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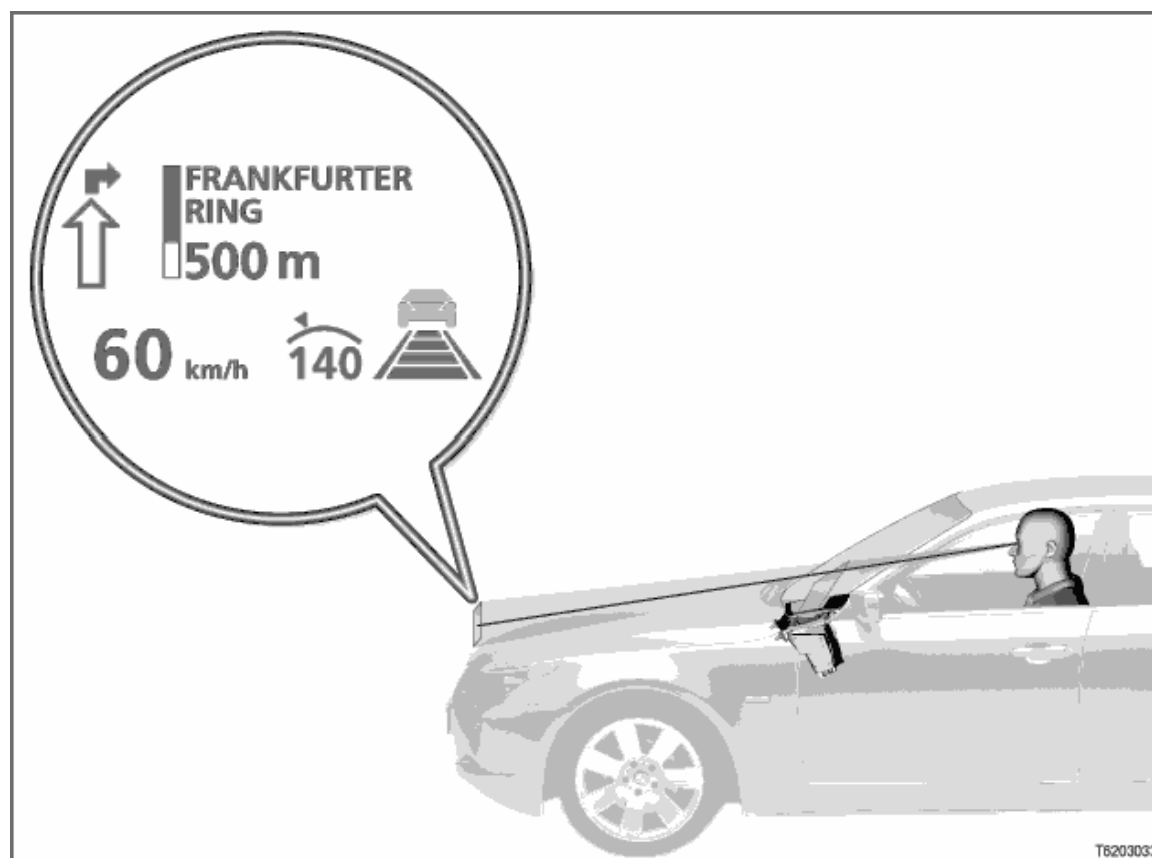
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Datum/Date:
10/2003 Update:
09/2006

Head-up display

E60, E61, E63, E64, E70

Introduction

The head-up display is used to display information relevant to driving the vehicle (e.g. navigation instructions, driving speed) in an ergonomically favourable position on the windscreen. Information appears as a virtual image approximately at the front of the bonnet.

> E60, E61, E63, E64 before 09/2005 [system overview ...]

> E60, E61, E63, E64 from 09/2005 [system overview ...]

> E70 [system overview ...]

Note: Displays in the instrument cluster and in the central information display
    Information relevant to driving the vehicle still appears in the customary manner in the instrument cluster and in the central information display.

The information displayed on the head-up display is independent of the equipment level. You can select the information using the controller on the Central Information Display (CID).

The following information can be shown on the head-up display:

-    Check-Control messages

-    Active Cruise Control (ACC) or cruise-control system (FGR)

-    Navigation instructions

-    Vehicle road speed

Benefits of the head-up display:

-    Important information relevant to driving the vehicle can be received without the driver having to take his eyes off the road.

SBT Head-up display E60, E61, E63, E64, E70
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23.12.2015 15:44
Page - 1 -

- This makes driving more relaxing. The eyes do not have to refocus as much or as frequently (i.e. when the eyes move from a wide view of the road to a small display in the instrument cluster).

The head-up display is employed for the first time as special equipment (option 610) on the E60.

Launch date is 11/2003.

The HUD of the E60 is identical to that of the E61.
The windscreens on the E63 and E64 are tilted more. The following modifications related to the HUD are therefore required for the E63/E64:

- Modified mirror set
- Modified integration into the instrument panel

The HUD in the E70 differs from the HUD in E60, E61, E63, E64 in the following respects:

- 2 mirrors instead of 4 mirrors
- Image orientation of the virtual image can be height-adjusted
- Head-up display can be adjusted **without** an adjustment tool (with BMW BMW diagnosis system).

Brief description of components

The SMG system comprises the following key components:

- **HUD: Head-up display**

  The head-up display can be compared to a projector. The image is formed by the projection display and is illuminated by the light source. [more ...]

- **Display range of the head-up display**

  The display range of the head-up display is optically divided into 2 sections. The upper section is used to display navigation instructions. the lower section is used to display speed-related information. [more ...]

- **Windscreen**

  A special windscreen is needed for the head-up display to appear optimally. [more ...]

- **Button for switching head-up display on and off**

  The button is located to the right of the rotary switch for side lights and dipped headlights. [more ...]

The following components are networked for the function of the head-up display (in alphabetical order):

- **Active cruise control or cruise control**

  The following signals are sent by optional extra 541 "Active Cruise Control" (ACC) or optional extra 540 "Cruise Control" or optional extra 544 "Cruise Control with Brake Function":

  • Set speed (= selected driving speed)

  • Distance (ACC only)

  • Object detection (ACC only)

  • Regulation display (ACC only)

  • Transfer prompt (ACC only)

- **CAS: Car access system**

  The CAS provides input signals relating to terminal status (e.g. terminal 15 ON).

  The head-up display is operational when terminal 15 is switched ON.

- **CHAMP or CCC or M-ASK: Multimedia platform or Car Communication Computer or multi-audio system controller**

  To display the navigation directions in the head-up display, the following signals are sent by the CHAMP (multimedia platform: CHAMP; Central Head Unit and Multimedia Platform) or CCC or M-ASK:

  • Next road

  • Driving direction arrow

  • Distance to road intersection/junction

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Issue status (12/2007) Valid only until next DVD is issued

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23.12.2015 15:44
Page - 2 -

- Bar gauge

The signals are sent via the MOST (Media Oriented System Transport) data bus.

- **CID and CON: Central Information Display and controller**

The preset brightness of the head-up display can be individually set using the CID. The brightness adjustment (= difference between set value and basic setting) is stored in the head-up display through the Car and Key Memory.

The CID can be used to select which information is displayed in the head-up display (e.g. Check-Control messages, navigation instructions).
The controller is the control element for selecting setting in the CID.

> E70

The image orientation of the virtual image can be height-adjusted.

- **DME or DDE: Digital engine electronics or digital diesel electronics**

The head-up display receives signals from the DME or DDE regarding the cruise-control system or active cruise control. The signals are transmitted via the PT-CAN and K-CAN.

- **FRM: Footwell module**

> E70

The footwell module controls and monitors the vehicle lights. Information is received and transmitted via the K-CAN data bus (body controller-area network).

The footwell module provides the terminal 58g signal via the K-CAN. The footwell module also transmits the dimmer signal to the head-up display.

- **JBE: Junction box electronics**

> E70

The junction box electronics is the data interface between the bus systems that are important for the head-up display:

- Body CAN (K-CAN)

- Powertrain CAN (PT-CAN)

The diagnosis lead is connected to the JBE.

- **KGM: Body gateway module from 09/2005**

> E60, E61, E63, E64

The KGM supersedes the SGM. The KGM is the data interface between the bus systems that are of importance for the head-up display:

- Body CAN (K-CAN)

- Powertrain CAN (PT-CAN)

The diagnosis wire is connected to the KGM.

- **KOMBI: Instrument cluster**

The instrument cluster transmits the following signals to the head-up display through the K-CAN:

- Vehicle road speed

- Check-Control messages

- **LM: Light module**

> E60, E61, E63, E64

The light module controls and monitors all vehicle lights. Information is received and transmitted via the K-CAN data bus (body controller-area network).

The light module provides the terminal 58g signal via the K-CAN. The light module also transmits the dimmer signal to the head-up display.

- **RLS: Rain-light sensor**

Vehicles with the "head-up display" optional extra (option 610) require a special rain/light sensor.

SBT Head-up display E60, E61, E63, E64, E70
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23.12.2015 15:44
Page - 3 -

Modifications compared to the previous rain/light sensor:

- **Viewing angle**

  On the previous rain/light sensor, the viewing angle has been directed more upwards (towards the sky). With the rain/light sensor for the head-up display, the viewing angle is directed more towards the virtual image (from the perspective of the rain/light sensor, downwards).

  The rain/light sensor measures the ambient light conditions in the background of the virtual image. Thus the display brightness is optimally adjusted to the ambient brightness of the virtual image.

- **Optical element**

  The optical element is adjusted to the new viewing angle.

- **Evaluation electronics**

  The evaluation electronics have also been modified (signal evaluation and software).

  As before, the signal is available via the K-CAN.

- **SGM: Safety and gateway module up to 09/2005**

  > E60, E61, E63, E64

  The SGM is replaced by the KGM as from 09/2006.

  The SGM is the data interface (gateway) between the bus systems that are important for the head-up display:

  - Body CAN (K-CAN)
  - **Byteflight**
  - Powertrain CAN (PT-CAN)

  The diagnosis wire is connected to the SGM.

- **SZL: Steering column switch cluster**

  The steering column switch cluster (SZL) sends the signals from the Active Cruise Control (ACC) or the Cruise Control (FGR) to the head-up display.

  The settings of the ACC or FGR are selected using the steering column switch.

System functions

The head-up display comprises the following functions:

- Switch-on response
- Projection of virtual image in front of the vehicle
- Automatic adaptation of display brightness
- Prioritisation of displays

Switch-on response

The head-up display is partially operational when terminal R is switched ON. This means:

- The projection display is initialised but information is not yet displayed.
- The head-up display is able to communicate with other bus-elements via the MOST and K-CAN data buses.

The head-up display is operational when terminal 15 is switched ON. This means:

- The light source is switched on when the button for switching the head-up display on and off is pressed.
- The projection display cover panel is folded out of the beam by the stepper motor.

  > E70

  The E70 has no cover panel for the projection display. One mirror is swivelled away to protect the display against direct sunlight when parked. As from terminal 15 ON the mirror is swivelled from the park position into the position stored by the Car and Key Memory.

- The automatic adaptation of the display brightness is activated.
- > E70

The image orientation of the virtual image can be height-adjusted.

Projection of virtual image in front of the vehicle

The head-up display projects a virtual image, i.e. an image that appears to hang in mid-air without a fixed image carrier (e.g. projection screen or similar).
The image is generated on a projection display in the head-up display and deflected by the windscreen in such a way that driver seemingly sees the image floating above the bonnet. (The effect of the virtual image is the same as when looking in a mirror: the observer looks not at the mirror but behind the mirror.)
The size of the virtual image is approx. 20 x 10 cm (width x height). The virtual image can only be seen from a defined area from the driver's side.

Automatic adaptation of display brightness

The automatic adaptation of display brightness prevents major sudden changes in the brightness of the head-up display when the vehicle moves between different ambient lighting conditions (e.g. from light to dark and from dark to light when driving through a tunnel).

The automatic adjustment of the display brightness depends on

- the ambient lighting conditions,
- the brightness adjustment setting,
- the dimmer setting for instrument lighting (only when the lights are on).

The surrounding brightness (day, night, twilight, sunshine, etc.) is recorded by the rain/light sensor. The value of the brightness adjustment (difference between base setting and individually set display brightness) is stored in the head-up display. When the lighting is switched on (terminal 58g, lights ON) the brightness of the head-up display is also influenced by the dimmer setting of the instrument lighting.

Prioritisation of displays

The information in the head-up display is classified according to priority (= importance for the driver). Displays with low priority are overwritten by displays with higher priority.

Priority	Function
1	Warnings from Active Cruise Control (ACC)
2	Check-Control messages
3	Test functions (= aids when troubleshooting without BMW diagnosis system)
4	Navigation instructions

Operation

The head-up display is controlled using the following control elements:

- Button for switching head-up display on and off
- Dimmer for instrument lighting
- Controller for selecting brightness of head-up display in Central Information Display (CID)

    > E70

    Controller and CID for adjusting the image orientation of the virtual image

Preconditions for activation

The conditions required to switch the head-up display on are:

- Terminal 15 switched on
- Button for switching head-up display on and off switched on

Notes for service staff

Service staff should note the following points:

- General information: [more ...]

- Diagnosis: [more ...]

- Encoding/programming: ---

- Car and Key Memory: [more ...]
  > E70: Nearly all Car and Key Memory functions are programmed inside the vehicle itself. (please refer to the "Personal profile" section in the Owner's Handbook: individual settings for up to 3 remote controls via the display in the instrument cluster or via the Central Information Display.)

National versions

Left-hand drive and right-hand drive vehicles each have different head-up displays. The constructions mirror each other nearly identically.

Subject to change.

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Page - 6 -