

Audi A2 2001 ➤

Running gear self-diagnosis for ESP, steering

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List of Workshop Manual Repair GroupsList of Workshop Manual
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Repair Group

01 - Self-diagnosis, Electrical check

Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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01 - Self-diagnosis, Electrical check

1 - Self-diagnosis

1.1 - Self-diagnosis

1.2 - General notes on self-diagnosis

Systems with self-diagnosis capability feature a control unit which detects faults whilst driving and stores them in a fault memory, where the information is retained even in the absence of battery voltage.

The self-diagnosis relates to the electrical/electronic section of a system, i.e. faults are only recognised if they affect electrical signals.

Self-diagnosis provides assistance with specific fault-finding. The self-diagnosis functions can be implemented using fault reader V.A.G 1551/1552 or vehicle system tester VAS 5051. This involves an exchange of data between the fault reader and the appropriate control unit. In other words, communication must be possible between the two.

The diagnostic connector is the interface for communication between the control unit and fault reader.

Start the fault-finding procedure by connecting the fault reader to the diagnostic connector. Then establish the communication link with the control unit of the system concerned => Page 2.

When the communication link has been established, the fault-finding functions provided by the system being tested can then be selected. The functions take the form of program sequences specified within the framework of self-diagnosis. Their applications are described in the appropriate Sections of this Workshop Manual. After first checking the control unit version, start with function 02 "Interrogating fault memory" =>Page 59.

The faults stored are indicated on the display of the fault reader. The fault information can be used to consult fault tables indicating possible causes and appropriate remedies. These fault tables are contained in the relevant Workshop Manual Sections.

The self-diagnosis function distinguishes between "static" and "sporadic" faults. If a fault which has been stored in the memory as a "static" fault is no longer present when the ignition is switched on, it is converted into a "sporadic" fault.

Sporadic faults are marked as such by "/SP" on the right of the tester display.

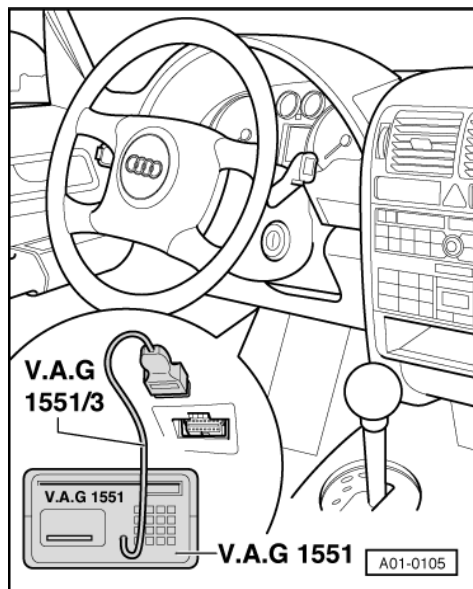
A sporadic fault is erased automatically if it no longer occurs over a certain number of driving cycles.

Static faults remain stored in the fault memory until the memory is erased with the fault reader.

If a control unit has to be replaced, first interrogate the control unit version. This appears on the display together with the code when communication has been established between control unit and fault reader.



1.3 - Connecting fault reader V.A.G 1551 and selecting address word



Use can also be made in place of the fault reader V.A.G 1551 of the vehicle system tester V.A.G 1552 or the vehicle diagnostic, testing and information system VAS 5051. Information cannot however be printed out when using the vehicle system tester V.A.G 1552.

Notes:

- ♦ ABS function is deactivated in control unit during self-diagnosis. ABS warning lamp -K47 flashes.
- ♦ Fault memory can be erased following completion of repair work and fault memory interrogation.
- ♦ Pay attention to test requirements for system concerned.

- -> With ignition switched off, use cable V.A.G 1551/3 to connect fault reader to diagnostic connector, which is located on left on underside of dash panel.

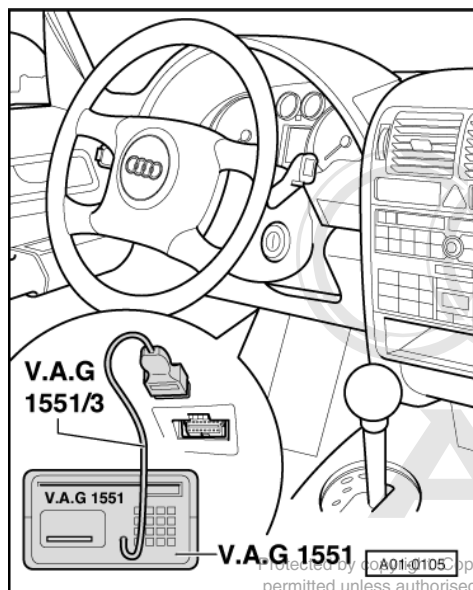
-> Indicated on display:

V.A.G self-diagnosis HELP
1-Rapid data transfer 1)
2-Flash code output1)

1) Displayed alternately

Notes:

- ♦ Check connections of diagnostic connector if display remains blank.



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=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ◆ Switch on printer by pressing PRINT key. Lamp in Print key lights when printer is on.
- ◆ Depending on the program, additional operating instructions can be printed out by pressing HELP key on V.A.G 1551.
- Switch on ignition.
- Press Print key on fault reader to switch on printer.
- Press key 1 for "Rapid data transfer" mode.

-> Indicated on display:

Rapid data transfer	HELP
Enter address word XX	

Note:

Address word selects control unit with which fault reader is to exchange data. The address word is made up of two digits and is indicated in the appropriate Section of the Workshop Manual.

Example: Pressing keys 03 enters address word "Brake electronics".

-> Indicated on display:

Rapid data transfer	Q
03 - Brake electronics	

- Confirm entry with Q key.

-> Indicated on display following entry of address word 03:

Rapid data transfer	
Tester transmits address word 03	

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-> Adjacent display then appears (example):

8Z0907379A	ESP	20	CAN
V003	□		
Code 10758	WSC	XXXXX	

Display shows the following:

- ◆ Control unit identification number

e.g. (8Z0907379A)

Control unit assignment

=> Parts List

- ◆ System designation (ESP)
- ◆ Data bus (CAN)
- ◆ Current control unit code
e.g. (10758)
- ◆ Current control unit version e.g. V003

Encoding control unit =>Page 22

- ◆ Workshop code =>Operating instructions for V.A.G 1551 fault reader
- Press => key.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	



Note:

One of the following four messages appears on the display if a problem occurs with the communication link between fault reader and control unit:

K-wire not switched to earth/positive
HELP

Print out list of possible causes by pressing HELP key.

No-signal from control unit

Check connections of diagnostic wire "K".

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Check power supply and earth connection to ABS with EDL control unit -J104.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

-> If adjacent display appears:

Fault in communication link

- Rectify fault.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- After eliminating possible causes of trouble, enter address word 03 for brake electronics again and confirm with Q key.

-> If communication between fault reader and control unit has been established properly, control unit identification (X), system designation (Y), hardware/software version (Z), code (V) and workshop code (W) will appear on display.

XXX XXX XXX YYY YYY YY YY YY
ZZZ □
Code VVVVV WSC:WWWWW

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Notes:

- ♦ Next step in program sequence can be selected by pressing ⇒ key.
- ♦ Details of the individual vehicle systems to be tested are given in the appropriate Section of this Workshop Manual.
- ♦ Control unit index can only be influenced by replacing control unit.

=> Parts List

- ♦ Check diagnostic wire if control unit identification number does not appear on display.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Press ⇒key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

1.4 - Erasing fault memory, end of output

Requirements:

- Fault memory interrogated

1. Erasing fault memory

- Press ⇒ key.

-> Indicated on display:
(function selection enable)

Rapid data transfer HELP
Select function XX

- Press keys 0 and 5 to enter "Erasing fault memory" function.

-> Indicated on display:

Rapid data transfer Q
05 - Erasing fault memory

- Confirm entry with Q key.

-> Indicated on display:

Rapid data transfer
Fault memory erased

- Press ⇒ key.

-> Indicated on display:
(function selection enable)

Rapid data transfer HELP
Select function XX

Notes:

Attention:
Fault memory not interrogated

- > This display indicates that test sequence has not been implemented correctly.
- ♦ Keep exactly to test sequence:
Interrogate fault memory first and then erase it

2. End of output

- Press keys 0 and 6 to end output.

-> Indicated on display:

Rapid data transfer Q
06 - End of output

- Confirm entry with Q key.

-> Indicated on display:

Rapid data transfer HELP
Enter address word XX

- Switch off ignition
- Unplug connector to fault reader V.A.G 1551
- Switch on ignition.



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ABS warning lamp -K47 must go out after approx. 2 seconds.

1.5 - Selecting functions

Communication established, control unit version checked and ⇒ key pressed.

-> Indicated on display:
(function selection, e.g. 02 - Interrogating fault memory)

Rapid data transfer	HELP
Select function XX	

One of the listed functions can now be selected. Start fault-finding with function 02 "Interrogating fault memory".

01 - Interrogating control unit version
02 - Interrogating fault memory
03 - Final control diagnosis
04 - Starting basic setting
05 - Erasing fault memory
06 - End of output
07 - Encoding control unit
08 - Reading measured value block
10 - Adaption
11 - Login procedure

How to implement the functions "Erasing fault memory" and "End of output" is explained for all applications in the following.

Information on how to implement the other functions can be found in the appropriate Sections of this Workshop Manual.

Press ⇒key if fault-finding procedure is to be returned to initial position "Function selection" following complete implementation of a given function.

Erasing fault memory

Requirements:

- Fault memory interrogated
- Press ⇒key.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 5 for "Erasing fault memory" function.

-> Indicated on display:

Rapid data transfer	Q
05 - Erasing fault memory	

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- Confirm entry with Q key.

-> Indicated on display:

Rapid data transfer	
Fault memory erased	

- Press ➡key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

Notes:

Attention:
Fault memory not interrogated

- > This display indicates that test sequence has not been implemented correctly.
- ♦ Always keep exactly to test sequence. First interrogate fault memory and then erase it in same diagnosis cycle.

End of output

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 6 for "End output" function.

-> Indicated on display:

Rapid data transfer Q
06 - End of output

- Confirm entry with Q key.

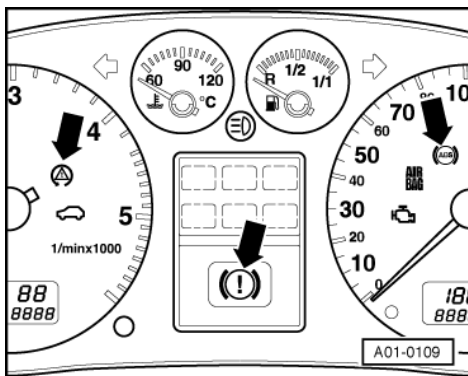
-> Indicated on display:

Rapid data transfer HELP
Enter address word XX

- Switch off ignition.
- Disconnect fault reader.

1.6 - Safety precautions and general notes on fault-finding

- ♦ ABS/EDL/ASR and ESP are vehicle safety systems; knowledge of these systems is essential for performing repair work.
- ♦ There are two different dash panel insert versions with or without driver information system (FIS).



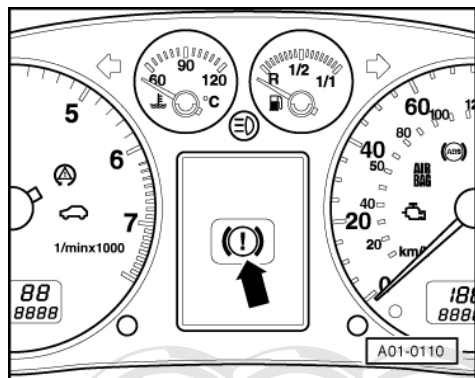
-> Dash panel insert without FIS

- ♦ If the self-diagnosis has detected a system fault, this is indicated by lighting of the warning lamps with the ignition switched on. The warning lamps are located in the dash panel insert, which is available in two versions (with or without FIS). Dash panel insert without FIS features ABS warning lamp -K47 (right arrow),

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brake system warning lamp -K118 (centre arrow, red "brake system malfunction" symbol) and traction control system warning lamp -K86 (left arrow). Further information can be found in the Section "Description of warning lamp functions" => Page 18.



-> Dash panel insert with FIS

- ◆ With FIS the "brake system malfunction" symbol lights up on the display.
- ◆ If brake system is not fully functional and ABS warning lamp -K47 and red brake malfunction symbol do not light, then fault is to be sought in mechanical/hydraulic brake system components.

=> Brake System; Repair Group 45; Exploded view of ESP components

Test drive

- ◆ Certain faults can only be detected by the self-diagnosis whilst driving. Perform test drive to check function of system. When doing so, drive for 30 seconds at a speed of at least 60 km/h. Pay attention to traffic situation and perform ABS controlled braking. Pulsation should be felt at the brake pedal as a result of the control action.
- ◆ The entire system is checked as part of the so-called EOL test.

-> Indicated on display:

```
Rapid data transfer    HELP
Select function XX
```

- Press keys 0 and 3 to select "Brake electronics" function.

-> Indicated on display:

```
Rapid data transfer    Q
03 - Brake electronics
```

- Confirm entry with Q key.

-> Indicated on display following entry of address word 03:

```
Rapid data transfer
Tester transmits address word 03
```

-> Adjacent display then appears (example):

```
8Z0907379A    ESP    20    CAN
V003          □
Code 10758    WSC XXXXX
```

-> Indicated on display:

```
Rapid data transfer    HELP
Select function XX
```

- Press keys 0 and 4 to select "Starting basic setting" function.

-> Indicated on display:

Rapid data transfer	Q
04 - Basic setting	

- Confirm entry with Q key.

-> Indicated on display:

Basic setting	HELP
Enter display group number XXX	

- Press keys 0, 9 and 3; activate system test.
- Confirm entry with Q key.

-> Indicated on display:

Rapid data transfer	HELP
System test activated	
	XXX

- ABS warning lamp -K47 lights.
- Traction control system/ESP warning lamp -K86 lights for 2 seconds and goes out again.
- Fault 01486 "System test active" is stored in fault memory.
- With vehicle stationary, press brake pedal with P = > 30 bar.
- EOL test is activated; traction control system/ESP warning lamp -K86 flashes.
- Cornering should then be implemented within 20 seconds at v = 20...30 km/h. Test can be re-started by pressing brake pedal again with vehicle stationary.
- ASR/ESP and ABS lamps go out on successful completion of EOL test; system is OK.

Attention:

EOL test cannot be interrupted. "Normal" ABS operation can only be re-established after successfully completing EOL test.

Attention:

ABS/ESP/EBPD are not active when system is in diagnostic mode.
 Danger of accident cannot be precluded if vehicle is driven after self-diagnosis has detected a fault.
 The brake system is only functional to a limited extent. The rear wheels have a tendency to over-brake as the brake pressure at the rear wheels is no longer regulated by way of the electronic brake pressure distribution function. This causes the rear of the vehicle to break away.
 If testers and measuring instruments are required during a test drive, these are always to be attached to the rear seat and operated from there by a second person.
 If testers and measuring instruments were to be operated from front passenger's seat, person sitting there could suffer injury in the event of an accident due to triggering of front passenger's airbag.

If a complaint is received, pin-pointed fault finding must be performed as follows:

- First switch on ignition and observe warning lamps. The table in the Section "Description of warning lamp functions" => Page 18 provides an initial indication of what to look for.
- Pay attention to test requirements => Page 10.
- Connect up fault reader V.A.G 1551 and select "Brake electronics" with address word 03 => Page 2.
- Check control unit version => Parts List and press → key.
- Interrogate fault memory => Page 6.
- Conclude transfer of data with "End output" function => Page 7.
- Repair fault using fault table => Page 60. Select "Brake electronics" again with address word 03. Interrogate and erase fault memory.
- Conclude transfer of data with "End output" function. Disconnect fault reader V.A.G 1551.
- Check that connectors have been plugged in and engaged. Perform test drive => Page 8. The warning lamps should not come on during the test drive. Repeat fault-finding procedure if any warning lamps do come on.

Note:

If connector is not plugged into control unit when the vehicle is moving, a spurious fault may be registered in the fault memory of another control unit. The brake system is only functional to a limited extent. The rear wheels



have a tendency to over-brake as the brake pressure at the rear wheels is no longer regulated by way of the electronic brake pressure distribution function. This causes the rear of the vehicle to break away. The danger of an accident cannot be precluded if vehicle is driven.

- Switch off ignition before performing assembly work. Establish code on vehicles with encoded radio and disconnect battery earth strap.
- ♦ Do not replace component indicated as being faulty before checking that wiring to component is OK. Wiring must be capable of transmitting the appropriate signals without interference. Check wiring for:
 - Corrosion and loose contacts in connectors and earth connections. If contacts at connectors are bent, broken or corroded, use wiring harness repair set VAS 1978 to fit new contacts.
 - Open circuits
 - Short circuits to positive/earth

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ♦ Absolute cleanliness must be ensured when working on hydraulic unit. Thoroughly clean hydraulic pipe connections and surrounding areas. Do not use aggressive cleaning agents (e.g. brake cleaner, petrol, thinners) or any products which contain mineral oil, such as oils and greases. Do not unfasten hydraulic pipe connections until they have been cleaned.
- ♦ Place parts removed on a clean surface and cover them over. Do not use fluffy cloths.
- ♦ Only use genuine wrapped parts for replacement purposes. Leave replacement parts in their wrapping until immediately prior to installation.
- ♦ Bleed brake system after performing work involving opening of brake system.

=> Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

- ♦ Welding work with an electric welding unit can affect the ABS/ESP system.

Test requirements

- Tyres of specified size and same make must be fitted on all wheels. Tyres must be inflated to correct pressure on all wheels.
- Mechanical/hydraulic components of brake system OK. No leaks in hydraulic connections and pipes (visually inspect hydraulic unit, brake calipers, wheel brake cylinders and tandem brake master cylinder).
- Wheel bearings and wheel bearing clearance OK.
- Speed sensor installation positions OK.

=> Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

- Supply voltage OK (at least 10.0 V).
- Connector on ABS with EDL control unit -J104 properly attached; catch engaged.
- Self-diagnosis can only be started with vehicle stationary and ignition switched on (or engine running). Self-diagnosis cannot be started at wheel speeds in excess of 2.75 km/h.
- Whilst checking the ESP system, it must be ensured that the vehicle electrical system is not exposed to electromagnetic interference, i.e. the vehicle must not be in the vicinity of equipment with high power input, e.g. electric welding equipment.

Attention:

Diagnosis is not terminated at speeds of $v = > 20\text{km/h}$. Danger of accident.

1.7 - Technical information required

- ♦ Applicable current flow diagram

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ♦ Fitting locations of electrical components

=> Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

- ♦ Information on eliminating current defects

=> Technical Service Handbook

2 - CAN bus

2.1 - CAN bus

2.2 - Function of CAN bus

Bus:

Bus is the term used to describe a data transfer and distribution system.

CAN:

The Controller Area Network is a two-wire bus system. The wires are referred to as bus wires. Data are transferred serially to the connected control units by way of the bus wires.

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These control units communicate, i.e. exchange data, by way of the CAN bus.

The two data bus wires form a twisted pair to prevent electromagnetic interference and irradiation. Pay attention to twist spacing.

2.3 - Testing "two-wire bus system"

If fault table indicates that bus should be checked:

- Use appropriate current flow diagram to establish how many control units are linked to CAN bus.
- Check for proper connection of multi-pin connectors of control units.
- Connect up one of the fault readers V.A.G 1551/1552 or VAS 5051 and press key 0 twice for "Automatic test sequence" function.

Before examining bus wires, make sure there are no malfunctions in any of the control units connected to the bus.

The term "malfunction" refers to a fault which does not directly affect the bus system but does somehow impair the operating sequence of a system. This may for example be a defective sensor. As a result, the sensor signal can no longer be conditioned for bus system data transfer. Such a malfunction has an indirect effect on the bus system. Problems will be encountered with communication with the other control units requiring the sensor signal concerned.

Is there a malfunction?

Start by rectifying this.

- Note down faults and erase fault memories of all control units => Page 6 .
- Press keys 0 and 6 for "End output" function and confirm entry with Q key.
- Conclude fault reader output with "End output" function => Page 7 .
- Repair malfunctions using fault table in appropriate Workshop Manuals.

After rectifying all malfunctions:

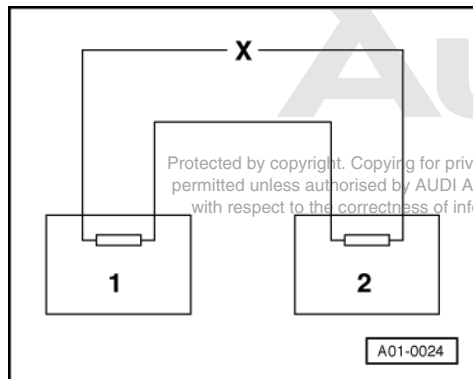
- Examine bus wires if there are still problems with control unit communication.



A distinction must be made between two situations when performing bus wire fault-finding:

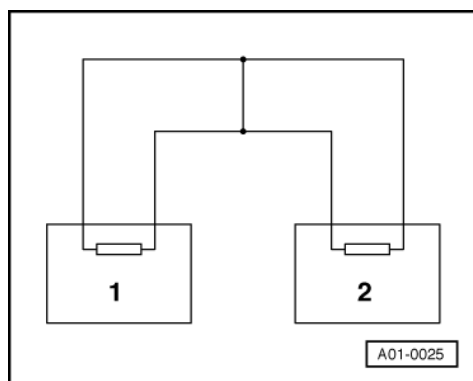
- ♦ Two control units communicating by way of a "two-wire bus system"
- ♦ Three or more control units communicating by way of a "two-wire bus system"

Communication between two control units by way of a "two-wire bus system"



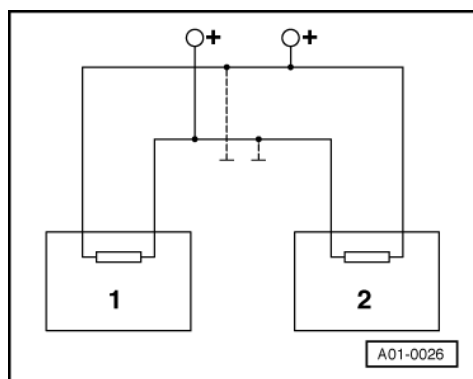
- Switch off ignition.
- -> Unplug the two control units.
- Check for open circuit in one of the bus wires.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



- -> Check for mutual short circuit in bus wires.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



- -> Check for short to positive/earth in one of the bus wires.

If no faults are found in bus wires:

- Try replacing the control unit which is quickest and least expensive to exchange.

- Replace second control unit if there are still problems with control unit communication via bus.

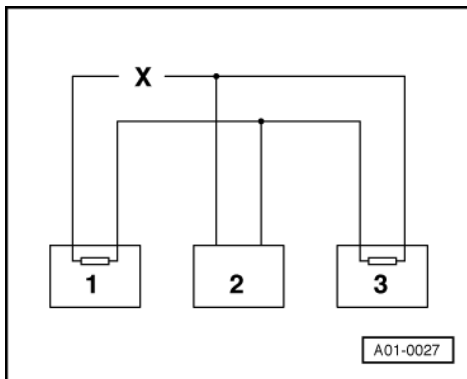
2.4 - Fault messages in CAN bus system

Communication between three or more control units by way of a "two-wire bus system"

- Assess faults stored in control units.

Example 1:

Faults entered in fault memories reveal that control unit 1 has no link with control units 2 and 3.



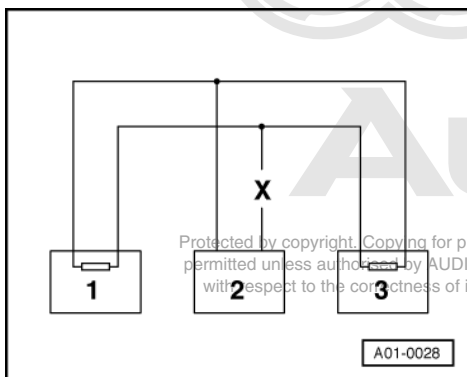
Control unit	Faults entered in fault memory
1	- No message from control unit 2 - No message from control unit 3
2	- No message from control unit 1
3	- No message from control unit 1

- Switch off ignition.
- Disconnect control units linked by bus wires and examine bus wires for open circuit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Example 2:

Faults entered in fault memories reveal that control unit 2 has no link with control units 1 and 3.



Control unit	Faults entered in fault memory
1	- No message from control unit 2
2	- No message from control unit 1 - No message from control unit 3



Control unit	Faults entered in fault memory
3	- No message from control unit 2

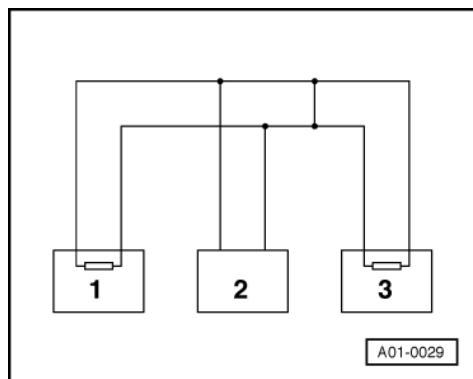
- Switch off ignition.
- Disconnect control units linked by bus wires and examine bus wires for open circuit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Replace control unit 2 if no faults are found in bus wires.
- Replace control unit 1 if no faults are found in bus wires.

Example 3:

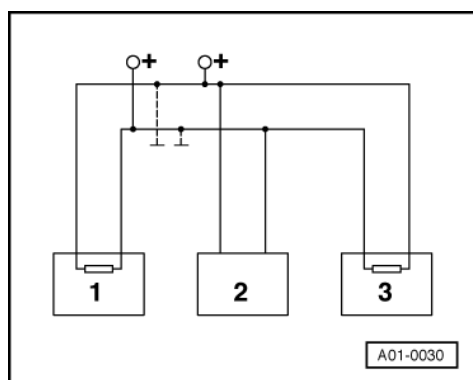
Faults entered in fault memory reveal that none of the control units can transmit or receive.



Control unit	Faults entered in fault memory
1	- Hardware defective
2	- Hardware defective
3	- Hardware defective

- Switch off ignition.
- -> Disconnect control units linked by bus wires and examine bus wires for mutual short circuit.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



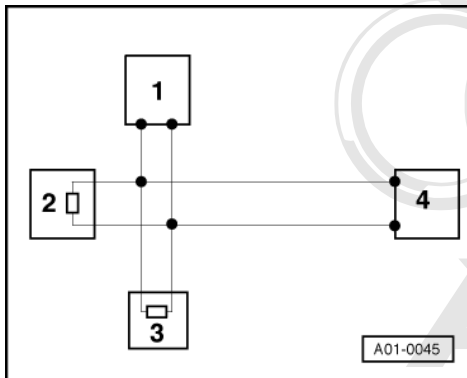
- -> Examine bus wires for short to positive/earth.

If cause of "Hardware defective" fault is not found in bus wires, check whether one of the control units is responsible for the problem.

All control units using CAN bus for communication still disconnected; ignition off.

- Connect one of the control units.
- Connect one of the fault readers. Switch on ignition and erase fault memory of control unit just connected. Terminate output of fault reader with function 06 "End output".
- Switch ignition off and on again.
- Leave ignition switched on for 10 seconds. Then use fault reader to read out fault memory of control unit just connected.

- If fault "Hardware defective" is read out, replace control unit just connected.
- If fault "Hardware defective" is not read out, connect next control unit and repeat sequence.



-> The ESP function presupposes that ABS with EDL control unit -item 2- is able to exchange data with engine control unit -item 3-, gearbox control unit -item 4- and steering angle sender G85 -item 1-.

The data bus termination takes the form of a resistor. This prevents the information transmitted echoing back from the ends and biasing the data.

On the Audi A2 the terminating resistors are located in the ABS with EDL control unit -J104 -item 2- and in the Motronic control unit -J220 -item 3-. The resistors each have a resistance of 60 Ω , making a total of 120 Ω . All other control units in the CAN are terminated with a high-impedance 2.6 k Ω resistor.

3 - Electronic Stability Program Continental Teves Mark 20 IE

3.1 - Electronic Stability Program Continental Teves Mark 20 IE

3.2 - Function of ESP

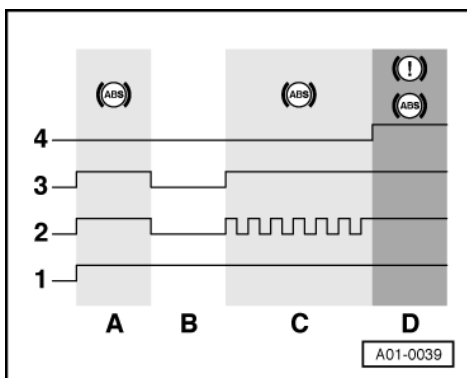
ESP incorporates the following functions: EBPDP, ABS, EDL and ASR. The tasks of the individual components are as follows:

EBPDP

The brake system is split diagonally into two hydraulic circuits, one for supplying the front left and rear right brakes and the other for supplying the front right and rear left brakes.

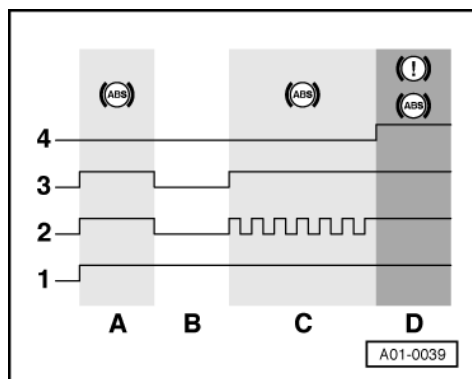
The ABS with EDL control unit -J104 is programmed with specially designed software for electronic brake pressure distribution (EBPDP), which takes over the function of the mechanical/hydraulic brake pressure limiter.

In cases where ABS failure has occurred but the electronic brake pressure distribution function can still be maintained by a back-up feature, the signal transmitted to the dash panel insert is pulsed. The dash panel insert distinguishes between three conditions: No signal, pulsed signal and constant signal. The ABS warning lamp and the red "brake system malfunction" symbol light accordingly.





- 1 - ➔ Terminal 15
- 2 - Signal for actuation of ABS warning lamp and red "brake system malfunction" symbol
- 3 - Power supply for ABS warning lamp
- 4 - Power supply for red "brake system malfunction" symbol



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A - In phase "A" (after ignition is switched on), ABS warning lamp is actuated for two seconds during self-test by means of signal "2" and comes on. During this phase, the dash panel insert automatically suppresses lighting of the red "brake system malfunction" symbol. Suppression only takes place if engine speed is < 2000 rpm or vehicle speed is < 20km/h.

B - There is no signal "2" in phase "B". Neither ABS warning lamp nor red "brake system malfunction" symbol come on.

C - In phase "C" self-diagnosis has detected a fault which does not cause EBPD to be deactivated. Signal "2" is pulsed. Only the ABS warning lamp lights.

D - In phase "D" self-diagnosis has detected a fault which causes EBPD to be deactivated. Signal "2" is constantly applied. Both ABS warning lamp and red "brake system malfunction" symbol come on.

Lighting of the red "brake system malfunction" symbol indicates failure of EBPD. Extra caution must be taken if the vehicle has to be driven in this condition => Page 8 , "Test drive".

For further information on actuation of warning lamps in connection with EBPD function, refer to: "Description of warning lamp functions"
=> Page 18

ABS:

The ABS prevents locking of the wheels when the brakes are applied by the driver. It regulates the brake pressure applied to the individual wheel brake cylinders as a function of the rate of acceleration/deceleration at the wheels (which depends on the amount of wheel slip) in such a manner that the wheels can develop maximum road adhesion and thus the best possible braking effect.

EDL:

The electronic differential lock (EDL) is designed to provide assistance when driving off. Electronically controlled brake application on the spinning drive wheel provides a torque reaction point for the differential. This enables the wheel with the better traction to make use of the engine power. The EDL is also effective when reversing.

In conjunction with ESP, EDL is active at vehicle speeds of up to 80 km/h.

ASR:

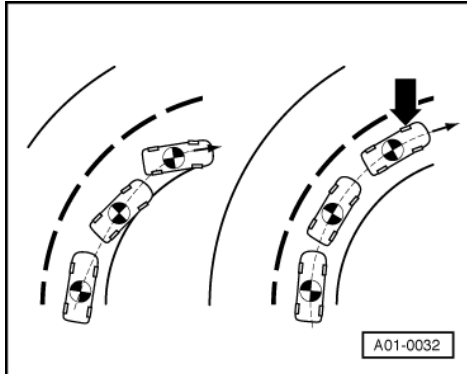
A prerequisite for the ASR function is that the ABS with EDL control unit -J104 can exchange data with the engine control unit and - in the case of vehicles with automatic gearbox - with the gearbox control unit. In other words, the control units must be able to communicate.

Data are transferred by way of the CAN bus => Page 11 .

By reducing engine power, ASR stops the drive wheels spinning on acceleration. The function can be employed over the entire vehicle speed range. EDL and ASR complement one another when accelerating.

ESP:

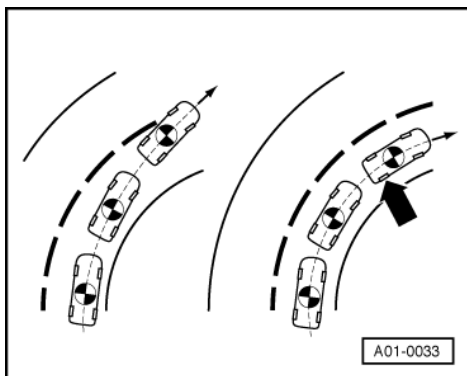
ESP stands for Electronic Stability Program. It is designed to stabilise the dynamic handling response of the vehicle by counteracting any tendency towards oversteer or understeer. EBPD, ABS, EDL and ASR functions are incorporated into the system. Its characteristic feature is however controlled brake application at individual wheels.



Examples:

-> In the event of oversteer, the rear of the vehicle breaks away and the vehicle rotates further about its vertical axis than is required for cornering. The system counteracts this excessive movement by applying a controlled braking force at the outside front wheel.

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-> In an understeer condition, the front end of the vehicle does not follow the required cornering radius and breaks away. The vehicle does not rotate far enough about its vertical axis to maintain course through the bend. The system increases the amount of rotation by applying a controlled braking force at the inside rear wheel.

Attention:

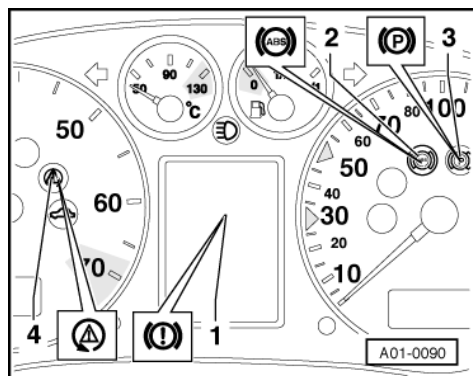
Physical limits still apply even when using ESP. It is particularly important to bear this in mind on a slippery, wet road surface.

Driving style must therefore always be adapted to road and traffic conditions. The enhanced level of safety provided by ESP does not mean that additional risks can be taken.



3.3 - Description of warning lamp functions

Indication of faults by way of warning lamps in dash panel insert

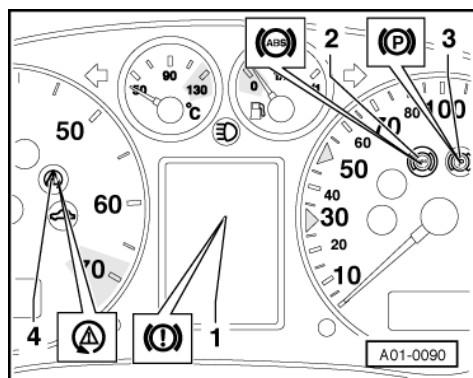


- ♦ K14 Handbrake warning lamp -3-
- ♦ K47 ABS warning lamp -2-
- ♦ K118 Brake system warning lamp -1-
- ♦ K86 Traction control system/ESP warning lamp -4-

Attention:

Once ABS warning lamp -K47 and brake system warning lamp -K118 have come on, even slight braking may cause rear wheels to lock.

ABS warning lamp -K47



- ♦ -> Possible causes of trouble if ABS warning lamp -K47 -2- does not go out after switching on ignition and on completion of test sequence:

-a- Power supply less than 10 V

-b- ABS fault

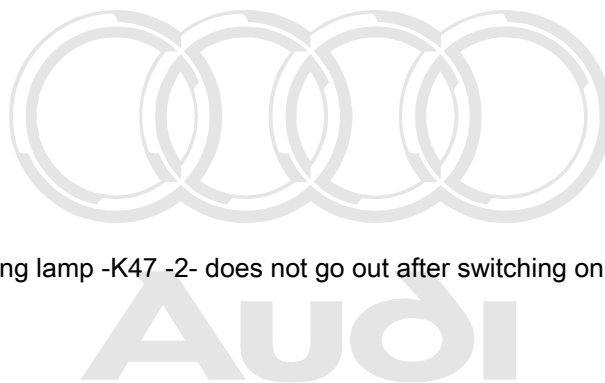
ABS fault -b- results in deactivation of anti-locking brake system. EBPD (electronic brake pressure distribution) function remains active, thus ensuring full operability of conventional brake system.

Interrogating fault memory

=>Page 59

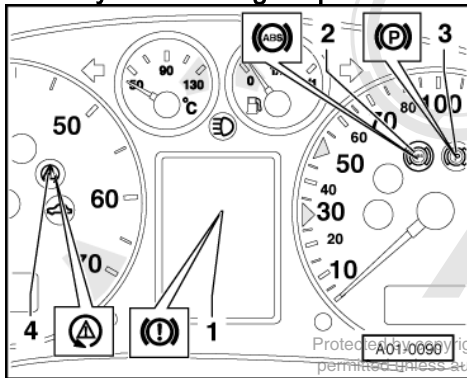
-c- Sporadic speed sensor fault after last vehicle start

In the event of a sporadic speed sensor fault -c- the ABS warning lamp goes out automatically on exceeding a speed of 20 km/h after re-starting vehicle.



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Brake system warning lamp -K118



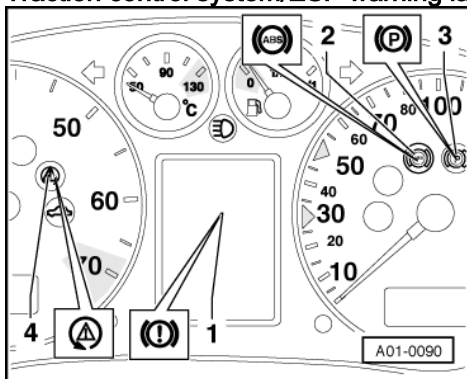
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- ♦ -> Possible causes of trouble if brake system warning lamp -K118 -1- does not go out after switching on ignition and on completion of test sequence:

- a- Brake fluid level too low
- b- Open circuit in ASR/ESP warning lamp actuation wire
- c- Dash panel insert defective
- d- Open circuit in connection between dash panel insert and ABS with EDL control unit -J104

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

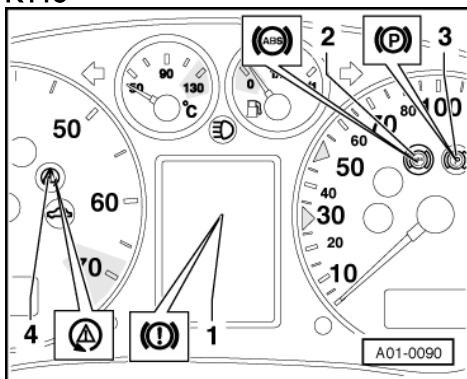
Traction control system/ESP warning lamp -K86



- ♦ Possible causes of trouble if traction control system/ESP warning lamp -K86 -4- does not go out after switching on ignition and on completion of test sequence:

- a- ASR/ESP system deactivated using button -E256
- b- Short to positive in ASR button
- c- Short to positive in actuation of ASR/ESP warning lamp
- d- Open circuit in ASR/ESP warning lamp actuation wire
- e- ABS with EDL control unit -J104 unplugged or no power supply/term. 15 for control unit

ASR or ESP is in control mode if traction control system warning lamp -K86 flashes whilst driving.
ABS warning lamp -K47, traction control system/ESP warning lamp -K86 and brake system warning lamp -K118



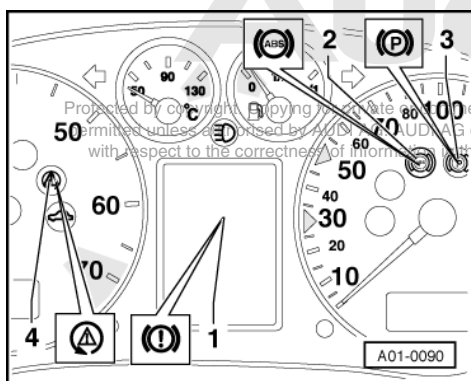


- ♦ Lighting of ABS warning lamp, traction control system/ESP warning lamp -2- and brake system warning lamp -1- indicates:

- a- ABS/ESP failure
- b- EBPD (electronic brake pressure distribution) failure

Attention:

Failure of electronic brake pressure distribution (EBPD) may cause rear wheels to lock even in the event of slight braking.



Handbrake warning lamp -K14

- ♦ The handbrake warning lamp -K14 lights with ignition on if handbrake is actuated.

Brake system warning lamp -K118	ABS warning lamp -K47	Traction control system/ESP warning lamp -K86	ASR button for ASR off	Possible reasons for lighting of warning lamps
off	off	off		- All warning lamps go out after self-test (after approx. 2 s ignition on); all systems OK
on	off	off		- Brake fluid level too low
off	on	off		- Sporadic speed sensor fault
off	off	flashes		- ASR/ESP in control mode; ASR/ESP warning lamp flashes approx. 3 times per second
off	off	on	Button pressed	- ASR deactivated by way of button - ABS and ESP remain active
off	flashes	on		- 00000 used to encode ABS with EDL control unit -J104
off	on	flashes		- Implementation of EOL test; lamps go out again on successful completion of test

Brake system warning lamp -K118	ABS warning lamp -K47	Traction control system/ESP warning lamp -K86	ASR button for ASR off	Possible reasons for lighting of warning lamps
on	on	on		- ESP failure, e.g. fault in steering angle sender, lateral acceleration sender, yaw rate sender, brake pressure senders or speed sensors - ABS/ESP failure - EBPDP failure; deactivation of all systems

3.4 - Description of senders and components in ESP system

ABS with EDL/ASR/ESP control unit -J104

The control unit is combined with the hydraulic unit to form an assembly. It regulates the ESP, ABS, EDL, ASR, EBPDP and overrun torque limiting functions. A control unit self-test is implemented when the ignition is switched on. All electrical connections are permanently monitored and the function of the solenoid valves periodically checked. In the event of total control unit failure, only the normal brake system is available.

Steering angle sender -G85

The steering angle sender is located in a joint housing together with the airbag coil connector. It is located on the steering column between steering column switch and steering wheel. The steering wheel angle is transmitted via the CAN bus to the control unit for ABS/ASR/ESP -J104. Zero position compensation must be performed following replacement of control unit or sender. There is no ESP function if the sender is defective.

Lateral acceleration sender -G200

The lateral acceleration sender transmits the cornering force values to the control unit for ABS/ASR/ESP -J104. Zero position compensation must be performed following replacement of control unit or sender. There is no ESP function if the sender is defective.

Yaw rate sender -G202

The yaw rate sender records data on so-called yaw moments or yaw rates which attempt to rotate the vehicle about its vertical axis and transmits these values to the control unit for ABS/ASR/ESP -J104. There is no ESP function if the sender is defective.

Brake pressure senders -G201 and -G214

The brake pressure sender records the instantaneous brake pressure in the brake circuit and transmits it to the ABS with EDL control unit -J104. The control unit uses this information to calculate the wheel braking forces and thus the longitudinal forces acting on the vehicle. Dual brake pressure senders are fitted to provide maximum reliability. There is no ESP function even if just one sender fails. The senders are located at the brake servo.

Brake pressure solenoid valve, in brake servo -N247

If the system recognises the need for ESP action and the driver has yet to press the brake pedal, the brake pressure solenoid valve is actuated by the ABS with EDL control unit -J104. This causes the brake servo to build up a pressure of approx. 10 bar and the brake system is activated.

Button and lamp for ASR

Only the ASR function can be deactivated/activated by way of the button. ASR deactivation is possible at vehicle speeds of up to 50 km/h. The ASR function is activated automatically at speeds in excess of 70 km/h. ASR



deactivation causes the ASR/ESP lamp to light. The ASR/ESP lamp flashes in the event of ASR/ESP action. The lamp is permanently lit if there is no control unit power supply, the control unit has been unplugged or the button pressed. It is appropriate to deactivate the ASR/ESP function when trying to drive off in deep snow or on soft ground, when using snow chains and when checking the vehicle on a dynamometer.

Brake detection switch, ESP -F83

The brake detection switch acts as a changeover switch. When the driver presses the brake, the switch changes from signal contact 1 to signal contact 2. As there is only ever one signal contact made, the system can clearly recognise the instantaneous state and the switch thus offers a high level of intrinsic safety.

Active brake servo with tandem master cylinder

The active brake servo or booster builds up pressure in the event of ESP action. This is necessary, as the return pump intake is not always sufficient to generate the pressure required on account of the high brake fluid viscosity at low temperatures.

EBPD

The brake system is split diagonally into two hydraulic circuits, one for supplying the front left and rear right brakes and the other for supplying the front right and rear left brakes.

4 - Performing self-diagnosis

4.1 - Performing self-diagnosis

4.2 - Encoding control unit

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The control unit fitted in the vehicle is encoded. New control units supplied as replacement parts are not coded and are to be encoded following installation.

Encoding is only possible after entering workshop code (WSC) in V.A.G 1551.

- Check control unit identification number.

e.g. (8Z0907379A)

Control unit assignment

=> Parts List

Test sequence

- Establish code on the basis of the following encoding table.
- Connect up fault reader V.A.G 1551 and - with ignition switched on - select brake electronics control unit (address word 03).

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter 07 for "Encoding control unit" function and confirm with Q key.

-> Indicated on display:

Rapid data transfer	Q
07 - Encoding control unit	

- Confirm entry with Q key.

-> Indicated on display:

Encoding control unit
Enter code number XXXXX (0-32767)

- Enter appropriate vehicle code number and confirm with Q key => V.A.G 1551 fault reader operating instructions.

-> Fault reader V.A.G 1551 displays control unit identification, e.g.:
8Z0907379A

8Z0907379A ESP 20 CAN
V003 ☐
Code 10758 WSC XXXXX

Encoding table

Code number	Engine version	Steering
10758	1.4 l/55 kW MPI	electrohydraulic
10758	1.4 l/55 kW TDI	electrohydraulic
10764	1.2 l/45 kW TDI	mechanical
10765	1.2 l/45 kW TDI	electrohydraulic

- Press => key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter 06 for "End output" function and confirm with Q key.

Note:

If control unit is encoded with a code not appropriate to the vehicle model:

-> Indicated on display:

Fault
Code XXXXX not accepted

If 00000 is entered as control unit code, ABS warning lamp -K47 flashes and traction control system/ESP warning lamp -K86 is permanently lit.

4.3 - Starting basic setting

Various display group numbers are available in function 04 "Starting basic setting" for ESP:



-1- Display group number 001 is used for bleeding hydraulic unit (starting basic setting).

-2- Display group number 031 is used for testing function of brake pressure solenoid valve and brake detection switch

=>Page 30 .

-3- Display group number 060 is used for zero position compensation for steering angle sender -G85

=>Page 25 .

-4- Display group number 063 is used for zero position compensation for lateral acceleration sender -G200 (starting basic setting)

=>Page 26 .

-5- Display group number 066 is used for zero position compensation for brake pressure senders

=>Page 27 .

Zero position compensation is necessary if:

- ♦ ABS with EDL control unit -J104 or steering column is replaced.
- ♦ On replacing steering angle sender -G85.
- ♦ If running gear settings are altered as part of wheel alignment.
- ♦ If steering wheel is detached or replaced.
- ♦ On replacing lateral acceleration sender -G200.
- ♦ On replacing brake pressure senders 1/2 -G201 and/or -G214.
- ♦ If brake servo is replaced.
- ♦ If fault memory contains appropriate prompt.
- ♦ Basic setting is also to be initiated following servicing work in the event of leaks in the brake system.

A prerequisite for performing zero position compensation in display group numbers 60, 63 and 66 is successful implementation of function 11 "Login procedure" with fault reader V.A.G 1551/52 => Page 24 .

4.4 - Login procedure

Encoding is only possible after entering workshop code (WSC) in V.A.G 1551.

Test sequence

- Connect up fault reader V.A.G 1551.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 1 and 1 to select "Starting login procedure" function.

-> Indicated on display:

Rapid data transfer	Q
11 Login procedure	

- Confirm entry with Q key.

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-> Indicated on display:

Login procedure	HELP
Enter code number	40168

- Enter code number 40168.

- Confirm entry with Q key.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

4.5 - Zero position compensation for steering angle sender -G85

Display group number 060: Zero position compensation for steering angle sender -G85

- Start engine.
- Perform brief test drive on a flat surface. Drive in a straight line at not more than 20 km/h, paying attention to the following two items.
- If steering wheel is not straight during test drive, perform correction as part of wheel alignment and fit steering wheel such that it is straight.

=> Running Gear, Axles, Steering; Repair Group 44; Wheel alignment Wheel alignment

- If steering wheel is straight when performing test drive, bring vehicle to a halt from straight ahead position.

Make sure steering wheel position is not altered. Leave ignition on.

- Check zero position compensation using function 08 "Reading measured value block" =>Page 31 , Display group number 4.
- Start by implementing function 11 "Login procedure" with fault reader V.A.G 1551/52 => Page 24 .

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 4 to select "Starting basic setting" function.

-> Indicated on display:

Rapid data transfer	Q
04 - Basic setting	

- Confirm entry with Q key.

-> Indicated on display:

Basic setting	HELP
Enter display group number XXX	

- Press keys 0, 6 and 0.
- Confirm entry with Q key.
- ABS warning lamp -K47 flashes.

-> Adjacent display indicates that login procedure has not been successfully implemented.

Function unknown or cannot be implemented at present	-
---	---

-> Indicated on display:

System in basic setting	60
Compensation OK	0.05

- or:

-> Adjacent display indicates that measured values are not within $\pm 15^\circ$ range permitted for zero position compensation.



System in basic setting	60
Compensation not possible	175

1. Interrogate fault memory (function 02).
2. Erase fault memory (function 05).
3. End output (function 06).
4. Switch off ignition.
5. Switch on ignition.
6. Perform zero position compensation again.

- Press ⇒ key.

-> Indicated on display:

Rapid data transfer	HELP
Enter address word XX	

- Press keys 0 and 6 to end output.

-> Indicated on display:

Rapid data transfer	Q
06 - End of output	

4.6 - Zero position compensation for lateral acceleration sender -G200

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Display group number 063: Zero position compensation for lateral acceleration sender -G200

- Position vehicle on a flat surface.
- Check measured values using function 08 "Reading measured value block" =>Page 31 , Display group number 4.
- Start by implementing function 11 "Login procedure" with fault reader V.A.G 1551/52 => Page 24 .

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 4 to select "Starting basic setting" function.

-> Indicated on display:

Rapid data transfer	Q
04 - Basic setting	

- Confirm entry with Q key.

-> Indicated on display:

Basic setting	HELP
Enter display group number XXX	

- Press keys 0, 6 and 3.
- Confirm entry with Q key.
- ABS warning lamp -K47 flashes.

-> Adjacent display indicates that login procedure has not been successfully implemented.

Function unknown or cannot
be implemented at present -

-> Indicated on display:

System in basic setting 63
Compensation OK 0.23m/s²

Value displayed does not switch to 0.00 m/s² on successful completion of zero position compensation.

- or:

-> Adjacent display indicates that measured values are not within ± 0.5 m/s² tolerance range.

System in basic setting 63
Compensation not possible 5.0m/s²

1. Interrogate fault memory (function 02).
2. Erase fault memory (function 05).
3. End output (function 06).
4. Switch off ignition.
5. Switch on ignition.
6. Perform zero position compensation again.

- Press $\Rightarrow$ key.

-> Indicated on display:

Rapid data transfer HELP
Enter address word XX

- Press keys 0 and 6 to end output.

-> Indicated on display:

Rapid data transfer Q
06 - End of output

4.7 - Zero position compensation for brake pressure senders -G201 and -G214

Display group number 066: Zero position compensation for brake pressure senders

- Brake pedal not pressed
- Check measured values using function 08 "Reading measured value block" =>Page 31 , Display group number 5.
- Start by implementing function 11 "Login procedure" with fault reader V.A.G 1551/52 => Page 24 .

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 4 to select "Starting basic setting" function.

-> Indicated on display:

Rapid data transfer Q
04 - Basic setting



- Confirm entry with Q key.

-> Indicated on display:

```
Basic setting      HELP
Enter display group number XXX
```

- Press keys 0, 6 and 6.
- Confirm entry with Q key.
- ABS warning lamp -K47 flashes.

-> Adjacent display indicates that login procedure has not been successfully implemented.

```
Function unknown or cannot -
be implemented at present
```

-> Indicated on display:

```
System in basic setting      66
Compensation      OK      - 0.42bar      -
0.63bar
```

Value displayed does not switch to 0.00 bar on successful completion of zero position compensation.

- or:

-> Adjacent display indicates that measured values are not within < 7 bar range permitted for zero position compensation.

```
System in basic setting      66
Compensation not possible +10.85bar )
12.12bar
```

1. Interrogate fault memory (function 02).
2. Erase fault memory (function 05).
3. End output (function 06).
4. Switch off ignition.
5. Switch on ignition.
6. Perform zero position compensation again.

- Press ⇒ key.

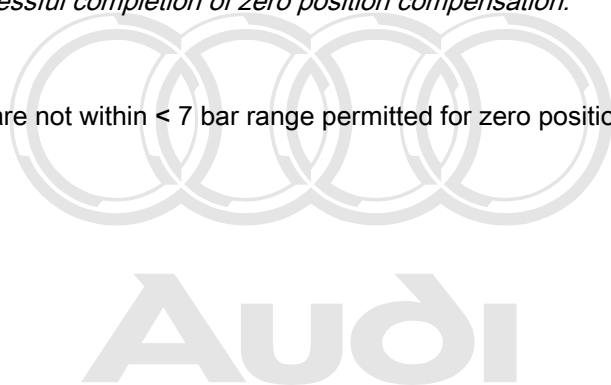
-> Indicated on display:

```
Rapid data transfer      HELP
Enter address word XX
```

- Press keys 0 and 6 to end output.

-> Indicated on display:

```
Rapid data transfer      Q
06 - End of output
```



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4.8 - Checking of speed sensors -G44 to -G47

Attention:
Never take resistance measurements at speed sensors.
The electronic circuitry is such that resistance measurements are not to be performed, as otherwise component damage could result.

In the Audi A2 use is made for the first time of active speed sensors (magneto-resistive principle; main difference from passive speed sensors is an independent power supply).

- Checking speed sensors involves raising vehicle and having a second mechanic turn the individual wheels by hand. The speed signals are indicated in measured value block 08, display group number 001. Replace appropriate speed sensor if no speed signal is displayed.
- Check wiring between speed sensor and ABS with EDL control unit -J104.

- => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
- => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components
- Connect up fault reader V.A.G 1551, enter address word 03 "Brake electronics" and keep switching until "Select function XX" appears on display.

-> Indicated on display:

Rapid data transfer

Select function XX

HELP

- Press keys 0 and 8 to start "Reading measured value block" function.

-> Indicated on display:

Rapid data transfer

08 - Reading measured value block

Q

- Confirm entry with Q key.

-> Indicated on display:

Reading measured value block

Enter display group number XXX

- Enter display group number 001.

-> Indicated on display (with vehicle stationary):

Reading measured value block

0 km/h 0 km/h 0 km/h 0 km/h

1

Reading measured value block	1 ⇒	Display group number: 001
0 km/h0 km/h0 km/h0 km/h		• Indicated on display (example)
Wheel speed at rear right speed sensor - (0...255 km/h)		
Wheel speed at rear left speed sensor - (0...255 km/h)		
Wheel speed at front right speed sensor - (0...255 km/h)		
Wheel speed at front left speed sensor - (0...255 km/h)		



4.9 - Checking of brake pressure solenoid valve, in brake servo -N247

- Connect up fault reader V.A.G 1551 and - with ignition switched on - select brake electronics control unit (address word 03).

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 4 to select "Starting basic setting" function.

-> Indicated on display:

Rapid data transfer	Q
04 - Basic setting	

- Confirm entry with Q key.

-> Indicated on display:

Basic setting	HELP
Enter display group number XXX	

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- Press keys 0, 3 and 1.
- Confirm entry with Q key.
- ABS warning lamp -K47 flashes.

-> Indicated on display:

System in basic setting	31
Solenoid valve	activated

- Press key 3.

-> Indicated on display:

System in basic setting	32
-0.63bar	-0.63bar not pressed

Do not press brake pedal.

- Press key 3.

-> Indicated on display:

System in basic setting	33
Press and hold pedal ...	

Press pedal firmly and hold in position.

Brake lights come on.

If brake lights do not come on:

- ♦ Brake lights deactivation relay -J508 defective

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ♦ Brake detection switch, ESP -F83 defective

=>Test step no. 19 => Page **56**

- Press key 3.

-> Indicated on display:

System in basic setting	34
29.96bar	31.45bar pressed

- Press key 3.

-> Indicated on display:

System in basic setting	35
Release pedal	

- Take foot off brake pedal.
- Press key 3.

-> Indicated on display:

System in basic setting	36
-0.63bar -0.63bar	not pressed

- Press key 3.

-> Indicated on display:

System in basic setting	37
Solenoid valve test over	

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- Press => key.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 6 to end output.

-> Indicated on display:

Rapid data transfer	Q
06- End of output	

4.10 - Reading measured value block

The control unit can output a wide range of measured values. These measured values supply information on the operating status of the system/connected senders. In many cases, the measured values output can be used to assist with fault-finding and fault rectification. As the measured values cannot all be output at the same time, they are summarised in individual display groups which can be selected by way of display group numbers.

There is no ABS/ESP/EBPD control in the course of a test drive with the fault reader V.A.G 1551 connected up and set to diagnosis/measured value block mode. The ABS warning lamp flashes; the ASR/ESP lamp lights.

- Connect up fault reader V.A.G 1551, enter address word 03 "Brake electronics" and keep switching until "Select function XX" appears on display.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 8 to start "Reading measured value block" function.

-> Indicated on display:

Rapid data transfer	Q
08 - Reading measured value block	

- Confirm entry with Q key.

-> Indicated on display:



Reading measured value block
Enter display group number XXX

- Enter display group number, list of available display group numbers =>Page 32 .

List of available display group numbers

Display group number	Display zone	Designation
001	1	Wheel speed at front left speed sensor (km/h)
	2	Wheel speed at front right speed sensor (km/h)
	3	Wheel speed at rear left speed sensor (km/h)
	4	Wheel speed at rear right speed sensor (km/h)
002	1	Starting speed at front left speed sensor (km/h)
	2	Starting speed at front right speed sensor (km/h)
	3	Starting speed at rear left speed sensor (km/h)
	4	Starting speed at rear right speed sensor (km/h)
003	1	Brake light switch
	2	Brake detection switch
	3	Not used
	4	Not used

004	1	Steering angle sender
	2	Lateral acceleration sender
	3	Yaw rate sender
	4	Not used
005	1	Brake pressure sender
	2	Brake pressure sender
	3	Not used
	4	Not used
125	1	Engine data bus
	2	Steering angle data bus 2)
	3	Not used
	4	Gearbox data bus 1)

- 1) Vehicles with automatic gearbox only

Test sequence and test tables with measured values

Display group number 001

- Press keys 0, 0 and 1.
- Confirm entry with Q key.

Reading measured value block 1
☐ 1 ☐ 2 ☐ 3 ☐ 4

-> A measured value block always has 4 display zones -arrows-. Explanatory notes on values 1 - 4 in the individual display zones are given in the following test table.

-> Indicated on display (with vehicle stationary):

Reading measured value block 1
 0 km/h 0 km/h 0 km/h 0 km/h

The next display group number 002 can be selected by pressing key -3-.

Press C key to enter next display group number.

If ➔key is pressed, keys 0 and 8 then have to be pressed to return to "Reading measured value block" sequence.

Heed the following for display group number 001:

The instantaneous wheel speeds are displayed. They are used to check the speed sensors and speed sensor wheel assignment (this involves raising the vehicle and having a second mechanic turn the wheel by hand).

Reading measured value block				1 ➔	Display group number: 001
0 km/h	0 km/h	0 km/h	0 km/h	0 km/h	◀ Indicated on display (example)
Wheel speed at rear right speed sensor - (0...255 km/h)					
Wheel speed at rear left speed sensor - (0...255 km/h)					
Wheel speed at front right speed sensor - (0...255 km/h)					
Wheel speed at front left speed sensor - (0...255 km/h)					

Display group number 002

- Press keys 0, 0 and 2.
- Confirm entry with Q key.

Reading measured value block				2
1	2	3	4	

-> A measured value block always has 4 display zones -arrows-. Explanatory notes on values 1 - 4 in the individual display zones are given in the following test table.

-> Indicated on display (with vehicle stationary):

Reading measured value block				2
255 km/h	255 km/h	255km/h	255	km/h

The next display group number down/up can be consecutively selected by pressing key -1- or key -3- respectively.

Press C key to enter next display group number.

If ➔key is pressed, keys 0 and 8 then have to be pressed to return to "Reading measured value block" sequence.

Reading measured value block				2 ➔	Display group number: 002
3 km/h1)	6 km/h1)	2 km/h1)	1 km/h1)	1 km/h1)	◀ Indicated on display (on driving off slowly)
Starting speed at rear right speed sensor - (0...255 km/h)					
Starting speed at rear left speed sensor - (0...255 km/h)					
Starting speed at front right speed sensor - (0...255 km/h)					



Starting speed at front left speed sensor
- (0...255 km/h)

Output of wheel speed at which signal is first detected

Output: Front left, front right, rear left, rear right

Value of 255 indicates that measurement has not yet been taken

Display group number 003

- Press keys 0, 0 and 3.
- Confirm entry with Q key.

Reading measured value block 3
□ 1 □ 2 3 □ 4

-> A measured value block always has 4 display zones -arrows-. Explanatory notes on values 1 - 4 in the individual display zones are given in the following test table.

-> Indicated on display (with vehicle stationary):

Reading measured value block 3
not pressed not pressed

The next display group number down/up can be consecutively selected by pressing key -1- or key -3- respectively.

Press C key to enter next display group number.

If =>key is pressed, keys 0 and 8 then have to be pressed to return to "Reading measured value block" sequence.

Reading measured value block 3 ➔		Display group number: 003
Not pressed	Not pressed	◀ Indicated on display
Not used Not used Brake detection switch: - Not pressed =>Brake pedal not pressed - Pressed =>Brake pedal pressed In the event of deviations: Test step no. 19, Page 56 Brake light switch: - 0 =>Brake pedal not pressed - 1 =>Brake pedal pressed If V.A.G 1551 displays -0- with foot brake pressed or -1- with foot brake not pressed, perform test step no. 4 on Page 47 It is also possible that the brake light switch has not been correctly adjusted =>Adjusting brake light switch =>Brake System; Repair Group 45; Exploded view of ESP components		

Display group number 004

- Press keys 0, 0 and 4.
- Confirm entry with Q key.

Reading measured value block 4
□ 1 □ 2 3 □ 4

-> A measured value block always has 4 display zones -arrows-. Explanatory notes on values 1 - 4 in the individual display zones are given in the following test table.

-> Indicated on display (with vehicle stationary):

Reading measured value block 4
0.05 0.0m/s² 1.265/s

The next display group number down/up can be consecutively selected by pressing key -1- or key -3- respectively.

Press C key to enter next display group number.

If ➔key is pressed, keys 0 and 8 then have to be pressed to return to "Reading measured value block" sequence.

All three values must be positive when negotiating a left-hand bend forwards.

All three values must be negative (-) when negotiating a right-hand bend forwards.

Reading measured value block	4 ➔	Display group number: 004
0,0° 0.0m/s2 0.53°/s		• Indicated on display (example)
Not used		
Yaw rate sender: - Specification with vehicle stationary on flat surface: ± 2.5°/s - Test step 15 =>Page 56 Lateral acceleration sender: - Specification with vehicle stationary on flat surface: ± 0.5m/s2 - Specification on full steering lock at a speed of 20 km/h in a left-hand bend: Measured value increases constantly with positive (not displayed) sign - Specification on full steering lock at a speed of 20 km/h in a right-hand bend: Constant increase in measured value with negative (-) sign Steering angle sender: - Specification with vehicle stationary on flat surface: ±4.5° Function 04 "Basic setting", Display group number 63 =>Page 52 Function 04 "Basic setting", Display group number 60 =>Page 51		

Display group number 005

- Press keys 0, 0 and 5.
- Confirm entry with Q key.

Reading measured value block	5
□ 1 □ 2 3 □ 4	

-> A measured value block always has 4 display zones -arrows-. Explanatory notes on values 1 - 4 in the individual display zones are given in the following test table.

-> Indicated on display (with vehicle stationary):

Reading measured value block	5
- 0.42 bar - 0.63 bar	

The next display group number down/up can be consecutively selected by pressing key -1- or key -3- respectively.

If ➔key is pressed, keys 0 and 8 then have to be pressed to return to "Reading measured value block" sequence.

Reading measured value block	5 ➔	Display group number: 005
-0.42 bar -0.63 bar		• Indicated on display (example)
Not used		
Not used		
Brake pressure sender - Specification with brake not pressed: <7 bar - Test steps 16 and 17 =>Page 54		



Brake pressure sender
- Specification with brake not pressed: <7 bar
- Test steps 16 and 17 =>Page 54

Display group number 125

- Press keys 1, 2 and 5.
- Confirm entry with Q key.

Reading measured value block 125
□ 1 □ 2 3 □ 4

-> A measured value block always has 4 display zones -arrows-. Explanatory notes on values 1 - 4 in the individual display zones are given in the following test table.

-> Indicated on display (with vehicle stationary):

Reading measured value block 125
Engine 1 Steering angle 1

Press C key to enter next display group number.

If =>key is pressed, keys 0 and 8 then have to be pressed to return to "Reading measured value block" sequence.

Reading measured value block 125 ➔				Display group number: 125
Engine 1	Steering angle 1	4WD 1	Gearbox 1	Indicated on display (example)
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not accept any liability with respect to the correctness of information in this document, even if caused by AUDI AG.				Gearbox data bus 1)
				- 1 =>Data bus link - 0 =>No data bus link2)
Not used				
Steering angle data bus				
- 1 =>Data bus link				
- 0 =>No data bus link2)				
Engine data bus				
- 1 =>Data bus link				
- 0 =>No data bus link2)				

- 1) Vehicles with automatic gearbox only
- 2) Interruption in data bus link or data bus wires interchanged

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

4.11 - Final control diagnosis

The final control diagnosis function can be used to check the pump motor as well as correct functioning of the hydraulic circuits (assignment of brake pressure pipes to wheel brakes and function of valves). It is also possible to detect interchanged connections and leaks.

Notes:

- ♦ Vehicle must be raised so that wheels are free to turn (second mechanic required to turn wheels).
- ♦ Exit from test sequence can be effected at any time by pressing C key.
- ♦ Pressing the brake pedal several times dissipates the vacuum in the brake servo. More pressure thus has to be applied to the brake pedal to attain the same fluid pressure in the brake system as that achieved with vacuum.
- ♦ When the vacuum in the brake servo is exhausted, the wheels may not lock => start engine to build up vacuum in brake servo.

Abbreviations: Examples

-> e.g. Indicated on display:

Final control diagnosis	-
Ifl: UBAT	Ofl: 0V fl wheel locked

fl = front left

fr = front right

rl = rear left

rr = rear right

I = Inlet valve

O = Outlet valve

UBAT = Battery voltage; voltage applied to valve

0V = 0 volts; no voltage applied to valve

locked/free = Wheel status; must be checked by second mechanic

-> e.g. Indicated on display (on vehicles with EDL):

Final control diagnosis	-
EDL valves/Hydr-P: UBAT	fl/fr wheel locked

Hydr-P = Hydraulic pump

- Switch on ignition.
- Release handbrake.
- Connect up fault reader V.A.G 1551 and select brake electronics control unit with address word 03.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 3.

-> Indicated on display:

Rapid data transfer	Q
03 - Final control diagnosis	

- Confirm entry with Q key.

Note:

In the course of the next steps, the ABS warning lamp flashes 4 times per second.

-> Indicated on display:

Final control diagnosis	-
ABS hydraulic pump - V64	

ABS hydraulic pump -V64 must start up.

- Press ⇒ key within the next 10 s.

-> Indicated on display:

Final control diagnosis	-
Press brake	



Brake pedal must not sag.

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Ifl: 0V OfI: 0V fl wheel locked	

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Ifl: UBAT OfI: 0V fl wheel locked	

- Press ⇒ key.

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ABS hydraulic pump -V64 must start up.

Brake pedal must not sag.

-> Indicated on display:

Final control diagnosis	-
Ifl: UBAT OfI: UBAT fl wheel free	

- Press ⇒ key within the next 10 s.

ABS hydraulic pump -V64 stops running.

-> Indicated on display:

Final control diagnosis	-
Ifl: UBAT OfI: 0V fl wheel free	

- Press ⇒ key.

Brake pedal must sag noticeably.

-> Indicated on display:

Final control diagnosis	-
Ifl: 0V OfI: 0V fl wheel locked	

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Release brake	

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Press brake	

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Ifr: 0V OfI: 0V fr wheel locked	

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis -
Ifr: UBAT Ofr: 0V fr wheel locked

- Press ⇒ key.

ABS hydraulic pump -V64 must start up.

Brake pedal must not sag.

-> Indicated on display:

Final control diagnosis -
Ifr: UBAT Ofr: UBAT fr wheel free

- Press ⇒ key within the next 10 s.

ABS hydraulic pump -V64 stops running.

-> Indicated on display:

Final control diagnosis -
Ifr: UBAT Ofr: 0V fr wheel free

- Press ⇒ key.

Brake pedal must sag noticeably.

-> Indicated on display:

Final control diagnosis -
Ifr: 0V Ofr: 0V fr wheel locked

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis -
Release brake

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis -
Press brake

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis -
Irl: 0V Orl: 0V rl wheel locked

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis -
Irl: UBAT Orl: 0V rl wheel locked

- Press ⇒ key.

ABS hydraulic pump -V64 must start up.

Brake pedal must not sag.

-> Indicated on display:



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Final control diagnosis	-
Irl: UBAT	Orl: UBAT
	rl wheel free

- Press ⇒ key within the next 10 s.

ABS hydraulic pump -V64 stops running.

-> Indicated on display:

Final control diagnosis	-
Irl: UBAT	Orl: 0V
	rl wheel free

- Press ⇒ key.

Brake pedal must sag noticeably.

-> Indicated on display:

Final control diagnosis	-
Irl: 0V	Orl: 0V
	rl wheel locked

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Release brake	

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Press brake	

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Irr: 0V	Orl: 0V
	rr wheel locked

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis	-
Irr: UBAT	Orl: 0V
	rr wheel locked

- Press ⇒ key.

ABS hydraulic pump -V64 must start up.

Brake pedal must not sag.

-> Indicated on display:

Final control diagnosis	-
Irr: UBAT	Orl: UBAT
	rr wheel free

- Press ⇒ key within the next 10 s.

ABS hydraulic pump -V64 stops running.

-> Indicated on display:

Final control diagnosis	-
Irr: UBAT	Orl: 0V
	rr wheel free



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- Press ⇒ key.

Brake pedal must sag noticeably.

-> Indicated on display:

Final control diagnosis -
Irr: 0V Orr: 0V rr wheel locked

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis -
Release brake

- Press ⇒ key.

-> Indicated on display:

Final control diagnosis -
EDL valves/Hydr-P: UBAT wheels locked

ABS hydraulic pump -V64 must start up.

- Press ⇒ key.

Note:

ABS warning lamp and brake system warning lamp go out.

-> Indicated on display:

Function unknown or cannot
be implemented at present

Note:

Final control diagnosis is over.

- Press ⇒ key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

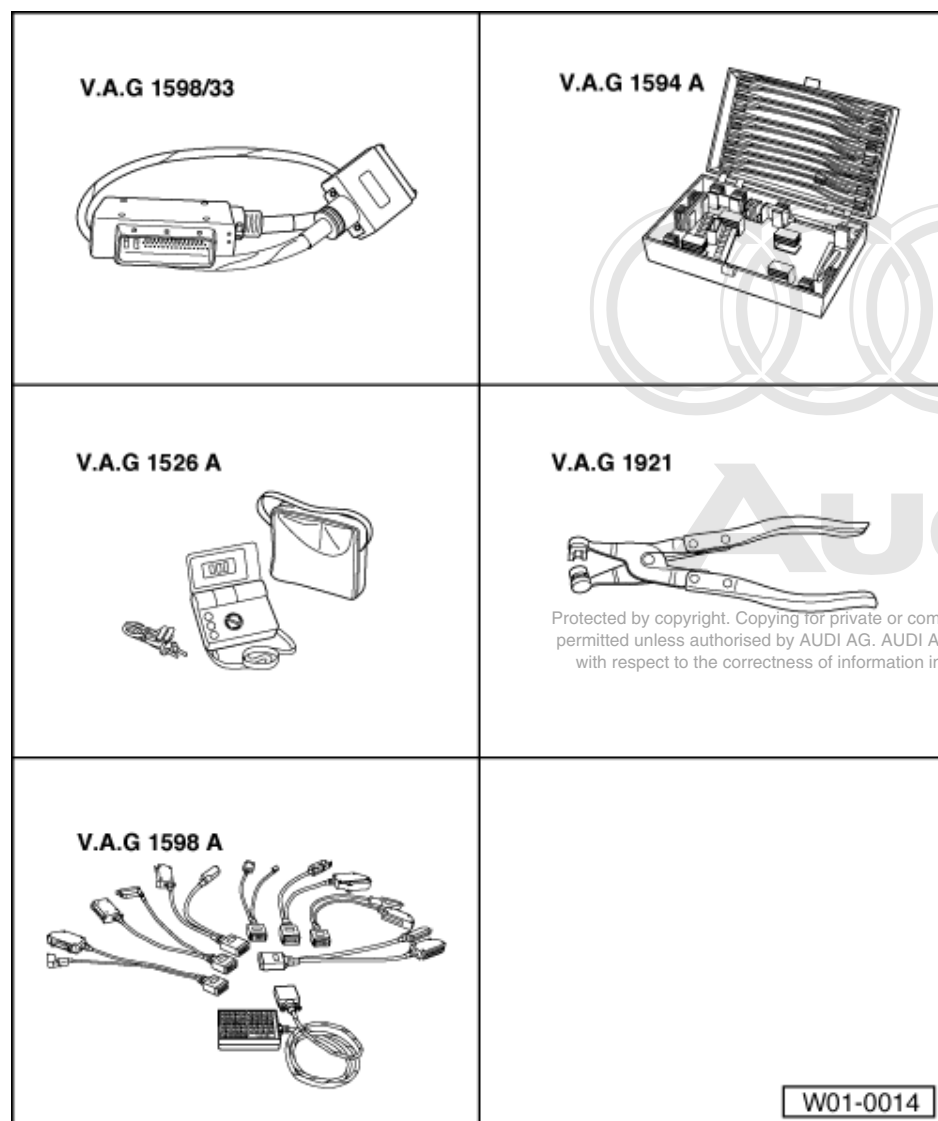
Notes:

- ◆ There is a fault in the system if the ABS warning lamp does not go out.
- ◆ Keep exactly to test sequence:
Interrogate fault memory first and then erase it
- End output => Page 5 .



5 - Electrical check on ABS/EDL/ASR/ESP ITT Mark 20 IE

5.1 - Electrical check on ABS/EDL/ASR/ESP ITT Mark 20 IE



Special tools and workshop equipment required

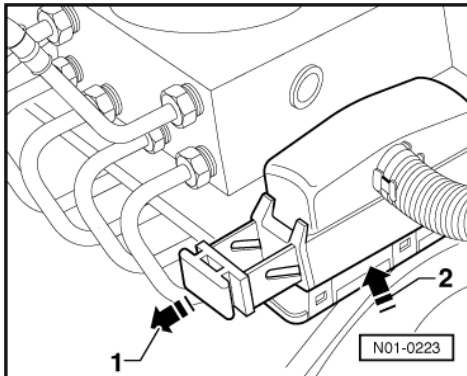
- ♦ V.A.G 1598/33 Adapter
 - ♦ V.A.G 1594 A Adapter set
 - ♦ V.A.G 1526 A Hand-held multimeter
 - ♦ V.A.G 1921 Pliers
 - ♦ V.A.G 1598 A Test box
-
- ♦ The entire electrical check is to be performed on vehicles for which the self-diagnosis does not give any indication of the source of the trouble.
 - ♦ Merely the test steps recommended in the fault table (specific testing) are to be performed on vehicles for which the self-diagnosis provides a direct indication of the source of the trouble.

All the test steps in the Electrical Check are listed on Page 45 .

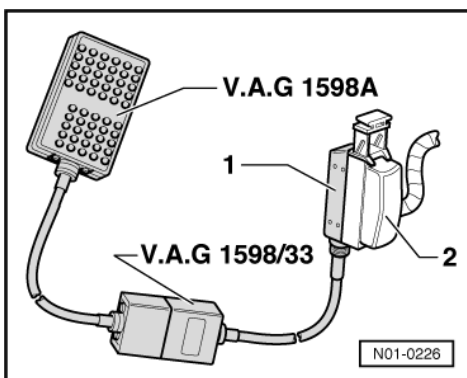
5.2 - Test requirements

- Switch off ignition and electr. loads (headlights, lighting, fan ...) before starting check

- Fuses S 40/10A, Si C/60A (6-position relay carrier in footwell on left) must be OK (take fuses out of fuse box for checking)



- -> Release (arrow -1-) connector from control unit and pull off (arrow -2-).



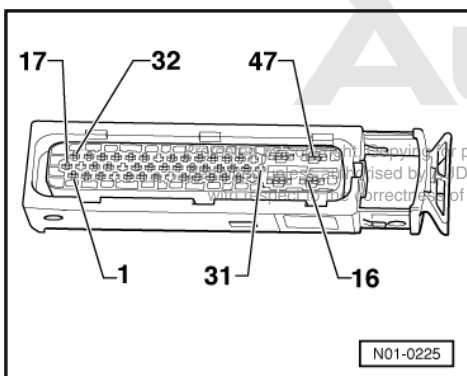
- -> Unplug multi-pin connector of ABS with EDL control unit -J104 and connect test box V.A.G 1598/33 -1- to connector of wiring harness -2-.

The specifications are geared to V.A.G 1526 and do not necessarily apply to other measuring instruments.

5.3 - Multi-pin connector and contact assignment

Note:

Contacts not listed are not used at present and are never to be connected to other components.





-> Contact assignment of connector T47 for wiring harness/ABS with EDL control unit -J104

Contact	Connection to component ...
1	=> Brake pressure solenoid valve, in brake servo -N247
3	=> Front right speed sensor -G45
4	=> Front right speed sensor -G45
5	=> Rear left speed sensor output
6	=> Rear right speed sensor -G44
7	=> Rear right speed sensor -G44
8	=> Front left speed sensor output (vehicles with navigation system only)
9	=> Lateral acceleration sender -G200, earth wire
10	=> Brake pressure sender 2 -G214
11	=> Yaw rate sender -G202, earth wire
12	=> Brake pressure sender 1 -G201
13	=> Brake detection switch, ESP -F83
14	=> Not used
15	=> Earth point on left of engine compartment
16	=> Term. 30 from alternator via fuse C

Contact	Connection to component ...
17	=> Brake pressure solenoid valve, in brake servo -N247
19	=> CAN High signal
20	=> CAN Low signal
22	=> ABS warning lamp -K47
23	=> Brake light switch -F
24	=> TCS/ESP button -E256
25	=> Lateral acceleration sender -G200, voltage wire
26	=> Brake pressure sender 2 -G214
27	=> Yaw rate sender -G202, voltage wire
28	=> Brake pressure sender 1 -G201
29	=> Brake detection switch, ESP -F83
30	=> Not used
31	=> Brake lights deactivation relay -J508
32	=> Brake detection switch, ESP -F83

Contact	Connection to component ...
33	=> Front left speed sensor -G47
34	=> Front left speed sensor -G47
35	=> Rear right speed sensor output (vehicles with navigation system only)
36	=> Rear left speed sensor -G46
37	=> Rear left speed sensor -G46
38	=> Front right speed sensor output (vehicles with navigation system only)
39	=> Connector T16/7, K-wire
40	=> Lateral acceleration sender -G200, signal wire
41	=> Brake pressure sender 2 -G214
42	=> Yaw rate sender -G202, signal wire
43	=> Brake pressure sender 1 -G201

Contact	Connection to component ...
44	=> Power supply, terminal 15 via S 40
45	=> Not used
46	=> Earth point on left of engine compartment
47	=> Term. 30 from alternator via fuse C

List of test steps

Component to be tested	
Power supply of ABS hydraulic pump -V64	- Perform test step 1
Power supply of valves in hydraulic unit	- Perform test step 2
Power supply of ABS with EDL control unit -J104	- Perform test step 3
Function of brake light switch -F	- Perform test step 4
Wiring of front right speed sensor -G45	- Perform test step 5
Wiring of front left speed sensor -G47	- Perform test step 6
Wiring of rear right speed sensor -G44	- Perform test step 7
Wiring of rear left speed sensor -G46	- Perform test step 8
Function of ABS warning lamp -K47	- Perform test step 9
Function of brake system warning lamp -K118	- Perform test step 10

Component to be tested	
Function of traction control system/ESP warning lamp -K86	- Perform test step 11
Function of TCS/ESP button -E256	- Perform test step 12
Actuation of steering angle sender -G85	- Perform test step 13
Actuation of lateral acceleration sender -G200	- Perform test step 14
Actuation of yaw rate sender -G202	- Perform test step 15
Actuation of brake pressure sender 1 -G201	- Perform test step 16
Actuation of brake pressure sender 2 -G214	- Perform test step 17
Actuation of brake pressure solenoid valve, in brake servo -N247	- Perform test step 18
Actuation of brake detection switch, ESP -F83	- Perform test step 19
CAN bus wiring and CAN bus system	- Perform test step 20
Power supply for V.A.G 1551, connector T16	- Perform test step 21
Resistance of self-diagnosis K-wire, connector T16	- Perform test step 22
Actuation of brake lights deactivation relay -J508	- Perform test step 23

5.4 - Test table

Notes on test table

- ♦ Socket designations of adapters V.A.G 1598/33 are identical to contact designations of ABS with EDL control unit -J104 in current flow diagram.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



- ♦ If measured values deviate from specifications, carry out fault rectification measures indicated on right of table.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ♦ Use adapter set V.A.G 1594 A for checking continuity.
- ♦ If measured values only differ slightly from specifications, clean sockets and connectors of testers and measurement leads (with contact spray G 000 700 04) and repeat test. Before replacing respective components, check wiring and connections and also repeat resistance check on component, particularly if specifications stipulate a resistance of less than 10 ω .

5.5 - Test table (test steps 1 - 23)

Select measuring range: Voltage measurement (20 V DC)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
1	15 + 47	Power supply for pump motor (terminal 30) at ABS with EDL control unit -J104	▪ Ignition off	10.0 - 14.5 V	- Wiring from contact T47/47 via fuse C to terminal 30 at alternator - Check wiring from contact T47/15 to earth => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
2	46 + 16	Power supply for valves (terminal 30) at ABS with EDL control unit -J104	▪ Ignition off	10.0 - 14.5 V	- Wiring from contact T47/16 via fuse C to terminal 30 at alternator - Check wiring from contact T47/46 to earth => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Select measuring range: Voltage measurement (20 V DC)

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Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
3	44 + 46	Power supply of ABS with EDL control unit -J104	▪ Ignition on	10.0 - 14.5 V	- Check wiring from contact T47/44 via fuse S 40 and ignition/starter switch Check wiring from contact T47/46 to earth => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Select measuring range: Voltage measurement (20 VDC) in test step 4, resistance measurement (200 ω)/(20 M ω) in test step 4a

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
4	23 + 46	Brake light switch -F	▪ Ignition off ▪ Brake pedal not pressed	0.0 - 0.5 V	- Adjust brake light switch if necessary => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components
			- Brake pedal pressed	10.0 - 14.5 V	- Check contact 1 of brake light switch -F to fuse S 30
4a		Brake light switch -F	▪ Select 200 ω measuring range - Unplug multi-pin connector T47 from ABS with EDL control unit -J104 - Unplug multi-pin connector from brake light/brake pedal switch - Check for open circuit in wiring	max. 1.5 ω	Check for open circuit in wiring Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
Test step 4a: Continued on next page					

Test step 4a (continued)

4a	- Check wiring from contact 23 (control unit) to contact 1 (brake light switch) ▪ Select 20 font=symbol charset=fontspecific code=77 descr='[Mgr]' ω measuring range - Take out fuse S 30 - Check for short to positive/earth in wiring	∞ ω
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Select measuring range: Resistance measurement (200 ω)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
5	3 + 4	Wiring from ABS with EDL control unit -J104 to front right speed sensor -G45	▪ Ignition off, unplug multi-pin connector T47 from ABS with EDL control unit -J104, connect up test box V.A.G 1598/33	max. 1.5 ω	- Unplug connector at speed sensor Check for open circuit and short to earth/positive in wiring between control unit and speed sensor => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

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					- Check connectors Shake wire during check (loose contact) If wiring is OK, check and if necessary replace appropriate speed sensor =>Page 29
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Select measuring range: Resistance measurement (200 ω)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
6	33 + 34	Wiring from ABS with EDL control unit - J104 to front left speed sensor -G47	▪ Ignition off	max.1.5 ω	- Unplug connector at speed sensor Check for open circuit and short to earth/positive in wiring between control unit and speed sensor => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Check connectors Shake wire during check (loose contact) If wiring is OK, check and if necessary replace appropriate speed sensor =>Page 29

Select measuring range: Resistance measurement (200 ω)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
7	7 + 6	Wiring from ABS with EDL control unit - J104 to rear right speed sensor -G44	▪ Ignition off	max.1.5 ω	- Unplug connector at speed sensor Check for open circuit and short to earth/positive in wiring between control unit and speed sensor => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Check connectors Shake wire during check (loose contact) If wiring is OK, check and if necessary replace appropriate speed sensor =>Page 29

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Select measuring range: Resistance measurement (200 ω)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
8	37 + 36	Wiring from ABS with EDL control unit - J104 to rear left speed sensor -G46	▪ Ignition off	max.1.5 ω	- Unplug connector at speed sensor Check for open circuit and short to earth/positive in wiring between control unit and speed sensor => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Check connectors Shake wire during check (loose contact) If wiring is OK, check and if necessary replace appropriate speed sensor =>Page 29

Functional test: ABS warning lamp -K47

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
9		Function of ABS warning lamp - K47	▪ Fault memory interrogated and no fault stored in fault memory of ABS with EDL control unit -J104 ▪ Ignition off ▪ Multi-pin connector attached to ABS with EDL control unit -J104 and engaged Switch on ignition	ABS warning lamp -K47 lights for 2 seconds and goes out again	- If ABS warning lamp does not light: Check for short to earth in vehicle electrical system voltage and wiring from contact T47/22 of ABS with EDL control unit -J104 to dash panel insert => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Fault in dash panel insert

Functional test: Brake system warning lamp -K118

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
10		Function of brake system warning lamp -K118	▪ Brake fluid level OK ▪ Ignition off ▪ Multi-pin connector attached to ABS with EDL control unit -J104 and engaged Switch on ignition	Brake system warning lamp - K118 lights for 2 seconds and goes out again	- Check brake fluid warning contact



					- Check for short to earth in wiring from contact 29 (green connector) in dash panel insert to brake fluid warning contact => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Fault in dash panel insert
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Functional test: Traction control system/ESP warning lamp -K86

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
11	-	Function of traction control system/ESP warning lamp -K86	▪ Ignition off ▪ Multi-pin connector attached to ABS with EDL control unit -J104 and engaged - Switch on ignition	Traction control system warning lamp -K86 lights for 2 seconds and goes out again	- Check for open circuit and short to positive in wiring from contact T47/24 (control unit) to contact 32, green connector (dash panel insert) - If traction control system warning lamp -K86 is permanently lit: Check for short to earth in wiring from contact T47/24 (control unit) to contact 32, green connector (dash panel insert) => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Fault in dash panel insert

Functional test: Warning lamp for TCS/ESP button -E256

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
12	-	Function of TCS/ESP button -E256	▪ Ignition off ▪ Function of traction control system/ESP warning lamp -K86 checked in test step 11 ▪ Multi-pin connector attached to ABS with EDL control unit -J104 and engaged - Switch on ignition - Press TCS/ESP button	Traction control system warning lamp -K86 lights for 2 seconds and goes out again Traction control system/ESP warning lamp -K86 lights	

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			- Press TCS/ESP button again	Traction control system/ESP warning lamp - K86 goes out	
Test step 12: Continued on next page					

Test step 12 (continued)

Select measuring range: Voltage measurement (20 VDC)					
Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
12	15 + 24	Function of TCS/ESP button -E256	- Switch off ignition - Unplug multi-pin connector from ABS with EDL control unit - J104 - Connect up test box V.A.G 1598/33 - Switch on ignition - TCS/ESP button not pressed and traction control system warning lamp -K86 does not light - TCS/ESP button not pressed and traction control system warning lamp -K86 lights - TCS/ESP button pressed	0.0 - 1.0 V 3.5 - 5.0 V 8.0 - 14.5 V	- Check wiring from contact T47/15 (control unit) to earth - Check for open circuit and short to positive/earth in wiring from contact T47/24 (control unit) to contact 6 (TCS/ESP button)
Test step 12: Continued on next page					

Test step 12 (continued)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
12					- Check for open circuit in power supply from contact 4 (TCS/ESP button) via fuse S40 => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Replace TCS/ESP button if no faults have been found in the preceding test steps

Select measuring range: Voltage measurement (20 VDC) in test step 13, resistance measurement (200 ω)/(20 M ω) in test step 13a

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
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13	-	Earth and power supply of steering angle sender -G85	▪ Ignition off Unplug multi-pin connector T47 from ABS with EDL control unit -J104 Unplug connector from steering angle sender Check power supply (term. 30) of steering angle sender at connector between contacts 4 and 1	10.0 - 14.5 V	- Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder Check for open circuit in wiring from contact 4 (steering angle sender) to fuse S 40
			- Ignition on Check power supply (term. 15) of steering angle sender at connector between contacts 5 and 1	10.0 - 14.5 V	- Check for open circuit in wiring from contact 5 (steering angle sender) to fuse S 40
Test step 13a: Next page					

Select measuring range: Voltage measurement (20 VDC) in test step 13, resistance measurement (200 ω)/(20 M ω) in test step 13a

13a	-	Wiring for steering angle sender -G85	▪ Select 200 ω measuring range - Connect up test box V.A.G 1598/33	∞ ω	
			▪ Select 20 Mω measuring range - Take out fuse S 40 - Check for short to positive/earth in wiring - Check for open circuit in wiring - Check wiring from contact 3 (steering angle sender) to contact T47/19 (ABS with EDL control unit -J104) - Check wiring from contact 2 (steering angle sender) to contact T47/20 (ABS with EDL control unit -J104) - Check wiring from contact 1 to earth connection -2- in dash panel wiring harness		
				max. 1.5 ω	- Check for open circuit in wiring Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Select measuring range: Resistance measurement (200 ω /20 M ω)

Test step	V.A.G 1598 sockets	Testing of	Test conditions - Additional work	Specification	Remedies if specification not attained
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Test step 14 (continued)

Select measuring range: Resistance measurement (200 ω /20 M ω)

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5.5 - Test table (test steps 1 - 23) **53**

Test step 15 (continued)

Select measuring range: Resistance measurement (200 ω /20 M ω)

Test step 16 (continued)

54 01 - Self-diagnosis, Electrical check

		- Check wiring from contact 2 (brake pressure sender) to contact T47/12 (ABS with EDL control unit -J104) Check wiring from contact 3 (brake pressure sender) to contact T47/43 (ABS with EDL control unit -J104)		
		▪ Select 20 M ω measuring range Take out fuse S40 Check for short to positive/earth in wiring	$\infty \omega$	

Select measuring range: Resistance measurement (200 ω /20 M ω)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
17	-	Wiring for brake pressure sender 2 - G214	▪ Ignition off ▪ Select 200 ω measuring range Unplug multi-pin connector T47 from ABS with EDL control unit -J104 Connect up test box V.A.G 1598/33 Unplug connector from brake pressure sender 2 -G214		
					Test step 17: Continued on next page

Test step 17 (continued)

17	-	- Check for open circuit in wiring Check wiring from contact 1 (brake pressure sender) to contact T47/26 (ABS with EDL control unit -J104) - Check wiring from contact 2 (brake pressure sender) to contact T47/10 (ABS with EDL control unit -J104) Wiring from contact 3 (brake pressure sender) with contact T47/41 (control unit)	max. 1.5 ω	Check for open circuit in wiring Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
		▪ Select 20 M ω measuring range Take out fuse S 40 Check for short to positive/earth in wiring	$\infty \omega$	

Select measuring range: Resistance measurement (200 ω /20 M ω)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
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18	-	Wiring for brake pressure solenoid valve, in brake servo -N247	- Ignition off - Select 200 ω measuring range - Unplug multi-pin connector T47 from ABS with EDL control unit -J104 - Connect up test box V.A.G 1598/33 - Unplug connector at brake servo - Check for open circuit in wiring		
Test step 18: Continued on next page					

Test step 18 (continued)

18	-	- Check wiring from contact 4 (brake pressure solenoid valve) to contact T47/17 (ABS with EDL control unit -J104) - Check wiring from contact 3 (brake pressure solenoid valve) to contact T47/1 (ABS with EDL control unit -J104)	max. 1.5 ω	- Check for open circuit in wiring	
		- Select 20 M ω measuring range - Take out fuse S 40 - Check for short to positive/earth in wiring	∞ ω	Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder	

Select measuring range: Resistance measurement (200 ω /20 M ω)

Test step	V.A.G 1598 sockets	Testing of	- Test conditions - Additional work	Specification	Remedies if specification not attained
19	-	Wiring for brake detection switch, ESP F83	- Ignition off - Select 200 ω measuring range - Unplug multi-pin connector T47 from ABS with EDL control unit -J104 - Connect up test box V.A.G 1598/33 - Unplug connector at brake servo - Check for open circuit in wiring		
Test step 19: Continued on next page					

Test step 19 (continued)

19	-	- Check wiring from contact 1 (brake detection switch) to contact T47/13 (ABS with EDL control unit -J104) - Check wiring from contact 2 (brake detection switch) to contact T47/29 (ABS with EDL control unit -J104) - Check wiring from contact 5 (brake detection switch) to contact T47/32 (ABS with EDL control unit -J104)	max. 1.5 ω	- Check for open circuit in wiring	
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	- Select 20 M ω measuring range - Take out fuse S40 - Check for short to positive/earth in wiring	$\infty \omega$	Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
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Select measuring range: Resistance measurement (200 ω /20 M ω)

Test step	V.A.G 1598 sockets	Testing of	Test conditions - Additional work	Specification	Remedies if specification not attained
20	19+20	Data bus wires Data bus system	- Check CAN bus => Reading measured value block, function 08, display group 125 => Page 31 - Ignition off - Select 200 ω measuring range - Connect up test box V.A.G 1598/33		
					Test step 20: Continued on next page

Test step 20 (continued)

20	- Check for open circuit in wiring Steering angle sender Engine control unit Automatic gearbox control unit1) - Check wiring from contact T47/19 (ABS with EDL control unit -J104) to contact 3 (steering angle sender) Check wiring from contact T47/20 (ABS with EDL control unit -J104) to contact 2 (steering angle sender)	max. 1.5 ω	- Check for open circuit in wiring
Test step 20: Continued on next page			

1) Vehicles with automatic gearbox only

Test step 20 (continued)

20	19+20	Check terminating resistance between contacts 19 and 20	approx. 60 ω	- Check all control units linked to CAN bus
		- Select 20 M ω measuring range - Take out fuse S 40 - Check for short to positive/earth in wiring	$\infty \omega$	Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Select measuring range: Voltage measurement (20 VDC) in test step 14, resistance measurement (200 ω) in test step 15

Test step	V.A.G 1598 sockets	Testing of	Test conditions - Additional work	Specification	Remedies if specification not attained
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21	-	Power supply for V.A.G 1551, connector T16	- Ignition on - Connect up hand-held multimeter V.A.G 1526 with adapter set V.A.G 1594 to T161) - Check wiring between contact T16/4 and contact T16/1	10.0 -14.5 V	- Check wiring from T16/4 to earth - Check wiring from T16/1 via S40 - Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
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1) => Page 43 , contact assignment of connector for power supply and self-diagnosis with fault reader V.A.G 1551

Select measuring range: Voltage measurement (20 VDC) in test step 10, resistance measurement (200 ω) in test step 11

Test step	V.A.G 1598 sockets	Testing of	- Test conditions - Additional work	Specification	Remedies if specification not attained
22	-	Resistance of K-wire for self-diagnosis, connector T16	- Ignition off - Select 200 ω measuring range - Take out fuse S 40 - Unplug multi-pin connector T47 from ABS with EDL control unit -J104 - Connect up test box V.A.G 1598/33 - Check wiring between contact T16/7 and contact T47/39	max. 1.5 ω	Check wiring from T16/7 to contact T47/39
			- Select 20 M ω measuring range - Take out fuse S 40 - Check for short to positive/earth in wiring	∞ ω	Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Select measuring range:
Resistance measurement (200 ω /20 M ω)

Test step	V.A.G 1598 sockets	Testing of	- Test conditions - Additional work	Specification	Remedies if specification not attained
23	-	Wiring of brake lights deactivation relay -J508	- Ignition off - Select 200 ω measuring range - Pull brake lights deactivation relay -J508 off auxiliary relay carrier - Unplug multi-pin connector T47 from ABS with EDL control unit -J104 - Connect up test box V.A.G 1598/33		

[illegible]

6.2 - Interrogating fault memory

Rapid data transfer HELP
Select function XX

Rapid data transfer Q
02 - Interrogating fault memory

- X faults detected



No faults detected

- Press ⇒ key.

The stored faults are consecutively displayed and printed out.

- Use fault table to eliminate faults.

As is the case with "No faults detected", program returns to start after pressing ⇒ key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

- End output (function 06) => Page 5 .

-> If adjacent display appears:

Attention:
Fault memory not interrogated

- Fault memory has not been interrogated.
- Select fault memory interrogation (function 02).
- Switch off ignition and unplug diagnostic connector.

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Notes:

Sequence of operations if fault has been detected:

1. Eliminate fault as per fault table on Page 60
2. Interrogate fault memory (function 02).
3. Erase fault memory (function 05).
4. End output (function 06).
5. Perform test drive
6. Interrogate fault memory again

6.3 - Fault table

Notes on fault table

- ♦ On account of the interlinking of control units by way of a data bus wire, always start fault-finding by implementing "Automatic test sequence" with key function 0 and 0 for all control units in the vehicle so as to interrogate their fault memories.
- ♦ Listed in the following in ascending order of 5-digit fault codes are all the faults which can be detected by the ABS with EDL control unit -J104 and printed out on V.A.G 1551 or VAS 5051.
- ♦ If faults only occur intermittently or if fault memory is not erased after fault elimination, such faults are displayed for a specified period as being "sporadic faults" -SP- => ABS with EDL control unit -J104 fault recognition, Page 59 .
- ♦ The fault code only appears on the printout (in "Rapid data transfer" mode).

Example:

Fault code	Fault type code
5-digit	3-digit

Example:	
00283	035

- ◆ The three-digit fault type code next to the fault code is a data code which can be ignored. Use is however to be made of the text relating to the type of fault.
- ◆ The "Fault remedy" column makes reference to the individual test steps in the electrical check.
- ◆ Before replacing components shown to be faulty, use current flow diagram to check all corresponding connectors, wires and earth connections.
- ◆ On completion of repairs, always interrogate fault memory again with fault reader V.A.G 1551 or VAS 5051, erase it and perform test drive (at more than 20 km/h).
- ◆ Always interrogate fault memory again after completing test drive.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
No faults detected	Self-diagnosis is over if "No faults detected" appears on completion of repair work. Proceed as follows if ABS/ESP does not function properly despite "No faults detected" appearing on display or if ESP warning lamp lights: 1. Perform test drive at more than 20 km/h. 2. Interrogate fault memory again; if there is still no fault stored: 3. Continue fault-finding without self-diagnosis and work through entire electrical check => Page 42 .	

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00283 Speed sensor front left -G47 open circuit/short to positive	- Open circuit, short to positive/earth or loose contact in wiring between front left speed sensor -G47 and ABS with EDL control unit -J104	- Check wiring, connectors =>Test step no. 5 =>Page 29
Speed sensor front left -G47 signal outside tolerance1)	- Excessive air gap between speed sensor and rotor (signal not OK) - Excessive wheel bearing clearance	- Check speed sensor and rotor for damage Check installation position of speed sensor Replace speed sensor or rotor Replace wheel bearing => Running Gear, Front-wheel Drive; Repair Group 40; Front suspension Front suspension
Speed sensor front left -G47 mechanical fault1)	- Rotor or speed sensor damaged or dirty	- Check speed sensor and rotor for damage; check, clean or replace speed sensor/rotor If fault still present: Replace control unit => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

1) Type of fault; this fault can only be recognised as of 20 km/h (perform test drive)

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00285 Speed sensor front right -G45 open circuit/short to positive	- Open circuit, short to positive/earth or loose contact in wiring between front right speed sensor -G45 and ABS with EDL control unit -J104	- Check wiring, connectors =>Test step no. 6 =>Page 29



Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
Speed sensor front right -G45 signal outside tolerance1)	- Excessive air gap between speed sensor and rotor (signal not OK) - Excessive wheel bearing clear- ance	- Check speed sensor and rotor for damage Check installation position of speed sensor => Brake System; Repair Group 45; Exploded view of ESP components Front suspension
Speed sensor front right -G45 me- chanical fault1)	- Rotor or speed sensor damaged or dirty	- Check speed sensor and rotor for damage; check, clean or replace speed sensor/rotor If fault still present: Replace control unit => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

1) Type of fault; this fault can only be recognised as of 20 km/h (perform test drive)

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00287 Speed sensor rear right -G44 open circuit/short to positive	- Open circuit, short to positive/ earth or loose contact in wiring be- tween rear right speed sensor - G44 and ABS with EDL control unit -J104	- Check wiring, connectors =>Test step no. 7 =>Page 29
Speed sensor rear right -G44 signal outside tolerance1)	- Excessive air gap between speed sensor and rotor (signal not OK) - Excessive wheel bearing clear- ance	- Check speed sensor and rotor for damage Check installation position of speed sensor Replace speed sensor or rotor Replace wheel bearing => Running Gear, Front-wheel Drive; Repair Group 42; Rear sus- pension Rear suspension
Speed sensor rear right -G44 me- chanical fault1)	- Rotor or speed sensor damaged or dirty	- Check speed sensor and rotor for damage; check, clean or replace speed sensor/rotor If fault still present: Replace control unit => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

1) Type of fault; this fault can only be recognised as of 20 km/h (perform test drive)

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00290 Speed sensor rear left -G46 open circuit/short to positive	- Open circuit, short to positive/ earth or loose contact in wiring be- tween rear left speed sensor -G46 and ABS with EDL control unit - J104	- Check wiring, connectors =>Test step no. 8 =>Page 29

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
Speed sensor rear left -G46 signal outside tolerance1)	- Excessive air gap between speed sensor and rotor (signal not OK) - Excessive wheel bearing clearance	- Check speed sensor and rotor for damage - Check installation position of speed sensor - Replace speed sensor or rotor - Replace wheel bearing => Running Gear, Front-wheel Drive; Repair Group 42; Rear suspension Rear suspension
Speed sensor rear left -G46 mechanical fault1)	- Rotor or speed sensor damaged or dirty	- Check speed sensor and rotor for damage; check, clean or replace speed sensor/rotor - If fault still present: Replace control unit => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

1) Type of fault; this fault can only be recognised as of 20 km/h (perform test drive)

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00538 Power supply of senders Reference voltage	- Open circuit or short to positive/earth in wiring - Yaw rate sender - Lateral acceleration sender - Brake pressure senders	- Check fuses, wiring, connectors and power supply for control unit =>Test step nos. 14, 15, 16 and 17 => Page 52
00668 Vehicle voltage terminal 30 Signal outside tolerance	- Open circuit or short to positive/earth in wiring - Check fuses S C/60A	- Check fuses, wiring, connectors and power supply for control unit =>Test step nos. 1 and 2 => Page 46

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00778 Steering angle sender -G85 No communication	- Open circuit or loose contact in data bus wires between steering angle sender -G85 and ABS with EDL control unit -J104 - Check specifications of: - Steering angle sender -G85 - Steering angle sender -G85 defective	- Check fuses, wiring, connectors and power supply for control unit =>Test step no. 13 => Page 51 - Function 08 "Reading measured value block" =>Page 31, Display group number 004 - Replace steering angle sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Then perform zero position compensation => Page 25

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Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00778 Steering angle sender -G85 No or incorrect setting	- No or incorrect setting values transmitted by steering angle sender -G85	- Perform zero position compensation for steering angle sender => Page 25
00778 Steering angle sender -G85 Mechanical fault	- Steering angle sender -G85 not correctly positioned - Wheel alignment not OK - Steering wheel detached and zero position compensation not subsequently performed	- Check installation position of steering angle sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Perform wheel alignment => Running Gear, Axles, Steering; Repair Group 44; Wheel alignment Wheel alignment - Then perform zero position compensation => Page 25

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00778 Steering angle sender -G85 Implausible signal	- Steering angle sender -G85 not correctly positioned - Zero position compensation not OK - Wheel alignment not OK	- Check installation position of steering angle sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Perform wheel alignment => Running Gear; Repair Group 44; Wheel alignment Wheel alignment - Then perform zero position compensation => Page 25
00778 Steering angle sender -G85 Defective	- Steering angle sender -G85 defective	- Replace steering angle sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Then perform zero position compensation => Page 25

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Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00810 Brake pressure senders 1/2 Implausible signal Sender 1 -G201 Sender 2 -G214	- Open circuit in earth connection for brake pressure sender 1 or 2 - Short circuit in signal wire to brake pressure sender 1 or 2 - Brake pressure sender 1 -G201 or brake pressure sender 2 -G214 defective	- Check fuses, wiring, connectors and power supply for control unit => Test step nos. 16 and 17 => Page 31 - Replace brake pressure sender 1 or 2 => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
	- Failure of hydraulic brake circuit	- Perform zero position compensation =>Page 27 - Check brake system => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00812 Brake pressure solenoid trip switch -F841)	- Open circuit or short to positive/earth in wiring to brake detection switch, ESP -F83 - Check brake detection switch, ESP -F83 - Brake servo defective	- Use current flow diagram to check wiring, connectors and earth wires =>Test step no. 19 =>Page 23 , Display group number 031 If fault still present: Replace brake servo => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

1) Brake pressure solenoid trip switch -F84 and brake detection switch, ESP -F83 are identical

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00813 Brake pressure sender 2 -G214 Electr. fault in circuit	- Open circuit or loose contact in wiring between brake pressure sender 2 -G214 and ABS with EDL control unit -J104 - Brake pressure sender 2 -G214 defective	- Check fuses, wiring, connectors and power supply for control unit =>Test step no. 17 => Page 42 , Electrical Check - Replace brake pressure sender 2 => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Perform zero position compensation Function 04 "Basic setting" =>Page 23 , Display group number 66

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00814 Brake pressure solenoid -N247	- Open circuit or loose contact in wiring between brake pressure solenoid valve -N247 and ABS with EDL control unit -J104 - Brake pressure solenoid valve, in brake servo -N247 defective - Brake servo defective	- Check fuses, wiring, connectors and power supply for control unit =>Test step no. 18 => Page 42 , Electrical Check - Perform functional test Function 04 "Basic setting" =>Page 23 , Display group number 31 - If fault still present: Replace brake servo => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components



Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
	- Output stage in ABS with EDL control unit -J104 defective	- If fault still present: Replace ABS with EDL control unit - J104 => Brake System; Repair Group 45; Exploded view of ESP components 23 , Display group numbers 60, 63 and 66

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01044 Control unit incorrectly coded	- Incorrect code number entered via V.A.G 1551 - Contacts 2 and 14 at control unit in use	- Check control unit encoding =>Page 22 Check fuses, wiring, connectors and power supply for control unit
01130 ABS operation Implausible signal1)	- Electrical interference from external sources (high-frequency irradiation, e.g. non-insulated ignition cables) - Open circuit, short to positive/earth or loose contact in wiring	- Check for short to positive/earth in all wires and connectors Erase fault memory Perform test drive at more than 20 km/h Interrogate fault memory again If fault still present: - Replace ABS with EDL control unit - J104 => Brake System; Repair Group 45; Exploded view of ESP components

1) Type of fault; this fault can only be recognised as of 20 km/h (perform test drive)

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01276 ABS hydraulic pump -V64 Signal outside tolerance1)	- Internal link between electric motor and control unit - Short to positive/earth or open circuit - Control unit defective - Pump motor defective	- Use current flow diagram to check wiring, connectors and earth wires =>Test step no. 1 =>Page 36 Try replacing control unit if pump motor does not start up during final control diagnosis Replace hydraulic unit if fault is still present - Replace control unit => Brake System; Repair Group 45; Exploded view of ESP components

1) Type of fault; this fault can only be recognised as of 20 km/h (perform test drive)

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01312		

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
Drive train data bus defective1)	- Open circuit, short to positive/earth or loose contact in data bus wire	- Use current flow diagram to check for open circuit or short circuit in data wire =>Test step no. 20 =>Page 42 , Electrical Check

1) Occurs with ESP in combination with fault: Steering angle sender -G85 no communication

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01314 Engine control unit Read out fault memory	- Fault in engine control unit	- Read out engine control unit fault memory
01314 Engine control unit No communication	- Open circuit	- Use current flow diagram to check for open circuit or short circuit in data wire =>Test step no. 20 =>Page 42 , Electrical Check
01315 Gearbox control unit1) No communication	- Open circuit	- Use current flow diagram to check for open circuit or short circuit in data wire =>Test step no. 20 =>Page 42 , Electrical Check

1) Vehicles with automatic gearbox only

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01423 Lateral acc. sender -G200 Electr. fault in circuit	- Open circuit, short to positive/earth or loose contact in wiring between lateral acceleration sender -G200 and ABS with EDL control unit -J104 - Lateral acceleration sender - -G200 incorrectly positioned - Lateral acceleration sender -G200 defective	- Check lateral acceleration sender Function 08 "Reading measured value block" =>Page 42 , Electrical Check - Check installation position of lateral acceleration sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Replace lateral acceleration sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Perform zero position compensation Function 04 "Basic setting" =>Page 23 , Display group number 63

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01423 Lateral acc. sender -G200 Implausible signal	- Lateral acceleration sender - -G200 incorrectly positioned	- Check lateral acceleration sender Function 08 "Reading measured value block" =>Page 31 , Display group number 004 Check installation position of lateral acceleration sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components



Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
	- Lateral acceleration sender -G200 defective	- Replace lateral acceleration sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Perform zero position compensation Function 04 "Basic setting" =>Page 23 , Display group number 63

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01435 Brake pressure sender 1 -G201 Electr. fault in circuit	- Open circuit or loose contact in wiring between brake pressure sender 1 -G201 and ABS with EDL control unit -J104 - Brake pressure sender 1 -G201 defective	- Check brake pressure sender 1 Function 08 "Reading measured value block" =>Page 54 - Replace brake pressure sender 1 => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Perform zero position compensation Function 04 "Basic setting" =>Page 23 , Display group number 66

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01542 Yaw rate sender -G202 Implausible signal	- Open circuit in earth connection for yaw rate sender -G202 - Yaw rate sender -G202 incorrectly positioned - Yaw rate sender -G202 defective	- Check yaw rate sender Function 08 "Reading measured value block" =>Page 53 - Check installation position of yaw rate sender => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components - Replace yaw rate sender -G202 => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01542 Yaw rate sender -G202 Electr. fault in circuit Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.	- Open circuit, short to positive/earth or loose contact in wiring between yaw rate sender -G202 and ABS with EDL control unit -J104 - Yaw rate sender -G202 defective	- Check yaw rate sender Function 08 "Reading measured value block" =>Page 53 - Replace yaw rate sender -G202 => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components
65535 Control unit defective	- Control unit defective	- Replace control unit => Brake System; Repair Group 45; Exploded view of ESP components Exploded view of ESP components

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
		- Perform zero position compensation Function 04 "Basic setting" =>Page 23 , Display group numbers 60, 63 and 66

7 - Electrohydraulic power steering

7.1 - Electrohydraulic power steering

7.2 - Description and function

The EPHS (Electrically Powered Hydraulic Steering) system is governed by steering angle velocity and vehicle speed. The electrohydraulic steering is similar to the conventional power steering. The control unit, the hydraulic unit (electric motor and gear pump) and the hydraulic fluid reservoir form one unit, known as the motor/pump assembly, which cannot be dismantled.

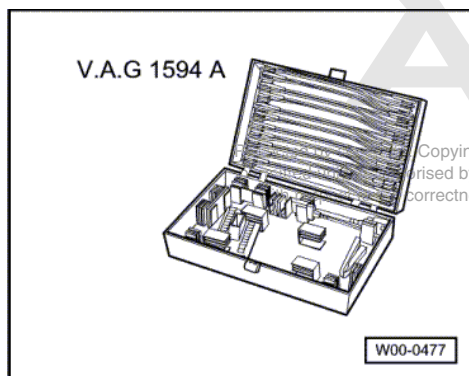
This unit is not driven via the engine, but rather by an electric motor integrated into the motor/pump assembly. Low steering angle velocity and high vehicle speed result in a low hydraulic fluid delivery rate and thus firm steering. When parking, vehicle speed is low and steering angle velocity high, thus producing light steering. The great advantage of this steering system is that it saves fuel, as energy consumption is based on actual requirements and is not dependent on the operating status of the engine.

Power steering sensor signals, vehicle speed signals and engine speed signals are transmitted to the power steering control unit -J500, which regulates the speed of the electric motor and thus the hydraulic fluid delivery rate.

Diagnostic communication is effected by way of the CAN. The gateway transfers the signals from the CAN to the K-wire. The self-diagnosis relates to the electrical section of the power steering. The control unit detects faults during vehicle operation and stores them in the dash panel insert (address word 17) in a non-volatile memory so that the information is retained even in the absence of battery voltage. Faults may take the form of defects in the electrical system. In the event of a fault entry, a yellow warning lamp lights in the dash panel insert display and the steering switches to a programmed emergency running mode. In this process, the steering function is retained but steering becomes slightly heavier. An acoustic warning signal is also given (1 beep).

8 - Electrical check on electrohydraulic steering

8.1 - Electrical check on electrohydraulic steering

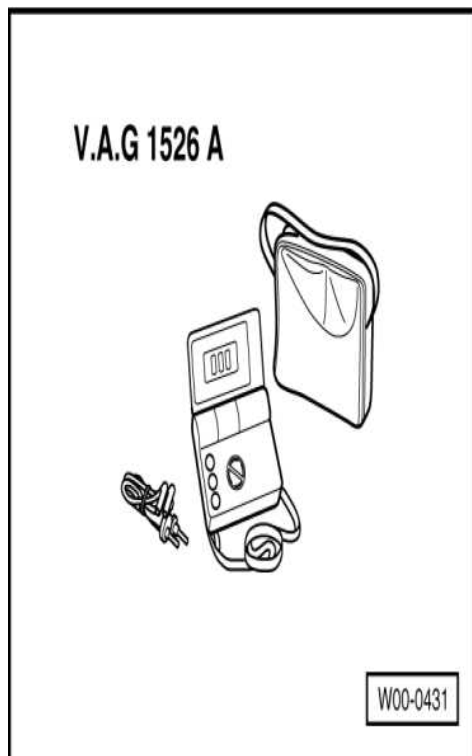


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Special tools and workshop equipment required



- ♦ V.A.G 1594 A Adapter set
- ♦ V.A.G 1526 A Hand-held multimeter
- ♦ V.A.G 1598 A Test box



8.2 - Test requirements

- ♦ Applicable current flow diagram

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ♦ Information on eliminating current defects

=> Technical Service Handbook

- Switch off ignition and electr. loads (headlights, lighting, fan ...) before starting check
- Remove front bumper

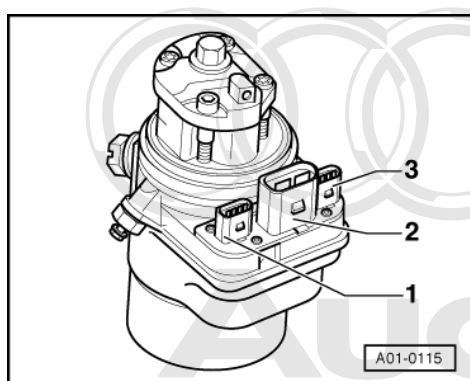
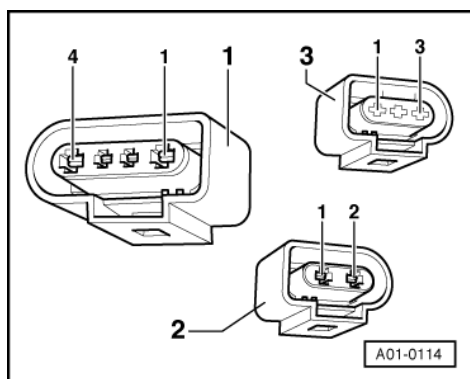
=> General Body Repairs, Exterior; Repair Group 63

- Fuses Si38 and Si C must be OK (for checking, take fuses out of fuse box)
- ♦ The entire electrical check is to be performed on vehicles for which the self-diagnosis does not give any indication of the source of the trouble.
- ♦ Merely the test steps recommended in the fault table (specific testing) are to be performed on vehicles for which the self-diagnosis provides a direct indication of the source of the trouble.

All the test steps in the Electrical Check are listed on Page 71.

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8.3 - Connectors and contact assignment of power steering control unit -J500



Connector 1	Four-pin
Contact	
1	CAN Low signal
2	CAN High signal
3	Not used
4	+ voltage term. 15
Connector 2	Two-pin
Contact	
1	+ voltage term. 30
2	Earth term. 31
Connector 3	Three-pin
Contact	
1	+ voltage, power steering sensor -G250
2	- voltage, power steering sensor -G250
3	PWM signal, power steering sensor - G250

List of test steps

Component to be tested	
Power supply, term. 30 of power steering control unit -J500	- Perform test step 1
Power supply, term. 15 of power steering control unit -J500	- Perform test step 2



Component to be tested	
Power supply for power steering sensor -G250	- Perform test step 3
Wiring	- Perform test step 4
Function of Servotronic warning lamp -K92	- Perform test step 5
CAN bus wires	- Perform test step 6
Electric motor in motor pump assembly	- Perform test step 7

8.4 - Test table

Notes on test table

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ♦ If measured values deviate from specifications, carry out fault rectification measures indicated on right of table.

=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- ♦ Use adapter set V.A.G 1594 A for checking continuity.
- ♦ If measured values only differ slightly from specifications, clean sockets and connectors of testers and measurement leads (with contact spray G 000 700 04) and repeat test. Before replacing respective components, check wiring and connections and also repeat resistance check on component, particularly if specifications stipulate a resistance of less than 10 Ω .

8.5 - Test table (test steps 1 - 7)

Select measuring range: Voltage measurement (20 V DC)

Test step	V.A.G 1598 sockets	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
1		Power supply for power steering control unit -J500 (term. 30)	▪ Ignition off Unplug connector 1 from control unit - J500 ▪ Ignition on Check power supply (term. 30) at connector between contacts 1 and 2	10.0 -14.5 V	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
2		Power supply for power steering control unit -J500 (term. 15)	▪ Ignition off Unplug connector 2 from control unit - J500 ▪ Ignition on Check power supply (term. 15) at connector between contact 4 and earth	10.0 -14.5 V	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

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Select measuring range: Voltage measurement (20 V DC)

Test step	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
3	Power supply for power steering sensor	▪ Ignition off - Unplug connector 3 from control unit -J500 ▪ Ignition on - Check power supply at connector at control unit -J500 between contacts 1 and 2	10.0 -14.5 V	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
4	Wiring	▪ Ignition off - Select resistance measuring range ▪ (200 ω)	max.1.5 ω	- Unplug connector at control unit -J500 - Check for open circuit or short to earth/positive in wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
5	Function of Servotronic warning lamp -K92	▪ Fault memory interrogated and no fault stored in fault memory of power steering control unit -J500 ▪ Check fuse Si 38 ▪ Check fuse Si C		- Servotronic warning lamp lights => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
Test step	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
6	Data bus wires	▪ Ignition off - Select 200 ω measuring range - Unplug multi-pin connectors from control units linked to data bus (connection in dash panel wiring harness, contacts 19 and 20)		

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Test step 6: Continued on next page

Select measuring range: Resistance measurement (200 ω /20 M ω)

Test step	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
6		- Check for open circuit in wiring - Steering angle sender - Engine control unit - Automatic gearbox control unit1) - Check wiring from contact 18/dash panel to contact 2/steering angle sender - Check wiring from contact 19/dash panel to contact 1/steering angle sender	max. 1.5 ω	- Check for open circuit in wiring
		▪ Select 20 M ω measuring range - Take out fuse S 40 - Check for short to positive/earth in wiring	∞ ω	- Use current flow diagram to repair wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



Select measuring range: Current measurement (50A) V.A.S. 5051

Test step	Testing of	▪ Test conditions - Additional work	Specification	Remedies if specification not attained
7	Current at motor pump assembly	▪ Ignition off ▪ Connect 50A current probe of V.A.S. 5051 to connector 2, contact 1 - Start engine - Turn steering wheel as far as left lock - Turn steering wheel as far as right lock	2 A - 42 A	- Perform hydraulic check on motor pump assembly => Running Gear; Front-wheel drive - Replace entire motor pump assembly => Running Gear; Front-wheel drive

9 - Steering fault table

9.1 - Steering fault table

9.2 - Interrogating fault memory

Notes:

- ♦ Power steering faults as of version 6Q0423155 = part no. of power steering control unit -J500 (refer to Parts List for current control unit version) are stored in the dash panel insert. In other words, power steering diagnosis is performed by the dash panel insert.
- Switch on ignition
- Switch on printer by pressing PRINT key (lamp in key lights).
- Press key -1- for "Rapid data transfer" mode.

-> Indicated on display:

```
Rapid data transfer  HELP
Enter address word XX
```

- Press keys 1 and 7 to enter address word of vehicle system to be tested (namely "Dash panel insert").

-> Indicated on display:

```
Rapid data transfer  Q
03 - Brake electronics
```

- Confirm entry with Q key.

-> Adjacent display then appears (example):

```
8Z0920930A  W1 Dash panel insert
VD0 X42
Code 05142  WSC XXXXX
```

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-> Indicated on display (function selection):

```
Rapid data transfer  HELP
Select function XX
```

- Press keys 0 and 2 to enter "Interrogating fault memory" function.

-> Indicated on display:

Rapid data transfer Q
02 - Interrogating fault memory

- Confirm entry with Q key.

-> The number of stored faults or "No faults detected" appears on the display.

X faults detected

No faults detected

- Press => key.

The stored faults are consecutively displayed and printed out.

- Consult fault table with fault message printout to eliminate faults.

As is the case with "No faults detected", program returns to start after pressing => key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

- End output (function 06) => Page 5

-> If adjacent display appears:

Attention:
Fault memory not interrogated

- Fault memory has not been interrogated.
- Select fault memory interrogation (function 02).
- Switch off ignition and unplug diagnostic connector.

Notes:

Sequence of operations if fault has been detected:

1. Eliminate fault as per fault table on Page 60
2. Interrogate fault memory (function 02).
3. Erase fault memory (function 05).
4. End output (function 06).
5. Perform test drive
6. Interrogate fault memory again

9.3 - Fault table

Notes on fault table

- ♦ On account of the interlinking of control units by way of a data bus wire, always start fault-finding by implementing "Automatic test sequence" with key function 0 and 0 for all control units in the vehicle so as to interrogate their fault memories.
- ♦ Listed in the following in ascending order of 5-digit fault codes are all the faults which can be detected by the power steering control unit -J500 and printed out on V.A.G 1551 or VAS 5051.
- ♦ If faults only occur intermittently or if fault memory is not erased after fault elimination, such faults are displayed for a specified period as being "sporadic faults" -SP-.



- ♦ The fault code only appears on the printout (in "Rapid data transfer" mode).

Example:	
Fault code	Fault type code
5-digit	3-digit
00566	035

- ♦ The three-digit fault type code next to the fault code is a data code which can be ignored. Use is however to be made of the text relating to the type of fault.
- ♦ The "Fault remedy" column makes reference to the individual test steps in the electrical check.
- ♦ Before replacing components shown to be faulty, use current flow diagram to check all corresponding connectors, wires and earth connections.
- ♦ On completion of repair work, always interrogate fault memory again with fault reader V.A.G 1551 or VAS 5051 and erase it.

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
No faults detected	Self-diagnosis is over if "No faults detected" appears on completion of repair work. Proceed as follows if electrohydraulic steering does not function properly despite "No faults detected" appearing on display or if Servotronic warning lamp -K92 lights: Continue fault-finding without self-diagnosis and work through entire electrical check => Page 69.	

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00566 Power steering operation implausible signal	- No vehicle-speed signal - Power steering switches to emergency operation	- Check data bus =>Page 73 Perform dash panel insert self-diagnosis => Electrical System; Repair Group 90; Dash panel insert Dash panel insert
00816 Steering assistance sensor -G250 short to earth	- Open circuit, short to earth or loose contact in wiring between power steering sensor -G250 and power steering control unit -J500 - Power steering sensor defective	- Check wiring, connectors Test step no. 4 =>Page 73 Replace power steering sensor => Running Gear, Front-wheel Drive; Repair Group 48
Steering assistance sensor -G250 open circuit/short to positive	- Open circuit, short to positive or loose contact in wiring between power steering sensor -G250 and power steering control unit -J500	- Check wiring, connectors Test step no. 4 =>Page 73 Replace power steering sensor => Running Gear, Front-wheel Drive; Repair Group 48
Steering assistance sensor -G250 defective	- Power steering sensor -G250 defective	- Replace power steering sensor => Running Gear, Front-wheel Drive; Repair Group 48

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
00817 Steering assistance temp. protection	- Excessive temperature in hydraulic circuit	- Check hydraulic circuit Check hydraulic fluid level => Running Gear, Front-wheel Drive; Repair Group 48
01288		

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
Supply voltage, term. 30 too low	- Supply voltage less than 10 V - Poor earth connection to control unit - Battery flat - Current draw with ignition off	- Check voltage - Test step no. 1 =>Page 73
Supply voltage, term. 30 too high	- Alternator voltage regulator defective - Overvoltage caused by starting assistance	- Check voltage - Test step no. 1 =>Page 72 - Check alternator voltage regulator => Electrical System; Repair Group 90; Dash panel insert Dash panel insert
01289 Supply voltage, term. 15 too low	- Open circuit in wiring	- Check voltage - Test step no. 2 =>Page 73

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01290 Power steering reference voltage short to positive/earth	- Open circuit, short to positive/earth or loose contact in wiring between power steering sensor -G250 and power steering control unit -J500 - Power steering sensor defective	- Check wiring, connectors - Test step no. 4 =>Page 73 - Replace power steering sensor => Running Gear, Front-wheel Drive; Repair Group 48
01309 Steering assistance control unit defective	- Power steering control unit defective - Loose connector 1, 2 or 3 =>Page 71 - Open circuit in wiring to control unit	- Replace control unit => Running Gear, Front-wheel Drive; Repair Group 48 73
01312 Drive train data bus defective	- Bus wires defective - Fault in one of control units linked to data bus	- Check data bus - Test step no. 6=>Page 73
01314 Engine control unit No communication	- Data bus defective - Engine control unit defective	- Check data bus - Test step no. 6 =>Page 73

Output on printer of V.A.G 1551	Possible cause of trouble	Fault remedy
01317 Control unit in dash panel insert No communication	- Data bus defective - Open circuit in power supply to ABS with EDL control unit -J104	- Check data bus =>Page 73 - Read out dash panel insert fault memory - Replace dash panel insert => Electrical System; Repair Group 90; Dash panel insert Dash panel insert