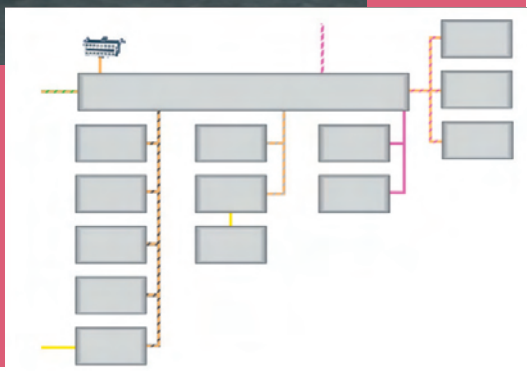
Service Training





The 2008 Audi A5/S5 Convenience Electronics

Self-Study Program 998703

Audi of America, Inc.
Service Training
Printed in U.S.A.
Printed 9/2007
Course Number 998703

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

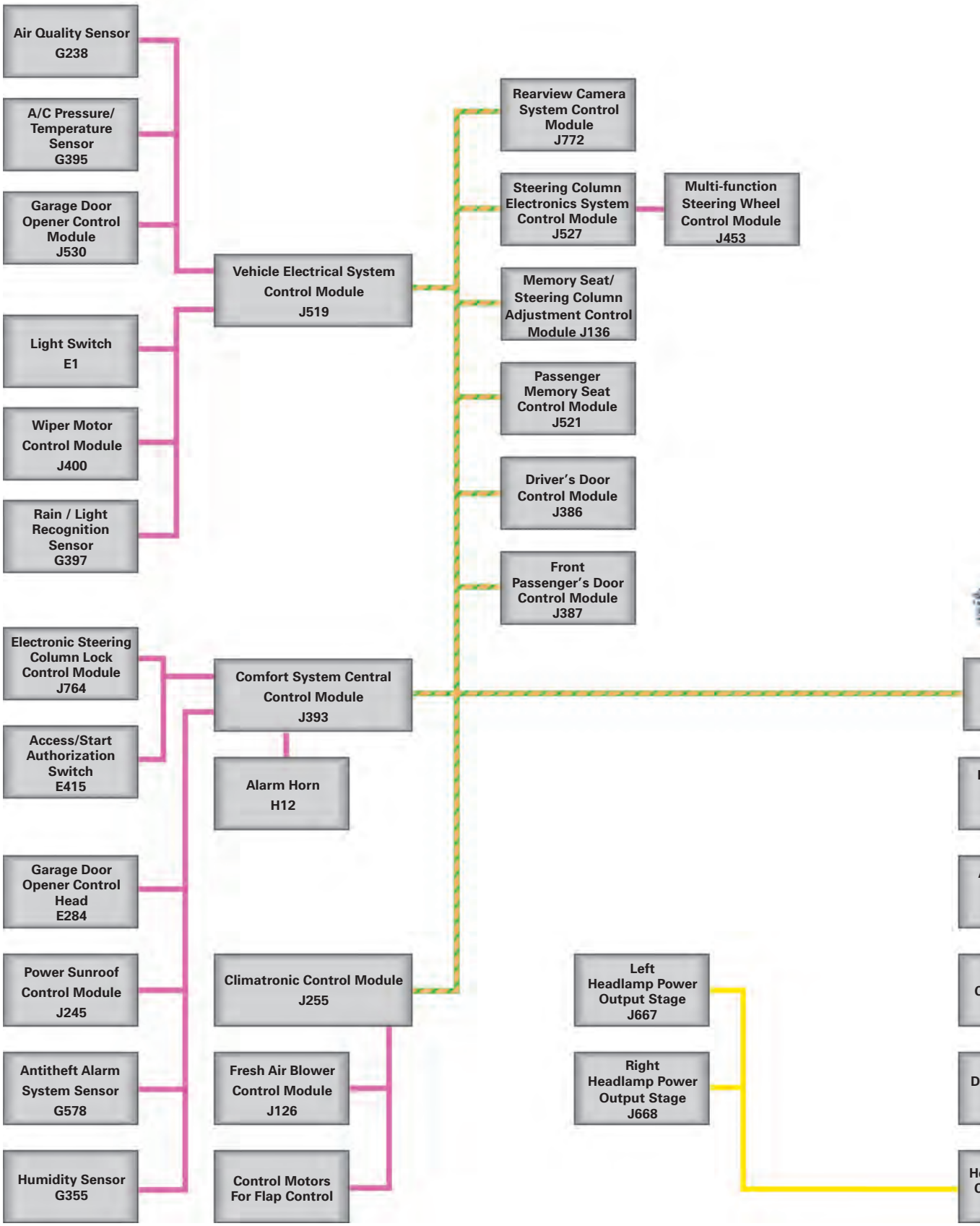
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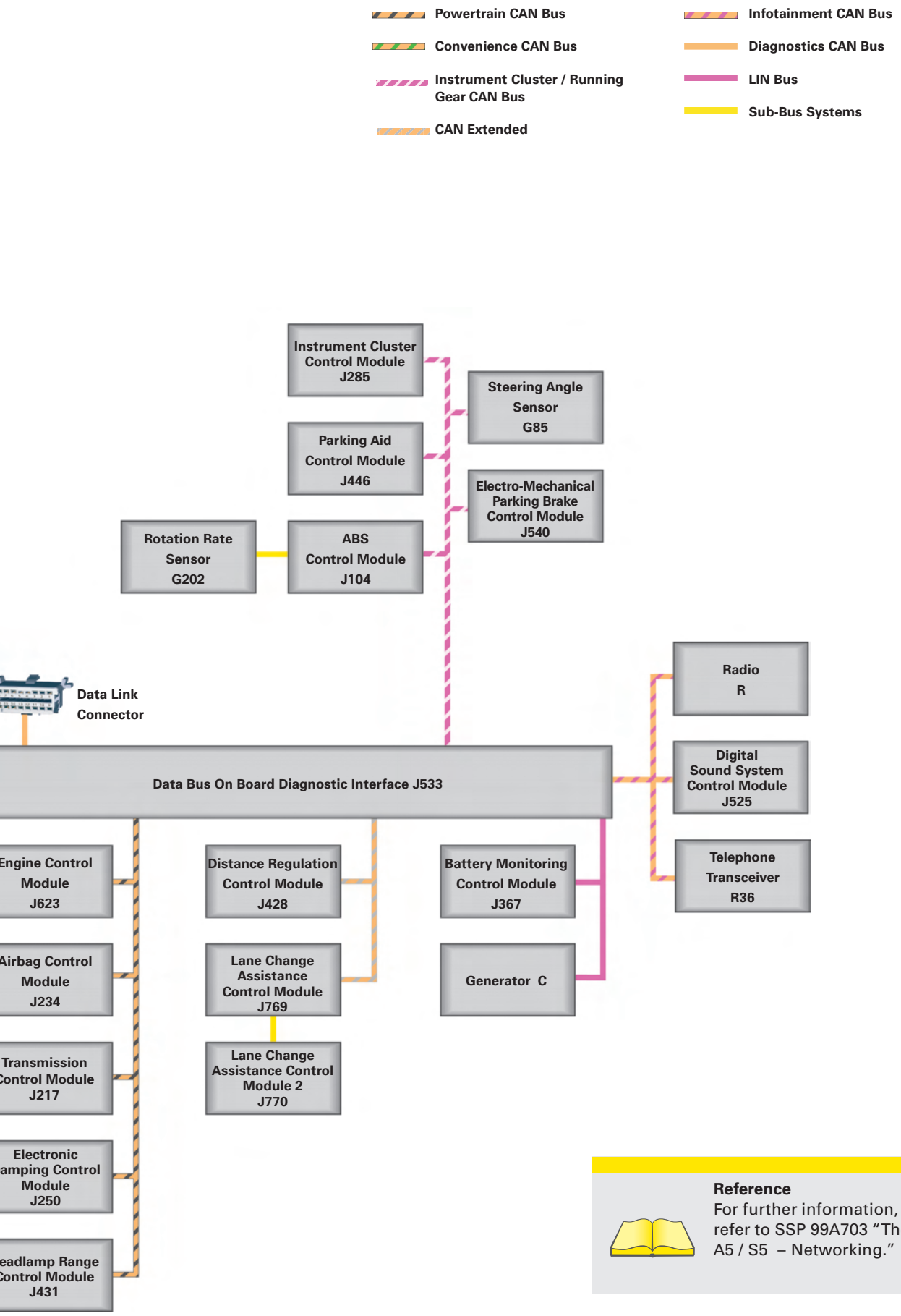


Note



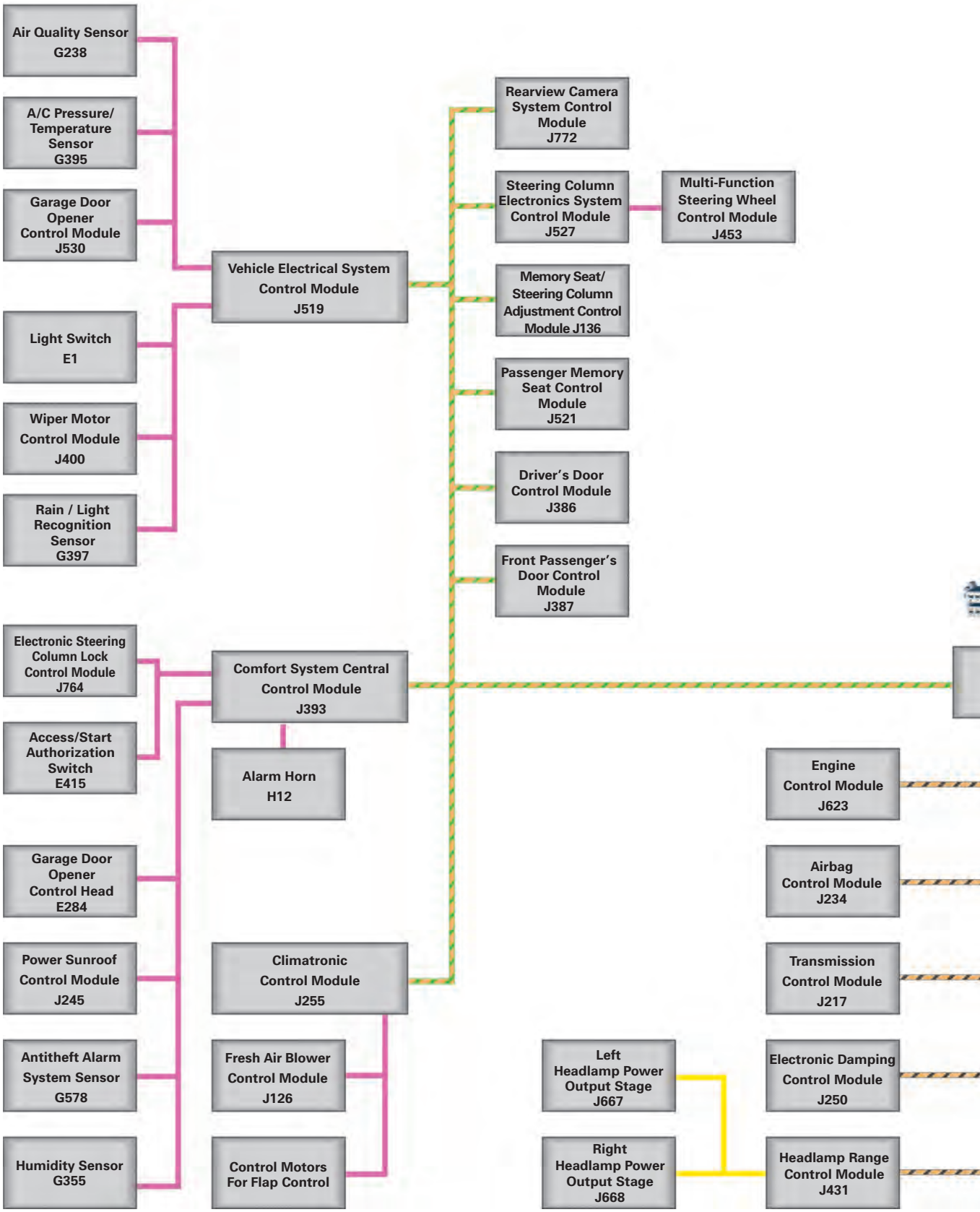
Networking – Vehicles with Infotainment CAN Bus

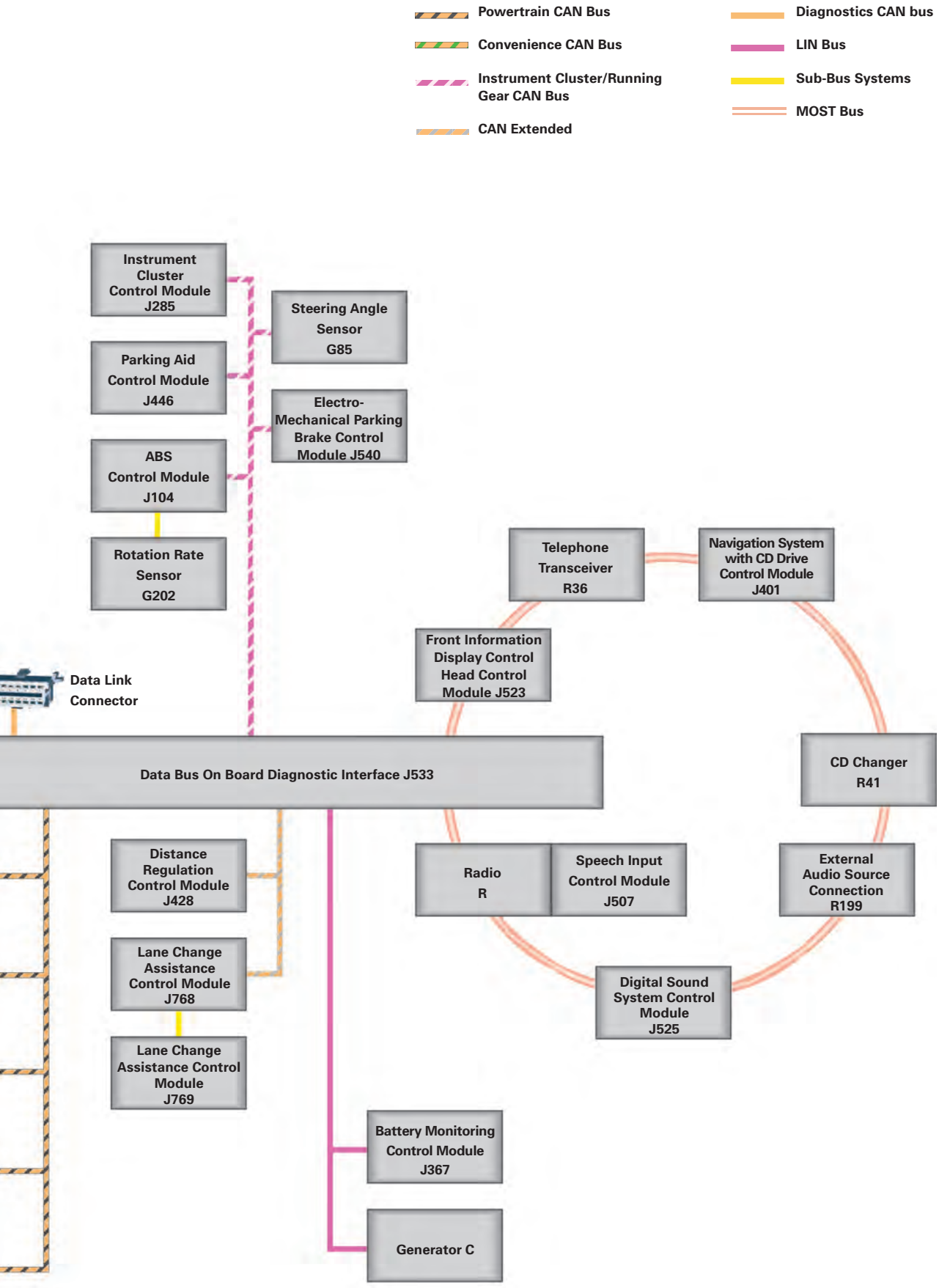




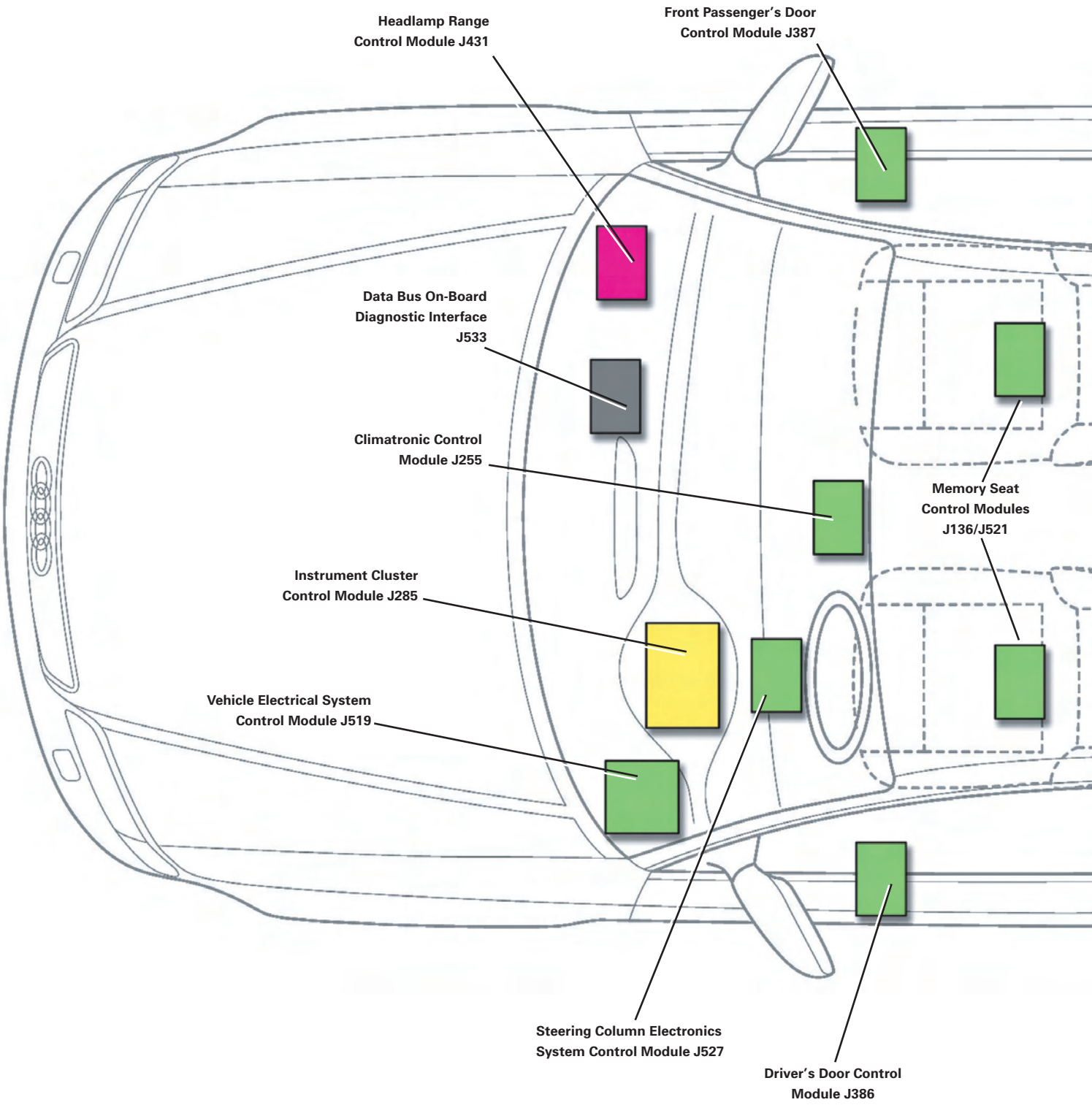
Reference
For further information, please refer to SSP 99A703 "The 2008 Audi A5 / S5 – Networking."

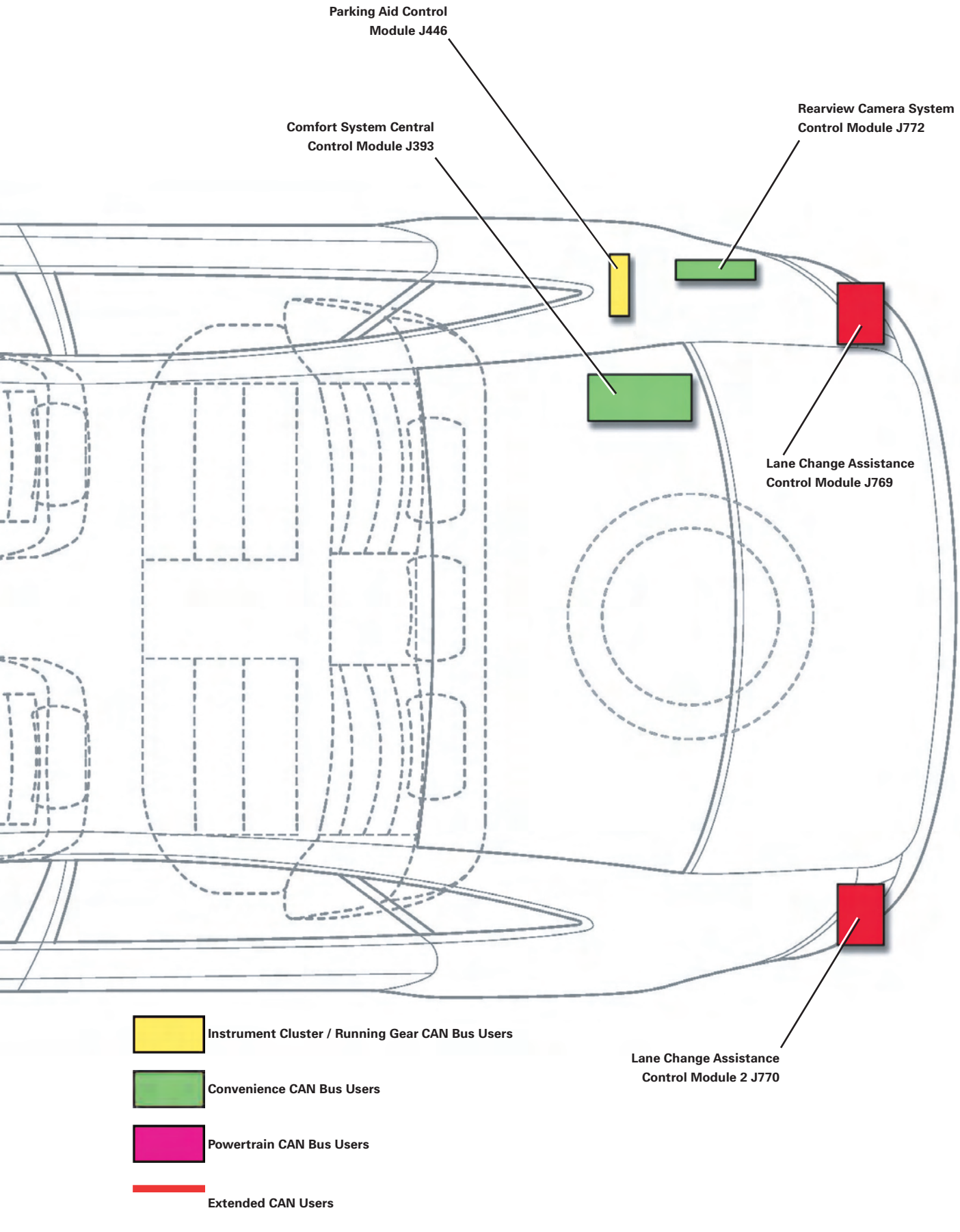
Networking - MOST Bus for Vehicles with MMI with Audi Navigation Plus




Powertrain CAN Bus
Convenience CAN Bus
Instrument Cluster/Running Gear CAN Bus
CAN Extended
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

Installation Locations of Control Modules




Parking Aid Control Module J446
Comfort System Central Control Module J393
Rearview Camera System Control Module J772
Lane Change Assistance Control Module J769
Lane Change Assistance Control Module 2 J770
Instrument Cluster / Running Gear CAN Bus Users
Convenience CAN Bus Users
Powertrain CAN Bus Users
Extended CAN Users

Instrument Cluster Control Module J285

New Features

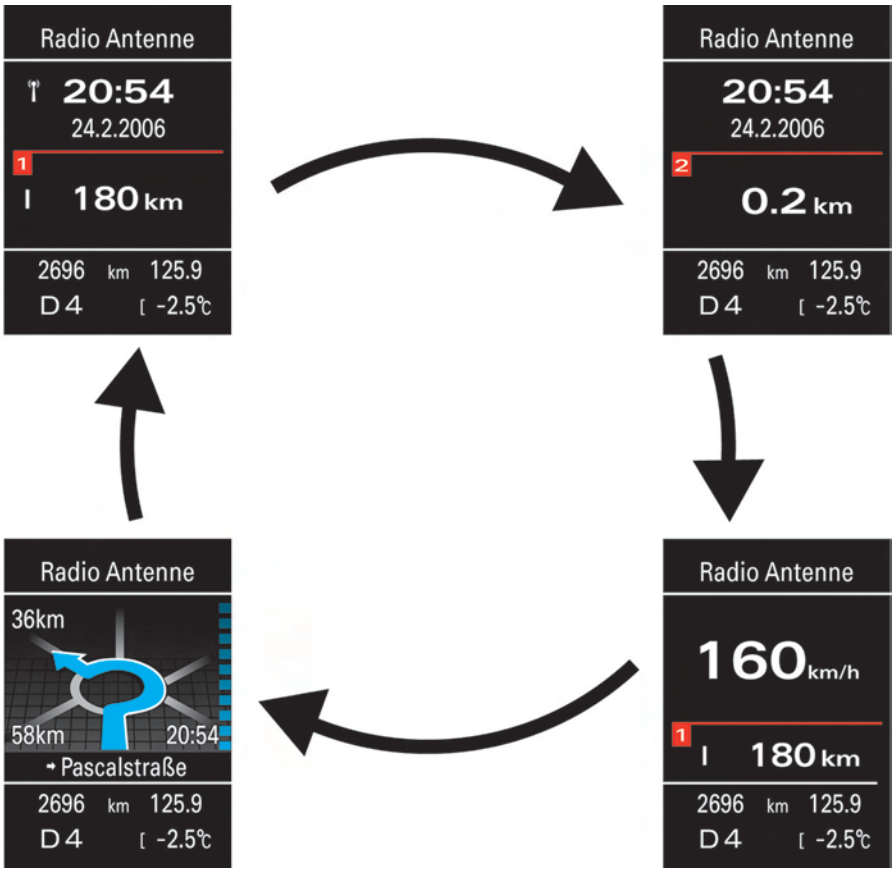
- The Zero position of the tachometer and speedometer are now at the “6 O’clock” position. The top of the scale is at the “3 O’clock” position.
- After switching the ignition ON, the needles make a full scale sweep.
- Trip mileage and total mileage are now displayed in the center of the Instrument Cluster.
- A Shift Suggestion Indicator is used to help facilitate a more fuel efficient driving style.
- The fuel level senders are the only components hard-wired to the Instrument Cluster.
- Display lighting through terminal 58d is now done through Electrical System Control Module J519 and not the Instrument Cluster.



Instrument Cluster Center Display Information

The driver can scroll through the individual display levels of the center display by pressing the Reset button on the windshield wiper stalk.

The displays shown below are with the color display and optional Audi Navigation Plus.



Shift Suggestion Indicator



Shift Suggestion Indicator in Midline or Highline Instrument Cluster Display

Function

The shift suggestion indicator in the center display of the instrument cluster is a new function designed to help the driver to reduce fuel consumption. The function is integrated in the engine management software. It is featured on models with a manual transmission.

Since modern vehicle engines deliver high torque even at low rpm, it is often possible to drive in a higher gear. In this case, a shift recommendation is indicated to the driver via the center display. The shift recommendation may involve skipping a gear.

The actual gear position is indicated continuously in the center display. This information is derived from the actual engine speed and road speed signals. Neither the actual gear position nor any shift recommendations are indicated while the clutch is actuated (for longer than 2 seconds.) Shift recommendation is not given when the engine is operating at full throttle.

Normally, no shift recommendation is issued during deceleration. However, if the engine speed drops below a critical threshold, a recommendation to shift down a gear will be given.

To implement the “shift suggestion indicator” function, the engine control module also requires information from Steering Angle Sensor G85, ABS Control Module J104, and Comfort System Central Control Module J393. The engine control module receives this information via CAN-bus.

Indicator

The shift recommendation computed by the engine control module is transmitted via CAN bus to the instrument cluster and displayed in the driver information system.

There are two possible states of the display:
1. Actual gear position (displayed with or without shift recommendation.)
2. No display (if clutch is actuated for longer than two seconds or driver has deactivated the function on MMI.)

Electrical Connections of Instrument Cluster Control Module J285

The following lines are connected to Instrument Cluster Control Module J285:

- 2 Lines Terminal 30.
- 2 Lines Terminal 31.
- 2 Test Leads to Fuel Tank Sender 1.
- 2 Test Leads to Fuel Tank Sender 2.
- A Ground Wire to Fuel Tank Senders.
- 2 CAN Lines of Instrument Cluster/Running Gear CAN.

The following lines are now connected to other control modules:

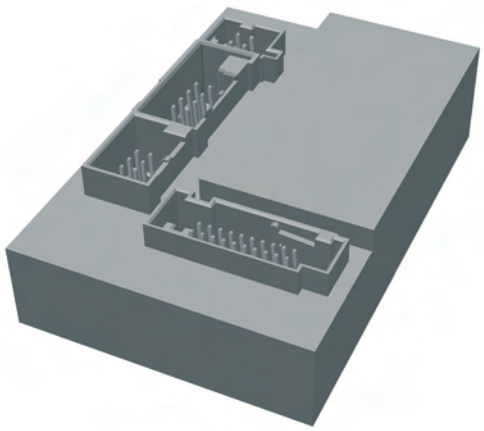
Lines on the Instrument Cluster of the Audi A4 '05	Solution in the new Audi A5
Line to Brake Pad Monitoring System	Read by Vehicle Electrical System Control Module J519
Line to Brake Fluid Switch	Read by Vehicle Electrical System Control Module J519
Line to Oil Pressure Switch	Read either by Engine Control Module or Vehicle Electrical System Control Module J519 (depending on Engine Type)
2 Lines to Transmitter and Receiver Coil in Ignition Switch	Key Recognition Components now integrated in Electronic Ignition Lock or Comfort System Central Control Module J393
Line to Front-End Ambient Temperature Sensor	Read by Vehicle Electrical System Control Module J519
Line to Coolant Temperature Sensor	Read by Vehicle Electrical System Control Module J519
Line to Coolant Level Switch	Read by Vehicle Electrical System Control Module J519
Line to Washer Fluid Level Switch	Read by Vehicle Electrical System Control Module J519
Line to Hood Switch	Read by Vehicle Electrical System Control Module J519
Line to Oil Level and Oil Temperature Sensor	Read by the Engine Control Module
K Wire	(K wire not needed)
Terminal 58s	Is Output by Vehicle Electrical System Control Module J519
Terminal 58d	Output by Vehicle Electrical System Control Module J519
Terminal 61 / Alternator Charge Indicator Lamp	LIN Bus User at Data Bus On Board Diagnostic Interface J533 (LIN master)
Terminal 15	No Longer Needed as Discrete Input at J285
Terminal 31 for Sensors	Provided by Vehicle Electrical System Control Module J519

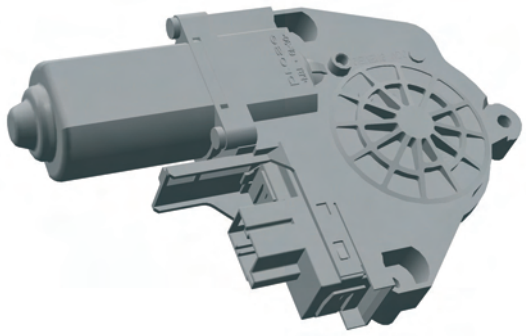
Door Control Modules J386 and J387

Introduction

The door control modules in the new Audi A5 are similar in design to those on the Audi A6 and Audi Q7: the control module and the window regulator motor are two separate components.

LED side indicators are integrated in the exterior mirrors of the new A5. They are activated by the associated door control modules.





Versions

The two door control modules of the new Audi A5 are distinguished as driver and passenger control modules (and not as left or right door control modules.)

The door control modules support the following additional functions and components:

- ► Convenience Fold-Back Door Mirrors.
- ► Electrochromatic Mirror Auto-Dimming.
- ► Mirror Potentiometer for Mirror Glass Position Sensing.
- ► Control Panel for Storing Personal Settings (Mirror Glass and Seat Positions).

Convenience Door Mirror Fold-Back

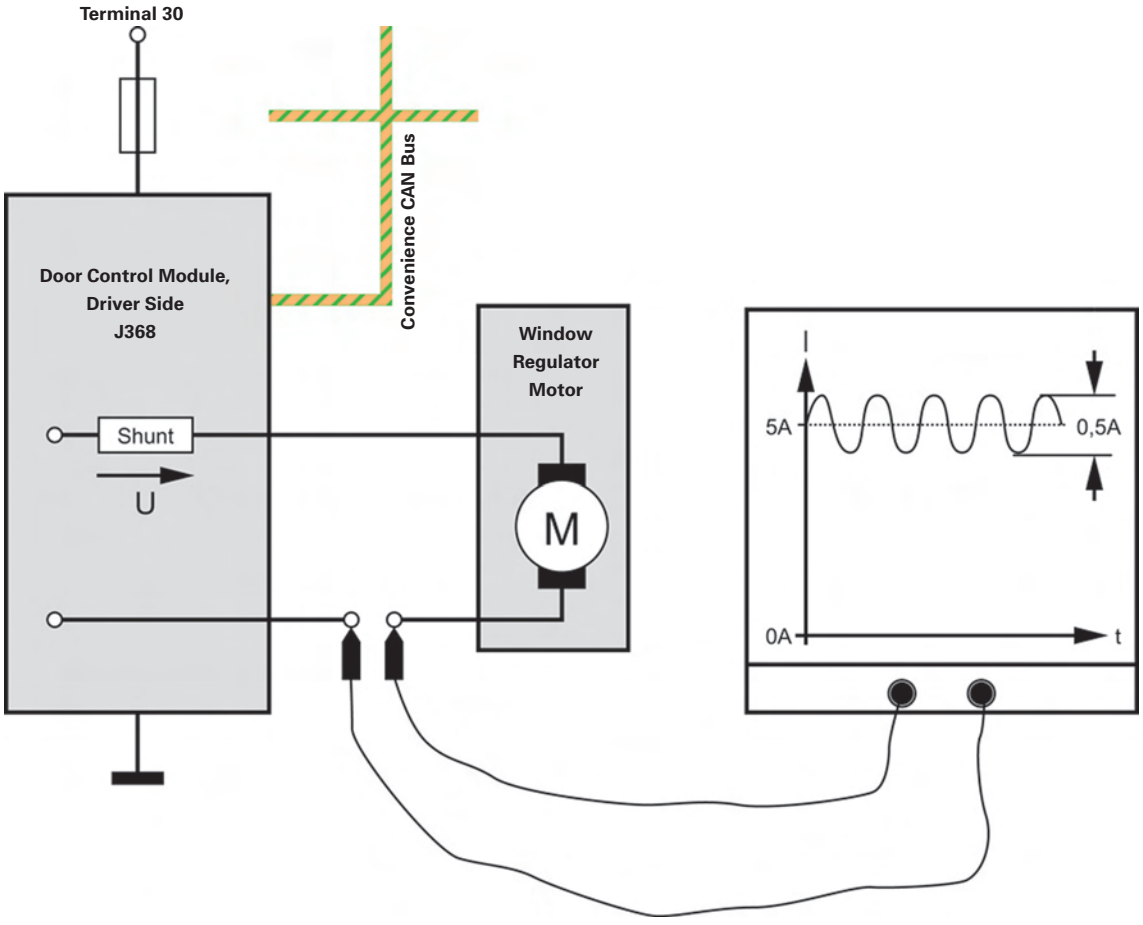
The “convenience door mirror fold-back” feature is optional on the A5. The driver can specify in the CAR menu on the MMI whether the door mirrors automatically fold back or not after locking the vehicle.

Accordingly, the door mirrors return automatically to their initial position after “ignition on.”

Sensorless Position Recognition (SLP) for Door Window Glass

The door control modules in the new Audi A5 do not use Hall sensors for window glass position recognition. The A5 uses a sensorless position recognition system (SLP), allowing the previously used Hall sensor to be eliminated.

The sensorless position recognition system measures the harmonic content of the electrical current drawn by the window regulator motor. The speed of the window regulator motor and the actual window glass position are determined from this information.



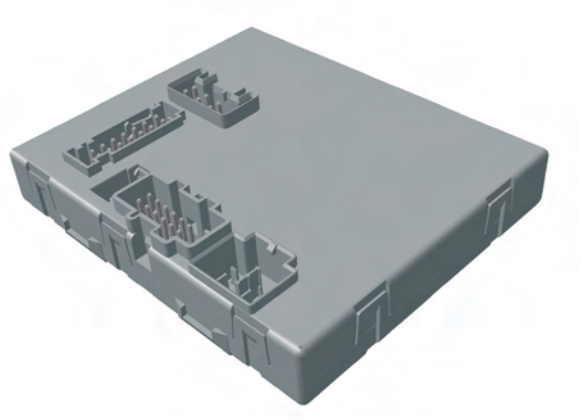
Note: A shunt is a very small resistance which is used for the measurement of electrical current. The voltage drop across the shunt is measured by the control module. The electrical current is calculated from the measured voltage.

The harmonic content is due to the continuous reversal in the polarity at the capacitor of the window regulator motor. The harmonic content measurement and analysis are also used to provide pinch protection. Each revolution of the motor produces eight harmonics.

Seat Control Modules

Electrically adjustable front seats with adjustment for seat height, backward/forward position, seat cushion angle, seat back angle, and 4-way lumbar adjustment are standard equipment on the A5/S5. A 2-position memory function for the driver's seat is standard on the S5 and optional for the A5.

The seat control modules are installed under the respective seats.



Seat Memory Stored Settings

The following settings are stored by pressing the Save button on the driver side memory block by locking the vehicle with the remote control key:
- Actual Positions of Left and Right Exterior Mirrors.
- Actual Positions of the 5 Driver Seat Adjustment Motors.

Memory Seat / Steering Column Adjustment Control Module J136 can store up to six different settings. Two settings can be stored with the Save buttons and another four with different remote control keys.

ON/OFF Switch

The basic requirement for all memory operations (as well as convenience functions such as seat symmetry, comfort side view, and seat adjustment with the easy entry switch) is that the ON/OFF switch of the memory block is at "ON."

The position of this switch is read by Driver's Door Control Module J386 and transferred to the control module via the CAN bus. However, the switch position is also hard wired through the driver door control module and from there to the seat control module ("emergency OFF line" in the electrical system overview).

If the switch is at "OFF," a hardware device prevents switching of the power modules for motor activation, which means no adjustments can be made. If the switch is at "ON" and if adjustments are being made, all adjustments are aborted immediately when the OFF switch is actuated.

Saving Settings and Adjusting Seats Using Programming Buttons

The settings previously described can be saved by pressing the SET button followed by either of the memory location buttons. The SET function remains enabled until the red function indicator LED in the button goes out.

An acoustic signal is given as feedback after a setting is saved successfully. Again, the prerequisite for this is that the memory block ON/OFF switch is at “ON.”

Saving Settings and Memory Adjustment using Remote Control Key

The following procedure is used to save the current mirror and driver seat settings to a remote control key:

1. Set “Remote Control Key” “ON” on the MMI Car Menu under “Systems,” “Seat Settings,” “Driver Seat.”
2. Turn the Memory Block ON/OFF switch to “ON.”
3. Close the driver’s door and lock the vehicle with the remote control key. (For this purpose, however, the seat back must not be unlocked.) After unlocking the vehicle with the remote control key and opening the driver’s door, the mirror, the driver’s seat, and the steering column are adjusted to the positions which have been saved to the remote control key. The front passenger seat does not have this function.

Retrieving Settings

If the driver door is open and at “terminal 15 OFF,” the mirrors and the driver’s seat can be adjusted to the pre-configured positions by pressing either of the Save buttons once. For this purpose, the driver’s door must not already have been open for longer than 10 minutes.

If the driver door is closed and the ignition is switched ON, the Save button must be kept pressed down until the adjustment is complete. The adjustment will be interrupted by releasing the Save button.

"Easy Entry" Function



The "easy entry" function allows the front seats to be moved into a position where the rear seats are more easily accessible.

The complete procedure is as follows:

1. The mechanical backrest unlocking is actuated manually.
2. Actuation is detected by a microswitch in the seat control module. The head restraints are then retracted electrically.
3. The backrest is folded forwards manually.
4. Press the easy entry button, and an electric motor moves the seat forward to allow more comfortable entry.
5. Once the person is seated in the rear of the vehicle, the easy entry button is pressed until the seat has moved back far enough. The seat stops when it is in its starting position.
6. The seat back is folded back into its starting position.
7. The seat control module recognizes when the backrest has reached its starting position and moves the head restraints back into their original position.

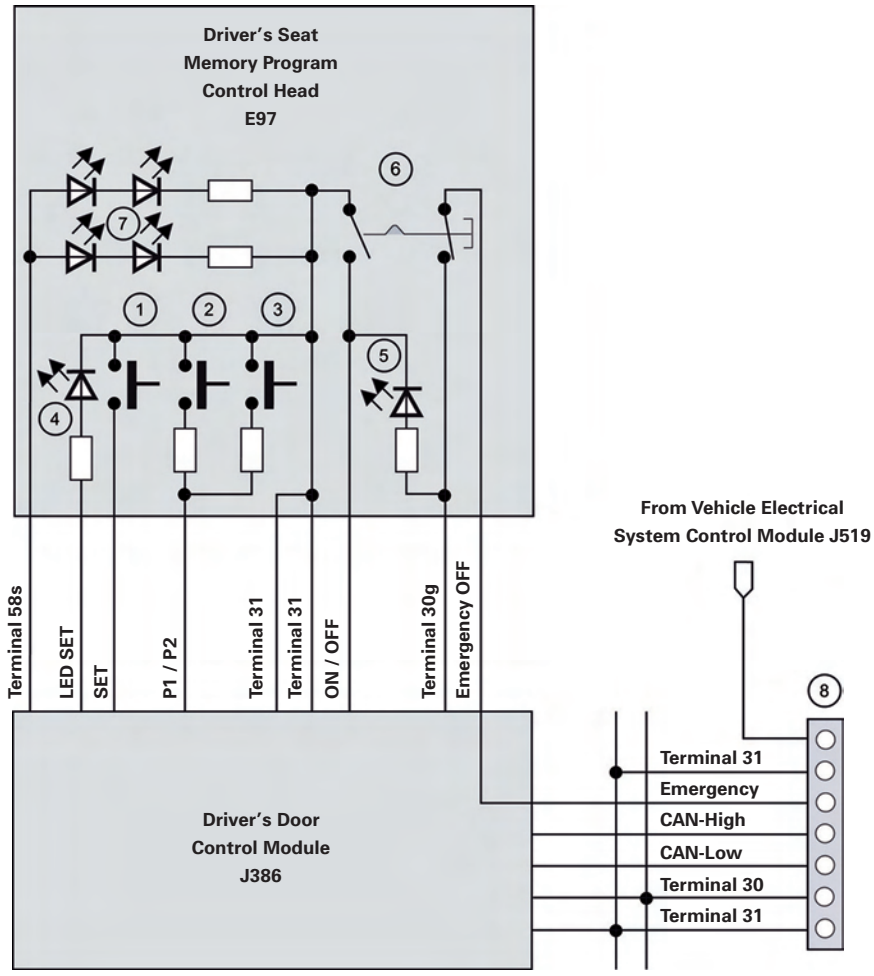
Note: Steps 5 and 6/7 can also be performed in the reverse order.

Sensorless Position Recognition System (SLP)

The positions of the individual seat adjustment motors are now detected by a sensorless position recognition system (SLP) instead of Hall sensors. The system is able to determine the exact distance travelled by the seat from the harmonic content of the motor.

<u>At roll-out of the new Audi A5, seat positions will be determined by both SLP and Hall sensors.</u>

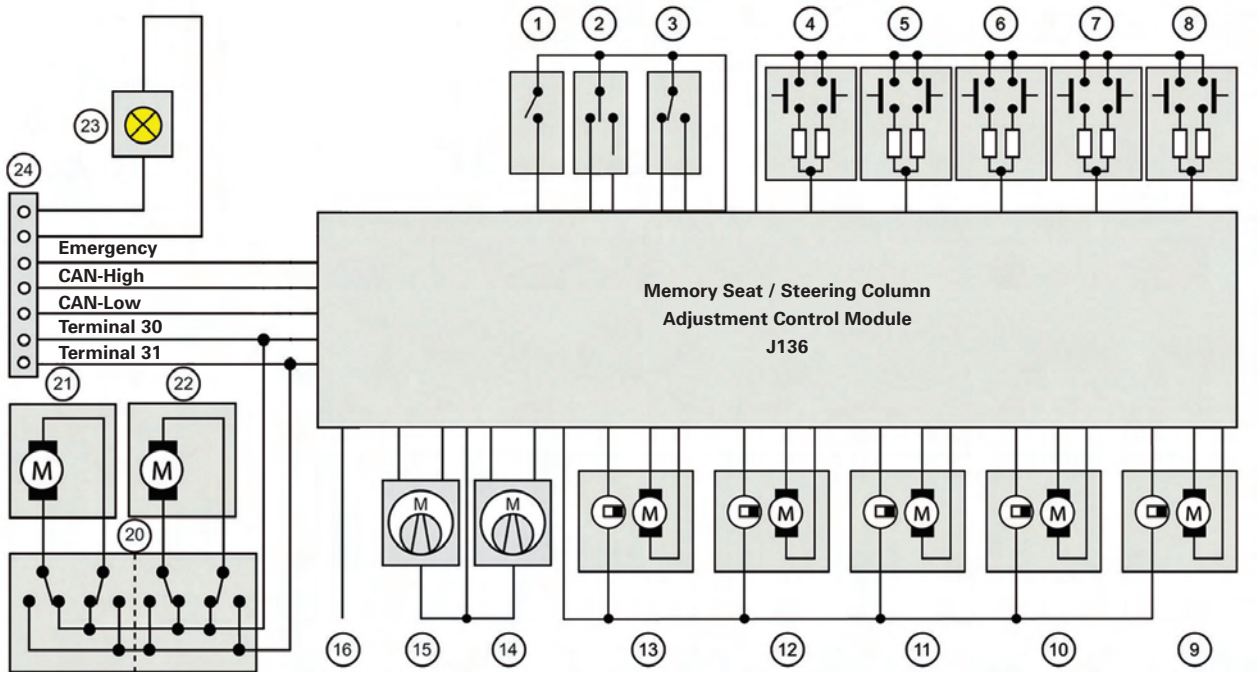
For this reason, the Hall sensors are still shown in the electrical overview. After a transition period, production of four of the five Hall sensors will be discontinued. The Hall sensor in the head restraint adjustment mechanism will continue to be used. The control module coding defines which system is currently in use. In this way, the transition can be made easily at any time.



Legend

1. SET button for programming seat memory
2. P1 button - memory location 1
3. P2 button - memory location 2
4. Function indicator LED in SET button (indicates when saving is in progress)
5. Function indicator LED in ON/OFF switch
6. ON/OFF switch for activating or deactivating seat memory
7. Locating light (illuminates four keys at dusk/darkness)
8. Electrical interface to the seat control module

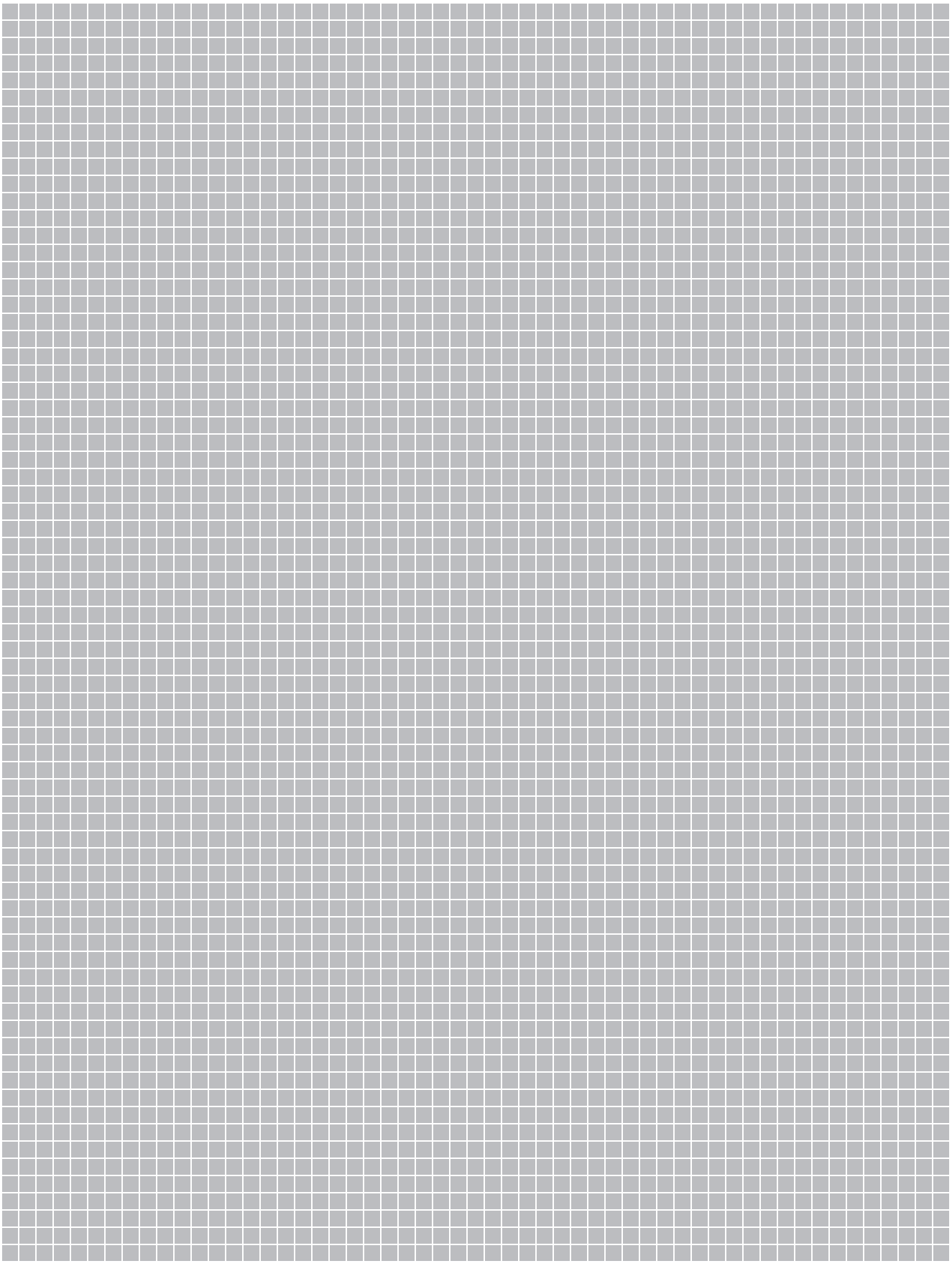
System Overview - Seat Control Module



Legend

1. Backrest Limit Switch for Adaptation of Seat and Protection of Gear Mechanism on Adjustment Motor
2. Easy Entry Button for Moving Seat Forward or Back for Easier Access to Rear Seats
3. Unlocked Backrest Recognition Switch
4. Double Push-Button for Seat Angle Adjustment
5. Double Push-Button for Seat Height Adjustment
6. Double Push-Button for Longitudinal Seat Adjustment
7. Double Push-Button for Backrest Adjustment
8. Double Push-Button for Head Restraint Adjustment
9. Head Restraint Adjustment Motor with Hall Sensor
10. Backrest Adjustment Motor with Hall Sensor
11. Longitudinal Seat Adjustment Motor with Hall Sensor
12. Seat Height Adjustment Motor with Hall Sensor
13. Seat Angle Adjustment Motor with Hall Sensor
14. Climate Control Fan in Seat Cushion
15. Climate Control Fan in Backrest
16. Line for Encoding: Driver or Front Passenger Seat Control Module
17. (Not used)
18. (Not used)
19. (Not used)
20. Switch Plate for Lumbar Support
21. Lumbar Support Height Adjustment Motor
22. Lumbar Adjustment Motor
23. Footwell Light (Exclusive with Lighting Package)
24. Electrical Interface to Vehicle Electronics or Electrical System

Notes



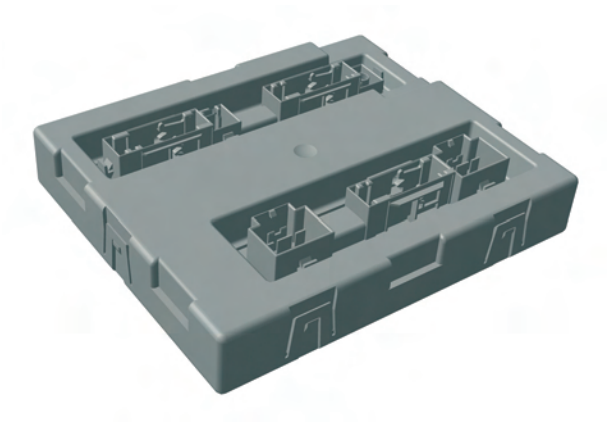
Comfort System Central Control Module J393

New Features

Comfort System Central Control Module J393 for the Audi A5 has undergone significant modifications.

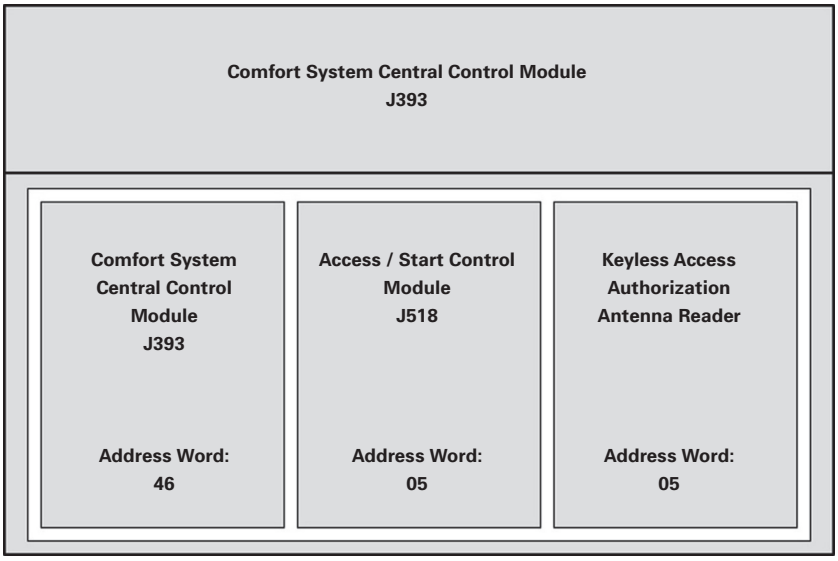
The “new” Comfort System Central Control Module J393 includes all the functions of the following (previously discrete) control modules:

- “Old” Comfort System Central Control Module J393.
- Access / Start Control Module J518.
- Keyless Access Authorization Antenna Reader J723.



To aid understanding of the Self-Study Program, the following two terms will be used hereafter:

Designation	Definition
“Old” Convenience System Control Module	Comfort System Central Control Module J393 in models A4 (B7), A6 (C6), Q7, and A8 (D3)
“New” Convenience System Control Module	Comfort System Central Control Module J393 in the new Audi A5 (B8) and the other models belonging to the B8 family



Address Words

To ensure as straightforward a transition as possible from discrete control modules J393, J518, and J723 to the "new" Comfort System Central Control Module J393, the different Address Words - 46 and 05 - have been retained. Keyless Access Authorization Antenna Reader J723 was also accessible previously for diagnostics via Address Word 05. This control module was a LIN bus system user whose master was Access/Start Control Module J518.

This means that
– Data Blocks
– Adaptation
– Actuator Diagnostics
– Fault Memory Entries
and
– Guided Fault Finding Programs,

which belonged to the "old" Comfort System Central Control Module J393, can also be found in the "new" J393 under Address Word 46.

The entry and start authorisation control module and the antenna reader module for entry authorization for keyless entry systems J723 are still accessible for diagnostics under address word 05, although control modules J519 and J723 no longer exist as separate control modules.

Versions

Comfort System Central Control Module J393 is available in a number of versions. These versions differ from one another in the following respects:

– Frequency of Remote Control Key (315MHz, 433MHz, or 868MHz).
– Installation of Antitheft Alarm System - "Yes" or "No."
– Vehicle has "Advanced Key" - "Yes" or "No."
– Installation of Electric Rear Window Roller Blind - "Yes" or "No."

However, all control module versions use the same software and have the same basic circuit board. The versions have different codings and different basic circuit board configurations.

Tasks of Comfort System Central Control Module J393

► Electrical Steering Column Lock ELV
– Communication with ELV Control Module via LIN Bus.
– Output of Locking Enable Signal via Discrete Line.
– Reading "Terminal 15" Enable Signal from ELV.
– Communication with EZS via LIN Bus.
– Reading in Microswitch in EZS.
– Activating Ignition Key Removal Lock.
– Terminal Management.

► Electronic Ignition Lock EZS and Associated Functions

Comfort System

▶ Central Locking
- Convenient Opening and Closing.
- Locking and Unlocking Fuel Filler Flap.
- Activating Luggage Compartment Lid Release System.
- Reading in Central Locking Antenna Signal.
- Reading in Handle in Luggage Compartment Lid.
- Reading in Luggage Compartment Lid Contact Switch.

▶ Advanced Key
- Activating Three Keyless Antennas.
- Reading in Capacity Sensors in Both Doors.
- Reading in Start/Stop Button.

▶ Activating Vehicle Lights
- Rear Lights.
- Brake Lights.
- Back-Up Lights.
- Rear Turn Signals.
- License Plate Light.
- Luggage Compartment Light.

▶ Antitheft Alarm System (ATA)
- Communication with Antitheft Alarm Sensor via LIN Bus.
- Communication with Alarm Horn via LIN Bus.

▶ Panorama Tilt Sunroof
- Communication with Panorama Tilt Sunroof via LIN Bus.
- Generation of the Enable Signal for Actuation of Power Window Regulators and Panorama Tilt Sunroof via CAN.

▶ Reading Information
- Reading in Selector Lever Position P or N.
- Reading in Clutch Pedal Switch.

▶ Activation of Relays
- Activation of Power Socket Relays.
- Activation of Rear Window Defroster Relay.

▶ Safety Functions
- Immobilizer V Master.
- Component Protection System Users.
- Crash Signal Evaluation.

▶ Diagnostics
- Provides Diagnostic Functions for Diagnostic Tester.
- Is Flashable Using Diagnostic Tester.

▶ Other Functions
- Activation of Rear Window Roller Blind.
- Communication with Humidity Sensor via LIN Bus; Data Transfer to Climatronic.
- Communication with Homelink® via LIN Bus and Data Transfer to Electrical System Control Module J519 via Convenience CAN Bus.
- Deactivation of Power Consumers when Transport Mode is Active (Antitheft Alarm, Advanced Key, Luggage Compartment Light, Rear Window Roller Blind, etc.).
- Management of MMI Settings Relevant to Convenience Functions (Central Locking, Convenient Opening and Closing, etc.).

Personalization and Adaptation Channels

With the transition to “online encoding” of the control modules of the Audi A5, several coding bits can now be found under Adaptation.

New vehicle parameters not previously adaptable have now been included into the adaptation function.

Adaptations Made Under Diagnostic Address 46:

- Resetting Personalization of All Keys to Factory Default.

Separate Adaptation Values for Ignition Keys:

- Unlock All Vehicle Doors or Only One Door After Sending “Open” Command by Radio-Operated Remote Control.
- Auto-Lock Active / Inactive.
- Auto-Unlock Active / Inactive.
- Convenient Opening System Users:
  - Driver Side Window.
  - Front Passenger Side Window.
  - Lifting Sunroof.
- Automatic Rear Window Roller Blind at Reverse On / Off Active when Reverse Gear Selected.
- Motorway Indicator Function On / Off.

Adaptation Channels Vehicle-Specific and Identical for All Ignition Keys:

- Alarm Threshold of Antitheft Alarm Tilt Sensor.
- Interior Monitor Sensitivity.
- Alarm Trip Delay After Mechanical Opening of Driver’s Door.

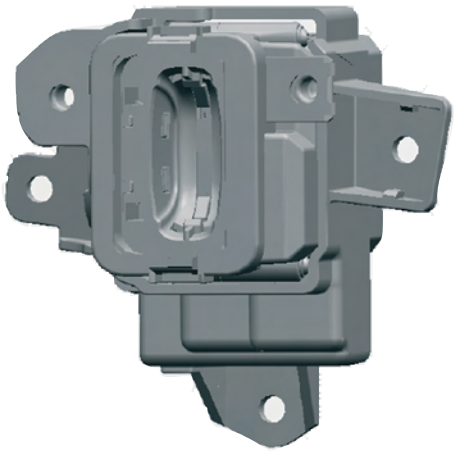
- ▶ Operating Options - Convenient Opening
  - – Power Window Regulators
    - – Via Lock Cylinder in Driver's Door (Activate / Deactivate)
    - – Using Window Regulator Switch in Driver's Door (Activate / Deactivate)
    - – Via Capacitance Sensors in Outer Door Handles (Activate / Deactivate; Advanced Key option only)
  - – Lifting Sunroof
    - – Via Lock Cylinder in Driver's Door (Activate / Deactivate)
    - – Using Window Regulator Switch in Driver's Door (Activate / Deactivate)
    - – Via Capacitance Sensors in Outer Door Handles (Activate / Deactivate; Advanced Key option only)
  - – Sunroof Roller Blind
    - – Via Lock Cylinder in the Driver's Door (Activate / Deactivate)
    - – Using Window Regulator Switch in Driver's Door (Activate / Deactivate)
    - – Via Capacitance Sensors in Outer Door Handles (Activate / Deactivate; Advanced Key option only)

- ▶ Operating Points - Convenient Locking
  - – Power Window Regulators
    - – Via Lock Cylinder in Driver's Door (Activate / Deactivate)
    - – Using Window Regulator Switch in Driver's Door (Activate / Deactivate)
    - – Via Capacitance Sensors in Outer Door Handles (Activate / Deactivate; Advanced Key option only)
  - – Lifting Sunroof
    - – Via Lock Cylinder in Driver's Door (Activate / Deactivate)
    - – Using Window Regulator Switch in Driver's Door (Activate / Deactivate)
    - – Via Capacitance Sensors in Outer Door Handles (Activate / Deactivate; Advanced Key option only)
  - – Sunroof Roller Blind
    - – Via Lock Cylinder in Driver's Door (Activate / Deactivate)
    - – Using Window Regulator Switch in Driver's Door (Activate / Deactivate)
    - – Via Capacitance Sensors in Outer Door Handles (Activate / Deactivate; Advanced Key option only)

The Electronic Ignition Lock

Access/Start Authorization Switch E415 has the following tasks:

- Mechanical Receiver and Locking of Ignition Key (Ignition Key Removal Lock).
- Electrical Unlocking of Ignition Key by a Lift Magnet.
- Detection of the Condition “Key Inserted” by Microswitch.
- Detection of Two Possible Key Positions:
  - Key in Rest Position.
  - Key Pressed via Microswitch.
- Reading and Writing of Data for Immobilizer or Audi Intelligent Key Function to and from Ignition Key.
- Receiving / Sending LIN Messages with Data from / to the Ignition Key.



Access/Start Authorization Switch E415 without Trim

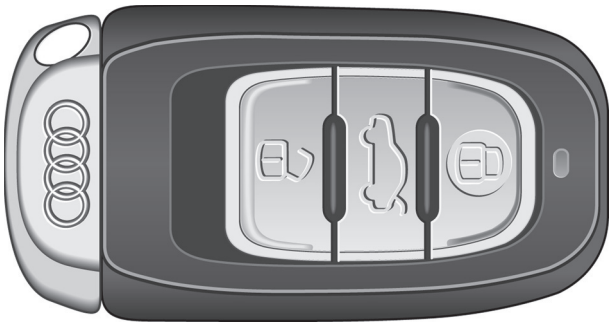


Key Inserted in Electronic Ignition Lock Module

Ignition Key

The new Audi A5 features an all-new key concept. Instead of the turning movement of the ignition key in the ignition lock, the vehicle is now started by a push movement of the key in the ignition lock.

No button operated folding key is needed.



Tasks of Ignition Key:

- Push-actuation of various microswitches in the ignition lock. The microswitches are read by Comfort System Central Control Module J393. The module generates the actual terminal status from these signals.
- Sending radio signals for operation of the Central Locking System.
- Storing data required by the Immobilizer.
- Storing vehicle data for the Audi Intelligent Key function.
- Locating the current key position by means of signals from the Entry and Start Authorization Antennas (with optional Audi Advanced Key).
- Includes a Mechanical Emergency Key.

The Ignition Key Removal Lock

The ignition key is locked mechanically when the key is inserted into the electronic ignition lock in such a way that it can no longer be removed by the driver.

The key is released as soon as the ignition is turned off. This happens as follows: an electrical current is applied to a lift magnet, releasing the ignition key. The lift magnet is seated in the electronic ignition lock and is energized by Comfort System Central Control Module J393.

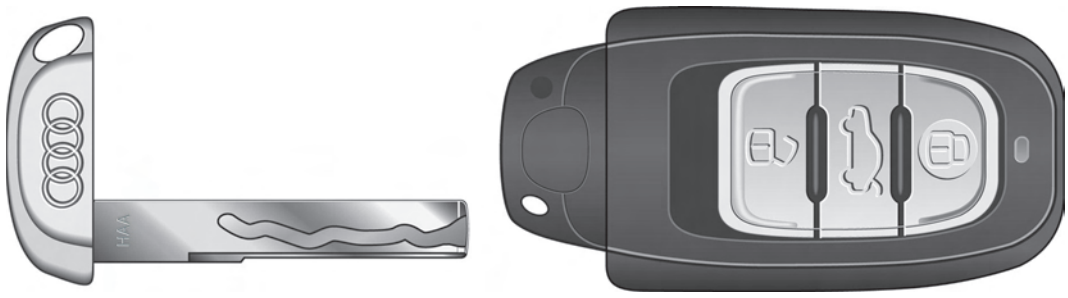
Depending on transmission type, there is one more condition for release of the key:

In models with automatic transmission:
The selector lever must be in the “P” position.

In models with manual transmission:
The vehicle must be stationary.

If the lift magnet of the ignition key removal lock cannot be energized due to a technical fault and if the key is currently inserted in the ignition lock, the key will remain engaged in the ignition lock. To be able to lock the vehicle despite this, a mechanical emergency key with bit can be removed from the ignition key.

The emergency key is integrated in the ignition key and can be used for locking the central locking system via the mechanical lock in the driver’s door.



The mechanical emergency key can be used for opening the vehicle via the mechanical lock in the driver’s door if the vehicle cannot be opened by radio remote control.

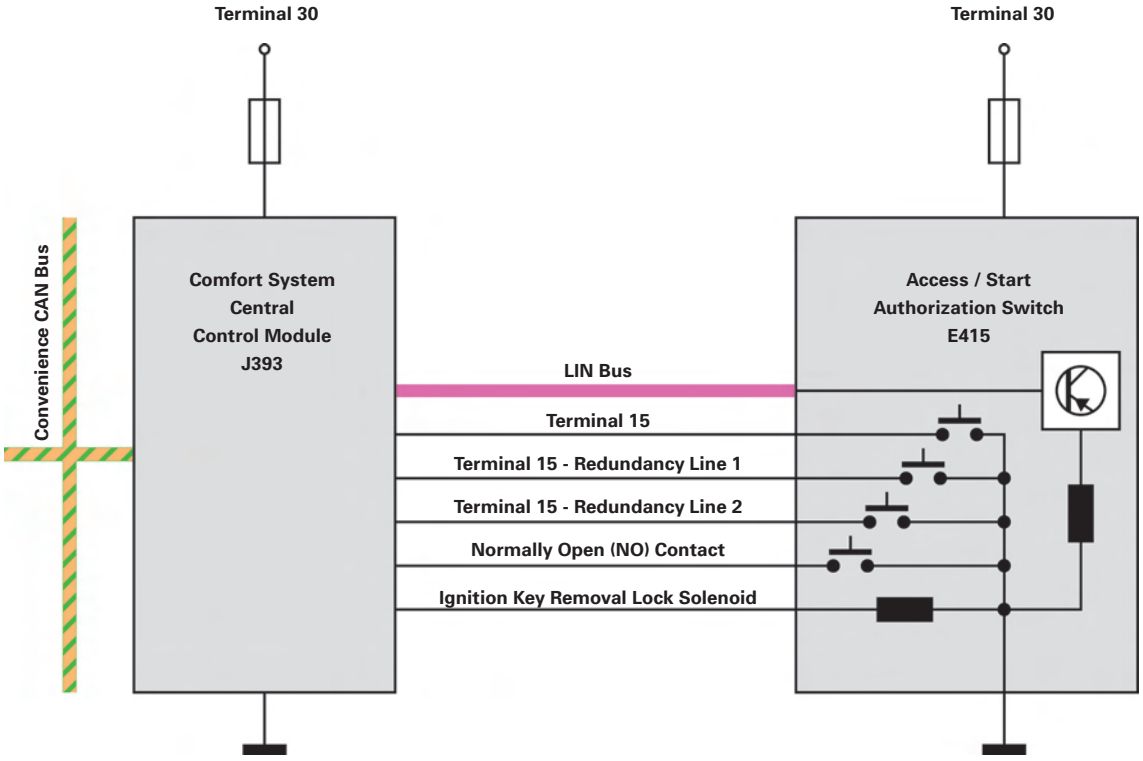
System Overview

Access/Start Authorization Switch E415 has a microswitch with a normally open contact which connects to ground when the key is inserted. The microswitch is read by Comfort System Central Control Module J393.

The "key pressed" position is read by three microswitches. All three microswitches connect to ground when key in the ignition lock is pressed. These switches are also read by Comfort System Central Control Module J393.

In the event of a fault, and if, for example, only two of the three microswitches connect to ground when the ignition key is pressed, it is decided by majority principle. In this case, the system would decide "key pressed." However, as feedback is not provided by all three microswitches, but only by two, a fault is registered and a warning is indicated.

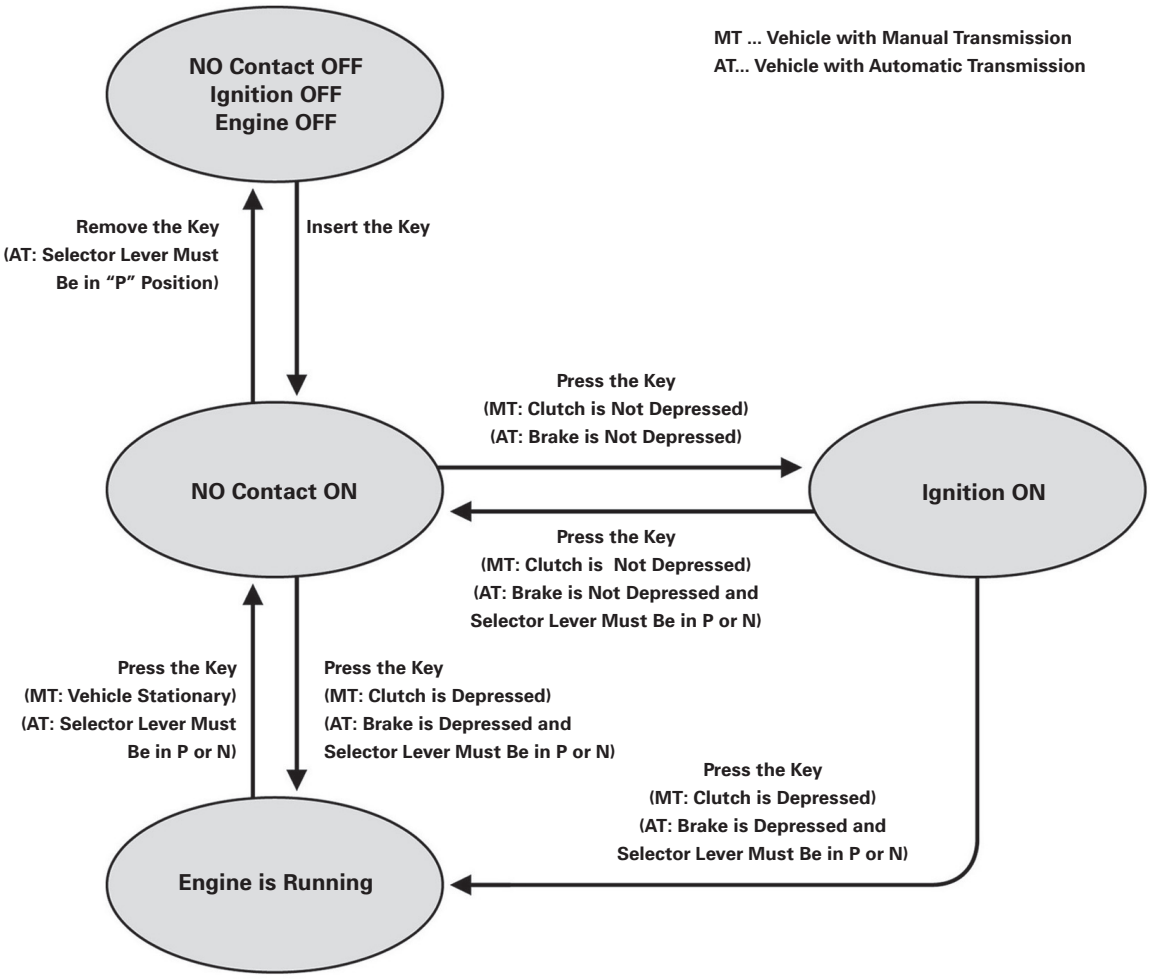
The lift magnet of the ignition key removal lock is also energized directly by the Comfort System Central Control Module. The information which is interchanged with the ignition key is transferred in the form of LIN messages to the electronic ignition lock and processed by the latter. An electronics device in the ignition lock then activates the read and write coil for the data transfer.



Starting with Ignition Key

An all-new operating logic is used for terminal control and for starting the engine. When the key is in the ignition lock (NO contact), the electronic ignition lock differentiates between only two different key positions:
– Key in Rest Position.
– Key Pressed.

These two positions are sufficient for complete control of the terminals. The associated logic is represented by the status graph below.



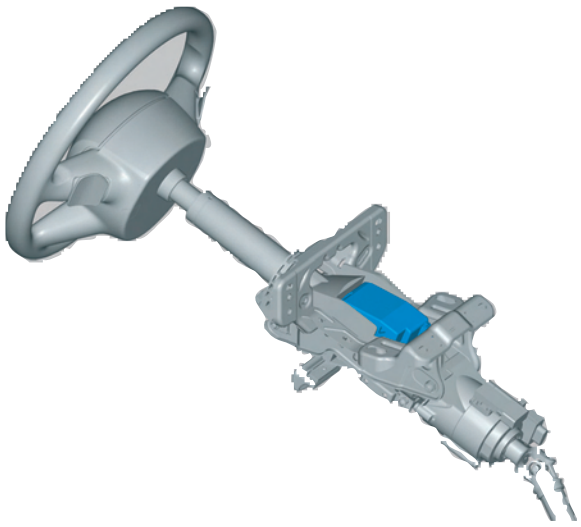
A function has also been implemented for the emergency shutdown of the engine. This function is identical in both manual and automatic transmission models.

The following actions will result in an emergency shutdown:
– Pressing the Key for too Long.
or
– Pressing the Key Twice Within a Second.

Electronic Steering Column Lock Control Module

Electronic Steering Column Lock Control Module J764 is mounted directly to the steering column with two shear bolts.

If J764 should malfunction, the entire column must be replaced.



Locking and Unlocking the Steering Column

Electronic Steering Column Lock Control Module J764 unlocks the steering column in the following situations:

During Ignition Lock Operation:
- When the ignition key is inserted in the ignition lock (detected by NO contact).

Keyless (Audi Advanced Key) Operation:
- Terminal S is activated by pressing the Start/Stop button.

Electronic Steering Column Lock Control Module J764 locks the steering column in the following situations:

During Ignition Lock Operation:
- The ignition key is removed.

Keyless (Audi Advanced Key) Operation:
- The door is opened.

To lock the steering column, the following additional conditions must be met:

- The ignition must be OFF.
- Terminal S must not be detected.
- The vehicle must be stationary.

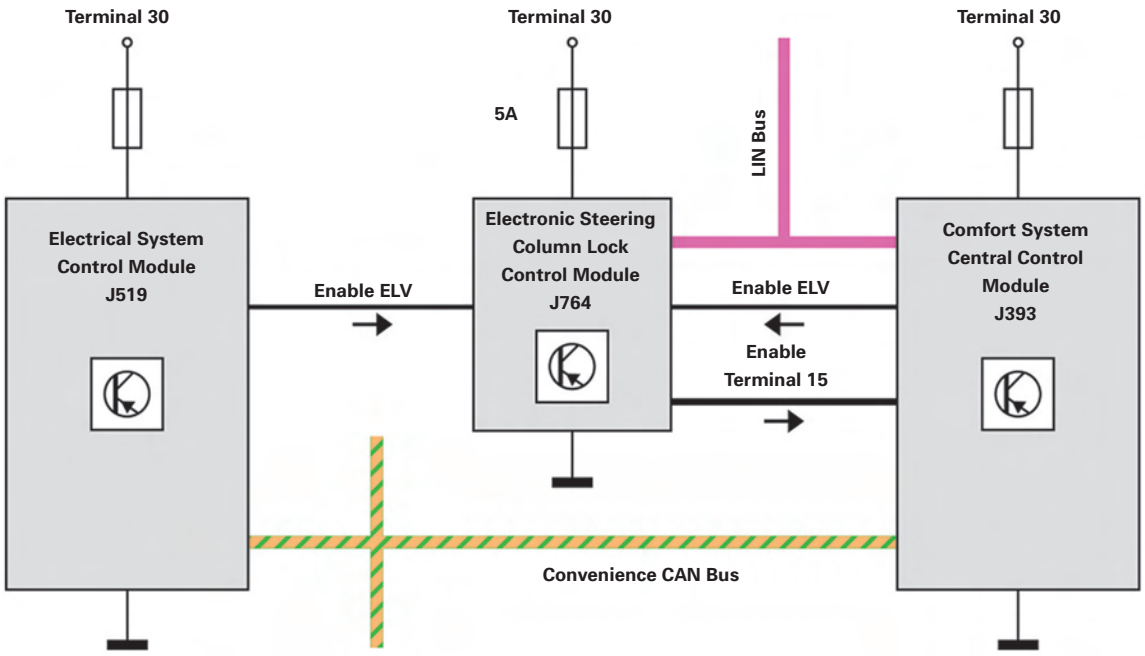
System Overview

The prerequisite for locking of the steering column (ELV) by Electronic Steering Column Lock Control Module J764 is the presence of supply voltage across both ELV enable lines. To this end, both Electrical System Control Module J519 and Comfort System Central Control Module J393 connect terminal 30 to the corresponding discrete lines for the duration of locking.

If a “terminal 15” request is issued to J393, then a check must be made to ensure the steering column has been successfully unlocked before terminal 15 is connected.

Operation Sequence:

- On receiving a “terminal 15” request, J393 queries J764 by a LIN Bus message.
- If the Steering Column has been successfully unlocked, J393 is notified via the discrete line “Enable Terminal 15.” The enable line remains active throughout the period in which the ELV is unlocked.
- After issuing an enable command, J393 activates the terminal 15 relay.



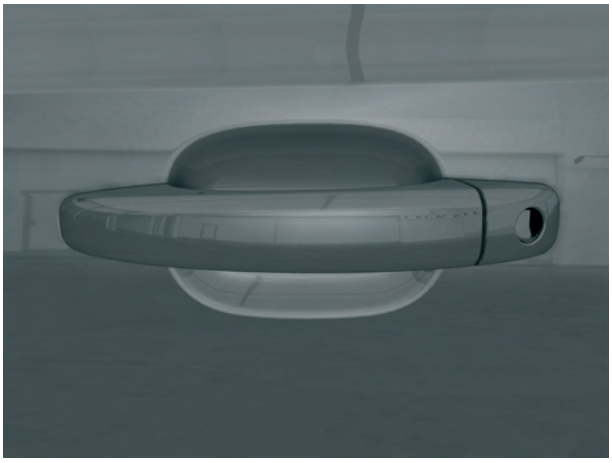
Audi Advanced Key

Introduction

The Audi Advanced Key concept has been adopted from the A6, Q7, and A8 models, and optimized to reduce the required number of system components.

New Features

The Audi A5/S5 has no central locking buttons on the door outer handles. Unlocking is done by touching the back of the exterior door handle, provided the key is close by (because of a capacitance sensor). Locking is done by touching only the rectangle on the front of the exterior door handle. (If an attempt is made to "check" that the vehicle is locked by pulling on the door handle, the system will unlock if the key is nearby.)



Door Outer Handle with Capacitance Sensor

Start/Stop Button

In the case of the Start/Stop button, the "two-button concept" (as featured on the A6, Q7, and A8) has been replaced by a "single-button concept." This means only one button is required for both the start and stop functions.



Installation Locations of Entry and Start Authorization Antennas

The number of antennas required for key recognition has been reduced to three when compared to the A6, A8L, and Q7 models.

The antennas are located in the driver's door, in the center console, and in the luggage compartment.



Installation Location of Left Access/Start Authorization Antenna R200

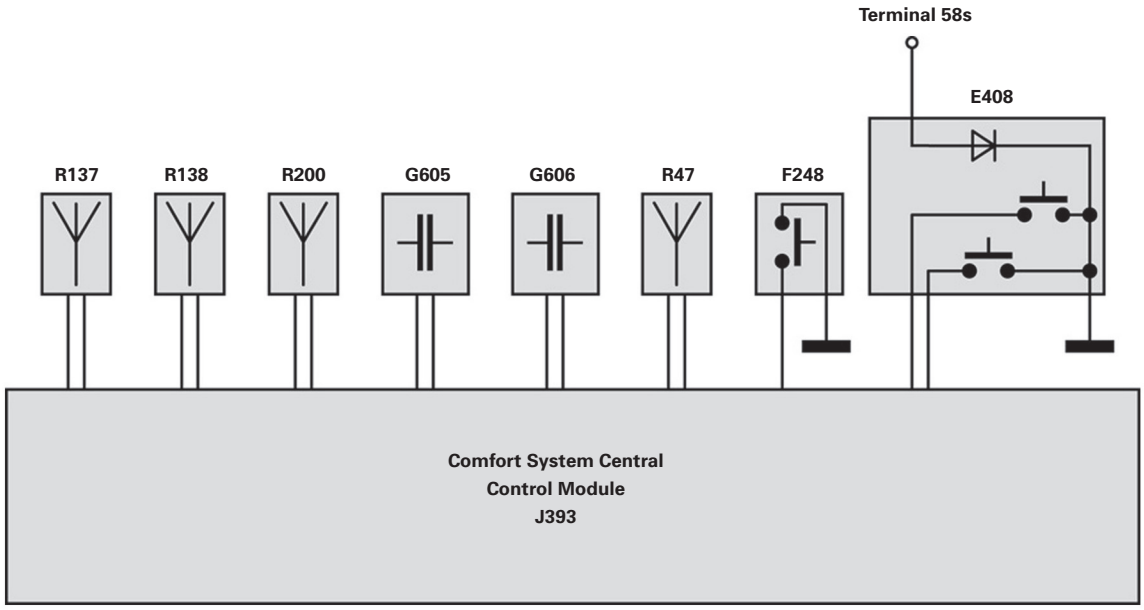


Installation Location of Interior Access/Start Authorization Antenna 1 R138



Installation Location of Luggage Compartment Access/Start Authorization Antenna R137

Overview of Vehicle Locking and Unlocking System



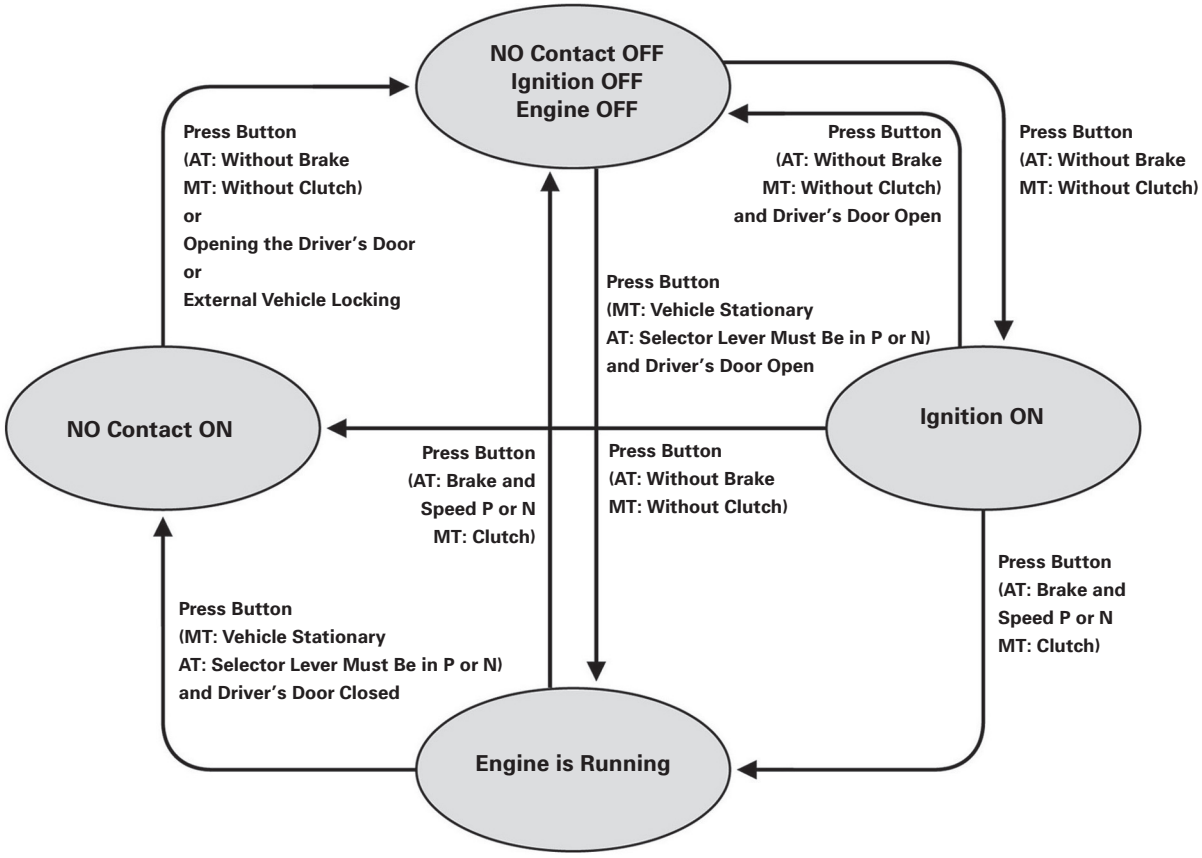
E408	Access/Start Authorization Button
F248	Rear Lid Lock Cylinder Unlock Button
G605	Left Front Outside Door Handle Touch Sensor
G606	Right Front Outside Door Handle Touch Sensor
R47	Central Locking and Antitheft Alarm System Antenna
R137	Luggage Compartment Access/Start Authorization Antenna
R138	Interior Access/Start Authorization Antenna 1
R200	Left Access/Start Authorization Antenna

Starting Engine with Audi Advanced Key

The new operating logic for terminal control and for starting the engine, as explained previously for starting the vehicle with the ignition key, can also be transferred easily to vehicles with the Audi Advanced Key.

As with the electronic ignition lock, the Start/Stop button distinguishes between two different states:
– Button in Rest Position.
– Button Pressed.

The two positions are also sufficient in this case for complete control of the terminals. The associated logic is represented by the graph below.



MT	Vehicle with Manual Transmission
AT	Vehicle with Automatic Transmission
Button	Start-Stop Button
Brake	Apply the Brake
Clutch	Depress the Clutch

Without Brake	Do Not Apply the Brake
Without Clutch	Do Not Depress the Clutch

A function has also been implemented for the emergency shutdown of the engine when using the Audi Advanced Key. It is identical in both manual and automatic transmission models.

Two conditions must be met to perform an emergency shutdown with the Start/Stop button:

– Brake is depressed.
– Vehicle is travelling less than 6 mph (10 kph).
The following actions will result in an emergency shutdown:
– Pressing the key for too long.
or
– Pressing the key twice within a second.

Audi Intelligent Key

Introduction

The ignition key of the new Audi A5 supports a new function known as Audi Intelligent Key. This key supports service processes by saving a variety of vehicle data.

Actual vehicle information is written at predefined intervals to a rewritable memory chip integrated in the key. This information can be read out using a special reader which is connected to the workshop computer via the USB interface.

The data read out can be displayed on a screen using software. A facility has also been provided which allows various service systems (e.g. ELSA) to read in this data directly.



Stored Information

The following vehicle information is stored on the Audi Intelligent Key:

- Last-Saved Date and Time.
- Mileage at Last-Saved Date.
- Current Service Interval Status.
- Transponder ID.

The status of the following items is stored in the Audi Intelligent Key in a digital form as

"OK" or "Not OK"
or
"Yes" or "No"

This means, for example, the individual fluid levels are not stored in actual volume readings. The key only stores information about whether the filling level is "OK" or whether it has dropped below a critical mark.

- ▶ Status of Various Fluid Levels:
  - – Coolant.
  - – Engine Oil.
  - – Washer Fluid.
  - – Fuel.

- ▶ Status of Various Temperatures:
  - – Engine Oil.
  - – Coolant.

- ▶ Status of Various Vehicle Systems:
  - – Steering.
  - – Dynamic Cornering Light.
  - – Headlight Range Control.
  - – Airbag.
  - – Wipers.
  - – Lane Change Assist:
    - – System Fault.
    - – Sensor Disabled.
    - – Currently Not Available.
  - – Advanced Key (if equipped):
    - – Low Key Battery Power.
    - – Key Not Recognized.
    - – Ignition Lock Faulty.
    - – Steering Lock Faulty.

- ▶ Status of Various Vehicle Components:
  - – Various Bulbs with Exact Function Specification.
  - – Alternator.
  - – Fuel Tank Sender.

- ▶ Wear
  - – Brake Pad.

Note

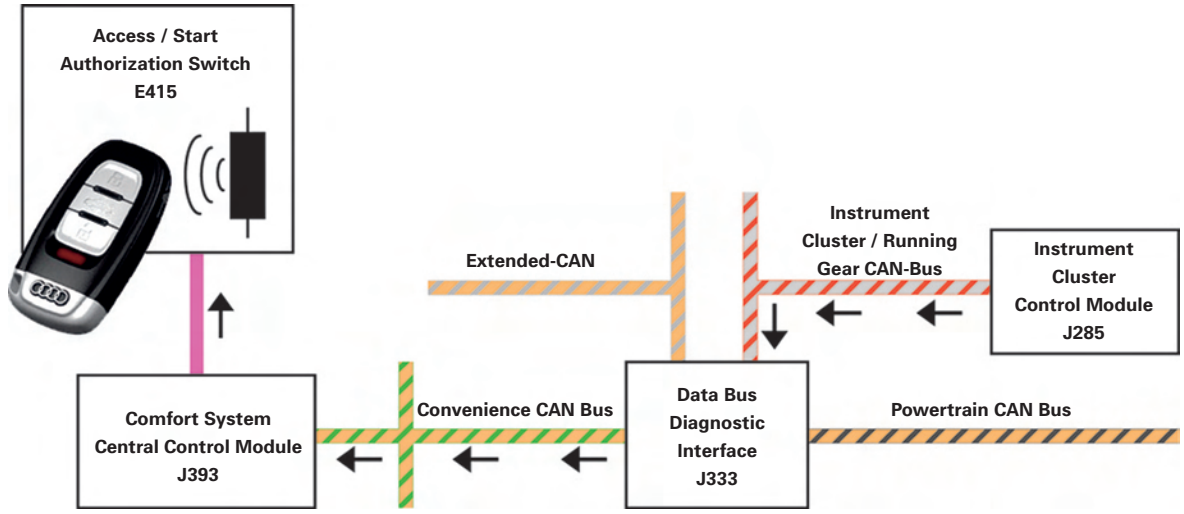
The above list is not a complete list of all the information stored on the key. It also includes information about systems which are optional on the new Audi A5.

Writing of Data to Audi Intelligent Key

There are three events which initiate a new write cycle on the ignition key:

1. When starting off on the first trip of the day (but not until 40 seconds have elapsed after starting the engine and after exceeding a road speed of 12 mph [20 kph]).
2. After every 12 mi (20 km) driven on the same day.
3. After modification of the status information stored on the key. (If, for example, a fault is detected in the Headlight Range Control System.)

On vehicles without the optional Audi Advanced Key, the writing of the Audi Intelligent Key is implemented technically as follows:



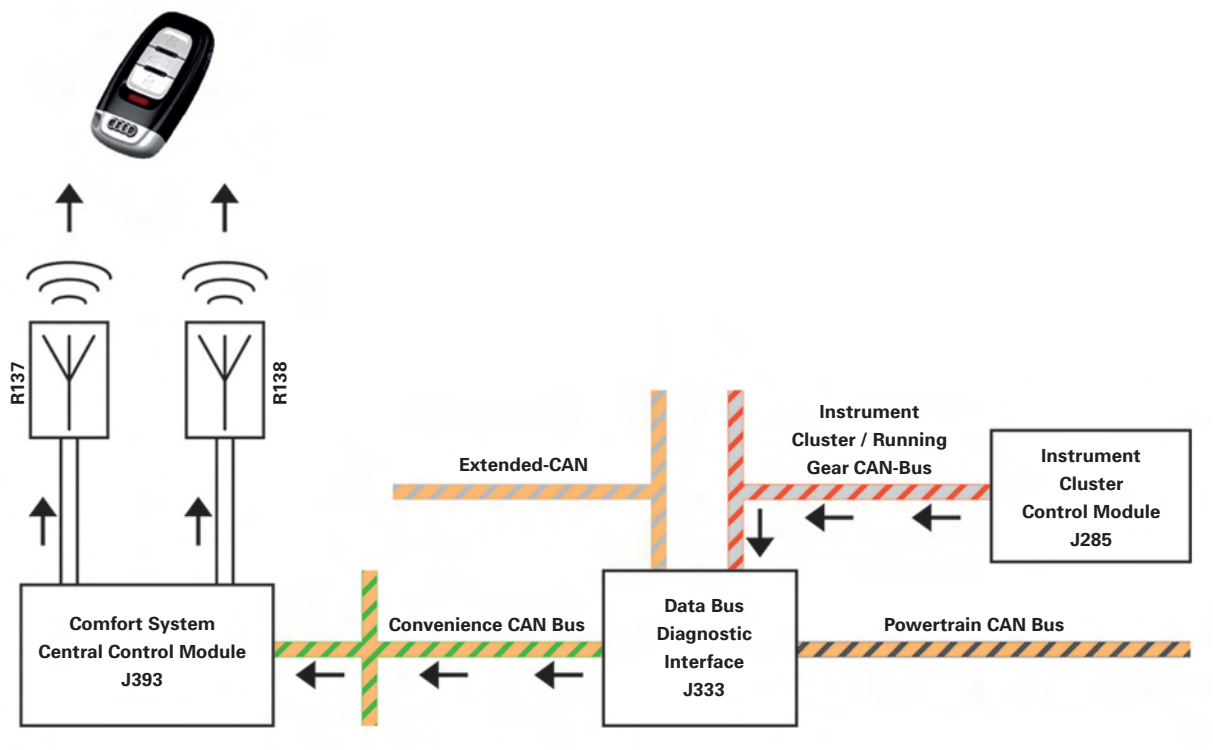
The data for writing to the key is provided by Instrument Cluster Control Module J285. Data is transferred to J393 via the Instrument Cluster / Running Gear CAN bus, Data Bus On Board Diagnostic Interface J533, and the convenience CAN bus.

Comfort System Central Control Module J393 transfers the data via a LIN bus line to Access/Start Authorization Switch E415, which transmits the data wirelessly to the ignition key by means of a coil in the ignition lock. Here the data is saved to an electronic chip.

Note

Use is made of the same coil as for transferring the immobilizer data.

On vehicles with the optional Audi Advanced Key, the writing of the Audi Intelligent Key is implemented technically as follows:



R137 Luggage Compartment Access / Start Authorization Antenna

R138 Interior Access / Start Authorization Antenna 1

The difference between vehicles with and without Audi Advanced Key lies in the way Comfort System Central Control Module J393 transfers data to the key. Keyless antennas R137 and R138 are used instead of the coil in the ignition lock for writing data to the ignition key.

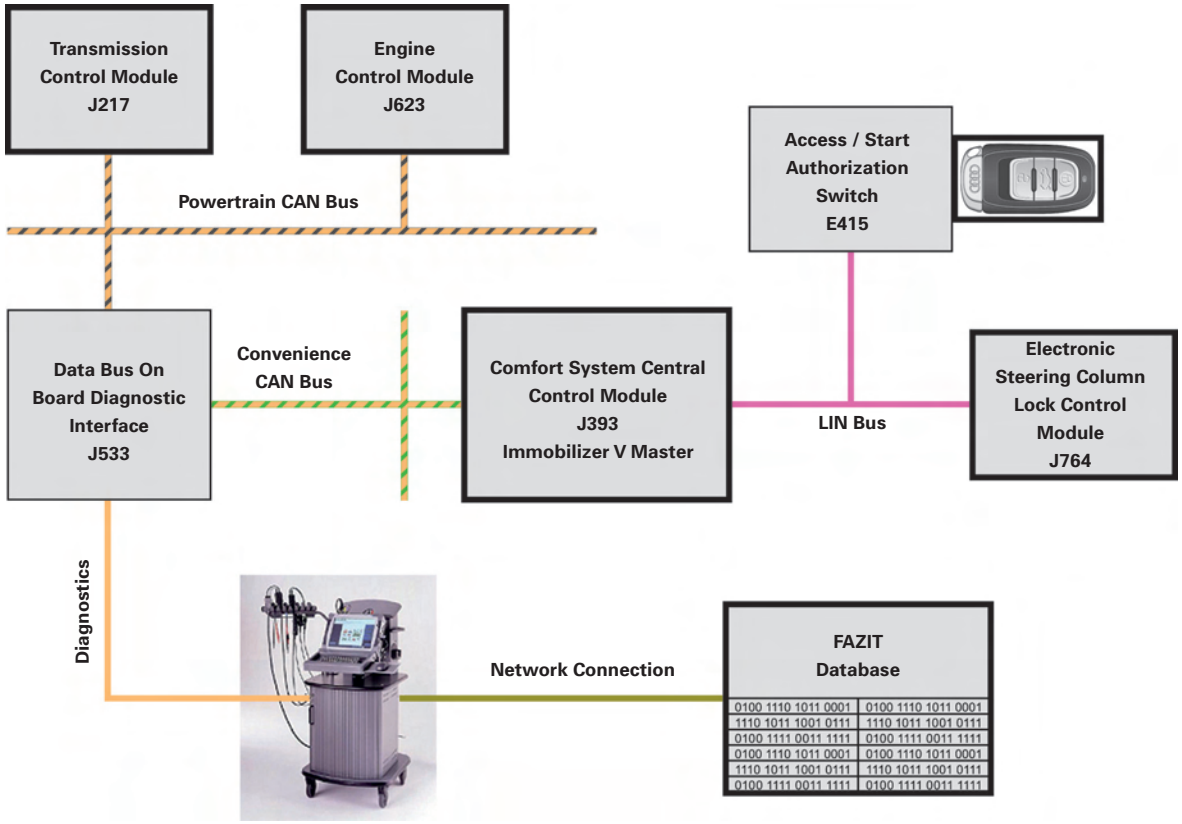
Depending on the actual position of the ignition key on the vehicle, one of the two antennas is used. In some cases, data is transferred redundantly by both antennas.

Immobilizer V

New for Audi, the Immobilizer V system is used on the Audi A5. It is an improved version of the Immobilizer IV system, and there are no significant differences between the two systems with respect to servicing. The various tasks performed on the immobilizer using the diagnostic tester, such as the adaptation of replaced immobilizer components, have been greatly simplified.

Many procedures on the Immobilizer V system are more heavily automated, and some procedures have been eliminated completely for the sake of simplicity.

System Overview



The master for the Immobilizer V system is Comfort System Central Control Module J393. The functions of the entry and Access / Start Control Module J518 have been integrated. Components with thick borders are all immobilizer system users. Components with thin borders, such as J522 and E415, only transfer immobilizer information.

As with the Immobilizer IV system, an online connection to the FAZIT database must be established before any work can be performed on the immobilizer. The online connection is made via the Scan Tool.

Actions of Immobilizer at Engine Start-Up

When the vehicle is started with the ignition key in the electronic ignition lock, the immobilizer runs several queries and actions before the engine is started:

1. After a normally open contact is detected, the Ignition Key and Comfort System Central Control Module J393 exchange Immobilizer data with one another. J393 determines whether the key is authorized for the vehicle.
2. J393 now exchanges Immobilizer data with Electronic Steering Column Lock Control Module J764. If steering column lock adapted to this vehicle, J393 enables the steering column.
3. Terminal 15 is then connected by Comfort System Central Control Module J393.
4. After "Terminal 15" is connected, J393 can communicate with the engine and transmission control modules. If these control modules are identified as adapted to the vehicle, starting of the engine is enabled.

Replacing Immobilizer Components

The process of replacing immobilizer components has been greatly simplified with respect to the subsequent adaptation procedure. The Scan Tool routine recognizes independently which component has been replaced and adapts it or queries whether keys have to be adapted. In this way, it is possible to adapt components of the immobilizer or even to install and adapt immobilizer components which were previously installed in another vehicle.

After the loss of an adapted ignition key, there are two possible approaches:

1. Readapt the remaining ignition keys. After that, the lost ignition key can no longer be used for starting the vehicle. (Caution: The key can still be used to open the vehicle via the lock in the driver's door.)
2. Replace the lock set and order a new set of ignition keys for the vehicle. This is the more expensive and safer variant, the advantage being that the key's finder cannot open the vehicle. In this case, the vehicle receives a new identity, i.e. it is no longer possible to readapt the lost (remaining) ignition key to the vehicle.

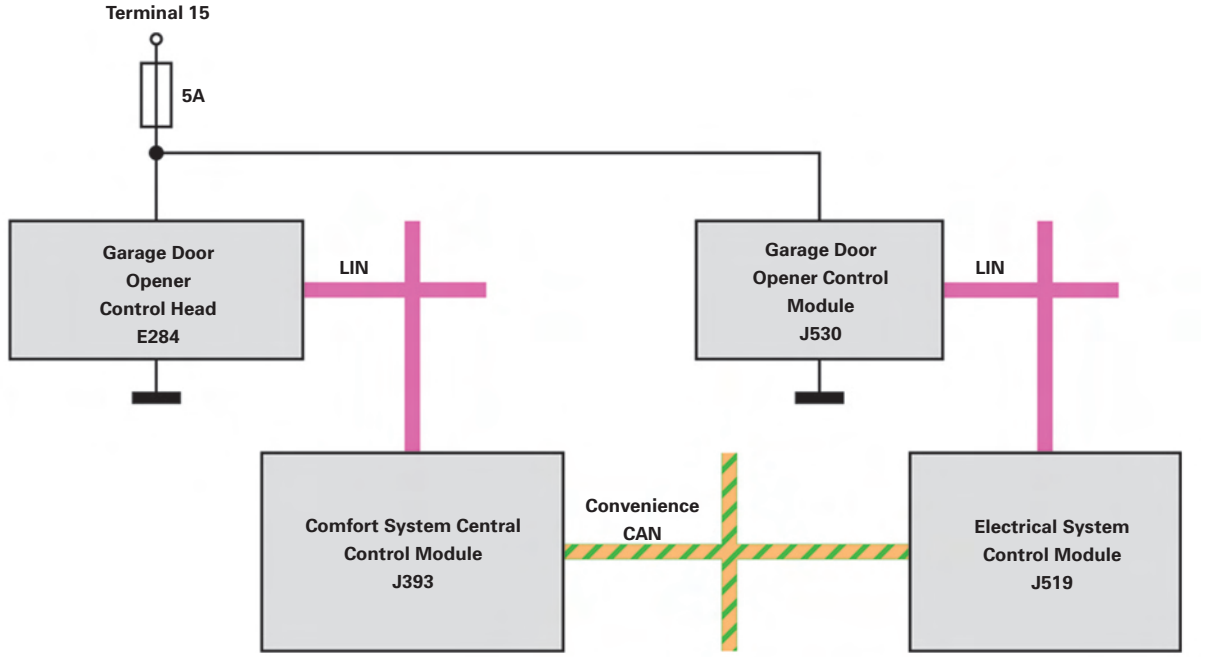
HomeLink® Garage Door Opener

New Features

The new Audi A5 is equipped with HomeLink®. HomeLink® was not previously integrated into the vehicle networking system.

This all changes with the new Audi A5, where Garage Door Opener Control Head E284 is connected to Comfort System Central Control Module J393 as a LIN bus user, and Garage Door Opener Control Module J530 is connected to Electrical System Control Module J519 as a LIN bus user.

Garage Door Opener System Overview



Diagnostics

The system is diagnosable by the tester. Comfort System Central Control Module J393 recognizes and registers the following faults:

- Garage Door Operating Unit - No Signal, No Communication.
- Garage Door Operating Unit - Implausible Signal.
- Garage Door Operating Unit - Faulty.
- Garage Door Opener Button 1 - Implausible Signal.
- Garage Door Opener Button 2 - Implausible Signal.
- Garage Door Opener Button 3 - Implausible Signal.

The following adaptation channels for the garage door opener are integrated in J393:

- Depending on country, different transmission frequencies are utilized.

Electrical System Control Module J519 detects the following faults and enters them into the fault memory:

- Garage Door Opener Sender Unit - No Signal, No Communication.
- Garage Door Opener Sender Unit - Implausible Signal.
- Garage Door Opener Sender Unit - Faulty.

In the case of both control modules, extensive data blocks are available for fault-finding.

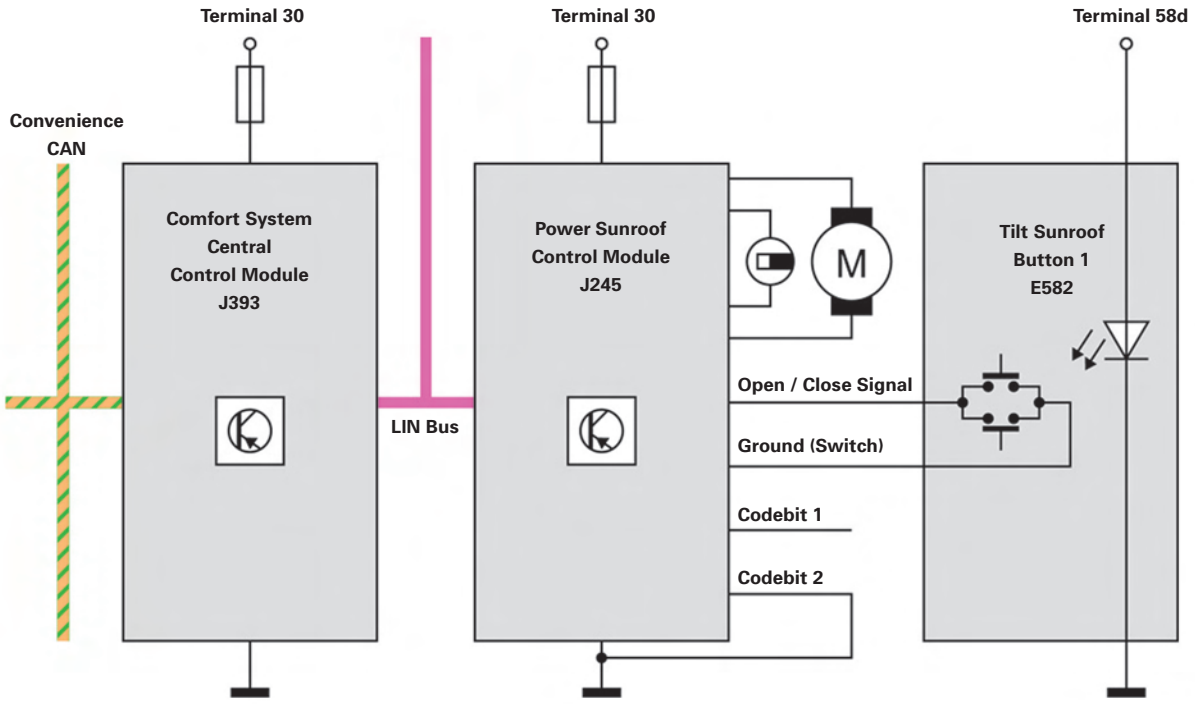
Panorama Tilt Sunroof

Panorama Tilt Sunroof System Overview

A Panorama tilt sunroof is optional on the new Audi A5. The Panorama tilt sunroof has a separate control module, the sliding sunroof control module, Power Sunroof Control Module J245. J245 communicates via a LIN bus with Comfort System Central Control Module J393, which in turn is networked with the remaining vehicle electronics via the convenience CAN bus. The tilt sunroof motor and the control module form a module, and can only be replaced together.

Power Sunroof Control Module J245 also reads in the Tilt Sunroof Button 1 E582 and opens or closes the Panorama tilt sunroof depending on the button position. The roof can be opened or closed in manual mode (the button is kept pressed throughout the cycle) or automatically (by briefly pressing the button once).

J245 has two hardware inputs via which it is “encoded” for this task. Encoding is performed on the vehicle via the wiring harness. The input is either left open or connected to ground.



Functions of Power Sunroof Control Module J245

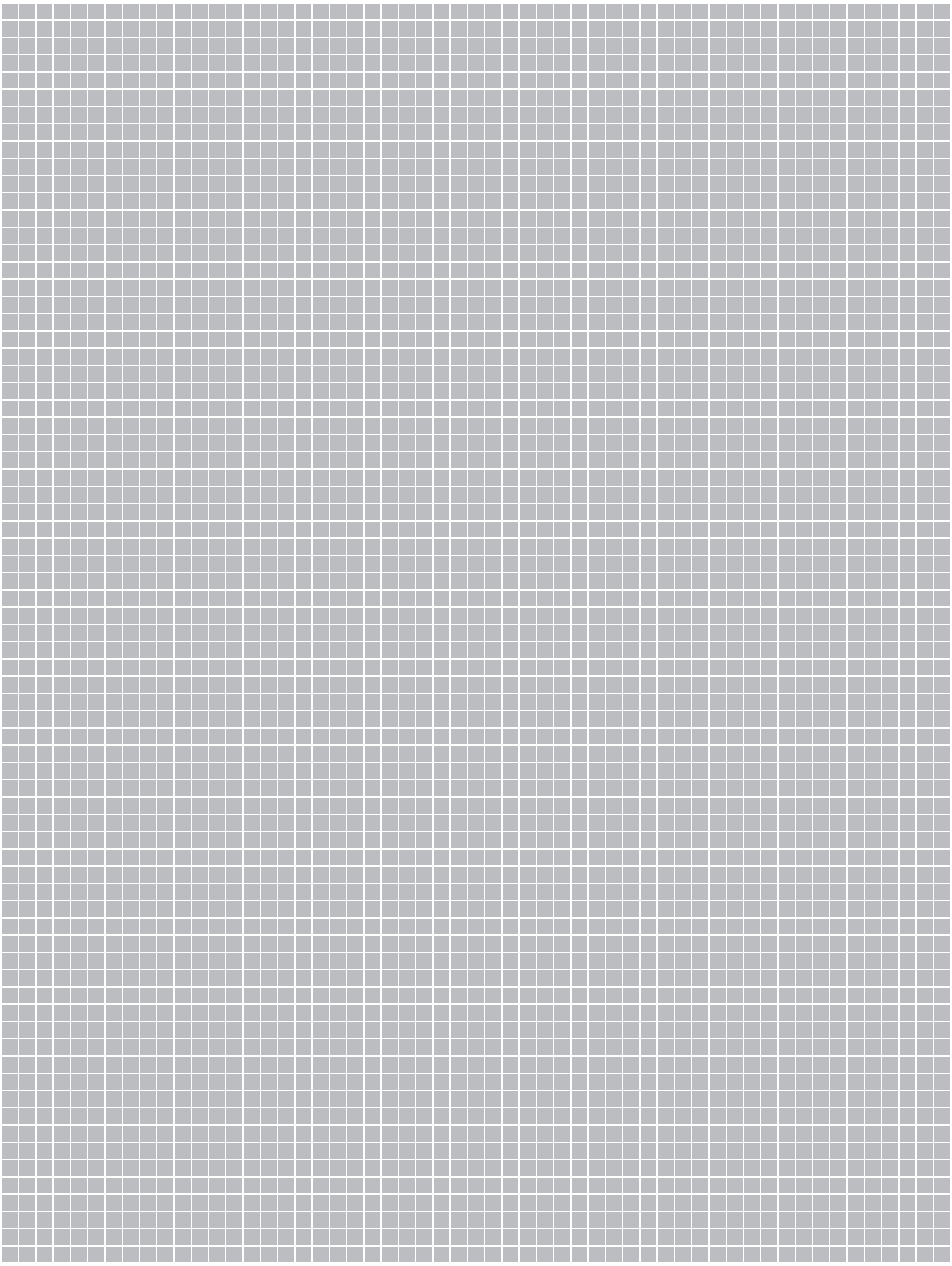
An anti-pinch protection function has been implemented for safety reasons. A Hall sensor supplies the signals needed to determine the position and travel speed of the sunroof. Slow-movement stages in the cycle are "learned" by the control module.

The tilt sunroof can only be actuated when the Comfort System Central Control Module sends the enable bit via the LIN bus. This bit is set after "terminal 15 ON." The bit is reset again after "terminal 15 OFF" and a delay of 10 minutes or after "terminal 15 OFF" and opening either of the doors.

After power-down level 2 of the battery management system, the tilt sunroof cannot be opened, but it can still be closed.

The system has also has an "emergency-close" function. If a closing cycle is interrupted due to activation of the anti-pinch protection system, the tilt sunroof subsequently will reopen. If a closing cycle is initiated by pressing the button within about five seconds after reopening, the anti-pinch protection system is deactivated and the tilt sunroof motor closes the Panorama tilt sunroof. The button must be kept pressed throughout the closing cycle.





Audi Parking System with Rearview Camera

The Audi Parking System rear with a rearview camera will be available as an option on the A5 / S5.

This is a 4-channel system (four rear ultrasonic sensors) with a rearview camera mounted in the luggage compartment lid.

Ultrasonic Sensors

Revised fifth generation ultrasonic sensors are used on the A5 / S5. These sensors have new isolating rings made of a material which exhibits enhanced thermal properties.

There is an internal and an external isolating ring. These two rings allow the membrane to oscillate upon excitation and thus produce ultrasonic waves.

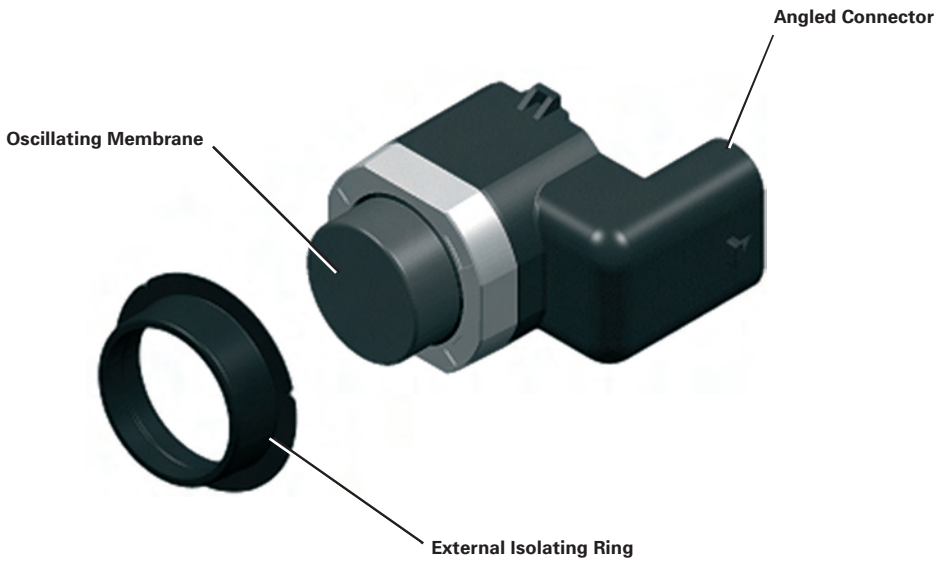
Ultrasonic Sensor Replacement

If it is necessary to replace an ultrasonic sensor in the service workshop, the following steps must be taken before commencing installation of the new ultrasonic sensor:

1. Paint the sensor membrane in the body color.

2. Install the external isolating ring.

Note: The external isolating ring is available only in black and gray. Depending on body color, either of the versions is selected.



Rearview Camera System

In addition to a few new features, the system is identical to the rear-view camera system introduced on the Q7.

New Features

- The height of the rear-view camera above ground is now entered directly via an adaptation channel. This information is required for calibrating the rear-view camera.

- Previously, in the Park mode 2 (“longitudinal parking”), two blue fields and two blue lines were projected onto the rear-view camera image. A dark-blue field and a dark-blue line were displayed for reverse parking to the right, and the light blue field and the light blue line assisted reverse parking to the left. The illustration shows a rear-view camera image on this side. In Park mode 2 on the Audi A5, the field and the line which are not required are not shown. They are hidden as soon as the turn signal is activated. Both fields and both lines are visible up to that point. If the right turn signal is activated, the light blue field and the light blue line are hidden. The field and the line remain hidden even after the turn signal returns to its initial position. The light blue field and the light blue line do not reappear until the turn signal is activated in the opposite direction.

- If the vehicle approaches an obstacle while backing up, a semitransparent OPS image is projected onto the rear-view camera image once the vehicle is within a defined distance from the obstacle. The obstacle is detected by the ultrasonic sensors.



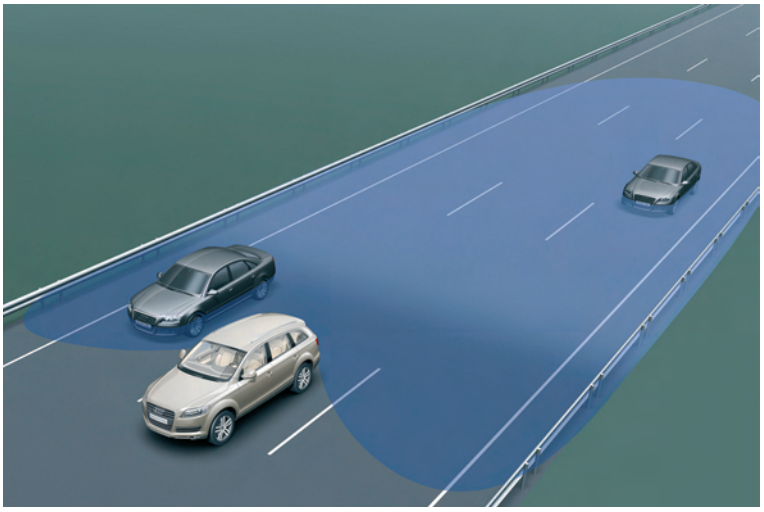
Note

For a detailed description of the rear view camera system, please refer to Self-Study Program 996603, The Audi Q7 Driver’s Assistance Systems.

Lane Change Assist System

The lane change assist has been adopted completely from the Audi Q7.

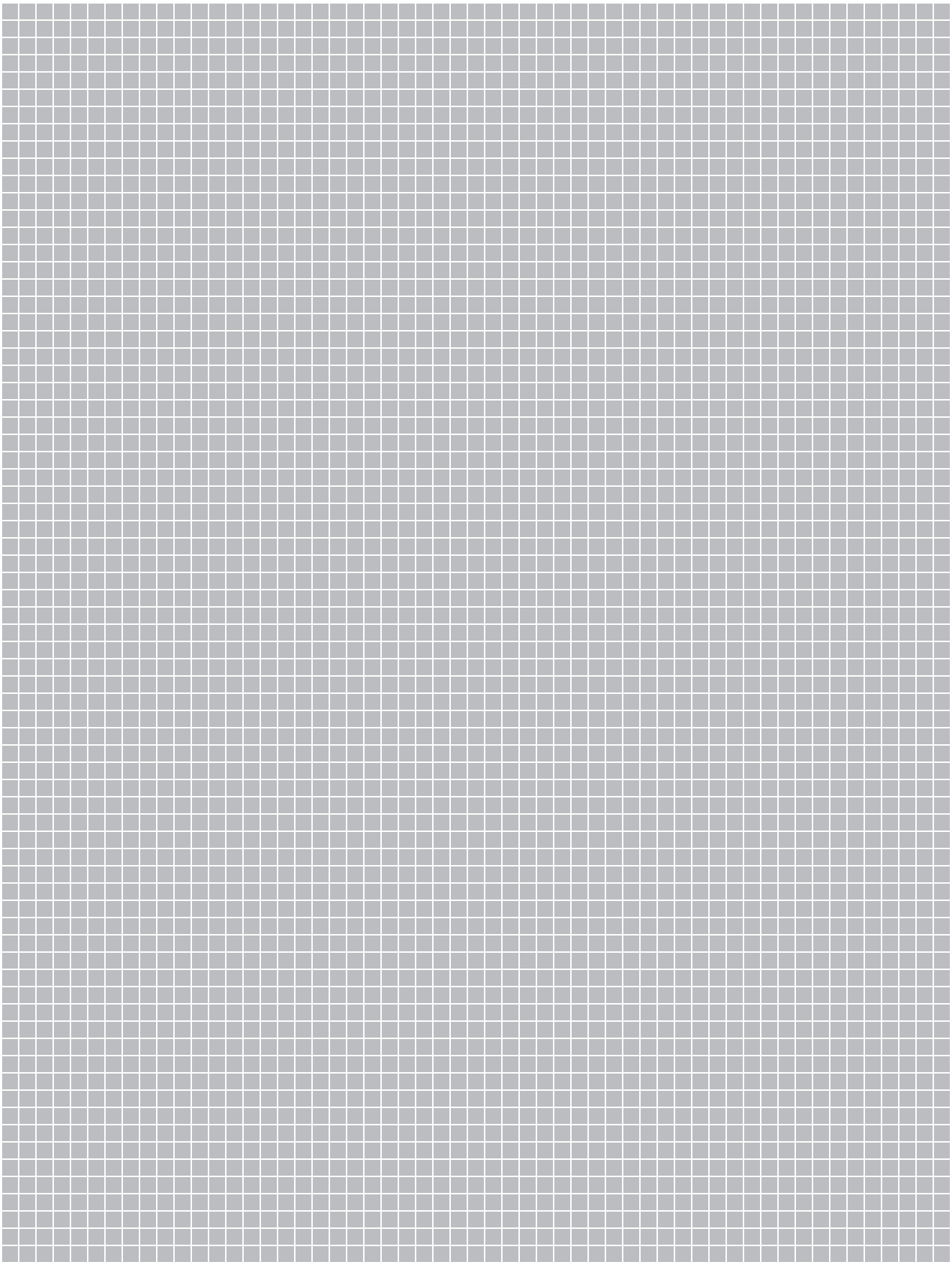
It has identical hardware and functions to the system on the Audi Q7.



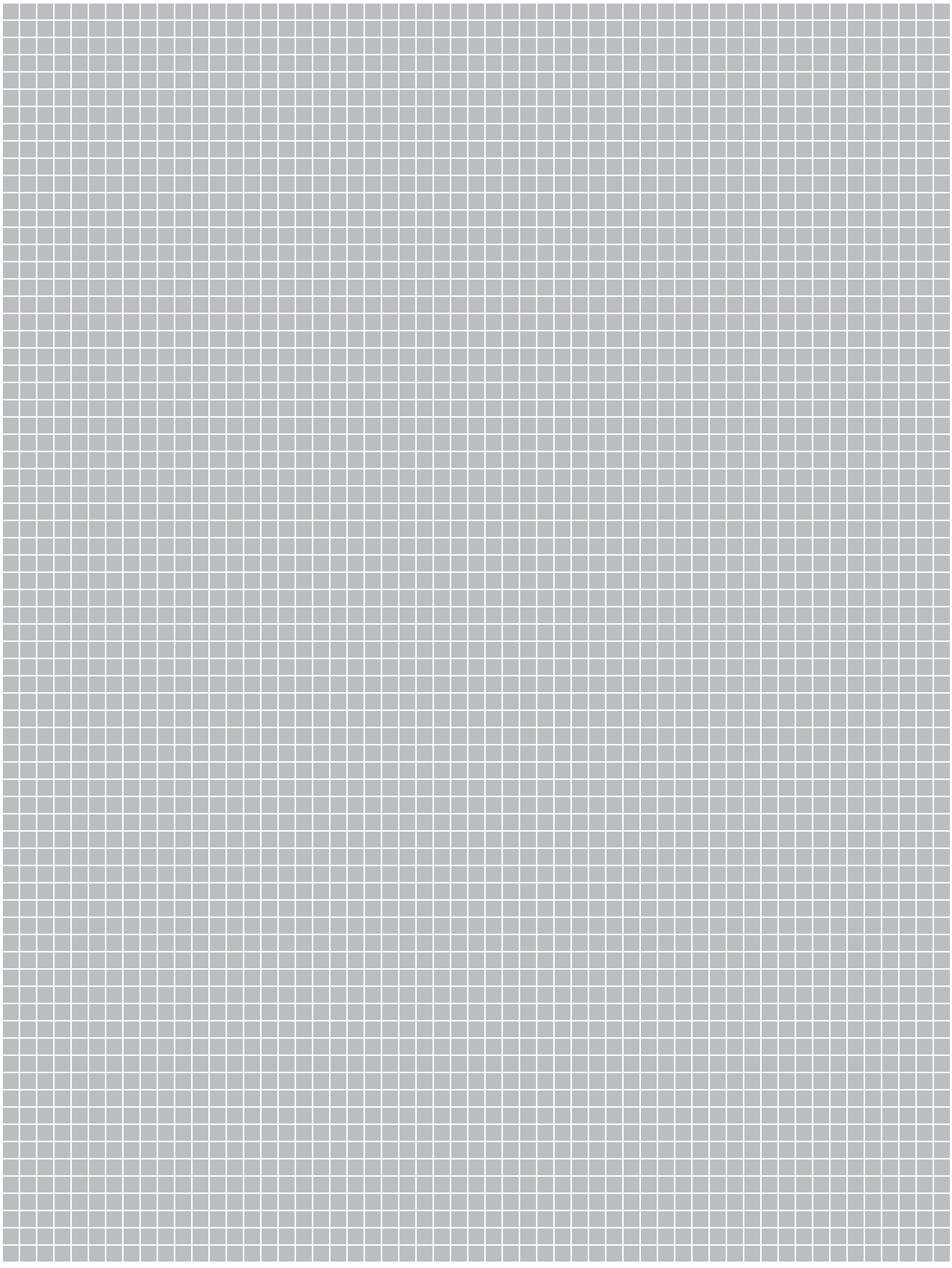
Note

For a detailed description of the lane change assistant system, please refer to Self-Study Program 996603, The Audi Q7 Driver's Assistance Systems.

Notes



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)

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