eSelf Study Program 970363

The 2017 Audi Q7 Occupant Protection and Infotainment System

Audi Academy

Audi of America, LLC
Service Training
Created in the U.S.A.
Created 9/2015
Course Number 970363

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

This eSelf Study Program teaches a basic knowledge of the design and functions of new models, new automotive components or technologies.

It is not a Repair Manual! All values given are intended as a guideline only.

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

Note

Reference

Occupant safety

Passive safety

Airbag Control Module J234 has been enhanced for the occupant protection system in the 2017 Audi Q7. It houses a sensor which now measures around the Z axis of the vehicle.

Communication with other control modules is now done via the FlexRay data bus. This allows for example, the ABS control module to receive real time data about vehicle rotation around the Z axis that is utilized by the Electronic Stability Control (ESC) system.

Active safety

Four Audi pre-sense functions are available for the Audi Q7. In addition to Audi pre-sense basic, these are:

- pre sense rear.
- pre sense front.
- pre sense city.

Audi pre sense city warns the driver about vehicles and pedestrians and brake within system limitations. Audi pre sense front brings to the Audi Q7 new functions such as evasion assist and turn assist.

Infotainment

Audi offers various levels of the infotainment modules for the Audi Q7. MMI Radio plus is standard. This offers interfaces for external devices such as mobile phones or memory cards. The Audi sound system delivers excellent sound quality from its ten speakers.

MMI navigation plus also includes the feature Audi connect, which connects the Audi Q7 to the Internet via the LTE standard. Rear passengers can surf via the WiFi hotspot with download speeds of up to 100 Mbit/s and send and receive e-mail. The driver can use the customized Audi connect services ranging from online traffic information to navigation with Google Earth and Google Street View to online media streaming.

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Learning objectives of this Self Study Program:

Once you have completed this Self-Study Program you will be able to answer questions on the following topics:

- New passive safety features.
- New active safety features.
- Modifications to and new features of the infotainment system.

Passive safety

Overview

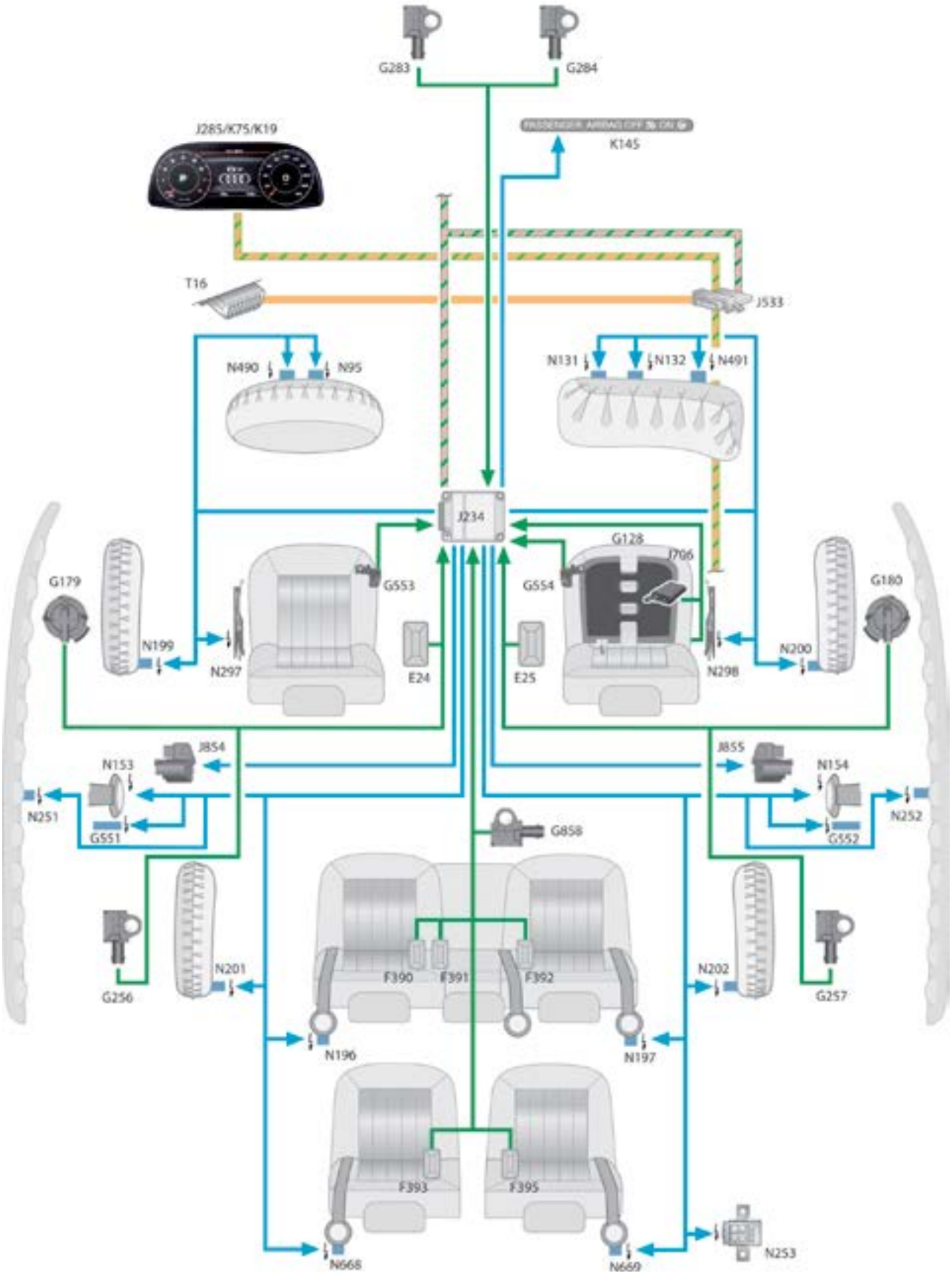
Components

- Airbag Control Module.
- Adaptive driver airbag.
- Adaptive front passenger airbag (front passenger airbag, two-stage country version).
- Front side airbags.
- Rear side airbags (equipment option).
- Side curtain airbags.
- Front airbag crash sensors.
- Crash sensors for side impact detection in the doors.
- Crash sensors for side impact detection in the 'C' pillars.
- Crash sensor for side and longitudinal impact detection.
- Center pedestrian protection crash sensor (acceleration sensor, country version).
- Left and right pedestrian protection crash sensors (pressure sensors).
- Front inertia-reel safety belts with pyrotechnic belt tensioners.
- Front inertia-reel safety belts with electrical belt tensioners.
- Front inertia-reel safety belts with active belt force limiters.
- Inertia-reel safety belts for second seat row with pyrotechnic belt tensioners, driver and front passenger sides.
- Inertia-reel safety belts for third seat row with pyrotechnic belt tensioners, driver and front passenger sides.
- Front lap belt tensioner.
- Safety belt warning for all seats.
- Seat occupancy sensor in front passenger seat.
- Front passenger airbag disabling switch.
- Front passenger airbag OFF and ON warning lamp.
- Driver and front passenger seat position sensors.
- Battery interrupter circuit.


Front side airbag
Side curtain airbag,
driver and front passenger side
Rear side airbag
Rear side airbag

637_007

System overview



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Key to figure on page 4:

E24 Driver Seat Belt Switch
E25 Front Passenger Seat Belt Switch

F390 Driver Side Second Row Seat Belt Switch
F391 Center Second Row Seat Belt Switch
F392 Driver Side Third Row Seat Belt Switch
F393 Driver Side Third Row Seat Belt Switch
F395 Passenger Side Third Row Seat Belt Switch

G128 Front Passenger Occupant Detection Sensor
G179 Driver Thorax Airbag Crash Sensor
G180 Front Passenger Thorax Airbag Crash Sensor
G256 Driver Side Rear Thorax Airbag Crash Sensor
G257 Passenger Side Rear Thorax Airbag Crash Sensor
G283 Driver Front Airbag Crash Sensor
G284 Passenger Side Front Airbag Crash Sensor
G551 Driver Belt Force Limiter
G552 Front Passenger Belt Force Limiter
G553 Driver Seat Position Sensor
G554 Front Passenger Seat Position Sensor
G858 Center Crash Sensor for X/Y Axis

J234 Airbag Control Module
J285 Instrument Cluster Control Module
J533 Data Bus On Board Diagnostic Interface (Gateway)
J706 Passenger Occupant Detection System Control Module
J854 Left Front Seat Belt Tensioner Control Module
J855 Right Front Seat Belt Tensioner Control Module

K19 Seat Belt Indicator Lamp
K75 Airbag Indicator Lamp
K145 Front Passenger Airbag -disabled- Indicator Lamp

N95 Driver Airbag Igniter
N131 Front Passenger Airbag Igniter 1
N132 Front Passenger Airbag Igniter 2
N153 Driver Seat Belt Tensioner Igniter 1
N154 Front Passenger Seat Belt Tensioner Igniter 1
N196 Driver Side Rear Seat Belt Tensioner Igniter
N197 Passenger Side Rear Seat Belt Tensioner Igniter
N199 Driver Thorax Airbag Igniter
N200 Front Passenger Thorax Airbag Igniter
N201 Driver Side Rear Thorax Airbag Igniter
N202 Passenger Side Rear Thorax Airbag Igniter
N251 Driver Head Curtain Airbag Igniter
N252 Front Passenger Head Curtain Airbag Igniter
N253 Battery Interrupt Igniter
N297 Driver Seat Belt Tensioner Igniter 2
N298 Front Passenger Seat Belt Tensioner Igniter 2
N490 Driver Airbag Release Valve Igniter
N491 Front Passenger Airbag Release Valve Igniter
N668 Driver Side Third Row Seat Belt Tensioner Igniter
N669 Front Passenger Side Third Row Seat Belt Tensioner Igniter

T16 16-pin Data Link Connector

Center Crash Sensor for X/Y Axis G858

Center Crash Sensor for X/Y Axis G858 is for measuring the movement (both acceleration and de-acceleration) of the vehicle along the X/Y axes.

It is used to validate the plausibility of defined crash situations.

637_010

Installation location

It is located on the center body tunnel near the cross member of the driver's seat.

637_011

Airbag Control Module J234

Sensors and data bus interface

The airbag control module for the Q7 has undergone extensive modification.

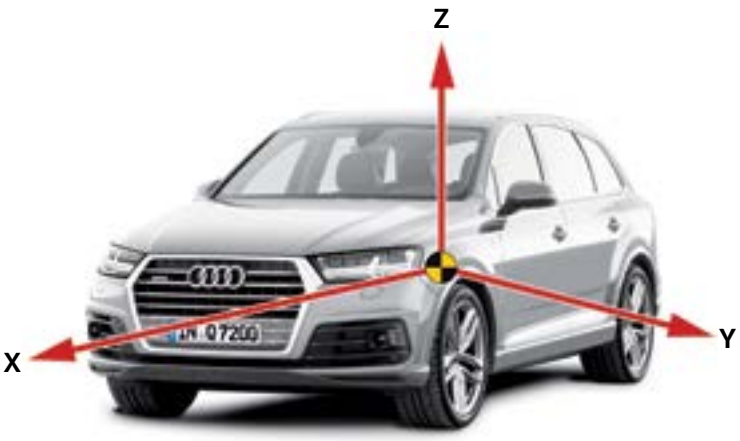
Sensors that measure acceleration in the X and Y directions and the yaw rate around the vehicle's Z axis (inertial sensors) are now installed in Airbag Control Module J234. J234 is now connected to the FlexRay bus to help ensure a minimum reaction time of approximately 2ms in the event of a crash.

Airbag Control Module J234 records and provides body movement data to ABS Control Module J104 (as well as other modules). J104 processes this information and initiates the appropriate action regarding all ESC functions.

637_050

Measurement of longitudinal vehicle movement in X, Y and Z directions

The sensors for the measurement of longitudinal vehicle movement in X, Y and Z directions work on the "seismic mass" principle.



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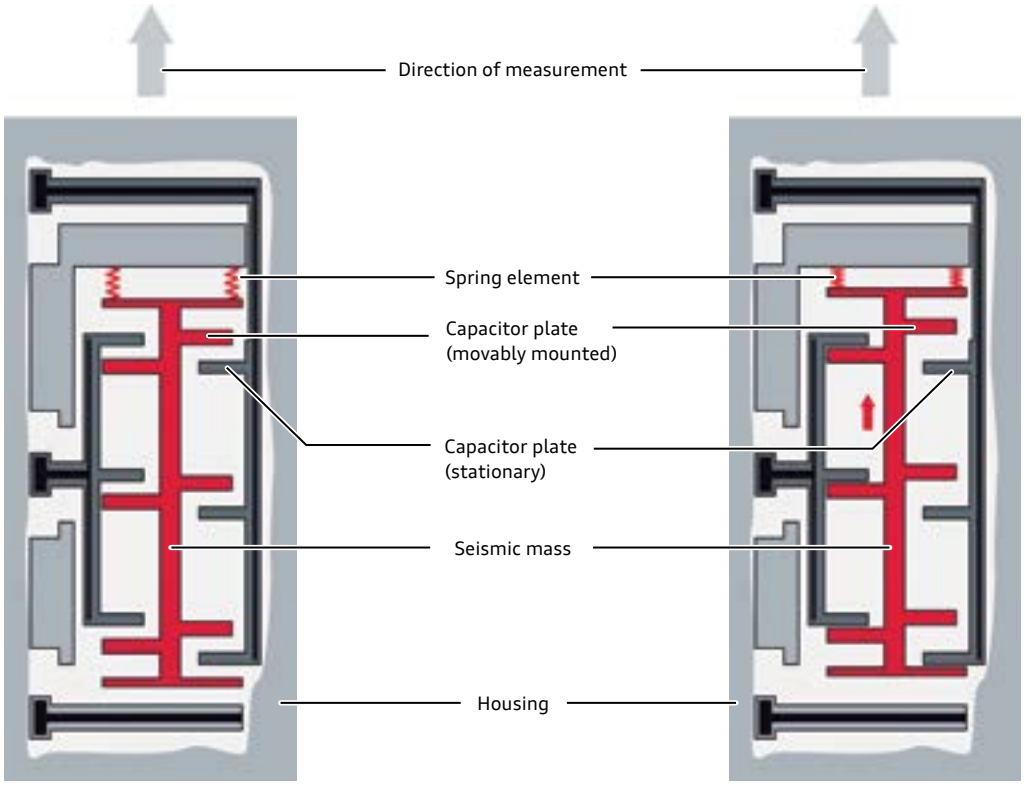
Design of the sensor

A moveable mounted mass (seismic mass) is integrated in the sensor at a defined distance to a stationary capacitor plate acting as an electrode. The seismic mass also has electrodes, which combine with the stationary electrodes to form a capacitor.

An acceleration force acting on the sensor changes the position of the seismic mass relative to the stationary capacitor plate. This, in turn, changes the physical magnitude of the capacitance, which is processed digitally and evaluated.

Rest position

Movement



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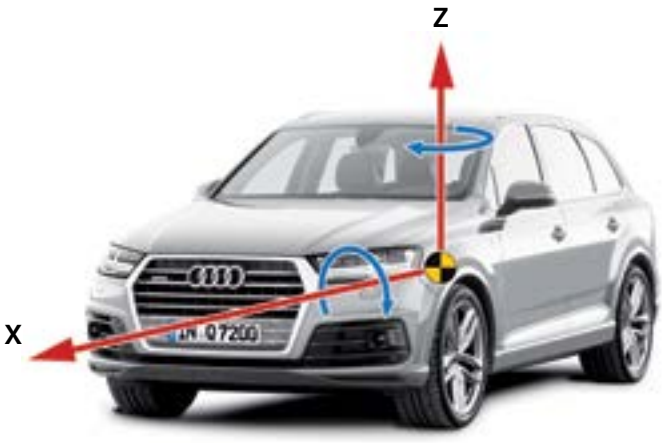
637_015

Measurement of vehicle rotation about the X and Z axes

The sensors for the measurement of vehicle rotation about the X and Z axes work on the "Coriolis force" principle.



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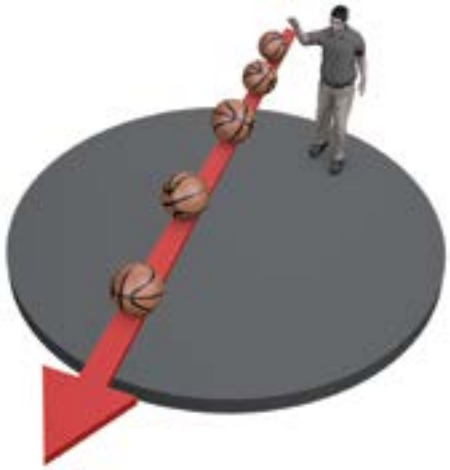
The Coriolis force acts on all bodies that move within a rotating reference system. The effect of the Coriolis force is demonstrated in the example given here. A ball is rolled on a disc. When the disc is stationary the ball rolls straight across it.



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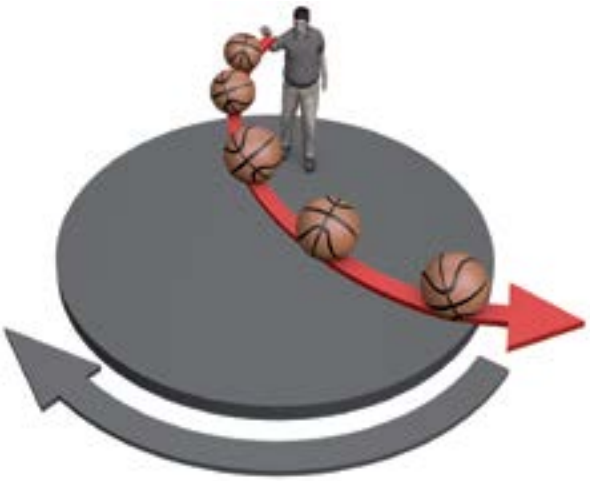
When the disc rotates while the ball is rolling on the platform, however, the ball is deflected opposite the direction of motion of the disc. The degree of deflection depends on the rotational speed of the disc.



637_016b

The sensor consists of a micromechanical body which is permanently subjected to oscillation excitation.

When the vehicle turns, the direction of movement of the oscillating body changes. These deflections relative to the direction of movement (changes in movement) are processed digitally and evaluated accordingly.

To measure rotation about the X and Z axes, a rollover sensor (for rollover detection) and an inertial sensor (for ESC signal indicating yaw rate about Z) are arranged at a 90° offset relative to each other in Airbag Control Module J234.

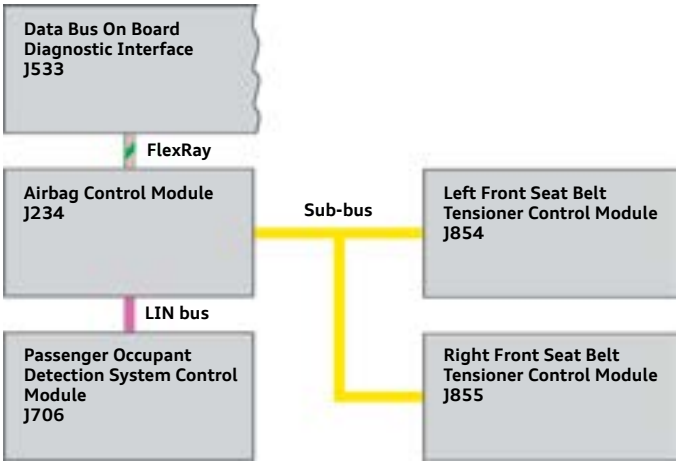
Airbag Control Module J234

637_012

Activation of the electrically reversible safety belt tensioners

When corrective adjustments are made by Audi pre-sense, Airbag Control Module J234 initiates tensioning of the safety belts via Left and Right Front Seat Belt Tensioner Control Modules J854 and J855. They communicate with each other through a sub-bus system.

From the topology chart



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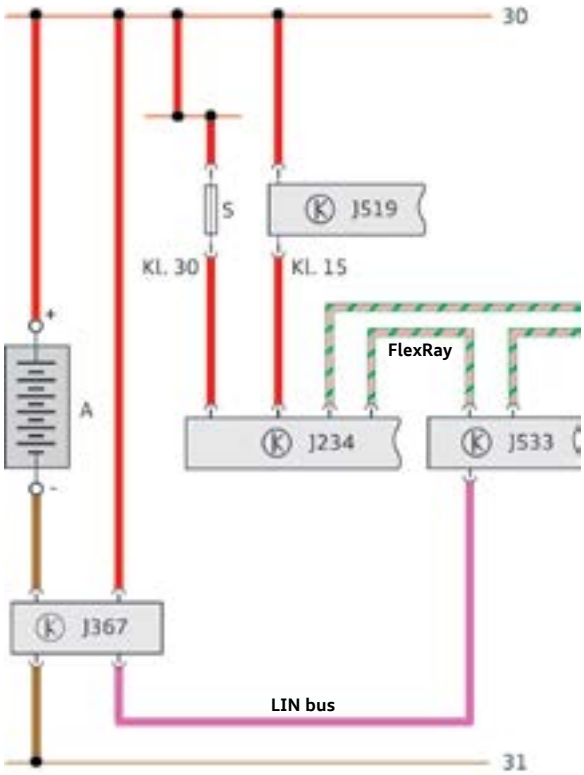
Terminal 30

Airbag Control Module J234 is connected to Terminal 30 and Terminal 15. In addition, it receives digital information on the status of Terminal 15 from Data Bus On Board Diagnostic Interface J533 through a discreet wire. The airbags will only deploy when the ignition is switched on.

A capacitor is integrated with Airbag Control Module J234. Its function is to provide power if Terminal 30 or 15 is disconnected during a vehicle crash.

Function diagram



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Key:

A Battery
J234 Airbag Control Module
J367 Battery Monitoring Control Module
J519 Vehicle Electrical System Control Module
J533 Data Bus On Board Diagnostic Interface

Diagnostics

The Airbag Control Module is diagnosed with the VAS Scan Tool using Address Word 15.

Because there are tolerances when installing the Airbag Control Module, the internal inertial sensors must be calibrated so they will accurately measure the X , Y axes and the yaw rate about the Z axis.

If a new control module is installed but not calibrated, the DTC - “C115E54 inertial sensors no basic setting” is recorded in its fault memory.

The inertial sensors must be calibrated after the following work:

- Removal/installation of Airbag Control Module J234.
- Replacement of Airbag Control Module J234.

Safety belts

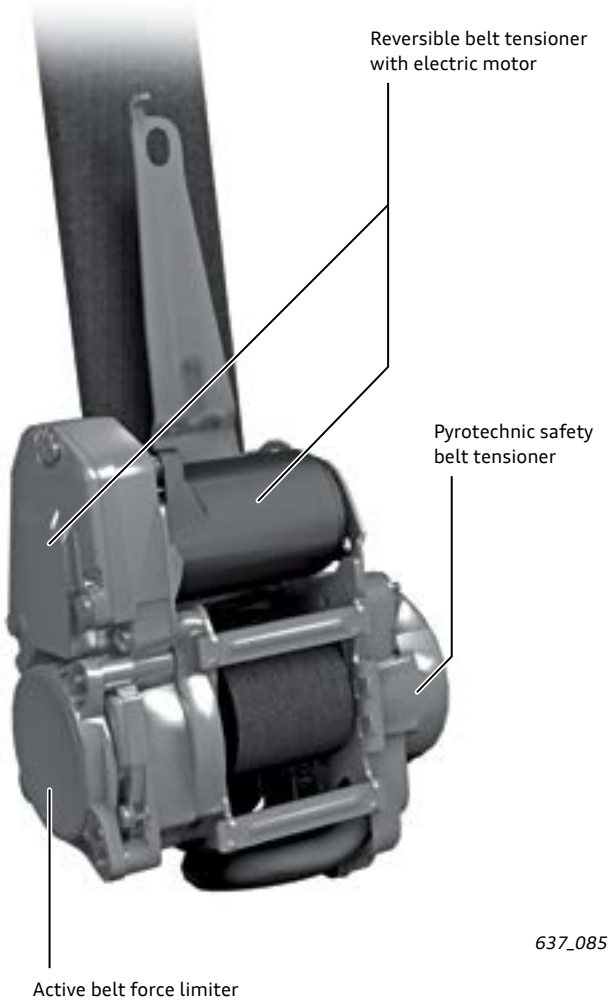
Front automatic belt retractor

With Audi pre sense basic, the front automatic belt retractors are equipped with pyrotechnic belt tensioners, active belt force limiters and with reversible safety belt tensioners with electric motors.

Left and Right Front Seat Belt Tensioner Control Modules J854 and J855 communicate with Airbag Control Module J234 over a sub-bus system. J854 and J855 have no “intelligence but are actuators of the airbag control module.

When Audi pre-sense basic detects specific driving situations, corresponding signals are placed on the data bus. The airbag control module evaluates these signals and if necessary instructs J854 and J855 to partially or fully tension the safety belts.

The Q7 uses ball-type pyrotechnic safety belt retractors. It is NOT necessary to perform a Basic Setting Test Plan if the belt is replaced.



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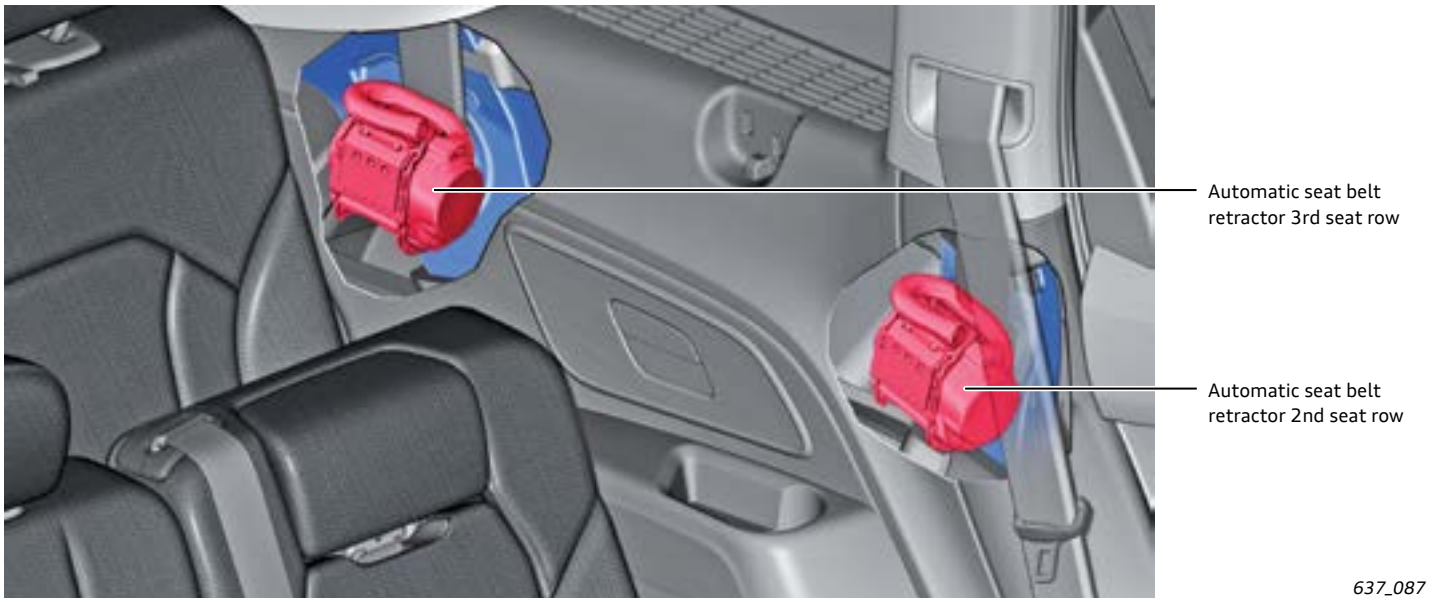
Outer automatic seat belt retractors for the 2nd and 3rd seat rows

The automatic seat belt retractors of the 2nd and 3rd seat rows are equipped with pyrotechnic belt tensioners.

The automatic seat belt retractors use pyrotechnic push rod tensioners.



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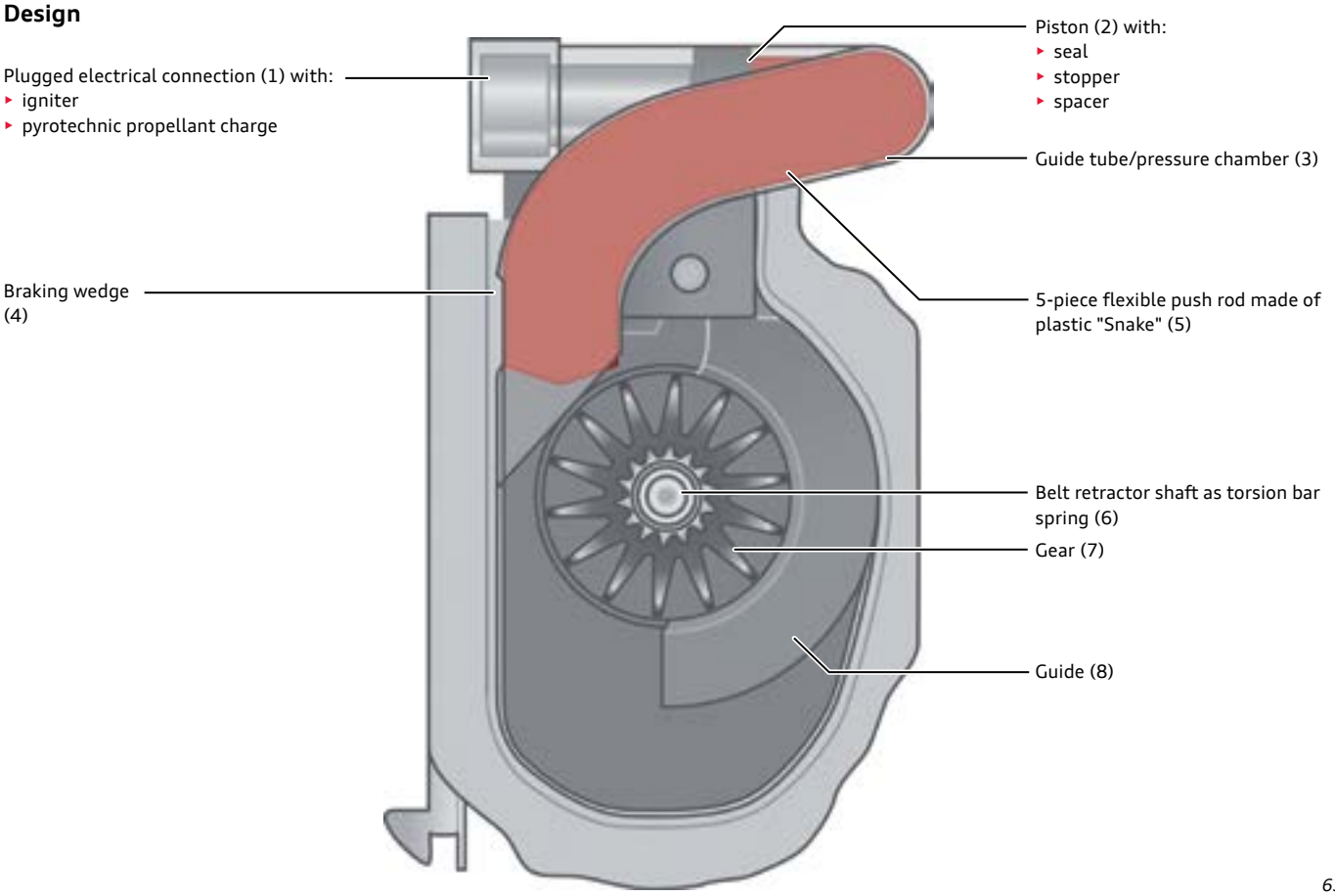
Push rod tensioner

Design

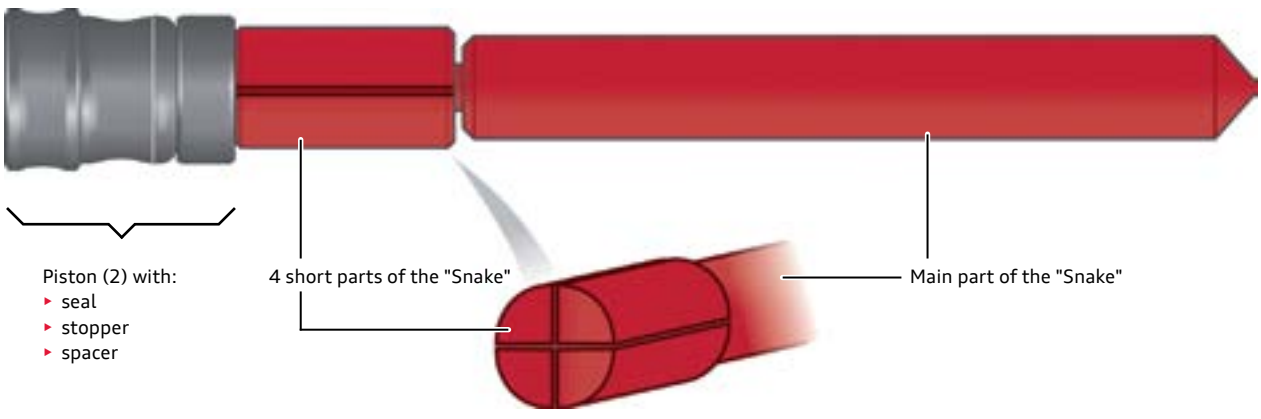


637_098

The guide tube/pressure chamber (3), accommodates the following:

- Plugged electrical connection with igniter and pyrotechnic propellant charge (1).
- 5-piece flexible push rod "Snake" (5) and "Snake" guide.
- Pressure chamber (3).
- Braking wedge (4).
- Piston (2) (including seal, stopper and spacer).

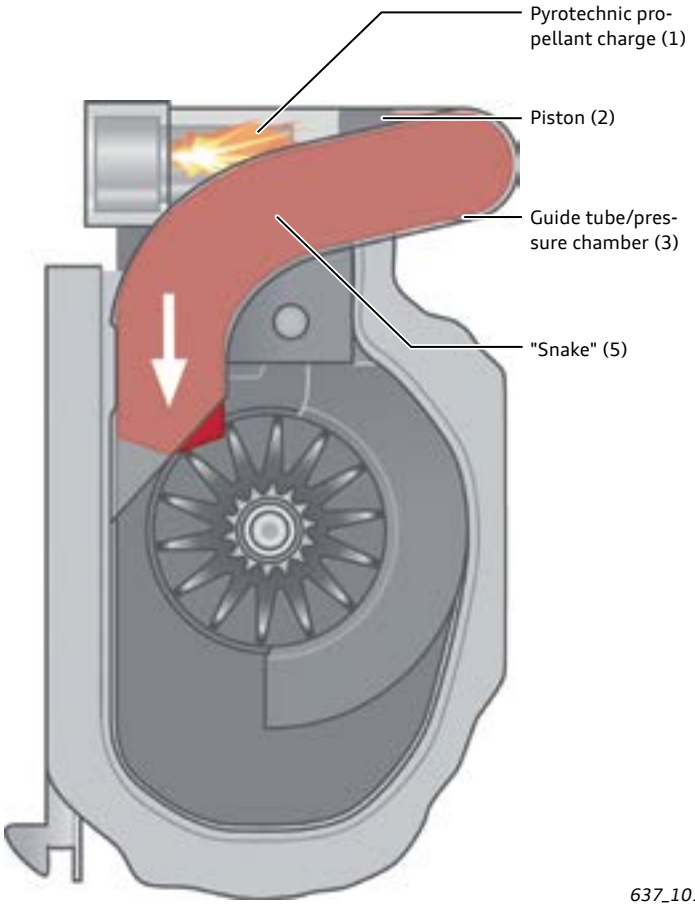
Piston (2) and push rod "Snake" (5)



637_100

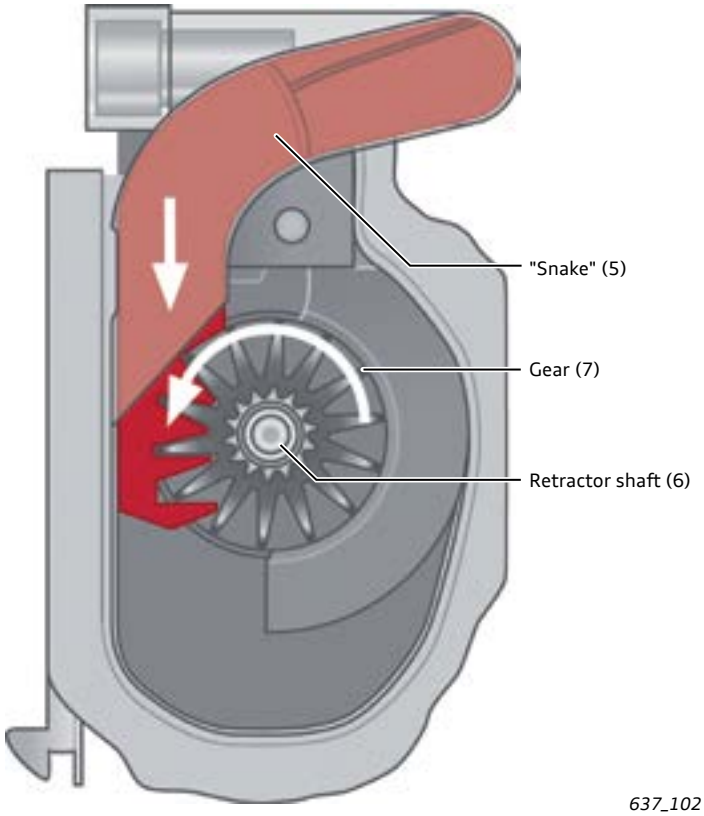
Function

When J234 instructs the safety belt to deploy, the propellant charge (1) ignites and there is a sudden rise of pressure inside the guide tube/pressure chamber (3). The pressure moves the piston (2) and the “Snake” (5) downward.



637_101

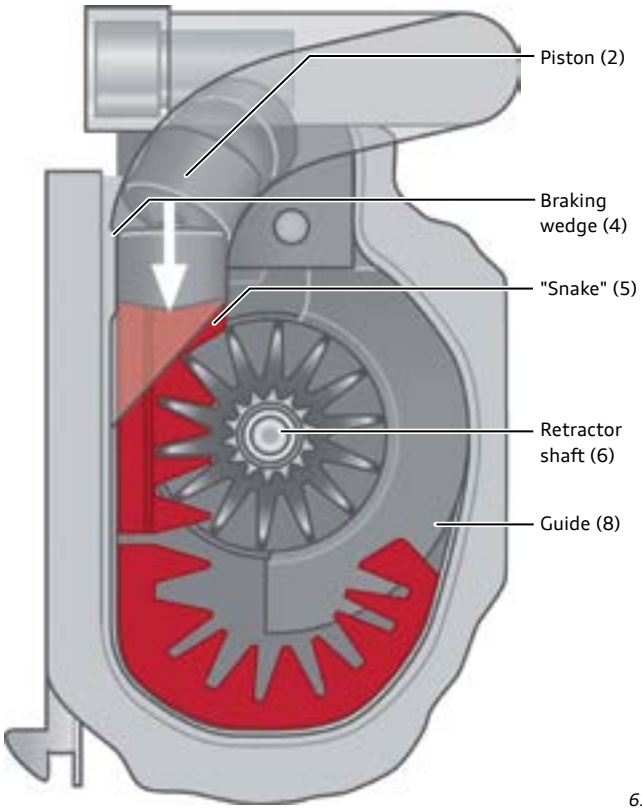
After the "Snake" (5) has moved out of the guide tube, it contacts the gear (7) which is firmly connected to the retractor shaft (6). The teeth of the gear mesh with the "Snake" due to the material characteristics and geometry of the components. The "Snake" is pushed further down and causes the gear together with the retractor shaft to rotate.



637_102

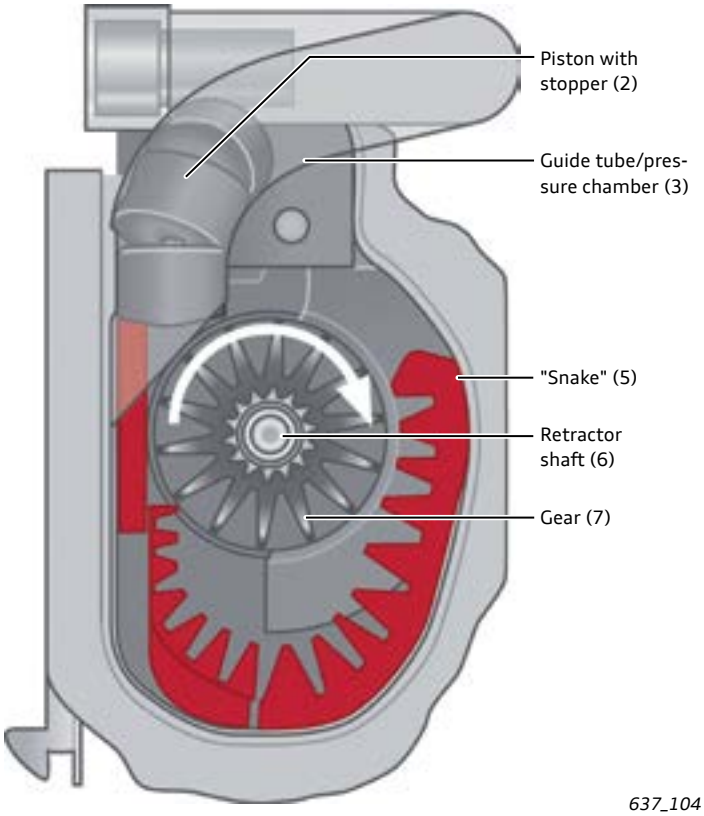
Because the safety belt is connected to the belt retractor shaft (6), the belt is retracted and tensioned.

To help ensure the belt force exerted on the occupants stays within a defined range, it is limited by the retractor shaft (6) which is a torsion bar spring. The “Snake” (5) is moved to the side by the guide (8) in a controlled manner. The distance which the piston (2) travels is limited by the stopper which moves up against the braking wedge (4).



637_103

When the stopper (2) has reached the end of its travel, the long part of the "Snake" (5) protrudes a defined distance from the guide tube/pressure chamber (3). At this point, four short parts of the "Snake" come into contact with the gear (7). Due to the five-piece design of the "Snake", the four short parts displace and push the "Snake" in such a way that the gear and the retractor shaft (6) are again free. The belt tensioning process is now complete.



637_104

Lap belt tensioner with buckle

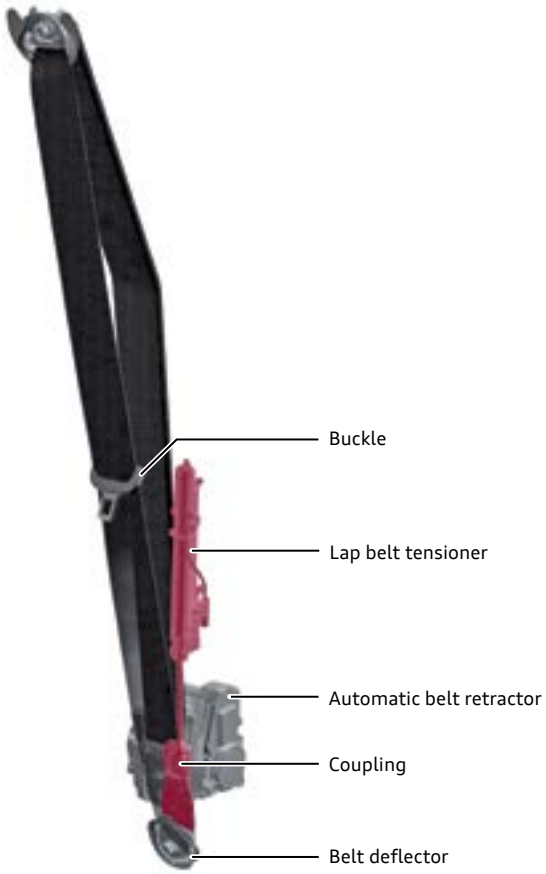
The Audi Q7 is equipped with lap belt tensioners, Driver Seat Belt Tensioner Igniter 2 N297 and Front Passenger Seat Belt Tensioner Igniter 2 N298 on the driver and front passenger sides.

When lap belt tensioners are installed, the safety belt of the automatic belt retractor has a buckle.

When the safety belt is being worn, the lap belt tensioner in combination with the buckle performs the following tasks in the event of an accident which meets the criteria for deployment:

- Separation of the force acting on the pelvis from the force acting on the thorax.
- Reduced chest compression.
- Reduced upper thigh load.
- Reduced forward displacement of the pelvis.
- Improved interfacing between the pelvis and seat.

Overview



637_044

Accident response sequence

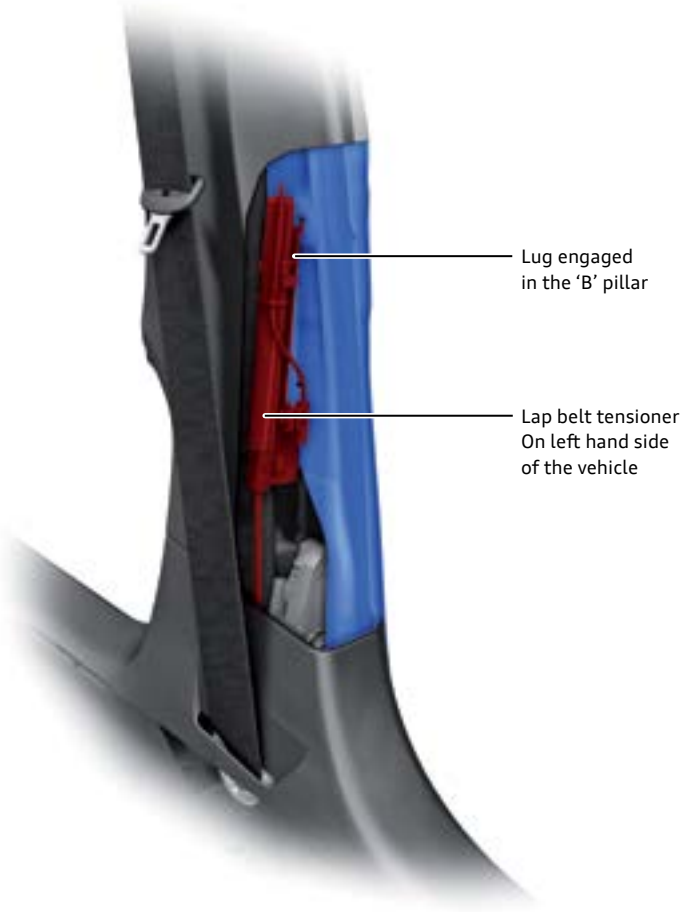
In the event of an accident meeting the criteria for deployment, the airbag control module deploys the safety belt tensioners and lap belt tensioners. The lap belt tensioner tensions the part of the safety belt between the occupant's pelvis and the buckle.

Safety belt travel

637_045

Installation location of the lap belt tensioner

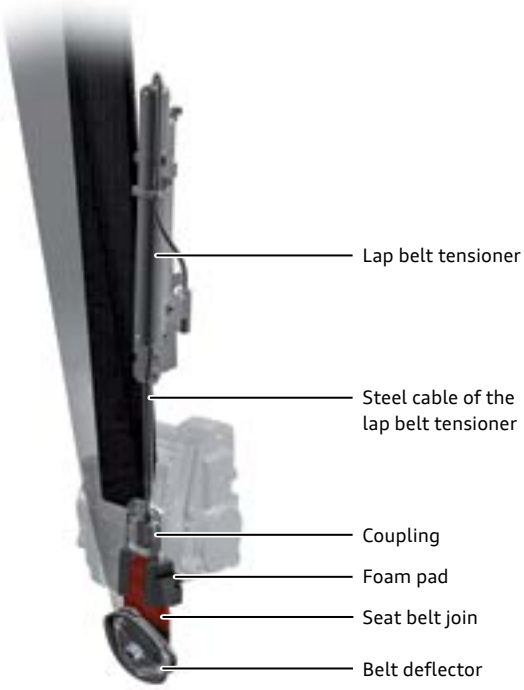
The lap belt tensioners are bolted into place on the ‘B’ pillars.



637_046

Coupling

The safety belt is deflected in the area of the ‘B’ pillar and is able to move upwards. A coupling is stitched to the end of the safety belt. The lap belt tensioner coupling is inserted into the safety belt coupling and clipped into place. To insulate against noise, a foam pad is installed in the coupling area.



637_047

Diagnostics

The lap belt tensioner is a pyrotechnic component. The safety instructions are the same as for other pyrotechnic components. The lap belt tensioner is damaged when ignited and has to be replaced as a unit.

Airbag Control Module J234 continuously monitors the lap belt tensioners for proper functioning and will enter a DTC if faults are detected.

Buckle

The difference between this safety belt buckle and a "regular" safety belt buckle is that it locks the belt in the event of an accident which matches the criteria for deployment. The result is a load path for the thorax region and a load path for the pelvic region, with all the aforementioned benefits for the occupants.

637_048

Reference

For further information about the function of the lap belt tensioner and buckle, please see eSelf-Study Program 990143, The 2015 Audi A3 Introduction.

Active safety

Audi pre-sense

Audi pre-sense is able to initiate actions that protect occupants and other road users in certain critical situations.

This is made possible by networking the various in-car systems which communicate continuously on the data bus. Other control modules are able to evaluate this data and take appropriate action.

Please note that Audi pre sense cannot prevent collisions. It serves only to assist the driver and it can reduce the severity of the collision. It should also be noted that not all objects or lane makings can be detected by the sensor or by the camera. The individual functions of Audi pre sense are described in greater detail below.

Audi pre-sense basic	PR no. 7W1
Audi pre sense city	PR no. 6K8
Audi pre-sense front	PR no. 8T3 / 8T8
Audi pre sense rear inclusive of pre sense basic	PR no. 7W3

Pre sense basic

With Audi pre sense basic, the following actions can be initiated:

- Belt slack reduction.
- Partial or full tensioning of the electrically reversible safety belt tensioners.
- Closing the panoramic glass sunroof.
- Closing the side windows.
- Switching on the emergency warning flashers.

Definition and function of belt slack reduction system for reversible safety belt tensioners

In certain situations, for example, when wearing a thick winter jacket, it may be the case that the safety belt is not tight fitting to the body after the reversible safety belt tensioners deploy. In such a case, the mechanical unreeling force of the automatic safety belt retractor is less than the force required to compress the thick winter jacket. The distance which the safety belt can travel until it fits the front occupants perfectly is referred to as "belt slack".

The safety belt is unreeled with defined force by the reversible seat belt tensioners under the following conditions. This enables any existing belt slack to be reduced.

- If the vehicle reaches a speed of about 9.3 mph (15 km/h) after starting the engine and traveling forwards.
- If the vehicle has not reached a speed of 9.3 mph (15 km/h) about 10 seconds after starting the engine and traveling forwards.

Safety belt fits rightly
(minimum belt slack)

637_004

Safety belt on "thick" clothing
(more belt slack)

637_005

System characteristics of the reversible safety belt tensioners

- After reducing safety belt slack, the seat belt is released again.
- If a safety belt is not worn, slack is not reduced for this safety belt.
- If the front passenger airbag is "off", slack is not reduced on the front passenger side.

Longitudinal dynamics function

Hazard braking

If the brake pressure reaches a defined value during a hazard braking maneuver, Audi pre sense basic initiates electrical **partial tensioning** of the reversible safety belt tensioners. A message indicating that Audi pre sense is active appears in the instrument cluster. No audible signal is given.

Emergency braking

During an emergency braking maneuver, the safety belt tensioners are either **partially** or **fully tensioned**. Depending on the situation, ABS Control Module J104 can instruct the emergency warning flashers to be activated. A distinction is made between the following two criteria for emergency braking.

- An emergency braking situation exists if ABS Control Module J104 detects that brake pressure had reached a specific value within a defined period of time. If the conditions are met, Audi pre sense basic initiates electrical **full tensioning** of the reversible safety belt tensioners. A message indicating that Audi pre sense is active appears in the instrument cluster. No audible signal is given.

System characteristics

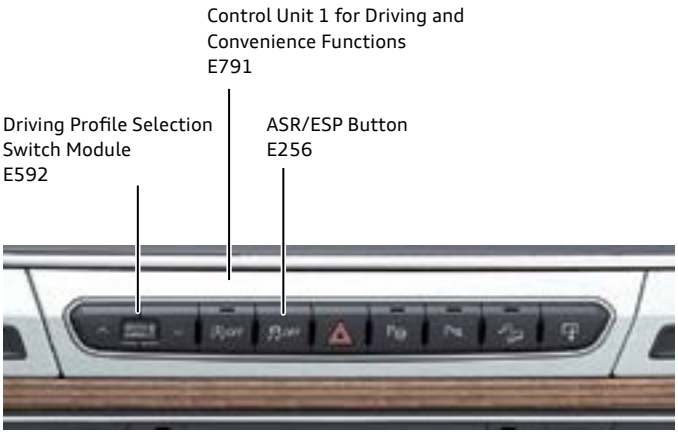
- If Electronic Stability Control (ESC) is set to "lift / offroad" of "off" using ASR/ESP Button E256, the safety belts are **not partially tensioned**.
- If Audi drive select is set to "dynamic" or "lift / offroad", the safety belts are **not partially tensioned**.
- If Audi pre sense is switched off in the MMI, the safety belts are **not partially tensioned** either.

- Reversible safety belt tensioners (J854/J855) communicate with Airbag Control Module J234 via a sub-bus system. J234 instructs the belt tensioners to reduce the belt slack.
- In the case of Audi pre sense basic, tensioning of the reversible safety belt tensioners can take place at speeds higher than18.6 mph (30.0 km/h) when the longitudinal and transverse dynamics functions are active. To activate longitudinal dynamics, the vehicle must be moving forwards.

  An exception here is the crash function in the low relative speed range (refer to page 18).

637_041

- An emergency braking situation exists if the given conditions are not met, but if ABS Control Module J104 has detected an emergency braking maneuver based on the pedal rates. If the conditions are met, Audi pre sense basic initiates electrical **partial tensioning** of the reversible safety belt tensioners. A message indicating that Audi pre sense is active appears in the instrument cluster. No audible signal is given.



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Transverse dynamics function

If the vehicle oversteers or understeers, the Electronic Stability Control (ESC) will try to stabilize the vehicle. If the vehicle becomes unstable because certain physical limits have been exceeded, J234 initiates **partial tensioning** of the electrically reversible safety belt tensioners. A message indicating that Audi pre sense is active appears in the instrument cluster. No audible signal is given.

If the vehicle can no longer be stabilized, the following actions are initiated:

- The electrically reversible safety belt tensioners are **fully tensioned**. A message indicating that Audi pre sense is active appears in the instrument cluster. No audible signal is given.
- The side windows and the panoramic glass sunroof are closed when the safety belts are fully and partially tensioned.
- When the safety belts are fully and partially tensioned, the hazard warning flashers are activated as long as the vehicle is unstable.

637_041

System characteristics

- If Audi drive select is set to "dynamic" or "lift / offroad", the safety belts are **not partially tensioned**.
- If Audi pre sense is switched off in the MMI, the safety belts are **not partially tensioned** either.
- When the vehicle is unstable, if the Electronic Stability Control is set to "lift / offroad" or "off" and if the driver actively applies the brakes, the safety belts are **fully tensioned**. A message indicating that Audi pre sense is active appears in the instrument cluster. No audible signal is given. The side windows and the panoramic glass sunroof are closed. The emergency warning flashers are activated as long as the vehicle is unstable.

Crash function in the low relative speed range

If J234 detects a head-on collision at a low relative speed[2)] and at a low rate of vehicle deceleration, the it decides situation-specifically on the basis of the control module algorithm whether to initiate electrical **full tensioning**.

If the above-mentioned conditions apply, pyrotechnic components such as the airbags do not deploy. No further actions are initiated, for example, activation of the emergency warning flashers, closing of the side windows or the panoramic glass sunroof.

[2)] The relative speed is the difference in speed between one's own vehicle and the following vehicle.

Pre sense rear

With Audi pre sense rear, the following actions can be initiated:

- RECAS warning (Rear End Collision Avoidance System).
- Inflation of the side bolsters in the seats and seat backs.
- Closing the panoramic glass sunroof.
- Closing of the side windows.
- Speed-dependent partial or full tensioning of the electrically reversible safety belt tensioners.

Audi pre-sense basic is always installed in combination with Audi pre-sense rear. Audi pre-sense rear is only possible if the vehicle has Audi side assist.

Two “mid-range” radar sensors are able to detect objects within a range of approximately 76.5 yards (70 meters) behind the vehicle. Lane Change Assistance Control Module J769 and Lane Change Assistance Control Module 2 J770 are mounted behind the rear bumper cover. Each module is combined with a radar sensor to form a unit. They communicate via a sub-bus system. In addition, J769 (master module) is connected to the Extended CAN.

Installation location

J769 is installed in the rear bumper on the right-hand side of the vehicle. 2 J770 is installed in the rear bumper on the left-hand side of the vehicle.

637_021

Function

The radar sensors continuously monitor the traffic following the vehicle whenever Audi side assist is inactive. Control modules J769 and J770 evaluate and condition the signals they receive and determine the distance to following vehicles within their detection range.

Based on the information supplied by ABS Control Module J104, the vehicle knows its own speed. The Audi side assist control modules J770 and J769 compute the speeds of the following vehicles based on this information. The following information is available to Audi pre sense rear[3)]:

- Distance to following vehicles.
- Speed of following vehicles.
- Speed of own vehicle.

If an Audi side assist control module detects a critical pre-sense rear situation, J769 sends the information to the Gateway. A critical situation is defined as one in which a following vehicle would collide with one’s own vehicle unless further action is taken by the driver of the following vehicle.

J533 forwards these signals to Airbag Control Module J234. J234 in turn decides on the basis of the information which actuators to activate and distributes the information to the different control modules.

[3)] The following vehicles must be within the detection range of the radar sensors.

Audi pre sense rear now initiates the following actions, which can be subdivided into two phases.

Phase 1

1. Initially, the indicators flash rapidly for about 3 second. This flashing cycle is known as the RECAS warning, RECAS is the abbreviation for Rear End Collision Avoidance System. Due to the high frequency at which the indicators are activated, humans see these signals as flashes of light. The flashing of the indicators alerts the drivers in following vehicles to a critical situation ahead and animates them to take appropriate action, for example, initiate braking. The time of activation of the RECAS warning depends on the severity of the critical situation and the relative speed[3] of the following vehicles. Vehicle Electrical System Control Module J519 activates the RECAS warning.

637_020

If the driver in the following vehicle reacts during this phase, for example, brakes or takes evasive action, and Audi lane assist control modules J769 and J770 no longer detect a critical situation, then no further action is taken.

Phase 2

1. If the critical situation still exists, the side windows and the panoramic glass sunroof are closed. If the vehicle is equipped with pneumatic front sport seats[2] or with individual contour seats[2] (PR no. Q1J or Q2J), the side bolsters of the seat bases and seat backs are inflated on the driver and front passenger seats.

637_105

2. Approximately 1 second after activating the side windows, the panoramic glass sunroof and inflation of the side bolsters[2] (the seat bases and seat backs), the instrument cluster indicates that Audi pre sense is active.

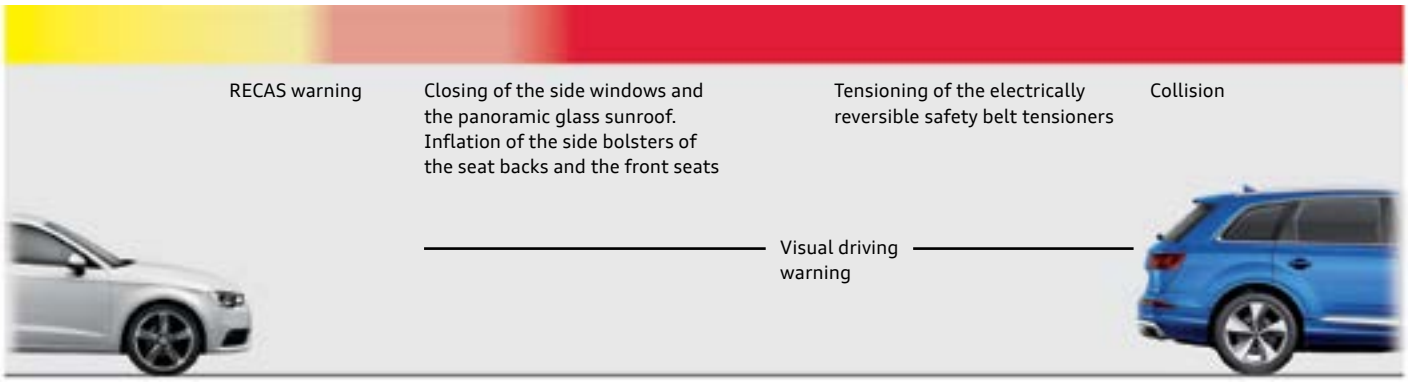
637_041

[2] Optional equipment.
[3] The relative speed is the difference in speed between one's own vehicle and the following vehicle.

3. If the vehicle is drawing closer and the danger of a rear end impact continues to increase, the front safety belts are electrically tensioned to the extent necessitated by the situation. If one's own vehicle speed exceeds a pre-defined value, the safety belts are not tensioned.

J234 signals Left and Right Front Seat Belt Tensioner Control Modules J854 and J855 to activate safety belt tightening. J854 and J855 communicate with F234 via sub-bus system.

Flowchart



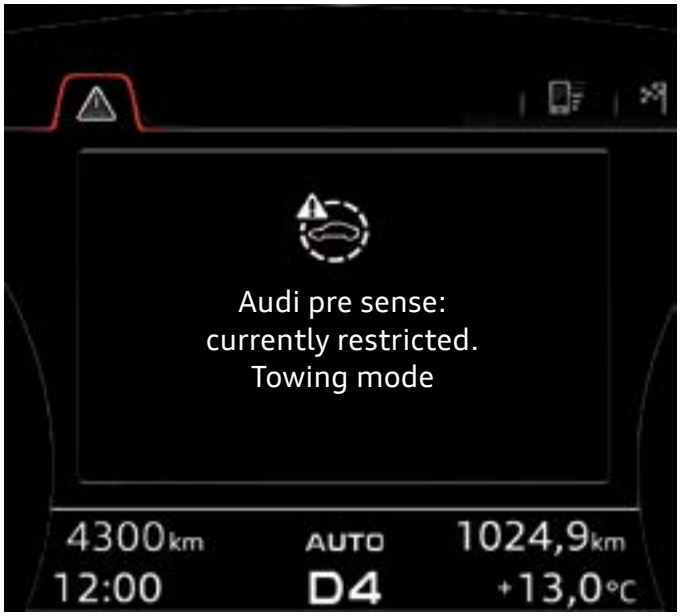
637_002

Towing mode

If a trailer is detected coupled to the vehicle using a dealer-installed tow bar, Audi pre sense rear is not active.

If a trailer is detected, the engine is running and the vehicle has reached a speed of about 4.9 mph (8.0 km/h), the 1st display appears in the instrument cluster. If pre sense city is also installed, the 1st display is followed by the 2nd.

1st display



637_042

2nd display

637_031

Note

The driver information display in Fig. 637_031 is expected to change at a later point in time in the instrument cluster.

Reference

For more information about the ACC, refer to Self-Study Program 960163, The 2017 Audi Q7 Running Gear and Suspension System. For more information about the front camera for driver assistance systems, refer to eSelf-Study Program 970263, The 2017 Audi Q7 Driver Assistance Systems.

Pre sense front

With Audi pre sense front, the following actions can be initiated:

- Audible and visual early warnings.
- Acute warning by brake jolt.
- Pre-charging of the brake system.
- Adaptation of hydraulic brake assist.
- Partial braking operations I and II[1)].
- Target braking[1)].
- Automatic emergency braking[1)].
- Turn assist[1)].
- Collision avoidance assistance.
- Switching on the emergency warning flashers[1)].

If the vehicle is equipped with Audi pre sense front, it also has the following equipment and auxiliary functions.

- ACC (Adaptive Cruise Control).
- Front camera for driver assistance systems.

ACC uses two “long range” radar sensors each combined with its own control module. The have a detection range of approximately 273.4 yards (250 meters) in front of the vehicle.

ACC unit

637_024

ACC units

The ACC units are installed under the front bumper cover. Distance Regulation Control Module J428 acts as a master control module and is connected to Distance Regulation Control Module 2 J850 via a sub-bus system.

637_023

[1)] Not available in all countries.

Function

The radar sensors continuously scan the area ahead of one's own vehicle. Audi pre sense front is active even if the ACC system is not active. J428 and J850 evaluate and conditions the signals and determine from this data the distance to vehicles within the detection range in front of the vehicle.

Based on the information supplied by ABS Control Module J104, the vehicle knows its own speed. On the basis of this information, J428 and J850 compute the speeds of the vehicles ahead. The following information is therefore known to Audi pre sense front[1)]:

- Distance to vehicles ahead.
- Speed of vehicles ahead.
- Speed of own vehicle.

Information processing

The master control unit J428 evaluates the information and transmits corresponding signals on the data bus. Other bus users receive the signals and are able to take appropriate action.

In addition, Audi pre sense front utilizes the information provided by Driver Assistance Systems Front Camera R242 (refer to Fig. 637_023 on page 22).

The classes and widths of the vehicles ahead can be determined more accurately using the additional information provided by the front camera.

Audi pre sense front only utilizes the information provided by the front camera if the light and visibility conditions are good enough. This means that in poor visibility conditions such as darkness or fog, where the front camera cannot provide reliable image data, only the data generated by the radar sensors is used for Audi pre sense front functions.

Audi pre sense front reacts only to vehicles which are traveling in the same direction and to vehicles which have stopped or are stationary. Turn assist is an exception here. If turn assist is available, the system also reacts to oncoming traffic.

Functions

Audi pre sense front has the following functions:

A	In the event of an impending collision, the driver is warned and assistance is provided by automatic braking[1)] or by boosting[1)] the braking pressure applied by the driver thereby gaining additional reaction time and reducing the vehicle's speed.
B	Turn assist - response to oncoming traffic
C	Collision avoidance assistance - response to moving, stopped or stationary vehicles

[1)] A precondition is that the following vehicles are within the detection range of the radar sensors.

Function A

When the vehicles approaches another vehicle which is moving much more slowly or is stationary, Instrument Cluster Control Module J285 issues visual and audible warnings to the driver if pre-defined limits are exceeded.

These warnings are given within a time frame ahead of the last braking opportunity for braking or collision avoidance before the actual collision occurs.

The timing of warnings depends on the driver's degree of activity. Depending on steering, pedal and turn signal inputs, the system classifies the driver as active or inactive and, consequently, as attentive or inattentive. If the driver is classed as attentive, the warning will be issued later than a warning for a driver classed as inattentive. At the same time, ABS Control Module J104 prefills the brake system and changes the deployment algorithms for hydraulic brake assist. This means that hydraulic brake assist starts to build up brake pressure even at low brake pedal actuation speeds.

If the driver does not respond to the warnings or, for example, eases off the accelerator, ABS Control Module J104 produces a warning jolt. The warning jolt is a very brief but easily noticeable braking impulse and does not serve to reduce speed. It alerts the driver to the traffic situation and indicates to the driver that he must react immediately in order to prevent an impending collision.

Depending on how attentive the driver is considered to be, the warning jolt will be produced within a time window ahead of the last opportunity to brake or take evasive action to avoid a collision. If the driver still fails to react or only eases his foot off the accelerator, the system will initiate partial braking operation I[1)], which involves applying up to 35% of maximum brake force. If Driver Assistance Systems Front Camera R242 has also detected the obstacle, partial braking operation II[1)] is initiated by applying up to 60% of maximum brake force.

637_041

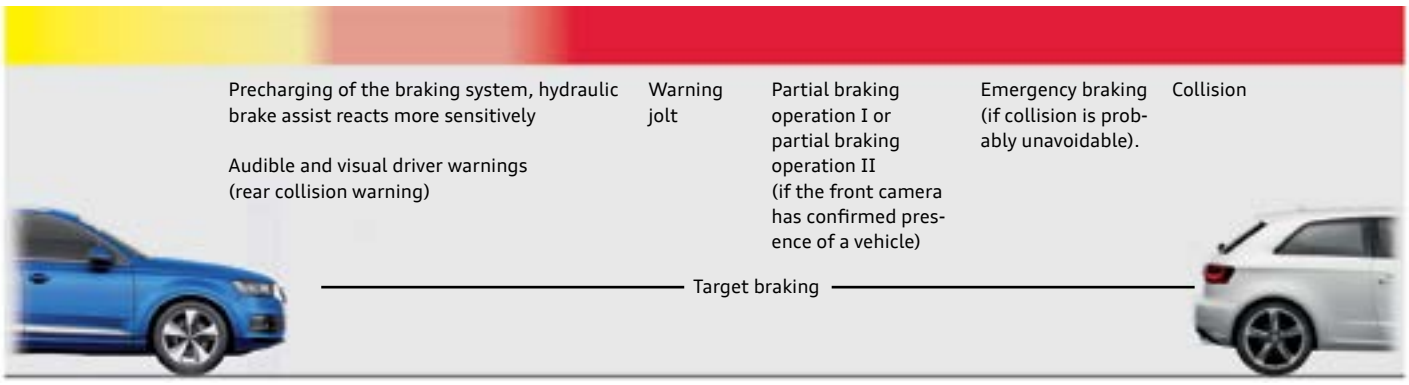
If the driver applies the brakes, a target braking maneuver may be performed in all of the phases described above (pre-charging of the brake system, reconfiguration of hydraulic brake assist, driver warning, warning jolt, partial braking operations I and II) [1)].

During the target braking maneuver, Audi pre sense front computes whether the driver is applying enough brake force to be able to avoid a collision. If this is not the case, the required brake pressure is increased depending on the situation.

If Audi pre sense front detects that an accident is likely to be unavoidable, ABS Control Module J104 can initiate automatic emergency braking[1)].

Emergency braking can be performed immediately up to a defined maximum speed or after partial braking operation II. If the vehicle has automatically brought the vehicle to a halt without driver input, further audible signals will sound. These signals alert the driver to the fact that he must actively take control of the vehicle (for example, by braking).

Flowchart

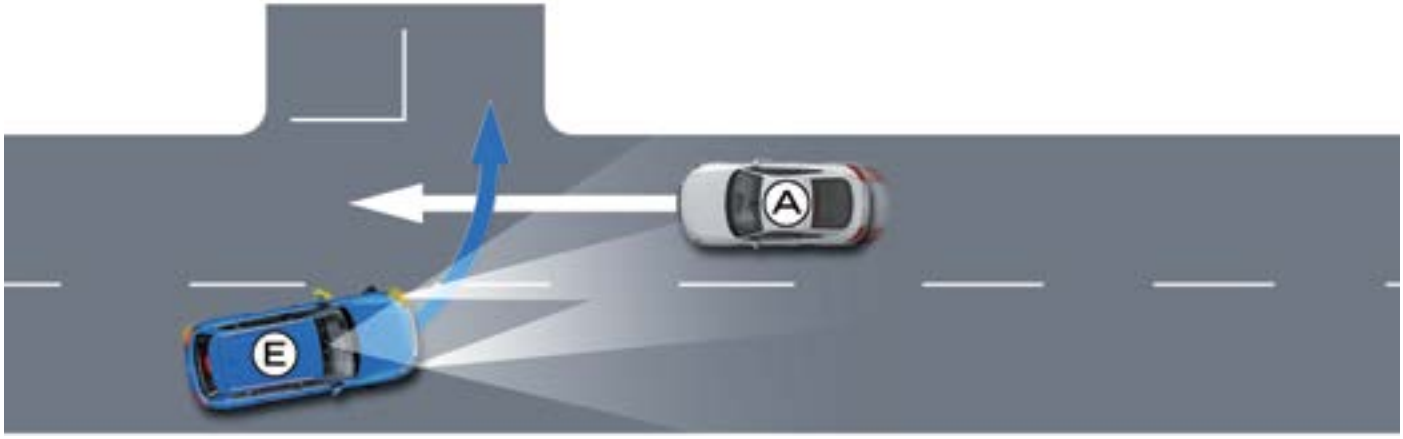


637_001

[1)] Not available in all countries.

Function B

Turning assist



637_106

The driver of vehicle (E) wants to turn right and indicates by actuating the left indicator. Vehicle (E) is travelling slower than 6.2 mph (10 km/h). Audi pre sense front continuously monitors the traffic ahead of the vehicle with the aid of ACC and the front camera. As a result, Audi pre sense front knows that another vehicle (A) is approaching in the oncoming direction.

Audi pre sense front also knows that the driver is planning to turn left (from the actuation of the indicator).

In this case, Audi pre sense front would automatically initiate emergency braking via J104 with the result that vehicle (E) is brought to a halt in its own lane. The driver is alerted visually and audibly to the fact that the vehicle is braking automatically[1)]. If the vehicle has automatically brought the vehicle to a halt without driver input, further audible signals will sound. These signals alert the driver to the fact that he must actively take control of the vehicle (for example, by braking).

If Audi pre sense detects that a critical situation would occur due to the current turning maneuver, hydraulic brake assist is reconfigured by ABS Control Module J104. In addition, the deployment algorithms for hydraulic brake assist are adjusted. This action ensures the rapid response of the brake during a braking maneuver. If the driver of vehicle (E) were now to continue the turning maneuver and move off, Audi pre sense front would detect this based on the information provided by the speed sensors of ABS Control Module J104.

637_041

System characteristics of the turn assist function

- Turn assist is available only at speeds below 6.2 mph (10 km/h).
- The indicators must be activated.
- In the case of left-hand-drive vehicles, the system only works when turning right.
- This is indicated audibly and visually.

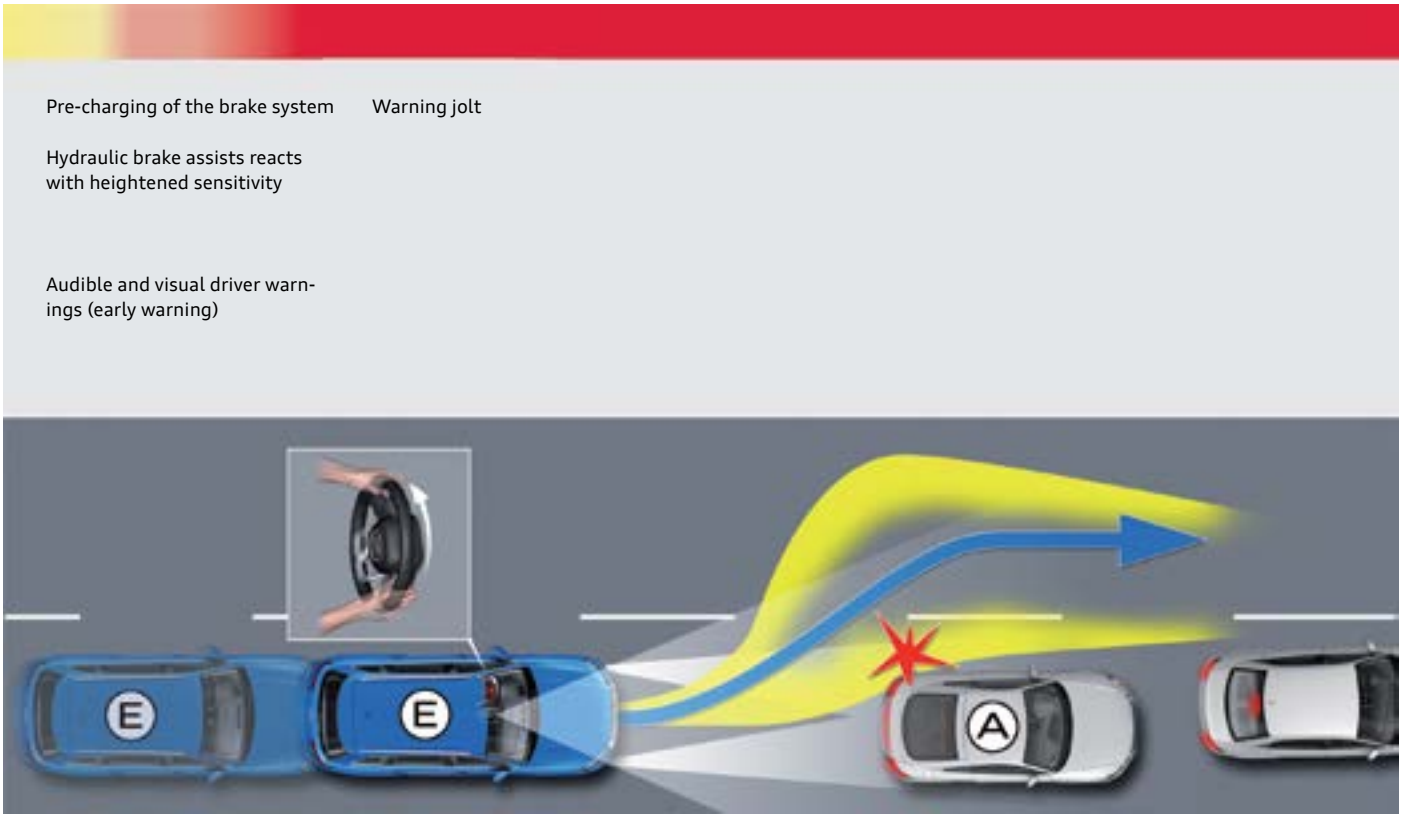
Deactivating turn assist

If Audi pre sense is switched off in the MMI, turning assist is not available. The system can be reactivated in the MMI. If the system has been shut off via the MMI, it will automatically be switched on the next time the ignition is switched on.

[1)] Not available in all countries.

Function C

Collision avoidance assistance



637_107

In the following example vehicle (E) is approaching another vehicle (A). Audi pre sense front has detected a critical situation based on the information provided by the ACC sensors or the front camera.

The following action was taken by Audi pre sense front:

- Audible and visual early warnings.
- Pre-charging of the brake system.
- Adaptation of hydraulic brake assist and the acute warning (warning jolt), refer to function **A** on page 24.

If the driver (E) takes action to evade vehicle (A) after the acute warning (brake jolt) has been given, collision avoidance assist provides assistance if needed by producing additional steering torque. Audi pre sense front computes a suitable evasion line based on various items of information, such as one's own speed and the lane in which the vehicle ahead in driving.

If vehicle (E) deviates too far from the evasion line, but is still within certain bounds, collision avoidance assistance will try to guide the vehicle along the evasion line by providing steering assistance. The aim is to help the driver steer past the obstacle. This can help to prevent loss of vehicle control while taking evasion action, provided this is within the physical limitations of the system.

System characteristics of the collision assistance function

- Collision avoidance assistance does not provide steering assistance unless the driver is actively steering the vehicle.
- It is available at speeds of between about 18.6 - 93.2 mph (30 -150 km/h).
- Helps the driver to steer around an obstacle on the left or right.

Deactivating collision avoidance

If Audi pre sense is switched off in the MMI, collision avoidance assistance is not available. The system can be reactivated in the MMI.

Depending on country version[1)], a deactivated Audi pre sense system is automatically re-activated when the ignition is turned off and on again.

Other functions

If the vehicle is also equipped pre sense basic or pre sense rear in addition to Audi pre sense front, the following action can also be taken in critical situations:

- Closing the side windows.
- Closing the panoramic glass sunroof.
- Inflation of the side bolsters in the seats and seat backs[2)].
- Tensioning of the electrically reversible safety belt tensioners.

Driver prioritisation over system

If the driver takes clear evasive action, accelerates or brakes during the individual phases of Audi pre sense front functions, the momentary actions of Audi pre sense front (for example, partial braking operation I) will be suppressed or cancelled.

Collision avoidance assistance is an exception here. If the driver takes clear evasive action after a warning jolt, the system can guide the driver along the computed evasion line by providing helpful steering inputs. In this case, the assistance is not cancelled by a clear evasive action.

Effect of system settings on Audi pre sense front functions

- If Audi pre sense is deactivated, the functions of Audi pre sense front are also deactivated.
- If ESC is set to "offroad" or "off", certain functions of Audi pre sense front are deactivated.
- If downhill assist is activated, certain functions of Audi pre sense front are deactivated.

[1)] Not available in all countries.
[2)] Optional equipment.

Pre sense city

With Audi pre sense city, the following actions can be initiated:

- Audible and visual early warnings.
- Acute warning by brake jolt.
- Pre-charging of the brake system.
- Reconfiguration (alteration of the parameters) of hydraulic brake assist.
- Automatic braking up to emergency braking intensity.
- Activation of the hazard warning flashers (emergency braking warning)[1].

Response to vehicles

637_025

Response to pedestrians

637_026

Audi pre sense city is a "camera based" system. To use Audi pre sense city, therefore, Driver Assistance Systems Front Camera R242 must be installed. The front camera continuously monitors the traffic ahead of the vehicle. Among other things, it makes allowance for the distance to and speed of other objects relative to one's own vehicle.

Depending on the severity of the critical driving situations, Audi pre sense city can warn the driver first and then, if necessary, initiate braking. The system can, under certain conditions, detect the following scenarios:

- Vehicle ahead.
- Pedestrians standing in the same lane or approaching the same lane as the vehicle.

Response to vehicles

The following preconditions must be met in order to activate the system:

- pre sense city can respond to vehicles which are travelling in the same direction and which have stopped or are stationary.
- pre sense city does not respond to crossing or oncoming traffic.
- pre sense city is active upwards of a speed of about 6.2 mph (10 km/h).
- pre sense city can warn against vehicles up to a speed of 155.3 mph (250 km/h).
- pre sense city can initiate braking up to a speed of 52.8 mph (85 km/h).

Collision warning phase

If the vehicle approaches another vehicle which is traveling in the same direction (up to a speed of 155.3 mph [250 km/h]) or has stopped, resulting in a critical driving situation, the instrument cluster gives the driver audible and visual early warnings when set limits are exceeded.

637_041

[1] Not available in all countries.

Warnings against a possible collision

These warnings are given within a certain time frame ahead of the last braking opportunity for braking or collision avoidance before the actual collision occurs. The timing of warnings depends on the driver's degree of activity. Depending on steering, pedal and turn signal inputs, the system classifies the driver as active or inactive and, consequently, as attentive or inattentive. If the driver is classed as attentive, the warning will be issued later than a warning for a driver classed as inattentive.

At the same time, ABS Control Module J104 prefills the brake system and modifies the deployment algorithms for hydraulic brake assist. This means that hydraulic brake assist starts to build up brake pressure even at low brake pedal actuation speeds.

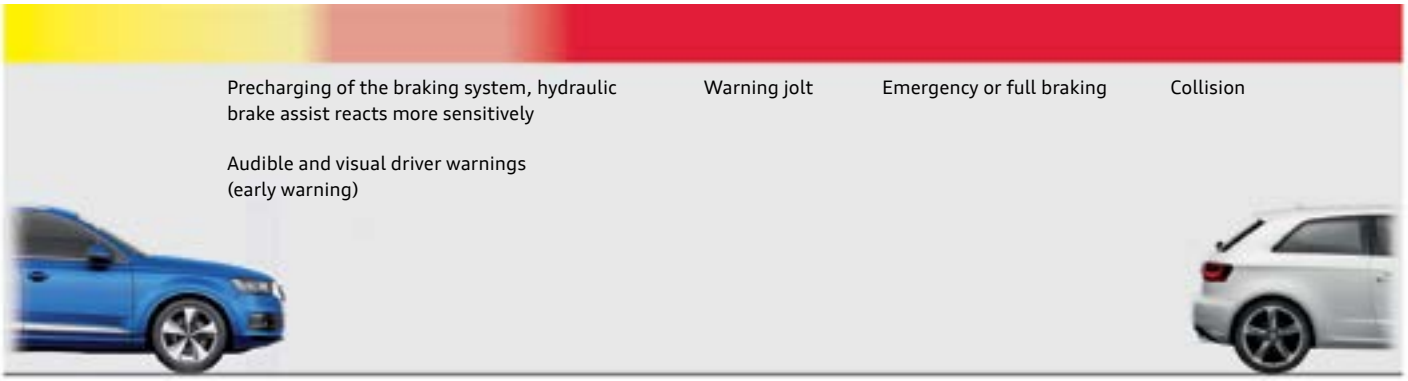
If driver does not respond to the warnings, however, J104 generates an acute warning by jolting the brakes. The warning jolt is a very brief but easily noticeable braking impulse which does not serve to slow the vehicle down. It alerts the driver to the traffic situation and indicates to the driver that he must react immediately in order to prevent an impending collision. Depending on how attentive the driver is considered to be, the warning jolt will be produced within a certain time window ahead of the last opportunity to brake or take evasive action to avoid a collision.

Braking intervention phase

If the driver does not respond to the warning jolt, J104 will automatically initiate braking. If the vehicle automatically comes to a halt without driver input, further audible signals will sound.

These signals alert the driver to the fact that he must actively take control of the vehicle (for example, by applying braking). If the driver fails to take control of the vehicle, the system will release the brake and the vehicle will start to move.

Flowchart



637_001

Response to pedestrians

The following preconditions must be met in order to activate the system:

- pre sense city responds to pedestrians who are standing in the same lane as the vehicle or moving towards same lane as the vehicle.
- pre sense city is active upwards of a speed of about 6.2 mph (10 km/h).

Collision warning phase

If the vehicle is traveling at a speed of about 6.2 mph (10 km/h) and a pedestrian crosses the lane in front of the vehicle or is standing in the same lane as the vehicle creating a critical driving situation, the instrument cluster issues audible and visual advanced warnings to the driver.

- pre sense city can warn against pedestrians up to a speed of 52.8 mph (85 km/h).
- pre sense city can initiate braking up to a speed of 52.8 mph (85 km/h).

637_041

Warnings against a possible collision

These warnings are given within a certain time frame ahead of the last braking opportunity for braking or collision avoidance before the actual collision occurs. The timing of warnings depends on the driver's degree of activity. Depending on steering, pedal and turn signal inputs, the system classifies the driver as active or inactive and, consequently, as attentive or inattentive.

If the driver is classed as attentive, the warning will be issued later than a warning for a driver classed as inattentive. At the same time, ABS Control Module J104 prefills the brake system and modifies the deployment algorithms for hydraulic brake assist. This means that hydraulic brake assist starts to build up brake pressure even at low brake pedal actuation speeds.

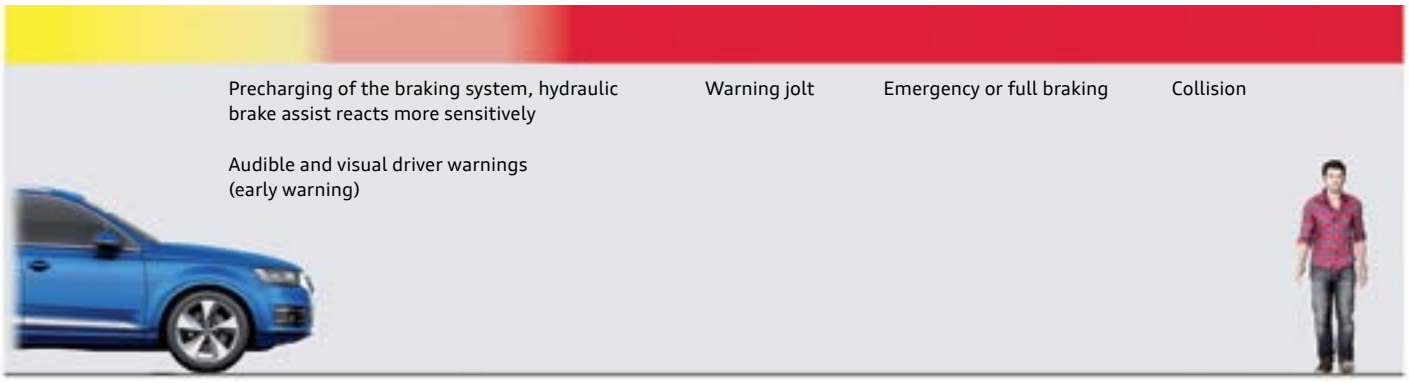
If driver does not respond to the warnings, however, J104 generates an acute warning by jolting the brakes. The warning jolt is a very brief but easily noticeable braking impulse which does not serve to slow the vehicle down. It alerts the driver to the traffic situation and indicates to the driver that he must react immediately in order to prevent an impending collision. Depending on how attentive the driver is considered to be, the warning jolt will be produced within a certain time window ahead of the last opportunity to brake or take evasive action to avoid a collision.

Braking intervention phase

If the driver does not respond to the warning jolt, ABS Control Module J104 will automatically initiate emergency braking. Maximum braking pressure is applied. If the vehicle automatically comes to a halt without driver input, further audible signals will sound.

These signals alert the driver to the fact that he must actively take control of the vehicle (for example, by applying braking). If the driver fails to take control of the vehicle for example, in a model with automatic transmission, the system will release the brake and the vehicle will start to move.

Flowchart



637_064

Towing mode

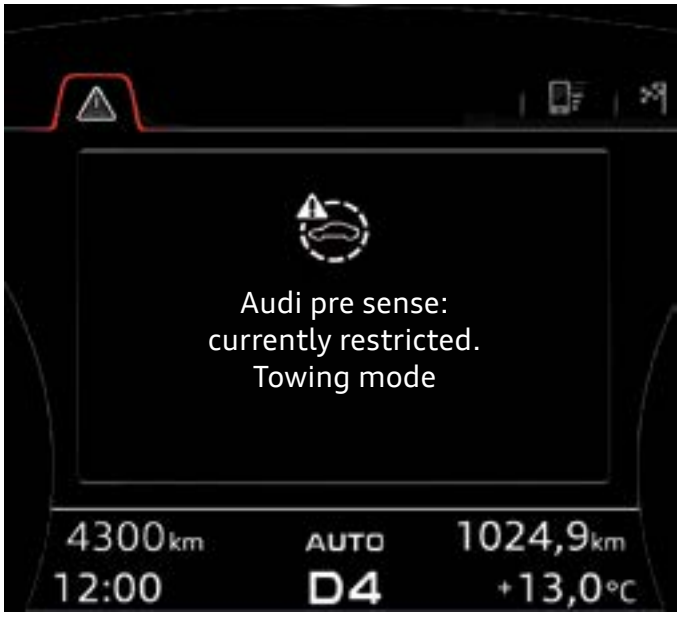
If a trailer is coupled to the dealer installed tow bar, Audi pre sense city will only be available to a limited extent or will be unavailable.

If a trailer is detected, the engine is running and the vehicle has reached a speed of about 3.1 mph (5 km/h), the 1st display appears in the instrument cluster. If pre sense rear is also installed, the 2nd display appears before the 1st display.

1st display

637_031

2nd display



637_042

Note
The driver information display in Fig. 637_031 is expected to change at a later point in time.

System characteristics

- If an emergency braking maneuver is initiated by the vehicle, pre sense city can help reduce the vehicle's speed by up to 24.8 mph (40 km/h).
- Depending on the situation, ABS Control Module J104 can instruct the hazard warning flashers (emergency braking warning)[1] to be activated.

Driver prioritization over system

If the driver takes clear evasive action or brakes during the collision warning or braking intervention phases of pre sense city actions, the current actions of Audi pre sense city (for example, early warning) will be suppressed or cancelled. If the obstacle is no longer relevant after this, Audi pre sense city will cancel assistance in this case.

Effect on Audi pre sense city functions

- If Audi pre sense is switched off in the MMI, the functions of Audi pre sense city are also deactivated.
- If ESC is has "restricted" functionality or is "switched off", certain functions Audi pre sense city will only be available to a limited extent or will be unavailable.
- If the functionality of Driver Assistance Systems Front Camera R42 is restricted due to bad visibility or light conditions such as darkness or fog, Audi pre sense city will only be available to a limited extent or will be unavailable.
- Depending on the selected mode of the Audi drive select setting, Audi pre sense city will only be available to a limited extent or will be unavailable.
- If a trailer is coupled to the vehicle via a factory fitted tow bar, Audi pre sense city will only be available to a limited extent or will be unavailable.
- If driver is not wearing a seat belt, certain functions Audi pre sense city will only be available to a limited extent or will be unavailable.
- Audi pre sense city is unavailable up to 10 seconds after turning off the ignition.

[1] Not available in all countries.

Settings and displays

Displays in the instrument cluster

Two different instrument clusters are available for the Audi Q7 depending on the model: there is the conventional analog display and the optional Audi virtual cockpit.

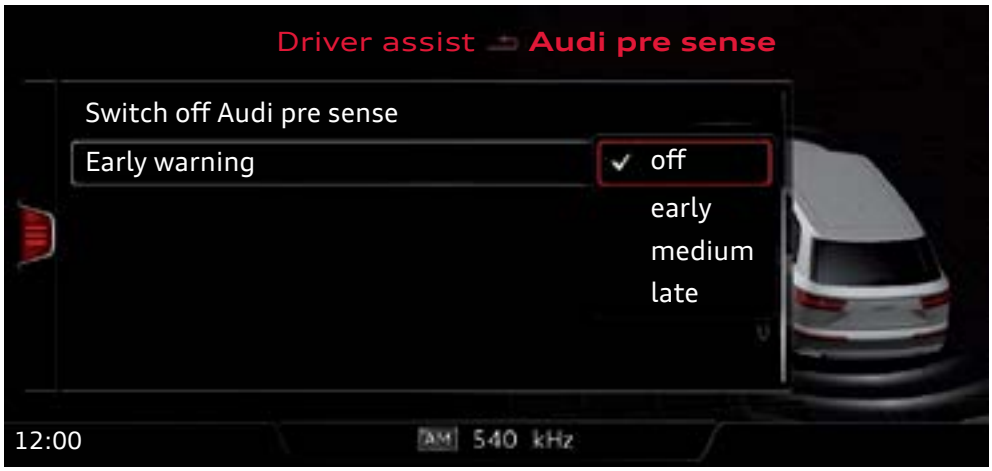
The displays differ depending on equipment level. The displays in the section of this eSelf-Study Program for Audi pre-sense are from a system with an analog display on a vehicle with ACC, MMI and MMI Navigation plus.

Setting and switching off the early warning

The early warning function of Audi pre sense city and pre sense front can be set and switched off in the MMI. The following setting options are available:

off	The audible and visual early warning is off.
early	The audible and visual early warning is adjusted to early.
medium	The audible and visual early warning is adjusted to medium.
late	The audible and visual early warning is adjusted to late.

Settings in the CAR menu



637_027

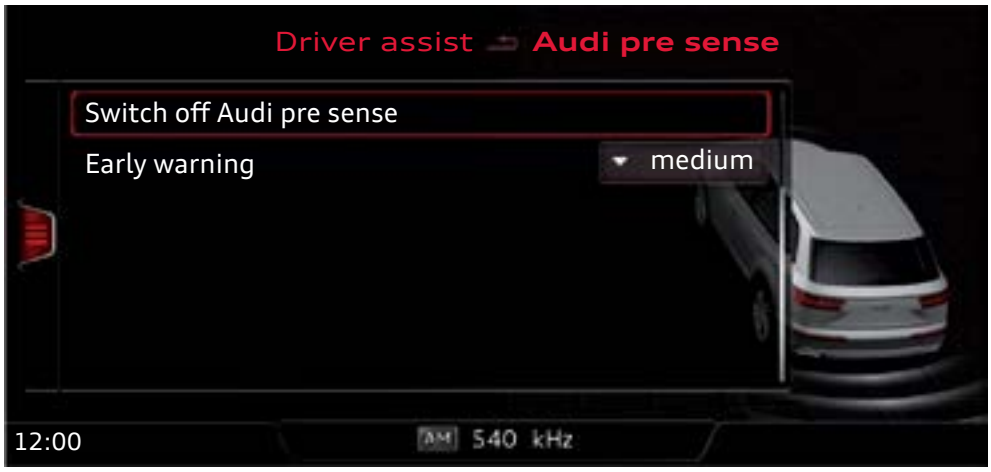
- The settings for the "early" "medium" or "late" early warning are active until another selection is made in the MMI.
- If the early warning has been set to "off", the early warning is switched on again after turning the ignition back on. The "late" setting is activated by the system. This system setting can change at a later date to the extent that the system activates the value used before the early warning was switched off.

Switching off Audi pre sense

Audi pre sense can be switched off in the MMI. Specific functions of the overall system are deactivated. This means that no individual functions of Audi pre sense can be deactivated:

The effect of switching off Audi pre sense on the individual pre sense functions is explained in the relevant sections of this eSelf-Study Program.

Display in the MMI



637_028

Displays when function is deactivated

If the vehicle is equipped with pre sense basic, pre sense rear or pre sense front, the 1st display will appear in the instrument cluster when the driver switches Audi pre sense off. If the vehicle is only equipped with pre sense city, the 2nd display appears.

If the vehicle is equipped with pre sense city and a further pre sense function, such as pre sense basic, both displays are shown one after the other. The messages are stored in the tab for driver information and warning lamps and can be retrieved.

1st display

637_030

2nd display

637_031

Note

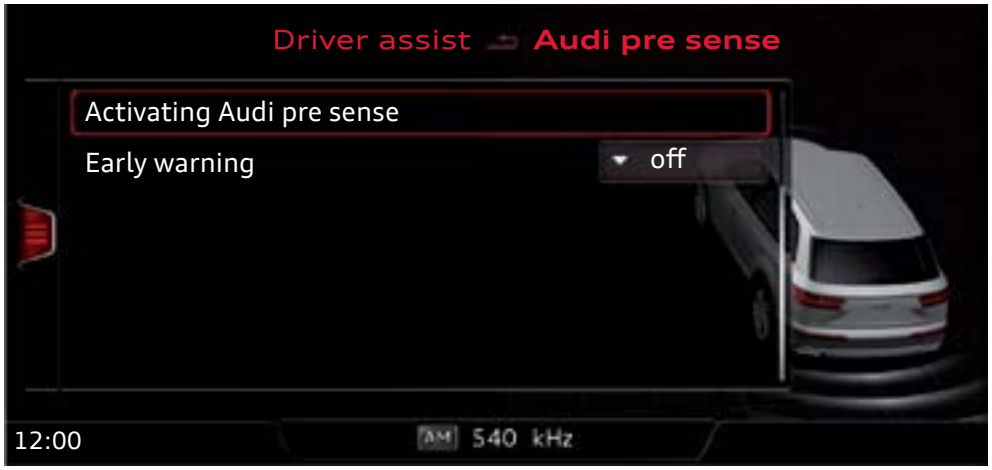
The driver information display in Fig. 637_031 is expected to change at a later point in time in the instrument cluster.

Activating Audi pre sense

If Audi pre sense is off, it can be re-activated in the MMI. All functions of Audi pre sense are re-activated.

If the ignition is turned off and on again, Audi pre sense is automatically re-activated if off.

Settings in the CAR menu

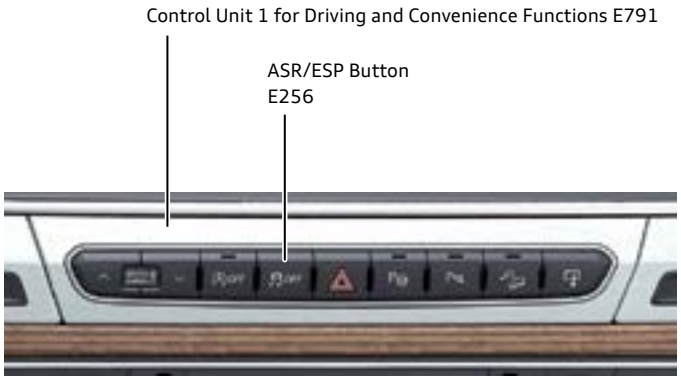


637_029

Effect of Electronic Stability Control (ESC) on Audi pre sense

ESC offroad

If ESC is set to "offroad" using ASR/ESP Button E256, the various functions of Audi pre sense will be restricted.



637_019

Displays

When ESC is set to "offroad" mode, the following two messages are successively displayed to the driver in the instrument cluster for about 5 seconds in each case.

The messages are stored in the tab for driver information and warning lamps and can be retrieved.

1st display

637_032

2nd display

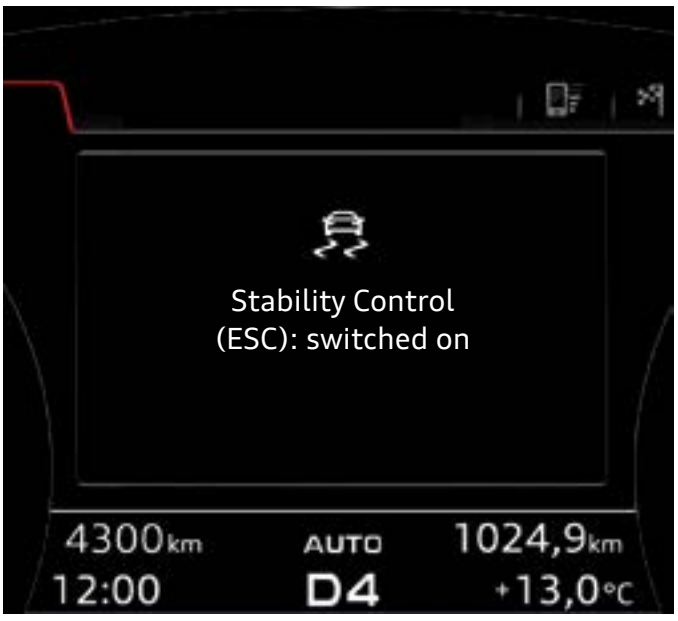
637_033

Limitations

The functions of Audi pre sense are restricted until the following conditions are met:

- The ESC mode "offroad" is deactivated using the ASR/ ESP Button E256.
- The ignition is turned off and on again because ESC is re-activated when the ignition is turned on.
- ACC is activated which would lead to the automatic activation of ESC.

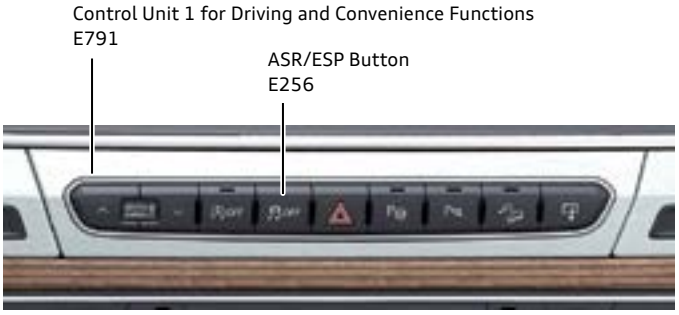
If ESC is switched on again using E256, the adjacent message is displayed in the instrument cluster.



637_034

ESC off

If ESC is set to "off" using ASR/ESP Button E256, the various functions of Audi pre sense will be limited.



637_019

If the ESC is set to "off" mode with pre sense basic, pre sense rear or pre sense front, the first two displays appear in the instrument cluster for about 5 seconds. If the vehicle is only equipped with pre sense city, the 1st and 3rd displays appear.

1st display

637_035

If the vehicle is equipped with pre sense city and a further pre sense function such as pre sense basic, the three displays are shown one after the other. The messages are stored in the tab for driver information and warning lamps and can be retrieved.

2nd display

637_036

3rd display

637_037

Note

The display for the driver information in Fig. 637_037 will change in the instrument cluster at a later point in time.

Limitations

The functions of Audi pre sense are restricted until the following conditions are met:

- The ESC mode "offroad" is deactivated using the ASR/ ESP Button E256.
- The ignition is turned off and on again because ESC is re-activated when the ignition is turned on.
- ACC is activated as this would lead to the automatic activation of ESC.

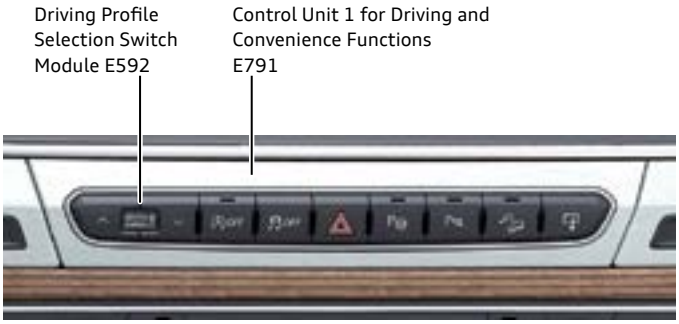
If ESC is switched on again using E256, the adjacent message is displayed in the instrument cluster.

637_038

Effect of Audi drive select settings on Audi pre sense

Audi drive select lift / offroad

If the vehicle is equipped with adaptive air suspension, and Audi drive select is set to "lift / offroad" in the MMI or with Driving Profile Selection Switch Module E592, the availability of the various Audi pre sense functions will be limited.



637_019

Display in "lift / offroad" mode

The Audi drive select "lift / offroad" mode is active until it is deactivated.

Settings of Audi drive select

637_039

Display in instrument cluster

If Audi drive select is set to "lift / offroad", the adjacent message is displayed to the driver for about 5 seconds in the instrument cluster.

The message is stored in the tab for driver information and warning lamps and can be retrieved.

637_040

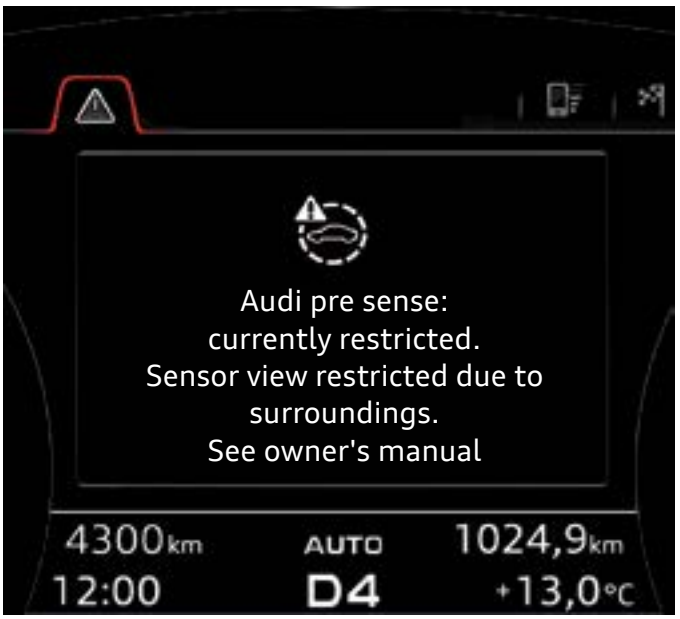
OFFROAD logo

Displays

The following messages are available for Audi pre sense. The warnings and messages are displayed for about five seconds.

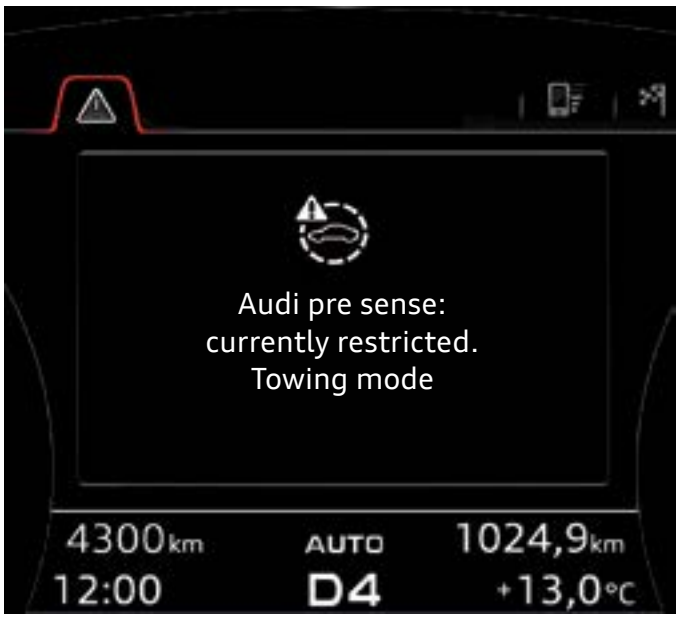
637_041

This warning is displayed if Audi pre sense has detected a critical situation (early warning) or is active. In addition, Audi pre sense city and pre sense front generate an audible signal. No audible signal sounds in the case of Audi pre sense basic and pre sense rear.



637_042

This driver information is displayed if radar sensor or camera visibility are impaired, for example, by leaves, snow, heavy spray or dirt. An audible signal also sounds.



637_042

This driver information is displayed if a dealer installed trailer socket is connected to a trailer. In this case, the functions of Audi pre sense rear and the braking intervention function of Audi pre sense city are deactivated. An audible signal also sounds.

637_042

This driver information is displayed if functions of Audi pre sense are impaired. This problem can be caused by, for example, a faulty sensor. An audible signal also sounds.

637_042

This driver information is displayed if the sub-system has temporarily failed. This subsystem could for example be ESC. An audible signal also sounds.

637_042

This driver message is displayed if the following conditions are met:

- Audi pre sense was switched off in the MMI or is not ready.
- The "lift / offroad" mode was set with Audi drive select.
- ESC was set to "offroad" or "off" with ASR/ESP Button E256.

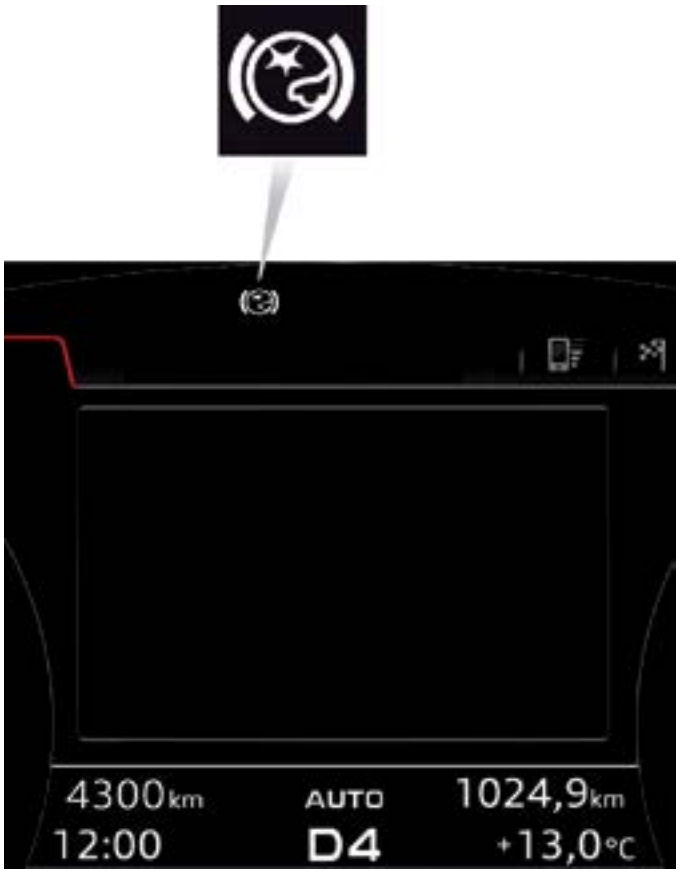
If Audi pre sense city is installed and at least one of the following conditions applies, the adjacent driver message is displayed:

- Audi pre sense deactivated in MMI or not ready.
- ESC was switched off.
- No trailer was detected.

637_037

Note
The display for the driver information in Fig. 637_037 will probably change in the instrument cluster at a later point in time.

This driver information is displayed for about 10 seconds after turning on the ignition because pre sense city is unavailable during this time. The reason is that the Driver Assistance Systems Front Camera R242 is required for about 10 seconds until the camera is ready.



637_076

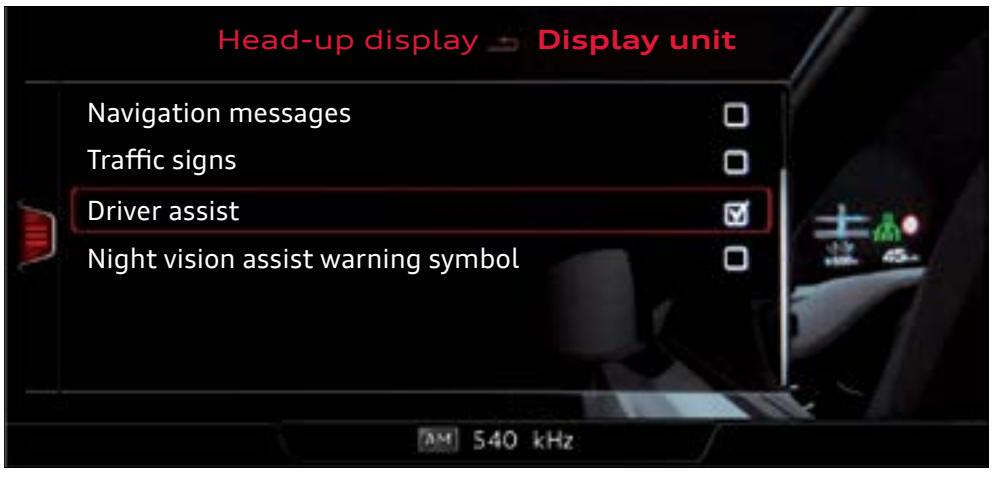
Head-up displays

In the MMI, the driver can select whether the pre sense early warning or pre sense actions are to be shown on the head-up display.

If the "Driver assist" option is activated in the CAR Menu in the MMI under "Head-up display"[1] and "Display content", pre sense early warnings and inputs will also be shown on the head-up display.

637_113

Settings in the CAR menu



637_084

[1] Optional equipment.

Infotainment

The infotainment systems of the Audi Q7 have been completely revised compared to the previous model. The Audi Q7 features a new operating concept first rolled out in the Audi TT.

Overview of versions

Two versions of the MMI are available on the Audi Q7:

- MMI Radio plus.
- MMI Navigation plus.

From a technical point of view, MMI Radio plus is identical to the second-generation MIB Standard.

MMI Navigation plus is a second-generation MIB High system.

MMI Radio plus (I8E)	MMI Navigation plus (I8H)
	
	
Standard equipment	
7.0“ TFT color monitor with 800 x 480 pixel resolution	8.3“ TFT color monitor with 1024 x 480 pixel resolution
Without navigation (7Q0)	3D SSD navigation system (7UG)
Operating unit (UJ0)	MMI touch (UJ1)
7“ display in the instrument cluster with driver information system (9S7)	7“ display in the instrument cluster with driver information system (9S7)
AM/FM radio with phase diversity	AM/FM radio with phase diversity and background tuner
	Jukebox (approx. 11 GB)
CD drive (MP3, WMA, AAC)	DVD drive (audio/video)
1 SDXC card readers	2 SDXC card readers
Audi music interface with 2 USB ports and AUX-in jack (UE7)	Audi music interface with 2 USB ports and AUX-in jack (UE7)
Audi sound system (9VD)	Audi sound system (9VD)
Bluetooth interface (9ZX)	Bluetooth interface (9ZX)
	UMTS/LTE data module (EL3)
	Audi connect (IW3)
Digital radio SDARS (QV3)	Digital radio SDARS (QV3)
Optional equipment	
Provision for Rear Seat Entertainment 9WQ	Provision for Rear Seat Entertainment 9WQ
	Bose Sound System with 3D sound (9VS)
	Bang & Olufsen Advanced Sound System with 3D sound (8RF)
	Audi virtual cockpit (9S8)

Reference
For further information about the infotainment system in the Audi Q7, refer to eSelf Study Program 970143 Modular Infotainment Platform (MIB).

MMI Radio plus

MMI Radio plus has the following features:

- Audi music interface with 2 fully functional USB data connections (UE7).
- Bluetooth interface for HFP and A2DP .
- Speech dialogue system.
- Internal audio amplifier for Audi sound system rated at 195 watts (9VD).

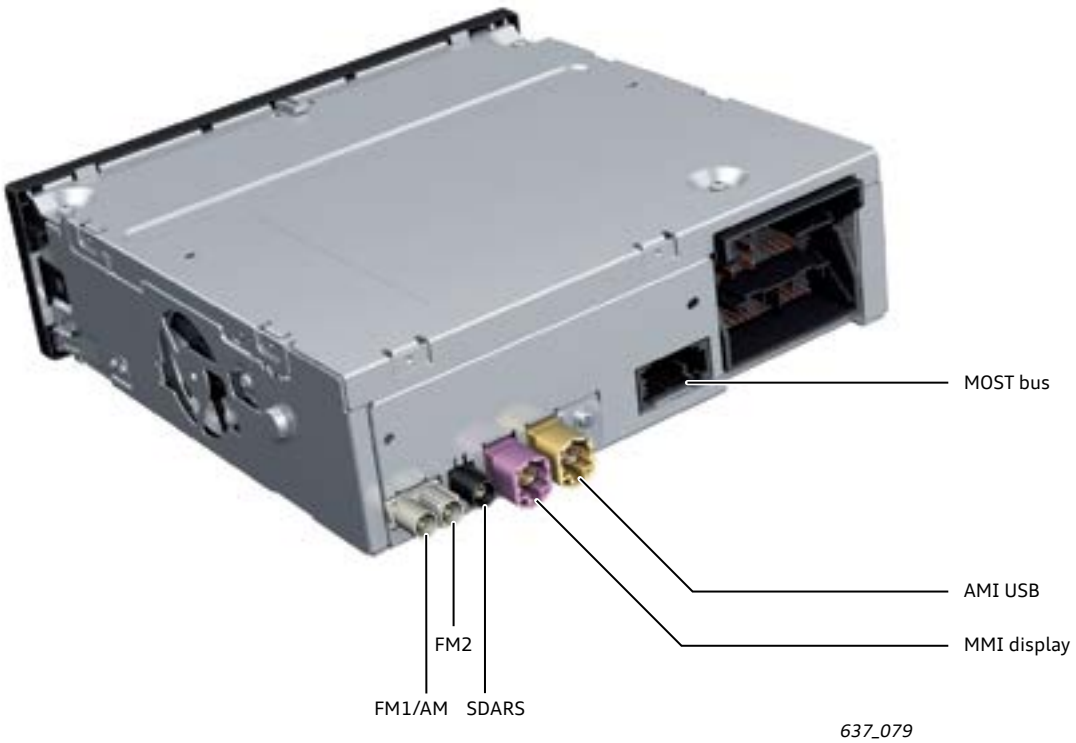
In addition, it may have the following options:

- External audio amplifier for Bose Sound System with 3D sound and 558 watts power output (9VS).
- SDARS tuner (NAR spec digital radio) (QV3).

If the vehicle has the PR numbers "I8E" plus "7Q0", MMI Radio plus is installed.

Display for MMI Radio plus *637_057*

J794 for MMI Radio plus *637_053*



Back panel of J794 for MMI Radio plus

MMI Navigation plus

Features of MMI Navigation plus include:

- Radio with phase diversity, FM dual tuner (very high frequency) and AM tuner (medium wave).
- Single DVD drive for audio and video files.
- 2 SDXC card readers for audio and video files.
- SSD drive (approx. 64 GB).
- Jukebox (approx. 11 GB).
- 3D navigation with navigation data on solid-state drive.
- Internal audio amplifier for Audi sound system rated at 195 watts (9VD).
- Audi music interface with 2 USB data ports and AUX-IN jack (UE7).
- Car menu.
- Bluetooth interface for HFP and A2DP.
- Premium interactive voice control system.
- Provision of predictive route data.
- Image output with 1024 x 480 and 1440 x 520 pixels.
- MMI touch.
- Mobile data module (UMTS/LTE).
- High-speed Wi-Fi module (up to 150 Mbit/s).

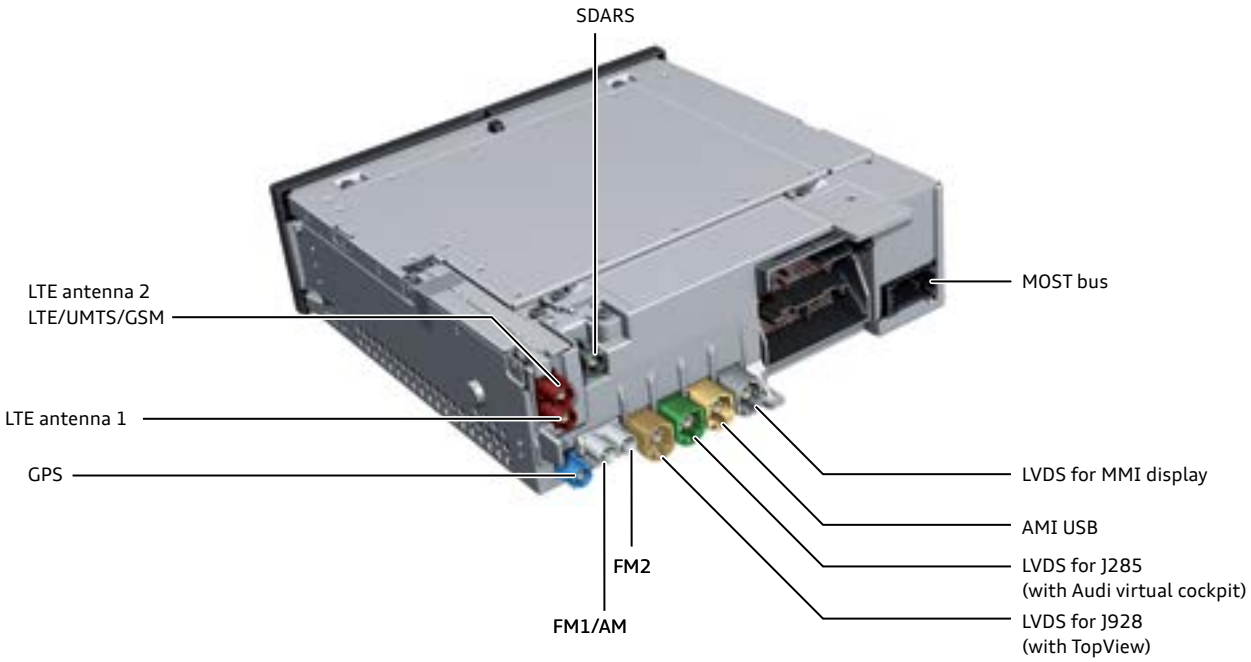
MMI Navigation plus display *637_058*

J794 for MIB Navigation plus with Audi connect *637_054*

Note:
With Generation 2 Audi connect, the SIM slot on the front of Information Electronics Control Module 1 J794 is not functional. Instead a SIM (referred to as an eSIM) is imbedded on the circuit board of J794.

The following optional equipment can be ordered for MMI High:

- Audi connect (EL3).
- SDARS tuner (NAR spec digital radio) (QV3).
- External audio amplifier for Bose Sound System with 3D sound and 558 watts power output (9VS).
- External audio amplifier for Bang & Olufsen Advanced Sound System with 3D sound and 1920 watts power output (8RF).



J794 for MMI Navigation plus

637_059

Audi connect

In the Audi Q7, Audi connect is even more flexible for customers. If a vehicle is equipped with MMI Navigation plus, then it already has an UMTS/LTE module (PR number: EL3). This allows the following functions to be used:

- Wi-Fi hotspot for connecting mobile devices to the Internet.
- MMI connect app.
- Audi connect 3 month free trial from delivery.

The customer has the option to order Audi connect services for a period of 3 years either directly with the vehicle or at a later date. After delivery, the customer can purchase the licence for Audi connect services.

For example, the following services are available for the Audi Q7 depending on country:

- Audi traffic information online.
- Google Earth maps.
- Facebook.
- Twitter.
- Weather.
- Fuel prices.
- Parking information.
- Online media (currently: Napster and AUPEO!).

All Audi connect services are now displayed in the Audi connect menu on the Audi Q7. In addition, an Audi connect options menu was designed showing the individual Audi connect services based on use.

The following menu options are possible:

- Information.
- Navigation.
- Entertainment.
- Communication.

If the vehicle has Audi connect, the delivered navigation map (country dependent) can be updated online for the first five six-month updates.

Main menu with Audi connect *637_060*

Audi connect options menu *637_061*

Audi connect: Navigation menu item *637_062*

Audi connect: Navigation options menu *637_063*

Note
The PR number for the ex-works Audi connect package is IT1. If the vehicle has the PR number IT0, it was ordered without the Audi connect package.

Control panel
(multimedia system operating unit E380)

Depending on the MMI version, two different control units are installed in the Audi Q7:

- Standard control unit.
- MMI touch.

The on/off switch and The on/off switch and Driver Volume Control E67 are identical in both variants. E67 is connected to Multimedia System Control Head E380 via a LIN bus.

637_065

Driver Volume Control E67

Standard control unit

The standard control unit has eight freely assignable station buttons. Radio stations, playlists and telephone numbers can be stored here for direct selection.

In addition, there are two rocker switches, the turn-push button and one button each for the following functions:

- Go to main menu (MENU).
- Return to previous menu (BACK).
- Open left side menu (options menu).
- Open right side menu (options menu).

The following menus can be activated with the left rocker switch:

- CAR.
- TEL (if available).

The following menus can be activated with the right rocker switch:

- RADIO.
- MEDIA.

637_066

Standard control unit

637_067

MMI touch

MMI touch

The new touch sensitive and large real glass touchpad on the Audi Q7 provides, for the first time, both tactile and acoustic feedback which gives the user the feel of pushing a button. When a function is selected on the new touchpad, it is briefly vibrated up by the electrical actuator underneath.

In addition, speakers integrated in the control module output the click sound typical of Audi. The acoustics, the speakers and the tactile effect of the electrical mechanism give the user the feel of pushing a button when selecting a function on the touchpad.

The following menus can be activated with the left rocker switch:

- NAV/MAP (navigation or map).
- TEL (Telephone).

The following menus can be activated with the right rocker switch:

- RADIO.
- MEDIA.

There are various areas on the touch sensitive touch for the following functions:

- 8 storage buttons.
- Left side menu.
- Right side menu.
- MENU button.
- BACK button.
- Central input area with with automatic handwriting recognition for functions such as:
  - Text input.
  - Moving the crosshairs.
  - Moving the map.
  - Zooming in/out of the map (Zoom).

The turn-push button with MMI touch has a four-way joystick function in addition to the standard functions. This can be used to control various actions and menus depending on menu. Examples:

- Moving the crosshairs in the navigation map.
- Moving the center of sound.
- Moving to the left: to open or close the options menu (right side menu).
- Moving to the right: to open or close the options menu (left side menu).
- Moving upwards: input field for the active list menu.
- Moving down: selection option in active medium. For example, a different station can be selected if the radio is active.

MMI touch *637_068*

Button combinations for service

System reset

To restart (reset), the following buttons must be briefly pressed at the same time:

- NAV/MAP (or CAR).
- Rotary pushbutton.
- RADIO.

637_069

Button combination for system reset

Screenshot

When a screenshot is taken, only the image transmitted by the MMI is saved. The image is saved to the internal memory of Information Electronics Control Module 1 J794. To save a screenshot, the following buttons must be pressed in succession and held down:

- NAV/MAP (or CAR).
- Rotary pushbutton.

The display on the MMI monitor flashes briefly to indicate that the screenshot has been saved. In total, up to 50 screenshots can be stored in J794. When the 51st screenshot is saved, the first screenshot is overwritten.

The saved screenshots can then be copied from J794 to an SD card using the VAS Scan Tool. The procedure is as follows:

1. Insert a blank SD card into the left SD card reader (SD1).
2. Select "5F – Basic setting" in the Guided Functions.
3. Start the "Write analysis data to SD card" Test Plan.

The analysis data including the screenshots are now copied to the SD card.

637_070

Button combination for screenshot

Engineering menu

To access the Engineering menu, the following buttons must be pressed in succession and held down:

- NAV/MAP (or CAR).
- MEDIA.

637_071

Button combination for the Engineering menu

Notes

Display mechanism

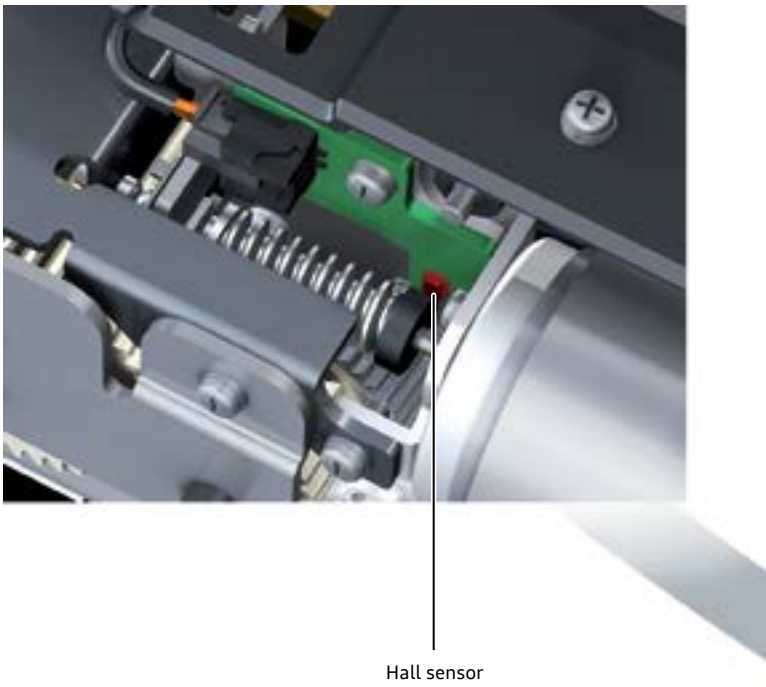
A new display mechanism is used on the Audi Q7. Both display versions have the same mechanism.

The display versions have the following features:

- 7.0“ TFT color monitor with 800 x 480 pixel resolution.
- 8.3“ TFT color monitor with 1024 x 480 pixel resolution.

The mechanism itself comprises:

- Display Opening/Closing Motor V301.
- Display -Open- Stop Switch F330.
- Display -Closed- Stop Switch F331.
- Hall-effect sensor for position recognition.
- Guide pin.
- Lifting arms.
- Springs (for backlash compensation and as weight balancing for support when extending the display).



Functional principle

When the display extends, the electric motor drives a lifting arm. The second lifting arm is connected to the first lifting arm by a rack segment (scissors principle) and thus also moves upwards. The current position of the display is determined by a Hall-effect sensor.

The electric motor speeds up after travelling a certain distance and slows down again before reaching its end position.

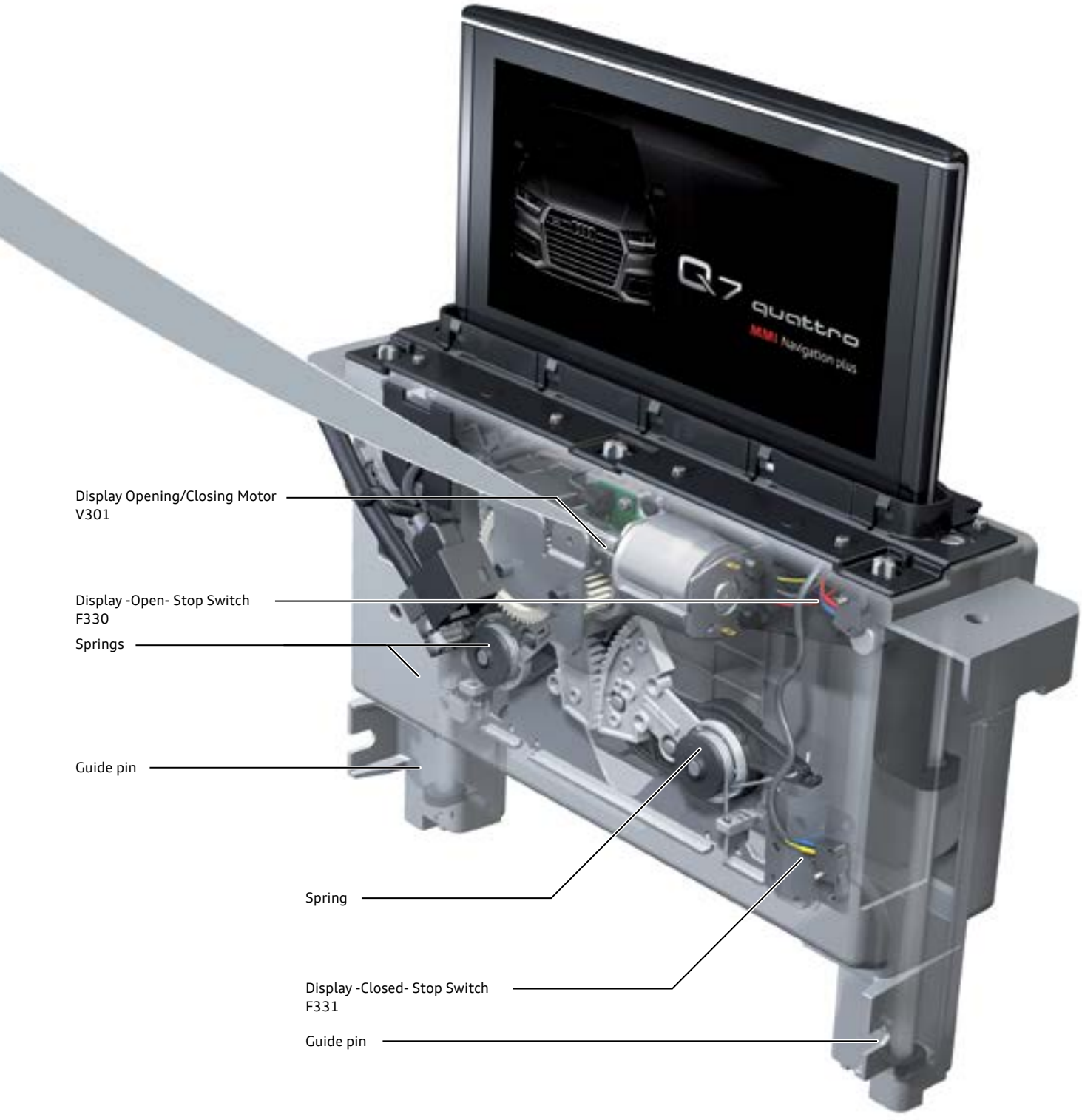
Shortly before reaching the upper end position, Display -Open- Stop Switch F330 sends a signal. The electric motor then continues turning until the Hall-effect sensor no longer detects that the motor is running. The electric motor is then deactivated.

This "run-on" feature ensures that the display is moved firmly into its end position in order to prevent a rattling noise.

The display retracts in the same way, with the electric motor turning in the reverse direction.

Activation mechanism

The motor and both limit switches are activated by Multimedia System Control Head E380. E380 transfers this data to Information Electronics Control Module 1 J794. J794 evaluates the data and issues the appropriate commands.


Q7 quattro
MMI Navigation plus
Display Opening/Closing Motor V301
Display -Open- Stop Switch F330
Springs
Guide pin
Spring
Display -Closed- Stop Switch F331
Guide pin

637_072

Protection against mechanical damage

To protect the mechanism against mechanical damage due to faulty operation, there are two safeguards:

1. Automatic lowering.
2. Slipping clutch.

If pressure is applied to the display from above and F330 is operated, the display is lowered at a steady speed. If the pressure applied to the display from above exceeds a defined value, a slipping clutch decouples the drive motor from the lifting arm in an effort to protect the drive against mechanical damage.

If the Hall-effect sensor fails but the limit switches are intact, the display extends and retracts according to a fixed characteristic. The characteristic is initiated by an 80% PWM signal.

If one of the limit switches fails, the display also moves to the stop according to a fixed characteristic (80% PWM). The motor then stops if motor operation is not detected for a set period of time based on the Hall-effect sensor signal.

637_073

Service position

The display mechanism has a service position. The display must be moved into this position to remove it from the mechanism. The service position can be activated using the Scan Tool.

This ensures the following:

- The display is not placed under stress.
- The connecting plug on the display can be accessed.

Diagnostics

The display mechanism and Display Unit Button E506 are diagnosed under Vehicle Electronics Control Module 1 J794 using Address Word 5F.

Audi music interface

The Audi music interface can be used to transfer and output audio and video data.

The Audi music interface has the following connectivity options:

- Two USB ports.
- Bluetooth audio streaming.
- Wi-Fi audio streaming.

The two USB ports provide a charging voltage of 5 V and charging currents of up to 500 mA. If an iPod or iPad is docked at one of the USB ports, an electrical current of up to 1.6 A is allowed to flow through this port.

Only video files sourced from a USB mass storage device (for example, USB stick) can be output via the USB ports. Smartphones often do not support the requisite protocol.

Connections available to week 34/15 *637_077*

Connections available from week 34/15 *637_078*

Note
If no Audi music interface is installed on the Audi Q7, at least one AUX IN jack and one 5 V USB charging port is available.

Reference
For more information about the coupling antenna, please refer to eSelf-Study Program 990143, The 2015 Audi A3 Introduction.

Network system

J794 is connected to J533 via the infotainment CAN bus in all infotainment versions. The infotainment CAN bus is a high-speed bus with a max. data transfer rate of 500 kbit/s.

The following control units may also be connected to the infotainment CAN depending on trim level:

- Instrument Cluster Control Module J285.
- Windshield Projection Head up Display Control Module J898.
- Selector Lever Sensor System Control Module J587.

Front Information Display Control Head J685 and Multimedia System Control Head E380 are connected to J794 via the Modular Infotainment Platform (MIB) CAN bus. It has a speed of 500 kbit/s.

The MOST bus is a MOST 150 with a data transfer rate of 150 Mbit/s. J794 acts both as the system master and diagnostics master for the MOST bus.

Due to the combination of infotainment CAN bus and MOST bus, an open circuit in the MOST bus will not result in total failure of the MMI. This means that all functions executed directly in J794 are still available. However, audio output via an external amplifier would no longer be possible.

Infotainment topology

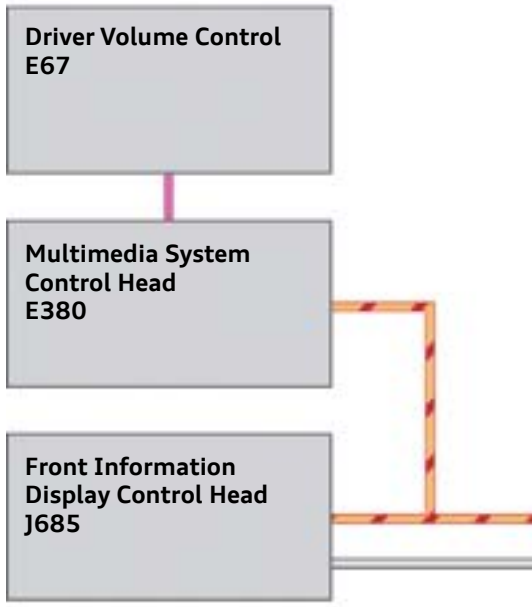


Image transfer

All image information which appears on Front Information Display Control Head J685 is sent from J794 via LVDS lines.

The displays for J285 are transferred from J794 as follows:

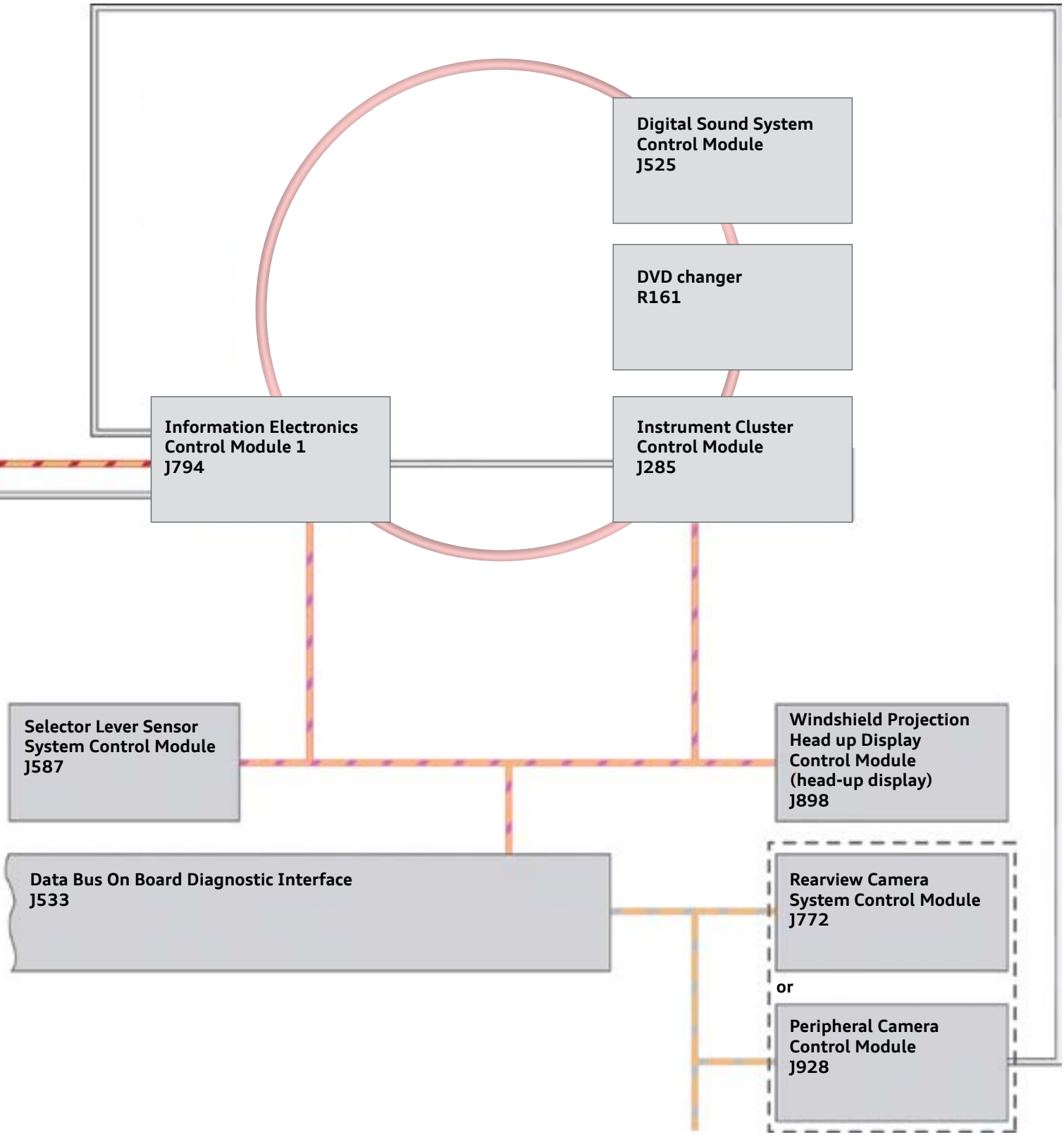
- LVDS:
  Only large navigation map and detailed intersection maps.
- MOST bus:
  All other content, such as list menus or cover art.

The image information from the DVD change is transmitted in the form of mpeg4 files via the MOST bus to J794. J794 then decodes this data.

Image information from the Peripheral Camera Control Module J928 (TopView) is transmitted toJ794 via LVDS lines.

Wire colors:

- Modular Infotainment Platform (MIB) CAN
- LIN bus
- Extended CAN
- Infotainment CAN bus
- MOST bus
- LVDS
- "OR" configuration


Digital Sound System Control Module J525
DVD changer R161
Information Electronics Control Module 1 J794
Instrument Cluster Control Module J285
Selector Lever Sensor System Control Module J587
Windshield Projection Head up Display Control Module (head-up display) J898
Data Bus On Board Diagnostic Interface J533
Rearview Camera System Control Module J772
or
Peripheral Camera Control Module J928

637_099

Sound systems

The Audi Q7 marks the premiere in 2015 of Audi's latest technology - 3D sound. The 3D sound is an integral part of both the Bang & Olufsen Advanced Sound System an Bose Surround Sound. The heart of the system is a complex processing algorithm which computes the control signals for each speaker quickly and precisely.

No special music format is required to experience 3D sound.

The 3D effect can be achieved regardless of format. The various sound systems available for the Audi Q7 are listed below.

Audi sound system (9VD)

The Audi sound system has 10 speakers.

The accompanying 6-channel amplifier has a power output of 195 watts.

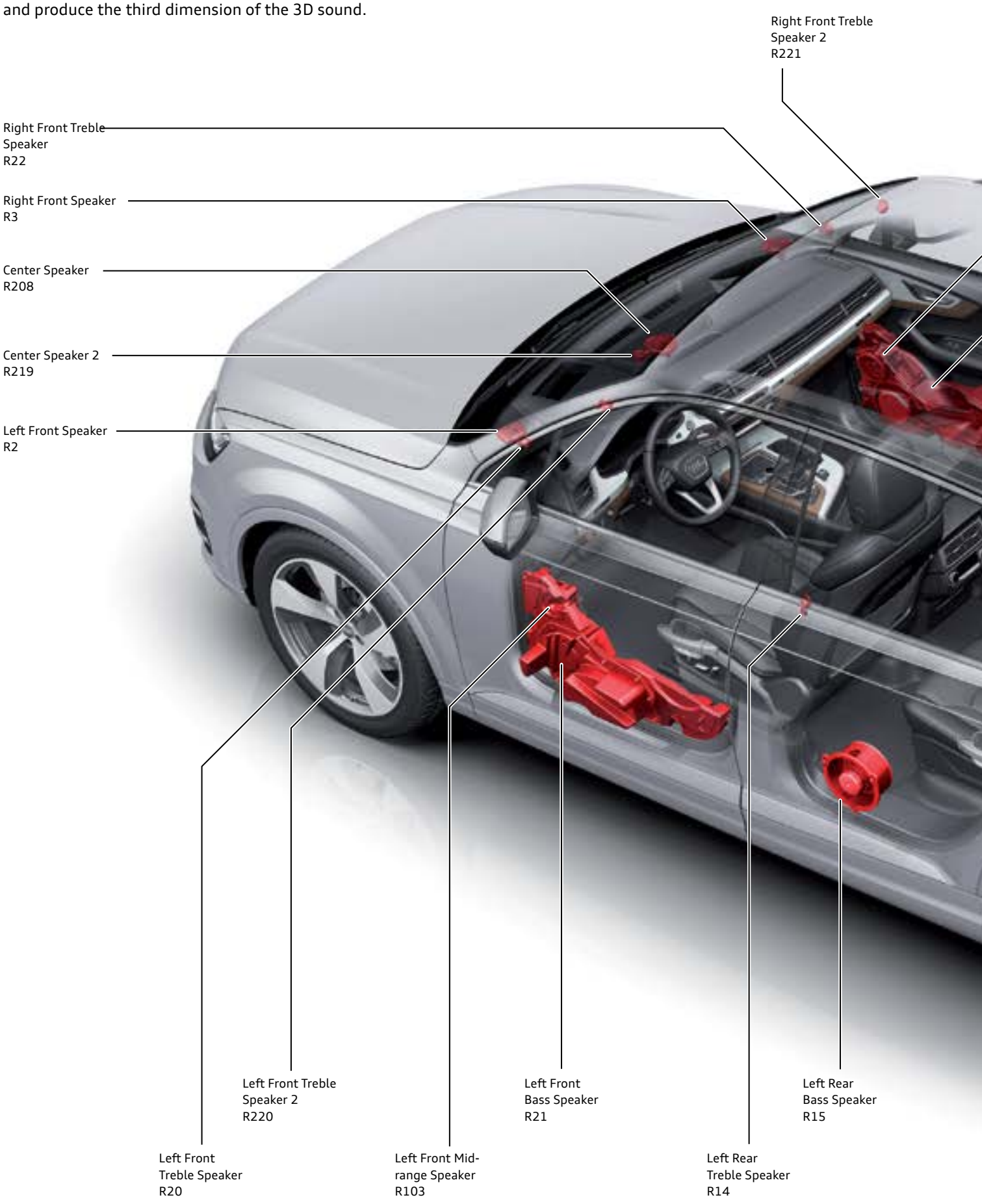
637_081

Notes

Bose Sound System with 3D sound (9VS)

The BOSE Sound System with 3D sound has 19 speakers. Four of these speakers are installed high up in the vehicle and produce the third dimension of the 3D sound.

The 15-channel amplifier has a power output of 558 watts.




Right Front Midrange Speaker R104
Right Front Bass Speaker R23
Right Rear Treble Speaker R16
Right Rear Bass Speaker R17
Right Effects Speaker R210
Left Effects Speaker R209
Subwoofer R211
Digital Sound System Control Module J525

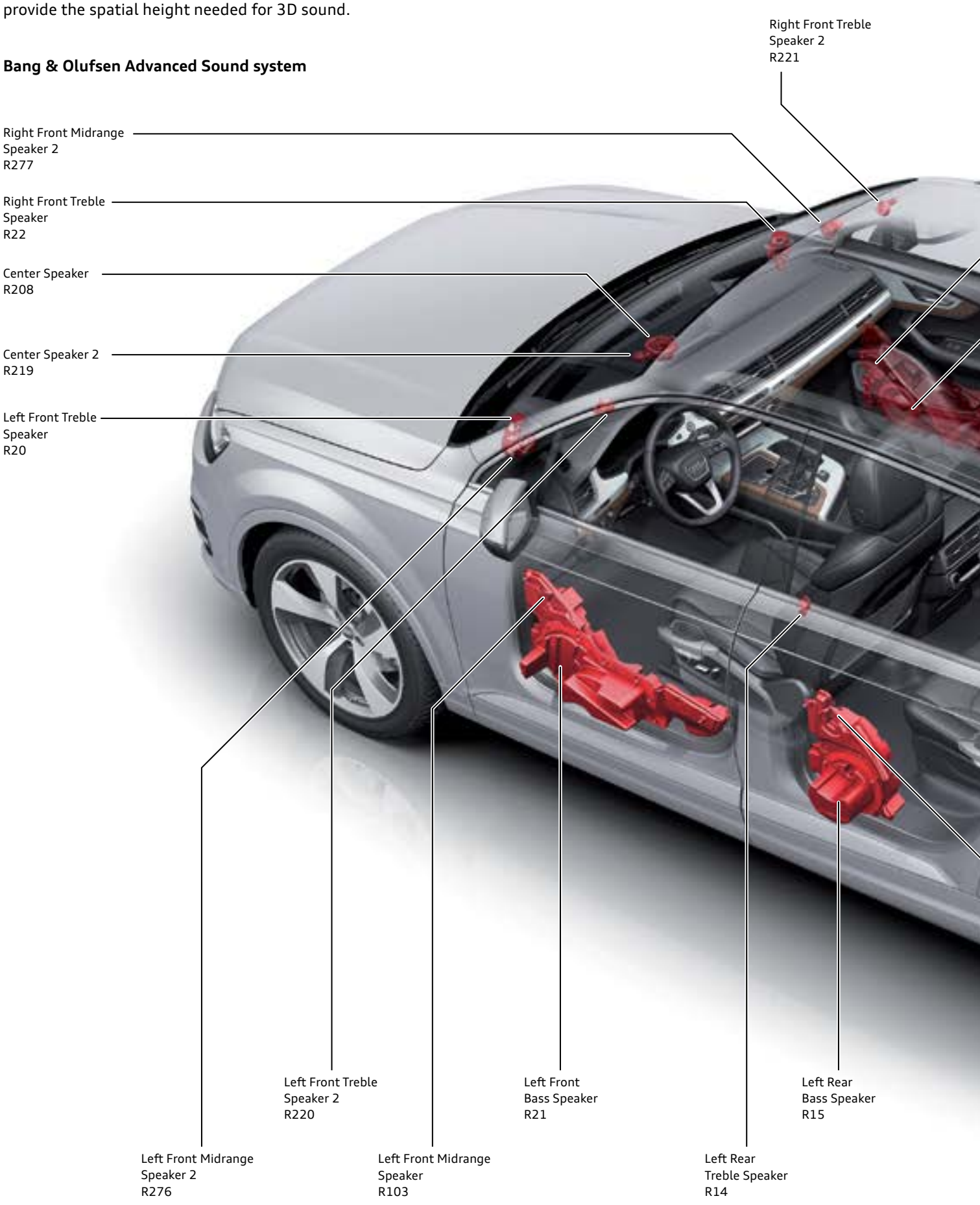
637_082

Bang & Olufsen Advanced Sound System with 3D sound (8RF)

The Bang & Olufsen Advanced Sound System with 3D sound has 23 speakers. Six of these are positioned higher up in the vehicle. They transmit the sound components which provide the spatial height needed for 3D sound.

Newly developed speakers and a new 1920 watt amplifier guarantee musical enjoyment on the highest level.

Bang & Olufsen Advanced Sound system




Right Front Midrange Speaker R104
Right Front Bass Speaker R23
Right Rear Treble Speaker R16
Right Rear Midrange Speaker R106
Right Rear Bass Speaker R17
Right Rear Treble Speaker 2 R218
Right Effects Speaker R210
Left Effects Speaker R209
Subwoofer R211
Digital Sound System Control Module J525
Left Rear Midrange Speaker R105
Left Rear Treble Speaker 2 R217

637_083

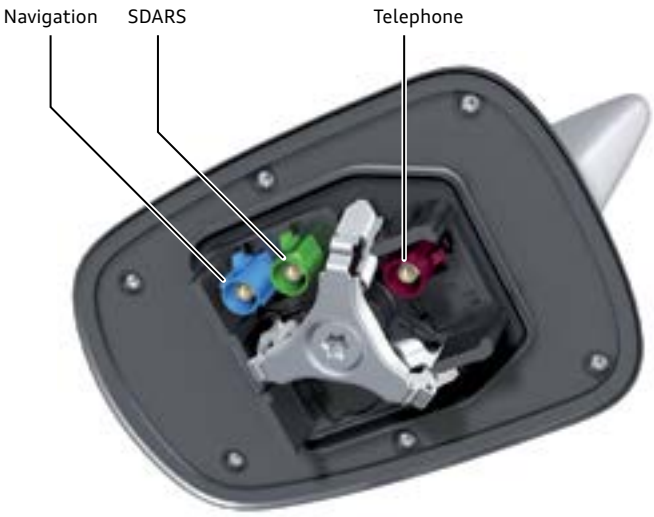
Antenna overview

Antennas are installed on the Audi Q7 in the following locations:

- Roof.
- Rear spoiler.
- Side window, rear right.
- Rear window.
- Rear bumper.

The amplifier antenna locations to Information Electronics Control Module 1 J794 are dependent on the vehicle specification. Only connections which are actually needed are installed.

Roof antenna R216
(NAR version)



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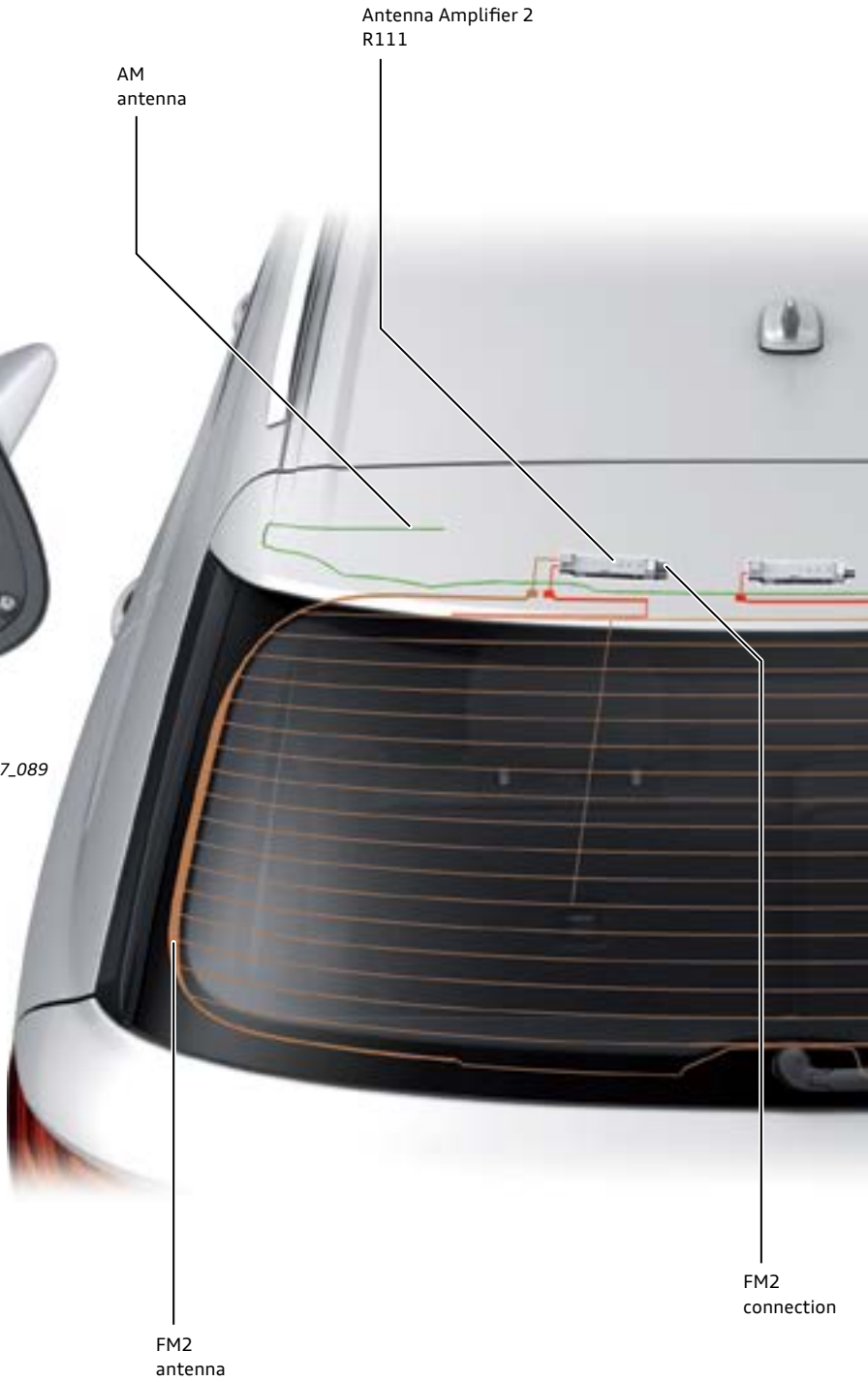
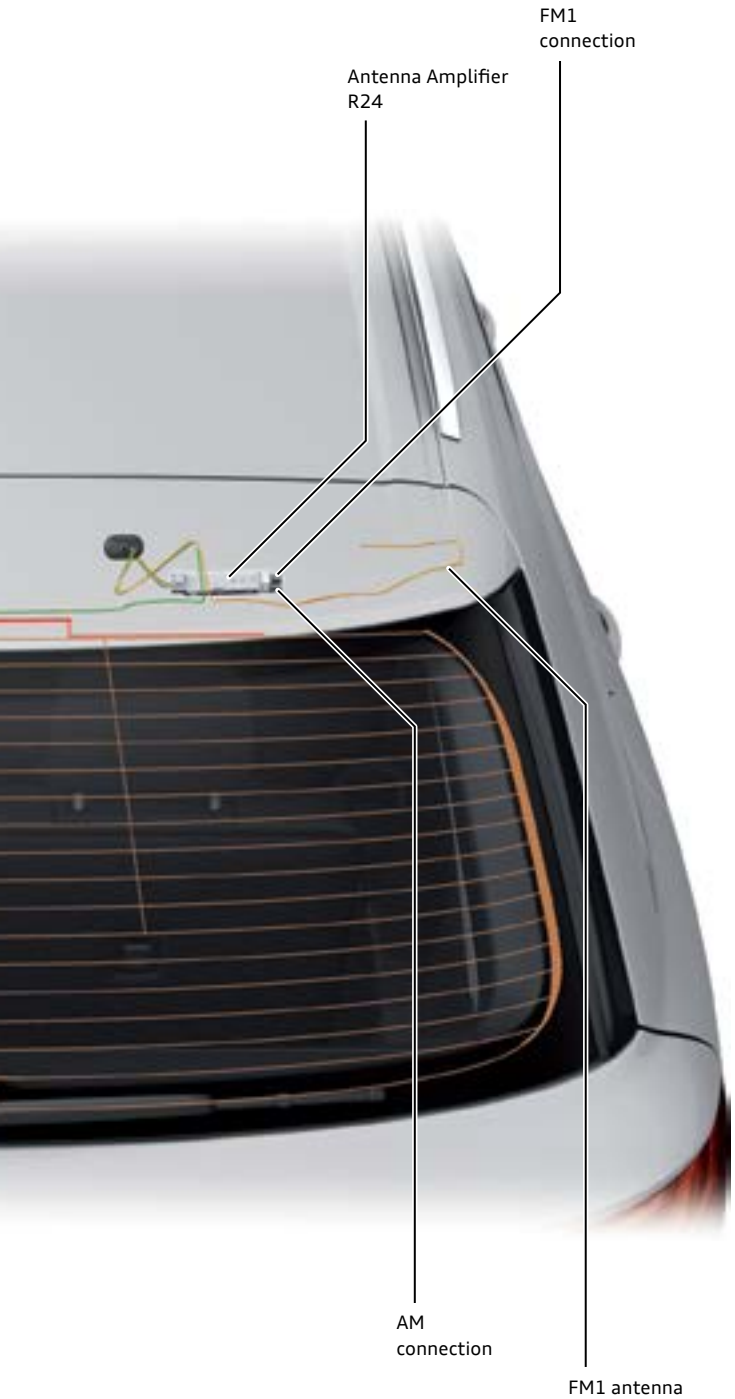




637_095

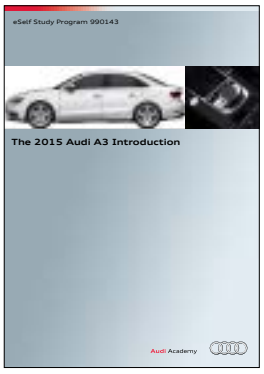
Side window, rear right

637_096

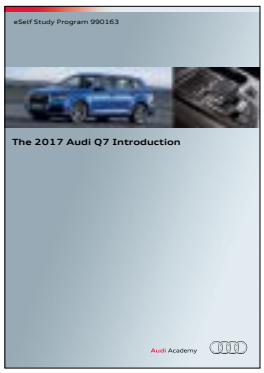
Self-Study Programs

For more information about the technology of the Audi Q7, please refer to the following eSelf-Study Programs.

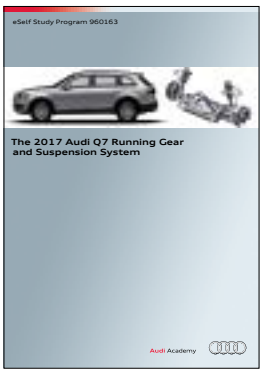
SSP 970143
MIB



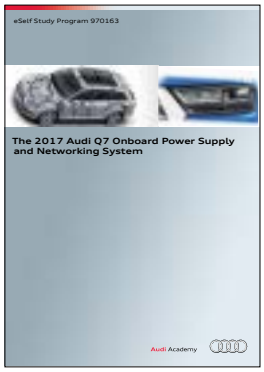
SSP 990143
The 2015 Audi A3 Introduction



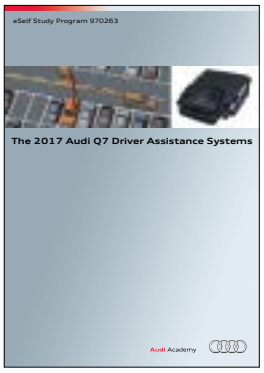
SSP 990163
The 2017 Audi Q7 Introduction



SSP 960163
The 2017 Audi Q7
Running Gear and Suspension System



SSP 970163
The 2017 Audi Q7
Onboard Power Supply and Networking System



SSP 970263
The 2017 Audi Q7
Driver Assistance Systems

Knowledge assessment

An On-Line Knowledge Assessment (exam) is Available for this eSelf-Study Program.

The Knowledge Assessment is required for Certification credit.

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 Course Catalog Search and select "970363 - The 2017 Audi Q7 Occupant Protection and Infotainment System"

Please submit any questions or inquiries via the Academy CRC Online Support Form which is located under the "Support" tab or the "Contact Us" tab of the Academy CRC.

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

Audi
Truth in Engineering

970363

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