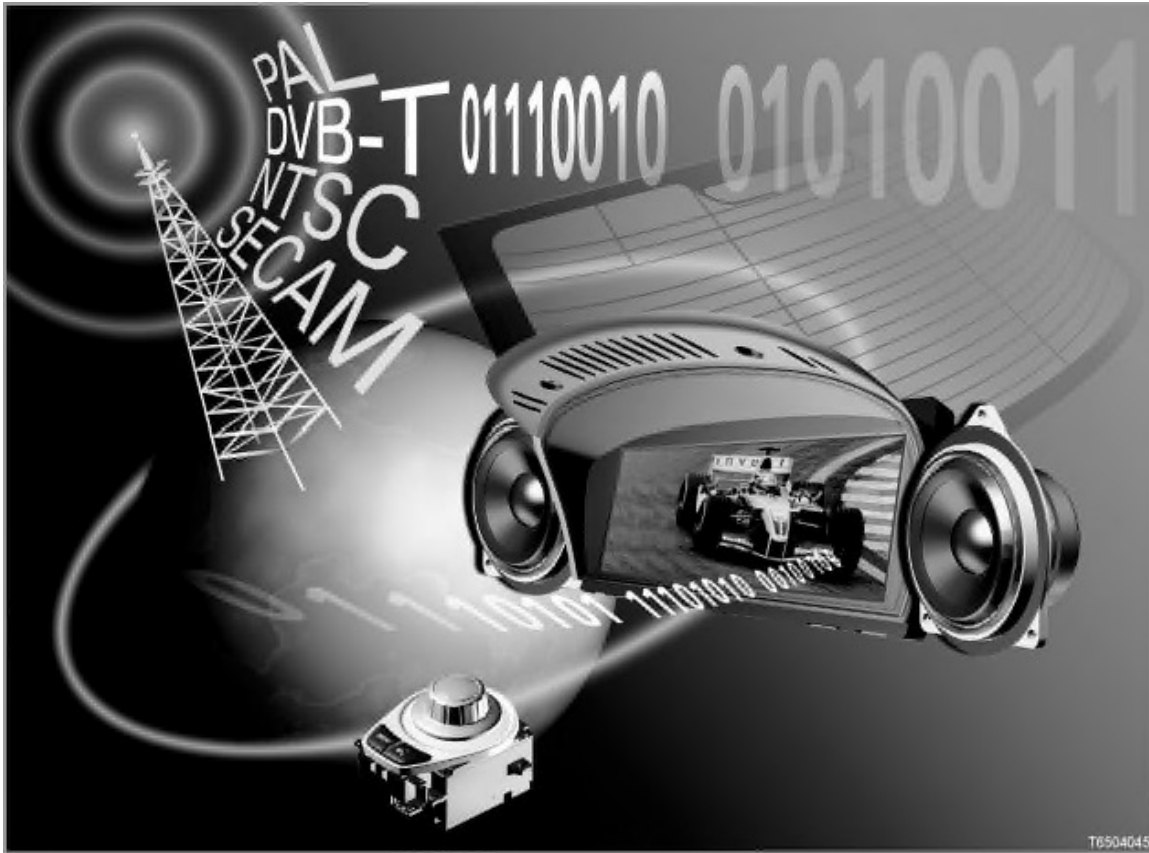


## Digital and analogue television

E60, E61, E63, E64, E65, E66, E70, E71, E83, E85, E86, E90, E91, E92, E93



*Note: Television picture in front is inactive while the vehicle is being driven.*

For safety reasons television is forbidden in the front when the vehicle is in motion. For this reason, the TV picture is faded out at roadspeeds greater than 3 km/h. However, TV sound remains audible.

### Introduction

The television can be ordered as special equipment (option 601 or 602). Either the Control Display (only E65, E66) or the Central Information Display are used as the TV screen.

TV reception in the rear:

> E65, E66

With option 603, "Rear monitor", it is possible to use the television in the rear seat area too.

> E70, E71

From 09/2007, TV reception is also possible in the rear in conjunction with option 6FF "DVD system in rear" **and** option 601 "TV function" **or** option 602 "on-board monitor with TV". Here, a headphones module and a special RSE control unit are used.

**New feature:** The newly developed video modules receive both analogue and digital television in accordance with the international standard DVB-T. The abbreviation "DVB-T" stands for "Digital Video Broadcasting - Terrestrial".

Depending on the series there are the following equipment versions for analogue and digital television:

- Front television:

Viewing television in the front is only possible when the vehicle is stationary.

> E60, E61, E63, E64 - Television in front:

[System overview ...]

- > E65, E66: Television in front:  
[System overview ...]
- > E70, E71: Television in front:  
[System overview]
- > E83, E85, E86  
[System overview ...]
- > E90, E91, E92, E93  
[System overview ...]
- Television in the front and rear is only available for model series E65, E66, E70, E71.  
When the vehicle is in motion it is only possible to watch television in the rear seat area. It is only possible to watch television in the front when the vehicle is stationary.
  - E65, E66: Front and rear seat television  
[System overview ...]
  - E70, E71: Front and rear seat television  
[System overview ...]

*Note: The Japan national version has its own system overview.*

There is a separate television system overview for the Japan national version. Please refer to the "National version" section.

## Brief description of components

The following components supply signals or data for the television:

### - **TV aerial**

The TV aerial receive the signals for the television.

2 or 3 TV aerials are used as follows for the best possible TV reception under varying reception conditions:

- > E60, E61, E63, E64 - Front television: 2 TV aerials
- > E65, E66 without navigation system: Front television: 3 TV aerials
- > E65, E66: Television in front and rear, analogue: 2 TV aerials
- > E65, E66: Front and rear seat television: 3 TV aerials
- > E70, E71: Front television: 2 TV aerials
- > E70, E71: Front and rear seat television: 3 TV aerials
- > E83, E85, E86: TV in front: 2 TV aerials
- > E90, E91, E92, E93: TV in front: 2 TV aerials

### - **TV aerial amplifier**

There are always 2 TV aerial amplifiers (TV tuners) installed.

The aerial signals are transmitted to the video module via coaxial cables.

- > E65, E66

On equipment versions with 3 TV aerials, 2 TV aerials are amplified by one TV aerial amplifier. One more TV aerial is amplified by the 2nd TV aerial amplifier.

- > E70, E71

On the equipment version with 3 TV aerials, there are 3 TV aerial amplifiers installed.

### - **MOST port**

Control units for the television are programmed and encoded via the MOST port.

### - **Diagnosis lead**

Control units for the television are diagnosed via the diagnosis lead.

- Diagnosis-on CAN (D-CAN)

D-CAN supersedes the previous diagnosis interface in all countries. The background for the conversion is a new legal requirement in the USA that stipulates that all vehicles from Model Year 2008 must be equipped with D-CAN.

[For further information, please refer to SI Technology (SBT) 61 03 05 144]

The following control units are involved in the television system (in alphabetical order):

- **AMP: Amplifier**

The amplifier issues the audio signals to the loudspeakers.

The following amplifier is fitted, depending on equipment variant:

- HiFi amplifier without AMP control unit
- TOP-HiFi amplifier with AMP control unit:  
This amplifier belongs to the "TOP-HiFi amplifier" option (Logic 7).

The TOP-HiFi amplifier is a control unit in the MOST network.

The audio signals are transmitted to the TOP-HiFi amplifier via the MOST bus.

- **ASK: Audio system controller**

> E65, E66

The audio system controller controls the sound.

The audio system controller is a control unit in the MOST network.

- **BZMF: Rear compartment centre armrest control centre**

> E65, E66

The rear compartment centre armrest control centre controls the headphones.

The centre armrest control panel in the rear is a control unit on the K-CAN SYSTEM

- **CCC: Car Communication Computer**

> E60, E61, E63, E64, E70, E71, E90, E91, E92, E93

The Car Communication Computer controls the information and communication systems.

Depending on the equipment and national version, the Car Communication Computer processes RGB signals or FBAS signals (RGB: red-green-blue; FBAS: Composite Video Burst Synchronisation).

The Car Communication Computer converts the analogue picture signals into digital LVDS signals (LVDS: Low Voltage Differential Signalling). The LVDS signals are transmitted to the screen via a special LVDS data wire (monitor is the CD or the CID).

The Car Communication Computer is a control unit in the MOST network.

[for more information, please refer to SI Technology bulletin (SBT) 84 06 03 053]

- **CD: Control display**

> E65, E66

The control display is the screen for the television and other information and communication systems (e.g. navigation system).

The Control Display is a control unit in the MOST network.

- **CID: Central Information Display**

> E60, E61, E63, E64, E70, E71, E83, E85, E86, E90, E91, E92, E93

The Central Information Display is the screen for the television and other information and communication systems (e.g. for the navigation system).

The Central Information Display is a control unit on the K-CAN.

[for more information, please refer to SI Technology bulletin (SBT) 62 01 03 027]

- **CON: Controller**

> E60, E61, E63, E64, E65, E66, E70, E71, E90, E91, E92, E93

The controller is the operating unit and the control unit for operating the screen (control display or Central

Information Display, see below).

The controller is a control unit on the K-CAN SYSTEM or K-CAN

(K-CAN-S on E65, E66; K-CAN on E60, E61, E63, E64, E70, E71, E90, E91, E92, E93).

[for more information, please refer to SI Technology bulletin (SBT) 62 01 03 027]

- **DSC: Dynamic Stability Control**

Fading out the TV picture in the front while the vehicle is being driven requires the speed signal to be evaluated. The wheel-speed signals are transmitted by the DSC control unit on the powertrain CAN (PT-CAN). The instrument cluster (KOMBI) prepares the speed signal and makes it available as a message on the K-CAN or K-bus.

- **DVD-C: DVD changer**

The films on DVD use the components and software of the television.

- **FCON: Rear controller**

> E65, E66

The rear compartment controller is part of option 603 "Rear monitor".

The rear compartment controller is integrated into the rear compartment centre armrest control centre (BZMF).

The rear compartment controller is the operating unit and control unit for operating the rear display. The rear compartment controller is a control unit on the K-CAN system

- **KHI: Headphones interface**

> E65, E66

The headphones interface is part of option 603 "Rear monitor".

The headphones interface transmits audio data to the headphones connection module.

The headphones interface is a control unit in the MOST network.

- **KHM: Headphones module**

> E70, E71

The headphones module is the interface between the MOST bus and the control unit for the RSE (rear entertainment system).

While the image signals from the video module are directly transmitted to the RSE control units via an RGB wire, the video module transmits the TV sound as a message (optical signal) on the MOST bus.

The headphones module converts the optical signal into an analogue signal.

The headphones module transmits the TV sound to the RSE control unit as an analogue signal through the audio wires. The RSE control unit regulates the audio output of the TV sound for the rear entertainment system.

- **NAV: Navigation system**

> E65, E66

The navigation system is important for the equipment version "TV in front".

With the equipment variant "Television in front", the NAV control unit works as an RGB decoder:

The navigation system converts FBAS signals into RGB signals.

The navigation system is a control unit in the MOST network.

> E60, E61, E63, E64, E70, E71, E90, E91, E92, E93

The navigation system has been integrated in the Car Communication Computer (CCC). This means that there is only a separate navigation system for certain national versions.

- **SG-FD: Rear display control unit**

> E65, E66

The rear compartment controller control unit is only provided with option 603 "Rear monitor".

The SG-FD is installed beneath the rear display.

The SG-FD is a control unit on the K-CAN system

The SG-FD converts the image signal into the screen display on the rear display: e.g. RGB signals into LVDS signals.

The SG-FD is actuated by the video module.

Signal path: VM -> RGB wire -> SG-FD -> LVDS data wire -> FD

- **SGM: Safety and gateway module**

> E65, E66

The safety and gateway module is the data interface between the K-CAN (K-CAN Periphery and K-CAN SYSTEM), the diagnosis wire, **byteflight** and PT-CAN.

The control units are diagnosed via the SGM.

> E60, E61, E63, E64

- Until 09/2005: SGM
- from 09/2005: Body gateway module (KGM)

- **VM: Video module**

Depending on the national version concerned, either the hybrid video module or the video module 5 (VM5) is fitted.

The video module is the central receiver unit for the picture signals from the TV aerials. In addition, the video module is a selector switch for the video sources.

- The video module is the master control unit for the television.
- The video module edits the picture signals from the TV aerials and from the DVD drive or DVD changer.

The video module is a control unit in the MOST network.

[more ...]

>E83, E85, E86

[more ...]

The following components are controlled:

- **Monitors: Central Information Display or Control Display**

- > E60, E61, E63, E64, E70, E71, E83, E85, E86, E90, E91, E92, E93: Central Information Display (CID)
- > E65, E66: Control display (CD)

- **FD: Rear display**

> E65, E66, E70, E71

The rear display is the monitor for the television in the rear.

The rear display is mounted on the centre console between the driver's and front passenger's seats.

> E65, E66

The rear display is part of option 603 "Rear monitor".

The rear display is actuated via an LVDS data wire by the rear display control unit (SG-FD). The rear display is a control unit on the K-CAN system

> E70, E71

The rear display is part of option 6FF "Rear seat entertainment".

The rear display is actuated via an LVDS data wire by the RSE control unit (RSE = "Rear Seat Entertainment"). The rear display is a control unit on the K-CAN.

- **Loudspeakers**

The following loudspeakers are actuated for audio output:

- Tweeters and medium-range loudspeakers: The loudspeakers are actuated by the CCC, the ASK or the radio.
  - > E60, E61, E63, E64, E70, E71, E90, E91, E92, E93: Car Communication Computer (CCC)
  - > E65, E66: Audio system controller (ASK)
  - > E83, E85, E86: BMW CD radio or BMW Business CD radio

- Woofers: If an amplifier (AMP) is fitted (HiFi amplifier or TOP-HiFi amplifier), the woofers are actuated by the amplifier.
- **Headphones connector module**
- > E65, E66:
- The headphones connector module is integrated into the rear compartment centre armrest control centre. The headphones are connected to the headphones connector module.
- The following wires are important:
- **FBAS wire**
- FBAS: Farbbild-Austast-Synchronsignal,  
English CVBS: Composite Video Burst Synchronisation
- The FBAS wire consists of 2 wires:
- One wire is used to transmit all three 3 RGB signals (red-green-blue) together.  
The synchronisation pulse (for a sharp TV picture) are also transmitted on the wire for RGB signals.
  - The other wire is used for screening and earthing.
- **Coaxial cable**
- The coaxial cables transmit high-frequency signals, e.g. between the TV aerial amplifier and the video module (VM):
- Construction of coaxial cable:
- Inner conductor ("core"), insulated
  - The outer conductor forms a mantle around the inner conductor
- **LVDS data wire**
- LVDS stands for "Low Voltage Differential Signalling".
- There is always an LVDS data wire between the control unit for the display and the screen (except E83, E85, E86):
- LVDS is a special technology for fast and secure data transmission:
- There are 2 wires for each signal. The signal is transmitted positively on one wire, negatively on the other (inverted). This means that each pair of wires is electrically neutral.
- Interference from outside has **no** effect on the signal transmission: such interference affects both wires equally. The signal information is thus unaffected. This is because: The control unit processes the difference between the positive and negative signals. This difference remains unchanged even in the event of interference from outside.
- The LVDS data wire for the television consists of the following wires:
- 2 wires for red
  - 2 wires for green
  - 2 wires for blue
  - 2 earth wires
  - Screening
- The synchronised pulses are transmitted on the wire for image signals.
- **RGB wire**
- The RGB wire has 3 wires for image signals: red-green-blue. The synchronised pulse is transmitted on the wire for the green signal.
- The RGB wire is screened. The screening carries no current.
- In addition, the RGB wire has its own earth wire for improved electromagnetic compatibility. The earth wire conducts current.
- **MOST bus**
- The MOST bus connects the control units for the vehicle's information and communication systems. These control units are programmed via the MOST port.

> E83, E85, E86: no MOST bus fitted.

- **K-bus: Body bus**

>E83, E85, E86

The K-bus links a series of control units whose functions are in the area of the body and in the information and communication systems of the vehicle.

- **K-CAN or K-CAN SYSTEM: Body CAN or body CAN SYSTEM:**

> E60, E61, E63, E64, E70, E71, E90, E91, E92, E93: K-CAN

> E65, E66: K CAN SYSTEM

[for more information, please refer to SI Technology bulletin (SBT) 61 02 03 015]

## System functions

The video module comprises the following functions:

- Digital and analogue television
- Television when the vehicle is stationary (front)
- Television when the vehicle is in motion (rear compartment only)
- Television reception
- Image build-up
- Sound reception
- Transmission of image signals in the vehicle
- Audio output
- Mute
- Station selection
- Aerial diversity (only with front and rear TV)

Aerial diversity for TV aerials is not a separate component, but rather a software component within the video module.

- Video switch

*Note: Digital television: Basic principles and introduction in various countries*

This SI Technology bulletin (SBT) describes digital television as used by BMW.

The enclosures also include the following information:

- Fundamental information about digital television

[more ...]

### Digital and analogue television

Depending on the equipment variant, analogue and/or digital television can be received.

For digital television the DVB-T standard is supported. Only terrestrial reception is possible.

The abbreviation "DVB-T" stands for "Digital Video Broadcasting - Terrestrial. In other words "DVB-T" means: digital television transmitted via antenna ("terrestrial").

### Television when the vehicle is stationary (front)

Viewing television in the front is only possible when the vehicle is stationary.

The television is deactivated when the vehicle reaches walking pace. The sound remains unaffected.

### Television when the vehicle is in motion (rear compartment only)

> E65, E66, E70, E71

It is also possible to watch television in the rear when the vehicle is in motion.

### Television reception

The analogue television supports the following television standards:

- NTSC: NTSC is most common in North and South America and in Japan. NTSC is an analogue television standard for colour transmission.  
NTSC stands for "National Television Standards Committee".
- PAL: PAL is most common in Europe.  
PAL is also used in Australia and in most African and Asian countries (except for Japan). PAL is common in all countries that **do not have** NTSC and SECAM.  
PAL is an analogue television standard for colour transmission.  
PAL is a further development of NTSC. As with NTSC, the TV pictures are transmitted in lines. PAL, however, evens out colour faults.  
PAL stands for "Phase Alternating Line".
- SECAM: SECAM is most common in France and Eastern Europe.  
SECAM stands for "Sequentielle Couleur à Mémoire", i.e. "sequential colour memory".

Digital television supports data transmission via MPEG.

MPEG stands for "Motion Picture Experts Group". MPEG is the designation of a data compression standard for image signals.

### **Transmission of image signals in vehicle**

Image signals are transmitted as follows, depending on equipment fitted:

- > E60, E61, E63, E64, E90, E91, E92, E93

#### **Television in front**

The video module transmits the image data via the FBAS wire (Europe version) to the Car Communication Computer (CCC).

A LVDS data wire transmits the image signal between the CCC and the CID (Central Information Display).

- > E65, E66

#### **Television in front**

Depending on the vehicle's equipment, the video module or the navigation system will transmit the RGB signals to the control unit for the monitor.

If a navigation system is fitted, the navigation system will transmit the RGB signals to the monitor (exception: Japan navigation system)

If there is **no** navigation system fitted, the video module will transmit the image signal to the monitor as follows: From the video module through the RGB wire to the control display.

#### **Front and rear seat television**

The navigation system transmits its image data to the video module.

The image signals are transmitted between the SG-FD and rear display through a LVDS data wire.

- > E70, E71

#### **Television in front**

The video module transmits the image data via the FBAS wire (Europe version) to the Car Communication Computer (CCC).

A LVDS data wire transmits the image signal between the CCC and the CID (Central Information Display).

#### **Front and rear seat television**

The video module transmits the image data via the RGB wire (Europe version) to the Car Communication Computer (CCC) and to the RSE control unit.

An LVDS data wire transmits the image signal between the CCC and the CID (Central Information Display).

The image signals are transmitted between the RSE control unit and rear display through a LVDS data



wire.

> E83, E85, E86

### **Television in front**

The video module transmits the image data via the RGB wire to the Central Information Display (CID).

### **Image build-up**

The TV picture is built up as follows:

- Colours are made up of individual red, green and blue pixels.
- The TV picture is built up line by line.
- Synchronisation of image signals: For a sharp TV picture, the pixels must be precisely synchronised. The synchronisation works as follows:
  - Horizontal synchronisation defines when a line ends and a new line starts.
  - Vertical synchronisation defines when a new image build-up is to start (in the top left corner).

A separate electrical pulse is provided for synchronisation: The synchronisation pulse. The synchronisation pulse is transmitted with the green signal (all model series).

### **Sound reception**

The sound signal is received together with the image signal in the TV signal.

### **Audio output**

Audio output is in mono or stereo as follows:

- Analogue TV sound in mono:
  - The video module receives the analogue TV sound in mono.
  - The analogue TV sound is digitalised.
  - The video module lays the digitalised signal on both the left and right synchronous channel of the MOST bus.
  - The ASK or CCC emit the audio signals to the loudspeakers (via the amplifier, depending on equipment variant).
- Digital TV sound in stereo:
  - The digital TV sound is received and emitted in stereo.
  - Precondition: The TV program is transmitted in stereo.
- 2-channel sound:
  - 2-channel sound is only available with digital television reception.
  - 2-channel sound allows, for example, a foreign-language broadcast to be overdubbed in English. With 2-channel sound, the language of the country concerned will be output through the loudspeakers. The other language will be muted.

### **Mute**

If necessary, audio output can be switched between navigation system and television.

The sound signals from the radio and television are muted under the following conditions:

- Telephone call
- Navigation system announcements
- Traffic reports

The CCC or the ASK controls the muting.

### **Station selection**

The video module manages a list of all the television stations that can currently be received.

This list of stations is shown on the Control Display (CD) or Central Information Display (CID) as follows:

- Where station names for individual TV programmes can be determined, the list starts with the station names arranged in alphanumeric order (e.g. ARD, BR3, SAT1 ...).

- After this, a list will appear showing the reception channels with unknown station names. This list is also alphanumerically ordered: e.g. CH3, CH7, CH12, ... for Channel 3, Channel 7, Channel 12.

**Television in front:** The list of stations is updated manually by selecting "Autostore".

**Front and rear seat television:** The list of stations is updated automatically.

The list of stations is also updated if another entertainment module is selected (e.g. if you change to the radio or DVD changer). When the television is called up again the current list of stations is offered automatically.

### **Aerial diversity**

The aerial diversity function, which is integrated in the video module ensures that the stationary vehicle always has the best possible reception. The aerial diversity uses certain criteria to select the TV aerial that offers the best reception.

2 TV aerials are fitted for TV reception in the front (TV 1, TV 2).

3 TV aerials are fitted for TV reception in the front and rear.

To ensure optimum reception, these 3 TV aerials work as follows:

- 2 TV aerials (TV 1, TV 2) receive the desired TV channel.
- 1 TV aerial (TV 3) searches in the background for other transmission frequencies for this television station.

The required television station is received on the transmission frequencies with the highest signal strength.

Aerial diversity works as follows:

If more than one station have the same name when analogue TV is in use, then there are alternative frequencies. e.g. "Television station 1" is being received on 3 different analogue frequencies. In this case the television station is displayed just once.

Aerial diversity automatically selects the best frequency. "Television station 1" is shown in the display.

If, however, a television station is transmitting "Television station 1" analogue on several frequencies and "1st digital" digitally on another frequency, then the display shows the following:

- Aerial diversity combines all frequencies for analogue television.  
The best frequency is selected and displayed. e.g.: "Television station 1".
- However, aerial diversity is **not** able to combine the following TV stations: Analogue reception for "Television station 1" and digital reception for the "1st digital".  
This is because: The video module cannot assign the two different notations and meanings to one another.

This means "Television station 1" appears twice in the list of stations: Once analogue as "Television station 1" and once digitally as the "1st digital".

### **Video switch**

The video module switchers between the various video sources, e.g. between television and video.

This function is called "video switch".

## **Operation**

The following operations are described:

- Adjusting screen settings
- Selecting television stations
- Updating list of stations

*Note: Please comply with instructions in Owner's Handbook.*

Detailed instructions for the television can be found in the vehicle's Owner's Handbook.

### **Adjusting screen settings**

Users can adjust the screen settings for colour, contrast and brightness: Cal up the corresponding menu

(with the controller on the CD or CID).

The controller controls the monitor settings.

Depending on the equipment specification, the screen setting is processed in the following control units:

- Vehicles with television in the front:
  - > E60, E61, E63, E64, E70, E71, E90, E91, E92, E93: Car Communication Computer (CCC)
  - > E65, E66, R83, E85, E86:

For vehicles **with** navigation system, the screen setting is processed in the control unit for the navigation system (NAV).

On vehicles **without** navigation system, the video module processes the monitor settings.

- Vehicles with rear display
  - > E65, E66: The video module processes the monitor settings for the rear display.
  - > E70, E71: The RSE control unit processes the monitor settings for the rear display.

### Selecting television stations

- Select country (on Control Display or Central Information Display)  
When a country is selected, the video module will set the correct television standard.
- Select the required television station from the list of stations.  
The video module administers a list of stations with all receivable television stations. This list is shown on the Control Display or Central Information Display.

### Updating list of stations

On vehicles with television in the front, the list of stations is manually updated as follows: Call up "Autostore".

### Preconditions for activation

The television is available from terminal R ON.

### Notes for service staff

The following information is available for service staff:

- General notes: [more ...]
- Diagnosis: [more ...]
- Encoding/programming: ---
- Car and Key Memory: The last settings made remain stored when the vehicle is shut down. The video module remembers the last TV station selected. The colour settings are also stored (in either the video module or navigation system, depending on equipment variant).

### National versions

Digital television is already available in many countries.

There are numerous analogue television standards worldwide. The video module supports these television standards and frequencies.

*Note: Subscription TV is not supported.*

Because special cards and decoders are needed for subscription TV (pay TV), pay TV is not supported. Pay TV is available, for example in the Netherlands and in the UK. Free TV stations in the UK are supported.

The following details are available with regard to national versions:

- US
- Japanese national version

*Note: The Japan national version is also valid for China and Korea.*

The equipment specifications for the Japanese national version also support television reception in China and Korea.

### **US national version**

In the US version, the television is deactivated by encoding.

Reason: watching television in cars is forbidden in the USA.

However, a video module is fitted, depending on the equipment. This video module serves as a video switch between the different entertainment sources (e.g. radio, CD changer).

### **Japanese national version**

There is no DVB-T in Japan. For this reason, the Japan national version only has analogue television. The image signals are transmitted on an RGB wire (RGB: red-green-blue).

Vehicles with the Japan national version have the following equipment specifications for television:

- E60, E61, E63, E64 - Television in front with Japan navigation system  
[System overview ...]
- E65, E66: Television in front with Japan navigation system  
[System overview ...]
- E65, E66: Television in front and rear, with Japan navigation system  
[System overview ...]
- E70, E71: Television in front and rear, with Japan navigation system  
[System overview ...]
- E83, E85, E86: Television in front with Japan navigation system  
[System overview ...]

The following components are also needed:

- **JNAV: Japan navigation system**

JNAV is the control unit for the Japan navigation system.

- > E60, E61, E63, E64, E70, E71, E90, E91, E92, E93  
The JNAV is a control unit in the MOST network.
- > E65, E66

JNAV is connected to the following control unit:

**FBI: Flexible bus interface**

The FBI connects the JNAV control unit to the MOST bus.

- > E83, E85, E86  
The JNAV is a control unit on the body bus (K-bus).

The Japan navigation system is supported as follows by the video module (example E60):

- When the controller is operated, the CCC receives the prompt "switch on navigation system".
- The CCC sends the message "Navigation system requested" to the video module.
- The video module routes the signals from the Japan navigation system (JNAV) through to the CCC.

### **Different switch-off conditions when driving in different national versions**

- Japan national version: The television in the front is switched off depending on the position of the gear lever or selector lever.
- Australia national version: it is only possible to watch television in the front when the selector lever position is "P" (with automatic transmission) or when the parking brake is applied.

Subject to change.