

Service.



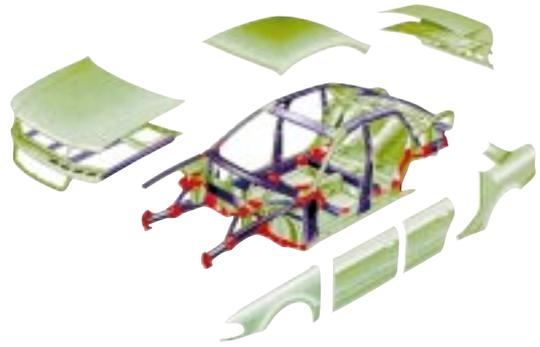
New Technology '99

Design and Function

Self-Study Programme 213

Modern like never before ...:

the aluminium body,



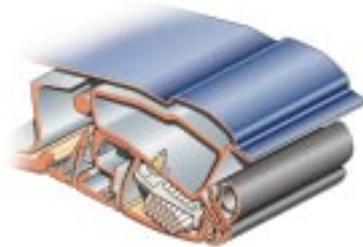
quattro technology,



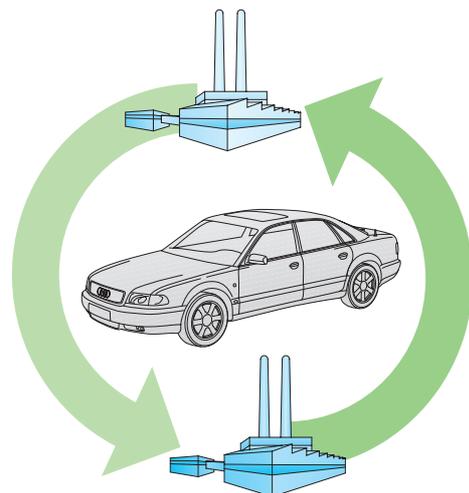
an extensive range of high-tech engines,



an excellent convenience and safety package



and a high level of ecological compatibility are the key components of our cutting-edge concept.



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Engine	12
Gearbox	15
Running gear	22
Air conditioning system	30
Electrics	40
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Body	70



The descriptions given on the following pages refer only to the technical status of the A8 major product upgrade.

The Self-Study Programme provides you with information regarding designs and functions.

The Self-Study Programme is not a Workshop Manual!

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

New



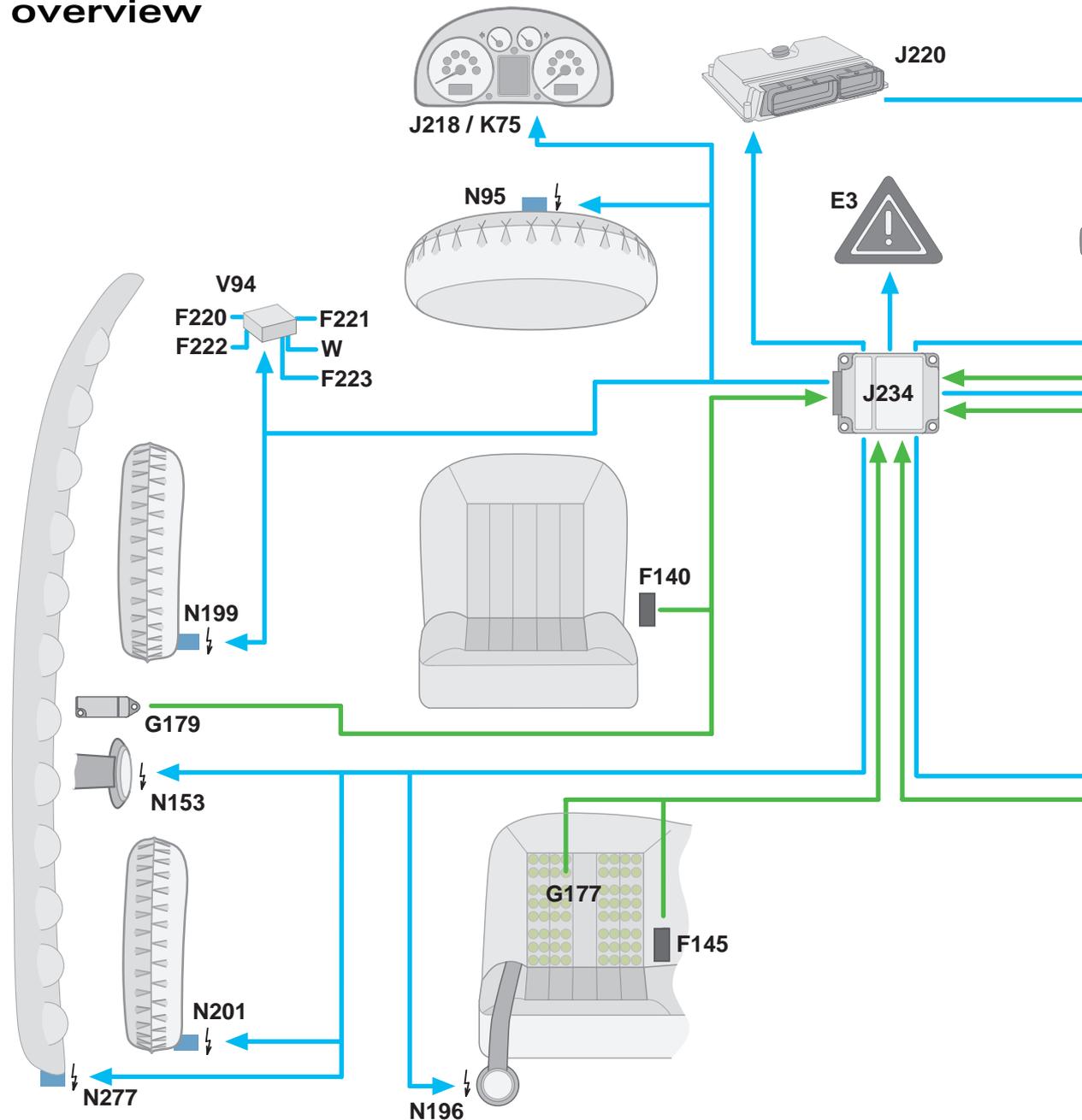
Important Note



Vehicle safety

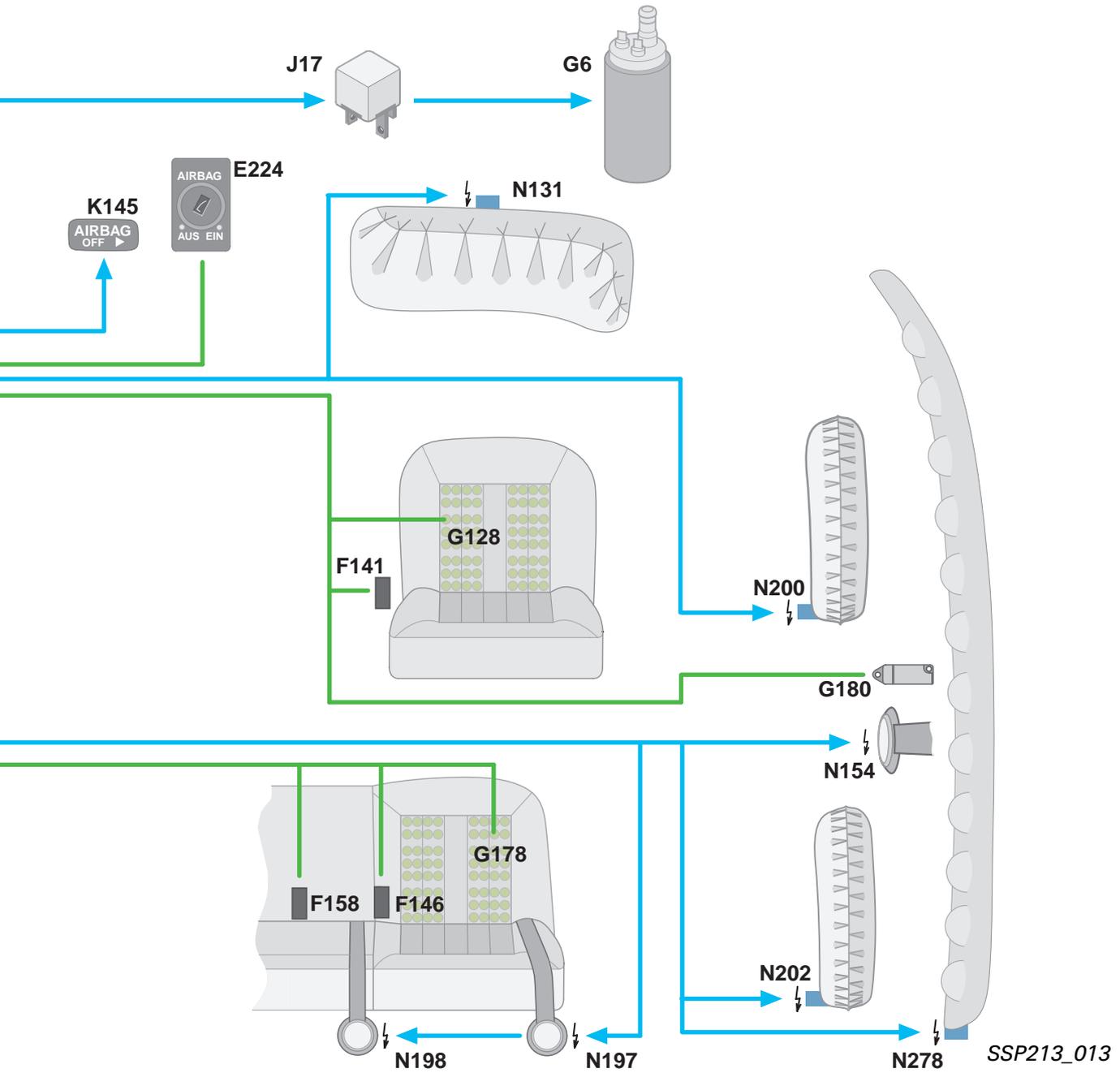


System overview



Legend

E3	Hazard warning light switch	G178	Seat occupied sensor, driver's side rear
E224	Airbag cutoff switch, passenger's side	G179	Side airbag crash sensor, driver's side (B pillar)
F140	Front left belt switch	G180	Side airbag crash sensor, front passenger's side (B pillar)
F141	Front right belt switch	J17	Fuel relay
F145	Rear belt switch, driver's side	J218	Combination processor in dash panel insert
F146	Rear belt switch, front passenger's side	J220	Motronic control unit
F158	Switch -1- for belt tensioner	J234	Airbag control unit
G6	Fuel pump	K75	Airbag warning lamp
G128	Seat occupied sensor, front passenger's side	K145	Airbag off warning lamp, front passenger's side
G177	Seat occupied sensor, driver's side rear	N95	Airbag igniter, driver's side



SSP213_013

- | | | | |
|------|---|------|---|
| N131 | Airbag igniter -1-, front passenger's side | N201 | Rear side airbag igniter, driver's side |
| N153 | Belt tensioner igniter -1-, driver's side | N202 | Rear side airbag igniter, front passenger's side |
| N154 | Belt tensioner igniter -2-, front passenger's side | N277 | Head airbag igniter in D pillar, driver's side |
| N196 | Rear belt tensioner igniter, driver's side | N278 | Head airbag igniter in D pillar, front passenger's side |
| N197 | Rear belt tensioner igniter, front passenger's side | V94 | Central locking motor with control unit for interior lights switch-off delay and anti-theft alarm system, in luggage compartment left |
| N198 | Rear belt tensioner igniter, centre | W | Interior light, front |
| N199 | Side airbag igniter, driver's side | W43 | Interior light, rear |
| N200 | Side airbag igniter, front passenger's side | | |

Vehicle safety



Head airbag



SSP213_077

The new SIDEGUARD head airbag system improves the high standard of safety already afforded.

The head airbag module extends from the D pillar to the A pillar on the driver's and front passenger's sides. It inflates in one unit along the roof frame trim.

A curtain type airbag located above the side windows protects the heads and shoulders of front and rear vehicle occupants.

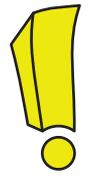
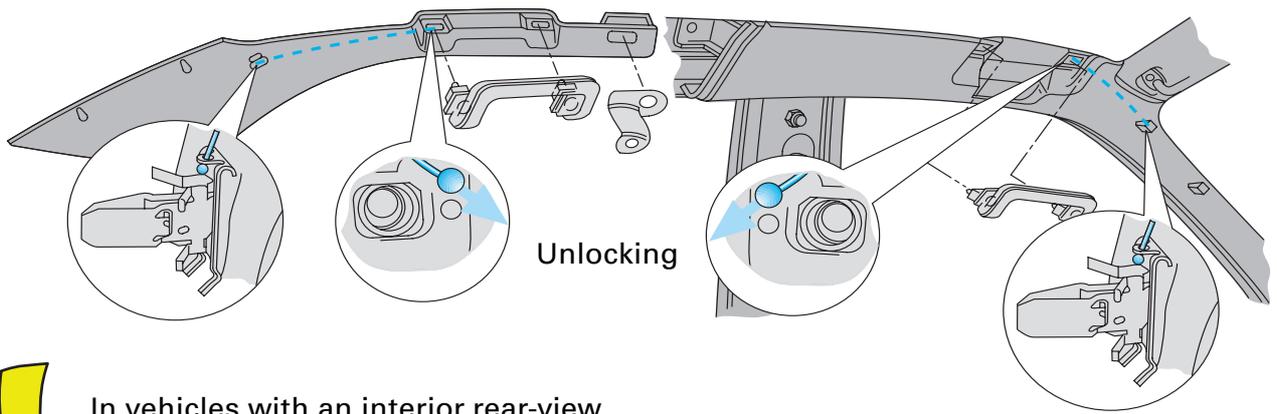
Another special feature of the large-area head airbag is the protection provided against impact with the A pillar. Specially positioned air pockets undertake this task.

Once activated, the head airbag stays inflated for longer in order to afford the occupants protection in the event of a roll-over after the collision.

This system supplements the conventional front and side airbags and is only triggered on the side of the vehicle on which the system detects the impact.



The head airbag module must not be kinked when carrying out repair work. You can find further safety regulations and instructions in the current Workshop Manual.



In vehicles with an interior rear-view mirror, the A and D pillar trims can only be released at the headlining using 2 wire cables.

Airbag key lock switch (optional)

The (optional) function for deactivating the front passenger's airbag is implemented in the glove box by means of an airbag key lock switch (e.g. when using a Reboard child's safety seat).



SSP213_026



Deactivation using the VAS 5051 Diagnosis Testing and Information System has priority over deactivation using the key lock switch.

Front passenger's airbag off lamp

In the A8 '99, a continuously lit warning lamp in the interior light/sliding roof switch trim indicates when the front passenger's airbag is deactivated.



SSP213_027

Vehicle safety



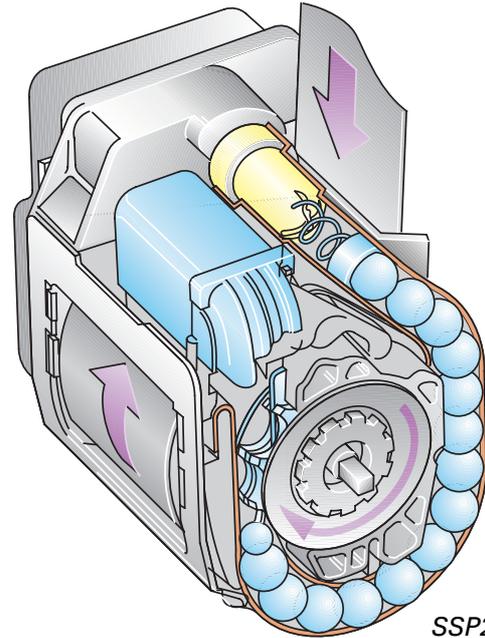
Belt tensioners

Ball-type tensioners are provided for all vehicle occupants in the A8 '99.

The balls are driven by a pyrotechnical charge. This kinetic energy is transmitted via a gear to the belt reel. Belt slack is taken up by reeling in the belt.

Testing of a triggered belt tensioner:

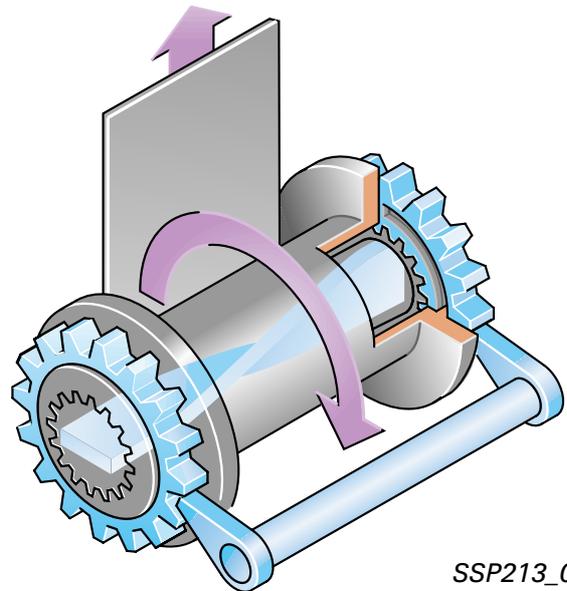
A distinct rattling sound can be heard when the removed belt tensioner is shaken.



SSP213_028

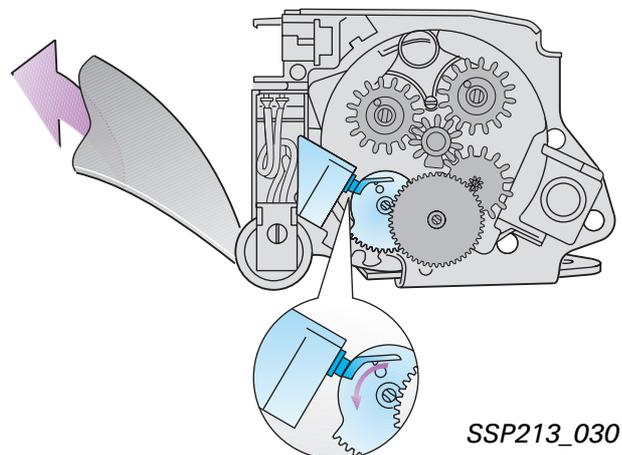
The front belt tensioners also have a belt force limiter with stop. Further tensioning is inhibited from a defined point at which the belt tensile force becomes hazardous to the vehicle occupants.

A belt length of up to 10 cm can be compensated via a torsion spindle integrated in the inertia reel.

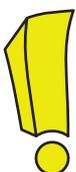


SSP213_029

The rear ball-type tensioners are activated by a microswitch after the system recognised that the seatbelt is fastened. The switch integrated in the automatic belt buckle closes as soon as the belt has unwound a certain distance. It short-circuits a resistor which causes the igniter pellet to be ignited as required by the airbag control unit.



SSP213_030



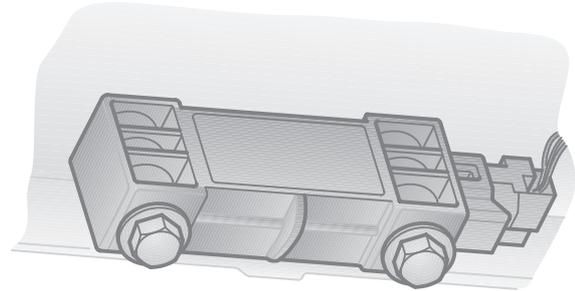
The self-diagnosis uses the resistor connected in parallel with the microswitch to ascertain when the ignition circuit is open.



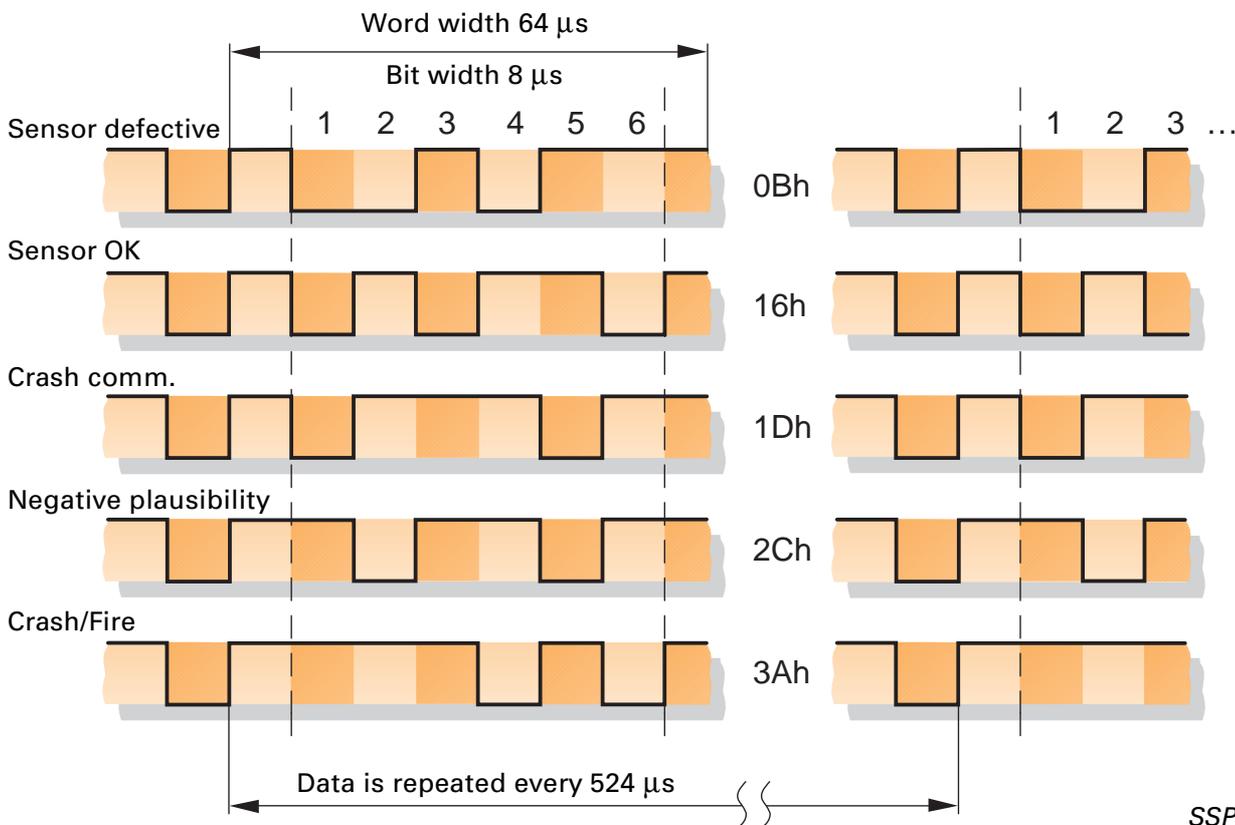
Lateral acceleration sensor G179/G180

The sensors, which have been moved out to the B pillar in the A8 '99, are connected to airbag control unit J234.

To activate the relevant output stages of the side airbag, the plausibility of the sensor signal has to be verified.



SSP213_031



SSP213_032

The following signal characteristic is produced:

- The lateral acceleration sensor G179/G180 outputs a continuous "Sensor defective" or "Sensor OK" signal to the airbag control unit after the ignition is turned "On".
- In the event of a side impact, the "crash commencement" signal is transmitted immediately.
- The airbag control unit interrogates the plausibility of the signal in the form of the "negative plausibility" signal.
- If this is positive then the signal "Crash/Fire" is transmitted. The same signal is generated by the capacitive acceleration sensor in the airbag control unit.
- If both signals match up with one another, the airbag control unit activates the relevant output stage of the side airbag.
- Data is repeated every 524 μs .

Vehicle safety

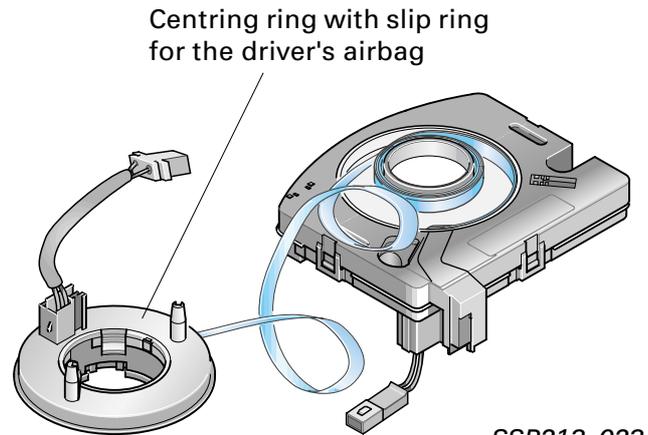


Centring ring with slip ring

The centring ring with slip ring forms the electrical connection between the airbag control unit and the driver's module integrated in the steering wheel. On vehicles with ESP, wheel angle sensor G85 is also integrated in the centring ring housing.



After repair work and parts replacement, basic adjustment of the wheel angle sensor must be carried out. Design and function are in the SSP 204 described.



Seat occupied recognition

is implemented by means of a pressure sensitive foil (Interlink). The electrically conductive plastic connects the positive contact to the negative contact. If no pressure is exerted on the foil, then the resistance between the electrical contacts is high, and vice versa.

The pressure sensor enables the airbag control unit to recognise the following states:

- "seat occupied" at high resistance
- "seat occupied" at low resistance

The seat occupied recognition function prevents unnecessary airbag ignitions taking place while affording the vehicle occupants an adequate level of protection.



For further information – refer to SSP 182, Page 12.



If a fault or an undefined state is detected, then the control unit immediately evaluates the seat as occupied after "ignition on".



Crash output

The crash output is activated during a head-on collision and side impact. When the crash output is activated, the Motronic control unit switches the fuel pump off. The airbag control unit activates the hazard warning lights directly. At the same time, the CLS control unit receives the crash signal, unlocks the doors and switches the interior lighting on. The possibility of a restart (engine speed > 300 rpm) after an accident makes it possible to remove the vehicle from a danger zone (if necessary).



The crash output function can be simulated with the VAS 5051 Diagnosis Testing and Information System using the actuator diagnosis function.

For further information – refer to SSP 217, page 17.

Airbag control unit 8 - J234

The task of the control unit is to detect vehicle deceleration data and evaluate this data to reduce the risk of injury and activate the airbag, belt tensioner units and crash output.

A self-test follows every time the ignition is turned on. At the same time, the connected periphery is monitored for conformity with the coded equipment. If there are any discrepancies, then the fault message “control unit incorrectly coded” is output through the diagnosis interface and airbag warning lamp K75 is activated.

The following actions are performed depending on belt buckle interrogation:

- the airbag ignition circuit is tripped at threshold 1 or 2 or
- the front belt tensioner ignition circuit is tripped.

The rear belt tensioner ignition current is induced by the control unit via the micro-switch for the belt-fastened sensor in the inertia reel.

The airbag control unit continuously evaluates the status of the belt buckles after turning on the ignition.

If, for instance, the system recognises that the front passenger's seat is “occupied” and the belt is not fastened, the front passenger's airbag is ignited earlier (threshold 1) in the event of a crash if the tripping criteria are exceeded.

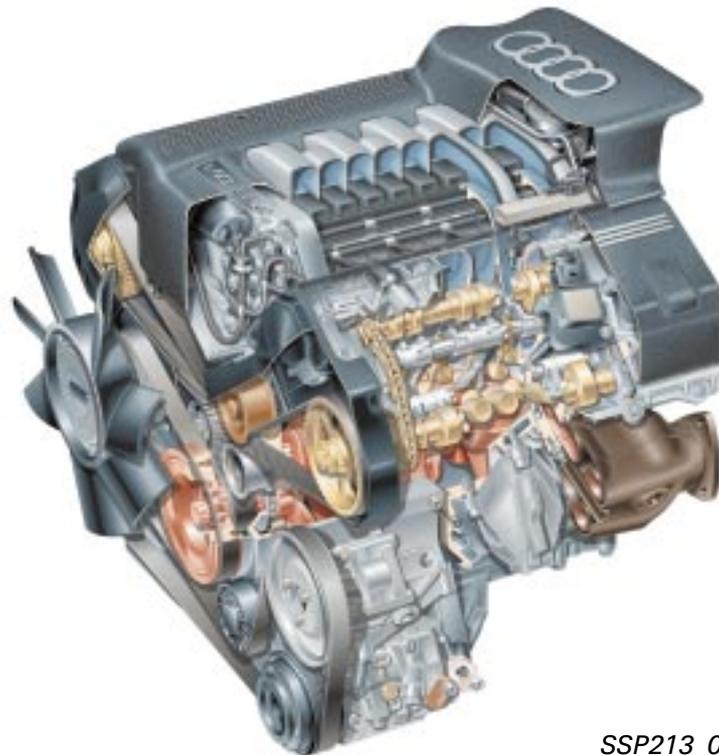


When the airbags and/or the belt tensioners are ignited, the fault message “crash data stored” is displayed. The airbag control unit can be no longer be recoded. Adaptation is still possible.

The belt tensioner is activated at tripping threshold 1.

With airbag version 8.4 in the A8 GP, the belt tensioners can be ignited in accordance with the activation criteria irrespective of the airbags.

V8 5V engines



SSP213_073

Introduction

AUDI has been producing state-of-the-art eight-cylinder engines since 1988. Engine displacement has increased from 3.6 litres to 4.2 litres.

The V8 engine together with Aluminium Space Frame technology was the technical basis for Audi's breakthrough into the luxury class of car manufacturing.

The V8 engines were fundamentally revised in the course of further development work.

The emphasis in this connection was on the following development goals:

- Meeting future exhaust emission regulations
- Reducing fuel consumption
- Torque and performance gains
- Enhancement of comfort/convenience
- Reducing engine weight
- Increased use of common parts of the AUDI engine series.

Compared to the V8 4-valve engine, the new features and/or modifications are as follows:

Modifications

- to crankcase and crankshaft drive
- to oil circuit
- to cooling circuit

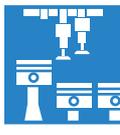
New features

- 5-valve cylinder head with roller type valve levers
- Camshaft adjuster
- 3-stage intake manifold
- Electro-hydraulic engine mount
- Bosch ME 7.1 engine management system

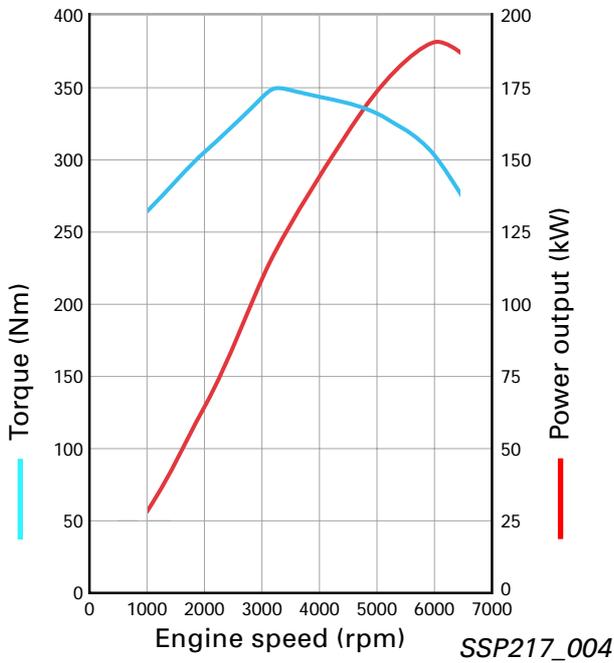


You can find detailed information on the new V8 - 5V engine in SSP 217.

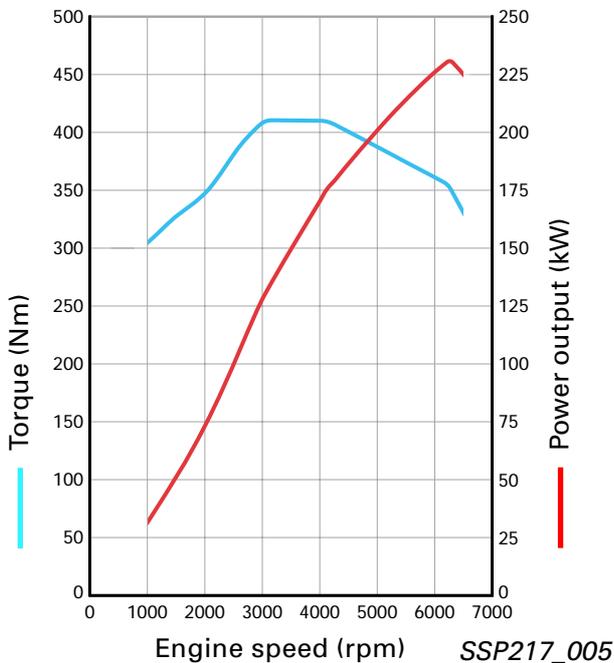
Specifications



3.7 l V8 - 5 V



4.2 l V8 - 5 V

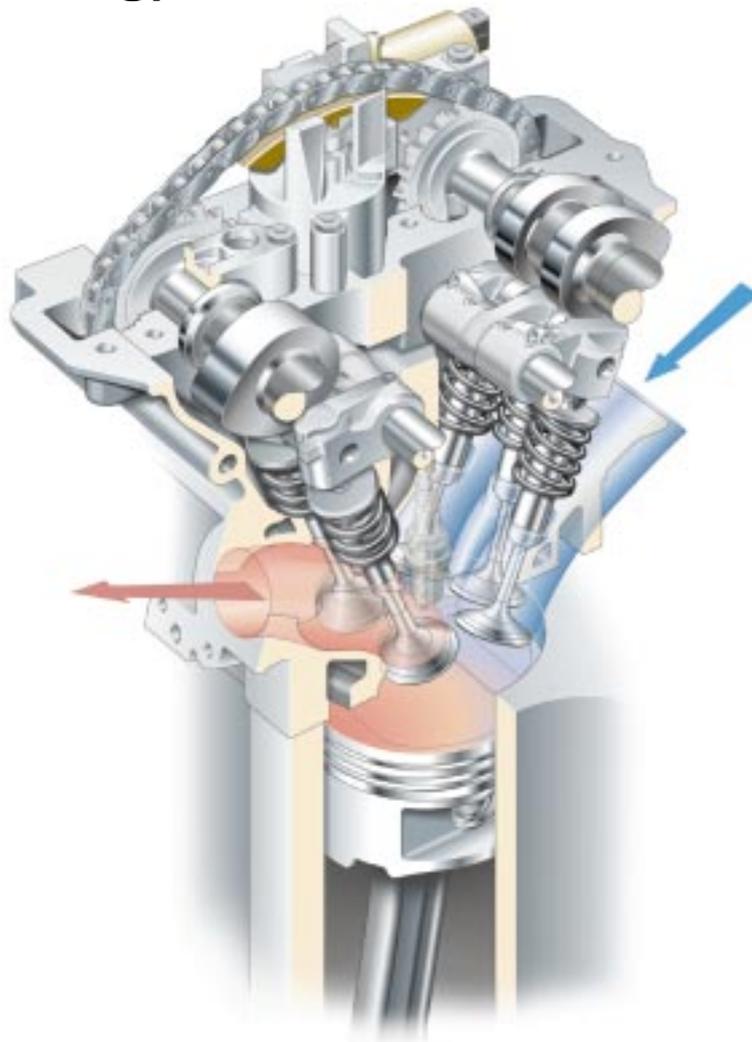
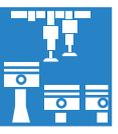


The specified performance data are only achievable using 98 RON fuel. A reduction in power output must be expected when using 95 RON fuel.

	3.7 l	4.2 l
Engine codes	AQG	AQF (A8) ARS (A6)
Type	V8 engine with 90° V-angle	
Displacement	3697 cm ³	4172 cm ³
Power output	191 kW 260 bhp at 6000 rpm	228/220 kW 310/300 bhp at 6000 rpm
Spec. power output	51.6 kW/l 70.3 bhp/l	54.6 kW/l 74.3 bhp/l
Torque	350 Nm at 3200 rpm	410 Nm at 3000 rpm
Spec. torque	94.7 Nm/l	98.3 Nm/l
Bore	84.5 mm	84.5 mm
Stroke	82.4 mm	93.0 mm
Compression ratio	11 : 1	11 : 1
Weight	198 kg	200 kg
Engine management	Motronic ME 7.1	
Fuel	98/95 RON	
Firing order	1 - 5 - 4 - 8 - 6 - 3 - 7 - 2	
Compliant with exhaust emission standard	EU 3	

Engine

5-valve technology



SSP217_020

The five-valve cylinder head with valve activation by a roller valve lever is employed in the new engine series.

Valve gear of this type produces a great deal less friction, particularly at low revs, thanks the use of optimised components.

All the new features improve exhaust emission, fuel efficiency and torque while also increasing power output.

Power output of the 4.2 l has increased from 300 to 310 bhp.

The power output of the 3.7 l engine has increased to an even greater extent - namely from 230 to 260 bhp.

Automatic gearbox 01V

5-speed automatic gearbox 01V already offered a high level of driving comfort and handling dynamics even when it was launched in 1995. To be able to keep pace with growing demands in this area in future, the electro-hydraulic control of the 01V gearbox has been revised. The mechanicals (planet gear sets and clutches) have remained unchanged.

The new "generation" of the 01V gearbox is used in the combination of petrol engines with the ME7 engine control unit and diesel engines which comply with the EU 3D exhaust emission standard.

Overview of new features

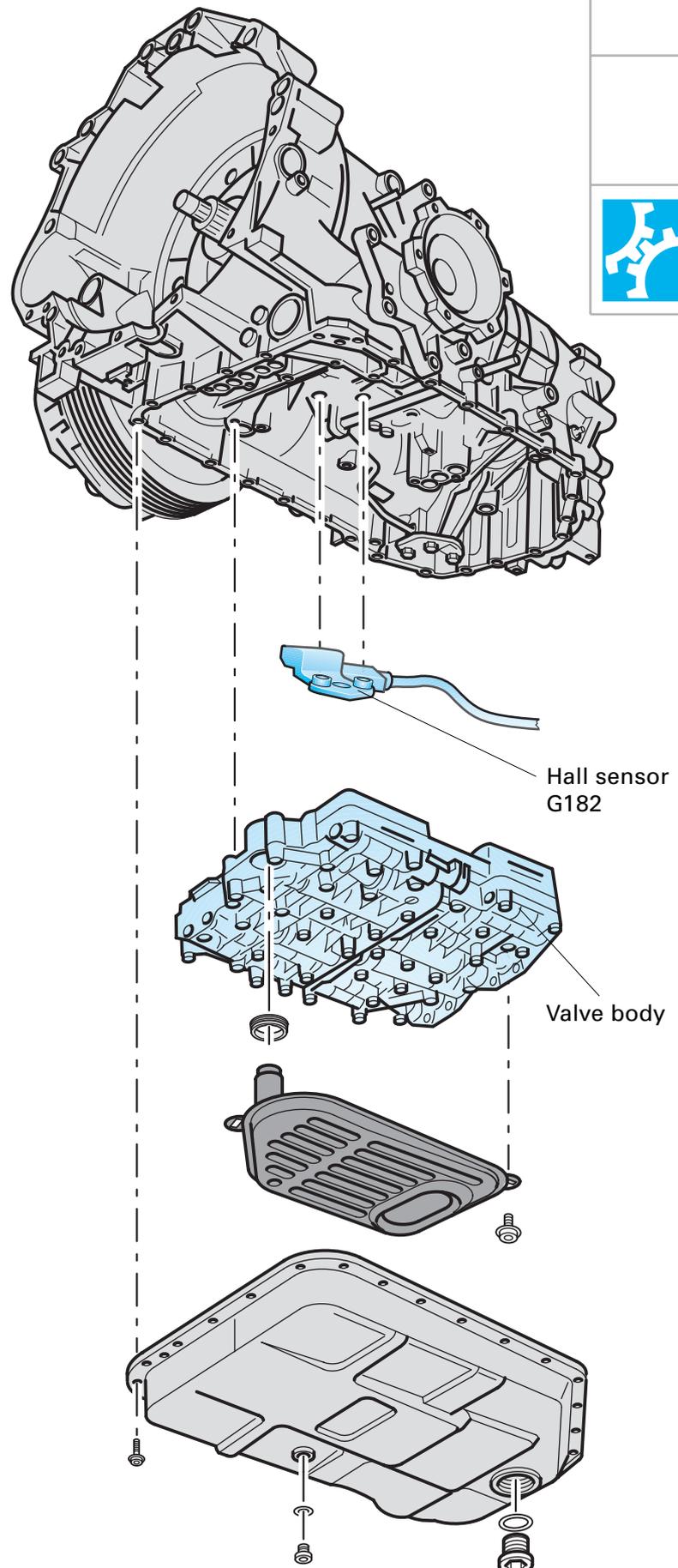
New gearbox input speed sender G182 for turbine speed data acquisition using a sensor system with Hall sender.

New valve body (hydraulic control unit) with modified operating cycles.

Gearbox control unit with higher processor power.

Facility for programming the control units of the vehicle and engine variant (currently not in use).

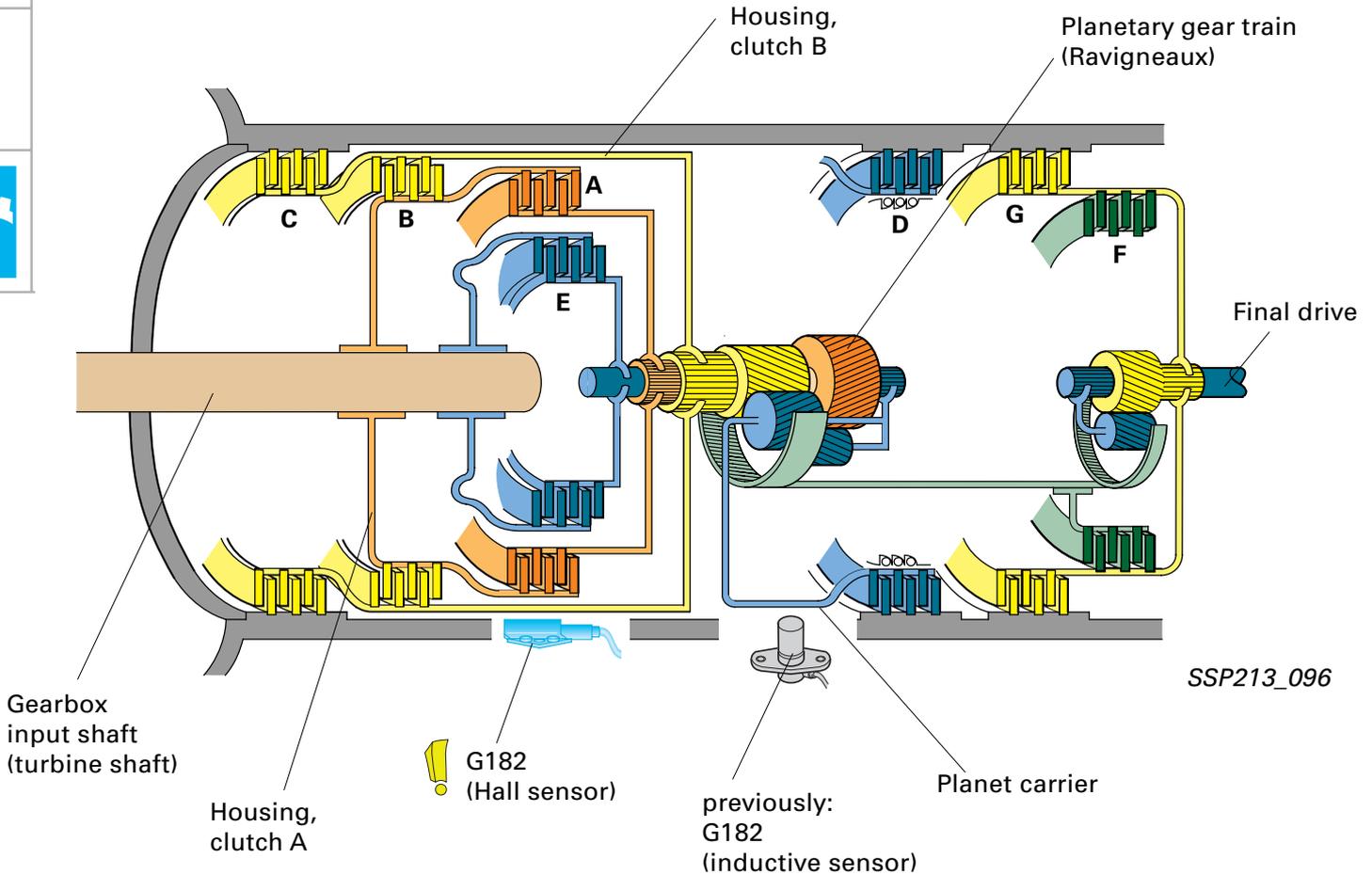
Additional ATF cooler for torque engines.



SSP213_021

Gearbox

Gearbox input speed sender G182



For design reasons, the speed of the planet carrier of the Ravigneaux planetary gear train has been used in the past to control shift operations.

The inductive sender G182 serves this purpose. The speed of the planet carrier was converted to a turbine speed in the gearbox control unit.

To achieve an excellent level of shift quality in all gears (precision control of shift operations), the precise turbine speed has to be detected (actual gearbox input speed).

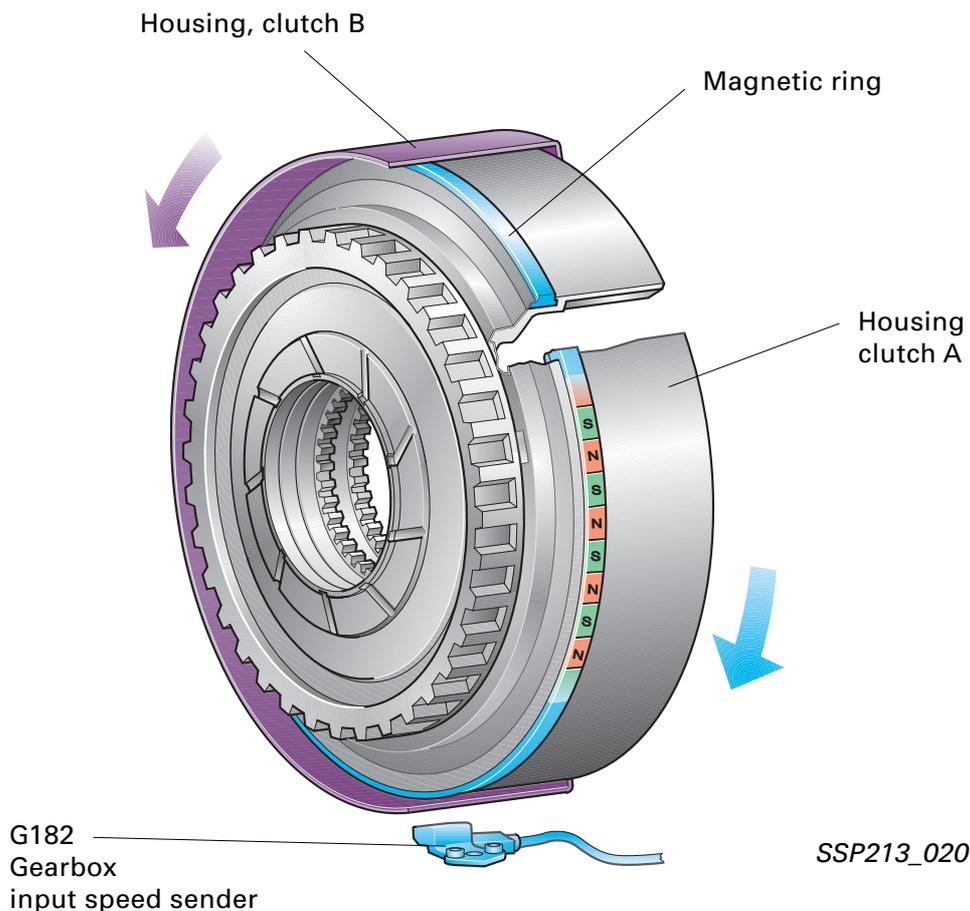
Measuring the turbine speed means gaining access to the housing of clutch A, which is responsible for power transmission.

The housing of clutch A is form-fitted to the turbine shaft and is located inside the housing of clutch B.

The distance between the sensor and the housing of clutch A makes it necessary to employ a system based on the Hall principle.

The system comprises the G182 and a magnetic ring, which is connected to the housing of clutch A.

The housing clutch B is made of non-magnetisable material, which means that the magnetic fields of the magnetic ring cannot be shielded from the sensor.



The advantages of precise turbine speed acquisition are as follows:

- Control and adaption during gearshifts to 1st gear and reverse. This reduces the engagement jolt when a drive gear is selected from P or N and when a rolling gearshift into 1st gear is executed.

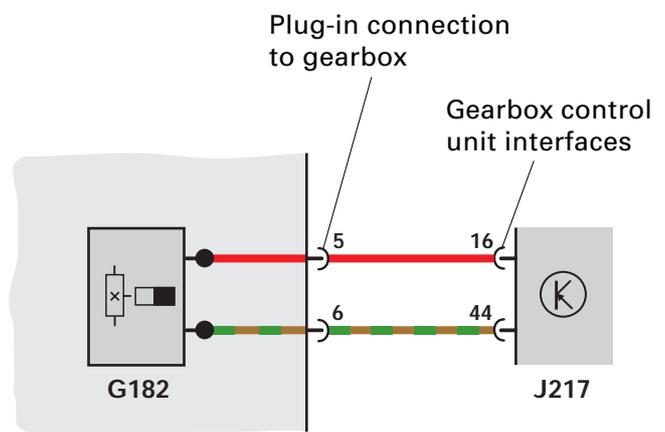
- Improvement in shift quality in all gears through precise control and adaption of gearshifts.
- Improvement in self-diagnosis quality through early detection of a slipping clutch/brake.

Electrical circuit

In comparison with the previously known Hall sensor systems, the G182 (Hall sensor) is now connected to control unit by two wires only.

The sensor signal and the earth supply is provided via Pin 44.

G182 is supplied with voltage via Pin 16.



SSP213_100



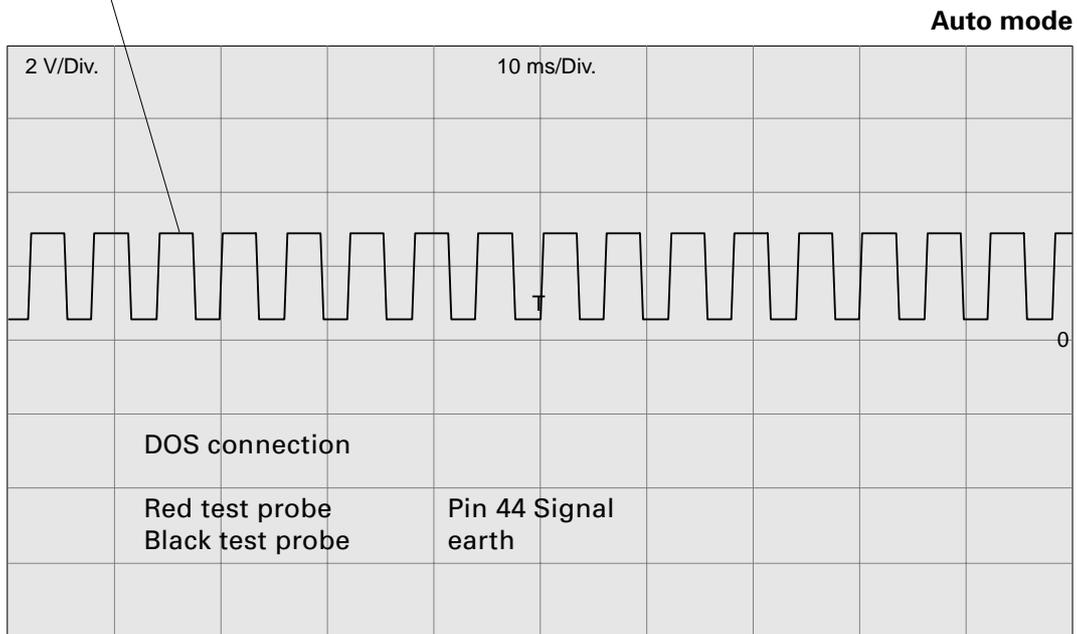
Gearbox

Signal characteristic of G182

Test conditions:

Engine idling speed

Gate selector lever in position "P"



Test conditions:

Ignition "on"

or

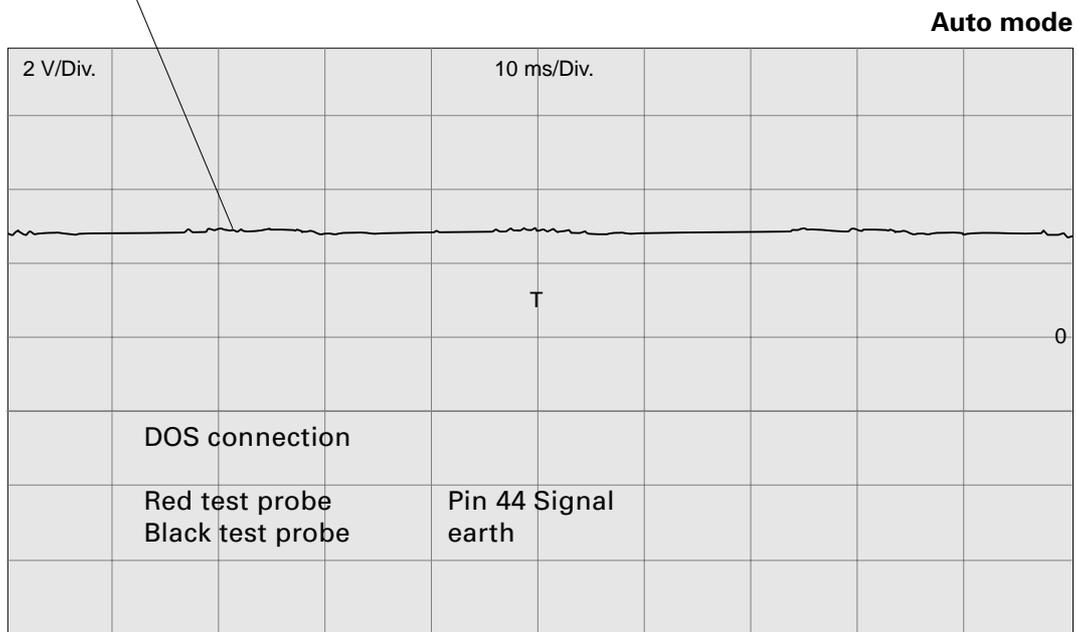
Engine at idling speed

Drive position selected

Brake operated (turbine not running)



Also refer to the relevant Workshop Manual



Auxiliary ATF cooler

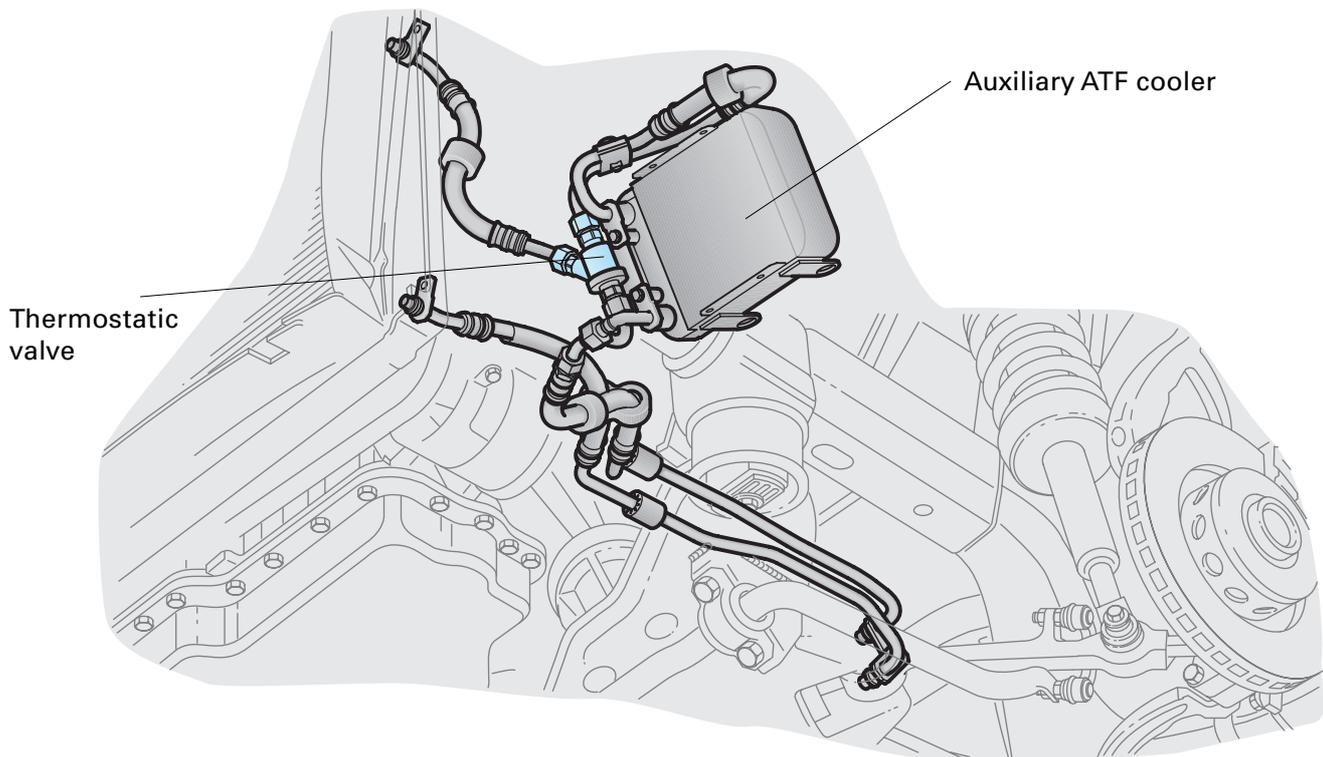
To account for the increased torque available to the six- and eight-cylinder engines, the following engine variants have an additional ATF cooler.

Two variants are used.



System	Engine capacity		Fitting location
Auxiliary ATF cooler with separate thermostatic valve	A6 V8 3.7 l	260 bhp	right, behind bumper
	A8 V8 3.7 l	260 bhp	left, behind bumper
	A8 V6 TDI	170 bhp	left, behind bumper
Auxiliary ATF cooler with integrated thermostatic valve	S4	250 bhp	left, behind charge air cooler
	A6 Biturbo	250 bhp	left, behind charge air cooler
	A6 V6 TDI	170 bhp	right, behind bumper

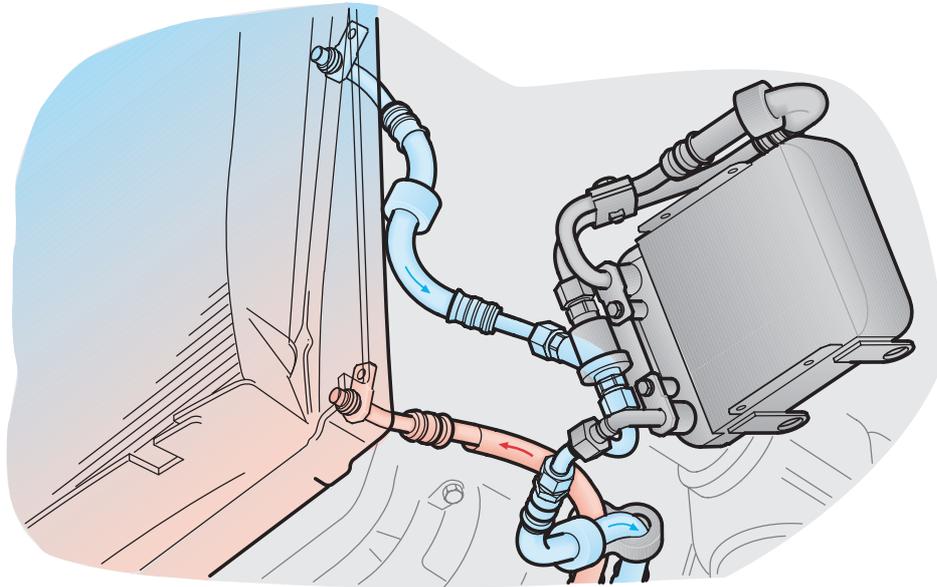
Auxiliary ATF cooler with separate thermostatic valve



SSP213_093

Gearbox

ATF temperature < 80°C



SSP213_095

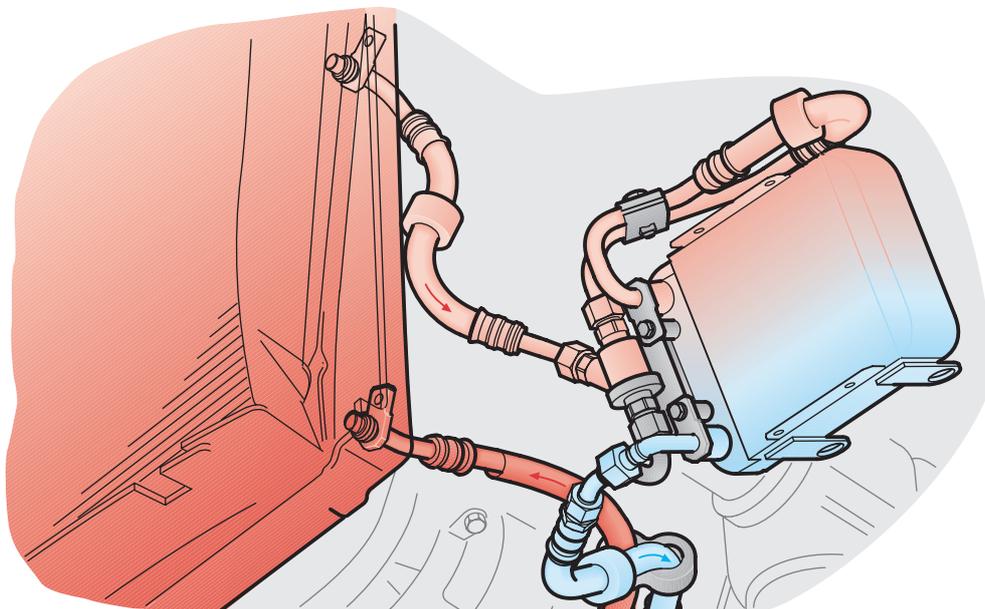
The auxiliary ATF cooler is designed as an oil-air heat exchanger and connected downstream of the main ATF cooler (oil-coolant heat exchanger) via a thermostatic valve.

The thermostatic valve closes the return line to the gearbox at approx. 80°C and opens the supply line of the auxiliary ATF cooler.

The auxiliary ATF cooler is now connected in series with the main ATF cooler.

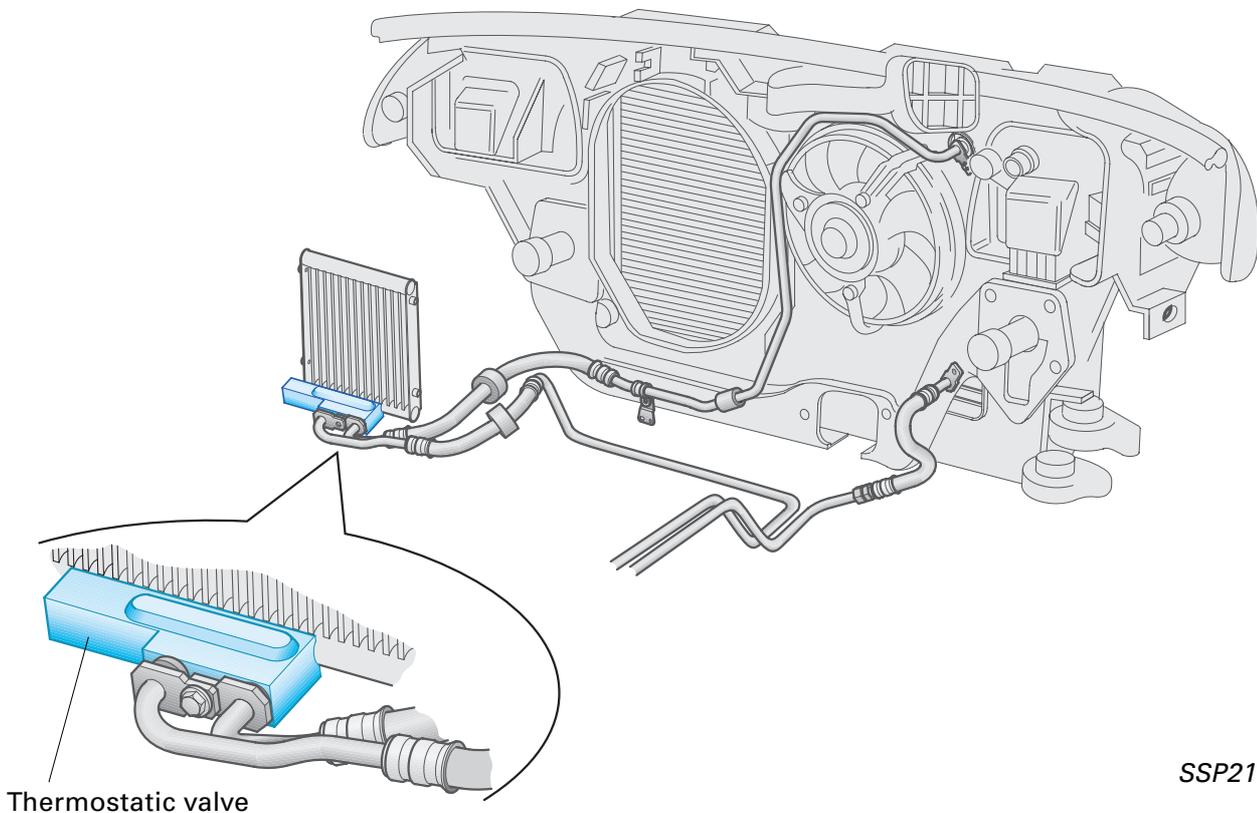
In this way the heat which develops as a result of the high power transmission is kept at an acceptable level.

ATF temperature > 80°C



SSP213_094

Auxiliary ATF cooler with integrated thermostatic valve (example: Audi A6 Biturbo/S4)



SSP213_092



When parts of the auxiliary cooler are replaced or ATF lines are disconnected, the auxiliary cooler goes to idling mode.

The auxiliary cooler cannot vent itself at low ATF temperatures, since the thermostatic valve does not open until the ATF temperature reaches approx. 80°C.

Given that the correct ATF level is tested at low ATF temperatures, non-compliance with the test requirements will result in a low ATF level.

Therefore, it is absolutely necessary to observe the instructions for carrying out the ATF check given in the Workshop Manual.



Running gear

Axle

Front and rear swing arms



SSP213_091

The reduction in weight offers additional benefits with regard to the running gear in particular, apart from general advantages with respect to fuel efficiency, exhaust emission and safety.

Driving comfort and handling dynamics have been substantially improved by reducing unsprung and rotating masses.

Further aluminium components will be phased in for the four-link front suspension which will initially be used in the Audi A8 with effect from model year 1999.

New swing arms and wheel carriers made of aluminium will also be introduced.

Forging, Audi A6



Casting, Audi A8



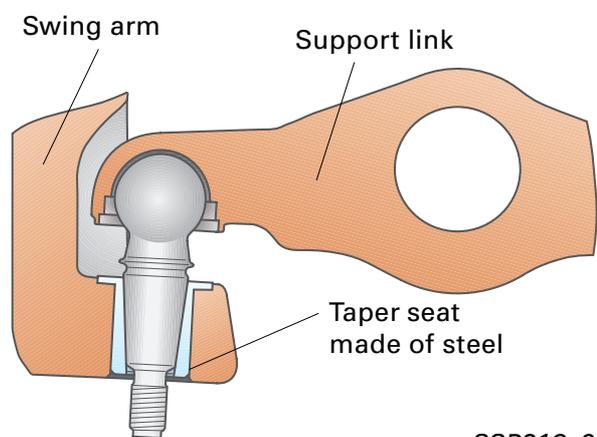
SSP213_051

The swing arms used in the Audi A8 are manufactured from an Al-Si-Mg alloy by means of a mould casting process. They are then subjected to heat treatment.

The swing arms for the Audi A6 - V8 and Audi S4 are forged from an AlMgSi alloy and then undergo heat treatment.

On account of the material pairing of aluminium and steel, it was necessary to reconstruct the wheel bearings and lower link anchorings.

To counteract the forces which are applied by the conical seats of the lower aluminium links, the taper seats in the swing arms are designed by means of press-fitted steel bushes.



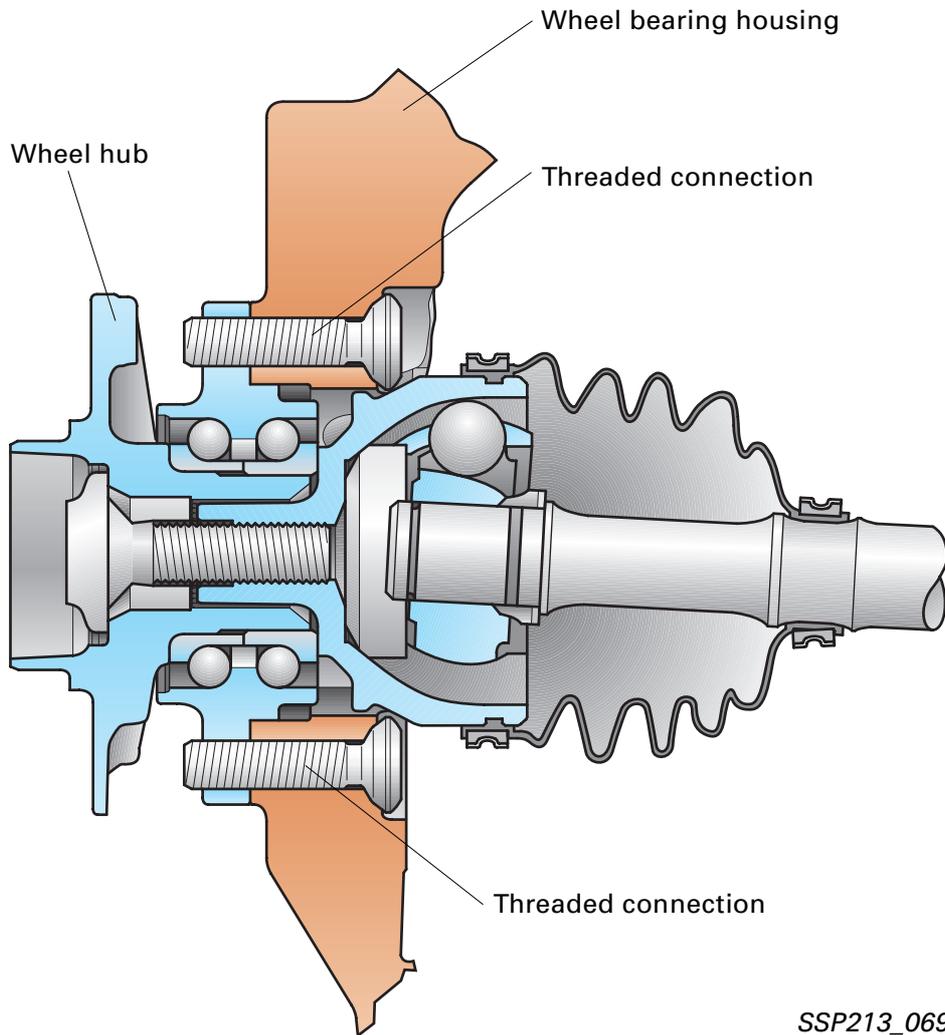
Clamping, lower link

SSP213_070



Running gear

Wheel bearing



Wheel bearing, threaded solution

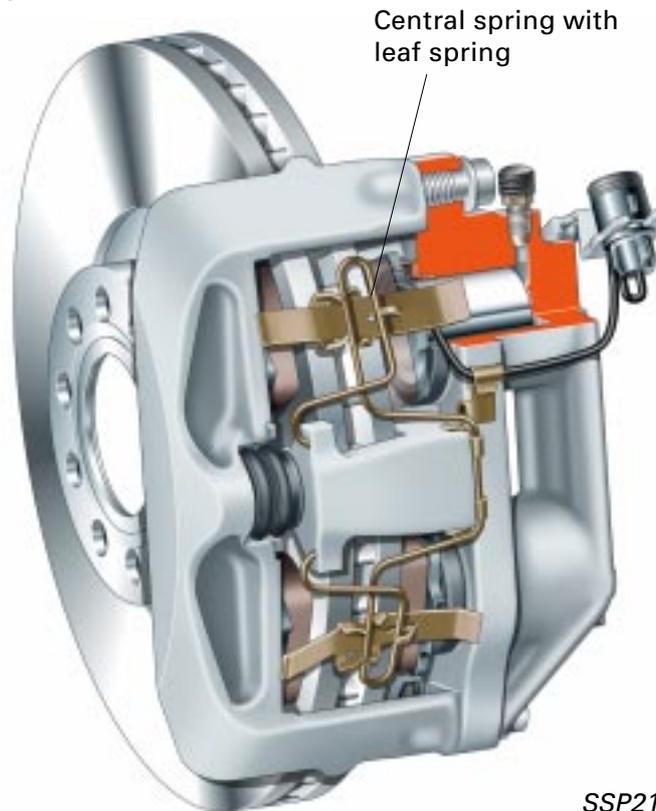
SSP213_069

The wheel bearings are not press-fitted into the swing arm or wheel bearing housing (previous construction). They are bolted directly to the swing arm in the form of a unit comprising the bearing and bearing housing.

The aluminium swing arm and the weight optimised wheel hubs together achieve a weight benefit on the front axle of approx. 3.8 kg in the Audi A8 and approx. 2.5 kg in the Audi A6 - V8 and S4.

This makes it possible to replace the wheel bearing without having to remove the swing arm or drive shaft.

HP2 brake caliper (Lukas)



SSP213_068

The high-performance HP2 brake system, which has been in use since 1992, was optimised for

- brake response
- weight and
- noise emission.

The new HP brake caliper is partly made of aluminium. This makes it possible to reduce weight by 2.2 kg at the front axle despite the fact that the brake discs are larger.

The guide pins of the floating caliper are positioned further outwards. Together with the large dimensioned centre pins, this provides a favourable leverage, resulting in little clearance between the housing frame and the brake carrier.

This measure, and an optimised brake pad location, act positively on brake response and noise emission. It also reduces brake wear.

The new central spring with leaf springs manufactured from stainless steel allows the brake pads to be changed without having to undo threaded connections or use special tools.

To avoid contact corrosion between aluminium and steel components, a new zinc-cobalt coating is applied to the floating caliper carrier and the outer floating caliper.

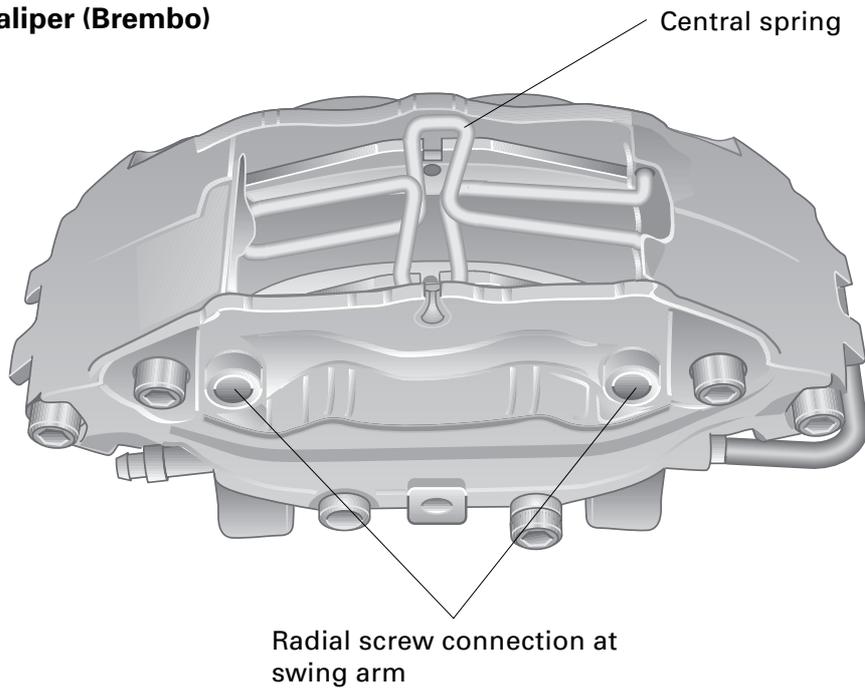
The following brake disc dimensions are used in the vehicles listed below:

Brake disc	Vehicle
323 x 30 mm	A8 GP
321 x 30 mm	A6 - V8 A6 Biturbo S4



Running gear

4-piston brake caliper (Brembo)



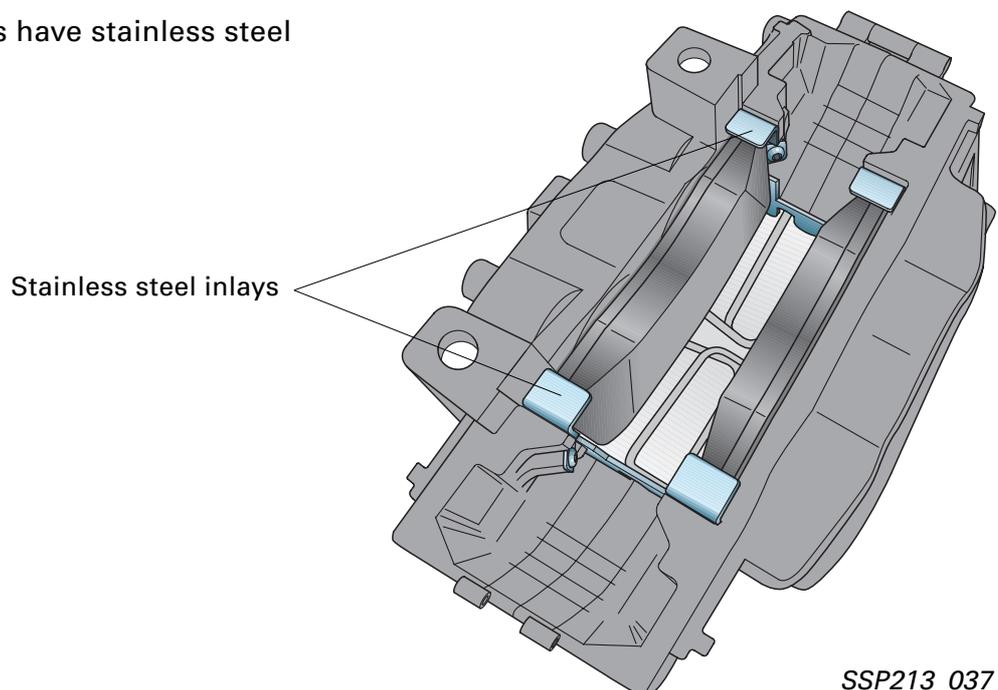
An all-aluminium 4-piston brake caliper is used in the Audi S8.

The powder-coated brake caliper is attached to the swing arm radially. This fastening method has a positive effect on the brake caliper's vibration characteristics and helps reduce noise.

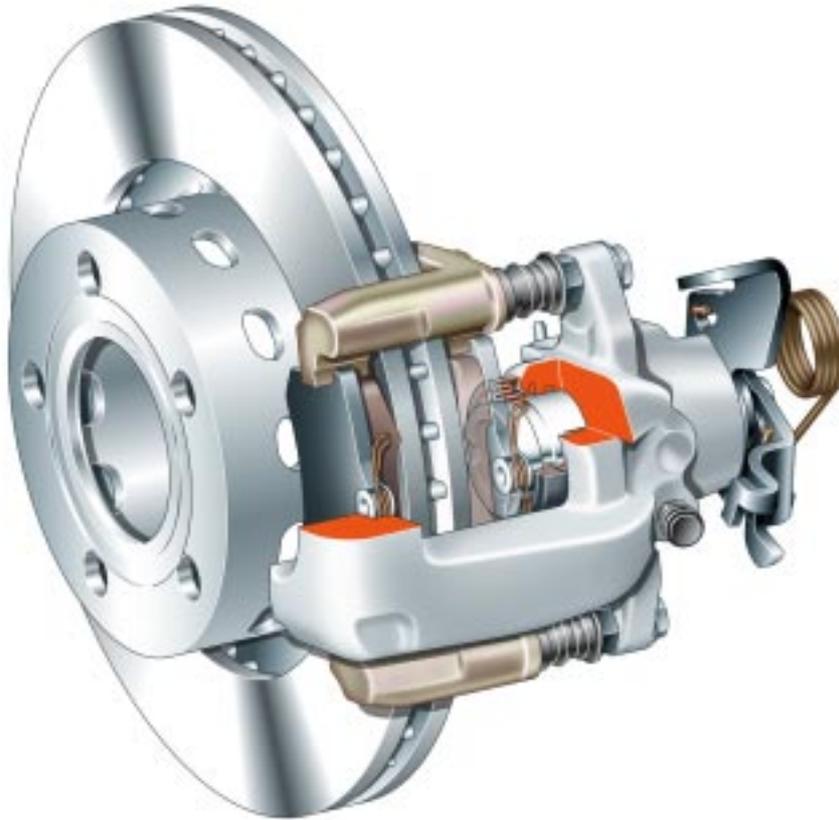
Weight saving and easy fitting are further advantages.

The brake discs measure 345 x 30 mm in keeping with engine performance.

The brake pad guides have stainless steel inlays.



Brake caliper, rear axle



SSP213_047

The rear brake has aluminium floating calipers. A weight reduction of approx. 0.5 kg per brake caliper was achieved by using aluminium.

Brake disc: 269 x 22 mm for A8
280 x 22 mm for S4
Piston diameter: 43 mm

As with the front wheel brake, the caliper is protected against corrosion by a zinc-cobalt coating.



Since aluminium has a greater tendency to subside, the majority of the threaded connections are made using the torque angle tightening method.

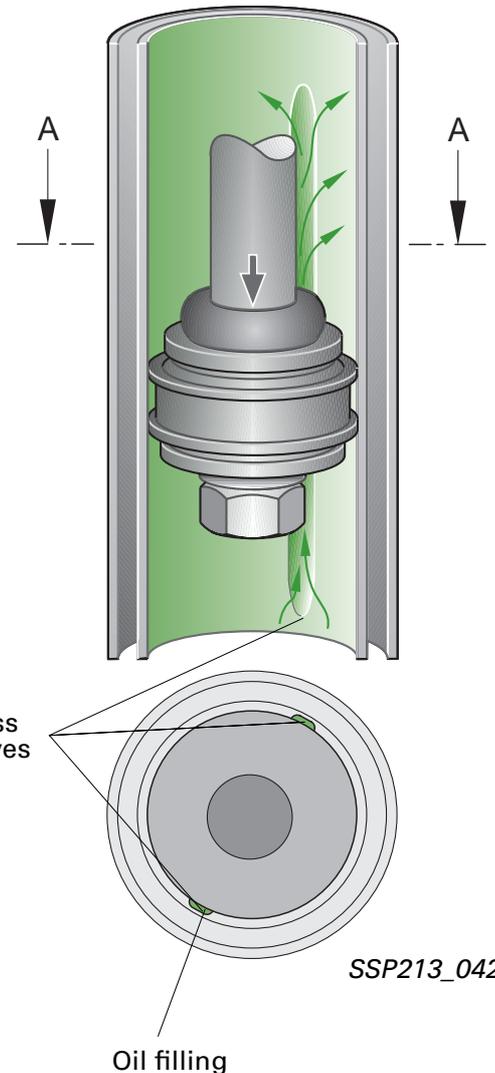


Running gear

Gas-filled twin-sleeve shock absorber

In combination with a new suspension setup, shock absorbers, which have a damping characteristic dependent on engine load and travel, are used in the Audi A8 on the front and rear axles.

The gas-filled shock absorbers respond to vehicle vibration.



Two grooves in the damper tube serve as a bypass and reduce the resistance of the damper piston.

Approx. 40 mm in length, the grooves are located within the operating range of the damper piston when the vehicle is in an unladen* state or if it is laden with one to three persons.

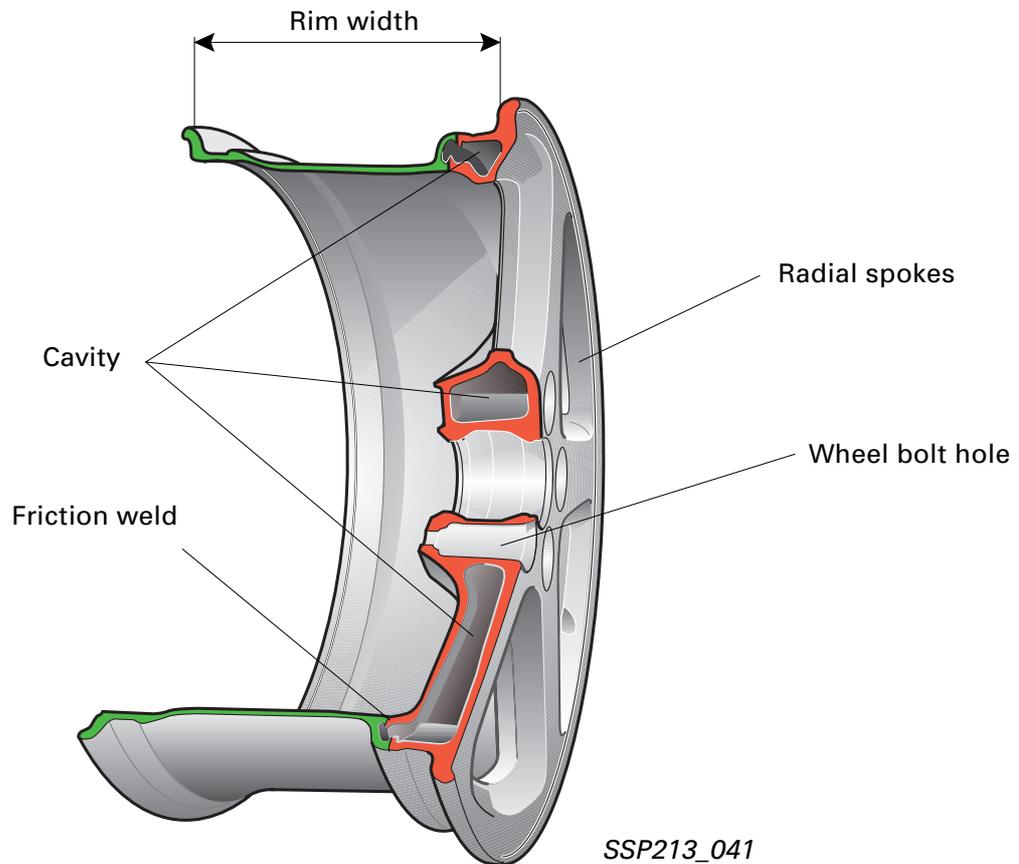
When the spring travels short distances relative to the laden state (± 20 mm), the damper piston moves within the grooved area, reducing the damper forces.

This gives rise to good spring response, which in turn has a positive effect on driving comfort.

If the piston leaves the grooved area with the springs travelling large distances, the damper force increases. Firm damping in this drive position benefits driving safety and increases the vehicle's handling dynamics appreciably.

* unladen state
... is the bump travel which occurs when the "serviceable" vehicle (with full fuel tank, spare wheel and tool kit) is standing on its wheels.

Hollow-spoke wheel



Reducing the weight of the wheels offers advantages in three respects:

- Reduces kerb weight (static)
- Reduces unsprung masses
- Reduces rotating masses

The known benefits of reducing weight have a much more marked effect on rotating masses (e.g. wheels) than on "static masses" (e.g. body), since these masses have to be made to rotate in addition to "normal acceleration".

The aluminium hollow-spoke wheel, therefore, helps to save a great deal of weight.

The light-alloy hollow-spoke 8J x 18 rim, which will be used in an Audi for the first time in the Audi A8 with effect from model year 99, reduces wheel weight in comparison with the conventional cast aluminium wheel by approx. 2 kg per wheel.

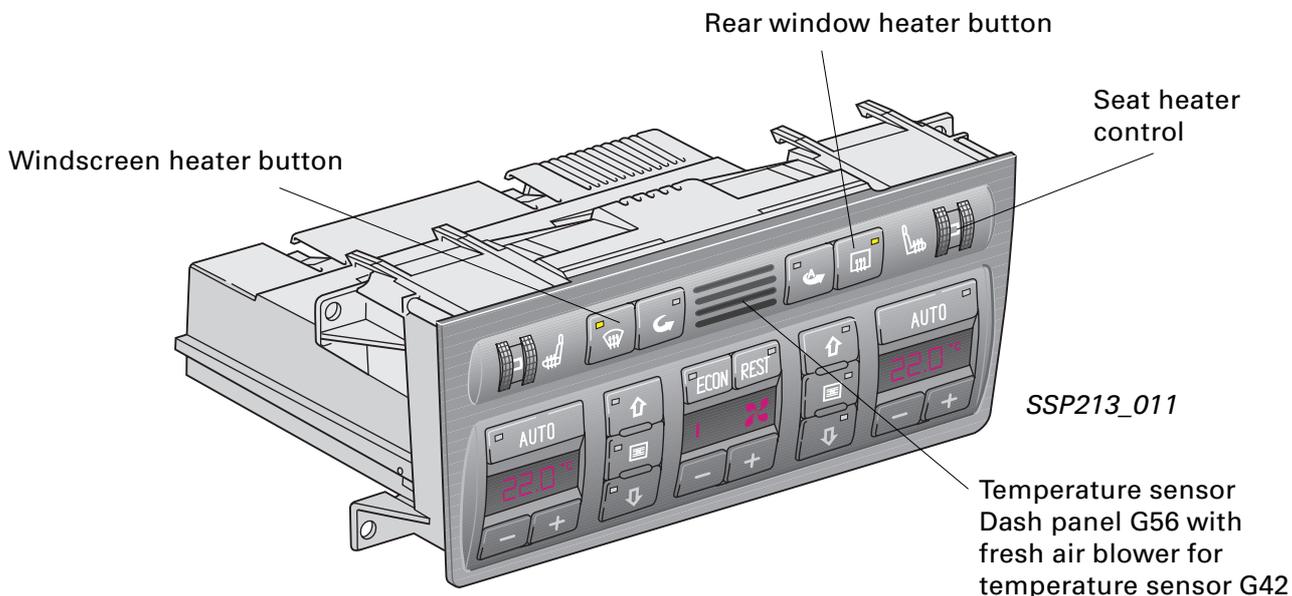
The wheel comprises two parts. Designed as a hollow body, the wheel disc (with radial spokes) and rim base are joined by friction welding.

In addition to weight advantages, the two-piece construction makes it possible to easily combine the wheel spokes with rims of various widths.



Air conditioning system

Operating and display unit E87



Technical status of operating and display unit – major product upgrade

Vehicles with a modified dash panel mid-section will be equipped with a new air conditioner operating and display unit with effect from model year A8 GP 1999. The automatic air conditioner control unit has been retained.

What features are new, both technically and visually?

- Operator keys have been repositioned.
 - Rear window heater button has been integrated.
 - Seat heater control is replaceable.
 - Connection to CAN bus drive (currently available on A8 only).
 - Key code
- The information on ambient temperature supplied by sender G17 is now transferred directly to the dash panel insert, where it is evaluated and made available on the data bus. The information on ambient temperature supplied by sender G89 is still transferred directly to the operating and display unit, where it is evaluated and made available on the data bus. Operating and display unit E87 uses the lower ambient temperature value in each case.
 - Air recirculation mode is automatically switched on for a defined period of time when the windscreen washer switch is operated.
 - The control unit of E87 switches the windscreen heater on in defined conditions.
 - Changed compressor switch-off conditions.

Key code

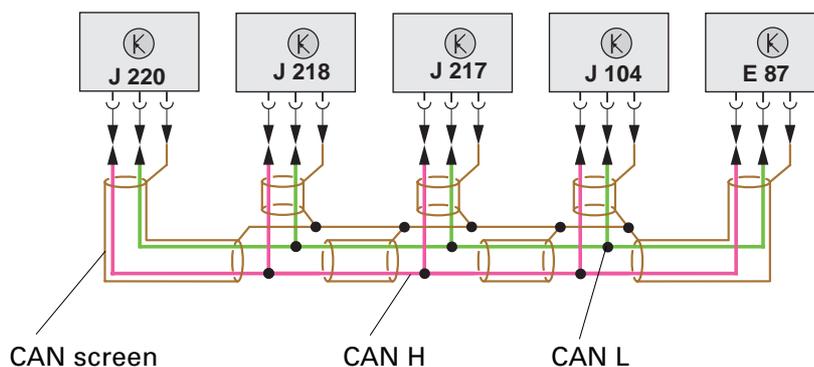
When the ignition is turned on, operating and display unit E87 initially adopts the setting, temperature, air distribution and fresh air blower speed which were valid when the ignition was last turned off with this key.

The key is coded by reading out the fixed transponder code. The immobiliser control unit integrated in the dash panel insert supplies this information to operating and display unit E87 along the CAN bus.

Information exchange between the automatic air conditioning system and other systems now takes place along the CAN bus



Up to 4 keys can be stored by E87.



SSP213_012

- In the Audi A8, the operating and display unit is connected to the "Drive data bus".
- Depending on the vehicle equipment specification, various control units belong to the drive data bus.
- If faults occur during information transfer within the bus system from the engine control unit or dash panel insert, then operating and display unit E87 does not switch the compressor on.

Drive data bus in max. communication configuration:

J104	ABS control unit with EDL
J217	Automatic gearbox control unit
J218	Combination processor in dash panel insert
J220	Motronic control unit (or equivalent engine control unit)
E87	Operating and display unit

Using the current flow diagrams, you can establish what and how many control units are connected to the bus system.

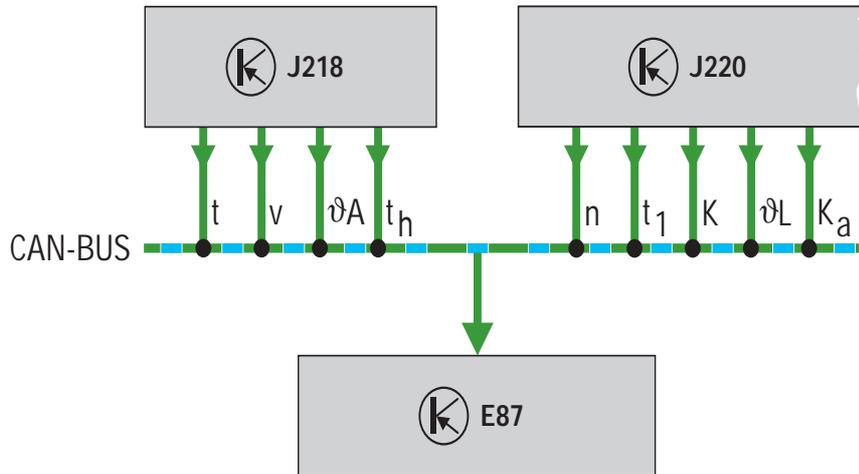


To rule out any possibility of interference with the data transfer along the Drive data bus, the data wires are protected by an additional screen and are neutral externally.



Air conditioning system

Example: Information networking E87



SSP213_014

The combination processor in dash panel insert J218 supplies the following information:

- Coolant temperature "t"
- Vehicle road speed "v"
- Ambient temperature "∂A"
- Stationary period "t_h"

Engine control unit J220 supplies the following information:

- Engine speed "n"
- Coolant temperature "t₁"
- Air conditioner compressor OFF/ON "K"
- Intake air temperature "∂L"
- Air conditioner compressor Off "K_a"

The operating and display unit sends the following messages to the air conditioning system along the Drive data bus:

- A/C ready (speed increase)
- Driver input, auxiliary heater
- Heated rear window
- Heated windscreen
- Compressor state OFF/ON
- No heat output required
- Ambient temperature (sensor)
- Air conditioner pressure
- Compressor load
- Fresh air blower voltage

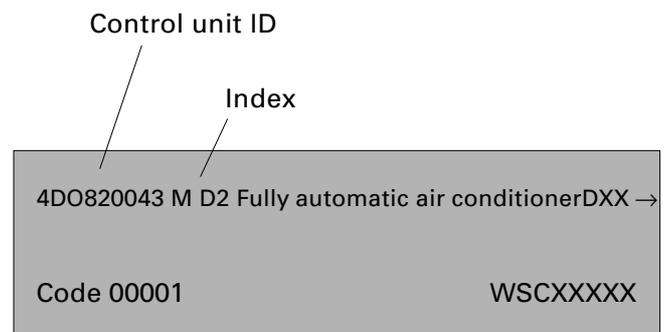
The operating and display unit, therefore, is no longer connected directly to certain sensors.

Self-diagnosis

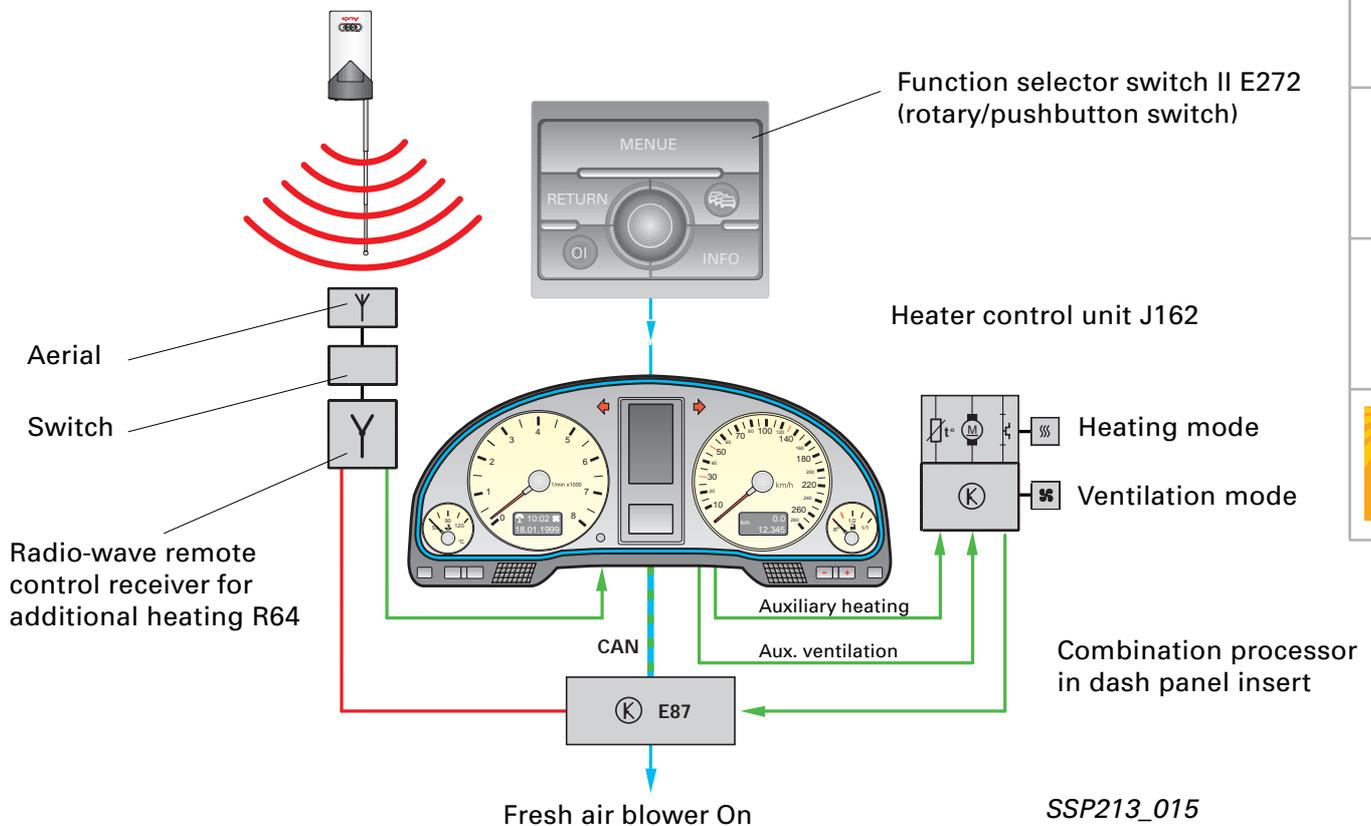
The operating and display unit is integrated in the self-diagnosis.

The control unit ID appears on the display of the Diagnostic Testing and Information System (in this special case Index "M").

The drive data bus must also be tested (the air conditioner control unit utilises the information supplied by other control units).



Auxiliary heating/ ventilation



What's new?

- The switch-on time can be preset on the vehicle timer. A separate presetting timer is no longer required. The switch-on time can be programmed with function selector switch II in the central console E272, which is also used for manual switch-on.
- The programming data are displayed on the dash panel insert display.
- "Timer activated" or "Auxiliary heating/ventilation switched on" are currently indicated on the display as follows:
 - Can be switched on by remote control.
 - Range: up to 600 m in the open.
 - There is no additional heating function when the fuel tank is "empty". Empty is roughly equivalent to the red display range.
 - The auxiliary heater system has a fault counter. If the auxiliary heater does not start after 6 start-up attempts, then it is switched off (interlocked) completely. The auxiliary heater remains in operation.

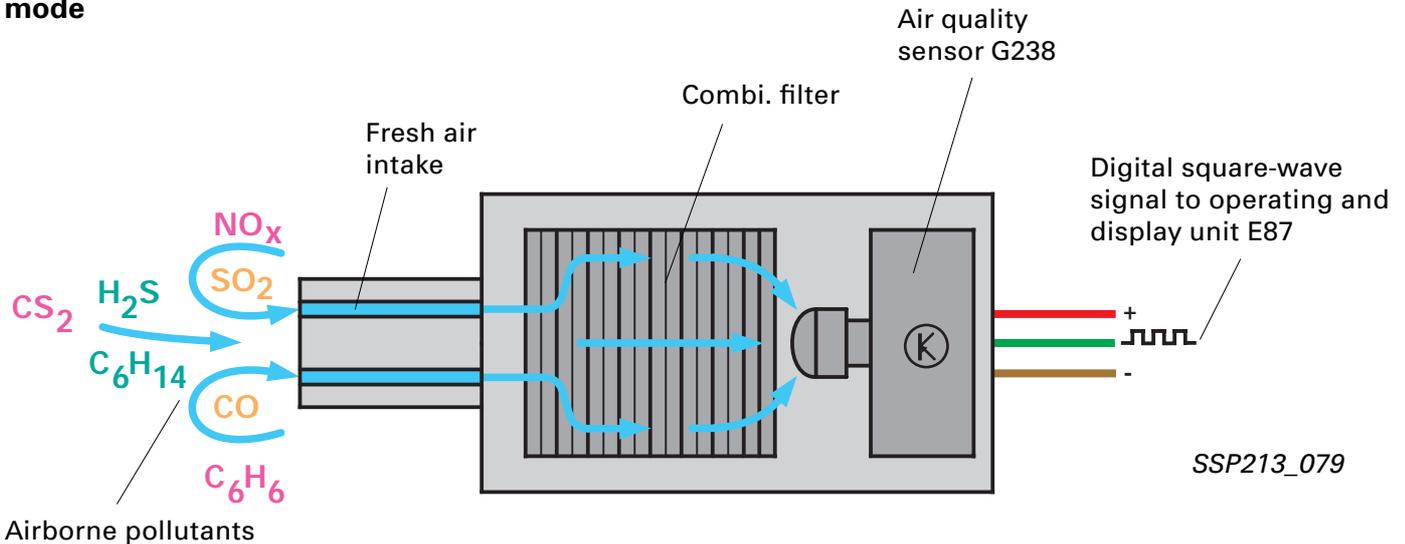
 Auxiliary ventilation
 Auxiliary heating

switched on timer-activated switch-on = flashing
 = steady light

Air conditioning system

Temperature control

Automatically controlled air recirculation mode

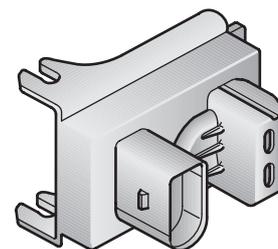


In automatic air recirculation mode, a change-over from fresh air mode to air recirculation mode takes place automatically when the sensor detects noxious smells.

In automatic air recirculation mode, the change-over takes place as soon as the air quality sensor detects pollutants, i.e. before noxious smells actually develop.

The system components

- Air quality sensor G238
An electronic component located in the fresh air intake upstream of the combination filter.
- Combination filters
The combination filters (there are 2 of them) replace the pollen filter. They comprise a particle filter containing activated charcoal. They are fitted in the fresh air intake duct.



Air quality sensor G238

SSP213_081



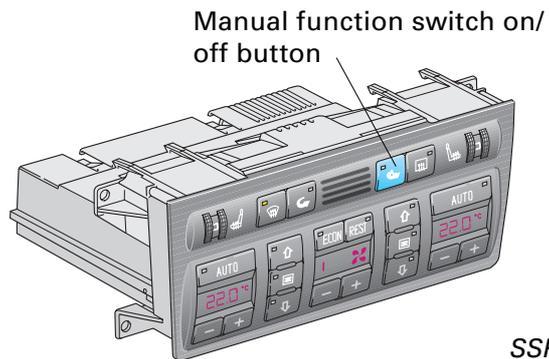
Combination filter

SSP213_088

The operating principle of the automatic change-over system



The “automatic air recirculation” function can be switched on or off manually.



SSP213_080

The operating principle

A gas sensor detects pollutants in the ambient air.

When a high pollutant concentration is measured, a signal is transmitted to operating and display unit E87, which then switches from fresh air mode to air recirculation mode.

If the pollutant concentration drops below a given threshold, fresh air is again supplied to the vehicle interior.

The period between the detection of pollutants and the closing of the fresh air supply is bridged by the activated charcoal in the combination filter.

The operating and display unit decides whether to carry out a change-over automatically depending on the level of air pollution, the ambient temperature, driver input and whether the compressor is on or off.

What pollutants are detected?

The primary pollutants contained in the exhaust gases of the petrol engine are:

CO - Carbon monoxide

C₆H₁₄ - Hexane

C₆H₆ - Benzene

C₇H₁₆ - n-heptane

The constituents of the exhaust gases of diesel engines are:

NO_x - Nitrogen oxides

SO₂ - Sulphur dioxide

H₂S - Hydrogen sulphide

CS₂ - Carbon bisulphide

Operating and display unit with automatically controlled air recirculation mode

Example:

Ambient temperature	Air pollution	Air recirculation
> +2 °C	Low rise	yes min. 25 sec.
> +2 °C	Low	no
+2 °C ... -5 °C	Higher rise	yes
< -5 °C	Higher rise	max. 12 sec.
ECON mode compressor off		max. 12 sec.
Defrost mode		no
Warm-up phase of sensor approx. 30 sec.		no



Automatic air recirculation mode is limited to 12 minutes.



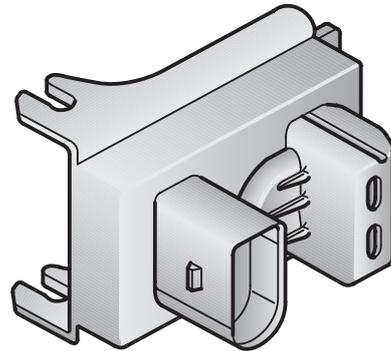
Air conditioning system

Air quality sensor G238

In principle, the sensor operates in much the same way as a lambda probe.

The measuring element is a mixed oxide sensor which incorporates semiconductor technology (tin oxide - SnO_2). Sensitivity to noxious gases is increased by catalytic additives consisting of platinum and palladium.

The sensor has an operating temperature of approx. 350°C . Its power consumption of 0.5 watts is very low.



Air quality sensor G238

SSP213_081

The evaluation electronics in the sensor

The evaluation electronics integrated in the ultrasonic sensor module react to changes in sensor conductivity.

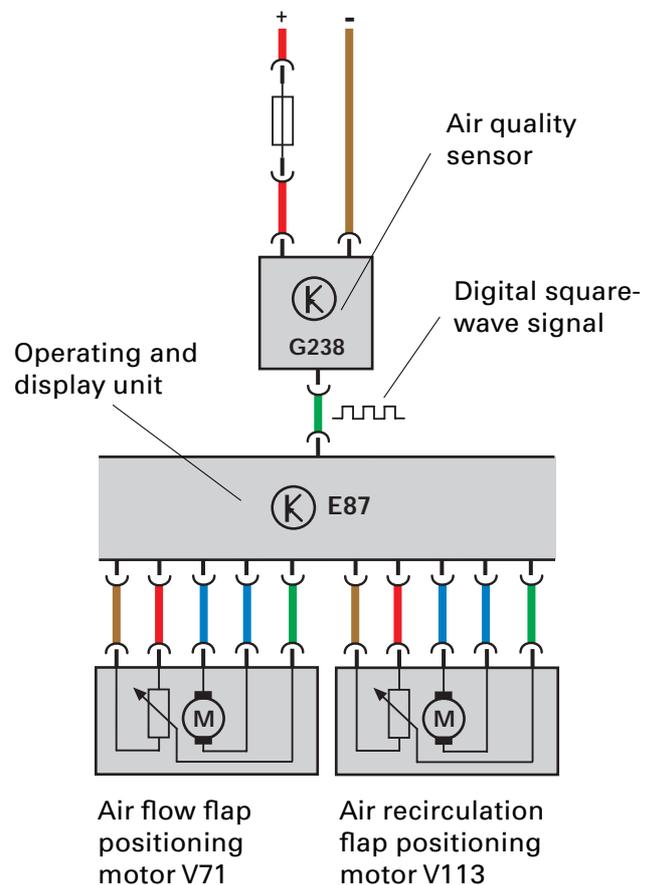
It achieves a high degree of sensitivity.

The system is "self-adaptive", i.e. self-learning.

The electronics determine the average pollutant concentration in the ambient air and send a request for air recirculation to the air conditioner control unit by means of a square-wave signal.

The control unit now closes the air recirculation flap and fresh air flap depending on the ambient temperature, driver input, whether the compressor is on or off and the extent of air pollution at peak pollution levels.

This ensures that the system is not continuously switched to air recirculation mode in highly polluted areas.



SSP213_082

Service

- The air quality sensor is wear-free.
- When washing the engine compartment, it is important to ensure that the air quality sensor is not wetted with cleaning agent and solvent, as this will impair its ability to operate.



The sensor reacts to exhaust emissions of diesel engines about twenty times more sensitively than to petrol vapours. This is roughly equivalent to the sensitivity of the human nose.

The combination filter

The combination filter is a dust and pollen filter made of a non-woven fabric with an additional filter inlay of activated charcoal granulate.

- The non-woven fabric filters out dust and pollen.
- The non-woven fabric can also filter out gaseous pollutants such as ozone, benzene, nitrogen dioxide and other pollutants in the air flowing through the filter.

Function

To absorb the gaseous impurities in the air flowing through the filter until the fresh air flap is closed and the air conditioning system has gone into air recirculation mode.

Air then no longer flows through the filter. Air recirculation mode inevitably extends the filter's service life.

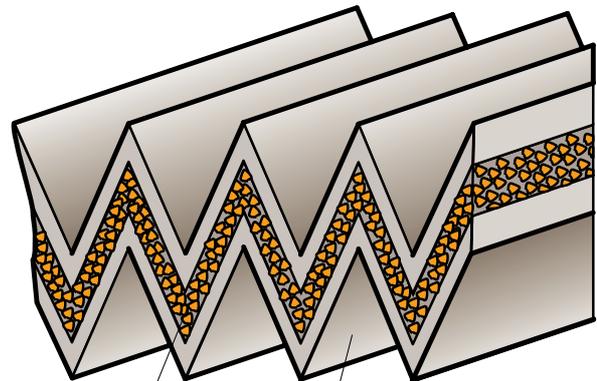
The activated charcoal layer reacts differently to different pollutants:

- Certain pollutants are bound permanently in the filter.
- Others are converted to harmless compounds in much the same way as in a catalytic converter.
- The activated charcoal has the same effect on the remaining pollutants as a condenser.

At increasing pollution levels, pollutants are absorbed to saturation point. When the pollutant concentration decreases, the absorbed particles are partially released.



Some of the pollutants are bound permanently in the filter. It is necessary, therefore, to change the filter from time to time.



SSP213_088

Non-woven fabric

Activated charcoal granulate



Service

The combination filter must be replaced at the prescribed service intervals.

Since the activated charcoal layer permanently binds a fraction of the pollutant particles, it is advisable to replace the filter earlier in certain conditions of use:

- when operating the vehicle in areas where air pollution levels are high,
- when operating the vehicle with the “automatic air recirculation” function switched off most of the time.

The combination filter can also be fitted in vehicles without an automatically controlled air recirculation mode.

Air conditioning system

Function diagram

The function diagram represents a simplified current flow diagram and shows how all component parts of the air conditioning system interact with one another.

Code codes

 = Input signal

 = Positive

 = Output signal

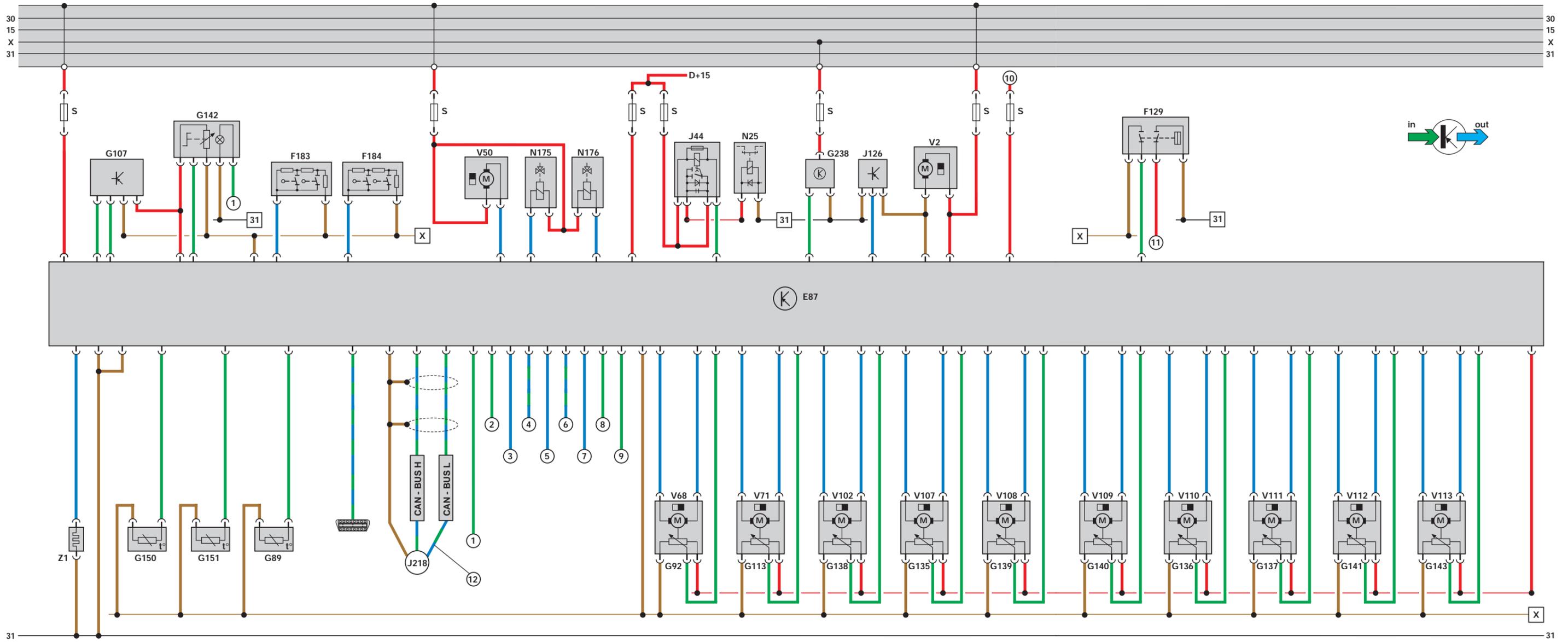
 = Earth

Components

D	Ignition switch, terminal 15	V2	Fresh air blower
E87	Air conditioner operating and display unit	V50	Coolant circulation pump
F129	Air conditioner pressure switch	V68	Temperature flap positioning motor
F183	Vent switch, middle left	V71	Air flow flap positioning motor
F184	Vent switch, middle right	V102	Centre vents positioning motor
G89	Fresh air intake duct, temperature sensor	V107	Defrost flap positioning motor
G92	Temperature flap positioning motor potentiometer	V108	Left footwell flap positioning motor
G107	Sunlight penetration photo sensor	V109	Right footwell flap positioning motor
G111	Air conditioner compressor speed sender	V110	Centre left vent positioning motor
G113	Air flow flap positioning motor potentiometer	V111	Centre right vent positioning motor
G135	Defrost flap positioning motor potentiometer	V112	Rear footwell vent positioning motor
G136	Potentiometer in left-hand central vent positioning motor	V113	Air recirculation flap positioning motor
G137	Potentiometer in right-hand central vent positioning motor	Z1	Heated rear window
G138	Potentiometer in central vent positioning motor		
G139	Potentiometer in left-hand footwell flap positioning motor		
G140	Potentiometer in right-hand footwell flap positioning motor		
G141	Potentiometer in rear footwell vent positioning motor		
G142	Potentiometer in central vent		
G143	Potentiometer in air recirculation flap positioning motor		
G150	Vent temperature sender, left		
G151	Vent temperature sender, right		
G238	Air quality sensor		
J44	Magnetic clutch relay		
J126	Fresh air blower control unit		
J218	Combination processor in dash panel insert		
N25	Air conditioner magnetic clutch		
N175	Heat regulation valve left		
N176	Heat regulation valve right		
S	Fuse		

Auxiliary signals and connections

①	From dash panel insert lighting instruments (terminal 58s)
②	From steering column switch/washer contact
③	To relay for fan speed 1
④	Air conditioner compressor On/Off signal
⑤	Speed increase signal
⑥	Windscreen heater
⑦	To relay for fan speed 2 (optional)
⑧	From relay for solar roof
⑨	From auxiliary heating control unit
⑩	From steering column switch terminal 58
⑪	To relay for radiator fan speed 2 J101
⑫	CAN data bus
31	Central earth
X	Signal earth



Dash panel insert

The basic information which is displayed by the dash panel insert has been adopted unchanged.

The new eight-colour dot matrix display is located in the middle.

The messages issued by the driver information system (DIS) cover the representation of

- graphic information of additional external systems, e.g. navigation, radio, telephone
- Ambient temperature
- On-board computer
- Shift indicator
- Auto-Check System (in the background)

A new feature is:

- Distance and cruise control display
- Tyre pressure monitoring (equipment-dependent)
- Menu guidance



You can find further information regarding distance and cruise control as well as tyre pressure monitoring in a special SSP.



SSP213_061

Radio-controlled clock

The time of day and date are displayed on the two-line clock display. The following segments are also integrated in the clock display:

- Radio tower at left of clock; the radio tower symbol is only displayed when a radio signal is received.
- Additional heating and auxiliary ventilation are indicated by symbols, with separate illumination when ignition is off.



SSP213_062

Menu guidance

In conjunction with the major product upgrade of the Audi A8, menu guidance has been introduced for the dash panel insert. The settings are made using function selector switch II E272 in the central console. Options menus are represented on the display of the driver information system.

The start menu has the following display modes:

- Menu from
- Interrogate
- Options
- Help



For instructions on how to operate the various menus as well as the functions, please refer to the vehicle's Owner's Manual.

The following functions are assigned to the start menu display modes:

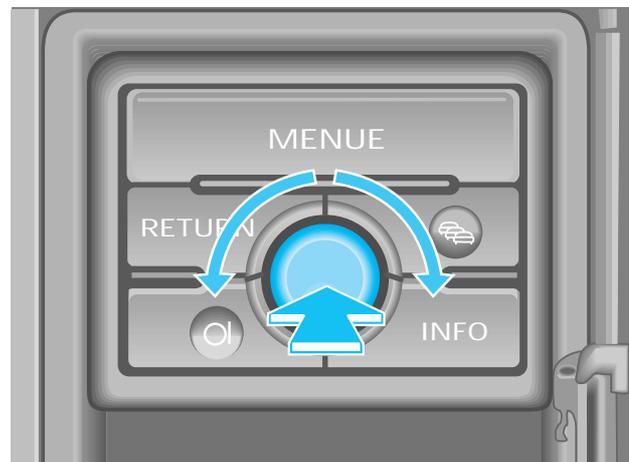
Menu from

- On-board computer
- Auto-Check Control/radio or telephone data
- Ambient temperature
- Speed warning
- "Door open/boot lid open" warning
- Information display or selector lever position display for automatic gearbox
- Navigation display*

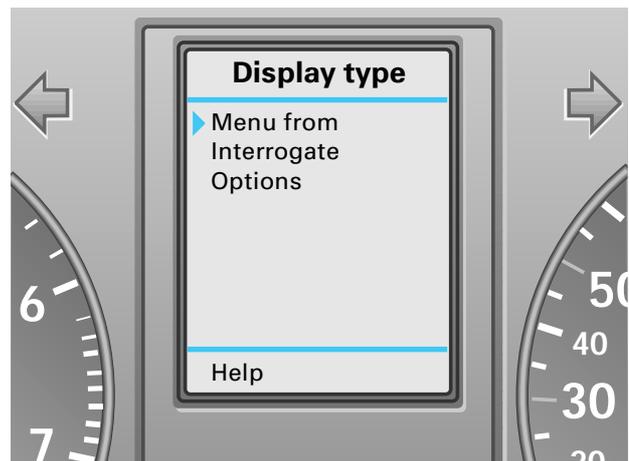
Interrogation functions

- Oil level
- Inspection

* equipment-dependent



SSP213_063



SSP213_065

Options

- Computer
- Clock
- Tyre pressure*
- Auxiliary heating*
- Auxiliary ventilation*
- Radio display
- Speed warning

Help

The Help function helps you to make the right choices when making entries.



Electrics

Lighting

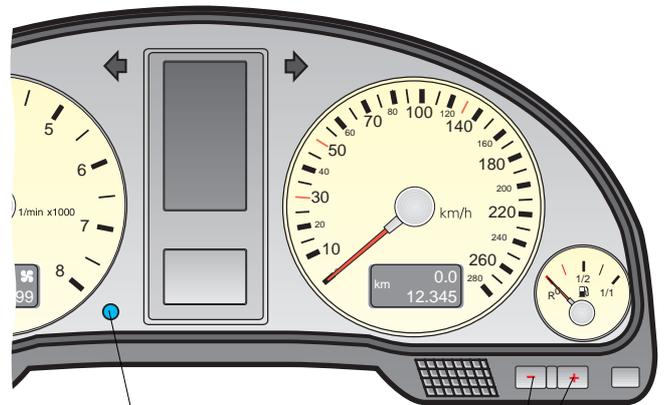
The brightness of the dash panel insert is regulated depending on

- an integral phototransistor
- an external phototransistor (G107 in E87)
- the adjustment made using the dimmer buttons

In addition to the combination lighting, the driving light indicator lamps (high beam, parking light, fog lights, etc.) are also dimmed depending on ambient luminosity.



In the A8 GP, all warning lamps have an LED, i.e. when a warning lamp fails, the dash panel insert has to be replaced.



SSP213_097

Internal phototransistor

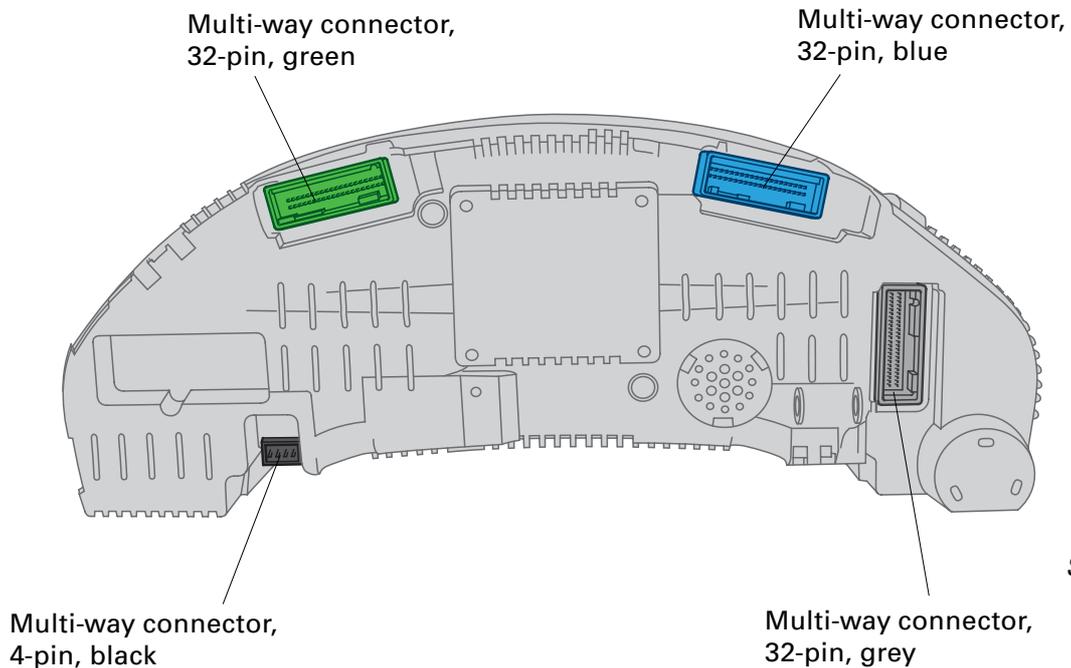
Dimmer button

Connections at dash panel insert

There are four multi-way connectors on the microprocessor-controlled dash panel insert.



Before doing this, it is very important to interrogate the fault memory and note down the values for Service Interval Display and mileage counter (refer to the relevant Workshop Manual).



SSP213_059

Input signals

Voltage supply

- Terminal 30
- Terminal 31
- Sensor earth



If terminal 30 is missing from the dash panel insert, then "SICH" or "FUSE" is indicated continuously on the mileage/kilometer counter display.

Analog signals

- Fuel tank sender
- Coolant temperature sender
- Ambient temperature
- External phototransistor

Digital signals

- Terminal 15
- Distance signal (Reed sender)
- Terminal TD/W
- Diagnosis interface (K-wire)
- Oil pressure switch 1.2 bar (switches to earth when oil pressure > 1.2 bar)
- Brake pad (shorting jumper to earth/ jumper is disconnected in case of fault)
- Brake fluid switch - switches to earth when brake fluid level drops below min.
- ABS signal
- Coolant level sender (when coolant level drops below min.)
- AIRBAG - wire control failure (High potential if airbag has failed)
- Right-hand parking light (circuit is broken when: "light On" or NO contact "open" and when indicating right)
- Left-hand parking light (circuit is broken when: "light On" or NO contact "open" and when indicating left)
- Ignition switch "NO contact" ("positive" if ignition key is in lock)
- Driver's door contact (closed - earth) if door opened

- Front passenger's door contact switch (closed - earth) if door opened
- Door contact switch rear left (closed - earth) if door opened
- Door contact switch rear right (closed - earth) if door opened
- Luggage compartment switch (closed - earth) if luggage compartment opened
- Driver's side belt switch (closed - earth) if not seat belt fastened and fitted
- Input for external buzzer activation (600 Hz, earth = active)
- Washer fluid (switches to earth when washer fluid level too low)
- Onboard computer buttons (RESET, left, right)
- Glow plug relay (switches to earth, normally open)
- Hydraulic pressure (switches to earth when pressure drops below minimum)
- Stop light defective
- Tail light defective/driving light defective
- Signals from radio, telephone and navigation computer
- Bonnet switch
- External radio digital clock module input
- Oil level and oil temperature sender
- Pressure switch for oil filter (feedback on degree of soiling of oil filter)
- Interface to function selector switch
- Radio input, additional heating
- Transponder coil for immobiliser

Output signal

- Speedometer output - signal can be output as inversion of input signal.
- Dimmer output digital (58s)
- Dimmer, digital (3W (58d)
- Switching on fan speed 3
- Output to four door contacts (door lock output of central locking)
- Additional heating On
- Summer/winter change-over, additional heating
- 5 V output to external electronics supply

CAN connection

- CAN Drive (high-speed)
- CAN Convenience (high-speed)
- CAN Display (high-speed)



Bus systems

The dash panel insert is equipped with three CAN buses and a gateway function.

The following bus systems are used:

- CAN Drive
High-Speed CAN at a transfer speed of 500 kBaud
- CAN Convenience
High-Speed CAN at a transfer speed of 100 kBaud
- CAN-Display
High-Speed CAN at a transfer speed of 100 kBaud



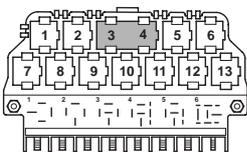
You can find further information regarding the CANbus in SSP 186.

The dash panel insert can maintain communications on the CAN bus up to an operating voltage of 6.5 V.



A 'gateway' is a function which assembles pieces of information from various identifiers (data messages) of a CAN bus to generate an identifier of another CAN bus, thus creating a new message.

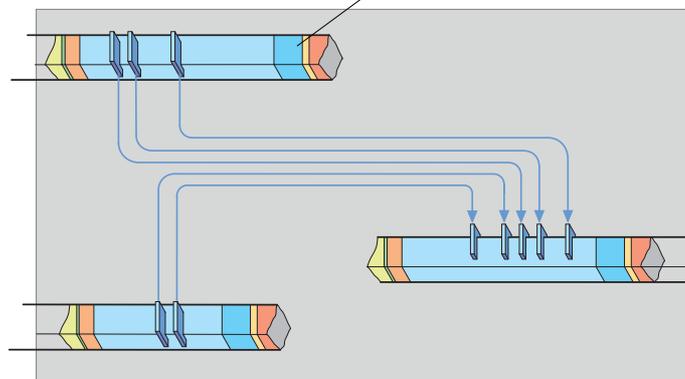
MFL Interface J453
Relay slot 3+4



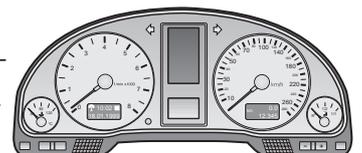
Navigation operating electronics control unit J402



Data message

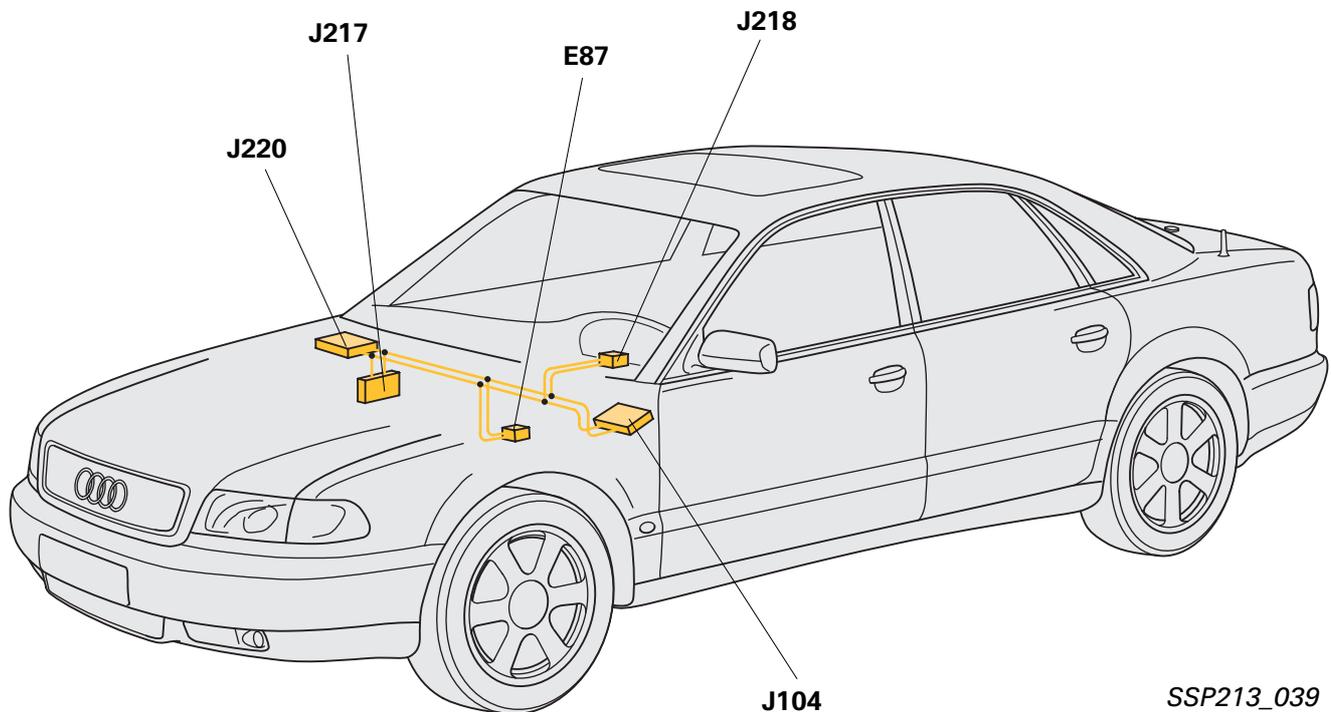


Combination processor in dash panel insert J218



SSP213_052

CAN Drive



SSP213_039

The following control units are networked to one another in CAN Drive:

- Motronic control unit J220
- Automatic gearbox control unit J217
- ABS control unit with EDL J104
- Air conditioner operating and display unit E87
- Combination processor in dash panel insert J218

The networking of the control units, i.e. mutual editing and dispatch of measured data, can be demonstrated well by means of the following examples:

Ambient temperature display:

The combination processor in the dash panel insert evaluates the analog voltage signal provided by the NTC resistor for digital display in the dash panel insert. The digital signal is encoded as a binary number and included in the data message. This signal is directly available to all connected control units.

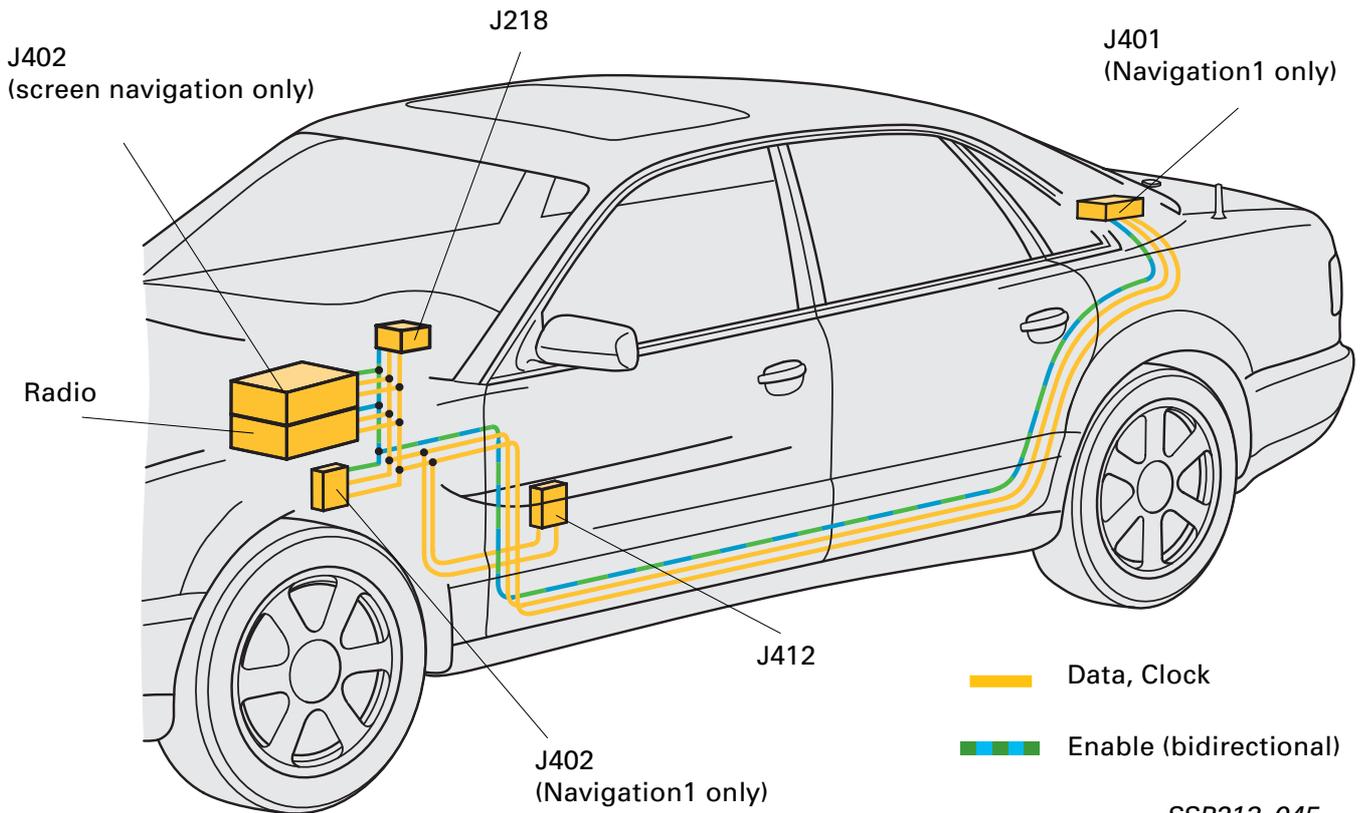
The air conditioner operating and display unit outputs the ambient temperature indicated by the plenum chamber sensor G89 via the CAN Drive output.

The dash panel insert compares the two temperature values and displays the lower of the two values.



Electrics

CAN Display



The following control units are networked on CAN Display:

- Radio (symphony only)
- Control unit for telephone operating electronics J412
- Control unit for navigation with CD drive J401 as well as navigation operating electronics control unit J402 for vehicles with Navigation 1,
or
- navigation operating electronics control unit J402 for vehicles with screen navigation (double DIN)
- Control unit for Telematics J499 (still not implemented)
- J218 combination processor in dash panel insert

Communication with the dash panel insert takes place through a three-wire interface by means of the signals Enable, Clock and Data.

The signal direction for Data and Clock is from the radio to the Auto Check System only. The Enable line is operated bidirectionally.

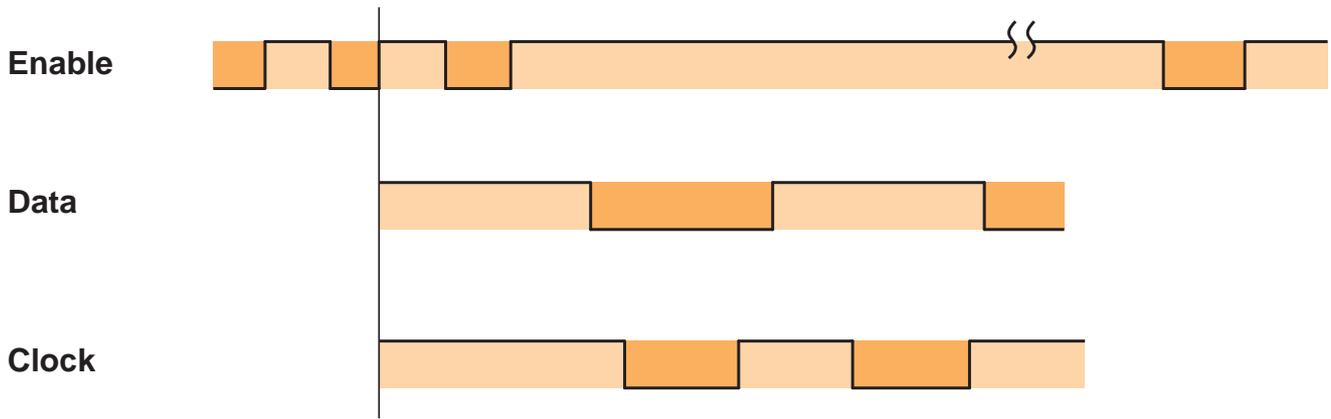
As the lower level control unit, the dash panel insert outputs a data request to the radio and telephone along the Enable line.

If the bus display is off load (no message on bus or bus partner off) and a dominant partner (radio, telephone) wants to send a message, the dominant partner activates the Enable line (bidirectional line), and the dash panel insert goes into standby mode.



The radio and telephone operate concurrently on the 3-wire bus of the instrument panel whereby the telephone gives higher priority to the data message than the radio data message.

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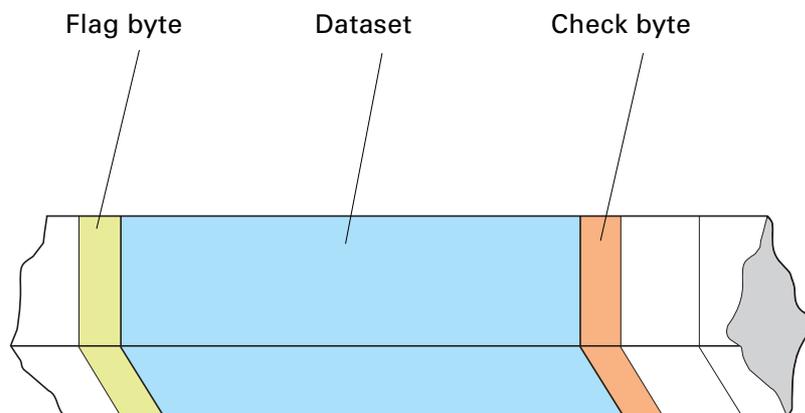


SSP213_089

The flag byte, dataset and check byte are transmitted along the Data and Clock wires.

The data message comprises a total of 18 bytes which are transferred from the radio or telephone to the dash panel insert and displayed as a message.

- 1 The first byte with different bits contains the identifier for radio or telephone.
- 2 - 17 bytes contain the dataset or message
- 18 byte is the check byte which contains the checksum of the message.



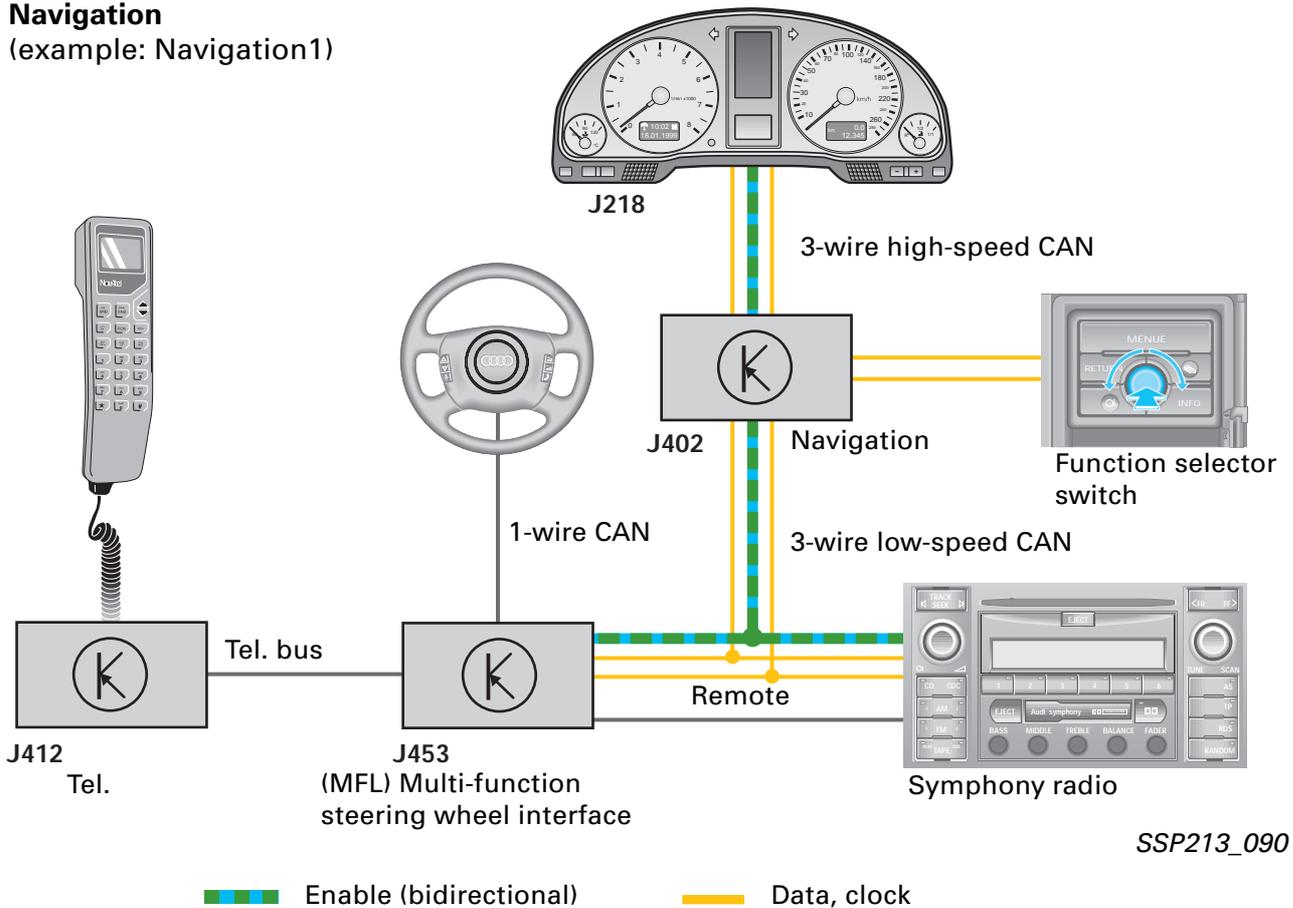
SSP213_046



No data messages are transferred along the Enable line.

Navigation

(example: Navigation1)



SSP213_090

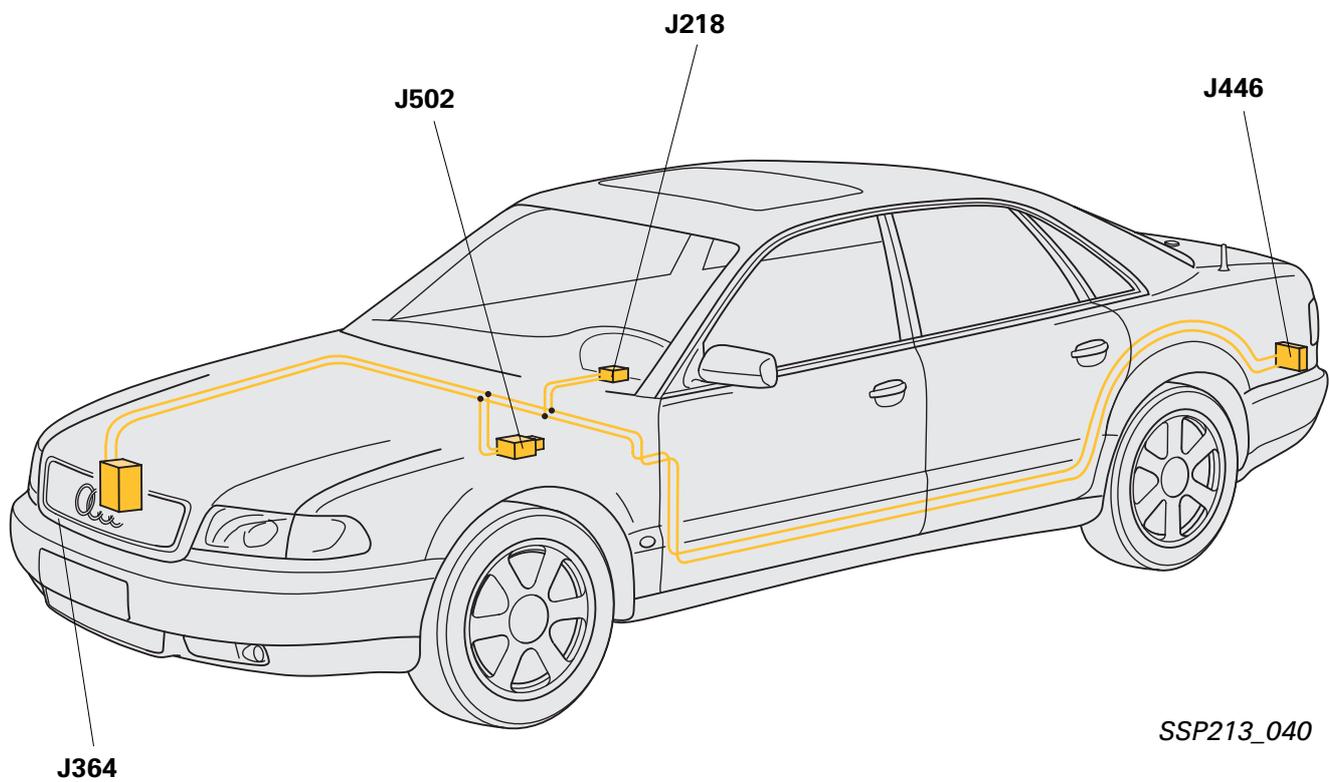
The navigation interface

Interfaces the dash panel insert to the parallel components radio/telephone (MFL Interface). Both interfaces are implemented as a wire bus (Clock, Data, Enable). However, message buildup, protocols and transfer rates of bus subscribers radio/telephone and navigation system are different. The navigation interface fulfills the tasks of implementing and adapting information transfer in both directions.

The following information is transferred:

- Messages from the dash panel insert to the navigation system through Enable pulse length coding (request new screen, navigation no longer on display, repeat request, radio request, etc.)
- Navigation messages for screen build-up, radio, telephone messages and other control messages from the navigation system to the dash panel insert. Data are contained in protected data structures.
- Data messages from the navigation system to the components radio and telephone.
- Data messages from the components radio and telephone to the navigation system.

CAN Convenience



SSP213_040

In CAN Convenience, the following control units are internetworked:

- Combination processor in dash panel insert J218
- Control unit for tyre pressure monitoring J502
- Control unit for parking aid J446
- Additional heating control unit J364

Self-diagnosis of dash panel insert



New contents in the following functions:

- 02 - Interrogate fault memory
- 08 - Read measured value block
- 10 - Adaptation



A static fault is saved if the malfunction exists for at least 20 seconds.

Interrogate fault memory

With the introduction of CAN systems, the interrogation/fault numbers which are monitored and stored have been incremented.

In the fault memory of the Audi A8, for example, this results in the following additional fault locations which can be displayed:



SSP213_038

Data line from Navigation	- implausible signal
Navigation operating electronics control unit	- no communication
Control unit for Telematics	- no communication
Telephone	- no communication
Radio control unit	- no communication
Engine control unit	- no communication
Gearbox control unit	- no communication
ABS control unit	- no communication
Tyre pressure monitoring	- no communication
Parking aid	- no communication
CAN Display	- defective in single-wire mode
CAN Convenience	- defective in single-wire mode
CAN Drive	- defective in single-wire mode
Ambient temperature signal	- open circuit/ short circuit to positive/ short circuit to earth



Please use the current Workshop Manuals to rectify any faults.

08 - Read measured value block

Display groups 12 to 16 give information on the Flexible Service Interval display:

Display groups 125, 126, 130 and 140 clearly show what control units are located on the CAN bus.

If a field in the display group contains no entries, then this is an indication that this control unit is not connected to the CAN bus.

Measured value block 125

Read measured value block 125 Engine 1 Gearbox 1	→	◀ Display
<p>ADR - display field for CAN interface</p> <ul style="list-style-type: none">- 1 - denotes ADR control unit is one of the CAN bus users- Empty display field denotes ADR control unit is not connected to CAN bus		
<p>ABS - display field for CAN interface</p> <ul style="list-style-type: none">- 1 - denotes ABS control unit is connected to CAN bus- Empty display field denotes ABS control unit is not connected to CAN bus		
<p>Gearbox - display field for CAN interface</p> <ul style="list-style-type: none">- 1 - denotes gearbox control unit is connected to CAN bus- Empty display field denotes gearbox control unit is not connected to CAN bus		
<p>Engine - display field for CAN interface</p> <ul style="list-style-type: none">- 1 - denotes engine control unit is connected to CAN bus- Empty display field denotes engine control unit is not connected to CAN bus		

Measured value block 126

Read measured value block 126 Air conditioner 1	→	◀ Display
<p>Air conditioner - display field for CAN interface</p> <ul style="list-style-type: none">- 1 - denotes air conditioner control unit is connected to CAN bus- Empty display field denotes air conditioner control unit is not connected to CAN bus		



Measured value block 130

Read measured value block 130 →

◀ Display

Parking aid - display field for CAN interface

- 1 - denotes parking aid control unit is connected to CAN bus
- Empty display field denotes parking aid control unit is not connected to CAN bus

Additional heating - display field for CAN interface

- 1 - denotes additional heating control unit is connected to CAN bus
- Empty display field denotes additional heating control unit is not connected to CAN bus

Tyre pressure - display field for CAN interface

- 1 - denotes tyre pressure control unit is connected to CAN bus
- Display field denotes tyre pressure control unit is not connected to CAN bus



Measured value block 140

Read measured value block 140 →

◀ Display

Telematics - display field for CAN interface

- 1 - denotes Telematics control unit is connected to CAN bus
- Empty display field denotes Telematics control unit is not connected to CAN bus

Navigation - display field for CAN interface

- 1 - denotes navigation control unit is connected to CAN bus
- Empty display field denotes navigation control unit is not connected to CAN bus

Telephone - display field for CAN interface

- 1 - denotes telephone control unit is connected to CAN bus
- Empty display field denotes telephone control unit is not connected to CAN bus

Radio - display field for CAN interface

- 1 - denotes radio control unit is connected to CAN bus
- Display field denotes radio control unit is not connected to CAN bus

10 - Adaptation

In the Audi A8 GP, for example, the following additional adaptation functions can be influenced:

Channel

- 02 - Adaptation of FSIA to Fix or Flexible
- 18 - Operating states of the additional heating
- 40 - Mileage/kilometres since inspection
- 41 - Time since inspection
- 42 - Minimum mileage/kilometres to inspection
- 43 - Maximum mileage/kilometres to inspection
- 44 - Maximum time interval to inspection
- 45 - Oil grade for calculating the maintenance interval
- 47 - Soot entrainment for calculating the maintenance interval for diesel vehicles
- 48 - Thermal load of oil for calculating the maintenance interval for diesel vehicles
- 60 - Adaptation, CAN Drive
- 61 - Adaptation, CAN Convenience
- 62 - Adaptation, CAN Display

The fitted control units which are connected to the CAN Drive in the Audi A8 GP are added.

Table: Drive CAN

Equipment	Adaptation value
Engine	1
Gearbox	2
ABS	4
Air conditioner	8
ADR	32
Dash panel insert	1024

Example: Automatic gearbox

Engine + gearbox + ABS + dash panel insert =
 $1 + 2 + 4 + 1024 = 1031$



The adaptation values can be found in the relevant Workshop Manual.



Sound system

symphony radio



SSP213_085

The symphony radio has the following outstanding features:

- Integrated Single-CD Player
- Improved ease of operation, e.g. separate sound control in the high, mid and low frequency bands
- System is CAN bus compatible
- Use of the change-over box

The geometry of the rear window results in different magnetic field strengths which can impair the reception (Rx) level in certain situations.

To optimise reception, aerials for the FM range as well as an aerial for the AM range are integrated in the rear window in the Audi A8 4.

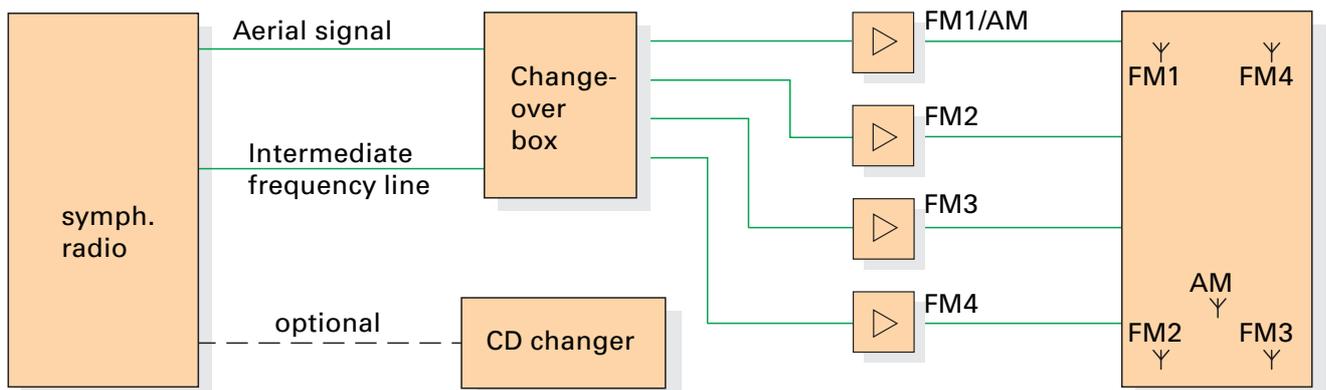
FM range:

The FM reception signals are consecutively supplied to the radio by 4 amplifiers, FM/AM and FM via the change-over box.

The radio makes a frequency adjustment and requests the change-over box via the intermediate frequency line to utilise the appropriate aerial and the highest reception signal.

AM range:

The reception signal in the AM range is permanently supplied via the FM/AM amplifier.



SSP213_086

Flexible Service Interval Display

The Service Interval Display informs the driver when a service is necessary.

The Fixed Interval Display, i.e. with limitation of distance or time to next service to 15,000 km or 1 year respectively, will be replaced gradually by a Flexible Service Interval Display.

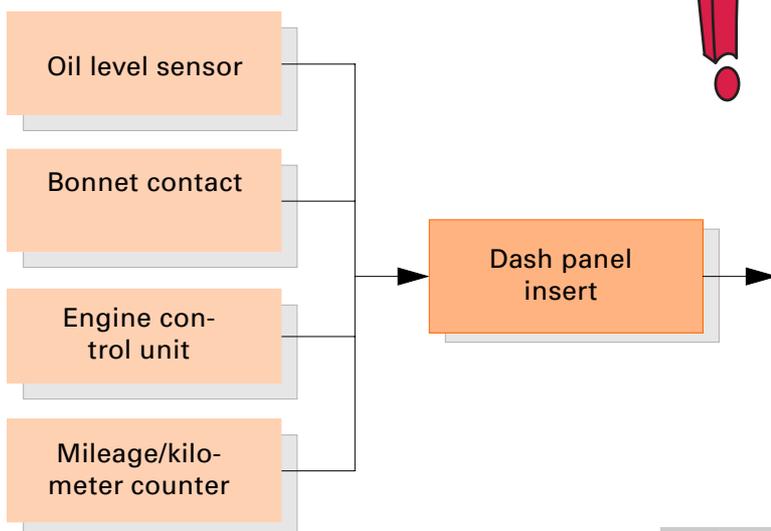
Compared to rigid maintenance intervals, the Flexible Service Interval Display allows better use to be made of the engine oil's performance reserves. A new sensor for detecting oil level and oil temperature has been developed for this purpose.



How do you identify what variant (Fixed or Flexible) is fitted? The adaptation channels, e.g. 45, 46 and 47, can only be displayed in connection with the FSIA!



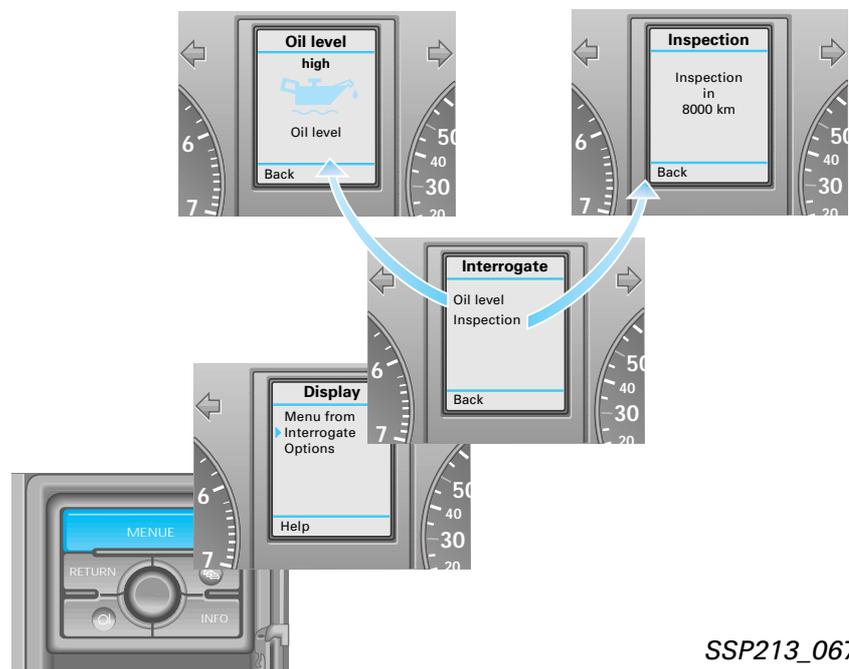
You can find further information on the Flexible Service Interval Display in SSP 207.



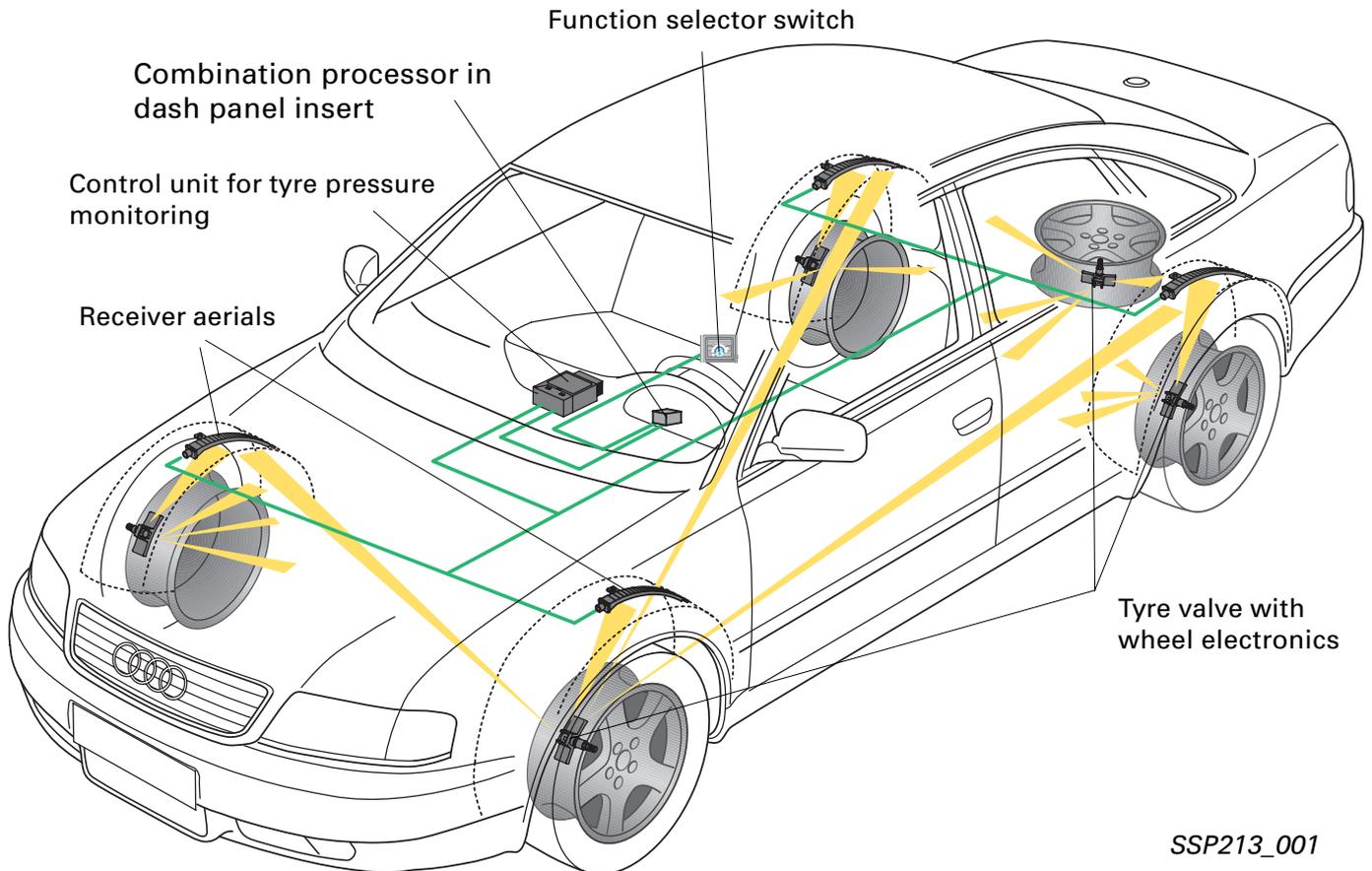
Warning display

1. Priority oil level "min"
2. Priority oil level "min" over distance

The oil level and the mileage/kilometres to next service can be interrogated using of the function selector switch.



Electronic tyre pressure monitoring



Function

The electronic tyre pressure monitor continuously monitors tyre pressure during the trip and when the vehicle is stationary.

An electronic metering and transmitter unit integrated in the tyre valve transmits a radio signal to a receiver aerial fitted in the wheel housing and control unit for monitoring the tyre pressure at regular intervals.

The control unit evaluates the tyre pressures or changes in tyre pressure and relays the appropriate warnings to the dash panel insert where they are displayed to the driver by the Driver Information System (DIS).

The following situations can be identified:

- Gradual loss of pressure; the driver is informed early, allowing tyre pressure to be corrected.
- Sudden loss of pressure; the driver is warned immediately during the trip.
- Excessive loss of pressure when vehicle is stationary; the driver is warned straight after turning on the ignition.

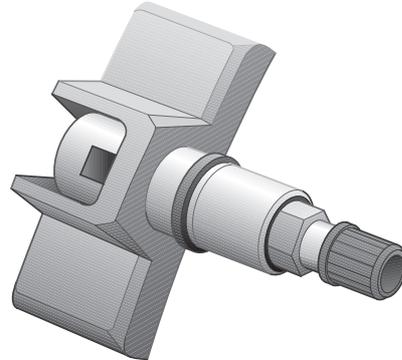
The wheel electronics

together with the valve form a compact unit which is bolted to the rim.

An intelligent sensor developed specially for this application is located here.

This sensor comprises a pressure sensor, a temperature sensor and an integrated circuit for complete measured-value acquisition and signal conditioning.

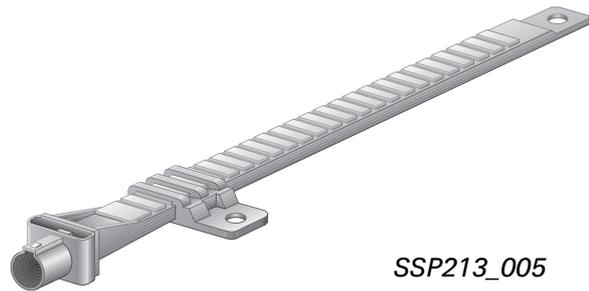
This sensor activates the HF transmitter stage. The sensor and transmitter stage are powered by a lithium battery.



SSP213_004

The receiver aerial

receives the data message supplied by the wheel sensor and transfers this to the control unit for tyre pressure monitoring for further processing.



SSP213_005

The function selector switch

The electronic tyre pressure monitoring function is activated and the momentary tyre pressures is stored in the submenu for tyre pressure using the selector switch function.



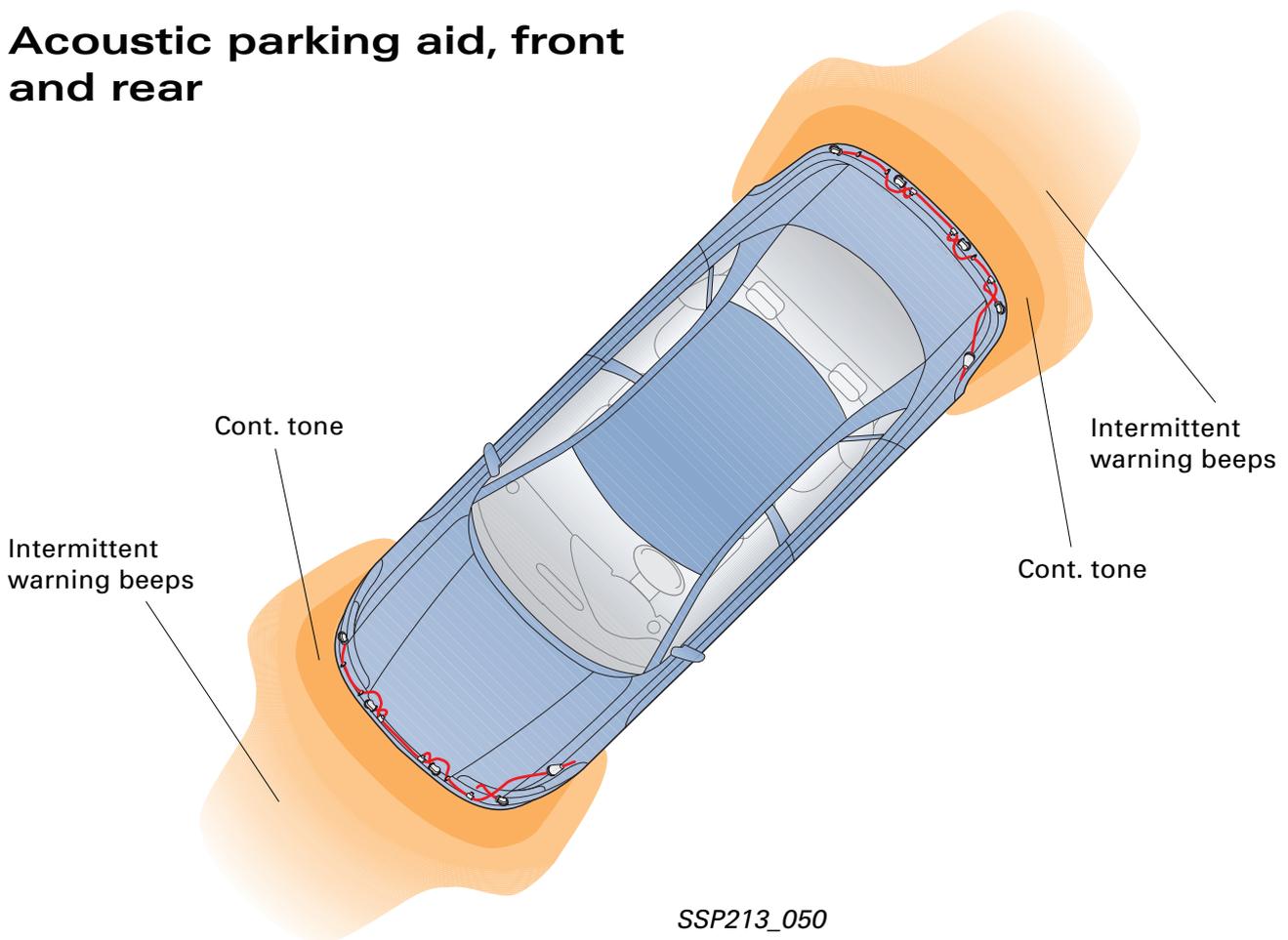
The subject of electronic tyre pressure monitoring is dealt with in detail in one of the following SSPs.



SSP213_063



Acoustic parking aid, front and rear



The Acoustic Parking System (APS) is an ultrasound based system that helps the driver to manoeuvre the vehicle. It alerts the driver by means of audible signals when the vehicle is approaching an obstacle.

Function

After turning on the ignition, the micro-computer performs a self-test and checks the periphery. The control unit is now permanently in operation.

Distance sensing is activated when you select a drive position or a gear. The function display in the parking aid switch lights up to indicate that the parking aid, and with it the distance sensing function, is active.

Intermittent warning beeps sound when the vehicles comes within approx. 160 centimetres of an obstacle. The closer the vehicle moves towards the obstacle, the shorter the interval between warning beeps.

When the vehicle comes within approx. 20 cm of an obstacle, the intermittent beeps become a continuous tone. To the driver, the direction of the warning beeps is identical to the direction of the obstacle.

Ultrasound converter

The ultrasound converters are housed in the front and rear bumper covers. They act as actuators and sensors, i.e. they transmit and receive signals.

Control unit for parking aid J446 gives the command to transmit or receive ultrasonic waves.

The converters receive an echo reflected by the obstacle. In the converters, evaluation electronics calculate the distance between the vehicle and an obstacle from the echo propagation time, i.e. the time between transmission and reception of the signal to the individual converters.

The evaluation electronics in the converters generate digital signals from the echo signals and relay them to the control unit.

In the control unit, the time between the command to transmit ultrasonic waves and receive digital signals from the converter is evaluated by timers.

The distance between the vehicle and the obstacle is calculated from the different times computed by the control unit using the triangulation method.

Triangulation

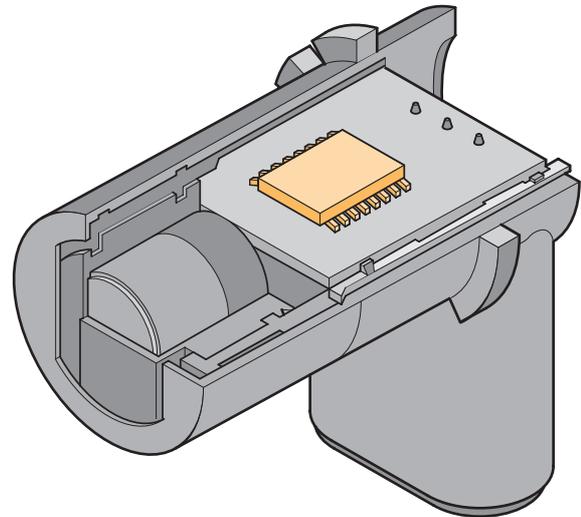
From the various distances it can be concluded that the object is located between the 2nd and 3rd converters. Height h can be determined using Pythagoras' theorem. The resulting distance is 44 cm.



Trailer operation is detected via the microswitch in trailer socket F216 and deactivates the rear APS.

If the distance between the two outer sensors and the obstacle does not change, the vehicle is driving alongside a wall.

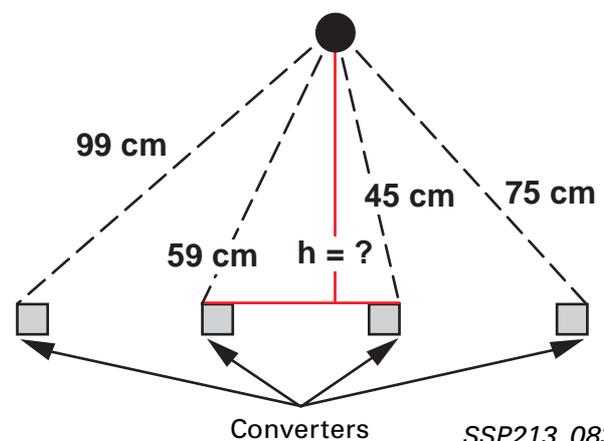
The warning beep is switched off after approx. 3 seconds and does not sound again until the distance to the obstacle lessens.



SSP213_072



Sample calculation



Function diagram

G202	Parking aid sender, rear left	F4	Reversing light switch
G203	Parking aid sender, rear left centre	F123	Anti-theft alarm, tailgate/boot lid contact switch
G204	Parking aid sender, rear right centre	F125	Function selector switch/automatic
G205	Parking aid sender, rear right	F216	Rear fog light cut-out, contact switch
G252	Parking aid sender, front right	E266	Contact switch for parking aid
G253	Parking aid sender, front right centre	K136	Parking aid warning lamp
G254	Parking aid sender, front left centre	K159	Parking aid warning lamp
G255	Parking aid sender, front left	J218	Combination processor in dash panel insert
H15	Warning buzzer for rear parking aid	J446	Control unit for parking aid
H22	Warning buzzer for front parking aid		



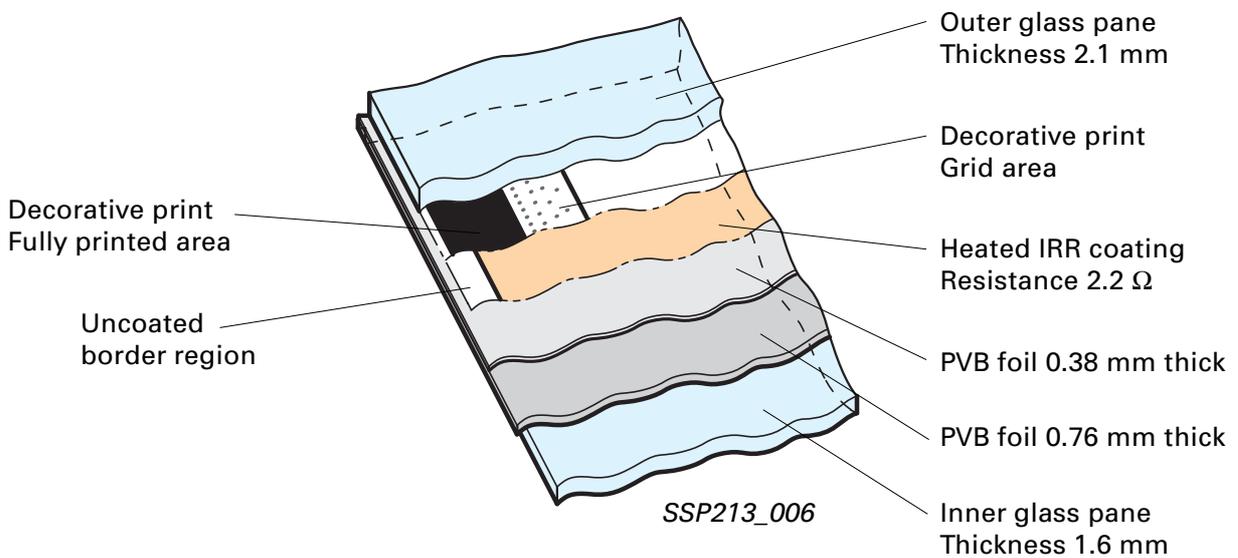
The function display in the parking aid switch is lit continuously when the parking aid is active. If a fault occurs in a converter or tone generator, the function display flashes at a frequency of 2 Hz.

Windscreen heater

Function

The windscreen is not heated like the rear window, i.e. by means of individual wires. It is heated by a metal foil sandwiched between the windows.

Windscreen – schematic diagram of layered structure



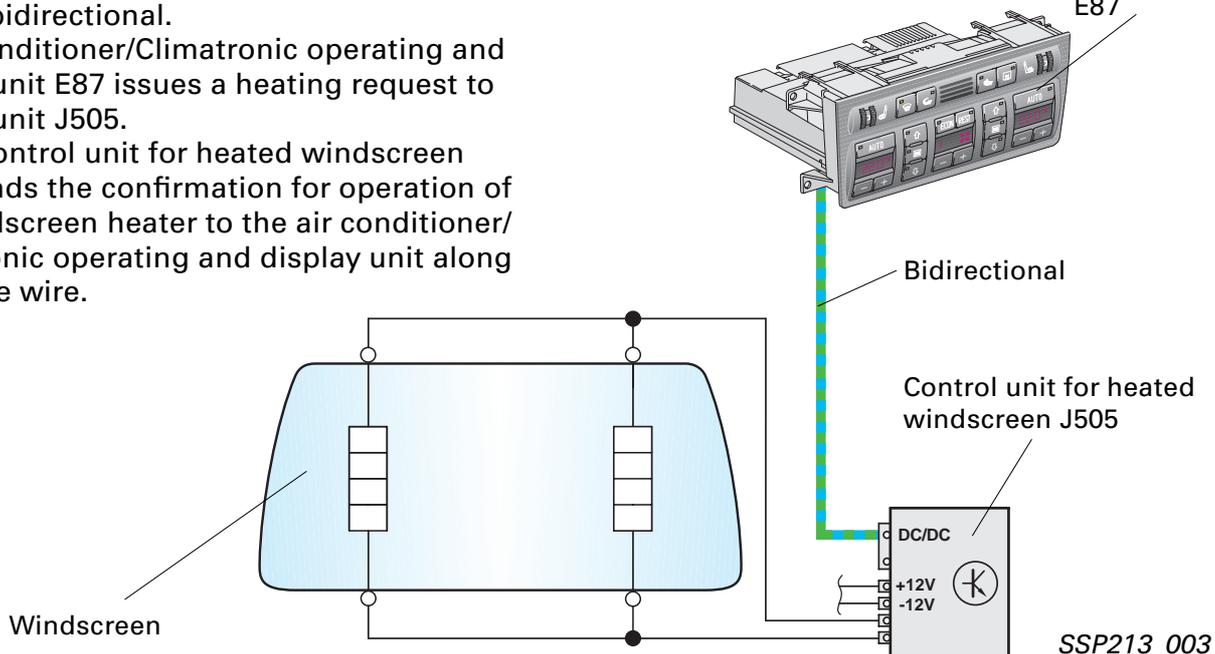
Communication between the air conditioner/ Climatronic operating and display unit E87 and the control unit for heated windscreen J505 is bidirectional.

Air conditioner/Climatronic operating and display unit E87 issues a heating request to control unit J505.

The control unit for heated windscreen J505 sends the confirmation for operation of the windscreen heater to the air conditioner/ Climatronic operating and display unit along the same wire.

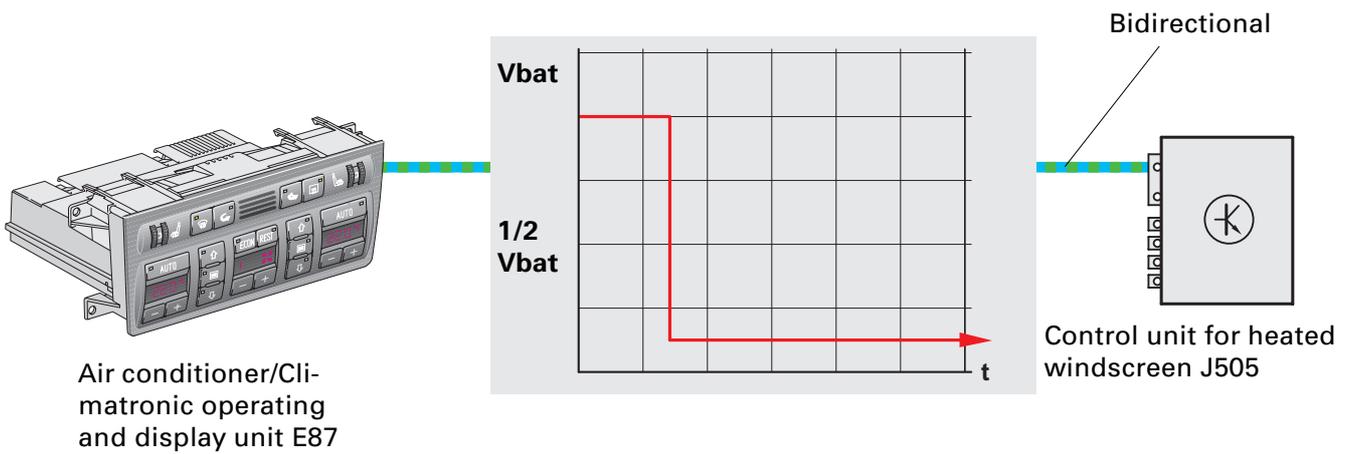
Electrical circuit

Air cond./Climatronic operating and display unit E87



Signal shape of heating request issued by air conditioner/Climatronic operating and display unit E87

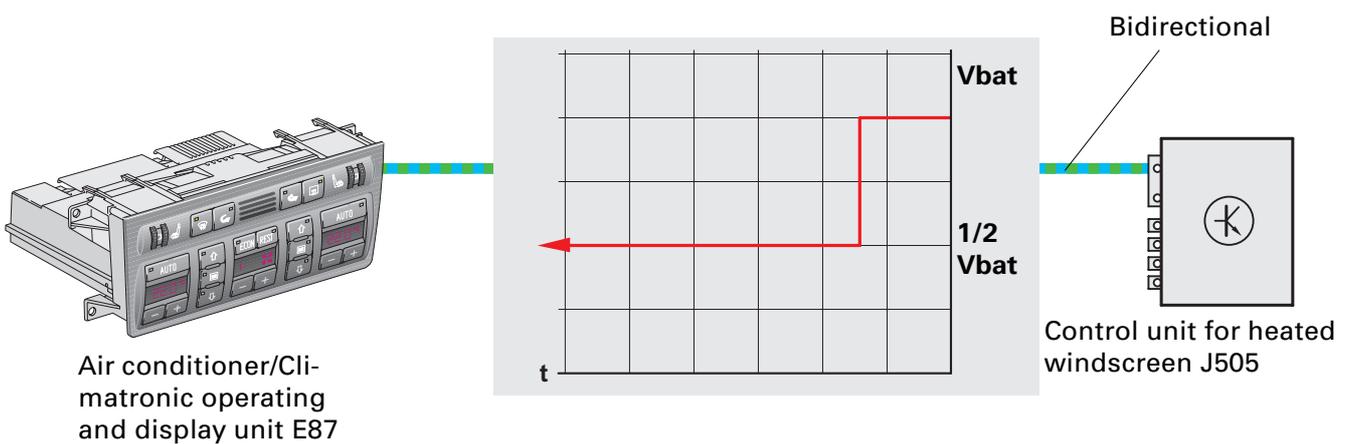
The air conditioner/Climatronic operating and display unit sends a Low signal to the control unit for heated windscreen J505 as a heating request.



Signal shape of windscreen ready for heating as well as heating by the control unit for heated windscreen J505

The control unit for heated windscreen J505 signals when the windscreen heating is ready in the form of a Vbat signal.

Windscreen heating On is implemented by a 1/2 Vbat signal.



The following ambient conditions are required to operate the windscreen heater:

Switch-on functions/conditions

“Automatic” setting on air conditioner/Climatronic operating and display unit:

- Engine running
- Ambient temperature $< +5^{\circ}\text{C}$
- Air conditioning system in the Heating mode
- Vent temperature $< +35^{\circ}\text{C}$
- Heating period dependent on ambient temperature
at $0^{\circ}\text{C} \sim 2 \text{ min.}$ and $-20^{\circ}\text{C} \sim 4 \text{ min.}$
- Limitation of fresh air blower voltage to 4 volts
- Operating state is not indicated
- Switch off after exceeding one of the values $< +5^{\circ}\text{C}$ and $< +35^{\circ}\text{C}$ or max. 4 min.



“Defrost” setting

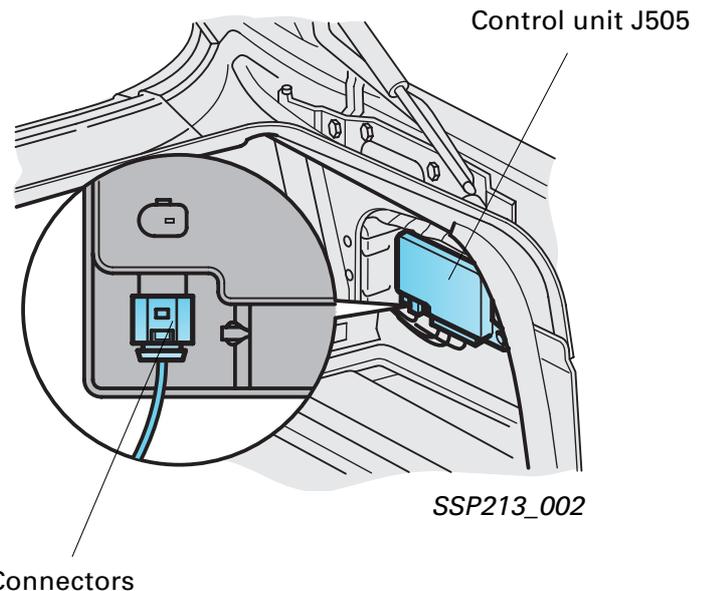
on air conditioner/Climatronic operating and display unit:

- Engine running
- Ambient temperature $< +5^{\circ}\text{C}$
- Heating period dependent on ambient temperature
- Limitation of fresh air blower voltage to 7 volts
- In the operating state, the LED in the Defrost button flashes or the Defrost symbol is displayed in the fresh air blower speed.

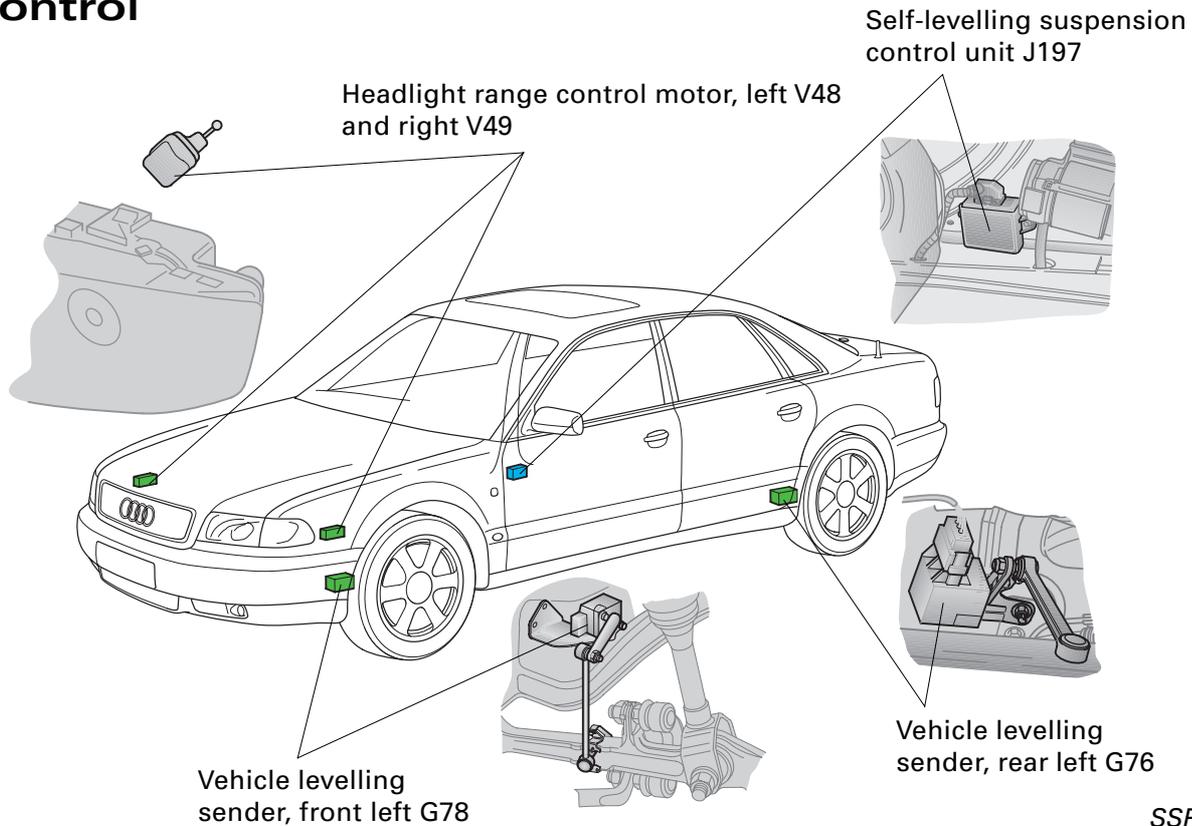
The windscreen heater cannot be activated in the switch position “ECON” on the air conditioner/Climatronic operating and display unit.



If the windscreen is damaged by external influences (e.g. cracked by stone chips), the windscreen heater must be shut down immediately. To avoid causing the air conditioning system to malfunction, the connection to the windscreen heater control unit must be interrupted. The connector must be disconnected from the windscreen heater control unit.



Dynamic headlight range control



A headlight cleaning system and automatic headlight range control are compulsory requirements for vehicles with gas discharge headlights.

The system comprises the following components:

- Vehicle levelling sensors at front and rear axles
- Control unit for headlight range control
- Control motor for left and right gas discharge headlights

The automatic, static headlight range control fitted previously automatically adapts the angle of inclination of the light beam emerging from the headlight to the load state of the vehicle.

When the vehicle is stationary with the ignition turned on, headlight range control is activated and set to the initial position.

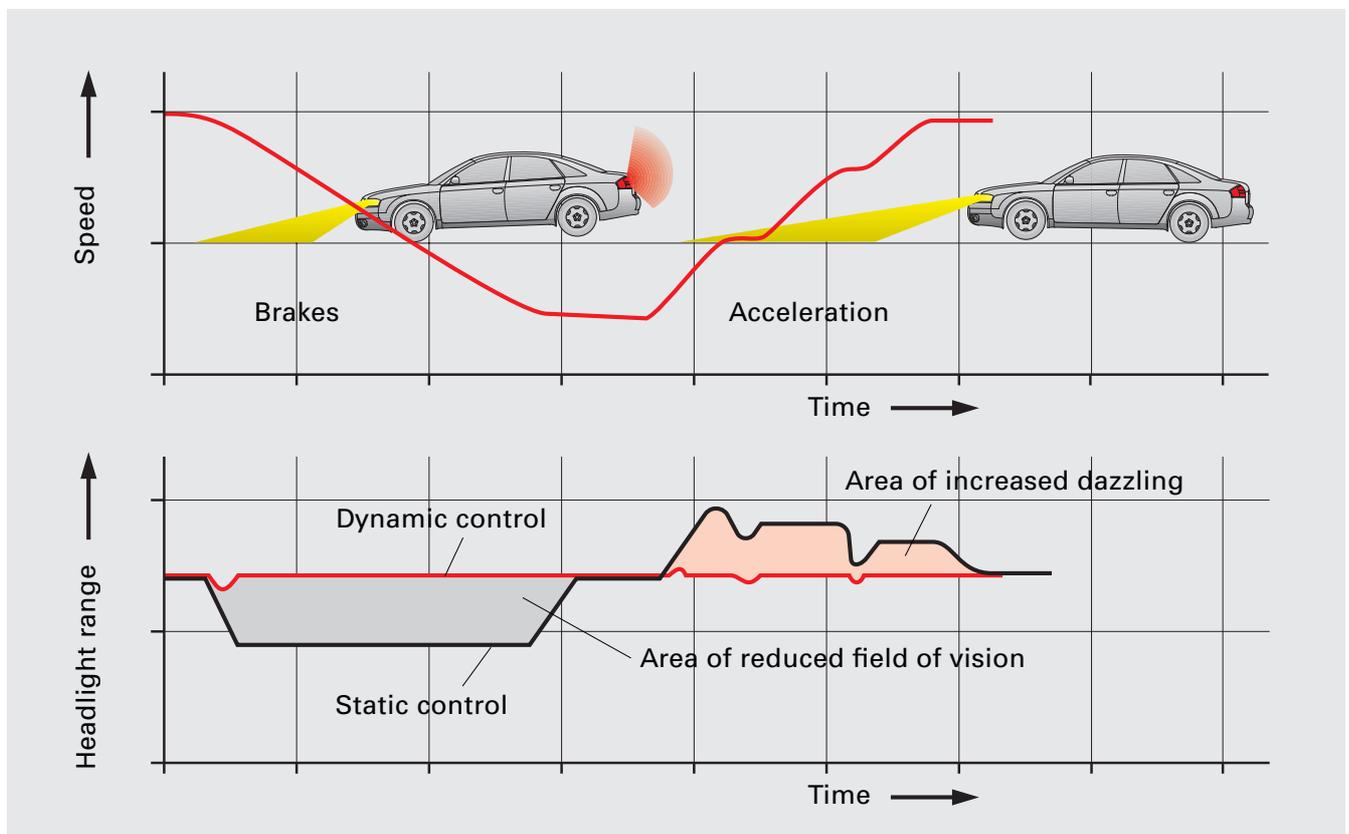
The dynamic control also operates as a quasi-static system until the dipped beam headlight is switched on, i.e. the angle of inclination of the light beam is slowly adapted depending on the vehicle's inclination.

Vehicle level sensors (1 apiece) at the front and rear axles supply a signal indicating the bumped state of the springs. The inclination setting of the emerging light beam is calculated from the difference between these two input signals in the control unit for headlight range control to provide optimum road illumination.

A signal proportional to the vehicle road speed is evaluated in the control unit, defining the control characteristic of the dynamic headlight range control.



Comparison of static and dynamic headlight range control



SSP213_078

Control is vehicle-specific. The mode of operation of the headlight range control adjusters is adapted to the vehicle's operating state.

A short reaction time is required in dynamic driving situations, such as braking and accelerating. At a constant road speed, the system reacts slowly.

The reaction times of the system are defined by a variable electrical filter. It is also responsible for absorbing fault signals such as bumps and pot-holes for example.

The control unit has self-diagnostic capability and can be adapted specifically to the vehicle through the diagnosis interface.

A faulty headlight range control system is indicated by an indication in the dash panel insert.

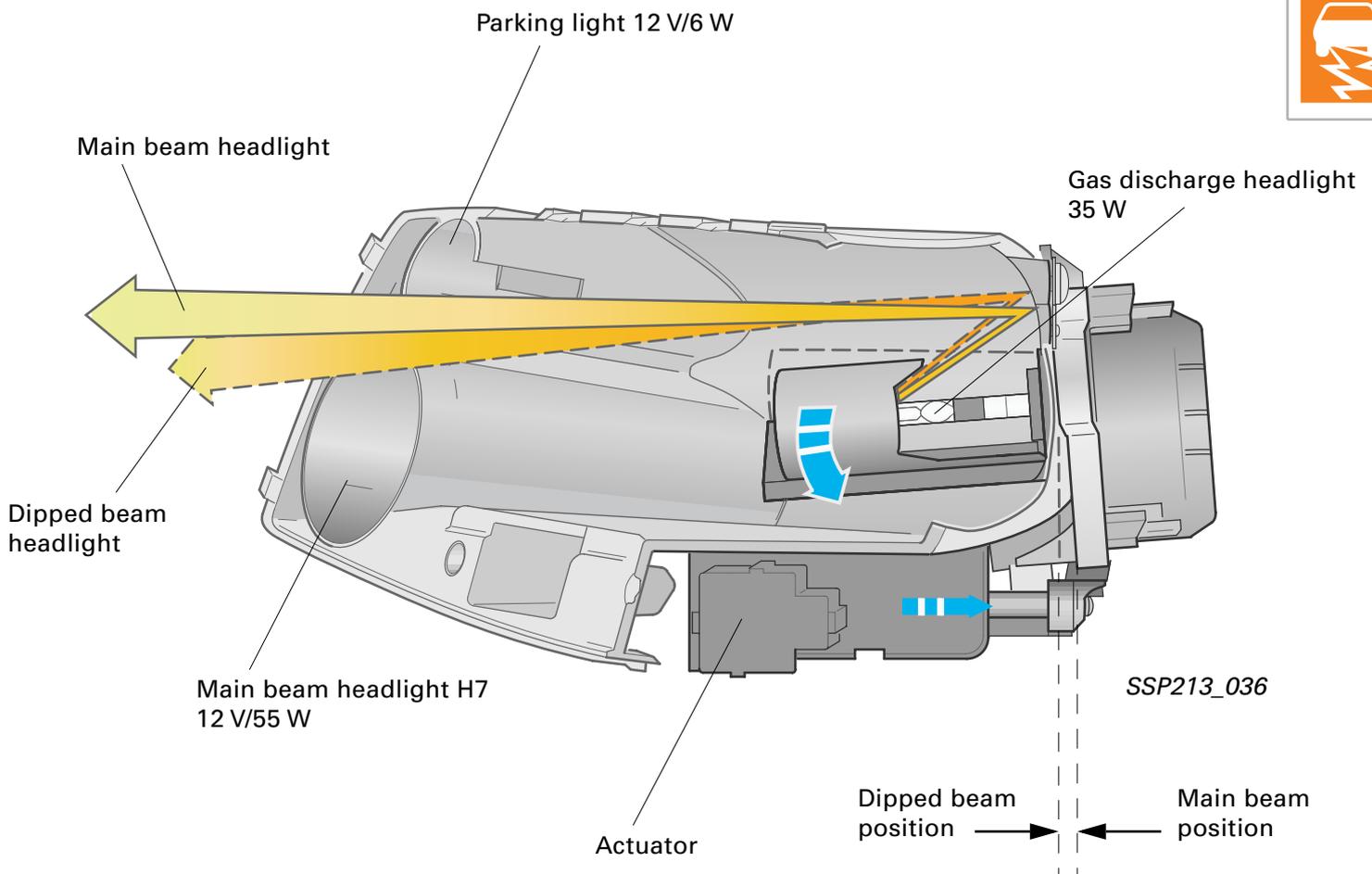
Gas discharge headlight system

Both the dipped beam and main beam are produced by only one gas discharge headlight.

When the dipped/main beam switch is operated, an actuator brings the gas discharge headlight in the reflector into two different positions which define the emitted light cone for the main or dipped beam headlight.



The additional halogen headlight fitted with an H7 lamp provides long-range illumination and acts as a flasher when the light is not switched on.



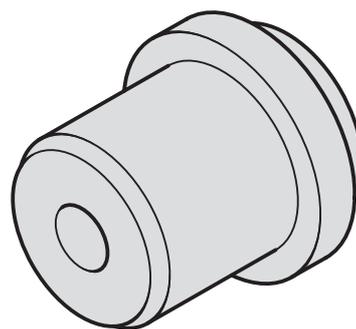
Service

Special tools

Pressure piece

for crankshaft sealing ring

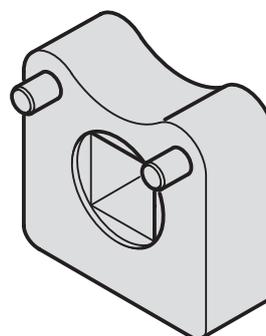
Order No.T40007



SSP213_007

Tensioning roller key

Order No.T40009



SSP213_008

Camshaft retainer

Order No.T40005

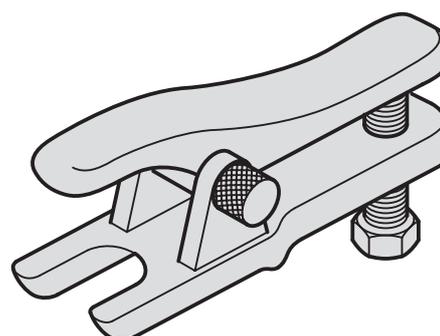


SSP213_009

Extractor for aluminium support link

Swing arm

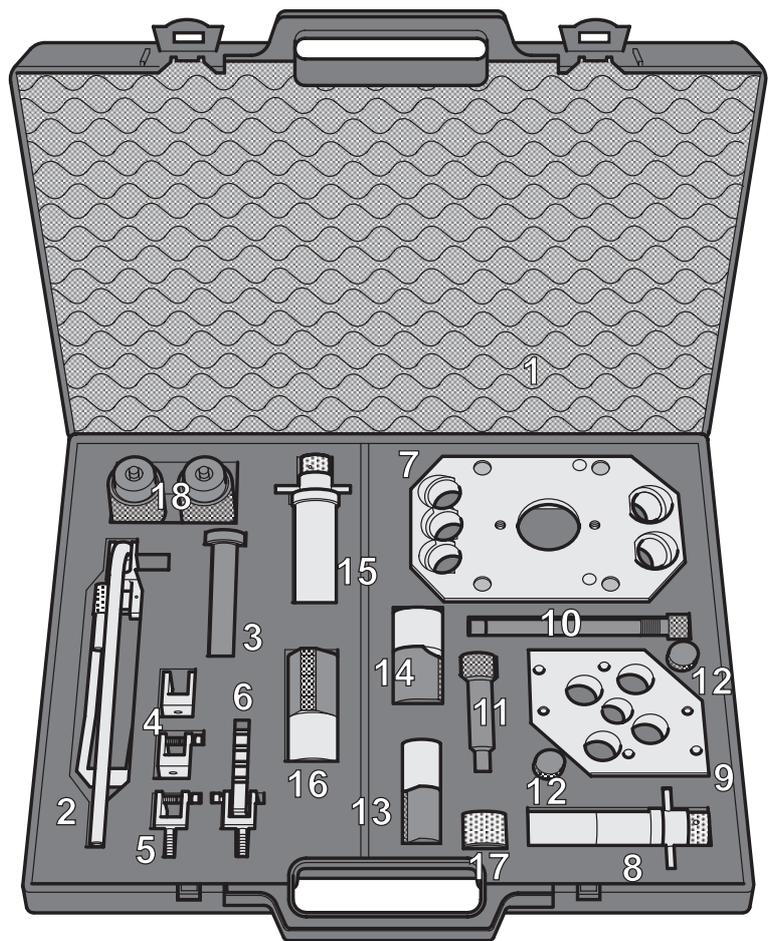
Order No.T40010



SSP213_010



**Removal/assembly device VAS 5161 for
valve repair**
(all VW/Audi engines)

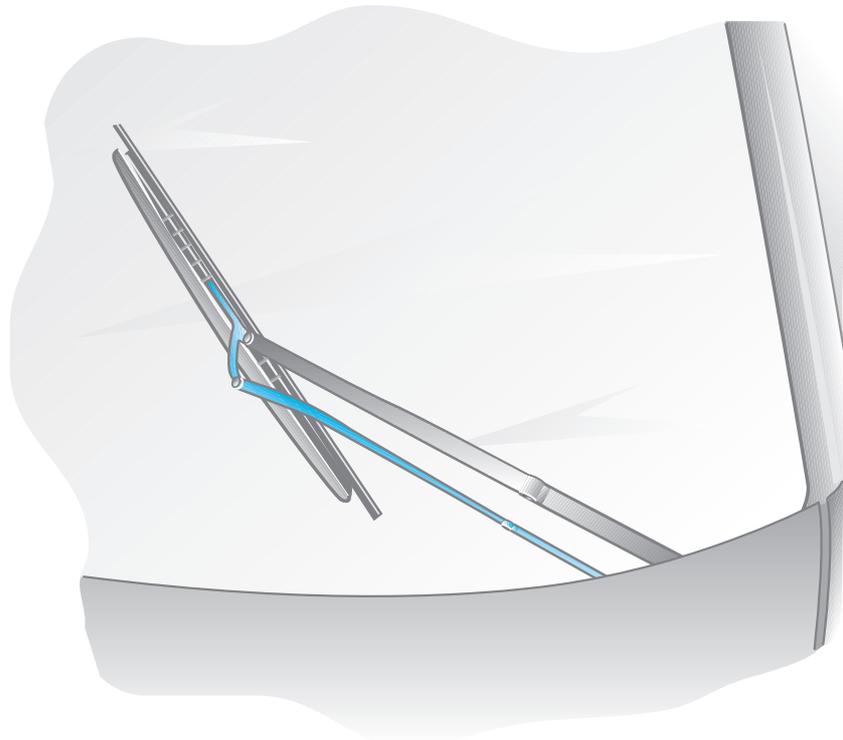


SSP213_016

VAS 5161/ 1	1	Case
VAS 5161/ 2	1	Thrust fork with lever for mounting cartridge
VAS 5161/ 3	1	Drift
VAS 5161/ 4	2	Interlocking fork M6/M8
VAS 5161/ 5	2	Interlocking fork M6/M8 with threaded bolt
VAS 5161/ 6	1	Grid
VAS 5161/ 7	1	Guide plate, dia. 22, for V8 - 5 V
VAS 5161/ 8	1	Assembly cartridge, dia. 22, for 4-cyl. 5 V / 6 cyl. - 5 V / V8 - 5 V / V 6 - TDI 4 V
VAS 5161/ 9	1	Guide plate, dia. 22, for V6 - TDI 4 V
VAS 5161/10	1	Sealing pin for VAS 5161/9
VAS 5161/11	1	Adapter for compressed air connection
VAS 5161/12	2	M6 knurled head screw
VAS 5161/13	1	Guide bush, dia. 22 / 5-valve engines, intake valve
VAS 5161/14	1	Guide bush, dia. 22 / 5-valve engines, exhaust valve
VAS 5161/15	1	Mounting cartridge, dia. 30 / 2-valve engines
VAS 5161/16	1	Guide bush, dia. 30 / 2-valve engines
VAS 5161/17	1	Spacer ring, dia. 22 for assembly cartridge (V 6 - TDI 4 V)
VAS 5161/18	1	Valve insertion device (6 dia. - 7 dia.)



Wiper system



SP213_024

The windscreen wiper system used on the Audi A8 has been redesigned on the driver's side.

The purpose of the revision is to reduce noise levels. This was achieved by using a modified wipe operation.

The wiper blade has an additional pivot point on the windscreen wiper arm which allows it to turn into the headwind earlier.

The noise level is modified with the support of the wind deflector plate and the associated change in the air flow.

The midpoint of the wiper blade continues to follow an orbital path. The path of the wiper blade ends on the other hand is defined by the additional pivot point.

The wiper blade tip initially accelerates more quickly to allow it to end the wipe cycle slowly.

The wiper blade achieves a better, aerodynamic working position in this way.

Notes

Outlook '99

AL 2

Tyre pressure monitoring

TT Roadster

CVT gearbox

Common Rail

V8 5 V engine