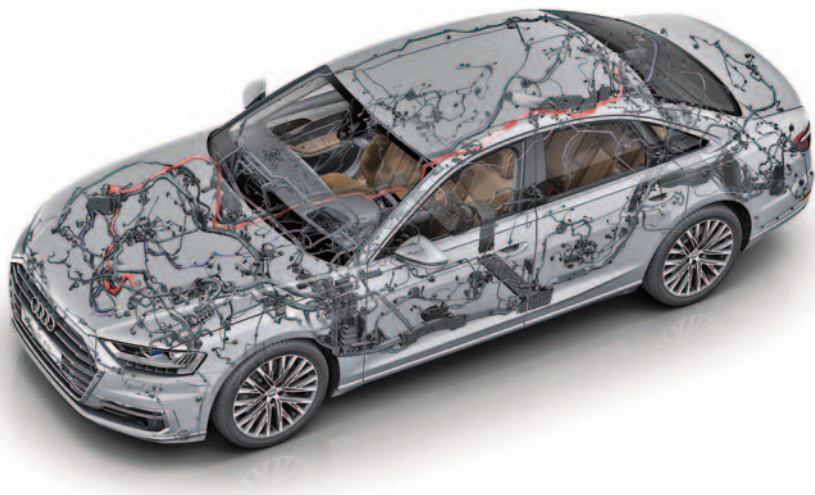




Audi A8 (type 4N)

Electrics and electronics

Self Study Programme 664



The fourth generation of the brand flagship is, once again, the reference point defining Vorsprung durch Technik – thanks to a new design language, an innovative touch concept and the systematic electrification of the driveline. Not only that, the Audi A8 (type 4N) is the world's first production car to be developed for highly automated driving. Starting in 2018, Audi will successively bring piloted functions into production.

All units work in conjunction with the belt starter generator, which is the heart of the 48-volt electrical system. This mild hybrid technology (MHEV, mild hybrid electric vehicle) enables the vehicle to coast with the engine off and to restart comfortably. It also has an advanced start-stop function and a high recuperation capacity of up to 12 kW.

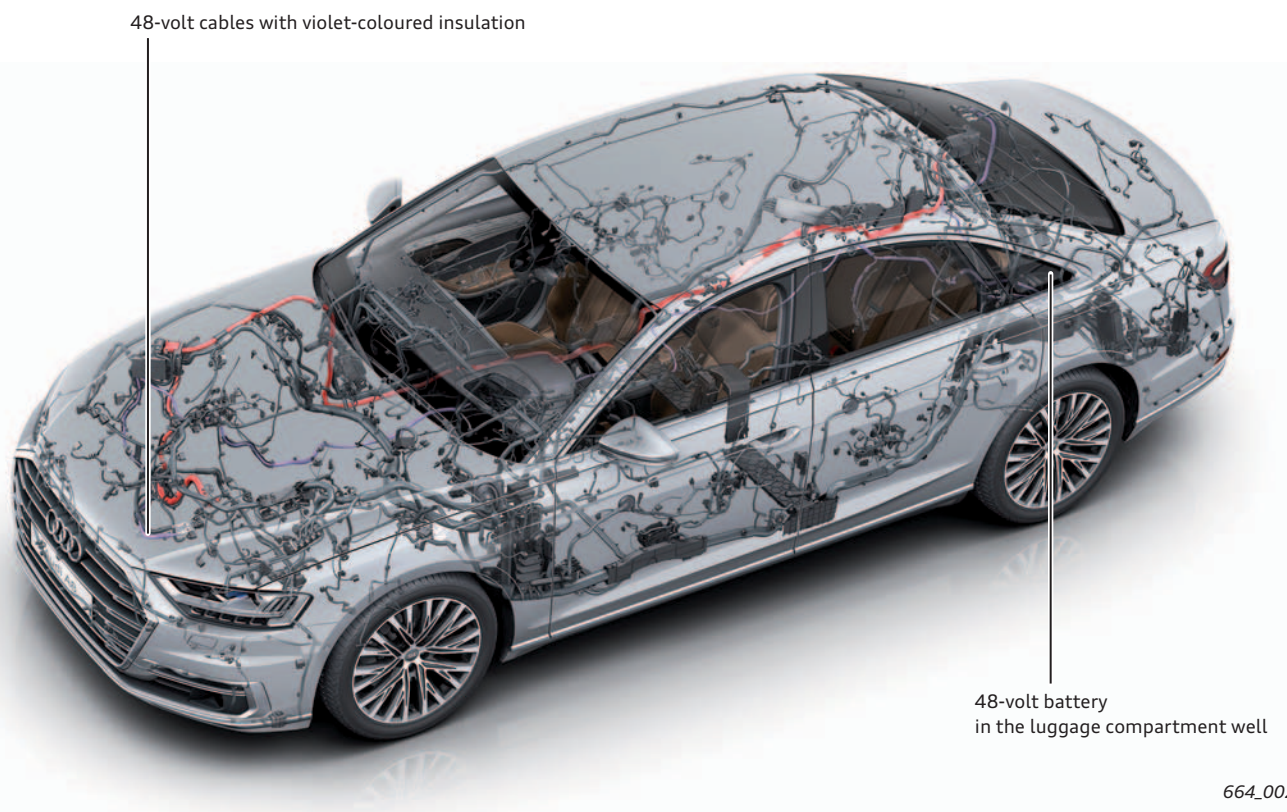
Taken together, these measures further improve the already high fuel efficiency of the engines by up to 0.7 litres per 100 km during actual vehicle operation.

The mild hybrid drive in the new Audi A8 comprises 2 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 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 in the new large saloon. 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 for thermal management.

The 48-volt MHEV technology is particularly comfortable and efficient. When the driver takes his foot off the accelerator at speed of between 55 and 160 kph, the car can coast for up to 40 seconds with the engine completely disengaged. The start-stop phase begins at 22 kph when coasting at low speed.

Wiring harness layout in the Audi A8 (type 4N)



664_002

Learning objectives of this self study programme:

This self study programme describes the electrics and electronics of the Audi A8 (type 4N). When you have worked through this self study programme, 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 units for the electrical system, networking and comfort/convenience electronics.

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The self-study programme provides information on the fundamentals of the design and function of new vehicle 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.

This content is not updated.

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



Note



Reference

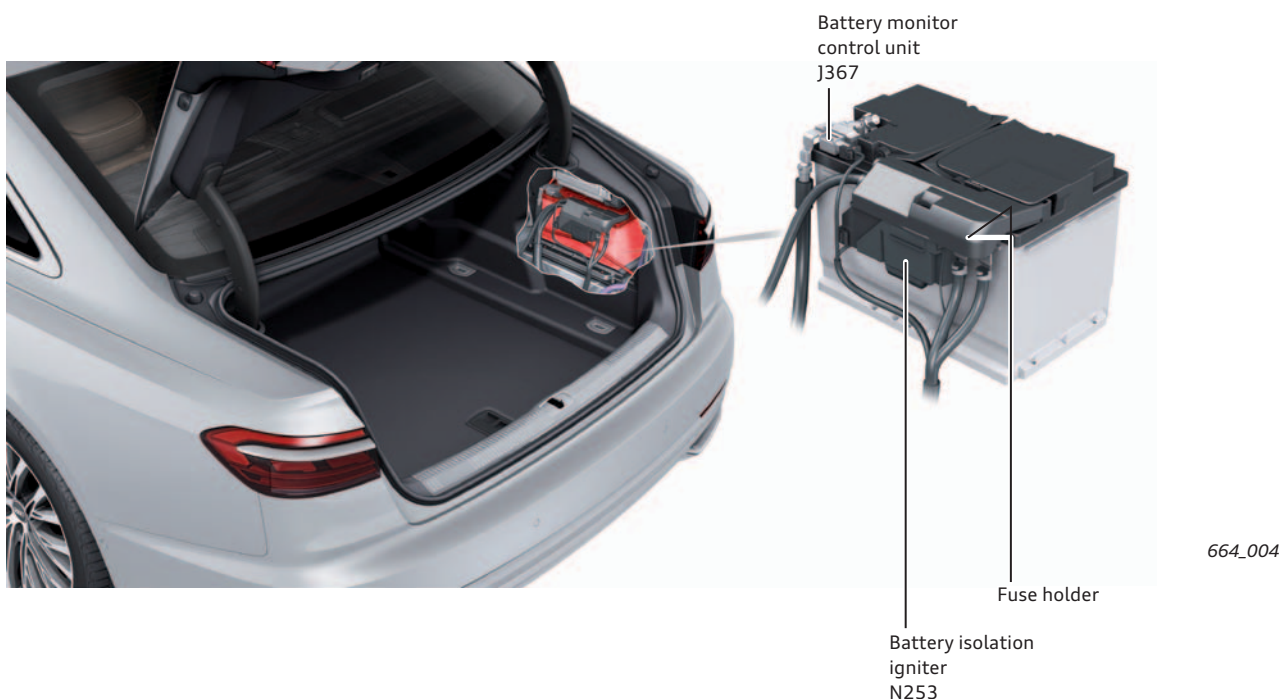
Power supply

12-volt car battery

The 12-volt battery of the Audi A8 (type 4N) is installed in the rear right side section. Depending on the car's equipment specification, use is made of different battery sizes and types matched to the car. Both EFB¹⁾ and AGM batteries²⁾ are used.

The main fuse holder and the battery isolation igniter N253 (battery isolator element) are attached to the battery plus terminal SA. If the battery isolation igniter is activated in case of deployment of the restraint systems, the starter, the glow plugs (diesel engine), the secondary air pump (petrol engine) and the radiator fans are disconnected from terminal 30, i.e. de-energised.

The battery monitoring control unit J367 is located at the negative terminal on the car battery. This control unit and the ground cable form a unit. The term battery data module (BDM) is sometimes also used for J367. The car battery test must be performed using the diagnostic tester, especially during the warranty period. A test program in the Guided Fault Finding system checks not only the voltage and internal resistance of the battery, but also evaluates the history data of the car battery. Thus, it is possible to include the age of the car battery and any general voltage undershoots which have occurred into the assessment of the car battery. To allow such an assessment to be made, the new car battery must be adapted to the battery monitoring control unit J367 after installation.



EFB battery

An EFB could be referred to as a heavy-duty wet-cell battery. The plus plate inside the car battery is coated with an additional polyester scrim which provides the active mass of the car battery with additional stability on the plate. The deep-cycle resistance of these car batteries is higher than that of conventional batteries. An EFB battery is charged in exactly the same way as a standard car battery.

AGM car battery

In the case of AGM car batteries, the battery electrolyte is absorbed by a glass microfibre mat. In addition to having higher deep-cycle resistance, the AGM car battery is noted for its leak-proof design. This is of course 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 program for AGM car batteries.

The following car batteries are used in the Audi A8 (type 4N):

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

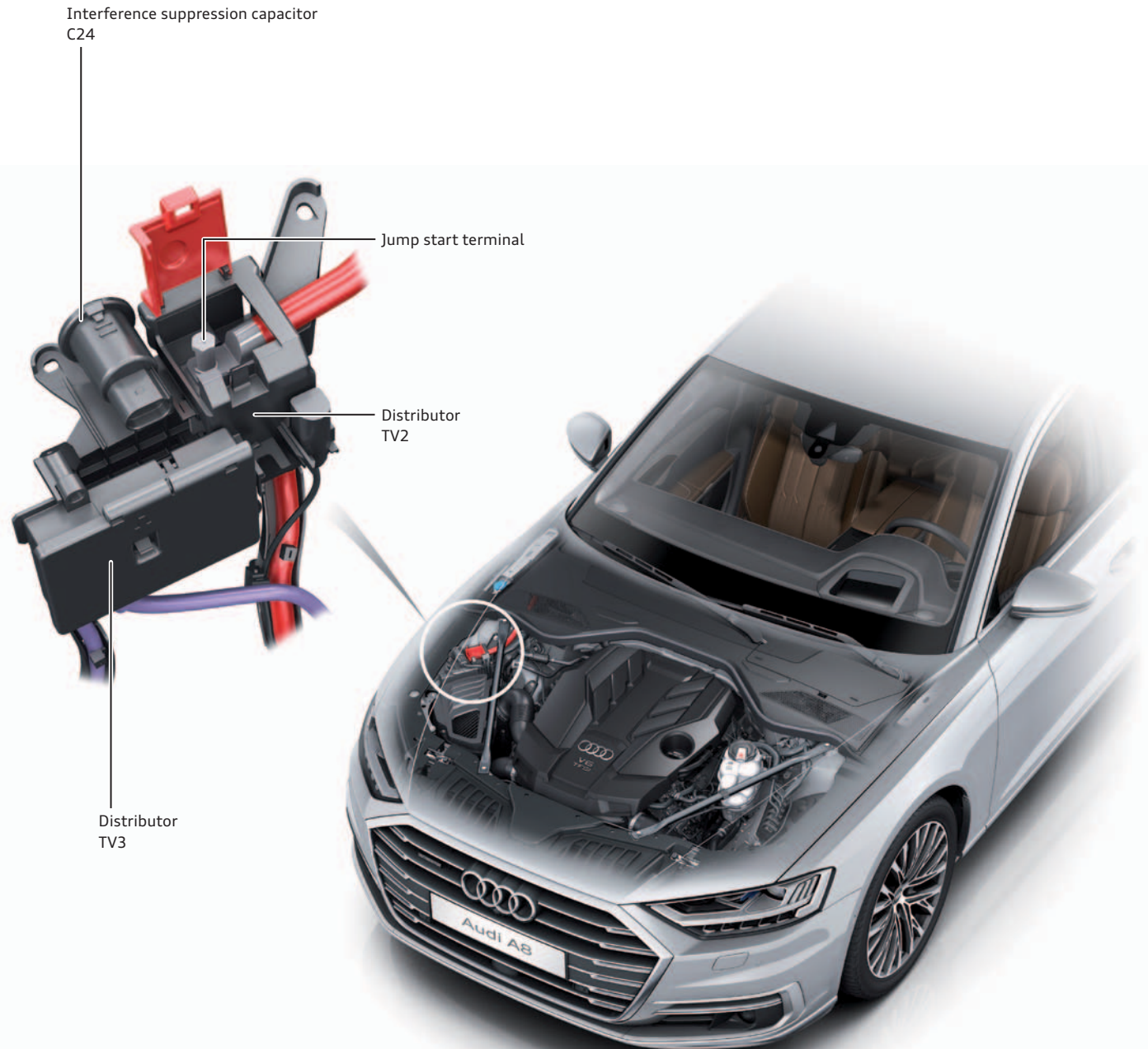
¹⁾ English: Enhanced Flooded Battery

²⁾ English: Absorbent Glass Mat

Jump start terminal

The jump start terminal is located in the engine bay on the right-hand side of the car, 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.



664_005

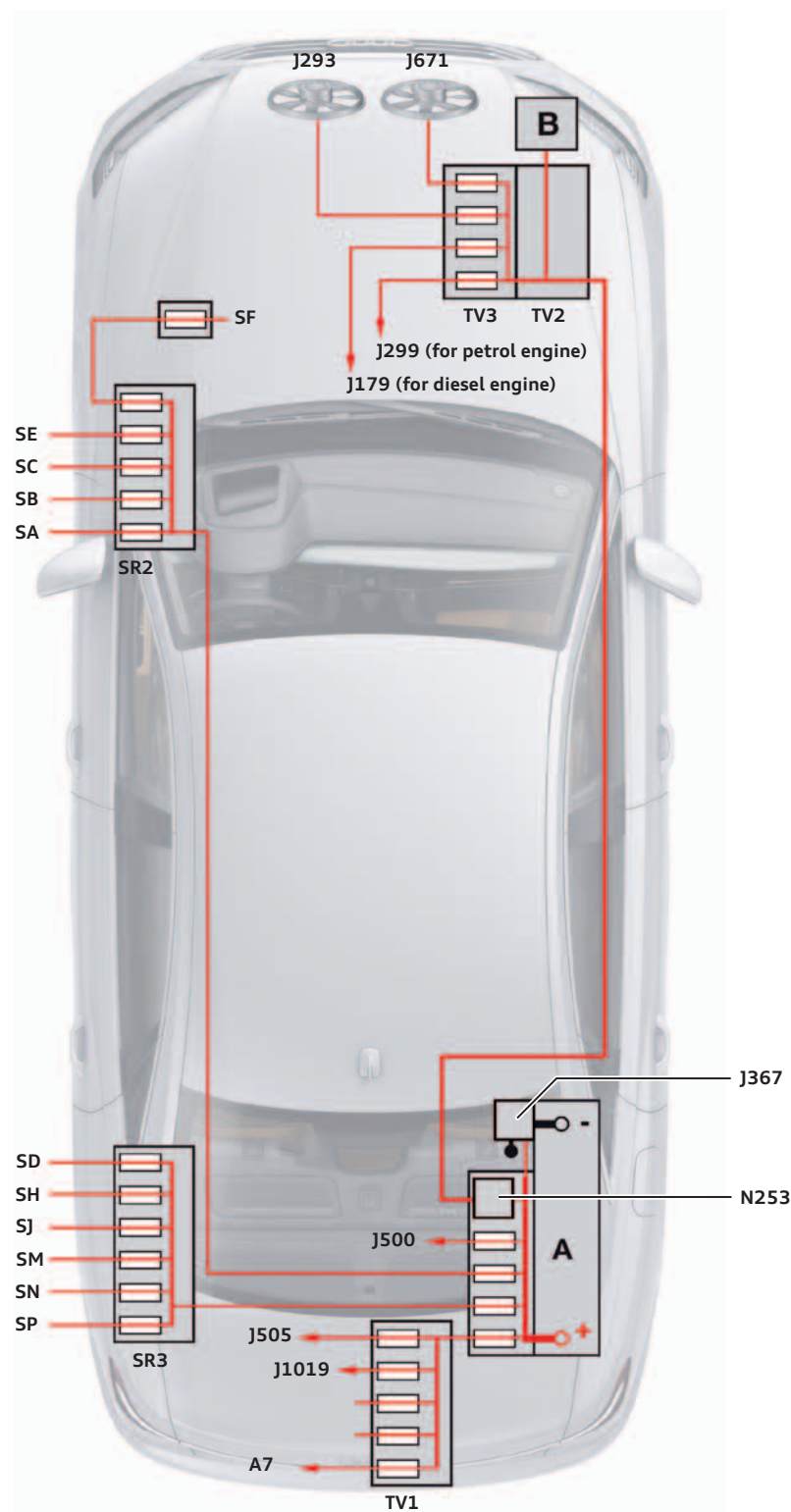
The actual jump starting terminal is located on the terminal 30 distributor TV2. It is supplied with voltage via a red 70 mm² cable from the 12-volt car battery. The terminal 30 distributor TV3, which has three fuses, is located directly adjacent to TV2.

The radiator fans, the glow plugs and the secondary air pump are supplied with voltage through these three fuses. The black 70 mm² 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

This diagram summarises the supply structure of the Audi A8 (type 4N). This is a schematic diagram.

For precise details of fuse assignment and cable routing, please refer to the relevant service literature.



664_006

Key:

A	12-volt battery	J1019	Rear steering control unit
A7	Voltage converter, 48V/12V	N253	Battery isolation igniter
B	Starter	SF	Fuse holder on dash panel, left
J179	Automatic glow period control unit	SR2	Relay and fuse holder on A post, bottom
J293	Radiator fan control unit	SR3	Relay and fuse holder in luggage compartment, left
J299	Secondary air pump relay	TV1	Distributor in luggage compartment, right
J367	Battery monitor control unit	TV2	Distributor in engine bay on left
J500	Power steering control unit	TV3	Distributor in engine bay on right
J505	Windscreen heater control unit		
J671	Radiator fan control unit 2		

Fuses and relays

The fuses connecting to the various distributors as well as to the relay and fuse holder SR1 are identified only 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, therefore, are also described in the vehicle owner's manual.

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Distributors TV2 and TV3 with jump start point

Relay and fuse holder SR1

Fuse holder at plus terminal on 12-volt battery



Relay and fuse holder SR2 on A post at bottom left. Fuse holders SA, SB, SC and SE are located here.

Fuse holder SF on left-hand side of dash panel

Relay and fuse holder SR3 in luggage compartment on left. Fuse holders SD, SH, SJ, SM, SN and SP are located here.

664_007



Note

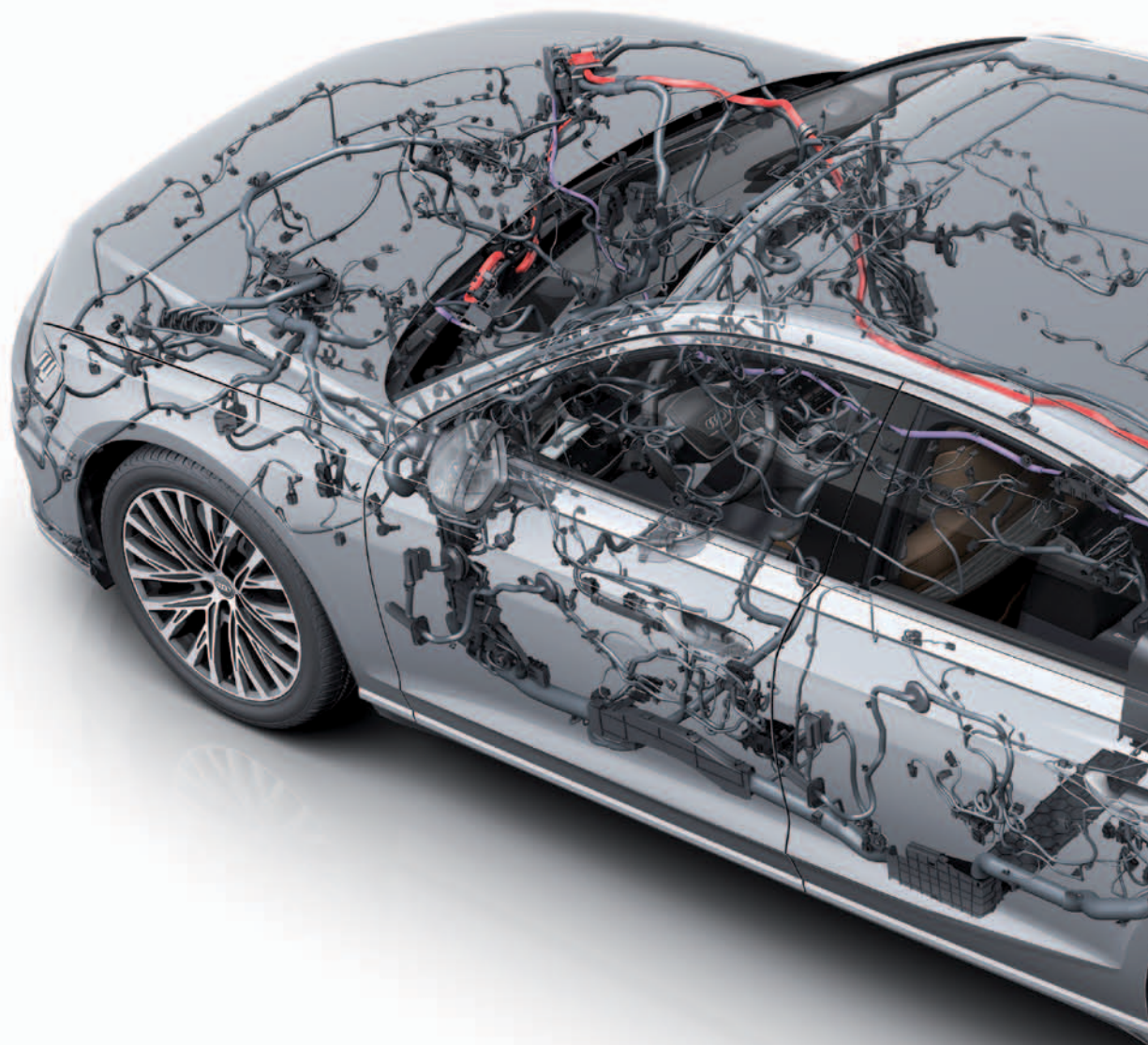
For the valid fuse assignments, please refer to the latest current flow diagrams in ElsaPro.

Electrical wiring

Main battery lead

Like its predecessor, the Audi A8 (type 4N) has an aluminium main battery lead. Unlike in the previous model, this is a single-piece lead. It is insulated by a red PVC coating and has a wire cross-section of 150 mm². It begins at the plus terminal of the 12-volt battery as a flexible round conductor.

It continues from the luggage compartment well 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 post, it runs from through the engine bulkhead into the engine bay to the distributor TV2.



Copper wires

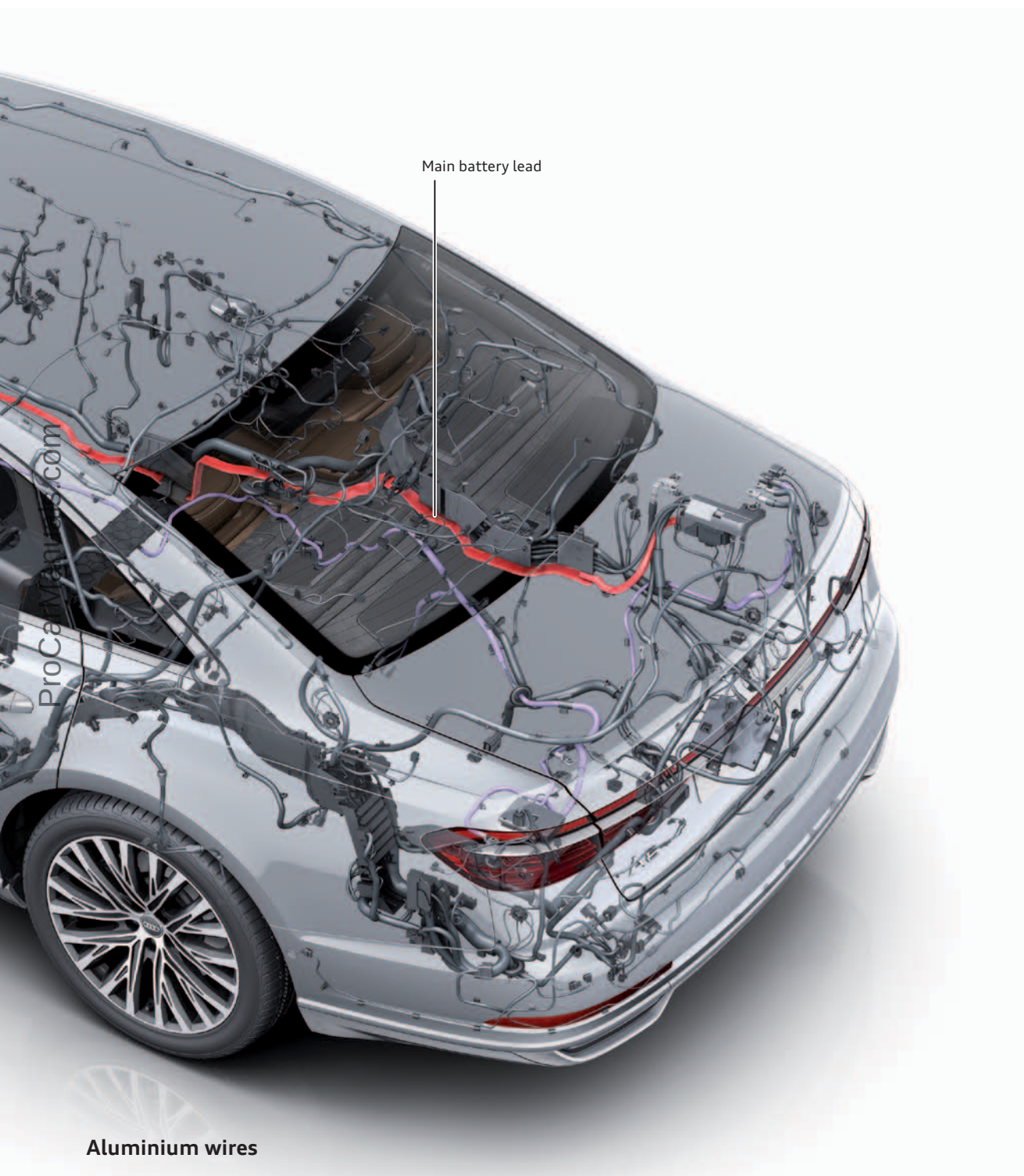
As before, this wiring repair set largely comprises copper wires in a variety of cross-sections. The range of use extends from 0.13 mm² wires in the area of the CAN bus network to 75 mm² wires for power supply to high-output equipment.

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 faulty.



Reference

For further information about the repair of electrical wiring refer to Self Study Programme 646 "Audi A4 (type 8W) Vehicle electrics and electronics", as well as service TV programmes STV 0401 "Repairing aluminium wires" and STV 0405 "Wiring harness repair set VAS 631 003".



664_008

Aluminium wires

As previously in the Audi A4 (type 8W), aluminium leads with cross-sections of 2.5 mm², 4.0 mm² and 6.0 mm² are used in addition to the main battery lead. Unlike the main battery lead, these leads can, if faulty, be repaired with wiring harness repair set VAS 631 001.

The use of aluminium alloys in certain areas of the vehicle provides a further reduction in the weight of the wiring harness. Aluminium wires are not installed in areas where wires are moved, e.g. in the doors, as they are less flexible than copper wires.

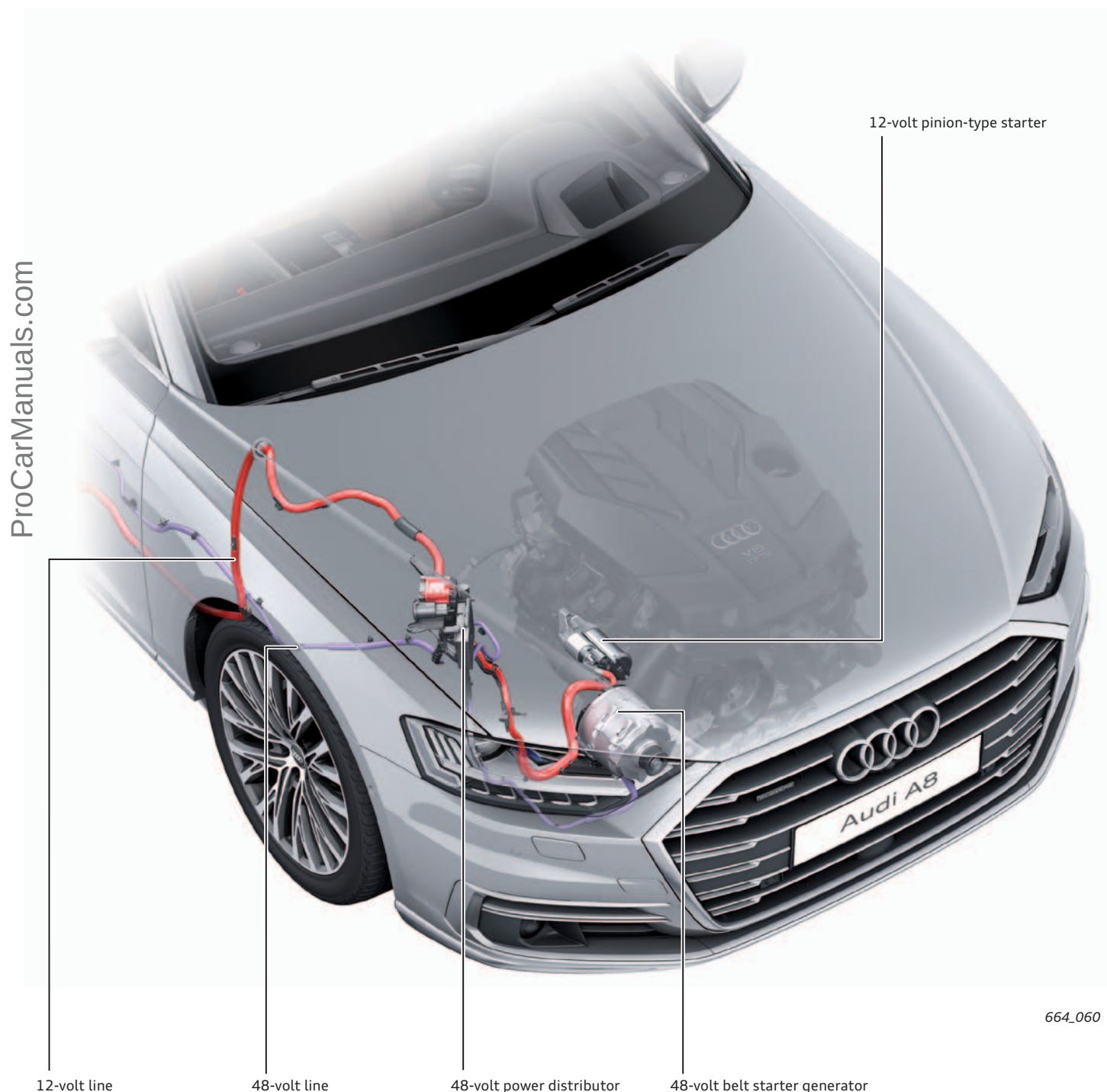
48-volt electrical system

General description

The 48-volt system was previously used in the Audi SQ7, albeit here as an electrical subsystem with a 12-volt generator. This 12-volt generator supplied the 48-volt battery through a voltage converter, which, in turn, supplied specific components with 48 volts DC. 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

The Audi A8 (type 4N) is the first Audi model to be powered by a 48-volt main electrical system. It uses a water-cooled 48-volt belt starter generator and a 48-volt lithium-ion battery. This 48-volt main electrical system also provides the basis for the mild hybrid technology. The Audi A8 (type 4N) is also known commonly as a 48-volt MHEV (Mild Hybrid Electric Vehicle).

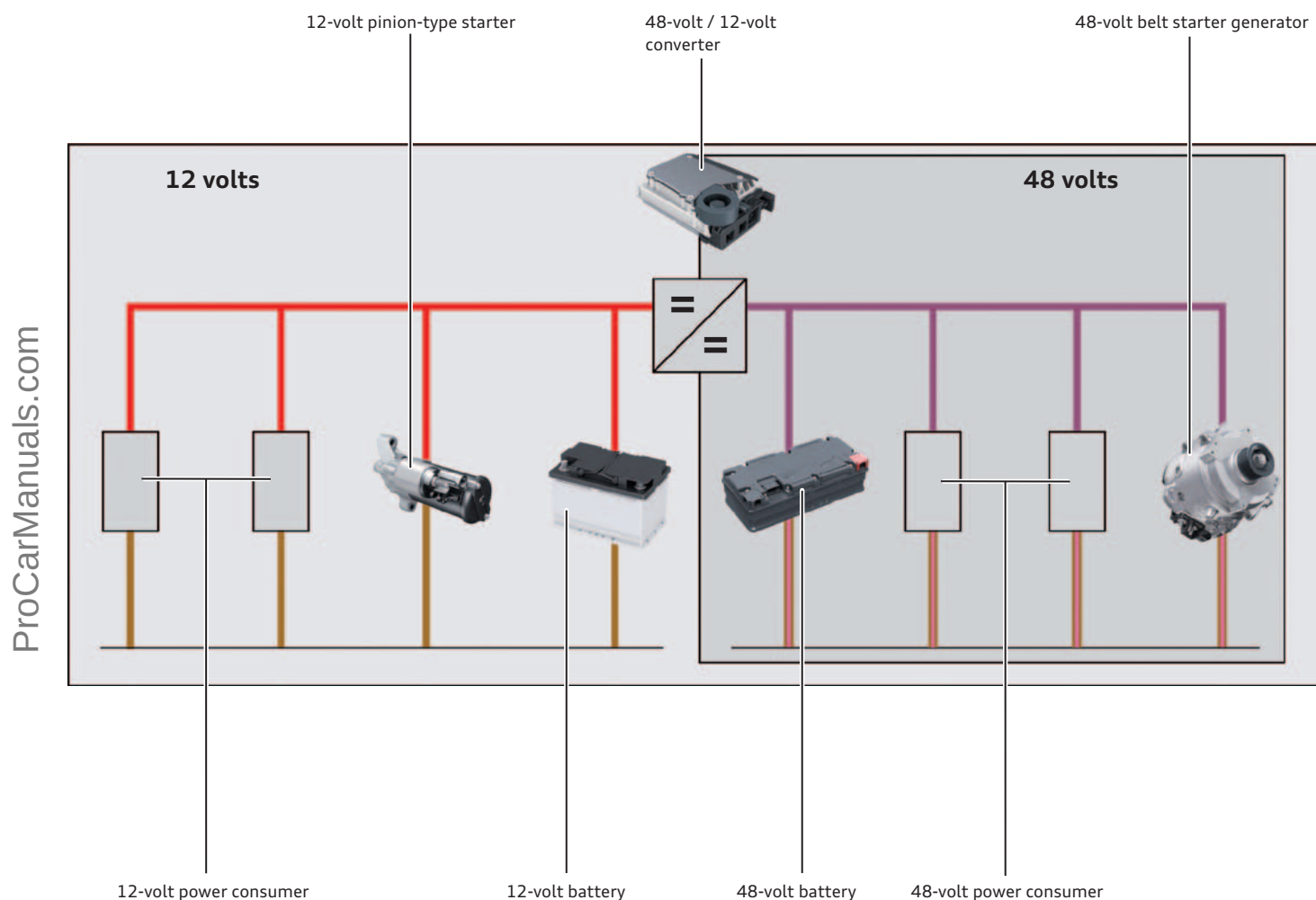


Components of the 48-volt electrical system

The main components of the 48-volt electrical system are the belt starter generator and the lithium-ion battery. As a generator, 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 (type 4N) these include all control units as well as the 12-volt pinion-type starter. However, it is only used for cold-starting the internal combustion engine or for starting it for the first time. All other starting processes are implemented using the 48-volt belt starter generator.

Circuit diagram



664_061

Energy management

The data bus diagnostics 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 the battery monitoring control unit J367, which communicates with J533 via a LIN bus.

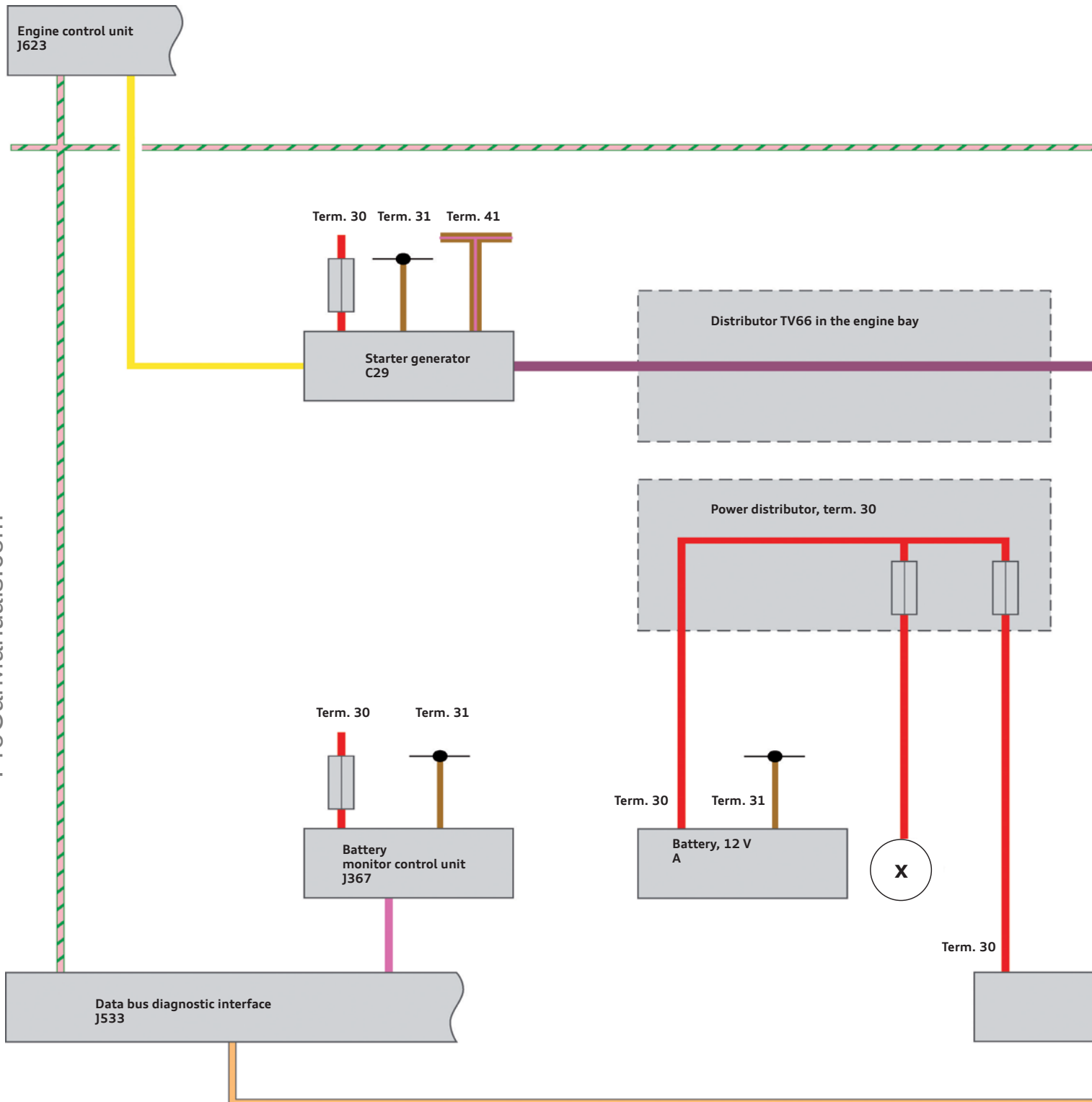
The belt starter generator sends information across a sub-bus system to the engine control unit J623, which, in turn, communi-

cates 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

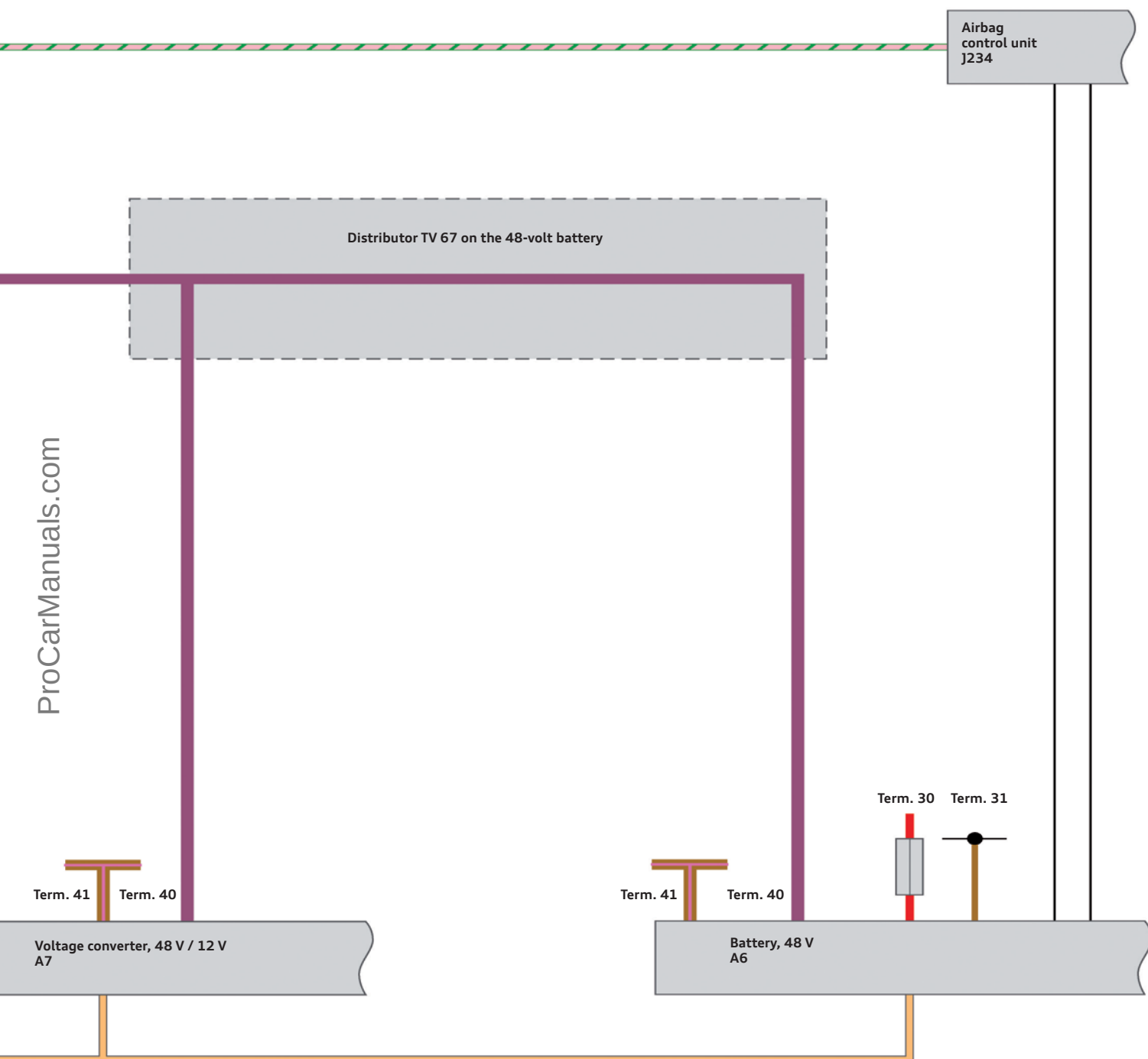
Schematic diagram



Key:

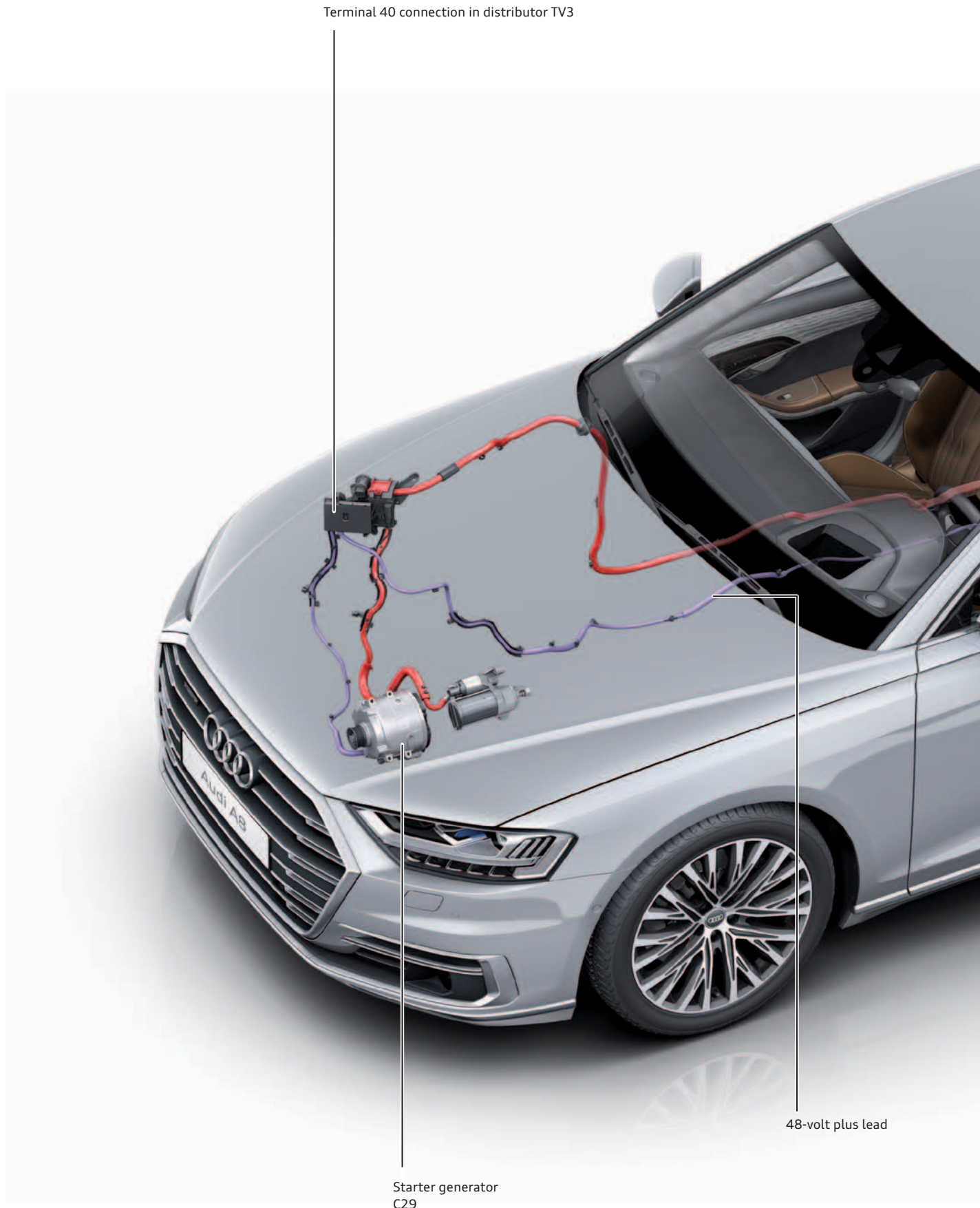
- Hybrid CAN
- FlexRay
- LIN bus
- Sub-bus systems
- 12 volts DC

- Discrete signal lines
- 48-volt DC positive side
- 48-volt DC negative side
- To the 12-volt power consumers



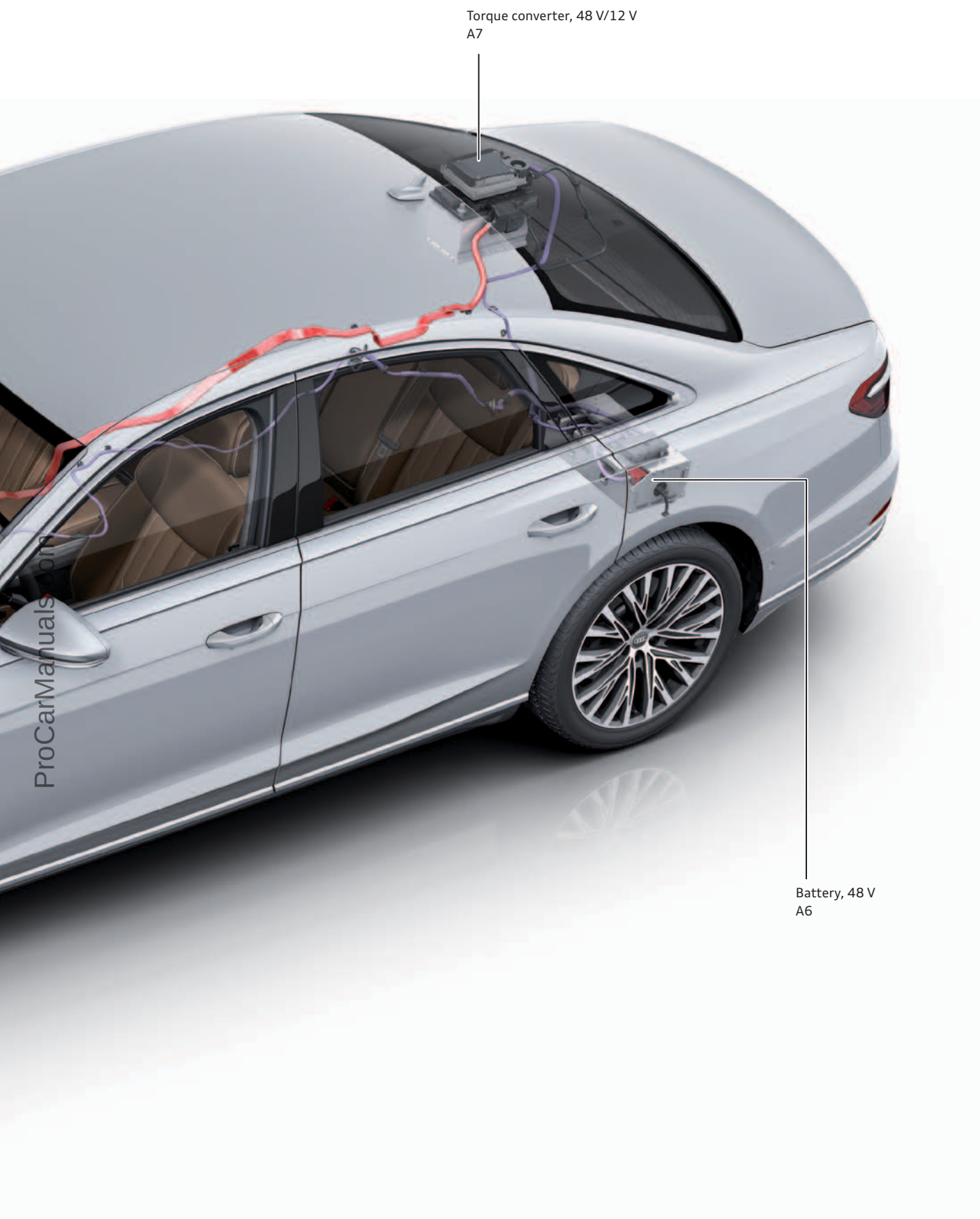
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Overview of the 48-volt components



Key:

- 48-volt DC voltage lines
- 12-volt DC voltage lines



Torque converter, 48 V/12 V
A7

Battery, 48 V
A6

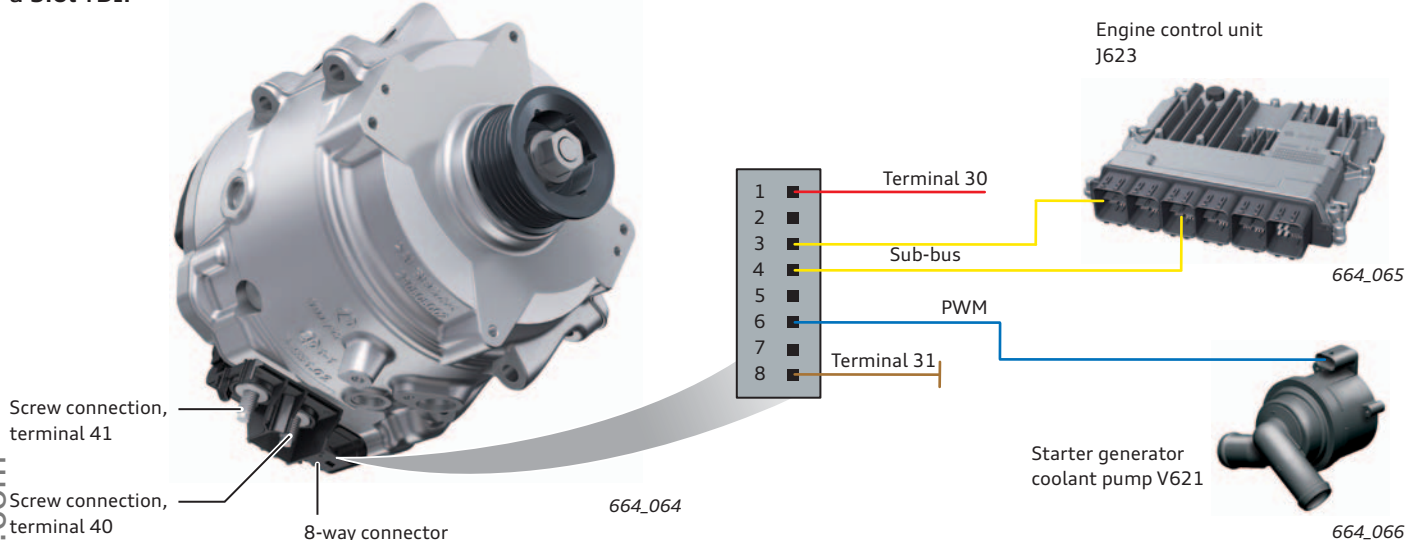
Starter generator C29

General description

The starter generator C29 is configured as 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 internal combustion engine.

It is water-cooled and has an electrical water pump. C29 communicates with the engine control unit via a sub-bus connection (also commonly known as the private CAN bus) and activates the starter generator coolant pump V621 by generating a pulse-width-modulated (PWM) signal.

The illustration shows the connection scenario for a 3.0l TDI.



Activation of V621

The starter generator coolant pump V621 is activated in an engine-specific fashion. It is connected to the starter generator in the 3.0l TDI (see figure) and directly to the engine control unit in the 3.0l TFSI. 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 unit software. In service centres it can be activated for purposes of function testing by means of the actuator diagnostics.

Specifications

Designation	Starter generator C29
Diagnostic code	00CC
Communication	Private CAN to engine control unit
48-volt positive / negative terminal designations	40/41
Nominal rpm	6000 rpm
Transmission ratio (starter generator / internal combustion 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 internal combustion engine, for max. 5 seconds)	approx. 6 kW
Rated output in generator mode (recuperation ² , for max. 5 seconds)	approx. 14 kW
Continuous rated output in generator mode	approx. 5 kW
Maximum torque in motor mode	60 Nm

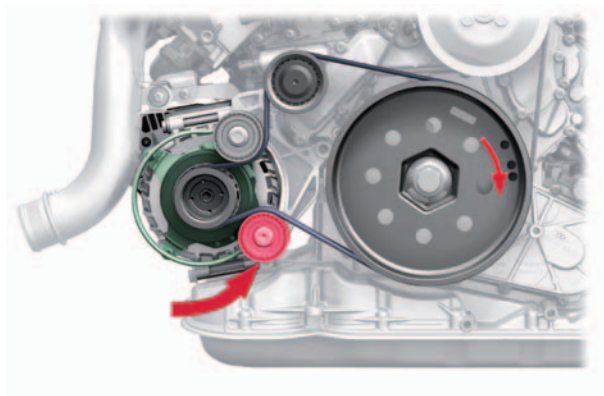
¹⁾ Recuperation: energy recovery, e.g. in overrun or under braking, the kinetic energy of the vehicle is transformed into electrical energy.

Connection to internal combustion engine

The starter generator C29 and the internal combustion 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, e.g. during start-up. The tensioning element of the belt tensioner has

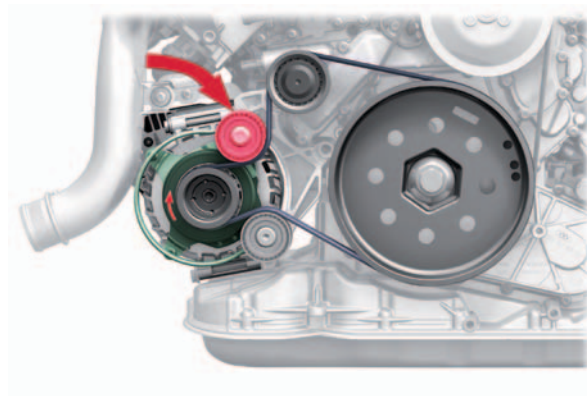
been adapted to meet the requirements of each engine and can be attached directly to the starter generator or to the engine block. It is important that the belt tensioner provide the poly V belt with as large an arc of contact as possible around the starter generator belt pulley.

C29 operating as a generator



664_067

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. In this version the belt tensioner is attached to the engine block.



664_070



Note

No provision had been made for periodic replacement of the poly V belt at the time of preparation of this self study programme. Please always refer to the instructions given in the service literature.

48-volt battery A6

Installation location

The 48-volt battery in the Audi A8 (type 4N) is installed in the centre of the luggage compartment well. It uses lithium-ion technology. Batteries using this technology have advantages over lead-acid batteries, such as higher energy density and higher deep-cycle resistance. A drawback is that the battery cells have to be protected against exhaustive discharge via the battery electronics because exhaustive discharge can cause the battery cells to short-circuit and destroy the battery.

Mechanical damage can also cause internal short-circuiting and chemical reactions due to the ingress of atmospheric moisture. For this reason, it is very important to avoid damaging the battery housing. As the battery housing is made from plastic, the battery is housed in a protective enclosure inside the vehicle. This enclosure is made of metal and is attached to the vehicle underbody by means of a terminal block.



Battery components

- > Plastic battery housing
- > Control unit (battery management)
- > 13 lithium-ion battery cells
- > 1 relay
- > 1 fuse
- > fans (number of fans depends on the type of vehicle)

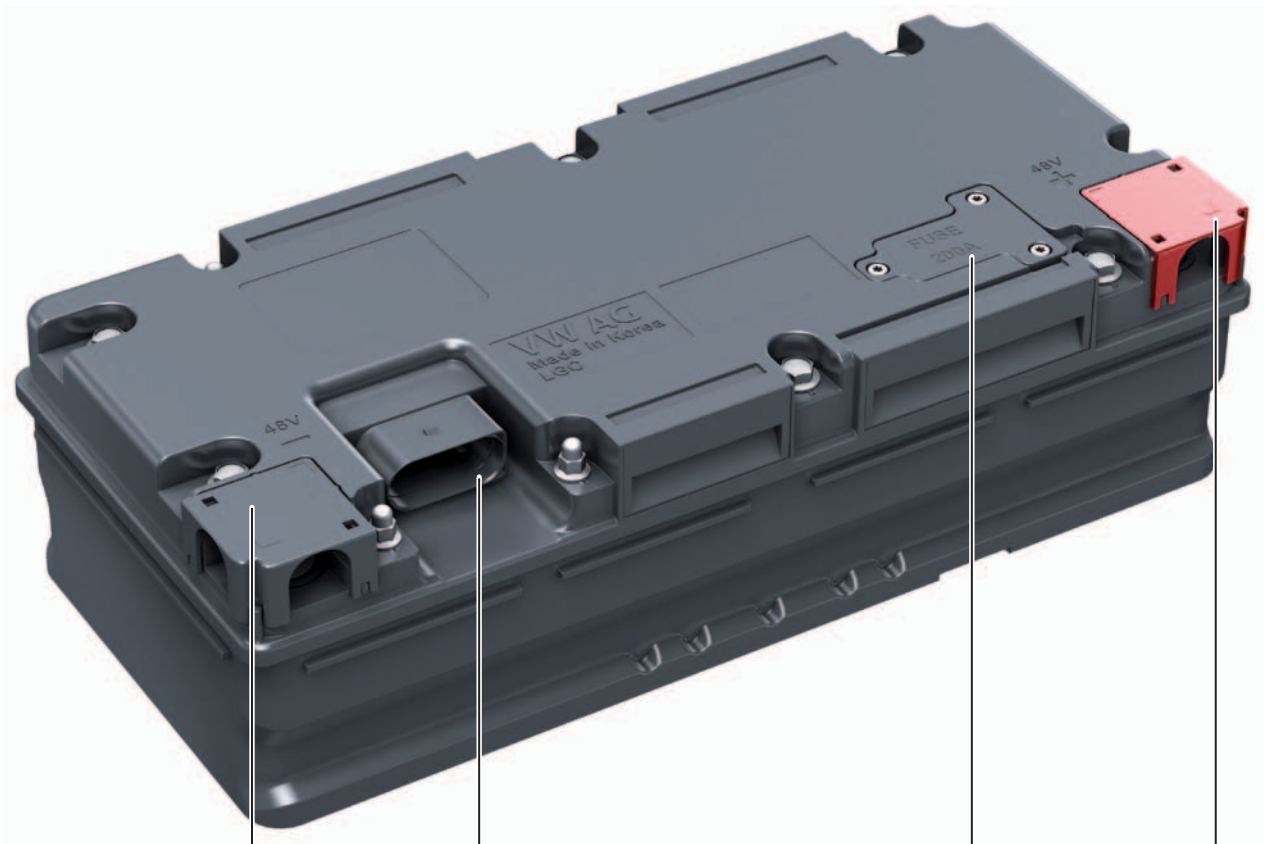
Connectivity

The 48-volt battery A6 is a hybrid CAN user and can be accessed under diagnostic address 0021 using the diagnostic tester. The positive side of the 48-volt DC voltage system is designated "terminal 40" and the negative side is designated "terminal 41".

The control unit in the 48-volt battery measures the voltage and temperature of the individual cells and transfers this data to the data bus diagnostic interface J533. In addition to this, the control unit activates the internal fans if a critical storage temperature is reached.

Specifications

Designation	Battery, 48 V A6
Diagnostic code	0021
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 in °C	-30 - +60
Weight in kg	approx. 10
Cooling	Air (active) via fans (number of fans depends on the type of vehicle)



48-volt negative pole
Terminal 41

Connection for the
battery-integrated control unit

Battery-integrated fuse
The fuse is **not** designed for
replacement by service workshops.

48-volt positive pole
Terminal 40

664_073

Battery-integrated control unit

In addition to the 12-volt power supply and the hybrid CAN communication lines for the control unit, signal lines running from the airbag control unit J234 are still connected to the battery-integrated control unit.

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

Battery design

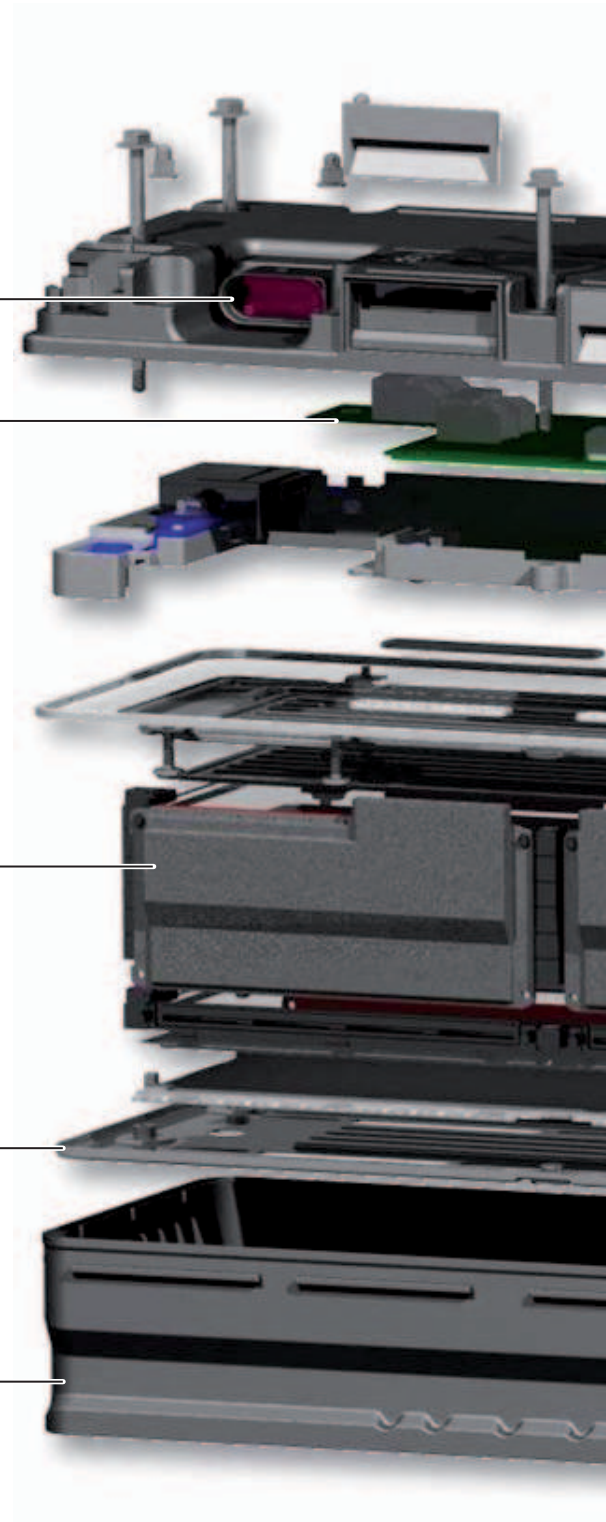
14-way connector
12-volt side

Battery-integrated
control unit
(battery management)

Cell assembly comprising
13 battery cells

Steel base plate

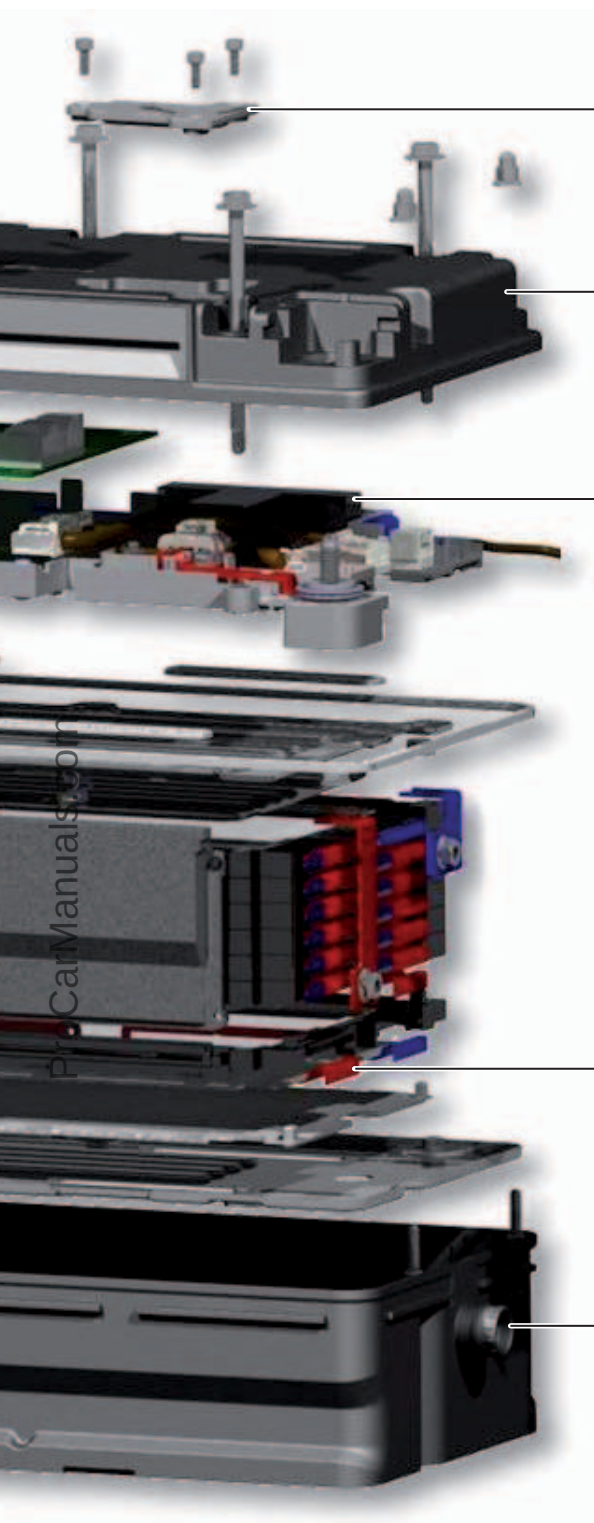
Battery housing
bottom section



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 above the 12-volt jump start, 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.



Battery-integrated
fuse cover

Battery housing
Top section

Connection plate with relay,
fuse and 48-volt terminal stud

Plug-in module with a single battery cell

Degassing valve

664_074

The diagnostic tester must be used for battery testing (classification). The battery data are read out of the built-in control unit of the 48-volt battery and assessed.

If the battery is no longer installed in the vehicle, the diagnostic tester can be connected to the battery via high-voltage diagnostic box VAS 5581 and adapter cable VAS 5581/1A.

Voltage converter, 48 V / 12 VA7

Installation location

In the Audi A8 (type 4N) the voltage converter 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 48V/12V voltage converter A7 is a bidirectional voltage converter. This means that, on the one hand, the 12-volt voltage generated by the alternator is converted to a 48-volt voltage to charge the 12-volt battery. On the other hand, the 12-volt voltage

is converted to a 48-volt voltage under certain conditions. This happens when, for example, an external charger is connected to the vehicle via the 12-volt jump start terminals.

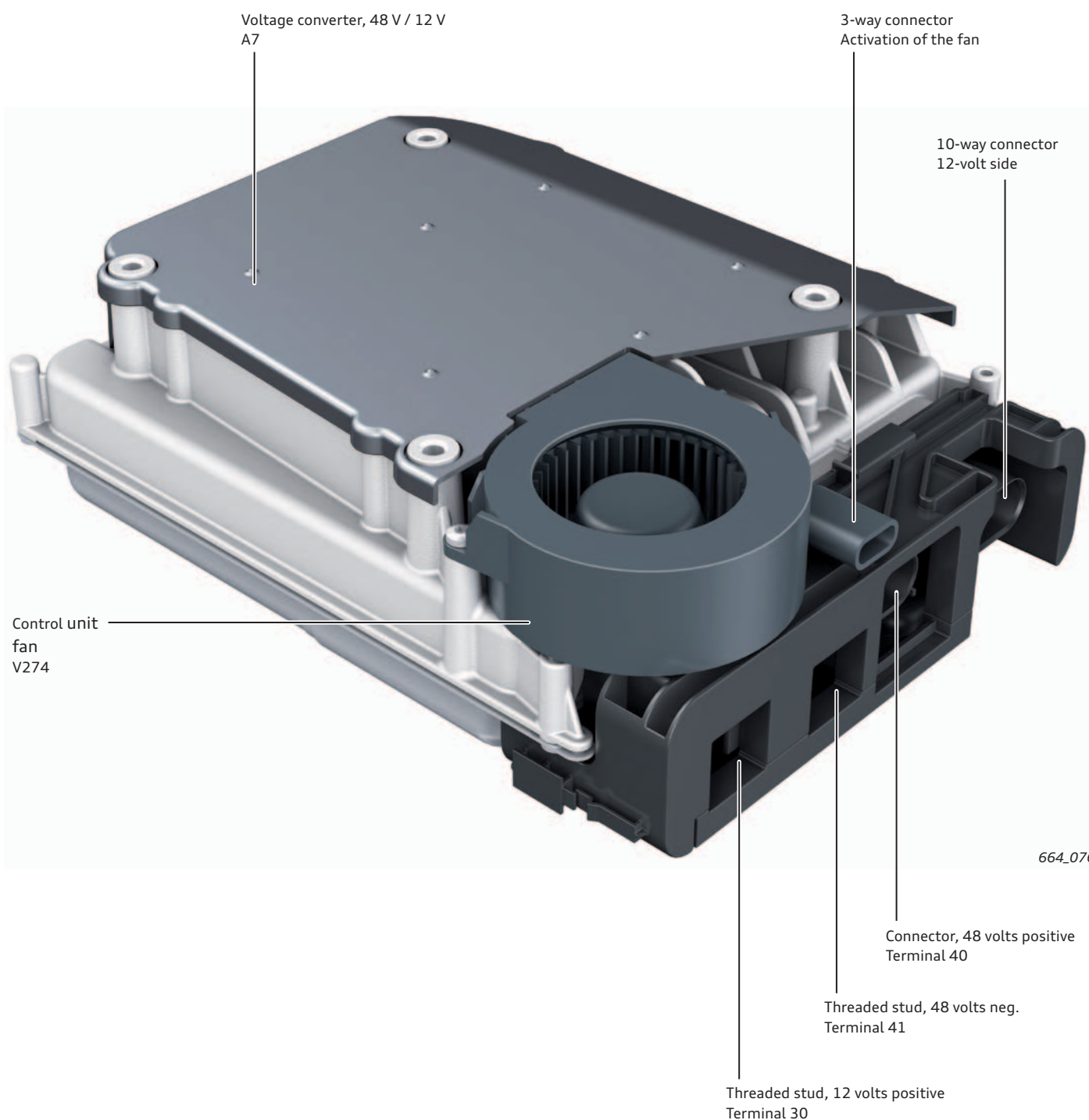
Activation of the control unit fan V274

The fan V274 is activated by the voltage converter. The 3 wires from the 3-way fan connector lead directly into the 10-way 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, service personnel have the option of running an actuator test for the V274 using the diagnostic code of the voltage converter.

Specifications

Designation	Voltage converter, 48 V / 12 VA7
Diagnostic code	00C4
Communication	Hybrid CAN
Terminal designations 48V positive/negative	40/41
Terminal designations 12 V	30
Power in kW	approx. 3
Weight in kg	approx. 2.5
Cooling	Air (passive)

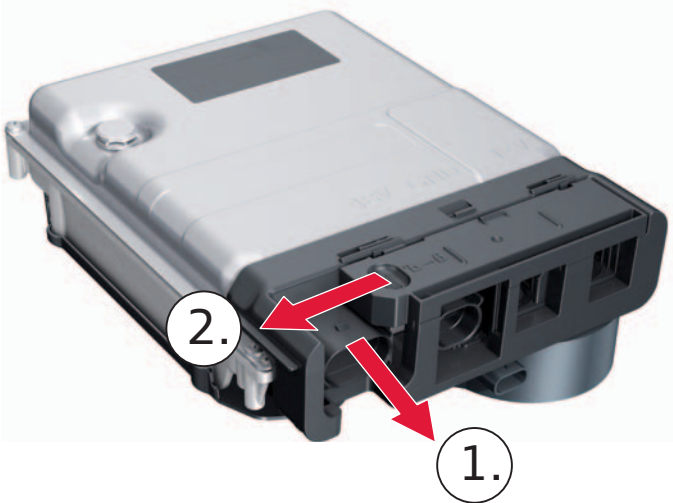


Connections

The connector for the terminal 40 line 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

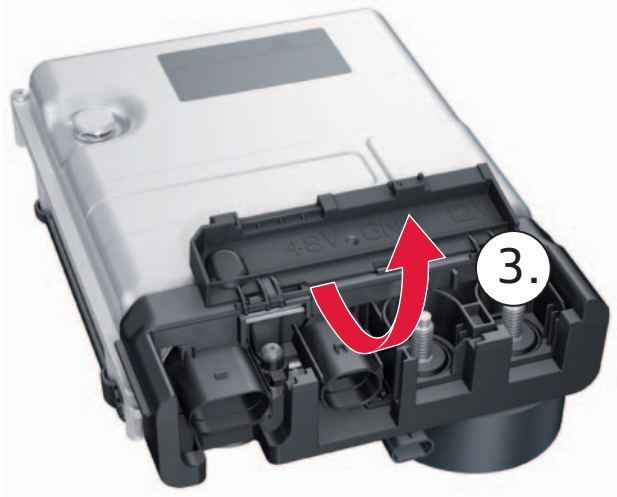
unlocked (moved). The flap therefore cannot be unlocked until the connector has been disconnected from the voltage converter. The flap can then be opened, providing access to the terminals.

Unlocking the flap



664_077

Opening the flap



664_078

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 summarised in the following table.

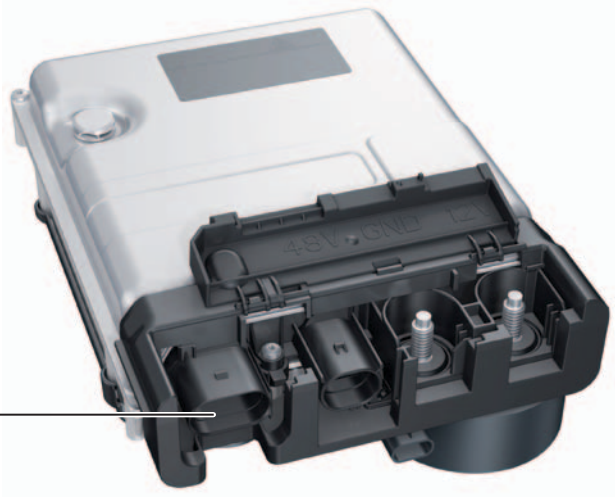
Engine operation	Terminal 15	External 12-volt charger	Voltage converter	Relays in the 48-volt battery
yes	on	no	48 volts → 12 volts	is closed
no	on	no	48 volts → 12 volts	is closed
no	on	yes	12 volts → 48 volts	is closed
no	off	yes	12 volts → 48 volts	is closed
no	off	no	not functional	open

10-pin connection

The hybrid CAN lines are also integrated into the 10-way plug-in connection. If the voltage converter is disconnected from the communication lines when terminal 15 is active, e.g. by disconnecting the 10-way 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.

10-way connector
12-volt side



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 automotive systems is a potential source of electrical hazards. Service centre employees must be able to identify a 48-volt electrical system and safely carry out 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-energised.

Recognition and identification

Positive lines of the 48-volt electrical system
DC voltage at terminal 40



Ground lines of the 48-volt electrical system
DC voltage at terminal 41

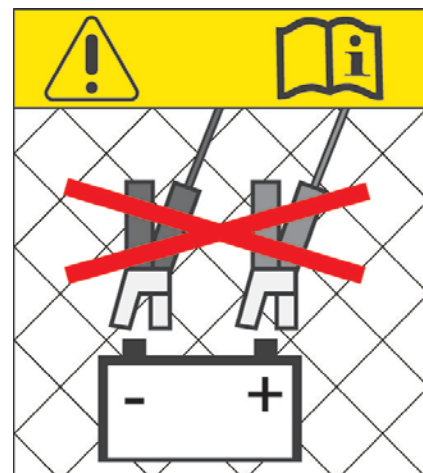


Warning label on the 48-volt battery



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 carrying out 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 startle response)

Taking out of service

Before carrying out work on the 48-volt electrical system, the electrical system must be shut down by a trained employee. The so-called "diagnostic de-energisation" of the 48-volt system involves running a test routine in the "Guided Functions" of the diagnostic tester.

In this case, a function in the data bus diagnostic interface J533 is used to open the relay in the 48-volt battery and to shut down the 48-volt system in a defined fashion and permanently. De-energisation of the 48-volt system is confirmed by reading out the voltage values of the 48-volt battery and of the 48 V / 12 V voltage converter A7.

The inspection report is a part of the test program and must be printed out, completed and signed by the mechanic. 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 NOK inspection report/finding, the 48-volt system must be shut down manually.

Putting into service

The 48-volt system is returned to service upon completion of work/repairs by running the test routine in the "Guided Functions" of the diagnostic tester. 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 not roadworthy any more.

48-Volt-System
freigeschaltet

1. Fahrzeugdaten (Fahrzeugkennnummer/Kenn-Nr.)
2. Datum
3. Fahrzeug-Betriebsbereitschaft aufheben
Klemme 15 ausschalten: Start-Engine-Stop Taste betätigen
4. 12V-Ladegerät abklemmen wenn vorhanden
5. Minus-Pol 12V-Batterie/en abklemmen und isolieren
6. Referenzspannung 12V messen
Messgerät ≥ CAT II für beide Messungen
Soll: 10,5 - 15,5 V Ist: V
7. Spannungsfreiheit 48V-System messen
Soll: ≤ 5V Ist: V
8. Minus-Pol 48V Energiespeicher abklemmen und isolieren

i.O.

i.O.

i.O.

i.O.

i.O.

i.O.

i.O.

i.O.

n.i.O. → n.i.O.

Freigeschaltet / Bestätigung

Name des Prüfers (Druckschrift)

Abteilung

Telefon

Unterschrift

Freigeschaltet / Bestätigung 48V-System freigeschaltet V 3.0

Wangnung durch Techn. n.i.O.

Alternativ: Diagnose-Protokoll auf graues Feld kleben

Abbruch Freischaltprozess! Weitere Schritte ggf. mit PSA (Schutzhandschuhe & -brille) oder durch Fachmann

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

Hazards due to lithium-ion technology

Apart from the voltage, hazards can 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 gives off toxic vapours. 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, please observe all statutory requirements applicable in your country as well as all instructions given in the service literature and in the Guided Fault Finding in ODIS.



Reference

Information on the packaging and shipping of lithium-ion batteries classified as critical can be obtained from Service TV programme STV 0443 "Metal containers for lithium-ion batteries".



Note

For a detailed description of the procedures for de-energising, 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, basically, that functions such as extended recuperation and internal combustion engine assistance by the e-machine (boost) are possible. The internal combustion 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 (type 4N) is designed as a 48-volt MHEV. The 48-volt battery serves as an auxiliary battery and the starter generator as the e-machine. This applies to both the 3.0l TFSI and 3.0l TDI versions of the A8. Only A8 models still equipped with the 2nd generation 3.0l TDI due to national restrictions are not designed as MHEV's and, therefore, do not have a 48-volt electrical system.

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 Audi A8 (type 4N):

- > Start-stop at speeds of less than 22 kph
- > 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)

Start-stop

The engine in the new Audi A8 (type 4N) can be shut off by the start-stop system at speeds of less than 22 kph, e. g. when coasting to a standstill at a red traffic light.

The driver sees the dial of the rev counter at "READY" and the green start-stop symbol in the instrument cluster.

If all of these conditions are not met, the engine is not shut off automatically by the start-stop system. The engine may still be in the warm-up phase, the engine oil temperature may be too high due to motorway driving, the air conditioning system may be preventing the engine from shutting off automatically, etc. In this case, the engine runs at idling speed when the vehicle is stationary and the white start-stop symbol is visible.



664_131



664_132

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 (type 4N) 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

Intelligent coasting / engine off

General description

The coasting strategy works in much the same way as an anticipatory driving style. Coasting is initiated in selected, anticipatory and worthwhile situations. Only the anticipatory function (efficiency assist) actively initiates coasting mode (engine on or engine off). The basic principle is: When the driver takes his foot off the accelerator, the vehicle always enters overrun mode, unless the anticipatory functions (efficiency assist, ACC or cruise control) initiate coasting mode. The intelligent coasting function can be selected by the driver in the MMI under the menu item "Driver assistance systems/Efficiency assist".

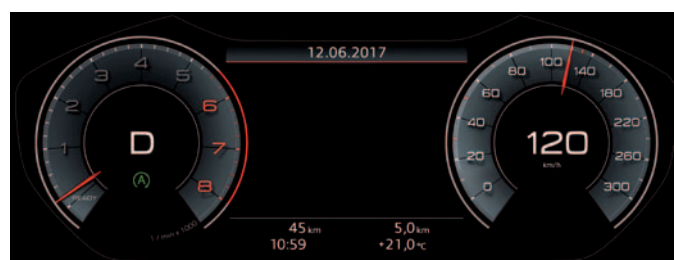
Displays

Displays in the instrument cluster indicate to the driver when intelligent coasting mode is active and when the engine is shut off. The dial on the speedometer indicates a speed of between 55 and 160 kph, the rev counter dial is at "READY" and the green start-stop symbol is lit.

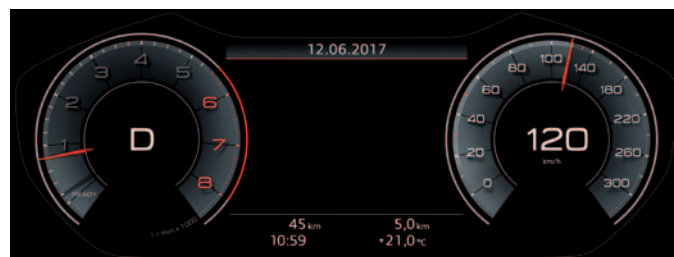
If coasting mode is active but the engine continues to run, this is indicated as follows in the instrument cluster. A vehicle speed of greater than 0 kph is displayed and the rev counter indicates idling speed.

Limits

- > Speed range 55 – 160 kph
- > Selector position D or efficiency mode
- > Accelerator and brake pedals not pressed
- > Downhill gradient <4 %
- > Uphill gradient <3 %
- > Lateral acceleration <1.5 m/s²



664_135



664_136

Improvements by starter generator

The use of the starter generator makes restarting the internal combustion 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 internal combustion engine via the poly V belt allows the internal combustion engine 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 internal combustion 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 internal combustion engine in certain load ranges, thus improving fuel economy. The starter generator in the Audi A8 (type 4N) is not designed to boost the torque and/or power output of the internal combustion engine.



Reference

For further, detailed information on coasting mode, refer to Self Study Programme 662 "Audi A8 (type 4N)".

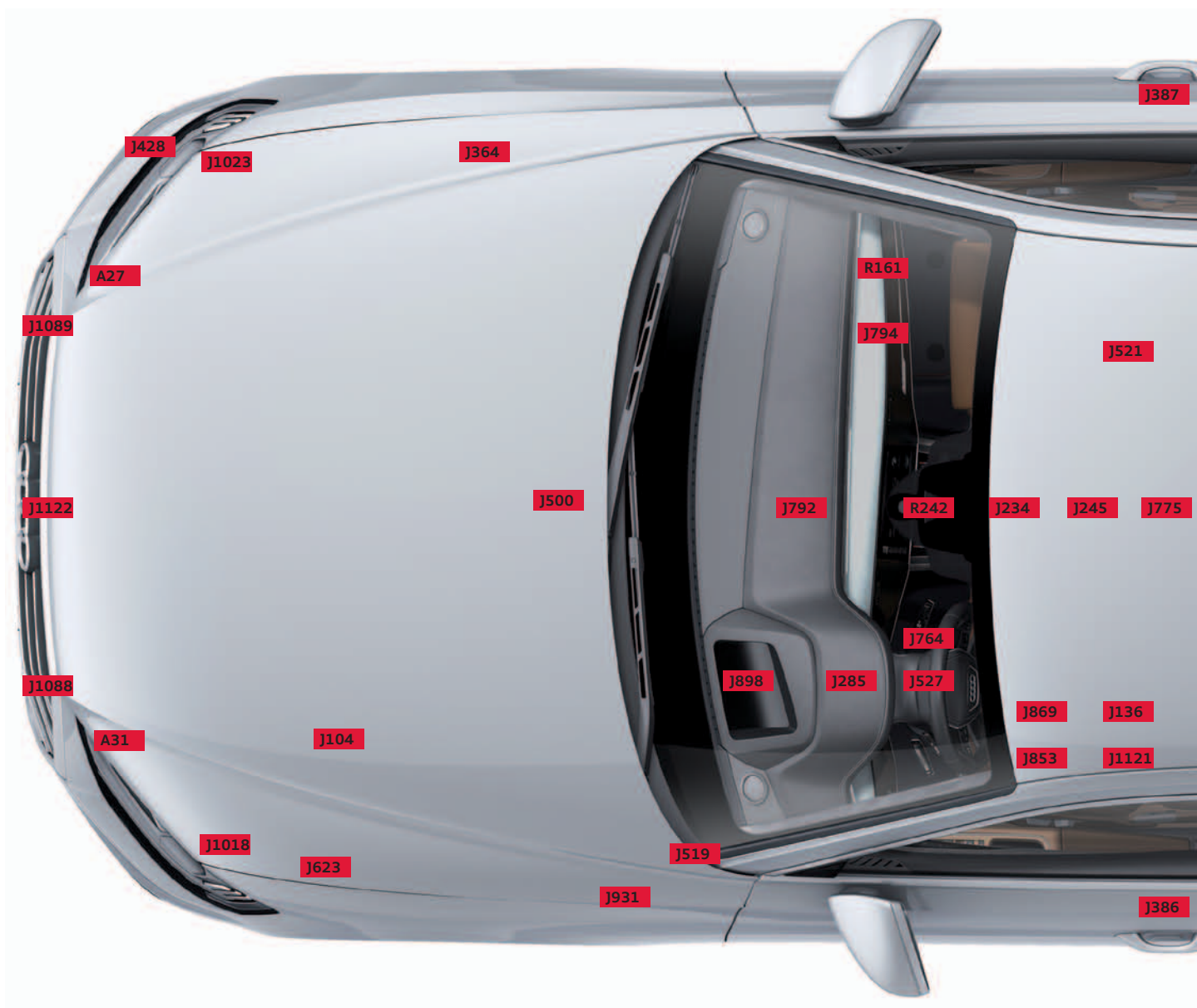
Networking

Installation locations of the control units

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

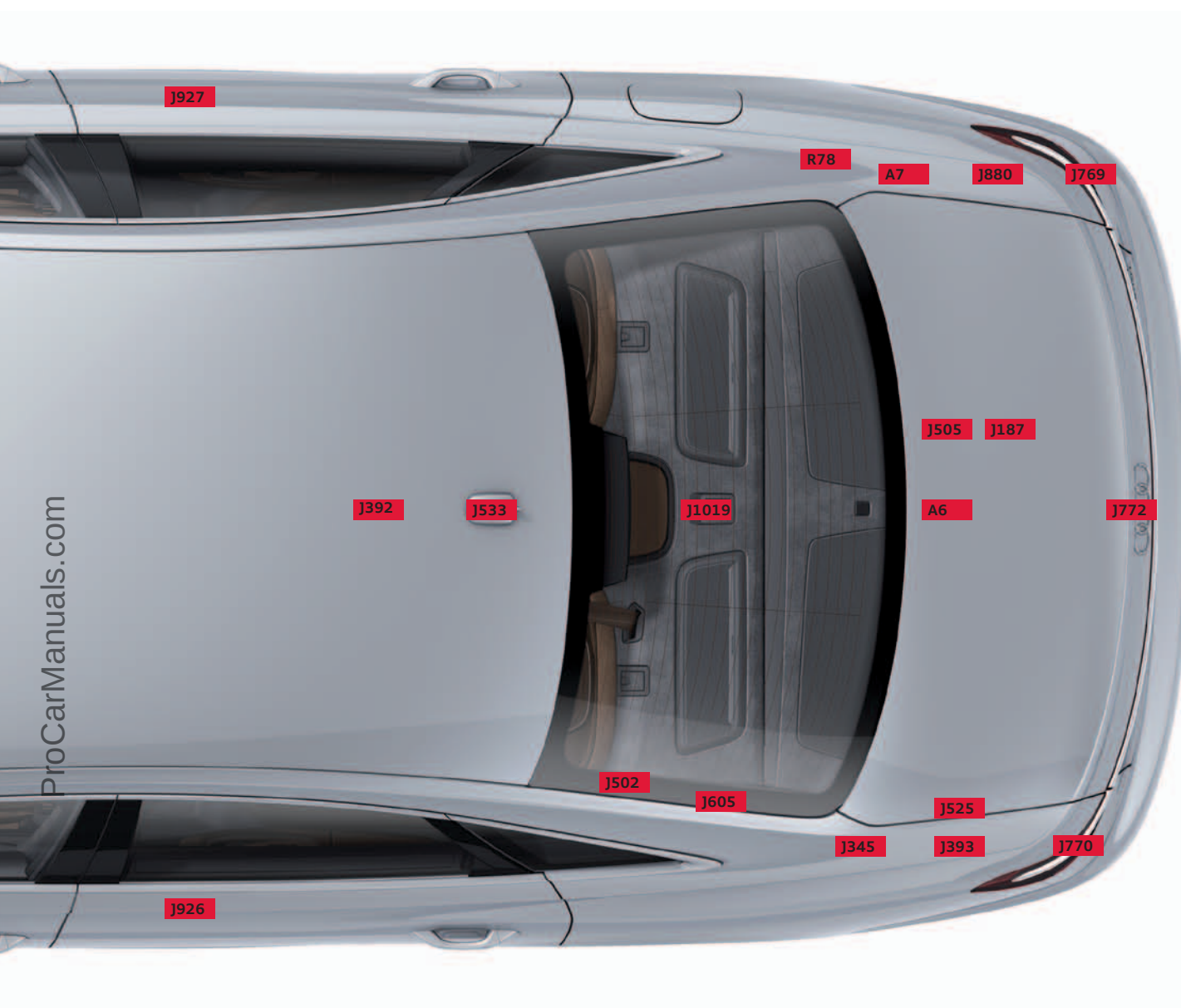
Refer to the current service literature for details of control unit installation positions, as well as instructions for installation and removal.

ProCarManuals.com



Key

A6	Battery, 48 V	J387	Front pass. side door control unit
A7	Voltage converter, 48V/12V	J392	Sliding sunroof adjustment control unit
A27	Power module 1 for right LED headlight	J393	Central comfort/convenience systems control unit
A31	Power module 1 for left LED headlight	J428	ACC control unit
J104	ABS control unit	J500	Power steering control unit
J136	Control unit for seat and steering column adjustment with memory function	J502	Tyre pressure loss indicator control unit
J187	Differential lock control unit	J505	Windscreen heater control unit
J234	Airbag control unit	J519	Electrical system control unit
J245	Sliding sunroof control unit	J521	Control unit for pass. seat adjustment with memory function
J285	Control unit in dash panel insert	J525	Digital sound package control unit
J345	Trailer detector control unit	J527	Steering column electronics control unit
J364	Additional heater control unit	J533	Data bus diagnostic interface
J386	Driver side door control unit	J605	Boot lid control unit
		J623	Engine control unit

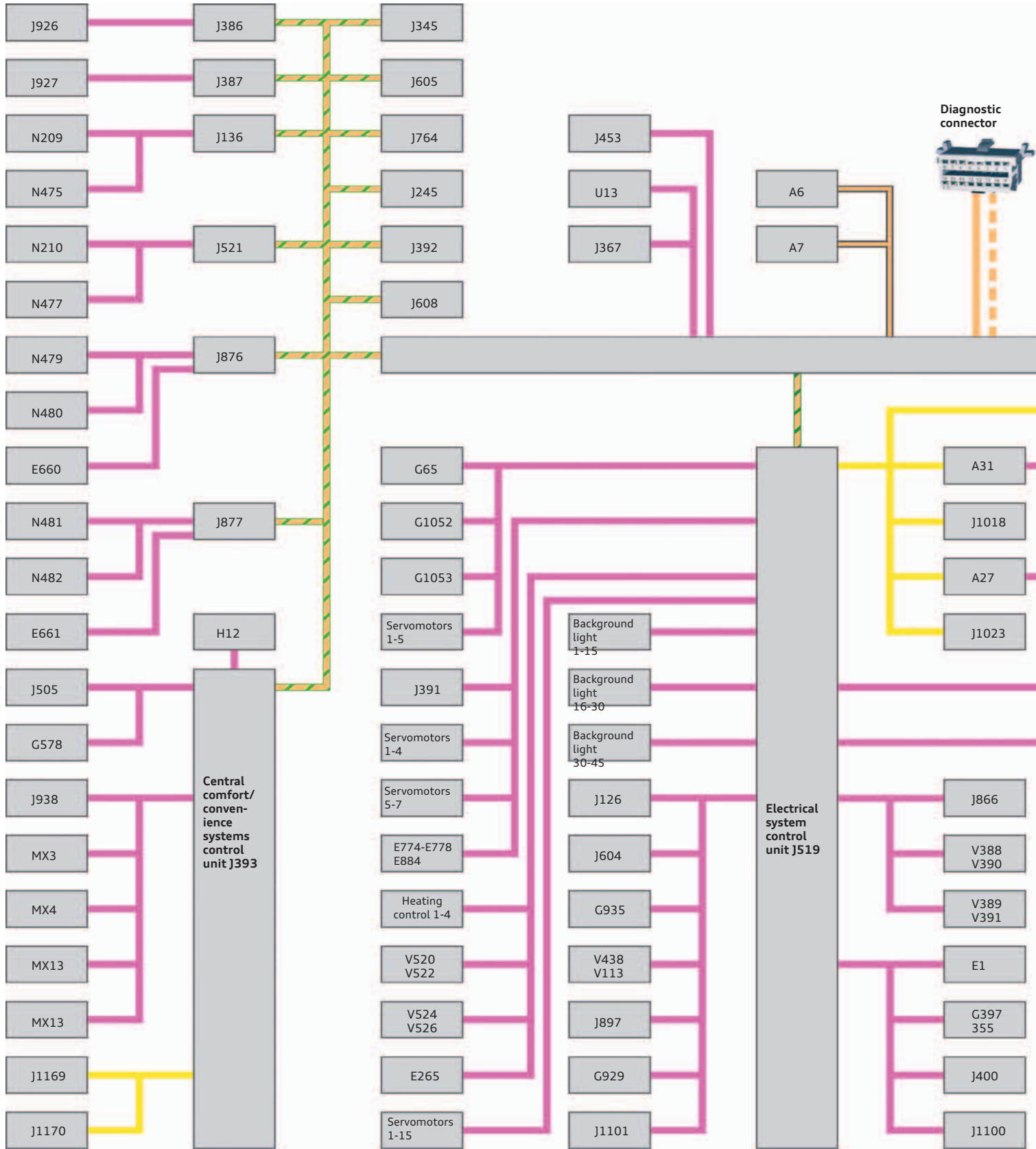


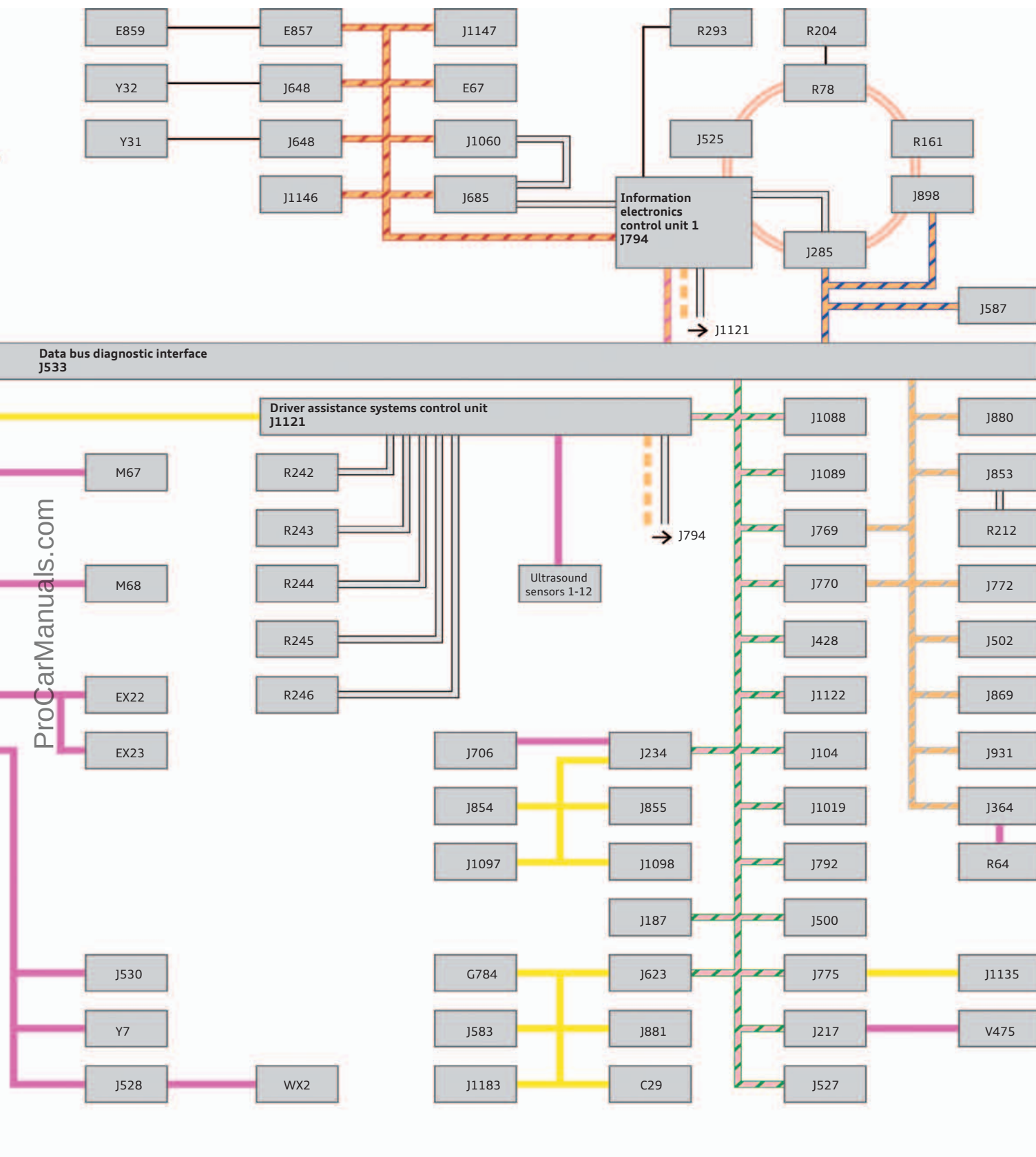
661_091

J764 Electrical steering column lock control unit
J769 Audi lane assist control unit
J770 Audi lane assist control unit 2
J772 Rear-view camera system control unit
J775 Suspension control unit
J792 Control unit for active steering
J794 Information electronics control unit 1
J853 Night vision system control unit
J869 Structure-borne noise control unit
J880 Reducing agent metering system control unit
J898 Windscreen projection control unit (head-up display)
J926 Rear driver side door control unit
J927 Rear pass. side door control unit
J931 Power unit mounting control unit
J1018 Left control unit for light control

J1019 Rear steering control unit
J1023 Control unit for light control, right
J1088 Control unit for front left radar sensor for object detection
J1089 Control unit for front right radar sensor for object detection
J1121 Control unit for driver assist systems
J1122 Control unit for laser distance control
R78 TV tuner
R161 DVD changer
R242 Front camera for driver assistance systems

Topology





664_087

Key:

A6	Battery, 48 V	J530	Garage door opener control unit
A7	Torque converter, 48 V/12 V	J583	NOx sensor control unit
A27	Right LED headlight power module 1	J587	Selector lever sensors control unit
A31	Left LED headlight power module 1	J604	Auxiliary air heater control unit
C29	Starter generator	J605	Boot lid control unit
E1	Light switch	J608	Special vehicle control unit
E67	Driver side volume control	J623	Engine control unit
E265	Rear air conditioner/Climatronic operating and display unit	J648	Control unit for rear left information display and operating unit
E660	Multi-contour seat switch, rear driver side	J649	Control unit for rear right information display and operating unit
E661	Multi-contour seat switch, rear pass. side	J685	MMI display
E774	Air conditioner operating and display unit 1	J706	Seat occupancy recognition control unit
E775	Air conditioner operating and display unit 2	J764	Electronic steering column lock control unit
E776	Air conditioner operating and display unit 3	J769	Audi side assist control unit
E777	Air conditioner operating and display unit 4	J770	Audi side assist control unit 2
E778	Air conditioner operating and display unit 5	J772	Rear-view camera system control unit
E857	Auxiliary display and operating unit 1	J775	Suspension control unit
E859	Wireless operating unit 1	J792	Active steering control unit
E884	Air conditioner operating and display unit 6	J853	Control unit for night vision system
EX22	Centre dash panel switch module	J854	Front left seat belt tensioner control unit
EX23	Centre console switch module 1	J855	Front right seat belt tensioner control unit
G65	High-pressure sensor	J866	Control unit for electrically adjustable steering column
G355	Humidity sensor	J869	Structure-borne sound control unit
G395	Refrigerant pressure/temperature sender	J876	Seat adjustment control unit, rear driver side
G397	Rain and light detector sensor	J877	Seat adjustment control unit, rear pass. side
G578	Anti-theft alarm sensor	J880	Reducing agent metering system control unit
G784	Particulate sensor	J881	NOx sensor control unit 2
G929	Cabin carbon dioxide level sensor	J897	Air improvement system control unit
G935	Exterior ambient air quality and humidity sensor	J898	Windscreen projection control unit (head-up display)
G1052	Refrigerant pressure/temperature sensor, low pressure side	J926	Rear driver side door control unit
G1053	Refrigerant pressure/temp. sensor, high pressure side	J927	Rear pass. side door control unit
H12	Alarm horn	J931	Power unit mounting control unit
J104	ABS control unit	J938	Boot lid power opening control unit
J126	Fresh air blower control unit	J1018	Left control unit for light control
J136	Seat and steering column adjustment control unit with memory function	J1019	Rear axle steering control unit
J187	Differential lock control unit	J1023	Right control unit for light control
J217	Automatic gearbox control unit	J1060	Lower touch screen
J234	Airbag control unit	J1088	Control unit for front left radar sensor for object detection
J245	Sliding sunroof adjustment control unit	J1089	Control unit for front right radar sensor for object detection
J285	Control unit in dash panel insert	J1097	Rear left seat belt tensioner control unit
J345	Trailer recognition control unit	J1098	Rear right seat belt tensioner control unit
J364	Auxiliary heating control unit	J1100	Windscreen washer pump control unit
J367	Battery monitor control unit	J1101	Cabin fragrance system control unit
J386	Driver side door control unit	J1122	Laser distance measurement control unit
J387	Front pass. side door control unit	J1135	Compressor electronics for adaptive suspension
J391	Rear fresh air fan control unit	J1146	Mobile devices charger 1
J392	Rear sliding sunroof control unit	J1147	Mobile devices charger 2
J400	Wiper motor control unit	J1169	Near field communication control unit
J428	ACC control unit	J1170	Near field communication control unit 2
J453	Multifunction steering wheel control unit	J1183	NOx sensor control unit 3
J500	Power steering control unit	M67	Left lamp for auxiliary main beam
J502	Tyre pressure loss indicator control unit	M68	Right lamp for auxiliary main beam
J505	Heated windscreen control unit	MX3	Left tail light
J521	Front pass. seat adjustment control unit with memory	MX4	Rear tail light
J525	Digital sound package control unit	MX13	Centre tail light
J527	Steering column electronics control unit		
J528	Overhead electronics control unit		

Key:

N209	Valve block for driver side lumbar support adjustment	U13	Inverter with socket, 12 V-230 V
N210	Valve block for pass. side lumbar support adjustment	V66	Adaptive suspension compressor motor
N475	Valve block 1 in driver seat	V113	Air recirculation flap control motor
N477	Valve block 1 in front pass. seat	V388	Fan for driver seat backrest
N479	Valve block 1 in driver side rear seat	V389	Fan for pass. seat backrest
N480	Valve block 2 in driver side rear seat	V390	Fan for driver seat cushion
N481	Valve block 1 in pass. side rear seat	V391	Fan for pass. seat cushion
N482	Valve block 2 in pass. side rear seat	V438	Fresh air flap control motor
R64	Remote control receiver for auxiliary heating	V475	Auxiliary hydraulic pump 1 for gear oil
R78	TV tuner	V520	Backrest fan 1, rear left
R161	DVD changer	V522	Seat cushion fan 1, rear left
R204	TV card reader	V524	Backrest fan 1, rear right
R212	Camera for night vision system	V526	Seat cushion fan 1, rear right
R242	Front camera for driver assistance systems	WX2	Rear cabin light
R243	Front surround view camera	Y7	Automatic anti dazzle rear view mirror
R244	Left surround view camera	Y31	Multimedia system display unit 3
R245	Right surround view camera	Y32	Multimedia system display unit 4
R246	Rear surround view camera		
R293	USB hub		

New features of the bus systems

As the diagram on pages 32/33 shows, the number of control units, 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 the electrical system control unit J519.

This stems from the fact that control of the air conditioning system is now also a function of J519.

This means that a separate air conditioning control unit is no longer installed in the Audi A8 (type 4N).

Diagnostic code "0008" is, therefore, no longer used for the air conditioning system. All diagnostic functions in this area can be implemented using diagnostic code "0009" of the electrical system control unit.

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, too, 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 cabin 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 (type 4N).

Bus systems used in the Audi A8 (type 4N)

Bus system	Cable colour	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
Dash panel insert CAN		Electrical bus system	500 kbit/s
Hybrid CAN		Electrical bus system	500 kbit/s
FlexRay		Electrical bus system	10 Mbit/s
MOST bus		Fibre-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 approx. 0.3 V. A typical application of LVDS is the activation of liquid crystal monitors. The LVDS cables in the Audi A8 (type 4N) are used, for example, to transfer image data between the information electronics control unit 1J794, the control unit in the dash panel insert and both MMI touch screens.

The LVDS lines are sheathed, much like the FlexRay lines. Unlike with 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 a fault, LVDS lines must always be replaced completely.

¹⁾ LVDS = Low Voltage Differential Signaling

Ethernet

Ethernet is a technology developed and specified for data networks (LANs²⁾). 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. A so-called "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 (type 4N) for communication between the diagnostic tester and the gateway as well as between the information electronics control unit J1794 and the driver assistance systems control unit J1121.

The high-speed transfer of data between the diagnostic tester and the gateway significantly reduces the time required for parameterising and updating control units. The Ethernet connection between the information electronics control unit J1794 and the driver assistance systems control unit J1121 is used for fast updating of J1121. For this purpose, an SD card containing the required data is inserted into J1794, and then the data is transferred across the Ethernet line. This process is much faster than transferring data first to the gateway and then via FlexRay to the J1121.

FlexRay

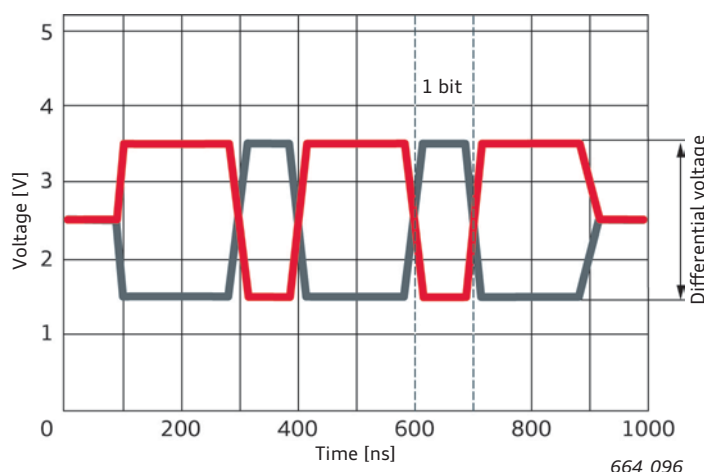
The launch of the Audi A8 (type 4H) saw the introduction of a new data bus system, the FlexRay bus, which is now used in numerous successor models and also in the Audi A8 (type 4N).

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:

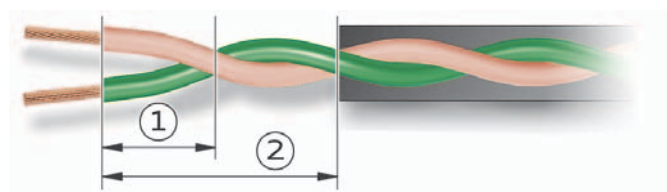
- > Electrical two-wire bus system
- > Data transfer rate: max. 10 Mbit/s
- > Data transfer with three signal states:
 - > "Idle" – both bus wires have a voltage of 2.5 V
 - > "Data 0" – the bus positive wire has a low voltage level and the bus negative wire has a high voltage level
 - > "Data 1" – the 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



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).



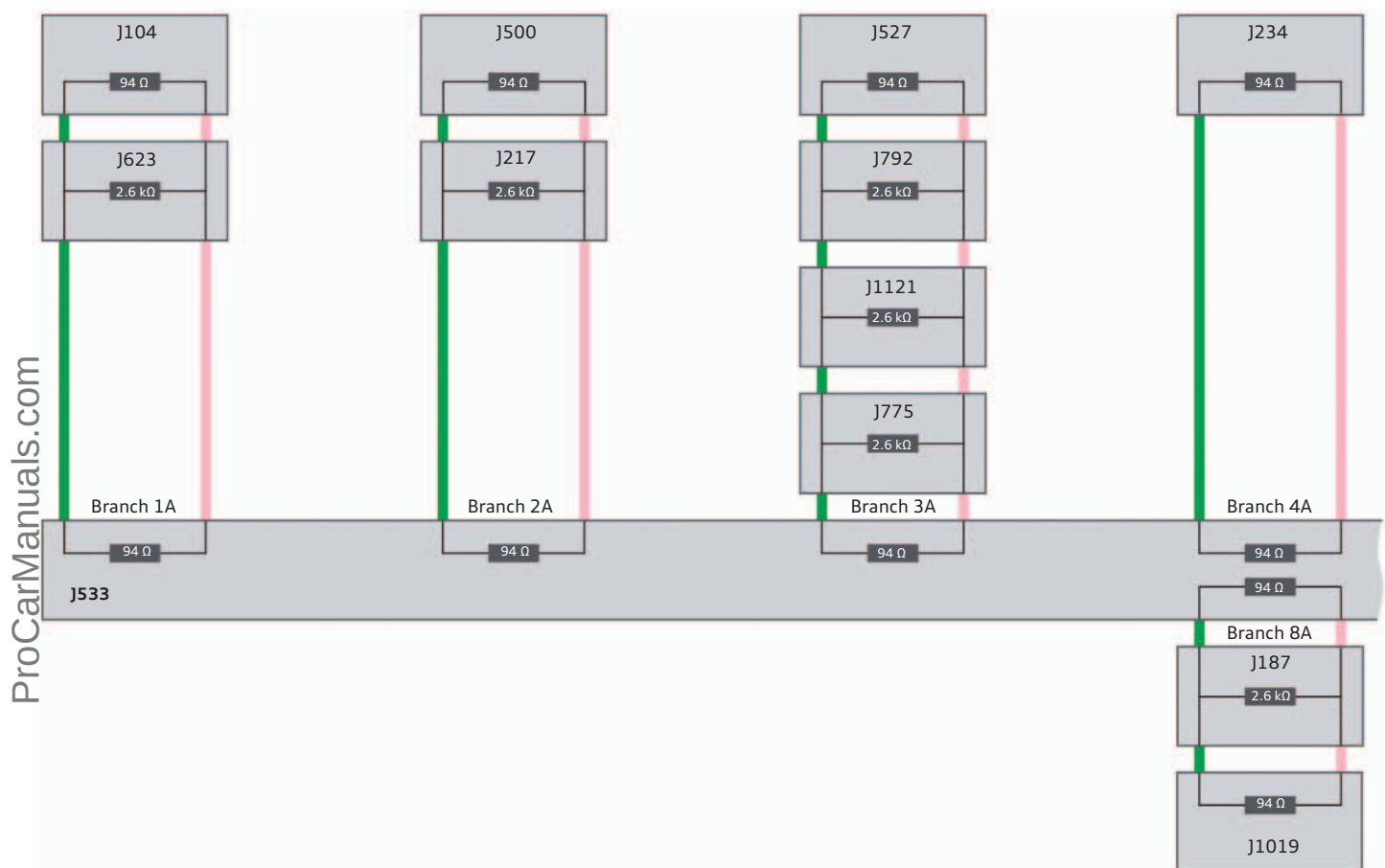
²⁾ LAN = Local Area Network

FlexRay

Given that the overall topology diagram cannot provide a realistic representation of the layout of the FlexRay control units, the following diagrams show how the control units are distributed to the individual FlexRay branches. The control units of an Audi A8 (type 4N) are shown here with a full range of features. As always with the FlexRay bus, the control units connected to the end of a branch have a resistance of 94 ohms. The intermediate control units have a resistance of 2.6 kohms.

The FlexRay technology allows the use of 2 channels per branch - an option not utilised in previous Audi models. These channels are designated channel "A" and channel "B". The 2nd channel generally offers 2 options:

- > sending data redundantly for higher fail safety.
- > doubling the volume of transferable data.



664_094



Reference

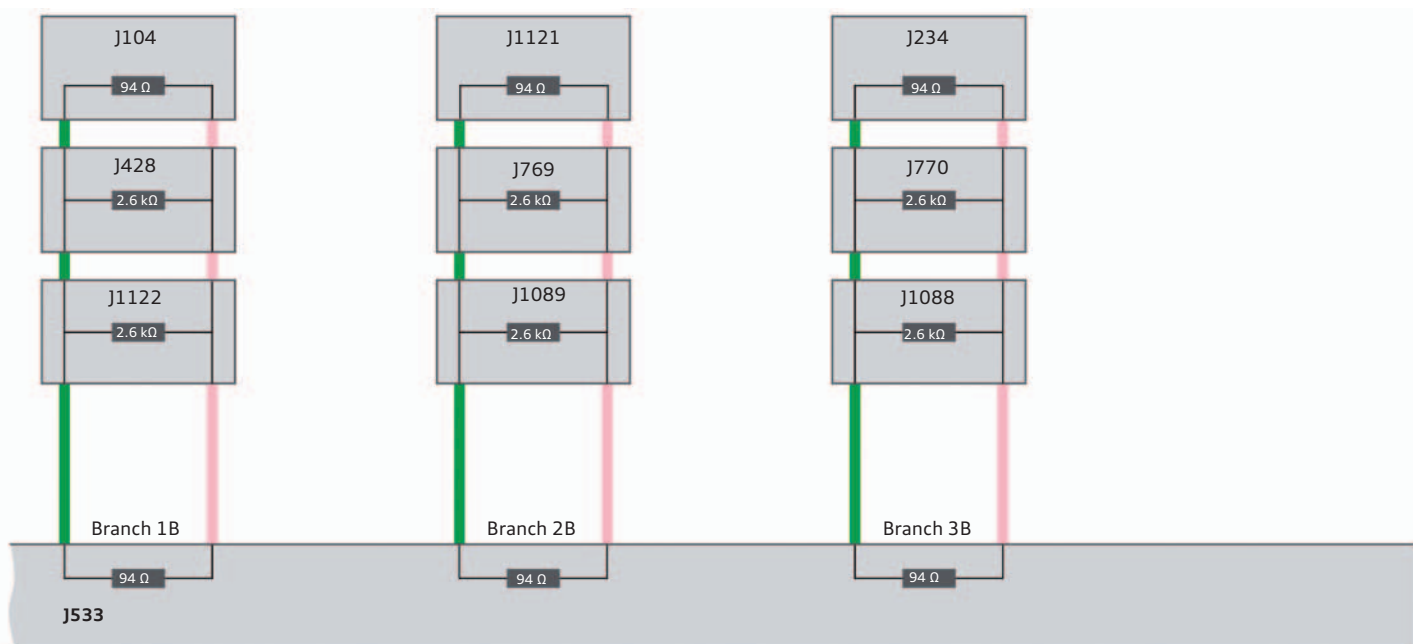
For further information about the design and working principle of the FlexRay bus, refer to Self Study Programme 459 "Audi A8 '10 Onboard Power Supply and Networking".

The "B" channel in the Audi A8 (type 4N) is used to increase the volume of transferable data. If the same control unit is connected to both channels, the diagnostic data of this control unit is transferred via channel "A". If a branch channel fails, e.g. 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 units 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 so-called "cold start" control units.

These are the following control units in the Audi A8 (type 4N):

- > Data bus diagnostic interface J533
- > ABS control unit J104
- > Airbag control unit J234



664_095

Key:

J104	ABS control unit	J770	Audi side assist control unit 2
J187	Differential lock control unit	J775	Suspension control unit
J217	Automatic gearbox control unit	J792	Active steering control unit
J234	Airbag control unit	J1019	Rear axle steering control unit
J428	ACC control unit	J1088	Control unit for front left radar sensor for object detection
J500	Power steering control unit	J1089	Control unit for front right radar sensor for object detection
J527	Steering column electronics control unit	J1121	Driver assistance systems control unit
J533	Data bus diagnostic interface (gateway)	J1122	Laser distance measurement control unit
J623	Engine control unit		
J769	Audi side assist control unit		

Optical data bus system MOST150



Media Oriented Systems Transport

664_098

History

For the first time in an Audi, an optical data bus system - the MOST bus - is fitted on the Audi A8 (type 4E).

This data bus system is named after the "Media Oriented Systems Transport (MOST) Cooperation". This organisation 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" denotes a network with media-oriented data transport. This means that, unlike in the CAN data bus, address-oriented messages are sent to a specific recipient.

This technology is used in Audi cars to transfer data within the infotainment system. The data transfer rate on the MOST25 bus is approx. 25 Mbit/s.

MOST150

The MOST150 was first used by Audi in the A3 (type 8V). The new Audi A8 (type 4N) 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 trans-

mitter and receiver units – Fiber Optical Transmitters (FOT) – had to be adapted.

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

Systems manager

In the Audi A8 (type 4N), up to six control units, including, for the first time, the windscreen projection control unit (head-up display), can be integrated into the MOST ring in the following order.

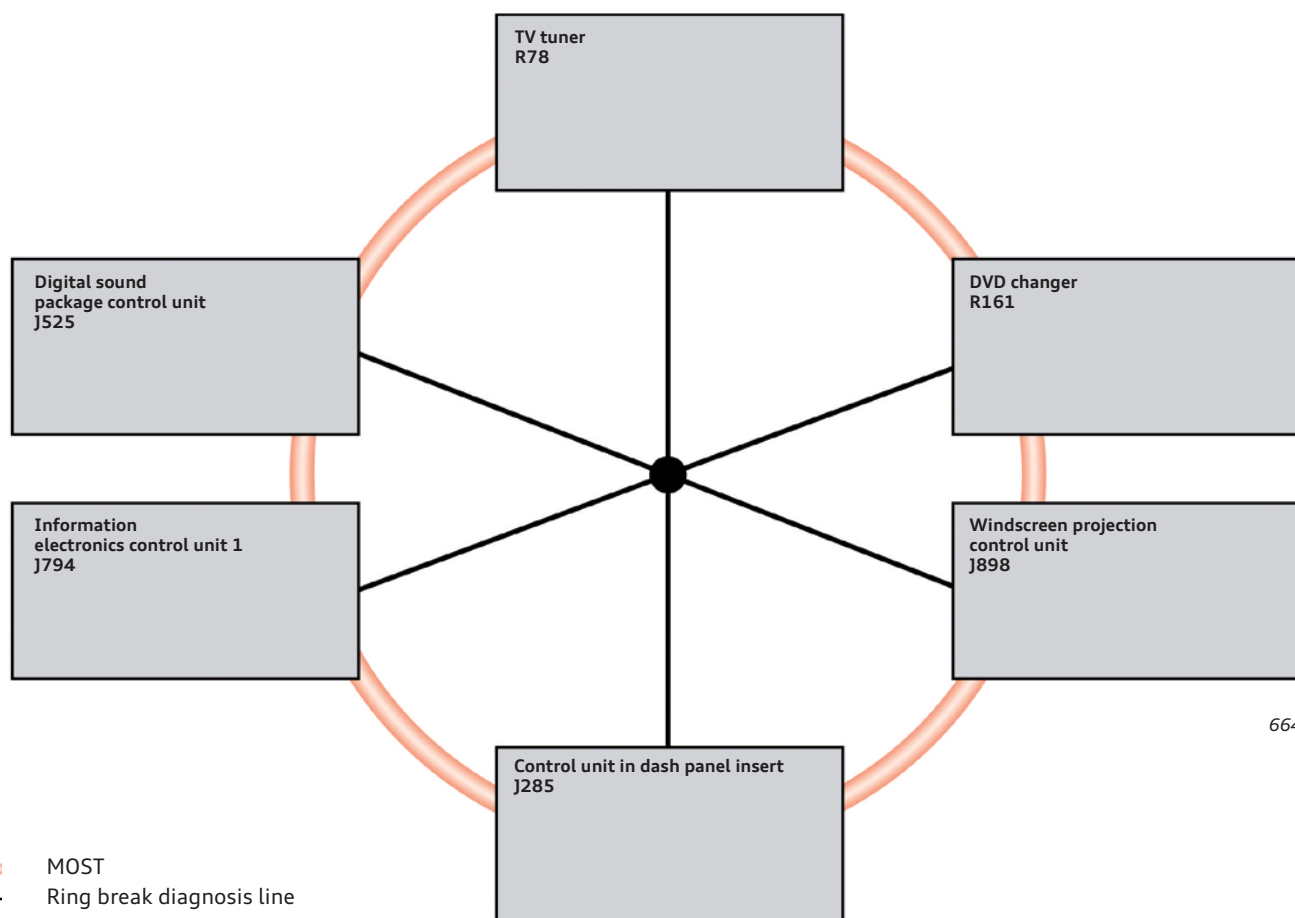
- > Information electronics control unit 1 J794
- > Control unit in dash panel insert J285
- > Windscreen projection control unit J898
- > DVD changer R161
- > TV tuner R78
- > Digital sound package control unit J525

In the Audi A8 (type 4N) the information electronics control unit 1 J794 acts not only as the system manager for the MOST bus but also as the diagnostic manager - a function previously assigned to the data bus diagnostic interface J533 in the Audi A8 (type 4H). As always with a MOST bus in Audi vehicles, the control units 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 brak 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 units.



664_099

Optical replacement control unit VAS 6778

Diagnostics

The ring break diagnosis procedure is identical to that of the previous MOST bus system. However, the inspection plan for the Audi A8 (type 4N) must be retrieved from the vehicle diagnostic tester via address code 005F.

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 units.



664_100



Reference

For further information on the MOST bus, refer to self study programme 286 "New Data Systems – LIN, MOST, Bluetooth™".

Control units

Data bus diagnostic interface J533

Brief description

The data bus diagnostic interface J533 (gateway) is part of the basic control unit specification and, therefore, is always installed. It is located at the centre of the new Audi A8 (type 4N) beneath the rear bench seat. It can still be accessed with the diagnostic tester under diagnostic code 0019.

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 (type 4N) 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
- > Dash 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 unit J367
- > for alternator C (with 12-volt generator)
- > for multifunction steering wheel control unit J453



664_040

Data bus
diagnostic interface
J533

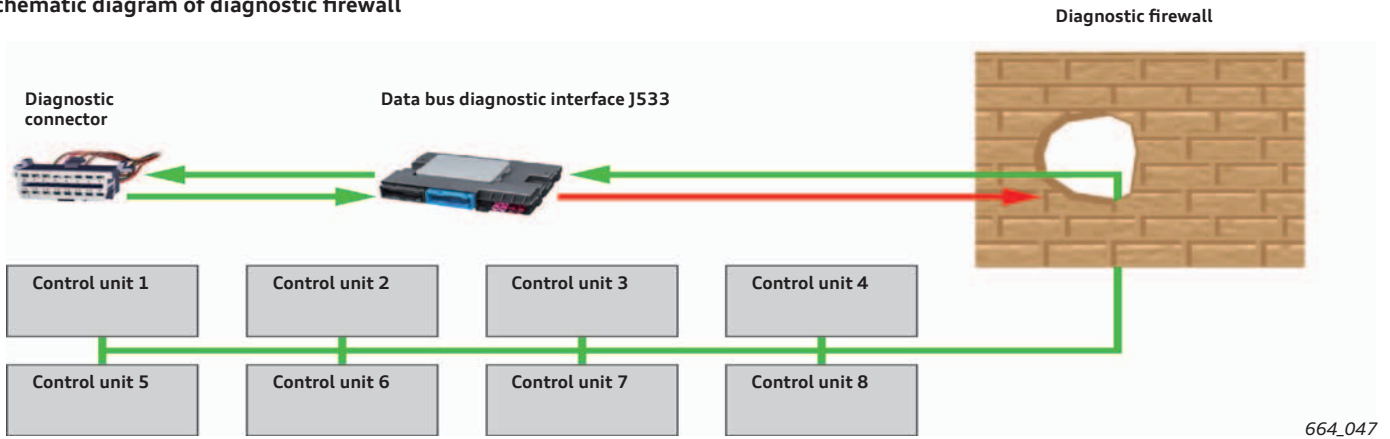
Diagnostic firewall

The diagnostic firewall will be introduced at the market launch of the Audi A8 (type 4N). The diagnostic firewall is a new safety function of the data bus diagnostic interface J533. It prevents unauthorised 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 200 km. This function will be used in other Audi models at a future date.

Schematic diagram of diagnostic firewall



White list:

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

Disabled services:

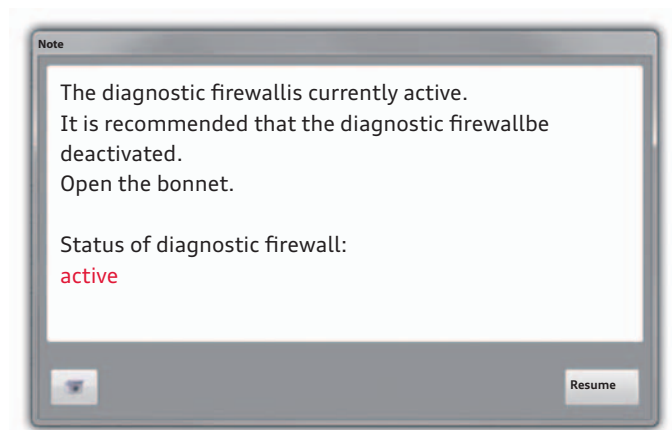
- > Activate control elements
- > Carry out basic setting
- > Replace control unit
- > Check SVM control unit configuration

	The diagnostic firewall is deactivated	The diagnostic firewall is reactivated
1	When the bonnet is opened	When the vehicle travels a distance of greater than 20 kilometres with the bonnet closed
2	If there is no communication with the vehicle electrical system control unit J519 (BCM1 timeout)	The diagnostic firewall is reactivated when the signals are present again.
3	When a crash signal is received from from airbag control unit J234	The diagnostic firewall is reactivated when transmission of the crash signal stops

When the diagnostics are accessed with ODIS, the user is informed that the diagnostic firewall is active.

The status of the diagnostic firewall can be read out via the data bus diagnostic interface J533.

The following message appears on the diagnostic tester display:

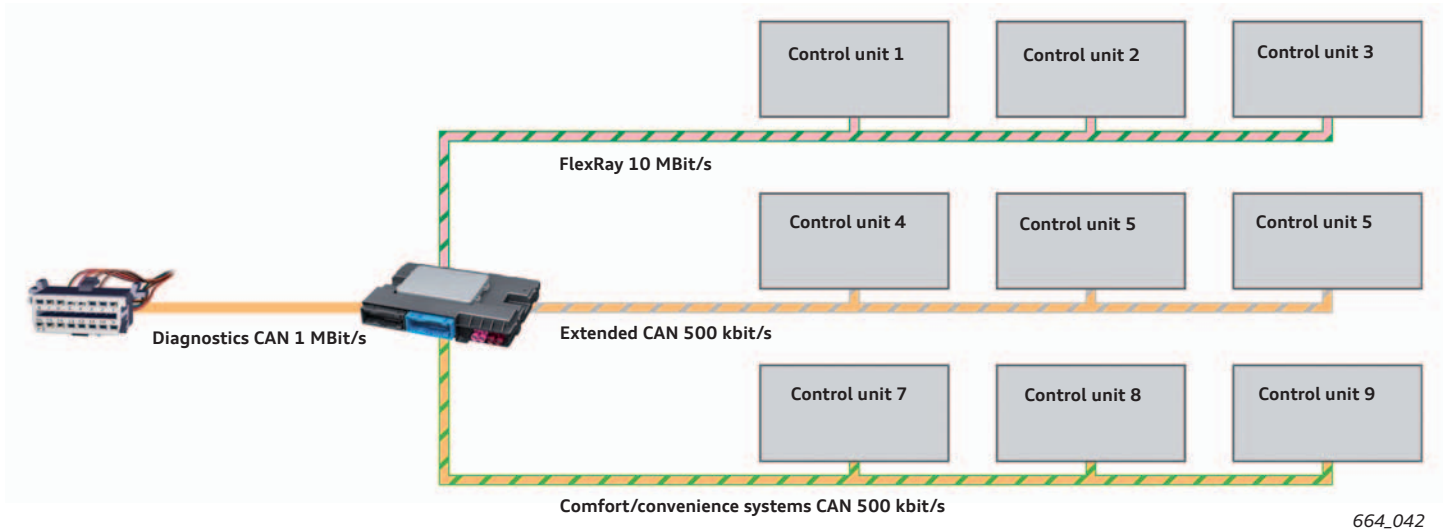


DoIP - Diagnostics over internet Protocol

Diagnose via CAN

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

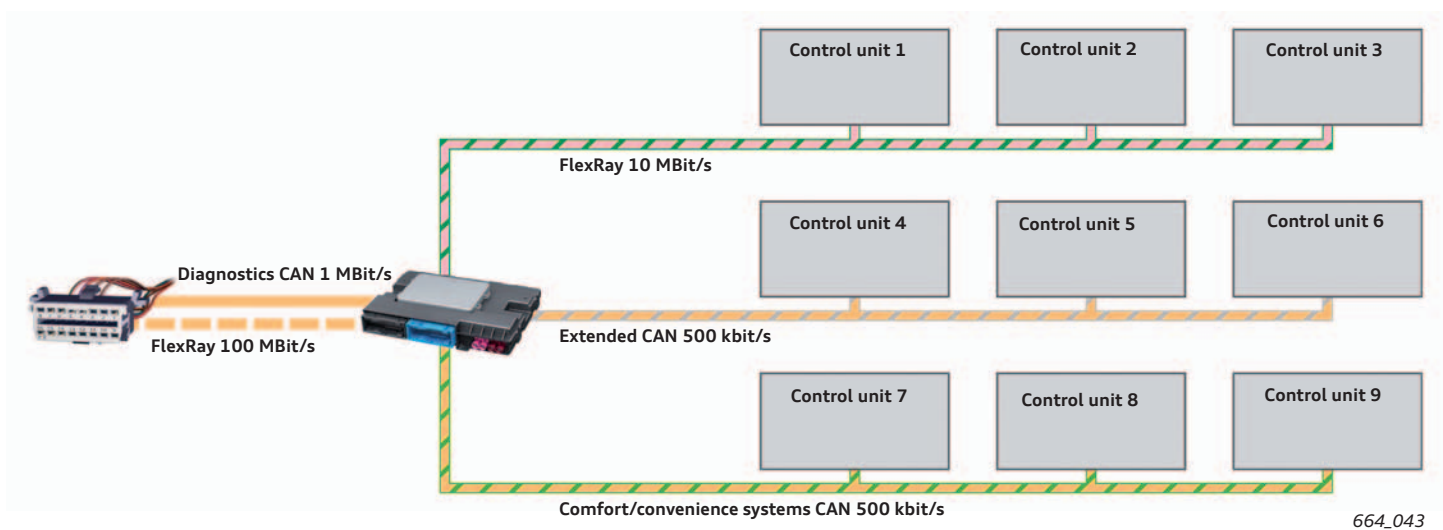
The CAN technology does not allow data to be transferred at a faster rate than this. This meant that the speed of the FlexRay (10 Mbit/s) could not be fully utilised for diagnostics or software updates.



Diagnosics via CAN and DoIP

With the additional Ethernet connection, it is now possible to utilise the full bandwidth of the FlexRay. This is especially advantageous when parameterising engine and gearbox control units. Furthermore, it is now also possible to parameterise CAN control units in parallel. To utilise the Ethernet connection, the diagnostic tester requires the data interface VAS 6154, which is equipped with WiFi technology.

The additional lines required for the diagnostic tester hardware have been installed since the launch of the Audi Q7 (type 4M) (the first representative of the MLBevo series). These lines connected to the diagnostic port have the same colour and cross-section as the FlexRay lines, but serve as an Ethernet connection.



Reference

Further information about the diagnostic interface VAS 6154 can be obtained from Service TV programme STV 0381 "Diagnostic interface VAS 6154".

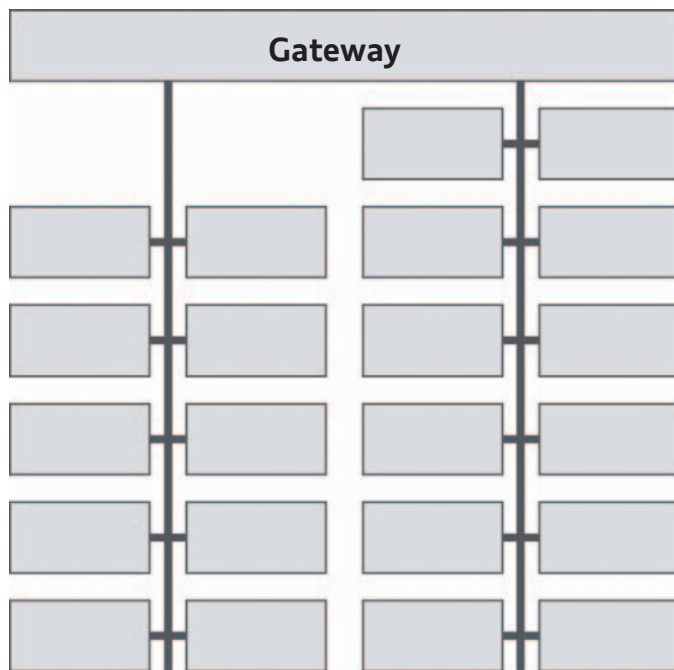
Selective partial network operation

Motivation

The demand for electrical power is constantly increasing due to the ever-growing number of control units in a modern vehicle. To counteract this development, many systems are configured according to requirements, i.e. the applicable system is utilised only when it is required. Until now, all control units have been active (awake) during vehicle operation; they have also participated in bus communications and consumed a great deal of electrical power by constantly running in standby mode.

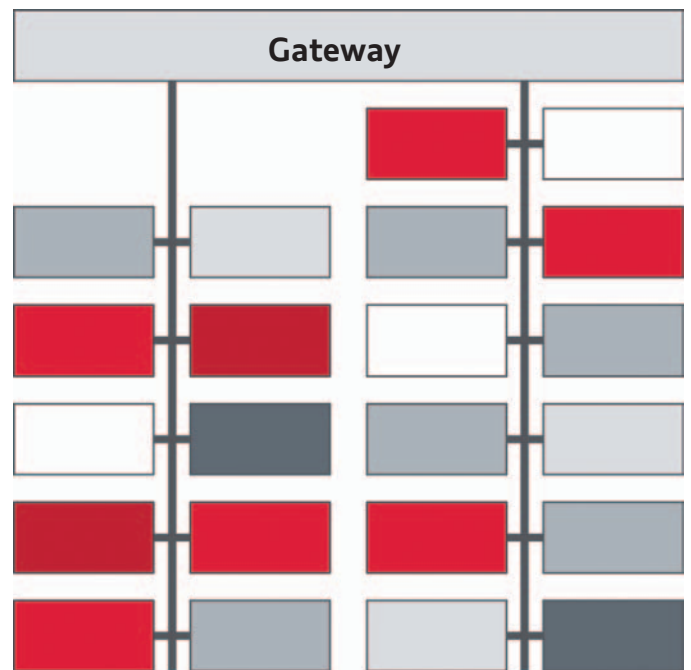
In future it will be possible to group together different control units to build various partial networks, irrespective of the bus system to which they are connected. The control units in the partial networks can be deactivated when they are not needed and activated as required. This technology saves electrical power. However, the control units require intelligent transceivers which do not activate the control unit until a relevant message is received. In the new Audi A8 (type 4N) 10 control units are configured for partial network operation in the first stage of the process.

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

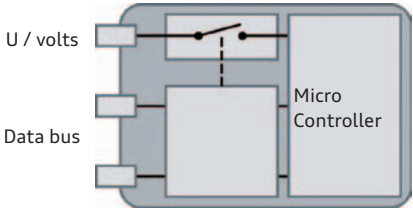
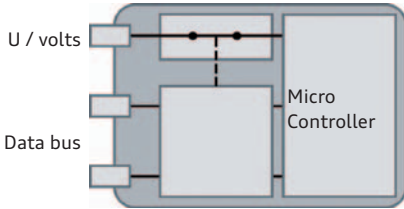
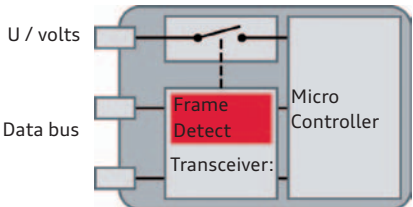
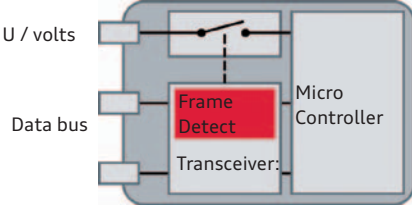
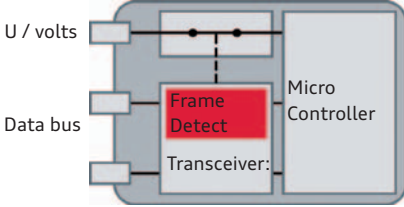
Frame Detect

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

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

In networks with partial network operation, selected control units are equipped with a transceiver which has a Frame Detect Mode, i.e. the control unit can assume a third state.

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

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

Service

Selective partial network operation does not affect service. When the diagnostics are accessed, all control units are woken up. This facilitates communication between the diagnostic tester and the control unit.

Electrical system control unit J519 (BCM1)

The electrical system control unit J519 is one of the central control units 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 implemented in the electrical system control unit.

A further feature of the Audi A8 (type 4N) is the air conditioning control system. The diagnostic code 0008 no longer applies to the air conditioner control unit. All diagnostic functions affecting the air conditioning system are now implemented by J519 via diagnostic code 0009. The electrical system control unit in the Audi A8 (type 4N) is installed on the left-hand side of the vehicle beneath the dash panel.



Electrical system control unit
J519

664_101



664_146

Brief description

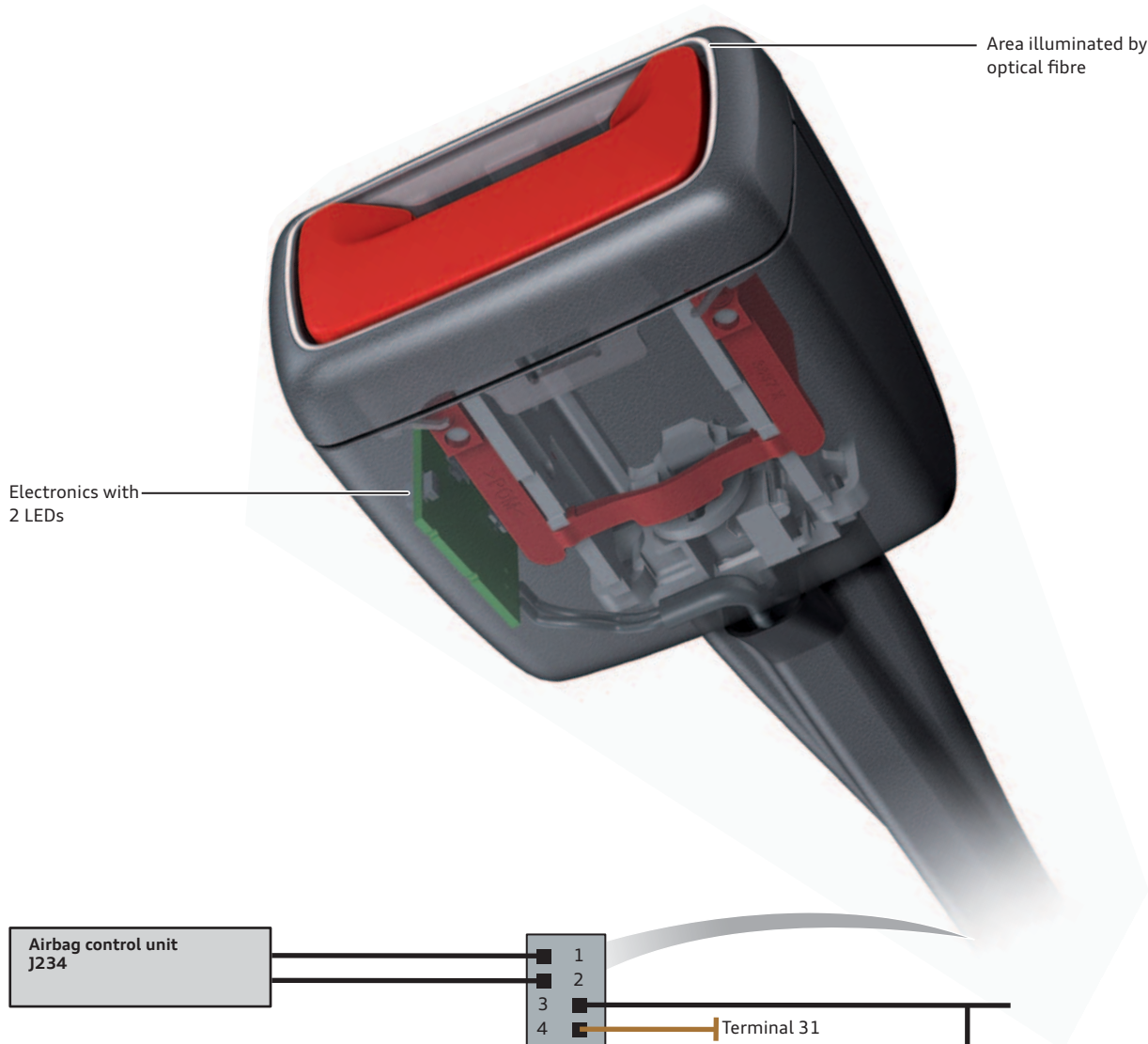
Designation	Electrical system control unit J519 / also referred to as BCM1 (Body Control Module 1)
Equipment	Always fitted
Installation location	Below the dash panel on the left-hand side of the vehicle (installation location is always on the L/H side, even in RHD models)
Tasks	Exterior lighting master Interior lighting master Diagnostic gateway for the light control units Interface for various connect services Integration functions > Parking > Parking aid > Park assist steering > Background lighting > Activation of the cabin light modules > AC control
Diagnostic code	0009
Data bus communication	> Comfort/convenience systems CAN 2 user > J519 is the LIN master for > LIN 1: Light switch E1, combined sensor – rain and light detection sensor G397 and humidity sender G355, wiper motor control unit J400, windscreen washer pump control unit J1100 > LIN 2: Garage door operation control unit J530, automatic anti-dazzle interior mirror Y7, overhead electronics control unit J528, rear cabin light WX2 > LIN 3: Electrically adjustable steering column control unit J866, fan for driver seat backrest V388, fan for driver seat cushion V390, fan for passenger seat backrest V389, fan for passenger seat cushion V391 > LIN 4: Centre dash panel switch module EX22, centre 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), rear left backrest fan 1 V520, rear left seat cushion fan 1 V522, rear right backrest fan 1 V524, rear right seat cushion fan 1 V526, rear air conditioner/Climatronic operating and display unit E265 > LIN 9: Servomotors (15 pcs) > LIN 10: Fresh air blower control unit J126, auxiliary air heater control unit J604, ambient air quality and humidity sensor G935, flap positioner (2 pcs), air improvement system control unit J897, cabin carbon dioxide level sensor G929, cabin fragrance system control unit J1101 > LIN 11: High pressure sensor G65, refrigerant pressure/temperature sensor, low pressure side G1052, refrigerant pressure/temperature sensor, high pressure side G1053, servomotors (LIN series, 5 pcs) > LIN 12: Rear fresh air blower control unit J391, servomotors (7 pcs), air conditioner operating and display unit 1 E774, air conditioner operating and display unit 2 E775, air conditioner operating and display unit 3 E776, air conditioner operating and display unit 4 E777, air conditioner operating and display unit 5 E778, air conditioner operating and display unit 6 E884 > Communicates via a sub-bus system with the left and right LED headlight power modules 1 A27 and A31, the left and right control units for light control J1018 and 1023 and the driver assistance systems control unit J1121
Special feature	The cabin 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 fault-finding. Always refer to the current flow diagram applicable to the vehicle's equipment specification.

Illuminated seat belt buckle PR no. 6C5

General description

The Audi A8 (type 4N) is optionally available with illuminated seat belt buckles. This option is coupled with the equipment "front and rear side airbags, with head airbag and interaction airbag front and rear" via PR no. 6C5. Illuminated seat belt buckles help the vehicle occupants to locate their seat belt buckle in the dark. The illuminated seat belt buckles are fitted at the front and rear on the driver and front passenger sides. The electrical system control unit J519 is, in its capacity as the "cabin light manager", responsible for illuminating the seat belt buckles.

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 electronics with 2 LEDs. These seat belt buckles have a 5-pin connector in which 4 pins are assigned. The two cables for the switches of the seatbelt fastening detection function are connected to the airbag control unit J234. The other two cables are required for activating the LEDs. The LEDs illuminate an optical fibre 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 electrical system control unit 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 cabin light as well as the lighting of key controls, such as the start-stop button, and now also the illuminated seat belt buckle. This lighting is switched off again after a certain time by the cabin lighting run-on function.

The automatic anti-glare rear-view mirror Y7

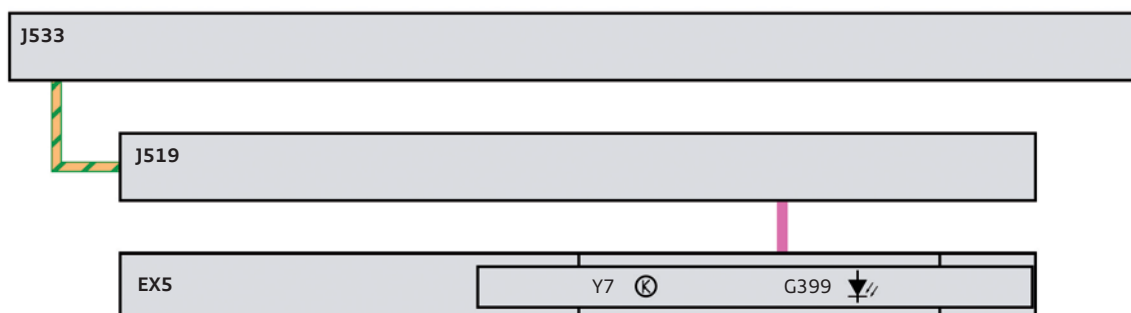
The rear-view mirrors and, where appropriate, the door mirrors are dimmed automatically when incident light is detected from the rear (e.g. headlights of a following vehicle).

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

Features of the automatic anti-glare mirrors:

- > "Frameless look" mirror housing with concealed edges; chrome accents are optional
- > Mirror is preconfigured for compass display, for the main beam assist electronics and for the camera systems of various assistance systems
- > Autom. automatic anti-dazzle system with glare sensors behind transreflective (semipermeable) glass – not visible to the driver
- > The electronics for dimming the rear-view mirror also control the dimming of the door mirrors.
- > The automatic anti-glare rear-view mirror Y7 is an integral part of the rear-view mirror module EX5.
- > The automatic anti-glare rear-view mirror Y7 is a LIN user of the electrical system control unit J519 and can, therefore, be accessed via diagnostic address 0009 using the diagnostic tester.

Schematic diagram



664_129

Key:

- EX5** Rear-view mirror
- G399** Light sensor
- J519** Electrical system control unit
- J533** Data bus diagnostic interface
- Y7** Automatic anti-glare rear-view mirror

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

The automatic anti-glare mirrors are not dimmed when the cabin lighting is on and when reverse gear is selected.

Rear-view mirror EX5



664_130

Automatic anti-glare rear-view mirror
Y7

Rain and light
sensor
G397

Light sensor
G399
(concealed behind the mirror glass)

Windscreen wipe and wash system

Windscreen washer system

The standard windscreen 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 2 wiper arms fitted with Aero wiper blades.

The wiper motor control unit J400 is, since its introduction in the Audi A3 '04, a LIN slave of the electrical system control unit J519 and has a number of wipe functions, such as

- > Touch wipe
- > After-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

Washer fluid tank with windscreen washer pump V5



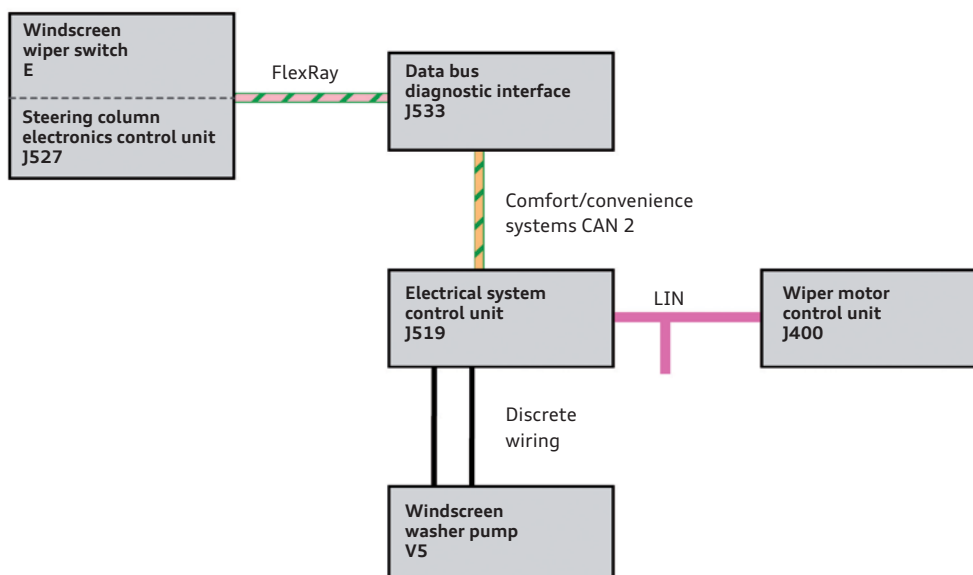
Wiper motor control unit J400

664_102

Function diagram

The signals from the windscreen wiper switch E are sent to the data bus diagnostic interface J533 by the steering column electronics control unit J527 via FlexRay. These messages are then transferred to the electrical system control unit J519 via comfort/convenience systems CAN 2.

The electrical system control unit activates the wiper motor control unit J400 via the LIN connection. The windscreen washer pump V5 is activated discretely by the electrical system control unit.

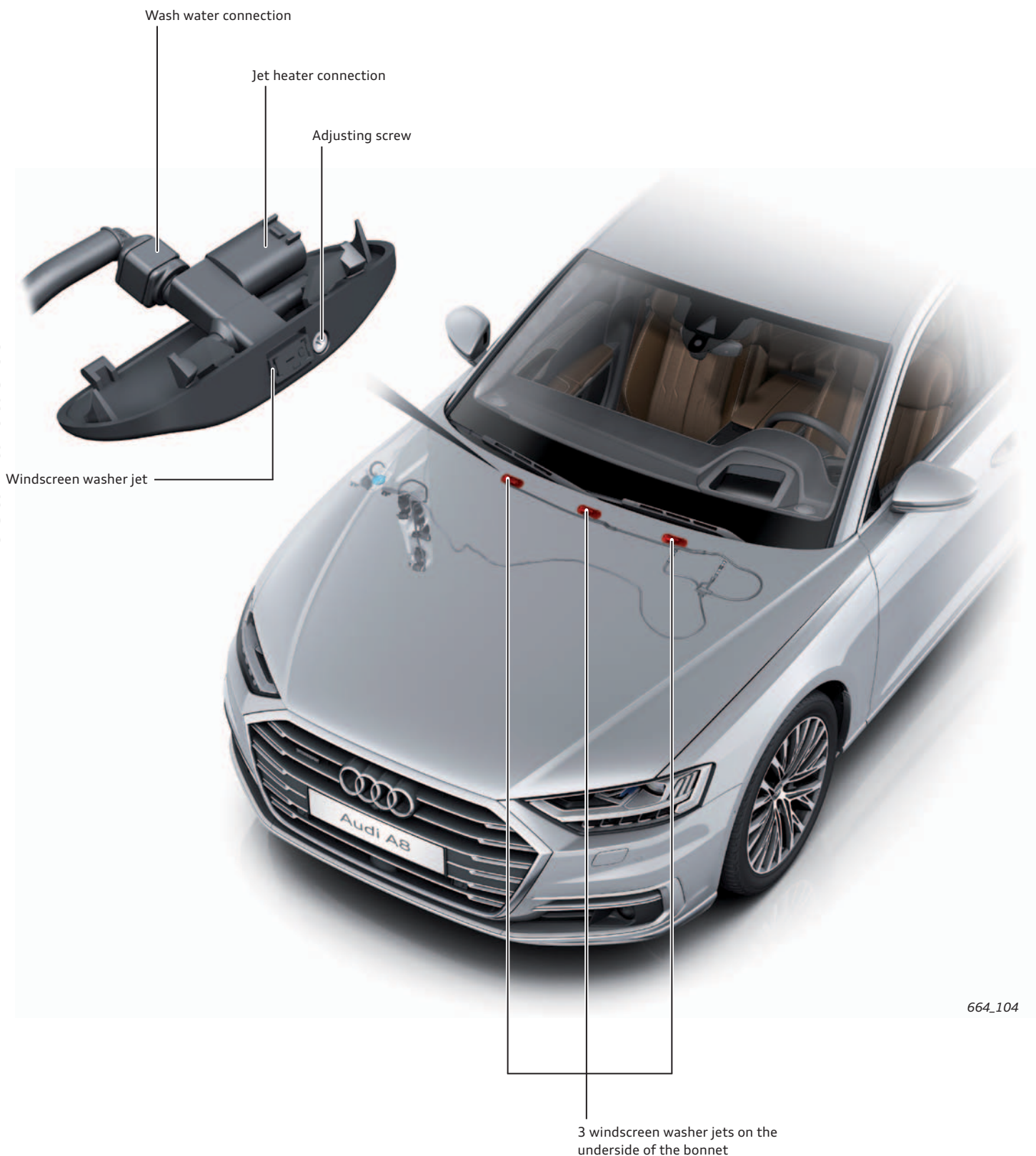


664_103

Windscreen washer

The standard windscreen washer system consists of the washer fluid tank with windscreen washer pump, the washer fluid hoses and the 3 windscreen washer jets. The windscreen washer jets are integrated into the underside of the bonnet.

They are heatable and have an adjusting screw for exact adjustment and optimal distribution of the washer fluid on the windscreen. The washer jet heating resistors are energised directly by the electrical system control unit.



664_104

Adaptive windscreen wiper with integrated washer jets (wet arm wipers) PR no. 9PF

General description

The Audi A8 (type 4N) can, as an option, be equipped with adaptive windscreen washers with integrated washer jets. These are also known commonly as wet arm wipers. In this version the windscreen washer jets are integrated in both wiper arms and 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 windscreen directly next to the wiper blade, which provides better cleaning results and water economy compared to the standard windscreen wiper system. Moreover, there is no splash of water onto windscreen to impair the driver's visibility. This means that the driver has a clear view during the wiping cycle, which is good for driving safety.

Washer jets above wiper blade are active



664_109

Washer jets below wiper blade are active

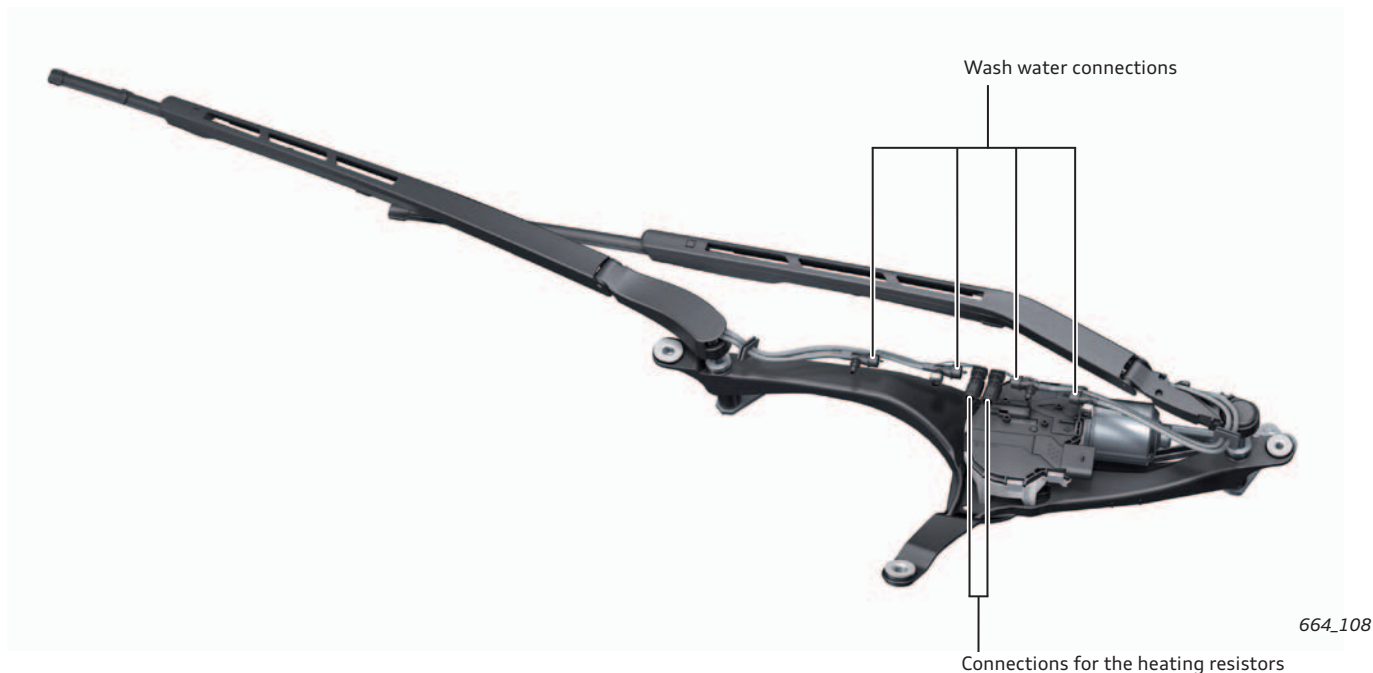


664_163

Windscreen washer system

The wiper linkage and the wiper motor control unit J400 are identical to those of the standard windscreen washer system. The wet arm wipers have 2 integrated, heatable washer jet channels each.

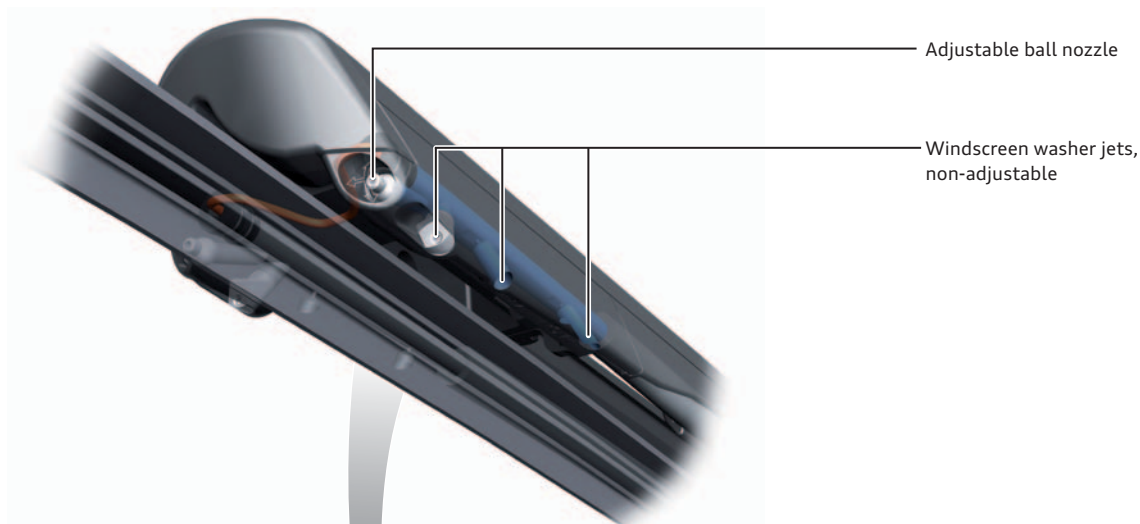
Each wiper arm has 2 washer fluid connections for both washer jet channels as well as an electrical connection for the heating resistors.



Wiper arms

2 washer jet channels are integrated in each wiper arm, 1 for the windscreen washer jets on the top of the wiper blade and 1 for the windscreen 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.



Windscreen washer pump control unit J1100

General description

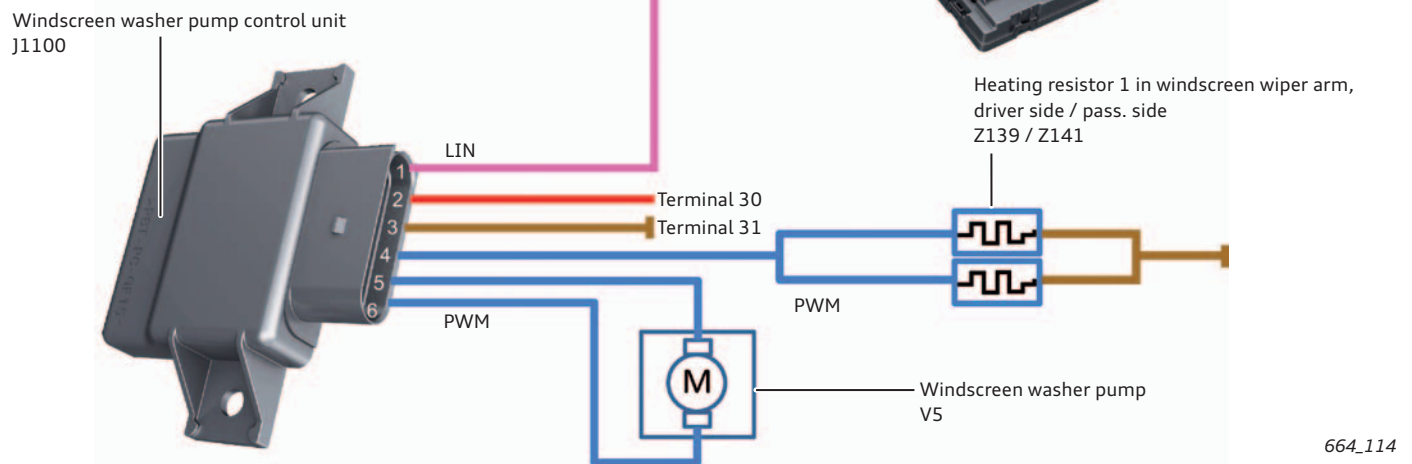
Models with the optional wet arm wipers feature a newly developed control unit: windscreen washer pump control unit J1100. It is installed in the plenum chamber and uses a pulse-width-modulated (PWM) signal to activate both the windscreen washer pump V5 and the heating resistors in the wiper arms.

The windscreen washer pump V5 of the wet arm wiper system is designed as a dual pump. When the pump turns in one direction, the windscreen washer jets on the top of the wiper arm are supplied with washer fluid. When the pump turns in the opposite direction, the windscreen washer jets on the bottom of the wiper arm are active.



Function diagram

The windscreen washer pump control unit J1100 is a slave of the electrical system control unit J519. The wiper motor sensor, the rain light and moisture sensor as well as the light switch are connected to the same LIN branch.



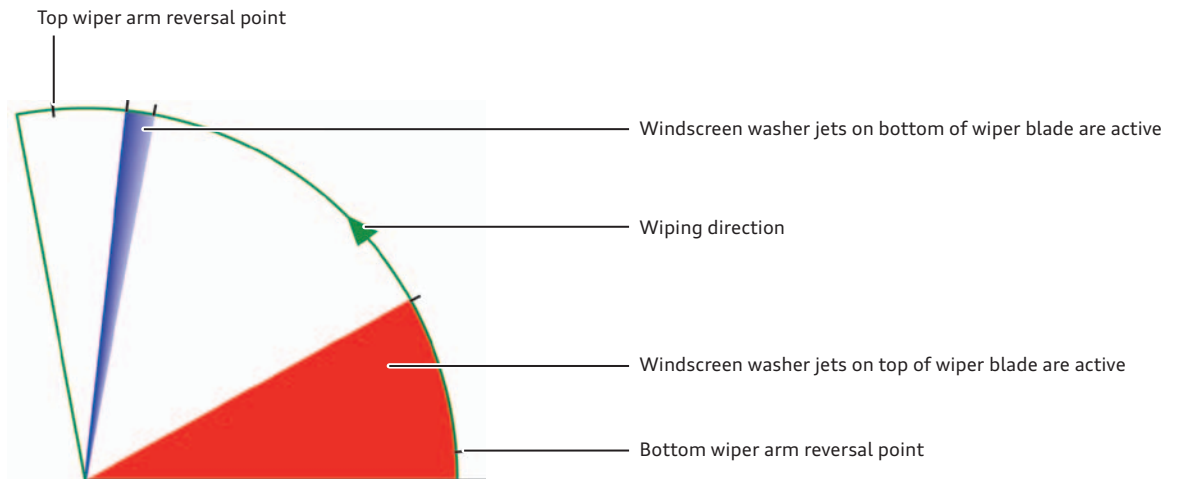
664_114

Operating the windscreen washer pump

The PWM signal controls both the quantity of washer fluid and the time at which water is applied to the windscreen. The windscreen washer jets on the top or bottom of the wiper blade are selected when the pump reverses direction. The way in which the windscreen 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 2 characteristics: winter mode and summer mode. Winter mode is active at temperatures below 5 °C. When the ambient temperature rises above 7 °C, the summer mode characteristic is selected. Each mode (summer/winter) is subdivided into a further 4 characteristics, depending on the speed at which the vehicle is travelling.

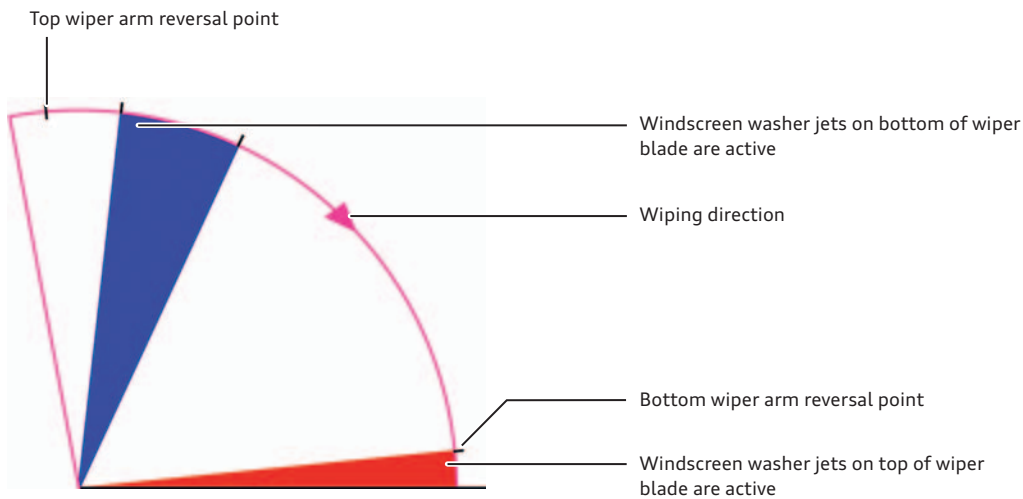
This means that, overall, there are 8 different scenarios for the activation of the windscreen washer pump. The diagrams below show, by way of example, how the windscreen washer pump is activated in winter model 1. The first diagram shows the movement of the wiper blade from the lower reversal point to the upper reversal point. In the area highlighted red the windscreen washer jets on the top of the wiper blade are activated, while in the area highlighted blue the windscreen 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

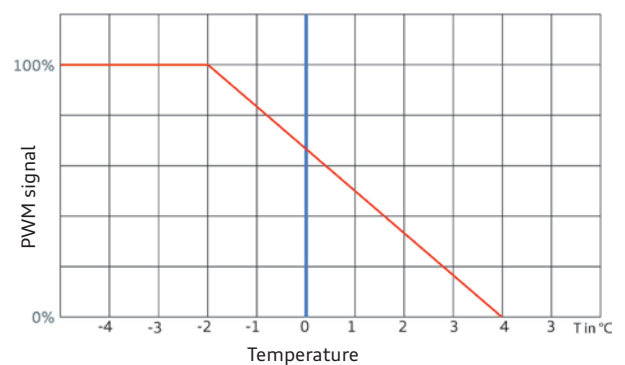
Diagram 2



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 4 °C. At an ambient temperature of -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

Windscreen washer system and washer system for the night vision system

General description

The windscreen is not the only area which is cleaned by the washer system. The Audi A8 (type 4N) can be equipped with a headlight washer system with 2 washer jets per headlight. The washer jets are concealed below covers in the bumper and do not extend until they are activated.

If the Audi A8 (type 4N) 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. Windscreen washing is initiated by the driver via the wiper stalk.

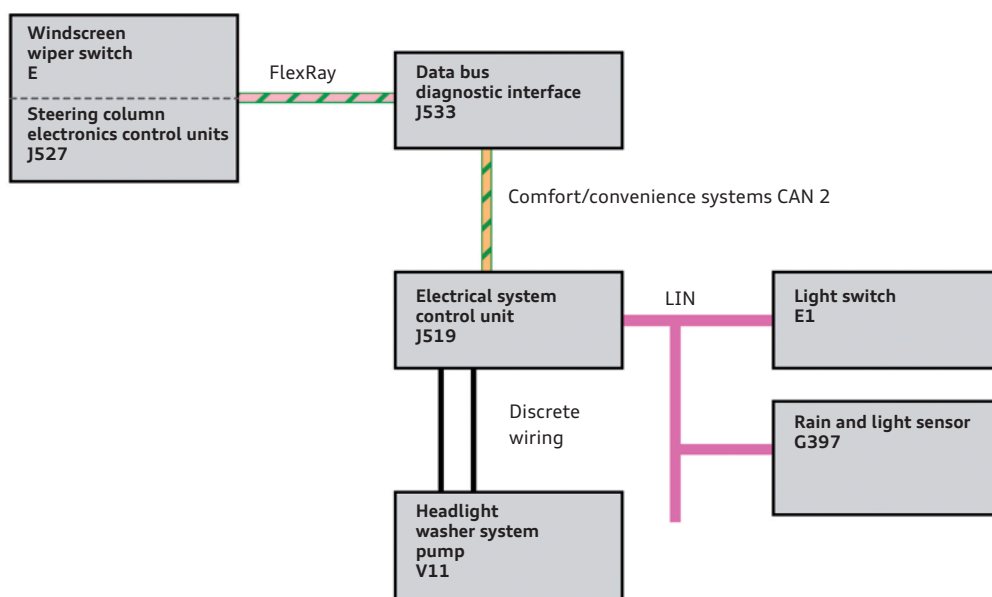


664_105

Function diagram

A condition for cleaning the headlights and the camera for the night vision system is that the driving lights are on. This occurs when the electrical system control unit J519 receives information via a LIN connection to the light switch that the dipped beam is on, or when the rain and light sensor indicates that it is dark. If the windscreen wiper switch E is now actuated, its signal is sent to the data bus diagnostic interface J533 by the steering column electronics control units J527 via FlexRay.

These messages are then transferred to the electrical system control unit via comfort/convenience systems CAN 2. The electrical system control unit then activates the headlight 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 Audi A8 (type 4N) is optionally 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 control unit for laser distance control J1122. If dirty, the laser scanner must be cleaned to ensure that it functions properly.

For this purpose, there is a washer jet on the left and right hand sides of the laser scanner. If the control unit for laser distance control 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.

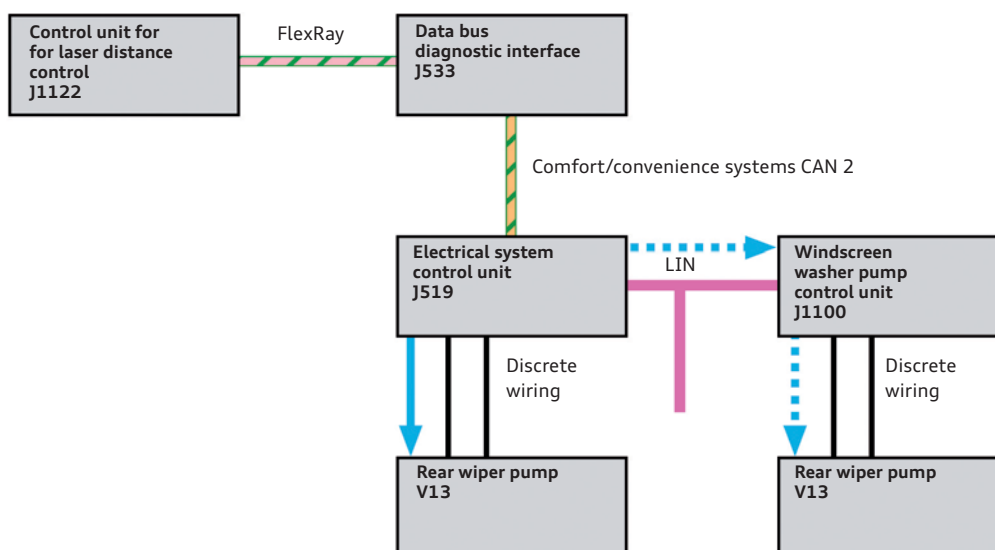


664_113

Function diagram

The control unit for laser distance control J1122 requests that its laser scanner be cleaned. For this purpose, it sends a data message via FlexRay to the data bus diagnostic interface J533, which in turn transfers the message to the electrical system control unit J519 via comfort/convenience systems CAN 2. The electrical system control unit must now activate the rear wiper pump V13, which then takes care of cleaning the laser scanner. The characteristic of this activation signal is dependent on the equipment fitted. There are 2 possible scenarios:

- 1.) The vehicle is equipped with a standard wiper system and a laser distance control system:
 - > The electrical system control unit sends a LIN message to the windscreen washer pump control unit J1100, which activates the pump V13 via discrete wiring.
- 2.) The vehicle is equipped with a wet arm wiper system and a laser distance control system:
 - > The electrical system control unit activates the pump V13 directly via discrete wiring.



664_118

Reversing camera washer system

General description

Due to the fact that the reversing camera is installed in the boot lid handle, it is prone to being obstructed by dirt build-up under certain ambient conditions. For this reason, the Audi A8 (type 4N) has a washer jet for cleaning the reversing camera. Camera lens cleaning can be initiated in 2 ways by brief activation of the washer jet.

1.) Driver-initiated cleaning cycle:

- > The driver has the option of initiating a reversing camera lens cleaning cycle in the parking aid settings menu. For this purpose, the driver selects the "Clean reversing camera" option.

2.) Cleaning cycle requested by reversing camera:

- > If the reversing camera control unit concludes that the camera lens is dirty when evaluating the camera images, it initiates a cleaning cycle.

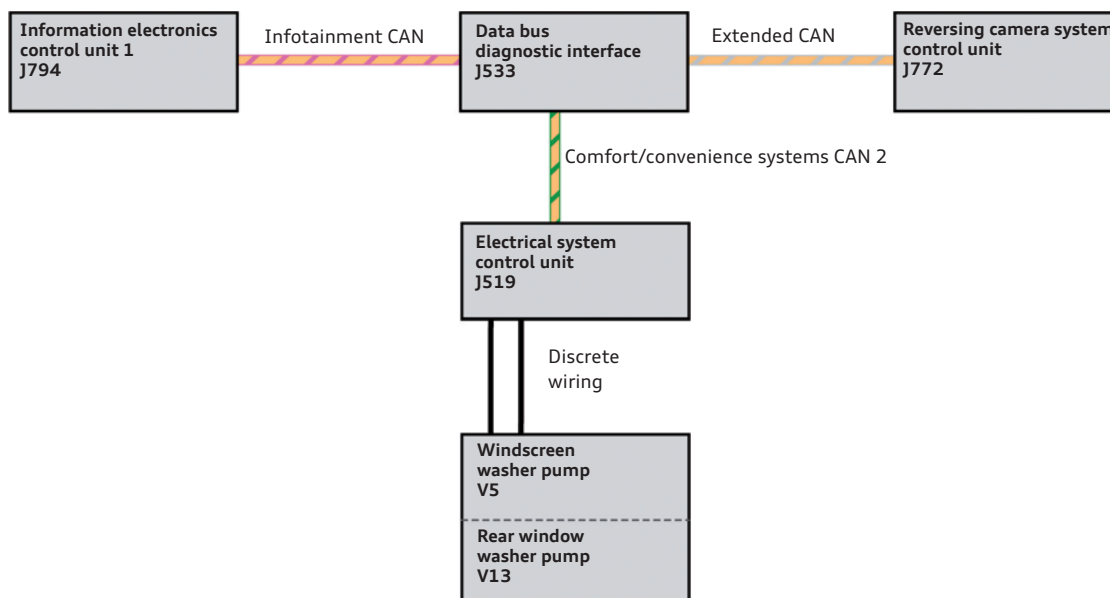


664_119

Function diagram

If the reversing camera cleaning cycle is initiated by the driver, the information electronics control unit 1 J794 sends a corresponding message to the data bus diagnostic interface J533 via the infotainment CAN. If cleaning of the camera lens is requested, J533 receives a corresponding message from the reversing camera system control unit J772 via extended CAN.

This second option is only implemented in models in which the reversing camera is fitted in combination with the surround view camera. The data is transferred from J533 to the electrical system control unit J519 via comfort/convenience systems CAN 2. Depending on equipment, J519 activates either windscreen washer pump V5 or the rear window washer pump V13 via the discrete wiring.



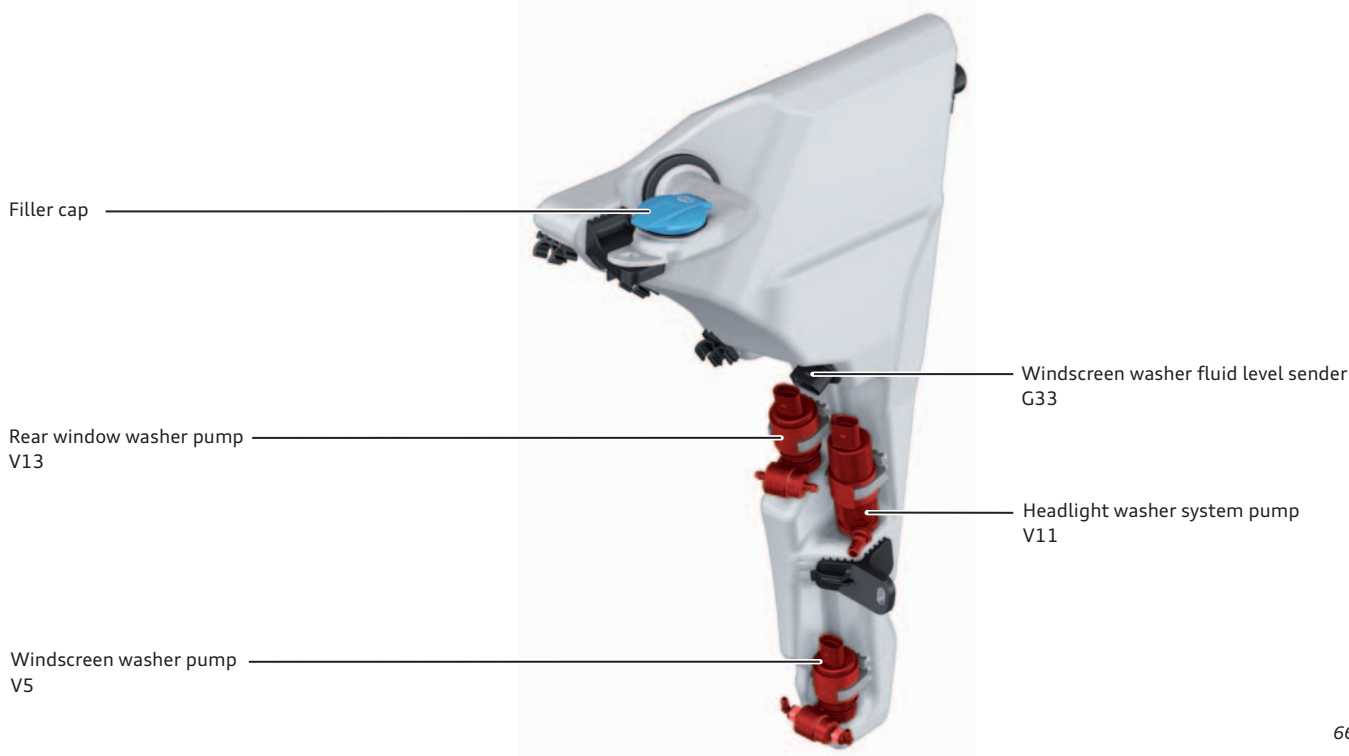
664_120

Wash water tank

General description

The washer fluid tank is installed in the wheel arch behind the right front wheel. This plastic tank has a capacity of approximately 5.7 litres. The driver is alerted via the dash panel insert when the remaining washer fluid level is about 1.7 litres.

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



664_121

Wash water pumps

The headlight 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, the headlight washer pump V5 and the 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
Windscreen washer system	Mono	–	Windscreen washer jets	–	–	–
Windscreen washer system + reversing camera	Dual	–	Windscreen washer jets	Reversing camera	–	–
Windscreen washer system + laser scanner	Mono	Mono	Windscreen washer jets	–	Laser scanner	–
Windscreen washer system + laser scanner	Mono	Dual	Windscreen washer jets	–	Laser scanner	Reversing camera
Wet arm wiper	Dual	–	Wet arm wiper down	Wet arm wiper up	–	–
Wet arm wipers + reversing camera	Dual	Mono	Wet arm wiper down	Wet arm wiper up	Reversing camera	–
Wet arm wipers + laser scanner	Dual	Mono	Wet arm wiper down	Wet arm wiper up	Reversing camera	–
Wet arm wipers + reversing camera + laser scanner	Dual	Dual	Wet arm wiper down	Wet arm wiper up	Reversing camera	Reversing camera

Central comfort/convenience systems control unit J393 (BCM2)

The comfort/convenience systems control unit J393 is based on the MLBevo platform and has been adopted from the Audi Q7 and further improved. Key new features are the Audi connect key and the tail lights featuring OLED technology.

The comfort/convenience system control unit J393:

- > has the diagnostic code 0046
- > is a comfort/convenience systems CAN user
- > has the following master functions:
 - > Central locking system master
 - > Immobiliser master
- > is the LIN master for:
 - > LIN1: Windscreen heater control unit J505, anti-theft alarm system sensor
 - > LIN2: Alarm horn H12
 - > LIN3: Boot lid opening control unit J938 (sensor-activated boot lid)
- > is located in the luggage compartment, on the left-hand side, behind the luggage compartment/side trim. Connectors and cables are downward-facing for protection against moisture.

Other integrated functions:

- > Terminals management
- > Entry and start authorisation
- > Central locking
- > Anti-theft alarm
- > Activation of the rear exterior lights
- > Heated rear window
- > Turn signal control
- > Rear roller blind control
- > Luggage compartment/boot lid release and -luggage compartment light control
- > Fuel filler flap locking
- > Boot 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

Special feature:

In addition to the car key, new Audi A8 (type 4N) offers customers the option of accessing and starting the vehicle by smartphone using NFC technology (Near Field Communication).

The hardware required for this purpose (the NFC aerial integrated in the Audi Phonebox) communicates with the comfort/convenience systems control unit J393 by sub-bus CAN.

Base of J393



Provision for FAKRA aerial socket for central locking system

Installation location of the central comfort/convenience systems control unit J393 on the left-hand side of the luggage compartment (also in right-hand-drive models)



664_013



Reference

For further information about the NFC system, refer to Self Study Programme 666 "Audi A4 (type 8W) Infotainment and Audi connect".



Note

The FAKRA aerial socket is not used in the new Audi A8 (type 4N).

Terminals management

General description

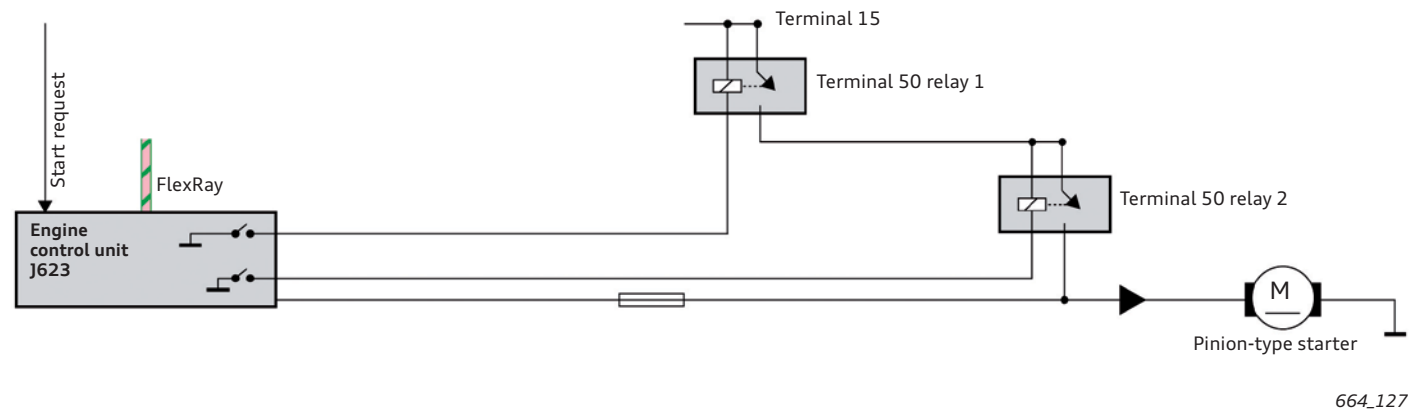
The terminals management system of the Audi A8 (type 4N) is identical to that of the Audi Q7 (type 4M). For information about the signal characteristic for the activation of terminals 15 and 50, refer to Self Study Programme 638 Audi Q7 (type 4M) Comfort/convenience electronics.

Due to the fact that the Audi A8 (type 4N) 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 internal combustion engine.

Engine starting with 12-volt pinion-type starter

As the starter generator cannot guarantee reliable engine starting, particularly when the engine is cold and in heavy conditions, the internal combustion engine of the Audi A8 (type 4N) is always started with the 12-volt pinion-type starter for the first time and at engine oil temperatures below 45°C.

The engine control unit J623 receives the start request as a discrete signal and a FlexRay message from the central comfort/convenience system control unit J393. J623 activates both terminal 50 relays, which in turn activate the 12-volt pinion-type starter.



Engine starting with 48-volt starter generator

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

The engine control unit J623 either receives a start request as a discrete signal and a FlexRay message from the central comfort/convenience system control unit J393 or decides itself to restart the internal combustion engine. J623 then activates the starter generator via a private CAN bus.



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.

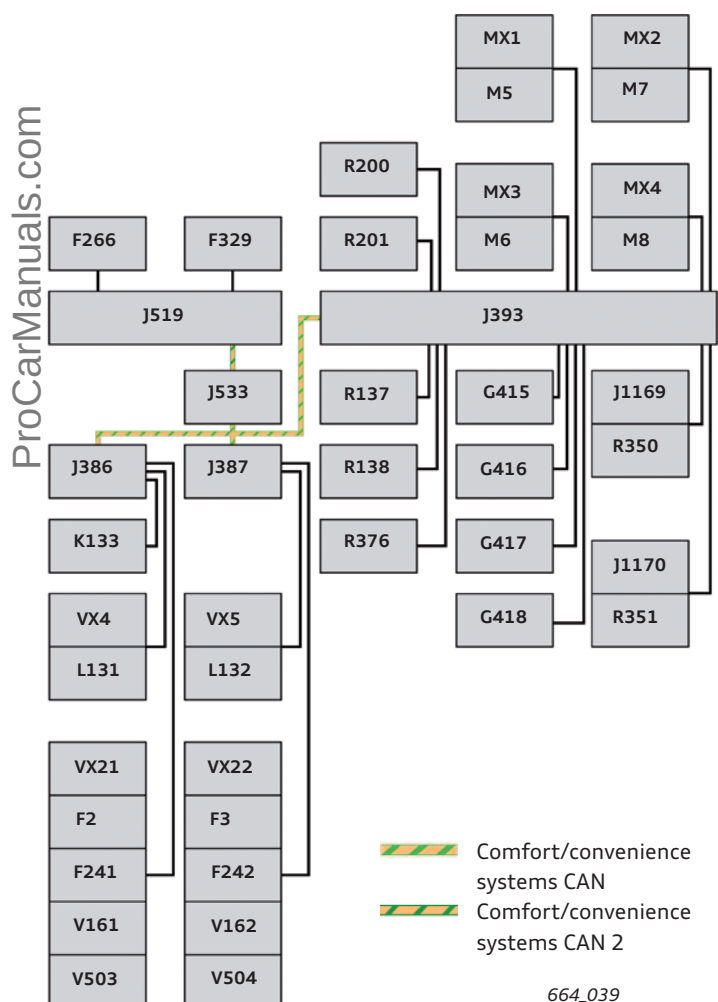
The new Audi A8 (type 4N) can be unlocked/locked in different ways:

- > 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
- > By Audi connect key
- > By Audi connect keycard

Conditions for successful vehicle locking are:

- > If the vehicle is locked with the radio remote control or with the driver side exterior door handle switch F546:
 - > The driver's door must be closed and the automatic gearbox selector lever must be in the park position.
 - > In models with Safelock, all door handles are disengaged mechanically. The doors cannot then be opened from the inside.
- > When the vehicle is locked by the driver side interior locking button E308 (lock button):
 - > All doors must be closed
 - > In this case, the door can be opened after operating the interior door handle.

Control units, sensors and actuators belonging to the central control unit:



- G415** Exterior door handle touch sensor, driver side
- G416** Exterior door handle touch sensor, front pass. side
- G417** Contact sensor for rear left exterior door handle
- G418** Contact sensor for rear right exterior door handle
- J386** Driver side door control unit
- J387** Front pass. side door control unit
- J393** Central comfort/convenience systems control unit
- J519** Electrical system control unit
- J533** Data bus diagnostic interface
- J1169** Near field communication control unit
- J1170** Near field communication control unit 2
- K133** Indicator lamp for SAFE function of central locking system
- L131** Turn signal lamp in driver side door mirror
- L132** Turn signal lamp in front pass. side door mirror
- M5** Front left turn signal lamp
- M6** Rear left turn signal lamp
- M7** Front right turn signal lamp
- M8** Rear right turn signal lamp
- MX1** Front left headlight
- MX2** Front right headlight
- MX3** Rear tail light
- MX4** Right tail light
- R137** Luggage compartment aerial for entry and start authorisation
- R138** Entry and starting system interior aerial 1
- R200** Left aerial for entry and start authorisation
- R201** Right aerial for entry and start authorisation
- R350** Near field communication aerial
- R351** Near field communication aerial 2
- R376** Front aerial for entry and start authorisation
- V161** Central locking SAFE function motor in driver door
- V162** Central locking SAFE function motor in front pass. door
- V503** Driver side central locking motor
- V504** Front pass. side central locking motor
- VX4** Driver side door mirror
- VX5** Pass. side door mirror
- VX21** Driver door locking unit
- VX22** Pass. door locking unit

Key

- F2** Driver side door contact switch
- F3** Front pass. side door contact switch
- F241** Key contact switch in lock cylinder, driver side
- F242** Key contact switch in lock cylinder, front pass. side
- F266** Bonnet contact switch
- F329** Bonnet contact switch 2

Anti-theft alarm

The anti-theft alarm system with electric immobiliser offers optimal protection against vehicle theft. Audible and visual warning signals attract the attention of passers-by and deter would-be thieves.

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 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 bonnet is opened
- > The boot lid is opened
- > The trailer plug is disconnected

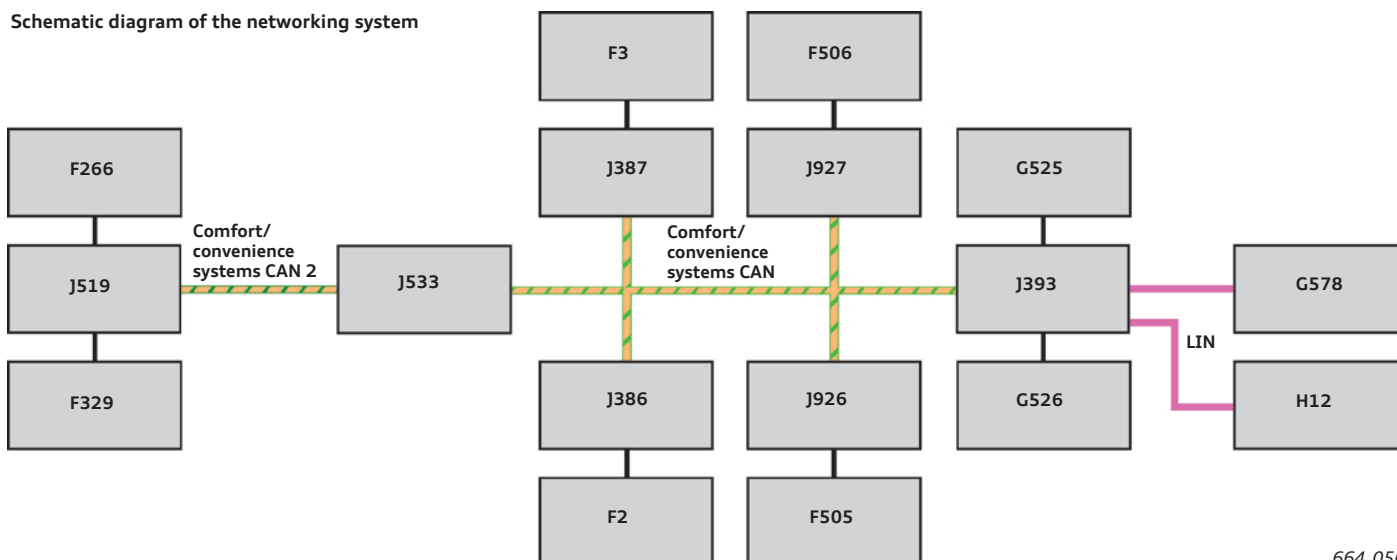
The alarm also deploys in the following situations:

- > 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, the vehicle inclination sensor G384 detects when the vehicle is raised.

2 sensors are combined in the anti-theft alarm system sensor G578:

- > The interior monitoring sensor G273
- > The vehicle inclination sensor G384

Schematic diagram of the networking system



Key:

- F2** Driver side door contact switch
- F3** Front pass. side door contact switch
- F266** Bonnet contact switch
- F329** Bonnet contact switch 2
- F505** Rear driver's side door contact switch
- F506** Rear pass. side door contact switch
- G525** Boot lid closed sensor 1
- G526** Boot lid closed sensor 2
- G578** Anti-theft alarm sensor
- J386** Driver side door control unit
- J387** Front pass. side door control unit
- J393** Central comfort/convenience system control unit
- J519** Electrical system control unit
- J533** Data bus diagnostic interface (gateway)
- J926** Rear driver side door control unit
- J927** Rear pass. side door control unit
- H12** Alarm horn

Installation of alarm horn H12



Boot lid control unit J605

The boot lid is operated manually in the new Audi A8 (Typ 4N) in basic trim. For this purpose, 2 springs and an oil damper are fitted on the left-hand side.

A power opening and closing boot lid can be ordered as optional equipment. In this case, only one spring is fitted on the right-hand side of the boot lid. A spindle drive is used on the left-hand side, eliminating the need for the hydraulic damper. The power-operated boot lid with sensor-activated luggage compartment release is the maximum which can be ordered.

The boot lid control unit J605 is located on the left-hand side of the luggage compartment, behind the luggage compartment lining.

Opening and closing of the boot lid:

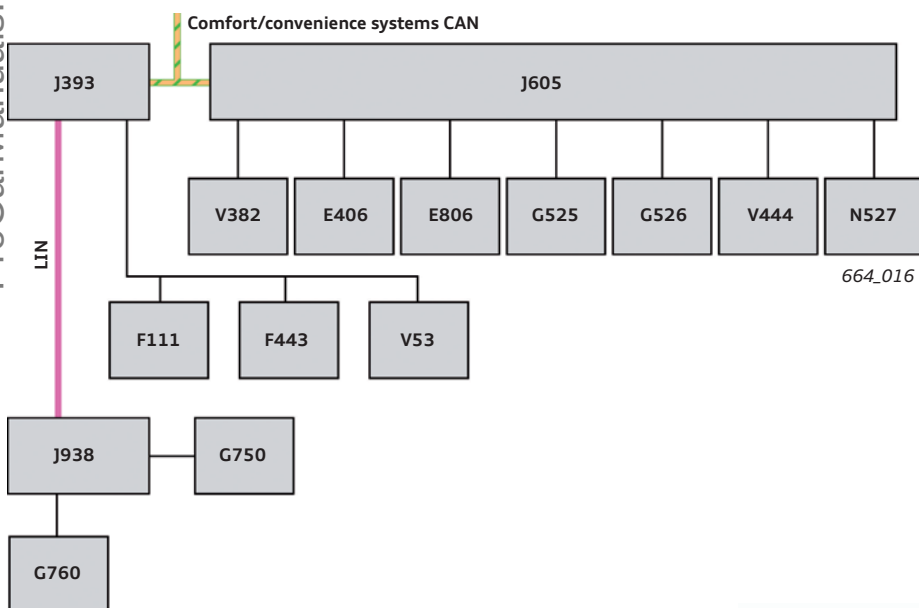
- > The boot lid can be unlocked with the remote control key
- > The boot lid can be unlocked with the advanced key or with the advanced key with sensor-activated luggage compartment release
- > The boot lid can be released with the Audi connect key
- > The boot lid can be opened manually with the locking cylinder



664_014

Spindle drive = boot lid motor 1
V444

Schematic diagram of the networking system



664_016

Key:

- E406** Boot lid lock button in luggage compartment
- E806** Locking button in the boot lid
- F111** Contact switch in the boot lid
- F443** Pawl contact switch
- G525** Boot lid closed sensor 1
- G526** Boot lid closed sensor 2
- G750** Boot lid opening sensor
- G760** Boot lid opening sensor 2
- J393** Central comfort/convenience system control unit
- J605** Boot lid control unit
- J938** Boot lid power opening control unit
- N527** Coupling in boot lid motor 1
- V53** Central locking motor in boot lid
- V382** Boot lid power latching system motor
- V444** Boot lid motor 1



Boot lid control unit
J605

664_015

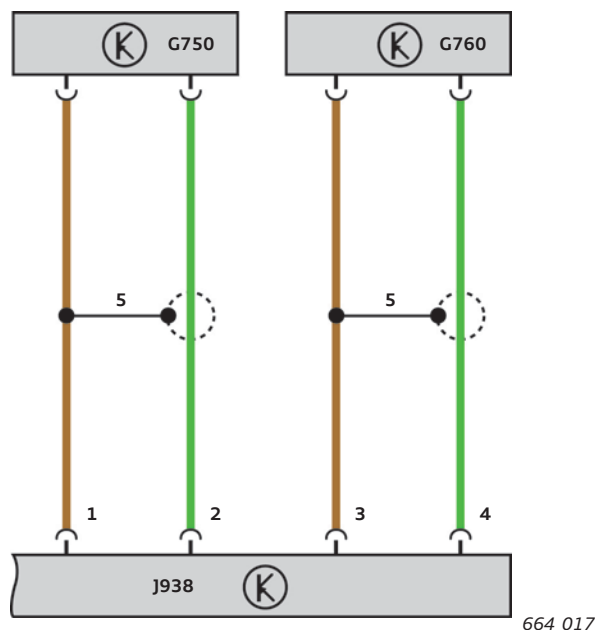
Activation of sensor-controlled boot lid

It is also possible to separately open the boot 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 boot lid opening sensors G750 and G760 detect the corresponding foot gesture (kick motion beneath the rear bumper), the boot lid opening control unit J938 initiates an advanced key search at the rear end of the vehicle. If the key is recognised, opening of the boot lid is initiated. The boot lid can also be closed by foot gesture.

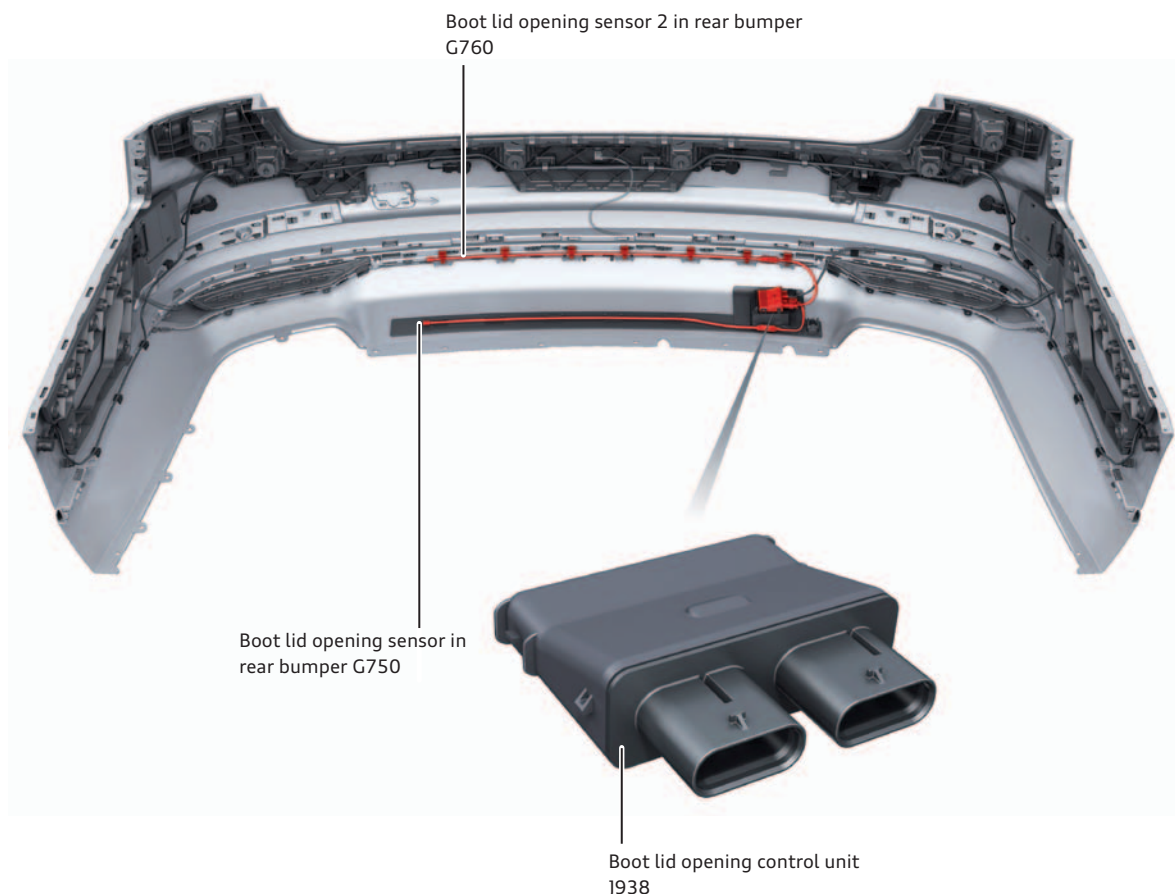
The boot lid opening control unit J938 is a LIN bus user connected to the central comfort/convenience systems control unit J393.

Schematic diagram



Key:

- G750** Boot lid opening sensor in rear bumper
- G760** Boot lid opening sensor 2 in rear bumper
- J938** Boot lid power opening control unit
- 1** G750 Sensor -
- 2** G750 Sensor +
- 3** G760 Sensor -
- 4** G760 Sensor +
- 5** Shielding



Garage door operation control unit J530

The garage door opener of the new Audi A8 (type 4N) 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  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.

Installation location



664_009

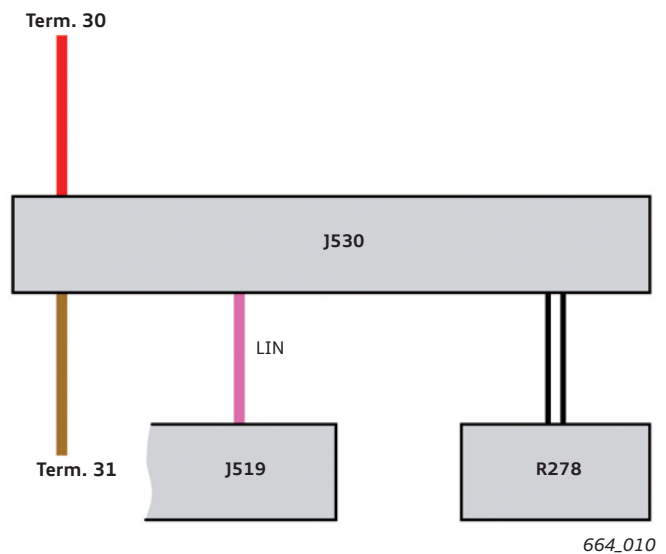
Garage door operation control unit J530

The HomeLink® garage door opener system in the new Audi A8 (type 4N) 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.

The garage door opener control unit J530 is a LIN user of the electrical system control unit J519. The aerial R278 required for programming the garage door opener is located inside the vehicle, near the rear bench seat heel plate.

The garage door opener control unit J530 is installed in the rear cross panel, below the rear bumper.

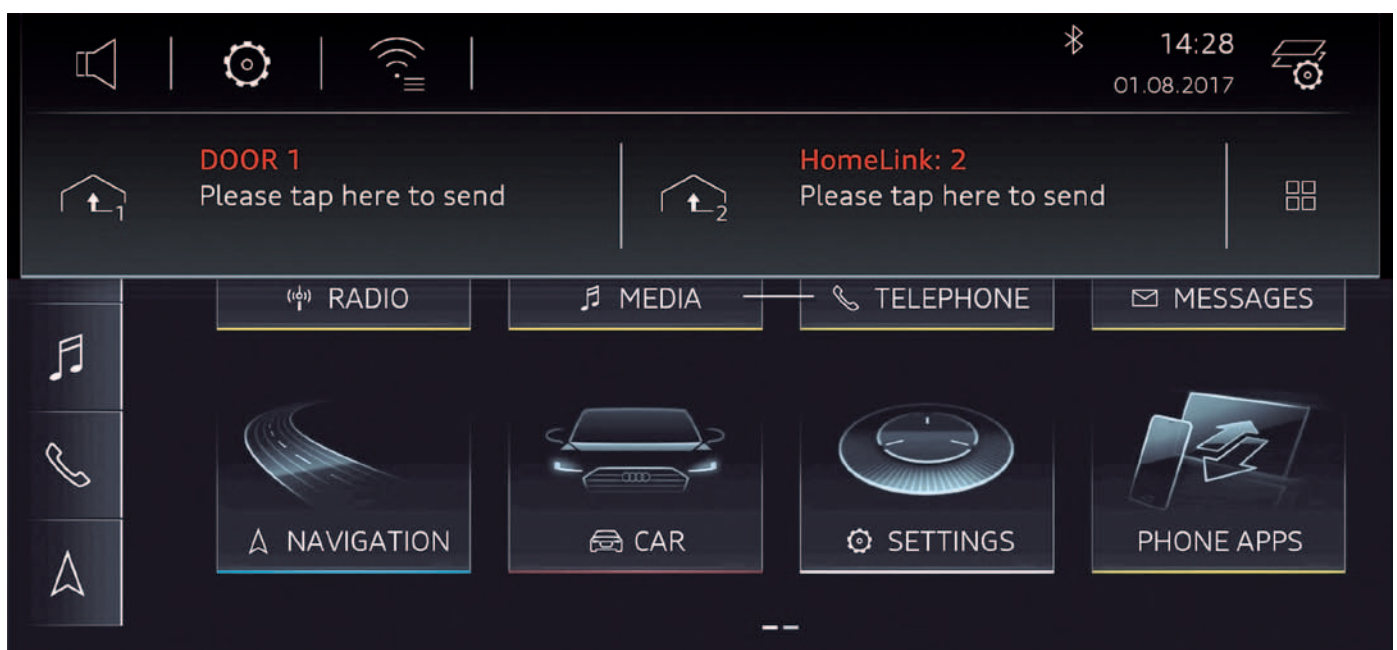
Schematic diagram



Key:

- J519** Electrical system control unit
- J530** Garage door opener control unit
- R278** Garage door opener programming aerial:

Homelink:
objects detected by GPS



664_122

Heated windscreen control unit J505

The windscreen heater in the new Audi A8 (type 4N) is still powered by a DC-to-DC converter on the basis of the 12V battery. The maximum heating capacity of the windscreen heater has been reduced to 700 W. Heating capacity is regulated automatically in a continuously variable manner according to the prevailing ambient conditions.

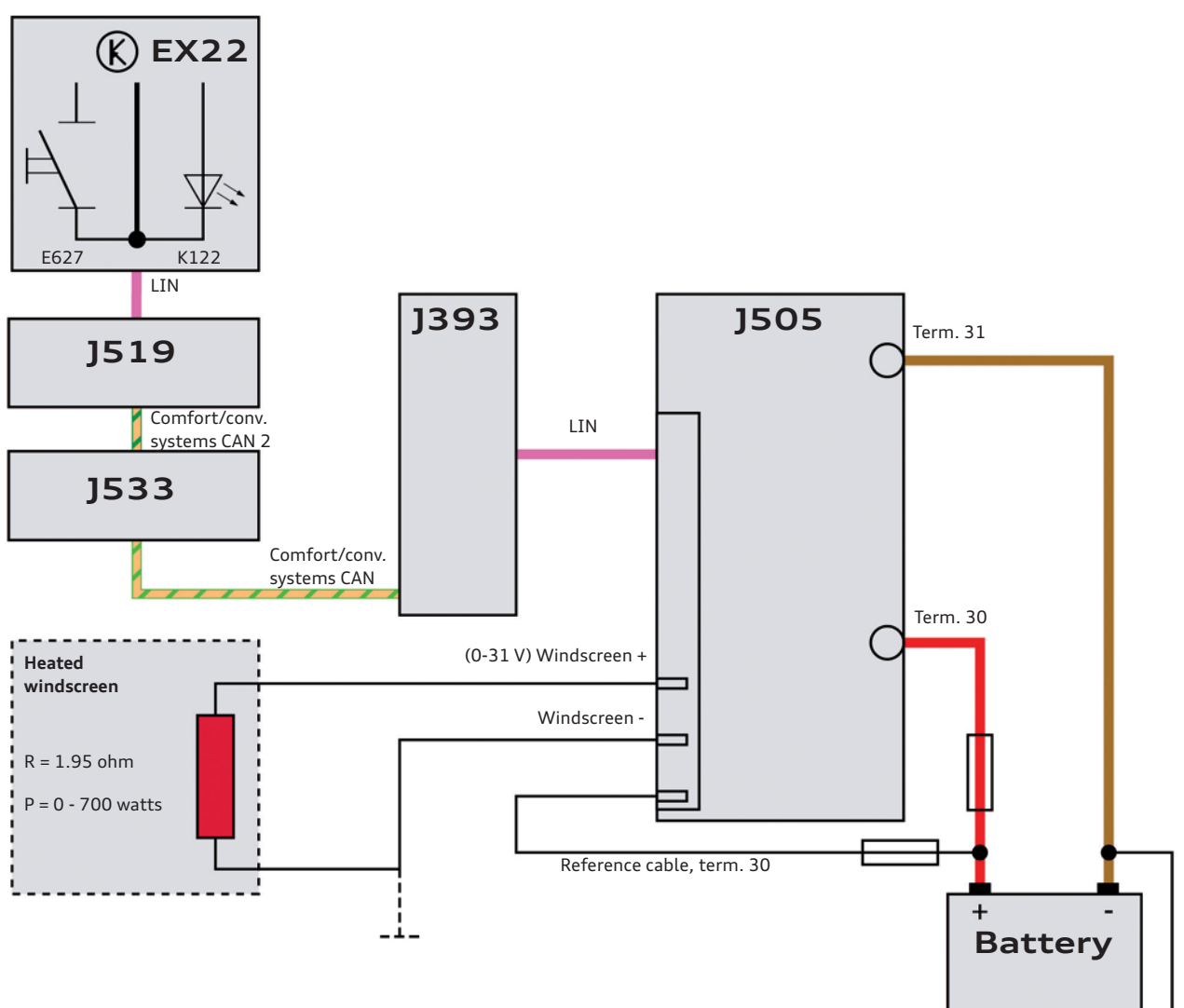
The battery voltage is transmitted to the heated front windscreen control unit J505 via the reference line at terminal 30. If the battery voltage is too low, the windscreen heater cannot be activated.

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

- > Battery A
- > Heated windscreen control unit J505
- > Central comfort/convenience systems control unit J393
- > Centre dash panel switch module EX22
- > Windscreen

The windscreen heater is operated via the lower touch display J1060. After pushing the Defrost button, the windscreen heater is activated automatically at low ambient temperatures. An activated windscreen heater is indicated by the windscreen heater warning lamp K122.

Schematic diagram of the windscreen heater



Key

- E627** Windscreen heater button
- EX22** Centre dash panel switch module
- J393** Central comfort/convenience systems control unit
- J505** Windscreen heater control unit
- J519** Electrical system control unit
- J533** Data bus diagnostic interface
- K122** Heated windscreen warning lamp

664_019

Audi connect key

The Audi connect key function (PR. no. 2F1) is a new mobile communications standard for wireless data transmission. With the Audi connect key, we digitise the conventional car key and integrate it into smartphone. This way, the smartphone can be used to open, close and start the vehicle. The digital key does is not designed to replace the conventional car key, but rather as an add-on.

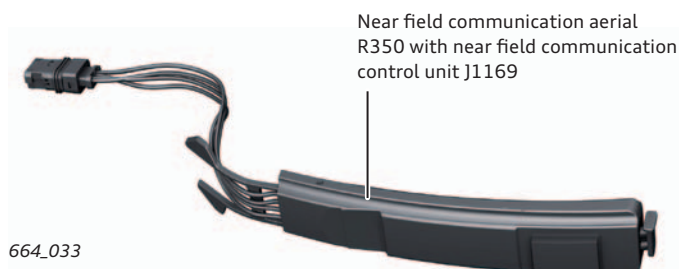
The technology is known under the acronym NFC. NFC stands for Near Field Communication, which in practice involves communication between 2 elements located near to one another. The special feature of NFC is that both devices have to be held within a few centimetres of each other. This facilitates highly secure data transmission over short distances.

The data rate of 424 KByte/s is less than the Bluetooth data rate, but is sufficient for the following in-car functions:

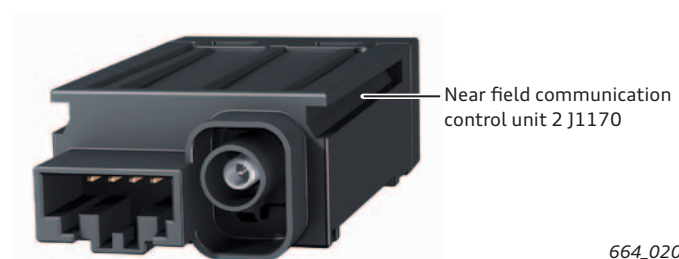
- > Keyless entry system:
 - > The vehicle is unlocked by holding the smartphone near to the driver door handle.
- > Engine start authorisation:
 - > To start the engine, it is sufficient to place the smartphone in the Audi phone box and then to push the start /stop button.

Due to technological constraints, the functions of the Audi advanced key system are unavailable when the Audi connect key functions are used. The functions of the remote control are also reserved for the actual car key.

Two NFC aerals are installed in the Audi A8 (type 4N): one in the door handle and one in the Audi phone box. The near field communication aerial R350 and the accompanying near field communication control unit J1169 (integrated in a module) is located in the driver door handle, which houses the driver side exterior door handle contact sensor G415.



The signal from the NFC near field communication aerial 2 R351 is routed from the Audi phone box to the near field communication control unit 2 J1170.



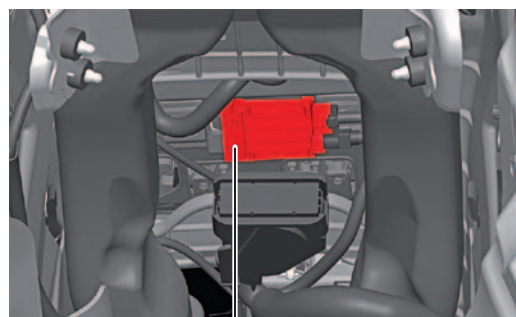
The two near field communication control units evaluate the signal of the respective near field communication aerial. Both control units are connected to the central comfort/convenience systems control unit J393- and exchange the data with the J393 via a private CAN. The NFC aerals are diagnosed by the diagnostic tester using diagnostic code 0046.

Accidental lock-out

- > If the last advanced key to be used is detected inside the vehicle, the vehicle cannot be locked from the exterior. An Audi connect key is, however, not detected inside the vehicle.



Installation position of control unit 2 for near field communication J1170



Installation position of control unit 2 for near field communication J1170

Control unit in dash panel insert J285

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

Information and instruments, such as the speedometer and rev counter, are displayed with absolute precision. The driver can choose between 2 views: In the classic view the gauges dominate the display, while in "Infotainment mode" the navigation system, telephone, Audi connect or media are highlighted.

The rain and light detector sensor G397 is responsible for automatic brightness control in the Audi virtual cockpit.

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 fitted on a transitional basis.

This photocell is no longer featured in the instrument cluster of the new Audi A8 (type 4N).

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



664_027

664_048

The display layout is that of a vehicle with an internal combustion engine. 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 Self Study Programme 628 "Audi virtual cockpit". Further information about the automatic brightness control system in the Audi virtual cockpit, refer to the Audi Service TV programme STV_0475_Audi A5_Interior lighting control.

Windscreen projection control unit (head-up display) J898

The optional head-up display, the windscreen projection control unit (head-up display) J898, projects warnings and selected information onto the windscreen 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 (type 4N) communicates with the diagnostic tester using diagnostic code 0082.

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.

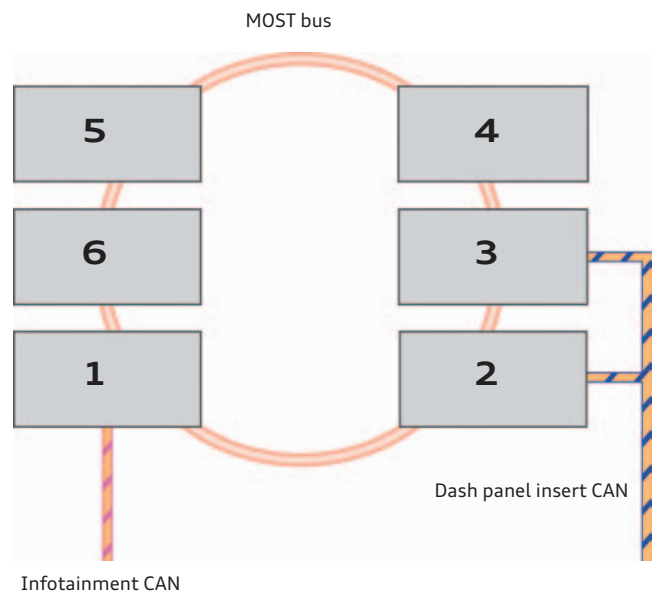
- > The head-up display is the only control unit connected to the optical bus system which does not participate in the component protection system.
- > The windscreen has to be replaced in order to remove the windscreen projection control unit (head-up display) J898. The individual steps are described 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 unit 1 J794
- 2 Control unit in dash panel insert J285
- 3 Windscreen projection control unit J898
- 4 DVD changer R161
- 5 TV tuner R78
- 6 Digital sound package control unit J525

Head-up display MOST bus interface

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

The information electronics control unit 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 the information electronics control unit 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

Trailer detector control unit J345

An electric swivelling towbar is available for the new Audi A8 (type 4N) as optional equipment.

The trailer detection control unit J345:

- > is used on all MLBevo platform vehicles.
- > can be accessed with the diagnostic tester via diagnostic code 0069.
- > participates in the vehicle network via the comfort/convenience systems CAN.
- > is installed in luggage compartment.

The trailer detection control unit J345 is available with 3 or 4 plug sockets. Control units with four plug sockets are used in the new Audi A8 (type 4N) with the "swivelling" towbar option.

Functions of the trailer detection control unit:

- > Trailer lighting activation (country-dependent)
- > Trailer can be illuminated with bulbs or LEDs
- > Trailer lamp diagnostics with function feedback
- > Emergency light function after processor or CAN failure
- > Trailer monitoring
- > Trailer power supply (switched terminal 30 charging cord)
- > Trailer power-off stages are possible
- > Locking status detection on models with swivelling towbar
- > Function feedback via instrument cluster and function LEDs in models with swivelling towbar

The trailer detection control unit J345 can be flashed using the diagnostic tester. Other functions, such as the detection and evaluation of the articulation angle sensors, are not used on the new Audi A8 (type 4N).

Installation location



664_057

Door control units J386/J387

Once again, four door control units are used on the new Audi A8 (type 4N).

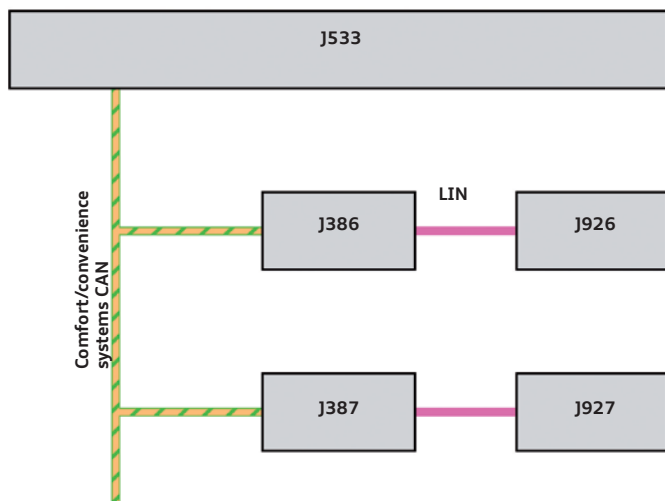
All door control units have their own diagnostic code and can be accessed using the diagnostic tester.

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 diagnostic codes are assigned to the control units:

- > Driver side door control unit J386: 0042
- > Front pass. side door control unit J387: 0052
- > Door control unit, rear driver side J926: 00BB
- > Rear pass. side door control unit J927: 00BC

Network overview

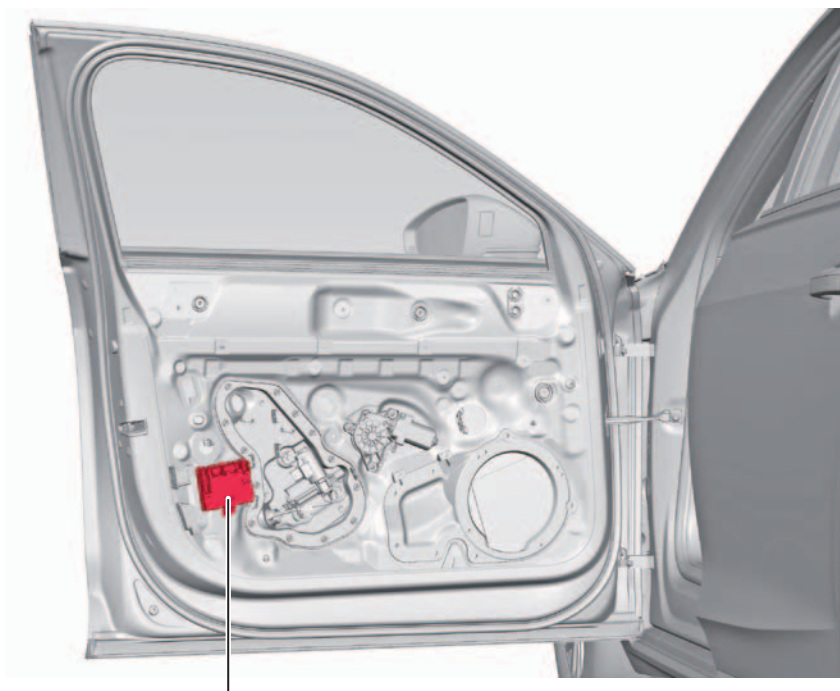


Key

- J386** Driver side door control unit
- J387** Front pass. side door control unit
- J533** Data bus diagnostic interface
- J926** Rear driver side door control unit
- J927** Rear pass. side door control unit

664_050

Installation location



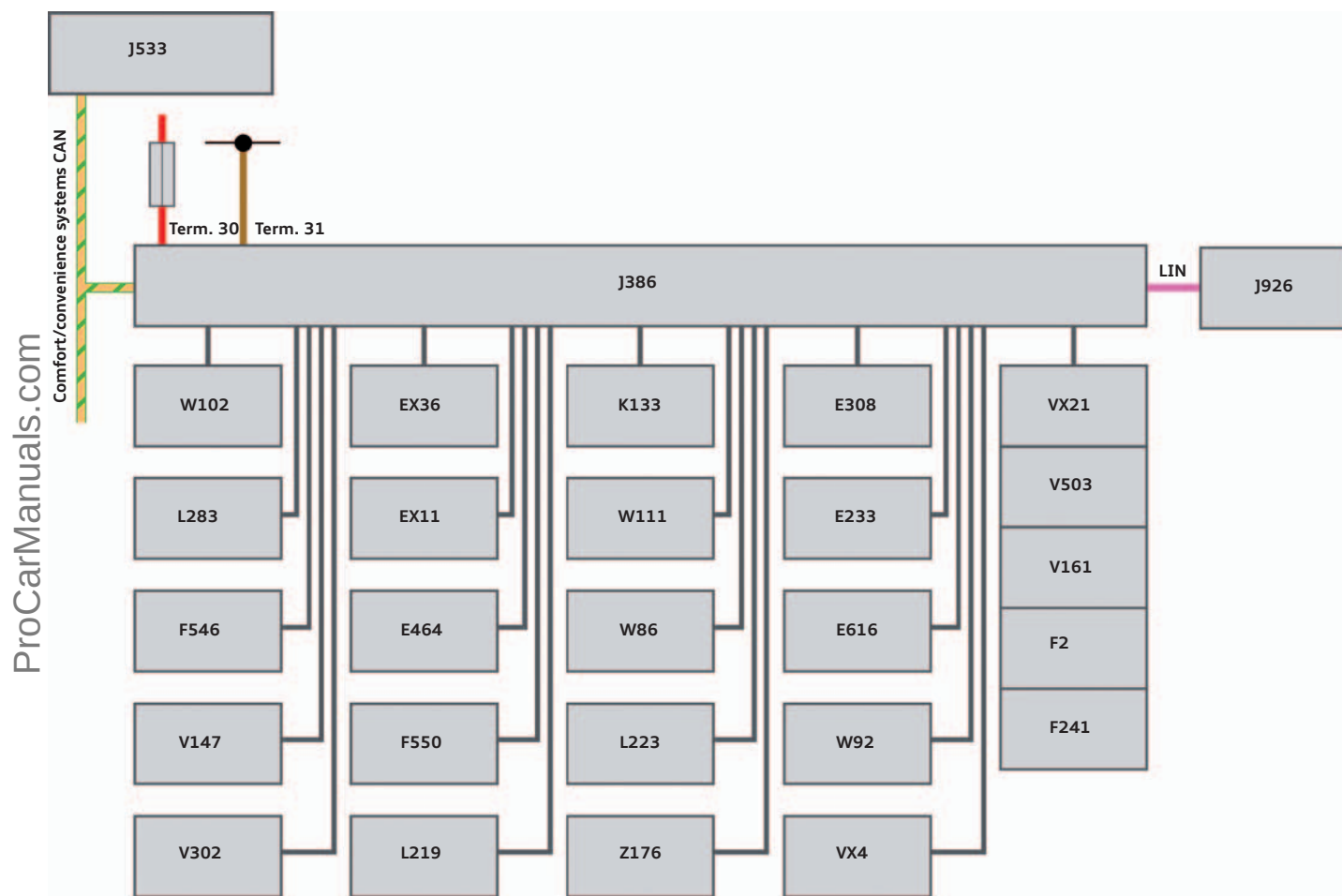
Installation location of the door control units using the driver's door as an example

664_051

Driver side door control unit J386

Components of the driver side door control unit J386:

- > A large number of actuators are connected directly to the door control units. Taking the driver side door control unit 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 lifter motor
- > The driver side exterior door handle switch
- > The driver door locking unit with SAFE function and the central locking motor
- > The window lifter operating unit in the driver's door and the childproof lock button
- > The button for driver side memory adjustment
- > Heating element 2 for front driver side door trim
- > Button for remote unlocking the boot 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

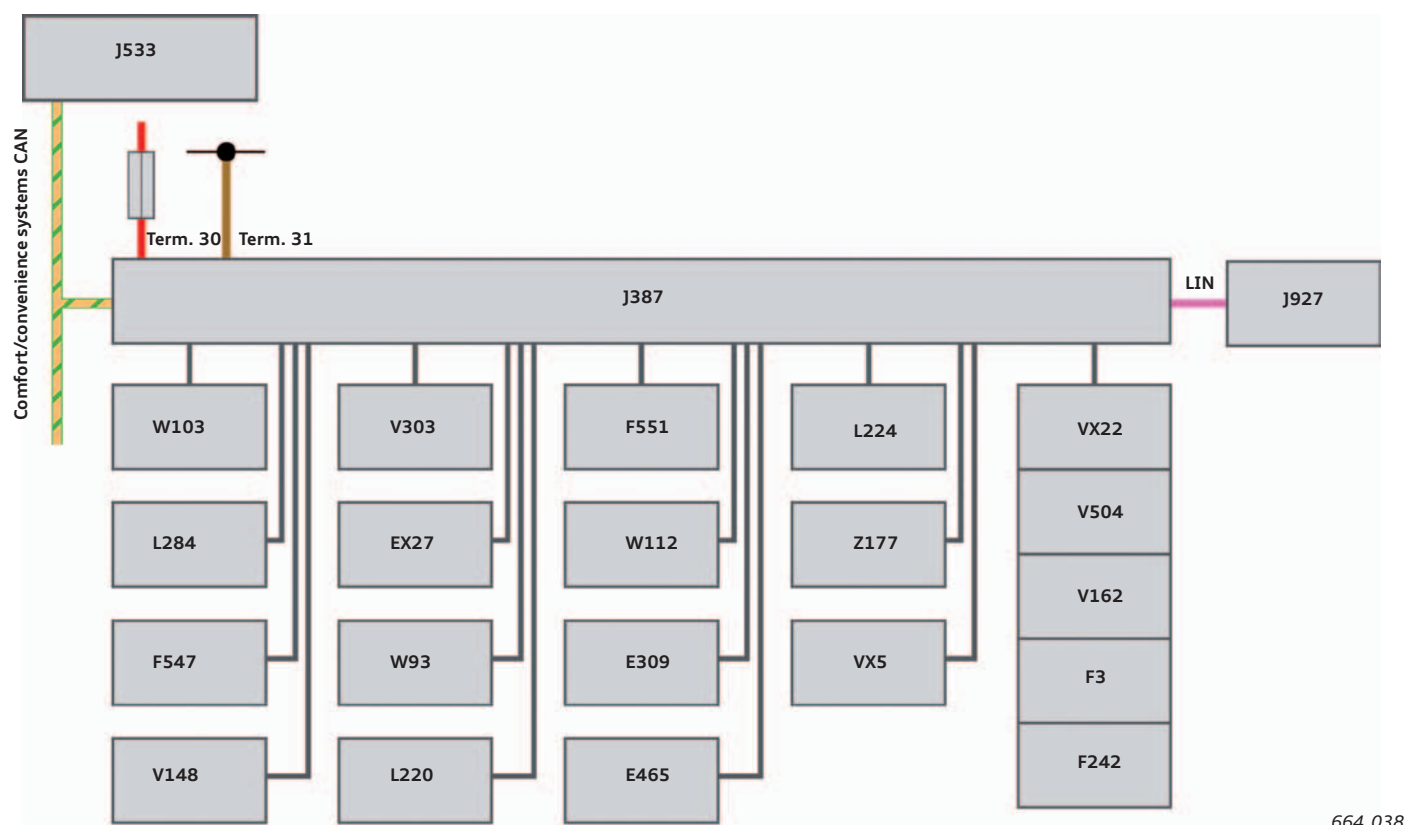


664_037

Key

- | | |
|---|--|
| E233 Boot lid remote release button | V147 Window lifter motor, driver side |
| E308 Driver side interior locking button | V161 Central locking SAFE function motor in driver door |
| E464 Operating unit for driver side memory adjustment | V302 Driver door power closing motor |
| E616 Button for deactivating the interior monitoring system and vehicle inclination sensor | V503 Driver side central locking motor |
| F2 Driver side door contact switch | W86 Driver side door background light (optional) |
| F241 Key contact switch in lock cylinder, driver side | W92 Driver side door sill courtesy light |
| F546 Driver side exterior door handle switch | W102 Background light of driver side door sill courtesy light |
| F550 Driver side interior door handle switch | W111 Driver side exit warning light |
| J386 Driver side door control unit | Z176 Heating element 2 for front driver side door trim |
| J533 Data bus diagnostic interface | EX11 Door mirror adjustment |
| J926 Rear driver side door control unit | EX36 Operating unit for driver door window lifters |
| K133 Indicator lamp for SAFE function of central locking system | VX4 Driver side door mirror |
| L219 Driver side interior door handle light | VX21 Driver door locking unit |
| L223 Door loudspeaker trim panel light, driver side | |
| L283 Driver side exterior door handle light | |

Front pass. side door control unit J387



664_038

Key

- | | |
|---|---|
| E309 Front pass. side interior locking button | W93 Front pass. side door sill courtesy light |
| E465 Operating unit for front pass. side memory adjustment | W103 Background light of front pass. side door sill courtesy light |
| F3 Front pass. side door contact switch | W112 Front pass. side exit warning light |
| F242 Key contact switch in lock cylinder, front pass. side | Z177 Heating element 2 for front pass. side door trim |
| F547 Front pass. side exterior door handle switch | EX27 Front pass. door window lifter switch |
| F551 Front pass. side interior door handle switch | VX5 Front pass. side door mirror |
| J387 Front pass. side door control unit | VX22 Front pass. door locking unit |
| J533 Data bus diagnostic interface | |
| J927 Rear pass. side door control unit | |
| L220 Front pass. side interior door handle light | |
| L224 Door loudspeaker trim panel light, front pass. side | |
| L284 Front pass. side exterior door handle light | |
| V148 Window lifter motor, front pass. side | |
| V162 Central locking SAFE function motor in front pass. door | |
| V303 Front pass. door power closing motor | |
| V504 Front pass. side central locking motor | |

Seat adjustment and seat memory control unit J136/J521

The new Audi A8 (type 4N) 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 3 stages.

The seat ventilation system is equipped with 2 fans per seat - one in the seat swab 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.

The fans have been redesigned and are now more powerful than the seat fans of the Audi Q7. This improves moisture transport away from the seat.

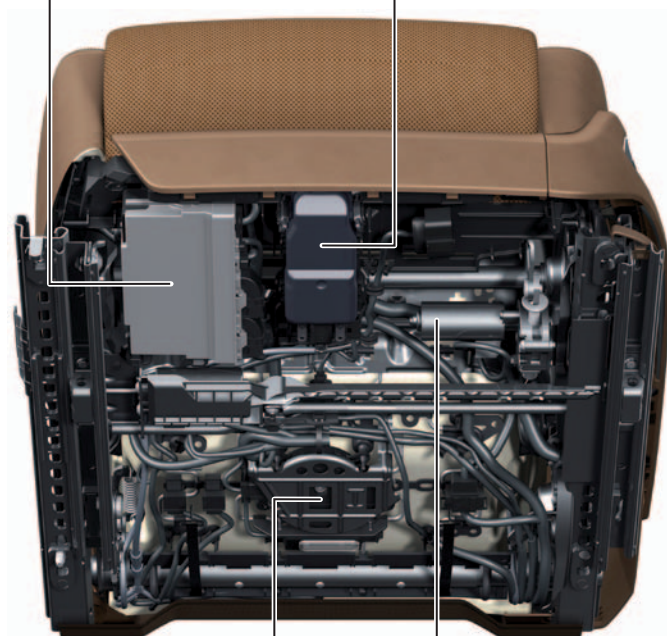


Seat and steering column adjustment control unit with memory function J136

664_088

Seat and steering column adjustment control unit with memory function J136

Compressor for multi-contour seat in driver seat V439



664_090

Fan for driver seat cushion V390

Driver seat longitudinal adjustment motor V28

Driver side massage function button E670

Front driver side seat switch module E663



664_089

Lumbar support adjustment button

Reclining seat in Audi A8 L

The Audi A8 (type 4N) is optionally available with individual rear seats. Only the right seat has a 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 in Remote Seat Remote, the leg rest is folded out and the Audi tablet is folded forward. In the reclining position the front passenger seat may no longer be used.



664_138



664_139

Sliding sunroof control unit J245/J392

The panoramic glass sunroof has 2 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.

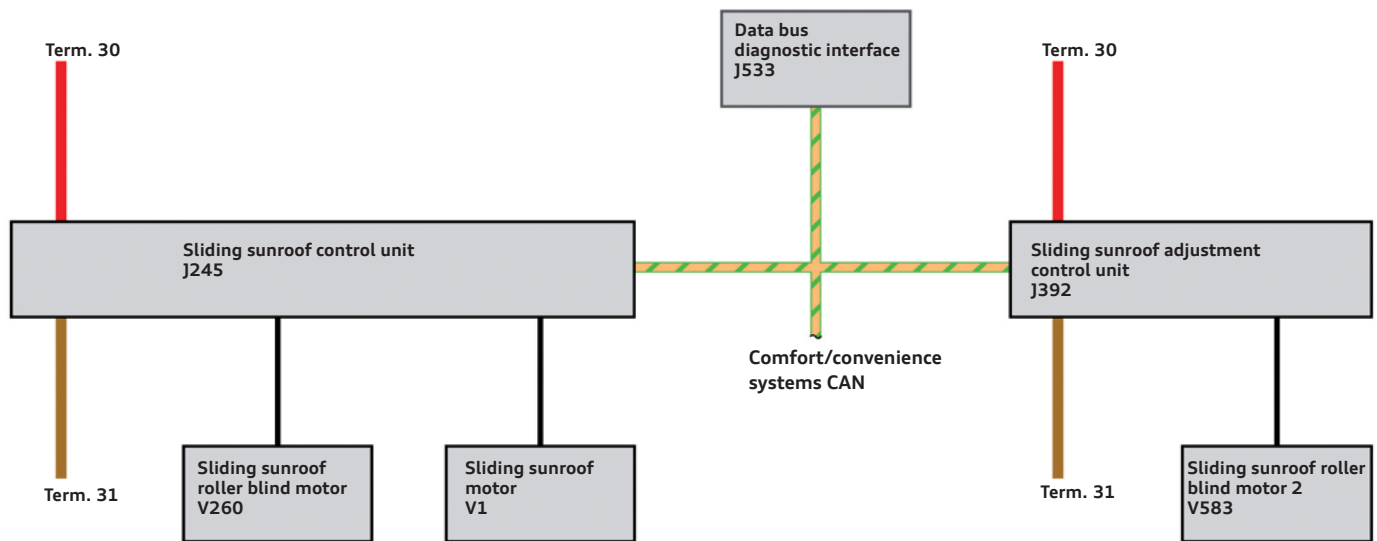
The panoramic glass sunroof and the front roof roller blind can also be pushed open or closed in a single motion by pushing or pulling the sliding sunroof button E325 to the second position twice in short succession.

Unlike the panoramic glass sunroof of the previous model, the Audi A8 L (type 4H), the rear sunroof segment cannot be lifted. The rear sliding sunroof control unit J392 no longer incorporates the rear sliding sunroof motor V146.

Tasks of the rear sliding sunroof control unit 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



Installation location of control units J245 and J392

664_059



664_137

Electrically adjustable steering column control unit J866

The electric steering column adjustment allows the driver to set the steering wheel position in the new Audi A8 (type 4N). The electric steering column adjustment control unit has a terminal 30 power supply. This ensures that the steering wheel can be positioned even when the ignition is off.

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

A type of 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 turned off.

The electrically adjustable steering column control unit J866 implements the driver commands, which are transmitted via the steering column adjustment switch E167. J866 participates in bus communication within the vehicle as a LIN bus user of the electrical system control unit J519.

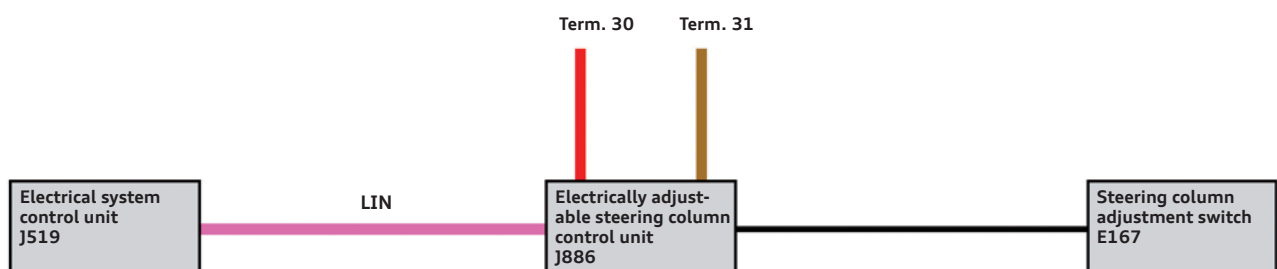
The electrically adjustable steering column control unit is located directly at the steering column. It can be accessed under diagnostic code 0009 as a LIN user of the electrical system control unit.



Electrically adjustable steering column control unit J866

664_025

Schematic diagram of the networking system



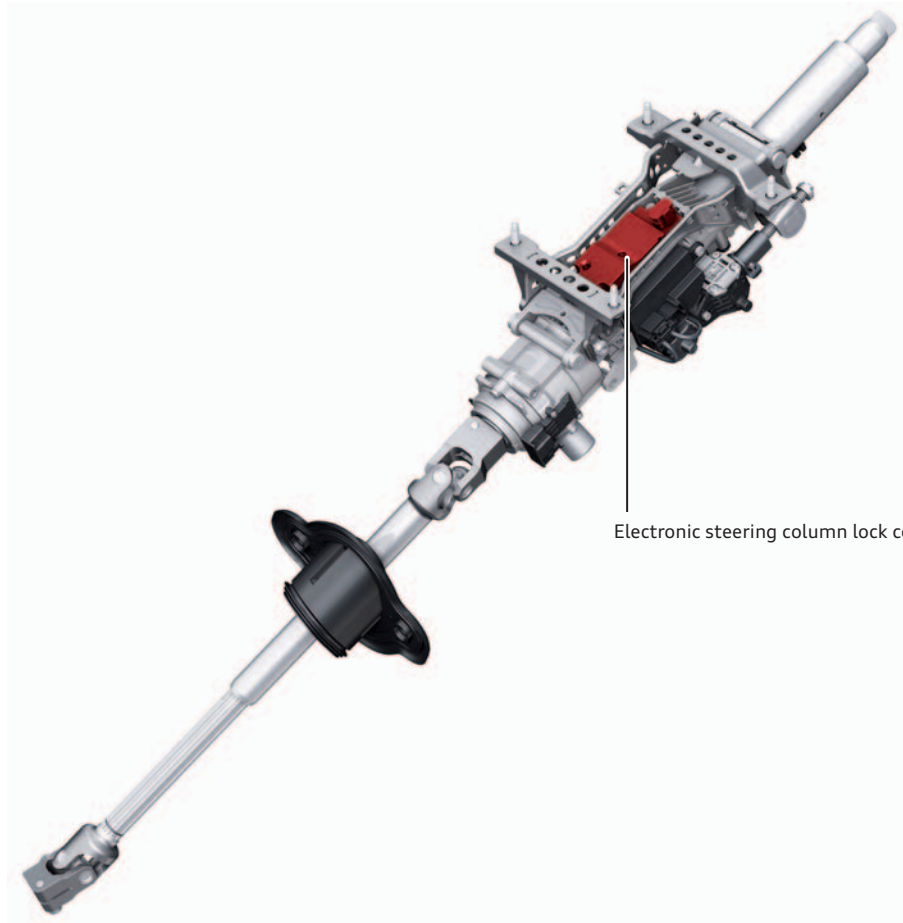
664_026

Electronic steering column lock control unit J764

The electronic steering column lock control unit J764 is located directly at the steering column. Depending on country, it is fitted in models equipped with an automatic gearbox. It can be accessed with the diagnostic tester under diagnostic code 002B. The steering column can only be locked if all locking conditions are met.

The following conditions apply:

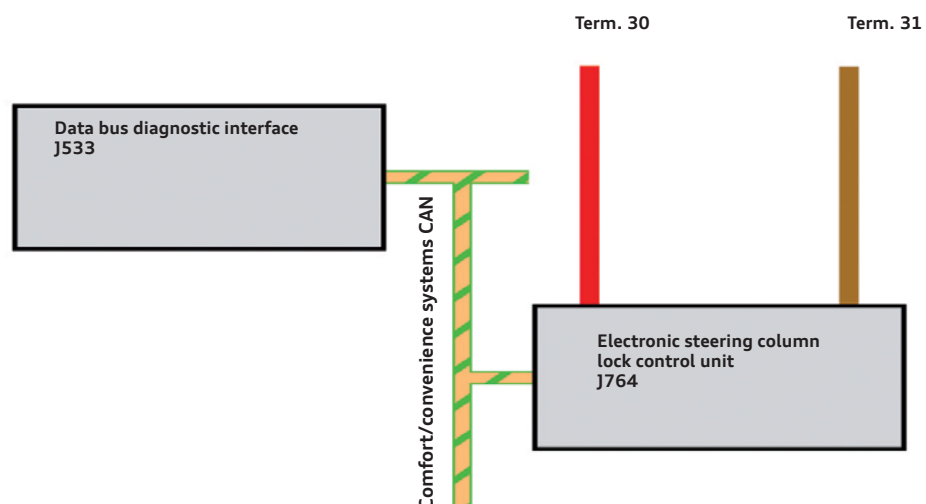
- > Vehicle is travelling at 0 kph
- > Engine is not running
- > Selector lever is in "P"
- > Terminal 15 is off
- > The NO contact is off



Electronic steering column lock control unit J764

664_058

Schematic diagram of the networking system



664_086

Steering column electronics control unit J527

The steering column electronics control unit J527 represents the interface between the vehicle network and the functions in the steering wheel area.

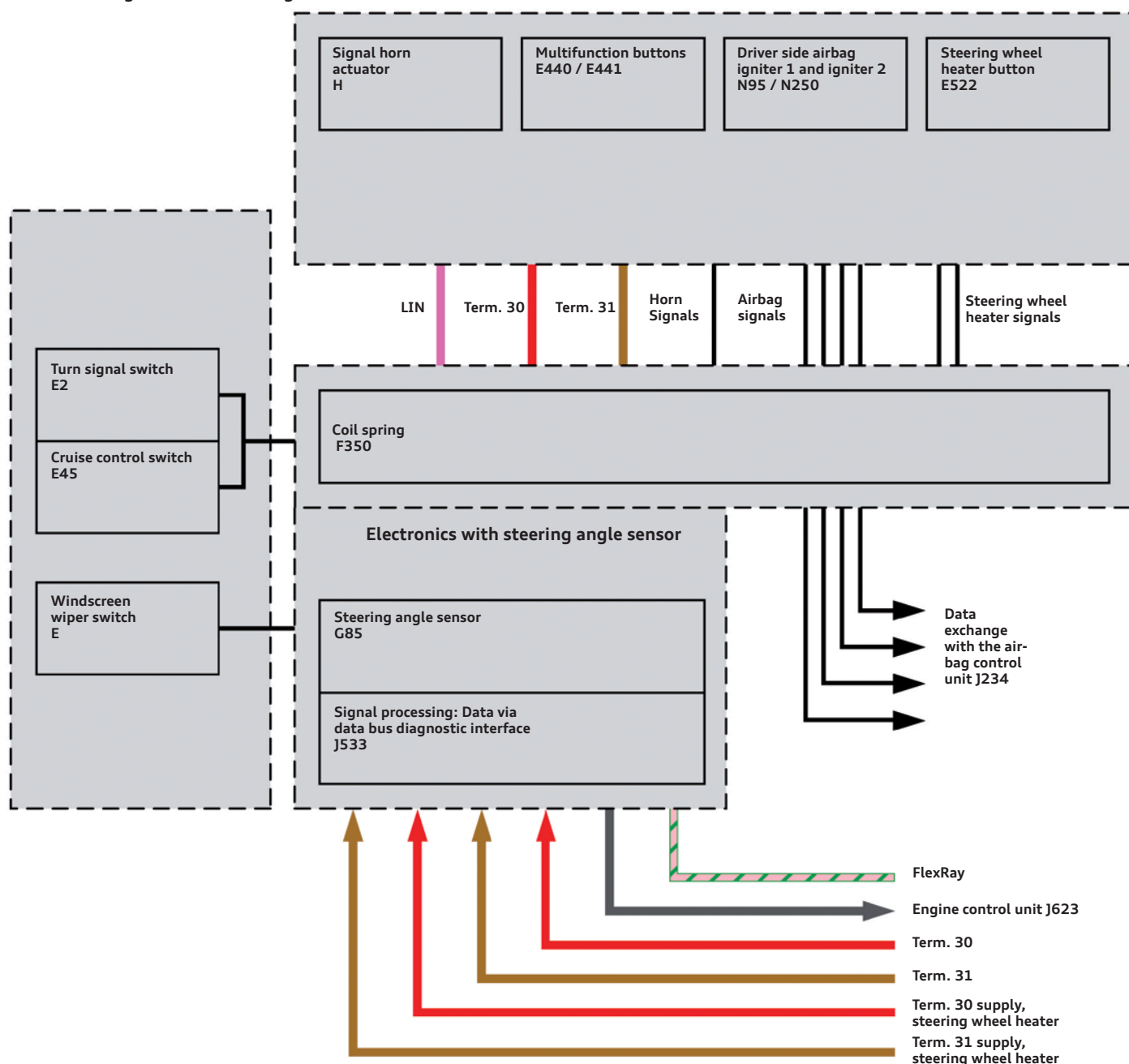
The functions are:

- > Turn signal switch E2
- > Cruise control switch E45
- > Windscreen wiper switch for intermittent mode E22
- > Airbag coil spring F350
- > Coil spring for airbag and resetting ring with collector ring F183
- > Airbag module in steering wheel
- > Steering angle sensor G85
- > Signal horn actuating switch
- > Audi lane assist button E517
- > Multifunction steering wheel control unit J453
- > Multifunction steering wheel button module
- > Steering wheel heating

The steering column electronics control unit J527 is a FlexRay bus system user.

The control unit can be accessed using the diagnostic tester under diagnostic code 0016.

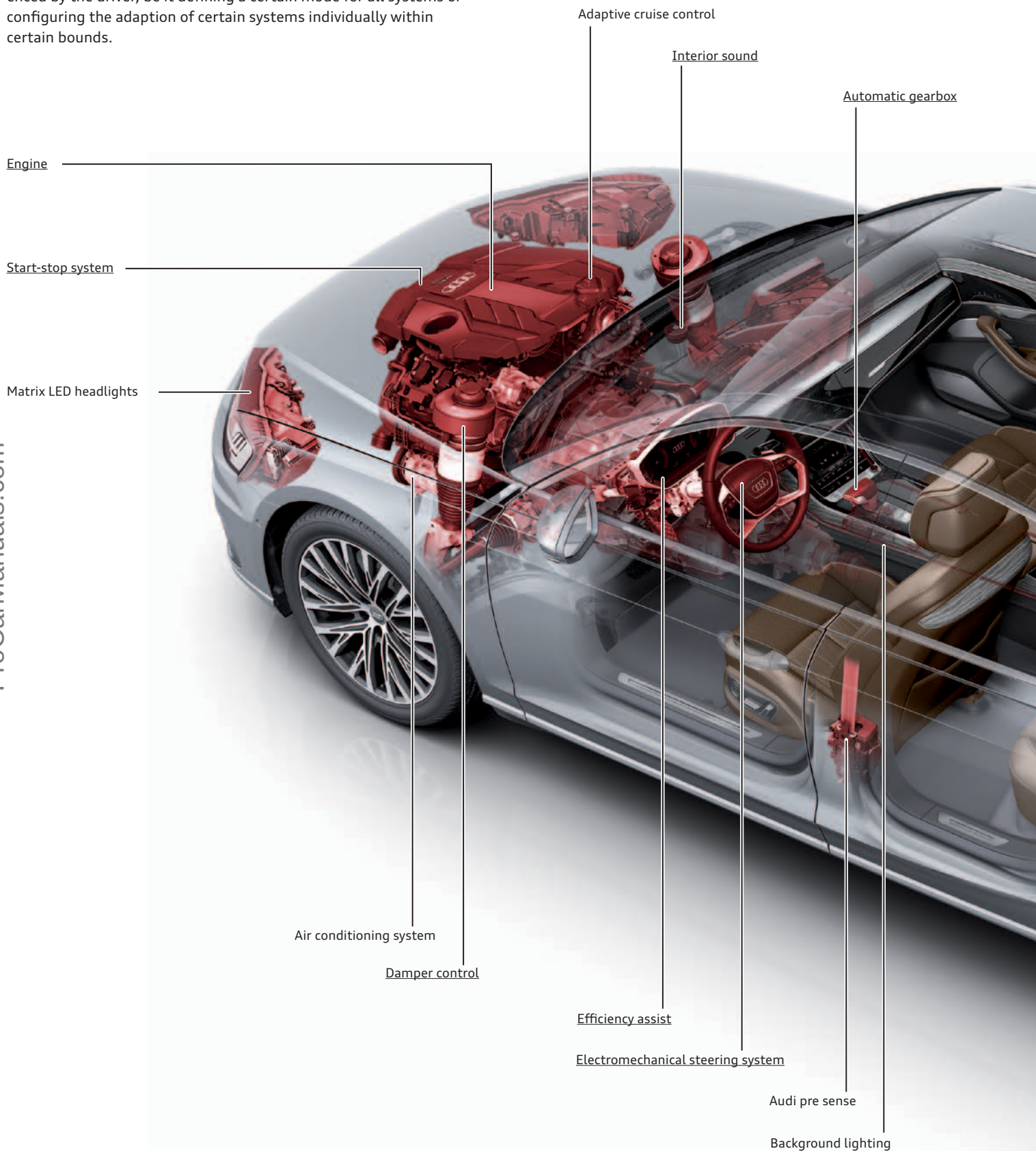
Schematic diagram of the steering wheel electronics



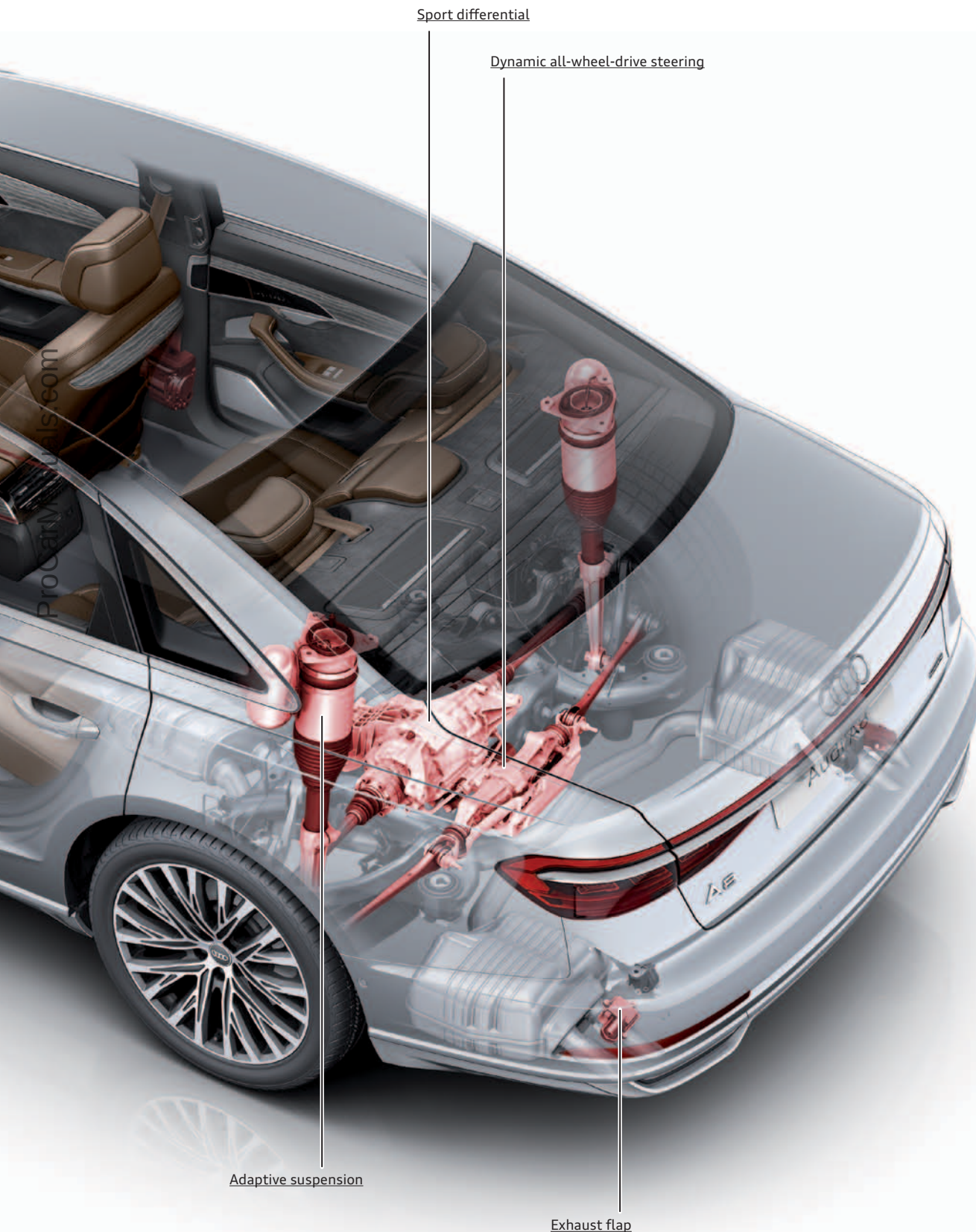
Audi drive select

Controllable systems

Audi drive select enables numerous vehicle systems to be influenced by the driver, be it defining a certain mode for all systems or configuring the adaption of certain systems individually within certain bounds.



In any case, steering assistance, the gearbox control unit, the engine characteristic and suspension control are affected. In addition to this, the system affects the equipment shown in the diagram. The highlighted systems can be influenced in "individual" mode.



Driving modes

The Audi A8 (type 4N) is equipped with the Audi drive select system. With Audi drive select, it is possible to modify the vehicle characteristic.

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

In the Audi A8 (type 4N), the driver can select between the following drive modes:

- > **efficiency** mode (not available for North American market)
- > **comfort** mode
- > **auto** mode
- > **dynamic** mode
- > **individual** mode

"individual" mode

In **individual** mode the vehicle systems are subdivided into 4 groups:

- > Driveline
- > Steering
- > Suspension
- > Engine sound

Drive group:

Settings: efficient, balanced, dynamic

Users:

- > Engine
- > Start-stop system
- > Automatic gearbox
- > Sport differential
- > Efficiency assist

Suspension group:

Settings: comfortable, balanced, dynamic

Users:

- > Damper control
- > Adaptive suspension

Functional features

- > The profile assigned to the car key and the individual settings are loaded after a terminal 15 changeover.
- > To active the newly selected mode for the engine as well, 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 as well, 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.

efficiency mode configures the car for fuel economy, reduces the output of the A/C and helps the driver conserve fuel (not available for the North American market).

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 customised in **individual** mode.

The driver has 3 adjustment options for each group. All vehicle systems within a group have the same operating characteristic. The 4 groups and the corresponding vehicle systems are listed below.

Steering group:

Settings: comfortable, balanced, dynamic

Users:

- > EPS
- > Dynamic all-wheel-drive steering

Engine sound group:

Settings: subdued, balanced, pronounced

Users:

- > Interior sound
- > Exhaust flaps

- > In dynamic mode gearbox position S is selected automatically, while in efficiency mode gearbox position E is selected automatically.
- > The start-stop system is generally activated when the vehicle is running in efficiency mode.

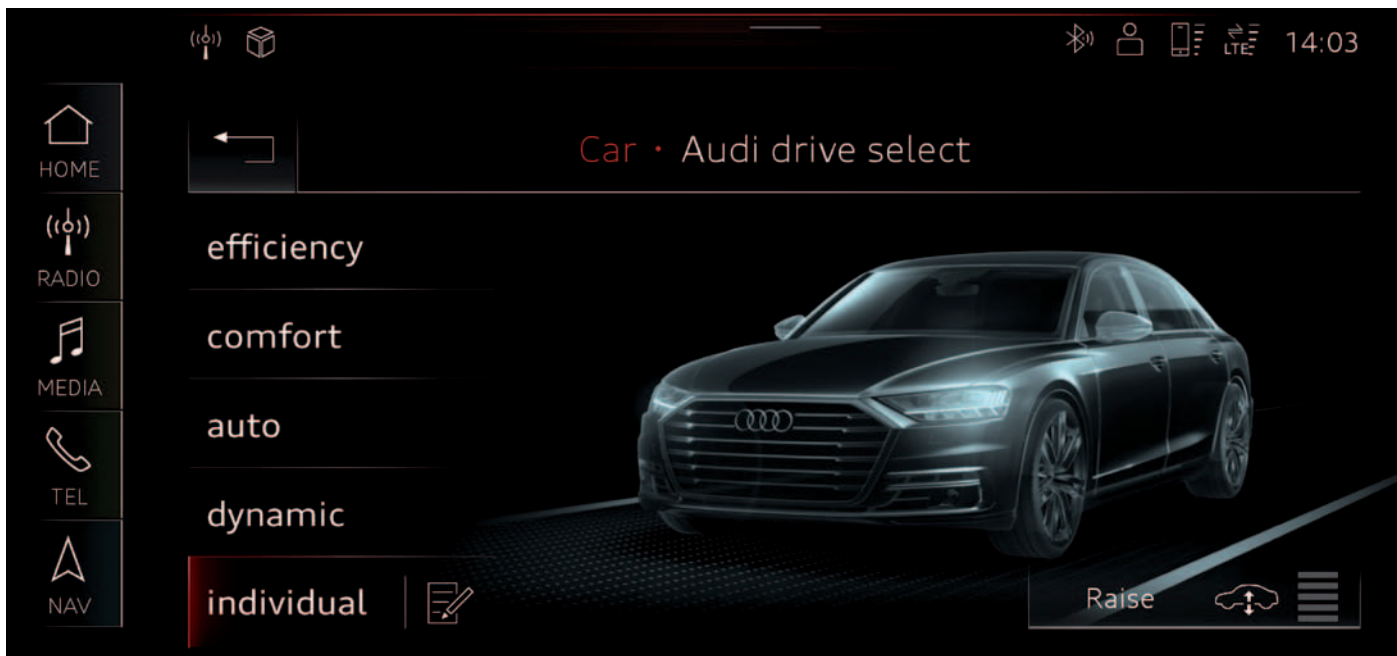
Certain systems (e.g. engine, gearbox, start-stop system) always revert to a defined state after a terminal 15 changeover (engine and gearbox return to "D", start-stop system is activated), regardless of which profile is active. These users remain unchanged until a new profile is selected.

Displays and operation

The Audi drive select system can be adjusted by pushing the Audi drive select button in the centre dash panel switch module EX22 in the centre console or via the MMI display J685.

The options menu containing the 5 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 MMI display J685



664_125

Operation via centre dash panel switch module EX22

Drive select button



664_126

Exterior lighting

Operation

Light switch E1

General description

The Audi A8 (type 4N) features a new operating concept for the light switches. In addition to this, a so-called light switch module has taken the place of the rotary light switch. However, the service designation "Light switch E1" is unchanged. The installation location in the dash panel is also the same as in the other Audi models. Light switch E1 is a LIN slave of the electrical system control unit J519.

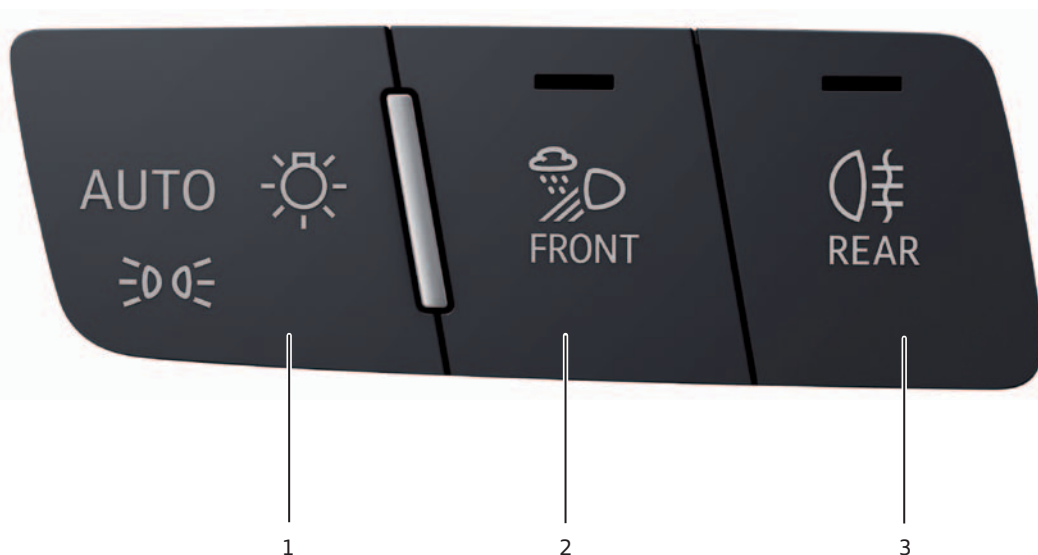
A distinction is made between 2 versions:

- > Standard light switch module with 3 mechanical buttons
- > Optional light switch module with sensor foil

The light switch module with sensor foil is optional (PR no. GS4/GS5 - operating button with a glossy finish and tactile feedback).

Standard light switch module

ProCarManuals.com



664_164

- | | |
|---|--|
| <p>1 Hardware or software button for the light functions: AUTO, dipped beam, side lights, OFF</p> <p>2 Hardware or software button for the all-weather lights (minimises self-dazzle effect, e.g. on wet roads)</p> | <p>3 Hardware or software button for the rear fog light function</p> |
|---|--|

Operating concept

The default³⁾ setting of the light switch module is "AUTO". This means that the "AUTO" position is selected automatically after each terminal 15 changeover. Functions such as main beam assist, matrix beam and the laser lights can be only be used in this position.

If the button is pressed once, the dipped beam is activated on the condition that terminal 15 is "on".

When the button is pressed again, the side lights are activated on the condition that the vehicle is travelling at a speed of less than 10 kph.

Pressing the button again deactivates all light functions on the condition that the vehicle is travelling at a speed of less than 10 kph.

If the "Side lights" or "OFF" switch position has been selected and the vehicle exceeds a speed of 10 kph, 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 a certain 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 the MMI display J675, the lower touch screen J1060 and the switch panel 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



664_165

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.

Main beam assist, the laser lights and the entry/exit lights can be selected and deselected in the MMI. If main beam assist has been deselected in the MMI, the main 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, certain light functions of 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	Dipped beam + side lights + tail lights
Matrix LED headlights	Dipped beam + side lights + tail lights
Matrix LED headlights with laser lights	Dipped lights + staggered activation of the side lights and tail lights



Reference

For further information about the headlight versions and the light functions, refer to the following pages of this self study programme.
Further information on operating and setting the exterior lighting can be found in the vehicle owner's manual.

Headlights

Headlight versions

In the case of the Audi A8 (type 4N) distinctions are made between the following headlight versions:

- > LED headlights (ECE¹⁾ and SAE²⁾)
- > Matrix LED headlights (ECE¹⁾ and SAE²⁾)
- > Matrix LED headlights with laser lights (ECE¹⁾ and SAE²⁾)

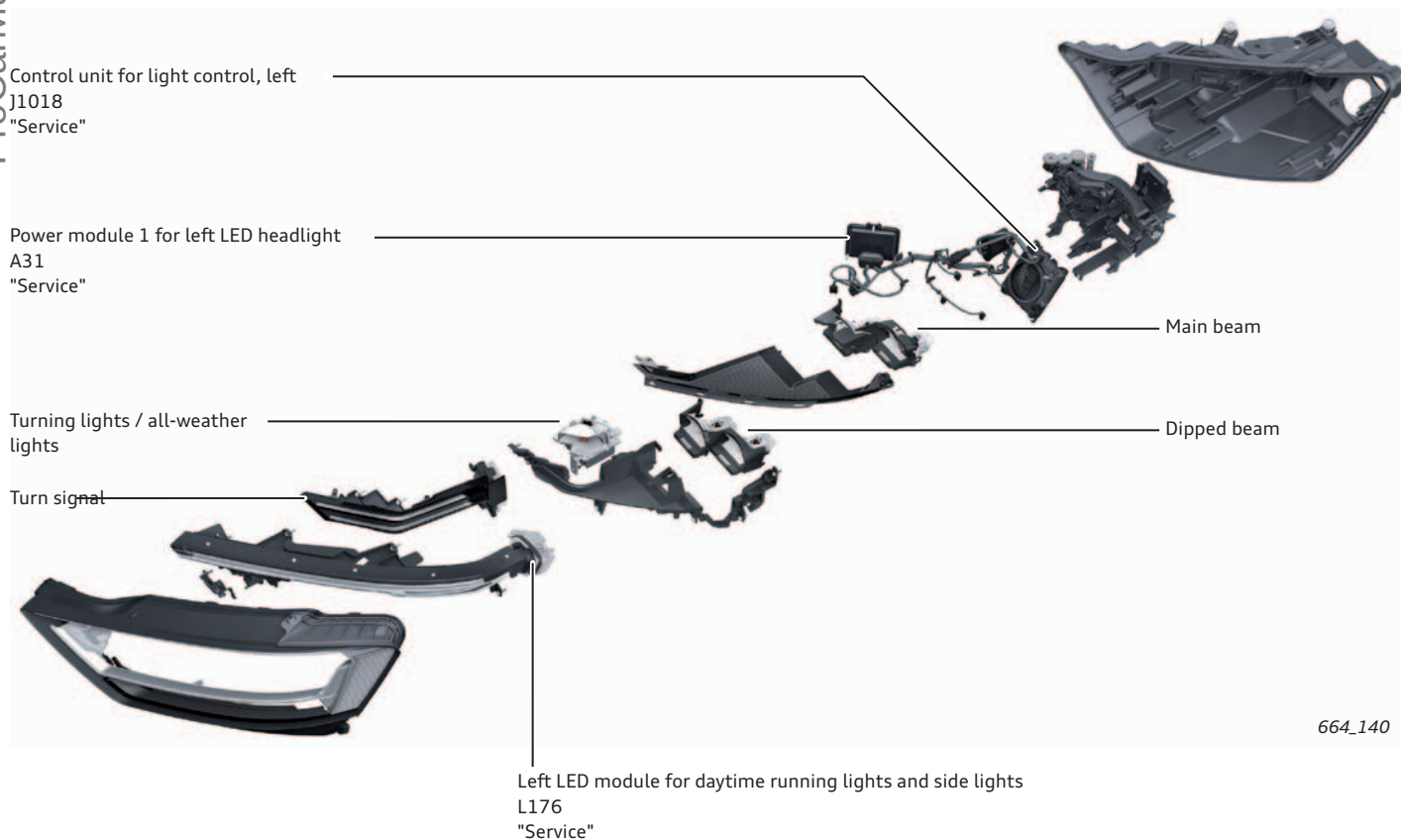
General description

Only LEDs or laser diodes are used as light sources for the headlights of the Audi A8 (type 4N). 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. Before the headlights can be removed, the bumper cover has to be detached. 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 descriptions of the headlights can be replaced individually in case of damage. Due to the fact that adaptive suspension is fitted as standard, it was possible to dispense with headlight range control in all headlight versions.

LED headlights PR no. 8IT + 8G1

The figure shows the left headlight in the ECE¹⁾ version.



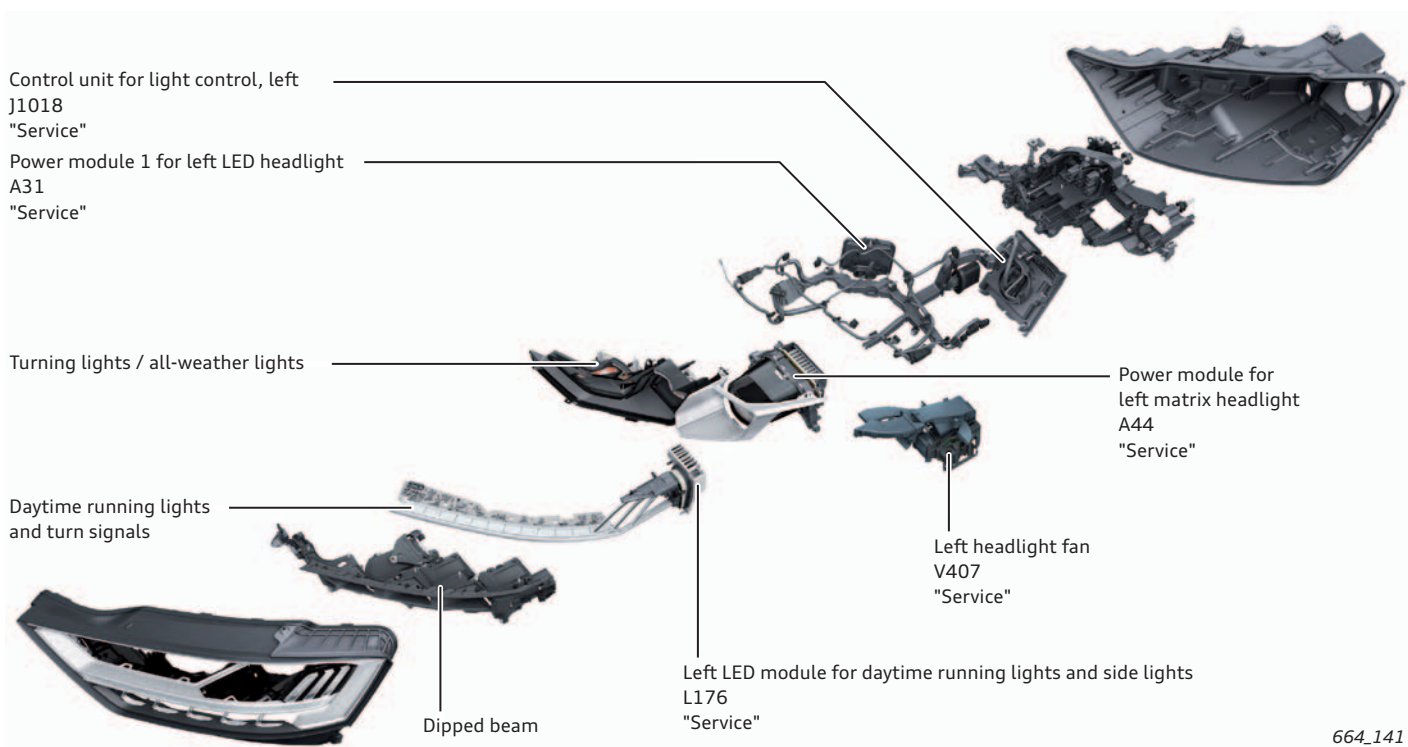
664_140

¹⁾ ECE = for the European market

²⁾ SAE = for the North American Region

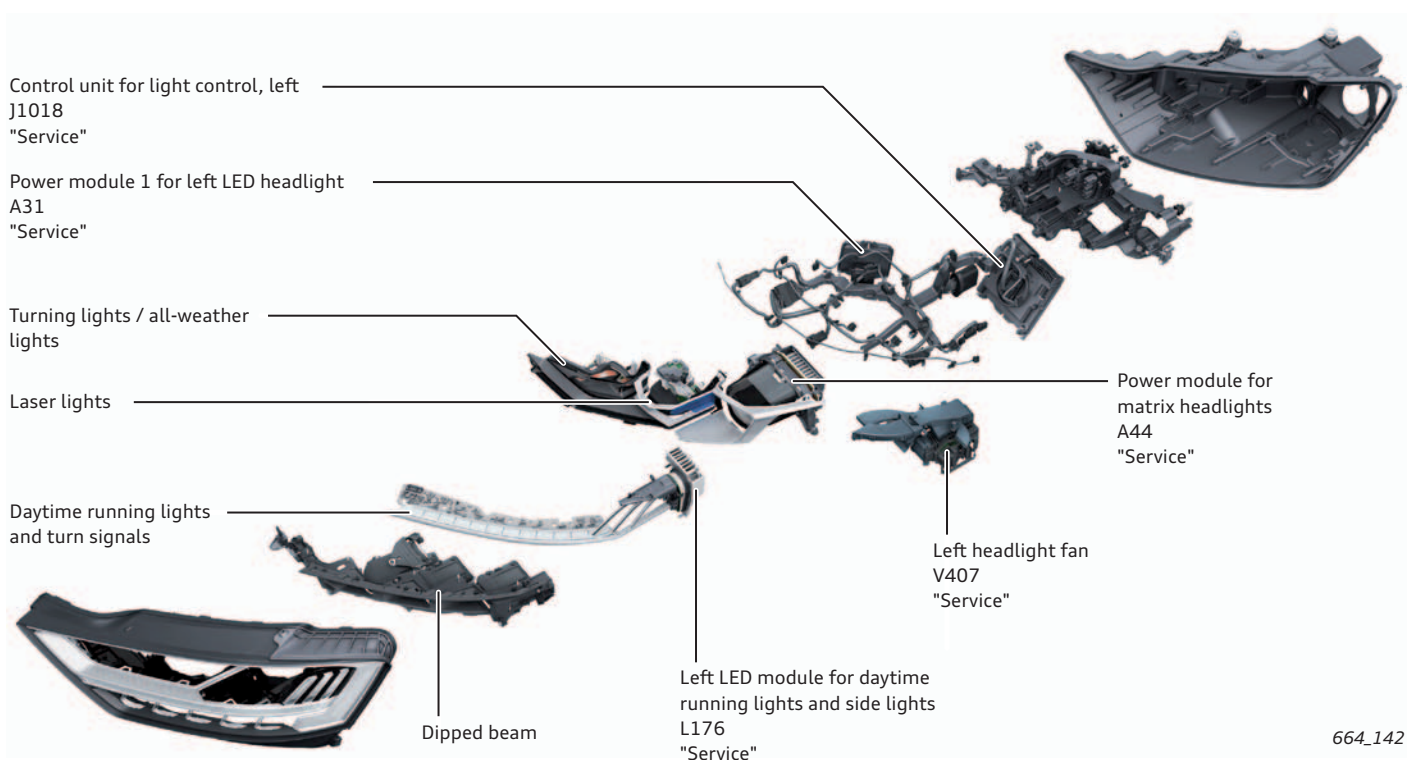
Matrix LED headlight PR no. 8IT + 8G5

The figure shows the left headlight in the ECE¹⁾ version.



Matrix LED headlight PR no. 8IZ + 8G5

The figure shows the left headlight in the ECE¹⁾ version.

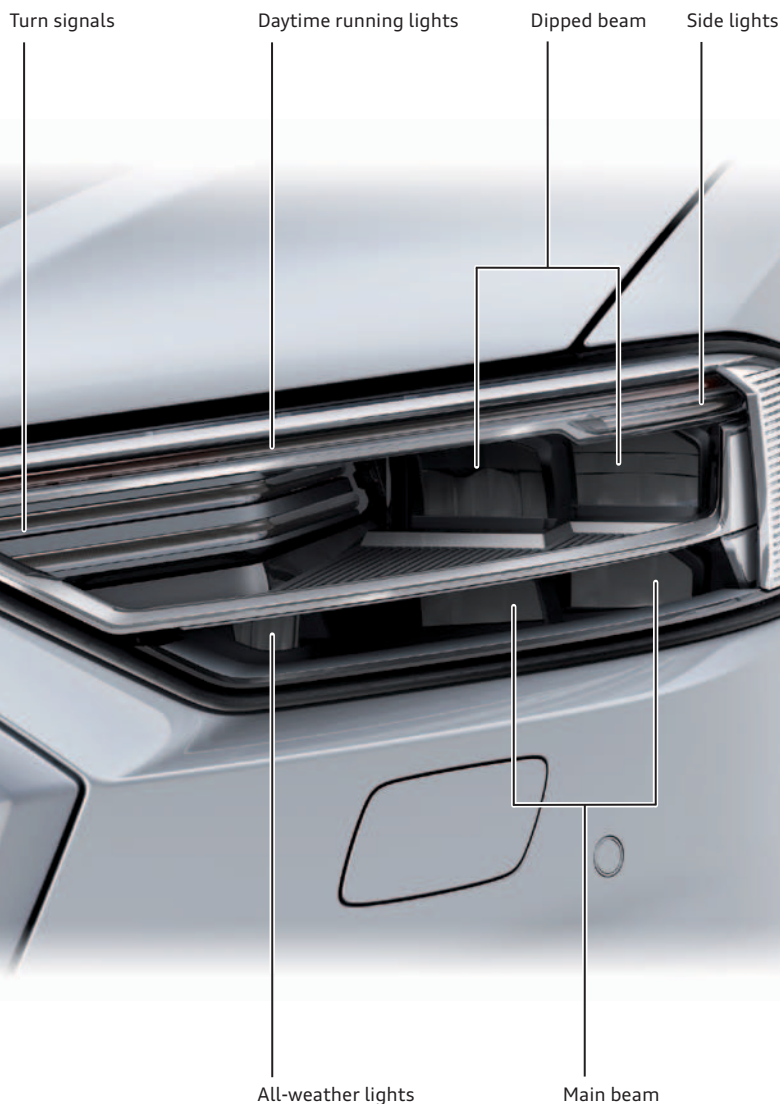


Note

For information on installation and removal as well as the corresponding spare part numbers, please refer to the workshop manual or the electronic parts catalogue.

LED headlights

The figure shows the ECE¹⁾ version



664_143

Light functions:

- > Daytime running lights
- > Side lights
- > Dipped beam
- > Main beam
- > All-weather lights
- > Turn signals
- > Side marker light (SAE²⁾ not shown)

Special features of the light functions

In the light switch position "AUTO" the daytime running lights and the side lights are not active until the vehicle is travelling at a speed of greater than 10 kph. The daytime running lights in the ECE¹⁾ version are dimmed to side lights level for the duration of the turn signalling cycle (in the SAE²⁾ 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.

Adaptation for driving on the opposite side of the road

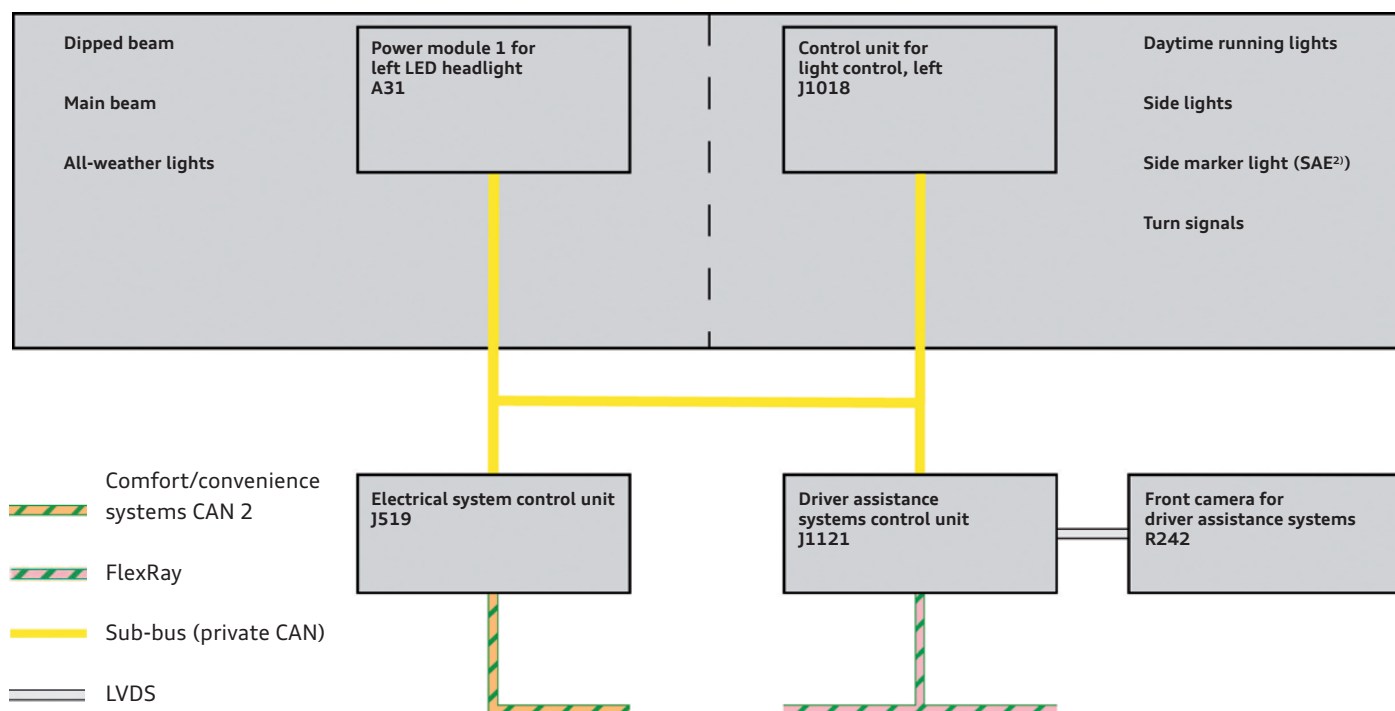
The headlights have to be adapted for driving in countries where vehicles drive on the opposite side of the road. This adjustment can be made by the driver in the MMI. The dipped beam LEDs are then dimmed, reducing the range of the dipped beam and reducing the dazzling effect on oncoming traffic.

Equipment

The LED headlights are combined as standard with main 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

The electrical system control unit J519 communicates with the left/right power modules 1 for the LED headlights A31/A27 as well as the left/right control units for light control J1018/J1023 via a sub-bus system. The power modules 1 for the LED headlights are responsible for activating the LEDs for the dipped beam, the main beam and the all-weather lights. The control units have self diagnostic capability and can be accessed via diagnostic codes 00D6/00D7.

The left/right control units for light control J1018/1023 are responsible for the side lights/daytime running lights, the turn signals and the side marker lights in the SAE²⁾ version. The control units have self diagnostic capability and can be accessed via diagnostic codes 0029/0039.

Main beam assist

The driver assistance systems control unit J1121, in conjunction with the front camera for driver assistance systems E242, is responsible for the main beam assist function. When the camera detects oncoming vehicles or preceding vehicles, it sends this information to the driver assistance systems control unit.

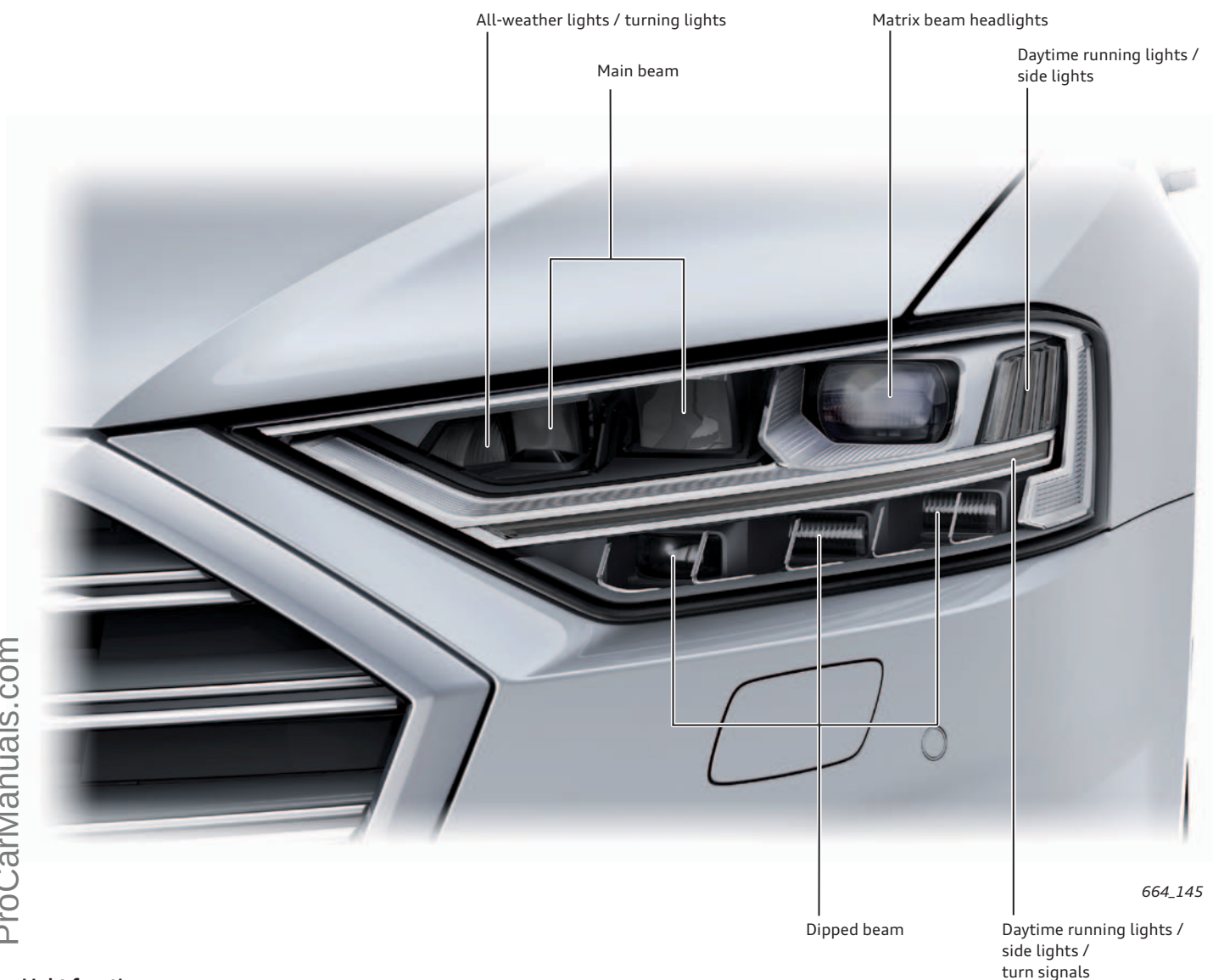
The driver assistance systems control unit then switches off the main beam to avoid dazzling other road users. This version of main beam assist can have 2 states: "main beam on" or "main beam off".

¹⁾ ECE = for the European market

²⁾ SAE = for the North American Region

Matrix LED headlights

The figure shows the ECE¹⁾ version



Light functions:

- > Daytime running lights
- > Side lights
- > Dipped beam
- > Matrix beam headlights

Special features of the light functions

In the light switch position "AUTO" the daytime running lights and the side lights are not active until the vehicle is travelling at a speed of greater than 10 kph. In the ECE¹⁾ version the daytime running lights and the side lights are switched off for the duration of the turn signalling cycle. In the SAE²⁾ version only the daytime running lights are deactivated, but the side lights stay switched on.

Service

The control units 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.

- > All-weather lights
- > Turning lights
- > Dynamic turn signal function
- > Side marker light (SAE²⁾ not shown)

Adaptation for driving on the opposite side of the road

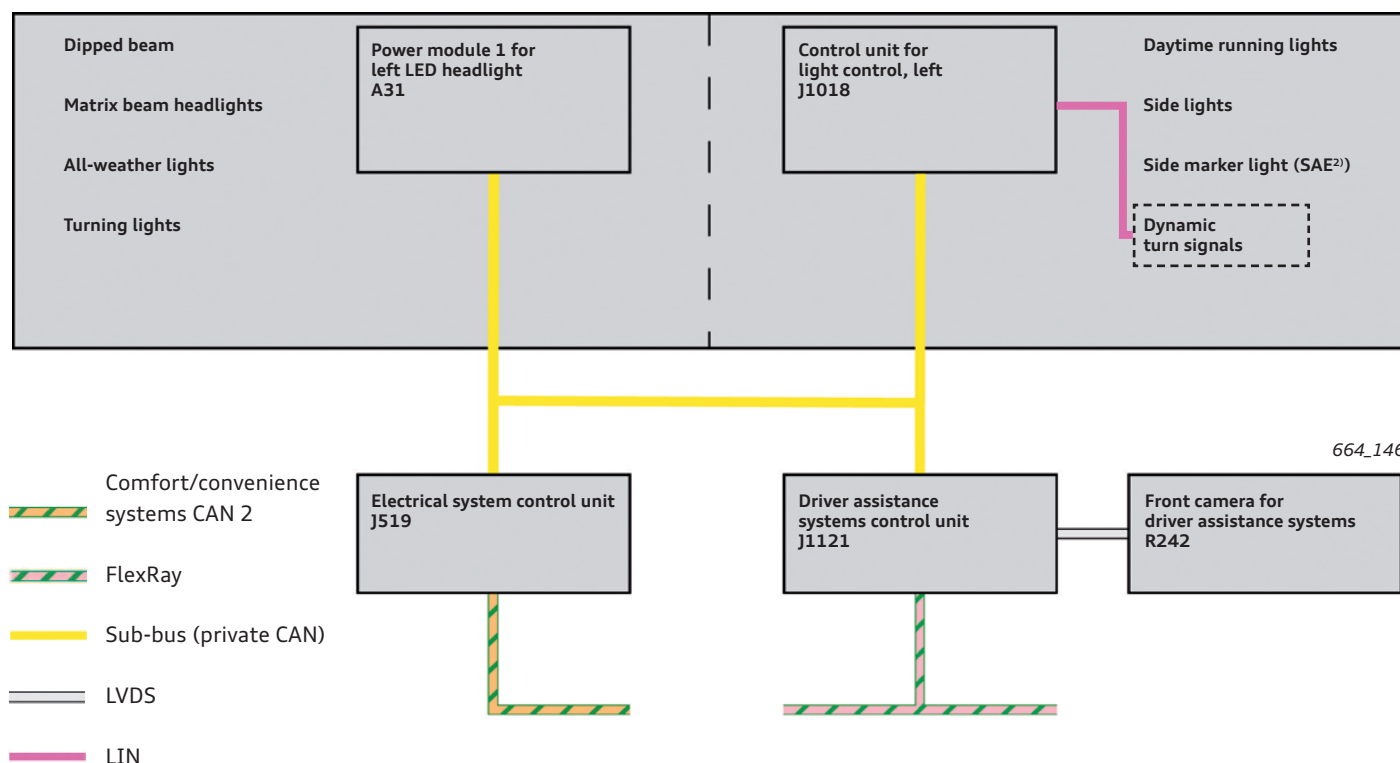
It is not necessary to adapt the headlights. No other measures are needed in order to meet statutory requirements.

Equipment

Audi A8 (type 4N) 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



664_146

Activation

The light functions in the matrix LED headlights are similar to those of the LED headlights. The left and right power modules for LED headlights 1 A31/A27 are now also responsible for activating the matrix beam headlights and the turning lights.

The left/right control units for light control J1018/J1019 additionally have a LIN connection. The dynamic turn signals are activated via this data connection.

Main beam assist

The main beam assist function of the matrix LED headlights can not only have the states "main beam on" and "main 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 dazzling other road users.

¹⁾ ECE = for the European market

²⁾ SAE = for the North American Region

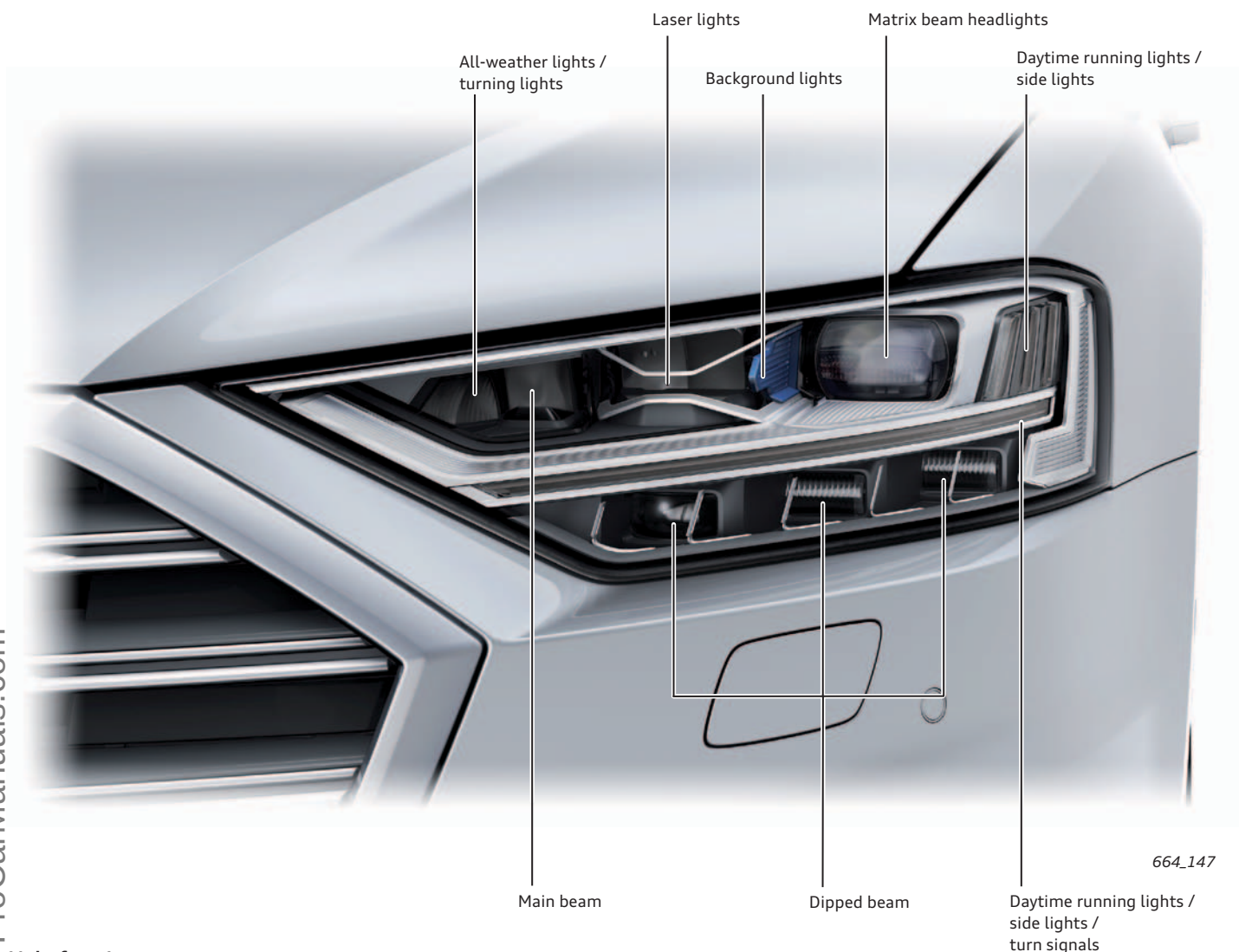


Reference

For further information about the matrix LED main beam assist function, refer to Self Study Programme 668 "Audi A8 (type 4N) Driver assistance systems."

Matrix LED headlights with laser lights

The figure shows the ECE¹⁾ version



Light functions:

- > Daytime running lights
- > Side lights
- > Background lights
- > Dipped beam
- > Matrix beam headlights
- > Laser lights
- > All-weather lights
- > Turning lights
- > Dynamic turn signal function
- > Side marker light (SAE²⁾ not shown)

Special features of the light functions

In the light switch position "AUTO" the daytime running lights, side lights and background lights are not active until the vehicle is travelling at a speed of greater than 10 kph. In the ECE¹⁾ version the daytime running lights and the side lights are switched off for the duration of the turn signalling cycle. In the SAE²⁾ version only the daytime running lights are deactivated during the turn signalling cycle, but the side lights stay switched on.

Service

The control units 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.

The blue background lights in the ECE¹⁾ version are operated together with the daytime running lights and the side lights, but remain switched off during the turn signalling cycle. In the SAE²⁾ 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 ECE¹⁾ version.

Adaptation for driving on the opposite side of the road

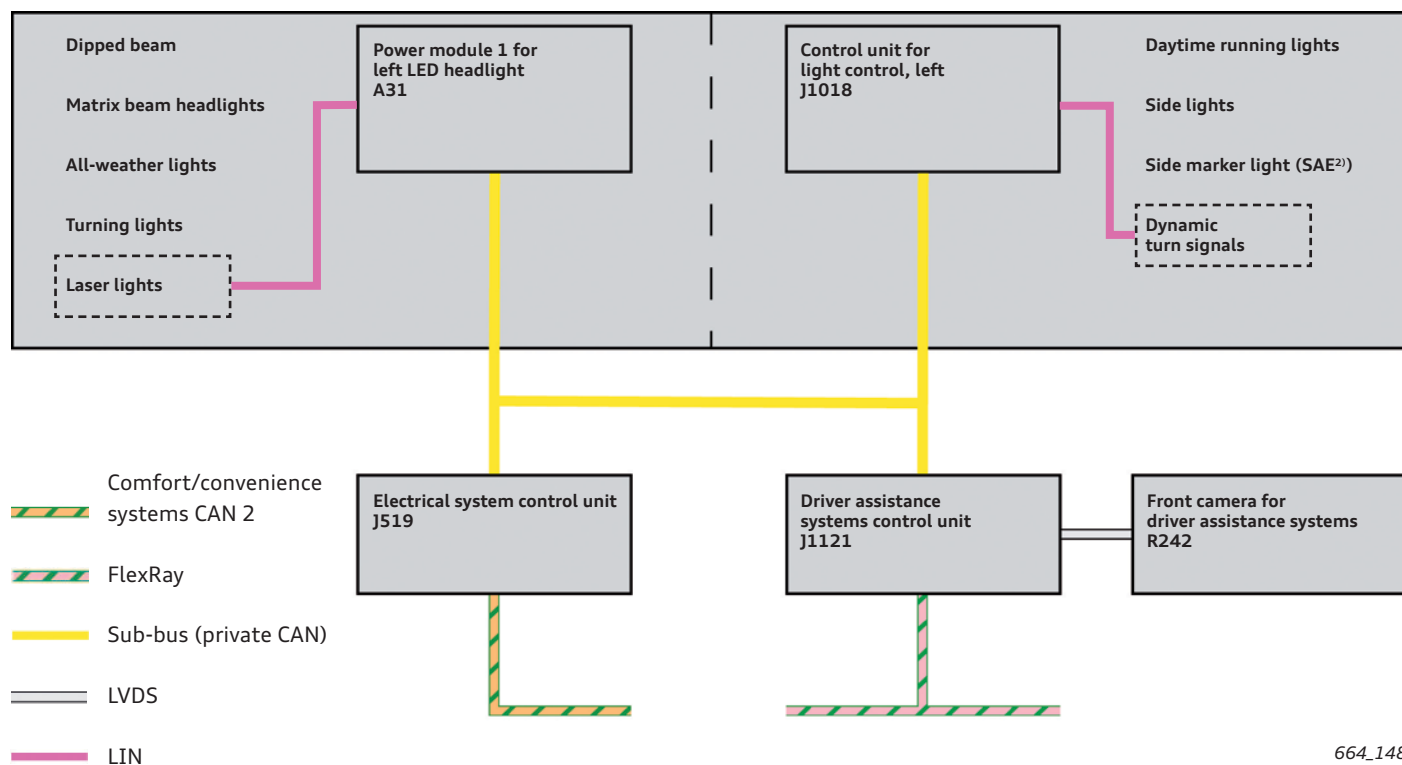
It is not necessary to adapt the headlights. No other measures are needed in order to meet statutory requirements.

Equipment

The Audi A8 (type 4N) 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. The left/right power modules 1 for the LED headlights A31/A27 additionally have a LIN connection. The laser light module is activated via this connection.

Main 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

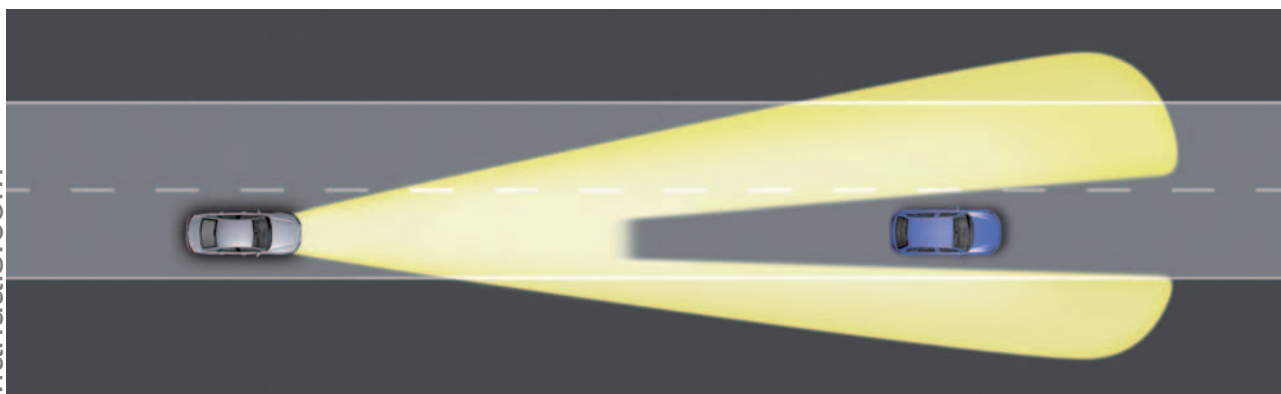
Matrix beam

General description

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

While these areas are "blocked out", the main 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 main beam. In addition to blocking out other vehicles, the light cone of the matrix beam adapts to the driving situation, e.g. when cornering. In this case, the intensity of the light cone is adjusted at the side or focused on the centre of the lane by activating different LEDs. This improves visibility for the driver without the risk of dazzling oncoming traffic.

Camera has detected a preceding vehicle



664_149

Camera has detected an oncoming vehicle



664_150



Reference

For further information about the matrix beam function, refer to Self Study Programme 619 "Audi matrix LED headlights".

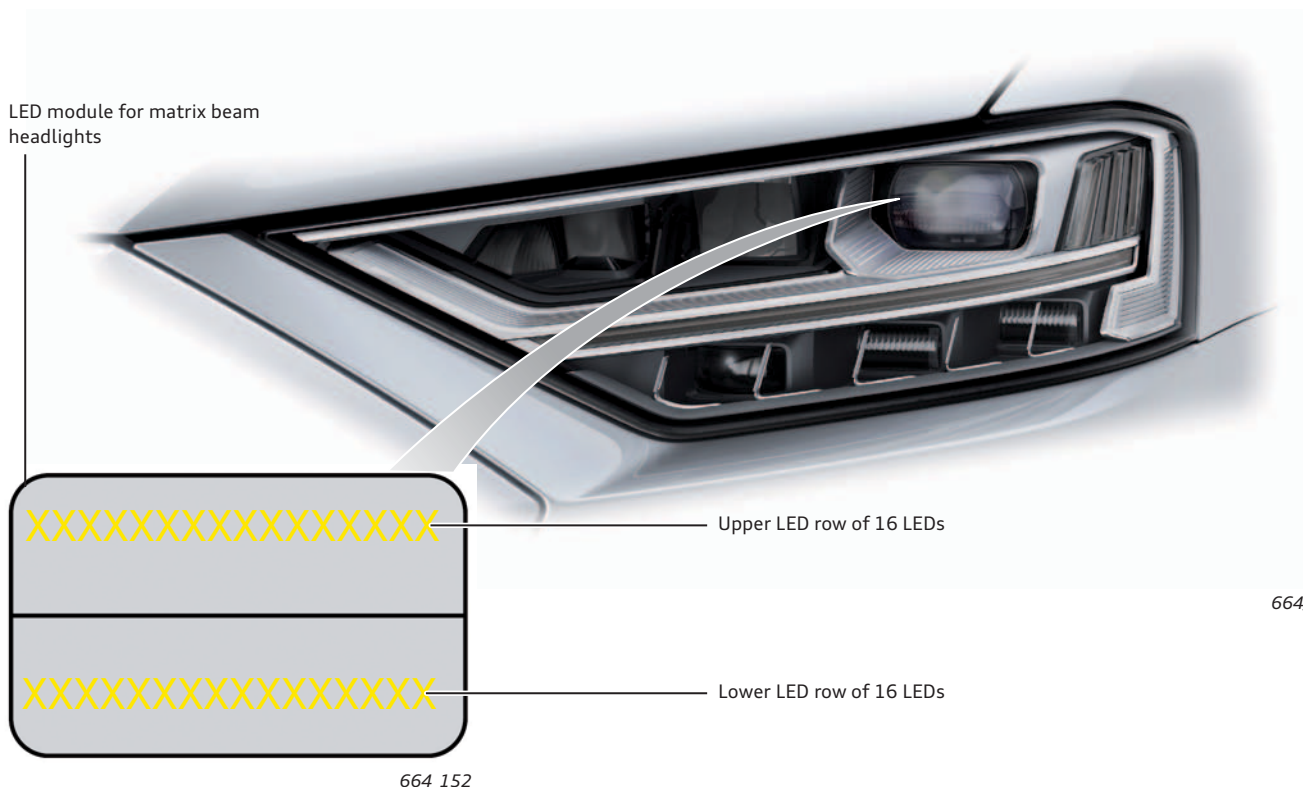
Matrix Beam 2.0

General description

In the first generation of matrix LED headlights, a total of 50 LEDs (25 LEDs per headlight) produce the matrix beam. Matrix Beam 2.0 features 32 LEDs per headlight. However, the crucial difference is not the number of LEDs.

In the first generation system the 25 LEDs were arranged in a row.

In the case of Matrix Beam 2.0 the LEDs are arranged in multiple rows: 2 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.



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 dazzling 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.



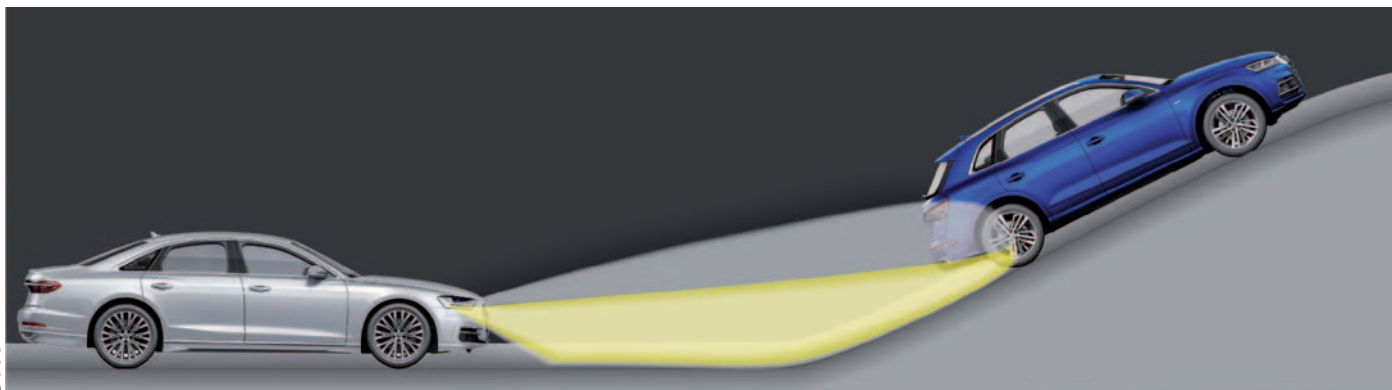
Scenario 2:

Preceding vehicle is travelling uphill

In this situation the preceding vehicle is travelling uphill. To avoid dazzling 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 dazzling 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 main beam where there is a risk of dazzling. This scenario also applies to an oncoming vehicle.



664_152



664_154

Calibrating Matrix Beam 2.0

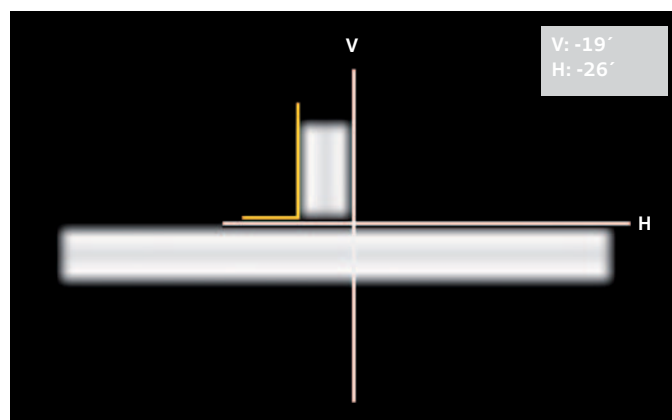
The following service work always involves calibrating the matrix headlights.

- > Adjusting the position of a headlight (removal and installation, undoing the fastening screws)
- > Adjusting the headlights.
- > Replacing the driver assist systems control unit J1121
- > A relevant entry is made in the event memory.

Measuring the reference segment

As with the first generation of the matrix LED headlight, 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 transferred to the driver assistance systems control unit J1121 using the diagnostic tester. 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



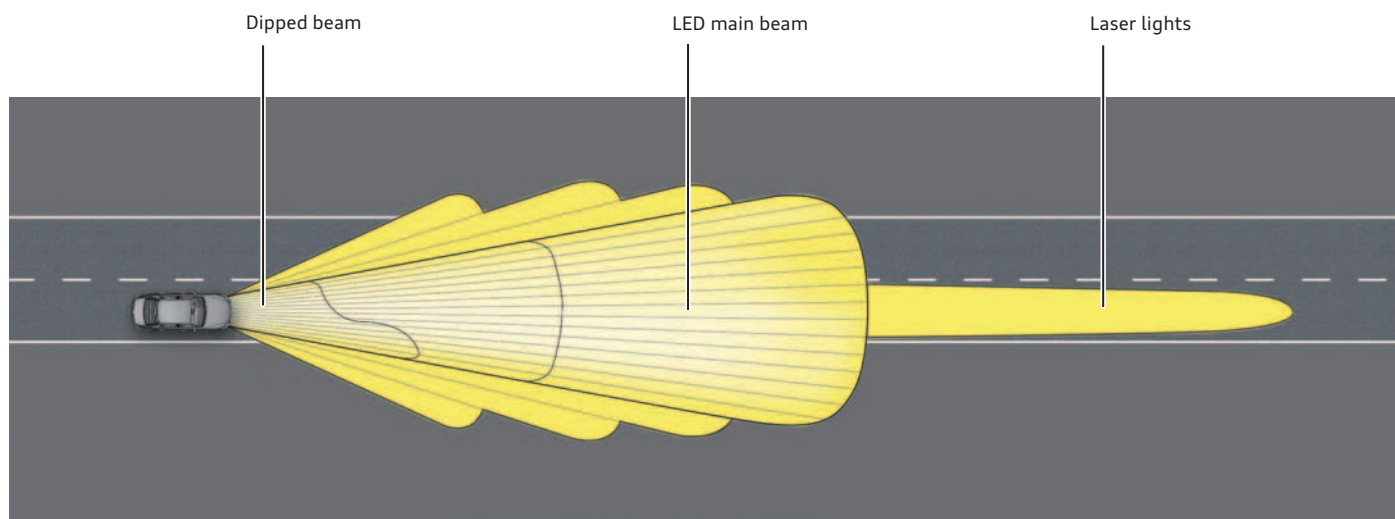
664_155

Laser lights

General description

The laser lights are utilised in the Audi R8 (type 4N) as an auxiliary main beam supplementing the LED main beam. The laser spot complements the LED main beam when the vehicle is travelling at speed of 70 kph or higher, doubling the range of the main beam.

The laser spot mainly illuminates the lane in which the vehicle is driving. The LED main beam is controlled by headlight assist. The laser lights are activated approximately 1 second after the LED main 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 dipped beam switched on
- > Main beam assist has been enabled in the MMI
- > Laser lights have been enabled in the MMI
- > Main beam assist has been activated with the main beam stalk
- > The vehicle is travelling at a speed of > 70 kph 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 70 kph and in combination with main beam assist. When the camera detects an oncoming vehicle or a preceding vehicle, the laser lights are switched off immediately. When main beam is activated manually, the laser lights are permanently off.

Displays in the instrument cluster

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



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



664_157

Service

It is not permitted to carry out work on the laser lights. The functioning of the laser lights can only be tested during a test drive.



Reference

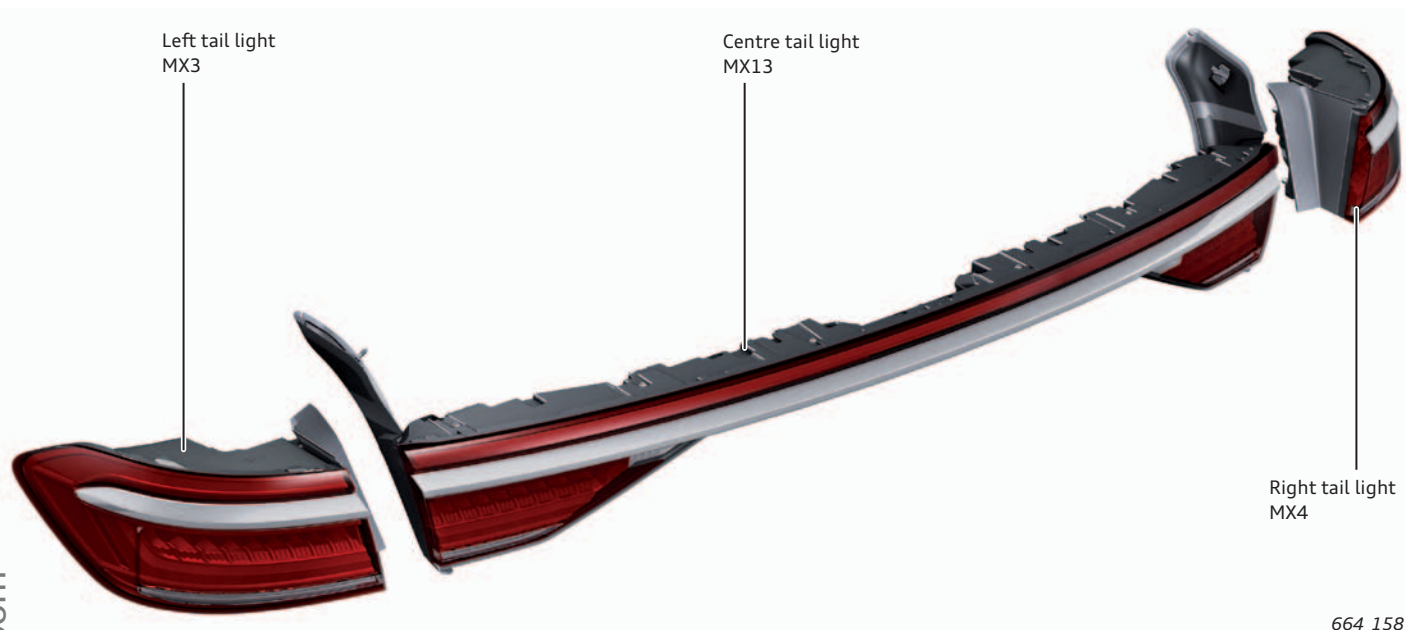
For further information about the laser lights, refer to Self Study Programme 641 "Audi R8 (type 4S)". Laser lights were first featured on an Audi model in the Audi R8 (type 4S).

Tail lights

General description

The Audi A8 (type 4N) 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 boot lid.

Only LEDs are used as light sources. The tail lights are activated by the central comfort/convenience systems control unit J393.



Versions

A distinction is made between three tail light versions:

- LED tail light PR no. 8SK (ECE¹⁾ only)
- LED tail light with dynamic turn signal function
PR no. 8SP (ECE¹⁾ and SAE²⁾)
- LED tail light with dynamic turn signal function and organic LEDs
PR no. 8SC (ECE¹⁾ and SAE²⁾)

Tail lights 8SK and 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 the central comfort/convenience systems control unit J393 via discrete wiring.

Tail lights 8SK and 8SP



¹⁾ ECE = for the European market

²⁾ SAE = for the North American Region

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 centre outwards in a staggered fashion by the central comfort/convenience systems control unit J393 via a LIN data cable.

Tail lights 8SK and 8SP



664_160

Headlight – tail light combinations

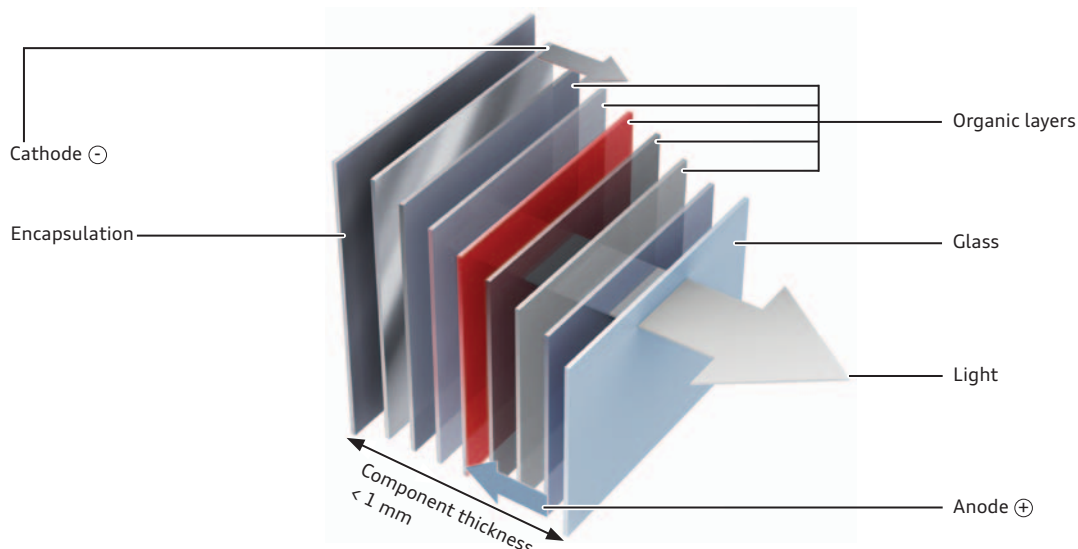
The following headlight and tail light combinations are available in the Audi A8 (type 4N):

- | | | |
|---|--------|--|
| > LED headlights | —————→ | LED tail lights |
| > Matrix LED headlights | —————→ | LED tail lights with dynamic turn signal function (OLEDs are optional) |
| > Matrix LED headlights with laser lights | —————→ | LED tail lights with dynamic turn signal function and OLEDs |

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

Cabin lighting

Background lighting

The cabin lighting in the new Audi A8 (type 4N) 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 and footwell light.

Function lights illuminate specific areas of the vehicle interior.

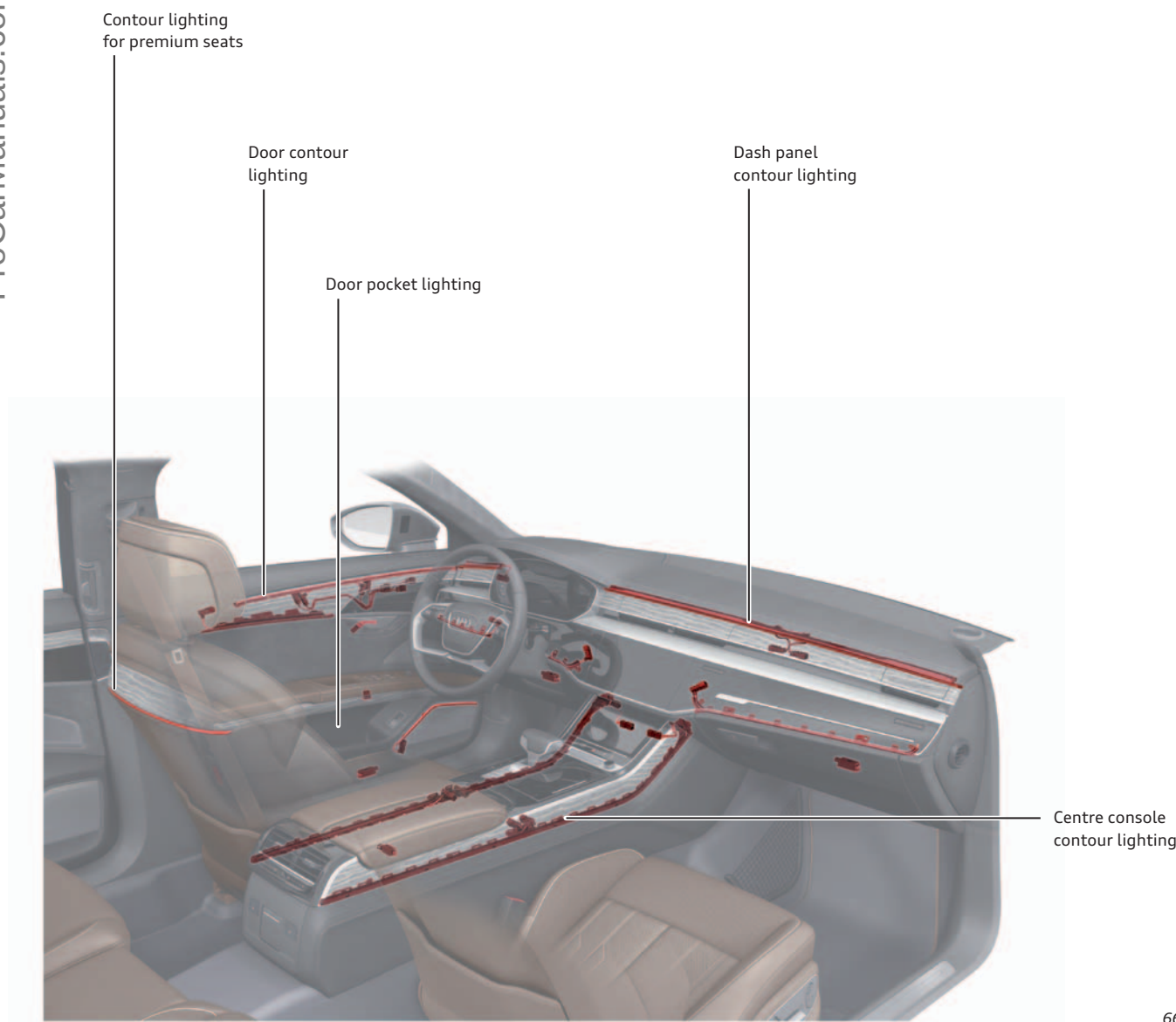
The background lighting illuminates interior areas by means of optical fibres and, in this way, creates a sophisticated atmosphere inside the cabin.

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

The new Audi A8 (type 4N) is also based generally on the MLBevo platform and, therefore, is comparable to the current Audi A5. The cabin lighting in the Audi A8 (type 4N) is much more extensive.

PR no. QQ0 is not available for the new Audi A8 (type 4N). The lights included in lighting package QQ1 are the basic equipment for cabin lighting. The vehicles have single-colour background lighting as standard.

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



Functions

The menu navigation system is, basically, identical to that used in previous MMI systems.

In the new Audi A8 (type 4N) 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 colour profiles.

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

The new Audi A8 (type 4N) is the first model in which the cabin lighting is no longer dependent on the rain and light detector 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 cabin 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 colour			
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)
Centre 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 colour			
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)
Centre 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 (type 4N) has capacitively controlled reading lights as standard.

There is a choice of 2 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 cabin 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 centre of the reading light serves to switch this function on and off.

When using the reading light as a 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.



Audi Rear Seat Remote

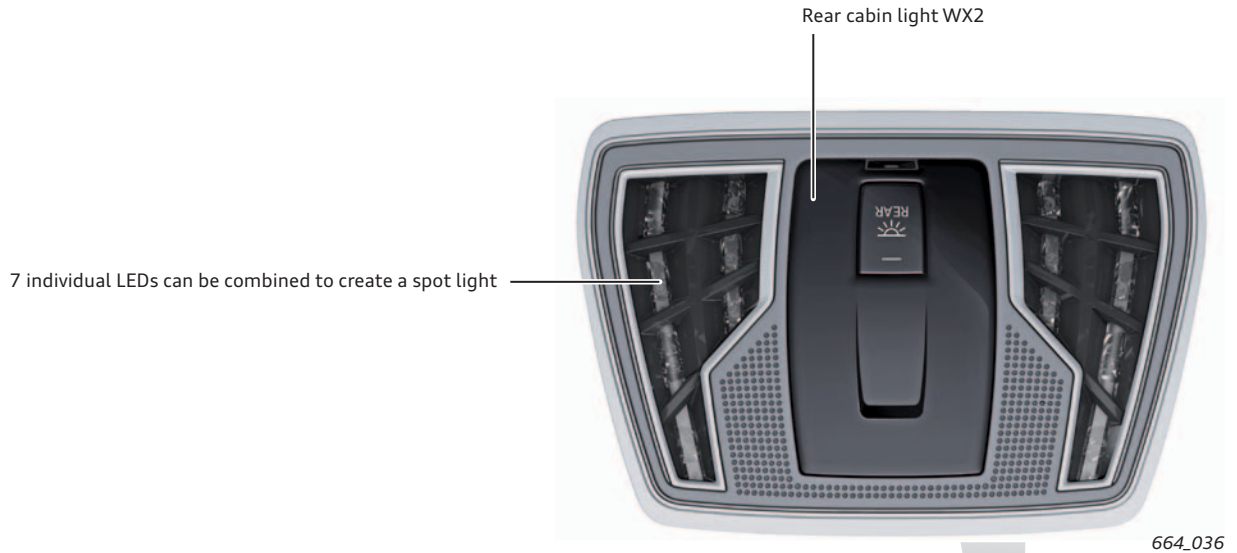
664_034

Headlining with rear matrix LED reading lights

The matrix LED reading lights have 7 individual LEDs which can be jointly controlled.

The headlining is available in different versions. In the case of the Audi A8L, optional left and vanity mirrors for the occupant cell (W49 and W50) can be ordered in addition to the passenger and driver side vanity mirrors (W14 and W20).

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

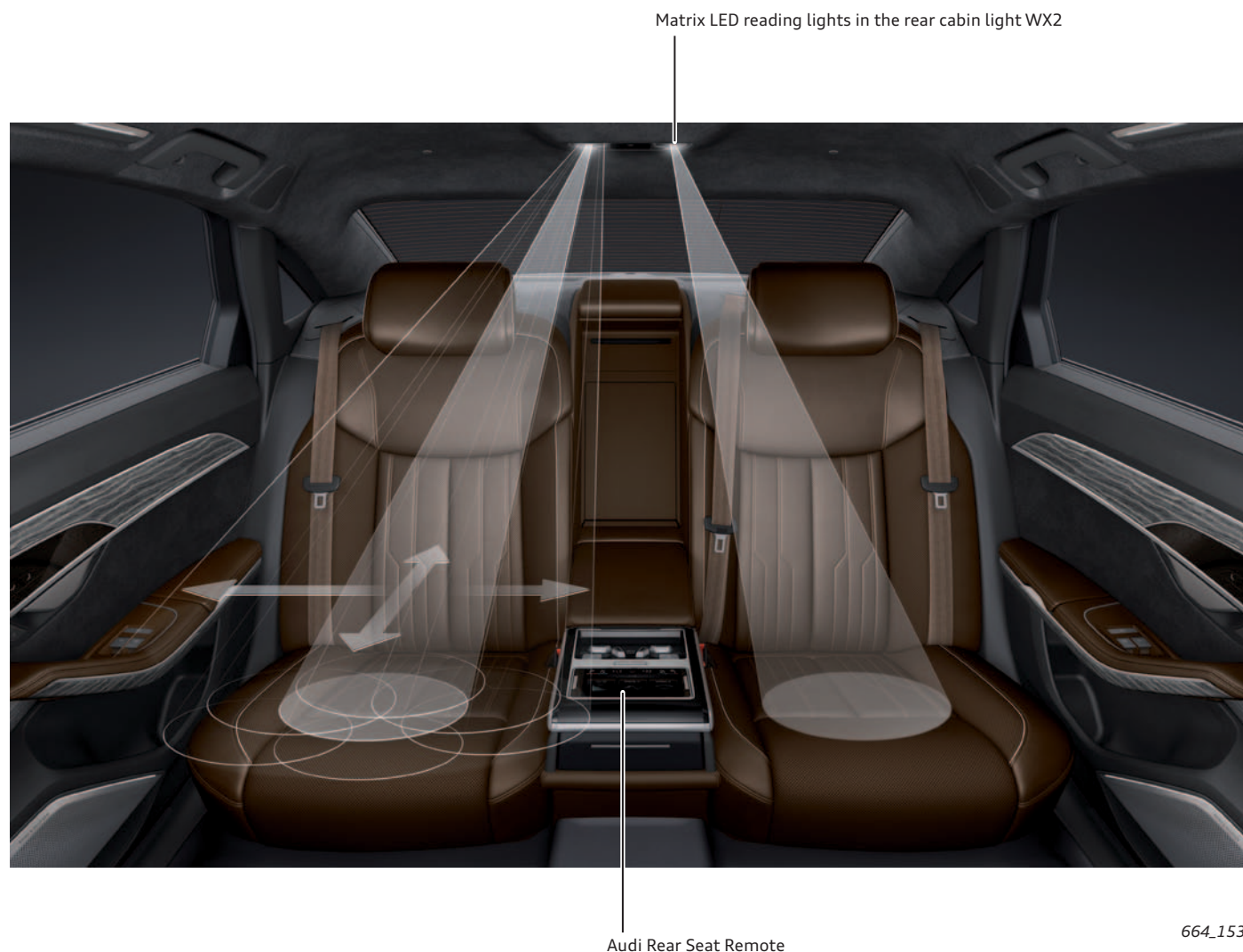
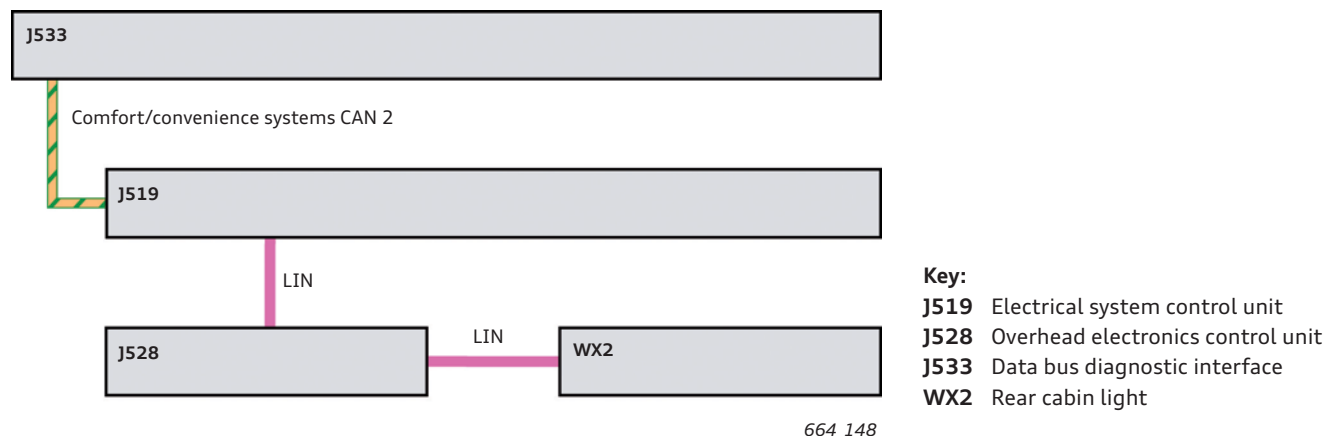


The newly developed matrix LED reading lights provide ideal lighting conditions for reading. Given that adjusting the reclining seat also alters the position of the rear passengers, the light cone can be adjusted individually with the aid of the matrix LED reading lights.

The 7 interconnected LEDs of the matrix LED reading light are integrated in the rear cabin light WX2. WX2 is a LIN user of the overhead electronics control unit J528, which, in turn, is a LIN user of the electrical system control unit J519.

The matrix LED reading light can be accessed under diagnostic code 0009.

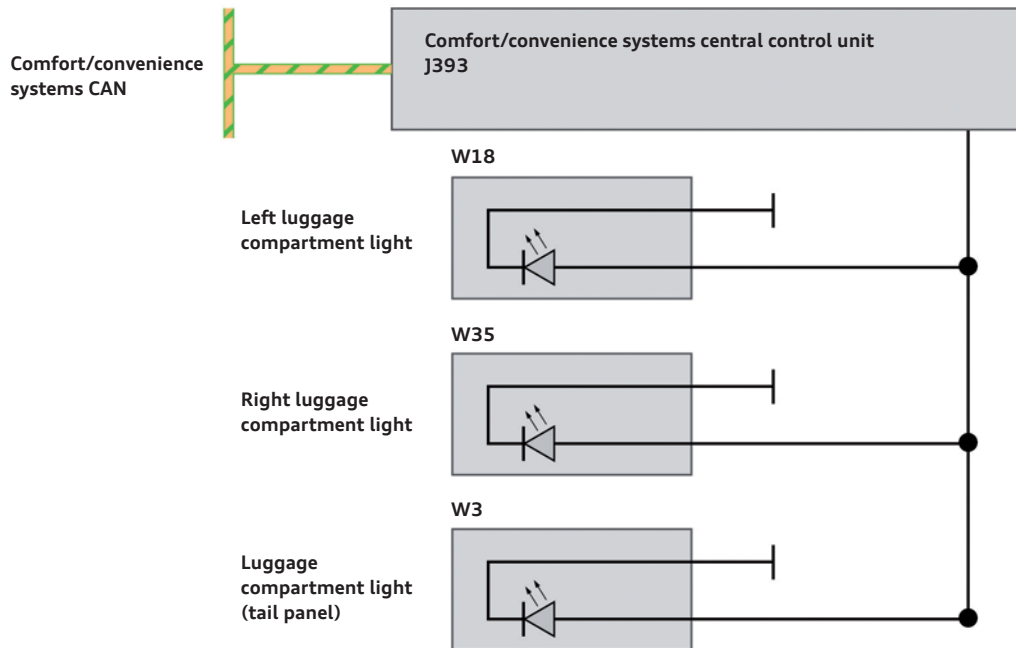
Schematic diagram — Networking of both overhead modules



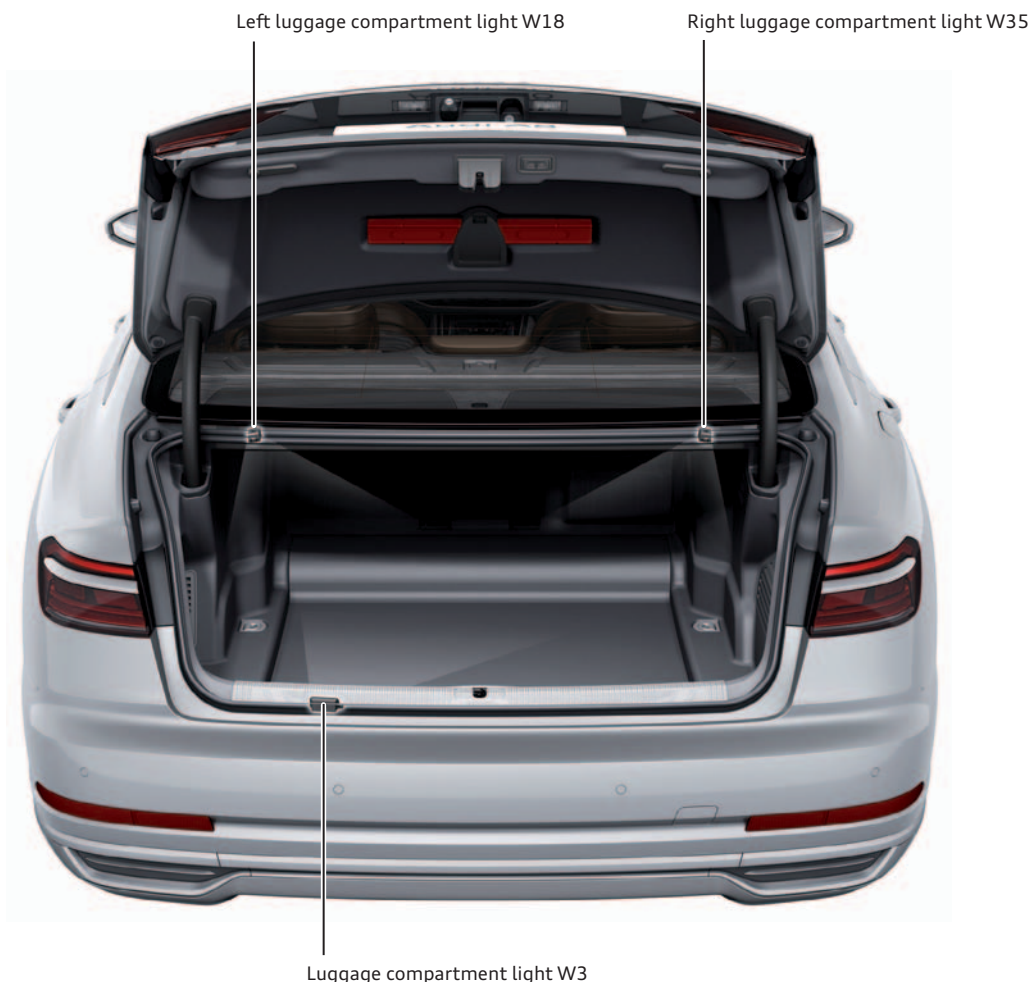
Luggage compartment lighting

The luggage compartment is illuminated by 3 luggage compartment lights using LED technology. The 3 LED luggage compartment lights are activated by the central comfort/convenience systems control unit 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 (such as the tow bar release button E754).



664_052



664_053

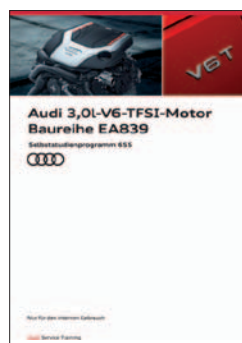
Appendix

Self study programmes

For more information about the technology of the Audi A8 (type 4N), please refer to the following self study programmes.



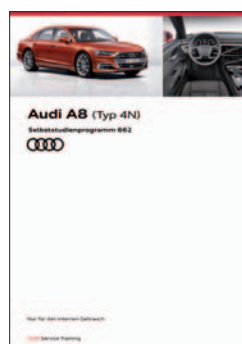
SSP 410 Audi occupant protection - Passive systems



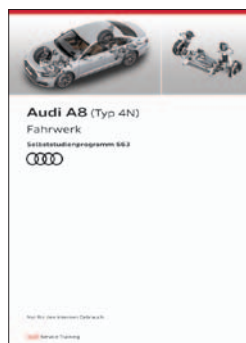
SSP 655 - Audi 3.0l V6 TFSI engine EA839 series



SSP 656 3.0l TDI engine series EA897evo2



SSP 662 Audi A8 (type 4N)



SSP 663 Audi A8 (type 4N) Suspension



SSP 665 Audi A8 (type 4N) New air conditioning features and introduction of refrigerant R744



SSP 666 Audi A8 (type 4N) Infotainment and Audi connect



SSP 668 Audi A8 (type 4N) Driver assistance systems

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