Laser Distance Regulation Control Module J1122

A laser scanner is used in the Audi A8 to implement complex driver assistance functions. It is installed in the center of the bumper under the license plate carrier. Like the long-range radar sensor, the laser scanner scans for objects ahead of the vehicle.

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Design and function

The general working principle is similar to that of a radar sensor: instead of radar waves, the laser scanner emits laser beams which are reflected when they hit the surfaces of other objects.

It is possible to measure the distance to an object by determining the elapsed time from emittance to reception of the reflected radiation components. A fundamental difference between laser scanners and radar sensors is the propagation characteristic of the radiation. The cone-shaped radar wave emitted by the radar sensor covers a large area, the bundling of the laser light components produces a single beam concentrated on a small area. To scan a larger area, multiple "individual beams" are emitted in a planar fashion and in multiple planes. The laser pulses which are used (pulse duration: approximately 4 ns) have a wavelength of approximately 905 nm. The electromagnetic radiation is neither visible to the human eye (infrared) nor harmful due to its low energy content (laser class 1).

The laser scanner used in the Audi A8 has a rotating mirror which scatters the light beams in a fan-like fashion. The light emitted by the transmitter unit hits on the surface of the mirror and is radiated. The mirror is driven by an electric motor. For example, if the radiation is reflected by an object at a distance of 100 m, it returns to the receiver diodes in the scanner less than 0.7 µs after it is emitted. The reflections hit on the lower part of the mirror und and then on the photodiodes, which convert the visual information to electrical signals.

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Transmission range

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Frequency band

The horizontal detection zone covers an angular range of about 145°. The range is approximately 87.4 yd (80 m) on average. Objects can be successfully recognized from a distance of about 3.9 in (10 cm).

The horizontal resolution is 0.25° and offers much greater precision than radar technology.

The laser beams are emitted vertically in four planes in a fan-like fashion, each at an angle of 0.8°. This gives an overall vertical angle of approx. 3.2°.

The laser scanner is the ideal complement to the long-range radar. Although the radar system has a much longer range (273.4 yd [250 m]), the coverage angle of approximately 35° is much less than that of the laser scanner.

Much like the radar beams, the laser technology has the advantage of being largely unaffected by ambient light conditions. Another advantage of the laser technology is its accuracy of measurement irrespective of distance. The reflection received by the scanner is made up of a multiplicity of dots known as dot clouds. The high resolution of the laser technology enables the contours of objects to be measured with much greater precision and therefore allows various types of object to be classified. These include passenger cars, trucks, motorcycles, etc. The laser technology also detects persons and geometric structures, such as crash barriers and other objects defining lane boundaries.

The received laser beams reflected by the object are evaluated in such a way that the overall horizontal detection zone of about 145° is subdivided into ten equally sized sectors. Internal software algorithms are able to detect dirt build-up or damage to the reflector lens as well as the range and misalignment of the lens.

Apart from this range information, the FlexRay message contains information about detected objects and their coordinates including applicable standard deviations, as well as the speeds of the objects and the probability that the relevant objects can be detected and classified.

The laser scanner is also equipped with a lens cleaning system. Telescopic washer jets are positioned on both sides of the unit. The accompanying electrical pump is attached directly to the wash water tank. It supplies the washer jets of the laser scanner and the rear camera. Depending on the direction of rotation of the pump motor, either the laser scanner or the rear camera is cleaned. If the laser scanner control module detects dirt build-up on the lens, a message is sent to Vehicle Electrical System Control Module J519, which in turn instructs Windshield Washer Pump Control Module J1100 to clean the lens.

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Service

The system can be accessed via Address Word 00CD using the VAS Scan Tool. Channel B of the FlexRay bus is used for communications.

The installation position of the laser scanner is adjustable. It can be adjusted vertically.

The basic adjustment procedure is identical to the existing procedure for adjusting ACC systems. Special Tool VAS 6430 is also identical and likewise the procedure for alignment of the gauge relative to the geometric drive axis of the vehicle.

A new optical target (calibration device) is used for adjustment of the laser scanner. The laser beam hits on, and is reflected by, the target. The correct alignment of the laser scanner relative to the geometric axis of the vehicle can be determined by evaluating the reflections received. The VAS Scan Tool instructs the Technician to make any necessary adjustments, specifying the direction of rotation and the angle of rotation of the adjusting screw.

The laser scanner unit can only be replaced as a complete unit. It cannot be repaired by service personnel. Although the radiation emitted by the sensor unit is not harmful, there are areas inside the unit where higher-energy radiation is present.

It is necessary to adjust the laser scanner:

- After removing, installing and replacing the laser scanner.
- After modifying the suspension set-up (specifically the rear axle tracking).
- After removing/installing the front bumper.
- After basic adjustment (programming the suspension height) of the adaptive air suspension.

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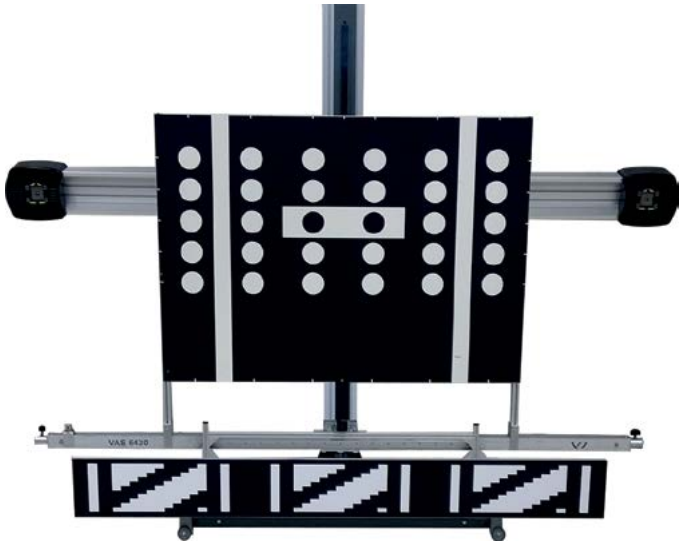

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Note

In models equipped with "dynamic all-wheel-drive steering", the rear wheels must be moved into the neutral position (zero steer angle) before starting wheel alignment and/or determining the geometric drive axis. Be sure to follow the instructions given in the Workshop Manual.

Control Module for Adaptive Cruise Control J428

Only one Control Module for Adaptive Cruise Control (J428) is used on the 2019 A8. The duties of a second ACC module are performed by Laser Distance Regulation Control Module J1122.

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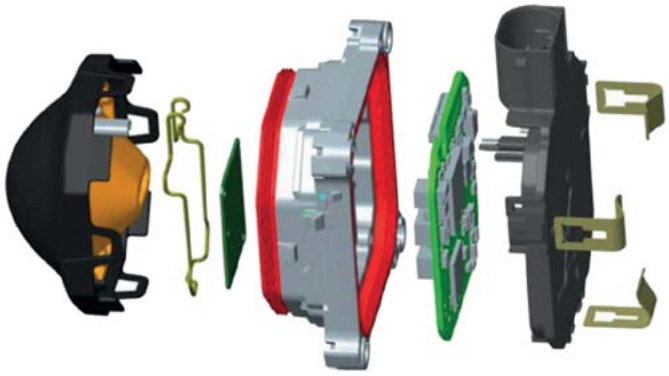
Design and function

The 4th generation system used in the Audi A8 is identical in design and basic functions to the ACC of the 2017 Audi Q7.

The ACC unit is integrated in the front bumper on the right-hand side of the vehicle.

J428 uses channel B of the FlexRay bus for communications.



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Operation and driver information

The ACC is primarily operated using the control stalk. The same applies to the driver information displays.

Service operations

J428 is accessed via Address Word 0013 via the VAS Scan Tool.

It consists of a radar transmitter and receiver as well as the control module itself and, if faulty, can only be replaced as a complete unit.

The ACC unit is adjusted by the usual procedure using Special Tool VAS 6430/1 in conjunction with ACC reflector mirror VAS 6430/3. The only difference to the adjustment procedure for the 2017 Audi Q7 is that only one ACC unit is installed and needs to be adjusted.

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