Self Study Programme 619
For internal use only

Audi Matrix LED Headlights

Audi
Service Training

Introduction

According to the latest statistics, nearly half of all fatal accidents happen at night although only 25% of traffic takes place at this time of day. This has to do, among other things, with the fact that problems of perception are a key factor contributing to road accidents.

When the headlights are dipped, a driver can detect persons wearing light-coloured clothes from a distance of 100 m. If persons are wearing dark-coloured clothes, the detection range decreases to a distance of between 50 and 60 m.

If this distance is compared to the stopping distance of a vehicle travelling at a speed of 100 kph, the problem quickly becomes obvious. The stopping distance is, namely, over 90 metres even in good ambient conditions, which means that persons wearing dark-coloured clothes may be detected too late and, consequently, the driver will not be able to bring the vehicle to a standstill in time.

With main beam, all test subjects were easily detected from a distance of 140 metres, regardless of whether they were wearing dark or light coloured clothes.

This begs the question as to why the main beam is not used more. In a survey, the following three reasons were the ones most frequently cited:

1. ... because drivers are worried that dipping too late will dazzle oncoming traffic ...

2. ... because drivers find it tedious having to constantly switch back and forth between main beam and dipped beam in heavy traffic ...

3. ... because drivers are so familiar with the route they are travelling, they do not think that using main beam will improve road safety ...

Why not let the car switch the main beam on and off automatically? This firstly reduces the strain on the driver and, secondly, enables the area in front of the vehicle to be better illuminated by the main beam in appropriate traffic and ambient conditions. This task can be performed by an electronic control unit working in conjunction with a front-end camera.

This requirements profile is identical to that of the MatrixBeam headlight assist system integrated in the Audi Matrix LED headlights, which are shown in this self study programme.

Contents

▸ The Self Study Programme teaches a basic knowledge of the design and functions of new models, new automotive components or new technologies.
It is not a Repair Manual! Figures are given for explanatory purposes only and refer to the data valid at the time of preparation of the SSP.
Content is not updated.
For further information on maintenance and repair work, always refer to the current technical literature.

Note

Reference

Headlight assist in Audi A8 (D4)

This self study programme describes the Audi Matrix LED headlights. The various lighting functions of the headlights are explained, and special emphasis is placed on MatrixBeam headlight assist. The new headlight assist system is based on entirely new technology and stands out clearly from the previously available headlight assist system.

The Audi A8 is the world's first motor vehicle to be equipped with the new MatrixBeam technology, which will be available for the first time with the facelifted version of the Audi A8 in 2013.

Supply structure of the headlight assist system in the Audi A8 (D4) prior to product upgrade

"Digital" headlight assist

Until the rollout of the facelifted Audi A8 in 2013, LED headlights could only be combined with the "digital" headlight assist system. This system independently switches the main beam on and off depending on the traffic situation and other ambient conditions, and thereby reduces the strain on the driver. It is referred to as "digital" headlight assist because it utilises only the "main beam on" and "main beam off" states. The "digital" version is controlled by headlight assist control unit J844, which is integrated in the interior rear-view mirror.

Intelligent light system

Since the launch of the Audi A8 (D4) in 2010, an advanced version of headlight assist can be ordered in combination with xenon headlights equipped with cornering light. The option in question is the "intelligent headlight system".

With this solution, the range of the main beam is continuously adjusted depending on traffic and other ambient conditions. This is done using a rotatable roller integrated in the headlight.

The intelligent light system requires both cornering light and headlight range control unit J745 and camera control unit J852.

619_001

Functional principle of the intelligent light system

Note
Further information on the "digital" headlight assist system can be found in Self Study Programme 434.
The intelligent light system is described in Self Study Programme 461.

Lighting functions of Audi Matrix LED headlights

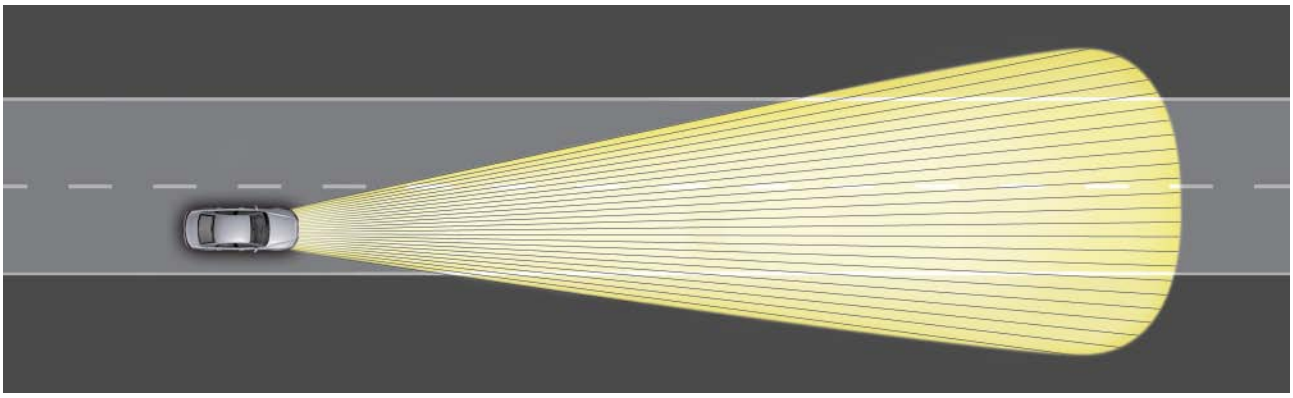
MatrixBeam main beam

The MatrixBeam technology is available in conjunction with the optional Audi Matrix LED headlights for the first time in an Audi. The technology in question is a headlight assist system which saves the customer having to constantly switch back and forth between main beam and dipped beam when driving at night.

The MatrixBeam headlight consists of 25 light segments which overlap one another and collectively produce the main beam. The MatrixBeam technology allows individual light segments to be switched on and off independently of one another.

Dimmed activation is also possible. If other road users are detected, only the light segments of the main beam which could cause dazzling are switched off. This can be either traffic ahead or oncoming traffic.

The major advantage of this technology is that all other main beam segments that presently do not dazzle other road users continue to illuminate the road with main beam. This allows optimal illumination of the road at all times and maximises the potential of the main beam.



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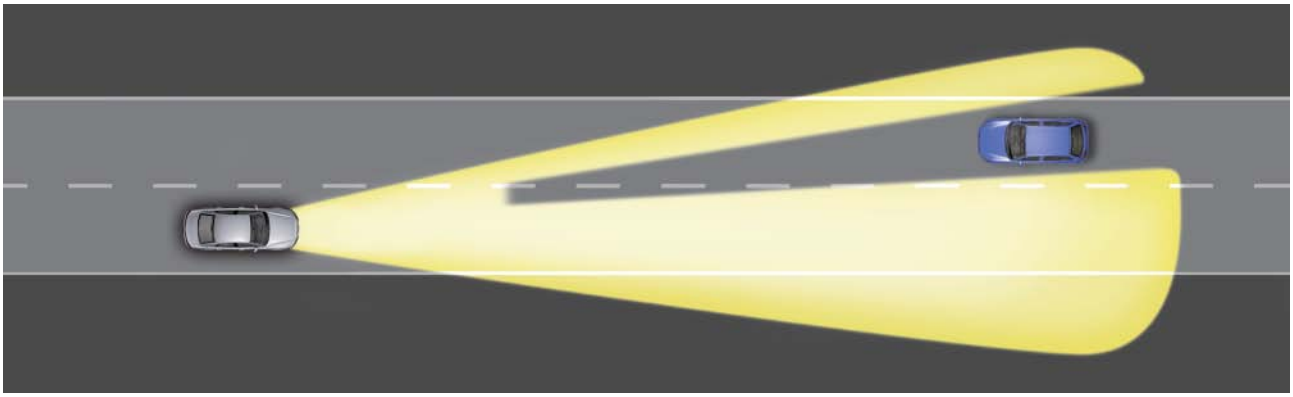
Subdivision of the main beam into individually activatable segments

The system can also detect motorcyclists. The detectability of cyclists depends on the luminosity of the headlights and the quality of road illumination.

How the MatrixBeam main beam responds to other detected road users

Oncoming traffic and traffic head are detected by camera control unit J852. The image processing software in the camera control unit scans for headlights and taillights. If vehicles have been detected, the angle and distance are determined.
This data is then transmitted to the MatrixBeam control unit, which determines which main beam segments can be left switched on and which have to be switched off so that no other road users are dazzled. The results are transmitted to the power modules in the Audi Matrix LED headlights, which then activate the main beam LEDs accordingly.



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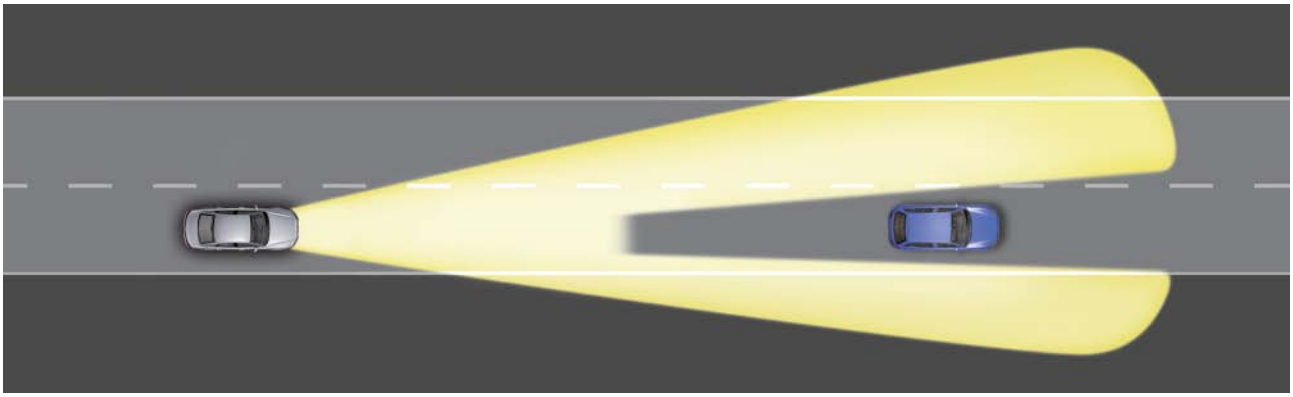
Audi A8 with MatrixBeam main beam in a scenario with oncoming traffic



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Audi A8 with MatrixBeam main beam in a scenario with traffic ahead

Predictive route data

If the vehicle has the MMI Navigation plus option and hence predictive route data at its disposal, the Audi Matrix LED headlights can operate in an anticipatory way. Thus, the MatrixBeam control unit has information on the road ahead, the type of road the vehicle is currently on and whether the vehicle is currently inside or outside a built-up area. This additional information allows some light functions to be implemented or activated earlier.

System behaviour in built-up areas (towns and cities)

The vehicle always uses the dipped beam in built-up areas. Built-up areas can be detected as such by the camera control unit J852. To this end, the image processing software scans the camera video data for suitable light sources. If the light sources meet certain conditions, they are classified as street lighting and their surroundings as a built-up area. If predictive route data is available to the vehicle, a built-up area can be identified more easily and reliably.

Speed thresholds for automatic headlight activation/deactivation

When driving in the dark with a headlight assist system activated by the driver, the following speed thresholds are used for automatic headlight activation/deactivation:

Vehicle with predictive route data

Scenario 1: built-up area

- When the vehicle exceeds a speed of 60 kph, the MatrixBeam headlight assist takes on the automatic headlight activation function.
- When the vehicle speed drops below 40 kph, MatrixBeam headlight assist exits main beam control mode. The vehicle continues using the dipped beam.

Scenario 2: non built-up area

- When the vehicle exceeds a speed of 30 kph, the MatrixBeam headlight assist takes on the automatic headlight activation function.
- When the vehicle speed drops below 20 kph, MatrixBeam headlight assist stops exits main beam control mode. The vehicle continues using the dipped beam.

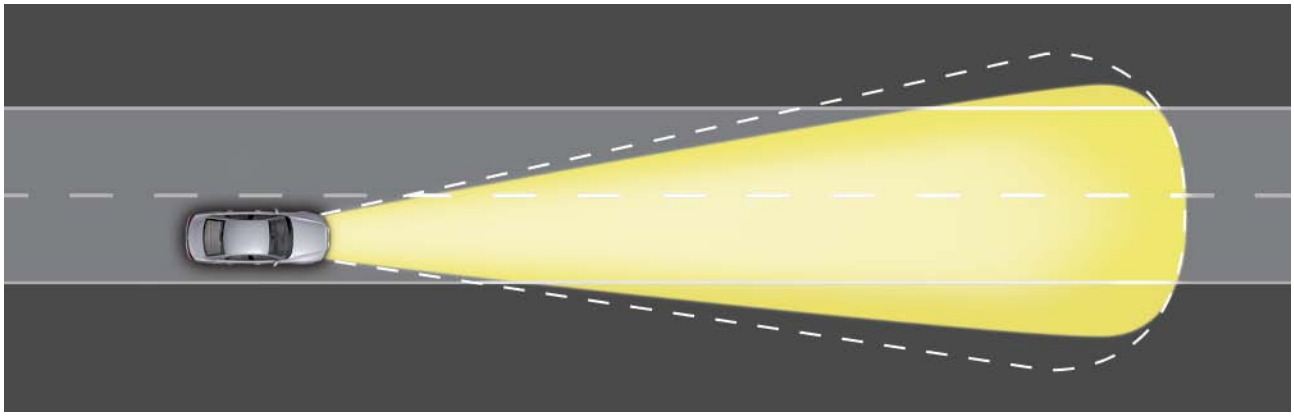
Vehicle without predictive route data

- When the vehicle exceeds a speed of 60 kph, the MatrixBeam headlight assist takes on the automatic headlight activation function.
- When the vehicle speed drops below 40 kph, MatrixBeam headlight assist exits main beam control mode. The vehicle continues using the dipped beam.

Motorway mode of the main beam

The motorway mode is a special mode of the main beam which is only available if the vehicle has predictive route data at its disposal. If the predictive route data indicates that the vehicle is driving on a motorway, the motorway mode is activated.

In motorway mode, the main beam becomes slightly narrower and thus adapts to the structural characteristics of the motorway.



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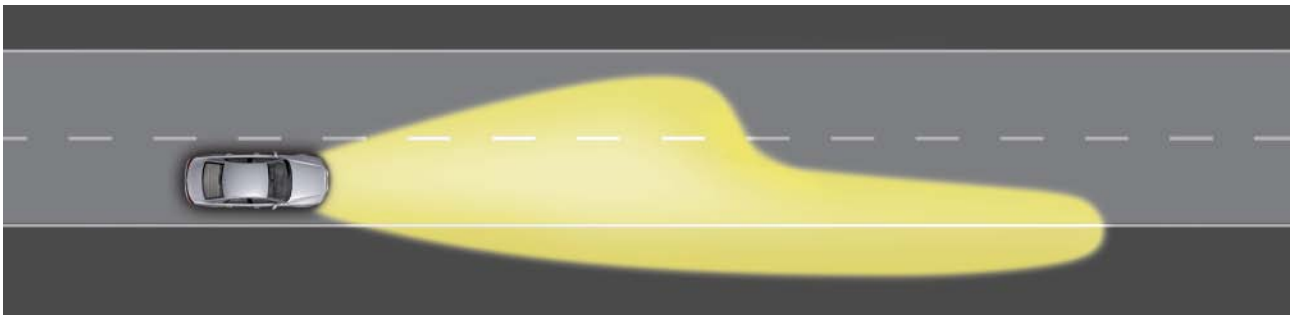
MatrixBeam main beam with motorway mode activated

Dipped beam

The Audi Matrix LED headlights utilise the well-known asymmetrical-shaped dipped beam. The edge of the road is illuminated over a wider area, enabling the driver to detect potential hazards more quickly. On the other hand, the centre of the lane is illuminated over a shorter distance because the first priority is not to dazzle oncoming traffic.

A total of 15 LEDs are integrated into each of the Audi Matrix LED headlights for the dipped beam. The dipped beam can be subdivided into an area immediately in front of the vehicle and a wider area ahead of the vehicle. The wider area in front of the vehicle also includes the asymmetrical component of the dipped beam. The area immediately in front of the vehicle is illuminated by 9 LEDs and the wider area ahead of the vehicle is illuminated by a total of 6 LEDs.



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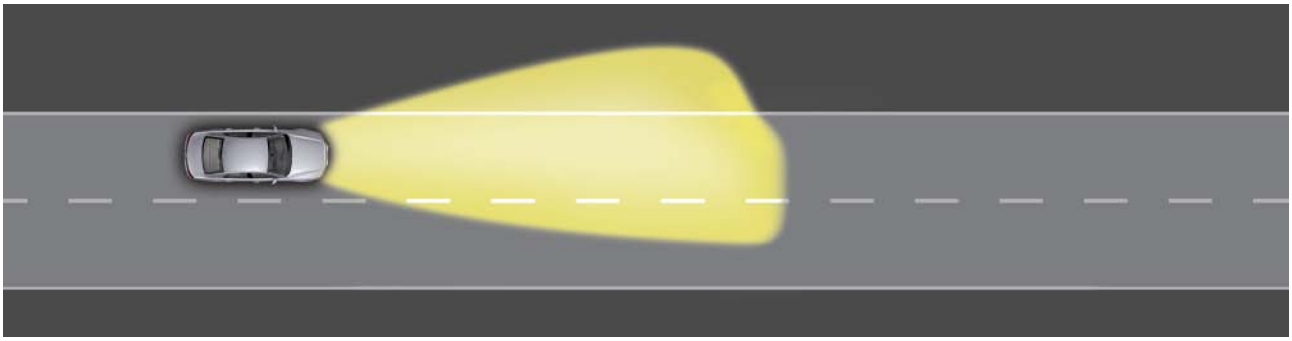
Driving with the dipped beam

Tourist lights

The tourist lights have to be activated if, for instance, a vehicle from a country with right-hand traffic is driving in a country with left-hand traffic. The asymmetrical dipped beam would dazzle oncoming traffic in the country with left-hand traffic, which is not acceptable. For this reason, the LEDs which produce the asymmetrical component of the main beam in the Audi Matrix LED headlights are deactivated when the tourist lights are activated.

In vehicles which have predictive route data at their disposal, the tourist lights are activated automatically. The MatrixBeam control unit determines from the predictive route data whether the vehicle is currently driving in a country with left or right-hand traffic.

In vehicles which have predictive route data at their disposal, the tourist lights have to be activated manually in the MMI at the country's border.



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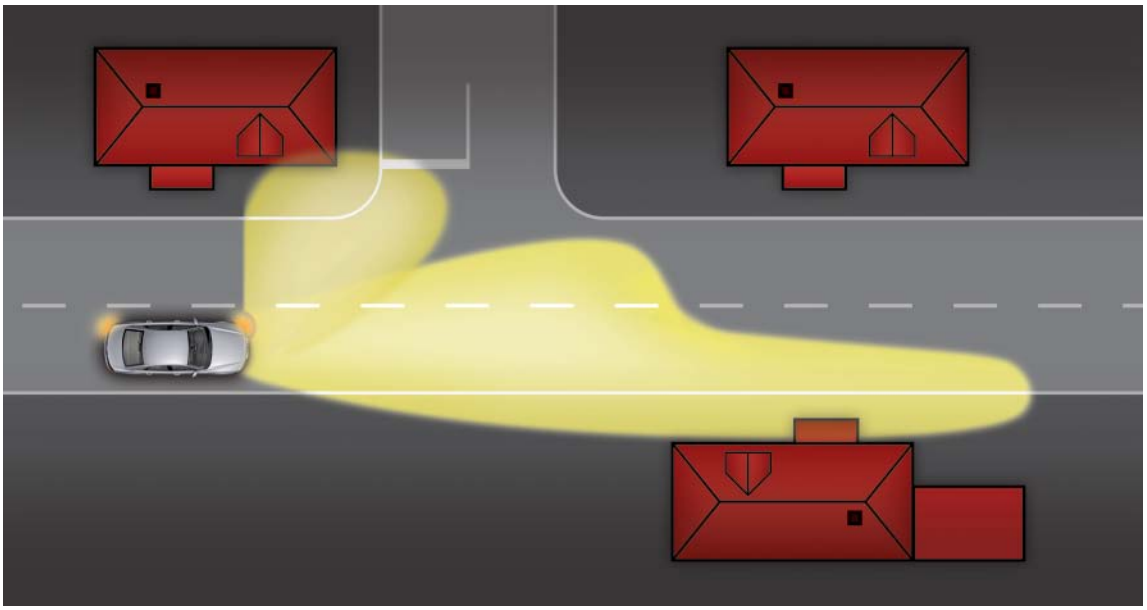
Right-hand drive vehicle with tourist lights activated in a country with left-hand traffic

Turning lights

The task of the turning light is to make turning off safer. It does this by providing better illumination of the area in front of the vehicle when turning off. In particular, the driver has a better view of the front-side area of the vehicle and can detect potential hazards more quickly.

An LED version of the turning light is also available. Both Audi Matrix LED headlights come fitted with three LEDs for this purpose.

The side on which the turning light is activated depends on which turn sign is activated or the direction in which the steering wheel is turned.



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Vehicle approaching intersection with the turning lights activated

The predictive route data has no effect on the functioning of the turning lights.

Activation of the turning light without activated turn signal:

The corresponding turning light is switched on if the steering wheel angle exceeds approximately 50 degrees at a vehicle speed of less than 60 kph.

The activated turning light is switched off again as soon as ...

- the vehicle exceeds a speed of 70 kph.

OR

- the steering wheel angle is less than approximately 15 degrees.

Activation of the turning light by an activated turn signal:

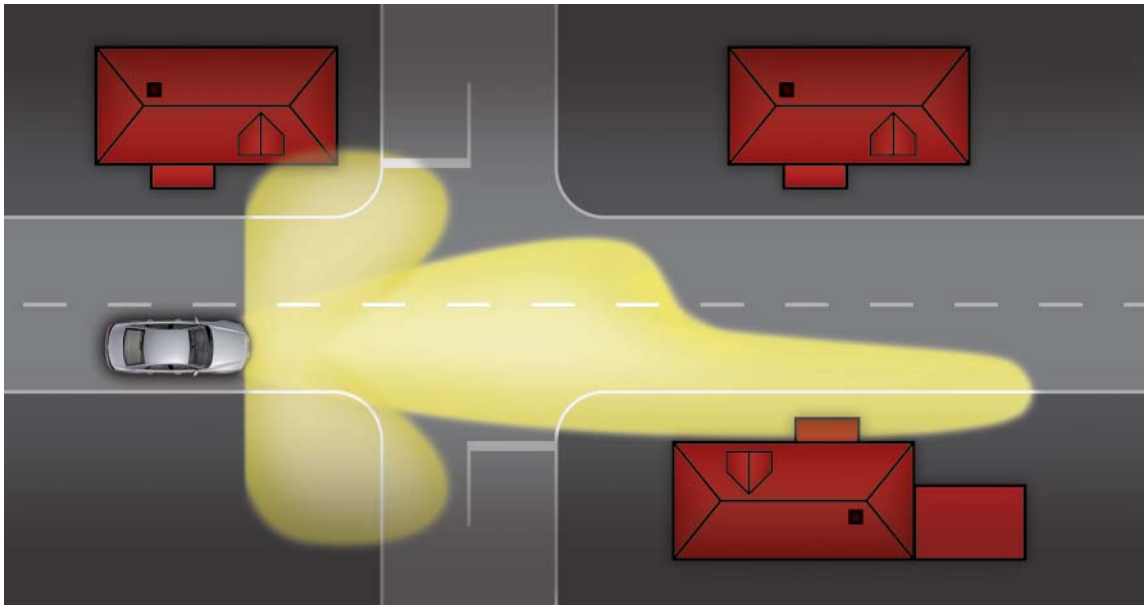
The turning light can also be activated by selecting the corresponding turn signal. This function is available up to a maximum vehicle speed of 30 kph.

The turning light is subsequently switched off again as soon as the vehicle exceeds a speed of 40 kph.

Intersection lights

The task of the intersection lights is to provide better illumination of intersection ahead of the vehicle. For this purpose, both turning lights are activated in addition to the normal dipped beam.

This provides better illumination of the area to the side of the vehicle, making it easier for the driver to spot potential hazards.



619_009

Vehicle approaching intersection with intersection lights activated

Intersection lights are only available if the vehicle has predictive route data at its disposal. Since intersections ahead of the vehicle cannot at present be reliably detected by a camera or other sensor, this navigation data is indispensable.

Both cornering lights, or, to be precise, the intersection lights, are switched on when the vehicle approaches an intersection travelling at a speed of less than 40 kph.

The intersection must be included in the predictive route data in order that the vehicle electronics can check the distance criterion.

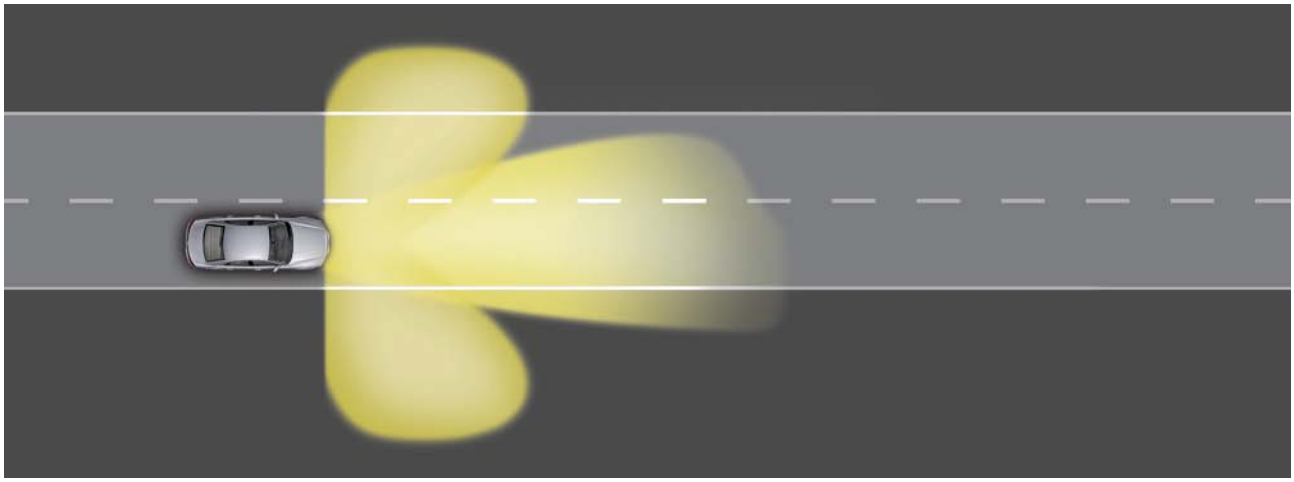
The intersection lights are subsequently switched off either 15 metres after the intersection or if the vehicle exceeds a speed of 50 kph.

Note
The town light and motorway light functions of the xenon headlights with intelligent light system are not implemented in the Audi Matrix LED headlights.

All-weather lights

The all-weather lights are intended for use in bad weather conditions, such as fog or snow. It helps to reduce the self-dazzling effect of headlight reflection. This is achieved by shortening the range of the dipped beam.

At the same time, the area in front of the vehicle is illuminated over a wider area by activating both cornering lights.



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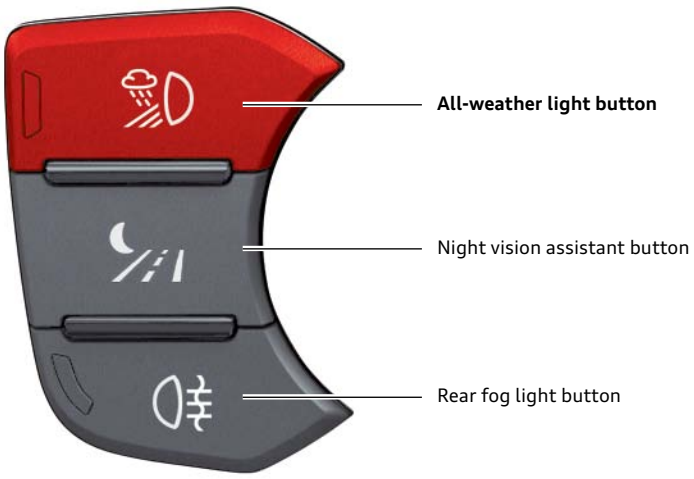
Driving with the all-weather light activated

The all-weather light is activated by pushing the appropriate button in the light switch module. The all-weather light can be activated when travelling at speeds of up to 110 kph and is indicated by a function LED in the button.

If the all-weather light is activated, MatrixBeam headlight assist deactivates itself if previously activated. Both functions cannot be activated simultaneously.



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Light switch module

If activated, the all-weather light function stays active until the vehicle exceeds a speed threshold of 140 kph and then switches over to normal dipped beam.

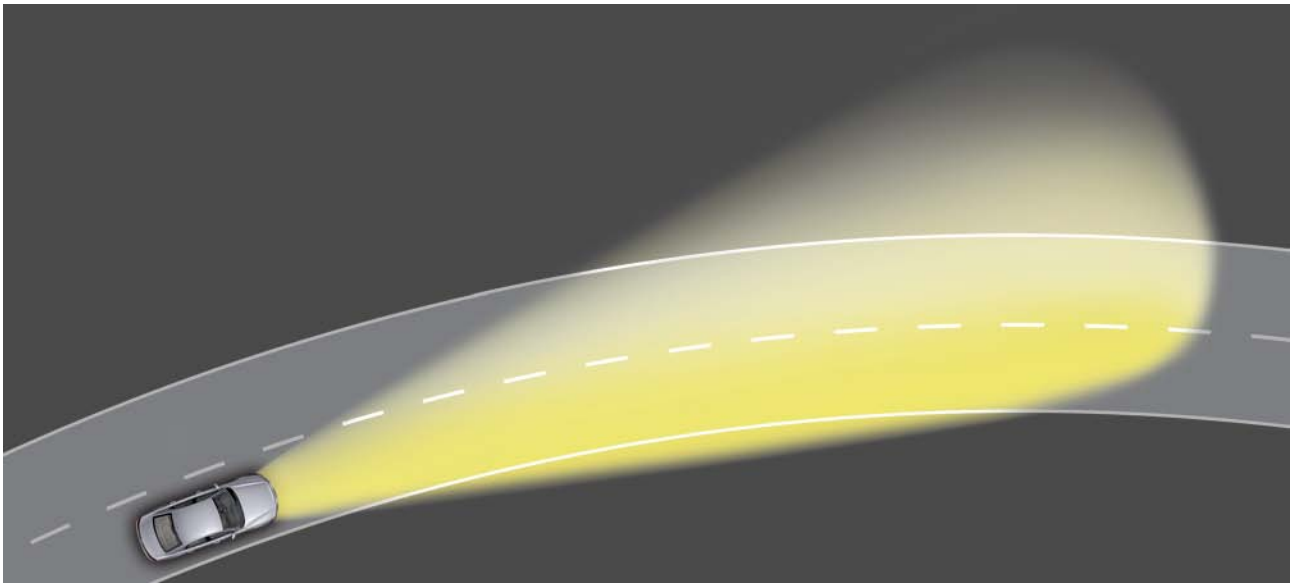
The all-weather light function is used again as soon as the vehicle speed drops below a threshold of 110 kph.

Cornering lights

The Audi Matrix LED headlights also have a cornering light function. The cornering light function of the Audi Matrix LED headlights is available for the main beam but not for the dipped beam.

No mechanical swivelling function is needed in order to implement this function. The Audi Matrix LED headlights do entirely without positioning motors.

The cornering light is produced by shifting the brightness maximum away from the centre of the main beam towards the required side. The dimmability of the main beam LEDs is utilised for this purpose.

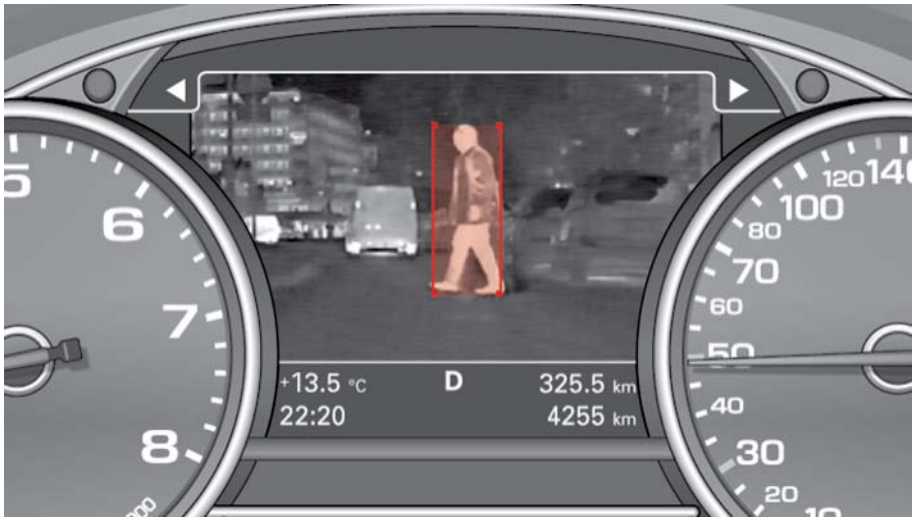


619_012

Driving with an active cornering light

Marker light

If the vehicle is equipped with the night vision assistant, the possibilities of the new Audi Matrix LED headlights are also utilised by this function.
If the night vision assistant detects a potential collision with a pedestrian, the driver is alerted as described in Self Study Programme 462 "Audi A8 '10 Night Vision Assist".
The driver is alerted by an audible signal sounds and the pedestrian is marked by red brackets.



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Marking of detected pedestrian in instrument cluster display

The main beam of the Audi Matrix LED headlights can also be used to alert the driver to the hazardous situation.

1. If **main beam is on**: by dimming the main beam segments illuminating the pedestrian three times in succession.
2. If **main beam is off**: by dimming the main beam segments illuminating the pedestrian three times in succession.

The following conditions apply to the use of the marker light:

- Vehicle is travelling at a speed of greater than 60 kph
- The vehicle is outside a lit built-up area
- No vehicle which can be dazzled by the marker light is currently detected

619_014

Marking of detected pedestrian by Audi Matrix LED headlights

Sequential flashing

The Audi Matrix LED headlights are the first headlights to feature sequential flashing, where the LEDs illuminate in a sweeping motion from the inside outwards. All flashing LEDs then switch off at once.

619_015

Sequential flashing with Audi Matrix LED headlights

Sequential flashing LEDs are available with the optional Audi Matrix LED headlights and LED taillights. The principle of sequential flashing LED taillights was adopted for the first time in the facelifted version of the Audi R8 rolled out in 2012.

The instruction to activate the turn signal flasher is sent by the turn signal master, convenience system control unit J393. This instruction is received by onboard power supply control unit J519, which thereupon makes the flashing signal available to the power modules 2 in the headlights via discrete lines.

Given that sequential flashing is not desirable in all indicating modes, convenience system control unit J393 uses a discrete line to indicate to both power modules 3 for the LED headlights whether sequential or conventional flashing is required.

Conventional flashing is used, for example, for indicating a crash/collision, an emergency or as a hazard warning after heavy braking. Sequential flashing, on the other hand, is used for indicating changes in direction, the manually activated hazard warning flashers, central locking acknowledgement and as confirmation of successful programming.

Operation and displays

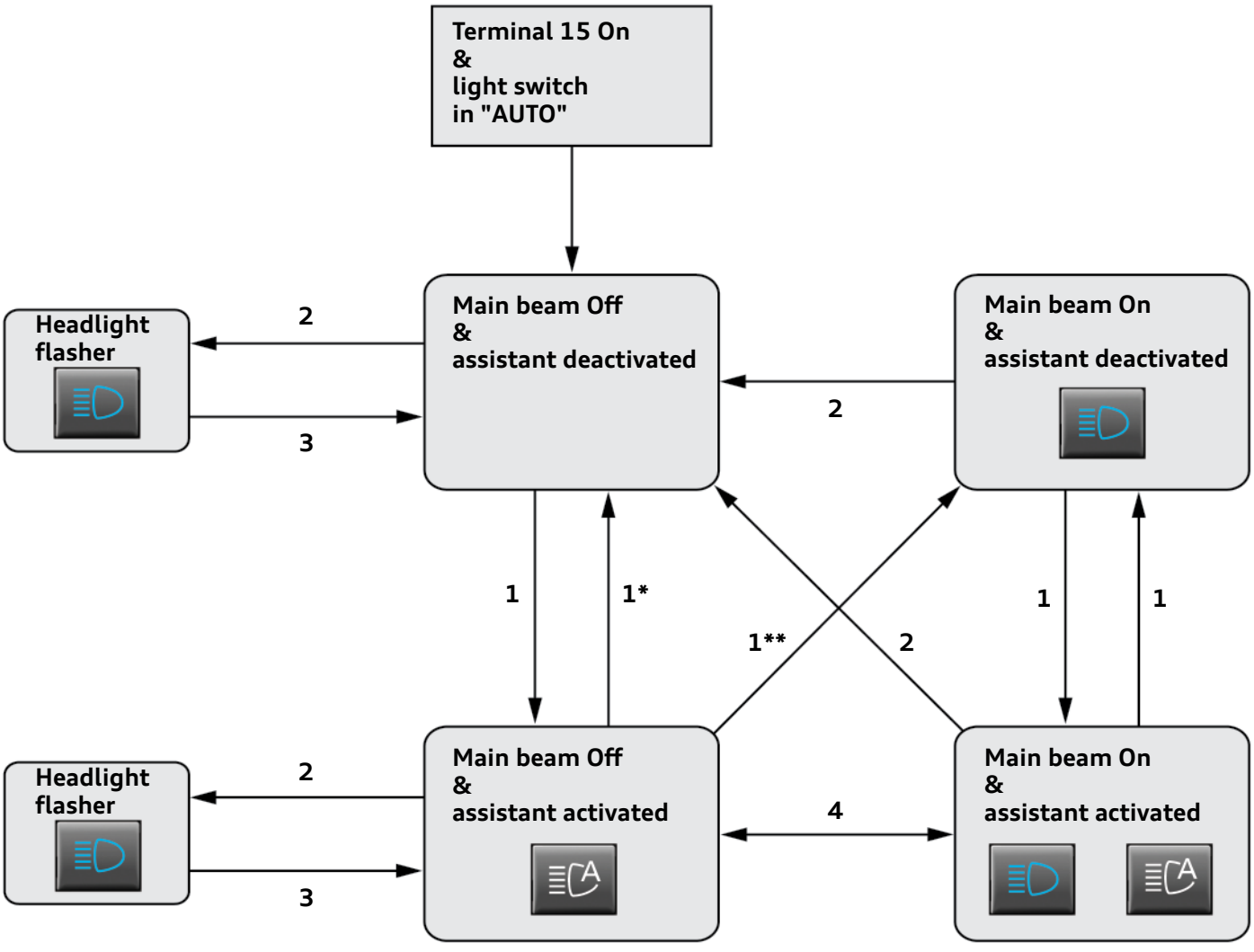
Operation

The main beam has two control options for activating and deactivating MatrixBeam headlight assist, manual override of MatrixBeam headlight assist by the driver, switching the manually operated main beam on and off, and operating the headlight flasher:

- flicking the main beam stalk forwards
- pulling the main beam stalk back

To achieve this many functions with just two control options, the software of the onboard power supply control unit J519 integrates an advanced operating logic. The operating logic can best be represented in the form of a status diagram with the following main states:

- MatrixBeam headlight assist deactivated and main beam Off
- MatrixBeam headlight assist deactivated and main beam On
- MatrixBeam headlight assist activated and main beam Off
- MatrixBeam headlight assist activated and main beam On



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Status diagram of MatrixBeam headlight assist operating logic

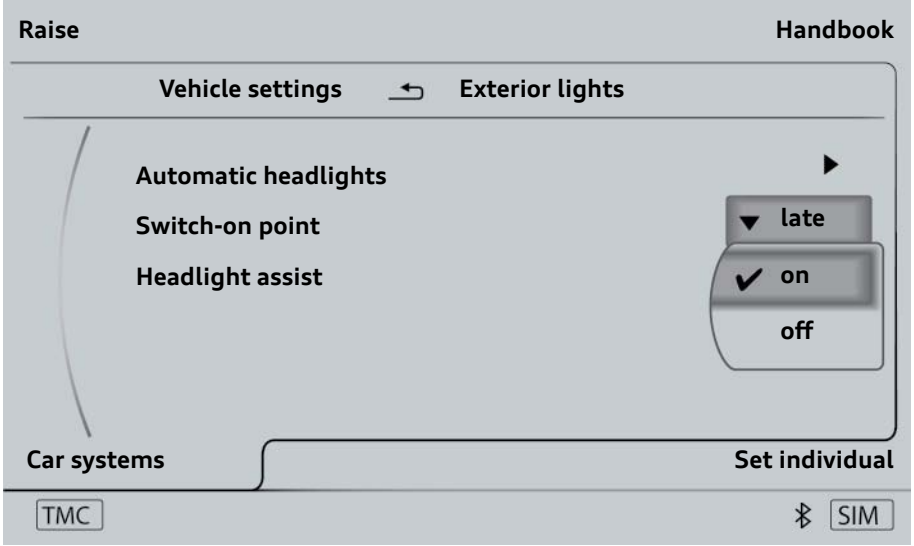
Key:

1	Flick the main beam stalk forwards
1*	Flick the main beam stalk forwards (dipped beam is switched off)
1**	Flick the main beam stalk forwards (dipped beam is switched on)
2	Pull main beam stalk back
3	Release the main beam stalk
4	Situation dependent - automatic

Settings

MatrixBeam headlight assist can be switched on or off in the MMI Car Menu using the menu options < Vehicle settings / External lighting / Automatic headlights >. If MatrixBeam headlight assist is switched on, it can be activated by the driver by flicking the main beam stalk forwards. A basic requirement for this, however, is that the light switch is in the AUTO position.

In the "dipped beam" light switch position, the main beam can be switched on and off manually using the main beam stalk. If the MMI setting for headlight assist is at "Off", the main beam can be switched on and off manually in the AUTO light switch position.



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Activating headlight assist in the MMI

Displays

The following symbols can be displayed by the MatrixBeam:

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If MatrixBeam headlight assist has been activated by the customer, this symbol is displayed in the instrument cluster.

619_018

If MatrixBeam headlight assist has been activated, the blue main beam symbol appears in the instrument cluster as soon as the main beam LED comes on.

Hardware

Audi Matrix LED headlight

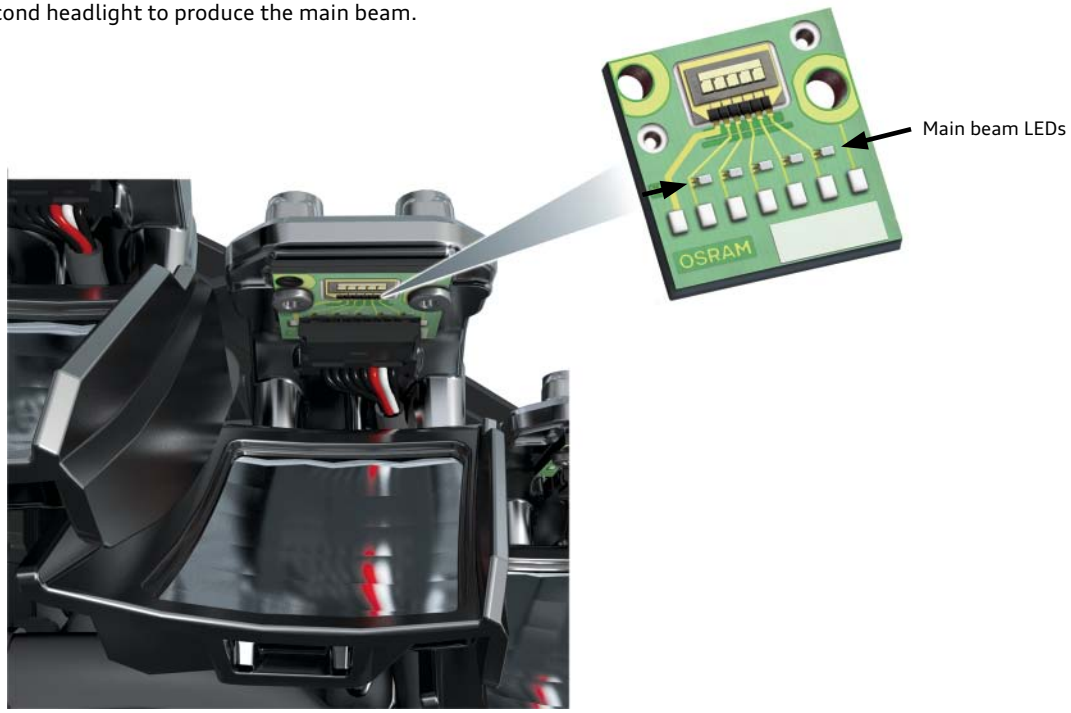
Front view of the Audi Matrix LED headlight

Design of the Audi Matrix LED headlight

Boards with main beam LEDs

The main beam of the Audi Matrix LED headlight consists of five separate LED boards, on each of which five LEDs are arranged in series. This means that a total of 25 main beam LEDs can be individually activated per headlight, combining with the main beam module of the second headlight to produce the main beam.

Each individual LED is responsible for illuminating a segment of the main beam whereby the individual segments overlap one another.



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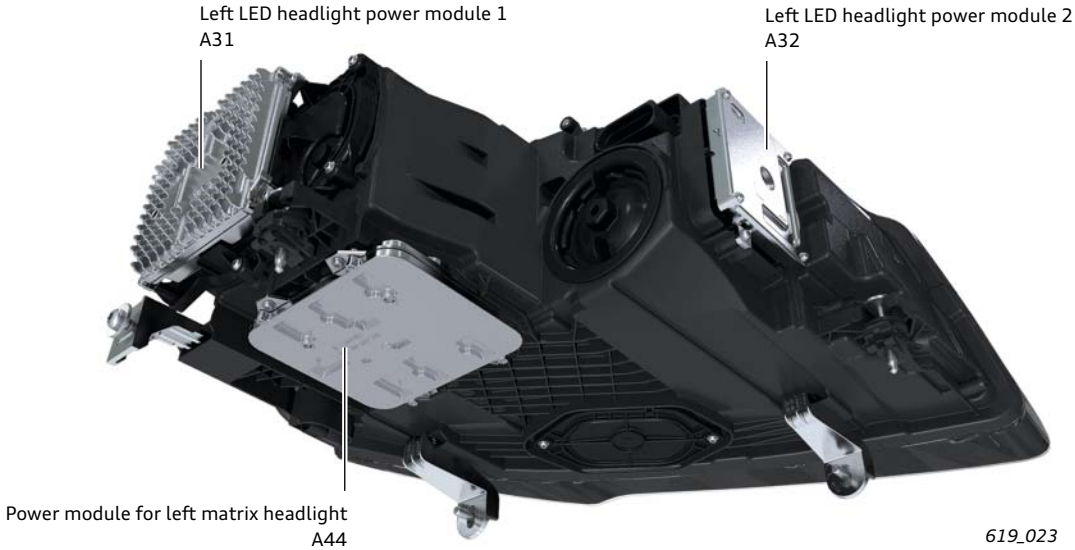
Board with main beam LEDs

Components of the Audi Matrix LED headlights which can be replaced in service centres

Five components of the Audi Matrix LED headlight can be replaced separately in service centres.
These are as follows:

- Power module 1 for LED headlight, right A27 / left A31
- Power module 2 for LED headlight, right A28 / left A32
- Power module 3 for LED headlight, right A29 / left A33
  (The electronics of A29 and A33 are integrated in the Audi Matrix LED headlights. They can be replaced after removing the rear headlight cover.)
- Power module for matrix headlight, left A44 / right A45
- Headlight fan, left V407 / right V408



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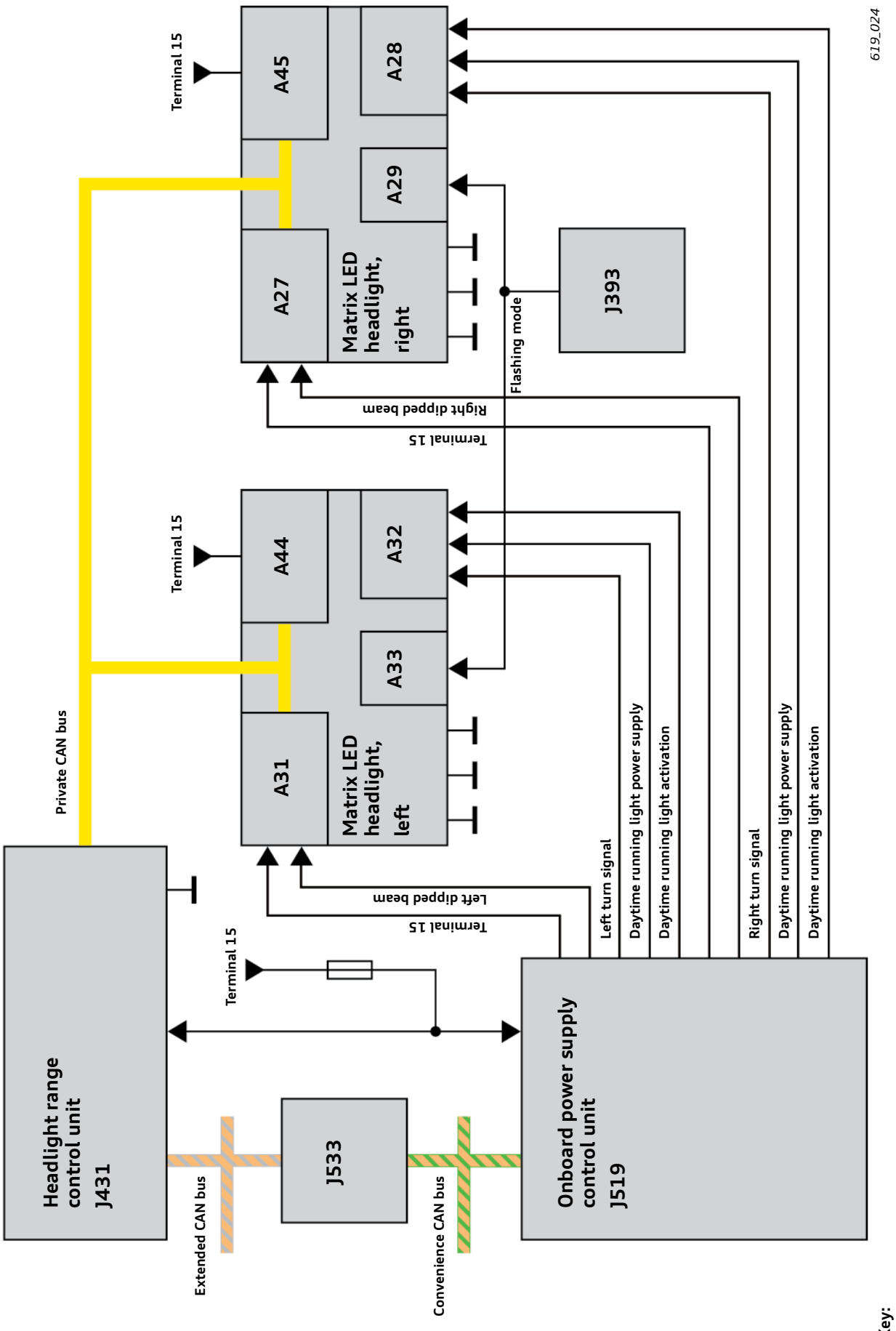
General circuit diagram of the Audi Matrix LED headlight



Key:

A27	Right LED headlight power module 1	A32	Left LED headlight power module 2
A28	Right LED headlight power module 2	A33	Left LED headlight power module 3
A29	Right LED headlight power module 3	A44	Power module for left matrix headlight
A31	Left LED headlight power module 1	A45	Power module for right matrix headlight

J393	Convenience system control unit
J533	Data bus diagnostic interface

Power modules of the Audi Matrix LED headlights

Power modules 1 for LED headlight, right A27 / left A31

Tasks:

Supplying and activating the dipped beam and cornering light LEDs as well as activating the fan in the headlight.

Lines connected to power module 1 for LED headlights:

- A "terminal 15" line running from onboard power supply control unit J519 to the power supply of the cornering light, the fan and the power module processing unit.
- Discrete "dipped beam" line from onboard power supply control unit J519. The line supplies power to the dipped beam.
- Two CAN bus lines (private CAN) to headlight range control unit J431. Lighting requirements are indicated to the power module via these bus lines. This information tells the power module what dipped beam LEDs to activate and how much power to apply to these LEDs. The power module is likewise instructed to switch the cornering light on and off as required.

Power modules 2 for LED headlights, right A28 / left A32

Tasks:

Supplying and activating the LEDs of the position light (side light), daytime running light and turn signal.

Lines connected to power module 2 for the LED headlights:

- A "daytime running light power supply" line running from the onboard power supply control unit J519 to the power supply LEDs of the daytime running light and/or position light (side light).
- Discrete "daytime running light activation" line from onboard power supply control unit J519. A PWM signal for dimming the lights is transmitted via this line. The daytime running light is activated without dimming and the position light is dimmed according to the PWM signal.
- Discrete "left / right turn signal" line running from onboard power supply control unit J519 to the power supply for the flasher LEDs. This line also acts as the signal line of the turn signal.

Power modules 3 for LED headlights, right A29 / left A33

Tasks:

Implementing the requested flashing mode

Line connected to power module 3 for the LED headlights:

- Discrete "flashing mode" line from convenience system control unit J393. This is a digital signal line which indicates whether conventional or sequential flashing is required.

Power modules for matrix headlights, left A44 / right A45

Tasks:

Activating the various individual main beam LEDs at the luminosity level indicated by the headlight range control unit J431.

Lines connected to the matrix headlights power module:

- A "terminal 15" line for supplying the power module and the main beam LEDs.
- Two CAN bus lines (private CAN) connecting to headlight range control unit J431. These bus lines are used to indicate to the power module what main beam LEDs to activate and how much power to apply to these LEDs.

MatrixBeam control unit

(Headlight range control unit J431)

The MatrixBeam control unit is designated in the service literature as headlight range control unit J431. The reason for this designation is that the hardware in use is utilised in other models for headlight range control.

However, the software of control unit J431 in the Audi A8 ’14 controls the MatrixBeam function only, i.e. it does not provide any headlight range control functions.

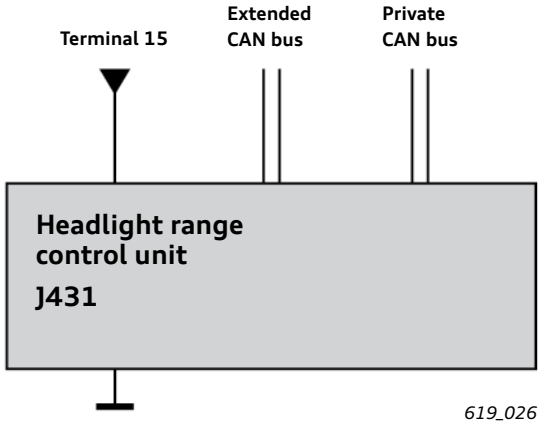
619_025

Headlight range control unit J431

Air suspension is standard equipment on the Audi A8 ’14. For this reason, no headlight range control is needed when fitting LED headlights.

Terminal diagram

The headlight range control unit J431 has six connecting lines: two power supply lines and two pairs of CAN bus lines.



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Line connections of control unit J431

Installation location of the control unit

Headlight range control unit J431 is installed in the Audi A8 (D4) on the back of the rear seat, being on the left-hand side below the load-through facility.

Tasks

Headlight range control unit J431 acts as the master of the MatrixBeam function. It is also responsible for implementing other light functions, such as the dynamic cornering light, the turning and intersection light, the all-weather light and the marker light of the night vision assistant.

Implementation of the MatrixBeam function

Headlight range control unit J431 receives data on vehicles identified by the camera's image processing software from camera control unit J852. This data consists of the angle and distance to the other vehicle.

Headlight range control unit J431 uses this data to determine which LEDs to activate and how much power to apply to these LEDs. The result is that the road is illuminated as best possible without dazzling other detected road users. The cornering light is also factored into calculating the luminosity of the individual main beam LEDs. When vehicle enters a curve, the brightness maximum of the main beam is shifted in such a way that the curve is illuminated better. If the main beam is in motorway mode, this also affects calculations. If motorway mode is active, the LEDs which produce the outer segments of the main beam are activated to a lesser degree or not activated at all.

The calculated luminosity of the individual main beam LEDs is continuously transmitted to the left and right matrix headlight power modules (A44 and A45 respectively) via a private CAN bus. These power modules activate the LEDs accordingly.

The LEDs are only activated if all other conditions for the utilisation of MatrixBeam headlight assist are met. These include:

- that the light switch is in the AUTO position
- that the headlight assist menu option in the MMI is "on"
- that the function has been activated by the driver
- that the vehicle is travelling in the correct speed range
- that it is sufficiently dark in the current location

Implementation of other lighting functions

Headlight range control unit J431 instructs the power modules 1 which dipped beam LEDs to activate. These values are sent to both power modules 1 in the Audi Matrix LED headlights. The power modules in turn activate the headlights as instructed.

Control unit J431 is also responsible for the all-weather lights. If the all-weather lights have been switched on by the driver and all other conditions for their use have been met, the luminosity of the dipped beam LEDs is adapted to the bad weather conditions. The required luminosity settings are then indicated to, and applied by, the LED headlight power modules 1.

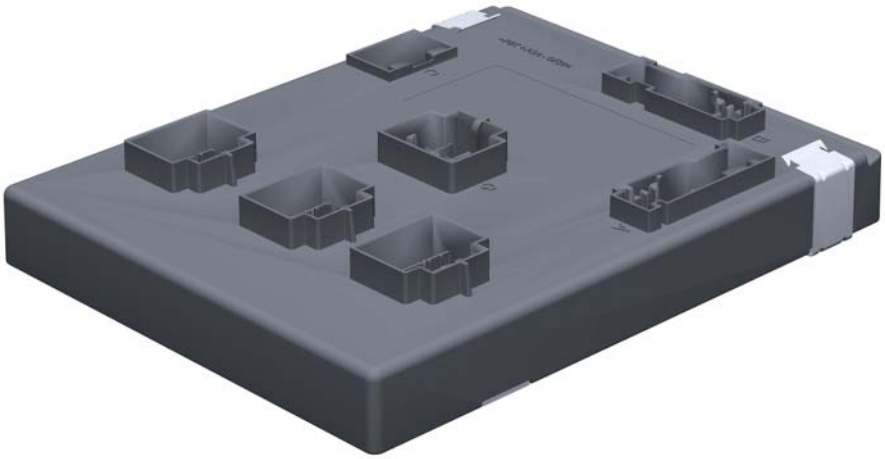
Using the received vehicle data, headlight range control unit J431 also determines whether to activate a turning light or both turning lights (intersection lights). If this is the case, a signal is sent via private CAN bus to the corresponding power modules 1, which in turn activate the LED turning lights.

The same process takes place when the tourists light function is activated. Control unit J431 receives this request via the extended CAN bus. The control unit then reduces the luminosity settings of the LEDs which produce the asymmetrical component of the dipped beam accordingly and sends this information to both power modules 1 in the Audi Matrix LED headlights.

Onboard power supply control unit J519

Onboard power supply control unit J519 acts as the exterior lighting control master in the Audi A8. Control unit J519 receives information on the current light switch position, as well as the activation of the all-weather lights, from light switch E1 via LIN bus.

The light switch position is of key importance to the exterior lights because MatrixBeam headlight assist and other lighting functions are only available in the AUTO position of the light switch.



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Onboard power supply control unit J519

Main beam stalk actuations are indicated to control unit J519 by steering column electronics control unit J527 via the convenience system CAN bus. J527 uses this information to ascertain the current activation status of MatrixBeam headlight assist, which, in turn, re-transmits this information onto the CAN bus.

The power modules 1 for the left and right LED headlights supply the onboard power supply control unit with terminal 15. The power modules 1 also have a combined power supply and signal line for the dipped beam.

The power modules 2 for the LED headlights are exclusively activated by the onboard power supply control unit. This is done via the discrete power supply line of the position and daytime running light and a PWM signal line. The PWM signal dictates the luminosity of the LEDs, which can be used both as position lights and as daytime running lights.

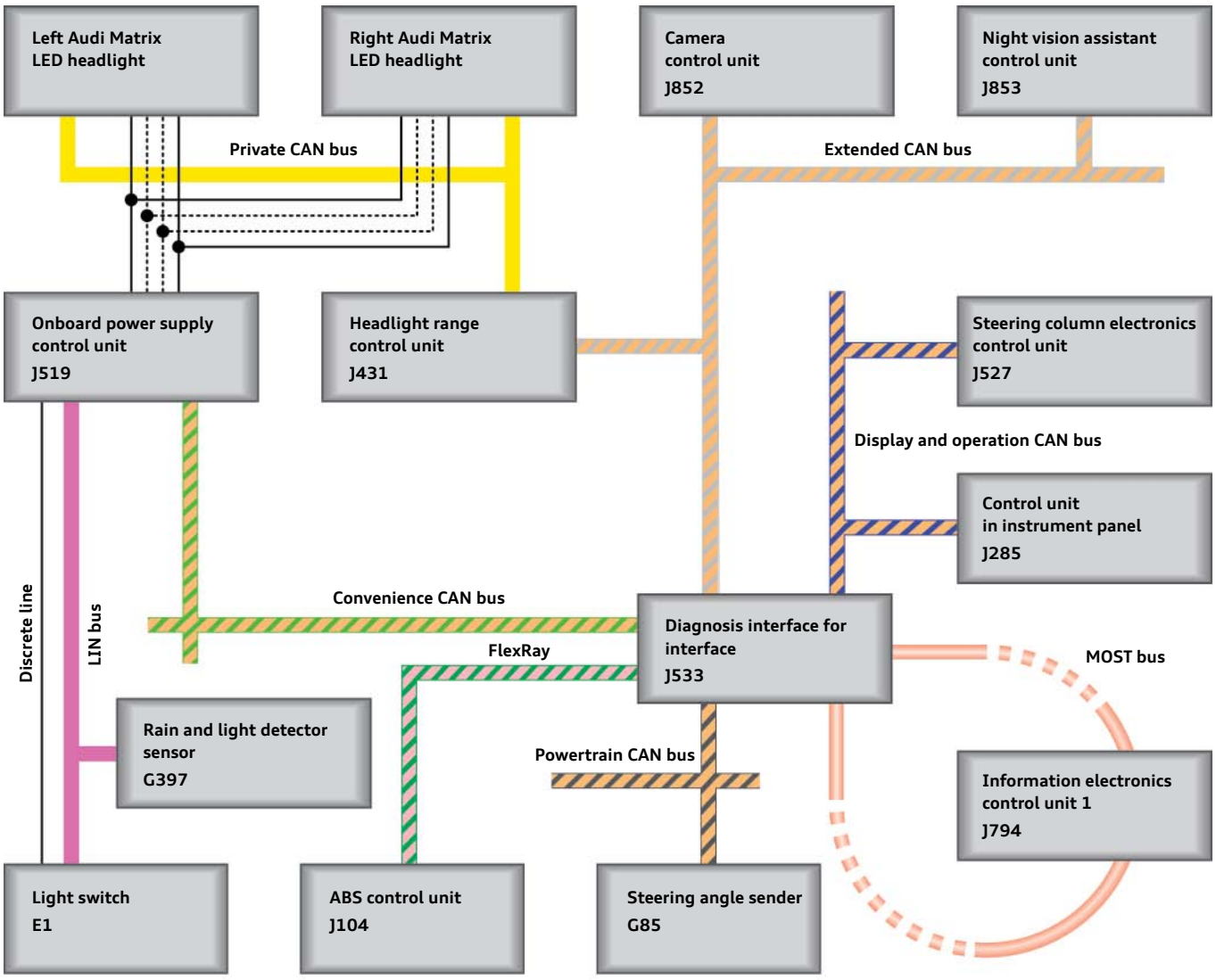
The flasher LEDs in both Audi Matrix LED headlights are activated via a third discrete line.

Networking

The networking diagram provides an overview of all control units involved in the MatrixBeam function, as well as representing the bus systems which the control units use to exchange data with one another.

The control units can be directly involved in the function, supply vehicle data to the function, offer the customer options for setting the function or, for instance, display functionally relevant information.

The topology is identical to that of an Audi A8 (D4) after the product upgrade in 2013. In other Audi models the networking diagram may deviate from the one shown here.



Networking diagram of the MatrixBeam function

Onboard power supply control unit J519

The tasks of the onboard power supply control unit are described in the section on Hardware.

Headlight range control unit J431

The tasks of the headlight range control unit are described in the section on Hardware.

Camera control unit J852

The camera integrated in the interior rear-view mirror monitors the area in front of the vehicle. The image processing software scans the camera images continuously for traffic ahead and oncoming traffic. These other road users are detected by means of the vehicle's activated exterior lights.

When road users are detected, the angle to the other vehicle is determined and the distance between both vehicles is estimated. This information is made available to the headlight range control unit J431.

The camera also monitors the ambient brightness. This dictates whether an activated headlight assist may actually use the main beam, since use of the main beam is only permitted when driving in the dark.

Steering column electronics control unit J527

Re-transmits information on forward or backward movement of the main beam stalk onto the CAN bus.

Light switch E1

Supplies onboard power supply control unit J519 with information on the current light switch setting and indicates that the all-weather switch has been actuated.

Instrument panel control unit J285

Uses symbols in the instrument cluster to indicate whether MatrixBeam headlight assist is currently activated. The blue mean beam light in the instrument cluster indicates whether the main beam is currently in use. Fault messages affecting the MatrixBeam are also displayed in the instrument cluster. These messages refer, among other things, to image processing problems incurred by the camera due to soiling of the lens, misting or fog.

Electronic information systems control unit 1, J794

Indicates whether the "Headlight assist" menu option in the MMI Car Menu is at "on" or "off". It also supplies predictive route data in models equipped with the optional MMI navigation system.

ABS control unit J104

Re-transmits the current vehicle speed onto the CAN bus.

Steering angle sender G85

Re-transmits the current steering angle onto the CAN bus.

Rain/light sensor G397

Indicates the current ambient brightness to onboard power supply control unit J519 via LIN bus. This variable is utilised to decide when the automatic headlights switch the dipped beam on and off.

Night vision system control unit J853

Indicates the danger of a collision with a detected pedestrian and the position of the pedestrian to the headlight range control unit J431.

Test your knowledge

All of the following questions may have one or more correct answer.

Question 1: How are the tourist lights implemented in the Audi Matrix LED headlights?

- ☐ a) Both headlights have to be covered with a lens film which can be obtained from service centres.
- ☐ b) The headlights reflect their light geometries and, in this way, shift the asymmetrical component towards the other side of the road.
- ☐ c) The asymmetrical light component is blanked out by deactivating the corresponding LEDs in the headlights.
- ☐ d) The headlight range control motor lowers the headlight to the extent that oncoming traffic cannot be dazzled.

Question 2: Which driver assistance system utilises the Audi Matrix LED headlight function which allows the main beam LEDs to be individually activated?

- ☐ a) Audi active lane assist
- ☐ b) Audi night vision assistant
- ☐ c) Audi side assist
- ☐ d) Reversing camera

Question 3: Which control unit determines what main beam LEDs to activate and how much power to apply to these LEDs?

- ☐ a) Onboard power supply control unit J519
- ☐ b) Headlight range control unit J431
- ☐ c) Convenience system control unit J393
- ☐ d) The two power modules for the left and right matrix headlights

Question 4: Which components of the Audi Matrix LED headlight can be replaced separately in service workshops?

- ☐ a) Power module 1 for left and right LED headlights
- ☐ b) The 5 LED boards of the main beam
- ☐ c) The fan
- ☐ d) The LED dipped beam

Question 5: How is the cornering light function implemented in the Audi Matrix LED headlights?

- ☐ a) By a motor with swivelling mechanism for the dipped beam and main beam
- ☐ b) Through adjustment of the mirror system by an electric motor
- ☐ c) Cornering lights are not available with these headlights because they do not have positioning motors.
- ☐ d) By displacing the brightness maximum within the main beam

Question 6: Which of the following statements on the Audi Matrix LED headlights are correct?

- ☐ a) For the first time, the headlights can even detect oncoming traffic and traffic ahead.
- ☐ b) The main beam LEDs can be activated individually and at different intensity levels.
- ☐ c) The headlights do not have mechanical positioning motors.
- ☐ d) The headlights have all the known lighting functions of the intelligent light system.

Solutions: 1) c; 2) b; 3) b; 4) ac; 5) d; 6) bc

Self Study Programmes

You can find information about other versions of Audi headlight assist and the lighting systems of the Audi A8 (D4) in the following self study programmes:

SSP 434 The Audi Headlight Assist System

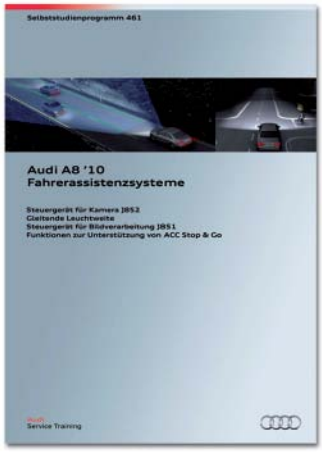
- Functional description
- Mode of operation of headlight assist
- System displays and operation
- Implementation of the function in the vehicle
- Diagnosis

Order number: A07.5S00.50.20

SSP 459 Audi A8 '10 - Onboard power supply and networking

- Power supply
- Networking
- FlexRay
- Control units
- Exterior lights
- Service

Order number: A08.5S00.44.20



SSP 461 Audi A8 '10 - Driver assistance systems

- Camera control unit J852
- Intelligent light system
- Image processing control unit J851
- Functions supporting ACC Stop & Go

Order number: A10.5S00.65.20

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