



## The 2012 Audi A7 Onboard Power Supply and Networking



Audi of America, LLC  
Service Training  
Printed in U.S.A.  
Printed 1/2011  
Course Number 990403

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

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The Self-Study Program provides introductory information regarding the design and function of new models, automotive components, or technologies.

**The Self-Study Program is not a Repair Manual!**  
**All values given are intended as a guideline only.**

For maintenance and repair work, always refer to current technical literature.

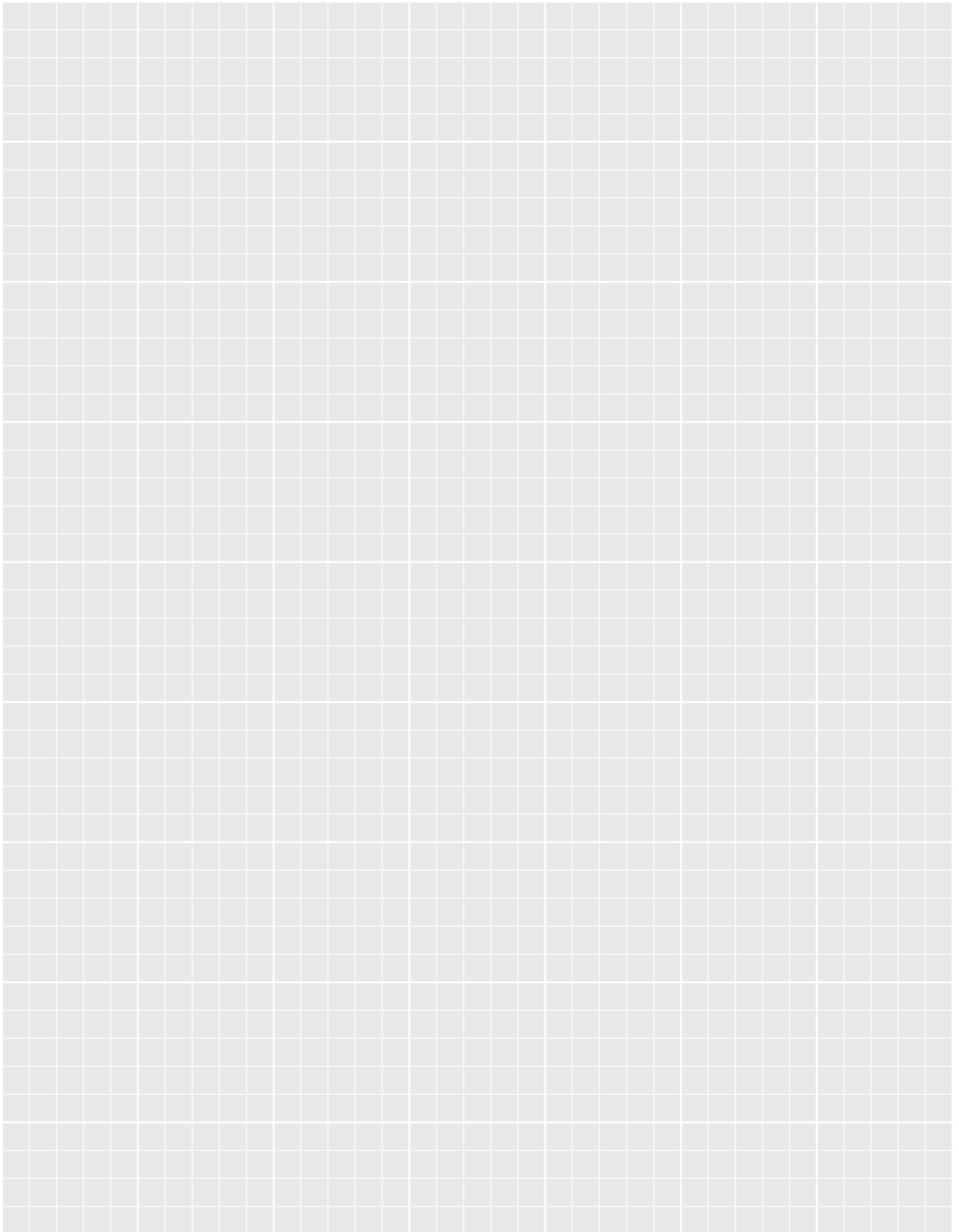
Reference



Note



# Notes



# Introduction

Four-zone air conditioning, head-up display, Bang & Olufsen Advanced Sound System, navigation, WLAN hotspot, massage seats, LED headlights, Night Vision Assist, Audi pre sense, Keyless Go, Audi drive select, Audi active lane assist, reversing camera – all of these convenience features and safety functions would not be possible without the use of increasingly efficient electronics.

To ensure the perfect operation of these electronic components it is necessary to have a stable and reliable onboard power supply, as well as high speed data bus networks.

To achieve this, the 2012 Audi A7 comes equipped with:

- An aluminum main battery lead
- Energy recuperation for the alternator system
- FlexRay bus system
- LED headlights

This Self-Study Program provides you with an in depth guide to the onboard power supply system and networking functions of the 2012 A7.



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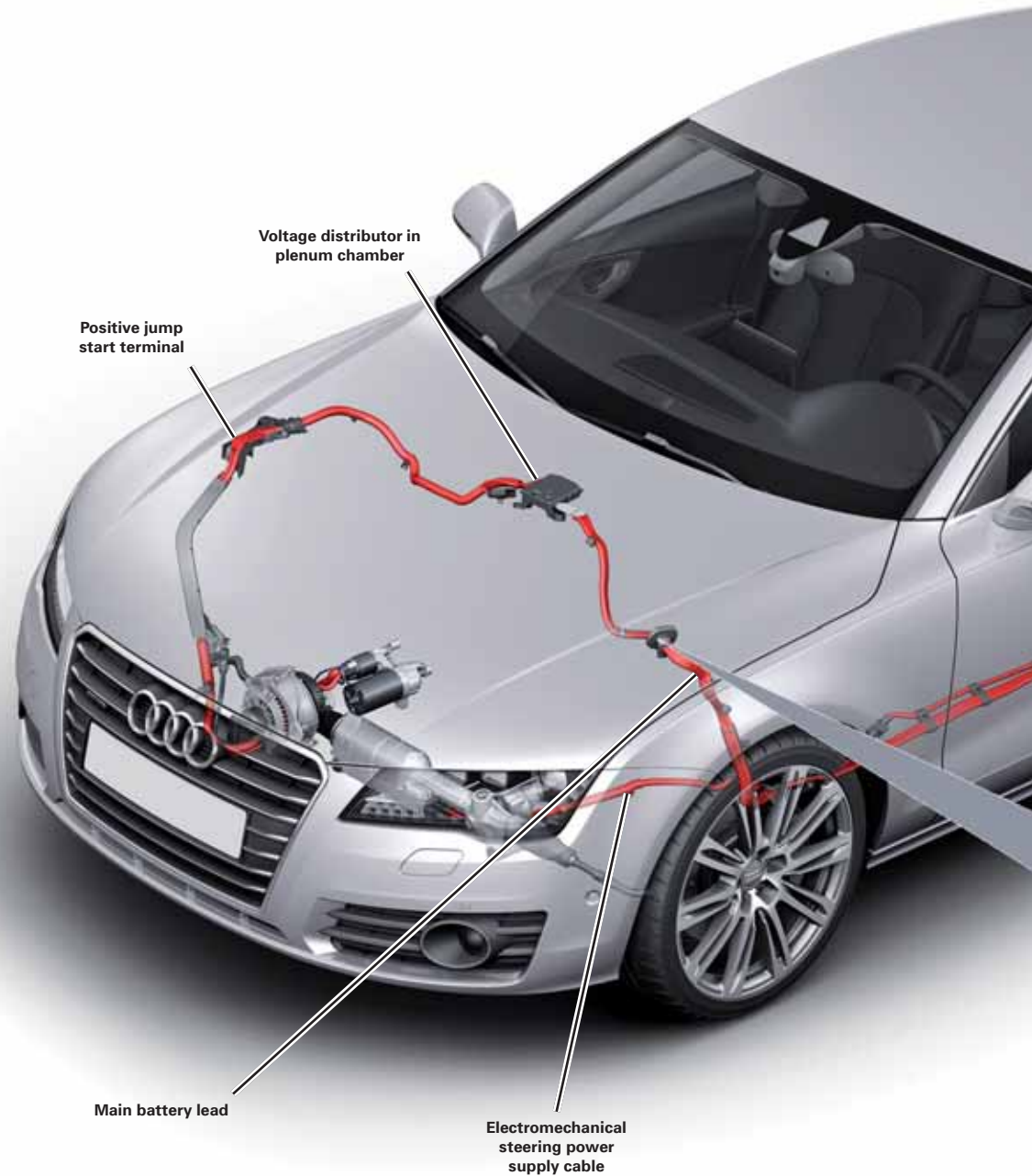
# Power Supply

## Jump Start Terminals

The jump start terminals are located on the right hand side of the engine compartment.

The positive terminal is connected to the main battery cable at the voltage distributor in the plenum chamber. The alternator and starter receive power via a cable connected to the jump start terminal.

The ground terminal is located on the inner fender panel.



## Battery

The 2012 A7 battery is housed in the spare tire well. The main fuse carrier and Battery Interrupt Igniter N235 are connected to the battery positive terminal. Battery Monitoring Control Module J367 is located to the right of the battery and connected to the battery negative terminal.

The A7 for the North American market will come equipped with a 110Ah/520A wet cell battery.

## Main Battery Cable

The main battery cable of the A7 is a flexible aluminum ribbon cable.

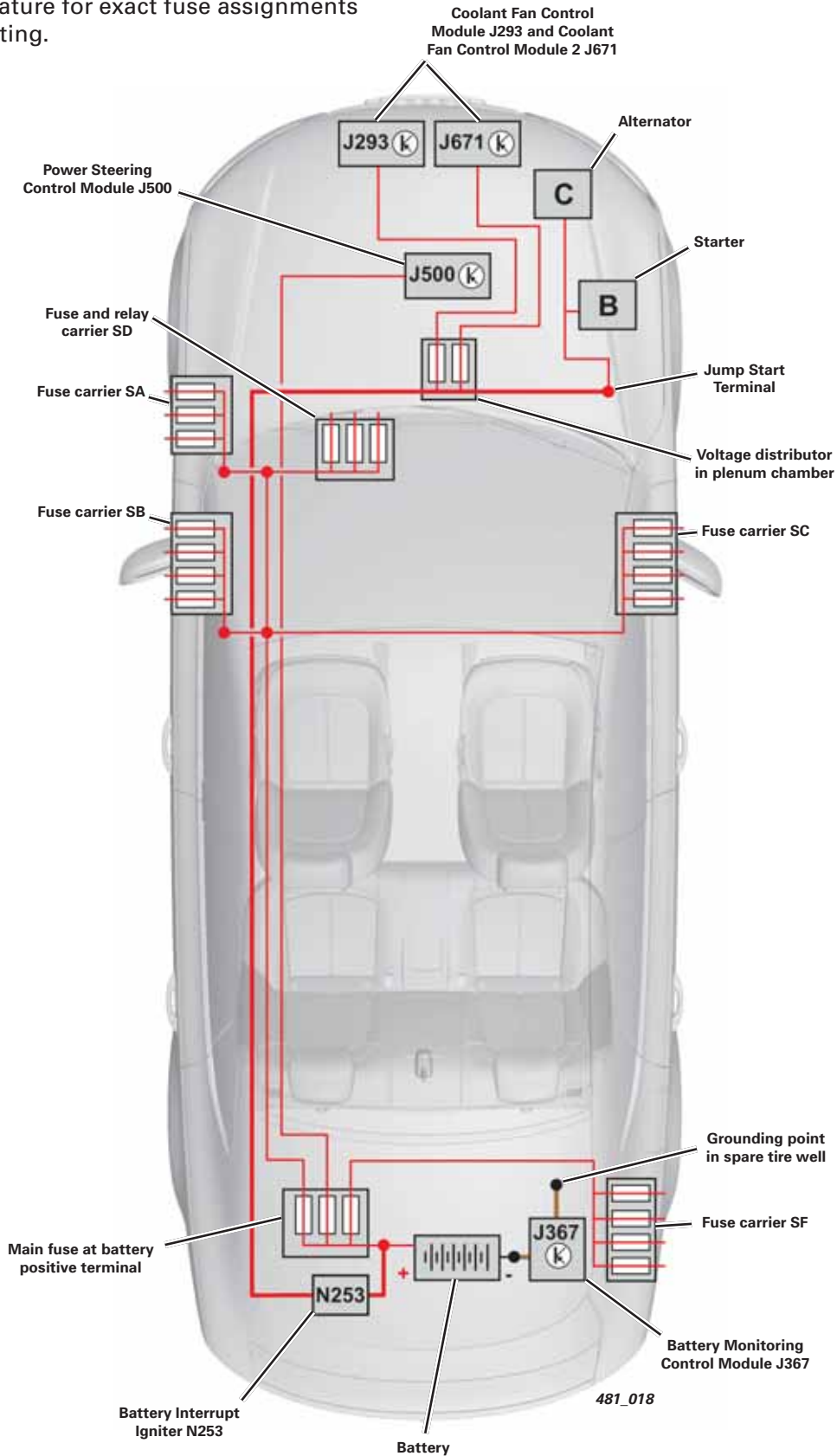
It is routed together with a round aluminum cable that supplies power for the electromechanical power steering system. They are routed through a rubber grommet in the spare tire well and then along the underbody along the left side of the vehicle.

The two cables separate in the front left wheel well. The ribbon cable is routed through a rubber grommet into the plenum chamber. The round cable is directly routed from the wheel well to the electromechanical steering system in the engine compartment.



# Power Supply Overview

This is a schematic diagram. Refer to current technical literature for exact fuse assignments and cable routing.



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## Fuses and Relays

### Voltage distributor in plenum chamber

The coolant fan control modules are supplied power via fuses located at this point. The main battery cable junction point is here.

### Fuse and relay carrier on the right side of the instrument panel

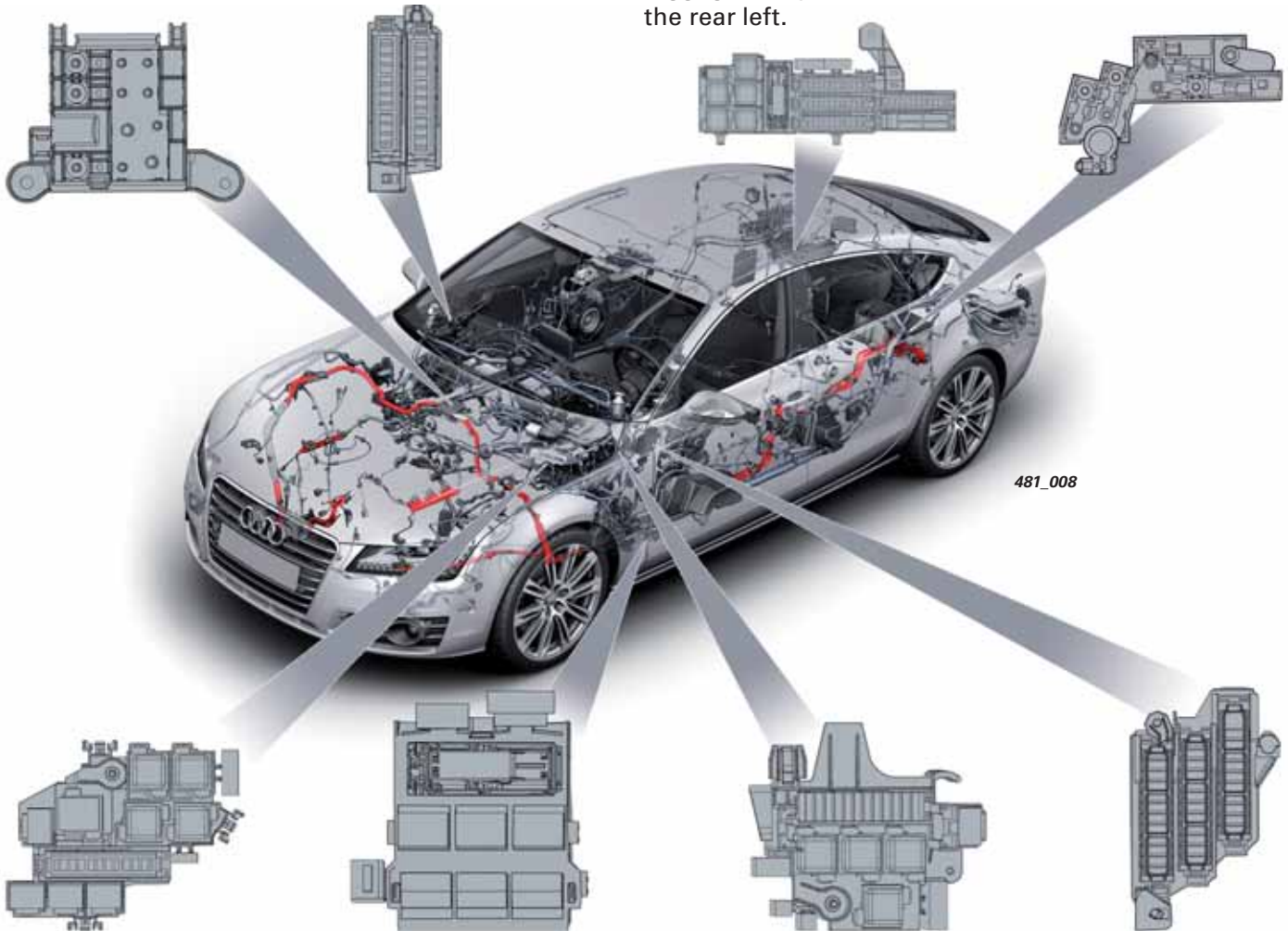
The fuses are labeled SC in the current flow diagram. They can be accessed by the customer after removing the instrument panel end cover.

### Fuse and relay carrier and CAN node connector in luggage compartment, right

The fuses are labeled SF in the current flow diagram. The fuses can be accessed by the customer after removing the storage compartment in the luggage compartment at the rear left.

### Main fuse carrier at battery positive terminal

The battery interrupt igniter is also mounted on this fuse carrier.



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### Fuse and relay carrier in the E-box in the plenum chamber, driver side

(under the windshield washer system reservoir)

The E-box lid also serves as a support for the engine control module. The fuses in the E-box are labelled SA in the current flow diagram.

### Coupling station and CAN node connector at the bottom left A-pillar

### Fuse and relay carrier in the Vehicle Electrical System Control Module area

(below the instrument panel in the driver footwell)

The fuses are labeled SD in the current flow diagram.

### Fuse and relay carrier on the instrument panel, left

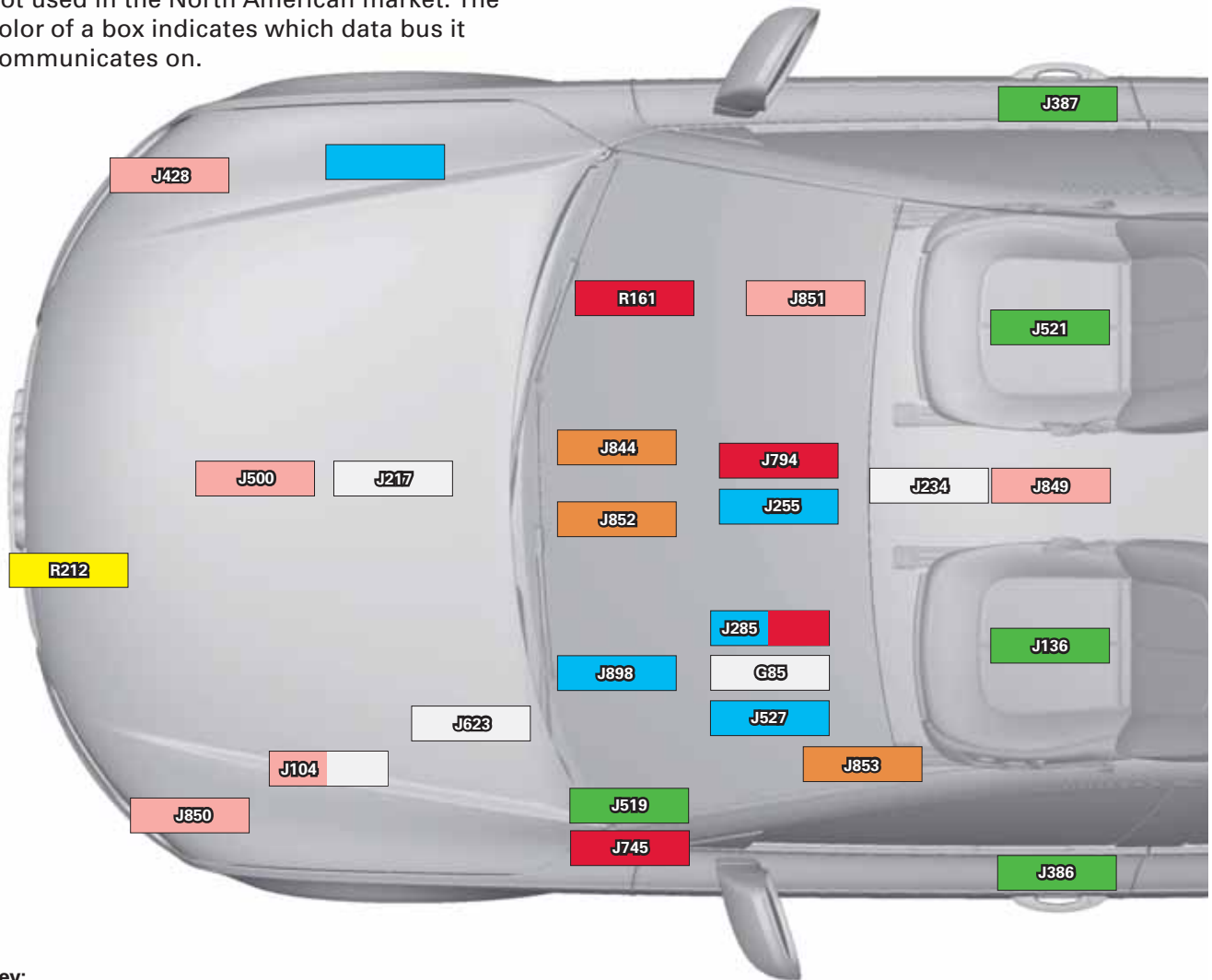
The fuses are labeled SB in the current flow diagram. They can be accessed by the customer after removing the instrument panel end cover.

# Networking

## Control Module Locations

Some of the control modules shown in this overview are optional and/or are country-specific equipment. Boxes without numbers in the illustration indicate locations for components not used in the North American market. The color of a box indicates which data bus it communicates on.

Refer to current technical literature for exact installation locations of control modules, as well as for installation and removal instructions.

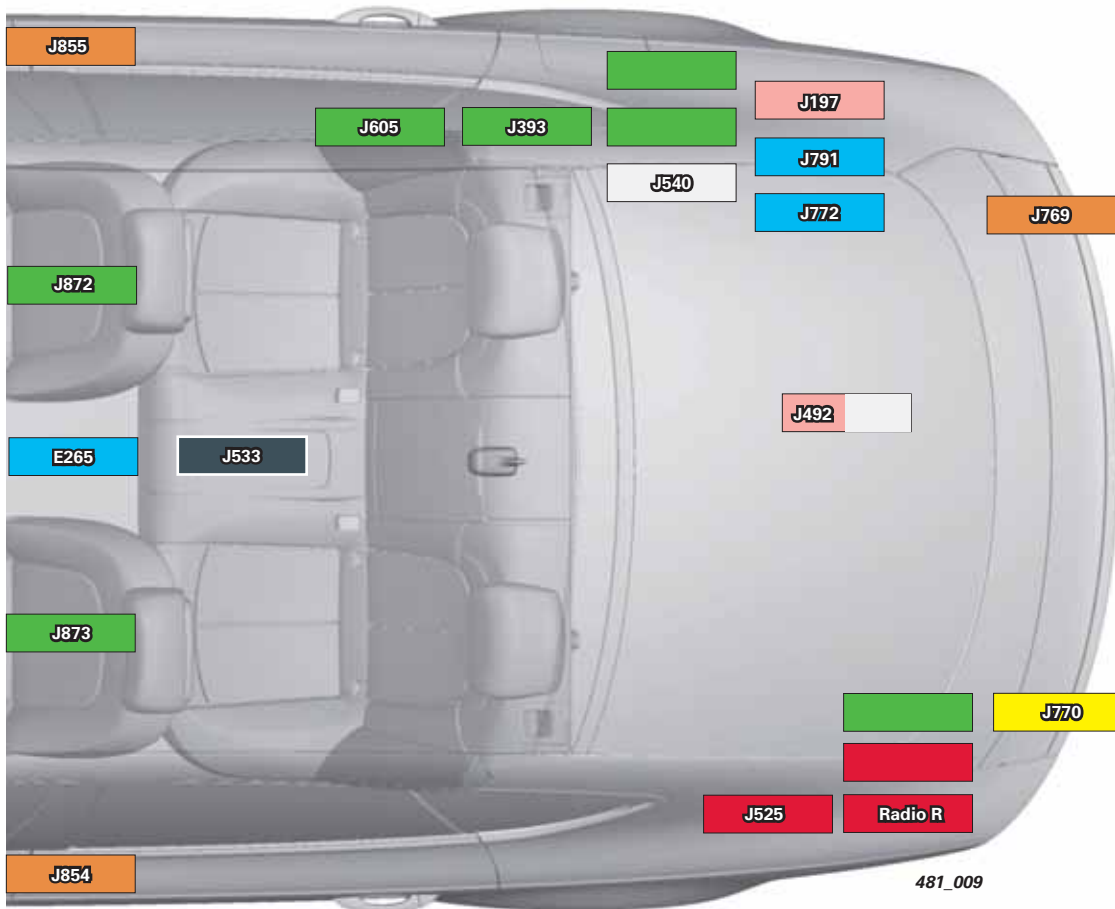


### Key:

- Control Modules on the Convenience CAN bus**
- J136 Memory Seat/Steering Column Adjustment CM
- J386 Driver Door Control Module
- J387 Front Passenger Door Control Module
- J393 Comfort System Central Control Module
- J519 Vehicle Electrical System Control Module
- J521 Front Passenger Memory Seat Control Module
- J605 Rear Lid Control Module
- J872 Front Passenger Multicontour Seat CM
- J873 Driver Multicontour Seat Control Module

- Control Modules on the Display and Control CAN bus**
- E265 Rear A/C Display Control Head
- J255 Climatronic Control Module
- J285 Instrument Cluster Control Module
- J527 Steering Column Electronics Control Module
- J772 Rear View Camera System Control Module
- J791 Parallel Parking Assistance Control Module
- J898 Windshield Projection Head-Up Display CM

- Control Modules on the Powertrain CAN bus**
- G85 Steering Angle Sensor
- J234 Airbag Control Module
- J540 Electromechanical Parking Brake Control Module
- J623 Engine Control Module
- J217 Transmission Control Module



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- Control Modules on the Extended CAN bus**
- J745 Cornering Lamp and Headlamp Range CM
- J769 Lane Change Assistance Control Module
- J844 Automatic High Beam Assist Control Module
- J852 Camera Control Module
- J853 Night Vision System Control Module
- J854 Left Front Seat Belt Tensioner Control Module
- J855 Right Front Seat Belt Tensioner Control Module

- Control Modules on the MOST bus**
- J285 Instrument Cluster Control Module
- J525 Digital Sound System Control Module
- J794 Information Electronics Control Module 1
- R Radio
- R161 DVD Changer

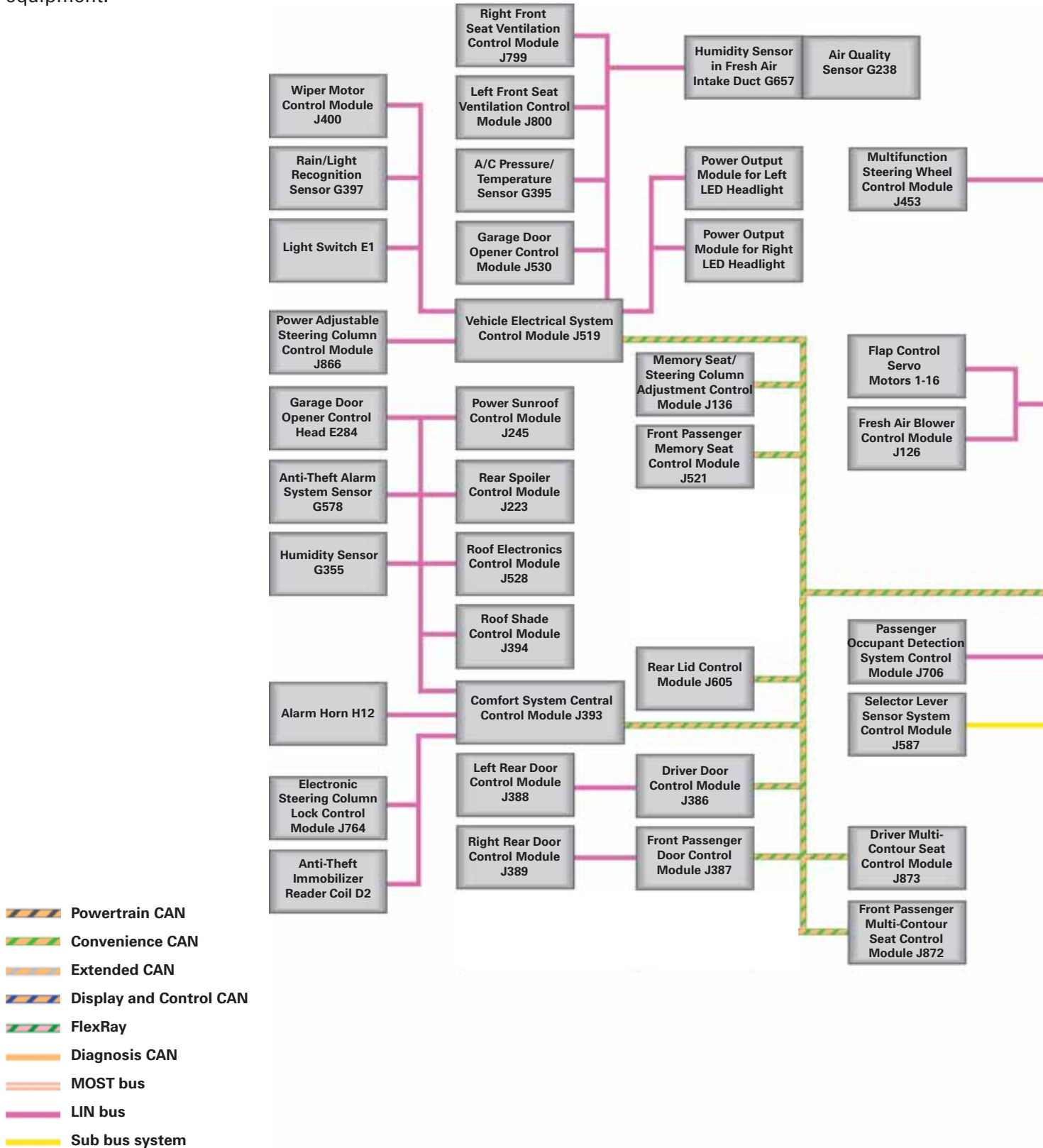
- Control Modules on the FlexRay bus**
- J104 ABS Control Module
- J197 Level Control System Control Module
- J428 Distance Regulation Control Module
- J492 All Wheel Drive Control Module
- J500 Power Steering Control Module
- J849 Sensor Electronics Control Module
- J850 Distance Regulation Control Module 2
- J851 Image Processing Control Module

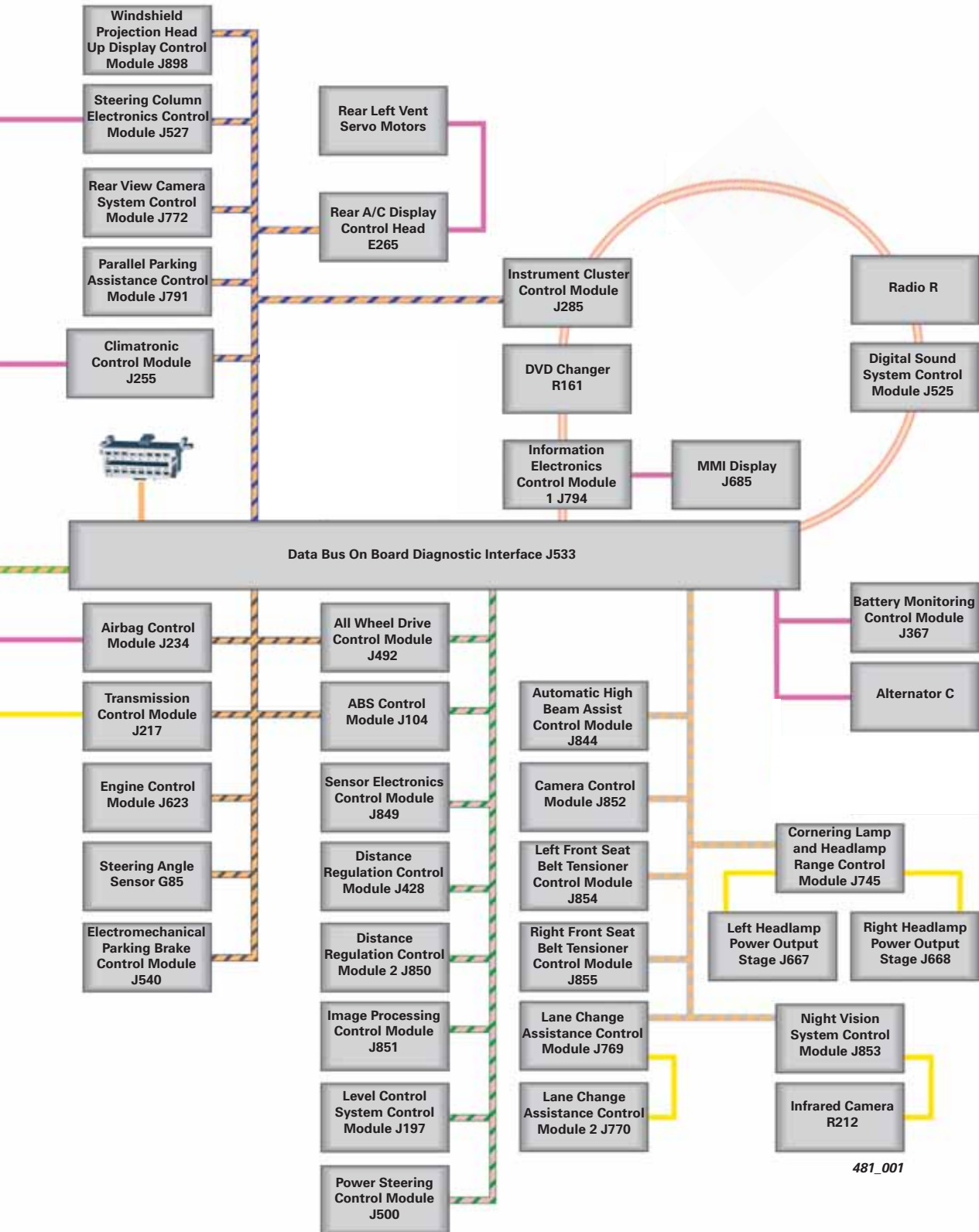
- Sub-Bus Users**
- R212 Infrared Camera
- J770 Lane Change Assistance Control Module 2

- Users of all Bus Systems (Gateway)**
- J533 Data Bus On Board Diagnostic Interface

# Topology










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





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## 2012 A7 Bus Systems

Bus System	Cable Color	Configuration	Transmission Rate	Characteristic
Powertrain CAN		Electrical two-wire bus system	500 kbit/s	Not capable of single-wire operation
Convenience CAN		Electrical two-wire bus system	500 kbit/s	Not capable of single-wire operation
Extended CAN		Electrical two-wire bus system	500 kbit/s	Not capable of single-wire operation
Display and Control CAN		Electrical two-wire bus system	500 kbit/s	Not capable of single-wire operation
Diagnosis CAN		Electrical two-wire bus system	500 kbit/s	Not capable of single-wire operation
FlexRay		Electrical two-wire bus system	10 Mbit/s	Not capable of single-wire operation
MOST bus		Fiber-optic bus system	22.5 Mbit/s	Ring break = failure of complete system
LIN bus		Electrical single-wire bus system	20 kbit/s	Capable of single-wire operation
Sub bus system		Electrical two-wire bus system	500 kbit/s	Not capable of single-wire operation

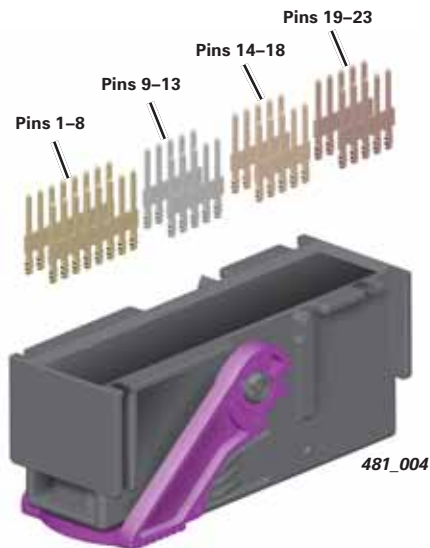
### Most Important New Features

- Convenience CAN is a high speed bus system
- FlexRay bus system (as used on 2011 A8)
- Instrument Cluster Control Module J285 is a bus device in two bus systems – Display and Control CAN and MOST bus
- All Wheel Drive Control Module J492 and ABS Control Module J104 are bus devices in two bus systems – Powertrain CAN and FlexRay

## CAN Isolating Connector

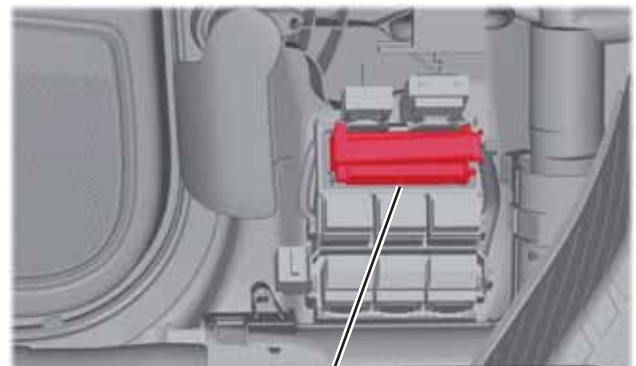
The 2012 A7 has two CAN isolating connectors. One is located at the connector station at the lower left A-pillar. The second isolating connector is located in the right rear of the luggage compartment behind the trim cover.

Both connectors are identical in design but provide connections to different bus systems.



The front isolating connector is assigned to only three bus systems:

- Pins 1 – 8: node for control modules on the Convenience CAN bus
- Pins 9 – 13: node for control modules on the Powertrain CAN bus
- Pins 14 – 18: node for control modules on the Extended CAN bus
- Pins 19 – 23 are unused



The rear isolating connector is assigned to four bus systems:

- Pins 1 – 8: node for control modules on the Convenience CAN bus
- Pins 9 – 13: node for control modules on the Powertrain CAN bus
- Pins 14 – 18: node for control modules on the Extended CAN bus
- Pins 19 – 23: node for control modules on the Display and Control CAN bus



## CAN Adaptor VAG 1598/38

As with other Audi models, the CAN isolating connector provides connectivity for CAN adaptor VAG 1598/38. Individual elements can be disconnected from the CAN bus by disconnecting jumpers on the isolating adaptor.

Measurements can be taken both from individual elements and from the complete CAN bus during operation. These measurement options allow faults to be systematically analyzed and identified on the CAN bus.



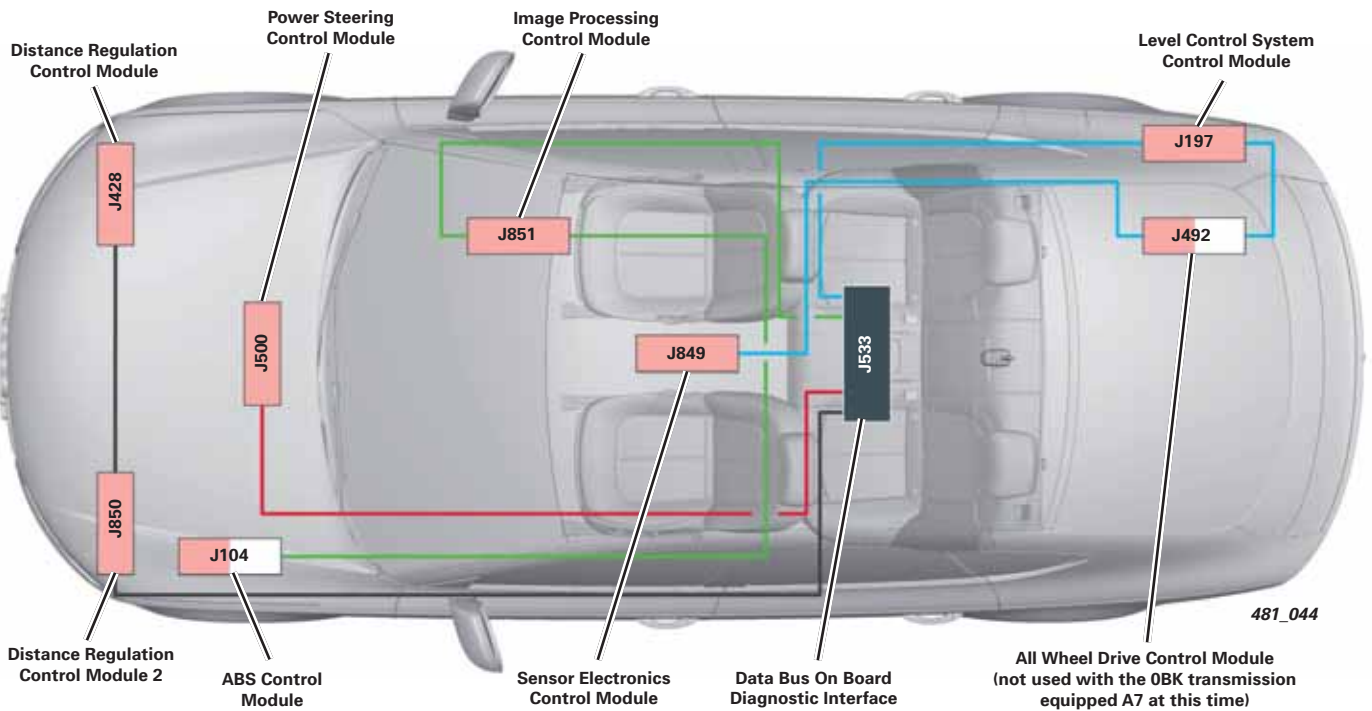
# FlexRay





The FlexRay data bus, first introduced on the 2011 A8, is also used on the 2012 A7. FlexRay is an electrical two-wire bus system with a maximum data transfer rate of 10 Mbit/s. The cables are referred to as bus positive (pink cable) and bus negative (green cable).

FlexRay does not allow single wire operation since the voltage difference between both wires is evaluated. Data transfer timing is not based on the priority of the message as in other data bus systems. It is controlled based solely on fixed time allotments.

Data Bus On Board Diagnostic Interface J533 acts as the controller for the FlexRay system. In a fully equipped A7 there are four FlexRay branches and eight control modules. Up to three control modules (excluding J533) can be connected within a branch.

For diagnostic purposes, the control modules at the end of a branch each have two 47 Ω resistors connected in series. The intermediate control modules have two 1.3 kΩ resistors connected in series. The maximum length of a cable within a branch is limited to 39.3 ft (12 m).



FlexRay Branches	1	2	3	4
Colors in diagram				
Control modules	<ul style="list-style-type: none"> <li>- Data Bus On Board Diagnostic Interface J533</li> <li>- Image Processing CM J851</li> <li>- ABS Control Module J104</li> </ul>	<ul style="list-style-type: none"> <li>- Data Bus On Board Diagnostic Interface J533</li> <li>- Power Steering CM J500</li> </ul>	<ul style="list-style-type: none"> <li>- Data Bus On Board Diagnostic Interface J533</li> <li>- Level Control System CM J197</li> <li>- All Wheel Drive CM J492</li> <li>- Sensor Electronics CM J849</li> </ul>	<ul style="list-style-type: none"> <li>- Data Bus On Board Diagnostic Interface J533</li> <li>- Distance Regulation CM 2 J850</li> <li>- Distance Regulation CM J428</li> </ul>



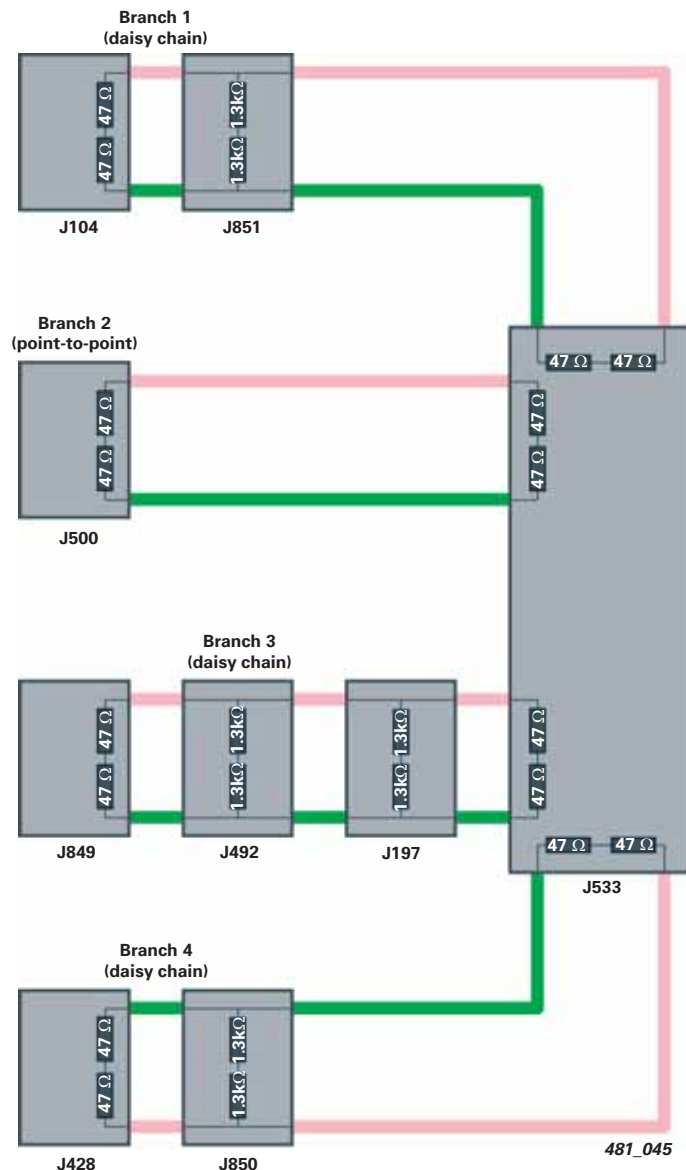
## FlexRay Topology

Within the FlexRay topology, Data Bus On Board Diagnostic Interface J533 is referred to as the “active hub” or “active node”. The connection between J533 and, for example, J500, is referred to as a “point-to-point” connection. The other three branches are referred to as a “daisy chain” connection.

A “daisy chain” connection is a linkage of control modules. The intermediate control modules have four FlexRay connections, while the control modules at the end have only two. The FlexRay cables are routed through to the printed circuit board of the intermediate control modules.

The printed circuit board offers practically no resistance to the transmission of signals. As long as the circuits of the intermediate control modules remain intact, FlexRay signals will be transmitted and the linked control modules can take part in the communication process.

Therefore, a faulty power supply in an intermediate control module does not automatically mean faulty communication with the remaining control modules.

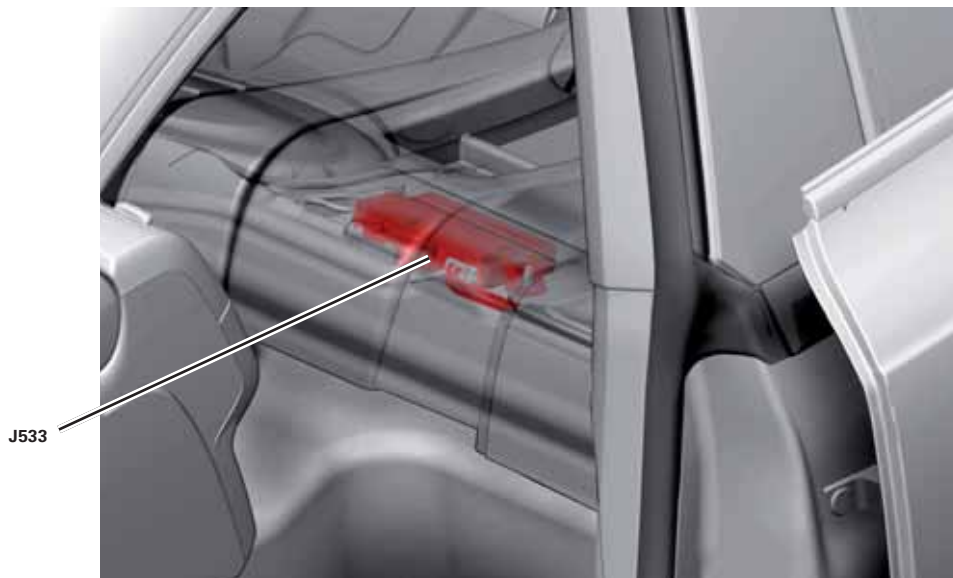
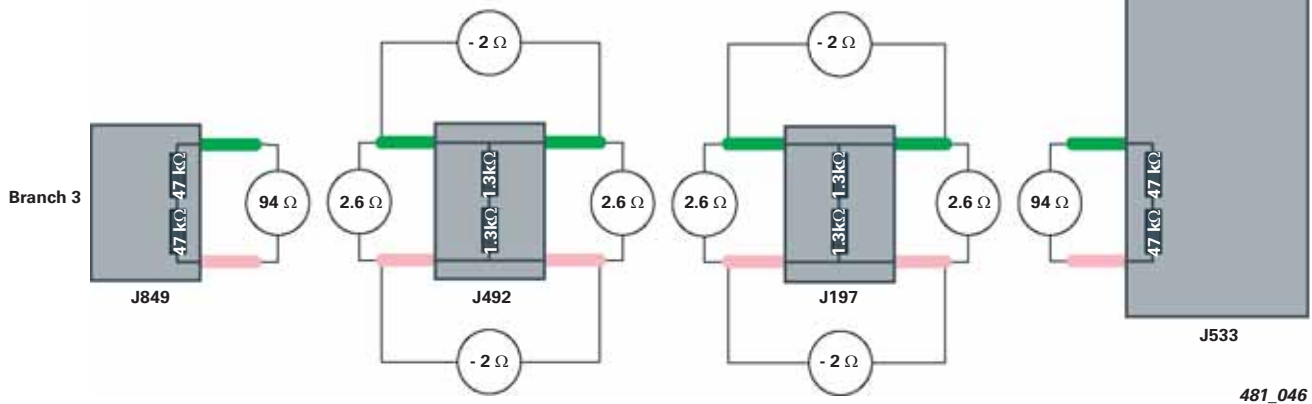


## Resistors

Each control module has two 47 ohm resistors connected in series at the end of each FlexRay branch. The intermediate control modules also have two 1.3 kohm resistors connected in series.

The resistors can be measured using a multimeter. However, only the total resistance of a control module can be determined by taking measurements at the control module pins. It is also permissible to perform continuity checks of the intermediate control module wiring.

This example shows measurement at the control modules of branch 3.



### Reference

For further information about the FlexRay bus, refer to 970103, *The 2011 Audi A8 Convenience Electronics and Networking Systems*.

## Data Bus On Board Diagnostic Interface J533

### Control Module Description

Description	Data Bus On Board Diagnostic Interface J533		
Location	At the center of the vehicle, under the rear seat		
Bus systems	Convenience CAN	500 kbit/s	Not single-wire capable
	Powertrain CAN	500 kbit/s	Not single-wire capable
	Extended CAN	500 kbit/s	Not single-wire capable
	Display and Control CAN	500 kbit/s	Not single-wire capable
	Diagnostics CAN	500 kbit/s	Not single-wire capable
	FlexRay	10 Mbit/s	Not single-wire capable
	MOST bus	22.5 Mbit/s	Ring structure (open circuit results in failure)
	LIN bus	20 kbit/s	Single-wire bus system
Functions	<ul style="list-style-type: none"> <li>– Networking gateway</li> <li>– Diagnostic interface</li> <li>– Diagnostic master for MOST bus system</li> <li>– Transport mode manager</li> <li>– Wake-up monitor (monitors bus standby mode or bus wake-up function)</li> <li>– Energy management</li> <li>– LIN master for: <ul style="list-style-type: none"> <li>• Battery Monitoring Control Module J367</li> <li>• Alternator C</li> </ul> </li> </ul>		
Address Word	19		
Function of J533 in the VAS Scan Tool	<ul style="list-style-type: none"> <li>– Read identification data</li> <li>– Installation locations</li> <li>– Static current measurement without current probe</li> <li>– Output check diagnosis, alternator voltage</li> <li>– Ring break diagnostics</li> <li>– Ring break diagnostics with 3 dB attenuation</li> <li>– Encoding</li> <li>– Read MVBs</li> <li>– Activate / deactivate Transport mode</li> <li>– Activate / deactivate Showroom mode</li> <li>– Adapt battery</li> <li>– Reset MOST bus open circuit counter</li> <li>– Check optical power reserve</li> <li>– Replace control module</li> <li>– Read battery history data</li> <li>– Read data bus standby mode</li> <li>– Read start–stop data</li> <li>– J533 – activate component protection</li> </ul>		

## Showroom Mode with Component Protection Feature

The 2012 A7 has a showroom mode for component protected control modules. This mode prevents unwanted deactivation of component protected control modules in showrooms and at auto shows.

Control modules integrated into the component protection system have to be cyclically authenticated by J533. This means a module's component protection feature is activated if the module is activated a certain number of times without switching the ignition ON between activations.

Once showroom mode is activated, J533 sends an authentication signal to all control modules after a wake-up of the bus system.

Showroom mode is activated using the VAS Scan Tool. Like transport mode, showroom mode is automatically deactivated after driving the vehicle a short distance.

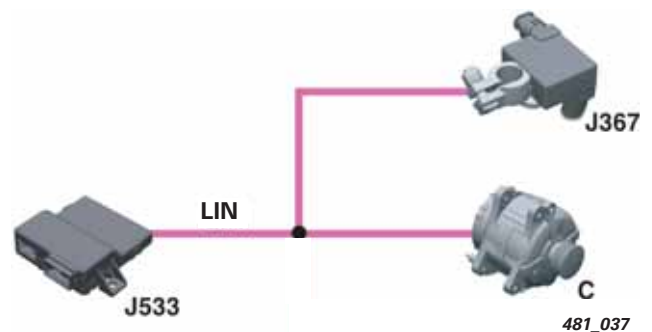
## Energy Management

The energy management system of the 2012 A7 is the same as the Audi A8 and includes:

- Data Bus On Board Diagnostic Interface J533
- Battery Monitoring Control Module J367
- Alternator C

J533 acts as the LIN master.

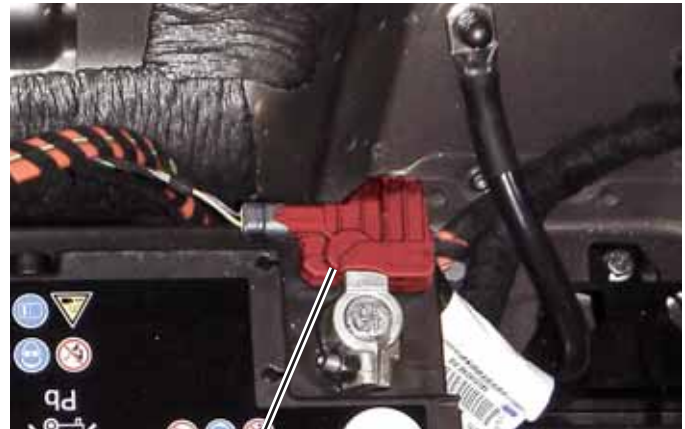
The energy recuperation function is also an integral part of the energy management system on the A7, helping to improve fuel economy and keeping emissions to a minimum.



## Battery Monitoring Control Module J367

### Summary Information

Description	Battery Monitoring Control Module J367
Installation Location	At the vehicle battery negative terminal
Functions	Measurement of: <ul style="list-style-type: none"><li>– Charging and discharge currents of the car battery</li><li>– Battery voltage</li><li>– Battery temperature</li></ul>
Address Word	None, LIN slave, measured data and diagnostics via J533 (Gateway)



### Battery Current Measure

Battery current is measured at the battery's negative terminal, where it flows through a shunt resistor. This resistor has a low resistance in the milli-ohm range.

The drop in voltage at the shunt resistor is proportional to the electrical current flowing into and out of the battery, which is computed and measured.

### Battery Voltage Measurement

Battery voltage is determined by measuring the voltage directly at the battery's positive terminal. For this purpose, a measuring lead runs from the battery positive terminal to J367.

### Battery Temperature Measurement

Battery temperature is measured using an NTC temperature sensor integrated in J367. Since the NTC temperature sensor is attached directly to the battery, it can be used to reliably determine the battery's temperature.

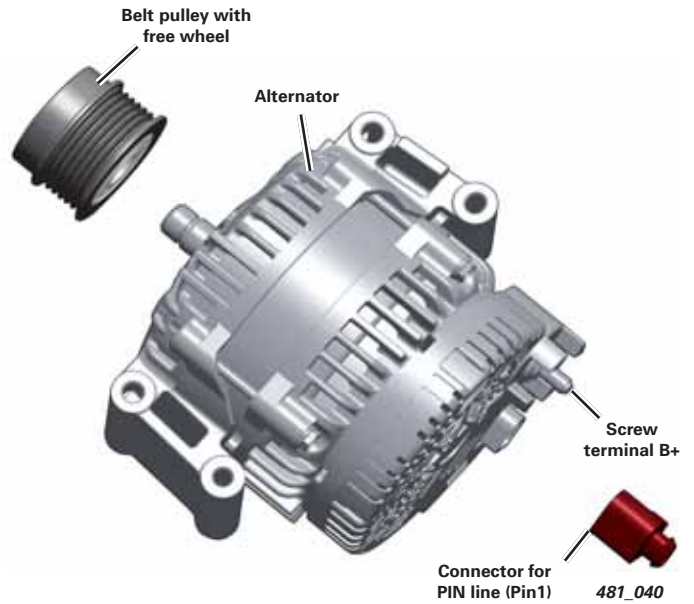


### Reference

For further information about the energy recuperation function, refer to Self-Study Program 970103, *The 2011 Audi A8 Convenience Electronics and Networking Systems*.

# Alternator C

Summary Information	
Description	Alternator C
Installation Location	at the bottom front right of the engine, driven by ribbed V belt
Functions	Charging the vehicle battery
Address Word	None, LIN slave, measured data and diagnostics via J533 (Gateway)



An air cooled alternator is used on the A7. It is equipped with a LIN controller and has two terminals: a bolted B+ terminal and a two-terminal connector in which only one pin is assigned to the LIN line. (Pin 2 remains unassigned)

J533 sends LIN messages to the LIN controller. Depending on the status of the onboard power supply, the messages specify a voltage value between 12.2V and 15.0V, which the controller then sets.

If the voltages are not set because, for example, there is an open LIN circuit, the controller will identify the condition and set a constant alternator voltage of 14.3V after a defined period of time.

The charge warning lamp in the instrument cluster does not activate unless there is a fault in the system. There is no “bulb check” when the ignition is switched ON.

Alternator testing and battery history evaluation is performed using the VAS Scan Tool via Data Bus On Board Diagnostic Interface J533.



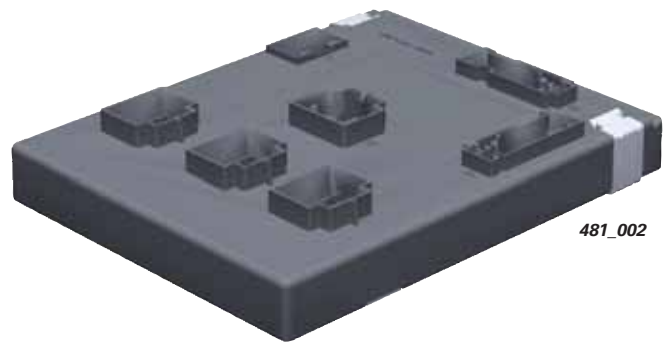
**Note**

To ensure that energy recuperation is not active during an alternator test, the low beam headlights must be switched ON. Care must be taken not to cover the headlights as this can cause overheating.

## Vehicle Electrical System Control Module J519

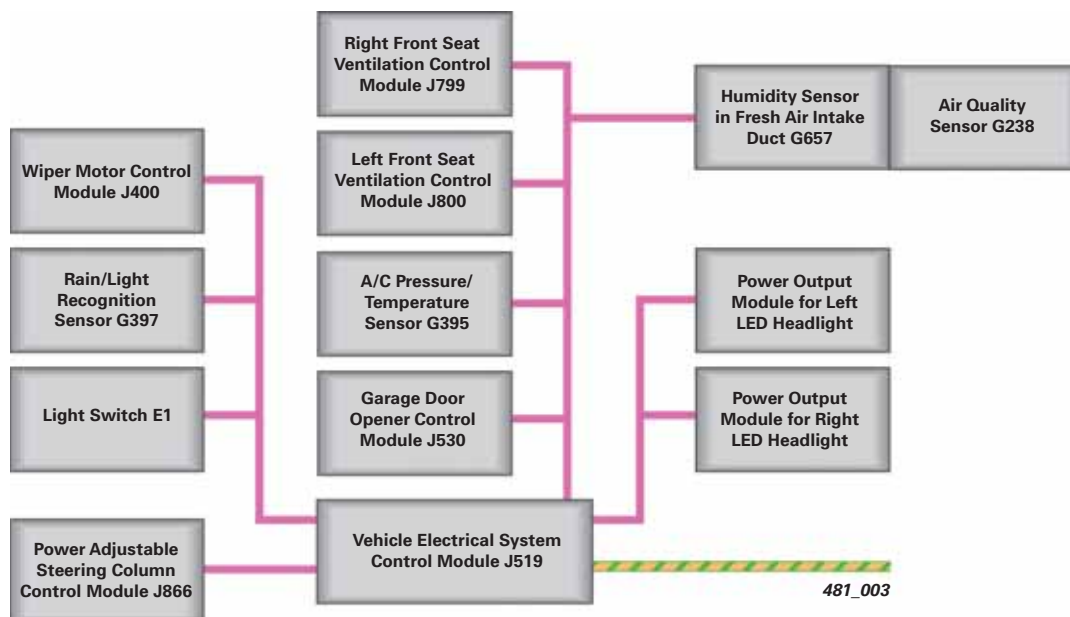
### Summary Information

Description	Vehicle Electrical System Control Module J519
Installation Location	Under instrument panel, driver side
Functions	<ul style="list-style-type: none"> <li>– All tasks of onboard power supply and tasks formerly performed by Vehicle Electrical System Control Module 2 J540</li> <li>– LIN master</li> <li>– LIN gateway</li> </ul>
Address Word	09
New Functions	See overview on next page



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### Function as LIN bus Master and LIN Gateway



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### Functions in the Data bus System

Vehicle Electrical System Control Module J519 is a Convenience CAN bus user. It is the master control module for the following LIN users:

- Wiper Motor Control Module J400
- Rain/Light Recognition Sensor G397
- Light Switch E1
- Power Adjustable Steering Column Control Module J866
- Power Output Module for LED Headlights

J519 functions as a gateway for the following LIN bus users:

- Air Quality Sensor G238
- Humidity Sensor in Fresh Air Intake Duct G657
- A/C Pressure/Temperature Sensor G395
- Right Front Seat Ventilation Control Module J799
- Left Front Seat Ventilation Control Module J800
- Garage Door Opener Control Module J530

## Functions

Light Functions	<ul style="list-style-type: none"> <li>- Emergency light operation logic in case of main processor failure</li> <li>- Read Rain/Light Recognition Sensor via LIN bus connection</li> <li>- Read warning light button and light</li> <li>- Activation of the front indicators (the indicator master is Comfort System Central Control Module J398)</li> <li>- Emergency indicator operation master (turn signals, emergency flashers, crash indication) in case of failure of J393</li> <li>- Activation of the side indicator lights via the door control modules</li> <li>- Read Light Switch E1 via LIN bus connection</li> <li>- Turning light/adaptive light via main headlights</li> <li>- Interior light master (interior light, front and rear footwell lights)</li> <li>- Function and search lighting (terminal 58s, 58st, 58d)</li> </ul>
Driver Information	<ul style="list-style-type: none"> <li>- Read ambient temperature</li> <li>- Read oil pressure switch</li> <li>- Read brake pad wear warning</li> <li>- Read brake fluid warning</li> <li>- Read coolant warning</li> <li>- Read washer solvent warning</li> <li>- Read light warning</li> </ul>
A/C Functions	<ul style="list-style-type: none"> <li>- Activation of front seat heater</li> <li>- LIN gateway for Air Quality Sensor G238, A/C Pressure/Temperature Sensor G395, and Humidity Sensor in Fresh Air Intake Duct G657</li> <li>- LIN gateway for seat heating and seat ventilation</li> <li>- Activation of A/C compressor</li> </ul>
Wipe/Wash Function	<ul style="list-style-type: none"> <li>- Activation of Wiper Control Module J400 via LIN bus connection</li> <li>- Read Rain/Light Recognition Sensor via LIN bus connection</li> <li>- Activation of the windshield washer pump</li> <li>- Activation of the headlight washer pump</li> </ul>
Interface to Comfort System Central Control Module J393	<ul style="list-style-type: none"> <li>- Enabling signal for electrical steering column lock (discrete and via CAN)</li> <li>- Feedback from discrete "terminal 15" (message to J393 via CAN)</li> <li>- Valet Parking Lock Button E536 and function LED (Valet Key)</li> <li>- Read rear roller blind button</li> </ul>
Other Functions	<ul style="list-style-type: none"> <li>- Activation of signal horn relay</li> <li>- Read back up light switch (CAN information from TCM J217)</li> <li>- Read parking brake switch (CAN information from electromechanical parking brake)</li> <li>- Read hood contact switch</li> <li>- Read settings via MMI (exterior light, interior light, wiper, Audi drive select and HomeLink)</li> <li>- LIN gateway for Garage Door Opener Control Module J530</li> <li>- Plausibilized "terminal 15": "terminal 15" via CAN or "terminal 15" via discrete line</li> <li>- Coordinator for Audi drive select</li> </ul>
Special Functions	<ul style="list-style-type: none"> <li>- Energy management system power down levels</li> <li>- Transport mode (interior light, footwell lights, Coming/Leaving Home, daytime running lights, heated windshield washer jets)</li> <li>- Component protection system user</li> </ul>



# Exterior Lighting

## Light Switch E1

Summary Information	
Description	Light Switch E1
Installation Location	Instrument panel, driver side
Functions	To indicate the driver's preferred light setting to Vehicle Electrical System Control Module J519
Address Word	None, LIN slave, MVBs, and diagnostics via J519 (master)




### Function

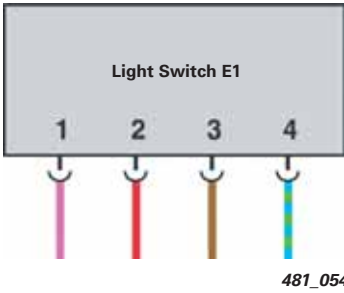
The rotary knob has four settings:

**0** Lights OFF (in some countries, daytime running lights are switched ON automatically at "terminal 15 on")

**AUTO** Automatic daytime running lights are switched ON and OFF depending on the light sensor

 Side light

 Low beam



### Electrical Connections and Circuit

All signals from switches and controls connected to Light Switch E1 are read by Vehicle Electrical System Control Module J519. The commands for the switch lighting and warning lamps of the individual functions are sent to Light Switch E1 by J519.

A redundancy line is connected to ground via an electrical circuit inside the switch and serves to determine plausibility of the switch position.

In the event of a short circuit or open circuit in the LIN line or redundancy line, the emergency light function is activated by Vehicle Electrical System Control Module J519 (low beam ON) and a DTC is logged.


Terminals:


- Pin 1 LIN to J519
- Pin 2 "terminal 30"
- Pin 3 "terminal 31"
- Pin 4 Redundancy line to J519


## Button Functions

The light switch control panel has a different design depending on equipment level. Four different versions are available.

The following functions can be switched ON and OFF via the control panel:

 All-weather light  
(not on vehicles in the U.S. market)

 Night vision assist

 Rear fog light



There are four versions of the control panel



481\_055

## Headlights

Two lighting variants are available on the 2012 A7:

- Bi-xenon headlights
- LED headlights

Two versions of bi-xenon light are offered depending on vehicle model level:

- Bi-xenon
- Bi-xenon with AFS adaptive light

Both bi-xenon headlight systems use identical lighting elements. However, the light functions, activation mechanisms, and headlight range adjustment configurations of these systems differ.

### Bi-Xenon Headlights



481\_010

### LED Headlights

All lighting functions are performed by LEDs.



481\_011

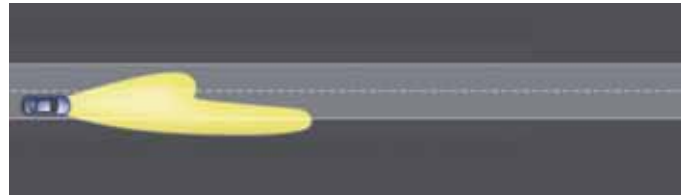
## Bi-Xenon Headlights

Light Function	Type of Light Used	Power
Side light	14 LEDs, dimmed	not specified
Daytime running light	14 LEDs	not specified
Flasher	Light bulb (PSY24W)	24 watts
Low beam headlight	Gas discharge lamp (D3S)	35 watts
High beam headlight	Gas discharge lamp (D3S)	35 watts

### Light Functions

#### Low Beam

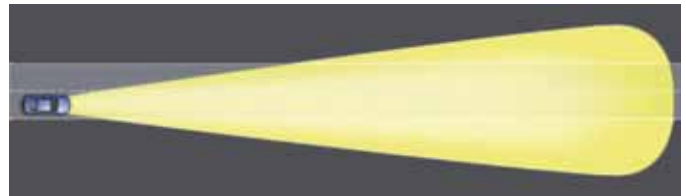
A gas discharge lamp and lens produces an asymmetric low beam.



481\_056

#### High Beam

A gas discharge lamp and lens, as well as an electrically actuated shutter covering the asymmetric range, produces a symmetrical main beam.

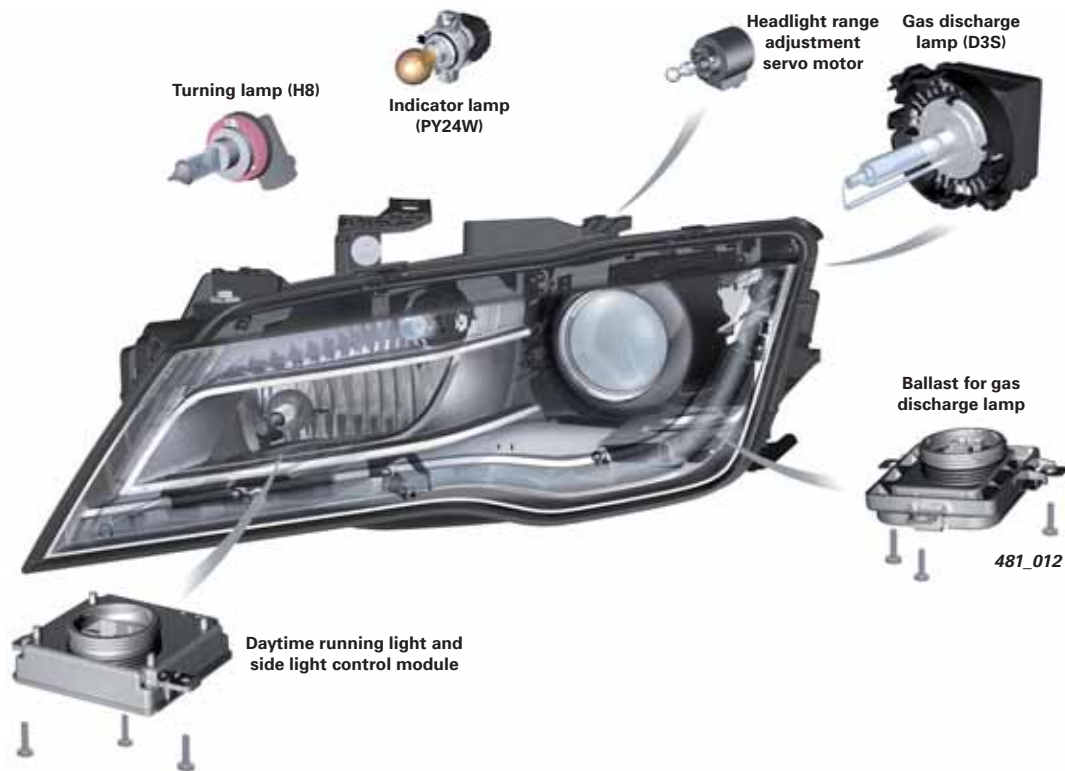


481\_057

## Component Parts

Caps, repair tabs, screws, and vents can be replaced on bi-xenon headlights. Also, the parts shown in the illustration below can be replaced.

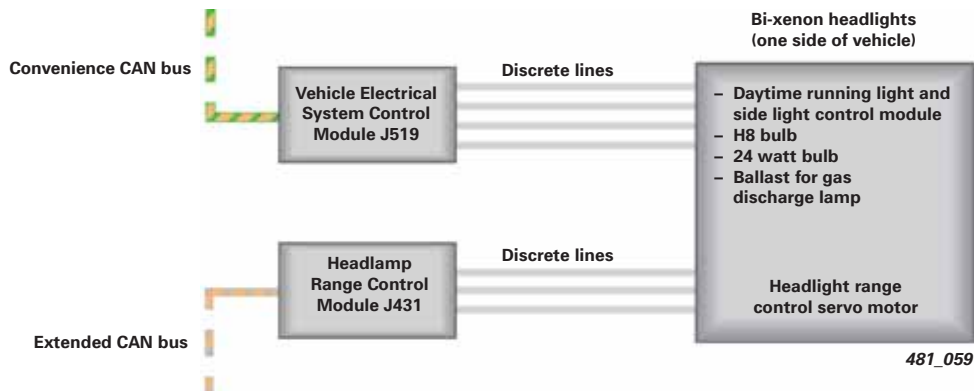
To replace the headlight range control servo motor, the headlight housing must be cut open and then re-sealed with a repair cover and seal.



## Activation Mechanism

The individual lights (both right and left) and the control modules for the DRLs and side lights are activated discretely by Vehicle Electrical System Control Module J519. The headlight range control system is activated by Headlamp Range Control Module J431.

## Schematic Diagram of the Activation Mechanism



## Bi-Xenon Headlights with AFS Adaptive Light

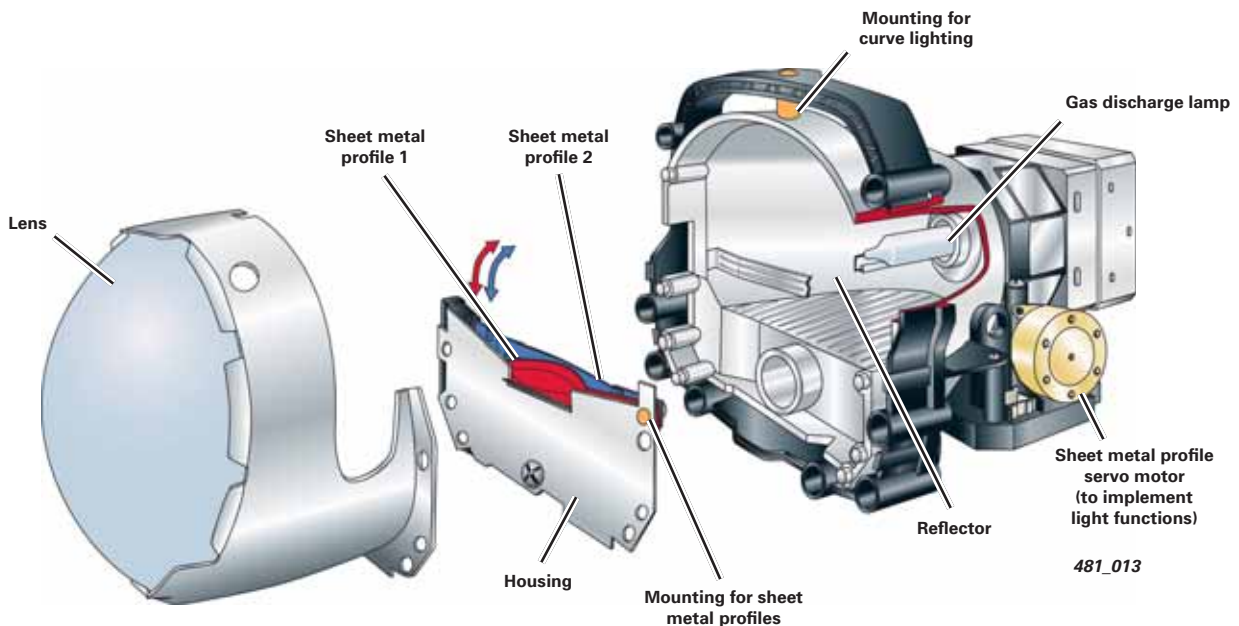
Light Function	Type of Light Used	Power
Side light	14 LEDs, dimmed	not specified
Daytime running light	14 LEDs	not specified
Flasher	Light bulb (PSY24W)	24 watts
Low beam headlight	Gas discharge lamp (D3S)	35 watts
High beam headlight	Gas discharge lamp (D3S)	35 watts
Turning light	H8 bulb	35 watts

### Implementation of Light Functions

The headlights on vehicles equipped with bi-xenon and AFS have two sheet metal profiles positioned in front of the gas discharge lamp. These profiles are used to partially mask the beams of the light source.

The sheet metal profiles are attached only on one side and rotate in a vertical direction. A servo motor is used to rotate the profiles.

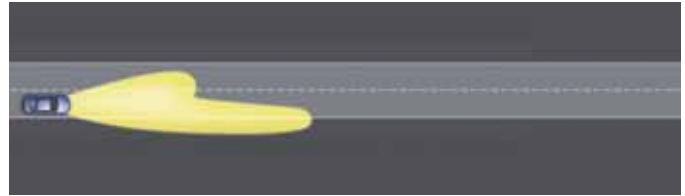
The sheet metal profiles allow different lighting functions to be implemented. In addition, the complete projection module (reflector, lens, gas discharge lamp, and sheet metal profiles) is swiveled sideways, depending on the left/right movement of the steering wheel via a separate motor (not shown). This produces a turning light which illuminates a wider area of the road when steering through curves.



## Light Functions

### Low Beam Headlights

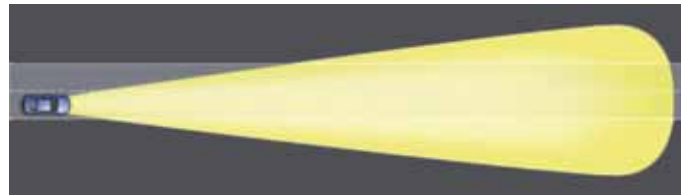
The gas discharge lamp produces an asymmetric low beam.



481\_060

### High Beam

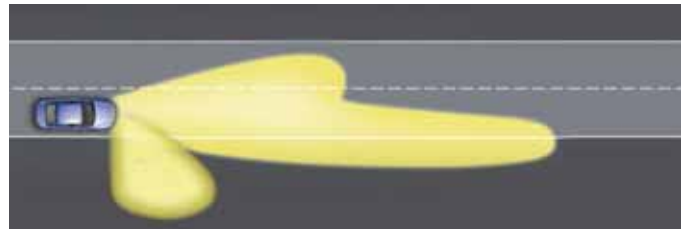
The gas discharge lamp produces a symmetrical main beam.



481\_062

### Turning Light

The turning light is produced by activating the H8 bulb on one side of the vehicle at speeds of less than 43.4 mph (70 km/h), when heavy steering lock is applied or when the indicators are activated and the vehicle is travelling at less than 24.8 mph (40 km/h). It is activated in conjunction with the low beam.

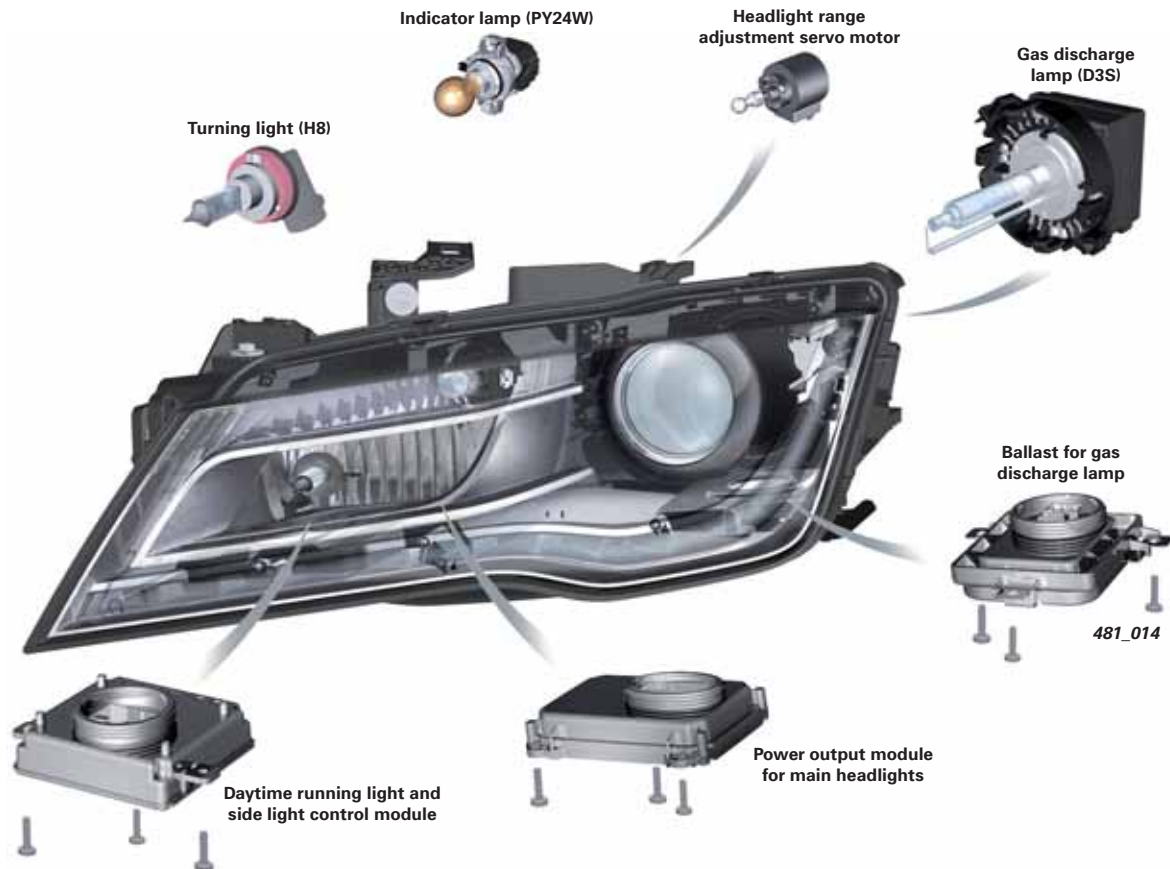


481\_065

## Component Parts

The bi-xenon headlights with AFS parts in the illustration below are replaceable:

To replace the headlight range control servo motor, the headlight housing must be cut open and then re-sealed with a repair cover and seal.



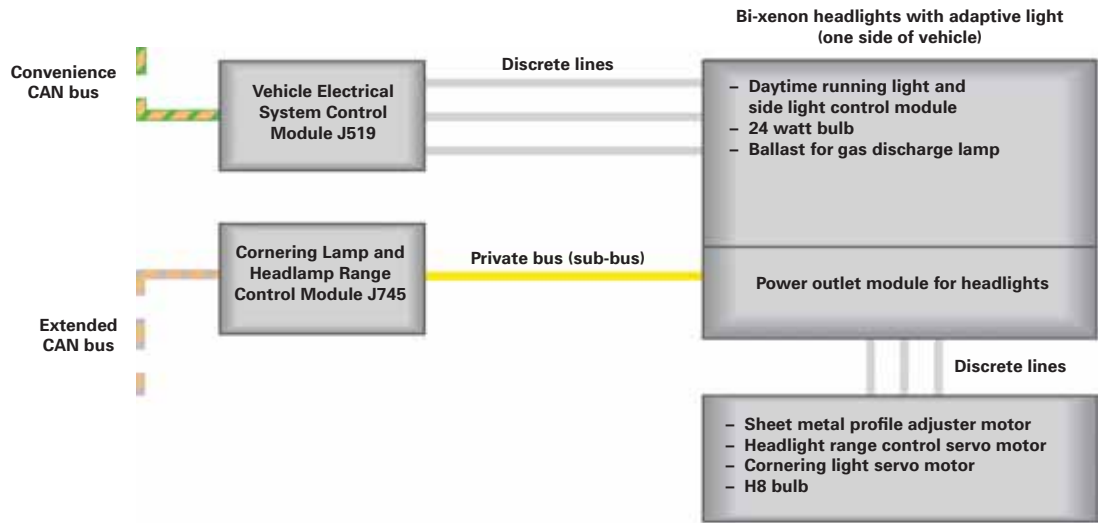
## Activation Mechanism

Vehicle Electrical System Control Module J519 activates the DRLs, the side light control module, and the 24-watt bulb and ballast for the gas discharge lamp via discrete lines.

Cornering Lamp and Headlamp Range Control Module J745 activates the power output module for the headlights via a private CAN bus. This module activates the sheet metal profile adjuster motor, the headlight range control servo motor, the cornering light servo motor, and the H8 bulb via discrete lines.



## Schematic Diagram of the Activation Mechanism



481\_015

## LED Headlights

Light Function	Type of Light Used
Side light	18 LEDs, white dimmed
Daytime running light	18 LEDs, white
Indicator light	11 LEDs, yellow
Low beam headlight	16 LEDs (2x 2-chip, 2x 2-chip, 2x 4-chip)
High beam headlight	20 LEDs (1x 4-chip, in addition to low beam)
Turning light	20 LEDs (1x 4-chip, in addition to low beam)
Coming home / Leaving home	8 LEDs (2x 2-chip, 2x 2-chip)

### Daytime Running Lights (DRL)

The daytime running lights and side lights are formed by 22 white LEDs. They are activated by a pulse-width modulation (PWM) signal.



481\_069

### Low Beam Headlights

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



481\_070

### Flasher

The flasher is comprised of 22 orange LEDs housed in the same space as the daytime running light LEDs. While the flasher is operating, the daytime running light LEDs are switched OFF.

The LEDs for the flasher are supplied with a higher current due to statutory requirements. For this reason, Left LED Headlamp Power Output Module 5 A35 is also installed.



481\_071

### High Beam Headlights

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



481\_072

## Turning Light

The turning light is produced by supplementing the low beam by switching ON a quadruple LED chip. This chip is located below the daytime running light, and illuminates the turning zone with the aid of a reflector.

The pre-condition for switching this chip ON is either the flasher is ON in conjunction with a vehicle speed under 24.8 mph (40 km/h), or the steering wheel is turned more than a pre-specified amount while vehicle speed is under 43.4 mph (70 km/h).



481\_074

## Coming Home / Leaving Home

Both inner LED modules are used for the coming home / leaving home functions. These functions are activated either when leaving the vehicle by opening the driver door, or when central locking is unlocked with the remote control key.

The following activation conditions must be present:

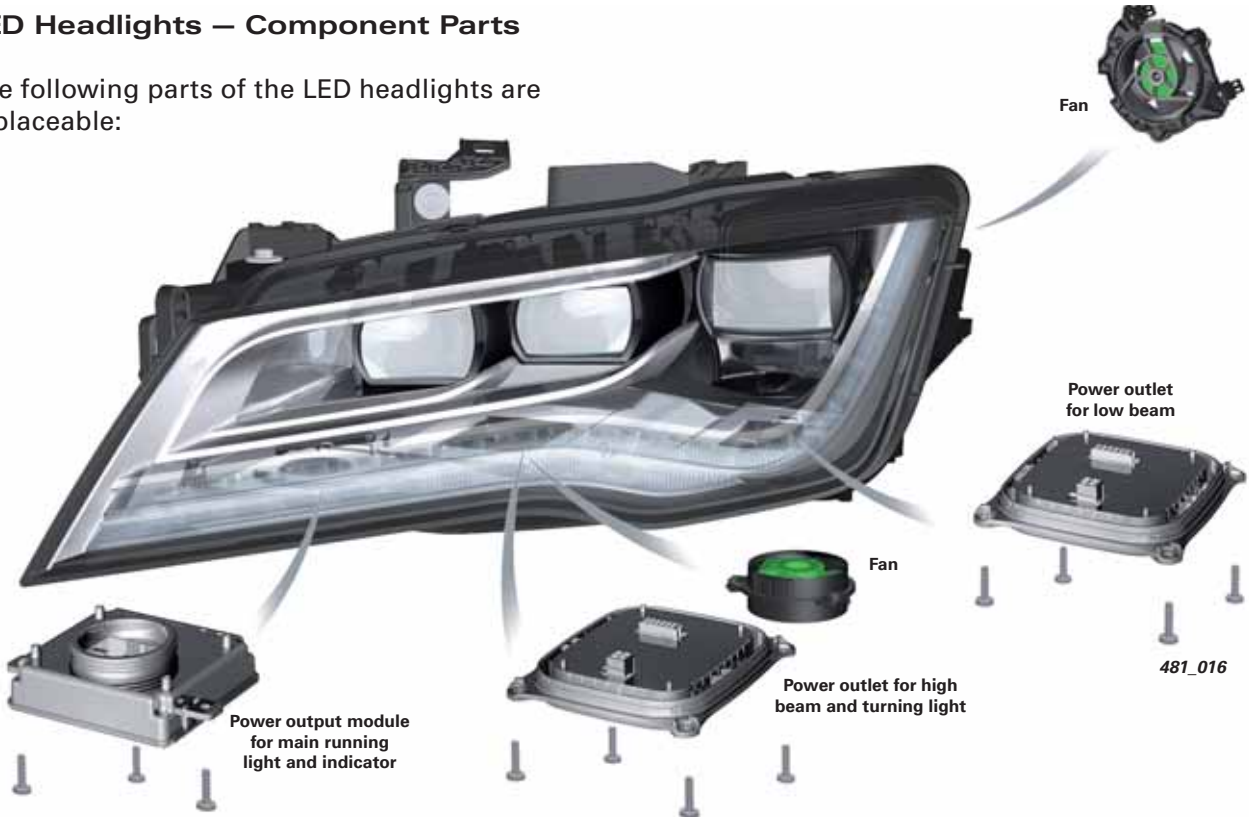
- Light switch must be in the "AUTO" position
- Rain/Light Recognition Sensor G367 must detect "dark"
- Both functions are enabled in the MMI



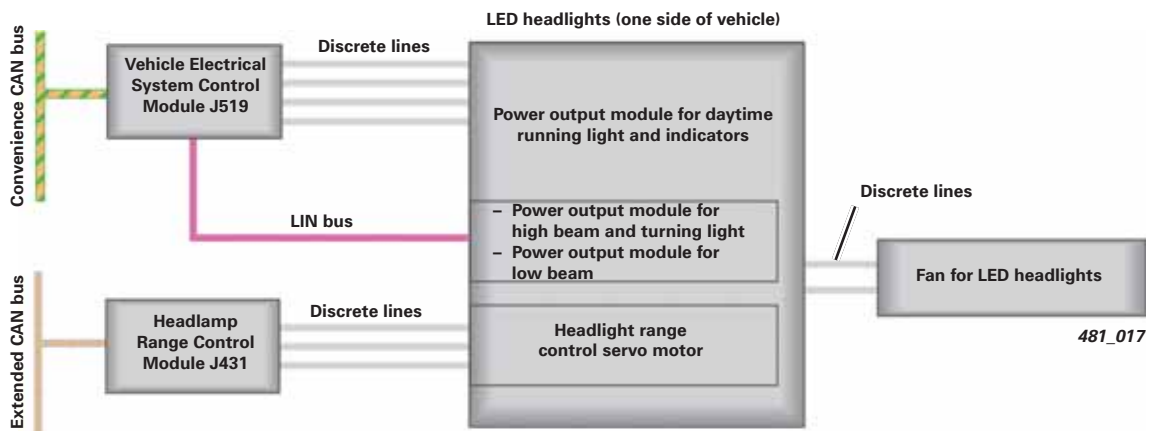
481\_073

## LED Headlights – Component Parts

The following parts of the LED headlights are replaceable:



## Schematic Diagram of the Activation Mechanism



The power output module for high beam and cornering lights is activated via a discrete line by Vehicle Electrical System Control Module J519. The output modules are LIN slaves.

These LIN slaves monitor both ventilation fans in the LED headlights via discrete lines. The fans are activated at "terminal 15 on" and run continuously until "terminal 15" is deactivated again.



### Note

Caution! ESD protection must be ensured during all work on the headlights, particularly when replacing internal components. Workshop equipment VAS 6613 is available for this purpose (see page 38).

## Side Marker Lights

Vehicles for the North American market come equipped with side marker lights, in keeping with statutory regulations.

The marker lights are clipped into the vehicle bumper covers and use 5 watt (W5W) bulbs.

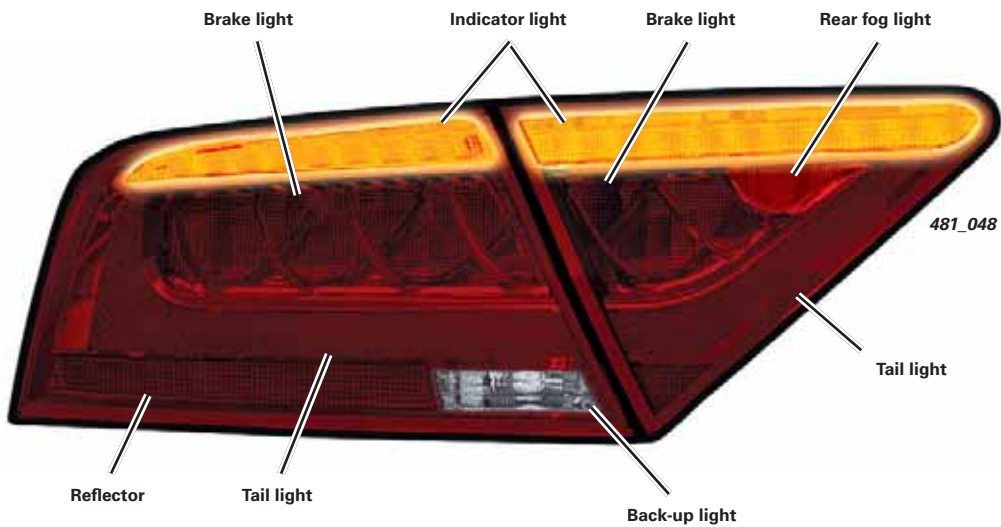


## Tail Lights

The tail lights of the 2012 A7 consist of two separate parts. One light module is installed in the fender while the other is in the trunk lid. All lighting functions except the back-up lights are performed by LEDs.

The back-up lights are 16 watt (HP16W) bulbs located in the fender mounted tail light module. They are activated by Comfort System Central Control Module J393.

The back-up light bulbs are not customer accessible.



## Brake Light

The brake light is produced by 19 red LEDs (12 in the fender mounted light module, seven in the trunk lid mounted module) plus an additional 21 red LEDs located in the upper section of the tail light modules.



481\_020



481\_024

All 40 LEDs of the brake light are used for the indicator lights. The LEDs flash at a frequency of approximately 1.5 Hz.

The back-up light function is performed by a 16 watt (HP16W) long-life bulb.

## Tail Light

The tail light is produced by 18 red LEDs in the fender mounted module and 9 LEDs in the trunk lid mounted module.

Forty additional LEDs are lit in addition to those of the tail light.



481\_026



481\_028

27 red LEDs for the tail light are lit and an additional 40 red LEDs flash when the turn signals are activated.

The following LEDs are lit:

- 27 red LEDs of the tail light mounted in the fender module plus 10 LEDs in the upper chamber
- 12 red LEDs for the brake light in the fender mounted module
- One red LED in the trunk lid module for the fog light
- Six LEDs above the fog light



481\_030



481\_032

## High Level Brake Light

All A7 models for the North American market have a high-level brake light module (48 LEDs) at the center top edge of the rear window.

## Emergency Brake System

In an emergency braking situation, the brake light initially flashes at a frequency of 3 Hz until the vehicle comes to a standstill, after which the warning flashers are activated.

The emergency braking signal is also activated by using the parking brake or a corresponding command from the cruise control system.

Other requirements must also be met to trigger the emergency braking light function:

- Vehicle speed must be over 37.2 mph (60 km/h)
- A pre-defined brake pressure or deceleration value (dependent on the coefficients of friction between the road and tires)
- An ABS intervention at a minimum of two wheels, of which one must be a front wheel

If these criteria have been met, ABS Control Module J104 sends an emergency braking signal via the data bus. Comfort System Central Control Module J393 receives this signal and then activates the tail lights accordingly. At present, this function cannot be tested using the VAS Scan Tool.

Light Function	SAE Version
Brake light	40x LED
Indicator light	40x LED
Tail light	27x LED
Rear fog light	34x LED
High level brake light	48x LED
Back up light	1x HP16W, 16 watts
Side marker light	1x W5W, 5 watts

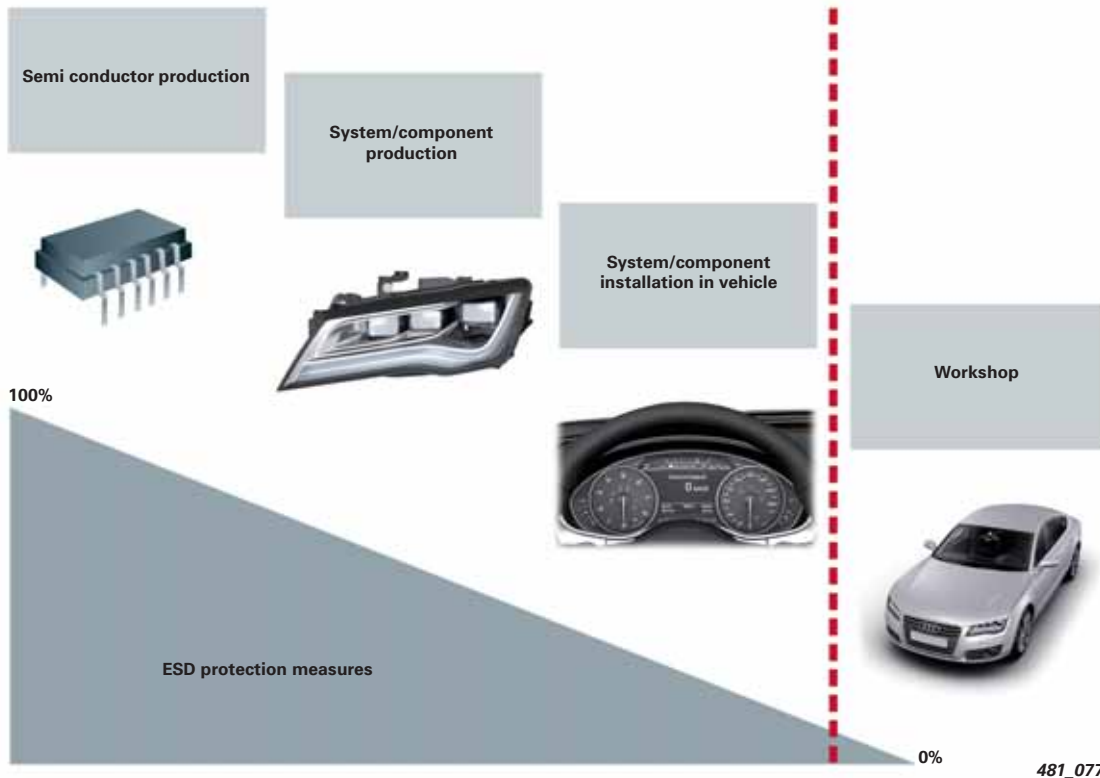


## ESD Protection During Electronic Repairs

Electrostatic discharge is one of the most common causes of failure in semiconductor elements. Integrated semiconductor modules and LEDs are particularly sensitive and are capable of withstanding only very low voltages.

Until now, protection of these components against electrostatic discharge was tested continuously in the various stages of the process chain from manufacturing to workshop replacement. For this reason, electrostatically sensitive components previously had to be replaced completely.

ESD protection process chain

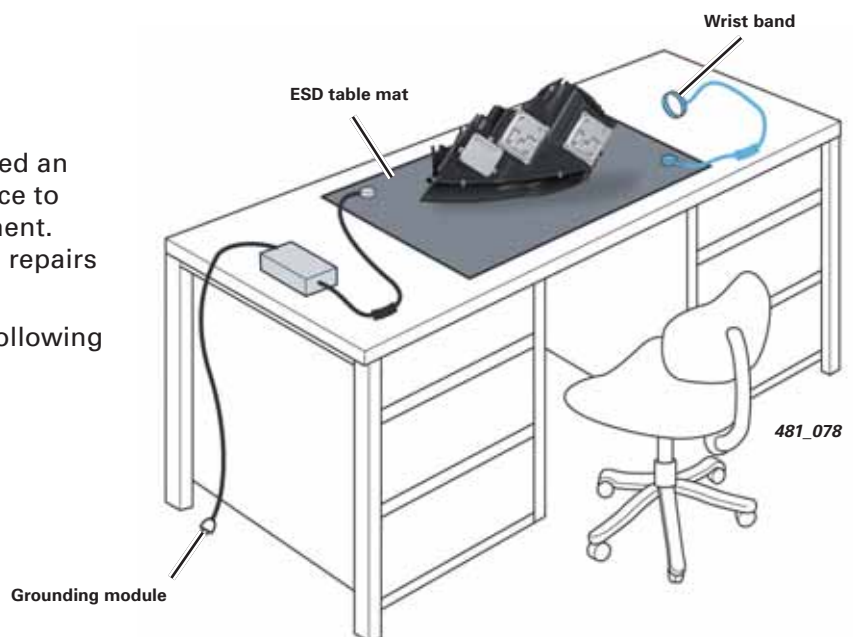


### Workshop Equipment VAS 6613

The introduction of VAS 6613 has provided an electrostatic discharged protected surface to perform electronic component replacement. This surface must be used when making repairs to electronic components.

Electronic repairs are approved for the following modules on the A7:

- LED headlights
- Bi-xenon headlights



# Self-Study Programs for the 2012 Audi A7

## SSP 990203 The 2012 Audi A7 Vehicle Introduction

- Body
- Occupant Protection
- Engine
- Power Transmission
- Suspension System
- Electrical System
- Climate Control
- Infotainment

## SSP 990303 The 2012 Audi A7 Running Gear and Suspension Systems

- Axles and Wheel Alignment
- Adaptive Air Suspension
- Steering System
- Electromechanical Steering
- Brake System
- ESP
- Sensor Electronics Control Module J849
- Adaptive Cruise Control (ACC)
- Wheels and Tires
- Tire Pressure Monitoring (TPMS)

## SSP 990403 The 2012 Audi A7 Onboard Power Supply and Networking

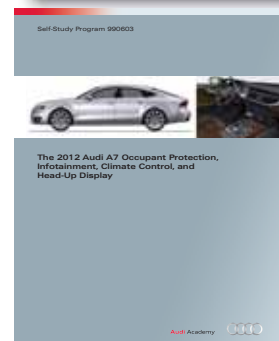
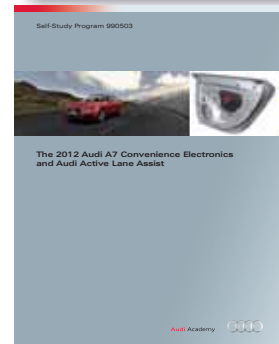
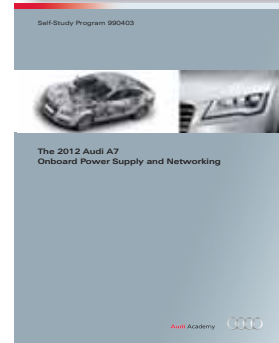
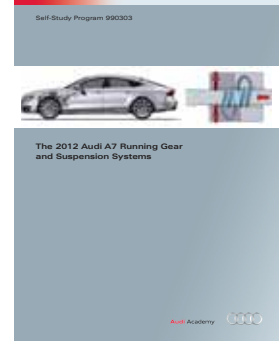
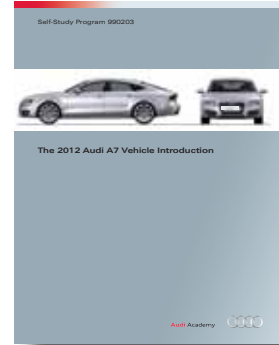
- Power Supply
- Networking
- Control Modules
- Exterior Lighting

## SSP 990503 The 2012 Audi A7 Convenience Electronics and Audi Active Lane Assist

- Topology
- Convenience Electronics
- Audi Active Lane Assist

## SSP 990603 The 2012 Audi A7 Occupant Protection, Infotainment, Climate Control, and Head-Up Display

- Occupant Protection
- Audi pre sense
- Infotainment
- Air Conditioning
- Seat System
- Head-Up Display



# Knowledge Assessment

An on-line Knowledge Assessment (exam) is available for this Self-Study Program.

The Knowledge Assessment is required for Certification.

You can find this Knowledge Assessment at:

**[www.accessaudi.com](http://www.accessaudi.com)**

From the [accessaudi.com](http://accessaudi.com) Homepage:

- Click on the "ACADEMY" tab
- Click on the "Academy Site" link
- Click on the "CRC/Certification" link
- Click on Course Catalog and select "990403 — The 2012 Audi A7 Onboard Power Supply and Networking"

For assistance please call:

**Audi Academy**  
**Certification Resource Center (CRC)**  
**1-877-283-4562**  
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Or you may send an email to:

**[audicrhelpdesk@touchstone-group.com](mailto:audicrhelpdesk@touchstone-group.com)**

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

