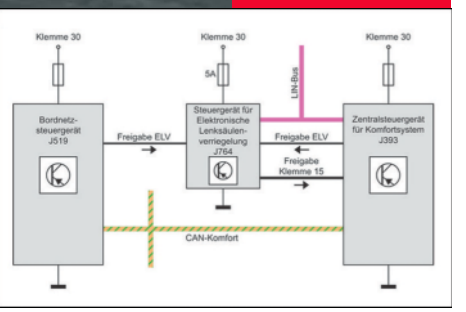
Service Training



Audi A5 -
Convenience Electronics and Driver Assist Systems

Self-Study Programme 393

The new Audi A5

The new Audi A5 features a number of impressive innovations in the area of convenience electronics. One of the most striking of these is the new ignition key. This key is pushed into the electronic ignition lock, and the engine is started with a push movement of the key instead of a turning movement.This new concept replaces the button-operated folding key.

The ignition key houses an emergency key which allows the vehicle to be opened mechanically in case of failure of the vehicle electronics. The ignition key can also be used to lock the vehicle mechanically if the key removal lock prevents withdrawal of the key from the ignition lock.

393_034

393_046

The new Audi A5 comes with an extensive range of optional equipment. Many systems previously exclusive to the larger models A6, Q7 and A8 are now also available on the A5.

Systems include the "Advanced Key" and the front and rear acoustic parking system, which is available with an auxiliary visual display under the name "Audi Parking System Plus". The acoustic parking system can also be ordered in combination with a rear-view camera under the name "Audi Parking System Advanced", this being the full-expanded version of the acoustic parking system.

The wide range of optional equipment on the Audi A5 also includes a lane change assistant system which assists the driver when changing lane by means of an indicator light in the exterior mirrors. However, the absolute highlight on the new Audi A5 is the Audi Lane Assist system, which will be available for order in 2007. In June 2007, there will be a separate self-study programme about this system, which explains why the system is not described in this self-study programme.

393_042

Contents

The self-study programme teaches the design and function of new vehicle models, new automotive parts or new technologies.

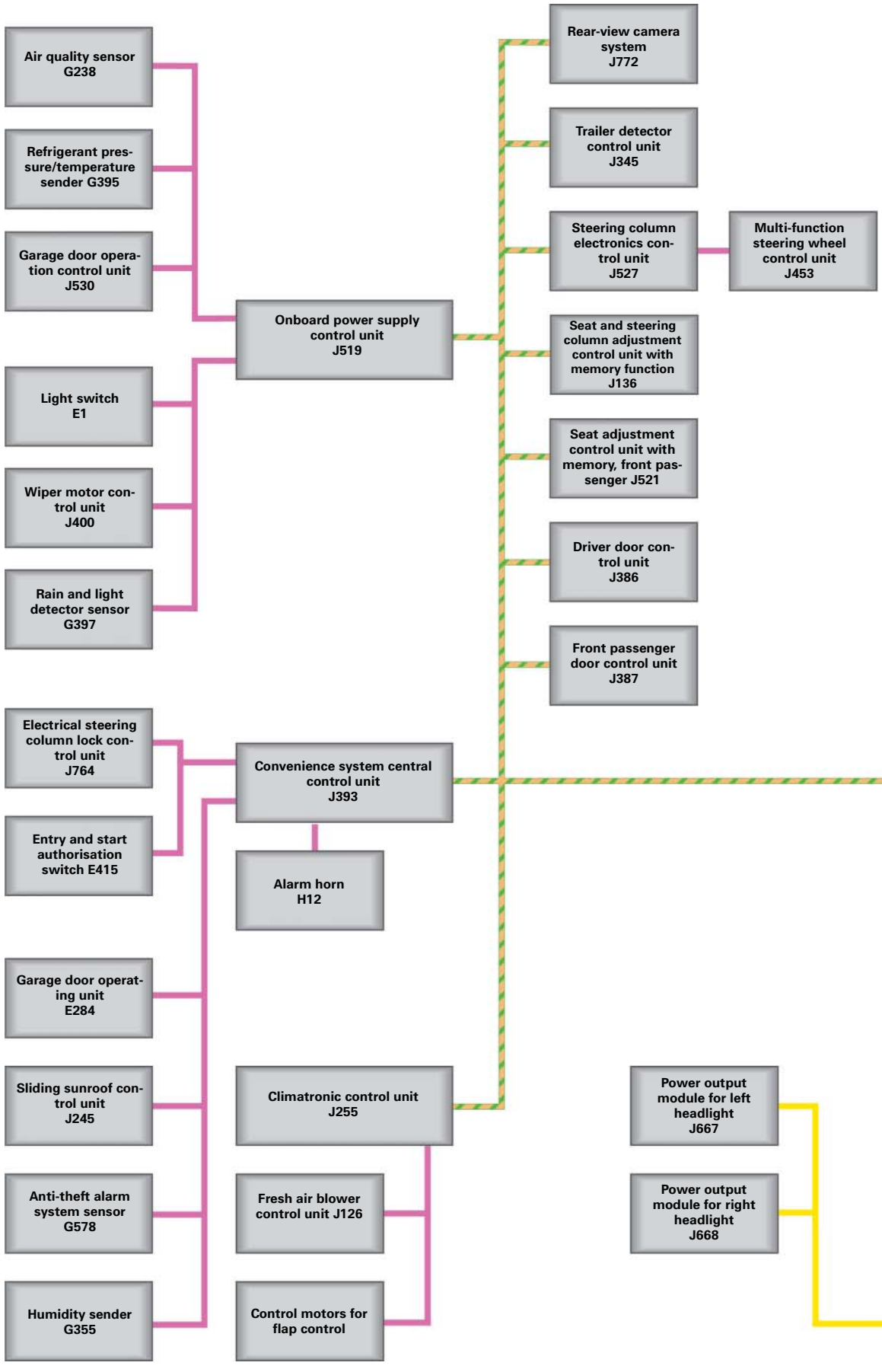
The self-study programme is not a repair manual!
All values given are intended as a guideline only and refer to the software version valid at the time of preparation of the SSP.

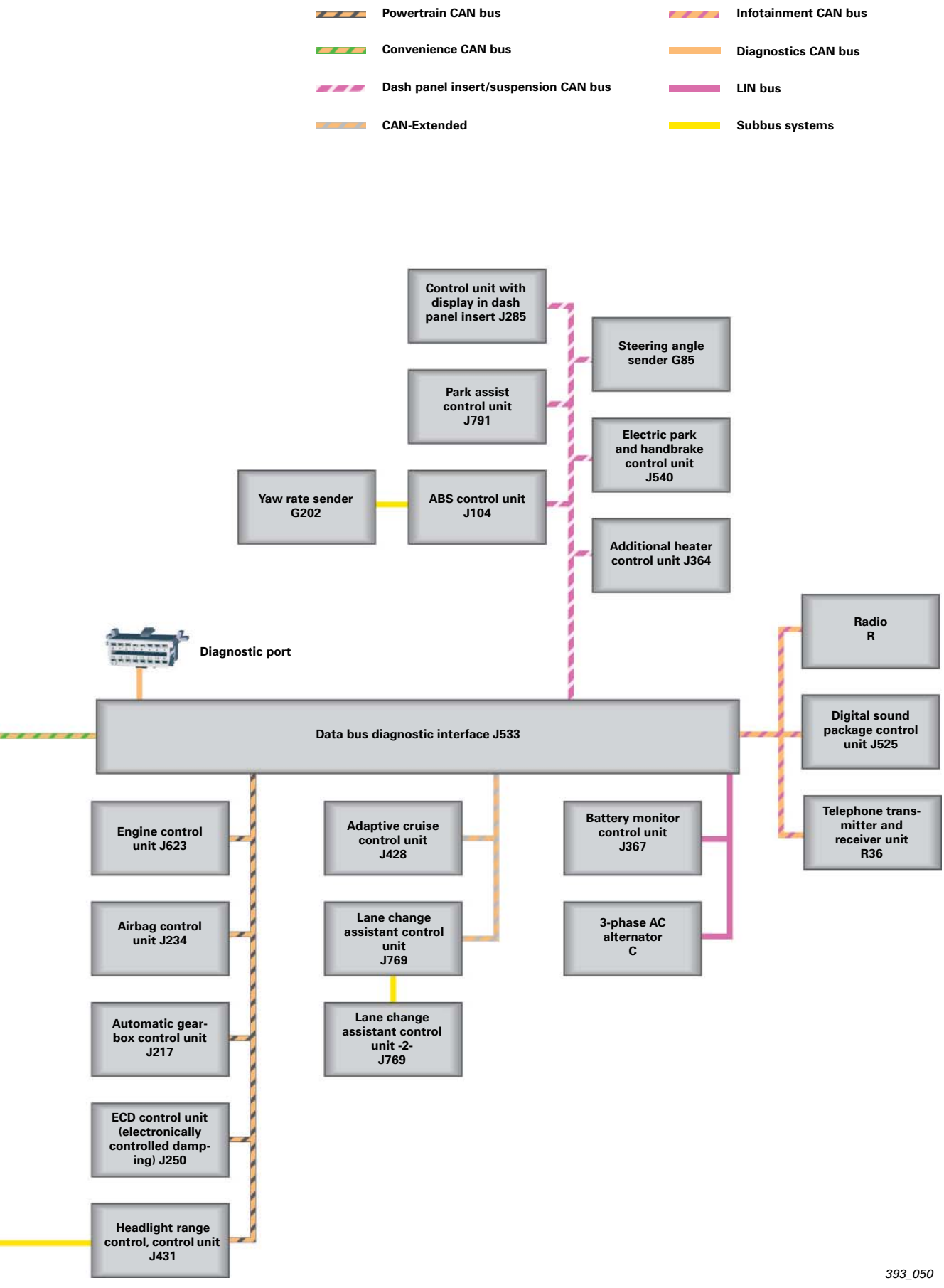
For maintenance and repair work, always refer to the current technical literature.

Reference

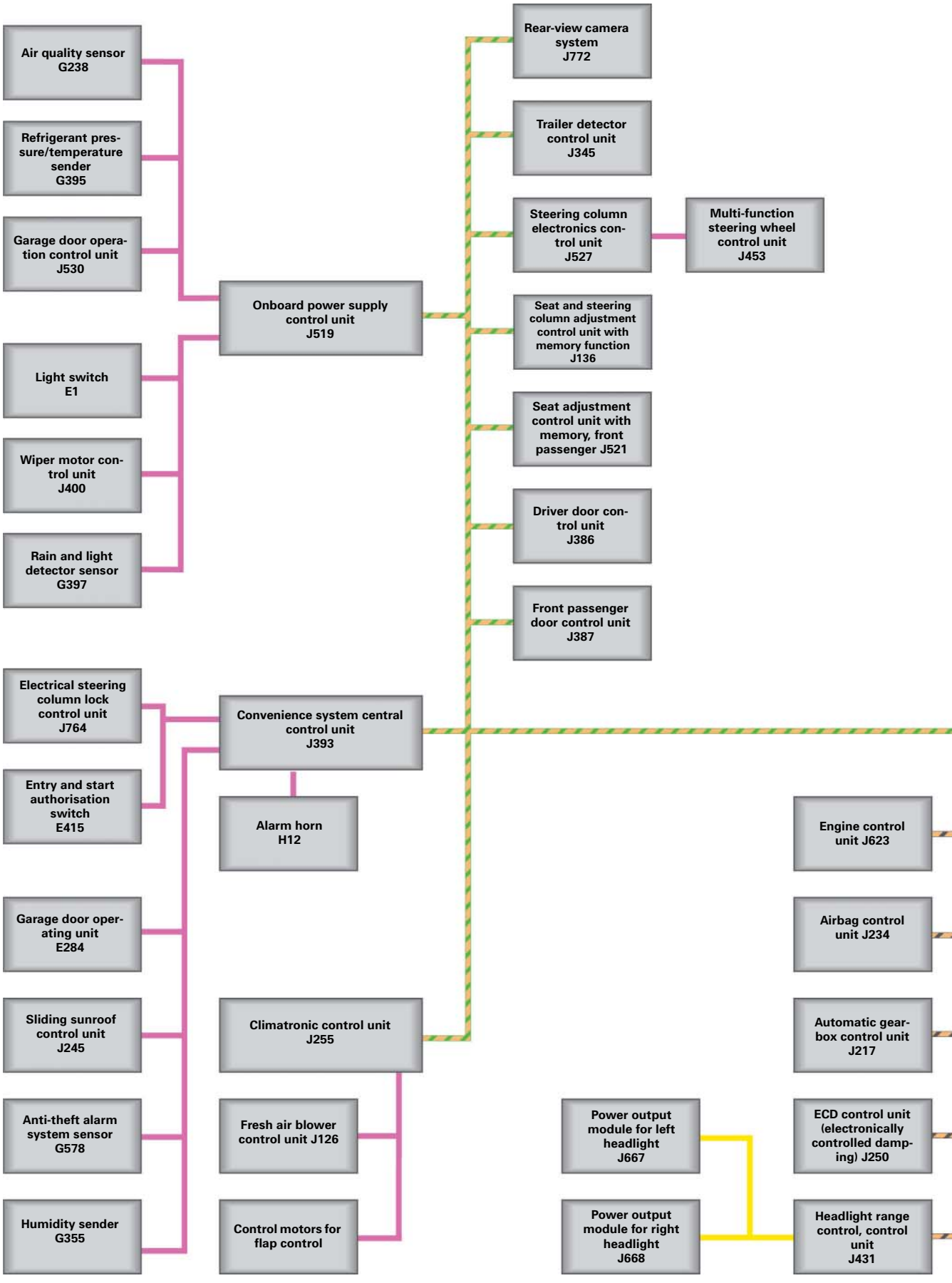
Note

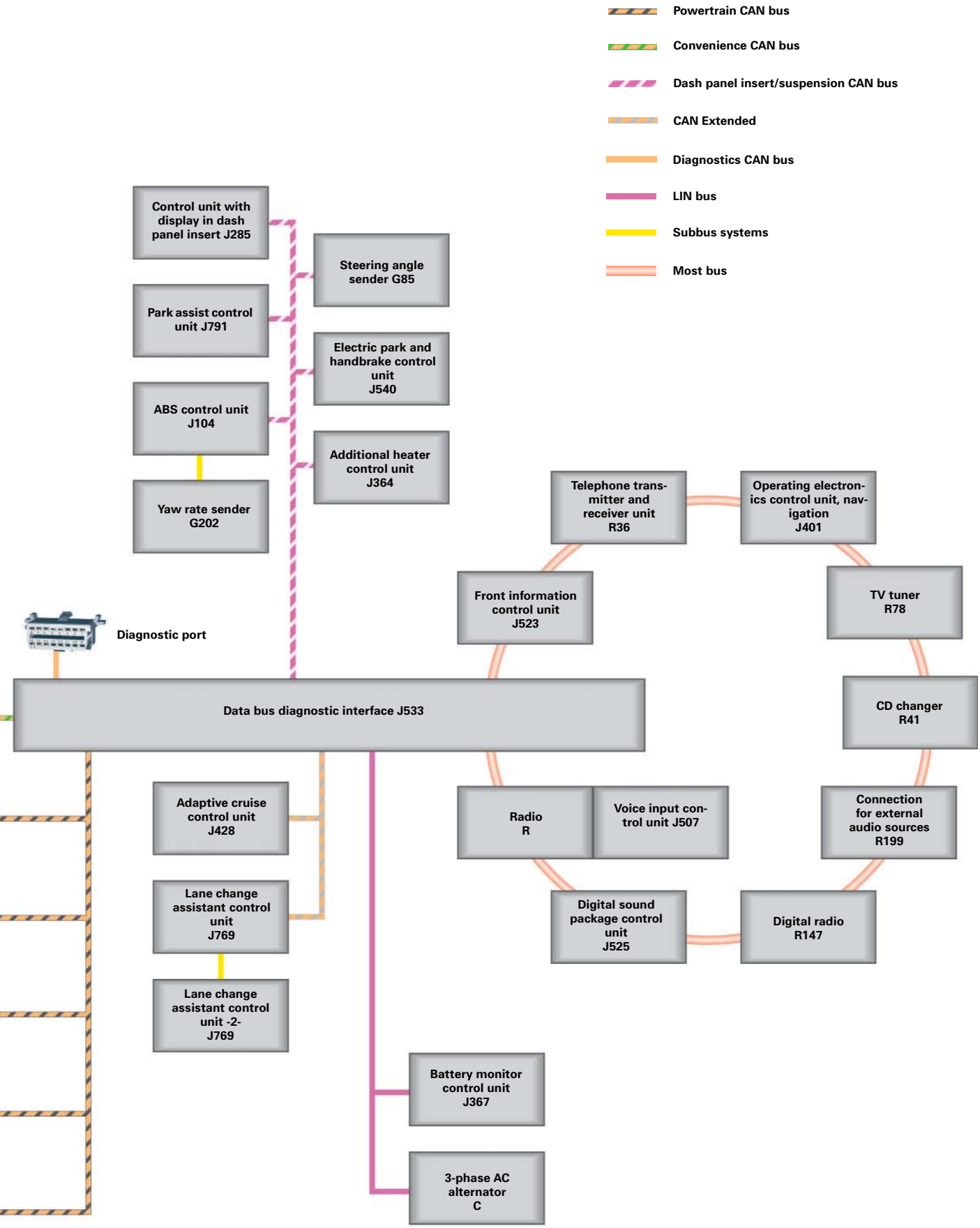
Networking / vehicles with infotainment CAN bus




Powertrain CAN bus
Convenience CAN bus
Dash panel insert/suspension CAN bus
CAN-Extended
Infotainment CAN bus
Diagnostics CAN bus
LIN bus
Subbus systems
Control unit with display in dash panel insert J285
Steering angle sender G85
Park assist control unit J791
Electric park and handbrake control unit J540
Yaw rate sender G202
ABS control unit J104
Additional heater control unit J364
Diagnostic port
Radio R
Data bus diagnostic interface J533
Digital sound package control unit J525
Telephone transmitter and receiver unit R36
Engine control unit J623
Adaptive cruise control unit J428
Battery monitor control unit J367
Airbag control unit J234
Lane change assistant control unit J769
3-phase AC alternator C
Automatic gearbox control unit J217
Lane change assistant control unit -2- J769
ECD control unit (electronically controlled damping) J250
Headlight range control, control unit J431
393_050

Networking / vehicles with MOST bus




Powertrain CAN bus
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CAN Extended
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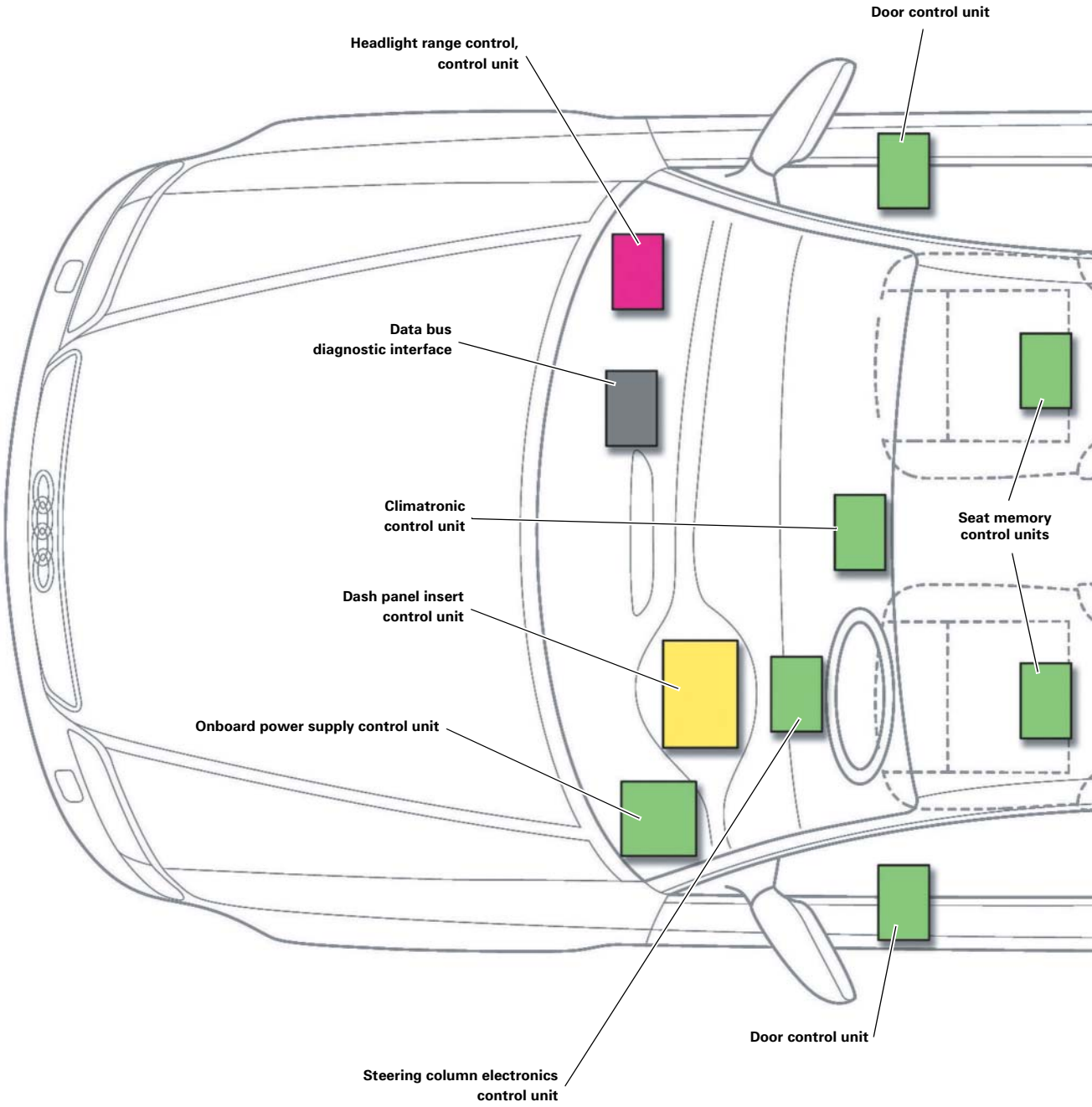
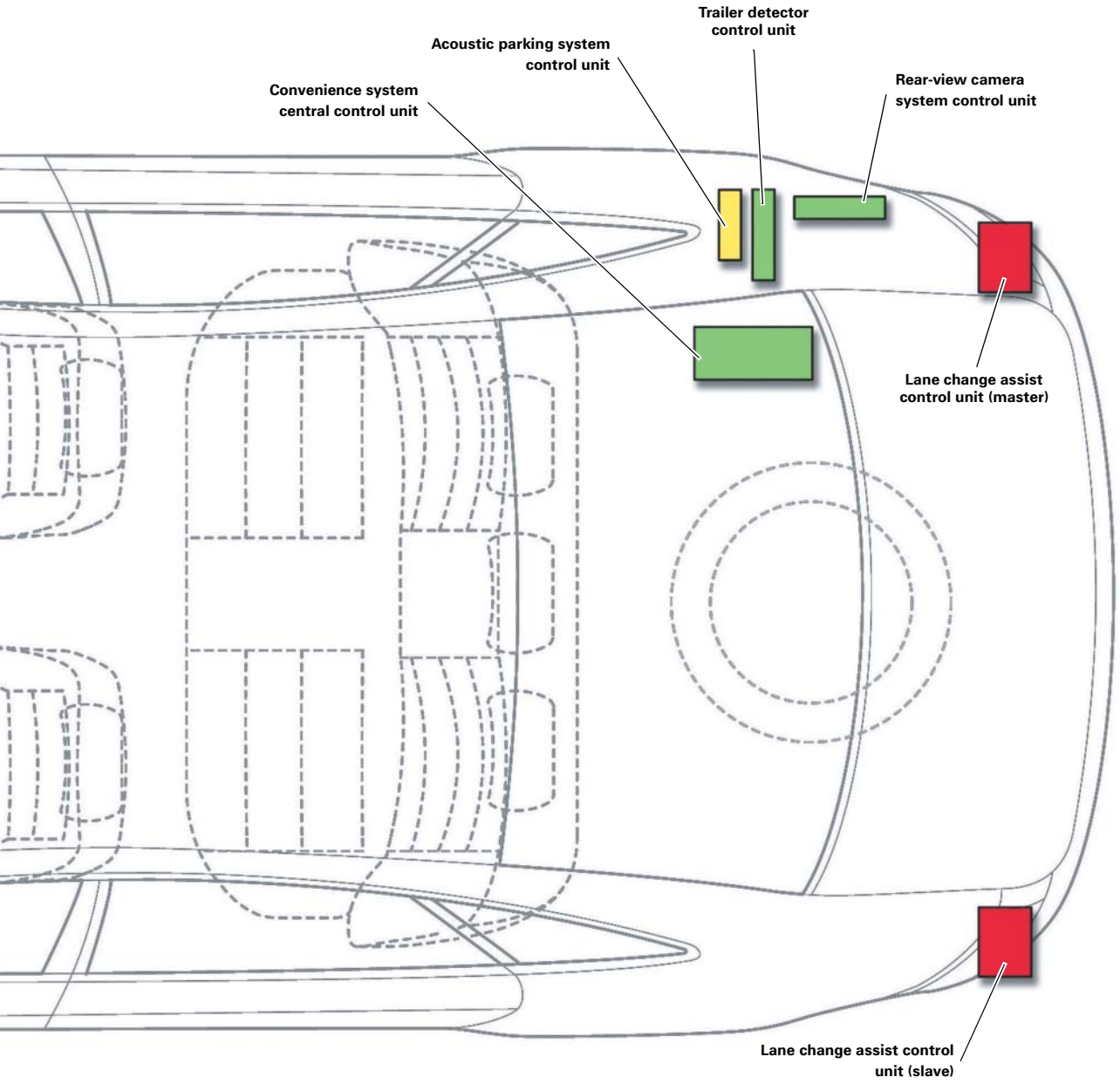
ABS control unit J104
Additional heater control unit J364
Yaw rate sender G202
Telephone transmitter and receiver unit R36
Operating electronics control unit, navigation J401
Front information control unit J523
TV tuner R78
Diagnostic port
Data bus diagnostic interface J533
CD changer R41
Adaptive cruise control unit J428
Radio R
Voice input control unit J507
Connection for external audio sources R199
Lane change assistant control unit J769
Digital sound package control unit J525
Digital radio R147
Lane change assistant control unit -2- J769
Battery monitor control unit J367
3-phase AC alternator C

393_051

Installation locations of the control units





393_049

Dash panel insert/suspension CAN bus users

Convenience CAN bus users

Powertrain CAN bus users

CAN-Extended users

Control unit with display in dash panel insert

New features

The dash panel insert of the new Audi A5 explores new directions with its styling and concept. It is very different to the dash panel inserts in other Audi models in several respects. The most obvious changes are:

- The zero position of the rev counter and speedometer is the so-called "6 o'clock position". The top end of the scale is the "3 o'clock position".
- After "ignition "on"", the dial makes a full scale sweep.
- Neither of the small displays in the rev counter and the speedometer is required. The trip mileage and total mileage, as well as the date and time, are indicated on the centre display
- The upshift indicator in the centre display help the driver to maintain a fuel-efficient driving style (detailed information is given in a separate chapter)
- The fuel tank sender and the radio digital clock module are the only vehicle components which are still hard-wired to the control unit with display in dash panel insert J285
- The new master for display lighting terminal 58d is the onboard power supply control unit J519, and no longer the dash panel insert

393_001

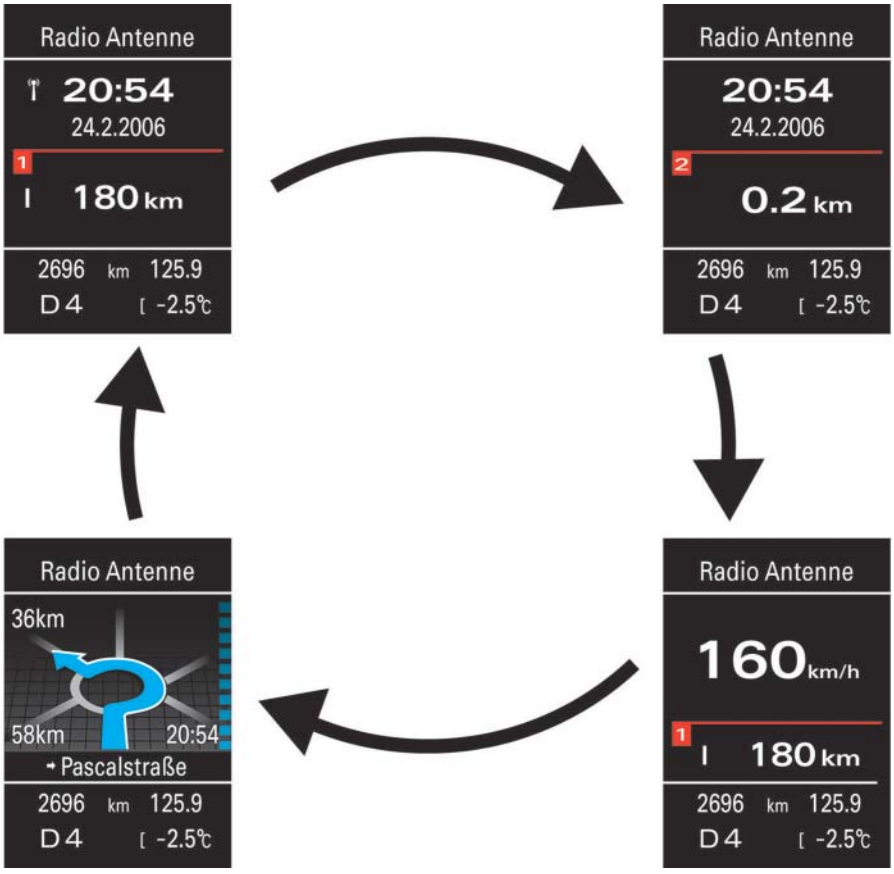
Versions of the dash panel insert

Depending on vehicle type and the country in which the vehicle is registered, the following differences exist between the individual dash panel inserts:

- Petrol engine / diesel engine
- Distance to destination display in kilometres, miles (UK) or miles (USA)
- Analog display of coolant temperature in ºC or ºF
- Midline dash panel insert (DOT matrix) or Highline dash panel insert (colour TFT display)
- Highline dash panel insert with or without speedometer ring display for ACC

Information shown on the centre display of the dash panel insert

The user can scroll through the individual display levels in the dash panel insert by pressing Reset button on the onboard computer in the windscreen wiper stalk. The displays in an Audi A5 are shown below with the optional dash panel insert with colour display and navigation system.



393_002

Control unit with display in dash panel insert

The upshift indicator

Upshift indicator in Midline or Highline dash panel insert *393_043*

Function

The upshift indicator in the driver information system 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 all petrol and diesel models with manual gearbox.

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

The actual gear position is indicated continuously in the driver information system. This information is derived from the actual engine speed and road speed signals. Neither the actual gear position nor any gearshift recommendations are indicated while the clutch is actuated (for longer than 2 seconds). No gearshift recommendation is given when the engine is operating at full throttle either.

Normally no gearshift recommendation is issued when the vehicle is in overrun. However, if the engine speed drops below a critical threshold, a recommendation to shift down a gear will be given.

To implement the "upshift indicator" function, the engine control unit also requires information from the steering angle sender G85, the ABS control unit J104 and the convenience system control unit J393. The engine control unit receives this information via CAN bus.

Indicator

The gearshift recommendation computed by the engine control unit is transmitted via CAN bus to the dash panel insert and displayed in the driver information system. There are two possible states of the display:

1 The actual gear position is displayed with or without a gearshift recommendation.

2 No display. This is the case if the clutch is actuated for longer than two seconds or if the driver has deactivated the function on the MMI.

Electrical connections of the control unit with display in dash panel insert

The following lines are connected to the control unit with display in dash panel insert on the Audi A5:

- 2 lines terminal 30
- 2 lines terminal 31
- A 5V supply line to the radio digital clock module (radio-controlled clock is optional)
- A signal line to the radio digital clock module (radio-controlled clock is optional)
- 2 test leads to fuel tank sender 1
- 2 test leads to fuel tank sender 2 (quattro models only)
- An earth wire to the fuel tank senders
- 2 CAN lines of the dash panel insert/suspension CAN

The following lines are now connected to other control units:

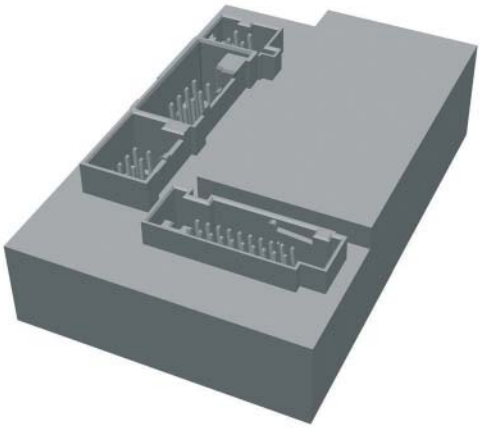
Lines on the dash panel insert of the Audi A4 '05	Solution in the new Audi A5
Line to brake pad monitoring system	is read in by onboard power supply control unit J519
Line to brake fluid switch	is read in by onboard power supply control unit J519
Line to oil pressure switch	is read in either by the engine control unit or by the onboard power supply control unit J519, depending on engine type
2 lines to the transmitter and receiver coil in the ignition switch	The key recognition components are now integrated in the electronic ignition lock or in the convenience system control unit J393
Line to front-end ambient temperature sensor	is read in by onboard power supply control unit J519
Line to coolant temperature sensor	is read in by onboard power supply control unit J519
Line to coolant level switch	is read in by onboard power supply control unit J519
Line to washer fluid level switch	is read in by onboard power supply control unit J519
Line to bonnet switch	is read in by onboard power supply control unit J519
Line to oil level and oil temperature sensor	is read in by the engine control unit
K wire	The K wire is no longer needed!
Terminal 58s	is output by the onboard power supply control unit J519
Terminal 58d	is output by the onboard power supply control unit J519
Terminal 61 / alternator charge indicator lamp	is a LIN bus user at the data bus diagnostic interface J533 (LIN master)
Terminal 15	is no longer needed as a discrete input at J285
Radio controlled clock earth wire	The radio controlled clock uses an external earth
Terminal 31 for sensors	is provided by onboard power supply control unit J519
5 lines to the Navigation Low setting switch	The setting switch is no longer needed!

Door control units

Introduction

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

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



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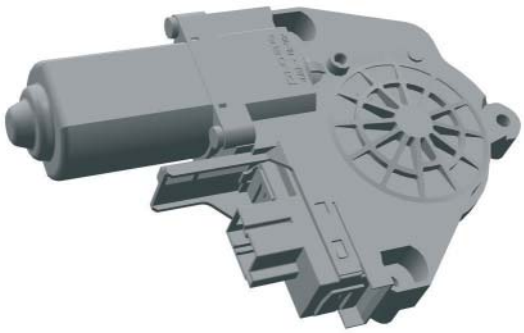


393_026

Versions

The two door control units of the new Audi A5 are distinguished as driver and passenger control units (and not as left or right door control units).
The door control will be are available in the entry-level and full-spec versions. Full-spec door control units support the following additional functions and components:

- Convenience fold-back door mirrors
- Electrochromatic mirror
- Mirror potentiometer for actual mirror glass position sensing
- Control panel for storing personal settings (mirror glass and seat positions)

Convenience fold-back

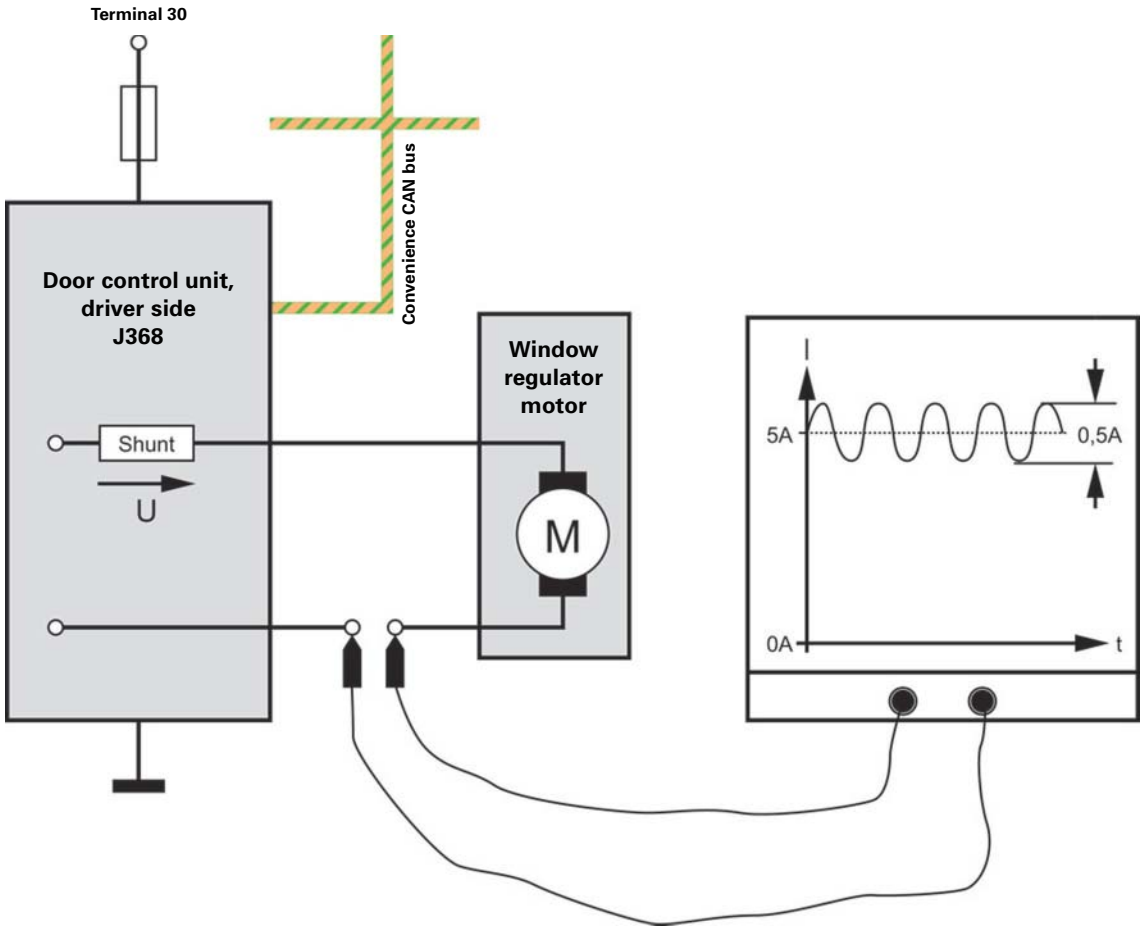
The "convenience door mirror fold-back" feature is optional on the A5. The driver can specify in the CAR menu on the MMI whether the door mirrors automatically fold back or not after locking the vehicle.

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

Sensorless position recognition (SLP)

The door control units in the new Audi A5 do not use Hall sensors for window glass position recognition. For the first time, the A5 uses the so-called sensorless position recognition system (SLP), allowing the previously used Hall sensor to be dispensed with.

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.



393_027

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 unit. 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 anti-pinch protection. Each revolution of the motor produces eight harmonics.

Seat control units

Introduction

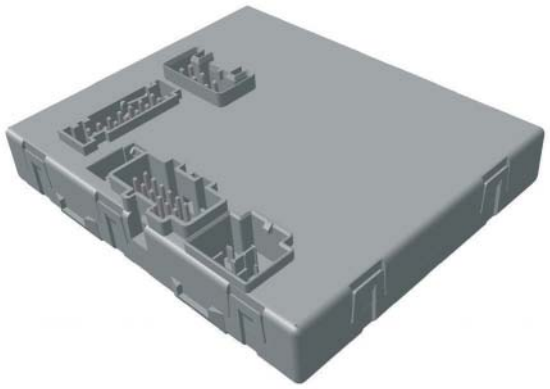
Electrically adjustable seats and a seat memory are available as optional equipment for the new Audi A5. The seat memory will only be available for the driver's seat on the Audi A5. It allows various positions of the driver seat and the two door mirrors to be stored.

If electrically adjustable seats are ordered, they automatically have a seat control unit in the driver and front passenger seats. In other vehicle models, seat control units are required only in combination with the optional seat memory.

The electrically adjustable basic and sports seats have the following 5 adjustment motors:

1 Longitudinal seat adjustment motor
2 Seat height adjustment motor
3 Seat angle adjustment motor
4 Backrest adjustment motor
5 Head restraint adjustment motor

The Super sports seat has fixed head restraints and therefore has only four adjustment motors.



393_048

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 position of left and right exterior mirrors
– Actual positions of the 5 driver seat adjustment motors

The driver side control unit 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.

The 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 in by driver door control unit J386 and transferred the control unit via the CAN bus. However, the switch position is also hard wired through the driver door control unit and from here to the seat control unit ("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 that 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 the seats using the programming buttons

The settings described above 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".

Saved settings can be retrieved as follows:

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 at "terminal 15 ON", the Save button must be kept pressed down until the adjustment is complete. The adjustment can be interrupted by releasing the Save button.

Saving settings and memory adjustment using a remote control key

To save the current mirror and driver seat settings to a remote control key,
follow this procedure:

- The settings are saved after closing the driver's door and locking 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.

However, the function described above will only be executed properly if two basic requirements are met:

- "Remote Control Key" must be set to "ON" on the MMI Car Menu under "Systems", "Seat Settings", "Driver Seat".

- The memory block ON/OFF switch must be at "ON".

"Easy entry" function

393_032

The "easy entry" function allows the front seats to be moved into a position in which 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 unit. The head restraints are thereupon 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 on the rear of the car, 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 unit recognises when the backrest has reached its starting position and moves the head restraints back into their original position.

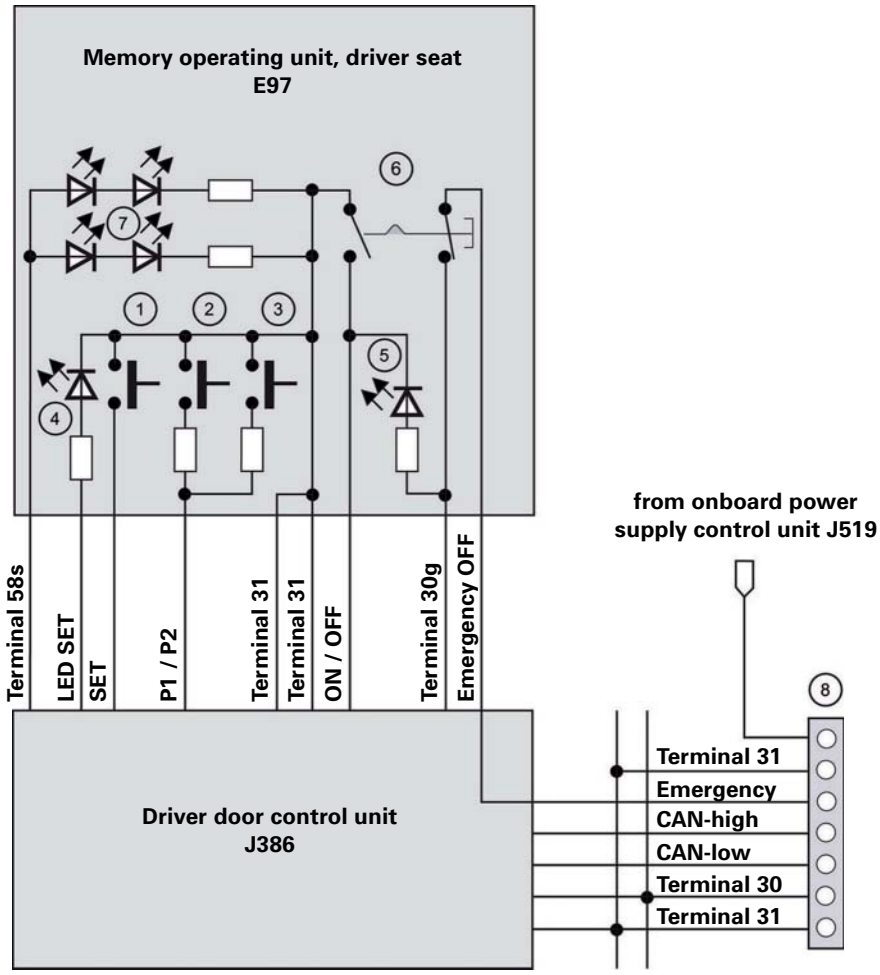
Note: Steps 5 and 6/7 can also be performed in the reverse order.

Sensorless position recognition system (SLP)

In the new Audi A5, 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 current. For a detailed description, refer to "Door control units".
At roll-out of the new Audi A5, seat positions will be determined by both SLP and Hall sensors.

For this reason, the Hall sensors are still shown in the electrical overview. After a transition period, production of 4 of the 5 Hall sensors will be discontinued. The Hall sensor in the head restraint adjustment mechanism will continue to be used. The control unit coding defines which system is currently in use. In this way, the transition can be made easily at any time.

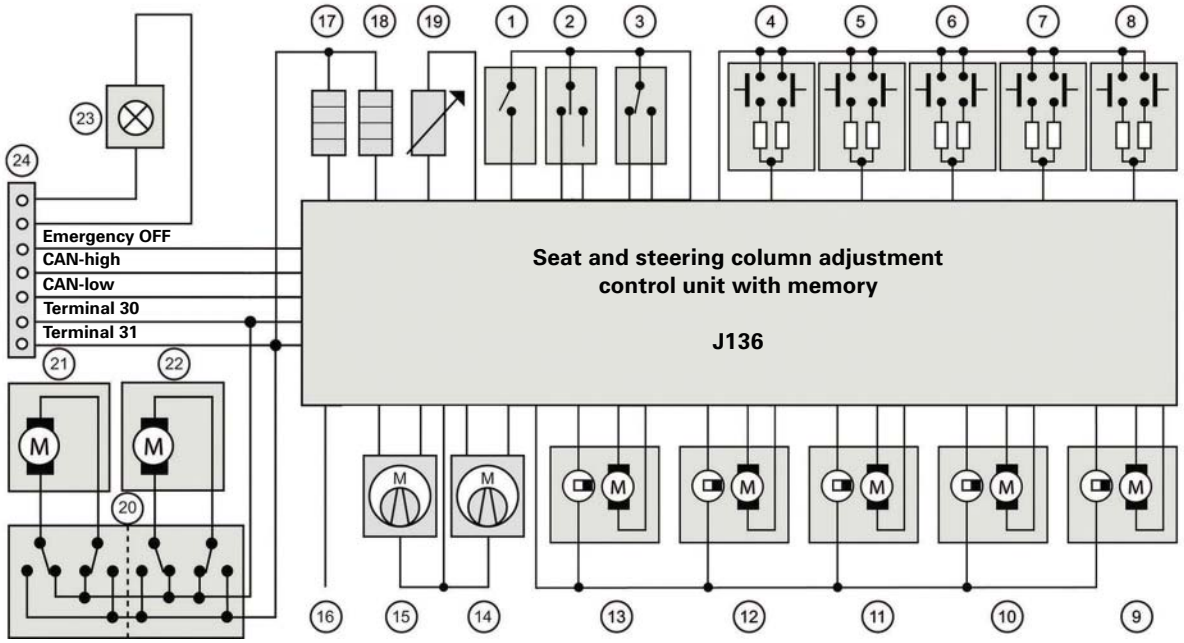
Reading in the memory control panel



Legend

1 SET button for programming the 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 the seat memory
7 Locating light which illuminates the four keys at dusk or in darkness
8 Electrical interface to the seat control unit

System overview - seat control unit



393_031

Legend

1 Backrest limit switch (is required for adaption of the seat and protection of the gear mechanism on the adjustment motor)
2 Easy entry button, for moving the seat forward or back for easier access to the 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 the seat cushion
15 Climate control fan in the backrest
16 Line for encoding: driver or front passenger seat control unit
17 Heating mat in the seat cushion
18 Heating mat in the seat bolsters
19 NTC temperature sensor of the seat heater
20 Switch plate for the lumbar support
21 Lumbar support height adjustment motor
22 Lumbar lordosis adjustment motor
23 Footwell light (exclusive with lighting package)
24 Electrical interface to vehicle electronics or electrical system

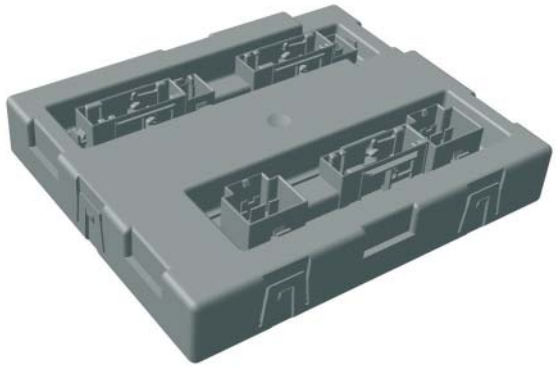
Convenience system central control unit

New features

The convenience system central control unit J393 of the Audi A5 has undergone the most modification of the convenience electronics control units.

Beginning with the Audi A5, the "new" convenience system control unit J393 includes all the functions of the following (previously discrete) control units:

- "old" convenience system control unit J393
- Entry and start authorisation control unit J518
- Aerial reader unit for entry authorisation for keyless entry system J723



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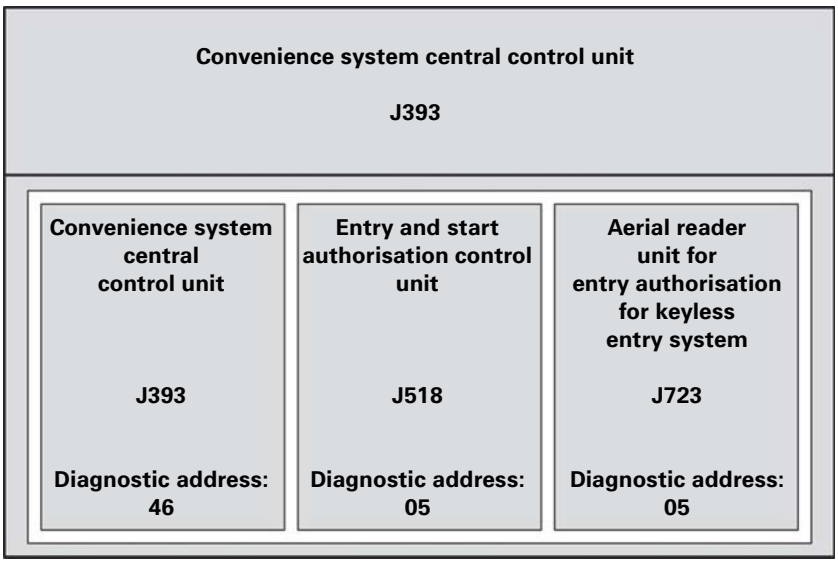
To aid understanding of the self-study programme, the following two terms will be used hereafter:

Designation	Definition
"old" convenience system control unit	Convenience system central control unit in models A4 (B7), A6 (C6), Q7 and A8 (D3)
"new" convenience system control unit	Convenience system central control unit in the new Audi A5 (B8) and the other models belonging to the B8 family



393_003b

Diagnostic addresses

To ensure as straightforward a transition as possible from the three discrete control units J393, J518 and J723 to the "new" convenience system control unit, the different diagnostic addresses - 46 and 05 - have been retained. The aerial reader unit for entry authorisation for keyless entry system J723 was also accessible previously for diagnostics via address word 05. This control unit was a LIN bus system user whose master was entry and start authorisation control unit J518.

This means that

– data blocks
– adaption
– actuator diagnostics
– fault memory entries

and

– the Guided Fault Finding programs,

which belonged to the "old" convenience system control unit J393, can also be found in the "new" convenience system control unit under address word 46.

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

Versions

The convenience system central control unit is available in a number of different versions. These versions differ from one another in the following respects:

- ► the frequency of the remote control key (315MHz, 433MHz or 868MHz)
- ► installation of an anti-theft alarm system - "yes" or "no"
- ► the vehicle has "Advanced Key" - "yes" or "no"
- ► installation of an electric rear window roller blind - "yes" or "no"

However, all control unit 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 the convenience system central control unit J393

- ► Electrical steering column lock ELV
  - – Communication with the ELV control unit via LIN bus
  - – Output of locking enable signal via discrete line
  - – Reading in the "terminal 15" enable signal from the ELV

- ► Electronic ignition lock EZS and associated functions
  - – Communication with the EZS via LIN bus
  - – Reading in the microswitch in the EZS
  - – Activating the ignition key removal lock
  - – Terminals management

- Central locking
  - Convenient opening and closing
  - Locking and unlocking the fuel filler flap
  - Activating the boot lid release system
  - Reading in the central locking aerial
  - Reading in the handle in the boot lid
  - Reading in the boot lid contact switch

- Advanced Key
  - Activating the 3 Keyless aerials
  - Reading in the capacitance sensors in both doors
  - Reading in the Start/Stop button

- Activating the vehicle lights
  - Rear lights
  - Brake lights
  - Reversing light
  - Rear fog lights
  - Rear turn signals
  - License plate light
  - Boot light

- Anti-theft alarm system (ATA)
  - Communication with the anti-theft alarm sensor via LIN bus
  - Communication with the alarm horn via LIN bus

- Panorama tilt sunroof
  - Communication with the Panorama tilt sunroof via LIN bus
  - Generation of the enable signal for actuation of the power window regulators and the Panorama tilt sunroof via CAN

- Reading in information
  - Reading in selector lever position P and selector lever position P or N
  - Reading in the clutch pedal switch

- Activation of relays
  - Activation of the power socket relays
  - Activation of the rear window defroster relay

- Safety functions
  - Immobiliser V master
  - Component protection system users
  - Crash signal evaluation

- Diagnostics
  - provides diagnostic functions for the diagnostic tester
  - is flashable using the diagnostic tester

- Other functions
  - Activation of the rear window roller blind
  - Communication with the humidity sensor via LIN bus; data transfer to Climatronic
  - Communication with the control panel of the universal garage door opener via LIN bus and data tran fer to the onboard power supply control unit via convenience CAN bus
  - Deactivation of power consumers when Transport mode is active (anti-theft alarm, Advanced Key, boot light, rear window roller blind, etc.)
  - Management of MMI settings relevant to convenience functions (central locking, convenient opening and closing, etc.)

Personalisation and adaption channels

With the transition to "online encoding" of the control units on the Audi A5, several coding bits can now be found under Adaption. New vehicle parameters not previously adaptable have now been included into the adaption function.

The following adaptations can be made under diagnostic address 46:

- Resetting the personalisation of all keys to factory default

There are separate adaption values for each of the 4 ignition keys. These are:

- unlock all vehicle doors or only one door after sending "open" command by radio-operated remote control
- Autolock active / inactive
- Autounlock 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
- Motorway indicator function on / off

The following adaption channels are again vehicle-specific and identical for all ignition keys:

- Alarm threshold of anti-theft alarm tilt sensor
- Interior monitor sensitivity
- Alarm trip delay after mechanical opening of driver's door

► Operating options - convenient opening

- Power window regulators
  - by radio-wave remote control (activate / deactivate)
  - via the lock cylinder in the driver's door (activate / deactivate)
  - using the window regulator switch in the driver's door (activate / deactivate)
  - via capacitance sensors in the outer door handles (activate / deactivate) (only relevant to optional "Advanced Key")

- Lifting sunroof
  - by radio-wave remote control (activate / deactivate)
  - via the lock cylinder in the driver's door (activate / deactivate)
  - using the window regulator switch in the driver's door (activate / deactivate)
  - via capacitance sensors in the outer door handles (activate / deactivate) (only relevant to optional "Advanced Key")

- Sunroof roller blind
  - by radio-wave remote control (activate / deactivate)
  - via the lock cylinder in the driver's door (activate / deactivate)
  - using the window regulator switch in the driver's door (activate / deactivate)
  - via capacitance sensors in the outer door handles (activate / deactivate) (only relevant to optional "Advanced Key")

► Operating points - convenient locking

- Power window regulators
  - by radio remote control (activate / deactivate)
  - via the lock cylinder in the driver's door (activate / deactivate)
  - using the window regulator switch in the driver's door (activate / deactivate)
  - via capacitance sensors in the outer door handles (activate / deactivate) (only relevant to optional "Advanced Key")

- Lifting sunroof
  - by radio remote control (activate / deactivate)
  - via the lock cylinder in the driver's door (activate / deactivate)
  - using the window regulator switch in the driver's door (activate / deactivate)
  - via capacitance sensors in the outer door handles (activate / deactivate) (only relevant to optional "Advanced Key")

- Sunroof roller blind
  - by radio remote control (activate / deactivate)
  - via the lock cylinder in the driver's door (activate / deactivate)
  - using the window regulator switch in the driver's door (activate / deactivate)
  - via capacitance sensors in the outer door handles (activate / deactivate) (only relevant to optional "Advanced Key")

The electronic ignition lock

The electronic ignition lock has the following tasks:

- Mechanical receiver and locking of the ignition key
  (➔ ignition key removal lock)
- Electrical unlocking of the ignition key by a lift magnet
- Detection of the condition "key inserted" by microswitch
- Detection of the two possible key positions:
  – Key in rest position
  – Key pressed
  via microswitch
- Reading and writing of data for the immobiliser or the "Audi Service Key" function to and from the ignition key
  Detailed information about the "Audi Service Key" can be found in a separate chapter
- Receiving and sending LIN messages with data for or from the ignition key

Electronic ignition lock module E415 without trim *393_006*

Key inserted in electronic ignition lock module *393_005*

The 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.

393_004

Tasks of the ignition key:

- Push-actuation of various microswitches in the ignition lock. The microswitches are read in by convenience system control unit J393. The J393 generates the actual terminal status from these signals.
- Sending radio signals for operation of the central locking system
- Storing data required by the immobiliser
- Storing vehicle data for the "Audi Service Key" function
- Locating the current key position by means of signals from the entry and start authorisation aerials
- 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 energised directly by the convenience system central control unit J393.

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

In models with automatic gearbox:
the selector lever must be in the "P" position

In models with manual gearbox:
the vehicle must be stationary.

If the vehicle can is unable to energise the lift magnet of the ignition key removal lock 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.

393_007

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. The same key is also used for deactivating the front passenger airbag.

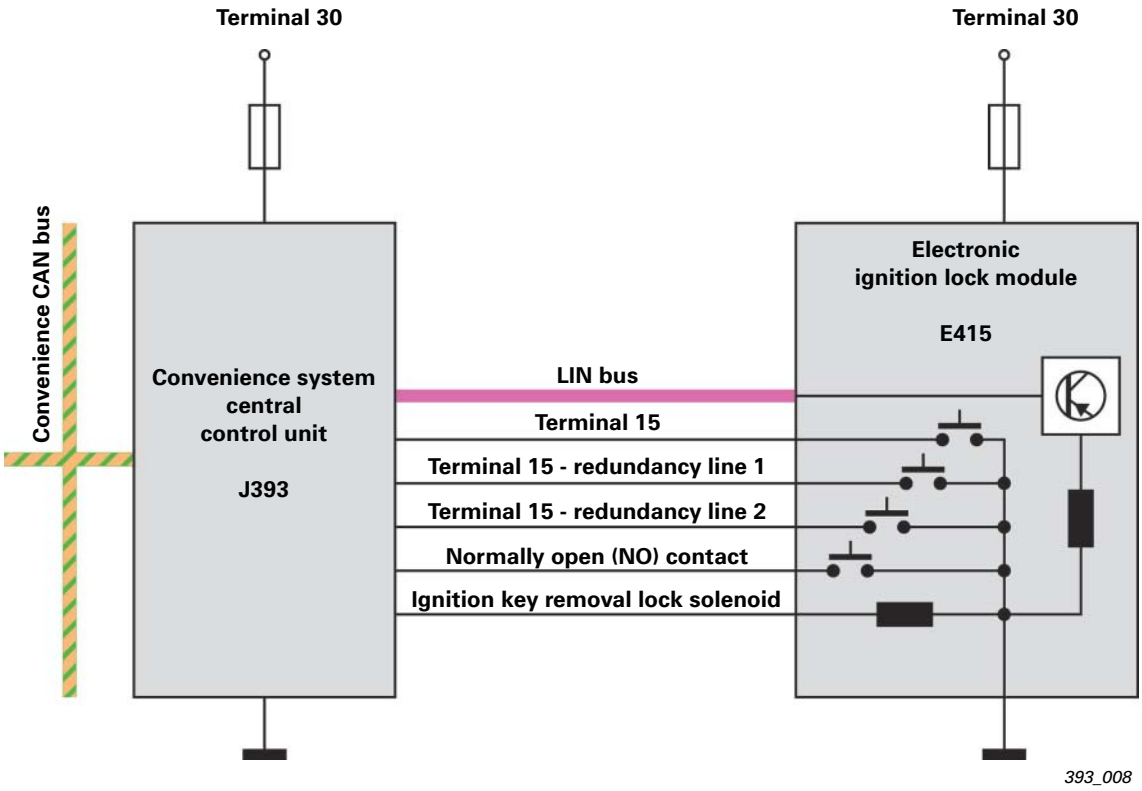
System overview

The electronic ignition lock E415 has a microswitch for a normally open contact which connects to earth when the key is inserted in the ignition lock. The microswitch is read in directly by the convenience system central control unit J393.

The "key pressed" position is read in by three microswitches. All three microswitches connect to earth when key in the ignition lock is pressed. The switches are also read in directly by the convenience system central control unit J393.

In the event of a fault, and if for example only 2 of the 3 microswitches connect to earth when the ignition key is pressed, it is decided by the 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 energised directly by the convenience system central control unit. 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 thereupon activates the read and write coil for the data transfer.

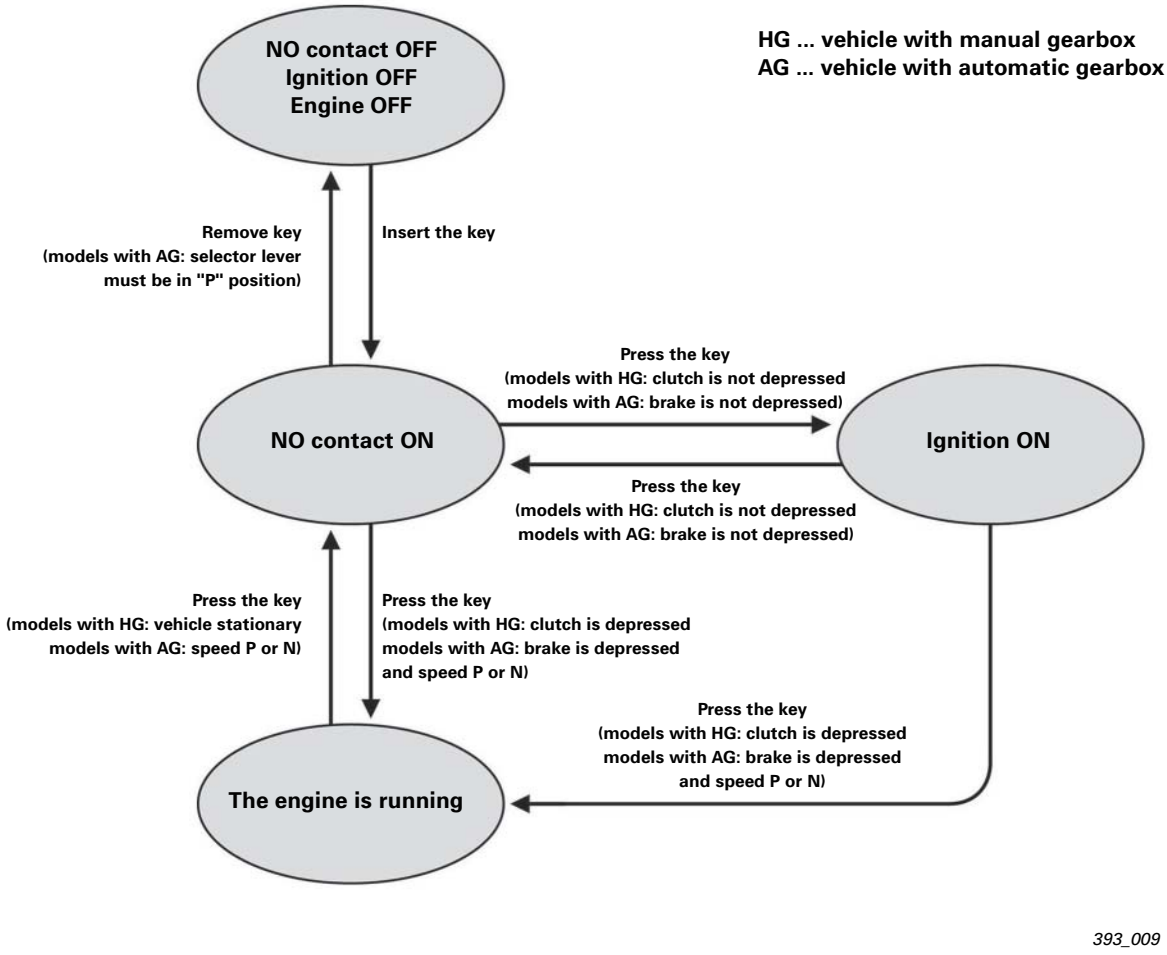


Starting with the ignition key

An all-new operating logic is used in the new Audi A5 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 a status graph:



393_009

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

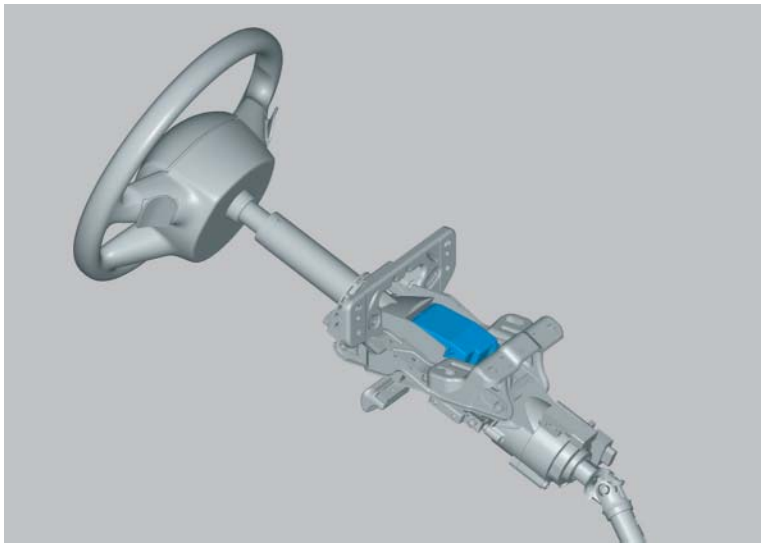
The following actions will result in an emergency shutdown:

– Pressing the key for too long
or
– Pressing the key twice within a second

The electrical steering column lock

In the new Audi A5, the electrical steering column lock control unit J764 is again firmly attached to the steering column.

In case of malfunction of the steering column lock, it is necessary to replace the complete steering column, to which the steering column lock is attached by 2 tear-off screws.



393_020

Locking and unlocking the steering column

Control unit 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 operation:
– Terminal S is activated by pressing the Start/Stop button

Control unit J764 locks the steering column in the following situations:

During ignition lock operation:
– the ignition key is removed

Keyless 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 by the electrical steering column lock control unit J764 is the presence of supply voltage across both ELV enable lines. To this end, both the onboard power supply control unit J519 and the convenience system central control unit J393 connect terminal 30 to the corresponding discrete lines for the duration of locking.

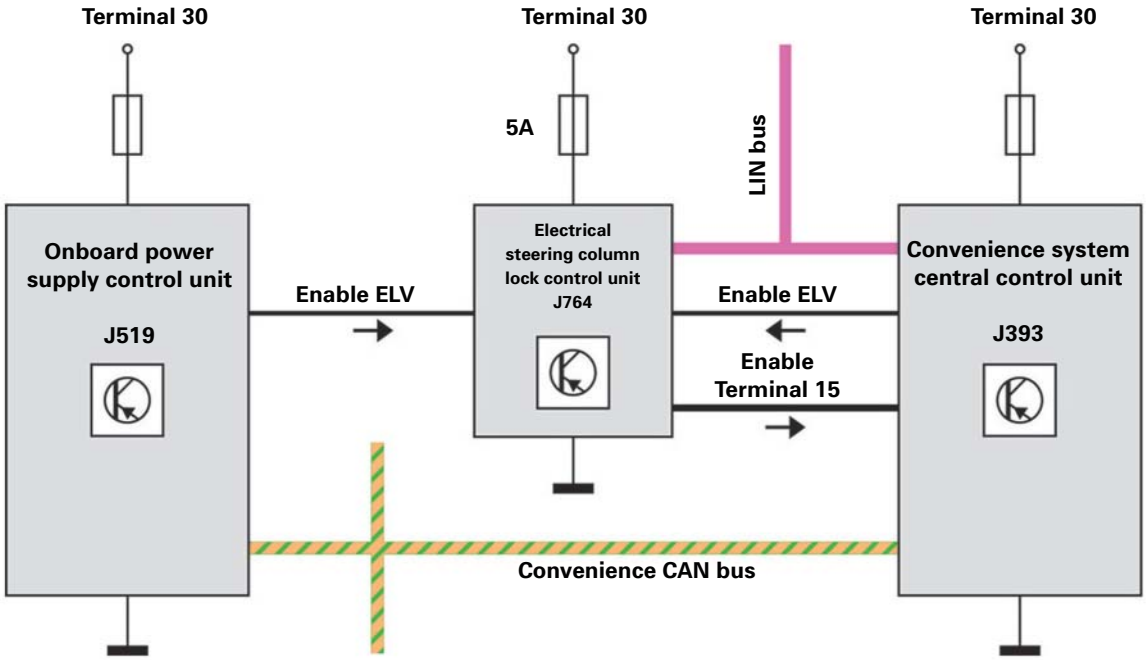
If a "terminal 15" request is issued to the convenience system central control unit J393, then a check must be made to ensure that steering column has been successfully unlocked before terminal 15 is connected.

This happens as follows:

– On receiving a "terminal 15" request, the convenience system control unit J393 queries the electrical steering column lock control unit J764 by a LIN bus message.

– If the steering column has been successfully unlocked, control unit 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, the convenience system central control unit J393 activates the terminal 15 relay



393_021

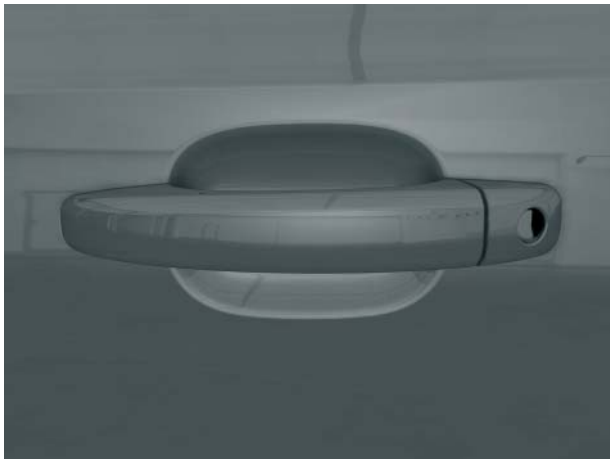
Advanced Key

Introduction

The "Advanced Key" is available for the first time in this vehicle category as optional equipment on the new Audi A5. The concept has been adopted from the A6, Q7 and A8 models, and optimised to reduce the requisite number of system components.

New features

There are no longer any central locking buttons on the door outer handles on the Audi A5. Closing and opening are activated by touching the capacitance sensors on the door outer handle.



Door outer handle with capacitance sensor *393_013*

The Start/Stop button

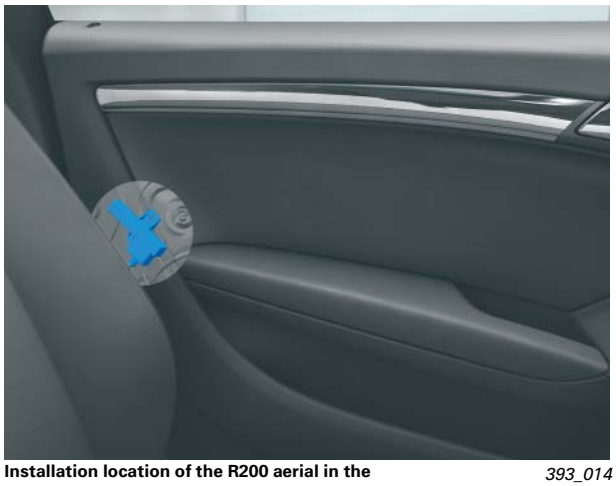
In the case of the Start/Stop button, the "two-button concept", as featured on the A6, Q7 and A8, has been replaced by a "single-button concept". This means that only one button is required for both the start and stop functions.

393_017

Installation locations of the entry and start authorisation aerials

The number of aerials required for key recognition has been reduced to 3.

In the case of Audi A5, the aerials are located in the driver's door, in the centre console and in the luggage compartment.



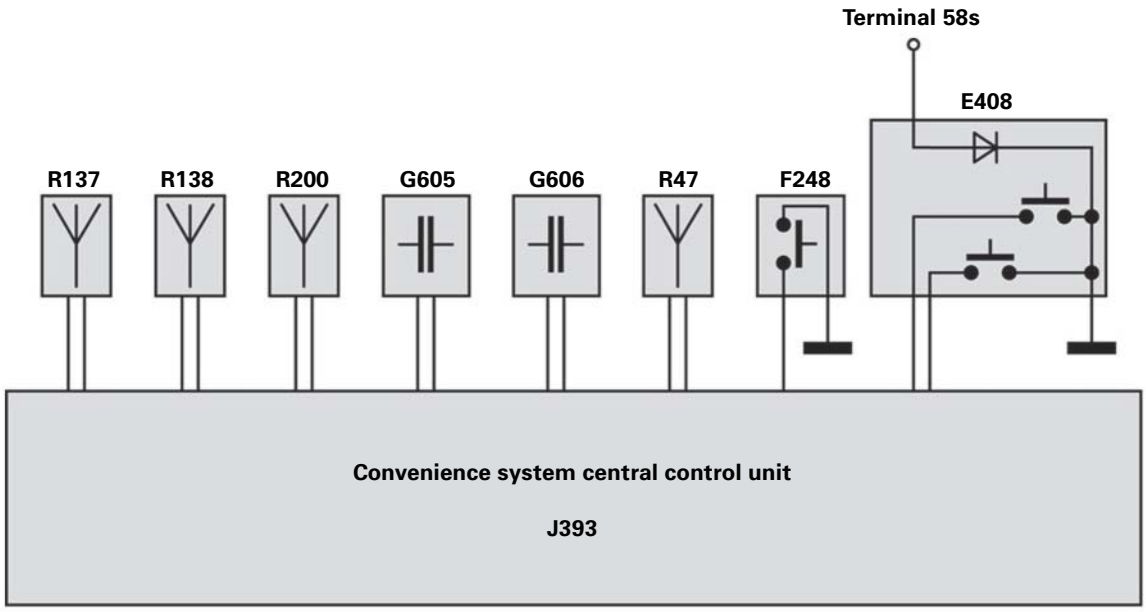
Installation location of the R200 aerial in the *393_014*

Installation location the R138 aerial in the centre console *393_015*

Installation location of the R137 aerial in the luggage compartment *393_016*

Convenience system central control unit

Overview of the vehicle locking and unlocking system



393_018

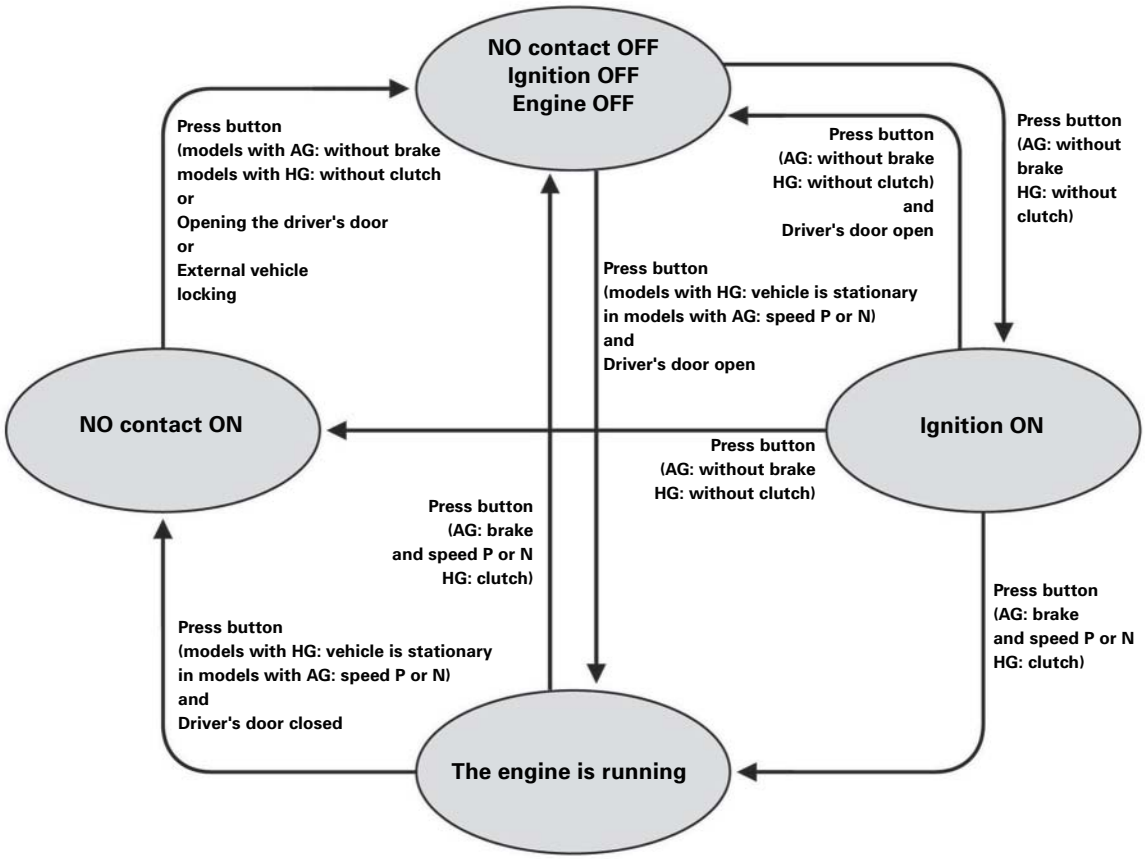
E408 ... Kessy Start/Stop button
F248 ... Release button for rear lid lock cylinder
G605 ... Front left door outer handle contact sensor
G606 ... Front right door outer handle contact sensor
R47 ... Central locking and anti-theft alarm system aerial
R137 ... Luggage compartment aerial for entry and start authorisation
R138 ... Interior aerial -1- for entry and start authorisation
R200 ... Left entry and start authorisation aerial

Starting the engine with "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 "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 a status graph:



HG ... vehicle with manual gearbox
AG ... vehicle with automatic gearbox
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

393_019

A function has also been implemented for the emergency shutdown of the engine in the case of "Advanced Key". It is identical in both manual and automatic models. Two conditions must be met to perform an emergency shutdown with the Start/Stop button:

– the brake is depressed
– the vehicle is travelling at a speed of less than 10 kph

The following actions will result in an emergency shutdown:

– Pressing the button for too long
or
– Pressing the button twice within a second

The "Audi Service Key"

Introduction

The ignition key of the new Audi A5 supports a new function known as "Audi Service 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. Therefore, there is no longer any need for the time-consuming and error-prone process of entering data manually.

393_010

Stored information

The following vehicle information is stored on the "Service 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 Service Key" in a digital form as

"OK" or "not OK"

or

"yes" or "no"

This means that, for example, the individual fluid levels are not stored in ml. 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 level
  - – Engine oil level
  - – Washer fluid level
  - – Fuel level in fuel tank

- ▶ Status of various temperatures
  - – Engine oil temperature
  - – Coolant temperature

- ▶ Status of various vehicle systems
  - – Steering system
  - – Dynamic cornering light
  - – Headlight range control
  - – Airbag system
  - – Wipers
  - – Lane change assist
    - – System fault
    - – Sensor disabled
    - – currently not available
  - – Advanced Key
    - – Low key battery power
    - – Key not recognised
    - – 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. In also includes information about systems which are optional on the new Audi A5.

The vehicle can be identified clearly via the transponder ID. The system is able to determine and display the vehicle identification number via this ID. The vehicle identification number is not stored on the key for reasons of data protection.

Writing of data to an ignition key

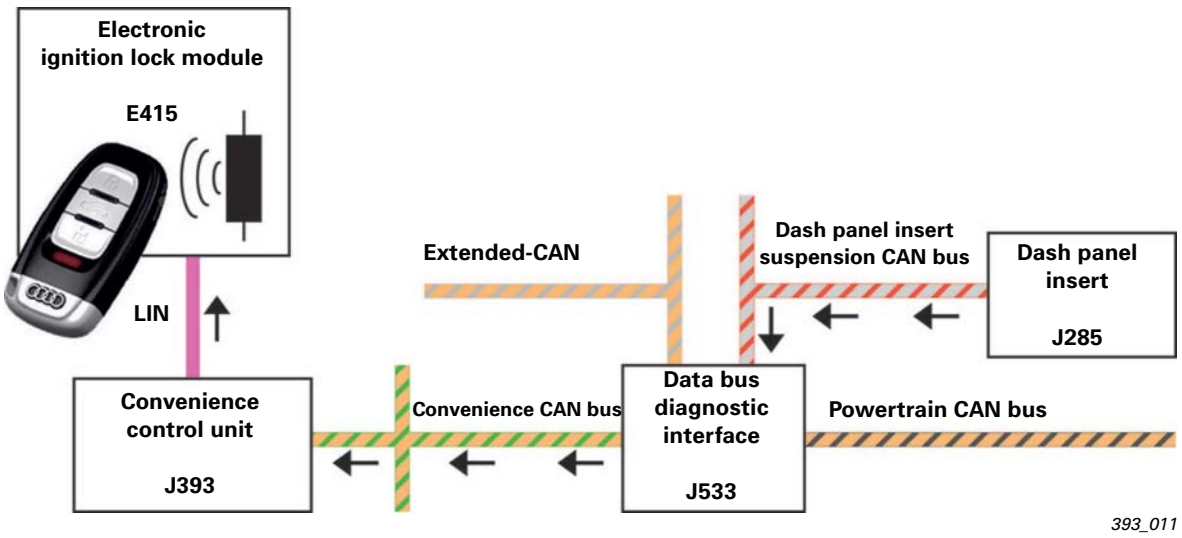
There are three events which initiate a new write cycle on the ignition key:

1 when setting 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 20 kph)

2 after every 20 kilometres 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 "Advanced Key", the writing of the "Audi Service Key" is implemented technically as follows:



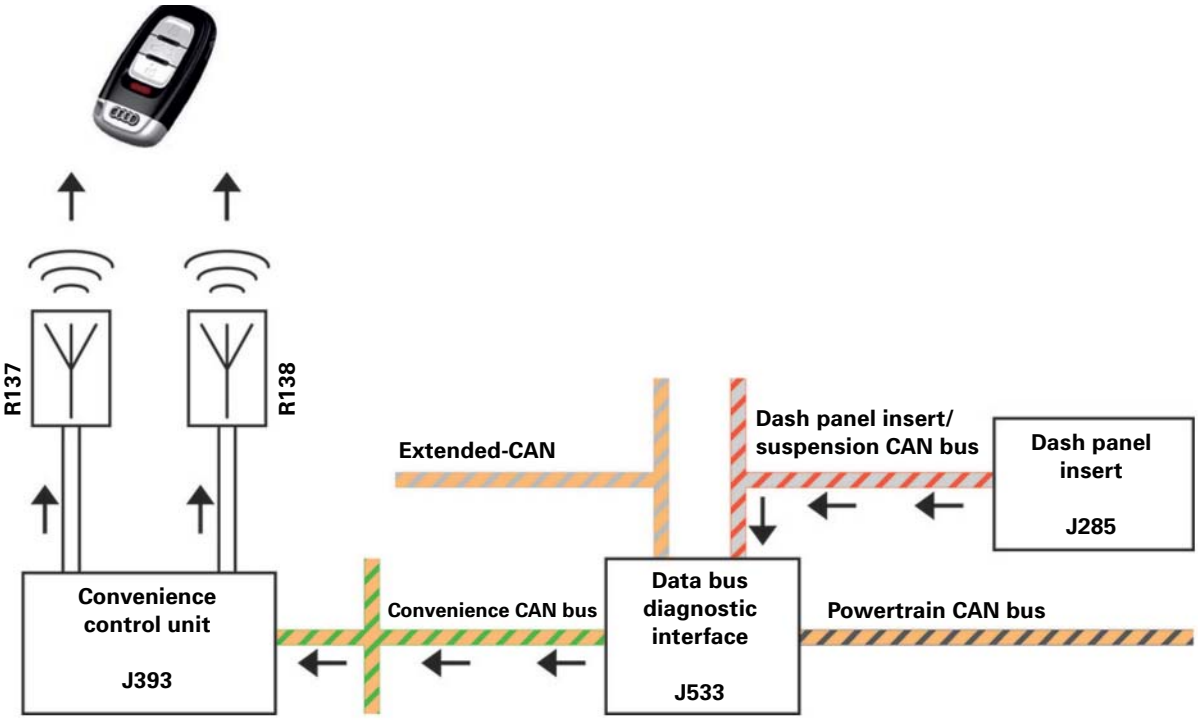
The data for writing to the key is provided by the control unit with display in dash panel insert J285. Data is transferred to the convenience system control unit J393 via the dash panel insert/suspension CAN bus, the data bus diagnostic interface J533 and the convenience CAN bus.

The convenience system control unit transfers the data via a LIN bus line to the electronic ignition lock module 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 immobiliser data.

On vehicles with the optional "Advanced Key", the writing of data to the "Audi Service Key" is implemented as follows:



393_012

R137 ... Luggage compartment aerial for entry and start authorisation

R138 ... Centre console aerial for entry and start authorisation

The difference between vehicles without and without "Advanced Key" lies in the way the convenience system control unit transfers data to the key. The two keyless aerials R137 and R138 are used instead of the coil in the ignition lock for writing data to the ignition key.

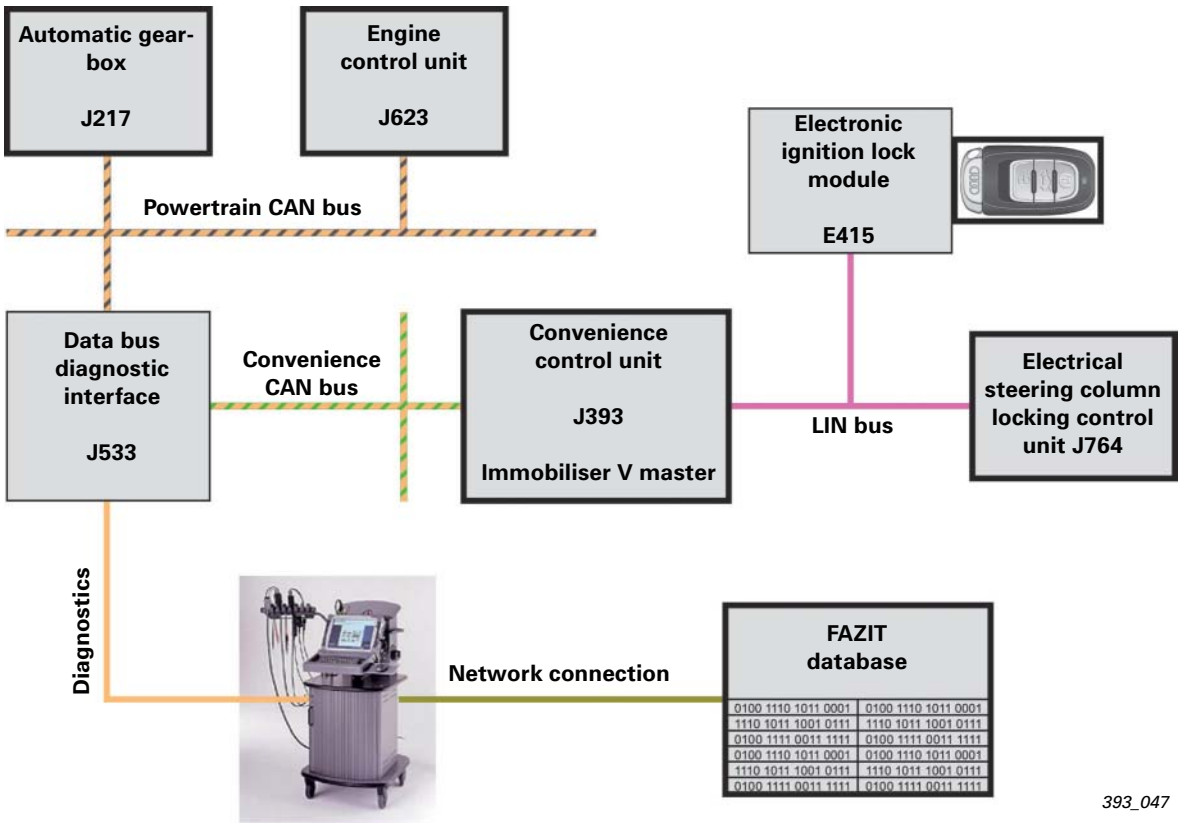
Both aerials are located in the centre console and in the luggage compartment. Depending on the actual position of the ignition key on the vehicle, one of the two aerials is used. In some cases, data is transferred redundantly by both aerials.

Immobiliser V

For the first time, immobiliser V system is used on the new Audi A5. It is an improved version of the immobiliser IV system and there are no significant differences between the two system with respect to servicing. The various tasks performed on the immobiliser using the diagnostic tester, such as the adaption of replaced immobiliser components, have been greatly simplified.

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

System overview



The master for the immobiliser is the convenience system control unit J393, into which the functions of the entry and start authorisation control unit J518 have been integrated. Components which thick borders are all immobiliser system users. Components with thin borders, such as a data bus diagnostic interface and the electronic ignition lock, only transfer immobiliser information.

As with the immobiliser IV system, an online connection to the FAZIT database must be established before any work can be performed on the immobiliser. The online connection is made via the diagnostic tester.

Actions of the immobiliser at engine start-up

If an Audi A5 is started with the ignition key in the electronic ignition lock, the immobiliser runs several queries and actions before the engine is started:

1 After a normally open contact is detected, the ignition key and convenience system control unit J393 exchange immobiliser data with one another. The convenience system control unit determines whether the key is authorised for the vehicle.

2 The convenience system control unit now exchanges immobiliser data with the electrical steering column lock control unit J764. If the device in question is the steering column lock adapted to this vehicle, the convenience system control unit enables the steering column.

3 Terminal 15 is then connected by the convenience system control unit.

4 After "terminal 15" is connected, the convenience system control unit can communicate the engine and the gearbox control unit. If these devices are also identified as control units which have been adapted to this vehicle, starting of the engine is enabled.

Replacing immobiliser components

The process of replacing immobiliser components has been greatly simplified with respect to the subsequent adaption procedure. The diagnostic tester routine recognises 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 immobiliser or even to install and adapt immobiliser 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: of course, 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 (i.e. remaining) ignition key to the vehicle.

The anti-theft alarm system

The anti-theft alarm system on the Audi A5 has, apart from a few minor modifications, been adopted unchanged from the Audi TT Coupé.

Anti-theft alarm sensors

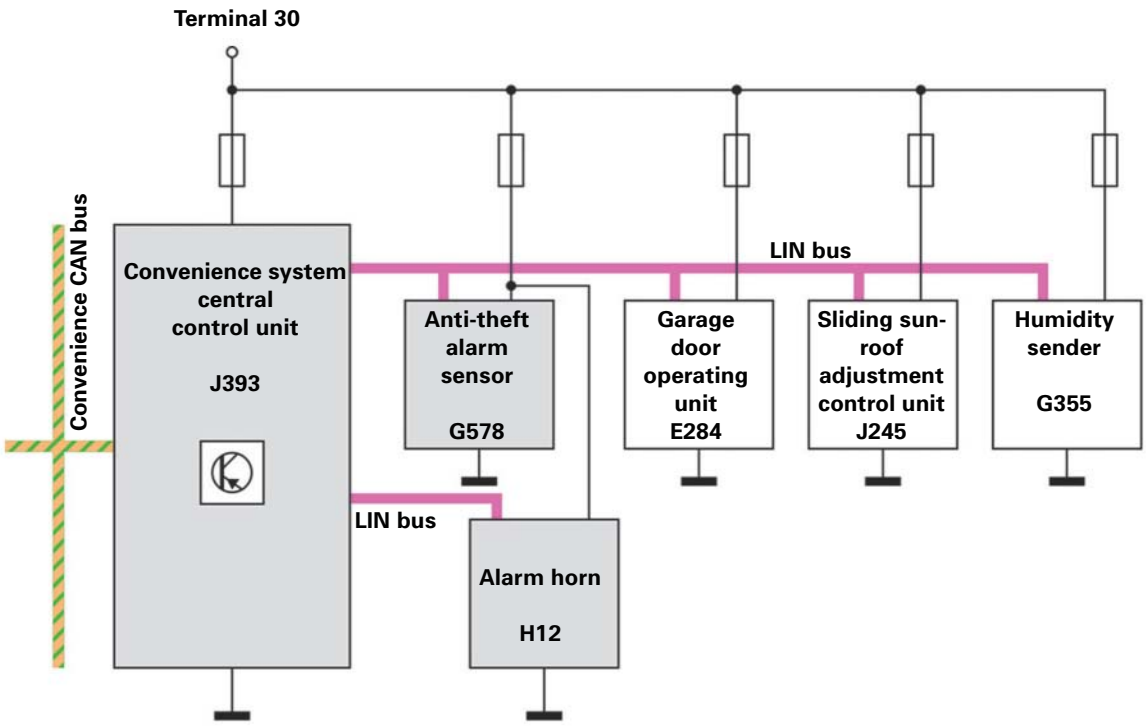
The anti-theft alarm sensor has the same part number as in the TT Coupé.

Nevertheless the sensor has to know what vehicle it is in, due to the different vehicle interior characteristics. It obtains this information through the coding.

New features

The networking system has undergone modifications: the alarm horn H12 and the anti-theft alarm sensor G578 are connected to various LIN busses on the Audi A5 together with other components which have nothing to do with the anti-theft alarm system.

In addition, the anti-theft alarm system on the Audi A5 requires a third ultrasonic sensor for interior monitoring, whereas only two sensors were required on the Audi TT Coupé. The anti-theft alarm sensor is capable of evaluating up to 4 ultrasonic sensors. However, 2 sensors are sufficient for smaller vehicle interiors.



393_023

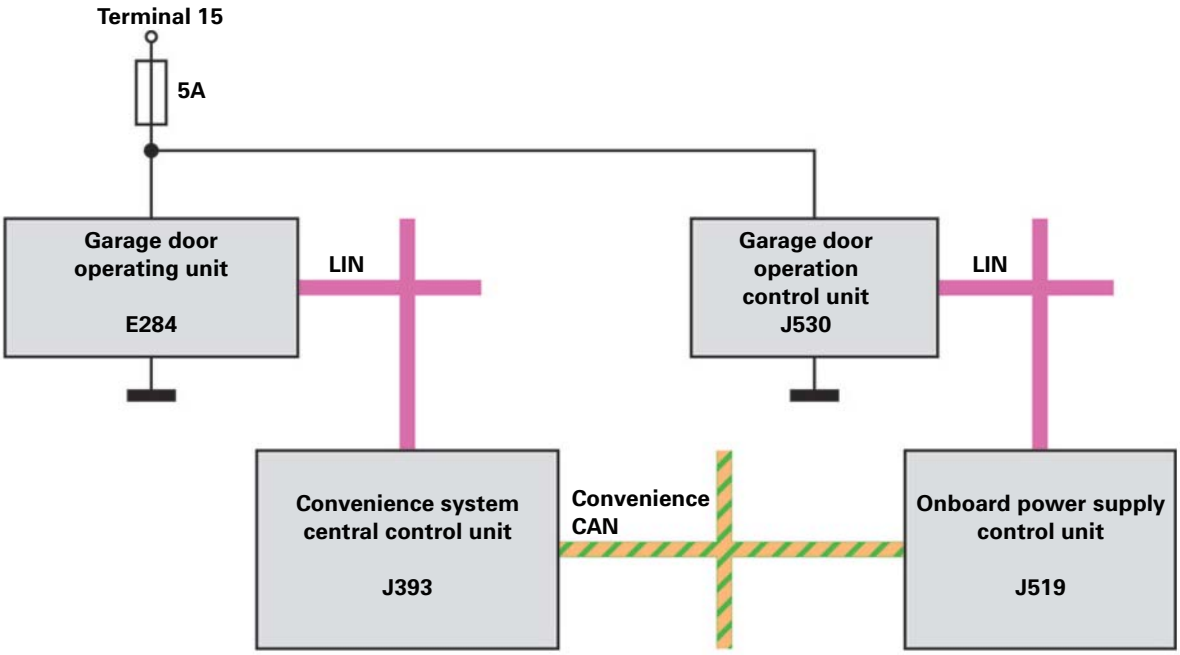
The HomeLink garage door opener

New features

The new Audi A5 is equipped with the HomeLink "universal garage door opener" as featured on other models. The "universal garage door opener" was not previously integrated into the vehicle networking system.

This all changes with the new Audi A5, where the garage door operating unit E284 is connected to the convenience system central control unit J393 as LIN bus user and the garage door operation control unit J530 is connected to the onboard power supply control unit J519 as a LIN bus user.

Garage door opener system overview



393_022

Diagnostics

As a result, the system is diagnosable by the tester for the first time. The convenience system central control unit J393 recognises 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 adaption channels for the garage door opener are integrated in control unit J393

- Depending on country, different transmission frequencies are utilised

The onboard power supply control unit 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 units, extensive data blocks are available for fault-finding.

The Panorama tilt sunroof

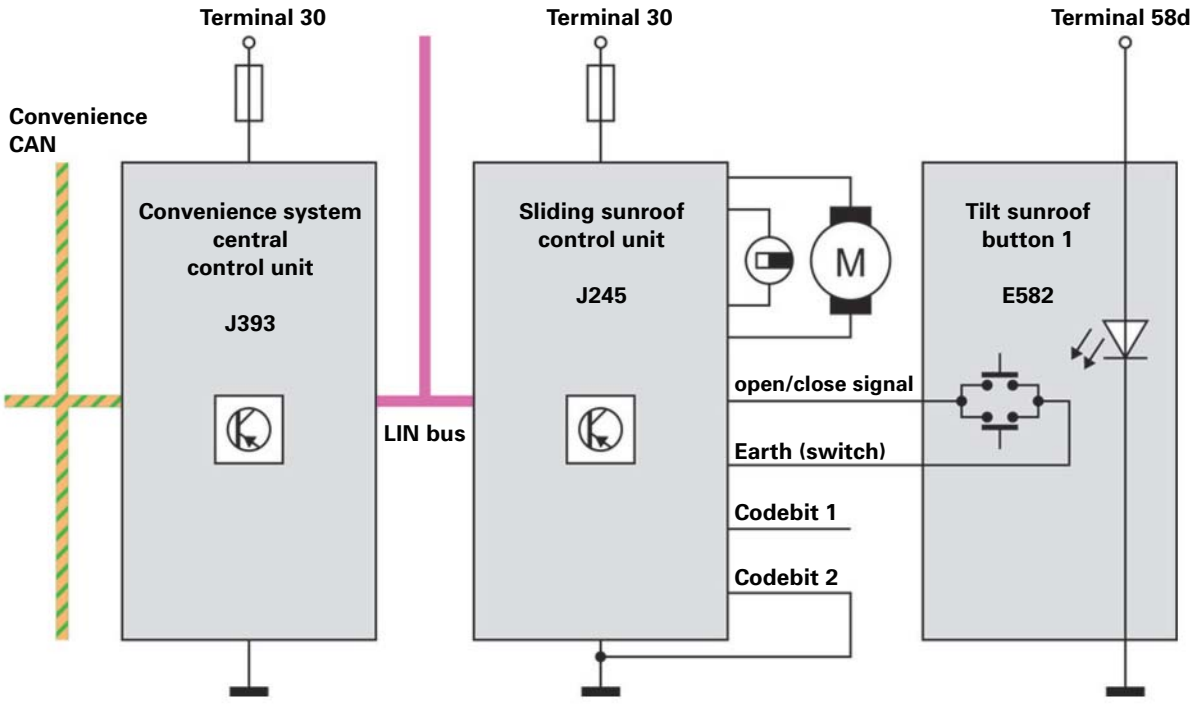
Panorama tilt sunroof system overview

A Panorama tilt sunroof is optional on the new Audi A5. The Panorama tilt sunroof has a separate control unit, the sliding sunroof control unit J245. This control unit communicates via a LIN bus with the convenience system central control unit J393, which in turn is networked with the remaining vehicle electronics via the convenience CAN bus. The tilt sunroof motor and the control unit form a unit, and can only be replaced together.

Control unit J245 also reads in the tilt sunroof button 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).

The control unit J245 has two hardware inputs via which it is "encoded" for this task. Encoding is performed on the vehicle via the wiring harness. Either the Input is left open or connected to earth. The same control unit/motor unit can be used either for a tilt sunroof, for a sliding sunroof or for a power operated sun blind.

No sliding sunroof or power-operated sun blind is available on the Audi A5.



393_024

Functions in the sliding sunroof control unit 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 unit.

The tilt sunroof can only be actuated when the convenience system central control unit J393 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 power management system, the tilt sunroof cannot be opened, but 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 5 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.

393_028

Park assist control unit (acoustic parking system)

The new control unit J791

The park assist control unit on the Audi A5 is a new control unit. This control unit replaces the acoustic parking system control unit J446 as featured previously on other models. The park assist system will, however, not initially be available on the Audi A5. The park assist control unit is only required for the acoustic parking system.

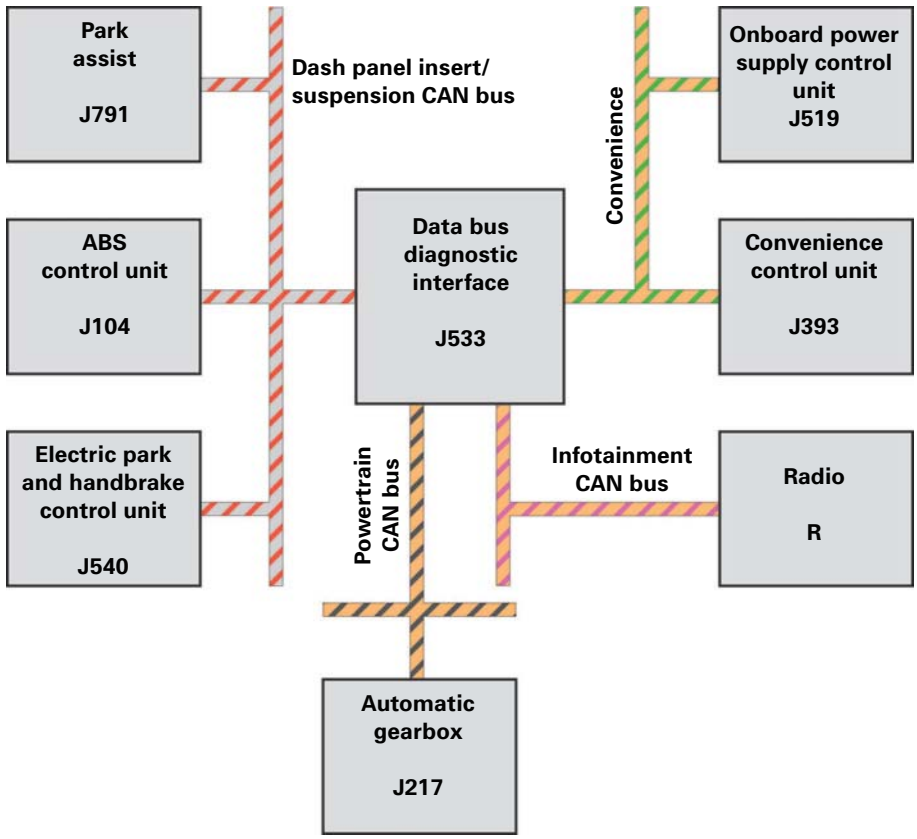
The park assist system will make parking even easier in future: as the vehicle passes a vacant parking space, the system measures it. After that, all the driver has to do is press the accelerator, and the necessary steering movements are performed by an electric motor. A condition for this function is that the vehicle is equipped with an electromechanical steering system.

New features

- The park assist control unit is a high-speed dash panel insert/suspension CAN bus user, and no longer a convenience CAN bus user like the acoustic parking system control unit.
- The control unit is supplied with terminal 15 only, and is no longer additionally supplied with terminal 30. For this reason, it no longer has run-on capability.
- Operation of the control unit J791 is coupled to reception of the terminal 15 bit from the convenience system control unit J393. If no set bit is received via the CAN bus, the acoustic parking system will not function.
- An MMI is no longer mandatory for the eight-channel acoustic parking system with visual display. The third generation radio display can be used for this purpose. This display is identical to the display used on the MMI High (colour display).
- The diagnostic address word has changed: The new park assist control unit can be addressed with address word 10 (the acoustic parking system control unit had the address word 76).
- When the acoustic parking system is activated (by selecting reverse gear or pressing the acoustic parking system button), the audio volume is reduced a settable level. After the acoustic parking system is deactivated, the volume is again increased to the level it was at earlier. Only the third generation radio presently has this function. It will be implemented on the MMI at a later date.
- The acoustic parking system muted when the parking brake is closed. However, this function is only available in combination with the front and rear acoustic parking system, and not with the rear acoustic parking system.

Communication structure of the acoustic parking system

This diagram shows the communication structure for an eight-channel acoustic parking system on an Audi A5 without MMI.



To ensure the proper operation of the acoustic parking system, the park assist control unit J533 exchanges the following information with the control units listed below:

ABS control unit J104:

– actual vehicle road speed

Electric park and handbrake control unit J540:

– actual parking brake status (open or closed)

Automatic gearbox control unit J217:

– actual selector lever position

Radio R:

– preset warning beep volume, warning beep frequency and whether the rear-view camera image or the acoustic parking graphic is to be displayed (from R to J791)
– For the graphic display of required information (from J791 to R)

Convenience system control unit J393:

Current ignition key number and terminal 15 bit

Onboard power supply control unit J519:

"reversing light on or off" bit

Park assist control unit (acoustic parking system)

System versions

Three different acoustic parking systems are available on the new Audi A5:

- The four-channel system with acoustic warning (rear acoustic parking system)
  ➔ Audi Parking System

- The eight-channel system with acoustic warning and visual display (front and rear acoustic parking system)
  ➔ Audi Parking System Plus

- The eight-channel system with acoustic warning, visual display and additional rear-view camera
  ➔ Audi Parking System Advanced

Ultrasonic sensors

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

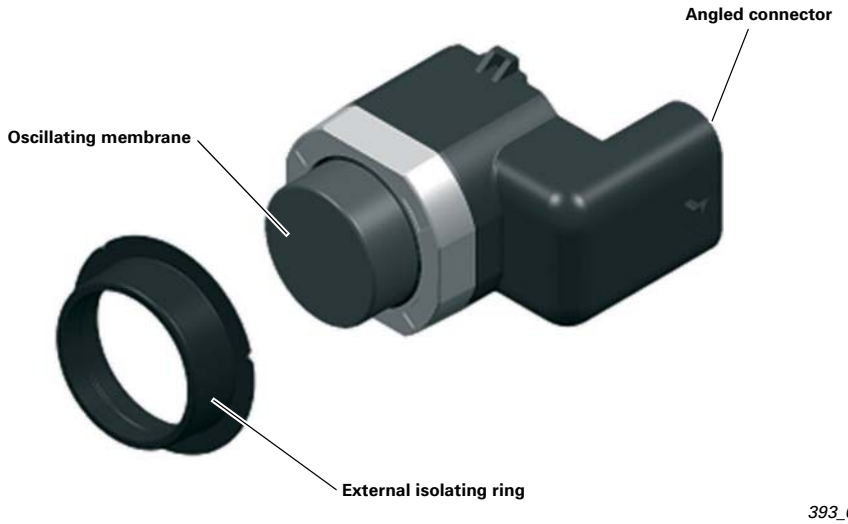
There is an internal and an external isolating ring. These two rings allow the membrane to oscillate upon excitation and thus produce ultrasonic waves.

Procedure for the replacement of an ultrasonic sensor in the service workshop

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 colour
2 Then fit the external isolating ring

Note: the external isolating ring is available in the colours black and grey. Depending on body colour, either of the versions is selected.



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Rear-view camera system control unit

Introduction

A rear-view camera system is optional on the new Audi A5. It can be ordered under the name "Audi Parking System Advanced" together with the eight-channel acoustic parking system with acoustic warning and visual display. The MMI is required for the "Audi Parking System Advanced" in order to display the rear-view camera image.

The system cannot be ordered in combination with the MMI Basic or the third generation radio.

Apart from 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 adaption channel. This information is required for calibrating the rear-view camera.

- Previously, in the so-called 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 line are visible up to that point. If the right turn signal is now 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 does not reappear until the turn signal is activated in the opposite direction.

- If the vehicle approaches an obstacle when reversing, 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 of the acoustic parking system.

393_044

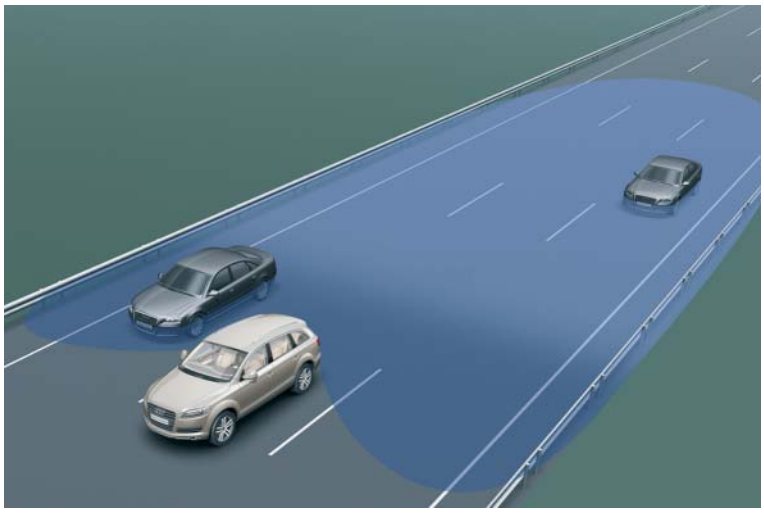
Note

For a detailed description of the rear view camera system, please refer to SSP375.

Lane change assistant control units

The lane change assistant system is optional on the new Audi A5. The lane change assistant system on the Audi A5 is expected to be available for order in the autumn of 2007.

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.



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Note

For a detailed description of the lane change assistant system, please refer to SSP375.

Note

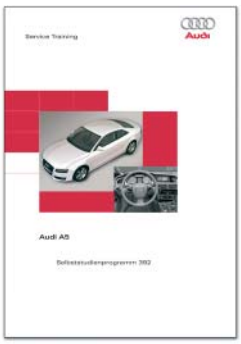
In June 2007, there will be a separate self-study programme about the "Audi Lane Assist" system, which will be available on the Audi A5 from autumn 2007.

Note

Self-study programmes relating to the Audi A5

The following self-study programmes have been prepared for the Audi A5:

- SSP 392 Audi A5
- SSP 393 Audi A5 - Convenience Electronics and Driver Assist Systems
- SSP 394 Audi A5 - Suspension
- SSP 395 Audi A5 - Networking



SSP 392 Audi A5

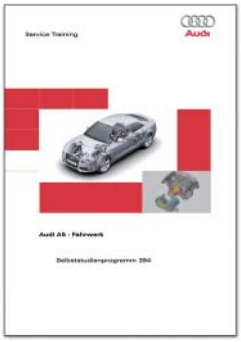
- Body
- Occupant protection
- Engine
- Gearboxes
- Suspension
- Electrical systems
- Infotainment
- Air conditioning
- Service
- Diagnostics

Order number: A07.5S00.34.20

SSP 393 Audi A5 - Convenience Electronics and Driver Assist Systems

- Dash panel insert
- Door control unit,
- Convenience system control unit
- Electronic ignition lock
- Audi Service Key

Order number: A07.5S00.35.20



SSP 394 Audi A5 - Suspension

- Front axle
- Rear suspension
- Brake system
- Steering system

Order number: A07.5S00.36.20

SSP 395 Audi A5 - Networking

- Networking / topology
- Battery monitoring
- Onboard power supply control unit
- Exterior lights

Order number: A07.5S00.37.00

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