The 2019 Audi A8 Electrics and Electronics

eSelf-Study Program 970293

Audi Academy

Audi of America, LLC
Service Training
Created in the U.S.A.
Created 01/2018

Course Number 970293

Always check Technical Bulletins and the latest electronic service repair literature for information that may supersede any information included in this booklet.

The eSelf-Study Program (eSSP) teaches a basic understanding of the design and mode of operation 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.

For further information about maintenance and repair work, always refer to the current technical literature.

Note

Reference

Revision: June 27, 2018

eMedia

This eSSP contains video links which you can use to access interactive media.

Introduction

The fourth generation of the brand flagship is, once again, the reference point defining the Audi brand – due to a new design language, an innovative touch concept and the introduction of mild hybrid technology (MHEV).

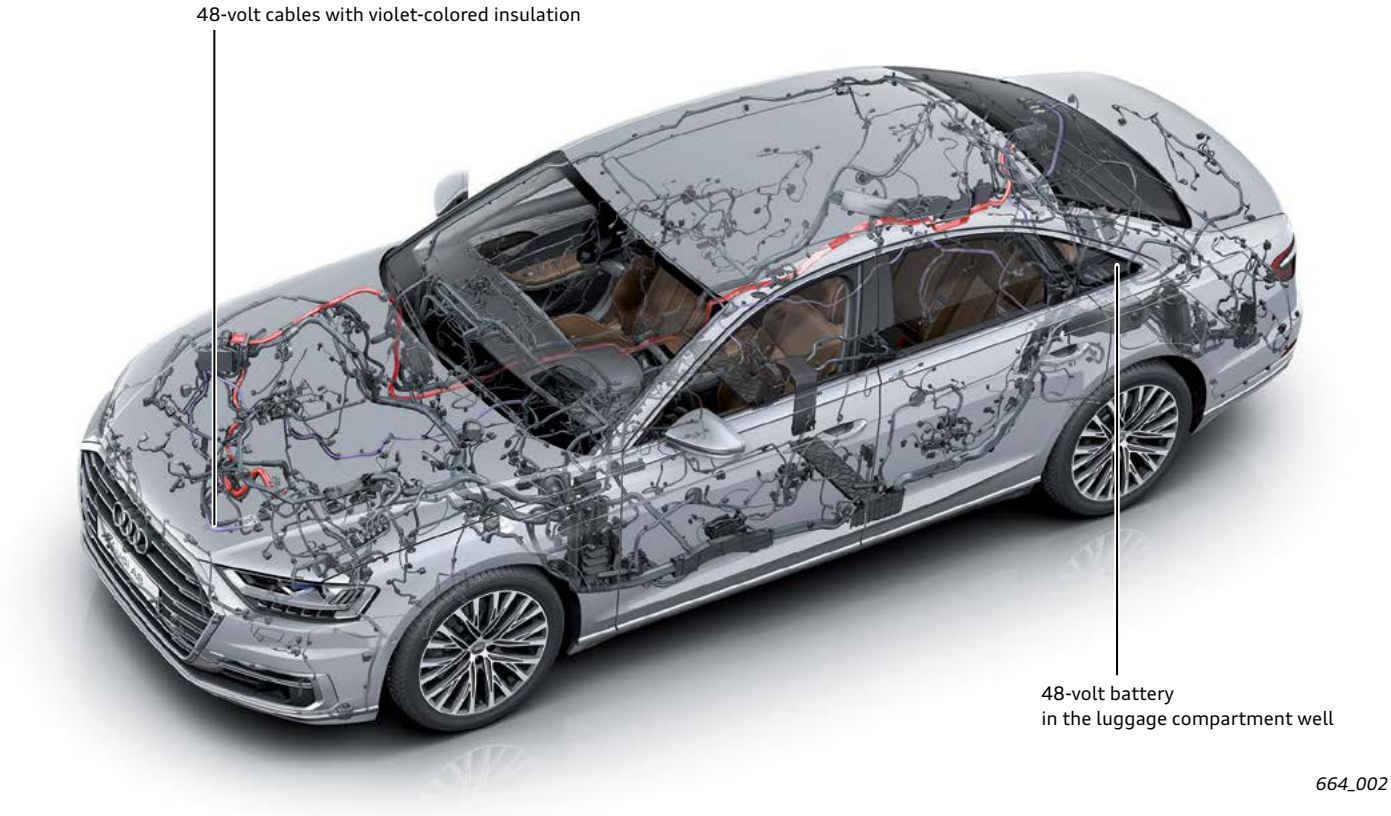
The MHEV technology of Audi is based on the newly developed 48 volt electrical system - it supplies the 12 volt electrical system, which in this case is the electrical subsystem. The 48-volt electrical system is powered by a belt alternator starter (BAS) which is connected to the engine serpentine drive. A lithium-ion battery, positioned safely under the luggage compartment floor, serves as an energy storage device.

Taken together, these measures further improve the already high fuel efficiency of the engines.

The mild hybrid drive in the new Audi A8 has two central building blocks. One of them is the water-cooled belt starter generator mounted to the end face of the engine. A high-performance poly V belt connects it to the crankshaft. The belt starter generator has a recuperation capacity of 12 kW and produces up to 44.25 lb ft (60 Nm) of torque.

The second component is a lithium-ion battery with a charge capacity of 10 Ah and a voltage capacity of 48 volts. The newly developed 48-volt electrical system is the main electrical system. The 12-volt electrical system is coupled to the main electrical system via a DC-to-DC converter. The lithium-ion battery housed in the luggage compartment is about the same size as a large lead acid battery. A closed-loop air cooling system provides thermal management.

The 48-volt MHEV technology is particularly unobtrusive and efficient. When the driver takes his foot off the accelerator at speed of between 34.1 and 99.4 mph (55 and 160 km/h), the car can coast for up to 40 seconds with the engine completely disengaged. The start-stop phase begins at 13.6 mph (22 km/h) when coasting at low speed. For a more complete description of an MHEV, please refer to page 26.



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Learning objectives of this eSelf-Study Program:

This eSelf-Study Program describes the electrical and electronic systems of the 2019 A8. When finished, you will be able to:

- Explain the components of the 48-volt electrical system.
- Explain the functions and tasks of the Starter Generator C29.
- List the installation locations and new features of the control modules for the electrical system, networking and comfort/convenience electronics.

Power supply

12-volt car battery

The 12 volt battery of the A8 is located in the right hand side of the luggage compartment behind a trim panel. Depending on vehicle equipment, either an EFB[1)] or AGM battery[2)] is used.

Fuse Panel SA and Battery Interrupt Igniter N253 are attached to the positive battery terminal. If the igniter is activated, the starter, secondary air pump, and radiator fans are disconnected from Terminal 30.

Battery Monitoring Control Module J367 is located at the negative terminal of the 12 volt battery. J367 and the ground cable form a unit. The term battery data module (BDM) is sometimes also used for J367. The battery should only be tested using the VAS Scan Tool via GFF or Guided Functions. J367 also evaluates the history data of the battery. As in other Audi models, if the battery is replaced, it must be adapted using the Scan Tool.

664_004

EFB battery

An EFB is a heavy duty wet cell battery. The positive plates are coated with an additional polyester film which provides the active mass of the battery with additional stability. The deep cycle resistance of this type of battery is higher than that of a conventional battery.

AGM car battery

With AGM car batteries, the battery electrolyte is absorbed by a glass microfiber mat. In addition to having higher deep-cycle resistance, the AGM car battery is noted for its leak-proof design. This is very important for installation of the battery inside the car. When charging, it is important to follow the charger's operating instructions and, if necessary, to set the charger program for AGM car batteries.

The following car batteries are used in the Audi A8 worldwide:

EFB battery	AGM car batteries
69 Ah/360A	68 Ah/380 A
70 Ah/420 A	92 Ah/520 A
	105 Ah/580 A

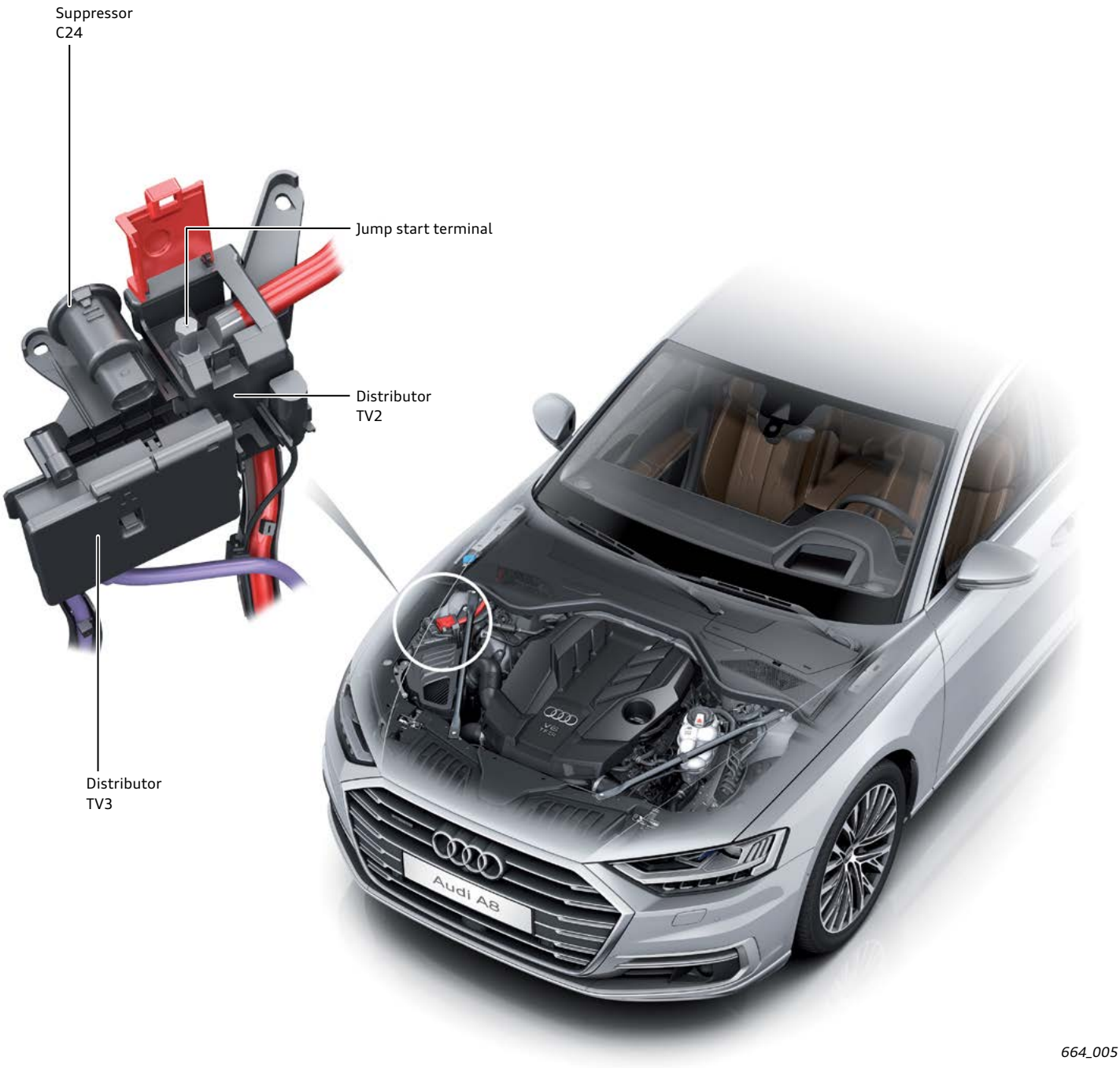
[1)] **E**nhanced **F**looded **B**attery

[2)] **A**bsorbent **G**lass **M**at

Jump start terminal

The jump start terminal is located in the engine compartment on the right-hand side, between the coolant reservoir and the plenum chamber.

This connection can also be used for charging both car batteries in the showroom or for purposes of diagnostic work in the workshop.



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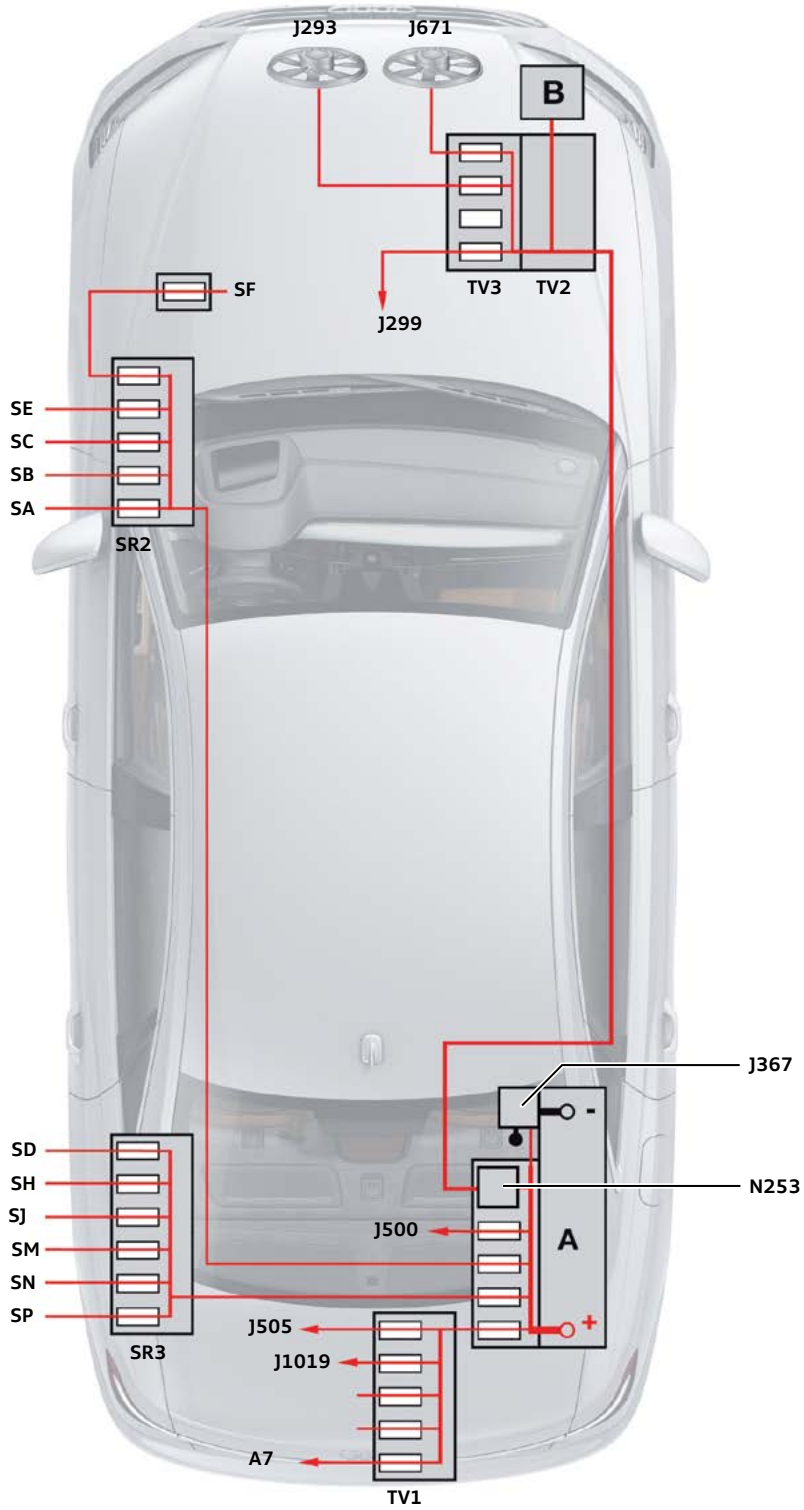
The jump starting terminal is located on the Terminal 30 distributor TV2. It is supplied with voltage via a red 70 mm^2 cable from the 12-volt car battery. The Terminal 30 distributor TV3, which has three fuses, is located directly adjacent to TV2.

The radiator fans, and the secondary air pump are supplied with voltage through these three fuses. The black 70 mm^2 cable connecting to distributor TV2 leads to the 12-volt starter motor. The interference suppression capacitor C24 is located adjacent to the distributor.

12-volt supply structure



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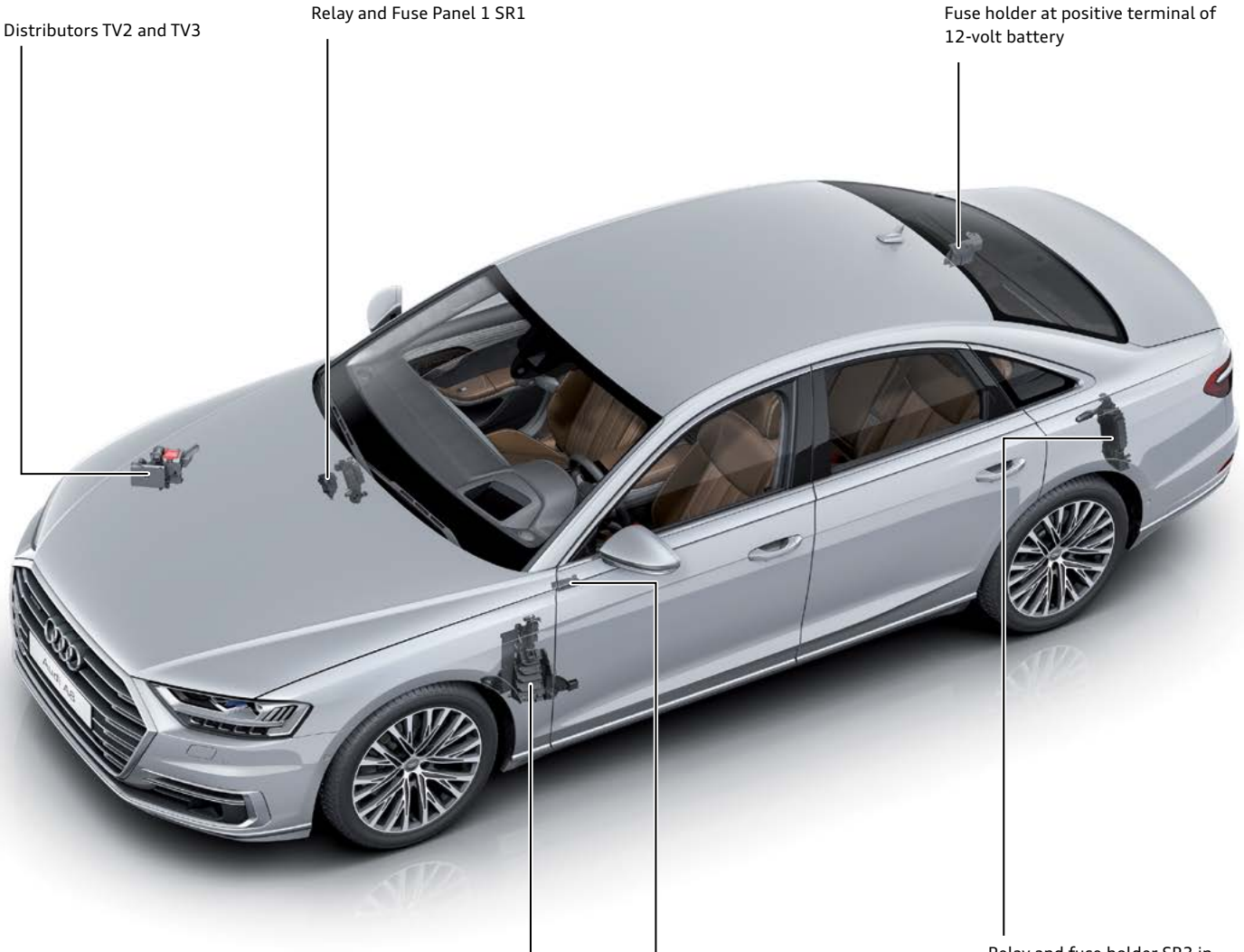
Key:

A	12-volt battery
A7	Voltage Converter, 48 V/12 V
B	Starter
J293	Radiator Fan Control Module
J299	Secondary Air Injection Pump Relay
J367	Battery Monitoring Control Module
J500	Power Steering Control Module
J505	Windshield Defogger Control Module
J671	Radiator Fan Control Module 2
J1019	Rear Axle Steering Control Module
N253	Battery Interrupt Igniter
SF	Fuse Panel F
SR2	Relay and Fuse Panel 2
SR3	Relay and Fuse Panel 3
TV1	Distributor in luggage compartment, right
TV2	Distributor in engine compartment on left
TV3	Distributor in engine compartment on right

Fuses and relays

The fuses are identified by the letter "S" and by a number in the current flow diagram. This also applies to other individual fuses distributed throughout the vehicle.

The fuses connecting to the relay and fuse holders SR2 and SR3 as well as the fuses connecting to fuse holder SF are also accessible to the driver and also described in the vehicle Owner's Manual.



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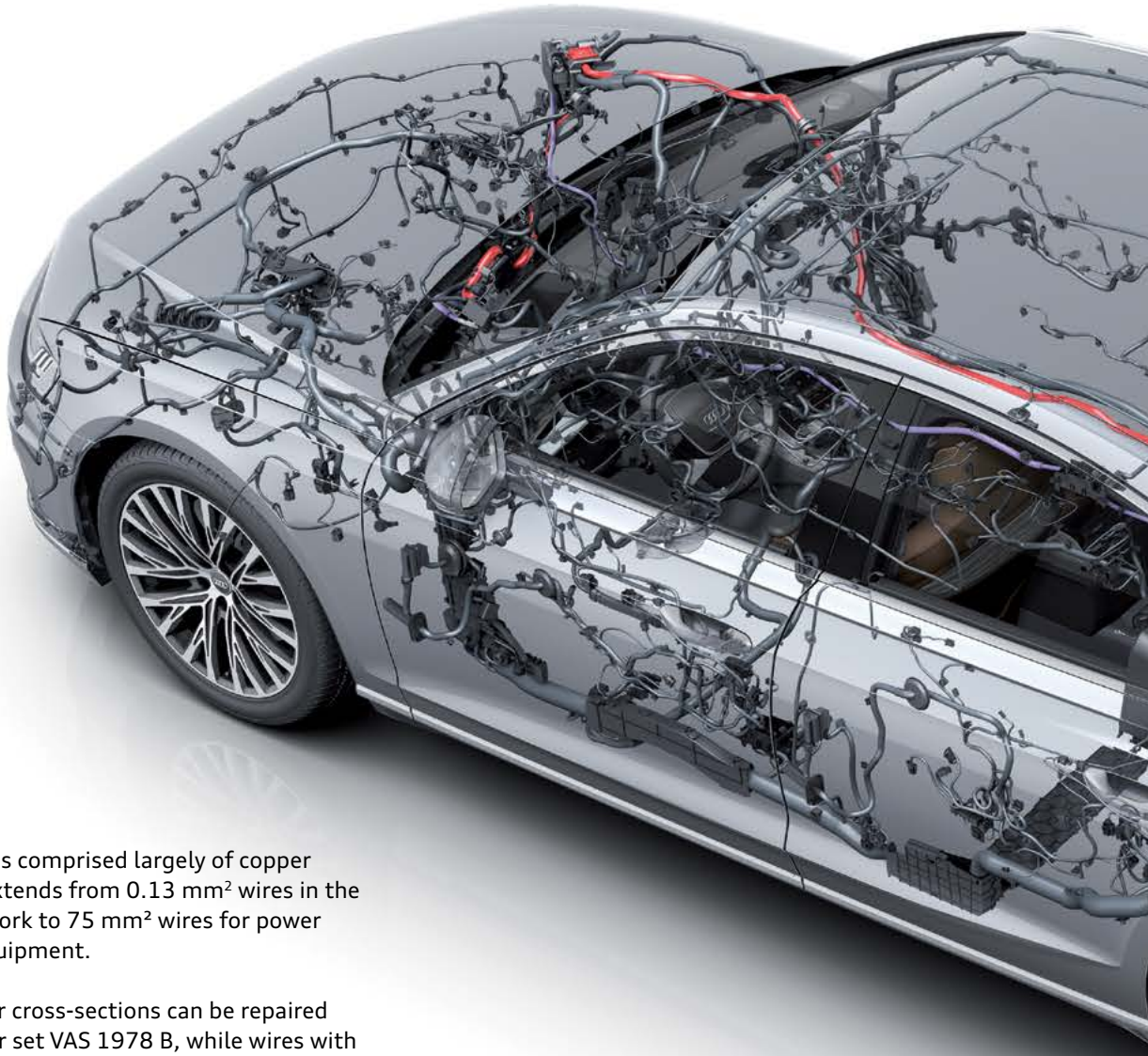
Note
When locating fuse assignments, please refer to the latest current flow diagrams in ElsaPro.

Electrical wiring

Main battery lead

Like its predecessor, the Audi A8 has an aluminum main battery cable. Unlike in the previous model, this is a single-piece cable. It is insulated by a red PVC coating and has a wire cross-section of 150 mm². It begins at the positive terminal of the 12-volt battery as a flexible round conductor.

It continues from the luggage compartment to the right-hand side sill as a torsionally rigid flat-section conductor. Then, as a flexible round-section conductor in the area of the A pillar, it runs from through the engine bulkhead into the engine compartment to the distributor TV2.



Copper wires

The A8 electrical system is comprised largely of copper wires. The range of use extends from 0.13 mm² wires in the area of the CAN bus network to 75 mm² wires for power supply to high-output equipment.

Copper wires with smaller cross-sections can be repaired with wiring harness repair set VAS 1978 B, while wires with cross-sections of 10.0 mm² and 16.0 mm² can be repaired with wiring harness repair set VAS 631 003. Wires with cross-sections greater than 16.0 mm² have to be replaced if damaged.

eMedia

Repairing aluminum wires

eMedia

Wiring harness repair using the VAS 631003

Reference

For further information refer to eSelf-Study Program 970563 The 2017 A4 Electronic and Electrical Systems.

Aluminum wires

Aluminum wires with cross-sections of 2.5 mm^2, 4.0 mm^2 and 6.0 mm^2 are used in addition to the main battery cable. Unlike the main battery cable, these wires can, if damaged, be repaired with wiring harness repair set VAS 631 001.

The use of aluminum alloys in certain areas of the vehicle provides a further reduction in the weight of the wiring harness. Aluminum wires are not installed in areas where wires are moved, for example, in the doors, because they are less flexible than copper wires.

664_008

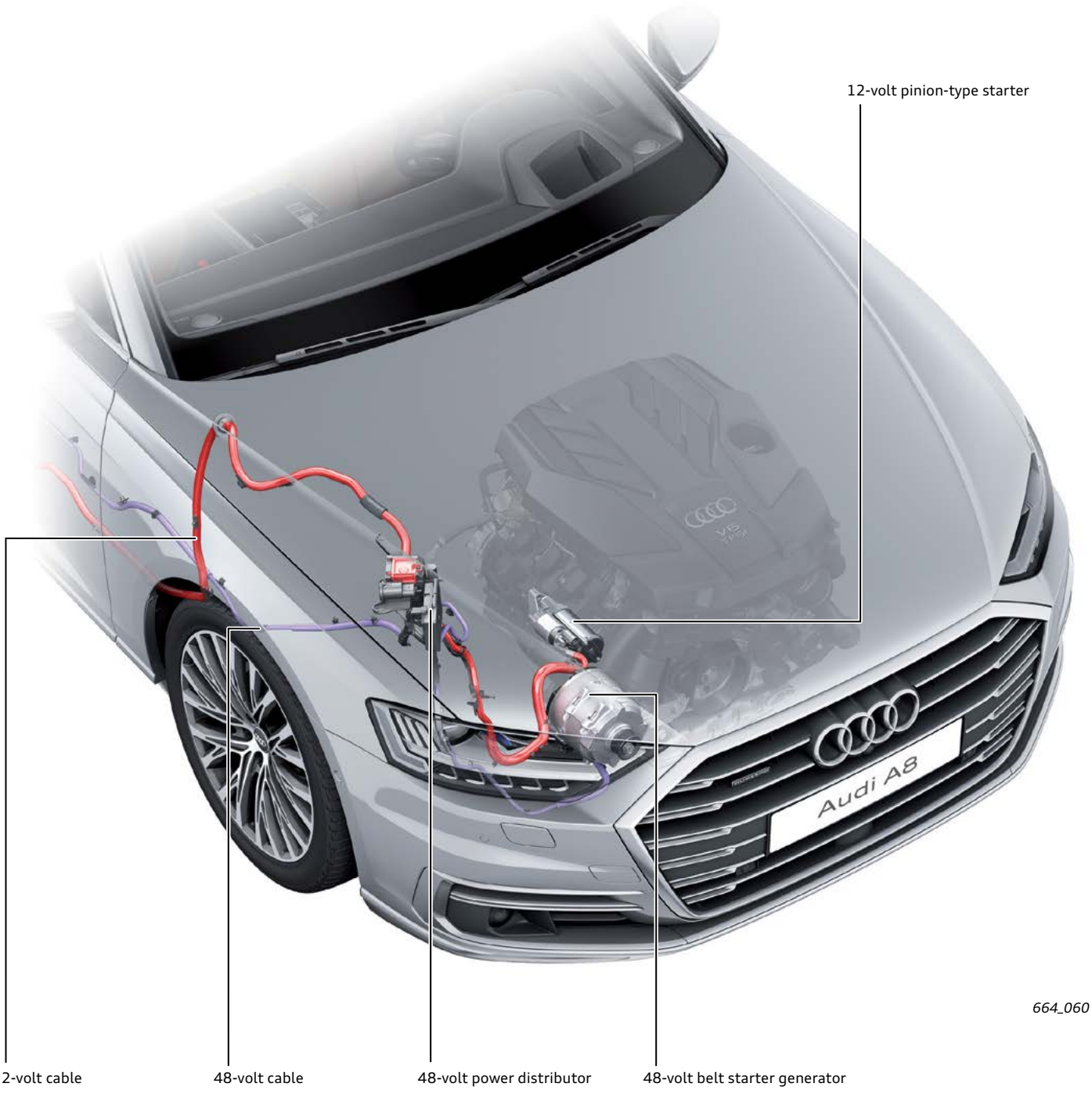
48-volt electrical system

General description

The 2019 A8 is the first North American Audi model to be powered by a 48-volt electrical system. It uses a water-cooled 48-volt belt starter generator and a 48-volt lithium-ion battery. The 48-volt main electrical system also provides the basis for the mild hybrid technology. The Audi A8 is also known commonly as a 48-volt MHEV (Mild Hybrid Electric Vehicle).

Two new terminal designations were introduced at the launch of the 48-volt electrical subsystem:

- Terminal 40 for the 48-volt positive side.
- Terminal 41 for the 48-volt negative side.

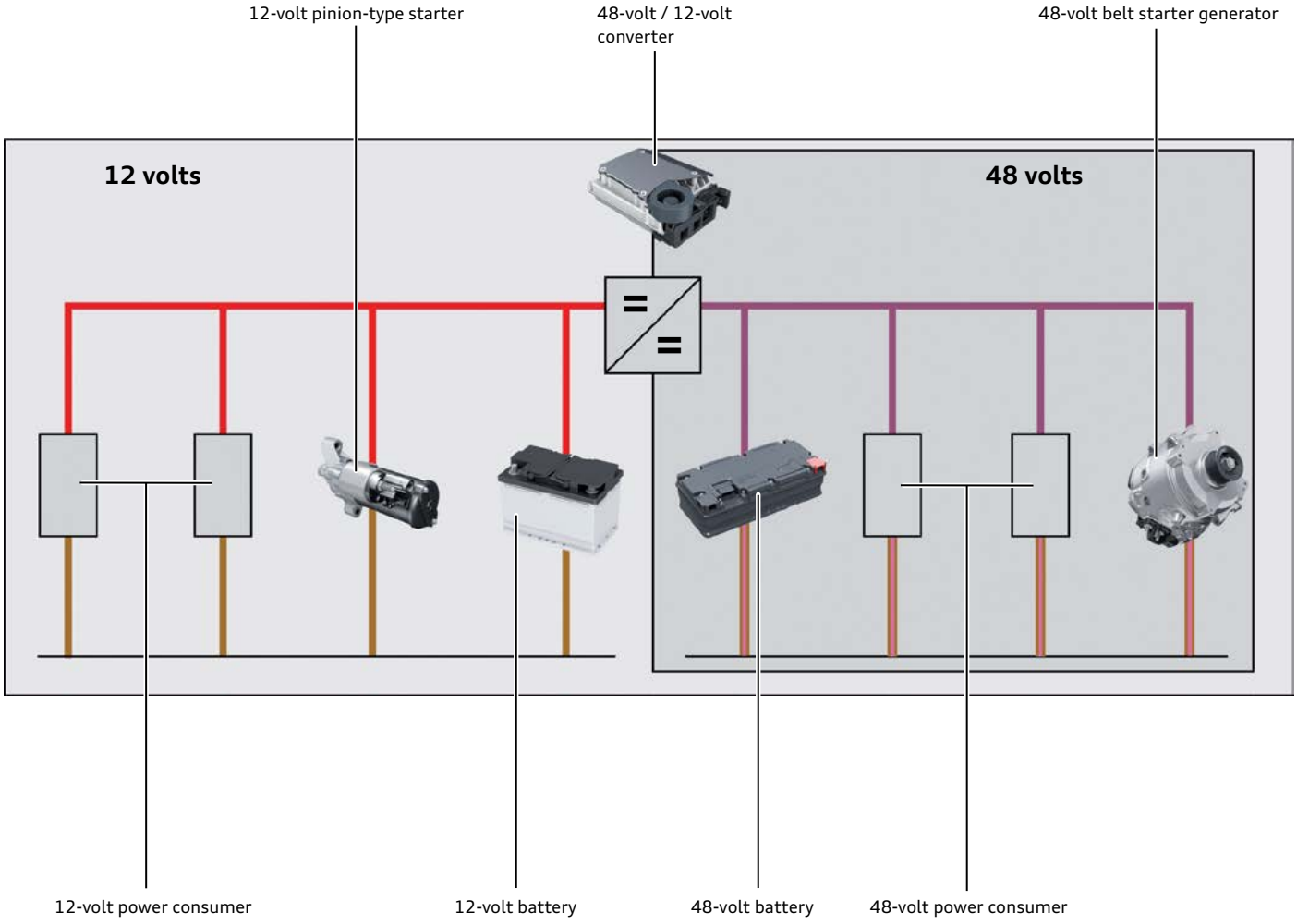


Components of the 48-volt electrical system

The main components of the 48-volt electrical system are the belt starter generator and the lithium-ion battery. The belt starter generator is the power source for the 48-volt electrical system. If operated as a starter, it has to be considered a power consumer within the 48-volt system. The voltage converter is the link between the 48-volt electrical system and the 12-volt electrical system.

The 12-volt electrical system, with its lead acid battery, supplies all 12-volt power consumers. At the launch of the Audi A8 these include all control modules as well as the 12-volt pinion-type starter. However, it is only used for cold-starting the TFSI engine or for starting it for the first time. All other starting processes are implemented using the 48-volt belt starter generator.

Circuit diagram



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Energy management

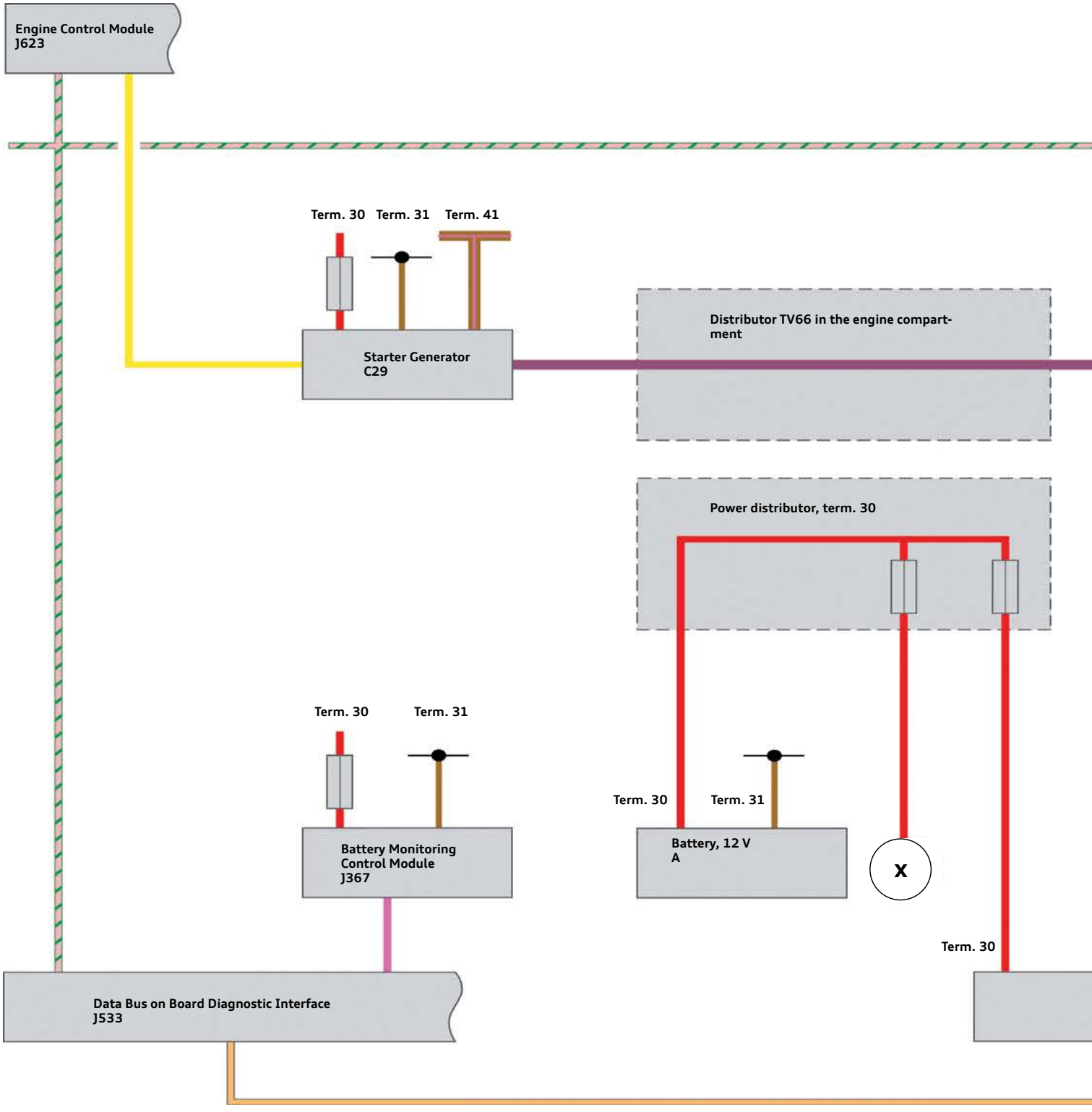
Data Bus on Board Diagnostic Interface J533 (gateway) handles the task of energy management for the 12-volt electrical system as well as the 48-volt electrical system. J533 receives information on the status of the 12-volt battery from Battery Monitoring Control Module J367, which communicates with J533 via a LIN bus.

The belt starter generator sends information across a sub-bus system to Engine Control Module J623, which in turn, communicates with the gateway via the FlexRay bus. The gateway communicates with the voltage converter and the 48-volt battery via the hybrid CAN bus.

For a schematic diagram of the 48-volt electrical system including the 12-volt components relevant to the power supply, refer to the following double page.

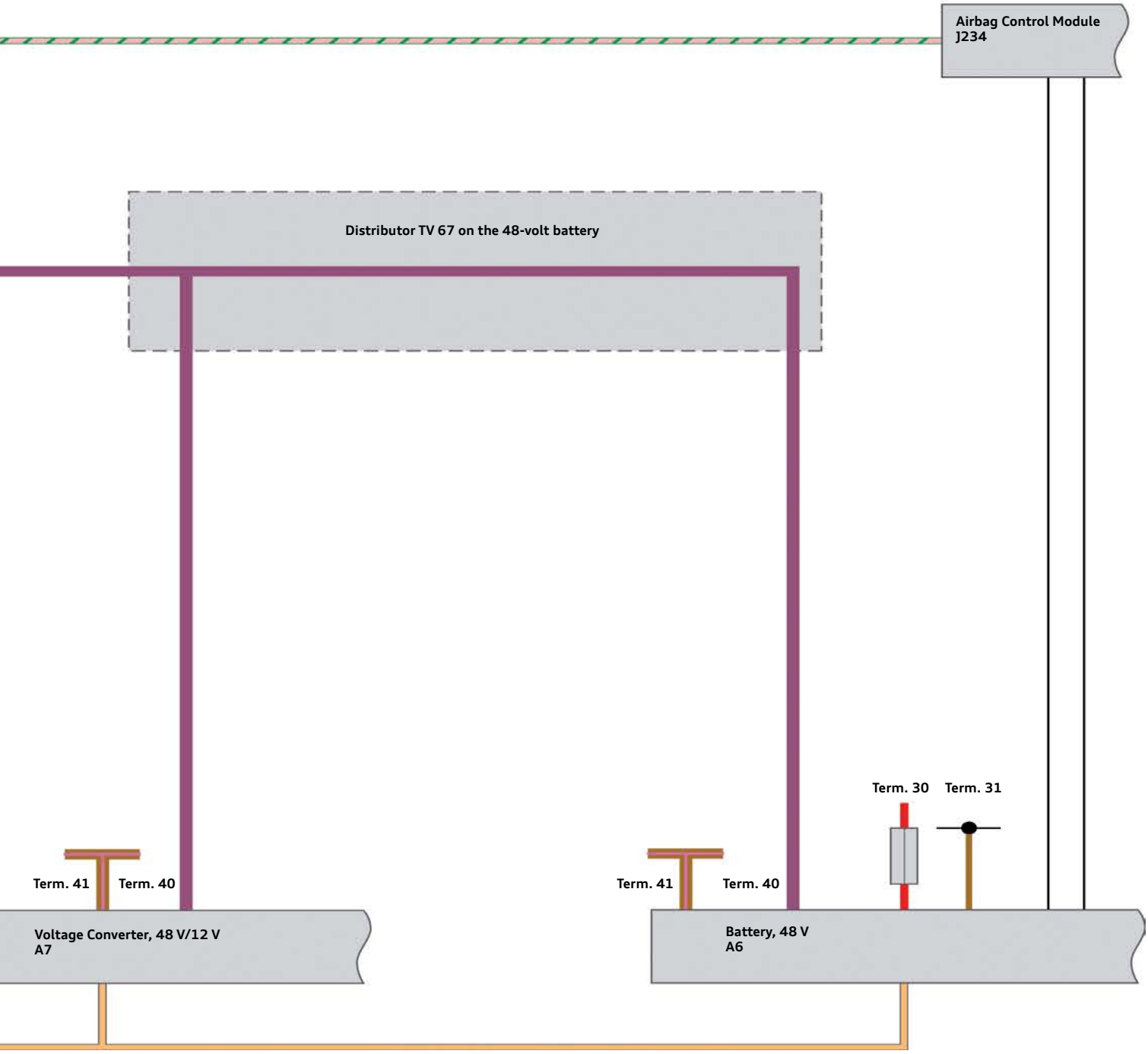
Design of the 48-volt electrical system

Schematic diagram



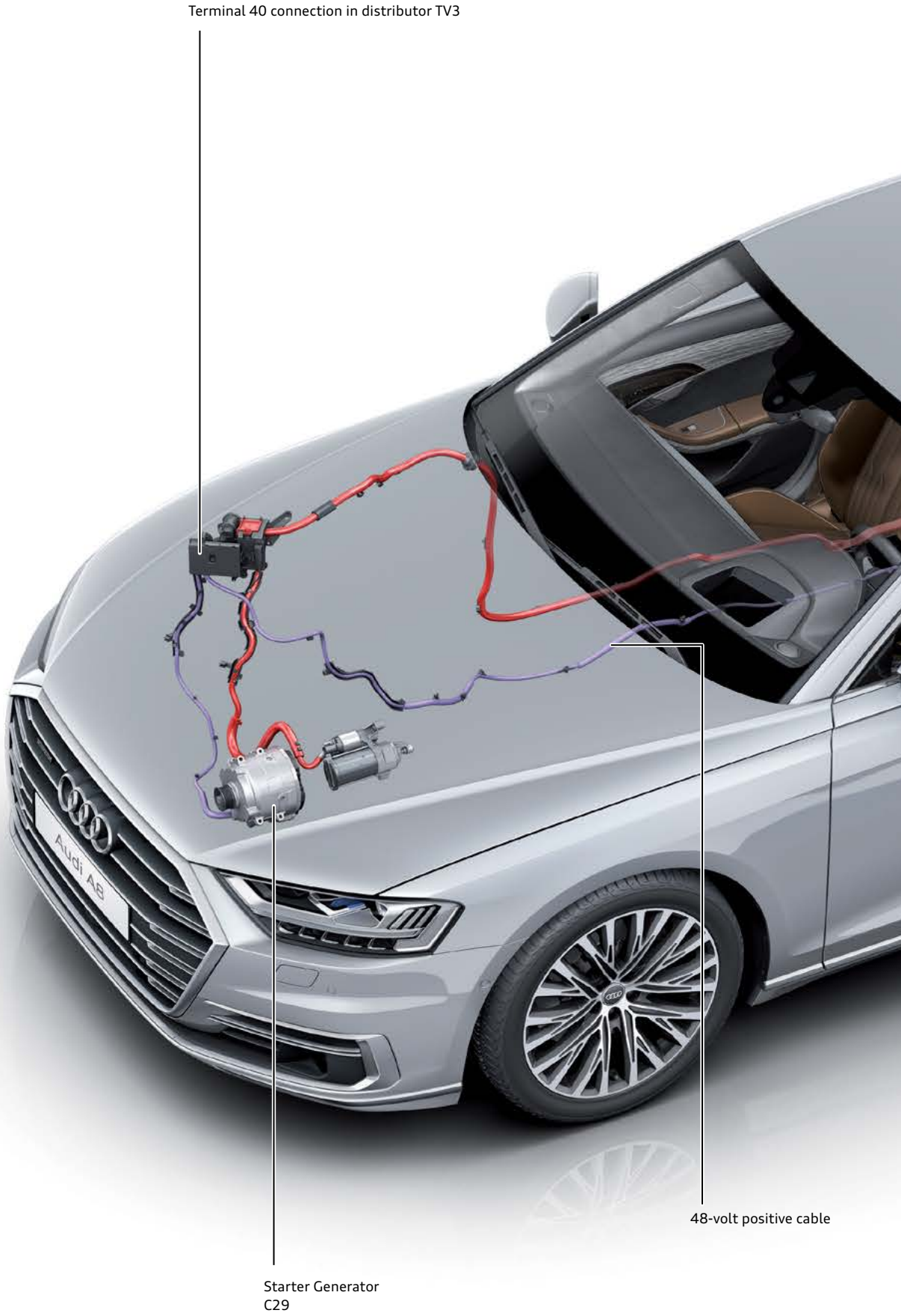
Key:

- Hybrid CAN
- FlexRay
- LIN bus
- Sub-bus systems
- 12 volts DC
- Discrete signal lines
- 48-volt DC positive side
- 48-volt DC negative side
- (X) To the 12-volt power consumers


Airbag Control Module
J234
Distributor TV 67 on the 48-volt battery
Term. 30
Term. 31
Term. 41
Term. 40
Term. 41
Term. 40
Voltage Converter, 48 V/12 V
A7
Battery, 48 V
A6

664_062

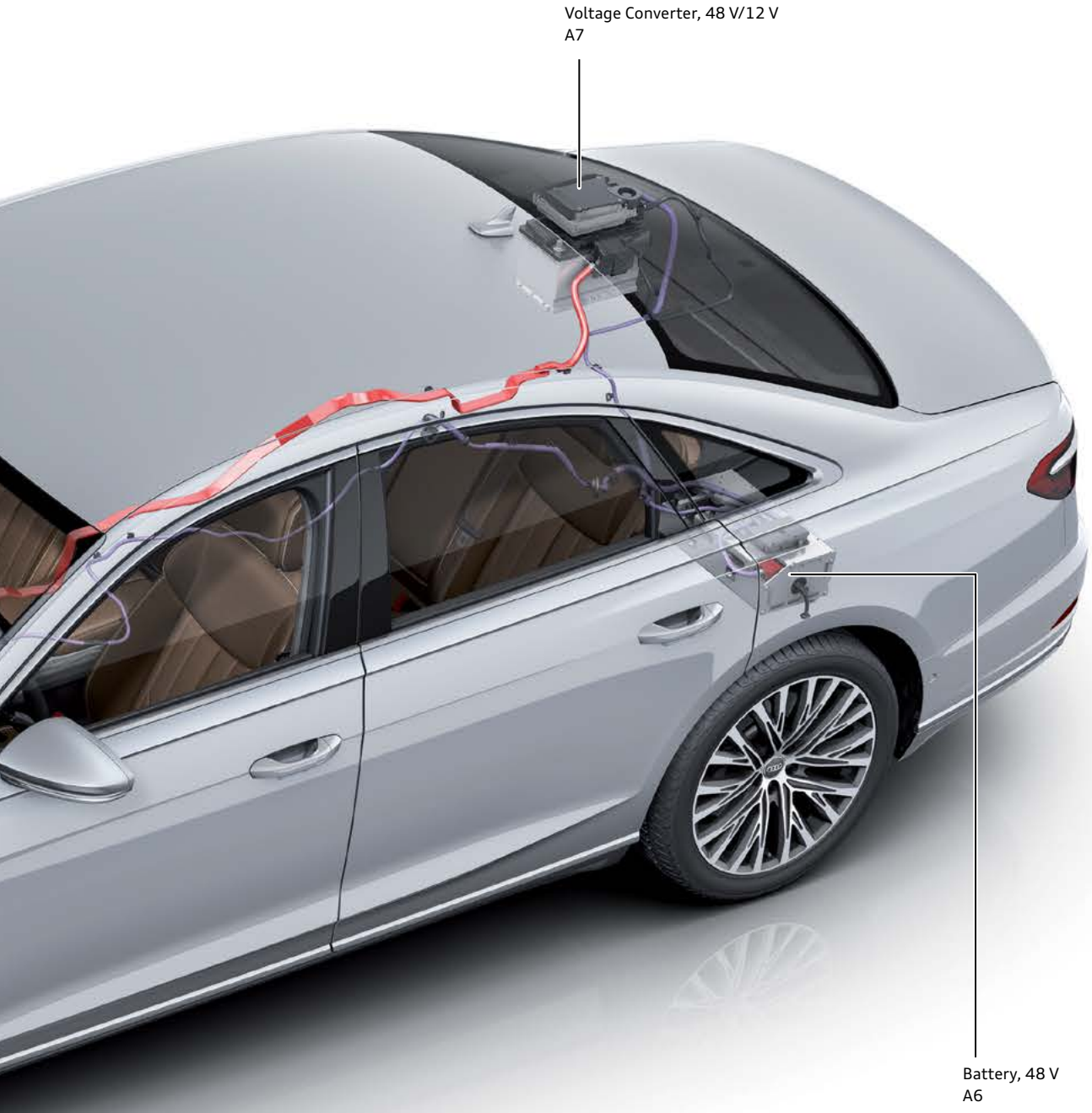
Overview of the 48-volt components



Key:

48-volt DC voltage cables

12-volt DC voltage cables



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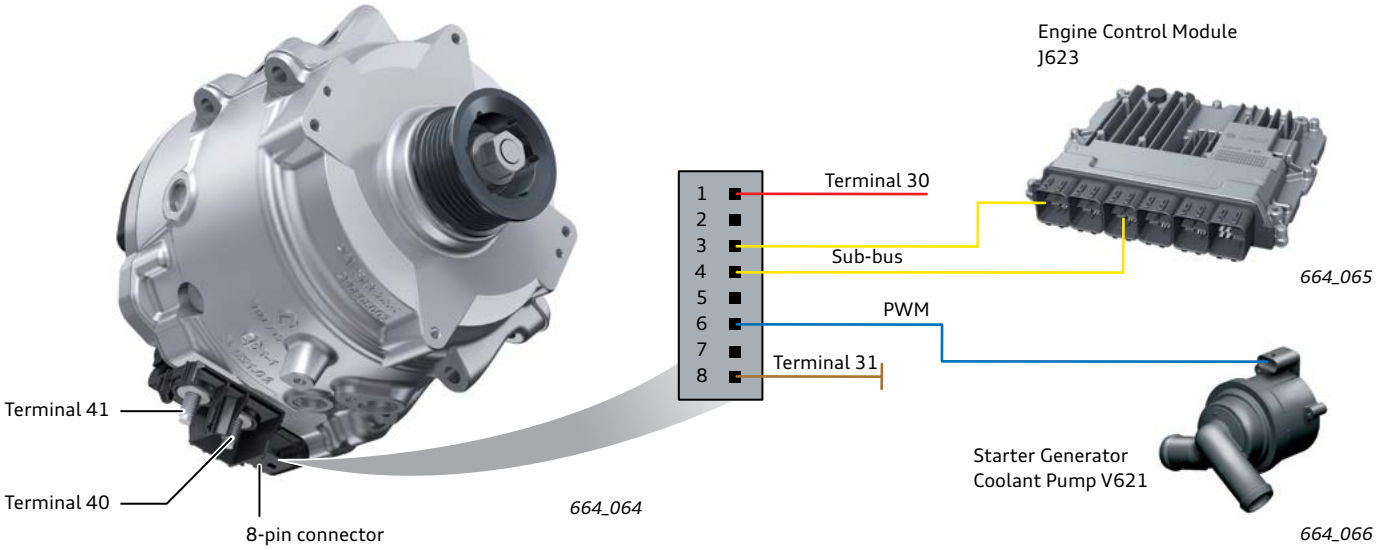
Starter Generator C29

General description

Starter Generator C29 is a 48-volt belt starter generator. As a generator, it charges the 48-volt battery and supplies the voltage converter with 48 volts DC. As an electric motor, it can be used both as a starter and as a booster for the TFSI engine.

It is water-cooled and has an electrical water pump. C29 communicates with the engine control module via a sub-bus connection (private CAN bus) and activates Starter Generator Coolant Pump V621 by generating a pulse-width-modulated (PWM) signal.



Activation of Starter Generator Coolant Pump V621

V621 is activated in an engine-specific fashion. It is connected directly to the engine control module. The integration of V621 into the engine cooling system varies from one engine type to another. In some engines coolant flow through the starter generator is assisted by the main water pump, while in others it is not.

In some cases, V621 performs additional tasks within the engine cooling system. The conditions under which the starter generator coolant pump is operated are defined in the engine control module software. The pump can be activated using the VAS Scan Tool.

Specifications

Designation	Starter Generator C29
Address Word	00CC
Communication	Private CAN to engine control module
48-volt positive / negative terminal designations	40/41
Nominal rpm	6000 rpm
Transmission ratio (starter generator /TFSI engine)	2.72 – 3.40 (depending on engine type)
Rated voltage in motor mode	40 volts
Rated voltage in generator mode	51.5 volts
Rated output in motor mode (boost for the TFSI engine, for maximum 5 seconds)	approximately 8 hp
Rated output in generator mode (recuperation [2], for maximum 5 seconds)	approximately 18 hp
Continuous rated output in generator mode	approximately 6 hp
Maximum torque in motor mode	60 Nm

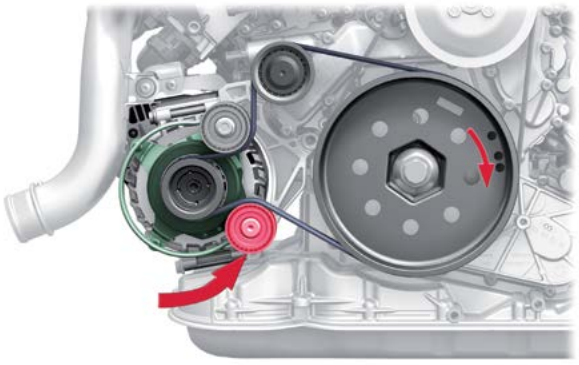
[1] Recuperation: energy recovery, for example, in overrun or under braking, the kinetic energy of the vehicle is transformed into electrical energy.

Connection to the TFSI engine

The Starter Generator C29 and the TFSI engine are connected by a poly V belt. The starter generator places heavy demands on the belt tensioner as is the driven element in generator mode, but is the driving element during engine operation, for example, during start-up.

The tensioning element of the belt tensioner has been adapted to meet the requirements of each engine and can be attached directly to the starter generator or to the engine block. It is important that the belt tensioner provide the poly V belt with as large an arc of contact as possible around the starter generator belt pulley.

C29 operating as a generator



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C29 operating as a starter

664_068

664_069

Examples of belt tensioner versions

The illustration shows the starter generator of a 3.0l TFSI engine. The belt tensioner is attached to the engine block.

Note

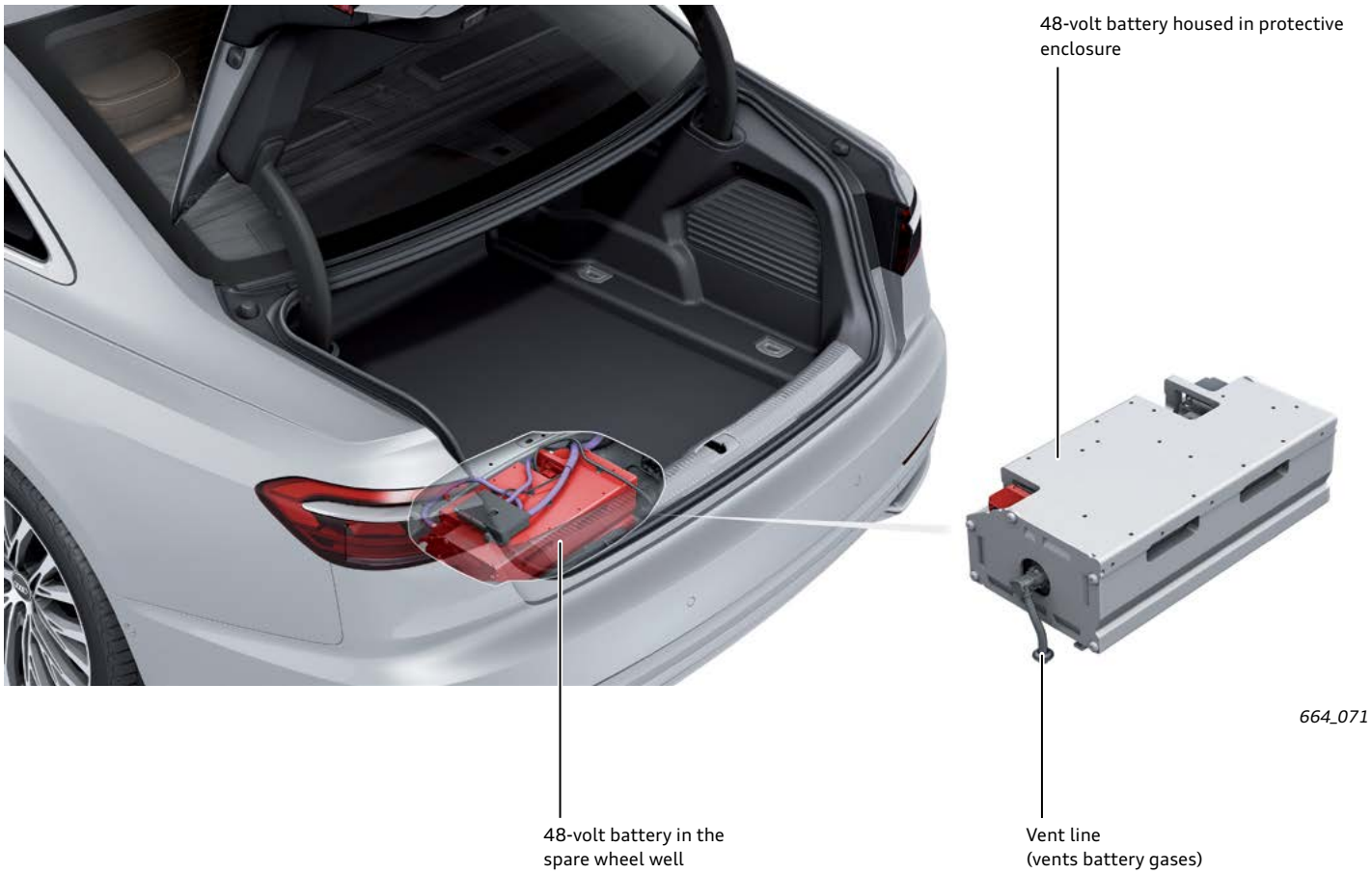
No provision had been made for periodic replacement of the poly V belt at the time of preparation of this eSelf-Study Program. Always refer to the instructions given in the service literature.

48 Volt Battery A6

Installation location

The 48 volt battery is installed in the spare tire well. It is a lithium ion battery. This type of battery has advantages over lead acid batteries such as higher energy density and higher deep cycle resistance. However, lithium ion batteries have to be protected from exhaustive discharge cycles which can cause the battery cells to short circuit.

Mechanical damage can also cause internal short-circuiting and chemical reactions due to the ingress of atmospheric moisture. The battery housing is made from plastic. It is also covered inside the vehicle by a metal enclosure attached to the vehicle underbody.



Battery components

- Plastic battery housing.
- Control module (battery management).
- 13 lithium-ion battery cells.
- 1 relay.
- 1 fuse.
- Fans.

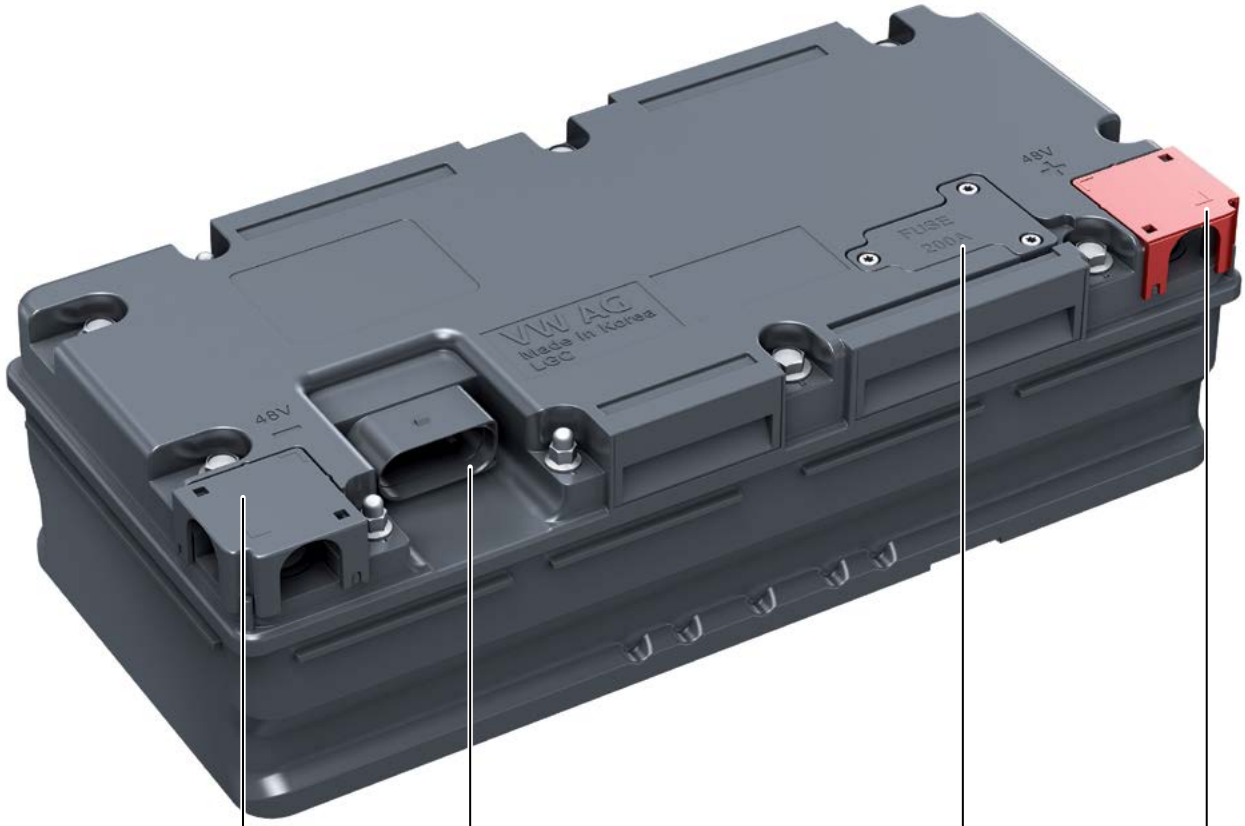
Connectivity

A6 is a hybrid CAN user and can be accessed with the VAS Scan Tool using Address Word 21. The positive side of the 48-volt DC voltage system is designated "Terminal 40" and the negative side is designated "Terminal 41".

The control module in the 48-volt battery measures the voltage and temperature of the individual cells and transfers this data to Data Bus on Board Diagnostic Interface J533. In addition to this, it activates the internal fans if a critical storage temperature is reached.

Specifications

Designation	48 Volt Battery A6
Address Word	21
Communication	Hybrid CAN
Positive/negative terminal designations	40/41
Rated voltage in V	48
Capacitance in Ah	9.6
Number of cells	13
Cell voltage in V	3.68
Operating temperature	- 22 to 140 °F (-30 to 60 °C)
Weight	Approximately 22.0 lb (10 kg)
Cooling	Air (active) via fans



48-volt negative terminal
Terminal 41

Connection for the
battery-integrated control module

Battery-integrated fuse
The fuse is **not** designed for replacement

48-volt positive terminal
Terminal 40

664_073

Battery-integrated control module

In addition to the 12-volt power supply and the hybrid CAN communication lines for the control module, signal wires running from the Airbag Control Module J234 are still connected to the battery-integrated control module.

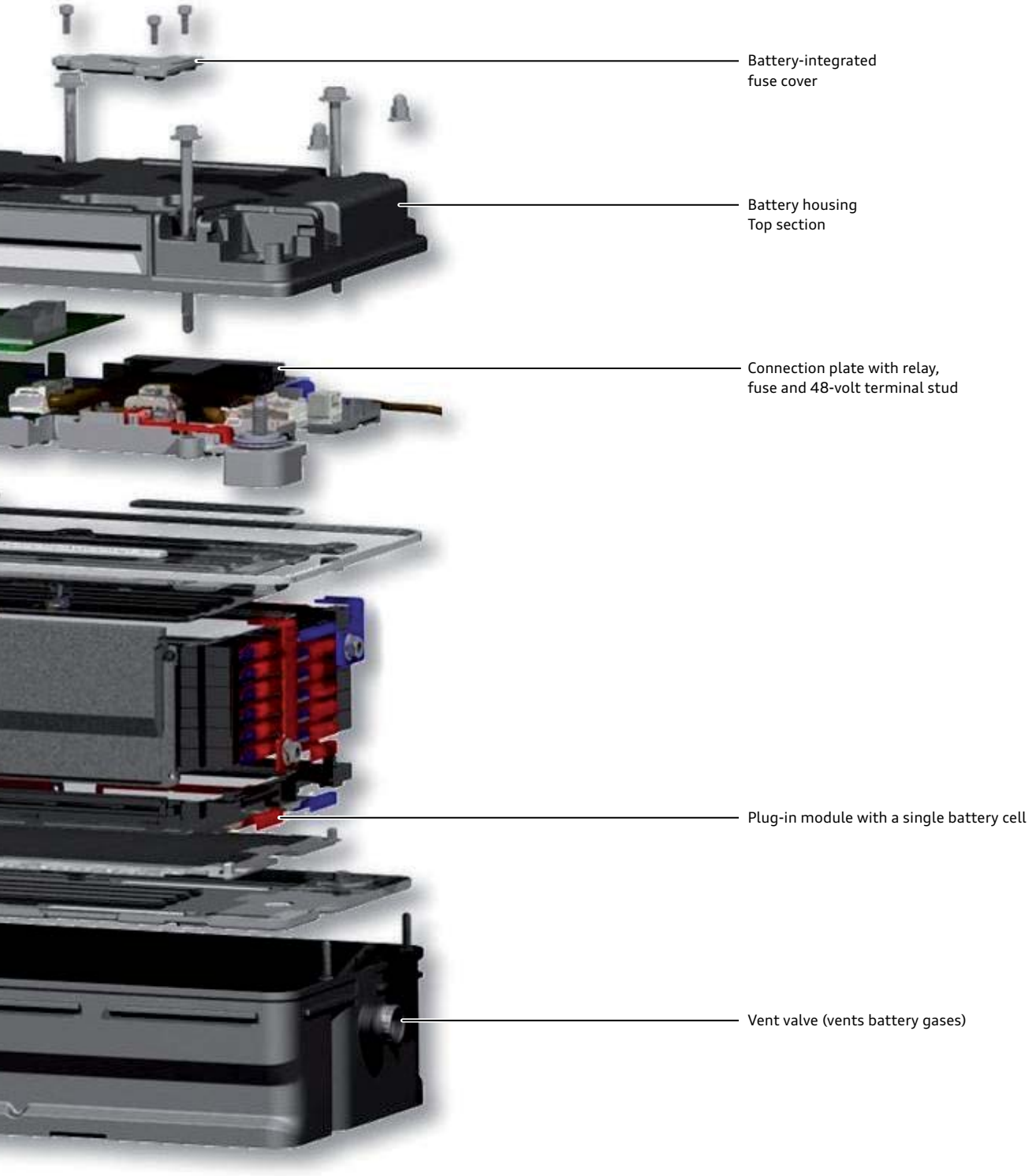
In an airbag deployment situation, the power contactor in the battery A6 is opened and the 48-volt electrical system is de-energized.

Battery design

Charging, jump-starting and replacement

When the engine is running, the 48-volt battery is charged directly by the starter generator. When an external 12-volt charger is used for charging at the 12 volt jump start terminal, the 48-volt battery is charged via the voltage converter. There is no provision for connecting a charger directly to the 48-volt battery.

The 12-volt jump start terminal in distributor TV 3 is available for jump-starting.



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The VAS Scan Tool must be used for battery testing (classification). The battery data is read from the built-in control module of the 48-volt battery and assessed.

If the battery is not installed in the vehicle, the Scan Tool can be connected to a battery via high-voltage diagnostic box VAS 5581 and adapter cable VAS 5581/1A.

Voltage Converter, 48V/12V A7

Installation location

A7 is installed behind the right-hand luggage compartment trim above the 12-volt battery,

Like the 12-volt battery, the voltage converter can be accessed after removing the protective cap.

Function

The Voltage Converter, 48 V/12 V A7 is a bidirectional voltage converter. This means that the 12 volts generated by the alternator is converted to 48 volts. It is also converted back to 12 volts in order to charge the 12 volt battery.

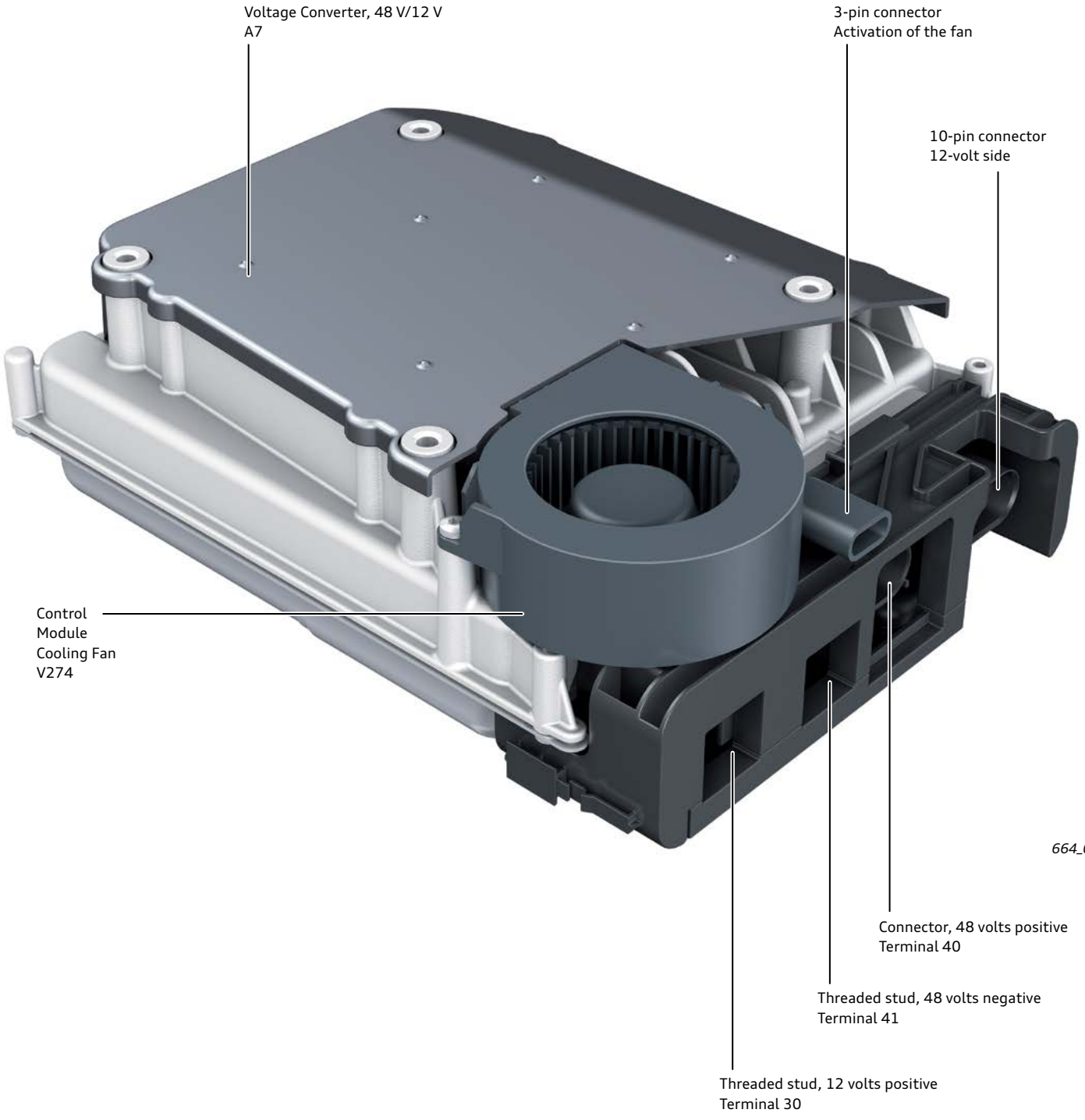
In addition, the 12 volts can be converted to 48 volts under certain conditions. This happens when, for example, an external charger is connected to the vehicle via the 12-volt jump start terminals.

Activation of Control Module Cooling Fan V274

V274 is activated by the voltage converter. The three wires from the 3-pin fan connector lead directly into the 10-pin connector at the voltage converter. The fan does not run continuously when the engine is running, but only when the voltage converter requires active cooling. The fan does not have a run-on function. To check the fan, technicians have the option of running an actuator output check for the V274 using the Address Word of the voltage converter.

Specifications

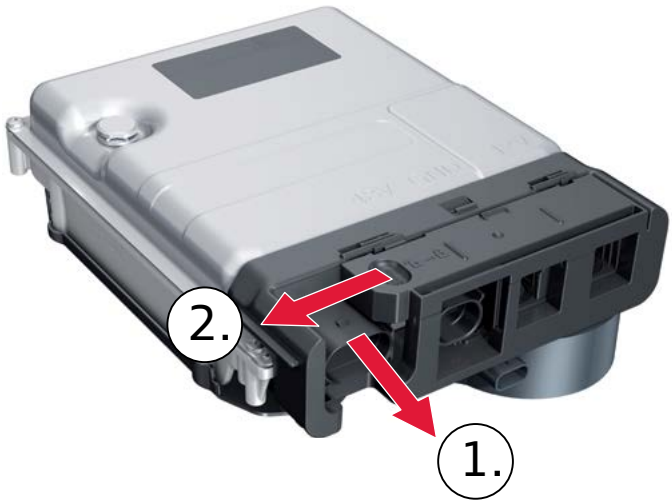
Designation	Voltage converter, 48 V / 12 VA7
Address Word	C4
Communication	Hybrid CAN
Terminal designations 48V positive/negative	40/41
Terminal designations 12 V	30
Power in kW	Approximately 3
Weight	Approximately 5.51 lb (2.5 kg)
Cooling	Air (passive)



Connections

The connector for Terminal 40 as well as the two threaded studs for Terminals 41 and 30 are protected by a cover flap. To access the terminals, this flap first has to be unlocked and then opened. The 10-pin connector prevents the cover flap from being unlocked (moved). The flap cannot be unlocked until the connector has been disconnected from the voltage converter. The flap can then be opened, providing access to the terminals.

Unlocking the flap



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Opening the flap

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Operating scenarios

Even if driving represents the "normal" operating state of a vehicle, other scenarios are possible. These scenarios and their effects on the voltage converter as well as the 48-volt and 12-volt batteries are summarized in the following table.

Engine operation	Terminal 15	External 12-volt charger	Voltage converter	Relays in the 48-volt battery
yes	on	no	48 volts → 12 volts	is closed
no	on	no	48 volts → 12 volts	is closed
no	on	yes	12 volts → 48 volts	is closed
no	off	yes	12 volts → 48 volts	is closed
no	off	no	not functional	open

10-pin connection

The hybrid CAN wires are also integrated into the 10-pin plug-in connection. If the voltage converter is disconnected from the communication lines when Terminal 15 is active, for example, by disconnecting the 10-pin plug-in connector, the voltage converter is deactivated.

The relay in the 48-volt battery stays closed and the 48-volt electrical system stays active.

The 12-volt system also stays active but the 12-volt battery is no longer charged.

664_078

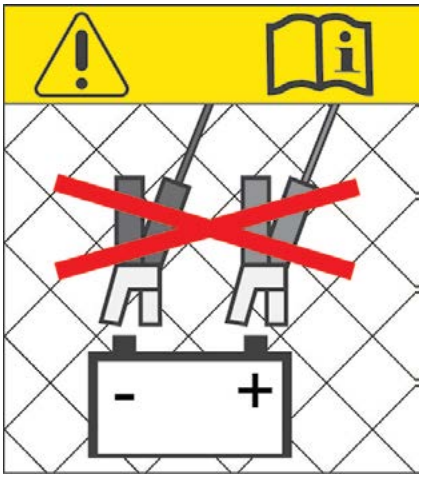
12-volt battery	48-volt battery	Remarks
is charged	is charged	The 48-volt generator runs, charges the 48-volt battery and supplies the voltage converter, which, in turn, converts the voltage and charges the 12-volt battery.
is boosted	is discharged	The 48-volt battery boosts the 12-volt electrical system via the voltage converter in certain operating states.
is charged	is charged	Charger is detected – 12-volt charger charges 12-volt battery. Voltage converter transforms voltage to 48 volts and charges 48-volt battery.
	is not charged	If insufficient charging current is available for the 12-volt battery because an underrated charger is used, the voltage converter does not supply 48 volts for this Terminal 15 cycle and, therefore, the 48-volt battery is not charged.
is charged	is charged	Charger is detected – 12-volt charger charges 12-volt battery. Voltage converter transforms voltage to 48 volts and charges 48-volt battery.
is discharged	is disconnected	The 48-volt battery is "disconnected". The 12-volt battery is discharged depending on the vehicle's static current.

Working on the 48-volt electrical system

Aim

The use of 48-volt systems in automative systems is a potential source of electrical hazards. Service employees must be able to identify a 48-volt electrical system and safely perform whatever work is necessary.

All work on the 48-volt electrical system may only be performed by trained employees with a basic knowledge of electrics and with the system de-energized.

Recognition and identification	
Positive wires of the 48-volt electrical system DC voltage at Terminal 40	
Ground wires of the 48-volt electrical system DC voltage at Terminal 41	
Warning label on the 48-volt battery	 664_081
Warning label on the protective caps of the 48-volt-battery and the 48-volt distributor boxes	 664_082

Hazards

The following hazards can occur when performing work on an active 48-volt electrical system in the event of a fault or incorrect handling:

- Short circuits.
- Arcing.
- Secondary hazards (burns due to molten metal spatter as well as injuries due to startled reaction).

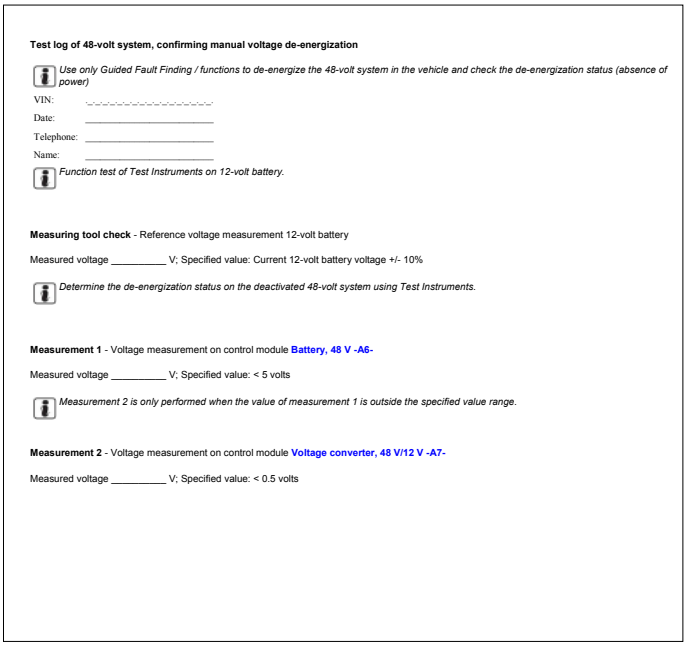
Taking out of service

Before working on the 48 volt electrical system, it must first be de-energized. This is done through Guided Functions using the VAS Scan Tool.

Through Guided Functions, Data Bus On Board Diagnostic Interface J533 opens the relay of the 48 volt battery which shuts down the system in a defined order. To confirm the system has been de-energized, you must read the voltage value of the battery and Voltage Converter, 48V/12V A7.

An inspection report is part of the de-energizing Test Plan and must be printed out and signed by the Technician. It should include the vehicle's details as well as the measurement data for the 48-volt system. After that, it must be attached to the vehicle in an easily visible place.

In the event of an “Not OK” inspection report/finding, the 48-volt system must be shut down manually.



Test log of 48-volt system, confirming manual voltage de-energization

Use only Guided Fault Finding / functions to de-energize the 48-volt system in the vehicle and check the de-energization status (absence of power)

VIN: _____.

Date: _____

Telephone: _____

Name: _____

Function test of Test Instruments on 12-volt battery.

Measuring tool check - Reference voltage measurement 12-volt battery

Measured voltage _____ V; Specified value: Current 12-volt battery voltage +/- 10%

Determine the de-energization status on the deactivated 48-volt system using Test Instruments.

Measurement 1 - Voltage measurement on control module **Battery, 48 V -A6-**

Measured voltage _____ V; Specified value: < 5 volts

Measurement 2 is only performed when the value of measurement 1 is outside the specified value range.

Measurement 2 - Voltage measurement on control module **Voltage converter, 48 V/12 V -A7-**

Measured voltage _____ V; Specified value: < 0.5 volts

Example of an inspection report (page 1 of 6)
the display on the diagnostic tester may be slightly different)

Returning to service

The 48-volt system is returned to service after completion of work/repairs by running the Test Plan in "Guided Functions". If the system is not returned to service, the vehicle runs without a durable 48-volt/12-volt voltage supply, that means the 12-volt-battery is not charged. As soon as the 12-volt battery is discharged completely, the vehicle is no longer roadworthy.

Hazards due to lithium-ion technology

Hazards can also occur due to the design of a lithium-ion battery and electro-chemical processes inside a lithium-ion battery. The electrolyte in the lithium-ion battery is easily flammable, potentially explosive, causes chemical burns and emits toxic vapors.

For this reason, special guidelines apply to the storage, transportation and recycling of lithium-ion batteries. Special emphasis is placed here on the handling of critical batteries. These processes are often subject to national regulations. When handling lithium-ion batteries, all statutory requirements applicable in your country as well as all instructions given in the service literature and Guided Fault Finding in ODIS.

Note
Always refer to the service literature for information on handling requirements for lithium ion batteries.

Note
For a detailed description of the procedures for de-energizing, repairing and starting up the 48-volt electrical system, please refer to the current service literature.

The 48-volt MHEV (Mild Hybrid Electric Vehicle)

General description

The abbreviation MHEV stands for Mild Hybrid Electric Vehicle. These vehicles generally have an additional battery as well as a small e-machine. This means that functions such as extended recuperation and internal combustion engine assistance by the e-machine (boost) are possible.

The TFSI engine is generally responsible for drive and for generating electrical energy. All-electric driving is not possible with the Audi A8 MHEV.

The Audi A8 is designed as a 48-volt MHEV. The 48-volt battery serves as an auxiliary battery and the starter generator as the e-machine.

Mild hybrid functions

The 48-volt MHEV concept offers drivers a number of new functions which enhance both efficiency and ride comfort. These additional functions also require additional controls and displays.

The following functions have been implemented in the 2018 Audi A8.

- Start-stop at speeds of less than 13.6 mph (22 km/h).
- Internal combustion engine assistance by the starter generator.
- Extended recuperation.
- Intelligent coasting with internal combustion engine shut-off.
- More comfortable internal combustion engine start-up by the starter generator.
- More comfortable internal combustion engine shut-off by the starter generator.
- Immediate restarting of the internal combustion engine by the starter generator (change of mind).

Extended recuperation

In recuperation mode, the vehicle's kinetic energy is used to charge the battery during overrun phases. Thanks to their auxiliary battery, mild-hybrid vehicles have a higher recuperation capacity than previous vehicles. The Audi A8, with its lithium-ion battery and the 48-volt starter generator has a recuperation capacity of up to 12 kW.

The so-called "overrun recuperation" cycle is indicated by a 50% display in the instrument cluster.

The "extended recuperation" cycle is initiated by efficient assist and indicated by the 100% display in the instrument cluster.

Medium recuperation

664_133

Maximum recuperation

664_134

Improvements by starter generator

The use of the starter generator makes restarting the TFSI engine while driving much more comfortable than is the case with conventional pinion-type starters. The fact that the starter generator is permanently coupled to the engine via the poly V belt allows it to be restarted even if it has not yet come to a complete standstill. This situation can occur if, for example, the engine is shut off by the start-stop system, but has not come to a complete standstill and the driver presses the accelerator because he wants to continue driving (change of mind situation).

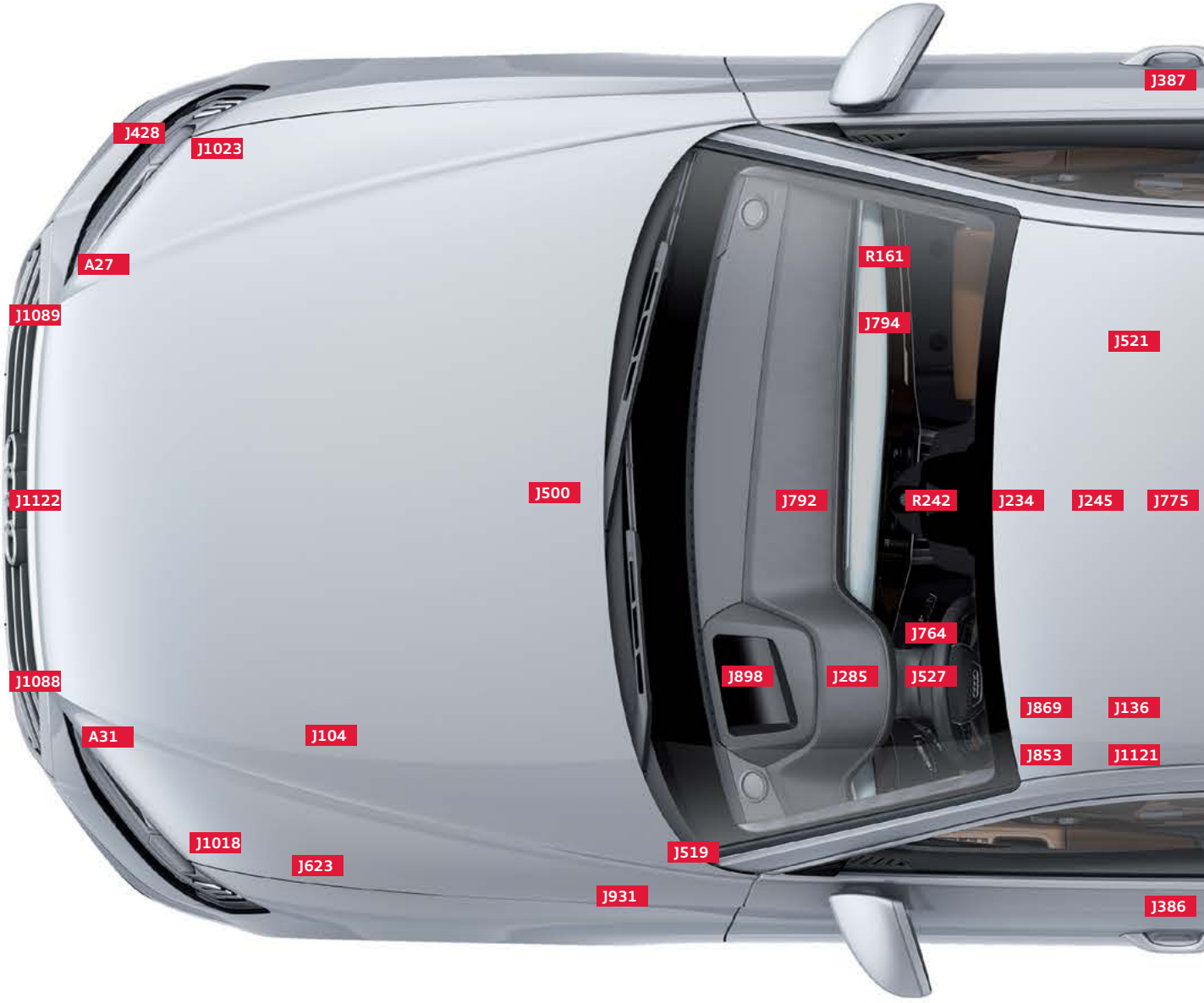
A further improvement stems from the fact that the TFSI engine can be braked precisely by the starter generator during shut-off, allowing “shut-off judder” to be reduced significantly. The starter generator can be used as an e-machine while the engine is running and can assist the engine in certain load ranges, thus improving fuel economy. The starter generator in the Audi A8 is not designed to boost the torque and/or power output of the TFSI engine.

664_069

Networking

Some of the control modules shown in the overview are optional and/or country-specific equipment. For the sake of clarity, not all control modules fitted in the vehicle can be shown here.

Refer to the current service literature for details of control modules installation positions, as well as instructions for installation and removal.

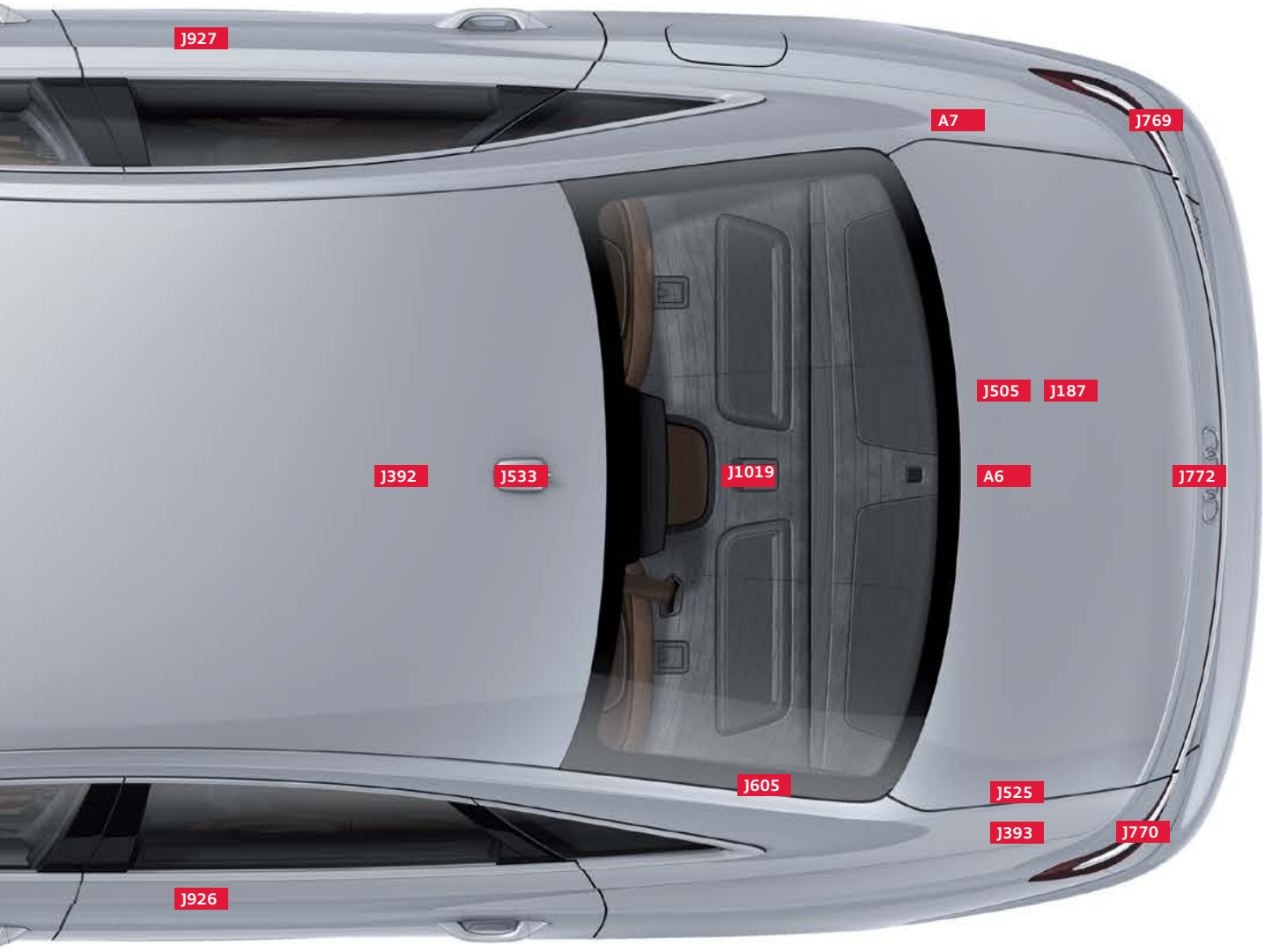


Key

A6 Battery, 48 V
A7 Voltage Converter, 48 V/12 V
A27 Right LED Headlamp Power Output Module 1
A31 Power module 1 for left LED headlight

J104 ABS Control Module
J136 Memory Seat/Steering Column Adjustment Control Module
J187 Differential Lock Control Module
J234 Airbag Control Module
J245 Sunroof Control Module
J285 Instrument Cluster Control Module
J386 Driver Door Control Module
J387 Front Passenger Door Control Module
J392 Rear Sunroof Control Module
J393 Comfort System Central Control Module

J428 Control Module for Adaptive Cruise Control
J500 Power Steering Control Module
J505 Windshield Defogger Control Module
J519 Vehicle Electrical System Control Module
J521 Front Passenger Memory Seat Control Module
J525 Digital Sound System Control Module
J527 Steering Column Electronics Control Module
J533 Data Bus on Board Diagnostic Interface
J605 Rear Lid Control Module
J623 Engine Control Module
J764 Electronic Steering Column Lock Control Module
J769 Lane Change Assistance Control Module
J770 Lane Change Assistance Control Module 2
J772 Rearview Camera System Control Module
J775 Drivetrain Control Module



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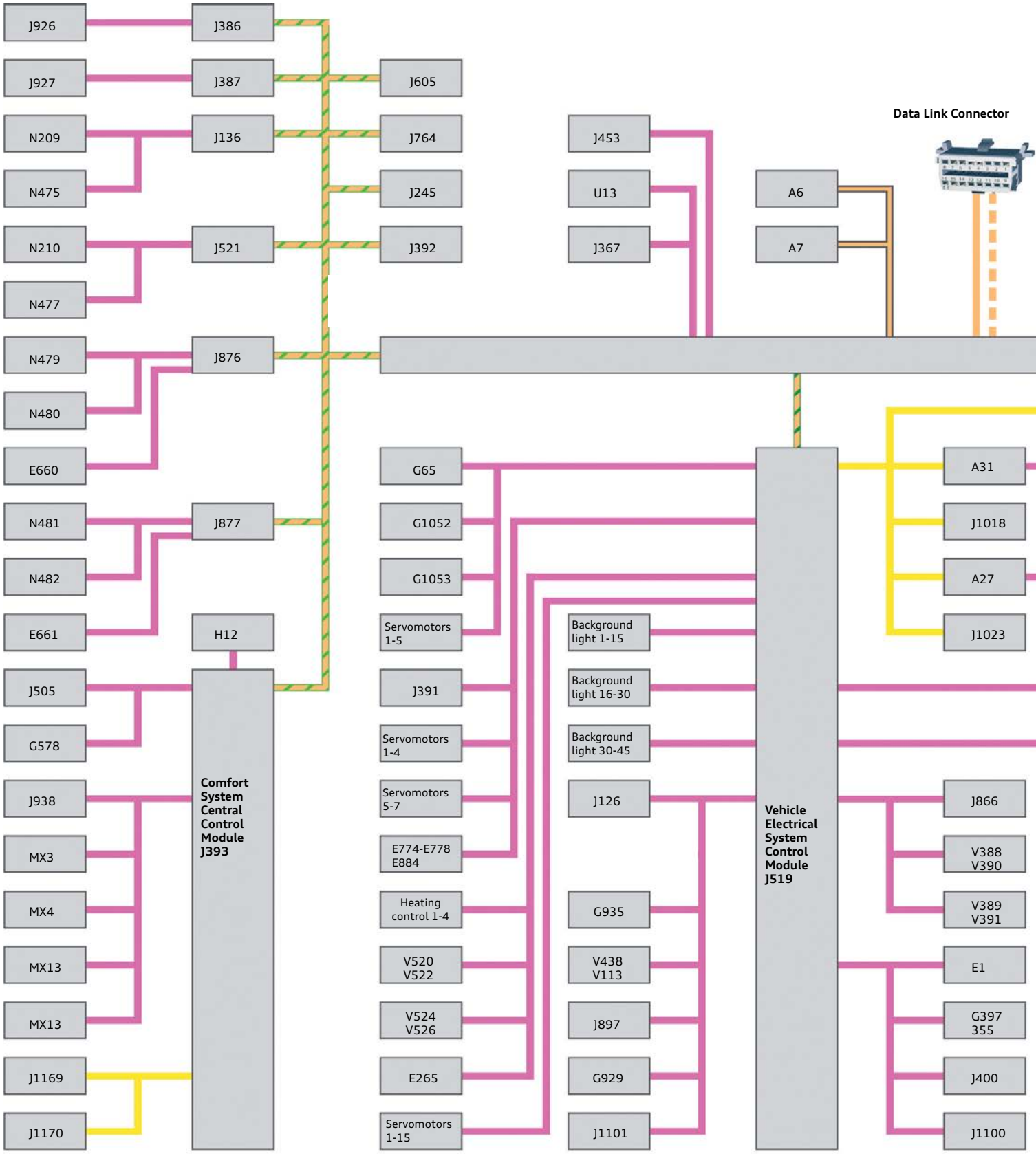
J792 Active Steering Control Module
J794 Information Electronics Control Module 1
J853 Night Vision System Control Module
J869 Structure Borne Sound Control Module
J898 Windshield Projection Head Up Display Control Module
J926 Driver Side Rear Door Control Module
J927 Passenger Side Rear Door Control Module
J931 Subframe Mount Control Module
J1018 Left Light Control Module
J1019 Rear Axle Steering Control Module
J1023 Right Light Control Module
J1088 Control Module for Left Front Object Detection Radar Sensor
J1089 Control Module for Right Front Object Detection Radar Sensor
J1121 Driver Assistance Systems Control Module
J1122 Laser Distance Regulation Control Module

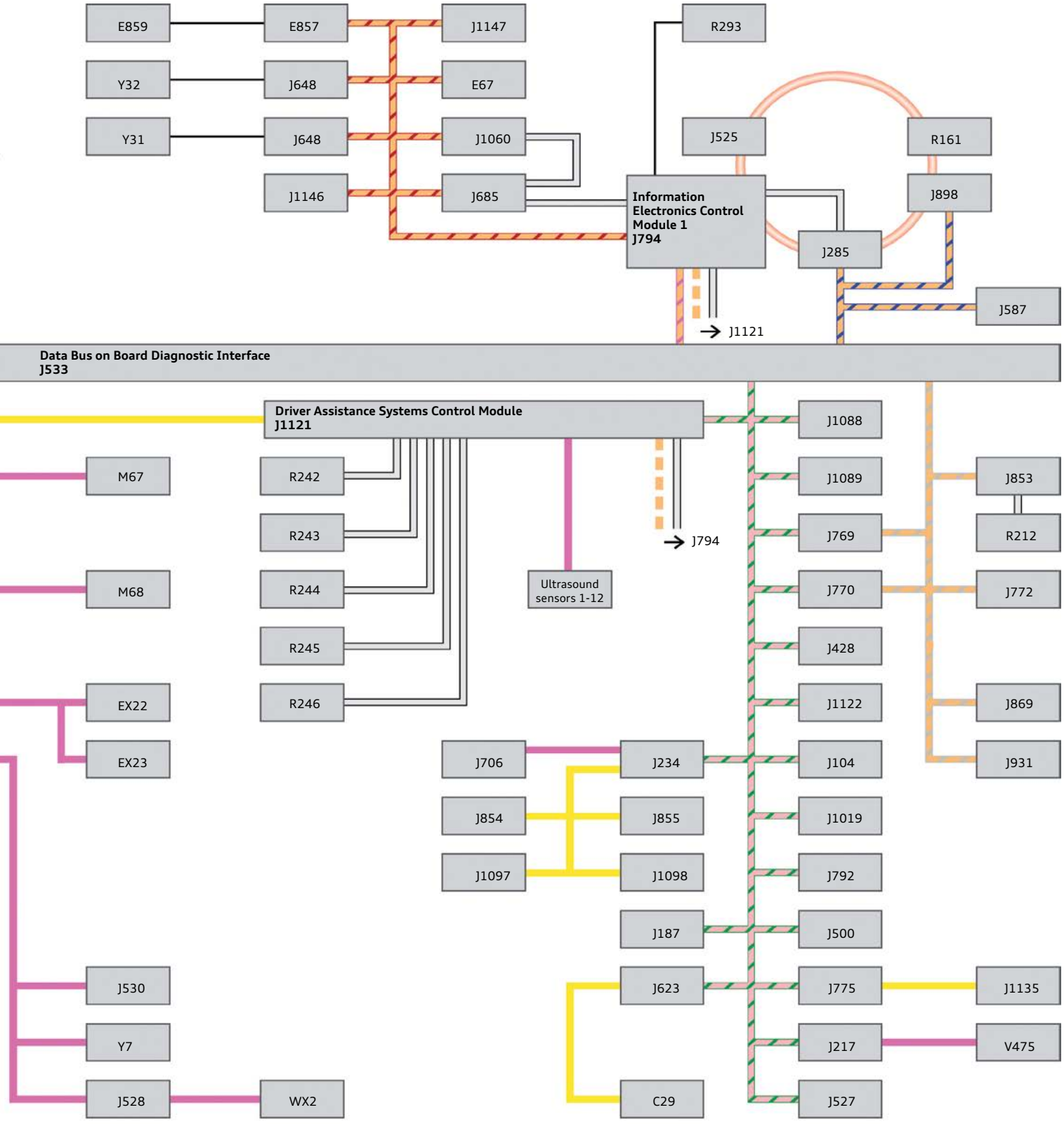
R161 DVD Changer
R242 Driver Assistance Systems Front Camera

Topology



Key:

- Comfort/convenience systems CAN
- Hybrid CAN
- Extended CAN
- Infotainment CAN
- Diagnostics CAN
- FlexRay
- Modular Infotainment Matrix (MIB) CAN
- LIN bus



664_087

Sub-bus systems
MOST bus
LVDS
Instrument cluster CAN
USB lines
Ethernet port
Comfort/convenience systems CAN 2

Key:

A6 Battery, 48 V
A7 Voltage Converter, 48 V/12 V
A27 Right LED Headlamp Power Output Module 1
A31 Left LED headlight power module 1
C29 Starter Generator
E1 Light Switch
E67 Driver Volume Control
E265 Rear A/C Display Control Head
E660 Driver Side Rear Multi-Contour Seat Switch
E661 Passenger Side Rear Multi-Contour Seat Switch
E774 Front A/C Display Control Head 1
E775 Front A/C Display Control Head 2
E776 Front A/C Display Control Head 3
E777 Front A/C Display Control Head 4
E778 Front A/C Display Control Head 5
E857 Auxiliary Display Control Head 1
E859 Wireless Control Head 1
E884 Front A/C Display Control Head 6
EX22 Switch Module in Instrument Panel, Center
EX23 Center Console Switch Module 1
G65 High Pressure Sensor
G355 Humidity Sensor
G395 A/C Pressure/Temperature Sensor
G397 Rain/Light Recognition Sensor
G578 Anti-Theft Alarm System Sensor
G929 Vehicle Interior Carbon Dioxide Concentration Sensor
G935 Exterior Air Quality and Humidity Sensor
G1052 Low Pressure Side A/C Pressure/Temperature Sensor
G1053 High Pressure Side A/C Pressure/Temperature Sensor
H12 Alarm Horn
J104 ABS Control Module
J126 Fresh Air Blower Control Module
J136 Memory Seat/Steering Column Adjustment Control Module
J187 Differential Lock Control Module
J217 Transmission Control Module
J234 Airbag Control Module
J245 Sunroof Control Module
J285 Instrument Cluster Control Module
J345 Towing Recognition Control Module
J367 Battery Monitoring Control Module
J386 Driver Door Control Module
J387 Front Passenger Door Control Module
J391 Rear Fresh Air Blower Control Module
J392 Rear Sunroof Control Module
J400 Wiper Motor Control Module
J428 Control Module for Adaptive Cruise Control
J453 Multifunction Steering Wheel Control Module
J500 Power Steering Control Module
J502 Tire Pressure Monitoring Control Module
J505 Windshield Defogger Control Module
J521 Front Passenger Memory Seat Control Module
J525 Digital Sound System Control Module
J527 Steering Column Electronics Control Module
J528 Roof Electronics Control Module
J530 Garage Door Opener Control Module
J587 Selector Lever Sensor System Control Module
J604 Auxiliary Heater Control Module
J605 Rear Lid Control Module
J623 Engine Control Module
J648 Left Rear Information Display Control Head Control Module
J649 Right Rear Information Display Control Head Control Module
J685 Front Information Display Control Head
J706 Passenger Occupant Detection System Control Module
J764 Electronic Steering Column Lock Control Module
J769 Lane Change Assistance Control Module
J770 Lane Change Assistance Control Module 2
J772 Rearview Camera System Control Module
J775 Drivetrain Control Module
J792 Active Steering Control Module
J853 Night Vision System Control Module
J854 Left Front Seat Belt Tensioner Control Module
J855 Right Front Seat Belt Tensioner Control Module
J866 Power Adjustable Steering Column Control Module
J869 Structure Borne Sound Control Module
J876 Driver Side Rear Seat Adjustment Control Module
J877 Passenger Side Rear Seat Adjustment Control Module
J897 Air Ionization System Control Module
J898 Windshield Projection Head Up Display Control Module
J926 Driver Side Rear Door Control Module
J927 Passenger Side Rear Door Control Module
J931 Subframe Mount Control Module
J938 Power Rear Lid Opening Control Module
J1018 Left Light Control Module
J1019 Rear Axle Steering Control Module
J1023 Right Light Control Module
J1060 Front Information Display Control Head 2
J1088 Control Module for Left Front Object Detection Radar Sensor
J1089 Control Module for Right Front Object Detection Radar Sensor
J1097 Left Rear Seat Belt Tensioner Control Module
J1098 Right Rear Seat Belt Tensioner Control Module
J1100 Windshield Washer Pump Control Module
J1101 Air Freshening System Control Module
J1122 Laser Distance Regulation Control Module
J1135 Level Control System Compressor Electronics
J1146 Mobile Device Charger 1
J1147 Mobile Device Charger 2
M67 Left Auxiliary High Beam Bulb
M68 Right Auxiliary High Beam Bulb
MX3 Left Tail Lamp
MX4 Right Tail Lamp
MX13 Center Tail Lamp

Key:

N209 Driver Lumbar Support Adjustment Valve Block
N210 Front Passenger Lumbar Support Adjustment Valve Block
N475 Valve Block 1 in Driver Seat
N477 Valve Block 1 in Front Passenger Seat
N479 Valve Block 1 in Driver Side Rear Seat
N480 Valve Block 2 in Driver Side Rear Seat
N481 Valve Block 1 in Passenger Side Rear Seat
N482 Valve Block 2 in Passenger Side Rear Seat
R64 Parking Heater Radio Receiver
R161 DVD Changer
R212 Night Vision System Camera
R242 Driver Assistance Systems Front Camera
R243 Front Peripheral Camera
R244 Left Peripheral Camera
R245 Right Peripheral Camera
R246 Rear Peripheral Camera
R293 USB Distributor
V66 Level Control System Compressor Motor
V113 Recirculation Door Motor
V388 Driver Seat Backrest Blower Fan
V389 Front Passenger Seat Backrest Blower Fan
V390 Driver Seat Cushion Blower Fan
V391 Front Passenger Seat Cushion Blower Fan
V438 Fresh Air Door Motor
V475 Transmission Fluid Auxiliary Hydraulic Pump 1
V520 Left Rear Backrest Fan 1
V522 Left Rear Seat Cushion Fan 1
V524 Right Rear Backrest Fan 1
V526 Right Rear Seat Cushion Fan 1
WX2 Rear Interior Lamp
Y7 Automatic Dimming Interior Rearview Mirror
Y31 Multimedia Display Unit 3
Y32 Multimedia Display Unit 4

New features of the bus systems

As the diagram on the pervious page shows, the number of control modules, sensors and actuators which participate in data communications in one form or another is steadily increasing. What is especially striking is the large number of LIN users which are connected to Vehicle Electrical System Control Module J519.

This is in part because the climate control system is now also a function of J519.

This means that a separate air conditioning control module is no longer installed in the Audi A8.

Address Word 08 is no longer used for the climate control system. All climate control diagnostic functions are implemented via Address Word 09.

The topology diagram cannot provide a realistic representation of the actual networking situation, especially in the area of the FlexRay bus. In the case of the LIN bus users, multiple LIN slaves are grouped together in the diagram in order to provide some measure of clarity.

In the area of the AC servomotors or the interior light modules, for example, only one LIN user is shown symbolically, although the LIN slaves are actually daisy-chained. The following table provides an overview of the bus systems used in the Audi A8.

Bus systems used in the Audi A8

Bus system	Cable color	Configuration	Data transfer rate
Comfort/convenience systems CAN		Electrical bus system	500 kbit/s
Comfort/convenience systems CAN 2		Electrical bus system	500 kbit/s
Extended CAN		Electrical bus system	500 kbit/s
Infotainment CAN		Electrical bus system	500 kbit/s
Modular Infotainment Matrix (MIB) CAN		Electrical bus system	500 kbit/s
Diagnostics CAN		Electrical bus system	500 kbit/s
Instrument cluster CAN		Electrical bus system	500 kbit/s
Hybrid CAN		Electrical bus system	500 kbit/s
FlexRay		Electrical bus system	10 Mbit/s
MOST bus		Fiber-optic bus system	150 Mbit/s
LIN bus		Electrical single-wire bus system	20 kbit/s
Sub-bus system		Electrical bus system	500 kbit/s 1 Mbit/s
LVDS[1)]		Electrical bus system	200 Mbit/s
Ethernet		Electrical bus system	100 Mbit/s

LVDS

This data transfer system is notable for its relatively low voltage. As is the case with high-speed CAN bus systems, the differences in voltage are evaluated. In the case of LVDS, the voltage is approximately 0.3 V. A typical application of LVDS is the activation of liquid crystal monitors. The LVDS cables in the Audi A8 are used, for example, to transfer image data between Information Electronics Control Module 1 J794, Instrument Cluster Control Module J285 and both MMI touch screens.

The LVDS lines are sheathed, much like the FlexRay lines. Unlike the FlexRay bus, the sheathing of the LVDS lines not only protects against mechanical stresses and moisture, but also shields against electromagnetic interference. In the event of damage, LVDS lines must always be replaced rather than repaired.

[1)] **LVDS** = **L**ow **V**oltage **D**ifferential **S**ignaling

Ethernet

Ethernet is a technology developed and specified for data networks (LANs[2)]). This technology is commonly referred to as LAN technology. It provides data transfer rates ranging from 10 Mbit/s to 100 Gbit/s, depending on configuration level. "Fast Ethernet" system with a data transfer rate of 100 Mbit/s is used in Audi models. This form of data transfer is used in the Audi A8 for communication between the VAS Scan Tool and the gateway as well as between the Information Electronics Control Module 1 J794 and the Driver Assistance Systems Control Module J1121.

The high-speed transfer of data between the Scan Tool and the gateway significantly reduces the time required for parameterizing and updating control modules. The Ethernet connection between Information Electronics Control Module 1 J794 and the Driver Assistance Systems Control Module J1121 is used for fast updating of J1121. For this purpose, an SD card containing the required data is inserted into J794, and then the data is transfered across the Ethernet line. This process is much faster than transferring data first to the gateway and then via FlexRay to the J1121.

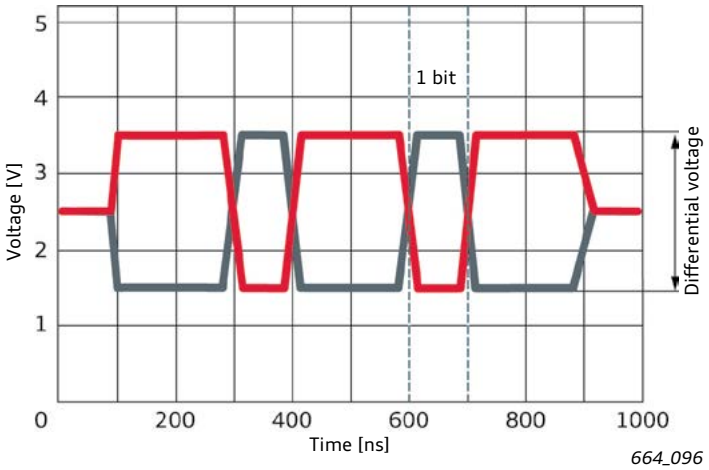
FlexRay

The aim of using the FlexRay bus is to meet the rising demands on in-car connectivity in future.

It is particularly worth noting that the FlexRay bus offers much higher data transfer rates and a higher level of fail safety than the CAN bus. These are indispensable features given the many complex dynamic control systems and driver assistance systems.

The FlexRay bus has the following features:

- Electrical two-wire bus system.
- Data transfer rate: maximum 10 Mbit/s.
- Data transfer with three signal states:
  - "Idle" – both bus wires have a voltage of 2.5 V.
  - "Data 0" – the bus positive wire has a low voltage level and the bus negative wire has a high voltage level.
  - "Data 1" – the bus positive wire has a high voltage level and the bus negative wire has a low voltage level.
- "Active" star topology (gateway).
- Real-time capability.
- Enables distributed control and the use of safety-related systems.



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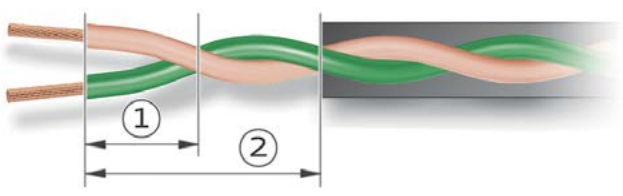
Repairing a FlexRay line

The FlexRay wires are twisted in the same way as the CAN wires. Depending on model and year of manufacture, these wires may be sheathed or non-sheathed.

In principle, sections of FlexRay lines can be replaced. Note the untwisted length (1) and the unsheathed length (2). Always refer to the electronic service and repair literature for specifics.



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[2)] LAN = Local Area Network

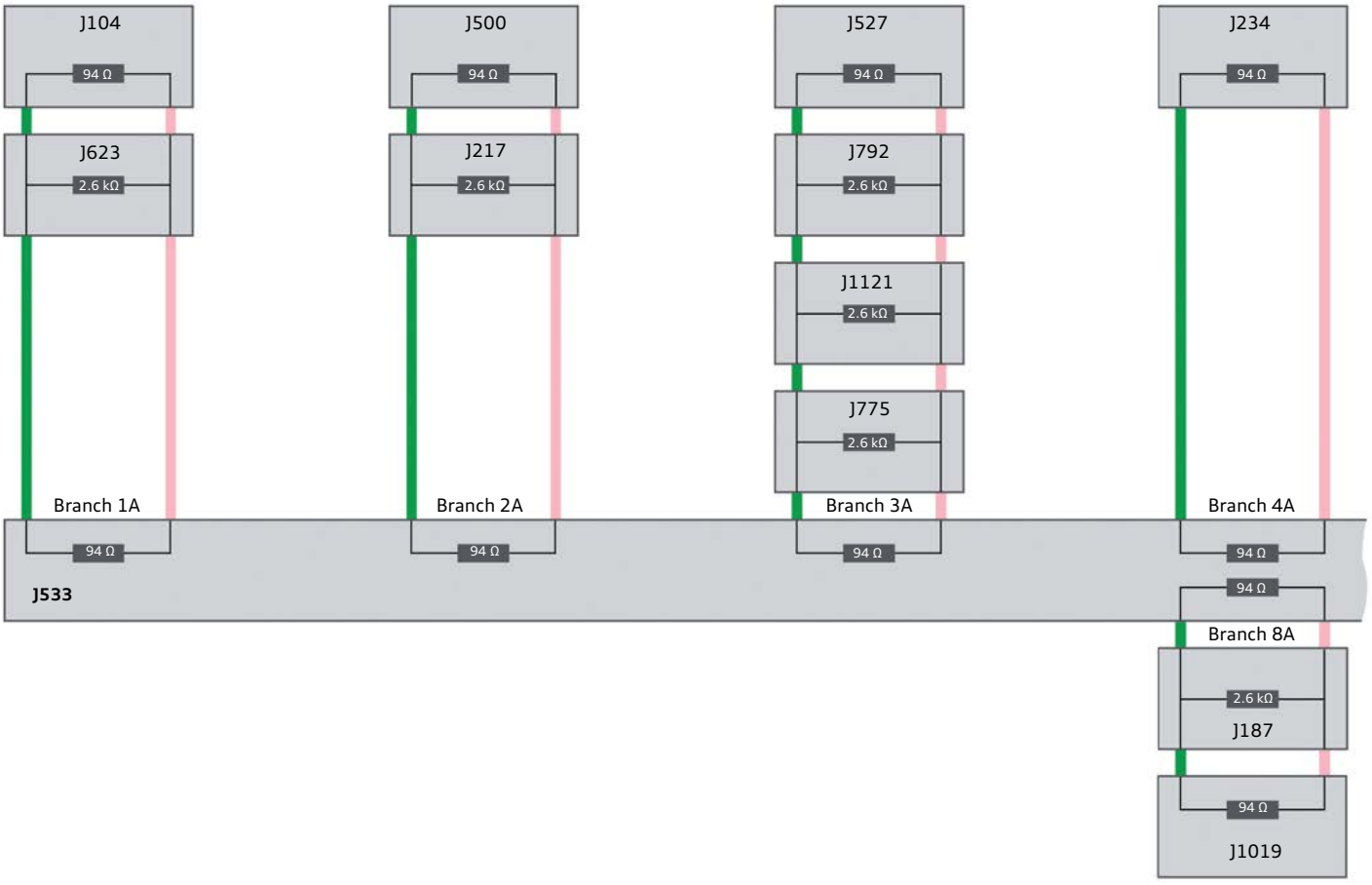
FlexRay

Given that the overall topology diagram cannot provide a realistic representation of the layout of the FlexRay control modules, the following diagrams show how the modules are distributed to the individual FlexRay branches. The control modules of the 2019 A8 are shown here with a full range of features. As always with the FlexRay bus, the modules connected to the end of a branch have a resistance of 94 ohms. The intermediate control modules have a resistance of 2.6 kohms.

The FlexRay technology allows the use of two channels per branch - an option not utilized in previous Audi models. These channels are designated channel "A" and channel "B".

The 2nd channel generally offers two options:

- Sending data redundantly for higher fail safety.
- Doubling the volume of transferable data.



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Reference

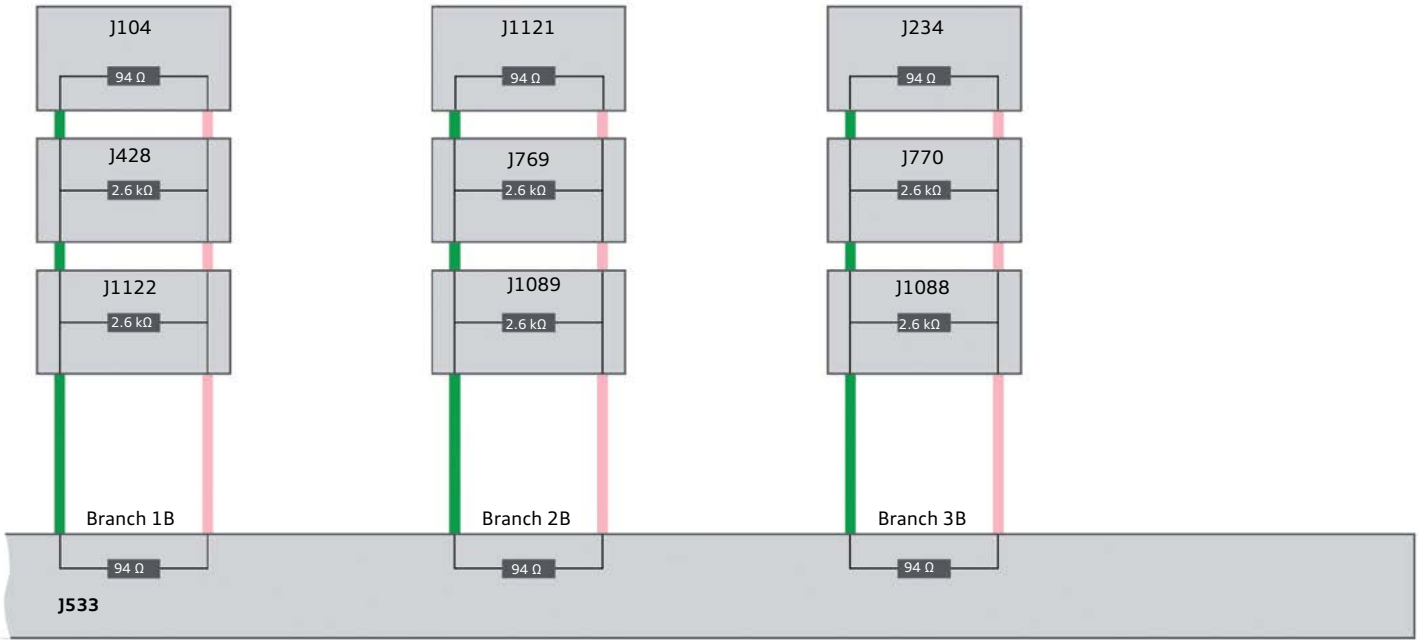
For further information about the design and working principle of the FlexRay bus, refer to eSelf-Study Program 970103 The 2011 Audi A8 Convenience Electronics and Networking Systems.

The "B" channel in the Audi A8 is used to increase the volume of transferable data. If the same control module is connected to both channels, the diagnostic data of this module is transferred via channel "A". If a branch channel fails, for example, due to a short circuit in the FlexRay lines, the channel affected by the fault is also indicated in the diagnostic tester. This allows the relevant control modules and/or lines to be systematically tested.

As data transfer across the FlexRay bus is time-controlled, the network may only be started up by "cold start" control modules.

These are the following control units in the Audi A8:

- Data Bus on Board Diagnostic Interface J533.
- ABS Control Module J104.
- Airbag Control Module J234.



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Key:

J104 ABS Control Module
J187 Differential Lock Control Module
J217 Transmission Control Module
J234 Airbag Control Module
J428 Control Module for Adaptive Cruise Control
J500 Power Steering Control Module
J527 Steering Column Electronics Control Module
J533 Data Bus on Board Diagnostic Interface (gateway)
J623 Engine Control Module
J769 Lane Change Assistance Control Module
J770 Lane Change Assistance Control Module 2
J775 Drivetrain Control Module
J792 Active Steering Control Module
J1019 Rear Axle Steering Control Module
J1088 Control Module for Left Front Object Detection Radar Sensor
J1089 Control Module for Right Front Object Detection Radar Sensor
J1121 Driver Assistance Systems Control Module
J1122 Laser Distance Regulation Control Module

Optical data bus system MOST150

664_098

History

This data bus system is named after the "Media Oriented Systems Transport (MOST) Cooperation". This organization is made up of various automobile manufacturers, their components suppliers and software companies which joined forces to create a standardised high-speed data transfer system.

The term "Media Oriented Systems Transport" means that address-oriented messages are sent to a specific recipient. This technology is used in Audi cars to transfer data within the infotainment system.

MOST150

The MOST150 was first used by Audi in the A3. The new Audi A8 also benefits from this advancement in MOST technology. The data transfer rate is six times that of the MOST25.

The development process necessitated making various modifications to the components of the MOST bus. For instance, the transmitter and receiver units – Fiber Optical Transmitters (FOT) – had to be adapted.

Other components such as the optical connectors, the fiber optics and the electrical connectors of the control units are identical to those of the MOST25.

Systems manager

In the Audi A8, up to six control modules, including, for the first time, the windshield projection control module (head-up display), can be integrated into the MOST ring in the following order.

- Information Electronics Control Module 1 J794.
- Instrument Cluster Control Module J285.
- Windshield Projection Head Up Display Control Module J898.
- DVD Changer R161.
- Digital Sound System Control Module J525.

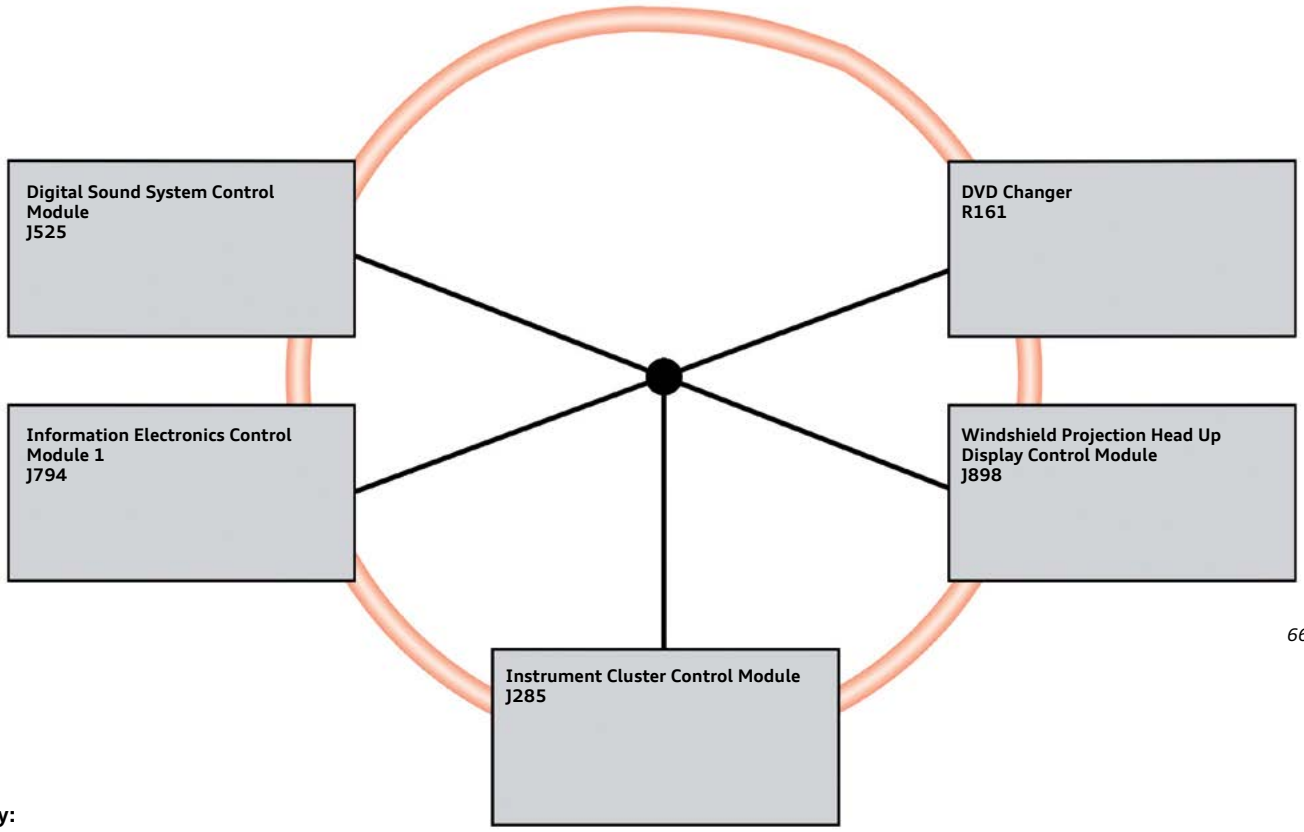
In the Audi A8, Information Electronics Control Module 1 J794 acts not only as the system manager for the MOST bus but also as the diagnostic manager - a function previously assigned to theData Bus on Board Diagnostic Interface J533 in the Audi A8. As always with a MOST bus in Audi vehicles, the control modules are interconnected by an electronic ring break diagnostics line.

This line is only required for electronic ring break diagnostics in the event of a fault.

Ring break diagnostics

The ring break diagnosis line is, as the name suggests, only required for diagnostics after loss of MOST communication.

A ring brake diagnosis line is not relevant for data transfer between the control modules.



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Key:

MOST
Ring break diagnosis line

Optical replacement control unit VAS 6778

Diagnostics

The ring break diagnosis procedure is identical to that of the previous MOST bus system. Diagnostic information is retrieved via Address Word 5F using the VAS Scan Tool.

Even though the ring break diagnosis procedure remains unchanged, a modified tool – the optical replacement control unit VAS 6778 – must be used in the event of an optical fault in the MOST150 bus, due to the modified transmitter and receiver units in the control modules.

664_100

Reference

For further information on the MOST bus, refer to eSelf-Study Program 971303 Audi New Data Bus System – LIN, MOST, Bluetooth™.

Control modules

Data Bus on Board Diagnostic Interface J533

Brief description

It is located at the center of the new Audi A8 beneath the rear bench seat. It can still be accessed with the via Address Word 19 using the VAS Scan Tool.

The gateway performs the following functions:

- Network system gateway.
- Controller for FlexRay bus.
- Diagnostics master.
- Energy manager for low-voltage electrical system (12 volts).
- Energy manager for medium-voltage electrical system (48 volts).
- Interface for various connect services.

Special feature:

- The gateway manages the diagnostic firewall featured in the new Audi A8 for the first time.

It is a user of the following data bus systems:

- Hybrid CAN.
- Comfort/convenience systems CAN.
- Comfort/convenience systems CAN 2.
- Infotainment CAN.
- Instrument panel insert CAN.
- Extended CAN.
- FlexRay.
- Diagnostics CAN.
- Ethernet.

It is not a user of:

- Modular Infotainment Matrix (MIB) CAN.
- MOST bus.

It is the LIN master for:

- Battery Monitoring Control Module J367.
- for alternator C (with 12-volt generator).
- for Multifunction Steering Wheel Control Module J453.

664_040

Data Bus on Board Diagnostic Interface J533

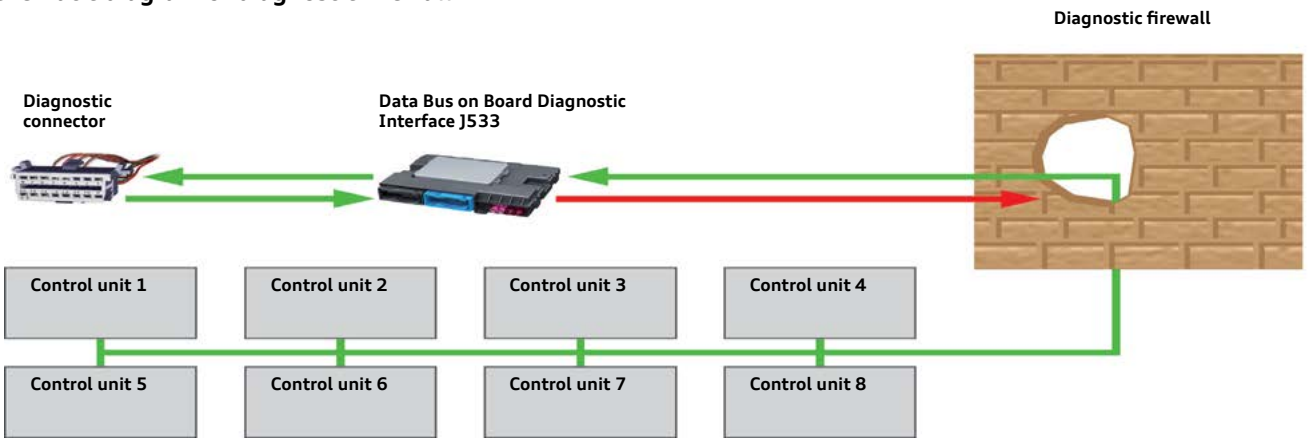
Diagnostic firewall

The diagnostic firewall is a new safety function of the Data Bus on Board Diagnostic Interface J533. It prevents unauthorized access to sensitive vehicle data during vehicle operation.

J533 contains a "White List" which determines which service is permitted access when the diagnostic firewall active. As a basic principle, all read services are enabled and all write services are disabled.

The diagnostic firewall is activated for the first time when the vehicle has covered a distance of more than 124.2 miles (200 km). This function will be used in other Audi models at a future date.

Schematic diagram of diagnostic firewall



664_047

White list:

- Accessing the diagnostics.
- Read event memory.
- Read measured data.
- Read identication data.
- Clear event memory.
- Activate / deactivate Transport mode.
- All services in the gateway.

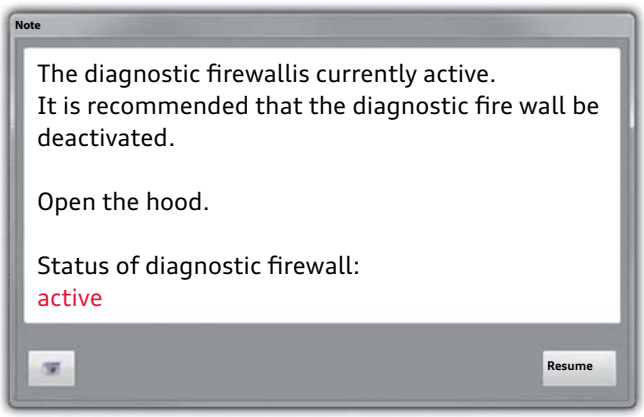
Disabled services:

- Activate control elements.
- Carry out basic setting.
- Replace control module.
- Check SVM control module configuration.

	The diagnostic firewall is deactivated	The diagnostic firewall is reactivated
1	When the hood is opened	When the vehicle travels a distance of greater than 12.4 miles (20 km) with the hood closed
2	If there is no communication with the Vehicle Electrical System Control Module J519 (BCM1 timeout)	The diagnostic firewall is reactivated when the signals are present again.
3	When a crash signal is received from Airbag Control Module J234	The diagnostic firewall is reactivated when transmission of the crash signal stops

When the diagnostics are accessed with the VAS Scan Tool, the user is informed that the diagnostic firewall is active.

The following message appears on the diagnostic tester display:



664_166

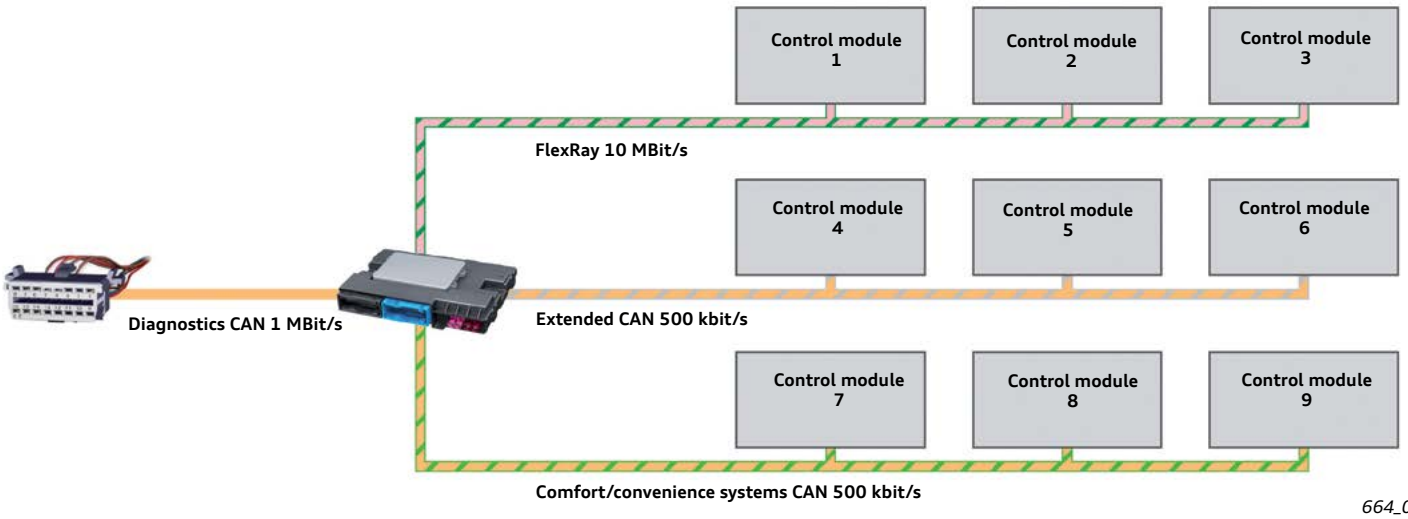
The status of the diagnostic firewall can be seen via the Data Bus on Board Diagnostic Interface J533.

DoIP - Diagnostics over Internet Protocol

Diagnose via CAN

Because the CAN bus was previously used for vehicle diagnostics, the speed at which the data could be transmitted across the gateway to the control modules in a vehicle was limited to a maximum of 1 Mbit/s.

The CAN technology does not allow data to be transferred at a faster rate than this. This meant that the speed of the FlexRay (10 Mbit/s) could not be fully utilized for diagnostics or software updates.



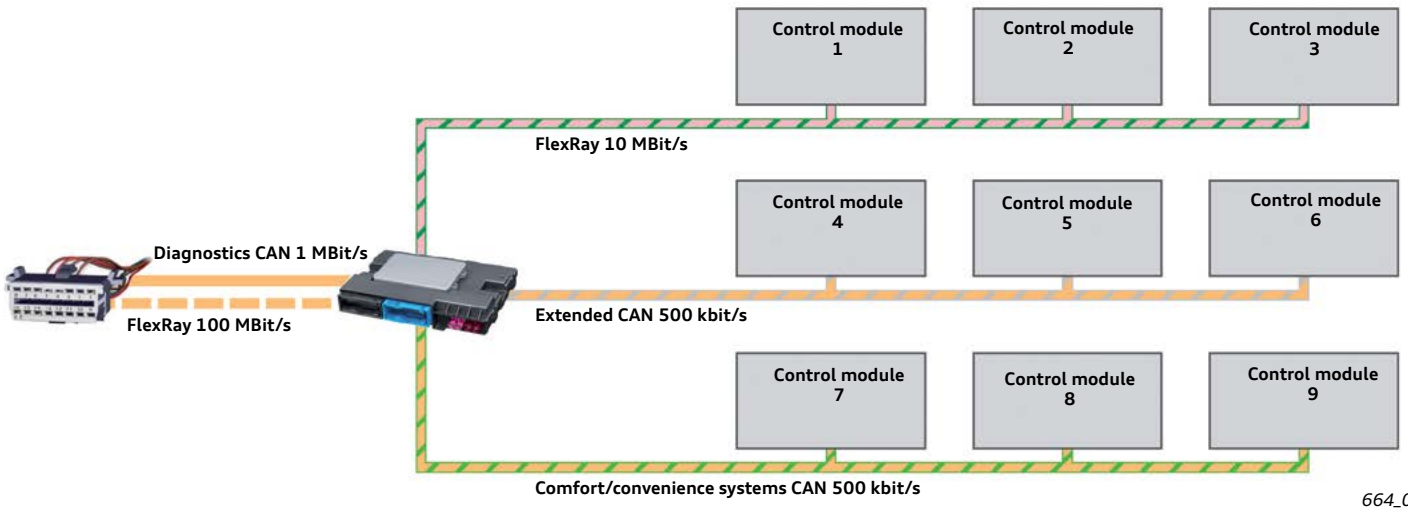
664_042

Diagnostics via CAN and DoIP

With the additional Ethernet connection, it is now possible to utilize the full bandwidth of the FlexRay. This is especially advantageous when parameterizing engine and transmission control modules. Furthermore, it is now also possible to parameterise CAN control modules in parallel. To utilize the Ethernet connection, you must use data interface VAS 6154, which is equipped with WiFi technology.

The additional wires required for the diagnostic tester hardware have been installed since the launch of the 2017 Audi Q7 (the first representative of the MLBevo series).

The wires connected to the Data Link Connector have the same color and cross-section as the FlexRay lines, but serve as an Ethernet connection.



664_043

Selective partial network operation

Rationale

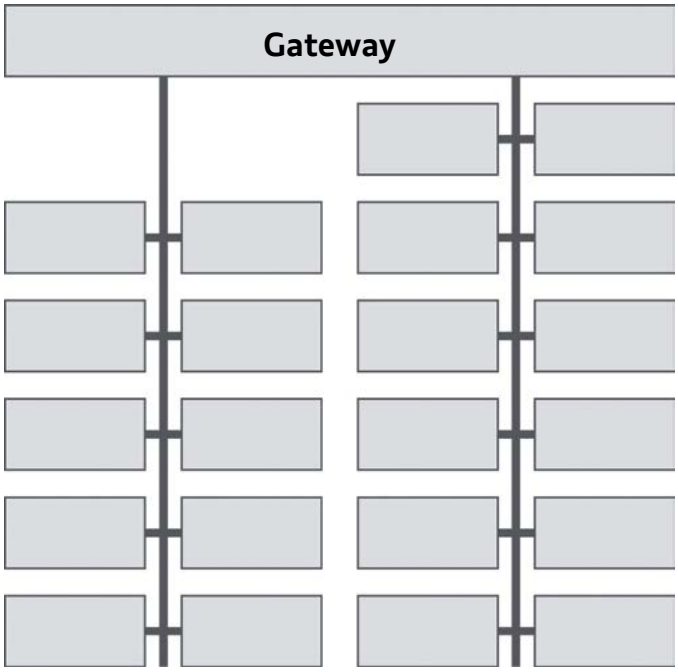
The demand for electrical power in the modern automobile is constantly increasing due to the increasing number of electronic control modules. To reduce this need for power, many electrical systems are being configured to operate according to requirement. That is, they are only utilized when needed.

Until now, all control modules have been active (awake) during vehicle operation. The have also participated in bus communications and consumed electrical power by constantly running in stand-by mode.

In the future, it will be possible to group together different control modules to build various partial networks irrespective of the bus system to which they are connected. The modules in these partial networks can be activated and de-activated as required. This saves electrical power. To do this, the control modules require intelligent transceivers which do not activate the module until a relevant message is received.

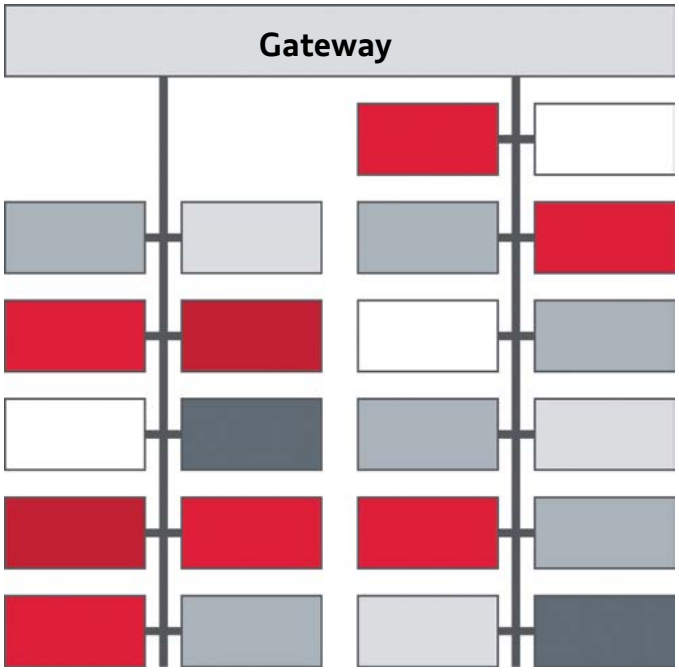
In the 2019 A8, ten control modules are configured for partial network operation.

Without partial network operation



664_044

With partial network operation



664_045

Key:

- Continuous operation
- Partial network 1
- Partial network 2
- Partial network 3
- Partial network 4
- Partial network 5

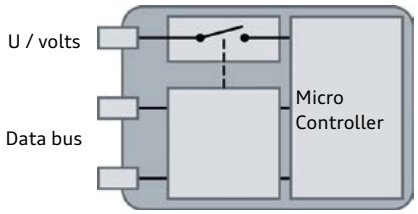
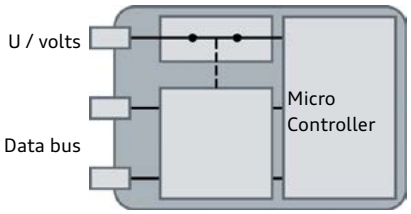
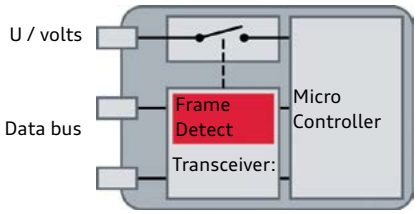
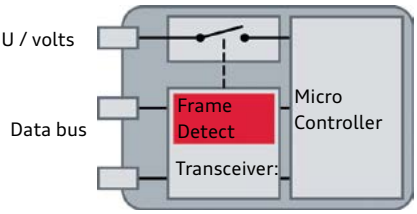
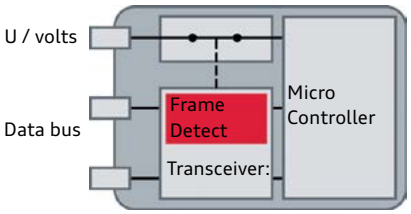
Frame Detect capability

Control modules in network topologies without selective partial network operation know only two states.

- Bus idle - the control module is also inactive.
- Data bus active - the control module is running and consuming electrical power.

In networks with partial network operation, selected control modules are equipped with a transceiver which has a Frame Detect Mode, that is, the control module can assume a third state.

- Data bus active - but the control module is still inactive because the transceiver has not yet recognized a wake-up message (i.e. it has not yet detected a data frame which causes it to wake up the control module).

Bus idle	Frame Detect mode	Data bus active
Without partial network operation		
		
› Bus communication: Off › Transceiver: **Sleep mode** › Control module: "Sleeping"		› Bus communication: On › Transceiver: **Active** › Control module: "Awake"
With partial network operation		
		
› Bus communication: Off › Transceiver: **Sleep mode** › Frame Detect function: **Off** › Control module: "Sleeping"	› Bus communication: On › Transceiver: Standby **mode** › Frame Detect function: **On** › Control module: "Sleeping"	› Bus communication: On › Transceiver: **Active** › Wake-up message detected › Control module: "Awake"

Service

Selective partial network operation does not affect vehicle repair procedures. When the diagnostics are accessed, all control modules are woken up. This facilitates communication between the Scan Tool and the control module.

Vehicle Electrical System Control Module J519 (BCM1)

The Vehicle Electrical System Control Module J519 is one of the central modules whose functions have been expanded successively in recent years. In addition to typical tasks such as reading in numerous sensors and activating actuators of the external lighting and wiper control system, a number of integration functions such as park assist or seat heater activation are now implemented in J519.

As noted earlier, J519 is now the control module for the climate control system. All diagnostic functions for the climate control system are also performed by J519.

It is installed on left hand side of the vehicle under the instrument panel.

Vehicle Electrical System Control Module J519

664_101

664_146

Brief description

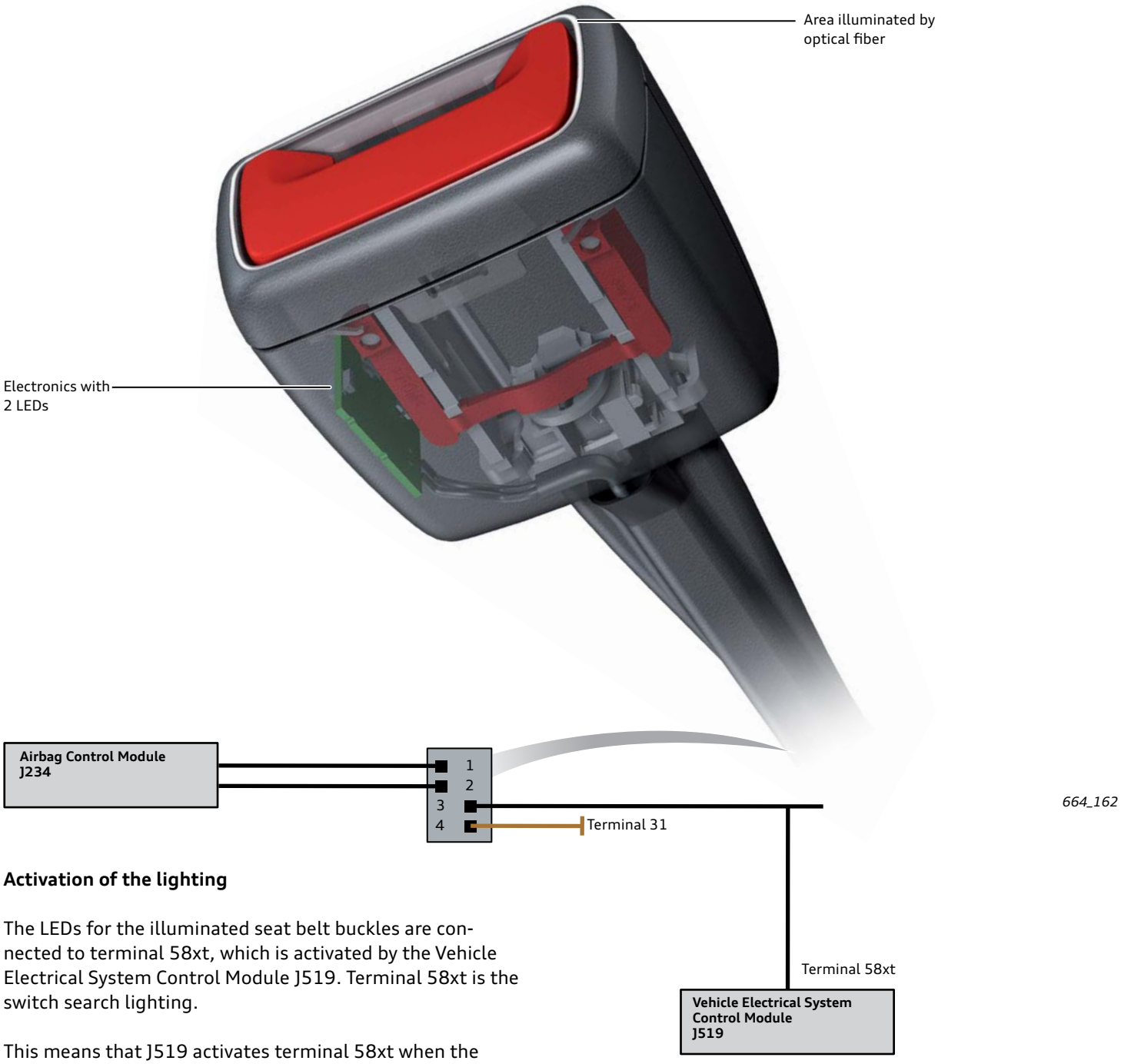
Designation	Vehicle Electrical System Control Module J519 / also referred to as BCM1 (Body Control Module 1)
Equipment	Always installed
Installation location	Below the instrument panel on the left-hand side of the vehicle (installation location is always on the L/H side, even in RHD models)
Tasks	Exterior lighting master
	Interior lighting master
	Diagnostic gateway for the light control modules
	Interface for various connect services
	Integration functions › Parking ▸ Parking aid ▸ Park assist steering › Background lighting ▸ Activation of the interior light modules › Climate control
Address Word	0009
Data bus communication	› Comfort/convenience systems CAN 2 user › J519 is the LIN master for ▸ LIN 1: Light Switch E1, Rain/Light Recognition Sensor G397 and Humidity Sensor G355, Wiper Motor Control Module J400, Windshield Washer Pump Control Module J1100 ▸ LIN 2: Garage Door Opener Control Module J530, Automatic Dimming Interior Rearview Mirror Y7, Roof Electronics Control Module J528, Rear Interior Lamp WX2 ▸ LIN 3: Power Adjustable Steering Column Control Module J866, Driver Seat Backrest Blower Fan V388, Driver Seat Cushion Blower Fan V390, Front Passenger Seat Backrest Blower Fan V389, Front Passenger Seat Cushion Blower Fan V391 ▸ LIN 4: Switch Module in Instrument Panel, Center EX22, Center Console Switch Module 1 EX23 ▸ LIN 5: Interior light modules 1 - 15 ▸ LIN 6: Interior light modules 16 - 30 ▸ LIN 7: Interior light modules 31 - 45 ▸ LIN 8: Heating control (4 pcs), Left Rear Backrest Fan 1 1 V520, Left Rear Seat Cushion Fan 1 V522, Right Rear Backrest Fan 1 V524, Right Rear Seat Cushion Fan 1 V526, Rear A/C Display Control Head E265 ▸ LIN 9: Servomotors (15 pcs) ▸ LIN 10: Fresh Air Blower Control Module J126, Exterior Air Quality and Humidity Sensor G935, flap positioner (2 pcs), Air Ionization System Control Module J897, Vehicle Interior Carbon Dioxide Concentration Sensor G929, Air Freshening System Control Module J1101 ▸ LIN 11: High Pressure Sensor G65, Low Pressure Side A/C Pressure/Temperature Sensor G1052, High Pressure Side A/C Pressure/Temperature Sensor G1053, servomotors (LIN series, 5 pcs) ▸ LIN 12: Rear Fresh Air Blower Control Module J391, servomotors (7 pcs), Front A/C Display Control Head 1 E774, Front A/C Display Control Head 2 E775, Front A/C Display Control Head 3 E776, Front A/C Display Control Head 4 E777, Front A/C Display Control Head 5 E778, Front A/C Display Control Head 6 E884 › Communicates via a sub-bus system with the Left and Right LED Headlamp Power Output Modules 1 A27 and A31, Left Light Control Module J1018 and 1023 and the Driver Assistance Systems Control Module J1121
Special feature	The interior light modules of the background lighting and the AC servomotors can be connected to the relevant LIN branch both as LIN series and in parallel. This possibility must be considered during troubleshooting. Always refer to the current flow diagram applicable to the vehicle's equipment specification.

Illuminated seat belt buckle (optional, PR no. 6C5)

General description

The 2019 A8 is optionally available with illuminated seat belt buckles. Illuminated seat belt buckles help the vehicle occupants to locate their seat belt buckle in the dark. The illuminated seat belt buckles are installed at the front and rear on the driver and front passenger sides. The Vehicle Electrical System Control Module J519 is, in its capacity as the "interior light manager", responsible for illumination.

The actual seat belt function is unchanged. Each seat belt buckle has a switch for seatbelt fastening detection. A 2-pin connector is sufficient for this purpose. The illuminated seat belt buckles are additionally equipped with two LEDs. These seat belt buckles have a 5-pin connector with four assigned pins. The two wires for the switches of the seatbelt fastening detection function are conneceted to the Airbag Control Module J234. The other two wires are required for activating the LEDs. The LEDs illuminated an optical fiber which, in turn, illuminates the area around the seat belt button.



Activation of the lighting

The LEDs for the illuminated seat belt buckles are connected to terminal 58xt, which is activated by the Vehicle Electrical System Control Module J519. Terminal 58xt is the switch search lighting.

This means that J519 activates terminal 58xt when the vehicle is unlocked and if a door is opened after the vehicle has been unlocked. This switches on the interior light as well as the lighting of key controls, such as the start-stop button, and the illuminated seat belt buckle. This lighting is switched off again after a certain time by the interior lighting run-on function.

Automatic Dimming Interior Rearview Mirror Y7

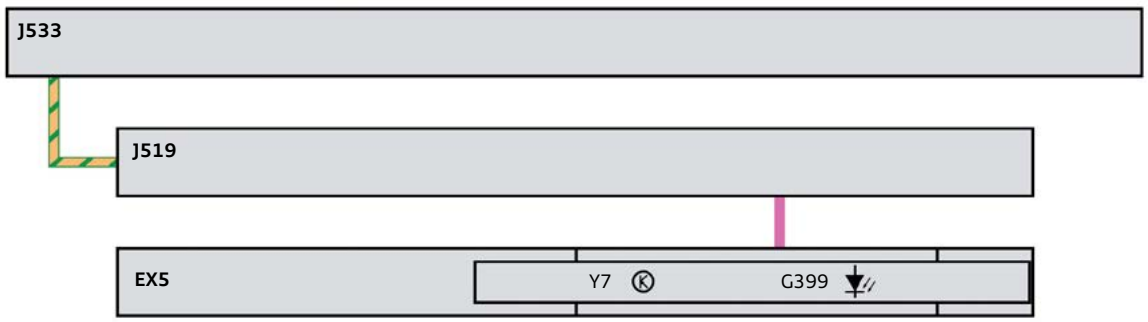
The rear-view mirror and exterior door mirrors door mirrors are dimmed automatically when incident light is detected from the rear (for example, headlights of a following vehicle).

The light sensor is located at the top center behind the glass surface of the rear-view mirror (not visible to the driver).

Features of the automatic dimming mirrors:

- "Frameless look" mirror housing with concealed edges; chrome accents are optional.
- Mirror is preconfigured for compass display, for the high beam assist electronics and for the camera systems of various assistance systems.
- Glare sensors located behind trans-reflective (semi-permeable) glass – not visible to the driver.
- The electronics for dimming the rear-view mirror also control the dimming of the door mirrors.
- Y7 is an integral part of the rear-view mirror module EX5.
- Y7 is a LIN user of the Vehicle Electrical System Control Module J519 and can, therefore, be accessed via Address Word 09 with the VAS Scan Tool.

Schematic diagram



664_129

Key:

EX5 Interior Rear View Mirror
G399 Light Recognition Sensor
J519 Vehicle Electrical System Control Module
J533 Data Bus on Board Diagnostic Interface
Y7 Automatic Dimming Interior Rearview Mirror

If the incidence of light on the rear-view mirror is impaired, the automatic dimming mirrors will not function properly.

The automatic dimming mirrors are not dimmed when the inteiror lighting is on and when reverse gear is selected.

Rear-view mirror EX5

664_130

Rain/Light Recognition Sensor
G397

Light Recognition Sensor
G399
(concealed behind the mirror glass)

Automatic Dimming Interior Rearview Mirror
Y7

Windshield wiper and washer system

Windshield washer system

The standard windshield washer system is similar in design and working principle to the systems used on previous Audi models. The wiper linkage integrated in the plenum chamber including the wiper motor with integrated control unit drives two wiper arms with Aero wiper blades.

Wiper Motor Control Module J400 is a LIN slave of the Vehicle Electrical System Control Module J519 and has a number of functions:

- Touch wipe.
- Tear drop wipe.
- Alternating park position of the wiper blades.
- Speed reduction at reversal points.
- Speed-dependent wiping speed.
- Service position of the wiper arms for wiper blade replacement.

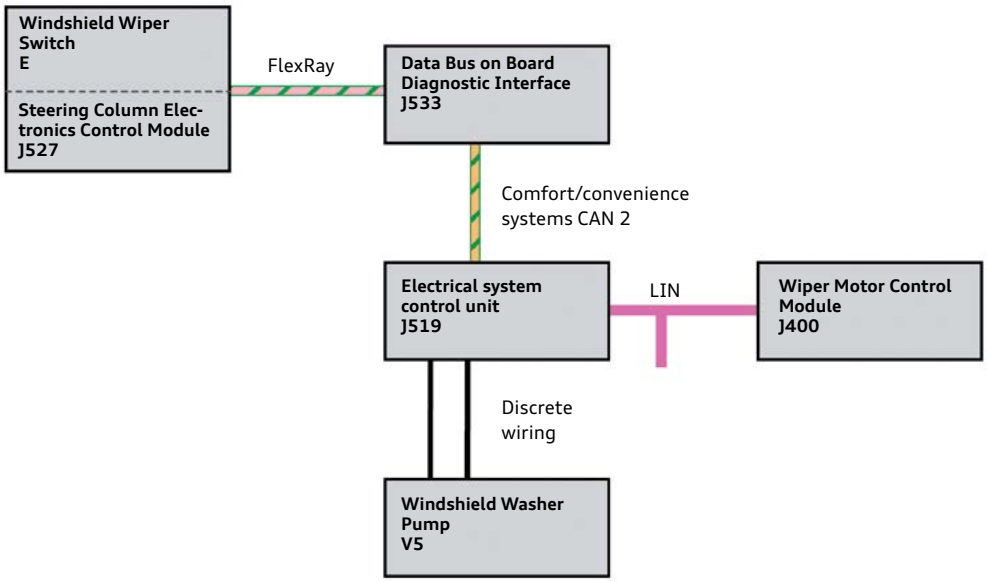
664_102

Function diagram

The signals from Windshield Wiper Switch E are sent to the Data Bus on Board Diagnostic Interface J533 by the Steering Column Electronics Control Module J527 via FlexRay. These messages are then transfered to the Vehicle Electrical System Control Module J519 via comfort/convenience systems CAN 2.

J519 activates the Wiper Motor Control Module J400 via the LIN connection.

Windshield Washer Pump V5 is activated by J519 (it is discretely wired).



664_103

Windshield washer

The standard windshield washer system consists of the washer fluid tank with windshield washer pump, the washer fluid hoses and the three windshield washer jets. The windshield washer jets are integrated into the underside of the hood.

They are heatable and have an adjusting screw for exact adjustment and optimal distribution of the washer fluid on the windshield. The washer jet heating resistors are energized directly by Vehicle Electrical System Control Module J519.

664_104

Adaptive windshield wiper with integrated washer jets (wet arm wipers)

General description

The 2019 A8 may be equipped with adaptive windshield washers (cold weather package) with integrated washer jets. These are also known commonly as wet arm wipers. In this version the windshield washer jets are integrated in both wiper arms above and below the wiper blade. Both of the washer jet channels in each wiper arm are heated.

The washer fluid is applied to the windshield directly next to the wiper blade, which provides better cleaning results and water economy compared to the standard windshield wiper system. There is no splash of water onto windshield to impair the driver's visibility. This means that the driver has a clear view during the wiping cycle.

Washer jets above wiper blade are active

664_109

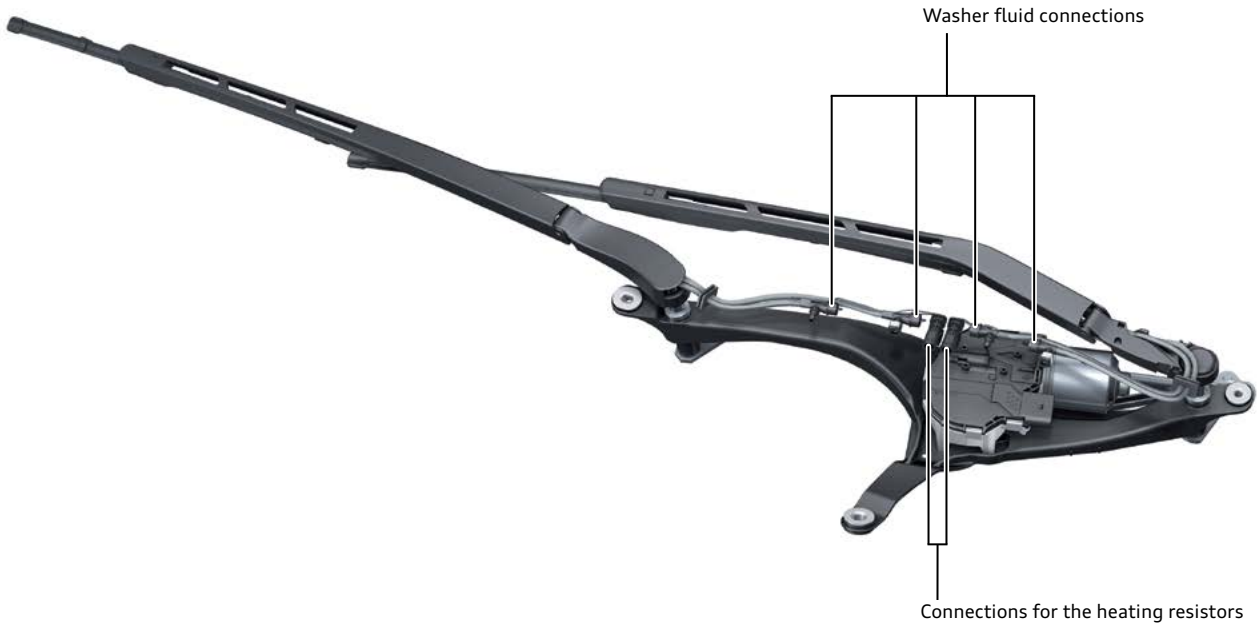
Washer jets below wiper blade are active

664_163

Windshield washer system

The wiper linkage and the Wiper Motor Control Module J400 are identical to those of the standard windshield washer system. The wet arm wipers have 2 integrated, heatable washer jet channels each.

Each wiper arm has two washer fluid connections for both washer jet channels as well as an electrical connection for the heating resistors.

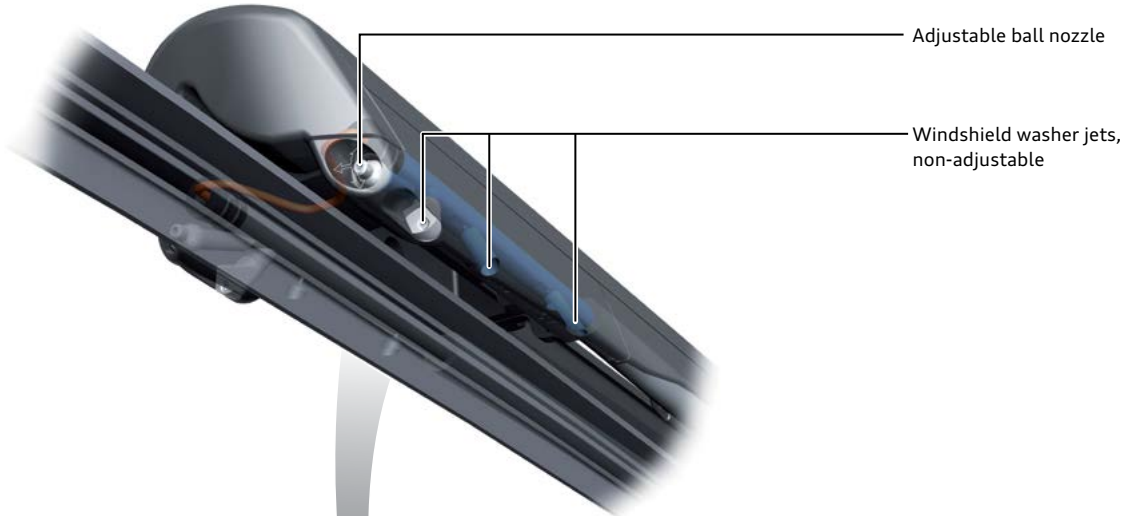


664_108

Wiper arms

Two washer jet channels are integrated in each wiper arm, one for the windshield washer jets on the top of the wiper blade and one for the windshield washer jets on the bottom of the wiper blade. 11 jet outlets are integrated into in each washer jet channel.

The jet at the tip of the washer jet channel is designed as an adjustable ball nozzle. The direction of the washer fluid outlet can be controlled. All other jets are non-adjustable.



664_106

664_107

Windshield Washer Pump Control Module J1100

General description

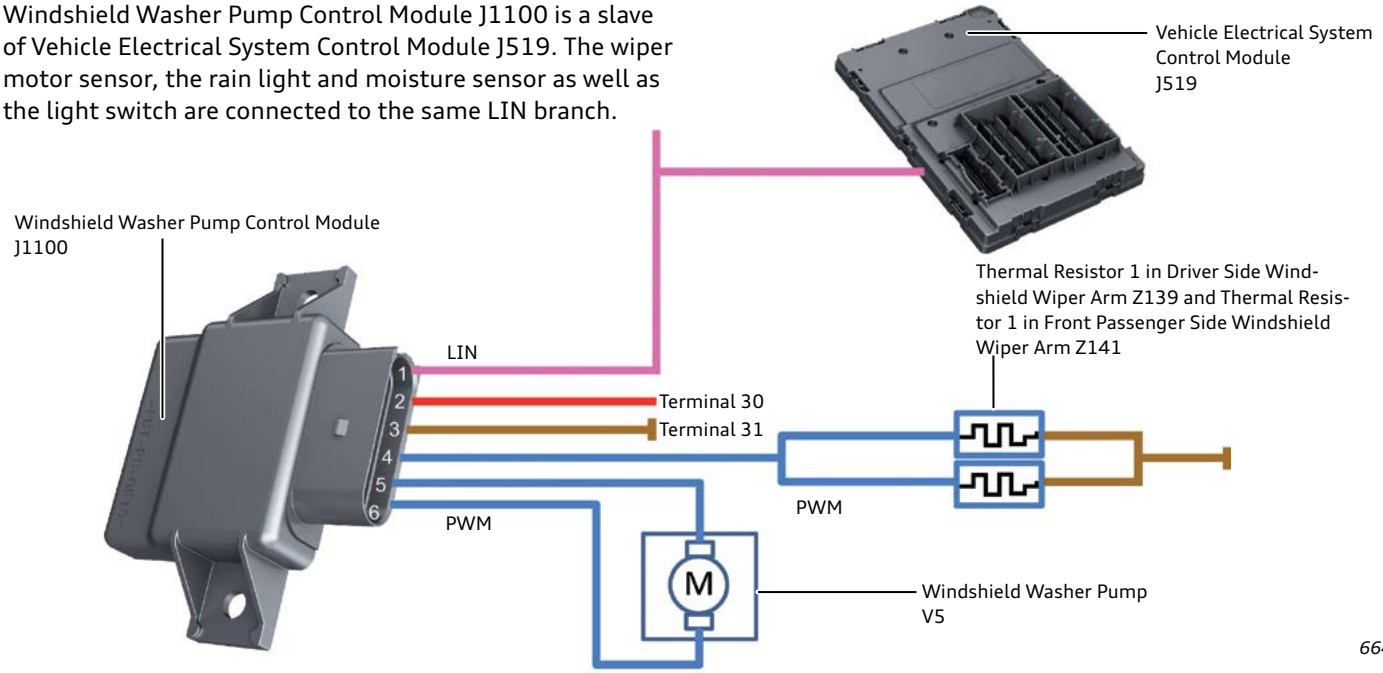
Models with the optional wet arm wipers feature a newly developed control module: Windshield Washer Pump Control Module J1100. It is located in the plenum chamber and uses a pulse-width-modulated (PWM) signal to activate both Windshield Washer Pump V5 and the heating resistors in the wiper arms.

The windshield washer pump of the wet arm wiper system is designed as a dual pump. When the pump turns in one direction, the windshield washer jets on the top of the wiper arm are supplied with washer fluid. When the pump turns in the opposite direction, the windshield washer jets on the bottom of the wiper arm are active.

664_111

Function diagram

Windshield Washer Pump Control Module J1100 is a slave of Vehicle Electrical System Control Module J519. The wiper motor sensor, the rain light and moisture sensor as well as the light switch are connected to the same LIN branch.



664_114

Operating the windshield washer pump

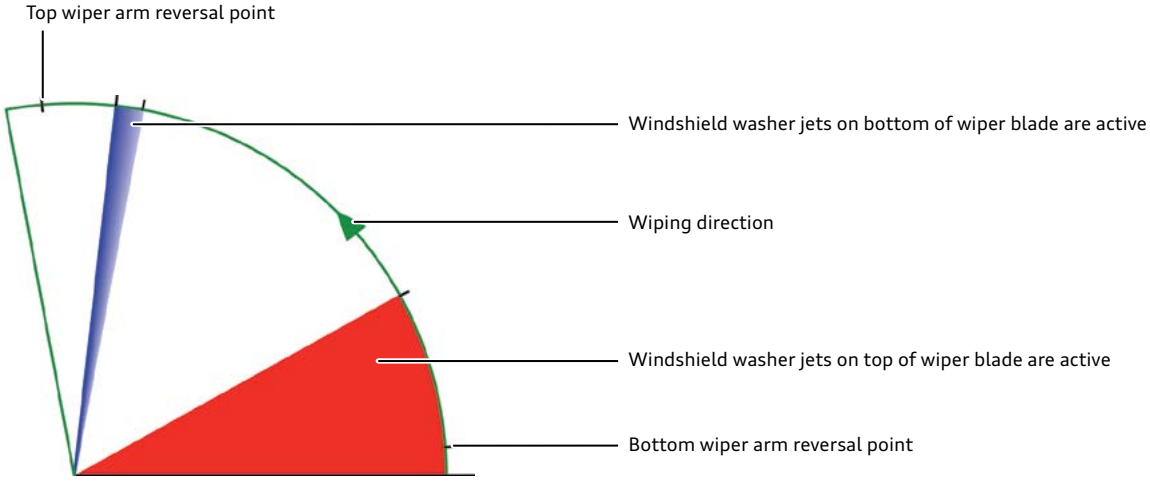
The PWM signal controls both the quantity of washer fluid and the time at which water is applied to the windshield. The windshield washer jets on the top or bottom of the wiper blade are selected when the pump reverses direction. The way in which the windshield washer pump is activated depends on the ambient temperature, the position of the wiper arm and the speed at which the vehicle is travelling.

Basically, a distinction is made between two characteristics: winter mode and summer mode. Winter mode is active at temperatures below 41 °F (5 °C). When the ambient temperature rises above 44.6 °F (7 °C), the summer mode characteristic is selected. Each mode (summer/winter) is subdivided into a further four characteristics, depending on the speed at which the vehicle is travelling.

This means that, overall, there are eight different scenarios for the activation of the windshield washer pump. The diagrams below show how the windshield washer pump is activated in winter model one. The first diagram shows the movement of the wiper blade from the lower reversal point to the upper reversal point. In the area highlighted red the windshield washer jets on the top of the wiper blade are activated, while in the area highlighted blue the windshield washer jets on the bottom of the wiper blade are activated.

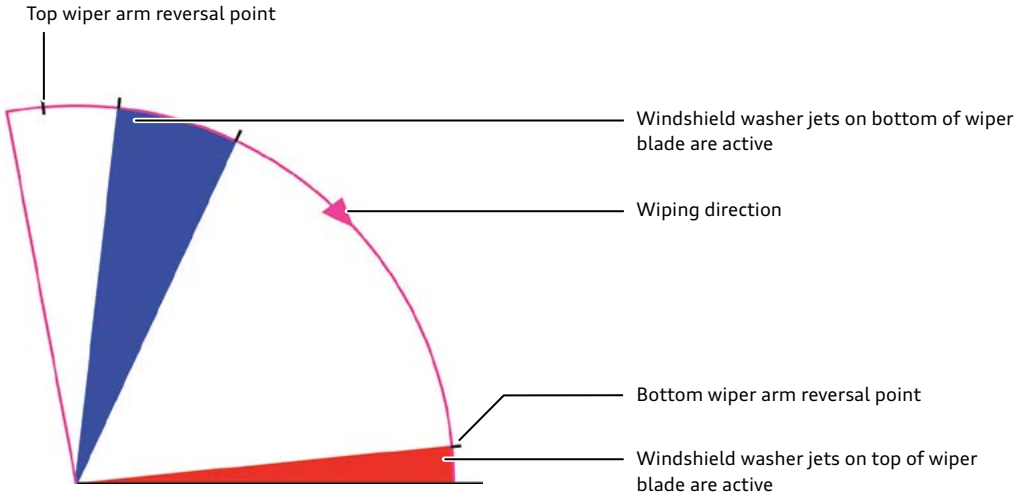
The second diagram shows the water distribution during the movement of the wiper blade from bottom to top. The washer jets on the opposite side are activated shortly before the reversal point is reached.

Diagram 1



664_115

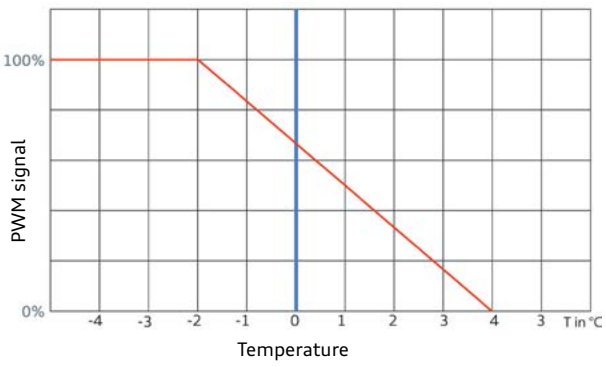
Diagram 2



664_116

Activation of the heating resistors

The heating resistors in the wiper arms are also activated by a PWM signal. The heating resistors are not activated at ambient temperatures above 39.2 °F (4 °C). At an ambient temperature of 28.4 °F (-2 °C) and below, the heating resistors are fully activated (100 % PWM signal). Between these two temperature values, the PWM signal has a linear characteristic.



664_117

Washer system for headlights and night vision

General description

The 2019 A8 can be equipped with a headlight washer system with two washer jets per headlight. The washer jets are concealed below covers in the bumper and do not extend until they are activated.

If the vehicle is equipped with night vision assist, the accompanying camera also has a washer jet. Both systems are supplied with washer fluid by a common pump. Washing is initiated by the driver via the wiper stalk.

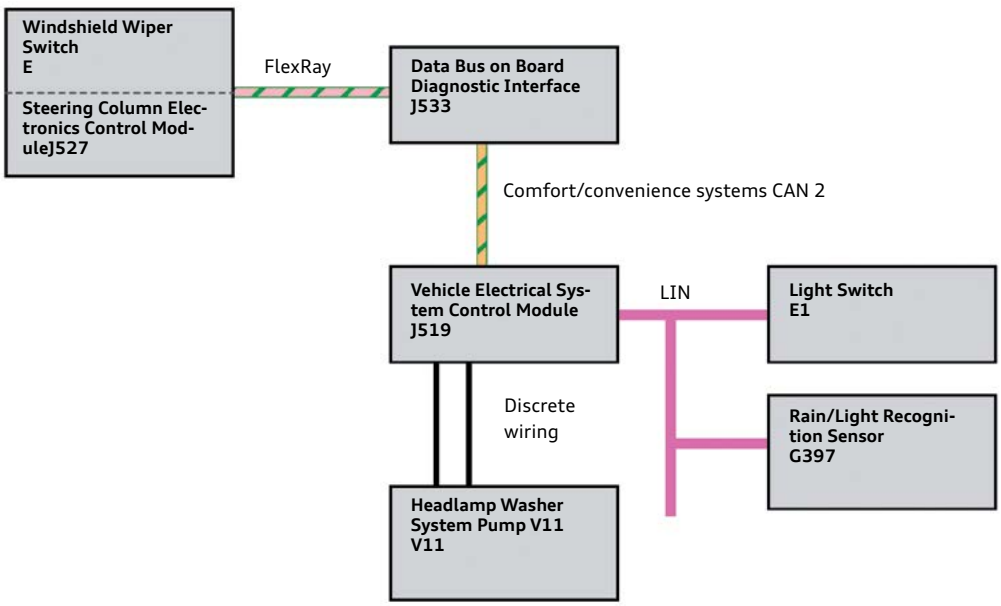
664_105

Function diagram

A condition for cleaning the headlights and the camera for the night vision system is that the driving lights are on. When Vehicle Electrical System Control Module J519 receives information via a LIN connection from the light switch that the low beam is on, or when the rain and light sensor indicates that it is dark. If Windshield Wiper Switch E is now actuated, its signal is sent to J533 by the Steering Column Electronics Control Module J527 via FlexRay.

These messages are then transfered to Vehicle Electrical System Control Module J519 via comfort/convenience systems CAN 2.

J519 then activates Headlamp Washer System Pump V11. The headlights and the night vision system camera are cleaned when the wiper stalk is actuated for the first time, and then at preset intervals. Night vision assist does not have to be activated.



664_112

Laser scanner washer system

General description

The 2019 A8 available with adaptive cruise assist. This system includes a laser scanner for the recognition of objects in front of the vehicle. The laser scanner forms a unit together with the Laser Distance Regulation Control Module J1122. If dirty, the laser scanner must be cleaned to ensure that it functions properly.

This is done by a washer jet on the left and right hand sides of the laser scanner. If Laser Distance Regulation Control Module J1122 detects that the signals from the laser scanner are too weak, it automatically requests a cleaning cycle. The driver cannot activate this cleaning function.

664_113

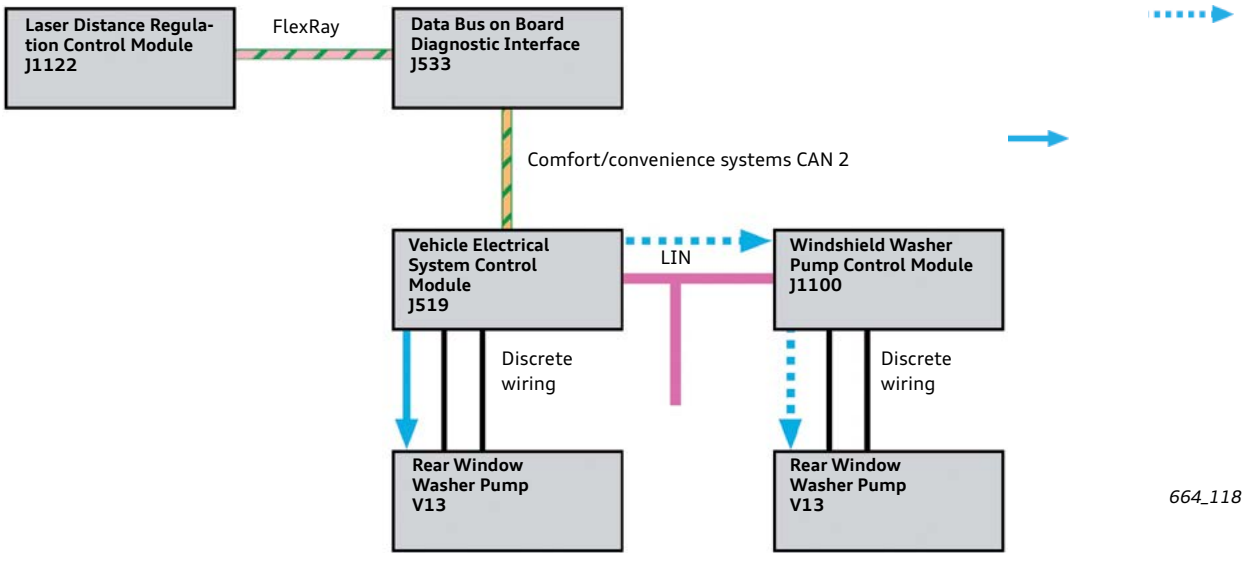
Function diagram

Laser Distance Regulation Control Module J1122 requests that its laser scanner be cleaned. It sends a data message via FlexRay to Data Bus on Board Diagnostic Interface J533, which in turn transfers the message to Vehicle Electrical System Control Module J519 via comfort/convenience systems CAN 2. J519 must now activate Rear Window Washer Pump V13. V13, which then takes care of cleaning the laser scanner. The characteristic of this activation signal is dependent on the equipment fitted.

There are two possible scenarios:

1. The vehicle is equipped with a standard wiper system and a laser distance control system:
   › J519 sends a LIN message to the Windshield Washer Pump Control Module J1100, which activates V13 via discrete wiring.

2. The vehicle is equipped with a wet arm wiper system and a laser distance control system:
   › J519 activates V13 directly via discrete wiring.



664_118

Rear view camera washer system

General description

Due to the fact that the rear view camera is installed in the trunk lid handle, it is prone to being obstructed by dirt build-up under certain ambient conditions. The 2019 A8 has a washer jet for cleaning the camera lens. Camera lens cleaning can be initiated in two ways by brief activation of the washer jet.

1. Driver-initiated cleaning cycle:
   - › The driver has the option of initiating a rear view camera lens cleaning cycle in the parking aid settings menu. To do this, the driver selects the "Clean reversing camera" option.

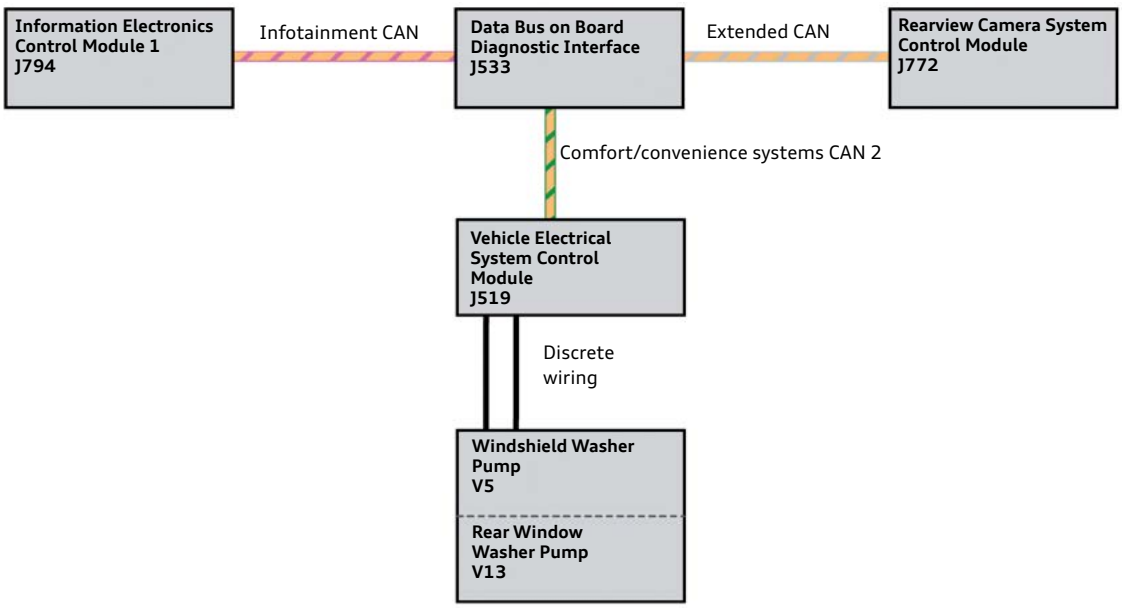
2. Cleaning cycle requested by the rear view camera:
   - › If Rearview Camera System Control Module J772 determines that the camera lens is dirty when evaluating the camera images, it initiates a cleaning cycle.

664_119

Function diagram

If the rear view camera cleaning cycle is initiated by the driver, Information Electronics Control Module 1 J794 sends a corresponding message to Data Bus on Board Diagnostic Interface J533 via the infotainment CAN. If cleaning of the camera lens is requested, J533 receives a corresponding message from the Rearview Camera System Control Module J772 via extended CAN.

This second option is only implemented in models in which the rear view camera is installed in combination with the surround view camera. The data is transfered from J533 to the Vehicle Electrical System Control Module J519 via comfort/convenience systems CAN 2. Depending on equipment, J519 activates either Windshield Washer Pump V5 or Rear Window Washer Pump V13 via the discrete wiring.



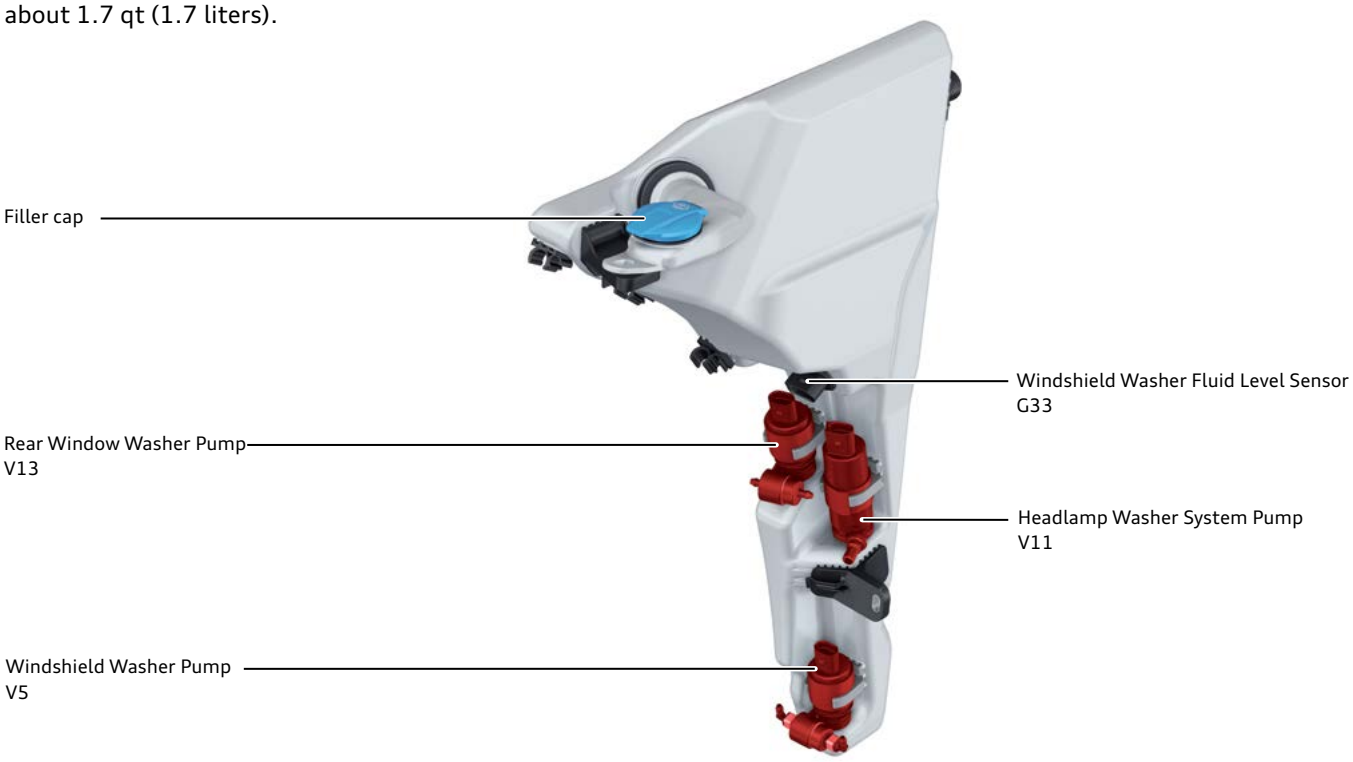
664_120

Washer tank

General description

The washer fluid tank is installed in the wheel well behind the right front wheel. This plastic tank has a capacity of approximately 1.5 gal (5.7 l). The driver is alerted via the instrument cluster display when the remaining fluid level is about 1.7 qt (1.7 liters).

The tank should, if possible, be filled with clean, softened water in order to avoid limescale build-up on the washer jets. A windshield fluid (containing antifreeze in the winter) should always be added to the water.



Wash water pumps

Headlamp Washer System Pump V11 is typically configured as a mono pump and cleans both the headlights and the night vision system camera at the same time.

Depending on equipment, Windshield Washer Pump V5 and Rear Window Washer Pump V13 can be configured as mono or dual washer pumps.

The illustration of the washer fluid tank with pumps V5, V11 and V13 shows the full equipment specification. Here, V5 and V13 are configured as dual washer pumps. The following table provides an overview of the version and the tasks of pumps V5 and V13 depending on equipment.

Equipment	V5	V13	V5 Connection 1	V5 Connection 2	V13 Connection 1	V13 Connection 2
Windshield washer system	Mono	–	Windshield washer jets	–	–	–
Windshield washer system + rear view camera	Dual	–	Windshield washer jets	Rear view camera	–	–
Windshield washer system + laser scanner	Mono	Mono	Windshield washer jets	–	Laser scanner	–
Windshield washer system + laser scanner	Mono	Dual	Windshield washer jets	–	Laser scanner	Rear view camera
Wet arm wiper	Dual	–	Wet arm wiper down	Wet arm wiper up	–	–
Wet arm wipers + rear view camera	Dual	Mono	Wet arm wiper down	Wet arm wiper up	Rear view camera	–
Wet arm wipers + laser scanner	Dual	Mono	Wet arm wiper down	Wet arm wiper up	Rear view camera	–
Wet arm wipers + rear view camera + laser scanner	Dual	Dual	Wet arm wiper down	Wet arm wiper up	Rear view camera	Rear view camera

Comfort System Central Control Module J393 (BCM2)

Comfort System Central Control Module J393 is based on the MLBevo platform and has been adopted from the Audi Q7 and further enhanced. Key new features are the Audi connect key and the tail lights featuring OLED technology.

Comfort System Central Control Module J393:

- Is accessed via Address Word 46.
- Is a comfort/convenience systems CAN user.
- Has the following master functions:
  - Central locking system master
  - Immobilizer master

- Is the LIN master for:
  - LIN1: Windshield Defogger Control Module J505, anti-theft alarm system sensor.
  - LIN2: Alarm Horn H12.
  - LIN3: Power Rear Lid Opening Control Module J938 (sensor-activated trunk lid).

- Is located in the luggage compartment, on the left-hand side, behind the side trim. Connectors and wires are downward-facing for protection against moisture.

Other integrated functions:

- Terminal management.
- Entry and start authorization.
- Central locking.
- Anti-theft alarm.
- Activation of the rear exterior lights.
- Heated rear window.
- Turn signal control.
- Rear roller blind control.
- Luggage compartment/trunk lid release and -luggage compartment light control.
- Fuel filler flap locking.
- Trunk lid power closing system.
- Sliding sunroof activation.
- Roof roller blind activation.
- Electronic steering column lock.
- Sensor-activated luggage compartment release.
- Fuel tank sensor management.
- Automatic switch-on of the turn signal system and unlocking of the doors in a collision triggering the crash sensor.

Terminal management

General description

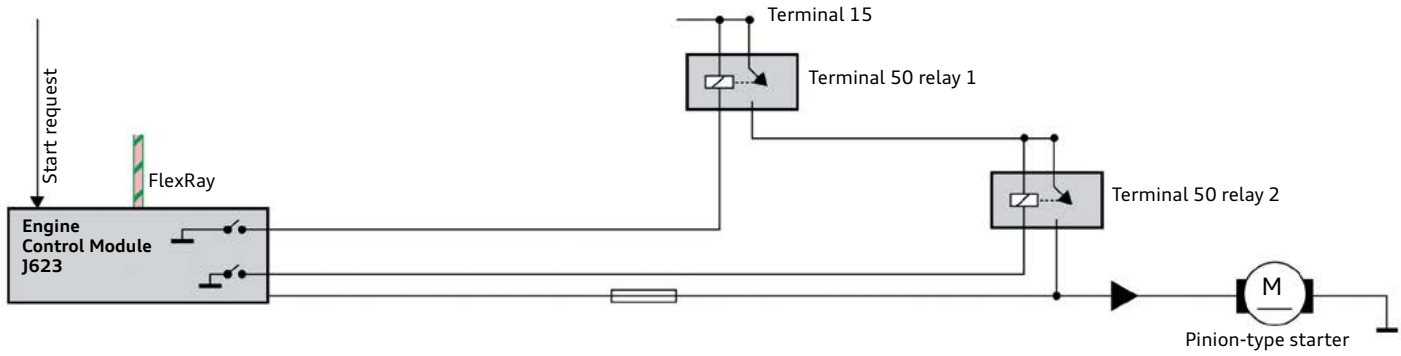
Terminal management for the 2019 A8 is similar to that of the 2017 Q7. For information about the signal characteristic for activating Terminals 15 and 30, refer to eSelf-Study Program 970463, The 2017 Audi Q7 Convenience Electronics.

Because the 2019 A8 has both a 12-volt pinion-type starter and a 48-volt starter generator, there are differences to the Audi Q7 with regard to starting the engine.

Engine starting with 12-volt pinion-type starter

The engine of the 2019 A8 is always started with the 12 volt pinion type starter for the first time and at engine oil temperatures below 113 °F (45 °C).

Engine Control Module J623 receives the start request as a discrete signal and a FlexRay message from the Comfort System Central Control Module J393. J623 activates both Terminal 50 relays, which in turn activate the 12-volt pinion-type starter.



664_127

Engine starting with 48-volt starter generator

The 48-volt starter generator is always used at engine oil temperatures above 113 °F (45 °C), and for restarting after engine shut-off by the start-stop system or by the intelligent coasting function.

The Engine Control Module J623 either receives a start request as a discrete signal and a FlexRay message from the Comfort System Central Control Module J393 or determines by itself to restart the engine. J623 then activates the starter generator via a private CAN bus.

664_128

Central locking

All doors and the luggage compartment lid can be centrally locked and unlocked at once. As is customary, the system can be configured via the MMI to unlock the complete vehicle or only the driver's door. The turn signals flash twice when the vehicle is unlocked and once when it is locked.

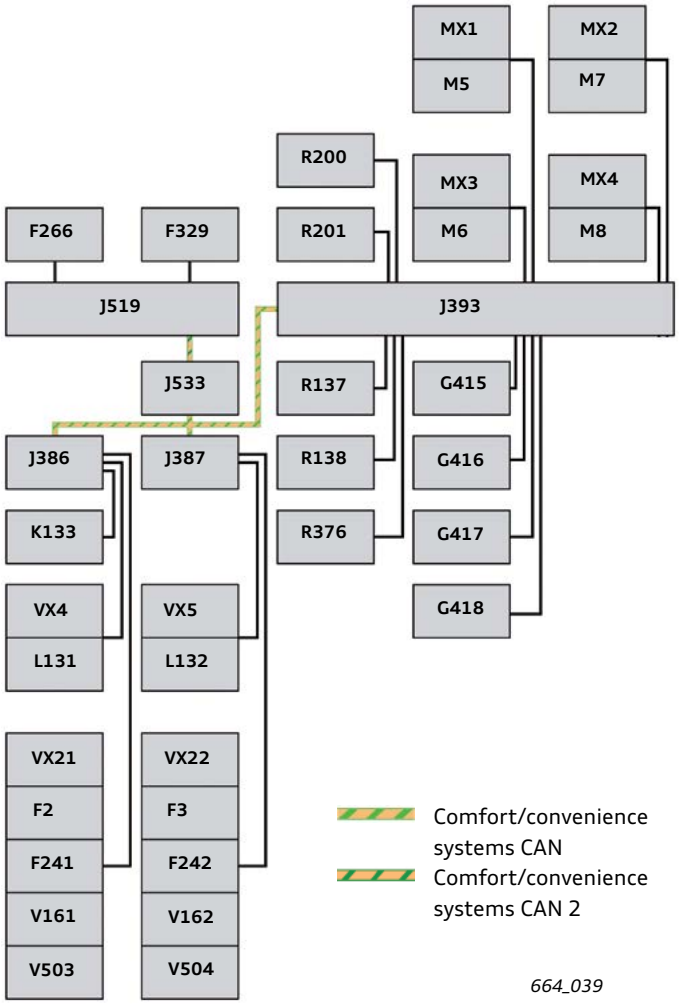
The new 2019 A8 can be unlocked/locked in different ways:

- By car key
- By the sensors in the door handle
- By the locking cylinder on the driver's door
- By the interior central locking switch

Conditions for successful vehicle locking are:

- If the vehicle is locked with the radio remote control or with Driver Side Exterior Door Handle Switch F546:
  - The driver's door must be closed and the transmission selector lever must be in the Park position.
- When the vehicle is locked by Driver Interior Locking Button E308:
  - All doors must be closed
  - In this scenario, the door can be opened after operating the interior door handle.

Control modules, sensors and actuators belonging to J393:



G415 Driver Exterior Door Handle Touch Sensor
G416 Front Passenger Exterior Door Handle Touch Sensor
G417 Left Rear Exterior Door Handle Touch Sensor
G418 Right Rear Exterior Door Handle Touch Sensor
J386 Driver Door Control Module
J387 Front Passenger Door Control Module
J393 Comfort System Central Control Module
J519 Vehicle Electrical System Control Module
J533 Data Bus on Board Diagnostic Interface
K133 Indicator lamp for SAFE function of central locking system
L131 Driver Exterior Rearview Mirror Turn Signal Bulb
L132 Front Passenger Exterior Rearview Mirror Turn Signal Bulb
M5 Left Front Turn Signal Bulb
M6 Left Rear Turn Signal Bulb
M7 Right Front Turn Signal Bulb
M8 Right Rear Turn Signal Bulb
MX1 Left Front Headlamp
MX2 Right Front Headlamp
MX3 Left Tail Lamp
MX4 Right Tail Lamp
R137 Access/Start System Antenna in Luggage Compartment
R138 Access/Start System Antenna 1 in Vehicle Interior
R200 Left Access/Start Authorization Antenna
R201 Right Access/Start Authorization Antenna
R376 Front Access/Start Authorization Antenna
V161 Driver Door Central Locking -Safe- Motor
V162 Front Passenger Central Locking -Safe- Motor
V503 Driver Side Central Locking Motor
V504 Front Passenger Side Central Locking Motor
VX4 Driver Exterior Rearview Mirror
VX5 Front Passenger Exterior Rearview Mirror
VX21 Driver Door Lock Unit
VX22 Front Passenger Door Lock Unit

Key

F2 Driver Door Contact Switch
F3 Front Passenger Door Contact Switch
F241 Driver Lock Cylinder Contact Switch
F242 Front Passenger Lock Cylinder Contact Switch
F266 Engine Hood Contact Switch
F329 Hood Contact Switch 2

Anti-theft alarm

The basic functions of the anti-theft alarm system are identical in all Audi vehicles. The interior monitoring system is based on that of the 2017 Audi Q7, and the parameters have been adapted in a model-specific way.

To arm the anti-theft alarm system, the following conditions must apply:

- The vehicle must be locked with either the locking cylinder, the remote control key or the exterior door handle switch (in models with advanced key).
- The driver's door must be closed.
- Neither the NO contact nor Terminal 15 may be active.

It takes about 30 s until the anti-theft alarm is armed.

An alarm is activated by Alarm Horn H12 as soon as any of the following events occurs:

- A door is opened.
- The hood is opened.
- The trunk lid is opened.

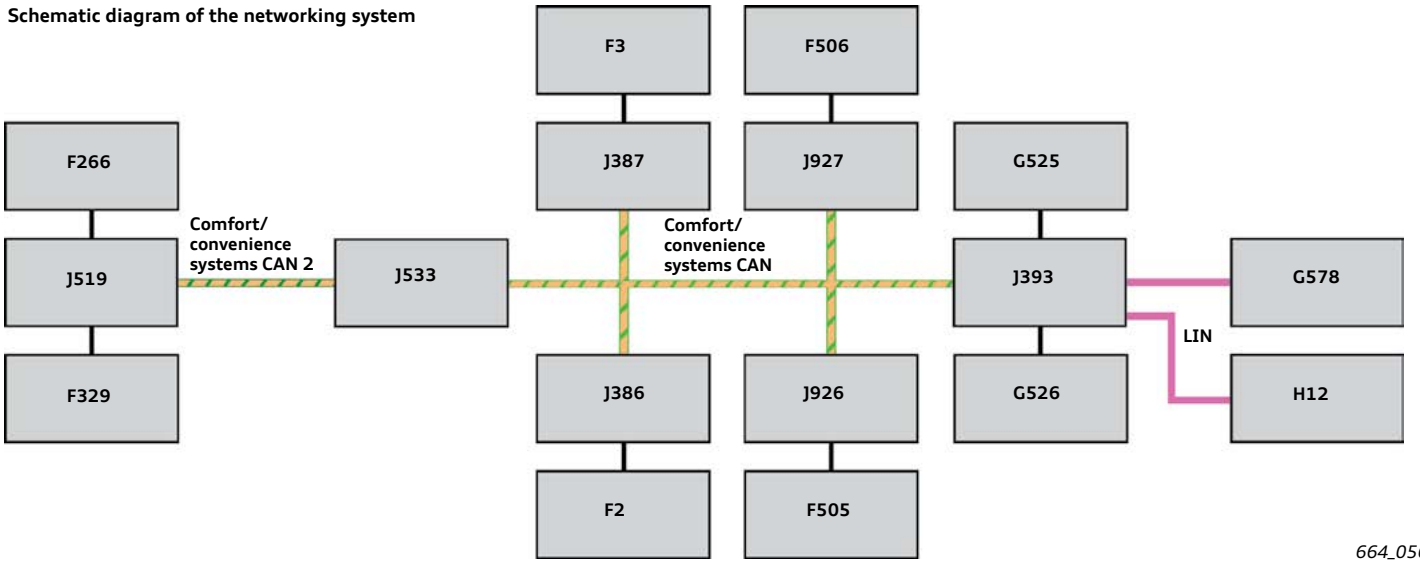
The alarm also activates in the following situations:

- The interior monitoring system detects movement inside the occupant cell via the ultrasound sensors (the alarm is also triggered when a window is broken).
- The inclination sensor provides tow-away protection. In addition, Vehicle Inclination Sensor G384 detects when the vehicle is raised.

Two sensors are combined in Anti-Theft Alarm System Sensor G578:

- Interior Monitoring Sensor G273.
- Vehicle Inclination Sensor G384.

Schematic diagram of the networking system



664_056

Key:

F2 Driver Door Contact Switch
F3 Front Passenger Door Contact Switch
F266 Engine Hood Contact Switch
F329 Hood Contact Switch 2
F505 Driver Side Rear Door Contact Switch
F506 Passenger Side Rear Door Contact Switch
G525 Rear Lid -Closed- Sensor 1
G526 Rear Lid -Closed- Sensor 2
G578 Anti-Theft Alarm System Sensor
J386 Driver Door Control Module
J387 Front Passenger Door Control Module
J393 Comfort System Central Control Module
J519 Vehicle Electrical System Control Module
J533 Data Bus on Board Diagnostic Interface (gateway)
J926 Driver Side Rear Door Control Module
J927 Passenger Side Rear Door Control Module
H12 Alarm Horn

Location of Alarm Horn H12

664_123

Rear Lid Control Module J605

A power opening and closing trunk lid is standard equipment. A spindle drive is used on the left-hand side, eliminating the need for the hydraulic damper.

Rear Lid Control Module J605 is located on the left-hand side of the luggage compartment, behind the luggage compartment lining.

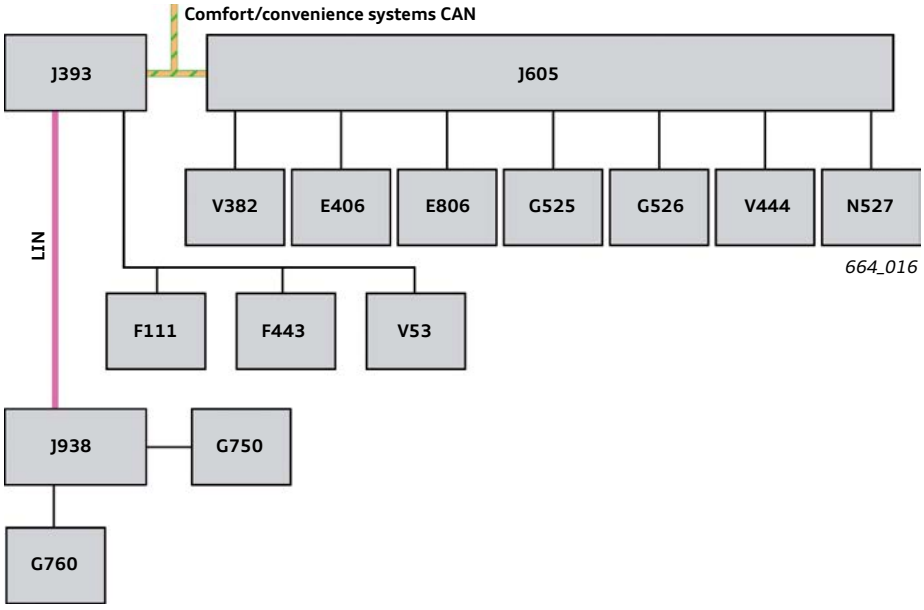
Opening and closing of the trunk lid:

- The trunk lid can be unlocked with the remote control key.
- The trunk lid can be unlocked with the advanced key or with the advanced key with sensor-activated luggage compartment release.
- The trunk lid can be opened manually with the locking cylinder.

664_014

Spindle drive = trunk lid motor 1 V444

Schematic diagram of the networking system



664_016

Key:

E406 Rear Lid Lock Button in Luggage Compartment
E806 Locking Mechanism Button in the Rear Lid
F111 Rear Lid Contact Switch
F443 Lock Pawl Contact Switch
G525 Rear Lid -Closed- Sensor 1
G526 Rear Lid -Closed- Sensor 2
G750 Power Rear Lid Opening Sensor
G760 Power Rear Lid Opening Sensor 2
J393 Comfort System Central Control Module
J605 Rear Lid Control Module
J938 Power Rear Lid Opening Control Module
N527 Coupling in Rear Lid Motor 1
V53 Rear Lid Central Locking System Motor
V382 Rear Lid Closing Aid Motor
V444 Rear Lid Motor 1

Rear Lid Control Module J605

664_015

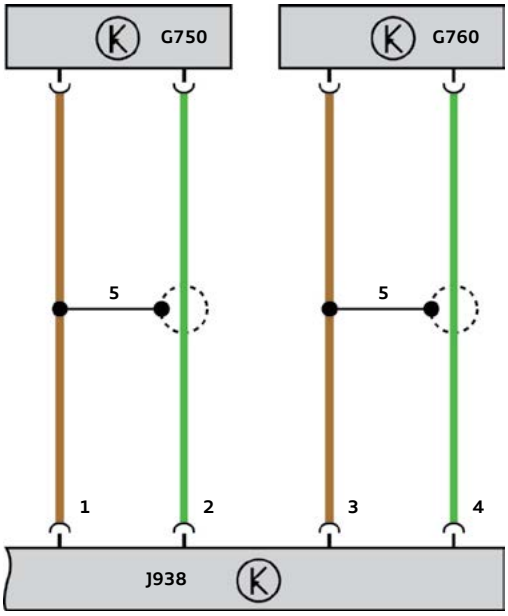
Hands-free trunk release

It is also possible to open the trunk lid when the vehicle is locked. For this purpose, it can be opened directly with the corresponding button on the advanced key or with the advanced key with sensor-activated luggage compartment release.

When the two Power Rear Lid Opening Sensors G750 and G760 detect the corresponding foot gesture (kick motion beneath the rear bumper), Power Rear Lid Opening Control Module J938 initiates an advanced key search at the rear of the vehicle. If the key is recognized, opening of the trunk lid is initiated. The trunk lid can also be closed by foot gesture.

Power Rear Lid Opening Control Module J938 is a LIN bus user connected to Comfort System Central Control Module J393.

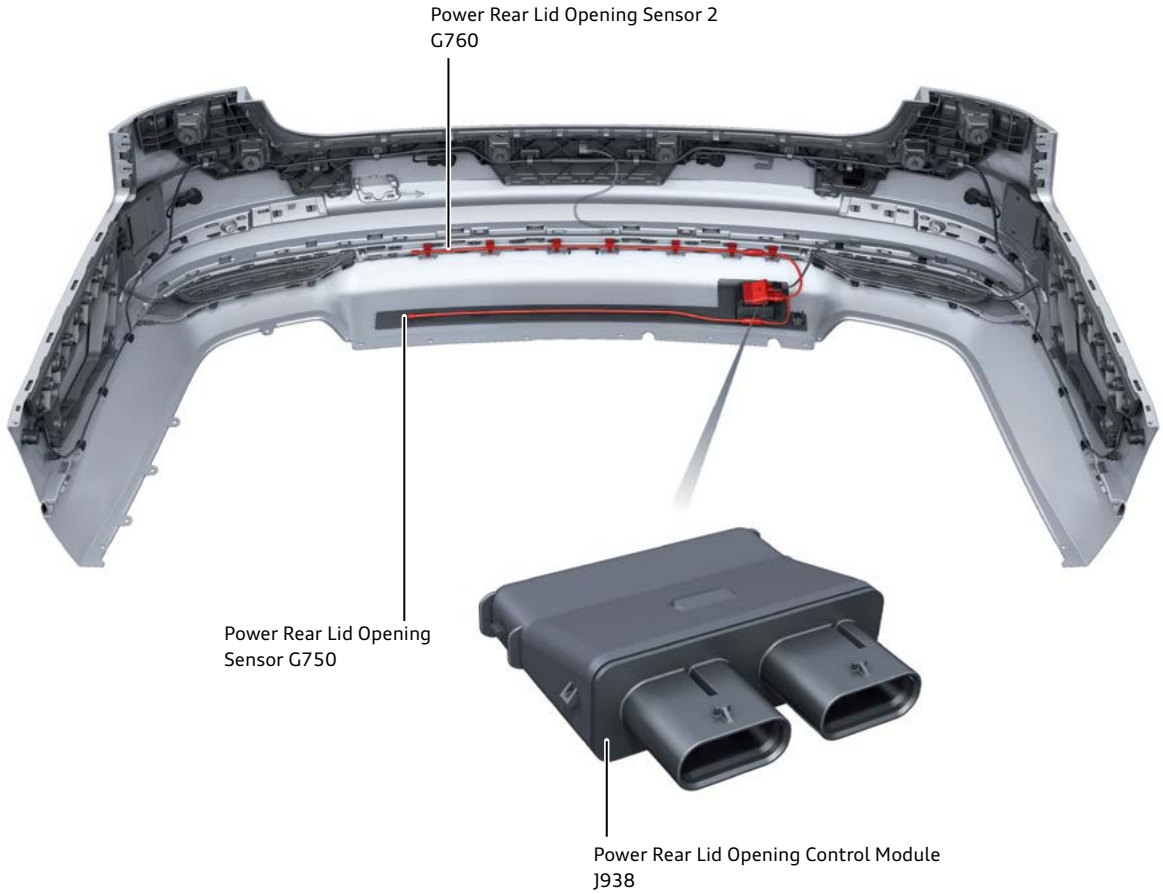
Schematic diagram



664_017

Key:

G750 Power Rear Lid Opening Sensor
G760 Power Rear Lid Opening Sensor 2
J938 Power Rear Lid Opening Control Module
1 G750 Sensor -
2 G750 Sensor +
3 G760 Sensor -
4 G760 Sensor +
5 Shielding



664_018

Garage Door Opener Control Module J530

The garage door opener of the A8 is based on the proven HomeLink® system. Different systems, such as garage doors, safety systems or house lighting can be activated by radio remote control.

Both fixed code systems and rolling code systems can be programmed in the MMI.

Once programmed, the systems can be selected on the lower display and, for example, opened or closed with the HomeLink® button.

If more than one hand-held transmitter is programmed for the vehicle, the button on the lower display must be selected first, followed by the corresponding system.

The HomeLink® garage door opener system can be programmed by linking to a GPS satellite which determines the location of the garage door opener system and displays this automatically on the MMI when the vehicle approaches it.

Garage Door Opener Control Module J530 is a LIN user of the Vehicle Electrical System Control Module J519. Garage Door Opener Programming Antenna R278 required for programming the garage door opener is located inside the vehicle, near the rear bench seat heel plate.

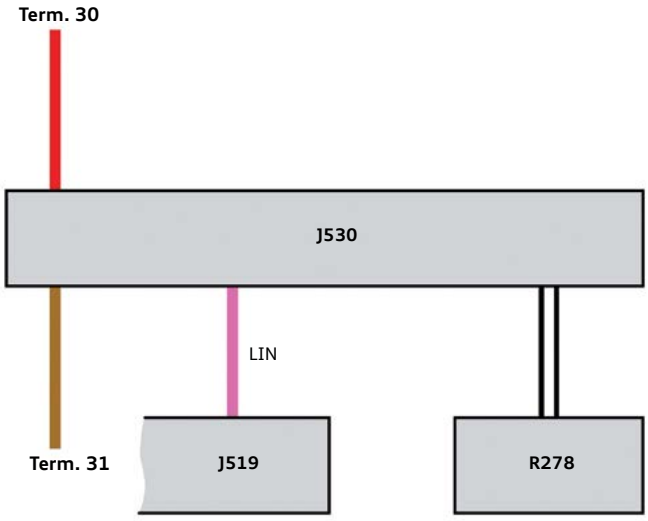
Garage Door Opener Control Module J530 is installed in the rear cross panel, below the rear bumper.

Installation location

664_009

Garage Door Opener Control Module J530

Schematic diagram

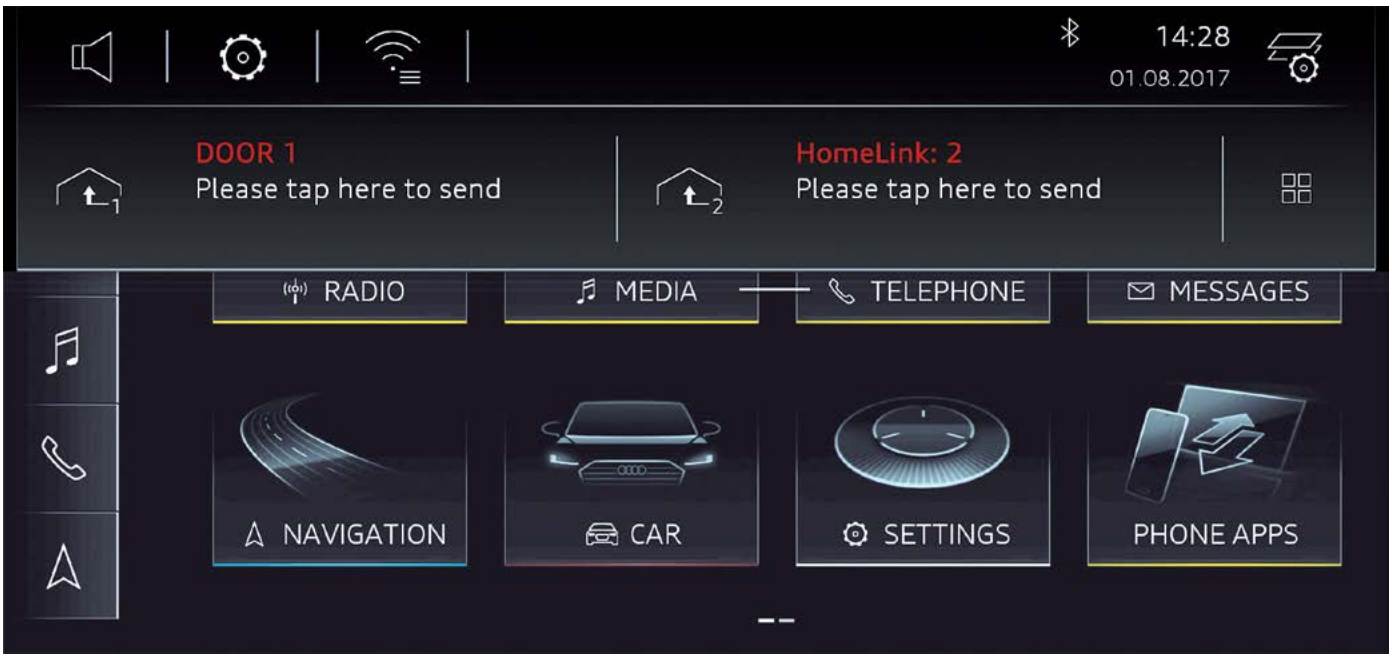


664_010

Key:

J519	Vehicle Electrical System Control Module
J530	Garage Door Opener Control Module
R278	Garage Door Opener Programming Antenna

Homelink:
objects detected by GPS



664_122

Windshield Defogger Control Module J505

The windshield heater in the new A8 is still powered by a DC-to-DC converter on the basis of the 12V battery. The maximum heating capacity of the windshield heater has been reduced to 700 W. Heating capacity is regulated automatically in a continuously variable manner according to the prevailing ambient conditions.

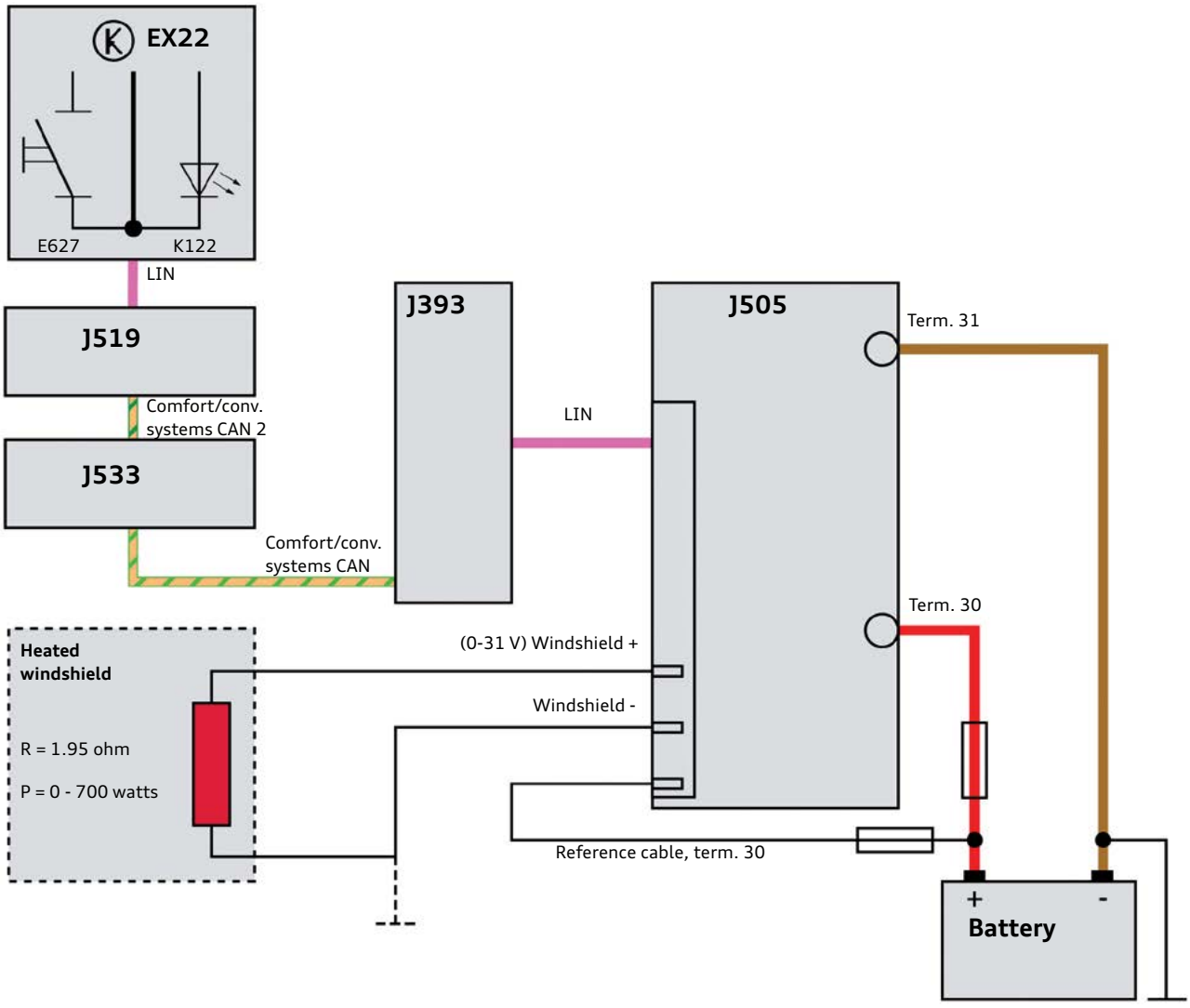
The battery voltage is transmitted to Windshield Defogger Control Module J505 via the reference wire at Terminal 30. If the battery voltage is too low, the windshield heater cannot be activated.

The following components and control units participate in the windshield heating system:

- Battery A.
- Windshield Defogger Control Module J505.
- Comfort System Central Control Module J393.
- Switch Module in Instrument Panel, Center EX22.
- Windshield.

The windshield heater is operated via the Front Information Display Control Head 2 J1060. After pushing the Defrost button, the windshield heater is activated automatically at low ambient temperatures. An activated windshield heater is indicated by Windshield Defogger Indicator Lamp K122.

Schematic diagram of the windshield heater



664_019

Key

E627 Windshield Defogger Button
EX22 Switch Module in Instrument Panel, Center

J393 Comfort System Central Control Module
J505 Windshield Defogger Control Module
J519 Vehicle Electrical System Control Module
J533 Data Bus on Board Diagnostic Interface

K122 Windshield Defogger Indicator Lamp

Instrument Cluster Control Module J285

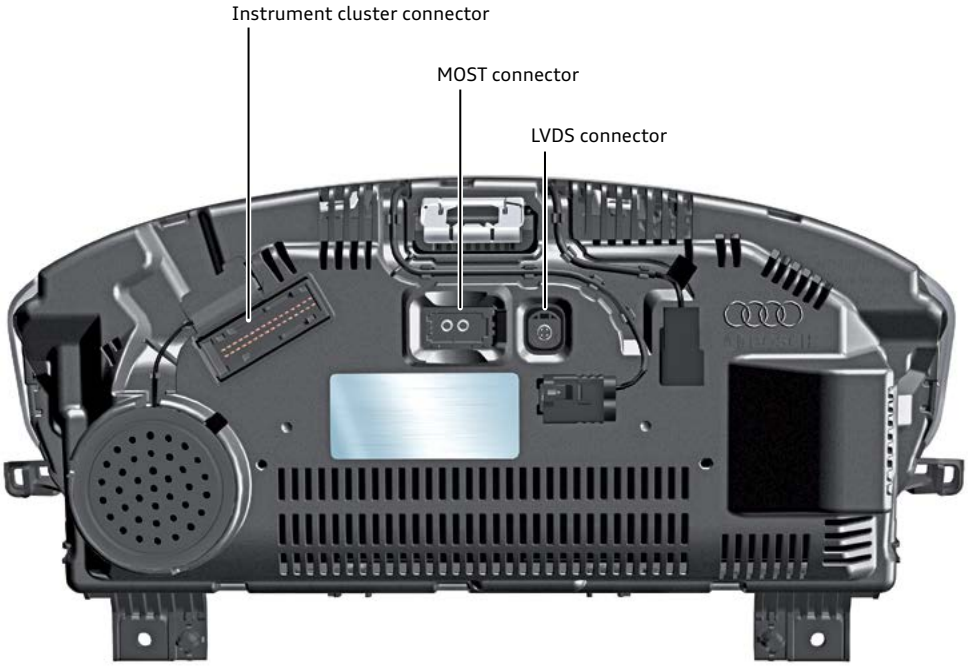
The Audi virtual cockpit displays all information directly to the driver in high resolution.

Information and instruments, such as the speedometer and tachometer, are displayed with absolute precision. The driver can choose between two views: In the classic view the gauges dominate the display, while in "Infotainment mode" the navigation system, telephone, Audi connect or media are highlighted.

Rain/Light Recognition Sensor G397 is responsible for automatic brightness control in the Audi virtual cockpit.

The new processor provides the digital instrument cluster with full HD resolution.

Note: The photocell, which was typically located at the bottom of the instrument cluster, was not functional after the launch of the new Audi A5 on the basis of the MLBevo platform even though it was still installed on a transitional basis. This photocell is no longer featured in the instrument cluster of the new Audi A8 .



664_027

664_048

Different displays will be used in the event that alternative drive concepts are introduced at a future date.

Reference

For detailed information about the Audi virtual cockpit, refer to eSelf-Study Program 910153, Audi Virtual Cockpit.

Windshield Projection Head Up Display Control Module J898

The optional head-up display, Windshield Projection Head Up Display Control Module J898, projects warnings and selected information onto the windshield in such a way that the displays appear in the driver's extended field of vision.

The head-up display content can be switched on and off with the relevant button in the function bar in the lower display.

The settings can also be recalled and changed using this function button.

The following can be set:
- Screen height.
- Screen rotation.
- Display brightness.
- Display content.

Various settings are saved to the active private profiles automatically.

The head-up display in the new Audi A8 communicates with the VAS Scan Tool via Address Word 82.

The head-up display is connected to both the instrument cluster CAN bus and the MOST bus.

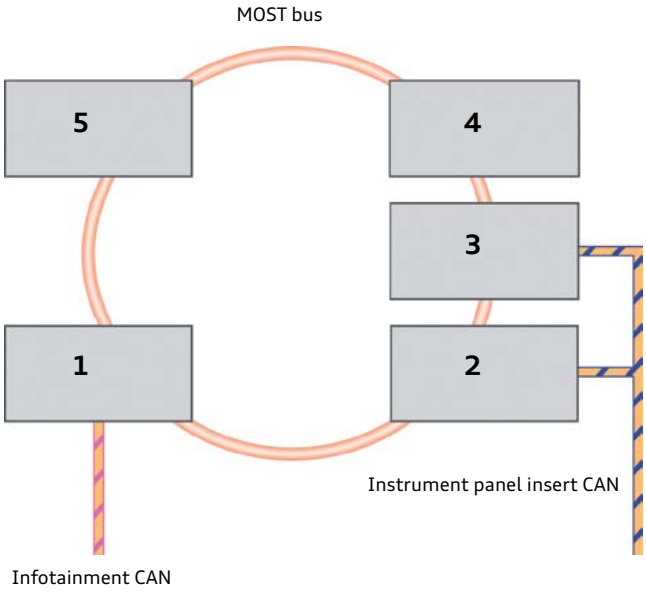
Signal inputs and outputs in the head-up display:

CAN high, CAN low, Terminal 30, Terminal 31, MOST signals with optical signal input and output.
- The head-up display is the only control module connected to the optical bus system which does not participate in the component protection system.
- The windshield has to be replaced in order to remove Windshield Projection Head Up Display Control Module (head-up display) J898. The individual steps are described in the workshop manual.

Installation location of the head-up display

664_049

Sequence of MOST bus ring users



664_029

Key

1	Information Electronics Control Module 1 J794
2	Instrument Cluster Control Module J285
3	Windshield Projection Head Up Display Control Module J898
4	DVD changer R161
5	Digital Sound System Control Module J525

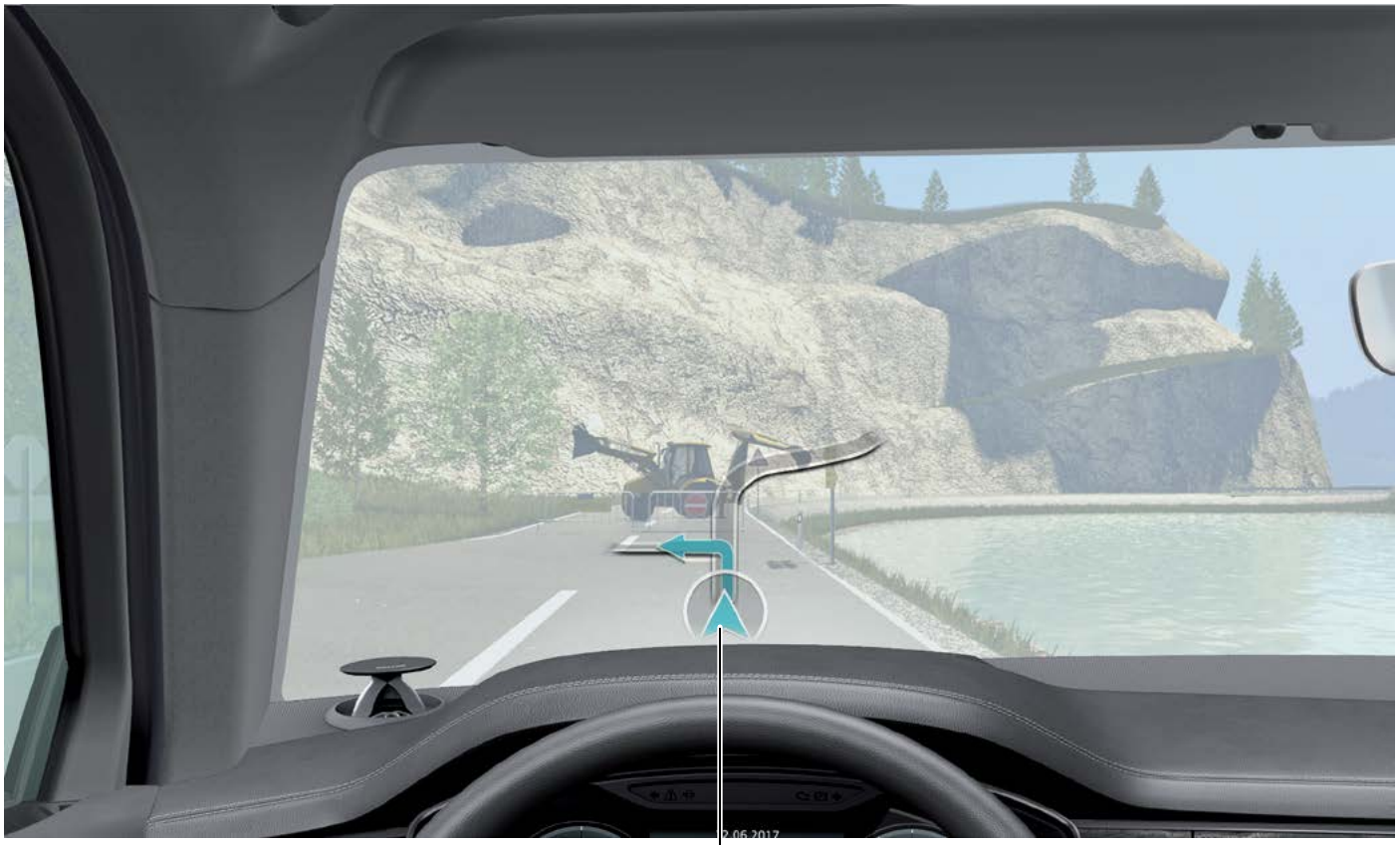
Head-up display MOST bus interface

The head-up display is both an instrument cluster CAN user and a MOST bus user.

Information Electronics Control Module 1 J794 makes, for example, the detailed intersection map available by MOST bus. In complex driving situations not only a map or an arrow is shown on the head-up display, but also the moving location arrow in the map displayed.

This is transmitted from Information Electronics Control Module 1 J794 to the head-up display as a video stream signal.

In the case of the head-up display the data of a possible software update is imported in a conventional manner via the instrument cluster CAN.



664_030

Movable location arrow in the head-up display

Door Control Modules J386/J387

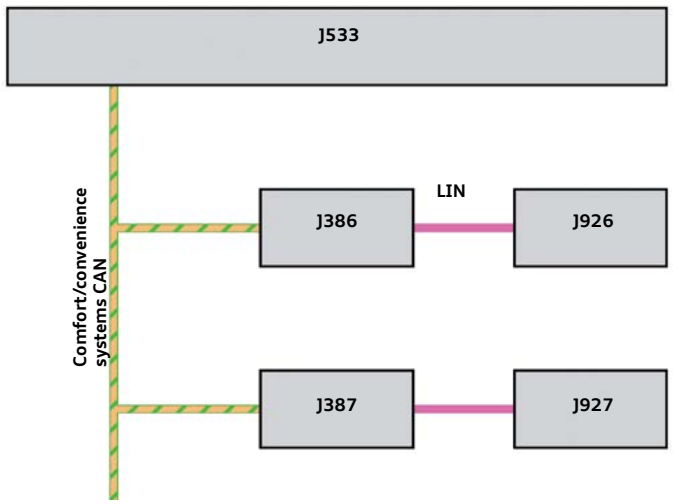
All door control modules have their own Address Word and are accessed with the VAS Scan Tool.

On each side of the vehicle, the rear door control unit is connected to the front door control unit by LIN data bus.

The following Address Words are assigned to the control units:

- Driver Door Control Module J386: 42
- Front Passenger Door Control Module J387: 52
- Driver Side Rear Door Control Module J926: BB
- Passenger Side Rear Door Control Module J927: BC

Network overview

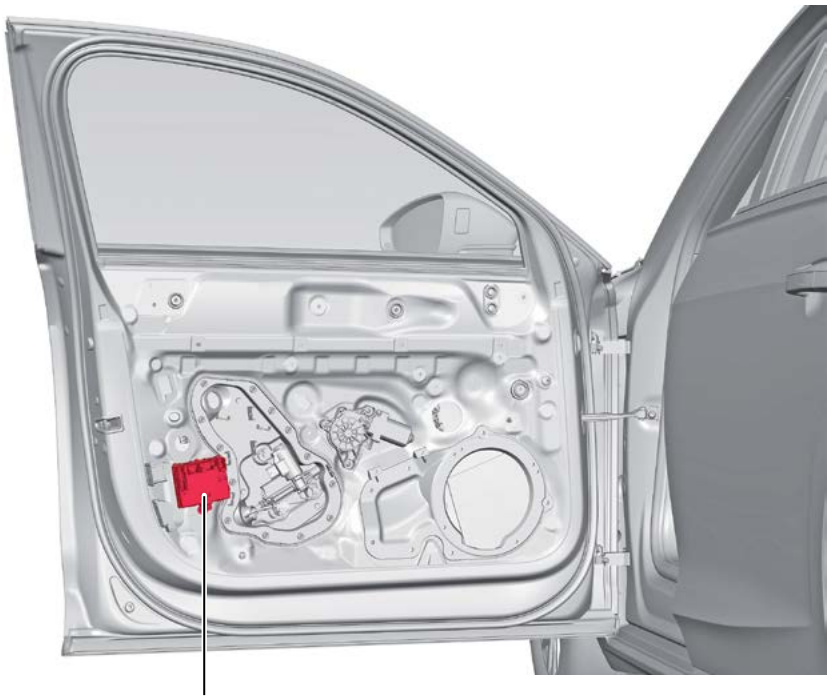


664_050

Key

J386 Driver Door Control Module
J387 Front Passenger Door Control Module
J533 Data Bus on Board Diagnostic Interface
J926 Driver Side Rear Door Control Module
J927 Passenger Side Rear Door Control Module

Installation location



664_051

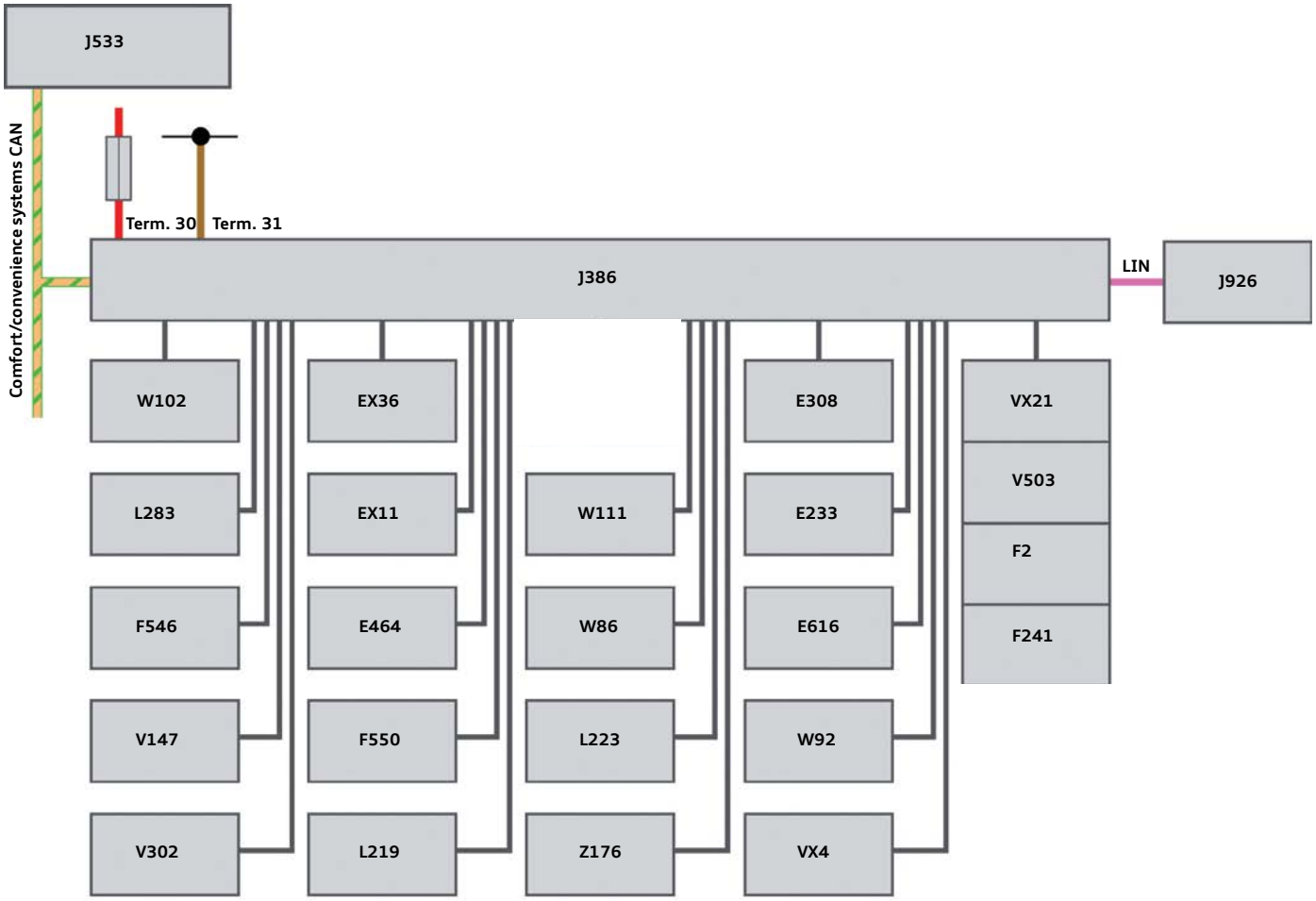
Installation location of the door control using the driver's door as an example

Driver Door Control Module J386

Components of the Driver Door Control Module J386:

A large number of actuators are connected directly to the door control modules. Using Driver Door Control Module J386 as an example, these are:

- The background lighting in the driver door (varies depending on equipment).
- The left surround view camera (in the driver side door mirror).
- The driver side window regulator motor.
- The driver side exterior door handle switch.
- The childproof lock button.
- The button for driver side memory adjustment.
- Heating element two for front driver side door trim.
- Button for remote unlocking the trunk lid.
- The fuel filler flap release button.
- The alarm OFF button.
- The driver side door mirror with:
  - turn signal in door mirror
  - door mirror heater
  - mirror folding motor
  - lane assist warning lamp
  - mirror adjustment motors



664_037

Key

E233 Rear Lid Remote Release Button
E308 Driver Interior Locking Button
E464 Driver Seat Memory Settings Control Head
E616 Interior Monitoring and Vehicle Inclination Deactivation Button
F2 Driver Door Contact Switch
F241 Driver Lock Cylinder Contact Switch
F546 Driver Side Exterior Door Handle Switch
F550 Driver Side Interior Door Handle Switch
J386 Driver Door Control Module
J533 Data Bus on Board Diagnostic Interface
J926 Driver Side Rear Door Control Module

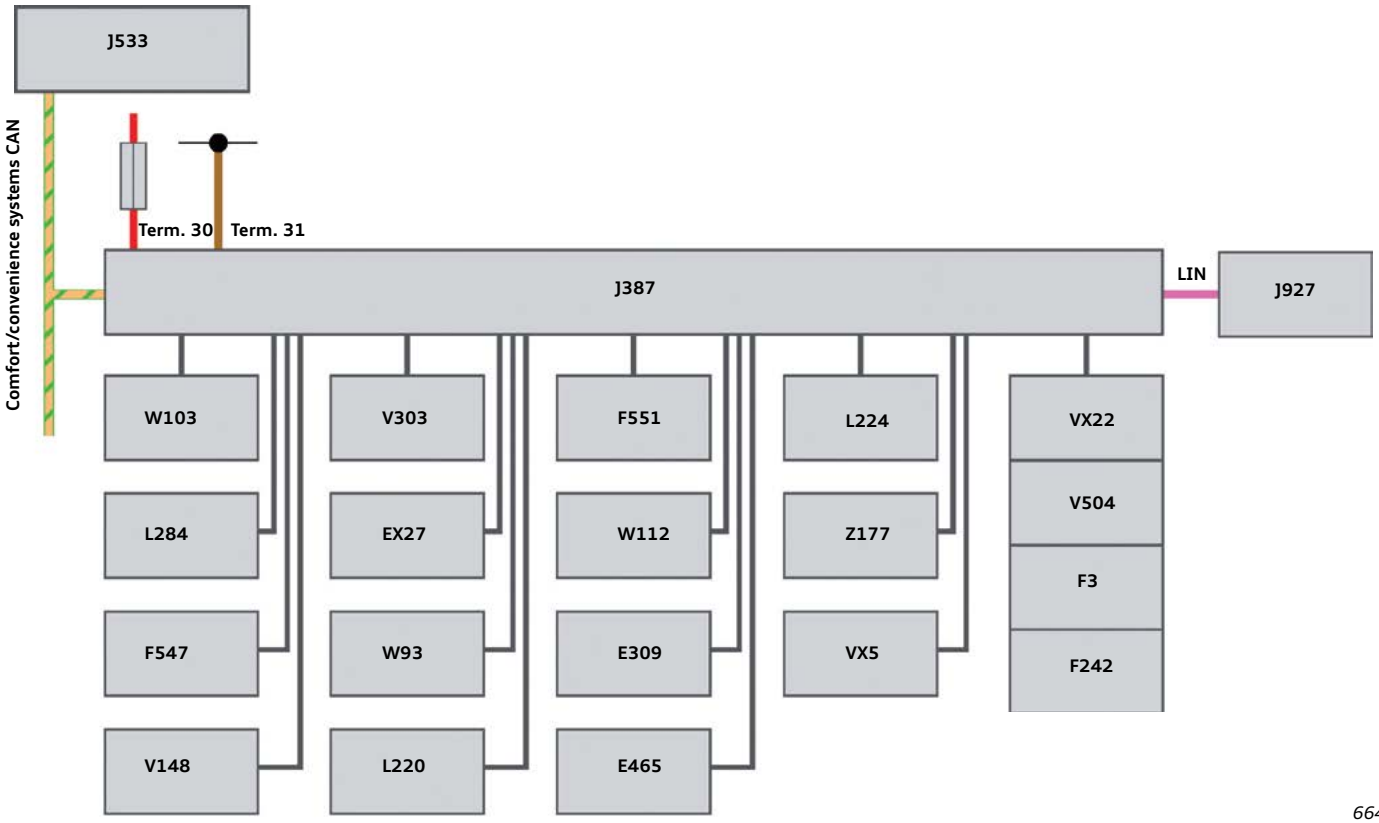
L219 Driver Side Interior Door Handle Illumination Lamp
L223 Lamp for Driver Side Door Speaker Trim
L283 Driver Side Exterior Door Handle Illumination Lamp

V147 Driver Window Regulator Motor
V302 Driver Door Closing Aid Motor
V503 Driver Side Central Locking Motor

W86 Driver Side Door Ambient Lighting Lamp
W92 Driver Side Entry Lamp
W102 Driver Side Sill Panel Strip Ambient Lighting Lamp
W111 Driver Exit Warning Lamp

Z176 Driver Side Front Door Trim Panel Heating Element 2
EX11 Exterior Rearview Mirror Adjuster
EX36 Power Window Control Head in Driver Door
VX4 Driver Exterior Rearview Mirror
VX21 Driver Door Lock Unit

Front Passenger Door Control Module J387



664_038

Key

E309 Front Passenger Interior Locking Button
E465 Front Passenger Seat Memory Settings Control Head

F3 Front Passenger Door Contact Switch
F242 Front Passenger Lock Cylinder Contact Switch
F547 Front Passenger Exterior Door Handle Switch
F551 Front Passenger Side Interior Door Handle Switch

J387 Front Passenger Door Control Module
J533 Data Bus on Board Diagnostic Interface
J927 Passenger Side Rear Door Control Module
L220 Passenger Side Interior Door Handle Illumination Lamp
L224 Lamp for Passenger Side Door Speaker Tri
L284 Front Passenger Exterior Door Handle Illumination Lamp

V148 Front Passenger Window Regulator Motor
V303 Front Passenger Closing Aid Motor
V504 Front Passenger Side Central Locking Mot

W93 Passenger Side Entry Lamp
W103 Front Passenger Side Sill Panel Strip Ambient Lighting Lamp
W112 Front Passenger Exit Warning Lamp

Z177 Passenger Side Front Door Trim Panel Heating Element 2

EX27 Front Passenger Door Power Window Switch
VX5 Front Passenger Exterior Rearview Mirror
VX22 Front Passenger Door Lock Unit

Memory Seat/Steering Column Adjustment Control Module J136/J521

The new Audi A8 is available with different front and rear seat versions.

In the full trim version the individual contour seat has seat heating, seat ventilation and a massage function. The seat heating and ventilation systems can be adjusted separately in three stages.

The seat ventilation system is equipped with two fans per seat - one in the seat cushion and one in the seat back.

The fans are configured as an aspirating system. To facilitate air intake between the passenger and the seat, a breathable seat cover (perforated leather) is required. This air flow wicks away moisture and creates a pleasant and dry climate at the seat contact surface.

664_088

Memory Seat/Steering Column Adjustment Control Module
J136

664_090

664_089

Reclining rear seat

The 2019 A8 is available with optional individual rear seats. Only the right seat has a full reclining function.

To set the reclining position, push the reclining seat position adjustment button until the seat has reached its end position.

At the same time, the front passenger seat is moved forward, the front passenger seat head restraint is folded forward and the backrest is adjusted to a flatter position.

Depending on the last setting of the Rear Seat Remote System, the leg rest is folded out and the Audi table is folded forward. In the reclining position the front passenger seat may no longer be used.

664_138

664_139

Sunroof Control Module J245/J392

The panoramic glass sunroof has two glass panels. The front glass panel can be lifted or opened, while the rear glass panel is fixed.

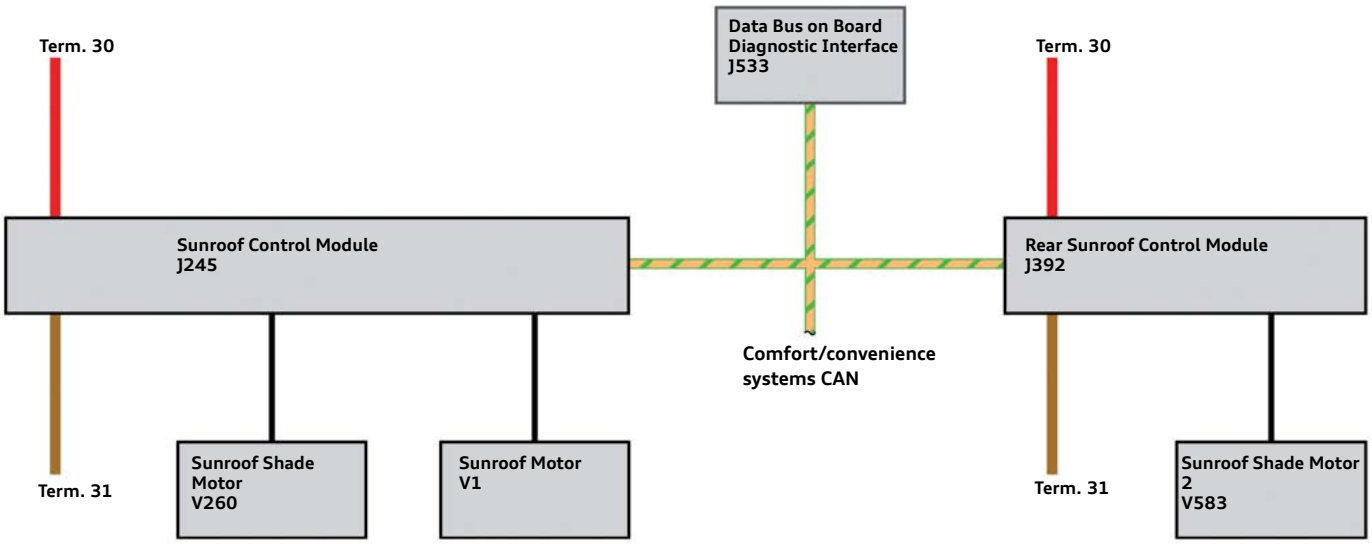
The sliding sunroof and the front and rear roof roller blinds can be operated from both the cockpit and the rear passenger compartment.

The panoramic glass sunroof and the front roof roller blind can also be pushed open or closed in a single motion by pushing or pulling Sunroof Button E325 to the second position twice in short succession.

Unlike the panoramic glass sunroof of the previous model, the rear sunroof segment cannot be tilted. Rear Sunroof Control Module J392 no longer incorporates Rear Sunroof Motor V146. Tasks of Rear Sunroof Control Module J392 include controlling the rear roof roller blind.

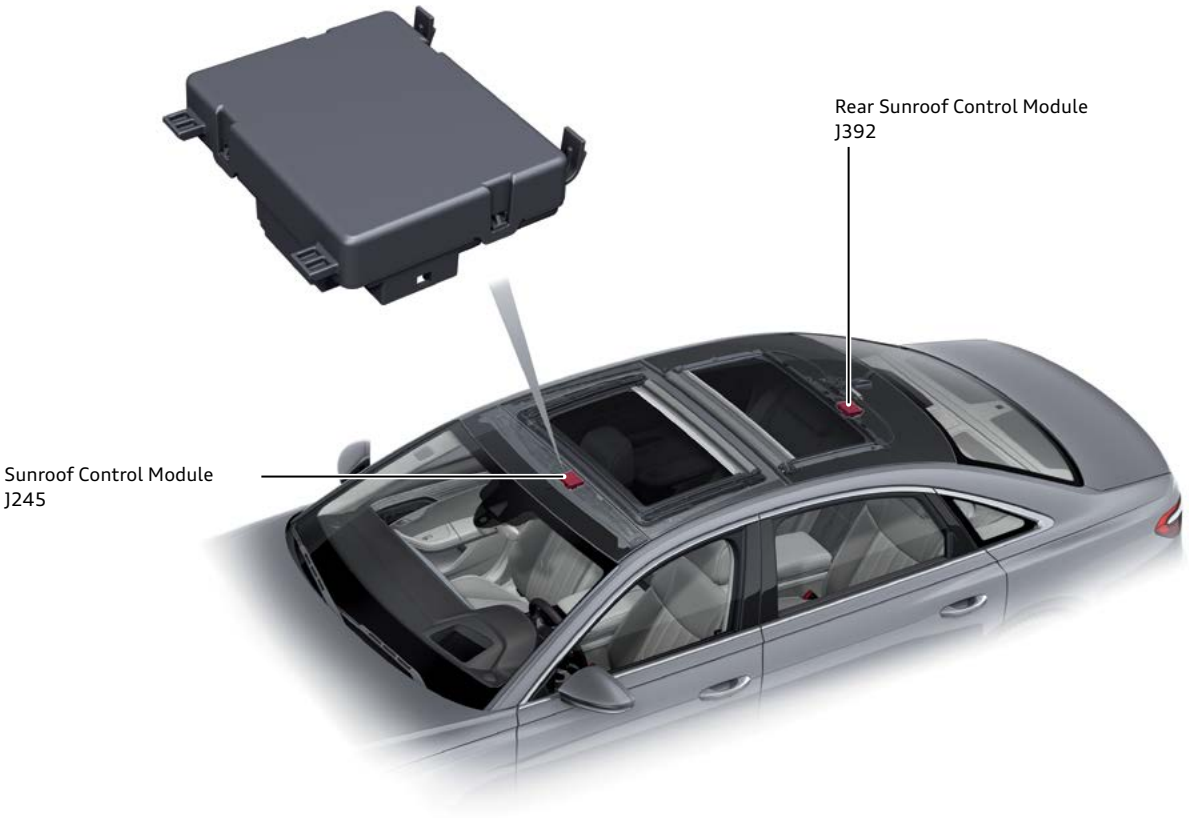
The front glass sunroof segment can also be operated from the rear passenger compartment. Depending on trim level, the sunroof can be operated either with the buttons in the rear doors or, alternatively, with the optional Rear Seat Remote System.

Schematic diagram of the networking system



664_059

Installation location of control modules J245 and J392



664_137

Power Adjustable Steering Column Control Module J866

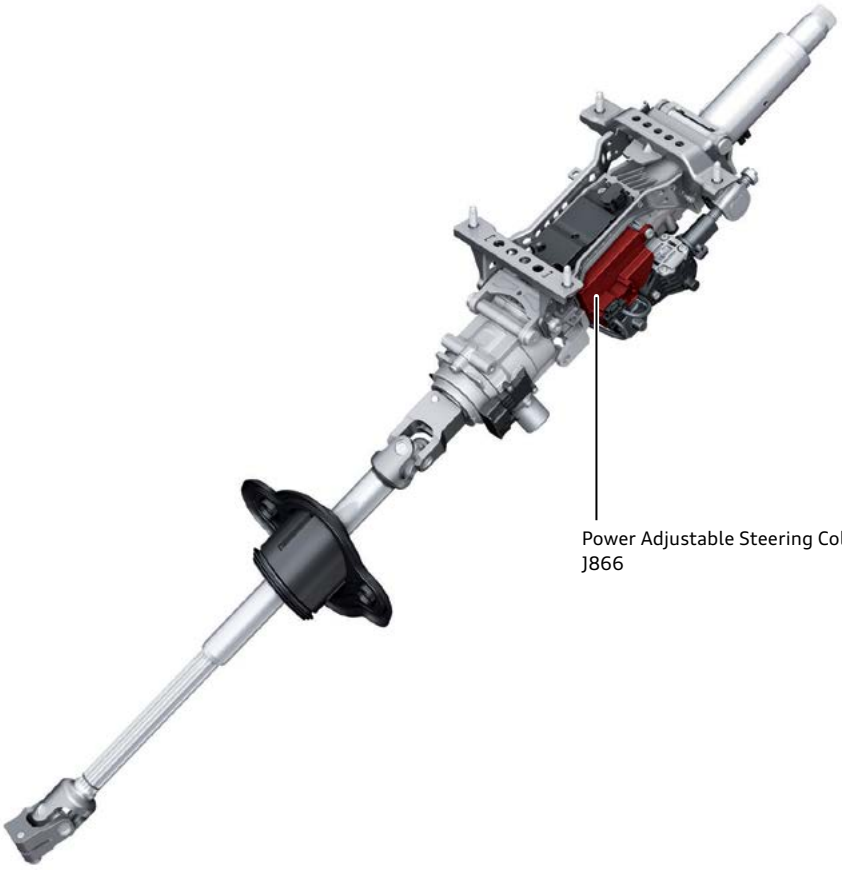
The steering column of the 2019 A8 is adjusted electrically. The control module has a Terminal 30 power supply to ensure the column can be positioned even when the ignition is switched off.

In models with a memory function the steering wheel position is stored in a key-specific manner together with the seat position.

An easy entry function makes it easier to enter and exit the vehicle by moving the steering column up into a park position after the ignition is switched off.

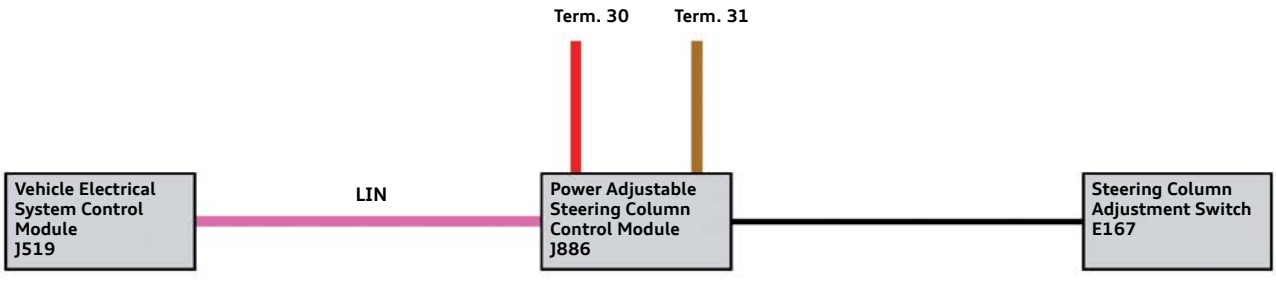
Power Adjustable Steering Column Control Module J866 implements the driver commands, which are transmitted via Steering Column Adjustment Switch E167. J866 participates in bus communication within the vehicle as a LIN bus user of Vehicle Electrical System Control Module J519.

The electrically adjustable steering column control module is located directly at the steering column. It can be accessed using Address Word 09 with the VAS Scan Tool.



664_025

Schematic diagram of the networking system



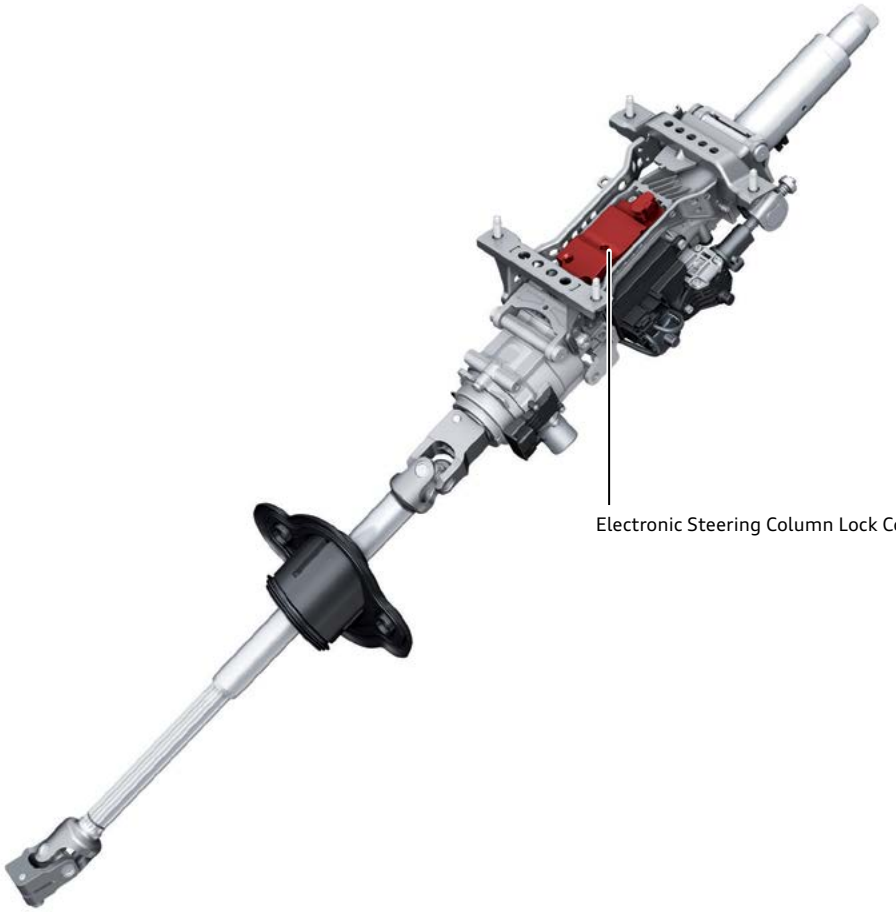
664_026

Electronic Steering Column Lock Control Module J764

Electronic Steering Column Lock Control Module J764 is located directly at the steering column. It can be accessed using Address Word 28 with the VAS Scan Tool.

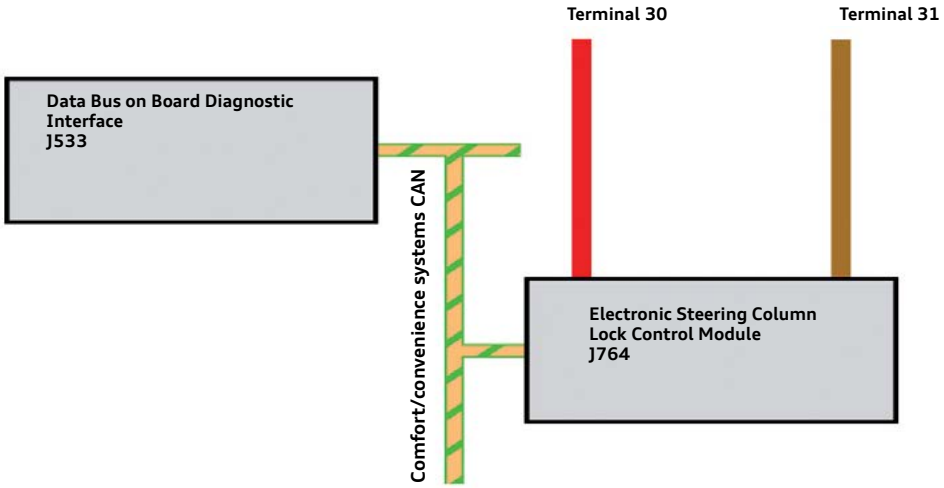
The steering column can only be locked if all locking conditions are met.

The following conditions apply:
- Vehicle is travelling at 0 mph.
- Engine is not running.
- Selector lever is in "P".
- Terminal 15 is off.
- The NO contact is off.



664_058

Schematic diagram of the networking system



664_086

Steering Column Electronics Control Module J527

Steering Column Electronics Control Module J527 provides the interface between the vehicle network and the functions in the steering wheel.

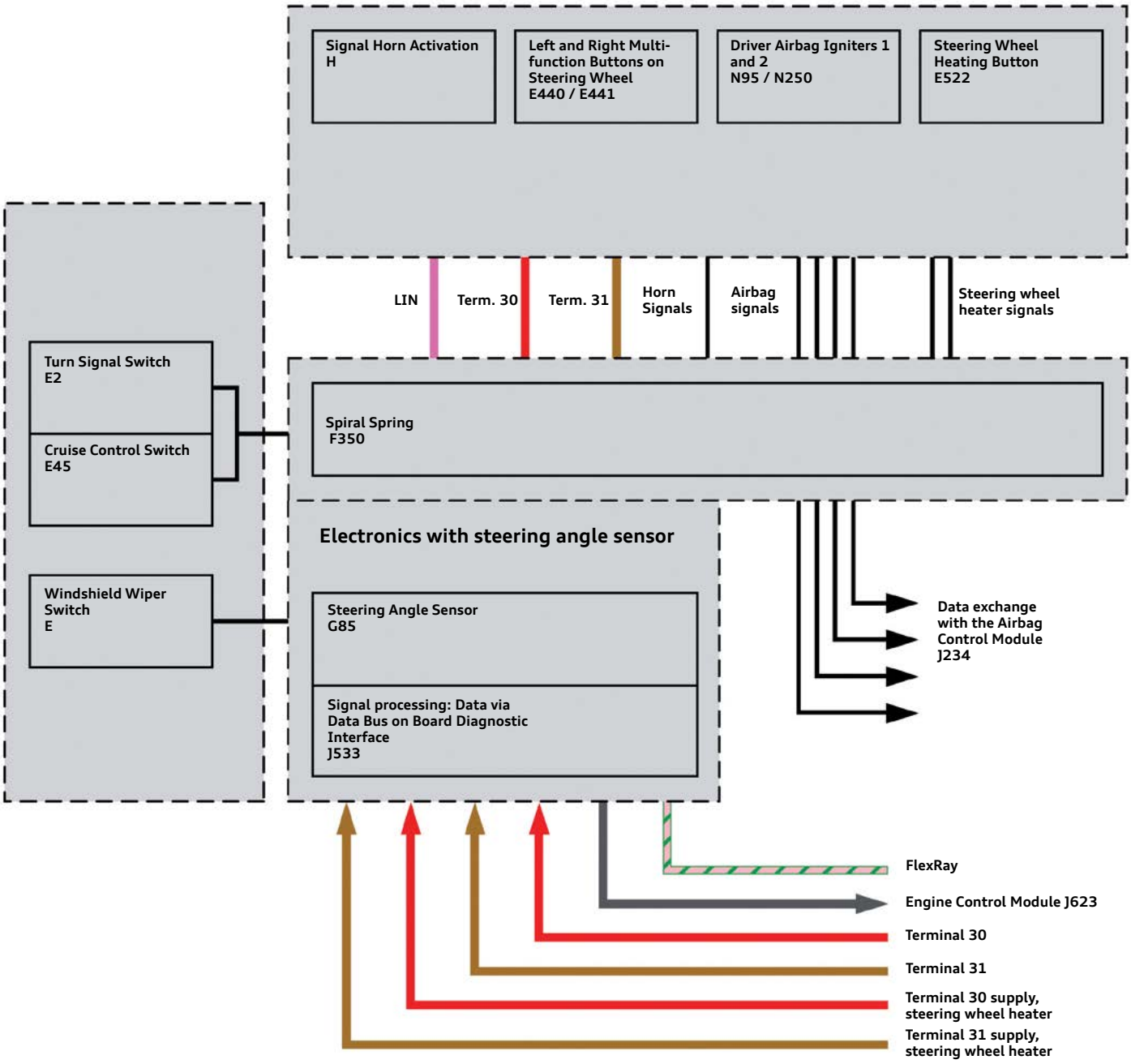
The functions are:

- Turn Signal Switch E2.
- Cruise Control Switch E45.
- Windshield Wiper Intermittent Mode Switch E22.
- Spiral Spring F350.
- Coil spring for airbag and resetting ring with collector ring F138.
- Airbag module in steering wheel.
- Steering Angle Sensor G85.
- Signal horn actuating switch.
- Directional Stabilization Assistance Button E517.
- Multifunction Steering Wheel Control Module J453.
- Multifunction steering wheel button module.
- Steering wheel heating.

Steering Column Electronics Control Module J527 is a FlexRay bus system user.

It can be accessed using Address Word 16 with the VAS Scan Tool.

Schematic diagram of the steering wheel electronics



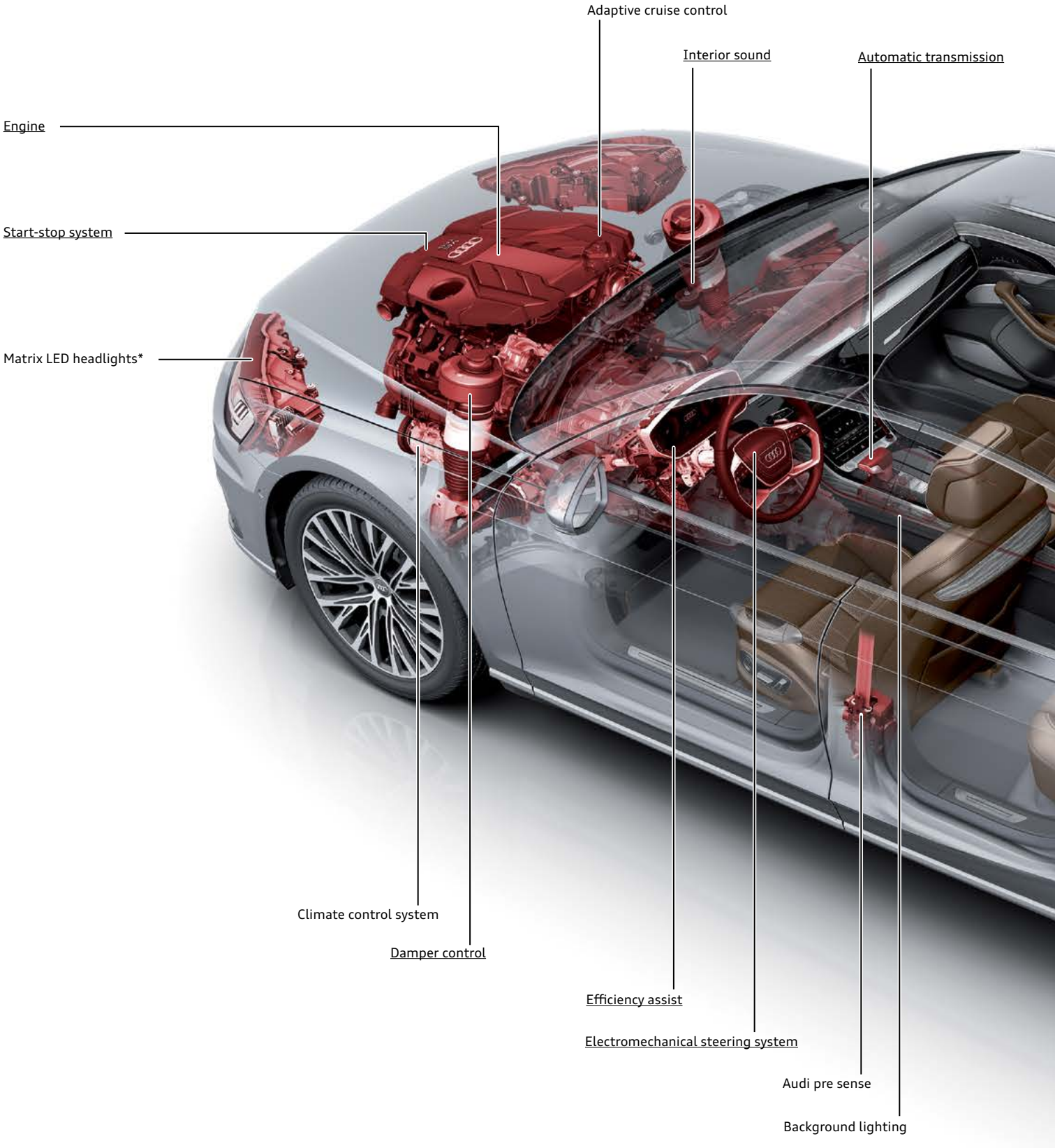
664_032

Audi drive select

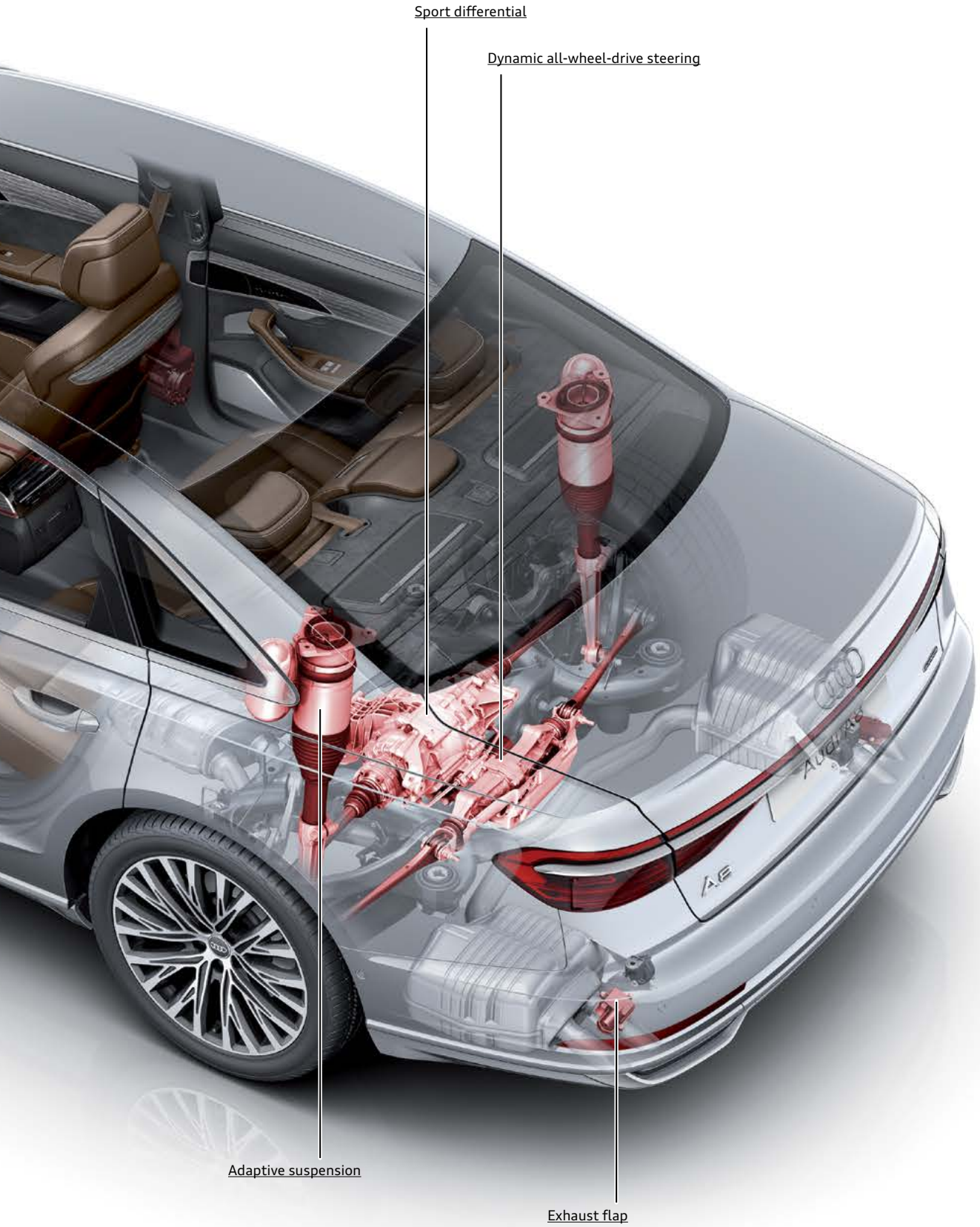
Controllable systems

Audi drive select enables numerous vehicle systems to be configured by the driver; from defining a certain mode for all systems or configuring the adaption of certain systems individually.

Steering assistance, the transmission characteristics, engine performance and suspension control can be influenced through Audi select. The underlined systems can be influenced in “individual” mode.



*Not available at launch


Sport differential
Dynamic all-wheel-drive steering
Adaptive suspension
Exhaust flap

664_124

Driving modes

It is possible to switch between the driving modes when the vehicle is stationary or while driving on the condition that Terminal 15 is switched on. To activate a new mode for the engine, the driver must allow the accelerator pedal to return briefly to the idle position.

›

In the Audi A8, the driver can select between the following drive modes:

comfort mode provides a comfort-oriented setup and is, for example, suitable for long motorway trips.

auto mode provides a comfortable yet dynamic overall driving feel and is well suited to everyday use.

dynamic mode conveys a sporty driving feel to the driver and is suited to a sporty driving style.

In addition, the car setup can be customized in **individual** mode.

"individual" mode

In **individual** mode the vehicle systems are subdivided into four groups:

- Driveline
- Steering
- Suspension
- Engine sound

The driver has three adjustment options for each group. All vehicle systems within a group have the same operating characteristic. The four groups and the corresponding vehicle systems are listed below.

Drive group:
Settings: balanced, dynamic
Users:

- Engine
- Start-stop system
- Automatic transmission
- Sport differential
- Efficiency assist

Steering group:
Settings: comfortable, balanced, dynamic
Users:

- EPS
- Dynamic all-wheel-drive steering

Suspension group:
Settings: comfortable, balanced, dynamic
Users:

- Damper control
- Adaptive suspension

Engine sound group:
Settings: subdued, balanced, pronounced
Users:

- Interior sound
- Exhaust flaps

Functional features

- The profile assigned to the car key and the individual settings are loaded after Terminal 15 is switched on.
- To activate the newly selected mode for the engine, the accelerator must be briefly released (idle position) or briefly pushed down into the full throttle position.
- To activate the newly selected mode for the steering, the steering wheel must also be moved into the straight-ahead position (zero position).
- In some models, top speed is only available in the auto and dynamic driving modes.
- In dynamic mode, transmission position S is selected automatically.
- The start-stop system is generally activated when the vehicle is running in efficiency mode.

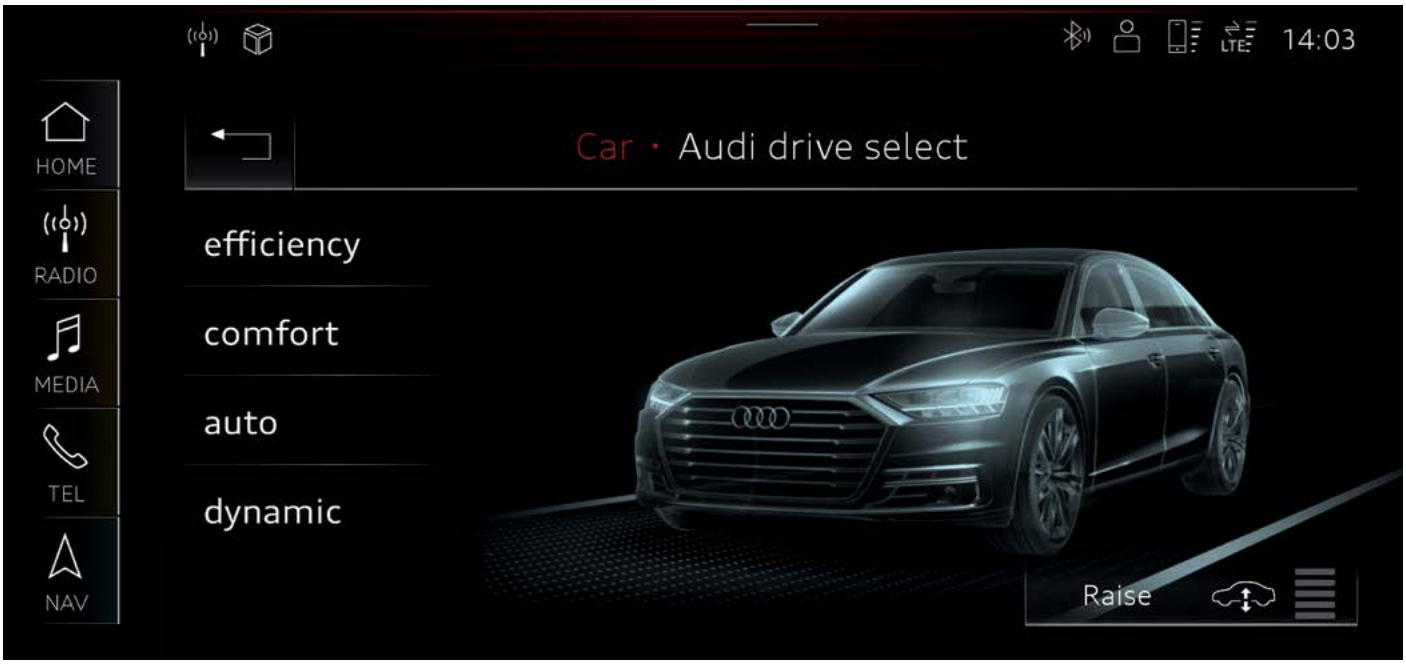
Certain systems (for example, engine, transmission, start-stop system) always revert to a defined state after Terminal 15 is cycled on/off. The transmission returns to “D”, start-stop system is activated), regardless of which profile is active. These users remain unchanged until a new profile is selected.

Displays and operation

The Audi drive select system can be adjusted by pushing the Audi drive select button in Switch Module in Instrument Panel, Center EX22 in the center console or via Front Information Display Control Head J685.

The options menu containing the five selectable drive modes as well as a selection of vehicle systems compatible with **individual** mode is visible on the MMI display. The mode currently selected is also displayed in the Audi virtual cockpit.

Display and operation via Front Information Display Control Head J685



664_125

Switch Module in Instrument Panel, Center EX22

664_126

Exterior lighting

Operation

Light Switch E1

General description

The 2019 A8 has a new operating concept for the light switch. A light switch module replaces the previously used rotary light switch. However, the service designation Light Switch E1 remains unchanged. The light switch module is located to the left of the steering column on the instrument panel. Light Switch E1 is a LIN slave of the Vehicle Electrical System Control Module J519.

There are two versions:

- Standard light switch module with three mechanical buttons.
- Optional light switch module with sensor foil.

The light switch module with sensor foil is optional It has a glossy finish and provides tactile feedback when the buttons are pushed.

Standard light switch module

664_164

1. Hardware or software button for the light functions: AUTO, low beam, side lights, OFF
2. Hardware or software button for the all-weather lights (minimizes self-blinding effect, for example, on wet roads)
3. Hardware or software button for the rear fog light function

Operating concept

The default[3)] setting of the light switch module is "AUTO". This means that the "AUTO" position is selected automatically after each Terminal 15 on/off cycle. Functions such as high beam assist, matrix beam and the laser lights can be only be used in this position.

If the button is pressed once, the low beam is activated.

When the button is pressed again, the side lights are activated if the vehicle is travelling at a speed of less than 6.2 mph (10 km/h).

Pressing the button again deactivates all light functions if vehicle is travelling at a speed of less than 6.2 mph (10 km/h).

If the "Side lights" or "OFF" switch position has been selected and the vehicle exceeds a speed of 6.2 mph (10 km/h), the "AUTO" position is selected automatically.

[3)] default = preset or standard value or status

Light switch module with sensor foil

The light switch module with sensor foil is distinguishable by its glossy finish and the seamless transitions between the individual user interfaces. There is a pressure-sensitive sensor foil behind the touch-sensitive surface of the user interface. When pressure is detected by this sensor foil, the corresponding function is switched on or off. A small loudspeaker and an electric motor are integrated in the light switch module. The loudspeaker generates a sound and thus provides audible feedback.

The small electric motor provides tactile feedback by shifting the user interface slightly sideways. To the user, this feels and sounds like he is pressing a switch. This principle is applied not only to the light switch module but also to Front Information Display Control Head J685, Front Information Display Control Head 2 J1060 and Switch Module in Instrument Panel, Center EX22. The user can deactivate audible and tactile feedback for both displays in the corresponding MMI menu, but not for light switch module and the switch panel.

Light switch module with sensor foil

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Setting the exterior lighting

Depending on trim level, the exterior lighting can be adjusted in the MMI menu "Lights & vision - Exterior lighting".

The sensitivity of the light sensor and the activation points "early", "medium" and "late" can be selected for the auto headlights.

High beam assist, the laser lights and the entry/exit lights can be selected and deselected in the MMI. If high beam assist has been deselected in the MMI, the high beam can only be switched on and off manually using the operating stalk. In this case, the laser lights are not functional.

Coming home / leaving home

The conditions for this function are that darkness has been detected by the light sensor and that this function has been enabled in the MMI by the user. If these conditions apply, the headlights and tail lights are activated when the vehicle is locked and unlocked.

The light functions which are now activated are dependent on trim level. In the following table the light functions for the entry/exit lights are assigned to the corresponding headlight version.

Headlight version	Lighting functions
LED headlights	Low beam + side lights + tail lights
Matrix LED headlights (not available at launch)	Low beam + side lights + tail lights
Matrix LED headlights with laser lights (S8 only)	Low beam + staggered activation of the side lights and tail lights

Reference
Further information on operating and setting the exterior lighting can be found in the vehicle Owner's Manual.

Headlights

Headlight versions

The 2019 A8 can be equipped with the following headlight versions: the following headlight versions:

- LED headlights (ECE[1)] and SAE[2)]).
- Matrix LED headlights* (ECE[1)] and SAE[2)]).
- Matrix LED headlights with laser lights (S8 only - ECE[1)] and SAE[2)]).

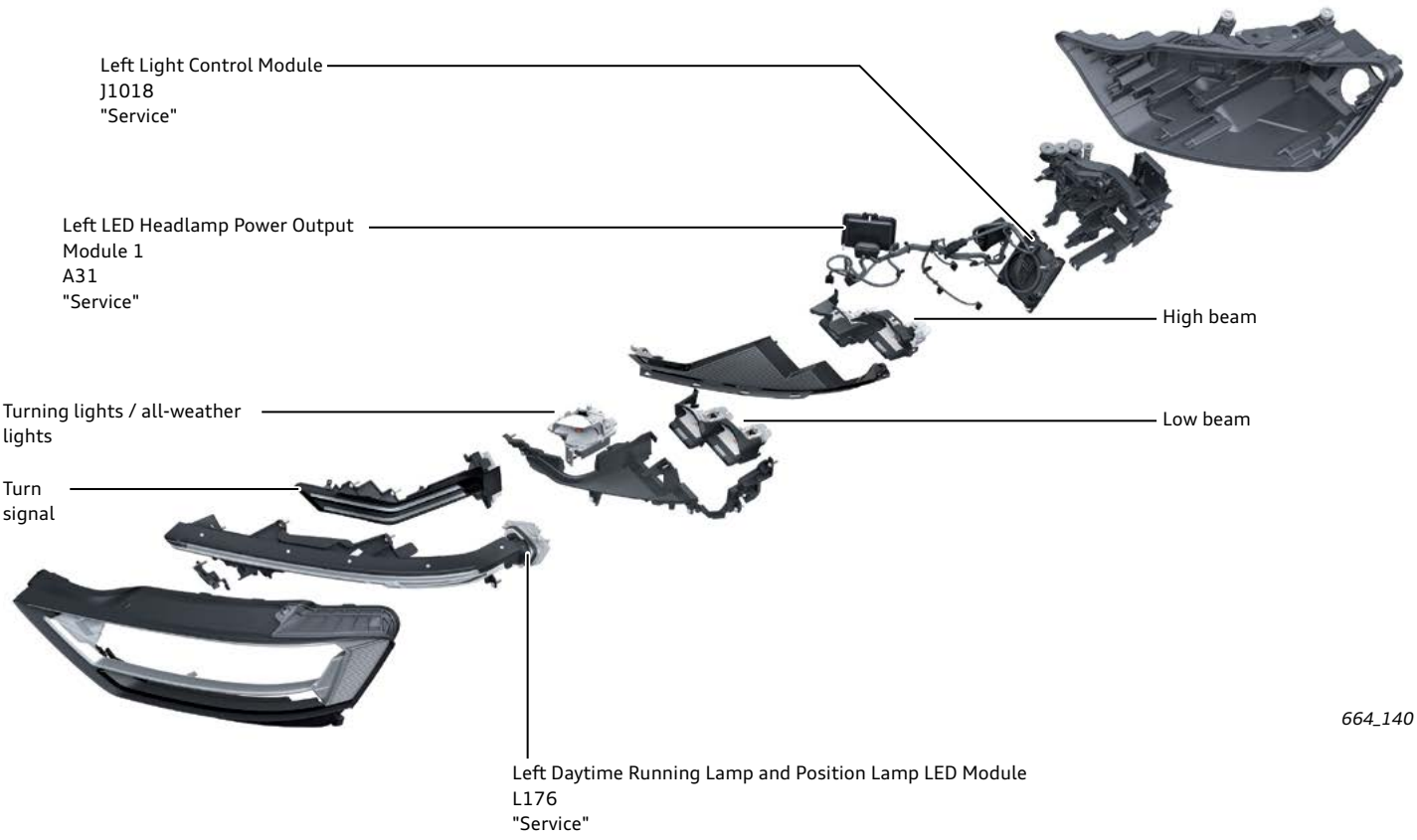
General description

Only LEDs or laser diodes are used as light sources for the headlights of the Audi A8. The headlights are connected to the vehicle body by adjusting elements. This allows the headlights to be aligned exactly with the other parts of the body. The bumper cover must be removed before removing the headlights. In the event of damage to the upper and inner headlight attachments, repair tabs can be attached to the headlight housing.

The parts marked "Service" in the detailed illustration can be replaced individually in case of damage. Due to the fact that adaptive suspension is installed as standard, it was possible to eliminate headlight range control in all headlight versions.

LED headlights PR no. 8IT + 8G1

The figure shows the left headlight in the ECE[1)] version.



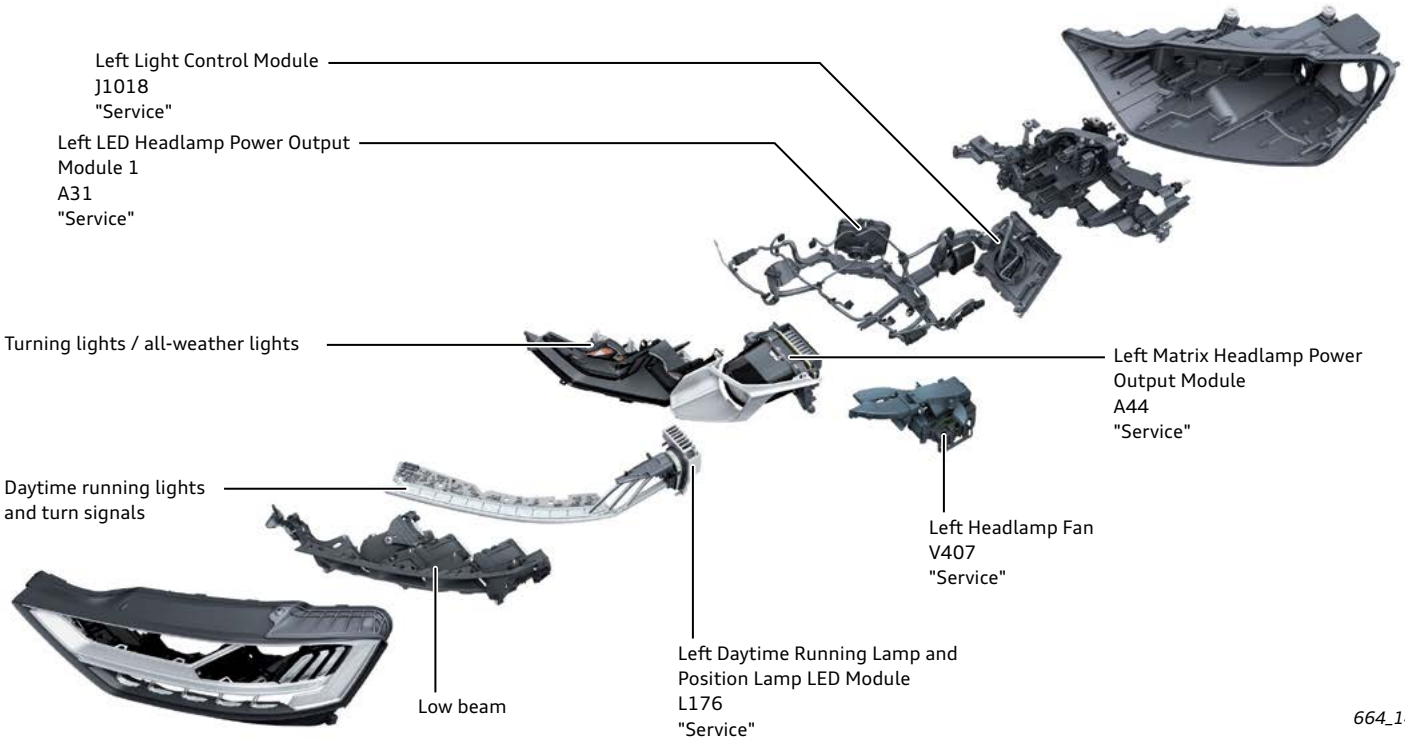
*Not available at launch

[1)] ECE = for the European market

[2)] SAE = for the North American Region

Matrix LED headlight* PR no. 8IT + 8G5

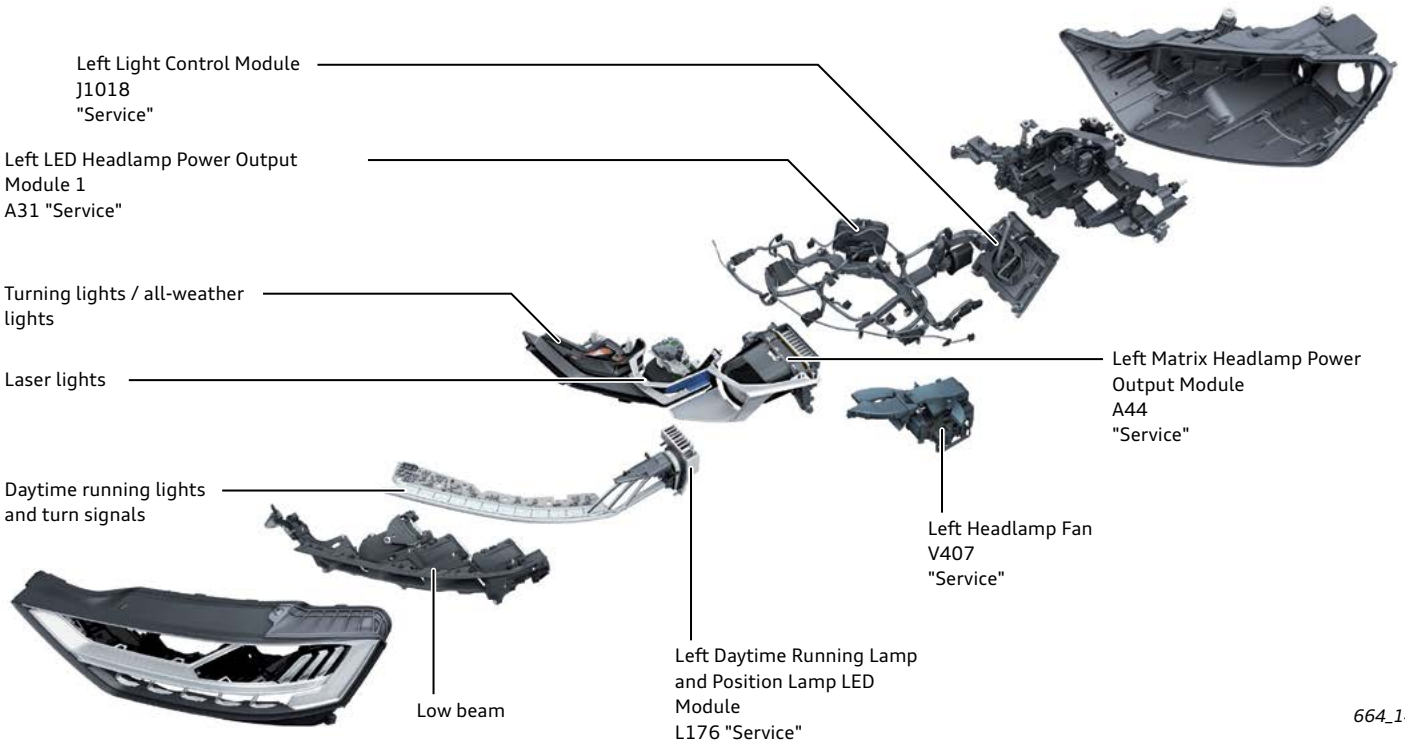
The figure shows the left headlight in the ECE[1)] version.



664_141

Matrix LED headlight* PR no. 8IZ + 8G5

The figure shows the left headlight in the ECE[1)] version.



664_142

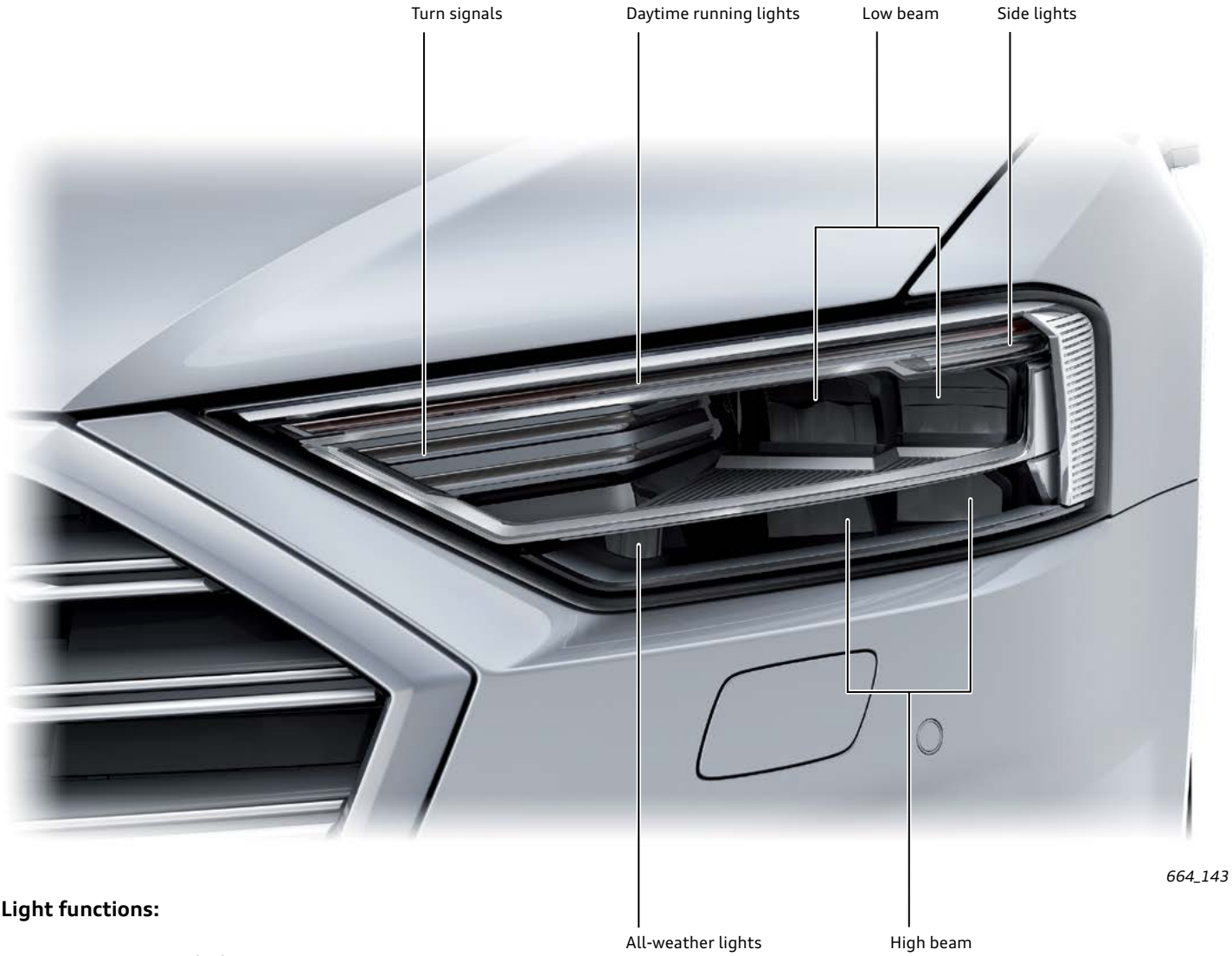
*Not available at launch

Note

For information on installation and removal as well as the corresponding spare part numbers, please refer to ElsaPro or ETKA.

LED headlights

The figure shows the ECE[1] version



Light functions:

- Daytime running lights.
- Side lights.
- Low beam.
- High beam.
- All-weather lights.
- Turn signals.
- Side marker light (SAE[2] not shown).

Special features of the light functions

When the light switch is in the "AUTO" position, the daytime running lights and the side lights are not active until the vehicle is travelling at a speed of greater than 6.2 mph (10 km/h). The daytime running lights in the ECE[1] version are dimmed to side lights level for the duration of the turn signalling cycle (in the SAE[2] version they are switched off). The side lights remain activated in both versions.

Service

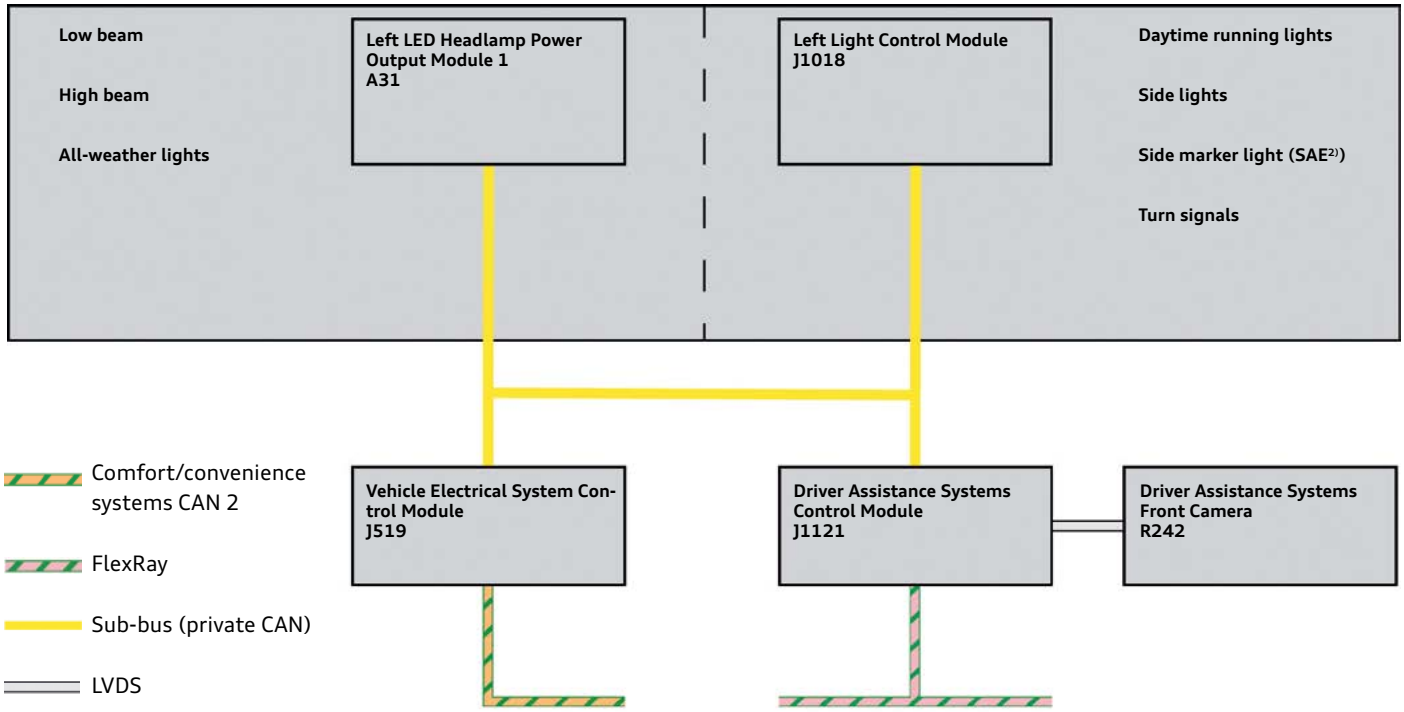
The control units attached to the exterior of the headlight housing can be replaced if faulty. It is not possible to replace individual lamps.

Equipment

The LED headlights are combined as standard with high beam assist. A headlight washer system (PR no. 8X1) is optional.

Activation of the LED headlights

Schematic diagram of the left headlight



664_144

Activation

Vehicle Electrical System Control Module J519 communicates with Left/Right Power Modules 1 A31/A2. A31/A27 as well as Left/Right Light Control Modules J1018/J1023 via a sub-bus system. A331/A27 for the LED headlights are responsible for activating the LEDs for the low beam, the high beam and the all-weather lights. The modules have self diagnostic capability and can be accessed via Address Words D6 and D7 respectively.

Left/Right Light Control Modules J1018/1023 are responsible for the side lights/daytime running lights, the turn signals and the side marker lights in the SAE[2)] version. The modules have self diagnostic capability and can be accessed via Address Words 29/39 respectively.

High beam assist

Driver Assistance Systems Control Module J1121, in conjunction with Driver Assistance Systems Front Camera E242, is responsible for the high beam assist function. When the camera detects oncoming vehicles or preceding vehicles, it sends this information to the Driver Assistance Systems Control Module.

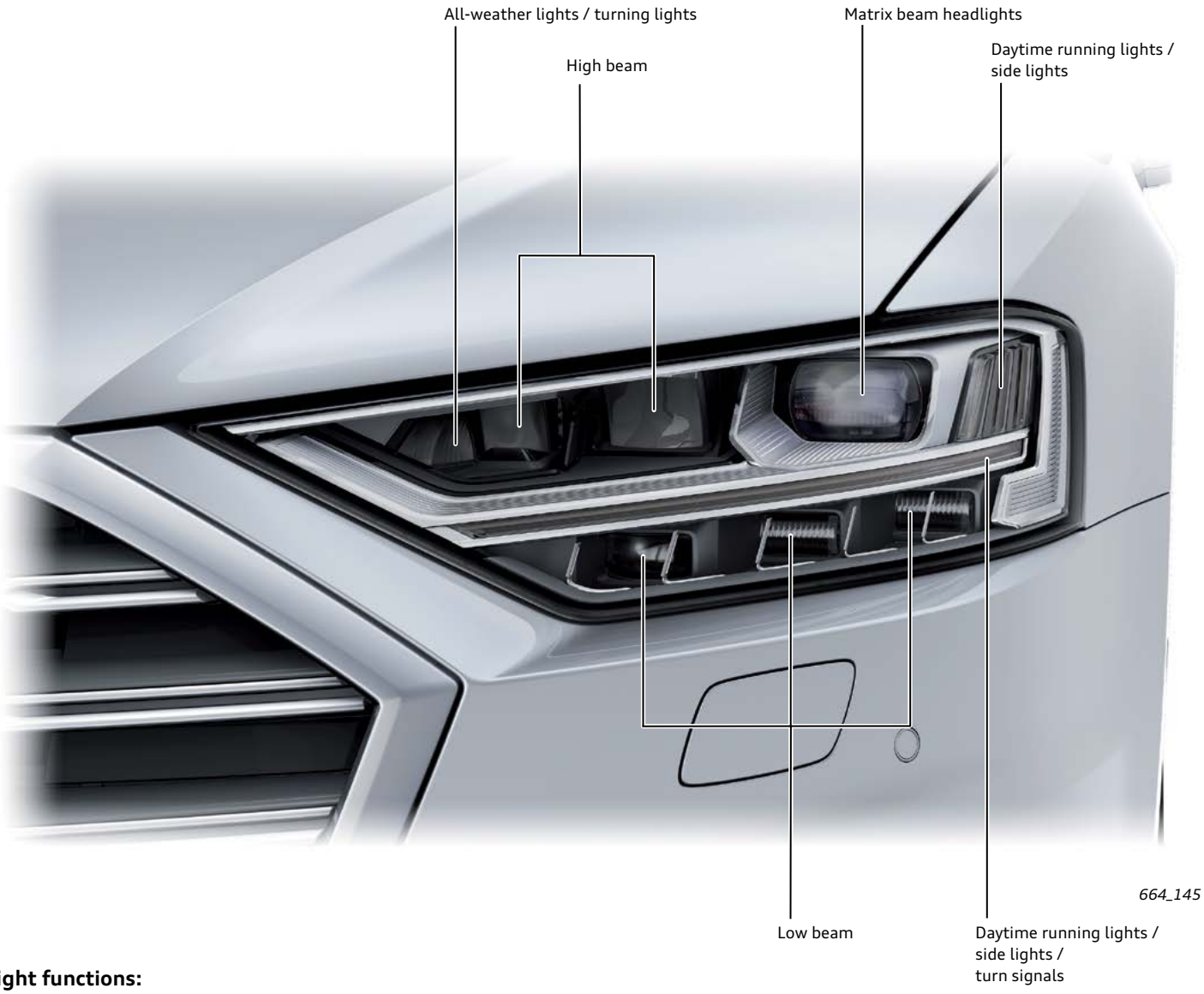
Driver Assistance Systems Control Module J1121 then switches off the high beam to avoid blinding other road users. This version of high beam assist can have two states: “high beam on” or “high beam off”.

[1)] ECE = for the European market

[2)] SAE = for the North American Region

Matrix LED headlights (not available at launch)

The figure shows the ECE[1] version



Light functions:

- Daytime running lights.
- Side lights.
- Low beam.
- Matrix beam headlights.
- All-weather lights.
- Turning lights.
- Dynamic turn signal function.
- Side marker light (SAE[2] not shown).

Special features of the light functions

With the light switch in the "AUTO" position, the daytime running lights and the side lights are not active until the vehicle is travelling at a speed of greater than 6.2 mph (10 km/h). In the ECE[1] version the daytime running lights and the side lights are switched off for the duration of the turn signalling cycle. In the SAE[2] version only the daytime running lights are deactivated, but the side lights stay switched on.

Service

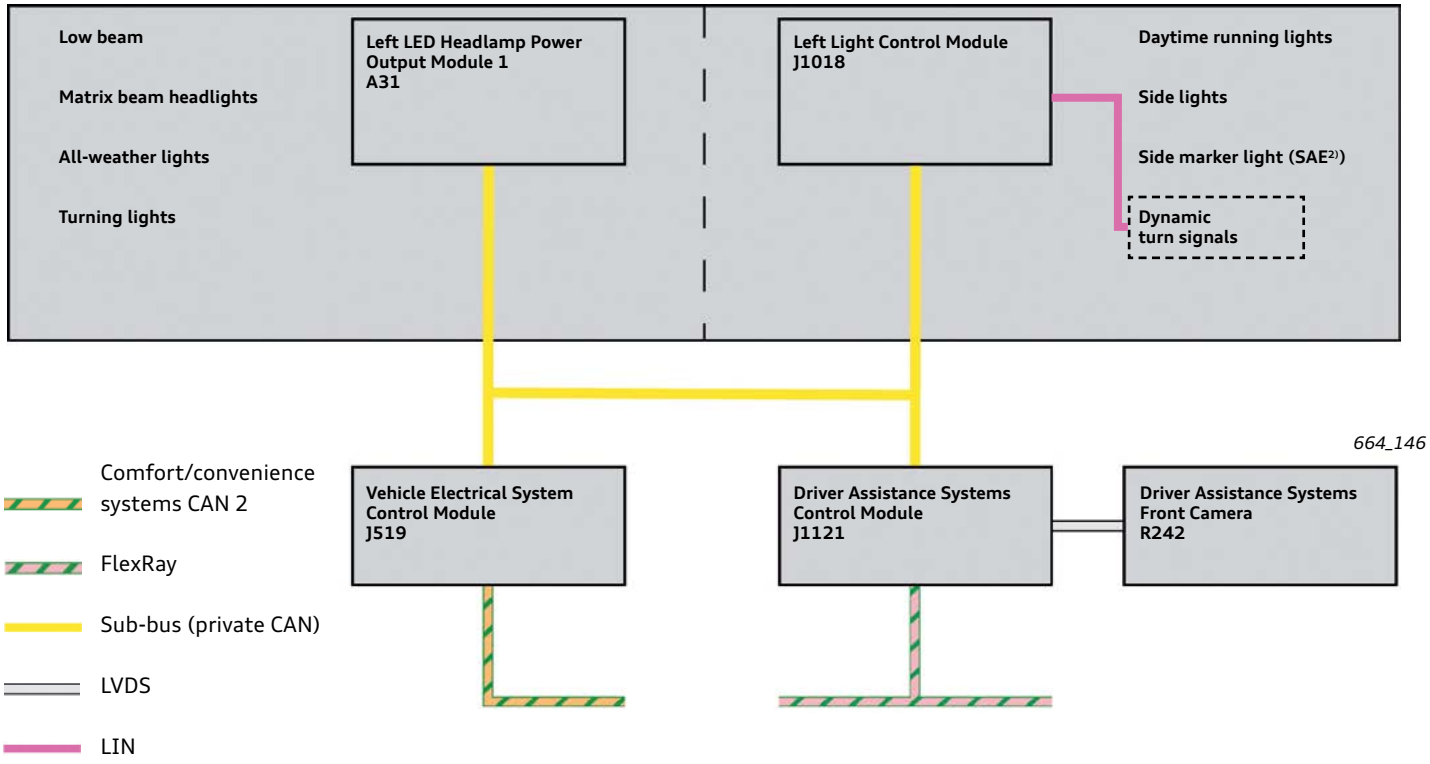
The control modules attached to the exterior of the headlight housing, the fan and the power module for matrix headlights can be replaced in the event of a fault. Because the power module for matrix headlights is integrated in the headlight, ESD workstation VAS 6613 must be used when replacing the module. It is not possible to replace individual lamps.

Equipment

Audi A8 with matrix LED headlights are equipped as standard with a headlight washer system.

Activation of the matrix LED headlights

Schematic diagram of the left headlight



Activation

The light functions in the matrix LED headlights are similar to those of the LED headlights.

Left and Right LED Headlamp Power Output Modules 1 A31/A27 are now also responsible for activating the matrix beam headlights and the turning lights.

Left/Right Light Control Modules J1018/J1019 additionally have a LIN connection.

The dynamic turn signals are activated via this data connection.

High beam assist

The high beam assist function of the matrix LED headlights can not only have the states "high beam on" and "high beam off", it can also adjust the luminosity of the individual LEDs.

This allows it respond exactly to oncoming traffic and preceding vehicle, and so avoid blinding other road users.

[1] ECE = for the European market

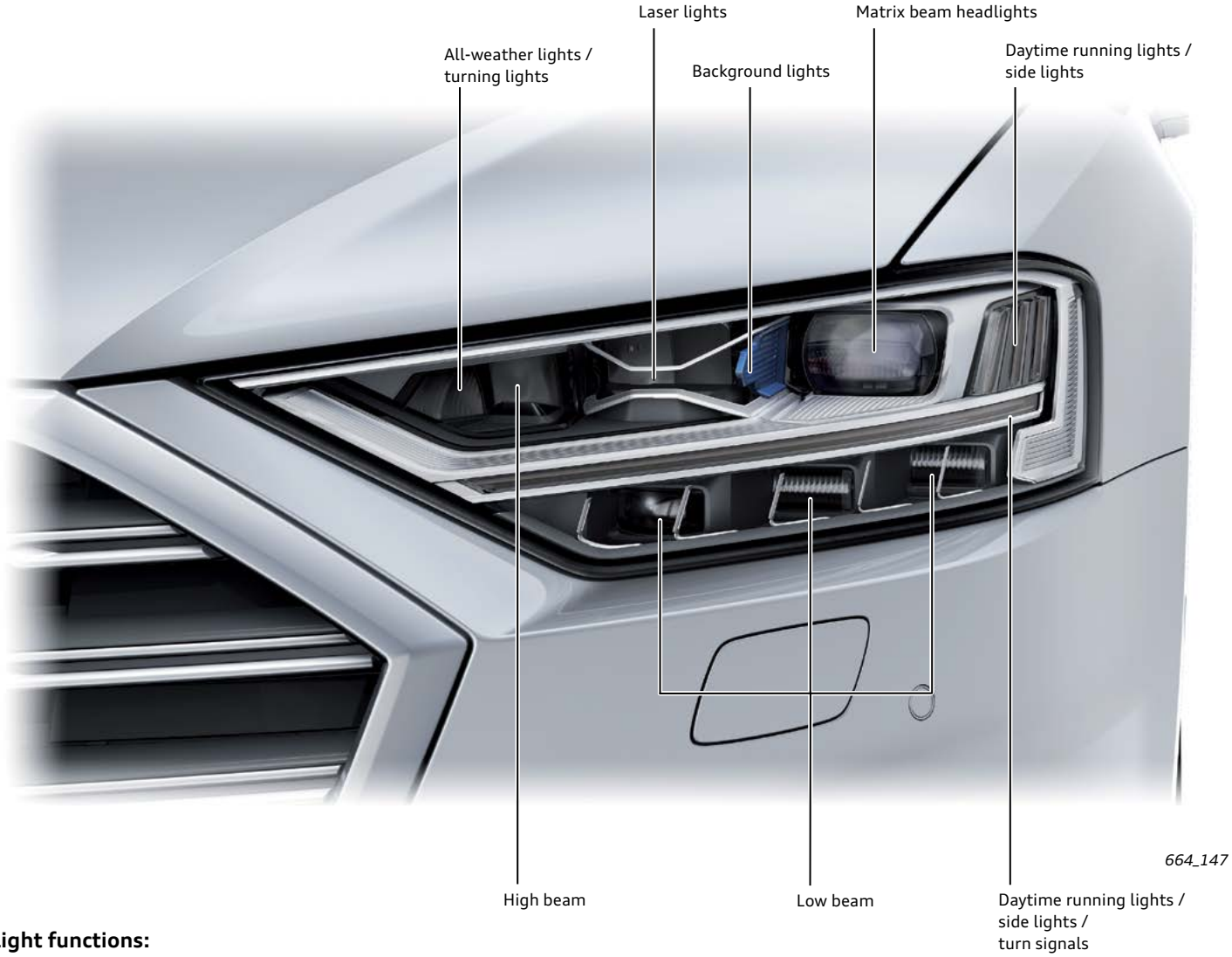
[2] SAE = for the North American Region

Note
The harware for matrix LED headlights is installed in the 2019 A8L. However, at a future date pending government approval the matrix headlights will be activated via software (SVM).

Reference
For further information about the matrix LED high beam assist function, refer to eSelf-Study Program 990393, The 2019 Audi A8 Driver Assistance Systems.

Matrix LED headlights with laser lights (S8 only)

The figure shows the ECE[1] version



Light functions:

- Daytime running lights.
- Side lights.
- Background lights.
- Low beam.
- Matrix beam headlights.
- Laser lights.
- All-weather lights.
- Turning lights.
- Dynamic turn signal function.
- Side marker light (SAE[2] not shown).

Special features of the light functions

With the light switch in the "AUTO" position, the daytime running lights, side lights and background lights are not active until the vehicle is travelling at a speed of greater than 6.2 mph (10 km/h). In the ECE[1] version the daytime running lights and the side lights are switched off for the duration of the turn signalling cycle. In the SAE[2] version only the daytime running lights are deactivated during the turn signalling cycle, but the side lights stay switched on.

The blue background lights in the ECE[1] version are operated together with the daytime running lights and the side lights, but remain switched off during the turn signalling cycle. In the SAE[2] version, the background lights are always active together with the daytime running lights, but they remain switched off during the turn signalling cycle, like in the ECE[1] version.

Service

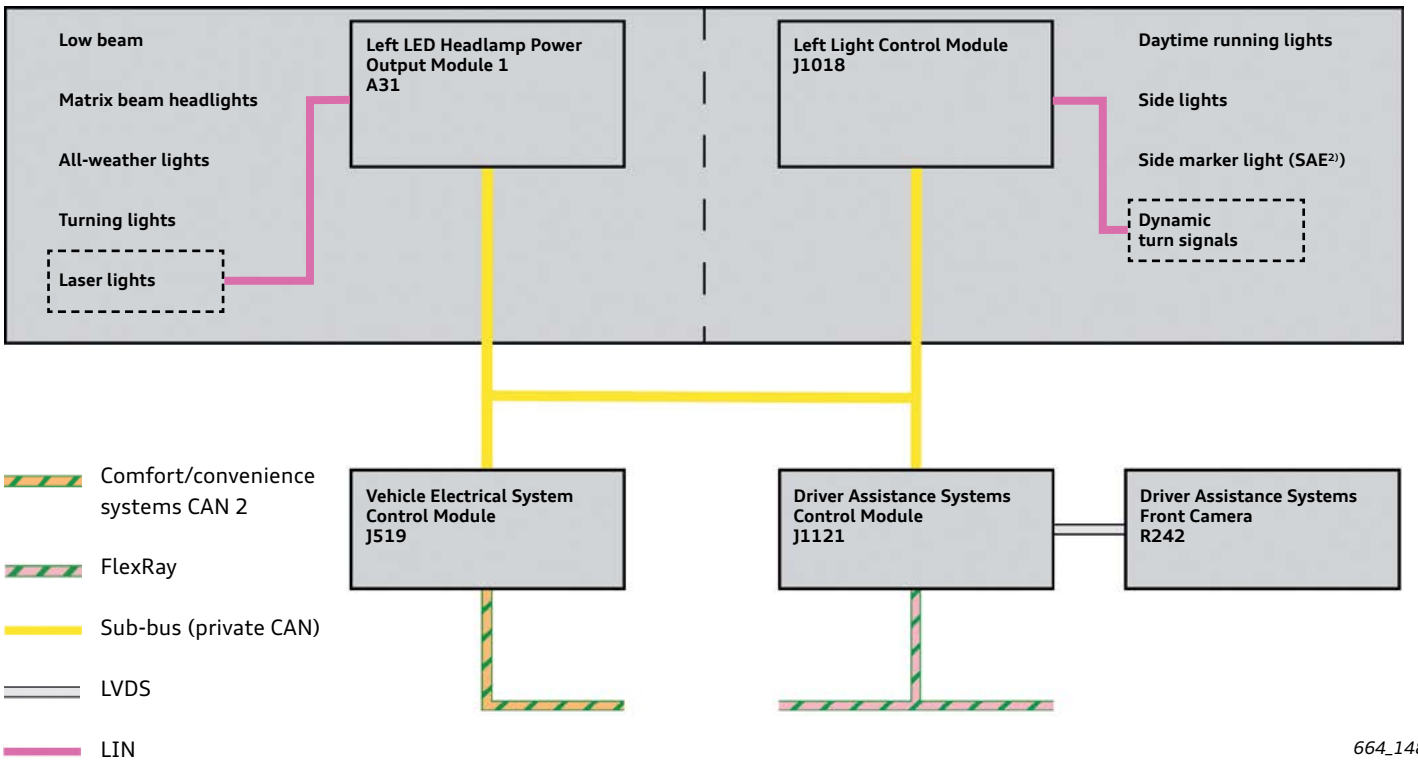
The control modules attached to the exterior of the headlight housing, the fan and the power module for matrix headlights can be replaced in the event of a fault. As the power module for matrix headlights is integrated in the headlight, ESD workstation VAS 6613 must be used when replacing the module. It is not possible to replace individual lamps.

Equipment

The Audi A8 with matrix LED headlights is equipped as standard with a headlight washer system.

Activation of the matrix LED headlights with laser lights

Schematic diagram of the left headlight



664_148

Activation

The light functions are activated in the same way as the matrix LED headlights. Left/Right LED Headlamp Power Output Modules 1 A31/A27 additionally have a LIN connection. The laser light module is activated via this connection.

High beam assist

The functions are the same as those of the matrix LED headlights. Only the laser lights have been added.

1) ECE = for the European market

2) SAE = for the North American Region

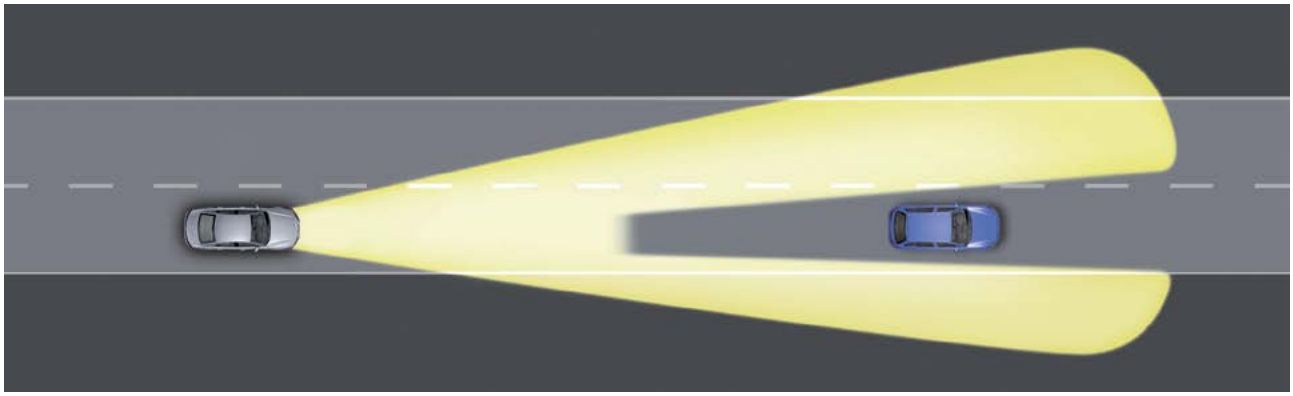
Matrix beam

General description

The matrix beam is a light function which allows the vehicle to drive with a permanent high beam without the risk of blinding oncoming traffic or any preceding vehicles. Unlike the Dynamic Light Assist dynamic high beam control system, this system has no mechanical parts. A camera detects preceding vehicles and oncoming traffic and cuts them out of the high beam in a fraction of a second by deactivating or dimming individual LEDs in the matrix. The use of the matrix technology now makes it possible to open multiple tunnels at the same time.

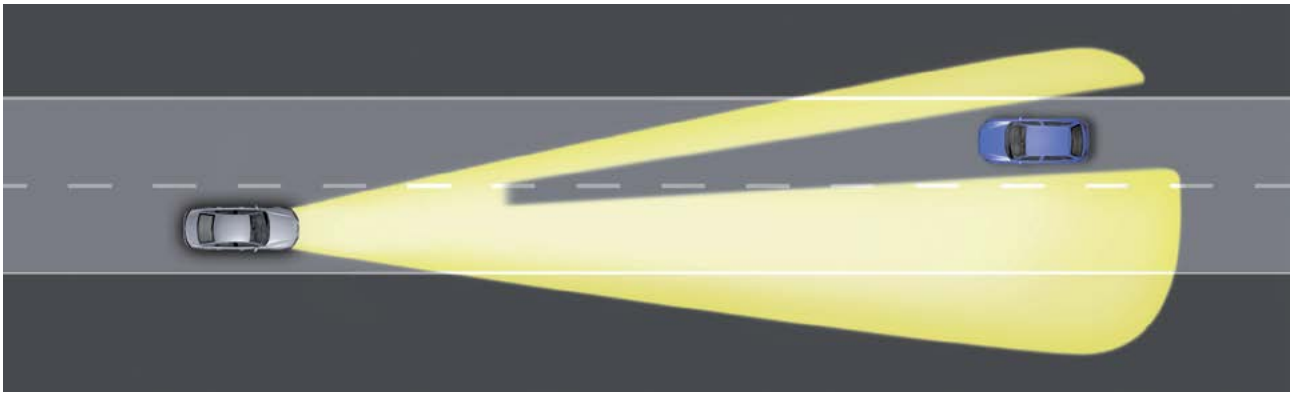
While these ares are "blocked out", the high beam illuminates all the areas between the vehicles and to the left and right of them. When the vehicle is no longer in the driver's field of view, the system returns to full high beam. In addition to blocking out other vehicles, the light cone of the matrix beam adapts to the driving situation, for example, when cornering. In this case, the intensity of the light cone is adjusted at the side or focused on the center of the lane by activating different LEDs. This improves visibility for the driver without the risk of blinding oncoming traffic.

Camera has detected a preceding vehicle



664_149

Camera has detected an oncoming vehicle

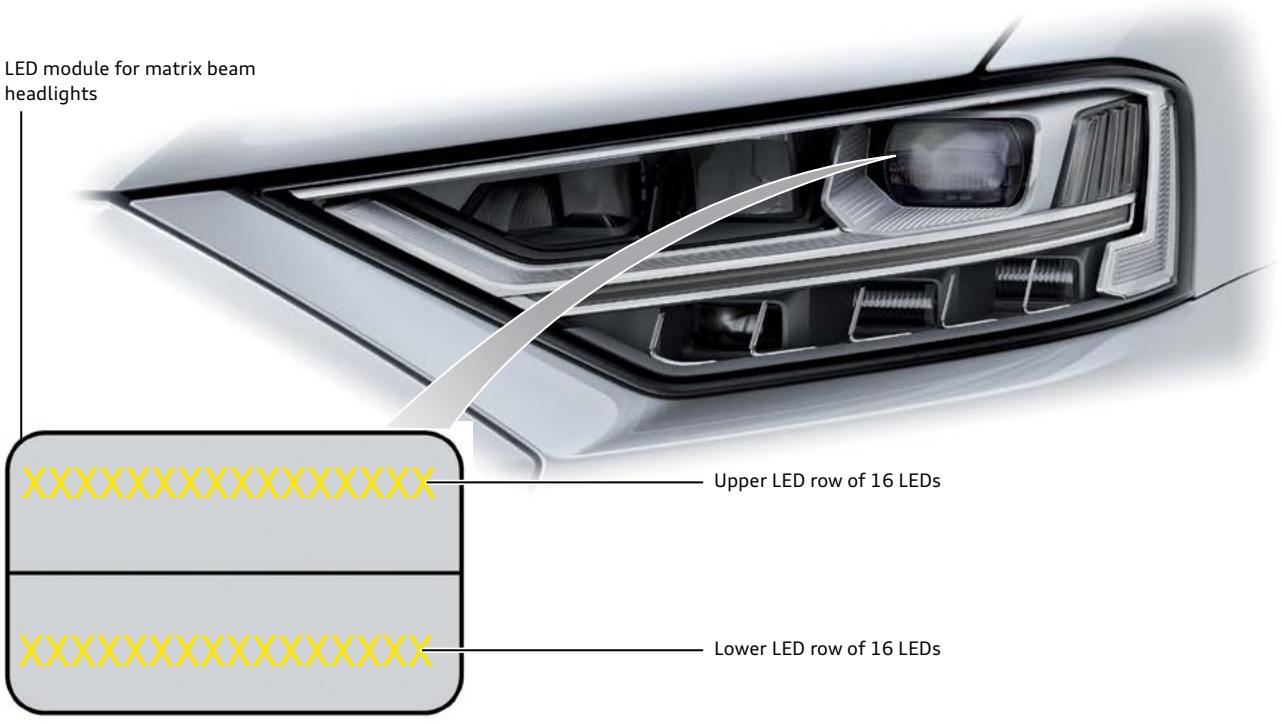


664_150

Matrix Beam 2.0*

General description

In Matrix Beam 2.0 the LEDs are arranged in multiple rows: two rows of 16 LEDs, one above the other. The LEDs in both rows can be activated independently of one another, allowing a more precise response to the traffic situation.



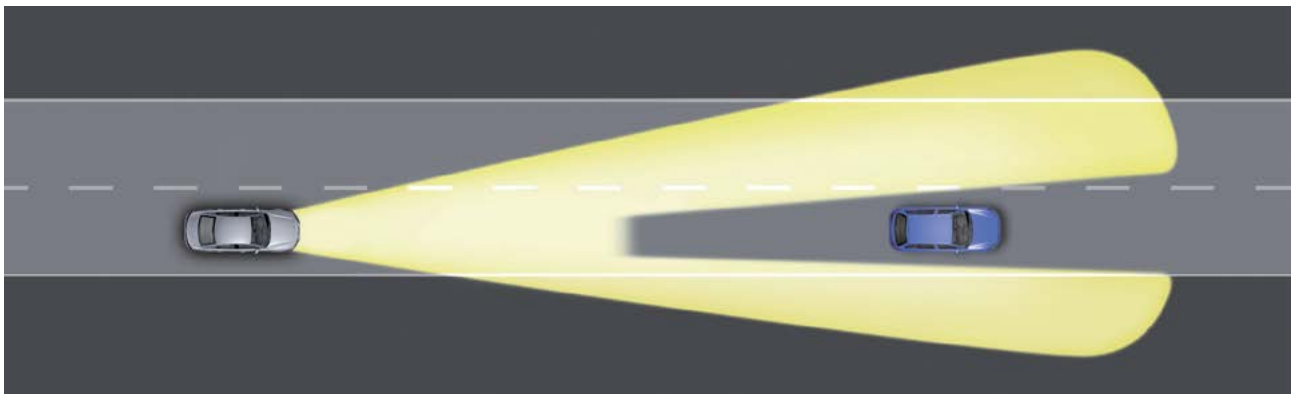
664_151

664_152

Scenario 1:
Both vehicles are driving at the same level

This situation shows how the matrix beam headlights respond to the preceding vehicle. To avoid blinding the other road user, the LEDs must be deactivated within the area of the preceding vehicle. As both vehicles are at the same level, the LEDs in both the upper and low rows have to be deactivated or dimmed.

664_152

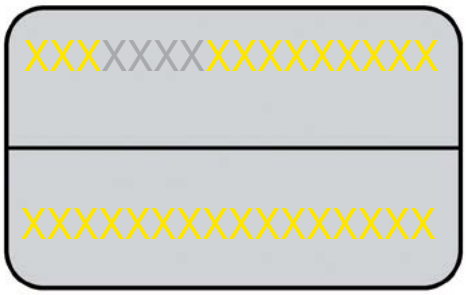


664_149

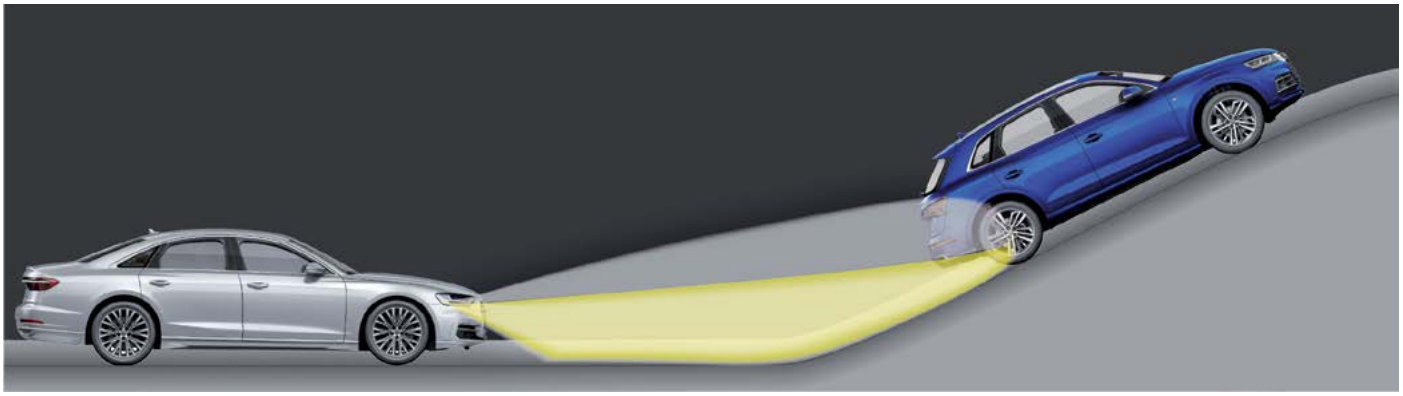
*Not available at launch

Scenario 2:
Preceding vehicle is travelling uphill

In this situation the preceding vehicle is travelling uphill. To avoid blinding the other road user, the upper row of LEDs has to be deactivated, but the LEDs in the lower row can be switched on again to illuminate the road. This not only avoids blinding the other road user, it also allows the road to be well illuminated again. The driver does not have to wait until the preceding vehicle is no longer within the range of the high beam where there is a risk of blinding. This scenario also applies to an oncoming vehicle.



664_152



664_154

Calibrating Matrix Beam 2.0

The following service work always requires calibrating the matrix headlights:

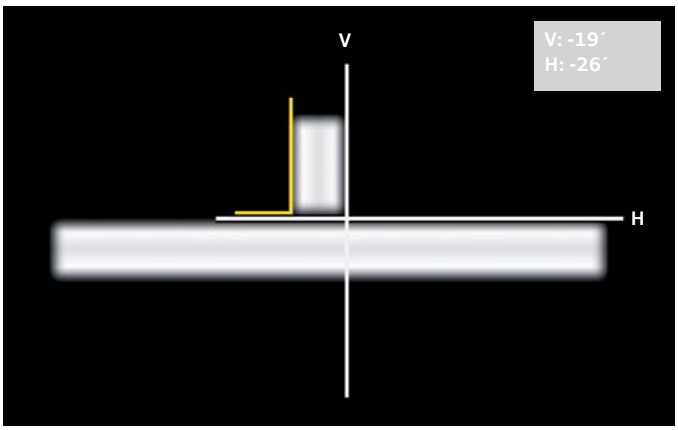
- Adjusting the position of a headlight (removal and installation, removing the fastening screws).
- Adjusting the headlights.
- Replacing the Driver Assistance Systems Control Module J1121.
- A relevant DTC is recorded.

Measuring the reference segment

The calibration procedure begins with measuring the reference segment using headlight adjustment unit VAS 621 001. Due to the fact that Matrix Beam 2.0 contains two rows of LEDs, not only the horizontal deviation but also the vertical deviation of the reference segment must be determined during the calibration procedure.

The deviation values are then transfered to Driver Assistance Systems Control Module J1121 using the VAS Scan Tool. The yellow lines in the diagram show the edges at which the reference segment is measured. In this example a vertical deviation of -19 minutes and a horizontal deviation of -26 minutes have been determined.

The illustration shows the reference segment of the left matrix LED headlight



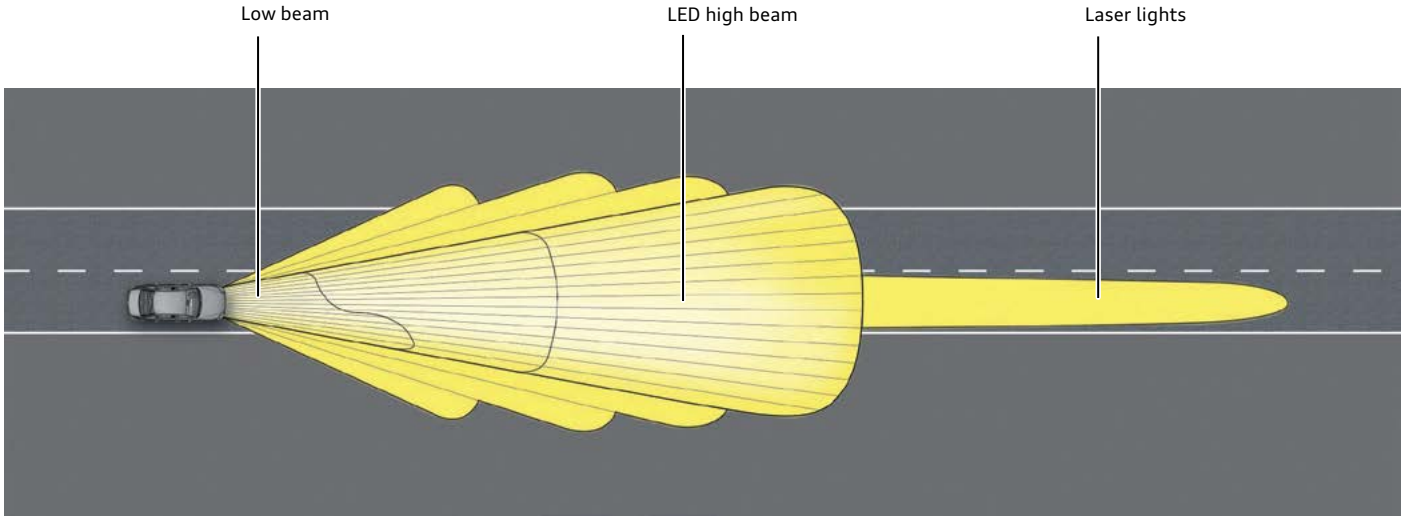
664_155

Laser lights (S8)

General description

The laser lights are used in the 2019 A8 as an auxiliary high beam supplementing the LED high beam. The laser spot complements the LED high beam when the vehicle is travelling at speed of 43.4 mph (70 km/h) or higher, doubling the range of the high beam.

The laser spot mainly illuminates the lane in which the vehicle is driving. The LED high beam is controlled by headlight assist. The laser lights are activated approximately one second after the LED high beam is activated.



664_156

Activation of the laser lights

The laser lights are activated if the following conditions apply:

- Light switch in "Auto" position and low beam switched on.
- High beam assist has been enabled in the MMI.
- Laser lights have been enabled in the MMI.
- High beam assist has been activated with the high beam stalk.
- The vehicle is travelling at a speed of greater than 43.4 mph (70 km/h) and no vehicle has been detected within the illuminated area.

For legal reasons, the laser lights may only be used when travelling at speeds of over 43.4 mph (70 km/h) and in combination with high beam assist. When the camera detects an oncoming vehicle or a preceding vehicle, the laser lights are switched off immediately. When high beam is activated manually, the laser lights are permanently off.

Displays in the instrument cluster

The following symbol in the instrument cluster indicates when high beam assist is active:

If all conditions apply, the following display appears when the laser lights are active:

664_157

Service

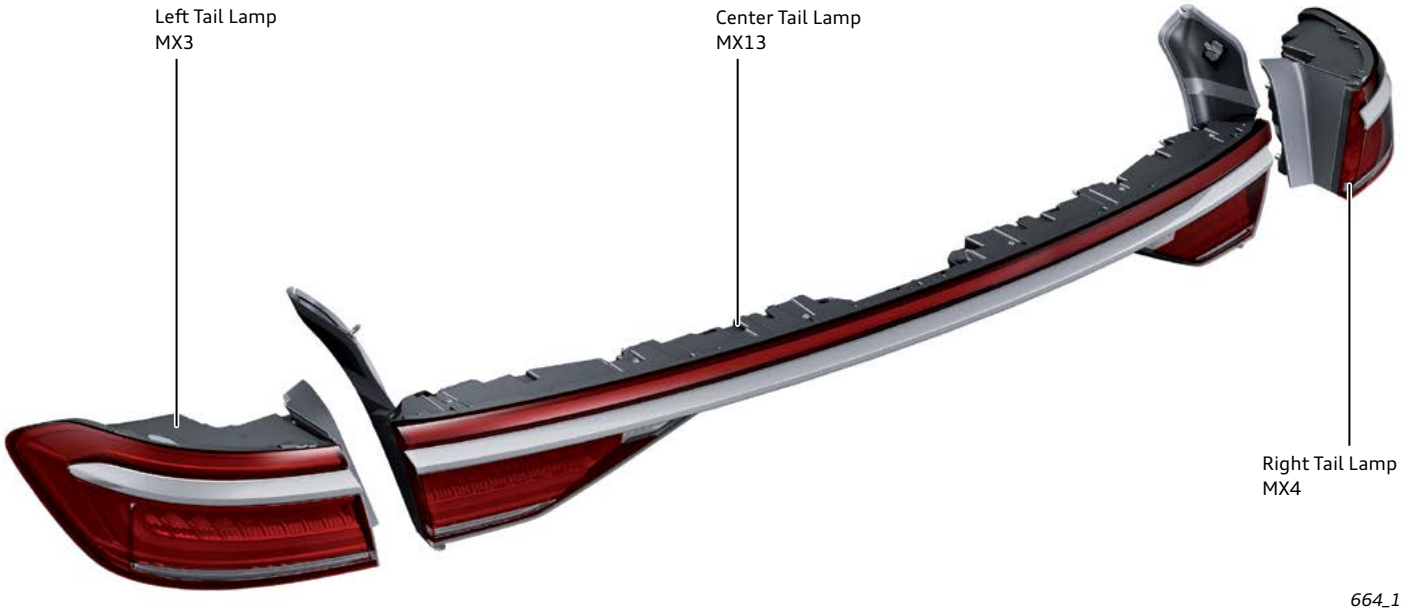
It is not possible to activate the laser lights in the shop for safety reasons. The functioning of the laser lights can only be tested during a test drive.

Tail lights

General description

The Audi A8 has three tail lights: a tail light on the left side section, a tail light in the side section and a light strip extending across the full width of the trunk lid.

Only LEDs are used as light sources. The tail lights are activated by Comfort System Central Control Module J393.



664_158

Versions

A distinction is made between tail light versions:

- LED tail light with dynamic turn signal function PR no. 8SP.
- LED tail light with dynamic turn signal function and organic LEDs PR no. 8SC.

Tail lights 8SP

Both of these tail light versions are identical geometrically and in design.

However, the 8SP version has a dynamic turn signal function.

Both versions are activated by Comfort System Central Control Module J393 via discrete wiring.

664_159

Tail lights 8SC

The 8SC tail lights differ from one another both in terms of their design and inner workings. In addition to conventional LEDs for the tail light and brake light functions, they have organic LEDs or what are known as OLEDs.

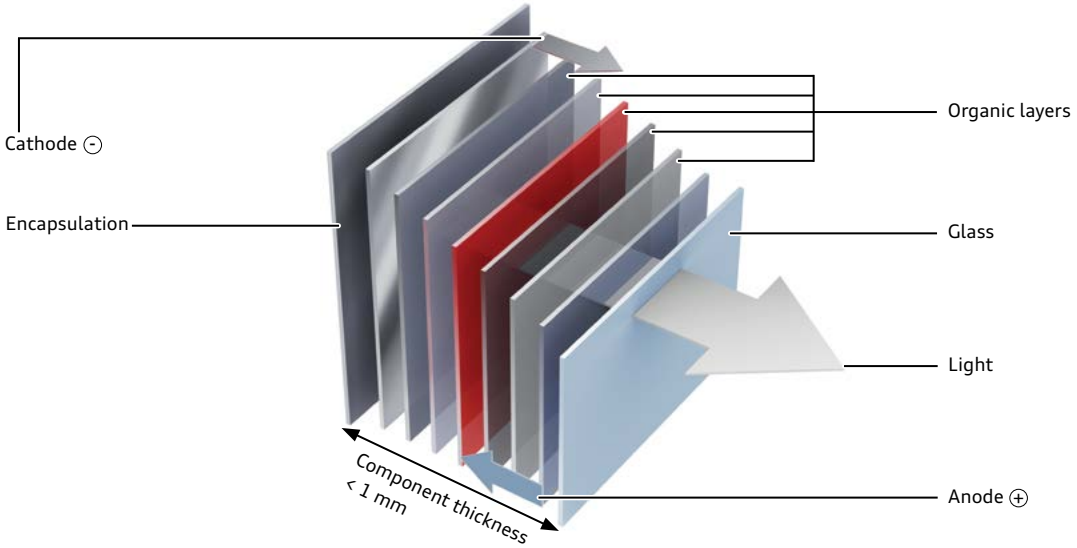
These tail lights also have a dynamic turn signal function. In addition, the OLEDs are activated in a staggered fashion for the coming/leaving home function. Here, the tail light OLEDs are activated from the center outwards in a staggered fashion by Comfort System Central Control Module J393 via a LIN data cable.

664_160

OLED

An organic light emitting diode (OLED) is a light-emitting diode (LED) in which the emissive electroluminescent layer is a film of organic compound that emits light in response to an electric current.

OLEDs are large-area light sources, while LEDs are spot light sources. In this respect, both technologies are designed for different applications. OLEDs emit a soft, diffuse light and have until now mainly been used for decorative applications.



664_161

Interior lighting

Background lighting

The interior lighting in the new Audi A8 is subdivided into the function, contour and background lighting areas.

The function lighting includes:
- Cupholder light
- Door pocket light
  - Storage compartment light
  - Recessed handle light
  - Footwell light

Function lights illuminate specific areas of the vehicle interior.

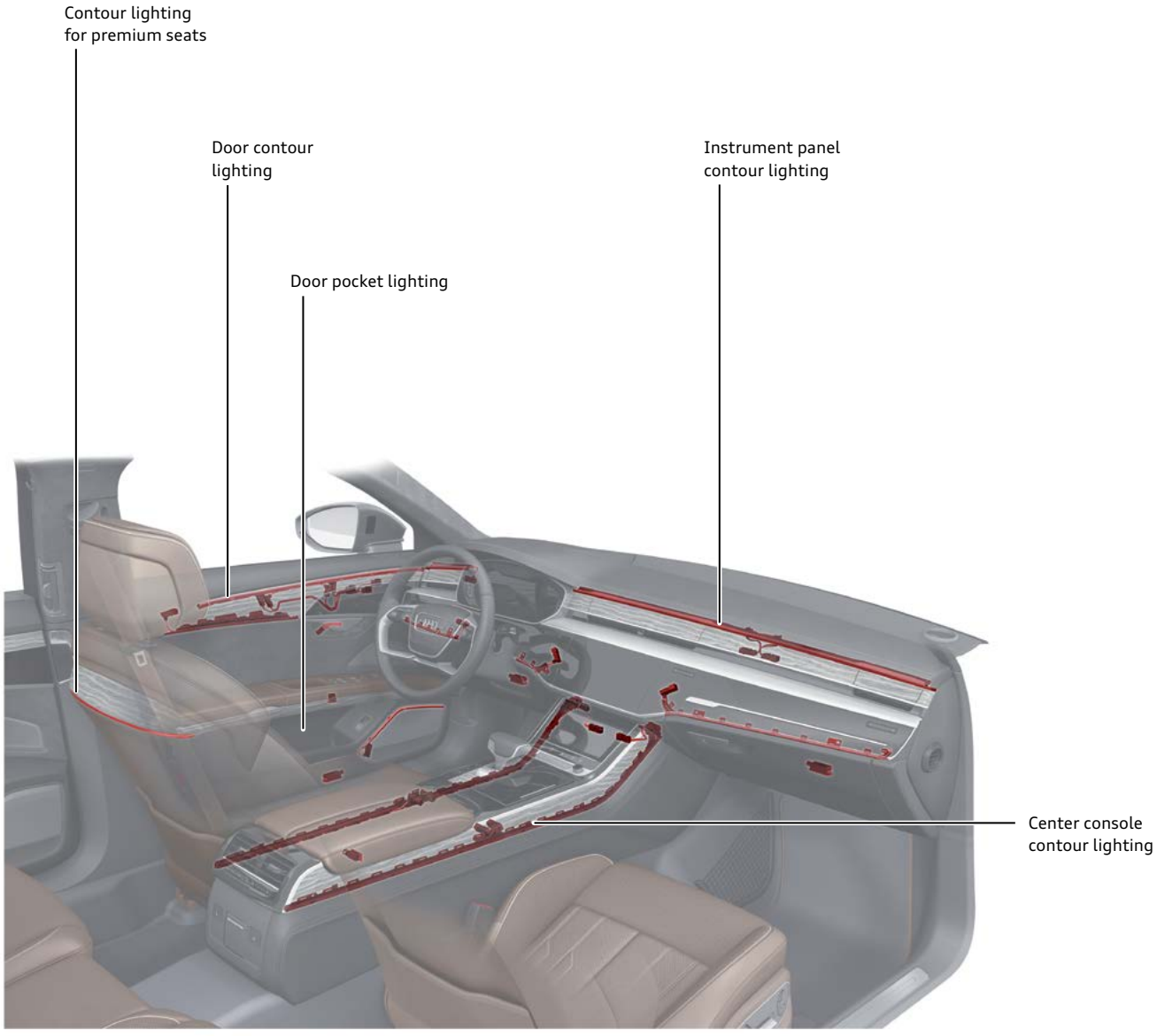
The background lighting illuminates interior areas by means of optical fibers and, in this way, creates a sophisticated atmosphere inside the interior.

The contour lighting directly illuminates and highlights specific areas of the vehicle interior.

The new A8 is also based generally on the MLBevo platform and, therefore, is comparable to the current Audi A5. The interior lighting in the Audi A8 is much more extensive.

PR no. QQ0 is not available for the new Audi A8. The lights included in lighting package QQ1 are the basic equipment for interior lighting. The vehicles have single-color background lighting as standard.

Multi-colored background and contour lighting is available under PR no. QQ2 as an option. The customer can choose from 30 different colors in the Individual menu.



664_022

Functions

The menu navigation system is similar to that used in previous MMI systems.

In the new Audi A8 adjustments can be made using the front and rear touch screens. The background lighting can be adapted individually, or the customer can choose between pre-defined color profiles.

When different Audi drive profiles are selected, the colors of the background and contour lighting also change.

The new Audi A8 is the first model in which the interior lighting is no longer dependent on Rain/Light Recognition Sensor G397. This means that the lighting stays on continuously, regardless of whether it is dark or light outside when the customer activates the background and/or contour lighting in the menu.

All interior lights including the glove compartment light use LED technology.

LEDs are also used to illuminate the front and rear door pockets. The door pocket lights are illuminated in cold white only.

Passive door reflectors are integrated into the doors as standard.

Depending on trim level, different areas are illuminated in addition to the QQ1 and QQ2 packages:

- Illumination of the bass loudspeakers in Audi advanced sound systems.
- Option for illumination of the door entry strips using LED technology – this is standard equipment in the Audi S8 and Audi A8.

664_024

Function, contour and background lighting

Function/installation location	Number of LEDs	PR no. QQ1	PR no. QQ2
Single color			
Interior door handle light	4	LED (white)	LED (white)
Door pocket lighting	4	LED (white)	LED (white)
Premium sound	4		
Advanced sound	4		
Front/rear background lighting	6	LED (white)	
Exit warning system	4		
Cockpit			
Front/rear background lighting	4	LED (white)	LED (white)
Center console			
Front cupholder lighting	2	LED (white)	LED (white)
Front background lighting	4	LED (white)	LED (white)
Front contour lighting	4		
Rear cupholder lighting	2	LED (white)	LED (white)
Rear background lighting	4	LED (white)	LED (white)
Rear contour lighting	4		
Rear storage compartment lighting (folding)	0		
Rear cupholder lighting (folding)	2		
Rear background lighting (folding)	4	LED (white)	
Rear contour lighting (folding)	0		

Multi color			
Contour lighting	8		LED (RGB)
Front/rear background lighting	6		LED (RGB)
Exit warning system	4		
Cockpit			
Contour lighting	3		LED (RGB)
Front/rear background lighting	4		LED (RGB)
Center console			
Front cupholder lighting	0		
Front background lighting	4		LED (RGB)
Front contour lighting	4		LED (RGB)
Rear cupholder lighting	2		
Rear background lighting	4		LED (RGB)
Rear contour lighting	4		LED (RGB)
Rear cupholder lighting (folding)	2		
Rear background lighting (folding)	4		LED (RGB)
Rear contour lighting (folding)	4		LED (RGB)
Contour lighting application on the front seats	4		LED (RGB)

Touch-sensitive reading lights

The new Audi A8 has capacitive switch controlled reading lights as standard.

There is a choice of two reading lights in the rear compartment:
- Touch-sensitive reading lights (basic equipment).
- Matrix LED reading lights.

To switch the standard reading lights on and off, a brief touch of the surface of the actual LED is all that is needed. To activate the manual dimming function of the reading lights, the light must be off and the surface must be pressed until the required brightness level is obtained.

Standard equipment of the rear interior lighting

664_035

Operation of the matrix LED reading lights by Audi Rear Seat Remote

The optional matrix LED reading lights are also used as entry lighting. A button in the center of the reading light serves to switch this function on and off.

When using the matrix LED reading light, the following setting can be adapted individually while the reading light is on.
- Brightness.
- Position.
- Focal length.

To make these adjustments, the "Reading lights" setting must be selected individually in the "Lights" menu in Rear Seat Remote.

664_034

Audi Rear Seat Remote

Headliner with rear matrix LED reading lights

The matrix LED reading lights have seven individual LEDs which can be jointly controlled.

The vanity mirrors in the occupant cell function as interior lights when folded down. This is made possible by additional LEDs in the housings of both vanity mirrors.

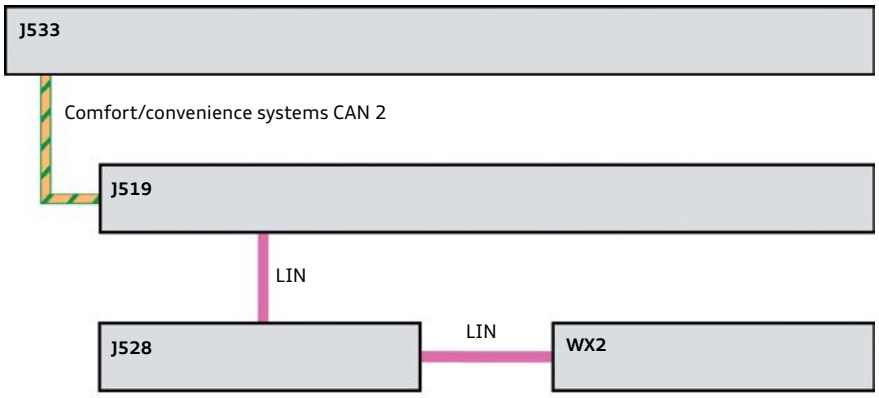
The matrix LED reading lights provide ideal lighting conditions for reading. Given that adjusting the reclining seat also alters the position of the rear passengers, the light cone can be adjusted individually with the aid of the matrix LED reading lights.

The seven interconnected LEDs of the matrix LED reading light are integrated in Rear Interior Lamp WX2.

WX2 is a LIN user of the Roof Electronics Control Module J528, which, in turn, is a LIN user of the Vehicle Electrical System Control Module J519.

The matrix LED reading light can be diagnosed via the VAS Scan Tool under Address Word 09.

Schematic diagram — Networking of both overhead modules



Key:
J519 Vehicle Electrical System Control Module
J528 Roof Electronics Control Module
J533 Data Bus on Board Diagnostic Interface
WX2 Rear Interior Lamp

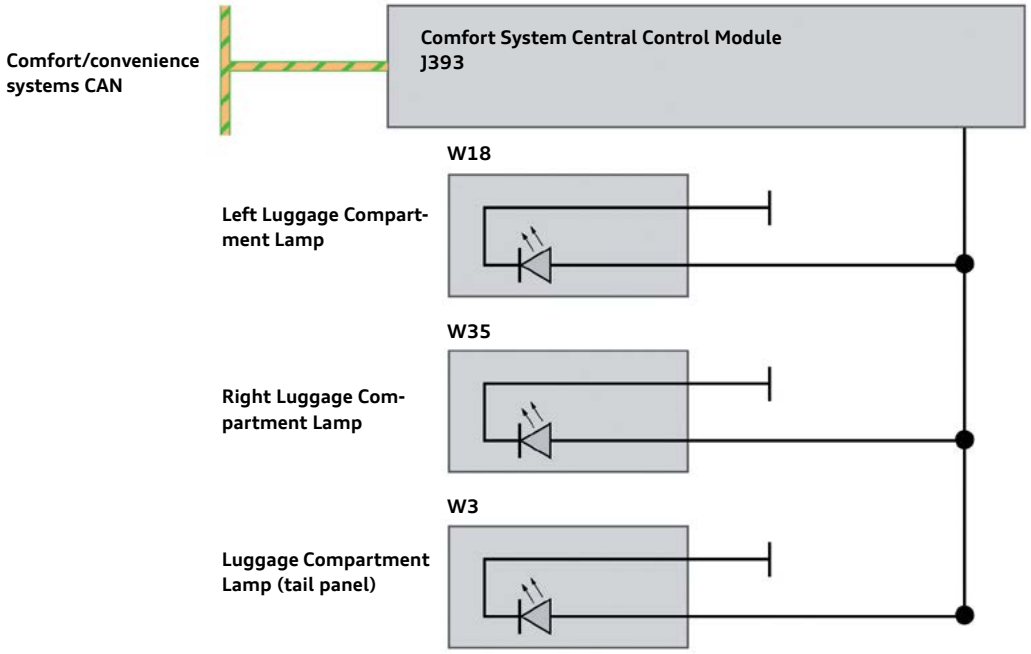
664_148

664_153

Luggage compartment lighting

The luggage compartment is illuminated by three luggage compartment lights using LED technology. The three LED luggage compartment lights are activated by Comfort System Central Control Module J393.

No dimming or background light functions are available for the illumination of the actual luggage compartment or for the illuminated switches in the luggage compartment.



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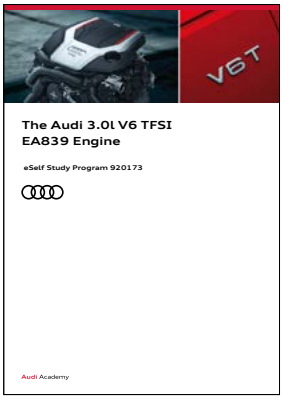
664_053

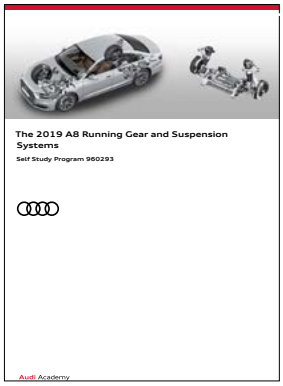
eSelf-Study Programs

For more information about the technology of the Audi A8, please refer to the following eSelf-Study Programs.

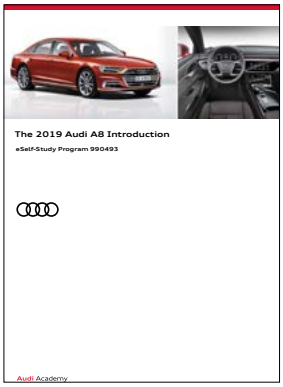
SSP 970133
Audi Occupant Protection Systems



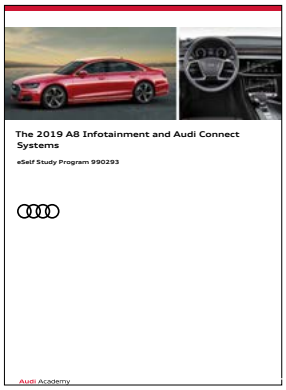
SSP 920173
The Audi 3.0l V6 TFSI
EA839 Engine



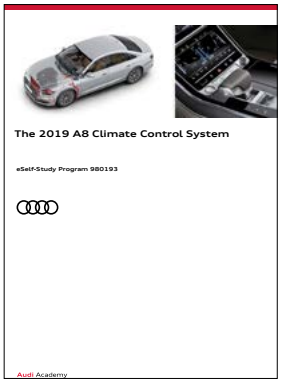
SSP 960293
The 2019 Audi A8 Running Gear and Suspension



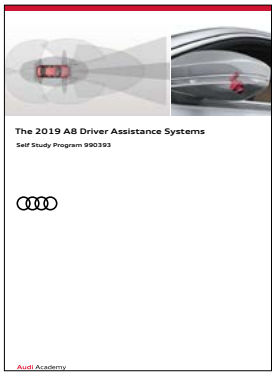
SSP 990493
The 2019 Audi A8 Introduction



SSP 990293
The 2019 Audi A8
Infotainment and Audi Connect Systems



SSP 980193
The 2019 Audi A8 Climate Control Systems



SSP 990393
The 2019 Audi A8 Driver Assistance Systems

Knowledge assessment

An On-Line Knowledge Assessment (exam) is Available for this eSelf-Study Program.

The Knowledge Assessment is required for Certification credit.

You can find this Knowledge Assessment at: **www.accessaudi.com**

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- Click on the "App Links"
- Click on the "Academy site CRC"

Click on the Course Catalog Search and select "970293 - The 2019 Audi A8 Electrics and Electronics"

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Thank you for reading this eSelf-Study Program and taking the assessment.

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