

TSS 2. Generation, "AUDI B6 / C6"

Tire Safety System TSS 2nd. Generation, "AUDI B6 / C6"

Dept. BEE



Bedienungsanleitung TSS 2. Generation, "AUDI B6 / C6" <i>User Manual 2nd Generation "TSS AUDI B6 / C6"</i>	Dokument Nr.: Document no.:	Änderungsstand: Status of modification:	Index: Index:
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b	00	Maintenance of WE transmitting power according to FCC	Saric/ 11.05.04	Köninger/ 11.05.04	Denzler/ 11.05.04
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1 System and Functional Description

Section 15.19: Labeling requirements

This device complies with Part15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Section 15.21: Information to the user

The user manual or instruction manual for an intentional or unintentional radiator shall caution the user that makes changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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1.1 System Description

The Tire Safety System (TSS) controls and monitors tire pressures.

The system comprises the following components:

B6 System:

- 1 TSS control unit
- 4 sets of wheel electronics including valve
- 1 digital antenna

C6 System, Low Line variant:

- 1 TSS control unit
- 4 sets of wheel electronics including valve
- 1 digital antenna

C6 System, High Line variant:

- 1 TSS control unit
- 4 sets of wheel electronics including valve
- 1 digital antenna
- 4 trigger transmitters

The system's primary function is to monitor tire pressure during travel.

An electronic mechanism mounted inside the tire measures tire pressure and temperature at regular intervals and transfers the values telemetrically via a HF transmission line to a reception antenna. In the receiver antenna, the radio data telegram is decoded and transferred to the control unit as a digital signal. The control unit evaluates the received data and forwards the information to the driver as required. This provides the driver with information on the necessary tire pressure or tire tension adjustments.

The C6 High Line System also offers a bi-directional communication with the wheel electronics (trigger function).

The benefits offered by the tire pressure control system are:

- **Safety**
An early warning signal is triggered on sudden pressure loss.
"Blow-outs" caused by excessive flexing and then driving on inadequate tire pressure are avoided.
The driver is prompted to adjust the tire pressure where necessary.
- **Comfort**
Tire handling is made simple. Using filling equipment at the fuel station and removing the valve cap is necessary only for correcting the tire pressure.
- **New tire developments**

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Tires with limp-home features avoid having to change a wheel immediately and render the spare wheel superfluous. They do, however, require permanent monitoring of the tire pressure.

- Service life and economy
Tire wear is minimized through correct air pressure.

The essential additional function is the self-learning system enabling the vehicle to detect individual wheels (individual wheel detection). The C6 High Line System also detects the installed position of the individual wheels (wheel position detection).

This enables the system, during normal driving operation, to clearly assign the wheels to the wheel position and set the required reference pressures without operator intervention.

Optional additional functions relate to tire pressure monitoring when stood still:

- early warning of bursts prior to setting off (C6 HighLine System only)

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2 Functional description

The wheel electronics are mounted within the tires and measure tire pressure, temperature and wheel electronics. The measured data is sent from the wheel via a send stage in the wheel electronics. A system with relatively seldom measured data transfer is adequate for tire pressure monitoring provided it features the additional option of detecting sudden pressure loss. This enables the electronics in the wheel to be designed for minimum power draw and battery operation.

All wheel electronics have their own code (ID) that is forwarded with the data at each transfer. The HF transfer occurs in the 433 MHz range, referred to as the ISM range and/or in some countries in the 315 MHz range. The trigger functionality of the C6 High Line System is achieved by a 125kHz LF channel.

All wheel electronics send measured values every 30 seconds if it detects a radial acceleration > 11 g (vehicle moving). The wheel electronics send no data when the vehicle is stood. With the C6 High Line system, the wheel electronics are called-up for sending data messages by the control unit via the trigger sender every 54 s. Tire pressure and wheel electronics temperature are also measured every 3 seconds. When a pressure loss 0.2 bar on the last send pressure value is detected, the wheel electronics switch immediately to fast-send mode. In this situation, the wheel electronics measure and send every 0.8.

The TSS measures and transfers considerably more data than is necessary to ensure reliable basic function. It can therefore use a data transfer path that is not assigned for the error-free transfer of each individual data protocol. The B6 and C6 LowLine systems send measured data from wheel to vehicle using a unidirectional HF transfer. During this HF transfer, data messages can be destroyed by incidental, external interference sources or through statistical fluctuations of the receive amplitude due to varying receive relationships in the wheelhouse for wheel rotation and wheel position. The C6 High Line system employs the trigger functionality and requests again an implausible and/or non-received data message from the corresponding wheel electronics.

The data sent by the wheel electronics are received via the digital antenna and decoded. The decoded data are transferred onwards to the control unit via a digital interface (LIN interface). In the B6, the antenna is installed in the rear bumper, in the C6, in the roofliner.

The control unit evaluates the received data and forwards the information to the driver information system as required. This provides the driver with information on the necessary tire pressure or tire tension adjustments.

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The main functional characteristics of the control unit are:

- A central warning algorithm and an algorithm for the wheel manager
- The vehicle-specific connection for the power supply system and manufacturer-specific operation and display philosophy

The essential feature of wheel management is the self-learning system with automatic individual wheel detection. The HighLine system also detects the installed position of the individual wheels (wheel position detection).

This enables the system, during normal driving operation, to clearly assign the wheels to the wheel position and set the required reference pressures without operator intervention.

Thanks to fast triggering of the wheel electronics when T 15 is ON, the HighLine system detects a flat tire well before the start of a journey.

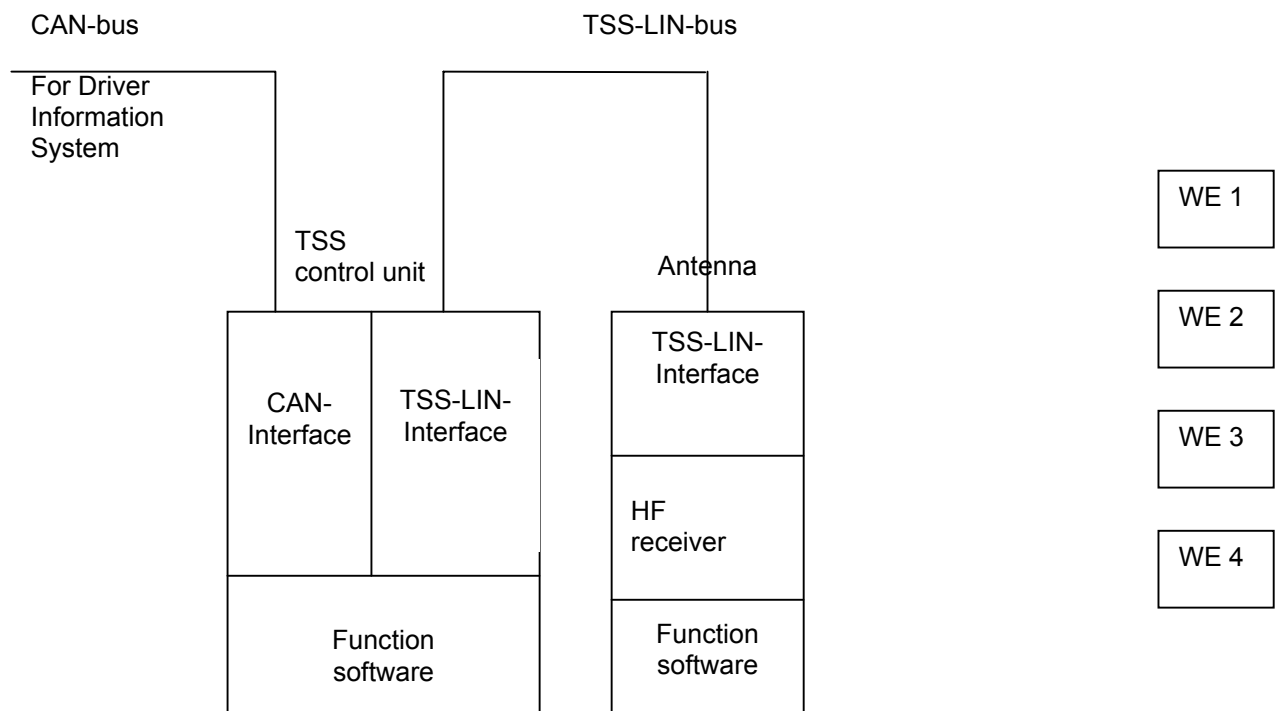


Figure 1: Modular mimic display, 2nd Generation TSS System B6/ C6 LowLine

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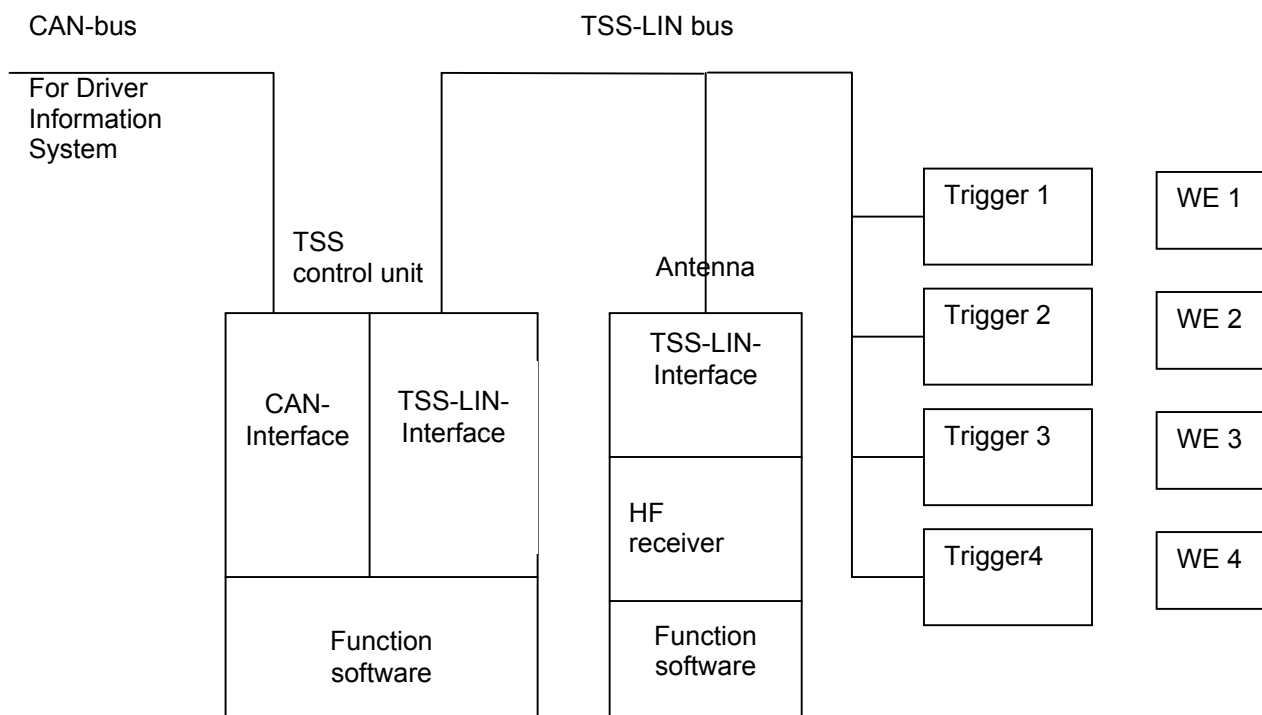


Figure 2: Modular mimic display, 2nd Generation TSS System C6 HighLine

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3 Warning algorithm

The reference pressures to be monitored can be notified to the system by 2 different methods.

- Reference pressure specified via tabulated value
- Reference pressure specified by calibration

If reference pressures are specified via tabulated values, the reference pressures to be monitored are placed in a table.

If reference pressures are specified via calibration, the driver instructs the system through a calibration command to accept the actual measured pressure as the reference pressure value (calibration can be started by pressing a key or selecting a menu item).

The value is accepted for a specific position once the positions of the wheels are detected and confirmed. The defined reference pressure is verified by the system for plausibility of the pressure values prior to acceptance (comparison by axle of reference pressures with HighLine, minimum pressure).

The tire pressure changes only slowly during normal operation. A gradual pressure drop through diffusion is typical. A sudden pressure loss occurs only in isolated cases. Spontaneous blow-outs without previous history are extremely rare; in this case the driver will notice the reaction of the vehicle before even the fastest monitoring system can trigger a warning.

The calculation of the warning limits uses the isochoric relationship between pressure and temperature and thus enables the same warning precision to be achieved over a wide temperature range.

In the case of slow temperature changes, the temperature of the wheel electronics is equivalent to the average air temperature of the tire. The temperature of the wheel electronics can therefore be used to calculate the isochoric linears. In the case of sudden temperature changes (e.g. due to heavy braking), the temperature of the wheel electronics is higher than the average air temperature of the tires due to the improved thermal coupling at the rim. This correlation is considered in the control unit and corrected.

The tire temperature is considered in the comparison between current tire pressure and reference pressure (isochoric evaluation, see Annex 1). During calibration, the system uses reference pressure and temperature to calculate valid reference values for the current tire temperature. There are two distinct warnings to indicate low pressure:

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- **"Reminder" or soft warning**

The "Reminder" operating status indicates low tire pressure, where driving safety remains guaranteed. At the next "ignition on", the driver is requested to correct the pressure at the earliest opportunity (soft warning, "Check tire pressure" message).

- **"Breakdown" or hard warning**

The "Breakdown" operating status indicates that driving safety is no longer guaranteed. The driver is requested to stop and check the condition of the tires. It is the driver's responsibility to decide whether to continue the journey to the next repair station at low speed or carry out the repair there and then.

If the limit values are underrun, the control unit will send the corresponding signals to the Driver Information System in dependence of the pressure deviation.