Self-study Programme 459

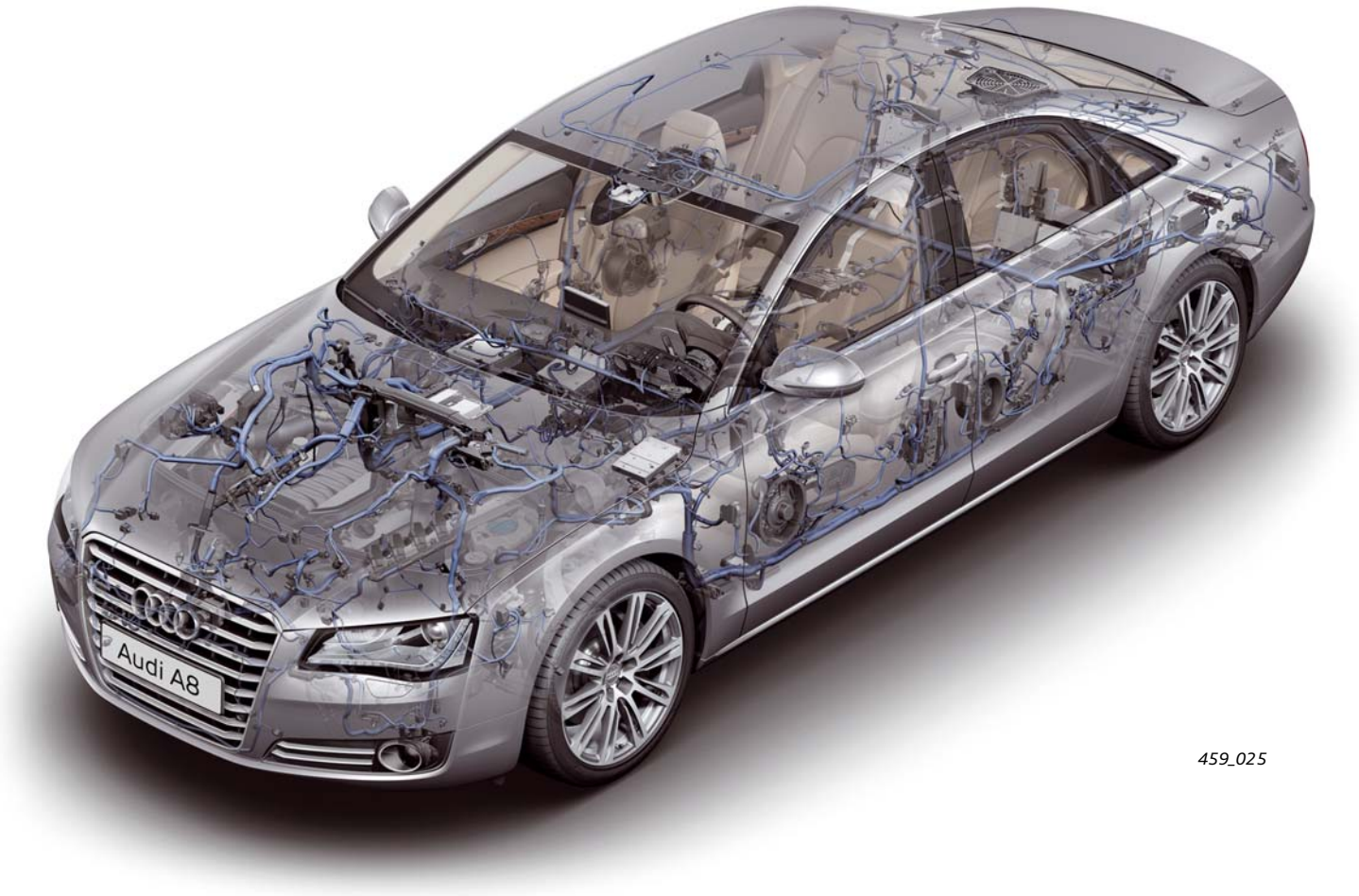
Audi A8 ’10
Electrical and network systems

Audi
Service Training

Stability and reliability within the electrical system are an important basis for system quality in a situation where the number of electronic systems and components are increasing.
With an overall weight of as much as 50 kilogrammes, around 1,500 individual leads with an average length of approx. 2 metres, numerous contacts, switches, seals, fuse boxes and wiring ducts, the electrical system is one of the largest, heaviest and most expensive parts of a motor vehicle. Nowadays, the electrical system plays a major role in ensuring the high quality standards demanded of the electrics/electronics at Audi.
Against the background of present-day energy and environmental considerations, the development of new, lighter electrical system components is extremely important, as weight is a major factor in fuel consumption and, therefore, CO_2 emissions.

The number of electronic control units has grown rapidly in recent years. Most of today's innovations have only been made possible by the increasingly higher performance of the electronic systems. Without that development, many vehicle comforts and conveniences that are now taken for granted would not have been achievable.
In comparison with its predecessor, the Audi A8 '10 features the following most noticeable differences:

- the number of control units has increased from 68 to 95
- a new bus system, the FlexRay, has increased the number of bus systems from 6 to 7
- the volume of software on the vehicle now exceeds 230 MB, which is almost four times the amount on the previous model



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Learning objectives of this Self-study Programme

This Self-study Programme informs you about the network topology of the Audi A8 '10. It allows you to quickly and effectively gain a detailed insight into the electronics on the Audi A8 '10.
When you have completed this Self-study Programme, you will be able to answer the following questions:

- In what locations are electrical components fitted on the vehicle?
- What service-related information should be noted for specific control units?
- What tasks and functions are performed by the control units on the vehicle?
- What are the new features of the exterior lights?

Contents

▸ The Self-study Programme conveys a basic knowledge of the design and function of new vehicle models, new vehicle components or new technologies.
The Self-study Programme is not a repair guide! Any figures quoted merely serve the purpose of facilitating understanding and relate to the software version valid at the time the SSP was produced.
For details of servicing and repair operations, it is imperative that you refer to the latest technical literature.

Note

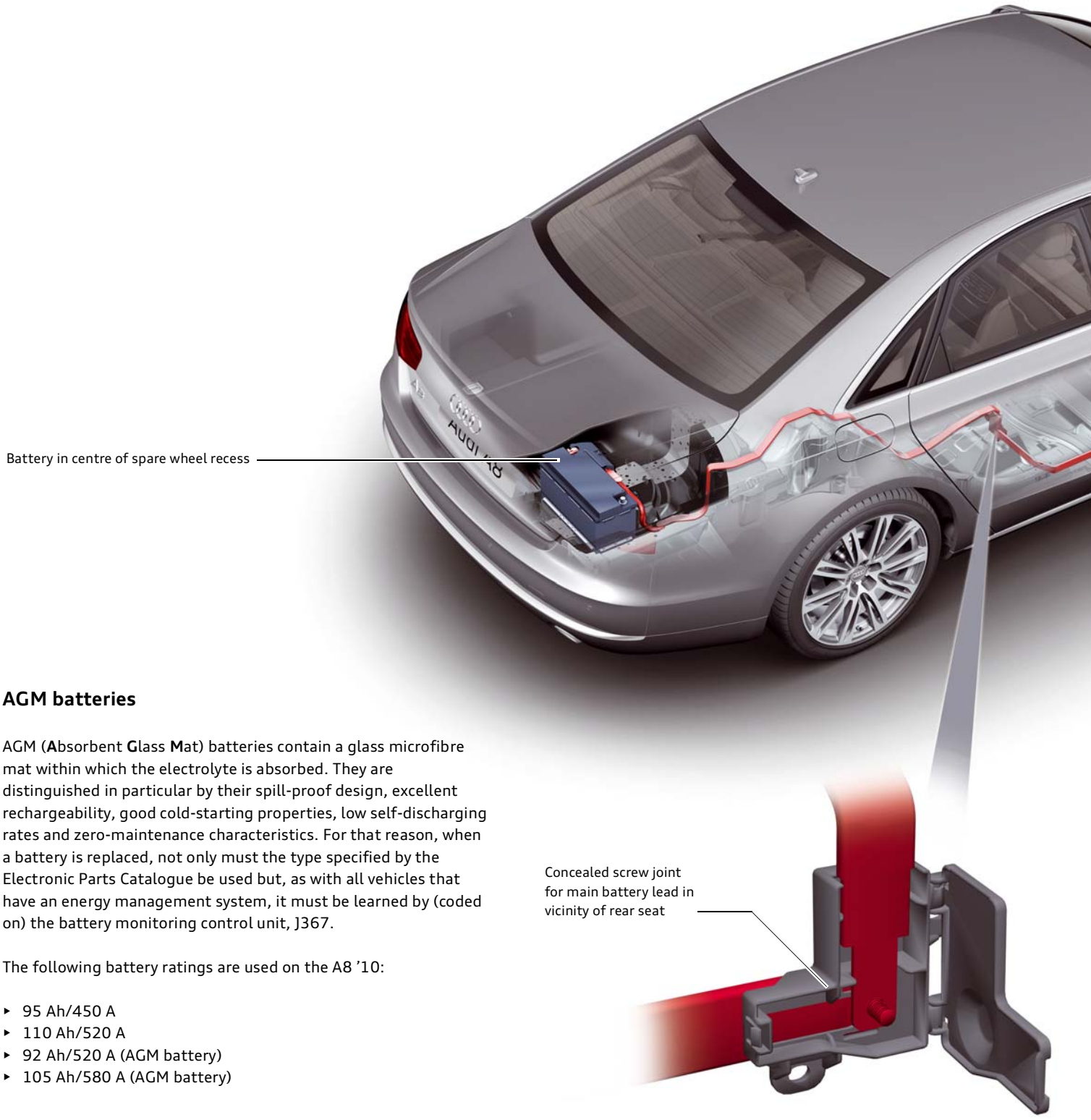
Reference

Power supply

Battery

The battery on the Audi A8 ’10 is located in the centre of the spare wheel recess. Attached to the battery positive terminal is the main fuse box and the battery isolator.
On the negative terminal is the battery monitoring control unit, J367. Often referred to as the battery data module (BDM), it is integral with the earth lead.

Depending on the equipment level on the vehicle, different battery sizes and types are used to suit the specific vehicle.
All vehicles with Start-Stop system, auxiliary heater or extended energy recuperation (see page 23) are always fitted with an AGM battery.



AGM batteries

AGM (**A**bsorbent **G**lass **M**at) batteries contain a glass microfibre mat within which the electrolyte is absorbed. They are distinguished in particular by their spill-proof design, excellent rechargeability, good cold-starting properties, low self-discharging rates and zero-maintenance characteristics. For that reason, when a battery is replaced, not only must the type specified by the Electronic Parts Catalogue be used but, as with all vehicles that have an energy management system, it must be learned by (coded on) the battery monitoring control unit, J367.

The following battery ratings are used on the A8 ’10:

- 95 Ah/450 A
- 110 Ah/520 A
- 92 Ah/520 A (AGM battery)
- 105 Ah/580 A (AGM battery)

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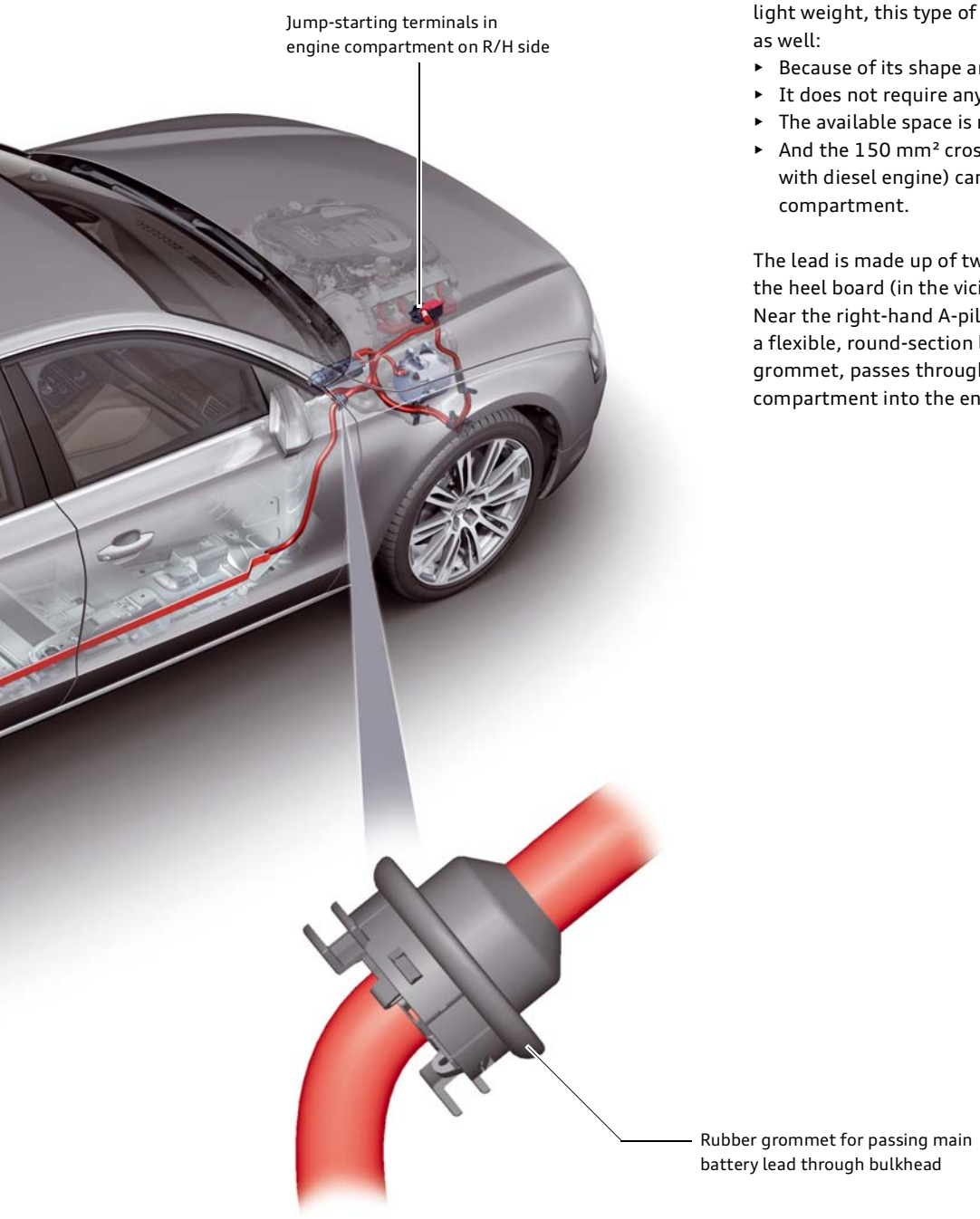
Jump-starting terminals

The jump-starting terminals are in the engine compartment on the right-hand side of the vehicle and can also be used for charging the battery in the showroom or when performing diagnostic checks in the workshop.



Main battery lead

An advanced-design main battery lead is used on the Audi A8 ’10. Although an aluminium main battery lead has been used before on the Audi A8 ’03, that was a round-section lead. The Audi A8 ’10 has a rigid, flat-section conductor made of aluminium and covered with a red plastic insulation layer.

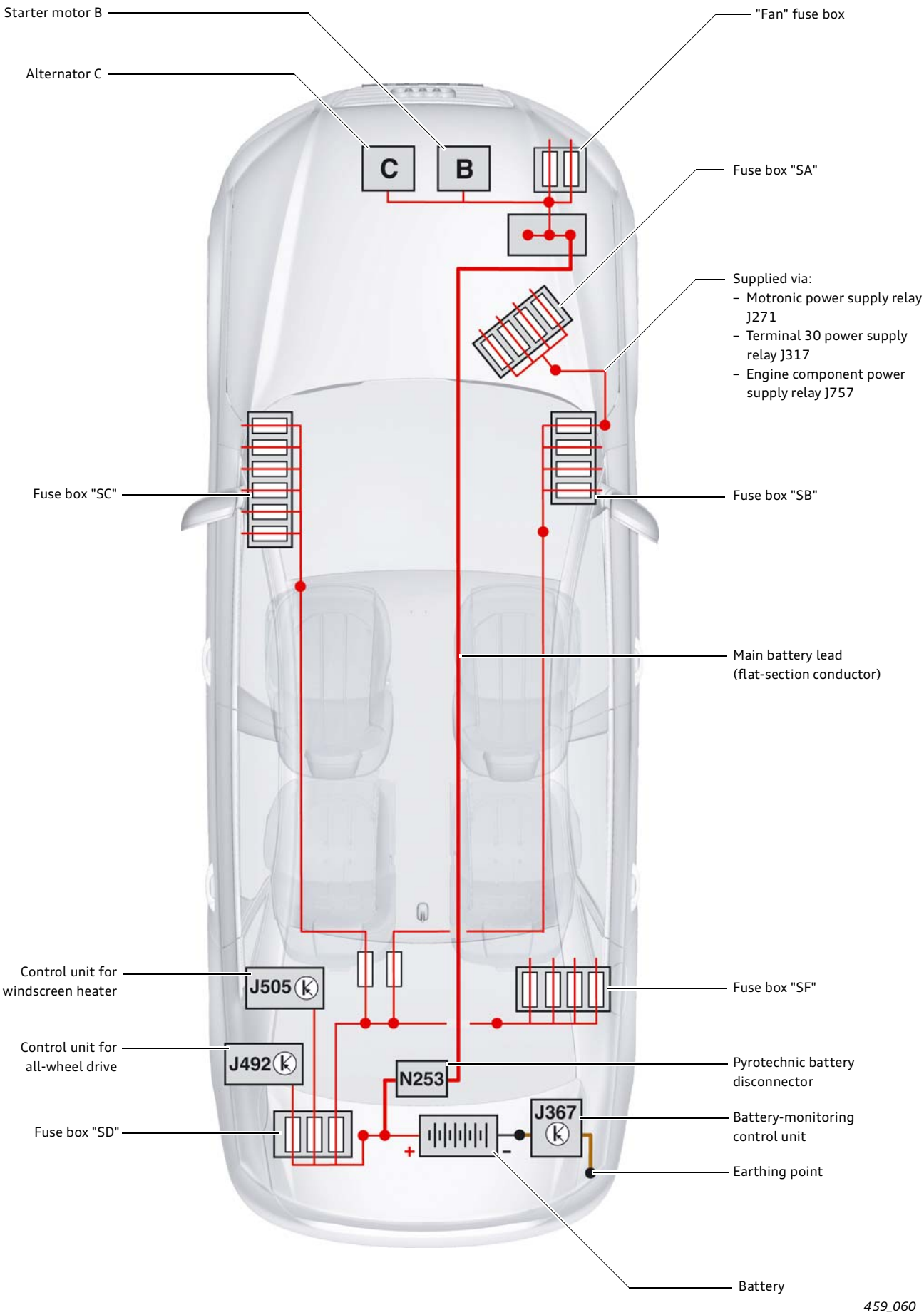
Lead routing

The main battery lead starts at the battery positive terminal as a flexible, round-section lead. It becomes a rigid, flat-section conductor before it leaves the spare wheel recess. Apart from its light weight, this type of main battery lead has other advantages as well:

- Because of its shape and rigidity, fixings can be dispensed with
- It does not require any cable ducts
- The available space is more efficiently used
- And the 150 mm² cross-section main lead (required on vehicles with diesel engine) can be routed through the passenger compartment.

The lead is made up of two sections which are bolted together on the heel board (in the vicinity of the rear seat).
Near the right-hand A-pillar, the flat conductor changes back into a flexible, round-section lead again which, protected by a rubber grommet, passes through the bulkhead from the passenger compartment into the engine compartment.

Power supply structure



This diagram provides a general view of the power supply structure on the Audi A8 '10. It is a schematic diagram.
For precise details of fuse assignment and cable routing, please refer to the relevant service literature.

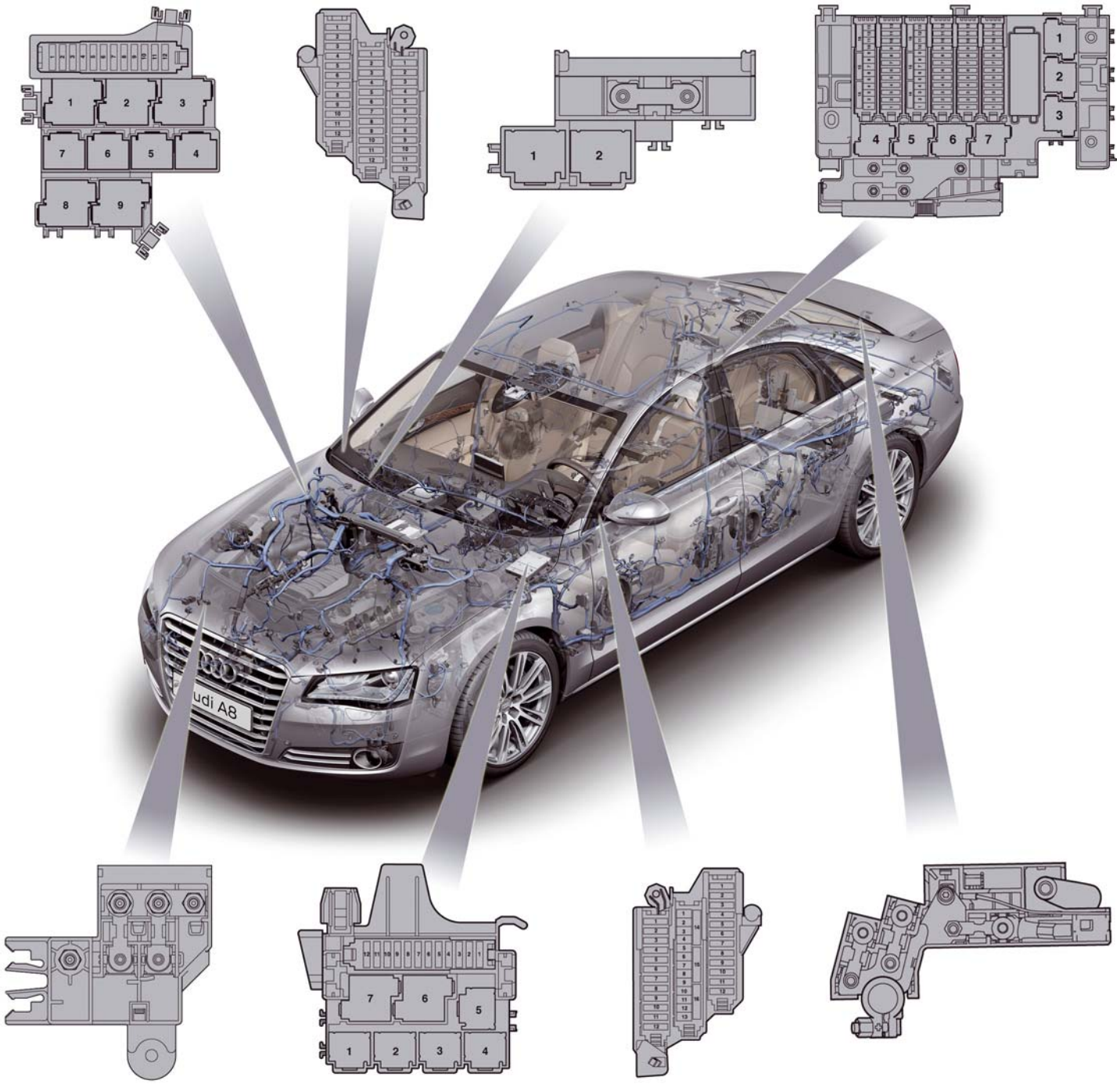
Fuses and relays

Fuse and relay box in engine compartment
Fuses in this box are identified by the designation "SA" in the circuit diagram.

Fuse box behind dashboard on right
Designation in circuit diagram: "SB"; the customer can access these fuses by removing the dashboard trim.

Fuse and relay box at base of right A-pillar
This holds the fuse for the ABS control unit J104.

Fuse and relay box on electronic module in boot on right
Designation in circuit diagram: "SF"; the customer can access these fuses by removing a cover.



Fuse box at forward end of longitudinal chassis member
This fuse box holds the fuses for the radiator fans.

Fuse and relay box in vicinity of electrical system control unit
(below dashboard in driver's side footwell)

Fuse box behind dashboard on left
Designation in circuit diagram: "SC"; the customer can access these fuses by removing the dashboard trim.

Fuse box on battery positive terminal
Designation in circuit diagram: "SD"; the battery isolator is fitted in the same location.

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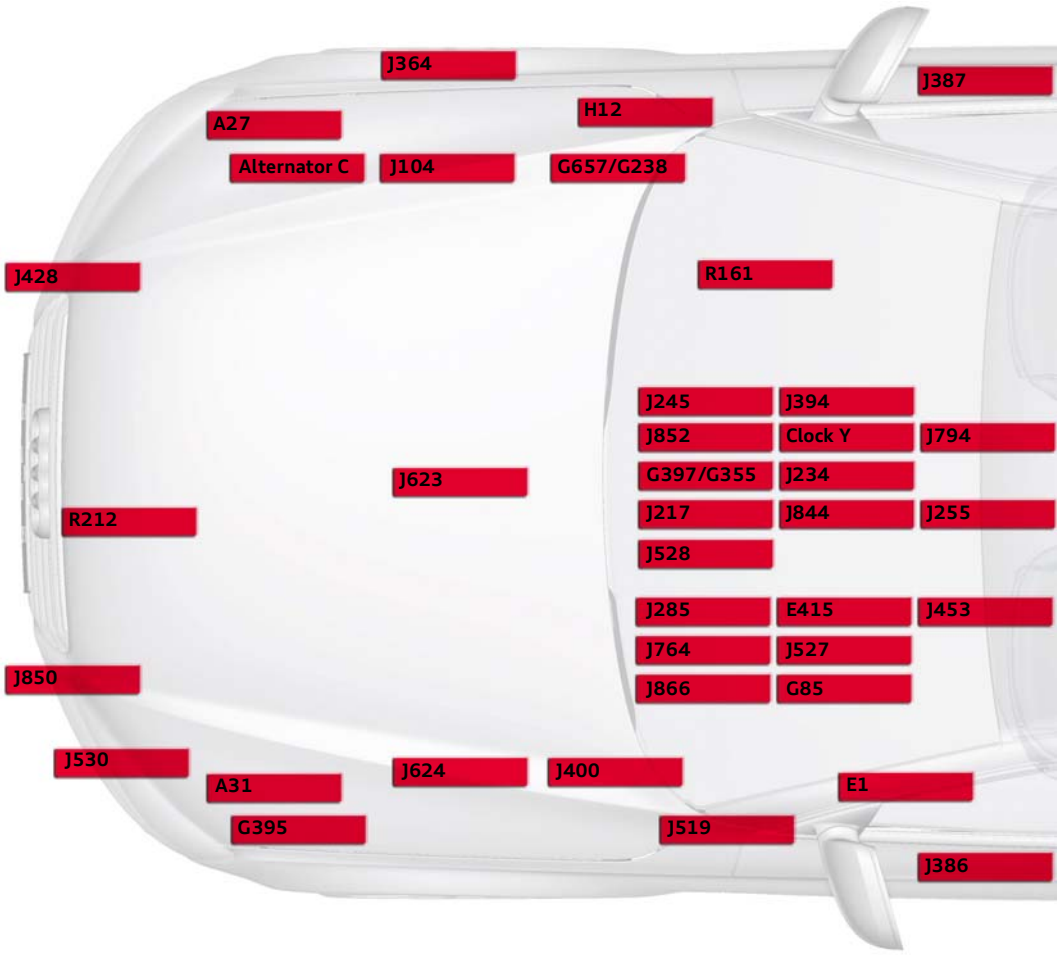
Network system

Locations of control units

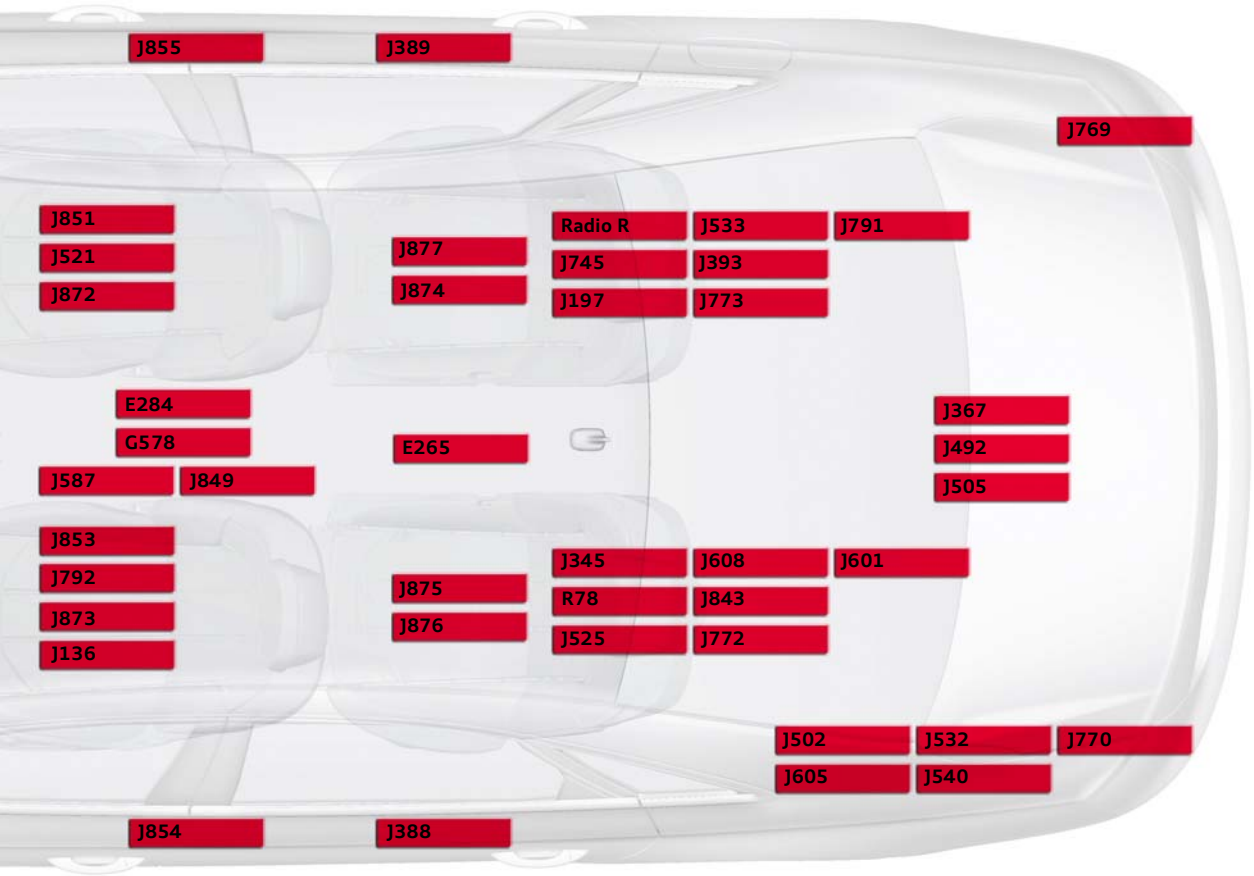
Some of the control units listed here are optional or specific to particular national markets.

Notes on the precise locations of the control units and instructions on fitting and removing them can be found in the current service literature.



Key:

A27	Power module 1 for right LED headlight
A31	Power module 1 for left LED headlight
E1	Light switch
E265	Control and display panel for rear Climatronic
E284	Control panel for garage door opener
E415	Switch module for access and start authorisation
G85	Steering angle sensor
G238	Air quality sensor
G355	Air humidity sensor
G395	Sensor for refrigerant pressure and temperature
G397	Rain/light sensor
G578	Sensor for anti-theft alarm system
G657	Air humidity sensor in fresh air intake duct
H12	Alarm horn
J104	ABS control unit
J136	Control unit for seat and steering column adjustment with memory function
J197	Control unit for ride-height adjustment
J217	Control unit for automatic transmission
J234	Airbag control unit
J245	Sliding sunroof control unit
J255	Climatronic control unit
J285	Control unit in dashboard module
J345	Trailer detection control unit
J364	Control unit for auxiliary heating
J367	Battery-monitoring control unit
J386	Door control unit, driver's side
J387	Door control unit, passenger side
J388	Door control unit, rear left
J389	Door control unit, rear right
J393	Central control unit for comfort/convenience systems
J394	Control unit for roof blind
J400	Control unit for wiper motor
J428	Control unit for gap maintenance
J453	Control unit for multifunction steering wheel
J492	Control unit for all-wheel drive
J502	Control unit for tyre pressure monitoring
J505	Control unit for windscreen heater
J519	Electrical system control unit
J521	Control unit for passenger seat adjustment with memory function
J525	Control unit for digital sound package



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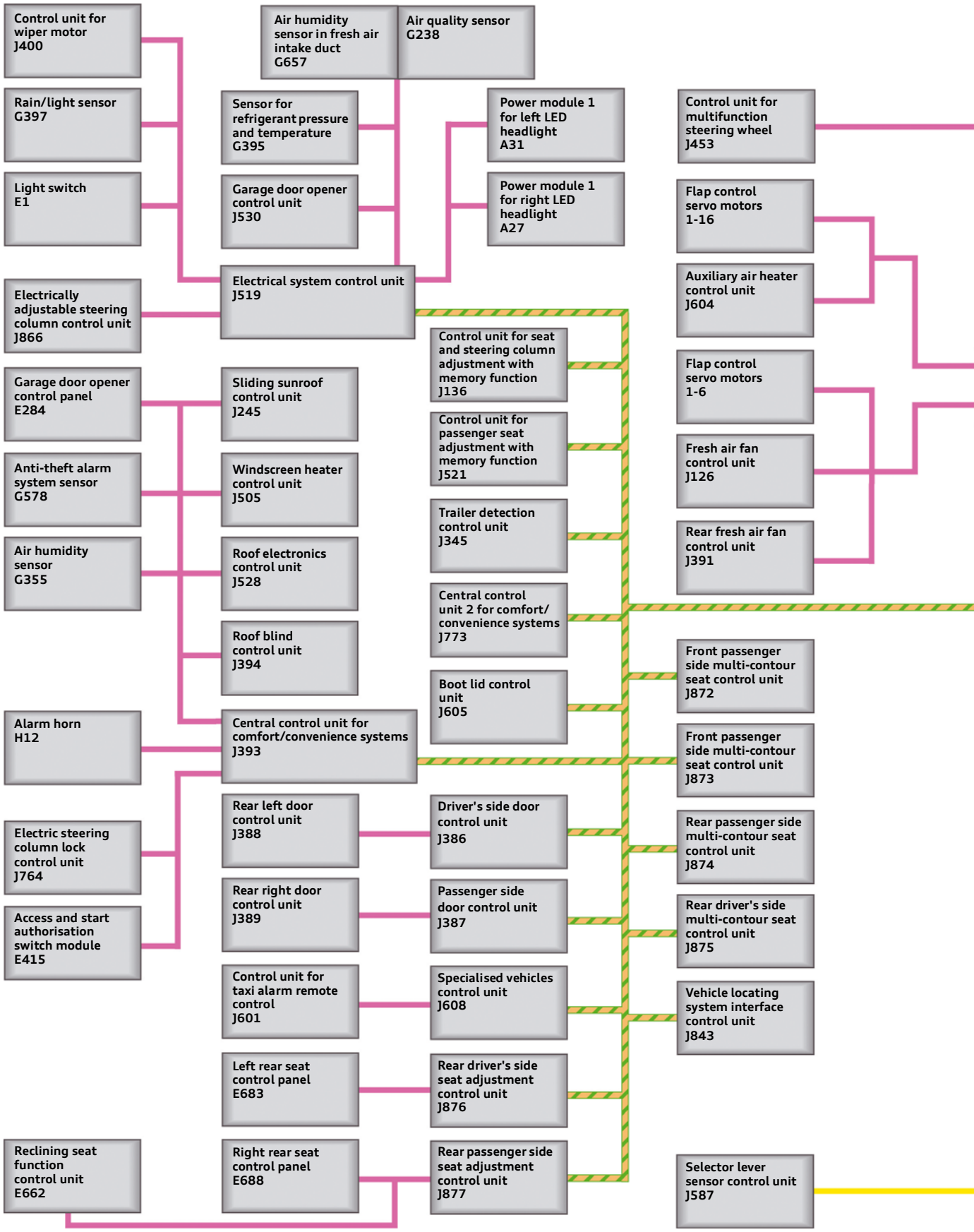
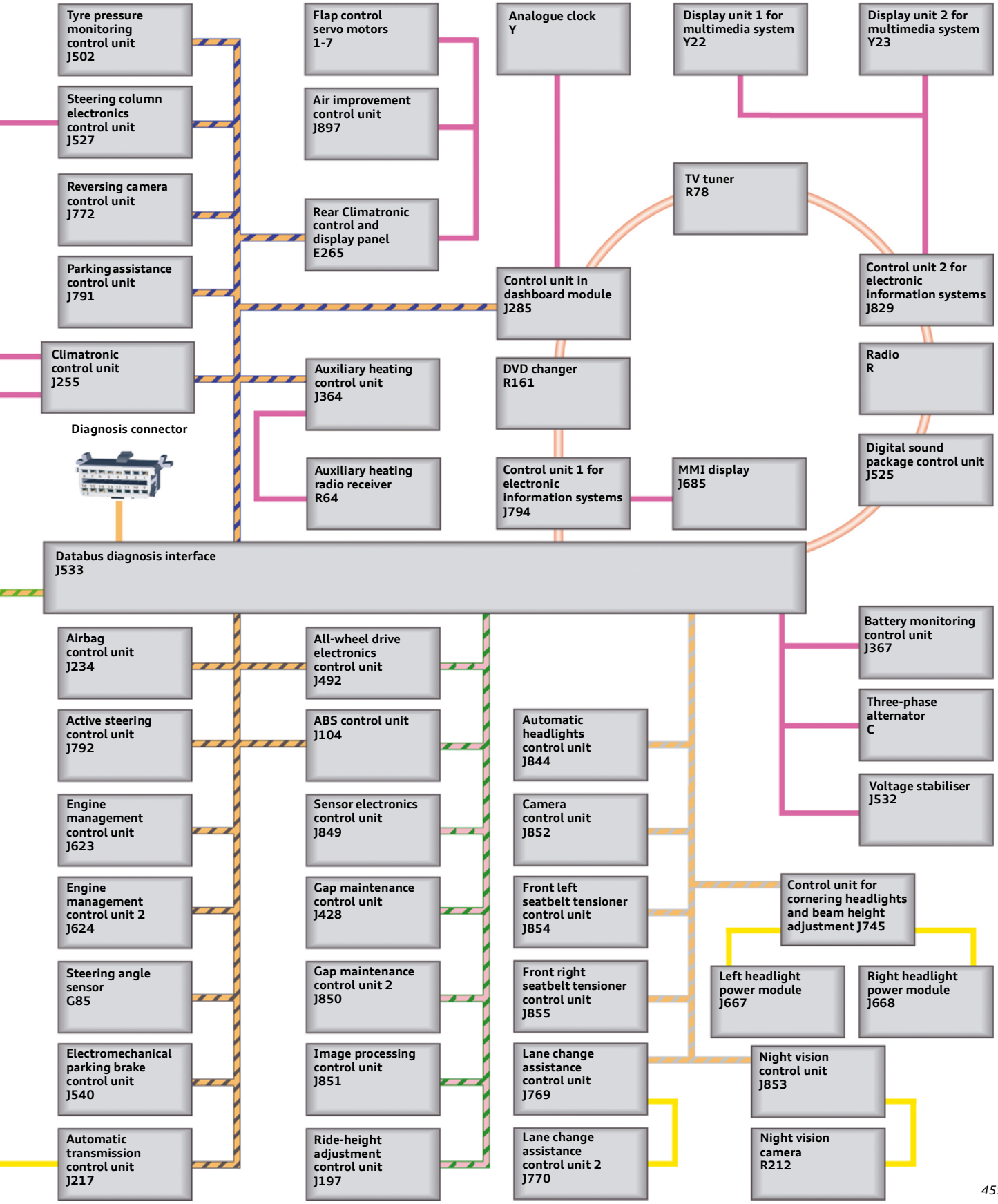
J527	Control unit for steering column electronics
J528	Control unit for roof electronics
J530	Control unit for garage door opener
J532	Voltage stabiliser
J533	Databus diagnosis interface
J540	Control unit for electromechanical parking brake
J587	Control unit for selector lever sensors
J601	Control unit for taxi alarm remote control
J605	Control unit for boot lid
J608	Control unit for specialised vehicles
J623	Engine management control unit
J624	Engine management control unit 2
J745	Control unit for cornering headlights and beam height adjustment
J764	Control unit for electric steering column lock
J769	Control unit for lane change assistance
J770	Control unit 2 for lane change assistance
J772	Control unit for reversing camera system
J773	Central control unit 2 for comfort/convenience systems
J791	Control unit for parking assistance
J792	Control unit for active steering
J794	Control unit 1 for electronic information systems
J843	Interface control unit for vehicle locating system
J844	Control unit for automatic headlights
J849	Control unit for sensor electronics
J850	Control unit 2 for gap maintenance
J851	Image processing control unit
J852	Camera control unit
J853	Night vision control unit
J854	Control unit for seatbelt tensioner, front left
J855	Control unit for seatbelt tensioner, front right
J866	Control unit for electrically adjustable steering column
J872	Control unit for multi-contour seat, front passenger side
J873	Control unit for multi-contour seat, front driver's side
J874	Control unit for multi-contour seat, rear passenger side
J875	Control unit for multi-contour seat, rear driver's side
J876	Control unit for seat adjustment, rear driver's side
J877	Control unit for seat adjustment, rear passenger side
R78	TV tuner
R161	DVD changer
R212	Night vision camera

Network topology



The diagram shows the network topology for a vehicle with an extensive level of optional equipment.

Some of the control units listed are optional or specific to particular national markets.



Drivetrain CAN

Comfort/convenience CAN

Extended CAN

Display and control CAN

FlexRay

Diagnosis CAN

MOST bus

LIN bus

Sub-bus systems

New features of bus system

As can be seen from the network diagram, the number of control units has increased once again on the Audi A8 ’10. The number of bus systems has grown as well.

Bus systems used on the Audi A8 ’10:

Bus system	Cable colour	Type	Data transmission rate	Characteristic
Drivetrain CAN		Electrical two-core bus system	500 kbit/s	Not capable of single-core operation
Comfort/convenience CAN		Electrical two-core bus system	500 kbit/s	Not capable of single-core operation
Extended CAN		Electrical two-core bus system	500 kbit/s	Not capable of single-core operation
Display and control CAN		Electrical two-core bus system	500 kbit/s	Not capable of single-core operation
Diagnosis CAN		Electrical two-core bus system	500 kbit/s	Not capable of single-core operation
FlexRay		Electrical two-core bus system	10 Mbit/s	Not capable of single-core operation
MOST bus		Fibre-optic bus system	22.5 Mbit/s	Ring system Circuit break = failure of complete system
LIN bus		Electrical single-core bus system	20 kbit/s	Capable of single-core operation
Sub-bus system		Electrical two-core bus system	500 kbit/s	Not capable of single-core operation

Summary of the most important new features:

- The Comfort/convenience CAN is a high-speed bus system on the A8 ’10
- New FlexRay bus system
- Dashboard module control unit J285 is a bus device in two bus systems – Display and control CAN and MOST bus
- All-wheel drive electronics control unit J492 and ABS control unit J104 are bus devices in two bus systems – Drivetrain CAN and FlexRay
- Analogue clock is LIN bus device

The network diagram provides a schematic illustration of the communication paths between the control units on the vehicle. Which control units are fitted on the vehicle depends on the equipment level. Listed here are just a few examples:

- Tyre pressure monitoring control unit J502 only fitted on armour-protected vehicles
- Control unit J745 for cornering headlights and beam height adjustment is used on vehicles with Xenon plus headlights and is never fitted at the same time as the power modules for LED headlights
- Control unit 2 for electronic information systems, J829, and its two display units, Y22 and Y23, is only fitted on vehicles with rear entertainment system
- Control units for multi-contour seats are only fitted on vehicles with massage-seat function

Reference
Basic information on the databus systems used on Audi vehicles to date can be found in the Self-study Programmes 238 and 269, "Data exchange on the CAN bus", and 286, "New databus systems – LIN, MOST and Bluetooth".

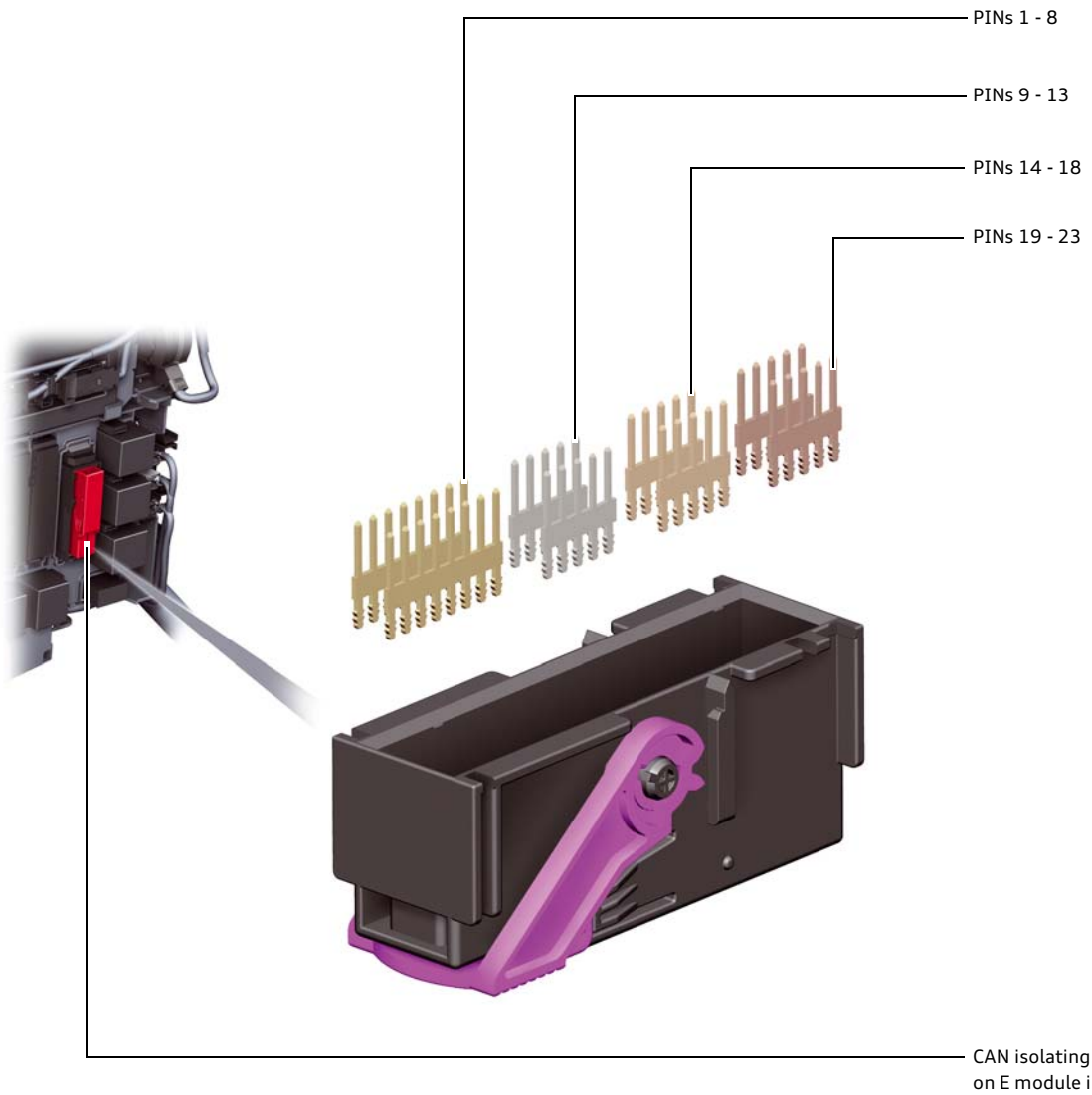
CAN isolating connector

The Audi A8 ’03, A6 ’05 and Q7 have two CAN isolating connectors which are fitted on the left and right hand sides of the dashboard respectively. Connected to them are two bus systems, the Comfort/convenience CAN and the Drivetrain CAN.
The B8 series models (A5, A4 ’08 and Q5) are also equipped with two CAN isolating connectors. They are located at the base of the left A-pillar and the right-hand side of the dashboard. They incorporate three jumper plugs for the Comfort/convenience CAN, the Drivetrain CAN and the Infotainment CAN.
By contrast, the A8 ’10 has only one CAN isolating connector, which is fitted to the E module on the right-hand side of the boot. The isolating connector houses the lead connectors for four bus systems:

- PINs 1 - 8 (Comfort/convenience CAN junction)
- PINs 9 - 13 (Drivetrain CAN junction)
- PINs 14 - 18 (Display and control CAN junction)
- PINs 19 - 23 (Extended CAN junction)

As already familiar from other Audi models, the CAN isolating connector provides the facility for connecting the V.A.G 1589/38 CAN adaptor.
By removing jumpers from the isolating adaptor, it is possible to isolate individual spur lines from the CAN bus. Readings can then be taken not only on the individual spur lines but also on the entire CAN bus while systems are in operation. That facility enables systematic analysis of faults on the CAN bus and identification of the causes.

Overview



FlexRay

Introduction

A new databus system makes its debut on the Audi A8 ’10 in the shape of the FlexRay bus. What precisely is FlexRay? The FlexRay consortium, a cross-manufacturer development organisation, was established in 2000 and has since been joined by more members, including Volkswagen.

What does FlexRay stand for?

Flex = Flexibility
Ray = Ray (i.e. the fish, as featured in the consortium's logo)

The aim of using FlexRay is to meet the higher demands of future network systems in motor vehicles, in particular faster data transfer rates, real-time capability and failure-safety. It thus extends the range of possible uses such as for dynamic handling control, ACC active cruise control and image processing.

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Features

The FlexRay bus on the Audi A8 ’10 has the following features:

- Electrical two-core bus system
- Data transfer rate: 10 Mbit/s maximum
- Data communication by means of three signal statuses
  - "Idle"
  - "Data 0"
  - "Data 1"
- "Active" star topology
- Real-time capability
- Enables distributed control and the use of safety-related systems

Basic principle

FlexRay differs from the databus systems so far used such as CAN, LIN and MOST simply by virtue of its fundamental method of operation.
That can be simply illustrated by comparing it to a cable car.
The cable car stations represent the bus devices, i.e. sender and receiver (control units). The cable cars represent the message frames, and the passengers the messages.

The time at which a bus device can send messages over the FlexRay is precisely defined. The time at which a sent message reaches the receiver is also precisely known. We can compare it to the scheduled timetable for the cable car service.

Even if a bus device does not send any information at the allotted time, a certain bandwidth is reserved for it. Like the cable car, which travels whether or not there is anyone on board. That means that prioritisation of messages, such as occurs on a CAN bus, is not necessary.

On the Audi version of the system, an "empty cable car" is detected as a sender fault, i.e. the control units always send data. New information is flagged by means of an "update bit". If there is no new information to send, the old data is resent.

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Comparison between CAN bus and FlexRay

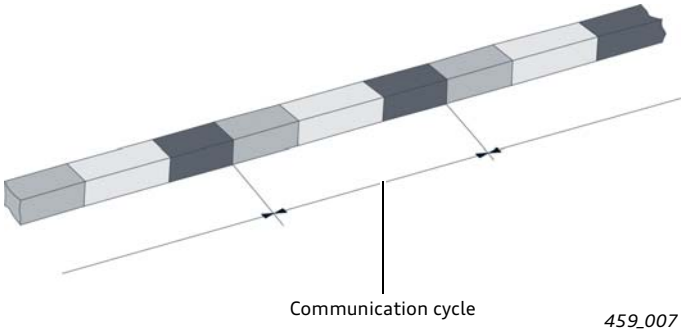
Characteristic	CAN databus	FlexRay
		
Wiring	Electrical, two-core	Electrical, two-core
Signal statuses	"0" – dominant, "1" – recessive	"Idle", "Data 0", "Data 1"
Data rate	500 kbit/s	10 Mbit/s
Access principle	Event-controlled	Timer-controlled
Topologies	Bus, passive star	Active star, point-to-point, daisy chain[1)]
Arbitration	Higher-priority message sent before lower-priority message	None, data is sent at defined times
Confirmation signal	Receiver confirms receipt of a valid data protocol	Sender receives no information as to whether a data protocol has been correctly transmitted
Fault protocol	A fault can be identified on the network by a fault protocol	Every receiver checks for itself whether the data protocol received is correct
Data protocol length	Max. 8 bytes useful data	Max. 256 bytes useful data
Usage	▸ Used when required ▸ Time at which the CAN bus can be used depends on available capacity ▸ CAN bus can potentially be overloaded	▸ Time at which the data protocol can be used is defined ▸ Duration of usage is defined ▸ Sending slot is reserved even if it is not required
Time of receipt	Unknown	Known

[1)] Daisy chain = By analogy with the children's game of threading daisies together to make a string, figuratively refers to a series of things linked together. In this context, means that control units are connected together in series.

FlexRay protocol

On the FlexRay bus, messages are transmitted in communication cycles. A communication cycle is a sequence that is continually repeated, i.e. one cycle is immediately followed by the next. One communication cycle lasts 5 milliseconds.

It consists of:
- the static segment
- the dynamic segment
- the network idle time



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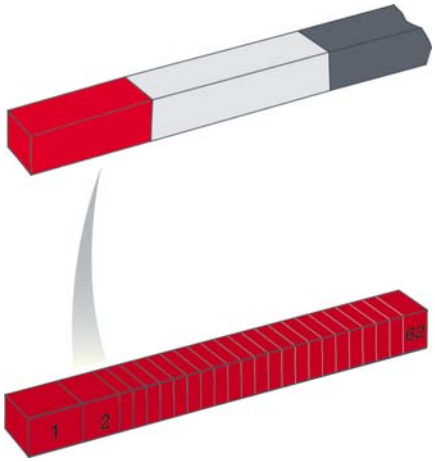
Static segment

The static segment is used to transmit the messages between the bus devices. It is subdivided into 62 static time slots for data transmission. Only one particular bus device may send in each separate static time slot. However, all bus devices can receive in all static time slots, i.e. including those not allocated to them.

All static time slots have precisely the same length of 42 bytes. The order of the slots is permanently fixed. From one communication cycle to the next, the message contents transmitted in the static segments in each case may change. The entire time-slot structure is always transmitted regardless of whether all slots contain messages. With the version of the system used by Audi, however, the bus devices always send messages and use "update bits" to indicate whether or not the information is new.



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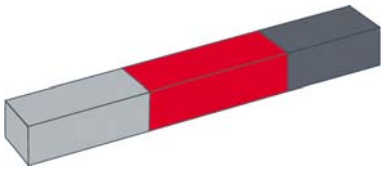
Dynamic segment

The dynamic segment, which is subdivided into mini-slots, is received by all bus devices. The dynamic segment is a reserved space within a communication cycle in which event-controlled data can be sent.



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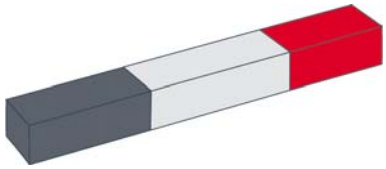
Network idle time

As the term suggests, network idle time is the period when the network is inactive. It is the time when no data is being transmitted over the FlexRay bus. It is required by the databus diagnosis interface, J533, to be able to synchronise the data transmission sequence on the FlexRay network.
All bus devices use the network idle time to synchronise their internal clocks with a global time base.



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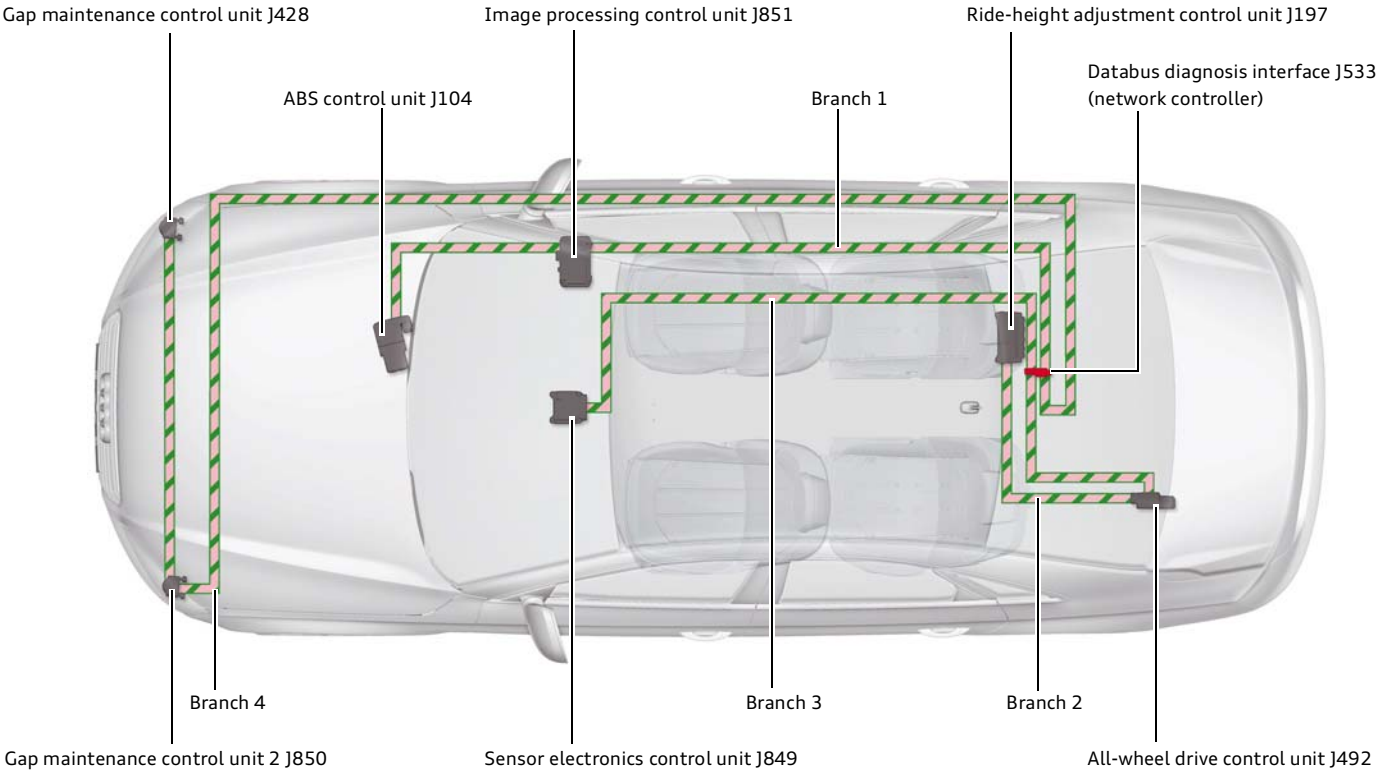
Configuration

The topology of the FlexRay is configured as an "active" star with point-to-point (branch 3) and daisy chain (branches 1, 2 and 4) connections. The databus diagnosis interface, J533, performs the function of the network controller. It has connections for four branches. The other bus devices are arranged around the databus diagnosis interface, J533, on the various branches.

On the Audi A8 ’10, they comprise a maximum of two control units on each branch.
The active star and the "terminal control units" on each branch have a low terminal resistance (low internal resistance), while the "mid control units" have a high terminal resistance (high internal resistance).

Network topology



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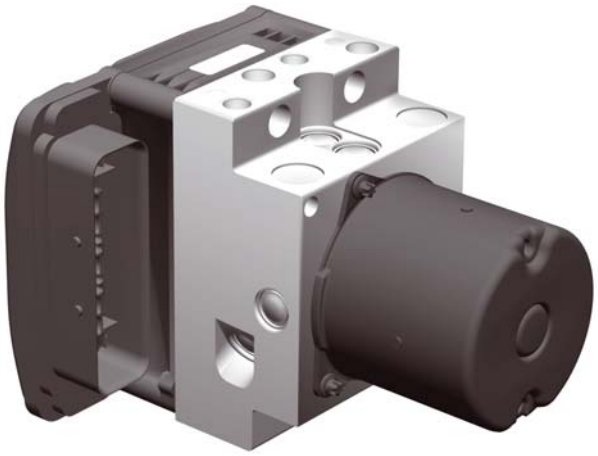
Control units

The "mid control units" on a FlexRay branch have four pins for connecting to the FlexRay, two of them for "looping through" the bus signals to the downline control units.
The other two are for direct communication on the FlexRay network. The "terminal control units" such as the ABS control unit J104 (right) have only two pins.



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Functional sequences

Wake-up

If the FlexRay is in sleep mode, the wake-up sequence initially switches the system to standby mode. However, waking up the Terminal 30 devices does not immediately enable active communication on the FlexRay network.

To wake up the network, a wake-up control unit places what is called a "wake-up symbol" on the FlexRay. Before transmission, it always waits a certain amount of time to make sure there is definitely no communication taking place on the FlexRay, i.e. that all control units are definitely in sleep mode.

Start-up

The start-up sequence initiates actual communication on the FlexRay bus. The network can only be started up by what are referred to as "cold-start" control units. The first cold-start control unit that sends a message on the FlexRay initiates the start-up sequence. Cold-start and synchronisation control units are allowed to start up a network and establish synchronisation.
The cold-start and synchronisation control units are:

- Databus diagnosis interface J533
- ABS control unit J104
- Sensor electronics control unit J849

By contrast, "non cold-start" control units are not allowed to start up the FlexRay and make no contribution to synchronisation. Non cold-start control units can not send messages on the FlexRay until at least two other bus devices are active on the network. The non cold-start control units are:

- Gap maintenance control unit J428
- Gap maintenance control unit 2 J850
- Image processing control unit J851
- All-wheel drive control unit J492
- The ride-height control unit J197 (right) can not start up the network but contributes to synchronisation.

Initialisation

Cold-start control unit 1, the control unit that has initiated start-up, begins transmitting data based on its own unsynchronised time reference. Cold-start control unit 2 then synchronises itself with the data stream from cold-start control unit 1. Only when at least two cold-start control units are communicating on the network can a non cold-start control unit synchronise itself with the FlexRay.

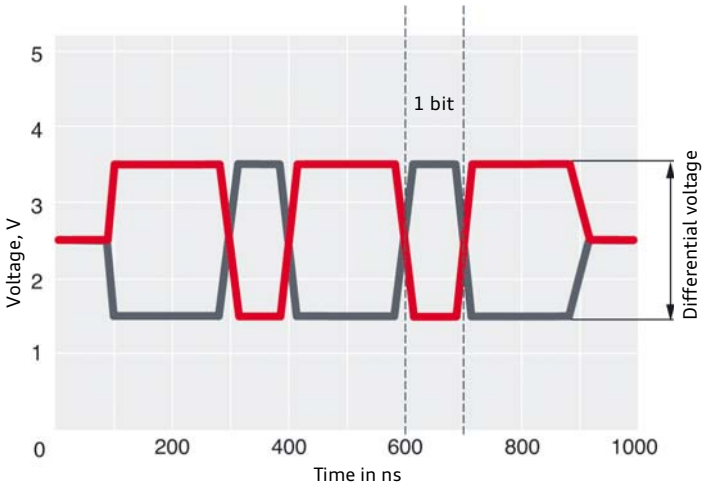
459_015

Signal statuses

The two cores of the FlexRay cable are designated bus positive and bus negative. Their voltage levels vary between a minimum of 1.5 volts and a maximum of 3.5 volts. The FlexRay works with three signal statuses:

- "Idle" – the level of both bus cable cores is 2.5 volts
- "Data 0" – the bus positive has a low voltage level and the bus negative a high voltage level
- "Data 1" – the bus positive has a high voltage level and the bus negative a low voltage level

One bit has a width of 100 nanoseconds. The transmission time is dependent on the cable length and the transition times through the bus drivers. The signals are transmitted by differential means, i.e. two cable cores are required.
The receiver detects the actual bit status by means of the difference between the two signals. Typical signals are voltage differences of between 1.8 V and 2.0 V. At the sender, a voltage differential of at least 1200 mV must be present. A voltage differential of at least 800 mV must be still be present at the receiver.
If no activity takes place on the bus for 640 - 2660 ms, the FlexRay automatically enters sleep mode (idle).



459_013

Diagnosis

The databus diagnosis interface J533 detects faults on the network and can ensure that unaffected areas can continue to function. Some faults may be limited to specific areas of the network but others may affect the entire network.

The following types of fault on the FlexRay can be identified by means of a vehicle diagnostic tester (address code 19 – databus diagnosis interface):

- Control unit – no communication
- FlexRay databus defective
- FlexRay databus initialisation failure
- FlexRay databus signal fault

459_011

Response of FlexRay to faults

One bus core shorting to earth
The databus diagnosis interface J533 detects a permanent voltage differential. The bus spur affected is deactivated until "idle" status, i.e. the sleep mode voltage level is detected again.

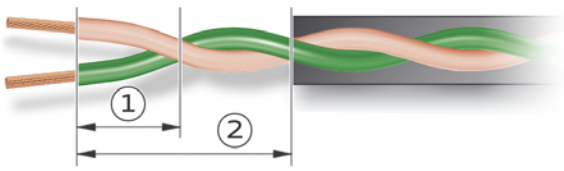
Short between bus cores
The databus diagnosis interface J533 detects a permanent "idle" signal voltage. Sending and receiving is not possible for any devices on the bus spur affected.

Control unit sending constant "idle" signal
The databus diagnosis interface J533 detects this situation and deactivates the bus spur affected.

Repairing a FlexRay lead

The FlexRay cable cores are twisted together like the CAN cores. They are also sheathed. However, the sheathing does not provide shielding against electromagnetic interference, it merely minimises external effects such as damp and temperature on the core's characteristic impedance.

In principle, FlexRay cores can be replaced in sections if they need repairing. When doing so, the untwisted length (1) and the unsheathed length (2) must be observed.



459_012

Note
For details of the precise procedure for repairing a FlexRay lead and which special tools are required, you should refer to the up-to-date repair guide on the ELSA system.

Control units

Databus diagnosis interface J533

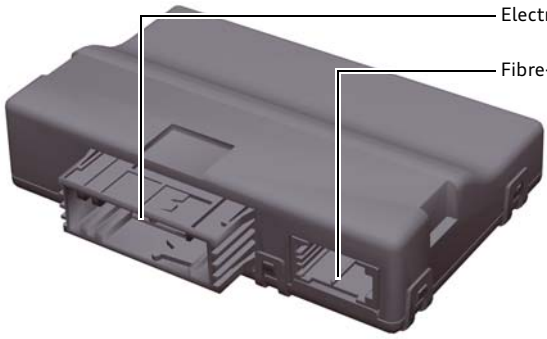
The databus diagnosis interface (gateway) performs the functions familiar from the Audi A8 ’03. On the A8 ’10 it is connected to the following bus systems:

- Comfort/convenience CAN
- Drivetrain CAN
- Extended CAN
- Display and control CAN
- Diagnosis CAN
- FlexRay
- MOST bus
- LIN bus

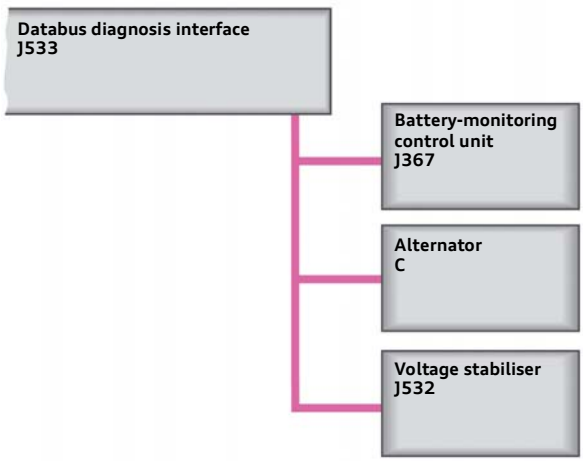
Summary information	
Description	Databus diagnosis interface J533
Fitted location	E box on right-hand side of boot

Functions	▸ Network system gateway
	▸ Diagnosis master for diagnosing ring circuit break on MOST bus
	▸ LIN master for:
	  ▸ Battery-monitoring control unit J367
	  ▸ Alternator C
	  ▸ Voltage stabiliser J532 (vehicles with Start-Stop system)

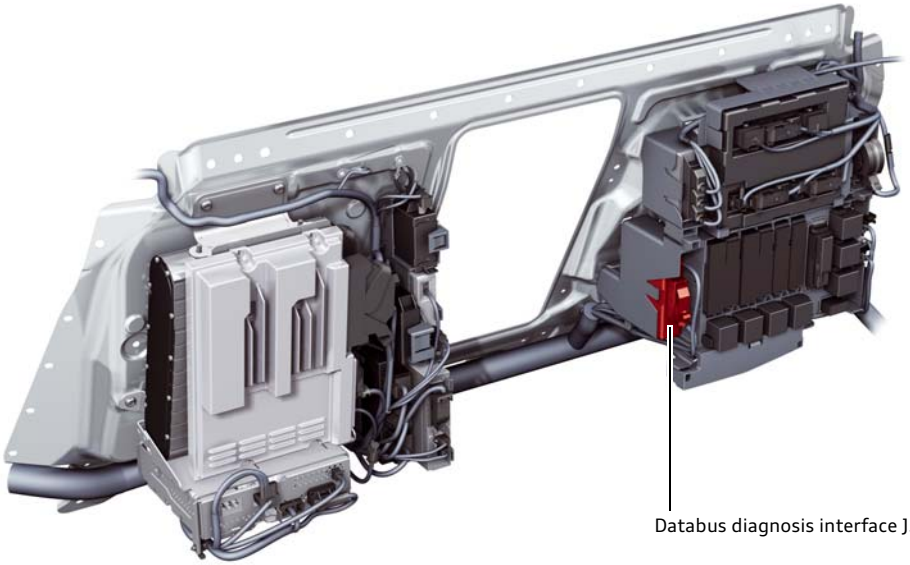
Diagnosis address	19
New functions	Showroom mode for component protection



459_032



459_019



459_024

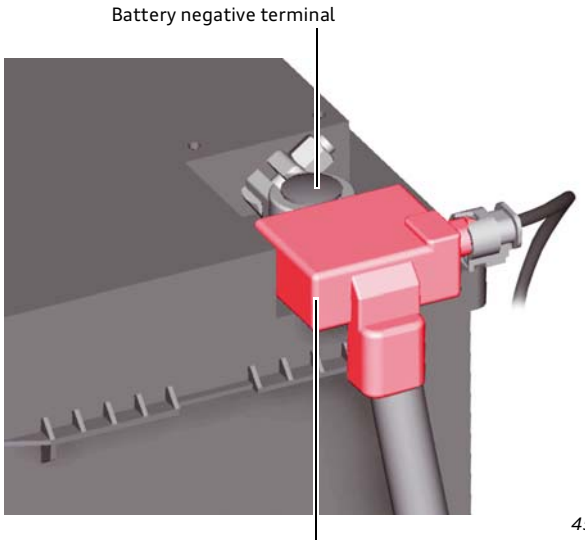
Showroom mode for component protection

On the Audi A8 ’10 a showroom mode for component protection control units is used for the first time. Its purpose is to prevent the control units with component protection being switched off unintentionally in showrooms and exhibition centres.
Background: control units that are incorporated in the component protection system require cyclic authentication by the databus diagnosis interface J533. That means that after the control units have been activated a certain number of times without the ignition being switched on in between, the component protection function is activated on the control units.

After activating showroom mode, the databus diagnosis interface J533 sends an authentication signal to all control units after the bus system is woken up.
Showroom mode is switched on with the aid of a vehicle diagnostic tester with an online connection on the databus diagnosis interface J533, address code 19, using the guided function "Databus diagnosis interface, showroom component protection".
In similar fashion to transport mode, showroom mode is automatically deactivated as soon as the vehicle is driven a short distance.

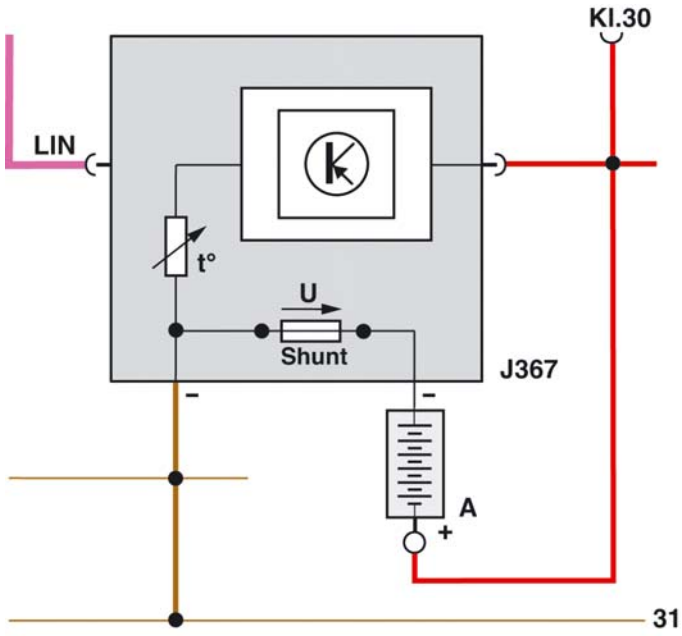
Battery-monitoring control unit J367

The Audi A8 ’10 is now fitted with the Energy management system 2 first used on the Audi A5. That means that the energy management control unit J644 used on the Audi A8 ’03 is no longer used.
Its functions have been taken over by the databus diagnosis interface J533 in conjunction with the battery-monitoring control unit J367.



459_026

Summary information	
Description	Battery-monitoring control unit J367
Fitted location	On negative terminal of vehicle battery
Functions	Measurement of: ▸ battery current ▸ battery voltage ▸ battery temperature
Diagnosis address	None, LIN slave, readings and diagnosis performed via databus diagnosis interface J533 (master)



459_018

Key:

A	Battery
J367	Battery-monitoring control unit
Shunt	Measuring shunt

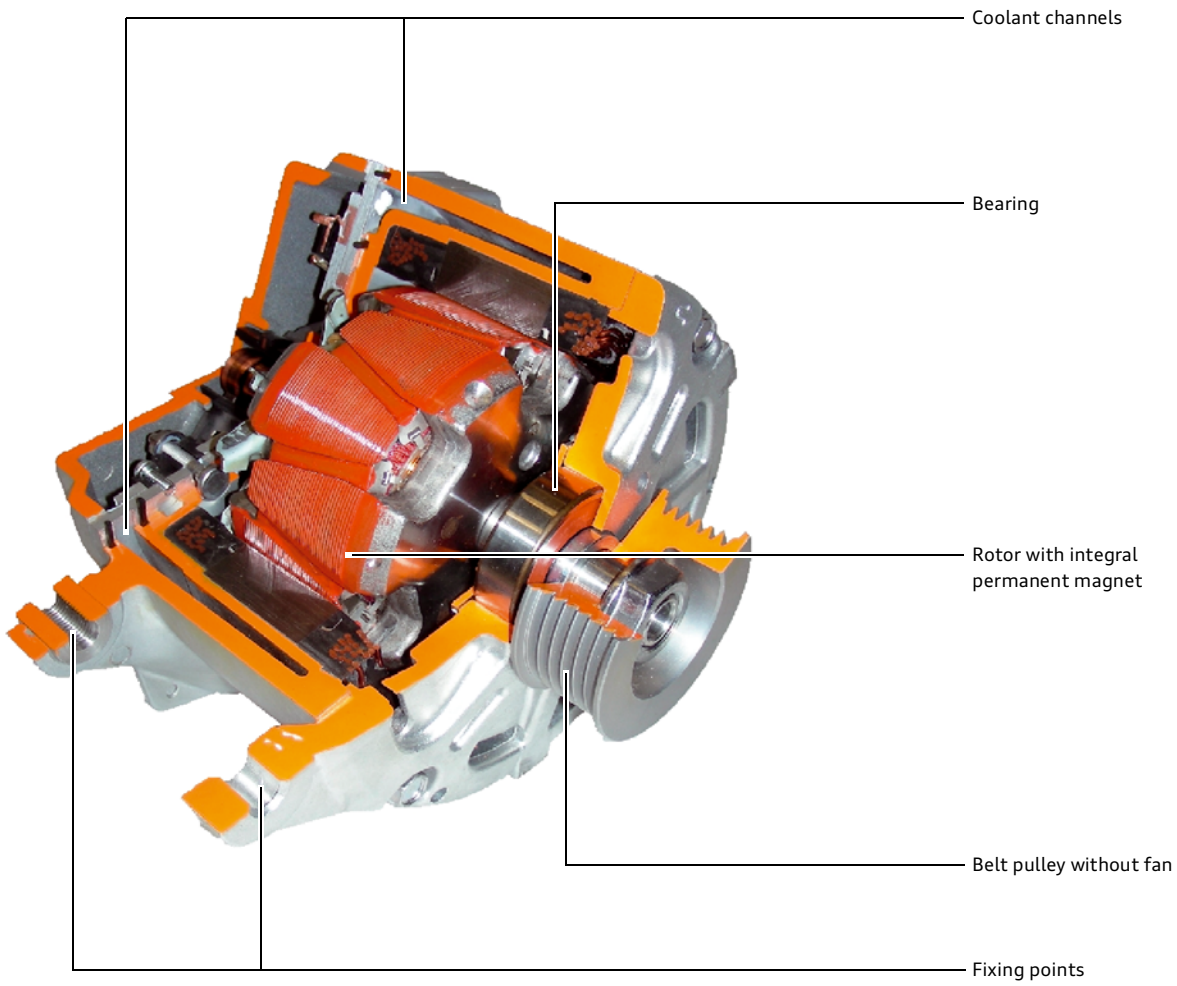
Reference
Further information on the battery-monitoring control unit J367 can be found in Self-study Programme 395, "Audi A5 – Electrical and network systems"

Alternator C

The water-cooled alternator was first used on the 6.0l W12 engine. The A8 ’10 sees the introduction of the second generation with substantially improved efficiency (for reducing fuel consumption) and a rated output of 210 A.
As no fan is required on the water-cooled alternator, it is very quiet in operation. Another advantage becomes evident during energy recuperation.
Although an air-cooled alternator is relieved of the electrical load during energy recuperation, it continues to use power from the engine in order to overcome the air resistance acting on the alternator fan. This is not the case with a water-cooled alternator as it has no fan.

Summary information	
Description	Alternator C
Fitted location	On the right-hand side of the engine at the bottom; driven by central poly-V belt
Function	Charging the vehicle battery
Diagnosis address	None, LIN slave, readings and diagnosis performed via databus diagnosis interface J533 (master)

Design



459_027

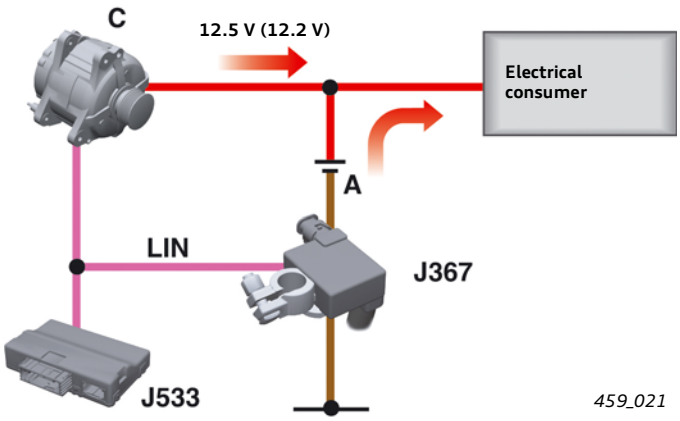
Reference
More information on the water-cooled alternator can be found in Self-study Programme 268, "The 6.0l W12 engine on the Audi A8 – Part 2".

Energy recuperation

Energy recuperation (from Latin "recuperare" = recover, regain) generally refers to the utilisation of kinetic energy when the vehicle is slowing down. That means that when the vehicle is braking or the engine is overrunning, the "free" energy produced is recovered and stored in the vehicle battery.

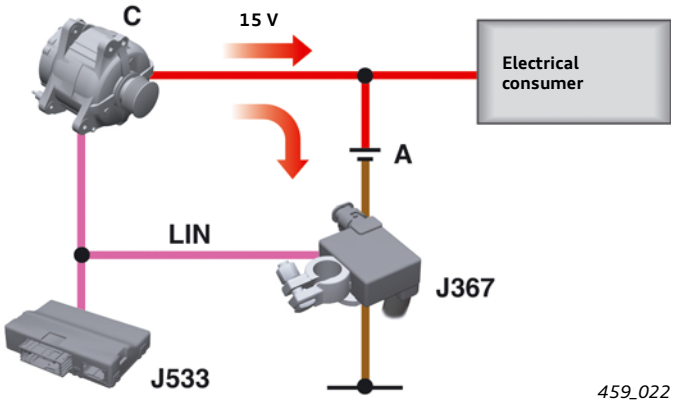
Method of operation
The energy recuperation function is an essential part of electrical energy management by the databus diagnosis interface J533. Two different operating modes are distinguished in energy recuperation.

Power transmission mode: battery is discharged
When the engine is transmitting power to the drivetrain, the alternator output voltage is lowered to a level below the battery voltage (12.5 V) and the alternator's current output drops. That reduces the load on the engine so that fuel consumption and, consequently, CO_2 emission are reduced.
During this phase, the battery takes over power supply to the electrical system. On Audi A8 '10 models with extended energy recuperation (12.2 volts) an AGM battery is usually fitted, see page 4.



459_021

Overrunning mode: battery is charged
As opposed to the drive transmission phases, in the engine overrun phases the alternator voltage is raised again and thus the battery recharged.



459_022

Key:

A	Battery
C	Alternator
J367	Battery-monitoring control unit
J533	Databus diagnosis interface

The preconditions for energy recuperation are specific statuses regarding:

- battery temperature
- electrical system load
- battery condition
- engine load
- coolant temperature
- air conditioning system
- lighting system

In addition, neither production nor transport mode must be active.

Alternator testing
Before the actual alternator test, the following checks should be carried out:

- Attachment of terminals
- Tension of alternator drive belt
- Alternator attachment
- Terminal 30 connection on alternator
- Earth connections

When testing the alternator with a vehicle diagnostic tester, the lights must be switched on so that the test results can not be distorted by energy recuperation. When the lights are on, the alternator makes sure that a charging voltage of at least 13.5 volts is provided.

Note
When carrying out the alternator test, the headlights must not be covered over by a protective mat. Otherwise there is a risk of the headlights overheating.

Voltage stabiliser J532

On vehicles with the Start-Stop system, a greater load is placed on the battery due to the engine being started more frequently, leading to the battery voltage dropping below 12 volts when starting the engine.
In order to avoid inconvenience to the customer when starting the engine, the voltage stabiliser J532 (DC/DC transformer) is fitted on all vehicles with Start-Stop system. It produces a stable supply voltage from the electrical system voltage for selected electrical consumers during the starting sequence.

The electrical consumers connected are, for example:

- Instrument cluster
- TV tuner
- Reversing camera
- Control unit 1 for electronic information systems
- Sound amplifier

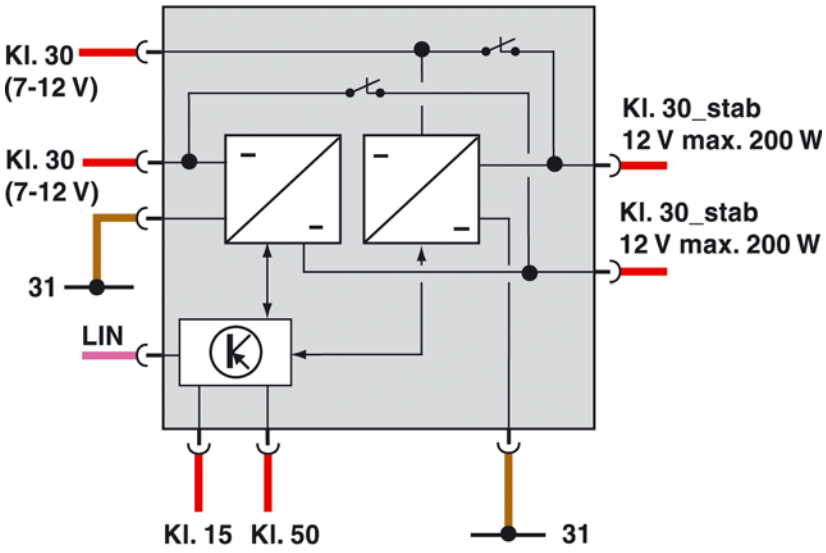
There are two versions of the voltage stabiliser:

- Version 1: 200 watts with one output (max. 200 watts/ 16.7 amperes)
- Version 2: 400 watts with two outputs (max. 2 x 200 watts/ 2 x 16.7 amperes)

459_029

Summary information	
Description	Voltage stabiliser J532
Fitted location	Rear left of boot
Function	Stabilising the supply voltage for selected components during engine starting sequence
Diagnosis address	None, LIN slave, readings and diagnosis performed via databus diagnosis interface J533 (master)

Schematic diagram of 400-watt voltage stabiliser



459_028

Inputs

- 2 x Terminal 30
- 2 x Terminal 31
- 1 x Terminal 15
- 1 x Terminal 50

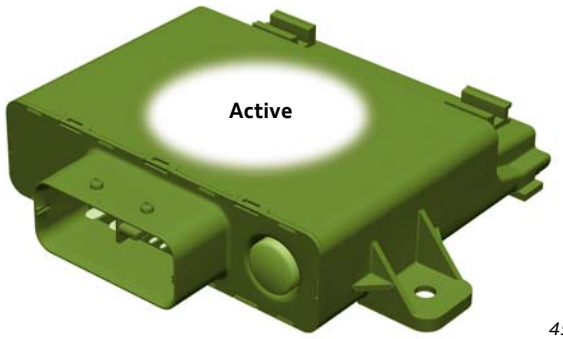
Outputs

- 2 x Terminal 30 stabilised
- LIN bus connection for diagnosis and status signals

Method of operation

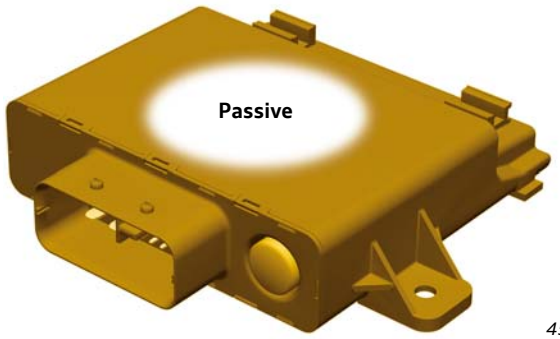
The voltage stabiliser basically distinguishes between two different statuses: "Active" and "Passive".

Active status
On "Ignition ON" (power at Terminal 15 input), the voltage stabiliser switches to the general status "Active". In "Active" status, a distinction is made between "Standby" and "Stabilising".



459_081

Passive status
On "Ignition OFF" (no power at Terminal 15 input), the voltage stabiliser switches to the status "Passive". In "Passive" status, the Terminal 30 input and the Terminal 30_stabilised output are conductively connected by a low resistance connection (equates to continuity).



459_082

Standby status
Terminal 30 is still conductively connected through to the output with a low resistance. The status signalled via the LIN cable is "Standby".

Stabilising status
During the engine starting sequence (power at Terminal 50 input), the voltage stabiliser switches from "Standby" to "Stabilising" status. If, after commencement of the starting sequence, the voltage at the Terminal 30 input drops below 12 volts, the stabiliser starts stabilising and holds the voltage at Terminal 30_stabilised at a constant 12 volts.
Stabilising is performed regardless of whether the starting sequence is initiated by the Start-Stop system or the ignition key. The status signalled via the LIN bus connection is "Stabilising".

Change of status
When the starting sequence has been completed (but power is still present at the Terminal 15 input) and no fault is present, the stabiliser reverts back to "Standby" status. On "Ignition OFF" (no power at Terminal 15 input), it switches to the status "Passive".
If excessive temperature or a fault condition is detected while the "Ignition ON" signal is present (Terminal 15 = High), the voltage stabiliser switches to "Error_active" status.

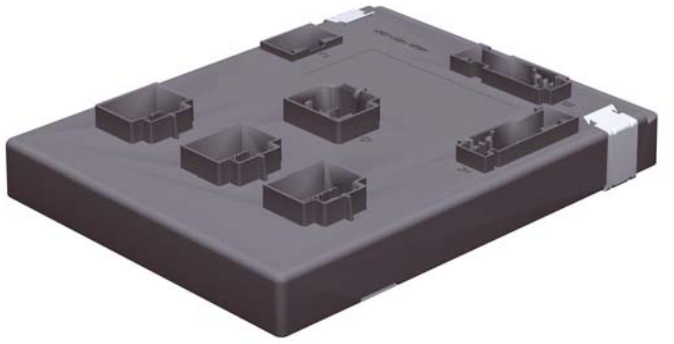
Error_active status
In this status, the stabilising function is inhibited. Input (Terminal 30) and output (Terminal 30_stabilised) are conductively connected with a low resistance if possible. The status signalled via the LIN bus connection is "Error_active".

Once the temperature returns to a normal level or the fault condition is no longer present, the stabiliser switches to "Active" status. On "Ignition OFF" (no power at Terminal 15 input), the voltage stabiliser switches to the status "Passive".

Electrical system control unit J519

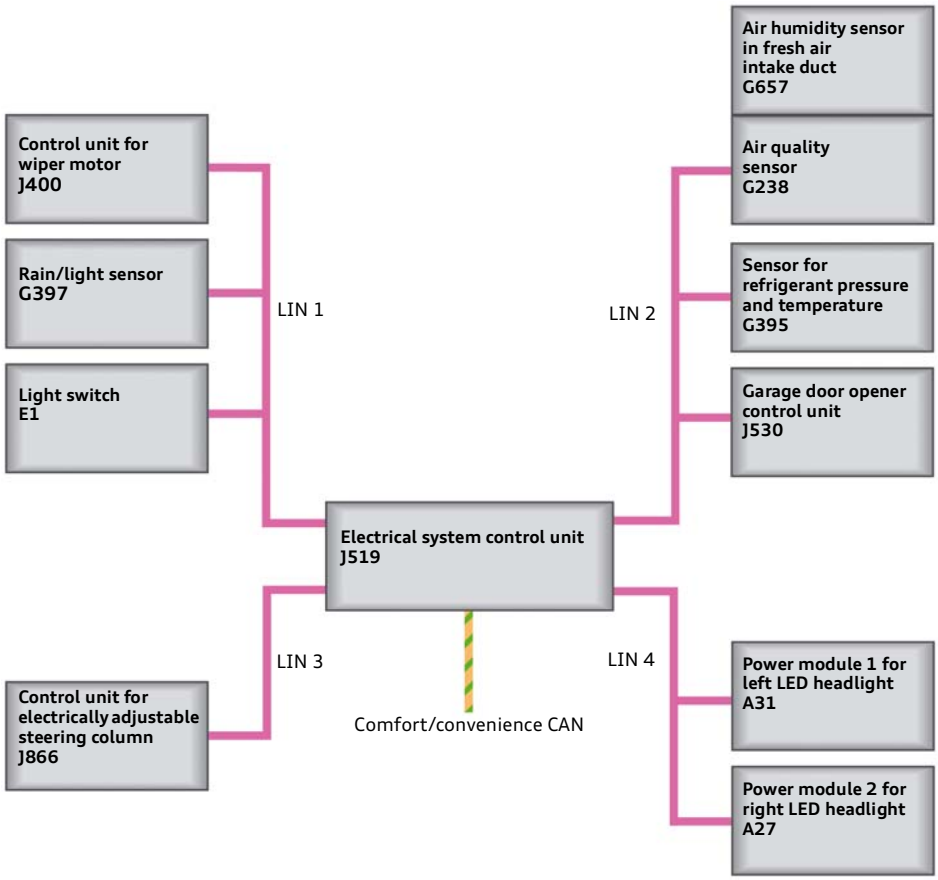
The electrical system control unit on the Audi A8 ’10 combines the functions of the electrical system control unit and electrical system control unit 2 familiar from the A8 ’03. It also performs additional functions as well.

Summary information	
Description	Electrical system control unit J519
Fitted location	Behind footwell trim on driver's side
Functions	▸ All functions of electrical system control unit J519 and electrical system control unit 2, J520, on Audi A8 ’03 ▸ LIN master ▸ LIN gateway
Diagnosis address	09
New functions	See summary on page 31



459_023

LIN bus master and LIN gateway functions



459_020

Functions within the databus system

The electrical system control unit J519 is a network device on the Comfort/convenience CAN.
It is the master control unit for the following LIN bus devices:

- Control unit for wiper motor
- Rain/light sensor
- Light switch
- Electrically adjustable steering column control unit
- Power modules for LED headlights

The electrical system control unit acts as gateway for the following LIN bus devices:

- Air quality sensor
- Air humidity sensor
- Sensor for refrigerant pressure and temperature[1)]
- Garage door opener control unit

[1)] Signal for refrigerant temperature is not used.

Functions	
Lighting system functions	▸ Exterior lighting master and operating front lights ▸ Safe mode algorithm for lights if main processor fails ▸ Reading rain/light sensor signal via LIN bus link ▸ Reading hazard warning light button signal and illuminating button ▸ Safe mode master for flashers (direction indicating, hazard warning, crash warning) if J393 fails ▸ Operation of front flashers (flasher master is central control unit for comfort/convenience systems J393) ▸ MMI gateway for "driving abroad" headlight function (with Xenon plus headlights implemented on cornering headlights and beam-height adjustment control unit J745; with LED headlights, by switching off segments[1)]) ▸ Operation of side repeater flashers via door control units[1)] ▸ Reading signal from rotary light switch via LIN bus connection[1)] ▸ Turning/cornering headlight function using main headlights[1)] ▸ Interior lighting master (interior lights, front and rear footwell lights)[1)] ▸ Function and location lighting (Terminal 58s/58st/58d)[1)]
Driver information	▸ Reading outside temperature[1)] ▸ Reading oil pressure switch signal[1)] ▸ Reading brake pad wear warning signal[1)] ▸ Reading brake fluid warning signal[1)] ▸ Reading coolant warning signal[1)] ▸ Reading washer fluid warning signal[1)] ▸ Reading light warning signal[1)]
Climate control functions	▸ Operating front seat heating[1)] ▸ LIN gateway for air quality sensor and refrigerant pressure sensor and air humidity sensor in fresh air intake duct[1)] ▸ Operating air conditioning compressor[1)]
Washer/wiper functions	▸ Activating the wiper control unit J400 via LIN bus connection ▸ Reading rain/light sensor signal via LIN bus link ▸ Operating the windscreen washer pump ▸ Operating the headlight washer pump[1)]
Interfaces with central control unit for comfort/ convenience systems J393	▸ Enabling electric steering column lock (discrete signal and via CAN)[1)] ▸ Reporting back discrete Terminal 15 signal (reporting to J393 via CAN)[1)] ▸ Valet Key button and function LED[1)] ▸ Reading rear sunblind button signal[1)]
Other functions	▸ Operating horn relay ▸ Reading reversing light switch signal (CAN signal from automatic transmission control unit) ▸ Reading handbrake switch signal (CAN signal from electromechanical parking brake) ▸ Reading bonnet switch signal ▸ LIN gateway for garage door opener control unit J530 ▸ Reading settings via MMI (exterior lights, interior lights, wipers, Audi drive select and home link) ▸ Operating valve for Servotronic[1)] ▸ LIN gateway for garage door opener control unit[1)] ▸ Plausibility-checked Terminal 15: Terminal 15 via CAN or Terminal 15 via discrete lead[1)] ▸ Co-ordinator for Audi drive select[1)]
Special functions	▸ Energy management shut-down stages (interior lights, footwell lights, coming/leaving home lights, daytime lights, heated washer jets) ▸ Transport mode (interior lights, footwell lights, coming/leaving home lights, daytime lights, heated washer jets) ▸ Participation in component protection ▸ Deactivating daytime lights coding variant

[1)] New functions compared with the functions performed by electrical system control units J519 and J520 on Audi A8 '03.

Exterior lights

Light switch

The light switch on the Audi A8 ’10 is comparable with the one on the B8 Series models as far as the electrical connections are concerned. Due to the bus technology, it has been possible to reduce the number of connections from the eight used on the A8 ’03 to only four on the A8 ’10.

Summary information	
Description	Light switch E1
Fitted location	Dashboard, driver's side
Function	Communicating driver's desired light settings to the electrical system control unit
Diagnosis address	None, LIN slave, readings and diagnosis performed via electrical system control unit J519 (master)

459_059

Function

The light switch can be set to one of four possible positions:

0 Lights off (in some countries the daytime lights are switched on at "Terminal 15 on")

AUTO The headlights are switched on and off automatically according to the light sensor readings (this position is also a requirement for the "headlight assistance"/ "infinitely variable beam" functions)

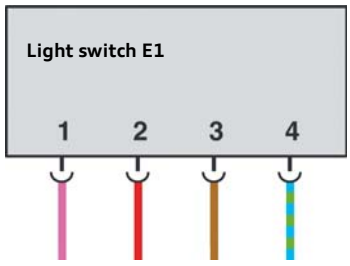
 Side lights

 Dipped headlights

Electrical connections and circuitry

The rotary switch position, the button positions and the instrument illumination adjuster setting are read by the electrical system control unit J519 via the LIN lead. In addition, all commands for switch illumination and the individual function indicator lamps are communicated to the light switch.
The redundant back-up lead is connected to earth via an electronic circuit inside the switch and is used to check the plausibility of the switch settings.

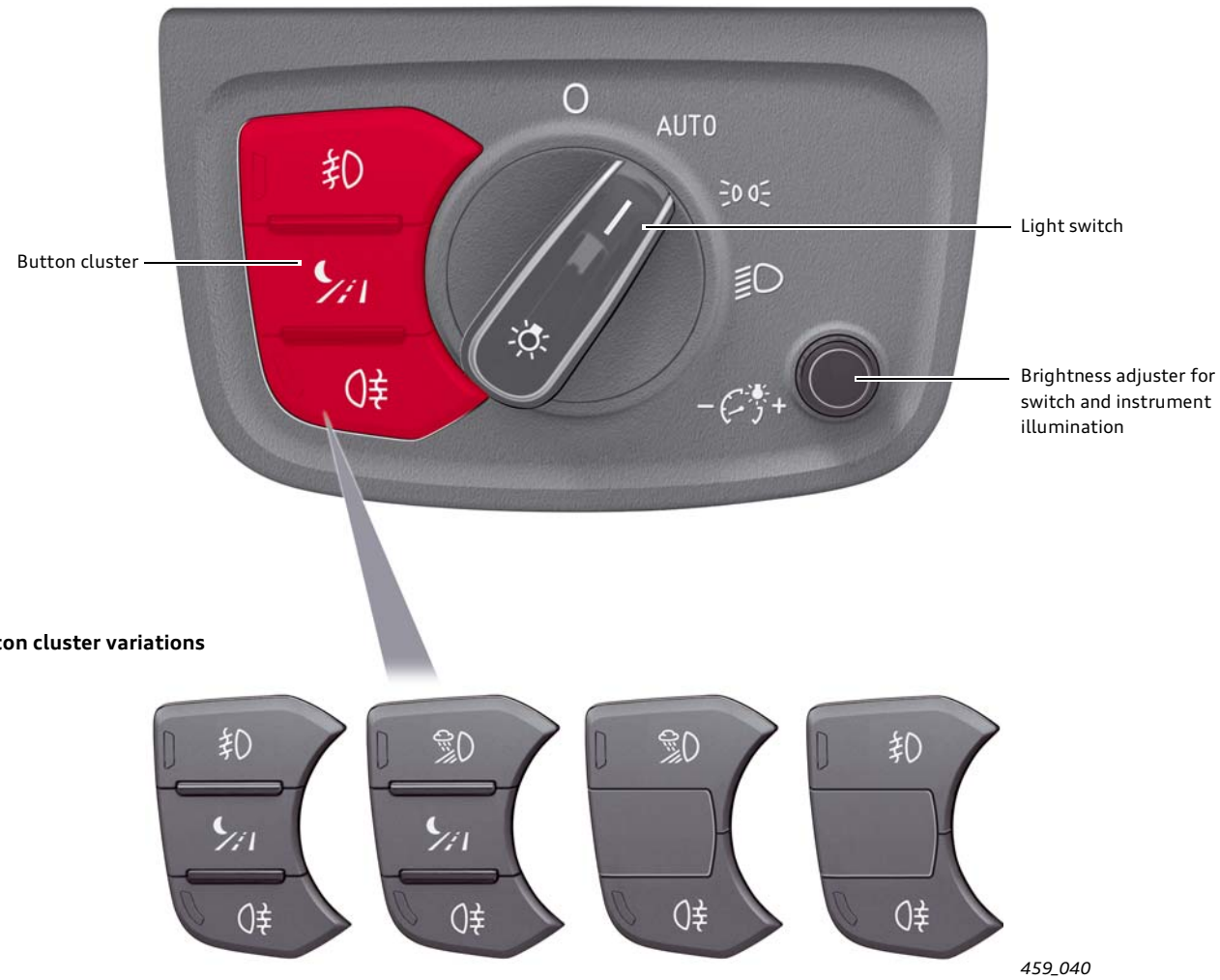
If there is a short circuit on the LIN or redundant back-up lead, the lighting system safe mode ("Dipped headlights on") is activated by the electrical system control unit and a corresponding fault registered in the electrical system control unit's fault memory.



459_042

Connections:
Pin 1 LIN (to electrical system control unit J519)
Pin 2 Terminal 30
Pin 3 Terminal 31
Pin 4 Redundant back-up lead (to electrical system control unit J519)

Button cluster



Button functions

The appearance of the button cluster on the light switch can vary depending on the equipment level fitted. There are four possible variations. The button cluster can be used to switch the following functions on/off:

- Front fog lights (on vehicles with Xenon plus without adaptive headlights)
- All-weather headlight beam (on vehicles with Xenon plus and adaptive headlights/LED headlights)
- Night vision assistance
- Rear fog lights

Reference

For a description of the design and function of night vision assistance, refer to Self-study Programme 462 "Audi A8 '10 Night vision assistance".

Headlights

There are basically two types of headlight that can be fitted on the Audi A8 ’10:

- Xenon plus headlights
- LED headlights

There are three variations of the Xenon plus headlights:

- Xenon plus
- Xenon plus with adaptive headlights
- Xenon plus with adaptive headlights and "infinitely variable beam"

The type of light used is identical on all three variations of the Xenon plus headlights. However, the light functions and the operation and implementation of headlight beam control are different.

Xenon plus headlights

LED headlights

The Audi A8 ’10 is the first volume-production vehicle to feature headlights that are entirely based on LED technology. LED technology offers advantages over "normal" headlights in terms of power consumption. The use of LEDs in headlights also offers entirely new possibilities regarding the variability of the headlight beam such as the all-weather headlight beam function.

Thus individual LEDs can be switched on or off for specific light functions.
As this headlight unit is capable of all light functions, there are no separate fog lights.

1) SAE = for North American market

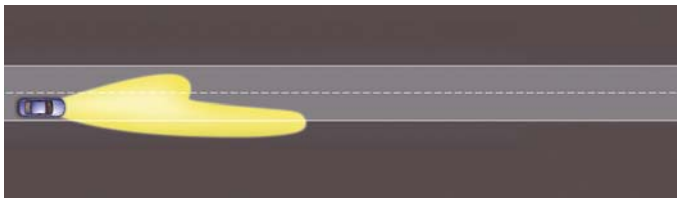
Xenon plus headlights – functions

Light function	Type of light used	Power
Side light	20 LEDs, dimmed	4 watts
Daytime light	20 LEDs	11 watts
Flasher	Light bulb (PSY24W)	24 watts
Dipped beam headlight	Gas discharge lamp (D3S)	35 watts
Main beam headlight		
Fog light	H7 light bulb (long-life)	55 watts
Sidemarker light, SAE only[1)]	3 LEDs	Approx. 1 watt

[1)] SAE = for North American market

Dipped beam headlights

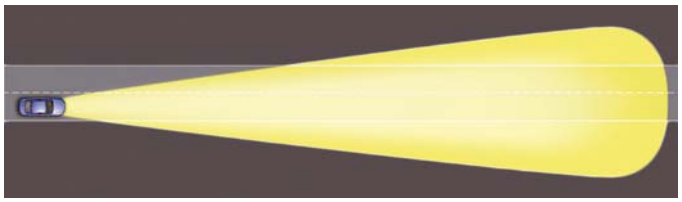
Asymmetrical dipped beam produced by gas discharge lamp and lens.



459_052

Main beam headlights

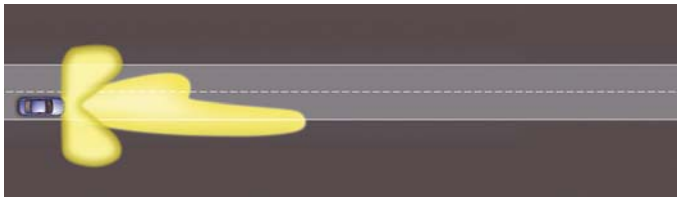
Symmetrical main beam produced by gas discharge lamp and lens and electrically operated screen (shutter) which covers the asymmetrical area.
This function is activated by the main beam switch or the headlight assistance function.



459_053

Fog lights

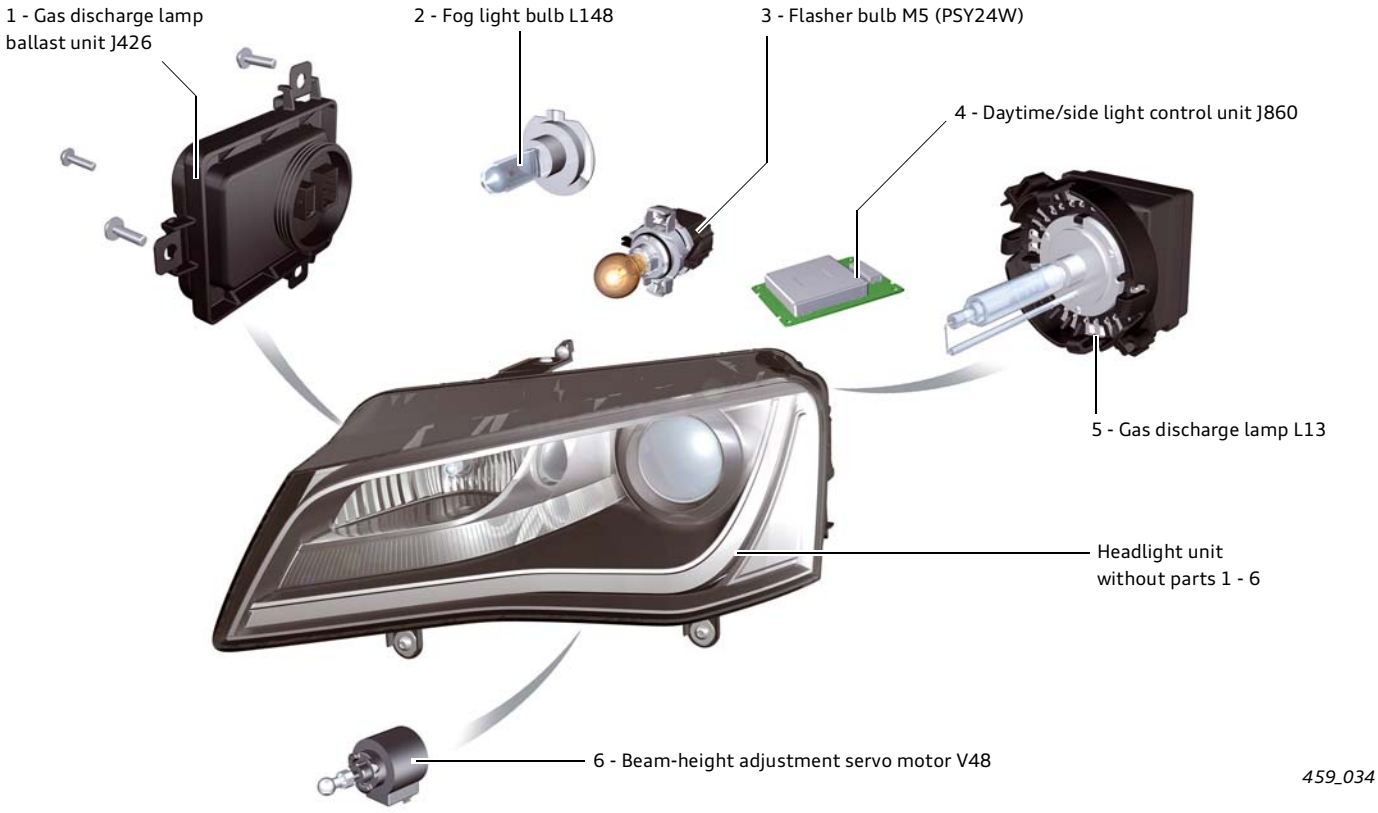
Minimal-reflection fog light beam produced by switching on H7 bulbs on both sides.



459_054

Xenon plus headlight unit – individual components

In addition to the replaceable headlight components such as caps, repair tabs, screws and venting devices that are features of all A8 ’10 headlight units, the Xenon plus headlight units also have the headlight-specific replaceable components illustrated below.



459_034

Operation

The individual lights and the daytime/side light control unit in the Xenon plus headlight unit are operated discretely by the electrical system control unit J519.

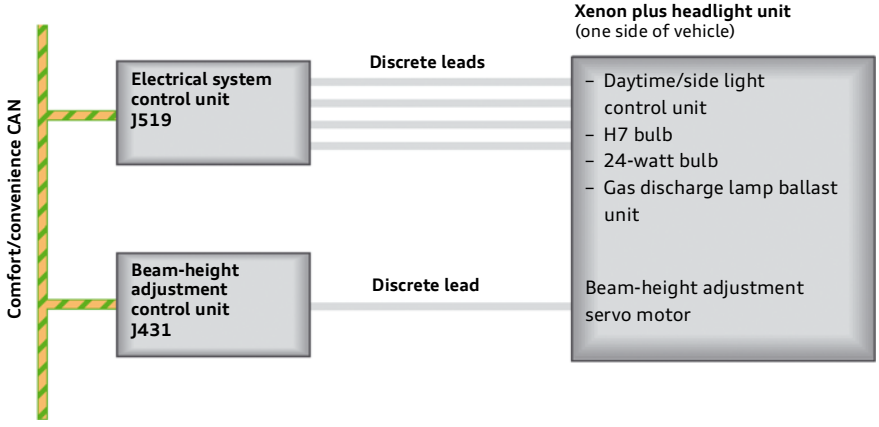
The beam height is adjusted discretely by the beam-height adjustment control unit J431.

Changing headlight setting for driving on other side of road

Changing the headlight setting for driving on the other side of the road is done via the MMI. By opening the "CAR" menu followed by the item "Exterior lights", you can select the option "Set lights for driving on left" or "Set lights for driving on right".

The adjustment is made by lowering the beam height by 5 cm at a distance of 10 m using the beam-height adjustment servo motors.

Schematic diagram of operation



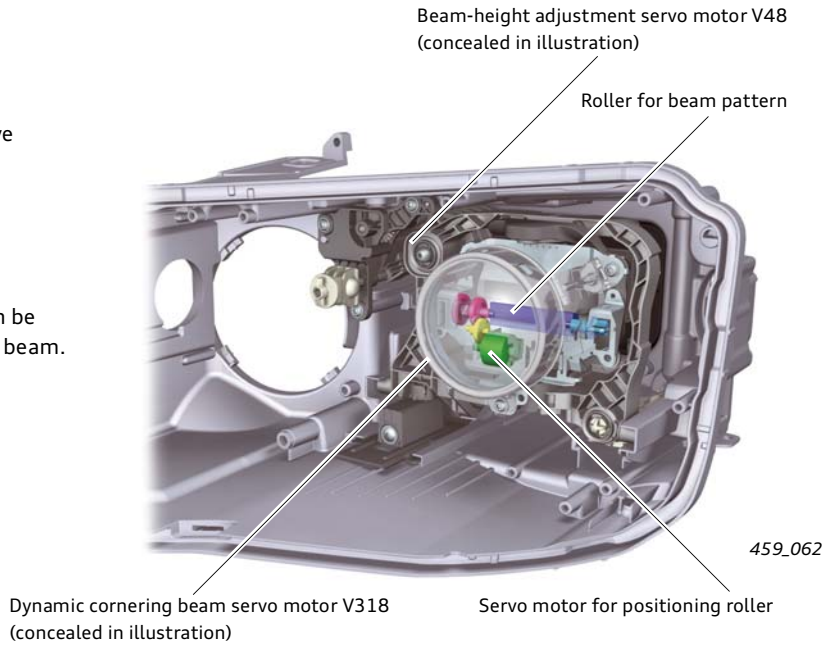
459_061

Xenon plus headlight unit with adaptive headlights

Light function	Type of light used	Power
Side light	20 LEDs, dimmed	4 watts
Daytime light	20 LEDs	11 watts
Flasher	Light bulb (PSY24W)	24 watts
Country road beam	Gas discharge lamp (D3S)	35 watts
Motorway beam		
Urban road beam		
All-weather beam[1)]		
Turning beam	H7 light bulb (long-life)	55 watts
Road junction beam[2)]		
Sidemarker light, SAE only[3)]	3 LEDs	Approx. 1 watt

[1)] Not for North American market
[2)] Only on vehicles with navigation system
[3)] SAE = for North American market

Implementation of different light functions
The lights used in the Xenon plus headlight unit with adaptive headlights are the same as in the Xenon plus headlight unit.
On vehicles with adaptive headlights, a roller is fitted in the headlight unit.
The roller has different profiles around its circumference.
Turning the roller by means of a servo motor produces the different headlight functions. In addition, the entire lens can be swivelled sideways to provide a dynamic cornering headlight beam.

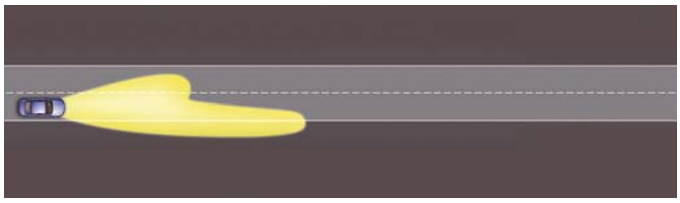


459_062

Note
It is not possible within the scope of this Self-study Programme to detail and describe all the legal regulations and exceptions (which are also constantly changing). For example, at the time this SSP went to press, a variable headlight beam pattern or adaptation of the illuminated area outline to the prevailing conditions was not allowed in South Korea, Japan, USA, Canada, China or the "rest of Asia". In those countries, the "adaptive headlights" consist only of dynamic panning of the beam without the urban road and motorway beam functions.

Xenon plus headlight unit with adaptive headlights – light functions

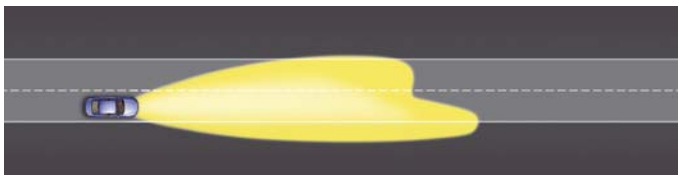
Country road beam
Asymmetrical dipped beam produced by gas discharge lamp, roller and lens. The country road beam is active at road speeds upwards of 50 kph. If a speed of 110 kph is exceed for an extended period, the lights switch to motorway beam. The motorway beam is activated immediately if a speed of 130 kph is exceeded.
On vehicles with navigation system, the country road beam is always active if urban or motorway conditions are not detected.
When the country road beam is active, dynamic beam panning can also take place.


459_052

Motorway beam

Asymmetrical dipped beam produced by gas discharge lamp, roller and lens; off side of carriageway is illuminated to a greater distance.

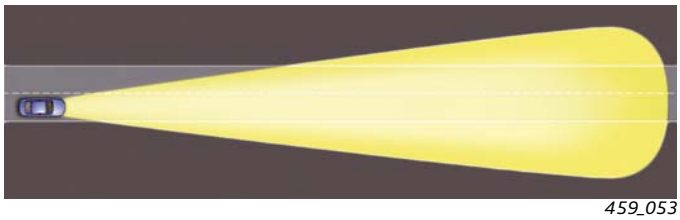
The motorway beam is activated if a road speed of 110 kph is exceed for an extended period or immediately if a speed of 130 kph is exceeded. On vehicles with navigation system, the motorway beam is activated if the vehicle speed is above 80 kph and the navigation system has detected that the vehicle is driving on a motorway. When the motorway beam is active, dynamic beam panning can also take place.



459_077

Main beam

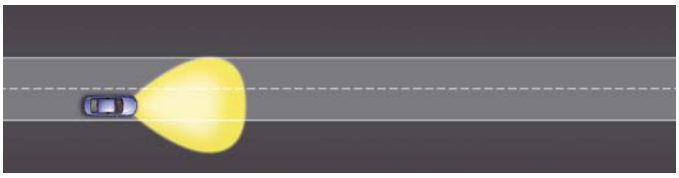
Symmetrical main beam produced by gas discharge lamp, roller and lens. Activated by operating the main beam stalk.



459_053

Urban road beam

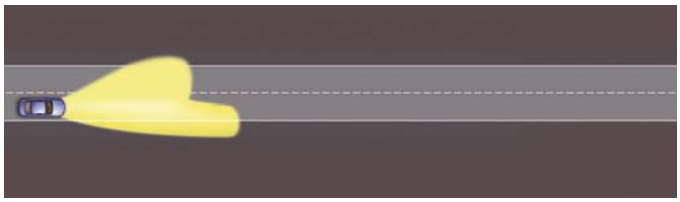
Symmetrical short-range beam produced by gas discharge lamp, roller and lens; beam is also panned outwards slightly. The urban road beam is active at speeds from 5 kph to 50 kph, or form 5 kph to 60 kph on vehicles with navigation system if the system detects that the vehicle is driving on urban roads. Dynamic beam panning does not take place while the urban road beam is active.



459_076

All-weather beam

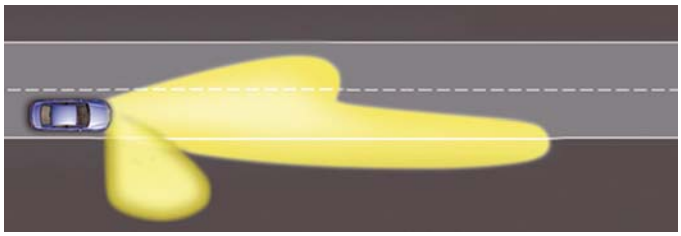
The all-weather beam is an asymmetrical short-range beam with minimal beam reflection produced by gas discharge lamp and lens. The off-side lens is panned slightly outwards and the beam throw shortened by slightly lowering the beam height.



459_079

Turning beam

The turning beam is produced by switching on the H7 light on one side and is activated at speeds under 70 kph when the steering wheel is turned more than a certain amount or when the turn indicator is on at speeds under 40 kph. It is activated in addition to the country road beam (illustrated right) or the urban road beam.



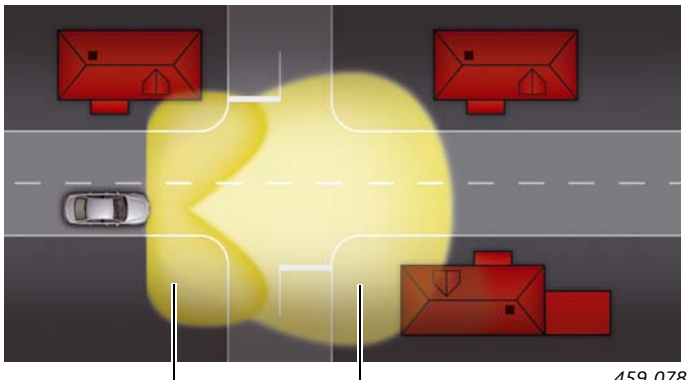
459_080

Road junction beam

On vehicles with navigation system, the "road junction beam" function is also implemented.

The road junction beam is produced by switching on both static turning lights. It helps the driver to see potential hazards at the sides at road junctions. It is switched on in good time before the junction is reached.

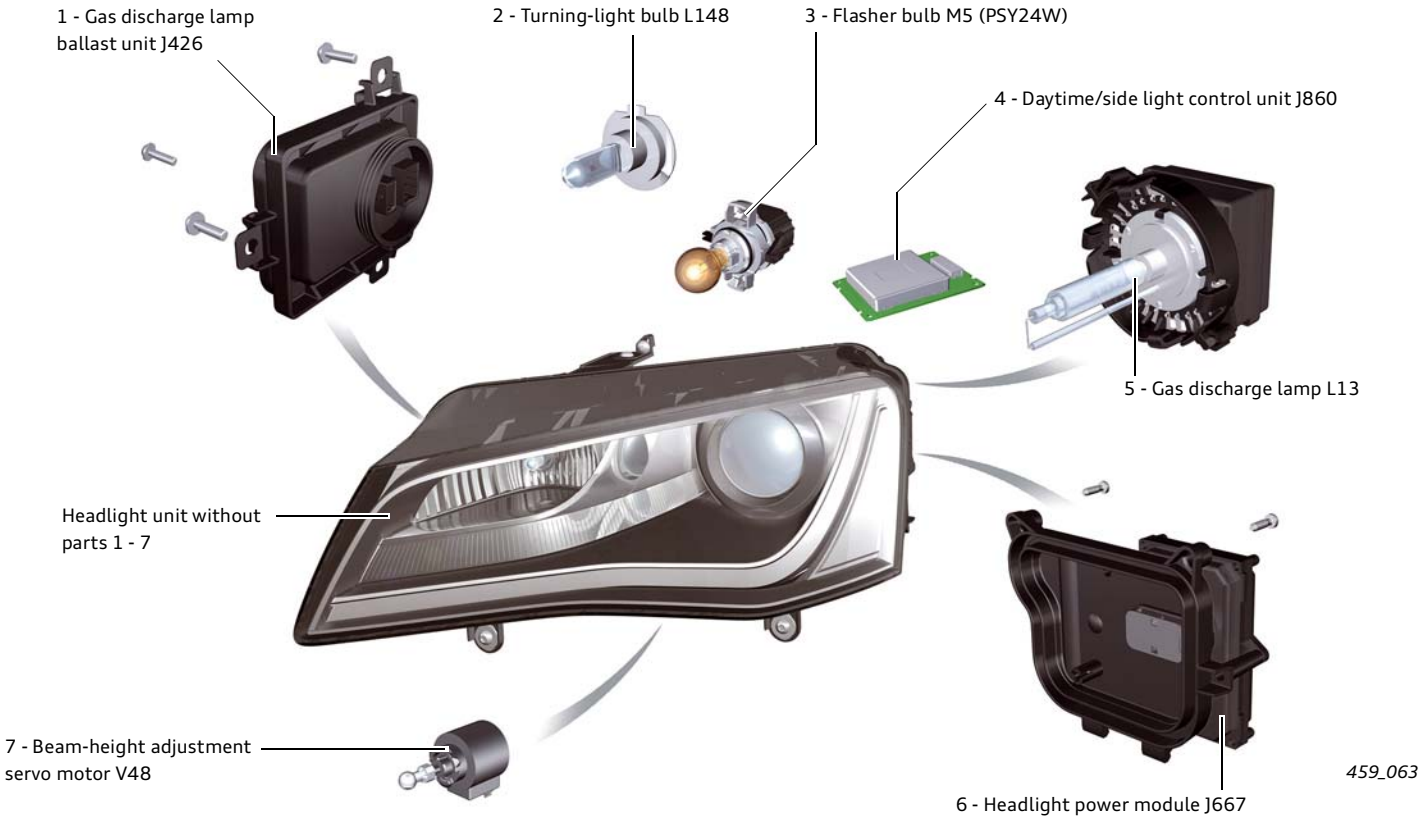
The road junction beam is always used in conjunction with another beam. When driving on urban roads, it is used in conjunction with the urban road beam (illustrated right) and in conjunction with the country road beam when driving on country roads.



459_078

Xenon plus headlight unit with adaptive headlights – individual components

In addition to the replaceable headlight components such as caps, repair tabs, screws and venting devices that are features of all A8 '10 headlight units, the Xenon plus headlight units with adaptive headlights also have the headlight-specific replaceable components illustrated below.



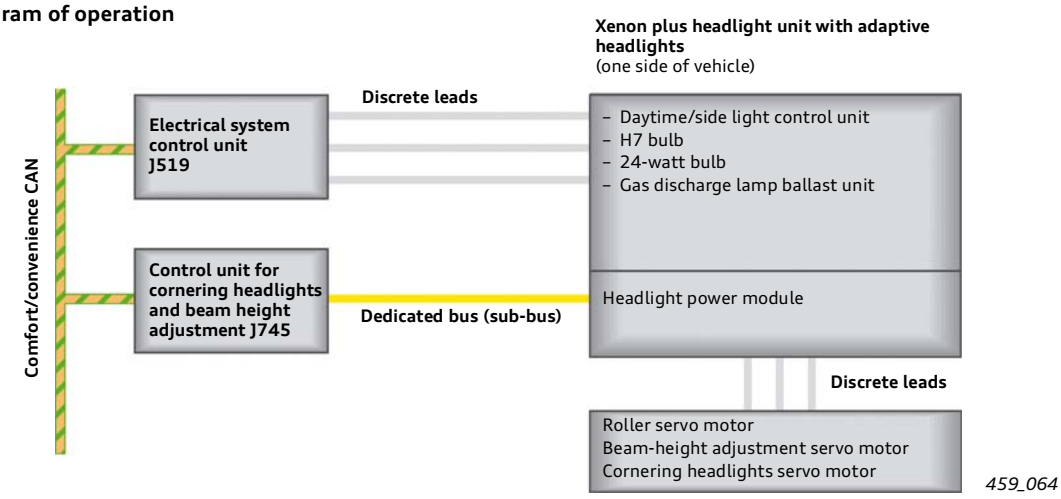
Operation

The LED control unit, the H7 light bulb and the 24-watt bulb are operated discretely by the electrical system control unit J519.
The cornering-headlights and beam-height adjustment control unit operates the headlight power module via a dedicated CAN.
The headlight power module operates the roller servo motor, the beam-height adjustment servo motor and the cornering headlights servo motor via discrete leads.

Changing headlight setting for driving on other side of road

Changing the headlight setting for driving on the other side of the road is done via the MMI. By opening the "CAR" menu followed by the item "Exterior lights", you can select the option "Set lights for driving on left" or "Set lights for driving on right".
The changeover is effected by rotating the roller through 180°. In that way, complete conversion of the headlights to driving on the left or right can be achieved, i.e. the asymmetrical beam is reversed to illuminate the other side of the road. On vehicles with navigation system, the changeover can be performed automatically when the vehicle crosses a border into a country where the traffic drives on the other side of the road.

Schematic diagram of operation

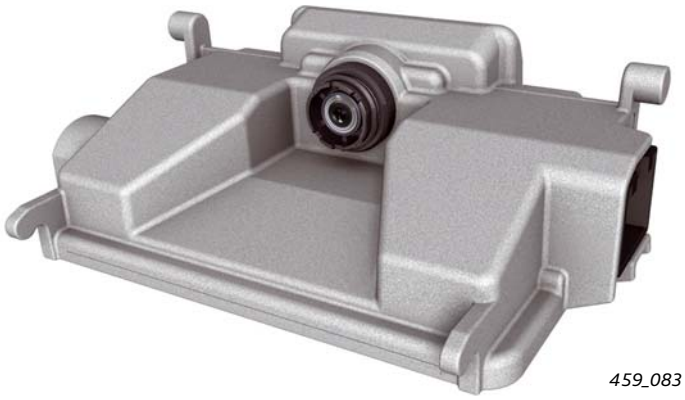


Xenon plus headlight unit with adaptive headlights and "infinitely variable beam"

The design and individual components are the same as for the Xenon plus headlight unit with adaptive headlights.
In addition, the "infinitely variable beam" function requires the camera control unit J852 for assessing the current road traffic conditions, i.e. vehicles in front, oncoming vehicles and built-up areas are detected.

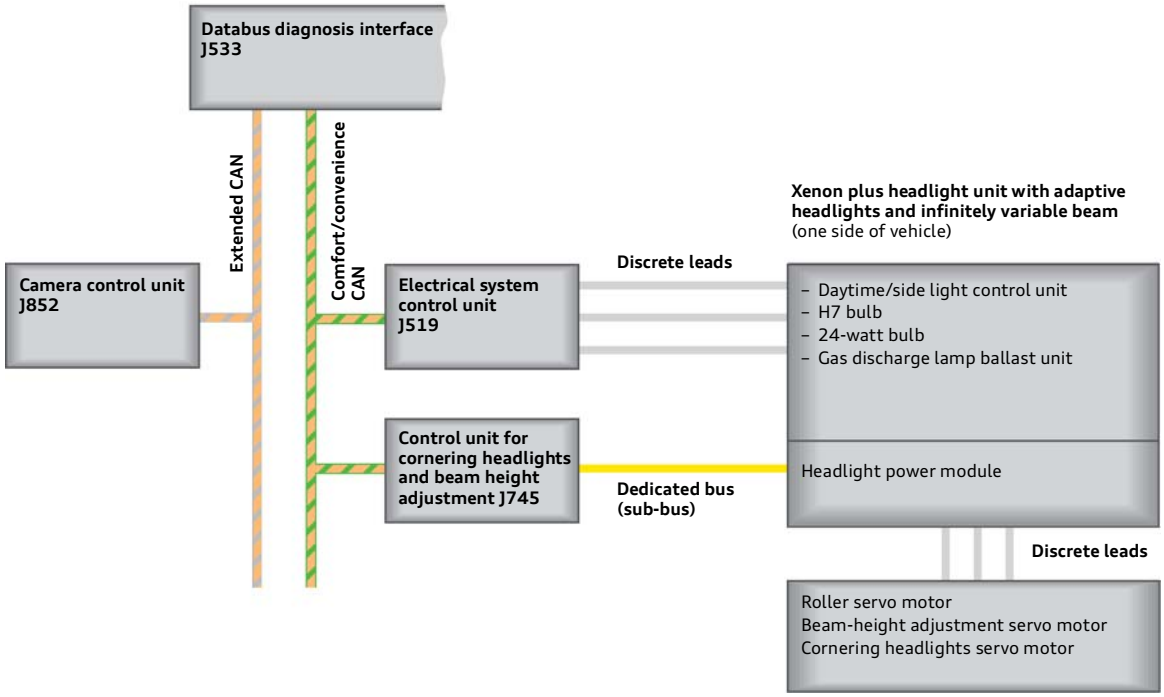
As a result, the beam throw can be infinitely varied in the range between dipped beam and main beam by continuous adjustment of the roller instead of simply switching the beam pattern based on vehicle speed alone.

Summary information	
Description	Camera control unit J852
Fitted location	On the windscreen above the rear-view mirror pedestal
Functions	▸ Infinitely variable headlight beam ▸ Lane departure assistance
Diagnosis address	85



459_083

Schematic diagram of operation



459_074

Reference
For a description of the "infinitely variable beam" function, refer to Self-study Programme 461 "Audi A8 '10 Driver assistance systems".

LED headlights

Light function	Type of light used
Side light	22 LEDs (white, dimmed)
Daytime light	22 LEDs (white)
Flasher	22 LEDs (orange)
Dipped beam	16 LEDs (6 x Twin LED chips + 4 individual LEDs)
Main beam	8 LEDs (2 x Quadruple LED chips)
Motorway beam	4 LEDs (1 x Quadruple LED chip)
Turning beam	4 LEDs (1 x Quadruple LED chip)
All-weather beam	18 LEDs (14 from dipped beam + 4 from turning beam)
Driving abroad beam (adjusted beam for driving on other side of road)	13 LEDs (13 from dipped beam)
Sidemarker light, SAE only[1)]	3 LEDs

Daytime light
The daytime lights and the side lights are formed by 22 white LEDs. They are activated by means of a pulse-width modulated (PWM) signal.

459_065

Dipped beam headlight
The dipped beam headlight consists of 10 separate LED modules containing either single or twin LED chips.

459_066

Flasher
The flasher is implemented by means of 22 orange LEDs accommodated in the same space as the daytime light LEDs. While the flasher is operating, the daytime light LEDs are switched off. On the SAE version[1)], the LEDs for the flasher are supplied with a higher current due to legal requirements. For that reason the LED power module 5 is also fitted (see illustration on page 39).

459_067

Main beam headlight
The main beam function is performed by two reflector sections, each with a quadruple LED chip.

459_068

[1)] SAE = for North American market

Motorway beam
To produce the motorway beam, a separate section containing a quadruple LED is switched on in addition to the dipped beam. The motorway beam is activated if a road speed of 110 kph is exceed for an extended period or immediately if a speed of 140 kph is exceeded.

459_069

Turning beam
The turning beam is produced by supplementing the dipped beam by switching on a quadruple LED chip which is located below the daytime light and illuminates the turning zone with the aid of a reflector. The precondition for switching it on is either that the flasher is on in conjunction with a road speed of under 40 kph or that the steering wheel is turned more than a certain amount while the speed is under 70 kph.

459_070

All-weather beam
The all-weather beam, which is activated by means of a button next to the light switch, is created by the same lights as the for the dipped beam. The only difference is that the top two dipped-beam LEDs are switched off for this function.

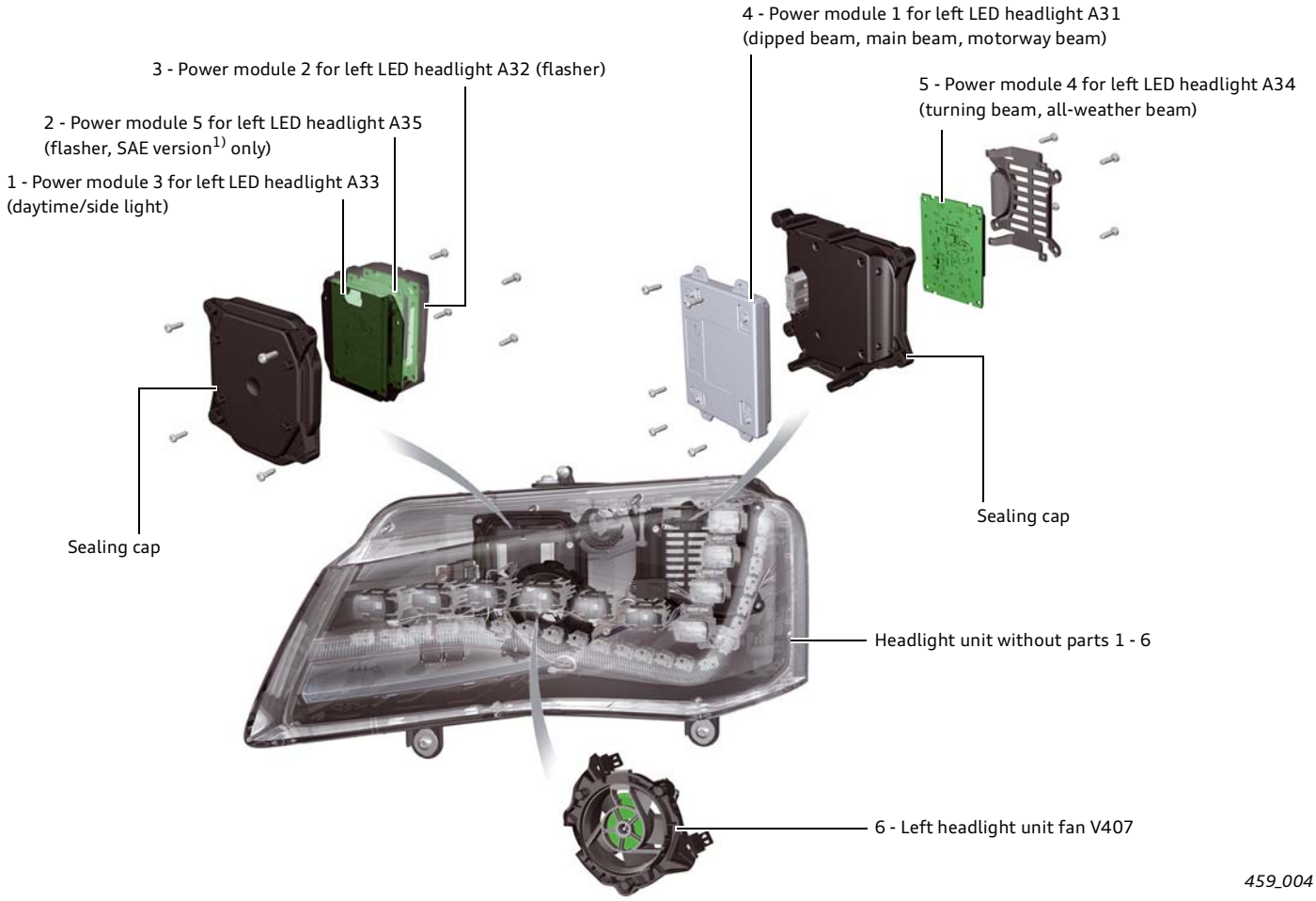
459_071

Driving abroad beam
The driving abroad beam (selected by means of MMI) should be used when driving in countries where the traffic drives on the opposite side of the road to that in the country for which the vehicle was produced. It is created by using the dipped beam function with the top three LEDs switched off.

459_072

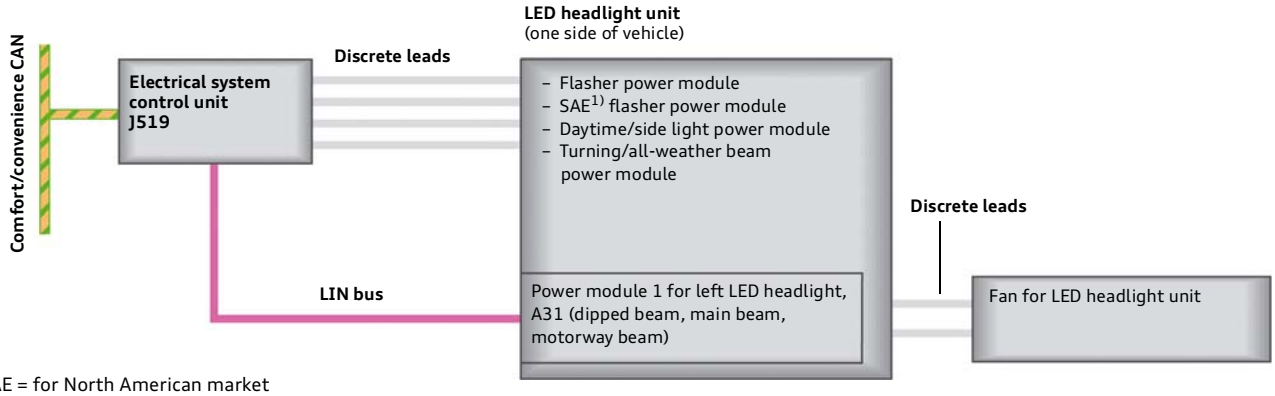
LED headlights – individual components

In addition to the replaceable headlight components such as caps, repair tabs, screws and venting devices that are features of all A8 '10 headlight units, the LED headlight units also have the headlight-specific replaceable components illustrated below.



459_004

Schematic diagram of operation



459_075

1) SAE = for North American market

The function modules for flashers, daytime/side lights and turning/all-weather beam are controlled by the electrical system control unit J519 via discrete leads.
The power module for dipped beam, main beam and driving abroad beam is a LIN slave of the electrical system control unit.

That power module operates the headlight unit fan, once again via discrete leads. The fan is activated by "Terminal 15 ON" and then runs constantly until Terminal 15 is switched off again.

Note
Caution! ESD protection must be ensured whenever carrying out work of any kind on the headlight unit and especially when replacing the internal components. Equipment set VAS 6613 is available for the purpose, see page 42.

Rear lights

The rear light clusters on the Audi A8 '10 are made up of two parts on each side of the vehicle. One half of the light cluster is incorporated in the side panel and the other half in the boot lid. All functions are implemented by means of LED technology. Only the reversing light function is achieved by means of a conventional light bulb (long-life). Two different versions of the rear light cluster are used – an ECE version and an SAE version. The way in which the lights are operated on the SAE version differs from the ECE version due to the different regulations that apply.

Externally, the light clusters are identical apart from an additional sidemarker in the side-panel half of the SAE version. The rear light cluster functions are controlled by the central control unit for comfort/convenience systems, J393. The LEDs/electronic modules in the rear light units can not be separately replaced. Only the 16-watt bulb (HP16W), which is fitted in the outer half of the rear light cluster, can be replaced after removing the light unit. It is not intended that this bulb should be replaced by the customer.

Summary of rear light functions:

Tail light:
The tail light on both versions is formed by a total of 30 LEDs, of which 12 are in the side-panel half of the light cluster and 18 in the boot-lid half.

The LEDs are also supplemented by a fibre-optic conductor to reinforce the impression of a continuous strip of light from all angles.

ECE[1)]

459_044

SAE[2)]

459_048

Brake light:
The brake light on the ECE version consists of five sections each containing five LEDs.

On the SAE version, the brake light is formed by a total of 72 LEDs.

459_045

459_049

Brake light together with rear fog light (not illustrated):
If the rear fog light is switched on at the same time, the centre section of the five brake light sections is switched off by the central comfort/convenience system control unit in order to provide the legally stipulated separation of 100 mm between brake light and fog light.

In addition, on the SAE version the top outer light strip section is switched off and the light strip dimmed to tail light level.

[1)] ECE = for European market
[2)] SAE = for North American market

Flasher:
On the ECE version, 17 orange LEDs are used for the flasher, of which 6 are in the side-panel half of the light cluster and 11 in the boot-lid half.

The SAE version, on the other hand, uses all 72 of the LEDs used for the brake light function.

ECE[1)]

459_046

SAE[2)]

459_050

Rear fog light:
For the rear fog light, the ECE version uses the two inner 5-LED sections and, above them, another 7 LEDs. Those 7 red LEDs are on a common chip together with the orange LEDs for the flasher function on the ECE version (for greater clarity, the illustration shows only the rear fog light without the tail light function which would also be required at the same time).

The SAE version uses only the 7 LEDs in the upper strip to perform the rear fog light function. If the rear flasher function is activated at the same time as the fog lights, only the flasher LEDs in the side-panel half of the light cluster are activated in order to prevent thermal overload.

Reversing light:
The reversing light with its conventional 16-watt bulb (long-life) is located in the side-panel half of the light cluster only.

459_047

459_051

Description	Type and power, ECE version	Type and power, SAE version
Reversing light	1 x HP16W, 16 watt	1 x HP16W, 16 watt
Tail light	30 LEDs, approx. 10 watts	30 LEDs, approx. 10 watts
Rear fog light	17 LEDs, approx. 5 watts	17 LEDs, approx. 4 watts
Brake light	25 LEDs, approx. 10 watts	72 LEDs, approx. 23 watts
Direction indicator	17 LEDs, approx. 11 watts	72 LEDs, approx. 23 watts
Reflector	-	-
Sidemarker light, SAE only[1)]	-	1 LED, approx. 3 watts

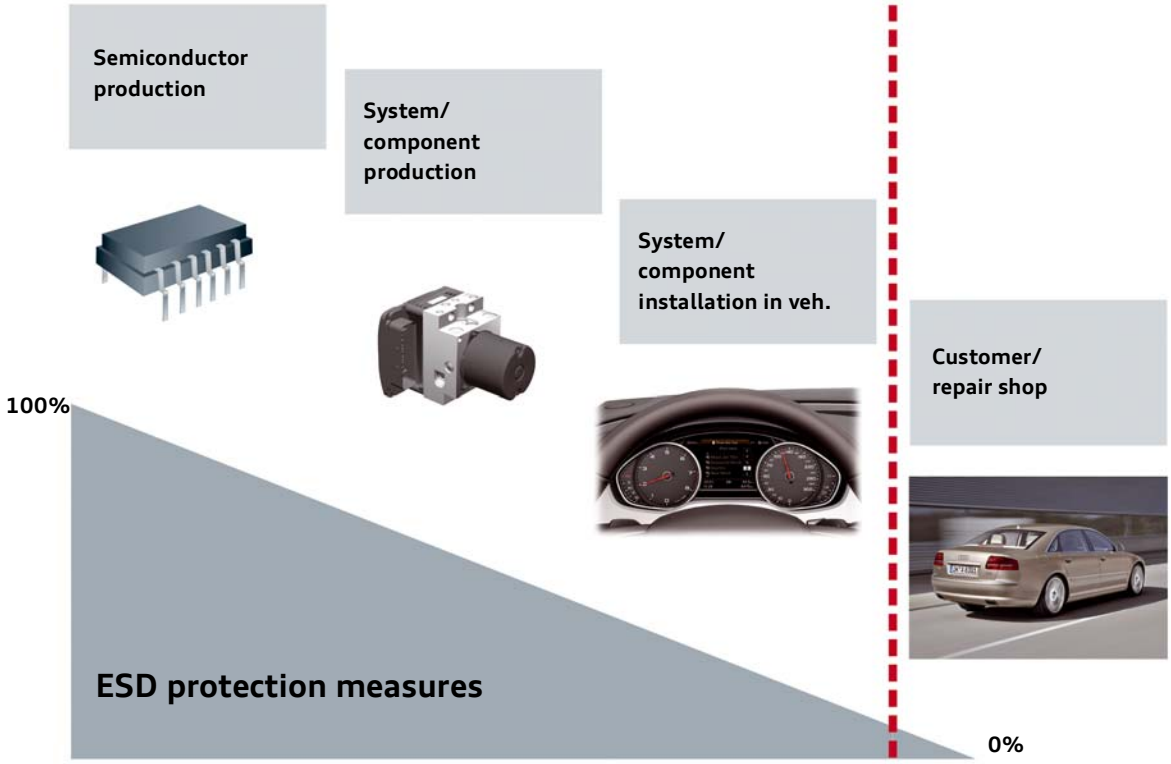
[1)] SAE = for North American market

Repairing electronic components using ESD protection

Electrostatic discharge (ESD) is one of the most frequent causes of the failure of semiconductor components. Especially sensitive in that regard are integrated semiconductor modules and LEDs which can often only tolerate very low voltages.

The protection of such components against electrostatic discharge has up to now diminished progressively throughout the process chain from manufacture to replacement in the repair shop.
For that reason, electrostatically sensitive devices (ESDs) could only be replaced as complete units up to now.

ESD protection process chain



459_073

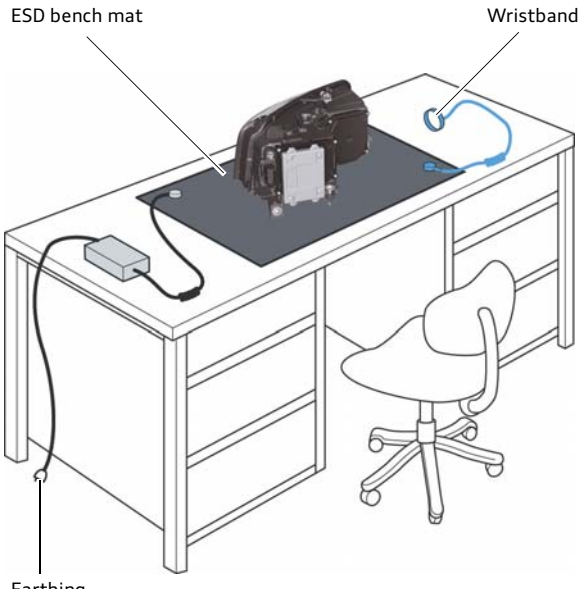
Equipment set VAS 6613

For the first time, electronic component repairs have now been allowed for the following assemblies on the Audi A8 '10:

- LED headlight units
- Xenon plus headlight units
- ABS control unit J104

The precondition for carrying out such repairs, in addition to the greatest possible cleanliness and care, is the use of an ESD-protected workspace. Such an ESD-protected workspace is achieved by the use of equipment set VAS 6613.

The replacement of individual parts of electronic components been made possible only by the introduction of this type of workspace, which will open the way to further potential applications in the future.



459_043

Self-study Programmes

This Self-study Programme summarises all the important information on the electrical system of the Audi A8 ’10. More detailed information on the subsystems referred to can be found in the following Self-study Programmes:

SSP 460 Audi A8 ’10 Convenience electronics and Audi tracking assist

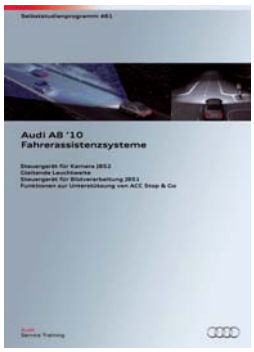
- Control unit with display in dash panel insert J285
- Convenience system control unit J393
- Background lighting
- Audi tracking assist

Order number: A10.5S00.64.20

SSP 461 Audi A8 ’10 Driver assistance systems

- The new image processing system
- The camera control unit J852
- Intelligent light system
- Intelligent light systemwith navigation system assistance
- The image processing control unit J851
- Functions of image processing system for ACC Stop & Go

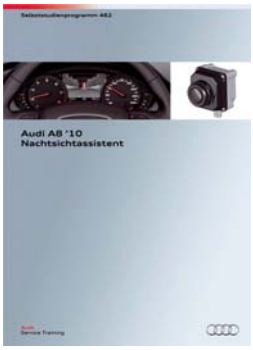
Order number: A10.5S00.65.20



SSP 462 Audi A8 ’10 Night Vision Assist

- How Night Vision Assist works
- System operation and displays
- System components
- System overview
- Diagnostic functions and system calibration

Order number: A10.5S00.66.20



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