



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



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

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

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

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

Reference



Note



# Introduction

The process of developing a new vehicle involves numerous crash tests. These are initially run in a virtual environment on the computer and finally on the actual car at the Audi safety center. The engineers of Audi AG not only evaluate the results of our own in-house tests, but also actual accidents recorded by the accident researchers and scientists at the Audi Accident Research Unit (AARU).

The AARU was founded in 1998 and is working with police and doctors to develop as exact a knowledge of accidents as possible. Using this information, we are constantly working to improve our tests. The focus of Audi vehicle safety is people. Because they have the responsibility for protecting something very valuable, only our most exceptional staff are entrusted with the safety of our vehicles.



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Another feature of the new Audi A7 is that of consistency. The elegant exterior design carries over into the high-end interior. The interior design of the A7 cossets the driver and passengers, giving them a feeling of complete security. The comfortable seats are finished in high-grade materials and provide excellent support.

The A7 is optionally available with leather comfort seats, including a memory function. Depending on version, these seats have a seat heater, seat ventilation, and multi-level massage function. There is nothing more inspiring than a moment of tranquility.

We deliver on our promise of “Vorsprung durch Technik” everywhere you look in an Audi, for example in the Multi Media Interface (MMI) with retractable fold-away screen. You can use the MMI to operate a variety of in-car media, the navigation system, and other comfort and convenience functions.

The Google Earth map in the MMI Navigation plus system is a new feature. The photo-realistic display gives you an even clearer view, and makes getting to your destination even simpler. Another great feature of the optional MMI Navigation plus system is the WLAN hotspot. Occupants can simultaneously connect up to eight devices, such as a laptop, Apple iPad, or Netbook, to the Internet via the WLAN module integrated in the vehicle and by UMTS. Follow your intuition, and you will reach your goal.



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# Occupant Protection

## Overview

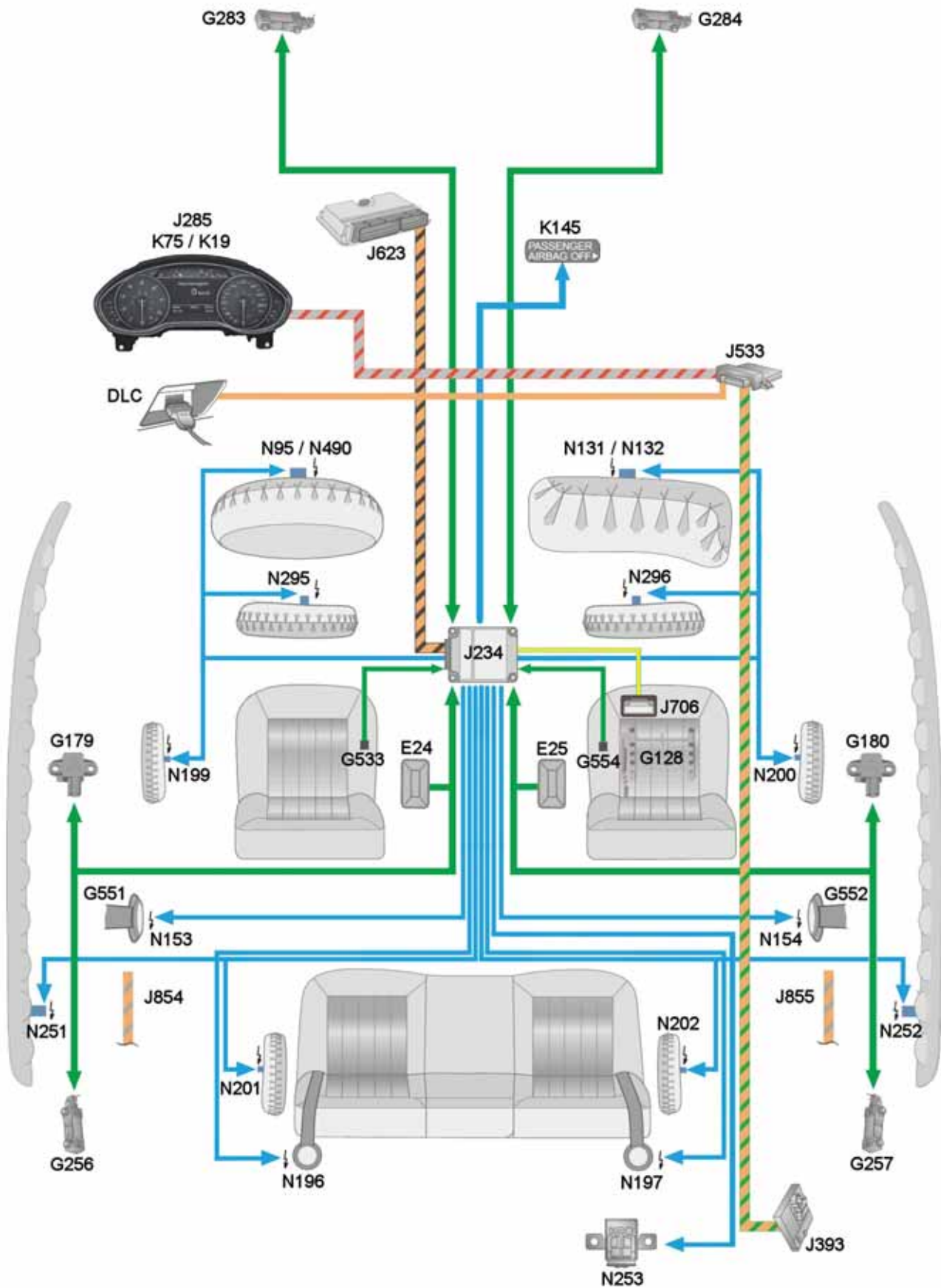
There is close-knit interaction between the driver assistance and passive restraint systems in the 2012 A7.

The occupant protection system has the following features:

- Airbag control module
- Adaptive driver and passenger airbags
- Side airbags (thorax), front and rear
- Audi Sideguard (side curtain airbags)
- Up-front crash sensors
- Door-integrated crash sensors for side impact detection
- Crash sensors for side impact detection on the C-pillars
- Front inertia-reel safety belts with pyrotechnic and electrically reversible belt tensioners and active belt force limiters
- Driver and passenger knee airbags
- Rear inertia reel safety belts with pyrotechnic belt tensioners
- Battery interrupt igniter
- Safety belt reminder for driver and front passenger
- Safety belt switch, driver and front passenger side
- Seat occupied sensor in front passenger seat
- Driver and front passenger seat position sensors

### Legend:

|      |  |      |  |
|------|--|------|--|
| E24  | Driver's Seat Belt Switch                          | K19  | Seat Belt Indicator Light                        |
| E25  | Front Passenger Seat Belt Switch                   | K75  | Airbag Indicator Lamp                            |
| G128 | Front Passenger Seat Occupant Sensor               | K145 | Front Passenger Airbag –Disabled– Indicator Lamp |
| G179 | Driver Side Airbag Crash Sensor                    | N95  | Driver Airbag Igniter                            |
| G180 | Front Passenger Side Airbag Crash Sensor           | N131 | Front Passenger Airbag Igniter 1                 |
| G256 | Driver Side Rear Side Airbag Crash Sensor          | N132 | Front Passenger Airbag Igniter 2                 |
| G257 | Front Passenger Side Rear Side Airbag Crash Sensor | N153 | Driver Seat Belt Tensioner Igniter 1             |
| G283 | Driver Front Airbag Crash Sensor                   | N154 | Front Passenger Seat Belt Tensioner Igniter 1    |
| G284 | Front Passenger Front Airbag Crash Sensor          | N196 | Left Rear Seat Belt Tensioner Igniter            |
| G551 | Driver Belt Force Limiter                          | N197 | Right Rear Seat Belt Tensioner Igniter           |
| G552 | Front Passenger Belt Force Limiter                 | N199 | Driver Thorax Airbag Igniter                     |
| G553 | Driver Seat Position Sensor                        | N200 | Front Passenger Thorax Airbag Igniter            |
| G554 | Front Passenger Seat Position Sensor               | N201 | Left Rear Thorax Airbag Igniter                  |
| J234 | Airbag Control Module                              | N202 | Right Rear Thorax Airbag Igniter                 |
| J285 | Instrument Cluster Control Module                  | N251 | Driver Head Curtain Airbag Igniter               |
| J533 | Data Bus On Board Diagnostic Interface             | N252 | Passenger Head Curtain Airbag Igniter            |
| J623 | Engine Control Module                              | N253 | Battery Interrupt Igniter                        |
| J706 | Passenger Occupant Detection System Control Module | N295 | Driver Knee Airbag Igniter                       |
| J854 | Left Front Seat Belt Tensioner Control Module      | N296 | Front Passenger Knee Airbag Igniter              |
| J855 | Right Front Seat Belt Tensioner Control Module     | N490 | Driver Airbag Release Valve Igniter              |
|      |  | T16  | Data Link Connector                              |



## Airbag Control Module J234

The purpose of J234 is to measure and evaluate the vehicle's acceleration and deceleration to determine if a collision has occurred. External sensors, as well as those in the control module are used. J234 can only detect an accident from the information provided by the sensors.

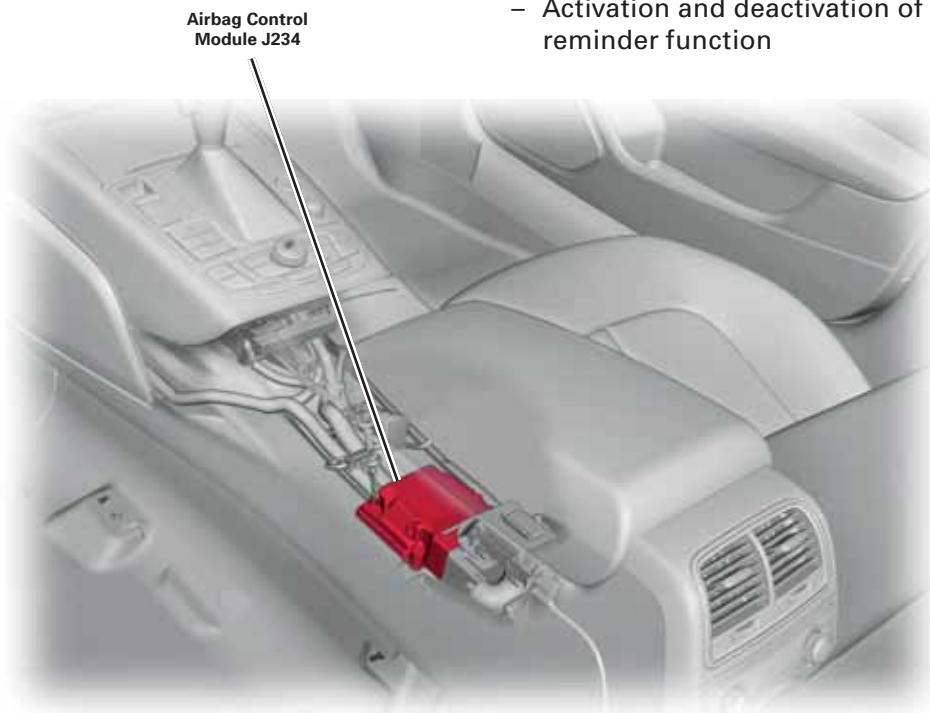
Once all of the sensor information has been evaluated, J234 decides when and which safety components will be activated. Depending on the severity and nature of the impact, the appropriate restraint systems (belt tensioner or belt tensioner and airbag) are activated.

Other vehicle systems are also notified of the collision event.

Through continued development, J234 no longer needs a second crash sensor ("safety switch") for head-on impact detection.

The main tasks of the airbag electronics are:

- Evaluation of all input information
- Continuous monitoring of the overall airbag system
- Collision detection (front, side, rear)
- Defined deployment of the belt tensioners, airbags, and battery isolator
- Defined activation of front airbag adaptivity
- Defined activation of the adaptive belt force limiter
- Independent power supply through a capacitor for a defined period of time (approximately 150 ms)
- Fault indication by the airbag warning lamp
- Storage of fault and crash information
- Notification of a collision event to other system components via the Powertrain CAN
- Activation and deactivation of the safety belt reminder function



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## Rollover Protection System

Two additional sensors for rollover recognition have been integrated into J234. For higher rollover recognition sensitivity, information is also collected from ABS Control Module J104, Active Steering Control Module J792, and Steering Angle Sensor G85.

J234 does not require additional information from these sensors. It is capable of independently identifying a rollover situation. When a rollover is detected, the safety belt tensioners and Audi Sideguard airbags are activated.



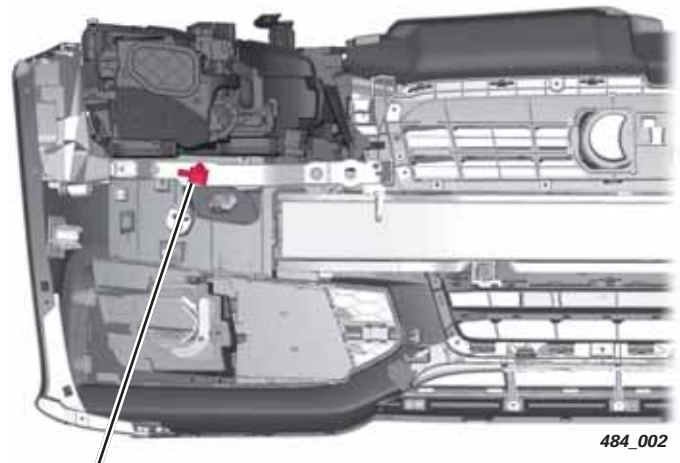
## Sensors

### Driver and Front Passenger Front Airbag Crash Sensors G283 and G284

G283 and 284 are used in combination with the crash sensor integrated into Airbag Control Module J234. They provide early detection and evaluation of head-on collisions.

The information from these sensors is used to adapt deployment of the safety belt pretensioners, belt force limiters, and airbags in accordance with the severity of the accident situation. Adaptive deployment of occupant protection system components provides better accident protection.

G283 and G284 are located below the left and right headlights, respectively.



Crash sensor G283

### Driver and Front Passenger Side Airbag Crash Sensors G179 and G180

G179 and G180 are pressure-type sensors integrated into the front doors. They are used to detect and evaluate side impact collisions. If a door is deformed from a collision, a brief increase in air pressure within the door will occur. The sensor measures this increase in pressure, transferring the information to the airbag control module.

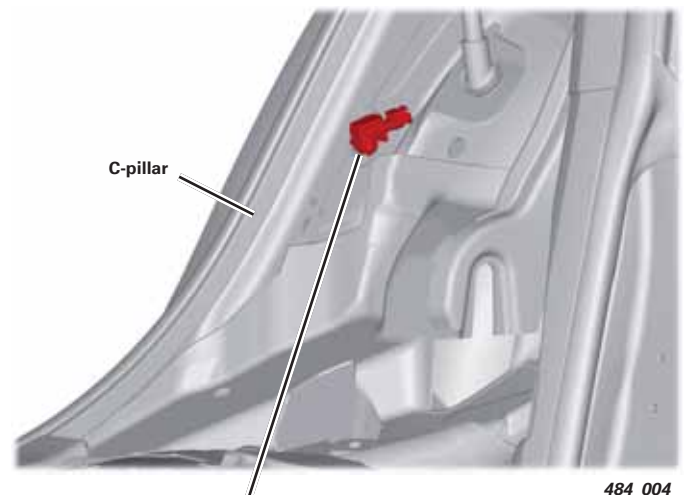


Crash sensor G179

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### Driver and Front Passenger Side Rear Side Airbag Crash Sensors G256 and G257

G256 and G257 are acceleration sensors. Installed on the body near the left and right C-pillars, they record transverse acceleration of the vehicle, sending this information to the airbag control module.



Crash sensor G257

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## Driver and Front Passenger Seat Position Sensors G553 and G554

The front seats of the A7 are equipped with Hall sensors G553 and G554. These sensors report the fore and aft position of the front seats relative to the instrument panel.

Based on the signal of the seat position sensors, the airbag control module is able to determine if a seat is located in the front third of its adjustment range or in the rear two-thirds. The airbag control module uses this information to adapt the function of the belt force limiters and front airbags to the severity of a collision.

If the seat is in the front third of its adjustment range, Airbag Control Module J234 can activate the adaptive airbag igniter earlier than when the seat is in the rear two-thirds of its adjustment range.

Due to the phased ignition of Driver Airbag Release Valve Igniter N490 and Front Passenger Airbag Igniter 2 N132, airbag deployment is best adapted to a collision situation. For instance, airbag deployment can be automatically modified for smaller occupants.

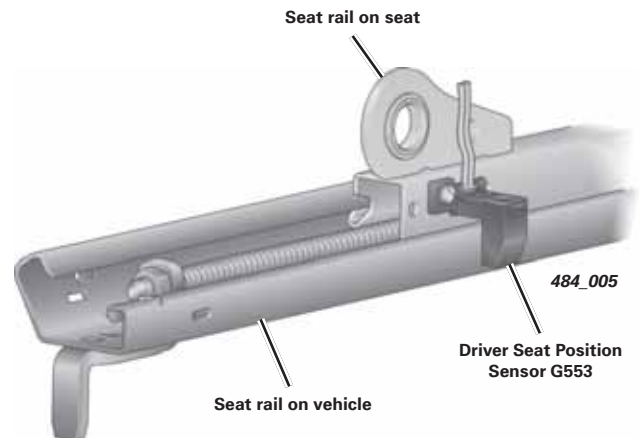
Belt force limiter igniters G551 and G552 are also activated in a phased manner, which adapts the restraint system to the accident situation and seat position, accordingly.

Most importantly, properly adjusted seats and properly adjusted safety belts offer significant occupant protection.

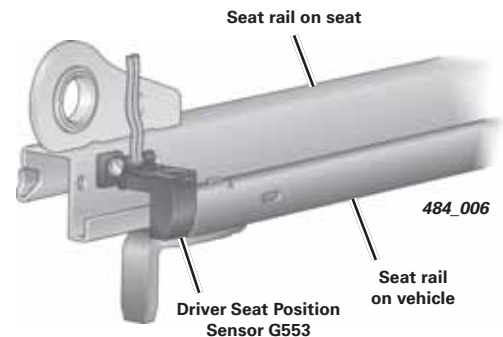
### Seat Position Detection

The seat position detection sensors are mounted on the seat rail of each seat, and move with the seat.

Airbag Control Module J234 interprets information from these sensors to identify specific seats and their position or change in position. For instance, a sensor's power consumption is approximately 5–7 mA when the seat is in a "pushed back" position.



If a seat is moved forward and the seat position sensor moves beyond the seat rail of the vehicle body, power consumption increases to approximately 12–17 mA. J234 interprets this information and identifies the seat to be in a forward position.

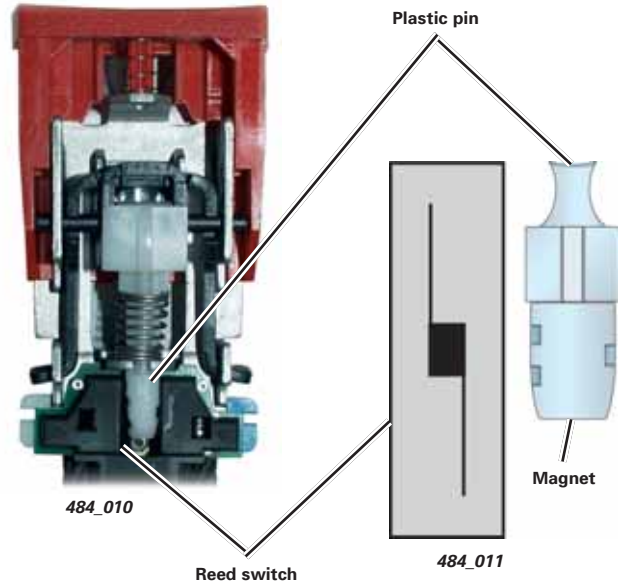


## Driver and Front Passenger Seat Belt Switches E24 and E25

E24 and E25 are integrated into the front safety belt buckles. These reed switches are components of the safety belt reminder system.

If the safety belt is not buckled, the reed switch is closed. In this position, a magnet built into the tip of a plastic pin acts on the reed switch.

If the safety belt is buckled, the reed switch is open. The inserted belt tongue lifts the plastic pin. The magnet no longer acts on the reed switch and it opens. Airbag Control Module J234 reads the resistance and determines if the safety belt is buckled or not.



## Front Safety Belt Reminder

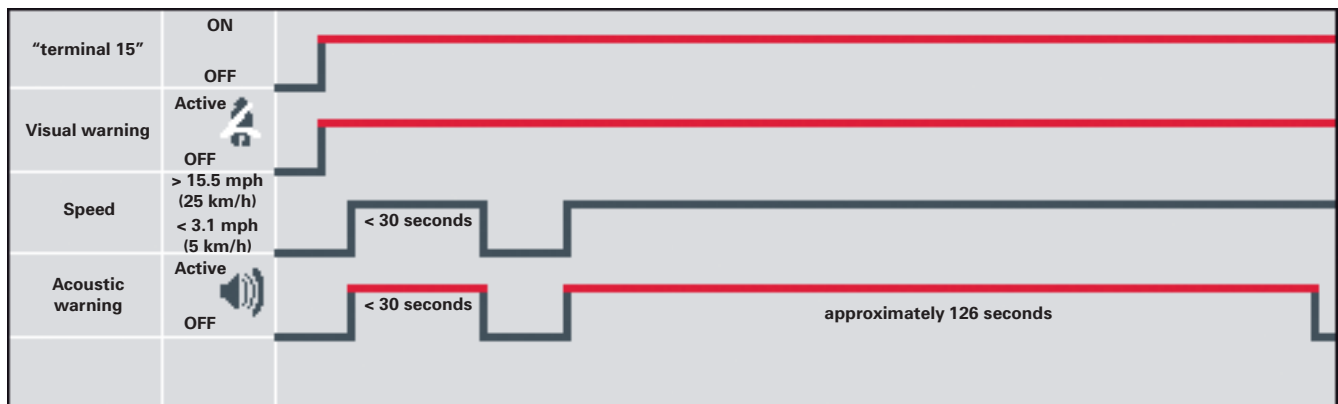
Front seat occupants are alerted by Seat Belt Indicator Lamp K19 if they are not wearing their safety belts after the ignition is switched ON.

When the vehicle exceeds a speed of 15.5 mph (25 km/h) and the safety belts are not fastened, an acoustic warning is given.

If the acoustic warning has sounded and the vehicle decelerates to a speed of less than 3.1 mph (5 km/h) within the first 30 seconds, the acoustic warning is suppressed. If the vehicle's speed increases again to above 15.5 mph (25 km/h), the acoustic warning resumes.

If the first 30 seconds have elapsed since the start of the acoustic warning, the acoustic warning does not stop unless the safety belts are fastened. The total duration of the acoustic warning is limited to 126 seconds and varies in volume and frequency.

### Safety belts not fastened warning

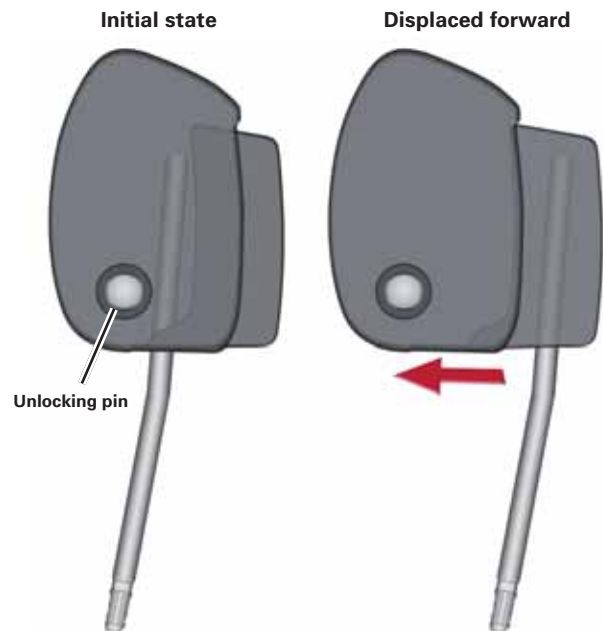


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## Front Head Restraints

It is possible to set the head restraint vertically and horizontally. To move the head restraint into the upper position, the entire head restraint is pulled upward. To adjust the head restraint downward, the unlocking button must be pressed. Three locking positions are available for vertical adjustment of the head restraint.

For horizontal adjustment, the front part of the head restraint can be moved. The head restraint can be pushed back together by pressing the unlocking button. Six locking positions are available for horizontal adjustment.



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# Airbags

## Front Airbags

### Driver Airbag Igniter N95 and Driver Airbag Release Valve Igniter N490

The 2012 A7 is equipped with adaptive driver and front passenger airbag modules. However, the modules have different types of gas generators.

The driver side airbag module has a solid propellant generator, and the front passenger side airbag module uses a hybrid gas generator.

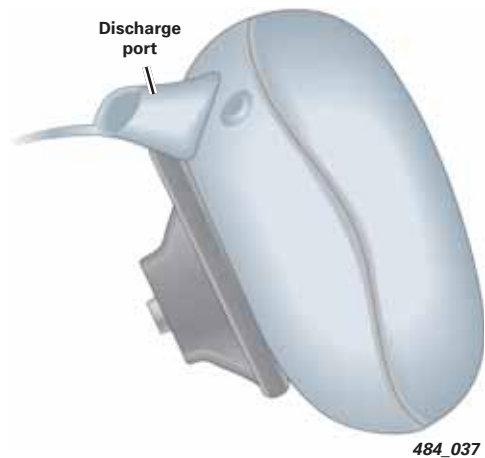
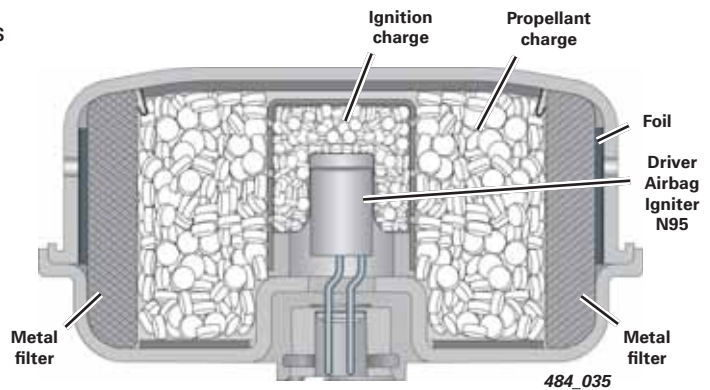
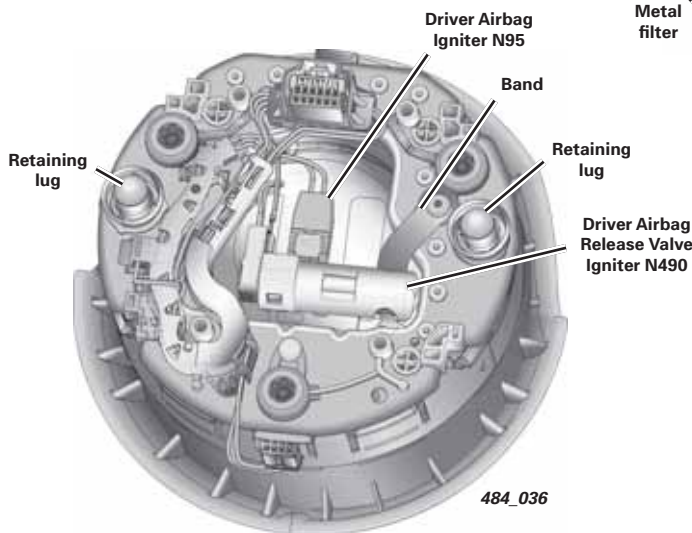
### Driver Airbag Operation

In the event of a collision severe enough to deploy the airbags, Airbag Control Module J234 activates Driver Airbag Igniter N95. The ignition charge then ignites the propellant charge. When the gas pressure produced by combustion of the propellant charge exceeds a predetermined level, a foil opens the discharge ports. This allows gas to flow through the metal filter and into the airbag. The airbag unfolds and is inflated.

Depending on force of impact and driver seating position, J234 activates the driver airbag release valve igniter, cutting the band and opening the additional discharge port. The airbag is "adapted" to the event seating situation of the occupants.

To provide adaptivity, an additional igniter, Driver Airbag Release Valve Igniter N490, and a discharge port are located on the back of the gas generator. This discharge port is kept closed in the airbag by a band.

The gas generator of the driver's airbag is mounted on the steering wheel in a rubber ring, which minimizes vibration.



#### Note

The driver airbag module is attached to the steering wheel by clips. Refer to current technical literature for complete removal instructions.

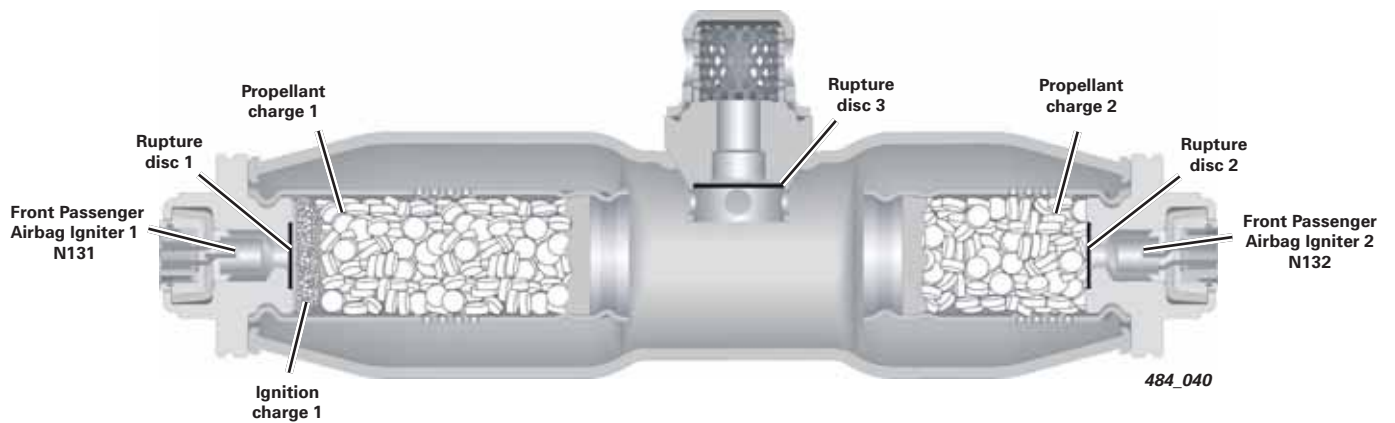
## Front Passenger Airbag

### Front Passenger Airbag Igniter 1 N131 and Front Passenger Airbag Igniter 2 N132

The 2012 A7 for the North American market comes equipped with a two-stage adaptive front passenger airbag. It uses a two-stage hybrid gas generator.

Based on accident parameters, Airbag Control Module J234 determines the time interval at which Front Passenger Airbag Igniter 2 N132 is activated after Front Passenger Airbag Igniter 1 N131.

Front passenger two-stage hybrid gas generator



#### Note

When performing work on the airbag system, it is very important to pay close attention to the Cautions and Warnings provided in current technical literature.

## Front Side Airbags

### Driver and Front Passenger Thorax Airbag Igniters N199 and N200

The seat-mounted side airbag modules have solid propellant generators for inflating side airbags with gas.

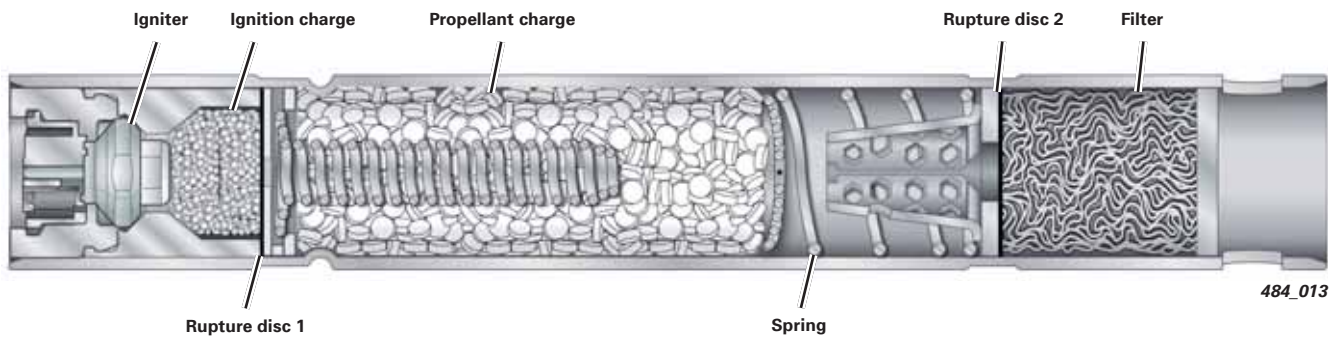
If a side impact necessitating the deployment of the side airbag is detected, Airbag Control Module J234 energizes N199 and N200. This ignites the priming charge.

The resulting gas pressure breaks rupture disc 1 and ignites the propellant charge. Rupture disc 2 breaks when a predetermined pressure level is exceeded, producing gas that unfolds and inflates the airbag.

Gas generators are used for the front and optional rear side airbag modules.



Design

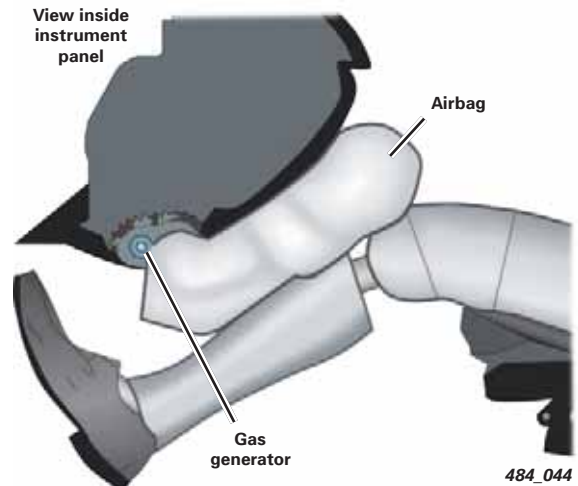


## Knee Airbags

### Driver and Front Passenger Knee Airbag Igniters N295 and N296

Deployed knee airbags protect occupants earlier in the vehicle deceleration process. On the driver's side, the knee airbag is integrated into the trim at the bottom of the instrument panel.

On the front passenger side, the knee airbag is located just below the glove box lid. Knee airbags are activated in combination with the front airbags. Hybrid gas generators are used.



## Audi Sideguard Airbags

### Driver and Front Passenger Head Curtain Airbag Igniters N251 and N252

Audi Sideguard airbags are located on the left and right hand sides of the vehicle along the base of the headliner.

Their range of protection extends from the A-pillar to the D-pillar and covers almost the entire side window area.



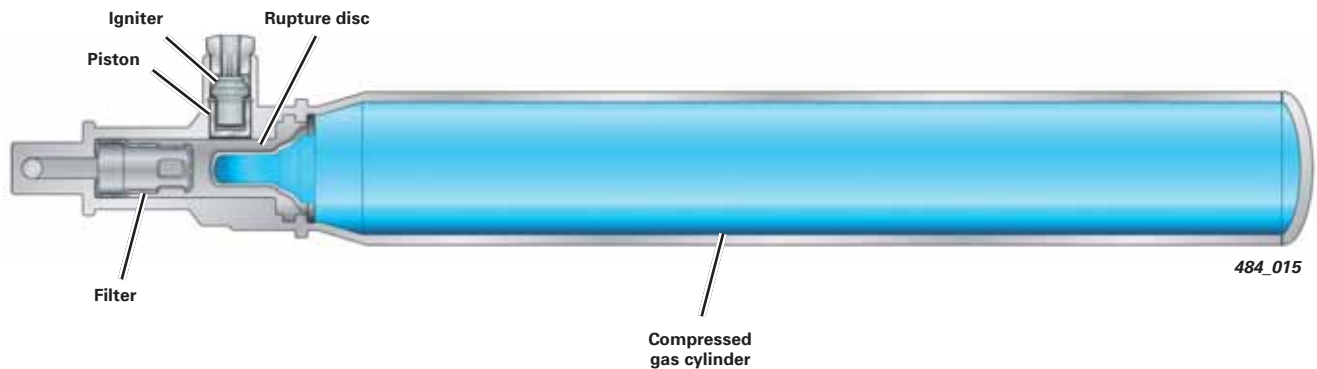
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N251 and N252 are activated by Airbag Control Module J234. The gas pressure produced in the igniter displaces a piston which in turn shears off the rupture disc.

The compressed gas emerging from the gas cylinder can now flow into the airbag, which unfolds and is inflated.

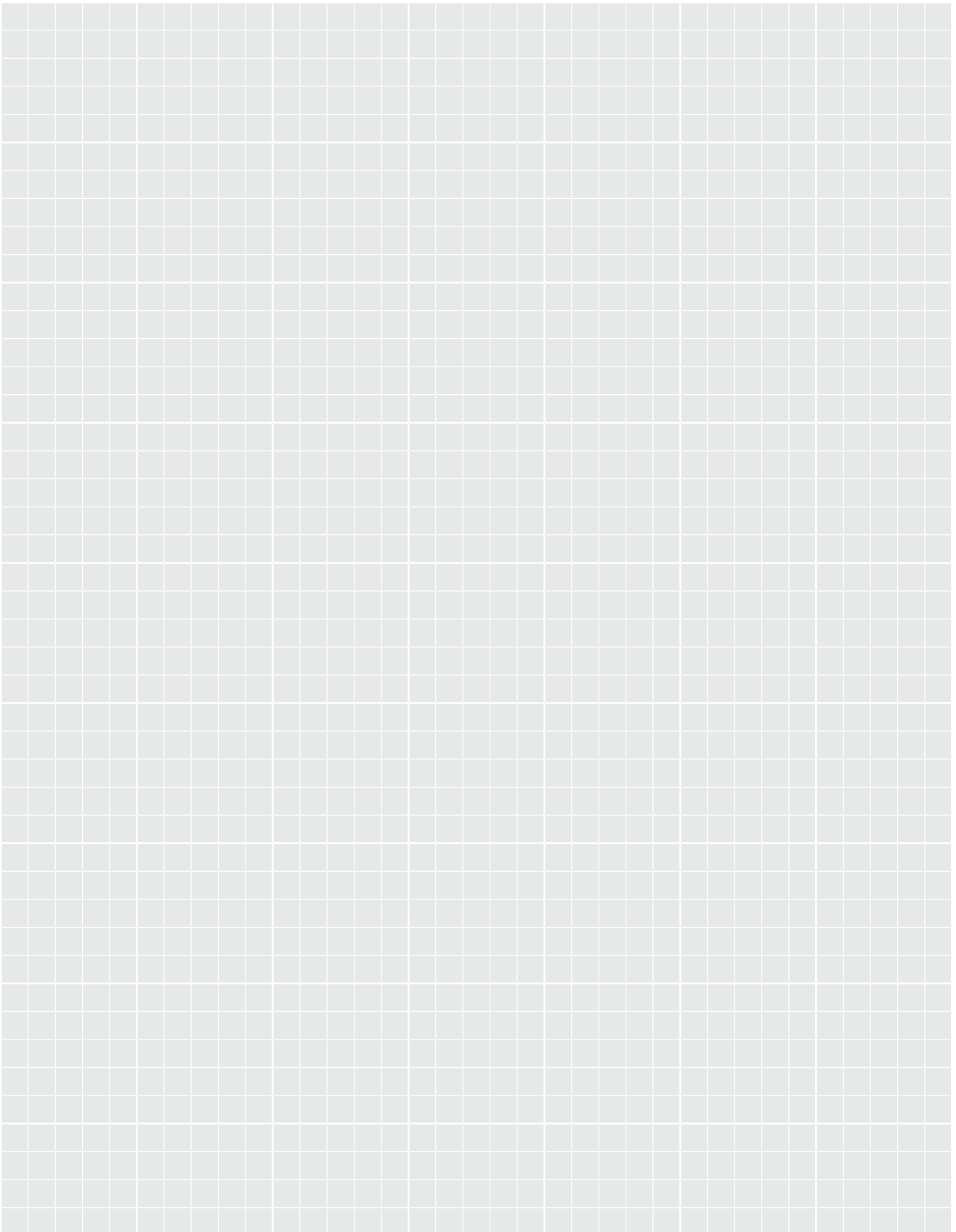
The sole task of the pyrotechnic igniters is to open the compressed gas cylinder.

The gas generators for Audi Sideguard protection are located at the transition point of the B-pillar and roof line.



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# Safety Belts

## Front Inertia-Reel Safety Belts

### For Vehicles without Audi Presense Basic or Audi Presense Plus

On vehicles not equipped with Audi presense basic or Audi presense plus, the inertia-reel safety belts have the following functions:

- Pyrotechnic safety belt pretensioners
- Adaptive belt force limiters

### Front Safety Belt Pretensioner

#### Driver and Front Passenger Seat Belt Tensioner Igniters 1 N153 and N154

With this type of safety belt pretensioner, a metal band is wound around the safety belt retractor shaft. Both open ends of the band are connected to the safety belt retractor shaft. The closed end is looped around the safety belt pretensioner igniter.

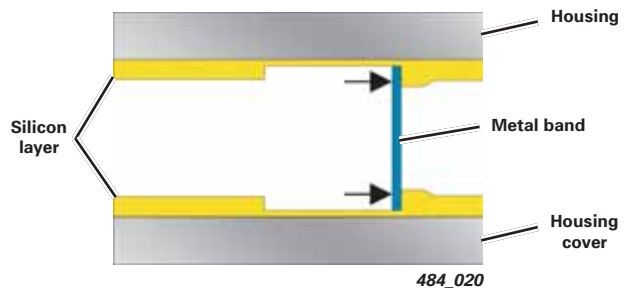
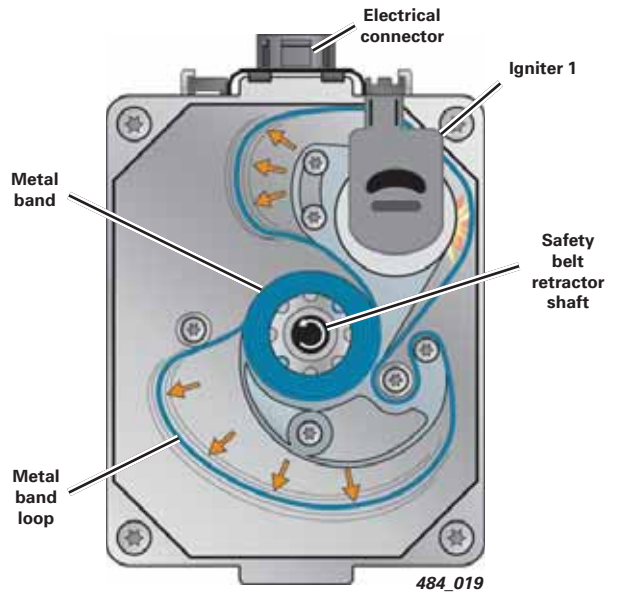
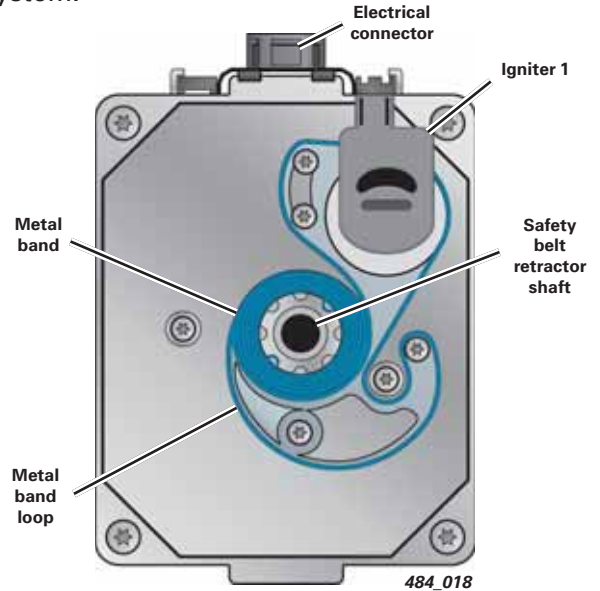
When either N153 or N154 are ignited by the Airbag Control Module, the resulting pressure causes the loop of the metal band to expand.

The movement of the metal band pulls on the safety belt retractor shaft, which then begins to rotate. This in turn tightens the safety belt.

This causes the distance between the safety belt and the occupant (belt slack) to be reduced. The retractor stops tensioning the safety belt when the counterforce on the safety belt is greater than the force exerted by the pretensioner.

The surface of the housing and the housing cover between which the metal band moves are coated in a layer of silicon. When the metal band moves, it thrusts a part of this silicon layer ahead of itself, ensuring that a tight seal is maintained and pressure losses are reduced.

If the vehicle is equipped with Audi presense basic or Audi presense plus, please see page 16 for a complete description of the safety belt system.



# Adaptive Belt Force Limiter

## For Vehicles without Audi Presense Basic or Audi Presense Plus

### Driver and Front Passenger Belt Force Limiters G551 and G552

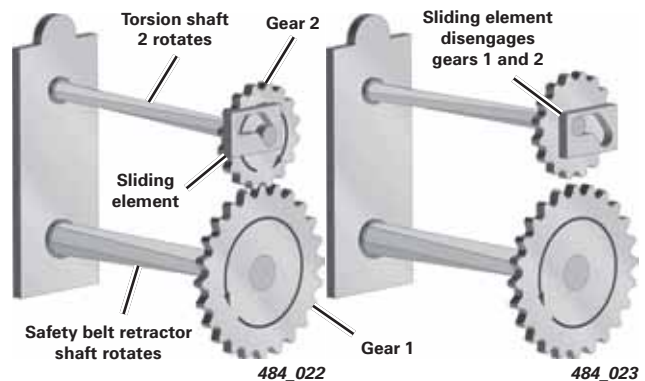
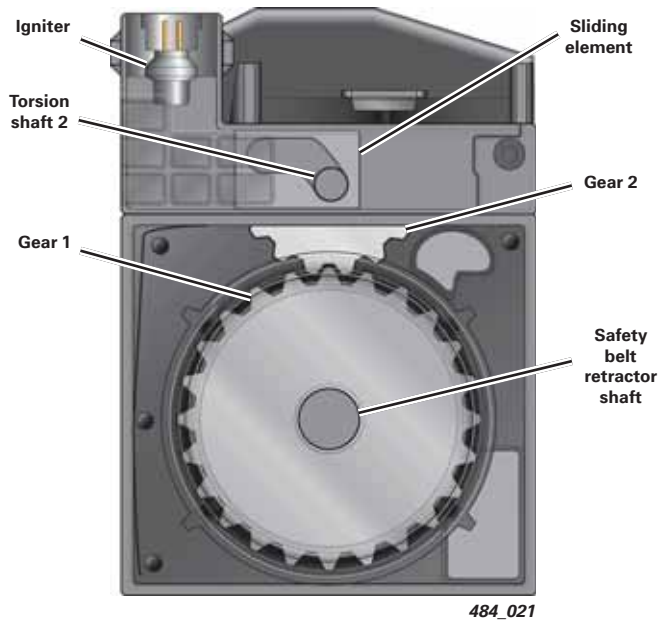
The front inertia-reel safety belts have adaptive two-stage belt force limiters.

In the event of a collision in which the pyrotechnic safety belts will deploy, the belt pretensioners are ignited first. The belt pretensioner retracts the safety belt as far as possible. The inertia-reel safety belt blocks the safety belt retractor shaft and prevents the safety belt from unreeling, which otherwise would occur due to the forward motion of the occupants.

If the occupant moves forward due to deceleration, the belt force limiter allows controlled unreeling of the safety belt as of a predetermined force level.

The load which the safety belt exerts on the occupants is thus reduced.

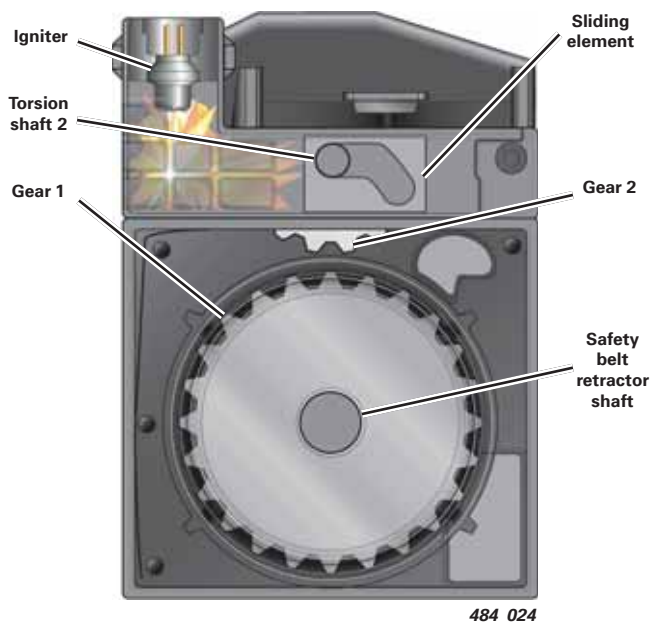
The safety belt retractor shaft is designed as a torsion shaft and is coupled with torsion shaft 2 via gears 1 and 2. Both torsion shafts are rotated (high belt force level).



Depending on impact severity and seating position, Airbag Control Module J234 determines when to activate G551 and G552.

The resulting gas pressure displaces a sliding element, which decouples the second torsion shaft from the safety belt retractor shaft. The safety belt retractor shaft now counteracts by itself the force which the safety belt exerts (low force). To optimize occupant protection, the belt tensioning function, the belt force limiting function, and the front airbags are phased.

The belt force limiter igniters are not activated in the event of a side impact or rear collision.



On vehicles equipped with Audi presense basic or Audi presense plus, the following functions are integrated into the front inertia reel safety belts:

- Reversible belt tensioner with control module
- Pyrotechnic belt tensioner
- Adaptive belt force limiter

Reversible belt tensioners:

- Left Front Seat Belt Tensioner Control Module J854
- Right Front Seat Belt Tensioner Control Module J855

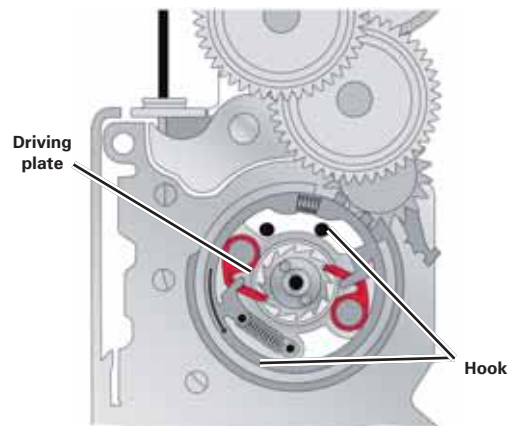
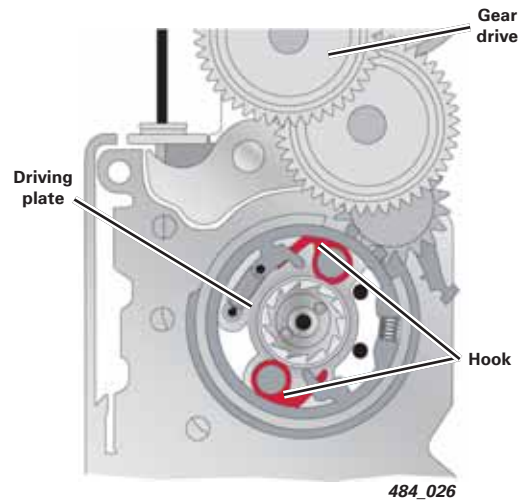
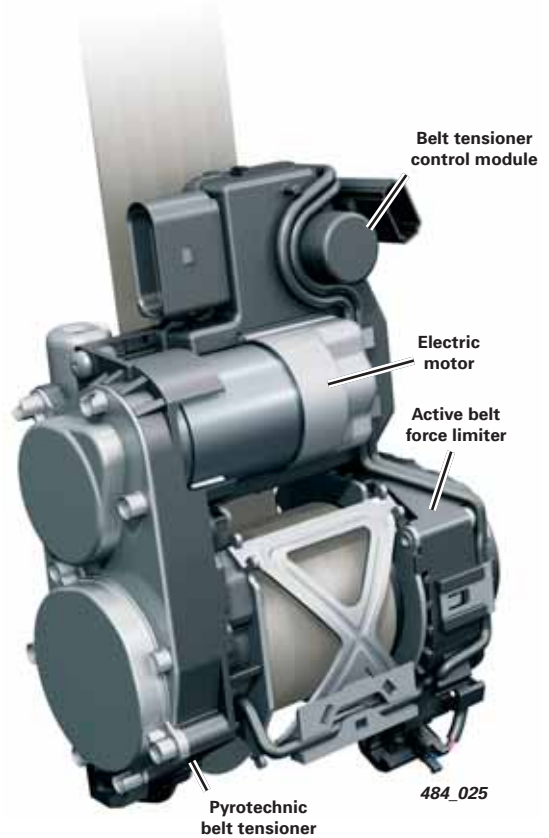
Control modules J854 and J855 communicate via the Extended CAN bus and Data Bus On Board Diagnostic Interface J533. The control modules activate electric motors which vary the tension applied to the belts.

Three different force levels are available:

1. Low force = belt slack reduction
2. Medium force = partial tensioning
3. High force = full tensioning

If Airbag Control Module J234 detects a minor head-on collision where the belt tensioners are not needed, a corresponding signal is sent to J854 and J855 to initiate full electrical motor tensioning of the safety belts.

When the electric motors operate, a driving plate is driven by toothed gearing. Two hooks extend connecting the driving plate to the safety belt retractor shaft. The safety belt is retracted. When the motors stop or reverse slightly, the hooks retract, releasing the safety belt retractor shaft.

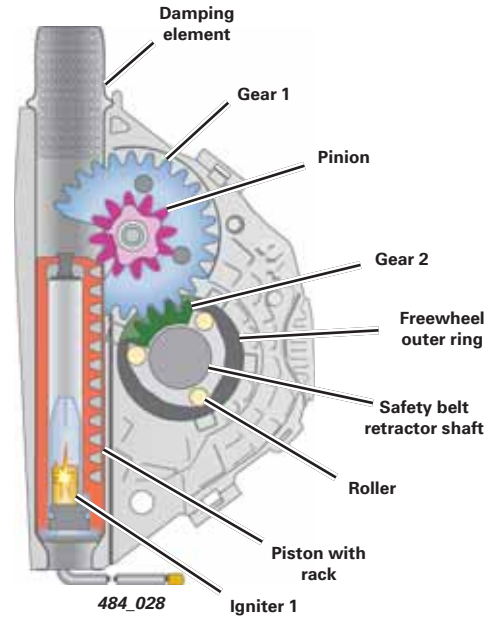


## Front Pyrotechnic Belt Pretensioners

### Driver and Front Passenger Seat Belt Tensioner Igniters 1 N153 and N154

These pyrotechnic safety belt pretensioners are of rack-and-pinion design.

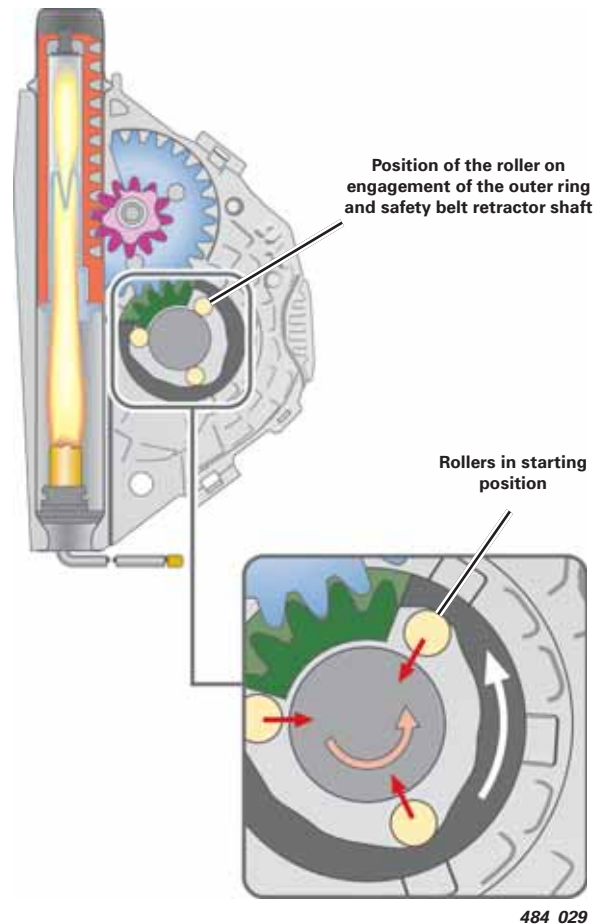
The signal from Airbag Control Module J234 ignites N153 or N154. The build-up of pressure causes the piston coupled to the rack to move upwards. The rack turns gears 1 and 2 via the pinion.



### Activated

Gear 2 is permanently connected to the outer ring of the safety belt retractor shaft freewheel. When the outer ring turns, the rollers are thrust inwards until they lock into place between the outer ring and safety belt retractor shaft, providing traction between these two components. Rotational movement is now transmitted to the safety belt retractor shaft and the process of retracting the safety belt begins.

The retractor stops tensioning the safety belt when the counterforce on the safety belt is greater than the force exerted by the pretensioner.



## Adaptive Belt Force Limiter

The front inertia-reel safety belts have dual-stage belt force limiters. In a head-on collision where impact force exceeds a predetermined deployment threshold, the pyrotechnic belt tensioners are ignited first.

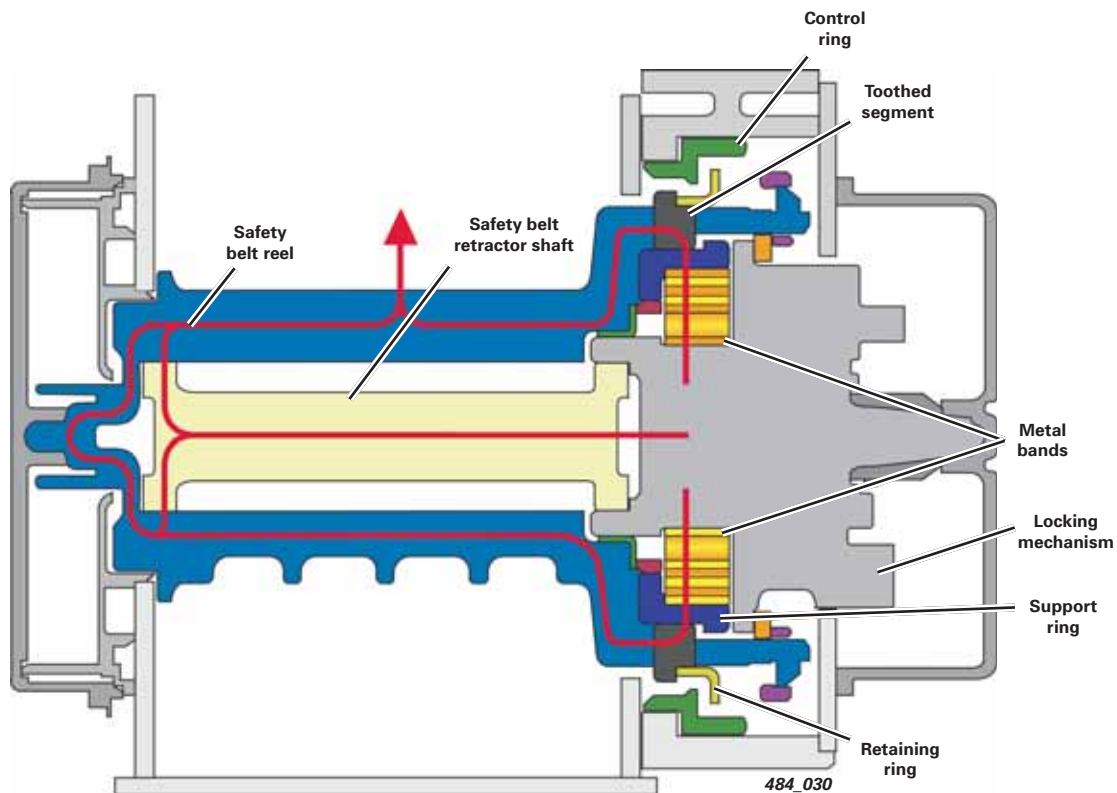
The inertia-reel safety belt locking mechanism then blocks the safety belt retractor shaft, preventing the safety belt from unwinding. Otherwise, due to the forward motion of the occupants, the safety belts would attempt to unwind.

To reduce the load exerted on occupants by the safety belt, the safety belt retractor shaft and a belt winder allow the safety belt to unwind in a controlled way.

The airbag control module activates the belt force limiter igniter in relation to the force of impact and the longitudinal position of the seat.

The force counteracting the safety belt is distributed as follows:

1. From the safety belt reel to the locking mechanism via the safety belt retractor shaft. The safety belt retractor shaft twists like a torsion bar.
2. From the safety belt reel to the locking mechanism via toothed segments, support ring, and metal bands. The metal bands, which are connected to the support ring and locking mechanism, are retracted.



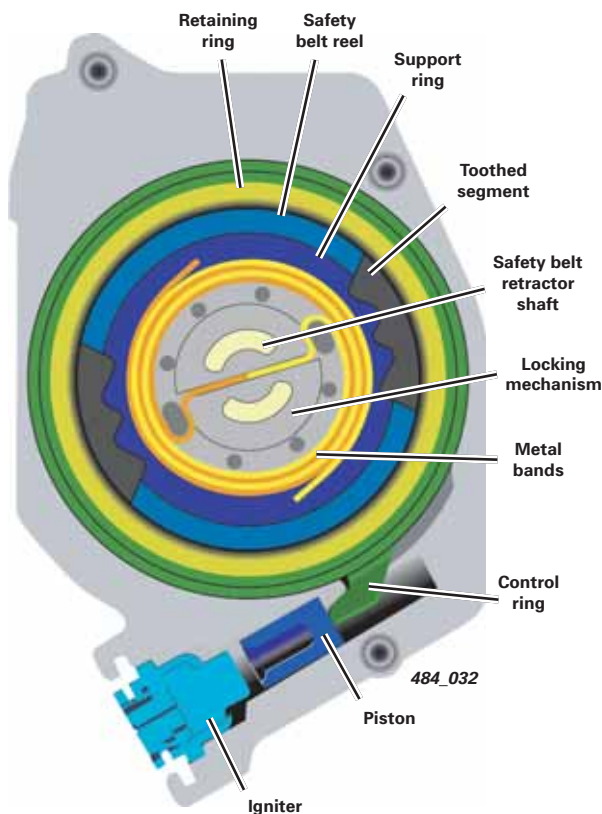
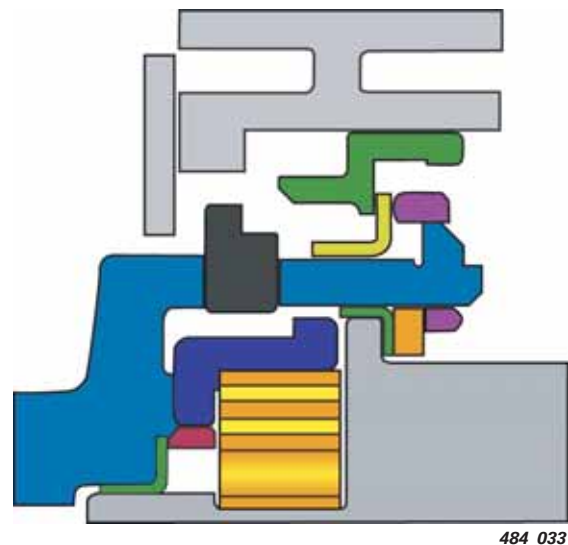
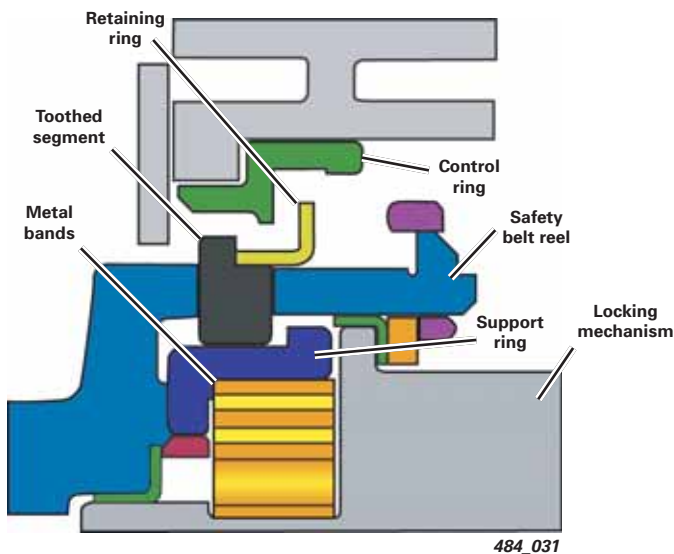
Depending on impact severity and longitudinal seating position, Airbag Control Module J234 activates belt force limiter igniters G551 and G552.

This results in gas pressure displacing the piston, causing the control ring to rotate. This displaces the retaining ring and disengages the toothed segments from the support ring, decoupling the belt winder.

The torsion bar then counteracts the force which the safety belt exerts (low force).

The belt tensioning function, belt force limiting function, and front airbags are phased. The belt force limiter igniters are not activated in the event of a side or rear impact collision.

Note: Belt Force Limiter Igniters G551 and 552 may not always be deployed. Always treat the pyrotechnic safety belt assemblies with caution.



## Front Passenger Occupancy Detection

### Passenger Occupant Detection System Control Module J706 and Front Passenger Seat Occupant Sensor G128

The task of the seat occupancy recognition system is to send the occupancy status of the front passenger seat to Airbag Control Module J234.

Two occupancy conditions are recognized:

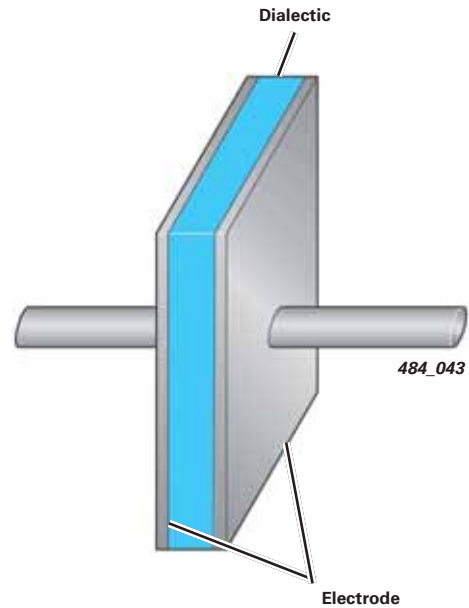
1. Seat not occupied, or child seat installed
2. Seat occupied by an adult

### Front Passenger Seat Occupant Sensor G128

G128 is a capacitive sensor, which consists of two meshed plates (electrodes) and an electrical insulator (dielectric) sandwiched between them.

When voltage is applied to one of the electrodes, with the other electrode connected to ground, the capacitor begins to accumulate energy. The accumulated energy (capacitance) is measured in units called farads. Capacitance can be altered by varying the size of the electrode plate or the dielectric.

This determines whether the front passenger front airbag and front passenger knee airbag are activated or deactivated. If the components are deactivated, Front Passenger Airbag –Disabled– Indicator Lamp K145 in the instrument cluster lights up to inform occupants.

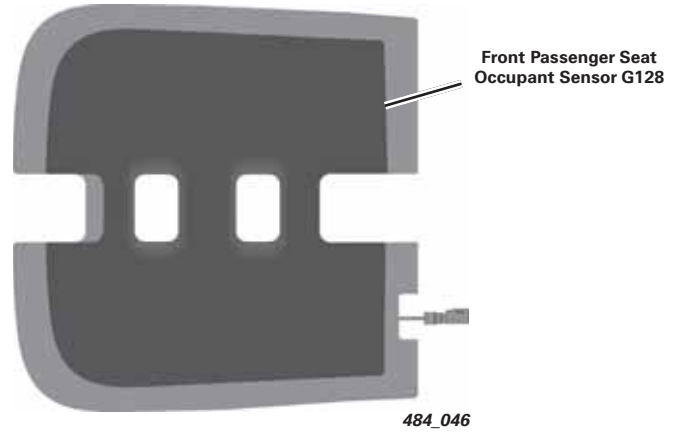




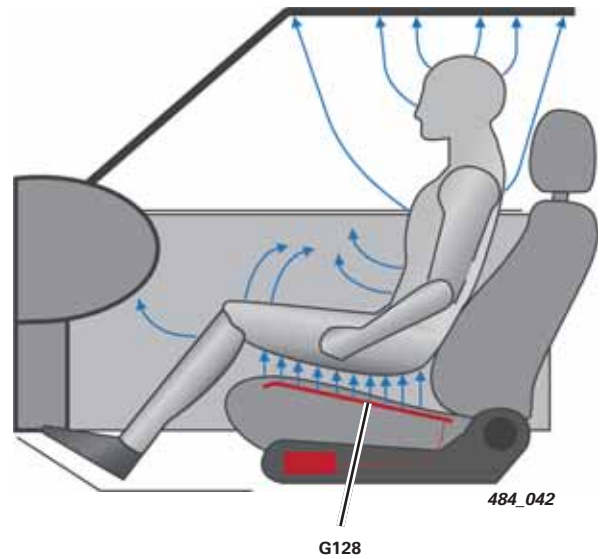
With this type of occupancy recognition system, the first electrode plate is Front Passenger Seat Occupant Sensor G128 and the second electrode plate is the vehicle body. The size of these components is not variable.

The dielectric consists of the seat cover, the atmosphere, and the trim components. When an adult is seated in the front passenger seat, the dielectric between G128 and the vehicle body changes due to the person's fluid content. The capacitance therefore changes.

If a child seat is placed on the front passenger seat, the dielectric (and therefore capacitance) changes again. This change in capacitance is much smaller compared to an adult.



G128 is integrated into the seat cover above the seat cushion.



## Passenger Occupant Detection System Control Module J706

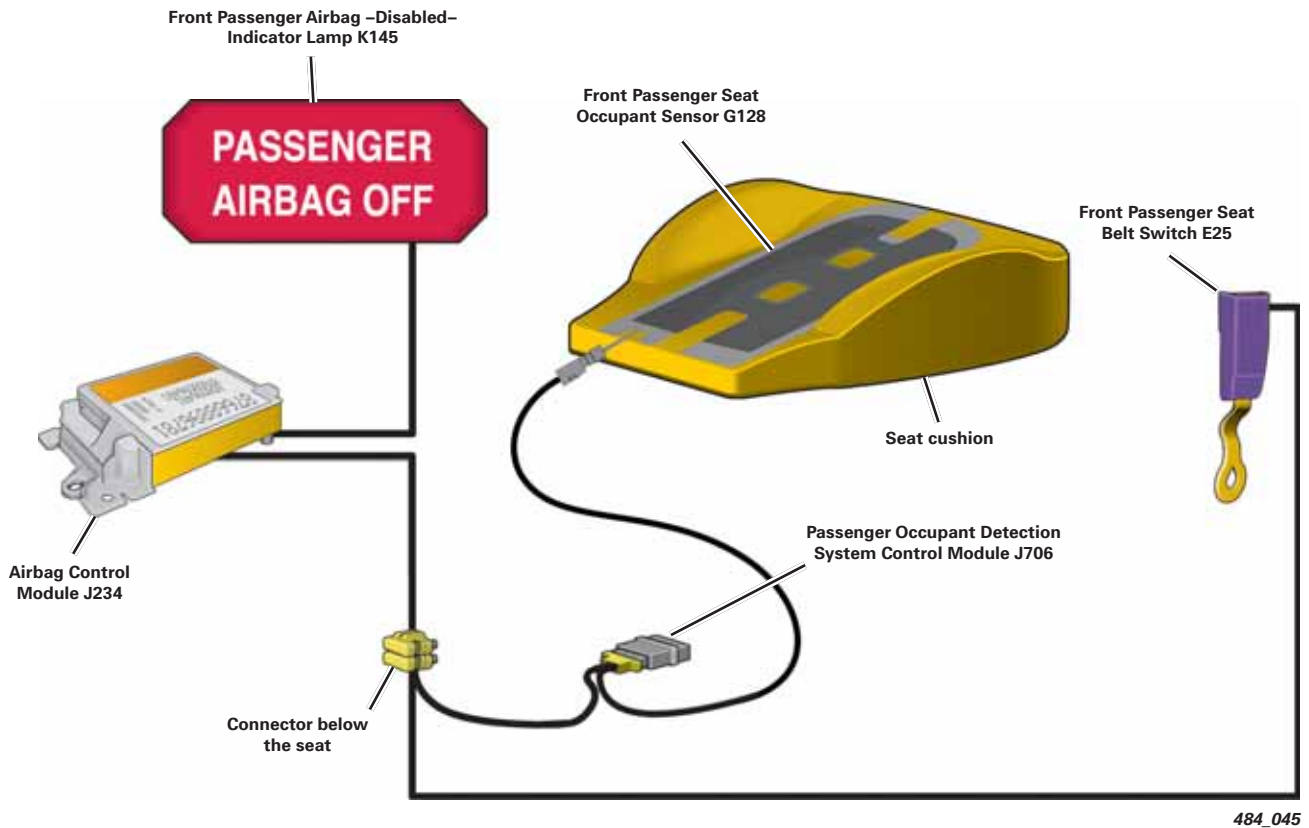
Front Passenger Seat Occupant Sensor G128 and Passenger Occupant Detection System Control Module J706 are connected by coaxial cable.

J706 detects a change in capacitance of the seat sensor and determines if the seat is occupied by a child seat or adult. The capacitance is measured cyclically by J706.

Airbag Control Module J234 and J706 communicate via the LIN bus.

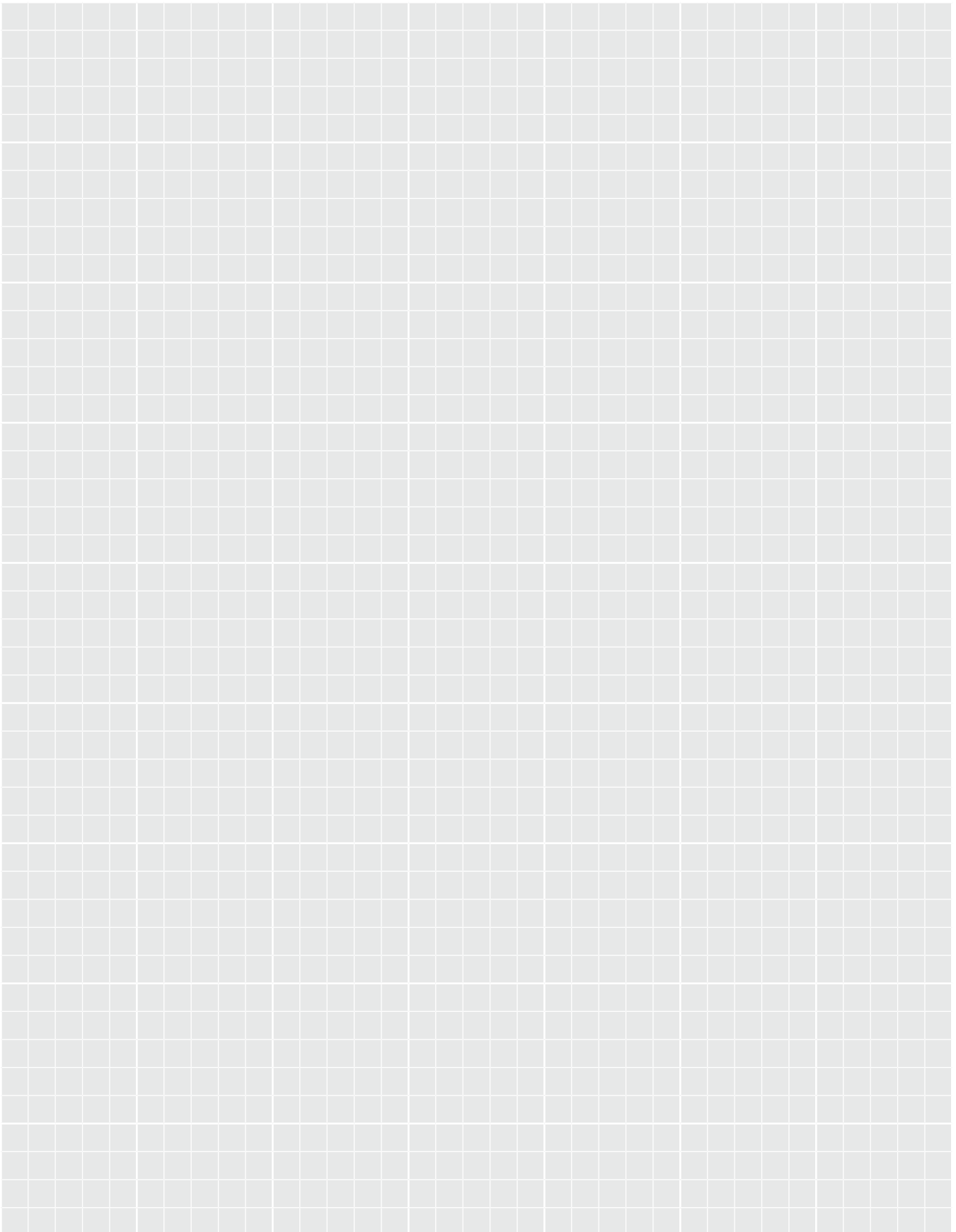
J234 activates or deactivates the front passenger airbag and illuminates Front Passenger Airbag –Disabled– Indicator Lamp K145 based on information from J706.

J706 is installed under the front passenger seat. There are different seat types and different seat occupancy recognition control modules. The software in the control modules is adapted specifically to each seat.



### Note

When repairing the seat occupancy recognition system, always refer to Guided Fault Finding, ETKA, and the latest electronic service information.



## Audi Pre Sense

Two versions of the Audi pre sense system are available on the 2012 A7.

- Audi pre sense basic
- Audi pre sense plus (includes: pre sense basic, pre sense front, and pre sense rear)

Audi pre sense is unable to prevent accidents. It alerts the driver to hazardous situations and assists where technically feasible. However, drivers are entirely responsible for their driving actions.

Audi pre sense networks various in-car systems via individual control modules and data bus systems. The associated control modules can evaluate the constant stream of information and take action as necessary.

The Audi pre sense systems on the 2012 A7 operate in the same way as on the 2011 A8.

## Audi Pre Sense Basic

### Belt Slack Reduction Function

If front seat occupants are wearing their safety belts and a vehicle speed of approximately 9.3 mph (15 km/h) is detected (forward travel), Left and Right Front Seat Belt Tensioner Control Modules J854 and J855 will activate the electric motors in the inertia-reels to reduce belt slack.

If the vehicle is traveling forward at a speed of less than 9.3 mph (15 km/h), belt slack is reduced after approximately 10 seconds. If safety belts are not being worn, the electric motors in the inertia reels will not be activated. Occupants can switch the automatic belt tensioner (belt slack reduction) OFF and ON via the MMI.



### Reference

For more information about Audi pre sense, refer to Self-Study Program 990103, *The 2011 Audi A8 Introduction*.

### Longitudinal Dynamics Function

If the driver applies heavy braking, Left and Right Front Seat Belt Tensioner Control Modules J854 and J855 will initiate partial safety belt tensioning once a predetermined braking pressure is exceeded.

If the driver performs an extreme braking maneuver (for example, emergency braking), a sudden increase in brake pressure will occur in the brake system due to pressure on the brake pedal. If this brake pressure reaches a predetermined level within a defined period of time, the safety belts are fully tensioned by J854 and J855.

ABS Control Module J104 also switches the hazard warning light system ON. Electrical belt tensioning reduces the forward motion of occupants by up to approximately 3.9 in (10.0 cm), depending on the situation.

### Transverse Dynamics Function

If the vehicle begins to understeer or oversteer, the Electronic Stability Program (ESP) is activated, sending a signal to partially tension the safety belts. If the vehicle can no longer be stabilized, the safety belts are fully tensioned, and closing of the side windows/sunroof is initiated. If an accident does not occur, the safety belts are again released and the hazard warning lights (if ON) are switched OFF.

Depending on how Audi drive select is configured and whether the Traction Control System (TCS) is switched ON or OFF, the safety belts are electrically tensioned according to the driving situation.

Due to the short amount of time available, the side windows/sunroof may not fully close. Closing of the side windows/sunroof can reduce the probability of miscellaneous objects entering the vehicle interior.







484\_106

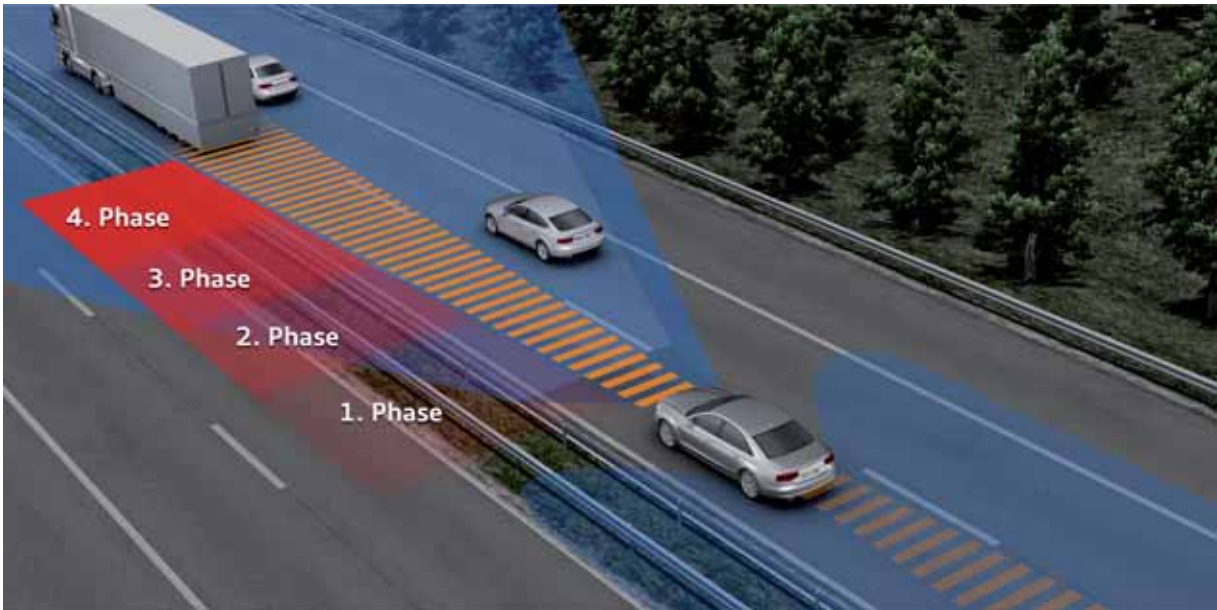
# Audi Pre Sense Plus

## Audi Pre Sense Front

In the U.S. market, Audi pre sense plus is only available in combination with Adaptive Cruise Control (ACC), Audi braking guard, and Audi side assist.

The Distance Regulation Control Modules of the ACC system continue to monitor the traffic ahead and send information, even when the ACC is switched OFF. Other control modules can receive and evaluate these messages before taking appropriate action.

|   |   |   |  |
|---|---|---|--|
| <p><b>Phase 1</b></p> <ul style="list-style-type: none"><li>- Visual and audible warning</li><li>- Pre-charging of the brake system</li><li>- Damper adjustment</li></ul>  | <p><b>Phase 2</b></p> <ul style="list-style-type: none"><li>- Warning braking</li><li>- Safety belt slack reduction</li><li>- Partial braking 1 (approx. 30%)</li></ul>  | <p><b>Phase 3</b></p> <ul style="list-style-type: none"><li>- Partial braking 2 (approx. 50%)</li><li>- Closing of windows/sliding sunroof</li><li>- Activation of hazard warning lights</li></ul>  | <p><b>Phase 4</b></p> <ul style="list-style-type: none"><li>- Reversible belt pretensioners</li><li>- Full braking</li></ul>  |
|---|---|---|--|

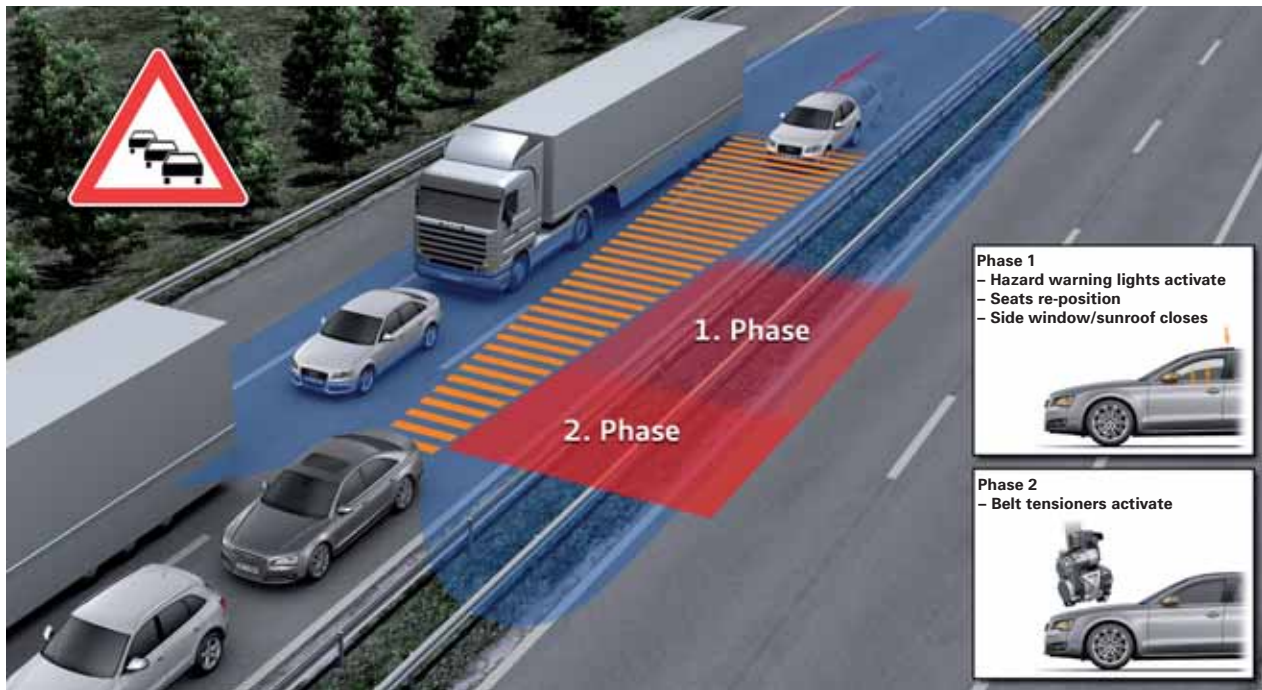


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## Audi Pre Sense Rear

Audi pre sense rear enables following traffic to be monitored. The radar sensors of the Audi side assist system provide a continuous flow of information to Lane Change Assistance Control Module J769, which evaluates the information and places any relevant information onto the data bus.

J769 even sends data when the Audi side assist system is switched OFF.



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# Infotainment

## Introduction

The A7 comes equipped with the MMI Radio plus or the MMI Navigation plus system, depending on the vehicle model level.

MMI Radio plus



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484\_067

MMI Navigation plus



484\_065



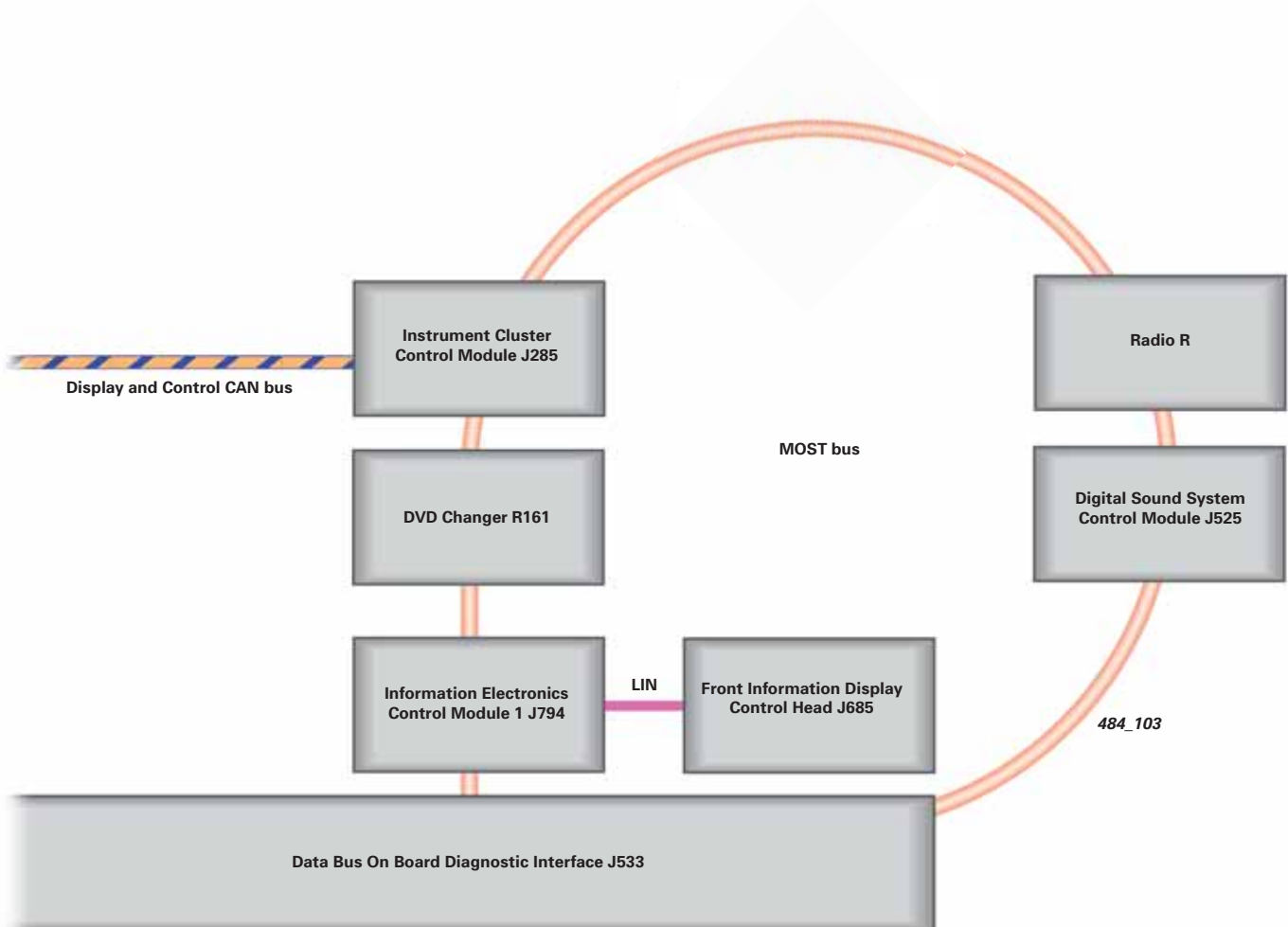
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## Topology

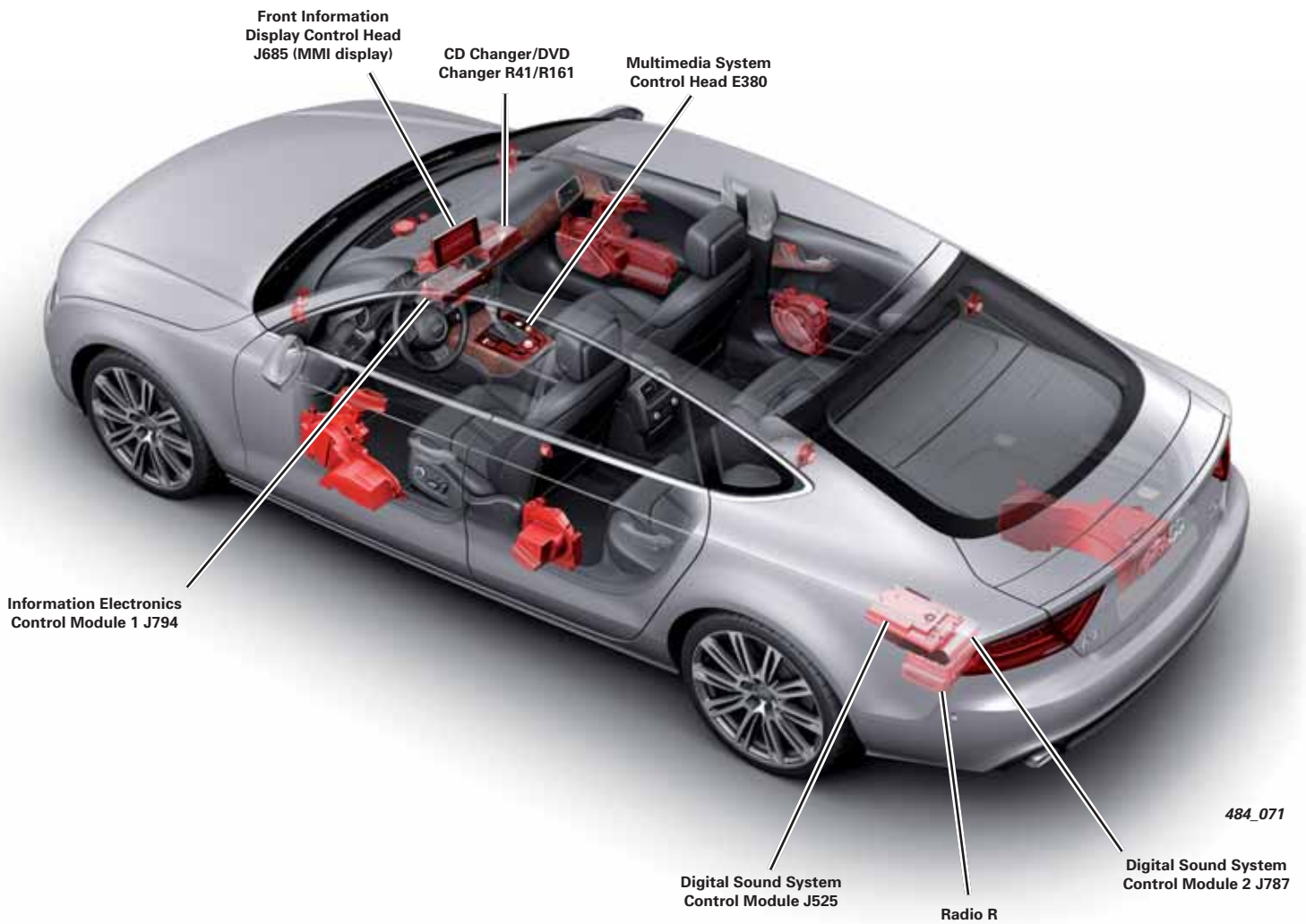
The A7 Infotainment control modules communicate over the MOST bus. This allows very high data transfer rates.

Picture signals from the back-up camera or DVD changer are transmitted as FBAS signals to Information Electronics Control Module 1 J794.



## Infotainment Control Module Locations

The control modules of the Infotainment system of the A7 are installed in various locations based on the equipment level of the vehicle. The following illustration shows the installation locations for an A7 with MMI Navigation Plus.



## Radio Media Center (RMC)

The MMI Radio plus system belongs to the Radio Media Center infotainment platform.

Depending on equipment level, the Radio Media Center combines nearly all the hardware functions of a modern infotainment system in a single housing, which is the equivalent of a 1-DIN device. The RMC is also central controller for the infotainment system.

The main difference in the RMC with the third generation MMI system is that there is no separate radio control module. The functions of the radio are integrated into Information Electronics Control Module 1 J794. On vehicles with MMI Radio plus, J794 has an additional audio amplifier.

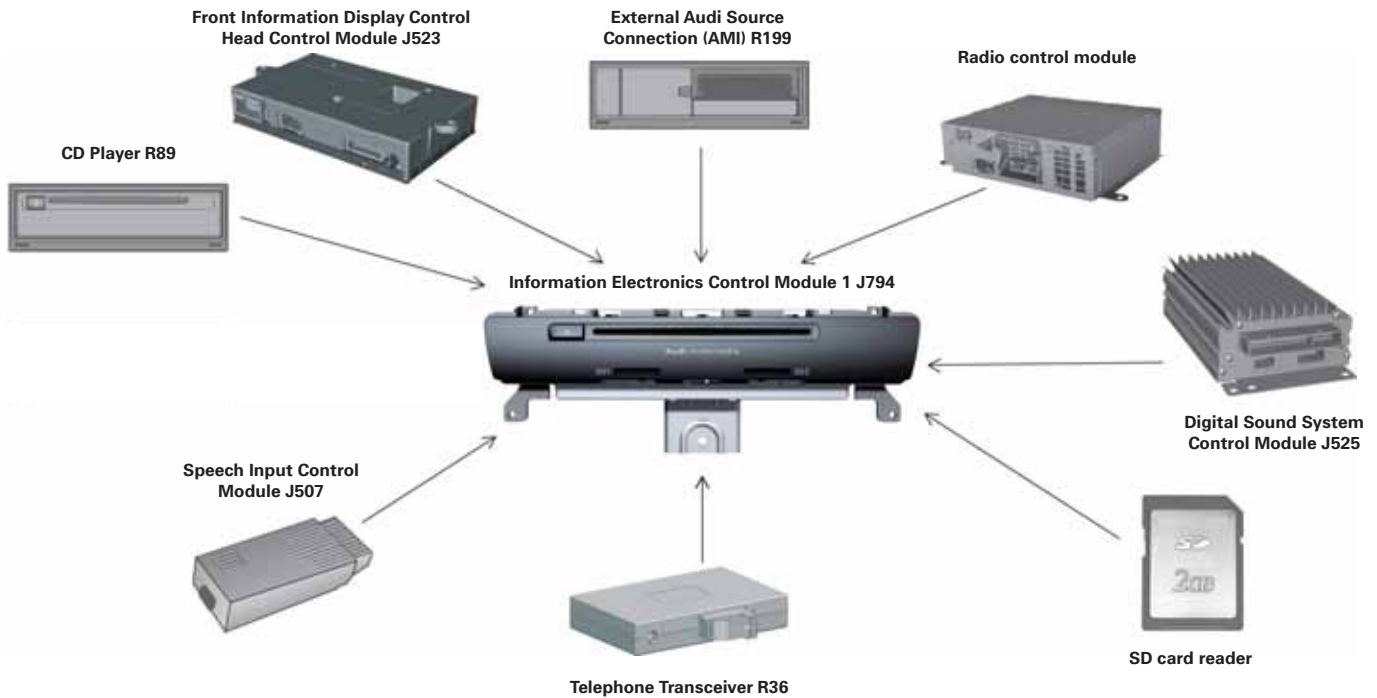
Radio diagnosis with the VAS Scan Tool is done through Address Word 5F – Information Electronics Control Module 1 J794.

Front panel of J794 for MMI Radio plus



## RMC Control Modules

This illustration below shows which control modules and functions are grouped within Information Electronics Control Module J749 of the Radio Media Center.



## MMI Radio Plus (RMC)

MMI Radio plus has the following features:

- Two SD card readers
- Integrated six-channel amplifier for the Audi Sound System with 180 watts power output
- Bluetooth interface
- Speech dialogue system
- Driver Information System (DIS) with monochrome screen in the instrument cluster
- Digital satellite radio
- AUX in on center console
- Compatible with optional equipment
- 6.5-inch color display with 400 x 200 pixel resolution
- Control panel with six freely assignable radio station keys
- FM tuner with dual diversity

With MMI Radio plus, the CD drive and the SD card reader support playback of the following audio files:

- MP3
- WMA
- AAC
- WAV

The metadata in these files (album, track, artist, etc.) and the embedded album cover can also be displayed.

### Bluetooth Interface

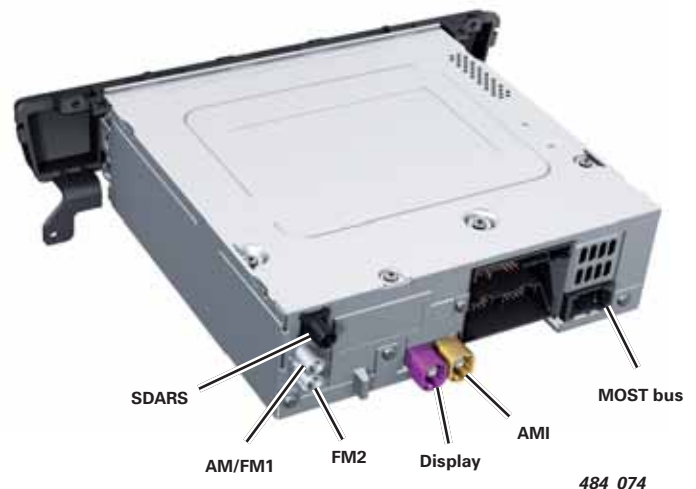
The MMI Radio for the A7 comes with a Bluetooth interface, which enables the RMC to be used for the hands-free telephone and audio streaming.

The Bluetooth HFP profile is used for the hands-free telephone and A2DP for audio streaming. The AVRCP profile is used to control the audio player connected via Bluetooth. The scope of the control options is dependent upon the device in use.

Front panel of J794 for MMI Radio plus



Back panel of J794 for MMI Radio plus



### Speech Dialogue System

MMI Radio plus comes with an integrated speech dialogue system, which can be used, among other things, for the hands-free telephone or for selecting a radio channel. The main functions of the RMC can be operated by voice control (for example, find a contact in a directory, dial a number, etc.).

## MMI Navigation Plus

The MMI Navigation plus system is identical to the system of the 2011 A8. It is a third generation MMI system with the internal designation MMI3G plus. The following features are standard on the A7:

- 60 GB hard drive (with approximately 20 GB for Jukebox)
- 3D navigation with 3D city models
- DVD drive
- Two SD card readers (for SDHC cards up to 32 GB in size)
- Premium speech dialogue system
- Radio control module with phase diversity
- Six-channel amplifier with 180 watts power output (integrated into the radio control module)
- 8-inch TFT screen with 800 x 480 pixel resolution
- Driver information system with 7-inch color screen in the instrument cluster
- MMI touch
- Bluetooth interface for:
  - Hands-free telephone (HFP)
  - Audio streaming (A2DP)

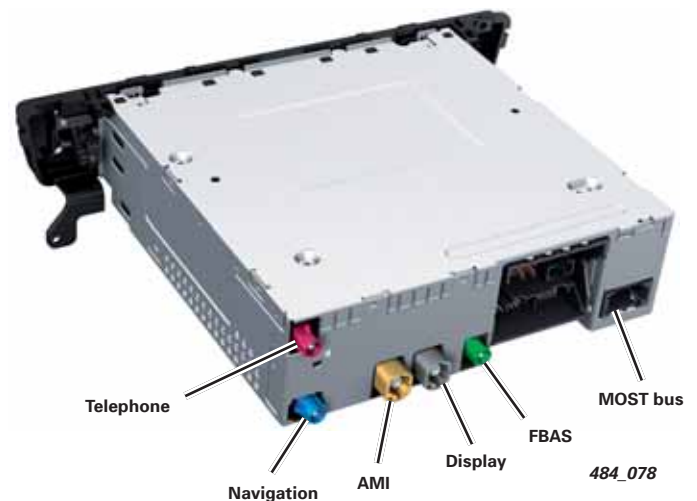
The A7 with MMI Navigation plus also has the following standard equipment features:

- Audi Music Interface
- Audi Connect (WLAN hotspot)
- Digital satellite radio tuner

Front panel of J794 for MMI Navigation plus



Back panel of J794 for MMI Navigation plus



## New Features of MMI Navigation Plus

### Google Earth Map

The 3D map display can be expanded to include satellite mapping via Google Earth.

The 3D satellite map display is produced by combining the 3D map display with the existing 3D topographical display. This function is only available in combination with Audi Connect and an active data link.

### WLAN Hotspot

The A7 has a WLAN hotspot in combination with Audi Connect. Passengers with suitable devices can use the WLAN hotspot to surf the Internet, retrieve data or e-mails or, for example, to conveniently and securely download the latest apps for an iPad.

When a network link is active, it is indicated at the bottom right of the display. 2G is displayed for GSM network and 3G for UMTS network.

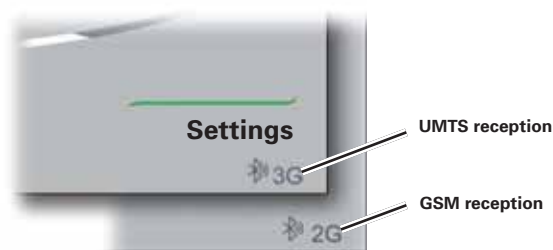
The Universal Mobile Telecommunications System (UMTS) is a third generation (3G) mobile communications standard which provides for significantly higher data transfer rates (up to 7.2 Mbit/s with HSDPA [High Speed Downlink Packet Access] and up to 384 kbit/s without) than the second generation (2G) mobile communications standard, the GSM Standard (up to 220 kbit/s with EDGE and max. 55 kbit/s without).

3D satellite map



484\_079

Network connectivity display



484\_081



#### Note

The final operational features and graphic displays for Audi Connect and Google Earth may differ from those presented here. Always check appropriate literature for the latest information.

## Google Earth Mapping

A “normal” 3D map or a 3D map with Google Earth can be selected for MMI Navigation plus in the “Settings” menu of the navigation system.

If the Google Earth variant is active, the satellite maps are loaded directly from the Internet (currently from Google Earth). This satellite map is combined with the navigation map on the hard drive to produce a 3D satellite map.

The prerequisites for use of Google Earth maps are:

- MMI Navigation plus
- Audi Connect
- Data capable SIM card

### Loading Google Earth Maps

The following requirements must be met in order to load mapping material from Google Earth:

- T-Mobile SIM card inserted in the card reader
- Active Audi Connect account
- Configured data link

Also, in the “Settings” menu of the navigation system:

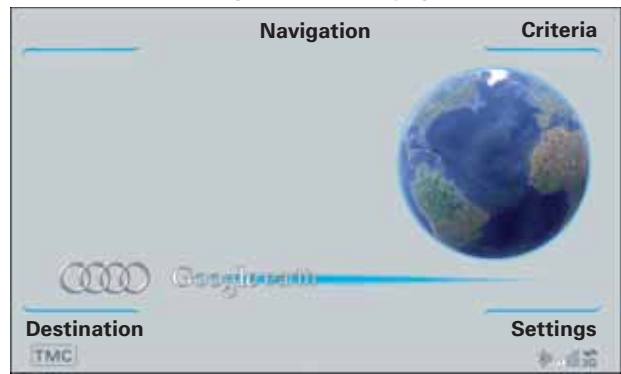
- Map type must be set to “Position 3D”
- Map display must be set to “Google Earth”

If these requirements are met, Information Electronics Control Module 1 J794 always loads the satellite map for the current location and the expected route. The loaded data packets are cached on the hard drive, where the current map view is then unpacked and displayed.

If enough data packets are stored for a certain route because the user travels this route on a daily basis, a 3D satellite map can be displayed even without an active link to Google Earth.

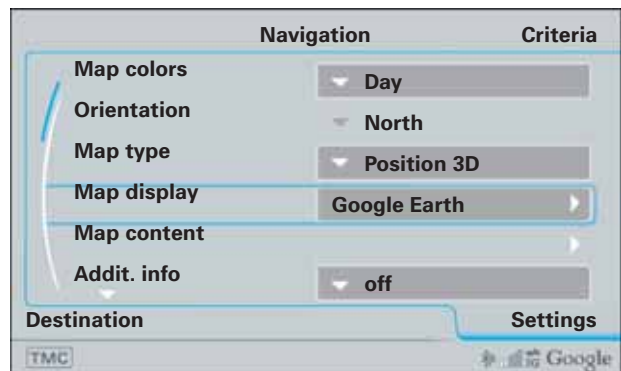
If there is not enough data in the cache to display a map of adequate quality on the MMI screen, the system informs the user and switches to the standard map.

Google Earth home page



484\_082

Settings for Google Earth



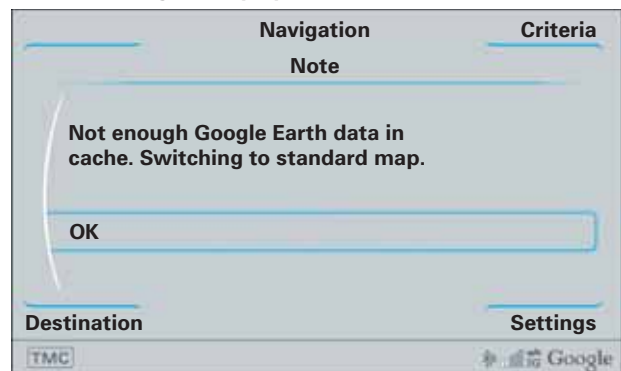
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3D satellite map



484\_079

This message is displayed if too little data is available



484\_084



#### Note

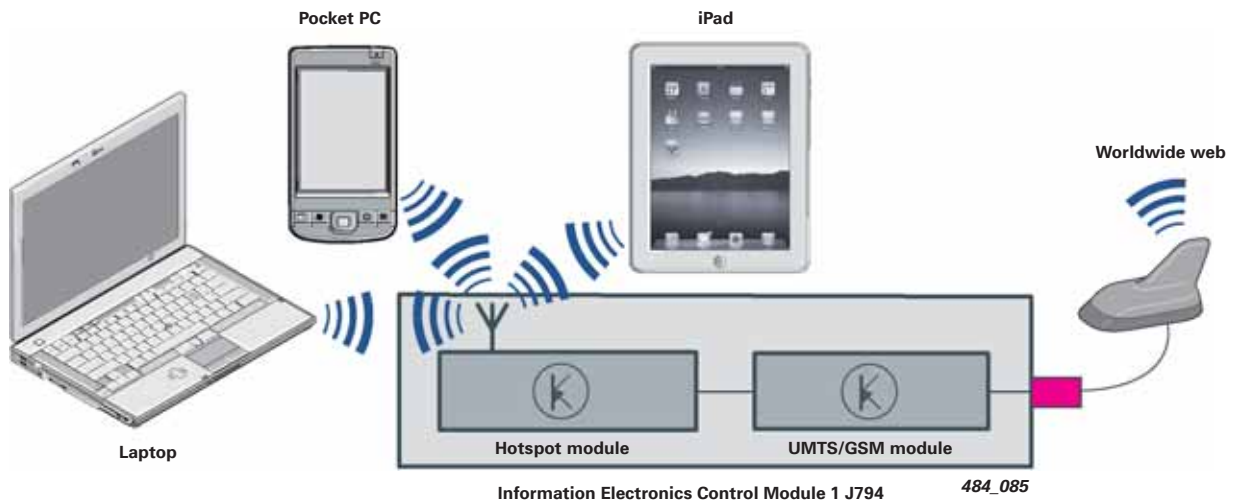
The final operational features and graphic displays for Audi Connect and Google Earth may differ from those presented here. Always check appropriate literature for the latest information.

## WLAN Hotspot

Wireless high-speed internet access is made possible via WiFi connectivity technology, which provides a link between WLAN (wireless local area network) hotspots and multiple devices.

A hotspot is a location which offers public Internet access via a wireless network. Unlike a regular WLAN network, the devices usually do not have to be linked to one another or networked. They are linked separately to the hotspot. Like most public hotspots, Audi also uses the IEEE802.11b/g wireless standard for transmitting data.

Schematic diagram of a WLAN hotspot



## WLAN on the Audi A7

Audi Connect is required to implement the WLAN hotspot. It transforms the A7 into a full-fledged office on wheels. Up to eight devices (for example, iPads, laptops, PDAs, etc.) can be linked to the hotspot. The reception range is confined to the interior of the vehicle.

The WLAN hotspot is installed with the following equipment combination:

- MMI Navigation plus
- Audi Connect

The control module required for the WLAN hotspot is integrated in Information Electronics Control Module 1 J794. The hotspot can also be used for connecting suitable devices via WLAN.

The UMTS module connects the device to the Internet via the vehicle's external aerial. The UMTS module is built into J794. Maximum download speed is 7.2 Mbit/s.

The following Internet connectivity requirements must be met:

- T-Mobile SIM card inserted in the card reader
- Active Audi Connect account
- Configured data link



### Note

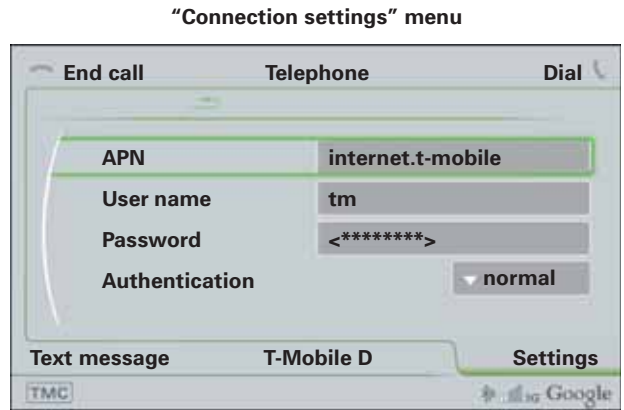
The final operational features and graphic displays for Audi Connect and Google Earth may differ from those presented here. Always check appropriate literature for the latest information.



## Setting up a Data Link to the Internet

When a data link is set up for the first time, it is configured automatically. If this fails, the following values must be entered manually in the telephone submenu “Data connection” under “Connection settings”:

- APN (access point)
- User name
- Password
- Authentication



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## Connecting a WLAN Device

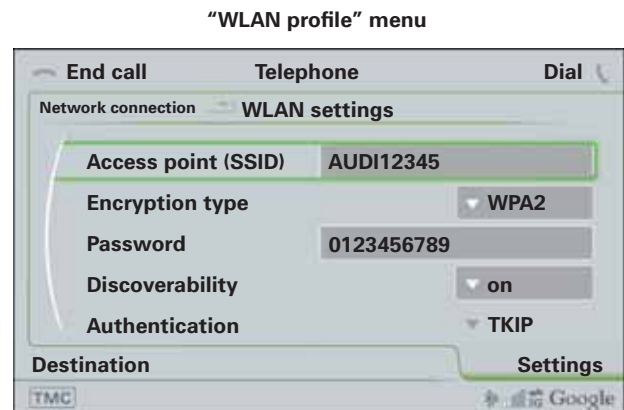
To connect the device, the car phone must be in operation. To connect a WLAN device to the hotspot for the first time, the following values must be entered into the device:

- Access point (SSID) – name of WLAN network
- Encryption type – WEP, WPA or WPA2
- Password
- Discoverability ON

The following values can be changed individually in the “WLAN settings” submenu. Likewise, the same values must be entered into the WLAN device.

The “WLAN settings” submenu can be accessed via the following menu options:

- Telephone
- Settings
- Connections
- Network connection (WLAN)
- WLAN settings



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### Note

The final operational features and graphic displays for Audi Connect and Google Earth may differ from those presented here. Always check appropriate literature for the latest information.

## Operating Unit

### Multimedia System Control Head E380

Two versions of E380 are used on the A7. Vehicles equipped with MMI radio plus have a six button keypad for selecting radio presets. On vehicles with the MMI Navigation plus, a touchpad is standard equipment.

E380 has been redesigned for the A7, and is different from the E380 found on the 2011 A8. The "Info" and "Tone" buttons have been eliminated. However, these two functions are still available in the main menu.

E380 is connected to Information Electronics Control Module 1 J794 via a serial RS232 port. E380 is also responsible for activating the MMI display. It is diagnosed via J794 using Address Word 5F.

Operating unit for MMI Radio plus



484\_089

Operating unit for MMI touch



484\_089

### Button Combinations for Service Work

E380 has modified button combinations for system reset functions and for activating the Engineering menu.

### System Reset

To reset the MMI system, the following buttons must be pressed briefly at the same time:

- Turn-push button
- Softkey at top right
- MENU

### Engineering Menu

To access this menu, the following buttons must be pressed one after the other and held down:

- CAR
- BACK

Button combination for system reset



484\_092

Button combinations for the Engineering menu



484\_093

## MMI Display

### Front Information Display Control Head J685

Two different displays are used on the A7, depending on vehicle model level. They differ from one another in terms of their size and resolution.

The display is connected to Information Electronics Control Module 1 J794 by a 4 pin connector.

The various features of the display are listed below.

#### 6.5-inch MMI Display

The 6.5-inch display is a TFT color screen with ¼ VGA resolution. This is equivalent to 400 x 240 pixels. It comes standard with the MMI Radio plus system.

Two of the four wires are used for transferring images via LVDS, and one is used for transferring data via the LIN bus. The fourth wire provides a ground circuit.

The display is supplied with electrical power via a separate connector.

#### 8-inch MMI Display

The 8-inch display is a TFT color screen with VGA resolution. This is equivalent to 800 x 480 pixels. It comes exclusively with MMI Navigation plus.



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484\_094

## MMI Display Swivel Mechanism

A cable pull drive is used to raise and lower the MMI display.

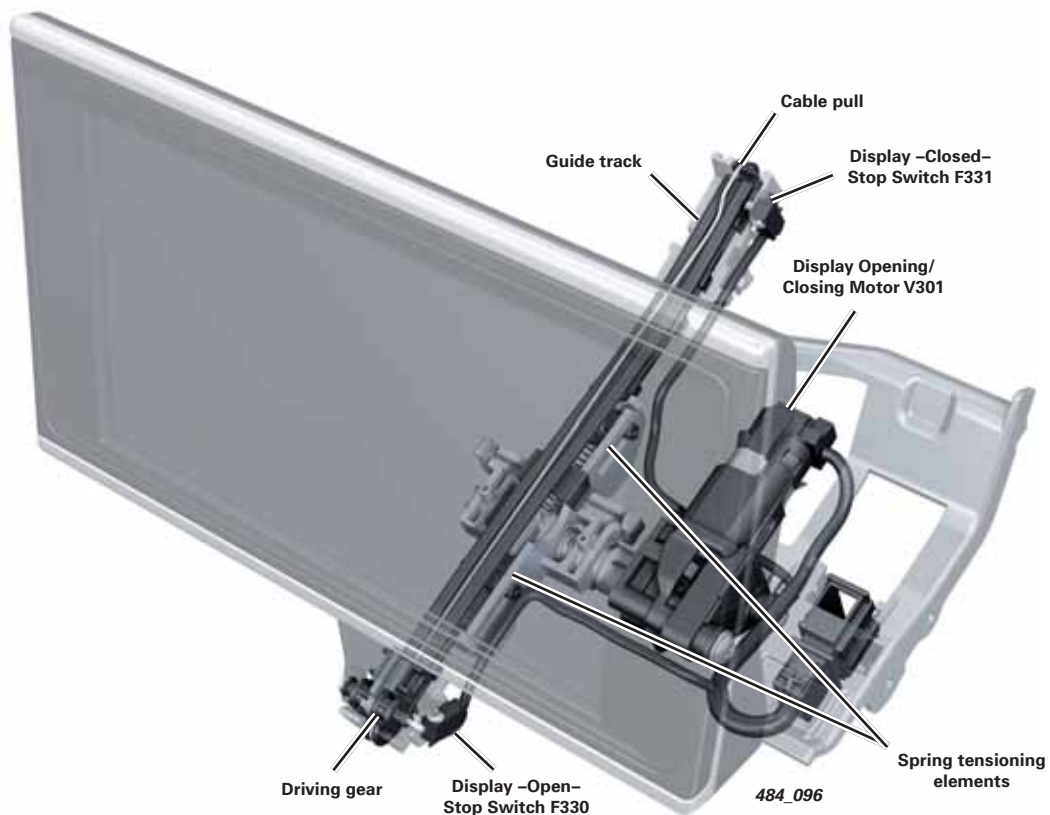
The swivel mechanism has the following parts:

- Display Opening/Closing Motor V301
- Display –Open– Stop Switch F330
- Display –Closed– Stop Switch F331
- Cable pull
- Spring tensioning elements
- Guide track
- Driving gear

## Activation Mechanism

The motor and both limit switches are activated and evaluated by Multimedia System Control Head E380.

## Design



## Operation

When the display is opening, V301 drives the pulley. The cable is retracted below the driving gear and unreeled above the driving gear. The driving gear moves down.

The display mount is firmly attached to the driving gear and is swiveled downward, opening the display.

Display Opening/Closing Motor V301 stops the moment the shuttle actuates Display –Open– Stop Switch F330. The spring in the tensioning element ensures the cables remain taut. The pre-tension of the springs also prevents any rattling noise when the display is open.

## Safety Time Out

If Display Unit Button E506 is actuated 10 times within one minute, a safety time out will be activated for one minute. The MMI display remains in the momentary end position during this time. This precaution protects against overloading of the swivel mechanism.

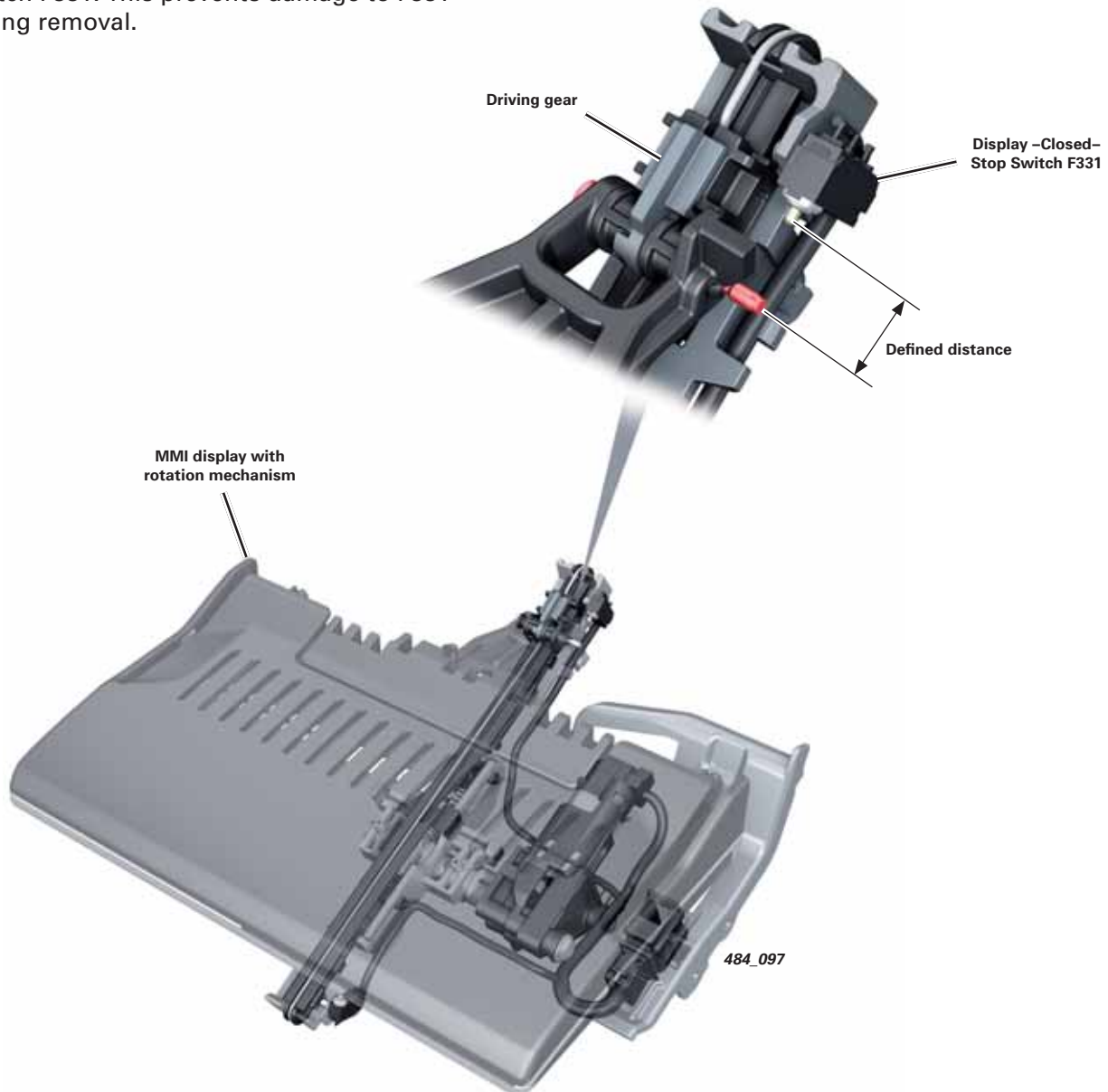
## Service Position

The display must be placed into a service position before it can be removed. During this process, the driving gear is moved to within a defined distance of Display -Closed- Stop Switch F331. This prevents damage to F331 during removal.

## Diagnostics

The diagnostic function of the swivel mechanism and Display Unit Button E506 are performed via Information Electronics Control Module 1 J794. The Address Word is 5F.

The display is moved into the service position using Guided Fault Finding.



## Sound Systems

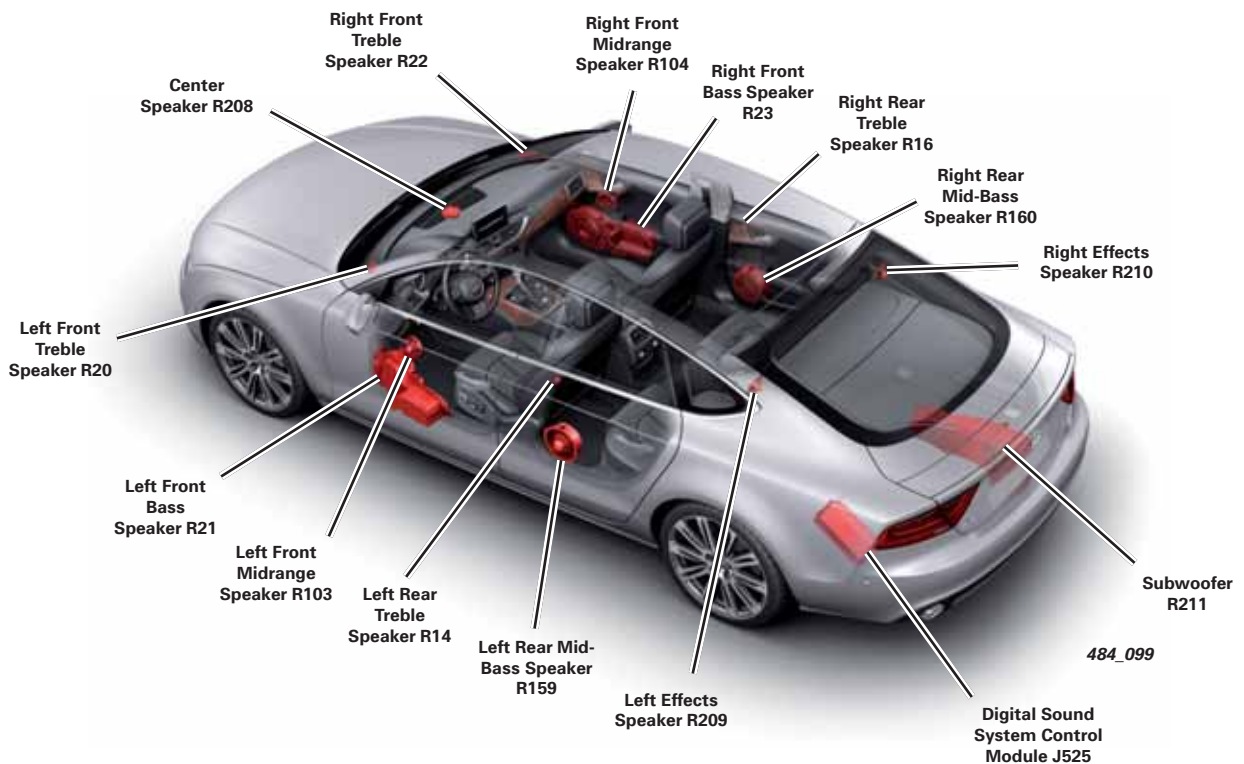
Three sound systems are offered for the A7. Sound system availability is vehicle model dependent. They are:

- The Audi Sound System
- The Bose Surround Sound System
- The Bang & Olufsen Advanced Sound System

### Audi Sound System, 10 loudspeakers, 180 Watts



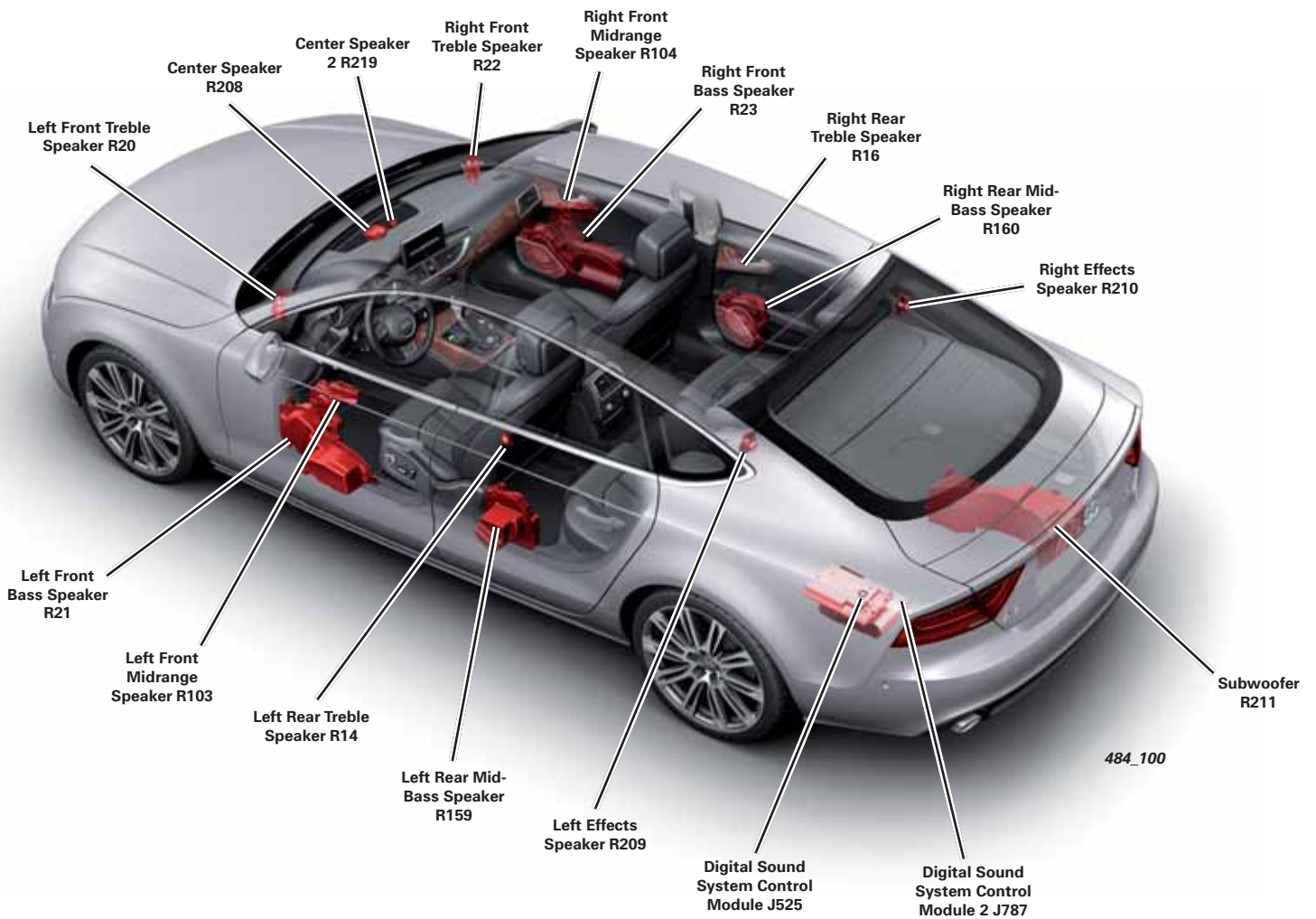
### Bose Surround Sound System, 14 loudspeakers, 630 Watts



## Bang & Olufsen Advanced Sound System

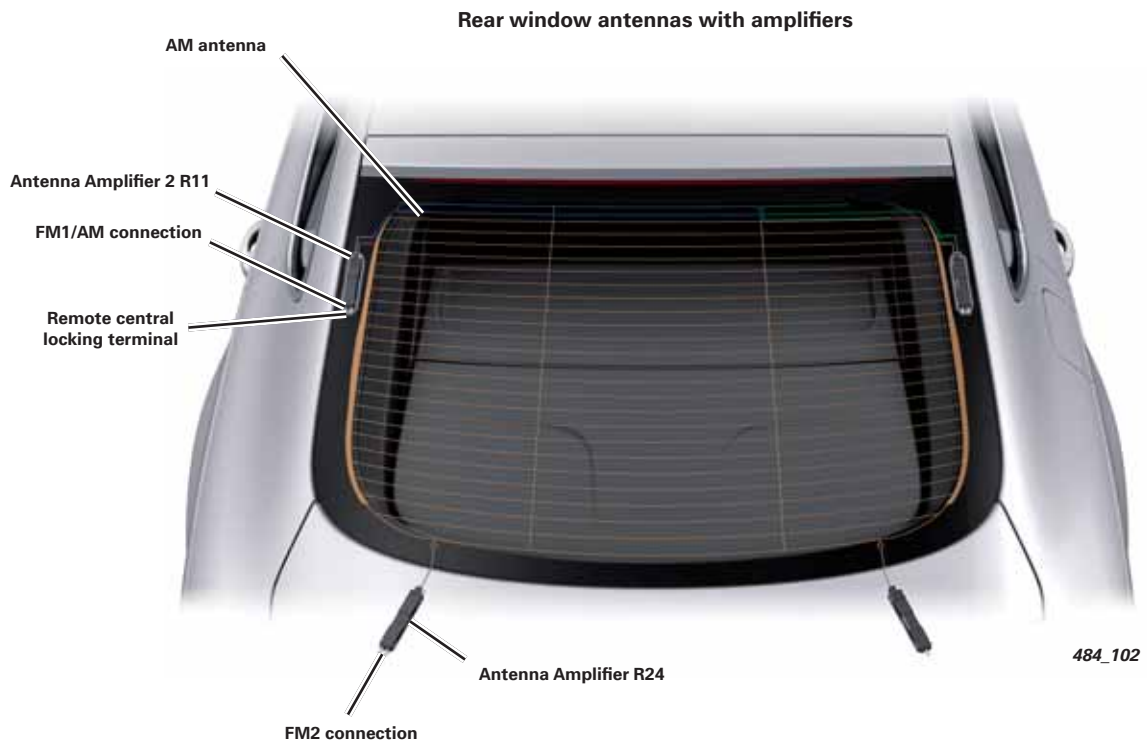
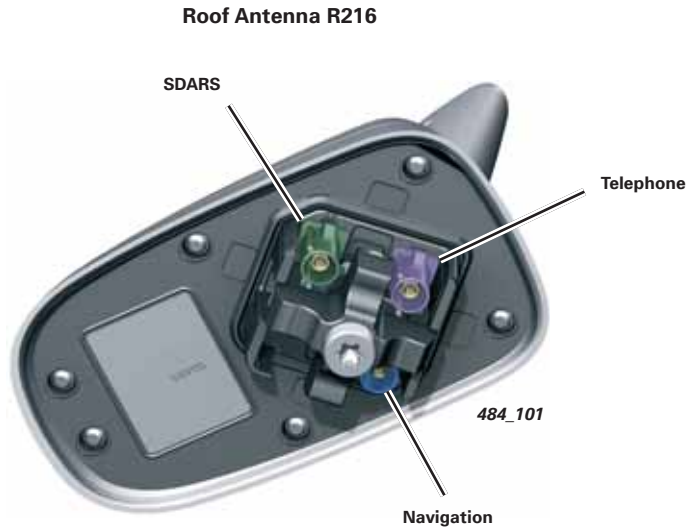
The Bang & Olufsen Advanced Sound System uses 15 loudspeakers and two amplifiers. They create a sense of space resembling the ambience of a concert hall.

Both amplifiers supply the loudspeakers with 1300 watts total RMS output power. Retractable tweeters in the instrument panel set the stage for a perfect production.



## Antenna Overview

The antennas for the A7 are located in the rear window glass and the roof. The amplifiers for the rear glass mounted antennas are located in the trunk lid.





# Climate Control

## Overview

### Climate Control System Versions

Three-zone and four-zone climate control systems are available on the 2012 A7.

On the three-zone system, rear passengers can adjust the temperature via a button located on the rear center console.

Two humidity sensors, Humidity Sensor in Fresh Air Intake Duct J657 and Humidity Sensor G355 are used in both the three- and four-zone systems.

The four-zone system also has Rear A/C Display Control Head E265 with the following functions:

- Temperature adjustment
- Fan adjustment
- Separate rear left and right air distribution adjustment

To provide climate control in the rear, the four-zone system has air outlets in the B-pillars. The climate control system has the following features:

- Automatic recirculation control by Air Quality Sensor G238
- Residual heat function
- Separate footwell temperature control
- Glove compartment cooling system
- Three different air conditioning modes: soft, medium, and intensive

### Three-Zone Climate Control System



Rear upper body vent

484\_053

### Four-Zone Climate Control System



Rear A/C Display Control Head E265

484\_052

## Operation

### Climatronic Control Module J255

The control knob is used for adjusting temperature, fan speed, and air distribution in the front two climate zones. The diode in each button is lit when that function is activated. The front climate settings are indicated on the Climatronic display and, for several seconds, on the MMI display.

Climate control can be adjusted separately for the driver and front passenger zones. On the four-zone version, front passengers can adjust the rear cabin settings or synchronize all four zones with the driver's climate zone setting. On the three zone version, the rear passengers can only adjust the temperature setting.



Seat heating/ventilation adjustment buttons

484\_049

### Residual Heat

In the four-zone climate control system, the residual heat function can be activated when the ignition is OFF by pressing and holding the fan speed setting button. The residual heat of the cooling water is used for heating the interior of the passenger compartment. Coolant Recirculation Pump V50 continuously circulates hot water through the heating system. The residual heat function is deactivated automatically after approximately 30 minutes.

### Rear A/C Display Control Head E265

In the four-zone climate control system, both rear climate zones can be controlled by E265.



Rear seat heater with three settings

484\_050

## Equipment

| Function or Component                         | Three-Zone Climate Control   | Four-Zone Climate Control  |
|---|--|--|
|   | <br>484_049 | <br>484_049 |
| Temperature zones                             | Three temperature zones: driver, front passenger, and one in rear                            | Four temperature zones: driver, front passenger, rear left and right                           |
| Fan zones                                     | Two fan zones: driver and passenger  | Four fan zones: driver, front passenger, rear left and right                                   |
| Air distribution zones                        | Two air distribution zones: driver and passenger   | Four air distribution zones: driver, front passenger, rear left and right                      |
| Indirect ventilation                          | yes  | yes  |
| Rear ventilation in the center console        | yes  | yes  |
| Air outlets in the B-pillars                  | no   | yes  |
| Sunlight Photo Sensor G107                    | yes  | yes  |
| Air Humidity Sensor G355                      | yes  | yes  |
| Humidity Sensor in Fresh Air Intake Duct G657 | yes  | yes  |
| Air Quality Sensor G238                       | yes  | yes  |
| Dust and pollen filter                        | yes  | yes, with activated charcoal   |
| Climatronic Control Module J255               | yes, with display  | yes, with display  |
| Rear A/C Display Control Head E265            | no   | yes, with display  |
| Residual heat function                        | no   | yes  |
| Glove compartment cooling system              | yes  | yes  |

## Characteristics

The climate control system of the 2012 A7 is based on that of the 2011 A8. The number of servo motors differs between the two models, as does mounting positions.

The three-zone system uses fewer servo motors than the four-zone system. Both systems have two evaporator drains that join at the center tunnel.

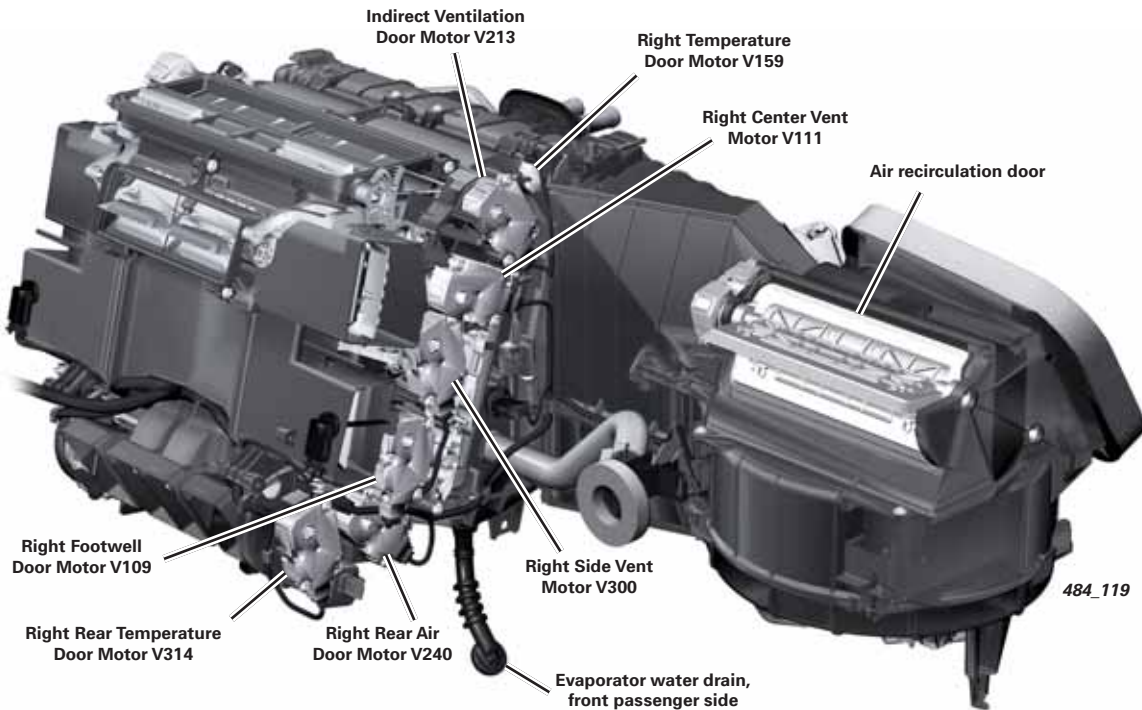
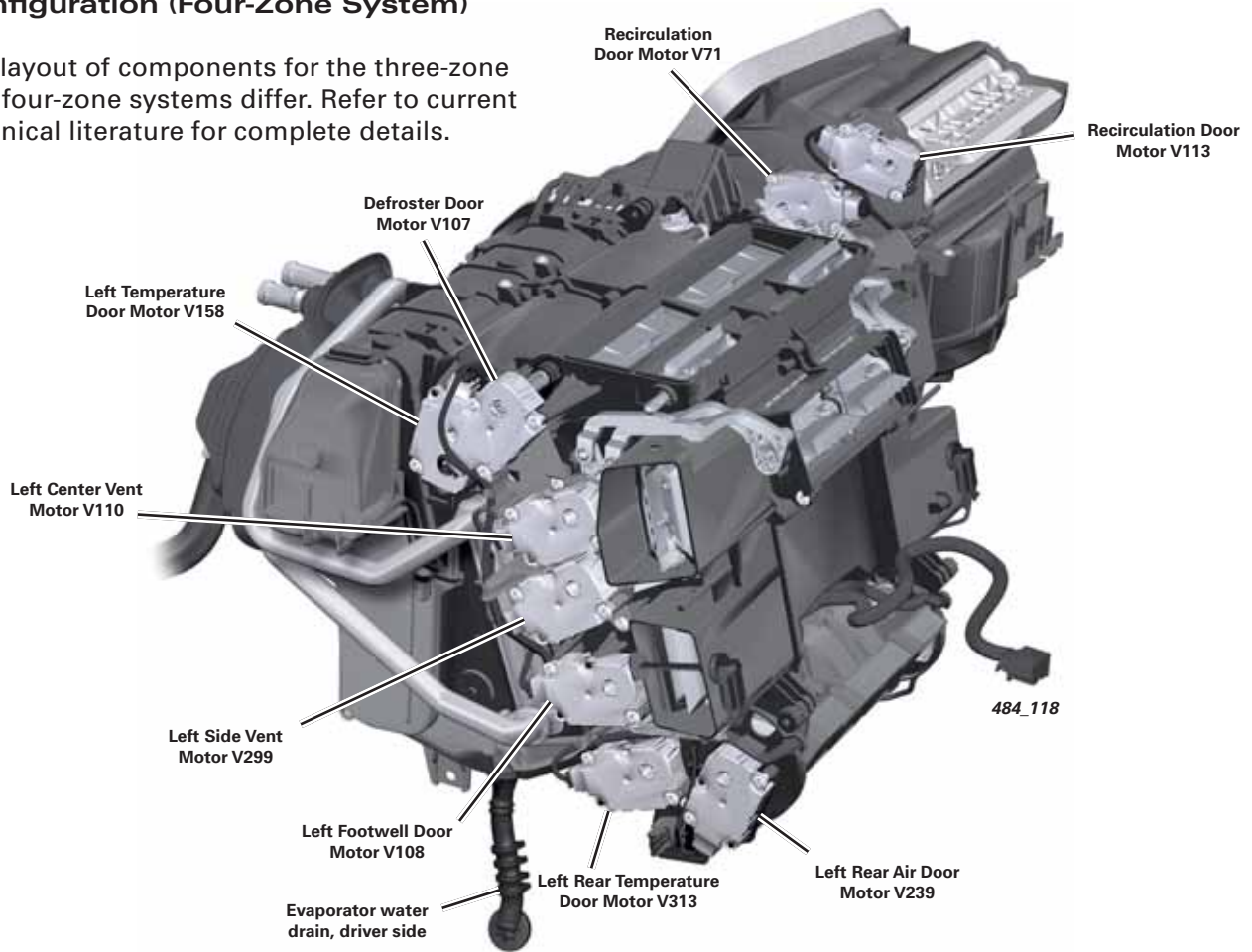
The servo motors are identical in design and are assigned to the flaps during system configuration.

The following components can be replaced without removing the instrument panel:

- Heater heat exchanger
- Servo motors
- Fresh Air Blower V2 with Fresh Air Blower Control Module J126
- Dust and pollen filter
- Temperature sensors
- Evaporator sensor

## Configuration (Four-Zone System)

The layout of components for the three-zone and four-zone systems differ. Refer to current technical literature for complete details.



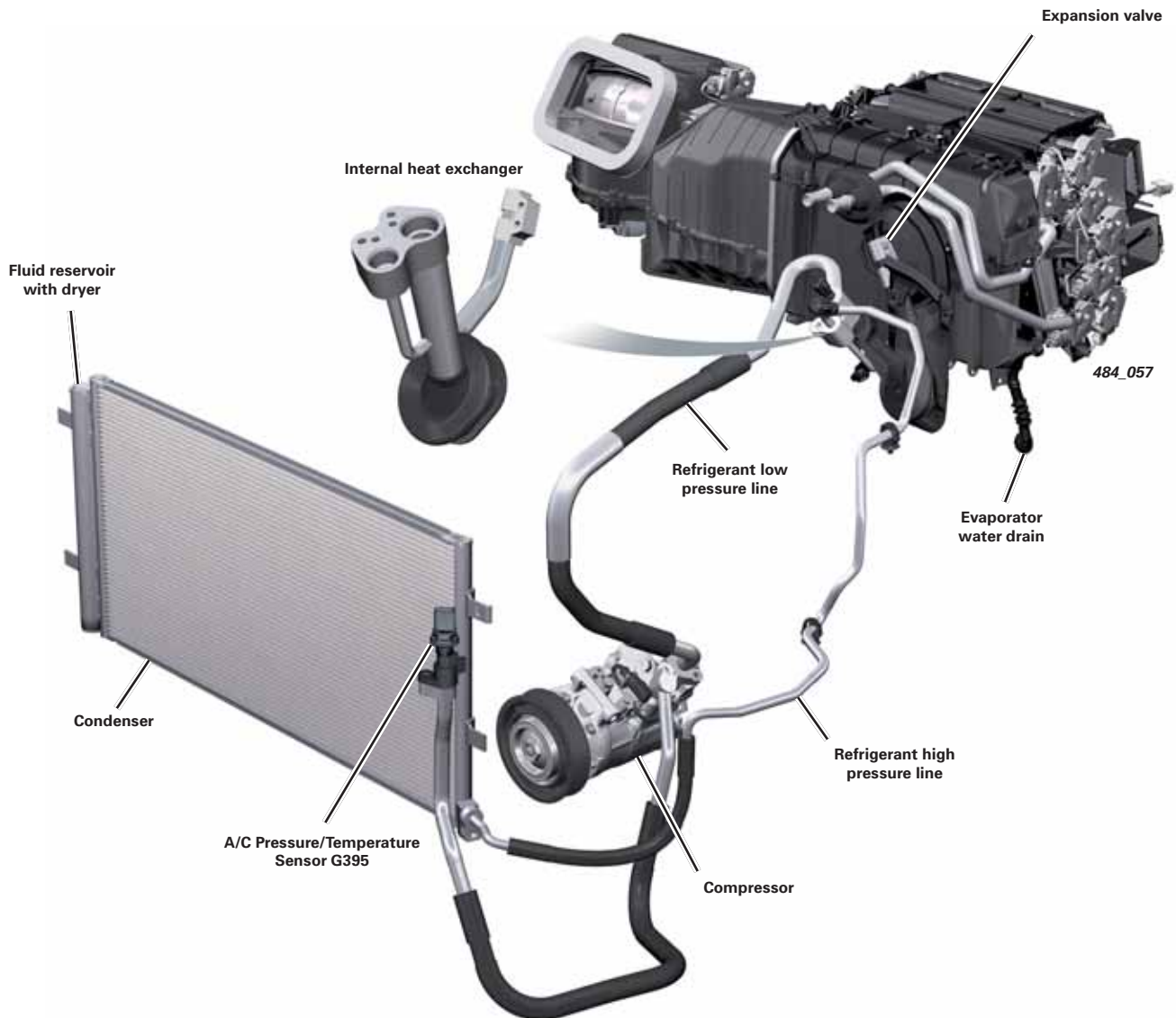
## Refrigerant Circuit

The refrigerant circuit for the three-zone and four-zone climate control systems uses R134a and has only one evaporator.

An internal heat exchanger is used to maximize fuel economy and minimize CO2 emissions.

When flushing the refrigerant circuit during repairs, no additional adaptor is needed to bypass the refrigerant reservoir. However, adapters are used in place of the expansion valve and refrigerant compressor.

To flush the circuit, the dryer cartridge is removed, then the fluid reservoir is re-sealed. The refrigerant system is closed and can be flushed. After flushing, a new dryer cartridge is installed.



### Note

During operation of the climate control system, PAG oil is distributed through the refrigerant circuit. When replacing components of the refrigerant circuit, ensure that the necessary quantity of PAG oil is retained in the system.

## Humidity Sensor in Fresh Air Intake Duct G657

G657 determines the temperature and moisture content of the intake airflow. Measurement data is sent to Vehicle Electrical System Control Module J519 via the LIN bus.

From J519, the information is sent to Climatronic Control Module J255, which then calculates the relative humidity of the inducted fresh air.



Humidity Sensor in Fresh Air Intake Duct G657 in the three-zone climate control system



**Legend:**

- 1. Air humidity sensor
- 2. Temperature sensor

In the four-zone system, G657 is combined with Air Quality Sensor G238. This system also has an automatic air recirculation control system.

It takes about two minutes for G238 to configure the system after the ignition is switched ON.

Humidity Sensor in Fresh Air Intake Duct G657 with Air Quality Sensor G238 in the four-zone climate control system

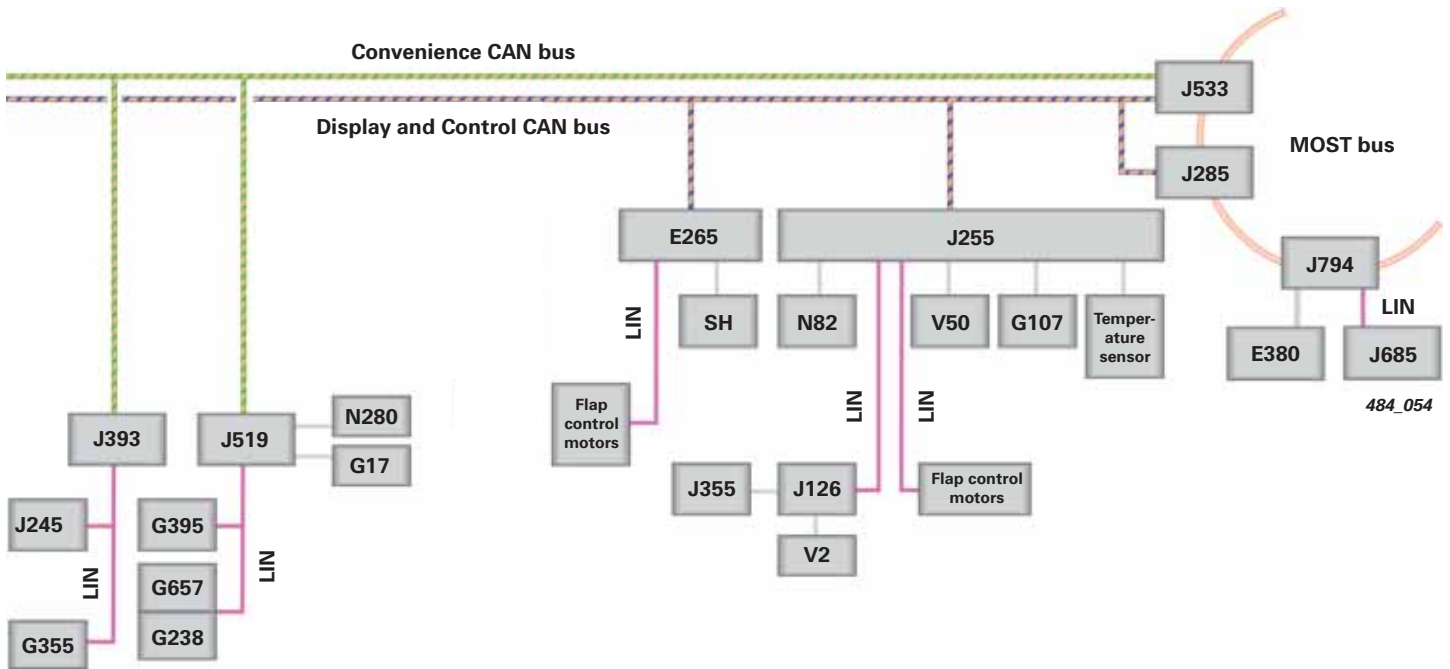


**Legend:**

- 1. Air humidity sensor
- 2. Temperature sensor
- 3. Air quality sensor (via G238)

# Topology

The network structure for the 2012 A7 climate control system is based on that of the 2011 A8.



## Legend:

|      |  |      |  |
|------|--|------|--|
| E265 | Rear A/C Display Control Head            | J285 | Instrument Cluster Control Module        |
| E380 | Multimedia System Control Head           | J355 | Solar Operation Control Module           |
| G17  | Outside Air Temperature Sensor           | J393 | Comfort System Central Control Module    |
| G107 | Sunlight Photo Sensor                    | J519 | Vehicle Electrical System Control Module |
| G238 | Air Quality Sensor                       | J533 | Data Bus On Board Diagnostic Interface   |
| G355 | Humidity Sensor                          | J685 | Front Information Display Control Head   |
| G395 | A/C Pressure/Temperature Sensor          | J794 | Information Electronics Control Module 1 |
| G657 | Humidity Sensor in Fresh Air Intake Duct | N82  | Coolant Shut-Off Valve                   |
| J126 | Fresh Air Blower Control Module          | N280 | A/C Compressor Regulator Valve           |
| J245 | Power Sunroof Control Module             | SH   | Seat Heating                             |
| J255 | Climatronic Control Module               | V2   | Fresh Air Blower                         |
|      |  | V50  | Coolant Recirculation Pump               |



## Auto Addressing of Servo Motors

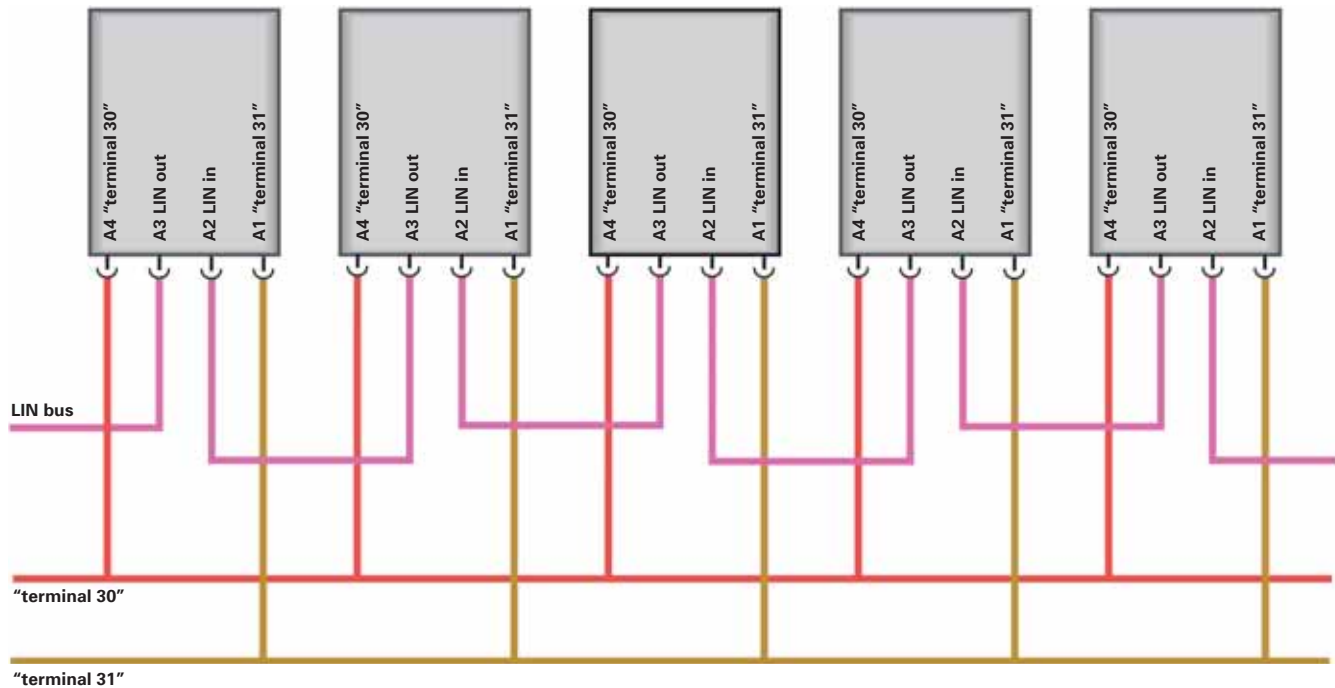
The servo motors of the A7 climate control system are connected in series to Climatronic Control Module J255 or Rear A/C Display Control Head E265 via the LIN bus. They are adapted and activated through this LIN connection. Individual servo motors are assigned to individual flaps by address coding.

If a fault occurs with a servo motor, a DTC is set in the fault memory and can be accessed using the VAS Scan Tool.

If the LIN bus is interrupted in a servo motor, the faulty servo motor and the servo motors connected in series downstream will be indicated as faulty.

If two or more servo motor connectors are interchanged during a repair, they will retain their respective functions until the next auto-addressing cycle. If the positions of two servo motors are interchanged, they will not function properly with the old address assignment at the new location.

During the next auto-addressing cycle, however, these servo motors will be assigned to the wrong flaps because the connectors are in the wrong order in the wiring harness.



484\_117

# Seat System

The 2012 A7 is offered with three front seat versions: standard, deluxe, and sport. Standard seats are optionally available with active seat ventilation, while deluxe seats have seat ventilation and massage functions.

## Seat Adjustment Controls

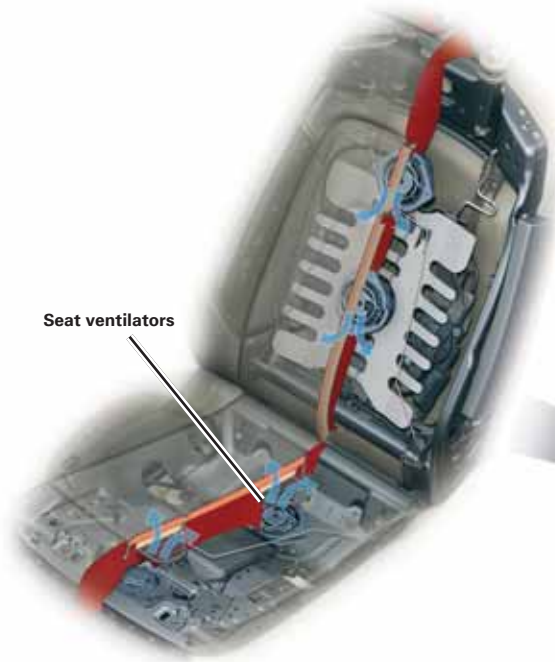
Located on the side of all electrically adjustable seats, these controls have buttons for lumbar support, and longitudinal and vertical seat adjustment.

## Standard Seats

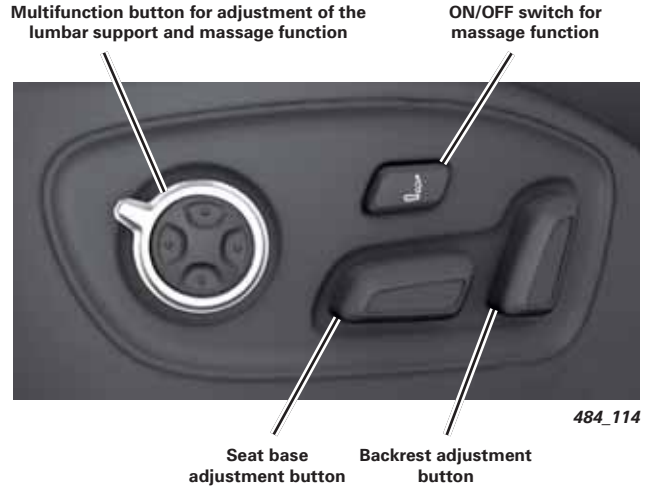
These seats can be adjusted both manually and electrically, with the mechanical lumbar supports electrically adjustable.

Each front seat is equipped with two ventilator fans for the seat cushion and two for the backrest.

The blow-through ventilation system is similar to that offered on the Audi A4. The cooling effect is through the seat cushion and backrest, as the side bolsters are not ventilated.



There is currently no active seat ventilation or massage option for rear occupants. In models with seat ventilation, both the front and rear seats are upholstered with perforated leather.



## Comfort Seats

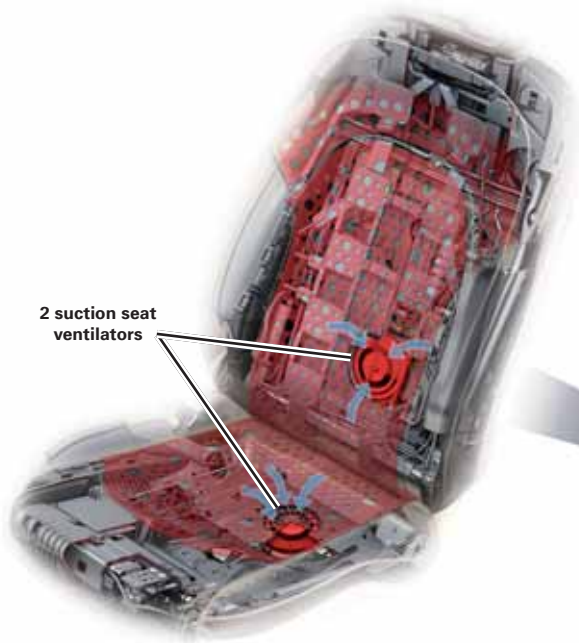
Comfort seats with a massage function have a multifunction button for adjustment of the lumbar support and various massage functions. There is an additional button on the seat which can be used to directly activate and deactivate the selected massage function.



## Comfort Seats

These seats are multicontour seats with pneumatic lumbar support, as well as pneumatic seat and backrest width adjusters. The A7 multicontour seats use the same suction ventilation system as the 2011 A8.

The optional massage system offers additional comfort, with five different massage programs and five different massage intensity levels. The cooling effect takes place in the backrest and seat base. The side bolsters are not ventilated.



484\_110

## Sport Seats

Optional sport seats are adjusted both manually and electrically, with the mechanical lumbar supports electrically adjustable. Sport seats do not have pneumatic lumbar support or ventilation features.



484\_111

## Repairing Pneumatic Lines in Comfort Seats

Pneumatic repair set VAS 6618 with pneumatic lines and line connectors is available for repairing the pneumatic lines of A7 comfort seats. It includes various coupling elements.

Separable connector sleeves are used during diagnosis of the pneumatic system. Non-separable line connectors are used for the properly completed repair.

### Guidelines for repairing pneumatic lines in seats:

- Pneumatic lines must not be disconnected directly from components
- Original replacement parts are delivered with short stubs connected to the pneumatic lines using special connectors
- Pneumatic lines and line connectors must be protected from contamination during repair work, because contamination of the coupling points can cause leaks
- Heating pneumatic lines for joining to line connectors is not permitted. Pneumatic lines must be repaired dry (without lubricant) using line connectors
- The length of pneumatic lines must not be altered during repair work. Repaired pneumatic lines are subject to a length tolerance of 0.39 in (10 mm)



484\_116

## Pneumatic Repair Set VAS 6618

This repair set contains the following tools:

- Two pairs of assembly pliers
- Four separable quick connectors for lumbar support
- Four separable quick connectors for side bolster
- Twelve separable quick connectors for massage
- One pressure equalization tank
- Various hoses, adaptors, and couplings



484\_122

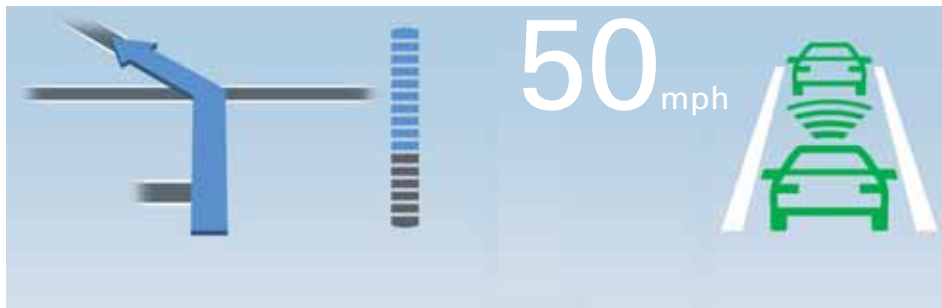
# Head-Up Display

## Introduction

The term “head-up display” describes optical systems which project information from various automotive systems into the driver’s extended field of vision.

To view this information, the driver does not have to change their head position significantly and can continue to focus on the road ahead while maintaining an upright posture. Since the driver’s head can remain “up” and need only be lowered slightly, the system is referred to as a head-up display.

The use of special windshields on models with head-up display gives the impression that the display is not actually in the windshield area, but at a comfortable distance of 8.2 ft (2.5 m) away from the driver. The head-up display appears to hover over the hood.



482\_002

## Viewing Advantages of Head-Up Display Over Instrument Cluster Display

- The placement of the head-up display in the extended field of vision of the driver means that the driver’s head only needs to be inclined approximately five to 10 degrees to see display data. To see similar data on the instrument cluster display, the driver’s head needs to be inclined approximately 20–25 degrees.
- As the head-up display can be seen in the extended field of vision of the driver, the human eye does not have to adapt to darker surroundings to register the display content, unlike a glance at the instrument cluster.  
This particularly applies during daylight. Adaptation of the eyes from bright to dark to register vehicle parameters and subsequent adaptation from dark to bright can be avoided.
- As the head-up display is perceived at a distance of approximately 6.5 ft – 8.2 ft (1.9 m – 2.4 m) away from the driver, the time the eye needs to focus is significantly lower than glancing periodically at an instrument cluster.

These benefits mean that desired information can be seen more easily and with greater clarity than glancing at an instrument cluster. With head-up display, driver attention to the road ahead is increased.

Use of head-up display greatly improves perception of what is happening on the road, improving overall road safety.

## Display Information

Content of the head-up display has been restricted to the most important vehicle parameters. Current vehicle speed is always shown. It cannot be deactivated in the MMI.

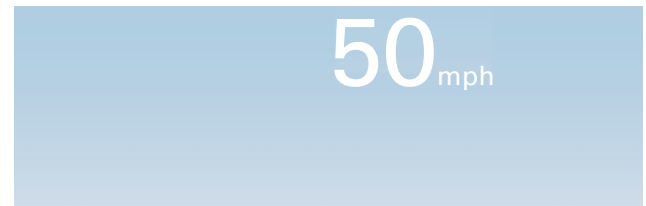
Other display content is only shown if activated in the MMI. Content can be activated in the MMI at the menu option "Head-up Display", then menu "Display Content".

Other content is only displayed temporarily, for example warnings, or modified system settings.

**The display can show the following content:**

### Current Vehicle Speed

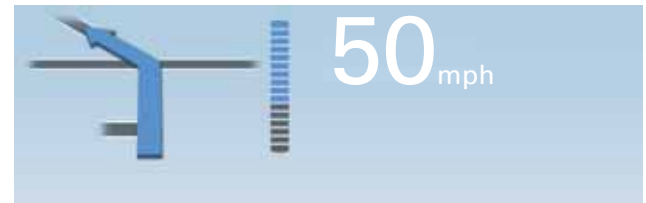
Current vehicle speed is the only vehicle variable that is always displayed. This display cannot be deactivated by the driver.



482\_003

### Navigation Information

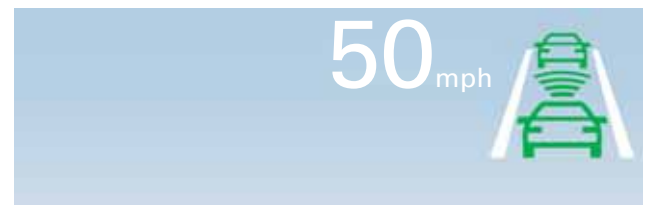
"Navigation Information" is only displayed when the route guidance function is active. This information must be activated in the MMI.



482\_004

### Combined Display of ACC and Audi Active Lane Assist

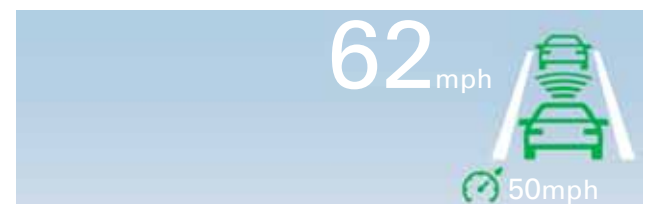
The "ACC/Audi active lane assist" display content must be activated in the MMI.



482\_005

### Current ACC Set Speed

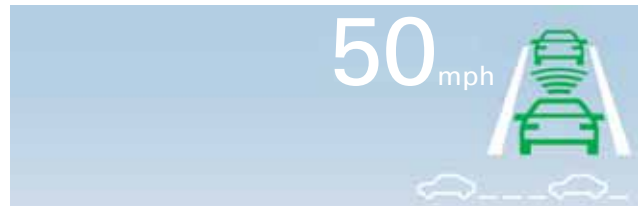
The set control speed of the ACC appears temporarily in the head-up display if modified. The "ACC / Audi active lane assist" display content must be activated in the MMI.



482\_006

### Current ACC Control Distance

This display appears for a short period of time if a change is made to the control distance for ACC.



482\_007

### Audi Night Vision Assist Warning

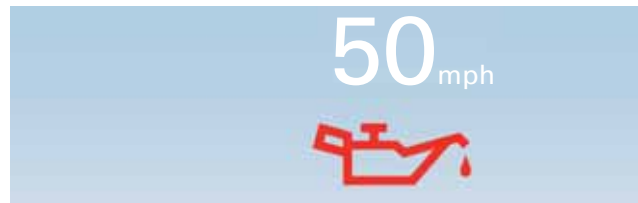
Audi Night Vision Assist warnings can also be shown on the head-up display, once activated in the MMI.



482\_010

### Red Warning Symbols

If red warning signals appear in the instrument cluster, they also appear on the head-up display. The display of red warning symbols cannot be deactivated, and are only displayed briefly. When red warning signals are displayed, all other content is suppressed except vehicle speed.

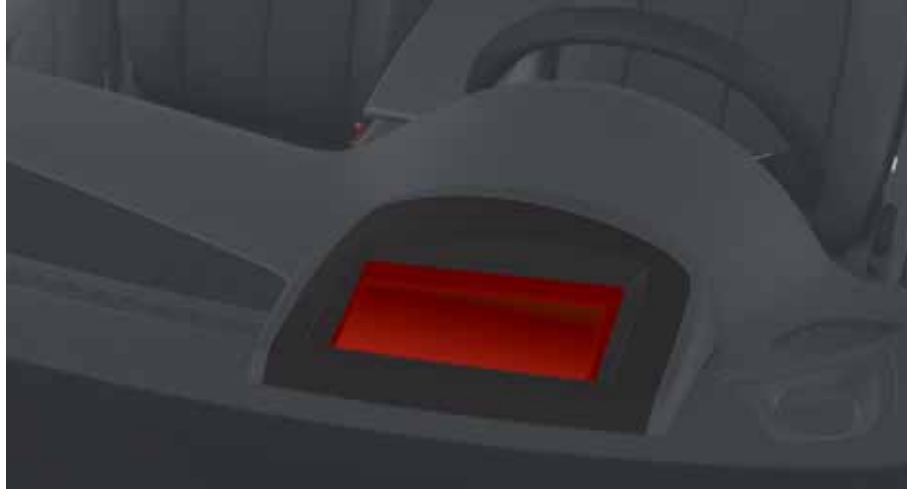


482\_011

## Windshield Projection Head Up Display Control Module J898

The central component of the head-up display system is J898. It contains all the optical, mechanical, and electrical components required for the system.

J898 is mounted in the instrument panel, directly in front of the instrument cluster.



482\_012

Windshield Project Head Up Display Control Module J898



482\_013



### Note

If J898 is defective, the complete unit must be replaced. Replacement requires the removal of the windshield. For more information, refer to current technical literature.



## Optical System

The head-up display is generated by backlighting with 15 LEDs a high resolution TFT display, which is a matrix of Thin Film Transistors.

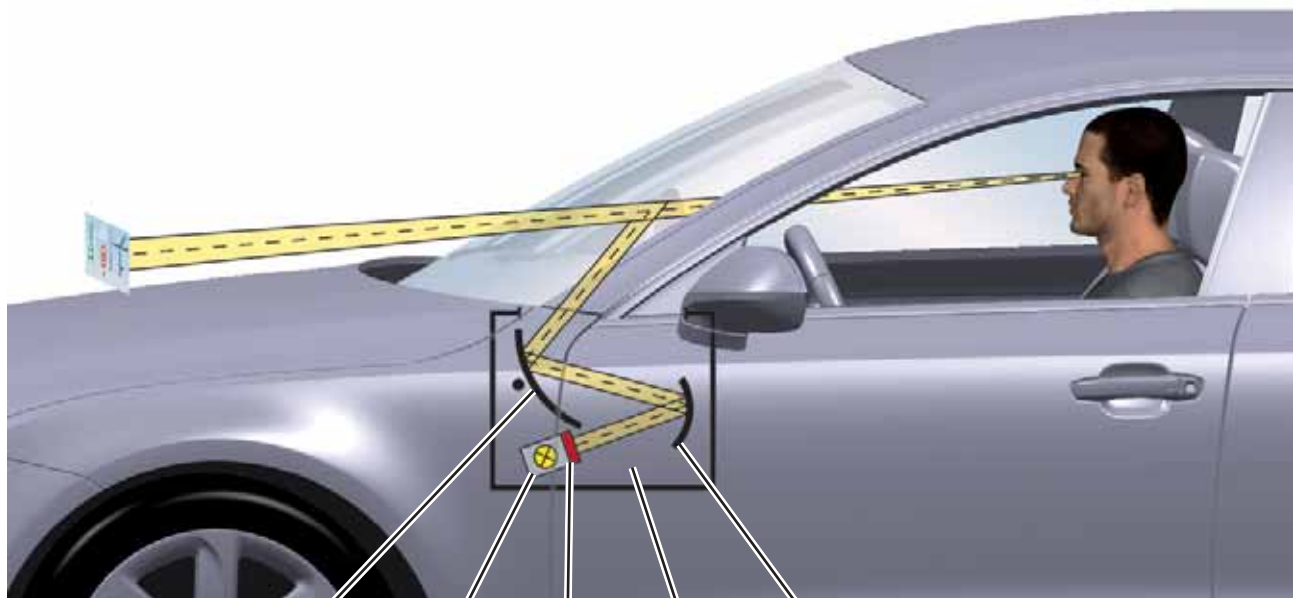
The display's function is similar to that of a slide projector. Light rays are projected via two deflection mirrors onto the windshield. One of the two mirrors is adjustable and is used for height adjustment of the display. This adapts the position of the head-up image to the seating position or body size of the driver.

The mirrors also correct any image distortion caused by curvature of the windshield.

The light intensity of the displayed image is continuously adapted to current ambient lighting conditions. To do this, Windshield Projection Head Up Display Control Module J898 evaluates luminosity values from Rain/Light Recognition Sensor G397.

The driver can adjust the brightness of the display according to their needs. This is done through the MMI and the system controls located on the vehicle light switch.

The light intensity is configured so the display also remains easily legible in direct sunlight.



482\_014

Adjustable mirror  
Lighting unit of the head-up display  
High-resolution TFT display  
Windshield Projection Head Up Display Control Module J898  
Non-adjustable mirror

## Windshield

The windshield is an important optical component of the head-up display. Because the display image is also reflected by the windshield, its function represents a third mirror.

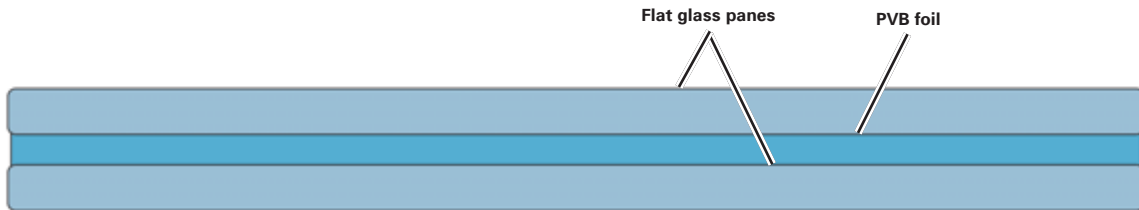
A standard windshield can create a disruptive double image.

The windshield of a vehicle with the head-up display differs from a conventional windshield in that the PVB foil (polyvinyl butyral) between the two flat glass panes of a head-up windshield is not a constant thickness.

A head-up windshield has a slight wedge shape, so the thickness of the windshield increases slightly in an upward direction. This wedge shape eliminates the potential for double images.

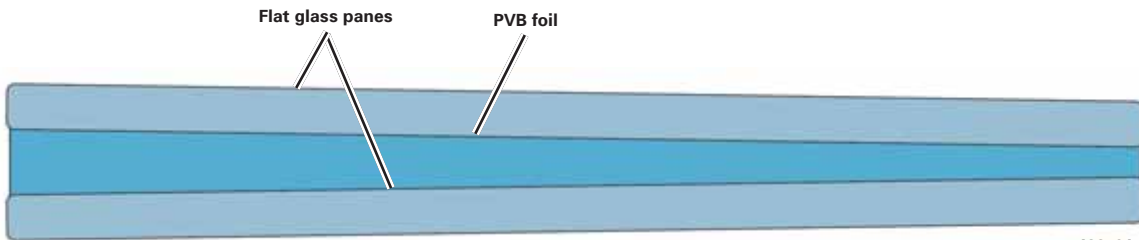
The tolerances for windshield installation are very tight for a vehicle with head-up display.

Windshield of a vehicle without head-up display



482\_016

Windshield of a vehicle with head-up display



482\_015

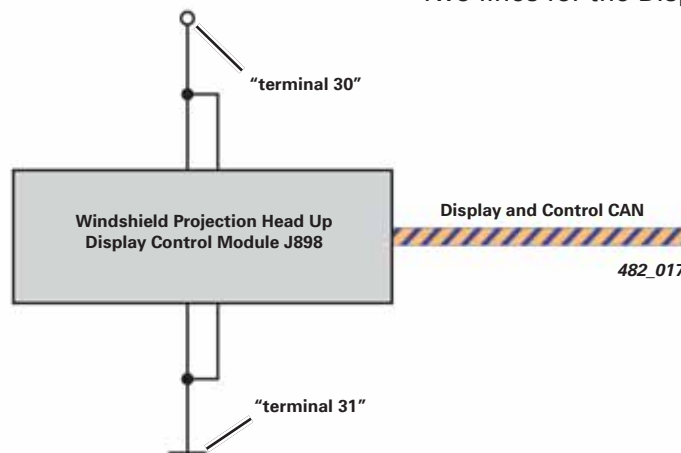
## Electrical System

Windshield Projection Head Up Display Control Module J898 communicates with other control modules over the Display and Control CAN.

It is accessed with the VAS Scan Tool through Address Word 82.

There are six electrical connections at the control module:

- Two lines for "terminal 30"
- Two lines for "terminal 31"
- Two lines for the Display and Control CAN



Windshield Projection Head Up Display Control Module J898 receives information from the following control modules:

#### **Instrument Cluster Control Module J285**

- Current vehicle speed
- Warning messages of priority 1 (red warning symbols)

#### **Information Electronics Control Module 1 J794**

- Direction arrow with active destination guidance
- Bar display (bar graph) or distance information with active destination guidance
- MMI customer setting for display of head-up display content
- MMI customer setting for head-up display brightness

#### **Engine Control Module J623**

- Current cruise control set speed of the cruise control system

#### **Image Processing Control Module J851**

- Warnings and system state, Audi active lane assist (combined display with ACC)

#### **Night Vision System Control Module J853**

- Display of pedestrian symbol for driver warning

#### **Distance Regulation Control Module J428**

- Status of active cruise control ACC (combined display with Audi active lane assist)
- Set control distance for the ACC

#### **Vehicle Electrical System Control Module J519**

- Current values of ambient luminosity from Rain/Light Detection Sensor G397 (J519 is the master of the LIN bus to which sensor G397 is connected)
- Pressing the Reacting to Windshield Projection Head Up Display Button E736 in the light switch module (switching the system ON or OFF)
- Turning the position controller for head-up display in the light switch module (vertical movement of the visible area)
- Turning the controller for display and instrument lighting (changing the display brightness)

#### **Memory Seat/Steering Column Adjustment Control Module J136**

- Asks J898 to save current settings of the head-up display. The settings are saved for the seat memory button that was pressed.
- Asks J898 to activate stored head-up display settings. It transmits the button number of the actuated button of seat memory.

#### **Data Bus On Board Diagnostic Interface J533**

- Turning OFF the head-up display if battery voltage is low
- Deactivation of the head-up display if in active transport mode



#### **Note**

The settings for the head-up display system are only stored in J898 when the vehicle is equipped with the seat memory option. Head-up display and driver seat position settings are stored at the same time.

## Operation

### Setting Options at the Light Switch



Position controller for head-up display  
Windshield Projection  
Head Up Display Button E736

Controller for the basic  
setting of the display and  
instrument lighting

482\_018

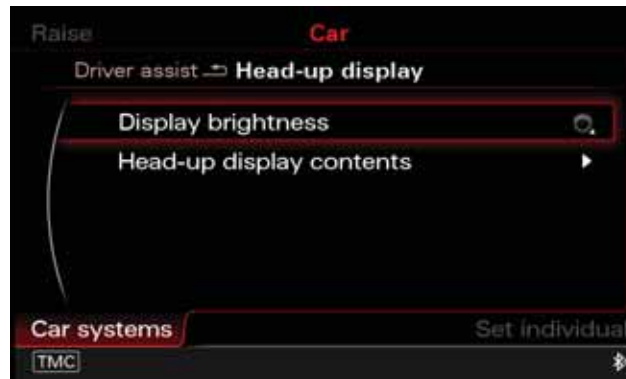
#### Position Controller for Head-Up Display

The following settings are made using the position controller for the head-up display:

- Switching the head-up display ON and OFF by pressing the position controller
- Setting the vertical position of the visible area (eye box) of the head-up display by turning the position controller. This setting option enables optimal adaptation of the visible area of the head-up display, taking into account the seating position or body size of the driver

#### Controller for Display and Instrument Lighting

This controller can be used to make a basic setting of the display and instrument lighting. If this setting is changed, the display brightness of the head-up display also changes.



482\_019

### Setting Options at the MMI

The driver has two setting options for the head-up display in the MMI:

- Display brightness
- Display content

To reach the settings menu:

1. Press the function button "CAR" of the MMI control panel
2. Press the control button at the bottom left for "Car Systems"
3. Select the menu option "Driver Assist"
4. Select the menu option "Head-Up Display"

## Setting Display Brightness

The brightness of the head-up display can be adjusted at the menu option "Display Brightness".

The basic setting for instrument and display lighting is made using the corresponding controller at the light switch.

Using this light switch controller also influences the brightness of the head-up display. Setting head-up display brightness in the MMI, along with any adjustments to instrument and standard display lighting, will effect the brightness of the head-up display.

To set maximum display brightness, both setting options must be set to maximum.



482\_020

## Head-Up Display Content

The customer can enable or disable various display content in the head-up display. Depending on vehicle equipment, the customer has the following display content available:

- Navigation system information
- Combined display of ACC and Audi active lane assist
- CCS control speed
- Audi night vision assist warnings



482\_021

# Calibration

There are two calibration steps:

## 1. Basic vertical setting of the visible area of the head-up display (height calibration)

The basic vertical setting creates a standardized adjustment range for the head-up display. After performing this adjustment, the driver, regardless of body size and seating position, can set the display visible area using the position controller on the light switch so that the entire display is visible.

## 2. Removal of distortion effects (image calibration)

Distortion effects of the head-up image arise due to tolerances of various system components. In its original state, the internal TFT display in J898 presents an undistorted image for projection. This image would be projected without distortion onto the windshield if all the system components were within tolerance.

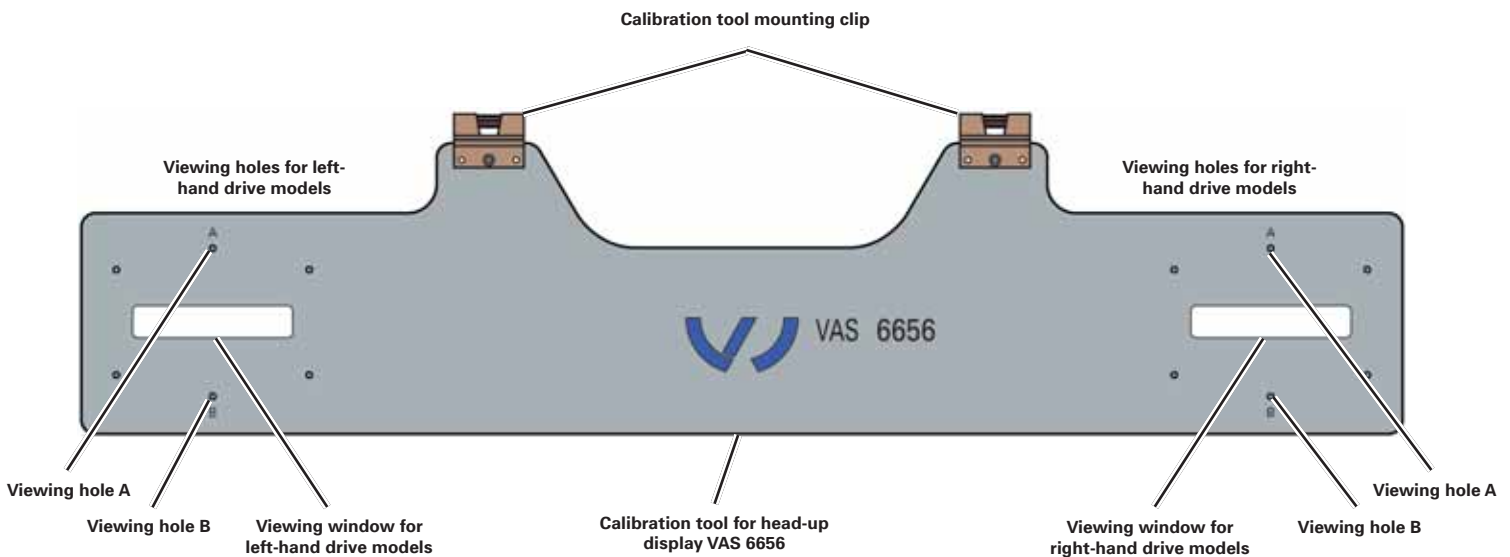
However, all components have manufacturing and installation tolerance variations. The head-up display image may be distorted and would then need to be calibrated.

The TFT display is changed by the calibration procedure so that the projected image is free of distortion.

Two tools are required for calibration of the head-up display:

- VAS Scan Tool
- New special tool VAS 6656

The VAS 6656 is model-specific. It is only suitable for calibration of the head-up display on the A7. Other Audi models with head-up display will receive an adapted tool with a unique VAS number.



482\_022

## Calibration Procedure

Before calibration of the head-up display can be started, the following steps must be performed:

1. Sun visors on the driver and front passenger side must be unclipped
2. Calibration tool VAS 6656 must be attached to the two brackets of the sun visor
3. VAS Scan Tool must be connected
4. J898 must be selected in Guided Fault Finding



482\_023

### Basic Vertical Setting (height calibration) of the Visible Area of the Head-Up Display

The "J898 Height Calibration" Test Plan must be performed first. J898 will project a test image.

The VAS Scan Tool is used to adjust the head-up display so that it appears to be cut off to the same degree when looking through viewing holes A and B on special tool VAS 6656.

Once this is done, the compensation of distortion effects can be performed.

### Compensation of Distortion Effects (image calibration)

After setting the vertical height, Test Plan "J898 – Image Calibration" can be performed. This Test Plan will indicate which distortion effects can be compensated.

The test image that is projected onto the windshield should be assessed for distortions. Those distortions that are most conspicuous should be corrected first. The corresponding program is selected and the effect is corrected by entering a correction value.

This operation is repeated until the test image is projected onto the windshield with good quality. The quality of the projected image is a subjective judgement based on personal perception.

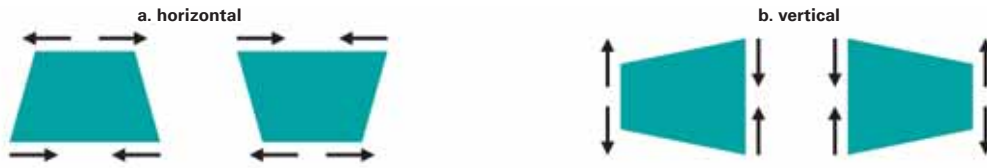
Keep in mind that the quality of the image may be perceived differently by the customer.



482\_024

# Correction Possibilities for Head-Up Display Distortion Effects

## 1. Trapezium



## 2. Cushion



## 3. Smile



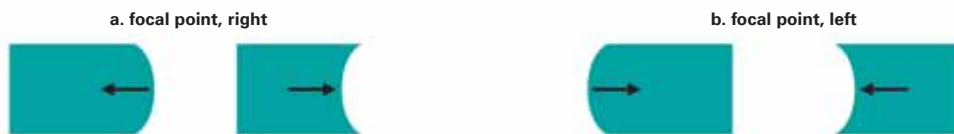
## 4. Shear



## 5. Asymmetrical shear, horizontal



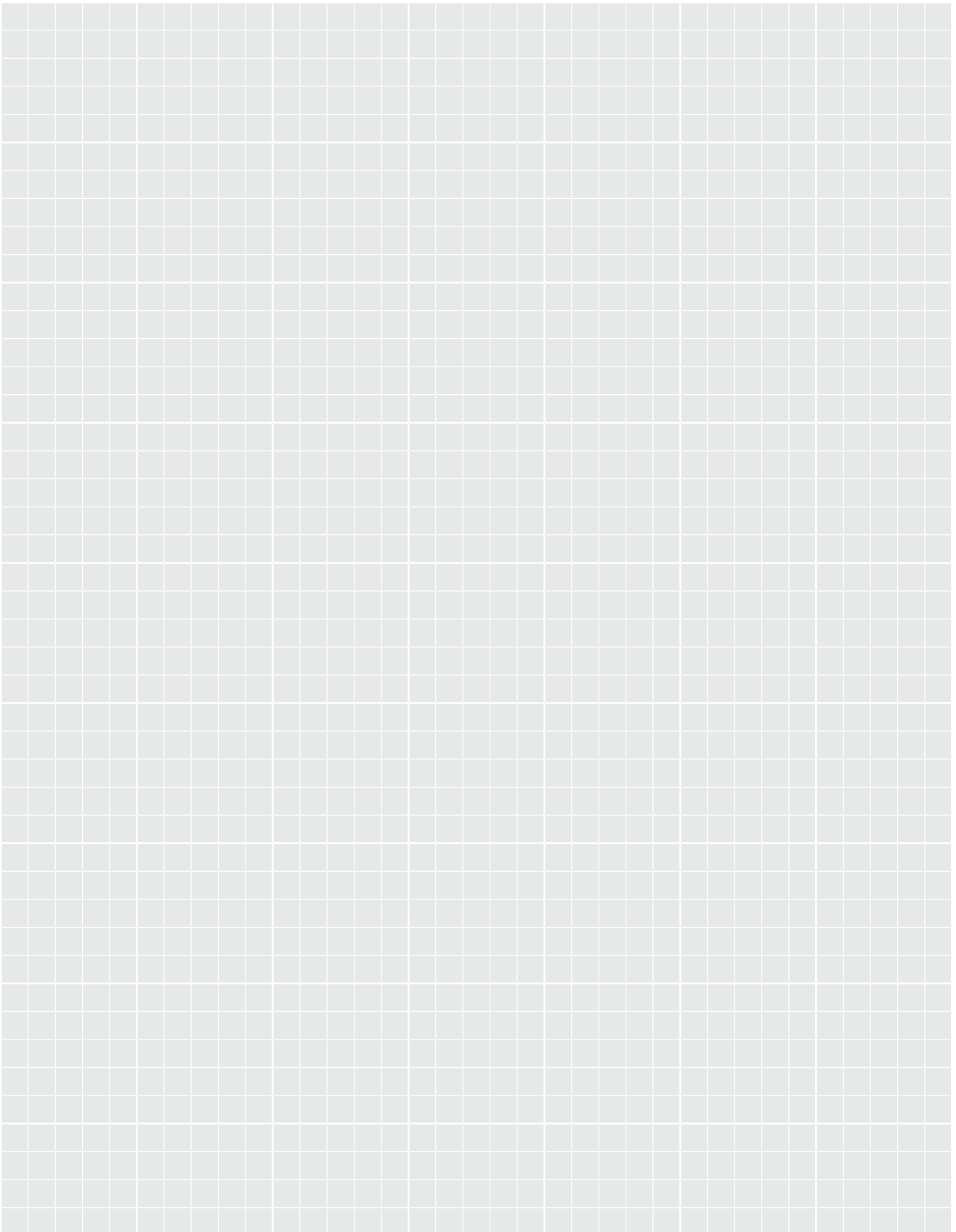
## 6. Asymmetrical cushion, horizontal



## 7. Rotation







# Self-Study Programs for the 2012 Audi A7

## SSP 990203 The 2012 Audi A7 Vehicle Introduction

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

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

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

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

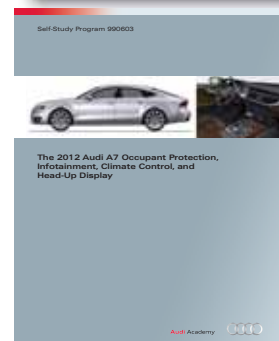
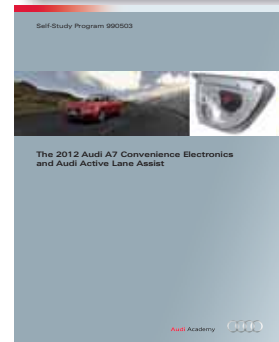
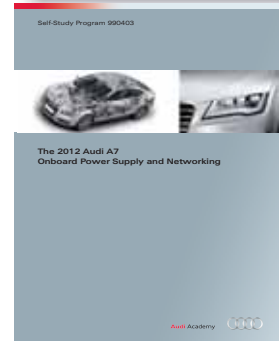
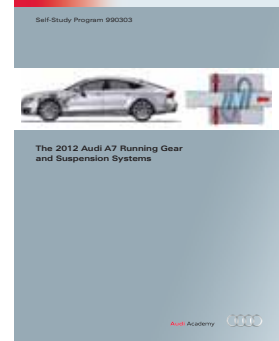
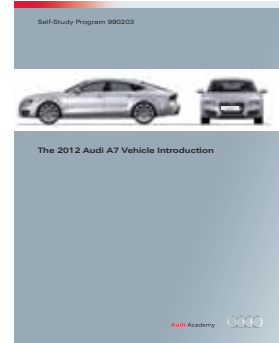
- Power Supply
- Networking
- Control Modules
- Exterior Lighting

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

- Topology
- Convenience Electronics
- Audi Active Lane Assist

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

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



# Knowledge Assessment

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

The Knowledge Assessment is required for Certification.

You can find this Knowledge Assessment at:

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

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

- Click on the "ACADEMY" tab
- Click on the "Academy Site" link
- Click on the "CRC/Certification" link
- Click on Course Catalog and select "990603 — The 2012 Audi A7  
Occupant Protection, Infotainment,  
Climate Control, and Head-Up Display"

For assistance please call:

**Audi Academy**  
**Certification Resource Center (CRC)**  
**1-877-283-4562**  
**(8:00 a.m. to 8:00 p.m. EST)**

Or you may send an email to:

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

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

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