Service Training





The 2008 Audi TT
Running Gear

Self-Study Program 993703

Audi of America, Inc.
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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 and refer to the software version valid at the time of publication of the SSP.

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

Reference



Note



Notes

Overview

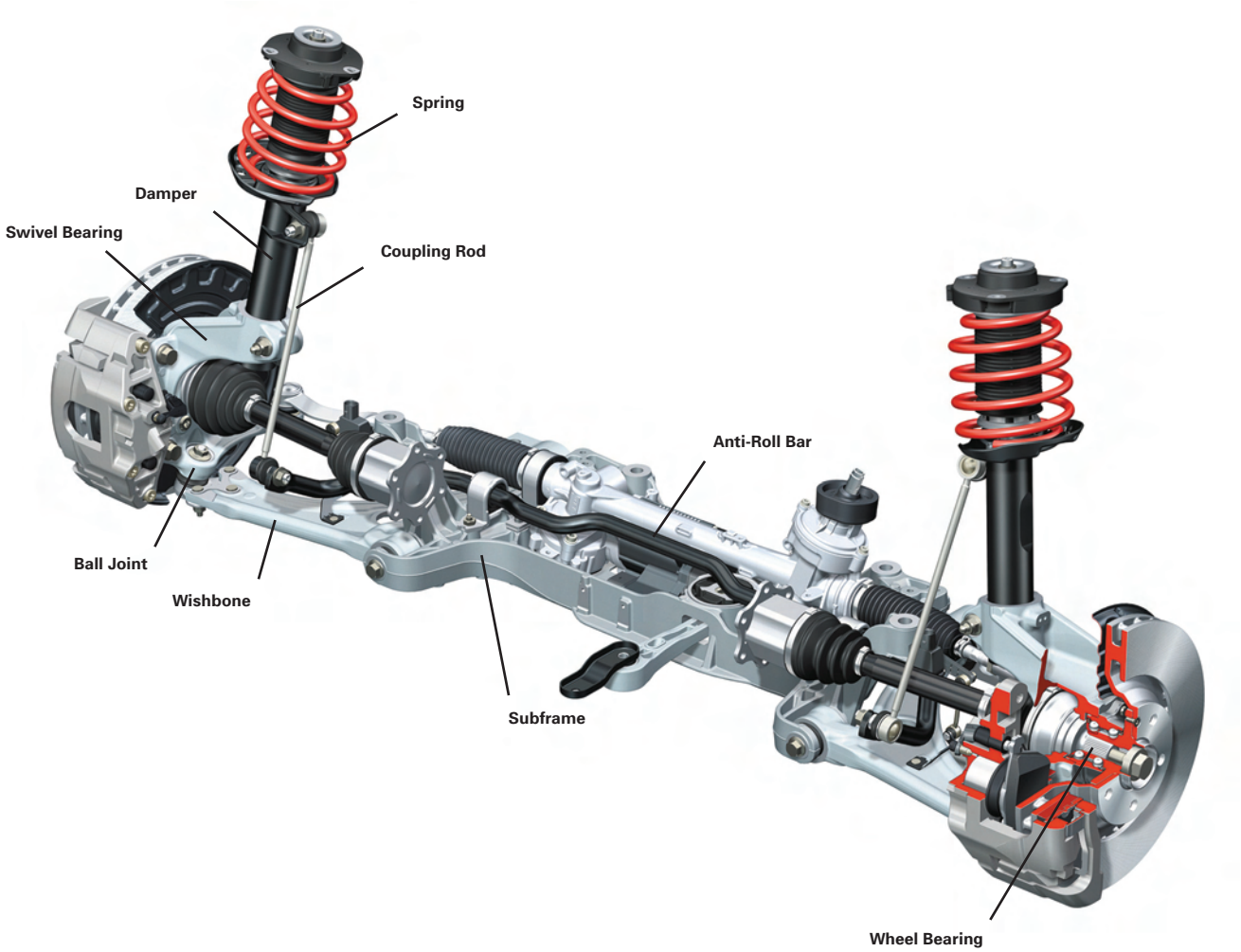
The Audi TT is available with three different suspension systems. The dynamic suspension system represents the basic specification, with the semi-active “Audi magnetic ride” suspension optional. The driver can select between comfort and sport suspension settings at the touch of a button.

quattro GmbH is also offering an S-Line suspension system, which is sportier than the dynamic suspension system. The main axle components are identical in design and function to those of the Audi A3.



Front Axle

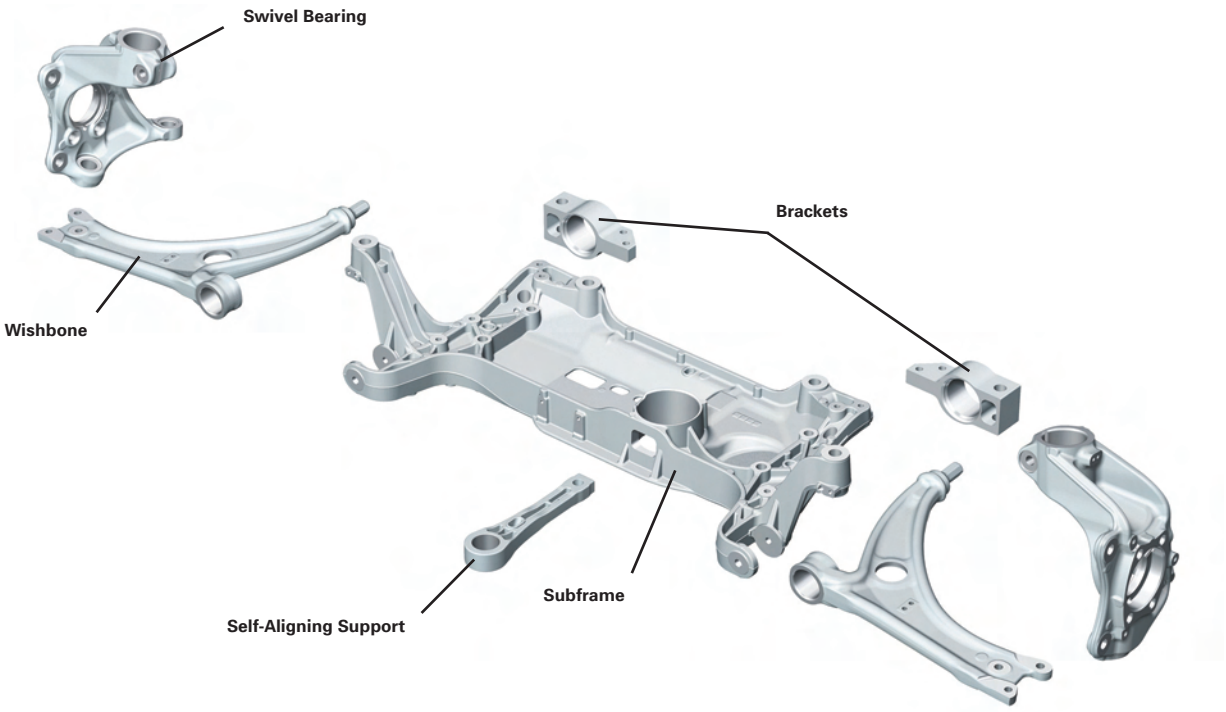
A revised version of the MacPherson suspension is used. The design of the front axle is identical to that of the Audi A3. Detail modifications have been made to reflect the particularly sporty character of the Audi TT. In addition to the tuning parts (springs, dampers, and anti-roll bars), the same axle components are used in all TT suspension variants.



System Components

Subframe

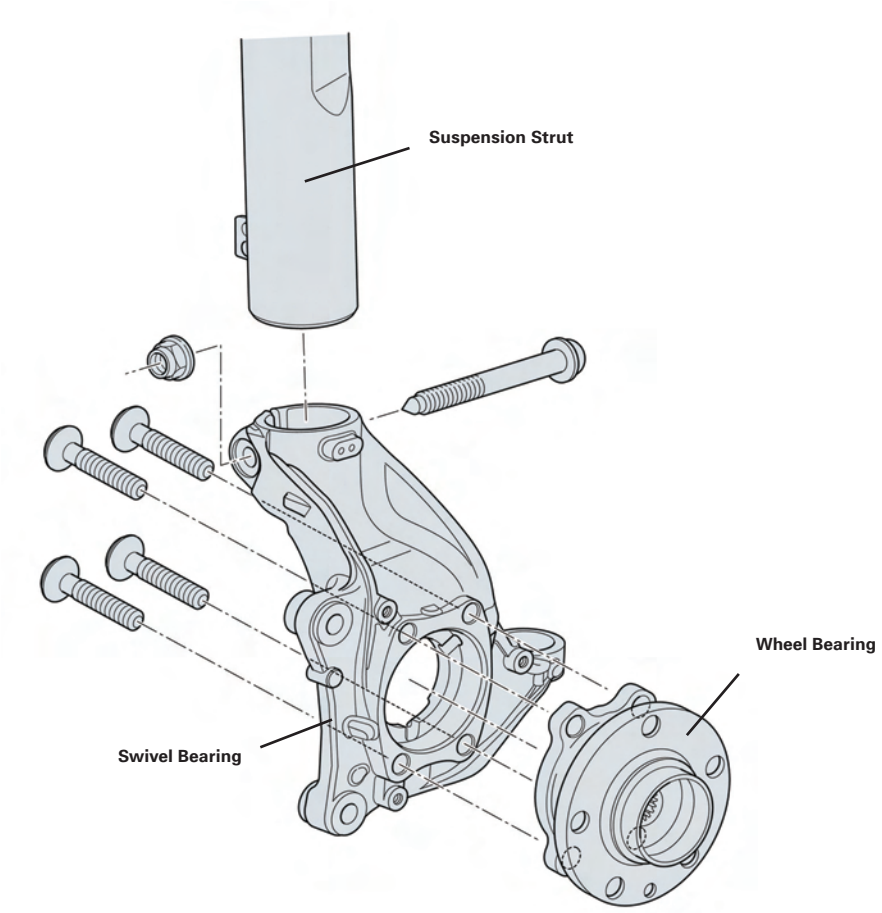
The aluminum subframe supports the wishbones, the anti-roll bar and the steering gear of the electro-mechanical steering system. The two brackets for mounting the wishbones are now common parts. The illustration below shows the aluminum components of the front axle.



Swivel Bearing, Wheel Bearing

The aluminum swivel bearing is manufactured using high-strength Cobapress technology. Its new design provides a wider track width. Steel bushings are press fit into the swivel bearing at the track rod and ball joint mounting points.

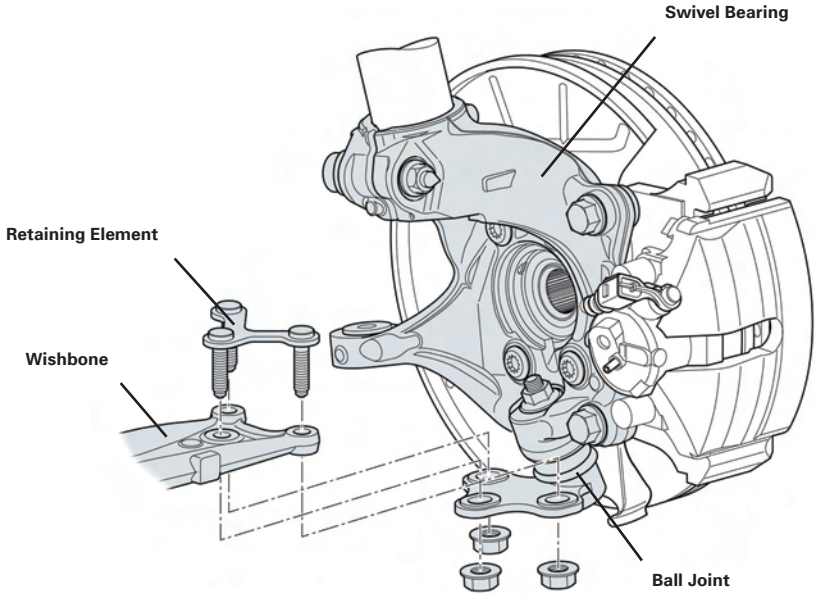
The wheel bearings are the same as those used on the Audi A3. The bolts are now coated with a chromium-6 free material to protect the environment during their manufacture. The suspension strut is connected to the swivel bearing by a clamp.

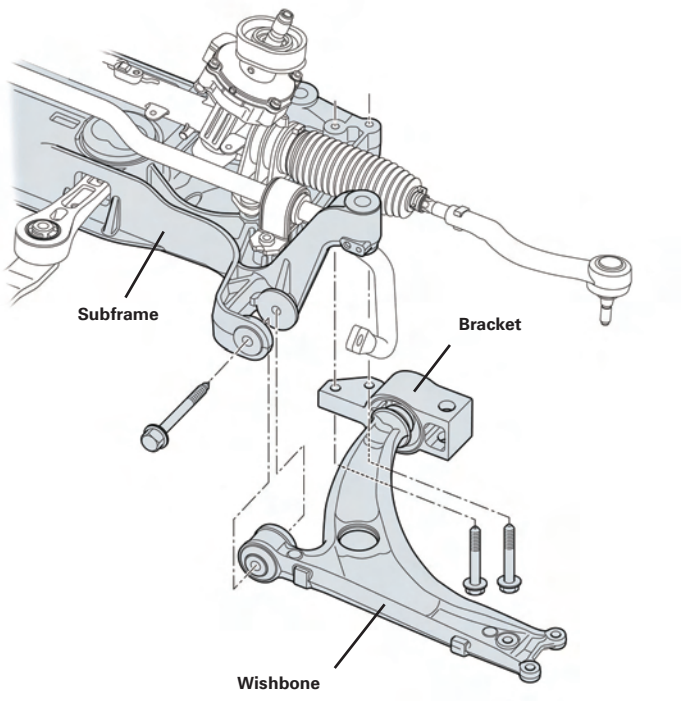


Wishbones, Ball Joint, and Bracket

The ball joint is connected to the wishbone at three bolting points. The fastening bolts are integral parts of a separate retaining element, and are inserted from above through the wishbone and ball joint.

The wishbone is attached directly to the subframe at the inside front and to the body at the inside rear by an aluminum bracket.





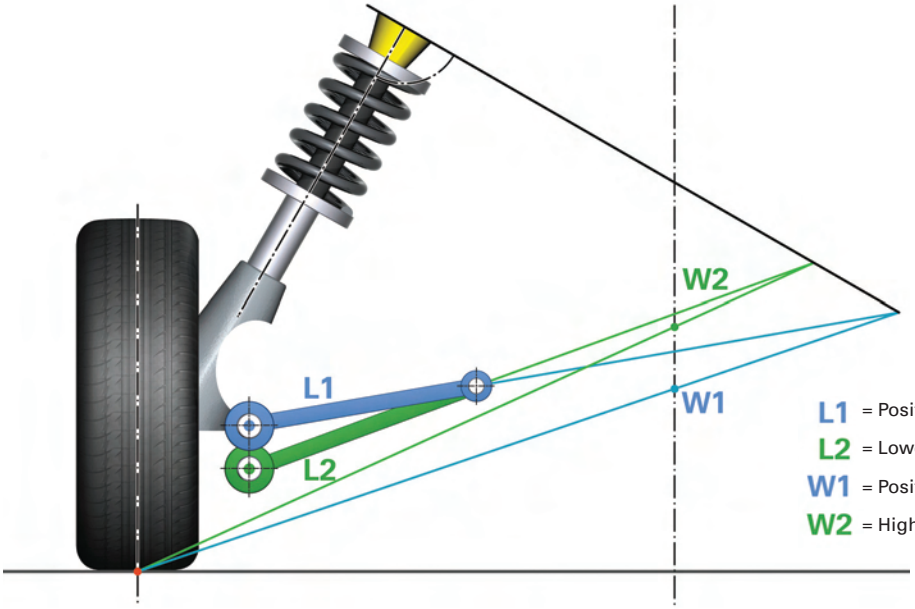
Note

Always replace the retaining element if the bolt to the ball joint has been loosened. Refer to current service repair information for the complete work procedure.

Front Suspension Geometry

The ball joint is in a lower position than on the Audi A3. The result is a higher center of roll. This enhances roll stabilization and provides sportier handling.

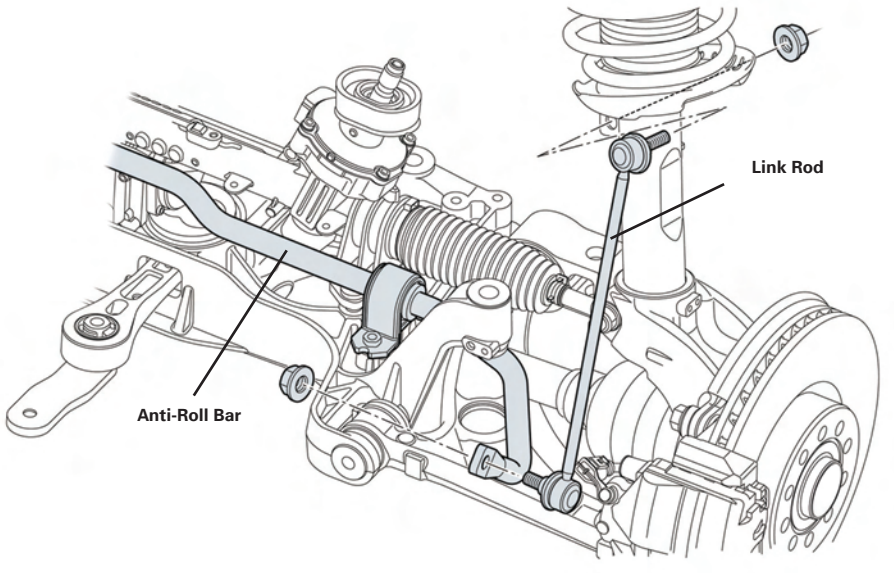
The center of roll is the level with the front axle in the center of the vehicle about which the body pivots when subjected to lateral forces, for example, when cornering.



L1 = Position of the ball joint in the Audi A3
L2 = Lower position of the ball joint in the Audi TT
W1 = Position of the center of roll in the Audi A3
W2 = Higher position of the center of roll in the Audi TT

Anti-Roll Bar

A tubular anti-roll bar is used on models with frontwheel drive, while a solid bar is used on quattro models.

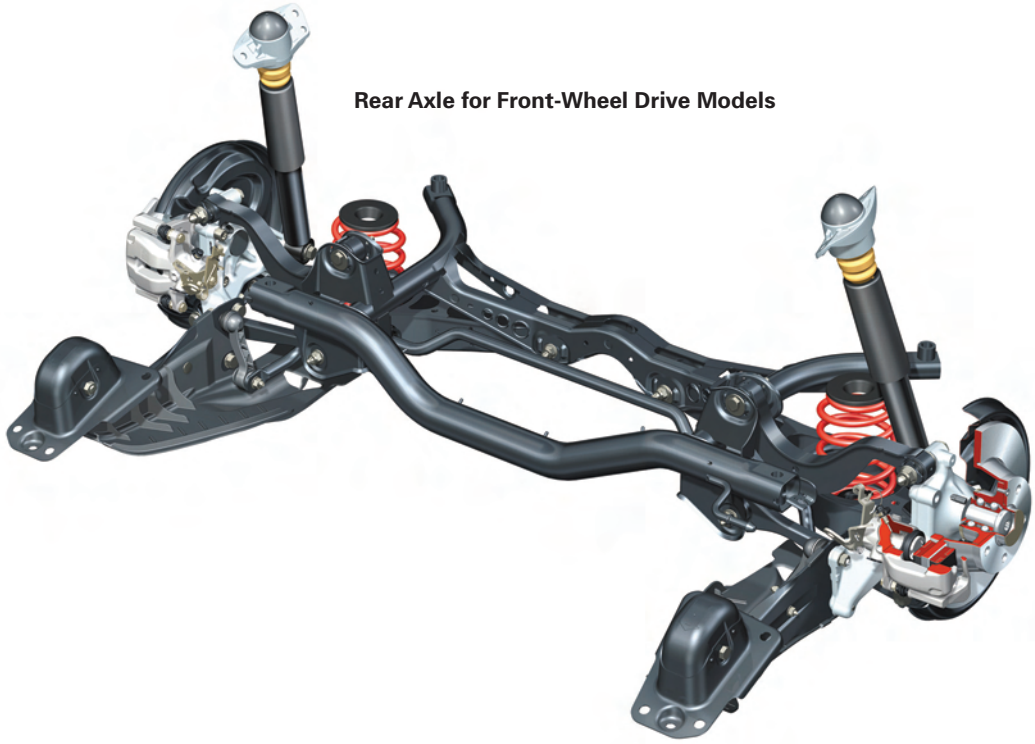


Rear Axle

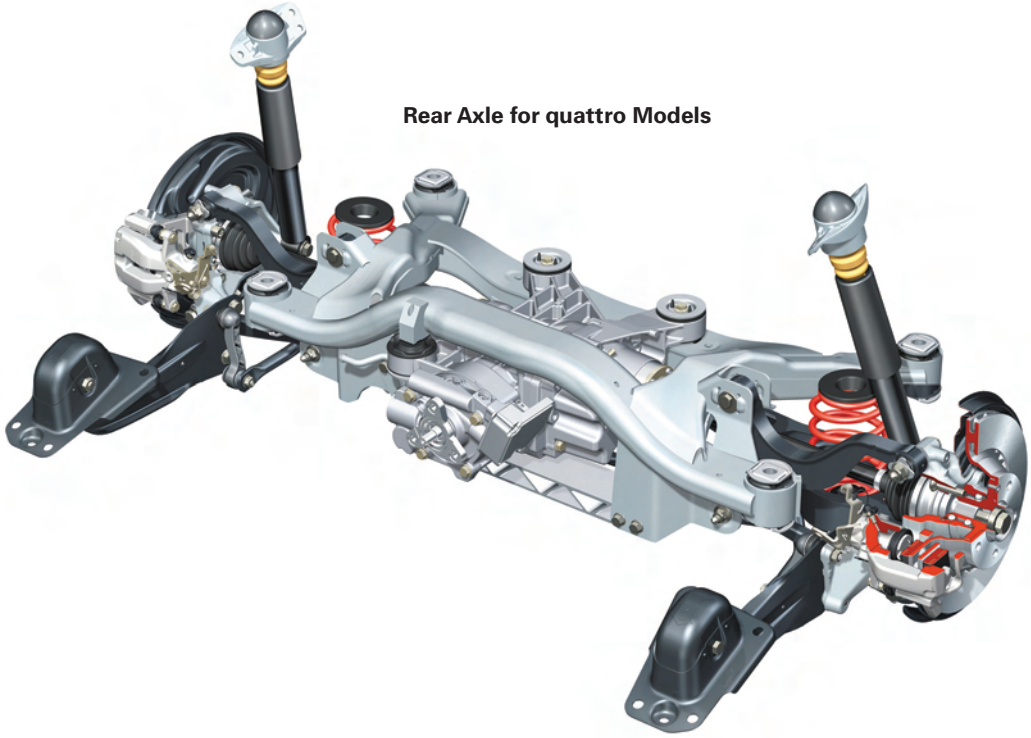
The TT's wheel carriers, damper bearings, and wheel bearings are modifications of Audi A3 Sportback components. The suspension and damping components (springs, dampers and anti-roll bars) were adapted to the specific requirements of the TT.

Additional stone chip protection is provided for certain markets. The trailing arms on these models are protected by plastic claddings.

Rear Axle for Front-Wheel Drive Models



Rear Axle for quattro Models

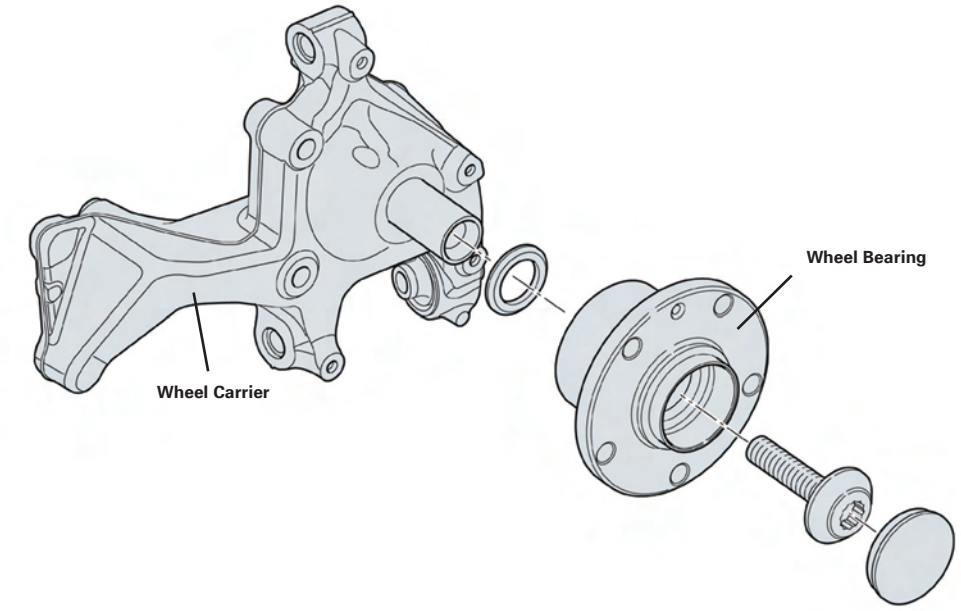


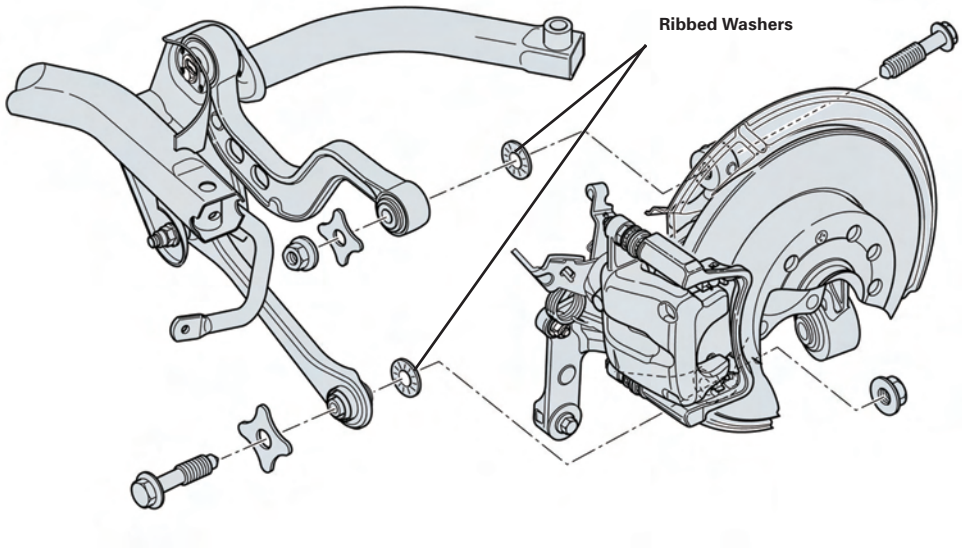
System Components

Wheel Carrier, Wheel Bearing

The wheel carrier has been modified geometrically to increase track width. Front-wheel-drive models use a second-generation wheel bearing which is larger than the bearing on the Audi A3. The diameter of the wheel carrier bearing journal has been adapted to match the internal diameter of the wheel bearing.

Ribbed washers are used for attaching the track link, upper wishbones and damper to the wheel carrier. These washers are required to achieve the necessary surface pressures.





Note

Always replace the ribbed washers during removal and installation of parts.

Wheel Alignment

Front Axle

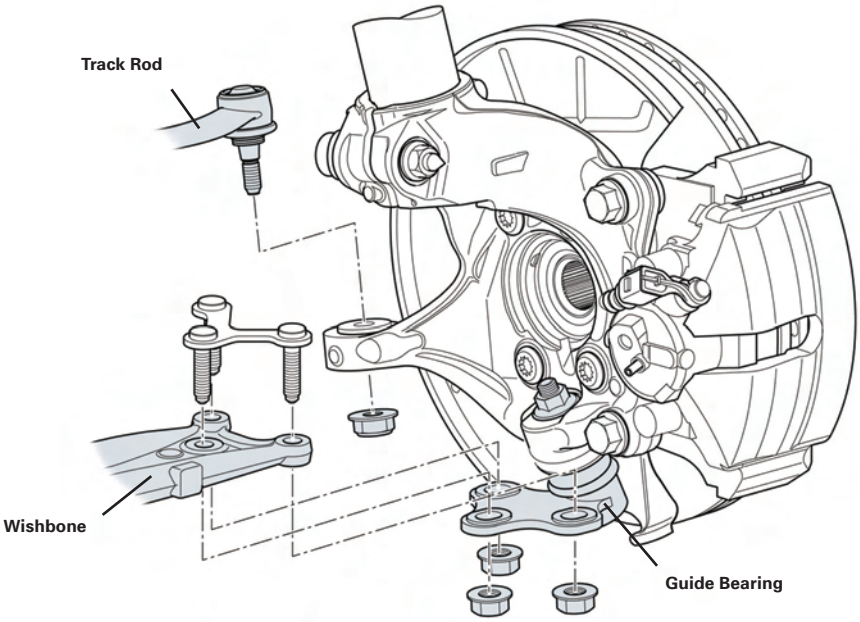
Toe and camber can be adjusted at the front axle. The toe-out values are adjusted at the track rods. Left and right camber can be adjusted separately.

The camber is adjusted at the connection between the wishbone and the guide bearing. For this purpose, the holes in the guide bearing are oblong in shape.

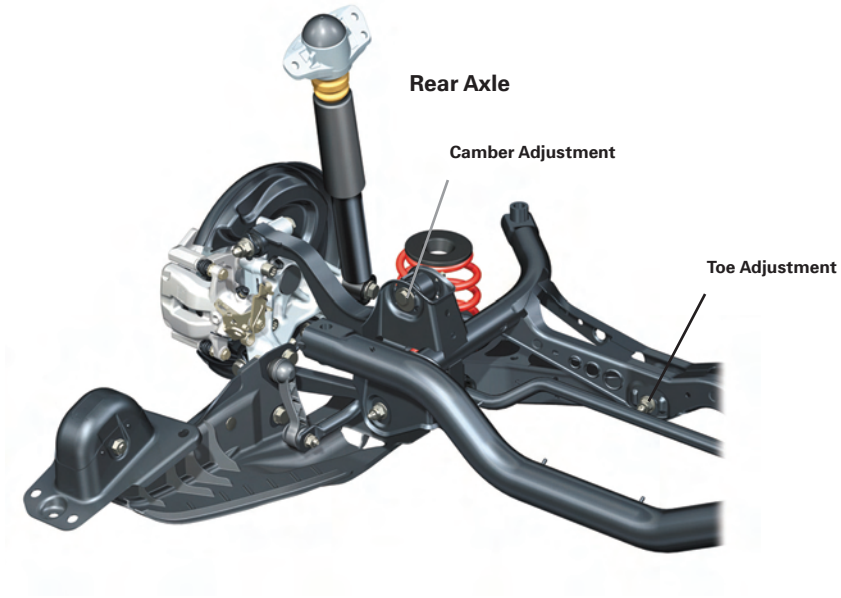
Rear Axle

The camber and toe can be adjusted at the rear axle. The adjustment procedure is the same as for the Audi A3.

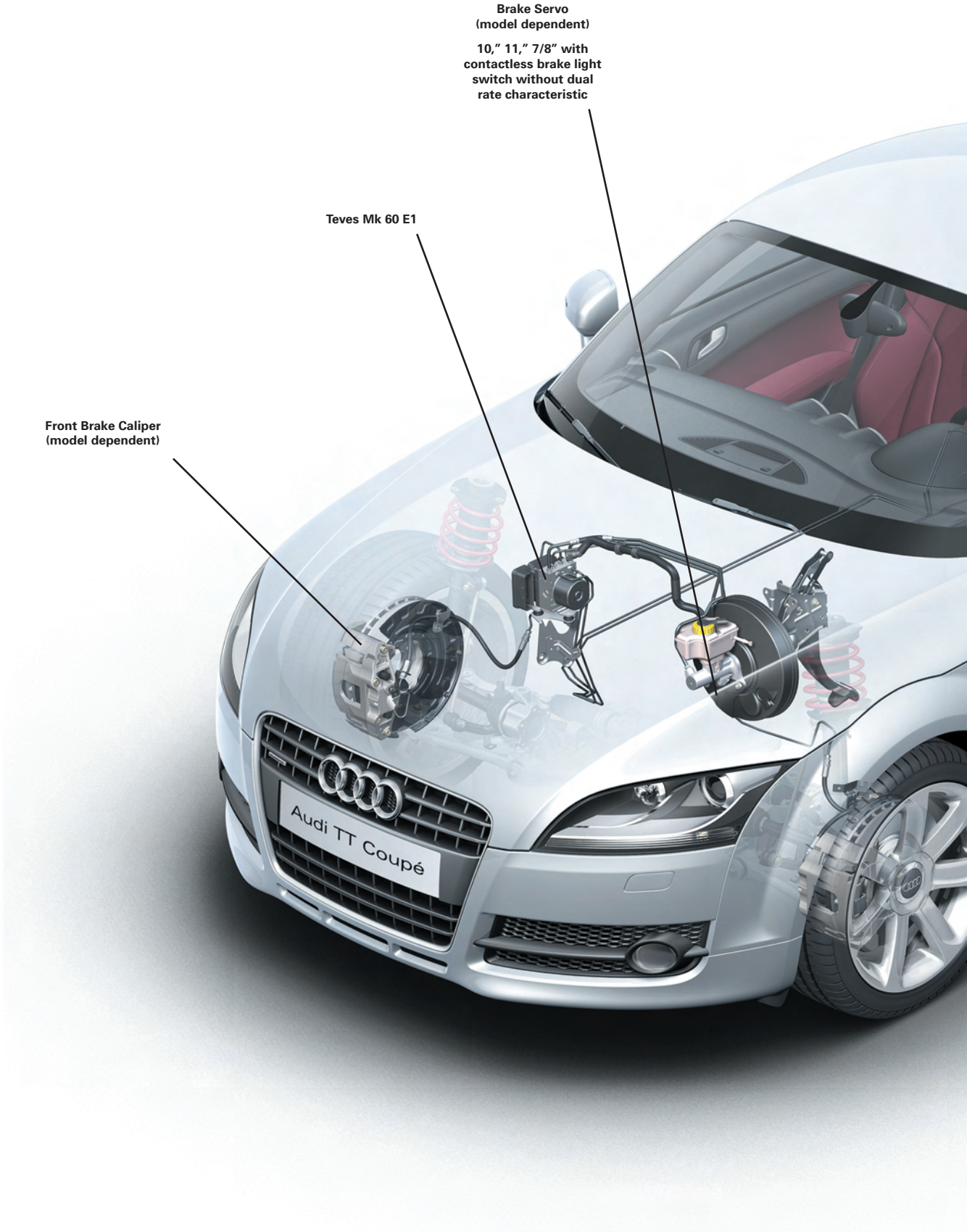
Front Axle

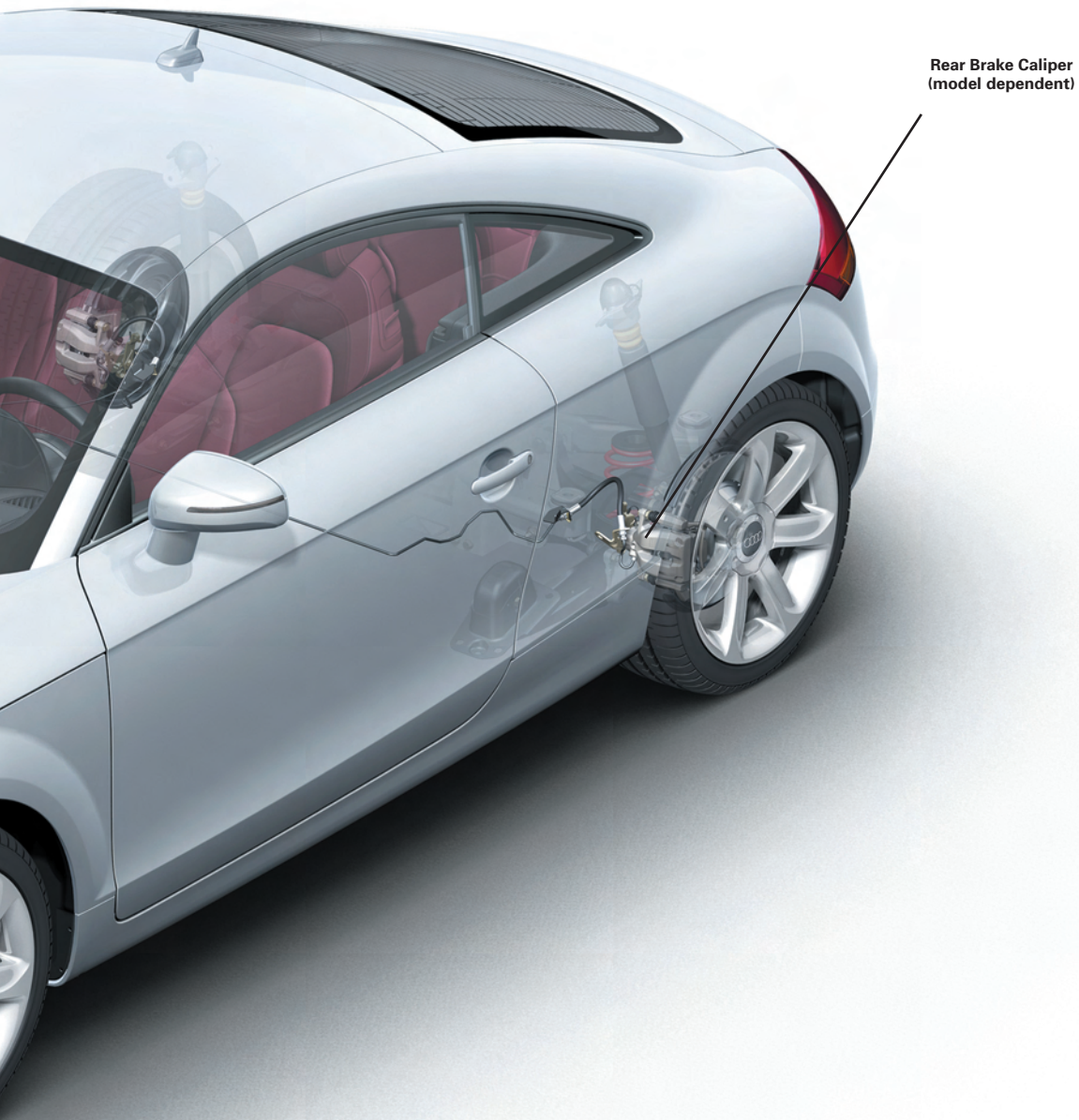


Rear Axle



Overview


Brake Servo
(model dependent)
10," 11," 7/8" with
contactless brake light
switch without dual
rate characteristic
Teves Mk 60 E1
Front Brake Caliper
(model dependent)
Audi TT Coupé


Rear Brake Caliper
(model dependent)

Brake System

Front Axle Brake System

Engine	2.0L TFSI	3.2L V6 MPI
Minimum Wheel Size	16''	17''
Brake Type	FN3	FNR-G
Number of Pistons	1	1
Piston Diameter	2.12 in (54 mm)	2.24 in (57 mm)
Brake Disc Diameter	12.28 in (312 mm)	13.38 in (340 mm)

Rear Axle Brake System

Engine	2.0L TFSI	3.2L V6 MPI
Minimum Wheel Size	16''	17''
Brake Type	CII38	CII41
Number of Pistons	1	1
Piston Diameter	1.49 in (38 mm)	1.61 in (41 mm)
Brake Disc Diameter	11.25 in (286 mm)	12.20 in (310 mm)

System Components

Front Brakes

The brake calipers are identical in design and operation to the brake calipers on the Audi A3. A zinc-nickel coating is now applied. The brake discs used on vehicles with 16'' wheels are the same as those used on the Audi A3. The brake discs used on vehicles with 17'' wheels have been modified due to the geometry of the wheel. This change was necessary due to the modified wheel rim geometry of the Self-Supporting Tires (SST).

The Audi TT has new brake hoses with modified holders on the swivel bearing. The backing plates have been adopted from the Audi A3. Brake pad wear is on the interior lining of the left wheel brake.

On the brake system for vehicles with 17'' wheels, a vibration damper is attached to the caliper at the lower fastening bolt.

Front Brake Assembly for Vehicles with 16'' Wheels



Front Brake Assembly for Vehicles with 17'' Wheels



Rear Brakes

The brake calipers are identical in design and operation to those on the Audi A3. The brake carriers have been modified since the Audi TT has wider rims than the Audi A3.

Compared to the Audi A3, the brake calipers have been shifted 0.39 in (10 mm) further inward. New backing plates are used, and the brake hoses have been modified. The transition point from brake hose to brake line is located on the side member (it is located on the subframe in the Audi A3).

Rear Brake Assembly for Vehicles with 16'' Wheels



Rear Brake Assembly for Vehicles with 17'' Wheels



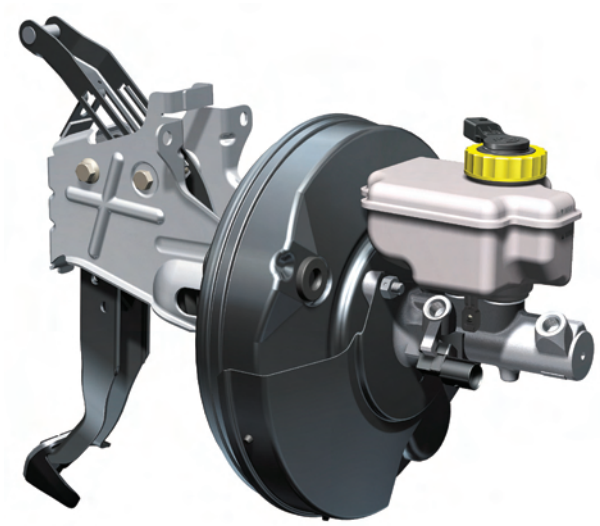
Power Brake Unit / Brake Servo

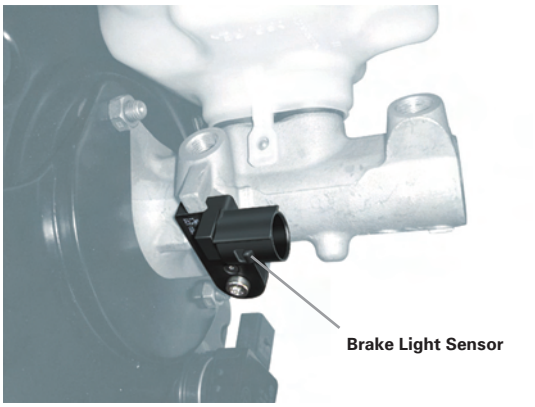
Vehicles with 16'' wheels will have a 10'' single brake servo. Vehicles with 17'' wheels will have an 11'' single brake servo.

For the Audi TT, no dual rate characteristic was applied to either brake servo.

The OHB-V function from the Audi A3 is used on TTs equipped with the 3.2L VR6 engine and DSG transmission.

A contactless brake light sensor is used on the Audi TT. The pedal assembly has been adopted from the Audi A3.





Reference

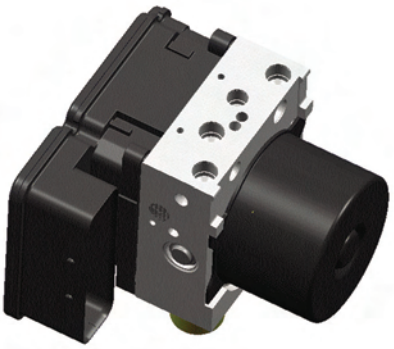
For detailed information on the dual rate and OHB-V systems, refer to The 2006 Audi A3 Running Gear, Self-Study Program 993503.

ESP Control Module

The Audi TT uses a new generation Mk60E1 ESP by Continental Teves.

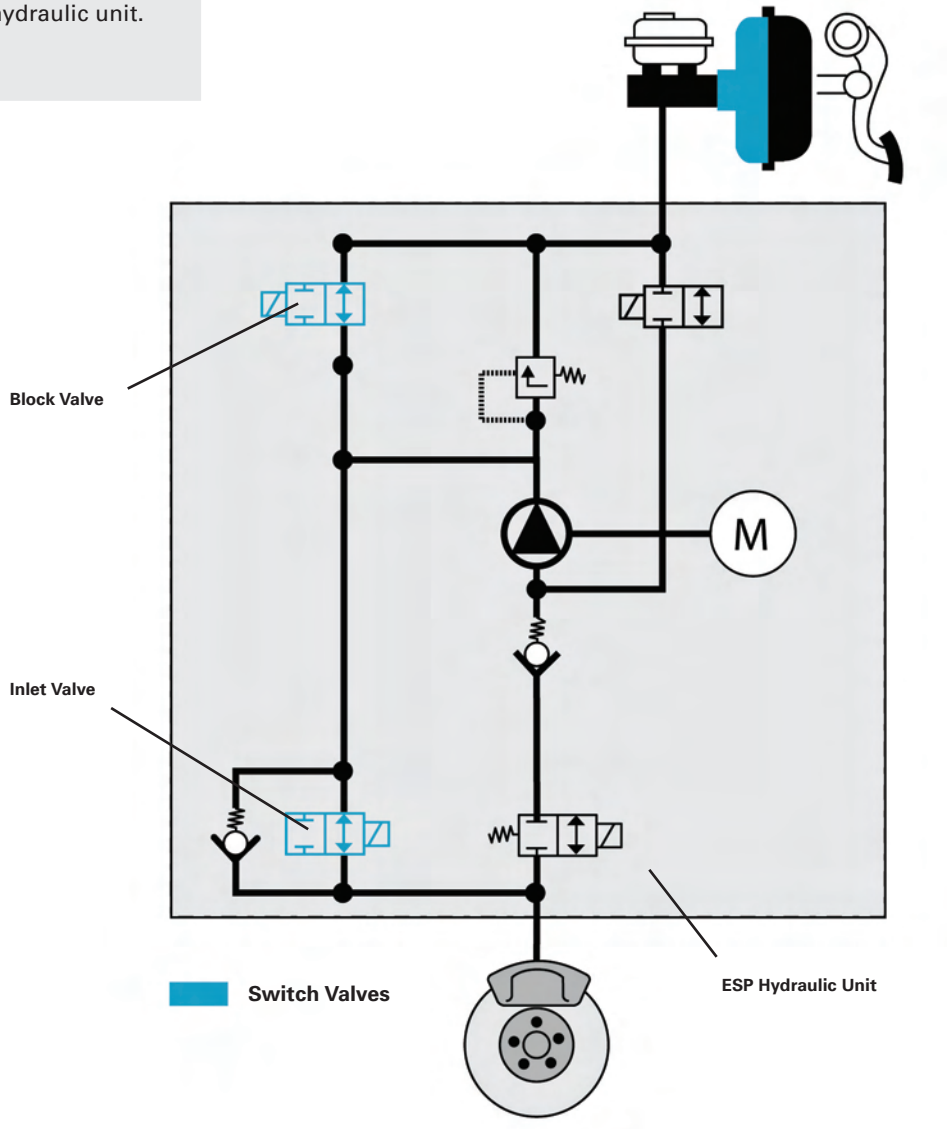
As with the Mk25E1 in the current Audi Q7, the Mk60E1 has analogized switch valves (four intake valves and two block valves) and an integrated pressure sensor. In the case of analogized switch valves, the port cross-section is determined by the activation current. Unlike systems with conventional open and closed switch valves, more precise brake control is possible.

The ESP control module has the same integrated functions as in the Mk60 control module on the Audi A3, however these functions have been adapted to the Audi TT.



Note

Due to the configuration of the switch valves, it is not possible to disconnect the control module from the hydraulic unit.



ESP Sensor Unit G419

G419 is composed of Transverse Acceleration Sensor G200 and Rotation Rate Sender G202 This is similar to the configuration of the A3 Sportback. On quattro vehicles, Longitudinal Acceleration Sensor G251 is also included.

Wheel Speed Sensors G44 - G47 and Steering Angle Sensor G85 are identical to those used in the Audi A3 Sportback.



ASR/ESP Button E256

E256 functions and displays are as follows:

Pressing ASR/ESP Button 256 for less than three seconds ONLY deactivates the traction control operation (TSC) of the ESP system.

Switching the TCS OFF improves traction under some circumstances, for example, when starting from a stop on loose surfaces, including loose gravel, sand, or snow.

The TCS remains OFF until a road speed of 44 mph (70 km/h) is reached. The TCS is automatically switched back ON when this speed is reached. In all TTs with quattro, TCS is automatically switched OFF again when the speed drops below 44 mph (70 km/h). In front-wheel drive TTs, TCS is not automatically switched OFF when the vehicle's road speed drops below this threshold.

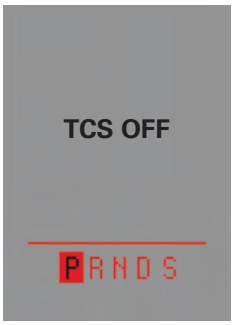
If E256 is pressed for longer than three seconds, the ESP (including TCS) is switched OFF.

When the brake is applied, both ESP and TCS are switched back ON for the duration of the braking maneuver and remain active until a stable driving condition is restored.

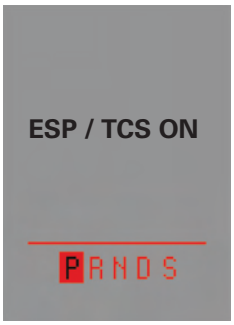
The ESP function is automatically switched ON if faults are diagnosed with the Audi magnetic ride system or with the automatic, electrically adjustable rear spoiler.

If E256 is pressed for longer than 10 seconds when the ESP is OFF, it is switched back ON and cannot be switched OFF again until the ignition switch has been cycled OFF and then ON.





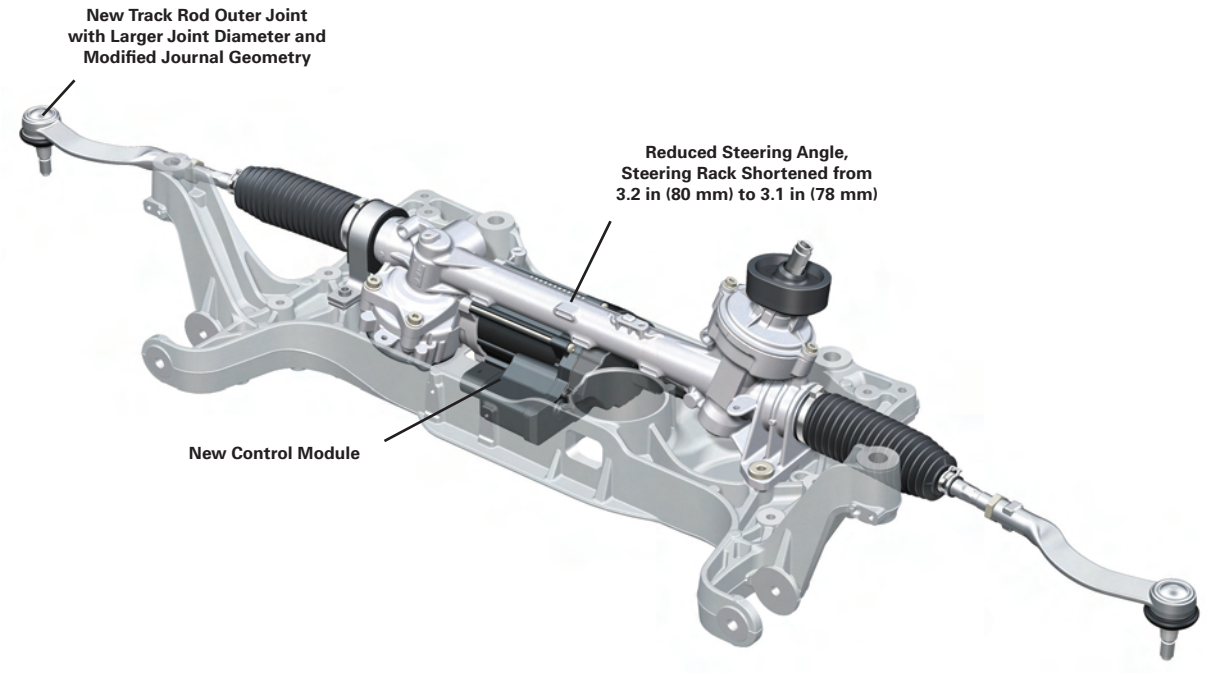




Electro-Mechanical Steering System

The electro-mechanical steering system (EPS) used in the Audi A3 Sportback has been adapted for use in the new Audi TT. The changes are noted in the illustration below.

A new control module is used in the Audi TT due to new control software that does not include the DSR function. The power steering assist maps programmed into the control module of the Audi TT were determined based on the vehicle powertrain type (front-wheel drive or quattro) While in the A3 Sportback, assist maps were determined by the weight of the front axle.

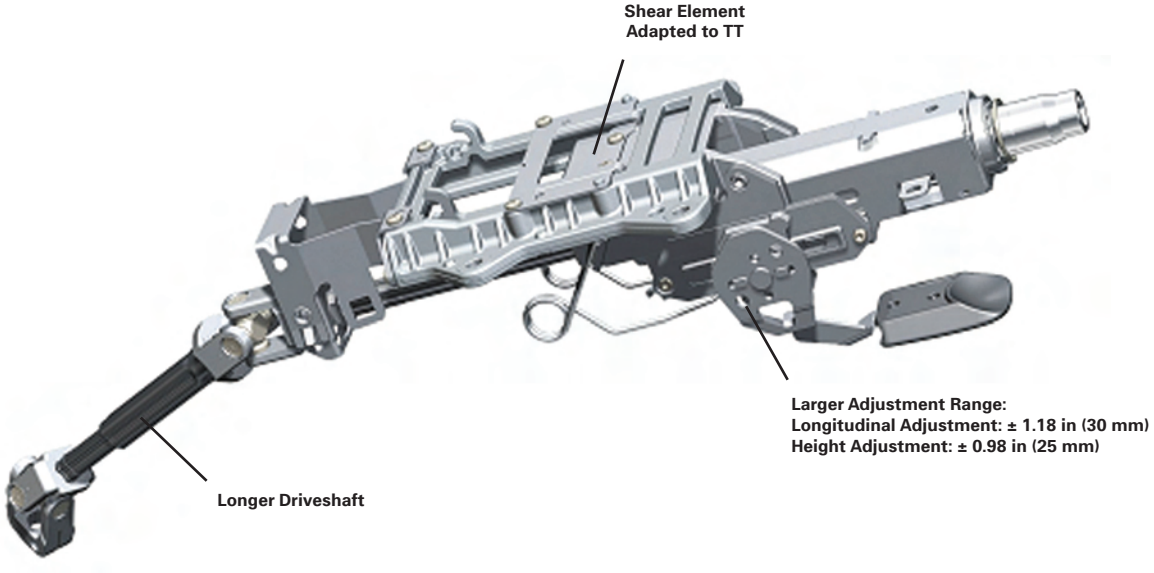


Reference

For detailed information on the design and function of the EPS system, refer to The 2006 Audi A3 Running Gear, Self-Study Program 993503.

Steering Column

The mechanically adjustable steering column of the Audi TT is similar to that of the Audi A3 Sportback with the modifications shown in the illustration below.



Steering Wheel

A redesigned steering wheel is used in the Audi TT. All models are equipped with three-spoke leatherbound steering wheels with integrated two-stage airbag module.

In addition to the standard version, steering wheels are available to accommodate multi-function switches and Tiptronic. The inner frame of the steering wheel is made of magnesium.

The airbag module is centered in the steering wheel by two locating pins and retained by bolts threaded into caged nuts. The caged nuts are used for tolerance compensation during assembly.

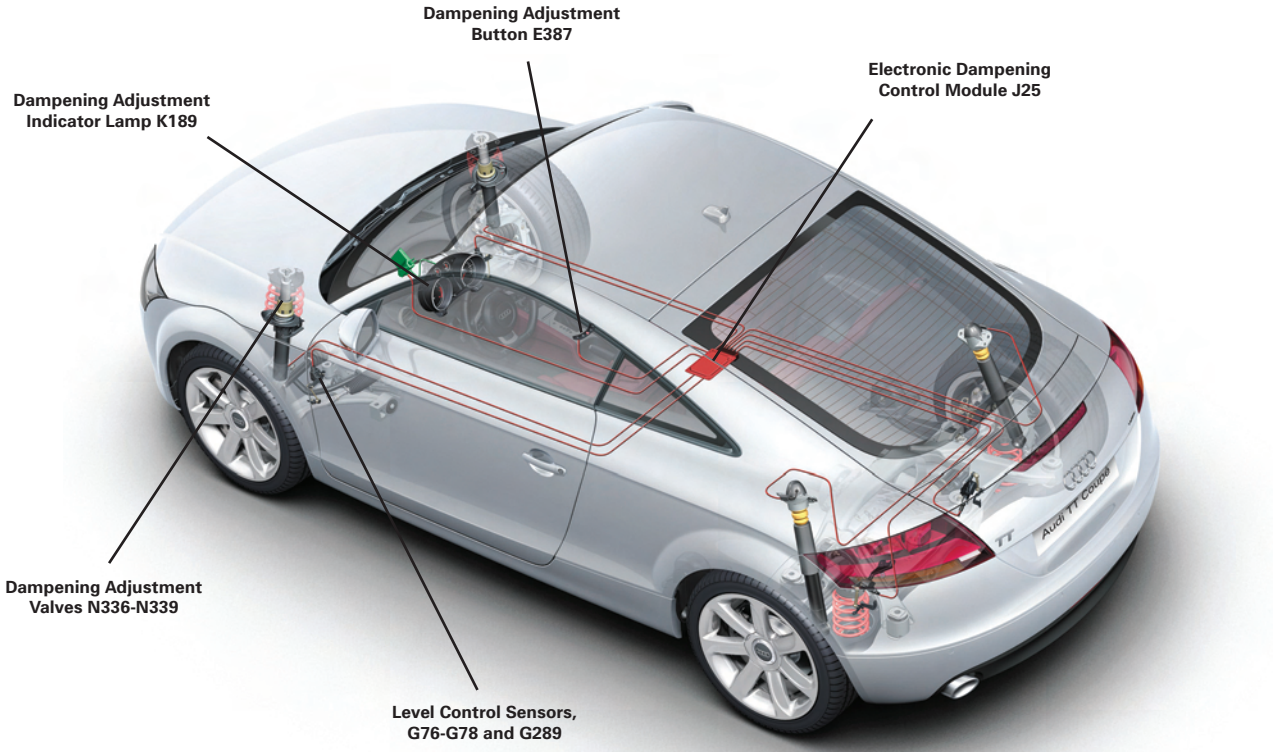


Overview

The Audi TT is the first Audi to feature Audi magnetic ride — a new semi-active suspension system with magneto-rheologically controlled dampers. Sport or comfort damper settings can be selected at the touch of a button.

Audi magnetic ride improves driving dynamics and driving comfort for the following reasons:

- Reduced body movement (pitch and roll)
- Optimized road-holding
- Optimized handling



Operating Concept

The damping function is based on the magneto-rheological effect. The prerequisite for this is the use of a special damping fluid. This magneto-rheological fluid is a composition of a hydrocarbon-based synthetic oil in which soft magnetic particles with a diameter of 0.00012-0.00040 in (3-10 µm [microns]) are held in suspension.

The fluid has various additives to stabilize its composition. Applying a magnetic field changes the properties of the magneto-rheological fluid. The magnetic particles are aligned in the direction of the magnetic field lines. This alters the flux voltage of the fluid.

When the magnetic coils are not activated electrically, the magnetic particles are arranged irregularly in the damper oil.

During the piston stroke, the individual particles are forced with the fluid through the piston bores. The particle-laden suspension damping fluid has a low resistance to the movement of the piston. As a result the damping force is low.

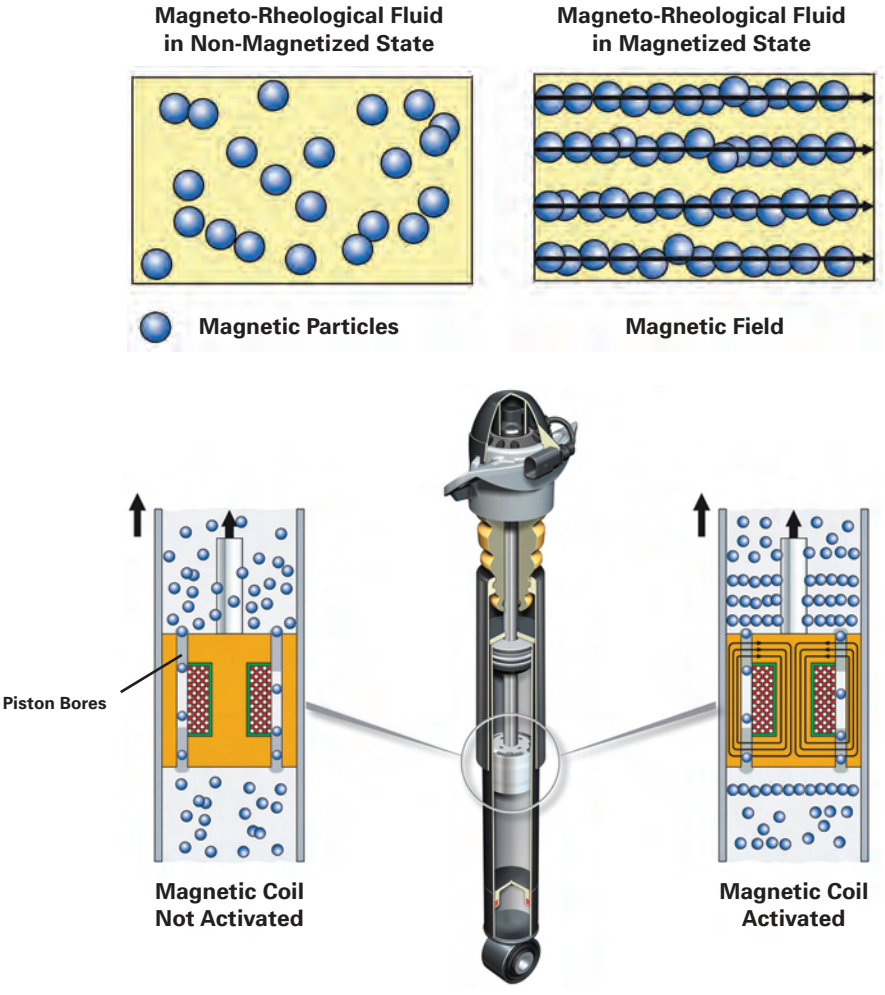
When the magnetic coil is activated electrically, the magnetic particles are aligned with the magnetic field lines. Thus, long particle chains form in the vicinity of the piston.

These particle chains are aligned cross-wise before the fluid enters the piston bores.

During the piston stroke, individual particles break up and are forced with the fluid through the piston bores. To "break up" these chains, force must be applied.

The resistance which the piston must overcome is greater than in the case of a non-energized magnetic coil, and is dependent on the amount of electrical current and the strength of the magnetic field.

This allows greater damping forces to be achieved.

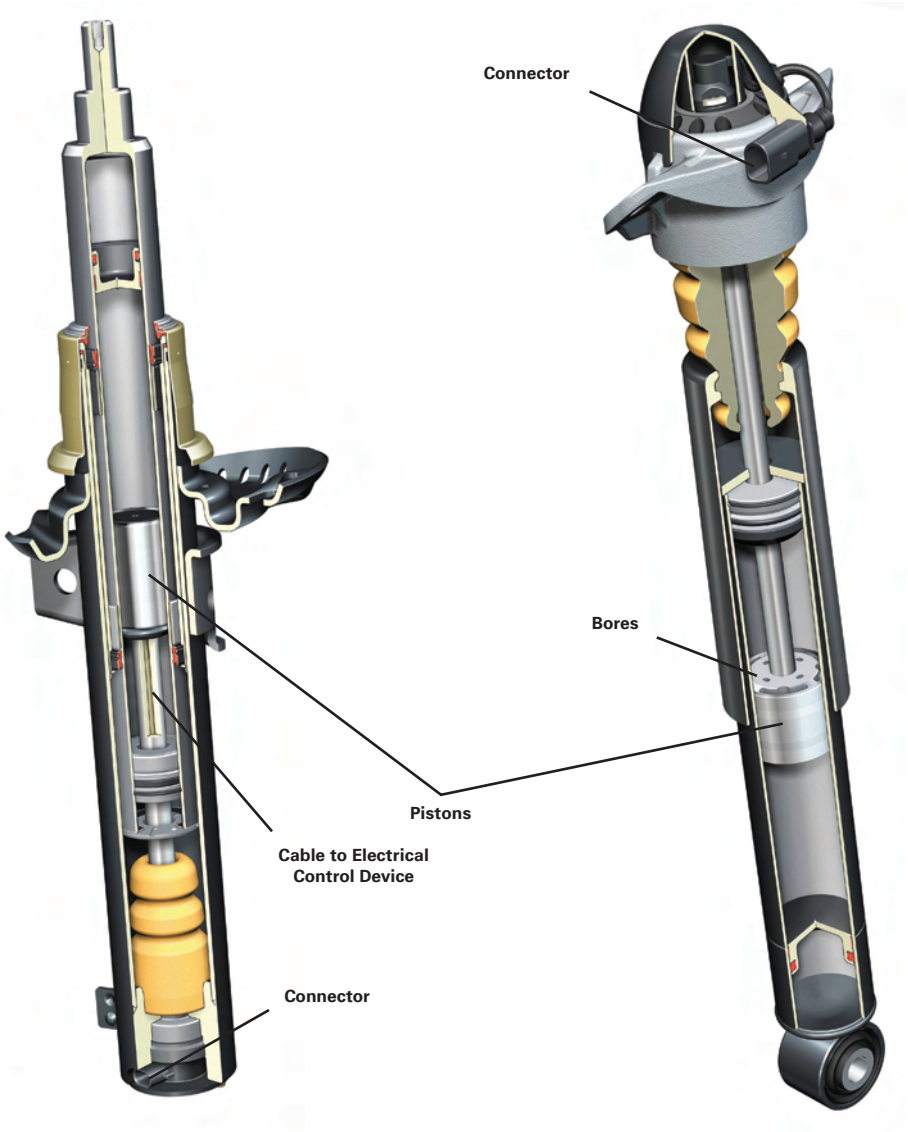


System Components

Damper

The magneto-rheological dampers are much simpler in design than conventional dampers. The complex conventional damping valves are no longer required. These have been replaced by bores in the piston through which the fluid is displaced. In addition, single-tube dampers are used. The magnetic coils are integrated in the pistons.

Power is supplied through the hollow piston rods directly from Electronic Damping Control Module J250. Depending on engine type (4-cylinder or 6-cylinder engine), different front dampers are used. A single damper is used for all engine types on the rear axle.



Front Axle Damper

Rear Axle Damper

Variable activation of the solenoid valve allows the shock absorber damping force to be adjusted over a wide range.

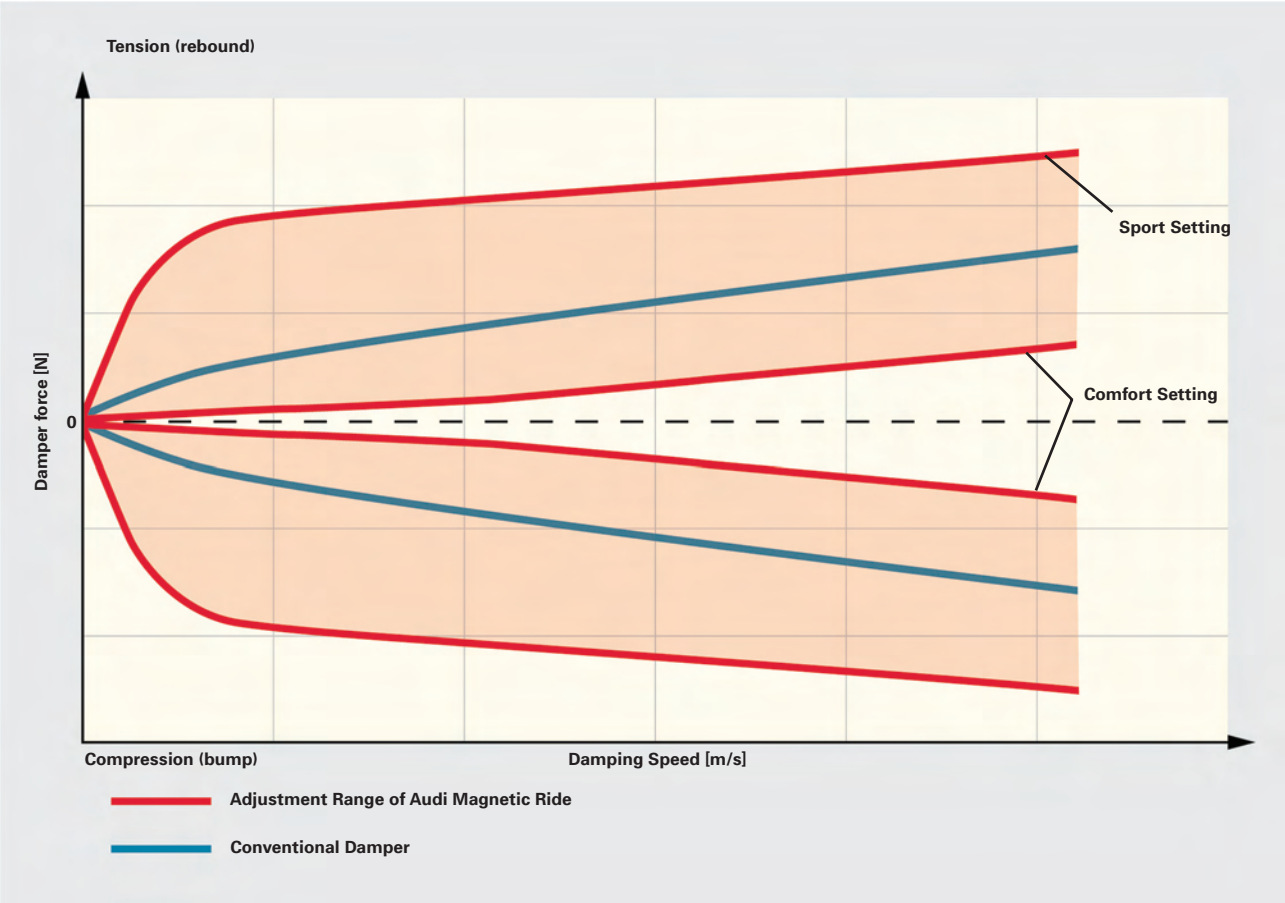
Damping force adjustments are made within milliseconds. This allows the damping force to be adapted to the requirements of bump and rebound cycles.

Electronic Dampening Control Module J250

J250 receives data from the level sensors G76-G78 and G289 in addition to the current driving condition from the ESP Control Module.

J250 processes the data and determines the momentary activation current of the dampers. Each damper is activated individually.

J250 is located under the front passenger seat.





Level Control Sensors G76-78 and G289

These level control sensors are identical in design and function to those used in the A6 and A8. The sampling rate is 800 Hz. Measured data is read in by Electronic Dampening Control Module J250 through discrete wiring, is processed, and then relayed to the headlight range control module (if equipped) on the CAN-bus.

Dampening Adjustment Button E387

E387 is used to select a damper setting. In standard operation, the dampers are configured for comfort. A sport damping characteristic can be activated by pressing the button.

The LED indicator integrated in the button indicates that the sport setting is active. The signal from the button is read in by the control module across a discrete line.





Dampening Adjustment Indicator Lamp K189

System faults are indicated by K189 in the instrument cluster. This warning lamp is checked whenever the ignition is turned ON. K189 also comes ON if the instrument cluster has been coded incorrectly.



Special Functions

Temperature Effects

The suspension damping becomes softer with increasing magneto-rheological fluid temperature. A software map for temperature compensation is integrated in the control module. The rising temperature is compensated by increasing the magnetic coil activation current. Likewise, the activation current is reduced at low ambient temperatures.

Temperature is determined indirectly by measuring the resistance of the magnetic coil. A current of 3A is applied to the coil for 40 ms. The required voltage is determined and the resistance is calculated.

The basic value is the resistance measured in a vehicle which has been shut OFF for at least six hours. The measurements are correlated with the basic value. Based on the change in resistance, the control module determines the actual temperature in the shock absorber damper. In addition, the temperature of the control module is calculated. This is done by evaluating the electrical currents used by the control module to activate the coils.

Temperature Shut-Off

The magnetic coil activation current must be increased to compensate for the effect of temperature increase in the dampers.

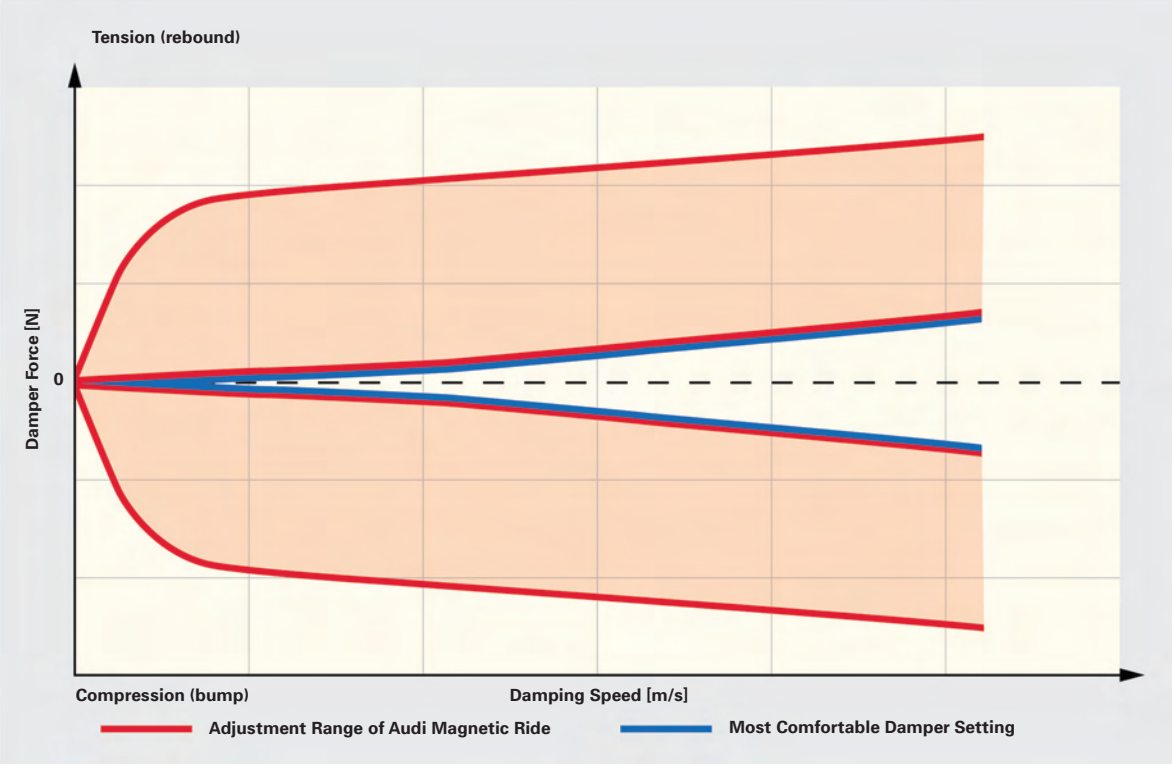
However, increasing the electrical current causes further heating of the magnetic coil. When temperatures are higher than a defined threshold temperature of 194°F (90°C), it is no longer possible for the driver to select "Sport" mode.

In "Sport" mode, higher damping forces are produced by increasing the magnetic coil activation current. Activating the "Sport" mode would cause a further increase in the already high temperature in the suspension damper. The control module is shut down when its temperature exceeds 230°F (110°C).

Emergency Operation in Case of Failure in Electrical Activation of Magnetic Coil

In case of failure in electrical activation of multiple magnetic coils, the magnetic coils of all suspension dampers are no longer activated.

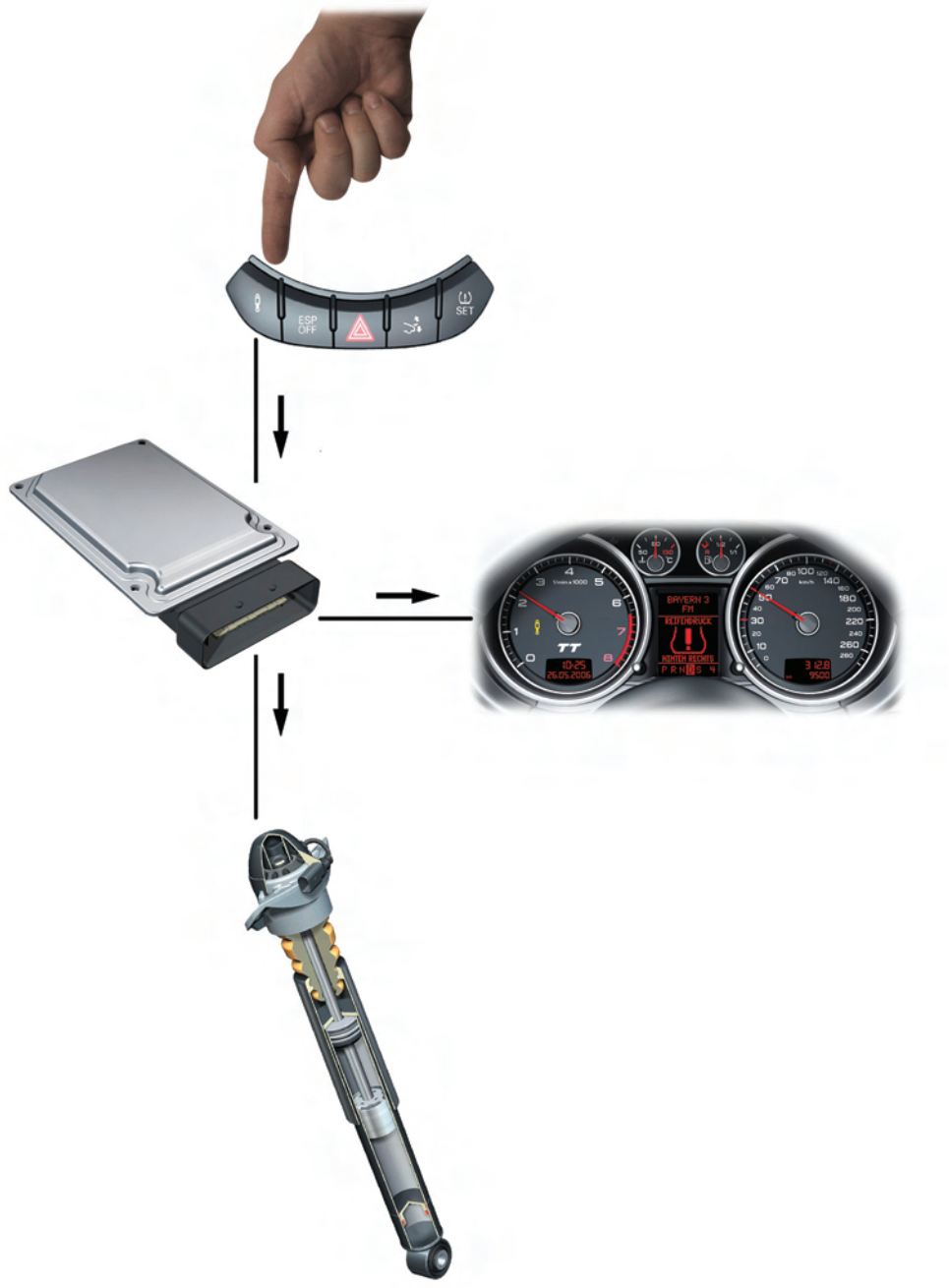
When this occurs, the most comfortable suspension damping characteristic is set.



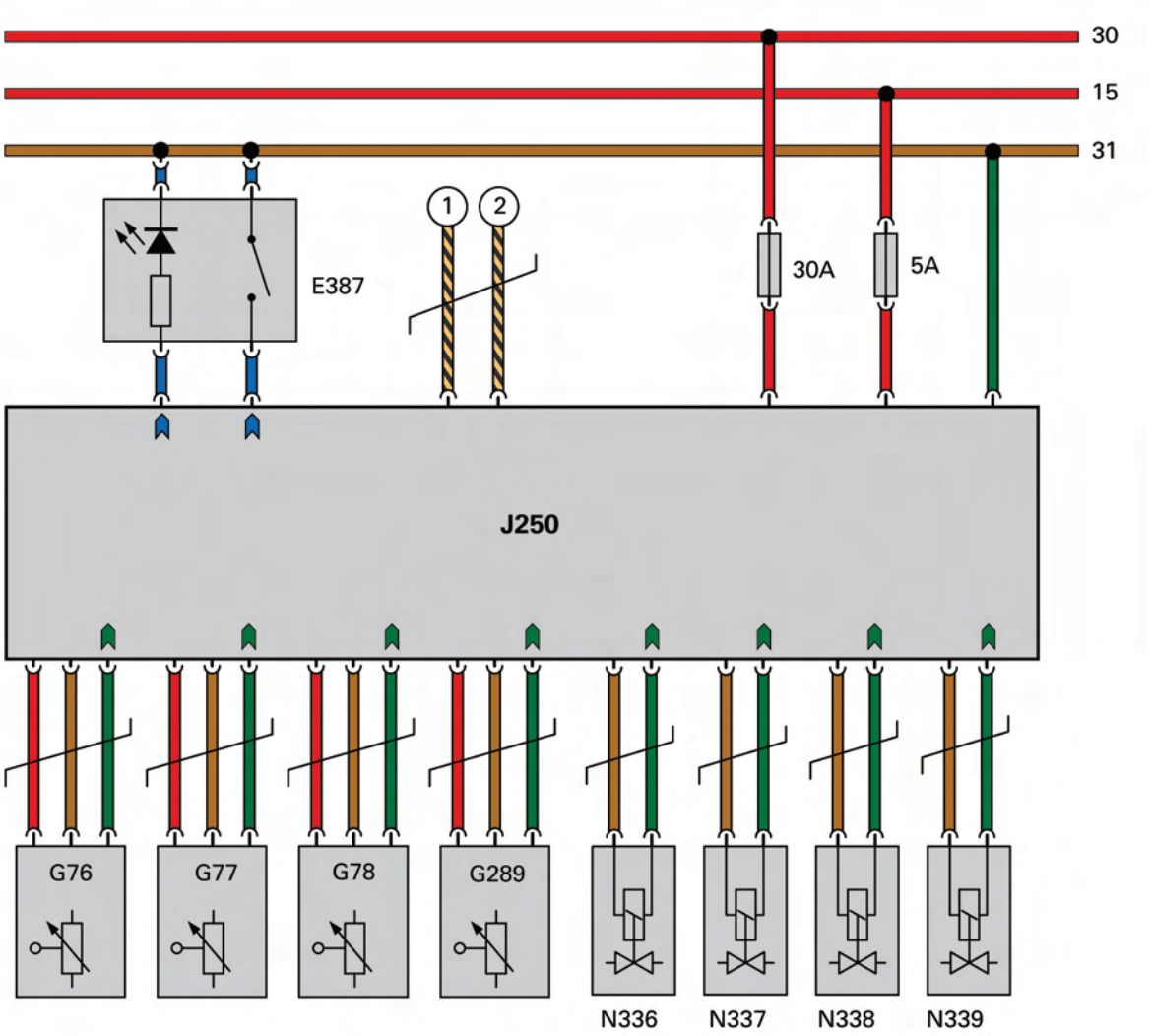
Shock Absorber Test

When Dampening Adjustment Button E387 is pressed for longer than five seconds, the magnetic coils are activated by the application of a constant electrical current. In this state, the shock absorbers can be tested.

The indicator LED in the button flashes when the “shock absorber test” mode is active. The system exits the mode automatically when the button is pressed again, after the ignition is switched ON/OFF or when driving at a speed of at least 6.2 mph (10 kph).



Function Diagram



Positive

Ground

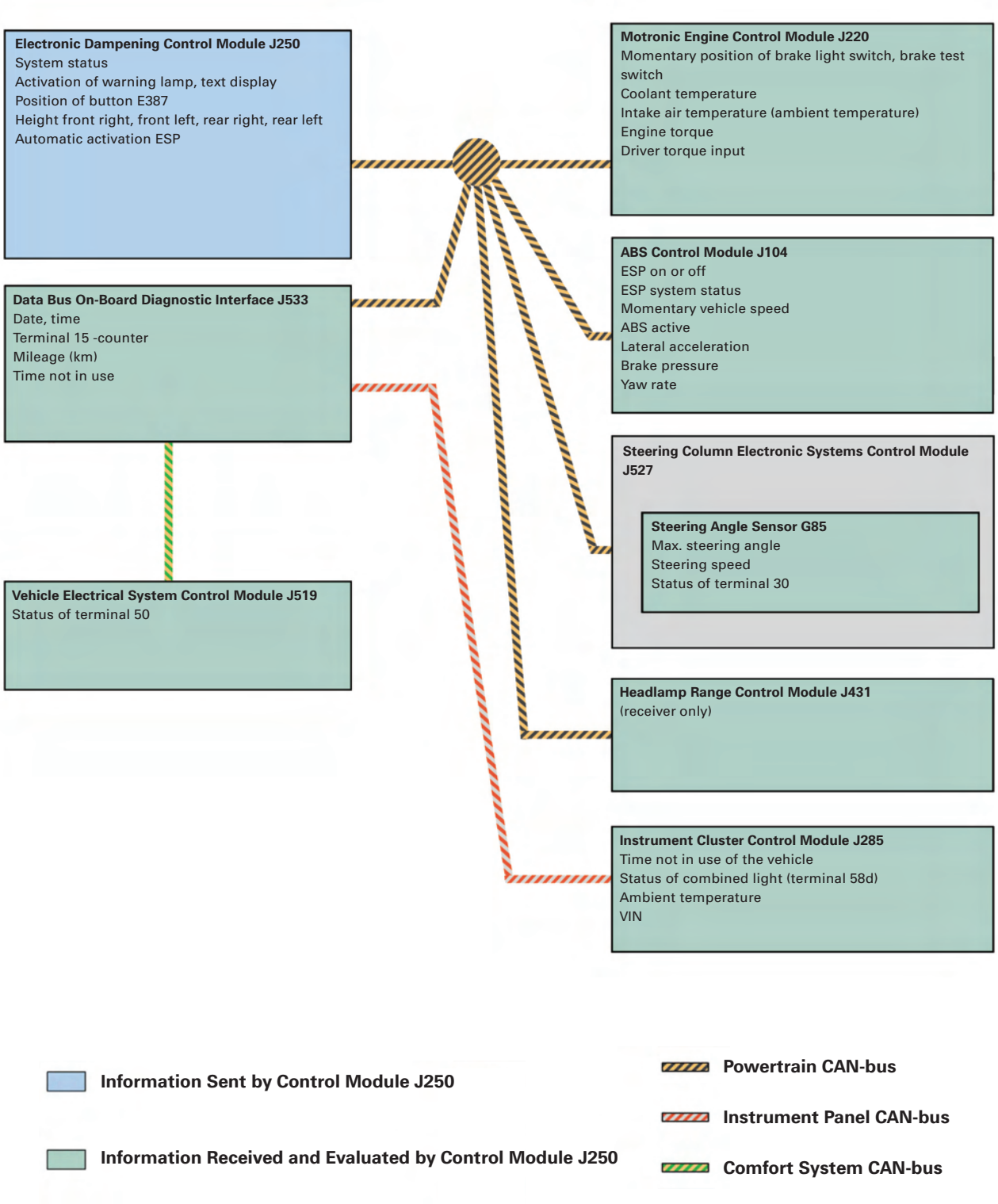
Powertrain CAN-bus

Input Signal

Output Signal

J250 ECD	Electronic Dampening Control Module
G76-78, G289	Level Control Sensors
N336-339	Dampening Adjustment Valves
E387	Dampening Adjustment Button

CAN Data Exchange



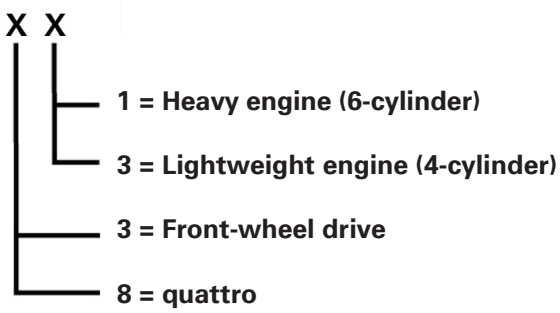
Service Work

Address Word 14

The system is accessed using Address Word 14.

Coding

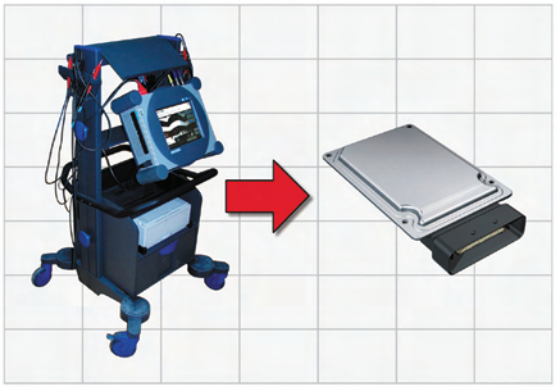
Coding tells Electronic Dampening Control Module J250 the engine and transmission type of the vehicle. New coding is only accepted after switching the ignition OFF then back ON.

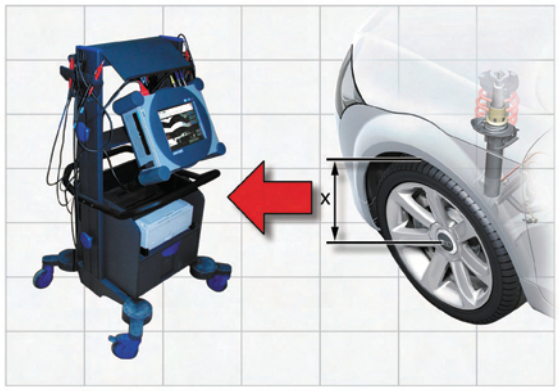


System Initialization

System initialization must be performed when J250 and/or any of the level sensors are replaced. The characteristic curves of the vehicle level sender are stored in the control module.

During the system initialization procedure, the control module is informed which vehicle ride heights at the wheel positions match the actual measured values generated by the vehicle level sensor. If these are known to the control module, then all measured values generated subsequently by the vehicle level sensors can be converted to vehicle ride heights.





Output Check Diagnosis

The dampers can be activated selectively in Output Check Diagnosis using the VAS scan tools. The dampers are activated by applying a current of 2A.

Measuring Value Blocks

The Measuring Value Blocks (MVBs) are used to check key system status information. The temperature values calculated for the dampers and control module, for example, are represented in MVB 28.

Cold Starting

When Electronic Dampening Control Module J250 or any of the dampers are replaced, the control module must determine the electrical resistance values of the damper coils at ambient temperature. J250 saves these values as “standard values” for purposes of temperature.

This function is activated automatically after the ignition is switched ON, provided the vehicle has been out of use for at least three hours, (for example, after a cold start in the morning). During this time not in use, the temperatures of the dampers have adjusted to the ambient temperature.

If a technician installs dampers which are already at ambient temperature, a resistance measurement function using the VAS scan tool can be started immediately.

Flashing

The control module software can be flashed using the VAS scan tool.

Self-Supporting Tires (SST)

For the new TT, Audi is offering optional Self-Supporting Tires (SST) that provide run-flat capability.

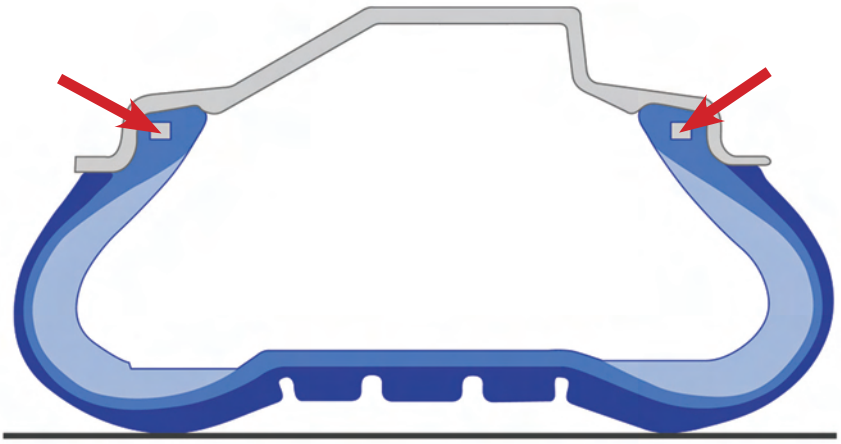
Self-Supporting Tires feature a stiffer internal construction capable of temporarily carrying the weight of the vehicle, even after the tire has lost all air pressure. With SST, it is possible to drive the vehicle up to 30 miles (50 km) at a maximum of 50 mph (80 kph).

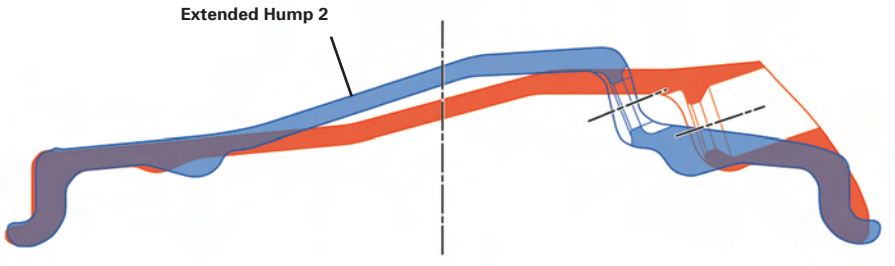
Due to the design and construction of an SST, special wheels are required. These wheels have the designation EH2 (extended hump 2).

When compared to a conventional wheel, the special SST wheel has been modified substantially. The wheels have deep recesses for the tire beads. The tire beads are sealed in these recesses and support the tire toward the inside of the tim. The modifications prevent inward displacement of the tire beads when tire pressure is lost.

The special 17'' wheels on the Audi TT can be used for both conventional tires and SST tires. For 18'' wheels, conventional tires are available in combination with conventional rims. SST tires are always combined with the low tire pressure indicator.

A properly functioning Tire Pressure Monitoring System is important on a vehicle with SST because these tires mask the symptoms of a flat tire.





Legend

Conventional Tire

Self-Supporting Tire

Tire Pressure Monitoring System

The Audi TT for the North American market uses a revised version of the system used on the Audi A6. It is a direct pressure measuring system with tire pressure sensors in the wheels.



J285	Instrument Cluster Control Module
J533	Data Bus On Board Diagnostic Interface
J502	Tire Pressure Monitoring Control Module
E492	Tire Pressure Monitoring Display Button
G222-225	Tire Pressure Monitoring Sensors

Instrument Cluster CAN

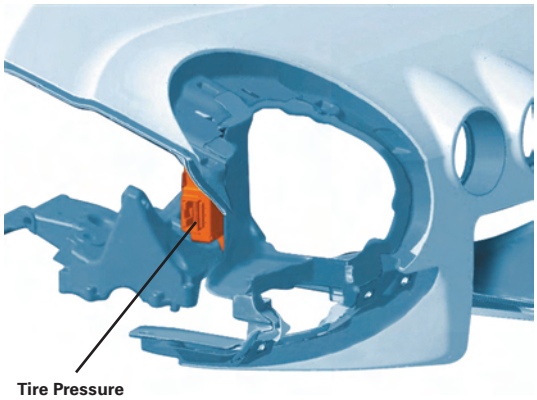
Powertrain CAN

Tire Pressure Monitoring Antenna R96

R96 is integrated into Tire Pressure Monitoring Control Module J502. It is located on a bracket behind the instrument cluster. J502 communicates over the Comfort CAN.

R96 receives radio signals from tire pressure sensors G222-G226. The sensors operate at a radio frequency of 315 MHz. The sensors are identical in function to those on the Audi A6. The valve body and sensor cannot be separated. As with current Audi A4, A6 and Q7 models, the sensors do not start to transmit until the wheels begin to turn. To meet country specific requirements, the battery service life is ten years. The tire pressure of the spare wheel is not monitored.

When Tire Pressure Monitoring Display Button E492 is pressed, actual tire pressures are displayed as new target pressures. E492 is connected to J502 through discrete wiring.



Tire Pressure Monitoring Control Module J502





Design and Function

Tire pressure warnings are indicated by the yellow warning lamp in the instrument cluster.

No position related warning is given. Warnings are indicated in accordance with country specific statutory requirements at a residual tire pressure of 75% or less. Tire pressures are determined taking into account the tire air temperature.

Service Work

The following are changes to the service procedures for the Audi TT:

Coding

The coding tells Tire Pressure Monitoring Control Module J502 which system variant is being used, which engine and transmissions are installed, wheel size, and type of tire.

The control module will only accept new coding after the ignition has been switched OFF and back ON.



Note

Special Tool VAS 6287 cannot be used to check tire pressure monitoring systems on the 2008 Audi TT. Always refer to electronic service repair information for the latest repair procedures.

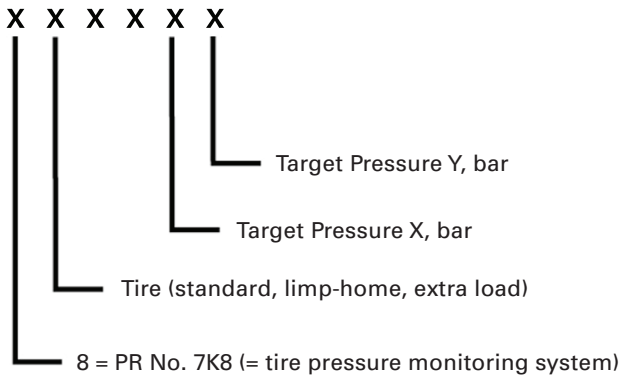
Adaptation

Tire Pressure Monitoring Control Module J502 recognizes new tire pressure sensors when the ignition is switched ON after the vehicle has remained stationary with the ignition OFF for 20 minutes.

When the new tire pressure sensor identification number has been recognized, the fault indicator lamp in the instrument cluster is activated.

The driver enables the monitoring of the actual tire pressures by pressing the SET key. The system is now ready for operation again.

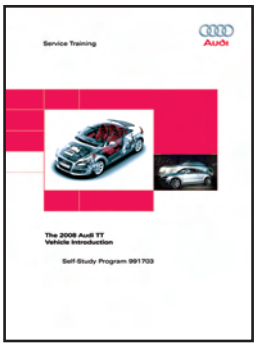
Tire pressure sensor identification numbers can also be transmitted to J502 through “Adaption” using the VAS scan tool. When done this way, the 20 minute waiting period is bypassed. Identification numbers are printed on each sensor housing.



Self-Study Programs for the Audi TT

SSP 991703 The 2008 Audi TT Introduction

- Body
- Occupant Protection
- Engine
- Suspension System
- Electrical System
- Air Conditioning
- Infotainment



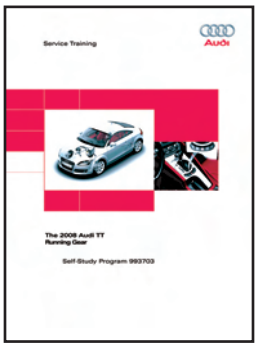
SSP 992703 The 2008 Audi TT Electrical and Infotainment Systems

- Control Module Locations
- Topology and Networking
- Electrical and Comfort System Electronics



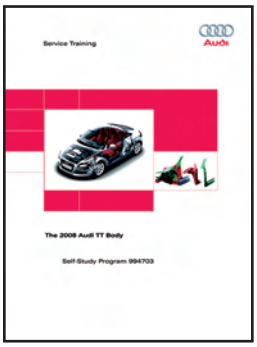
SSP 993703 The 2008 Audi TT Running Gear

- Axles
- Brake System
- Steering System
- Audi Magnetic Ride
- Other Features



SSP 994703 The 2008 Audi TT Body

- Audi Space Frame (ASF)
- Joining Techniques and Production Processes
- Vehicle Safety Concept
- Dimensions



Knowledge Assessment

An on-line Knowledge Assessment (exam) is available for this SSP.

The Knowledge Assessment may or may not be required for Certification.

You can find this Knowledge Assessment at:

www.accessaudi.com

From the accessaudi.com homepage:

- Click on the “ACADEMY” Tab
- Click on the “Academy Site” Link
- Click on the ”CRC Certification” Link

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