Self-study programme 307

The Touran
Electrical system

Design and function
The networking technology, used until now only in luxury class vehicles, will be a feature in compact vans, such as the Volkswagen Touran.

The control units installed in this system also manage tasks that were previously carried out by relays and switches. In order that these tasks can be fulfilled efficiently, the units have to exchange a great deal of information (data) between each other. Such a high rate of data transfer would only be possible with a large number of cables if standard means were used, such as wiring connections.

To keep the number of wiring connections at a manageable level, Volkswagen favours the use of data bus connections on a wider scale.

This self-study programme is designed to help you better understand the networking concept of the Volkswagen Touran.

It covers the allocation of control units to the various data bus systems, the fitting locations of relay slots, fuses and control units. Furthermore, it describes the various functions of and changes to the diagnosis system.
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Introduction

Fuse boxes and relay slots in vehicle’s electrical system

Fitting locations
The onboard power supply of the Touran is decentralised. For this reason, the fuse boxes and relay slots are installed at various locations in the vehicle.

The adjacent diagram shows the various fitting locations.
Fuse box on left under dash panel

Relay carrier on left under dash panel

Relay carrier on onboard power supply control unit on left under dash panel

Fuse box on left under dash panel
The networking concept

Overview of networked control units

In order that data can be transferred between the control units, these are networked via various data bus systems.

The data bus diagnosis interface J533 (gateway) provides the interface for the data buses:

- Drive train CAN data bus
- Convenience CAN data bus
- Infotainment CAN data bus
- Dash panel insert CAN data bus
- Diagnosis CAN data bus

In addition to the CAN data bus, a number of electric components are networked via the LIN data bus.

The data protocols have been changed. Therefore, these control units cannot be exchanged with those of other vehicle models e.g. Touareg or Phaeton.
**Key**

- **E221** Operating unit in steering wheel
- **G85** Steering angle sender
- **G273** Interior monitoring sensor
- **G384** Vehicle inclination sensor
- **G419** ESP sensor unit
- **H8** Anti-theft alarm signal horn
- **J104** ABS with EDL control unit
- **J136** Seat adjustment control unit
- **J162** Heating control unit
- **J217** Autom. gearbox control unit
- **J220** Matronic control unit
- **J234** Airbag control unit
- **J255** Climatronic control unit
- **J285** Control unit with display in dash panel insert
- **J345** Trailer detector control unit
- **J386** Door control unit, driver side
- **J387** Door control unit, front passenger side
- **J388** Door control unit, rear left
- **J389** Door control unit, rear right
- **J393** Convenience system central control unit
- **J400** Wiper motor control unit
- **J412** Cellphone electronics control unit
- **J431** Headlight range control, control unit
- **J446** Parking aid control unit
- **J500** Power steering control unit
- **J503** Control unit with display for radio and navigation
- **J519** Onboard power supply control unit
- **J525** Digital sound package control unit
- **J527** Steering column electronics control unit
- **J533** Data bus diagnosis interface
- **J584** Wiper motor control unit front passenger side
- **J587** Selector lever sensors control unit
- **J604** Auxiliary air heater control unit
- **R** Radio
- **R78** TV tuner
- **T16** Diagnosis connection
Control units and fitting locations

The adjacent diagram shows the control units that belong to the drive train CAN data bus and associated fitting locations.

The data is transferred at a speed of 500 kbit/s. Transfer is made via the orange/black CAN high line and orange/brown CAN low line. To make data transfer more efficient, the CAN lines are entwined.
Control unit for headlight range control J431 on left under dash panel, on tunnel support.

Automatic gearbox control unit J217 in wheel housing.

data bus diagnosis interface J533 under dash panel, above relay carrier.
Introduction

The control units in the drive train CAN data bus

Control units and fitting locations

Shown in the diagram are the control units of the convenience CAN data bus and their fitting locations.

The speed of data transfer is 100 kbit/s.
The data is transferred via the orange/green CAN high line and orange/brown CAN low line. Both CAN lines are entwined together.

- Climatronic control unit J255 in centre console
- Convenience system central control unit J393 on right under dash panel, near centre console
- Steering column electronics control unit J527 on steering column switch
- Climatronic control unit J255 in centre console
Parking aid control unit J446 in rear right side part

Trailer detector control unit J345 in rear right side part

Onboard power supply control unit J519 under dash panel, on relay carrier

Door control units J386, J387, J388, J389 in doors

data bus diagnosis interface J533 under dash panel, above relay carrier
The control units in the infotainment CAN data bus

Control units and fitting locations

The control units of the CAN data bus and fitting locations are shown in the adjacent diagram.

The infotainment CAN data bus transfers data at a rate of 100 kbit/s. The CAN high line is orange/purple and the CAN low line is orange/brown. Both CAN lines are entwined together.

Cellphone operating electronics control unit J412 on front right in footwell

Heater control unit J162 on front right under wing
Control unit with display for radio and navigation J503 or Radio R in centre console
The control units in the dash panel insert CAN data bus and in the diagnosis CAN data bus

**The dash panel insert CAN data bus and the diagnosis CAN data bus are new data bus connections in the Volkswagen Touran.**

**Dash panel insert CAN data bus**
The data bus transfers data from the dash panel insert to the data bus diagnosis interface. The control unit with display unit in the dash panel insert and the data bus diagnosis interface are the only control units attached to this data bus.

**Diagnosis CAN data bus**
Data transfer between the diagnosis connection T16 and the data bus diagnosis interface is via the diagnosis CAN data bus.

**Rate of data transfer**
The rate at which data is transferred is 500 kbit/s for both CAN data buses.
data bus diagnosis interface J533 under dash panel, above relay carrier

T16 Diagnosis connection on left in footwell
LIN data bus

The LIN data bus as sub data bus system

General description
A sub data bus system connects control units with their electrical components. Among these components are, for example, control units, switches, sensors, actuators etc. This type of connection and data transfer is used in the Volkswagen Touareg for a number of systems.

As a sub data bus system, the LIN data bus has an advantage in cost. The designation LIN stands for local interconnect network, and it means that all the associated electrical components are within a set and limited area of the vehicle.

It is possible for a number of LIN data bus systems to be installed in a vehicle. They will each have different functions to perform. A LIN data bus system consists of a master control unit and one or more slave control units.

The master control unit is also networked with other control units (apart from slave control units) in the vehicle via the CAN data bus. This permits the transfer of data to other LIN data bus systems and other CAN data bus control units.

LIN data bus system

data bus diagnosis interface J533
**Data transfer**

The data is transferred at a speed of 1 kbit/s to 20 kbit/s. The rate of data transfer is therefore a maximum of 20% of the rate for convenience or infotainment CAN data buses and is fixed in the software of the LIN master.

This transfer is made via data leads that are violet in basic colour with a white identification mark. The cross section of the wire is 0.35 mm². The LIN data bus is a single wire bus. The data lead is not screened.

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**Signal level**

The signal level of the LIN data buses is either close to battery voltage (UB) (recessive level) or earth (0 Volt) (dominant level).
**Master control unit**

The control unit connected via the CAN data bus system performs the master functions in the LIN data bus system.

Among these master functions are:

- Data conversion of LIN data bus messages to the data format used by the CAN data buses, if and when these messages are required.
- The control of data transfer in the LIN data bus and monitoring of the data transfer rate.
- The transfer of diagnosis data to the LIN slave control unit.

The transfer of data between master and slave is always initialised by the master. A slave is not capable of communicating independently.
**Slave control unit**

The slave function could be taken on by control units such as the multi-function steering wheel, actuators such as the anti-theft alarm horn or sensors such as the vehicle altitude sensor.

The electronics integrated in the slave control unit evaluate the driver's input via the operating unit buttons in the steering wheel, they convert the input into digital information e.g. "radio louder" and send it when required to the master control unit via the LIN data bus.

The sensors also have electronics that transfer the measured values digitally to the master control unit.
Onboard power supply

The electrics box

Fitting location

The electrics box can be found on the left in the engine compartment.

Description

All fuses and relays that safeguard or control components in the engine compartment, are housed in the electrics box (E box).

A wiring guide to the interior and back is therefore no longer necessary. Fault finding is simplified, safeguarding is adapted more effectively to the consumers and multiple assignment of fuses is largely avoided.

Electrics box

![Electrics box image](S307_012)
**Electrics box**

In addition to the fuses for components in the engine compartment, the electrics box has the following relays:

- Power supply relay terminal 15 J329
- Power supply relay terminal 50 J682
- Glow plug relay J52
- Motronic power supply relay J271
- Power supply relay J317

**Back-up fuse box**

The back-up fuse box houses fuses for the following:

- Alternator,
- Electro-mechanical power steering,
- Radiator fan,
- Auxiliary heater.
The relay carrier and the fuse box in the interior

Fitting location
In the interior, on the left under the dash panel, you can find the relay carrier, the relay carrier on the onboard power supply control unit and the fuse box.
**Relay carrier**

The relay carrier accommodates additional relays and fuses from optional extras in the vehicle.

**Relay carrier on onboard power supply control unit**

The following relays can be found on the onboard power supply control unit relay carrier.

- Power supply relay terminal 30G
- Heated rear window relay J9
- Horn relay J413
- Double washer pump relay 1 (front) J729
- Double washer pump relay 2 (rear) J730
- X contact relief relay J59

**Fuse box**

Included in the fuse box are the fuses for the electrical components in the vehicle.

For the latest terminal assignment details about the fuse box, please refer to ELSA.