

Diagnosis/troubleshooting

Anti-lock brake system

System ABS 5.3 and System ABS/TC 5.3

Anti-lock brake system, diagnosis

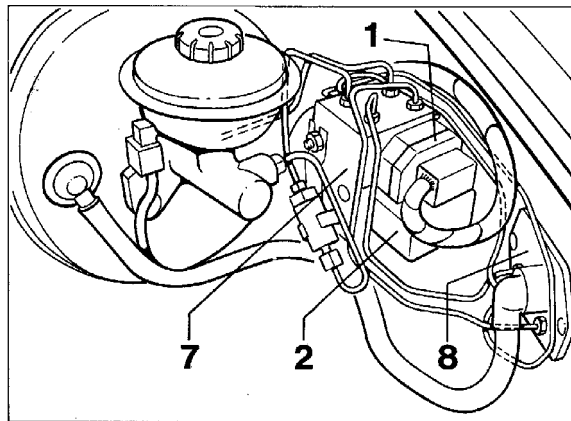
Important information about ABS 5.3 and ABS/TC 5.3

General

The Porsche Boxster is fitted **as standard** with an anti-lock brake system (ABS 5.3).

"**Traction Control (TC)**" can be obtained on **special request** on the basis of ABS 5.3. **Traction Control (TC)** is a combination of anti-slip control (ASR) and Automatic Brake Differential (ABD). **TC is a further system for increasing driving safety.**

ABS 5.3 is optimized with regard to installed volume and weight **compared with the ABS 5** (ABS 5 in the 993). Control module (No. 1), hydraulic unit (No. 7), pump motor relay and valve relay (No. 2) of ABS 5.3 and ABS/TC 5.3 **are a unit** that is positioned next to the master brake cylinder.



Diagnosis and system checks on both systems are carried out with the **Porsche System Tester 2**.

Differences between ABS 5.3 and ABS/TC 5.3

ABS 5.3 = 3-channel system

ABS/TC 5.3 = 4-channel system

The essential **distinguishing features** between ABS and ABS/TC **are:**

- Number of brake lines at intermediate piece
ABS 5.3 = 3 brake lines
ABS/TC 5.3 = 4 brake lines
- TC OFF switch for switching driving stability control on and off is not available on vehicles with Solo ABS (ABS 5.3).

TC (ASR/ABD) MIL and

TC (ASR/ABD) function light

(Information light) in vehicles **with ABS/TC**. These lights are lit when the ignition is switched on (lamp check).

In vehicles **with ABS 5.3** (Solo ABS) these lamps are **not fitted** in the instrument cluster.

A figure showing the warning (MIL) and function lights

ABS 5.3 (3-channel system) system description ABS operation

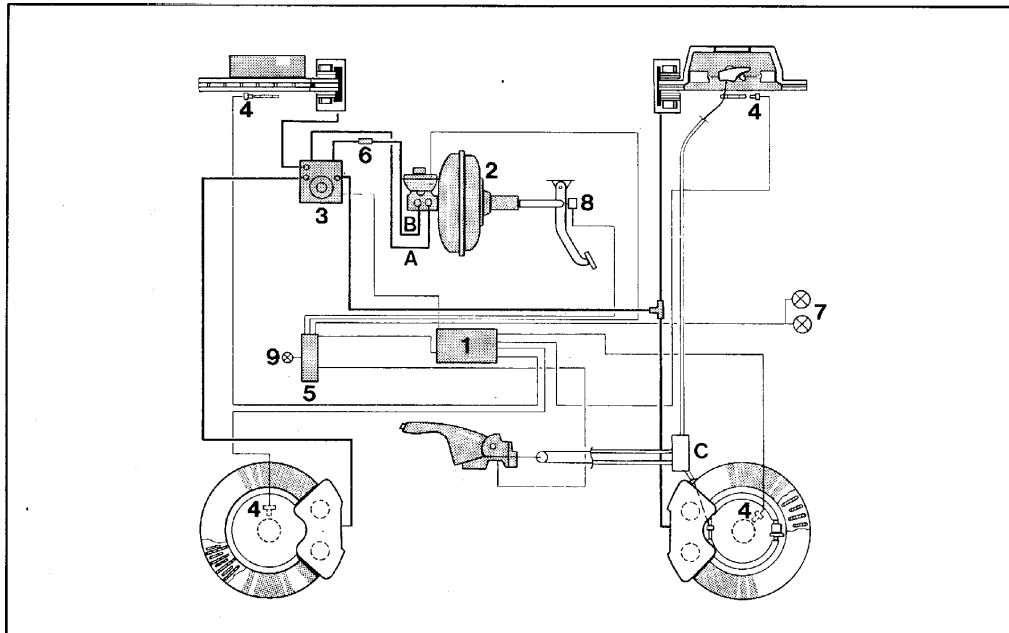
The ABS control module receives a signal from the stoplight switch and the AC voltage signals from the four speed sensors. These signals are converted into digital wheel-speed signals independently of each other by two microprocessors. The wheel slip (approximately proportional to the computed vehicle reference speed) is formed from these wheel-speed signals.

If vehicle deceleration and excess slip are detected at a wheel, the pressure-holding phase is initiated as the first step, i.e. the inlet valve for the relevant wheel is closed to prevent a further increase in pressure. If in spite of the pressure being held constant the wheel tends to continue to locking up, the pressure in the brake cylinder is reduced. For this purpose, the outlet valve is opened and the brake fluid is pumped back to the brake master cylinder via the return pump (pressure-reduction phase), until the wheel turns again. Then, depending on the control cycle, further appropriate cycles are initiated.

This function or the input signals are continuously monitored. If a fault is detected, the control module switches the ABS function off, switches on the ABS MIL and stores the fault in a non-volatile memory in the control module.

In addition, whenever a trip is begun and a speed of 6 km/h is exceeded, a test program is started. The solenoid valves and the pump motor are electrically actuated and checked. If a fault is detected, the control module switches the ABS function off, the ABS MIL is switched on and the fault is stored.

Diagram: ABS 5.3 (3-channel system)



»a-96

1 - ABS control module

2 - Brake unit (brake booster with tandem master brake cylinder)

3 - ABS hydraulic unit * (3 hydraulic outputs)

4 - ABS speed sensors

5 - Central Information System

6 - Brake proportioning valve (lx)

7 - Brake light

8 - Stop-light switch

9 - ABS MIL (yellow)

A = Front-axle braking circuit

B = Rear-axle braking circuit

C = Parking brake cable deflection box

Control module, hydraulic unit, pump motor relay and valve relay **form a unit**, which is located next to the master brake cylinder.

ABS/TC 5.3 (4-channel system) system description

Note

Traction Control (TC) represents an extension of the ABS system and is a combination of anti-slip control (ASR) and Automatic Brake Differential (ABD).

TC prevents spinning of the drive wheels when moving off and accelerating. Driving stability and traction are improved over the entire speed range.

Traction Control (TC) is ready for operation when ever the engine is started.

The TC information lamp in the instrument panel is lit during a control process and warns **that the driving style must be adapted to road conditions.**

Function.

Driving stability control:

If Traction Control (TC) detects that a certain speed difference between the wheels has been exceeded (wheel-spin), engine power is automatically reduced.

Brake control:

In addition to reducing the engine power (driving stability control), the TC (via the ABD) brakes the drive wheel that is spinning.

Since this control requires the drive wheels to be individually controlled the ABS/TC system is a **4-channel system.**

Switching off driving stability control

Press the "TC OFF" logo of the rocker switch. Driving stability control cannot be switched off during a TC control process (information light on).

One-sided wheel speed on the drive axle is further prevented by brake control up to a speed of 100 km/h.

Driving stability is not monitored, since the drive wheels can start to spin at the same speed (slip).

With driving stability control switched off, the TC MIL in the instrument panel and the indicator light in the rocker switch are lit.

It can be advantageous to switch off driving stability control:

- on a loose surface and in deep snow
- when "rocking" the vehicle free
- when using snow chains.

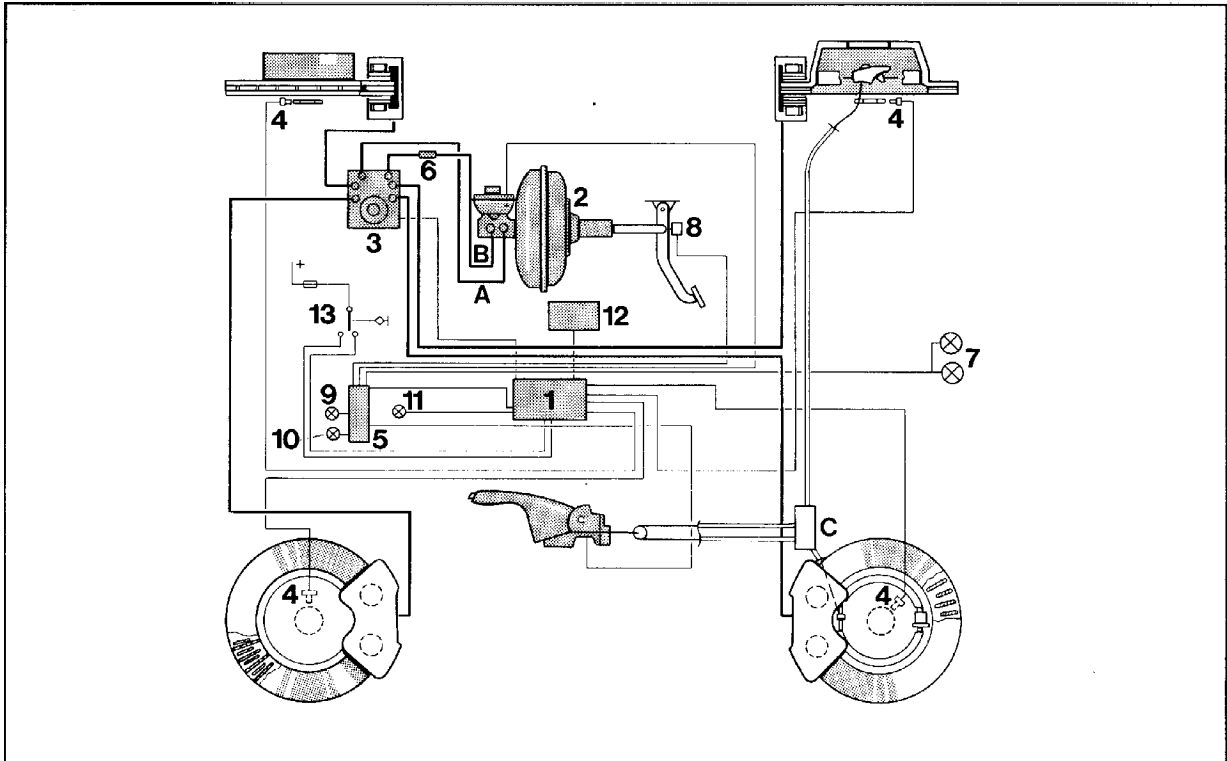
Switching driving stability control back on *

Press the indicator light in the rocker switch.

Driving stability control cannot be switched on again during a TC control process (information light on).

Press the switch for at least 0.1 second. Then a further 0.3 seconds will pass until the routine is complete. Only then is driving stability control switched off or on.

Diagram: ABS/TC 5.3 (4-channel system)



1 - **ABS/TC** control module

2 - Brake unit (brake booster with tandem master brake cylinder)

3 - **ABS/TC** hydraulic unit * (4 hydraulic outputs)

4 - ABS speed sensors

5 - Central Information System

6 - Brake proportioning valve (lx)

7 - Brake light

8 - Stop-light switch

9 - **ABS MIL** (yellow)

10 - **TC MIL** (TC/yellow)

11 - **TC function light** (green)

12 - **DME control module**

13 - TC rocker switch (see Page 45 D 10)

A = Front axle braking circuit

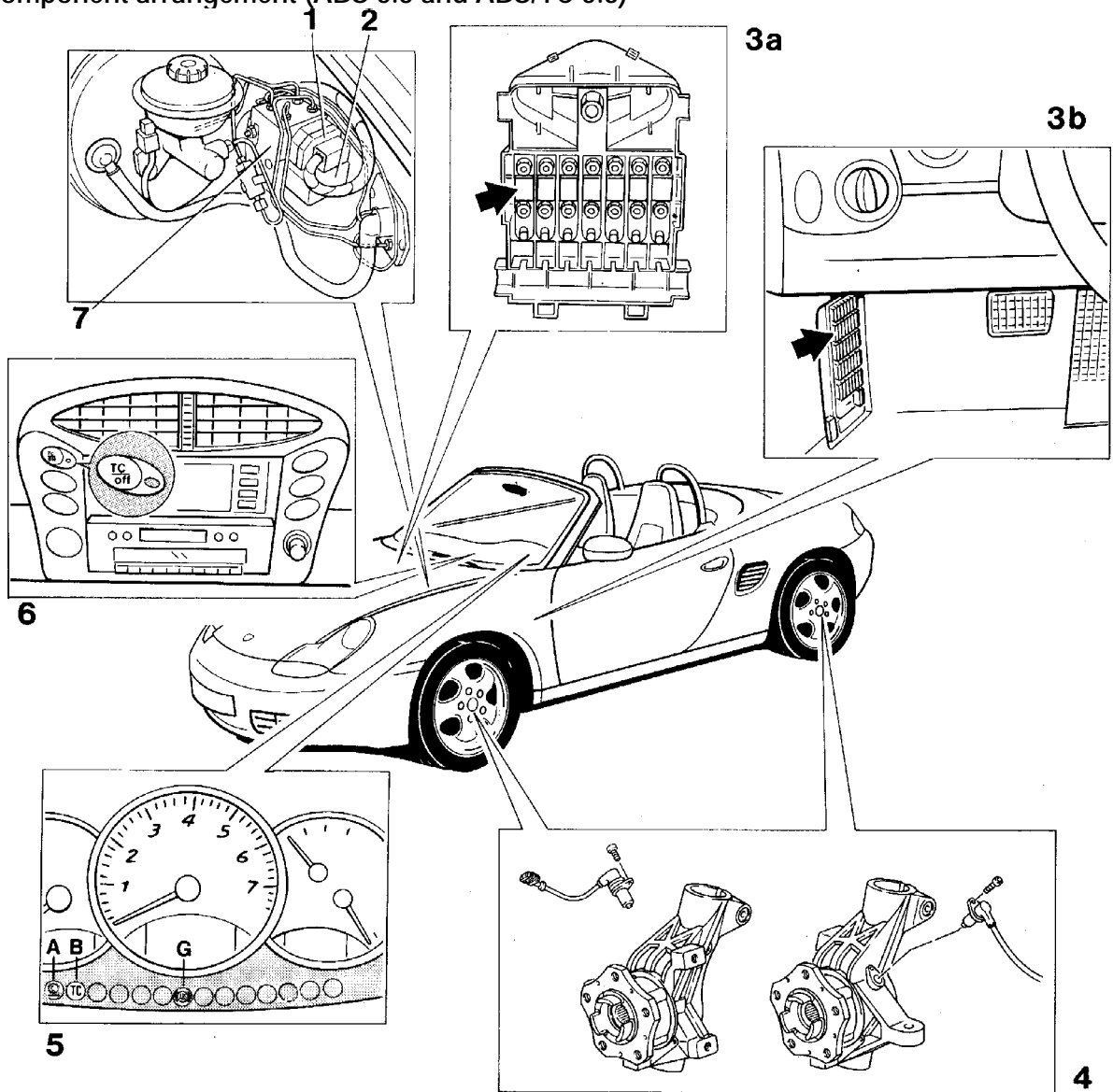
B = Rear-axle braking circuit

C = Parking brake cable deflection box

*

Control module, hydraulic unit, pump-motor relay and valve relay form a unit, which is located beside the master brake cylinder.

Component arrangement (ABS 5.3 and ABS/TC 5.3)



Function of individual components

1. Control module (ABS 5.3 and ABS/TC 5.3)

This module processes incoming signals and actuates the solenoid valves or/and the return pump in the hydraulic unit when wheel slip is excessive (see also System description). If the ABS or ABS/TC switches off when a system fault is **detected**, it activates the MIL and stores the fault in a non-volatile memory.

Note

The control module and relay are not supplied individually. In **the event** of replacement, the complete hydraulic unit must be replaced.

The relays cannot be exchanged.

When replacement is necessary, the complete hydraulic unit must be replaced.

3. Fuses

3a. A 50-A fuse in the current distributor (F1/arrow) protects the return pump and **the** solenoid valves.

The current distributor is located under the instrument panel. The fastening points are accessible from the luggage-compartment side.

Note

3b. The 15-A fuse F 2/9 (field 2, No. 9) on the central electrical board protects the control module's electrical supply (ABS and ABS/TC). The arrow points to field 2.

2. Relay

The solenoid valve relay is actuated by **the** control module(closes) as soon as the control module receives voltage from the generator (D+ / terminal 61).

As soon as the relay has closed (picked up), battery positive voltage (terminal 30)is present at **the** valve coils of all solenoid valves in the hydraulic unit.

If the ABS or the TC (ABD) begins to control, **the** control module applies negative voltage to the appropriate valve coil of the valve to be controlled at the appropriate wheel.

The return pump relay is actuated (with **a negative** voltage) by the control module if required, and closes.

As soon as the relay has closed/ picked up, battery positive voltage (terminal 30)is applied to **the** return pump, which then runs.

On vehicles with Traction Control (TC), **the**

1 5-A fuse F 2/1 (field 2, No. 1) on the central electrical board protects the supply to **the** "TC OFF" rocker switch (switch for switching driving stability control on and off).

4. Speed sensors

The speed sensors provide wheel speed information (speed information for each wheel) to **the**

control module. These speed sensors operate according to the inductive principle, in which sinusoidal alternating voltages are generated in accordance with the number of teeth on a pulse wheel and at a frequency that is a measure of the wheel speed.

5. MIL and information lights Note

A = TC information light (see Page 45- D 10)

B = TC MIL (see Page 45- D 10) G = ABS MIL (see Page 45- D 10)

Information light for TC (A)

- Lights for a lamp check when the ignition is switched on

Indicates a control process (even when driving stability control is switched off).

MIL for TC (B)

Lights in combination with the indicator light in the rocker switch (TC OFF) for a lamp check when the ignition is switched on.

In combination with the indicator light in the rocker switch, indicates that driving stability control is off.

- Indicates defect: TC is out of order

Lights together with the ABS MIL if there is an ABS fault

6. TC (OFF) rocker switch with light

Switching driving stability control on and off.

The rocker switch has one contact for switching off and another for switching on.

To switch off, press the "TC OFF" logo on the rocker switch. This applies a positive voltage to the control module while the switch is pressed. This switches off driving stability control. Driving stability control cannot be switched off during a TC control process (information light on).

When driving stability control is off, the TC MIL in the instrument panel and the indicator light in the rocker switch are lit. To switch on driving stability control, press the indicator light in the rocker switch. This applies a positive voltage to the control module while the switch is pressed. This switches on driving stability control.

Driving stability control cannot be switched back on during a TC control process (information light on),

Driving stability control is ready for operation, (i.e. is switched on automatically, whenever the engine is started.)

MIL for ABS (G)

- Lights up for a lamp check when ignition is switched on.

If the ABS MIL lights up **with the engine running**, the ABS has switched off due to a fault.**7. Hydraulic unit**

The hydraulic unit essentially consists of fast-switching electromagnetic valves and a return pump. Regardless of the pressure in the master brake cylinder, the hydraulic unit can change the fluid pressure to the wheel brake cylinders (holding or reducing pressure). Increasing the pressure above that of the master brake cylinder is not possible, however.

The ABS 5.3 hydraulic unit has three hydraulic outputs (3-channel system) and six electromagnetic valves (three inlet and three outlet valves).

The ABS / T C 5.3 hydraulic unit has four hydraulic outputs (4-channel system) and ten electromagnetic valves (four inlet valves / four outlet valves, one switch-over valve and one intake valve).

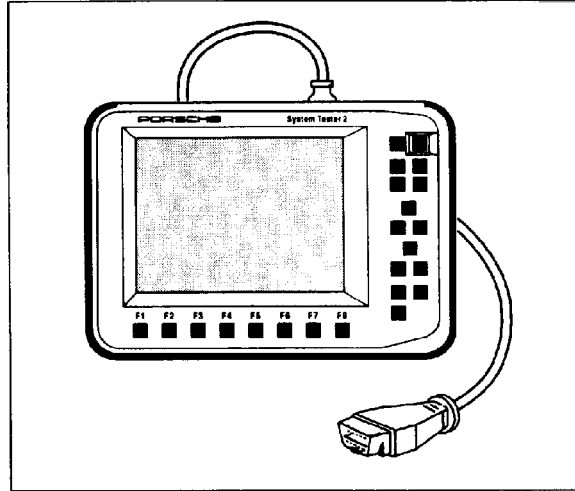
The intake and the switch-over valves are required so that the return pump can perform **two tasks**:

- I. Return flow to the master brake cylinder (pressure reduction during ABS control).
- II. Supply (pressure increase) to the right.or left rear-wheel brake cylinder during **TC control (ABD control)**.

In the case of **ABS control** at the rear axle, the solenoid valves for both rear wheels are actuated in parallel (joint control as in Solo ABS control (3-channel system)).

Tools

1. Porsche System Tester 2 with integrated digital multimeter.



54768

2. When performing measurements on the control module connector with a multimeter, use measuring leads (e.g. commercially available leads from Messrs. Bosch or shop-made leads) in order to avoid damaging the contacts in the control module connector.

Normal pins:

1 to 2 measuring leads with 2.5 mm flat connectors.

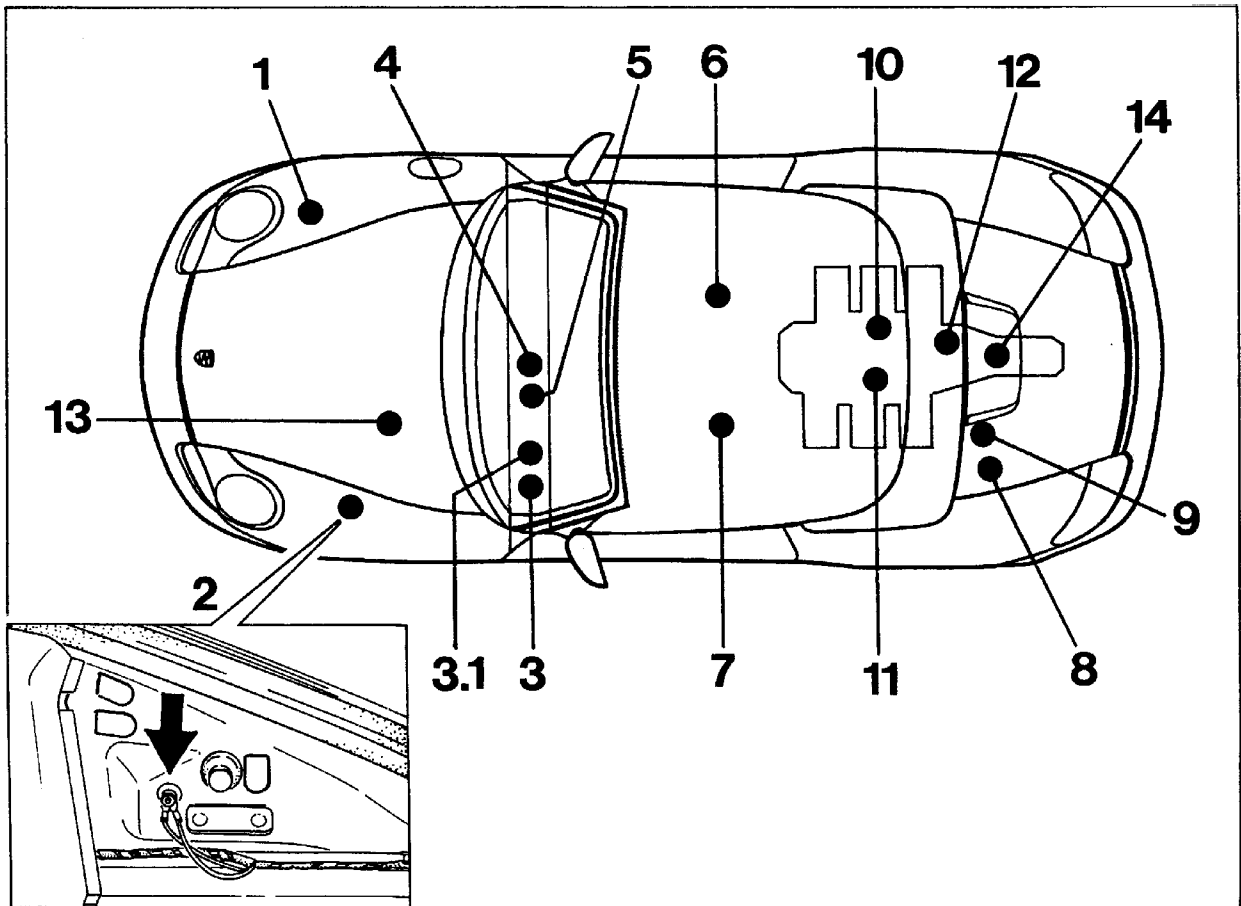
Mini pins:

1 to 2 measuring leads with 1.6 mm flat connectors.

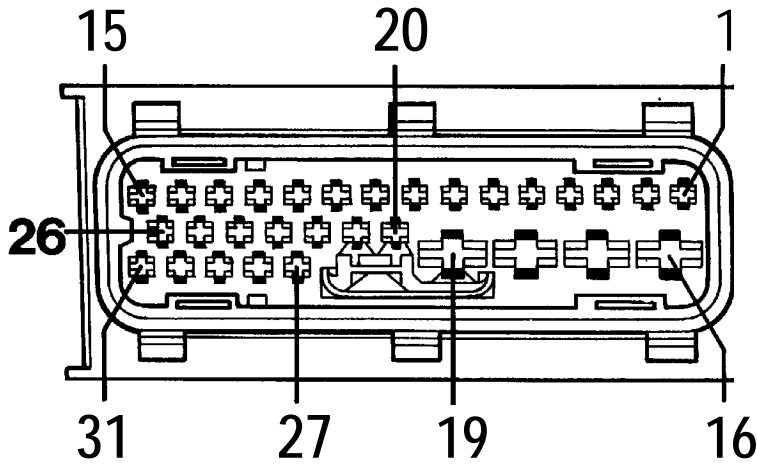
Ground points

Notes

- Ground point 5 = Electronics ground.
- Ground point 13 = Battery ground.
- Ground point 14 = Body/engine ground.
- Important ground points for ABS and ABS/C: Ground point 2 (on the left in the front luggage compartment) and ground point 5 (electronics ground).



Connector assignment, control module (ABS and ABS/TC)



- 1 - Ground from speed sensor, rear right
- 2 - Signal from speed sensor, rear right
- 3 - Free
- 4 - Ground from speed sensor, front right
- 5 - Signal from speed sensor, front right
- 6 - Ground from speed sensor, front left
- 7 - Signal from speed sensor, front left
- 8 - Ground from speed sensor, rear left
- 9 - Signal from speed sensor, rear left
- 10 - D +, terminal 61
- 11 - Mine from diagnosis
- 12 - TC OFF from rocker switch (activation with positive voltage)
- 13 - Signal to the DME control module (set-point engine torque / MMR)
- 14 - Stop-light switch signal
(vehicle voltage when brake actuated)
- 15 Control module power supply (terminal 15 / from fuse F2/9)
- 16 - Ground
- 17/18 - Voltage for return pump relay and valve relay

- 19 - Ground
- 20 - Activation of TC MIL (ground)
- 21 - Activation of ABS MIL (ground)
- 22 - TC switch indicator lamp (activation by ground) Output signal (speed sensor, rear left) to the instrument cluster (speedometer signal) and to the DME
- 23- Activation of TC information lamp(ground)
- 24- On Tiptronic vehicles = output signal (speed sensor, front left) to the Tiptronic control module
- 25- On Tiptronic vehicles = Output signal (speed sensor, front right) to the Tiptronic control module
- 27* Signal from the DME control module (actual engine torque / MMI)
- 28* Signal to the Tiptronic-control module during TC control, for activation of a specific Tiptronic map
- 29- Free
- 30* Signal from the DME control module (engine speed) (Vehicles with Traction Control)
- 31" - TC ON from the rocker switch (activation with positive voltage)

Fault overview / troubleshooting (diagnosis / test plan)

Test point DTC		Fault display (brief fault text)
1	4607	Control module faulty
2	4206	Front lee speed sensor, signal implausible
3	4201	Front right speed sensor, signal implausible
4	4211	Rear right speed sensor, signal implausible
5	4216	Rear lee speed sensor, signal implausible
6	4205	Front lee speed sensor wire*
7	4200	Front right speed sensor wire *
8	4210	Rear right speed sensor wire *
9	4215	Rear lee speed sensor wire *
10	4256	Control module faulty **
10	4261	Control module faulty **
10	4226	Control module faulty **
10	4231	Control module faulty **
10	4246	Control module faulty **
10	4251	Control module faulty **
10	4236	Controlmodule faulty **
10	4241	Control module faulty **
11	4276	Valve supply voltage
12	4266	Return pump fault
13	4340	Stop-light switch
14	4225	Wrong gear wheel
15	4802	Undervoltage

* Open circuit / short to ground / short to B+

** ABS solenoid valve fault. As only the complete hydraulic unit with control module can be replaced, a solenoid valve fault is interpreted as a control module fault.

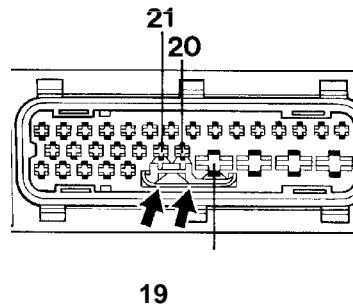
Test point DTC Fault display (short fault text)

16	5260	Intake Valve
17	5265	Switch-over valve
18	5281	Version coding
19	5282	Electrical connection between ABS/TC and Tiptronic
20	5283	Engine rpm information missing
21	5284	Electrical connection between TC and DME (MMI)
22	5285	Electrical connection between TC and DME (MMR)
23	5286	Fault stored in DME control module

The ABS MIL or TC MIL can light up although no fault is stored in the fault memory. The following faults are possible in this case:

- Mechanical switching contacts (arrows) in the control module connector bent. As a consequence, these contacts are permanently connected to ground (ground of PIN 19 connected to PIN 20 and PIN 21).

Explanation: Normally, these contacts are grounded only when the connector is pulled off. This causes the ABS MIL or the TC MIL to be activated when the engine is running.



540/1-95

When the engine is running, the "terminal 61" signal is missing at the control module. This can be checked with the Porsche System Tester 2 via the **Input signals** menu

Work after fault elimination

The fault memory must be erased after a fault occurs in the anti-lock brake system and is eliminated. Then perform a short **test drive and perform a TC control operation, taking the road conditions into consideration. Then read out the fault memory again.**

Fill/bleed the system after the hydraulic unit has been replaced or removed and reinstalled. **Then perform a system test.**

Fault, DTC

Possible causes, elimination, notes

Test point 1

Control module faulty

If "Control module faulty" is displayed in combination with

DTC 4607, 4226, 4231, 4236, 4241, 4246, 4251, 4256, or 4261

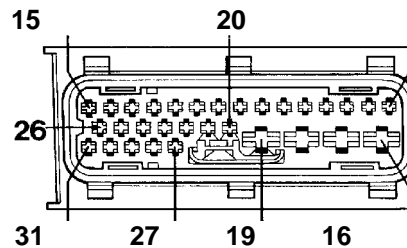
- If the control module is damaged, the complete hydraulic unit with integrated control module must be replaced. **Important:** Before replacing the hydraulic unit, check whether:

there are voltage differences due to contact resistance (missing or poor ground connections).

Important:

Poor ground connections can be present not only on the affected parts, but also at other important ground points.

- ground is connected to control module connector PIN 16 (from ground point 2) and PIN 19 (from electronics ground). The locations of the ground points are shown on the wiring diagram Ground points.
- positive voltage (vehicle voltage) is connected to control module connector PIN 17 and PIN 18.



Fault DTC

Possible causes, elimination, notes

Test point 2

Front left speed sensor, signal implausible

DTC 4206

Control module receives a false/ unrealistic speed sensor signal.

Procedure

Check the speed sensor signal with the System Tester 2 via the "Actual values" menu. To do this, call up the front left wheel speed.

Two tests are possible here.

Test 1 with raised vehicle.

(Swap of speed sensors and test of the speed sensor signal quality). Test 2 with vehicle driving straight at approx. 2-4 km/h. (Comparison of wheel speed signal qualities with each other). Test 2 is a better measure of the signal quality than is test 1.

Further to test 1

To perform the test, manually rotate the lee front wheel at a speed of approx. 2- 3 km/h (observe display in the Tester screen). Slowly increase the speed and simultaneously observe the speed in-crease (display).

Nominal values/require display

Speed steps of approx. 0.06 km/h. First display at 1.81 km/h. This means: From the value measured last, the next value must be 0.06 km/h higher or, if the wheel is rotating slower, must be 0.06 km/h lower.

The Tester rounds the value down to 0.05 km/h or up to 0.07 km/h in some cases.

Example	= 1.81 km/h
First measured value	
Second nominal value	= 1.87 km/h
Third nominal value	--1.93 km/h etc.

Fault DTC

Test point 3 Front right speed sensor, signal implausible

DTC 4201

Test point 4 Rear right speed signal, signal implausible **DTC 4211**

Test point 5 Rear left speed signal, signal implausible **DTC 4216**

Possible causes, elimination, notes Further to test 2

Display all four wheels in the Tester display.

Drive straight ahead at a uniform speed of approx. 2-4 km/h and have a second person observe • the Tester display.

Required display: Deviation between the wheel speeds of the four wheels max. 1 km/h.

Further details about tests 1 and 2 are given under "Actual values menu"

Possible faults (cause in the event of deviation)

Air gap between speed sensor and gear wheel (pulse wheel) too large or, due to wear (chip formation), too small (check installation).

Pulse wheel defective or corroded.

Wheel bearing damage (wheel bearing not adjustable).

Plug connection in wiring from the speed sensor to the control module or PIN on the control module connector not OK.

General procedure as for test point 2/diagnostic trouble code 4206 (check speed sensor signal with the Porsche System Tester 2).

Speed sensor signal: Go to the Actual values menu. There, select the front right wheel speed.

General procedure as for test point 2/diagnostic trouble code 4206 (check speed sensor signal with the Porsche System Tester 2).

Speed sensor signal: Go to the Actual values menu. There, select the rear right wheel speed.

General procedure as for test point 2/diagnostic trouble code 4206 (check speed sensor with the Porsche System Tester 2).

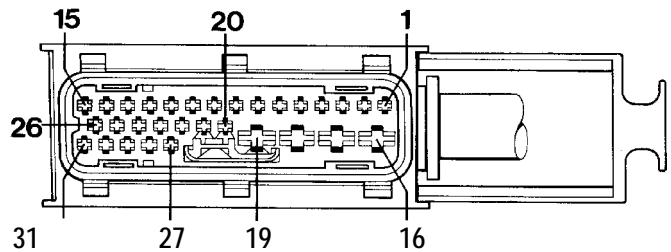
Speed sensor signal: Go to the Actual values menu. There, select the rear left wheel speed.

Fault, DTC

Possible causes, elimination, notes

Wire/plug connection between control module and speed sensor not OK (open circuit, short to B± or short to ground) or the speed sensor itself is damaged.

- Check the speed sensor wire and plug connection in the wheel area for damage (visual inspection).
 - Check the speed sensor signal with the Porsche System Tester 2 via the Actual values menu (see test point 2/diagnostic trouble code 4206). If no speed is displayed when the left front wheel is turned, check the wiring from the control module connector to the speed sensor (following test step).
 - Pull off control module connector. Measure internal resistance/continuity between PIN 6 and PIN 7 on the connector (see connector assignment)
Nominal value 1600 - 1800 Ohms.
If the nominal value is not achieved, check wires and plug connection in the wiring from the front left speed sensor.
If the nominal value (1600...1800 Q) is not achieved although the wiring / plug connection is OK, replace the speed sensor.



- Check PIN 6 and PIN 7 of the control module connector (visual inspection for deformation).

Test point 6

Front left
speed sensor, open circuit/ short to ground/
short to B+ **DTC 4205**

Fault DTC Possible causes, elimination, notes**Test point 7**

Front right speed sensor,
open circuit short to ground/ short to B+
DTC 4200

General procedure as for test point 6/diagnostic trouble code 4205.

Speed sensor signal: Check with the Porsche System Tester 2 via the Actual values menu (call up front right wheel speed).

Internal resistance/continuity between PIN 4 and PIN 5 on the control module connector.

Test point 8

Rear right
speed sensor,
open circuit
short to ground short to B+ **DTC 4210**

General procedure as for test point 6/diagnostic trouble code 4205.

- Speed sensor signal: Check with the Porsche System Tester 2 via the Actual values menu (call up rear right wheel speed).

- Internal resistance/continuity between PIN 1 and PIN 2 on the control module connector.

Test point 9 Rear left

Speed sensor, open circuit / short to ground/ short to B+
DTC 4215

General procedure as for test point 6/diagnostic trouble code 4205.

Speed sensor signal: Check with the Porsche System Tester 2 via the Actual values menu (call up rear left wheel speed).

Internal resistance/continuity between PIN 8 and PIN 9 on the control module connector.

Fault, DTC

Possible causes, elimination, notes

Test point 10

Control module faulty:
**fault. DTCs 4226, 4231, 4236,
4241, 4246, 4251, 4256, 4261**

Actual fault: ABS solenoid valve

The System Tester 2 can be used to check the function of the ABS solenoid

If the control module or ABS solenoid valves are damaged, the complete hydraulic unit with integrated control module must be replaced. **Important:** Before replacing the hydraulic unit, check whether:

ground is connected to control module connector PIN 16 (from ground point 2) and PIN 19 (from electronics ground). The locations of the ground points are shown on the wiring diagram Ground points.

(vehicle voltage) is connected to control module connector PIN 17 and PIN 18.

Use the System Tester 2 to test the function of the ABS solenoid valves via the Drive links menu (reaction at the front left, front right, rear left and rear right wheels).
If **the reaction is not** OK, (check the hydraulic location test below).

Allocation test using example of left front wheel:

In the Drive links menu sub-menu **Reduce pressure, front left**, the left front wheel must alternately lock up and then rotate freely (also see P. 45- D 35/36).

The allocation is wrong if the activated wheel does not alternately lock up and rotate freely again, but a **different wheel** does this in-stead.

The hydraulic unit must be replaced if the aforementioned drive link test is not .OK but the hydraulic lines are not swapped.

Test point 11

Valve supply
voltage
DTC 4276

The System Tester 2 can be used to determine whether the valve relay has picked up or dropped out. Select "Valve relay" in the Input signals menu. "Valve relay picked up" or "Valve relay dropped out" then appears in the Tester display.

Required display: Valve relay picked up.

If the control module connector was pulled off, first switch off the ignition before the test and then switch it on again, as the valve relay will otherwise not pick up.

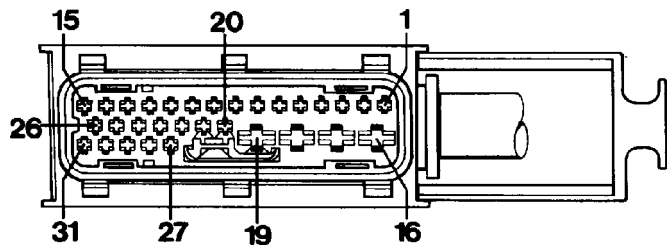
The valve relay also can be in the dropped-out state if there is another system fault. (ABS valve fault.)

The complete hydraulic unit with integrated valve relay must be replaced if the valve relay is damaged.

Important: Before replacing the hydraulic unit, check whether:

ground is connected to control module connector PIN 16 (from ground point 2) and PIN 19 (from electronics ground). The locations of the ground points are shown on the wiring diagram Ground points.

- plus (vehicle voltage) is connected to control module connector PIN 17 and PIN 18.



540-98

- If all test steps are OK, **replace the hydraulic unit.**

Fault, DTC

Test point 12

Return pump fault
4266

Possible causes, elimination, notes

No feedback signal (return-pump monitoring) to the control DTC

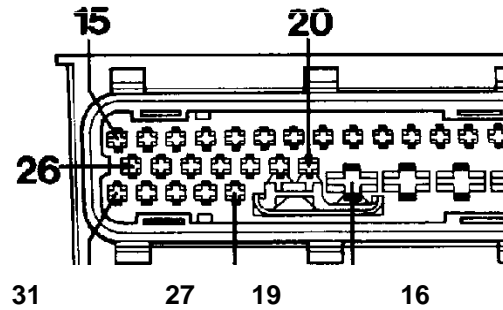
The Porsche System Tester 2 can be used to test the function of the re-turn pump via the Drive links menu.

To do this, call up the return pump in the Drive links menu and activate the pump (required function: return pump runs).

The complete hydraulic unit must be replaced if the return pump is damaged.

Important: Before replacing the hydraulic unit, check whether:

- ground is connected to control module connector PIN 16 (from ground point 2). The locations of the ground points are shown on the wiring diagram Ground points.
- plus (vehicle voltage) is connected to control module connector PIN 17 and PIN 18.

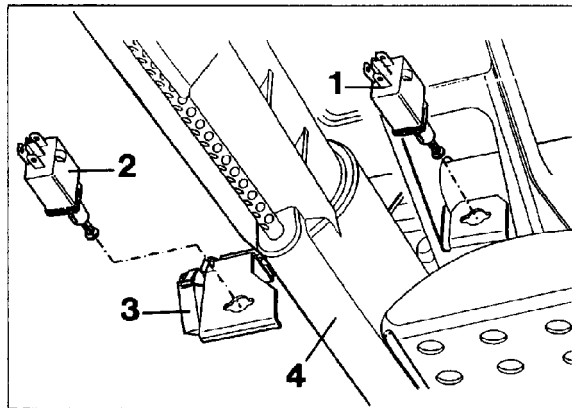


- the plug connection on the return pump is OK.

Fault, DTC

Possible causes, elimination, notes

- Check with the System Tester 2 via the **"Input signals"** menu. Press the brake pedal after selection of the stop-light switch. Required display: Display in screen changes from "not actuated" to "actuated".
 - Pull off wires on the stop-light switch (No. 1). Test the stop-light switch with a multimeter (remove switch for the test if necessary).



620/1-96

- Check stop-light switch adjustment (operating point) (see Volume 4, Running gear, repair group 46).
 - Check wiring according to the wiring .

Test point 14

Wrong gear wheel
DTC 4225

The ABS gear wheels possess 48 teeth. Not all 48 teeth are detected during a revolution of the wheel.

- Check ABS gear wheels (clamping pins on the front axle / pulse strip on the rear axle) for dirt or damage. Replace damaged parts.
- Check wheels and tires (extreme tire differences or impermissible wheel-tire combination).

Test point 13

Stop light switch **DTC 4340, 4802**
elimination

Fault DTC

Possible causes,

15

Undervoltage Control module supply voltage too low (less than 9.5 V).

Normally this fault occurs only when the engine is started in combination with a discharged battery.

Pull off the control module connector and measure the voltage between PIN 15 (plus) and PIN 19 (ground). **Nominal value: Vehicle voltage.**

- Check wiring and ground point in combination with the wiring diagram.

16

Intake valve

The complete hydraulic unit must be replaced if the intake valve is damaged -**DTC 5260** .

In the intake valve test with the Porsche System Tester 2, select Intake valve in the Drive links menu.

Perform the test according to the Tester instructions. If the functions specked in the Tester display: Rear axle locked up / Rear axle still locked/ Release (rear axle free) are not achieved, the following fauns are possible:

Test sequence not observed.

Inadequate bleeding of ABS secondary circuit, Function of the intake valve not OK.

Return pump operation not OK.

Check ABS pump operation. To do this, select return pump in the Drive links menu (pump must then run) Intake or switch-over valve leaks.

Fault DTC**Possible causes, elimination, notes****Test point 17**

switch-over valve

DTC 5265

The complete hydraulic unit must be replaced if the switch-over valve is damaged.

In the switch-over valve test with the Porsche System Tester 2, select switch-over valve in the Drive links menu and perform the test according to the Tester instructions

If the functions specked in the Tester display:

Rear axle locked up / Rear axle free are not achieved, the following fauns are possible:

Brake not actuated at the star of the test Test sequence not observed

Function of the switch-over valve not OK. Wrong version coding in the control module. Change coding.

The active transmission version (Tiptronic or manual transmission can be read out under menu item "Extract coding".

The ABS/TC control module can be adapted to the transmission version under menu item "Modify coding".

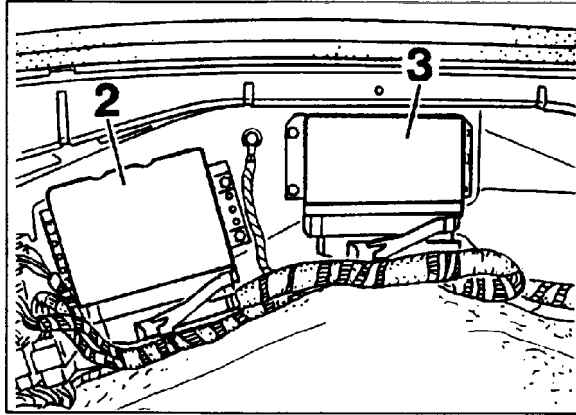
Test point 18 Version coding **Possible causes, elimination**
Fault DTC 5281

Tiptronic control module (No. 3) does not receive a signal from the ABS/TC control module.

- Check wire for open circuit, short to B+ and to ground (PIN 28 on the ABS/TC control module and PIN 19 on the Tiptronic control module).

The ABS/TC control module does not receive any speed information (rpm signal) from the DME control module (No. 2). The rpm signal is checked with the Porsche System Tester 2 via the Actual values menu.

- Check the rpm signal (indication of the current engine speed) via the Actual values menu with the engine running.
Then select the DME system and also check the rpm signal there via the Actual values menu. If the signal is present in the DME system but not in the ABS/TC system, the fault lies in the wiring between the ABS/TC control module and the DME control module.
- Check the wiring (wire, connectors on the control modules) (PIN-30 on the ABS/TC control module and PIN 80 on the DME control module).The ABS/TC control module does not receive any signal from the DME control module (No. 2) (actual engine torque).
- Check wire for open circuit, short to B+ and to ground (PIN 27 on the ABS/TC control module and PIN 58 on the DME control module).



Test point 19

Electrical connection between ABS/TC and Tiptronic
DTC 5282

Test point 20

Engine rpm information missing
DTC 5283

Test point 21

Electrical connection between TC and DME (MMI)
DTC 5284

Fault, DTC**Possible causes, elimination notes****Test point 22**

Electrical connection between DME control module does not receive any signal from the ABS/TC control module (set-point engine torque)

DTC 5285

Check wire for open circuit short to B+ and short to ground
(PIN 13 on the ABS/TC control module connector and PIN 48
on the DME control module connected)

Test point 23

Fault stored in the the fault readout memory in the DME control module and remedy
DME control module according to the DME test plan (DME troubleshooting).

Drive links (ABS and ABS/TC)

The following drive links can be activated with the System Tester 2 via the Drive links menu:

Drive links with Solo ABS MIL

Return pump

Front left ABS solenoid valves via: Maintain pressure, front left Reduce pressure, front left

Front right ABS solenoid valves via: Maintain pressure, front right Reduce pressure, front right

Rear ABS solenoid valves via: Maintain pressure, rear (rear axle Reduce pressure, rear (rear axle)

Drive links with ABS/TC ABS MIL

TC information light

TC switch indicator light Return pump

Intake valve **switch-over valve**

Front left ABS solenoid valves via: Maintain pressure, front left Reduce pressure, front left

Front right ABS solenoid valves via: Maintain pressure, front right Reduce pressure, front right

Rear left ABS solenoid valves via: Maintain pressure, rear left Reduce pressure, rear left

Rear right ABS solenoid valves via: Maintain pressure, rear right Reduce pressure, rear right

Important note

Drive links must be activated only when the vehicle is stationary.

In the solenoid valve test, it is possible to check both the function and the allocation (test to determine whether electrical or hydraulic lines are swapped).

If the selected drive link does not function or does not function correctly (reaction) after activation

with the Porsche System Tester 2, perform troubleshooting according to the test plan (troubleshooting list) in the following text.

Diagnosis / test plan (troubleshooting)

Further to front and rear ABS solenoid valves

(Maintain pressure and Reduce pressure)

The function of the solenoid valves or the return **Further to MILs and information light** pump is not OK. If a solenoid valve has a mechanical fault, the fault is not stored in the fault memory

The corresponding MIL or information light (depending on selection) does not flash. Hydraulic or electrical lines could be swapped.

- Check bulb.

Check wiring from the instrument cluster to the control module according to the wiring diagram.

Further to the return pump

Return pump does not run after activation.

If a fault is stored in the fault memory, first eliminate this fault.

Test step "Maintain pressure" not OK:

Brake pedal not pressed or not pressed at the right time.

Electrical or hydraulic lines swapped if the activated wheel locks up

Inlet valve faulty.

Test step "Reduce pressure" not OK: Brake pedal not actuated.

If the activated wheel does not alternately lock up and then rotate freely again but another wheel (precondition: the parking brake is not engaged and the selector lever of Tiptronic vehicles is in position "N"), the hydraulic lines are swapped.

Outlet valve faulty.

Perform troubleshooting analogous to test point 12 (diagnostic trouble code 4266)

Further to the intake and switch-over valves (solenoid valves for ABD)

Solenoid valves not OK (function or leakage. **Note**

A correct test on the ABS solenoid valves is possible only if there is no fault on an ABS inlet valve or ABS outlet valve.
Therefore, readout the fault memory beforehand and remedy this fault first if necessary.

Test step "Intake valve" not OK Test sequence not observed. Function of the intake valves not OK.

Return pump operation not OK.

Check ABS pump operation. To do this, select return pump in the Drive links menu (pump must then run).

ABS secondary circuit poorly bled. Bleeding

Intake or switch-over valve leaks. Test step "Switch-over valve" not OK

-Function of the switch-over valve not OK.

Actual values (ABS and ABS/TC)

The following actual values can be checked with this menu (with this function

Speed (wheel speed / test possible up to 18 km/h)

Front left speed sensor, Front right speed sensor, Left rear Speed,

Right rear speed sensor

Engine rpm (not present with Solo ABS) **Further to speed:**

Select, activate and call up the desired wheel using the arrow keys.

The wheel speed is displayed according to the wheel rpm.

All four wheels are displayed if all speeds are activated and called up.

Example (front left wheel)

Speed, front left 15.00 km/h
Procedure

Two tests are possible to determine the speed-sensor signal.

Test 1 with the vehicle raised.

(Swapping the speed sensors and checking the quality of the speed sensor signal.)

Test 2 when driving straight ahead at approx. 2- 4 km/h.

(signal qualities of the individual wheels are compared with each other) Test 2 is a **better** measure of the signal quality than is test 1.

Further to test 1

In order to perform the test, manually turn the left front wheel at a uniform speed of approx. 2- 3 km/h (observe display in the Tester screen). Slowly increase the speed while simultaneously observing the speed increase (dismay).

Nominal values/require display

Speed steps of approx. 0.06 km/h.

First display at 1.81 km/h.

This means: From the value measured last, the next value must be 0.06 km/h higher or, if rotating slower, must be 0.06 km/h lower. The Tester rounds the value down to 0.05 km/h or up to 0.07 km/h in some cases.

Example (all wheel)

Speed, front left Speed, front right Speed, rear left Speed, rear right

15.00 km/h	Example	-- 1.81 km/h
	First measured value	
	Second nominal value	-- 1,87 km/h
15.00 km/h	Third nominal value	-- 1,93 km/h

Note

When performing the test on the rear axle, lock up (hold) the opposite wheel.

Further to test 2

Display all four wheels in the Tester display.

Drive straight ahead at a uniform speed of approx. 2-4 km/h, and have a second person observe the Tester display.

Required display: Deviation between the four wheel speeds max. 1 km/h.

Further to engine speed:

Precondition: engine running. Display of the current engine speed.

Input signals, (ABS and ABS/TC)

The following input signals can be checked with

Further to signal terminal 61: this menu (with this function):

- Stop-light switch - Valve relay

- Return pump

- Signal, terminal 61

Further to the stop-light switch: Press the brake pedal

Required display: Change from "not actuated" to "actuated"

Further to the valve relay:

The following appears in the display panel if the ignition is switched on or the engine is running and if the system is intact: "Valve relay picked up".

Further to the return pump:

Display: Return pump not running (Display if the pump were running: Return pump running).

Required display:

with engine running - not present with engine running- present.

Further to the TC switch:

Required display without actuation: TC switch not actuated.

Required display, depending on actuation: Switching Traction Control off or on): TC switch

ON actuated or

TC switch OFF actuated.

Static test (ABS and ABS/TC)

Electrical test of the system (advance check, e.g. after replacement of the hydraulic unit or if connectors were pulled off).

Important: This is not a substitute for the system test, as no check for swapped electrical and hydraulic lines is performed.

Furthermore, the mechanical function of the solenoid valves is not tested.

If a fault is displayed perform troubleshooting with the diagnosis/test plan

Menu: Bleed (ABS/TC 5.3)

Bleeding

Important notes

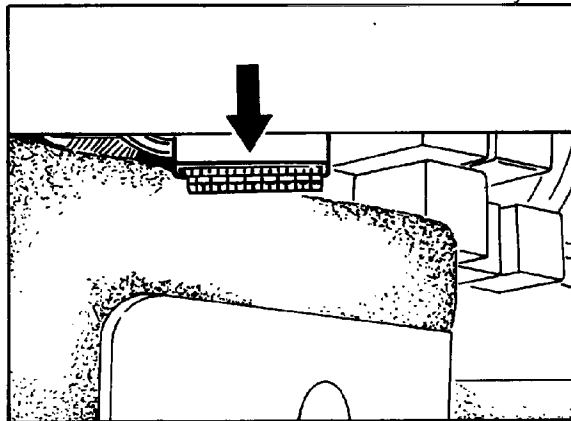
The Bleed menu is not available with the Solo ABS (it is not required).

On vehicles with Traction Control, this menu can be used to bleed the ABD secondary circuit in the hydraulic unit.

This additional bleeding is necessary **only** after **conventional** bleeding has been performed and only if the hydraulic unit is replaced or was removed. The secondary circuit also can be bled in the event that the brake pedal travel is too large if the system was properly bled by the conventional method beforehand.

Bleeding the ABS circuit

- Preparatory work: Bleed brakes by conventional method (repair group 47, Volume 4, Running gear).
- The bleeding unit remains connected (switched on) when the ABD circuit is being bled. Bleed pressure. 1.5.to 2.0 bar.
- Connect the **Porsche System Tester 2** to the diagnostic socket. The diagnostic socket is located in the driver's footwell (left-hand drive vehicles) or passenger's footwell (right-hand drive vehicles) near the fuse box. Switch on the ignition. Select the "Bleed" menu in the ABS/TC system.



12-96

- Open the rear right bleeder valve (use collection bottle).
- Press the Start key on the System Tester. This initiates certain functions in the hydraulic

unit (the return pump, outlet solenoid valve and the switch-over solenoid valve are activated).

Bleed the system until the brake fluid emerges without bubbles.

In addition (during the entire bleeding process), fully depress the brake pedal to the stop (pump) at least ten times.

Important: Double the number of pumping cycles for vehicles with extremely high mileage or for very old vehicles, and use only half of the master brake cylinder stroke (dam-age could be caused to the master brake cylinder / primary boots).