS engages in a dialogue with the user. If a command is not understood, prompts will be issued.

The SVS software is loaded in the CCC. SVS uses the memories and processors in the CCC. The system is activated/deactivated with the push-to-talk button on the multi-function steering wheel or with the controller (not R56).

Voice commands are input through a separate microphone that is directly connected to the CCC. This microphone is discontinued from 09/2006. Voice commands are input via the hands-free microphone.

- TV function (not E87)

The TV function is available as special equipment (option 601 "TV function") for the Car Communication Computer (CCC). The Central Information Display (CID) in the dashboard acts as a screen for the TV function.

**Important: For reasons of safety, TV reception is not permissible while the vehicle is being driven!**

From a speed of 3 km/h upwards, the TV function is disabled. However, TV sound remains audible.

### CCC gateway

The CCC Gateway control unit forms the interfaces for data exchange between the MOST bus and the K-CAN. The two bus systems use/apply various data transmission rates and data formats. To communicate with all systems, data for each bus is configured as necessary in the CCC gateway.

- System master

The system master links the individual control units in the Car Communication Computer (CCC).

- Power master

The power master initialises the network and switches the MOST bus on and off (wake-up, sleep mode).

- Network master

The network master controls and monitors the MOST bus. Each time the network is started, the exact system configuration is recorded and compared with a stored target configuration. If systems do not work correctly, these are reset and separated from the MOST bus. Any operating fault in the network or any deviation from the target configuration is stored in a fault memory for the MOST bus.

### CCC user interface

The CCC user interface control unit contains the operating system for controlling the CCC. Signals from the controller for selecting the menus and submenus are processed in the CCC user interface control unit. To actuate the CID, the red-green-blue signals from the graphics processor are converted into Low Voltage Differential Signalling (LVDS) digital signals.

### **CCC audio system controller**

- Audio master

The audio master collects all the audio signals in the vehicle, processes the audio signals and outputs them over the loudspeakers. The audio master also produces additional audible signals for warnings and for Park Distance Control (PDC). By mixing or fading in and out, a "softer" audible change is obtained between the signal sources.

- Connection master

The connection master distributes the signals of the audio sources and the audible signals to the loudspeakers. The signals are transmitted to the loudspeakers in the following way:

- Front left and right (acoustic signals, telephone, messages from the navigation system, traffic information announcements)
- Front left and right, rear left and right (PDC signals)
- All loudspeakers (all sources in the "Entertainment" menu)

### **Notes for service staff**

Service staff should note the following points:

- General information: [more ...]
- Diagnosis: [more ...]
- Encoding/programming: ---

### **National versions**

- **US national version (only E60, E61, E63, E64, E70, E90, E91, E92, E93, R56)**

The US version has the two-tuner radio with FM, AM and Weatherband (7 channels) radio frequencies. The R56 only has the frequency bands FM, AM.

The telephone and GPS aerial also contains telephone aerial 2.

The SDARS aerial is installed in conjunction with special equipment (option 655 "BMW satellite tuner").

> E70 and E93 from start of series production

Of the 8 favourites buttons, 6 can be programmed with certain functions. 2 buttons are assigned fixed functions.

- **Japan national version (not R56)**

In the Japanese version, the Car Communication Computer has a MD drive (minidisc) instead of the CD-ROM drive. The two-tuner radio has the radio frequencies FM, AM and Traffic (2 channels).

In the Japanese version, the Car Communication Computer does not have a yaw-rate sensor or a HIP module.

Subject to change.