Self-study programme 482

Audi A7 Sportback

Head-up display and speed limit indicator

Audi
Service Training

Introduction

With the market launch of the Audi A7 Sportback, Audi is presenting two new systems that impressively underscore the continuous progress in automotive technology. First of all, this involves a head-up display, which projects important vehicle parameters directly into the field of vision of the driver. This means the driver has all the information relevant to driving in the primary field of vision at all times. For example, to find out the current road speed the driver no longer needs to shift his glance to the instrument cluster; he also sees it when looking through the windscreen. The head-up display makes it possible!

Another new system in the Audi A7 Sportback is the speed limit indicator. The driver is shown the current speed regulations both in the instrument cluster and in the head-up display. The system is also capable of displaying additional signs with restrictions to the prescribed speed. As a result, the driver is continuously informed with regard to which maximum speed is permitted on the current road, for example when towing a trailer.

The system operates on the basis of an image processing system that uses a camera to record the area around the front of the vehicle. These images are subsequently evaluated with image processing software with respect to road signs with prescribed speeds.

The system also uses information from the navigation system with regard to speed limits. The combination of both sources of information enables high reliability for exact recognition and representation of prescribed speeds.

The speed limit indicator is designed purely as an information system. It informs the customer regarding current speed limits, but neither intervenes in the driving itself nor issues warnings if limits are exceeded. At all times, the driver retains full responsibility.

482_001

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▸ The self-study programme describes the fundamentals of the design and function of new vehicle models, new automotive components or new technologies.
The self-study programme is not a Repair Manual! Any figures quoted merely serve the purpose of facilitating understanding and relate to the version of data valid at the time the SSP was produced.
It is essential that you refer to the latest technical literature when carrying out maintenance and repair jobs. You will find an explanation of terms that are printed in italics and marked with an asterisk in the glossary at the end of this self-study programme.

Note

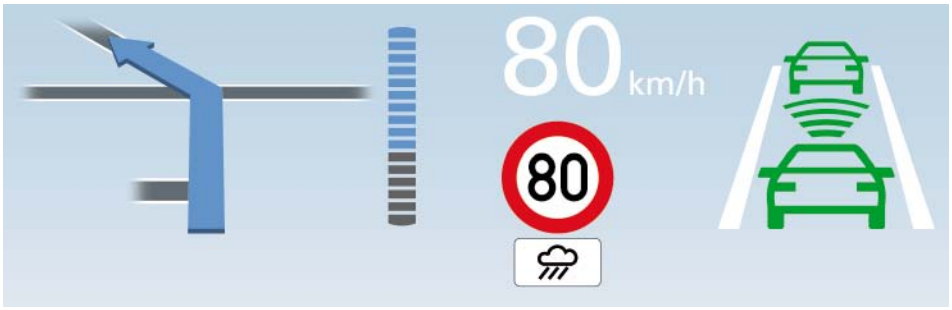
Reference

Head-up display

Introduction

Head-up display is the term used to describe optical systems that project information from various vehicle systems into the extended field of vision of the driver. To register these parameters, the driver does not need to change his head position to any significant extent; with an upright posture, he can keep his eyes on the road. The system has been named "head-up" display because the head can stay "up" and only needs to be lowered slightly.

The head-up display enables the driver to register important vehicle information quickly and precisely. The use of special windscreens in the case of vehicles with head-up display gives rise to the impression that the display of the head-up display does not appear in the area of the windscreen rather at a pleasant distance of two to two-and-a-half metres away from the driver. The head-up display appears to hover above the bonnet.



482_002

Advantages of the head-up display compared to the display of the instrument cluster

If you compare registering vehicle parameters in the instrument cluster with registering them by glancing at the head-up display, the head-up display has advantages in the following points:

- The favourable placement of the head-up display in the extended field of vision of the driver means that the head only needs to be inclined by approx. 5 to 10 degrees to resister the display. To register the display of the instrument cluster, on the other hand, the head needs to be inclined by 20 to 25 degrees.
- As the head-up display can be seen in the extended field of vision of the driver, the human eye does not have to adapt to darker surroundings to register the display content, unlike a glance at the instrument cluster. This applies in particular during daylight. The adaptation of the eyes from bright to dark to register the vehicle parameters and the subsequent adaptation from dark to bright can be avoided.
- As the head-up display is perceived at a distance of two to two-and-a-half metres away from the driver, the time the eye needs to focus is significantly lower that for a glance at the instrument cluster. The focus time is required to adapt visual acuity to the distance of each object.

The above benefits mean that the desired information can be registered substantially more comfortably in the case of a glance at the head-up display than in the case of a glance at the instrument cluster. The time in which the driver's gaze and attention are away from the road traffic is approximately halved. This means that use of the head-up display improves perception of what is happening on the road and contributes to greater road safety.

Displays of the head-up display

The content of the head-up display has been restricted to representation of the most important vehicle parameters. The current vehicle road speed is the central display variable that is always shown. It cannot be deactivated in the MMI.

Other display content is only shown if activated in the MMI. Content can be activated in the MMI at the menu option "Head-up Display", then menu "Display Content".

Another group of display content is only displayed temporarily, for example warnings or in the case of modified system settings.

The following information and vehicle parameters can be shown by the head-up display:

Current vehicle road speed

The current vehicle road speed is the only vehicle parameter that is always displayed. This display can **not** be deactivated by the driver in the MMI.

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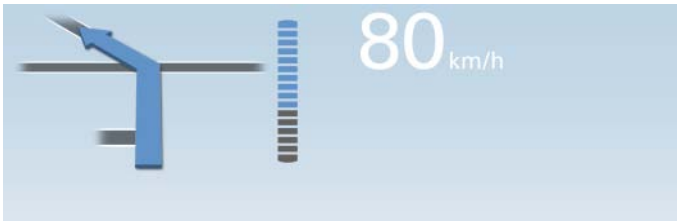
Navigation information

Navigation information is only displayed if the destination guidance is active. The "Navigation Information" display content must be activated in the MMI.



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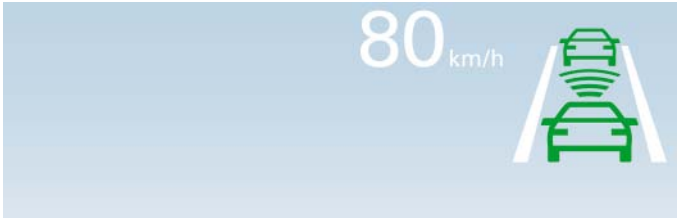
Combined display of ACC and Audi active lane assist

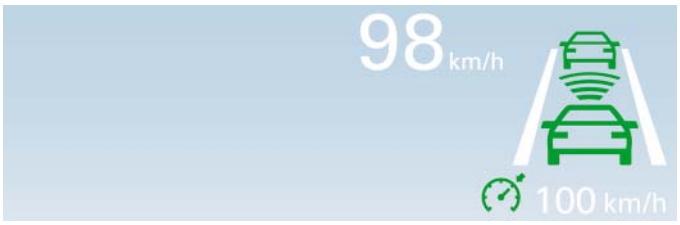
This display appears when the ACC or Audi active lane assist is switched on. The "ACC / Audi active lane assist" display content must be activated in the MMI.



482_005

Current control speed of the ACC

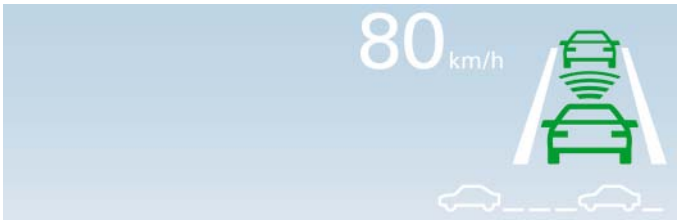
The set control speed of the ACC appears temporarily in the head-up display if modified. The "ACC / Audi active lane assist" display content must be activated in the MMI.



482_006

Current control distance of ACC

This display appears for a short period of time if a change is made to the control distance for ACC.



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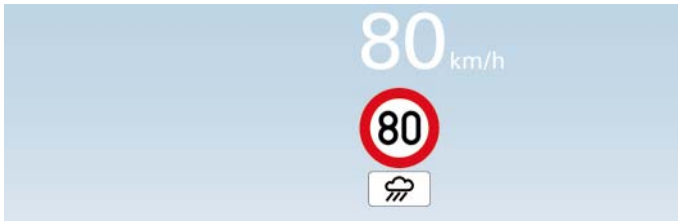
Display of the speed limit indicator

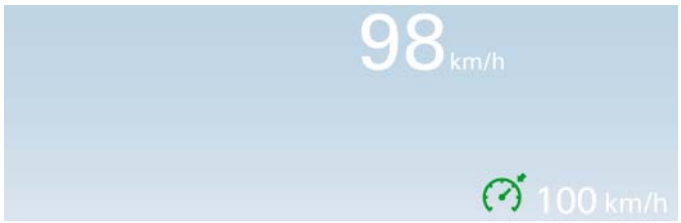
Road signs of the speed limit indicator appear in the head-up display when the display content "Speed Limit Indicator" is activated in the MMI.



482_008

Current control speed of the cruise control system

The set control speed appears temporarily in the head-up display if modified. The "Cruise Control System" display content must be activated.



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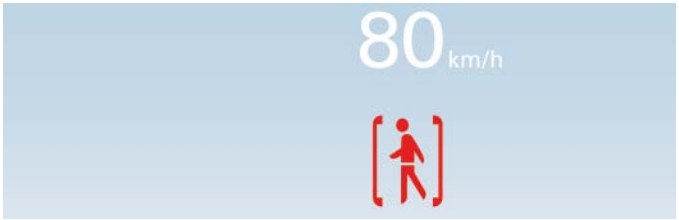
Warning from the Audi night vision assistant

The warning from the Audi night vision assistant appears in the head-up display if the corresponding display content is activated in the MMI.



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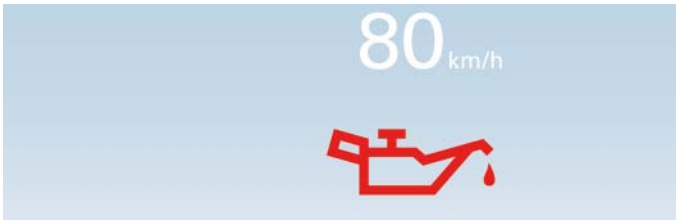
Red warning symbols

Red warning symbols always appear in the head-up display; they cannot be deactivated. Red warning symbols are only displayed for a short period of time. During the display, all other display content with the exception of the current vehicle road speed is suppressed.

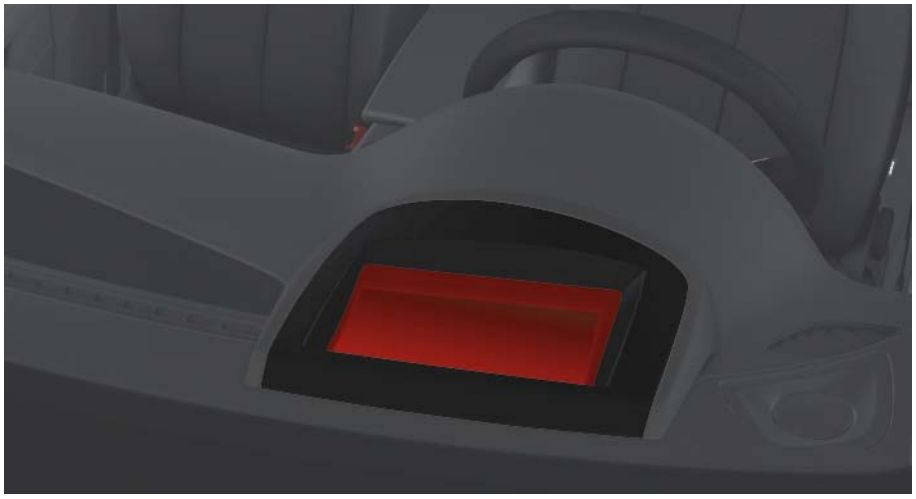


482_011

The control unit for windscreen projection J898

The central element of the head-up display is the control unit for windscreen projection J898 This control unit contains all the optical, mechanical and electrical components required for the head-up display.

It is located in the dash panel directly in front of the instrument cluster.



482_012

The control unit for windscreen projection J898 has self-diagnostic capability and is addressed with the **address word 82**.

482_013

Note

In the case of a defect in a component of the control unit J898, the complete control unit must always be replaced.

For replacement of the control unit J898, the windscreen always has to be removed. More detailed information on removing the control unit J898 can be found in the corresponding repair manual.

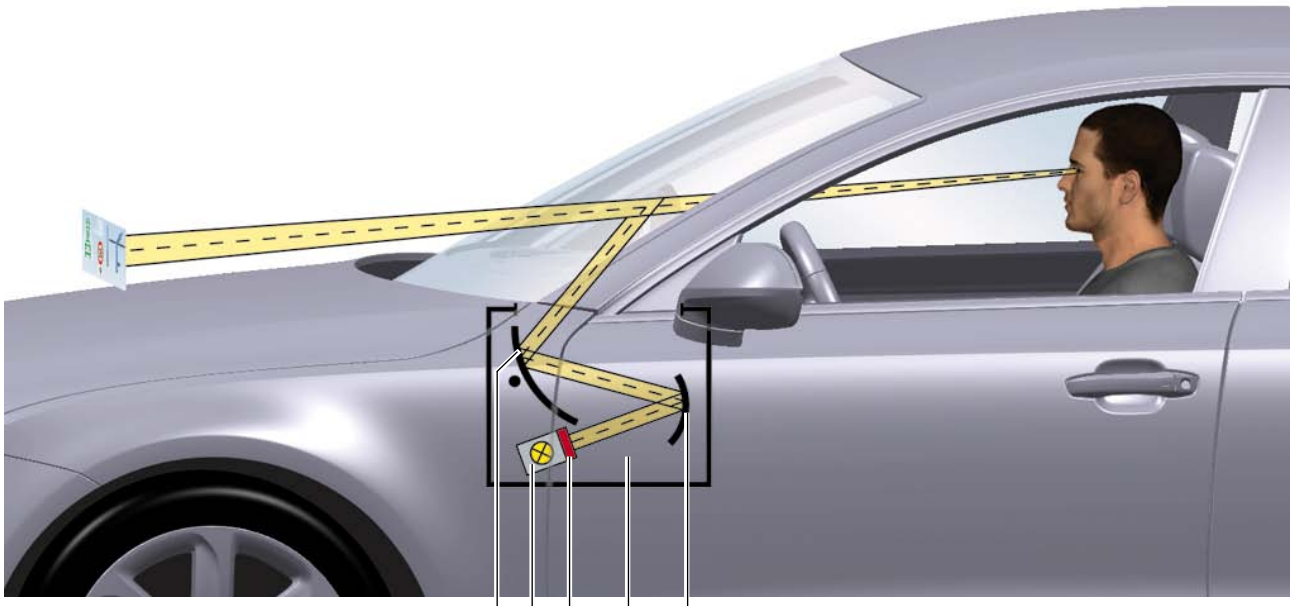
Optical system

The head-up display is generated in that a high-resolution TFT display is backlit by a strong light source. The light source comprises 15 LEDs in total. The technical structure is similar to that of a slide projector. The emerging light rays are projected via two deflection mirrors onto the windscreen. One of the two mirrors is adjustable and is used for height adjustment of the head-up display. This adjustment possibility is important to adapt the position of the head-up image to the seating position or body size of the driver. The mirrors also have the task of correcting distortions of the image caused by the curvature of the windscreen.

The light intensity of the displayed image is continuously adapted to the current ambient lighting conditions. To achieve this, the control unit J898 evaluates the ambient luminosity values from the rain and light sensor G397. The driver also has the possibility to adapt the brightness of the display according to his needs. To do so, he has a setting option in the MMI and the controller for the basic setting of the display and instrument lighting in the light switch.

The light intensity is configured in such a way that the display also remains easily legible in the case of direct solar radiation.

TFT display ... a display that consists of a matrix of **T**hin **F**ilm **T**ransistors



482_014

Non-adjustable mirror

Control unit for windscreen projection J898

High-resolution TFT display

Lighting unit of the head-up display

Adjustable mirror

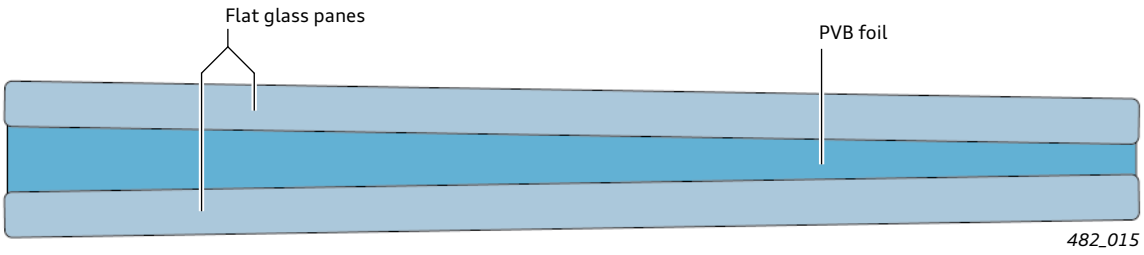
Windscreen

The windscreen is an important part of the overall optical system of the head-up display. The projected image is also reflected by the windscreen, which means the windscreen more or less represents a third mirror.

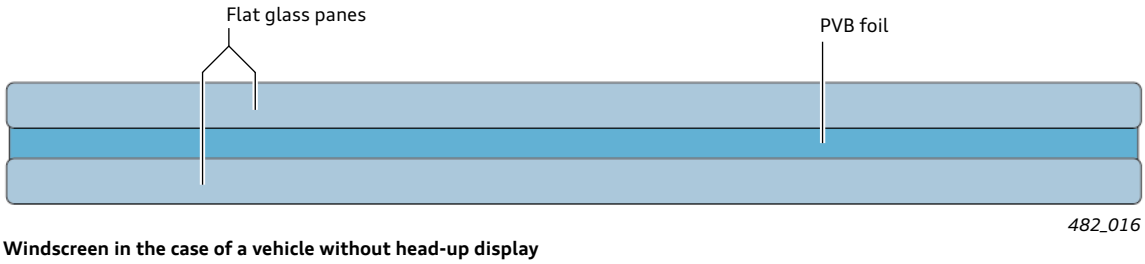
Due to this fact, the tolerances of the windscreen are very tight. A standard windscreen, as fitted in vehicles without a head-up display, has a structure that would lead to a disruptive double image. This is why a special windscreen is fitted in vehicles with head-up displays.

The windscreen for head-up displays differs from the conventional windscreen in that the PVB foil between the two flat glass panes of the windscreen is not of a constant thickness, rather is slightly wedge-shaped. This means the thickness of the windscreen increases slightly in the upward direction. The wedge-shaped PVB foil means that the driver does not see a double image.

PVB foil ... thin foil made of polyvinyl butyral



Windscreen in the case of a vehicle with head-up display



Windscreen in the case of a vehicle without head-up display

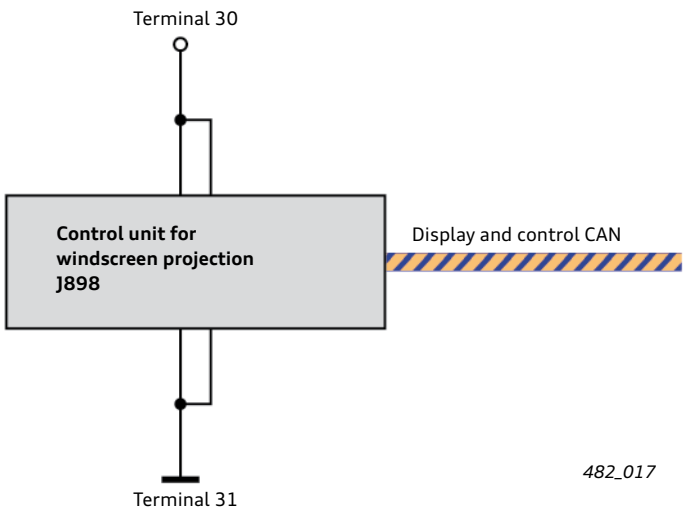
Electrical system

The control unit for windscreen projection J898 has self-diagnostic capability. It interchanges data with other control units across the display and control CAN.

It is addressed by the vehicle diagnostics tester with the **address word 82**.

It has six electrical connections at the control unit:

- Two lines for terminal 30
- Two lines for terminal 31
- Two lines for the display and control CAN



The control unit J898 receives information from the following control units for the head-up display:

Control unit in dashboard module J285

- Current vehicle road speed with the unit used in the country
- Warning messages of priority 1 (red warning symbols)

Control unit 1 for information electronics - J794

- Direction arrow with active destination guidance
- Bar display (bar graph) or distance information with active destination guidance
- MMI customer setting with regard to display content of the head-up display
- MMI customer setting with regard to display brightness of the head-up display

Engine management control unit J623

- Current control speed of the cruise control system

Image processing control unit J851

- Warnings and system state, Audi active lane assist (combined display with ACC)
- Road signs to be displayed currently in the speed limit indicator

Night vision control unit J853

- Display of the pedestrian symbol for driver warning

Gap maintenance control unit J428

- Status of active cruise control ACC (combined display with Audi active lane assist)
- Set control distance for the ACC

The following additional information and requests are received by the control unit J898 from the following control units:

Electrical system control unit J519

- Current values of the ambient luminosity from the rain and light sensor G397
  (The onboard supply control unit is the master of the LIN bus to which the sensor G397 is connected)
- Pressing the position controller for head-up display (button for windscreen projection E736) in the light switch module (switching the system on or off)
- Turning the position controller for head-up display in the light switch module
  (vertical movement of the visible area)
- Turning the controller for display and instrument lighting
  (changing the display brightness)

Seat and steering column adjustment control unit with memory J136

- Asks the J898 to save the current settings of the head-up display. The settings are saved in relation to the seat memory button that was pressed.
- Asks the J898 to activate stored head-up display settings. It transmits the button number of the actuated button of the seat memory.

Note:
Settings of the head-up display are only stored in the control unit J898 if the seat memory optional extra is present. Saving the settings of the head-up display only makes sense when the exact seat position of the driver's seat is also stored at the same time.

Data bus diagnosis interface J533

- Turning off the head-up display in the case of low battery voltage
- Deactivation of the head-up display in the case of active transport mode

Operation and setting options

Setting options at the light switch module

482_018

1. Position controller for head-up display (button for windscreen projection E736)

The following settings are made using the position controller for the head-up display:

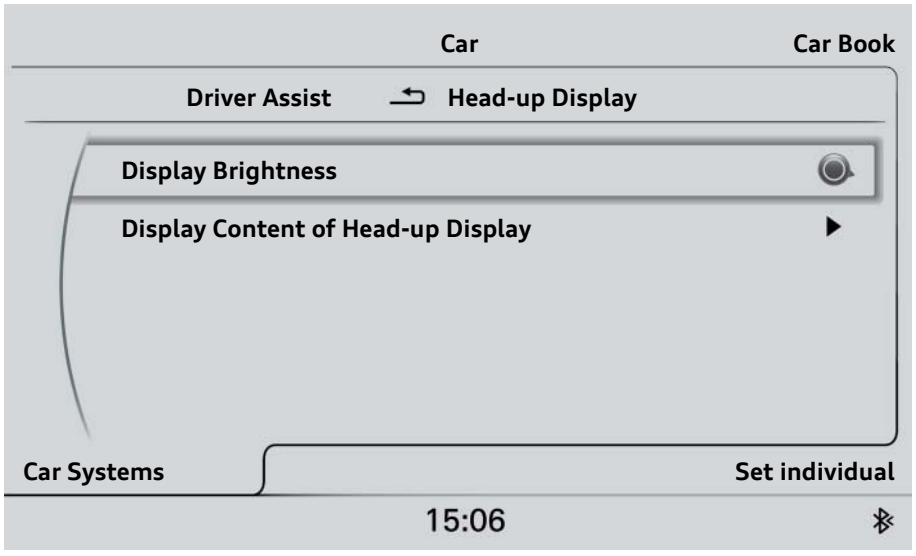
- Switching the head-up display on and off by pressing the position controller

and

- Vertical position of the visible area (eye box) of the head-up display by turning the position controller. This setting option enables optimal adaptation of the visible area of the head-up display in relation to the seating position or body size of the driver

2. Controller for display and instrument lighting

This controller can be used to make the basic setting of the display and instrument lighting. If this setting is changed, the display brightness of the head-up display also changes.



482_019

Setting options at the MMI

The customer has two setting options for the head-up display in the MMI:

- the display brightness

and

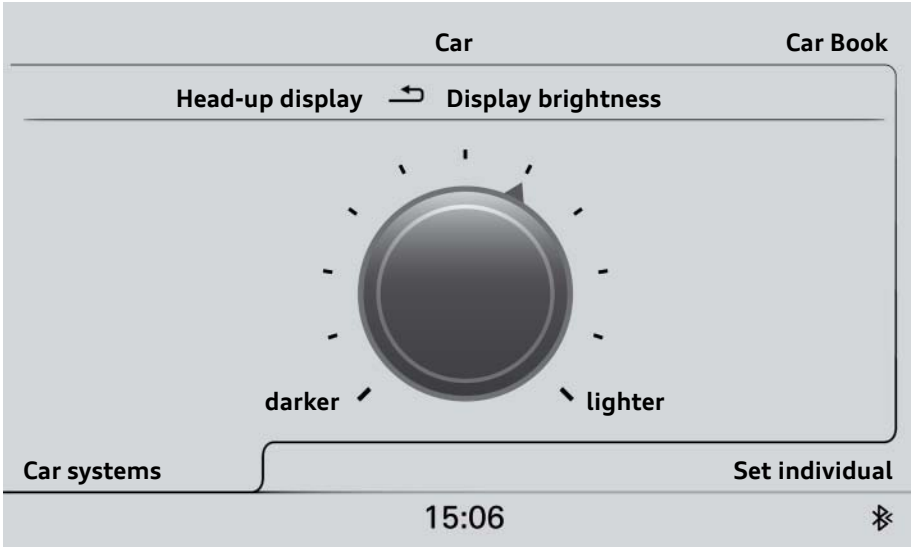
- the display content of the head-up display

Proceed as follows to reach the settings menu:

1. Press the function button "CAR" of the MMI control panel
2. Press the control button at the bottom left for "Car Systems"
3. Select the menu option "Driver Assist"
4. Select the menu option "Head-up Display"

Setting the display brightness

The brightness of the head-up display can be adjusted at the menu option "Display Brightness".



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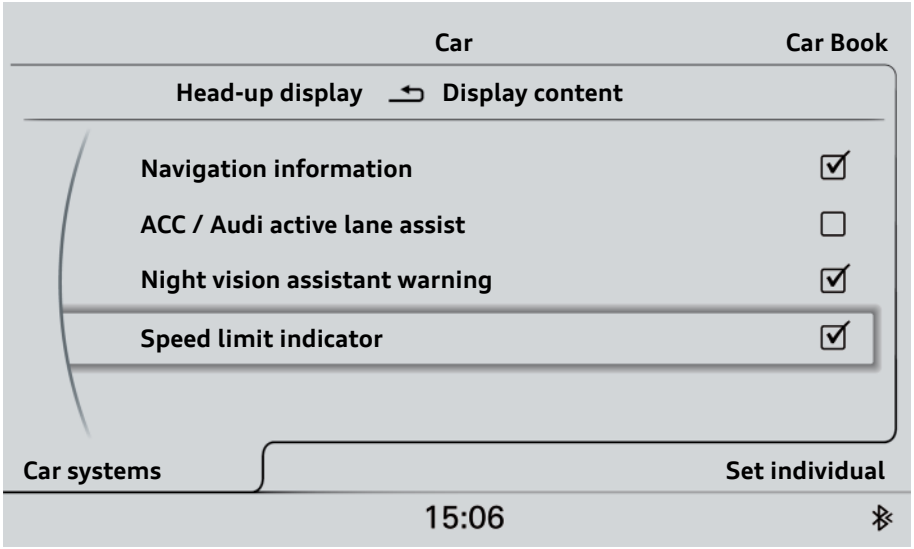
The basic setting for the instrument and display lighting is made using the corresponding controller at the light switch module. This also influences the brightness of the head-up display. The set display brightness in the MMI and the global setting of the instrument and display lighting together result in the overall brightness of the head-up display.
To set the maximum display brightness, both setting options must be set to maximum.

Display content of head-up display

The customer has the possibility to enable or disable various display content in the head-up display. Depending on the vehicle equipment, the customer has the following display content available:

- Information of the navigation system
- Combined display of ACC and Audi active lane assist
- Display of the CCS control speed
- Warning from the night vision assistant
- Road signs of the speed limit indicator



482_021

Calibration of the head-up display

What happens during calibration?

The calibration comprises two actions:

1. **Basic vertical setting of the visible area of the head-up display (height calibration)**

   The basic vertical setting creates a standardised adjustment range for the head-up display. As a result, it should be possible for the majority of drivers - regardless of their body size and seating position - to set the visible area using the position controller for the head-up display in such a way that they can see the head-up display completely (the display is cut off neither at the top nor at the bottom).

2. **Removal of distortion effects (image calibration)**

   Distortion effects of the head-up image arise due to tolerances of various system components. In its original state, the internal TFT display in the control unit J898 presents an undistorted image for projection. This image would be projected without distortion onto the windscreen if all the system components were free of tolerances. However, as all components have tolerances, the head-up display can appear in distorted form without calibration being carried out beforehand.

   This means the image in the TFT display is changed by the calibration procedure in such a way that the projected image appears free of distortion, i.e. the head-up display has good image quality.

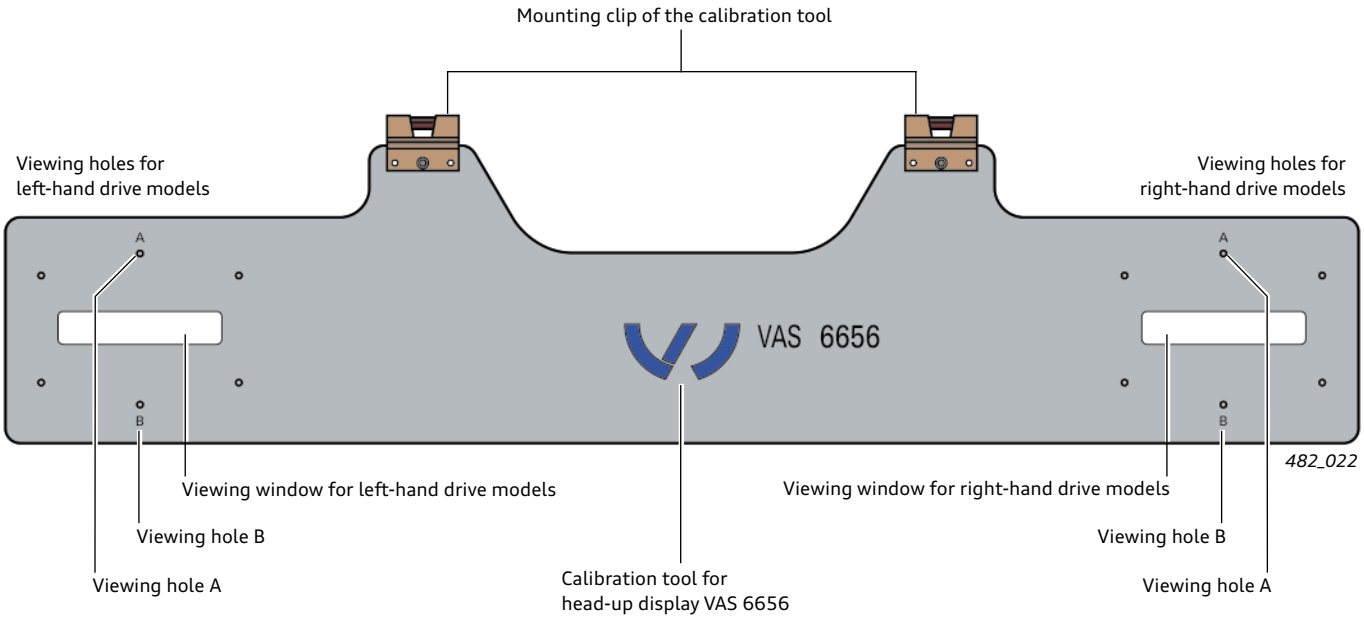
Two tools are required for calibration of the head-up display:

- a vehicle diagnostics tester

and

- the new special tool VAS 6656

The VAS 6656 tool is model-specific. It is only suitable for calibration of the head-up display in the Audi A7 Sportback. Other Audi models with head-up display will receive an adapted tool with a serial VAS number.



The calibration procedure

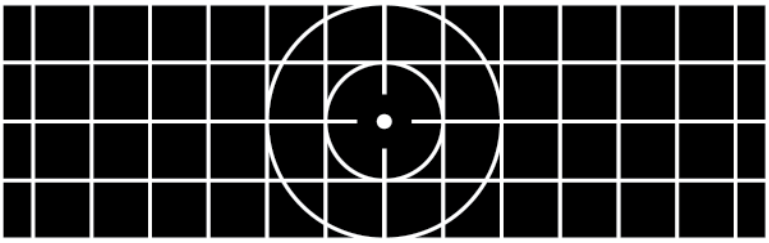
Before calibration of the head-up display can be started, the following preparations must be carried out first:

1. The sun visors on the driver's and front passenger's side must be unclipped.
2. The calibration tool VAS 6656 must be attached to the two brackets of the sun visor.
3. The vehicle diagnostics tester has to be connected to the vehicle.
4. In the Guided Fault-Finding, the control unit for windscreen projection J898 must be selected.

482_023

1. Basic vertical setting (height calibration) of the visible area of the head-up display

First of all, the basic vertical setting must be carried out. To do so, the program "J898 - Height Calibration" must be started. In response, the control unit for windscreen projection J898 projects a test image onto the windscreen.
Using the vehicle diagnostics tester, the vertical alignment of the head-up display is now adjusted in such a way that the head-up display appears to be cut off to the same degree on looking through viewing holes A and B of the calibration tool. If this is the case, the compensation of distortion effects can be resumed.



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2. Compensation of distortion effects (image calibration)

There is now the possibility to use the vehicle diagnostics tester to compensate for various distortion effects of the display test image. To do so, the program "J898 - Image Calibration" must be started. The program indicates which distortion effects can be compensated for.

The observer now assesses the test image that is projected onto the windscreen for distortions. It is recommended to start with the distortion that is most conspicuous. The corresponding program is selected and the effect is corrected by entering a correction value.

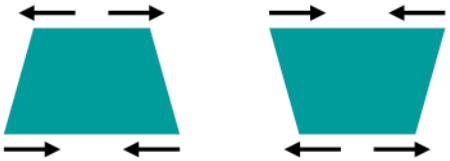
The described operation is repeated until the test image is projected onto the windscreen in good quality. The decision as to whether the quality is sufficient must be made continuously by the person performing the calibration on the basis of their personal perception.

On handing over the vehicle after a calibration, it can be helpful for the customer also to be convinced of the display quality of the head-up display. It is possible that there is a difference between the way the customer perceives the quality of the displayed image and the way the workshop employee perceives it. This effect can be the result of different body sizes or seating positions.

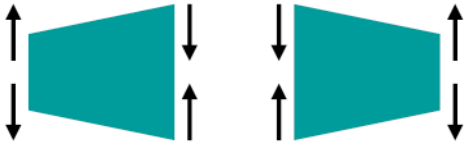
The following possibilities are available for the correction of distortion effects:

1. Trapezium

a) horizontal

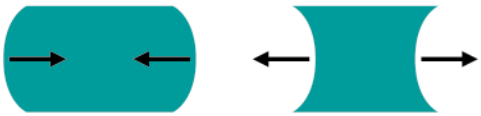


b) vertical

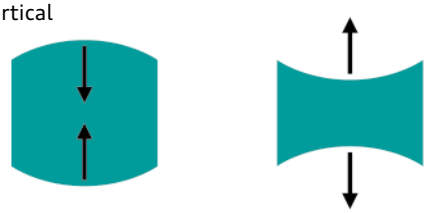


2. Cushion

a) horizontal

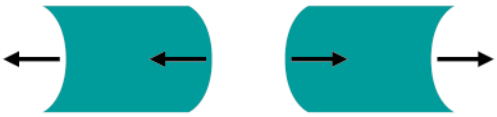


b) vertical



3. Smile

a) horizontal

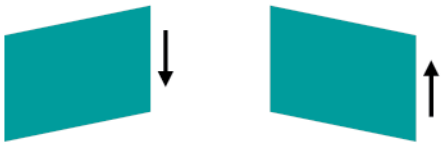


b) vertical

4. Shear

a) horizontal

b) vertical



5. Asymmetrical shear, horizontal

a) Focal point right

b) Focal point left

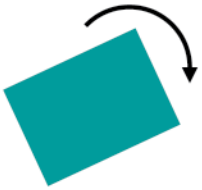
6. Asymmetrical cushion, horizontal

a) Focal point right

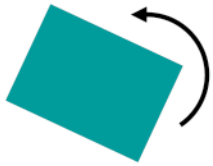
b) Focal point left

7. Rotation

a) Clockwise



b) Anticlockwise



482_025

Speed limit indicator

Introduction

Speed limit indicator based on navigation data

In the MMI Navigation Plus of the Audi A8 '10, Audi implemented a display of prescribed speeds for the first time. Speed limits are shown in the form of symbolised road signs in the MMI display. The system takes the required information from the data record of the navigation system.

This procedure has the advantage that no additional components have to be fitted in the vehicle to implement the functionality. The map material that is used only has to contain prescribed speeds; these are then displayed when driving on the corresponding roads.

However, the navigation data do not contain temporary prescribed speeds, which is why they cannot be displayed. The same applies to modifications to prescribed speeds made after generation of the data record.

482_026

Representation of road signs with prescribed speeds in the speed limit indicator based on navigation data

Speed limit indicator on the basis of an image processing system

Another concept for the display of current prescribed speeds is to record road signs with a video camera. The recorded camera images are analysed by image processing software with regard to signs with prescribed speeds and the determined speed limits are displayed to the driver.

The advantage of this method is that temporary and modified prescribed speeds can also be recorded and displayed.

However, inaccuracies in the optical recording of road signs can result from poor ambient conditions. For example, correct recording of road signs can be difficult or even temporarily impossible in heavy snow, rain, fog or in the event of dazzling. The same also applies to damaged and dirty road signs.

482_027

The Audi speed limit indicator

The Audi speed limit indicator combines the advantages of both of the systems described above: the speed limit indicator based on navigation data and the speed limit indicator on the basis of an image processing system. The combination of both systems provides two sources of information where the data can be checked for plausibility.

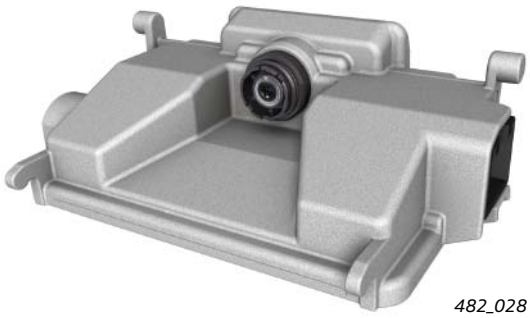
This makes the speed limit indicator even more reliable.
The combined speed limit indicator is offered by Audi for the first time in the Audi A7 Sportback and in the Audi A8 '11 as an optional extra.

System components

The combined speed limit indicator requires the image processing system familiar from the Audi A8 '10 and the MMI Navigation Plus.

The image processing system comprises the camera control unit J852 for recording the area in front of the vehicle and the image processing control unit J851 for evaluation of the camera images. The camera images are transferred by the camera control unit to the image processing control unit, where they are analysed with regard to road signs with prescribed speeds.

The function software of the speed limit indicator is also integrated in the image processing control unit J851.



482_028

Camera control unit J852

482_029

Image processing control unit J851

Reference
More detailed information on the image processing system can be found in self-study programme 461 "Audi A8 '10 – driver assistance systems".

The speed limit indicator function compares the optically detected speed limits with the prescribed speeds in the navigation data. If the information from the two systems is different, depending on the specific situation either the information of the image processing system or that of the navigation system is prioritised and displayed.

In the event of failure of one of the sources of information or of both, the speed limit indicator continues to operate with restrictions. The driver is notified by means of a corresponding message in the driver information system.

The speed limit indicator function is a driver assistance system that supports the driver in complying with prescribed speeds. However, responsibility for actually complying with the speed limits still lies exclusively with the driver. Furthermore, real road signs have priority over the speed limits displayed in the vehicle at all times!

Note
A driver warning is not issued if the maximum permitted speed is exceeded!
The system does not intervene in driving either. Responsibility for complying with speed limits remains with the driver at all times.

Display media of the speed limit indicator

To display speed limits, the speed limit indicator uses the following display media:

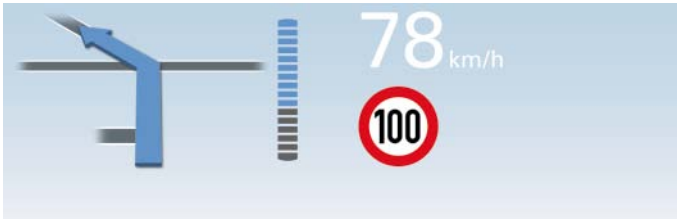
- the driver information system in the instrument cluster

  (fullscreen display is shown here)

482_030

and

- the optional head-up display



482_031

Several speed limits can be displayed simultaneously in the fullscreen display of the driver information system; only one speed limit can be displayed in the head-up display.

If the speed limit indicator optional extra is present, nothing appears in the MMI display. Speed limits are only shown in the MMI display if the vehicle has a speed limit indicator based purely on navigation data.

This is the case if the vehicle has the optional MMI Navigation Plus but the speed limit indicator optional extra was not ordered.

Display of maximum permitted speed

If the camera does not detect any prescribed speeds and none can be taken from the navigation data, the speed limit indicator shows the maximum permitted speed for that type of road in the specific country.

The speed limit indicator draws the following information, among other things, from the predictive route data that are continuously transmitted by the navigation system:

- the country in which the vehicle is currently moving
- the type of road the vehicle is currently on
- whether the vehicle is currently inside or outside a built-up area
- prescribed speeds recorded in the map material for the road the vehicle is currently on

The permitted maximum speeds in the countries for which the speed limit indicator is currently offered are stored in the image processing control unit J851.

This means that the speed limit indicator shows prescribed speeds at all times in countries in which the speed limit indicator is available. However, there are three important exceptions:

- The vehicle is moving on a road without a speed limit and also without a legally prescribed maximum speed
- Reverse gear has been engaged in the vehicle
- The ignition is switched on but the vehicle has not yet been moved

In these exceptional cases, the message "No speed limit detected" appears in the instrument cluster display.

Note
At the point in time of introduction of the speed limit indicator, the function is being offered in many European nations. An extension to countries outside of Europe is planned. A current list of the countries in which the optional extra is available can be found on the Audi internet site.

Displayed road signs with speed limits

The different road signs that the speed limit indicator can display are shown below.

As an example, all road signs are shown with a speed limit of 80 km/h.

The speed limit indicator can display the following road signs:

1. **A speed limit without supplementary sign**

482_032

2. **A speed limit with the supplementary sign "Only When Road Wet"**

The road sign with the restriction "Only When Road Wet" is displayed on recognition regardless of the actual weather.

If the supplementary sign is stored in the navigation data, the supplementary sign "Only When Road Wet" is also displayed even if it was not detected by the image processing system.

482_033

3. A speed limit with a time restriction

The image processing system is unable to reliably obtain the exact time restriction from the camera image.
This information is taken from the navigation data.
The only information taken from the camera image is that a road sign is a speed limit with supplementary sign.

Graphically, the supplementary sign is always only shown as a clock symbol; the exact time restriction is not displayed.

This road sign is always displayed, regardless of the current time, i.e. it is also displayed when the time restriction does not apply.

The exact time restriction is required for display prioritisation. The exact procedure for display prioritisation is described in more detail in a later chapter.

482_034

4. A speed limit with the supplementary sign "Only With Trailer"

This road sign is only displayed if the menu option "Signs Relevant to Trailers" has been enabled in the MMI. If this is the case, a speed limit with the supplementary sign "Only With Trailer" is always shown in the fullscreen display.

CAN messages from the trailer detector control unit J345 are not evaluated to control the display. The reasons for this are as follows:

1. Trailer operation would also be detected in the case of a bicycle rack equipped with a lighting system although the corresponding speed limit would be of no relevance in this case.

2. In the case of retrofit solutions for trailer operation from third-party providers, as a rule no original Audi trailer detector control unit is fitted. In this case, the speed limit indicator is unable to detect trailer operation by evaluating the CAN message.

482_035

Road signs that are not displayed but are relevant to the function

Although the following road signs are detected by the speed limit indicator, they are not displayed.

1. Speed limit with a direction arrow on the supplementary sign

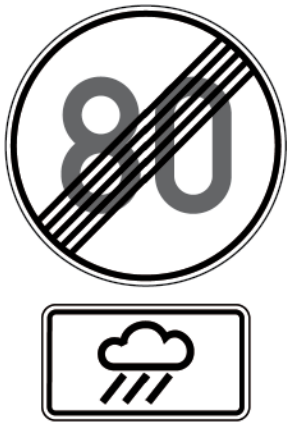
Speed limits with a direction arrow are detected by the system and can also be displayed as a speed limit without an additional sign.

Whether the speed limit is actually displayed depends on whether the vehicle drives onto the road to which speed limit applies.

482_036

2. Road signs to cancel existing prescribed speeds

Road signs that cancel speed limits are detected by the image processing system but are not displayed. The previously displayed speed limit disappears from the display and is replaced by the legally permitted maximum speed.



482_037

Displays

Fullscreen display

In the fullscreen display, up to three different road signs with prescribed speeds with or without supplementary signs can be displayed.

Example 1:

482_038

The speed limit indicator in example 1 would appear in the following two cases:

Case 1:

- Driving on a motorway (in the relevant country, the maximum permitted speed on motorways is greater than 100 km/h)

and

- A road sign with a prescribed speed of 100 km/h without supplementary sign has been detected

and

- No prescribed speed with the supplementary sign "Only When Road Wet" or a supplementary sign with time restrictions has been detected for that section of the route

and

- The menu option "Signs Relevant to Trailers" in the MMI is at "off"

Case 2:

- Driving on a dual carriageway

and

- The maximum permitted speed on dual carriageways in the country in which the vehicle is being driven is 100 km/h

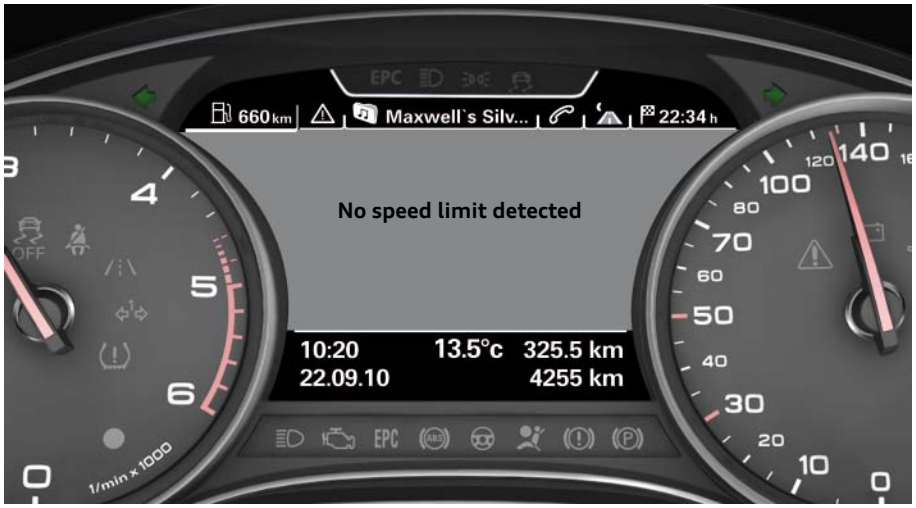
and

- No road signs with prescribed speeds were detected

and

- The menu option "Signs Relevant to Trailers" in the MMI is at "off"

Example 2:



482_039

The speed limit indicator of example 2 would appear in the following case:

Case 3:

- Driving on a motorway

and

- In the relevant country, there is no maximum permitted speed on motorways

and

- Road signs with prescribed speeds for the current section of motorway have not been detected

and

- The menu option "Signs Relevant to Trailers" in the MMI is at "off"

Example 3:

482_040

The speed limit indicator in example 3 would appear in the following two cases:

Case 4:

- Driving on a motorway

and

- A road sign with a prescribed speed of 120 km/h without supplementary sign has been detected

and

- A road sign with a prescribed speed of 100 km/h with the supplementary sign "Only When Road Wet" has been detected

and

- A road sign with a prescribed speed of 80 km/h with the supplementary sign "Only With Trailer" has been detected

and

- The menu option "Signs Relevant to Trailers" in the MMI is at "on"

Case 5:

- Driving on a motorway

and

- In the relevant country, there is a maximum speed on motorways of 120 km/h

and

- No road sign with a prescribed speed without additional sign has been detected

and

- A road sign with a prescribed speed of 100 km/h with a supplementary sign has been detected However, the supplementary sign could not be unambiguously identified by the image processing system; the navigation data contain a speed limit of 100 km/h with the restriction "Only When Road Wet"

and

- In the country in which the vehicle is currently driving, there is a maximum speed on motorways for vehicles with trailers of 80 km/h

and

- The menu option "Signs Relevant to Trailers" in the MMI is at "on"

Supplementary display in the driver information system

For example, if the driver wants navigation information to be displayed in the central instrument cluster display and does not want to do without the speed limit indicator, he can activate the supplementary display in the driver information system.

The supplementary display can be enabled or disabled using the MMI at the menu option "Speed Limit Indicator".

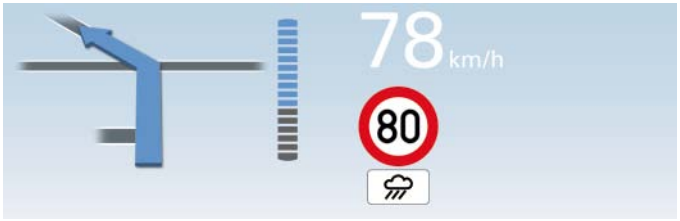
482_041

In the case of the supplementary display, the current speed limit is shown at the top left in the driver information system. With this display, a maximum of one speed limit sign with supplementary sign can be represented. If a number of speed limits were to be shown in the fullscreen display, the system would determine which speed limit to display on the basis of a prioritisation.

Speed limit indicator in the head-up display

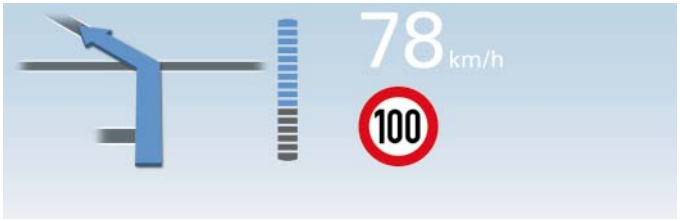
The speed limit indicator can also appear in the head-up display. In the same way as the supplementary display, a maximum of one speed limit with a supplementary sign can be shown in the head-up display.

In the same way as in the supplementary display, the speed limit with the highest priority is displayed if a number of speed limits with different restrictions are detected.



482_042

Speed limit indicator in the head-up display, whereby the speed limit of 80 km/h with the supplementary sign "Only When Road Wet" has the highest priority



482_031

Speed limit indicator in the head-up display, whereby the speed limit of 100 km/h without a supplementary sign has the highest priority

The customer can set in the MMI which information is to be displayed or not in the head-up display. The prerequisite for the speed limit indicator in the head-up display is that the menu option "Speed Limit Indicator" has been enabled in the "Display Content" menu.

Display prioritisation

For reasons related to space, only one speed limit can be displayed at any one time in the head-up display and in the supplementary display in the driver information system. For this reason, if there are a number of detected speed limits with different restrictions one of these is prioritised and then displayed.

Two examples will illustrate how the speed limit indicator proceeds in the case of display prioritisation.

Example 1:

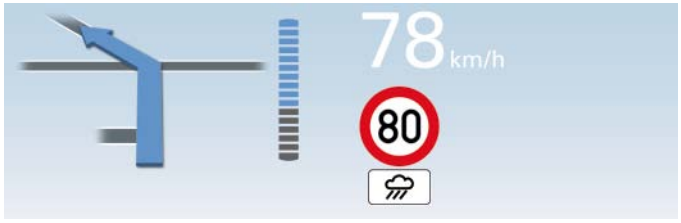
The following is currently in the fullscreen display:

482_043

1. If the condition

- windscreen wiper activated

is met, the speed limit of 80 km/h with the supplementary sign "Only When Road Wet" is prioritised and shown in the supplementary display and/or in the head-up display.



482_044

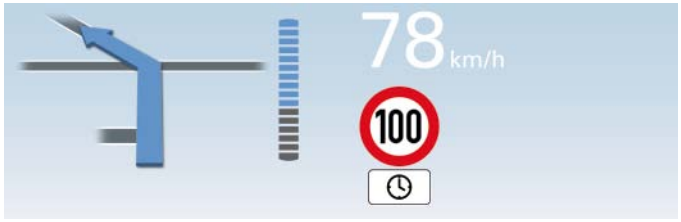
2. If the two conditions

- current time conforms to the time restriction of the speed limit

and

- windscreen wiper is switched off

are met, the speed limit of 100 km/h with the supplementary sign for a time restriction is prioritised and appears in the supplementary display and/or in the head-up display.



482_045

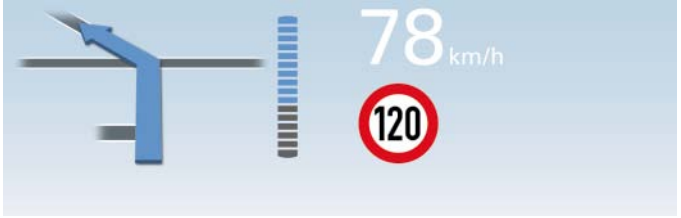
3. If the two conditions

- current time does not conform to the time restriction of the speed limit

and

- windscreen wiper is switched off

are met, the speed limit of 120 km/h without supplementary sign is prioritised and shown in the supplementary display and/or in the head-up display.



482_046

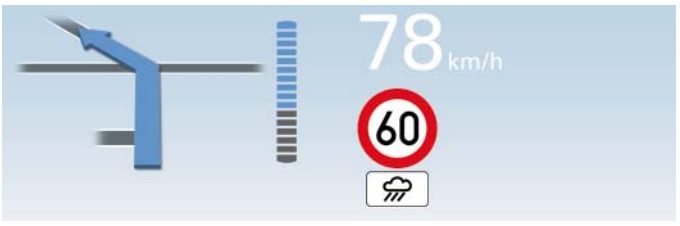
Example 2:

482_030

1. If the condition

- windscreen wiper is active

is met, the speed limit of 60 km/h with the supplementary sign "Only When Road Wet" is prioritised and shown in the supplementary display and/or in the head-up display.

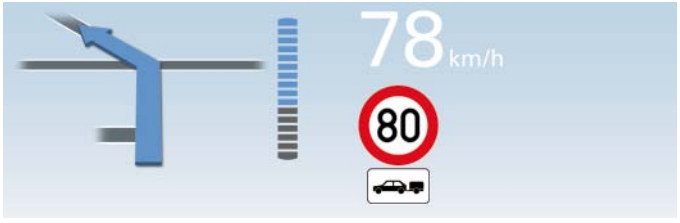


482_047

2. If the condition

- windscreen wiper is switched off

is met, the speed limit of 80 km/h with the supplementary sign "Only With Trailer" is prioritised and shown in the supplementary display and/or in the head-up display.



482_048

Message texts in the driver information system

The following circumstances can lead to display of the message text "Speed limit indicator: currently limited. No camera view":

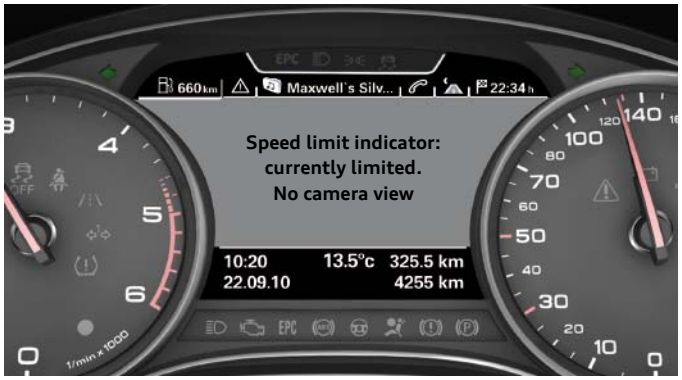
- internal or external fogging of the windscreen

or

- heavy fog

or

- dirt on the windscreen



482_039

The following circumstances can lead to display of the message text "Speed limit indicator: system malfunction!":

- defective control unit for image processing J851

or

- failure of the FlexRay bus to which the control unit J851 is connected

482_039

The following circumstances can lead to display of the message text "Speed limit indicator: currently limited!"

- a malfunction of the camera

or

- a malfunction of the navigation system

If this is the case, the speed limit indicator continues to operate with restrictions. As there is only one source of information available now, the rate of errors of the speed limit indicator increases.

482_039

The following circumstances can lead to display of the message text "Speed limit indicator: currently unavailable":

- temporarily no navigation data is being received

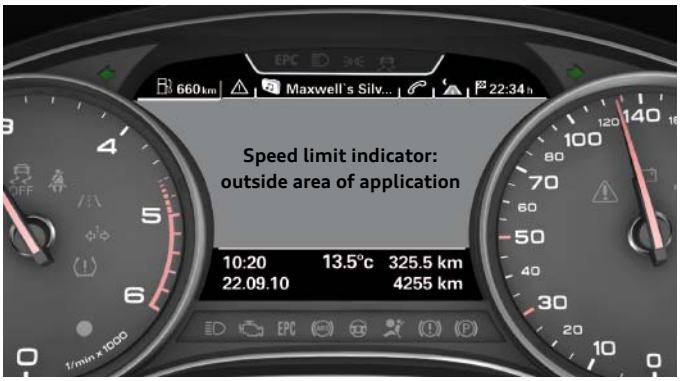
or

- although the camera sees contrasts, the image does not correspond to any road view

482_039

The message text "Speed limit indicator: outside area of application" appears if the vehicle is in a country that is not supported by the speed limit indicator.

The speed limit indicator determines which country the vehicle is in from the predictive route data in the navigation system.



482_039

Reference
Also read the information regarding the speed limit indicator in the Owner's Manual of the Audi A7 Sportback.

Operation and setting options

Switching the speed limit indicator on and off

The speed limit indicator function is active as soon as the ignition is switched on. For the customer, there is no possibility to switch the function on or off; it is always active with the ignition switched on.

The customer decides with the corresponding system settings whether the speed limit indicator is actively displayed or not. If the driver foregoes active display, the speed limit indicator operates in the background unnoticed by the driver.

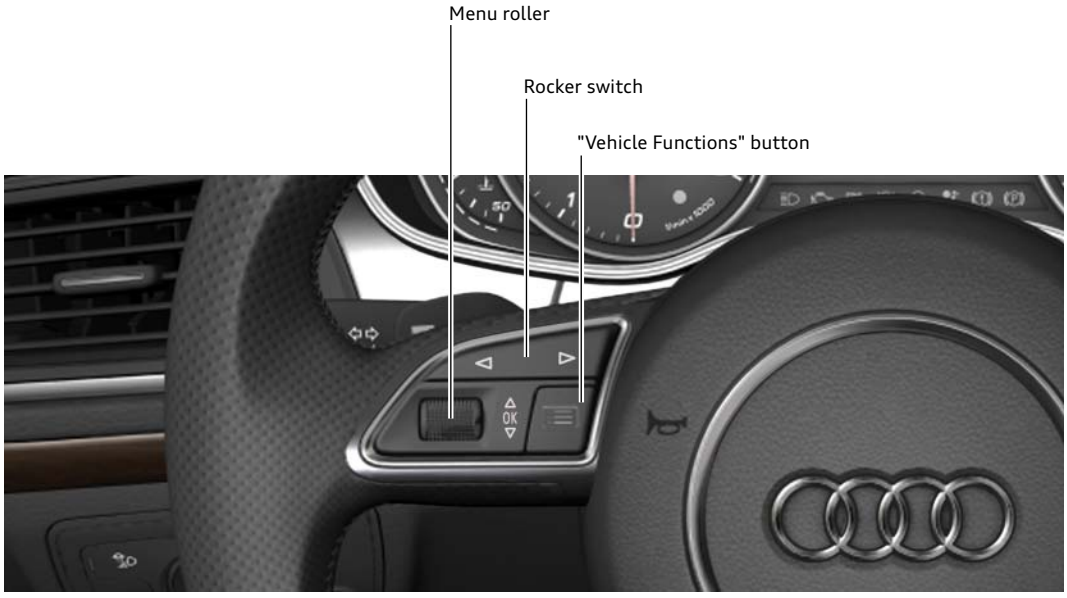
Activating the fullscreen display in the driver information system

Proceed as follows to display the full screen of the speed limit indicator:

1. In the driver information system, select the tab "On-board Computer". The selection is made using the rocker switch on the multifunction steering wheel.

2. Press the "Vehicle Functions" button in the series standard multifunction steering wheel; the "Vehicle Functions" menu appears in the driver information system.

3. With the menu roller, select the menu option "Speed Limit Indicator" and display it by pressing the roller.



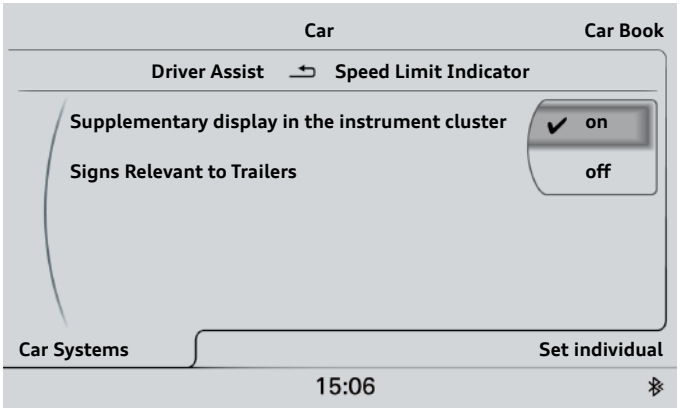
482_049

Multifunction steering wheel with buttons for operation of the driver information system

Supplementary display in the driver information system

The supplementary display is activated or deactivated via the MMI. The corresponding menu option is reached as follows:

1. Press the function button "CAR" in the MMI control panel
2. Press the control button at the bottom left for "Car Systems"
3. Select the menu option "Driver Assist"
4. Select the menu option "Speed Limit Indicator"
5. Set the menu option "Supplementary Displays in the Instrument Cluster" to "on" or "off"

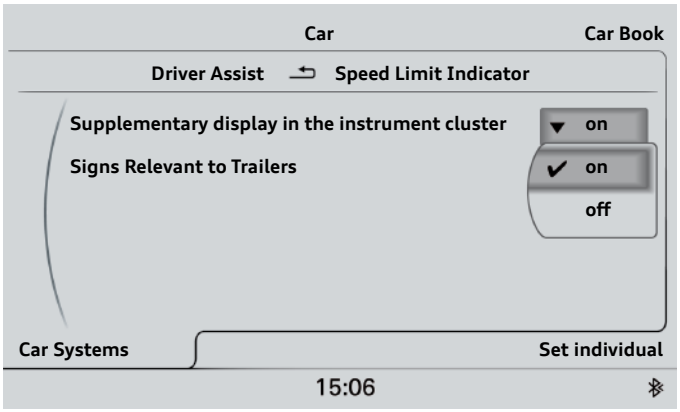


482_050

"Signs Relevant to Trailers" display

For speed limit for vehicles with trailers to be displayed, in the MMI the corresponding menu option "Signs Relevant to Trailers" must be set to "on". The corresponding menu option is reached as follows:

1. Press the function button "CAR" in the MMI control panel
2. Press the control button at the bottom left for "Car Systems"
3. Select the menu option "Driver Assist"
4. Select the menu option "Speed Limit Indicator"
5. Set the menu option "Signs Relevant to Trailers" to "on" or "off"

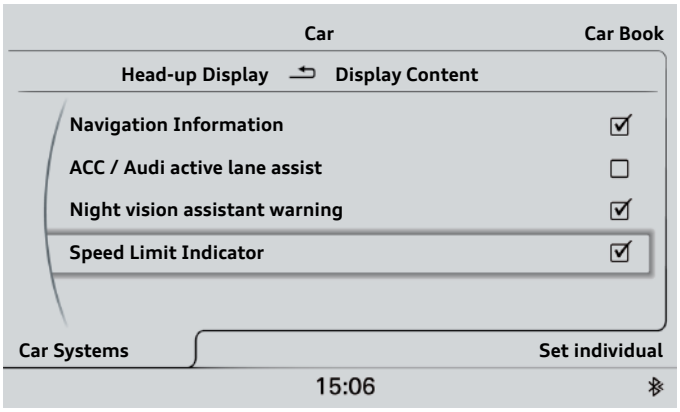


482_051

Speed limit indicator in the head-up display

For the speed limit indicator also to be shown in the head-up display, it has to be enabled in the corresponding MMI menu. The setting is reached as follows:

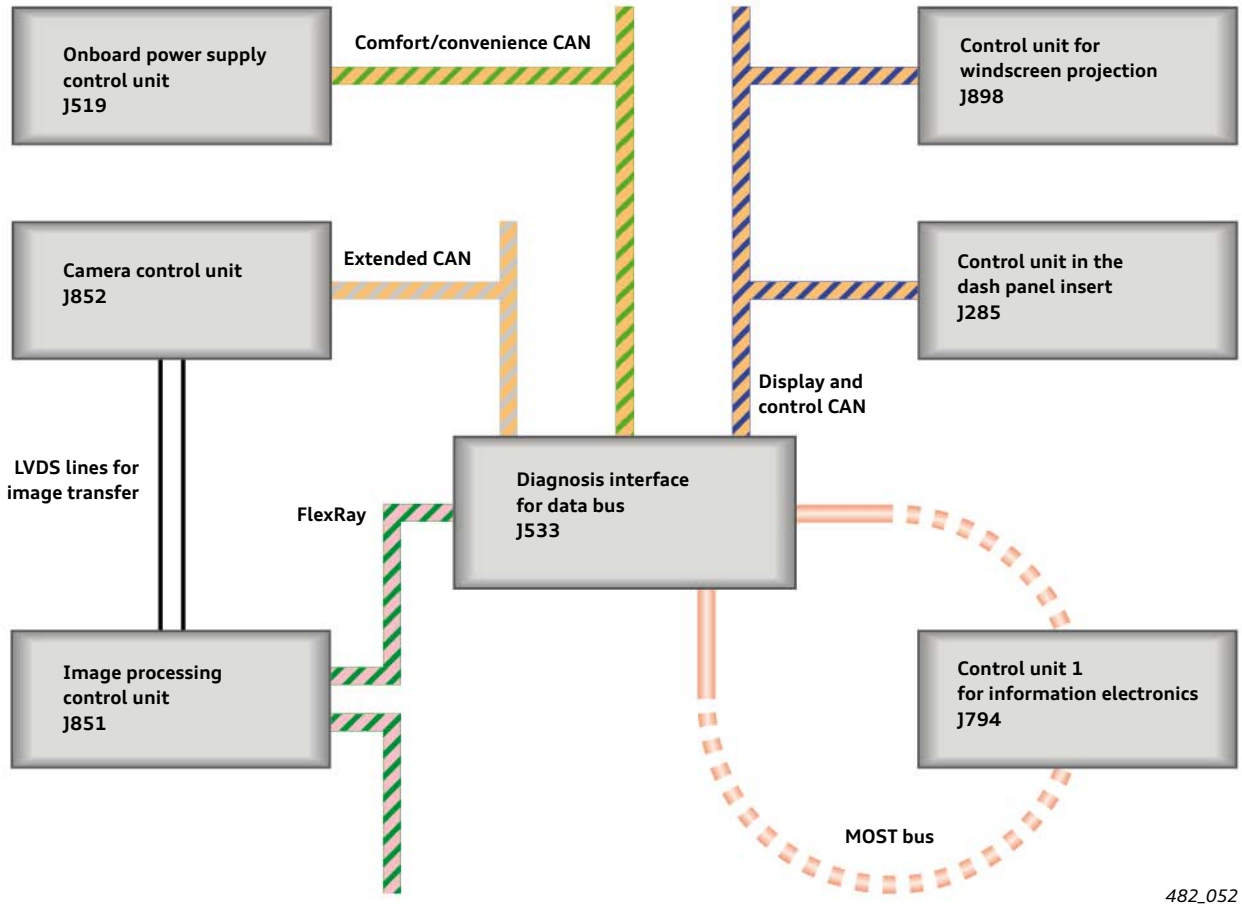
1. Press the function button "CAR" in the MMI control panel
2. Press the control button at the bottom left for "Car Systems"
3. Select the menu option "Driver Assist"
4. Select the menu option "Head-up Display"
5. Select the menu option "Display Content"
6. Enable or disable the menu option "Speed Limit Indicator"



482_021

Function implementation in the vehicle

The following diagram shows all of the control units involved in the function. It also shows the bus systems that are used for data interchange between the individual control units.



Camera control unit J852

The camera integrated in the control unit J852 continuously records images of the area in front of the vehicle. This is the same camera that is required for Audi active lane assist and adaptive cruise control ACC. It is located on the windscreen above the interior rear-view mirror.

The images are sent for evaluation via two LVDS lines to the image processing control unit J851.

Image processing control unit J851

The image processing control unit J851 receives images from the camera 25 times per second. The images are analysed with a special software algorithm with regard to road signs with prescribed speeds.

The complete function software of the speed limit indicator is also integrated in the image processing control unit J851.

Furthermore, the legally permitted maximum speeds of the different countries are also stored in the control unit J851.

Control unit 1 for information electronics – J794 (MMI)

The navigation system is integrated in the control unit 1 for information electronics. The navigation system provides the image processing control unit J851 with so-called predictive route data that are required for the speed limit indicator.

Moreover, the customer is offered various setting options with regard to the speed limit indicator in the control unit 1 for information electronics.

Control unit in dash panel insert J285 (instrument cluster)

The control unit in dash panel insert J285 shows the speed limit indicator in two possible display forms: in the full screen mode or in a reduced supplementary display. The instrument cluster also shows driver messages from the speed limit indicator and delivers the image processing control unit J851 the current time of day for display prioritisation.

Control unit for windscreen projection J898 (head-up display)

Speed limits can be shown in a reduced form in the optional control unit for windscreen projection J898.

Data bus diagnostic interface J533 (gateway)

The data bus diagnostic interface J533 is the interface of the various bus systems for information exchange of all function-relevant data between the control unit.

Electrical system control unit J519

The onboard supply control unit informs the speed limit indicator as to whether the windscreen wiper is activated or not.
The image processing control unit J851 requires this information for display prioritisation.

Test your knowledge

In all cases, one answer or a number of answers can be correct.

Question 1: Which display content can be shown in the head-up display?

- ☐ a) Warnings from the Audi night vision assistant
- ☐ b) Incoming telephone calls
- ☐ c) Combined display of ACC and Audi active lane assist
- ☐ d) Road signs of the speed limit indicator
- ☐ e) Current engine speed
- ☐ f) Yellow warning symbols (warnings with priority 2)

Question 2: Which settings can the customer make for the head-up display?

- ☐ a) Display brightness of the head-up display
- ☐ b) Display content of the head-up display
- ☐ c) Vertical position of the head-up display on the windscreen
- ☐ d) Image focus of the head-up display

Question 3: What tools are required for calibration of the head-up display in the Audi A7 Sportback?

- ☐ a) A wheel alignment unit
- ☐ b) A vehicle diagnostics tester
- ☐ c) The test box VAS 6256
- ☐ d) The calibration tool VAS 6656

Question 4: Which is the master control unit of the speed limit indicator?

- ☐ a) The camera control unit J852
- ☐ b) The control unit for speed limit indicator J899
- ☐ c) The image processing control unit J851
- ☐ d) The control unit in dash panel insert J285

Question 5: Which road signs can be displayed in the speed limit indicator?

- ☐ a) A speed limit with supplementary sign "Only For Lorries"
- ☐ b) A speed limit with supplementary sign "Only During Fog"
- ☐ c) A sign that cancels a speed limit
- ☐ d) A speed limit with supplementary sign "Only When Road Wet"
- ☐ e) A speed limit with supplementary sign with a time restriction
- ☐ f) A "no overtaking" sign

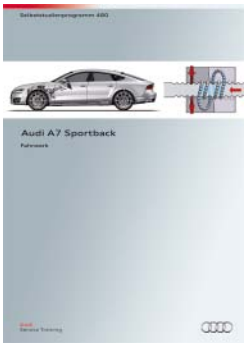
Question 6: What setting options does the customer have for the speed limit indicator?

- ☐ a) Whether or not signs relevant to trailers are displayed
- ☐ b) Whether or not a warning is issued when the permitted maximum speed is exceed
- ☐ c) Whether or not the supplementary display in the driver information system is used by the speed limit indicator
- ☐ d) Whether or not legally prescribed maximum speeds are displayed in the speed limit indicator

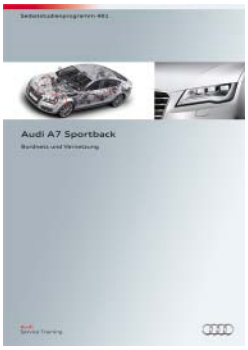
Solutions: 1) acd; 2) abc; 3) bd; 4) c; 5) de; 6) ac

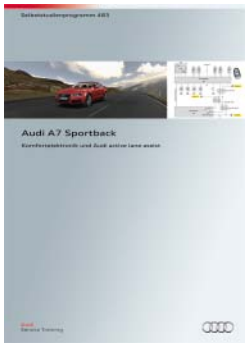
Self-study programmes

More information on the technology in the Audi A7 Sportback can be found in the following self-study programmes.



SSP 478 Audi A7 Sportback, Order number: A10.5S00.71.20
SSP 479 Audi 3.0-ltr. V6 TDI engine (2nd Generation), Order number: A10.5S00.72.20
SSP 480 Audi A7 Sportback running gear / suspension, order number: A10.5S00.73.20





SSP 481 Audi A7 Sportback vehicle electrical system and networking, Order number: A10.5S00.74.20
SSP 483 Audi A7 Sportback convenience electronics and Audi active lane assist, Order number: A10.5S00.76.20
SSP 484 Audi A7 Sportback occupant protection, infotainment, cabin climate, Order number: A10.5S00.77.20

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