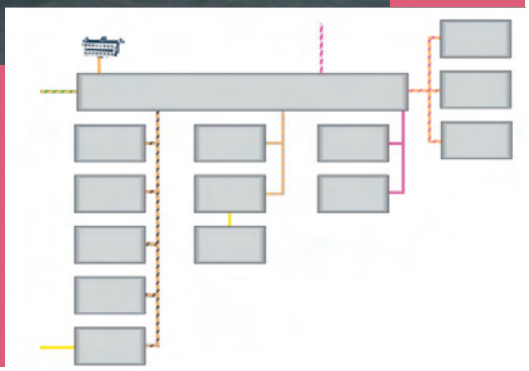
Service Training





The 2008 Audi A5/S5 Networking

Self-Study Program 99A703

Audi of America, Inc.
Service Training
Printed in U.S.A.
Printed 9/2007
Course Number 99A703

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The Self-Study Program teaches the design and function of new vehicle models, automotive components or technologies.

The Self-Study Program is not a Repair Manual!
The values given are only intended as a guideline. Refer to the software version valid at the time of publication of the SSP.

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

Reference

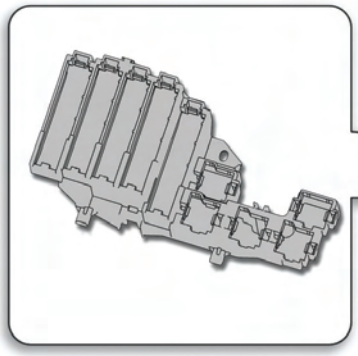


Note

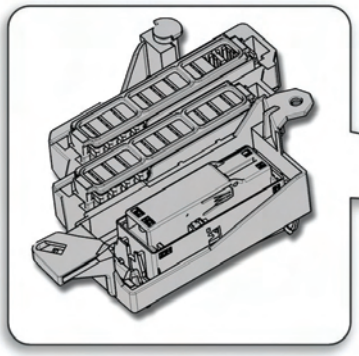


Fuses and Relays

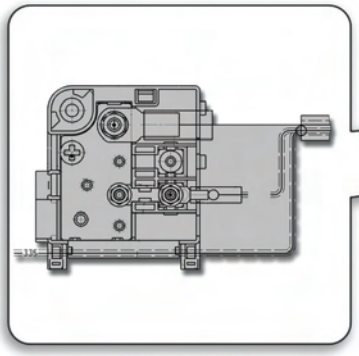
Relay Carrier and Fuse Panel in Right Side of Luggage Compartment



Fuse Panel, CAN Node Connector, Right End of Instrument Panel

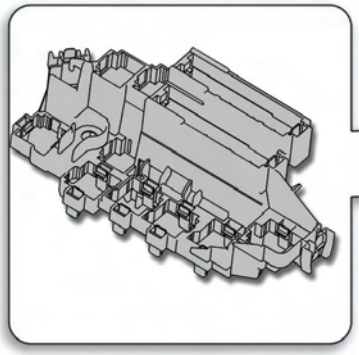


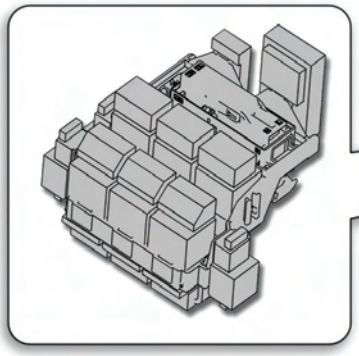
Fuse Panel and External Jump Start Lug Connection in Plenum Chamber



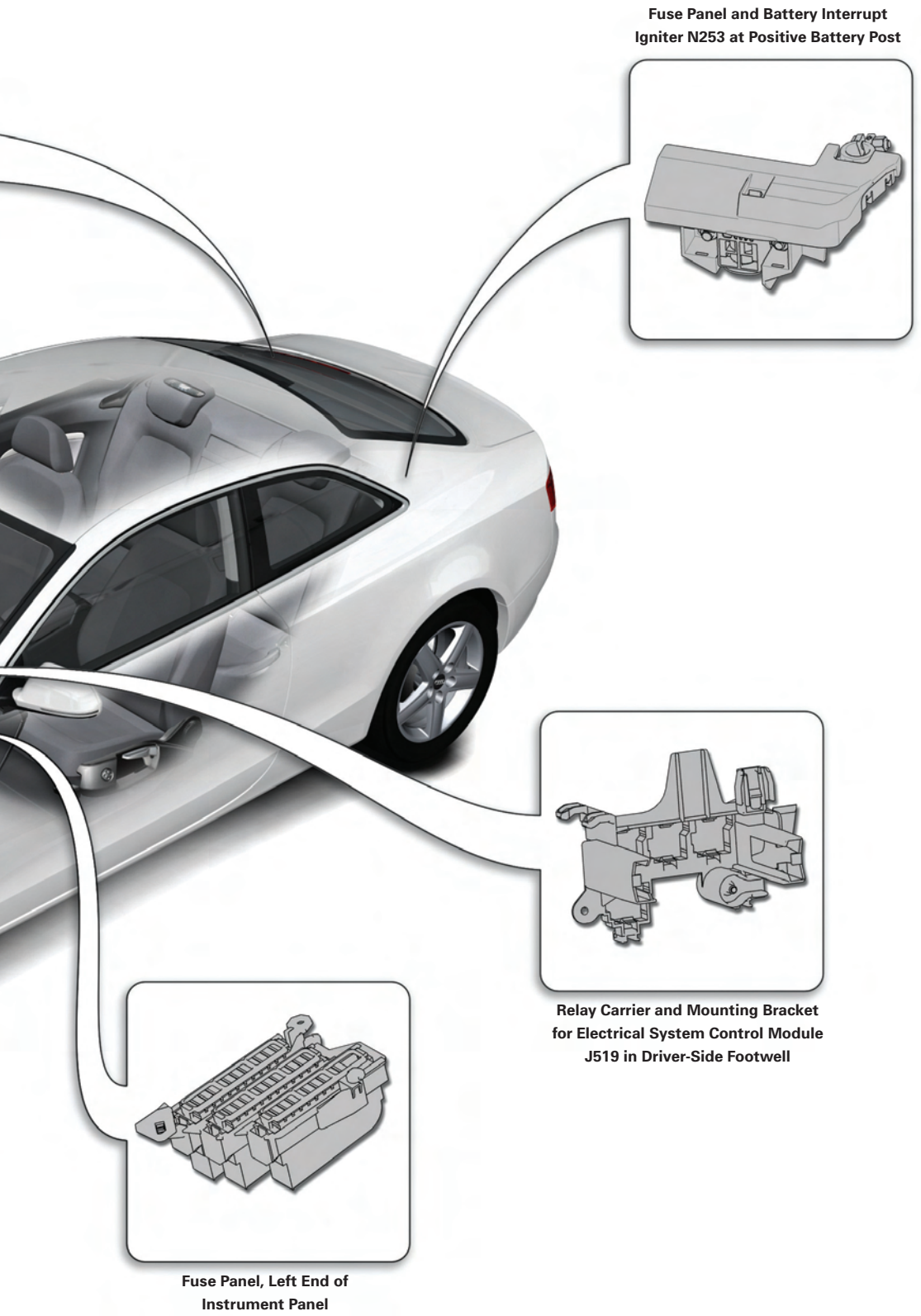


Relay Carrier and Fuse Panel in Electronics Box





Connector Station and CAN Node Connector at Lower Left A-Pillar

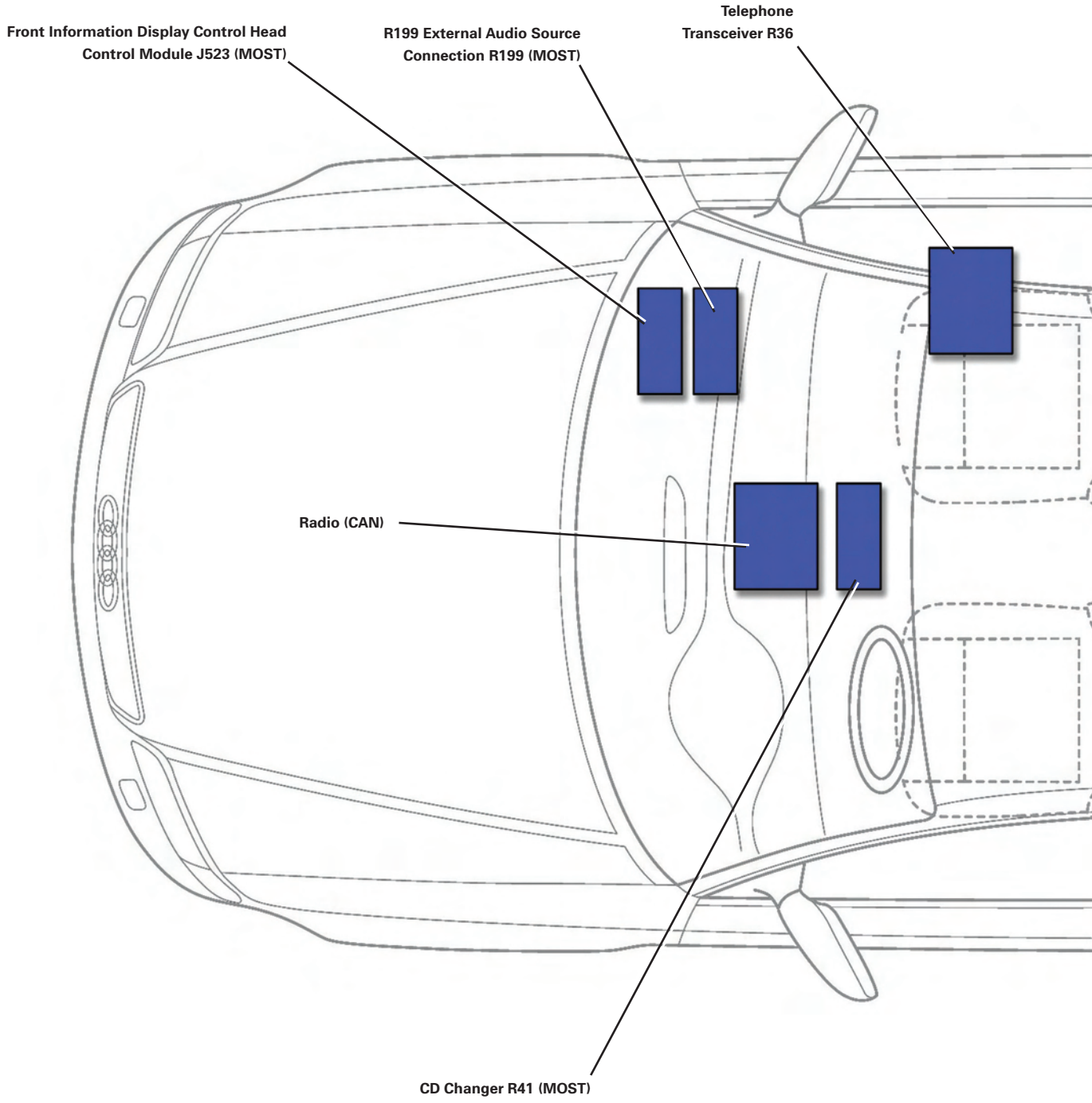


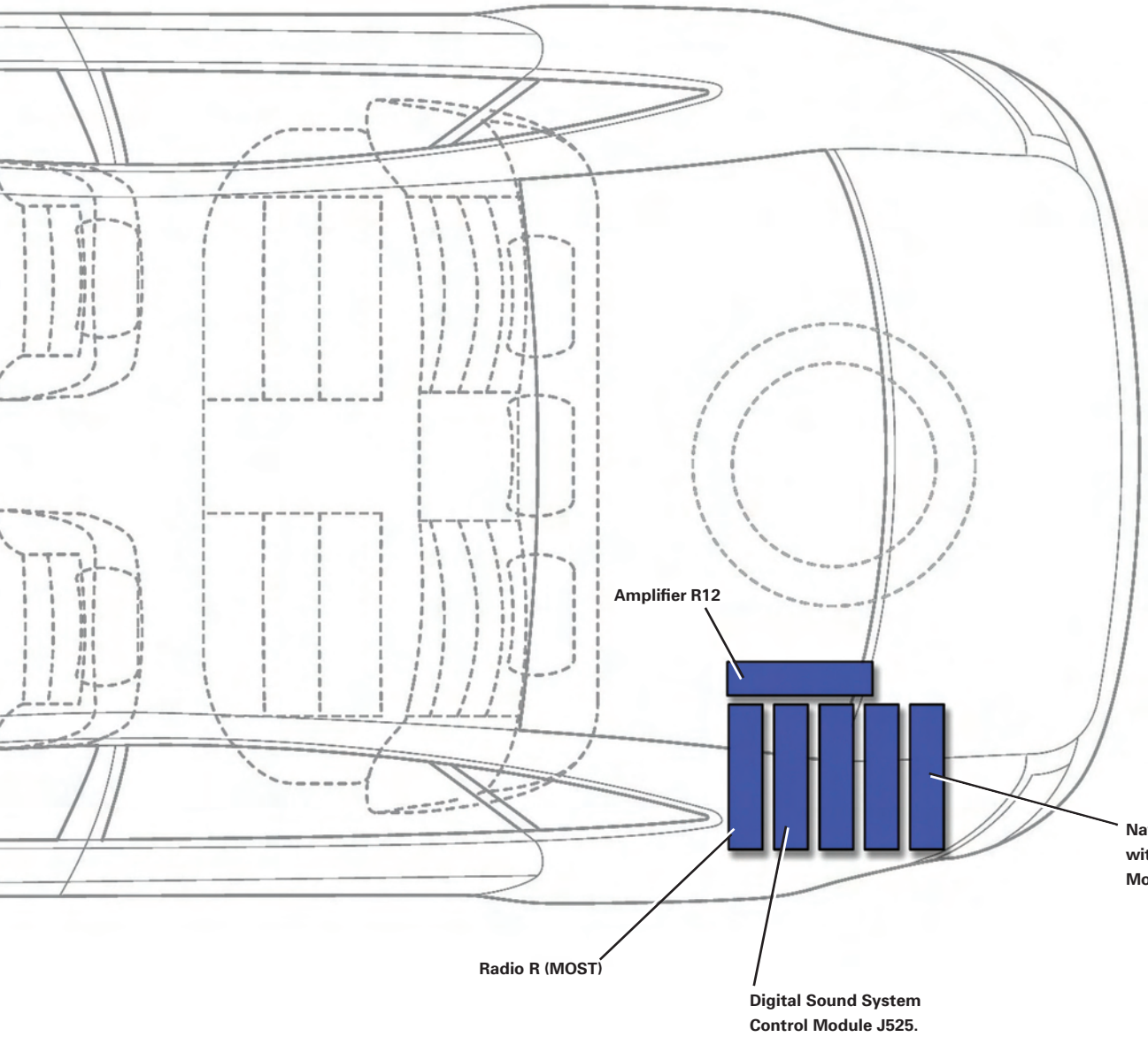
Fuse Panel and Battery Interrupt
Igniter N253 at Positive Battery Post

Relay Carrier and Mounting Bracket
for Electrical System Control Module
J519 in Driver-Side Footwell

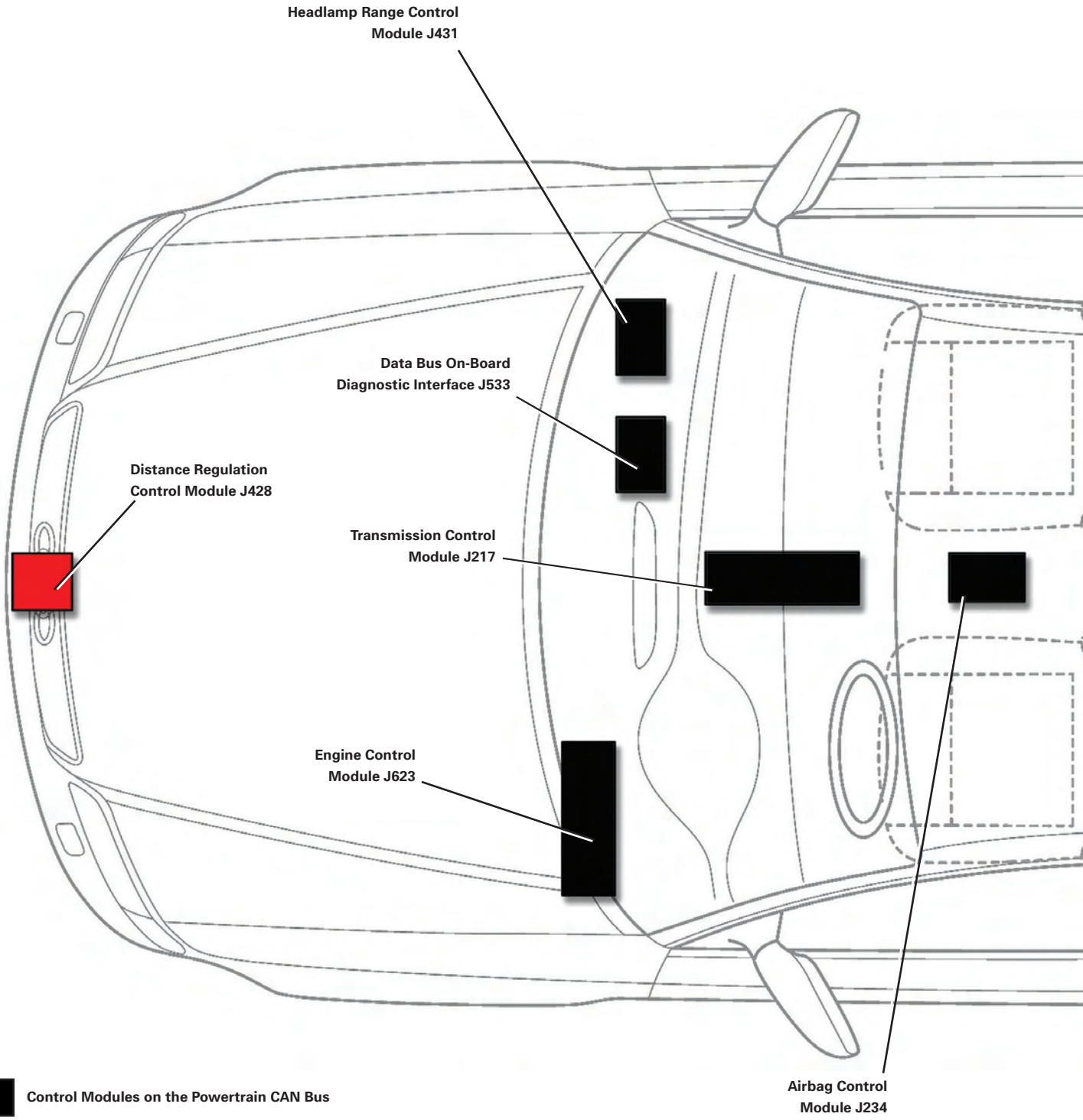
Fuse Panel, Left End of
Instrument Panel

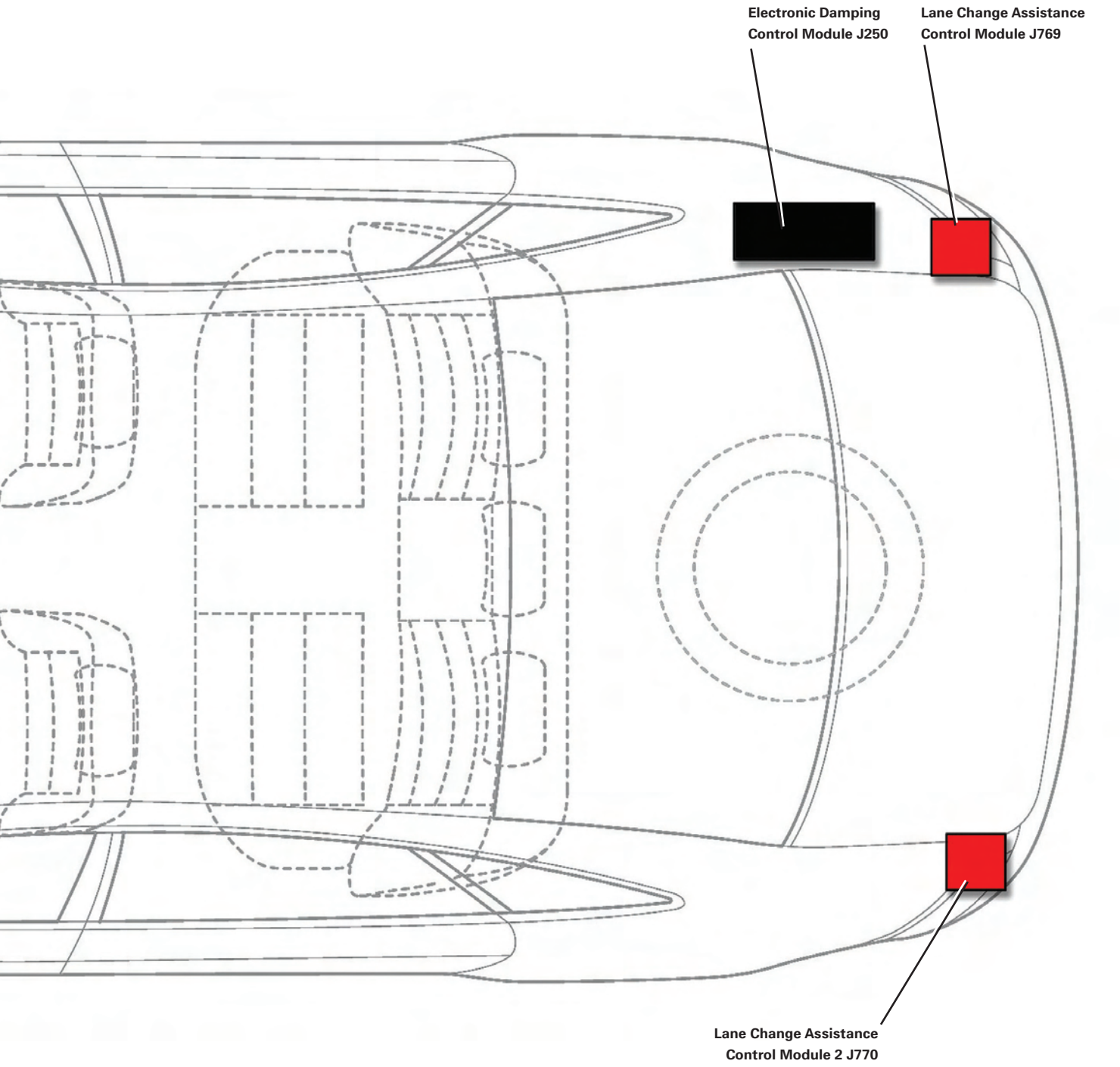
Installation Locations of Infotainment Components



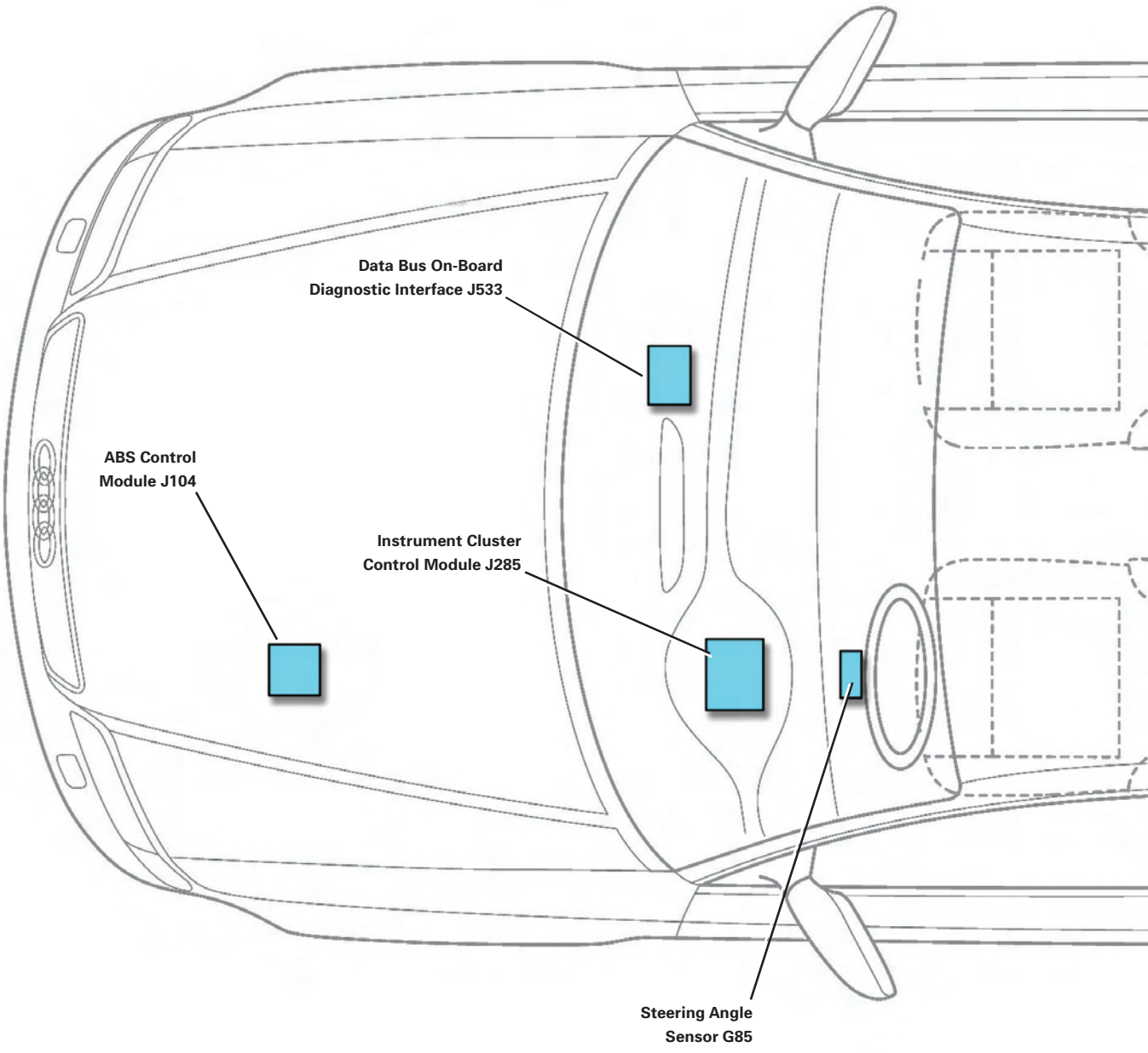

Amplifier R12
Navigation System with DVD Drive Control Module J401 (MOST)
Radio R (MOST)
Digital Sound System Control Module J525.

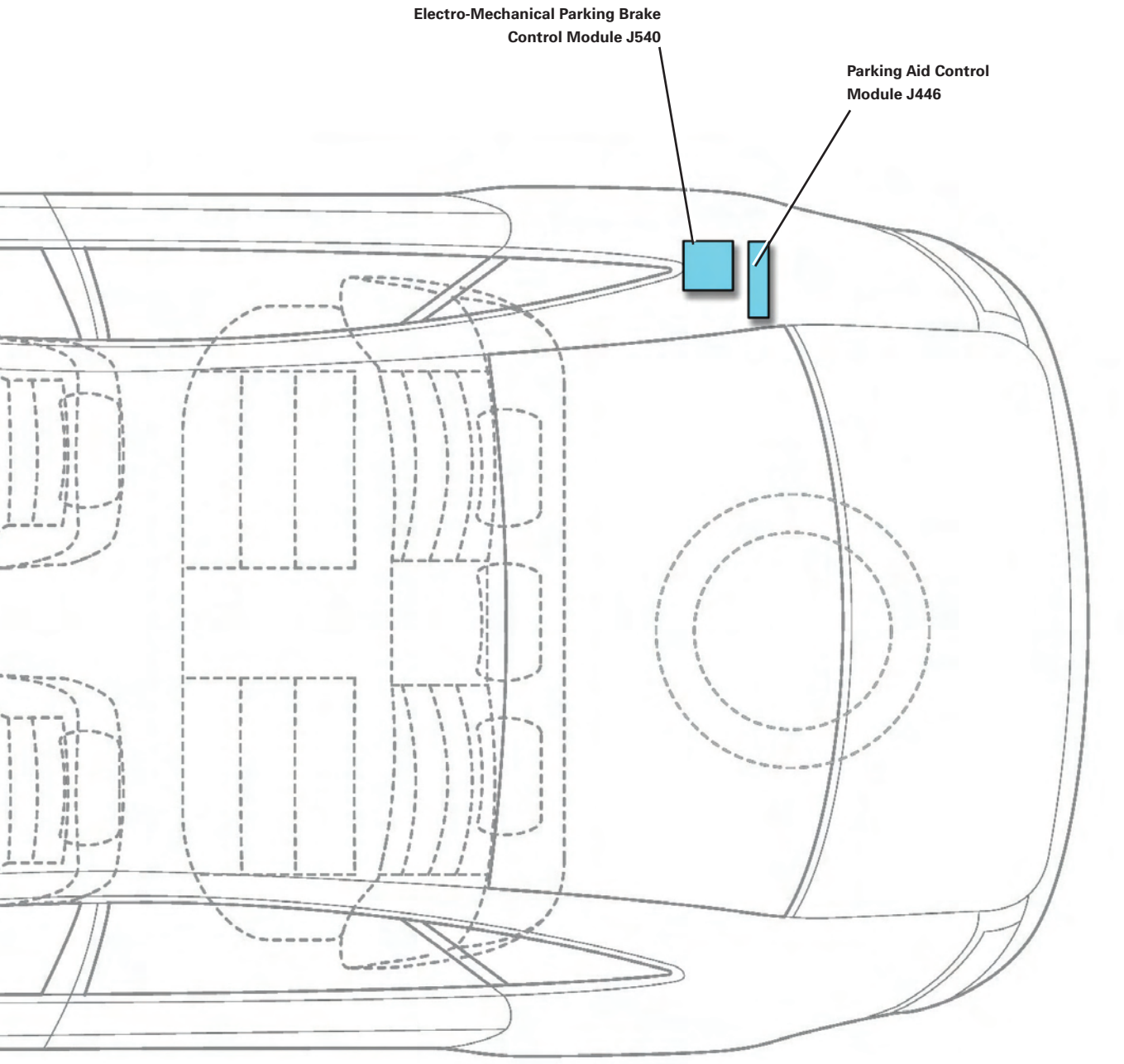
Installation Locations of Powertrain and Extended CAN Bus Components



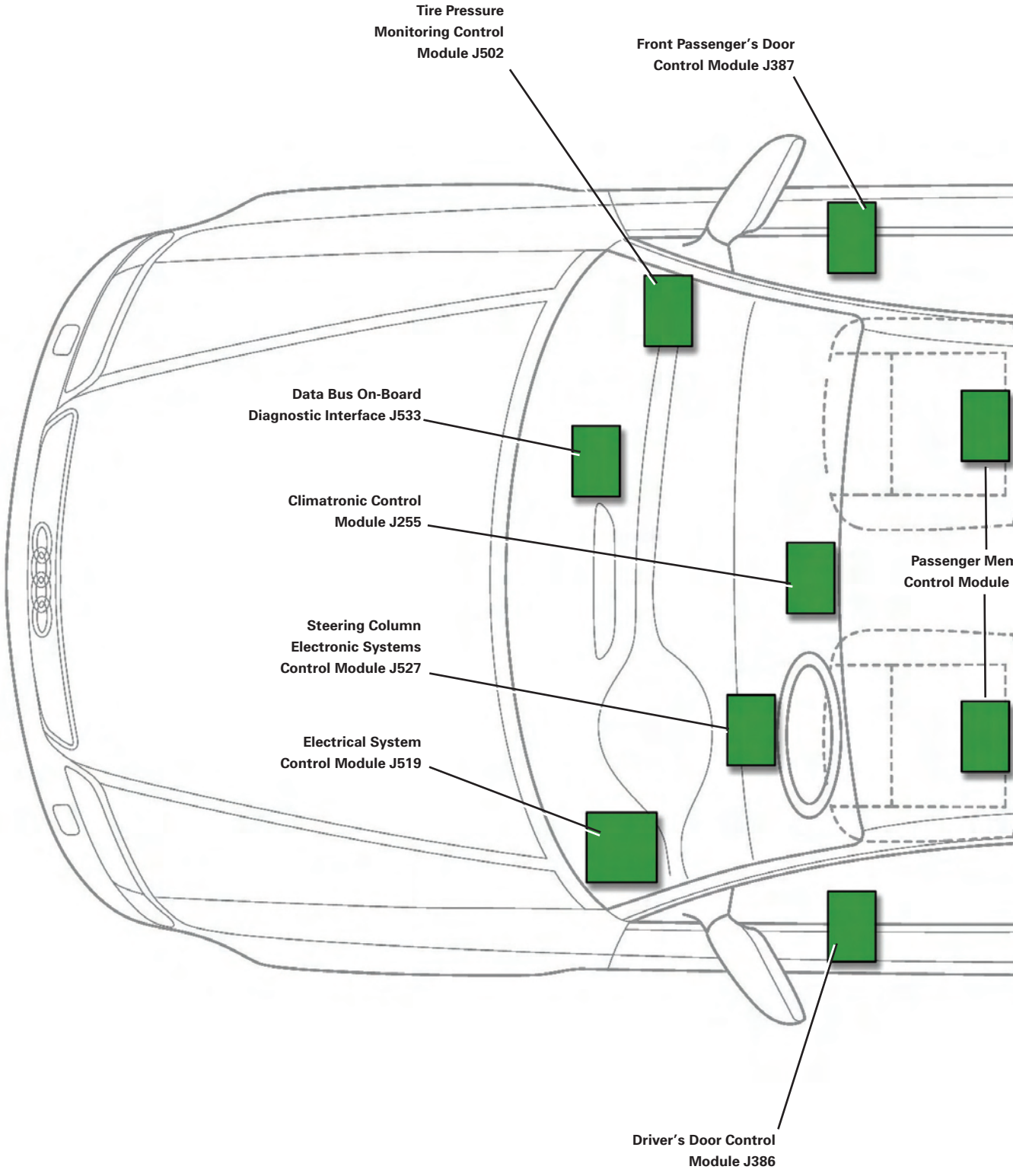

Electronic Damping Control Module J250
Lane Change Assistance Control Module J769
Lane Change Assistance Control Module 2 J770

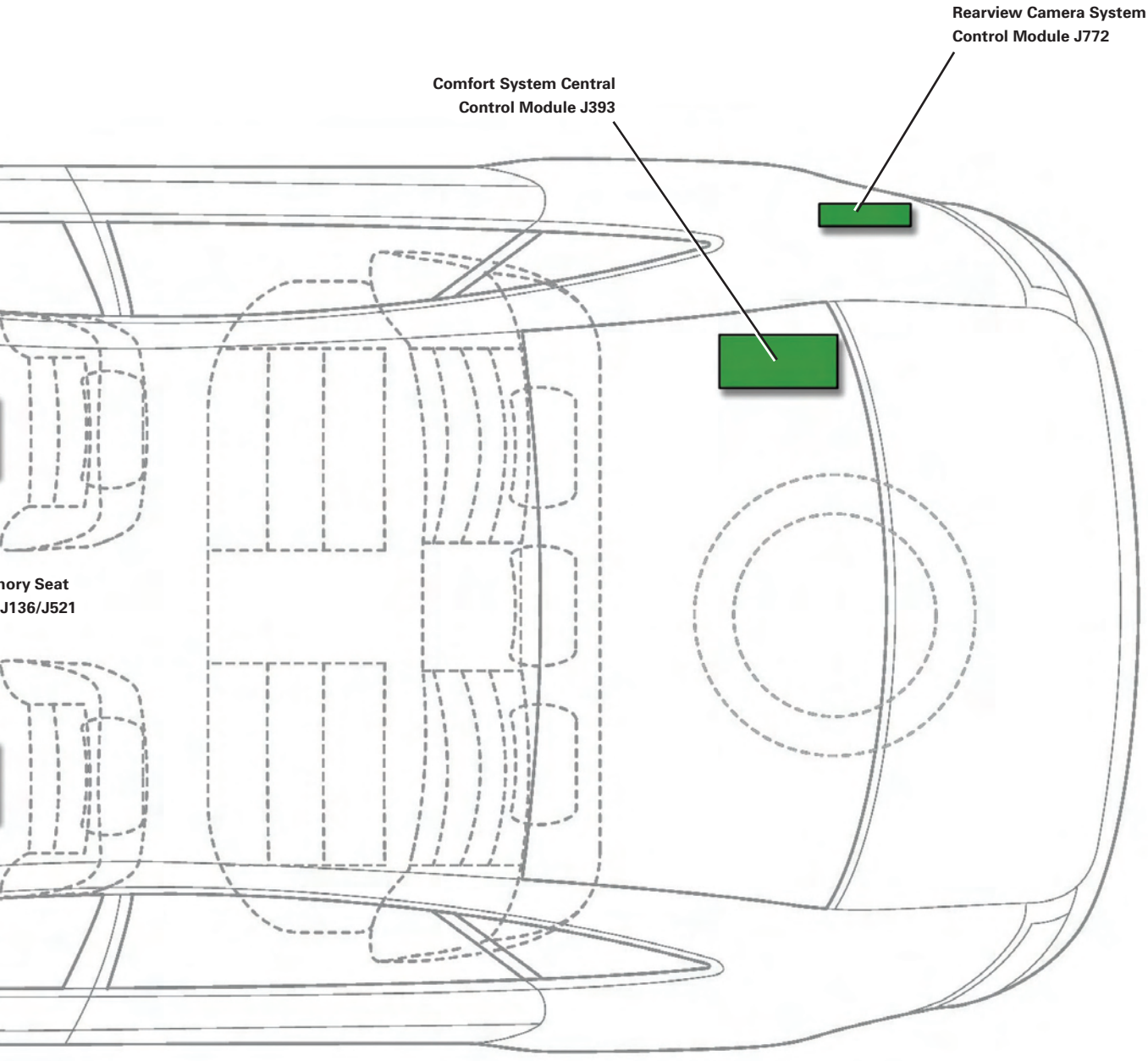
Installation Locations of Instrument Cluster/Running Gear CAN Bus Components



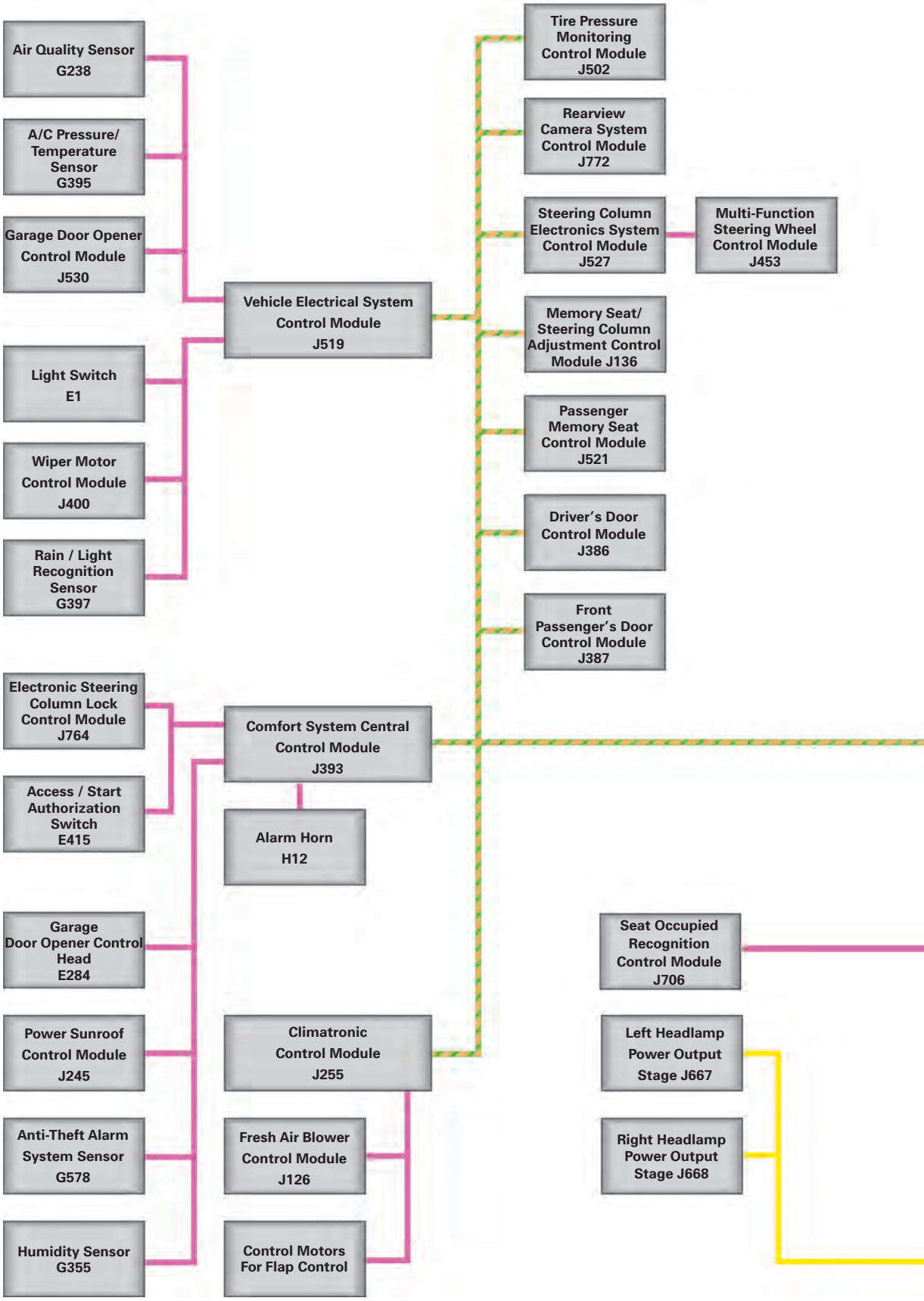

Electro-Mechanical Parking Brake
Control Module J540
Parking Aid Control
Module J446

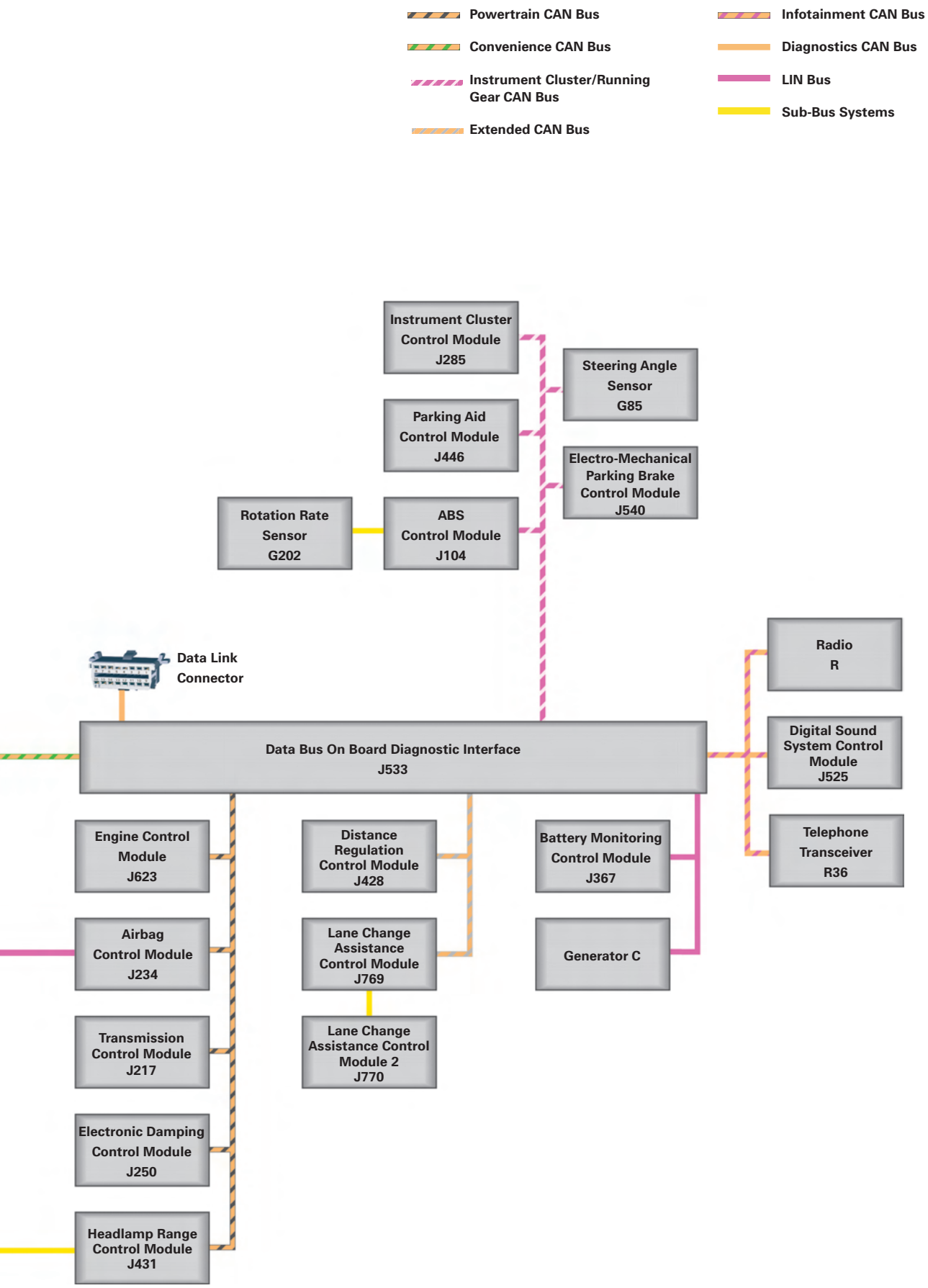
Installation Locations of Convenience CAN Bus Components



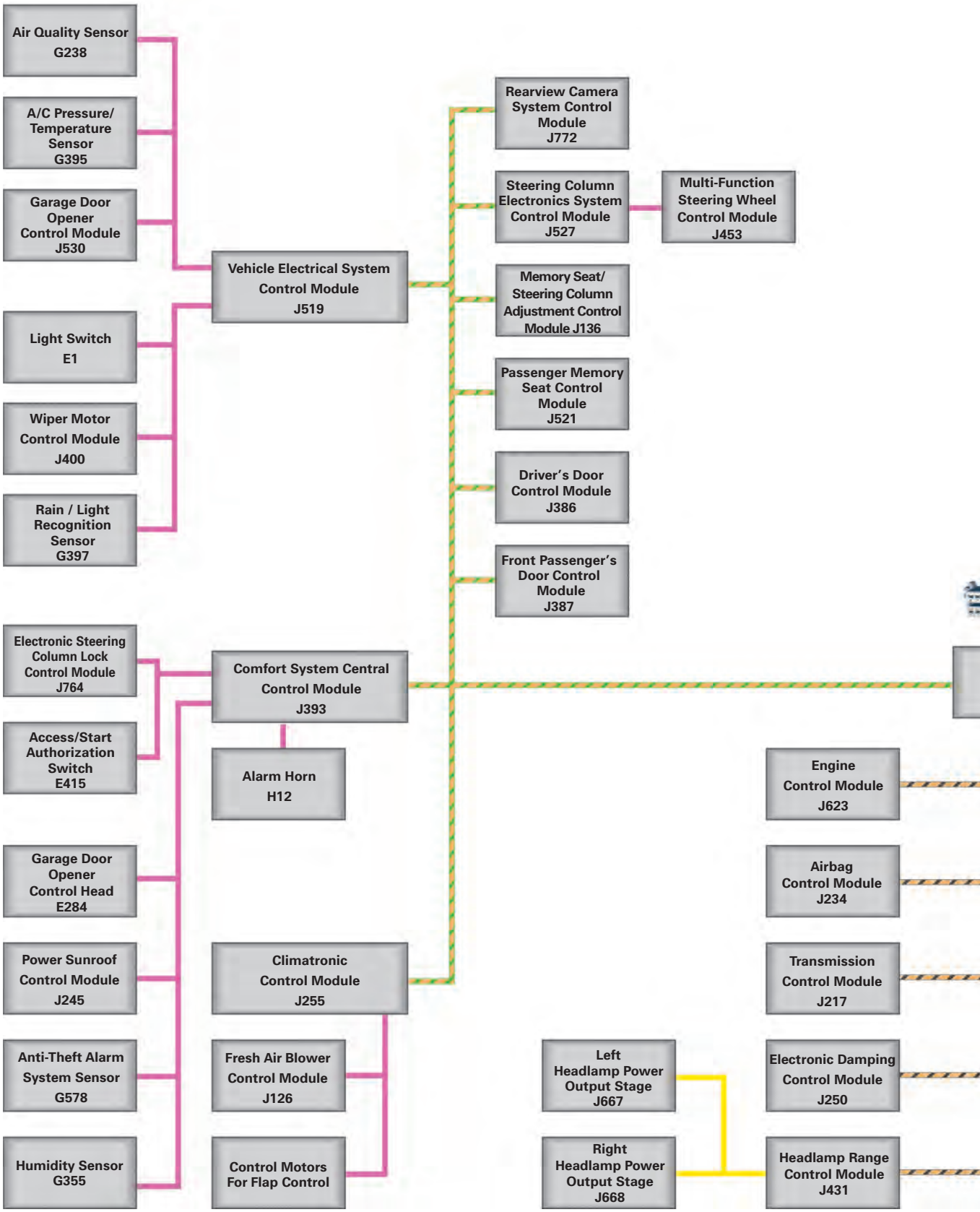

Rearview Camera System
Control Module J772
Comfort System Central
Control Module J393
hory Seat
J136/J521

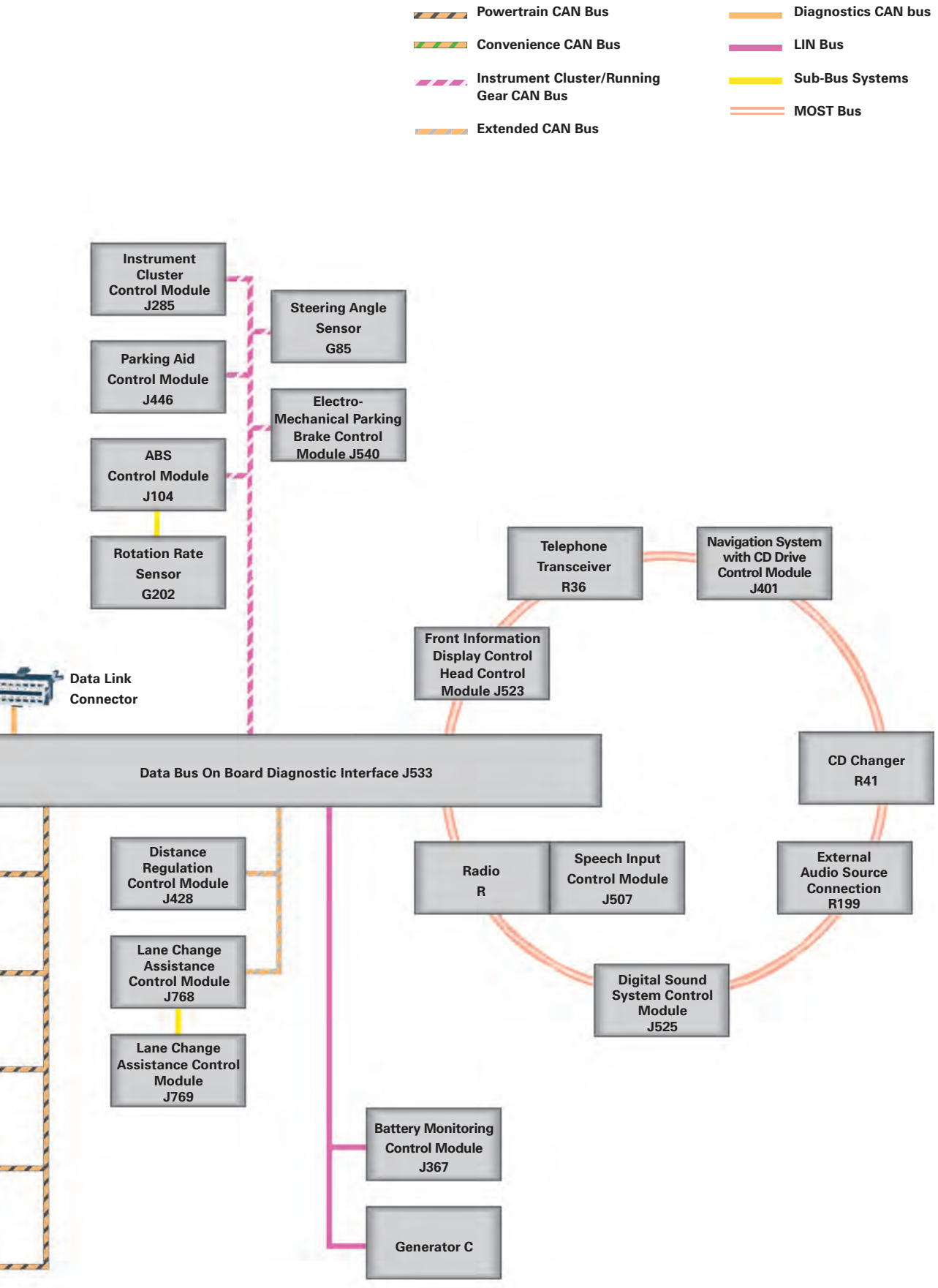
Networking – Vehicles with Infotainment CAN Bus




Powertrain CAN Bus
Convenience CAN Bus
Instrument Cluster/Running Gear CAN Bus
Extended CAN Bus
Infotainment CAN Bus
Diagnostics CAN Bus
LIN Bus
Sub-Bus Systems
Instrument Cluster Control Module J285
Steering Angle Sensor G85
Parking Aid Control Module J446
Electro-Mechanical Parking Brake Control Module J540
Rotation Rate Sensor G202
ABS Control Module J104
Data Link Connector
Radio R
Data Bus On Board Diagnostic Interface J533
Digital Sound System Control Module J525
Telephone Transceiver R36
Engine Control Module J623
Distance Regulation Control Module J428
Battery Monitoring Control Module J367
Airbag Control Module J234
Lane Change Assistance Control Module J769
Generator C
Transmission Control Module J217
Lane Change Assistance Control Module 2 J770
Electronic Damping Control Module J250
Headlamp Range Control Module J431

Networking – Vehicles with MOST Bus



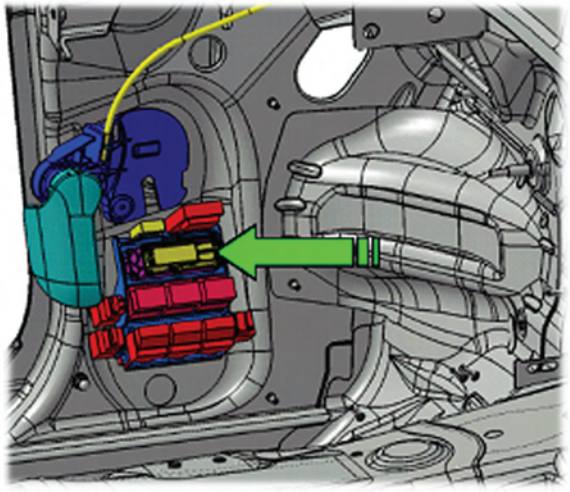

Powertrain CAN Bus
Convenience CAN Bus
Instrument Cluster/Running Gear CAN Bus
Extended CAN Bus
Diagnostics CAN bus
LIN Bus
Sub-Bus Systems
MOST Bus
Instrument Cluster Control Module J285
Steering Angle Sensor G85
Parking Aid Control Module J446
Electro-Mechanical Parking Brake Control Module J540
ABS Control Module J104
Rotation Rate Sensor G202
Telephone Transceiver R36
Navigation System with CD Drive Control Module J401
Front Information Display Control Head Control Module J523
Data Link Connector
Data Bus On Board Diagnostic Interface J533
CD Changer R41
Distance Regulation Control Module J428
Radio R
Speech Input Control Module J507
External Audio Source Connection R199
Lane Change Assistance Control Module J768
Digital Sound System Control Module J525
Lane Change Assistance Control Module J769
Battery Monitoring Control Module J367
Generator C

CAN Node Connectors

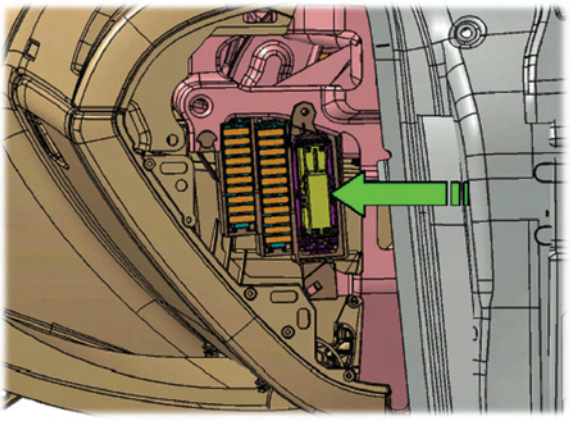
Installation Location

The CAN node connectors are located on the relay carrier at the lower A-pillar on the left and on the fuse holder at the end of the instrument panel on the right.

Relay Carrier, Left



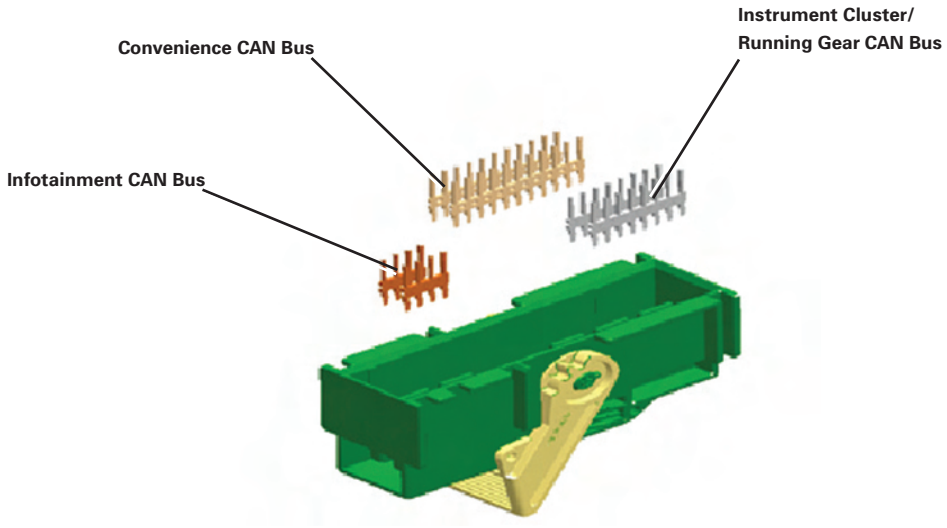
Fuse Holder in Instrument Panel on Right



Assignments

The infotainment CAN bus, the convenience CAN bus, and the instrument cluster/running gear CAN bus control modules are connected to both CAN node connectors. CAN isolating adaptor V.A.G 1598/38 can be used for fault-finding. In this way, it is possible to access the data lines of the control modules without removing trim parts or opening the wiring harness. This reduces diagnosis time.

The powertrain CAN and extended CAN bus systems are not connected to the node connectors. They are connected to the wiring harness by crimp connectors.



Diagnostics

To enable the VAS testers to carry out diagnostics on the Audi A5, the base CD 11.XX and the relevant brand CD by Audi must be used. This is because the data protocol (language) which several control modules and the Scan Tool use to interchange data has been modified.

The tester must be capable of processing both the “old” data protocol, Key Word 2000, and the “new” data protocol (UDS with ASAM[2]/ODX[3].) The change in the data protocol does not directly affect service personnel. The Guided Fault Finding and Guided Functions programs can be operated as before.

Data is exchanged between the vehicle and the testers via the diagnostics CAN bus. The voltage level and the transmission speeds on this CAN data bus are unchanged.

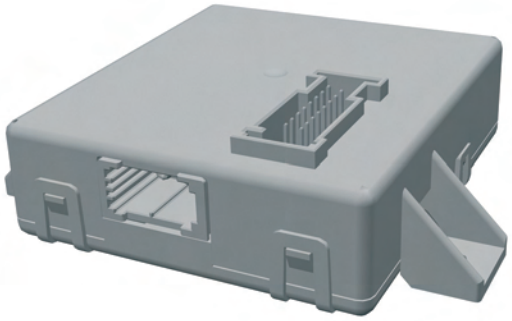
In the case of the Audi A5, for the first time, it is only possible to encode the control modules with a Scan Tool which is connected online. Coding is no longer possible without an active online connection.





1) **UDS - U**nified **D**iagnostic **S**ervices **P**rotocol
2) **ASAM - A**ssociation for **S**tandardization of **A**utomation and **M**easurement **S**ystems. ASAM has Been a Registered German Association since 1998.
3) **ODX - O**pen Diagnostic **D**ata E**x**change

Data Bus On Board Diagnostic Interface J533 (Gateway)

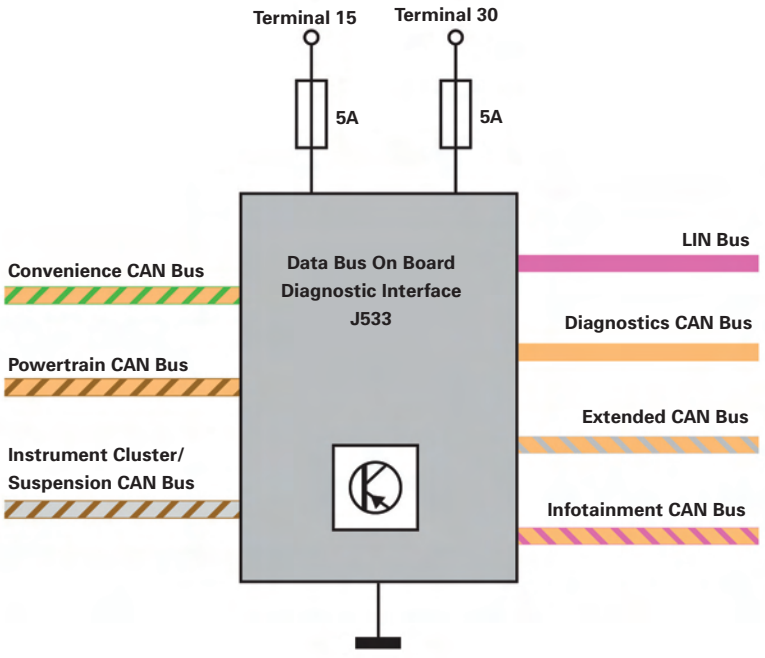


Introduction

The new Audi A5 has an independent On Board Data Bus Diagnostic Interface J533. J533 functions as the link between the various CAN bus systems.

Every A5/S5 has the following CAN bus systems: Convenience, Diagnostics, Instrument Cluster/Running Gear, and Powertrain.

A5/S5 vehicles have either an Infotainment CAN bus or MOST bus system (depending on specification).
If an A5/S5 has ACC or Lane Change Assist, it has an Extended CAN bus.



New Features

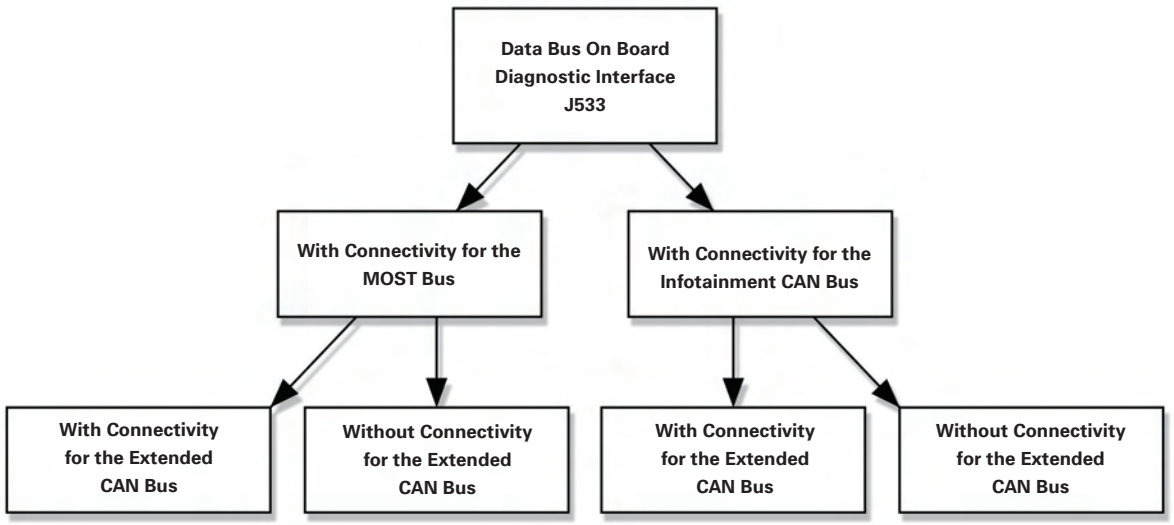
The Data Bus On Board Diagnostic Interface now includes a battery power management function. For this purpose, a LIN line is connected to Battery Monitoring Control Module J367. J367 is next to the negative battery post.

It has also been possible to eliminate the wake-up line between J533 and Instrument Cluster Control Module J285.

The Instrument Cluster Control Module is now connected to J533, along with various running gear control modules, via the Instrument Cluster/Running Gear CAN-bus. This high speed CAN-bus has the necessary wake-up capability so the discrete line is no longer needed.

Versions

In total, there are four different versions of the Data Bus On Board Diagnostic Interface:



Address Word

As on other Audi vehicles, Data Bus On Board Diagnostic Interface J533 can be accessed through the Scan Tool using Address Word 19.

Installation Location

Data Bus On Board Diagnostic Interface J533 is located behind the instrument panel and can be accessed from the passenger footwell after removing the trim pieces.

Extended Adaptation

Data Bus On Board Diagnostic Interface J533 has what is known as “extended adaptation” capability. The adaptation program can be used to start diagnostic routines and perform settings.

Manual encoding is no longer needed. The following actions and settings can be performed using the “extended adaptation” function:

1. Transport mode can be activated and deactivated.
2. Static current power-down stages can be set manually. This can be used to check for correct response of individual control modules to preset power-down stages.
3. A quick static current measurement can be made. The measured actual static current is output through a data block and displayed on the Scan Tool.
4. New battery parameters can be entered into the Data Bus Diagnostic Interface. This must be done after changing the battery and after replacing the Data Bus On Board Diagnostic Interface.
5. The Battery Data Module is flashable. The Battery Data Module is connected to the Data Bus On Board Diagnostic Interface via the LIN bus.
6. The light power of MOST bus users can be reduced. This gives an indication of the attenuation of the optical fibers.

Component Protection Function

The Data Bus On Board Diagnostic Interface is the master for the component protection function. The task of the component protection function is to prevent the use of stolen control modules in a different vehicle. All new control modules with a component protection function must be adapted online using the Scan Tool.

As with the immobilizer, the Fazit database is used for this purpose. If a control module is not adapted, it will only have limited operating capability.

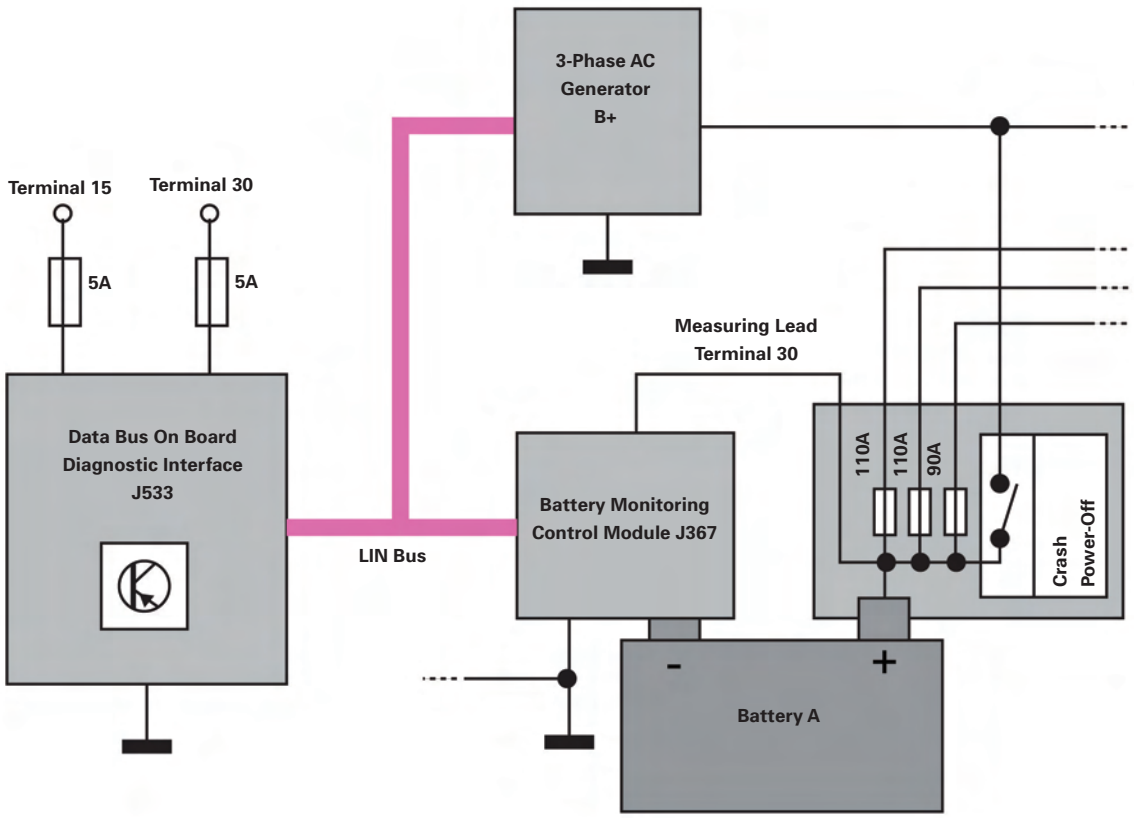
Battery Monitoring Control Module J367 (Battery Data Module)

The battery data module measures the following parameters:
– Charging and Discharge Currents of the Vehicle Battery.
– Battery Voltage.
– Battery Temperature.

These three parameters and other information which the module receives from J533 via the LIN bus is required by the "Electronic Battery Sensor." This software computes the actual battery state and sends information to the LIN master, i.e. Data Bus On Board Diagnostic Interface J533.

"Quick static current measurement" capability has been implemented on the battery data module. This function is started using the Scan Tool in the "extended adaptation" mode of the Data Bus On Board Diagnostic Interface J533. The measured static current is then indicated on the Scan Tool. This function allows a quick static current measurement to be performed without the need for labor-intensive preparation of the vehicle.

J367 is flashable. The flash cycle is also started in the "extended adaptation" mode of Data Bus On Board Diagnostic Interface J533. The new software is then transmitted to the battery data module via the Scan Tool, the diagnostics CAN bus, the data bus diagnostic interface, and the LIN bus.



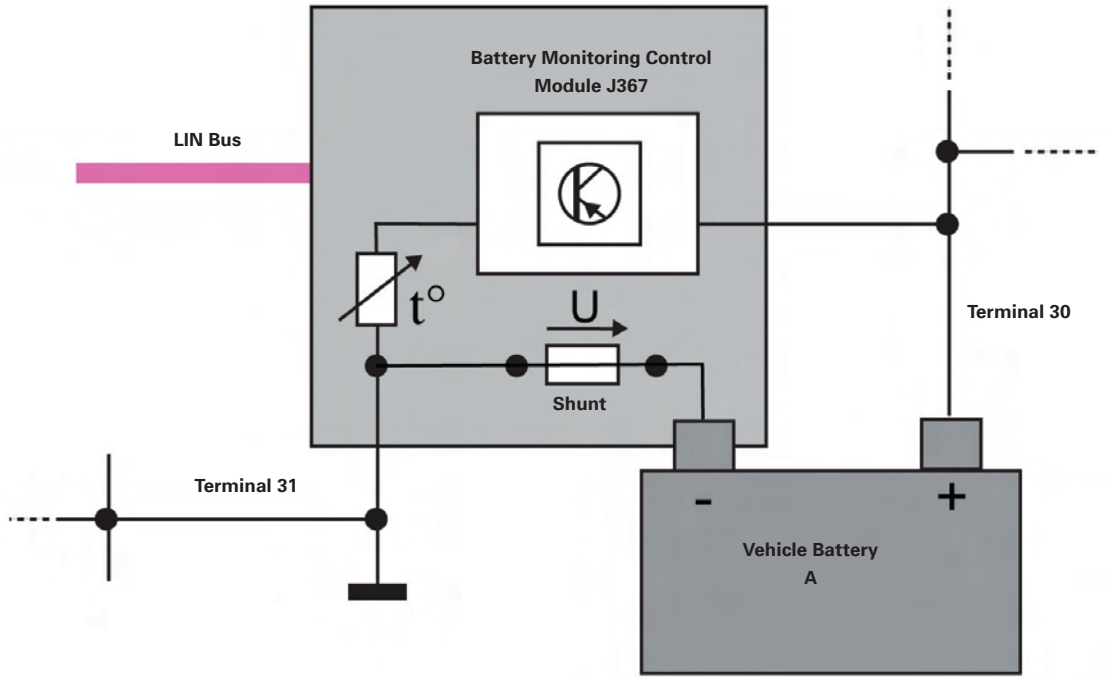
Functions of the Electronic Battery Sensor

The Electronic Battery Sensor in the Battery Monitoring Control Module J367 computes the following parameters, which are transmitted to J533 via the LIN bus:

1. "Battery Down" Recognition: If the Battery Data Module fails to detect a Battery for longer than 30s, a corresponding bit is set.
2. The Voltage currently required for Optimal Battery Charging.
3. The "Engine Start Capability" Bit (indicates whether or not the battery is presently capable of starting the engine.)
4. How much Charge can currently be withdrawn from the Battery until the limit of Engine Start Capability is reached.
5. Actual Battery State of Charge.
6. Battery Aging (aging of the battery can be determined from parameters such as energy storage capacity and actual battery power.)
7. Battery Static Voltage.
8. Battery Internal Resistance.

Design of Battery Monitoring Control Module J367

The core of the battery data module is a CPU which determines the three measurands and communicates with the Data Bus On Board Diagnostic Interface.



Battery Current Measurement

The battery current is measured at the battery negative post, to which J367 is also attached. The total current at the battery negative post flows through a shunt resistor. The shunt resistor has a resistance in the milliohm range. This value must be small to minimize power loss and therefore heat build-up.

The falling voltage at the shunt resistor is proportional to the electrical current. The CPU measures the voltage drop and can therefore compute the electrical current flowing back into the battery.

Battery Voltage Measurement

Battery voltage is monitored directly at the battery positive post by voltage measurement.

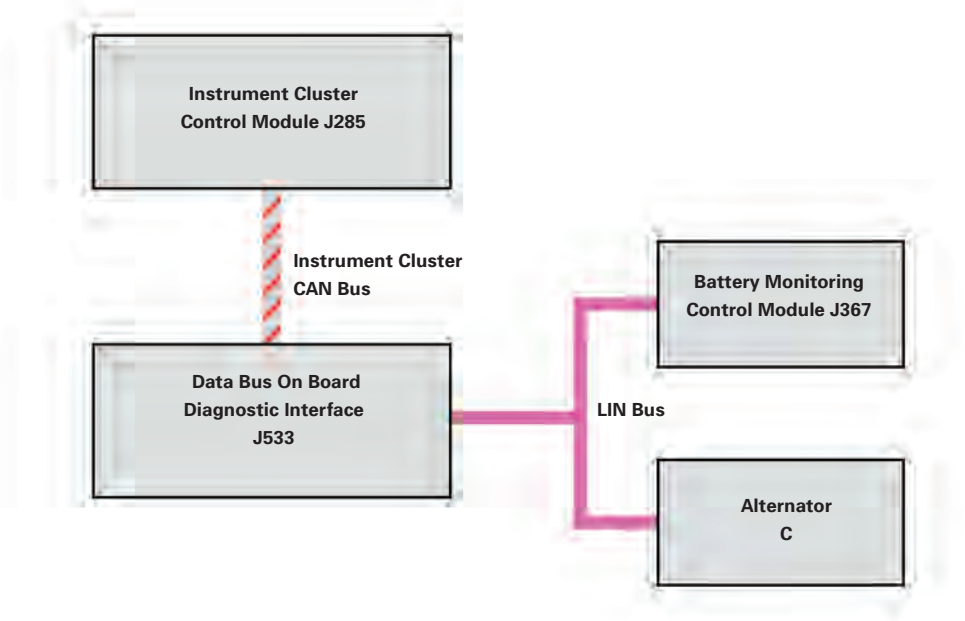
For this purpose, a measuring lead is routed from the positive post to Battery Monitoring Control Module J367.

Battery Temperature Measurement

The battery temperature is measured by an NTC temperature sensor in the battery module.

Since Battery Monitoring Control Module J367 is attached directly to the battery, the battery temperature can be determined reliably via the NTC temperature sensor within the module, and the data can be subsequently processed by the software.

Alternator



Data Transfer

In addition to J367, the alternator is the second LIN bus user on the Data Bus On Board Diagnostic Interface J533. All data relevant to the status of the alternator is read in at J533 via the LIN connection.

The information which is required to activate the alternator warning lamp is provided by J533 and read in by the instrument cluster CAN via J285.

Diagnostics

In case of problems with the alternator, the following components and terminals should be checked:

- Battery Posts.
- Ribbed Vee Belt Tension.
- Alternator Mounting.
- Terminal 30 Screw Connection on Alternator.
- Voltage Drop Between Body Ground and Engine Ground.

Diagnostics

Because Data Bus On Board Diagnostic Interface J533 is the master control module for the alternator (LIN bus user), Address Word 19 must be used for alternator diagnostics with the Scan Tool. The data blocks contain information on the status of the alternator.

The following information is displayed:

– Alternator Communication Status.
– Alternator Type, Manufacturer, and Size.
– Alternator Electrical / Mechanical / Thermal Status.

In the event of sporadic alternator faults, data is available in the following format in set 13 of the history data on Data Bus On Board Diagnostic Interface J533:

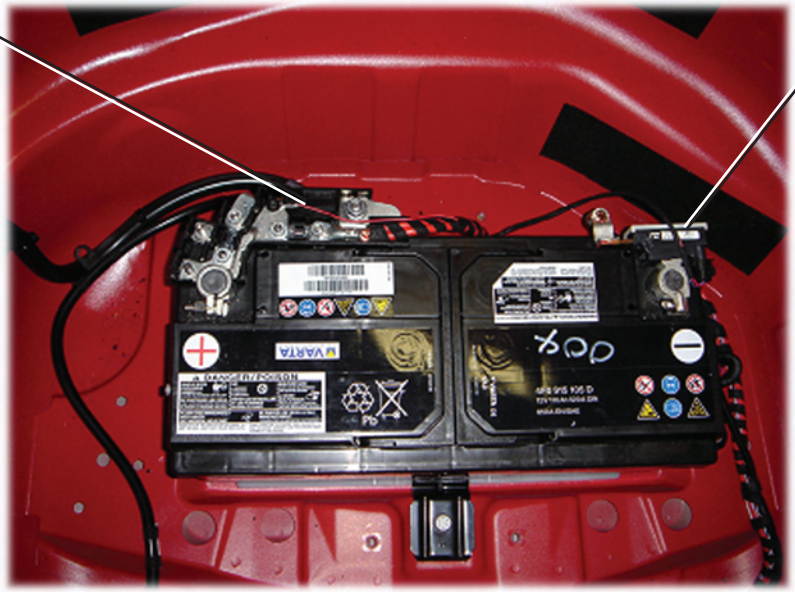
YYYY-MM-DD-hh:mm*I-J-K-L*RRR.R*AAAAA**
YYYY-MM-DD-hh:mm*I-J-K-L*RRR.R*AAAAA**
YYYY-MM-DD-hh:mm*I-J-K-L*RRR.R*AAAAA**
YYYY-MM-DD-hh:mm*I-J-K-L*RRR.R*AAAAA**
YYYY-MM-DD-hh:mm*I-J-K-L*RRR.R*AAAAA**
YYYY-MM-DD-hh:mm*I-J-K-L*RRR.R*AAAAA**

This means:

YYYY-MM-DD = Date
hh:mm = Time
I = 1 means there was an electrical fault in the alternator.
= 0 means there was no electrical fault in the alternator.
J = 1 means there was a mechanical Fault in the alternator.
= 0 means there was no mechanical fault in the alternator.
K = 1 means there was a thermal fault in the alternator.
= 0 means there was no thermal fault in the alternator.
L = Continuously Negative Energy Balances. (This means the battery is discharging, as more electrical current is consumed than is supplied by the alternator.)
RRRR.R = Duration of last trip in hours.
AAAAA = Number of data entries on sporadic faults.

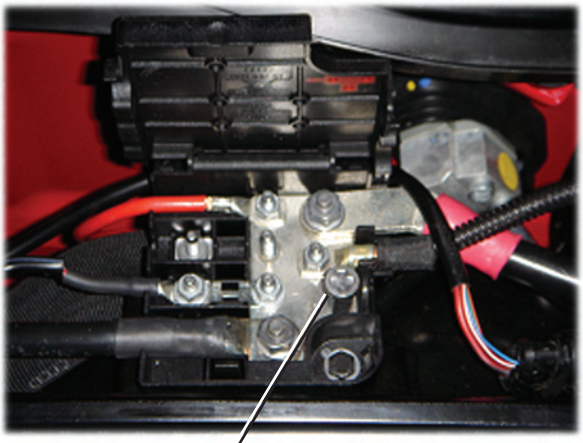
Battery/Jump Start Connection

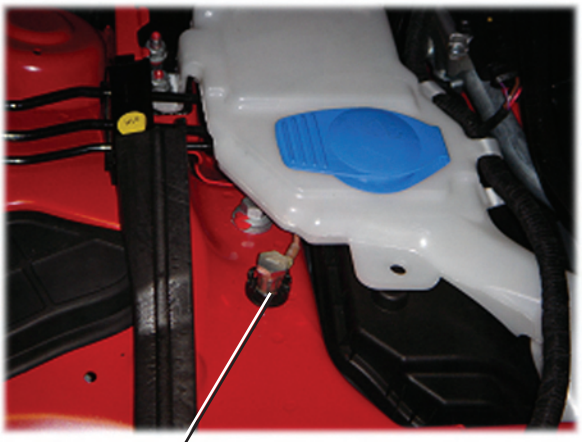
The battery is located in the spare-wheel recess in the luggage compartment.



A jump start connection is installed in the plenum chamber.

It is easily accessible and can be used for attaching a battery maintainer in the workshop or showroom.





Electrical System Control Module J519



Functions

Electrical System Control Module J519 has the following functions on the Audi A5:

Lighting Functions:

- Outside Light Master and Activation of the Front Lights.
- Emergency Light Operation Logic in Case of Failure of the Main Central Processor.
- Verification of Terminal 15: Terminal 15 Via CAN or Terminal 15 via Discrete Line.
- Reading in the Rotary Light Switch via LIN Bus Connection.
- Reading in the Rain / Light Sensor via LIN Bus Connection.
- MMI Gateway for Tourist Light
  (Implemented in the Headlamp Range Control Module J431.)
- Activation of the Front Turn Signals
  (The Turn Signal Master is Comfort System Central Control Module J393.)
- Activation of the Side Turn Signals via the Door Control Modules.
- Reading in the Hazard Warning Button.
- Emergency Turn Signal Master (Direction Indicator Function, Hazard Warning Lights, Flashing Light Collision Warning) in Case of Failure of J393.
- Interior Lighting Master (Interior Light, Front and Rear Footwell Lights.)
- Function and Locating Lights (Terminals 58s, 58st and 58d.)

Control Modules

Driver Information:

- ► Reading Ambient Temperature.
- ► Reading Oil Pressure Switch.
- ► Reading Brake Pad Wear Warning.
- ► Reading Brake Fluid Warning.
- ► Reading Coolant Warning.
- ► Reading Low Washer Fluid Warning.
- ► Reading Light Warning.

Air Conditioning Functions:

- ► Activation of Front Seat Heater.
- ► LIN Gateway for Air Quality Sensor and Refrigerant Pressure Sensor.
- ► Activation of Air Conditioner Compressor.

Windshield Wiper/Wash Functions:

- ► Activation of Wiper Motor Control Module J400 via LIN Bus Connection.
- ► Reading Rain / Light Sensor via LIN Bus Connection.
- ► Activation of Windshield Washer Pump.
- ► Activation of Headlight Washer Pump.

Interfaces to Comfort System Central Control Module J393:

- ► Enabling of Electrical Steering Column Lock (Discretely and via CAN).
- ► Feedback from Discrete Terminal 15 (to J393 via CAN).
- ► Reading Rear Window Roller Sun Blind Switch.

Other Functions

- Activation of Horn Relay.
- Activation of Servotronic Valve.
- Reading Back-Up Light Switch (Discrete Signal or CAN Information for Models with Automatic Transmission.)
- Reading Forward Gear Selector.
- Reading EPB Switch (CAN Information from the Electromechanical Parking Brake.)
- Enabling Power Supply to Electrical Seat Adjustment System (via External Relay.)
- Reading Hood Contact.
- LIN Gateway for Garage Door Opener Control Module J530.
- Reading in Settings via MMI (Outside Light, Interior Light, Wiper.)

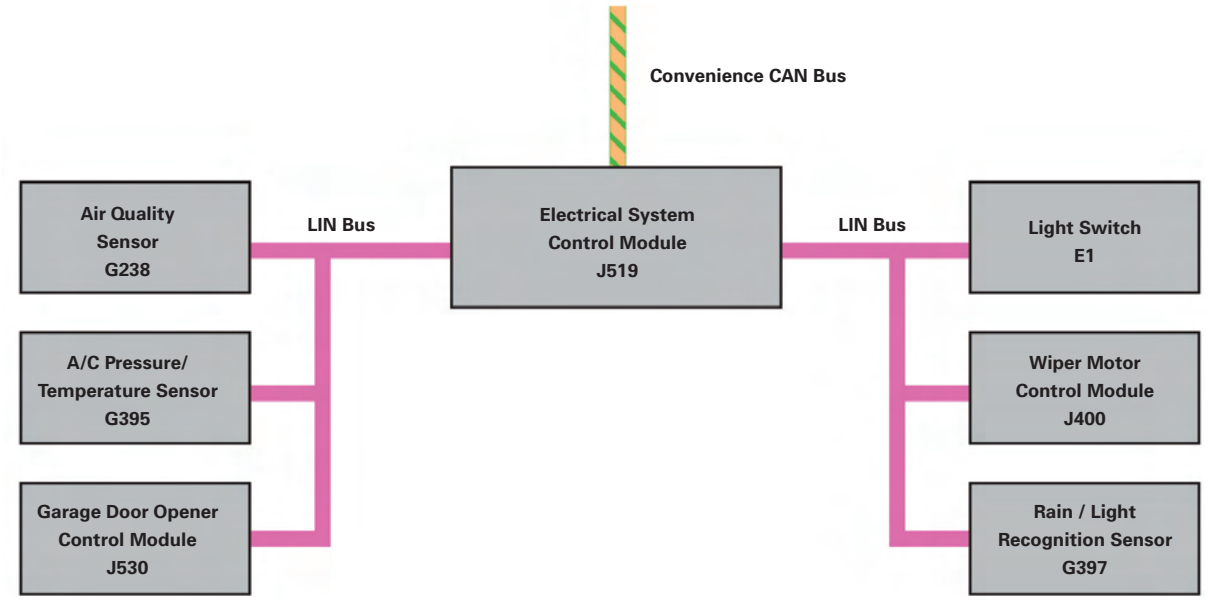
Special Functions

- Encoding Option: Daytime Driving Light Deactivated.
- Energy Management Power-Down Stages (Interior Light, Footwell Lights, Coming/Leaving Home, Daytime Driving Light, Main Beam Deactivated.)
- Transport Mode (Interior Light, Footwell Lights, Coming/Leaving Home, Daytime Driving Light, Fog Light.)
- Component Protection Function.

System Overview

Electrical System Control Module J519 is a convenience CAN bus user participant. It is the master control module for Wiper Motor Control Module J400, Rain / Light Recognition Sensor G397, and Light Switch E1 which communicate via a LIN-bus.

Electrical System Control Module J519 also performs a gateway function via LIN-bus for Air Quality Sensor G238, A/C Pressure / Temperature Sensor G395, and Garage Door Opener Control Module J530.



Address Word

As on all other Audi vehicles, Electrical System Control Module J519 can be accessed using the Scan Tool via Address Word 09.

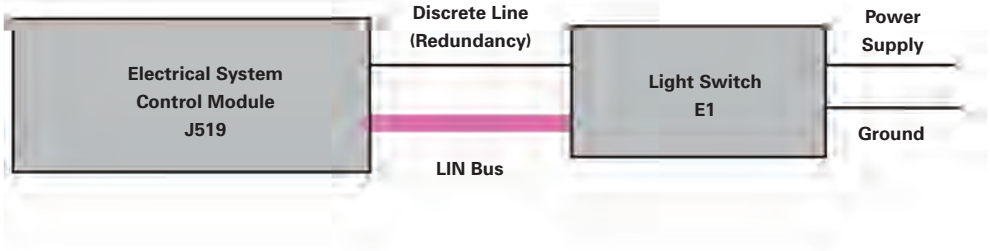
Light Switch

Function

For the first time, light switch E1 is a LIN slave of Electrical System Control Module J519.

The light switch has four electrical connections. In addition to the power supply and ground connections, there is a LIN bus connection and a discrete line leading to Electrical System Control Module J519. The light switch indicates its switch position via the LIN bus.

The discrete line serves as a redundancy line for verifying the switch position. If the same switch position is not indicated to J519 via both lines, the Electrical System Control Module activates the emergency light function. The following entry appears in the fault memory: “Light switch implausible switch position.”



Wiper Motor Control Module

Wiper Motor Control Module J400 is already known from other Audi models. The following functions have been implemented on the Audi A5:

— Alternating Wiper Blade Parking Position.
— Engine Speed Reduction at Reversing Points.
— Intermittent Control via Rain Sensor.
— “Teardrop” (Afterwipe) Function.
— Snow Load Protection.
— One-Level Wiping Speed Reduction when Vehicle Stops.
— Flick Wipe (Speed Setting 2.)
— Service Position for Wiper Blade Replacement.

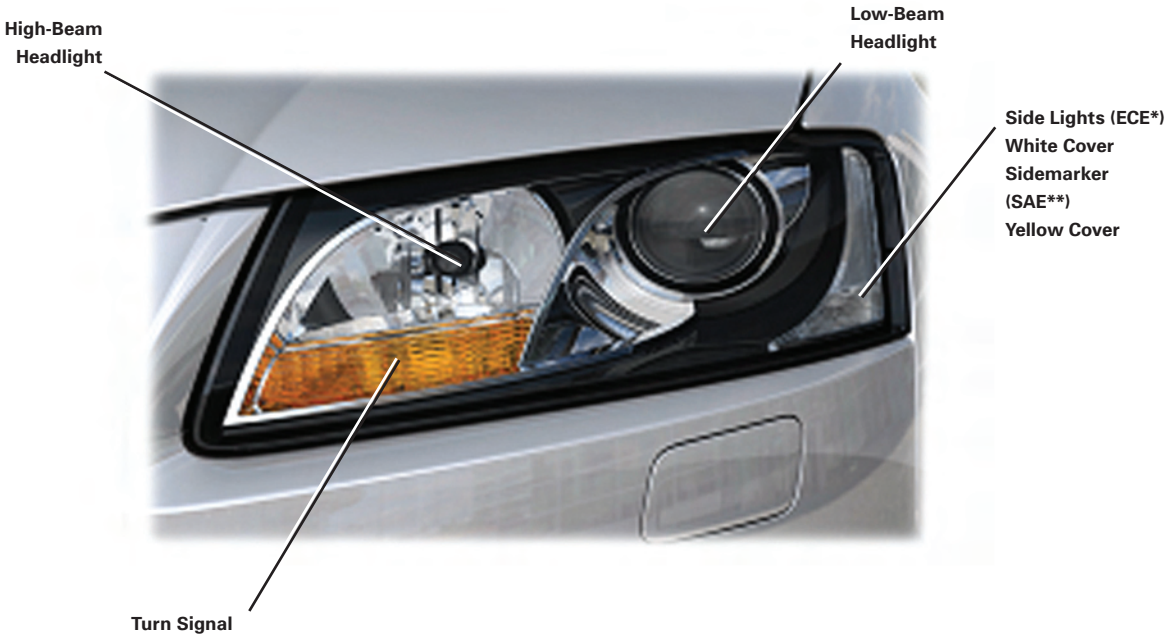
Outside Lights, Front

Headlights

Halogen headlights are standard equipment on the A5 while self-levelling Bi-xenon headlights are standard for the S5 and optional on the A5.

Adaptive Bi-xenon headlights are available as an option on both the A5 and S5.

Halogen Headlight

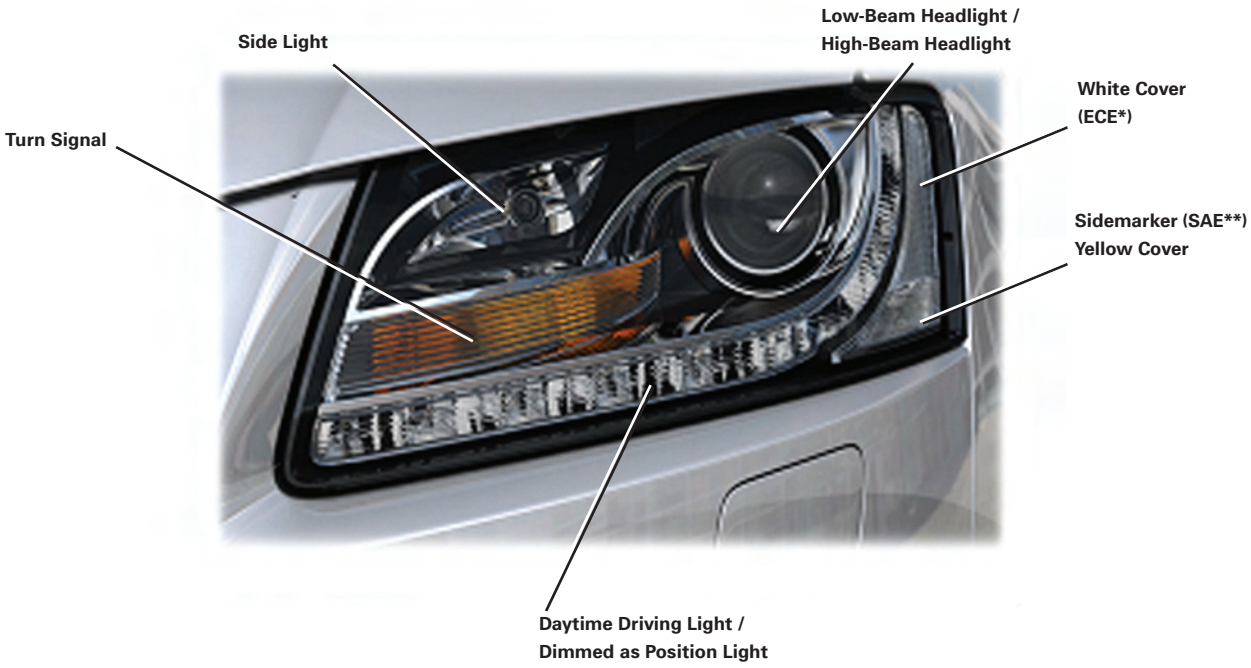


The following bulbs are used on the halogen headlight variant:

12 V Bulb	Type	Rated Power
Side Light*	W5WH	5 Watts
Low-Beam Headlight	H 7	55 Watts
High Beam Headlight	H 7	55 Watts
Turn Signal	PY24W	24 Watts
Sidemarker (SAE **)	W5WH	5 Watts

* ECE Variant for the European Market
** SAE Variant for the North American Market

Bi-Xenon and Adaptive Bi-Xenon Headlights



The following bulbs are used on the Bi-xenon headlight variant:

12 V Bulb	Type	Rated Power
Side Light	W5WH	5 Watts
Low-Beam Headlight	D3S	35 Watts
Main-Beam Headlight	D3S	35 Watts
Turn Signal	H21W	21 Watts
Sidemarker (SAE **)	W5WH	5 Watts
Daytime Driving Lights	8 LEDs	

* ECE Variant for the European Market
** SAE Variant for the North American Market

Fog Lights

The fog lights on the Audi A5 are integrated in the bumper. After removing the grille and the two Torx screws, the fog lights can be removed and the bulb replaced. A 55 watt H11 bulb is used.



Sidelight

The side turn signal uses LED technology and is housed in the door mirror housing. It is activated by the respective door control module. The side turn signal and the electrically adjustable outer mirror glass drive motor can be replaced separately.

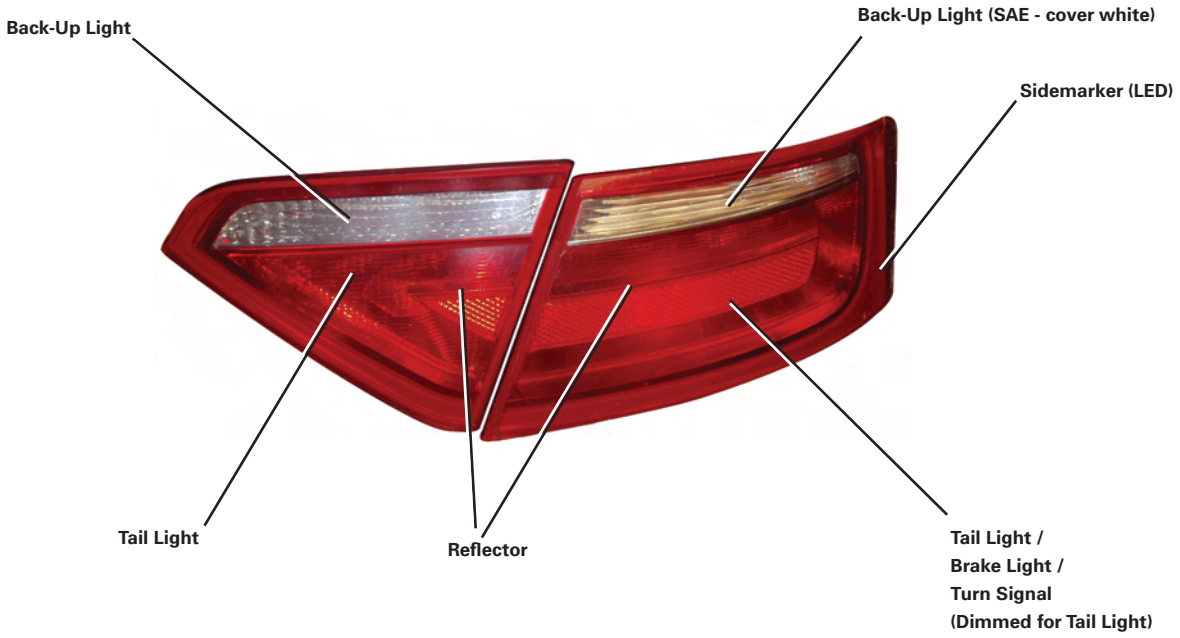


Outside Lights, Rear

Tail Lights

The tail lights of the A5/S5 are a two-piece design.

One part of each tail light is housed in the luggage compartment lid and one in the side panel.



The following bulbs are used on the halogen headlight variant:

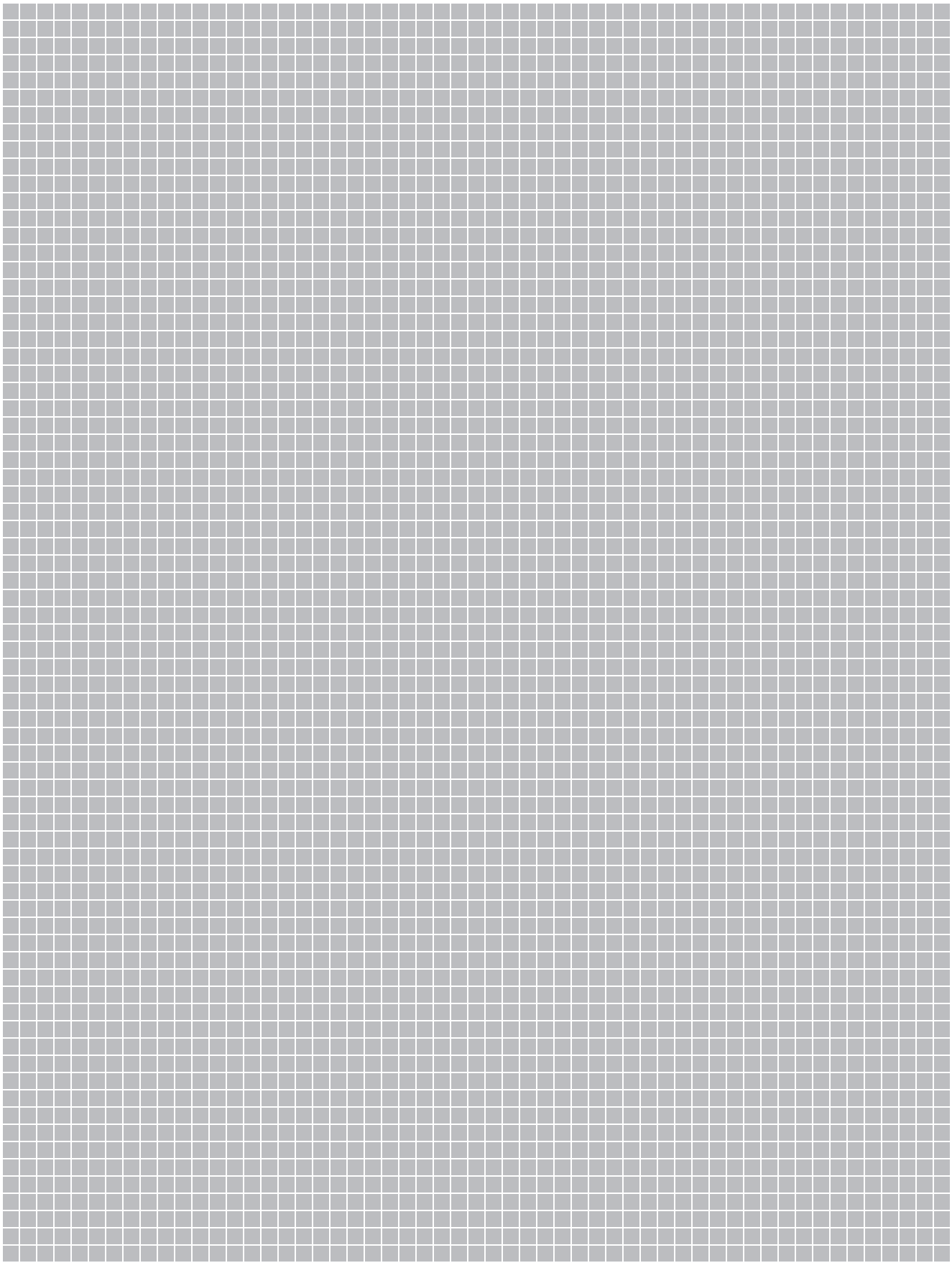
12 V Bulb	Type	Rated Power
Back-Up Light	W16W	16 Watts
Turn Signal	W16W	16 Watts
Tail Light	P21W	21 Watts (Dimmed)
Brake Light	P21W	21 Watts

Light Bulb Replacement

For replacement of the bulbs, there is a maintenance flap on the luggage compartment lid trim through which access can be gained to the tail light bulbs.

The tail lights in the body side panels must be removed to replace the light bulbs. This can be done by removing the mounting bolt in the side panel and taking the lamps out of the body side panel.

Notes



The following Self-Study Programs have been prepared for the Audi A5:
– SSP 997703 The 2008 Audi A5/S5 - Vehicle Introduction
– SSP 998703 The 2008 Audi A5/S5 - Convenience Electronics
– SSP 999703 The 2008 Audi A5/S5 - Running Gear
– SSP 99A703 The 2008 Audi A5/S5 - Networking



SSP 997703
The 2008 Audi A5/S5 - Vehicle Introduction

– Body
– Occupant Protection
– Engine
– Running Gear
– Electrical System
– Infotainment
– Air Conditioning
– Service
– Diagnostics



SSP 998703
The 2008 Audi A5/S5 - Convenience Electronics

– Instrument Cluster
– Door Control Module
– Convenience System Control Module
– Electronic Ignition Lock
– Audi Service Key



SSP 999703
The 2008 Audi A5/S5 - Running Gear

– Front Axle
– Rear Axle
– Brake System
– Steering System



SSP 99A703
The 2008 Audi A5/S5 - Networking

– Networking/Topology
– Battery Monitoring
– Onboard Power Supply Control Module
– Outside Lights

Knowledge Assessment

An on-line Knowledge Assessment (exam) is available for this SSP.

The Knowledge Assessment may or may not be required for Certification.

You can find this Knowledge Assessment at:

www.accessaudi.com

From the accessaudi.com homepage:

- Click on the “ACADEMY” Tab
- Click on the “Academy Site” Link
- Click on the ”CRC Certification” Link

For assistance, please call:

Audi Academy

Learning Management Center Headquarters

1-877-AUDI-LMC (283-4562)

(8:00 a.m. to 8:00 p.m. EST)

99A703

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**Audi of America, Inc.
3800 Hamlin Road
Auburn Hills, Michigan 48326**